ROBOTICS

Product manual

IRB 1200



Trace back information:
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Skribenta version 5.6.019

Product manual

IRB 1200-5/0.9
IRB 1200-5/0.9 type A
IRB 1200-5/0.9 type B
IRB 1200-7/0.7
IRB 1200-7/0.7 type A
IRB 1200-7/0.7 type B
IRB 1200-7/0.9

IRC5, OmniCore

Document ID: 3HAC046983-001

Revision: AF

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Original instructions.

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Overview of this manual

About this manual

This manual contains instructions for:

- mechanical and electrical installation of the robot
- maintenance of the robot
- mechanical and electrical repair of the robot.

Usage

This manual should be used during:

- installation, from lifting the robot to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work and calibration.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

Maintenance/repair/installation personnel working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Product manual scope

The manual covers covers all variants and designs of the IRB 1200. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Contents
Safety, service	Safety information that must be read through before performing any installation or service work on robot. Contains general safety aspects as well as more specific information on how to avoid personal injuries and damage to the product.
Installation and commissioning	Required information about lifting and installation of the robot.
Maintenance	Step-by-step procedures that describe how to perform maintenance of the robot. Based on a maintenance schedule that may be used to plan periodical maintenance.
Repair	Step-by-step procedures that describe how to perform repair activities of the robot. Based on available spare parts.

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Continued

Chapter	Contents
Calibration	Calibration procedures and general information about calibration.
Decommissioning	Environmental information about the robot and its components.
Reference information	Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards, etc.
Spare parts and exploded views	Reference to the spare part list for the robot.
Circuit diagram	Reference to the circuit diagram for the robot.

References

Documentation referred to in the manual, is listed in the table below.

General

Document name	Document ID
Product manual, spare parts - IRB 1200	*3HAC046984-001*
Safety manual for robot - Manipulator and IRC5 or OmniCore controller [i]	*3HAC031045-001*
Circuit diagram - IRB 1200	*3HAC046307-003*
Technical reference manual - Lubrication in gearboxes	*3HAC042927-001*

[i] This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

IRC5 robots

Document name	Document ID
Product specification - IRB 1200	*3HAC046982-001*
Product manual - IRC5	*3HAC021313-001*
Product manual - IRC5 Compact	*3HAC047138-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Technical reference manual - System parameters	*Technical reference manual - System parameters*

OmniCore robots

Document name	Document ID
Product specification - IRB 1200	*3HAC081417-001*
Product manual - OmniCore C30 Type B	*3HAC097281-001*
Product manual - OmniCore C90XT Type A	*3HAC089065-001*
Product manual - OmniCore E10 Type A	*3HAC095278-001*
Operating manual - OmniCore (RobotWare 7)	*3HAC065036-001*
Operating manual - OmniCore (RobotWare 8)	*3HAC098383-001*
Operating manual - Integrator's guide OmniCore (RobotWare 7)	*3HAC065037-001*
Operating manual - Integrator's guide OmniCore (RobotWare 8)	*3HAC098381-001*
Technical reference manual - System parameters (RobotWare 7)	*3HAC065041-001*

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Document name	Document ID
Technical reference manual - System parameters (RobotWare 8)	*3HAC098390-001*

Revisions

Revision	Description
-	First edition.
A	Changes made in this revision: • Information added about removal of axis-4 mechanical stop and axis-4 FPC unit from housing extender unit, prior to replacing the radial sealing at the housing extender unit. See *Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 261*. • Information added about disconnecting and reconnecting the air hoses at the tubular, when replacing the axis-4 timing belt. See *Replacing the axis-4 timing belt on page 770*. • Information added about removing screws that fasten the fix sheet to the inner plastic guide inside housing, when removing axis-3 drive unit, see *Creating space for separation of upper and lower arm on page 697*. Information also added about refitting the same screws, throughout complete manual. • Information added about releasing the holding brakes prior to rotating axes manually, in calibration procedures, chapter *Calibration on page 837*. • Working range of axis 6 corrected from ±360° to ±400°, see *Working range on page 63*. • Information added about extra o-rings that are enclosed with the robot at delivery, see *Installation of extra O-ring on page 80* and *Installation of extra O-ring on page 116*. Also added to repair procedures, where needed. • Changed pin number for 24V connection, see *Manually releasing the brakes on page 76*.

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Continued

Revision	Description
B	Changes made in this revision: • Information regarding how to read the procedures in this product manual are updated, see *How to read the product manual on page 20*. • Information added about protection covers for water and dust proofing, see *Protection covers on page 46*. • Information added about transportation bracket that is used during shipping and transport and must be removed before lifting the robot, see *Transportation bracket on page 47* and *Attaching the roundslings on page 70*. • Timing belt tension of axis-4 and axis-5 motors changed from 13 N and 15 N to 26 N and 30 N, respectively, in repair procedures, chapter *Repair on page 171*. • Tightening torque of M3 screws used on plastic materials changed from 1.5 Nm to 0.3 Nm, in repair procedures, chapter *Repair on page 171*. • Total amount of grease used on axis-3 drive unit changed from 42 g to 32 g, see *Replacing the axis-3 drive unit on page 692*. • Information added about checking PTFE film before refitting the cable housing cover, see *Replacing the EIB/SMB unit on page 307*, *Replacing the axis-2 drive unit on page 668*, *Replacing the axis-3 drive unit on page 692*, and *Replacing the axis-4 timing belt on page 770*. • No need to remove and refit cable bracket when removing and refitting the cable package to the axis-1 sealing ring, see *Replacing the main cable package on page 185*. • No need to remove and refit connector plate when removing and refitting the axis-5 motor with pulley, see *Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 261*, *Replacing the axis-4 gearbox, drive shaft and pulley on page 715*, *Replacing the axis-5 motor with pulley on page 789*. • No need to remove and refit mechanical stop screw when removing the axis-4 mechanical stop, see *Replacing the axis-4 mechanical stop on page 481*. • Information modified about replacing motor bracket together with motor flange when removing and refitting the axis-4 motor, see *Replacing the axis-4 gearbox, drive shaft and pulley on page 715* and *Replacing the axis-4 motor with pulley on page 758*. • No need to remove tilt covers when replacing axis-5 drive unit, see *Replacing the axis-5 and axis-6 drive unit on page 809*.

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Revision	Description
C	Changes made in this revision • Flange sealing changed from *12340011-116 Loctite 574* to *3HAC026759-002 Sikaflex-521FC* for small cover on the housing, see *Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 261*. • Tightening torque for attachment screws on lifting accessories is changed from 40 Nm to 15 Nm. • Tightening torque for lower arm cable • Tightening torque for the axis-4 FPC unit attachment screws is changed from 1.5 Nm to 0.3 Nm. • Added a tightening torque for the attachment screws of the axis-1 calibration stop pin and the axis-1 calibration pin. • Added a caution note to keep a straight line when fitting the axis-1 calibration pin. • Article number of grease 3HAC031695-001 changed to 3HAC037302-001. • Total amount of grease for axis 2 and axis 5 changed from 80 g and 12 g to 60 g and 9 g, respectively, • Maximum revolution of axis 6 corrected to ±242°, see *Working range on page 66*. • Clean Room option added. • Food grade lubrication option added. • Spare part numbers for several gaskets (IP67) updated. • The base, the swing and the axis-1 sealing ring are updated due to IP67 improvements
D	Published in release R16.2. The following updates are done in this revision: • New standard calibration method introduced (Axis Calibration). See *Calibration on page 837*. • Information about grounding point is added, see *Grounding and bonding point on manipulator on page 116*. • Foundry Plus option added.
E	Published in release R17.1. The following updates are done in this revision: • A new standard IEC 61340-5-1:2010 added. See *Applicable standards on page 920*. • V-ring on axis-1 sealing ring version 3HAC058568-001 added as a spare part. • Notes added for spare part versions. See *Description of spare part versions on page 909*. • Information about Type B robots supporting SafeMove 2 added. • Plug on base added to options IP67 and Foundry Plus.

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Revision	Description
F	Published in release R17.2. The following updates are made in this revision: • Caution about removing metal residues added in sections about EIB/SMB boards. • Information about minimum resonance frequency added. • Bending radius for static floor cables added. • Updated list of applicable standards. • Article number for the Calibration tool box, Axis Calibration is changed. • Section *Start of robot in cold environments on page 122* added. • Tightening torque of screws securing the axis-5 and axis-6 drive unit updated. • Information about mechanically restricting the working range added. • Updated description about Clean Room class. • Label added to remind the fitting of extra o-ring for robots with protection class IP67 and with protection type Foundry Plus.
G	Published in release R18.1. The following updates are made in this revision: • Added sections in *General procedures on page 173* • Safety section restructured. • Note added to clarify the usage of the two M4 thread holes on the upper arm. • Added transportation bracket information for robots delivered with a force control package. • Updated extra o-ring fitting information for robots with protection type Clean Room and robots with food grade lubrication. • Note added to calibration chapter to emphasize the requirement of equally dressed robot when using previously created reference calibration values. • Information about myABB Business Portal added. • Spare part number of axis-4 gearbox shaft changed from 3HAC049631-001 to 3HAC044692-001.
H	Published in release R18.2. The following updates are made in this revision: • Added customer connection information. • Spare part information about axis-2 drive unit and axis-3 drive unit updated. • Updated axis-4 and -5 timing belt inspection procedure. • Added note for transportation bracket removal procedure.
J	Published in release R18.2. The following updates are made in this revision: • Updated references.
K	Published in release 19B. The following updates are made in this revision: • New touch up color Graphite White available. See *Cut the paint or surface on the robot before replacing parts on page 177*. • New article numbers for manipulator cables in section *Robot cables on page 114*.

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Revision	Description
L	Published in release 19D. The following updates are made in this revision: • Spare part version of axis-1 sealing ring updated. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. • Compatibility between cable harness and axis-1 sealing ring added. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. • Note added about the need to calibrate if the robot is other than floor mounted. See *When to calibrate on page 841*.
M	Published in release 20B. The following updates are made in this revision: • Clarified and added information in mounting instructions for rotating sealings, see *Mounting instructions for sealings on page 173*. • Clarified text about position of robot and added table with dependencies between axes during Axis Calibration. • Article number of Calibration tool box, Axis Calibration is changed from 3HAC062326-001 to 3HAC074119-001. • Replaced article number and name of grease, previously 3HAB3537-1. • Added information about Wrist Optimization in calibration chapter.
N	Published in release 20C. The following updates are made in this revision: • Flange sealing changed from 12340011-116 Loctite 574 to 3HAC026759-003 Sikaflex 521FC for tubular covers for robots with protection class IP67 and protection type Clean Room. • Updated the figure of customer connection information.
P	Published in release 20D. The following updates are made in this revision: • Added information about maintenance activity of robot overhaul.
Q	Published in release 21A. The following updates are made in this revision: • Added step about applying Loctite 243 to screws securing the cable housing cover on lower arm for robots with protection class IP67, protection types Clean Room and Foundry Plus and food grade lubrication.
R	Published in release 21B. The following updates are done in this revision: • Text regarding fastener quality is updated, see *Fastener quality on page 96*. • Text regarding diameter of air hoses is updated, see *Customer connections on page 119*.
S	Published in release 21D. The following updates are done in this revision: • Hygienic option added. • Controllers OmniCore C30, OmniCore C90XT and OmniCore E10 supported.
T	Published in release 22A. The following updates are done in this revision: • IRB 1200 Hygienic supported working with OmniCore C line controllers. See *Manipulator description on page 903*. • Added information about length of thread engagement for attachment screws. • Modified the replacing interval of the axis-6 sealing set on tool flange for Hygienic robots from 60000 operating hours to 6000 hours. • Updated information about Gleitmo treated screws, see *Screw joints on page 922*.

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Revision	Description
U	Published in release 22B. The following updates are done in this revision: • IRB 1200 Hygienic supported working with OmniCore E line controllers. See *Manipulator description on page 903*. • Updated wipe-down cleaning procedure for Hygienic robots. • Added cleaning instructions for robots with protection type Clean Room. • Updated the tightening torques for SMB connector screws and battery pack plate screws. • Updated spare part article numbers of main cable harnesses for IRB 1200 Type B.
V	Published in release 22C. The following updates are done in this revision: • Updated tightening torque for securing the seal ring unit on Hygienic robots. • Updated the extra O-ring label figure because the label is now available to all protection options of IP67, clean room, foundry plus, Hygienic and food grade lubrication. • Added maintenance activity of replacing axes 1-4 mechanical stops for Clean Room robots that have disinfection requirements. • Added disinfection instructions for Clean Room robots. • Updated spare part article numbers for swing, axis-2 sealing ring and axis-3 sealing ring. • Added robot description for new appearance design.
W	Published in release 23B. The following updates are done in this revision: • Added spare part Swing bracket transfer 3HAC044925-001 and tool Customer interface kit 3HAC082459-001. • Updated spare part article numbers of gasket on process hub, gasket for tubular cover and gasket for tubular cable housing cover.
X	Published in release 23C. The following updates are done in this revision: • Updated fitting note for M2 variseal sealing 3HAC044641-009 because it is not used with robots in protection class IP40. • Added a note to installation step of protection cover for turning disk for Foundry Plus robots. • Added the tightening torque required for the protective plug used on tilt unit.
Y	Published in release 23D. The following updates are done in this revision: • Added new robot variant IRB 1200-7/0.9. • Minor changes.
Z	Published in release 24B. The following updates are done in this revision: • Updated spare part article numbers and tightening torques of axis-2 sealing ring, axis-3 sealing ring and the sleeve on drive unit of axis-5 and axis-6.

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Revision	Description
AA	Published in release 24C. The following updates are done in this revision: • Added support for OmniCore C90XT Type A controller and removed information for C90XT. • IRB 1200-7/0.9 supported working with OmniCore C line controllers. See *Manipulator description on page 903*. • Updated spare part article number of M12 protector. • Changed locking liquid Loctite 243 to Loctite 2400. • Updated the spare part article numbers of Gasket for tubular cover, Gasket for tubular cable housing cover, and Housing cover gasket to support robots in different protection types. • Updated the spare part article number of Axis-1 sealing ring used for robots in different protection types. • Updated power cables for OmniCore from 3HAC061139-00x to 3HAC077245-00x. See *Robot cables on page 114*.
AB	Published in release 25A. The following updates are made in this revision: • Added information about expected component life working in L/H/P applications. • Updated cleaning instructions for Clean Room robots.
AC	Published in release 25.2. The following updates are made in this revision: • Added the section *Lubrication in gearboxes on page 926*. • Adding information about applying locking liquid to all the screws securing the covers for IP67, Clean Room, food grade lubrication, Hygienic and Foundry Plus robots. • Updated the spare part number and tightening torque of the sleeve on IP40 robots. • Updated cleaning instructions with more details for Clean Room robots.
AD	Published in release 25.3. The following updates are made in this revision: • Company name updated to reflect current legal entities. • Added support for OmniCore E10 Type A controller and removed information for E10. • Added a note to the amount of the lubrication grease used in axis-3 gearbox. • Updated the figure showing the wipe down and wash down areas for Hygienic robots.
AE	Published in release 26.1. The following updates are made in this revision: • Company name updated to reflect current legal entities. • Updated the figure illustrating the step of cutting cable strap on the battery pack for IRB 1200 Type B. • Added support for RobotWare 8. • Added support for OmniCore C30 Type B controller and removed information for C30 Type A. • Added information of timing belt measuring tool, dynamometer.
AF	Published in release 26B. The following updates are made in this revision: • Added caution and warning notes for cable connection. See *Robot cabling and connection points on page 114*. • Added testing activities for maintenance schedule.

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Product documentation

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.



Tip

All documents can be found via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Product manuals

Manipulators, controllers, DressPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Troubleshooting.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.

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- How to use the application.
- Examples of how to use the application.

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

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How to read the product manual

Reading the procedures

The procedures contain all information required for the installation or service activity and can be printed out separately when needed for a certain service procedure.

Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in the chapter *Safety on page 21*.

Illustrations

The product is illustrated with general figures that does not take painting or protection type in consideration.

Likewise, certain work methods or general information that is valid for several product models, can be illustrated with illustrations that show a different product model than the one that is described in the current manual.

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1 Safety

1.1 Safety information

1.1.1 Limitation of liability

Limitation of liability

Any information given in this manual regarding safety must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

The information does not cover how to design, install and operate a robot system, nor does it cover all peripheral equipment that can influence the safety of the robot system.

In particular, liability cannot be accepted if injury or damage has been caused for any of the following reasons:

- Use of the robot in other ways than intended.
- Incorrect operation or maintenance.
- Operation of the robot when the safety devices are defective, not in their intended location or in any other way not working.
- When instructions for operation and maintenance are not followed as intended.
- Non-authorized design modifications of the robot.
- Repairs on the robot and its spare parts carried out by in-experienced or non-qualified personnel.
- Foreign objects.
- Force majeure.

Spare parts and equipment

ABB supplies original spare parts and equipment which have been tested and approved for their intended use. The installation and/or use of non-original spare parts and equipment can negatively affect the safety, function, performance, and structural properties of the robot. ABB is not liable for damages caused by the use of non-original spare parts and equipment.

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1.1.2 Requirements on personnel

General

Only personnel with appropriate training are allowed to install, maintain, service, repair, and use the robot. This includes electrical, mechanical, hydraulics, pneumatics, and other hazards identified in the risk assessment.

Persons who are under the influence of alcohol, drugs or any other intoxicating substances are not allowed to install, maintain, service, repair, or use the robot.

The plant liable must make sure that the personnel is trained on the robot, and on responding to emergency or abnormal situations.

Personal protective equipment

Use personal protective equipment, as stated in the instructions.

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1.2 Safety signals and symbols

1.2.1 Safety signals in the manual

Introduction to safety signals

This section specifies all safety signals used in the user manuals. Each signal consists of:

- A caption specifying the hazard level (DANGER, WARNING, or CAUTION) and the type of hazard.
- Instruction about how to reduce the hazard to an acceptable level.
- A brief description of remaining hazards, if not adequately reduced.

Hazard levels

The table below defines the captions specifying the hazard levels used throughout this manual.

Symbol	Designation	Significance
	DANGER	Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in serious injury.
	WARNING	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in serious injury.
	ELECTRICAL SHOCK	Signal word used to indicate a potentially hazardous situation related to electrical hazards which, if not avoided, could result in serious injury.
	CAUTION	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in slight injury.
	ELECTROSTATIC DISCHARGE (ESD)	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in severe damage to the product.
	NOTE	Signal word used to indicate important facts and conditions.

Continues on next page

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1.2.1 Safety signals in the manual
Continued

Symbol	Designation	Significance
	TIP	Signal word used to indicate where to find additional information or how to do an operation in an easier way.

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1.2.2 Safety symbols on manipulator labels

Introduction to symbols

This section describes safety symbols used on labels (stickers) on the manipulator.

Symbols are used in combinations on the labels, describing each specific warning. The descriptions in this section are generic, the labels can contain additional information such as values.

> **Note**
>
> The symbols on the labels on the product must be observed. Additional symbols added by the integrator must also be observed.

Types of symbols

Both the manipulator and the controller are marked with symbols, containing important information about the product. This is important for all personnel handling the robot, for example during installation, service, or operation.

The safety labels are language independent, they only use graphics. See *Symbols on safety labels on page 25*.

The information labels can contain information in text.

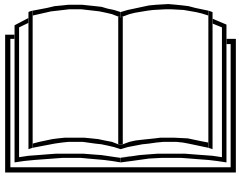
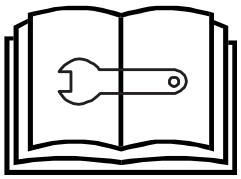
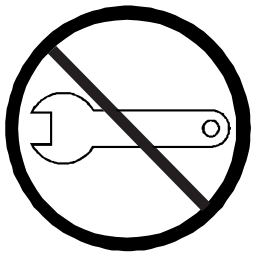
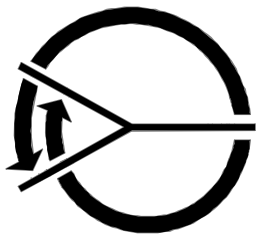
Symbols on safety labels

Symbol	Description
 xx0900000812	**Warning!** Warns that an accident *may* occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0900000811	**Caution!** Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0900000839	**Prohibition** Used in combinations with other symbols.

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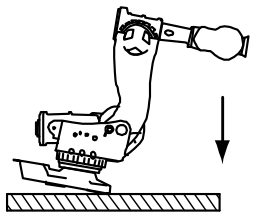
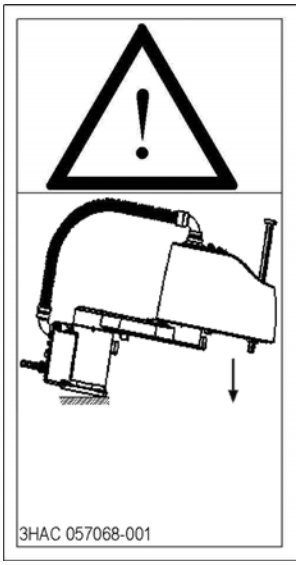
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1.2.2 Safety symbols on manipulator labels
Continued

Symbol	Description
 xx1400001152	Read the user manual before use.
 xx0900000813	**See user documentation** Read user documentation for details. Which manual to read is defined by the symbol: • No text: *Product manual*. • EPS: *Application manual - Electronic Position Switches*.
 xx0900000816	**Before disassembly, see product manual**
 xx0900000815	**Do not disassemble** Disassembling this part can cause injury.
 xx0900000814	**Extended rotation** This axis has extended rotation (working area) compared to standard.
 xx0900000808	**Brake release** Pressing this button will release the brakes. This means that the robot arm can fall down.

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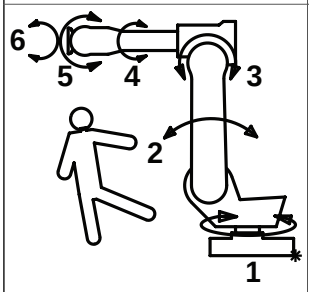
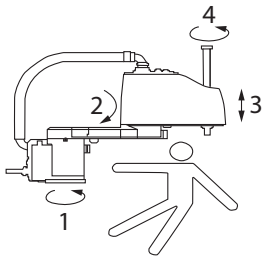
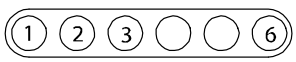
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Symbol	Description
 xx0900000810  xx1500002402	**Tip risk when loosening bolts** The robot can tip over if the bolts are not securely fastened.
  xx0900000817	**Crush** Risk of crush injuries.
 xx1400001151	Electrical shock

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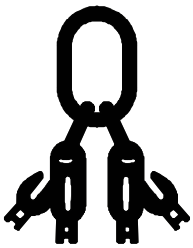
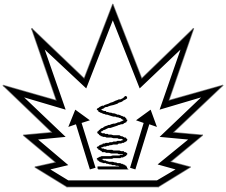
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1.2.2 Safety symbols on manipulator labels
Continued

Symbol	Description
 xx0900000818  xx1300001087	**Heat** Risk of heat that can cause burns. (Both signs are used)
 xx2400000736  xx1500002616	**Moving robot** The robot can move unexpectedly.
 xx0900000820  xx1000001140	**Brake release buttons**

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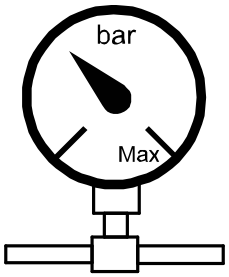
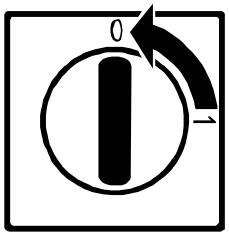
Symbol	Description
 xx0900000821	**Lifting bolt**
 xx1000001242	**Adjustable chain sling with shortener**
 xx0900000822	**Lifting of robot**
 xx0900000823	**Oil** Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	**Mechanical stop**
 xx1000001144	**No mechanical stop**
 xx0900000825	**Stored energy** Warns that this part contains stored energy. Used in combination with *Do not disassemble* symbol.

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1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx0900000826	**Pressure** Warns that this part is pressurized. Usually contains additional text with the pressure level.
 xx0900000827	**Shut off with handle** Use the power switch on the controller.
 xx1400002648	**Do not step** Warns that stepping on these parts can cause damage to the parts.

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1.3 Robot stopping functions

Protective stop and emergency stop

The protective stops and emergency stops are described in the product manual for the controller.

For more information see:

- *Product manual - OmniCore C30 Type B*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10 Type A*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

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1.4 Safety during installation and commissioning

National or regional regulations

The integrator of the robot system is responsible for the safety of the robot system.

The integrator is responsible that the robot system is designed and installed in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

The integrator of the robot system is required to perform a risk assessment.

Layout

The robot integrated to a robot system shall be designed to allow safe access to all spaces during installation, operation, maintenance, and repair.

If robot movement can be initiated from an external control panel then an emergency stop must also be available.

If the manipulator is delivered with mechanical stops (limiting devices), these can be used for reducing the working space. For OmniCore robots, safe supervision can be configured for the working space through software-based limiting.

A perimeter safeguarding, for example a fence, shall be dimensioned to withstand the following:

- The force of the manipulator.
- The force of the load handled by the robot if dropped or released at maximum speed.
- The maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the robot.

The maximum TCP speed and the maximum velocity of the robot axes are detailed in the section *Robot motion* in the product specification for the respective manipulator.

Consider exposure to hazards, such as slipping, tripping, and falling.

Hazards due to the working position and posture for a person working with or near the robot shall be considered.

Hazards due to noise emission from the robot needs to be considered.

Consider hazards from other equipment in the robot system, for example, that guards remain active until identified hazards are reduced to an acceptable level.

Allergenic material

See *Environmental information on page 900* for specification of allergenic materials in the product, if any.

Securing the robot to the foundation

The robot must be properly fixed to its foundation/support, as described in the respective product manual.

When the robot is installed at a height, hanging, or other than mounted directly on the floor, there will be additional hazards.

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Using lifting accessories and other external equipment

Ensure that all equipment used during installation, service and all handling of the robot are in correct condition for the intended use.

Electrical safety

Incoming mains must be installed to fulfil national regulations.

The power supply wiring to the robot must be sufficiently fused and if necessary, it must be possible to disconnect it manually from the mains power.

The power to the robot must be turned off with the main switch and the mains power disconnected when performing work inside the controller cabinet. Lock and tag shall be considered.

Harnesses between controller and manipulator shall be fixed and protected to avoid tripping and wear.

Wherever possible, power on/off or rebooting the robot controller shall be performed with all persons outside the safeguarded space.

Note

Use a CARBON DIOXIDE (CO_2) extinguisher in the event of a fire in the robot.

ELECTRICAL SHOCK

The controller mains power switch shall be disabled before connecting or disconnecting the controller power cable from the mains supply.

ELECTRICAL SHOCK

This equipment exhibits high earth leakage current. Consequently, a reliable protective bonding connection is mandatory. Installation must be performed in strict accordance with IEC 60204-1.

Note

The system integrator is responsible for the acceptance of the ON/OFF operating means color coding. The integrator shall ensure that the final machine complies with the identification and color coding requirements specified in IEC 60204-1.

Safety devices

The integrator is responsible for that the safety devices necessary to protect people working with the robot system are designed and installed correctly.

When integrating the robot with external devices to a robot system:

- The integrator of the robot system must ensure that emergency stop functions are interlocked in accordance with applicable standards.
- The integrator of the robot system must ensure that safety functions are interlocked in accordance with applicable standards.

Continues on next page

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Other hazards

A robot may perform unexpected limited movement.

> **WARNING**
>
> Manipulator movements can cause serious injuries on users and may damage equipment.

The risk assessment should also consider other hazards arising from the application, such as, but not limited to:

- Water
- Compressed air
- Hydraulics

End-effector hazards require particular attention for applications which involve close human collaboration with the robot.

Pneumatic or hydraulic related hazards

> **Note**
>
> The pressure in the complete pneumatic or hydraulic systems must be released before service and maintenance.
>
> All components in the robot system that remain pressurized after switching off the power to the robot must be marked with clearly visible drain facilities and a warning sign that indicates the hazard of stored energy.

Loss of pressure in the robot system may cause parts or objects to drop.

Dump valves should be used in case of emergency.

Shot bolts should be used to prevent tools, etc., from falling due to gravity.

All pipes, hoses, and connections have to be inspected regularly for leaks and damage. Damage must be repaired immediately.

Verify the safety functions

Before the robot system is put into operation, verify that the safety functions are working as intended and that any remaining hazards identified in the risk assessment are mitigated to an acceptable level.

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1.5 Safety during operation

Automatic operation

Verify the application in the operating mode manual reduced speed, before changing mode to automatic and initiating automatic operation.

Unexpected movement of robot arm



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

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1.6 Safety during maintenance and repair

1.6.1 Safety during maintenance and repair

General

ELECTRICAL SHOCK

The controller mains power switch shall be disabled before connecting or disconnecting the controller power cable from the mains supply.

Corrective maintenance must only be carried out by personnel trained on the robot.

Maintenance or repair must be done with all electrical, pneumatic, and hydraulic power switched off, that is, no remaining hazards.

Hazards due to stored mechanical energy in the manipulator for the purpose of counterbalancing axes must be considered before maintenance or repair.

Never use the robot as a ladder, which means, do not climb on the controller, manipulator, including motors, or other parts. There are hazards of slipping and falling. The robot might be damaged.

Make sure that there are no tools, loose screws, turnings, or other unexpected parts remaining after maintenance or repair work.

When the work is completed, verify that the safety functions are working as intended.

Hot surfaces

Surfaces can be hot after running the robot, and touching these may result in burns. Allow the surfaces to cool down before maintenance or repair.

Allergic reaction

Warning	Description	Elimination/Action
 Allergic reaction	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.

Gearbox lubricants (oil or grease)

When handling oil, grease, or other chemical substances the safety information of the respective manufacturer must be observed.

Note

Take special care when handling hot lubricants.

Continues on next page

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Warning	Description	Elimination/Action
 **Hot oil or grease**	Changing and draining gearbox oil or grease may require handling hot lubricant heated up to 90 °C.	Make sure that protective gear like goggles and gloves are always worn during this activity.
 **Allergic reaction**	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
 **Possible pressure build-up in gearbox**	When opening the oil or grease plug, there may be pressure present in the gearbox, causing hot lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling. Put oil absorbent cloth, bags or paper at appropriate locations to catch any oil residues. Use appropriate protective gear such as heat-resistant gloves, goggles/protective visor, or a body suit if necessary.
 **Do not overfill**	Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	Make sure not to overfill the gearbox when filling it with oil or grease. After filling, verify that the level is correct.
 **Specified amount depends on drained volume**	The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.	After filling, verify that the level is correct.

Hazards related to batteries

Under rated conditions, the electrode materials and liquid electrolyte in the batteries are sealed and not exposed to the outside.

There is a hazard in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. As a result under certain circumstances, electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow.

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.

Operating temperatures are listed in *Operating conditions, robot on page 56*.

See safety instructions for the batteries in *Material/product safety data sheet - Battery pack* (*3HAC043118-001*).

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1.6.1 Safety during maintenance and repair
Continued

Unexpected movement of robot arm



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

Related information

See also the safety information related to installation and operation.

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1.6.2 Emergency release of the robot axes

Description

In an emergency situation, the brakes on a robot axis can be released manually by pushing a brake release button.

How to release the brakes is described in the section:

- *Manually releasing the brakes on page 76*.

The robot may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar equipment.

Increased injury

Before releasing the brakes, make sure that the weight of the manipulator does not result in additional hazards, for example, even more severe injuries on a trapped person.

DANGER

When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways.

Make sure no personnel is near or beneath the robot.

Prerequsites for access to brake release buttons

Make sure that the brake release buttons on the manipulator are within reach and quickly accessible in case of emergency situations, even when the manipulator is installed on a height, on a wall, or suspended.

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1.6.3 Brake testing

When to test

During operation, the holding brake of each axis normally wears down. A test can be performed to determine whether the brake can still perform its function.

How to test

The function of the holding brake of each axis motor may be verified as described below:

1. Run each axis to a position where the combined weight of the manipulator and any load is maximized (maximum static load).
2. Switch the motor to the MOTORS OFF.
3. Inspect and verify that the axis maintains its position.

   If the manipulator does not change position as the motors are switched off, then the brake function is adequate.

Note

It is recommended to run the service routine *BrakeCheck* as part of the regular maintenance, see the operating manual for the robot controller.

For robots with the option SafeMove, the *Cyclic Brake Check* routine is recommended. See the operating manual for the robot controller.

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1.7 Safety during troubleshooting

General

When troubleshooting requires work with power switched on, special considerations must be taken:

- Safety circuits might be muted or disconnected.
- Electrical parts must be considered as *live*.
- The manipulator can move unexpectedly at any time.



DANGER

Troubleshooting on the controller while powered on must be performed by personnel trained by ABB or by ABB field engineers.



ELECTRICAL SHOCK

The controller mains power switch shall be disabled before connecting or disconnecting the controller power cable from the mains supply.

A risk assessment must be done to address both robot and robot system specific hazards.



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

Related information

See also the safety information related to installation, operation, maintenance, and repair.

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1.8 Safety during decommissioning

General

See section *Decommissioning on page 899*.

If the robot is decommissioned for storage, take extra precaution to reset safety devices to delivery status.

Unexpected movement of robot arm

WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.

WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

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2 Installation and commissioning

2.1 Introduction to installation and commissioning

General

This chapter contains assembly instructions and information for installing the IRB 1200 at the working site.

See also the product manual for the robot controller.

The installation must be done by qualified installation personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

The technical data is detailed in section *Technical data on page 53*.

Safety information

Before any installation work is commenced, all safety information must be observed.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter *Safety on page 21* before performing any installation work.

WARNING

Always connect the controller and the IRB 1200 to protective earth and residual current device (RCD) before connecting to power and starting any installation work.

For more information see:

- *Product manual - OmniCore C30 Type B*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10 Type A*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

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2.2 Unpacking

2.2.1 Extra O-rings

Installation of extra O-rings

For robots with protection class IP67

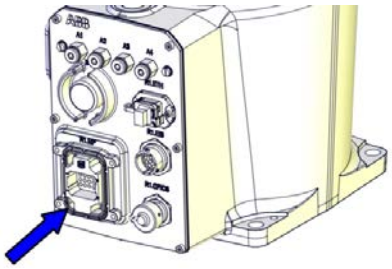
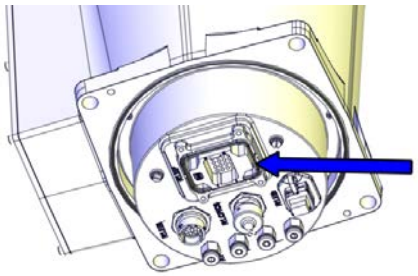
For robots with protection type Foundry Plus

For robots with protection type Clean Room

For robots with food grade lubrication

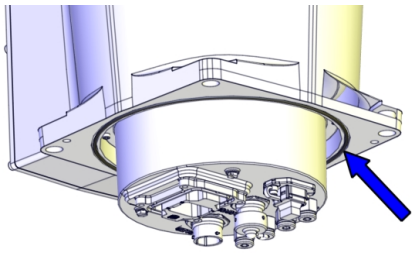
For robots with protection type Hygienic

Two extra O-rings are delivered together with the robot and must be fitted to the robot during installation.

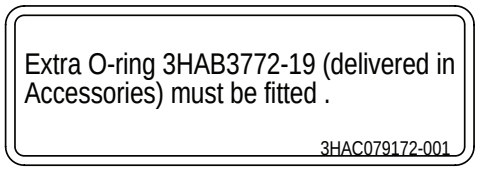
Equipment	Art. no.	Note
O-ring	3HAB3772-19	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used to seal between the main power cable and the connector. Robots with manipulator cables routed from the rear of the base:  xx1500000243 Robots with manipulator cables routed from below (option 996-1):  xx1500000242

Continues on next page

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Equipment	Art. no.	Note
O-ring	3HAB3772-141	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241

A label, as shown in the following, is fitted on the connector to remind the fitting of extra O-ring 3HAB3772-19. The label must be removed before the O-ring and main cable is fitted.



xx2100001272

Further information

For installation information, see *Orienting and securing the robot on page 79* and *Electrical connections on page 114*.

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2.2.2 Protection covers

Protection covers for water and dust proofing

For robots delivered with option 803-2 Ethernet, Parallel, Air (IRC5)

For robot delivered with option 3303-2 Ethernet, Parallel, Air (OmniCore)

A dust cap and two protectors are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

Equipment	Art. no.	Note
Dust cap	3HEA800897-002	Used to cover unused connectors for water and dust proofing. Replace if damaged.
M12 protector	3HAC073531-001	Used with option 803-2 (IRC5) or option 3303-2 (OmniCore). Used to cover unused connectors for water and dust proofing. Replace if damaged.
RJ 45 protector	3HAC047539-001	Used with option 803-2 (IRC5) or option 3303-2 (OmniCore). Used to cover unused connectors for water and dust proofing. Replace if damaged.

Protection covers for Foundry Plus robots

For robots with protection type Foundry Plus

Extra protection covers, sealing and plugs are delivered together with Foundry Plus robots and must be fitted to the robot during installation.

Equipment	Art. no.	Note
Protection bracket for CP/CS connectors	3HAC058350-001	Used with protection type Foundry Plus. Replace if damaged.
Protection cover for axis-6 turning disk	3HAC044666-001	Used with protection type Foundry Plus. Replace if damaged.
T40 variseal sealing	3HAC044641-012	Used with protection type Foundry Plus. Replace if damaged.
Protection plug for lifting holes	3HAC4836-24	Used with protection type Foundry Plus. Replace if damaged.

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2.2.3 Transportation bracket

Location of the transportation bracket

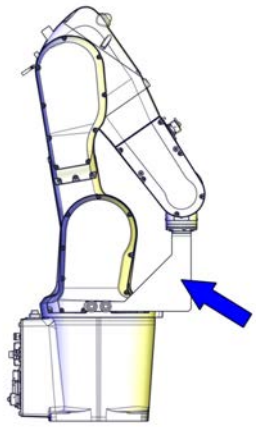
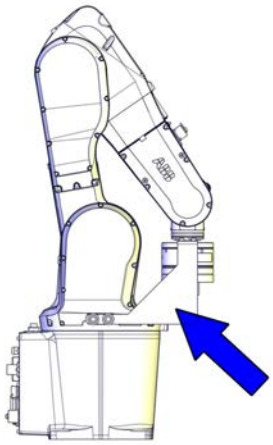
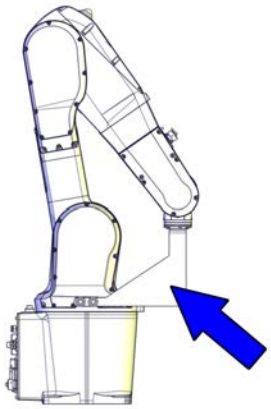
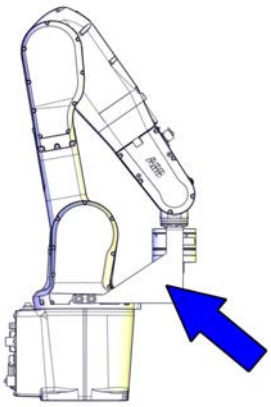
A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

Note

For robots delivered with option 636-1 Force Control Package (IRC5)

For robot delivered with option 3038-1 Force Control Interface (OmniCore)

The transportation bracket is installed on the force sensor.

IRB 1200-7/0.7		IRB 1200-5/0.9 and IRB 1200-7/0.9	
Without force control package	**With force control package**	**Without force control package**	**With force control package**
 xx1500001605	 xx1800000004	 xx1800000003	 xx1800000002
3HAC051896-001	3HAC064317-001	3HAC051897-001	3HAC064318-001

Removing the transportation bracket

Use this procedure to remove the bracket.

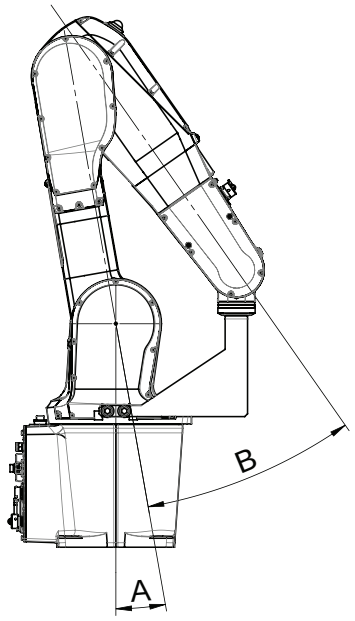
Note

The bracket must be kept for reuse after removal. Once robot shipping and transportation are required, the transportation bracket has to be reinstalled for securing the robot position.

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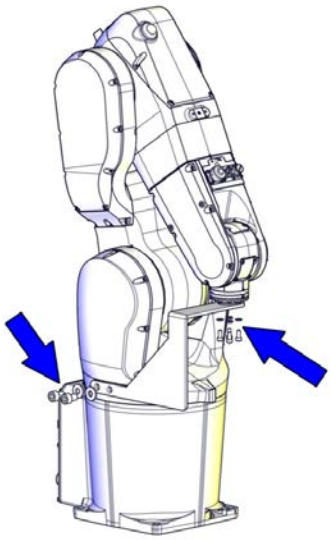
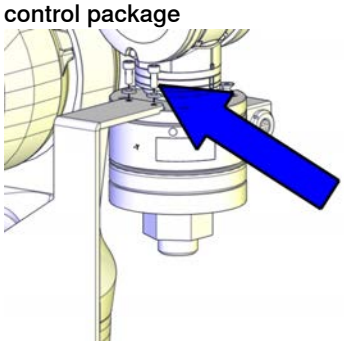
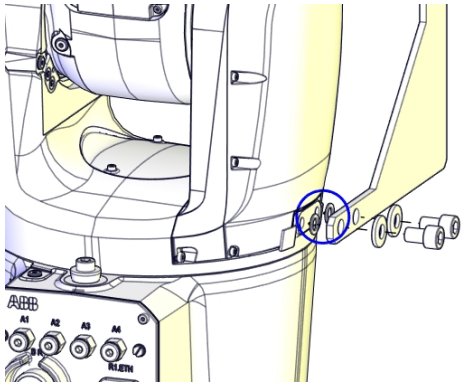
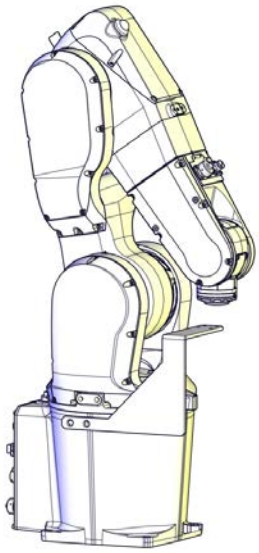
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2.2.3 Transportation bracket
Continued

	Action	Note
1	Move the robot to an appropriate position. **WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	Taking IRB 1200-5/0.9 as an example  xx1500001399 **A** / **B** IRB 1200 all variants (not in protection type Hygienic): 10° / 25° IRB 1200-7/0.7 (in protection type Hygienic): 11.95° / 25.66° IRB 1200-5/0.9 (in protection type Hygienic): 11.77° / 25.48°
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** It is important not to rub against the paint of the robot while performing any service work on the robot.	

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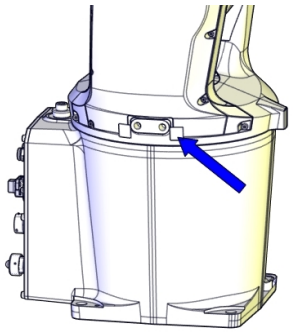
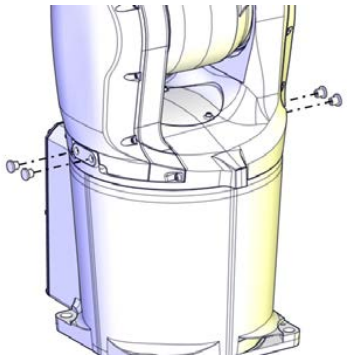
	Action	Note
3	Remove the screws and washers. **CAUTION** Do not remove the force sensor if the robot is delivered with a force control package. **For robots with protection type Hygienic** Hygienic robots use M5x20 screws for fixing the transportation bracket on the tool flange. Do not mix the screws with those used on robots not in protection type Hygienic, which are M5x12.	 xx1500001604 For robots delivered with force control package  xx1800000005
4	Remove the bracket. **For robots with protection type Foundry Plus** Remove the two M10 rubber washers, as circled in the figure, together with the bracket and reserve them for further use.  xx1600001178	 xx1500001400

Continues on next page

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2.2.3 Transportation bracket

Continued

	Action	Note
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Make sure the swing sealing plug is intact and the sealant around fully covers the joint. If not, replace the swing sealing plug and seal the joint. See *Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots on page 181*. After the replacement, wipe clean.	Swing sealing plug: 3HAC053687-001  xx1600000205
6	**For robots with protection type Foundry Plus** Fit protection plugs to the lifting holes.	Protection plug for lifting holes: 3HAC4836-24  xx1600001147

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2.2.4 Pre-installation procedure

Introduction

This section is intended for use when unpacking and installing the robot for the first time. It also contains information useful during later re-installation of the robot.

Prerequisites for installation personnel

Installation personnel working with an ABB product must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/maintenance/repair work
- conform to all national and local codes.

Risk assessment for special environments

During the planning of applications using robots with protection type Hygienic, it is recommended to perform an initial hygienic risk assessment according to EN ISO 14159 and SS-EN 1672-2. The risk assessment should fully involve considerations from production process experts, risk assessment experts and any personnel who will work with the robots.

If performing a risk assessment according to EN ISO 14159, it shall be assumed that the robot conforms to Level 1 as defined in EN ISO 14159 Annex A.

Following risks (but not limited to) should be assessed:

- Leakage of oil and grease
- Wearing of gaskets and sealings
- Loss of plugs and screws
- Tiny clearances and hard-to-reach areas of the robot
- Flakes of paint
- Uncoated areas on the robot
- Residuals of products and/or cleaning and disinfecting agents
- Improper installation of customer tools
- Misuse of cleaning and disinfecting agents
- Improper cleaning and disinfecting practices

Checking the pre-requisites for installation

	Action
1	If the robot is to be work in Clean Room environments, make sure that sufficient space is reserved for moving the robot in and out of the Clean Room working spaces.
2	Make a visual inspection of the packaging and make sure that nothing is damaged.
3	Remove the packaging.
4	Check for any visible transport damage.  **Note** Stop unpacking and contact ABB if transport damages are found.
5	Clean the unit with a lint-free cloth, if necessary.

Continues on next page

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2.2.4 Pre-installation procedure

Continued

	Action
6	Make sure that the lifting accessory used (if required) is suitable to handle the weight of the robot as specified in: *Weight, robot on page 53*
7	If the robot is not installed directly, it must be stored as described in: *Storage conditions, robot on page 56*
8	Make sure that the expected operating environment of the robot conforms to the specifications as described in: *Operating conditions, robot on page 56*
9	Before taking the robot to its installation site, make sure that the site conforms to: • *Loads on foundation, robot on page 54* • *Protection classes, robot on page 56* • *Requirements, foundation on page 55*
10	Before moving the robot, please observe the stability of the robot: *Risk of tipping/stability on page 67*
11	When these prerequisites are met, the robot can be taken to its installation site as described in section: *On-site installation on page 70*
12	Install required equipment, if any. • *Installing the signal lamp on IRC5 robots on page 99*

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2.2.5 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 1200	IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg

Note

The weight does not include tools and other equipment fitted on the robot.

Mounting positions

The table shows valid mounting options for the manipulator.

Mounting option	Installation angle	Note
Floor mounted	Any angle	
Wall mounted	Any angle	
Suspended	Any angle	
Tilted	Any angle	Contact ABB for further information about acceptable loads.

Note

The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See *Setting the system parameters for a suspended or tilted robot on page 83*.

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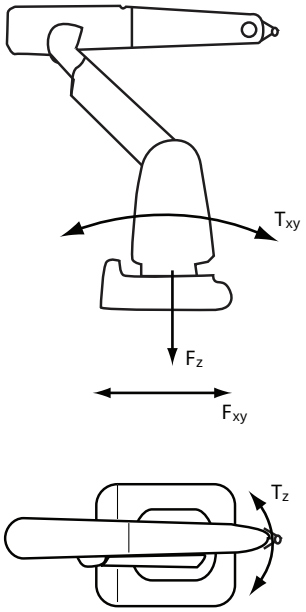
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2.2.5 Technical data
Continued

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

The directions are valid for all floor mounted, suspended and inverted robots.



xx1100000521

F_{xy}	Force in any direction in the XY plane
F_z	Force in the Z plane
T_{xy}	Bending torque in any direction in the XY plane
T_z	Bending torque in the Z plane

The table shows the various forces and torques working on the robot during different kinds of operation.

Note

These forces and torques are extreme values that are rarely encountered during operation. The values also never reach their maximum at the same time!

WARNING

The robot installation is restricted to the mounting options given in following load table(s).

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	-550 ±980 N	-550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

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Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±1210 N	±1940 N
Force z	0 ±900 N	0 ±1340 N
Torque xy	±700 Nm	±1650 Nm
Torque z	±300 Nm	±610 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	+550 ±980 N	+550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

Requirements, foundation

The table shows the requirements for the foundation where the weight of the installed robot is included:

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy.
Minimum resonance frequency	22 Hz **Note** It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment. [i] For information about compensating for foundation flexibility, see the application manual of the controller software, section *Motion Process Mode*.
Minimum foundation material yield strength	150 MPa	

[i] The minimum resonance frequency given should be interpreted as the frequency of the robot mass/inertia, robot assumed stiff, when a foundation translational/torsional elasticity is added, i.e., the stiffness of the pedestal where the robot is mounted. The minimum resonance frequency should not be interpreted as the resonance frequency of the building, floor etc. For example, if the equivalent mass of the floor is very high, it will not affect robot movement, even if the frequency is well below the stated frequency. The robot should be mounted as rigid as possibly to the floor.

Disturbances from other machinery will affect the robot and the tool accuracy. The robot has resonance frequencies in the region 10 – 20 Hz and disturbances in this region will be amplified, although somewhat damped by the servo control. This might be a problem, depending on the requirements from the applications. If this is a problem, the robot needs to be isolated from the environment.

Continues on next page

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2.2.5 Technical data
Continued

Note

For robots with protection type Hygienic, the foundation where the robot is installed and the robot base must be far away from the food contact areas.

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25ºC
Maximum ambient temperature	+55ºC
Maximum ambient temperature (less than 24 hrs)	+70ºC
Maximum ambient humidity	95% at constant temperature (gaseous only)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5ºC [i]
Maximum ambient temperature	+45ºC
Maximum ambient temperature for robots with food grade lubrication for robots in protection type Hygienic	+35ºC [ii]
Maximum ambient humidity	95% at constant temperature

i At low environmental temperature < 10ºC is, as with any other machine, a warm-up phase recommended to be run with the robot. Otherwise there is a risk that the robot stops or run with lower performance due to temperature dependent oil and grease viscosity.

ii For robots with food grade lubrication
For robots with protection type Hygienic
If environment temperature > 35ºC, contact ABB for further information.

Protection classes, robot

The table shows the available protection types of the robot, with the corresponding protection class.

Protection type	Protection class [i] / Suitability class [ii]
Manipulator, protection type Standard	IP40 IP67 (option 287-10, with IRC5 controllers) IP67 (option 3350-670, with OmniCore controllers)
Manipulator, protection type Foundry Plus	IP67 (option 287-3, with IRC5 controllers) IP67 (option 3352-10, with OmniCore controllers)

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Protection type	Protection class [i] / Suitability class [ii]
Manipulator, protection type Clean Room	ISO Class 3 (option 287-1, with IRC5 controllers) ISO Class 3 (option 3351-3, with OmniCore controllers)
Manipulator, protection type Hygienic	IP67 IP69K (max.30bar) on axis 6 flange

i According to IEC 60529.

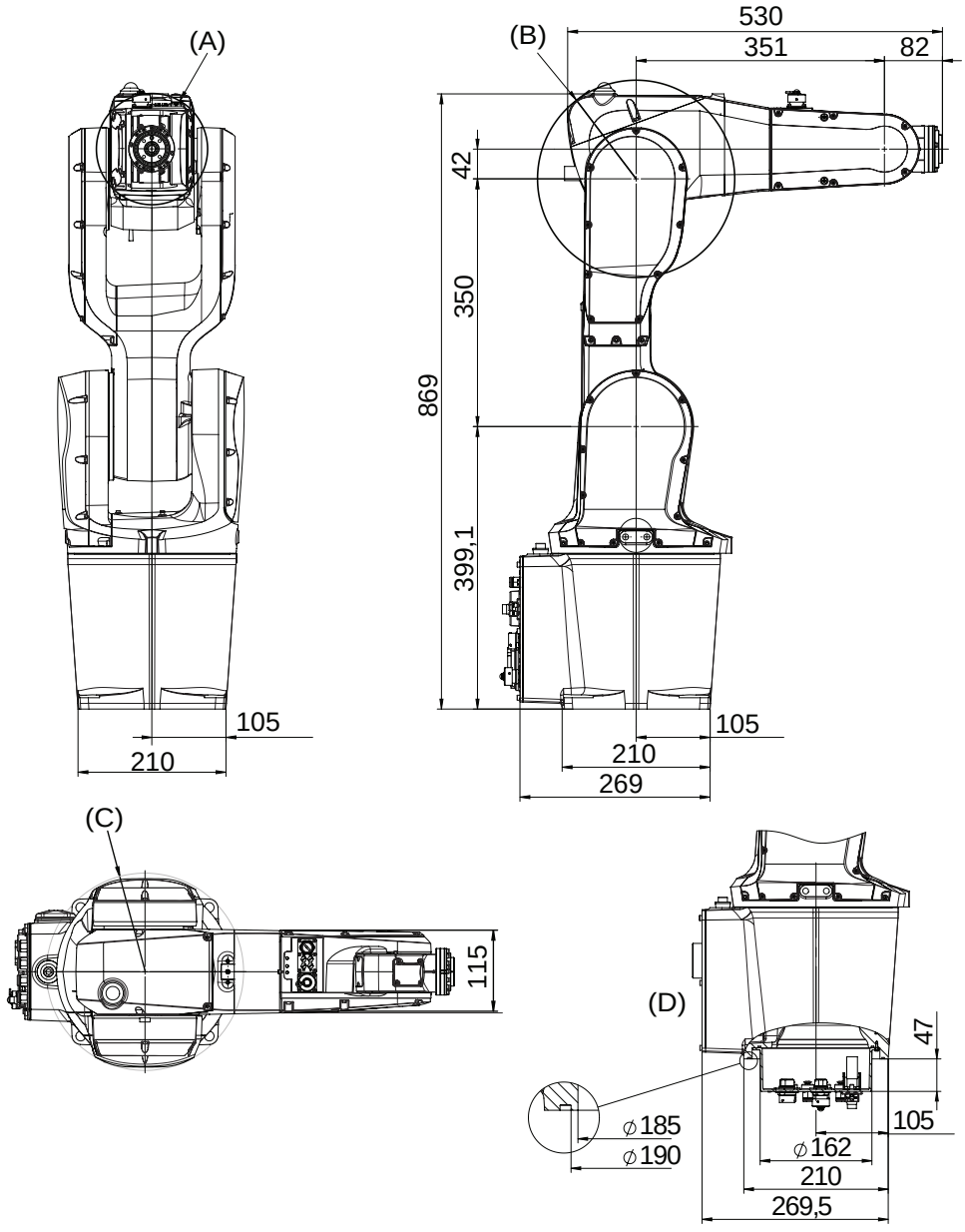
ii Air Cleanliness Class for Clean Room robots was accessed in compliance with DIN EN ISO 14644-1, -14.

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2.2.6 Dimensions

Dimensions IRB 1200-7/0.7

For robots in protection type IP67, Foundry Plus, Clean Room and food grade lubrication robots



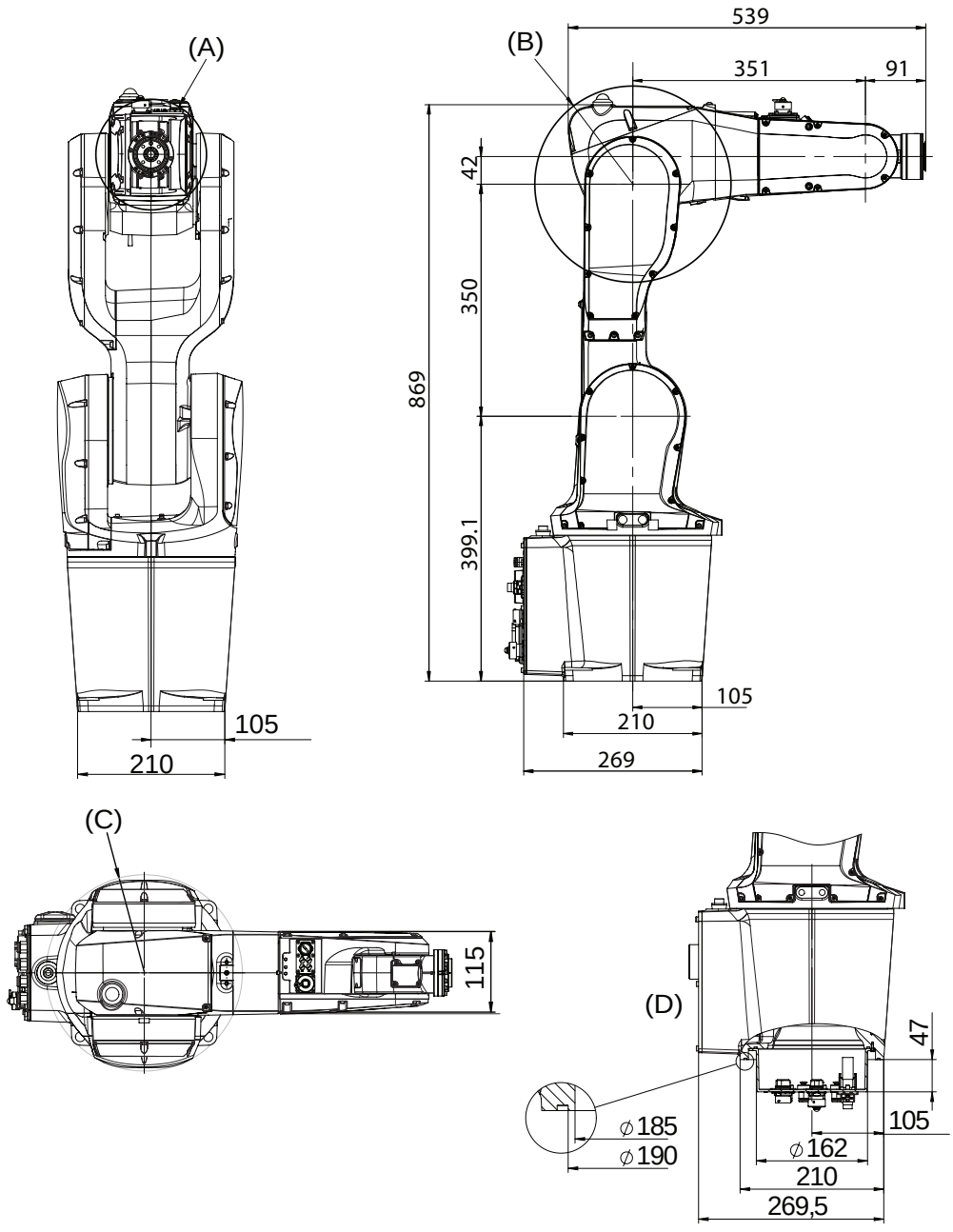
xx1300000366

Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below3309-1 From below

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For robots in protection type Hygienic



xx2100001277

Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below3309-1 From below

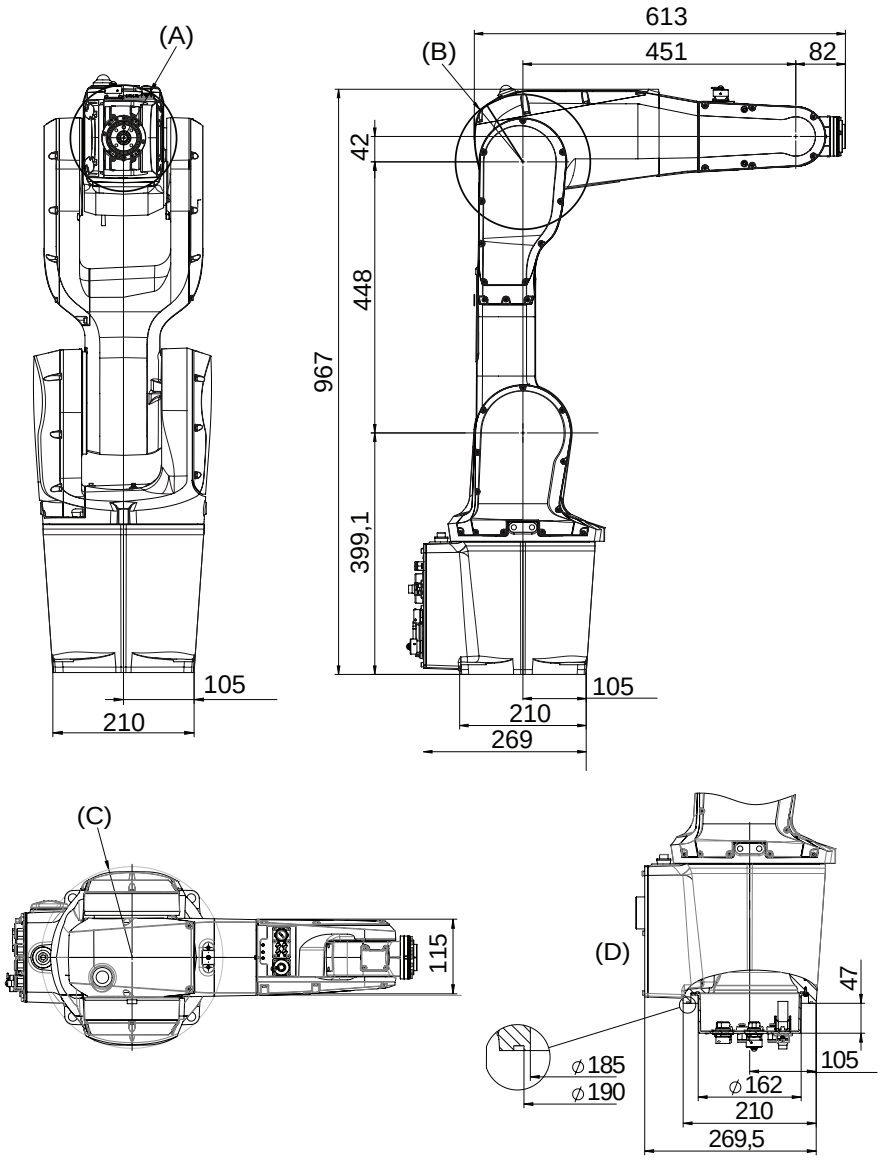
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2.2.6 Dimensions
Continued

Dimensions IRB 1200-5/0.9

For robots in protection type IP67, Foundry Plus, Clean Room and food grade lubrication robots



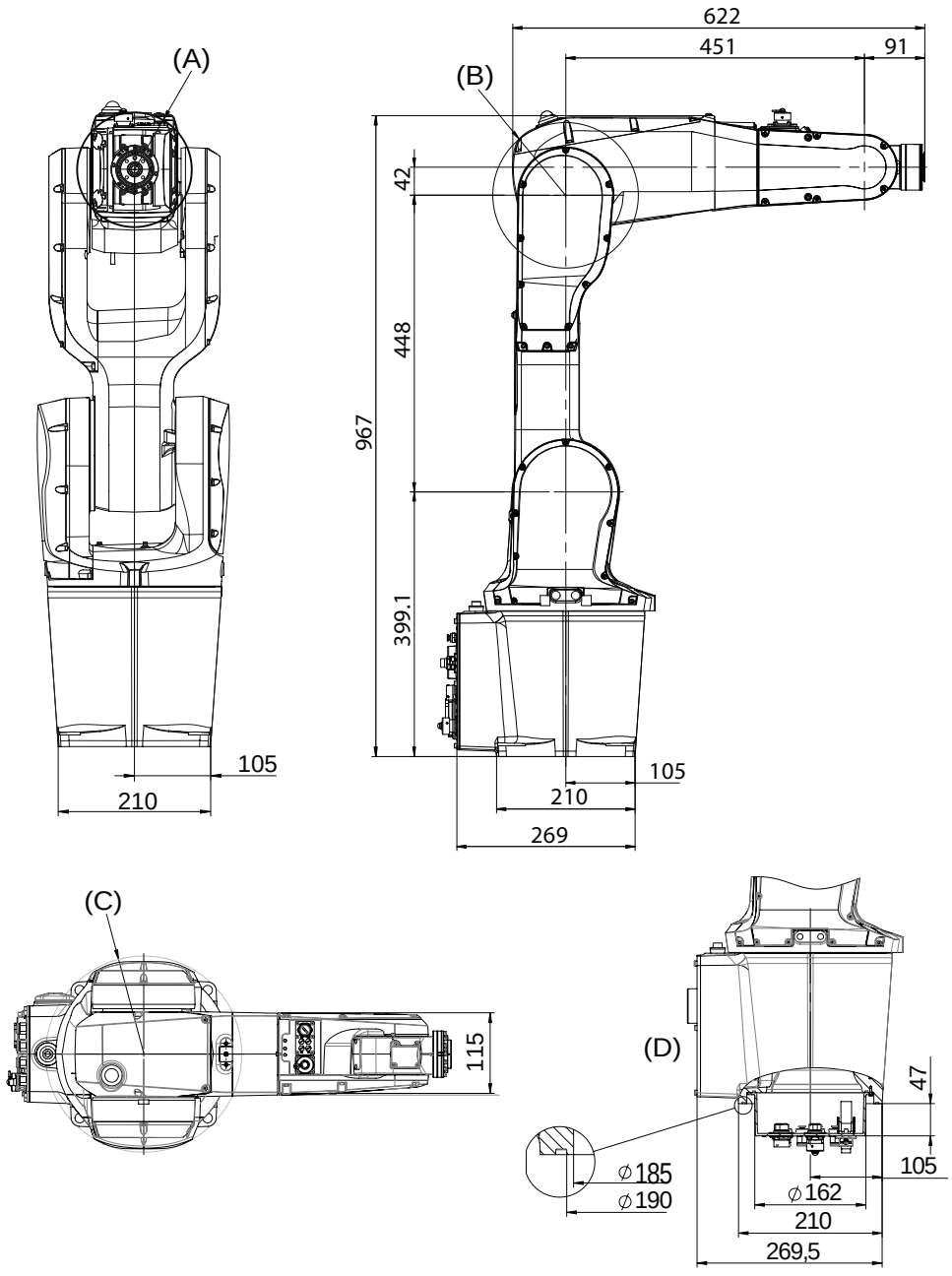
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Pos	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=111 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below3309-1 From below

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For robots in protection type Hygienic



xx2100001278

Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below3309-1 From below

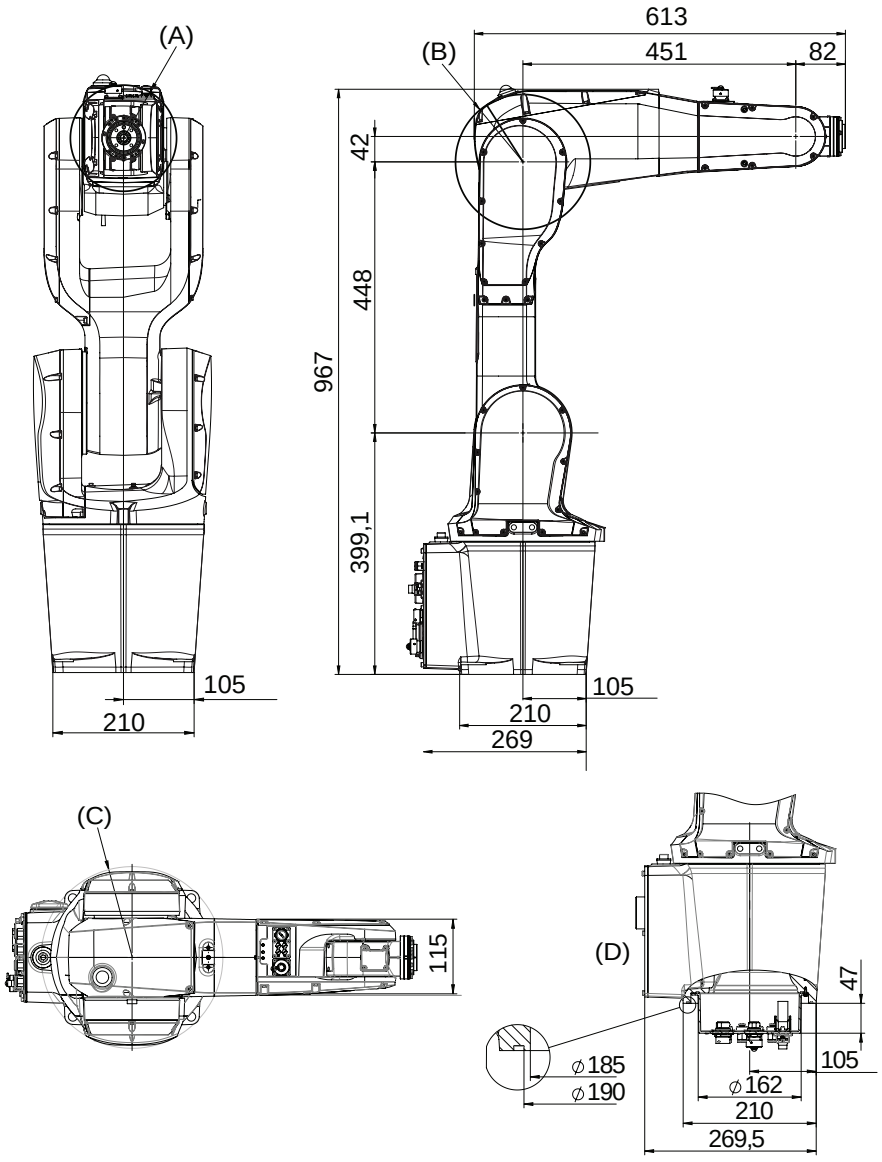
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2.2.6 Dimensions
Continued

Dimensions IRB 1200-7/0.9

For robots in protection type IP67, Foundry Plus, Clean Room



xx1400000339

Pos	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=111 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below3309-1 From below

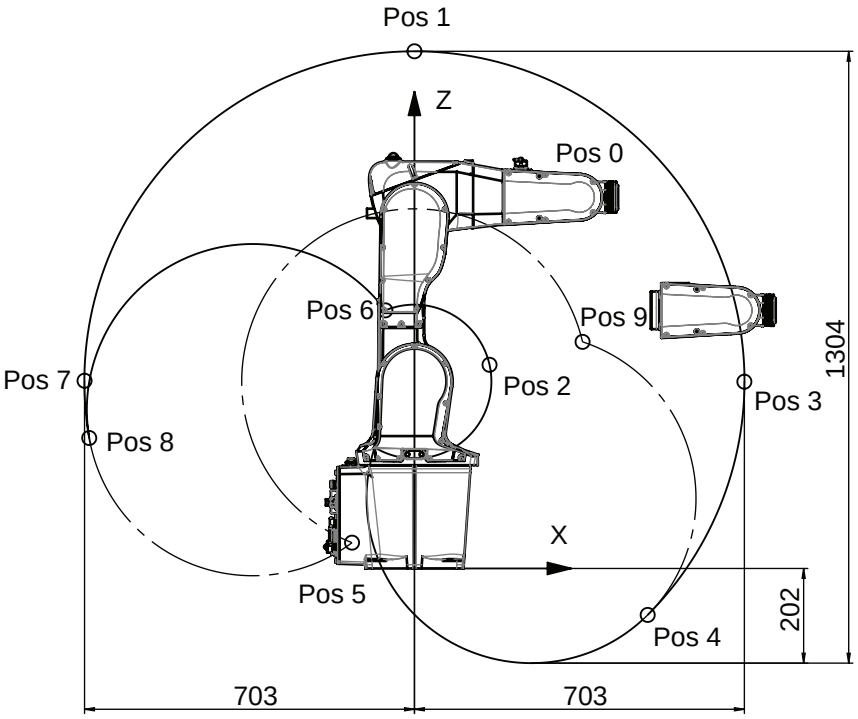
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2.2.7 Working range

Illustration, working range IRB 1200-7/0.7

IRB 1200-7/0.7 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx1300000386

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	351	791	0º	0º
Pos1	0	1102	0º	-83º
Pos2	160	434	0º	+70º
Pos3	703	398	+90º	-83º
Pos4	497	-99	+135º	-83º
Pos5	-133	55	-100º	-200º
Pos6	-62	550	-100º	+70º
Pos7	-703	400	-90º	-83º
Pos8	-693	278	-100º	-83º
Pos9	358	488	+135°	-200°

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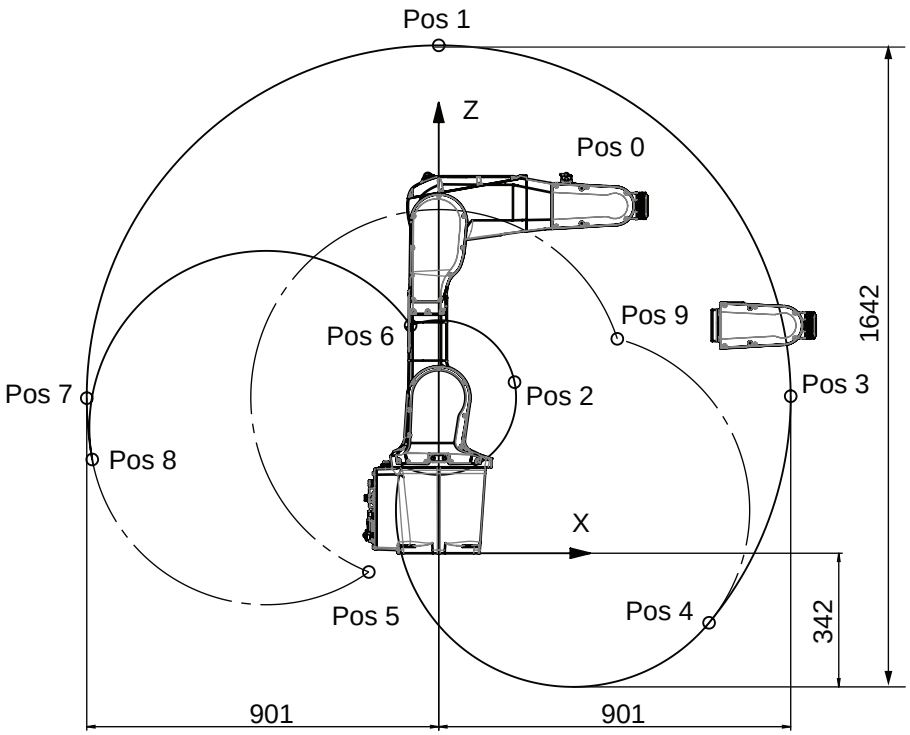
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2.2.7 Working range
Continued

Illustration, working range IRB 1200-5/0.9

IRB 1200-5/0.9 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx1300000387

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	451	889	0º	0º
Pos1	0	1300	0º	-85º
Pos2	194	438	0º	+70º
Pos3	901	402	+90º	-85º
Pos4	692	-178	+130º	-85º
Pos5	-179	-48	-100º	-200º
Pos6	-72	583	-100º	+70º
Pos7	-901	397	-90º	-85º
Pos8	-887	240	-100º	-85º
Pos9	458	549	+130°	-200°

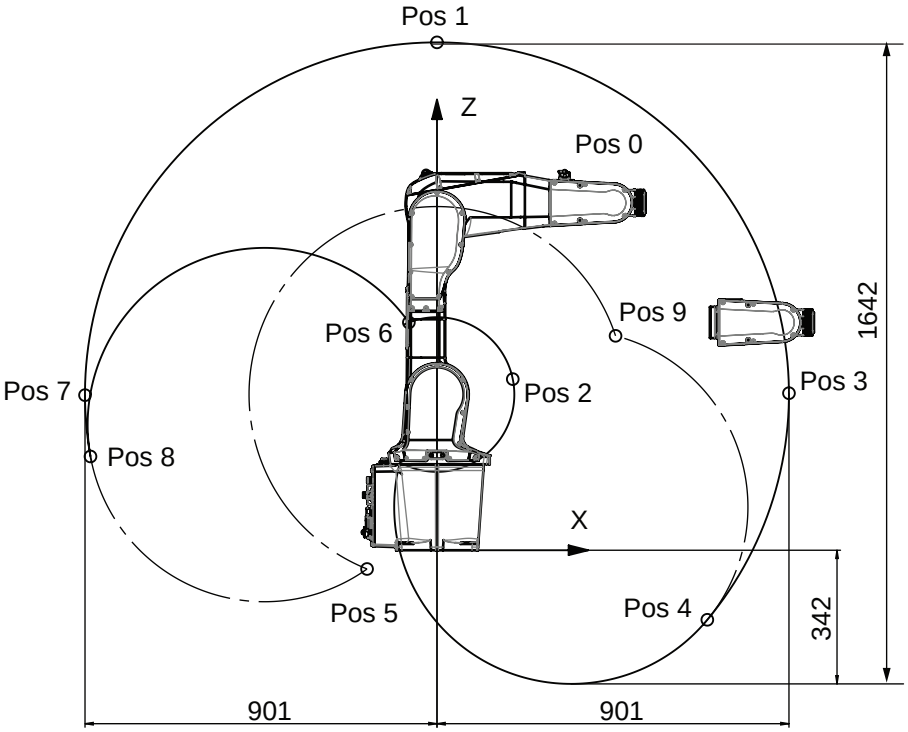
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Illustration, working range IRB 1200-7/0.9

IRB 1200-7/0.9 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx1300000387

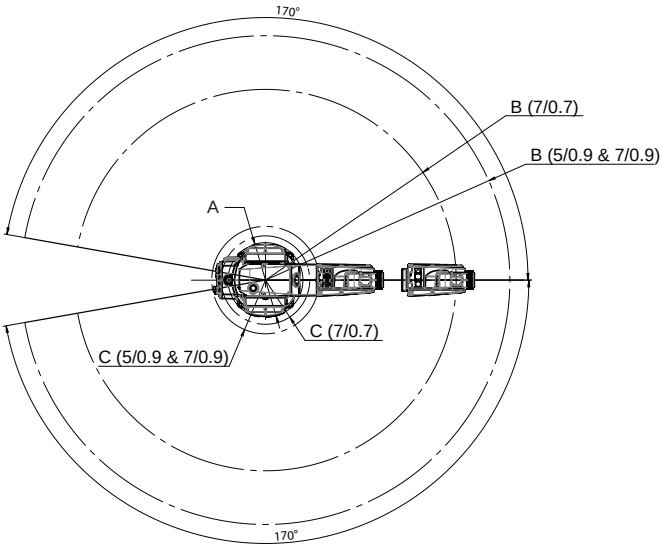
Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	451	889	0º	0º
Pos1	0	1300	0º	-85º
Pos2	194	438	0º	+70º
Pos3	901	402	+90º	-85º
Pos4	692	-178	+130º	-85º
Pos5	-179	-48	-100º	-200º
Pos6	-72	583	-100º	+70º
Pos7	-901	397	-90º	-85º
Pos8	-887	240	-100º	-85º
Pos9	458	549	+130°	-200°

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2.2.7 Working range
Continued

Minimum turning radius of axis 1



xx1400000681

Robot variant	Radius A	Radius B	Radius C
IRB 1200-5/0.9	138 mm [i]	901 mm	198 mm
IRB 1200-7/0.7	138 mm *[i]*	703 mm	163 mm
IRB 1200-7/0.9	138 mm *[i]*	901 mm	198 mm

i Maximum turning radius of axis 1.

Working range

Axis	Type of motion	IRB 1200-7/0.7	IRB 1200-5/0.9	IRB 1200-7/0.9
Axis 1	Rotation motion	+170° to -170°	+170° to -170°	+170° to -170° [i]
Axis 2	Arm motion	+135° to -100°	+130° to -100°	+130° to -100°
Axis 3	Arm motion	+70° to -200°	+70° to -200°	+70° to -200°
Axis 4	Wrist motion	+270° to -270°	+270° to -270°	+270° to -270°
Axis 5	Bend motion	±130° (not Hygienic robots) ±128° (Hygienic robots)	±130° (not Hygienic robots) ±128° (Hygienic robots)	±130°
Axis 6	Turn motion	Default: +400° to -400° Maximum revolution: ±242 [ii]	Default: +400° to -400° Maximum revolution: ±242 *[ii]*	Default: +400° to -400° Maximum revolution: ±242 *[ii]*

i Wall mounted robot has a work area for axis 1 that depends on payload and the positions of other axes. Simulation in RobotStudio is recommended.

ii The default working range for axis 6 can be extended by changing parameter values in the software. Option Independent axis can be used for resetting the revolution counter after the axis has been rotated (no need for "rewinding" the axis).

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2.2.8 Risk of tipping/stability

Risk of tipping

If the robot is not fastened to the foundation while moving the arm, the robot is not stable in the whole working area. Moving the arm will displace the center of gravity, which may cause the robot to tip over.

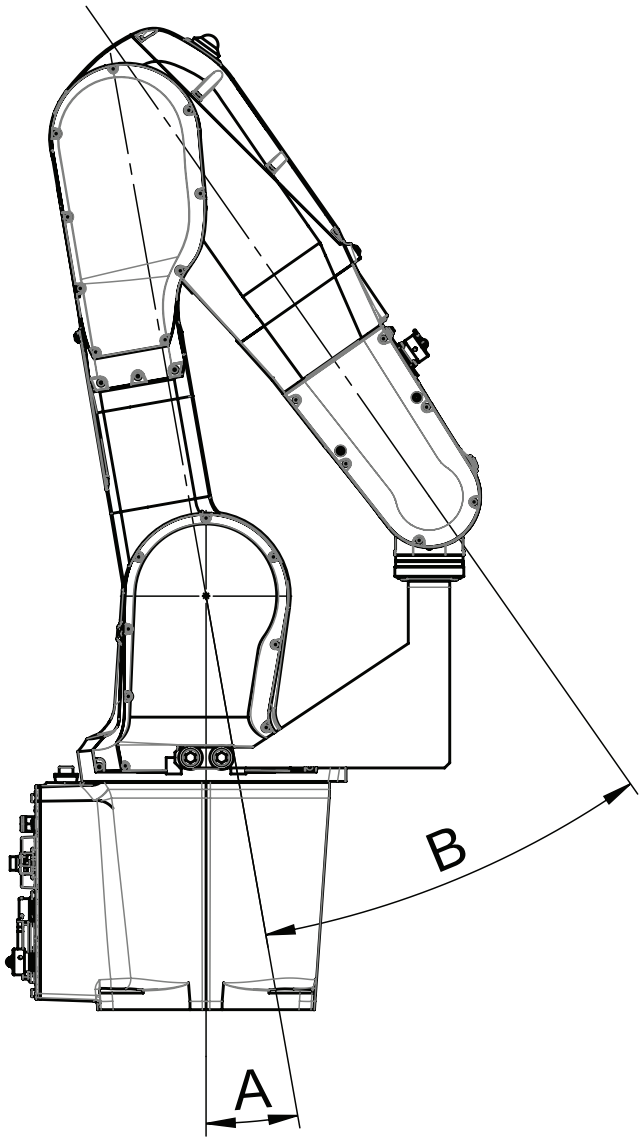
The transportation position is the most stable position.

Do not change the robot position before securing it to the foundation!

Transportation position

This figure shows the robot in its transportation position.

Taking IRB 1200-5/0.9 as an example



xx1500001399

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2.2.8 Risk of tipping/stability
Continued

	A	B
IRB 1200 all variants (not in protection type Hygienic)	10°	25°
IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°
IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°

Note

The robot might be positioned in a different position at delivery, due to actual configurations and options (for example DressPack).

Transportation bracket

A transportation bracket is installed and delivered together with the robot for securing the robot position during transportation. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see *Transportation bracket on page 47*.

WARNING

The robot will be mechanically unstable if not properly secured to the foundation.

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2.2.9 The unit is sensitive to ESD

Description

ESD (electrostatic discharge) is the transfer of electrical static charge between two bodies at different potentials, either through direct contact or through an induced electrical field. When handling parts or their containers, personnel not grounded may potentially transfer high static charges. This discharge may destroy sensitive electronics.

Safe handling

Use one of the following alternatives:

- Use a wrist strap.

  Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.
- Use an ESD protective floor mat.

  The mat must be grounded through a current-limiting resistor.
- Use a dissipative table mat.

  The mat should provide a controlled discharge of static voltages and must be grounded.

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2.3 On-site installation

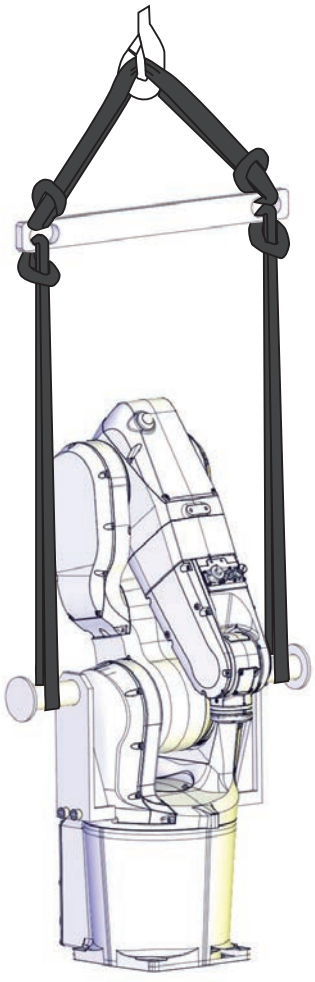
2.3.1 Lifting robot with roundslings

Attaching the roundslings

Note

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see *Transportation bracket on page 47*.



xx1400000501

Required equipment

Equipment, etc.	Article number	Note
Overhead crane	-	

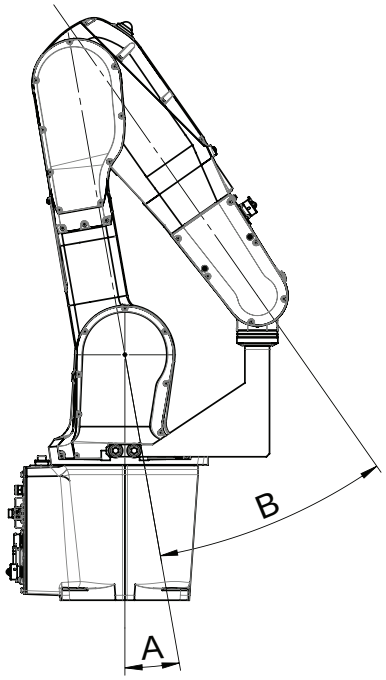
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Equipment, etc.	Article number	Note
Roundsling, 0.6 m	-	2 pcs. Length: 0.6 m. Lifting capacity: 60 kg.
Roundsling, 1.5 m	-	2 pcs. Length: 1.5 m. Lifting capacity: 60 kg.
Lifting accessory, robot	3HAC049711-001	Includes lifting accessories, lifting beam and screws.

Lifting and turning the robot with roundslings

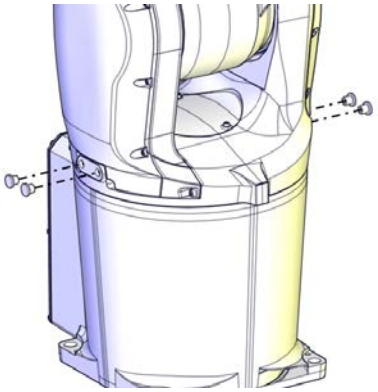
Use this procedure to lift the robot with roundslings.

	Action	Note
1	Move the robot to an appropriate lifting position. **WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	Taking IRB 1200-5/0.9 as an example  xx1500001399 **A** / **B** IRB 1200 all variants (not in protection type Hygienic): 10° / 25° IRB 1200-7/0.7 (in protection type Hygienic): 11.95° / 25.66° IRB 1200-5/0.9 (in protection type Hygienic): 11.77° / 25.48°

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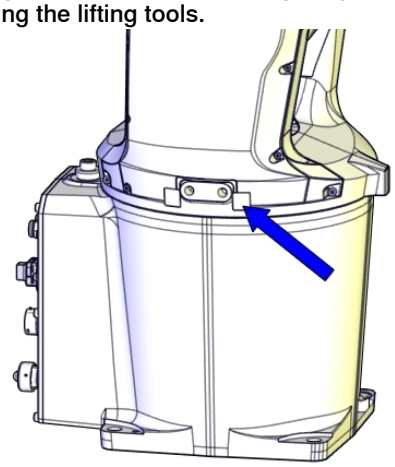
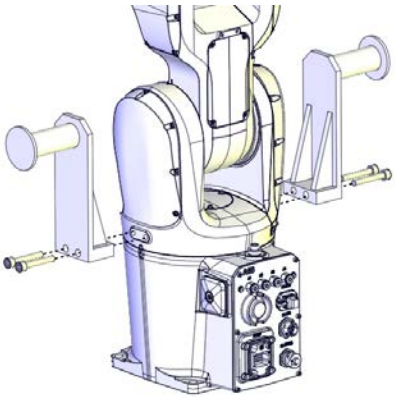
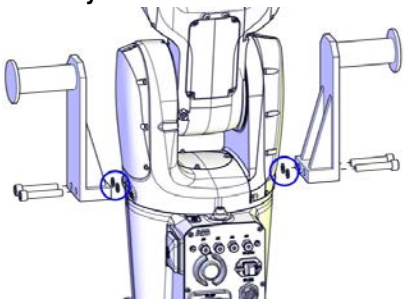
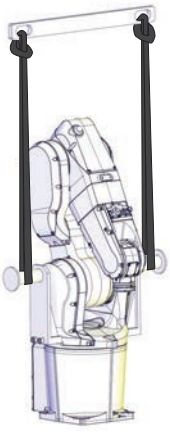
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2.3.1 Lifting robot with roundslings
Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** It is important not to rub against the paint of the robot while performing any service work on the robot.	
3	**For robots with protection type Foundry Plus** Remove the protection plugs in lifting holes.	 xx1600001147

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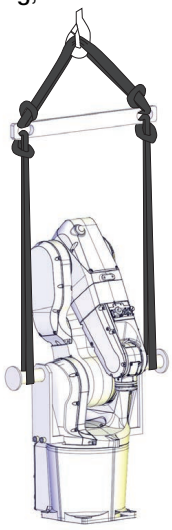
	Action	Note
4	Fit the lifting tools to the robot. Use the enclosed screws. **For robots with protection type Foundry Plus** Use two M10 rubber washers, as circled in the figure, on the lifting holes at each side of the robot (4 pcs in total) for protection when fitting the lifting tools. **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Pay attention not to damage the swing sealing plug and the sealant covering the joint when fitting the lifting tools.  xx1600000205 Replace the swing sealing plug if damaged and seal the joint. See *Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots on page 181*. After the replacement, wipe clean.	Lifting accessory, robot: 3HAC049711-001  xx1400000498 Tightening torque: 15 Nm **For robots with protection type Foundry Plus**  xx1600001177
5	Fit the roundslings to the lifting tools and attach them to the lifting beam.	Make sure the roundsling has free space and does not wear against any part of the robot. Roundsling, 1.5 m  xx1400000511

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2.3.1 Lifting robot with roundslings

Continued

	Action	Note
6	Fit the roundslings to the lifting beam and to the overhead crane.	Roundsling, 0.6 m  xx1400000501
7	**CAUTION** The IRB 1200 robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
8	**WARNING** Personnel must not, under any circumstances, be present under the suspended load!	
9	Raise the overhead crane to lift the robot.	
10	If the manipulator should be mounted on a wall, or in an suspended position the manipulator can now be tilted slowly by hand.	 xx1600000005

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2.3.2 Lifting and turning a suspended mounted robot

Introduction

How to lift and turn the robot to a suspended position using the turning accessory is described in the lifting instruction delivered with the turning accessory. Article numbers for the accessory and the instruction is specified in *Special tools on page 928*. Any additional equipment required is specified in the instruction for the lifting accessory. Contact ABB for more information.

How to lift and turn the robot into position for **wall** position: Contact ABB for more information.

How to lift and turn the robot into position for **tilted** position: Contact ABB for more information.

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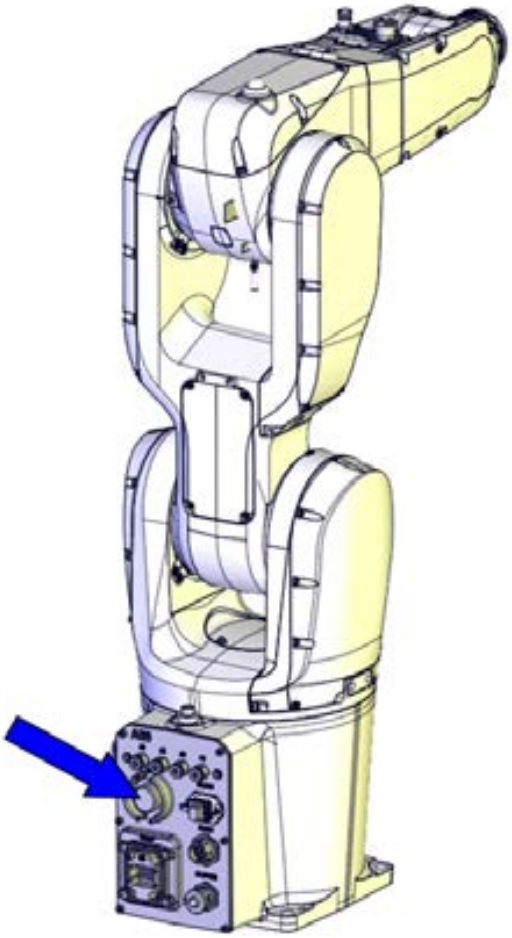
2.3.3 Manually releasing the brakes

Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the motors of each axis.

Location of brake release unit

The internal brake release unit is located as shown in the figure.



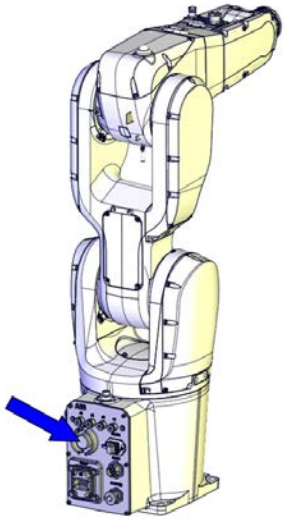
xx1400000030

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Releasing the brakes

This procedure details how to release the holding brakes when the robot is equipped with an internal brake release unit.

	Action	Note
1	The internal brake release unit is equipped with a button for controlling the axes brakes. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section *Supplying power to connector R1.MP on page 77*.	 xx1400000030
2	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
3	Release the holding brake on all robot axes by pressing the button on the internal brake release unit. The brake will function again as soon as the button is released.	

Supplying power to connector R1.MP

If the robot is not connected to the controller, power must be supplied to connector R1.MP on the robot in order to enable the brake release buttons.

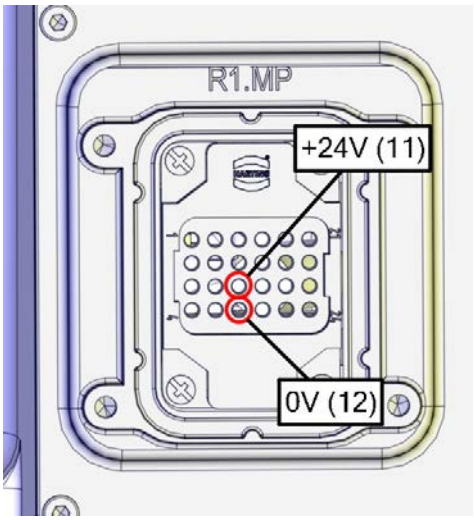
	Action	Note
1	**DANGER** Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously!	

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2.3.3 Manually releasing the brakes

Continued

	Action	Note
2	Supply +24V on pin 11 and 0V on pin 12. **Note** Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to the brake release unit and to the system board.	 xx1400000031

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2.3.4 Orienting and securing the robot

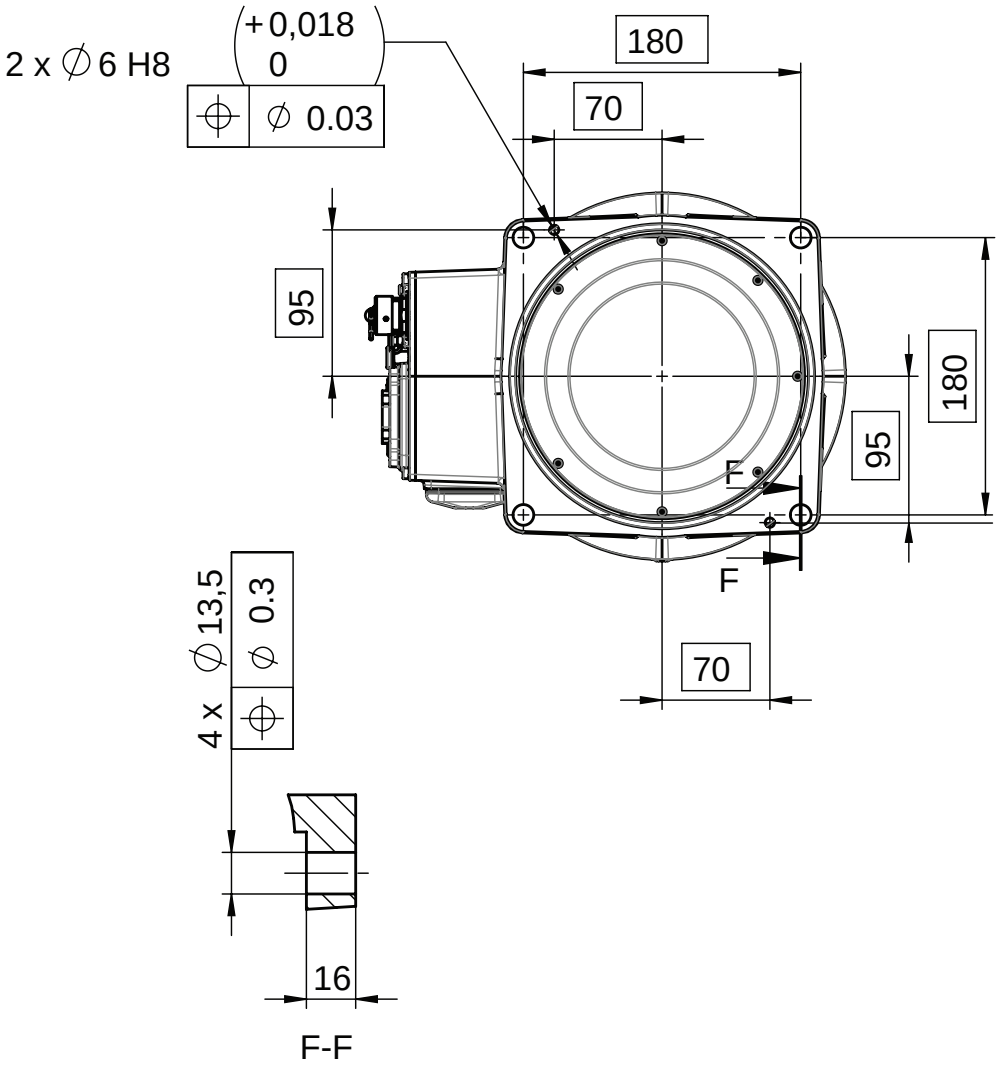
Introduction

This section details how to orient and secure the robot to the foundation or base plate in order to run the robot safely. The requirements made on the foundation are shown in sections:

- *Loads on foundation, robot on page 54*
- *Requirements, foundation on page 55*.

Hole configuration, base

The illustration shows the hole configuration used when securing the robot.



xx1300000368

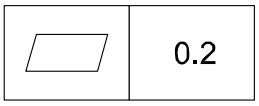
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2.3.4 Orienting and securing the robot
Continued

Specification, attachment screws and pins

The table specifies the type of securing screws and washers to be used to secure the robot directly to the foundation. It also specifies the type of pins to be used.

Suitable screws	M12x35 (robot installation directly on foundation)
Quantity	4 pcs
Quality	8.8
Suitable washer	13 x 20 x 2, steel hardness class 300HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	55 Nm ± 5 Nm
Length of thread engagement	Minimum 17 mm for ground with material yield strength 150 MPa
Level surface requirements	 xx0900000643

Installation of extra O-ring

For robots with protection class IP67

For robots with protection type FoundryPlus

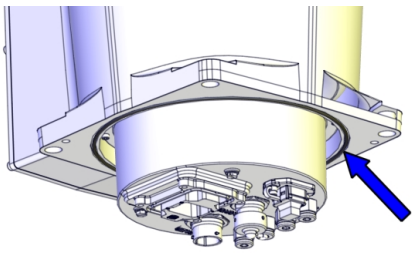
For robots with protection type Clean Room

For robots with food grade lubrication

For robots with protection type Hygienic

Manipulator cables routed from below

The O-ring specified below is delivered together with the robot and must be installed to the bottom of the base during installation.

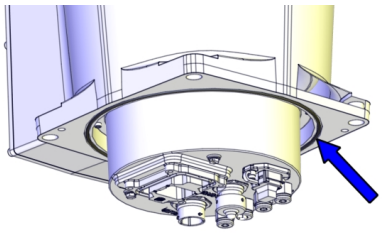
Equipment	Art. no.	Note
O-ring	3HAB3772-141	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241

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Orienting and securing the robot

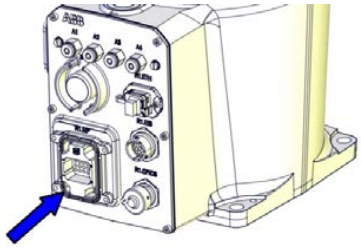
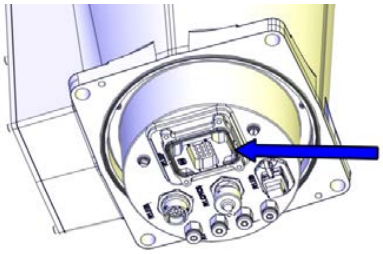
Use this procedure to orient and secure the robot.

	Action	Info
1	Make sure the installation site for the robot conforms to the specifications in section: • *Pre-installation procedure on page 51*.	
2	Prepare the installation site with attachment holes.	The hole configuration of the base is shown in the figure in: • *Hole configuration, base on page 79*
3	**CAUTION** The robot weighs . All lifting equipment must be sized accordingly! IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg	
4	**CAUTION** When the robot is put down after being lifted or transported, there is a risk of it tipping, if not properly secured.	
5	Lift the robot to its installation site.	How to lift the robot is described in section: • *Lifting robot with roundslings on page 70*
6	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** **Cabling routed from below** Fit the O-ring 3HAB3772-141 to underneath the robot base.	 xx1500000241
7	Fit two *pins* to the holes in the base.	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
8	Guide the robot gently, using the attachment screws while lowering it into its mounting position.	Make sure the robot base is correctly fitted onto the pins.
9	Fit the *securing screws* and *washers* in the attachment holes of the base.	Screws: M12x35 (robot installation directly on foundation), quality: 8.8
10	Tighten the bolts in a criss-cross pattern to ensure that the base is not distorted.	Tightening torque: 55 Nm ± 5 Nm

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2.3.4 Orienting and securing the robot
Continued

	Action	Info
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Fit the O-ring 3HAB3772-19 to the main power connector on the robot base.	Robots with manipulator cables routed from the rear of the base:  xx1500000243 Robots with manipulator cables routed from below (option 996-1):  xx1500000242

Securing robot on a mounting plate

When bolting a mounting plate or frame to a concrete floor, follow the general instructions for expansion-shell bolts.

Screw joints must be able to withstand the stress loads defined in section *Loads on foundation, robot on page 54*.

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2.3.5 Setting the system parameters for a suspended or tilted robot

General

The robot is configured for mounting parallel to the floor, without tilting, on delivery. If the robot is mounted in any other angle than 0°, then the system parameters that describe the mounting angle (how the robot is oriented relative to the gravity) must be re-defined.

Note

With inverted installation, make sure that the gantry or corresponding structure is rigid enough to prevent unacceptable vibrations and deflections, so that optimum performance can be achieved.

Note

The mounting positions are described in *Mounting positions on page 53*, and the requirements on the foundation are described in *Requirements, foundation on page 55*.

System parameters

Note

The mounting angle must be configured correctly in the system parameters so that the robot system can control the movements in the best possible way. An incorrect definition of the mounting angle will result in:

- Overloading the mechanical structure.
- Lower path performance and path accuracy.
- Some functions will not work properly, for example *Load Identification* and *Collision detection*.

Gravity Beta

If the robot is mounted upside down or on a wall (rotated around the y-axis), then the robot base frame and the system parameter *Gravity Beta* must be redefined. *Gravity Beta* should then be π (+3.141593) if the robot is mounted upside down (suspended), or ±π/2 (±1.570796) if mounted on a wall.

The *Gravity Beta* is a positive rotation direction around the y-axis in the base coordinate system. The value is set in radians.

Gravity Alpha

If the robot is mounted on a wall (rotated around the x-axis), then the robot base frame and the system parameter *Gravity Alpha* must be redefined. The value of *Gravity Alpha* should then be ±π/2 (±1.570796).

The *Gravity Alpha* is a positive rotation direction around the x-axis in the base coordinate system. The value is set in radians.

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2.3.5 Setting the system parameters for a suspended or tilted robot
Continued

> **Note**
>
> The system parameter *Gravity Alpha* is not supported for all robot types. It is not supported for IRB 140, IRB 1410, IRB 1600ID, IRB 2400, IRB 4400, IRB 6400R, IRB 6400 (except for IRB 6400 200/2.5 and IRB 6400 200/2.8), IRB 6600, IRB 6650, IRB 6650S and IRB 7600 (except for IRB 7600 325/3.1).
>
> If the robot does not support *Gravity Alpha*, then use *Gravity Beta* along with the recalibration of axis 1 to define the rotation of the robot around the x-axis.

> **Note**
>
> The parameter is supported for all robots on track when the system parameter *7 axes high performance motion* is set, see *Technical reference manual - System parameters*.

Gamma Rotation

Gamma Rotation defines the orientation of the robot foot on the travel carriage (track motion).

Mounting angles and values

The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

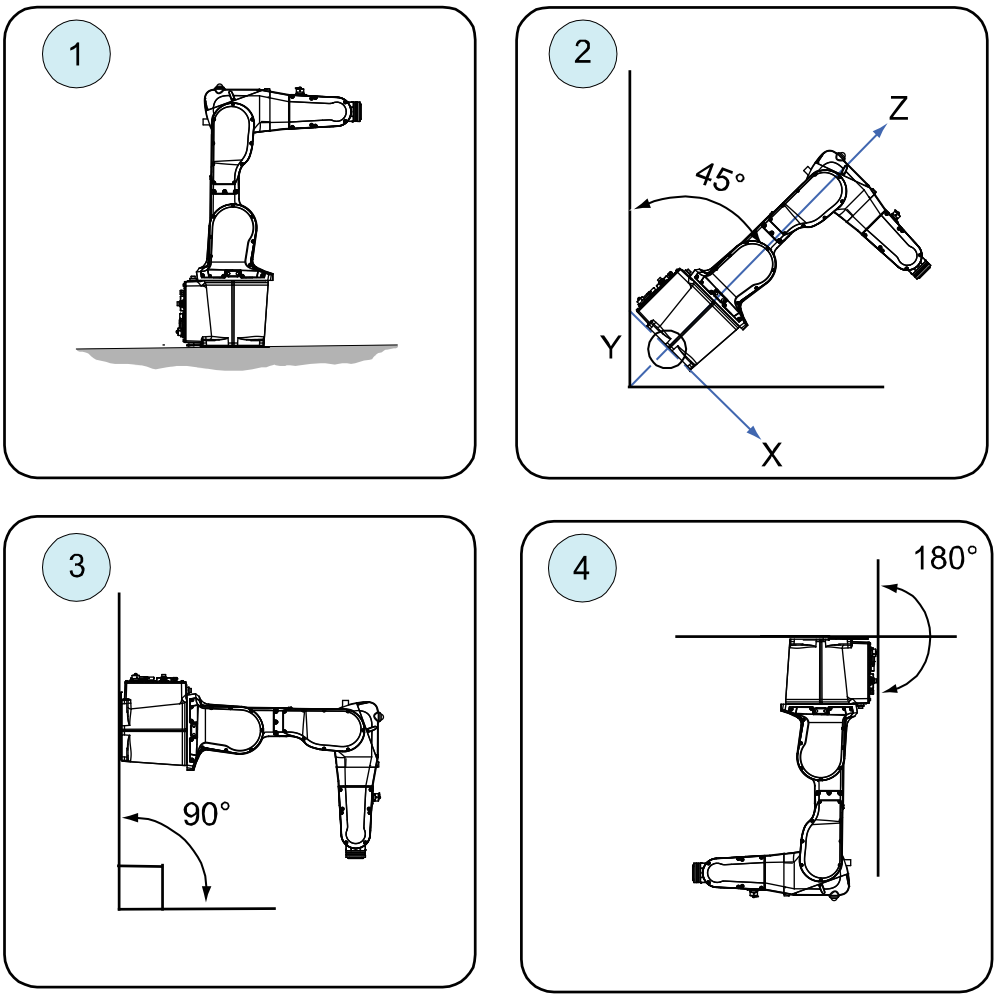
`Gravity Beta = A° x 3.141593/180 = B radians`, where `A` is the mounting angle in degrees and `B` is the mounting angle in radians.

Example of position	Mounting angle (A°)	Gravity Beta
Floor mounted	0°	0.000000 (Default)
Tilted mounting	45°	0.785398
Wall mounting	90°	1.570796
Suspended mounting	180°	3.141593

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Examples of mounting angles tilted around the Y axis (*Gravity Beta*)



xx1400000682

Pos 1	Floor mounted
Pos 2	Mounting angle 45° (Tilted)
Pos 3	Mounting angle 90° (Wall)
Pos 4	Mounting angle 180° (Suspended)

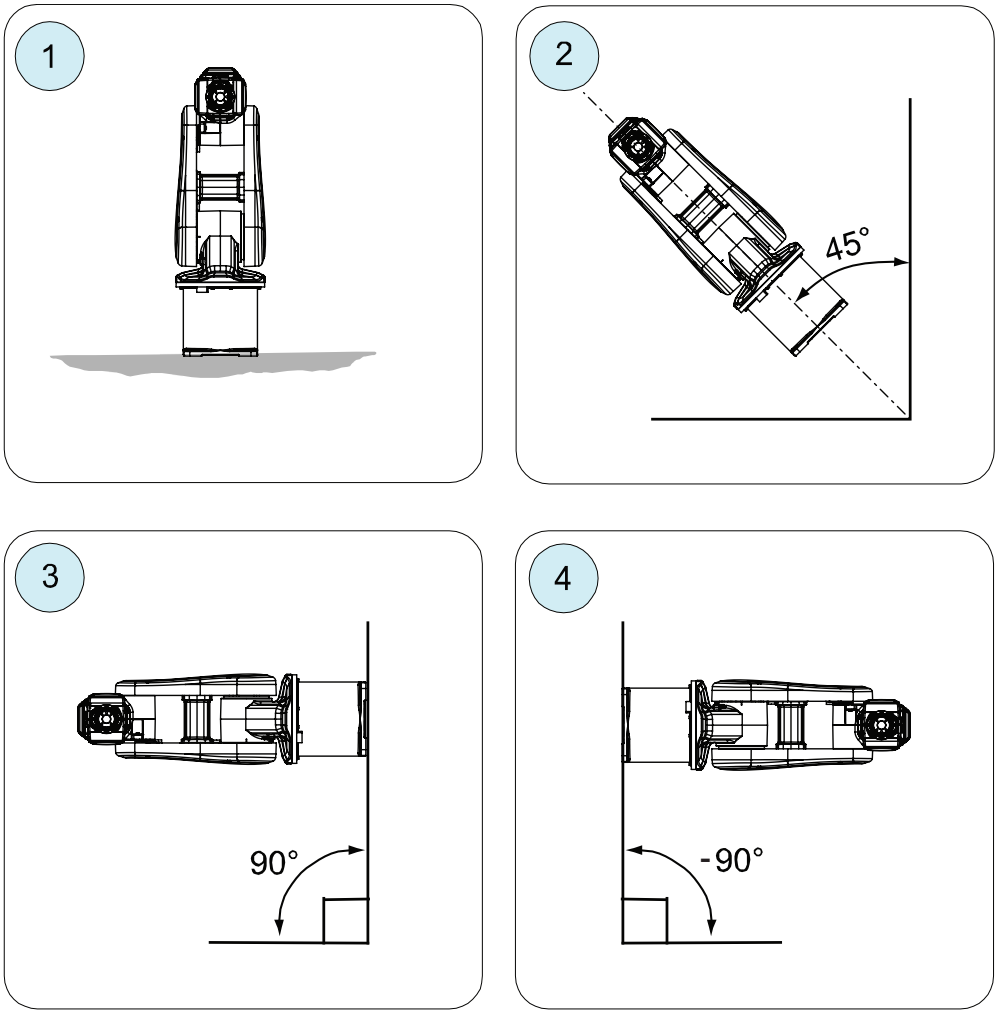
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2.3.5 Setting the system parameters for a suspended or tilted robot
Continued

Examples of mounting angles tilted around the X axis (*Gravity Alpha*)

The following illustration shows the IRB 120, but the same principle applies for all robots.



xx1500000532

Pos	Mounting angle	Gravity Alpha
1	0° (Floor mounted)	0
2	45° (Tilted)	0.785398
3	90° (Wall)	1.570796
4	-90° (Wall)	-1.570796

Note

For suspended robots (180°), it is recommended to use *Gravity Beta* instead of *Gravity Alpha*.

Continues on next page

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Defining the parameter in RobotWare

The value of the system parameters that define the mounting angle must be redefined when changing the mounting angle of the robot. The parameters belong to the type *Robot*, in the topic *Motion*.

How to calculate a new value is detailed in *Mounting angles and values on page 84*.

The system parameters are described in *Technical reference manual - System parameters*.

The system parameters are configured in RobotStudio or on the FlexPendant.

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2.3.6 Loads fitted to the robot, stopping time and braking distances

General

Any loads mounted on the robot must be defined correctly and carefully (with regard to the position of center of gravity and mass moments of inertia) in order to avoid jolting movements and overloading motors, gears and structure.

CAUTION

Incorrectly defined loads may result in operational stops or major damage to the robot.

References

Load diagrams, permitted extra loads (equipment) and their positions are specified in the product specification. The loads must be defined in the software.

- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - OmniCore*

Stopping time and braking distances

The performance of the motor brake depends on if there are any loads attached to the robot. For more information, see product specification listed in *References on page 10*.

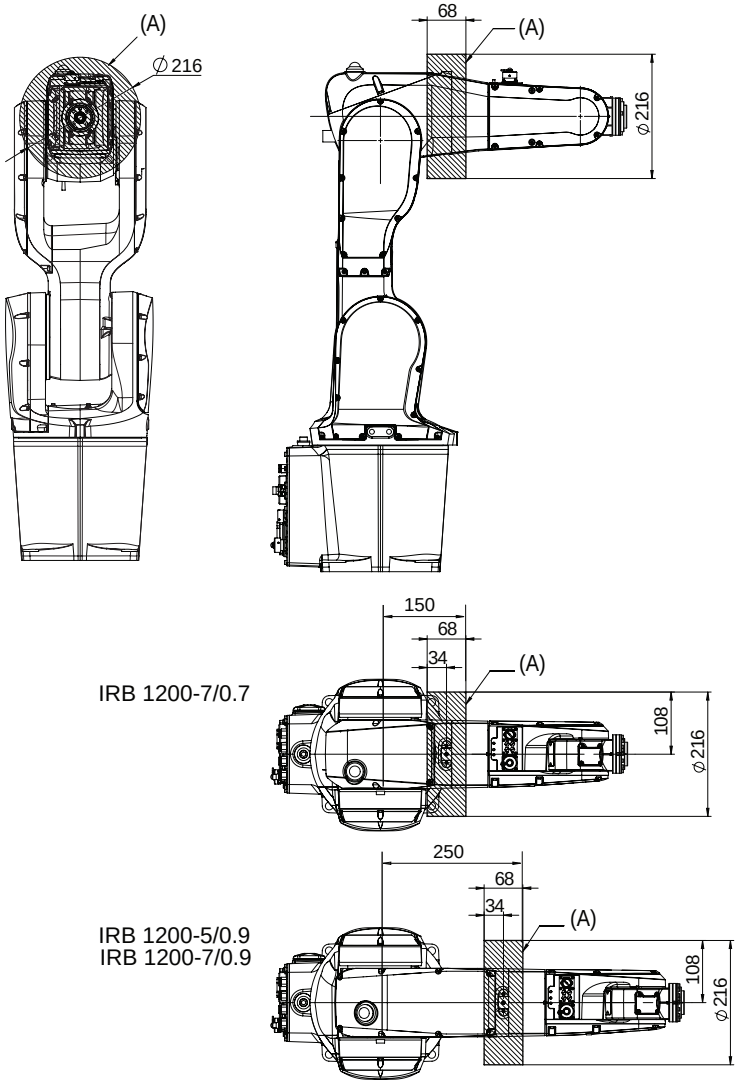
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2.3.7 Fitting of equipment on the robot

2.3.7.1 Introduction to fitting of equipment

General

Extra loads can be mounted on to the upper arm. Definitions of load area and permitted load are shown in figure below. The center of gravity of the extra load shall be within the marked load areas. The robot is supplied with holes for fitting of extra equipment. (See *Holes for fitting extra equipment on page 90*).



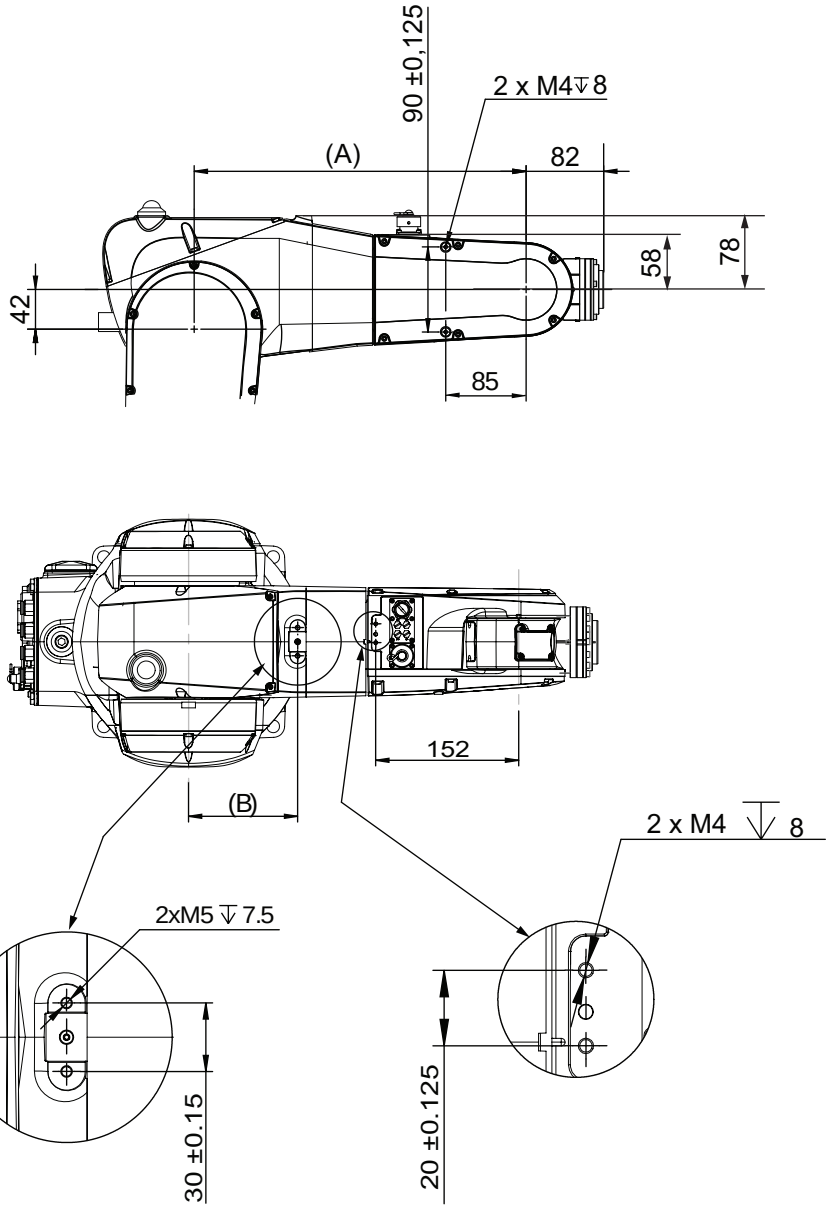
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Load area (A)	Max load
IRB 1200-5/0.9	0.3 kg
IRB 1200-7/0.7	
IRB 1200-7/0.9	0.5 kg

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2.3.7.2 Holes for fitting extra equipment

Upper arm



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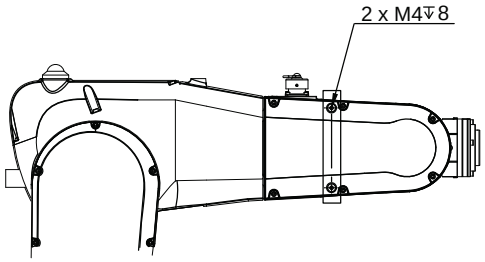
Pos	Description
A	IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm, IRB 1200-7/0.9 = 451 mm
B	IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm, IRB 1200-7/0.9 = 216 mm

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Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



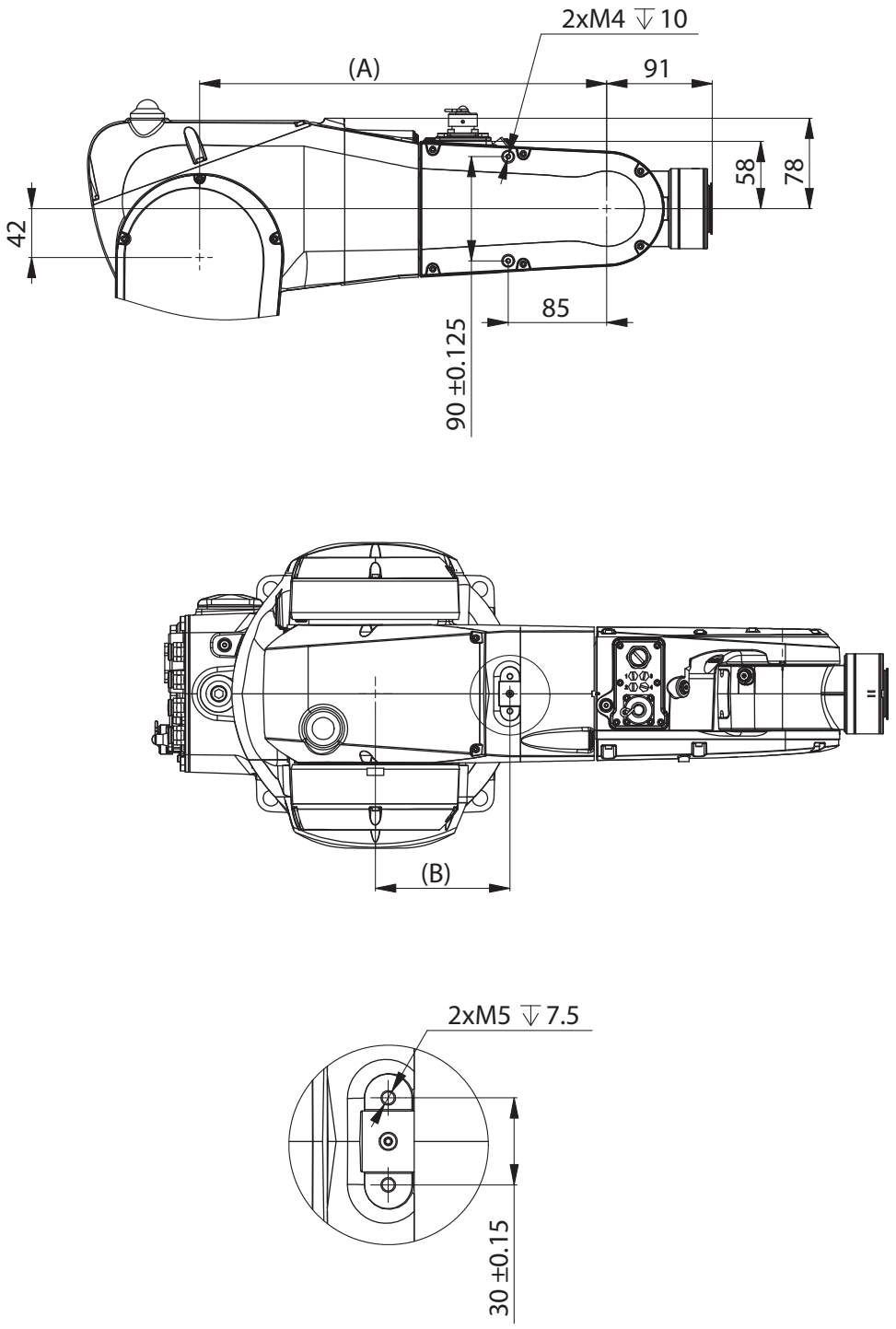
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2.3.7.2 Holes for fitting extra equipment
Continued

Upper arm for Hygienic robots



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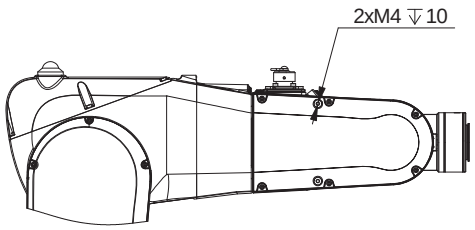
Pos	Description
A	IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm
B	IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm

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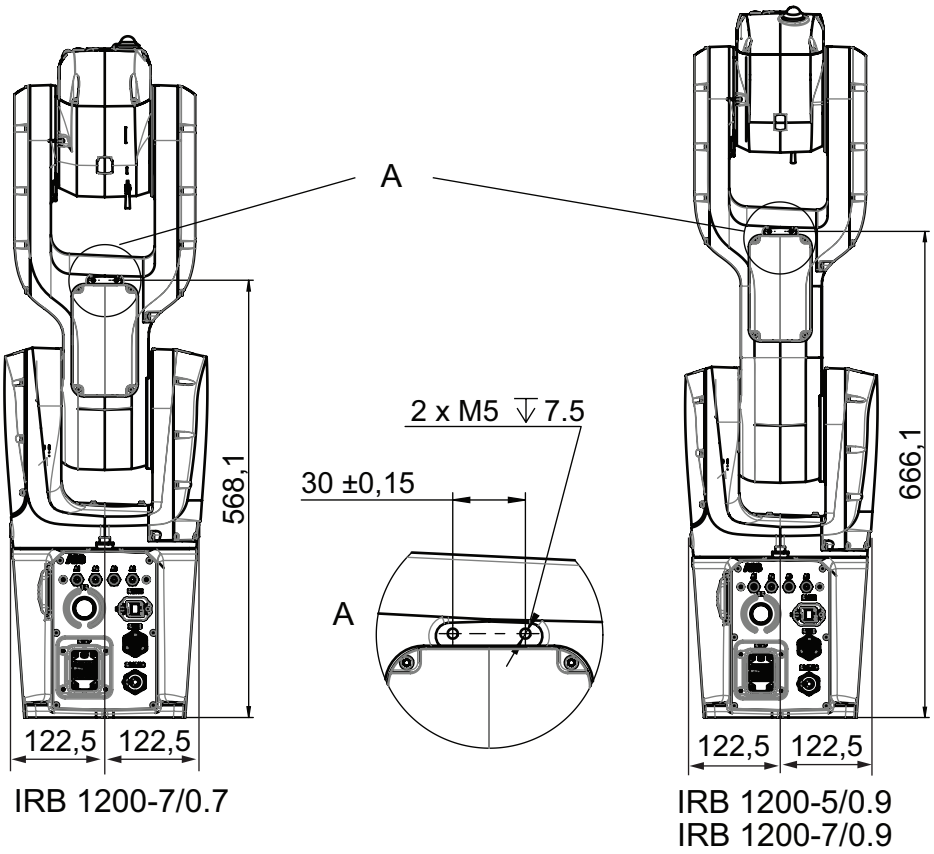
Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



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Lower arm



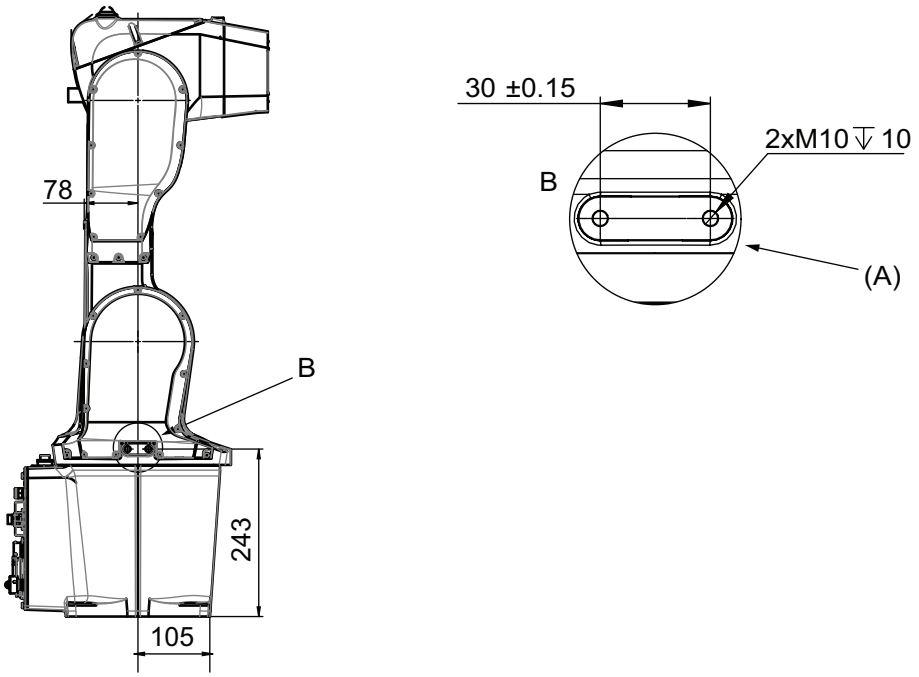
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2.3.7.2 Holes for fitting extra equipment
Continued

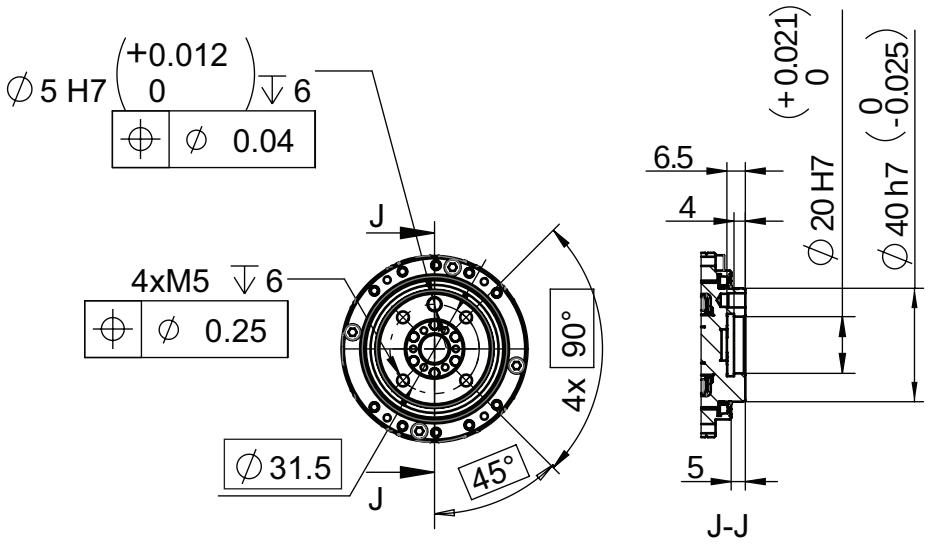
Frame



xx1400000590

Pos	Description
A	Holes on both sides

Robot tool flange

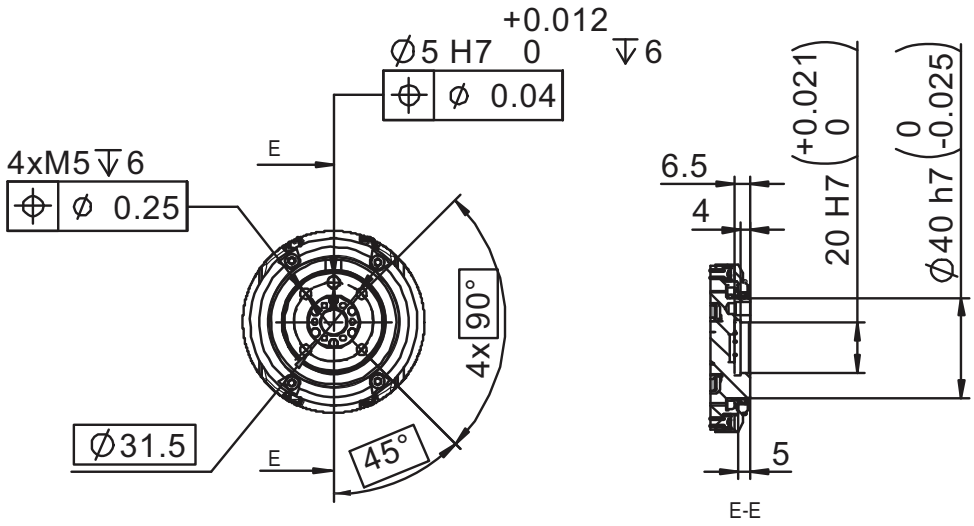


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Robot tool flange for Foundry Plus robots



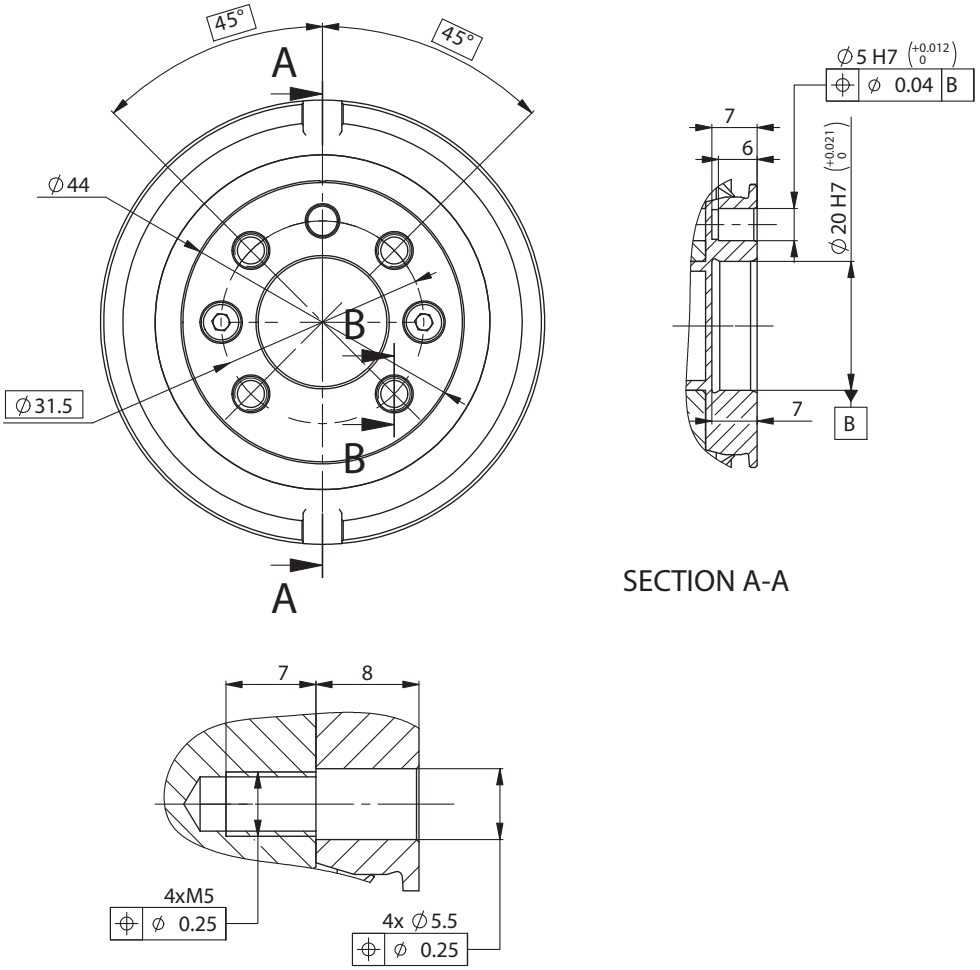
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2.3.7.2 Holes for fitting extra equipment
Continued

Robot tool flange for Hygienic robots



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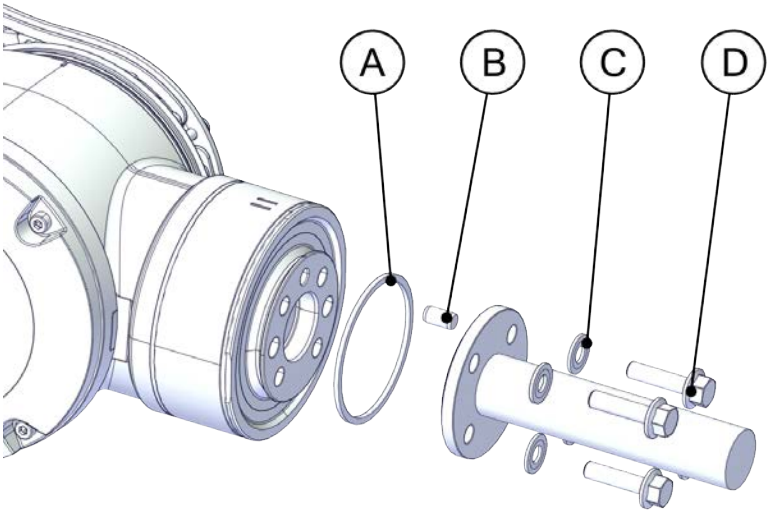
Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

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2.3.7.3 Fitting tools on Hygienic robots

For robots with protection type Hygienic, the gap between the tool flange and tool must be sealed by fitting a gasket, guide pin, stainless flange bolts and FDA washers, which are packaged (package number: 3HAC078800-001) with the robot at delivery.



xx2100002211

Item	Description	Qty.	Note
A	Gasket	1	
B	Guide pin	1	
C	FDA washers	4	
D	Stainless flange bolts	4	Tightening torque: 6 Nm Always apply a little grease Molykote P1900 to the bolt thread before fitting the tool using the bolts.

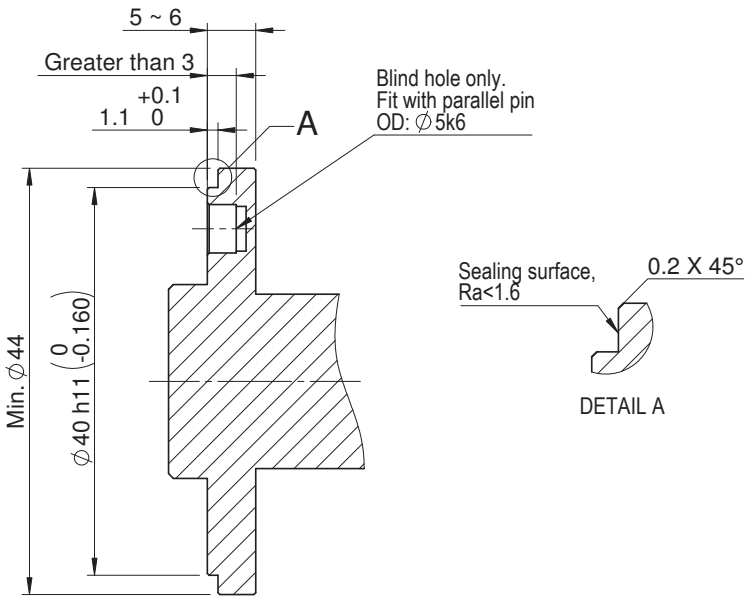
When designing the tools to be fit on the tool flange, make sure the tool dimension meets the following requirements in addition to the dimension of the robot tool flange specified in *Robot tool flange on page 94*.

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2.3.7.3 Fitting tools on Hygienic robots

Continued



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2.4 Installation of options

2.4.1 Installing the signal lamp on IRC5 robots

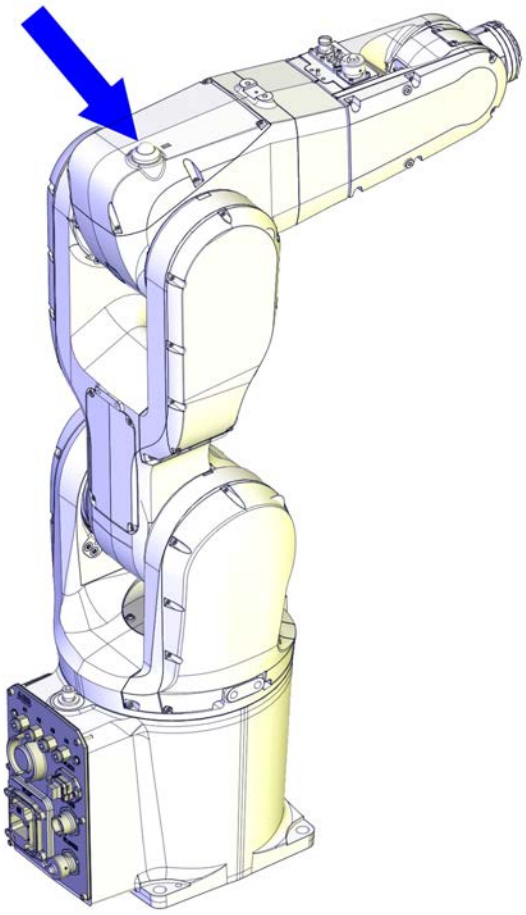
General

A signal lamp with an yellow fixed light can be mounted on the robot, as a safety device. The signal lamp is required on an UL/UR approved robot.

The lamp is active in MOTORS ON mode.

Location of signal lamp

The signal lamp is located as shown in the figure.



xx1300000455

Required spare parts

Spare part	Article number	Note
Signal lamp	3HAC16738-1	

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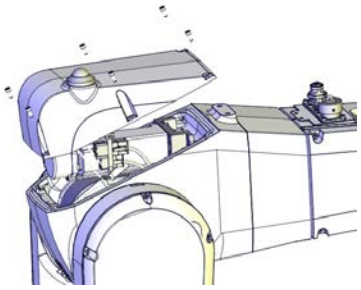
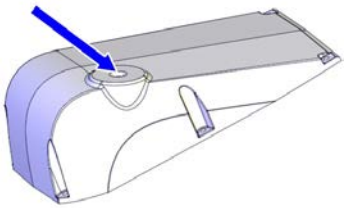
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2.4.1 Installing the signal lamp on IRC5 robots
Continued

Required tools

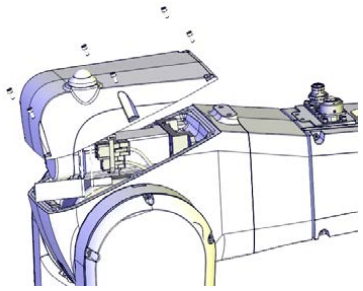
Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Installing the signal lamp

	Action	Note
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing.	 xx1300000464
4	Drill a hole with a diameter of 22.5 mm in the center of the raised platform.	 xx1300000465
5	Fit the lamp and tighten the nut.	
6	Connect the two lamp cables connectors (R3.H1 and R3.H2) to the cable harness lamp connectors (H1 and H2).	

Continues on next page

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	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
8	Refit the cover on the upper arm housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.
9	For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
10	The signal lamp is now ready for use and is lit in MOTORS ON mode.	

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2.4.2 Installing the signal lamp for OmniCore robots

Description

A signal lamp with a yellow fixed light can be mounted in the cell or any other visible location, and driven by I/O signal or MON_LAMP signal from the controller.

Function

The lamp is active in MOTORS ON mode.

Installation of signal lamp from I/O signal

	Action
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.
2	**For robots with OmniCore E line** Connect the lamp cable connector to the I/O connector on the controller. **Note** The I/O connector provides 8 digital output signals for use.
3	Configure the lamp by adding a *System Output* type signal with status set to *Motors On State*.
4	The lamp is now ready for use and is lit in MOTORS ON mode.

Installation of signal lamp from MON_LAMP signal

	Action
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.
2	**For robots with OmniCore E line** Connect the lamp cable connector to the MON connector on the controller. **Note** The MON connector provides MON_LAMP output signals for use. For more details, see chapter *Descriptions for connectors* in OmniCore product manuals.
3	The lamp is now ready for use and is lit in MOTORS ON mode.

Further information

Further information about the MOTORS ON/MOTORS OFF mode may be found in the product manual for the controller.

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Further information about how to set up I/O system may be found in *Technical reference manual - System parameters*.

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2.5 Restricting the working range

2.5.1 Axes with restricted working range

General

When installing the robot, make sure that it can move freely within its entire working space. If there is a risk that it may collide with other objects, its working space should be limited.

For OmniCore robots, the working range can be also be configured with safe supervision of the working range, see *Safe supervision of working range limitations (space limiting) on page 105*.

The working range of the following axes may be restricted:

- Axis 1, hardware (mechanical stop) and software. **Note!** The axis 1 stop is a fixed stop that must be installed during operation of robot!
- Axis 2, hardware (mechanical stop) and software. **Note!** The axis 2 stop is a fixed stop that must be installed during operation of robot!
- Axis 3, hardware (mechanical stop) and software. **Note!** The axis 3 stop is a fixed stop that must be installed during operation of robot!
- Axis 4, hardware (mechanical stop) and software. **Note!** The axis 4 stop is a fixed stop that must be installed during operation of robot!
- Axis 5, hardware (mechanical stop) and software
- Axis 6, software

This section describes how to install hardware that restricts the working range.

Note

Adjustments must also be made in the robot configuration software (system parameters). References to relevant manuals are included in the installation procedures.

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2.5.2 Safe supervision of working range limitations (space limiting)

About safe supervision of working range limitations

OmniCore robots with RobotWare 7.19 or later can use safe supervision (space limiting) of the working range limitations instead of mechanical stops. This requires the option *SafeMove Standard+*. The safe supervision can be set on axes 1-3. For robots with either of the MultiMove or additional axis options, all axes can be supervised.

The supervision is configured in Visual SafeMove. More details about Visual SafeMove are available in *Application manual - Functional safety and SafeMove*.

Note

If the robot has SafeMove Premium, then there are more configuration possibilities for the safe ranges and the safe axis positions, see *Application manual - Functional safety and SafeMove*.

Configure the safe axis range

With the option SafeMove Standard+, only one safe range can be configured.

With the option SafeMove Premium or SafeMove Collaborative, set up safe zones instead. See *Application manual - Functional safety and SafeMove*.

DANGER

When setting range limits, brake distances must be taken into consideration, so that the SafeMove functions are configured with enough margin. If an axis hits the range limit, the robot starts to brake and needs the brake distance to stop. This occurs outside the allowed range.

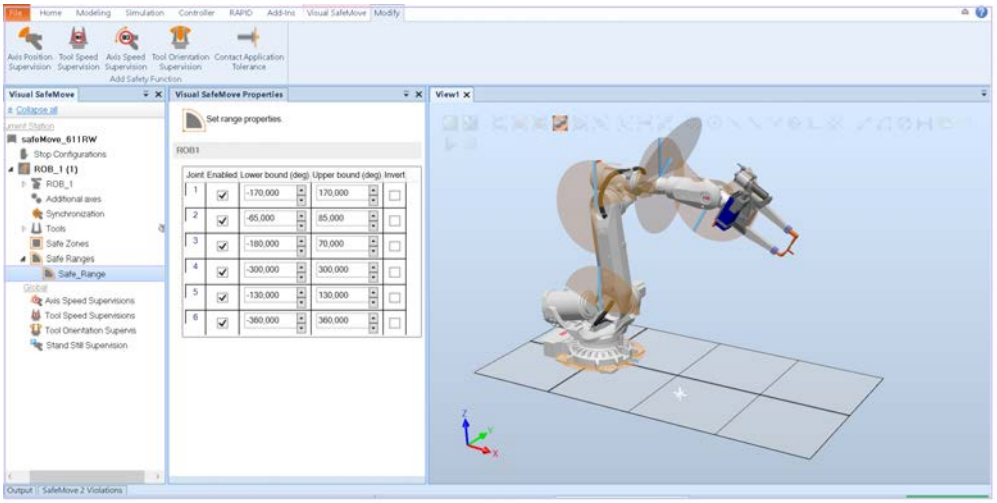
Note that if the robot starts accelerating strongly just before reaching a configured range limit, there will occur a speed overshoot before decelerating. This may result in a somewhat increased speed and extended braking distance compared to a smoother speed situation.

	Action	Note/illustration
1	In the **Visual SafeMove** ribbon, click on **Safe Range**.	A range of default size is shown for each axis in the graphics window.
2	Specify **Upper bound** and **Lower bound** for each axis.	Brake distances must be taken into consideration.
3	If an axis should be excluded from the safe range, clear the checkbox **Enabled** for that axis.	
4	To supervise the inverted range for an axis (below **Lower bound** and above **Upper bound**) select the checkbox **Inverted** for that axis.	

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2.5.2 Safe supervision of working range limitations (space limiting)
Continued



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Tip

To change the name of a range, right-click on the range in the **Visual SafeMove** browser, select **Rename** and type the desired name.

Configure the safe axis position

	Action	Note/illustration
1	To configure the safe axis position, right-click the safe range and select **Axis Position Supervision**. **Note** If the robot has either of the MultiMove or additional axis options, then more configuration options are available.	
2	For SafeMove Standard+, the supervision function is permanently active.	
3	In the **Violation action** part, configure the stop category. Select if violation of the function should stop the robot with stop category 0, stop category 1, or not stop the robot.	For SCARA robot axes without brakes, stop category 1 shall be used.[i]

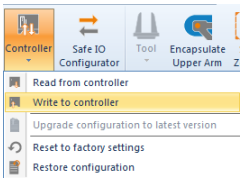
i See the product specification for the respective manipulator.

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Concluding procedure

The concluding procedure requires that the logged in user has the grant **Safety Services**.

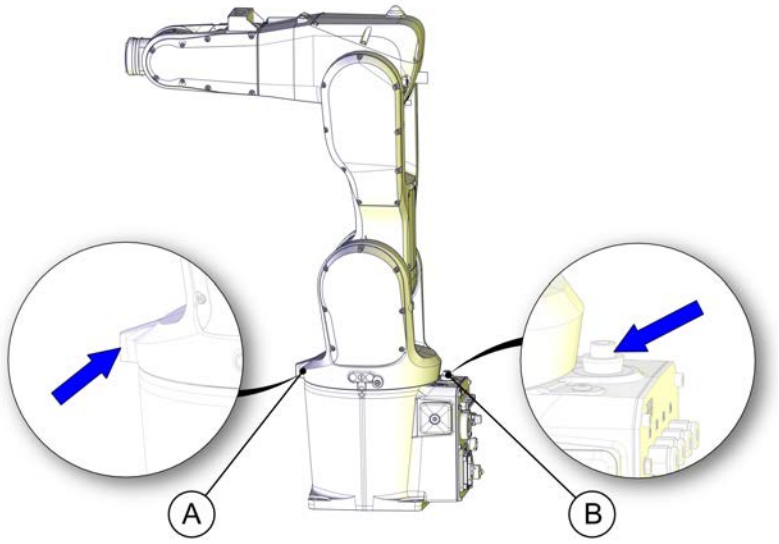
	Action	Note/illustration
1	In the **Visual SafeMove** ribbon, click on **Controller** and then select **Write to controller**.	 xx1500000801
2	A report of the safety configuration is shown. The report can be printed by clicking on **Print** (it is recommended to print the report since it should be used when validating the configuration). Click OK to close the report.	
3	Answer **Yes** when asked if you want to restart the controller.	After the restart, the downloaded configuration is active. Before running in auto mode, the configuration should be validated and locked.
4	Deactivate any supervision functions that are signal activated.	
5	Move the robot beyond the working range limit, for example with a move instruction.	The robot will stop when it reaches the limit.
6	Validate the checksum to verify that the right configuration is used. Lock the configuration.	

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2.5.3 Mechanically restricting the working range

Location of mechanical stops

The figures shows where the mechanical stops are placed on the robot.

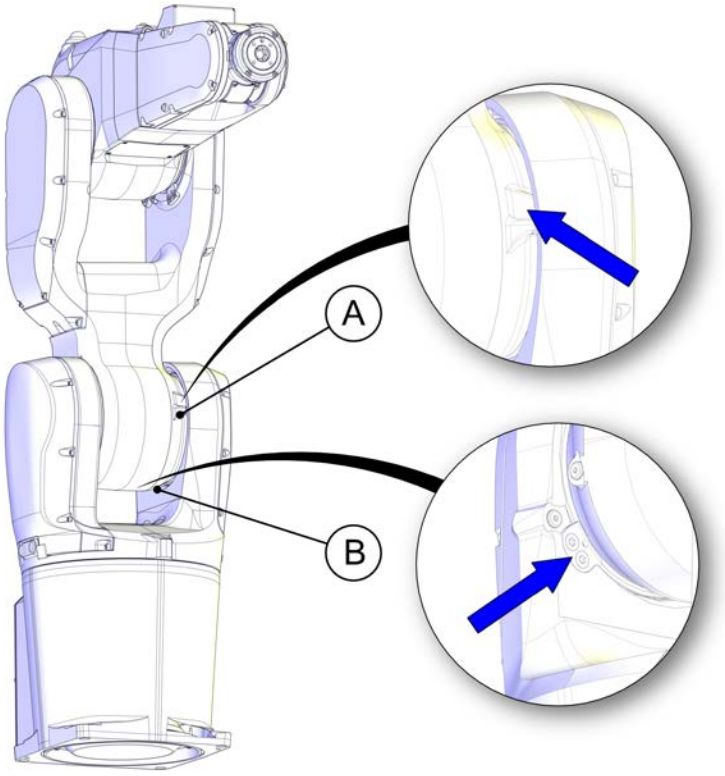


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A	Mechanical stop axis 1 (swing)
B	Mechanical stop axis 1 (base)

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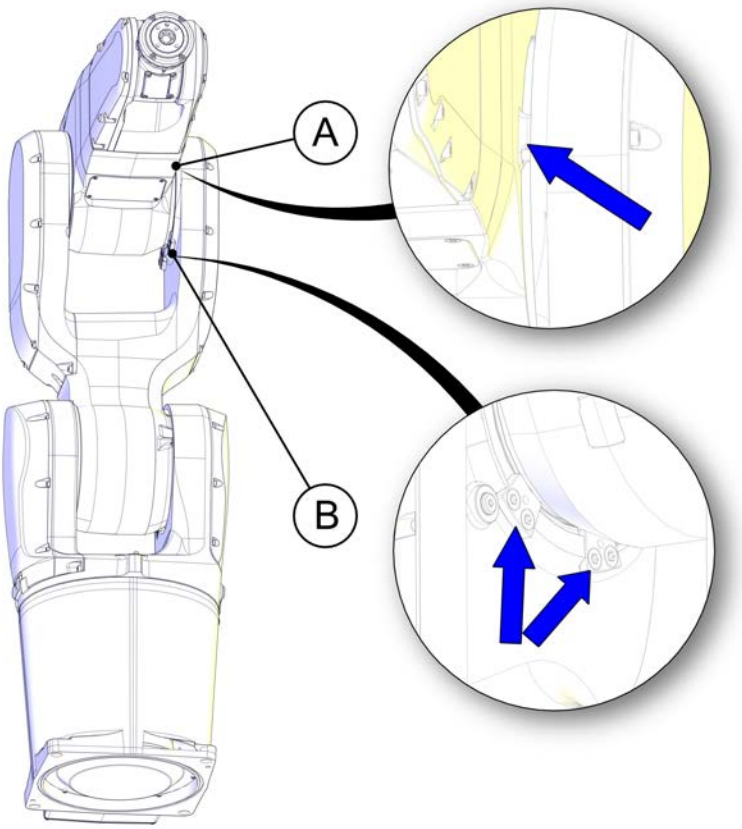
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A	Mechanical stop axis 2 (lower arm)
B	Mechanical stop axis 2 (swing)

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2.5.3 Mechanically restricting the working range
Continued

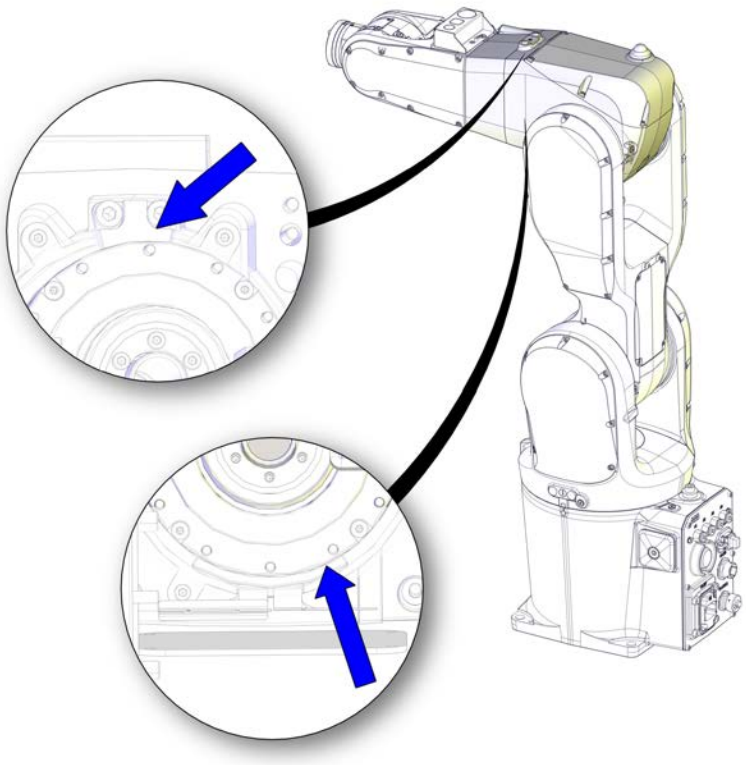


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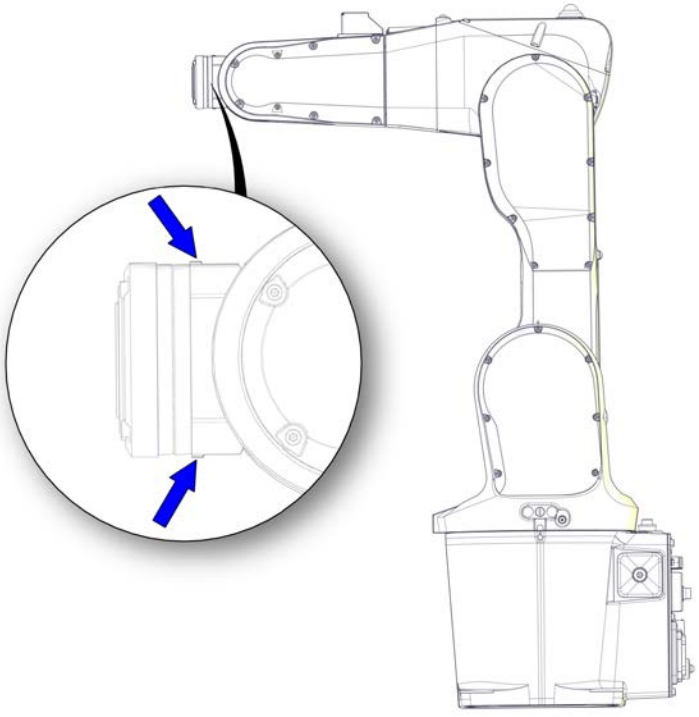
A	Mechanical stop axis 3 (lower arm)
B	Mechanical stop axis 3 (tubular)

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2.5.3 Mechanically restricting the working range
Continued

The axis-1, axis-2, axis-3, and axis-4 stops are fixed stops that must be installed during operation of robot. For details about how to install the stops, see:

- *Replacing the axis-1 mechanical stop on page 664*
- *Replacing the axis-2 mechanical stop on page 475*
- *Replacing the axis-3 mechanical stop on page 478*
- *Replacing the axis-4 mechanical stop on page 481*

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2.6 Making robot ready for operation

2.6.1 Additional installation procedure, Clean Room

General

Robots with protection type Clean Room are specially designed to work in a clean room environment. Clean Room robots are designed to prevent from particle emission from the robot. For example, the maintenance work possible to perform without cracking the paint.

Particle emission from the robot fulfill Clean room class standard according to DIN EN ISO 14644-1, -14. The classification results in accordance with ISO 14644-8 at test temperature 23℃ is Class -6.8 (total organic compounds *TOC*) and at test temperature 90℃ is Class -3.8 (total organic compounds *TOC*).

Any Clean Room parts that are replaced must be replaced with parts designed for use in Clean Room environments.

Clean Room class 3

According to **IPA test result**, the robot IRB 1200 is suitable for use in Clean Room environment.

Preparations before commissioning a Clean Room robot

During transport and handling of a Clean Room robot, it is likely that the robot has been contaminated with particles of different kinds. Therefore the robot must be carefully cleaned before installation.

Do not apply force on the plastic covers when lifting the robot! This may result in damage or cracks in the paint around the plastic cover.

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2.7 Electrical connections

2.7.1 Robot cabling and connection points

Introduction

Connect the robot and controller to each other after securing them to the foundation. The lists below specify which cables to use for each respective application.

DANGER

Turn off the main power before connecting any cables.

CAUTION

Connect the male and female connectors perfectly aligned horizontally to avoid any kind of tilt or skew.

CAUTION

Verify that the serial number is according to the number(s) in the *Declaration of Incorporation* (DoI).

Main cable categories

All cables between the robot and controller are divided into the following categories:

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the encoder interface board. Specified in the table *Robot cables on page 114*.
Customer cables (option)	Handles communication with equipment fitted on the robot by the customer (low voltage signals). The customer cables also handle Ethernet communication. See the product manual for the controller, see document number in *References on page 10*.

Robot cables

These cables are included in the standard delivery. They are completely pre-manufactured and ready to plug in.

Cable sub-category	Description	Connection point, cabinet	Connection point, robot
Robot cable, power	Transfers drive power from the drive units in the control cabinet to the robot motors.	XS1 (IRC5 controllers) X1 (OmniCore controllers)	R1.MP

Continues on next page

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Cable sub-category	Description	Connection point, cabinet	Connection point, robot
Robot cable, signals	Transfers encoder data from and power supply to the encoder interface board. Transfers resolver data from and power supply to the serial measurement board.	XS2 (IRC5 controllers) X2 (OmniCore controllers)	R1.EIB

Robot cable, power

The following table lists the power cables for connecting IRC5 controller.

Power cable length	Article number
3 m (IRC5)	3HAC040503-007
7 m (IRC5)	3HAC040503-001
15 m (IRC5)	3HAC040503-002
22 m (IRC5)	3HAC040503-003
30 m (IRC5)	3HAC040503-004

The following table lists the power cables for connecting OmniCore controller.

Power cable length	Article number
3 m (OmniCore)	3HAC077245-001
7 m (OmniCore)	3HAC077245-002
15 m (OmniCore)	3HAC077245-003

Robot cable, signals

The following table lists the signal cables for connecting IRC5 controller.

Signal cable length	Article number
3 m (IRC5)	3HAC068916-001
7 m (IRC5)	3HAC068917-001
15 m (IRC5)	3HAC068918-001
22 m (IRC5)	3HAC068919-001
30 m (IRC5)	3HAC068920-001

The following table lists the signal cables for connecting OmniCore controller.

Power cable length	Article number
3 m (OmniCore)	3HAC080671-001
7 m (OmniCore)	3HAC080671-002
15 m (OmniCore)	3HAC080671-003

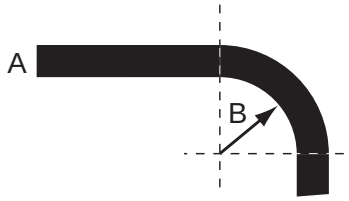
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2.7.1 Robot cabling and connection points
Continued

Bending radius for static floor cables

The minimum bending radius is 10 times the cable diameter for static floor cables.

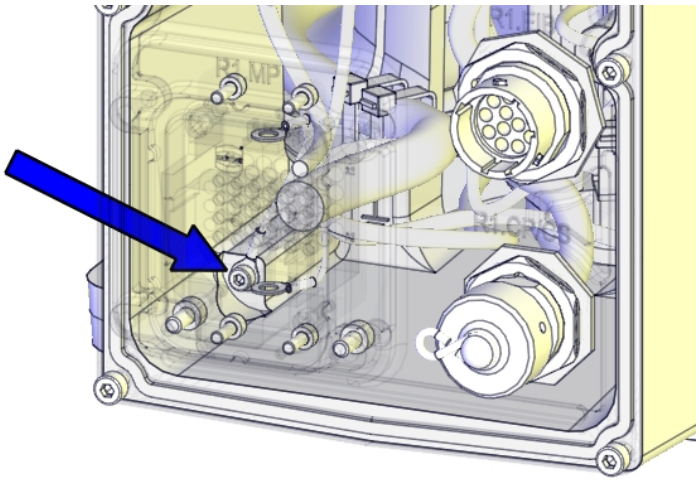


xx1600002016

A	Diameter
B	Diameter x10

Grounding and bonding point on manipulator

There is a grounding/bonding point on the manipulator base. The grounding/bonding point is used for potential equalizing between control cabinet, manipulator and any peripheral devices.



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Installation of extra O-ring

For robots with protection class IP67

For robots with protection type FoundryPlus

For robots with protection type Clean Room

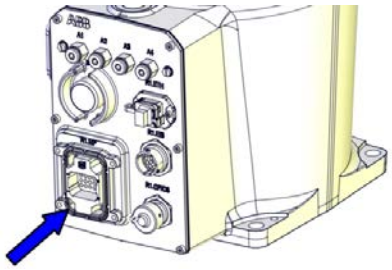
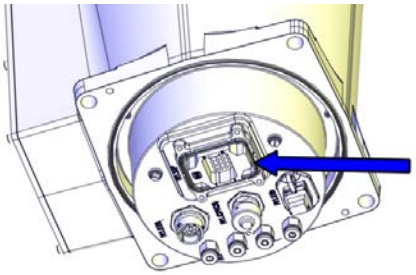
For robots with food grade lubrication

For robots with protection type Hygienic

The O-ring specified below is delivered together with the robot and must be installed to the main power connector during electrical installation.

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Equipment	Art. no.	Note
O-ring	3HAB3772-19	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used to seal between the main power cable and the connector. Robots with manipulator cables routed from the rear of the base:  xx1500000243 Robots with manipulator cables routed from below (option 996-1):  xx1500000242

Customer cables - CP/CS cable (option)

The following table lists the CP/CS cables for connecting IRC5/IRC5C controller.

CP/CS cable length	Article number
3 m (IRC5)	3HAC049089-001
7 m (IRC5)	3HAC049089-004
15 m (IRC5)	3HAC049089-005
22 m (IRC5)	3HAC049089-006
30 m (IRC5)	3HAC049089-007
3 m (IRC5C)	3HAC049186-001
7 m (IRC5C)	3HAC049186-004
15 m (IRC5C)	3HAC049186-005
22 m (IRC5C)	3HAC049186-006
30 m (IRC5C)	3HAC049186-007

The following table lists the CP/CS cables for connecting OmniCore controller.

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2.7.1 Robot cabling and connection points
Continued

CP/CS cable length	Article number
3 m (OmniCore)	3HAC049186-001
7 m (OmniCore)	3HAC049186-004
15 m (OmniCore)	3HAC049186-005

Customer cables - Ethernet floor cable (option)

The following table lists the Ethernet cables for connecting IRC5/IRC5C controller.

Ethernet floor cable length	Article number
3 m (IRC5/IRC5C)	3HAC055518-001
7 m (IRC5/IRC5C)	3HAC055518-002
15 m (IRC5/IRC5C)	3HAC055518-003
22 m (IRC5/IRC5C)	3HAC055518-004
30 m (IRC5/IRC5C)	3HAC055518-005

The following table lists the Ethernet cables for connecting OmniCore controller.

Ethernet floor cable length	Article number
7 m (OmniCore)	3HAC055518-002
15 m (OmniCore)	3HAC055518-003

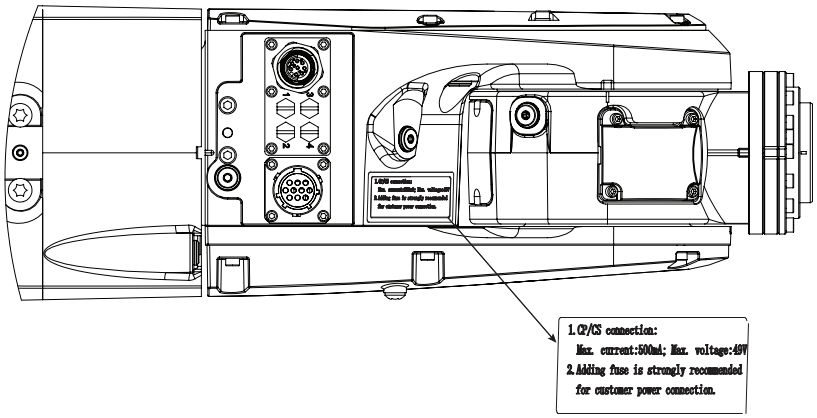
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2.7.2 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular housing (upper arm) and one at the base. There is one connector R4.CP/CS at the tubular housing. Corresponding connector R1.CP/CS is located at the base.

It is recommended to use a fuse protector for customer connection; otherwise, application overload will burn out the CP/CS cables in the robot. Detailed information about the CP/CS connection is provided in a warning label on the tubular housing.



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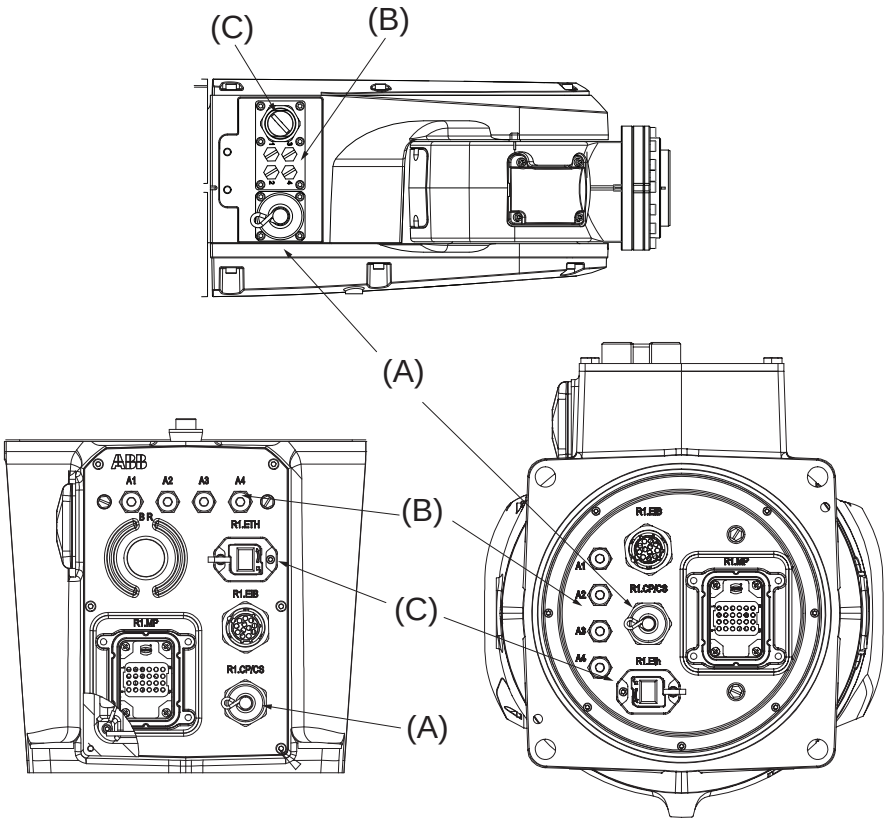
There is also connections for Ethernet, one connector R4.Ethernet at the tubular housing and the corresponding connector R1.Ethernet located at the base.

Hose for compressed air is also integrated into the manipulator. There are 4 inlets at the base (R1/8”) and 4 outlets (M5) on the tubular housing.

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2.7.2 Customer connections
Continued



xx1300000385

Position	Connection	Description	Number	Value
A	(R1)R4.CP/CS	Customer power/signal	10	49 V, 500 mA
B	Air	Max. 5 bar	4	Outer diameter of air hose: 4 mm
C	(R1)R4.Ethernet	Customer Ethernet	8	100/10 Base-TX

Connectors

The tables describes the connectors on base and tubular housing (upper arm).

Connectors, base

Position	Description	Art. no.
Robot	Pin connector 10p, bulkhead	3HAC022117-002
Customer connector	Connector set R1.CP/CS	3HAC037038-001

Connectors, tubular housing

Position	Description	Art. no.
Robot	Socket connector 10p, flange mounted	3HAC023624-002
Customer connector	Connector set R3.CP/CS	3HAC037070-001

Air, connector

Position	Description	Art. no.
Robot	4xM5	

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Position	Description	Art. no.
Customer cable	Air connector	3HAC032049-001

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2.8 Start of robot in cold environments

Introduction

This section describes how to start the robot in a cold environment if it is not starting the normal way.

Problems with starting the robot

Event message from Motion Supervision

Use this procedure if an event message indicates a problem with Motion supervision at start-up. More information about Motion Supervision is found in *Technical reference manual - System parameters*.

	Action	Note
1	Turn off Motion Supervision.	
2	Start the robot.	
3	When the robot has reached normal working temperature, the Motion Supervision can be turned on again.	

Robot stopping with other event message

Use this procedure if the robot is not starting.

	Action	Note
1	Start the robot with its normal program but with reduced speed.	The speed can be regulated with the RAPID instruction `VelSet`.

Adjusting the speed and acceleration during warm-up

Depending on how cold the environment is and what program is being used, the speed might need to be ramped up until reached maximum. The table shows examples of how to adjust the speed:

Work cycles	`AccSet`	Speed/velocity
3 Work cycles	20, 20	v100 (100 mm/s)
5 Work cycles	40, 40	v400 (400 mm/s)
5 Work cycles	60, 60	v600 (600 mm/s)
5 Work cycles	100, 100	v1000 (1000 mm/s)
More than 5 Work cycles	100, 100	Max.

If the program consists of large wrist movements, it is possible that the reorientation velocity, which is always high in predefined velocities, needs to be included in the ramping up.

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2.9 Test run after installation, maintenance, or repair

Safe handling

Use the following procedure after installation, maintenance, or repair, before initiating motion.

DANGER

Initiating motion without fulfilling the following aspects, may increase the risk for injury or cause damage to the robot.

	Action
1	Remove all tools and foreign objects from the robot and its working area.
2	Verify that the robot is properly secured to its position by all screws, before it is powered up.
3	Verify that any safety equipment installed to secure the position or restrict the robot motion during service activity is removed.
4	Verify that the fixture and work piece are well secured, if applicable.
5	Verify that all safety equipment is installed, as designed for the application.
6	Verify that no personnel are inside the safeguarded space.
7	If maintenance or repair has been done, verify the function of the part that was maintained.
8	Verify the application in the operating mode manual reduced speed.
9	Clearly label the manipulator and its matching controller. Verify that the manipulator is properly connected to its controller, then perform a jog test to confirm it is the intended manipulator to be moved.

Collision risks

CAUTION

When programming the movements of the robot, always identify potential collision risks before initiating motion.

CAUTION

Special care must be taken when restarting a robot that is stopped due to a collision. The robot might make a limited movement when restarted.

The revolution counters might need to be updated after a collision to ensure path accuracy.

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3 Maintenance

3.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 1200.

It is based on the maintenance schedule found at the beginning of the chapter. The schedule contains information about required maintenance activities including intervals, and refers to procedures for the activities.

Each procedure contains all the information required to perform the activity, including required tools and materials.

The procedures are gathered in different sections and divided according to the maintenance activity.

Safety information

Observe all safety information before conducting any maintenance work.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter *Safety on page 21* before performing any maintenance work.

The maintenance must be done by qualified personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

WARNING

If the IRB 1200 is connected to power, always make sure that the controller and IRB 1200 are connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30 Type B*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10 Type A*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*
- *Robot cabling and connection points on page 114*.

Moving the robot out of Clean Room working spaces before service activities

The robots must be moved out of the Clean Room working spaces before proceeding with the maintenance and repair works.

During the working space layout planning, reserve sufficient space to ensure that the robot can be moved in and out of the Clean Room working spaces smoothly.

Continues on next page

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The minimum space required for the equipment or device that are used to move or lift the robot should also be considered.

Protect the working space before service activities

Before proceeding with the maintenance and repair works, protect the area below the robot with a suitable sheet. This is to reduce the risk of contaminating the hygienic area below and around the robot.

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3.2 Maintenance schedule

3.2.1 Specification of maintenance intervals

Introduction

The intervals are specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the IRB 1200:

- Calendar time: specified in months regardless of whether the system is running or not.
- Operating time: specified in operating hours. More frequent running means more frequent maintenance activities.

Robots with the functionality *Service Information System* activated can show active counters in the device browser in RobotStudio, or on the FlexPendant.

Overhaul

Depending on application and operational environment a complete overhaul may be necessary in average around 30000 hours.

ABB Connected Services and its Assessment tools can help you to identify the real stress level of your robot, and define the optimal ABB support to maintain your robot working.

Contact your local ABB Customer Service to get more information.

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3.2.2 Maintenance schedule

Scheduled and non-predictable maintenance

The robot must be maintained regularly to ensure proper function. The maintenance activities and intervals are specified in the table below.

Non-predictable situations also give rise to inspections of the robot. Any damages must be attended to immediately!

Life of each component

The inspection intervals *do not* specify the life of each component.

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities	Regularly [i]	Every 12 months	Every 36 months	Every 6,000 operating hours	Reference
Cleaning activities					
Cleaning the robot	x				*Cleaning the IRB 1200 on page 161*
Inspection activities					
Inspecting the robot	x				Check for abnormal wear or contamination. For robots with protection type Clean Room: Inspect daily
Inspecting the robot paint	x				*Inspection of robot paint on page 131*
Inspecting the robot cabling [ii]	x [iii]				*Inspecting the robot cabling on page 132*
Inspecting the information labels		x			*Inspecting the information labels on page 133*
Inspecting the axis-1 mechanical stop pin	x [iv]				*Inspecting mechanical stops on page 138*
Inspecting the axis-2 mechanical stop	x [iv]				*Inspecting mechanical stops on page 138*
Inspecting the axis-3 mechanical stop	x [iv]				*Inspecting mechanical stops on page 138*
Inspecting the axis-4 mechanical stop	- [v]				
Inspecting the timing belts			x		*Inspecting timing belts on page 141*
Testing activities					
Running the *Brake Check* routine [vi]	x [vii]				Recommended to robots without the SafeMove option. See *Operating manual - IRC5 with FlexPendant*.
Running the *Cyclic Brake Check* routine [vi]	x [vii]				Recommended to robots with the SafeMove option. See *Application manual - Functional safety and SafeMove2*.
Replacement/changing activities					

Continues on next page

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Maintenance activities	Regularly [i]	Every 12 months	Every 36 months	Every 6,000 operating hours	Reference
Replacing the battery pack [viii]					*Replacing the battery pack on page 146*
Replacing the axis-6 sealing set on tool flange for Hygienic robots		x [ix]		x [ix]	*Replacing the sealing set on tool flange of Hygienic robots on page 156*
Replacing the mechanical stops, axes 1, 2, 3 and 4				x	Replace mechanical stops of the Clean Room robots that are cleaned or disinfected with cleaning detergents. See *Cleaning and disinfection instructions for Clean Room robots*. Mechanical stop replacement procedures are specified in *Repair on page 171*.

i "Regularly" implies that the activity is to be performed regularly, but the actual interval may not be specified by the robot manufacturer. The interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals. The more demanding movement pattern (sharper bending cable harness), the shorter intervals.

ii The robot cabling comprises the cabling between the robot and controller cabinet.

iii Replace when damage or cracks is detected or life limit is approaching.

iv Inspect immidiately if the mechanical stop is hit.

v Inspect immidiately if the mechanical stop is hit.

The robot needs to be disassembled according to section *Replacing the axis-4 mechanical stop on page 481* in order to get access to and inspect the mechanical stop.

vi Not needed separately if already included in the application.

vii Recommended test interval is within the range 8-48 hours.

viii The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See the operating manual of the controller.

See the replacement instruction for more details.

ix Replace the sealing set every 12 months or every 6000 operating hours. The actual interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals.

Activities and intervals, optional equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities	Every 12 months	Reference
Inspection activities		
Inspecting the signal lamp	x	*Inspecting the signal lamp (option) on page 144*

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3.2.2 Maintenance schedule
Continued

Expected component life - for L/H/P applications

The demanding nature of using IRB 1200 with protection type Clean Room in a Lifescience, Healthcare,and Pharmaceutical (L/H/P) application where extensive cleaning are applied can shorten the life of the robot's components compared to that of standard robots in a typical robotic application. Depending on the actual cleaning in the L/H/P application, the compromise of lifetime of IRB 1200 with protection type Clean Room in L/H/P applications will depend on a number of factors. The most important factors are:

- The cleaning detergent and cleaning protocol/regime applied.
- The ambient environment including temperature, humidity, water quality, etc.
  Using elevated temperature for cleaning bath is not recommended.
- Installation, maintenance, and repair procedures.
- The operation cycle of the robot.

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3.3 Inspection activities

3.3.1 Inspection of robot paint

General

For robots working in Clean Room environments, there is a risk of surface corrosion or paint peeling in case of mechanical damage to the coated surface. Therefore, it is important to regularly inspect robot surfaces for any paint breaking or damage.

Required tools and equipment

Equipment	Spare parts	Note
Lint free cloth		
Touch up paint Clean Room/Hygienic	3HAC036639-001	White

Inspection, robot paint

	Action	Description
1	Visually inspect the robot surface paint for any paint breaking.	
2	If there is paint breaking, clean the surface so that it is free from oil and grease.	Use a lint free cloth.
3	Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces. **Note** Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.	3HAC036639-001

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3.3.2 Inspecting the robot cabling

Introduction

CAUTION

For robots with protection type Clean Room

For robots with protection type Hygienic

Always read the specific instructions before doing any repair work, see *Cut the paint or surface on the robot before replacing parts on page 177*

Location of robot cabling

The robot cabling comprises the cabling between the robot and controller cabinet.

Required tools and equipment

Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

Inspection, robot cabling

Use this procedure to inspect the robot cabling.

	Action	Note
1	**DANGER** Turn off all: • electric power supply to the robot • hydraulic pressure supply to the robot • air pressure supply to the robot Before entering the robot working area.	
2	Visually inspect: • the control cabling between the robot and control cabinet Look for abrasions, cuts or crush damage.	
3	Replace the cabling if wear or damage is detected.	

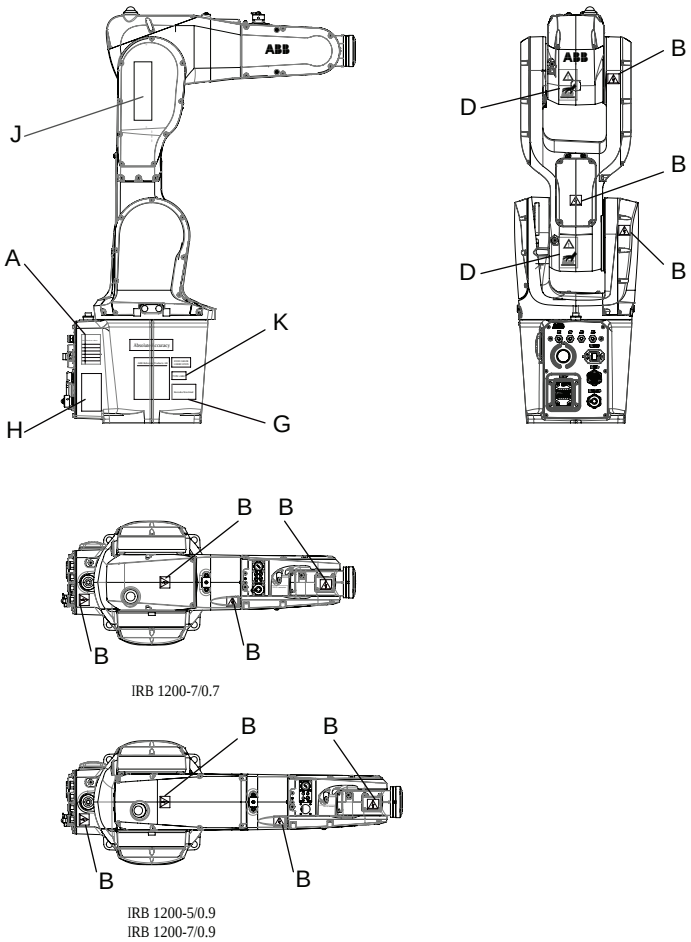
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3.3.3 Inspecting the information labels

Location of labels

These figures show the location of the information labels to be inspected. The symbols are described in section *Safety symbols on manipulator labels on page 25*.

Illustration 1 of 2



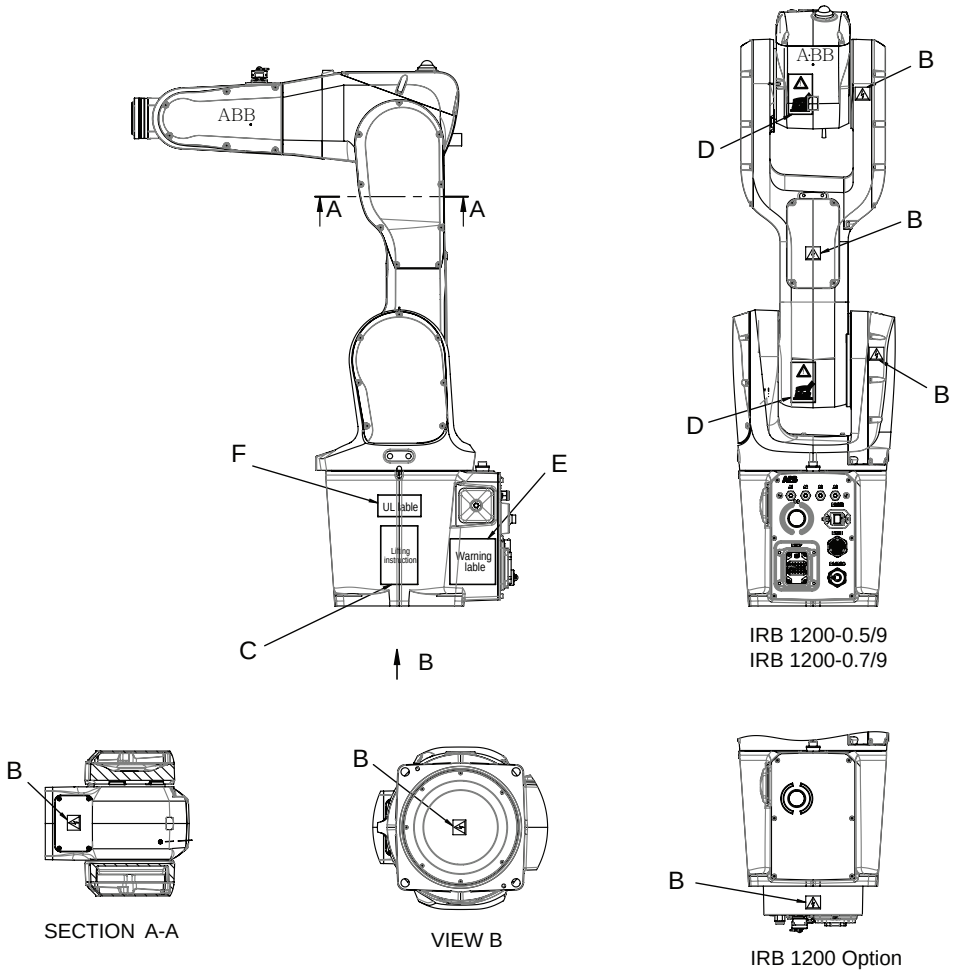
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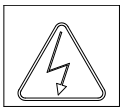
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3.3.3 Inspecting the information labels
Continued

Illustration 2 of 2

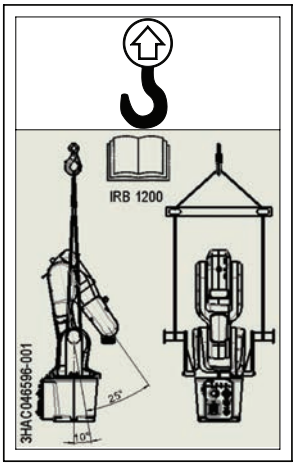
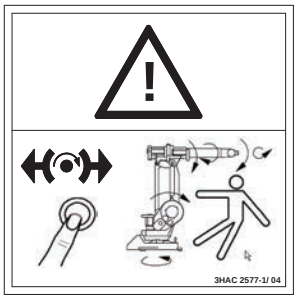


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	Description	Illustration
A	Calibration label	
B	Warning label **Flash**	 xx1300001091

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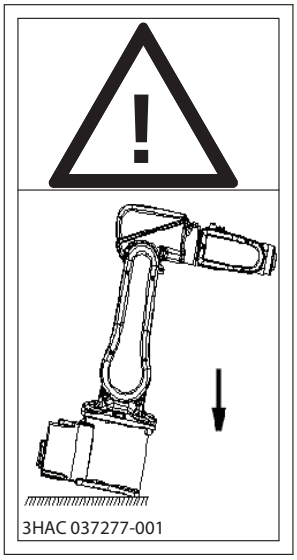
C	Instruction label **Lifting of robot**	 xx1400000518
D	Warning label **Heat**	 xx1300001087  xx1700000984
E	Instruction label **Brake release** **Moving robot** **Brake release buttons**	 xx1400000519
F	UL label	
G	Rating label	

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3.3.3 Inspecting the information labels

Continued

H	Warning label **Tip risk when loosening bolts**	 xx1400000527
J	Clean Room label	 xx1600001074
	Foundry Plus label	 xx1600001075

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K	Type A label	 xx1600002136
	Type B label	 xx1600002137

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Labels and plate set	3HAC051417-001	Not valid for protection type Hygienic. Includes all safety and information labels required for the robot. Missing, damaged or illegable labels must be replaced.

Required tools and equipment

Visual inspection, no tools are required.

Inspecting, labels

	Action	Note
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Inspect the labels, located as shown in the figures.	
3	Replace any missing or damaged labels.	Article numbers for the labels and plate set is specified in *Spare parts on page 933*.

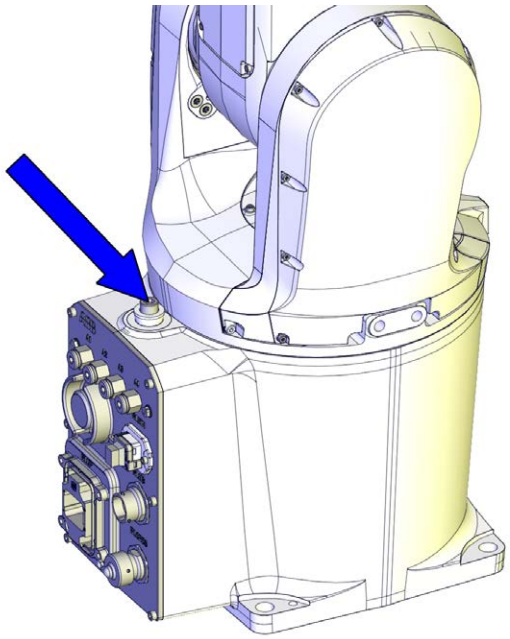
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3.3.4 Inspecting mechanical stops

Location of mechanical stops

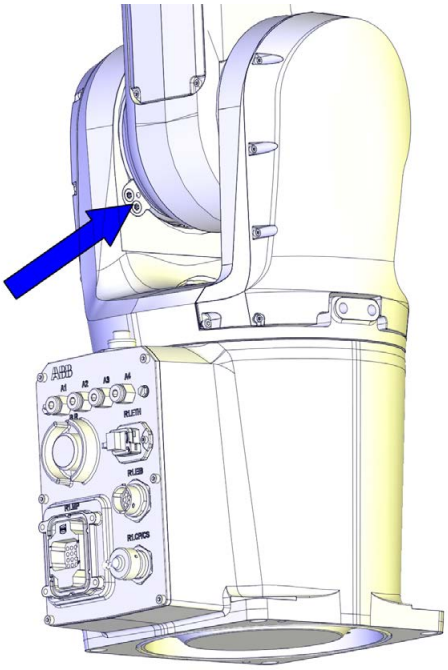
The mechanical stops on axes 1, 2 and 3 are located as shown in the figures.

Axis 1



xx1400000391

Axis 2

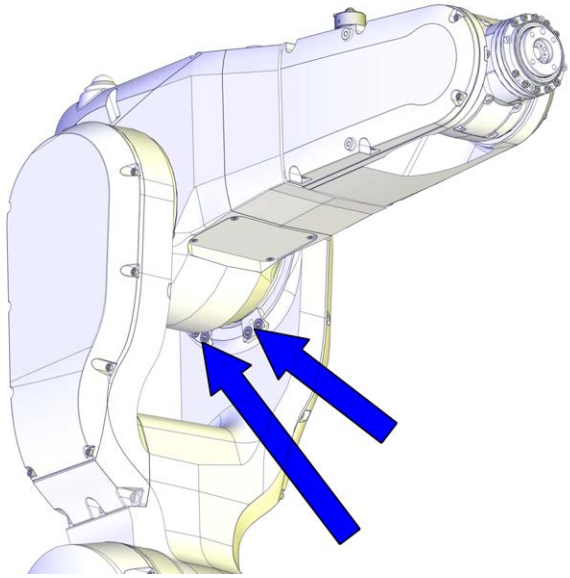


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Axis 3



xx1400000386

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Mechanical stop set, axis 1	3HAC049630-001	Includes mechanical stop pin (1 pc), washer and screw.
Mechanical stop set, axis 2	3HAC049637-001	Includes mechanical stop pin (1 pc) and screws.
Mechanical stop set, axis 3	3HAC049644-001	Includes mechanical stop pin (1 pc) and screws.

Required tools and equipment

Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

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3.3.4 Inspecting mechanical stops
Continued

Inspecting mechanical stops

Use this procedure to inspect mechanical stops on axes 1, 2 and 3.

	Action	Info
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Inspect the *mechanical stops*.	See the figures in: • *Location of mechanical stops on page 138*
3	Replace if the mechanical stop is: • bent • loose • damaged. **Note** The expected life of gearboxes can be reduced as a result of collisions with the mechanical stop.	
4	For Clean Room robots that are cleaned or disinfected with specific cleaning detergents, replace the mechanical stops if some of the below is discovered: • discoloration • loss of gloss	See *Cleaning and disinfection instructions for Clean Room robots on page 163*.

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3.3.5 Inspecting timing belts

Introduction

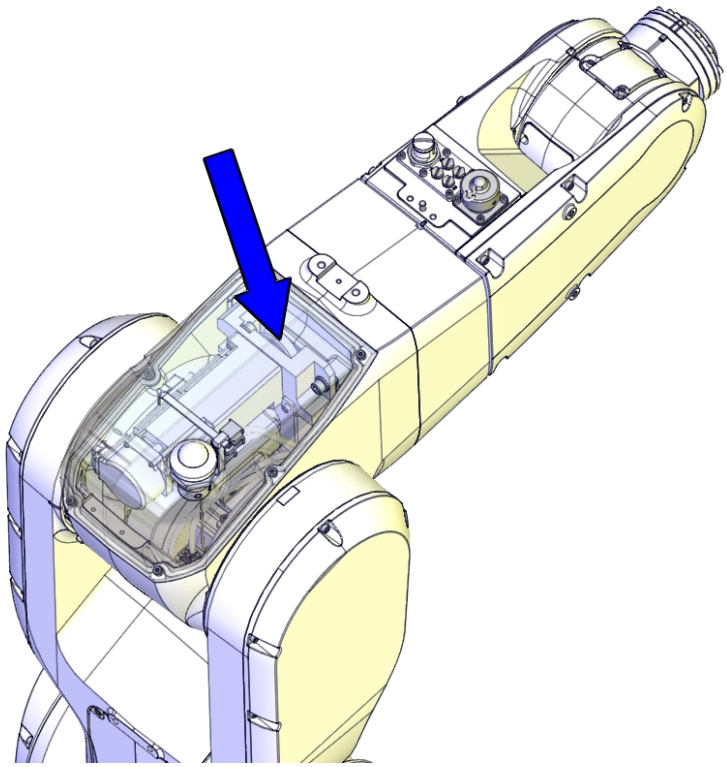
CAUTION

Always read the specific instructions if the robot has protection type Clean Room, before doing any repair work, see *Cut the paint or surface on the robot before replacing parts on page 177*.

Location of timing belts

The timing belts are located as shown in the figures.

Axis 4



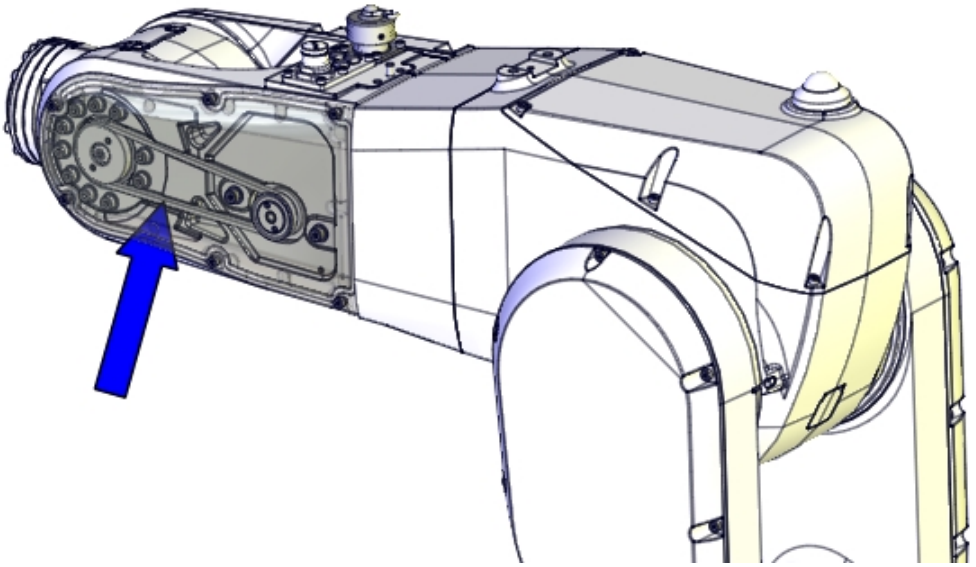
xx1400000036

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3.3.5 Inspecting timing belts
Continued

Axis 5



xx1400000032

Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section *Standard toolkit on page 927*.
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Inspecting timing belts

Use this procedure to inspect timing belts.

	Action	Info
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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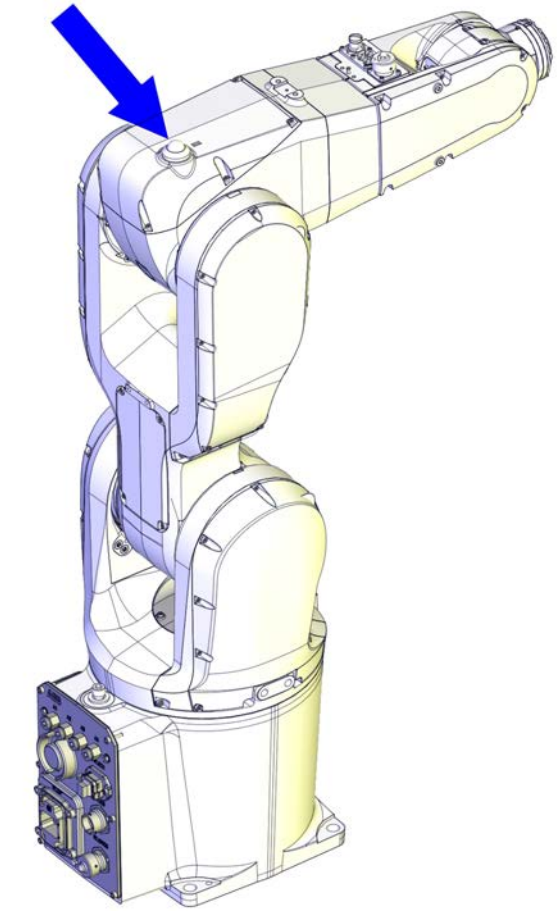
	Action	Info
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Gain access to each *timing belt* by removing the cover.	
4	Check the timing belts for damage or wear.	
5	Check the *timing belt pulleys* for damage.	
6	If any damage or wear is detected, the part must be replaced!	
7	Check whether timing belts are slack manually. If the belt has no tension, adjust it!	

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3.3.6 Inspecting the signal lamp (option)

Location of signal lamp

The signal lamp is located as shown in this figure.



xx1300000455

Required tools and equipment

Equipment	Article number	Note
Signal lamp kit	See *Spare parts on page 933*.	To be replaced if damage is detected.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Inspecting, signal lamp

Use this procedure to inspect the function of the signal lamp.

	Action	Note
1	Inspect that signal lamp is lit when motors are put in operation ("MOTORS ON").	

Continues on next page

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	Action	Note
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	If the lamp is not lit, trace the fault by: • inspecting whether the signal lamp is broken. If so, replace it. • inspecting cable connections. • inspecting the cabling. Replace the cabling if a fault is detected.	Article number is specified in *Required tools and equipment on page 144*.

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3.4 Replacement/changing activities

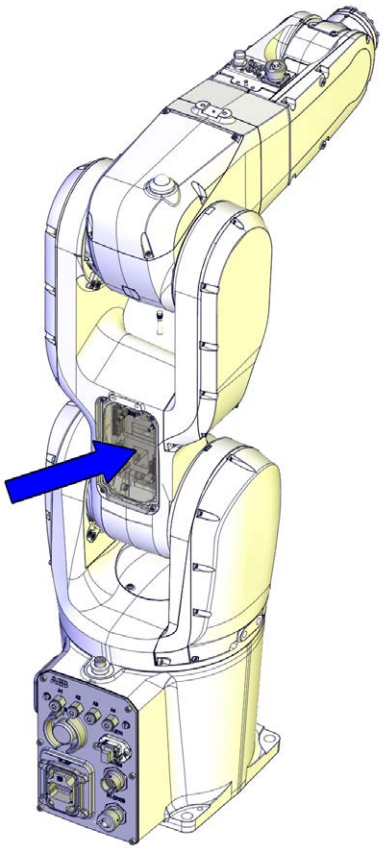
3.4.1 Replacing the battery pack

Note

The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See the operating manual for the robot controller.

Location of battery pack

The battery pack is located as shown in the figure.



xx1300002574

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Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Battery pack	3HAC051036-001	Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.
Battery pack, SafeMove 2-supported Battery pack, Hygienic	3HAC044075-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. For robots with protection type Hygienic Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See *Cut the paint or surface on the robot before replacing parts on page 177*.

Required consumables

Consumable	Article number	Note
Cable straps	-	

Removing the battery pack

Use this procedure to remove the battery pack.

Preparations before removing the battery pack

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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3.4.1 Replacing the battery pack

Continued

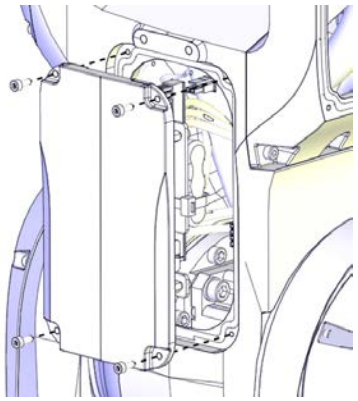
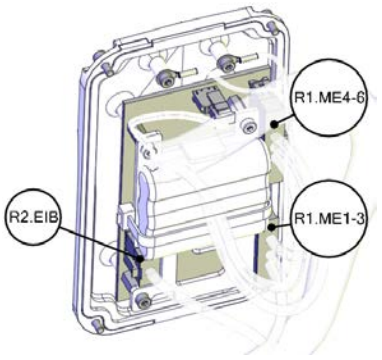
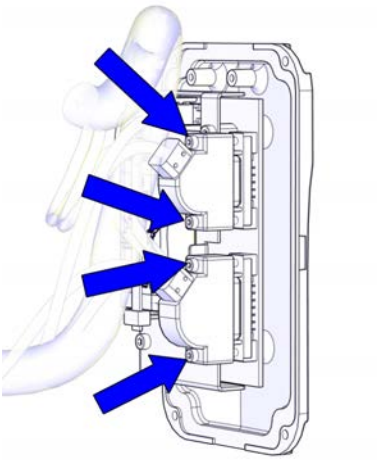
	Action	Note
2	Jog all axes to zero position.	This is done in order to facilitate updating of the revolution counter.
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Removing the battery pack

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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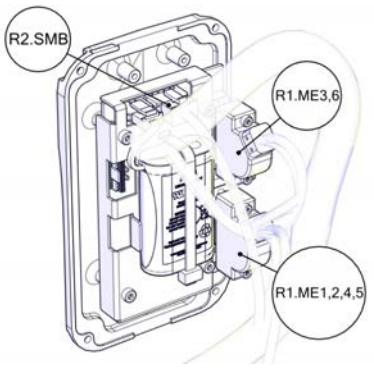
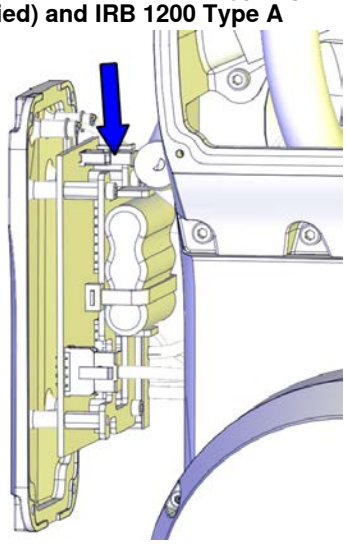
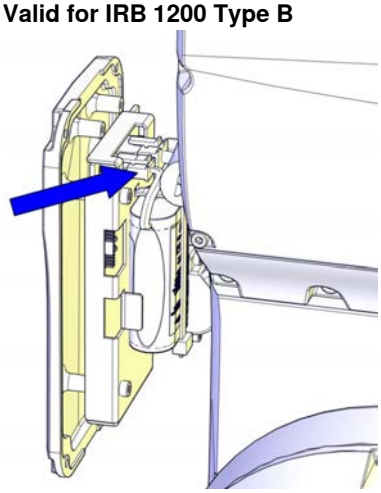
	Action	Note
4	Remove the connector cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover!	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB	 xx1400000812
6	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004

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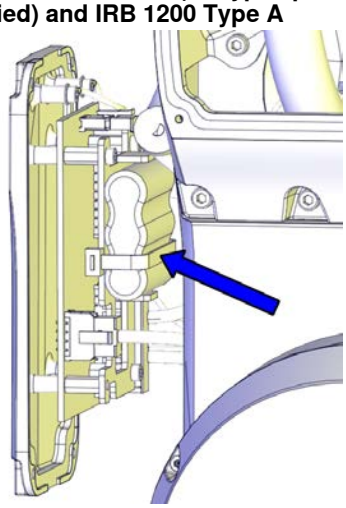
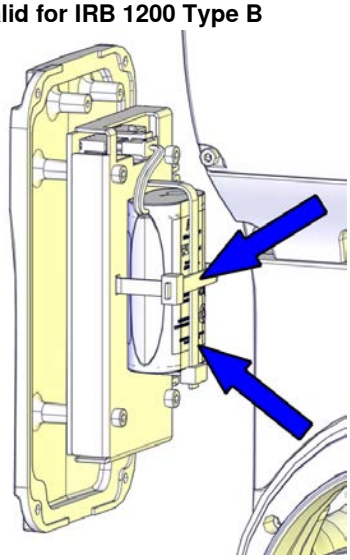
3.4.1 Replacing the battery pack

Continued

	Action	Note
7	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB	 xx1700000005
8	Disconnect the battery cable.	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A**  xx1300002571 **Valid for IRB 1200 Type B**  xx1700000006

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	Action	Note
9	Cut the cable strap that secures the battery and remove the battery. **Note** Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A**  xx1300002579 **Valid for IRB 1200 Type B**  xx1700000007

Refitting the battery pack

Use these procedures to refit the battery pack.

Refitting the battery pack

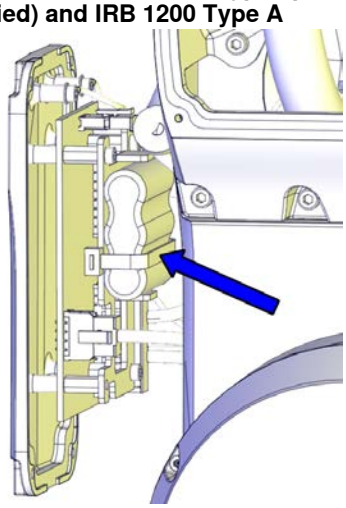
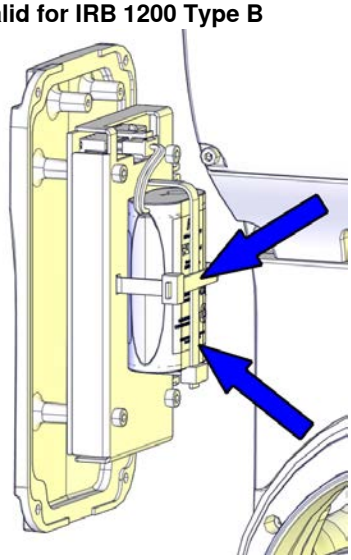
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	

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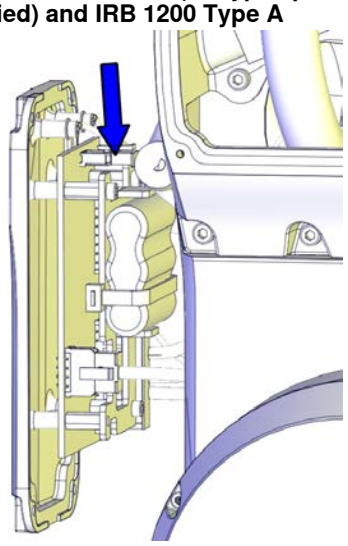
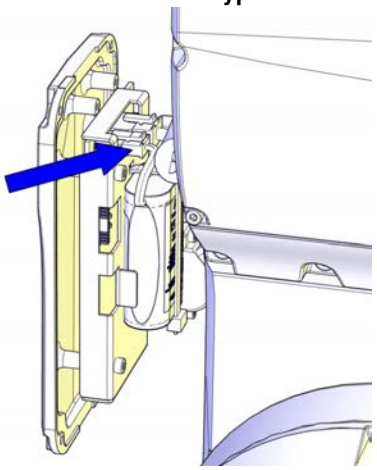
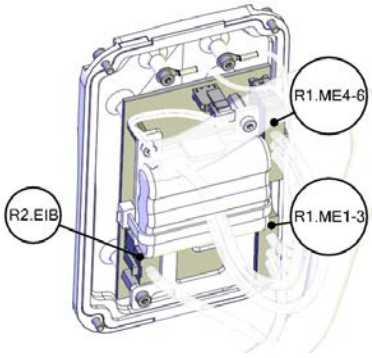
3.4.1 Replacing the battery pack

Continued

	Action	Note
2	For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Fit the battery and and secure it with a cable strap. **Note** Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A**  xx1300002579 **Valid for IRB 1200 Type B**  xx1700000007

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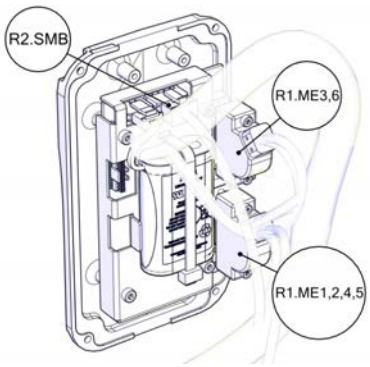
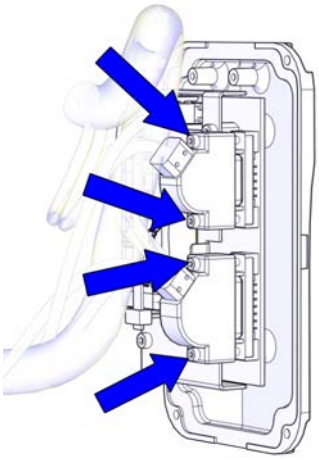
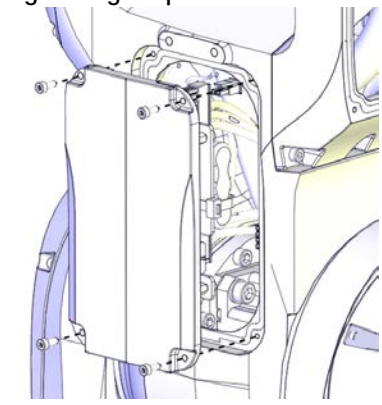
	Action	Note
4	Connect the battery cable.	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A**  xx1300002571 **Valid for IRB 1200 Type B**  xx1700000006
5	**Valid for IRB 1200 (not type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1400000812

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3.4.1 Replacing the battery pack

Continued

	Action	Note
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

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Concluding procedure

	Action	Note
1	Update the revolution counters.	See *Updating revolution counters on page 845*.
2	For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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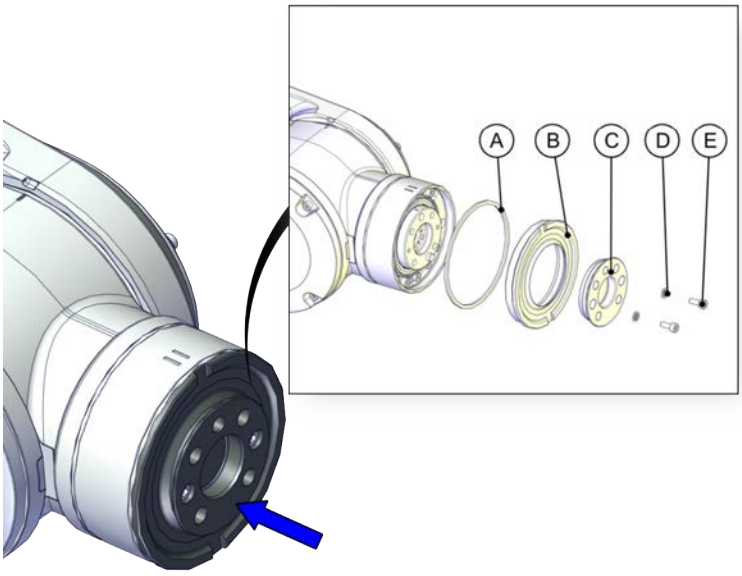
3.4.2 Replacing the sealing set on tool flange of Hygienic robots

General

To ensure the sealing efficiency, sealing parts on the tool flange of Hygienic robots is recommended to be replaced at an interval of 12 months or 6000 operating hours.

Location of the sealing set

Parts of the sealing set on the tool flange of Hygienic robots are located as shown in the figure.



xx2100001485

A	Gasket, axis 6, Hygienic	Recommended to replace at a 12-month interval.
B	Seal ring unit	Recommended to replace at a 12-month interval.
C	Stainless shaft	Replace if damaged.
D	Sealing washer	Recommended to replace at a 12-month interval.
E	Stainless screws	Replace if damaged.

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Art. no.	Note
Gasket, axis 6, Hygienic	3HAC078798-001	Used with protection type Hygienic. Replace if damaged.

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Spare part	Art. no.	Note
Seal ring unit	3HAC079688-001	Used with protection type Hygienic. Replace if damaged. The seal ring unit is wear part.
Sealing washer	3HAC034160-003	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic

Required consumables

Consumable	Art. no.	Note
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic

CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See *Cut the paint or surface on the robot before replacing parts on page 177*.

Replacing the sealing parts on tool flange of Hygienic robots

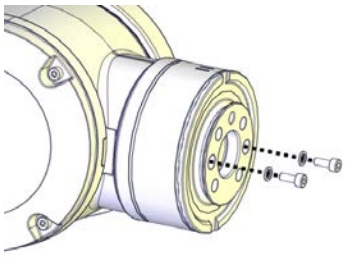
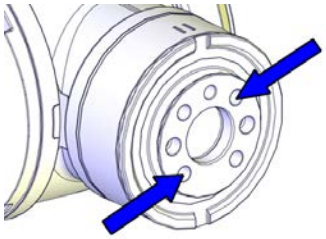
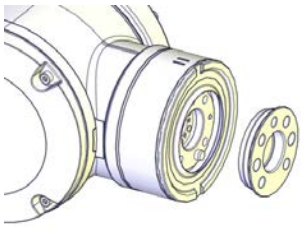
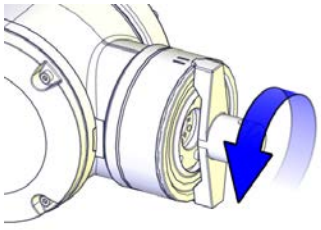
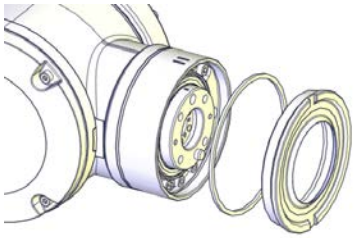
	Action	Note
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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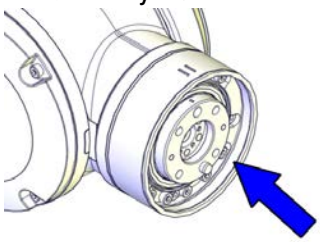
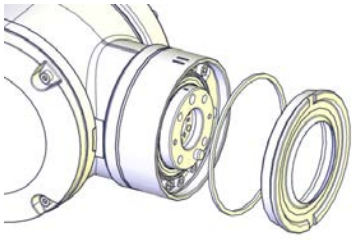
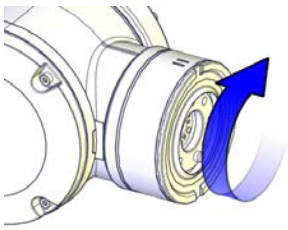
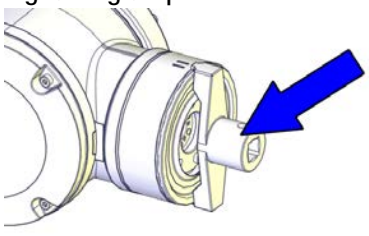
3.4.2 Replacing the sealing set on tool flange of Hygienic robots

Continued

	Action	Note
2	Remove the screws and washers.	 xx2100001449
3	Insert two M4 screws to the pressed out holes and press out the stainless shaft.	 xx2100001450  xx2100001451
4	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.	Flange tightening tool: 3HAC079686-001  xx2100001452
5	Remove the gasket and seal ring unit.	 xx2100001453

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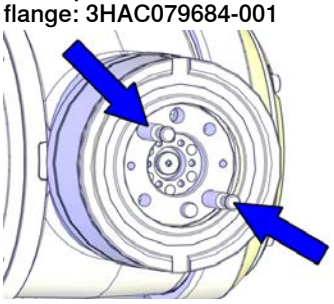
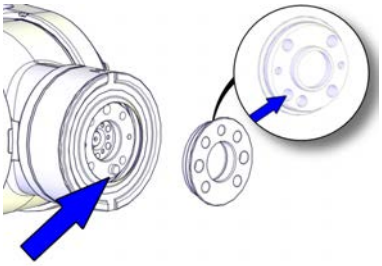
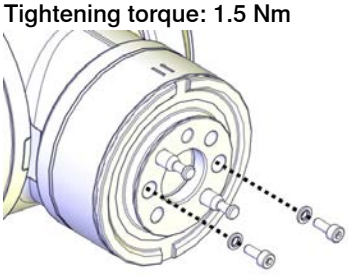
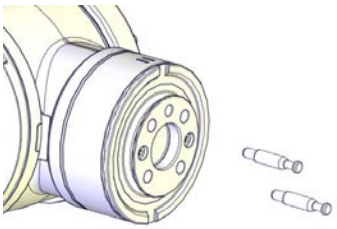
	Action	Note
6	Replace the parts with new ones.	
7	Apply a little grease to the screw thread.	Grease: Molykote P1900  xx2100001454
8	Put the gasket in place and then screw the seal ring unit.	 xx2100001453  xx2100001455
9	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	Flange tightening tool: 3HAC079686-001 Tightening torque: 8 Nm  xx2100001456

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3.4.2 Replacing the sealing set on tool flange of Hygienic robots

Continued

	Action	Note
10	Fit two guide pins to the tool flange.	Guide pin for stainless shaft on tool flange: 3HAC079684-001  xx2100001457
11	Place the stainless shaft on the tool flange with guidance of the two guide pins. Make sure the pin hole on the shaft aligned with the pin on the tool flange.	 xx2100001458
12	Secure with screws and washers.	Tightening torque: 1.5 Nm  xx2100001459
13	Remove the guide pins.	 xx2100001460

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3.5 Cleaning activities

3.5.1 Cleaning the IRB 1200

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

General

To secure high uptime it is important that the IRB 1200 is cleaned regularly. The frequency of cleaning depends on the environment in which the product works.

Different cleaning methods are allowed depending on the type of protection of the IRB 1200.

Note

Always verify the protection type of the robot before cleaning.

Special cleaning considerations

This section specifies some special considerations when cleaning the robot.

- Always use cleaning equipment as specified. Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning.
- Never point the water jet at connectors, joints, sealings, or gaskets.
- Do not use compressed air to clean the robot.
- Never use solvents that are not approved by ABB to clean the robot.
- Do not spray from a distance closer than 0.4 m.
- Do not remove any covers or other protective devices before cleaning the robot.

Cleaning methods

The following table defines what cleaning methods are allowed depending on the protection type.

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard IP40	Yes	Yes. With mild cleaning detergent.	No	No

Continues on next page

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3.5.1 Cleaning the IRB 1200
Continued

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
IP67 (option)	Yes	Yes. With mild cleaning detergent.	Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards.	No
Foundry Plus	Yes	Yes. With mild cleaning detergent or spirit.	Yes. It is highly recommended that the water contains a rust-prevention solution.	Yes[i]. It is highly recommended that the water and steam contains rust preventive, without cleaning detergents.
Clean room	Yes	Yes. With mild cleaning detergent.[ii] See *Cleaning and disinfection instructions for Clean Room robots on page 163*.	No	No
Hygienic	Yes	Yes. Only with detergent and disinfectants recommended by ABB.	Yes. Only limited to specific areas rather than the complete robot.[iii]	Yes. Only limited to specific areas with assistance of protective equipment.[iii]

i Perform according to section *Cleaning with water and steam on page 166*.
ii Clean Room robots shall be cleaned with recommended cleaning detergent in recommended cleaning frequency, which are specified in *Cleaning and disinfection instructions for Clean Room robots*.
iii Perform according to section *Cleaning the IRB 1200 with protection type Hygienic on page 167*.

Usable detergents

Wipe-down cleaning method is recommended for ABB robots with protection types *Clean Room*. Robot surfaces shall be wiped with clean and low particle emission cleanroom cloth which is soaked with following cleaning detergents.

Functional components	Concentration	Maximum cleaning frequency
Alcohol	70%	Daily
Isopropyl Alcohol (IPA)	70%	Daily
Peroxide (H_2O_2)	3%	Weekly

Ready-to-use pre-wetted wipes are allowed to use in condition of that the main detergent component and its concentration in the wipes meet the detergent specifciation specified in the previous table.

Followings are some recommended examples of detergent brands and types:

- Ecolab Klerwipe™ Alcodes GF
- Ecolab Klerwipe™ DrySan Duo
- Diversey® Clearklens Wipes

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- Diversey® Suma Wipes
- Diversey® Oxivir Excel Wipes

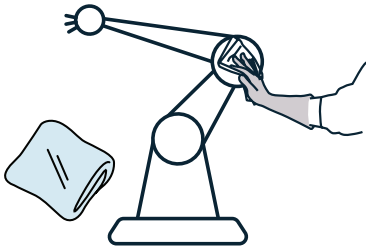
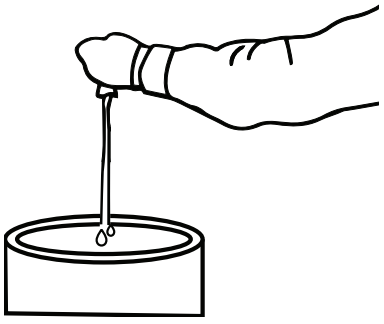
Wiping with cloth

Cleaning and disinfection instructions for Clean Room robots

ABB robots with protection types *Clean Room* are designed to be cleaned at a low cleaning frequency, before entering the cleanroom environment, after robot commissioning or during cleanroom maintenance.

Wipe-down cleaning method is recommended. Robot surfaces shall be wiped with clean and low particle emission cleanroom cloth which is soaked with cleaning detergents specified in *Usable detergents on page 162*.

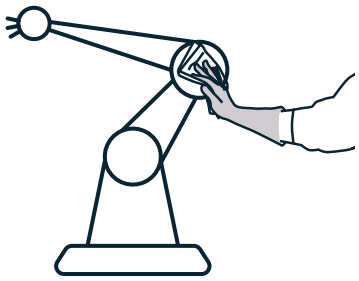
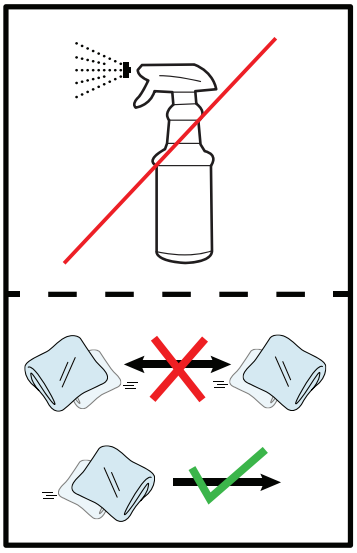
Use the following procedure to clean the robots.

	Action	Illustration/Note
1	Before cleaning, use the lint free cloth to remove dirt, debris or any other contaminant from the to-be cleaned surfaces. • Make sure no visible residues left. • Never apply hard forces on or rub against the robot surfaces to remove dirt or debris; otherwise, protective paint layers may be damaged. • Always read the Material Safety Date Sheet (MSDS) of the selected wipe product for safe handling before cleaning.	 xx2500000705
2	Turn off all electric power supply, hydraulic pressure supply and air pressure supply to the robot before cleaning.	
3	Wet a clean cloth with the cleaning detergent.	Only use cleaning agents whose functional components or concentrations are listed in *Usable detergents on page 162*. Contact ABB if using other unlisted detergents before conducting cleaning activities.
4	Express excess liquid before wiping. The wipe should be wet, but not dripping liquid.	 xx2500000706

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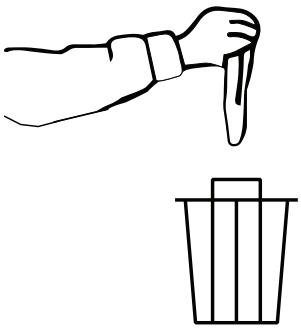
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3.5.1 Cleaning the IRB 1200
Continued

	Action	Illustration/Note
5	Wipe the painting surfaces on the robot. Do not apply cleaning detergents to mechnical stops. See *Clean Room robot components not wiped on page 165*.	 xx2500000707
	Make sure, • no cleaning agents are sprayed onto robot surfaces or into the robot structure. • the wiped surfaces covered by two sequential wiping movements are covered by 20%-30%. • Wipe from the surface center to edge and always in the same direction, or from the least contaminated area to most contaminated area, until covering all the exposed surfaces.	 xx2500000708
	Never, • force the clean cloth or wipes into joints or cover gaps. • apply the cleaning agents to unpainted surfaces such as screw holes, mounting surfaces and tool flange. Do not wipe too close to unpainted edges to prevent the cleaning agents from accumulating or running onto these surfaces.	
6	Wait a few minutes for detergent volatilization. Make sure no residue of cleaning agents left on the robot surfaces after wipe down cleaning.	

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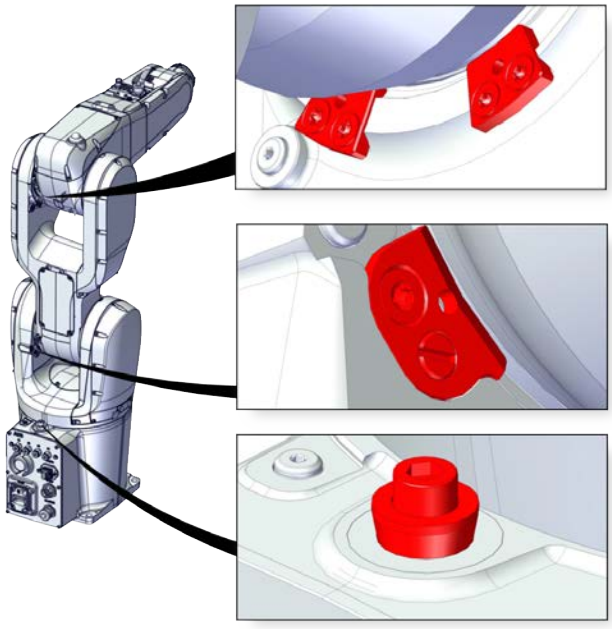
	Action	Illustration/Note
7	Dispose the wipe properly.	 xx2500000709

Note

End users/system integrators shall take the responsibility of assessing whether the disinfection is sufficiently implemented and reaches the disinfection degree required for the intended application and environment.

Clean Room robot components not wiped

Do not apply cleaning detergents to mechnical stops.



xx2500000374

Additional cleaning instructions for robots with food grade lubrication

Make sure that no liquid flows into the robot or stagnates in any gap or surface after cleaning.

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3.5.1 Cleaning the IRB 1200
Continued

Cleaning with water and steam

Instructions for rinsing with water

IRB 1200 with protection class IP67 (option) and with protection type *Foundry Plus* can be cleaned by rinsing with water (water cleaner).[1]

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 700 kN/m^2 (7 bar) [I]
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum flow: 20 liters/min[I]

I Typical tap water pressure and flow

Instructions for steam or high pressure water cleaning

ABB robots with protection types *Foundry Plus*, *Wash*, or *Foundry Prime* can be cleaned using a steam cleaner or high pressure water cleaner.[2]

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 2500 kN/m^2 (25 bar)
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum water temperature: 80° C
- Never point the nozzle at the components shown in *Instructions for rinsing with water on page 166*.

Cables

Movable cables need to be able to move freely:

- Remove waste material, such as sand, dust and chips, if it prevents cable movement.
- Clean the cables if they have a crusty surface, for example from dry release agents.

1 See *Cleaning methods on page 161* for exceptions.

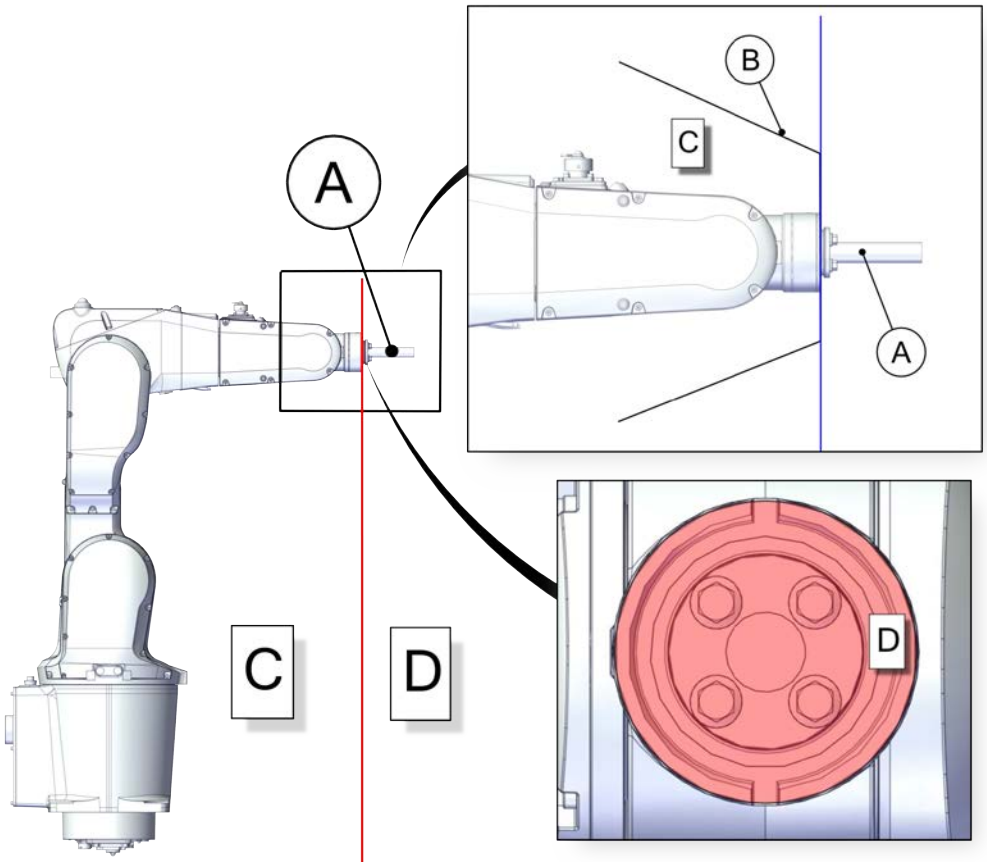
2 See *Cleaning methods on page 161* for exceptions.

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3.5.2 Cleaning the IRB 1200 with protection type Hygienic

Overview

Hygienic robots are designed with special sealings and coatings. The axis-6 tool flange is also equipped with stainless steel sealing set. These special designs allow the Hygienic robots to be wiped down or washed down using corresponding proper detergents according to actual working environments and applications. Cleaning methods also vary according to the to-be-cleaned surfaces and parts of the IRB 1200 with protection type Hygienic. Always use the proper cleaning method according to the actual applications and strictly follow the cleaning procedure.



xx2100001401

A	User tools	
B	Protective devices or equipment	
C	Wipe down area	The robot body without any protection should use the wipe down method for cleaning. If the robot body is properly covered by protective device or equipment, the wash down method is also applicable.
D	Wash down area	In most cases, the tool flange surface should use the wash down method for cleaning. Users can also perform wipe down cleaning on this part according to their applications.

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3.5.2 Cleaning the IRB 1200 with protection type Hygienic
Continued

Required equipment

Equipment	Note
High pressure washer	
Lint free cloth	

Usable detergents

Detergent	Type	Product concentration (v/v)	Note
Disinfectant	DRYSAN™ DUO	100%	
Disinfectant	Topactive DES	2%-3%	
Detergent	Topax66	2%-4%	Applicable to protein cleaning
Detergent	Topaz AC3	2%-4%	
Detergent	Topaz HD 1	2%-10%	Applicable to fat cleaning

Always use the recommended detergents listed in previous table for cleaning the IRB 1200 with protection type Hygienic. Contact ABB if using any disinfectants and detergents other than the listed ones before conducting cleaning activities.

The following list defines the prerequisites:

- Read the material safety data sheet (MSDS) before using any chemicals.
- Always use proper protective equipment like gloves, goggles, safety boots, face shields and apron when using chemicals.

Cleaning instructions

DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

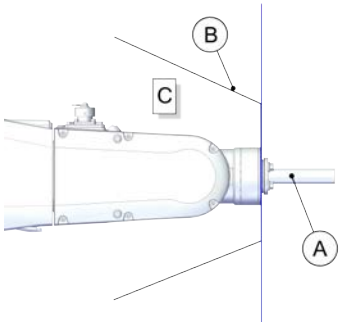
Also read the safety sections:

- *Pneumatic or hydraulic related hazards on page 34*
- *Electrical safety on page 33*
- *Safety during maintenance and repair on page 36*

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Wash down procedure

	Action	Note
1	Before cleaning, • Use protective devices and equipment to make sure the painted surfaces of the robot body (wipe down areas) not exposed directly to sprayed detergents, disinfectants and ejected water. • If user tools are removed from the robot flange before the cleaning, conduct protective measures on screw holes to make sure no intrusion of soils, water, detergents and disinfectants into the holes during cleaning.	 xx2100001402 A: User tools B: Protective devices or equipment C: Wipe down area
2	Pre-rinse with water for removal of food residues from to-be-cleaned areas. Make sure no visible residues left.	Recommended water temperature: 40 - 60 °C
3	Foam the surface with detergent Topax66 or Topaz HD 1. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy detergent.	• Detergent: Topax66, concentration (v/v) 2 % • Detergent: Topaz HD1, concentration (v/v) 2 %
4	Wait 15 minutes. Let the detergent work for approx 15 minutes to retain effective cleaning properties. Ensure that the cleaning agent does not dry on the surface.	
5	Rinse thoroughly with water to remove the detergent.	Recommended water temperature: 40 - 60 °C
6	Foam the surface with detergent Topaz AC3. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy detergent.	Detergent: Topaz AC3, concentration (v/v) 2 %
7	Wait 15 minutes. Let the detergent work for approx 15 minutes to retain effective cleaning properties. Ensure that the cleaning agent does not dry on the surface.	
8	Rinse thoroughly with water to remove the detergent.	Recommended water temperature: 40 - 60 °C
9	Foam the surface with disinfection Topactive DES. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy disinfection.	Detergent: Topactive DES, concentration (v/v) 2 %
10	Wait 15 minutes.	

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3.5.2 Cleaning the IRB 1200 with protection type Hygienic
Continued

	Action	Note
11	Rinse thoroughly with water to remove the disinfection.	Water temperature: ambient
12	Wipe the surface dry with lint free cloth.	
13	If user tools are removed from the robot flange before the cleaning, then, after cleaning, • Make sure no residues left on the tool flange or screw holes before reinstall the tools or any other accessories to the flange.	

Wipe down procedure

	Action	Note
1	Before cleaning, use the lint free cloth to remove soils or any other contaminant from the to-be-cleaned surfaces. Make sure no visible residues left.	
2	Spray disinfectant DRYSAN™ DUO on robot surfaces, or wet a clean cloth with the disinfectant and then wipe the robot surfaces.	Disinfectant: DRYSAN™ DUO, concentration (v/v) 100 %
3	Wait 1-2 minutes for disinfectant volatilization.	

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4 Repair

4.1 Introduction

Structure of this chapter

This chapter describes repair activities for the IRB 1200. Each procedure contains the information required to perform the activity, for example spare parts numbers, required special tools, and materials.

WARNING

Repair activities not described in this chapter must only be carried out by ABB.

Report replaced units

Note

When replacing a part on the IRB 1200, report to your local ABB the serial number, the article number, and the revision of both the replaced unit and the replacement unit.

This is particularly important for safety equipment to maintain the safety integrity of the installation.

Safety information

Make sure to read through the chapter *Safety on page 21* before commencing any service work.

CAUTION

Follow the instructions to avoid errors of fitting during maintenance or repair.

Moving the robot out of Clean Room working spaces before service activities

The robots must be moved out of the Clean Room working spaces before proceeding with the maintenance and repair works.

During the working space layout planning, reserve sufficient space to ensure that the robot can be moved in and out of the Clean Room working spaces smoothly. The minimum space required for the equipment or device that are used to moveor lift the robot should also be considered.

Protect the working space before service activities

Before proceeding with the maintenance and repair works, protect the area below the robot with a suitable sheet. This is to reduce the risk of contaminating the hygienic area below and around the robot.

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Tip

Whenever working inside the base unit, use a cloth or paper to cover the open areas. This will prevent any dropped screws, nuts, seals, or other small items from disappearing into the compartments for the motors and gear units.



WARNING

If the IRB 1200 is connected to power, always make sure that the controller and IRB 1200 are connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30 Type B*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10 Type A*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*
- *Robot cabling and connection points on page 114*.

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4.2 General procedures

4.2.1 Mounting instructions for sealings

General

This section describes how to mount different types of sealings.

Equipment

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2
Grease	-	LUBRIPLATE SYNXTREME FG0 Used for robots with food grade lubrication. Used for robots with protection type Hygienic.

Rotating sealings

The following procedures describe how to fit rotating sealings.

CAUTION

Please observe the following before commencing any assembly of sealings:

- Protect the sealing during transport and mounting, especially the main lip on radial sealings.
- Keep the sealing in its original wrappings or protect it well before actual mounting.
- The fitting of sealings and gears must be carried out on clean workbenches.
- Use a protective sleeve for the main lip during mounting, when sliding over threads, keyways or other sharp edges.
- Do not lubricate a static side of a sealing with grease, since this may result in movement of the sealing during operation.

  The only exception for lubrication of static sides of a sealing, is to use P-80 rubber lubrication gel against certain aluminium surfaces. If usage of P-80 is relevant, it is stated in the repair procedures.

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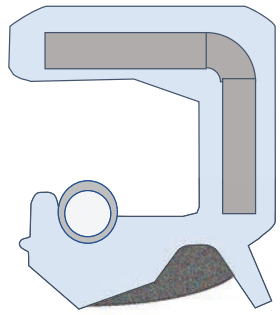
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4.2.1 Mounting instructions for sealings

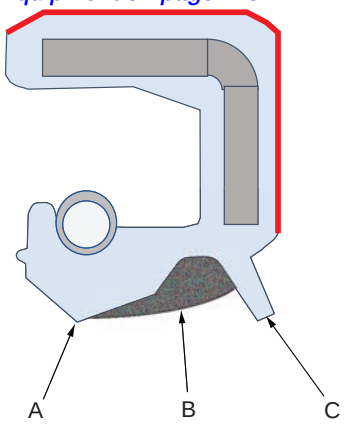
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Radial sealings

A radial sealing consists of a flexible rubber lip bonded to a rigid metal case. Only one side of the sealing is static with a metal insert.

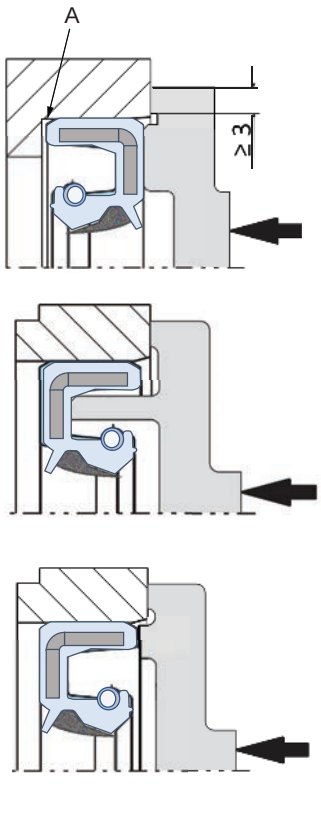


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	Action	Note
1	Check the sealing to ensure that: • The sealing is of the correct type. • There is no damage on the main lip.	
2	Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect.	
3	Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.) Fill 2/3 of the space between the dust lip and the main lip with grease. If the sealing is without dust lip, just lubricate the main lip with a thin layer of grease.	Article number is specified in *Equipment on page 173*.  xx2000000071 A Main lip B Grease C Dust lip **Note** Ensure that no grease is applied to the red marked surface.

Continues on next page

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	Action	Note
4	Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.	 xx2000000072 A Gap
5	Make sure that no grease is left on the robot surface.	

Flange sealings and static sealings

The following procedure describes how to fit flange sealings and static sealings.

	Action
1	Check the flange surfaces. They must be even and free from pores. It is easy to check flatness using a gauge on the fastened joint (without sealing compound). If the flange surfaces are defective, the parts may not be used because leakage could occur.
2	Clean the surfaces properly in accordance with the recommendations of ABB.
3	Distribute the sealing compound evenly over the surface.
4	Tighten the screws evenly when fastening the flange joint.

O-rings

The following procedure describes how to fit o-rings.

	Action	Note
1	Ensure that the correct o-ring size is used.	
2	Check the o-ring for surface defects, burrs, shape accuracy, or deformation.	Defective o-rings, including damaged or deformed o-rings, may not be used.

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4.2.1 Mounting instructions for sealings

Continued

	Action	Note
3	Check the o-ring grooves and mating surfaces. They should be free of pores, contamination and obvious scratches/damage.	
4	Lubricate the o-ring with grease.	
5	Tighten the screws evenly while assembling.	
6	Check that the o-ring is not squashed outside the o-ring groove.	
7	Make sure that no grease is left on the robot surface.	

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4.2.2 Cut the paint or surface on the robot before replacing parts

General

Follow the procedures in this section whenever breaking the paint of the robot during replacement of parts.

For robots with protection type Clean Room

For robots with food grade lubrication

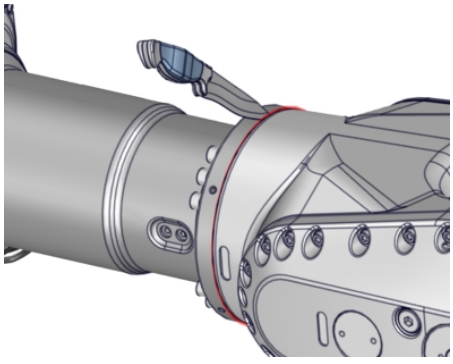
For robots with protection type Hygienic

When replacing parts on the robot, it is important to make sure that after the replacement, no particles will be emitted from the joint between the structure and the new part, and that the easy cleaned surface is retained.

Required equipment

Equipment	Spare parts	Note
Sealing compound	3HAC026759-001	Sikaflex 521 FC. Color white.
Sealing compound for Hygienic robots	3HAC073510-001	Trans clear
Tooling pin		Width 6-9 mm, made of wood.
Cleaning agent		Ethanol
Knife		
Lint free cloth		
Touch up paint Clean Room/Hygienic	3HAC036639-001	Used to repair coating damages on the manipulator. White
Touch up paint Standard/Foundry Plus	3HAC067974-001	Used to repair coating damages on the manipulator. Graphite White

Removing

	Action	Description
1	Cut the paint with a knife in the joint between the part that will be removed and the structure, to avoid that the paint cracks.	 xx2300000950
2	Carefully grind the paint edge that is left on the structure to a smooth surface.	

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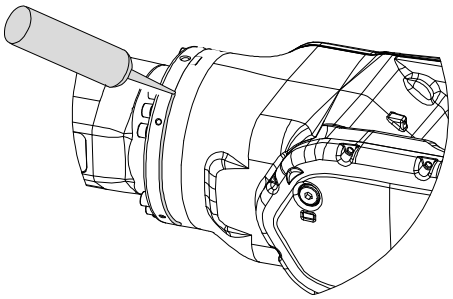
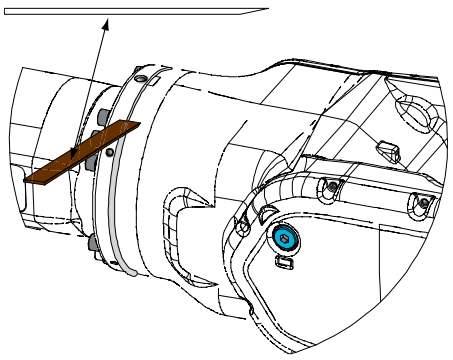
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4.2.2 Cut the paint or surface on the robot before replacing parts
Continued

Refitting

Note

Refitting is required only for robots with protection type Clean Room, with food grade lubrication and with protection type Hygienic.

	Action	Description
1	Before the parts are refitted, clean the joint so that it is free from oil and grease.	Use ethanol on a lint free cloth.
2	Place the tooling pin in hot water.	
3	Seal all refitted joints with sealing compound.	 xx0900000122
4	Use the tooling pin to even out the surface of the sealing compound.	 xx0900000125
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** Wait 10 minutes. **For robots with protection type Hygienic** Wait 40 minutes.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sikaflex 521FC skin dry time (10 minutes). **For robots with protection type Hygienic** Trans Clear skin dry time (40 minutes).
6	Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces. **Note** Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.	3HAC036639-001

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Note

After all repair work, wipe the robot free from particles with spirit on a lint free cloth.

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4.2.3 Sealing differences depending on protection class

Standard IP40 vs optional IP67

The IRB 1200 has IP40 as standard protection class. If the robot is delivered with option IP67, many of the covers are equipped with gaskets, several components has been applied with locking liquid etc.

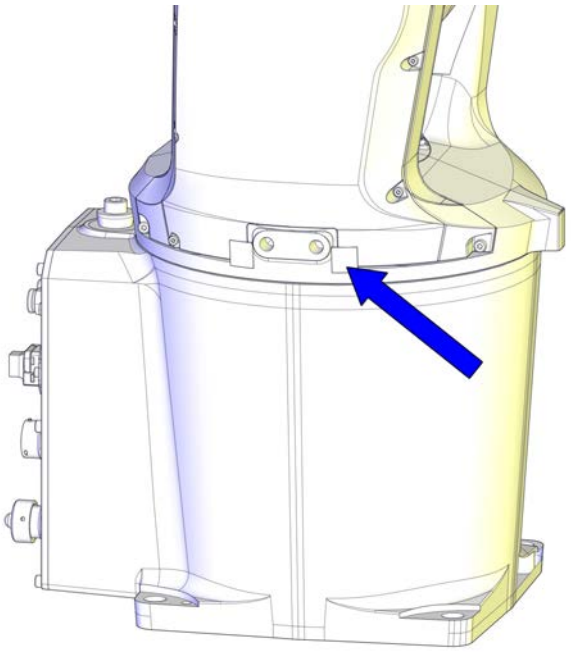
This means that there are differences in the repair procedures depending on the robot protection class. These are clearly stated in the step-by-step procedures.

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4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots

Location of the swing sealing plug

The swing sealing plug is located as shown in the figure.



xx1600000264

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Swing sealing plug	3HAC053687-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

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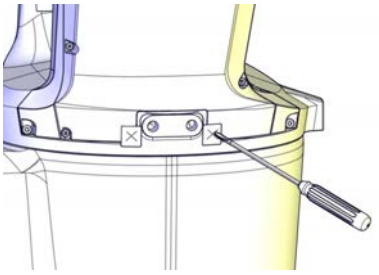
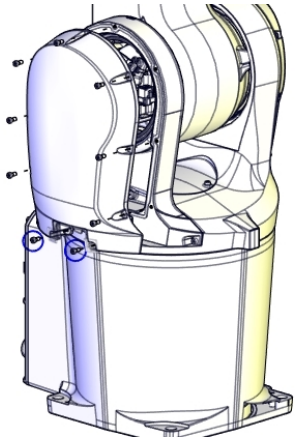
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4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots
Continued

Required consumables

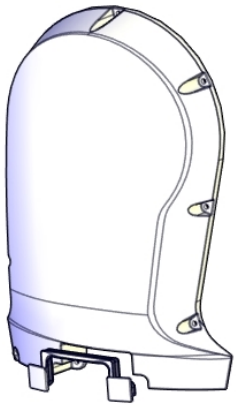
Consumable	Art. no.	Note
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Removing the swing sealing plug

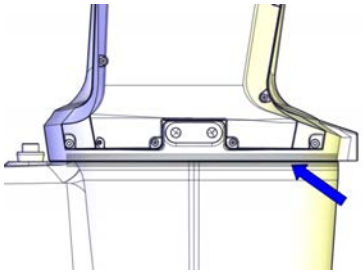
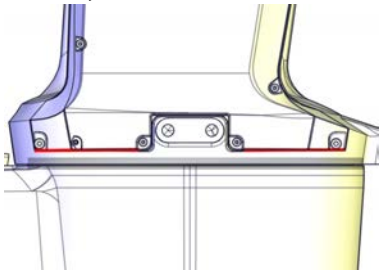
	Action	Note
1	Cut the swing sealing plug through with a sharp object to get access to the screws.	 xx1600000206
2	Remove the cable housing cover of the swing by removing the screws.	 xx1600000207

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	Action	Note
3	Detach the swing sealing plug from the cable housing cover.	 xx1600000208

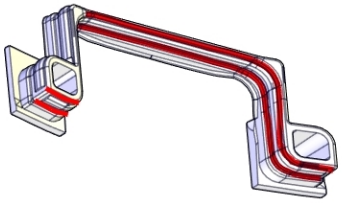
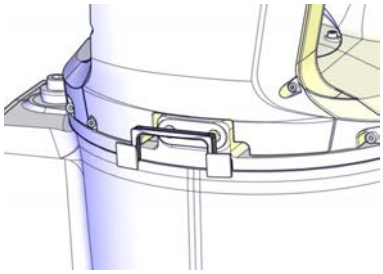
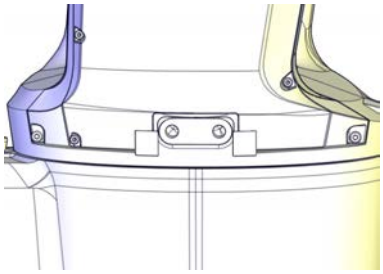
Refitting the swing sealing plug

	Action	Note
1	Mask the gap between the swing and the base.	 xx1600000209
2	Apply a string of the sealant to the joint of the swing cable housing cover.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, Sikaflex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000210
3	Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. Make sure the sealant fully covers the gap but is not applied to the screw cavities.	

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4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots
Continued

	Action	Note
4	Wait for the sealant to dry and then remove the mask.	Sikaflex 521FC skin dry time: 10 minutes Trans Clear skin dry time: 40 minutes
5	Apply a little sealant to the inner surface of the swing sealing plug.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, Sikaflex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000211  xx1600000261
6	Refit the swing sealing plug.	 xx1600000212
7	If there is any overflowing sealant, remove and clean it. Make sure no space exists between the swing sealing plug and the robot casting, and the sealant string is fully jointed with the plug.	 xx1600000213

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4.3 Cable harness

4.3.1 Replacing the main cable package

Location of the main cable package

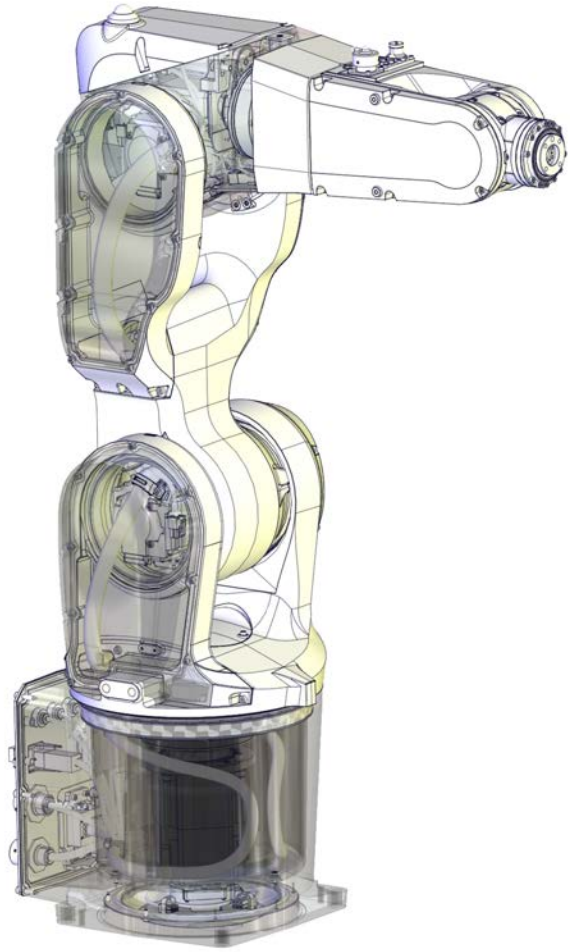
The main cable package runs from the base, up through the swing, up through the lower arm and into the housing. Inside the housing there is a division point for the axis-5 and axis-6 motor cables.

The main cable package includes the air hoses and the cabling for all the six motors. Optional Ethernet cabling can also be included.

The air hoses and optional Ethernet must be disconnected inside the wrist unit before the cable package can be removed.

As standard feature, the connector interface is located at the rear of the base. The interface can also be bottom mounted, as an option. This section describes both configurations.

Connector interface at the rear of the base (standard)



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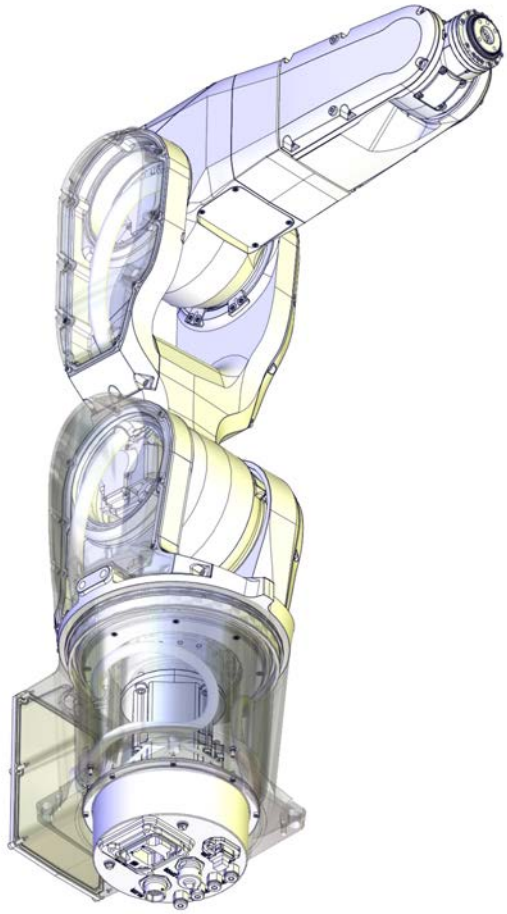
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4.3.1 Replacing the main cable package

Continued

Connector interface at the bottom of the base (option)



xx1400000410

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Manipulator cable harness with Ethernet (rear interface)	3HAC059673-001	With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface)	3HAC059674-001	With connector interface at rear of the base.
Manipulator cable harness with Ethernet (rear interface), Clean Room Manipulator cable harness with Ethernet (rear interface), food grade lubrication	3HAC056219-001	Used with protection type Clean Room. Used for robots with food grade lubrication. With connector interface at rear of the base.

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Spare part	Article number	Note
Manipulator cable harness without Ethernet (rear interface), Clean Room Manipulator cable harness without Ethernet (rear interface), food grade lubrication	3HAC056220-001	Used with protection type Clean Room. Used for robots with food grade lubrication. With connector interface at rear of the base.
Manipulator cable harness with Ethernet (bottom interface)	3HAC051415-001	With connector interface at bottom of the base.
Manipulator cable harness without Ethernet (bottom interface)	3HAC051416-001	With connector interface at bottom of the base.
Manipulator cable harness with Ethernet (rear interface), SafeMove 2-supported	3HAC084083-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface), SafeMove 2-supported	3HAC084086-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. With connector interface at rear of the base.
Manipulator cable harness with Ethernet (rear interface), Clean Room and SafeMove 2-supported Manipulator cable harness with Ethernet (rear interface), food grade lubrication and SafeMove 2-supported Manipulator cable harness with Ethernet (rear interface), Hygienic	3HAC084084-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface), Clean Room and SafeMove 2-supported Manipulator cable harness without Ethernet (rear interface), food grade lubrication and SafeMove 2-supported Manipulator cable harness without Ethernet (rear interface), Hygienic	3HAC084087-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. With connector interface at rear of the base.
Manipulator cable harness with Ethernet (bottom interface), SafeMove 2-supported Manipulator cable harness with Ethernet (bottom interface), Hygienic.	3HAC0084082-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Hygienic. With connector interface at bottom of the base.
Manipulator cable harness without Ethernet (bottom interface), SafeMove 2-supported Manipulator cable harness without Ethernet (bottom interface), Hygienic.	3HAC084085-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Hygienic. With connector interface at bottom of the base.

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4.3.1 Replacing the main cable package

Continued

Spare part	Article number	Note
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.
Base bottom cover (standard configuration)	3HAC049667-001	Replace if damaged.
Base rear cover, without connector interface	3HAC059675-001	Replace if damaged.
Base rear cover, without connector interface, Clean Room Base rear cover, without connector interface, food grade lubrication Base rear cover, without connector interface, Hygienic	3HAC056147-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket for rear base cover	3HAC058566-001 / 3HAC080710-001	Not used with protection class IP40. Replace if damaged.
O-ring	3HAB3772-86	Not used with protection class IP40. Replace if damaged.
Radial sealing with dust lip	3HAB3701-47	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-002	Used with protection class IP67. Used only on base 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. Replace if damaged.
Axis-1 sealing ring	3HAC073849-001 / 3HAC086035-001 / 3HAC068107-001 i	Replace if damaged.

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Spare part	Article number	Note
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001, 3HAC059554-001 and 3HAC082506-001. See *Spare part versions for the swing on IP40/IP67 robots on page 910*. Replace if damaged.
Axis-2 sealing ring	3HAC086036-001	Used with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Not used with protection class IP40. Replace if damaged.
Gasket of axis-2 sealing ring	3HAC045688-001 / 3HAC080697-001	Not used with protection class IP40. Replace if damaged.
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
Gasket of plastic plate	3HAC044894-001 / 3HAC080695-001	Not used with protection class IP40. Replace if damaged.
Cable protection	3HAC044691-001	Replace if damaged.
Torx countersunk head screw M3x5	3HAC14286-4	Replace if damaged.
Cover on top of swing	3HAC059679-001	Replace if damaged.
Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic	3HAC056133-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on top swing cover	3HAC056696-001 / 3HAC080698-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.

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4.3.1 Replacing the main cable package

Continued

Spare part	Article number	Note
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
EIB/SMB cover	3HAC059692-001	Replace if damaged.
EIB/SMB cover, Clean Room EIB/SMB cover, food grade lubrication EIB/SMB cover, Hygienic	3HAC056137-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.
Motor bracket	3HAC044689-001	Replace if damaged.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.

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Spare part	Article number	Note
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.
Cable bracket on swing	3HAC044925-001	

i For information on which sealing ring to be ordered, see *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Article number	Note
Cable straps	-	

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4.3.1 Replacing the main cable package
Continued

Equipment	Article number	Note
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication. For robots with protection class IP67. For robots with protection type Foundry Plus.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.

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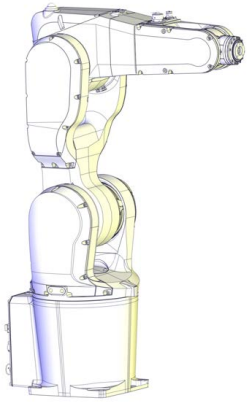
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	Action	Note
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the main cable package

Use these procedures to remove the main cable package from the robot.

Preparations before removing the main cable package

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

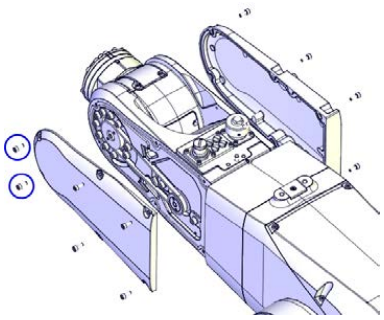
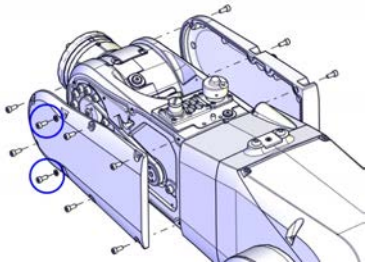
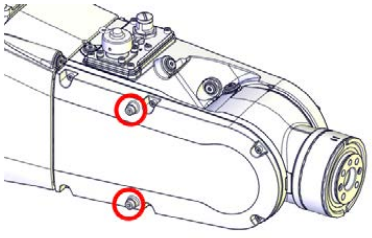
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4.3.1 Replacing the main cable package

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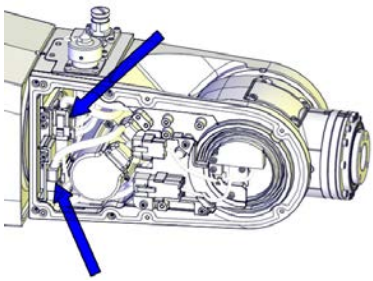
Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

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Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Disconnecting the axis-5 FPC connectors

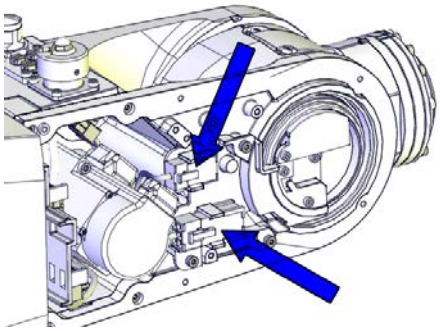
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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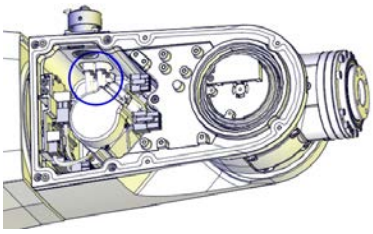
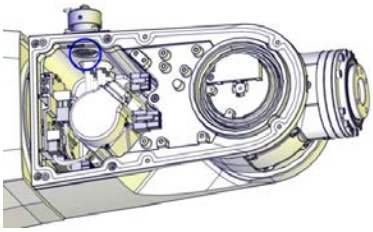
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4.3.1 Replacing the main cable package

Continued

	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

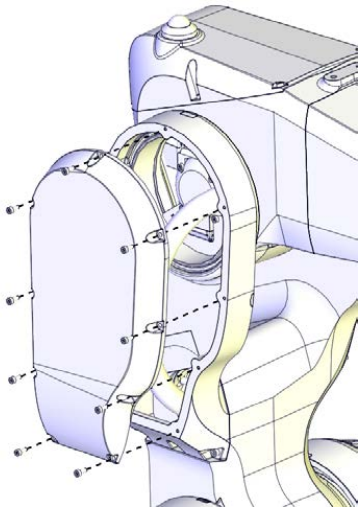
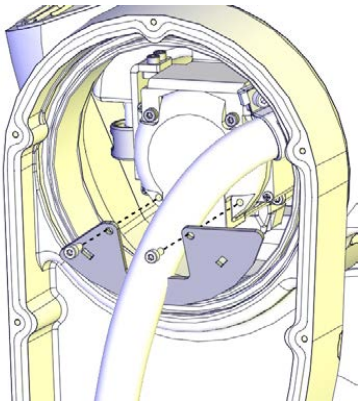
Disconnecting the air hoses and CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the air hoses.	 xx1400000738
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

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Disconnecting the axis-4 FPC connectors

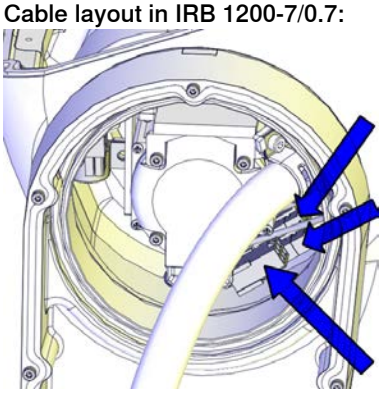
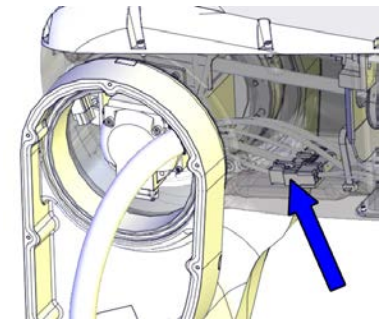
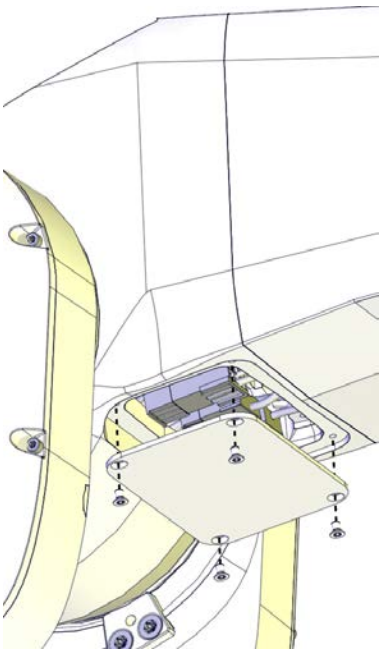
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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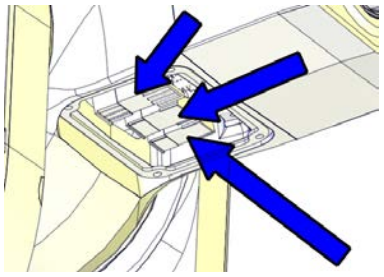
4.3.1 Replacing the main cable package

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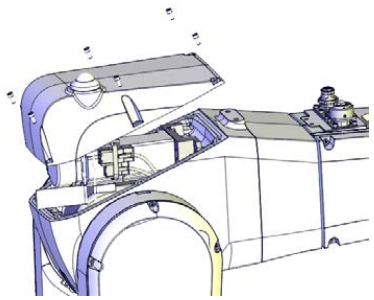
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
6	Remove the small cover of the housing.	 xx1300002398

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	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

Disconnecting the axis-4 motor connectors

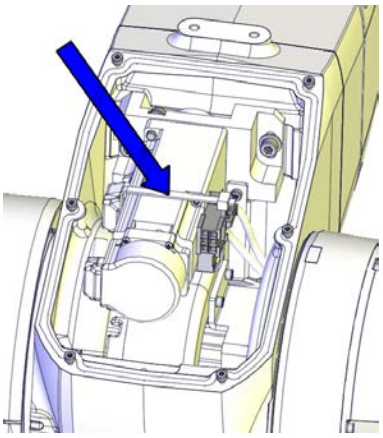
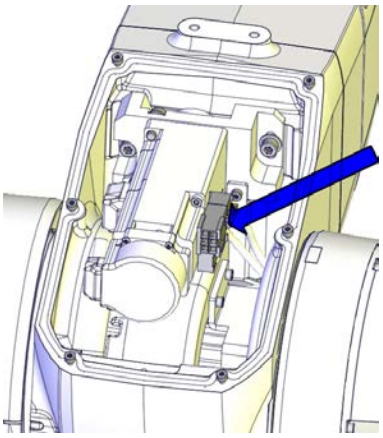
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456

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4.3.1 Replacing the main cable package

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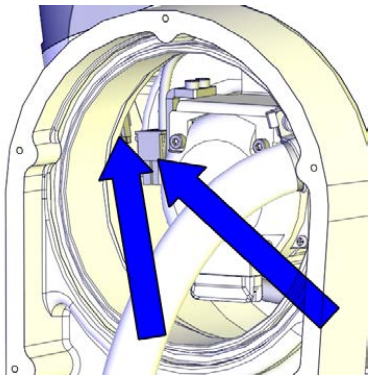
	Action	Note
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Disconnecting the axis-3 motor connectors

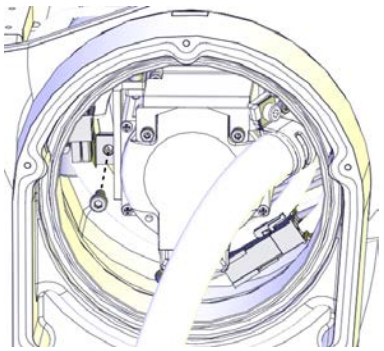
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Removing the cable package in the housing

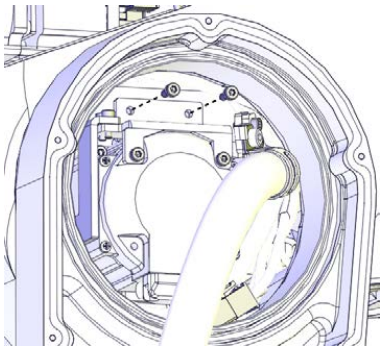
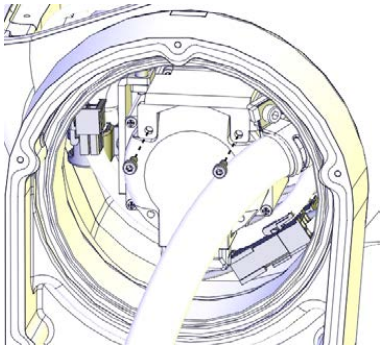
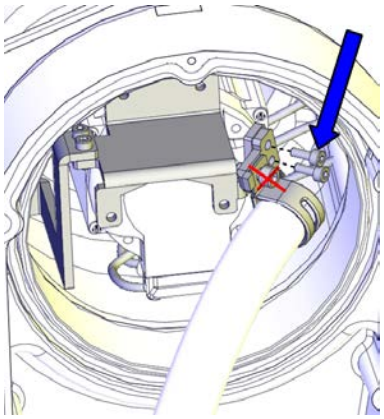
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the screw that fastens the air hose holder.	 xx1300002422

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4.3.1 Replacing the main cable package

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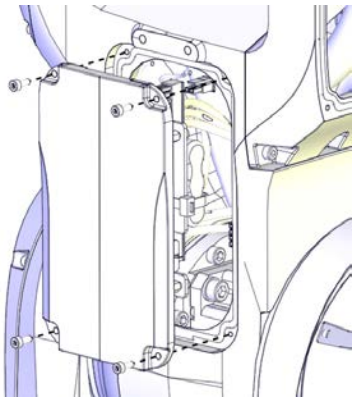
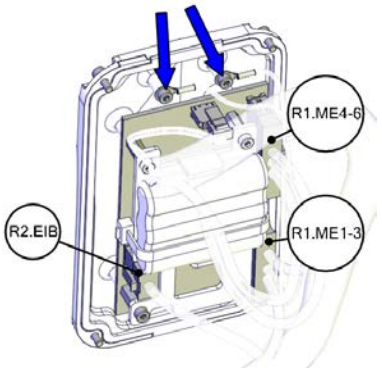
	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
5	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
6	Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002424
7	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Cut the cable straps at the bottom of the housing.	

Disconnecting the cabling in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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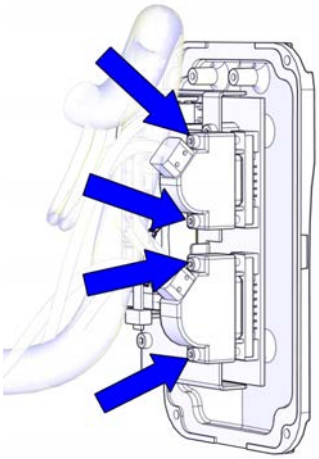
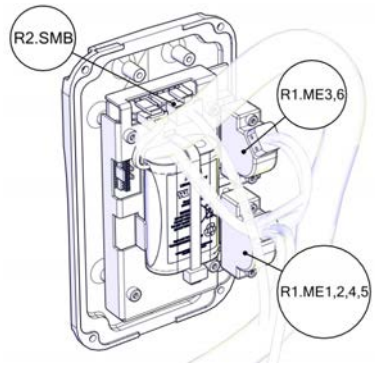
	Action	Note
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 xx1300002428
6	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the lugs on the EIB/SMB cover.	

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4.3.1 Replacing the main cable package

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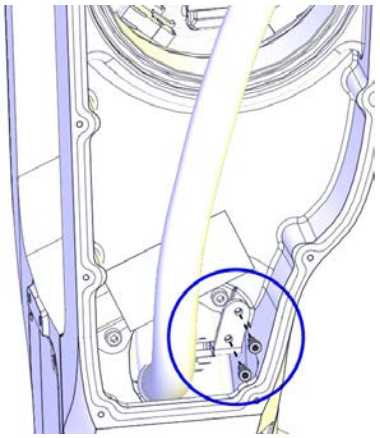
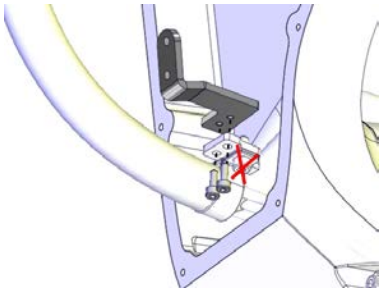
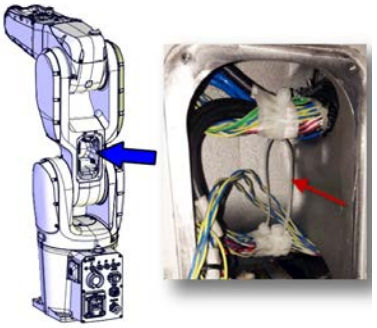
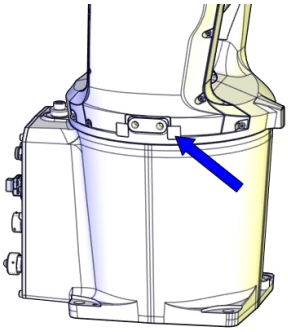
	Action	Note
7	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004
8	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB Remove the EIB/SMB cover completely from the lower arm.	 xx1700000005

Removing the cable package in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull the cable package out from the upper arm housing.	

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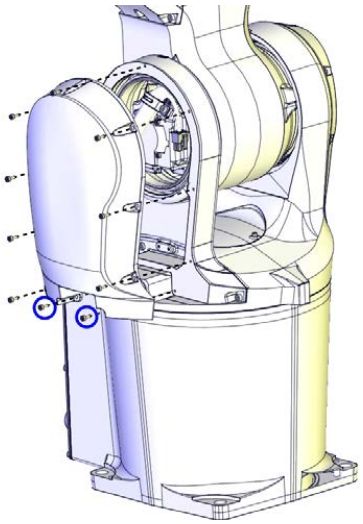
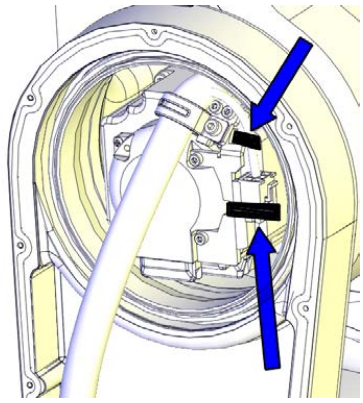
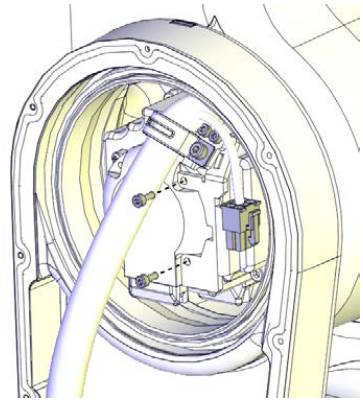
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 xx1300002426
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002430
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 xx1400001130
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the swing sealing plug. Follow the procedure specified in *Removing the swing sealing plug on page 182*.	 xx1600000205

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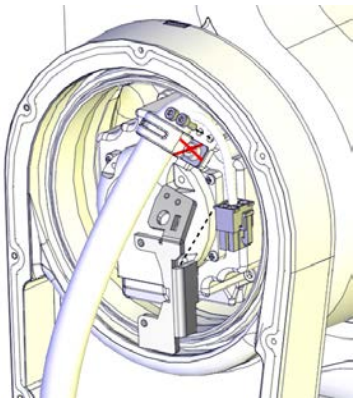
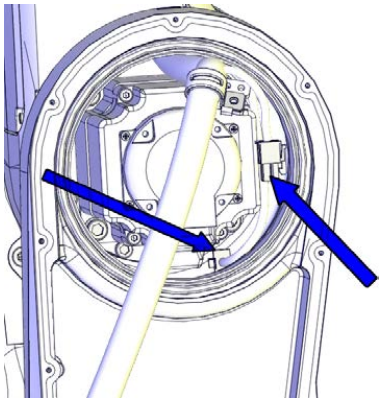
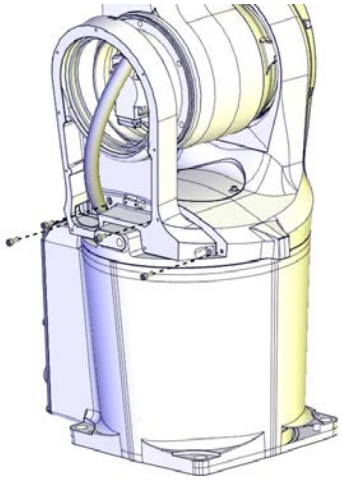
4.3.1 Replacing the main cable package

Continued

	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 xx1300002431
9	Cut the cable straps.	 xx1400001528
10	Remove the axis-2 motor bracket screws.	 xx1300002432

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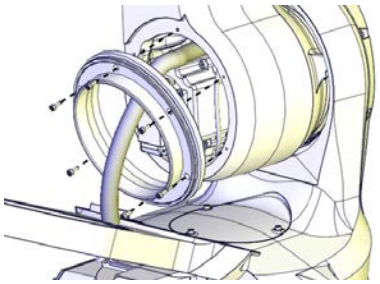
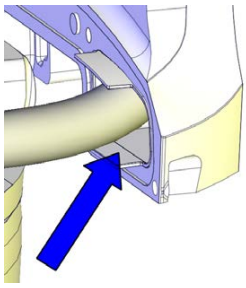
	Action	Note
11	Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002433
12	Disconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
13	Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.	 xx1300002435

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4.3.1 Replacing the main cable package

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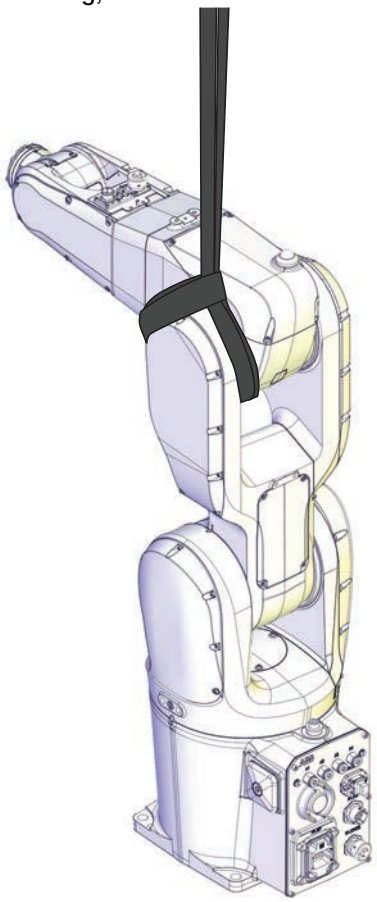
	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx1400000020
15	Pull out the cable package from the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx1400000023

Putting the robot on its side

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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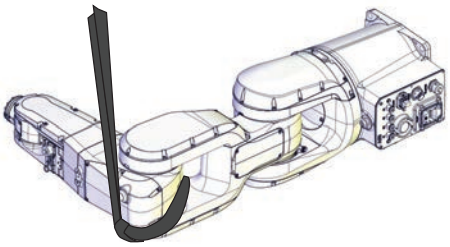
	Action	Note
3	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
4	Run a roundsling between the housing and the lower arm. **CAUTION** Put the sling on the lower arm side and **not** on the cable arm side, which would damage the robot.	Roundsling, 2 m  xx1400000679
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	

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4.3.1 Replacing the main cable package

Continued

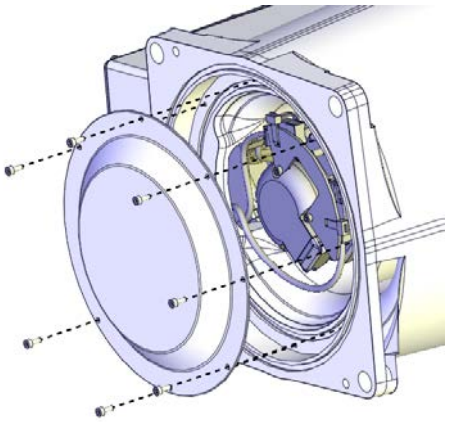
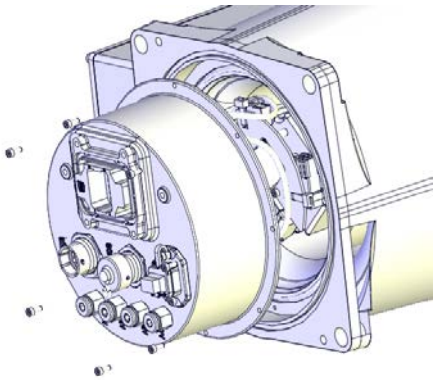
	Action	Note
6	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
7	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.	 xx1400000680

Disconnecting the axis-1 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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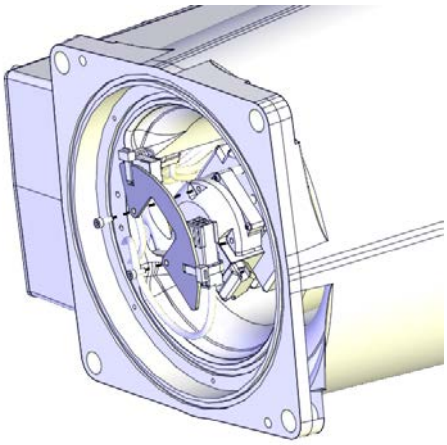
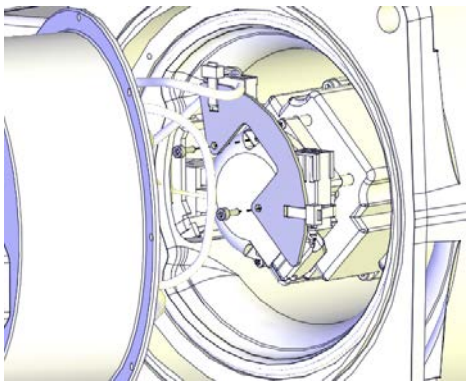
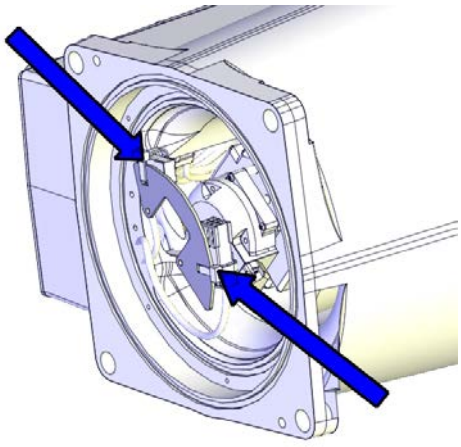
	Action	Note
3	Remove the bottom cover.	Rear connector interface:  xx1300000469 Bottom connector interface:  xx1400000403

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4.3.1 Replacing the main cable package

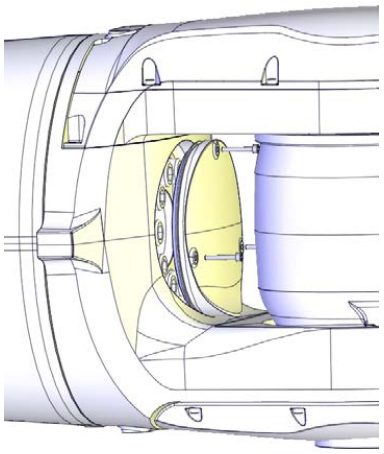
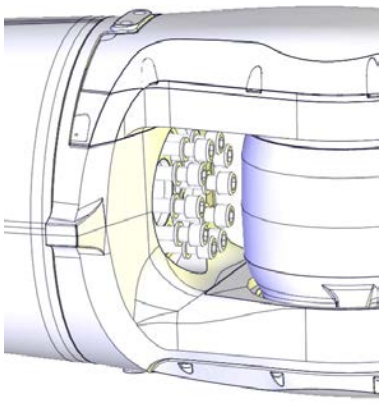
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	Action	Note
4	Remove the axis-1 motor bracket.	Rear connector interface:  xx1300000470 Bottom connector interface:  xx1400000404
5	Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors.	 xx1300002496

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Separating the arm system from base

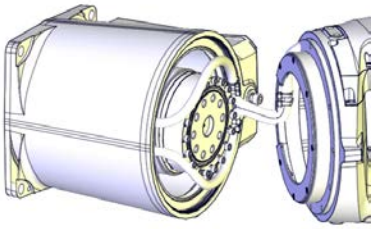
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the swing top cover by removing the screws. **Tip** Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.	 xx1300000467
4	Remove the screws and washers.	 xx1300000471

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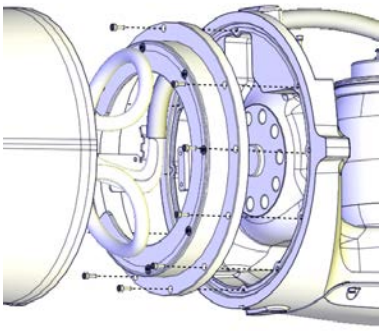
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4.3.1 Replacing the main cable package

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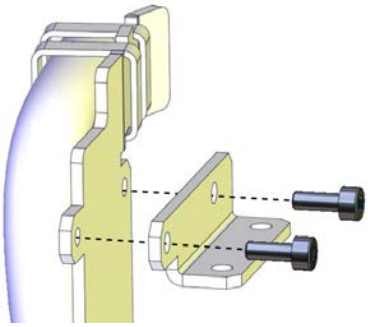
	Action	Note
5	Pull out the base slightly and turn it aside. **Tip** Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting.	 xx1300000472

Removing the cable package from the axis-1 sealing ring

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.	 xx1300002438
4	Remove the swing (including arm system) completely from the base and lay it aside on a safe location.	

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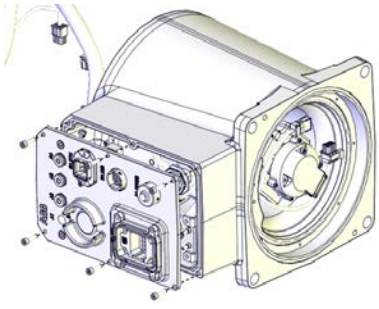
	Action	Note
5	Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part.	 xx1300002446

Removing the cable package from the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

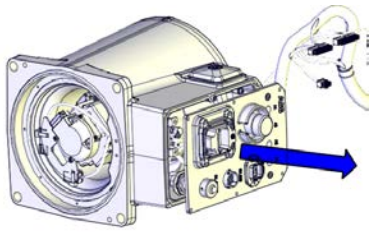
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Open the base cover.	 xx1300002448
4	Disconnect the earth cable.	

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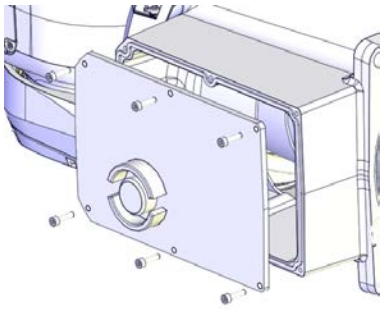
4.3.1 Replacing the main cable package

Continued

	Action	Note
5	Pull the cable package out from the base, through the rear.	 xx1300002456

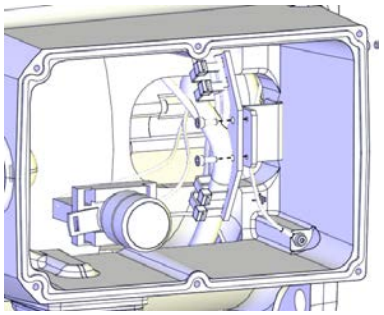
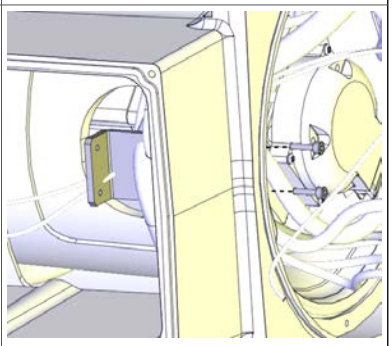
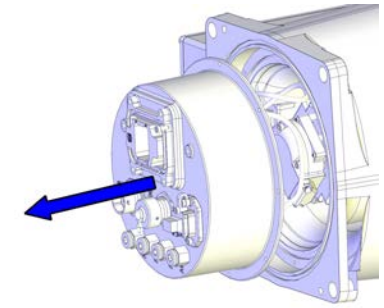
Cabling with bottom interface, and cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Open the base cover.	 xx1400000405
4	Remove the brake release button from the base cover.	
5	Disconnect the earth cable.	

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	Action	Note
6	Remove the cable bracket by removing the screws.	 xx1400000406
7	Remove the bracket inside the base by removing the screws.	 xx1400000407
8	Pull the cable package out from the base, through the bottom.	 xx1400000411

Refitting the main cable package

Use these procedures to refit the cable package.

Adjusting the air hose length for IRB 1200-7/0.7

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.3.1 Replacing the main cable package

Continued

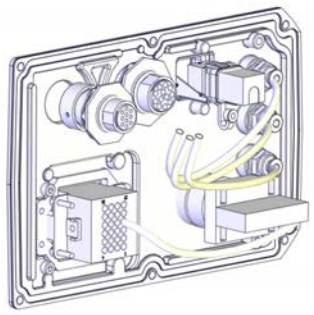
	Action	Note
2	**Valid for IRB 1200-7/0.7** If the cable harness is a new spare part, cut off 100 mm length of each air hose at the upper end. **Note** The same cable harness spare part is used for IRB 1200-5/0.9 and IRB 1200-7/0.9.	

Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

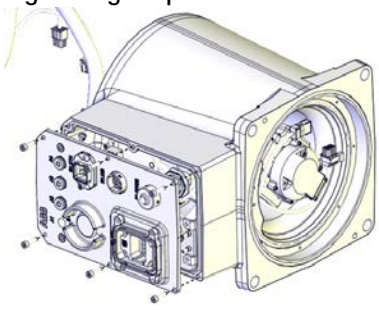
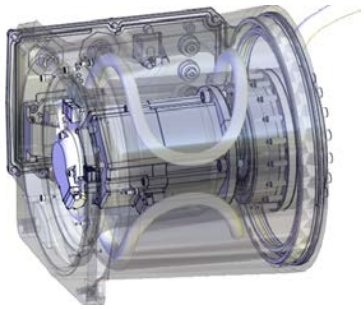
Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket on the base cover. Replace if damaged.	Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)  xx1400000741
3	Insert the cable package in and up through the base, through the rear.	
4	Reconnect the earth cable.	

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	Action	Note
5	Refit the base cover with the attachment screws.	Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.  xx1300002448 **Note** Only use specified screws, never replace them with other screws.
6	Route the cable package inside the base as shown in the figure. Apply grease to the cable package, cover all moving area of the package.	 xx1400000480

Cabling with bottom interface, cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

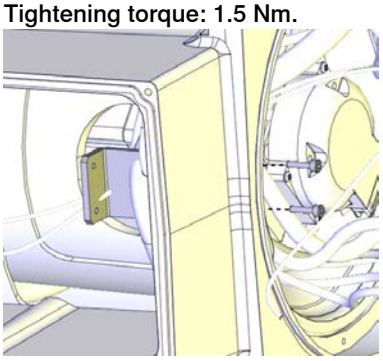
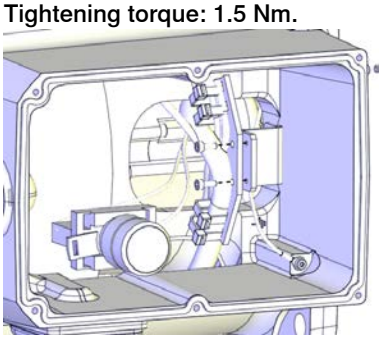
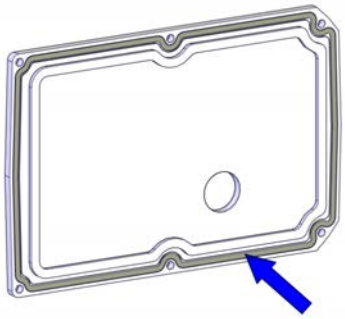
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the cable package in and up through the base, through the bottom.	

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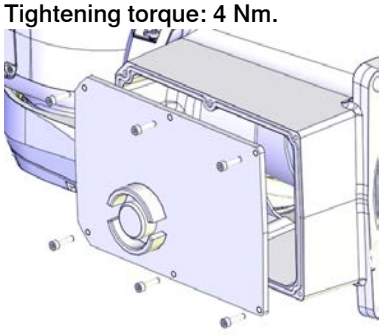
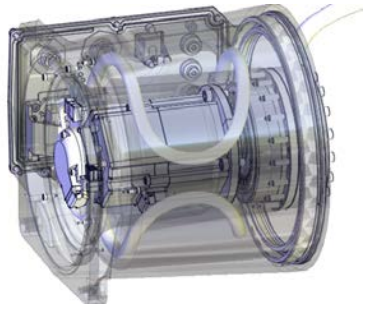
4.3.1 Replacing the main cable package

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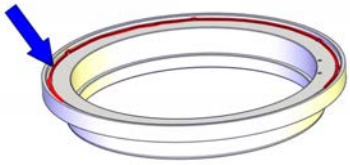
	Action	Note
3	Refit the bracket inside the base with the screws.	Tightening torque: 1.5 Nm.  xx1400000407
4	Refit the cable bracket with the screws.	Tightening torque: 1.5 Nm.  xx1400000406
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the base cover. Replace if damaged.	Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)  xx1400000413
6	Reconnect the earth cable.	
7	Refit the brake release button to the base cover.	

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	Action	Note
8	Refit the base cover.	Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.  xx1400000405 **Note** Only use specified screws, never replace them with other screws.
9	Route the cable package inside the base as shown in the figure. Apply grease to the cable package, cover all moving area of the package.	 xx1400000480

Refitting the cable package to the axis-1 sealing ring

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-1 sealing ring. Replace if damaged.	Axis-1 sealing ring: 3HAC073849-001 / 3HAC086035-001 / 3HAC068107-001 i
3	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.)	Sealant: Sikaflex 521FC.  xx1600001125

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4.3.1 Replacing the main cable package

Continued

	Action	Note
4	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the gasket on the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.) Replace if damaged.	On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001  xx1400000458 On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1600001149 On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1900001735

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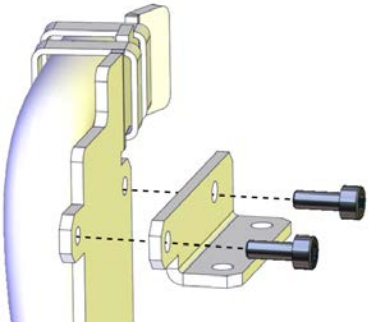
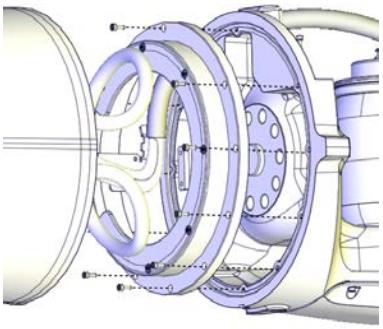
	Action	Note
5	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the V-ring on the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.) Replace if damaged.	V-ring: 3HAB3732-34 On axis-1 sealing ring version 3HAC056658-001:  xx1600001124 On axis-1 sealing ring version 3HAC058568-001:  xx1600001150 On axis-1 sealing ring version 3HAC068107-001:  xx1900001736
6	Check the cable protection on the axis-1 sealing ring. Replace if damaged. If replacing the cable protection, use locking liquid on the screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Cable protection: 3HAC044691-001 Torx countersunk head screw M3x5: 3HAC14286-4 Tightening torque: 0.3 Nm  xx1400000456

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4.3.1 Replacing the main cable package

Continued

	Action	Note
7	Refit the cable bracket to the cabling, if removed. Use locking liquid on the screw threads.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Cable bracket on swing: 3HAC044925-001 Tightening torque: 1 Nm.  xx1300002446
8	Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.	Tightening torque: 1.5 Nm.  xx1300002438

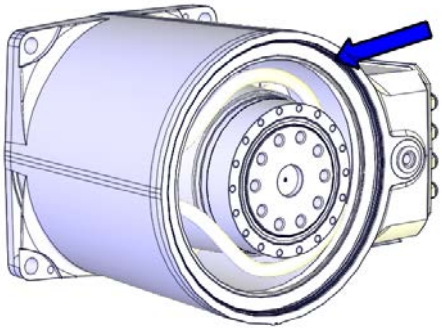
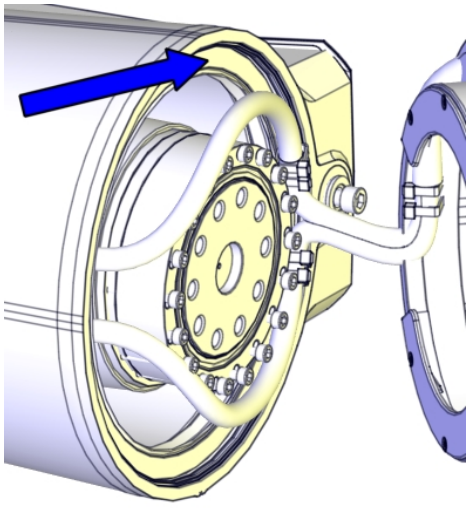
i For information on which sealing ring to be ordered, see *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.

Assembling the swing and base

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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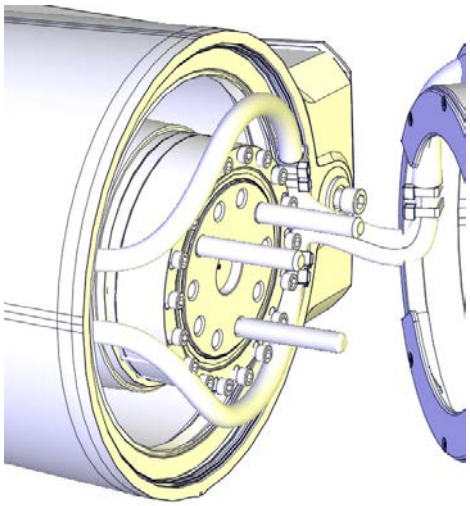
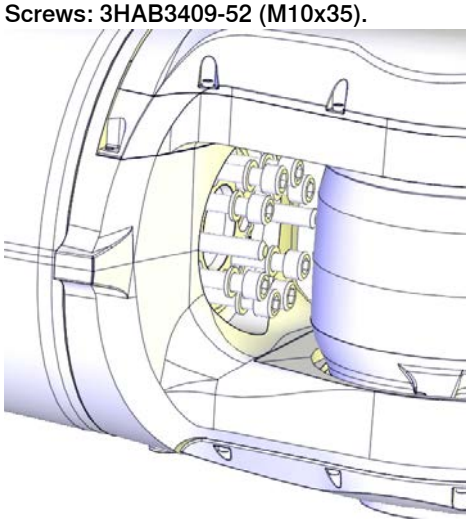
	Action	Note
2	Check the axis-1 radial sealing in the base. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing with dust lip: 3HAB3701-47 M2 variseal sealing: 3HAC044641-002  xx1400000472 Replacement is detailed in *Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 515*.
	For robots with protection class IP67 Check the M2 variseal sealing in the base. Replace if damaged. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply grease to the radial sealing surface.	Grease: 3HAC058065-001.  xx1600000170

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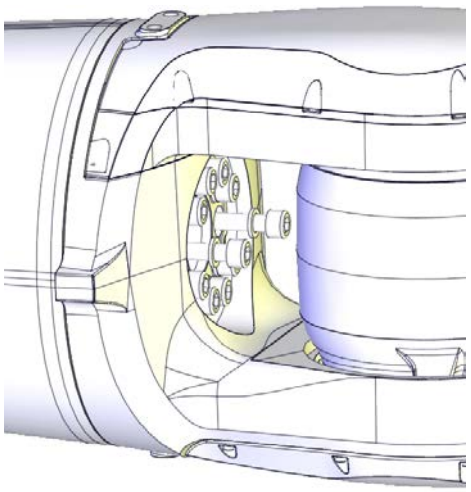
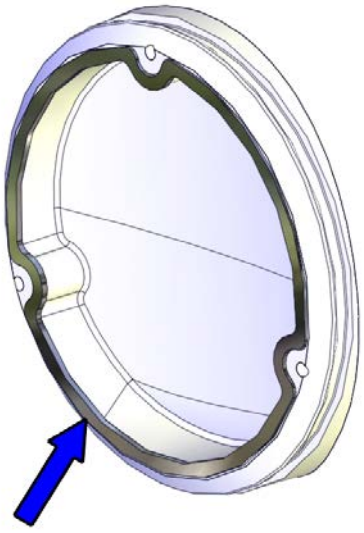
4.3.1 Replacing the main cable package

Continued

	Action	Note
4	Fit the guide pins to the drive unit.	Guide pin for axis-1 gear unit: 3HAC049703-001  xx1300002566 Always use three guide pins together!
5	Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing. Position and angle the cabling inside the base as it was positioned during removal. **CAUTION** Be careful not to squeeze any cabling during the refitting procedure.	
6	Secure with attachment screws and washers, but do not tighten yet.	Screws: 3HAB3409-52 (M10x35).  xx1300002567 **Note** Only use specified screws, never replace them with other screws.

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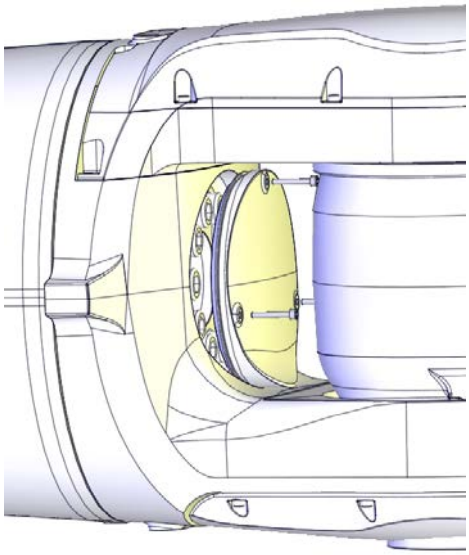
	Action	Note
7	Remove the guide pins and refit the remaining attachment screws and washers.	 xx1300000523
8	Tighten all screws.	Tightening torque: 40 Nm.
9	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Gasket on top swing cover 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)  xx1400000425

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4.3.1 Replacing the main cable package

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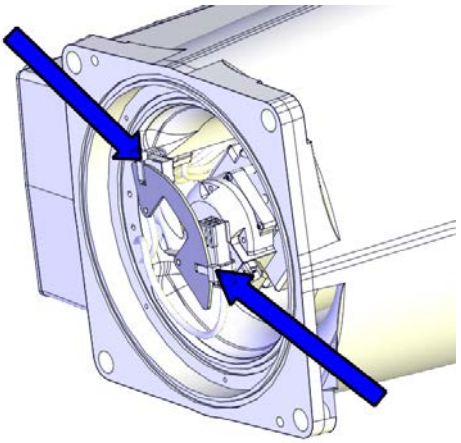
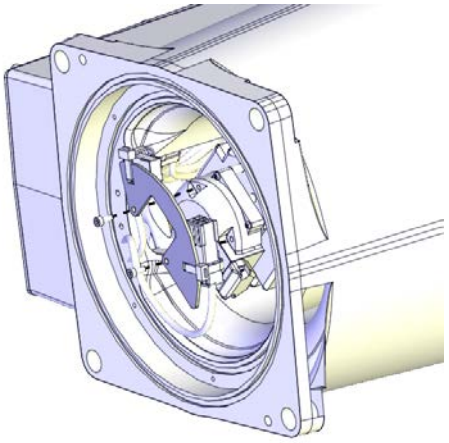
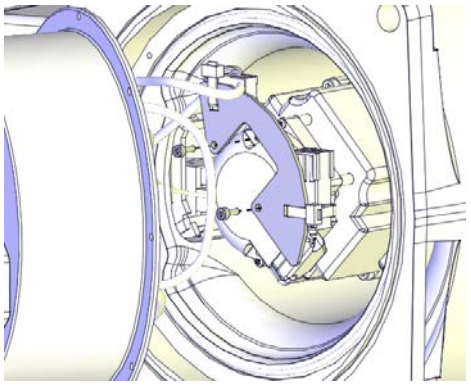
	Action	Note
10	Refit the swing top cover with the screws. Replace if damaged.	Cover on top of swing: 3HAC059679-001 Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic : 3HAC056133-001 Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.  xx1300000467 **Note** Only use specified screws, never replace them with other screws.

Connecting the axis-1 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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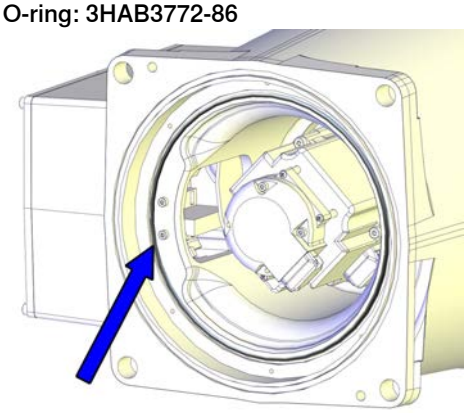
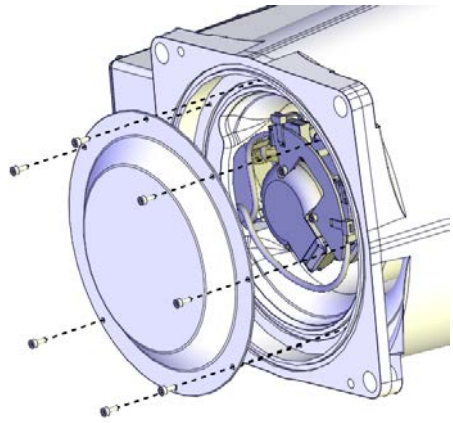
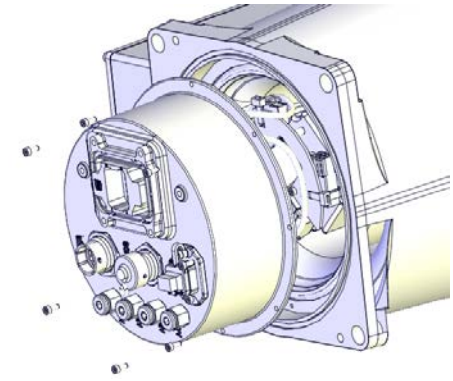
	Action	Note
2	Reconnect the connectors and secure the connectors to the bracket with cable straps.	 xx1300002496
3	Refit the axis-1 motor bracket.	Tightening torque: 1.5 Nm. Rear connector interface:  xx1300000470 Bottom connector interface:  xx1400000404

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4.3.1 Replacing the main cable package

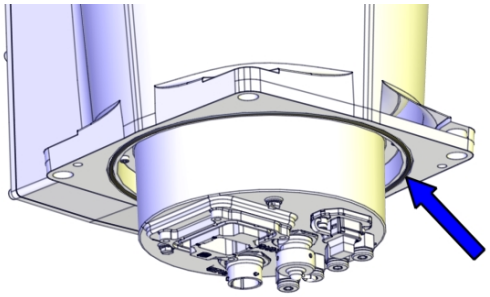
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	Action	Note
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the O-ring. Replace if damaged.	O-ring: 3HAB3772-86  xx1400000412
5	Refit the bottom cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Rear connector interface:  xx1300000469 Bottom connector interface:  xx1400000403 **Note** Only use specified screws, never replace them with other screws.

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Securing the robot to the foundation

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
3	**For robots with:** **protection class IP67,** **protection type Foundry Plus** **protection type Clean Room** **food grade lubrication** **with protection type Hygienic** **and manipulator cables routed from below** Check the gasket at the bottom of the base. Replace if damaged.	O-ring: 3HAB3772-141 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8. Washers: 13 x 20 x 2, steel hardness class 300HV. Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1. Tightening Torque: 55 Nm ± 5 Nm.

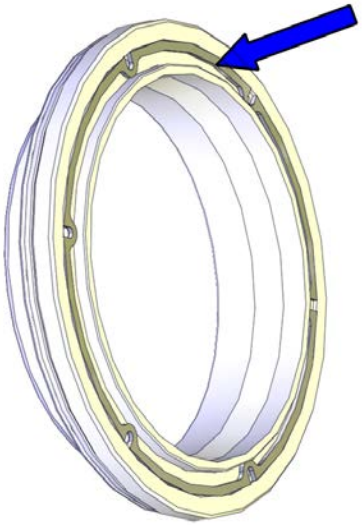
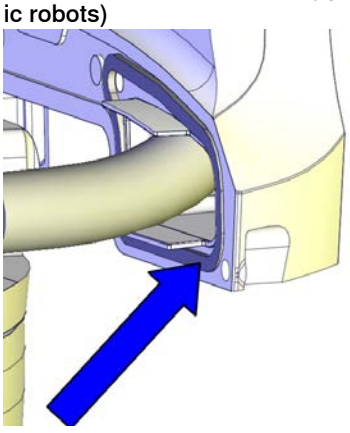
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4.3.1 Replacing the main cable package

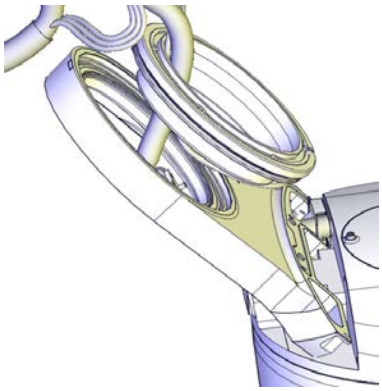
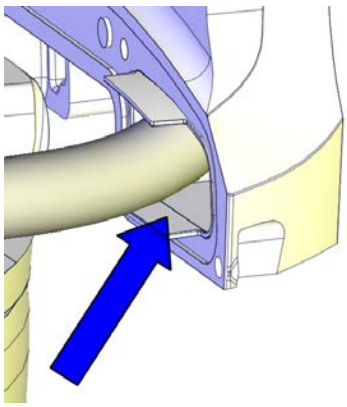
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Refitting the cable package in the lower arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-2 sealing ring. **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Axis-2 sealing ring: 3HAC086036-001 (for robots in IP40) / 3HAC044677-001 (for robots not in IP40) Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)  xx1400000476
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing plastic plate. Replace if damaged.	Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)  xx1400000457

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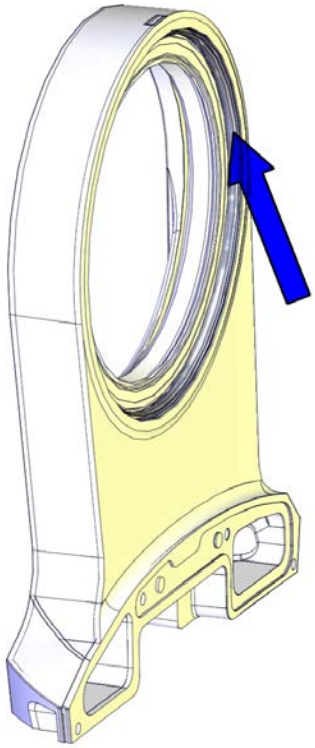
	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 xx1400000025
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	The plastic plate is included in: Cable harness material set: 3HAC049663-001.  xx1400000023

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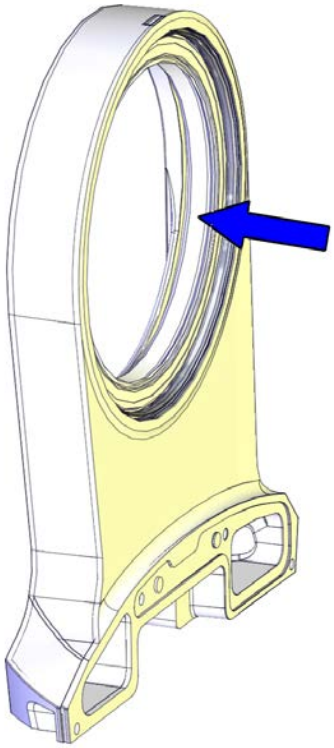
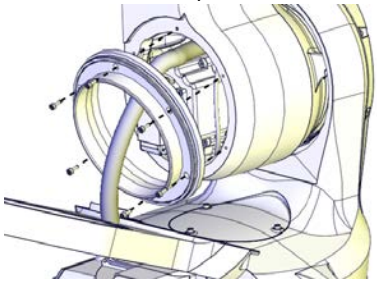
4.3.1 Replacing the main cable package

Continued

	Action	Note
6	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-004  xx1400000454

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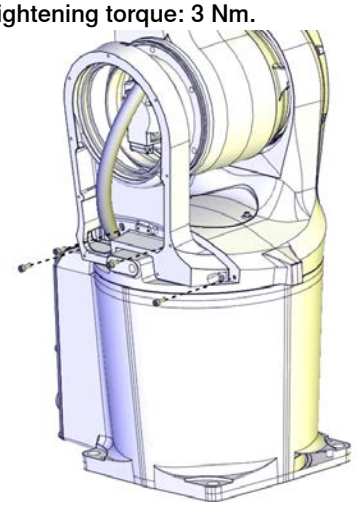
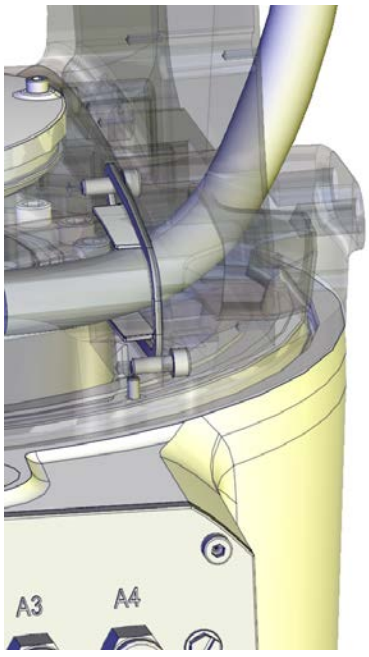
	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing with dust lip: 3HAB3701-41  xx1400000753 Replacement is detailed in *Replacing the swing spare parts (swing, axis-2 radial sealing) on page 595*.
8	Guide the cable package into the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
9	Refit the axis-2 sealing ring with the screws.	Tightening torque: 0.5 Nm (for Axis-2 sealing ring 3HAC086036-001) / 1.5 Nm (for Axis-2 sealing ring 3HAC044677-001)  xx1400000020

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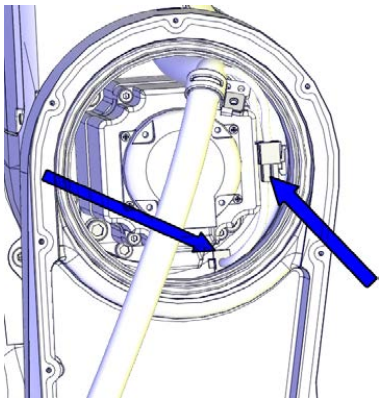
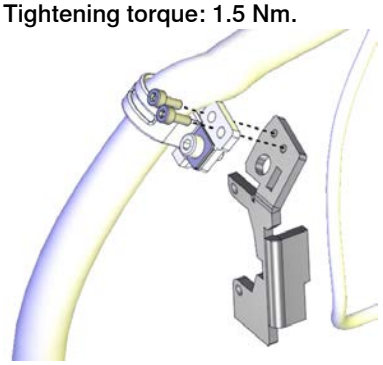
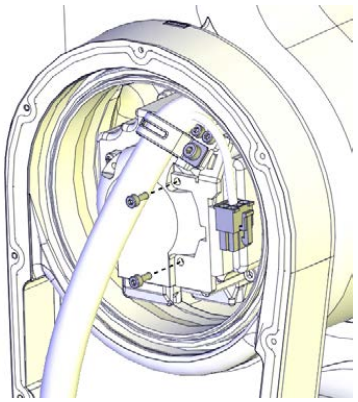
4.3.1 Replacing the main cable package

Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
11	Refit the cable housing with the screws.	Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.  xx1300002435 **Note** Only use specified screws, never replace them with other screws.
12	Apply grease to the cable package, cover all moving area of the package.	 xx1400000481

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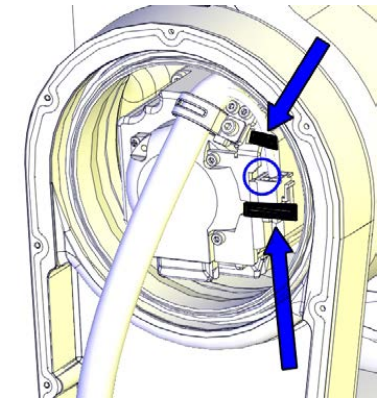
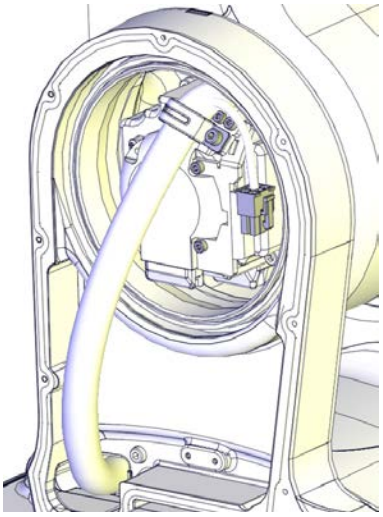
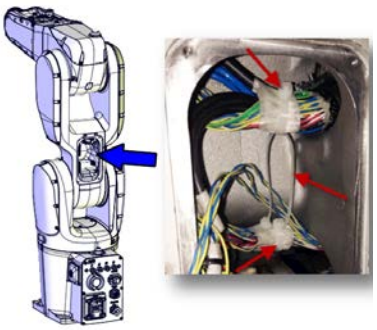
	Action	Note
13	Reconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
14	Refit the axis-2 motor bracket to the cable package with the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1400000021
15	Refit the axis-2 motor bracket to the motor.	 xx1300002432

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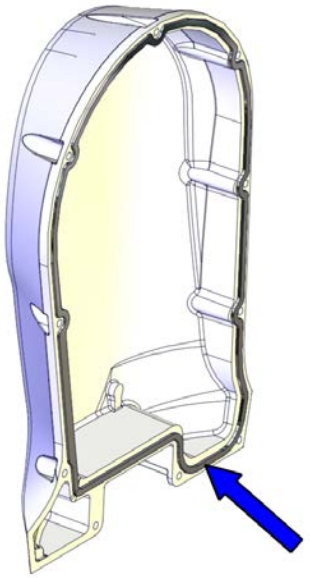
4.3.1 Replacing the main cable package

Continued

	Action	Note
16	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
17	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
18	In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity: 1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location. 2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. See the figure.	 xx1400001131

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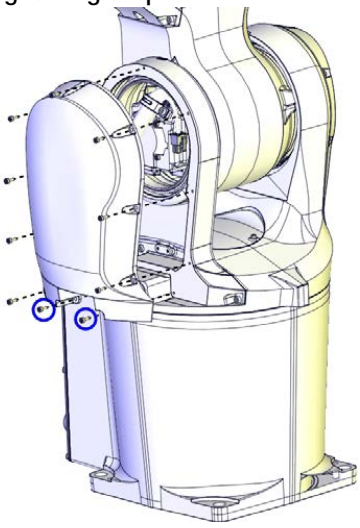
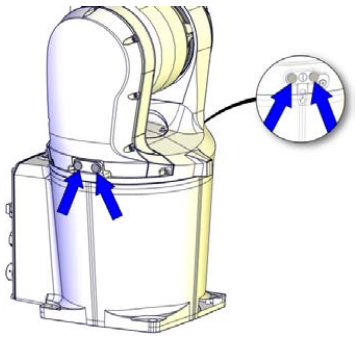
	Action	Note
19	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)  xx1400000424
20	Check the PTFE film. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
21	Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.	
22	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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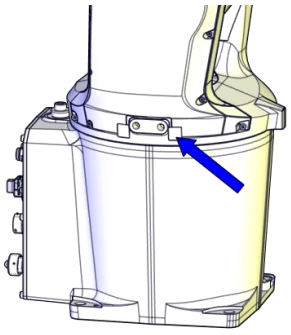
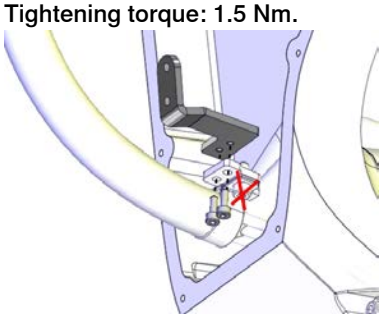
4.3.1 Replacing the main cable package

Continued

	Action	Note
23	Refit the cable housing cover. Replace if damaged. **Note** Remember to refit the two lower screws shown in the figure.	Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002431 **Note** Only use specified screws, never replace them with other screws.
24	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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	Action	Note
25	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Refit the swing sealing plug. Follow the procedure specified in *Refitting the swing sealing plug on page 183*.	Swing sealing plug:3HAC053687-001  xx1600000205
26	Refit the lower arm bracket to the cable package. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002430

Connecting the cabling in the lower arm

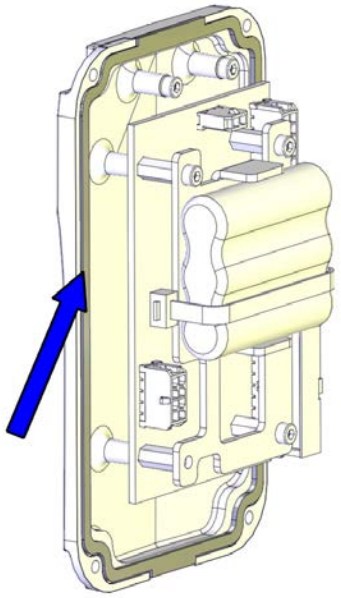
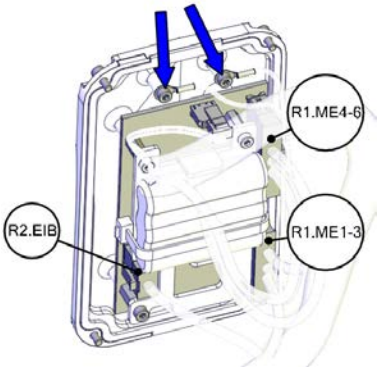
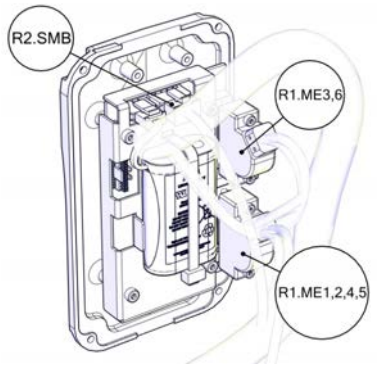
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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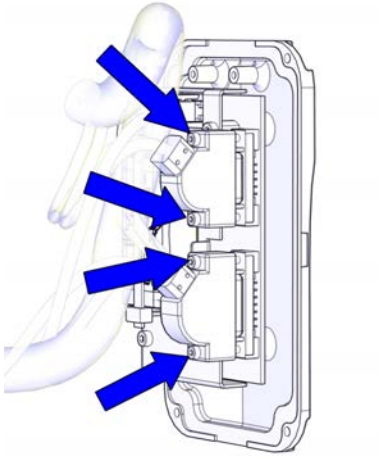
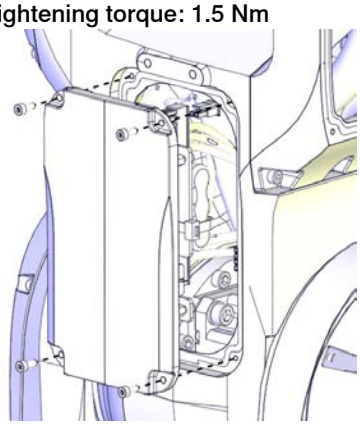
4.3.1 Replacing the main cable package

Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the EIB/SMB cover gasket. Replace if damaged.	Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)  xx1400000475
4	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1300002428
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the lugs to the EIB/SMB cover.	
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005

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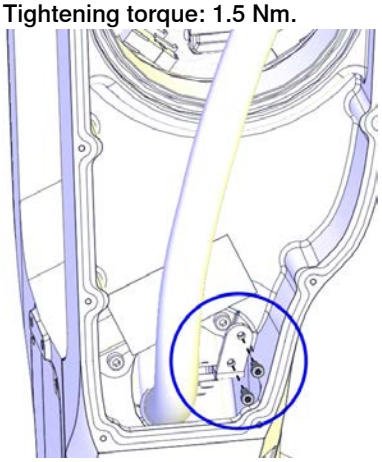
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	Action	Note
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

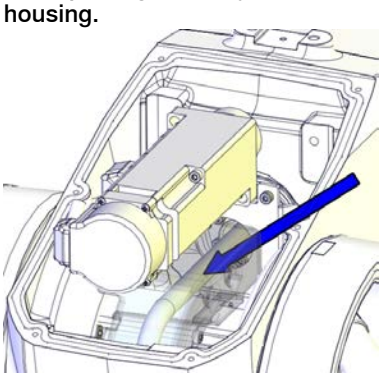
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4.3.1 Replacing the main cable package
Continued

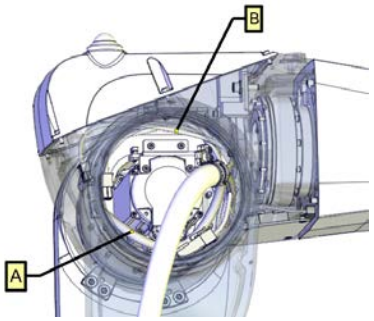
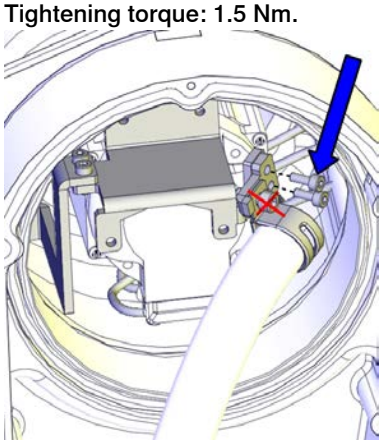
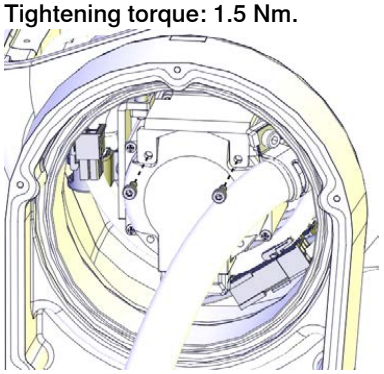
	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	Tightening torque: 1.5 Nm.  xx1300002426

Refitting the cable package in the housing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	Area to be lubricated, shown in cable package already fitted to the housing.  xx1400000483

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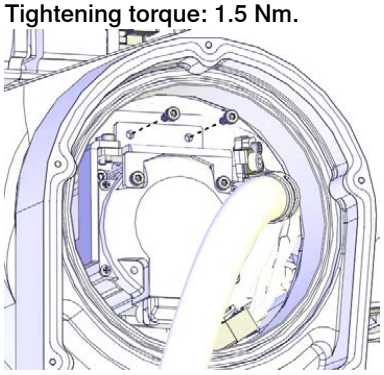
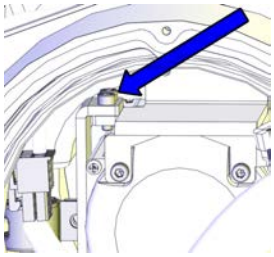
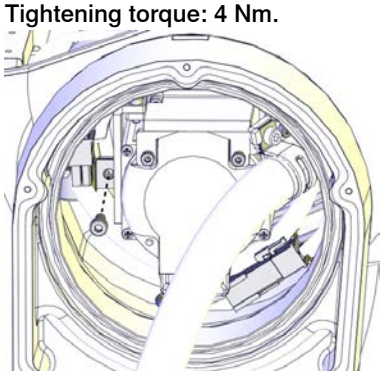
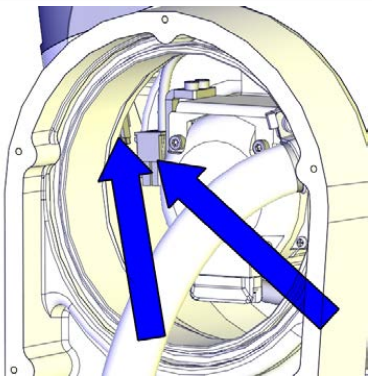
	Action	Note
3	Guide the cable package into the upper arm, through the housing. **Note** Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor. **Note** The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.	 xx1400001472
4	Refit the bracket to the sheet with two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002424
5	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423

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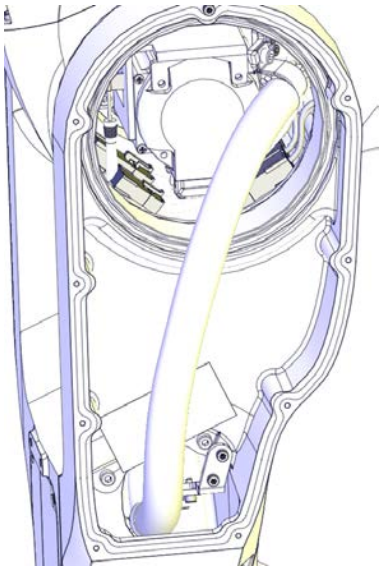
4.3.1 Replacing the main cable package

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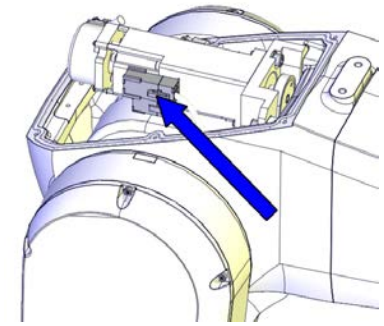
	Action	Note
6	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
7	Fit the air hose holder to the bracket. Replace the holder, if damaged. **Tip** If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.  xx1400001133	Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.  xx1300002422
8	Reconnect the axis-3 motor connectors.	 xx1300002420

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	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 xx1400000754
10	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

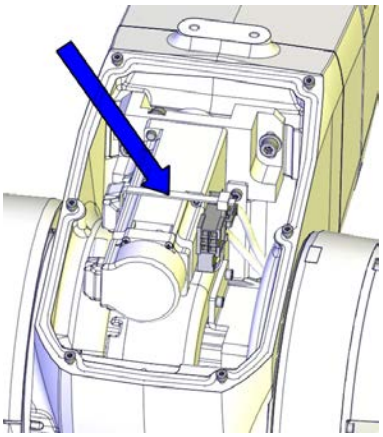
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

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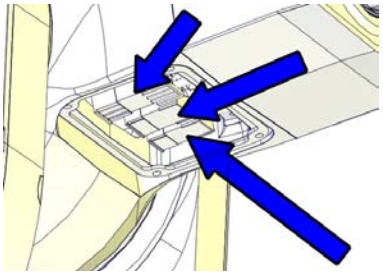
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4.3.1 Replacing the main cable package

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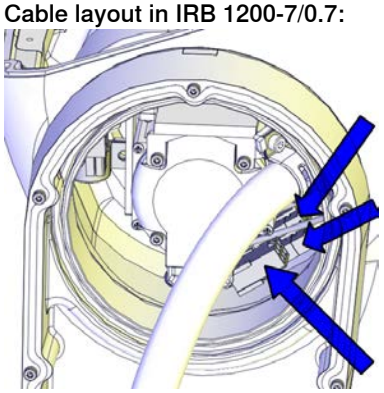
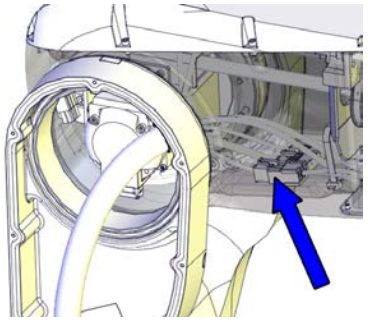
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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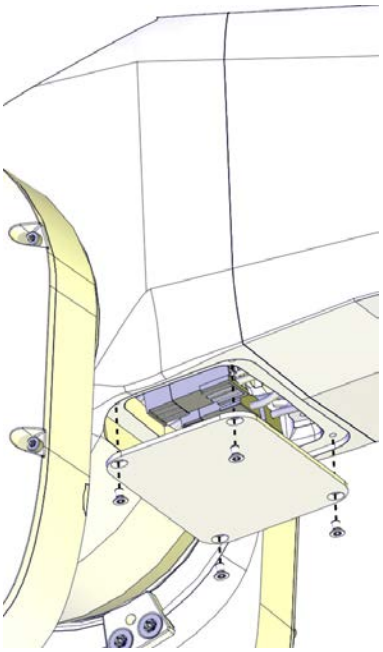
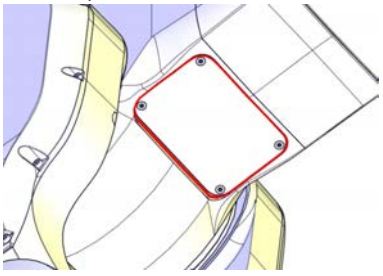
	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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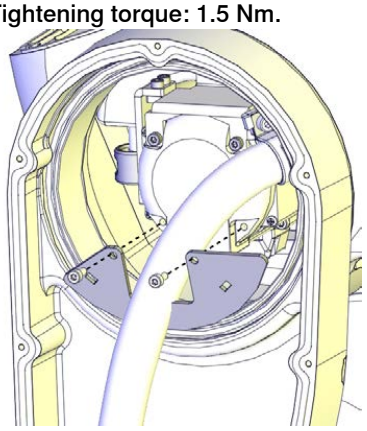
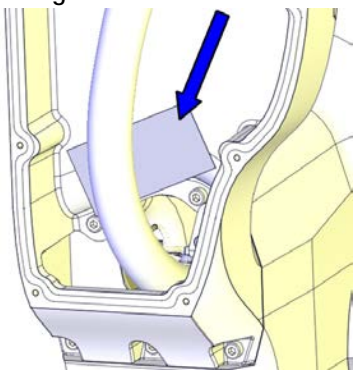
4.3.1 Replacing the main cable package

Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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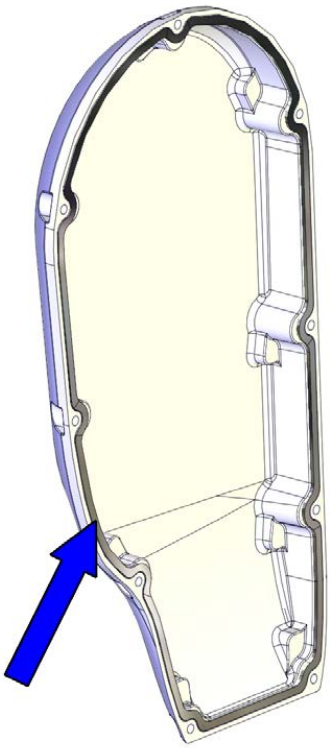
	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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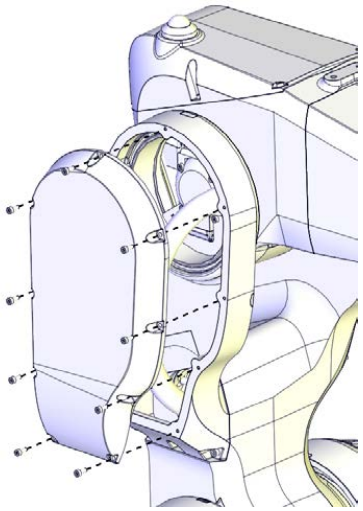
4.3.1 Replacing the main cable package

Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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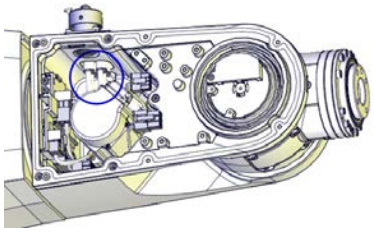
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

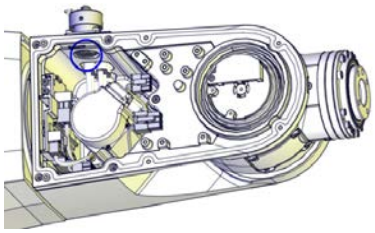
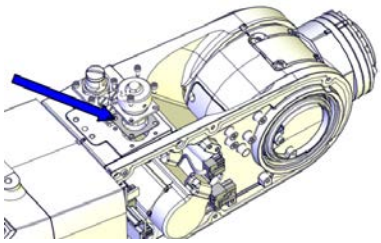
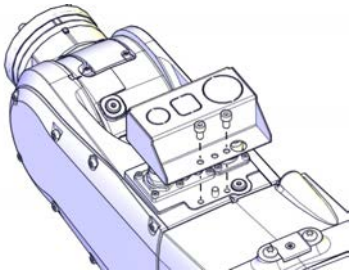
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738

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4.3.1 Replacing the main cable package

Continued

	Action	Note
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

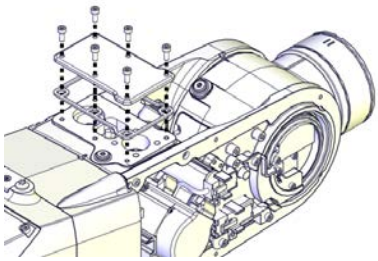
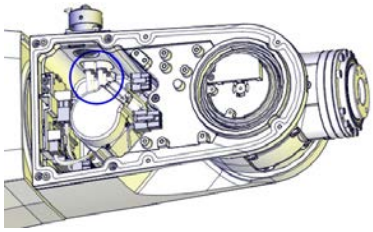
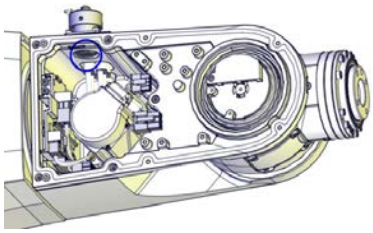
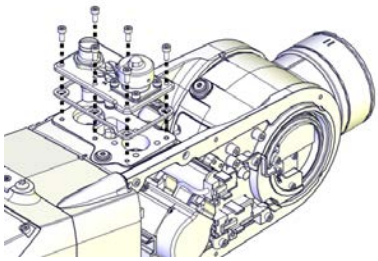
Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

Connecting the axis-5 motor FPC connectors

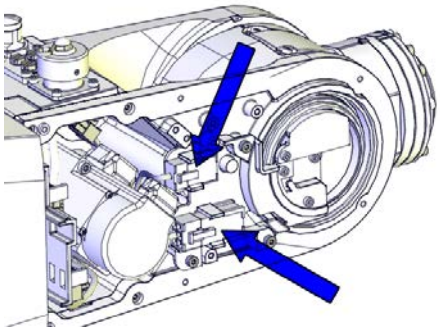
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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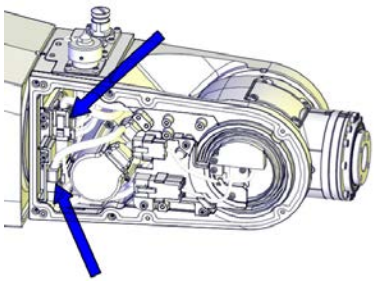
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4.3.1 Replacing the main cable package

Continued

	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

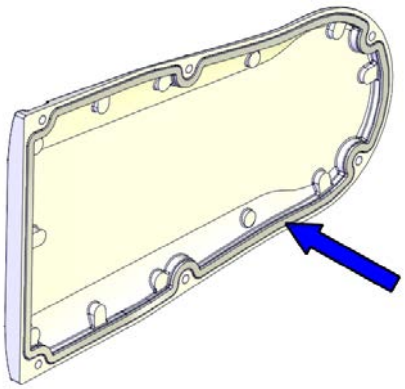
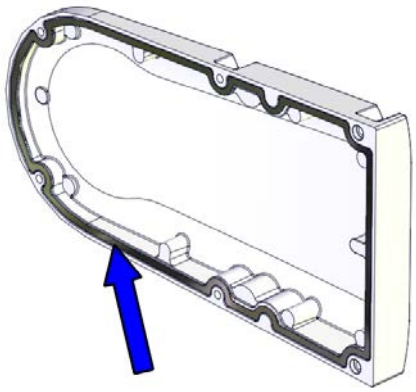
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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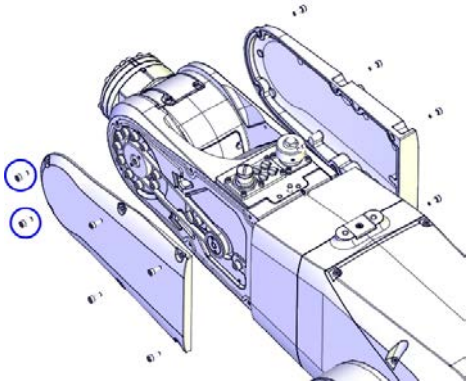
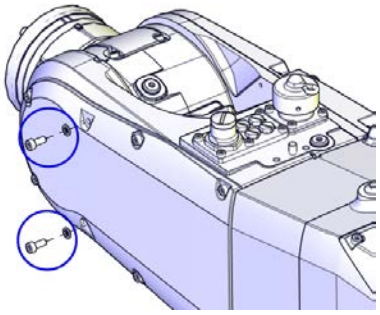
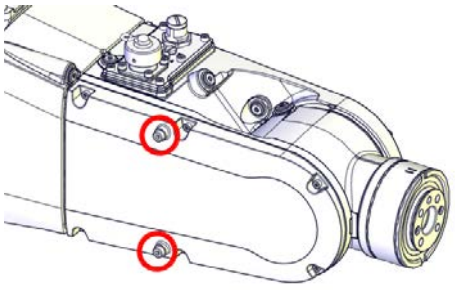
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.3.1 Replacing the main cable package

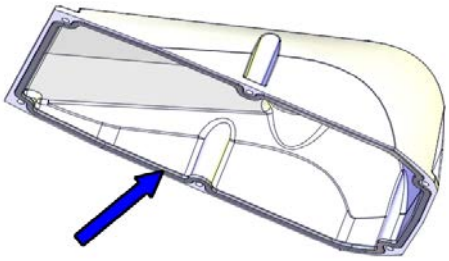
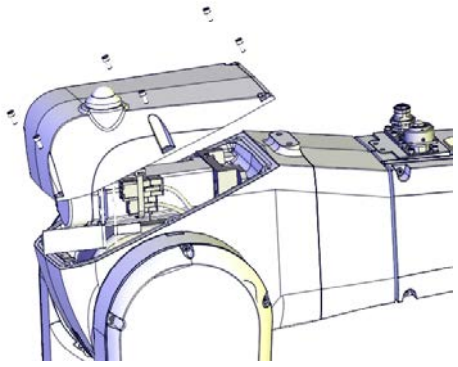
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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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Concluding procedure

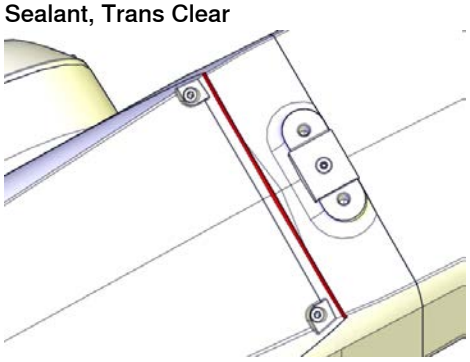
	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws. **CAUTION** **For robots with safety lamp (option)** Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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4.3.1 Replacing the main cable package

Continued

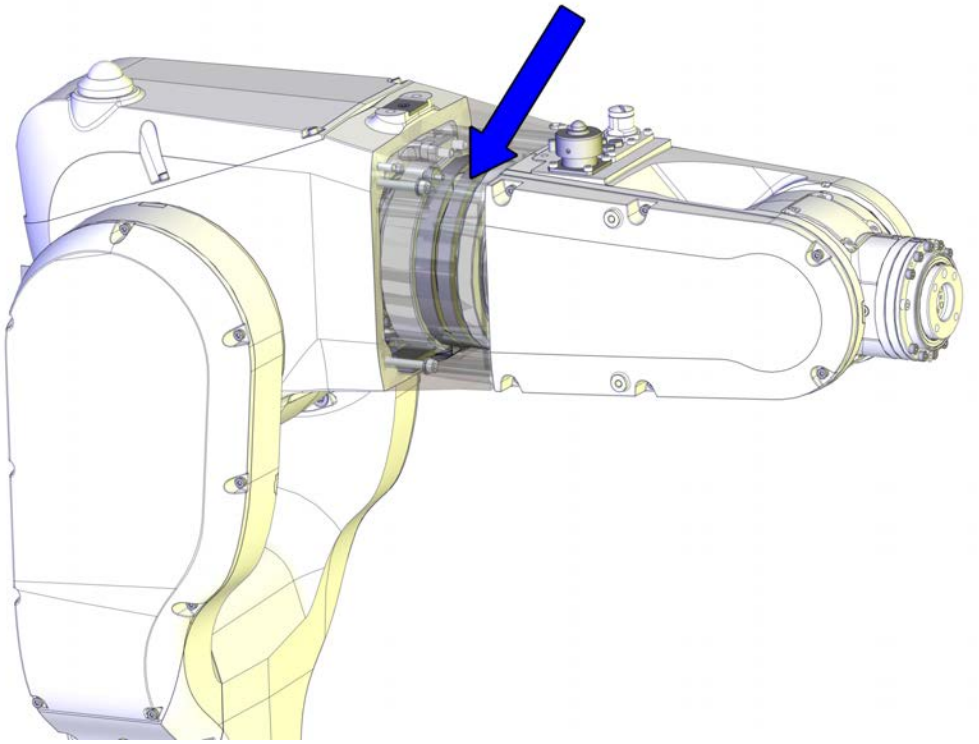
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Location of the FPC unit

The axis-4 FPC unit and the housing extender sealings are located inside the housing extender unit, as shown in the figure.



xx1300002419

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
FPC unit, axis 4	3HAC082235-001	
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Housing extender unit	3HAC059686-001	Replace if damaged.

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Spare part	Article number	Note
Housing extender unit, Clean Room Housing extender unit, food grade lubrication Housing extender unit, Hygienic	3HAC059703-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.

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Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the FPC unit and the housing extender sealings

Use these procedures to remove the axis-4 FPC unit and the housing extender sealings.

Preparations before removing the axis-4 FPC unit

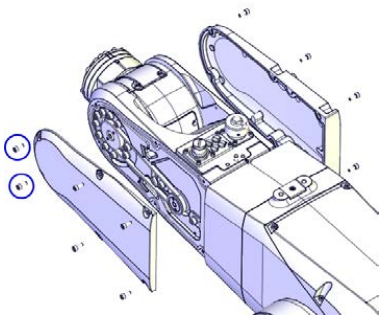
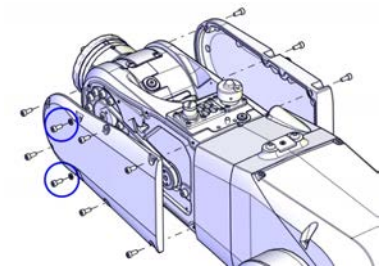
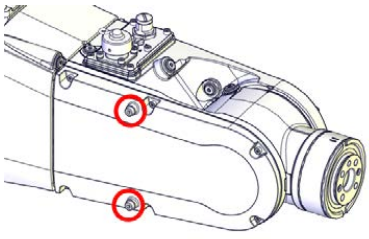
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog axis 4 to zero position.	
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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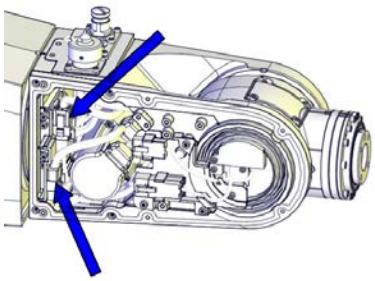
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Disconnecting the axis-5 motor connectors

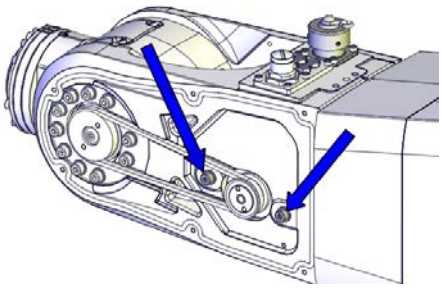
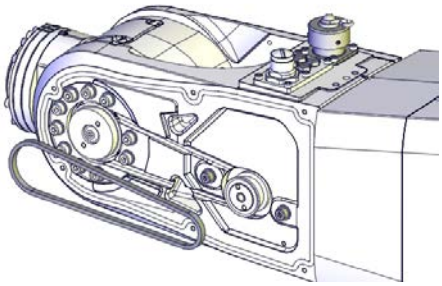
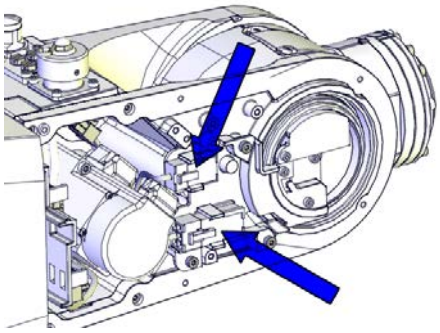
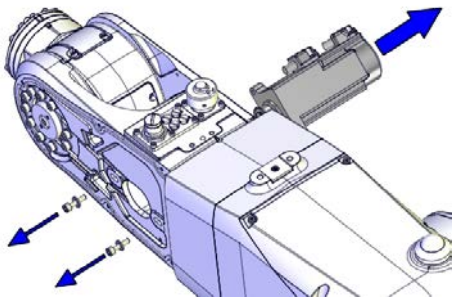
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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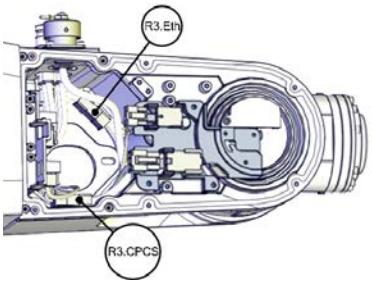
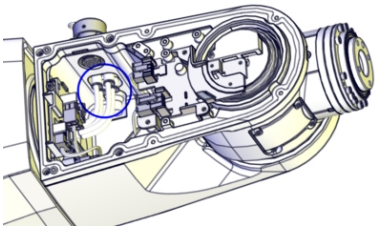
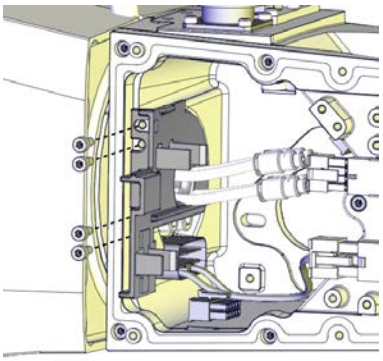
	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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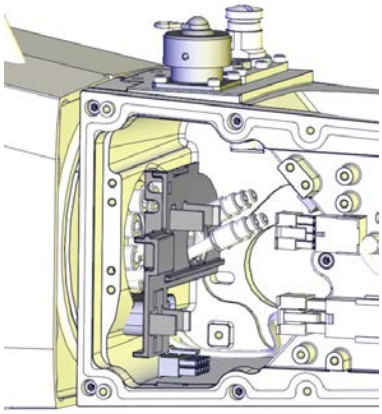
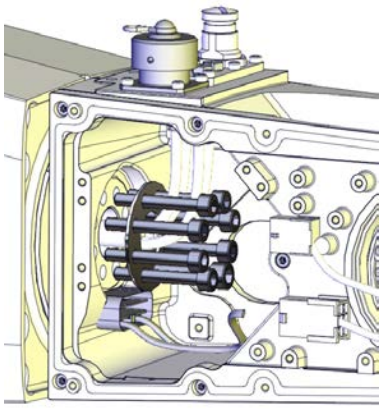
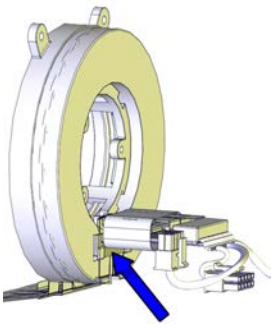
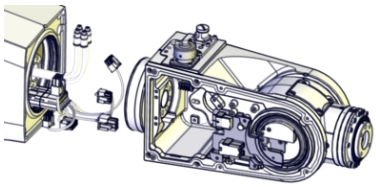
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Removing the wrist

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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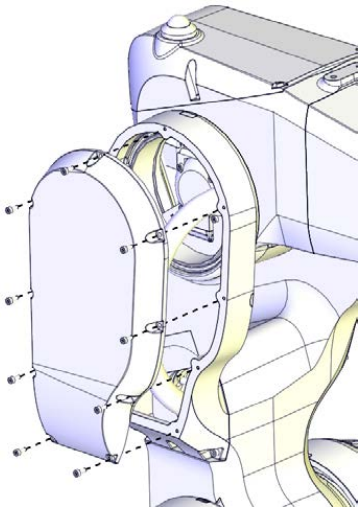
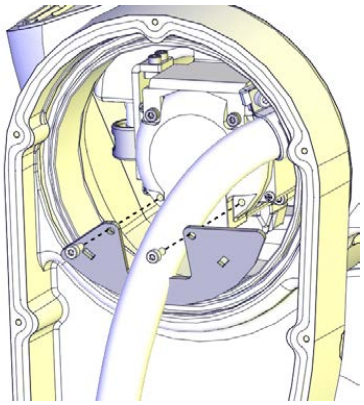
	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 xx1300002357
7	Support the weight of the wrist and remove the screws and the washer.	 xx1300002358
8	Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359

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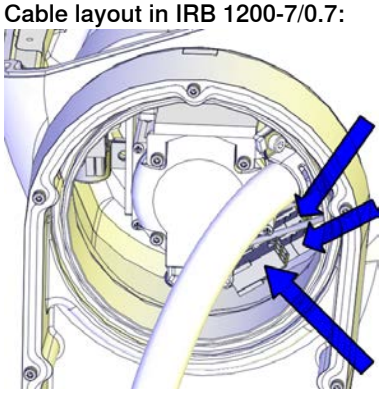
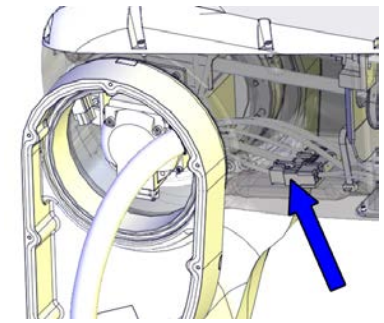
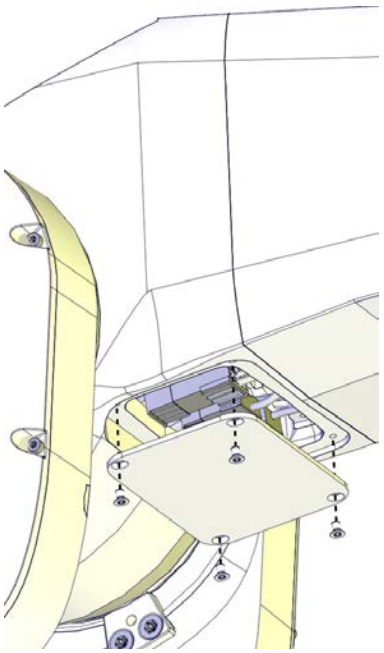
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Disconnecting the axis-4 FPC connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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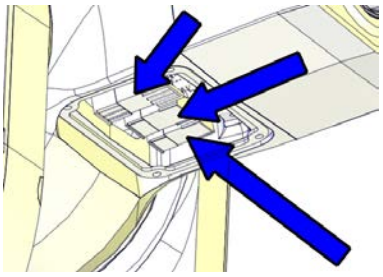
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	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
6	Remove the small cover of the housing.	 xx1300002398

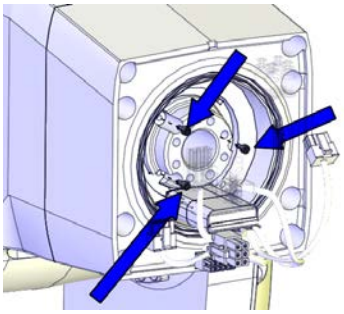
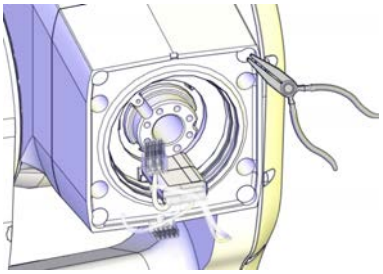
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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

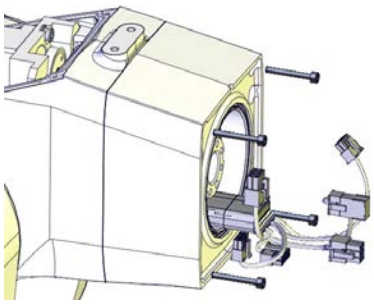
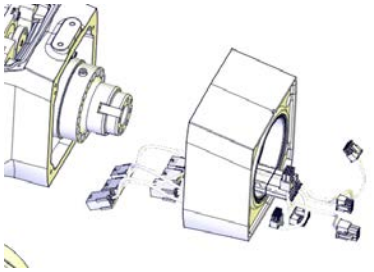
	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

Removing the housing extender unit

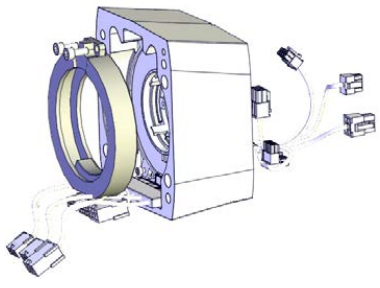
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the axis-4 FPC unit screws.	 xx1300002373
4	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the plugs covering the extender unit screws with a needle-nose plier.	 xx1600000262

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	Action	Note
5	Remove the extender unit screws.	 xx1300002372
6	Remove the housing extender unit. Be careful not to damage the cabling.	 xx1300002374

Removing the axis-4 mechanical stop

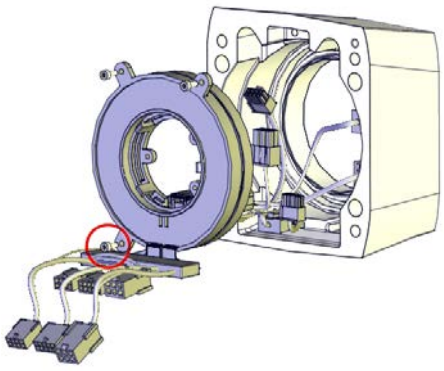
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the mechanical stop assembly from the housing extender unit by removing the screws.	 xx1300002415

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Removing the axis-4 FPC unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the FPC unit from the housing extender unit by removing the screws. **CAUTION** The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw.	 xx1300002417

Refitting the FPC unit and the housing extender sealings

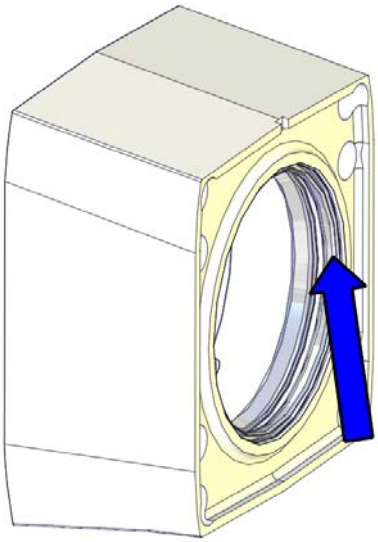
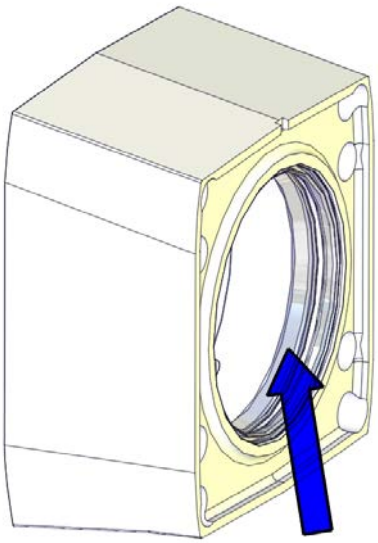
Use these procedures to refit the FPC unit and the housing extender sealings.

Checking the housing extender sealings

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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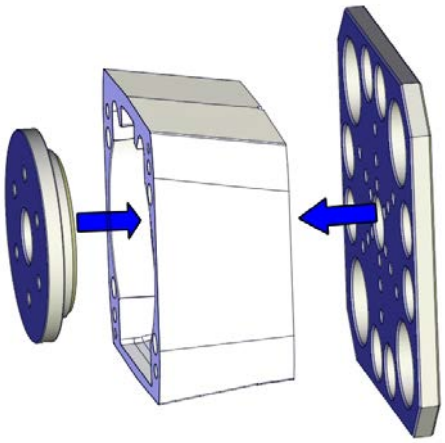
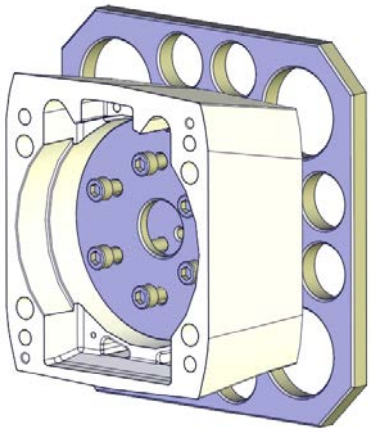
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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-007  xx1300002418
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged, as described below. In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.	Radial sealing with dust lip: 3HAB3701-48  xx1400000438
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the housing extender unit.	

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

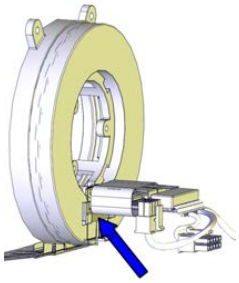
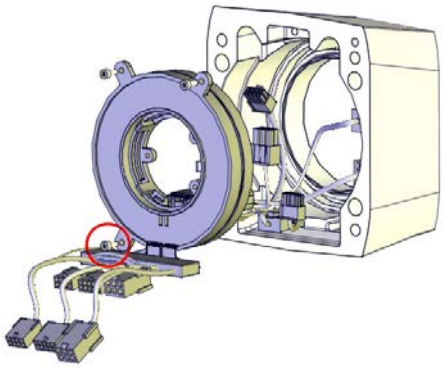
	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 xx1400000436
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000437
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Refitting the axis-4 FPC unit

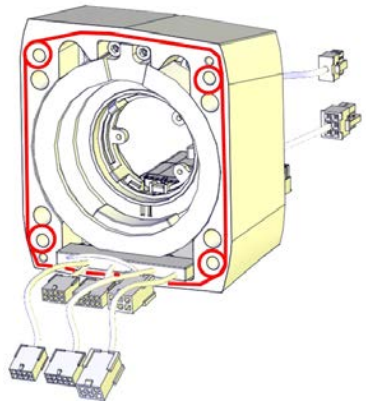
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the FPC unit to the housing extender unit and secure with the screws. **CAUTION** The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	Tightening torque: 0.5 Nm.  xx1300002417

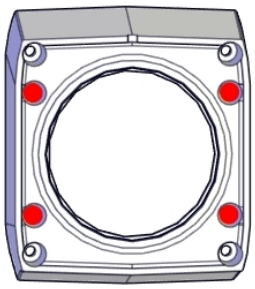
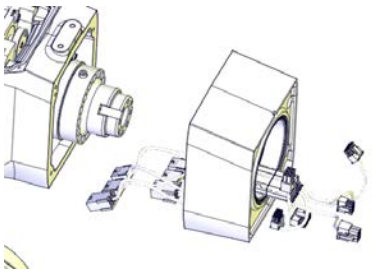
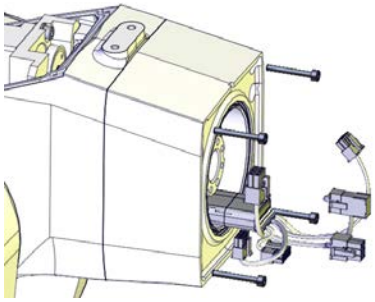
Refitting the housing extender unit

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.	 xx1300002613

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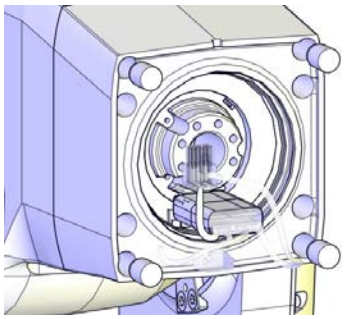
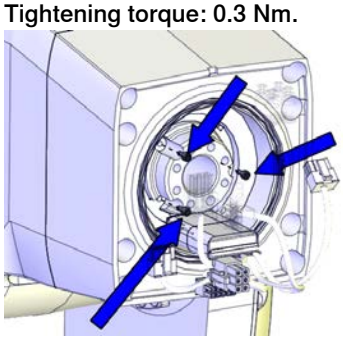
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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

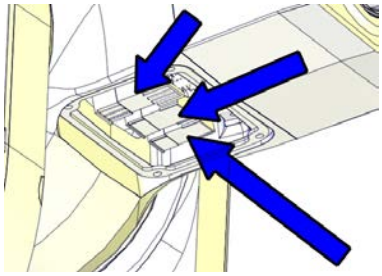
	Action	Note
3	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.	 xx1600000216
4	Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling. **CAUTION** Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit. **Note** Mate the unit to the two locating pins attached to the housing.	 xx1300002374
5	Secure with screws and washers, using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: M4x30. Tightening torque: 2.7 Nm.  xx1300002372

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	Action	Note
6	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Press in screw sealing plugs to cover the screws.	Screw sealing plug: 3HAC053685-001  xx1600000263
7	Fit and secure the axis-4 FPC unit screws.	Tightening torque: 0.3 Nm.  xx1300002373

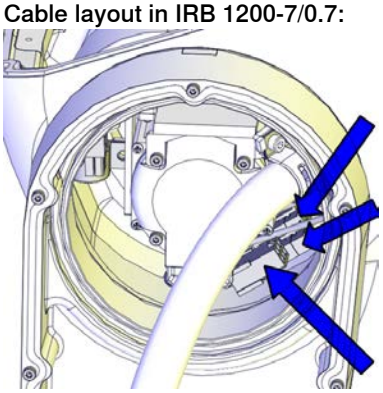
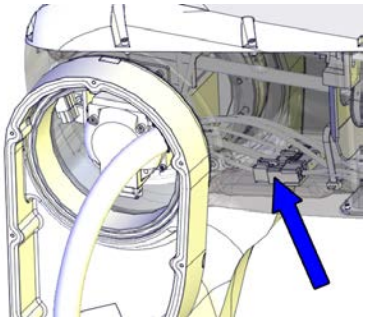
Connecting the axis-4 FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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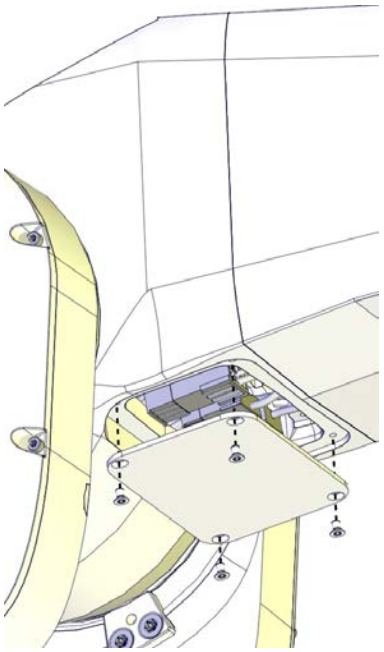
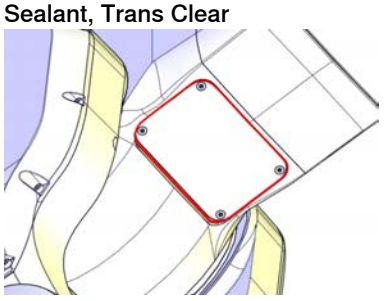
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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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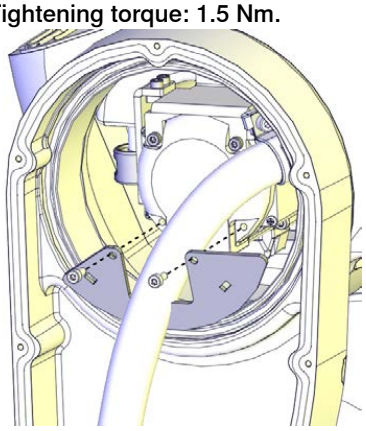
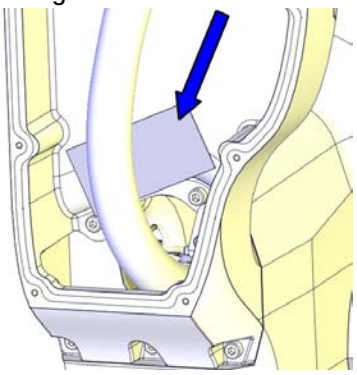
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	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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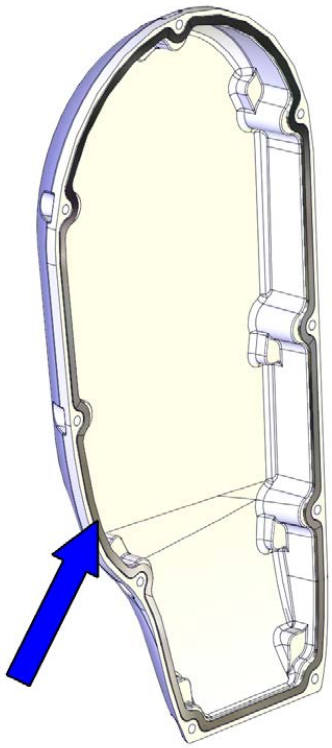
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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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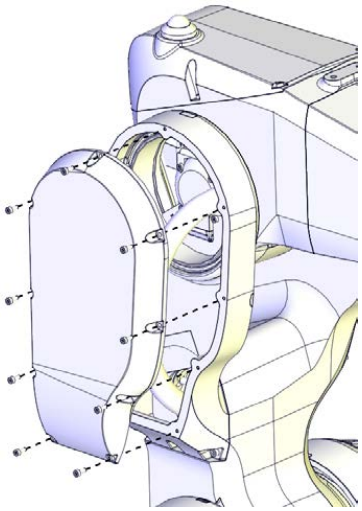
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	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

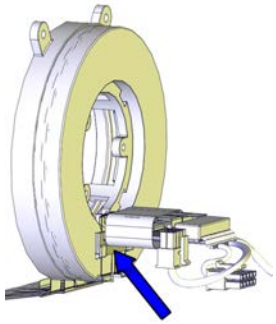
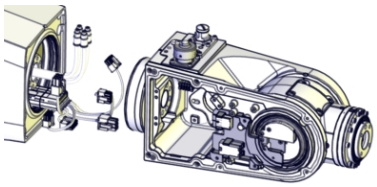
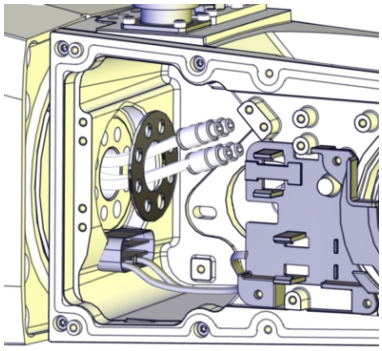
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Refitting the wrist

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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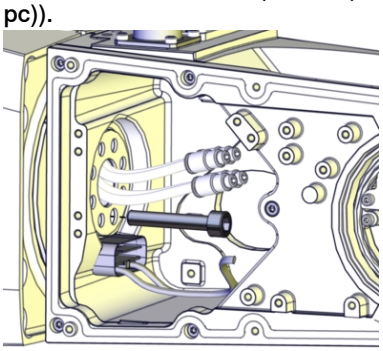
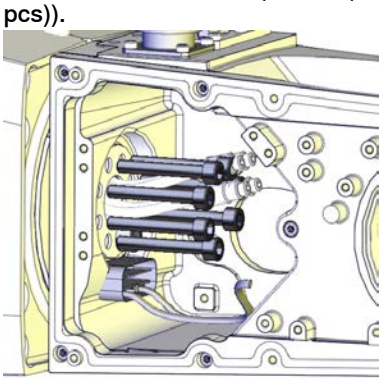
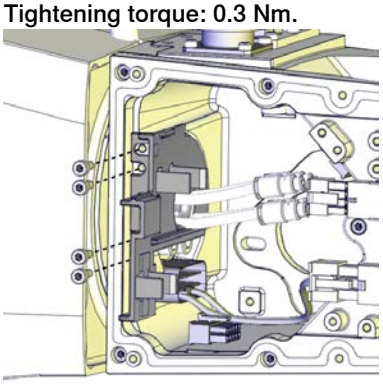
	Action	Note
2	Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359
3	Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.	Washer: 3HAC044869-001  xx1400000001

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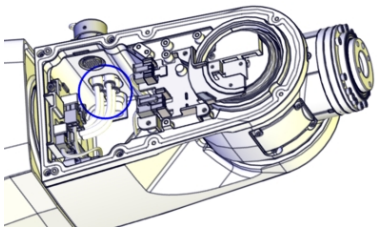
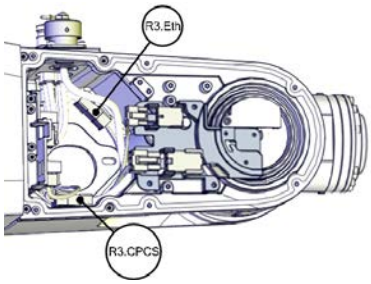
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

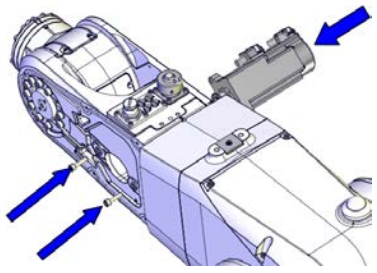
	Action	Note
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	Screw: 3HAB3409-238 (M6x35 (1 pc)).  xx1400000002 **Note** Only use specified screws, never replace them with other screws.
5	Refit the rest of the screws (M5x35 (7 pcs)).	Screw: 3HAB3409-237 (M5x35 (7 pcs)).  xx1400000003 **Note** Only use specified screws, never replace them with other screws.
6	Tighten all screws.	Tightening torque: 8 Nm.
7	Put the cables through the plate hole and refit the plate.	Tightening torque: 0.3 Nm.  xx1300002356

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	Action	Note
8	Reconnect the air hoses. **CAUTION** Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. • R3.Eth • R3.CPCS	 xx1300002353

Preparations before securing the axis-5 motor

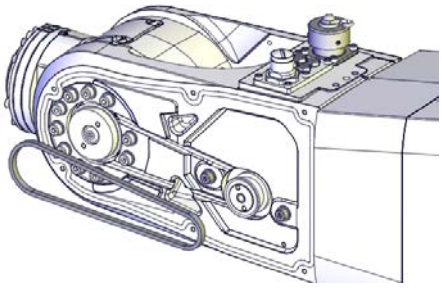
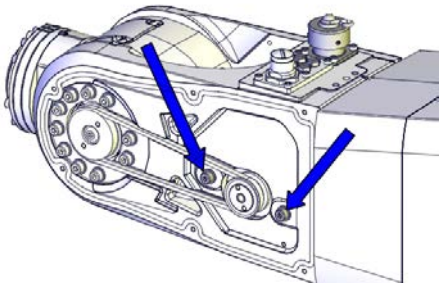
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463 **Note** Only use specified screws, never replace them with other screws.

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Securing the axis-5 motor and timing belt

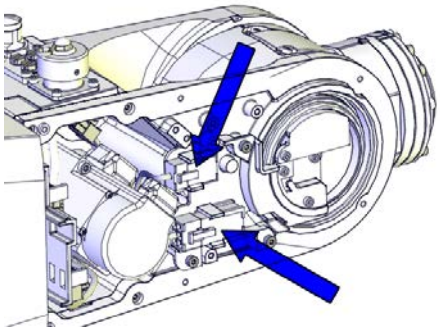
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

Connecting the axis-5 motor FPC connectors

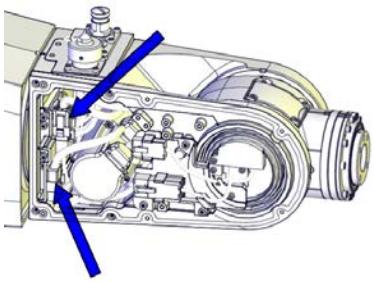
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

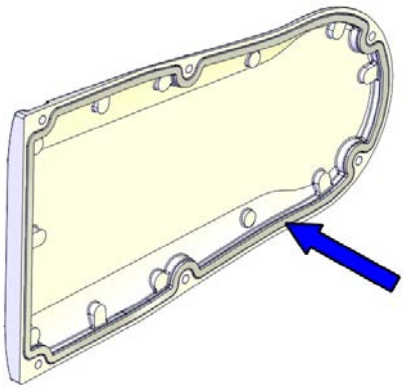
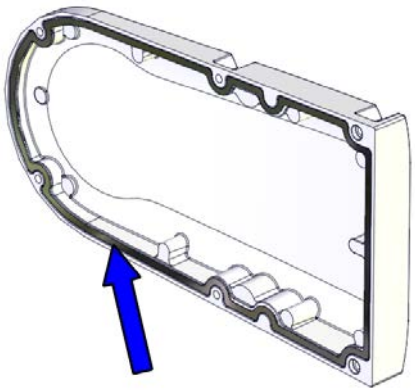
Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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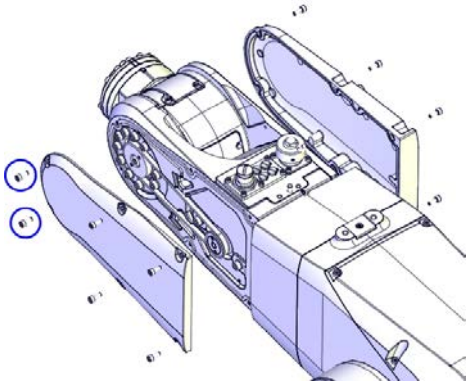
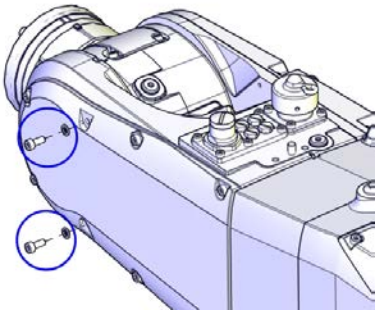
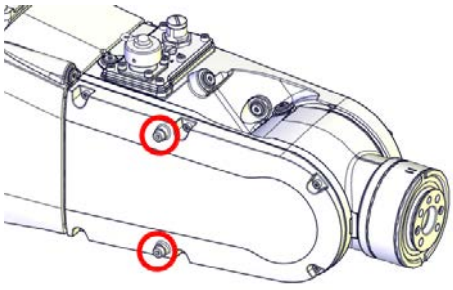
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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

Concluding procedure

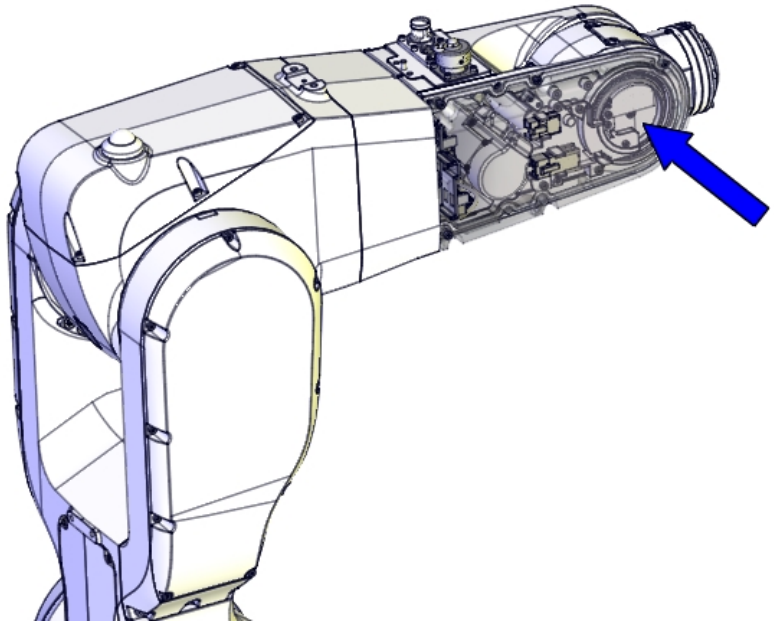
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.3.3 Replacing the axis-5 FPC unit

Location of axis-5 FPC unit

The axis-5 FPC unit is located as shown in the figure.



xx1300002397

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
FPC unit, axis 5	3HAC045743-001	
M2 variseal sealing	3HAC044641-009	Used with protection class IP67 and protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.

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4.3.3 Replacing the axis-5 FPC unit
Continued

Spare part	Article number	Note
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Tubular cable housing	3HAC059695-001	
Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication	3HAC056143-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Flange sealing	3HAC026759-003	Sikaflex 521FC For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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Deciding calibration routine

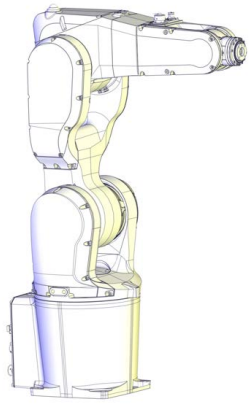
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the FPC unit

Use these procedures to remove the FPC unit.

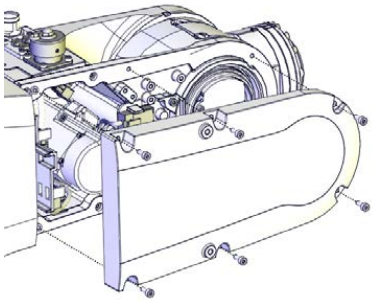
Preparations before removing the axis-5 FPC unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581

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4.3.3 Replacing the axis-5 FPC unit
Continued

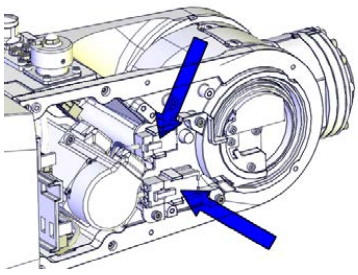
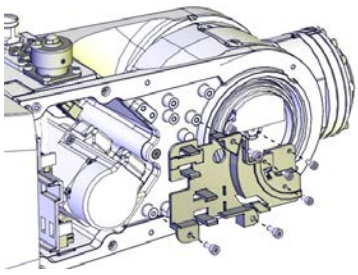
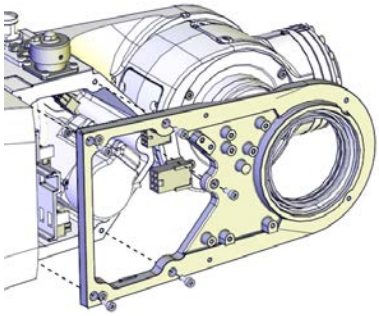
	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	Remove the tubular cable housing cover.	 xx1300002389

Removing the tubular cable housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
4	Remove the connector plate by first removing the screws.	 xx1300002391
5	Remove the cable housing of the tubular by first removing the screws. **Note** **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** The frame is glued and needs to be pried off.	 xx1300002392

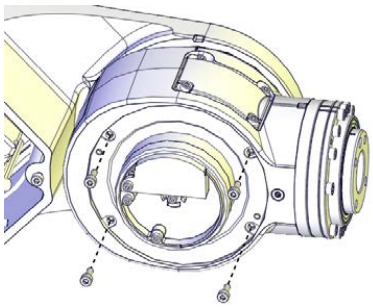
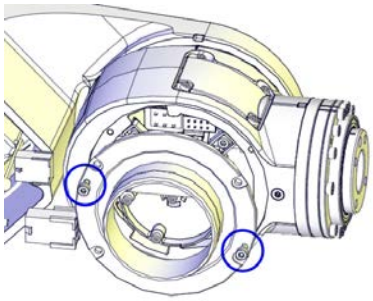
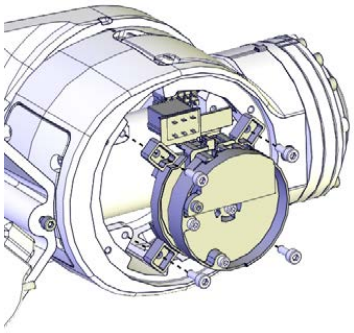
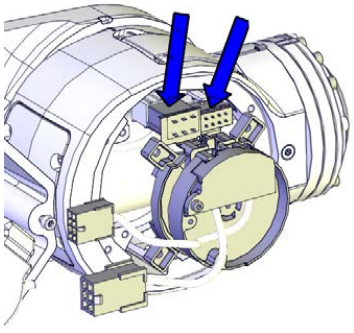
Removing the axis-5 FPC unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.3.3 Replacing the axis-5 FPC unit
Continued

	Action	Note
3	Remove the sleeve screws.	 xx1300002393
4	Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.	 xx1300002582
5	Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed.	 xx1300002394
6	Disconnect the axis-6 motor connectors and remove the FPC unit completely.	 xx1300002395

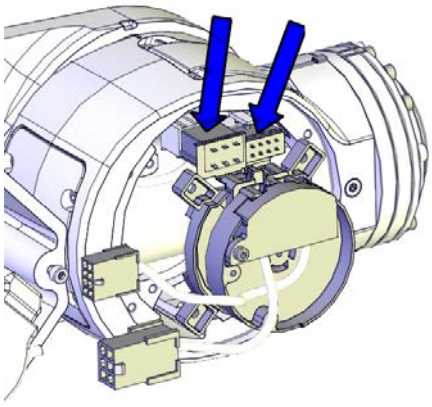
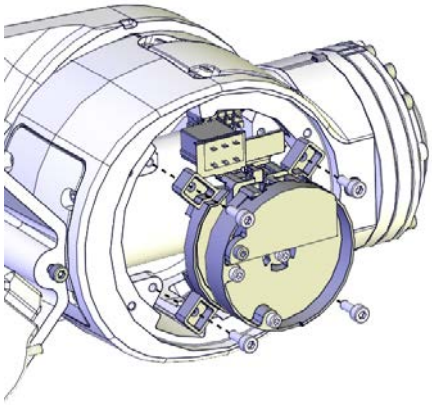
Refitting the FPC unit

Use these procedures to refit the FPC unit.

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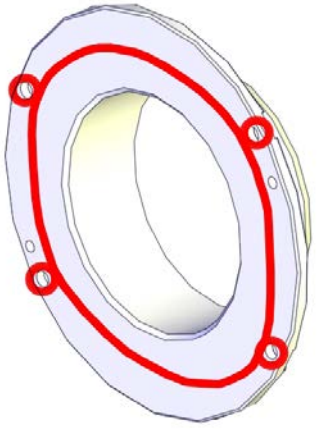
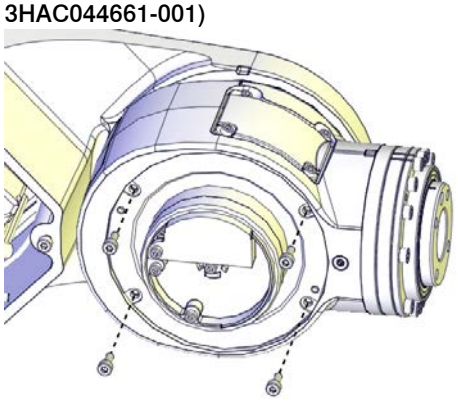
Refitting the axis-5 FPC unit

	Action	Note
1	**WARNING** It is important that axis 5 is in zero position when fitting the FPC unit. Make sure that the FPC is in zero position and does not get twisted during refitting.	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Reconnect the axis-6 motor connectors to the FPC unit.	 xx1300002395
4	Carefully refit the FPC unit and secure with screws. **Note** Check that the FPC unit is at the zero position when refitting it.	Tightening torque: 0.3 Nm.  xx1300002394

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4.3.3 Replacing the axis-5 FPC unit
Continued

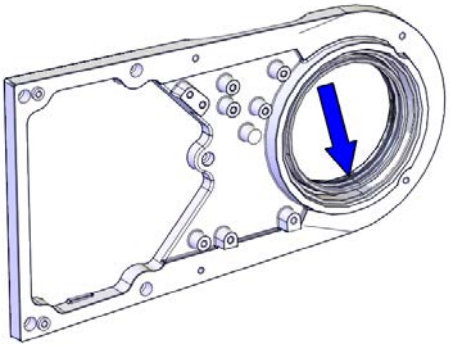
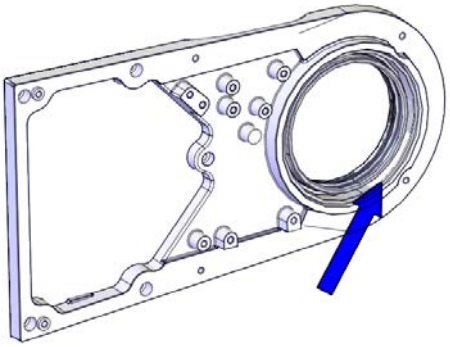
	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the sleeve. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealing, Loctite 574 **For robots with protection type Hygienic** Flange sealing, Trans Clear  xx1300002609
6	Refit the sleeve and secure with screws. Replace if damaged.	Sleeve: 3HAC081397-001 (for robots in IP40) / 3HAC044661-001 (for robots not in IP40) Tightening torque: 1.5 Nm (for Sleeve 3HAC081397-001) / 1.5 Nm (for Sleeve 3HAC044661-001)  xx1300002393

Checking the tubular cable housing sealings

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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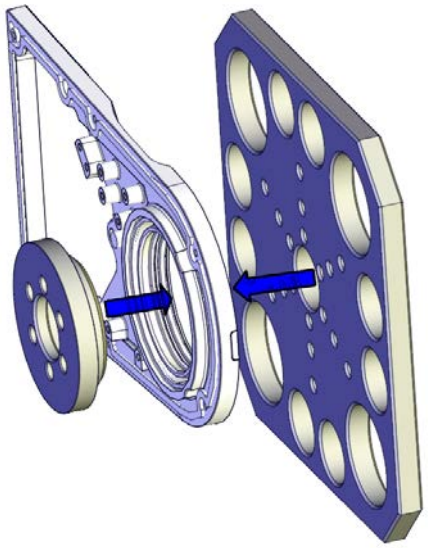
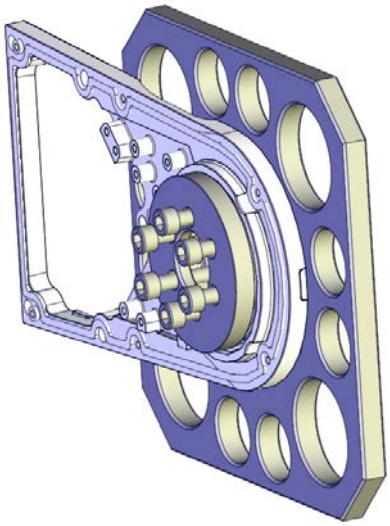
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-009  xx1300002396
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	Radial sealing: 3HAB3701-42  xx1300002608
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the tubular cable housing.	

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4.3.3 Replacing the axis-5 FPC unit

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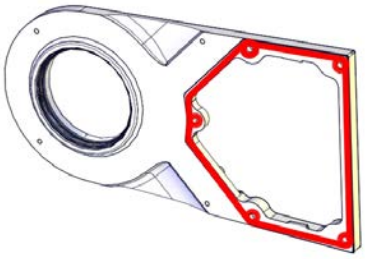
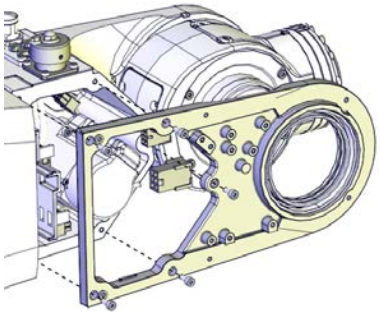
	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-5 sealing assembly tool set: 3HAC049701-001
7	Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.	 xx1400000485
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000486
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the tubular cable housing. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1300002610
3	Refit the tubular cable housing with the screws.	Tightening torque: 1.5 Nm. Tubular cable housing: 3HAC059695-001 Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication : 3HAC056143-001 Tubular cable housing, Hygienic: 3HAC079692-001  xx1300002392

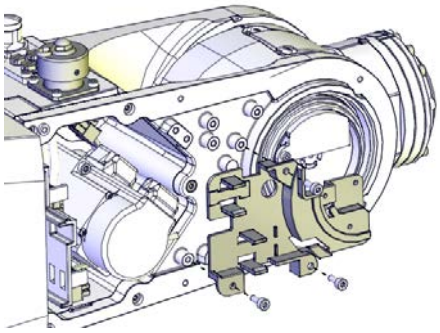
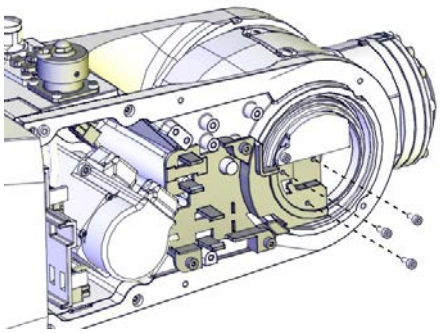
Refitting the connector plate

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

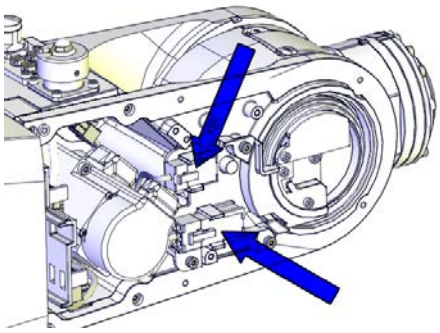
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4.3.3 Replacing the axis-5 FPC unit
Continued

	Action	Note
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

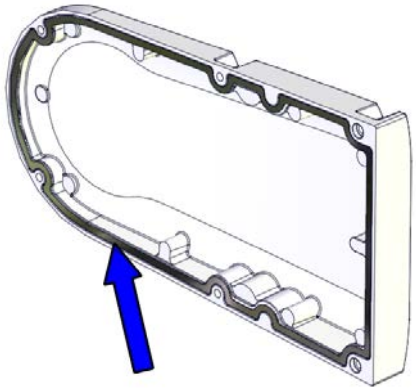
Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

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Refitting the tubular cable housing cover

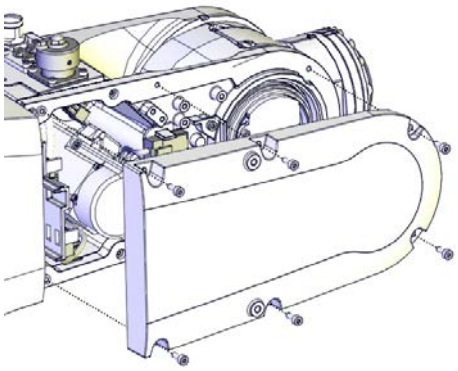
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001  xx1400000345
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.3.3 Replacing the axis-5 FPC unit

Continued

	Action	Note
4	Refit the cover to the cable housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002389 **Note** Only use specified screws, never replace them with other screws.

Concluding procedure

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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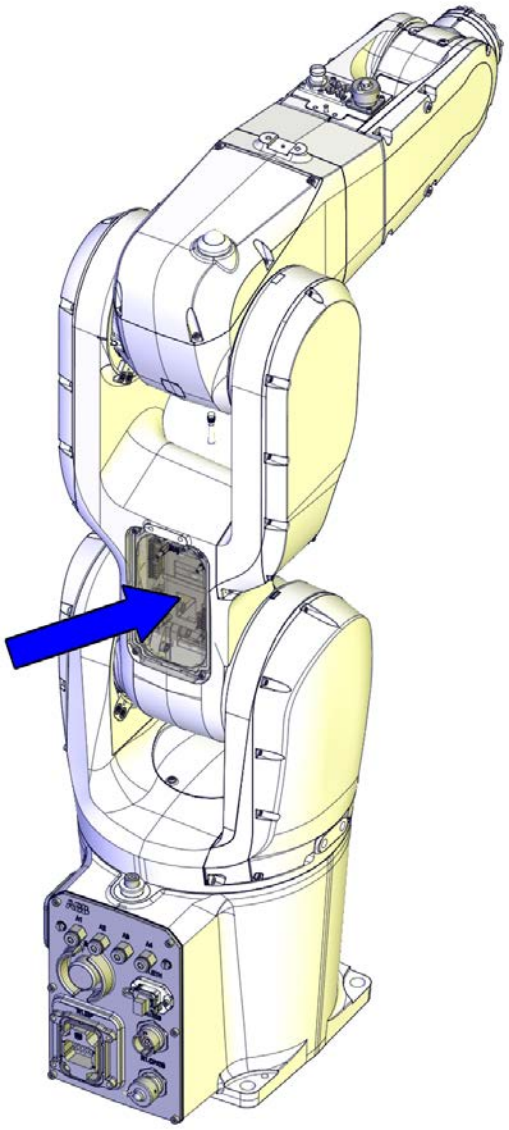
4.3.4 Replacing the EIB/SMB unit

Location of EIB/SMB unit

The EIB/SMB unit is located as shown in the figure.

Note

The EIB unit is used for IRB 1200 no type specified and IRB 1200 Type A.
The SMB unit is used for IRB 1200 Type B.



xx1300002574

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4.3.4 Replacing the EIB/SMB unit
Continued

Required spare parts

> **Note**
>
> The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
EIB unit	3HAC045759-001	
SMB unit	3HAC059122-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*.
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Required consumables

Equipment	Article number	Note
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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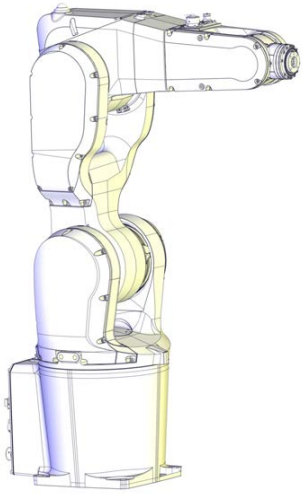
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the EIB/SMB unit

Use these procedures to remove the EIB/SMB unit.

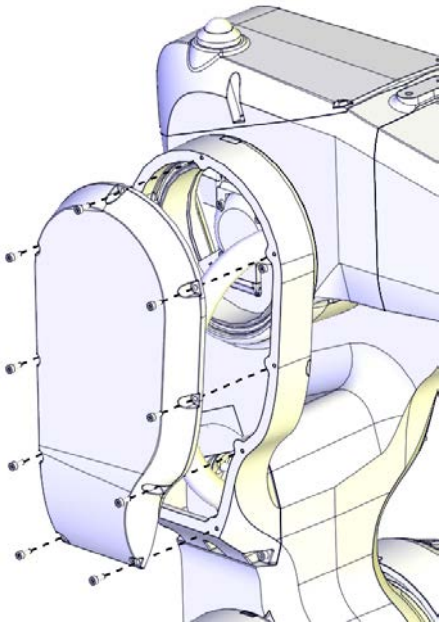
Preparations before removing the EIB/SMB unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4.3.4 Replacing the EIB/SMB unit
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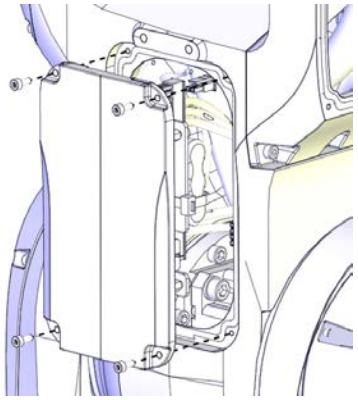
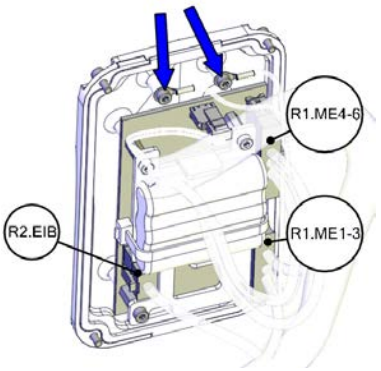
	Action	Note
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	Remove the lower arm cable housing cover.	 xx1300002400

Disconnecting the cabling in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	

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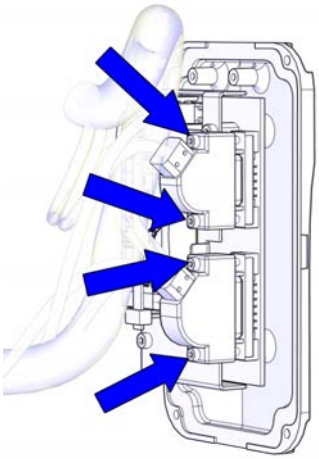
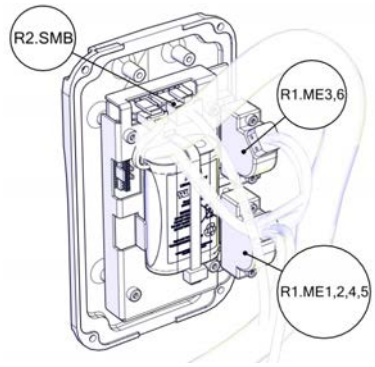
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	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 xx1300002428
6	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the lugs on the EIB/SMB cover.	

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4.3.4 Replacing the EIB/SMB unit
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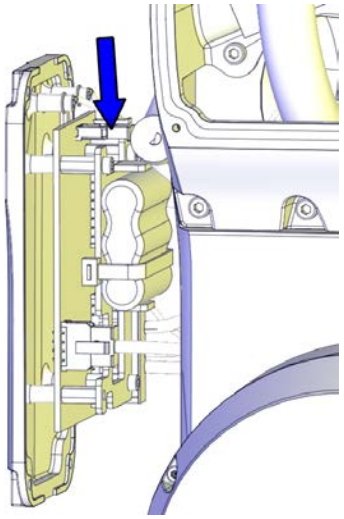
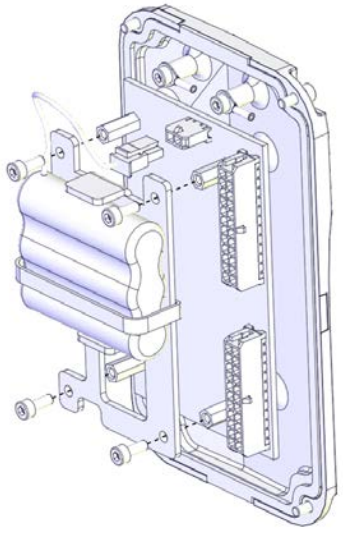
	Action	Note
7	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004
8	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB Remove the EIB/SMB cover completely from the lower arm.	 xx1700000005

Removing the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	

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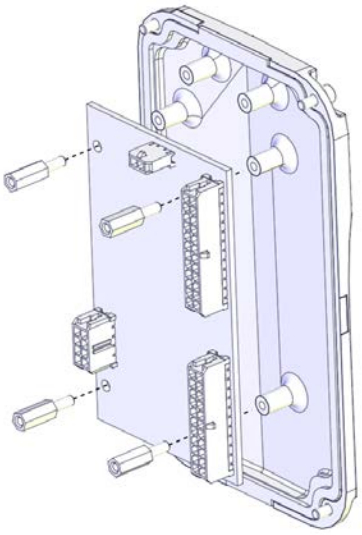
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	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Disconnect the battery cable.	 xx1300002571
5	Remove the battery pack plate by removing the screws.	 xx1300002572

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4.3.4 Replacing the EIB/SMB unit
Continued

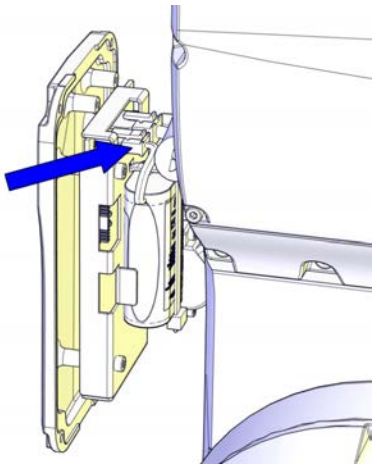
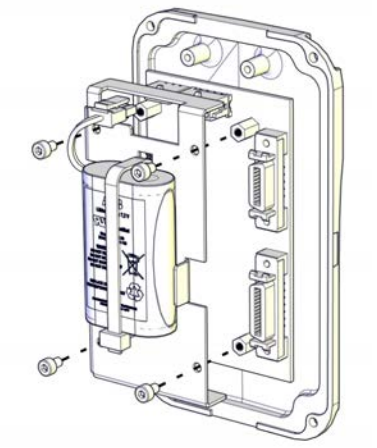
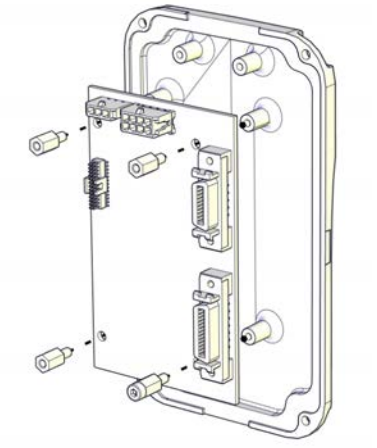
	Action	Note
6	Remove the EIB unit by removing the distance screws.	 xx1300002573

Removing the SMB unit (IRB 1200 Type B)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
4	Disconnect the battery cable.	 xx1700000006
5	Remove the battery pack plate by removing the screws.	 xx1700000008
6	Remove the SMB unit by removing the distance screws.	 xx1700000009

Refitting the EIB/SMB unit

Use these procedures to refit the EIB/SMB unit.

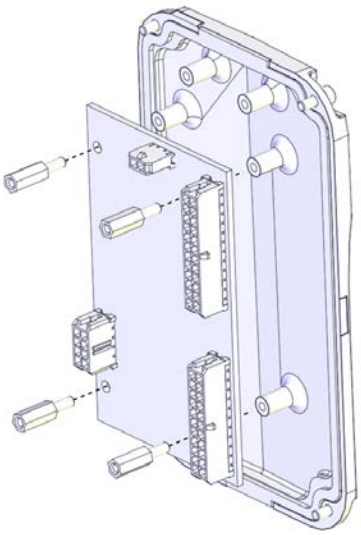
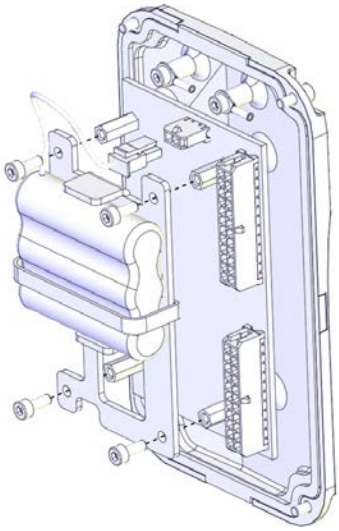
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4.3.4 Replacing the EIB/SMB unit

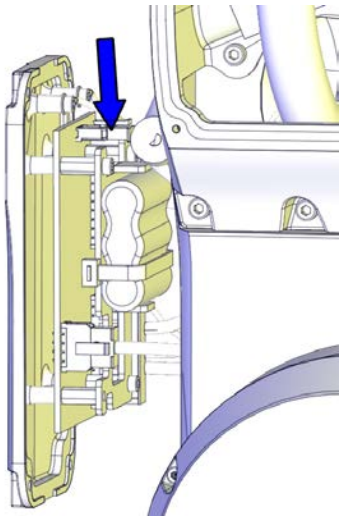
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Refitting the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

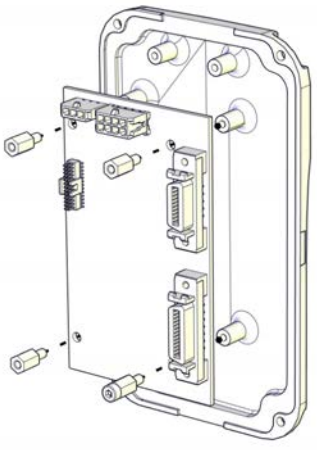
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Refit the EIB unit with the distance screws.	 xx1300002573
4	Refit the battery pack plate with the screws.	Tightening torque: 1 Nm.  xx1300002572

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	Action	Note
5	Reconnect the battery cable.	 xx1300002571

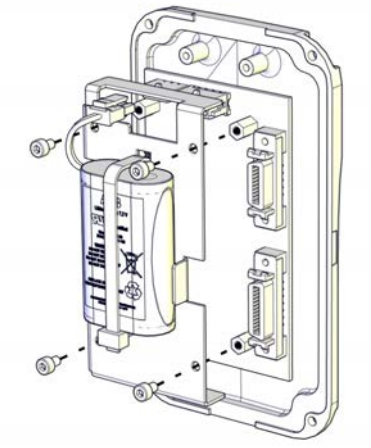
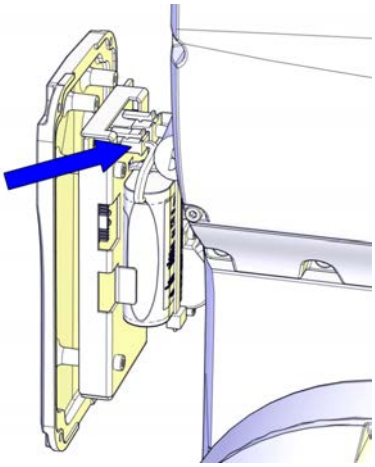
Refitting the SMB unit (IRB 1200 Type B)

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Refit the SMB unit with the distance screws.	 xx1700000009

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4.3.4 Replacing the EIB/SMB unit
Continued

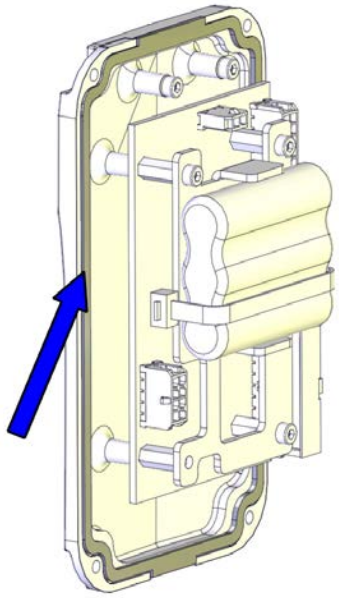
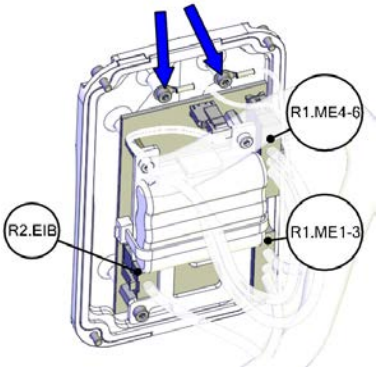
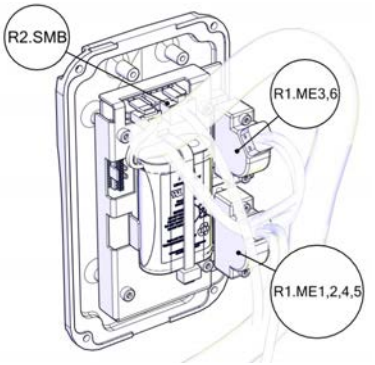
	Action	Note
4	Refit the battery pack plate with the screws.	Tightening torque: 1 Nm.  xx1700000008
5	Reconnect the battery cable.	 xx1700000006

Connecting the cabling in the lower arm

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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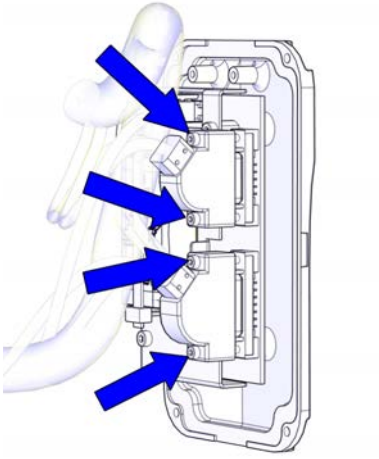
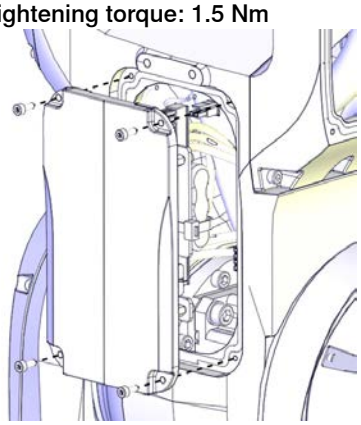
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	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the EIB/SMB cover gasket. Replace if damaged.	Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)  xx1400000475
4	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1300002428
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the lugs to the EIB/SMB cover.	
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005

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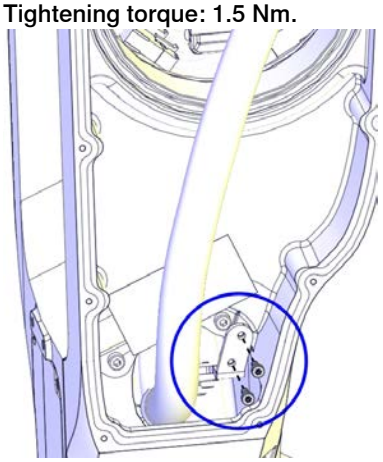
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4.3.4 Replacing the EIB/SMB unit
Continued

	Action	Note
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

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	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	Tightening torque: 1.5 Nm.  xx1300002426

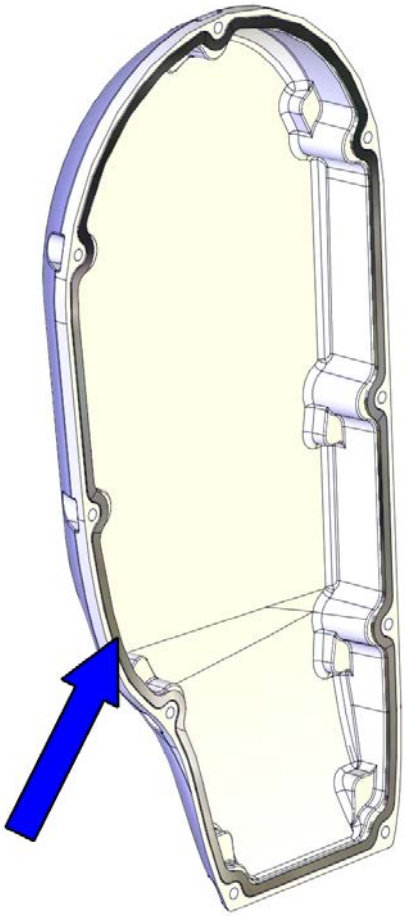
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4.3.4 Replacing the EIB/SMB unit

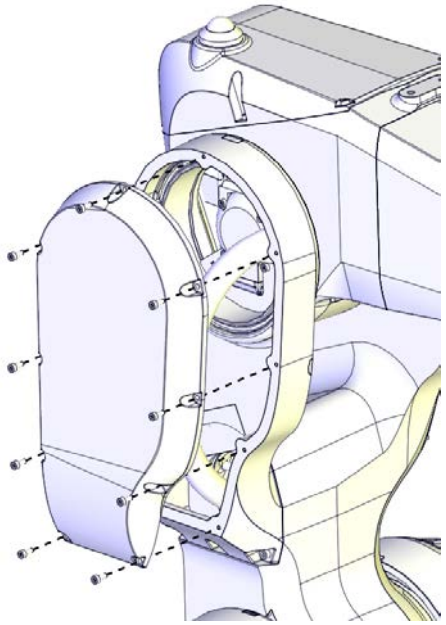
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Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)  xx1400000048
2	Check the PTFE film on the cable housing cover. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
3	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002400 **Note** Only use specified screws, never replace them with other screws.
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
7	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
8	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

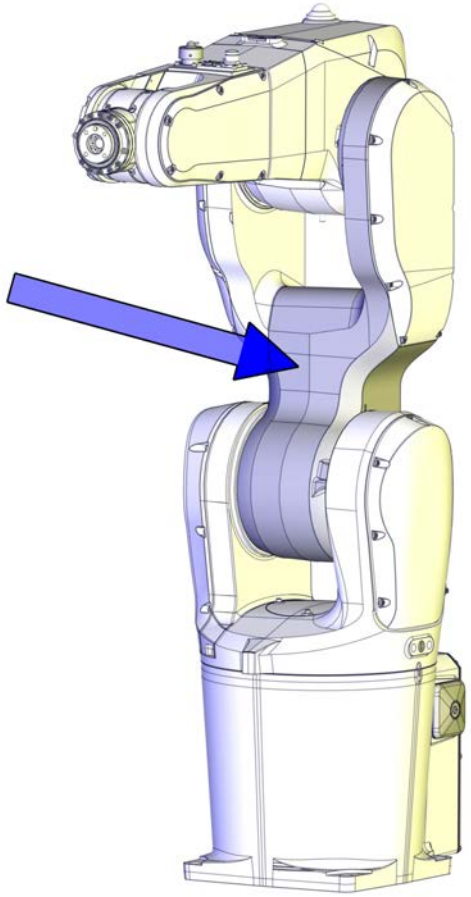
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4.4 Upper and lower arms

4.4.1 Replacing the lower arm

Location of the lower arm

The lower arm is located as shown in the figure.



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Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Lower arm (IRB 1200-7/0.7)	3HAC059687-001	Includes guide pin.

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Spare part	Article number	Note
Lower arm, Clean Room (IRB 1200-7/0.7) Lower arm, food grade lubrication (IRB 1200-7/0.7) Lower arm, Hygienic (IRB 1200-7/0.7)	3HAC059704-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Includes guide pin.
Lower arm (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC059688-001	Includes guide pin.
Lower arm, Clean Room (IRB 1200-5/0.9 and IRB 1200-7/0.9) Lower arm, food grade lubrication (IRB 1200-5/0.9) Lower arm, Hygienic (IRB 1200-5/0.9)	3HAC059705-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Includes guide pin.
M2 variseal sealing	3HAC044641-005	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable housing of the lower arm	3HAC059690-001	Replace if damaged.
Cable housing of the lower arm, Clean Room Cable housing of the lower arm, food grade lubrication Cable housing of the lower arm, Hygienic	3HAC056135-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC086036-001	Used with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Not used with protection class IP40. Replace if damaged.
Gasket of axis-2 sealing ring	3HAC045688-001 / 3HAC080697-001	Not used with protection class IP40. Replace if damaged.
Gasket of plastic plate	3HAC044894-001 / 3HAC080695-001	Not used with protection class IP40. Replace if damaged.

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4.4.1 Replacing the lower arm

Continued

Spare part	Article number	Note
Lower arm cover	3HAC059689-001	Replace if damaged.
Lower arm cover, Clean Room Lower arm cover, food grade lubrication Lower arm cover, Hygienic	3HAC056136-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on lower arm cover	3HAC056725-001 / 3HAC080703-001	Not used with protection class IP40. Replace if damaged.
Cable housing of the swing	3HAC059677-001	Replace if damaged.
Cable housing of the swing, Clean Room Cable housing of the swing, food grade lubrication Cable housing of the swing, Hygienic	3HAC056213-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
O-ring	3HAC048939-001	Replace if damaged.
Swing cover	3HAC059676-001	Replace if damaged.

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Spare part	Article number	Note
Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic	3HAC056215-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.

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4.4.1 Replacing the lower arm

Continued

Spare part	Article number	Note
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!
Guide pin for upper arm	3HAC049705-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i

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Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.

If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Flange sealing	12340011-116	Loctite 574
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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4.4.1 Replacing the lower arm

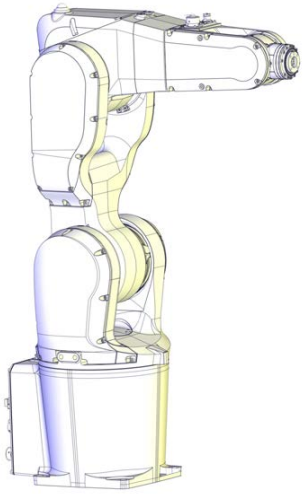
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the lower arm

Use this procedure to remove the lower arm.

Preparations before removing the lower arm

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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	Action	Note
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

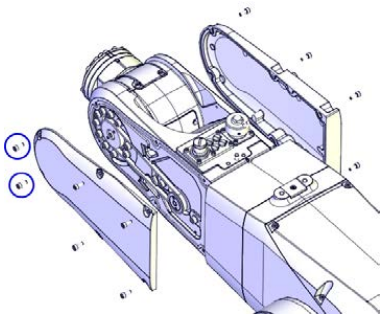
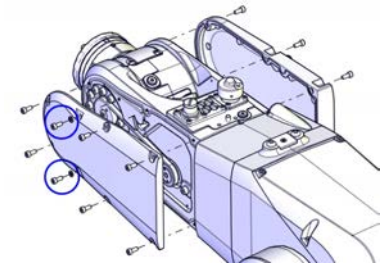
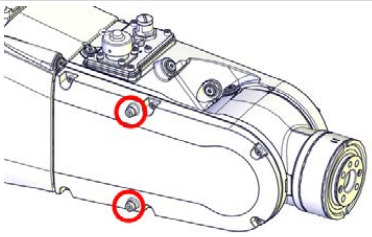
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.1 Replacing the lower arm

Continued

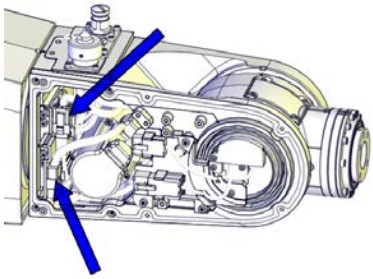
	Action	Note
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Disconnecting the axis-5 FPC connectors

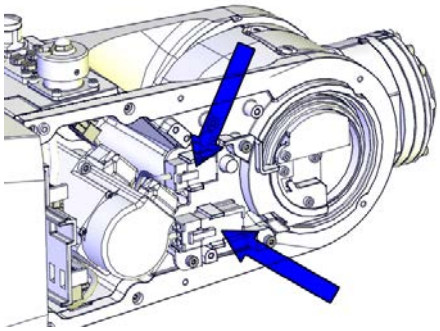
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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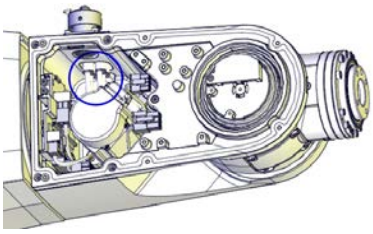
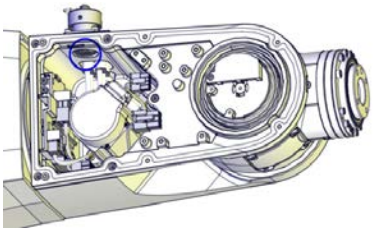
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4.4.1 Replacing the lower arm

Continued

	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

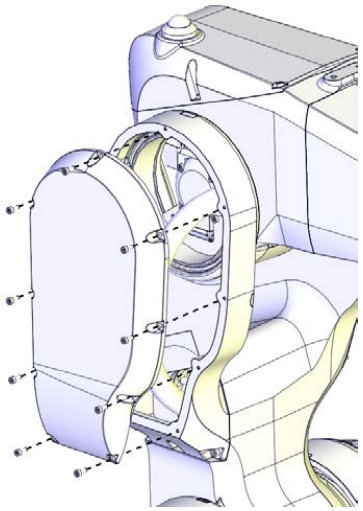
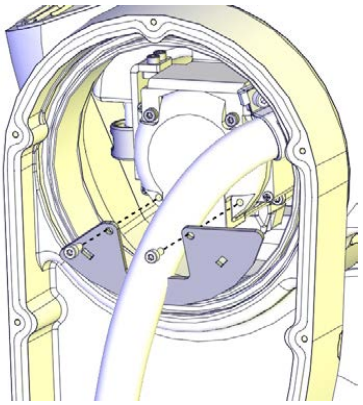
Disconnecting the air hoses and CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the air hoses.	 xx1400000738
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

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Disconnecting the axis-4 FPC connectors

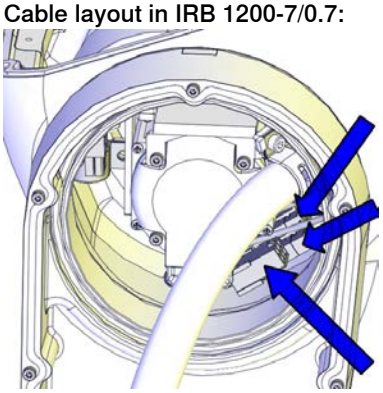
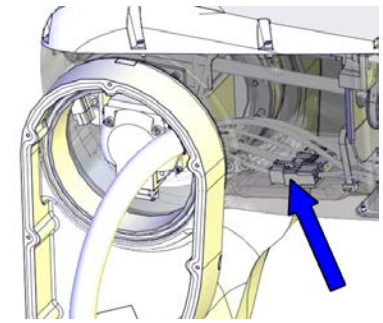
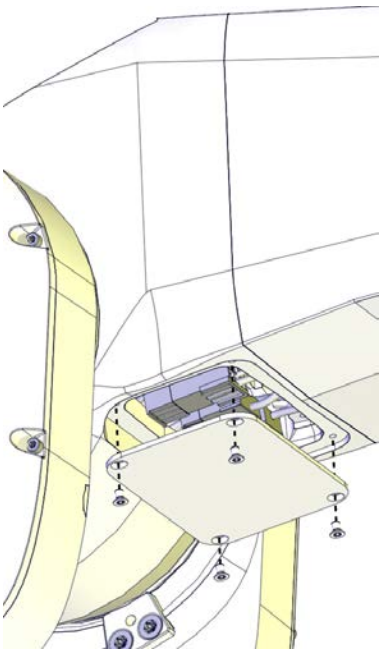
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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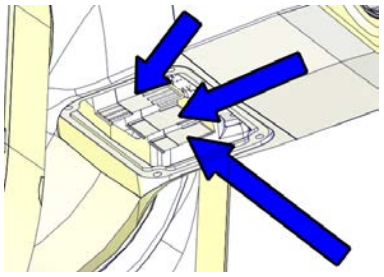
4.4.1 Replacing the lower arm

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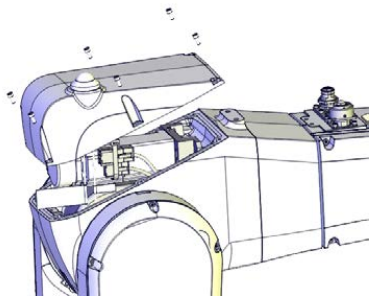
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
6	Remove the small cover of the housing.	 xx1300002398

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	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

Disconnecting the axis-4 motor connectors

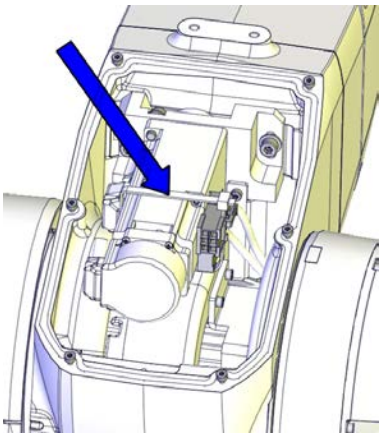
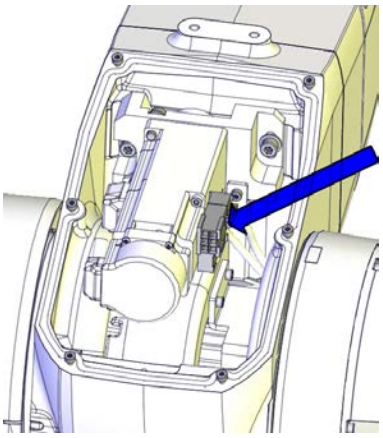
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456

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4.4.1 Replacing the lower arm

Continued

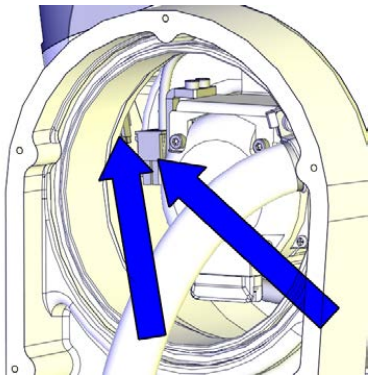
	Action	Note
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Disconnecting the axis-3 motor connectors

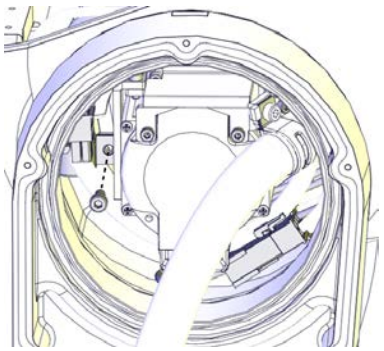
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Removing the cable package in the housing

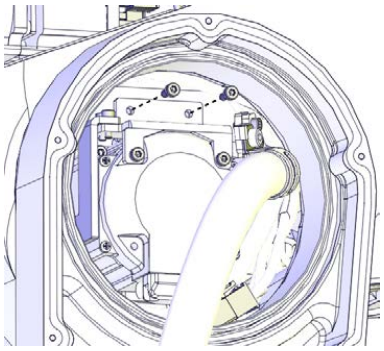
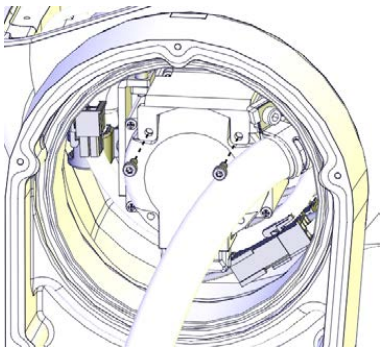
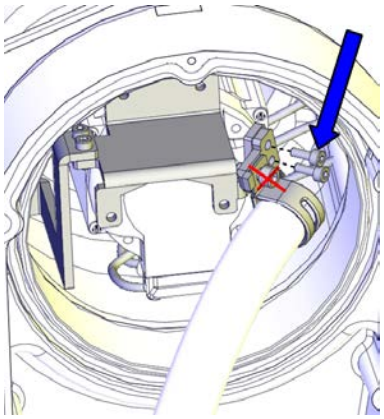
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the screw that fastens the air hose holder.	 xx1300002422

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4.4.1 Replacing the lower arm

Continued

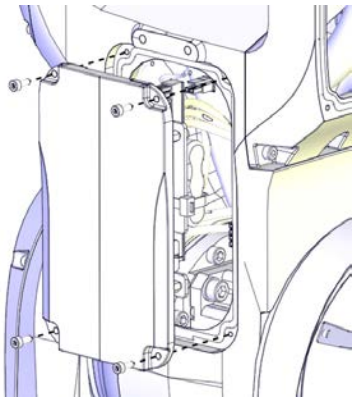
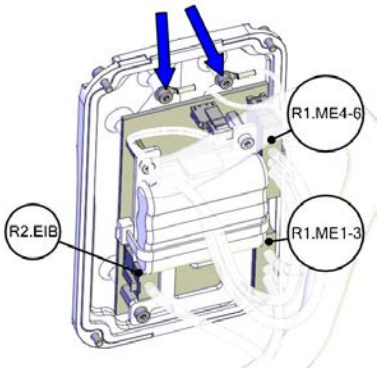
	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
5	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
6	Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002424
7	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Cut the cable straps at the bottom of the housing.	

Disconnecting the cabling in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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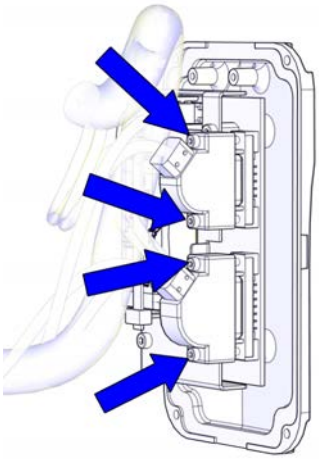
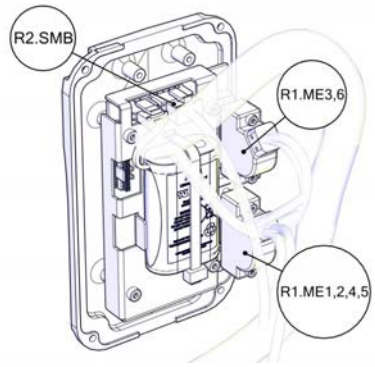
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	Action	Note
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 xx1300002428
6	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the lugs on the EIB/SMB cover.	

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4.4.1 Replacing the lower arm
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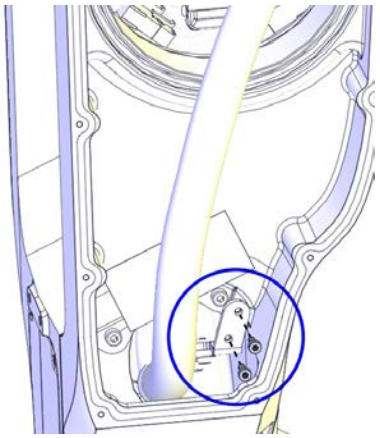
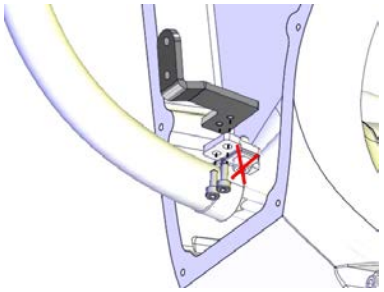
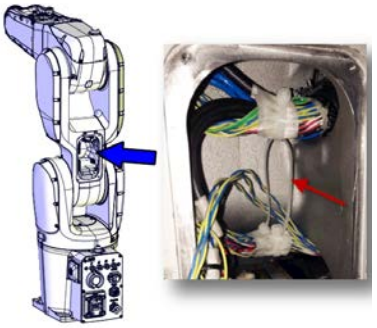
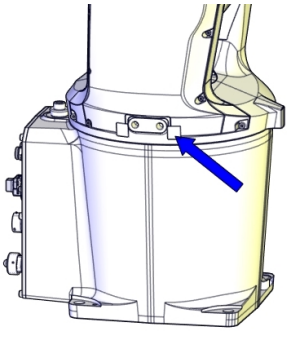
	Action	Note
7	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004
8	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB Remove the EIB/SMB cover completely from the lower arm.	 xx1700000005

Removing the cable package in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull the cable package out from the upper arm housing.	

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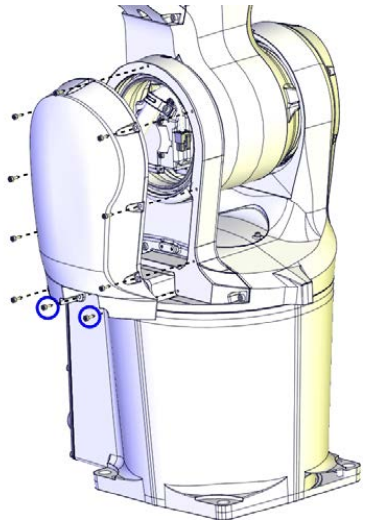
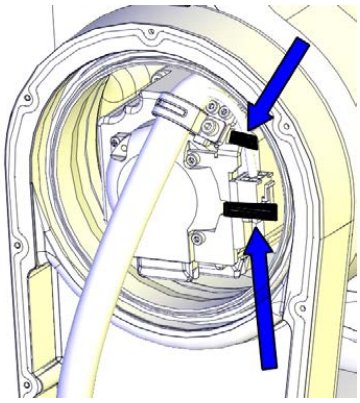
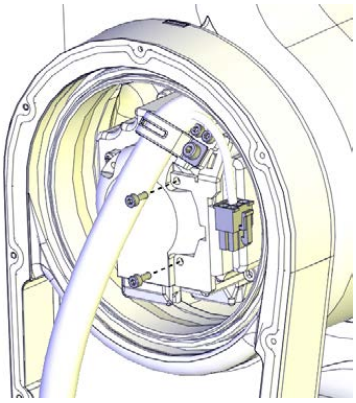
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 xx1300002426
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002430
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 xx1400001130
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the swing sealing plug. Follow the procedure specified in *Removing the swing sealing plug on page 182*.	 xx1600000205

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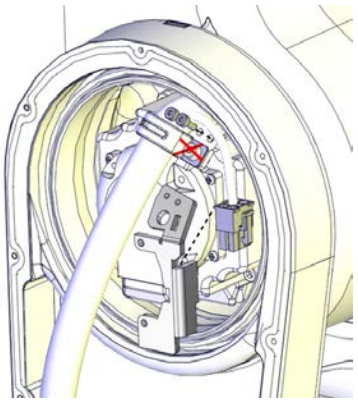
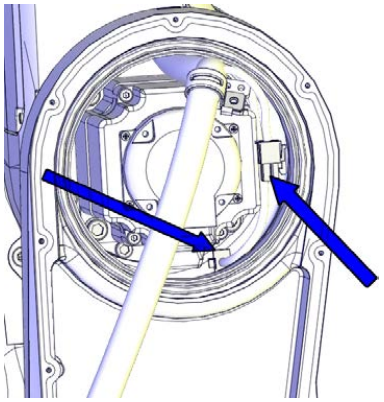
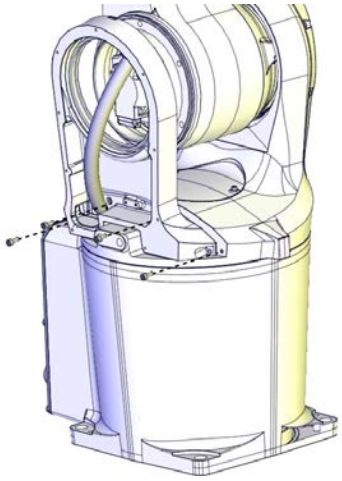
4.4.1 Replacing the lower arm

Continued

	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 xx1300002431
9	Cut the cable straps.	 xx1400001528
10	Remove the axis-2 motor bracket screws.	 xx1300002432

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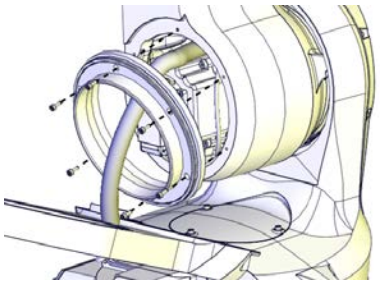
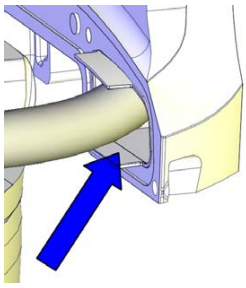
	Action	Note
11	Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002433
12	Disconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
13	Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.	 xx1300002435

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4.4.1 Replacing the lower arm

Continued

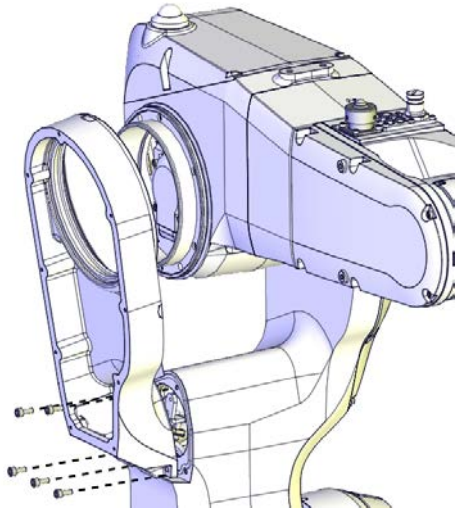
	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx1400000020
15	Pull out the cable package from the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx1400000023

Removing the lower arm cable housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Remove the cable housing of the lower arm by removing the screws.	 xx1300002529

Removing the upper arm

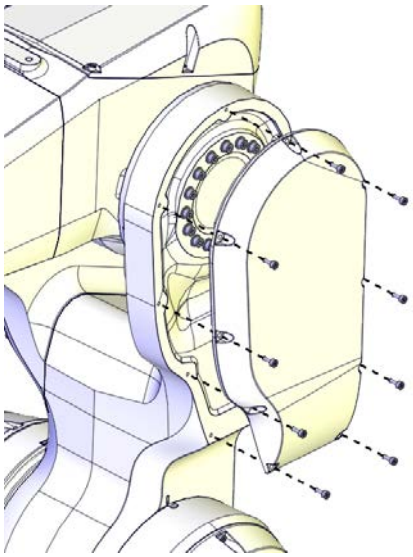
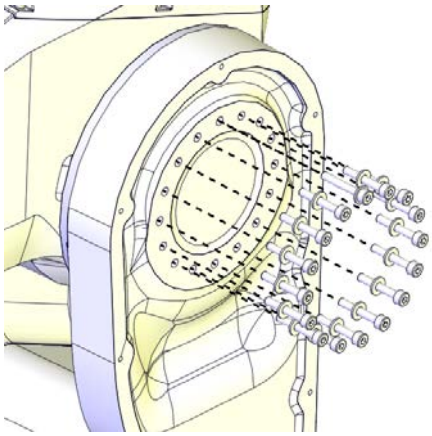
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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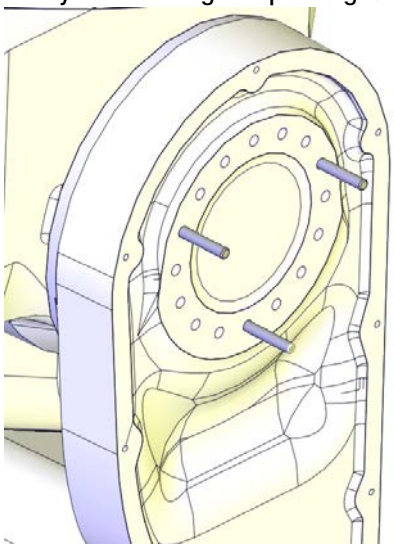
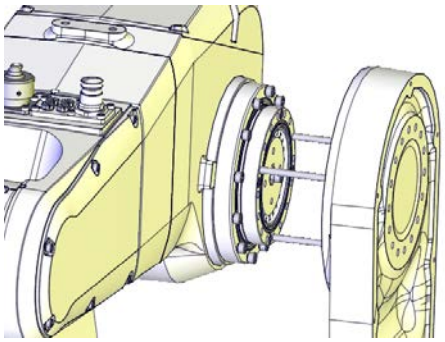
4.4.1 Replacing the lower arm

Continued

	Action	Note
3	Remove the lower arm cover.	 xx1300002528
4	**CAUTION** The upper arm weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit lifting slings to the upper arm to support the weight of the arm. (no force)	
6	Remove the upper arm screws. **WARNING** This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.	 xx1300002531

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	Action	Note
7	Fit guide pins to the upper arm.	Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!  xx1400000771
8	Separate the upper and lower arm with guidance from the guide pins.	 xx1300002533

Removing the lower arm

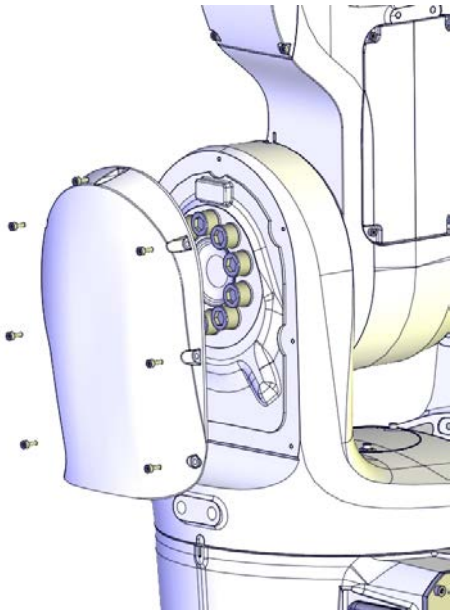
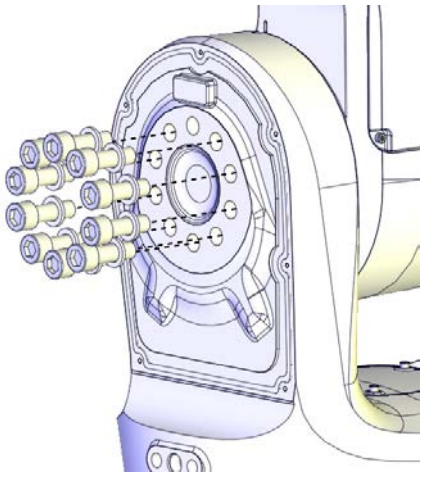
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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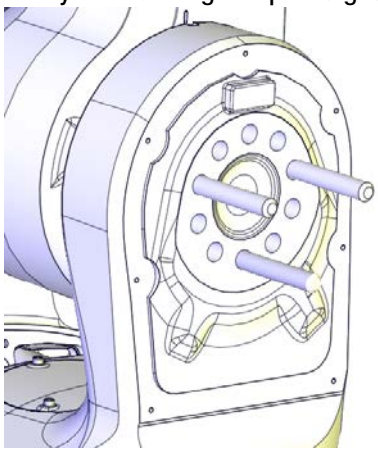
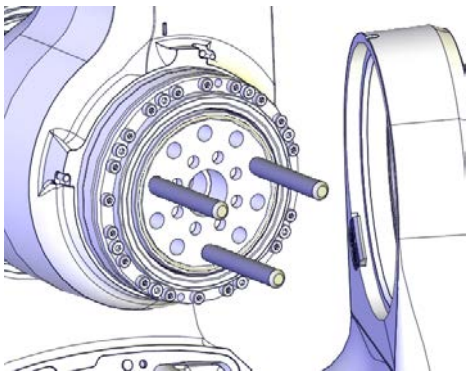
4.4.1 Replacing the lower arm

Continued

	Action	Note
3	Remove the swing cover.	 xx1300002551
4	Remove the lower arm screws and washers. **WARNING** This releases the lower arm from the swing. Make sure the weight of the arm is properly secured. The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.	 xx1300002552

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	Action	Note
5	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001 Always use three guide pins together!  xx1300002563
6	Separate the lower arm from the swing. **Tip** If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.	 xx1300002553

Removing the axis-2 drive unit

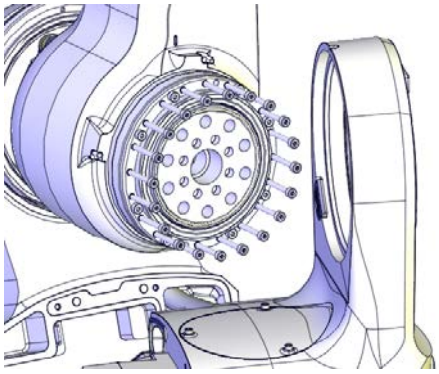
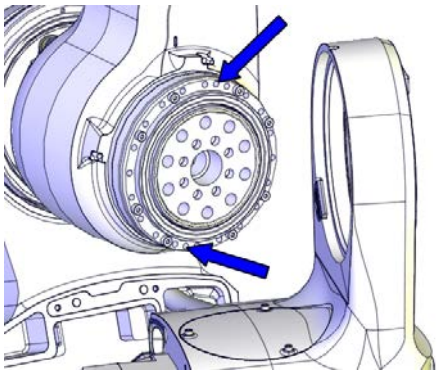
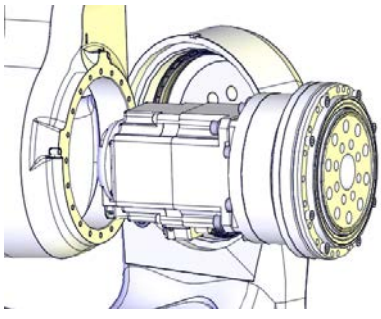
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.1 Replacing the lower arm

Continued

	Action	Note
3	**CAUTION** The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
4	If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm. If the site is cramp, the procedure can be performed having the lower arm hanging in the lifting slings. If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together: • Person 1: Hold the lower arm still. • Person 2: Remove the drive unit screws according to step below.	 xx1300002554
5	Remove the grey screws from the drive unit. **WARNING** Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.	
6	Insert two M4 screws to the press out holes and press out the drive unit.	 xx1400000008
7	Carefully pull out the complete drive unit.	 xx1300002555

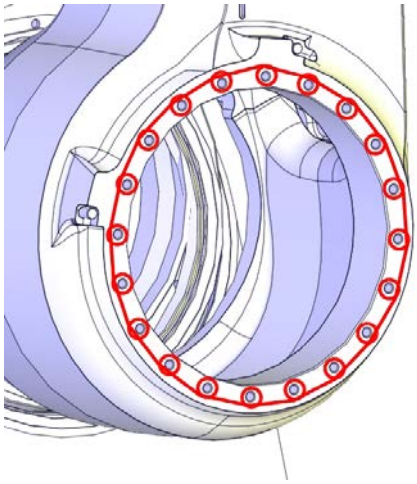
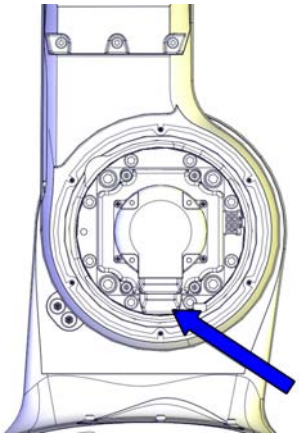
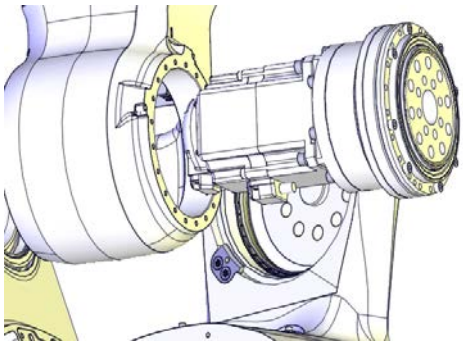
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Refitting the lower arm

Use these procedures to refit the lower arm.

Refitting the axis-2 drive unit

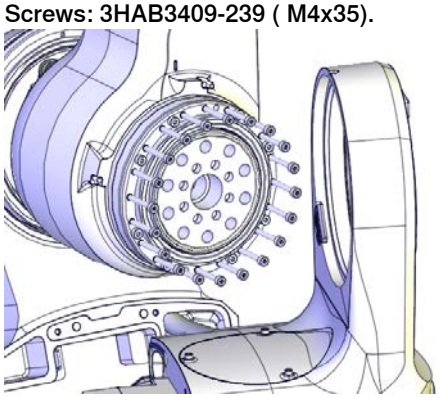
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.	 xx1400000006
3	Carefully insert the complete drive unit. **Note** Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.  xx1400000795 The figure shows the position of the motor connector block when axis 2 is in position 0°.	 xx1300002580

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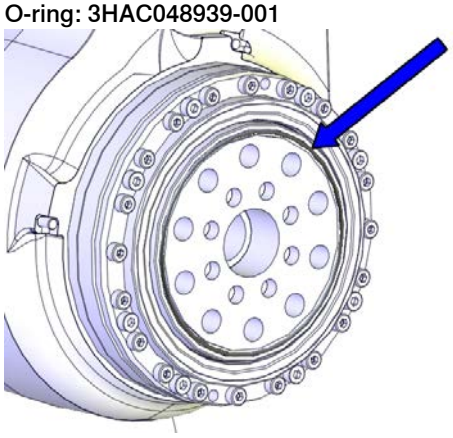
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4.4.1 Replacing the lower arm

Continued

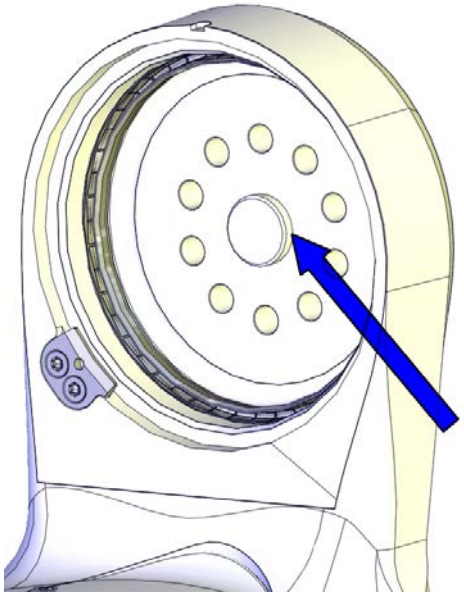
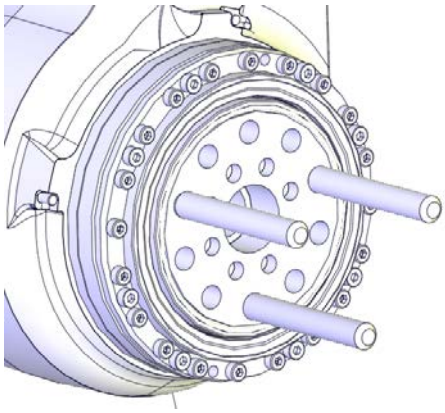
	Action	Note
4	If the gear is refitted in a hanging lower arm, this step requires two persons. • Person 1: Hold the lower arm still. • Person 2: Refit the drive unit screws. Secure the screws but do not tighten yet.	Screws: 3HAB3409-239 (M4x35).  xx1300002554 **Note** Only use specified screws, never replace them with other screws.
5	If the drive unit is refitted in a hanging lower arm, this step requires two persons. • Person 1: Hold the lower arm still. • Person 2: Tighten the screws.	Tightening torque: 5 Nm

Refitting the lower arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the o-ring. Replace if damaged.	O-ring: 3HAC048939-001  xx1300002556

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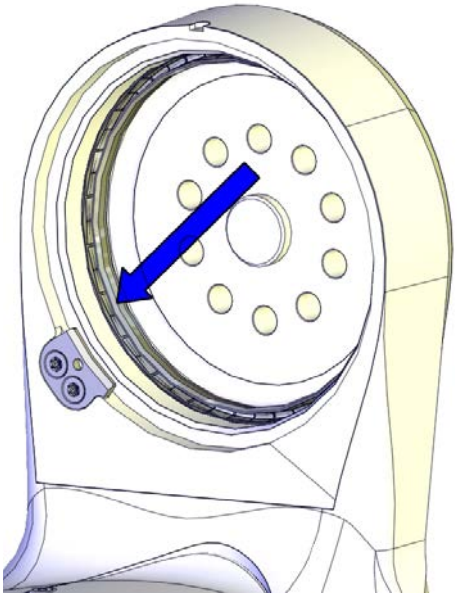
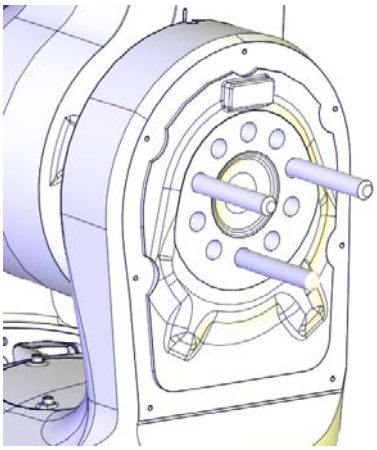
	Action	Note
3	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Wipe clean the overflowing Loctite 574 if there is any.	 xx1400001403
4	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001  xx1300002562 Always use three guide pins together!

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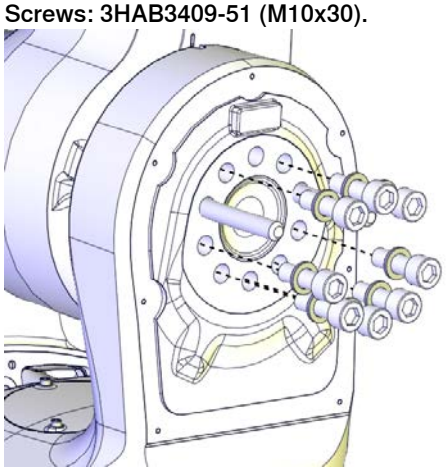
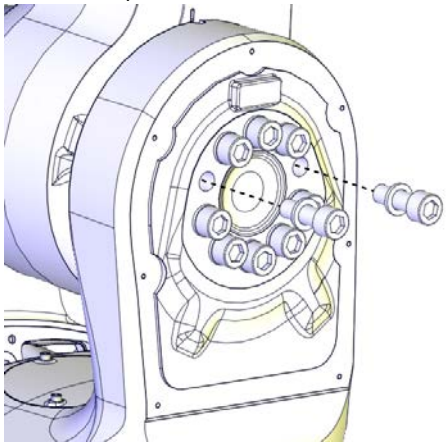
4.4.1 Replacing the lower arm

Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-003  xx1400000453
6	Fit the lower arm to the swing, with guidance from the guide pins.	 xx1300002563

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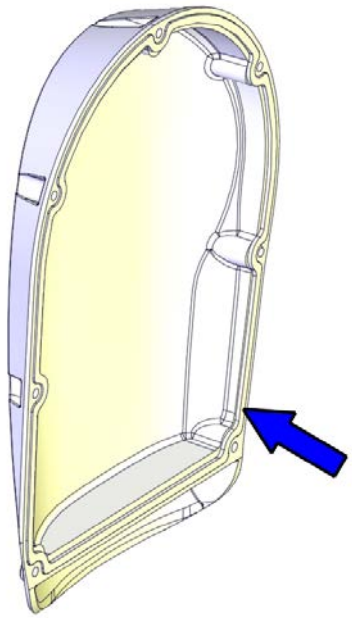
	Action	Note
7	Refit the lower arm screws and washers, using locking liquid. Secure the screws but do not tighten yet.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: 3HAB3409-51 (M10x30).  xx1300002564 **Note** Only use specified screws, never replace them with other screws.
8	Remove the guide pins and refit the remaining screws and washers using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)  xx1300002565
9	Tighten all screws.	Tightening torque: 45 Nm

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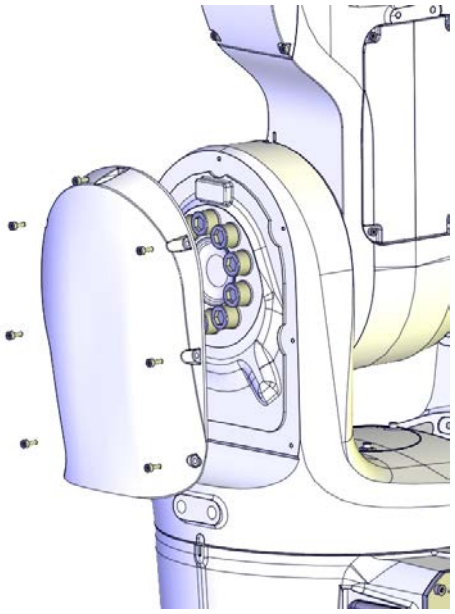
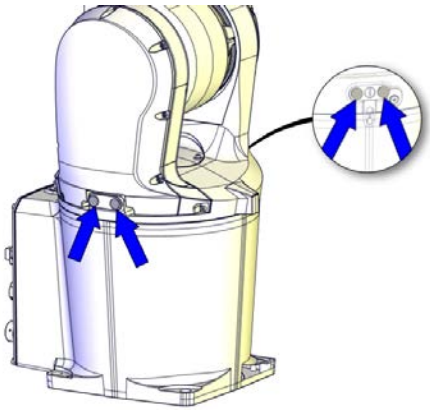
4.4.1 Replacing the lower arm

Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the swing cover gasket. Replace if damaged.	Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)  xx1400000007
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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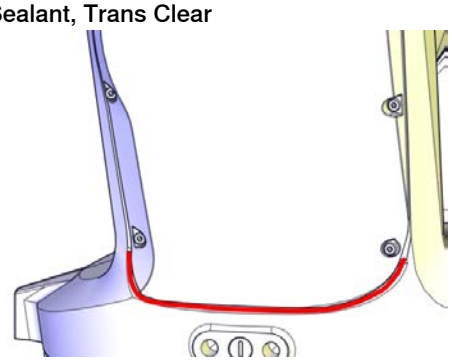
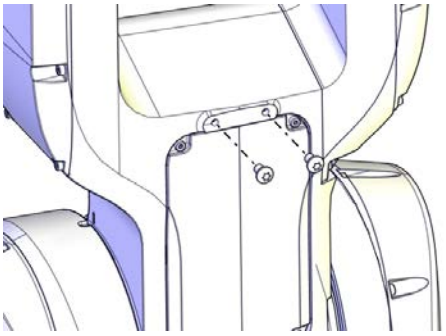
	Action	Note
12	Refit the swing cover. Replace if damaged.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001  xx1300002551
13	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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4.4.1 Replacing the lower arm

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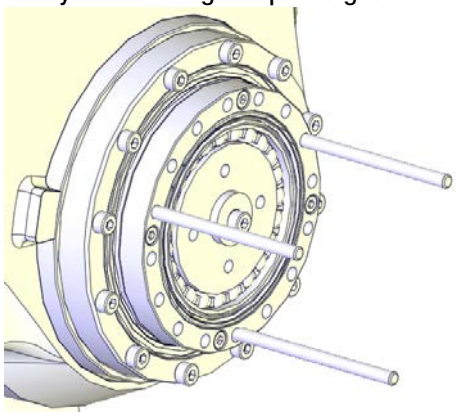
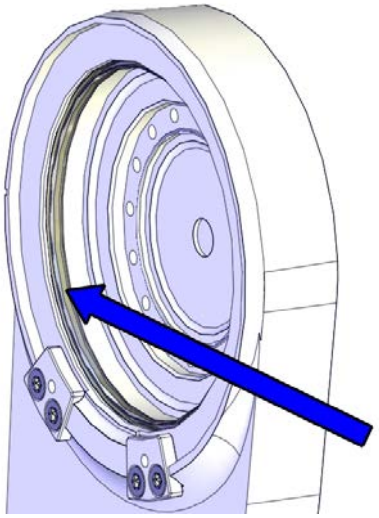
	Action	Note
14	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000217
15	**For robots with protection type Foundry Plus** If required, fit two screws for protection.	 xx1600001154

Refitting the upper arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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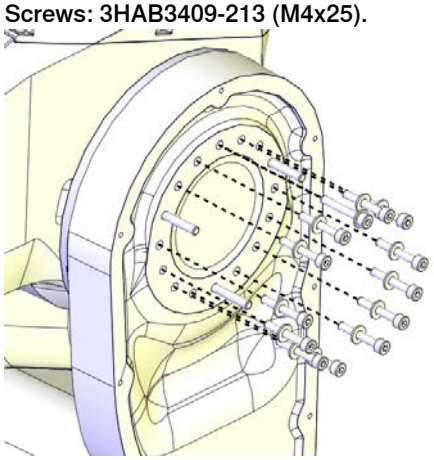
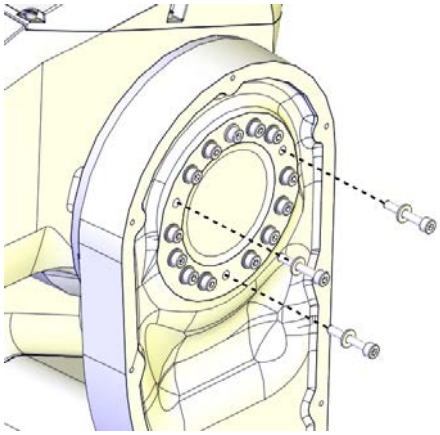
	Action	Note
2	Fit guide pins to the axis-3 gear unit.	Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!  xx1400000027
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-005  xx1400000474

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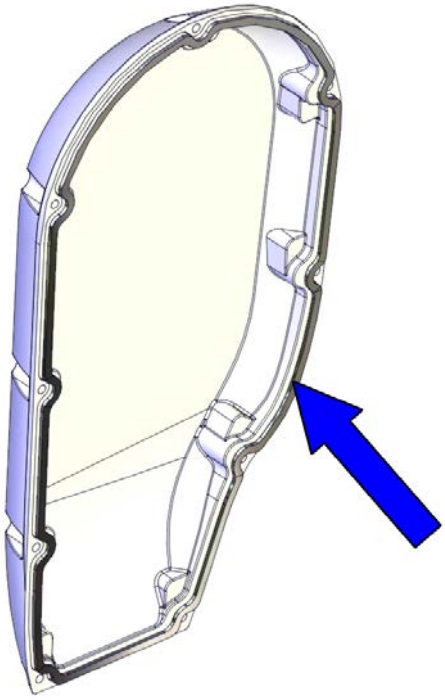
4.4.1 Replacing the lower arm

Continued

	Action	Note
4	Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet.	Screws: 3HAB3409-213 (M4x25).  xx1400000028 **Note** Only use specified screws, never replace them with other screws.
5	Remove the guide pins and refit the remaining screws and washers.	 xx1400000029
6	Tighten all screws.	Tightening torque: 4.5 Nm.

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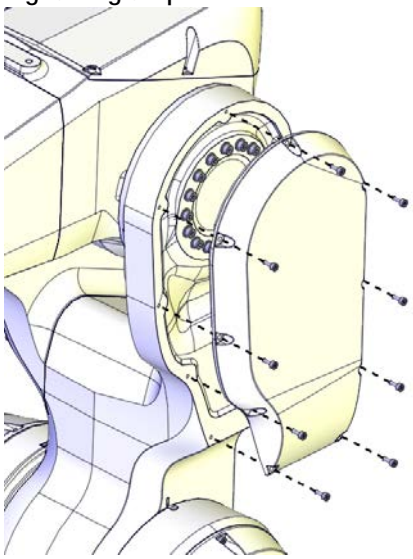
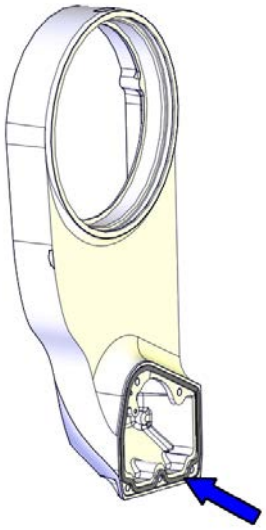
	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the lower arm cover gasket. Replace if damaged.	Gasket on lower arm cover: 3HAC056725-001 (not Hygienic robots) / 3HAC080703-001 (Hygienic robots)  xx1400000047
8	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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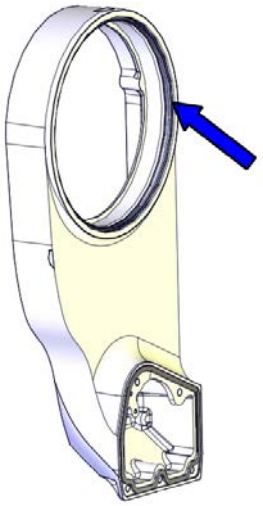
4.4.1 Replacing the lower arm

Continued

	Action	Note
9	Refit the lower arm cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002528 **Note** Only use specified screws, never replace them with other screws.
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the cable housing gasket. Replace if damaged.	Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)  xx1400000414

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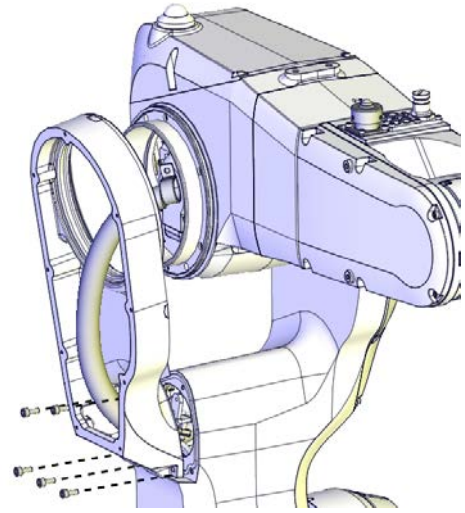
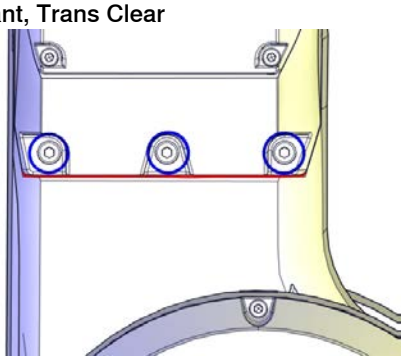
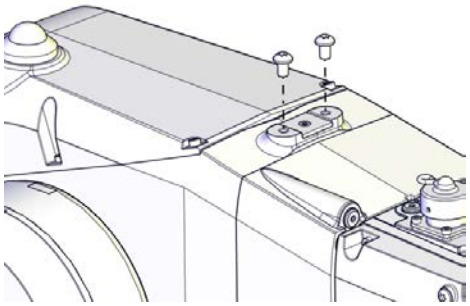
	Action	Note
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	M2 variseal sealing: 3HAC044641-006 Radial sealing: 3HAC024865-001  xx1400000473 Replacement is detailed in *Replacing the axis-3 radial sealing and sealing ring on page 439*.
12	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.4.1 Replacing the lower arm

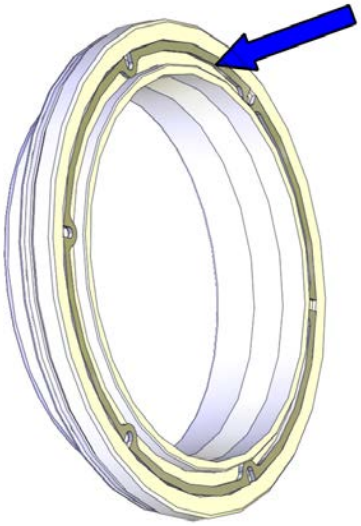
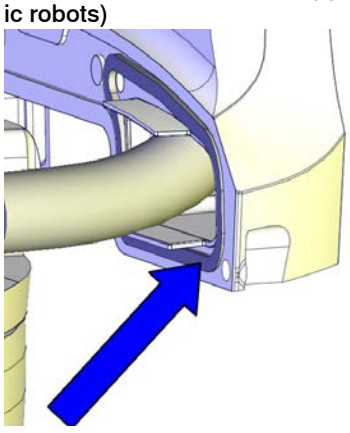
Continued

	Action	Note
13	Refit the cable housing of the lower arm.	Tightening torque: 3 Nm  xx1400000785
14	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the cable housing of the lower arm. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. **Note** No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000218
15	**For robots with protection type Foundry Plus** If required, fit two screws for protection.	 xx1600001155

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Refitting the cable package in the lower arm

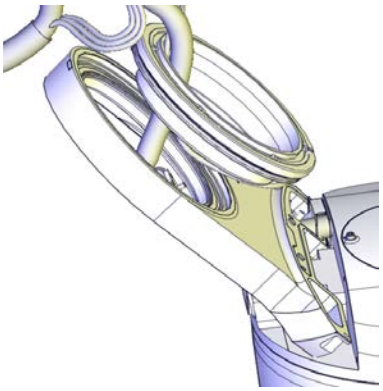
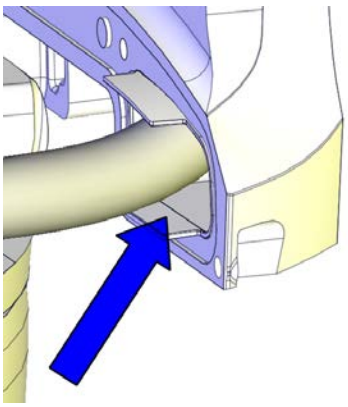
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-2 sealing ring. **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Axis-2 sealing ring: 3HAC086036-001 (for robots in IP40) / 3HAC044677-001 (for robots not in IP40) Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)  xx1400000476
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing plastic plate. Replace if damaged.	Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)  xx1400000457

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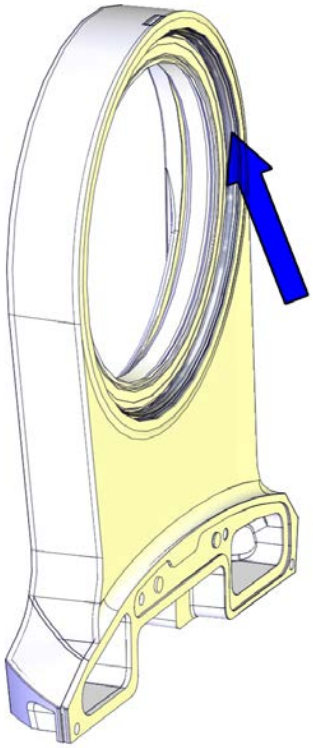
4.4.1 Replacing the lower arm

Continued

	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 xx1400000025
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	The plastic plate is included in: Cable harness material set: 3HAC049663-001.  xx1400000023

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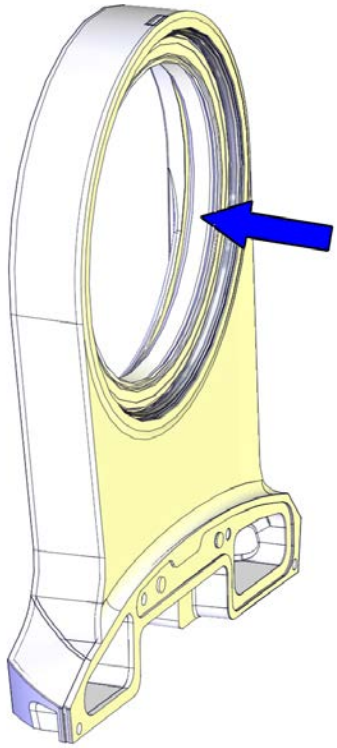
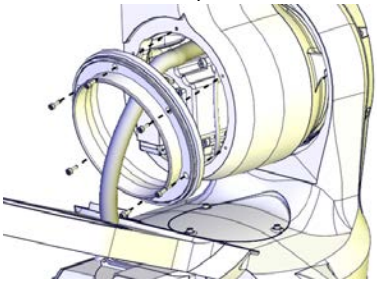
	Action	Note
6	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-004  xx1400000454

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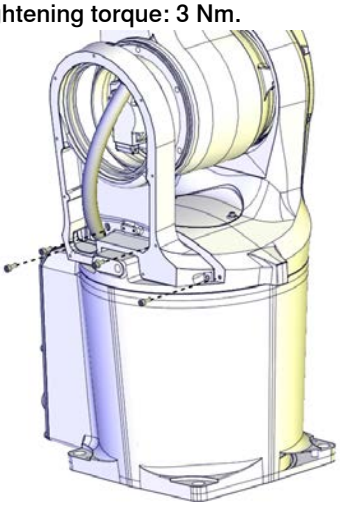
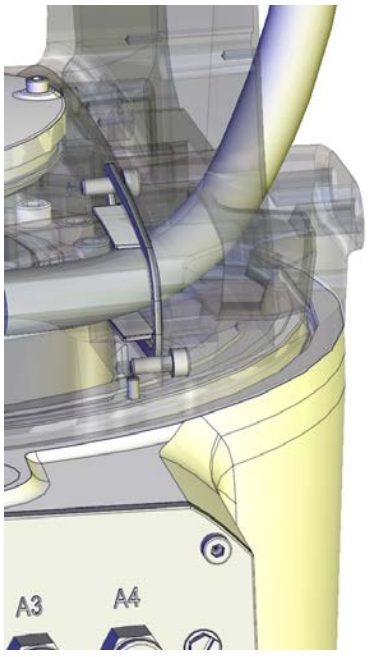
4.4.1 Replacing the lower arm

Continued

	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing with dust lip: 3HAB3701-41  xx1400000753 Replacement is detailed in *Replacing the swing spare parts (swing, axis-2 radial sealing) on page 595*.
8	Guide the cable package into the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
9	Refit the axis-2 sealing ring with the screws.	Tightening torque: 0.5 Nm (for Axis-2 sealing ring 3HAC086036-001) / 1.5 Nm (for Axis-2 sealing ring 3HAC044677-001)  xx1400000020

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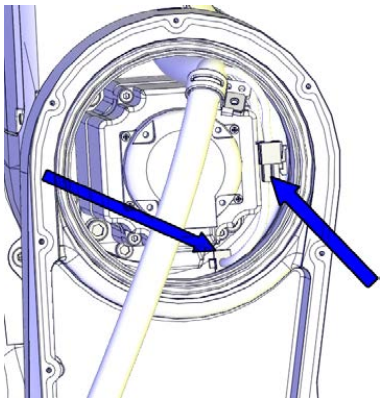
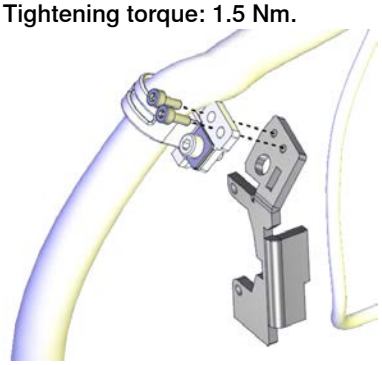
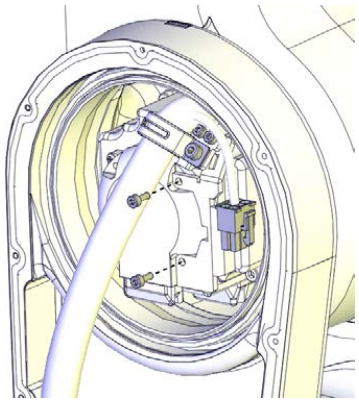
	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
11	Refit the cable housing with the screws.	Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.  xx1300002435 **Note** Only use specified screws, never replace them with other screws.
12	Apply grease to the cable package, cover all moving area of the package.	 xx1400000481

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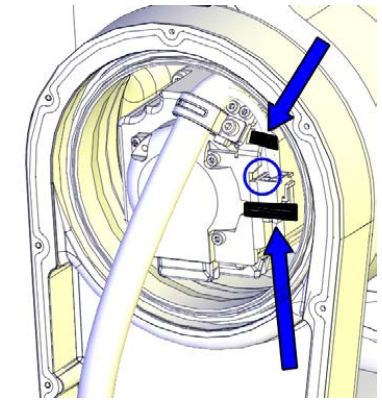
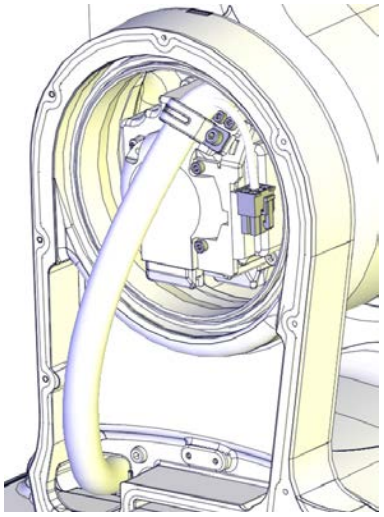
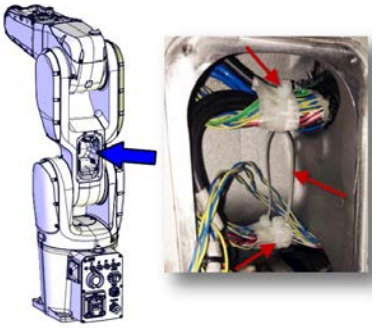
4.4.1 Replacing the lower arm

Continued

	Action	Note
13	Reconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
14	Refit the axis-2 motor bracket to the cable package with the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1400000021
15	Refit the axis-2 motor bracket to the motor.	 xx1300002432

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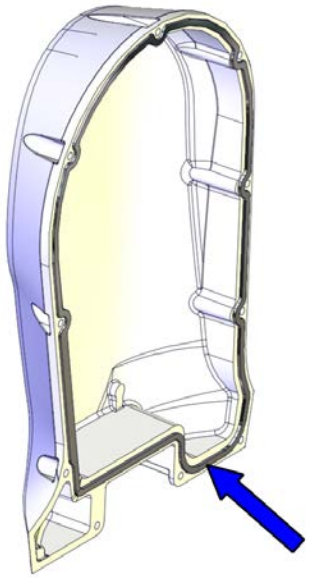
	Action	Note
16	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
17	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
18	In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity: 1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location. 2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. See the figure.	 xx1400001131

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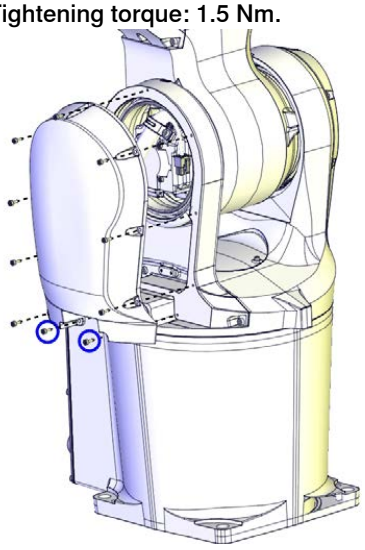
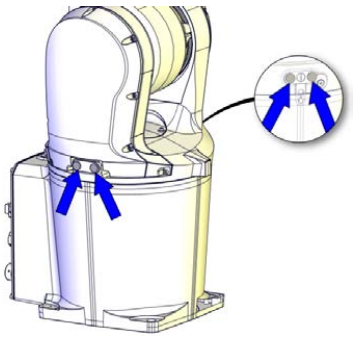
4.4.1 Replacing the lower arm

Continued

	Action	Note
19	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)  xx1400000424
20	Check the PTFE film. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
21	Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.	
22	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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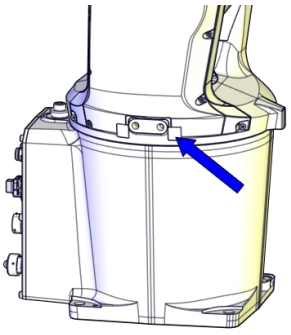
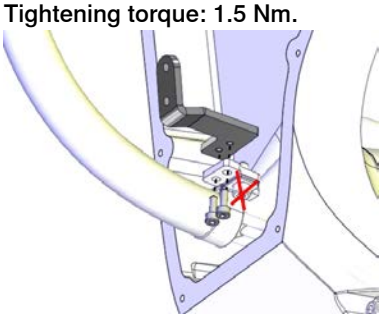
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	Action	Note
23	Refit the cable housing cover. Replace if damaged. **Note** Remember to refit the two lower screws shown in the figure.	Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002431 **Note** Only use specified screws, never replace them with other screws.
24	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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4.4.1 Replacing the lower arm
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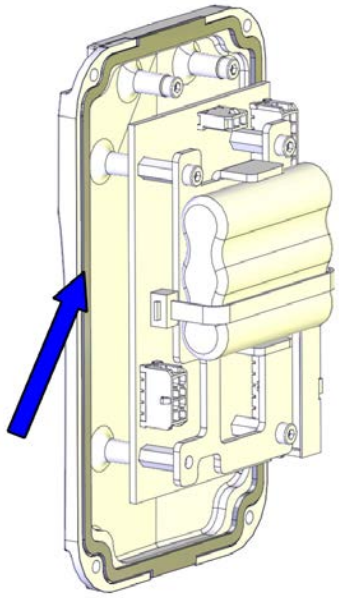
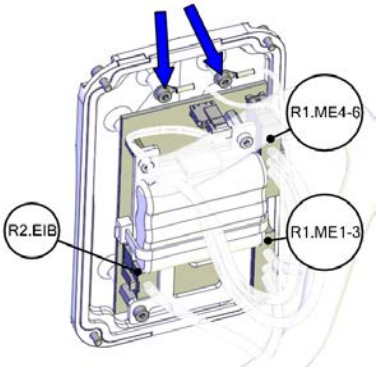
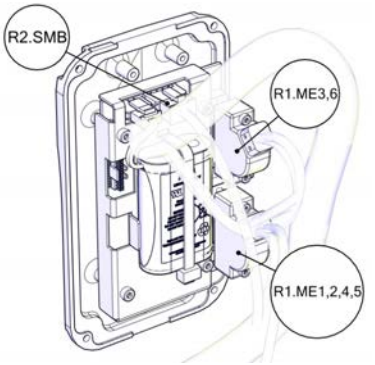
	Action	Note
25	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Refit the swing sealing plug. Follow the procedure specified in *Refitting the swing sealing plug on page 183*.	Swing sealing plug:3HAC053687-001  xx1600000205
26	Refit the lower arm bracket to the cable package. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002430

Connecting the cabling in the lower arm

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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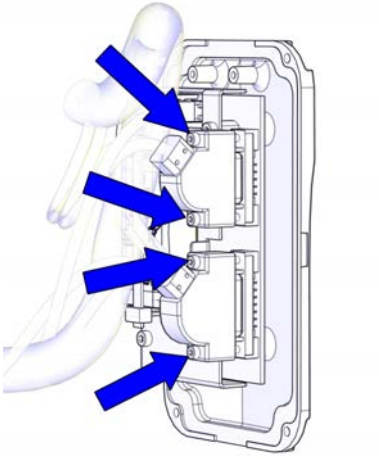
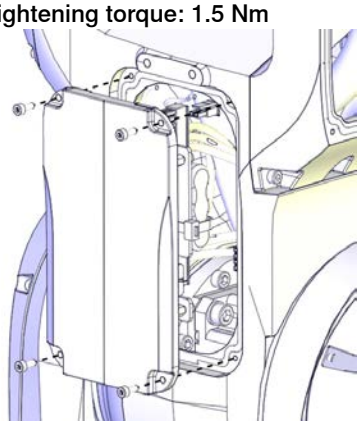
	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the EIB/SMB cover gasket. Replace if damaged.	Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)  xx1400000475
4	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1300002428
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the lugs to the EIB/SMB cover.	
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005

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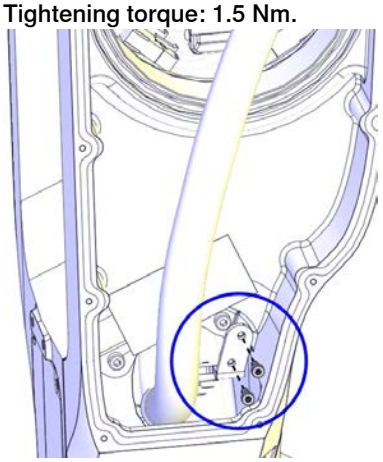
4.4.1 Replacing the lower arm

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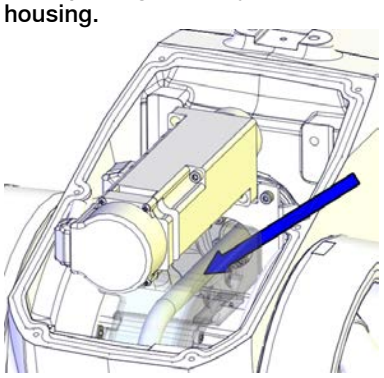
	Action	Note
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

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	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	Tightening torque: 1.5 Nm.  xx1300002426

Refitting the cable package in the housing

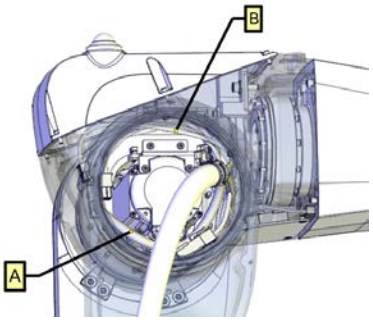
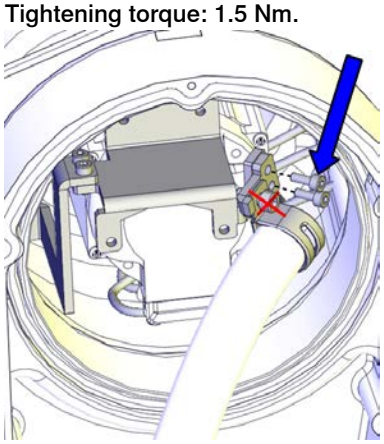
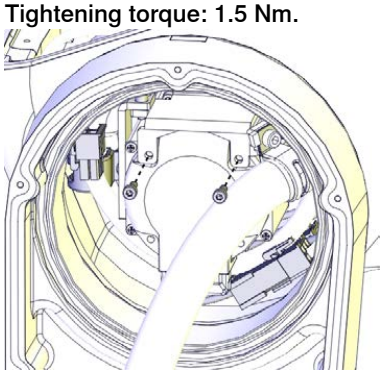
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	Area to be lubricated, shown in cable package already fitted to the housing.  xx1400000483

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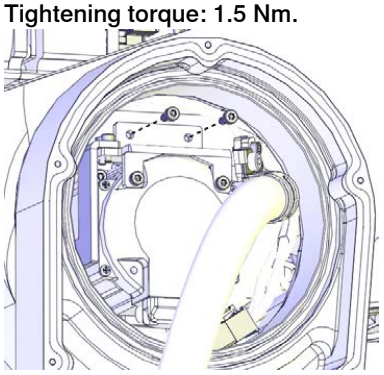
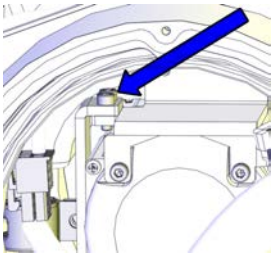
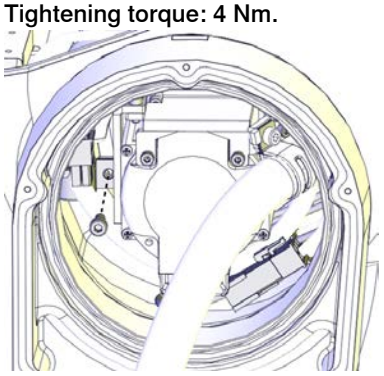
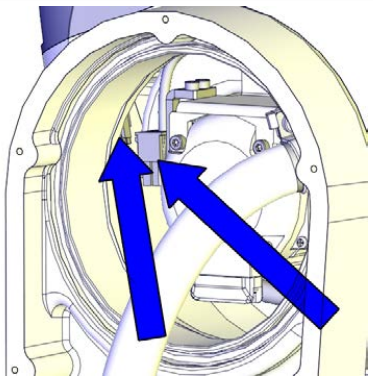
4.4.1 Replacing the lower arm

Continued

	Action	Note
3	Guide the cable package into the upper arm, through the housing. **Note** Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor. **Note** The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.	 xx1400001472
4	Refit the bracket to the sheet with two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002424
5	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423

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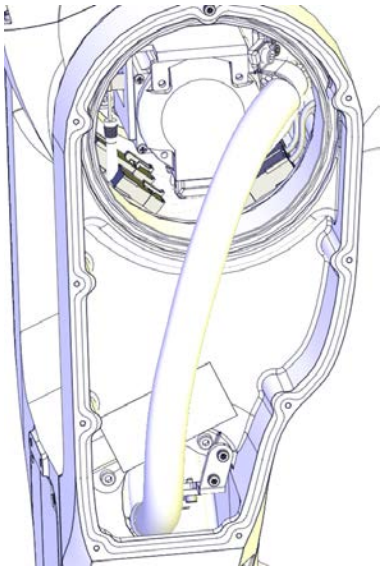
	Action	Note
6	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
7	Fit the air hose holder to the bracket. Replace the holder, if damaged. **Tip** If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.  xx1400001133	Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.  xx1300002422
8	Reconnect the axis-3 motor connectors.	 xx1300002420

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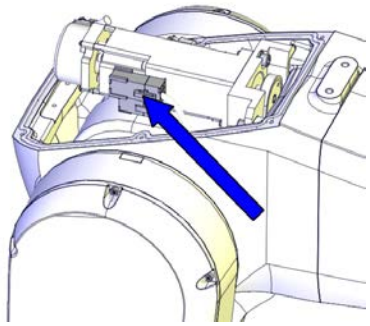
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4.4.1 Replacing the lower arm

Continued

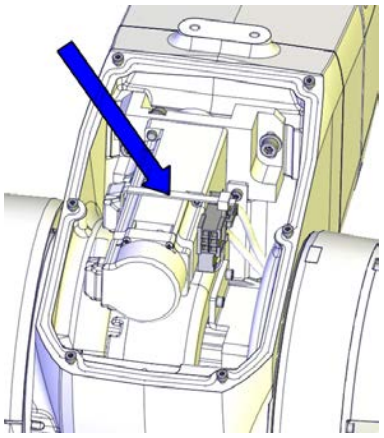
	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 xx1400000754
10	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

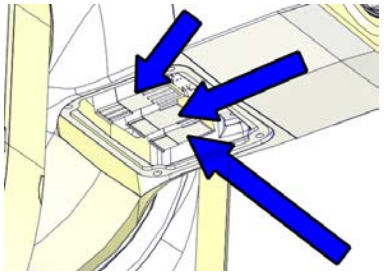
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

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	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

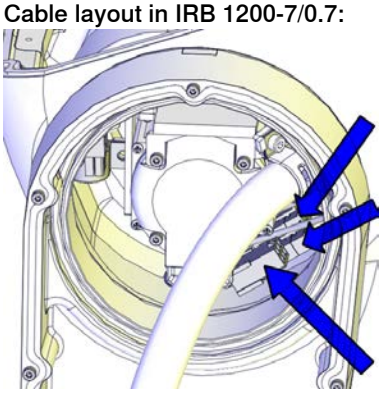
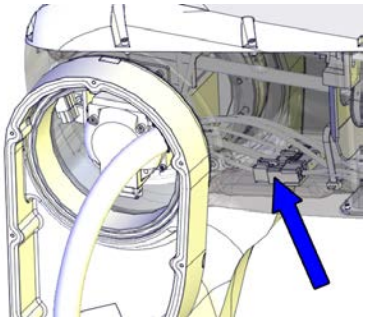
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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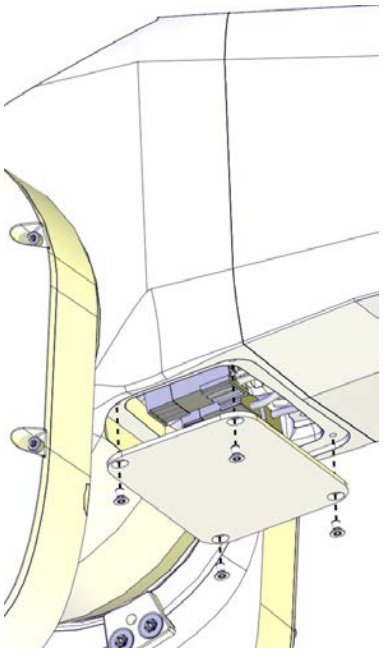
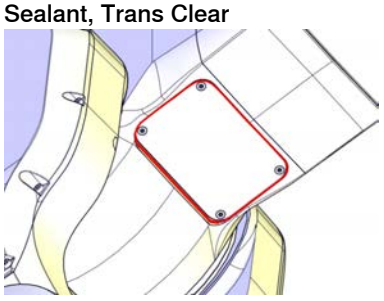
4.4.1 Replacing the lower arm

Continued

	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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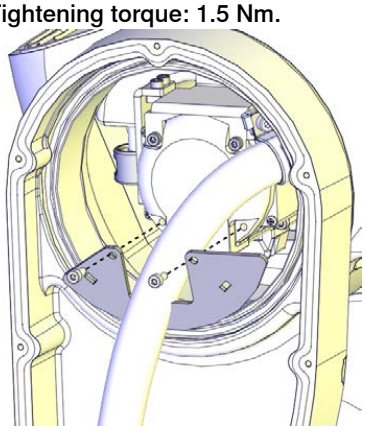
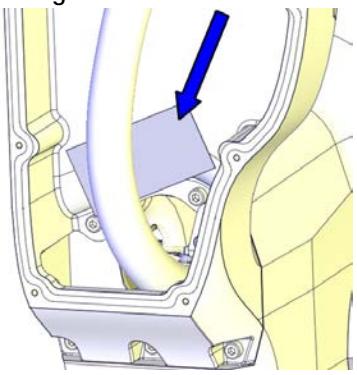
	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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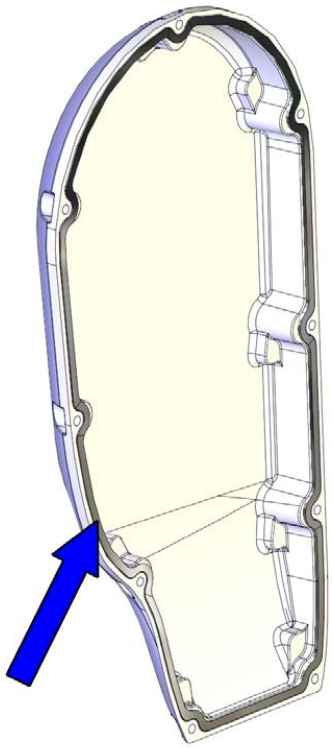
4.4.1 Replacing the lower arm

Continued

	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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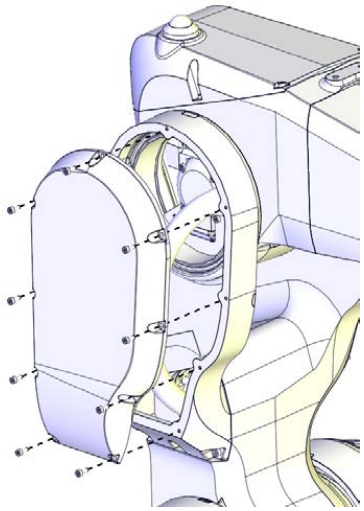
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	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.4.1 Replacing the lower arm
Continued

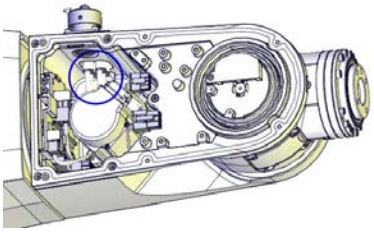
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

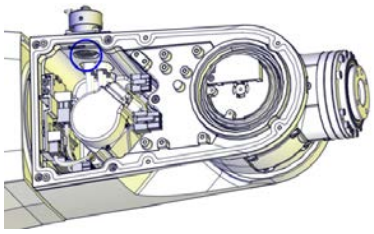
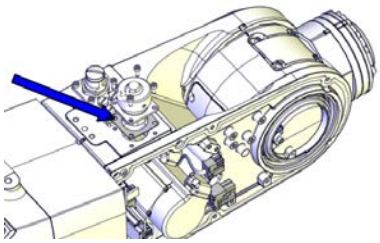
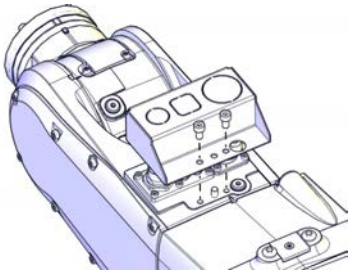
Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738

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	Action	Note
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

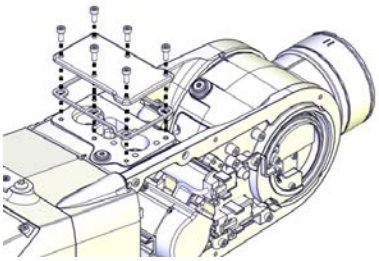
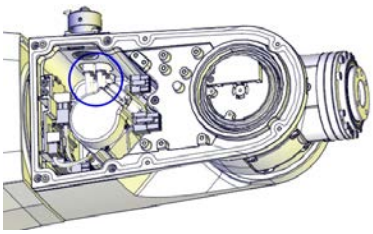
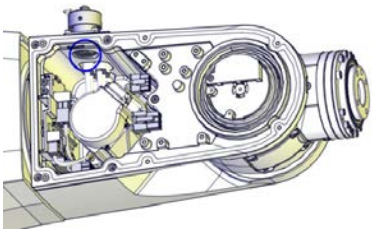
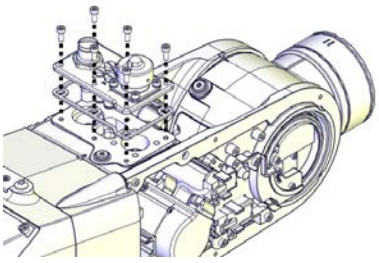
	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.4.1 Replacing the lower arm

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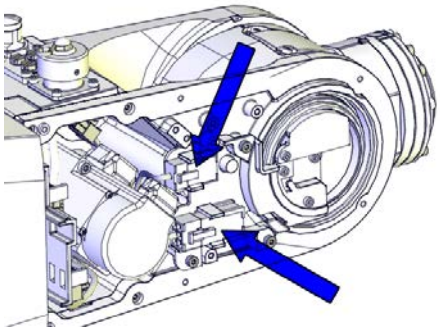
	Action	Note
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

Connecting the axis-5 motor FPC connectors

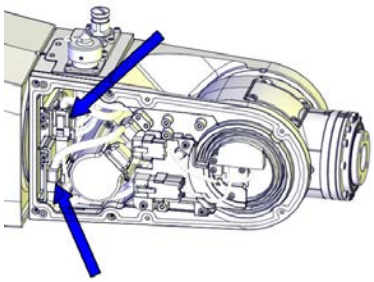
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the wrist covers

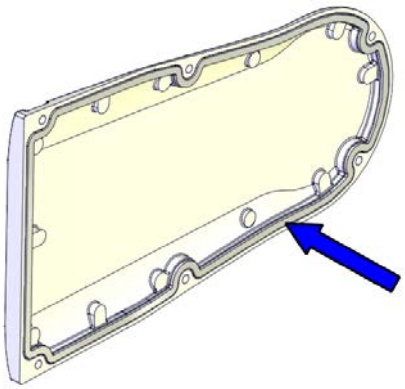
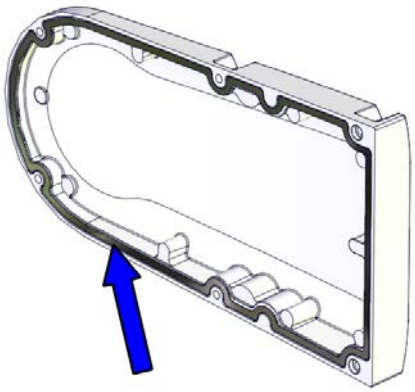
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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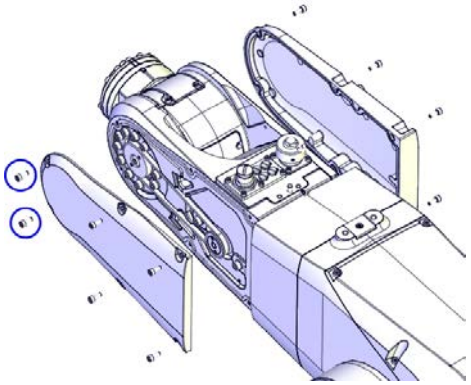
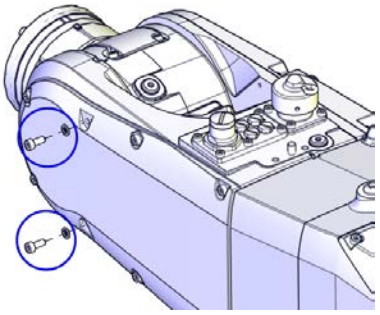
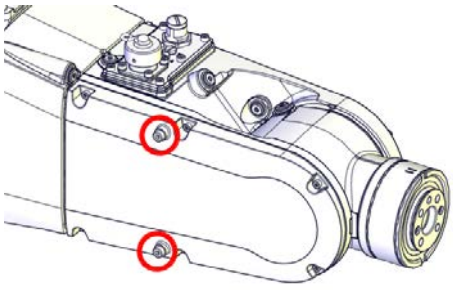
4.4.1 Replacing the lower arm

Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

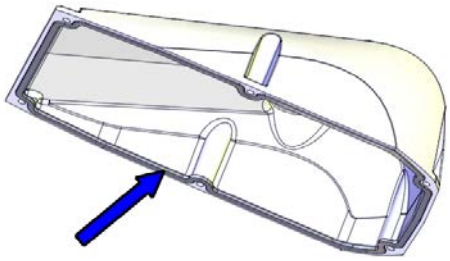
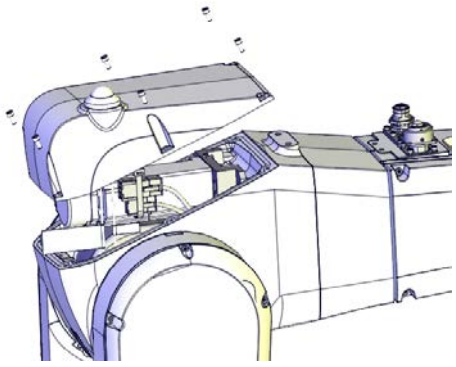
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4.4.1 Replacing the lower arm

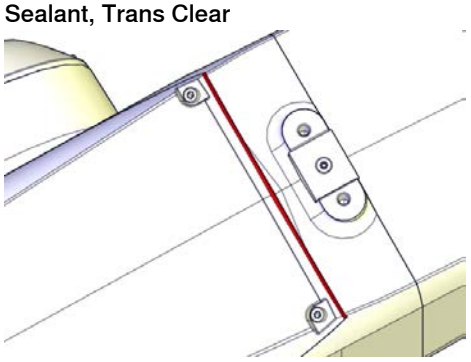
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Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws. **CAUTION** **For robots with safety lamp (option)** Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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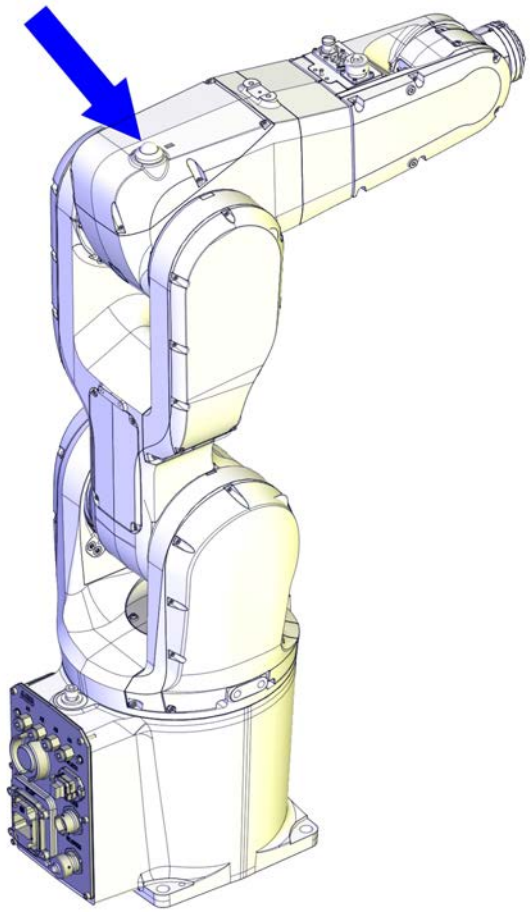
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.4.2 Replacing the signal lamp

Location of signal lamp

The signal lamp is located as shown in the figure.



xx1300000455

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Signal lamp	3HAC16738-1	

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Spare part	Article number	Note
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Replacing the signal lamp

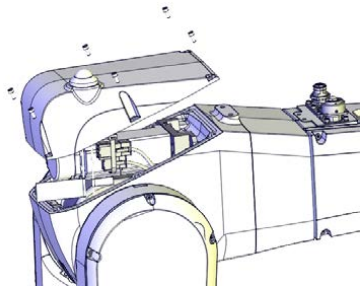
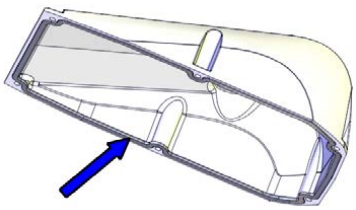
	Action	Note
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.2 Replacing the signal lamp

Continued

	Action	Note
3	Remove the attachment screws of the upper arm housing cover and lift the cover carefully until the connectors of the signal lamp can be reached.	 xx1300000456
4	Disconnect the connectors and remove the cover from the robot.	
5	Remove the nut from the lamp and pull out the lamp from the cover.	
6	Fit the new lamp to the cover and tighten the nut.	
7	Find the lamp connectors in the cable harness inside the upper arm housing. • Connect lamp connector R3.H1 to cable harness connector H1. • Connect lamp connector R3.H2 to cable harness connector H2.	
8	Clean the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*	
9	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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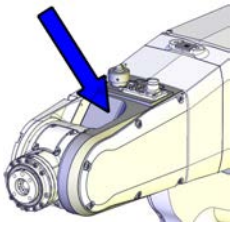
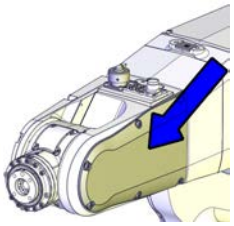
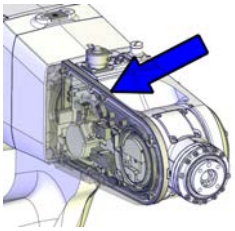
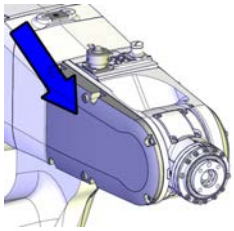
	Action	Note
11	Refit the cover on the upper arm housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. **Note** Only use specified screws, never replace them with other screws.
12	The signal lamp is now ready for use and is lit in MOTORS ON mode.	
13	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	

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4.4.3 Replacing the tubular spare parts

Location of tubular spare parts

The tubular parts that are considered spare parts are located as shown in the figure.

Tubular with sleeve	Tubular cover	Tubular cable housing	Tubular cable housing cover
 xx1400000432	 xx1400000433	 xx1400000434	 xx1400000435
3HAC059693-001 / 3HAC059723-001 [i]:	3HAC049656-001	3HAC059695-001	3HAC059694-001
3HAC059706-001: Used with protection type Clean Room. Used for robots with food grade lubrication.	3HAC056144-001 / 3HAC059708-001 [ii]: Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.	3HAC056143-001: Used with protection type Clean Room. Used for robots with food grade lubrication.	3HAC056145-001: Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
3HAC079693-001: Used with protection type Hygienic.	3HAC079689-001: Used with protection type Hygienic. Replace if damaged.	3HAC079692-001: Used with protection type Hygienic.	3HAC079690-001: Used with protection type Hygienic. Replace if damaged.

i For information on which tubular to be ordered, see *Spare part versions for the tubular on Type A robots on page 916*.

ii For information on which tubular cover for Clean Room robots to be ordered, see *Spare part versions for the tubular cover on Clean Room robots on page 917*.

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, https://one.robotics.abb.com/en/knowledge-hub.

Spare part	Article number	Note
Tubular with sleeve	3HAC059693-001 / 3HAC059723-001 [i]	
Tubular with sleeve, Clean Room Tubular with sleeve, food grade lubrication	3HAC059706-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular with sleeve, Hygienic	3HAC079693-001	Used with protection type Hygienic.

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Spare part	Article number	Note
Tubular cover	3HAC049656-001	Replace if damaged.
Tubular cover, Clean Room Tubular cover, food grade lubrication	3HAC056144-001 / 3HAC059708-001 ii	Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
Tubular cover, Hygienic	3HAC079689-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Tubular cable housing	3HAC059695-001	
Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication	3HAC056143-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.
M2 variseal sealing	3HAC044641-009	Used with protection class IP67 and protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.
Tubular cable housing cover	3HAC059694-001	Replace if damaged.
Tubular cable housing cover, Clean Room Tubular cable housing cover, food grade lubrication	3HAC056145-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
Tubular cable housing cover, Hygienic	3HAC079690-001	Used with protection type Hygienic. Replace if damaged.

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4.4.3 Replacing the tubular spare parts
Continued

Spare part	Article number	Note
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
M2 variseal sealing	3HAC044641-008	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.

i For information on which tubular to be ordered, see *Spare part versions for the tubular on Type A robots on page 916*.

ii For information on which tubular cover for Clean Room robots to be ordered, see *Spare part versions for the tubular cover on Clean Room robots on page 917*.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
Guide pin for tilt unit (axis 5)	3HAC049706-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic
Dynamometer	-	Used for measuring timing belt tension.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.

If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	

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Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	3HAC026759-003	Sikaflex 521FC For robots not with protection type Hygienic
Flange sealing	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

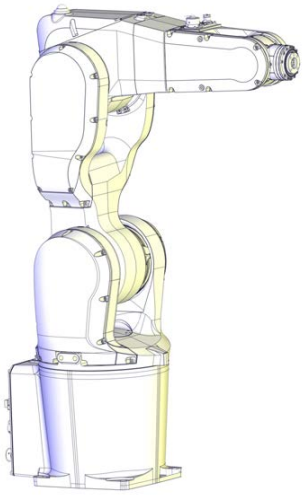
Preparations before removing the tubular spare parts

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Replacing the tubular cable housing

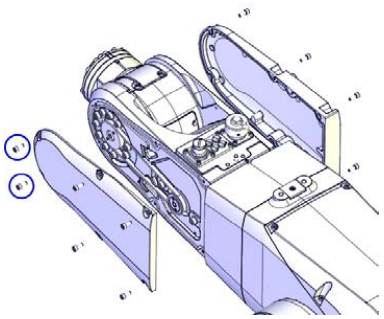
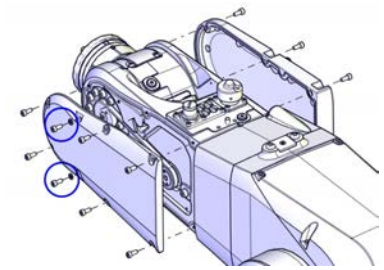
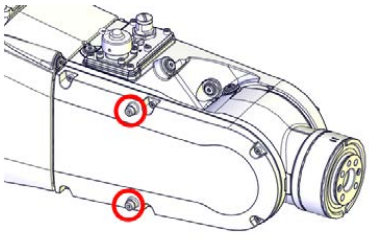
Use these procedures to replace the tubular cable housing.

Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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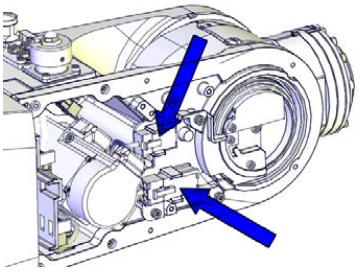
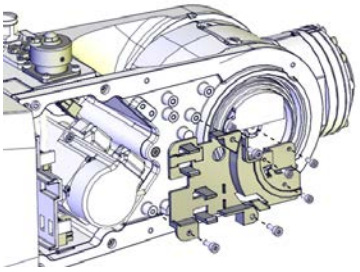
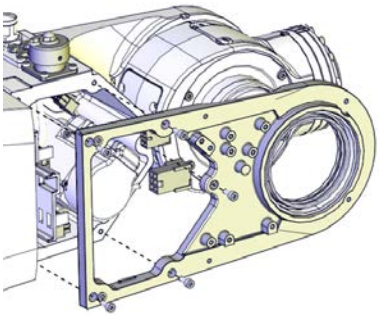
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

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4.4.3 Replacing the tubular spare parts
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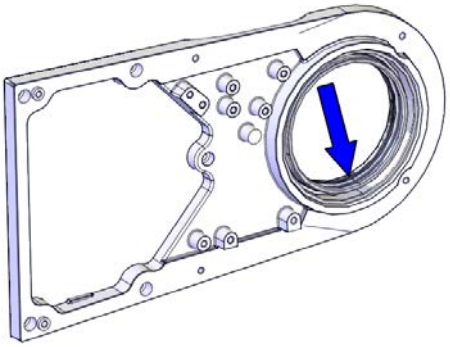
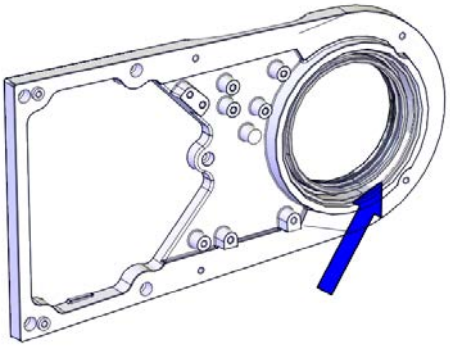
Removing the tubular cable housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
4	Remove the connector plate by first removing the screws.	 xx1300002391
5	Remove the cable housing of the tubular by first removing the screws. **Note** **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** The frame is glued and needs to be pried off.	 xx1300002392

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Checking the tubular cable housing sealings

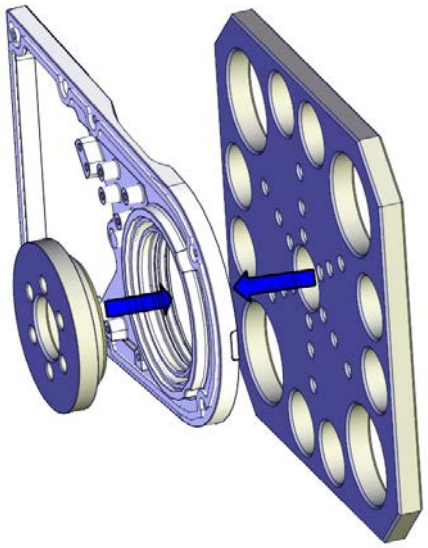
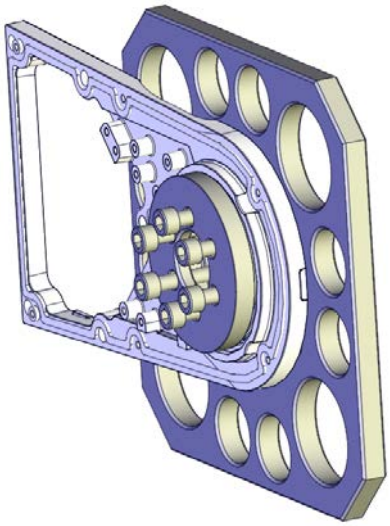
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-009  xx1300002396
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	Radial sealing: 3HAB3701-42  xx1300002608
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the tubular cable housing.	

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4.4.3 Replacing the tubular spare parts

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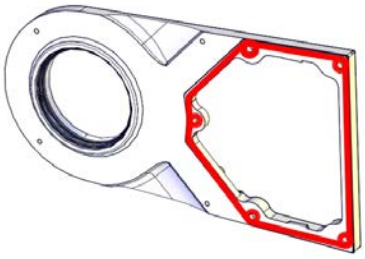
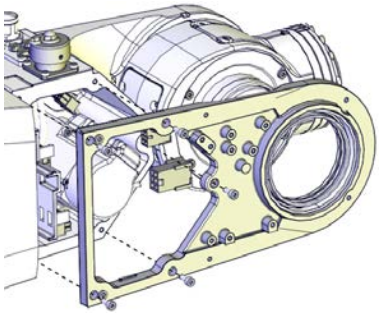
	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-5 sealing assembly tool set: 3HAC049701-001
7	Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.	 xx1400000485
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000486
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the tubular cable housing. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1300002610
3	Refit the tubular cable housing with the screws.	Tightening torque: 1.5 Nm. Tubular cable housing: 3HAC059695-001 Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication : 3HAC056143-001 Tubular cable housing, Hygienic: 3HAC079692-001  xx1300002392

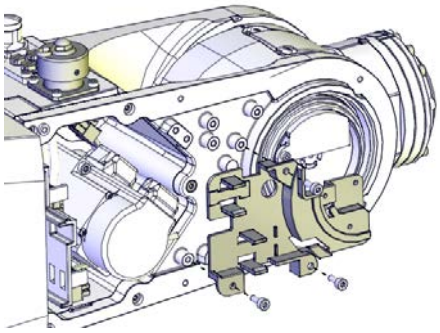
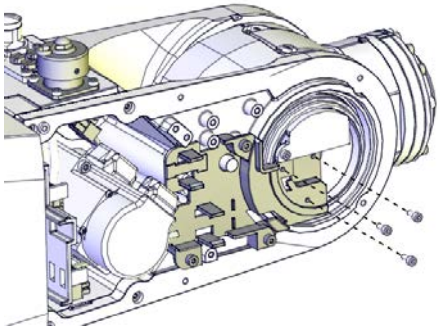
Refitting the connector plate

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

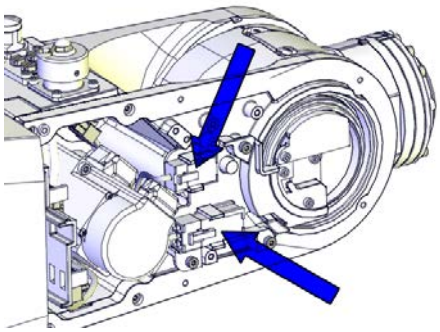
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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

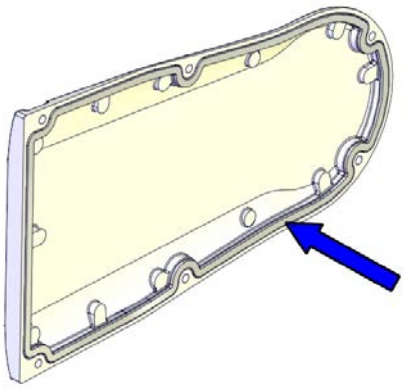
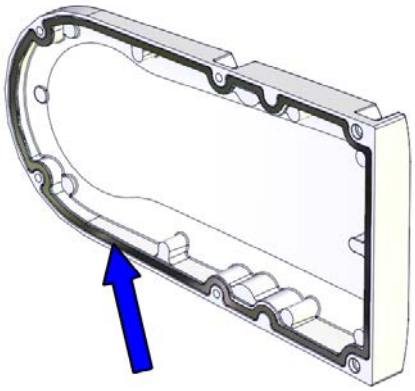
Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

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Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345

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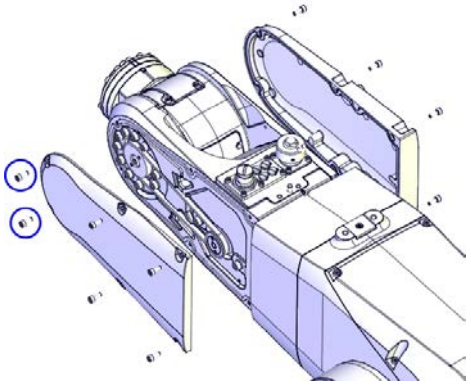
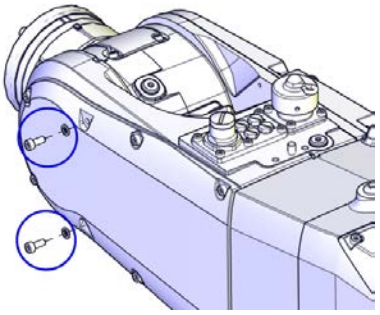
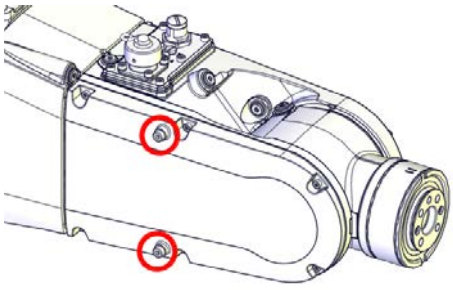
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

Removing the tubular

Use these procedures to remove the tubular.

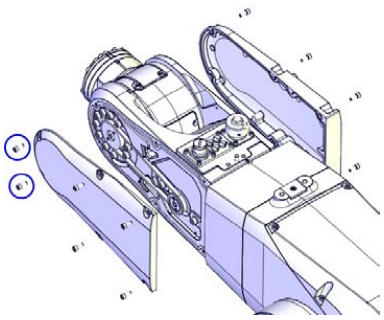
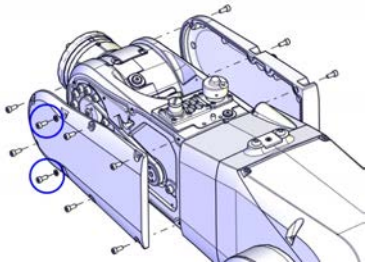
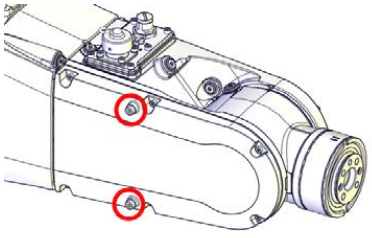
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4.4.3 Replacing the tubular spare parts

Continued

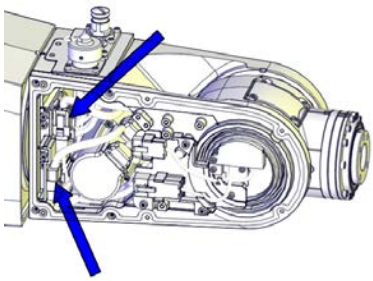
Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

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Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

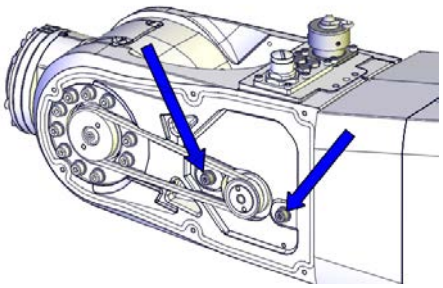
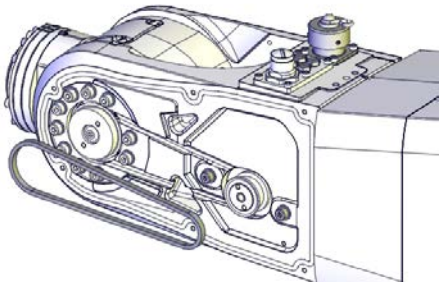
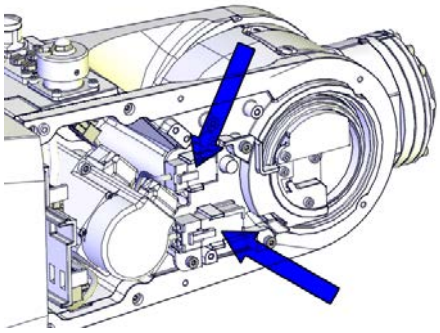
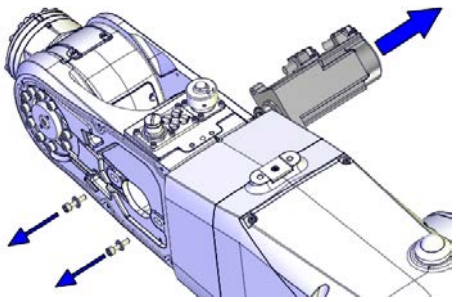
Removing the axis-5 motor with pulley

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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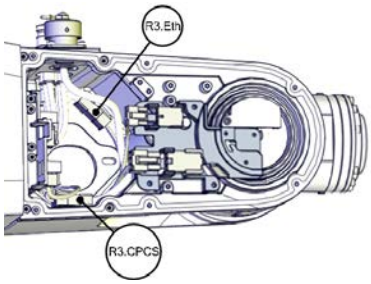
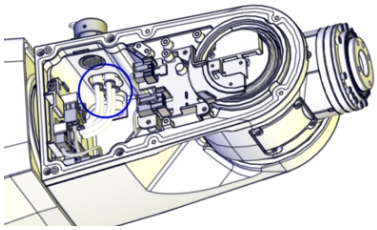
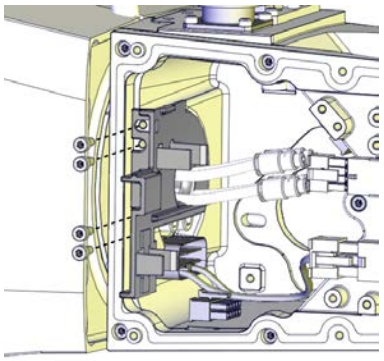
4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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Removing the wrist

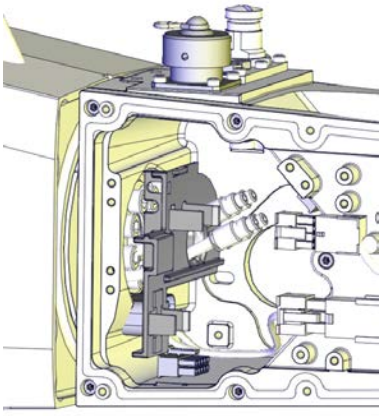
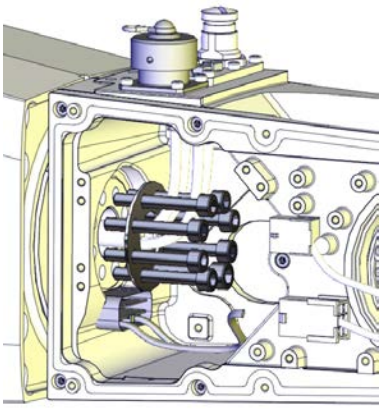
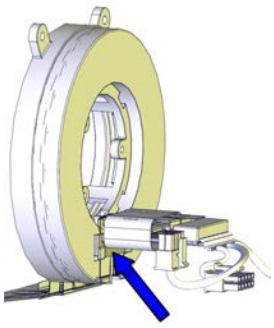
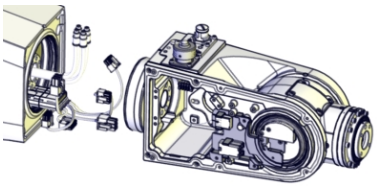
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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4.4.3 Replacing the tubular spare parts

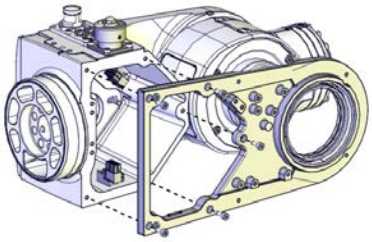
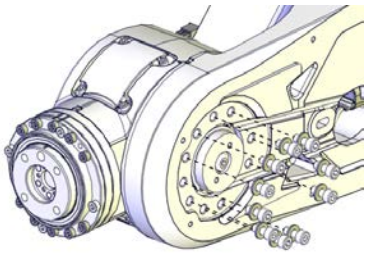
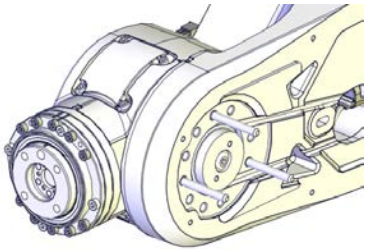
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	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 xx1300002357
7	Support the weight of the wrist and remove the screws and the washer.	 xx1300002358
8	Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359

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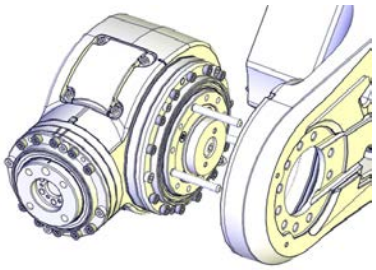
Separating the tilt unit from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing of the tubular by first removing the screws. **Note** **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** The frame is glued and needs to be pried off.	 xx1400000774
4	Support the weight of the tilt unit and remove the screws.	 xx1300002469
5	Fit guide pins to the gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001 Always use three guide pins together!  xx1400000775

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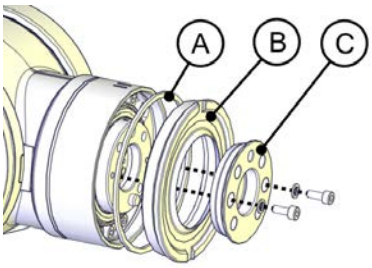
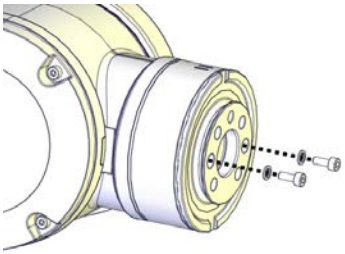
4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
6	Remove the tilt unit.	 xx1300002470

Refitting the tubular

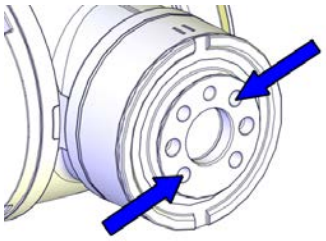
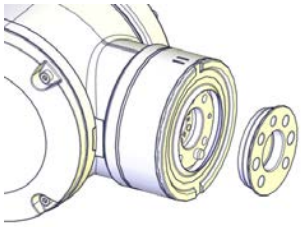
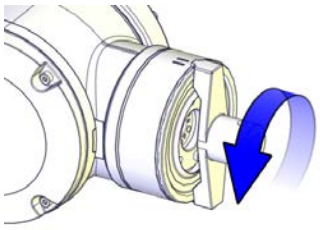
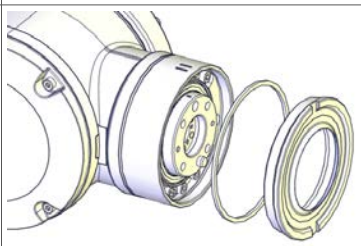
Use these procedures to refit the tubular.

Checking the sealing set on tool flange of Hygienic robots

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the gasket (A), seal ring unit (B) and stainless shaft (C) on the tool flange. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	 xx2100001448
3	Remove the screws and washers.	 xx2100001449

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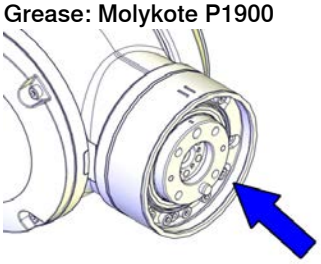
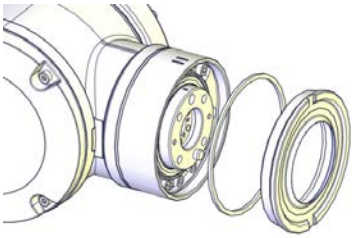
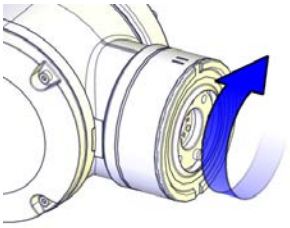
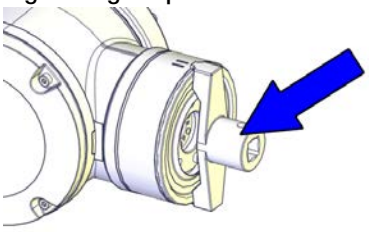
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	Action	Note
4	Insert two M4 screws to the pressed out holes and press out the stainless shaft.	 xx2100001450  xx2100001451
5	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.	Flange tightening tool: 3HAC079686-001  xx2100001452
6	Remove the gasket and seal ring unit.	 xx2100001453
7	Replace the damaged parts with new ones.	

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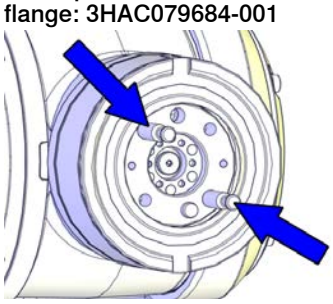
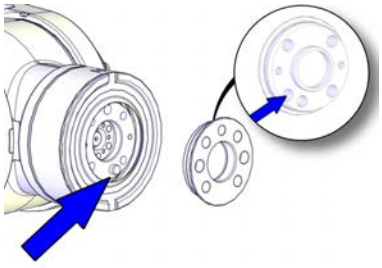
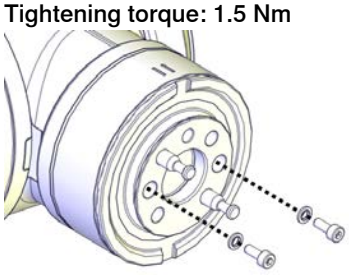
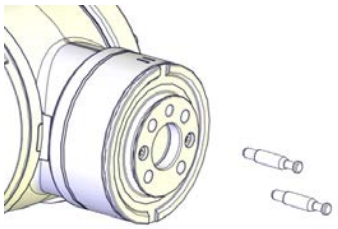
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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
8	Apply a little grease to the screw thread.	Grease: Molykote P1900  xx2100001454
9	Put the gasket in place and then screw the seal ring unit.	 xx2100001453  xx2100001455
10	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	Flange tightening tool: 3HAC079686-001 Tightening torque: 8 Nm  xx2100001456

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	Action	Note
11	Fit two guide pins to the tool flange.	Guide pin for stainless shaft on tool flange: 3HAC079684-001  xx2100001457
12	Place the stainless shaft on the tool flange with guidance of the two guide pins. Make sure the pin hole on the shaft aligned with the pin on the tool flange.	 xx2100001458
13	Secure with screws and washers.	Tightening torque: 1.5 Nm  xx2100001459
14	Remove the guide pins.	 xx2100001460

Refitting the axis-5 and axis-6 drive unit

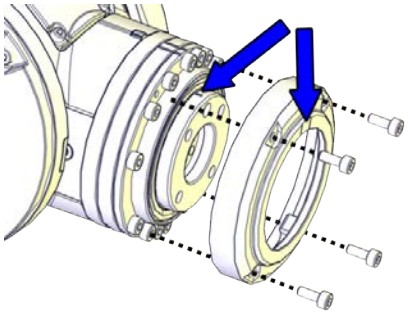
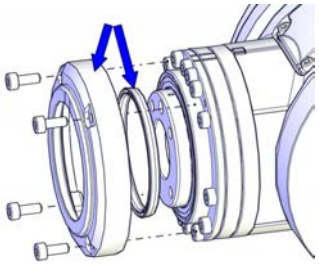
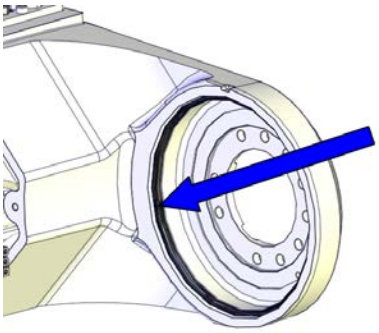
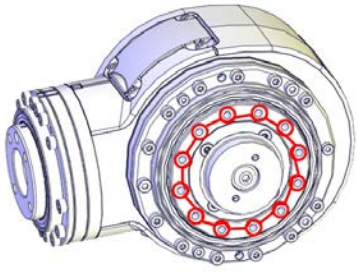
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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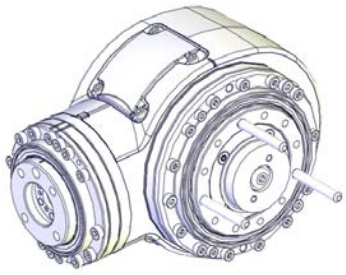
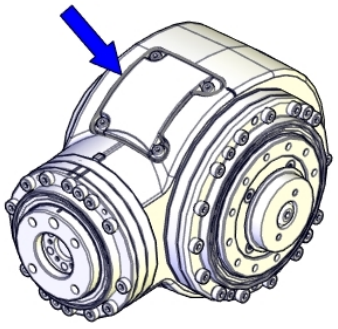
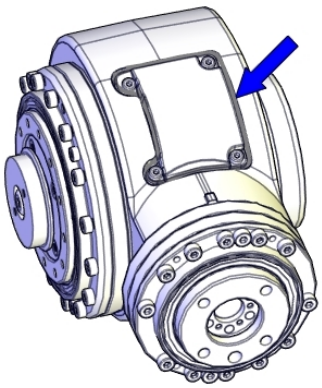
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
2	**For robots with protection type Foundry Plus** Check the protection cover for turning disk and T40 variseal sealing. Replace if damaged. **Note** When installing, make sure the notch on the protection cover is aligned with the synchronization mark on the tool flange so that the notch could be used as the synchronization mark during calibration.  xx2300001281	Protection cover for axis-6 turning disk: 3HAC044666-001 T40 variseal sealing: 3HAC044641-012  xx1600001126
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-008  xx1300002493
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the drive unit. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Wipe clean the overflowing sealant if there is any.	**For robots not in protection type Hygienic** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1400001404

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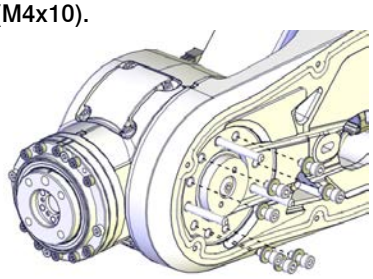
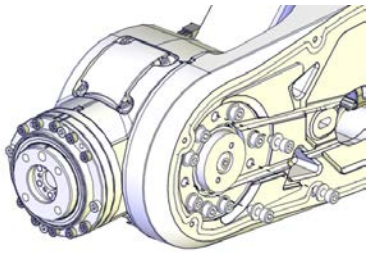
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	Action	Note
5	Fit guide pins to the axis-5 gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001  xx1300002568
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** Make sure the sealing to the tilt covers is intact before the refitting. **For robots with protection type Hygienic** Hygienic robots do not have tilt covers.	 xx1600000219  xx1600000220

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4.4.3 Replacing the tubular spare parts
Continued

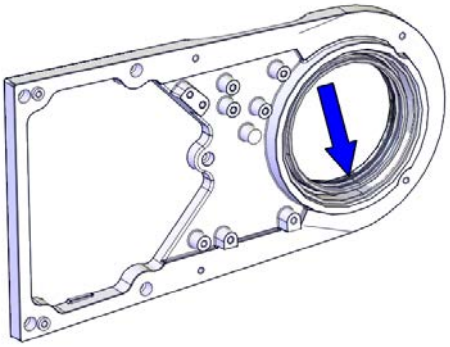
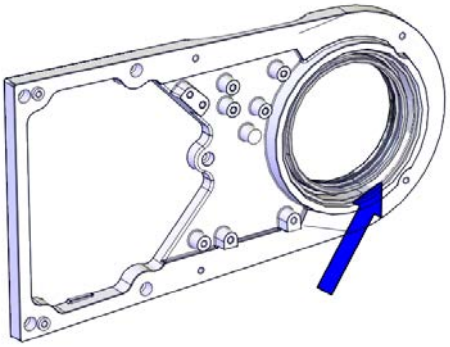
	Action	Note
7	Refit the drive unit and secure with the screws and washers. Secure the screws but do not tighten yet. **Note** If there is glue on the screw, please clean it or replace it with a new one.	Attachment screws: 3HAB3409-236 (M4x10).  xx1300002569 **Note** Only use specified screws, never replace them with other screws.
8	Remove the guide pins and refit the remaining screws and washers.	 xx1300002570
9	Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.	

Checking the tubular cable housing sealings

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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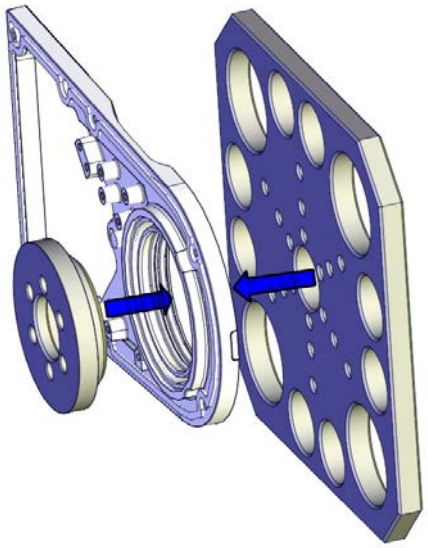
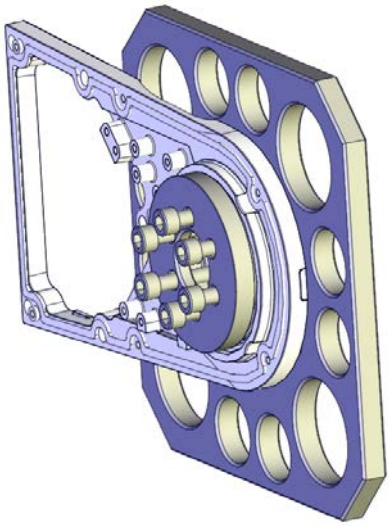
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-009  xx1300002396
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	Radial sealing: 3HAB3701-42  xx1300002608
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the tubular cable housing.	

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4.4.3 Replacing the tubular spare parts

Continued

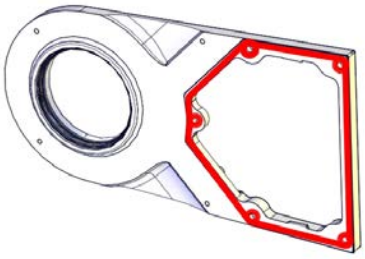
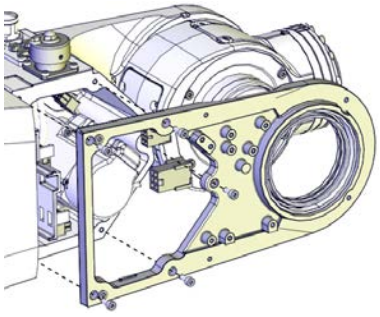
	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-5 sealing assembly tool set: 3HAC049701-001
7	Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.	 xx1400000485
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000486
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the tubular cable housing. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1300002610
3	Refit the tubular cable housing with the screws.	Tightening torque: 1.5 Nm. Tubular cable housing: 3HAC059695-001 Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication : 3HAC056143-001 Tubular cable housing, Hygienic: 3HAC079692-001  xx1300002392

Refitting the wrist

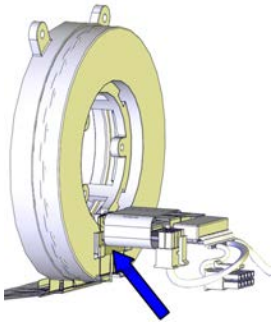
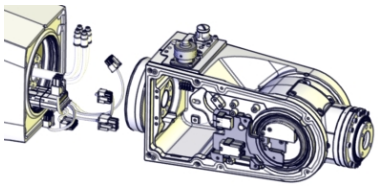
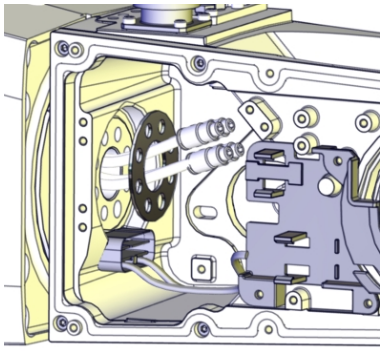
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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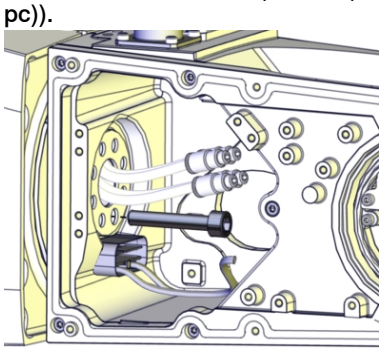
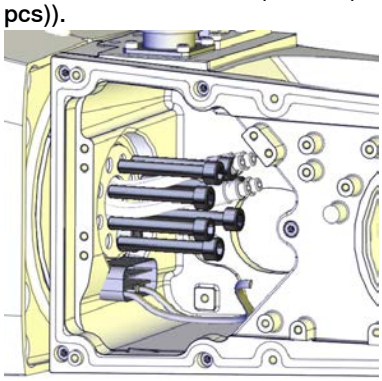
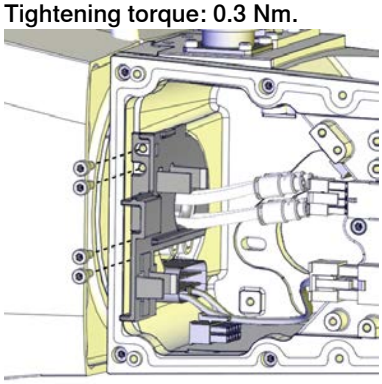
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
2	Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359
3	Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.	Washer: 3HAC044869-001  xx1400000001

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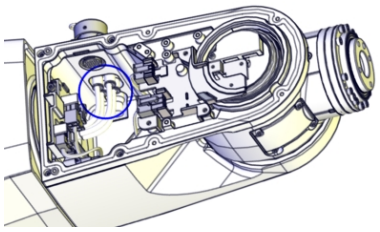
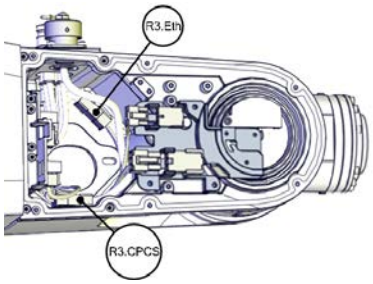
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	Action	Note
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	Screw: 3HAB3409-238 (M6x35 (1 pc)).  xx1400000002 **Note** Only use specified screws, never replace them with other screws.
5	Refit the rest of the screws (M5x35 (7 pcs)).	Screw: 3HAB3409-237 (M5x35 (7 pcs)).  xx1400000003 **Note** Only use specified screws, never replace them with other screws.
6	Tighten all screws.	Tightening torque: 8 Nm.
7	Put the cables through the plate hole and refit the plate.	Tightening torque: 0.3 Nm.  xx1300002356

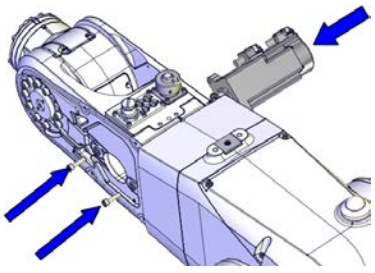
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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
8	Reconnect the air hoses. **CAUTION** Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. • R3.Eth • R3.CPCS	 xx1300002353

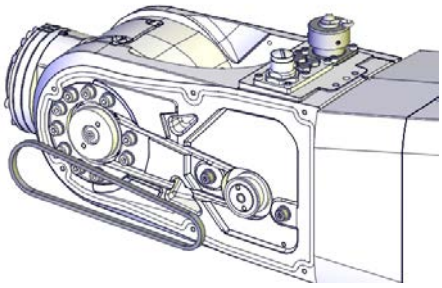
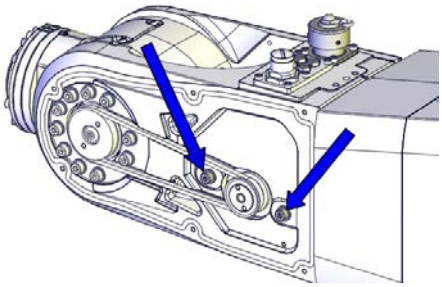
Preparations before securing the axis-5 motor

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463 **Note** Only use specified screws, never replace them with other screws.

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Securing the axis-5 motor and timing belt

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

Refitting the connector plate

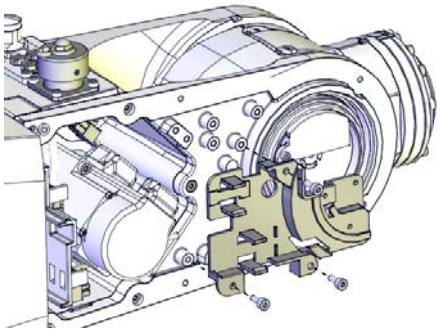
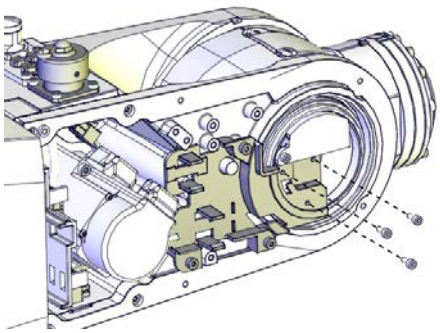
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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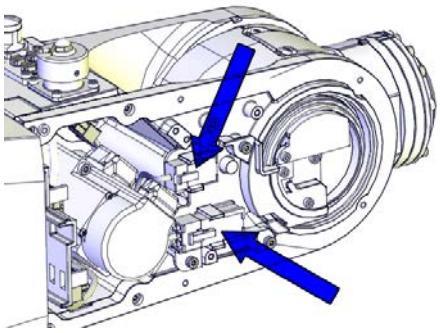
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4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

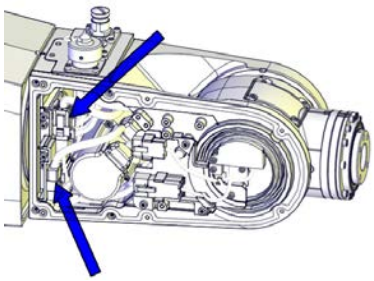
Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

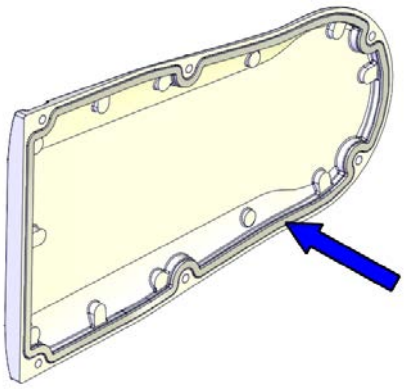
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Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the wrist covers

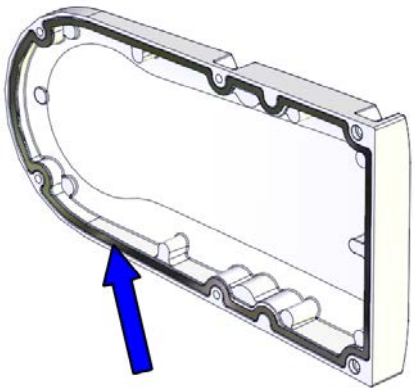
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034

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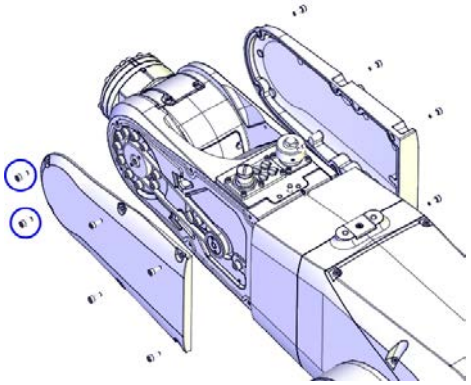
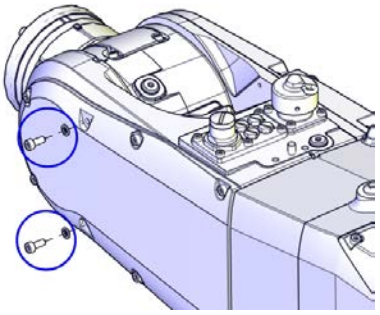
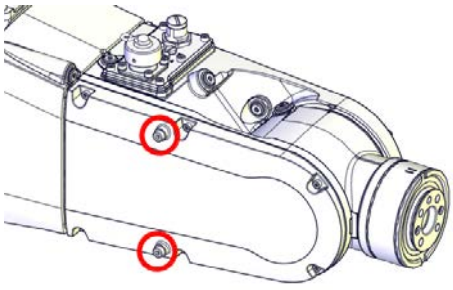
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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4.4.3 Replacing the tubular spare parts
Continued

Concluding procedures

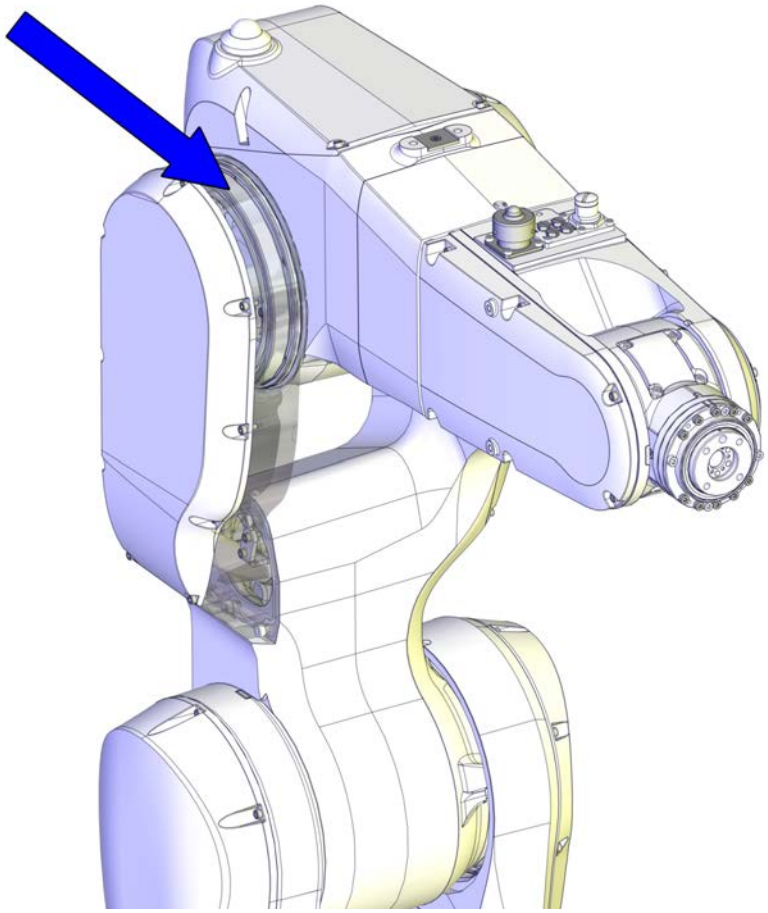
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*.  **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
3	 **DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

Location of the sealings

The axis-3 radial sealing and sealing ring are located as shown in the figure.



xx1400000336

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

Spare part	Article number	Note
Axis-3 sealing ring	3HAC086038-001	Used with protection class IP40. Replace if damaged.
Axis-3 sealing ring	3HAC044678-001	Not used with protection class IP40. Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-3 sealing assembly tool set	3HAC049697-001	Used to refit the axis-3 radial sealing.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

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Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Sealant	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.

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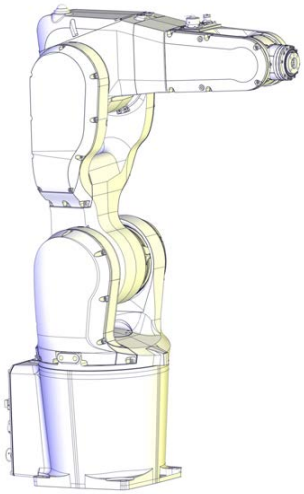
4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the sealings

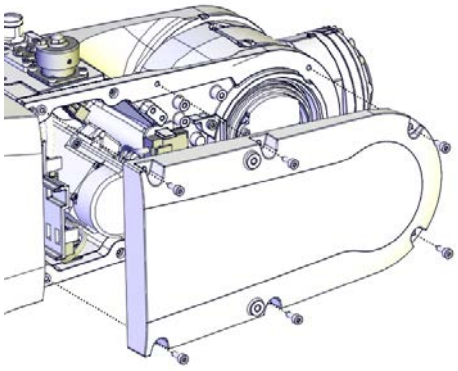
Use these procedures to remove the axis-3 radial sealing and/or axis-3 sealing ring.

Preparations before removing the sealings

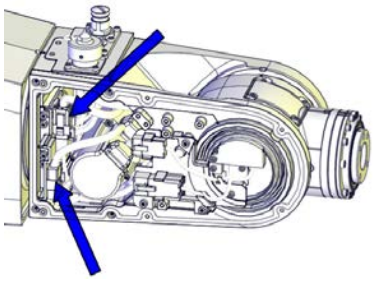
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
5	Remove the wrist cover.	 xx1300002389

Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Disconnecting the axis-5 FPC connectors

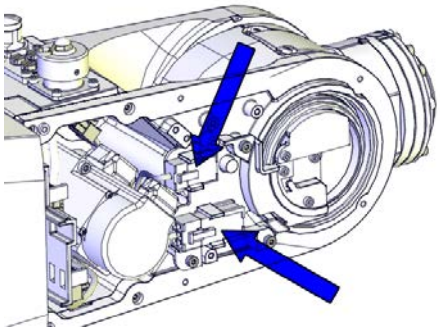
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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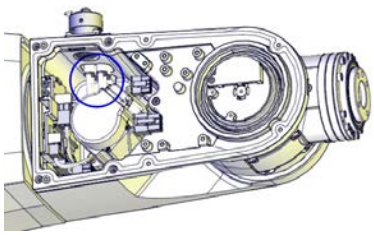
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4.4.4 Replacing the axis-3 radial sealing and sealing ring

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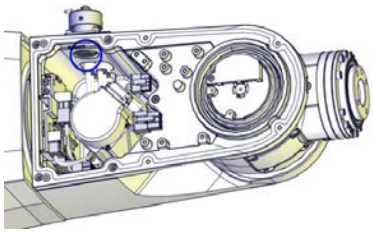
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

Disconnecting the air hoses and CP/CS cabling (if equipped)

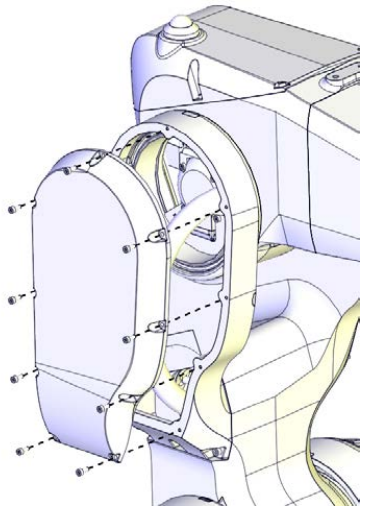
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the air hoses.	 xx1400000738

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	Action	Note
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

Disconnecting the axis-4 FPC connectors

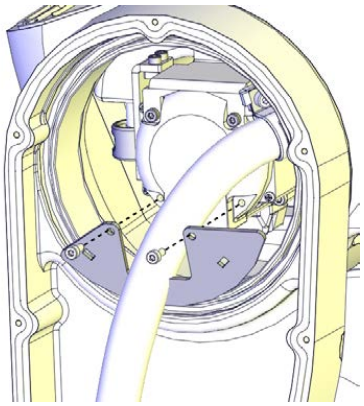
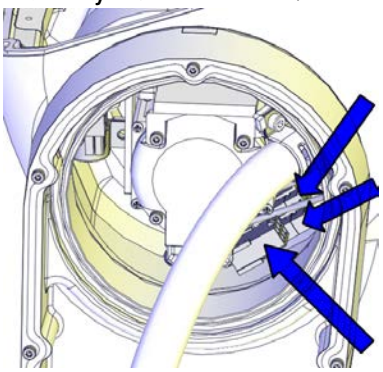
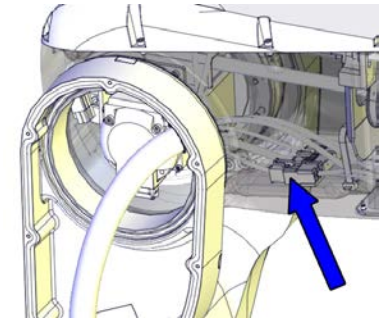
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400

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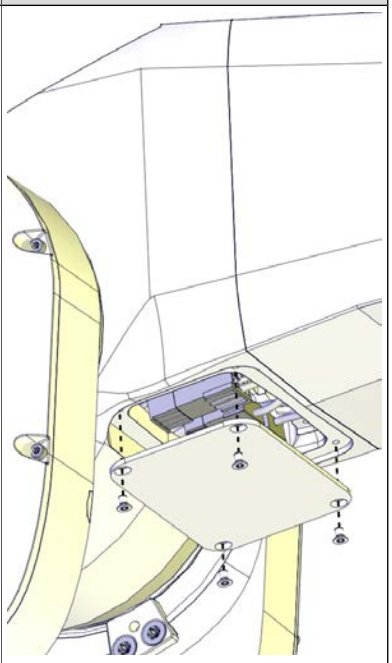
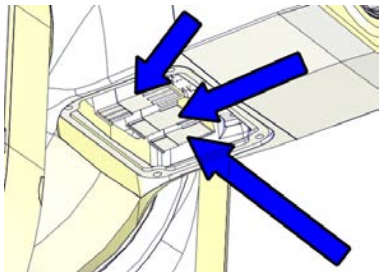
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
4	Remove the plate.	 xx1300002413
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471

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	Action	Note
6	Remove the small cover of the housing.	 xx1300002398
7	Disconnect the remaining FPC connectors.	 xx1300002399

Disconnecting the axis-4 motor connectors

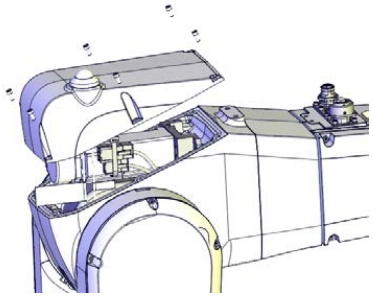
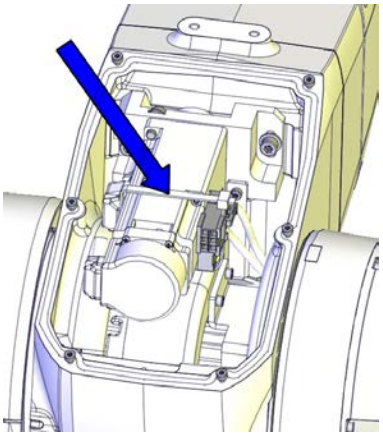
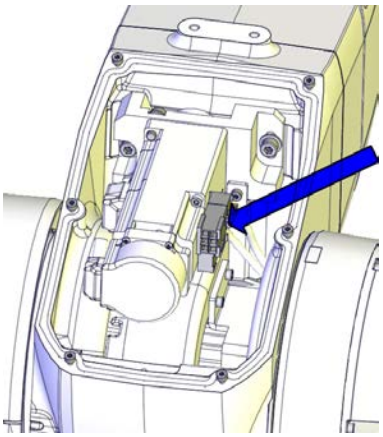
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

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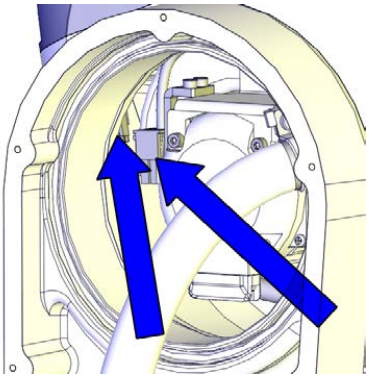
	Action	Note
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Disconnecting the axis-3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Removing the cable package in the housing

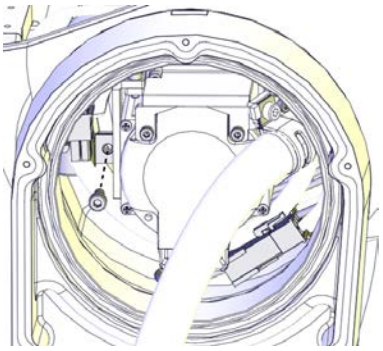
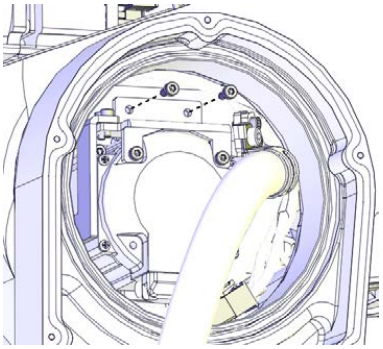
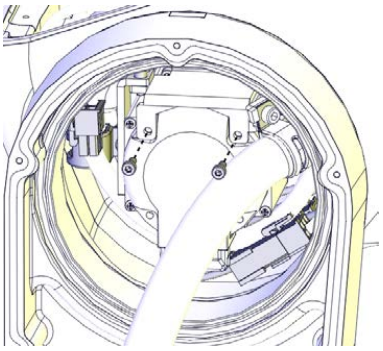
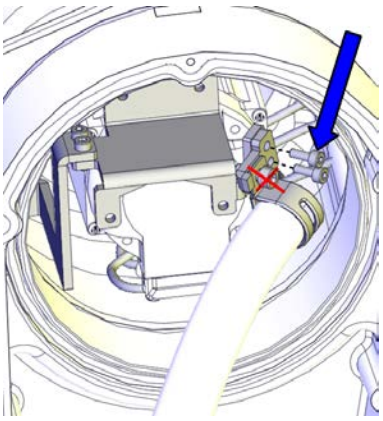
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

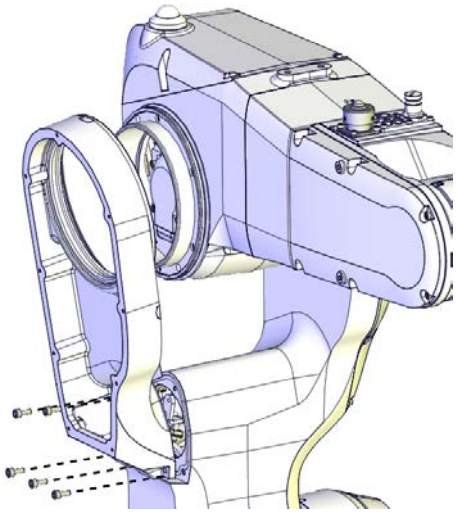
Continued

	Action	Note
3	Remove the screw that fastens the air hose holder.	 xx1300002422
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
5	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
6	Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002424
7	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Cut the cable straps at the bottom of the housing.	

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Removing the lower arm cable housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull the cable harness out from the upper arm housing.	
4	Remove the cable housing of the lower arm by removing the screws.	 xx1300002529

Removing the axis-3 radial sealing

Use this procedure if the axis-3 radial sealing is to be removed.

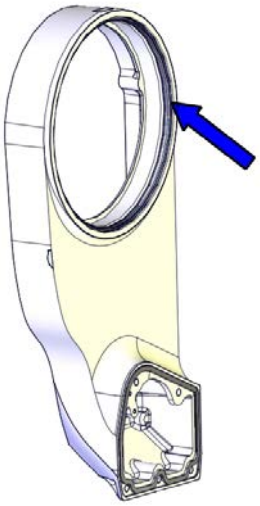
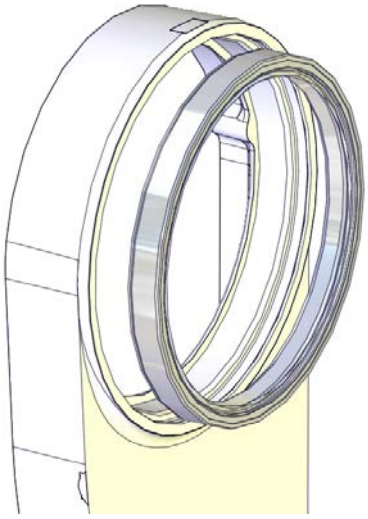
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

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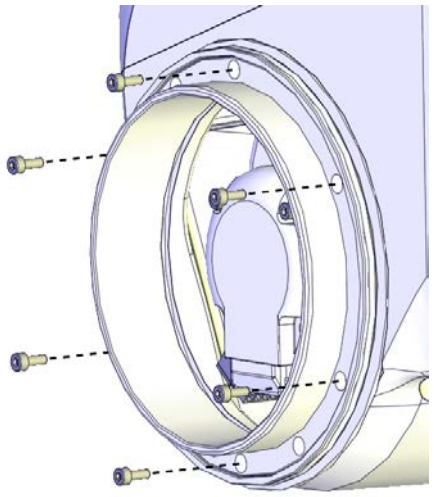
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove the M2 variseal sealing.	 xx1400000473
4	Remove the axis-3 radial sealing.	 xx1400000334

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Removing the axis-3 sealing ring

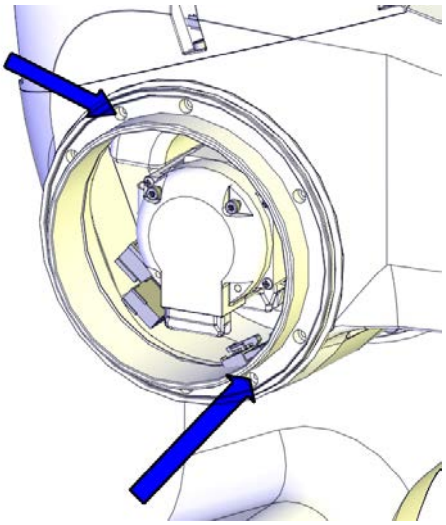
Use this procedure if the axis-3 sealing ring is to be removed.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the screws.	 xx1400000332

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
4	Use screws in the two press out holes to press the sealing ring out.	 xx1400000333

Refitting the sealings

Use these procedures to refit the axis-3 radial sealing and/or axis-3 sealing ring.

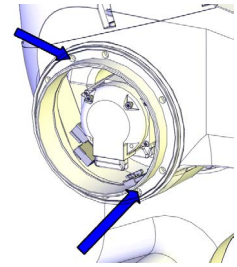
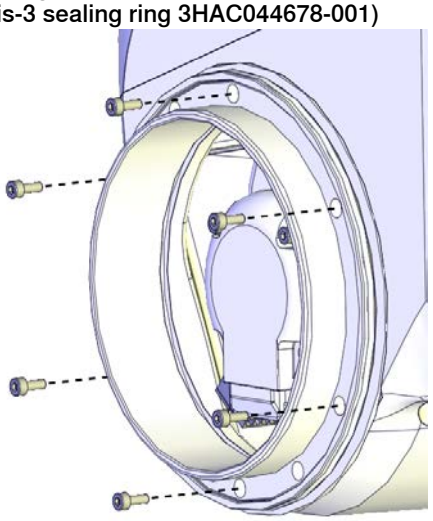
Refitting the axis-3 sealing ring

Use this procedure if the axis-3 sealing ring needs to be refitted.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the sealing ring.	

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	Action	Note
3	Refit the axis-3 sealing ring by securing the screws. **Note** Make sure to use the correct screw holes. The two holes shown in the figure are only used for pressing out the ring during removal.  xx1400000333	Tightening torque: 0.5 Nm (for Axis-3 sealing ring 3HAC086038-001) / 1.5 Nm (for Axis-3 sealing ring 3HAC044678-001)  xx1400000332

Refitting the axis-3 radial sealing

Use this procedure if the axis-3 radial sealing needs to be refitted.

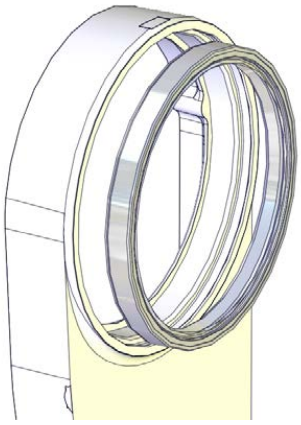
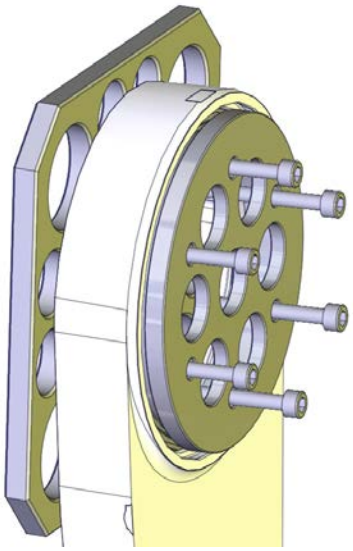
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	

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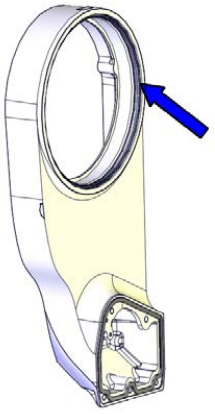
4.4.4 Replacing the axis-3 radial sealing and sealing ring

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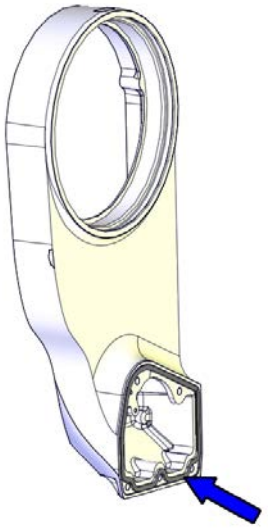
	Action	Note
3	Fit the axis-3 radial sealing to the cable housing.	Radial sealing: 3HAC024865-001  xx1400000334
4	Put the assembly tool on both sides of the cable housing, circular part against the sealing, and then slowly press the sealing into the housing by screwing the six screws (M6X50) into the plate little by little. Fit the circular part of the radial sealing fitting tool against the radial sealing.	Axis-3 sealing assembly tool set: 3HAC049697-001  xx1400000335
5	Fit the tool plate to the other side of the cable housing with the six screws M6X50.	
6	Screw the screws, little by little, to press the sealing into place.	
7	Remove the assembly tool.	

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	Action	Note
8	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Fit a new M2 variseal sealing.	M2 variseal sealing: 3HAC044641-006  xx1400000473
9	Check that the sealings are undamaged and properly fitted.	

Refitting the lower arm cable housing

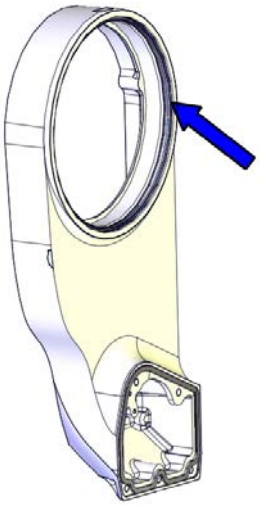
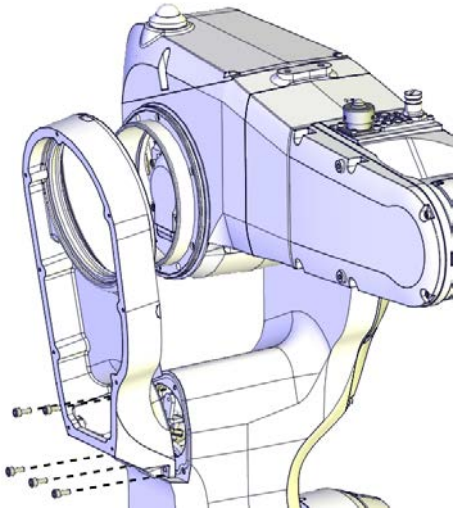
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the cable housing gasket. Replace if damaged.	Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)  xx1400000414

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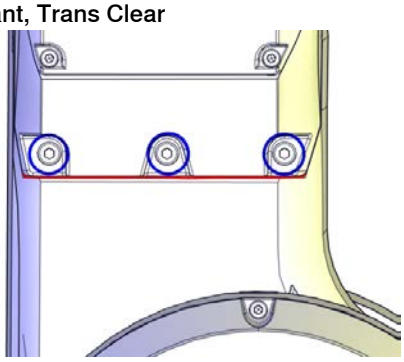
4.4.4 Replacing the axis-3 radial sealing and sealing ring

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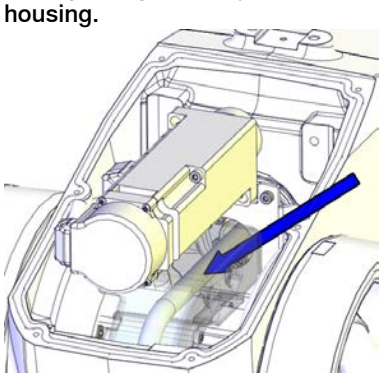
	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing and the M2 variseal sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing: 3HAC024865-001 M2 variseal sealing: 3HAC044641-006  xx1400000473 Replacement of the radial sealing is detailed in previous section.
4	Refit the cable housing of the lower arm.	Tightening torque: 4 Nm.  xx1300002529

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	Action	Note
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the cable housing of the lower arm. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. **Note** No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000218

Refitting the cable package in the housing

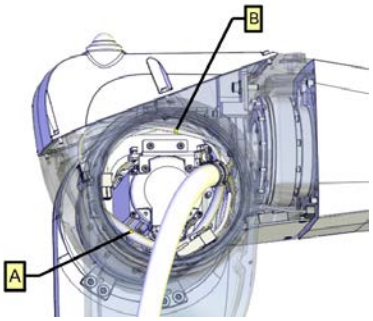
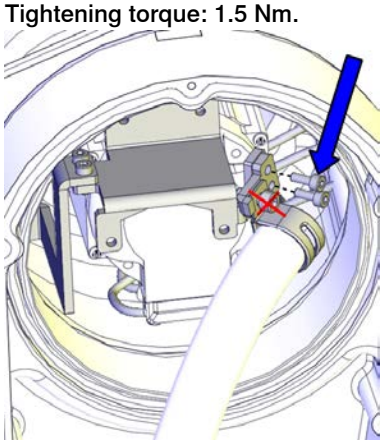
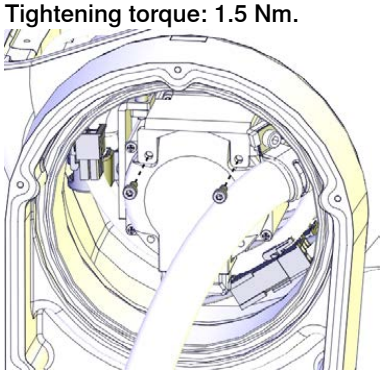
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	Area to be lubricated, shown in cable package already fitted to the housing.  xx1400000483

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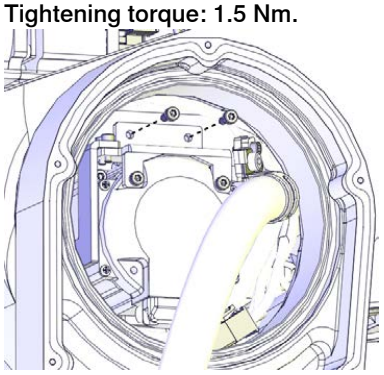
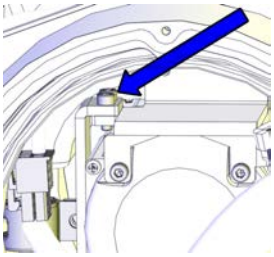
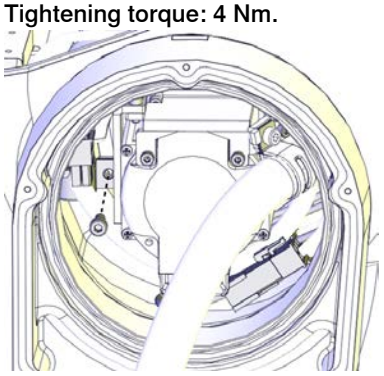
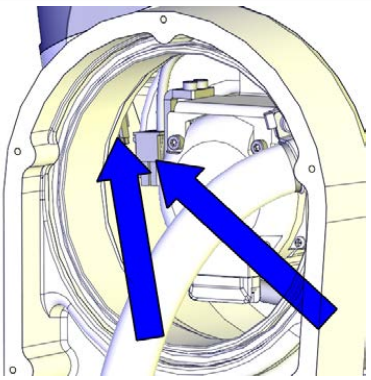
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
3	Guide the cable package into the upper arm, through the housing. **Note** Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor. **Note** The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.	 xx1400001472
4	Refit the bracket to the sheet with two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002424
5	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423

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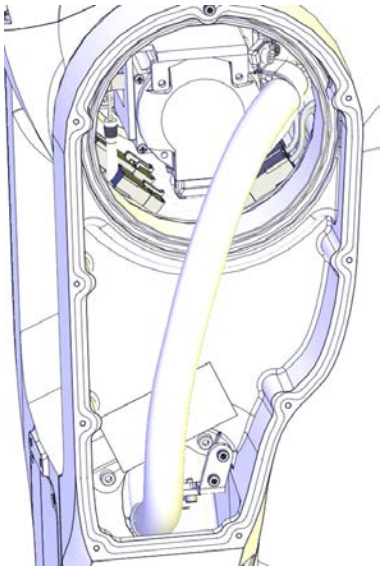
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
7	Fit the air hose holder to the bracket. Replace the holder, if damaged. **Tip** If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.  xx1400001133	Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.  xx1300002422
8	Reconnect the axis-3 motor connectors.	 xx1300002420

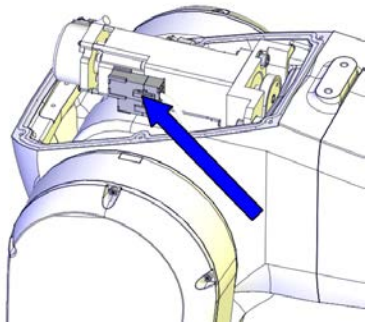
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4.4.4 Replacing the axis-3 radial sealing and sealing ring
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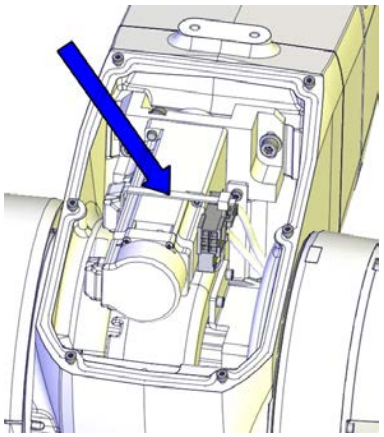
	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 xx1400000754
10	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

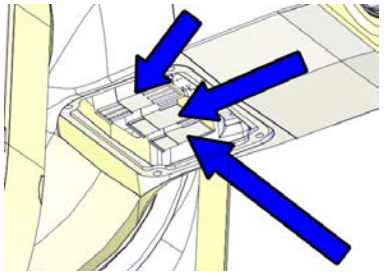
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

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	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

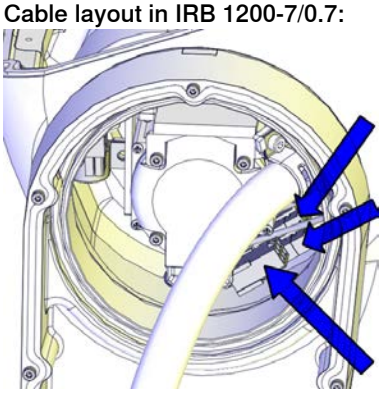
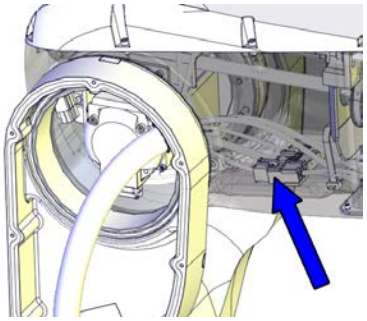
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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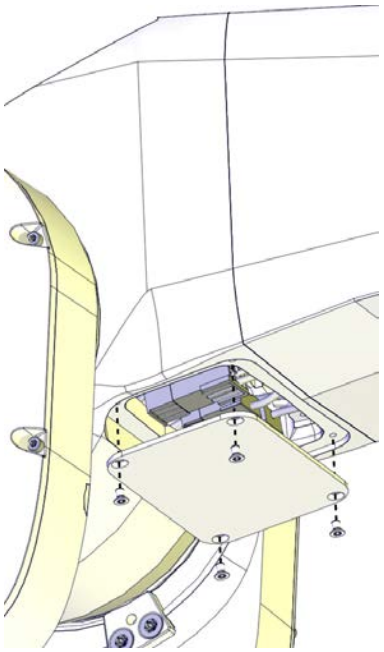
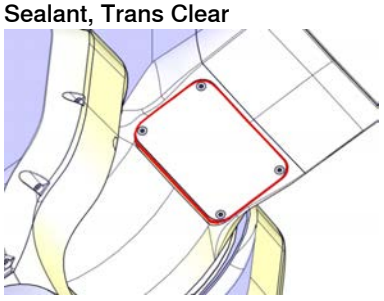
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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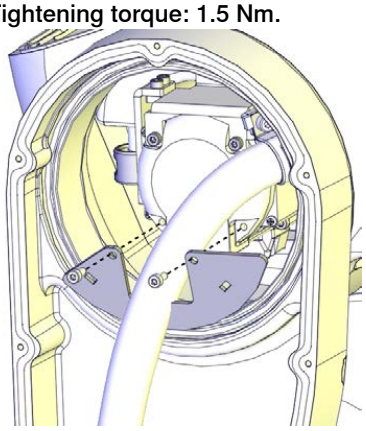
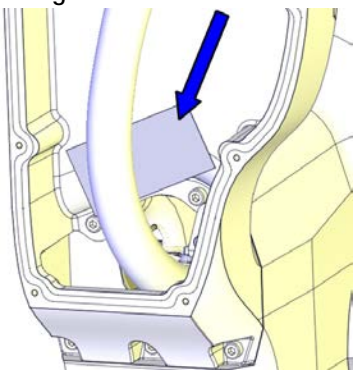
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	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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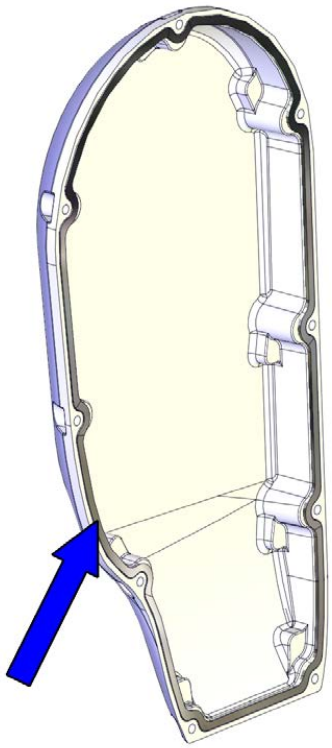
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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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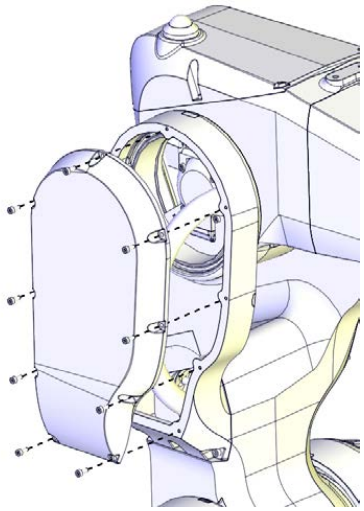
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	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

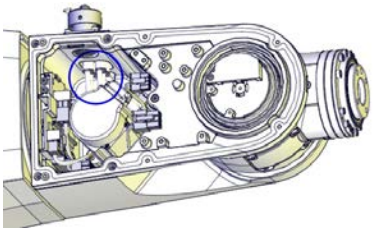
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

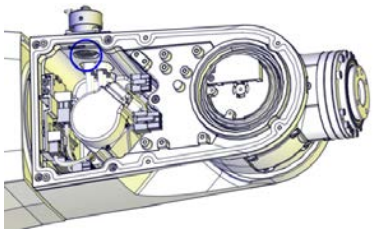
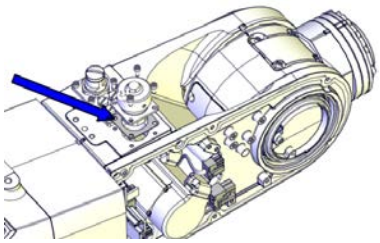
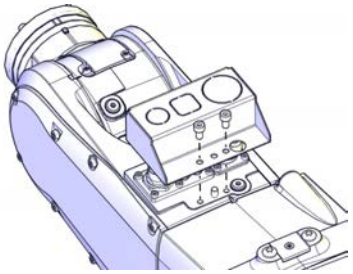
Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738

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	Action	Note
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

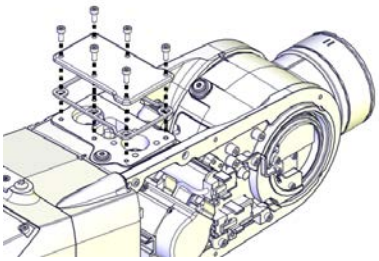
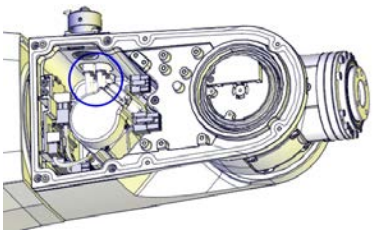
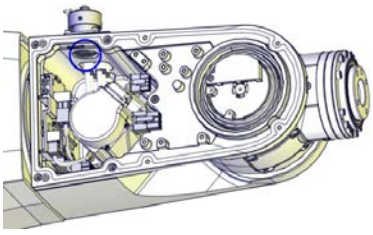
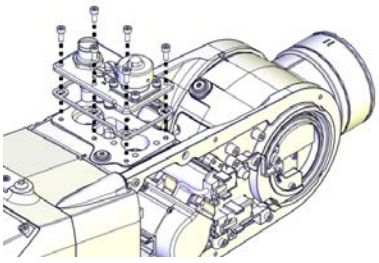
Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
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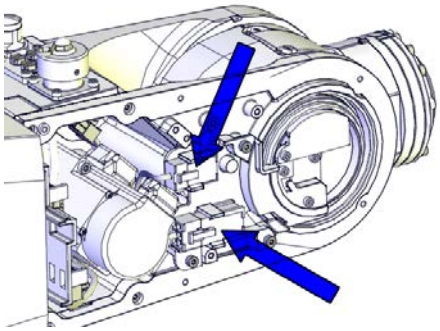
	Action	Note
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

Connecting the axis-5 motor FPC connectors

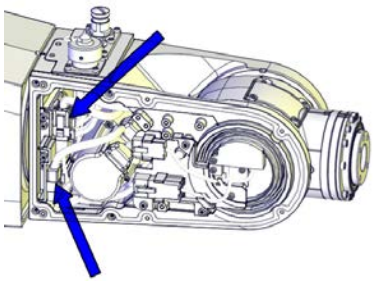
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the tubular cable housing cover

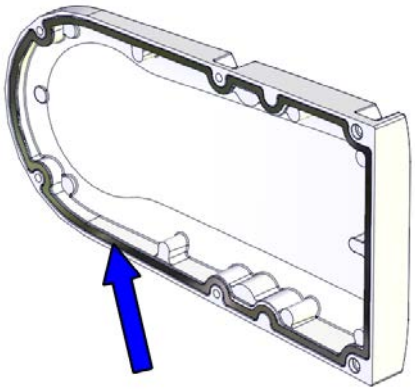
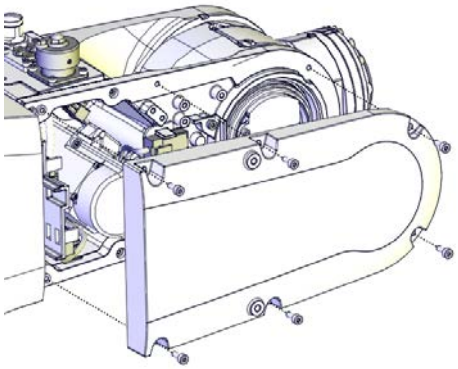
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

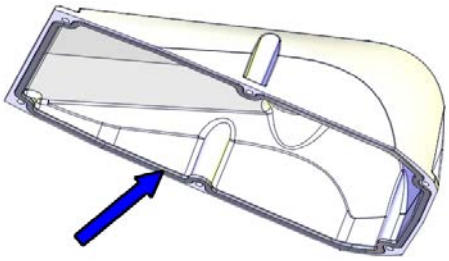
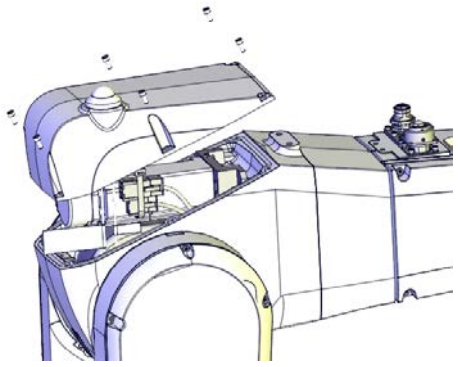
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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001  xx1400000345
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
4	Refit the cover to the cable housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002389 **Note** Only use specified screws, never replace them with other screws.

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Concluding procedure

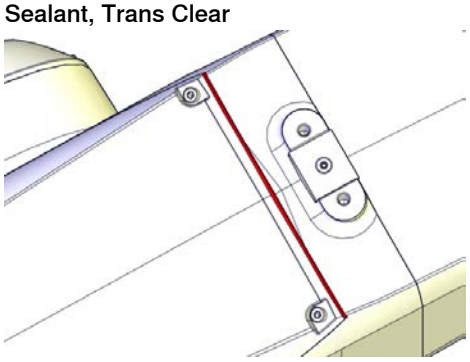
	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws. **CAUTION** **For robots with safety lamp (option)** Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

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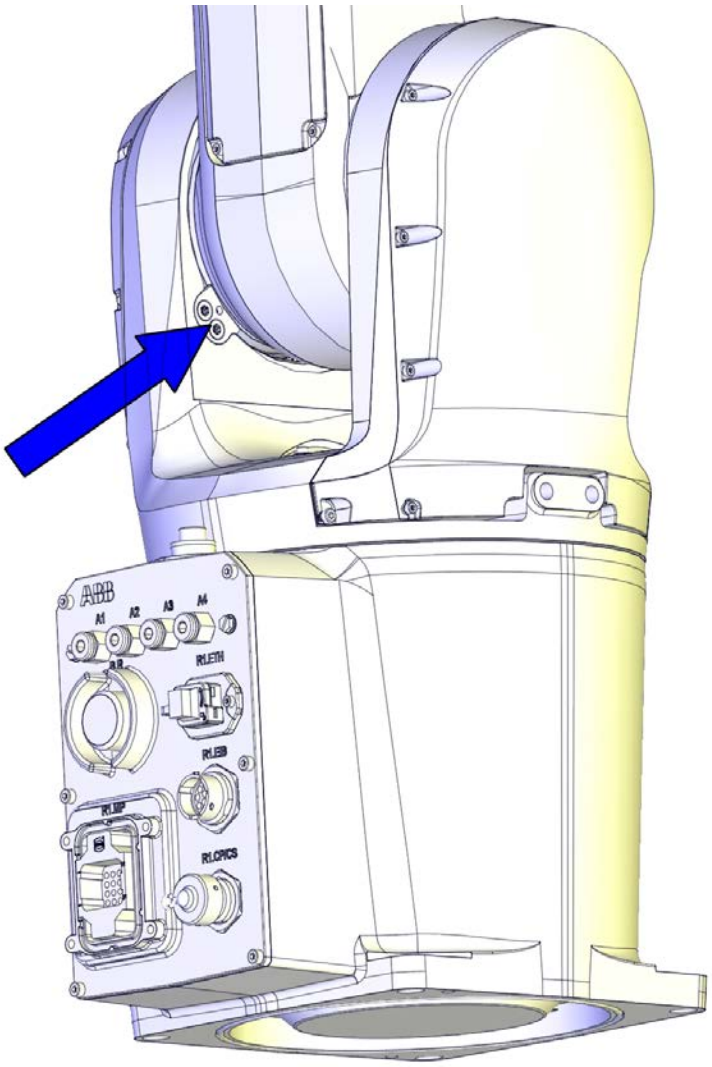
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.4.5 Replacing the axis-2 mechanical stop

Location of the mechanical stop

The axis-2 mechanical stop is located as shown in the figure.



xx1400000389

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Mechanical stop set, axis 2	3HAC049637-001	Includes mechanical stop pin (1 pc) and screws.

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4.4.5 Replacing the axis-2 mechanical stop

Continued

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

Replacing the mechanical stop

Use these procedures to remove the axis-2 mechanical stop.

Preparations before removing the mechanical stop

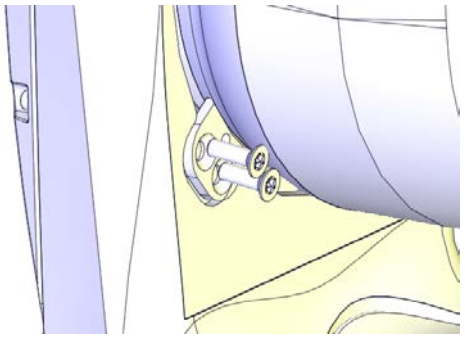
	Action	Note
1	Jog the robot to a position where the mechanical stop is most easily accessed.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Replacing the axis-2 mechanical stop

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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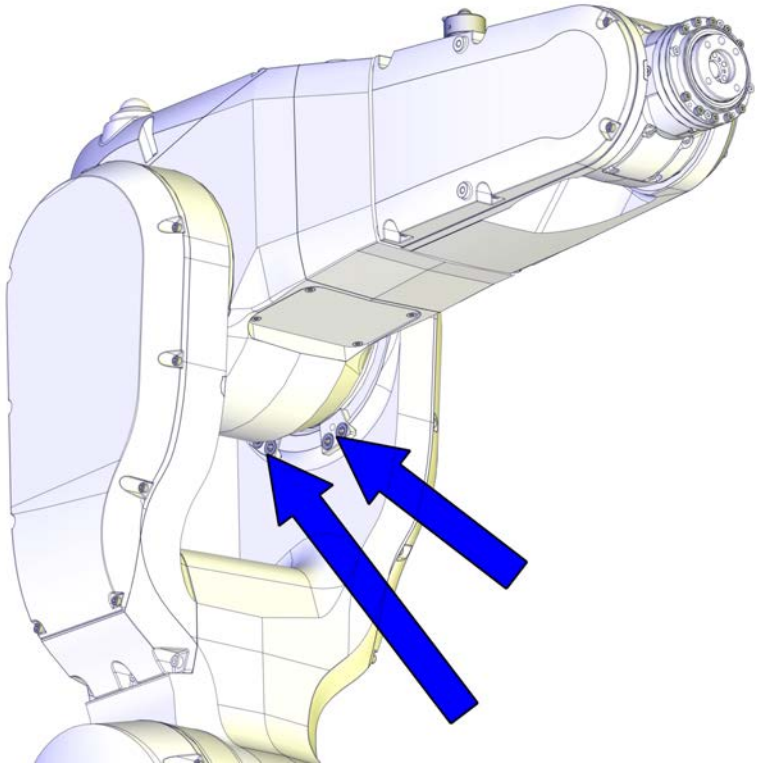
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the mechanical stop by removing the screws.	 xx1400000390 Screws: 9ADA624-45 (M5x16). Tightening torque: 4 Nm. **Note** Only use specified screws, never replace them with other screws.
4	Discard the old screws.	
5	Refit and secure the new stop with the enclosed screws.	
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.4.6 Replacing the axis-3 mechanical stop

Location of the mechanical stop

The axis-3 mechanical stop is located as shown in the figure.



xx1400000386

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Mechanical stop set, axis 3	3HAC049644-001	Includes mechanical stop pin (1 pc) and screws.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

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Replacing the mechanical stop

Use these procedures to replace the axis-3 mechanical stop.

Preparations before removing the mechanical stop

	Action	Note
1	Jog the robot to a position where the mechanical stops are most easily accessed.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Replacing the axis-3 mechanical stop

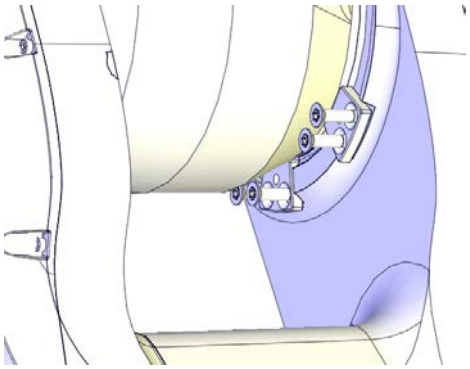
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.6 Replacing the axis-3 mechanical stop

Continued

	Action	Note
3	Remove the mechanical stop to be replaced by removing the screws.	 xx1400000387 Screws: 9ADA624-45 (M5x16). Tightening torque: 4 Nm **Note** Only use specified screws, never replace them with other screws.
4	Discard the old screws.	
5	Refit and secure the new stop with the enclosed screws.	
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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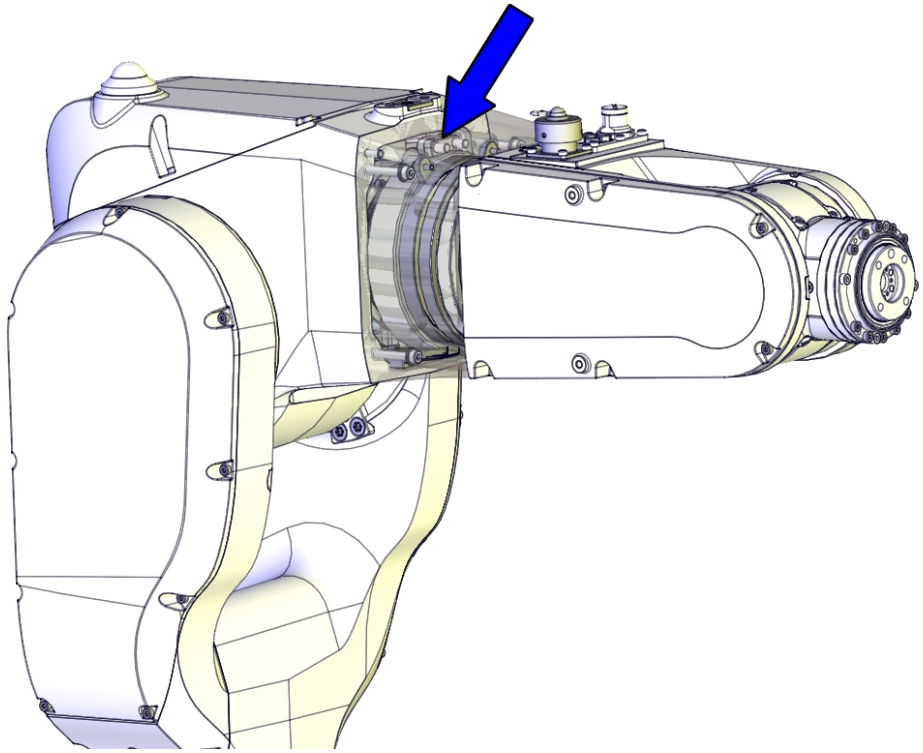
4.4.7 Replacing the axis-4 mechanical stop

WARNING

The mechanical stop needs to be inspected immediately if it gets hit. Replace the mechanical stop if damage is detected. Access to and inspection of the stop requires disassembly of the robot according to this section.

Location of the mechanical stop

The axis-4 mechanical stop is located inside the housing extender unit, as shown in the figure.



xx1300002416

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Mechanical stop set	3HAC049652-001	Includes mechanical stop pin, guide, slider and screws.

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4.4.7 Replacing the axis-4 mechanical stop
Continued

Spare part	Article number	Note
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
PTFE film on lower arm cable housing	3HAC044710-001	Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.

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Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 Used with protection class IP67 Used with protection type Foundry Plus
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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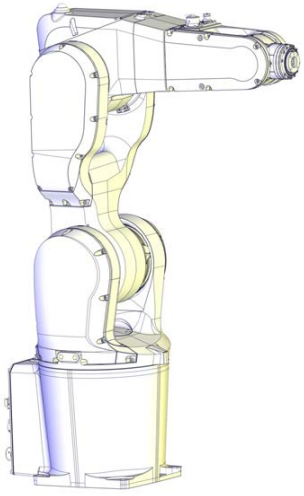
4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the mechanical stop

Use these procedures to remove the mechanical stop.

Preparations before removing the axis-4 mechanical stop

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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	Action	Note
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

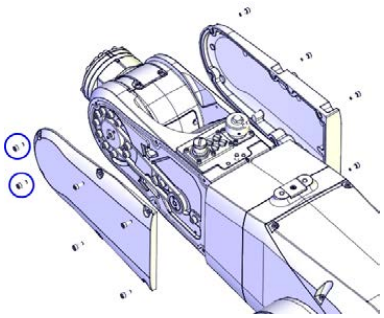
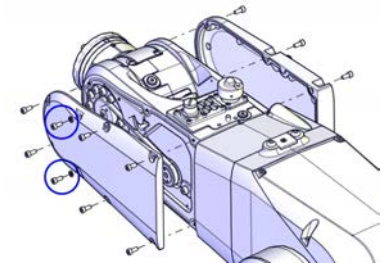
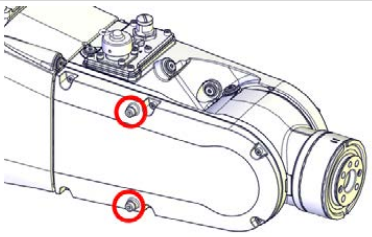
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.7 Replacing the axis-4 mechanical stop

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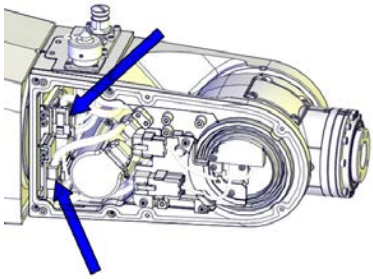
	Action	Note
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

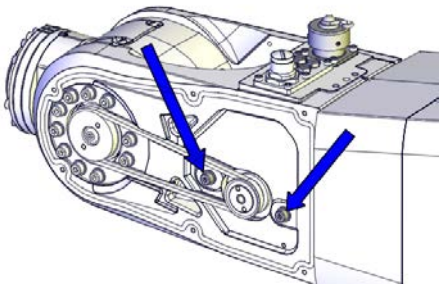
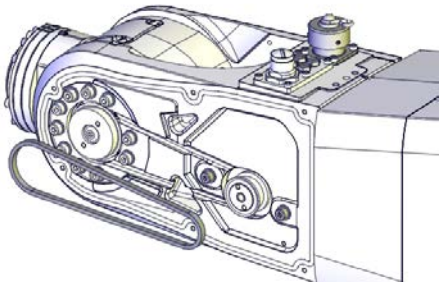
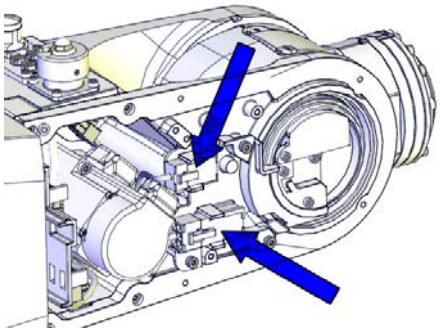
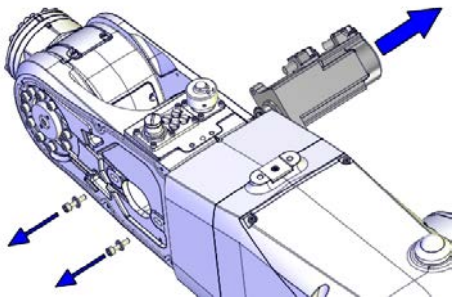
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.4.7 Replacing the axis-4 mechanical stop

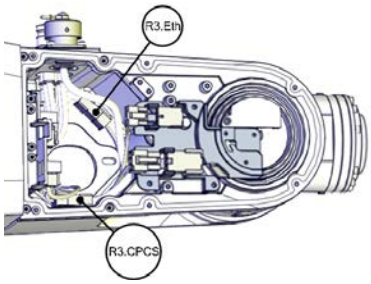
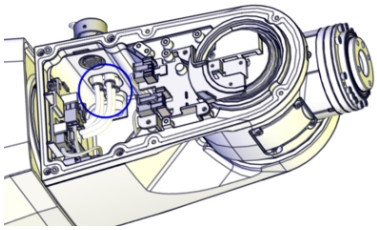
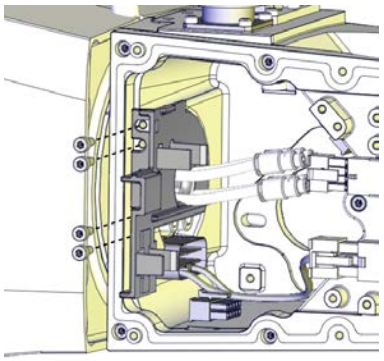
Continued

	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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Removing the wrist

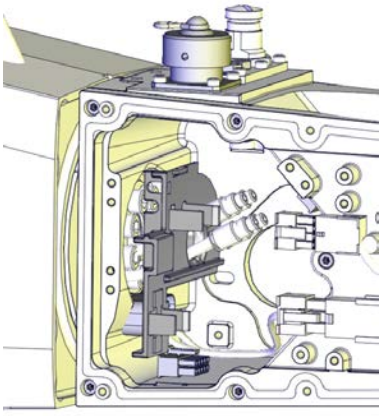
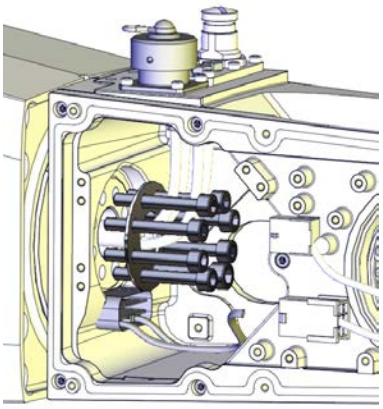
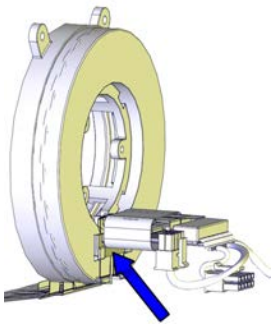
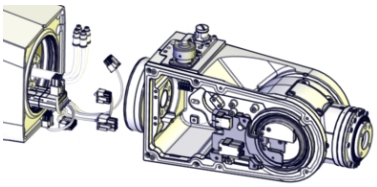
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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4.4.7 Replacing the axis-4 mechanical stop

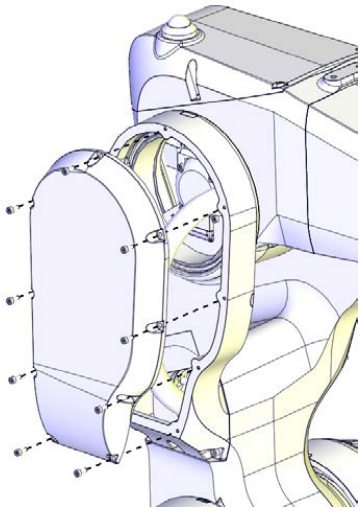
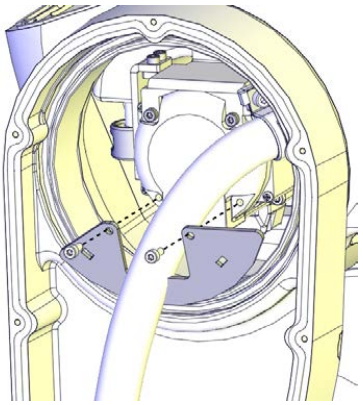
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	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 xx1300002357
7	Support the weight of the wrist and remove the screws and the washer.	 xx1300002358
8	Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359

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Disconnecting the axis-4 FPC connectors

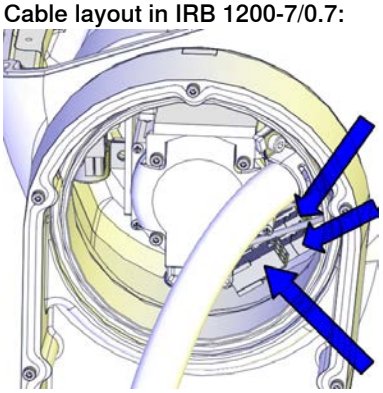
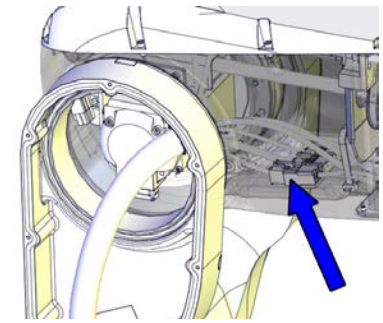
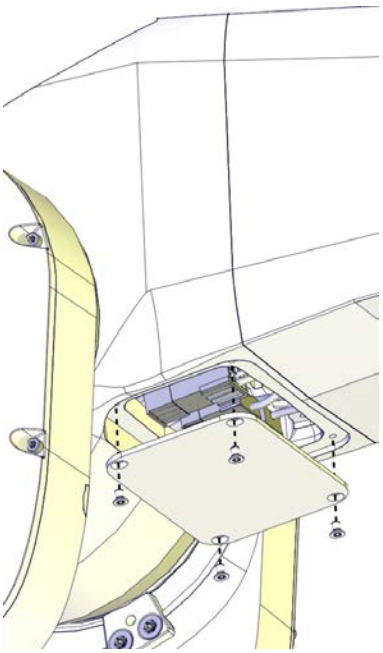
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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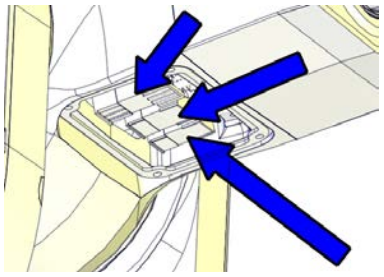
4.4.7 Replacing the axis-4 mechanical stop

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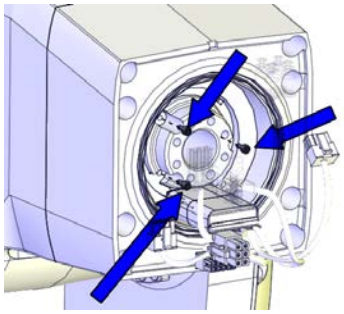
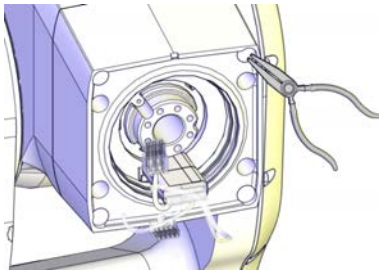
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
6	Remove the small cover of the housing.	 xx1300002398

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	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

Removing the housing extender unit

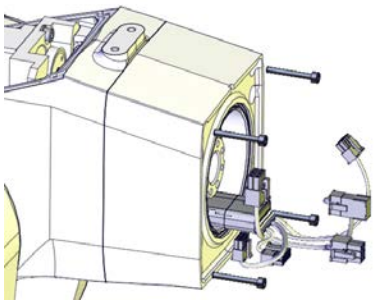
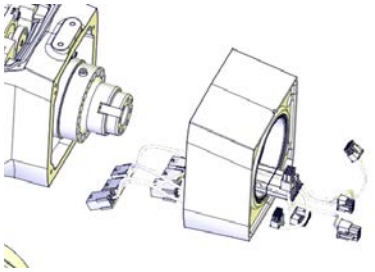
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the axis-4 FPC unit screws.	 xx1300002373
4	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the plugs covering the extender unit screws with a needle-nose plier.	 xx1600000262

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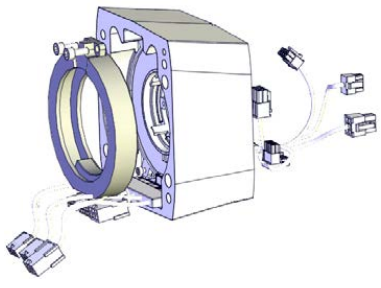
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4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
5	Remove the extender unit screws.	 xx1300002372
6	Remove the housing extender unit. Be careful not to damage the cabling.	 xx1300002374

Removing the axis-4 mechanical stop

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the mechanical stop assembly from the housing extender unit by removing the screws.	 xx1300002415

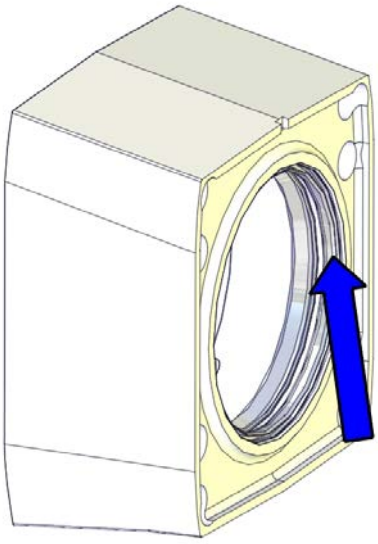
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Refitting the mechanical stop

Use these procedures to refit the mechanical stop.

Checking the housing extender sealings

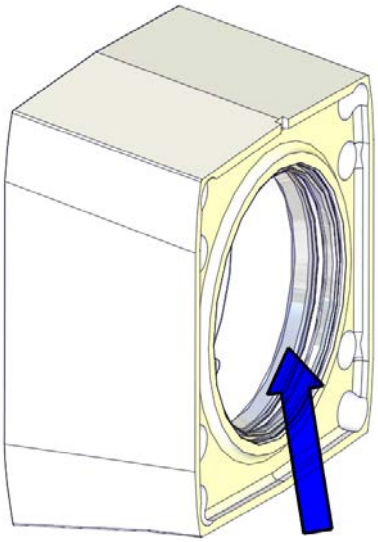
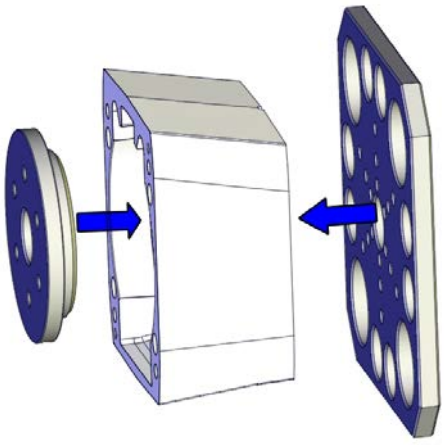
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-007  xx1300002418

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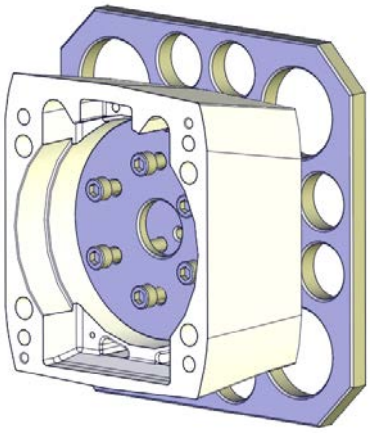
4.4.7 Replacing the axis-4 mechanical stop

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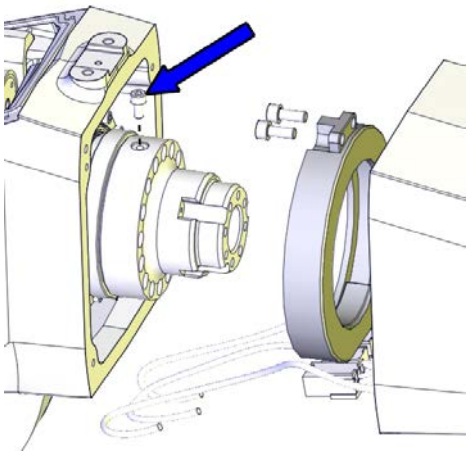
	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged, as described below. In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.	Radial sealing with dust lip: 3HAB3701-48  xx1400000438
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the housing extender unit.	
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 xx1400000436

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	Action	Note
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000437
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Refitting the axis-4 mechanical stop

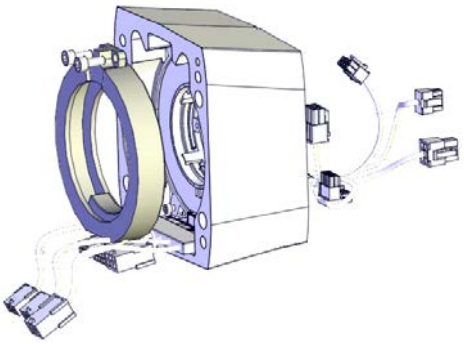
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Fit the mechanical stop screw to the axis-4 shaft.	Screws: 3HAB3409-231 (M4x8). Tightening torque: 4 Nm.  xx1400000393

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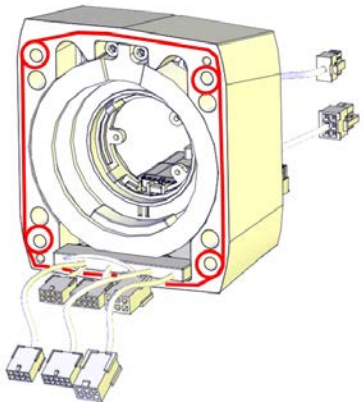
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4.4.7 Replacing the axis-4 mechanical stop

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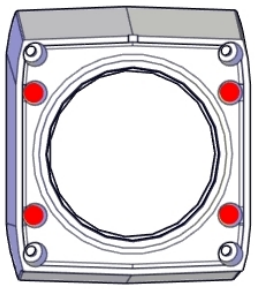
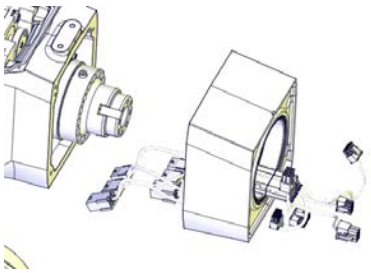
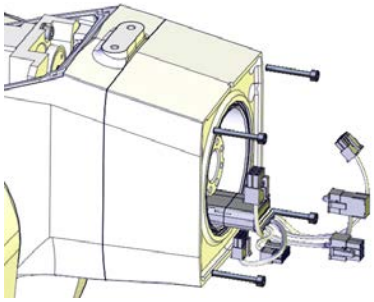
	Action	Note
3	Fit the mechanical stop assembly to the housing extender unit and secure with screws.	Screws: 3HAB3409-216 (M5x12). Tightening torque: 4 Nm.  xx1300002415 **Note** Only use specified screws, never replace them with other screws.

Refitting the housing extender unit

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.	 xx1300002613

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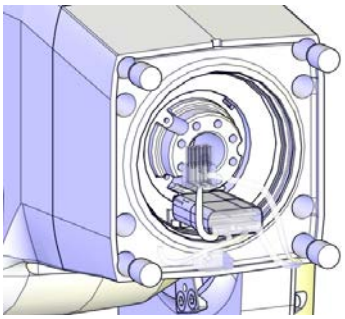
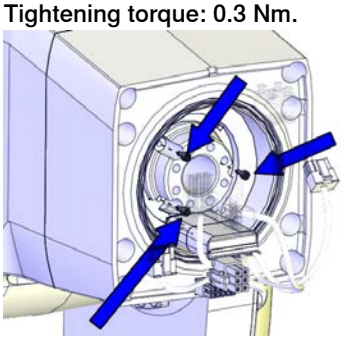
	Action	Note
3	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.	 xx1600000216
4	Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling. **CAUTION** Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit. **Note** Mate the unit to the two locating pins attached to the housing.	 xx1300002374
5	Secure with screws and washers, using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: M4x30. Tightening torque: 2.7 Nm.  xx1300002372

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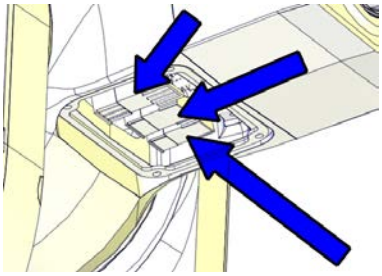
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4.4.7 Replacing the axis-4 mechanical stop

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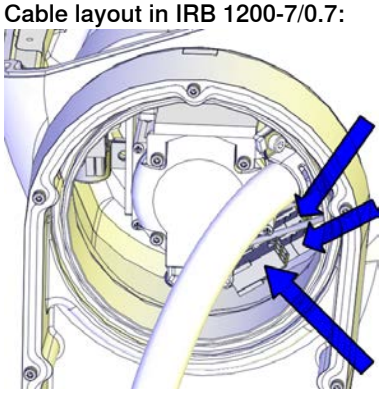
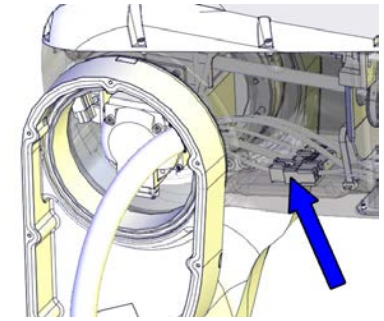
	Action	Note
6	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Press in screw sealing plugs to cover the screws.	Screw sealing plug: 3HAC053685-001  xx1600000263
7	Fit and secure the axis-4 FPC unit screws.	Tightening torque: 0.3 Nm.  xx1300002373

Connecting the axis-4 FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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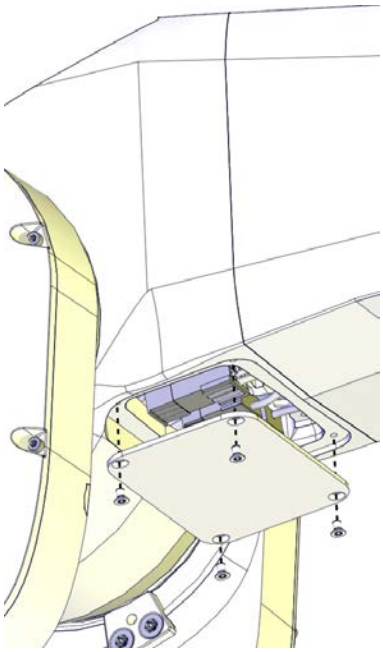
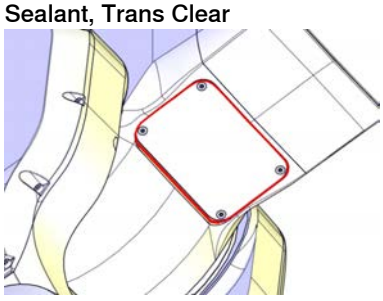
	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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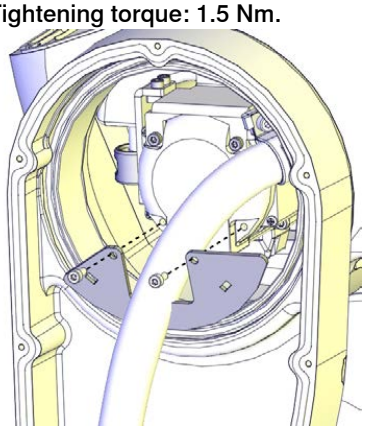
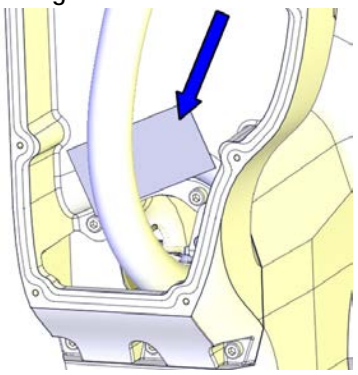
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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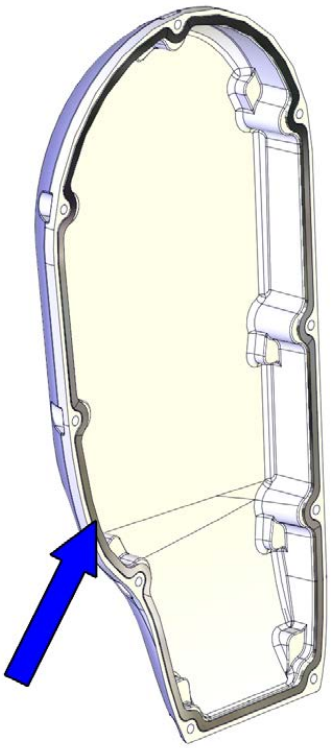
	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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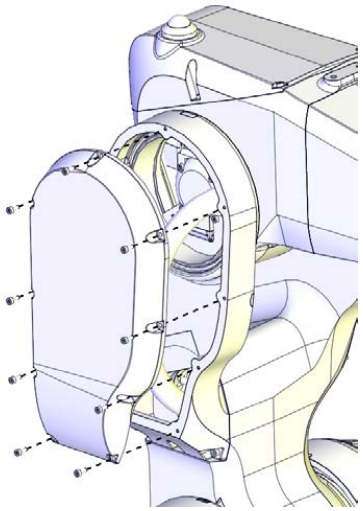
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Refitting the wrist

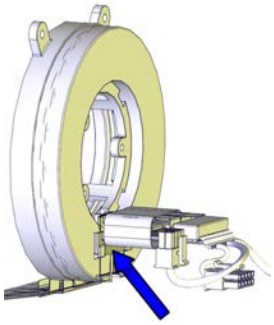
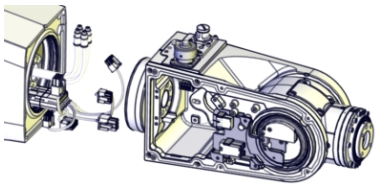
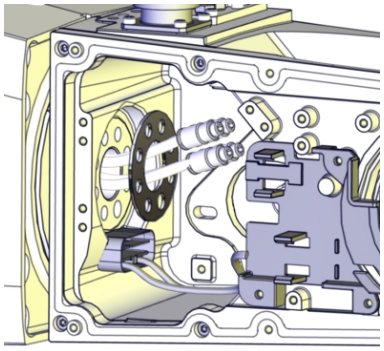
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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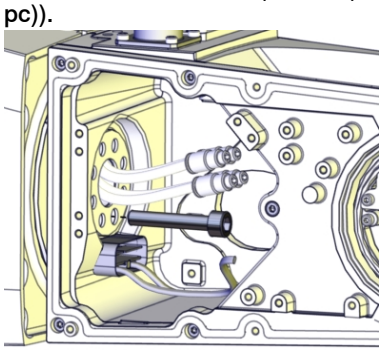
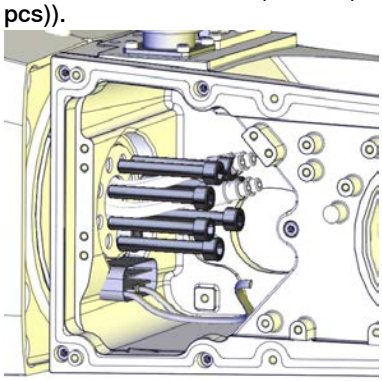
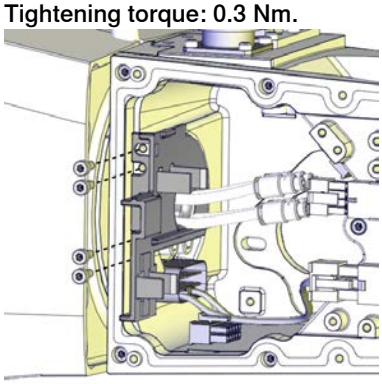
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
2	Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359
3	Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.	Washer: 3HAC044869-001  xx1400000001

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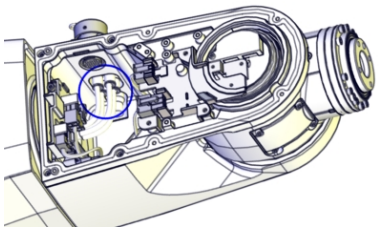
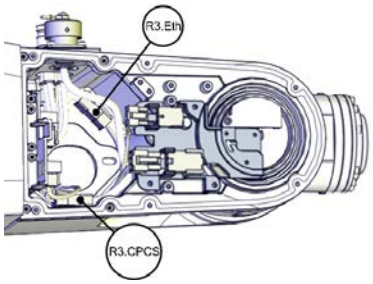
	Action	Note
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	Screw: 3HAB3409-238 (M6x35 (1 pc)).  xx1400000002 **Note** Only use specified screws, never replace them with other screws.
5	Refit the rest of the screws (M5x35 (7 pcs)).	Screw: 3HAB3409-237 (M5x35 (7 pcs)).  xx1400000003 **Note** Only use specified screws, never replace them with other screws.
6	Tighten all screws.	Tightening torque: 8 Nm.
7	Put the cables through the plate hole and refit the plate.	Tightening torque: 0.3 Nm.  xx1300002356

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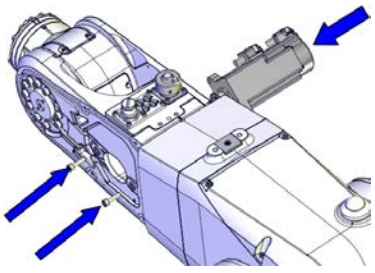
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4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
8	Reconnect the air hoses. **CAUTION** Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. • R3.Eth • R3.CPCS	 xx1300002353

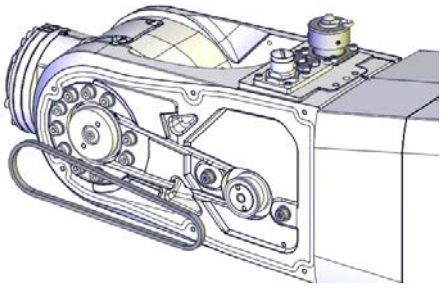
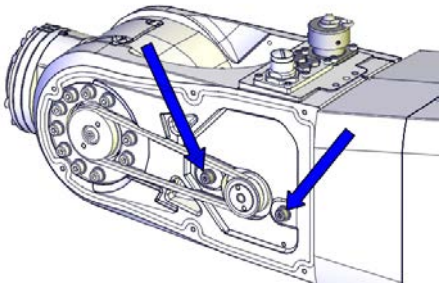
Preparations before securing the axis-5 motor

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463 **Note** Only use specified screws, never replace them with other screws.

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Securing the axis-5 motor and timing belt

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

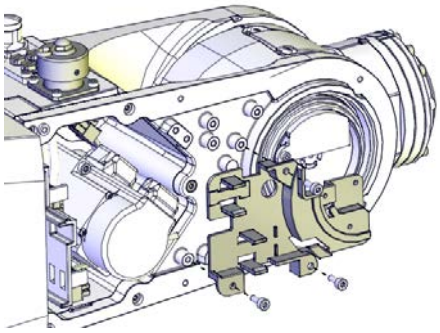
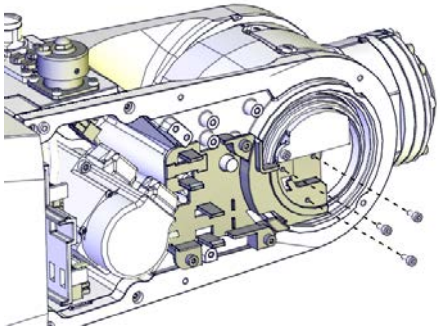
Refitting the connector plate

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

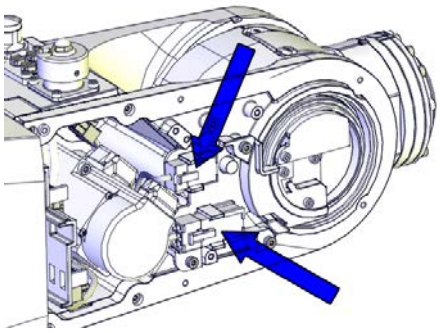
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4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

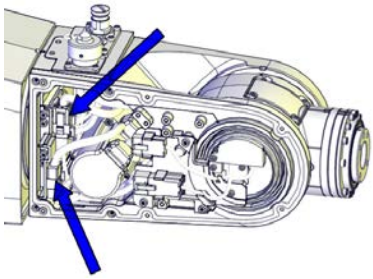
Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

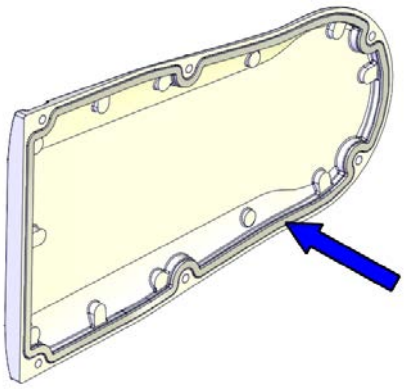
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Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the wrist covers

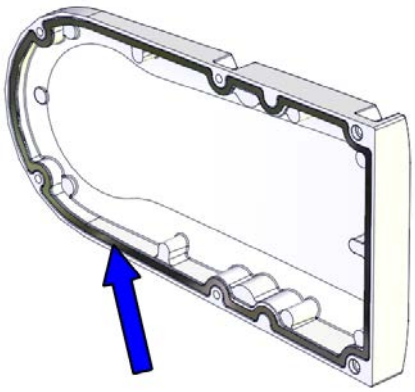
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034

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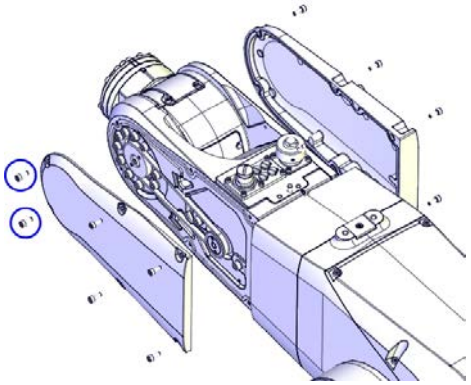
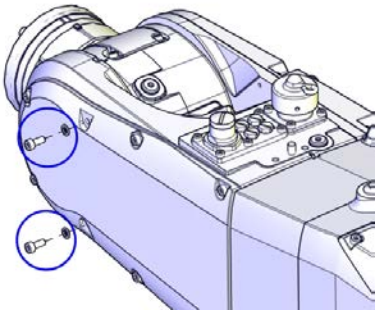
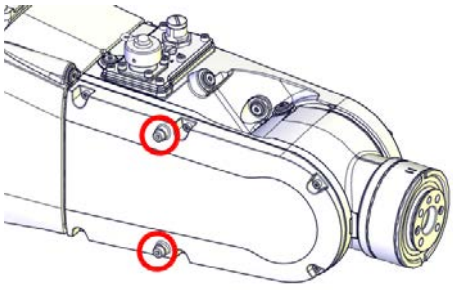
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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4.4.7 Replacing the axis-4 mechanical stop

Continued

Concluding procedure

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

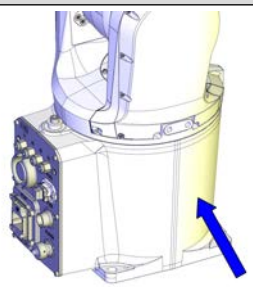
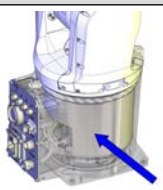
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4.5 Swing and base

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Location of the base spare parts

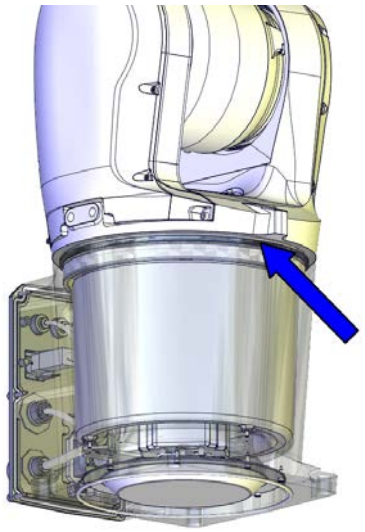
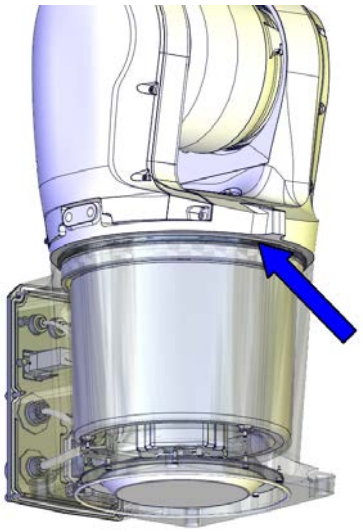
The base parts that are considered spare parts are located as shown in the figure.

Base	Base, SafeMove 2-supported	Radial sealing with dust lip	Cable protection sleeve inside base
 xx1400000396		 xx1400000269	 xx1400000395
3HAC059553-001 Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface. Incompatible with swing 3HAC049632-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*.	3HAC061270-001 Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.	3HAB3701-47 Not used with protection class IP40. Replace if damaged.	3HAC044690-001
3HAC059699-001 Used with protection type Clean Room.	3HAC061271-001 Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Clean Room.		
3HAC057906-001 Used for robots with food grade lubrication.	3HAC061272-001 Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used for robots with food grade lubrication.		

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

M2 variseal sealing	Sealing ring (not for IP40 robots) (IP40) / Sealing ring, gasket and V-ring (IP67)
 xx1400000471	 xx1400000471
3HAC044641-002 Used with protection class IP67. Used only on base 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. Replace if damaged.	Sealing ring (not for IP40 robots): 3HAC068107-001 (IP40)
	Sealing ring, gasket and V-ring: 3HAC059791-001 (IP67) Used with protection class IP67. Replace if damaged.

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Base	3HAC059553-001	Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface. Incompatible with swing 3HAC049632-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*.
Base, Clean Room	3HAC059699-001	Used with protection type Clean Room. Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.
Base, food grade lubrication	3HAC057906-001	Used for robots with food grade lubrication. Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.

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Spare part	Article number	Note
Base, SafeMove 2-supported	3HAC061270-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Base, Clean Room and SafeMove 2-supported	3HAC061271-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Clean Room. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Base, food grade lubrication and SafeMove 2-supported Base, Hygienic	3HAC061272-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used for robots with food grade lubrication. Used with protection type Hygienic. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Radial sealing with dust lip	3HAB3701-47	Not used with protection class IP40. Replace if damaged.
Axis-1 sealing ring gasket	3HAC045685-001	Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. Replace if damaged.
Axis-1 sealing ring gasket	3HAC058349-001 / 3HAC080707-001	Not used with protection class IP40. Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. Replace if damaged.
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001, 3HAC059554-001 and 3HAC082506-001. See *Spare part versions for the swing on IP40/IP67 robots on page 910*. Replace if damaged.
M2 variseal sealing	3HAC044641-002	Used with protection class IP67. Used only on base 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. Replace if damaged.

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

Spare part	Article number	Note
Sealing ring (not for IP40 robots)	3HAC068107-001	Not used with protection class IP40. Used only on base 3HAC059553-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. Replace if damaged.
Sealing ring, gasket and V-ring	3HAC059791-001	Used with protection class IP67. Replace if damaged.
Protection plug	3HAC051199-001	Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method). Replace if damaged.
Cable protection sleeve inside base	3HAC044690-001	
O-ring	3HAB3772-86	Not used with protection class IP40. Replace if damaged.
Gasket for rear base cover	3HAC058566-001 / 3HAC080710-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.

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Spare part	Article number	Note
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.
Cable bracket on swing	3HAC044925-001	

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Axis-1 sealing assembly tool set	3HAC049692-001	Used to refit the axis-1 radial sealing.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cable straps	-	
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

Equipment	Art. no.	Note
Grease	3HAC058065-001	Used for lubrication of radial sealing surface between base and swing. For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	12340011-116	Loctite 574 For robots with protection type Clean Room For robots with food grade lubrication
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

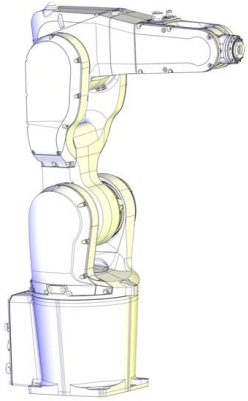
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Removing the cabling

Before the spare parts of the base can be removed, the cable harness must be removed from upper arm and down to the base. Use these procedures to remove the cabling in order to access the base spare parts.

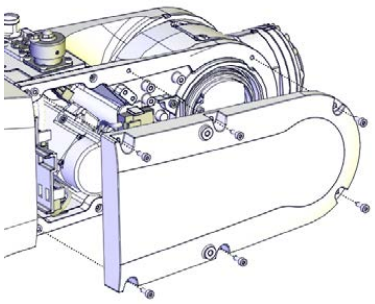
Preparations before removing the cabling

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

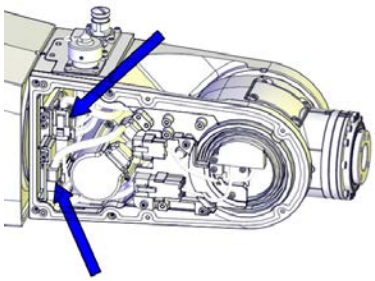
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
5	Remove the wrist cover.	 xx1300002389

Disconnecting the axis-5 motor connectors

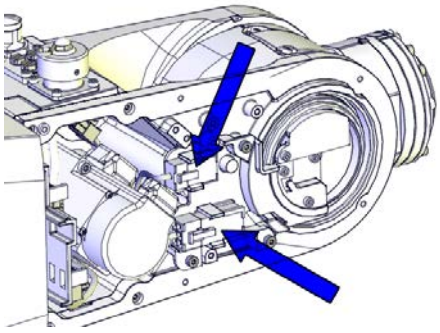
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Disconnecting the axis-5 FPC connectors

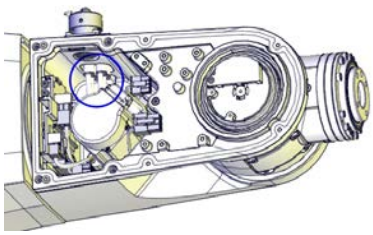
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

Disconnecting the air hoses and CP/CS cabling (if equipped)

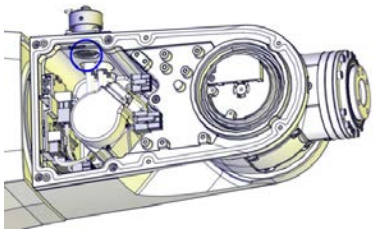
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the air hoses.	 xx1400000738

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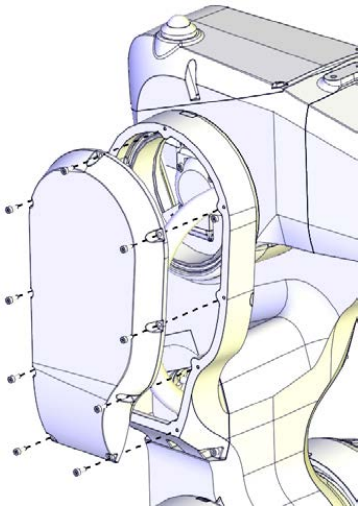
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

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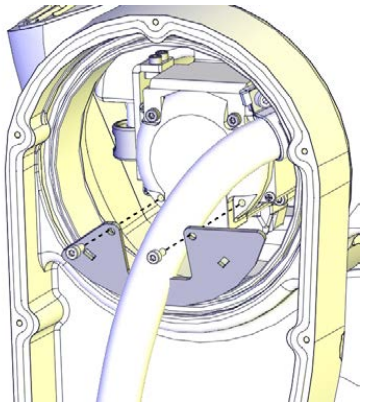
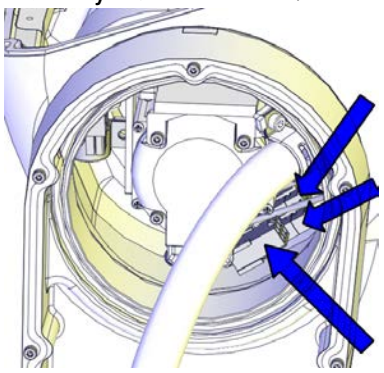
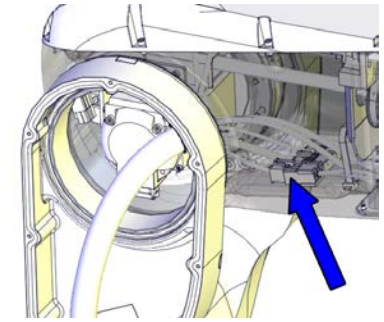
	Action	Note
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

Disconnecting the axis-4 FPC connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400

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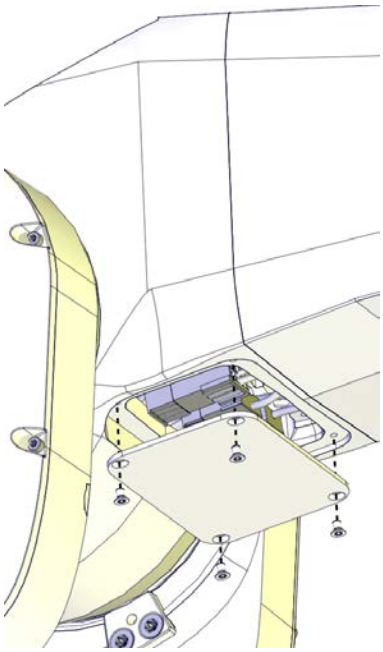
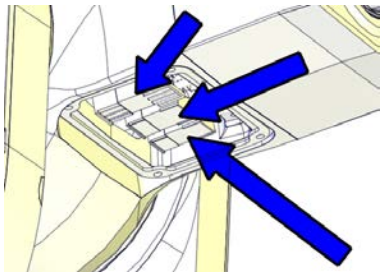
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	Action	Note
4	Remove the plate.	 xx1300002413
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
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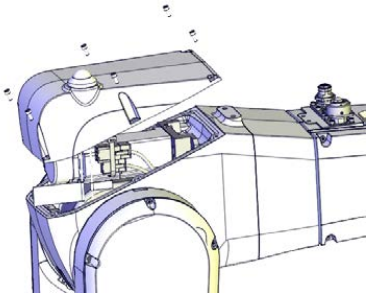
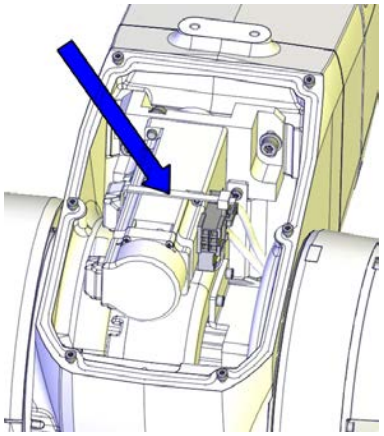
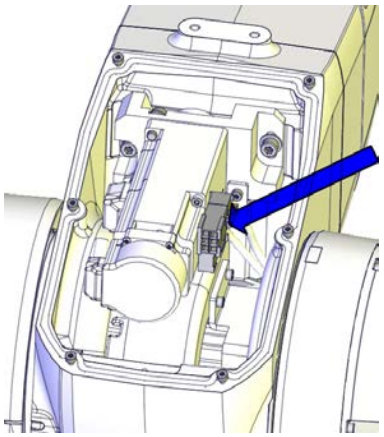
	Action	Note
6	Remove the small cover of the housing.	 xx1300002398
7	Disconnect the remaining FPC connectors.	 xx1300002399

Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

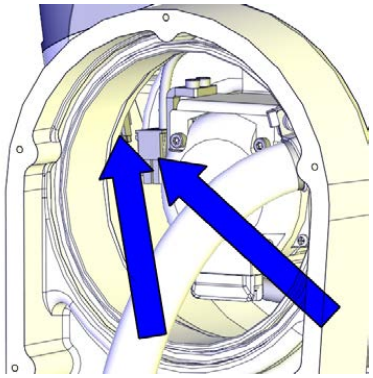
Disconnecting the axis-3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

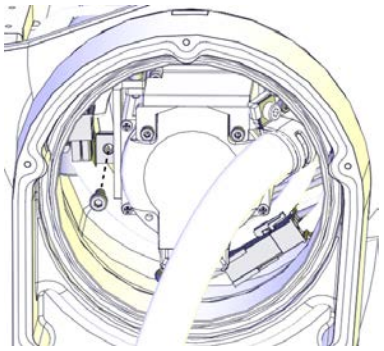
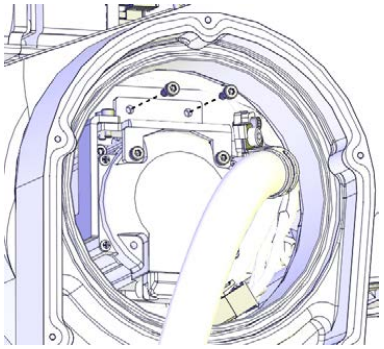
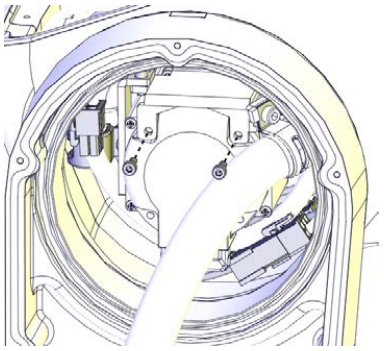
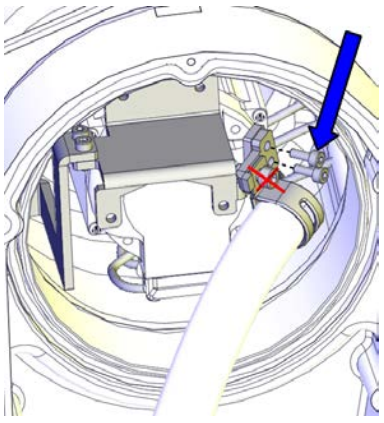
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Removing the cable package in the housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Remove the screw that fastens the air hose holder.	 xx1300002422
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
5	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
6	Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002424
7	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Cut the cable straps at the bottom of the housing.	

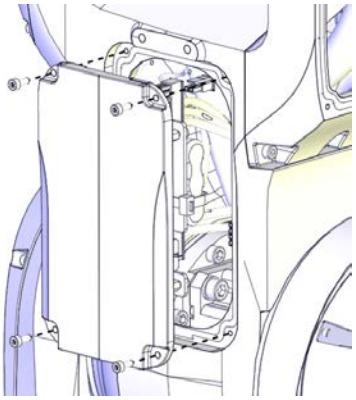
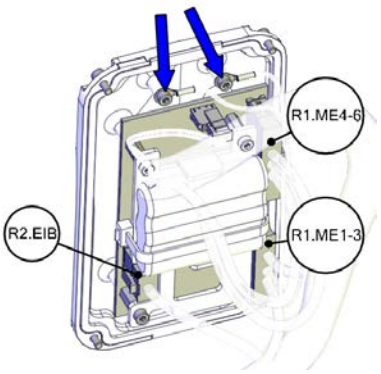
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

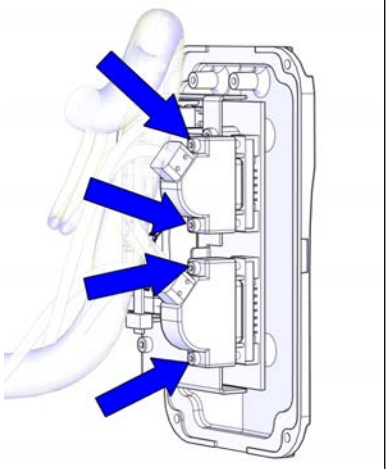
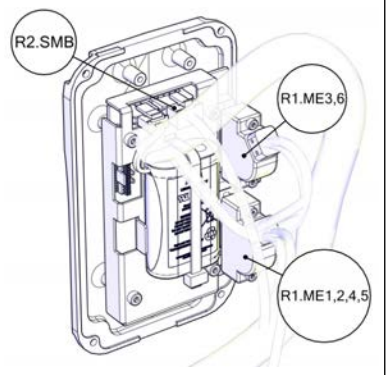
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Disconnecting the cabling in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 xx1300002428
6	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the lugs on the EIB/SMB cover.	

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	Action	Note
7	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004
8	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB Remove the EIB/SMB cover completely from the lower arm.	 xx1700000005

Removing the cable package in the lower arm

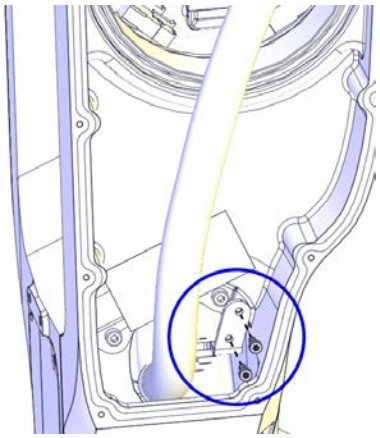
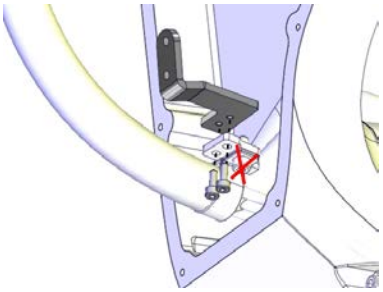
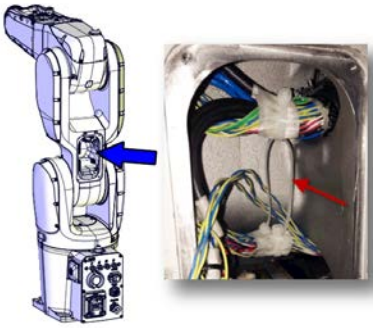
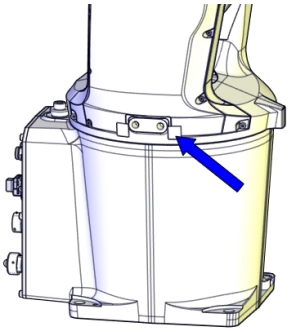
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull the cable package out from the upper arm housing.	

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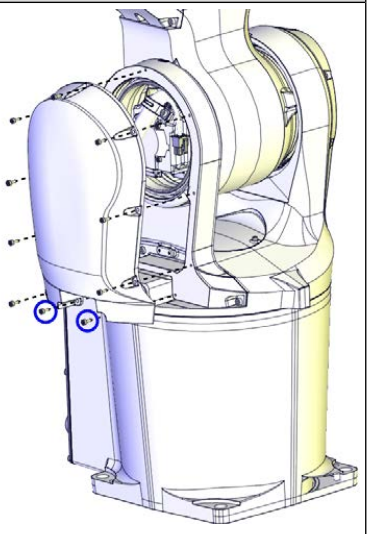
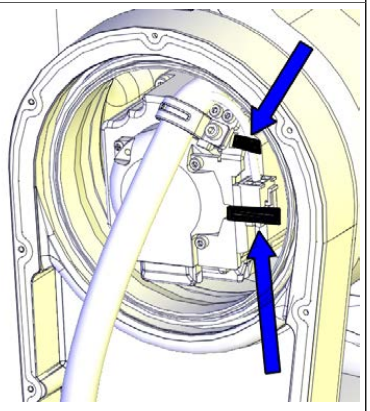
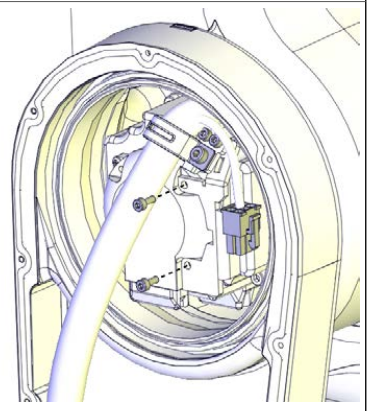
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 xx1300002426
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002430
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 xx1400001130
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the swing sealing plug. Follow the procedure specified in *Removing the swing sealing plug on page 182*.	 xx1600000205

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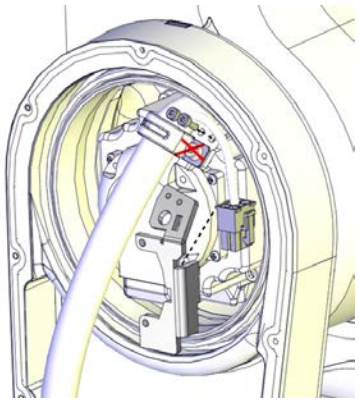
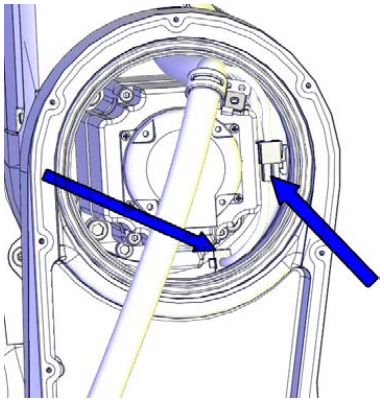
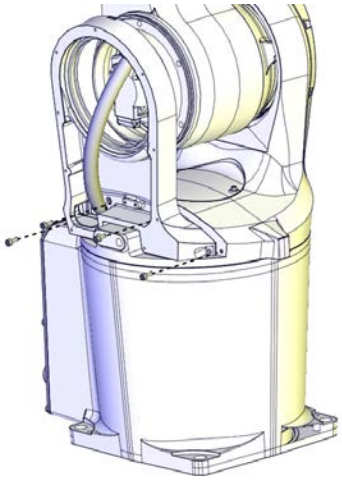
	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 xx1300002431
9	Cut the cable straps.	 xx1400001528
10	Remove the axis-2 motor bracket screws.	 xx1300002432

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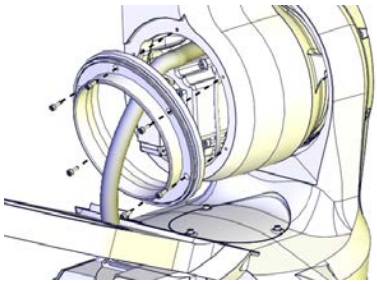
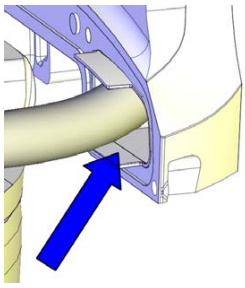
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
11	Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002433
12	Disconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
13	Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.	 xx1300002435

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	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx1400000020
15	Pull out the cable package from the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx1400000023

Putting the robot on its side

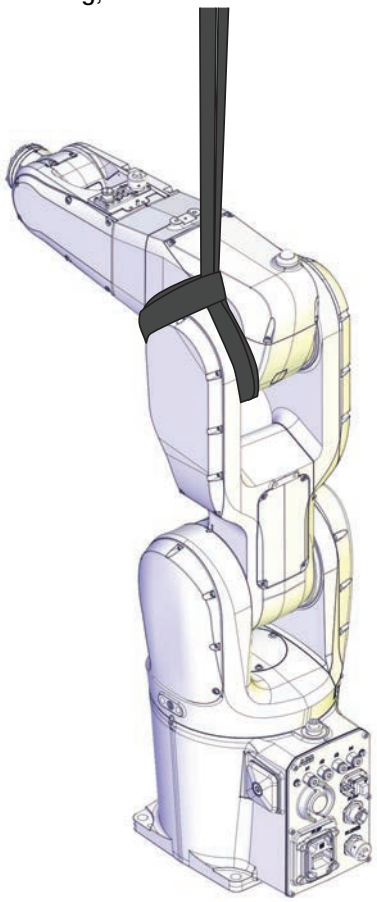
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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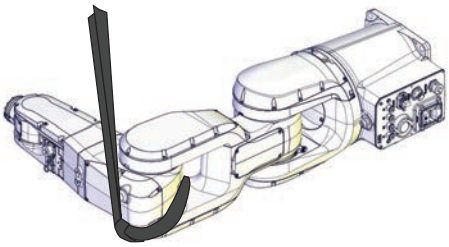
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
4	Run a roundsling between the housing and the lower arm. **CAUTION** Put the sling on the lower arm side and **not** on the cable arm side, which would damage the robot.	Roundsling, 2 m  xx1400000679
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	

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	Action	Note
6	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
7	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.	 xx1400000680

Separating the arm system from base

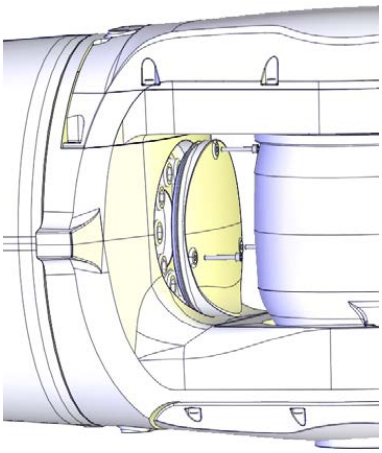
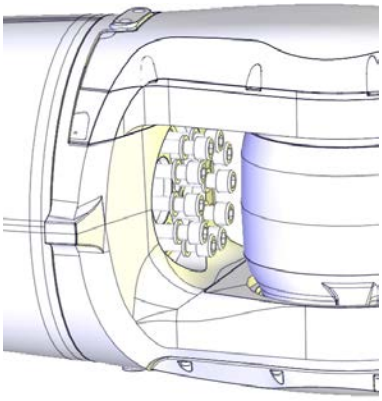
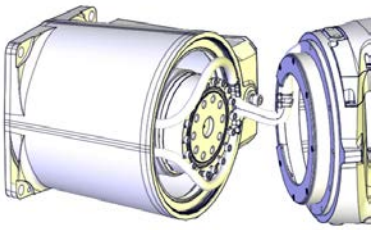
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Remove the swing top cover by removing the screws. **Tip** Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.	 xx1300000467
4	Remove the screws and washers.	 xx1300000471
5	Pull out the base slightly and turn it aside. **Tip** Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting.	 xx1300000472

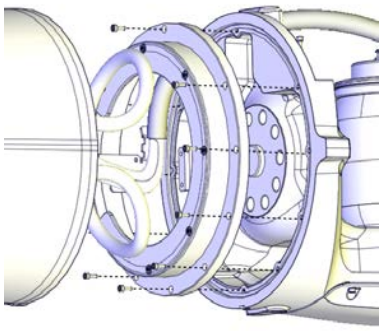
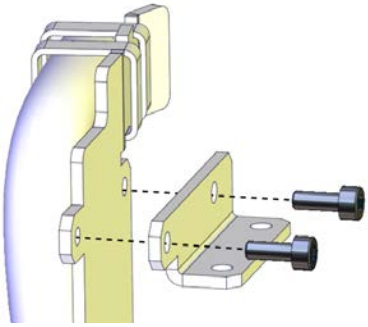
Removing the cable package from the axis-1 sealing ring

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.	 xx1300002438
4	Remove the swing (including arm system) completely from the base and lay it aside on a safe location.	
5	Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part.	 xx1300002446

Replacing the radial sealing (IP67 and Foundry Plus)

First remove the cabling according to *Removing the cabling on page 521*, then use this procedure to replace the axis-1 radial sealing.

The sealing is only used for robots with protection class IP67 and protection type Foundry Plus.

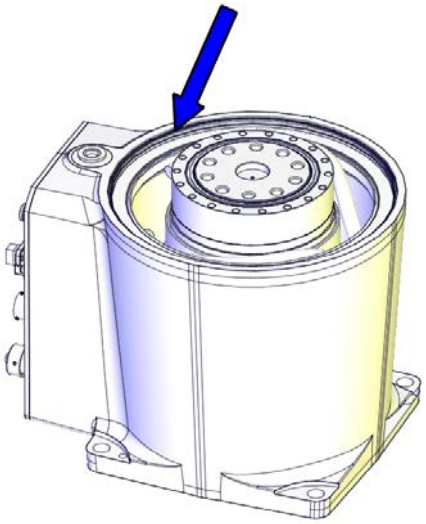
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

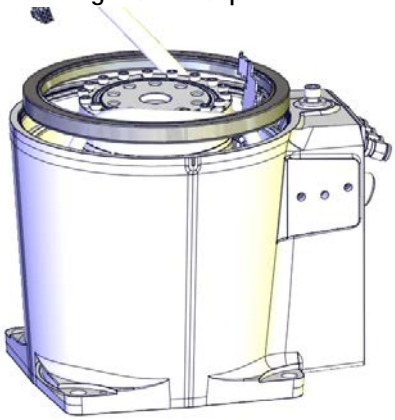
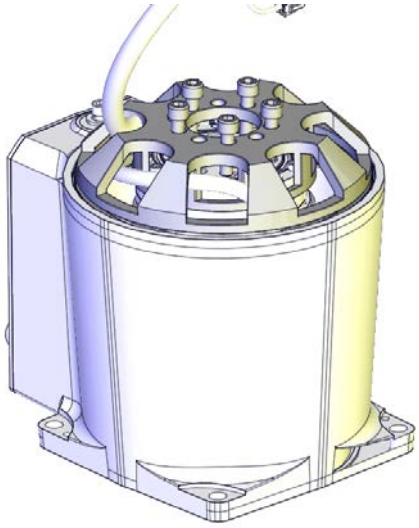
Removing the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).	
3	Remove the M2 variseal sealing. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*.	 xx1400000780
4	Remove the radial sealing.	 xx1400000270

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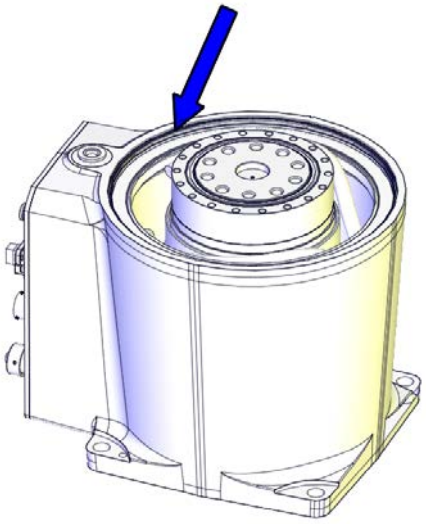
Refitting the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	Fit the new sealing in its groove in the base.	Radial sealing with dust lip: 3HAB3701-47  xx1400000270
2	Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little.	Axis-1 sealing assembly tool set: 3HAC049692-001  xx1400000271
3	Remove the assembly tool.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
4	Fit a new M2 variseal sealing in its groove in the base. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	 xx1400000780 M2 variseal sealing: 3HAC044641-002
5	Check that the sealings are undamaged and properly fitted.	

Replacing the M2 variseal sealing (IP67)

The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*.

First remove the cabling according to *Removing the cabling on page 521*, then use this procedure to replace the M2 variseal sealing.

Note

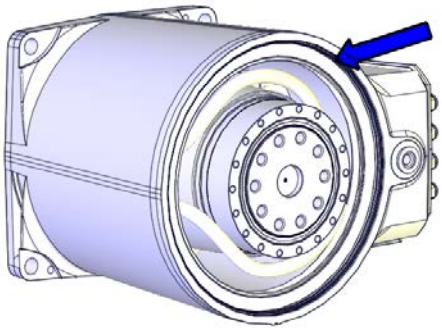
The sealing is only used for robots with protection class IP67. Do not fit M2 variseal sealing on robots in other protection class or protection types.

Replacing the axis-1 M2 variseal sealing (IP67)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	Remove the sealing.	 xx1400000472 M2 variseal sealing: 3HAC044641-002
3	Fit the new sealing in its groove in the base. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	

Replacing the cable protection sleeve

First remove the cabling according to *Removing the cabling on page 521*, then use this procedure to replace the protection sleeve.

Replacing the cable protection sleeve

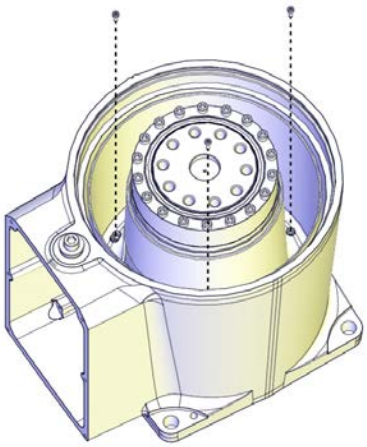
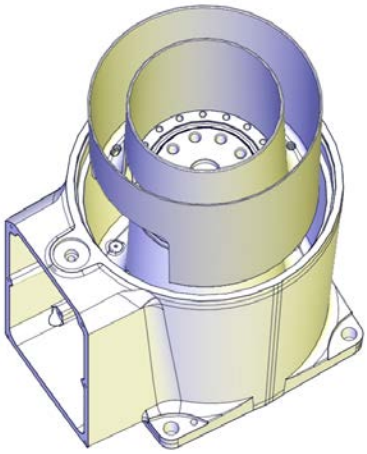
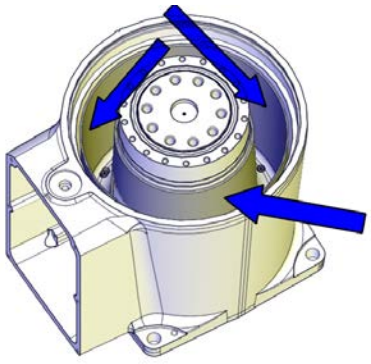
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cabling from the base.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Remove the screws.	 xx1400000776
5	Pull up the protection sleeve.	 xx1400000777
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
7	Fit the new protection sleeve and secure with screws.	Tightening torque: 0.3 Nm.
8	Apply grease on the inner surface of the protection sleeve, also on the bottom surface.	 xx1400000778

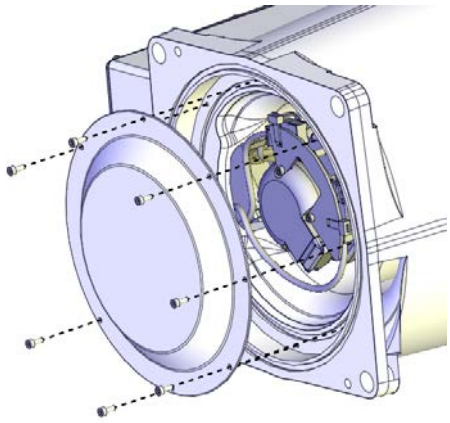
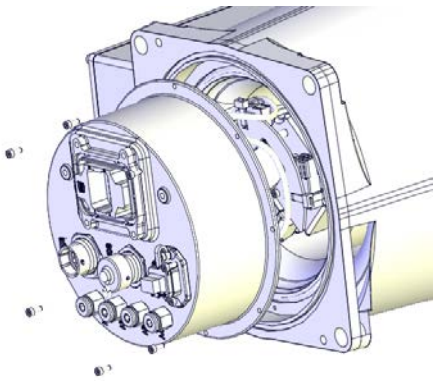
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Replacing the base

Use these procedures to replace the base.

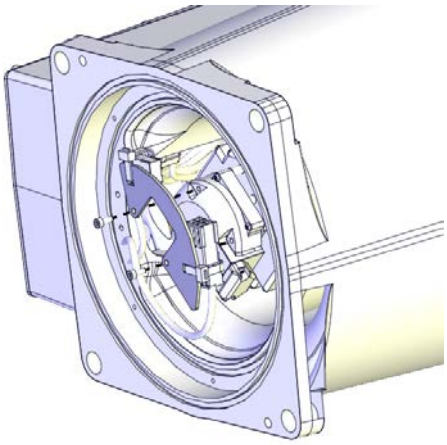
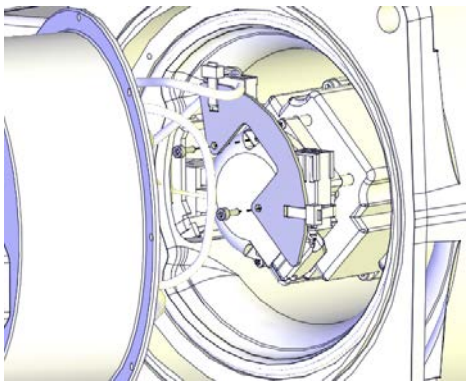
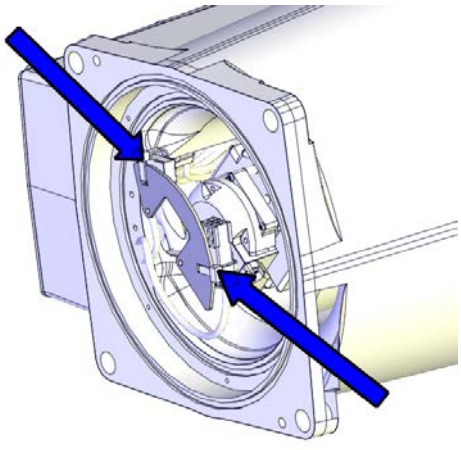
Disconnecting the axis-1 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the bottom cover.	Rear connector interface:  xx1300000469 Bottom connector interface:  xx1400000403

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
4	Remove the axis-1 motor bracket.	Rear connector interface:  xx1300000470 Bottom connector interface:  xx1400000404
5	Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors.	 xx1300002496

Removing the cable package from the base

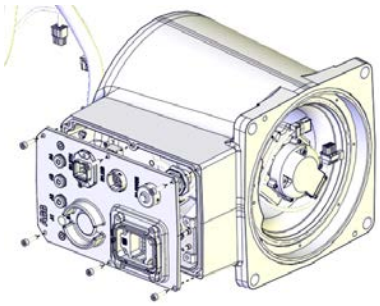
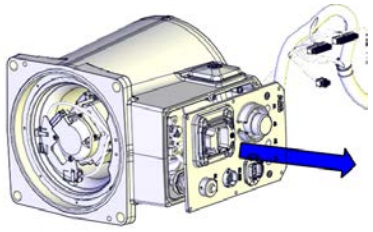
Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

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Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Open the base cover.	 xx1300002448
4	Disconnect the earth cable.	
5	Pull the cable package out from the base, through the rear.	 xx1300002456

Cabling with bottom interface, and cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

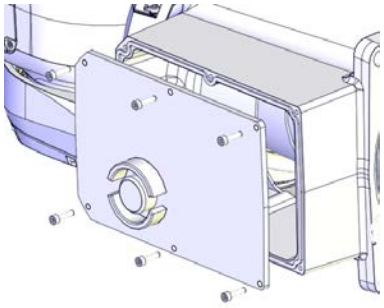
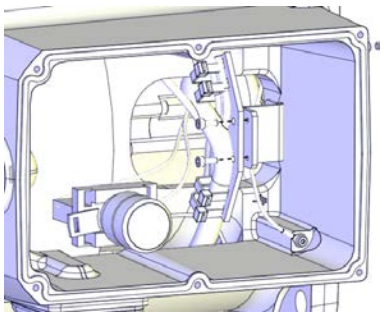
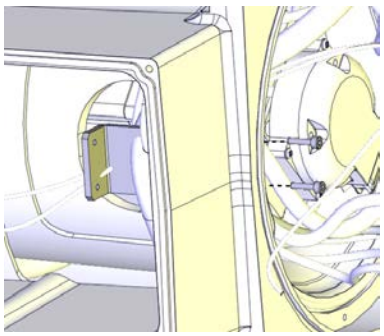
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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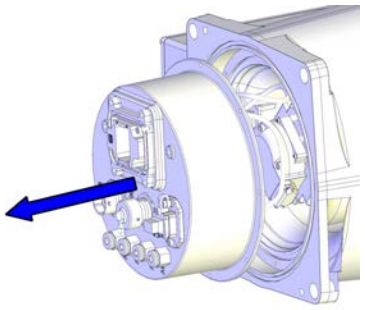
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Open the base cover.	 xx1400000405
4	Remove the brake release button from the base cover.	
5	Disconnect the earth cable.	
6	Remove the cable bracket by removing the screws.	 xx1400000406
7	Remove the bracket inside the base by removing the screws.	 xx1400000407

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	Action	Note
8	Pull the cable package out from the base, through the bottom.	 xx1400000411

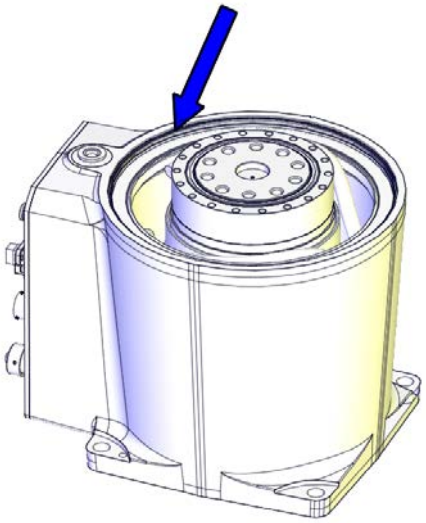
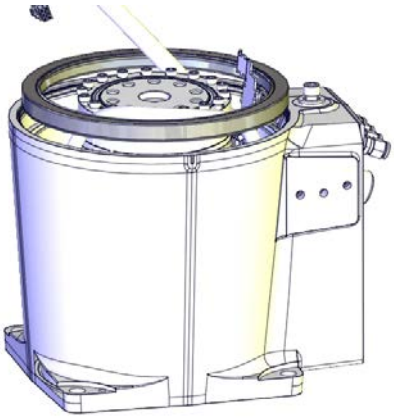
Removing the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

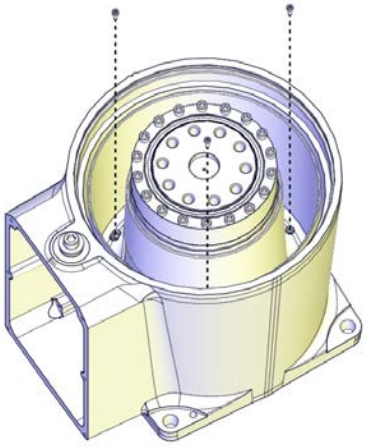
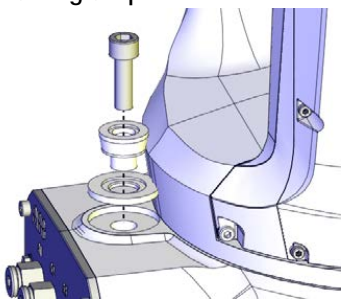
	Action	Note
4	Remove the M2 variseal sealing. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*.	 xx1400000780
5	Remove the radial sealing.	 xx1400000270

Replacing the base

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Move the protection sleeve from the old base to the new.	Tightening torque: 0.3 Nm.  xx1400000776
4	Move the axis-1 mechanical stop set from the old base to the new. Replace if damaged.	Tightening torque: 12 Nm.  xx1400000392

Refitting the axis-1 radial sealing and M2 variseal sealing

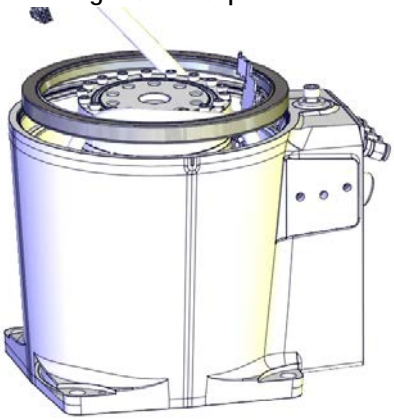
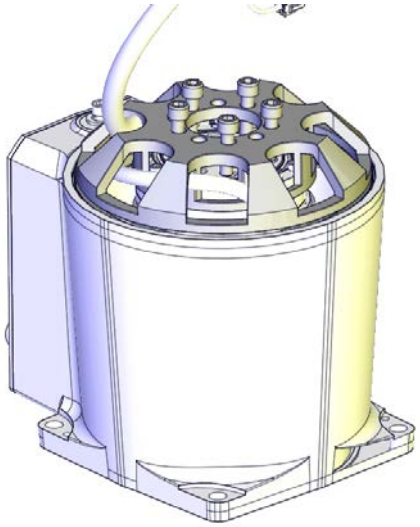
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Clean Room** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	

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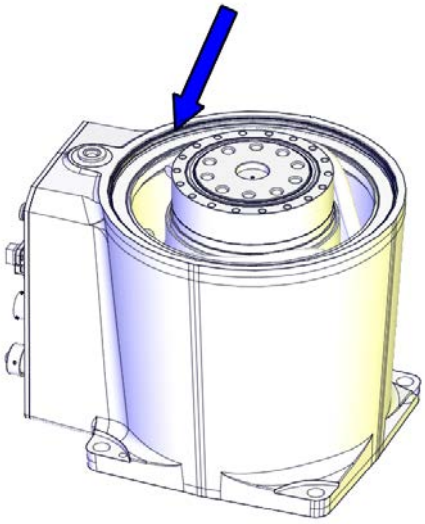
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Fit the new sealing in its groove in the base.	Radial sealing with dust lip: 3HAB3701-47  xx1400000270
4	Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little.	Axis-1 sealing assembly tool set: 3HAC049692-001  xx1400000271
5	Remove the assembly tool.	

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	Action	Note
6	Fit a new M2 variseal sealing in its groove in the base. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	 xx1400000780 M2 variseal sealing: 3HAC044641-002
7	Check that the sealings are undamaged and properly fitted.	

Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

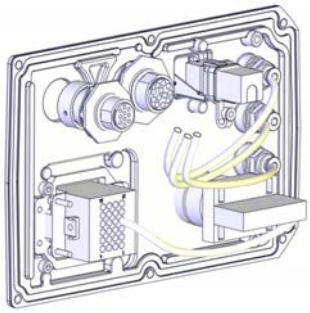
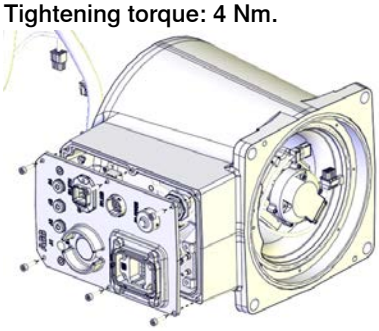
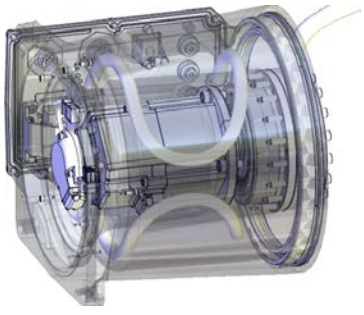
Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket on the base cover. Replace if damaged.	Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)  xx1400000741
3	Insert the cable package in and up through the base, through the rear.	
4	Reconnect the earth cable.	
5	Refit the base cover with the attachment screws.	Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.  xx1300002448 **Note** Only use specified screws, never replace them with other screws.
6	Route the cable package inside the base as shown in the figure. Apply grease to the cable package, cover all moving area of the package.	 xx1400000480

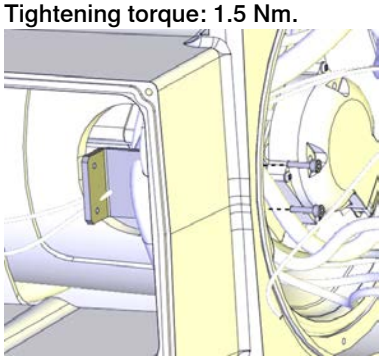
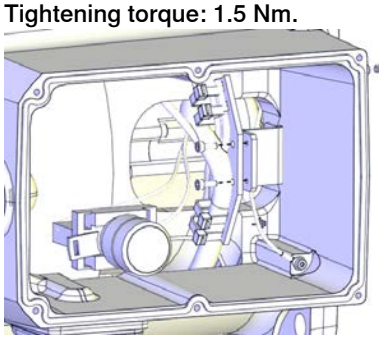
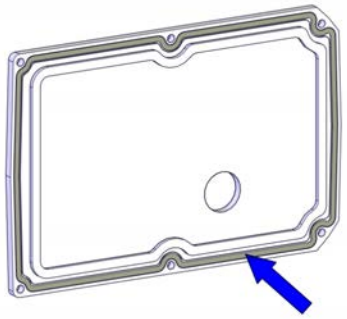
Cabling with bottom interface, cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

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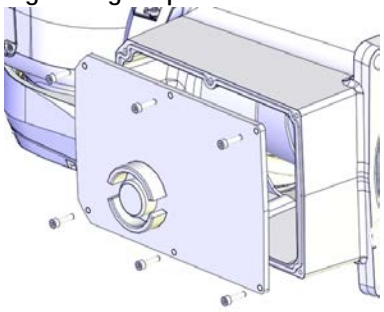
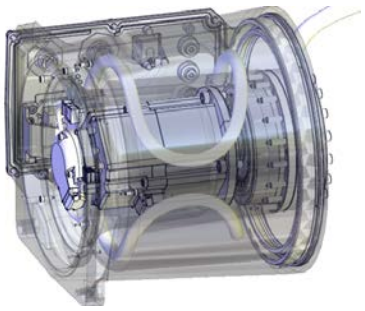
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the cable package in and up through the base, through the bottom.	
3	Refit the bracket inside the base with the screws.	Tightening torque: 1.5 Nm.  xx1400000407
4	Refit the cable bracket with the screws.	Tightening torque: 1.5 Nm.  xx1400000406
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the base cover. Replace if damaged.	Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)  xx1400000413
6	Reconnect the earth cable.	
7	Refit the brake release button to the base cover.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
8	Refit the base cover.	Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.  xx1400000405 **Note** Only use specified screws, never replace them with other screws.
9	Route the cable package inside the base as shown in the figure. Apply grease to the cable package, cover all moving area of the package.	 xx1400000480

Refitting the cabling

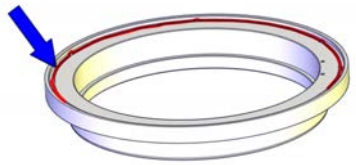
Use these procedures to refit the cabling, after the base part in question has been replaced.

Refitting the cable package to the axis-1 sealing ring

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-1 sealing ring. Replace if damaged.	Axis-1 sealing ring: 3HAC073849-001 / 3HAC086035-001 / 3HAC068107-001 i

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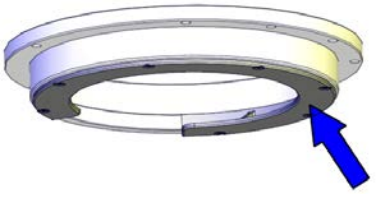
	Action	Note
3	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.)	Sealant: Sikaflex 521FC.  xx1600001125
4	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the gasket on the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.) Replace if damaged.	On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001  xx1400000458 On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1600001149 On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1900001735

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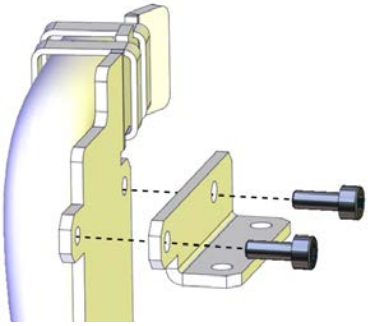
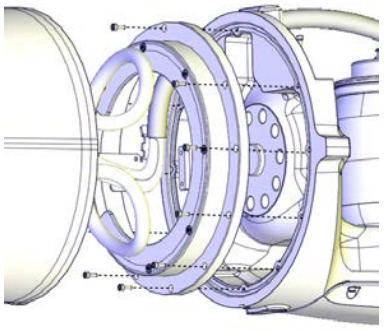
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
5	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the V-ring on the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.) Replace if damaged.	V-ring: 3HAB3732-34 On axis-1 sealing ring version 3HAC056658-001:  xx1600001124 On axis-1 sealing ring version 3HAC058568-001:  xx1600001150 On axis-1 sealing ring version 3HAC068107-001:  xx1900001736
6	Check the cable protection on the axis-1 sealing ring. Replace if damaged. If replacing the cable protection, use locking liquid on the screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Cable protection: 3HAC044691-001 Torx countersunk head screw M3x5: 3HAC14286-4 Tightening torque: 0.3 Nm  xx1400000456

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	Action	Note
7	Refit the cable bracket to the cabling, if removed. Use locking liquid on the screw threads.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Cable bracket on swing: 3HAC044925-001 Tightening torque: 1 Nm.  xx1300002446
8	Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.	Tightening torque: 1.5 Nm.  xx1300002438

i For information on which sealing ring to be ordered, see *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.

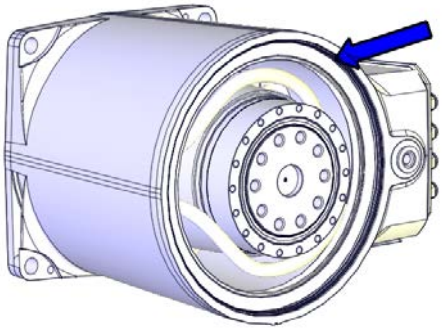
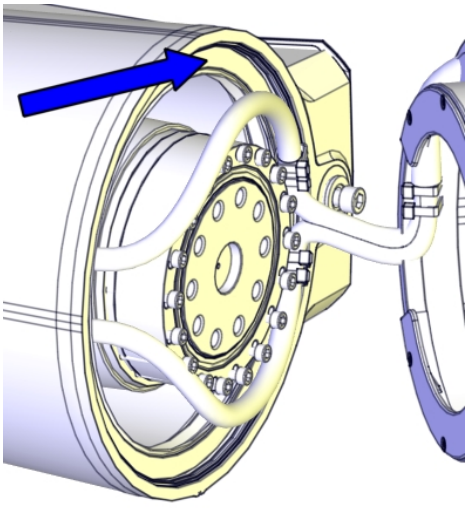
Assembling the swing and base

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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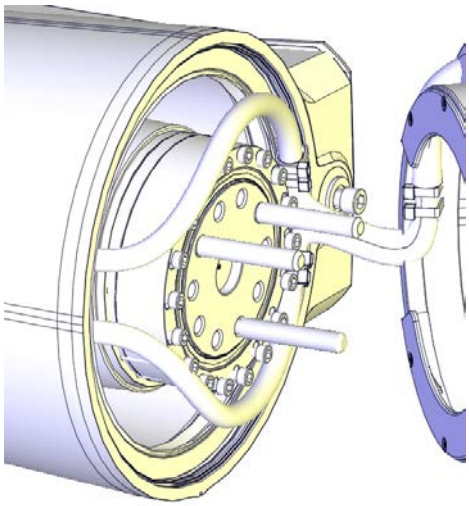
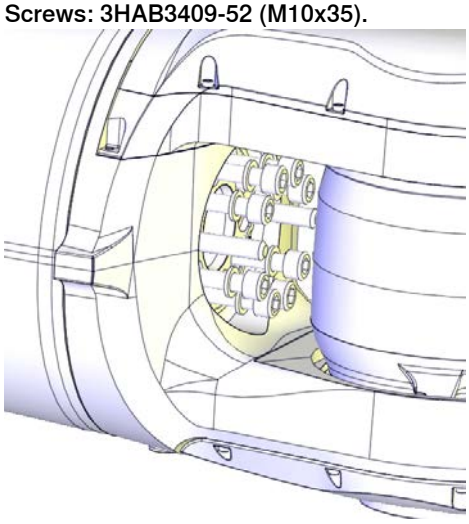
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
2	Check the axis-1 radial sealing in the base. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement. **For robots with protection class IP67** Check the M2 variseal sealing in the base. Replace if damaged. The M2 variseal sealing is only installed on base version 3HAC049628-001. See *Spare part versions for the base on IP40/IP67 robots on page 909*. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	Radial sealing with dust lip: 3HAB3701-47 M2 variseal sealing: 3HAC044641-002  xx1400000472 Replacement is detailed in *Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 515*.
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply grease to the radial sealing surface.	Grease: 3HAC058065-001.  xx1600000170

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

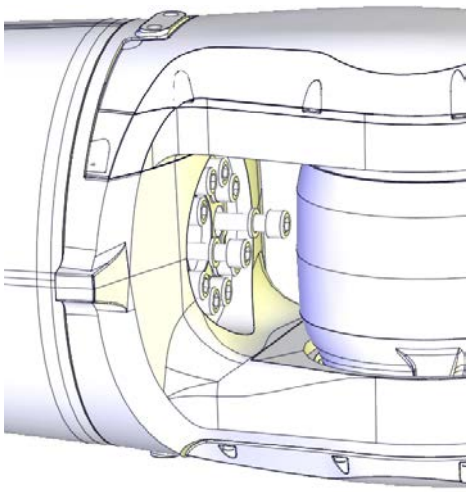
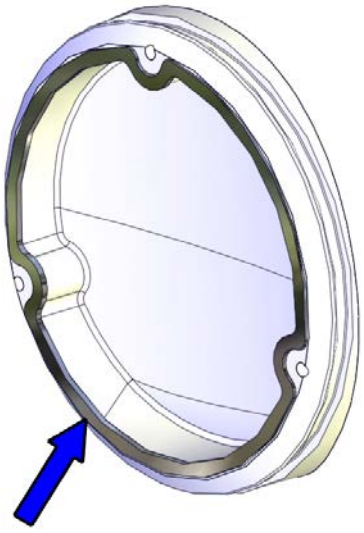
	Action	Note
4	Fit the guide pins to the drive unit.	Guide pin for axis-1 gear unit: 3HAC049703-001  xx1300002566 Always use three guide pins together!
5	Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing. Position and angle the cabling inside the base as it was positioned during removal. **CAUTION** Be careful not to squeeze any cabling during the refitting procedure.	
6	Secure with attachment screws and washers, but do not tighten yet.	Screws: 3HAB3409-52 (M10x35).  xx1300002567 **Note** Only use specified screws, never replace them with other screws.

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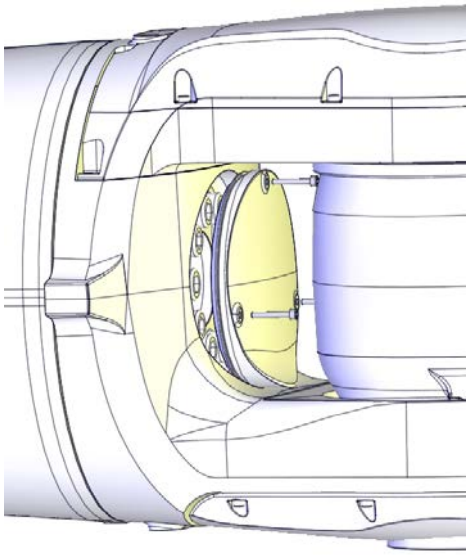
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
7	Remove the guide pins and refit the remaining attachment screws and washers.	 xx1300000523
8	Tighten all screws.	Tightening torque: 40 Nm.
9	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Gasket on top swing cover 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)  xx1400000425

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	Action	Note
10	Refit the swing top cover with the screws. Replace if damaged.	Cover on top of swing: 3HAC059679-001 Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic : 3HAC056133-001 Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.  xx1300000467 **Note** Only use specified screws, never replace them with other screws.

Connecting the axis-1 motor connectors

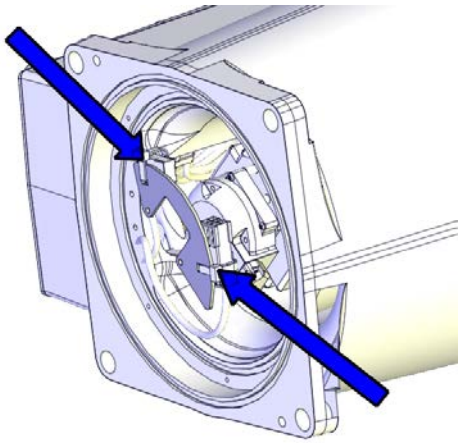
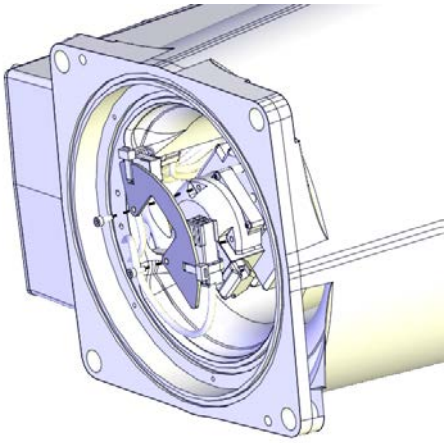
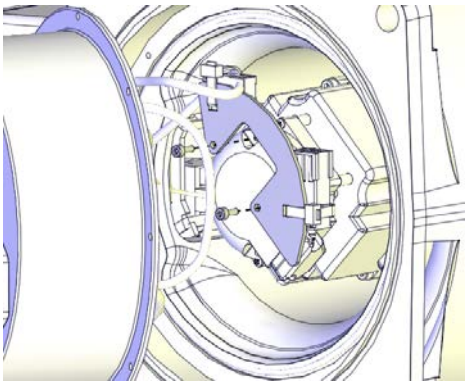
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

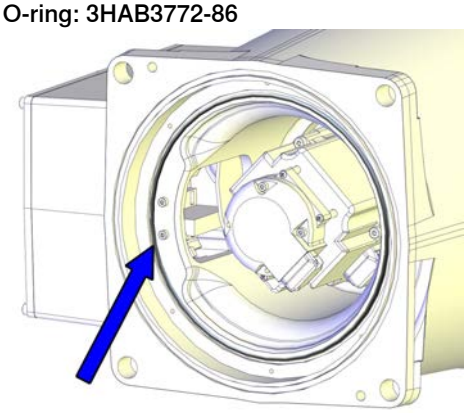
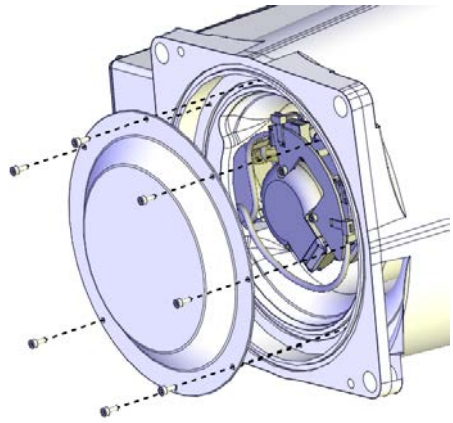
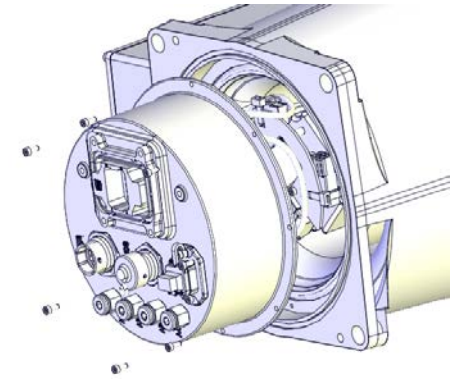
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	Action	Note
2	Reconnect the connectors and secure the connectors to the bracket with cable straps.	 xx1300002496
3	Refit the axis-1 motor bracket.	Tightening torque: 1.5 Nm. Rear connector interface:  xx1300000470 Bottom connector interface:  xx1400000404

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the O-ring. Replace if damaged.	O-ring: 3HAB3772-86  xx1400000412
5	Refit the bottom cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Rear connector interface:  xx1300000469 Bottom connector interface:  xx1400000403 **Note** Only use specified screws, never replace them with other screws.

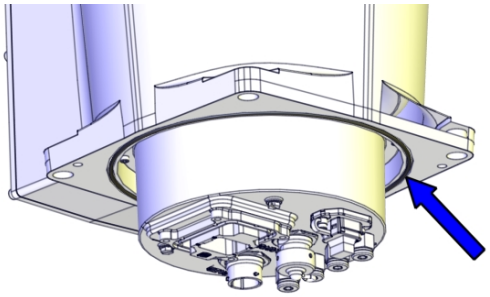
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

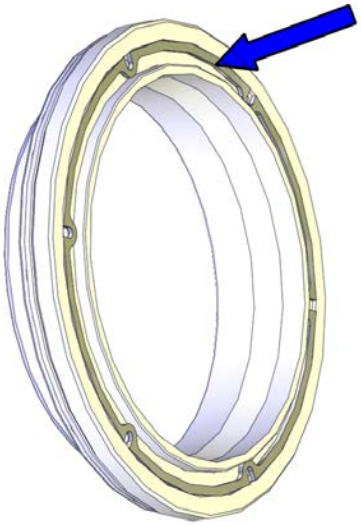
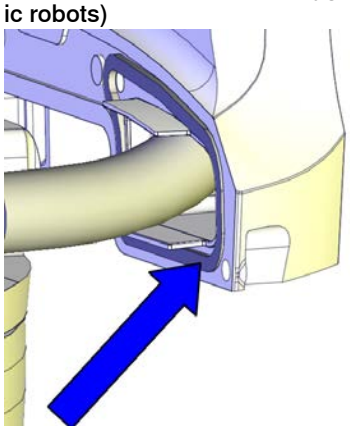
Securing the robot to the foundation

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg IRB 1200-7/0.9: 54 kg All lifting accessories used must be sized accordingly!	
3	**For robots with:** **protection class IP67,** **protection type Foundry Plus** **protection type Clean Room** **food grade lubrication** **with protection type Hygienic** **and manipulator cables routed from below** Check the gasket at the bottom of the base. Replace if damaged.	O-ring: 3HAB3772-141 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8. Washers: 13 x 20 x 2, steel hardness class 300HV. Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1. Tightening Torque: 55 Nm ± 5 Nm.

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Refitting the cable package in the lower arm

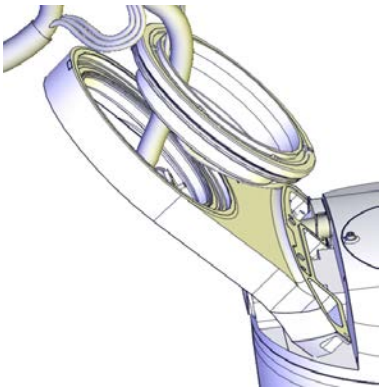
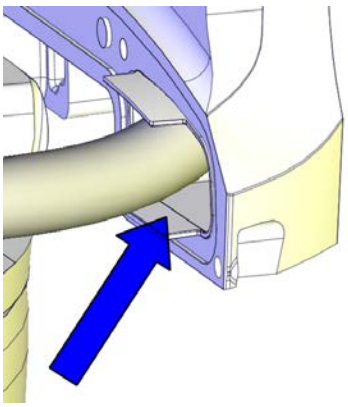
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-2 sealing ring. **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Axis-2 sealing ring: 3HAC086036-001 (for robots in IP40) / 3HAC044677-001 (for robots not in IP40) Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)  xx1400000476
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing plastic plate. Replace if damaged.	Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)  xx1400000457

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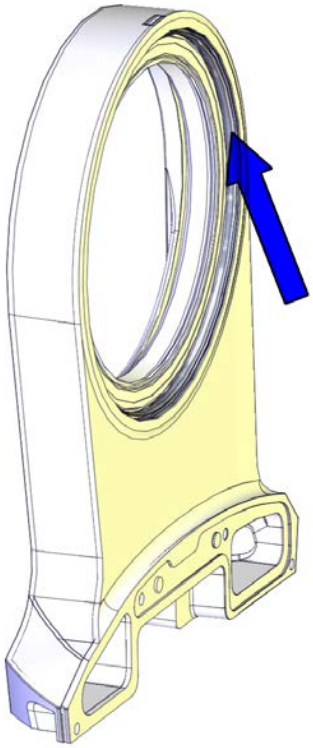
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 xx1400000025
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	The plastic plate is included in: Cable harness material set: 3HAC049663-001.  xx1400000023

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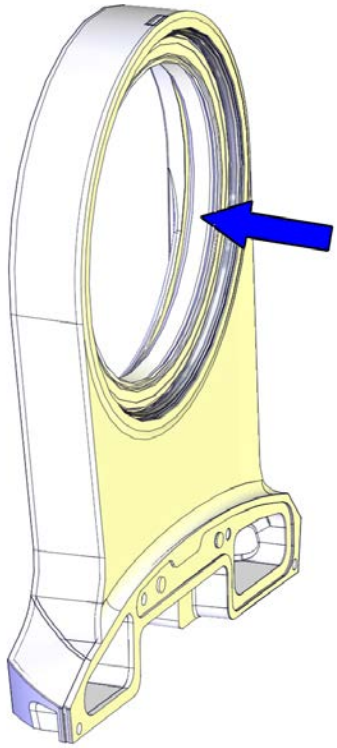
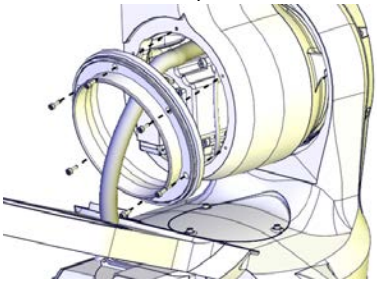
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	Action	Note
6	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-004  xx1400000454

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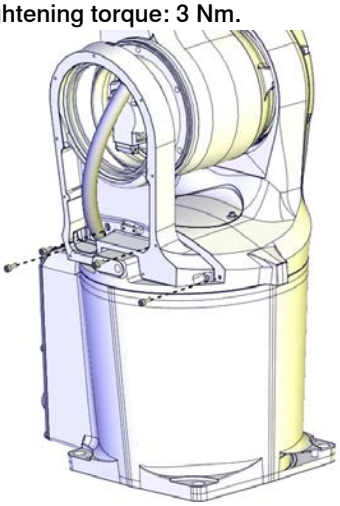
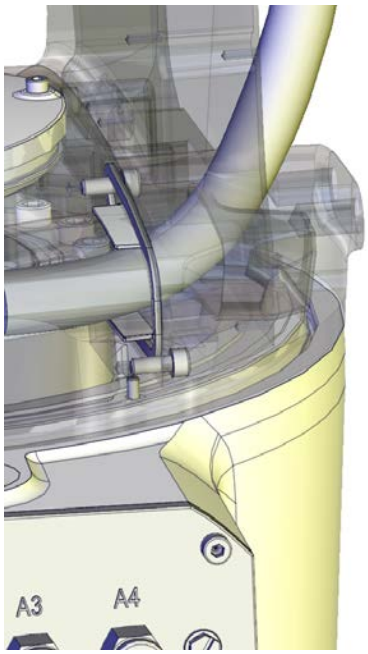
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing with dust lip: 3HAB3701-41  xx1400000753 Replacement is detailed in *Replacing the swing spare parts (swing, axis-2 radial sealing) on page 595*.
8	Guide the cable package into the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
9	Refit the axis-2 sealing ring with the screws.	Tightening torque: 0.5 Nm (for Axis-2 sealing ring 3HAC086036-001) / 1.5 Nm (for Axis-2 sealing ring 3HAC044677-001)  xx1400000020

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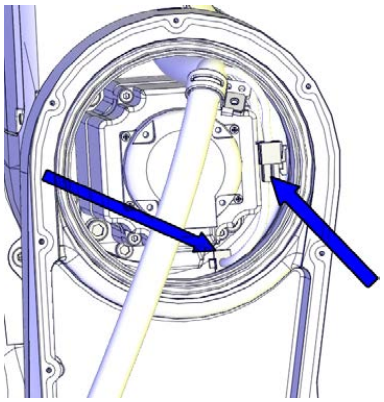
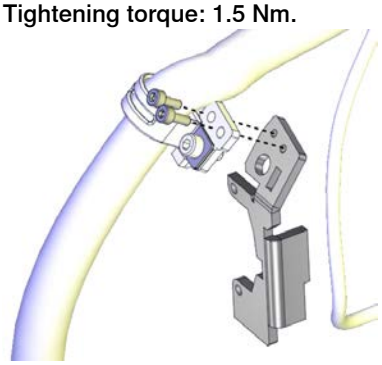
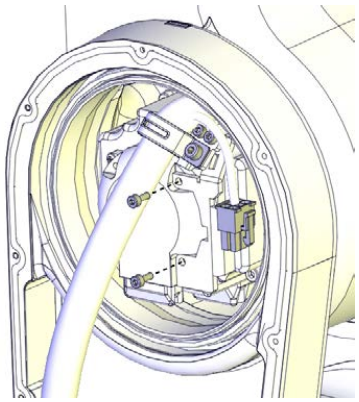
	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
11	Refit the cable housing with the screws.	Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.  xx1300002435 **Note** Only use specified screws, never replace them with other screws.
12	Apply grease to the cable package, cover all moving area of the package.	 xx1400000481

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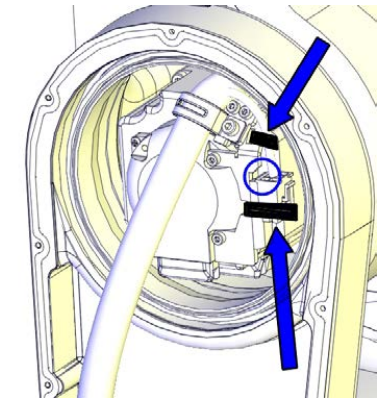
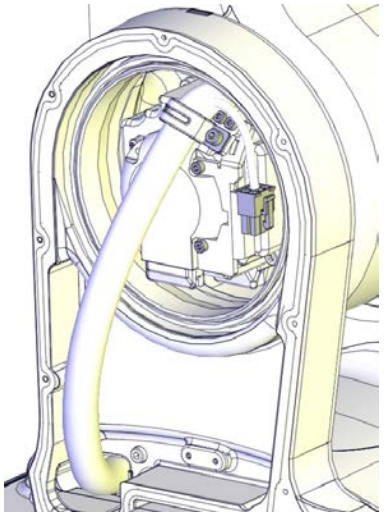
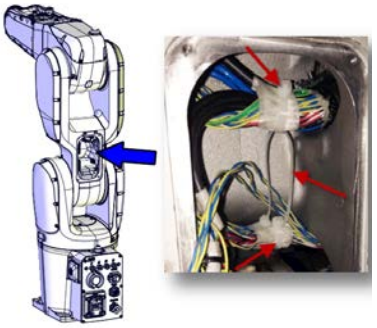
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
13	Reconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
14	Refit the axis-2 motor bracket to the cable package with the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1400000021
15	Refit the axis-2 motor bracket to the motor.	 xx1300002432

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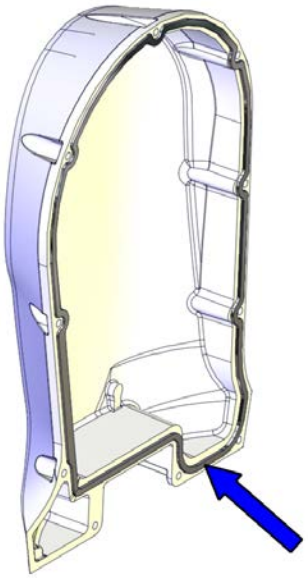
	Action	Note
16	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
17	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
18	In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity: 1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location. 2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. See the figure.	 xx1400001131

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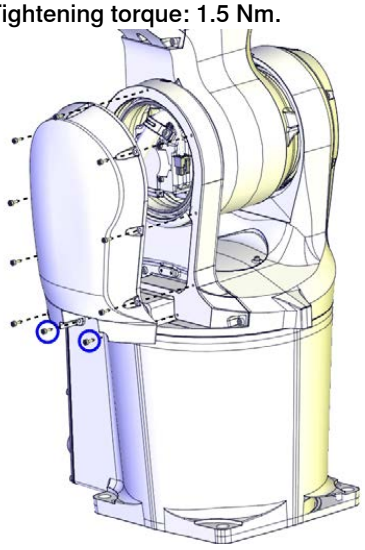
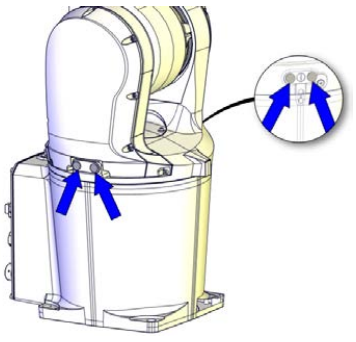
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
19	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)  xx1400000424
20	Check the PTFE film. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
21	Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.	
22	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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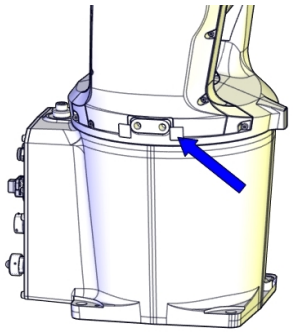
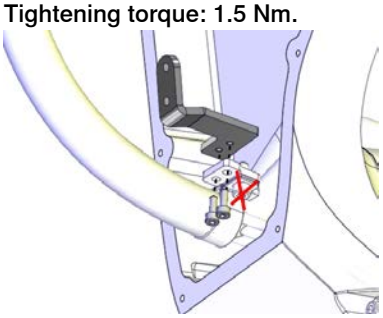
	Action	Note
23	Refit the cable housing cover. Replace if damaged. **Note** Remember to refit the two lower screws shown in the figure.	Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002431 **Note** Only use specified screws, never replace them with other screws.
24	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

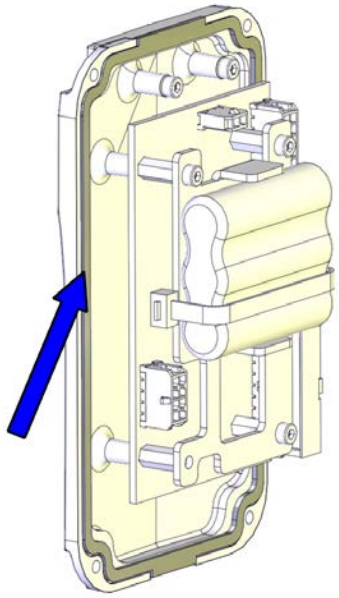
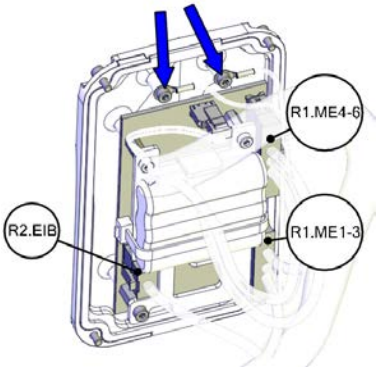
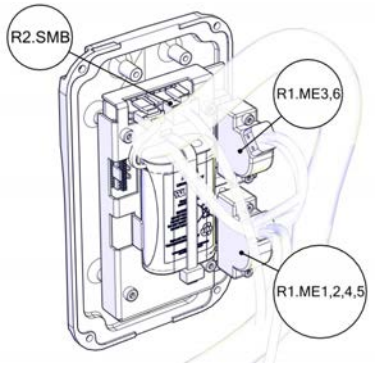
	Action	Note
25	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Refit the swing sealing plug. Follow the procedure specified in *Refitting the swing sealing plug on page 183*.	Swing sealing plug:3HAC053687-001  xx1600000205
26	Refit the lower arm bracket to the cable package. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002430

Connecting the cabling in the lower arm

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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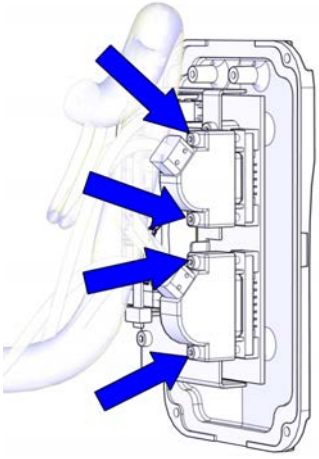
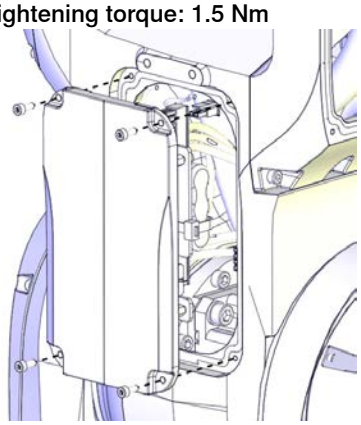
	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the EIB/SMB cover gasket. Replace if damaged.	Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)  xx1400000475
4	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1300002428
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the lugs to the EIB/SMB cover.	
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005

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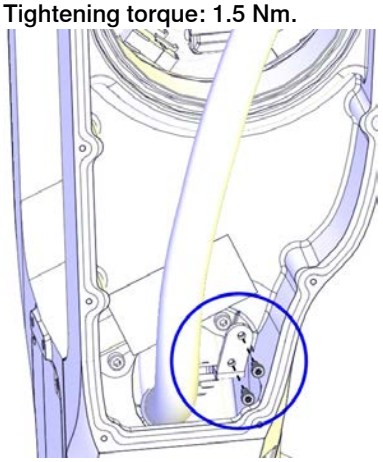
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

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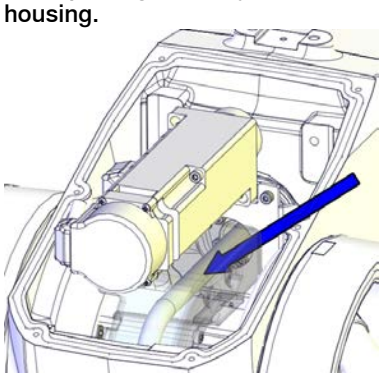
	Action	Note
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

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	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	Tightening torque: 1.5 Nm.  xx1300002426

Refitting the cable package in the housing

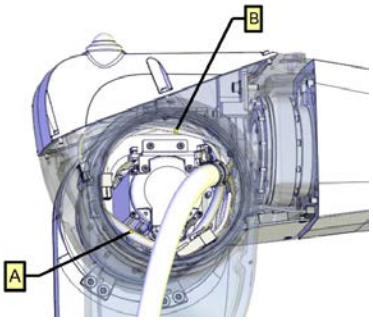
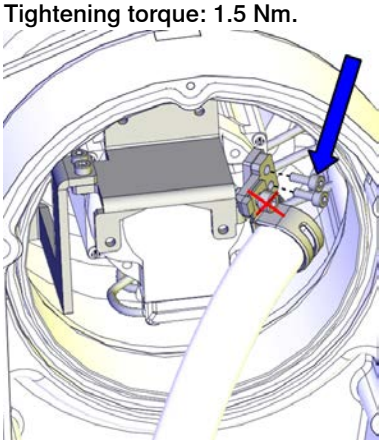
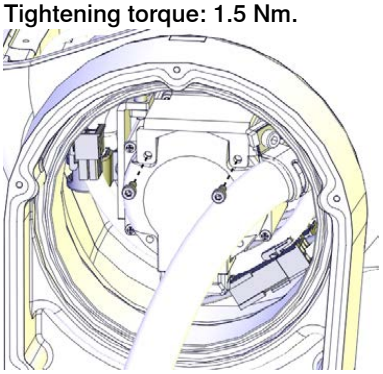
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	Area to be lubricated, shown in cable package already fitted to the housing.  xx1400000483

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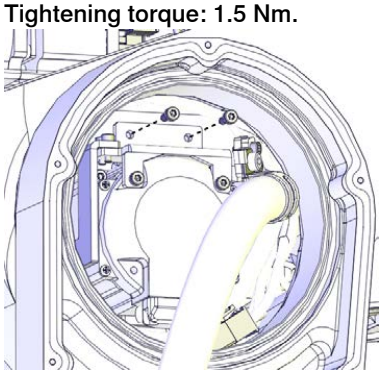
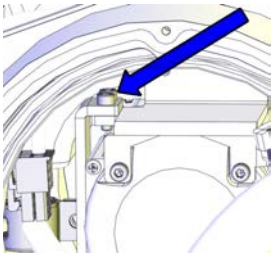
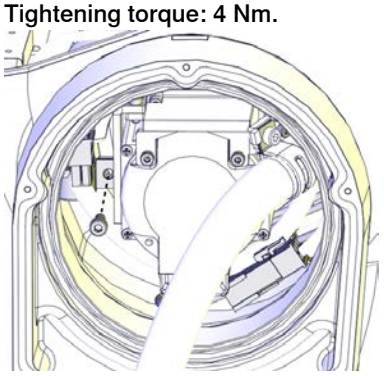
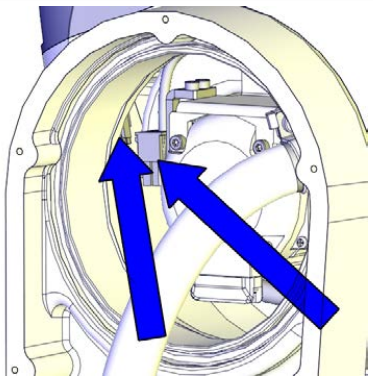
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Guide the cable package into the upper arm, through the housing. **Note** Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor. **Note** The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.	 xx1400001472
4	Refit the bracket to the sheet with two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002424
5	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423

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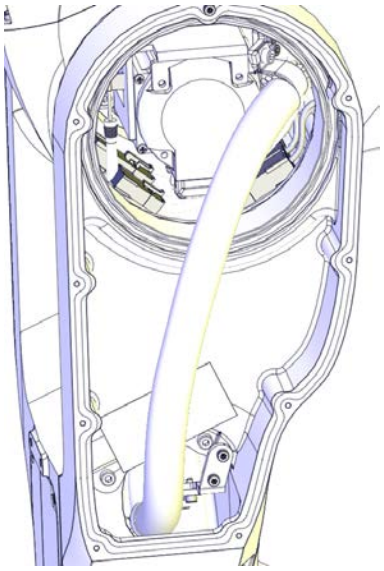
	Action	Note
6	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
7	Fit the air hose holder to the bracket. Replace the holder, if damaged. **Tip** If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.  xx1400001133	Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.  xx1300002422
8	Reconnect the axis-3 motor connectors.	 xx1300002420

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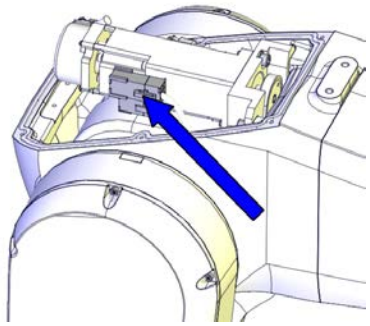
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

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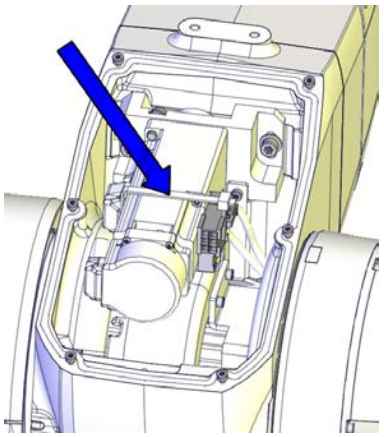
	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 xx1400000754
10	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

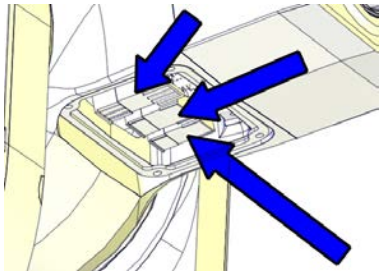
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

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	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

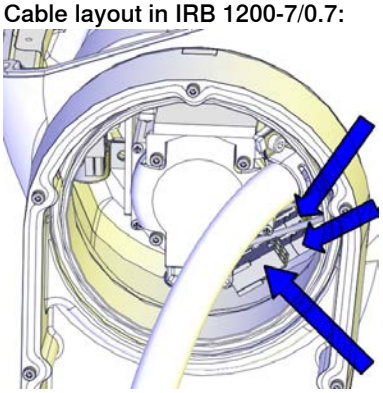
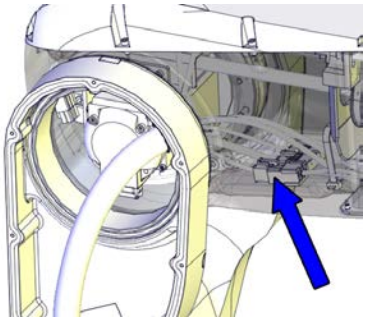
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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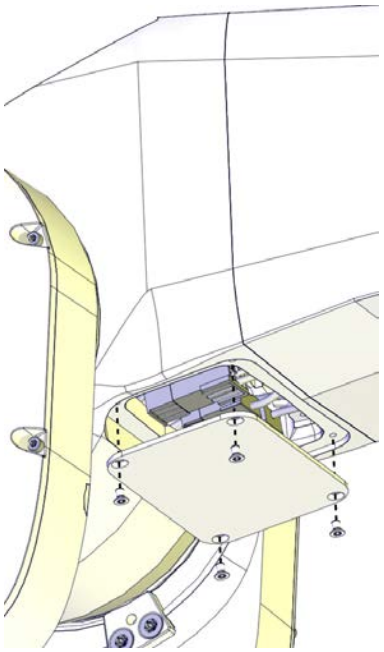
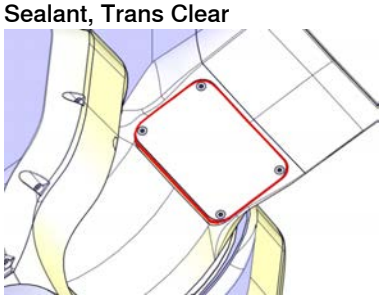
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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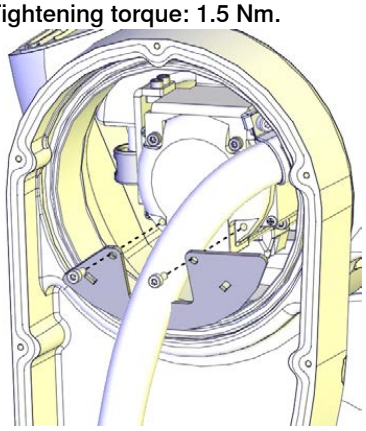
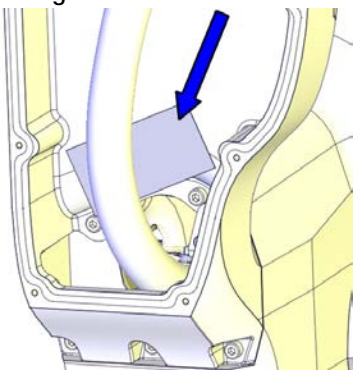
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	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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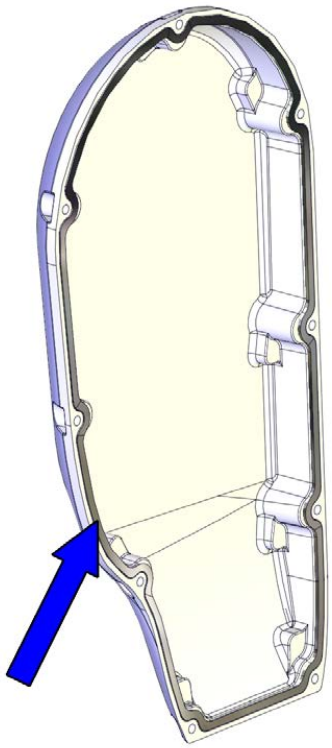
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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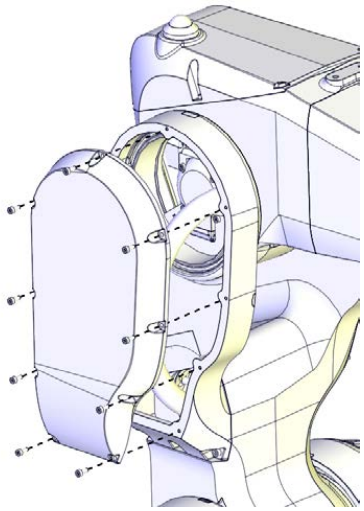
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	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

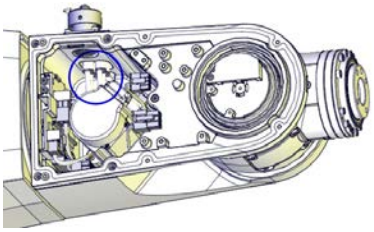
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

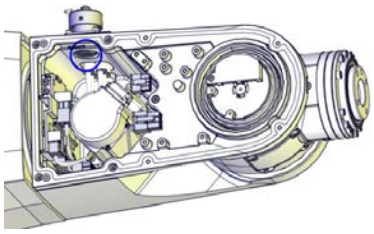
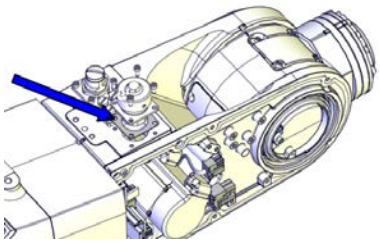
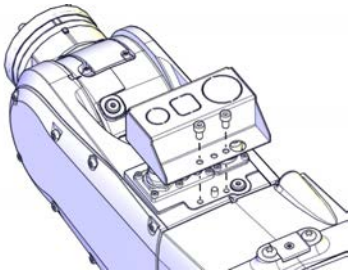
Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738

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	Action	Note
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

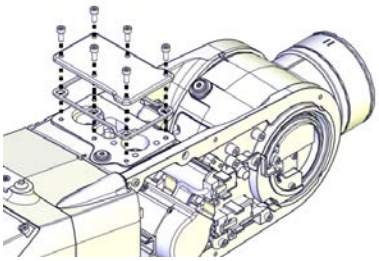
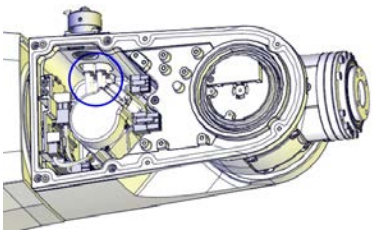
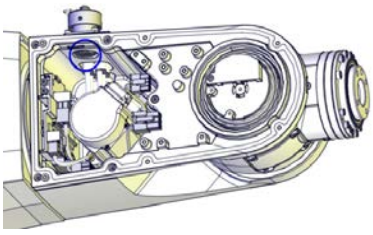
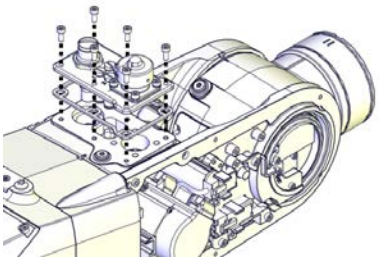
Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

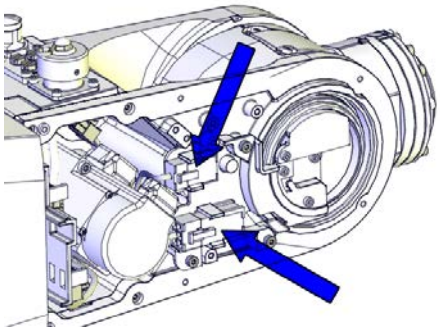
	Action	Note
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

Connecting the axis-5 motor FPC connectors

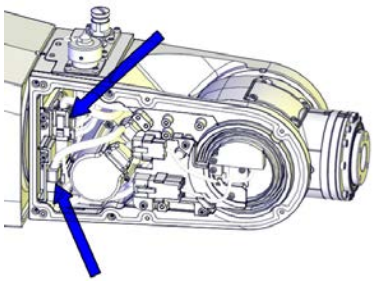
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

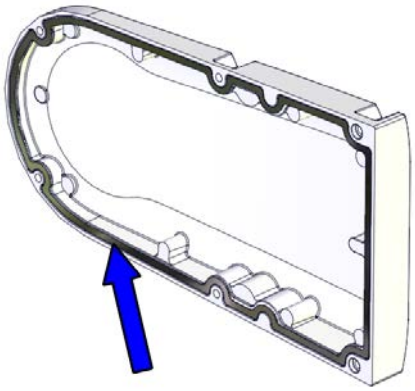
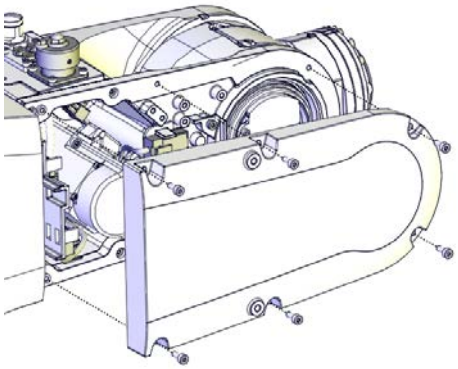
Refitting the tubular cable housing cover

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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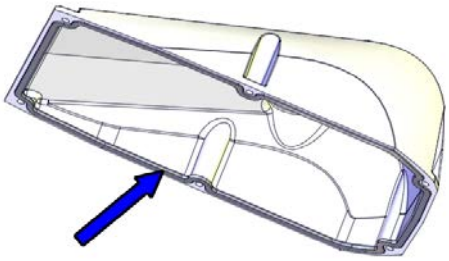
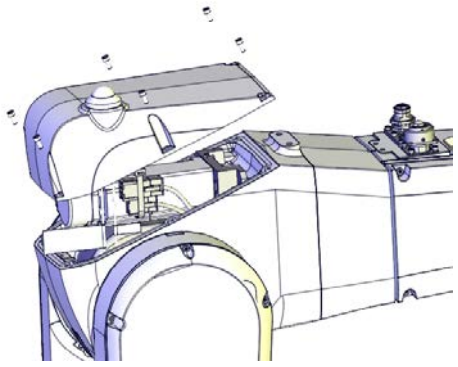
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001  xx1400000345
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
4	Refit the cover to the cable housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002389 **Note** Only use specified screws, never replace them with other screws.

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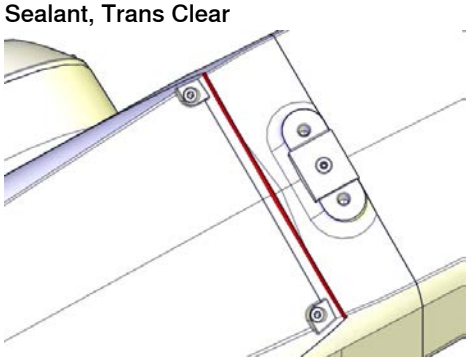
Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws. **CAUTION** **For robots with safety lamp (option)** Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

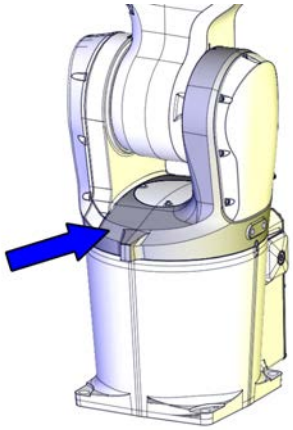
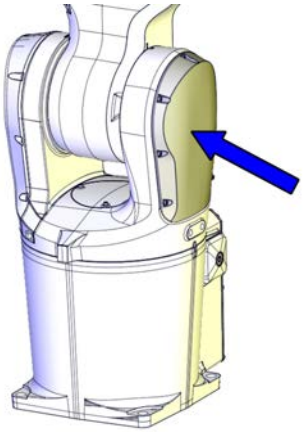
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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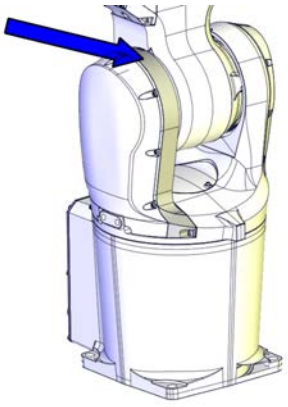
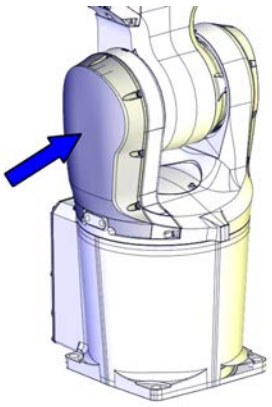
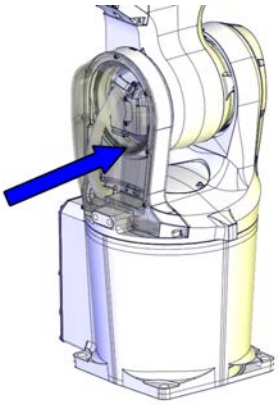
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Location of the swing spare parts

The swing parts that are considered spare parts are located as shown in the figures.

Swing	Swing cover
 xx1400000442	 xx1400000443
3HAC059554-001/3HAC082506-001 [i]	3HAC059676-001
3HAC059700-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic.	3HAC056215-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.

[i] Details about the differences between swing 3HAC059554-001 and swing 3HAC082506-001, see *Appearance description on page 903* and *Spare part versions for the swing on IP40/IP67 robots on page 910*.

Cable housing of the swing	Cable housing cover of the swing	Radial sealing with dust lip
 xx1400000446	 xx1400000445	 xx1400000444

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

Cable housing of the swing	Cable housing cover of the swing	Radial sealing with dust lip
3HAC059677-001	3HAC059678-001	3HAB3701-41 Not used with protection class IP40. Replace if damaged.
3HAC056213-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.	3HAC056214-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.	

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Swing	3HAC059554-001	Used with protection classes IP40, IP67 and protection type Foundry Plus. If the swing 3HAC049632-001 or 3HAC058000-001 is previously installed on the robot, also a new sealing ring and, for IP67 and Foundry Plus, a gasket and a V-ring is required. See *Spare part versions for the swing on IP40/IP67 robots on page 910*.
Swing	3HAC082506-001	Used with protection classes IP40, IP67 and protection type Foundry Plus. Swing 3HAC082506-001 is valid for robots with axis calibration. See *Appearance description on page 903* for its difference with swing 3HAC059554-001.
Swing, Clean Room Swing, food grade lubrication Swing, Hygienic	3HAC059700-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic.
Axis-1 sealing ring	3HAC073849-001 / 3HAC086035-001 / 3HAC068107-001 i	Replace if damaged.

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Spare part	Article number	Note
Axis-1 sealing ring gasket	3HAC045685-001	Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. Replace if damaged.
Axis-1 sealing ring gasket	3HAC058349-001 / 3HAC080707-001	Not used with protection class IP40. Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*. Replace if damaged.
Sealing ring, gasket and V-ring	3HAC059791-001	Used with protection class IP67. Replace if damaged.
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001, 3HAC059554-001 and 3HAC082506-001. See *Spare part versions for the swing on IP40/IP67 robots on page 910*. Replace if damaged.
Cable protection	3HAC044691-001	Replace if damaged.
Torx countersunk head screw M3x5	3HAC14286-4	Replace if damaged.
Cover on top of swing	3HAC059679-001	Replace if damaged.
Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic	3HAC056133-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on top swing cover	3HAC056696-001 / 3HAC080698-001	Not used with protection class IP40. Replace if damaged.
Swing cover	3HAC059676-001	Replace if damaged.
Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic	3HAC056215-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

Spare part	Article number	Note
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
Cable housing of the swing	3HAC059677-001	Replace if damaged.
Cable housing of the swing, Clean Room Cable housing of the swing, food grade lubrication Cable housing of the swing, Hygienic	3HAC056213-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC086036-001	Used with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
O-ring	3HAC048939-001	Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

i For information on which sealing ring to be ordered, see *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Axis-2 sealing assembly tool set	3HAC049694-001	Used to refit the radial sealing, if replacement is needed.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the swing parts

Use these procedures to remove the swing spare parts.

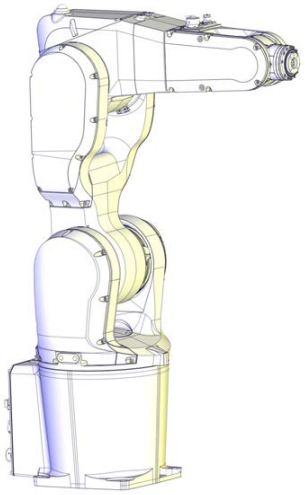
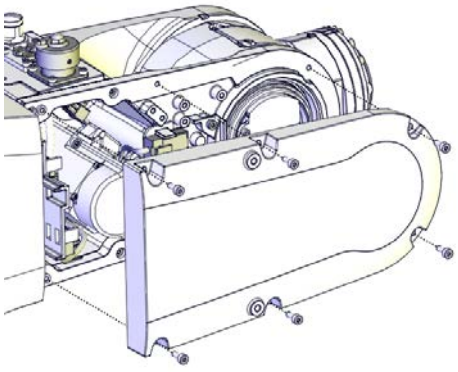
Preparations before removing the swing spare parts

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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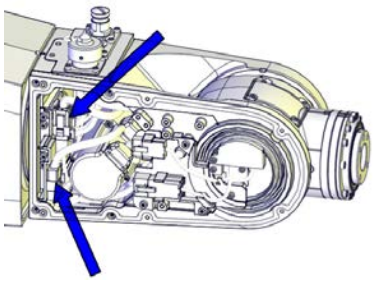
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	Remove the wrist cover.	 xx1300002389

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Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

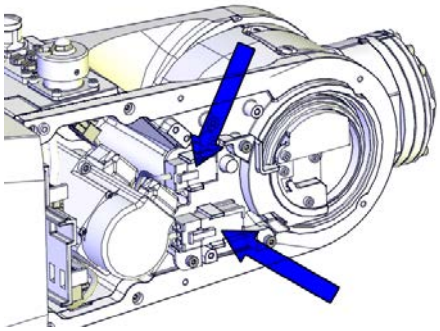
Disconnecting the axis-5 FPC connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

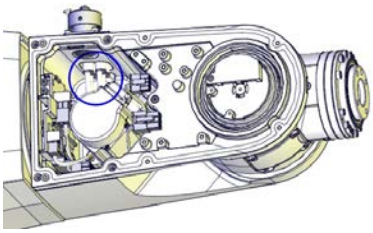
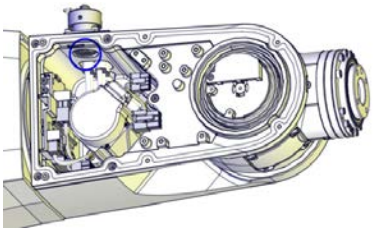
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

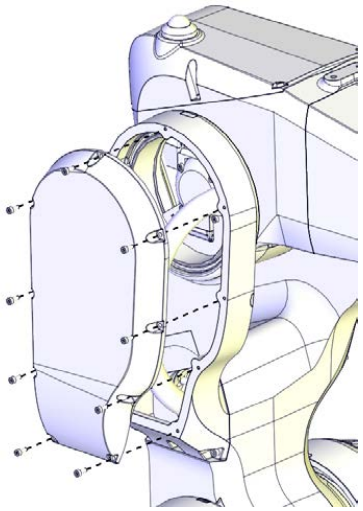
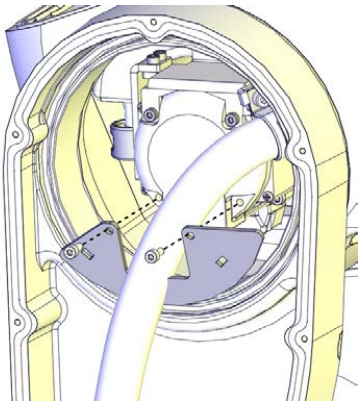
Disconnecting the air hoses and CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the air hoses.	 xx1400000738
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

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Disconnecting the axis-4 FPC connectors

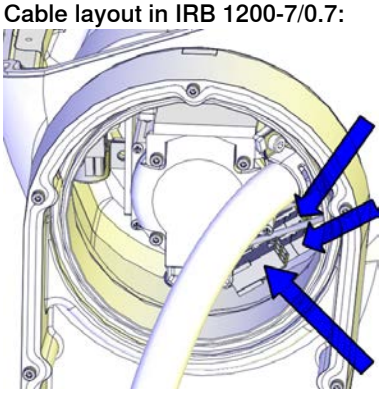
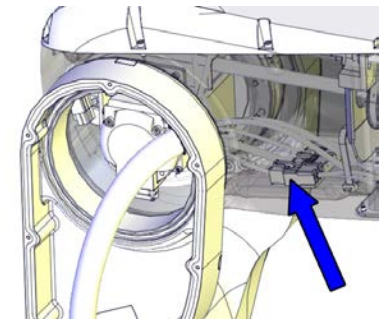
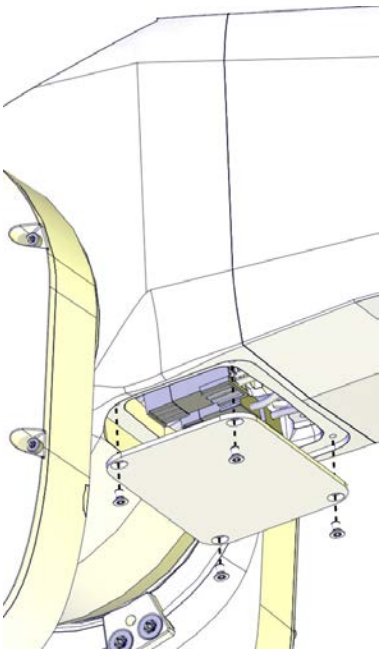
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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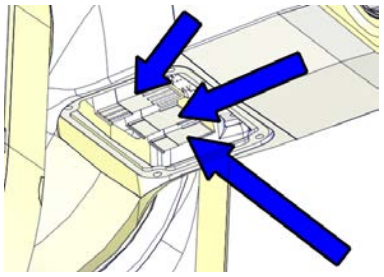
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

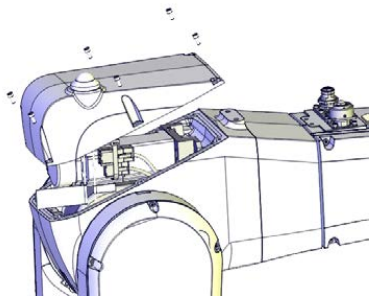
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
6	Remove the small cover of the housing.	 xx1300002398

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	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

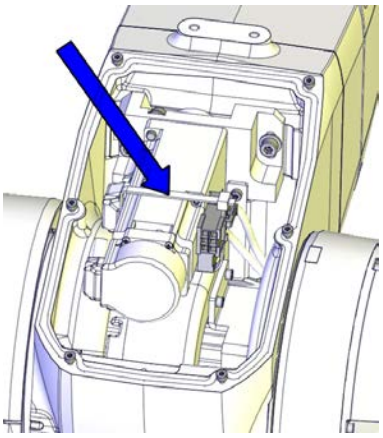
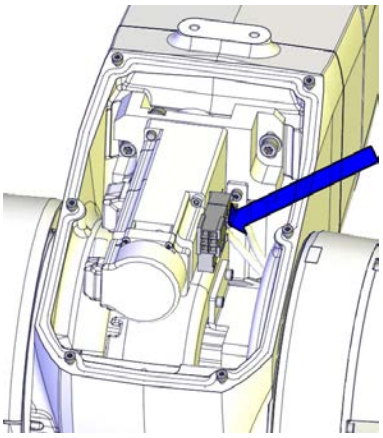
Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

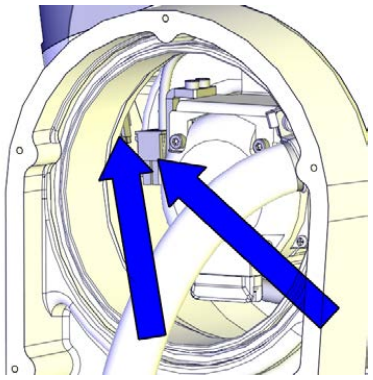
	Action	Note
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Disconnecting the axis-3 motor connectors

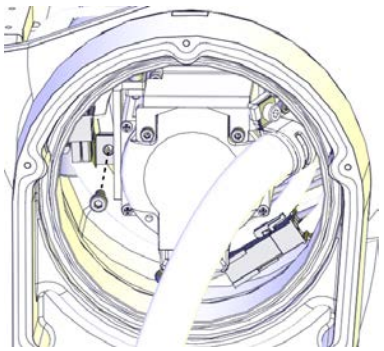
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

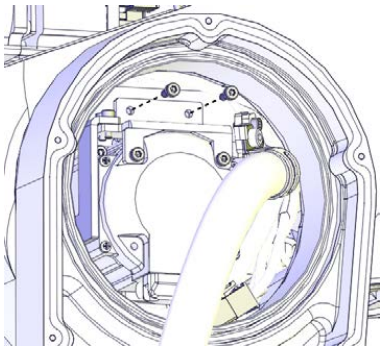
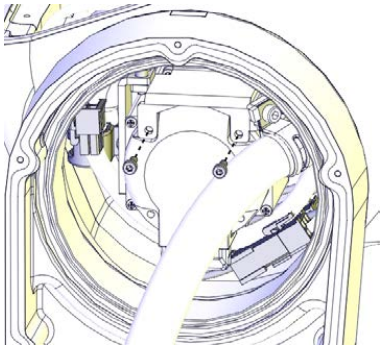
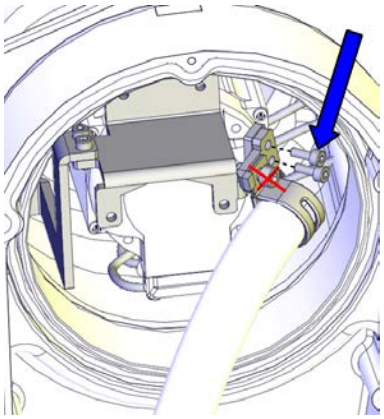
Removing the cable package in the housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the screw that fastens the air hose holder.	 xx1300002422

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

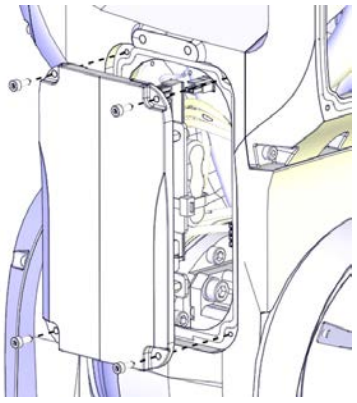
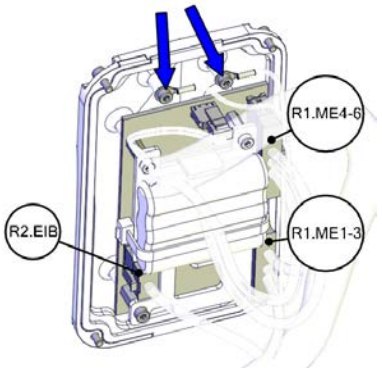
	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
5	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
6	Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002424
7	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Cut the cable straps at the bottom of the housing.	

Disconnecting the cabling in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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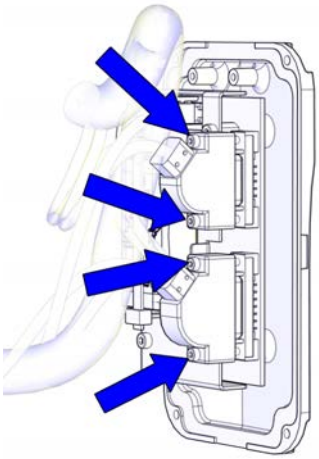
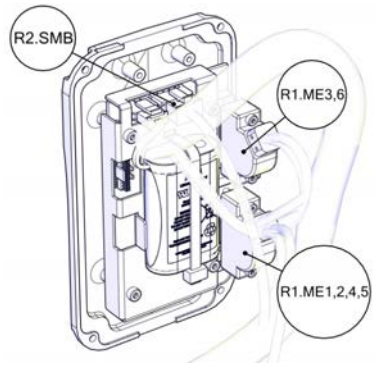
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	Action	Note
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 xx1300002427
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the connectors on the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 xx1300002428
6	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Disconnect the lugs on the EIB/SMB cover.	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

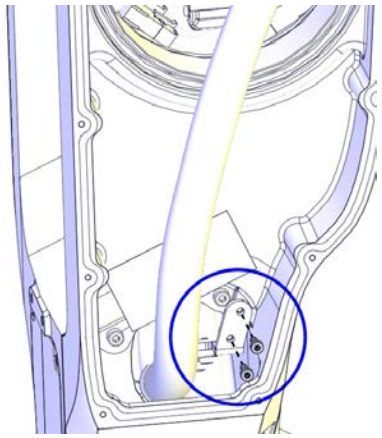
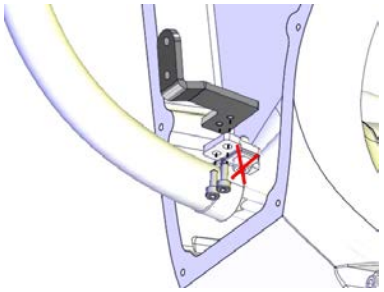
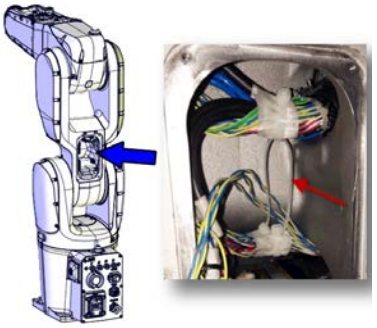
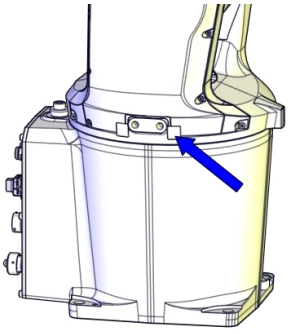
	Action	Note
7	**Valid for IRB 1200 Type B** Loose the connector screws.	 xx1700000004
8	**Valid for IRB 1200 Type B** Disconnect the connectors on the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB Remove the EIB/SMB cover completely from the lower arm.	 xx1700000005

Removing the cable package in the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull the cable package out from the upper arm housing.	

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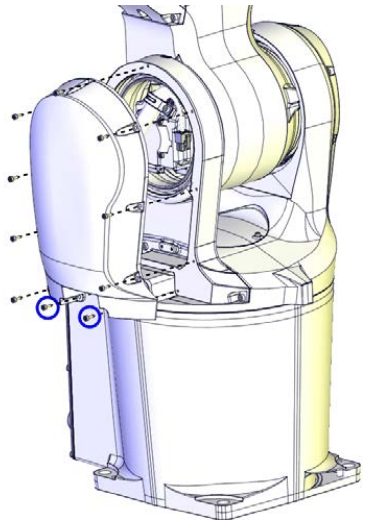
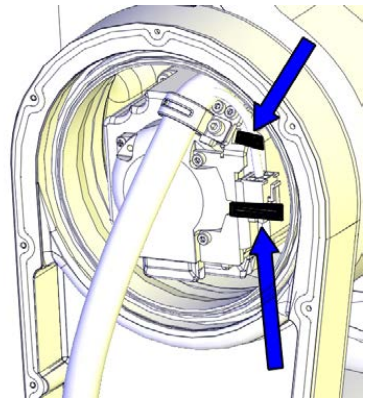
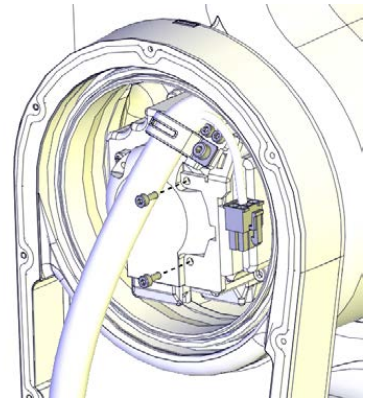
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 xx1300002426
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002430
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 xx1400001130
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the swing sealing plug. Follow the procedure specified in *Removing the swing sealing plug on page 182*.	 xx1600000205

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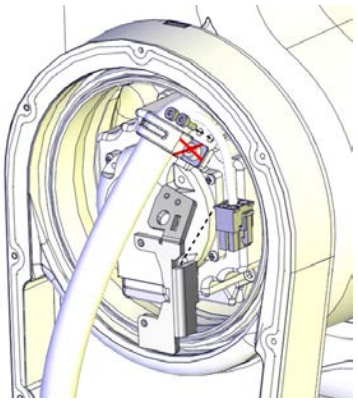
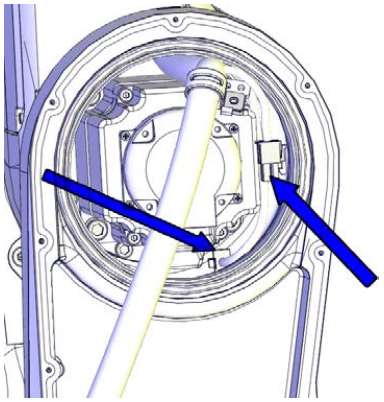
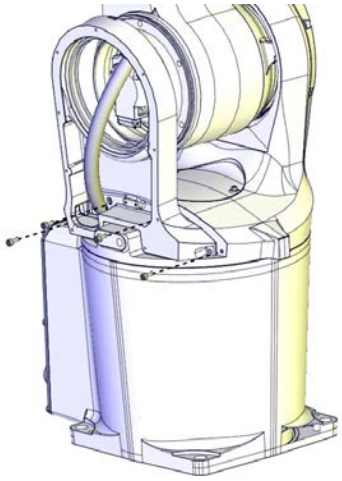
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 xx1300002431
9	Cut the cable straps.	 xx1400001528
10	Remove the axis-2 motor bracket screws.	 xx1300002432

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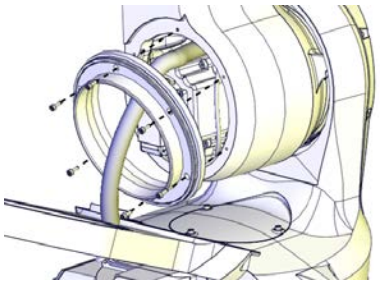
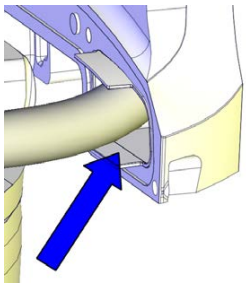
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	Action	Note
11	Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 xx1300002433
12	Disconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
13	Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.	 xx1300002435

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx1400000020
15	Pull out the cable package from the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx1400000023

Fitting lifting equipment to the upper and lower arm

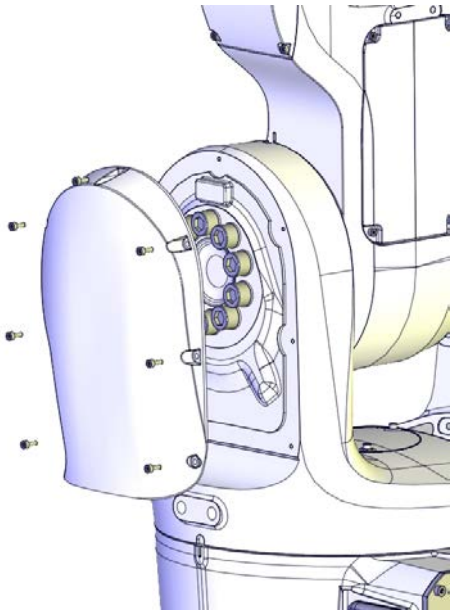
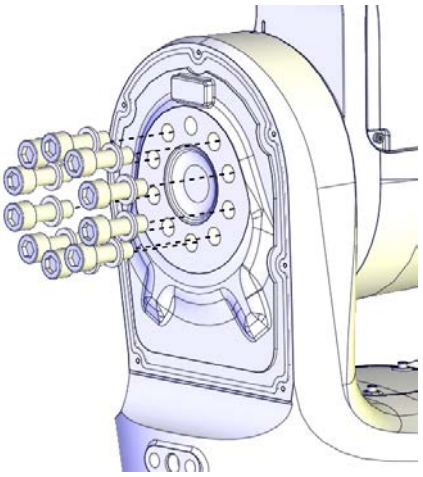
	Action	Note
1	**CAUTION** The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
2	Fit lifting slings to the upper and lower arm.	Roundsling, 2 m

Removing the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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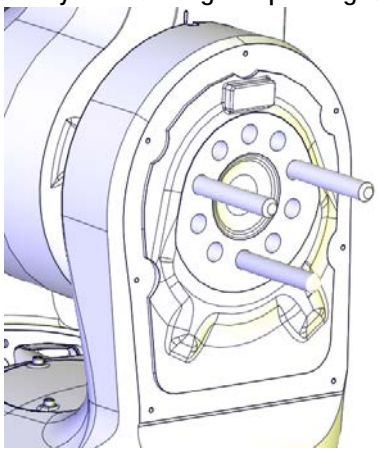
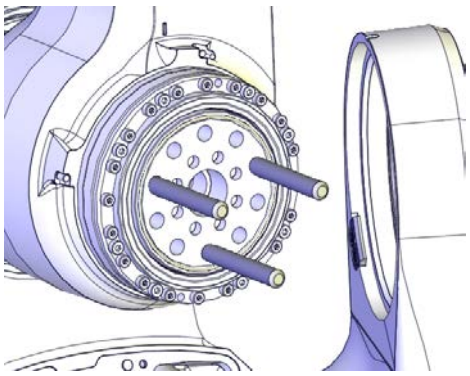
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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the swing cover.	 xx1300002551
4	Remove the lower arm screws and washers. **WARNING** This releases the lower arm from the swing. Make sure the weight of the arm is properly secured. The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.	 xx1300002552

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
5	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001 Always use three guide pins together!  xx1300002563
6	Separate the lower arm from the swing. **Tip** If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.	 xx1300002553

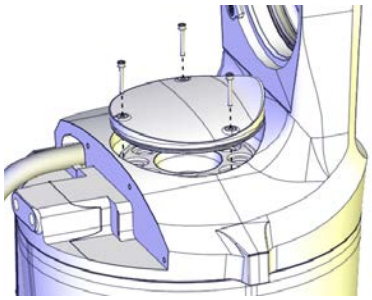
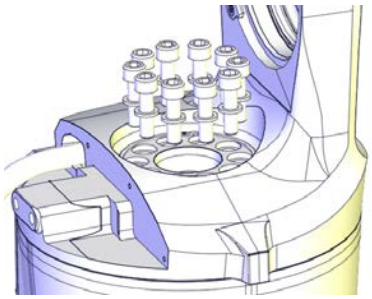
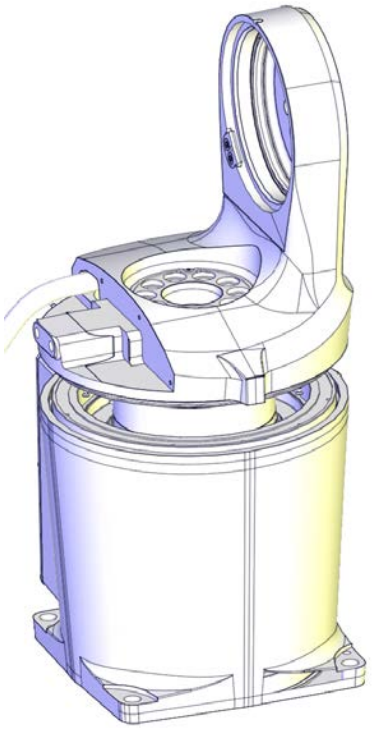
Removing the swing

Use this procedure if replacing the swing.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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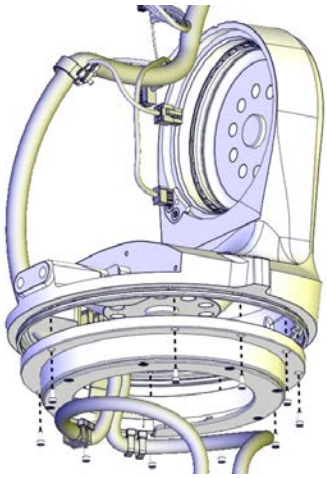
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	Action	Note
3	Remove the swing top cover by removing the screws. **Tip** Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.	 xx1400000447
4	Remove the swing attachment screws and washers.	 xx1400000448
5	Lift the swing upwards to access the axis-1 sealing ring. **CAUTION** Be aware of the cabling that is attached to the sealing ring fitted to the swing! The swing can not be removed completely until the axis-1 sealing ring is removed, as shown in following step.	 xx1400000449

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
6	Remove the axis-1 sealing ring from the swing and carefully run the cabling out from the swing.	 xx1400000455

Removing the axis-2 radial sealing (IP67 and Foundry Plus)

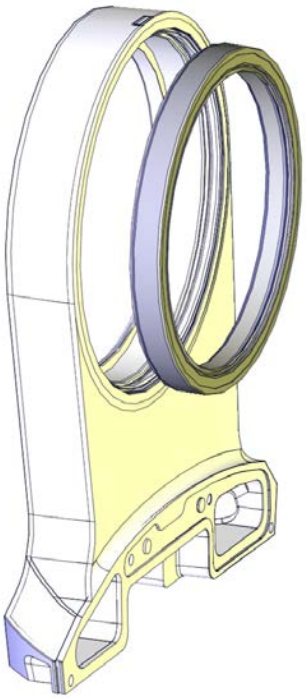
Use this procedure if replacing the axis-2 radial sealing.

The sealing is only used for robots with protection class IP67 and with protection type Foundry Plus.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	Remove the axis-2 radial sealing from the cable housing.	 xx1400000450

Refitting the swing parts

Use these procedures to refit the swing spare parts.

Refitting the swing

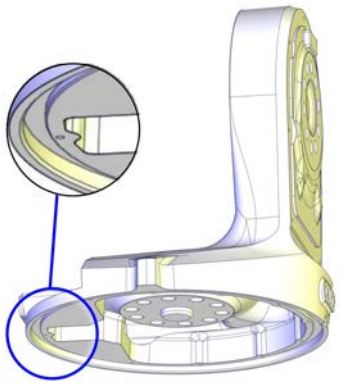
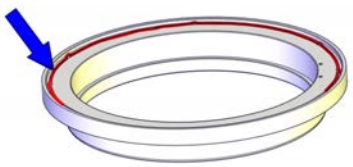
Use this procedure if replacing the swing.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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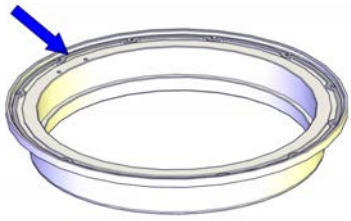
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** On swing version 3HAC058000-001: Add sealant to the swing groove.	Sealant: Sikaflex 521FC.  xx1600000053
3	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.)	Sealant: Sikaflex 521FC.  xx1600001125

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	Action	Note
4	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the gasket on the axis-1 sealing ring. Replace if damaged. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.)	On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001  xx1400000458 On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1600001149 On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)  xx1900001735

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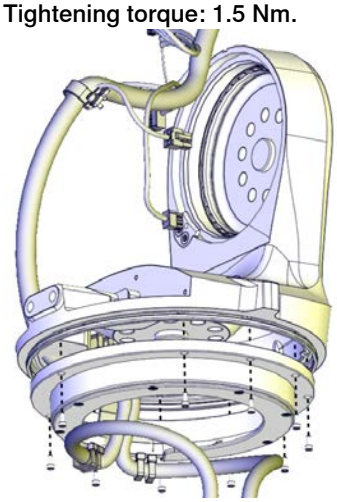
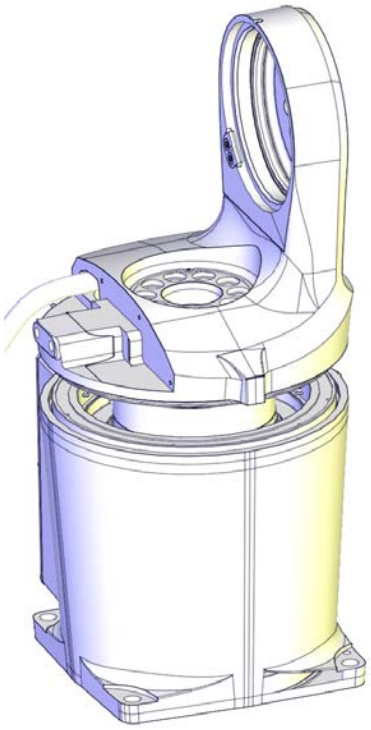
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
5	**For robots with protection class IP67** On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001: **For robots with protection type Foundry Plus** On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the V-ring on the axis-1 sealing ring. (See *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.) Replace if damaged.	V-ring: 3HAB3732-34 On axis-1 sealing ring version 3HAC056658-001:  xx1600001124 On axis-1 sealing ring version 3HAC058568-001:  xx1600001150 On axis-1 sealing ring version 3HAC068107-001:  xx1900001736
6	Check the cable protection on the axis-1 sealing ring. Replace if damaged. If replacing the cable protection, use locking liquid on the screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Cable protection: 3HAC044691-001 Torx countersunk head screw M3x5: 3HAC14286-4 Tightening torque: 0.3 Nm  xx1400000456

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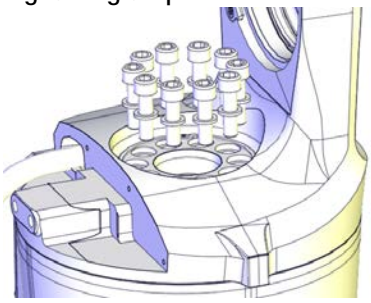
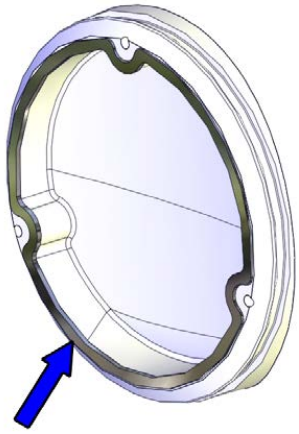
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	Action	Note
7	Fit the axis-1 sealing ring to the swing with the screws and carefully run the cabling out up through the swing.	Axis-1 sealing ring: 3HAC073849-001 / 3HAC086035-001 / 3HAC068107-001 i Tightening torque: 1.5 Nm.  xx1400000455
8	Lower the swing down into place while at the same time guiding the cabling through the cable hole.	 xx1400000449

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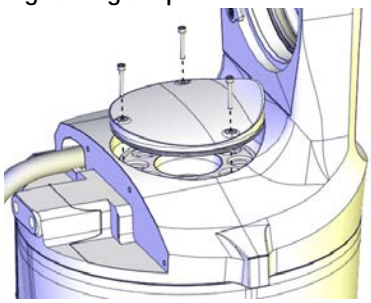
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
9	Refit the swing attachment screws and washers.	Screws: 3HAB3409-52 (M10x35). Tightening torque: 40 Nm.  xx1400000448 **Note** Only use specified screws, never replace them with other screws.
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Gasket on top swing cover: 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)  xx1400000425

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	Action	Note
11	Refit the swing top cover with the screws. Replace if damaged.	Cover on top of swing: 3HAC059679-001 Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic : 3HAC056133-001 Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.  xx1400000447 **Note** Only use specified screws, never replace them with other screws.

i For information on which sealing ring to be ordered, see *Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 912*.

Refitting the axis-2 radial sealing (IP67, Foundry Plus, Clean Room, food grade lubrication, Hygienic)

Use this procedure if replacing the axis-2 radial sealing.

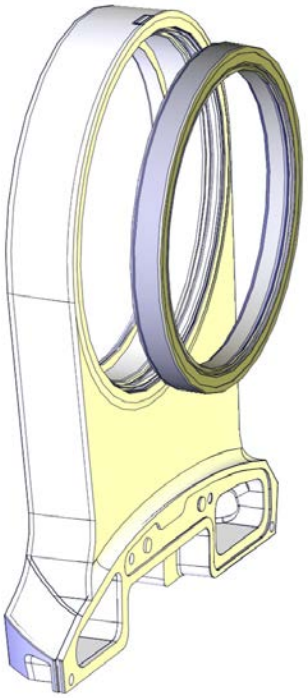
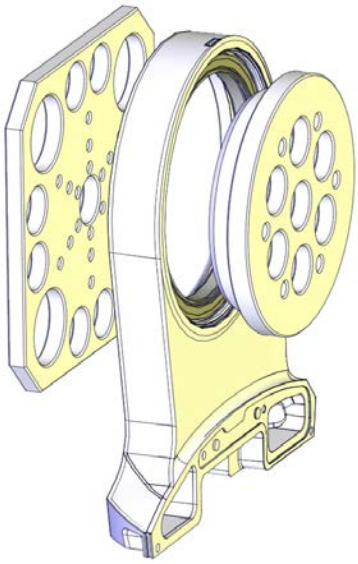
The sealing is only used for robots with protection class IP67, with protection type Foundry Plus, with protection type Clean Room, with food grade lubrication and protection type Hygienic.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing and wipe clean after the refitting.	

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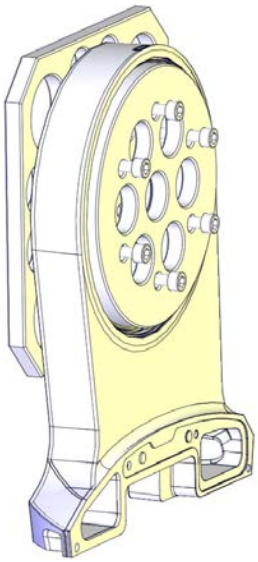
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
3	Fit the axis-2 radial sealing into the cable housing.	Radial sealing with dust lip: 3HAB3701-41  xx1400000450
4	Fit the circular part of the radial sealing fitting tool against the radial sealing.	Axis-2 sealing assembly tool set: 3HAC049694-001
5	Fit the tool plate to the other side of the cable housing with the six screws M6X50.	 xx1400000451

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	Action	Note
6	Screw the screws, little by little, to press the sealing into place.	 xx1400000452
7	Remove the assembly tool.	
8	Check that the sealing is undamaged and properly fitted.	

Fitting lifting equipment to the upper and lower arm

	Action	Note
1	**CAUTION** The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
2	Fit lifting slings to the upper and lower arm.	Roundsling, 2 m

Refitting the lower arm

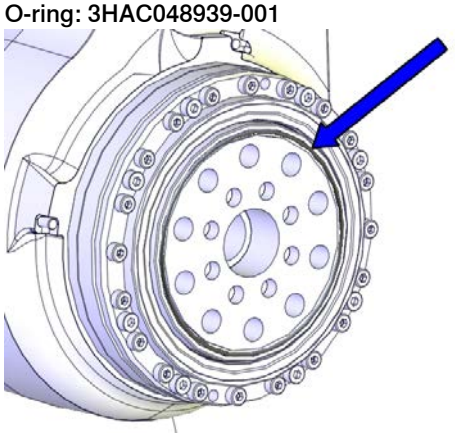
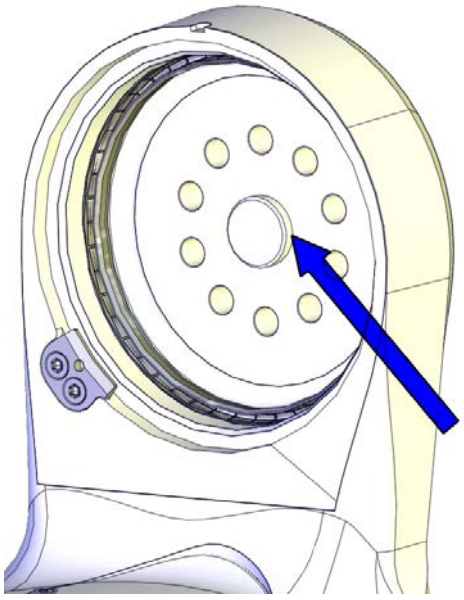
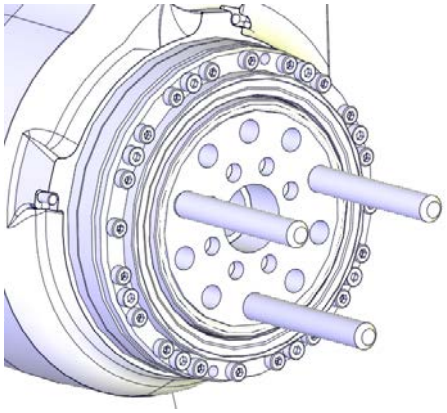
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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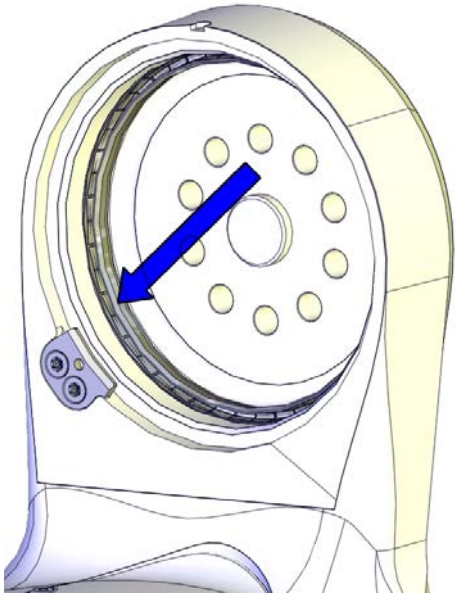
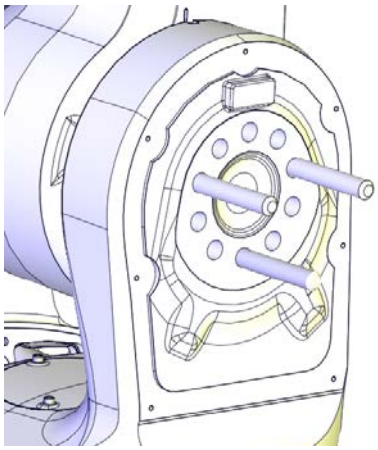
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
2	Check the o-ring. Replace if damaged.	O-ring: 3HAC048939-001  xx1300002556
3	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Wipe clean the overflowing Loctite 574 if there is any.	 xx1400001403
4	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001  xx1300002562 Always use three guide pins together!

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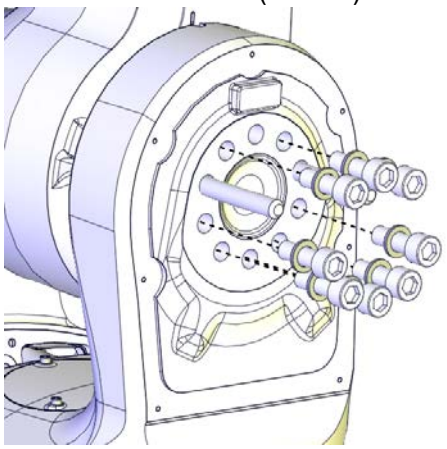
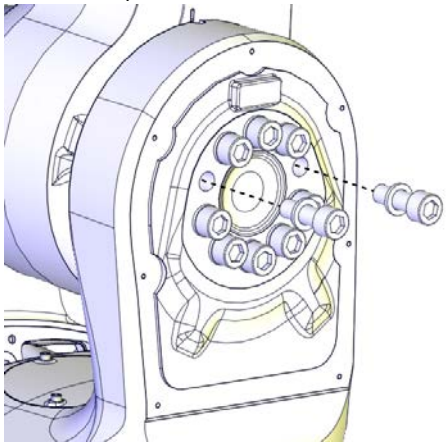
	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-003  xx1400000453
6	Fit the lower arm to the swing, with guidance from the guide pins.	 xx1300002563

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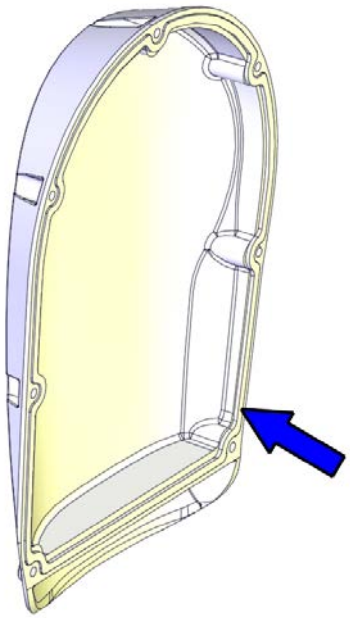
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
7	Refit the lower arm screws and washers, using locking liquid. Secure the screws but do not tighten yet.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: 3HAB3409-51 (M10x30).  xx1300002564 **Note** Only use specified screws, never replace them with other screws.
8	Remove the guide pins and refit the remaining screws and washers using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)  xx1300002565
9	Tighten all screws.	Tightening torque: 45 Nm

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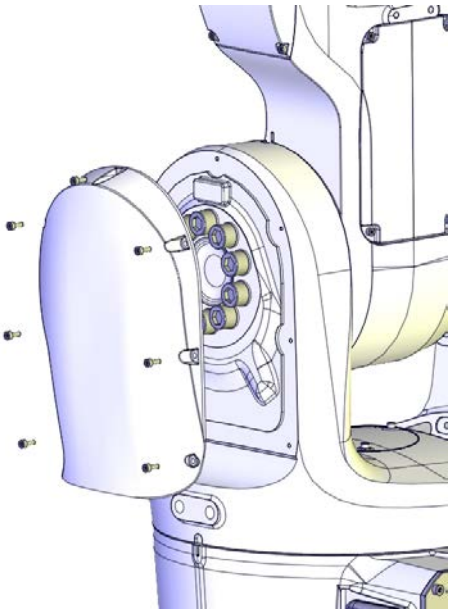
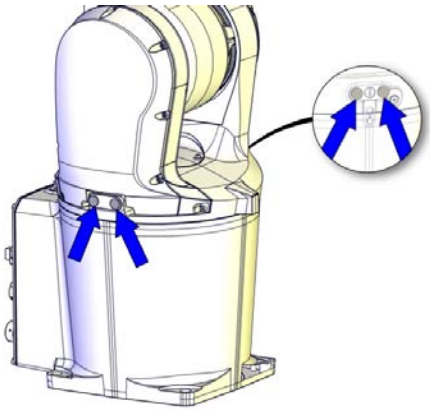
	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the swing cover gasket. Replace if damaged.	Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)  xx1400000007
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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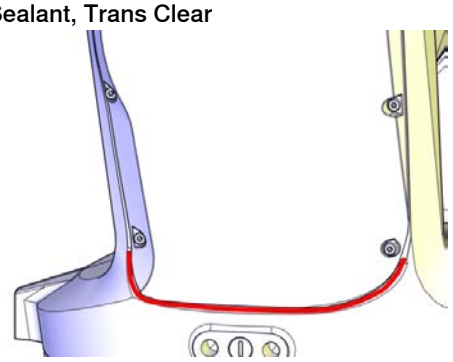
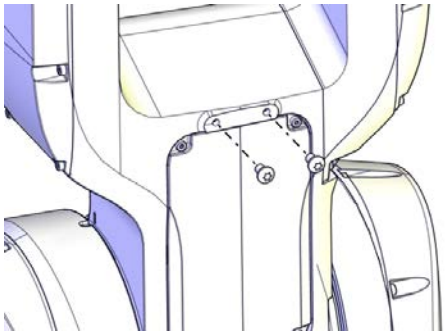
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
12	Refit the swing cover. Replace if damaged.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001  xx1300002551
13	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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	Action	Note
14	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000217
15	**For robots with protection type Foundry Plus** If required, fit two screws for protection.	 xx1600001154

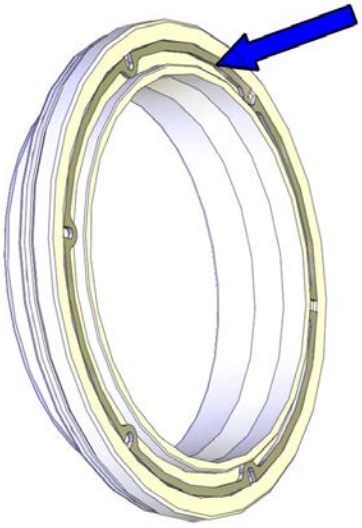
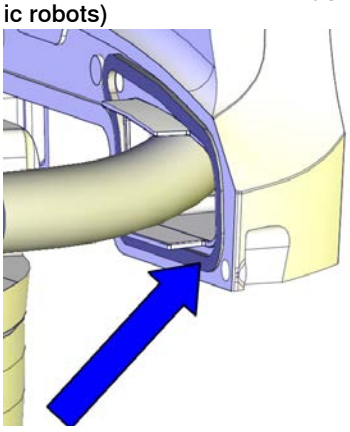
Refitting the cable package in the lower arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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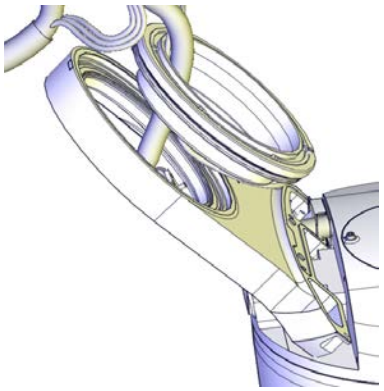
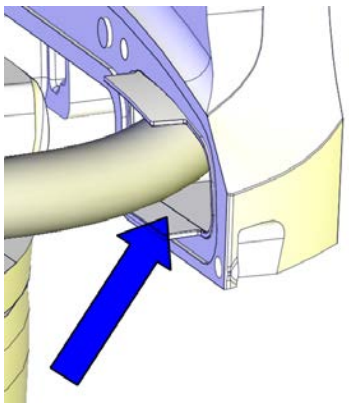
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
2	Check the axis-2 sealing ring. **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Axis-2 sealing ring: 3HAC086036-001 (for robots in IP40) / 3HAC044677-001 (for robots not in IP40) Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)  xx1400000476
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing plastic plate. Replace if damaged.	Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)  xx1400000457

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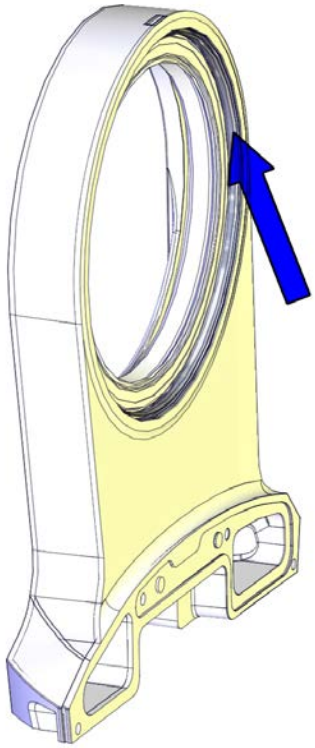
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	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 xx1400000025
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	The plastic plate is included in: Cable harness material set: 3HAC049663-001.  xx1400000023

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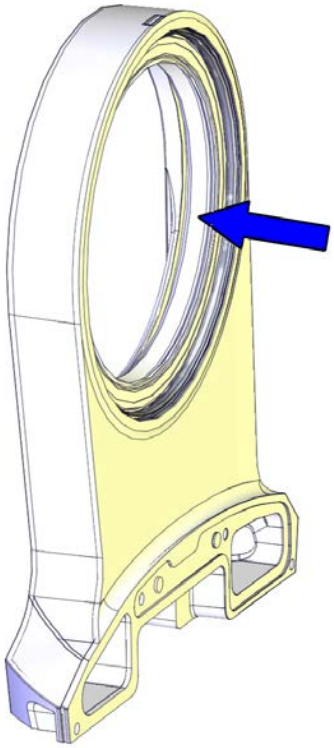
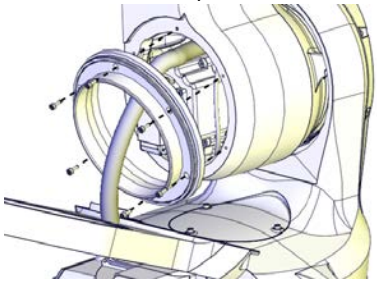
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
6	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-004  xx1400000454

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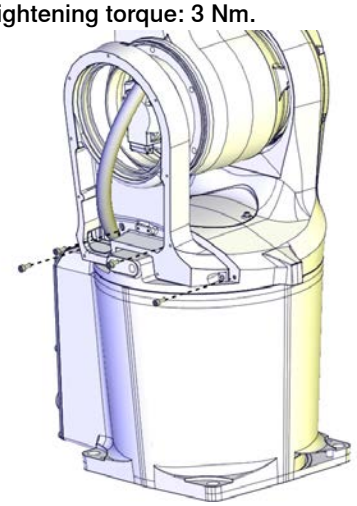
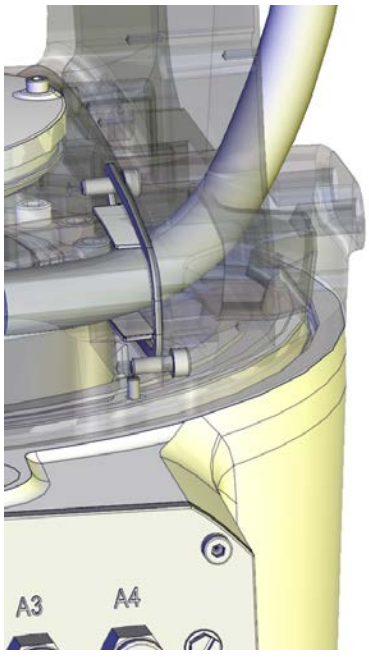
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	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	Radial sealing with dust lip: 3HAB3701-41  xx1400000753 Replacement is detailed in *Replacing the swing spare parts (swing, axis-2 radial sealing) on page 595*.
8	Guide the cable package into the lower arm. **Tip** There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
9	Refit the axis-2 sealing ring with the screws.	Tightening torque: 0.5 Nm (for Axis-2 sealing ring 3HAC086036-001) / 1.5 Nm (for Axis-2 sealing ring 3HAC044677-001)  xx1400000020

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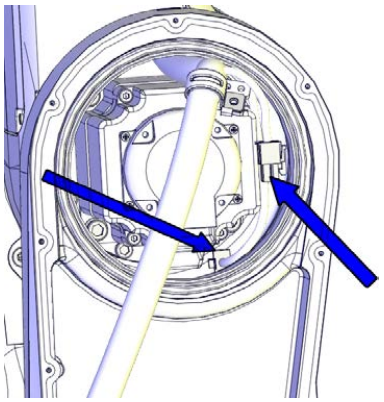
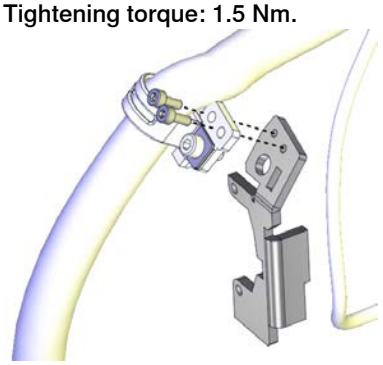
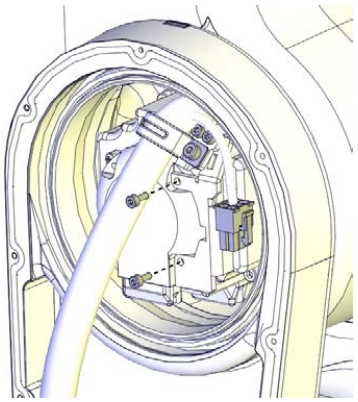
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
11	Refit the cable housing with the screws.	Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.  xx1300002435 **Note** Only use specified screws, never replace them with other screws.
12	Apply grease to the cable package, cover all moving area of the package.	 xx1400000481

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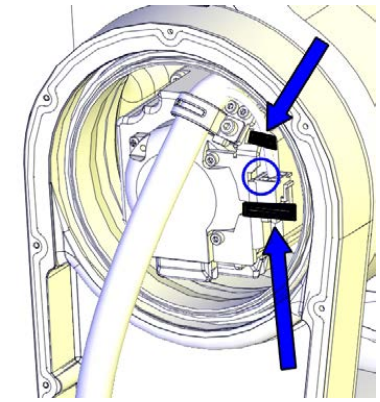
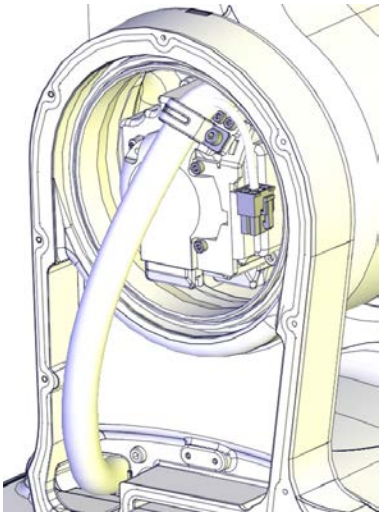
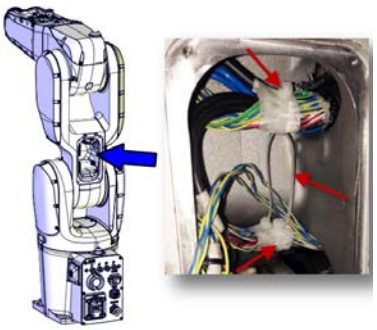
	Action	Note
13	Reconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
14	Refit the axis-2 motor bracket to the cable package with the two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1400000021
15	Refit the axis-2 motor bracket to the motor.	 xx1300002432

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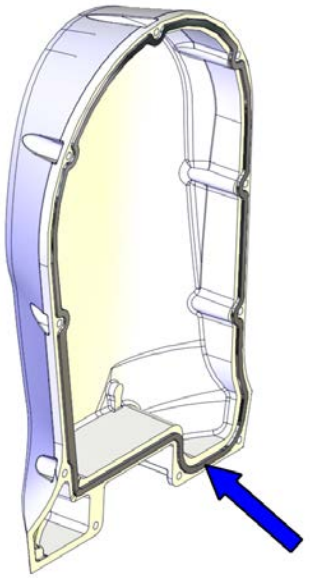
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
16	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
17	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
18	In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity: 1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location. 2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. See the figure.	 xx1400001131

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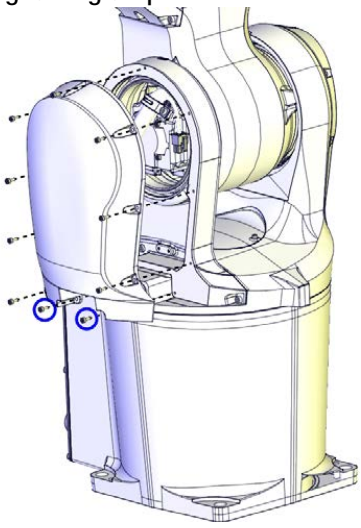
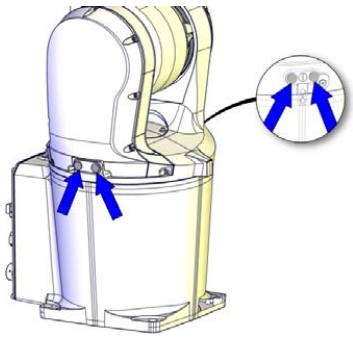
	Action	Note
19	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)  xx1400000424
20	Check the PTFE film. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
21	Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.	
22	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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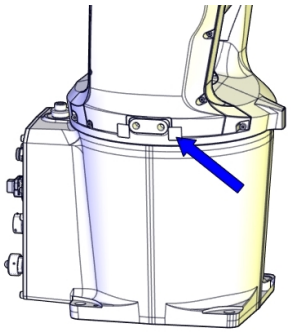
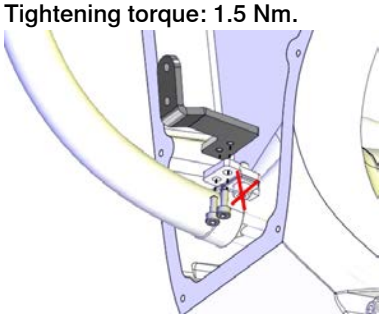
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
23	Refit the cable housing cover. Replace if damaged. **Note** Remember to refit the two lower screws shown in the figure.	Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002431 **Note** Only use specified screws, never replace them with other screws.
24	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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	Action	Note
25	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Refit the swing sealing plug. Follow the procedure specified in *Refitting the swing sealing plug on page 183*.	Swing sealing plug:3HAC053687-001  xx1600000205
26	Refit the lower arm bracket to the cable package. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002430

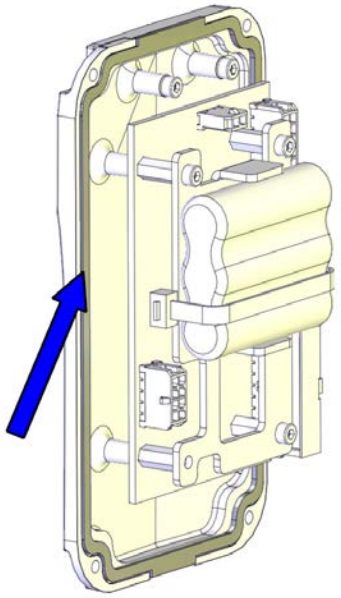
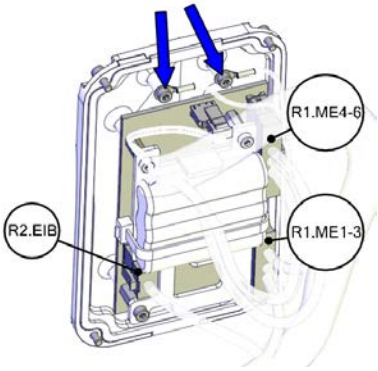
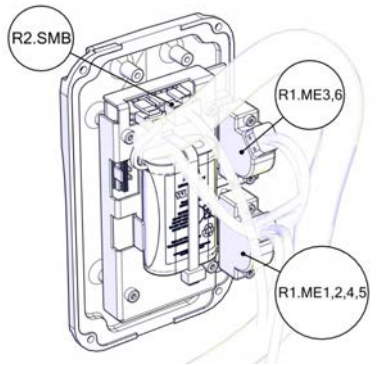
Connecting the cabling in the lower arm

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit please read the safety information in the section *The unit is sensitive to ESD on page 69*	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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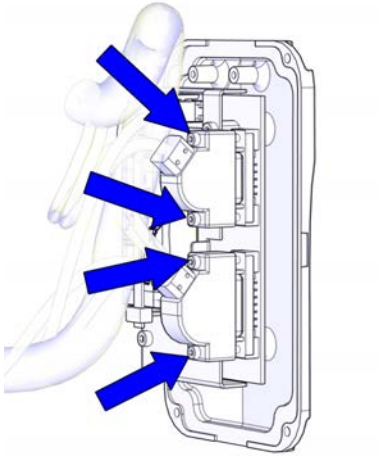
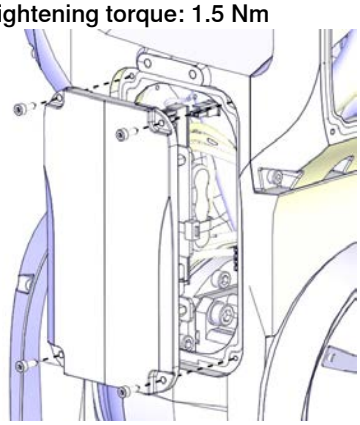
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the EIB/SMB cover gasket. Replace if damaged.	Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)  xx1400000475
4	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the connectors to the EIB unit. • R1.ME1-3 • R1.ME4-6 • R2.EIB **WARNING** Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1300002428
5	**Valid for IRB 1200 (no type specified) and IRB 1200 Type A** Connect the lugs to the EIB/SMB cover.	
6	**Valid for IRB 1200 Type B** Connect the connectors to the SMB unit. • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB **WARNING** Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.	 xx1700000005

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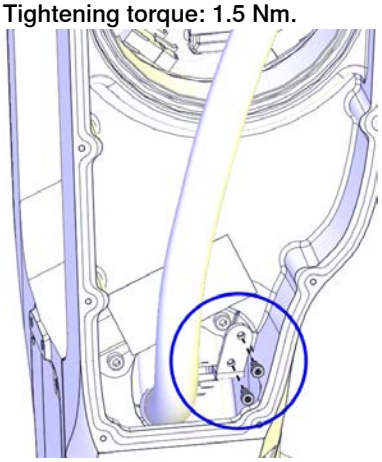
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	Action	Note
7	**Valid for IRB 1200 Type B** Tighten the connector screws.	Tightening torque: 0.2 Nm  xx1700000004
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002427 **Note** Only use specified screws, never replace them with other screws.

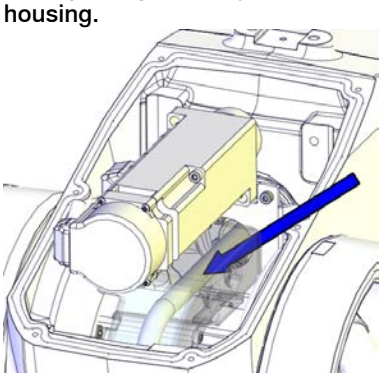
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
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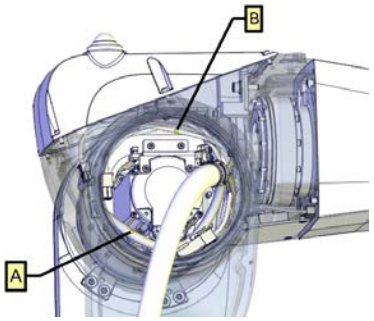
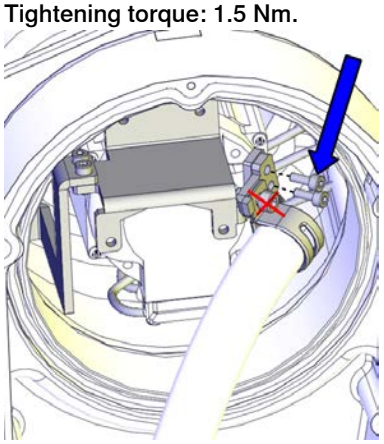
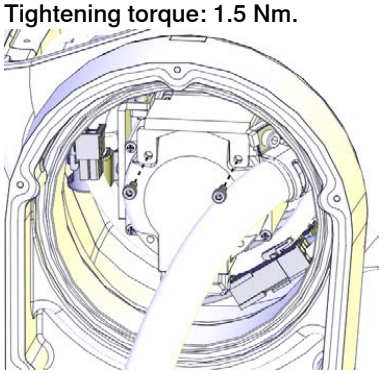
	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	Tightening torque: 1.5 Nm.  xx1300002426

Refitting the cable package in the housing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	Area to be lubricated, shown in cable package already fitted to the housing.  xx1400000483

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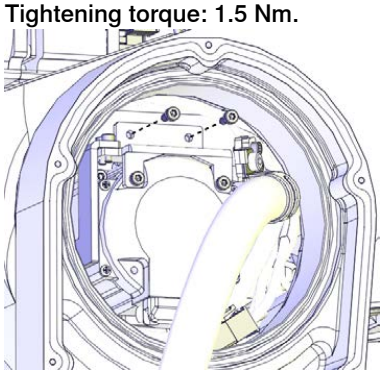
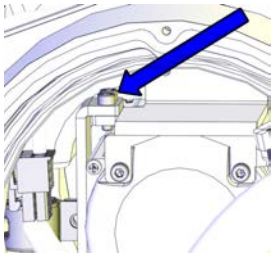
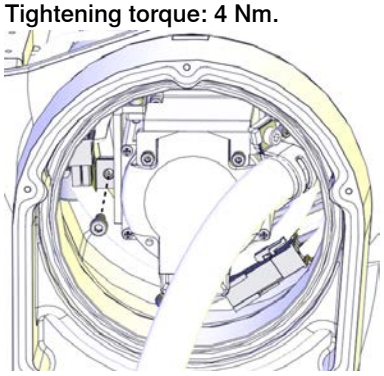
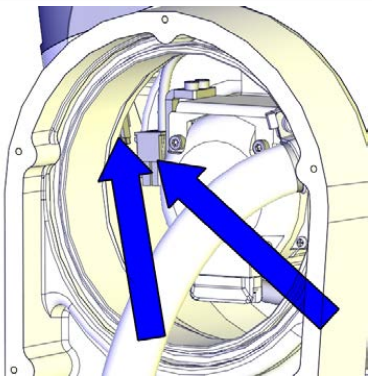
	Action	Note
3	Guide the cable package into the upper arm, through the housing. **Note** Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor. **Note** The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.	 xx1400001472
4	Refit the bracket to the sheet with two screws. **CAUTION** Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  xx1300002424
5	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423

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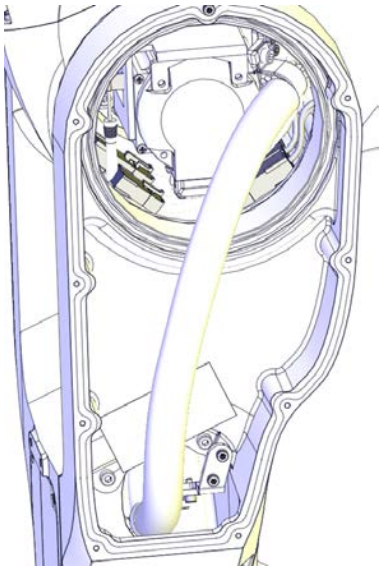
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

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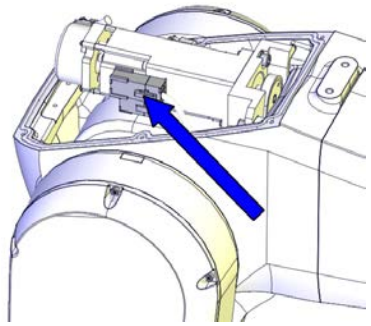
	Action	Note
6	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
7	Fit the air hose holder to the bracket. Replace the holder, if damaged. **Tip** If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.  xx1400001133	Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.  xx1300002422
8	Reconnect the axis-3 motor connectors.	 xx1300002420

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	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 xx1400000754
10	**Valid for IRB 1200-5/0.9 and IRB 1200-7/0.9** Secure the cable package at the bottom of the housing with cable straps.	

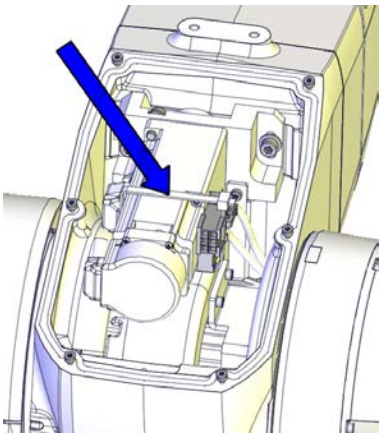
Connecting the axis-4 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

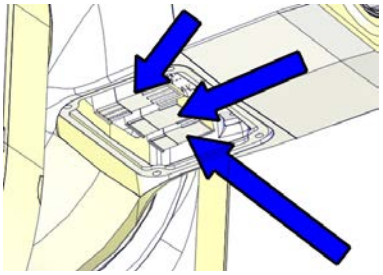
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

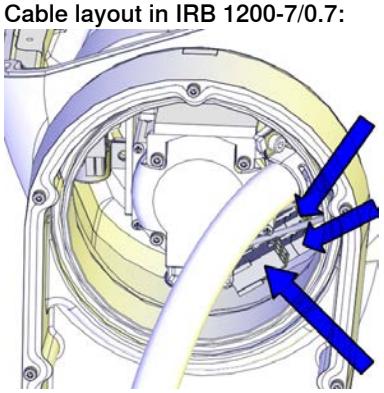
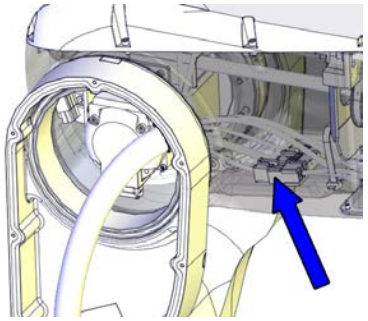
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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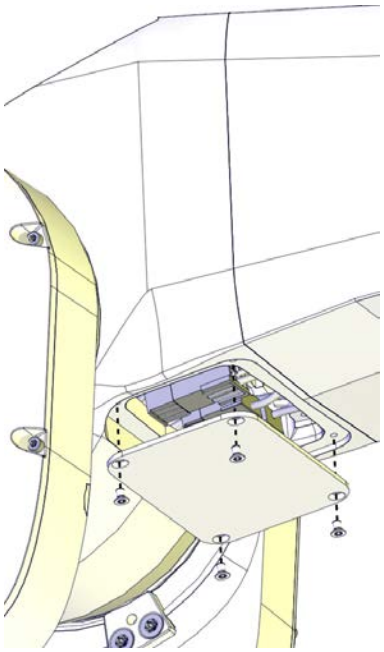
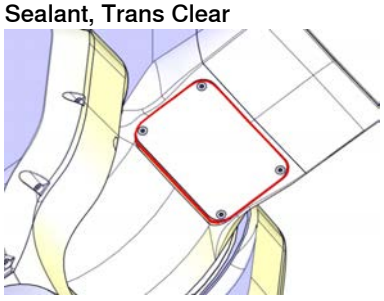
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	Action	Note
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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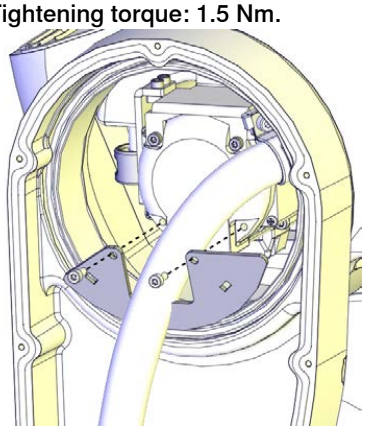
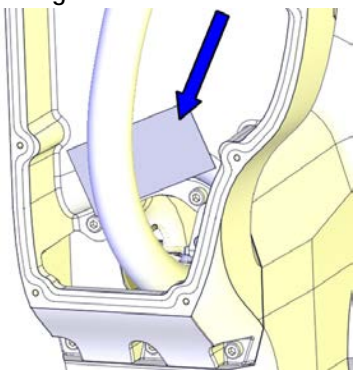
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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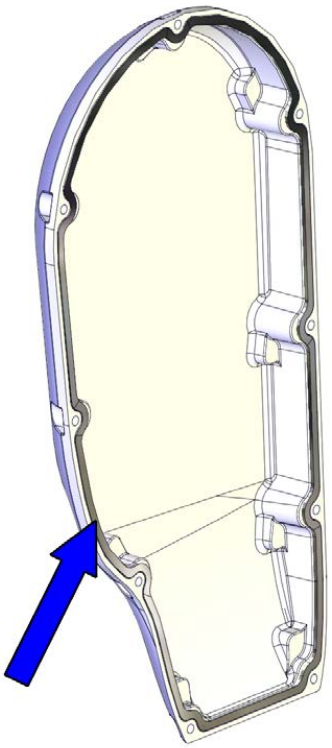
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	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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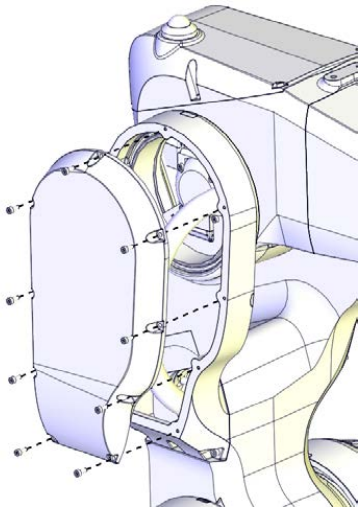
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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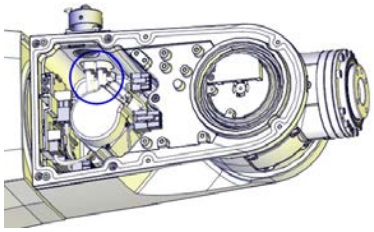
	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

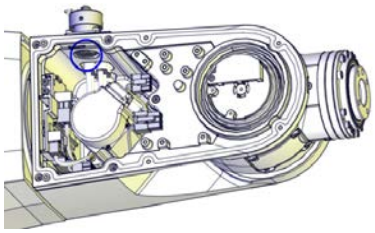
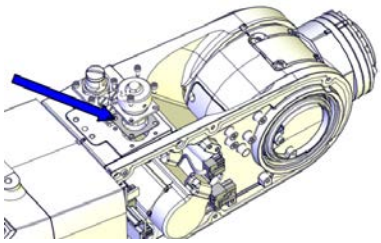
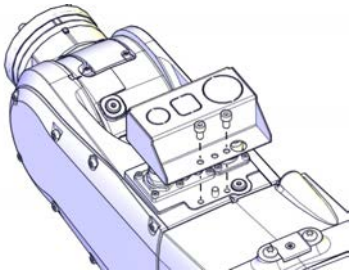
Use this procedure if the robot is not in protection type Hygienic.

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

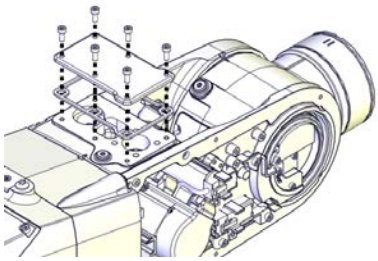
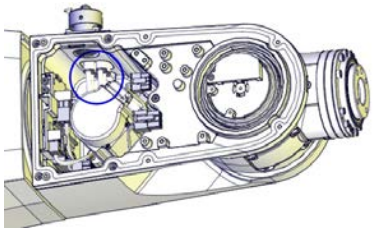
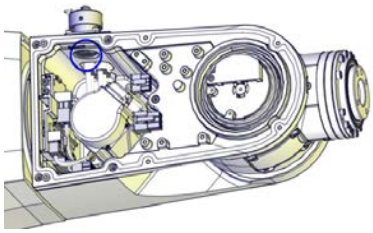
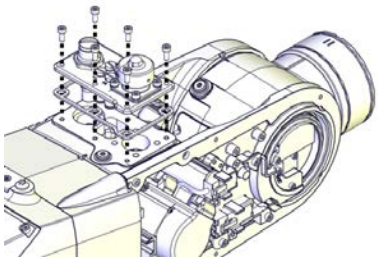
Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

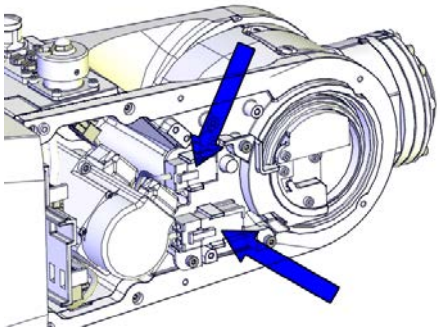
Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

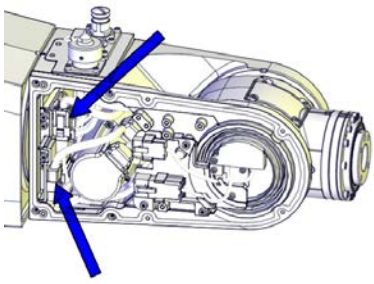
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

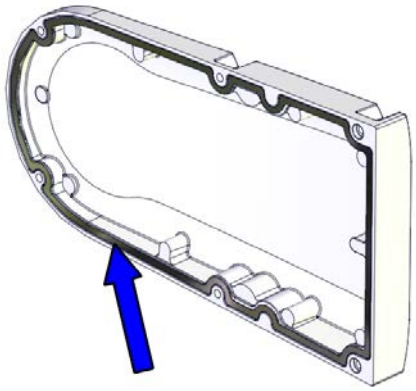
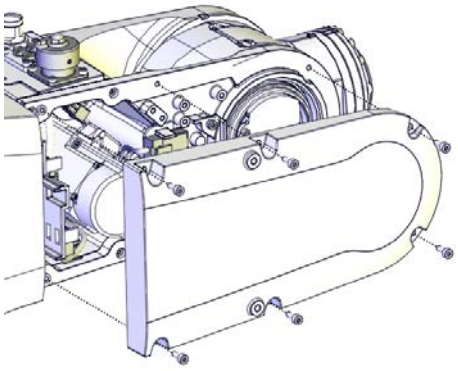
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the tubular cable housing cover

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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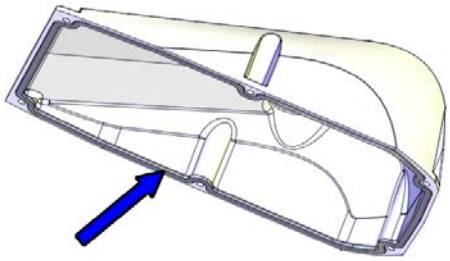
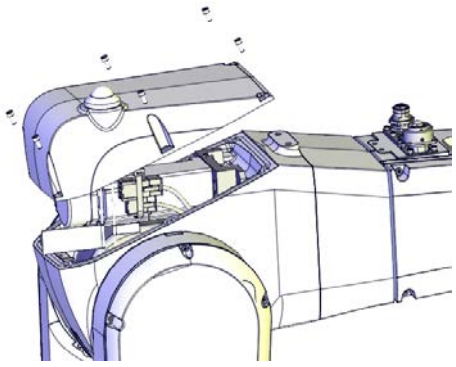
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001  xx1400000345
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
4	Refit the cover to the cable housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002389 **Note** Only use specified screws, never replace them with other screws.

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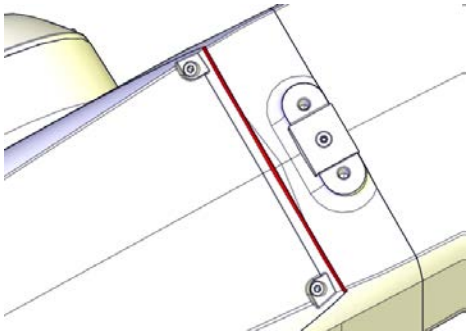
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws. **CAUTION** **For robots with safety lamp (option)** Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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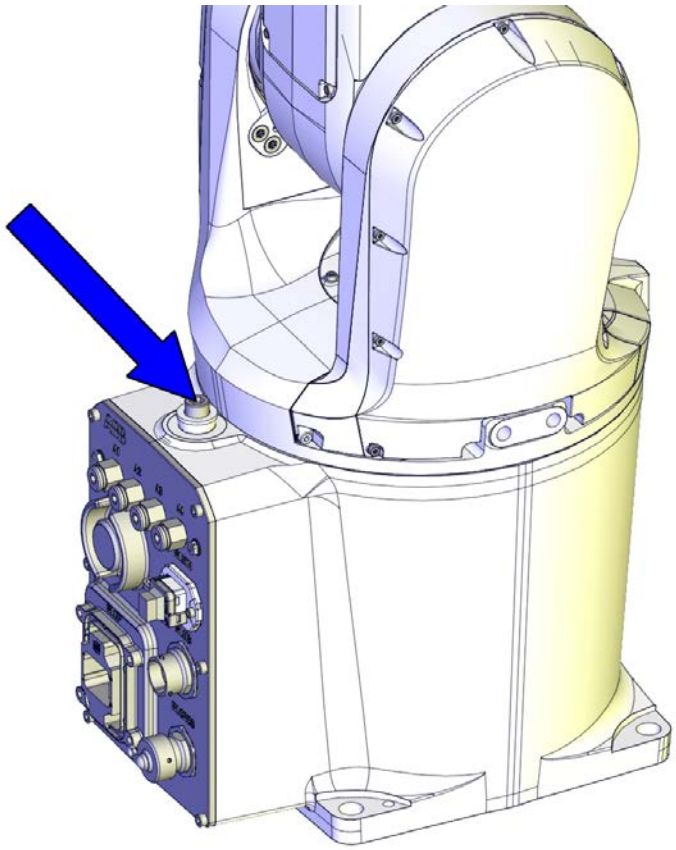
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.5.3 Replacing the axis-1 mechanical stop

Location of the mechanical stop

The axis-1 mechanical stop is located as shown in the figure.



xx1400000391

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Mechanical stop set, axis 1	3HAC049630-001	Includes mechanical stop pin (1 pc), washer and screw.

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

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Replacing the mechanical stop

Use these procedures to remove the axis-1 mechanical stop.

Preparations before removing the mechanical stop

	Action	Note
1	Jog the robot to a position where the mechanical stop is most easily accessed.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Replacing the axis-1 mechanical stop

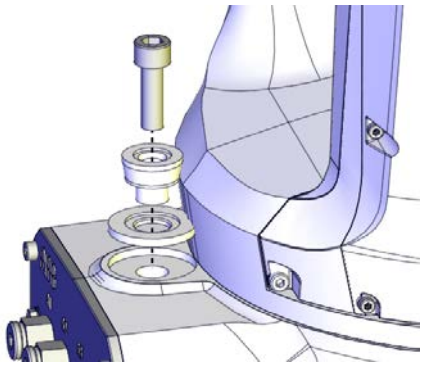
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.5.3 Replacing the axis-1 mechanical stop

Continued

	Action	Note
3	Remove the mechanical stop by removing the screw.	 xx1400000392 Screw: 9ADA183-37 (M8x25). Tightening torque: 12 Nm. **Note** Only use specified screws, never replace them with other screws.
4	Discard the old screw and washer.	
5	Refit and secure the new stop with the enclosed screw and washer.	
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6 Motors and gearboxes

4.6.1 Replacing the axis-1 gear unit

Part of complete base

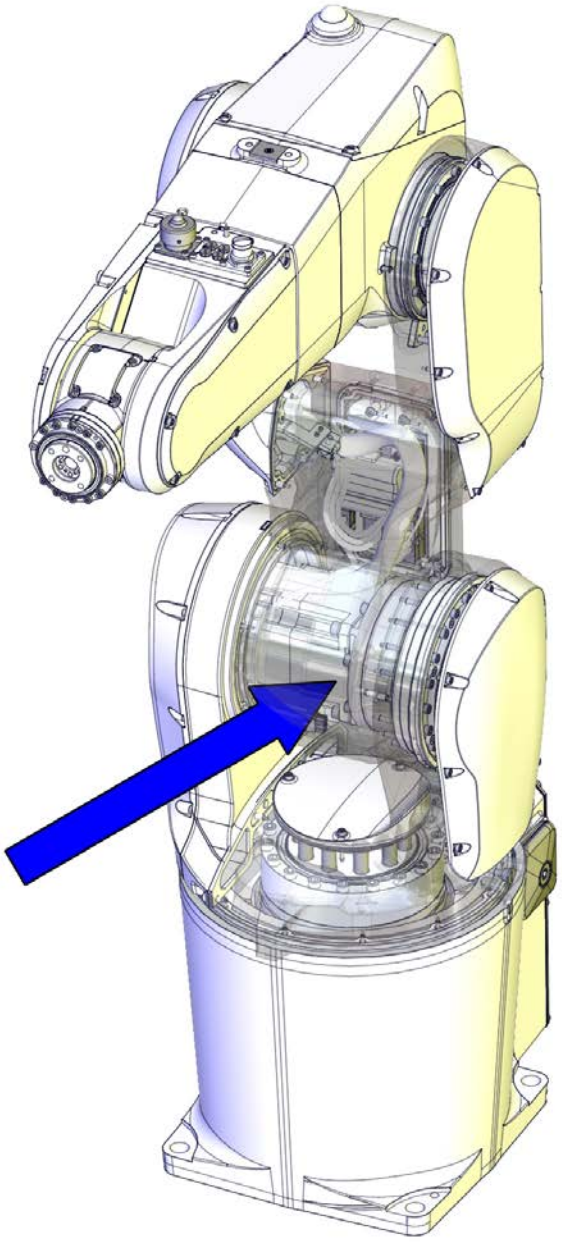
The axis-1 gear unit and axis-1 motor is part of the complete base spare part assembly, see *Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 515*.

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4.6.2 Replacing the axis-2 drive unit

Location of the drive unit

The axis-2 drive unit is located as shown in the figure.



xx1300002547

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Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Drive unit	3HAC049645-001	Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, food grade lubrication	3HAC057903-001	Used for robots with food grade lubrication. Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, SafeMove 2-supported	3HAC061273-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, food grade lubrication and SafeMove 2-supported Drive unit, Hygienic	3HAC061274-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used for robots with food grade lubrication. Used with protection type Hygienic Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001).
O-ring	3HAC048939-001	Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!

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4.6.2 Replacing the axis-2 drive unit
Continued

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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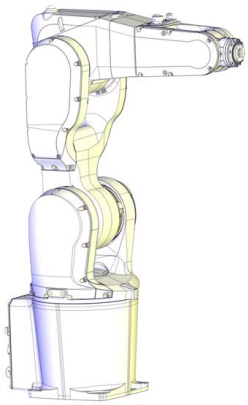
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the drive unit

Use these procedures to remove the axis-2 drive unit.

Preparations before removing the axis-2 drive unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4.6.2 Replacing the axis-2 drive unit
Continued

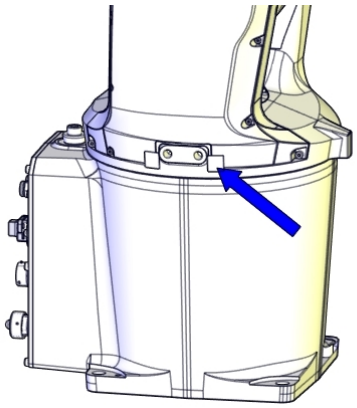
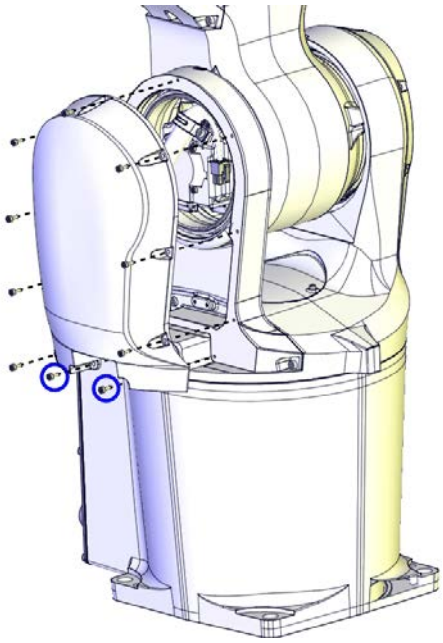
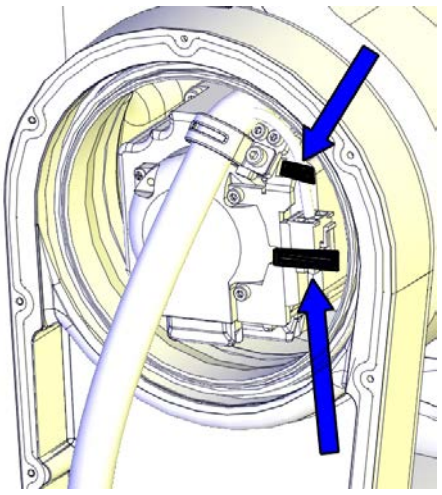
	Action	Note
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	**CAUTION** The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
6	Fit a roundsling to the upper arm to support the weight of the upper and lower arm. (no force)	

Loosening the cabling in the swing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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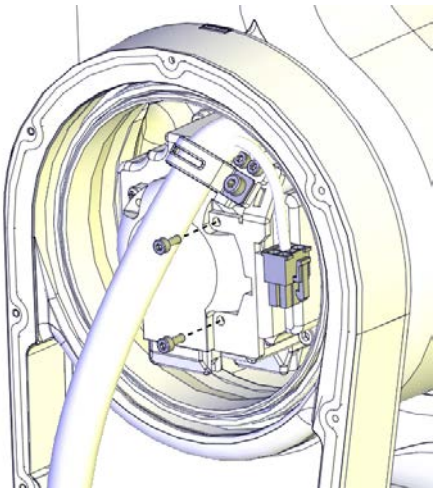
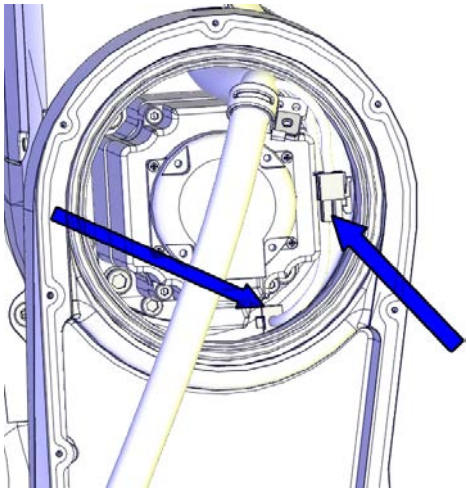
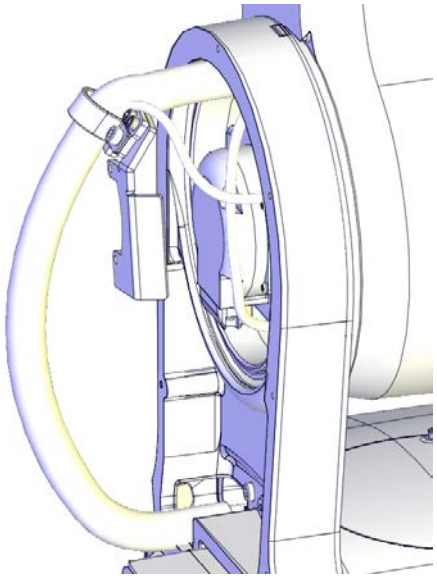
	Action	Note
3	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the swing sealing plug. Follow the procedure specified in *Removing the swing sealing plug on page 182*.	 xx1600000205
4	Remove the cable housing cover of the swing by removing the screws.	 xx1300002431
5	Cut the cable straps.	 xx1400001528

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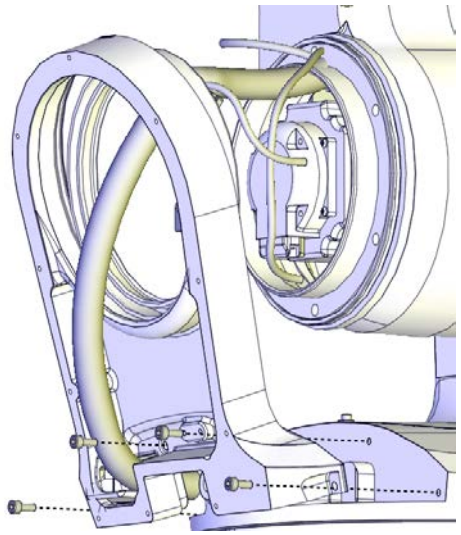
4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
6	Remove the axis-2 motor bracket screws.	 xx1300002432
7	Disconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
8	Pull out the cable harness slightly from the lower arm housing. **Note** The cabling is still connected inside the robot, so be careful not to strain the cables!	 xx1300002548

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	Action	Note
9	Loosen the cable housing of the swing by removing the screws, and tilt it outwards. **CAUTION** Make sure that the sealing in the cable housing does not get damaged when the cable housing is hanging on the cable.	 xx1300002549

Removing the lower arm

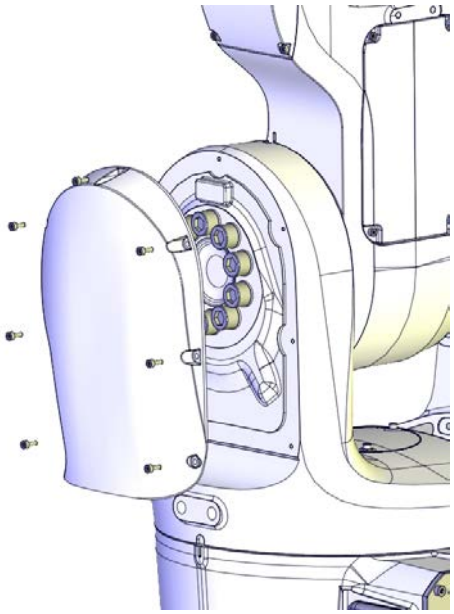
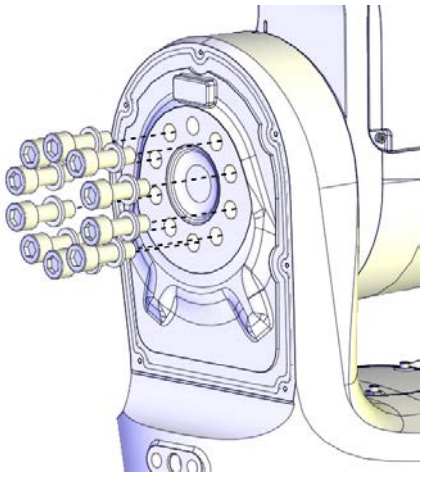
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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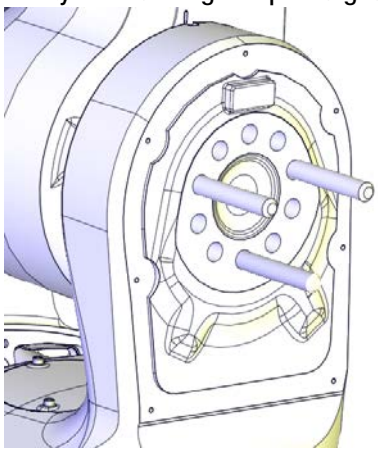
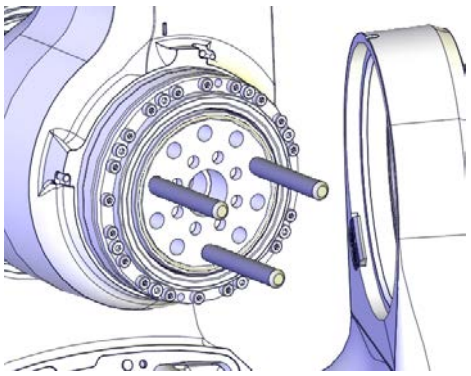
4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
3	Remove the swing cover.	 xx1300002551
4	Remove the lower arm screws and washers. **WARNING** This releases the lower arm from the swing. Make sure the weight of the arm is properly secured. The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.	 xx1300002552

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	Action	Note
5	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001 Always use three guide pins together!  xx1300002563
6	Separate the lower arm from the swing. **Tip** If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.	 xx1300002553

Removing the axis-2 drive unit

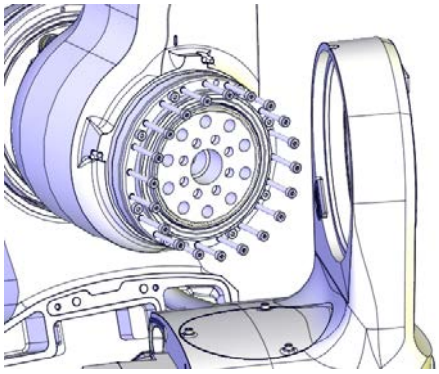
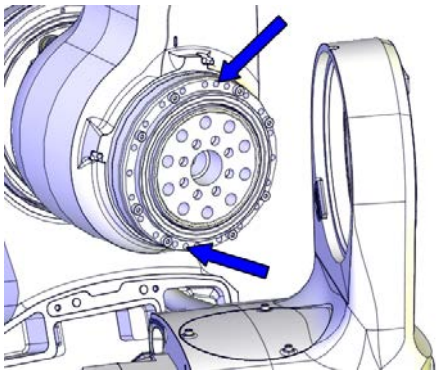
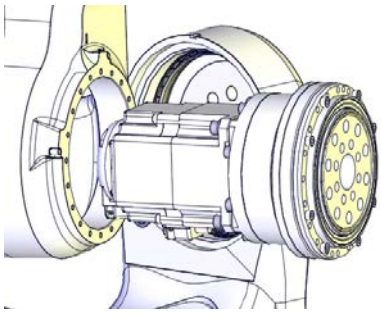
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
3	**CAUTION** The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
4	If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm. If the site is cramp, the procedure can be performed having the lower arm hanging in the lifting slings. If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together: • Person 1: Hold the lower arm still. • Person 2: Remove the drive unit screws according to step below.	 xx1300002554
5	Remove the grey screws from the drive unit. **WARNING** Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.	
6	Insert two M4 screws to the press out holes and press out the drive unit.	 xx1400000008
7	Carefully pull out the complete drive unit.	 xx1300002555

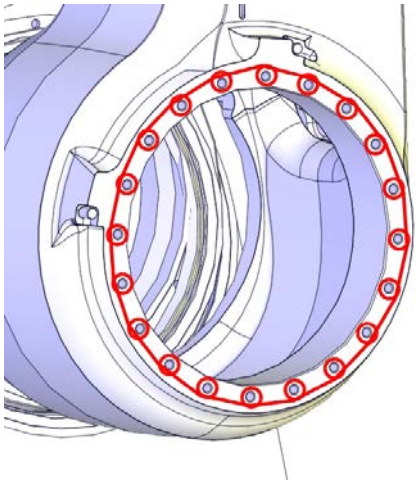
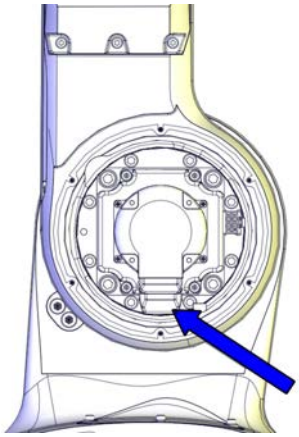
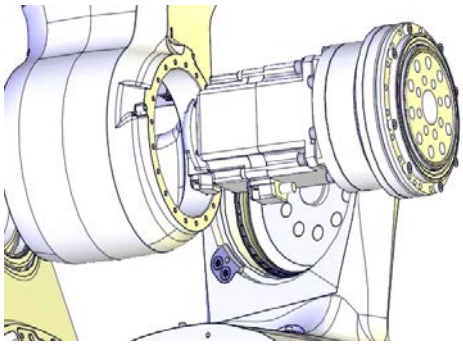
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Refitting the drive unit

Use these procedures to refit the axis-2 drive unit.

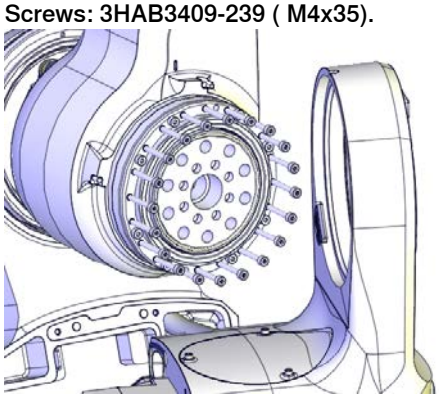
Refitting the axis-2 drive unit

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.	 xx1400000006
3	Carefully insert the complete drive unit. **Note** Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.  xx1400000795 The figure shows the position of the motor connector block when axis 2 is in position 0°.	 xx1300002580

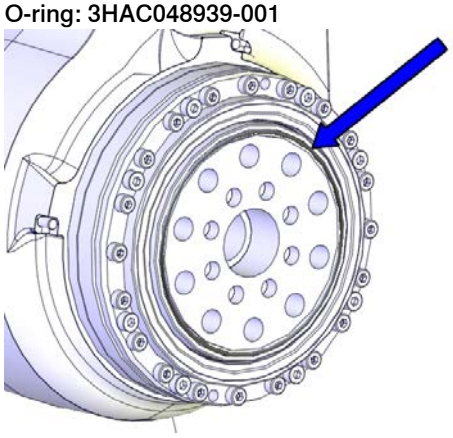
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4.6.2 Replacing the axis-2 drive unit
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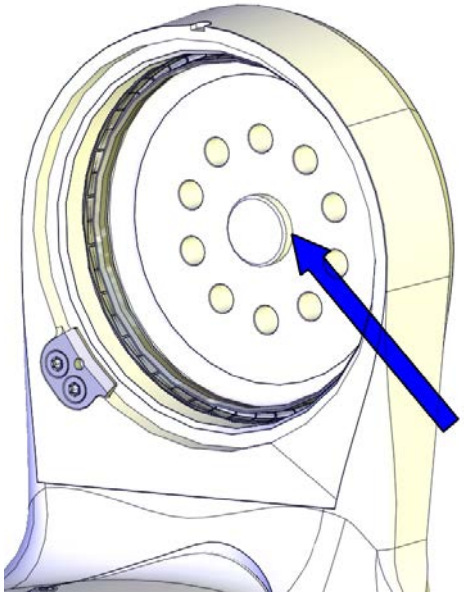
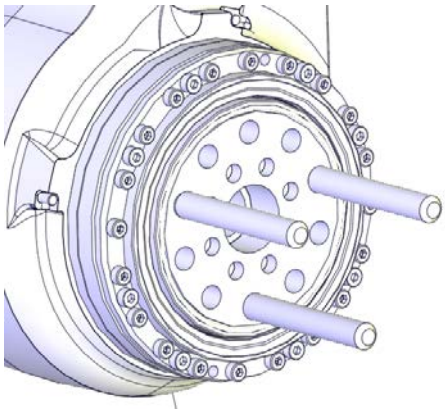
	Action	Note
4	If the gear is refitted in a hanging lower arm, this step requires two persons. • Person 1: Hold the lower arm still. • Person 2: Refit the drive unit screws. Secure the screws but do not tighten yet.	Screws: 3HAB3409-239 (M4x35).  xx1300002554 **Note** Only use specified screws, never replace them with other screws.
5	If the drive unit is refitted in a hanging lower arm, this step requires two persons. • Person 1: Hold the lower arm still. • Person 2: Tighten the screws.	Tightening torque: 5 Nm

Refitting the lower arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the o-ring. Replace if damaged.	O-ring: 3HAC048939-001  xx1300002556

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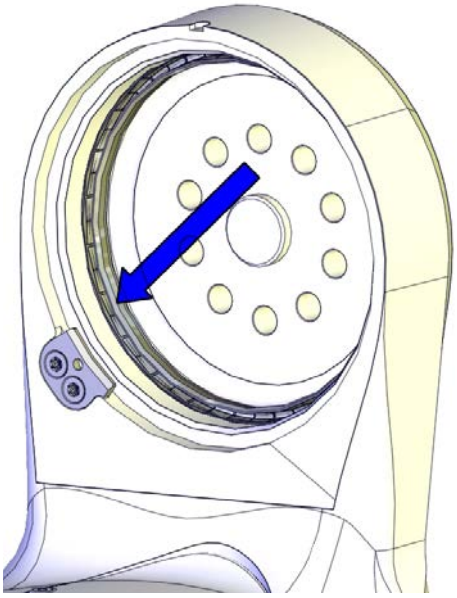
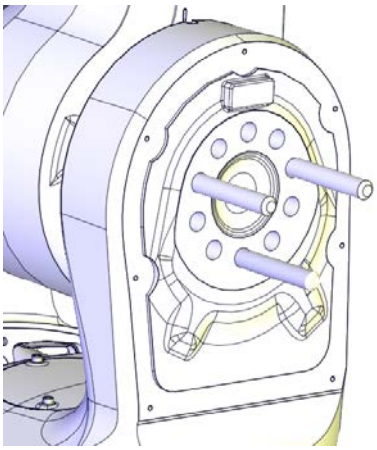
	Action	Note
3	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Wipe clean the overflowing Loctite 574 if there is any.	 xx1400001403
4	Fit guide pins to the gearbox.	Guide pin for axis-2 gear unit: 3HAC049704-001  xx1300002562 Always use three guide pins together!

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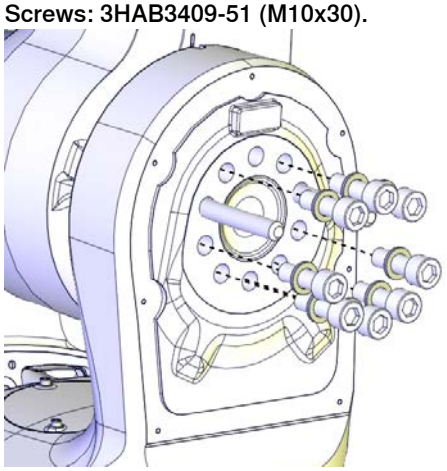
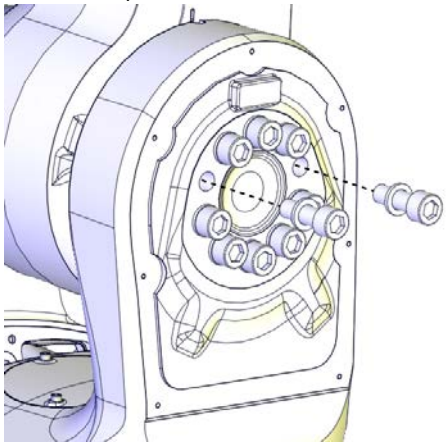
4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-003  xx1400000453
6	Fit the lower arm to the swing, with guidance from the guide pins.	 xx1300002563

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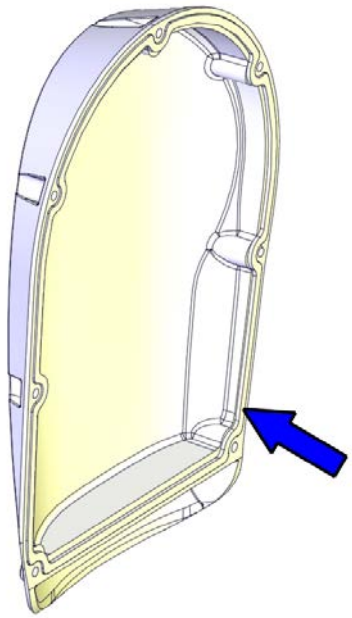
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	Action	Note
7	Refit the lower arm screws and washers, using locking liquid. Secure the screws but do not tighten yet.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: 3HAB3409-51 (M10x30).  xx1300002564 **Note** Only use specified screws, never replace them with other screws.
8	Remove the guide pins and refit the remaining screws and washers using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)  xx1300002565
9	Tighten all screws.	Tightening torque: 45 Nm

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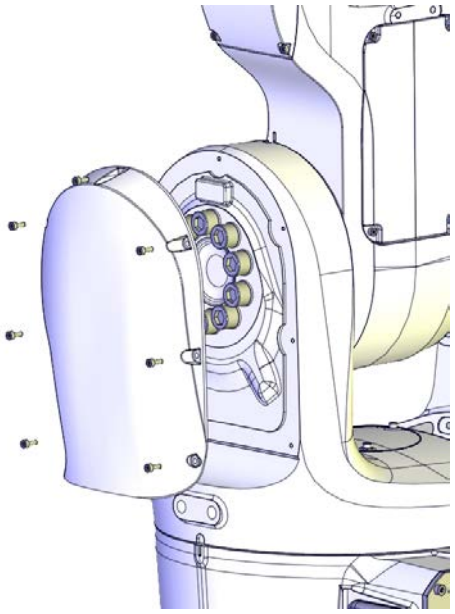
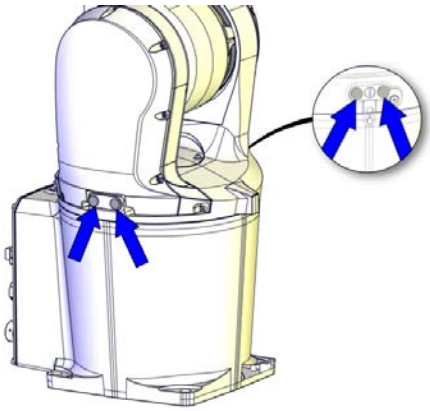
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4.6.2 Replacing the axis-2 drive unit
Continued

	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the swing cover gasket. Replace if damaged.	Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)  xx1400000007
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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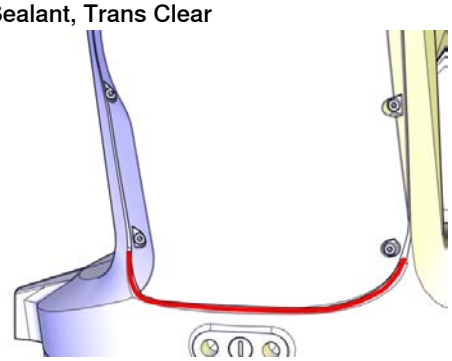
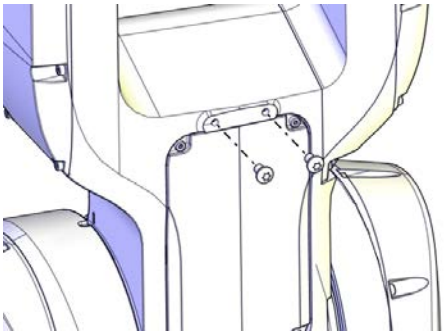
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	Action	Note
12	Refit the swing cover. Replace if damaged.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001  xx1300002551
13	**For robots with protection type Foundry Plus** Check the protection plugs for lifting holes. Replace if damaged.	Protection plug for lifting holes: 3HAC4836-24  xx1600001151

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4.6.2 Replacing the axis-2 drive unit
Continued

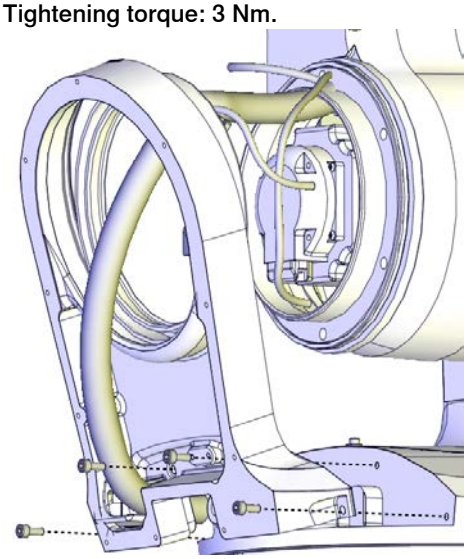
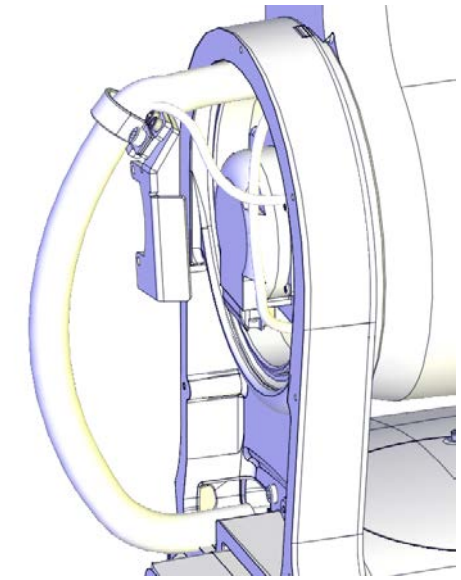
	Action	Note
14	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000217
15	**For robots with protection type Foundry Plus** If required, fit two screws for protection.	 xx1600001154

Securing the cabling to the swing

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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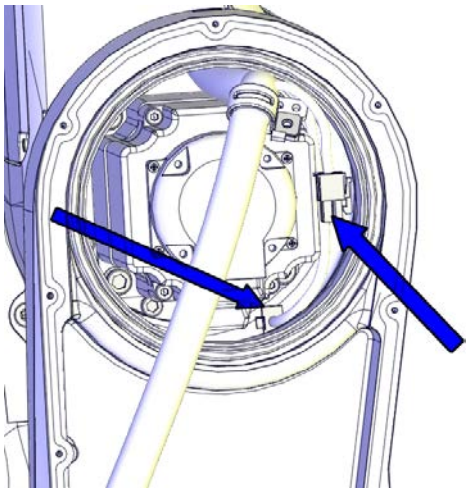
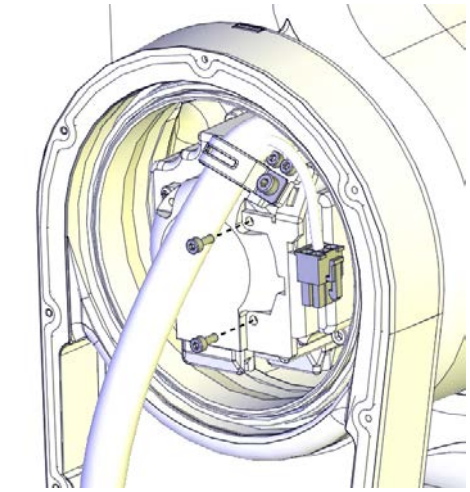
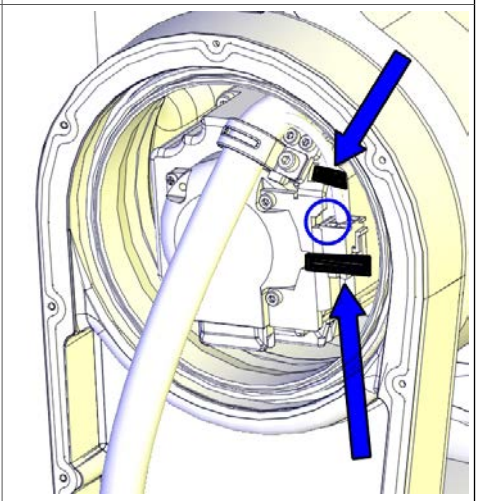
	Action	Note
2	Refit the cable housing to the swing with the screws.	Tightening torque: 3 Nm.  xx1300002549
3	Insert the cable harness into the lower arm.	 xx1300002548

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4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
4	Reconnect the motor connectors. • R2.ME2 • R2.MP2	 xx1300002434
5	Refit the axis-2 motor bracket with the screws.	 xx1300002432
6	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529

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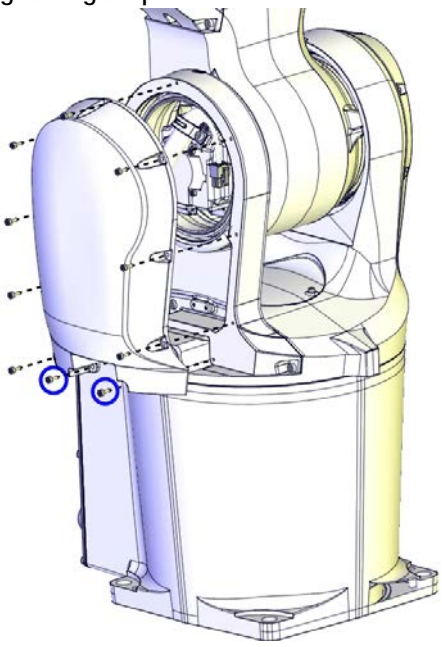
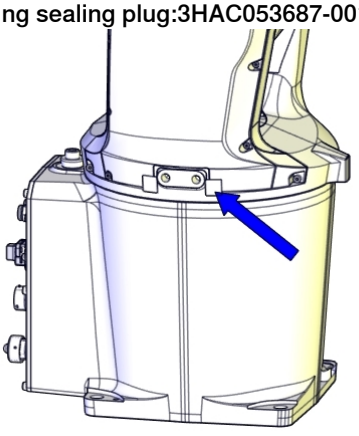
	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)
8	Check the PTFE film. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
9	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
11	Refit the cable housing cover with the screws. **Note** Remember to refit the two lower screws shown in the figure.	Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002431 **Note** Only use specified screws, never replace them with other screws.
12	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Refit the swing sealing plug. Follow the procedure specified in *Refitting the swing sealing plug on page 183*.	Swing sealing plug:3HAC053687-001  xx1600000205

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Concluding procedure

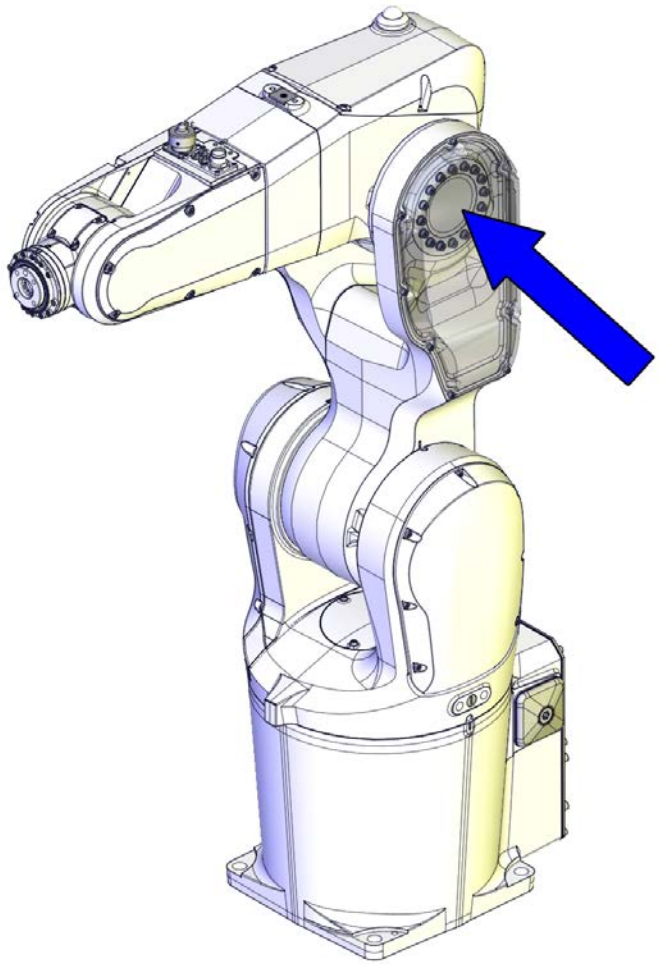
	Action	Note
1	Remove the lifting slings from the robot.	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
3	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
4	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.3 Replacing the axis-3 drive unit

Location of drive unit

The axis-3 drive unit is located as shown in the figure.



xx1300002527

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Drive unit	3HAC061403-001	Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002).

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Spare part	Article number	Note
Drive unit, food grade lubrication	3HAC057905-001	Used for robots with food grade lubrication. Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002).
Drive unit, SafeMove 2-supported	3HAC061275-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002).
Drive unit, food grade lubrication and SafeMove 2-supported. Drive unit, Hygienic	3HAC061276-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used for robots with food grade lubrication. Used with protection type Hygienic Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002).
O-ring	3HAC048939-002	Replace if damaged.
M2 variseal sealing	3HAC044641-005	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
Gasket on lower arm cover	3HAC056725-001 / 3HAC080703-001	Not used with protection class IP40. Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for upper arm	3HAC049705-001	Always use three guide pins together!
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
24 VDC power supply	-	Used to release the motor brakes.

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4.6.3 Replacing the axis-3 drive unit

Continued

Equipment, etc.	Article number	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

[i] The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.

If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Grease	3HAC037302-001	Total amount: 32 g. Used to lubricate the gearbox. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.
Grease	-	Total amount: 32 g. LUBRIPLATE SYNXTREME FG-0 Used to lubricate the gearbox of robots with food grade lubrication and robots with protection type Hygienic. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.

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Deciding calibration routine

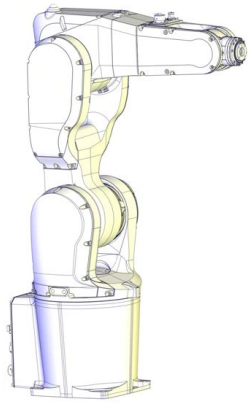
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the drive unit

Use these procedures to remove the axis-3 drive unit.

Preparations before removing the axis-3 drive unit

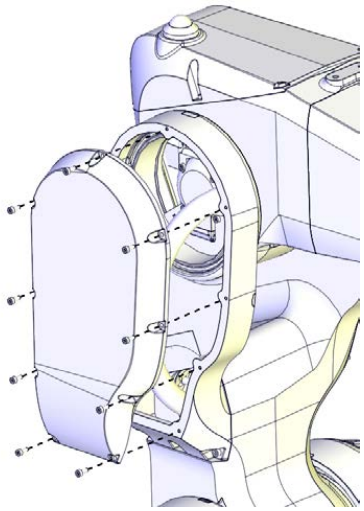
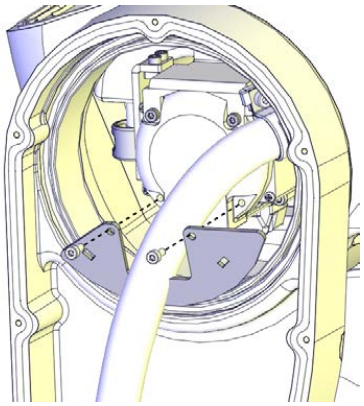
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581

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4.6.3 Replacing the axis-3 drive unit

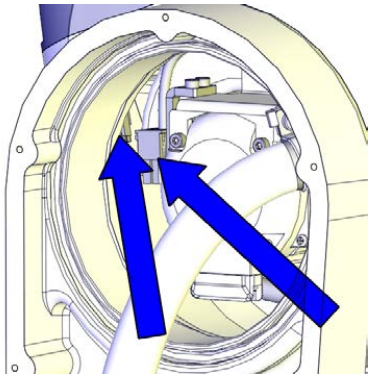
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	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	Remove the cable housing cover.	 xx1300002400
6	Remove the plate.	 xx1300002413

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Disconnecting the axis-3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Creating space for separation of upper and lower arm

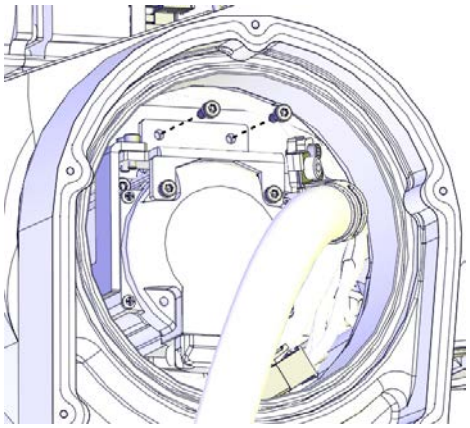
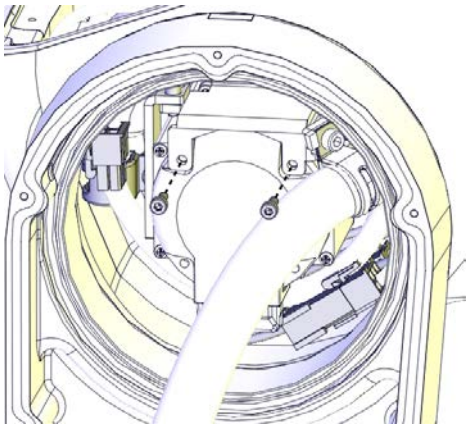
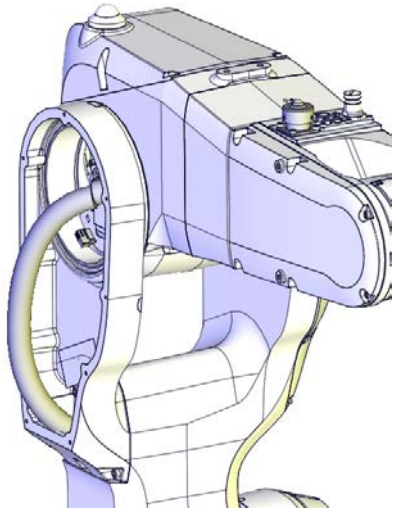
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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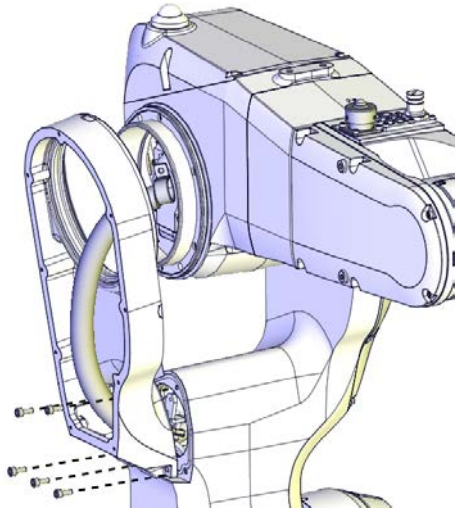
4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
3	Remove the screws that fasten the fix sheet to the inner plastic guide.	 xx1300002421
4	Remove the screws that fasten the fix sheet to the motor.	 xx1300002423
5	Pull out the cable harness slightly from the upper arm housing and from the lower arm. **Note** The cabling is still connected inside the robot, so be careful not to strain the cables!	 xx1300002530

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	Action	Note
6	Remove the cable housing of the lower arm by removing the screws, and tilt it outwards.	 xx1400000785

Removing the upper arm

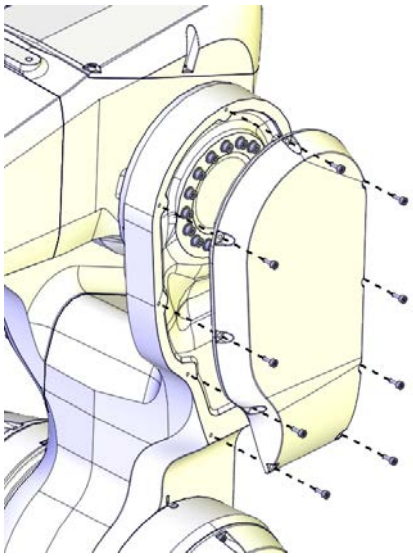
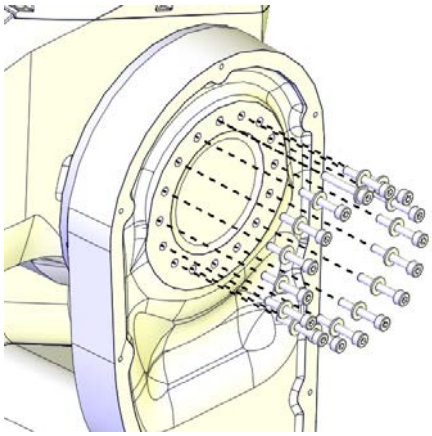
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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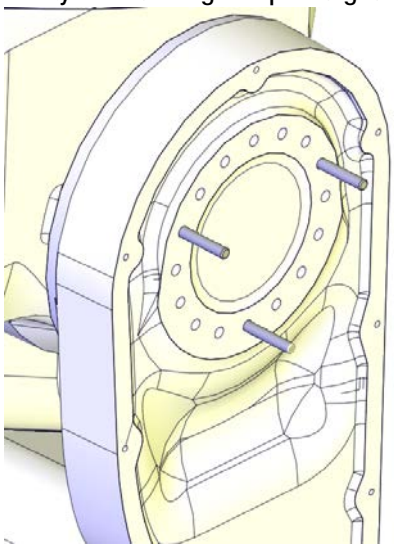
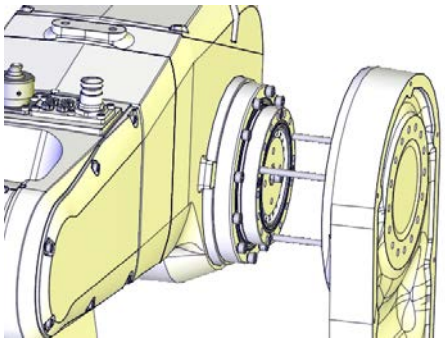
4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
3	Remove the lower arm cover.	 xx1300002528
4	**CAUTION** The upper arm weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit lifting slings to the upper arm to support the weight of the arm. (no force)	
6	Remove the upper arm screws. **WARNING** This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.	 xx1300002531

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	Action	Note
7	Fit guide pins to the upper arm.	Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!  xx1400000771
8	Separate the upper and lower arm with guidance from the guide pins.	 xx1300002533

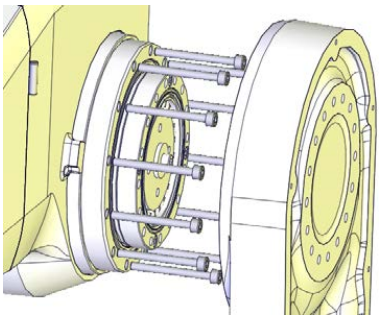
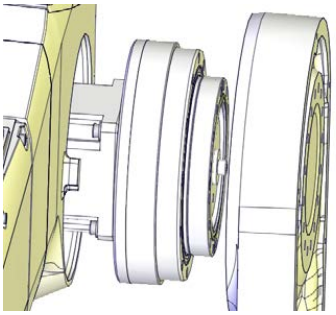
Removing the axis-3 drive unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.6.3 Replacing the axis-3 drive unit
Continued

	Action	Note
3	Remove the drive unit screws.	 xx1300002532
4	Carefully pull out the complete drive unit. **CAUTION** The axis-3 gear unit and motor adapter are not secured to each other with screws! Be careful when handling the drive unit.	 xx1300002534

Refitting the drive unit

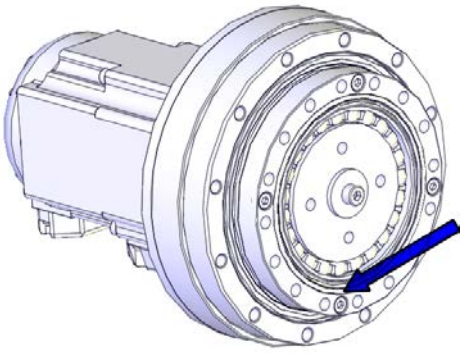
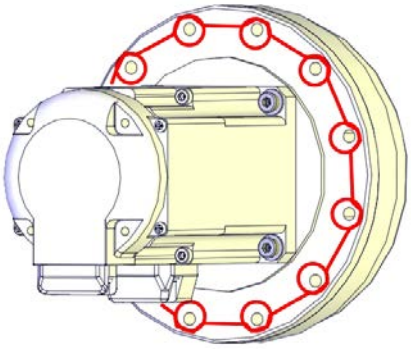
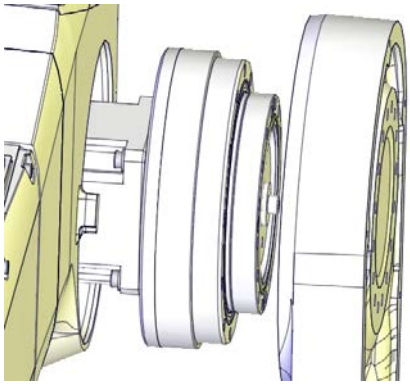
Use this procedure to refit the axis-3 drive unit.

Refitting the axis-3 drive unit

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.	Grease: 3HAC037302-001. **For robots with food grade lubrication** **For robots with protection type Hygienic** Grease: LUBRIPLATE SYNXTREME FG-0

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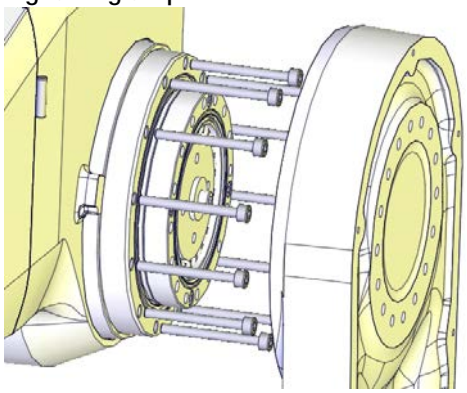
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	Action	Note
3	Check the o-ring for damage. Replace if damaged.	O-ring: 3HAC048939-002  xx1400000004
4	Remove the two screws and nuts that secure the axis-3 motor adapter and gear unit to each other during transport.	
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the motor adapter.	 xx1400000784
6	Refit the drive unit into the upper arm. **Note** Make sure to refit the drive unit correctly oriented. When the upper arm is in its zero position (horizontal), the motor connectors should point downwards.	 xx1300002534

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4.6.3 Replacing the axis-3 drive unit
Continued

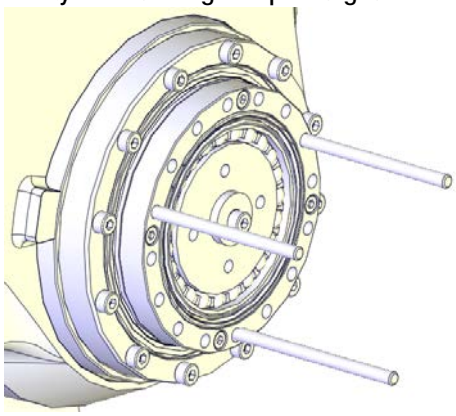
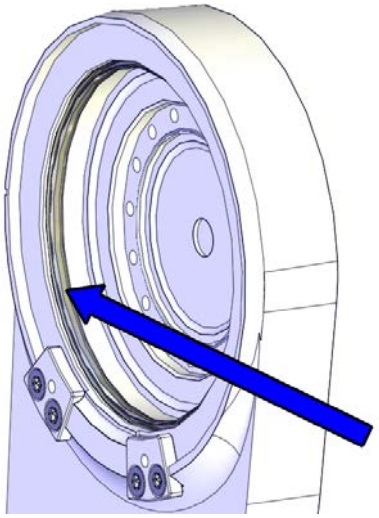
	Action	Note
7	Refit the drive unit screws.	Screws: 3HAB3409-214 (M4x40) Tightening torque: 4.5 Nm  xx1300002532 **Note** Only use specified screws, never replace them with other screws.
8	Seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177* **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	

Refitting the upper arm

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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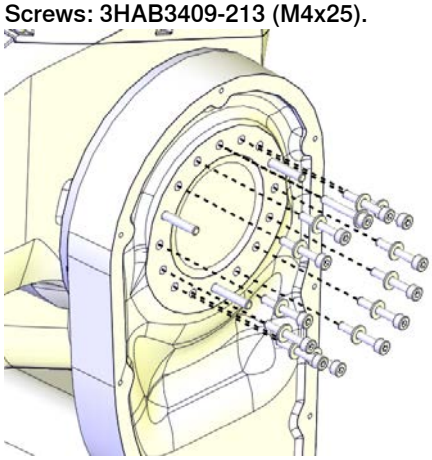
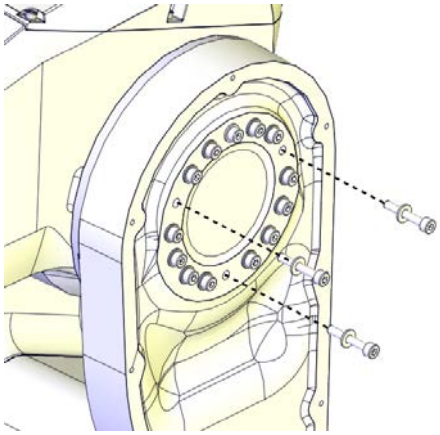
	Action	Note
2	Fit guide pins to the axis-3 gear unit.	Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!  xx1400000027
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-005  xx1400000474

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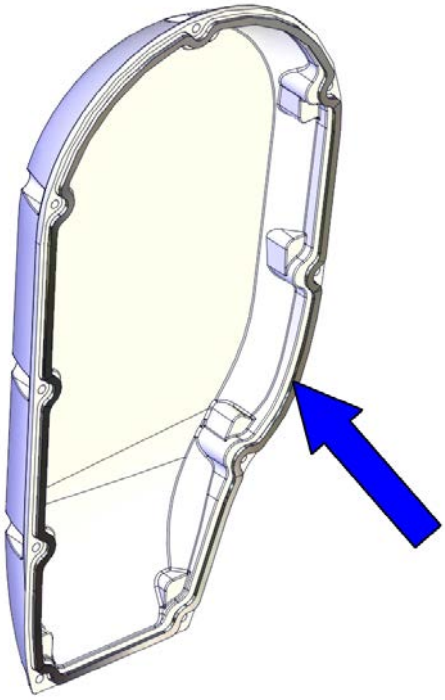
4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
4	Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet.	Screws: 3HAB3409-213 (M4x25).  xx1400000028 **Note** Only use specified screws, never replace them with other screws.
5	Remove the guide pins and refit the remaining screws and washers.	 xx1400000029
6	Tighten all screws.	Tightening torque: 4.5 Nm.

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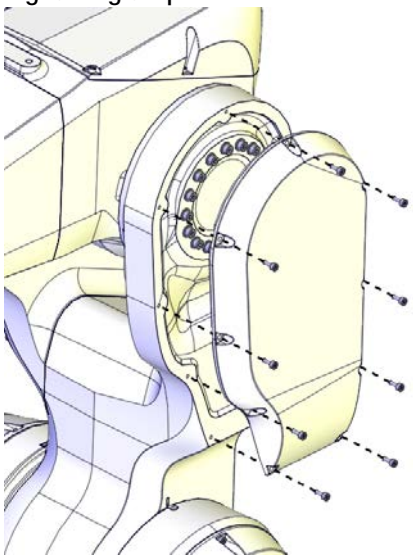
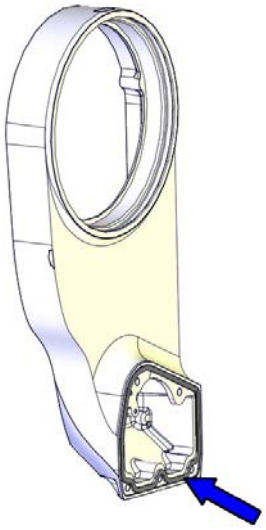
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	Action	Note
7	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the lower arm cover gasket. Replace if damaged.	Gasket on lower arm cover: 3HAC056725-001 (not Hygienic robots) / 3HAC080703-001 (Hygienic robots)  xx1400000047
8	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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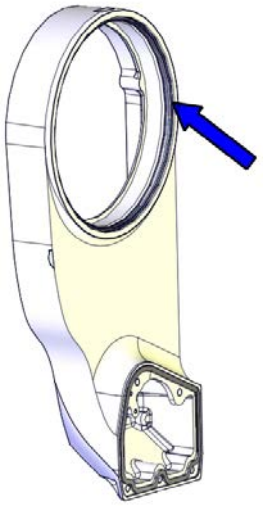
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4.6.3 Replacing the axis-3 drive unit
Continued

	Action	Note
9	Refit the lower arm cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002528 **Note** Only use specified screws, never replace them with other screws.
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the cable housing gasket. Replace if damaged.	Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)  xx1400000414

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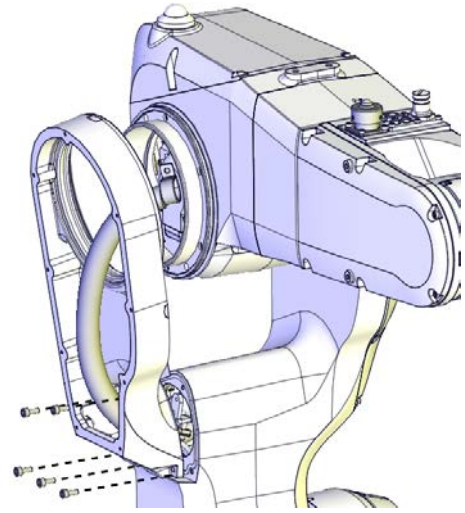
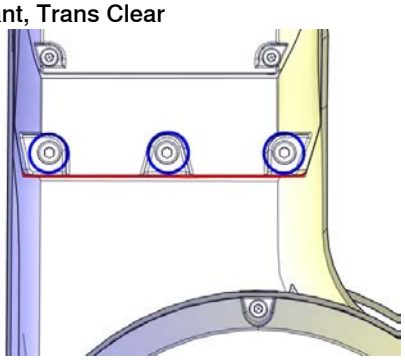
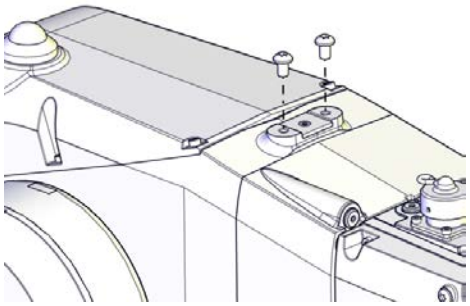
	Action	Note
11	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	M2 variseal sealing: 3HAC044641-006 Radial sealing: 3HAC024865-001  xx1400000473 Replacement is detailed in *Replacing the axis-3 radial sealing and sealing ring on page 439*.
12	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cable housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.6.3 Replacing the axis-3 drive unit

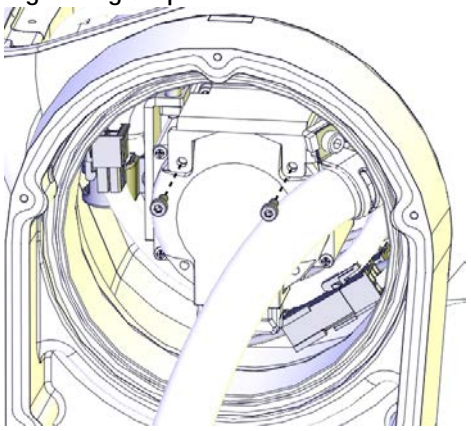
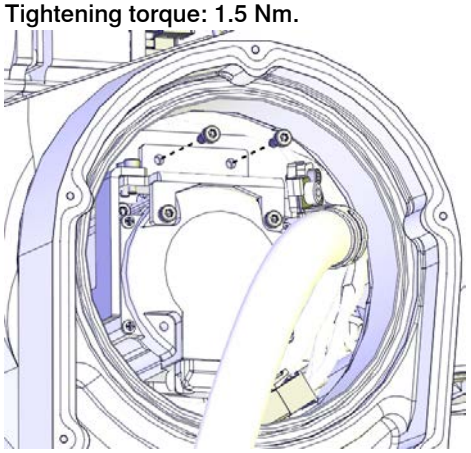
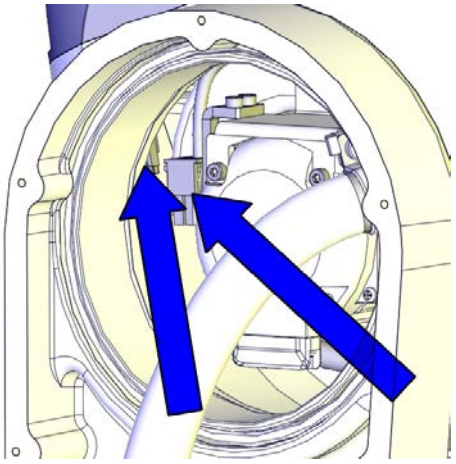
Continued

	Action	Note
13	Refit the cable housing of the lower arm.	Tightening torque: 3 Nm  xx1400000785
14	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the cable housing of the lower arm. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. **Note** No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000218
15	**For robots with protection type Foundry Plus** If required, fit two screws for protection.	 xx1600001155

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Concluding procedure

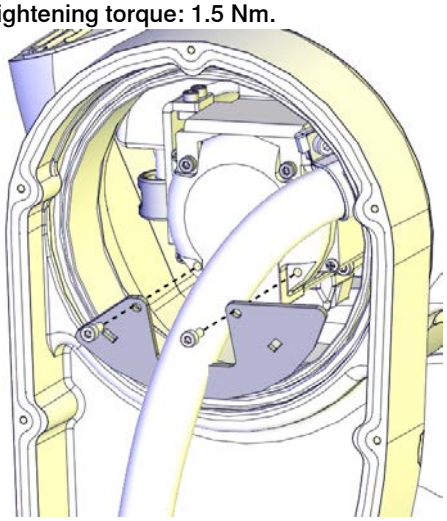
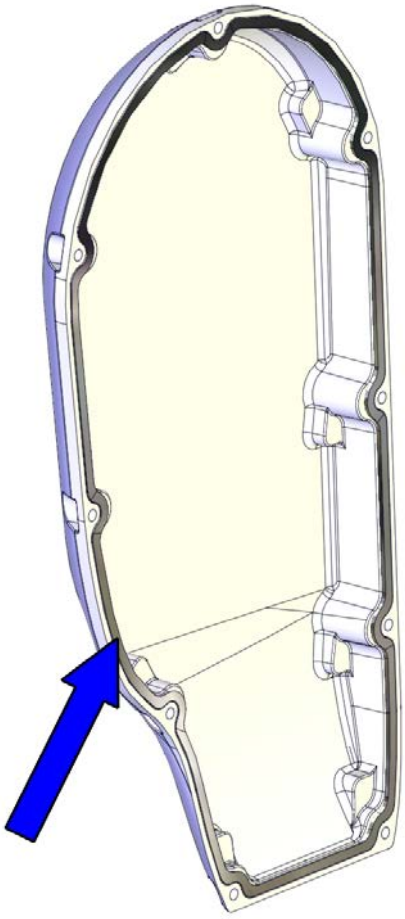
	Action	Note
1	Refit the fix sheet to the motor.	Tightening torque: 1.5 Nm.  xx1300002423
2	Refit the fix sheet to the inner plastic guide.	Tightening torque: 1.5 Nm.  xx1300002421
3	Reconnect the axis-3 motor connectors.	 xx1300002420

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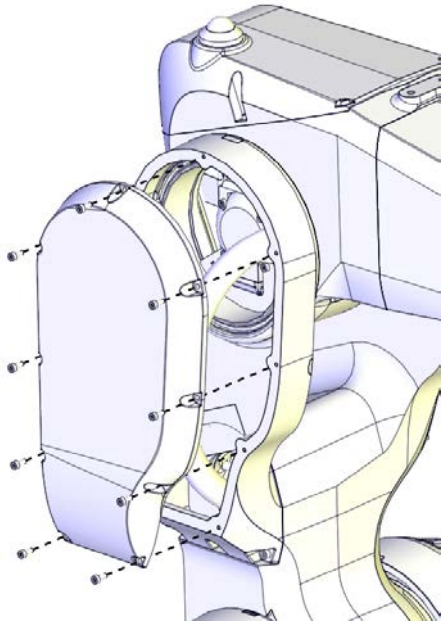
4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
4	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)  xx1400000048

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	Action	Note
6	Check the PTFE film on the cable housing cover. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
7	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
8	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
9	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

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4.6.3 Replacing the axis-3 drive unit
Continued

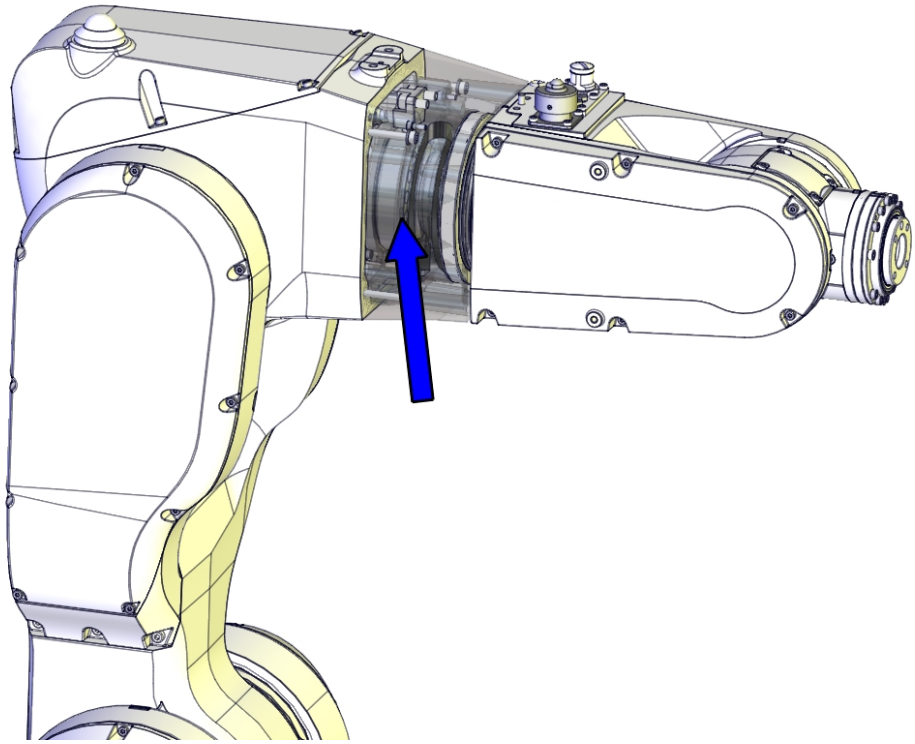
	Action	Note
10	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
11	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
12	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Location of gearbox, drive shaft and pulley

The axis-4 gearbox, including drive shaft and pulley, is located as shown in the figure.



xx1300002462

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Gearbox	3HAC049629-001	
Gearbox, food grade lubrication Gearbox, Hygienic	3HAC057904-001	Used for robots with food grade lubrication. Used with protection type Hygienic.
Shaft	3HAC044692-001	
Pulley	3HAC044687-001	
Motor bracket	3HAC044689-001	Replace if damaged.
Gearbox sleeve	3HAC044685-001	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

Spare part	Article number	Note
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.

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Spare part	Article number	Note
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

[i] The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

Consumable	Art. no.	Note
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

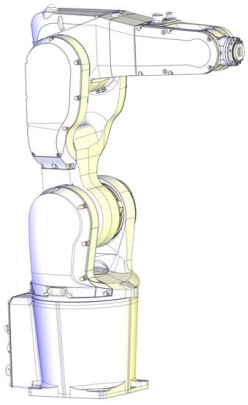
Removing the gear unit

Preparations before removing the axis-4 gear unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

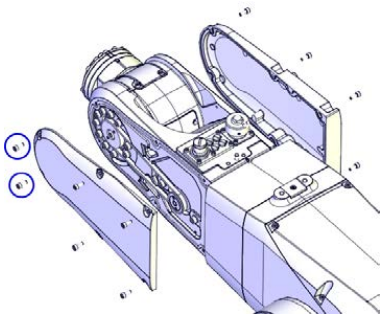
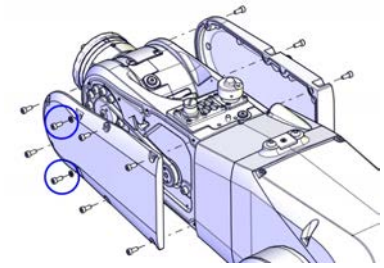
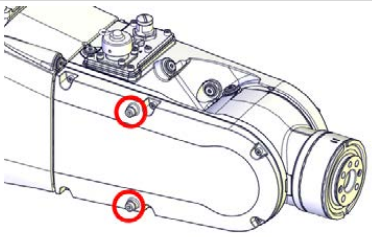
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

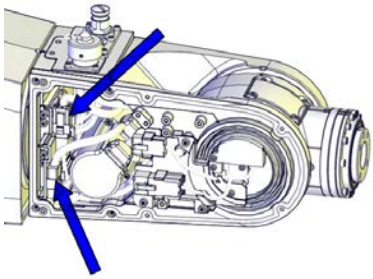
	Action	Note
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

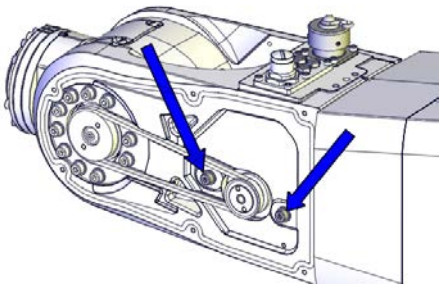
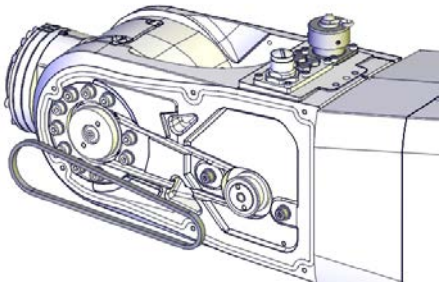
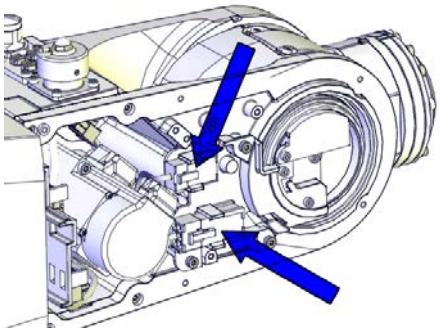
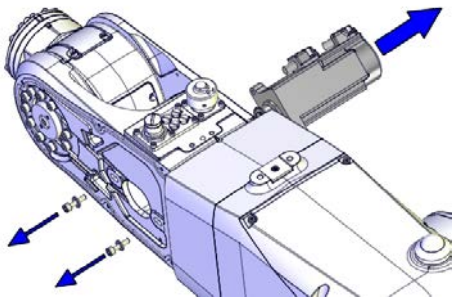
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

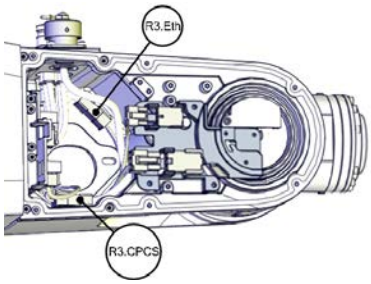
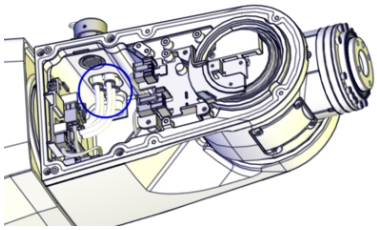
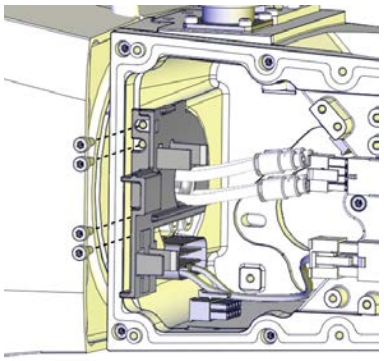
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	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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Removing the wrist

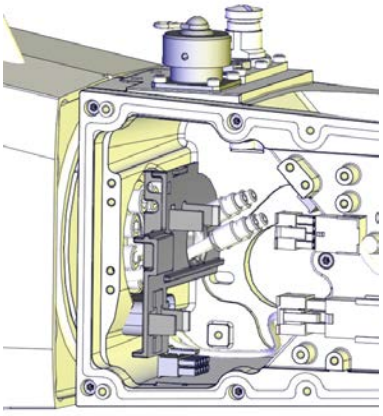
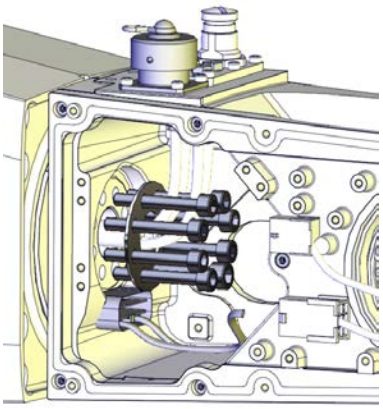
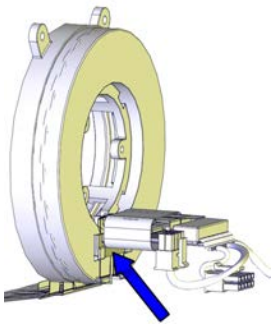
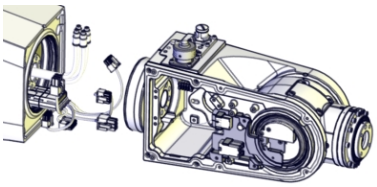
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

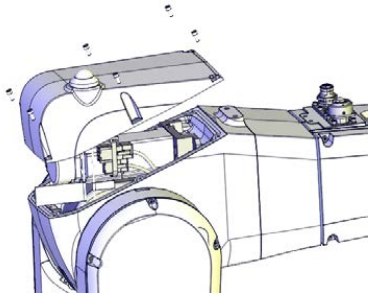
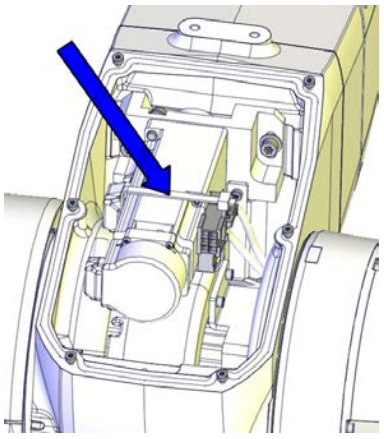
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	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 xx1300002357
7	Support the weight of the wrist and remove the screws and the washer.	 xx1300002358
8	Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359

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Disconnecting the axis-4 motor connectors

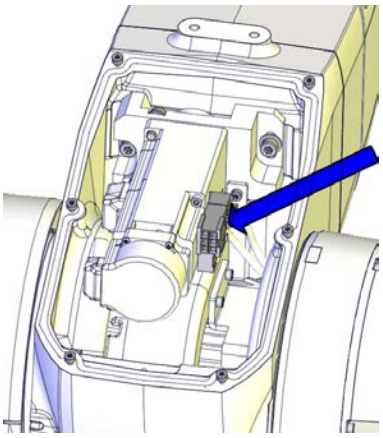
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456
4	Cut the strap that holds the connectors.	 xx1300002494

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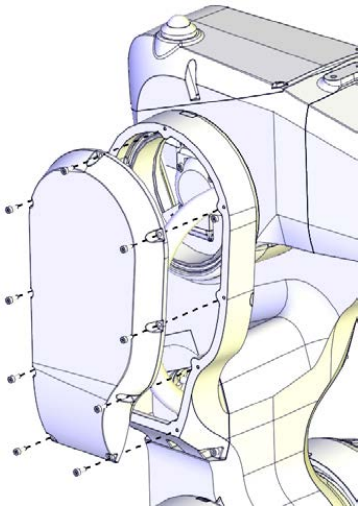
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

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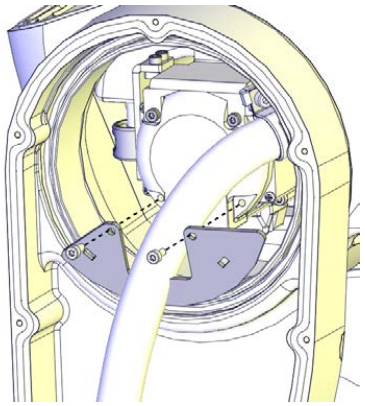
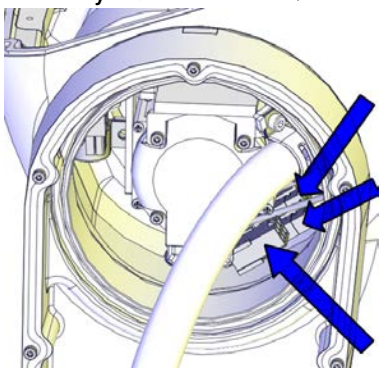
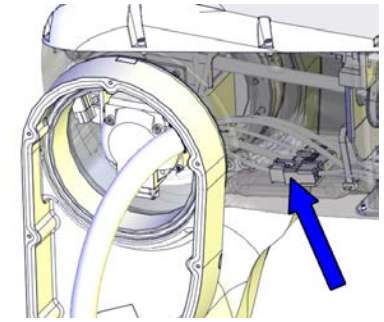
	Action	Note
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Disconnecting the axis-4 FPC connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cable housing cover.	 xx1300002400

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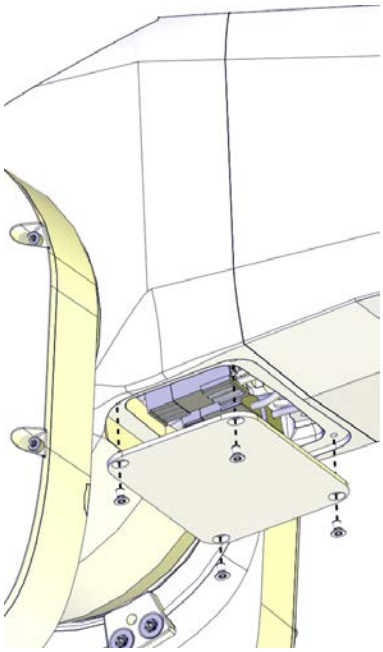
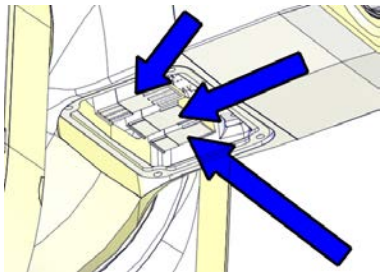
	Action	Note
4	Remove the plate.	 xx1300002413
5	Pull out the FPC connectors from the housing and disconnect them.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

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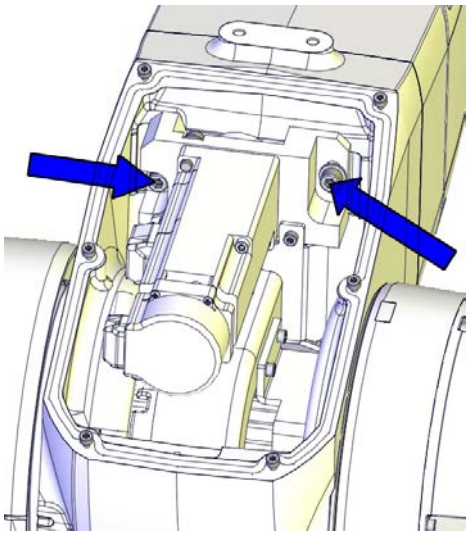
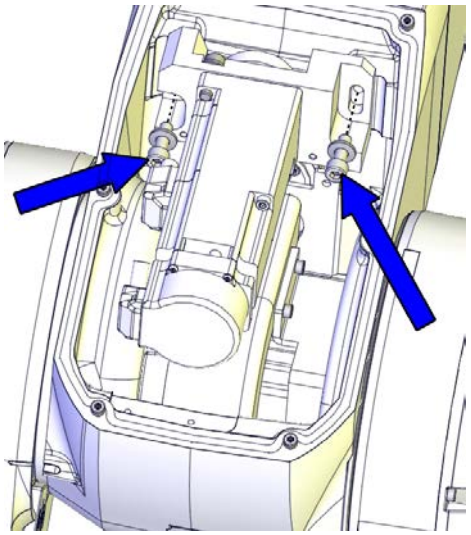
	Action	Note
6	Remove the small cover of the housing.	 xx1300002398
7	Disconnect the remaining FPC connectors.	 xx1300002399

Removing the axis-4 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 xx1300002524
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 xx1300002522
5	Remove the timing belt from its groove on the motor.	

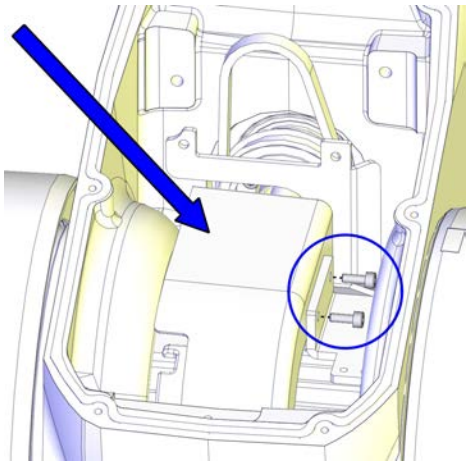
Removing the air hoses

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

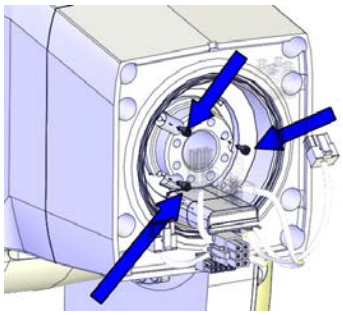
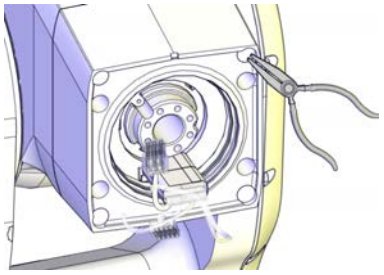
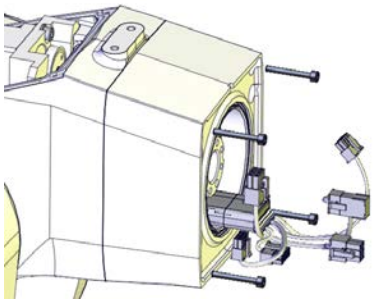
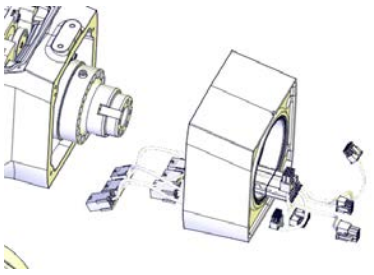
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the plastic protection plate by removing its screws.	 xx1400000797
4	Pull in the air hoses into the housing, out from the housing extender unit.	

Removing the housing extender unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Remove the axis-4 FPC unit screws.	 xx1300002373
4	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Remove the plugs covering the extender unit screws with a needle-nose plier.	 xx1600000262
5	Remove the extender unit screws.	 xx1300002372
6	Remove the housing extender unit. Be careful not to damage the cabling.	 xx1300002374

Removing the axis-4 drive shaft

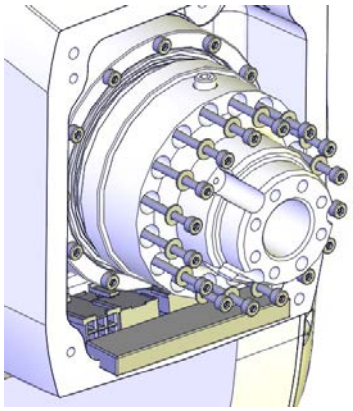
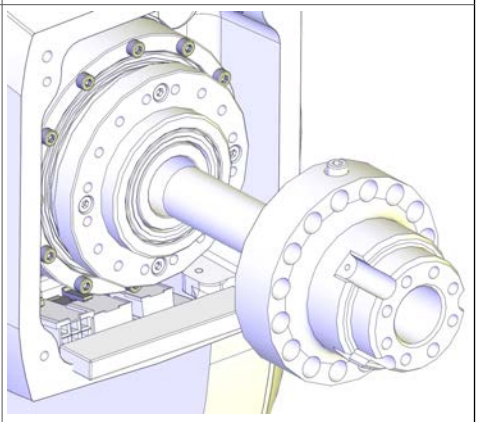
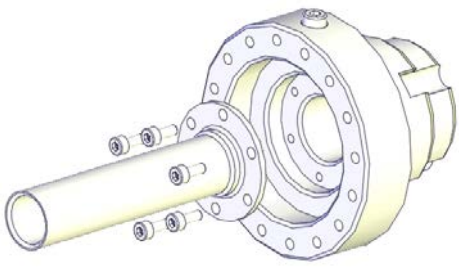
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

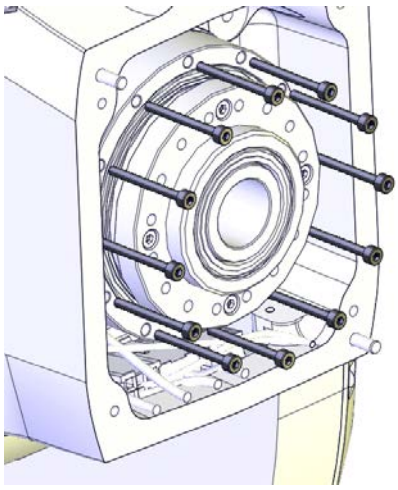
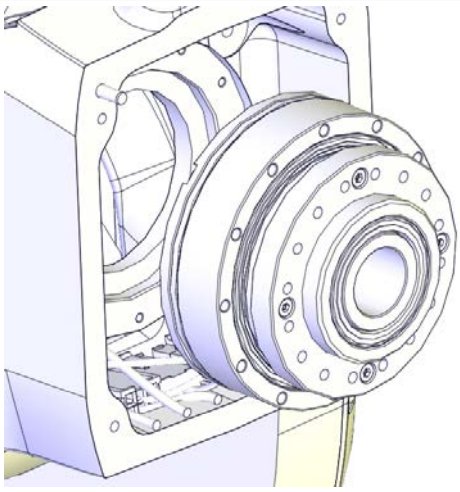
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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the screws and washers.	 xx1300002376
4	Remove the shaft.	 xx1400002400
5	If replacing the drive shaft with a new spare part, remove the sleeve from the shaft and fit it to the new shaft.	 xx1300002387

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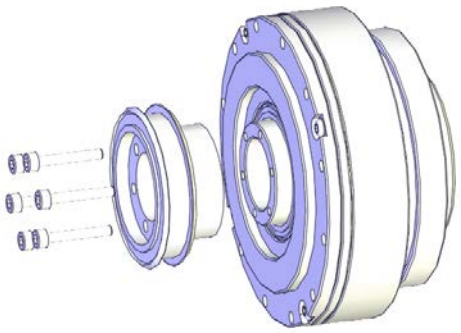
Removing the axis-4 gear unit and pulley

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the gear attachment screws.	 xx1300002378
4	Pull out the gear.	 xx1300002379

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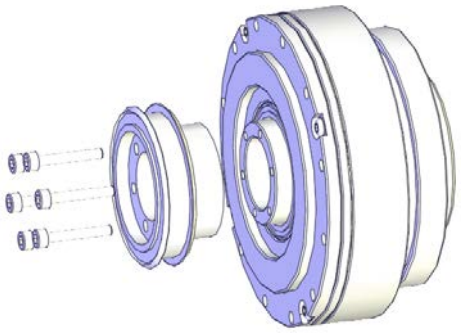
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
5	Remove the pulley from the gear by removing its attachment screws.	 xx1300002380

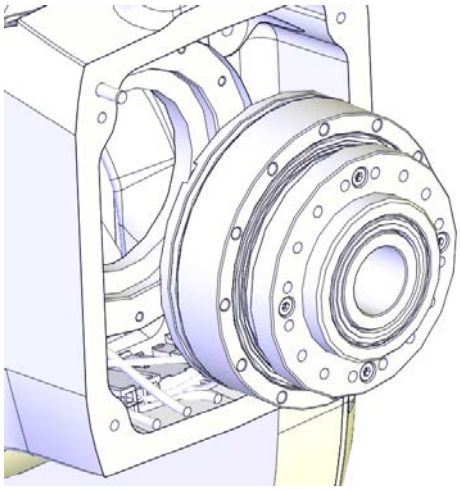
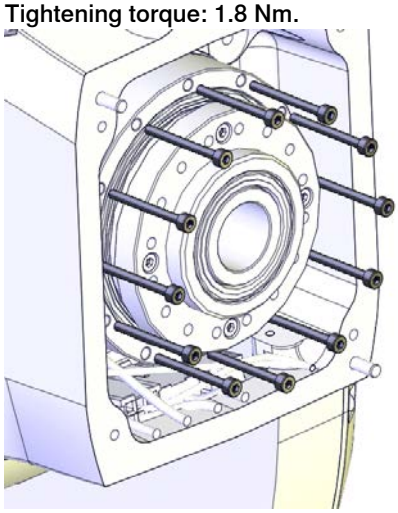
Refitting the gear unit

Refitting the axis-4 gear unit and pulley

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the pulley to the gear and secure with its attachment screws.	Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.1 Nm.  xx1300002380 **Note** Only use specified screws, never replace them with other screws.

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	Action	Note
3	Refit the gear to the housing.	 xx1300002379
4	Secure with the attachment screws.	Screws: 3HAB3409-211 (M3x30). Tightening torque: 1.8 Nm.  xx1300002378 **Note** Only use specified screws, never replace them with other screws.

Refitting the axis-4 drive shaft

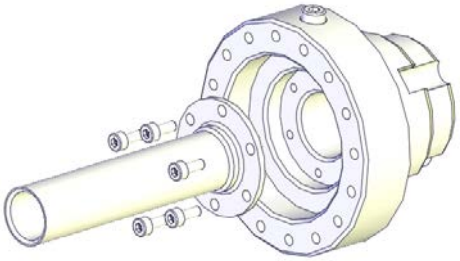
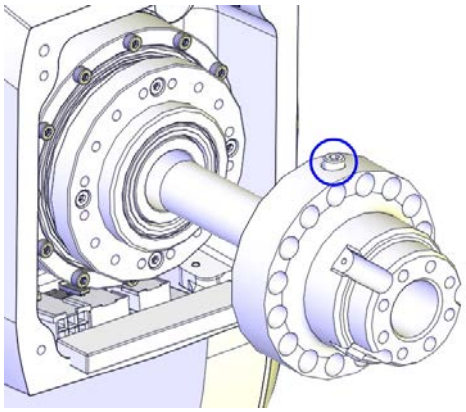
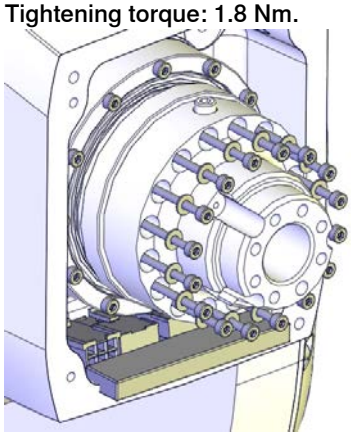
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

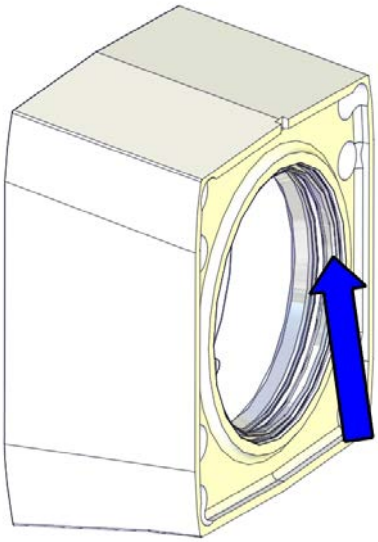
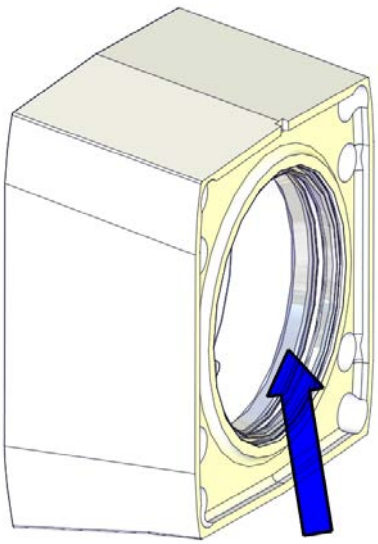
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	Action	Note
2	If replacing the drive shaft with a new spare part, remove the sleeve from the old shaft and fit it to the new shaft. Also move the screw on top of the old drive shaft to the new shaft.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002387
3	Position the shaft so that the encircled screw is on top, then refit the shaft.	 xx1300002377
4	Secure with screws and washers.	Screws: 3HAB3409-210 (M3x25). Tightening torque: 1.8 Nm.  xx1300002376 **Note** Only use specified screws, never replace them with other screws.

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Checking the housing extender sealings

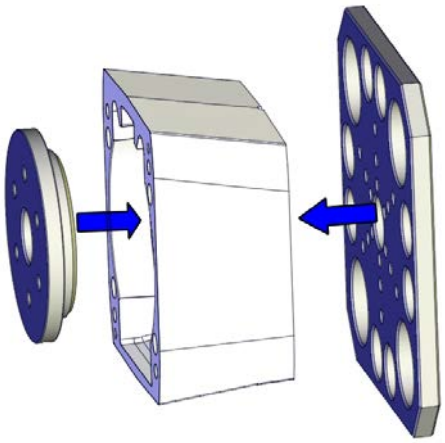
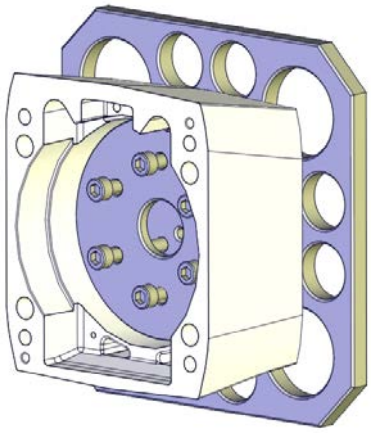
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-007  xx1300002418
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the radial sealing. Replace if damaged, as described below. In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.	Radial sealing with dust lip: 3HAB3701-48  xx1400000438
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

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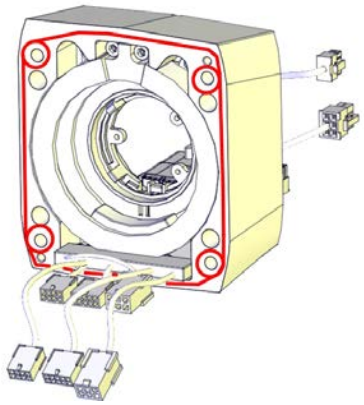
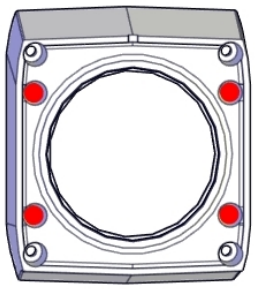
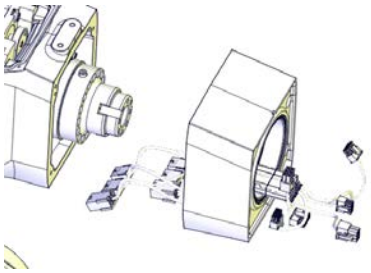
	Action	Note
5	Fit the radial sealing into the housing extender unit.	
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 xx1400000436
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000437
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Refitting the housing extender unit

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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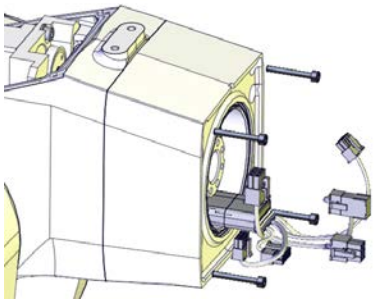
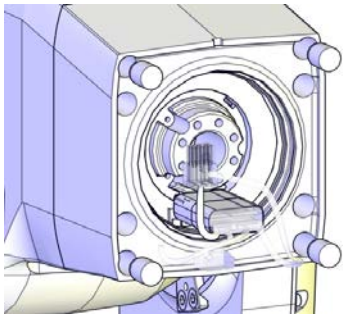
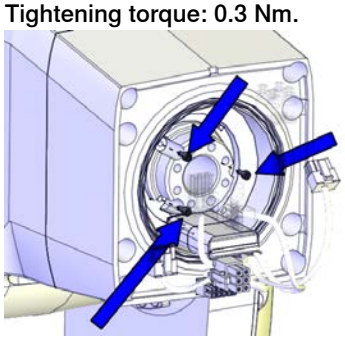
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	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.	 xx1300002613
3	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.	 xx1600000216
4	Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling. **CAUTION** Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit. **Note** Mate the unit to the two locating pins attached to the housing.	 xx1300002374

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
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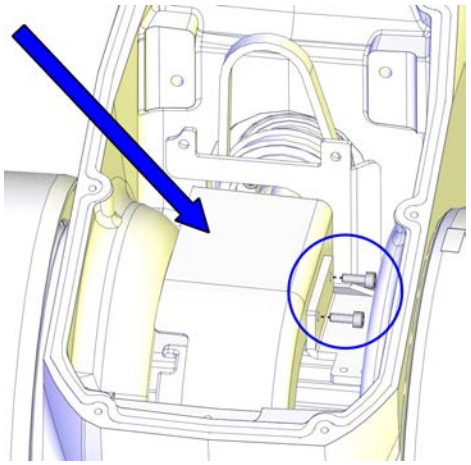
	Action	Note
5	Secure with screws and washers, using locking liquid.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Screws: M4x30. Tightening torque: 2.7 Nm.  xx1300002372
6	**For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Press in screw sealing plugs to cover the screws.	Screw sealing plug: 3HAC053685-001  xx1600000263
7	Fit and secure the axis-4 FPC unit screws.	Tightening torque: 0.3 Nm.  xx1300002373

Refitting the axis-4 timing belt and the air hoses

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Place the timing belt at the gear pulley and run the air hoses through the belt.	

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	Action	Note
3	Install the air hoses in and through the housing extender unit.	
4	Refit the plastic protection plate with its screws.	 xx1400000797

Securing the axis-4 motor

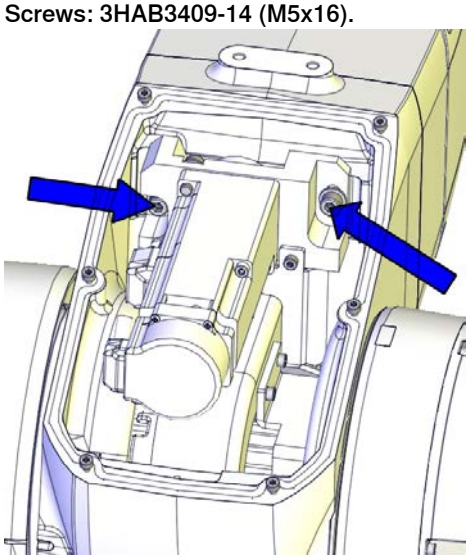
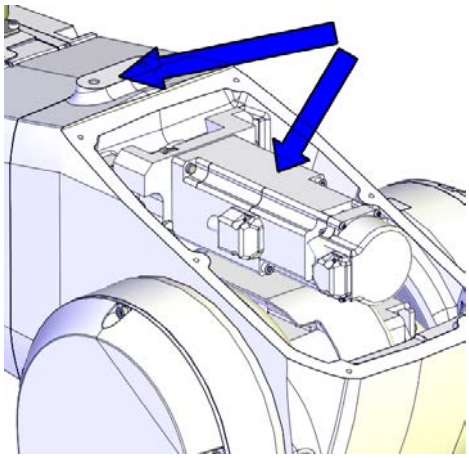
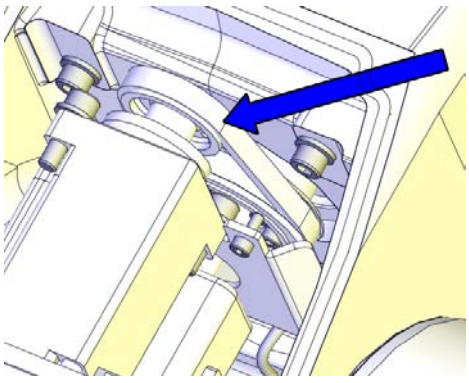
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and undamaged. • the motor is clean and undamaged.	
3	Fit the timing belt to the motor pulley.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

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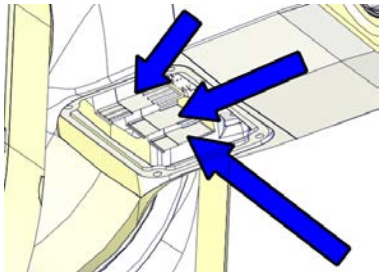
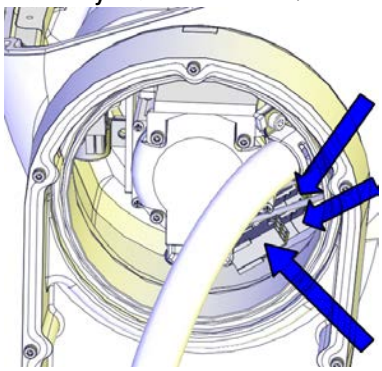
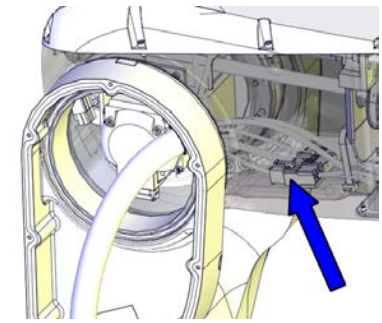
	Action	Note
4	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. Position the robot with the connectors directed as shown in the figure. Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.	Screws: 3HAB3409-14 (M5x16).  xx1300002524 **Note** Only use specified screws, never replace them with other screws.  xx1300002612
5	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx1300002525

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	Action	Note
6	Move the motor to achieve correct belt tension (F = 30 N).	Belt tension: F = 30 N.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm.

Connecting the axis-4 FPC connectors

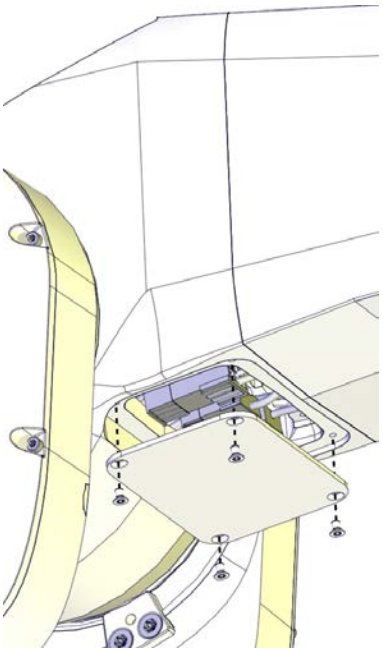
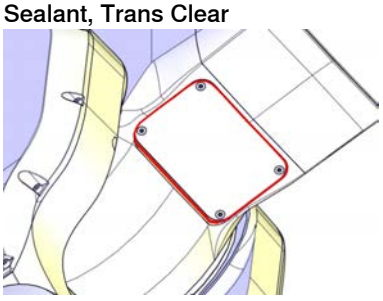
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors. **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399
3	Reconnect the FPC connectors and push them into place inside the housing. **Tip** See the number markings on the connectors for help to find the corresponding connector.	Cable layout in IRB 1200-7/0.7:  xx1300002412 Cable layout in IRB 1200-5/0.9 and IRB 1200-7/0.9:  xx1400001471
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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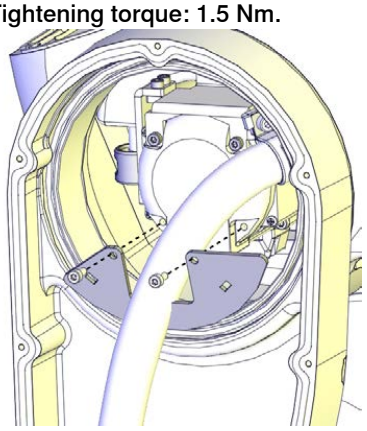
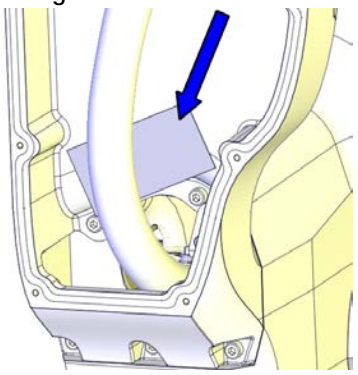
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.	 xx1300002398 Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.
6	Refit the small cover to the housing. Replace if damaged.	
7	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000214

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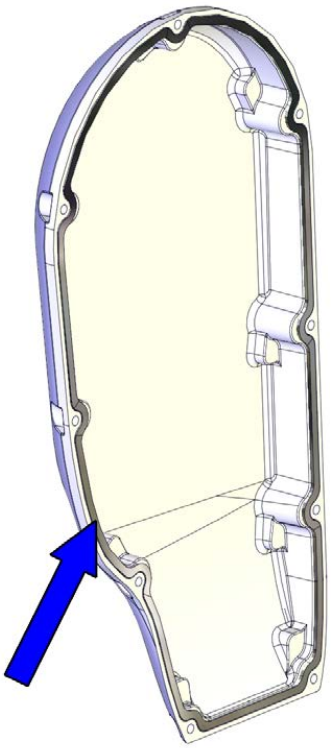
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	Action	Note
8	Refit the plate.	Tightening torque: 1.5 Nm.  xx1300002413
9	Check the PTFE film on the cable housing. Replace if damaged.	PTFE film on lower arm cable housing: 3HAC044710-001  xx1400000740

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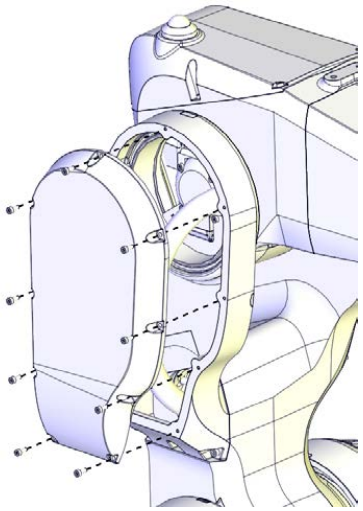
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

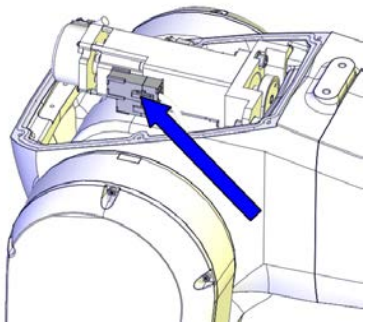
	Action	Note
10	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001  xx1400000048
11	Check the PTFE film on the cable housing cover. Replace if damaged.	
12	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
13	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
14	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.

Connecting the axis-4 motor connectors

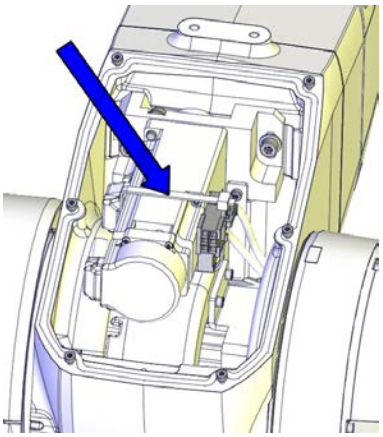
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371

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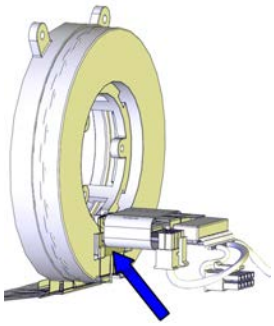
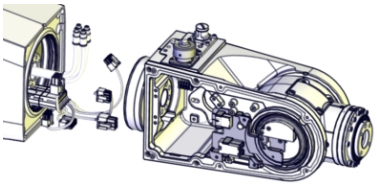
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

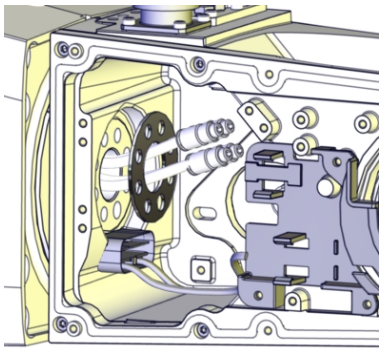
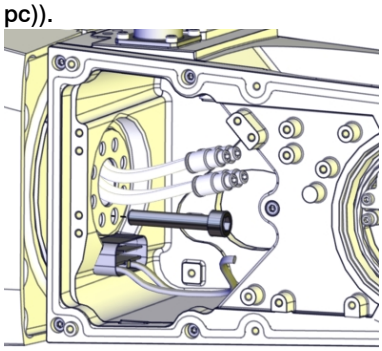
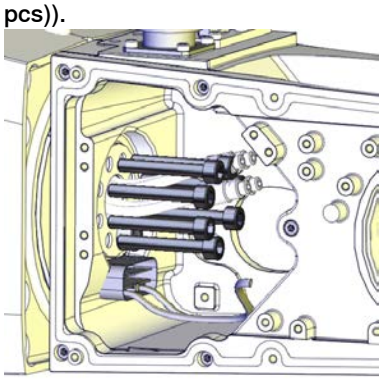
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Refitting the wrist

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors. **CAUTION** Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.  xx1300002611	 xx1300002359

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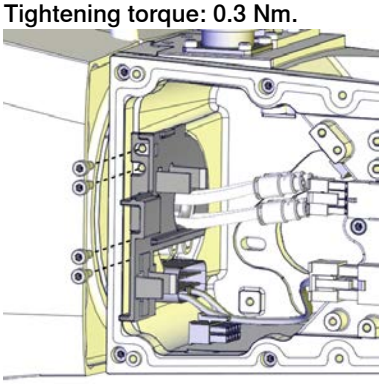
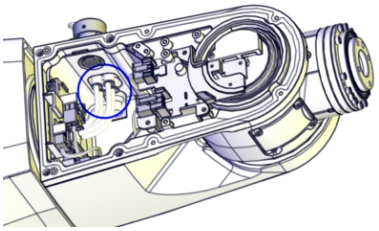
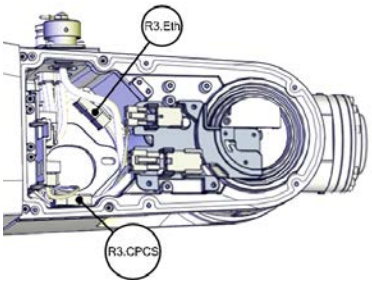
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	Action	Note
3	Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.	Washer: 3HAC044869-001  xx1400000001
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	Screw: 3HAB3409-238 (M6x35 (1 pc)).  xx1400000002 **Note** Only use specified screws, never replace them with other screws.
5	Refit the rest of the screws (M5x35 (7 pcs)).	Screw: 3HAB3409-237 (M5x35 (7 pcs)).  xx1400000003 **Note** Only use specified screws, never replace them with other screws.
6	Tighten all screws.	Tightening torque: 8 Nm.

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

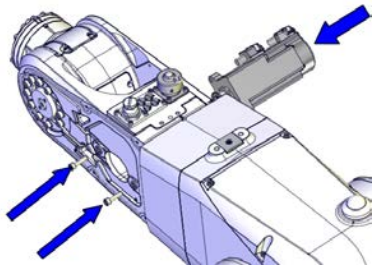
	Action	Note
7	Put the cables through the plate hole and refit the plate.	Tightening torque: 0.3 Nm.  xx1300002356
8	Reconnect the air hoses. **CAUTION** Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. • R3.Eth • R3.CPCS	 xx1300002353

Preparations before securing the axis-5 motor

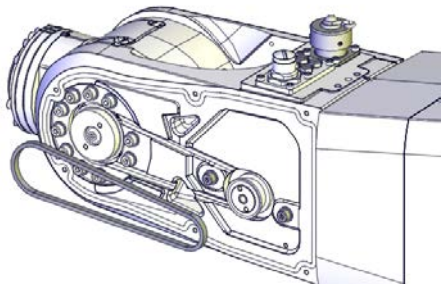
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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	Action	Note
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463 **Note** Only use specified screws, never replace them with other screws.

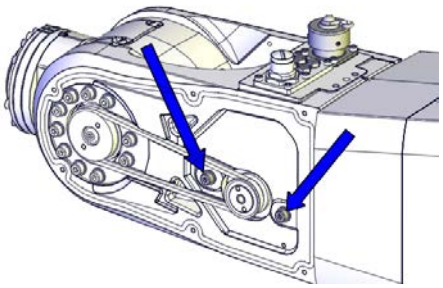
Securing the axis-5 motor and timing belt

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!

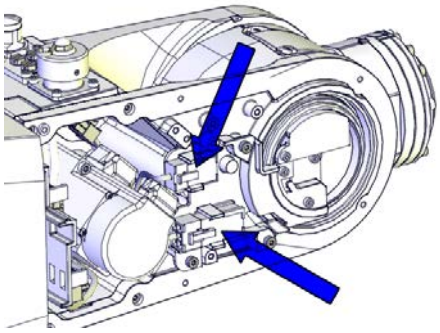
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

Connecting the axis-5 motor FPC connectors

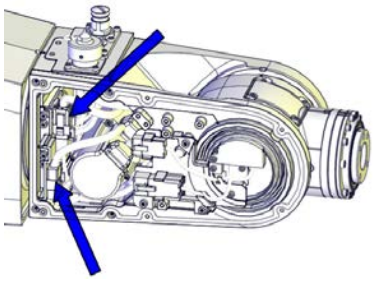
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

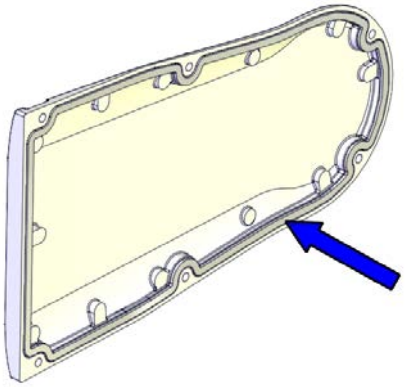
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

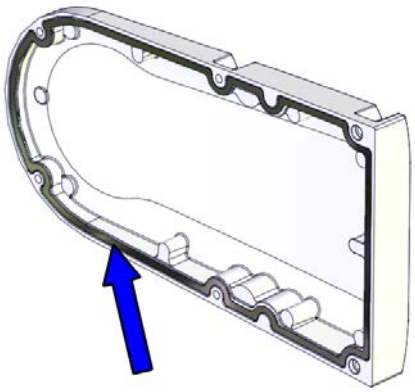
Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034

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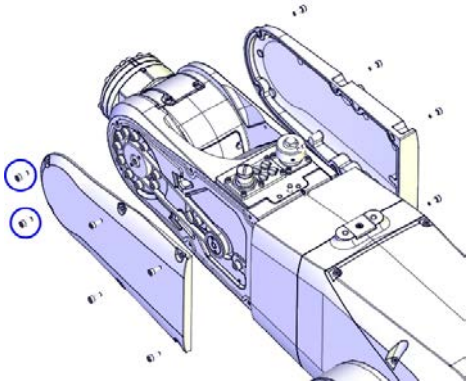
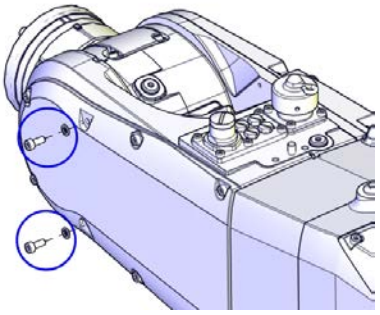
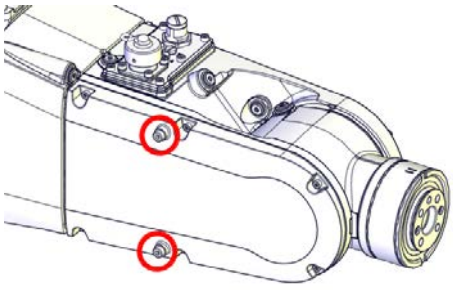
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

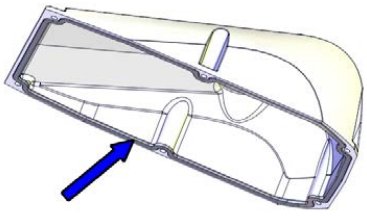
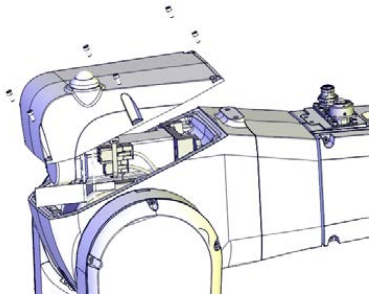
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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

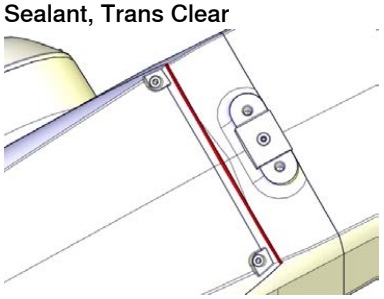
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Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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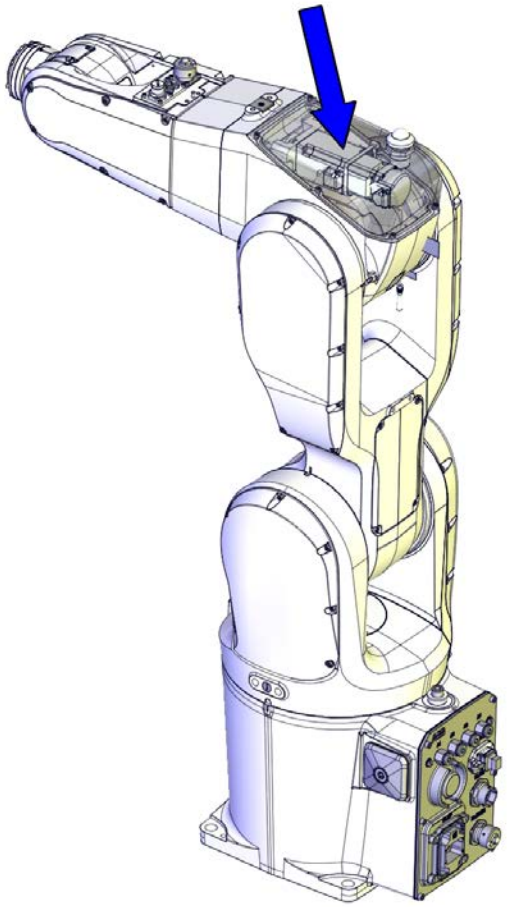
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.5 Replacing the axis-4 motor with pulley

Location of motor

The axis-4 motor is located as shown in the figure.



xx1300002474

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Motor with pulley	3HAC045827-001	
Motor with pulley, SafeMove 2-supported. Motor with pulley, Hygienic	3HAC061277-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Hygienic.
Motor flange	3HAC047479-001	Replace if damaged.

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Spare part	Article number	Note
Motor bracket	3HAC044689-001	Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

[i] The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Cable straps	-	
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.

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4.6.5 Replacing the axis-4 motor with pulley
Continued

Consumable	Art. no.	Note
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor with pulley

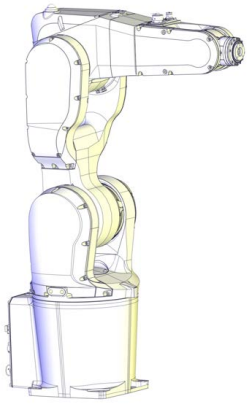
Use these procedures to remove the motor.

Preparations before removing the axis-4 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

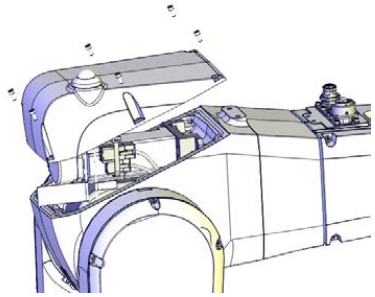
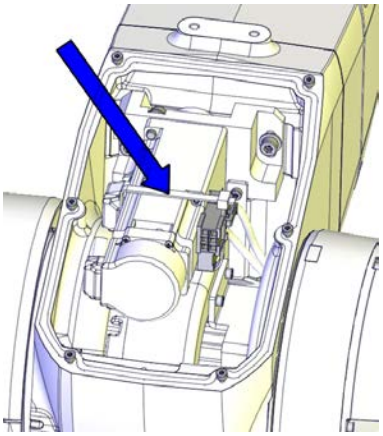
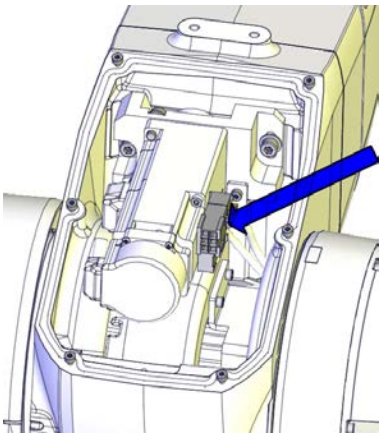
Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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4.6.5 Replacing the axis-4 motor with pulley
Continued

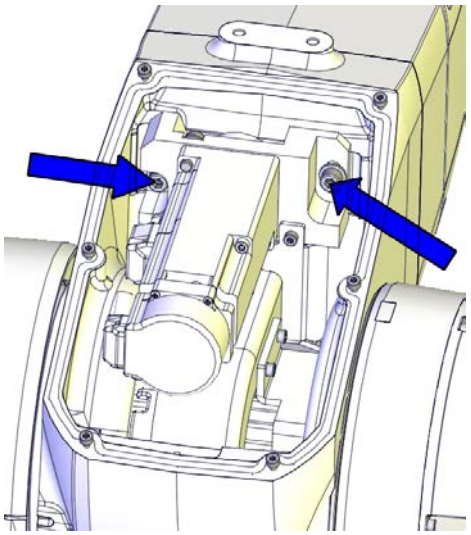
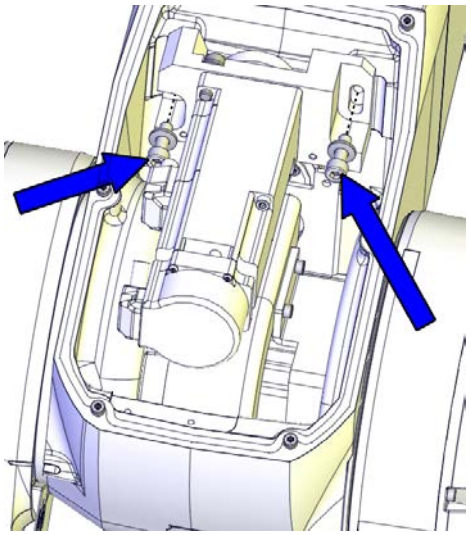
	Action	Note
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Removing the axis-4 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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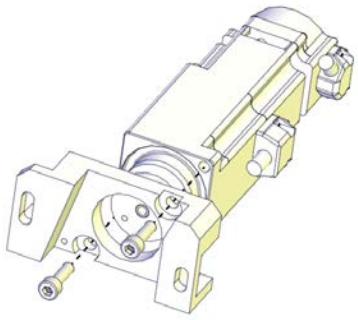
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 xx1300002524
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 xx1300002522
5	Remove the timing belt from its groove on the motor.	

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4.6.5 Replacing the axis-4 motor with pulley
Continued

Separating the axis-4 motor from the motor flange

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the motor flange and bracket from the motor by removing the screws.	 xx1300002523

Refitting the motor with pulley

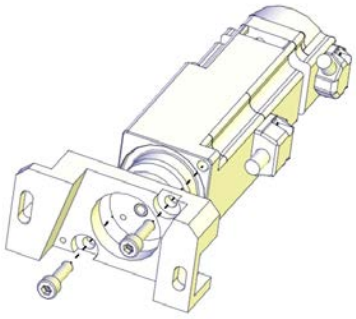
Use these procedures to refit the motor.

Fitting the axis-4 motor to the motor flange

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the motor flange and bracket to the motor with the screws. Replace the flange if damaged.	Motor flange: 3HAC047479-001 Screws: 3HAB3409-14 (M5x16). Tightening torque: 6 Nm.  xx1300002523 **Note** Only use specified screws, never replace them with other screws.

Securing the axis-4 motor

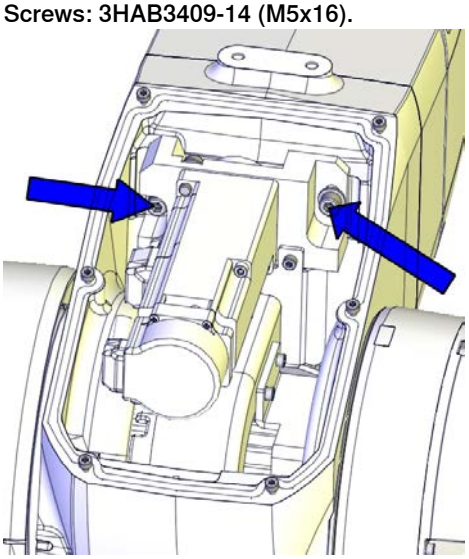
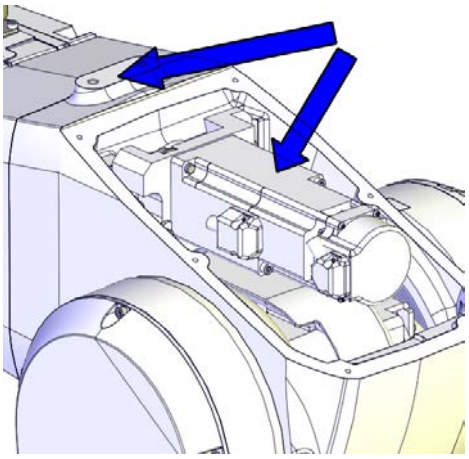
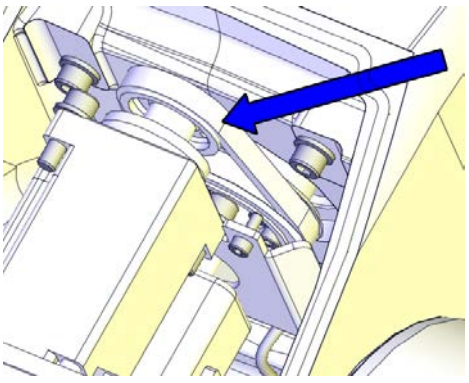
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and undamaged. • the motor is clean and undamaged.	
3	Fit the timing belt to the motor pulley.	

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4.6.5 Replacing the axis-4 motor with pulley

Continued

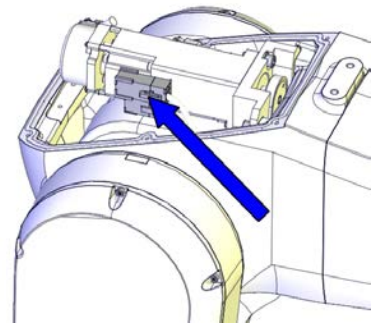
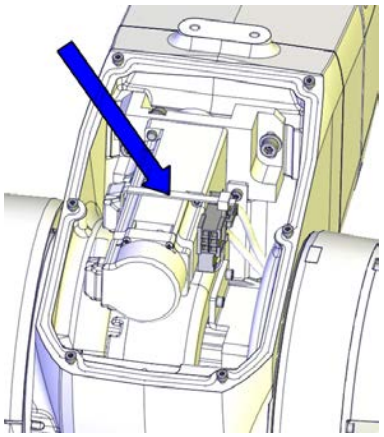
	Action	Note
4	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. Position the robot with the connectors directed as shown in the figure. Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.	Screws: 3HAB3409-14 (M5x16).  xx1300002524 **Note** Only use specified screws, never replace them with other screws.  xx1300002612
5	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx1300002525

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	Action	Note
6	Move the motor to achieve correct belt tension (F = 30 N).	Belt tension: F = 30 N.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm.

Connecting the axis-4 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

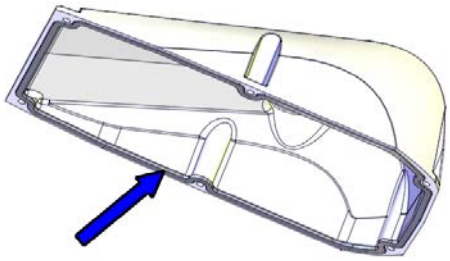
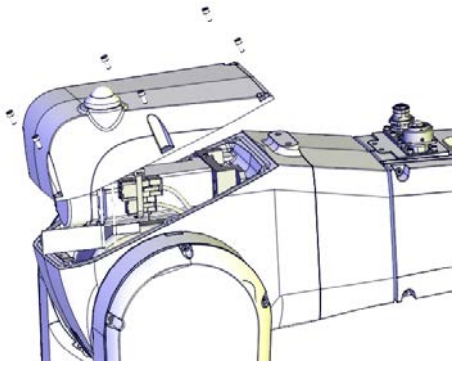
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4.6.5 Replacing the axis-4 motor with pulley

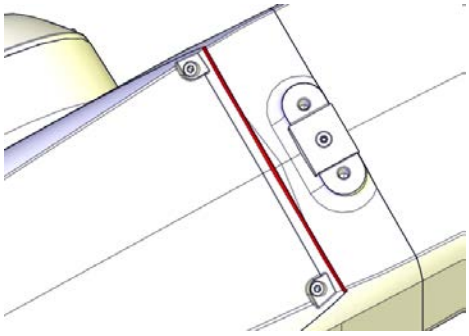
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Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the upper arm housing cover with the screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.

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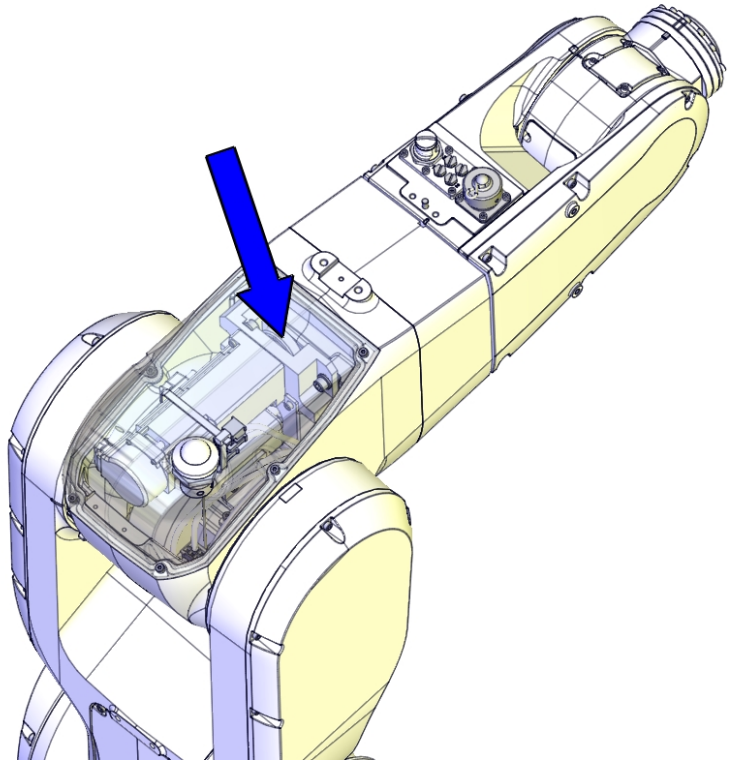
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215
5	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
6	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
7	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.6 Replacing the axis-4 timing belt

Location of timing belt

The axis-4 timing belt is located as shown in the figure.



xx1400000036

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Timing belt	3HAC044694-001	
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Housing cover gasket (IRB 1200-7/0.7)	3HAC091798-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-7/0.7)	3HAC080700-001	Used with protection type Hygienic. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9)	3HAC091797-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Housing cover gasket, Hygienic (IRB 1200-5/0.9)	3HAC080699-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

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4.6.6 Replacing the axis-4 timing belt
Continued

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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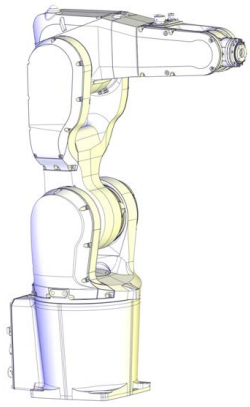
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the timing belt

Use these procedures to remove the axis-4 timing belt.

Preparations before removing the axis-4 timing belt

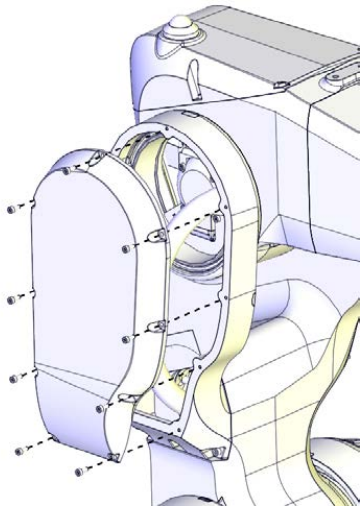
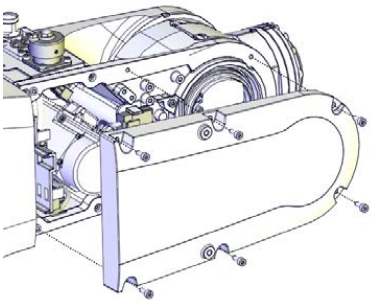
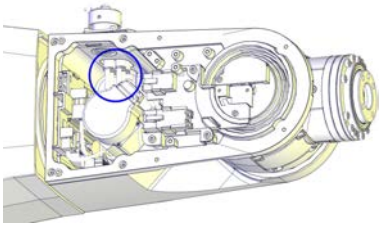
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4.6.6 Replacing the axis-4 timing belt

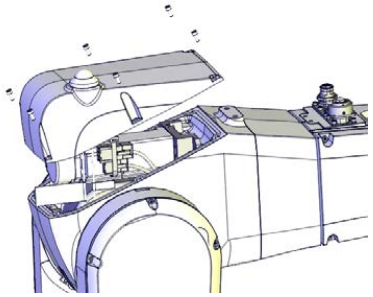
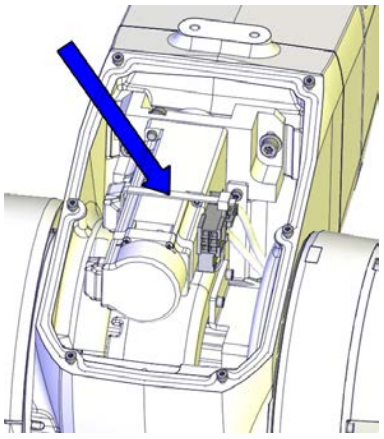
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	Action	Note
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
5	Remove the lower arm cable housing cover.	 xx1300002400
6	Remove the tubular cable housing cover.	 xx1300002389
7	Disconnect the air hoses.	 xx1400002327

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Disconnecting the axis-4 motor connectors

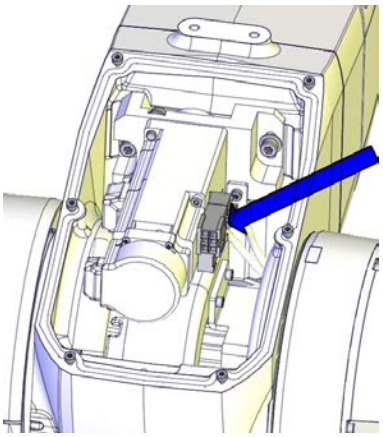
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the cover from the upper arm housing. **CAUTION** **For robots with safety lamp (option)** Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456
4	Cut the strap that holds the connectors.	 xx1300002494

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4.6.6 Replacing the axis-4 timing belt

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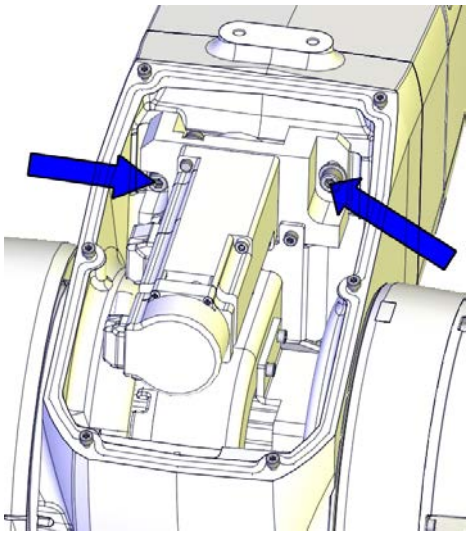
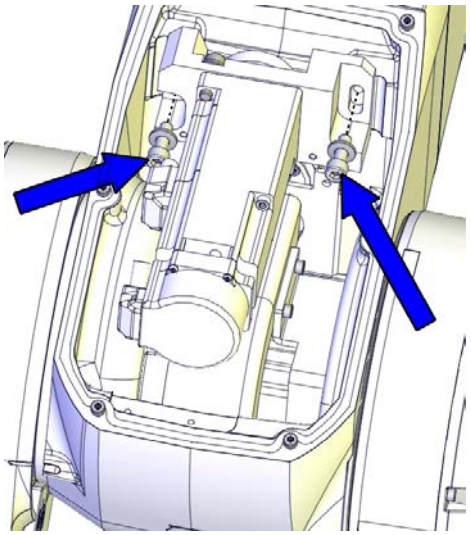
	Action	Note
5	Disconnect the motor connectors. **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Removing the axis-4 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 xx1300002524
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 xx1300002522
5	Remove the timing belt from its groove on the motor.	

Removing the air hoses

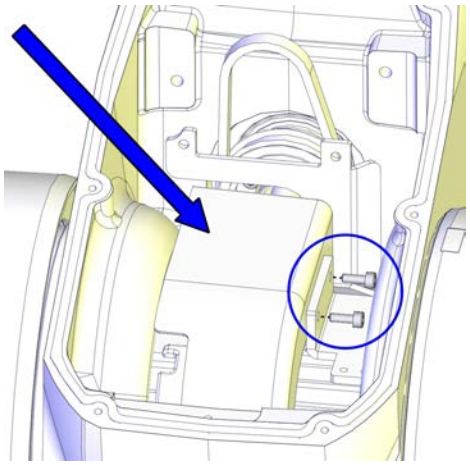
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.6.6 Replacing the axis-4 timing belt

Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the plastic protection plate by removing its screws.	 xx1400000797
4	Pull in the air hoses into the housing, out from the housing extender unit.	

Removing the axis-4 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the axis-4 timing belt.	

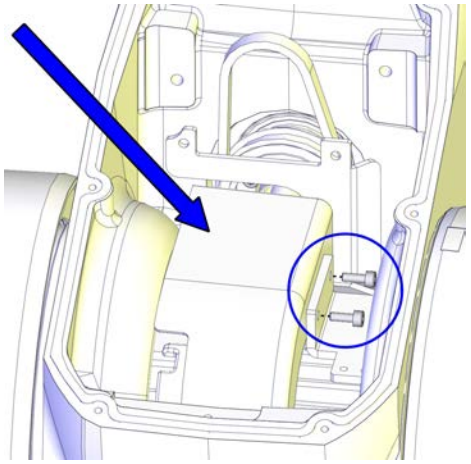
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Refitting the timing belt

Use these procedures to refit the axis-4 timing belt.

Refitting the axis-4 timing belt and the air hoses

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Place the timing belt at the gear pulley and run the air hoses through the belt.	
3	Install the air hoses in and through the housing extender unit.	
4	Refit the plastic protection plate with its screws.	 xx1400000797

Securing the axis-4 motor

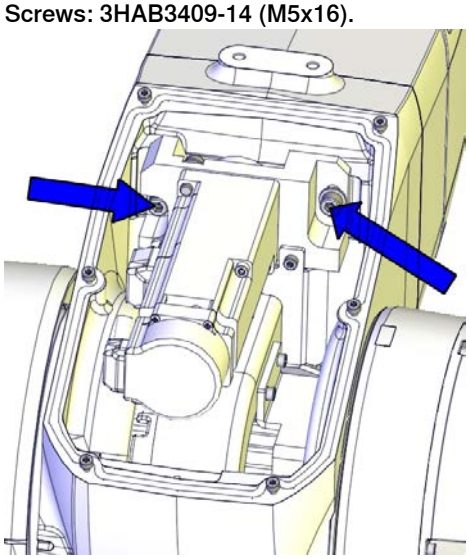
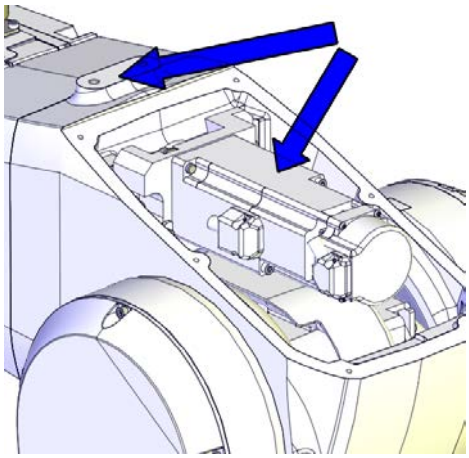
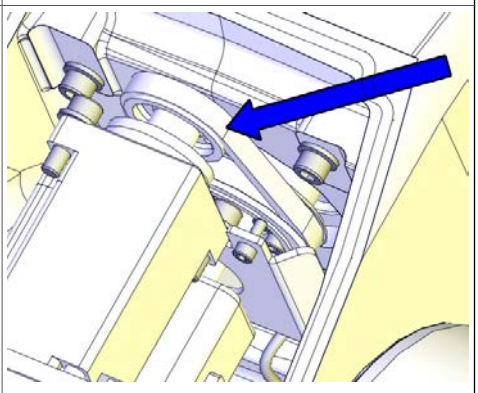
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and undamaged. • the motor is clean and undamaged.	
3	Fit the timing belt to the motor pulley.	

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4.6.6 Replacing the axis-4 timing belt

Continued

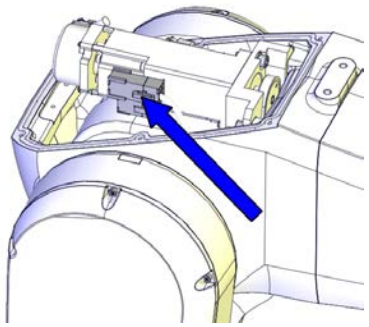
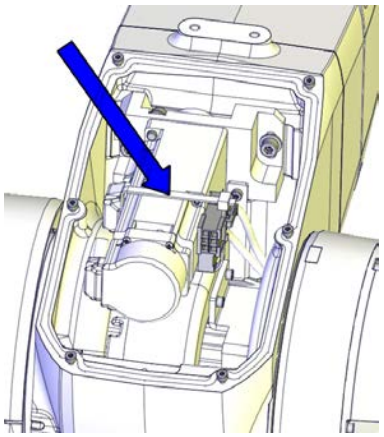
	Action	Note
4	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. Position the robot with the connectors directed as shown in the figure. Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.	Screws: 3HAB3409-14 (M5x16).  xx1300002524 **Note** Only use specified screws, never replace them with other screws.  xx1300002612
5	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx1300002525

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	Action	Note
6	Move the motor to achieve correct belt tension (F = 30 N).	Belt tension: F = 30 N.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm.

Connecting the axis-4 motor connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

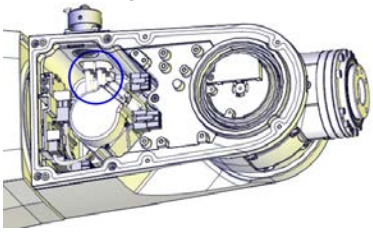
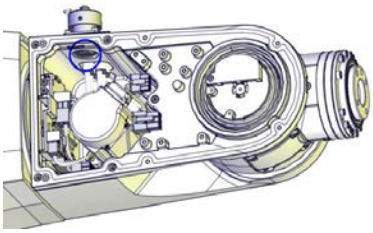
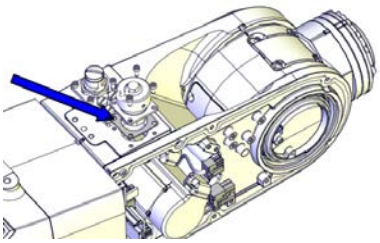
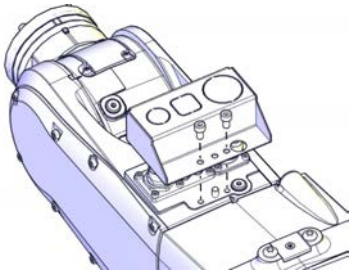
Use this procedure if the robot is not in protection type Hygienic.

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4.6.6 Replacing the axis-4 timing belt

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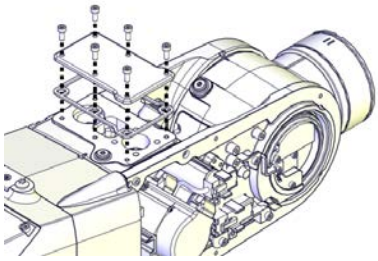
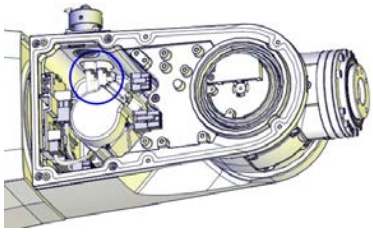
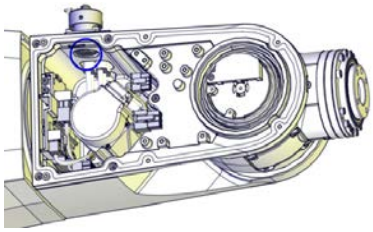
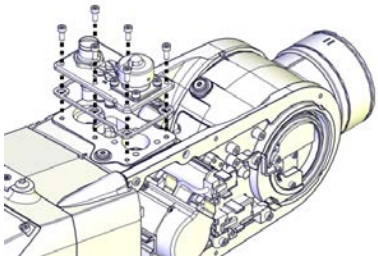
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. Replace the air hose connector set if damaged.	Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001  xx1400000738
3	If equipped, reconnect the CP/CS connector. **For robots with protection class IP67** **For robots with protection type Foundry Plus** 1 Check the gasket. 2 Replace if damaged. **For robots with protection type Clean Room** **For robots with food grade lubrication** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx1500000252 On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC080708-001  xx1500000251
4	**For robots with protection type Foundry Plus** If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

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Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

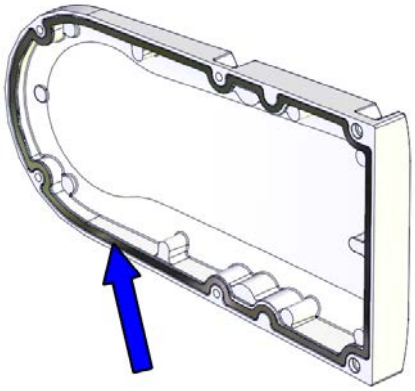
	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**If the Hygienic robot not equipped with air hoses and CP/CS cabling:** Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252
5	Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.	Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001  xx2100001434

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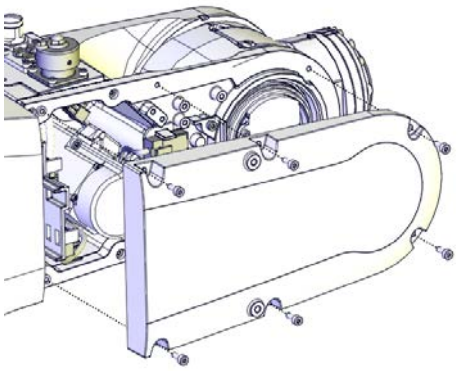
4.6.6 Replacing the axis-4 timing belt
Continued

Refitting the tubular cable housing cover

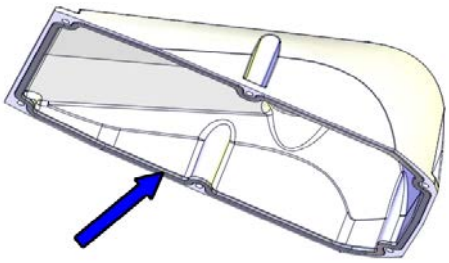
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001  xx1400000345
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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	Action	Note
4	Refit the cover to the cable housing.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300002389 **Note** Only use specified screws, never replace them with other screws.

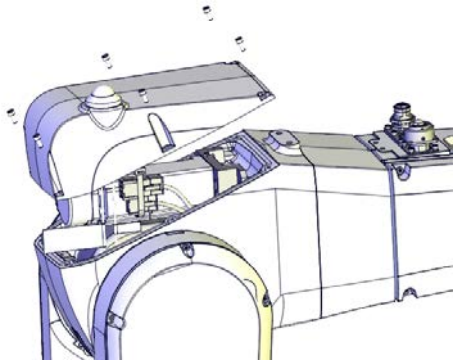
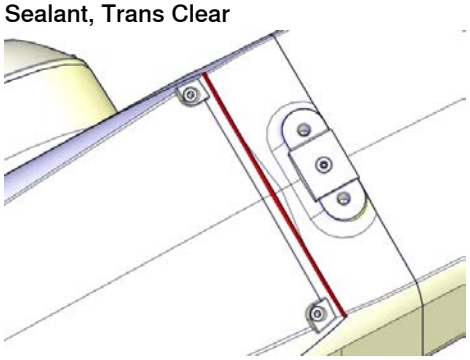
Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket. Replace if damaged.	Housing cover gasket (IRB 1200-7/0.7): 3HAC091798-001 Housing cover gasket, Hygienic (IRB 1200-7/0.7): 3HAC080700-001 Housing cover gasket (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC091797-001 Housing cover gasket, Hygienic (IRB 1200-5/0.9): 3HAC080699-001  xx1400000477
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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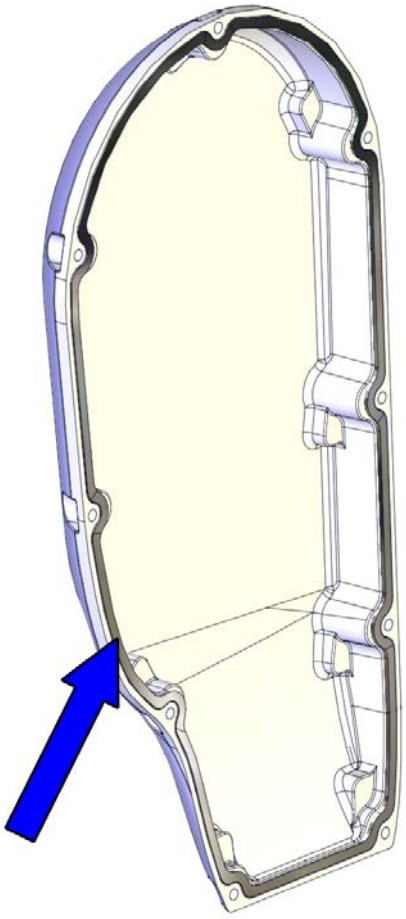
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4.6.6 Replacing the axis-4 timing belt
Continued

	Action	Note
3	Refit the upper arm housing cover with the screws.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1300000456 **Note** Only use specified screws, never replace them with other screws.
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.	**For robots with protection type Clean Room** **For robots with food grade lubrication** Sealant, SikaFlex 521FC **For robots with protection type Hygienic** Sealant, Trans Clear  xx1600000215

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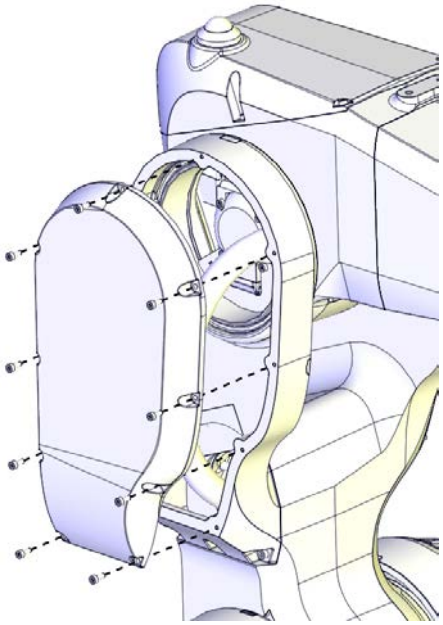
	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the cable housing cover. Replace if damaged.	Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)  xx1400000048
6	Check the PTFE film on the cable housing cover. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
7	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
8	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.6.6 Replacing the axis-4 timing belt

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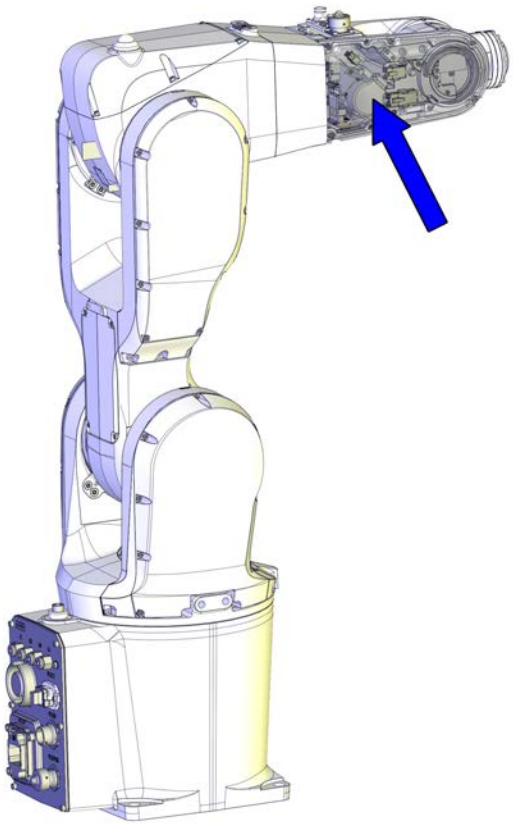
	Action	Note
9	Refit the cable housing cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400 **Note** Only use specified screws, never replace them with other screws.
10	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
11	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
12	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.7 Replacing the axis-5 motor with pulley

Location of motor

The axis-5 motor is located as shown in the figure.



xx1300002473

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Equipment, etc.	Article number	Note
Motor with pulley	3HAC045978-001	
Motor with pulley, SafeMove 2-supported. Motor with pulley, Hygienic	3HAC061278-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*.

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4.6.7 Replacing the axis-5 motor with pulley
Continued

Equipment, etc.	Article number	Note
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

[i] The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243) For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor with pulley

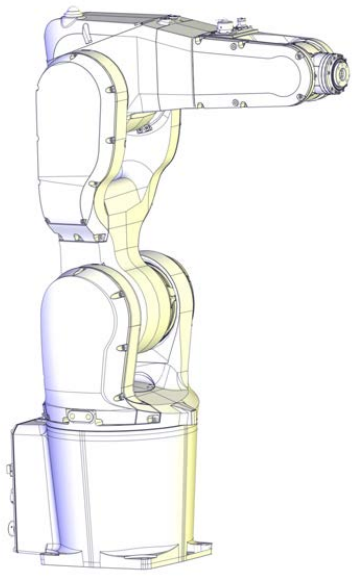
Preparations before removing the axis-5 motor, pulley or shaft

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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4.6.7 Replacing the axis-5 motor with pulley
Continued

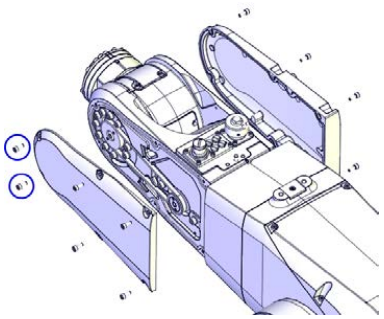
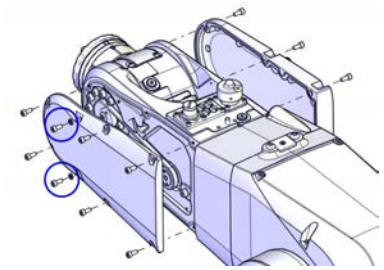
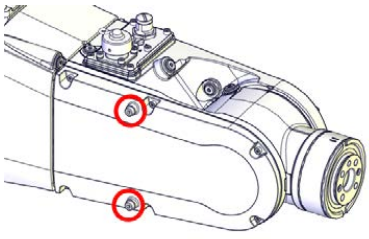
	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

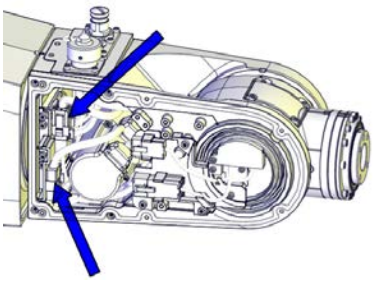
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4.6.7 Replacing the axis-5 motor with pulley

Continued

Disconnecting the axis-5 motor connectors

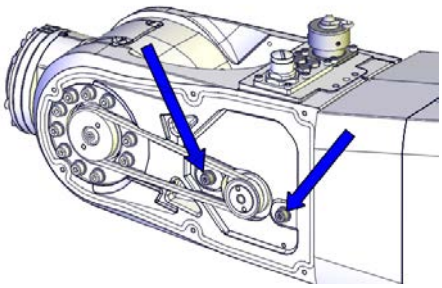
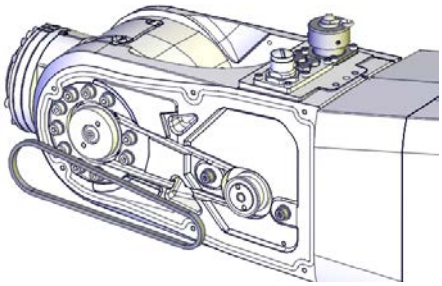
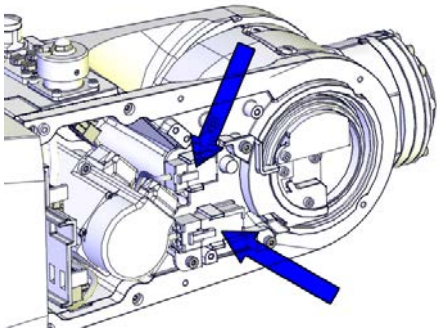
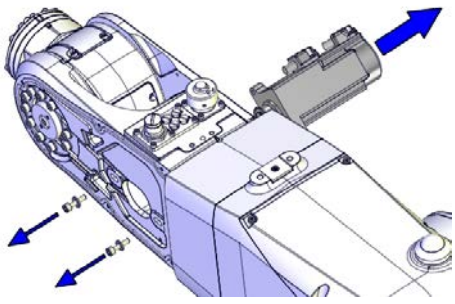
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose the motor connectors from their holders and then disconnect them. • R3.MP5 • R3.ME5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

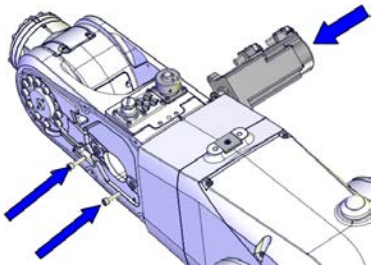
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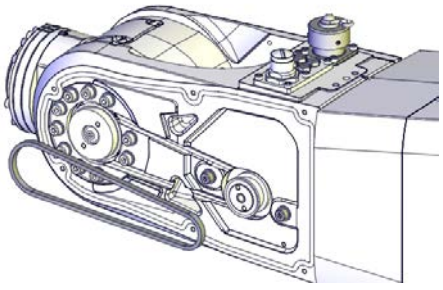
4.6.7 Replacing the axis-5 motor with pulley
Continued

Refitting the motor with pulley

Preparations before securing the axis-5 motor

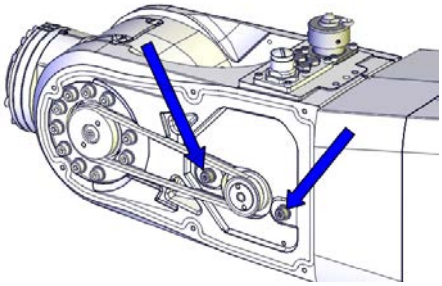
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463 **Note** Only use specified screws, never replace them with other screws.

Securing the axis-5 motor and timing belt

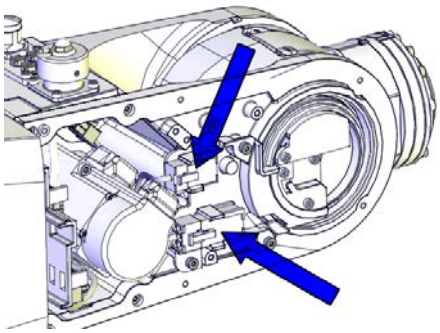
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351

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	Action	Note
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

Connecting the axis-5 motor FPC connectors

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Connecting the axis-5 motor connectors

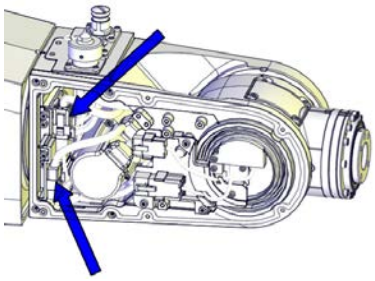
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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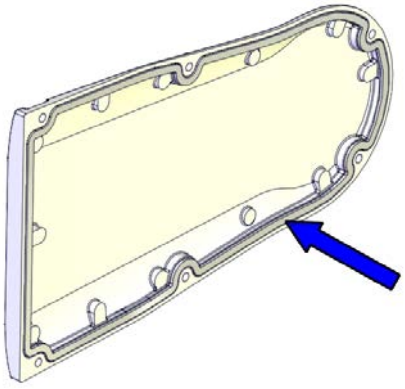
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4.6.7 Replacing the axis-5 motor with pulley

Continued

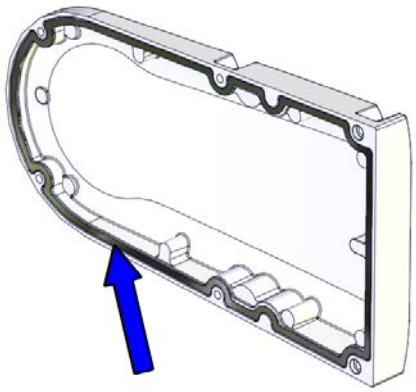
	Action	Note
2	Reconnect the motor cables. • R3.MP5 • R3.ME5	 xx1300002360

Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034

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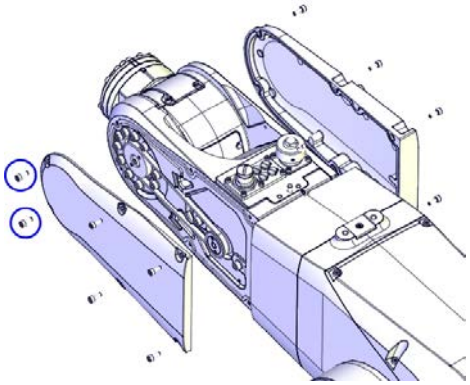
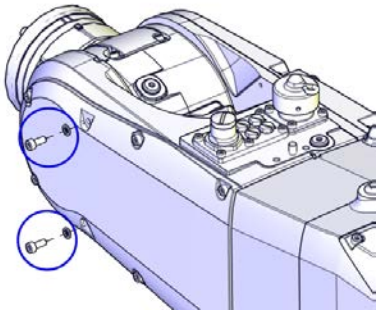
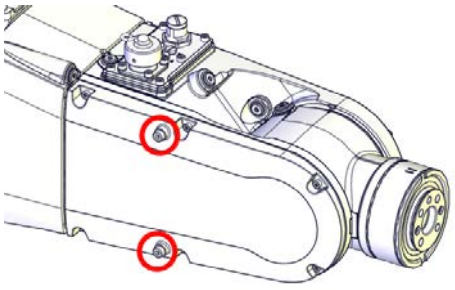
	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.6.7 Replacing the axis-5 motor with pulley

Continued

	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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Concluding procedure

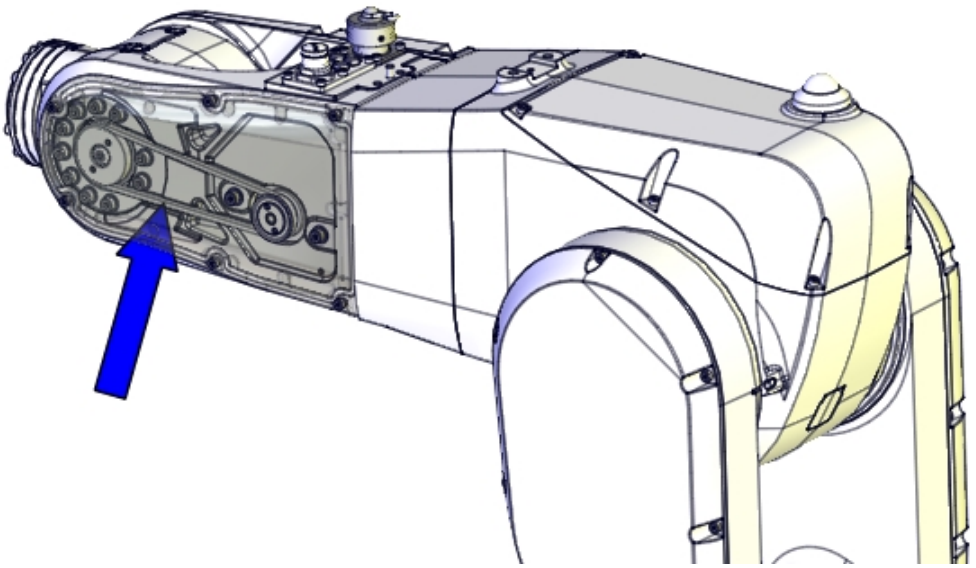
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.8 Replacing the axis-5 timing belt

Location of the timing belt

The axis-5 timing belt is located as shown in the figure.



xx1400000032

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Article number	Note
Timing belt	3HAC044657-001	
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.

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Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.
Dynamometer	-	Used for measuring timing belt tension.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243) For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the timing belt

Use these procedures to remove the axis-5 timing belt.

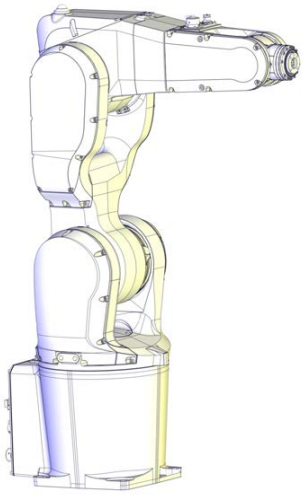
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4.6.8 Replacing the axis-5 timing belt

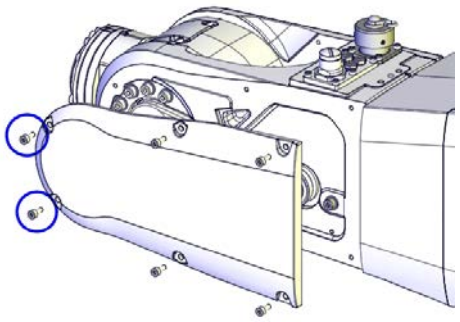
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Preparations before removing the timing belt

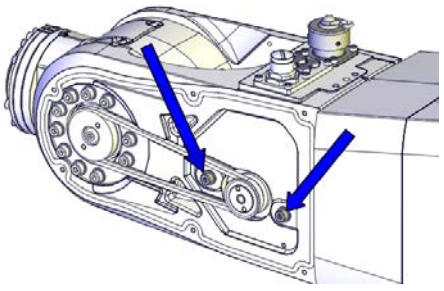
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
5	Remove the left hand side wrist cover.	 xx1400000033

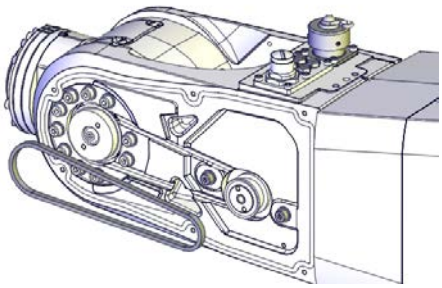
Removing the axis-5 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350

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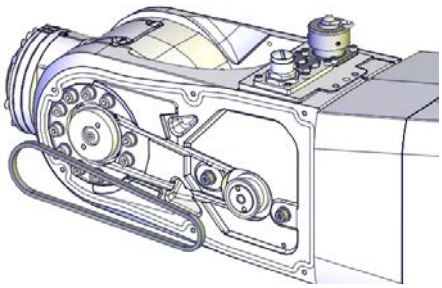
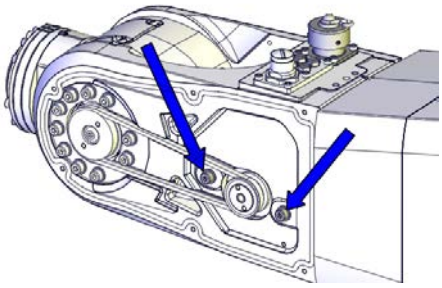
4.6.8 Replacing the axis-5 timing belt
Continued

	Action	Note
4	Remove the timing belt.	 xx1300002351

Refitting the timing belt

Use these procedures to refit the axis-5 timing belt.

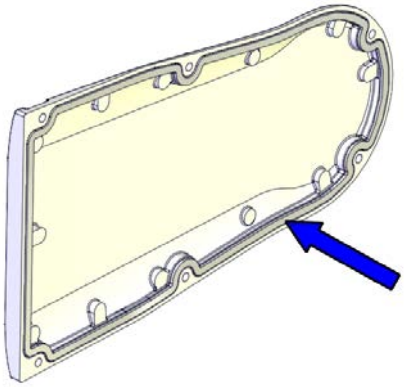
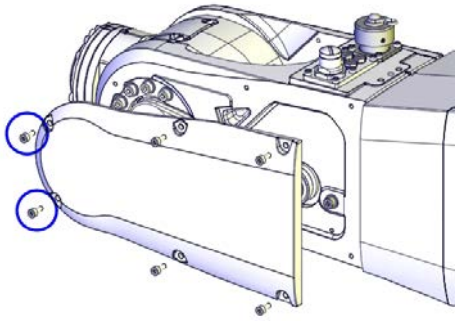
Refitting the axis-5 timing belt

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to achieve correct belt tension (F = 26 N).	Belt tension: F = 26 N.
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

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Concluding procedure

	Action	Note
1	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the gasket of the wrist cover. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the cover to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.  xx1400000033 **Note** Only use specified screws, never replace them with other screws.

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4.6.8 Replacing the axis-5 timing belt
Continued

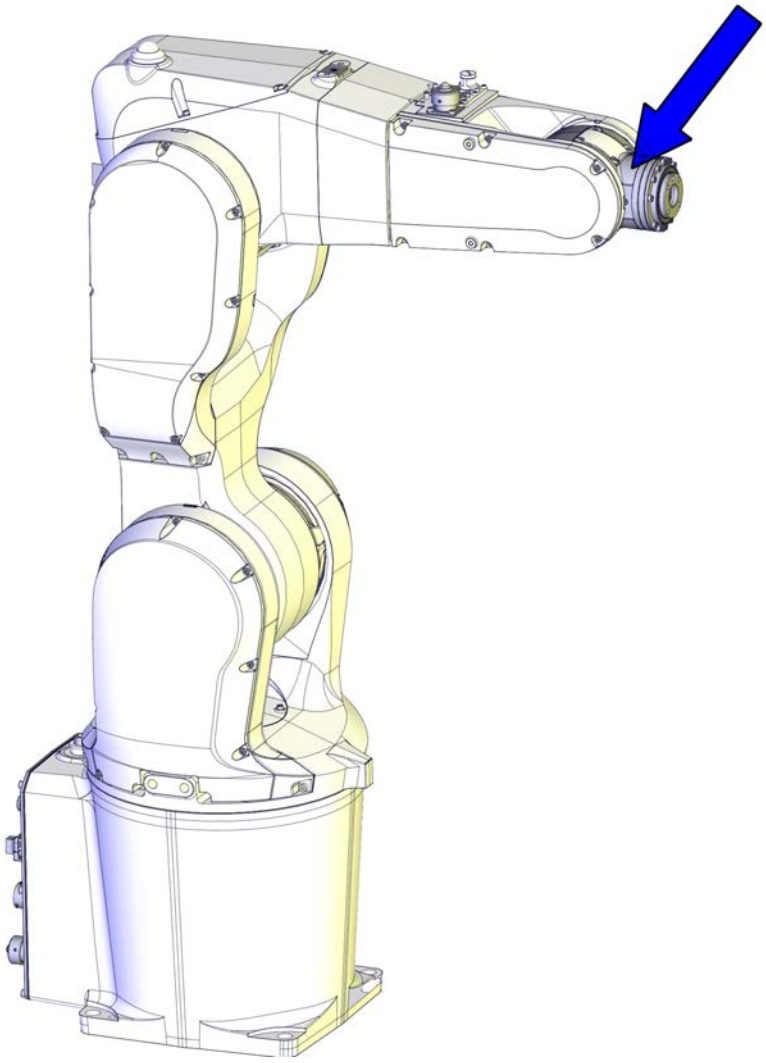
	Action	Note
4	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
5	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
6	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Location of the drive unit

The drive unit of axis-5 and axis-6 is located as shown in the figure.



xx1300002467

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Spare part	Art. no.	Note
Drive unit	3HAC059696-001	Includes axis-5 gear unit and axis-6 drive train unit.

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4.6.9 Replacing the axis-5 and axis-6 drive unit
Continued

Spare part	Art. no.	Note
Drive unit, Clean Room	3HAC059707-001	Used with protection type Clean Room. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, food grade lubrication	3HAC057907-001	Used for robots with food grade lubrication. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, Hygienic	3HAC079694-001	Used with protection type Hygienic. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, SafeMove 2-supported	3HAC061279-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, Clean Room and SafeMove 2-supported	3HAC061280-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used with protection type Clean Room. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, food grade lubrication	3HAC061281-001	Used for IRB 1200 Type B. See *Type B of IRB 1200 on page 908*. Used for robots with food grade lubrication. Includes axis-5 gear unit and axis-6 drive train unit.
M2 variseal sealing	3HAC044641-008	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-009	Used with protection class IP67 and protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.
Sleeve	3HAC081397-001	Used with protection class IP40. Replace if damaged.
Sleeve	3HAC044661-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Art. no.	Note
Gasket for tubular cover	3HAC091799-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cover, Hygienic	3HAC080709-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC091800-001	Used with protection class IP67. Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Foundry Plus. Replace if damaged.
Gasket for tubular cable housing cover, Hygienic	3HAC080701-001	Used with protection type Hygienic. Replace if damaged.
Tubular cable housing	3HAC059695-001	
Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication	3HAC056143-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.
Protection cover for axis-6 turning disk	3HAC044666-001	Used with protection type Foundry Plus. Replace if damaged.
T40 variseal sealing	3HAC044641-012	Used with protection type Foundry Plus. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for tilt unit (axis 5)	3HAC049706-001	Always use three guide pins together!
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. [i]
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 927*.

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4.6.9 Replacing the axis-5 and axis-6 drive unit
Continued

Equipment, etc.	Article number	Note
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic
Dynamometer	-	Used for measuring timing belt tension.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Flange sealing	3HAC026759-003	Sikaflex 521FC
Flange sealing	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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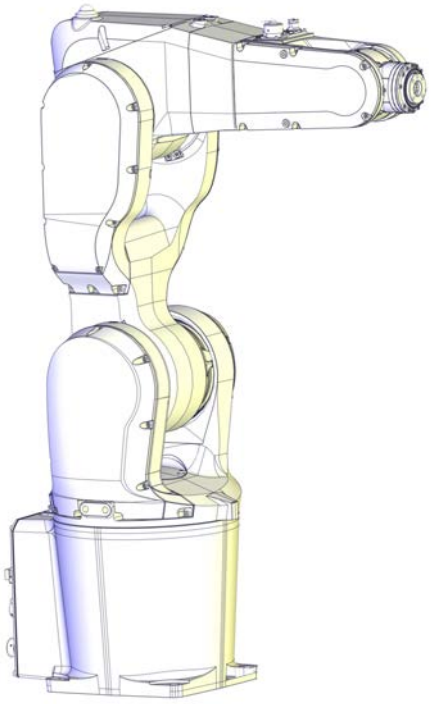
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in *Reference calibration routine on page 850*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the drive unit

Use these procedures to remove the drive unit.

Preparations before removing the axis-5 and axis-6 drive unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581

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4.6.9 Replacing the axis-5 and axis-6 drive unit
Continued

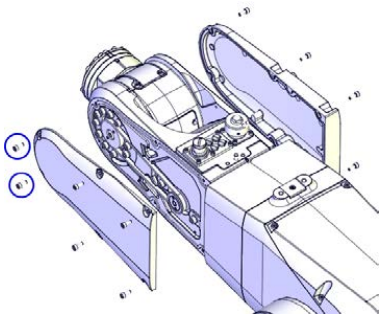
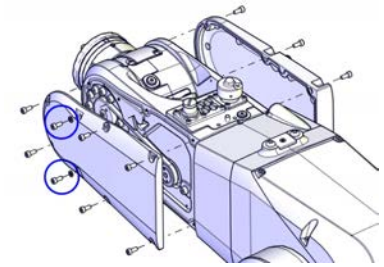
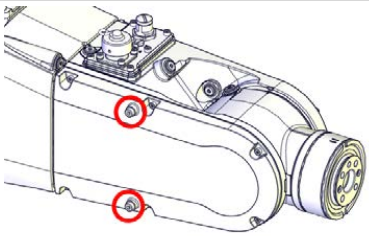
	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

Getting access to inside of the wrist unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	

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	Action	Note
3	Remove the covers on each side of the wrist by removing their screws. The screws have been fitted with locking liquid.	
	Note **For robots with protection class IP67** **For robots with protection type Foundry Plus** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1300002349
	Note **For robots with protection type Clean Room** **For robots with food grade lubrication** The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	 xx1600001148
	Note **For robots with protection type Hygienic** The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	 xx2100001406

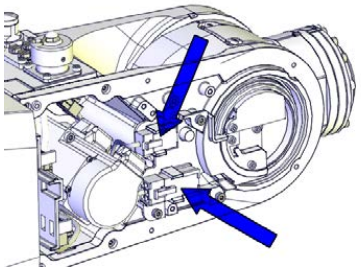
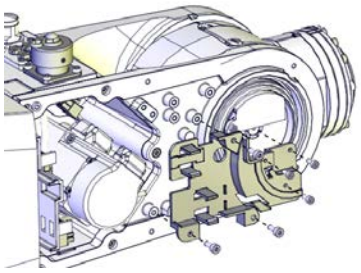
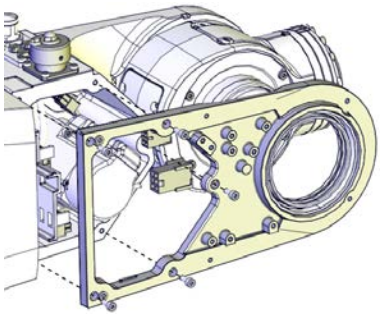
Removing the tubular cable housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.6.9 Replacing the axis-5 and axis-6 drive unit
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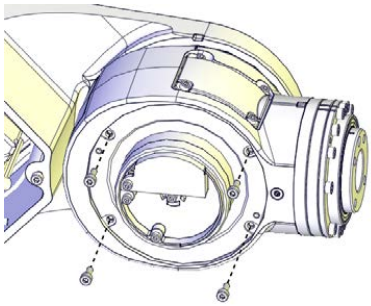
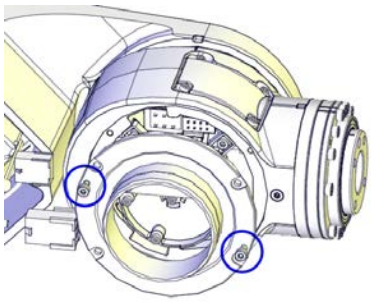
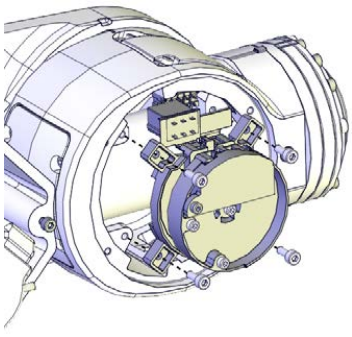
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
4	Remove the connector plate by first removing the screws.	 xx1300002391
5	Remove the cable housing of the tubular by first removing the screws. **Note** **For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** The frame is glued and needs to be pried off.	 xx1300002392

Removing the axis-5 FPC unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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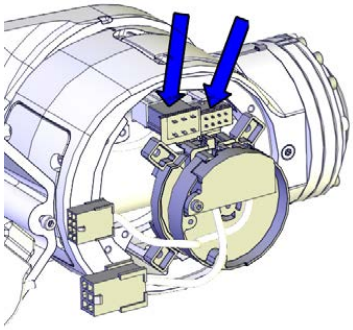
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Remove the sleeve screws.	 xx1300002393
4	Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.	 xx1300002582
5	Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed.	 xx1300002394

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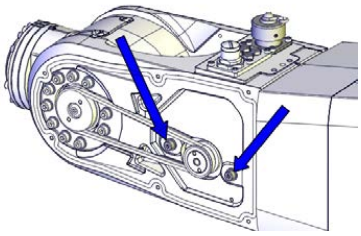
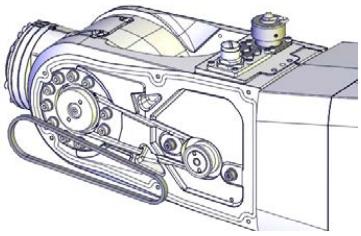
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4.6.9 Replacing the axis-5 and axis-6 drive unit

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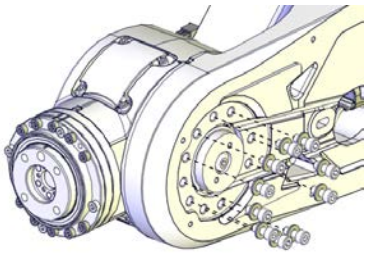
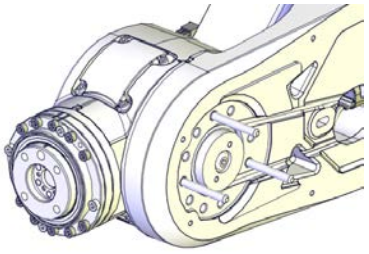
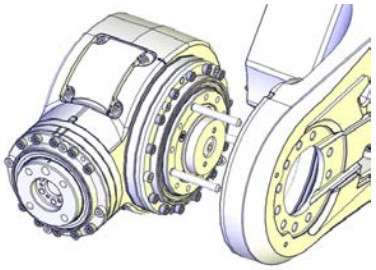
	Action	Note
6	Disconnect the axis-6 motor connectors and remove the FPC unit completely.	 xx1300002395

Removing the drive unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 177*.	
3	Loosen the attachment screws of the axis-5 motor so that the motor can slide sideways.	 xx1300002350
4	Slide the motor sideways to release the tension of the timing belt, and remove the timing belt.	 xx1300002351

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	Action	Note
5	Support the weight of the drive unit and remove the screws.	 xx1300002469
6	Fit guide pins to the gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001 Always use three guide pins together!  xx1400000775
7	Remove the drive unit.	 xx1300002470

Refitting the drive unit

Use these procedures to refit the drive unit.

Checking the sealing set on tool flange of Hygienic robots

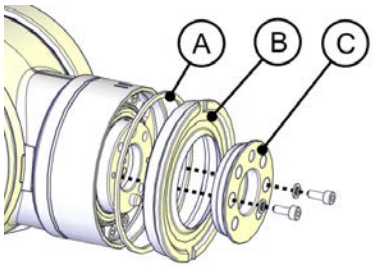
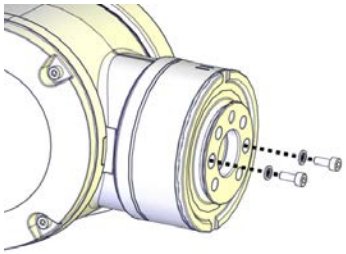
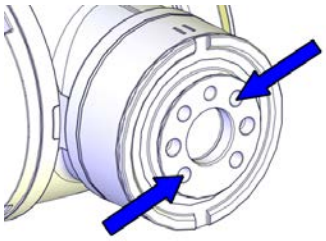
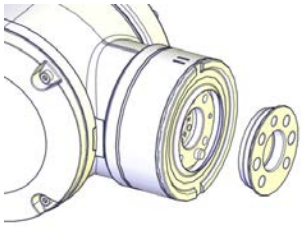
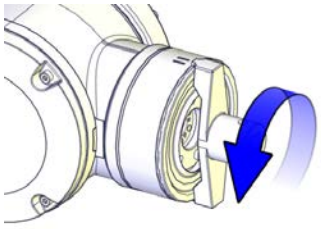
	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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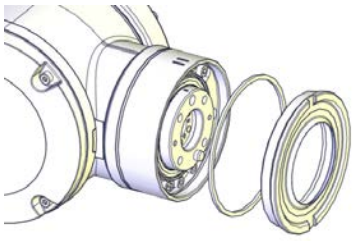
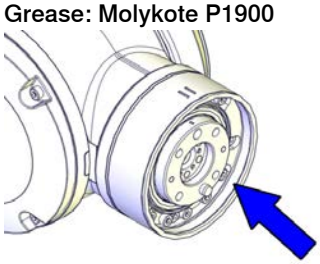
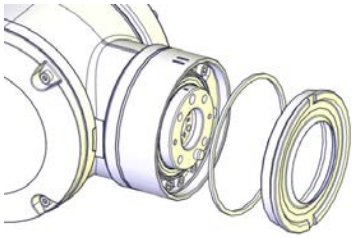
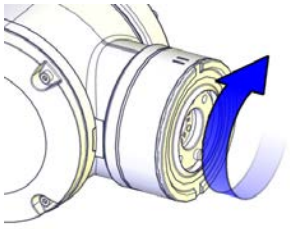
4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
2	Check the gasket (A), seal ring unit (B) and stainless shaft (C) on the tool flange. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	 xx2100001448
3	Remove the screws and washers.	 xx2100001449
4	Insert two M4 screws to the pressed out holes and press out the stainless shaft.	 xx2100001450  xx2100001451
5	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.	Flange tightening tool: 3HAC079686-001  xx2100001452

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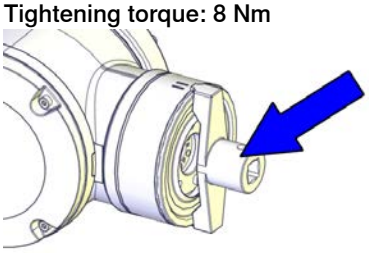
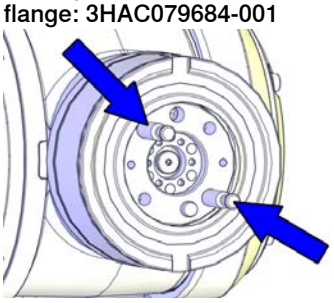
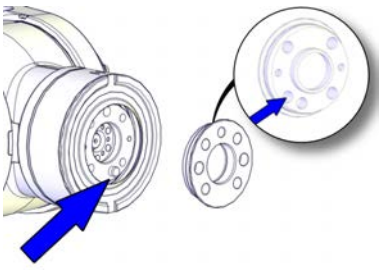
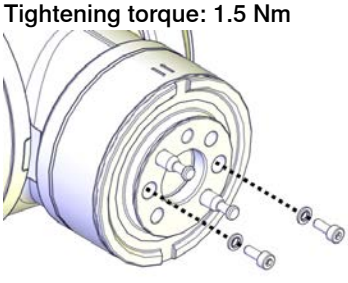
	Action	Note
6	Remove the gasket and seal ring unit.	 xx2100001453
7	Replace the damaged parts with new ones.	
8	Apply a little grease to the screw thread.	Grease: Molykote P1900  xx2100001454
9	Put the gasket in place and then screw the seal ring unit.	 xx2100001453  xx2100001455

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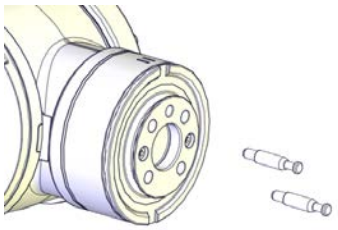
4.6.9 Replacing the axis-5 and axis-6 drive unit

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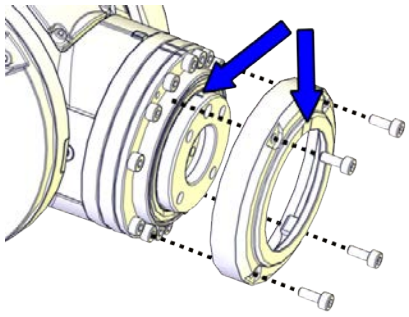
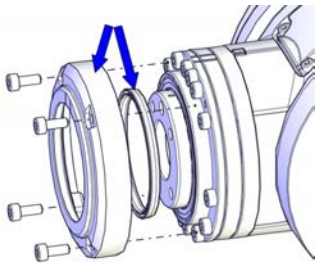
	Action	Note
10	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	Flange tightening tool: 3HAC079686-001 Tightening torque: 8 Nm  xx2100001456
11	Fit two guide pins to the tool flange.	Guide pin for stainless shaft on tool flange: 3HAC079684-001  xx2100001457
12	Place the stainless shaft on the tool flange with guidance of the two guide pins. Make sure the pin hole on the shaft aligned with the pin on the tool flange.	 xx2100001458
13	Secure with screws and washers.	Tightening torque: 1.5 Nm  xx2100001459

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	Action	Note
14	Remove the guide pins.	 xx2100001460

Refitting the axis-5 and axis-6 drive unit

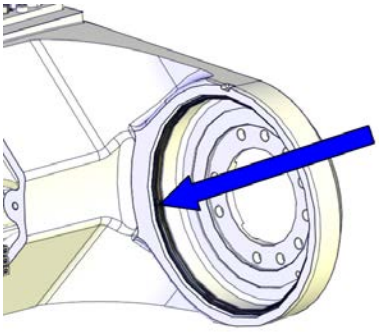
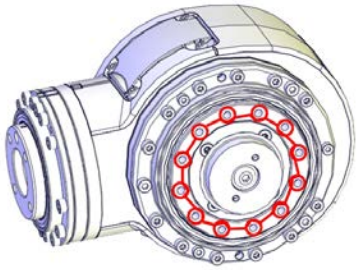
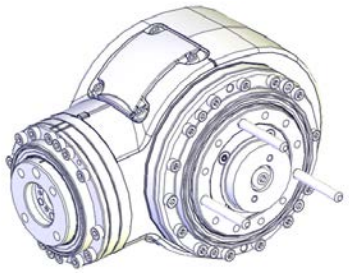
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Foundry Plus** Check the protection cover for turning disk and T40 variseal sealing. Replace if damaged. **Note** When installing, make sure the notch on the protection cover is aligned with the synchronization mark on the tool flange so that the notch could be used as the synchronization mark during calibration.  xx2300001281	Protection cover for axis-6 turning disk: 3HAC044666-001 T40 variseal sealing: 3HAC044641-012  xx1600001126

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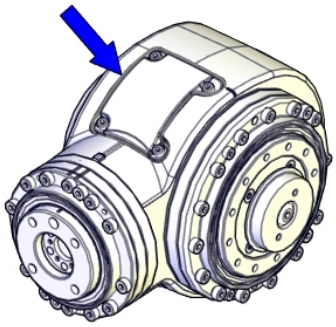
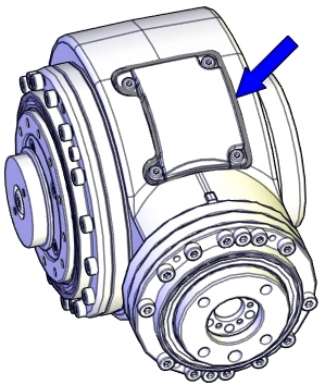
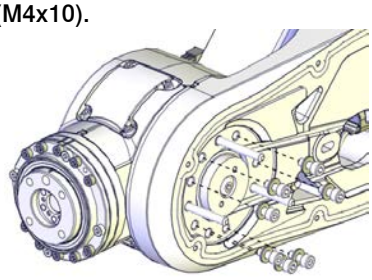
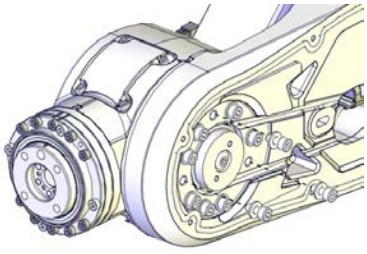
4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-008  xx1300002493
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the drive unit. **Note** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Wipe clean the overflowing sealant if there is any.	**For robots not in protection type Hygienic** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1400001404
5	Fit guide pins to the axis-5 gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001  xx1300002568

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	Action	Note
6	**For robots with protection type Clean Room** **For robots with food grade lubrication** Make sure the sealing to the tilt covers is intact before the refitting. **For robots with protection type Hygienic** Hygienic robots do not have tilt covers.	 xx1600000219  xx1600000220
7	Refit the drive unit and secure with the screws and washers. Secure the screws but do not tighten yet. **Note** If there is glue on the screw, please clean it or replace it with a new one.	Attachment screws: 3HAB3409-236 (M4x10).  xx1300002569 **Note** Only use specified screws, never replace them with other screws.
8	Remove the guide pins and refit the remaining screws and washers.	 xx1300002570

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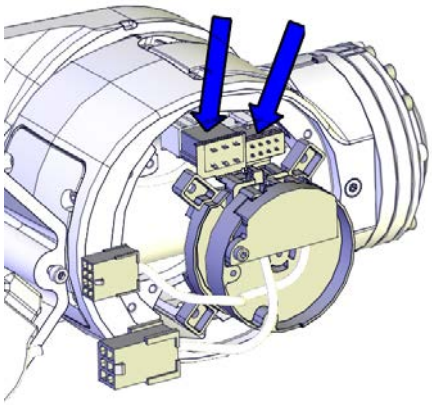
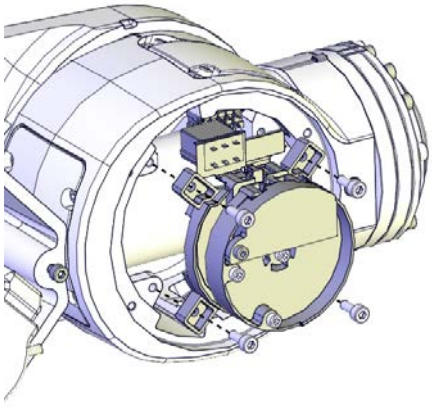
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4.6.9 Replacing the axis-5 and axis-6 drive unit

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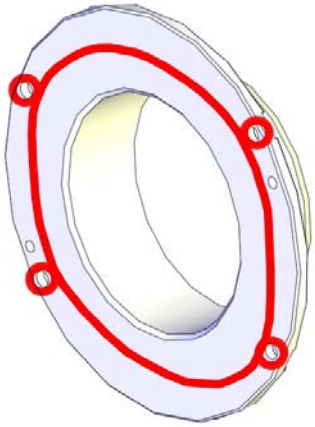
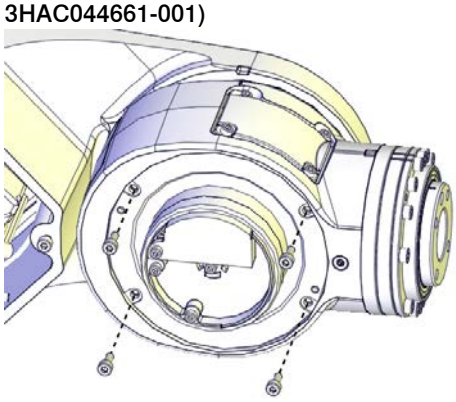
	Action	Note
9	Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.	

Refitting the axis-5 FPC unit

	Action	Note
1	**WARNING** It is important that axis 5 is in zero position when fitting the FPC unit. Make sure that the FPC is in zero position and does not get twisted during refitting.	
2	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Reconnect the axis-6 motor connectors to the FPC unit.	 xx1300002395
4	Carefully refit the FPC unit and secure with screws. **Note** Check that the FPC unit is at the zero position when refitting it.	Tightening torque: 0.3 Nm.  xx1300002394

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	Action	Note
5	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the sleeve. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealing, Loctite 574 **For robots with protection type Hygienic** Flange sealing, Trans Clear  xx1300002609
6	Refit the sleeve and secure with screws. Replace if damaged.	Sleeve: 3HAC081397-001 (for robots in IP40) / 3HAC044661-001 (for robots not in IP40) Tightening torque: 1.5 Nm (for Sleeve 3HAC081397-001) / 1.5 Nm (for Sleeve 3HAC044661-001)  xx1300002393

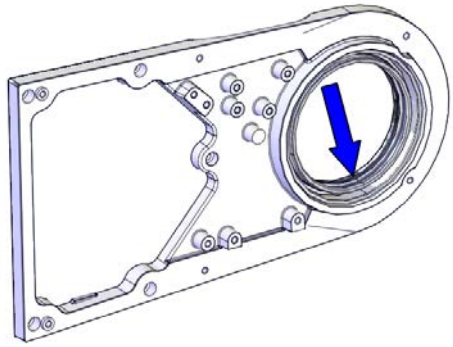
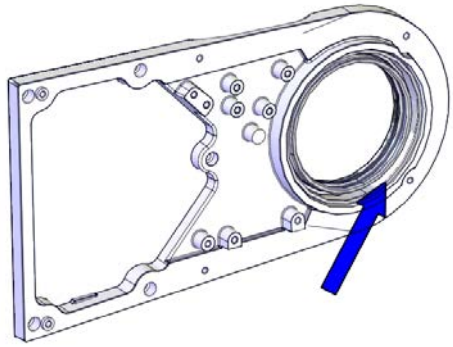
Checking the tubular cable housing sealings

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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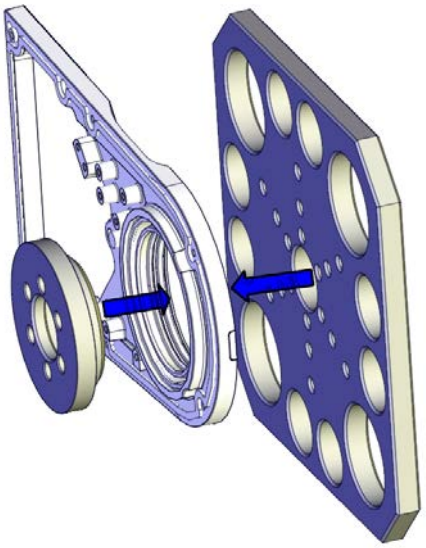
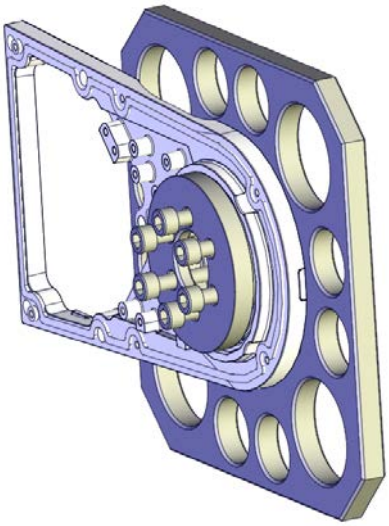
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4.6.9 Replacing the axis-5 and axis-6 drive unit
Continued

	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Check the sealing. Replace if damaged. **CAUTION** Do not fit M2 variseal sealing on robots in other protection class or protection types.	M2 variseal sealing: 3HAC044641-009  xx1300002396
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	Radial sealing: 3HAB3701-42  xx1300002608
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the tubular cable housing.	

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	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-5 sealing assembly tool set: 3HAC049701-001
7	Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.	 xx1400000485
8	Screw the screws, little by little, to press the sealing into place.	 xx1400000486
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing

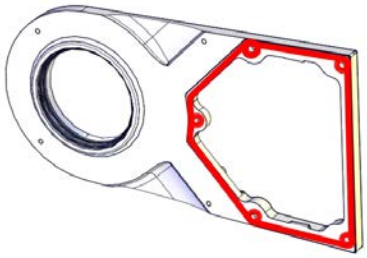
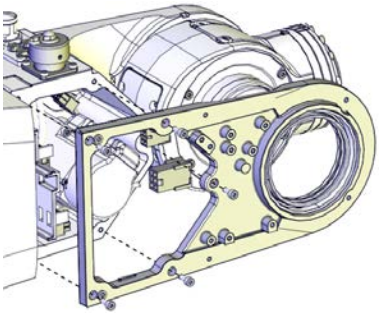
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

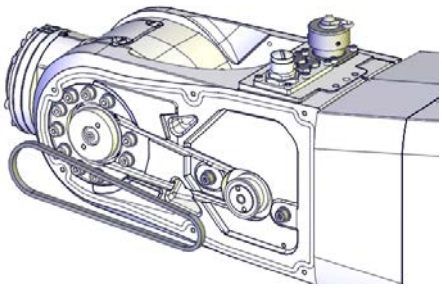
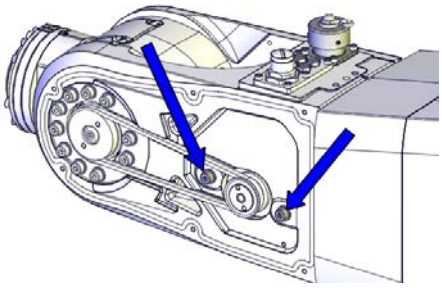
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Hygienic** Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the tubular cable housing. **Note** For Hygienic robots, wipe clean the overflowing flange sealing if there is any.	**For robots with protection class IP67** **For robots with protection type Foundry Plus** Flange sealant, SikaFlex 521FC **For robots with protection type Hygienic** Flange sealant, Trans Clear  xx1300002610
3	Refit the tubular cable housing with the screws.	Tightening torque: 1.5 Nm. Tubular cable housing: 3HAC059695-001 Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication : 3HAC056143-001 Tubular cable housing, Hygienic: 3HAC079692-001  xx1300002392

Securing the axis-5 motor and timing belt

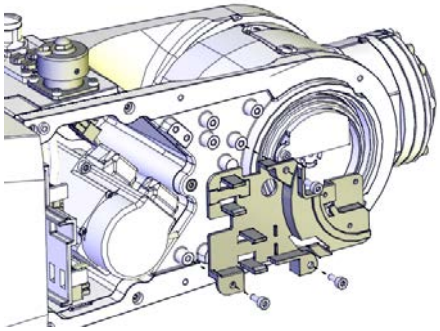
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the timing belt on the pulley.	 xx1300002351
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	**Note** Do not strech the timing belt too much!
4	Secure the motor with its attachment screws.	 xx1300002350 Tightening torque: 3.5 Nm.

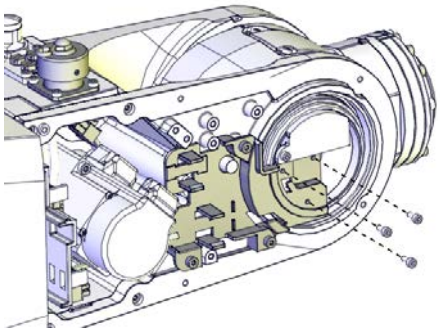
Refitting the connector plate

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401

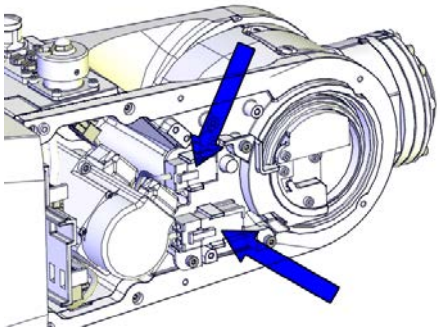
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4.6.9 Replacing the axis-5 and axis-6 drive unit
Continued

	Action	Note
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

Connecting the axis-5 motor FPC connectors

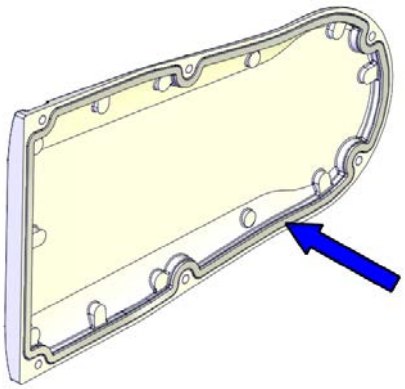
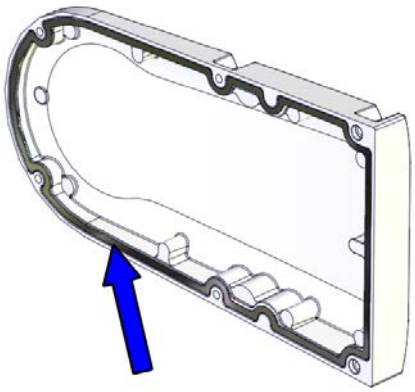
	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

Refitting the wrist covers

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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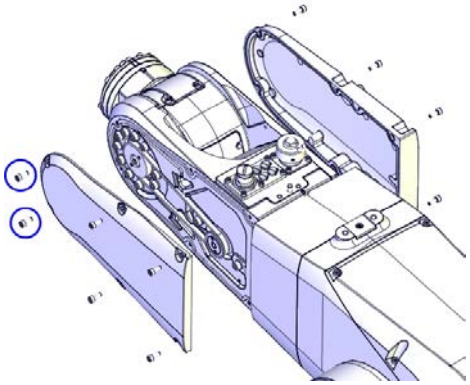
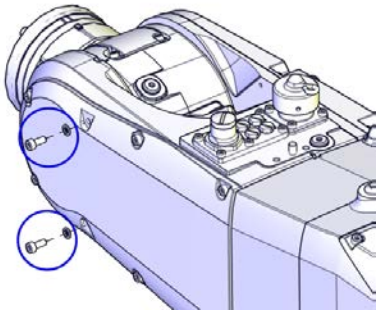
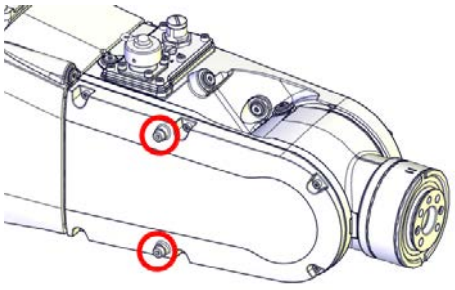
	Action	Note
2	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC091799-001 Gasket for tubular cover, Hygienic: 3HAC080709-001  xx1400000034
3	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Check the tubular cable housing cover gasket. Replace if damaged.	Gasket for tubular cable housing cover: 3HAC091800-001 Gasket for tubular cable housing cover, Hygienic: 3HAC080701-001  xx1400000345
4	**For robots with protection class IP67** **For robots with protection type Foundry Plus** **For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Apply a little locking liquid to all the screws securing the cover.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
5	Refit the both covers to the wrist.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.
	For robots with protection class IP67 **For robots with protection type Foundry Plus** Remember to refit the extra two screws and washers to the tubular cover.	 xx1300002349
	For robots with protection type Clean Room **For robots with food grade lubrication** Remember to refit the extra two screws and washers to the tubular cover.	 xx1600001153 **Note** Only use specified screws, never replace them with other screws.
	Note **For robots with protection type Hygienic** Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.	 xx2100001406

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Concluding procedure

	Action	Note
1	**For robots with protection type Clean Room** **For robots with food grade lubrication** **For robots with protection type Hygienic** Clean, seal and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 177*. **Note** After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration information is included in section *Calibration on page 837*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 123*.	

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5 Calibration

5.1 Introduction to calibration

5.1.1 Introduction and calibration terminology

Calibration information

This chapter includes general information about the recommended calibration methods and also the detailed procedures for updating the revolution counters, checking the calibration position etc.

Detailed instructions of how to perform Axis Calibration are given on the FlexPendant during the calibration procedure. To prepare calibration with Axis Calibration method, see *Calibrating with Axis Calibration method on page 849*.

Calibration terminology

Term	Definition
Calibration method	A collective term for several methods that might be available for calibrating the ABB robot. Each method contains calibration routines.
Synchronization position	Known position of the complete robot where the angle of each axis can be checked against visual synchronization marks.
Calibration position	Known position of the complete robot that is used for calibration of the robot.
Standard calibration	A generic term for all calibration methods that aim to move the robot to calibration position.
Fine calibration	A calibration routine that generates a new zero position of the robot.
Reference calibration	A calibration routine that in the first step generates a reference to current zero position of the robot. The same calibration routine can later on be used to recalibrate the robot back to the same position as when the reference was stored. This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed. Requires that a reference is created before being used for recalibrating the robot. Requires that the robot is dressed with the same tools and process equipment during calibration as during creation of the reference values.
Update revolution counter	A calibration routine to make a rough calibration of each manipulator axis.
Synchronization mark	Visual marks on the robot axes. When marks are aligned, the robot is in synchronization position.

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5.1.2 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration or manual calibration [i]
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory. For IRC5 robots, the absolute accuracy calibration data is delivered in a file, absacc.cfg, supplied with the robot at delivery. The file replaces the calib.cfg file and identifies motor positions as well as absolute accuracy compensation parameters. A robot calibrated with Absolute accuracy has a sticker next to the identification plate of the robot (IRC5). A robot calibrated with Absolute accuracy has the option information printed on its name plate (OmniCore). To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.  xx0400001197	CalibWare

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Type of calibration	Description	Calibration method
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4 and 5. **Note** For advanced users, it is also possible to do the wrist optimization using the RAPID instruction `WristOpt`, see *Technical reference manual - RAPID Instructions, Functions and Data types*. This instruction is only available for OmniCore robots.	Wrist Optimization

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1200. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

An introduction to the calibration method is given in this manual, see *Calibrating with Axis Calibration method on page 849*.

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

Manual calibration method

With the manual calibration method, the robot's axes are positioned in specific calibration positions using calibration tools. Under this condition, the position of the axis to be calibrated is pre-determined. The axes must be calibrated one at a time.

Continues on next page

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5.1.2 Calibration methods
Continued

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

References

Article numbers for the calibration tools are listed in the section *Special tools on page 928*.

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5.1.3 When to calibrate

When to calibrate

The system must be calibrated if any of the following situations occur.

The resolver values are changed

If resolver values are changed, the robot must be re-calibrated using the calibration methods supplied by ABB. Calibrate the robot carefully with standard calibration, according to information in this manual.

If the robot has *absolute accuracy* calibration, it is also recommended, but not always necessary to calibrate for new absolute accuracy.

The resolver values will change when parts affecting the calibration position are replaced on the robot, for example motors or parts of the transmission.

The revolution counter memory is lost

If the revolution counter memory is lost, the counters must be updated. See *Updating revolution counters on page 845*. This will occur when:

- The battery is discharged
- A resolver error occurs
- The signal between a resolver and measurement board is interrupted
- A robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

The robot is rebuilt

If the robot is rebuilt, for example, after a crash or when the reachability of a robot is changed, it needs to be re-calibrated for new resolver values.

If the robot has *absolute accuracy* calibration, it needs to be calibrated for new absolute accuracy.

Robot is not floor mounted

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

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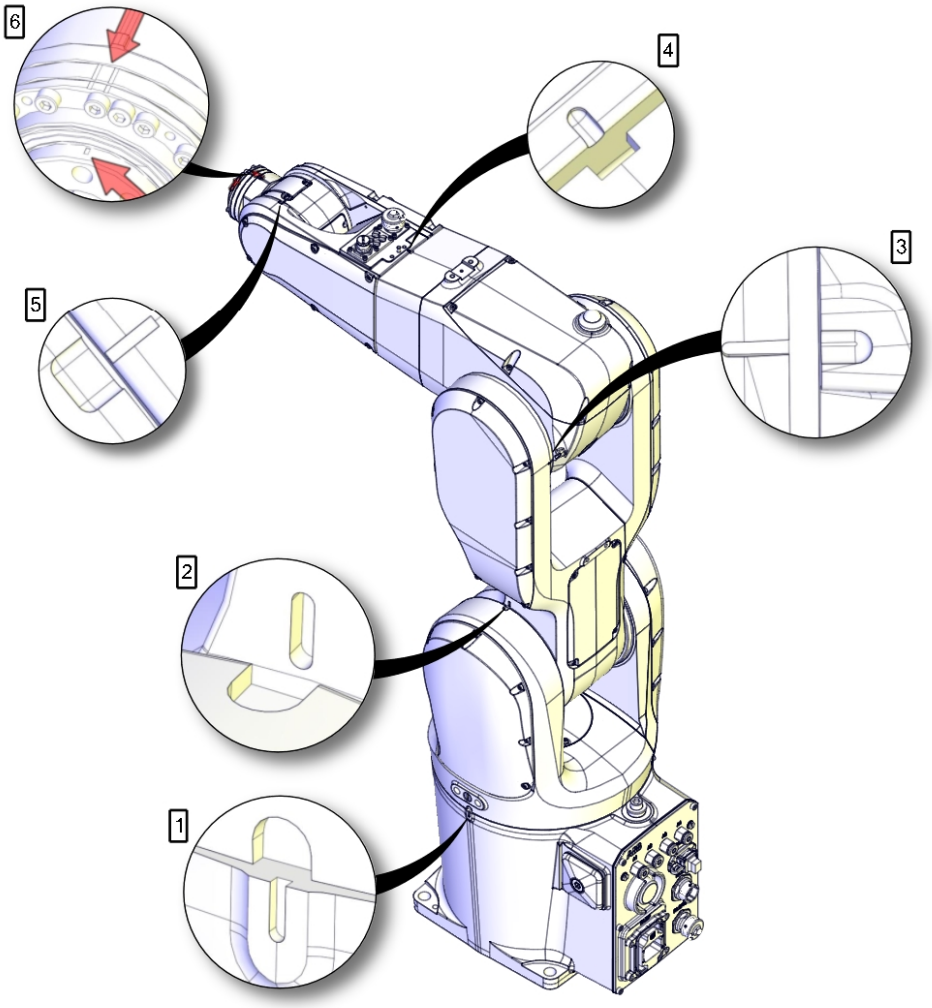
5.2 Synchronization marks and axis movement directions

5.2.1 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

Synchronization marks, IRB 1200

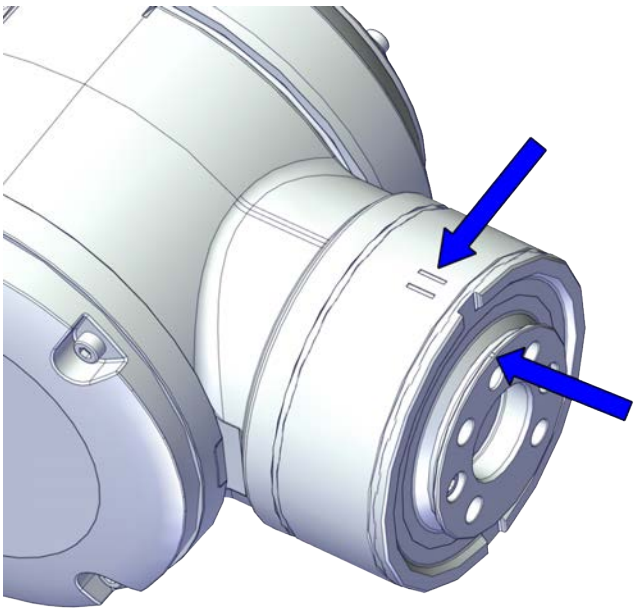


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Synchronization marks at axis 6 on Hygienic robots



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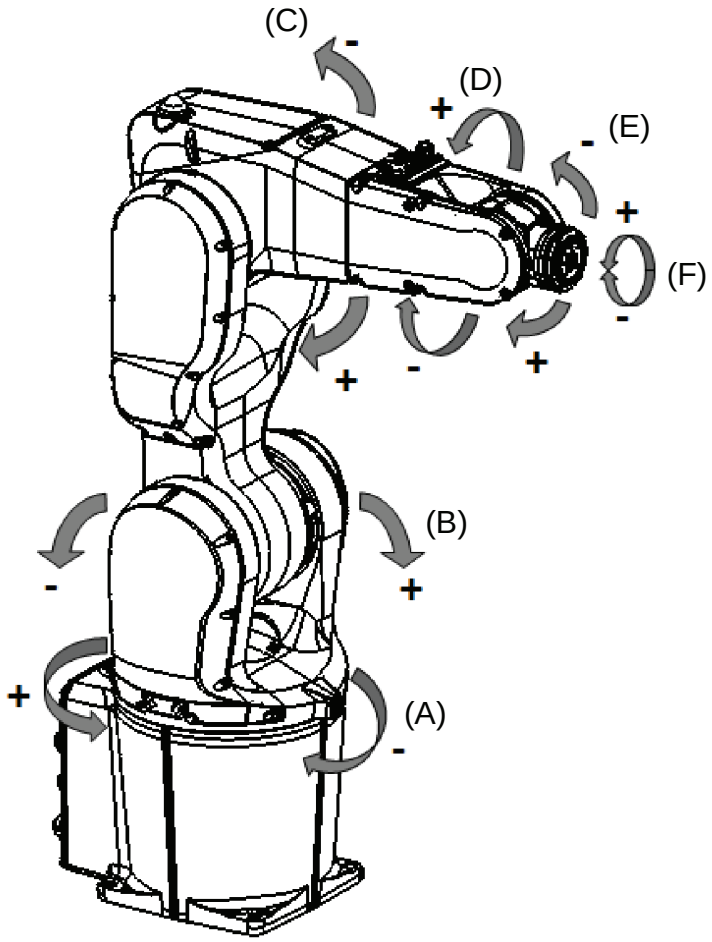
5.2.2 Calibration movement directions for all axes

Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

Manual movement directions



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Position	Description	Position	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

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5.3 Updating revolution counters

5.3.1 Updating revolution counters on IRC5 robots

Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Step 1 - Manually running the manipulator to the synchronization position

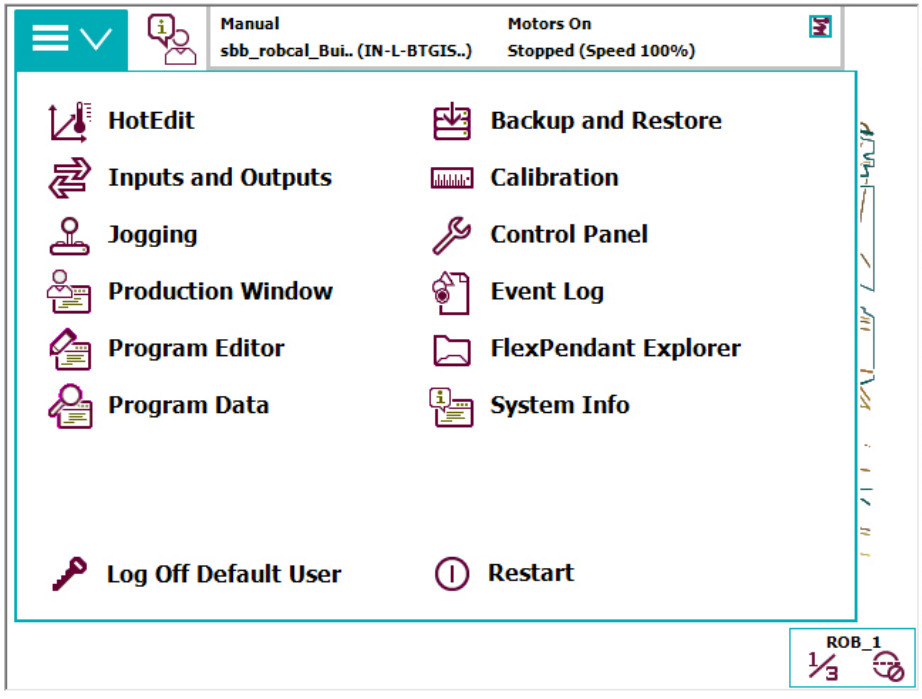
Use this procedure to manually run the manipulator to the synchronization position.

	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See *Synchronization marks and synchronization position for axes on page 842*.
3	When all axes are positioned, update the revolution counter.	*Step 2 - Updating the revolution counter with the FlexPendant on page 845*.

Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (IRC5).

	Action
1	On the **ABB** menu, tap **Calibration**.



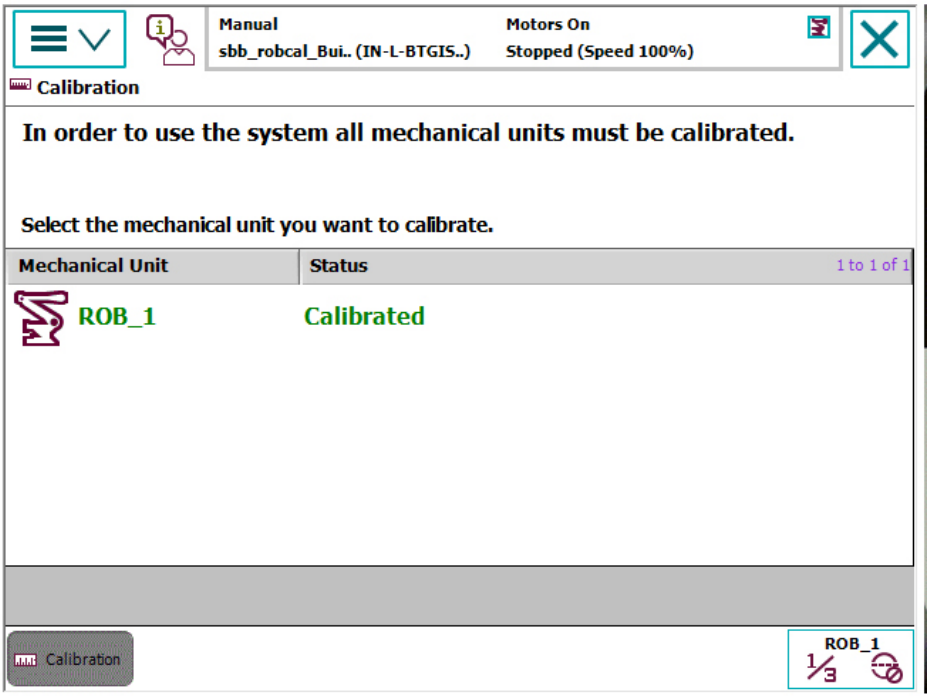
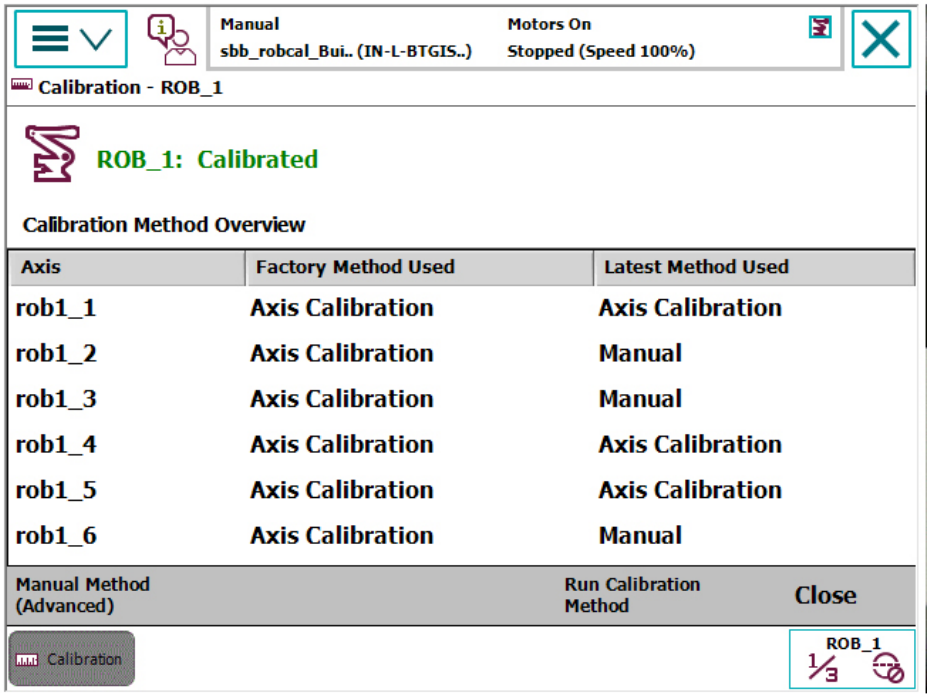
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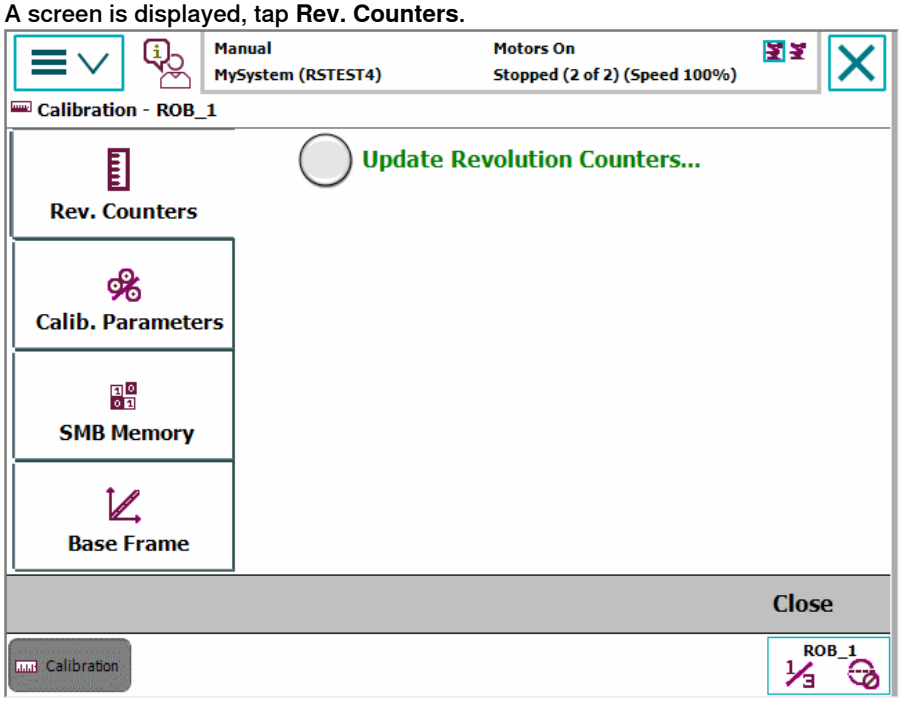
5.3.1 Updating revolution counters on IRC5 robots

Continued

	Action
2	All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.  xx1500000943
3	**This step is valid for RobotWare 6.04 and later.** Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration. Tap **Manual Method (Advanced)**.  xx1500000944

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	Action
4	A screen is displayed, tap **Rev. Counters**.  en0400000771
5	Tap **Update Revolution Counters...**. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to update the revolution counters. • Tap **No** to cancel updating the revolution counters. Tapping **Yes** displays the axis selection window.
6	Select the axis to have its revolution counter updated by: • Ticking in the box to the left • Tapping **Select all** to update all axes. Then tap **Update**.
7	A dialog box is displayed, warning that the updating operation cannot be undone: • Tap **Update** to proceed with updating the revolution counters. • Tap **Cancel** to cancel updating the revolution counters. Tapping **Update** updates the selected revolution counters and removes the tick from the list of axes.
8	**CAUTION** If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury! Check the synchronization position very carefully after each update. See *Checking the synchronization position on page 896*.

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5.3.2 Updating revolution counters on OmniCore robots

Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Step 1 - Manually running the manipulator to the synchronization position

Use this procedure to manually run the manipulator to the synchronization position.

	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See *Synchronization marks and synchronization position for axes on page 842*.
3	When all axes are positioned, update the revolution counter.	*Step 2 - Updating the revolution counter with the FlexPendant on page 848*.

Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (OmniCore).

	Action
1	On the start screen, tap **Calibrate**. The calibration summary page for the mechanical unit is displayed.
2	In the **Calibration Methods** menu, select **Revolution Counters**.
3	In the **Selection** column select the axes for which revolution counters need to be updated.
4	Tap **Update**. A dialog box is displayed warning that the updating operation cannot be undone.
5	Tap **OK** to update the revolution counter.
6	**CAUTION** If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury! Check the synchronization position very carefully after each update. See *Checking the synchronization position on page 896*.

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5.4 Calibrating with Axis Calibration method

5.4.1 Description of Axis Calibration

Instructions for Axis Calibration procedure given on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

This manual contains a brief description of the method, additional information to the information given on the FlexPendant, article number for the tools and images of where to fit the calibration tools on the robot.

Overview of the Axis Calibration procedure

The Axis Calibration procedure applies to all axes, and is performed on one axis at the time. The robot axes are both manually and automatically moved into position, as instructed on the FlexPendant.

Bushings are installed on each robot axis at delivery, for installation of the calibration tools. For axis 6 calibration there is one bushing on the wrist and one mounting hole on the tool flange.

The Axis Calibration procedure described roughly:

1 A removable calibration tool is inserted by the operator into a calibration bushing on the axis chosen for calibration, according to instructions on the FlexPendant.

> **WARNING**
>
> Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

> **WARNING**
>
> The calibration tool must be fully inserted into the calibration bushing, until the steel spring ring snaps into place.

2 During the calibration procedure, RobotWare moves the robot axis chosen for calibration so that the calibration tools get into contact. RobotWare records values of the axis position and repeats the coming-in-contact procedure several times to get an exact value of the axis position.

> **WARNING**
>
> Risk of pinching! The contact force for large robots can be up to 150 kg. Keep a safe distance to the robot.

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5.4.1 Description of Axis Calibration
Continued

3 The axis position is stored in RobotWare with an active choice from the operator.

Routines in the calibration procedure

The following routines are available in the Axis Calibration procedure, given at the beginning of the procedure on the FlexPendant.

Fine calibration routine

Choose this routine to calibrate the robot when there are no tools, process cabling or equipment fitted to the robot.

Reference calibration routine

Choose this routine to create reference values and to calibrate the robot when the robot is dressed with tools, process cabling or other equipment.

Also choose this routine if the robot is wall mounted or suspended.

Note

When calibrating the robot with the reference calibration routine, the robot must be dressed with the same tools, process cabling and any other equipment as when the reference values were created.

Note

When using reference calibration with some tools, typically large or flexible tools, oscillations in the robot can cause issues leading to failure of the calibration.

If calibrating the robot with reference calibration there must be reference values created before repair is made to the robot, if values are not already available. Creating new values requires possibility to move the robot. The reference values contain positions of all axes, torque of axes and technical data about the tool installed. A benefit with reference calibration is that the current state of the robot is stored and not the state when the robot left the ABB factory. The reference value will be named according to tool name, date etc.

Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.

When reference calibration is performed, the robot is restored to the status given by the reference values.

Update revolution counters

Choose this routine to make a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Validation

In the mentioned routines, it is also possible to validate the calibration data.

Position of robot axes

The robot axes should be positioned close to 0 degrees before commencing the calibration program. The axis chosen for calibration is then automatically run by

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the calibration program to its exact calibration position during the calibration procedure.

It is possible to position some of the other axes in positions different from 0 degrees. Information about which axes are allowed to be jogged is given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window. Also the following table shows the dependencies between the axes.

Requirements for axis positioning during calibration

	Axis to calibrate					
Required position of axis	**Axis 1**	**Axis 2**	**Axis 3**	**Axis 4**	**Axis 5**	**Axis 6**
Axis 1	-	*	*	*	*	*
Axis 2	0	-	0	*	*	*
Axis 3	0	0	-	*	*	*
Axis 4	*	*	*	-	*	*
Axis 5	*	*	*	*	-	X
Axis 6	*	*	*	*	*	-

-	Axis to be calibrated
*	Unrestricted. Axis is allowed to be jogged to other position than 0 degrees.
0	Axis must be put in position 0 degrees.
X	Special requirement

System containing SafeMove

SafeMove will lose its synchronization to the controller if a new calibration is done. New calibration values have to be downloaded to SafeMove, and a new SafeMove calibration has to be done. Make sure that the user rights admit to change the safety settings and to synchronize SafeMove.

For robots with EPS, the same applies as for SafeMove.

How to calibrate a suspended or wall mounted robot

The IRB 1200 is fine calibrated floor standing in factory, prior to shipping.

To calibrate a suspended or wall mounted robot, reference calibration could be used. Reference values for a suspended or a wall mounted robot must be created with the robot mounted at its working position, not standing on a floor.

To calibrate a suspended or wall mounted robot with the fine calibration routine, the robot must first be taken down and mounted standing on the floor.

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5.4.2 Calibration tools for Axis Calibration

Calibration tool set

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.

The calibration tool will eventually break from fatigue after longer period of use and then needs to be replaced. There is no risk for bad calibrations as long as the calibration tool is in one piece.

WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

Equipment, etc.	Article number	Note
Calibration tool box, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. i The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6.

i The robot is calibrated by either manual calibration or Axis Calibration at ABB factory before delivery. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Examining the calibration tool

Check prior to usage

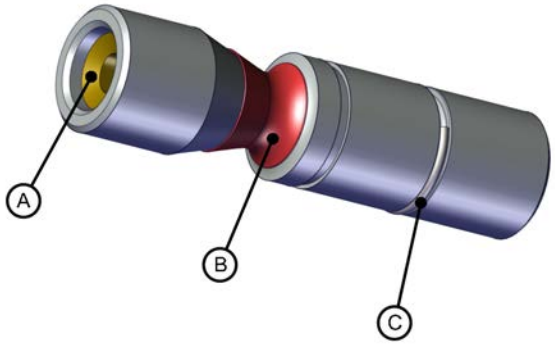
Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.

WARNING

If any part is missing or damaged, the tool must be replaced immediately.

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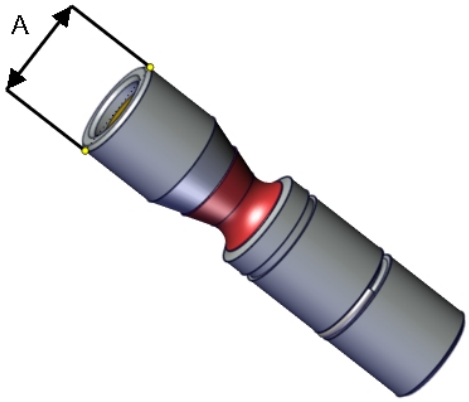
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A	Tube insert
B	Plastic protection
C	Steel spring ring

Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø12g4 mm, Ø8g4 mm or Ø6g5 mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx1500000951

A	Outer diameter

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø5g5 mm.
- Straightness within 0.005 mm.

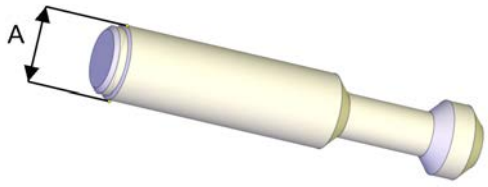
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5.4.2 Calibration tools for Axis Calibration

Continued



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A	Outer diameter

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5.4.3 Installation locations for the calibration tools

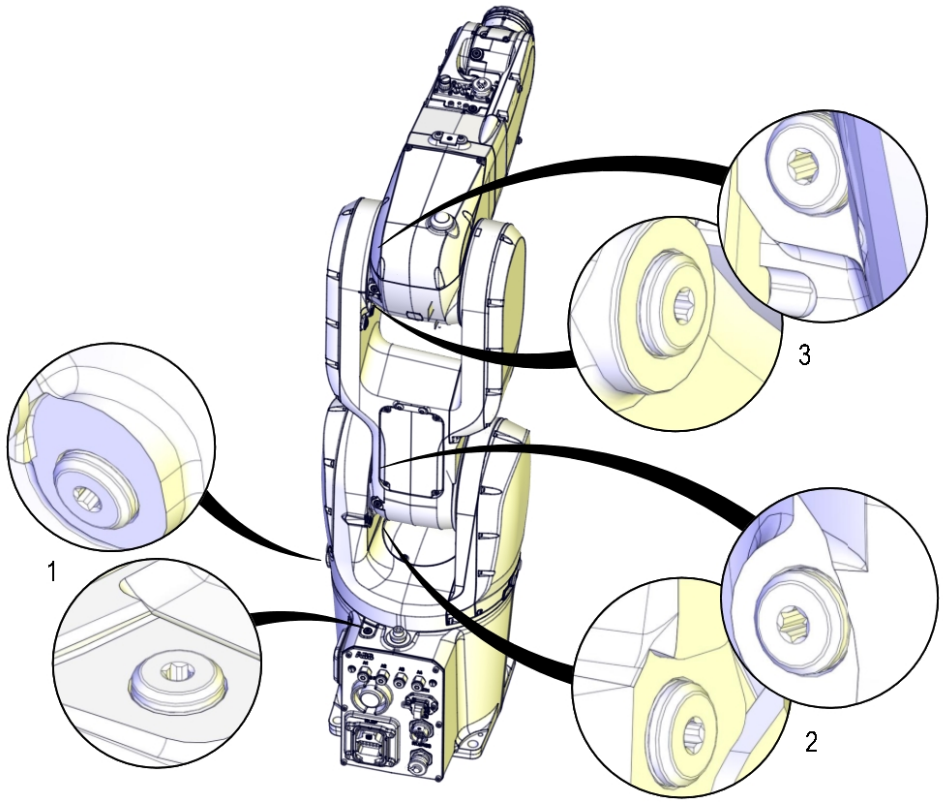
Location of fixed calibration items

This section shows how the robot is equipped with items for installation of calibration tools for Axis Calibration (fixed calibration pins and/or bushings). Installed calibration tools are not shown.

A fixed calibration pin and a bushing for the movable calibration tool are located on each axis as follows.

If there is not enough space on an axis to install a fixed calibration pin, the axis is equipped with two bushings instead, for installation of two calibration tools when calibration is carried out. This is shown in the figure.

For axis 6 there is only one bushing, the second calibration tool is installed at the mounting flange of the turning disk.

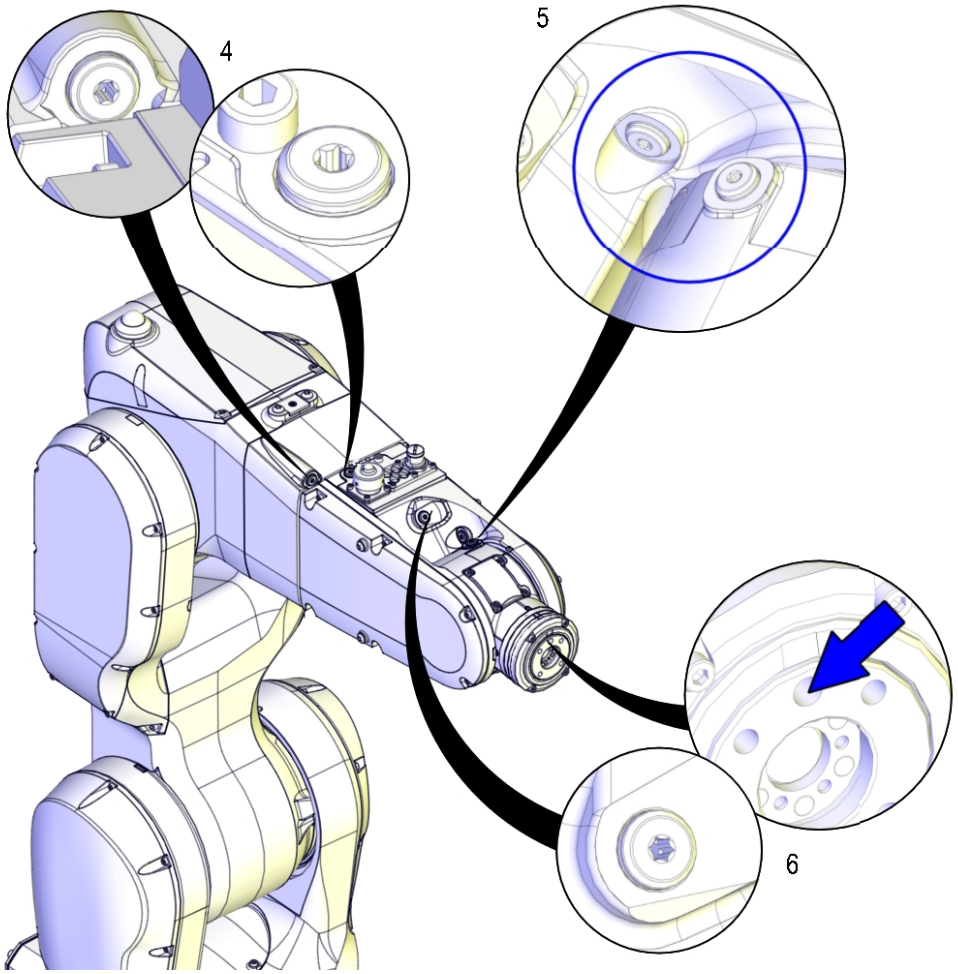


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5.4.3 Installation locations for the calibration tools
Continued



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Spare parts

When calibration is not being performed, a protective plug should always be installed in the bushing. Replace damaged parts with new, if needed.

Spare part	Article number	Note
Protective plug for bushing	3HAC059556-001	Replace if damaged or missing.
Protective plug for bushing, Clean Room Protective plug for bushing, food grade lubrication Protective plug for bushing, Hygienic	3HAC059557-001	Used with protection type Clean Room Used for robots with food grade lubrication Used with protection type Hygienic Replace if damaged or missing.

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5.4.4 Axis Calibration - Running the calibration procedure

Required tools

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.

WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration holes may cause severe damage to the robot and/or personnel.

Equipment, etc.	Article number	Note
Calibration tool box, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. i The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6.

i The robot is calibrated by either manual calibration or Axis Calibration at ABB factory before delivery. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Article number	Note
Clean cloth	-	

Spare parts

Spare part	Article number	Note
Protective plug for bushing	3HAC059556-001	Replace if damaged or missing.
Protective plug for bushing, Clean Room Protective plug for bushing, food grade lubrication Protective plug for bushing, Hygienic	3HAC059557-001	Used with protection type Clean Room Used for robots with food grade lubrication Used with protection type Hygienic Replace if damaged or missing.

Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure.

Continues on next page

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5.4.4 Axis Calibration - Running the calibration procedure
Continued

After the calibration method has been started on the FlexPendant, the following sequence will be run.

1 Choose calibration routine. The routines are described in *Routines in the calibration procedure on page 850*.
2 Choose which axis/axes to calibrate.
3 The robot moves to synchronization position.
4 Validate the synchronization marks.
5 The robot moves to preparation position.
6 Remove the protection plug from the bushings, and install the calibration tool.
7 The robot performs a measurement sequence by rotating the axis back and forth.
8 Remove the calibration tool and reinstall the protection plugs in the bushings.
9 The robot moves to verify that the calibration tool is removed.
10 Choose whether to save the calibration data or not.

Calibration of the robot is not finished until the calibration data is saved, as last step of the calibration procedure.

Preparation prior to calibration

The calibration procedure is described in the FlexPendant while conducting it.

	Action	Note
1	**DANGER** While conducting the calibration, the robot needs to be connected to power. Make sure that the robot's working area is empty, as the robot can make unpredictable movements.	
2	Wipe the calibration tool clean. **Note** The calibration method is exact. Dust, dirt or color flakes will affect the calibration value.	Use a clean cloth.
3	Check if the standard calibration data for axes 4 or 5 are updated with wrist optimization. This is shown in the calibration overview/summary window on the FlexPendant.	If the data is optimized, the calibration routine **Wrist Optimization** must be re-run after standard calibration. See *Calibrating with Wrist Optimization method on page 865*.

Starting the calibration procedure

Use this procedure to start the Axis Calibration routine on the FlexPendant.

	Action	Note
1	Tap the calibration icon and enter the calibration main page.	

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	Action	Note
2	All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question. **Note** For RobotWare 7 or later, the mechanical unit page is displayed only if there is more than one mechanical unit available.	
3	The calibration method used at ABB factory for each axis is shown, as well as calibration method used for the robot during last field calibration.	The FlexPendant will give all information needed to proceed with Axis Calibration.
4	**Valid for RobotWare 6** Tap **Call Calibration Method**. The software will automatically call for the procedure for the valid calibration method. If not, tap **Call Routine** and then tap **Axis calibration**.	
5	**Valid for RobotWare 7 or later** Tap **Calibration Methods** on the right pane and then tap **Calibration**. The software will automatically call for the procedure for the valid calibration method.	
6	Follow the instructions given on the FlexPendant.	A brief overview of the sequence that will be run on the FlexPendant is given in *Overview of the calibration procedure on the FlexPendant on page 857*.

Fitting of calibration tools

The figures show the calibration tools in contact with each other on each axis.

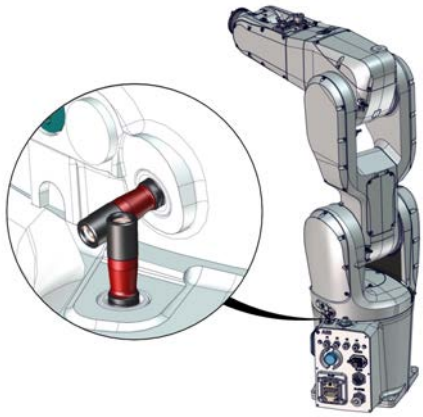
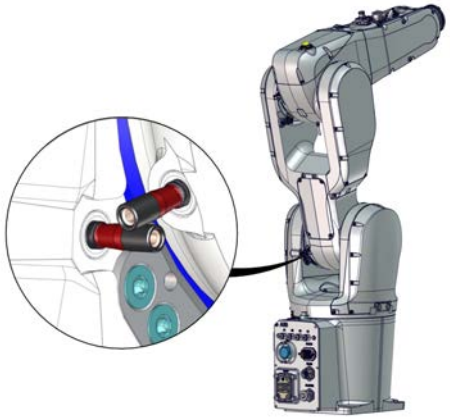
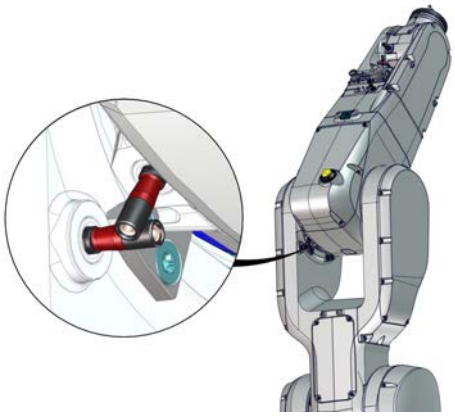
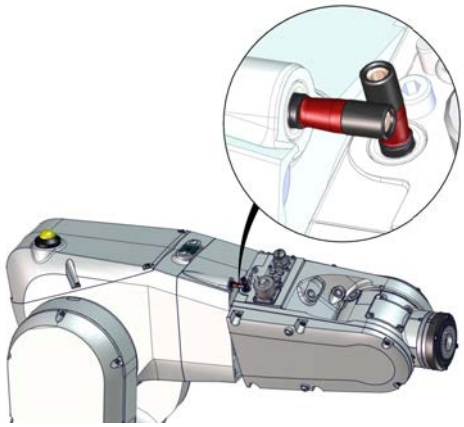
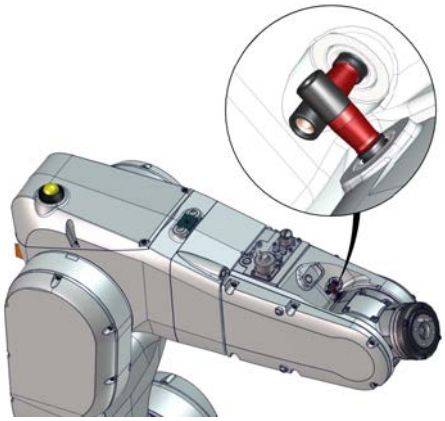
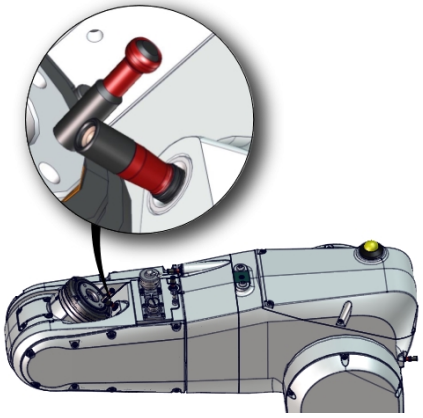
The position of the complete robot shown for each axis is only an example.

In order for the axis to be able to be moved to calibration position, or in order for getting proper access to the calibration bushing, other axes might need to be jogged to positions different from 0 degrees. Information about which axes are

Continues on next page

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allowed to be jogged will be given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window.

Calibration tools in contact	
Axis 1  xx1600001277	Axis 2  xx1600001276
Axis 3  xx1600001275	Axis 4  xx1600001274
Axis 5  xx1600001273	Axis 6 Make sure to orient the tool flange calibration tool correctly.  xx1600001272

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Restarting an interrupted calibration procedure

If the Axis Calibration procedure is interrupted before the calibration is finished, the RobotWare program needs to be started again. Use this procedure to take required action.

Situation	Action
The three-position enabling device on the FlexPendant has been released during robot movement.	Press and hold the three-position enabling device and press **Play**.
The RobotWare program is terminated with **PP to Main**.	Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See *Starting the calibration procedure*. If the calibration tool is in contact the robot axis needs to be jogged in order to release the calibration tool. Jogging the axis in wrong direction will cause the calibration tool to break. Directions of axis movement is shown in *Calibration movement directions for all axes on page 844*

Axis Calibration with SafeMove option

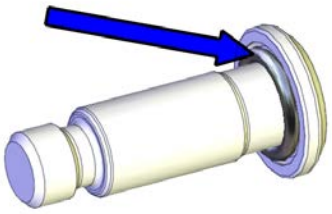
To be able to run Axis Calibration, SafeMove needs to be unsynchronized. The Axis Calibration routine recognizes if the robot is equipped with SafeMove and will force SafeMove to unsynchronize automatically.

However, SafeMove may generate other warning messages anytime during the Axis Calibration routine. When a warning message is displayed, tap **Acknowledge** to confirm the unsynchronized state and continue Axis Calibration procedure.

CAUTION

SafeMove must be synchronized after the calibration is completed.

After calibration

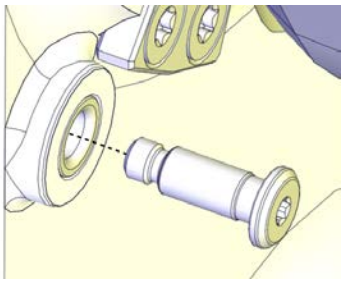
	Action	Note
1	Check the o-ring on the plug. Replace the plug with new spare part, if missing or damaged. **Note** **For robots with protection type Hygienic** Hygienic robots do not have the o-ring on the plug.	 xx1600001143

Continues on next page

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5.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
2	Reinstall the protective plugs in both bushings on each axis, directly after the axis is calibrated. Replace the plug with new spare part, if missing or damaged. **Note** **For robots with protection type Hygienic** Do not forget the washer. Replace the washer with new spare part, if missing or damaged. **Note** The protective plug on tilt unit (axis 5) shall be tightened with a tightening torque of 0.8 Nm. Do not over-tighten it.	 xx1600001144 Protective plug for bushing: 3HAC059556-001. : Robot.SpareParts.AxisCalibration.ProtectivePlugCleanRoom.ArticleNumber. Protective plug for bushing, Clean Room Protective plug for bushing, food grade lubrication Protective plug for bushing, Hygienic
3	If the standard calibration data for axes 4, 5 or 6 should be updated with wrist optimization, run the calibration routine **Wrist Optimization**.	See *Calibrating with Wrist Optimization method on page 865*.

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5.4.5 Reference calibration

Brief introduction to Reference Calibration

Reference calibration is a faster method compared to Fine calibration, as it refers to a previously made calibration.

1. Create a backup of the current robot system.
2. Check that the active calibration offset values corresponds to the values on the calibration label (located on the lower arm or the base).
3. Jog the manipulator so that all axes are in zero position (ex use `MoveAbsJ` instruction). Check that all axis scales are aligned with calibration marks.
4. If the scales differ from calibration marks it might depend on wrong turns of the revolution counters. Make a marker line on the corresponding axis to be able to validate the result of the calibration. If more than one motor revolutions are wrong, the calibration will fail.
5. Use a verification position. This is especially recommended if all axes were not aligned with the synchronization marks (step 3). Reuse an existing position that is suitable and accurate so it can be used to validate the repair. Use a position where a deviation in axis calibration gives a big deviation in positioning. Note! Check the position after each repair in one axis.
6. Use Reference calibration to save reference values for all axes that is to be replaced. Make sure that the values are saved in RobotStudio or FTP program. The files are located in "Active system folder name/HOME/RefCalibFiles".
7. Perform the repair.
8. Make sure that the tooling and process equipment are the same as when creating the reference. Use Reference calibration to update the system with new calibration offset value for the repaired axis.
9. Check the position against the verification position (step 5).
10. Proceed with the repair of the next axis, if necessary, and repeat (step 8-9) for every axis.
11. (For system containing SafeMove or EPS) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.(For system containing SafeMove) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.
12. (For system containing SafeMove or EPS) Synchronize SafeMove to activate SafeMove.(For system containing SafeMove) Synchronize SafeMove to activate SafeMove.
13. Perform test run.
14. Update the calibration label with new resolver values (calibration values).

Manual tuning of calibration offset

Manual tuning of calibration offset is normally not needed, but can be useful in some situations. The requirement to do manual tuning is that there is a known accurate position, that worked accurately before the repair (step 5, see *Brief introduction to Reference Calibration on page 863*).

Continues on next page

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5.4.5 Reference calibration
Continued

Example "Adjust axis 4":

1. Create a backup.
2. Run the manipulator to the verification position. (The manipulator position is now deviating from the verification position.)
3. Read and note current axis 4 value in degrees (example: 96.3 degrees).
4. Manually jog, only axis 4, so that the manipulator is correctly positioned to the verification position.
5. Read and note current axis 4 value in degrees (example: 94.2 degrees).
6. Move the manipulator to its calibration position.
7. Calculate the angle difference (ie 96.3-94.2=2.1 degrees).
8. Manually jog axis 4 the calculated angle difference (-2.1). NOTE! The direction +/- shall be the same direction as the direction used when axis 4 was manually jogged to coincide with the verification process. In the example -2.1 degrees.
9. Make a new manual fine calibration of axis 4 with axis in -2.1 degrees position.
10. Check again against the verification position.
11. Repeat the manual tuning if needed.
12. Create a new reference if the intention is to use the reference in the future.

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5.5 Calibrating with Wrist Optimization method

When to run Wrist Optimization

Wrist Optimization routine is run to improve TCP reorientation performance.

Calibrating the robot with standard calibration method overwrites the optimized positions of axes 4, 5. Re-run the **Wrist Optimization** routine after standard calibration to re-achieve the optimized positions of the wrist axes.

Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure sequence.

After the calibration method has been called for on the FlexPendant, the following sequence will be run.

1 Choose calibration routine Wrist Optimization.

2 Modify targets for 4-point tool frame definition, in Wrist Optimization routine.

> **Tip**
>
> Select positions with large reorientations around the TCP. For best results, make sure that axis 4 and 5 have large movements.

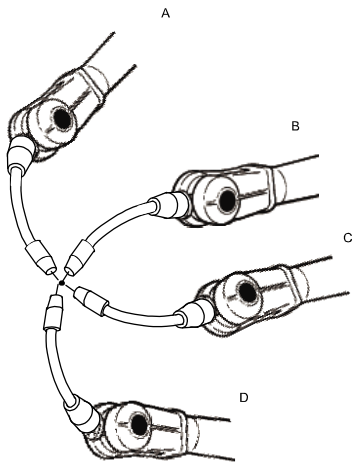
a Jog the robot to an appropriate position, A, for the first approach point.

Use small increments to accurately position the tool tip as close to the reference point as possible.

b Tap **Modify Position** to define the point.

c Repeat for each approach point to be defined, positions B, C, and D.

Jog away from the fixed world point to achieve the best result. Just changing the tool orientation will not give as good a result.



en0400000906

3 Improved calibration data to the wrist axes is identified and presented.

4 Optimized positions for the wrist axes are presented.

5 The robot moves to the optimized positions for the wrist axes and automatically overwrites previous calibration data.

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WARNING

Robot moves automatically when pressing **Calibrate**.

6 Wrist optimization is finished.

7 Redefine / verify TCP for all tools.

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5.6 Calibrating with manual calibration method

5.6.1 Manual calibration method - calibration position

Calibration position

The position of the axis to be calibrated is illustrated in each calibration section respectively.

The table below specifies the exact axis positions in degrees.

Axis	IRB 1200-5/0.9	IRB 1200-7/0.7	IRB 1200-7/0.9
1	+84.474066º	+84.474066º	+84.474066º
2	+131.862755º	+136.862755º	+131.862755º
3	+72.250000º	+72.250000º	+72.250000º
4	0º	0º	0º
5	-90º	-90º	-90º
6	0º	0º	0º

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5.6.2 Manual calibration method - content of calibration toolkit 3HAC051256-001

Content of calibration toolkit 3HAC051256-001

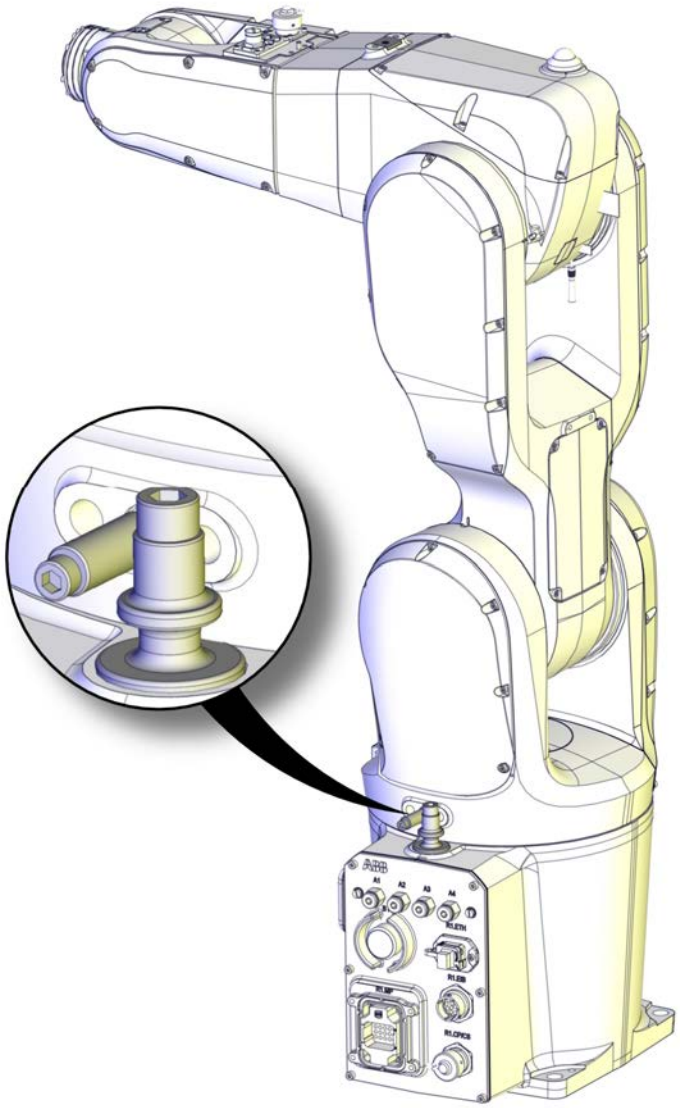
Content in calibration toolkit 3HAC051256-001	Art. no.	Note
Calibration pin, axis 1	3HAC051209-001	
Calibration stop pin, axis 1	3HAC051211-001	
Calibration tool, axis 4	3HAC051212-001	
Calibration tool, axes 5 and 6	3HAC051213-001	
Conical screw M3	3HAC055410-001	Used together with the calibration tool, axis 4.
Guide pin	3HAC034513-001	Used together with the calibration tool, axis 5/6.
Calibration block with pin	3HAC051254-001	Fitted on tubular.
Hex socket head screw	9ADA183-19	M5x40
Hex socket head screw	9ADA183-41	M8x45
Hex socket head screw	9ADA183-15	M5x20
Hex socket head screw	9ADA183-5	M4x16
Hex socket head screw	9ADA183-14	M5x16

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5.6.3 Manual calibration method - calibrating axis 1

Calibration position of axis 1

The figure shows axis 1 in calibration position, with calibration tools fitted.



xx1400001209

Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i

Continues on next page

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5.6.3 Manual calibration method - calibrating axis 1

Continued

Equipment	Art. no.	Note
Protection plug	3HAC051199-001	Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method). Replace if damaged.

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.

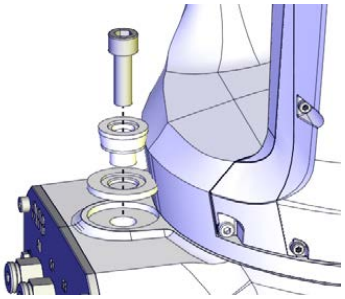
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

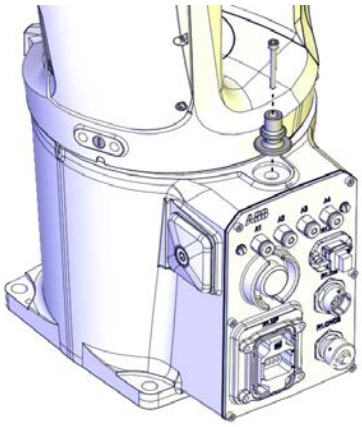
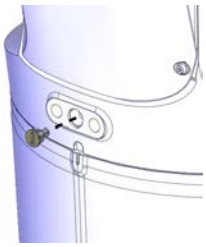
Calibrating axis 1

Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position.	
2	Remove the axis-1 mechanical stop pin.	 xx1400000392

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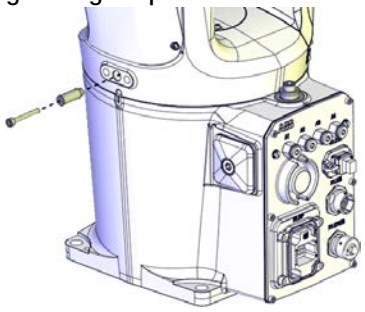
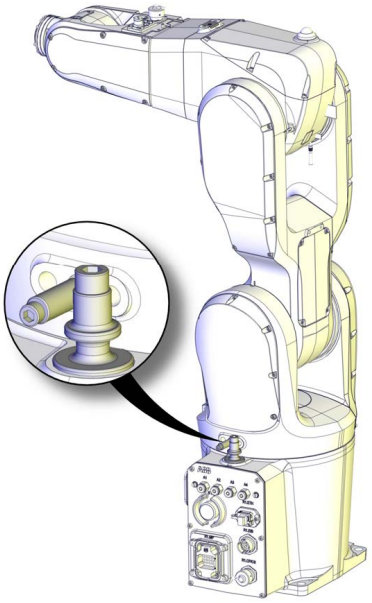
	Action	Note
3	The axis-1 calibration stop pin should now be fitted to the mechanical stop pin attachment hole, but it does not fit if the axis 1 stands in its zero position. Jog axis 1 to find a suitable position where the axis-1 calibration stop pin can be fitted to the attachment hole in the base. Fit the axis-1 calibration stop pin to the base and secure it with the screw.	Screw: M8x45. Tightening torque: 10 Nm. **Note** The position of the robot shown in the figure, is only a suggestion. The suitable position in which the axis-1 calibration pin is possible to fit may differ.  xx1400001100
4	Jog axis 1 to zero position.	
5	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
6	Remove the protection plug from the swing.	 xx1400001134

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5.6.3 Manual calibration method - calibrating axis 1

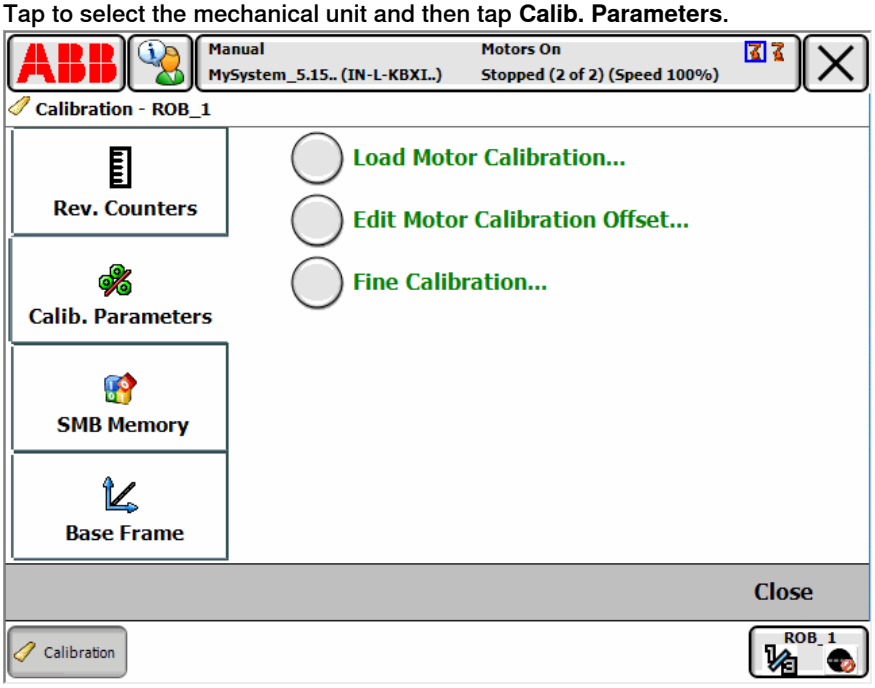
Continued

	Action	Note
7	Fit the axis-1 calibration pin to the swing and secure it with the screw. **CAUTION** Hold the calibration pin firmly with your hands while securing it with the screw, in order to keep a straight line when fitting the screw. The calibration pin must not be tilted.	Screw: M5x40. TighteningTorque: 5 Nm.  xx1400001099
8	Turn on the electric power to the robot.	
9	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
10	Release the brakes and manually rotate axis 1 until the two axis-1 calibration pins touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in *Manually releasing the brakes on page 76*.  xx1400001209

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Performing the fine calibration procedure

	Action	Note
1	**WARNING** Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the **ABB** menu, tap **Calibration**. All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap **Calib. Parameters**.  en0400001127	
4	Tap **Fine Calibration...**. A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to proceed. • Tap **No** to cancel.	
5	Select the check-box for the current axis/axes to be calibrated.	

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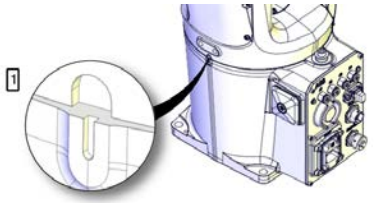
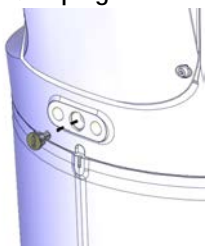
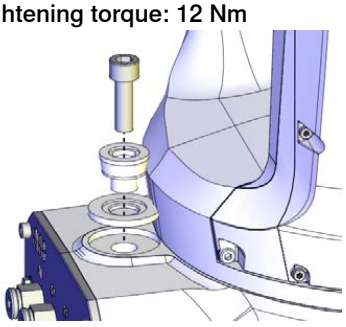
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5.6.3 Manual calibration method - calibrating axis 1

Continued

	Action	Note
6	Tap **Calibrate**. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: • Tap **Calibrate** to proceed. • Tap **Cancel** to cancel. Tapping **Calibrate** results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Jog axis 1 to zero degree using the FlexPendant.	
3	Check that the synchronization marks on axis 1 are aligned with eachother. Are they aligned within the tolerances? • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure.	 xx1400001092
4	Remove the axis-1 calibration pin from the swing and refit the protection plug.	Protection plug: 3HAC051199-001  xx1400001134
5	Rotate axis 1 to a suitable position to get access and remove the calibration stop pin from the base.	
6	Remove the axis-1 calibration stop pin from the base and refit the axis-1 mechanical stop.	Tightening torque: 12 Nm  xx1400000392

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After calibration

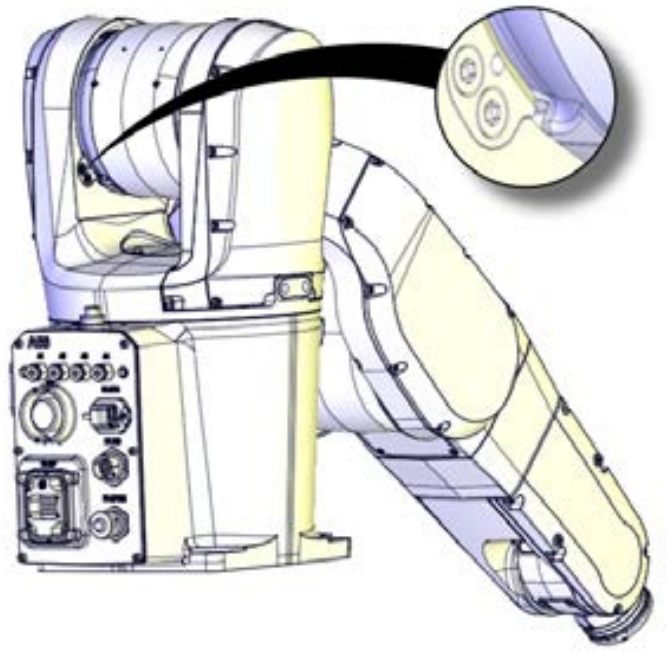
	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

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5.6.4 Manual calibration method - calibrating axis 2

Calibration position of axis 2

The figure shows axis 2 in calibration position.



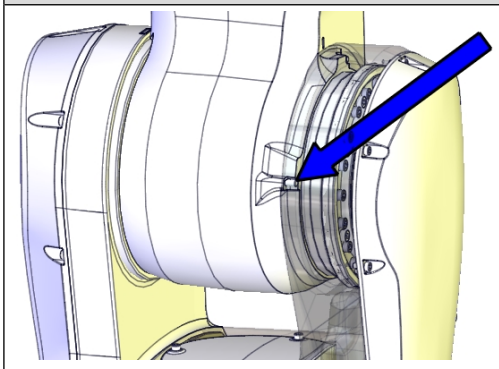
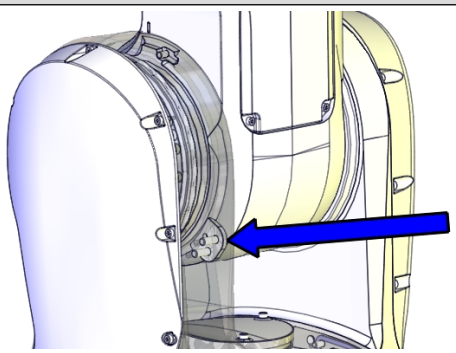
xx1400001201

Required equipment

Calibration of axis 2 is done by moving the lower arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.

See figures below for reference, and follow the step-by-step procedure that follows.

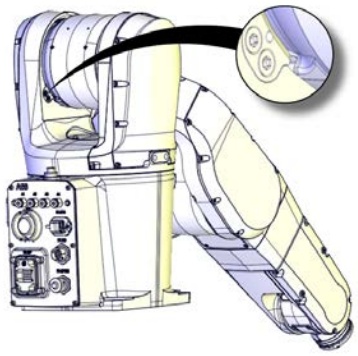
Calibration pin	Calibration stop
 xx1400001135	 xx1400001136
The press fit mechanical stop pin fitted to the lower arm is used for calibration of axis 2. No additional equipment is required.	The axis-2 mechanical stop fitted to the swing is used for calibration of axis 2. No additional equipment is required.

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Calibrating axis 2

Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position.	
2	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
3	Release the brakes and manually rotate axis 2 until the axis-2 calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in *Manually releasing the brakes on page 76*. The calibration pin and calibration stop are illustrated in *Required equipment on page 876*.  xx1400001201

Performing the fine calibration procedure

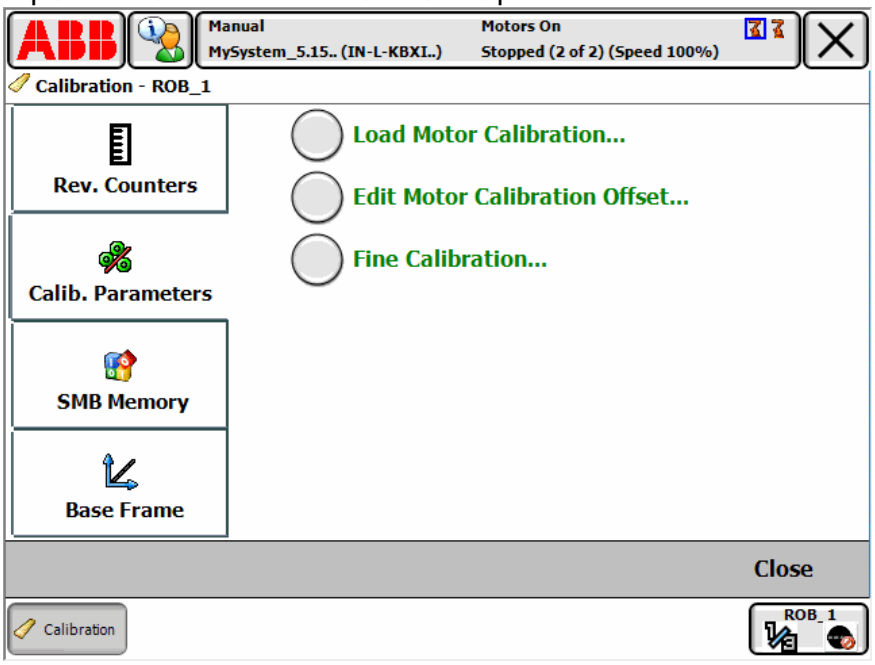
	Action	Note
1	**WARNING** Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the **ABB** menu, tap **Calibration**. All mechanical units connected to the system are shown along with their calibration status.	

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5.6.4 Manual calibration method - calibrating axis 2

Continued

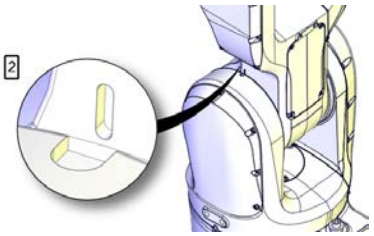
	Action	Note
3	Tap to select the mechanical unit and then tap **Calib. Parameters**.  en0400001127	
4	Tap **Fine Calibration...**. A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to proceed. • Tap **No** to cancel.	
5	Select the check-box for the current axis/axes to be calibrated.	
6	Tap **Calibrate**. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: • Tap **Calibrate** to proceed. • Tap **Cancel** to cancel. Tapping **Calibrate** results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	

Continues on next page

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	Action	Note
2	Jog axis 2 to zero degree using the FlexPendant.	
3	Check that the synchronization marks on axis 2 are aligned with eachother. Are they aligned within the tolerances? • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure.	 xx1400001093

After calibration

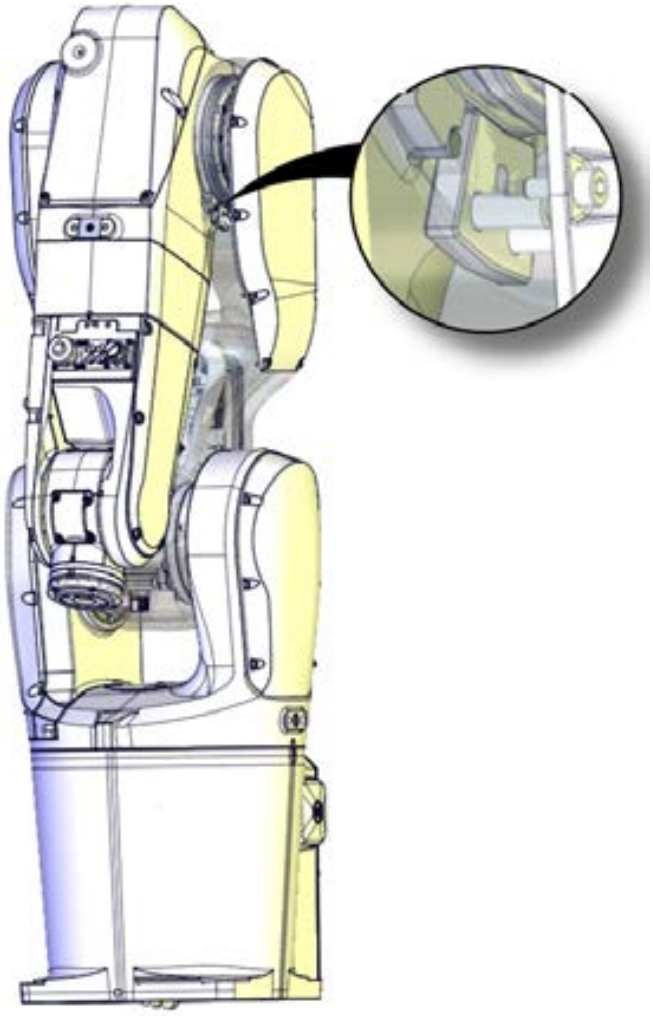
	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

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5.6.5 Manual calibration method - calibrating axis 3

Calibration position of axis 3

The figure shows axis 3 in calibration position.



xx1400001204

Required equipment

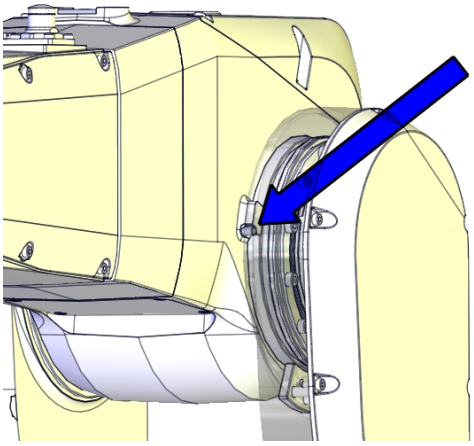
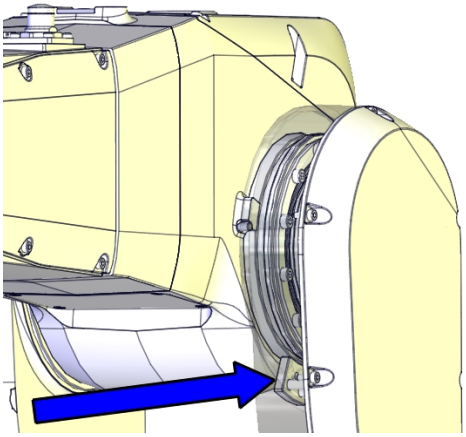
Calibration of axis 3 is done by moving the upper arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.

Continues on next page

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See figures below for reference, and follow the step-by-step procedure that follows the figures.

Calibration pin	Calibration stop
 xx1400001202	 xx1400001203
The press fit mechanical stop pin fitted to the upper arm is used for calibration of axis 3. No additional equipment is required.	The axis-3 mechanical stop fitted to the lower arm is used for calibration of axis 3. No additional equipment is required.

Calibrating axis 3

Moving the robot to calibration position

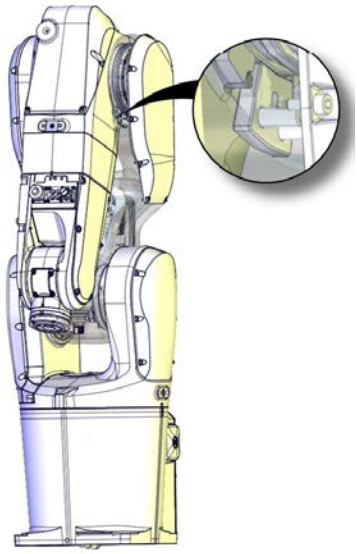
	Action	Note
1	Jog all axes to zero position.	
2	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	

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5.6.5 Manual calibration method - calibrating axis 3

Continued

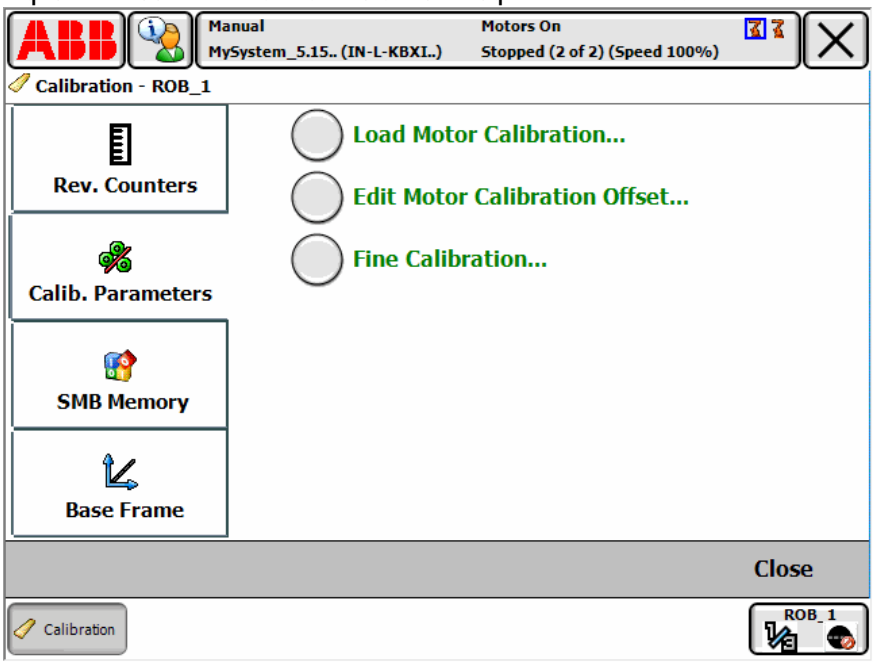
	Action	Note
3	Release the brakes and manually rotate axis 3 until the axis-3 calibration calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in *Manually releasing the brakes on page 76*. The calibration pin and calibration stop are illustrated in *Required equipment on page 880*.  xx1400001204

Performing the fine calibration procedure

	Action	Note
1	**WARNING** Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the **ABB** menu, tap **Calibration**. All mechanical units connected to the system are shown along with their calibration status.	

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	Action	Note
3	Tap to select the mechanical unit and then tap **Calib. Parameters**.  en0400001127	
4	Tap **Fine Calibration...**. A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to proceed. • Tap **No** to cancel.	
5	Select the check-box for the current axis/axes to be calibrated.	
6	Tap **Calibrate**. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: • Tap **Calibrate** to proceed. • Tap **Cancel** to cancel. Tapping **Calibrate** results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

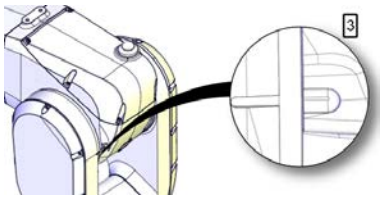
Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	

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5.6.5 Manual calibration method - calibrating axis 3
Continued

	Action	Note
2	Jog axis 3 to zero degree using the FlexPendant.	
3	Check that the synchronization marks on axis 3 are aligned with eachother. Are they aligned within the tolerances? • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure.	 xx1400001094

After calibration

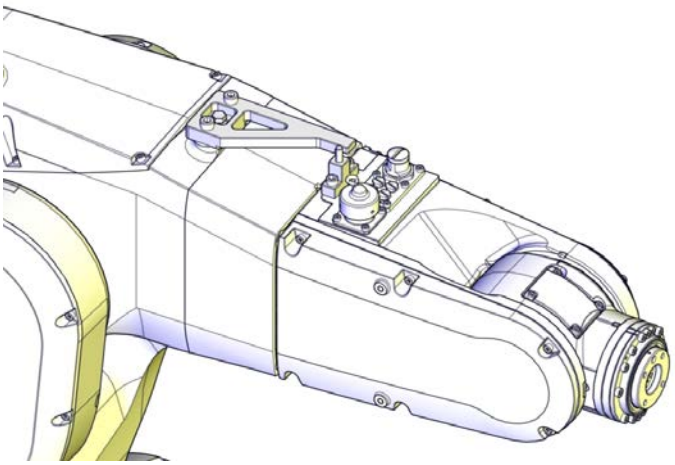
	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

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5.6.6 Manual calibration method - calibrating axis 4

Calibration position of axis 4

The figure shows axis 4 in calibration position, with calibration tools fitted.



xx1400001207

Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.

If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 4

Moving the robot to calibration position

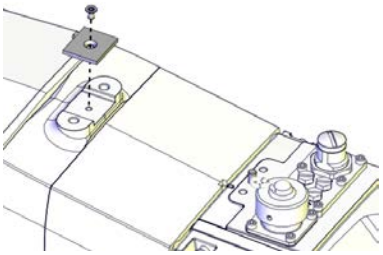
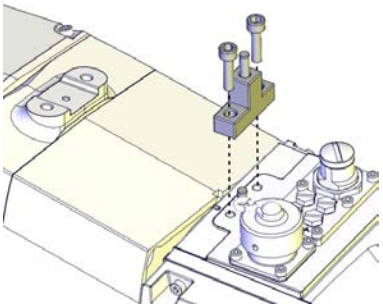
	Action	Note
1	Jog all axes to zero position. Rotate axis 4 some degrees toward positive direction to avoid interference between the calibration tools when fitting them.	

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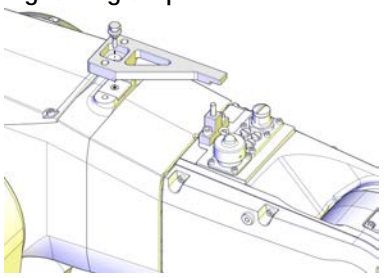
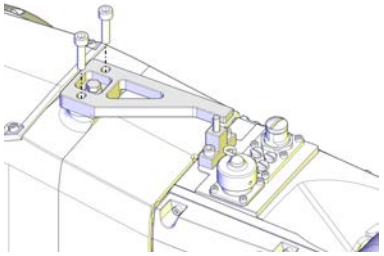
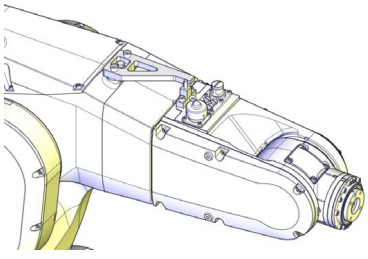
5.6.6 Manual calibration method - calibrating axis 4

Continued

	Action	Note
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Remove the protection cover from the housing.	 xx1400001205
4	Clean the location surfaces on the housing and the calibration tool surfaces to make sure there is no paint or burrs on these surfaces.	
5	Fit the calibration block to the tubular.	Screws: M4x16.  xx1400001208
6	Locate the calibration tool by the location surface on the housing. **Tip** Press down slightly on the calibration tool to make sure the tool attaches the location surface tightly.	

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	Action	Note
7	Fit the conical screw to the calibration tool.	Conical screw M3 (3HAC055410-001, 1 pcs) Tightening torque: 1 Nm  xx1500001608
8	Fit the M5 screws.	Screws: M5x20. Tightening torque: 2.5 Nm  xx1400001117
9	Turn on the electric power to the robot.	
10	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
11	Release the brakes and manually rotate axis 4 until the axis-4 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in *Manually releasing the brakes on page 76*.  xx1400001207

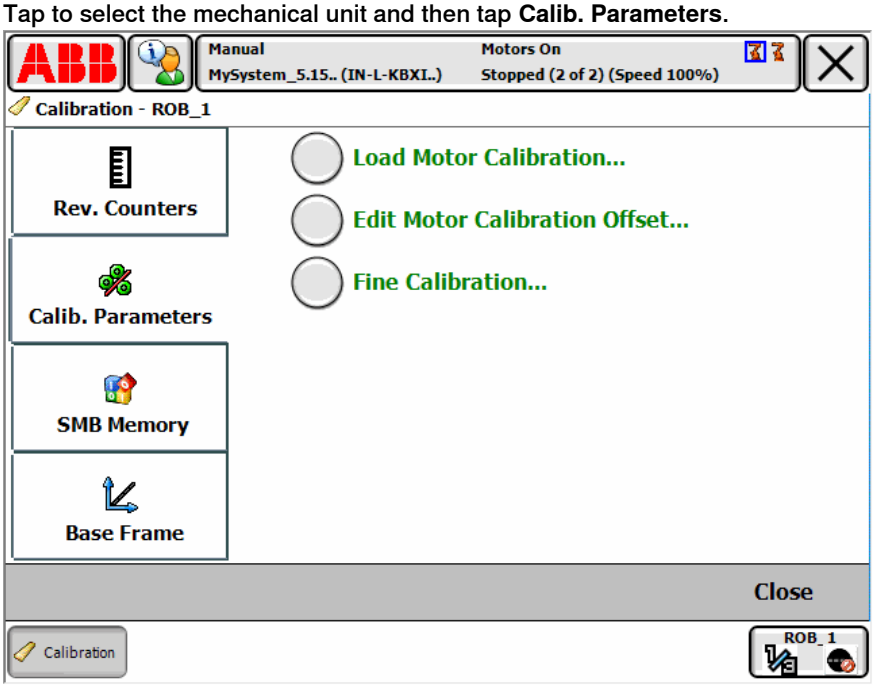
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5.6.6 Manual calibration method - calibrating axis 4

Continued

Performing the fine calibration procedure

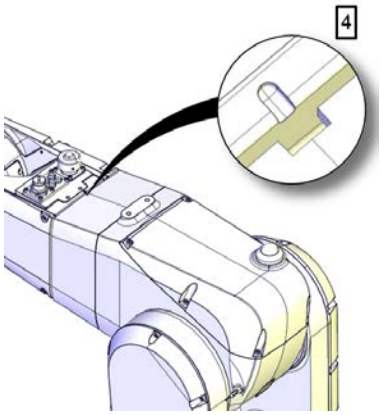
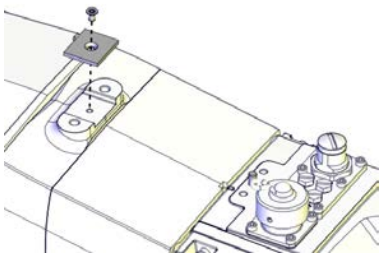
	Action	Note
1	**WARNING** Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the **ABB** menu, tap **Calibration**. All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap **Calib. Parameters**.  en0400001127	
4	Tap **Fine Calibration...**. A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to proceed. • Tap **No** to cancel.	
5	Select the check-box for the current axis/axes to be calibrated.	

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	Action	Note
6	Tap **Calibrate**. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: • Tap **Calibrate** to proceed. • Tap **Cancel** to cancel. Tapping **Calibrate** results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Remove the calibration tool of axes 4, 5, and 6 from the tubular.	
3	Remove the axis-4 calibration tool from the housing.	
4	Jog axis 4 to zero degree using the FlexPendant.	
5	Check that the synchronization marks on axis 4 are aligned with eachother. Are they aligned within the tolerances? • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure.	 xx1400001095
6	Refit the protection cover to the housing.	 xx1400001205

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5.6.6 Manual calibration method - calibrating axis 4
Continued

After calibration

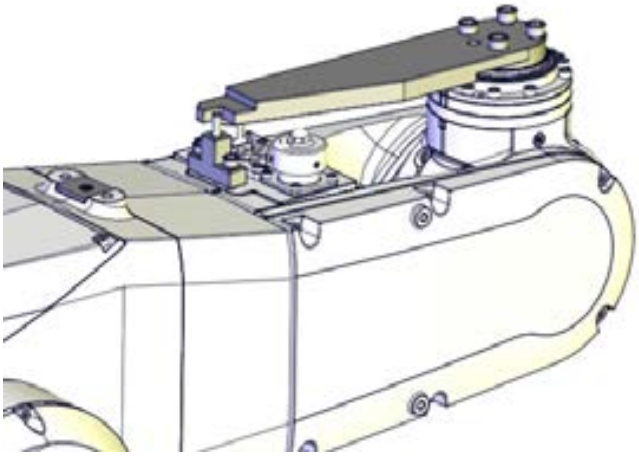
	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

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5.6.7 Manual calibration method - calibrating axis 5 and axis 6

Calibration position of axes 5 and 6

The figure shows axes 5 and 6 in calibration position, with calibration tools fitted.



xx1400001206

Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. i

i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 5 and axis 6

Moving the robot to calibration position

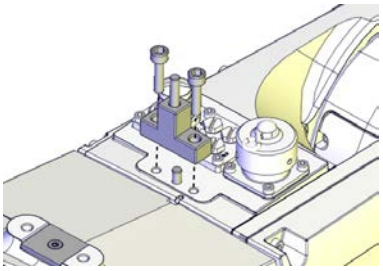
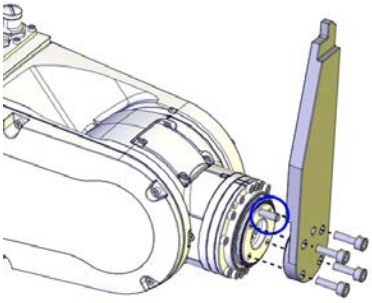
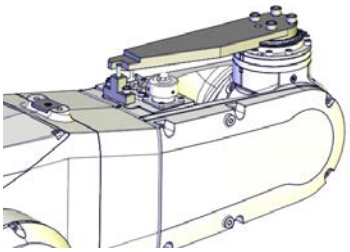
	Action	Note
1	Jog all axes to zero position.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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5.6.7 Manual calibration method - calibrating axis 5 and axis 6

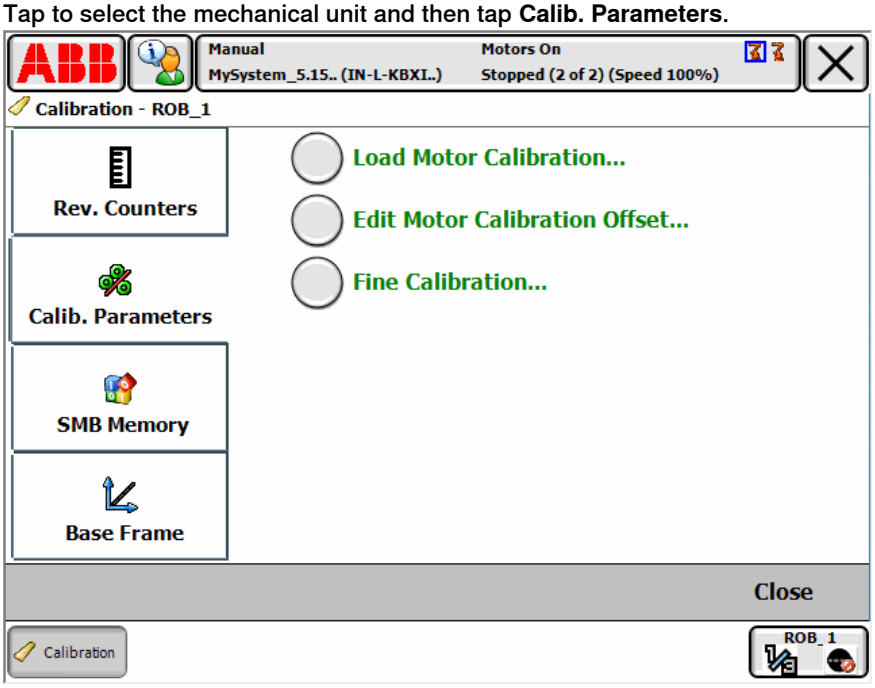
Continued

	Action	Note
3	Fit the calibration block to the tubular.	Screws: M4x16.  xx1400001114
4	Fit the guide pin to the disk and then fit the calibration tool of axes 5 and 6.	Screws: M5x16.  xx1400001115
5	**DANGER** When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
6	Release the brakes and manually rotate axes 5 and 6 until the axis-5/6 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in *Manually releasing the brakes on page 76*.  xx1400001206

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Performing the fine calibration procedure

	Action	Note
1	**WARNING** Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the **ABB** menu, tap **Calibration**. All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap **Calib. Parameters**.  en0400001127	
4	Tap **Fine Calibration...**. A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to proceed. • Tap **No** to cancel.	
5	Select the check-box for the current axis/axes to be calibrated.	

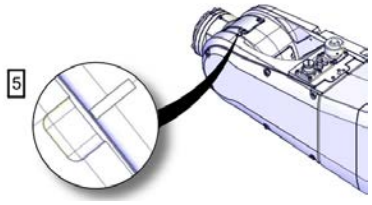
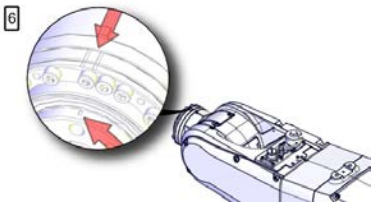
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5.6.7 Manual calibration method - calibrating axis 5 and axis 6
Continued

	Action	Note
6	Tap **Calibrate**. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: • Tap **Calibrate** to proceed. • Tap **Cancel** to cancel. Tapping **Calibrate** results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Jog axis 5 and 6 to zero degree using the FlexPendant.	
3	Check that the synchronization marks on axis 5 and axis 6 are aligned with eachother. Are they aligned within the tolerances? • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure.	 xx1400001096  xx1400001097
4	Remove the calibration block from the tubular.	
5	Remove the calibration tool of axes 5 and 6 from the disk.	

After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

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5.7 Verifying the calibration

Introduction

Always verify the results after calibrating *any* robot axis to verify that all calibration positions are correct.

Verifying the calibration

Use this procedure to verify the calibration result.

	Action	Note
1	Run the calibration home position program twice. Do not change the position of the robot axes after running the program!	See *Checking the synchronization position on page 896*.
2	Adjust the *synchronization marks* when the calibration is done, if necessary.	This is detailed in section *Synchronization marks and synchronization position for axes on page 842*.
3	Write down the values on a new label and stick it on top of the calibration label. The label is located on one side of the base.	

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5.8 Checking the synchronization position

Introduction

Check the synchronization position of the robot before beginning any programming of the robot system. This may be done:

- Using a `MoveAbsJ` instruction with argument zero on all axes.
- Using the **Jogging** window on the FlexPendant.Using the **Jog** window on the FlexPendant.

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5.8.1 Checking the synchronization position on IRC5 robots

Using a MoveAbsJ instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

	Action	Note
1	On ABB menu tap **Program editor**.	
2	Create a new program.	
3	Use **MoveAbsJ** in the **Motion&Proc** menu.	

4	Create the following program:
	`MoveAbsJ [[0,0,0,0,0,0],`
	`[9E9,9E9,9E9,9E9,9E9,9E9]]`
	`\NoEOffs, v1000, fine, tool0`	

5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See *Synchronization marks and synchronization position for axes on page 842* and *Updating revolution counters on page 845*.

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	On the **ABB** menu, tap **Jogging**.	
2	Tap **Motion mode** to select group of axes to jog.	
3	Tap to select the axis to jog, axis 1, 2, or 3.	
4	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
5	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See *Synchronization marks and synchronization position for axes on page 842* and *Updating revolution counters on page 845*.

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5.8.2 Checking the synchronization position on OmniCore robots

Using a MoveAbsJ instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

	Action	Note
1	Tap **Code**.	
2	Create a new program.	
3	Use **MoveAbsJ** in the **Add Instruction** menu.	

4	Create the following program:
	`MoveAbsJ [[0,0,0,0,0,0],`
	`[9E9,9E9,9E9,9E9,9E9,9E9]]`
	`\NoEOffs, v1000, fine, tool0`	

5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See *Synchronization marks and synchronization position for axes on page 842* and *Updating revolution counters on page 845*.

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	Tap **Jog**.	
2	From the **Mechanical unit** list select a mechanical unit.	
3	From the **Motion mode** section, select an axis-set that need to be jogged. For example, to jog axis 2, select the axis set **Axis 1-3**.	
4	Follow the screen instruction on joystick movements to understand the direction of the axis that you want to move and move the joystick.	
5	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See *Synchronization marks and synchronization position for axes on page 842* and *Updating revolution counters on page 845*.

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6 Decommissioning

6.1 Introduction to decommissioning

Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

> **Note**
>
> The decommissioning process shall be preceded by a risk assessment.

Disposal of materials used in the robot

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

See also *Environmental information on page 900*.

Transportation

Prepare the robot or parts before transport, this to avoid hazards.

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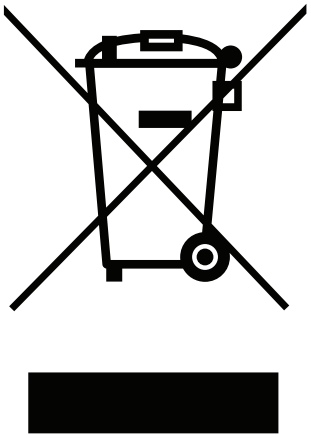
6.2 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials shall be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards. Robots or parts that can be reused or upcycled helps to reduce the usage of natural resources.

Disposal symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



xx1800000058

Materials used in the product

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly according to local regulations to prevent health or environmental hazards.

Material	Example application
Aluminium	Base, lower arm, upper arm
Batteries, Lithium	Encoder interface board
Cast iron/nodular iron	Gears
Copper	Cables, motors
Neodymium	Motors
Oil, grease	Gears
Stainless steel	Mechanical stop
Steel	Gears, screws, washers, brackets

Oil and grease

Where possible, arrange for oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose

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of oil and grease near lakes, ponds, ditches, down drains, or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills can form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired.
- Spillage can penetrate the soil causing ground water contamination.

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6.3 Scrapping of robot

Note

The decommissioning process shall be preceded by a risk assessment.

Important when scrapping the robot

DANGER

The risk assessment should consider hazards arising in the decommissioning, such as, but not limited to:

- Always remove all batteries. If a battery is exposed to heat, for example from a blow torch, it will explode.
- Always remove all oil/grease in gearboxes. If exposed to heat, for example from a blow torch, the oil/grease will catch fire.
- When motors are removed from the robot, the robot will collapse if it is not properly supported before the motor is removed.
- A used robot does not have the same performance as on delivery. Springs, brakes, bearings, and other parts might be worn or broken.

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7 Robot description

7.1 Introduction

Manipulator description

IRB 1200 is one of ABB 6-axis industrial robots, with multiple variants designed to work in various environments. Different IRB 1200 variant supports to work with either IRC5/IRC5C controller or OmniCore controller, or both. This section describes the relationship among robot variants, protection classes/types and supported controller type. For details, see *Product specification - IRB 1200*.

Supported controller type for different IRB 1200 variants

Protection	Controller type			
	IRC5	IRC5C	OmniCore C line	OmniCore E line
IRB 1200-5/0.9	X	X	X	X
IRB 1200-7/0.7	X	X	X	X
IRB 1200-7/0.9			X	X

Supported protection classes/types for different IRB 1200 variants

Protection	Robot variant		
	IRB 1200-5/0.9	IRB 1200-7/0.7	IRB 1200-7/0.9
Standard, IP40	X	X	X
Standard, IP67	X	X	X
Clean Room	X	X	X
Food grade lubrication	X	X	
Foundry plus	X	X	X
Hygienic	X	X	

Supported controller type for IRB 1200 in different protection classes/types

Protection	Controller type			
	IRC5	IRC5C	OmniCore C line	OmniCore E line
Standard, IP40	X	X	X	X
Standard, IP67	X	X	X	X
Clean Room	X	X	X	X
Food grade lubrication	X	X		
Foundry plus	X	X	X	X
Hygienic	X	X	X	X

Appearance description

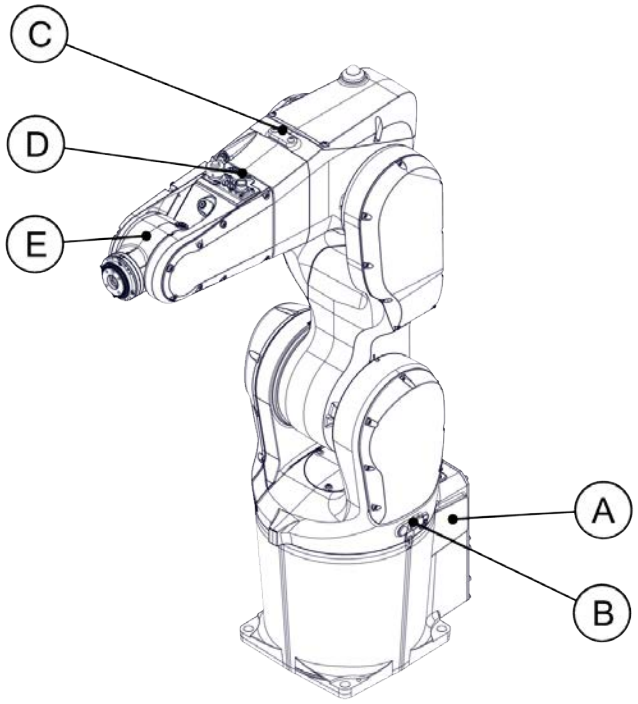
Appearance of IRB 1200 differs according to the actual order time, while robot functions remain the same.

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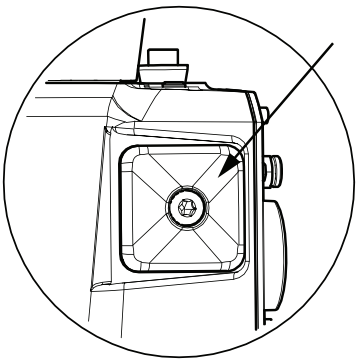
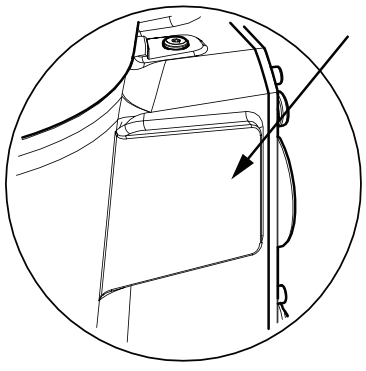
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Please note, figures throughout this product manual mainly show the original appearance design. If any installation, maintenance or replacement procedure is not required for the robots with new design, such as those related to tilt covers, skip related steps and proceed to following actions.

Refer to the following figure and table for detailed differences between original and new appearance design.

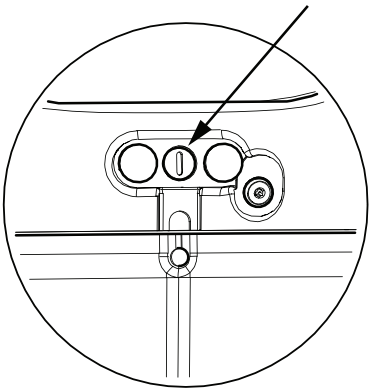
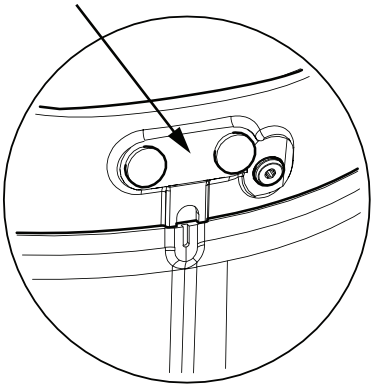
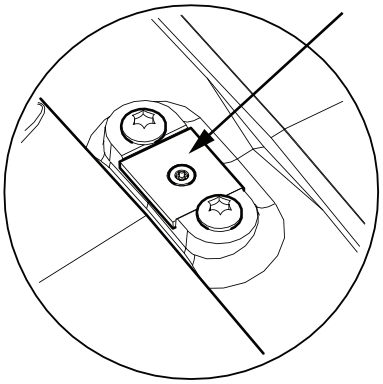
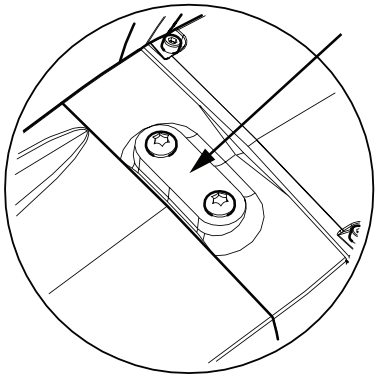
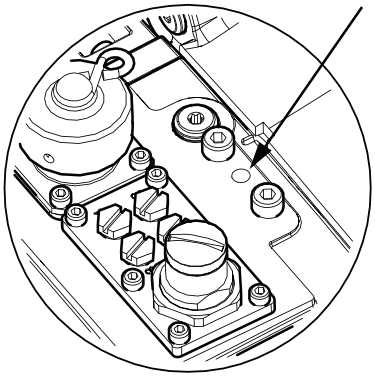
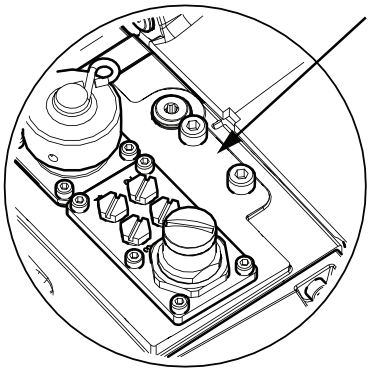


xx2200001263

Item	Location	Original appearance design	New appearance design
A	Base	 xx2200001264	 xx2200001265

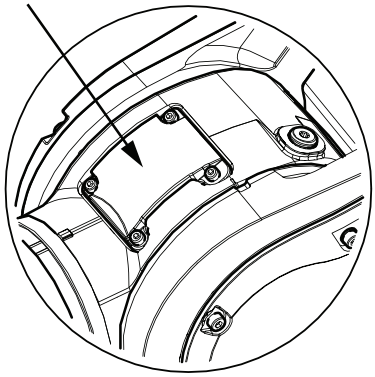
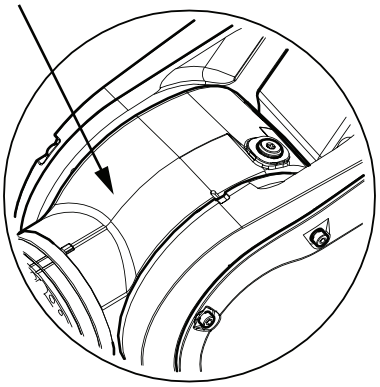
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Item	Location	Original appearance design	New appearance design
B	Swing	 xx2200001266	 xx2200001267
C	Housing	 xx2200001268	 xx2200001269
D	Connector set on tubular	 xx2200001270	 xx2200001271

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Item	Location	Original appearance design	New appearance design
E	Tilt unit	 xx2200001272	 xx2200001273

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7.2 Type A of IRB 1200

Type A - Axis Calibration

The difference between IRB 1200 and IRB 1200 Type A is that the Type A is calibrated with Axis Calibration. On each axis there are bushings for installation of calibration tools.

As a result of this, the castings differ between IRB 1200 and IRB 1200 Type A.

Note

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

The difference between IRB 1200 Type A and IRB 1200 Type B is that Type B also supports SafeMove 2. See *Type B of IRB 1200 on page 908*.

How to know which type the robot is?

The type label on the base of the robot tells if the robot is calibrated with Axis Calibration.

Those robots are named IRB 1200 Type A.

Note

If no type label attached on the robot, use the bushings on each axis to identify a robot calibrated with Axis Calibration.

Those robots which are not equipped for Axis Calibration are simply named IRB 1200 (no type specified).

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7.3 Type B of IRB 1200

Type B - SafeMove 2

The difference between IRB 1200 Type B and other IRB 1200 versions is that the Type B supports SafeMove 2.

As a result of this, the following parts differ from other versions:

- Base
- Drive unit, axis 2, axis 3, axis 5 and axis 6
- Motor with pulley, axis 4 and axis 5
- Manipulator cable harness
- Battery pack
- SMB unit (replacing EIB unit)

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

How to know which type the robot is?

The type label on the base of the robot tells if the robot supports SafeMove 2.

Those robots are named IRB 1200 Type B.

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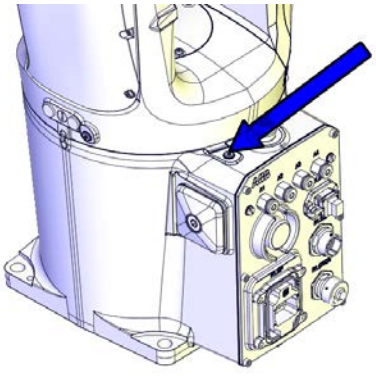
7.4 Description of spare part versions

7.4.1 Spare part versions for the base on IP40/IP67 robots

Spare part versions for the base on IP40/IP67 robots

Note

IRB 1200 has different base versions that are not compatible with each other. Always use the following list as a reference to check the base installed on robot and order the correct spare parts.

Base installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC049628-001	3HAC044533-001	Order: • base 3HAC059553-001 • swing 3HAC059554-001 or 3HAC082506-001 (depends on the calibration method used) • IP40: sealing ring 3HAC086035-001 • IP67: sealing ring + gasket + V-ring 3HAC059791-001	Look on the outside of the base. Base 3HAC049628-001 has no hole on the side of the base.  xx1600000124
3HAC057999-001	3HAC056657-001	Order: • base 3HAC059553-001	Base 3HAC057999-001 has a hole on the side of the base.  xx1600000051
3HAC059553-001	3HAC058386-001	Order: • base 3HAC059553-001	Base 3HAC059553-001 has a bushing for fitting calibration tool for Axis Calibration.  xx1600001037

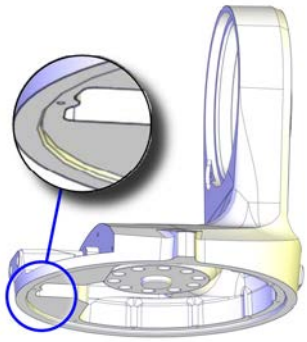
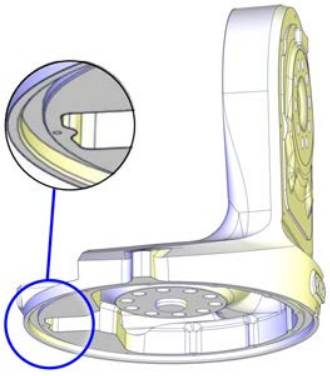
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7.4.2 Spare part versions for the swing on IP40/IP67 robots

Spare part versions for the swing on IP40/IP67 robots

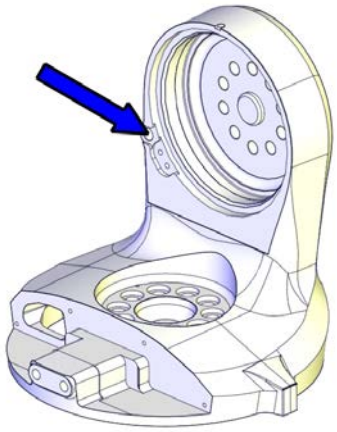
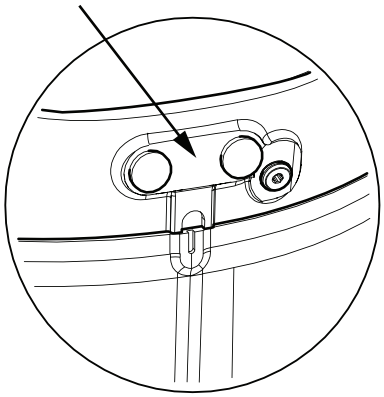
Note

IRB 1200 has different swing versions that are not compatible with each other. Always use the following list as a reference to check the swing installed on robot and order the correct spare parts.

Swing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC049632-001	3HAC044534-001	Order: • swing 3HAC059554-001 • IP67: sealing ring + gasket + V-ring 3HAC059791-001	Look underneath the swing, the surface is flat.  xx1600000052
3HAC058000-001	3HAC056656-001	Order: • swing 3HAC059554-001	Look underneath the swing, there is a groove.  xx1600000053

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Swing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC059554-001	3HAC058387-001	Order: • swing 3HAC082506-001	The swing has a bushing for fitting calibration tool for Axis Calibration.  xx1600001038
3HAC082506-001	3HAC081401-001	Order: • swing 3HAC082506-001	The swing removes the hole for fixing the manual calibration pin.  xx2200001267

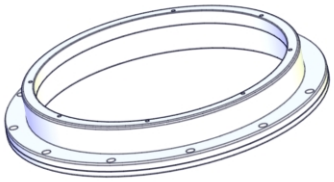
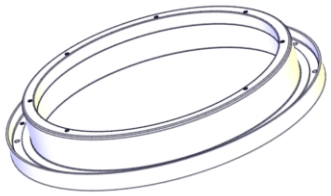
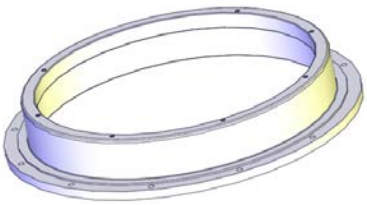
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7.4.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

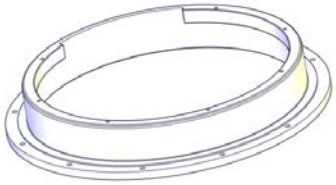
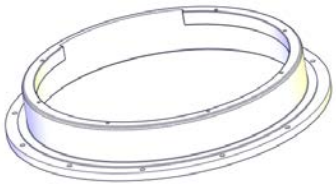
Note

IRB 1200 has different axis-1 sealing ring versions that are not compatible with each other. Always use the following list as a reference to check the sealing ring installed on robot and order the correct spare parts.

Sealing ring installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC044676-001	3HAC044676-001	Order: • sealing ring 3HAC073849-001	The sealing ring is flat.  xx1600000125
3HAC056658-001	3HAC056658-001	Order: • IP40: sealing ring 3HAC086035-001 • IP67: sealing ring + gasket + V-ring 3HAC059791-001	The sealing ring has one folded wall on both sides.  xx1600000126
3HAC058568-001	3HAC058568-001	Order: • IP40: sealing ring 3HAC086035-001 • Other than IP40: sealing ring 3HAC068107-001	The sealing ring is flat and the edge is thinner.  xx1600001039

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Sealing ring installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC068107-001	3HAC068107-001	Order: • IP40: sealing ring 3HAC086035-001 • Other than IP40: sealing ring 3HAC068107-001	The sealing ring has a gap in the inner side.  xx1900001603
3HAC086035-001	3HAC086035-001	Order: • sealing ring 3HAC086035-001	The sealing ring is in the same pattern as 3HAC068107-001 but has no coating. It is only used for IP40 robots.  xx1900001603

Compatibility between cable harness and axis-1 sealing ring on IP40/IP67 robots

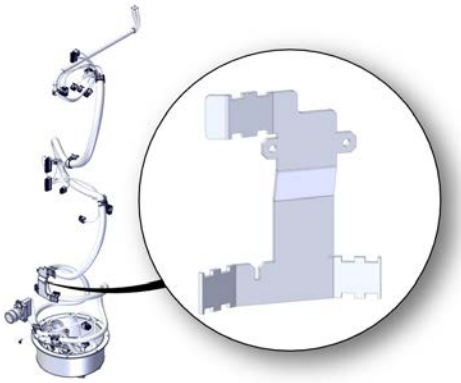
The manipulator cable harness is designed with different cable brackets that are compatible with different spare part versions of the axis-1 sealing ring. Always use the following list as a reference to check the cable harness installed on robot and order the correct spare parts.

How to see which kind of cable harness is installed on robot	What to order
 xx1900001602	Order: • corresponding cable harness. See "Manipulator cable harness" in *Product manual, spare parts - IRB 1200* for spare part numbers. • sealing ring 3HAC086035-001 (for IP40 robots) or 3HAC068107-001 (for robots other than IP40)

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7.4.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots
Continued

How to see which kind of cable harness is installed on robot	What to order
 xx1900001601	Order: • corresponding cable harness. See "Manipulator cable harness" in *Product manual, spare parts - IRB 1200* for spare part numbers.

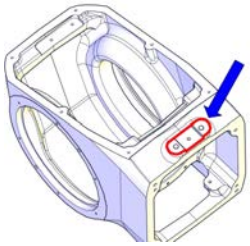
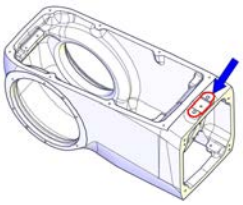
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7.4.4 Spare part versions for the housing on Type A robots

Spare part versions for the housing on Type A robots

Note

IRB 1200 and IRB 1200 Type A have different housing versions that are not compatible with each other. Always use the following list as a reference to check the housing installed on robot and to order the correct spare parts.

Robot variant	Housing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
IRB 1200-7/0.7	3HAC059680-001	3HAC044544-001	Order: • housing (IRB 1200-7/0.7): 3HAC059680-001	The plane (encircled in the figure) on housing 3HAC059680-001 has no painting, while that on housing 3HAC059721-001 is painted.  xx1600001127
	3HAC059721-001	3HAC058389-001 / 3HAC081402-001	Order: • housing (IRB 1200-7/0.7): 3HAC059721-001	
IRB 1200-5/0.9	3HAC059681-001	3HAC044556-001	Order: • housing (IRB 1200-5/0.9): 3HAC059681-001	The plane (encircled in the figure) on housing 3HAC059681-001 has no painting, while that on housing 3HAC059722-001 is painted.  xx1600001129
	3HAC059722-001	3HAC058393-001 / 3HAC081405-001	Order: • housing (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC059722-001	
IRB 1200-7/0.9	3HAC059722-001	3HAC081405-001	Order: • housing (IRB 1200-5/0.9 and IRB 1200-7/0.9): 3HAC059722-001	

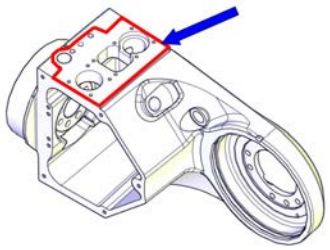
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7.4.5 Spare part versions for the tubular on Type A robots

Spare part versions for the tubular on Type A robots

Note

IRB 1200 and IRB 1200 Type A have different tubular versions that are not compatible with each other. Always use the following list as a reference to check the tubular installed on robot and to order the correct spare parts.

Tubular installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC059693-001	3HAC044548-001	Order: • tubular with sleeve: 3HAC059693-001	The plane (encircled in the figure) on tubular 3HAC059693-001 has no painting, while that on tubular 3HAC059723-001 is painted.  xx1600001128
3HAC059723-001	3HAC058390-001	Order: • tubular with sleeve: 3HAC059723-001	

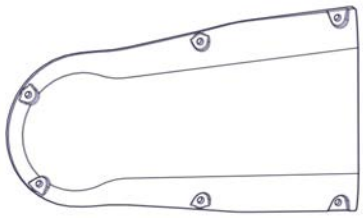
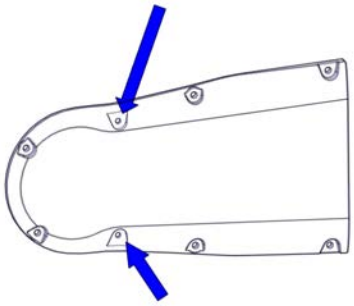
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7.4.6 Spare part versions for the tubular cover on Clean Room robots

Spare part versions for the tubular cover on Clean Room robots

Note

IRB 1200 with protection type Clean Room has different tubular cover versions that are not compatible with each other. Always use the following list as a reference to check the tubular cover installed on robot and to order the correct spare parts.

Tubular cover installed on Clean Room robots (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC056144-001	3HAC044550-001	Order: • tubular cover, clean room: 3HAC056144-001	Tubular cover 3HAC056144-001 has six screw holes.  xx1600001117
3HAC059708-001	3HAC058929-001	Order: • tubular cover, clean room: 3HAC059708-001	Tubular cover 3HAC059708-001 has eight screw holes.  xx1600001118

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7.4.7 Spare parts for Hygienic robots with food grade lubrication

Spare part order requirement for Hygienic robots with food grade lubrication

To have food grade lubrication for robots working with OmniCore controllers, order spare parts used for Hygienic robots, with a consult to your local ABB Customer Service first.

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8 Reference information

8.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

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8.2 Applicable standards

General

This product is designed according to the global product standard ISO 10218-1:2025, *Robots for industrial environments - Safety requirements - Part 1 Robots*, In case of deviation from ISO 10218-1:2025, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

Standard	Description
ISO 9283	Manipulating industrial robots - Performance criteria and related test methods
ISO 9787	Robots and robotic devices -- Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots - Presentation of characteristics
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
IEC 61326-3-1	Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena - General requirements
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

Region specific standards

Standard	Description
UL 1740 (option) CSA Z434 (option)	Standards For Safety - Robots and Robotic Equipment Industrial robots and robot Systems - General safety requirements Valid for USA and Canada.

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8.3 Unit conversion

Converter table

Use the following table to convert units used in this manual.

Quantity	Units		
Length	1 m	3.28 ft.	39.37 in
Weight	1 kg	2.21 lb.	
Weight	1 g	0.035 ounces	
Pressure	1 bar	100 kPa	14.5 psi
Force	1 N	0.225 lbf	
Moment	1 Nm	0.738 lbf-ft	
Volume	1 L	0.264 US gal	

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8.4 Screw joints

General

This section describes how to tighten the various types of screw joints on ABB robots.

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.



Tip

During maintenance and repair, screws must be retained and kept in order. When loosening screws, ensure they are sorted so that each screw can be correctly refitted.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. It is recommended by ABB for M6-M20 screw joints. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of **nitrile rubber** type should be used.

Generally, screws are lubricated with *Gleitmo 603* mixed with *Geomet 500* or *Geomet 702* in proportion 1:3. *Geomet* thickness varies according to screw dimensions, refer to the following.

Dimension	Lubricant	Geomet thickness
M6-M20 (any length except M20x60)	*Gleitmo 603 + Geomet 500*	3-5 µm
M6-M20 (any length except M20x60)	*Gleitmo 603 + Geomet 720*	3-5 µm
M20x60	*Gleitmo 603 + Geomet 500*	8-12 µm
M20x60	*Gleitmo 603 + Geomet 720*	6-10 µm

Screws lubricated in other ways

Screws lubricated with Molykote 1000 or Molykote P1900 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

1 Apply lubricant to the screw thread.

Continues on next page

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2 Apply lubricant between the plain washer and screw head.
3 Tighten to the torque as described in the procedures.

Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand,* and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not* jerk. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%**!

Tightening torque for oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *slotted or cross-recess head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Tightening torque for oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M4	-	4	5
M5	6	8	10
M6	10	14	17
M8	24	34	40
M10	47	67	80

Continues on next page

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Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M12	82	115	140
M16	200	290	340
M20	400	560	670
M24	680	960	1150

Tightening torque for lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 10.9, lubricated [i]	Tightening torque (Nm) Class 12.9, lubricated [i]
M5		8
M6		14
M8	28	35
M10	55	70
M12	96	120
M16	235	300
M20	460	550
M24	790	950

i Lubricated with Molycote 1000, Gleitmo 603 or equivalent

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8.5 Weight specifications

Definition

In installation, repair, and maintenance procedures, weights of the components handled are sometimes specified. All components exceeding 22 kg (50 lbs) are highlighted in this way.

To avoid injury, ABB recommends the use of a lifting accessory when handling components with a weight exceeding 22 kg. A wide range of lifting accessories and devices are available for each manipulator model.

Example

Following is an example of a weight specification in a procedure:

	Action	Note
	CAUTION The arm weighs 25 kg. All lifting accessories used must be sized accordingly.	

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8.6 Lubrication in gearboxes

General

This section describes the lubrication grease/oil required for maintenance and repair of gearboxes of the IRB 1200.

For amount the lubrication with spare part numbers can be ordered, see *Technical reference manual - Lubrication in gearboxes*.

Type of grease - currently used

This table shows the lubrication grease that is currently used in the gearboxes of the robot.

IRB 1200 all variants, M2004 and OmniCore

Note

The gearboxes contain grease, not lubrication oil!

The amount is measured in grams.

Axis	Spare part number	Amount
3	3HAC037302-001	32 gram [i]

i Total grease amount of the axis-3 gearbox. Due to the open design structure of the gearbox, grease volatilization is inevitable. During maintenance and repair activities, replenish an adequate amount of grease based on the actual loss observed.

Note

Gearboxes of axis-1, -2, -4, -5 and -6 contain lubrication grease at delivery and no grease amount is available.

IRB 1200 all variants, food grade lubrication, M2004

Note

The gearboxes contain grease, not lubrication oil!

The amount is measured in grams.

Axis	Type	Amount
3	LUBRIPLATE SYNXTREME FG-0	32 gram [i]

i Total grease amount of the axis-3 gearbox. Due to the open design structure of the gearbox, grease volatilization is inevitable. During maintenance and repair activities, replenish an adequate amount of grease based on the actual loss observed.

Note

Gearboxes of axis-1, -2, -4, -5 and -6 contain lubrication grease at delivery and no grease amount is available.

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8.7 Standard toolkit

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool	Rem.
1	Socket head cap 2-17 mm	
1	Torque wrench 0.3-45 Nm	
1	Torque wrench 55 Nm ± 5 Nm	For securing robot to foundation.
1	Ratchet head for torque wrench 1/2	
1	Hex socket head cap no. 2.5 socket 1/2" bit L=110 mm	
1	Small screwdriver	
1	T-handle with ball head	
1	Small cutting plier	
1	Plastic mallet	
1	Needle-nose plier	

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8.8 Special tools

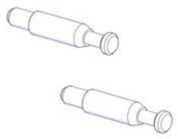
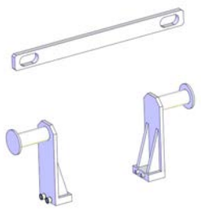
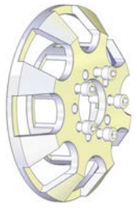
General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section *Standard toolkit on page 927*, and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

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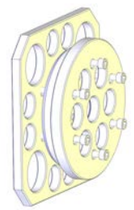
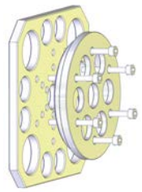
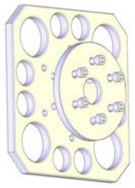
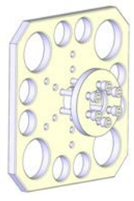
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Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt
Guide pins																							
3HAC049703-001	Guide pin for axis-1 gear unit		3					3	3														
3HAC049704-001	Guide pin for axis-2 gear unit								3	3													
3HAC049705-001	Guide pin for upper arm									3													
3HAC049706-001	Guide pin for tilt unit (axis 5)																3			3			
3HAC079684-001	Guide pin for stainless shaft on tool flange	 xx2100001461															2			2			
Lifting accessories																							
3HAC049711-001	Lifting accessory, robot Includes lifting accessories, lifting beam and screws.	 xx1400000542	1					1															
-	Roundsling, 2 m Length: 2 m. Lifting capacity: 100 kg.		1					1	1														
Press, puller and unloading tools																							
3HAC049692-001	Axis-1 sealing assembly tool set Used to refit the axis-1 radial sealing.	 xx1400000535						1															

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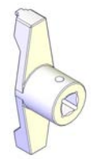
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8.8 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt
3HAC049694-001	Axis-2 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.	 xx1400000541							1														
3HAC049697-001	Axis-3 sealing assembly tool set Used to refit the axis-3 radial sealing.	 xx1400000538										1											
3HAC049699-001	Axis-4 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.	 xx1400000539			1											1					1		
3HAC049701-001	Axis-5 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.	 xx1400000540				1											1			1				
Other tools																							
-	24 VDC power supply		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3HAC051256-001	Calibration toolkit, manual calibration		1		1		1	1	1	1							1	1	1	1	1	1	1

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Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt
3HAC074119-001	Calibration tool box, Axis Calibration		1		1		1	1	1	1							1	1	1	1	1	1	1
3HAC079686-001	Flange tightening tool	 xx2100001462															1			1			
3HAC082459-001	Customer interface kit Used for interconversion of cabling with bottom interface and cabling with rear interface																						

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8.9 Lifting accessories and lifting instructions

General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

The instructions delivered with the lifting accessories should be stored for later reference.

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9 Spare parts

9.1 Spare part lists and illustrations

Location

Spare parts and exploded views are not included in the manual but delivered as a separate document for registered users via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.



Tip

All documents can be found via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

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10 Circuit diagrams

10.1 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but are available for registered users via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

See the article numbers in the tables below.

Controllers

Product	Article numbers for circuit diagrams
Circuit diagram - OmniCore C90XT Type A	*3HAC086305-010*
Circuit diagram - OmniCore E10 Type A_en	*3HAC092963-010*
Circuit diagram - IRC5	*3HAC024480-011*
Circuit diagram - IRC5 Compact	*3HAC049406-003*

Manipulators

Product	Article numbers for circuit diagrams
Circuit diagram - IRB 120	*3HAC031408-003*
Circuit diagram - IRB 140 type C	*3HAC6816-3*
Circuit diagram - IRB 260	*3HAC025611-001*
Circuit diagram - IRB 360	*3HAC028647-009*
Circuit diagram - IRB 390	*3HAC060545-009*
Circuit diagram - IRB 460	*3HAC036446-005*
Circuit diagram - IRB 660	*3HAC025691-001*
Circuit diagram - IRB 760	*3HAC025691-001*
Circuit diagram - IRB 1200	*3HAC046307-003*
Circuit diagram - IRB 1410	*3HAC2800-3*
Circuit diagram - IRB 1600/1660	*3HAC021351-003*
Circuit diagram - IRB 1510	*3HAC087368-003*
Circuit diagram - IRB 1520	*3HAC039498-007*
Circuit diagram - IRB 2400	*3HAC6670-3*
Circuit diagram - IRB 2600	*3HAC029570-007*
Circuit diagram - IRB 4400/4450S	*3HAC9821-1*
Circuit diagram - IRB 4600	*3HAC029038-003*
Circuit diagram - IRB 6620	*3HAC025090-001*
Circuit diagram - IRB 6620 / IRB 6620LX	*3HAC025090-001*
Circuit diagram - IRB 6640	*3HAC025744-001*
Circuit diagram - IRB 6650S	*3HAC13347-1* *3HAC025744-001*

Continues on next page

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10.1 Circuit diagrams
Continued

Product	Article numbers for circuit diagrams
Circuit diagram - IRB 6660	*3HAC025744-001* *3HAC029940-001*
Circuit diagram - IRB 6700 / IRB 6790	*3HAC043446-005*
Circuit diagram - IRB 7600	*3HAC13347-1* *3HAC025744-001*
Circuit diagram - IRB 14000	*3HAC050778-003*
Circuit diagram - IRB 910SC	*3HAC056159-002*

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