

ROBOTICS

Product manual

IRB 365



Trace back information:
Workspace 26-1 version a15
Checked in 2026-04-23
Skribenta version 5.6.019

Product manual
IRB 365-1.5/800
IRB 365-1.5/1100
IRB 365-1.5/1300

OmniCore

Document ID: 3HAC079185-001

Revision: F

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damage to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

This manual and parts thereof must not be reproduced or copied without ABB's written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

Table of contents

Overview of this manual	9
Product documentation	12
How to read the product manual	14
1 Safety	15
1.1 Safety information	15
1.1.1 Limitation of liability	15
1.1.2 Requirements on personnel	16
1.2 Safety signals and symbols	17
1.2.1 Safety signals in the manual	17
1.2.2 Safety symbols on manipulator labels	19
1.3 Robot stopping functions	25
1.4 Safety during installation and commissioning	26
1.5 Safety during operation	29
1.6 Safety during maintenance and repair	30
1.6.1 Safety during maintenance and repair	30
1.6.2 Emergency release of the robot axes	33
1.6.3 Brake testing	34
1.7 Safety during troubleshooting	35
1.8 Safety during decommissioning	36
2 Manipulator description	37
2.1 About the IRB 365	37
2.2 Technical data	38
2.3 Working range	42
2.4 The unit is sensitive to ESD	44
3 Installation and commissioning	45
3.1 Introduction to installation and commissioning	45
3.2 Unpacking	46
3.2.1 Pre-installation procedure	46
3.3 On-site installation	47
3.3.1 Brief installation procedure	47
3.3.2 Requirements on the installation site	49
3.3.3 Securing the robot frame	51
3.3.4 Orienting, assembling and securing the manipulator	53
3.3.5 Installing a brake release unit	61
3.3.6 Manually releasing the brakes	64
3.3.7 Loads	66
3.3.8 Loads fitted to the robot, stopping time and braking distances	68
3.3.9 Fitting equipment on the robot (robot dimensions)	69
3.4 Electrical connections	72
3.4.1 Robot cabling and connection points	72
3.5 Start of robot in cold environments	75
3.6 Test run after installation, maintenance, or repair	76
4 Maintenance	77
4.1 Introduction	77
4.2 Maintenance schedule and expected component life	78
4.2.1 Specification of maintenance intervals	78
4.2.2 Maintenance schedule	79
4.2.3 Expected component life	80
4.3 Inspection activities	81
4.3.1 Inspecting the upper arms	81
4.3.2 Inspecting the telescopic shafts	85

Table of contents

4.3.3	Inspecting the lower arms	93
4.4	Replacement/changing activities	95
4.4.1	Changing the SMB battery	95
4.5	Lubrication activities	99
4.6	Cleaning activities	100
4.6.1	Cleaning the IRB 365	100
5	Repair	101
5.1	Introduction	101
5.2	Definition of spare part levels	102
5.3	Base	103
5.3.1	Replacing the manipulator harness	103
5.3.2	Replacing the SMB unit	114
5.4	Upper and lower arms	120
5.4.1	Replacing the lower arms	120
5.4.2	Replacing the upper arms	125
5.4.3	Replacing the telescopic shafts and shaft components	130
5.4.3.1	Replacing the telescopic shafts	131
5.4.3.2	Replacing the telescopic shaft components	138
5.4.4	Replacing the delta unit	142
5.4.5	Replacing the tilt arm	148
5.5	Motors and gears	152
5.5.1	Replacing the axis-1, axis-2, and axis-3 motor	152
5.5.2	Replacing the axis-4 and axis-5 motor	162
5.5.3	Replacing the axis-1, axis-2, and axis-3 gear unit	172
5.5.4	Replacing the axis-4 and axis-5 gear unit	184
6	Calibration information	197
6.1	When to calibrate	197
6.2	Introduction and calibration terminology	198
6.3	Calibration method	199
6.4	Calibration movement directions for all axes	200
6.5	Calibrating axis 1-3	201
6.6	Calibrating axis 4-5	204
6.7	Fine calibration procedure on FlexPendant	206
6.8	Updating revolution counters on OmniCore robots	208
7	Troubleshooting	209
7.1	Introduction to troubleshooting	209
7.2	Mechanical noise or dissonance	211
7.3	Manipulator collapses on power down	212
7.4	Robot is jammed	213
8	Decommissioning	215
8.1	Introduction to decommissioning	215
8.2	Environmental information	216
8.3	Scrapping of robot	218
9	Reference information	219
9.1	Introduction	219
9.2	Applicable standards	220
9.3	Unit conversion	221
9.4	Screw joints	222
9.5	Weight specifications	225
9.6	Standard toolkit	226
9.7	Special tools	227
9.8	Lifting accessories and lifting instructions	229

Index	231
-------	-----

This page is intentionally left blank

Overview of this manual

About this manual

This manual contains instructions for:

- mechanical and electrical installation of the IRB 365
- maintenance of the IRB 365
- mechanical and electrical repair of the IRB 365

The robot described in this manual has the following protection types:

- *Standard*

Product manual scope

The manual covers all variants and designs of the IRB 365. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

Usage

This manual shall be used during:

- installation and commissioning, from lifting the product to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work
- decommissioning work



Note

It is the responsibility of the integrator to conduct a risk assessment of the final application.

It is the responsibility of the integrator to provide safety and user guides for the robot system.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

A maintenance/repair/installation craftsman working with an ABB robot shall:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
- be trained to respond to emergencies or abnormal situations.

Continues on next page

References



Tip

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

Document name	Document ID
<i>Circuit diagram - IRB 365</i>	3HAC079349-003
<i>Product specification - IRB 365</i>	3HAC079184-001
<i>Product manual - OmniCore C30</i>	3HAC060860-001
<i>Product manual - OmniCore C30 Type B</i>	3HAC097281-001
<i>Safety manual for robot - Manipulator and IRC5 or OmniCore controllerⁱ</i>	3HAC031045-001
<i>Operating manual - OmniCore (RobotWare 7)</i>	3HAC065036-001
<i>Operating manual - OmniCore (RobotWare 8)</i>	3HAC098383-001
<i>Application manual - Controller software OmniCore RobotWare 7 (RobotWare 7)</i>	3HAC066554-001
<i>Application manual - Controller software OmniCore RobotWare 8 (RobotWare 8)</i>	3HAC098393-001
<i>Technical reference manual - System parameters (RobotWare 7)</i>	3HAC065041-001
<i>Technical reference manual - System parameters (RobotWare 8)</i>	3HAC098390-001

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

Revisions

Revision	Description
A	First edition.
B	Published in release 23A. The following updates are made in this revision: • Added IRB 365-1.5/800 and IRB 365-1.5/1300. • Added information about Transportation on page 215. • Corrected working area for IRB 365 1.5/1100. • Corrected data for Loads on foundation, robot on page 39. • Updated article numbers for the signal cables, see Robot cables on page 72. • Updated drawings for the hole configuration of the robot base, see Robot base.
C	Published in release 25A. The following updates are made in this revision: • Changed locking liquid Loctite 243 to Loctite 2400.
D	Published in release R25.2. The following updates are made in this revision: • Updated the installation section regarding the requirements on the frame, securing the robot to the frame, and assembling the robot. • Minor corrections in calibration section about removing the calibration tool.

Continues on next page

Revision	Description
E	Published in release R25.3. The following updates are made in this revision: • Updated the installation section regarding the requirements on the frame, securing the robot to the frame, and assembling the robot. • Corrected the section Loads on page 66. • Company name updated to reflect current legal entities. • Updated portal name from myABB to ABB Robotics One.
F	Published in release R26.1. The following updates are done in this revision: • Added support for OmniCore C30 Type B and RobotWare 8. • Company name updated to reflect current legal entities.

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.robots.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.

Continues on next page

- 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.

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 15](#).

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.

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.

1 Safety

1.1.2 Requirements on personnel

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.

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

1 Safety

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.

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 19](#).

The information labels can contain information in text.

Symbols on safety labels

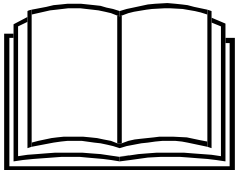
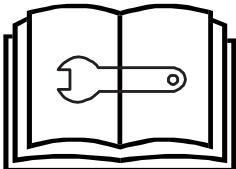
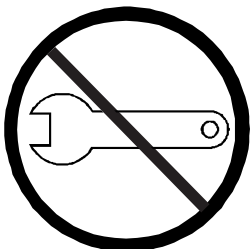
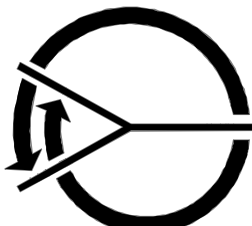
Symbol	Description
 xx0900000812	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical 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.

Continues on next page

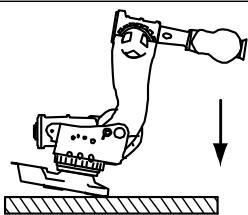
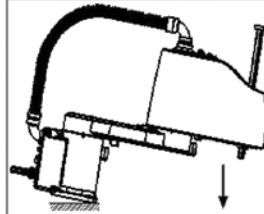
1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

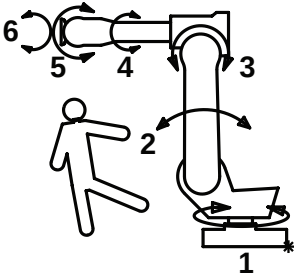
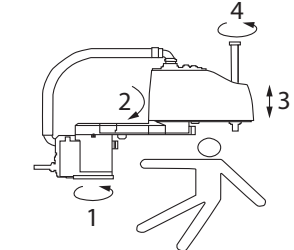
Symbol	Description
 xx1400001152	Read the user manual before use.
 xx0900000813	See user documentation Read user documentation for details. Which manual to read is defined by the symbol: No text: <i>Product manual</i>.
 xx0900000816	Before disassembly, see product manual
 xx0900000815	Do not disassemble 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.

Continues on next page

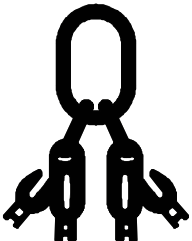
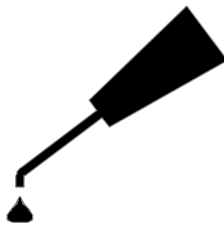
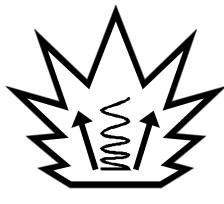
Symbol	Description
 xx0900000810   3HAC 057068-001 xx1500002402	Tip risk when loosening bolts The robot can tip over if the bolts are not securely fastened.
  xx0900000817	Crush Risk of crush injuries.
 xx1400001151	Electrical shock

1 Safety

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

Continues on next page

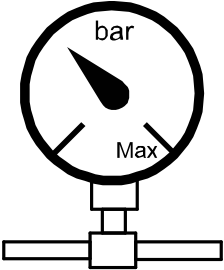
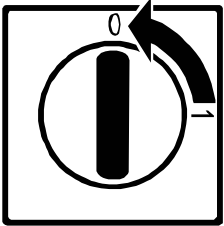
Symbol	Description
 xx0900000821	Lifting bolt
 xx1000001242	Adjustable chain sling with shortener
 xx0900000822	Lifting of robot
 xx0900000823	Oil Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	Mechanical stop
 xx1000001144	No mechanical stop
 xx0900000825	Stored energy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

Continues on next page

1 Safety

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.

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*
- *Product manual - OmniCore C30 Type B*

1 Safety

1.4 Safety during installation and commissioning

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 216](#) 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.

Continues on next page

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 (CO₂) 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.

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.

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

Continues on next page

1 Safety

1.4 Safety during installation and commissioning

Continued

- 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.

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.

1 Safety

1.6.1 Safety during maintenance and repair

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

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 40](#).

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

Continues on next page

1 Safety

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.

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 64.](#)

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.

Prerequisites 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.

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.

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.

1 Safety

1.8 Safety during decommissioning

1.8 Safety during decommissioning

General

See section [Decommissioning on page 215](#).

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.

2 Manipulator description

2.1 About the IRB 365

General introduction

IRB 365 FlexPicker™ is specially designed for high speed top loading pick & place processes.

2 Manipulator description

2.2 Technical data

2.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight
IRB 365-1.5/800	86 kg
IRB 365 1.5/1100	86 kg
IRB 365-1.5/1300	86 kg



Note

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

Mounting positions

The table shows valid mounting positions and the installation (mounting) angle for the manipulator.

Mounting position	Installation angle
Suspended in robot frame	0°



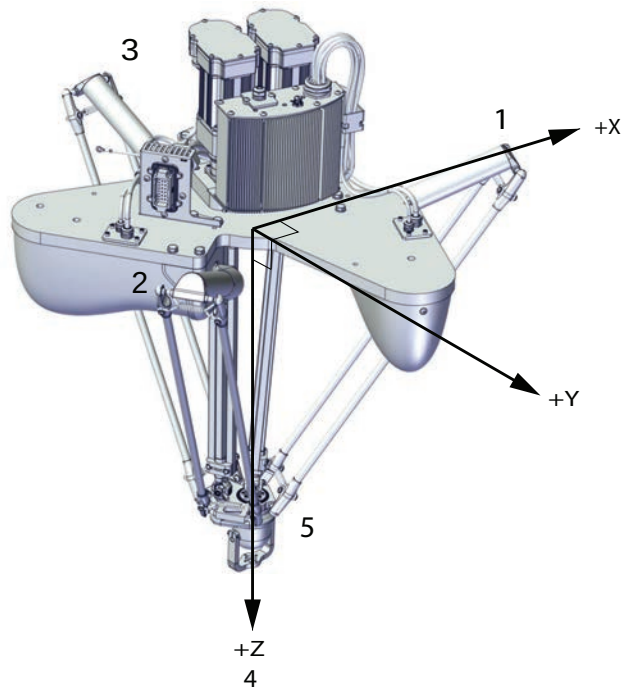
Note

The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected.

On robots running RobotWare 8, it is also possible to configure the mounting position on the FlexPendant, see the integrator's guide for the controller.

Continues on next page

Loads on foundation, robot



xx2200000421

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).

Suspended in robot frame

Force	Endurance load (in operation)	Maximum load (emergency stop)
Force xy	± 0.32 kN	± 2.3 kN
Force z	0.97 ± 0.21 kN	1.5 ± 0.78 kN
Torque xy	0.21 kNm	1.56 kNm
Torque z	0.10 kNm	0.51 kNm

Continues on next page

2 Manipulator description

2.2 Technical data

Continued

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	0.3 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.
Minimum resonance frequency	35 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 description of <i>Motion Process Mode</i> in the manual that describes the controller software option, see References on page 10 .

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 possible 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.

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25 °C
Maximum ambient temperature	60 °C
Maximum ambient temperature (less than 24 hrs)	90 °C
Maximum ambient humidity	90% at constant temperature

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	0 °C ⁱ
Maximum ambient temperature	45 °C
Maximum ambient humidity	90% at constant temperature

ⁱ At low environmental temperature < 10 °C is, as with any other machine, a warm-up phase recommended to be run with the robot. Below 5 °C this warm-up phase is mandatory. Otherwise there is a risk that the robot stops or run with lower performance due to temperature dependent oil- and grease viscosity.

Continues on next page

Protection classes, robot

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

Protection type	Protection class ⁱ
Manipulator, protection type Standard	IP54

ⁱ According to IEC 60529.

Environmental information

The product complies with IEC 63000. *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.*

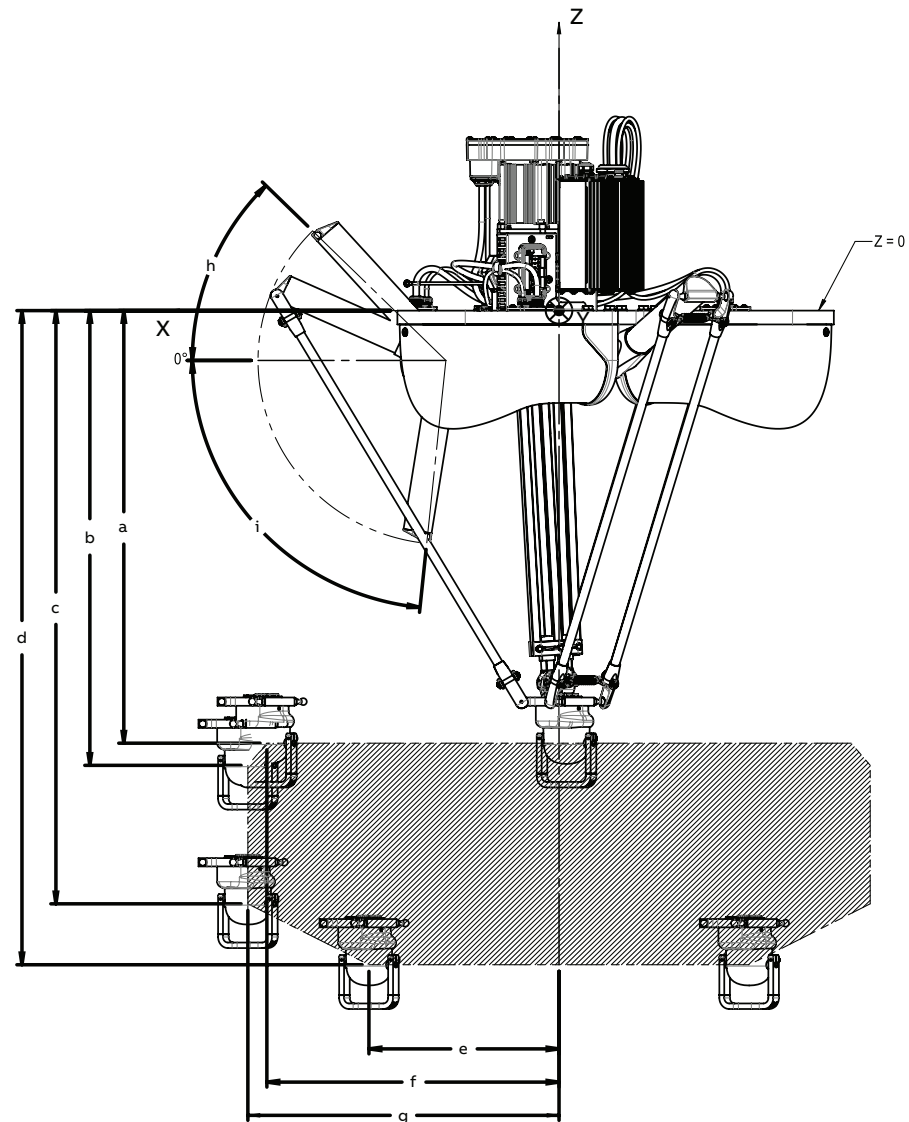
2 Manipulator description

2.3 Working range

2.3 Working range

Illustration, working range

This illustration shows the unrestricted working range of the robot.

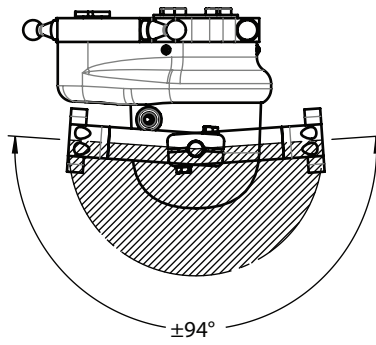


xx2200000476

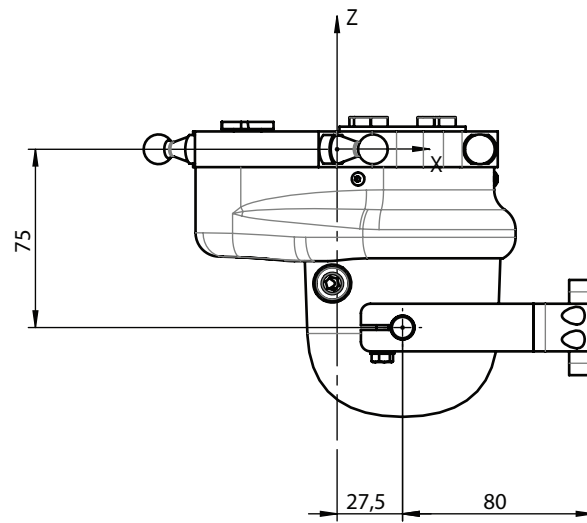
Dimensions

Variant	a	b	c	d	e	f	g	h	i
IRB 365-1.5/800	731	731	981	1081	257	400	400	-35°	+88°
IRB 365 1.5/1100	781	821	1031	1181	335	516	550	-47°	+99.5°
IRB 365-1.5/1300	881	931	1131	1281	409	608	650	-34°	+93.5°

Continues on next page



Axis 5



xx2200000477

2 Manipulator description

2.4 The unit is sensitive to ESD

2.4 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.

3 Installation and commissioning

3.1 Introduction to installation and commissioning

General

This chapter contains assembly instructions and information for installing the IRB 365 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 38](#).

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 15](#) before performing any installation work.



WARNING

Always connect the controller and the IRB 365 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*
- *Product manual - OmniCore C30 Type B*

3 Installation and commissioning

3.2.1 Pre-installation procedure

3.2 Unpacking

3.2.1 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.

Checking the prerequisites for installation

	Action
1	Make a visual inspection of the packaging and make sure that nothing is damaged.
2	Remove the packaging.
3	Check for any visible transport damage.  Note Stop unpacking and contact ABB if transport damages are found.
4	Clean the unit with a lint-free cloth, if necessary. Wipe away the protective transportation grease applied to the tool flange.
5	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 38
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 40
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 40
8	Before taking the robot to its installation site, make sure that the site conforms to: • Loads on foundation, robot on page 39 • Protection classes, robot on page 41 • Requirements, foundation on page 40
9	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 47
10	Install required equipment, if any.

3.3 On-site installation

3.3.1 Brief installation procedure

Introduction

This procedure is a brief guide when installing the robot for the first time. Also see [Pre-installation procedure on page 46](#).

First installation

Use these procedures to install the IRB 365.

	Action	Note
1	Transport the manipulator to its intended location.  Note Make sure to have required free space above the manipulator to be able to access the parts inside during maintenance or repair. See Requirements on the installation site on page 49 .	
2	Install the valid platform or prepare the foundation for the manipulator.	
3	Lift and secure the manipulator to the platform/foundation.	See Orienting, assembling and securing the manipulator on page 53 .
4	Connect the manipulator to the controller.  Note Make sure the manipulator is connected to the controller with the matching serial number and clearly labelled as a pair set.  WARNING The manipulator shall be powered only when it is properly fixed and bolted to its support.	See • <i>Product manual - OmniCore C30</i> • <i>Product manual - OmniCore C30 Type B</i>
5	Configure the safety settings.	See • <i>Product manual - OmniCore C30</i> • <i>Product manual - OmniCore C30 Type B</i>
6	How to start and run the robot is described in the product manual for the controller.	See • <i>Product manual - OmniCore C30</i> • <i>Product manual - OmniCore C30 Type B</i>
7	Install required equipment, if any.	

Continues on next page

3 Installation and commissioning

3.3.1 Brief installation procedure

Continued

	Action	Note
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 76 .	

3.3.2 Requirements on the installation site

Requirements on the frame

The manipulator is intended to be installed in a frame, platform, or similar. See [Hole configuration, base on page 55](#).

The robot frame must withstand the operational loads. See [Loads on foundation, robot on page 39](#).

Requirements on the layout

There must be sufficient free space around and access ways to the robot to safely perform installation, maintenance, and repair.

Required free space above the robot

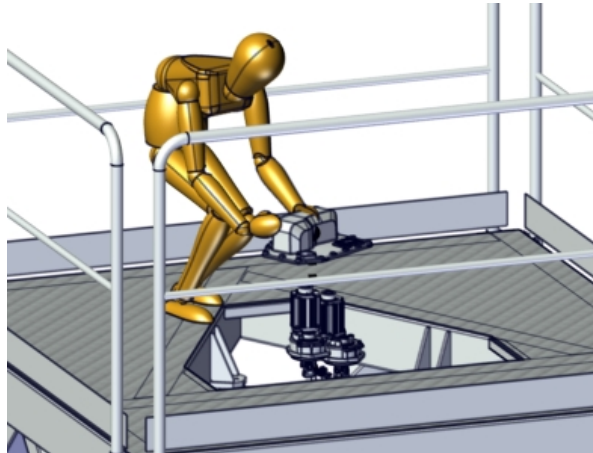
The following service activities require free space above the robot:

- Lifting away the base top cover.
- Replacing the base components, such as the SMB battery, axis-4 and axis-5 motor, cable harness.

Examples of access ways to the base components

Service platform

A service platform for access from above is recommended.



xx2000000672

Continues on next page

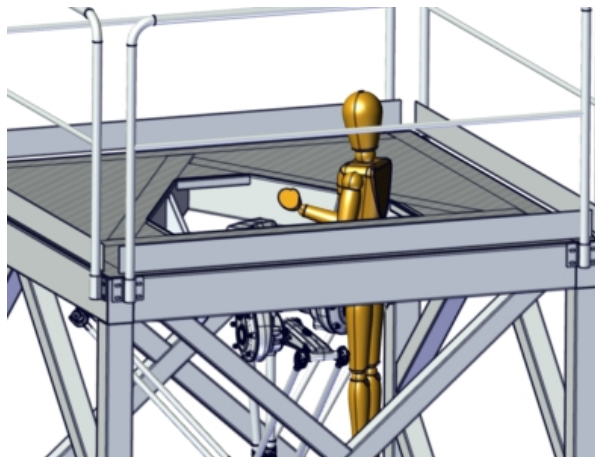
3 Installation and commissioning

3.3.2 Requirements on the installation site

Continued

Access way beside the robot

If a platform is not possible the service personnel need to be able to stand beside the robot according to the figure.



xx2000000671

3.3.3 Securing the robot frame

General

This section specifies the requirements for the robot frame installation.

Requirements on robot frame fastening

The fastening of the robot frame to the foundation must withstand the operational loads. See [Loads on foundation, robot on page 39](#).

The requirements for the robot foundation, that is the robot anchoring points on the robot frame, must be met. See [Requirements, foundation on page 40](#).



WARNING

The robot frame must be secured before mounting the robot.

Required equipment

Equipment	Spare part no.	Note
Standard tools		Standard toolkit on page 226

Orienting and securing

	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section Technical data on page 38 .	
2	Make sure that the space above the installation site is sufficient for repair and maintenance.	See Requirements on the installation site on page 49 .
3	Prepare the installation site.	
4	Secure the robot frame to the floor.  Note Use leveling shims if needed.	Use fastening bolts that withstand the requirements for current foundation.
5	Make sure the robot anchoring points are level after having installed and secured the frame to the floor/foundation.	See Requirements, foundation on page 40 . See Illustration of leveling the robot frame on page 51 .

Illustration of leveling the robot frame

The illustration is an example of how to meet the requirements for robot foundation, when fastening the robot frame.

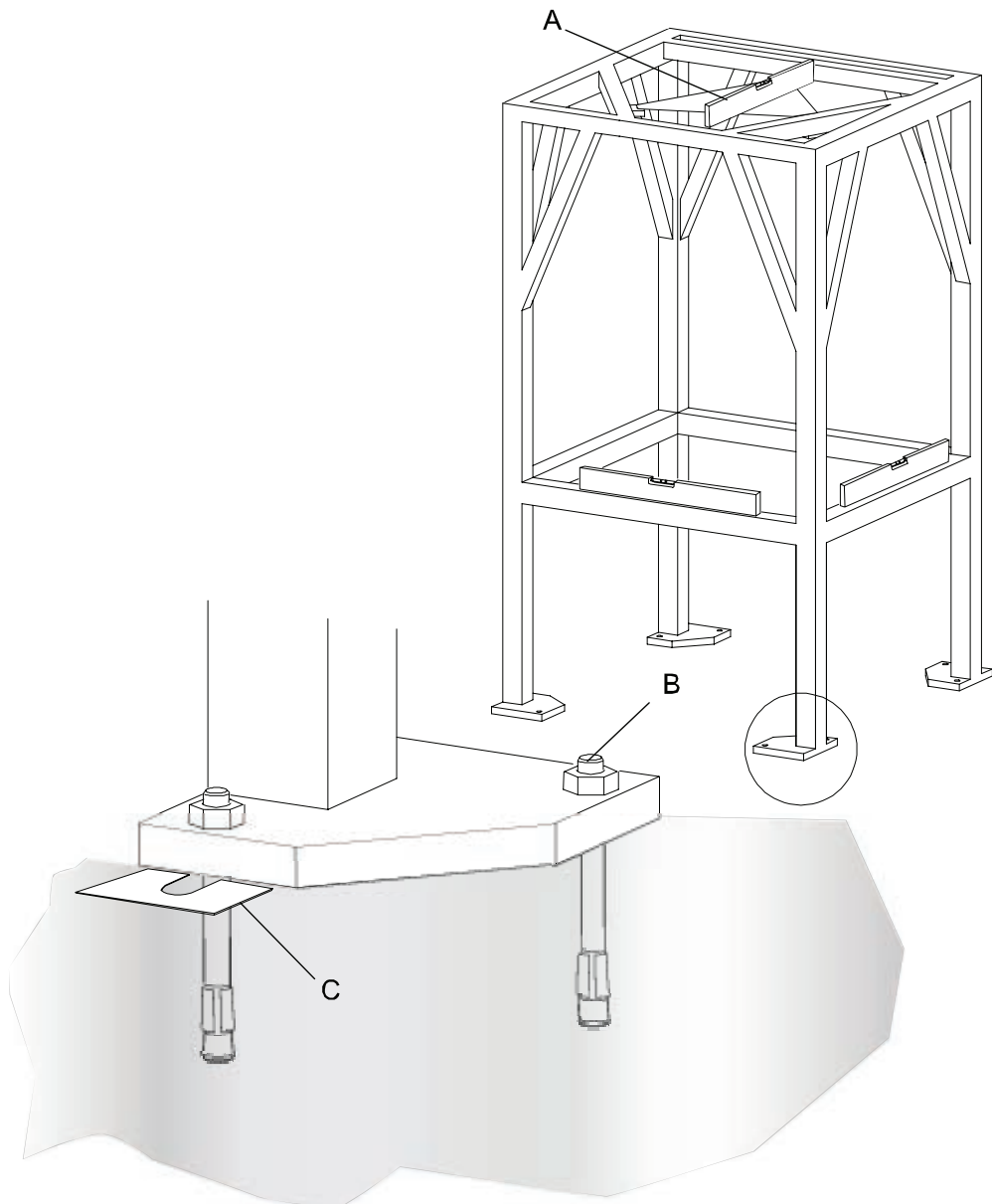
The robot anchoring points in the frame must achieve required values for the foundation requirements to run the robot safely. See [Requirements, foundation on page 40](#).

Continues on next page

3 Installation and commissioning

3.3.3 Securing the robot frame

Continued



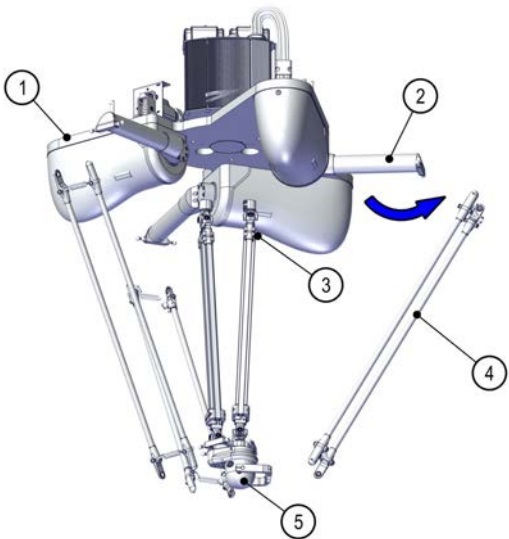
xx2000000601

A	Spirit level
B	Fastening bolts that withstand requirements for current foundation
C	Shim

3.3.4 Orienting, assembling and securing the manipulator

Overview of the assembly order

The IRB 365 is delivered in sub-assemblies which are assembled in the following order:

	Assembly order	Illustration
1	Install the base unit.	
2	Connect the base unit to the robot controller.	
3	Connect the brake release unit.	
4	Release the brakes and move the upper arms into calibration position (horizontal).	
5	Attach the upper end of the telescopic shafts to the motor axes (axes 4 and 5).	
6	Attach the lower arms to the upper arms.	
7	Attach the lower arms to the delta unit.	xx2100000836  Note Make sure not to over-extend the length of the telescope shafts due to risk of damaging the slide bearing.
8	Perform fine calibration of axis 4-5 and update the revolution counters.	

Detailed procedures for each step are given further on in this section.

Attachment screws

The table below specifies the type of securing screws and washers to be used for securing the robot to the base foundation.

Suitable screws	M16. Minimum length of thread engagement: 25 mm
Quantity	3 pcs
Quality	Screw class 8.8 with Yield Strength 640 MPa
Suitable washer	17x25x3 coated stainless steel 3HAC060866-005 (HV200)
Tightening torque	200 Nm
Level surface requirements	0.3 mm

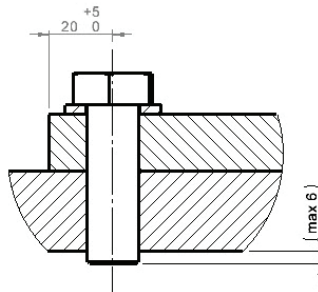
Continues on next page

3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

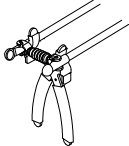
Continued

Loctite on threads	5700
--------------------	------



xx2200000282

Required tools and equipment

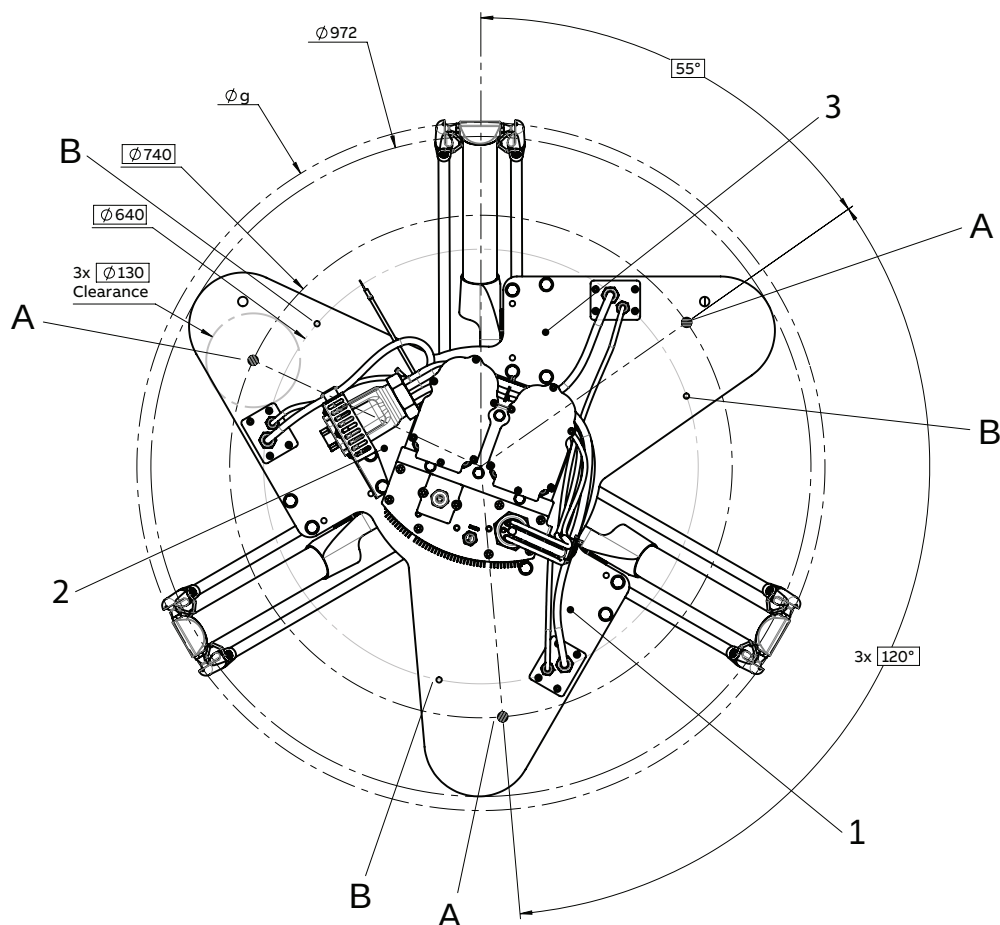
Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Required service parts

Consumable	Article number	Note
Cleaning agent	-	Isopropanol

Continues on next page

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



xx2100000837

1	Axis-1 gearbox
2	Axis-2 gearbox
3	Axis-3 gearbox
A	Robot mounting holes There is a clearance of Ø130 mm around the holes.
B	Attachment holes M8 for lifting eyes
g	IRB 365-1.5/800: 1,100 mm
g	IRB 365 1.5/1100: 1,100 mm
g	IRB 365-1.5/1300: 1,300 mm

See also *Fitting equipment on the robot (robot dimensions)* on page 69.

The IRB 365 is delivered in sub-assemblies.

Continues on next page

3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

Continued

Assemble the manipulator according to the following order.

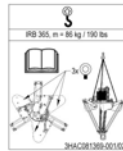
Preparations of the installation site

Use the procedure to prepare the installation site.

	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section Technical data on page 38 .	
2	Make sure that the space above the installation site is sufficient for repair and maintenance.	See Requirements on the installation site on page 49 .
3	Prepare the installation site with attachment holes.	The hole configuration of the base is shown in the figure in Hole configuration, base .

Installing the base unit

Use the procedure to install the base unit.

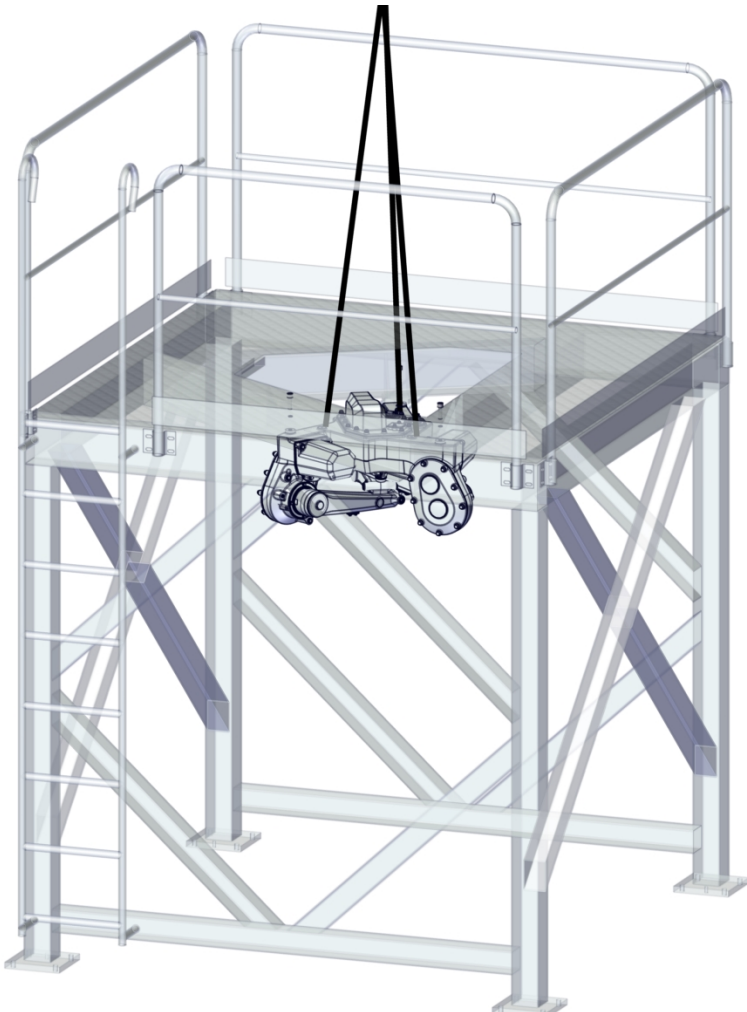
	Action	Note
1	Fasten three lifting eyes M8.	 xx2200000600
2	 CAUTION The weight of the complete base unit and upper arms is 86 kg. All lifting accessories used must be sized accordingly.	
3	Attach the round slings to the lifting eyes.  Note Make sure the round slings do not rub against any sharp edges.	Make sure the round sling has free space and does not wear against any part of the robot.
4	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	

Continues on next page

3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

Continued

	Action	Note
5	Lift the base unit to its mounting position, mate to the attachment holes and secure with attachment bolts and washers. Attachment bolts: M16. Minimum length of thread engagement: 25 mm, Screw class 8.8 with Yield Strength 640 MPa (3 pcs) Washers: 17x25x3 coated stainless steel  Note Do not damage the robot cabling.  xx2000000470	
6	Remove the round slings and lifting eyes.	

Continues on next page

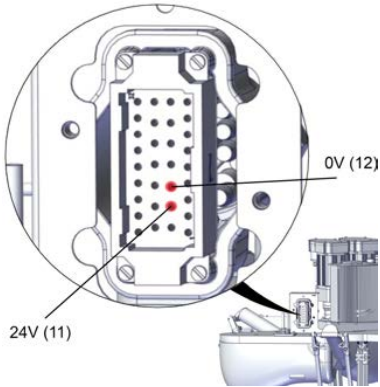
3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

Continued

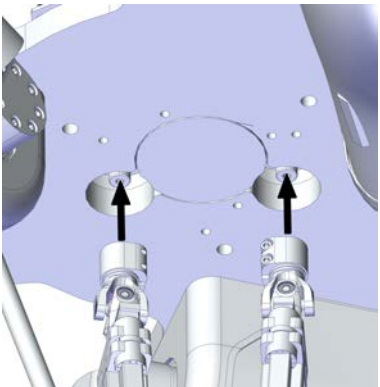
Moving the upper arms to installation position

Use this procedure to release the brakes and move the upper arms into installation position.

	Action	Note
1	Supply power to connector R1.MP on the robot, to be able to use the brake release button: • 0V on pin 12. • 24V on pin 11.  DANGER Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously and instantly!  Note Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to internal electrical components.	 xx2100000785
2	Release the brakes by pressing the brake release button and move the upper arms to calibration position.	Releasing the brakes on page 64  xx2200000021
3	Disconnect the 24V supply from the R1.MP connector.	

Attaching the telescopic shaft assembly and lower arms

Use this procedure to fit the telescopic shaft assembly.

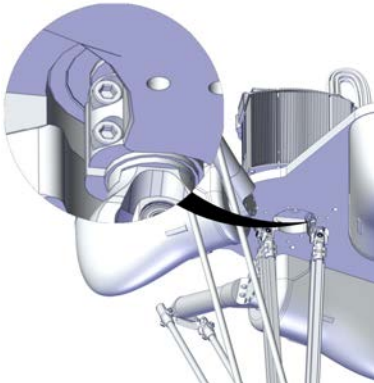
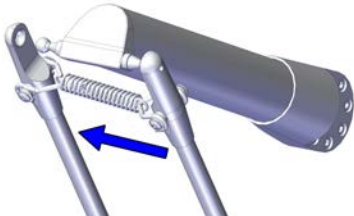
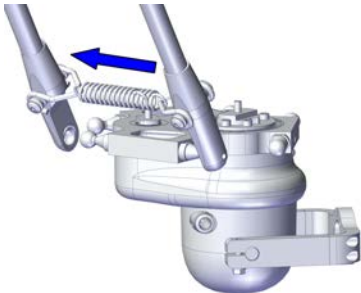
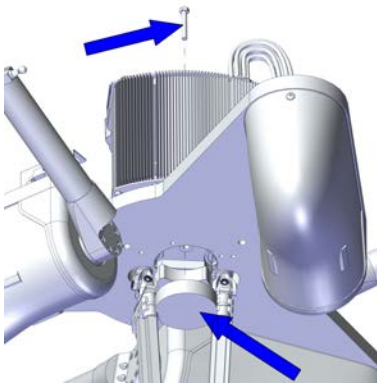
	Action	Note
1	Fit the telescopic shaft assembly including delta unit.  Note Do not tighten the mounting clamps screws before refitting the lower arms.	 xx2100000759

Continues on next page

3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

Continued

	Action	Note
2	Tighten the two attachment screws.	Tightening torque: 10 Nm  xx2100000729
3	Fit the lower arms to the upper arms by using the pliers, either on the left side or the right side, not both.  Note Be careful not to damage the ball bearing cups	 xx2100000721
4	Fit the lower arms to the delta unit by using the pliers, either on the left side or the right side, not both.  Note Be careful not to damage the ball bearing cups	 xx2100000722
5	Fit the center base cover.	 xx2100000732

Continues on next page

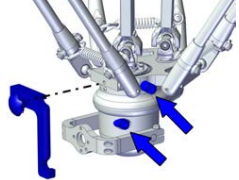
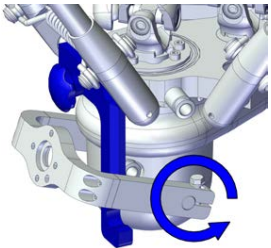
3 Installation and commissioning

3.3.4 Orienting, assembling and securing the manipulator

Continued

Calibration

Axis-4 and -5 must be calibrated with fine calibration. The full calibration procedure is described in section [Calibrating axis 4-5 on page 204](#).

	Action	Note
1	Slide the calibration tool onto the delta plate and tighten the star knob until the calibration tool is locked. Align the two pneumatic couplings in same direction.	Make sure to not scratch surfaces.  xx2100002601
2	Rotate tilt arm until it makes contact with calibration tool.	 xx2100002602
3	Perform a fine calibration of the tilt arm.	See Fine calibration procedure on FlexPendant on page 206 .
4	Remove the calibration tool.	
5	Update the revolution counters.	See Updating revolution counters on OmniCore robots on page 208 .

3.3.5 Installing a brake release unit

Brake release unit

The robot cable harness has a brake release unit connected to the SMB battery compartment. The brake release unit is connected on delivery and needs to be mounted somewhere near the robot.

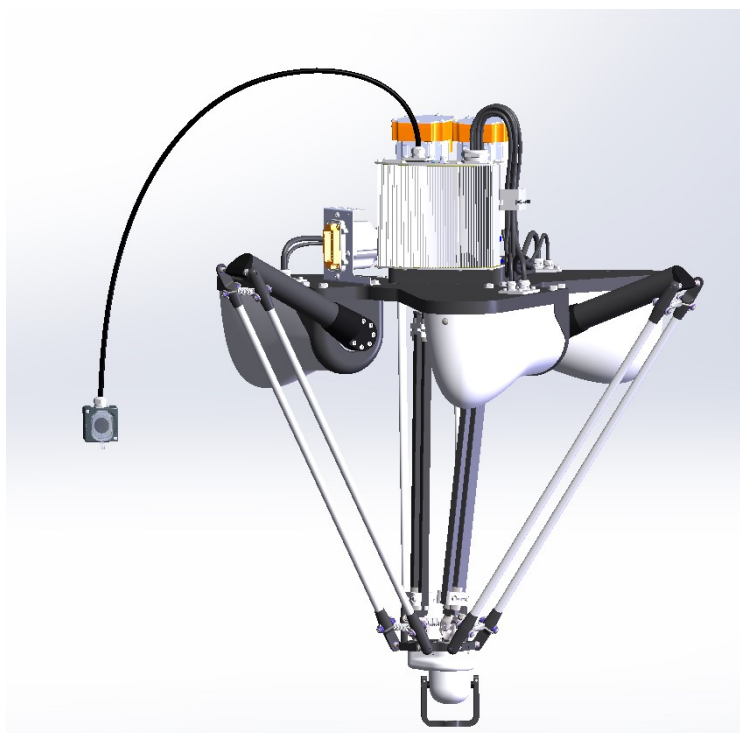


CAUTION

Risk of unintended contact with the push button. Place the brake release box in a way that eliminates the risk of unintended contact with the push button.

Installing the brake release unit

The figure shows a routed cable from the brake release unit to the SMB battery compartment located on top of the base unit.



xx2100002498

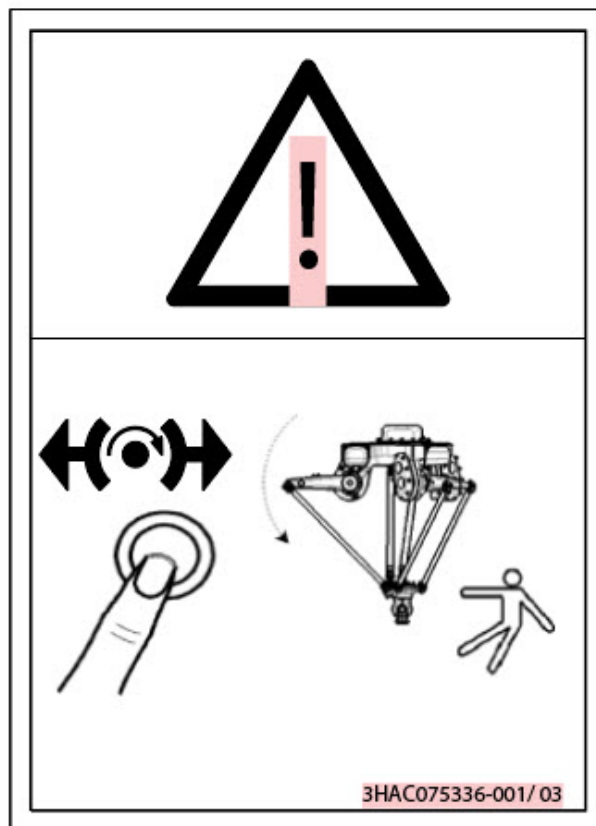
The figure shows an instruction label to be mounted next to the brake release unit.

Continues on next page

3 Installation and commissioning

3.3.5 Installing a brake release unit

Continued



xx2200000601



CAUTION

Risk of unintended contact with the push button. Place the brake release box in a way that eliminates the risk of unintended contact with the push button.



Note

The equipment must be installed in accordance with the specified protection class, see [Protection classes, robot on page 41](#).



Note

Place the equipment in a manner that makes it obvious which manipulator it is connected to. There must be no doubt on which manipulator is affected when activating the button.

Technical specification

Function	Data
Signal	24V DC

Continues on next page

Function	Data
Current	13 A continuously
Protection class	IP57

3 Installation and commissioning

3.3.6 Manually releasing the brakes

3.3.6 Manually releasing the brakes

Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the axes motors.

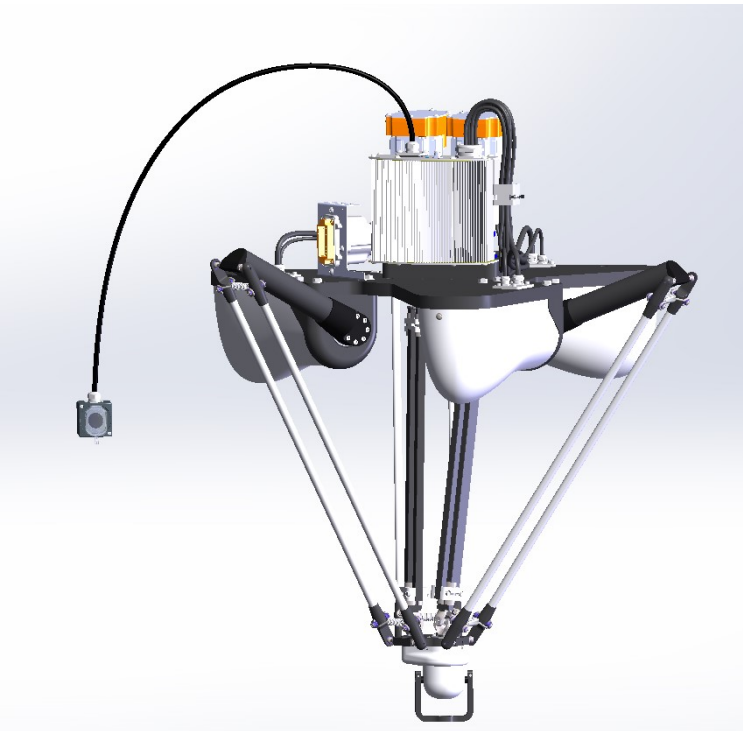


Note

It is recommended to train operators on how to use the brake release functionality, including for emergency or abnormal situations.

Location of the brake release unit

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



xx2100002498

Releasing the brakes

This procedure describes how to release the holding brakes when the robot is equipped with a brake release unit.

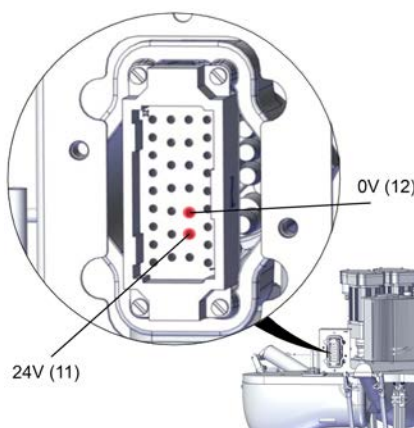
	Action	Note
1	 Note If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 65.	

Continues on next page

	Action	Note
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.	
3	Release the holding brake of all axes by pressing the brake release button. The brake is enabled when the button is released.  WARNING Pressing the brake release button will release the holding brakes on all axes simultaneously.	

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 and instantly!	
2	Supply • 0V on pin 12. • 24V on pin 11.  Note Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to internal electrical components.	 xx2100000785
3	Use the brake releasing button as described in Releasing the brakes on page 64 .	

3 Installation and commissioning

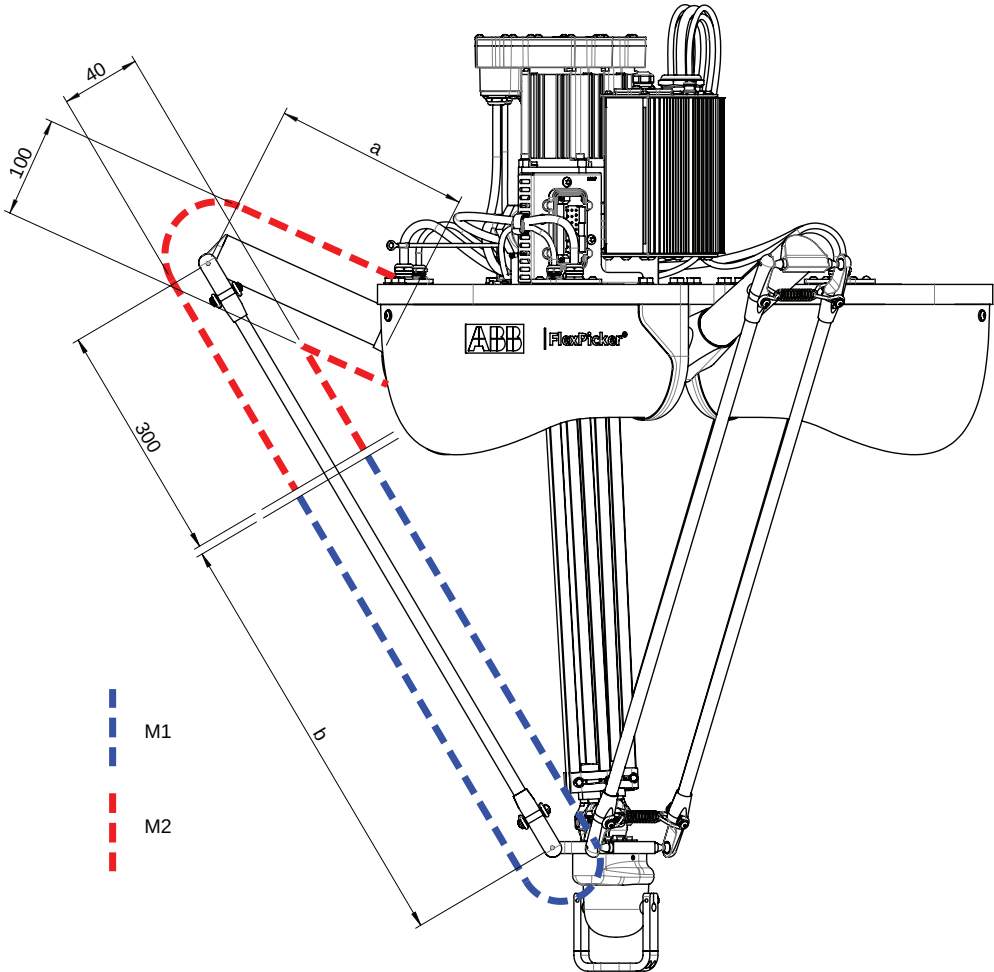
3.3.7 Loads

3.3.7 Loads

General

This section describes loads from external equipment. For information about general loads and diagrams see the product specification, listed in [References on page 10](#).

Extra equipment attached to the manipulator arms



xx2500001628

Variant	a	b
IRB 365-1.5/800	265.6	450
IRB 365 1.5/1100	245.6	550
IRB 365-1.5/1300	445.6	650

M1	Limitation lines for center of gravity for M1
M2	Limitation lines for center of gravity for M2

The robot is tuned for handling the weight of a vacuum system or a medium-sized hose. Other equipment attached to M1 and/or M2 should be calculated as a point load located in the same position as TCP 0. This point load needs to be added to

Continues on next page

the calculation of the tool load and declared in the tool data, see [Extra load mass to be calculated on page 67](#).

Extra load mass to be calculated

Part on arm system	Weight	Description
M1	0-175 g	Allowed. Do not calculate the extra load mass.
	175-350 g	Calculate the extra load mass by subtracting the weight with 175 g. ⁱ
	>350 g	Not allowed.
M2	0-175 g	Allowed. Do not calculate the extra load mass.
	175-350 g	Calculate the extra load mass by subtracting the weight with 175 g. ⁱ
	>350 g	Not allowed.

ⁱ Combine the extra load mass weight of M1 and M2 together and add the weight as a point mass in the center of the customer interface (TCP 0). This addition can be done in the tool definition or the payload definition. If only one of M1 or M2 needs to be calculated, add only that extra load mass subtracted with 175g in TCP 0.

Extra arm load can be calculated using the service routine *Load Identification* (*LoadId*). Because *LoadId* is only available on arm 3, then even if the equipment should be on another arm, then use arm 3 for the calculation.

Use the results to update the load.



Tip

LoadId is described in the operating manual for the controller.

Example of calculating the extra load mass

If the extra equipment (excluding option equipments) attached to M1 has the load mass of 210 g and the extra equipment attached on M2 has the load mass of 240 g, then the calculated extra load mass for M1 is (210 g - 175 g = 35 g) and for M2 (240 g - 175 g = 65 g). Adding together the calculated load mass for M1 and M2 (35 g + 65 g = 100 g) gives the correct amount of 100 g located at the same position as TCP0. This point load needs to be added to the calculation of the users tool load and declared in used tool data.

3 Installation and commissioning

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

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

Define loads carefully

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.

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

For more details about load identification and definition, see *Operating manual - OmniCore* and *Technical reference manual - RAPID Instructions, Functions and Data types*.

Stopping time and braking distances

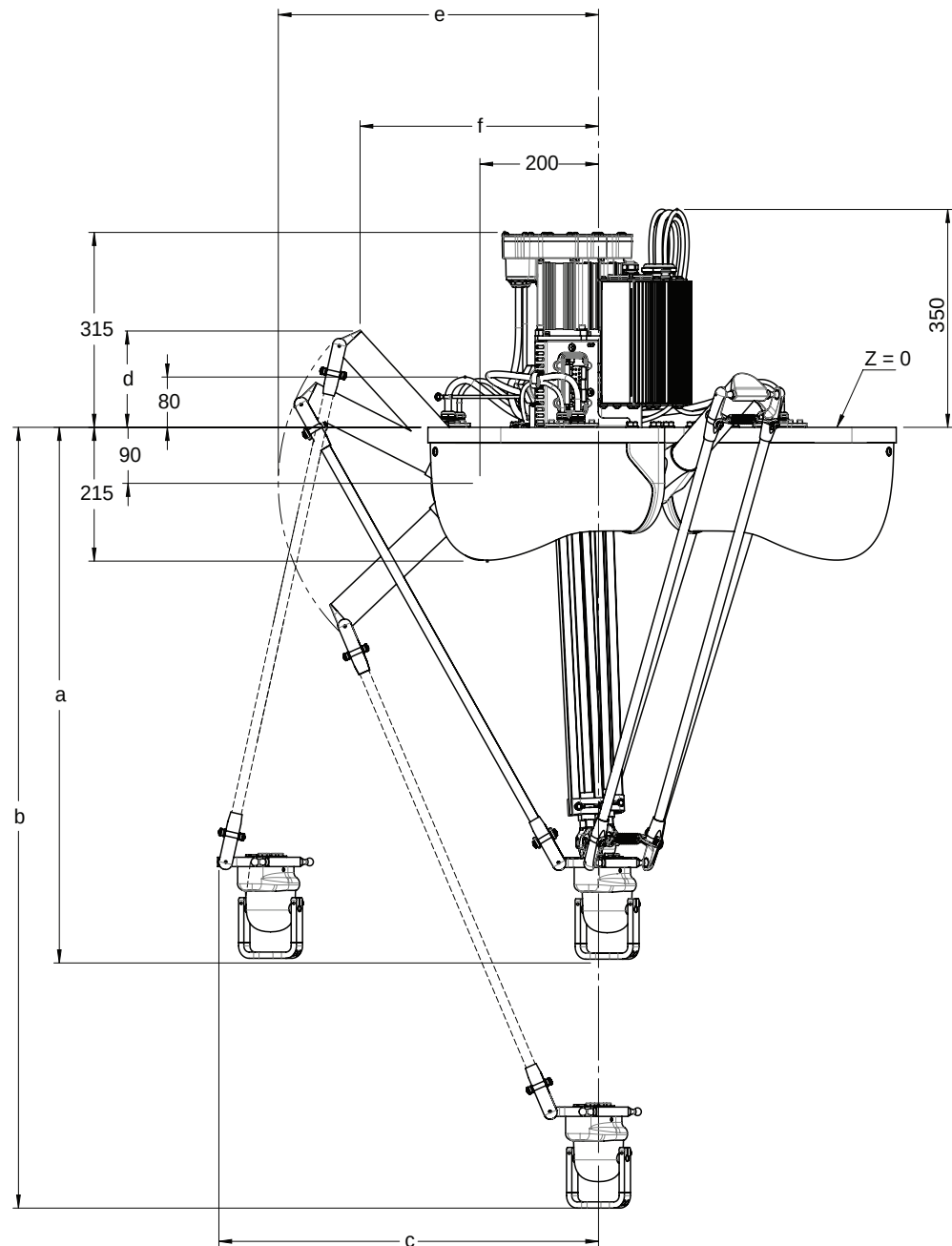
The performance of the motor brake depends on if there are any loads attached to the robot.

See the product specification for the robot, listed in [References on page 10](#).

3.3.9 Fitting equipment on the robot (robot dimensions)

Robot dimensions

The figure shows the dimension of the robot.



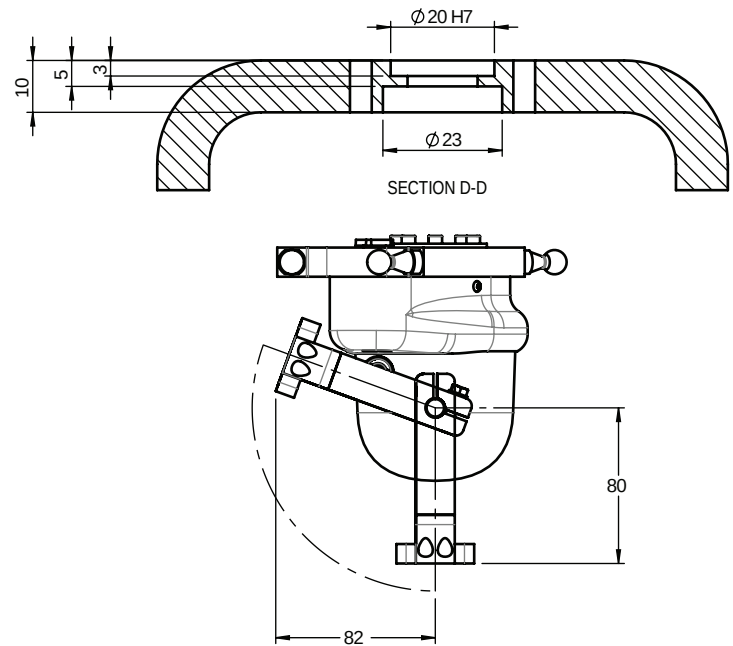
xx2200000423

Continues on next page

3 Installation and commissioning

3.3.9 Fitting equipment on the robot (robot dimensions)

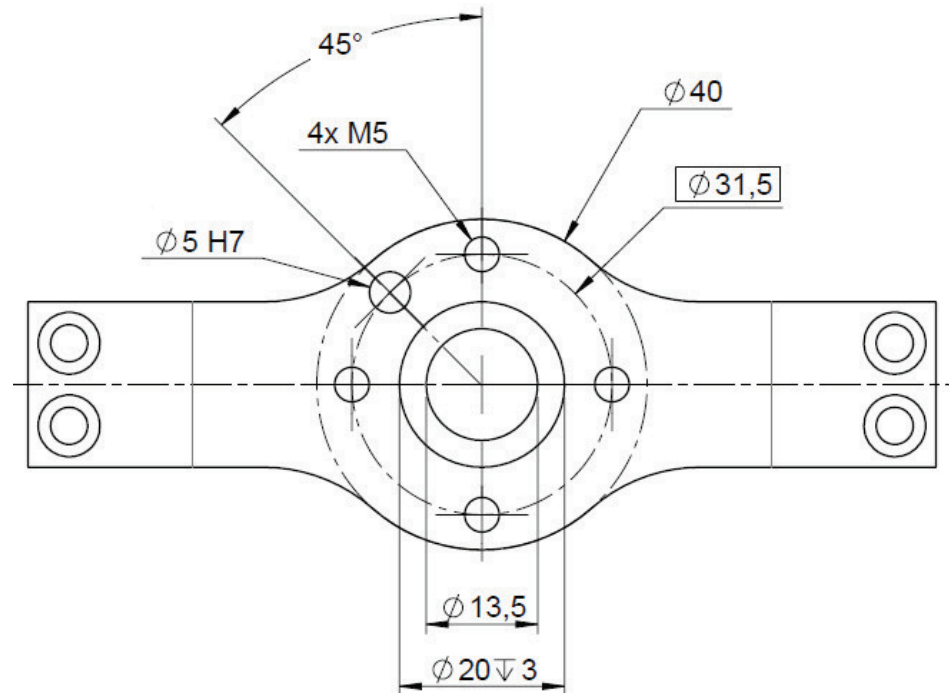
Continued



xx2200000433

Variant	a	b	c	d	e	f
IRB 365-1.5/800	811	1161	492	150	550	414
IRB 365 1.5/1100	861	1261	642	175	550	375
IRB 365-1.5/1300	961	1361	742	190	650	471

Mechanical interface of the tool flange



xx2100000962

Continues on next page

Extra equipment attached to the manipulator arms

Extra loads can be mounted on the manipulator. Definitions of dimensions and masses are shown in the following figures. Maximum allowed arm load depends on center of gravity of arm load and robot payload.

Center of gravity for extra loads on upper and lower arms

TBD New image of robot

M1	Limitation lines for center of gravity for M1
M2	Limitation lines for center of gravity for M2

Attachment of extra loads on the upper and lower arms

No holes for fitting extra equipment are available on the upper and lower arms. If attaching extra equipment to the arms, use shaped clamping blocks. Plastic cable ties can be used but risk of damaging surfaces. Do not use metal directly on the lower arms. Maximum extra load: 0.35 kg to either M1 or M2.

Equipment attached to M1 and/or M2 should be calculated as a point load located in the same position as TCP 0. This point load needs to be added to the calculation of the users normal tool load and declared in used tool data.

3 Installation and commissioning

3.4.1 Robot cabling and connection points

3.4 Electrical connections

3.4.1 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

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

Main cable categories

The following table specifies cabling categories between the robot and the controller. Some of the cabling belong to optional applications.

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the serial measurement board. Specified in the table Robot cables on page 72 .
Customer cables	Handles communication with equipment fitted on the robot by the customer, low voltage signals and high voltage power supply + protective ground. The customer cables also handle databus communication. See the product manual for the controller, see document number in References on page 10 .

Protective conductor (PE) is included in the power cable, see circuit diagrams.

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 cables, power	Transfers drive power from the drive units in the control cabinet to the robot motors.	XS1	R1.MP
Robot cable, signals	Transfers resolver data from and power supply to the serial measurement board.	XS2	R1.SMB

Robot cable, power

Power cable length	Article number
Power cable 3 m	3HAC079766-008

Continues on next page

3 Installation and commissioning

3.4.1 Robot cabling and connection points

Continued

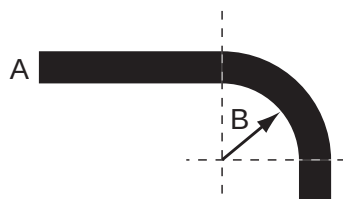
Power cable length	Article number
Power cable 7 m	3HAC079766-001
Power cable 15 m	3HAC079766-004
Power cable 22 m	3HAC079766-005
Power cable 30 m	3HAC079766-006

Robot cable, signals

Signal cable length	Article number
Signal cable, shielded: 3 m	3HAC084767-001
Signal cable, shielded: 7 m	3HAC084767-002
Signal cable, shielded: 15 m	3HAC084767-003
Signal cable, shielded: 22 m	3HAC084767-005
Signal cable, shielded: 30 m	3HAC084767-004

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

Continues on next page

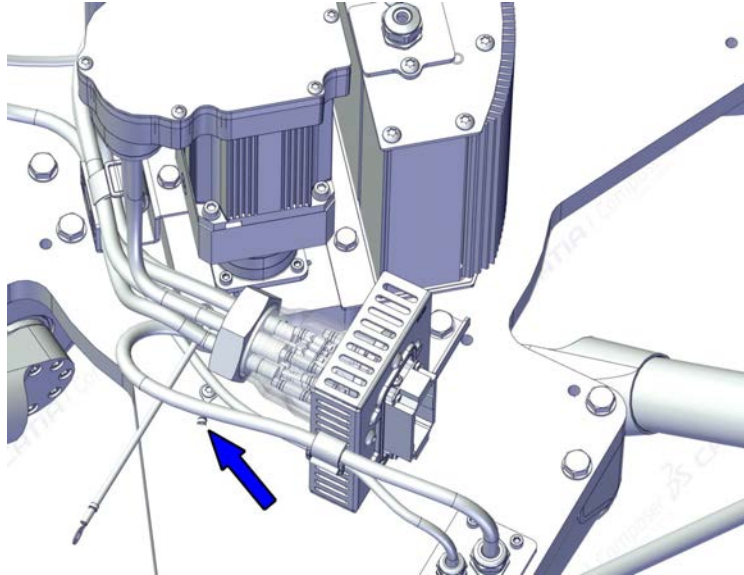
3 Installation and commissioning

3.4.1 Robot cabling and connection points

Continued

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.



xx2200000123

3.5 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.

3 Installation and commissioning

3.6 Test run after installation, maintenance, or repair

3.6 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.

4 Maintenance

4.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 365.

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 15](#) 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 365 is connected to power, always make sure that the controller and IRB 365 are connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C30 Type B*
- [Robot cabling and connection points on page 72.](#)

4 Maintenance

4.2.1 Specification of maintenance intervals

4.2 Maintenance schedule and expected component life

4.2.1 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 365:

- 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.

4.2.2 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 damage must be attended to immediately.

Life of each component

The inspection intervals *do not* specify the life of each component. Values for these are specified in the section [Expected component life on page 80](#)

Maintenance schedule

Maintenance activities	Regularly	Every 6 months	Every 12 months	Every 36 months	Every 8,000 hours ⁱ	Every 12,000 hours	Every 20,000 hours	Every 40,000 hours	Reference
Cleaning the robot	x								Cleaning the IRB 365 on page 100
Inspecting the telescopic shafts		x							Inspecting the telescopic shafts on page 86
Inspecting the lower arms		x							Inspecting the telescopic shafts on page 86
Replacing the SMB battery pack				x ⁱⁱ					Changing the SMB battery on page 95
Replacing the ball bearing cup			x ⁱⁱⁱ						Replacing ball bearing cup on page 123
Replacing the slide bearings			x ^{iv}						Inspecting the telescopic shafts on page 86

ⁱ Operating hours counted by the DTC = Duty Time Counter

ⁱⁱ The battery is to be replaced at given maintenance interval or at battery low alert.

ⁱⁱⁱ The ball bearing cups is to be replaced every 12 months or every 3800 hours which ever comes first

^{iv} The slide bearings is to be replaced every 12 months or every 3000 hours which ever comes first

4 Maintenance

4.2.3 Expected component life

4.2.3 Expected component life

Expected life depends on usage

The expected life of a specific component of the robot can vary greatly depending on how hard it is run.

Expected component life

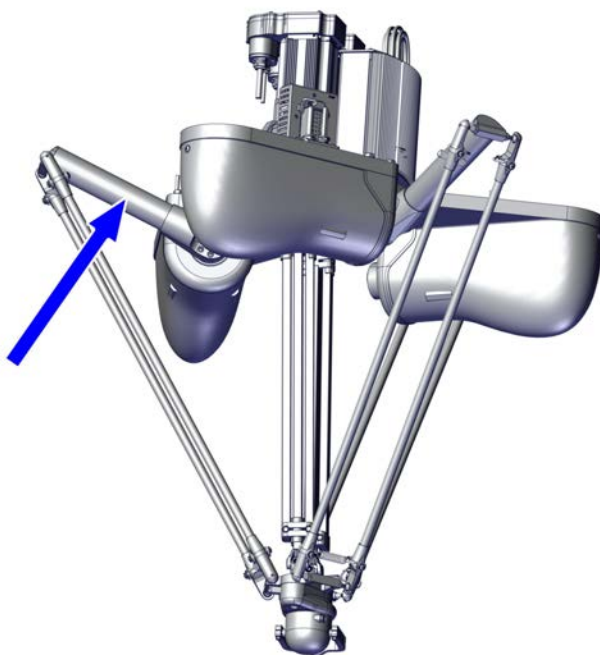
Component	Expected life	Note
Gearboxes	20,000 hours	

4.3 Inspection activities

4.3.1 Inspecting the upper arms

Location of the upper arm

The figure shows a 5-axis IRB 365.



xx2100000720

Required tools and equipment

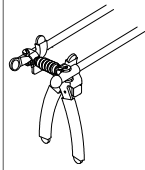
Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	

Continues on next page

4 Maintenance

4.3.1 Inspecting the upper arms

Continued

Equipment	Article number	Note	Image
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555



DANGER

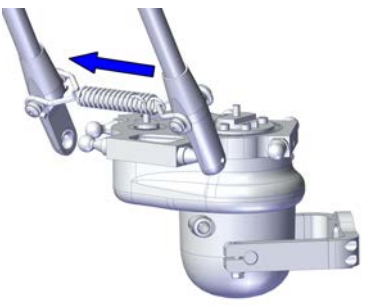
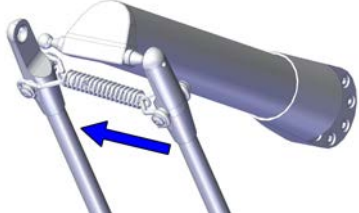
Turn off all:

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

to the robot, before entering the safeguarded space.

Inspecting the upper arms

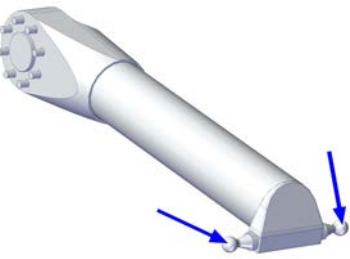
Removing the lower arms

	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Remove the lower end of the lower arms from the delta unit with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000722
3	Remove the upper end of the lower arms from the upper arms with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000721

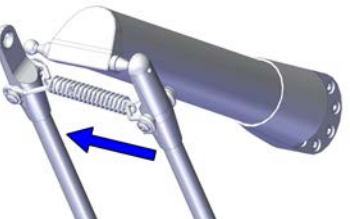
Continues on next page

4.3.1 Inspecting the upper arms Continued

Inspecting the upper arm

	Action	Note
1	Check the surface of the tube for cracks, if necessary replace the part.	 xx2100000839 Replacing the upper arms on page 125
2	Check surface of ball joints for cracks or burrs.	 xx2100000840 Replacing ball joint on page 122
3	Check tightening torque on attachment screws upper arm. Add locking liquid if removing a screw.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 16 Nm.  xx2100000841

Refitting the lower arm

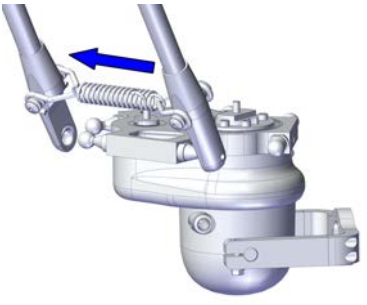
	Action	Note
1	Refit the lower arm to the upper arm with pliers.  Note Use the pliers either on the left side or the right side of the lower end on the lower arm.  Note Be careful and do not damage the ball bearing cups.	 xx2100000721

Continues on next page

4 Maintenance

4.3.1 Inspecting the upper arms

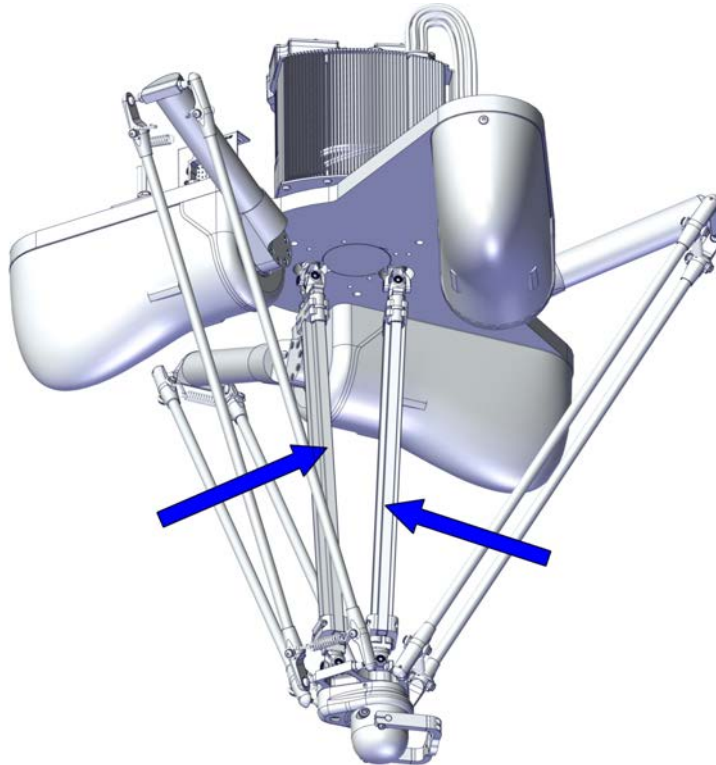
Continued

	Action	Note
2	Repeat the procedure in the lower end of all lower arms and on the delta unit.	 xx2100000722
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 76 .	

4.3.2 Inspecting the telescopic shafts

Location of the telescopic shafts

The figure shows a 5-axis IRB 365.



xx2100000730

Required tools and equipment

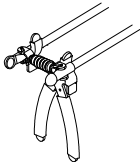
Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	

Continues on next page

4 Maintenance

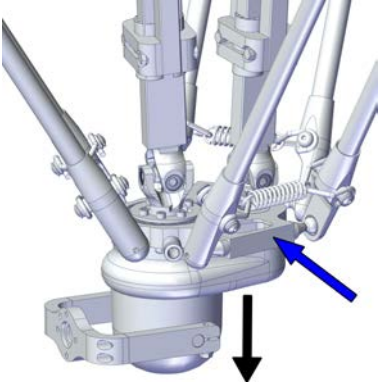
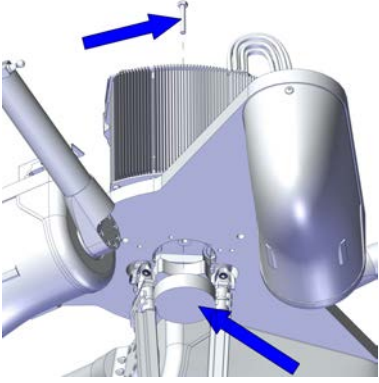
4.3.2 Inspecting the telescopic shafts

Continued

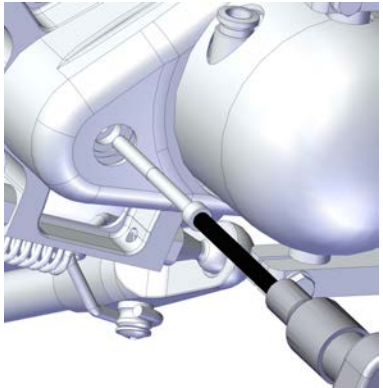
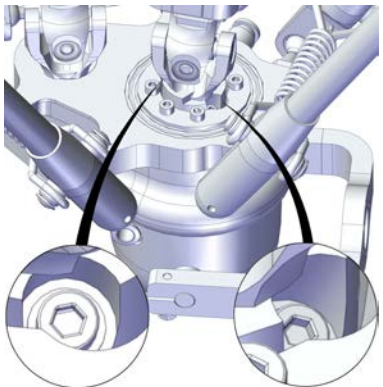
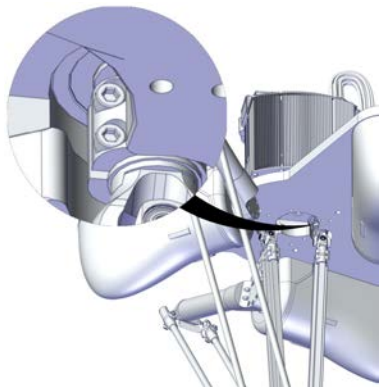
Equipment	Article number	Note	Image
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Inspecting the telescopic shafts

Removing the telescopic shaft

	Action	Note
1	 WARNING Make sure that all supplies for hydraulic pressure and air pressure are turned off.	
2	Push the brake release button and press the delta plate with head downwards to extend the two telescopic shafts.  Note Make sure not to over extend the length of telescope shafts due to slide bearing damage	 xx2100000747
3	 WARNING Turn off all: • electric power supply	
4	Remove the center base cover.	 xx2100000732

Continues on next page

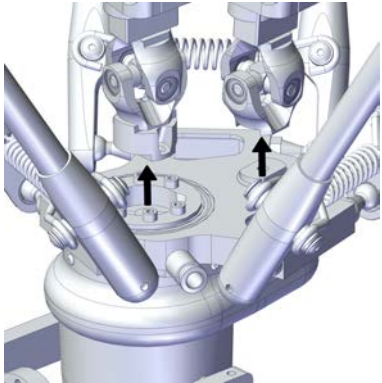
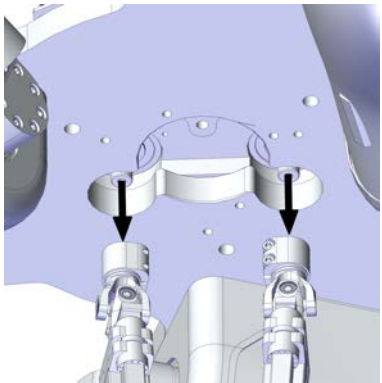
	Action	Note
5	Remove the attachment screw for telescopic shaft (axis-4).	 xx2100000735
6	Remove the two attachment screws with washers for telescopic shaft (axis-5).	 xx2100000736
7	Loosen the two attachment screws on the mounting clamp in the upper end of the telescopic shaft.	 xx2100000729

Continues on next page

4 Maintenance

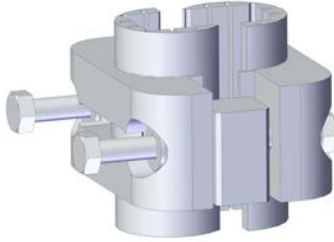
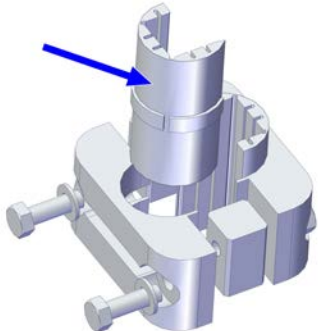
4.3.2 Inspecting the telescopic shafts

Continued

	Action	Note
8	Push the telescopic shaft together.  Note Use light force with mallet if necessary	 xx2100000749
9	Remove the telescopic shaft for axis-4 and -5.	 xx2100000733
10	Loosen the attachment screw, and remove the conical connection from the telescopic shaft for axis-5.	 xx2100000751

Continues on next page

Inspecting the joints

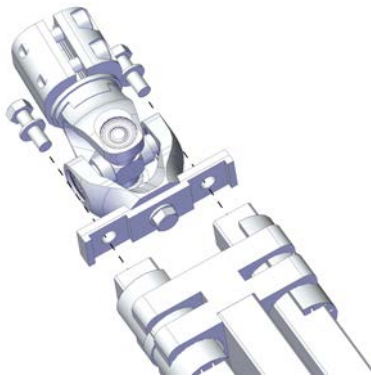
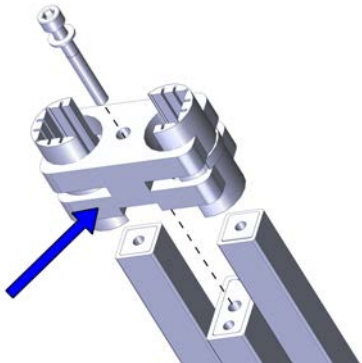
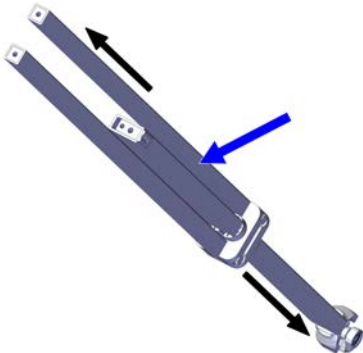
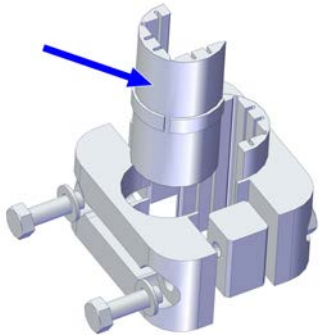
	Action	Note
1	Check the screws and the joints on the telescope bearing housing. Add locking liquid if replacing any screw.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 7 Nm  xx2100000773
2	Check the slide bearings, replace if damaged.	 xx2100000760

Continues on next page

4 Maintenance

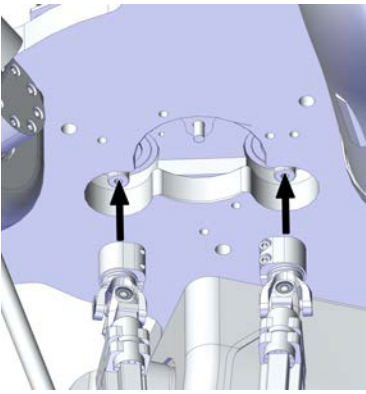
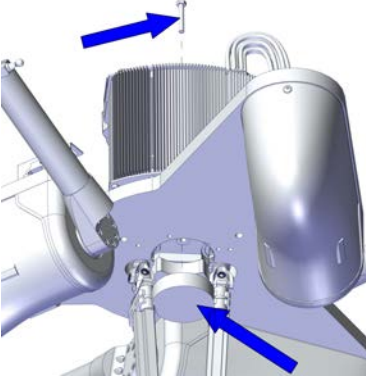
4.3.2 Inspecting the telescopic shafts

Continued

	Action	Note
3	Check the universal joints for any damage or cracks. If damage or cracks are detected, replace the complete joint.	 xx2100000753  xx2100000754  xx2100000755  xx2100000760

Continues on next page

Refitting the telescopic shaft

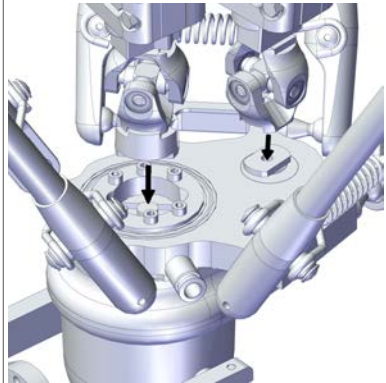
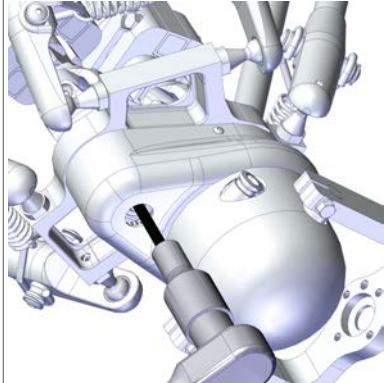
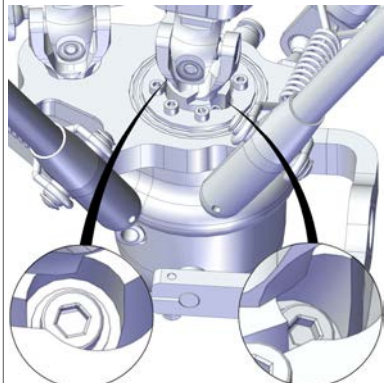
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Move the conical connection over to the telescopic shaft axis-5. Add Loctite 638 on the conical surfaces and locking liquid on the threads	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 10 Nm  xx2100000751
3	Refit the two telescopic shafts on motor axis-4 and -5.	 xx2100000750
4	Tighten mounting clamping screws.	Tightening torque: 10 Nm
5	Refit the center base cover.	 xx2100000732

Continues on next page

4 Maintenance

4.3.2 Inspecting the telescopic shafts

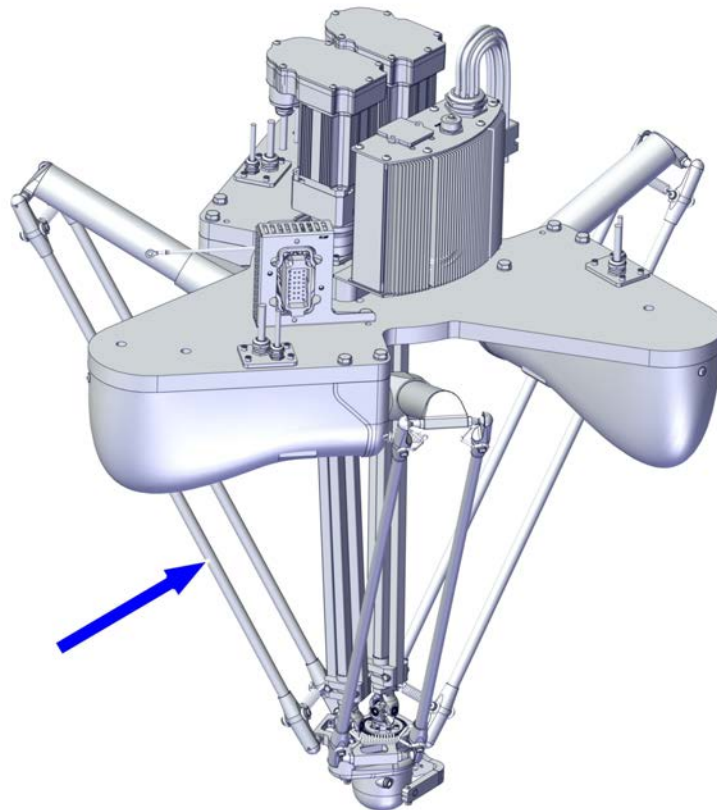
Continued

	Action	Note
6	Pull out the telescopic shaft and fit the conical coupling into the corresponding coupling on the delta plate Add Loctite 638 on the conical surfaces and locking liquid on the threads	10 Nm  xx2100000752
7	Refit the attachment screw for telescopic shaft and tighten (axis-4). Add Loctite 638 on the conical surfaces and locking liquid on the threads	Tightening torque: 10 Nm  xx2100000748
8	Refit the two attachment screws for telescopic shaft and tighten (axis-5). Add Loctite 638 on the conical surfaces and locking liquid on the threads	Tightening torque: 1.6 Nm  xx2100000736
9	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76.	

4.3.3 Inspecting the lower arms

Location of the lower arms

The figure shows a 5-axis IRB 365.



xx2100000719

Required tools and equipment

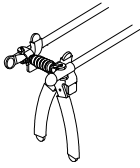
Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	

Continues on next page

4 Maintenance

4.3.3 Inspecting the lower arms

Continued

Equipment	Article number	Note	Image
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Inspecting the lower arms

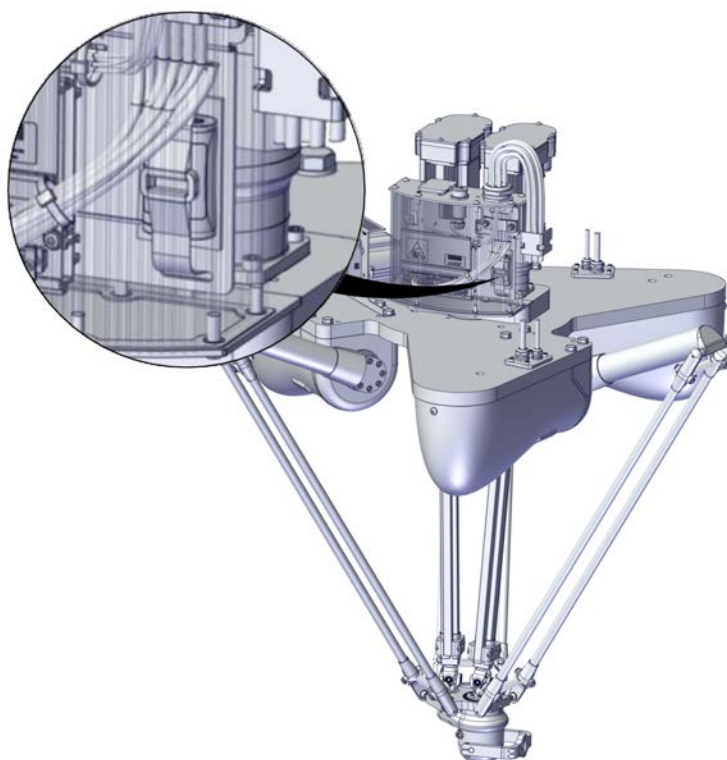
	Action	Note
1	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Check the ball bearing cups for wear, and change if damaged.	See Replacing ball bearing cup on page 123
3	If damage or cracks are detected, replace the lower arm.	See Replacing the lower arms on page 120 .

4.4 Replacement/changing activities

4.4.1 Changing the SMB battery

Location of the battery

The battery is located as shown in the figure.



xx2100000842

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note
Battery unit	3HAC044075-001	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Continues on next page

4 Maintenance

4.4.1 Changing the SMB battery

Continued

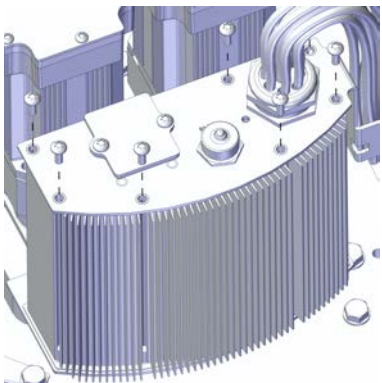
Required service parts

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

Removing the SMB battery

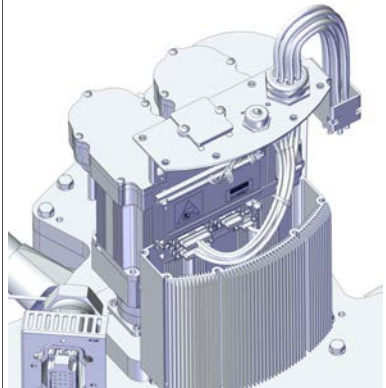
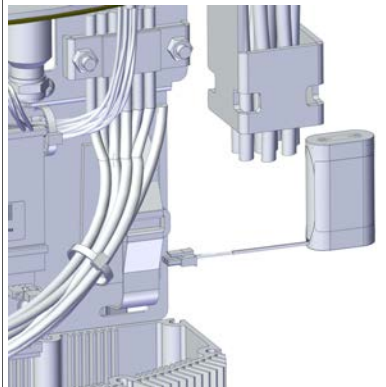
Use this procedure to remove the SMB battery.

Removing the SMB battery

	Action	Note
1	Jog the robot to calibration position.	This is done to facilitate updating of the revolution counter.
2	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
3	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 44.</i>	
4	Remove the SMB cover attachment screws.  CAUTION Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.	 xx2100000843

Continues on next page

4.4.1 Changing the SMB battery *Continued*

	Action	Note
5	Pull the SMB assembly out of the SMB box.	 xx2100000956
6	Carefully pull out the battery and disconnect the battery cable. Battery cable connector R2.G.	 xx2100000957
7	Remove the SMB battery. Battery includes protection circuits. Only replace with a specified spare part or with an ABB-approved equivalent.	

Refitting the SMB battery

Use this procedure to refit the SMB battery.

Refitting the SMB battery

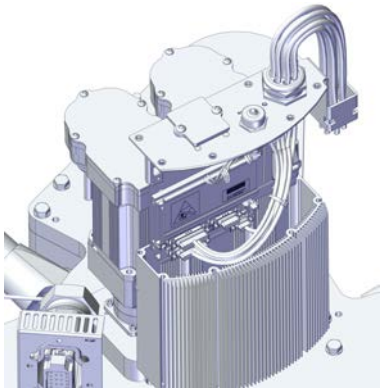
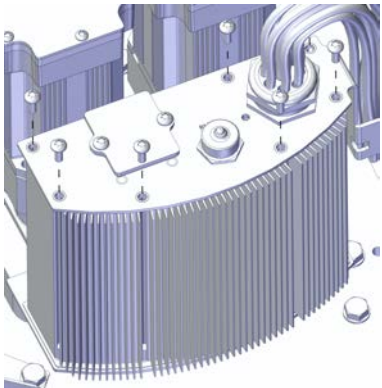
	Action	Note
1	Connect the battery cables and place the battery under the rubber band. Battery cable connector R2.G.	

Continues on next page

4 Maintenance

4.4.1 Changing the SMB battery

Continued

	Action	Note
2	Carefully push down the SMB assembly into the SMB box.	 xx2100000956
3	Fasten the battery cover and sealing, with lubricated screws and washers.  Note Do not overtighten to avoid damaging the sealing.	Tightening torque: 10 Nm  xx2100000843
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 76.	

4.5 Lubrication activities

Lubrication

Motors and gears on the IRB365 are lifetime lubricated and maintenance-free.

4 Maintenance

4.6.1 Cleaning the IRB 365

4.6 Cleaning activities

4.6.1 Cleaning the IRB 365

General

To secure high uptime it is important that the IRB 365 is cleaned regularly. The frequency of cleaning depends on the environment in which the manipulator works. Different cleaning methods are allowed depending on the type of protection of the IRB 365.



Note

Always verify the protection type of the robot before cleaning.



WARNING

Turn off all electrical power supplies to the robot before starting the 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.
- Do not point the water jet at connectors, joints, sealings or gaskets.
- Do not use compressed air to clean the robot.
- Only use detergents that are approved by ABB (or equivalent) to clean the robot.
- Do not remove any covers or other protective devices before cleaning the robot.

Cleaning methods

This following table defines what cleaning methods are allowed for ABB manipulators depending on the protection type.

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water, steam or spray
Standard	Yes	Yes ⁱ .	No	No

ⁱ The robot contains moving mechanical contacts (e.g. seals). Naturally these contacts can release wear particles and minor amounts of grease during their lifetime. Cleaning these areas as part of the normal cleaning routine of the robot is recommended.

5 Repair

5.1 Introduction

Structure of this chapter

This chapter describes repair activities for the IRB 365. 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 365, 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 15](#) before commencing any service work.



CAUTION

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



WARNING

If the IRB 365 is connected to power, always make sure that the controller and IRB 365 are connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C30 Type B*
- [Robot cabling and connection points on page 72.](#)

5.2 Definition of spare part levels

Spare part level

ABB spare parts are categorized into three levels, L1, L2 and L3. Always check the part level before conducting a service work on a spare part.

- L1 spare parts

The L1 parts can be replaced in the field. The maintenance and replacement instructions given in the related product manuals must be strictly followed. If there are any problems, contact your local ABB for support.

- L2 spare parts

To replace the L2 parts require specialized training and might need special tools. Only ABB field service personnel or qualified personnel trained by ABB can replace L2 parts.

- L3 spare parts

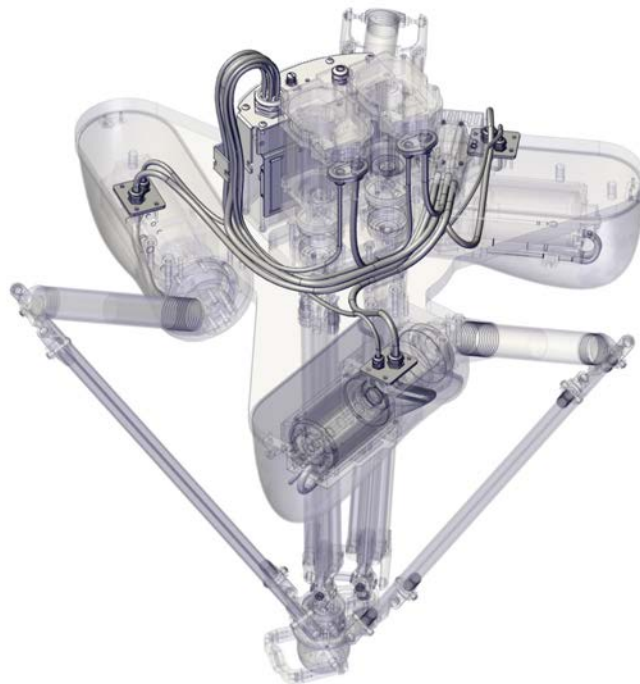
L3 spare parts shall only be replaced or repaired by qualified ABB service technician with knowledge of the application due to reduce risk of injury or damage to equipment. Improper installation may void warranty.

5.3 Base

5.3.1 Replacing the manipulator harness

Location of the manipulator harness

The manipulator harness is located as shown in the figure.



xx2100001811

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Cable harness	3HAC080571-001		L1

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Continues on next page

5 Repair

5.3.1 Replacing the manipulator harness

Continued

Required service parts

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

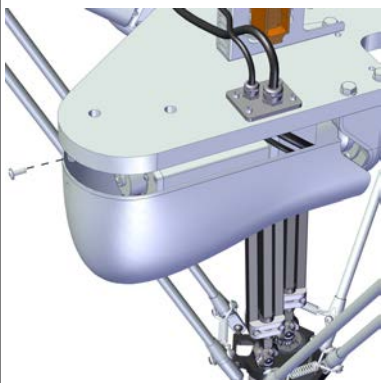
Removing the manipulator harness

Use these procedures to remove the manipulator harness.

Preparations before removing the manipulator harness

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

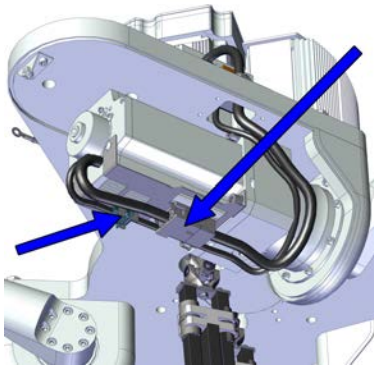
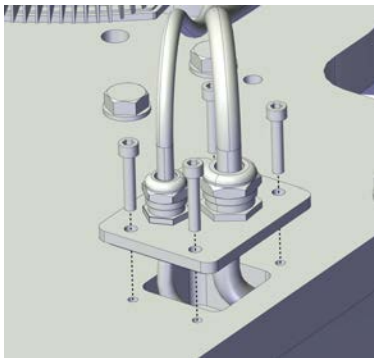
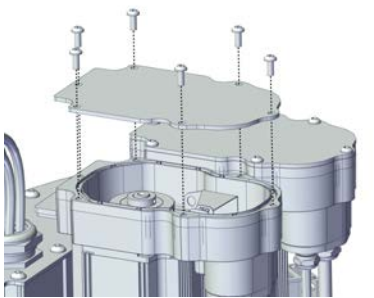
Removing the manipulator harness

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the motor cover axis 1, 2 and 3.	 xx2100000725

Continues on next page

5.3.1 Replacing the manipulator harness

Continued

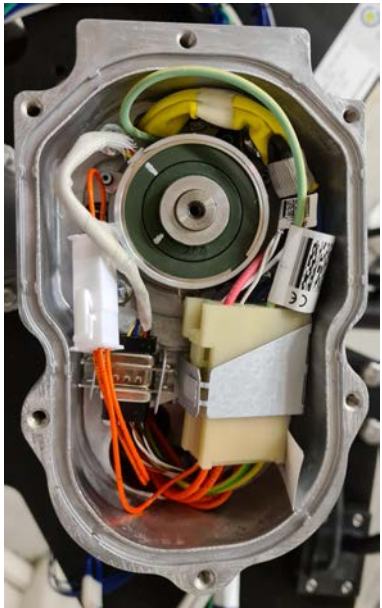
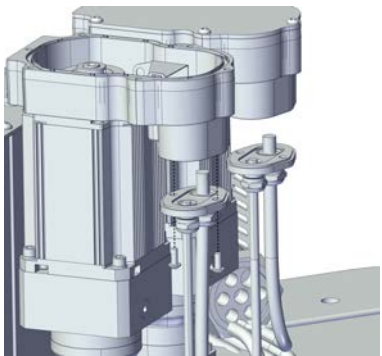
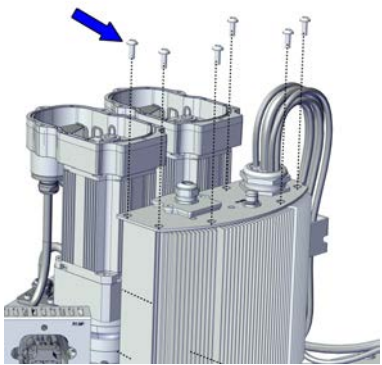
	Action	Note
3	Disconnect the two cable connectors on motor axis 1, 2 and 3.	 xx2100000967
4	Remove the sealing plate by removing the four screws on motor axis 1, 2 and 3.	 xx2100001814
5	Remove motor cover from motor axis 4 and 5.	 xx2100001418

Continues on next page

5 Repair

5.3.1 Replacing the manipulator harness

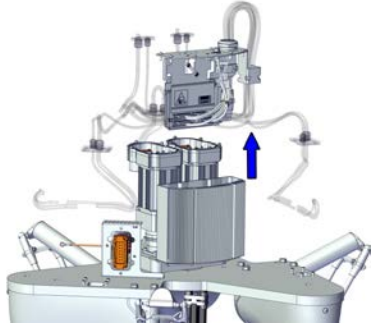
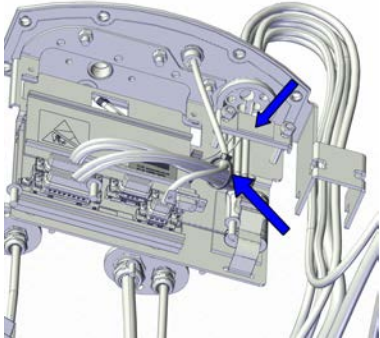
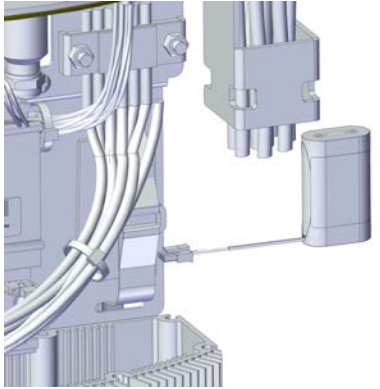
Continued

	Action	Note
6	Disconnect the white connector and the yellow connector on the motor top.	 xx2200000212
7	Remove the two screws and remove the cover with cable glands.	 xx2100001419
8	Remove the attachment screws on the SMB box top cover.	 xx2100002738

Continues on next page

5.3.1 Replacing the manipulator harness

Continued

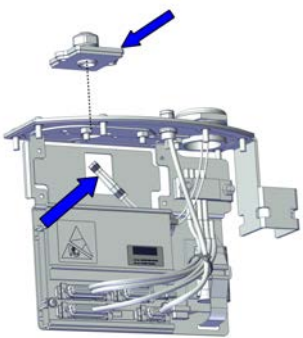
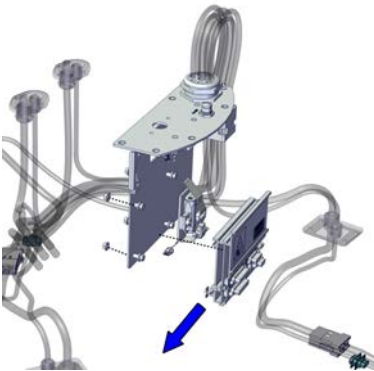
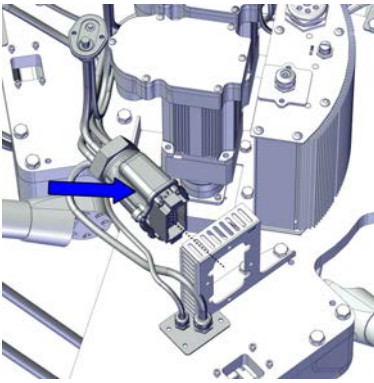
	Action	Note
9	Pull the manipulator harness out of the SMB box.	 xx2100002739
10	 ELECTROSTATIC DISCHARGE (ESD) When handling the computer outside of the controller, use the wrist strap button located on the side of the computer.	
11	Cut cable straps Remove the screen grounding plate	 xx2100001977
12	Carefully pull out the battery and disconnect the battery cable. Battery cable connector R2.G.	 xx2100000957
13	Remove the SMB battery. Battery includes protection circuits. Only replace with a specified spare part or with an ABB-approved equivalent.	

Continues on next page

5 Repair

5.3.1 Replacing the manipulator harness

Continued

	Action	Note
14	Remove the brake release sealing plate on the SMB box top cover. Disconnect the two cables from the brake release sealing plate.	 xx2100002737
15	Loosen the four nuts and slide the SMB unit from the manipulator harness.	 xx2100002740
16	Remove the two screws and remove the connector from the bracket.	 xx2100002806

Refitting the manipulator harness

Use these procedures to refit the cable harness.

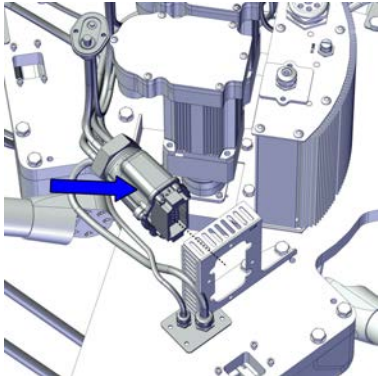
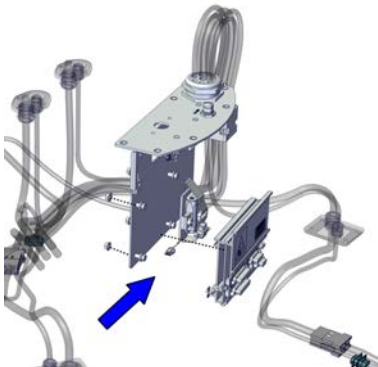
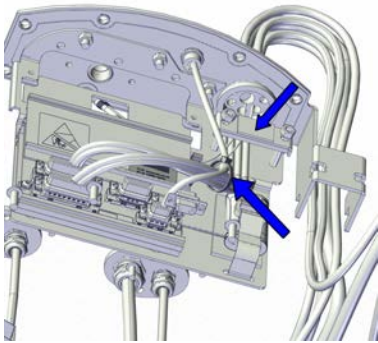
Refitting the manipulator harness

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

Continues on next page

5.3.1 Replacing the manipulator harness

Continued

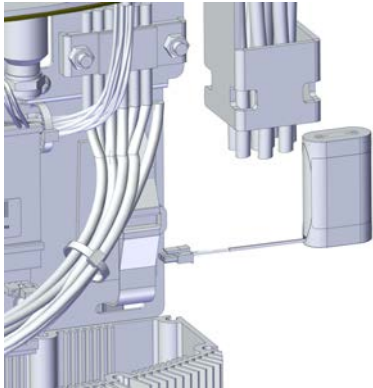
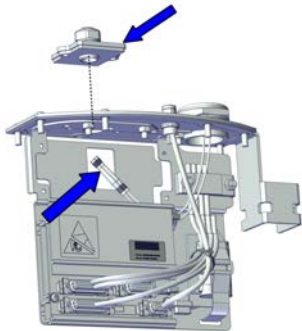
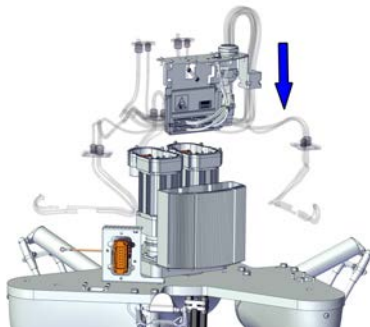
	Action	Note
2	Refit the connector to the bracket and tighten two screws.	Tightening torque: 10 Nm  xx2100002806
3	Refit the SMB-unit on the manipulator harness.	 xx2100002813
4	Connect cable straps and refit the screen grounding plate.	 xx2100001977

Continues on next page

5 Repair

5.3.1 Replacing the manipulator harness

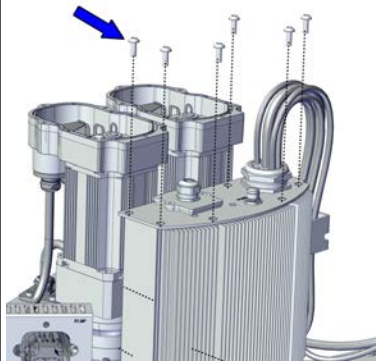
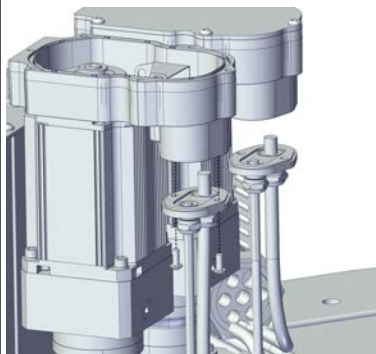
Continued

	Action	Note
5	Connect the battery cables and place the battery under the rubber band. Battery cable connector R2.G.	 xx2100000957
6	Refit the two cables for brake release unit. Add Loctite 5700 thread sealant on the two screws. Refit the brake release sealing plate on the SMB box top cover.	2 Nm  xx2100002737
7	Refit the manipulator harness in the SMB box.	 xx2100002742

Continues on next page

5.3.1 Replacing the manipulator harness

Continued

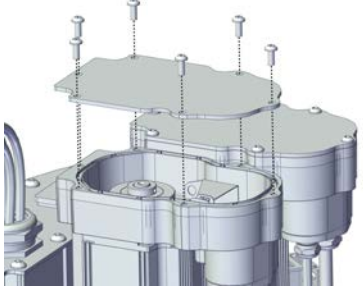
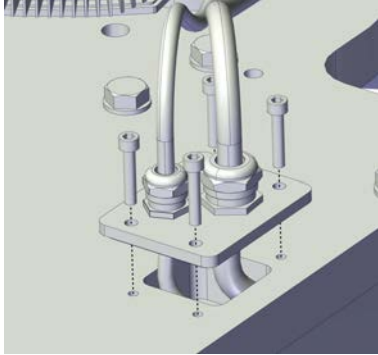
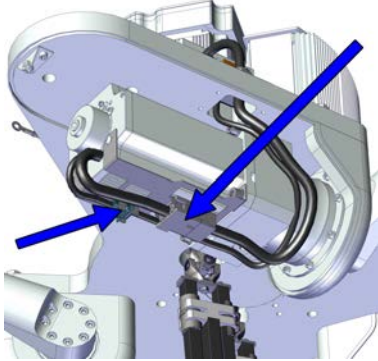
	Action	Note
8	Tighten the attachment screws on the SMB box top cover.	Tightening torque: 10 Nm  xx2100002738
9	Refit the cover with cable glands and tighten two screws.	3.5 Nm  xx2100001419
10	Reconnect the white connector and the yellow connector on the motor top.	 xx2200000212

Continues on next page

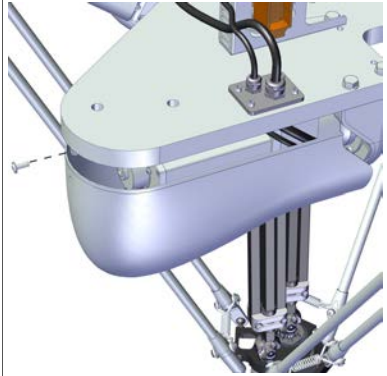
5 Repair

5.3.1 Replacing the manipulator harness

Continued

	Action	Note
11	Refit the motor cover to motor axis 4 and 5.	6 Nm  xx2100001418
12	Route the cables through the hole in the base and tighten four screws in the sealing plate.	3.5 Nm  xx2100001814
13	Reconnect the two cable connectors on motor axis 1, 2 and 3.	 xx2100000967

Continues on next page

	Action	Note
14	Refit the motor cover axis 1, 2 and 3.	Tightening torque: 2 Nm  xx2100000725

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76 .	

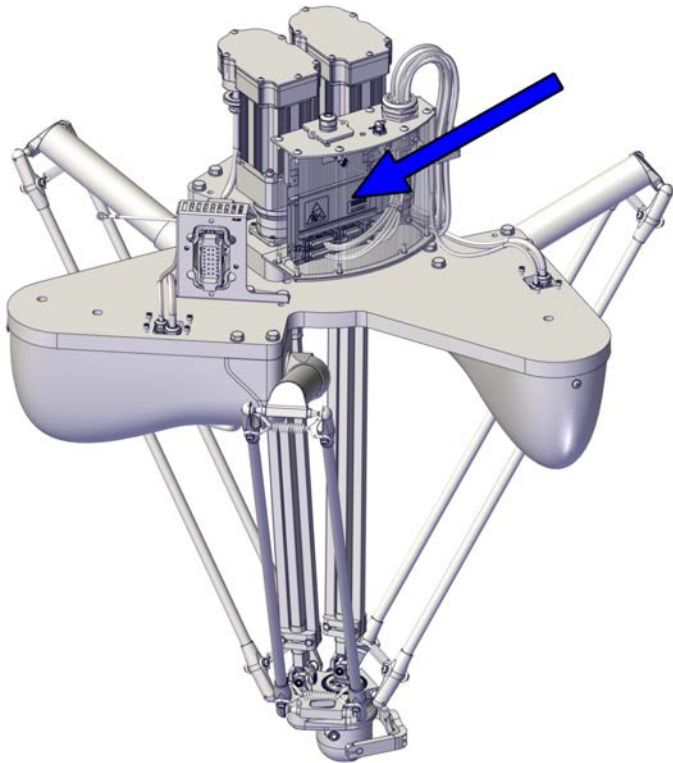
5 Repair

5.3.2 Replacing the SMB unit

5.3.2 Replacing the SMB unit

Location of the SMB unit

The SMB unit is located as shown in the figure.



xx2100001812

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
SMB unit	3HAC044168-001		

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Continues on next page

Required service parts

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

Removing the SMB unit

Use these procedures to remove the SMB unit.

Preparations before removing the SMB unit

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the SMB unit

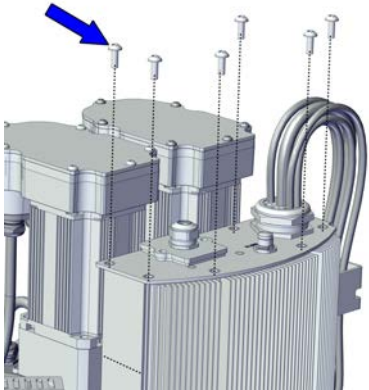
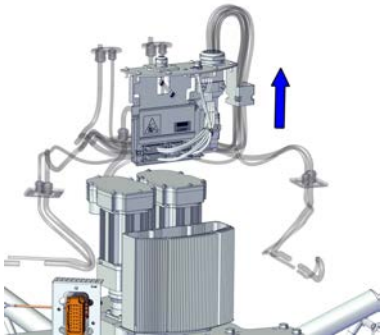
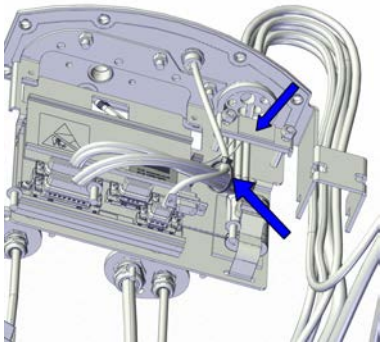
	Action	Note
1	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	 ELECTROSTATIC DISCHARGE (ESD) When handling the computer outside of the controller, use the wrist strap button located on the side of the computer.	

Continues on next page

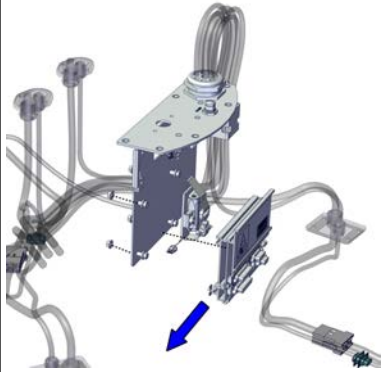
5 Repair

5.3.2 Replacing the SMB unit

Continued

	Action	Note
3	Remove the attachment screws on the SMB box top cover.	 xx2100002751
4	Pull the SMB board out of the SMB box and disconnect the cable connectors.	 xx2100002750
5	Cut cable straps and remove the screen grounding plate disconnect cable harness.	 xx2100001977
6	Disconnect the battery cable Battery cable connector R2.G.	

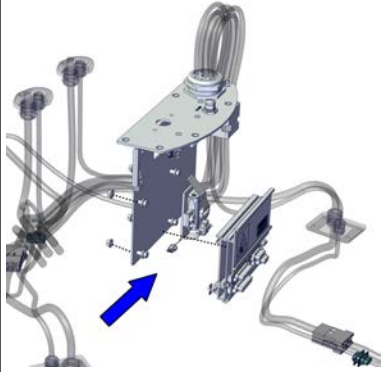
Continues on next page

	Action	Note
7	Loosen the 4 nuts and slide the SMB unit of the bracket.	 xx2100002740

Refitting the SMB unit

Use these procedures to refit the SMB unit.

Refitting the SMB unit

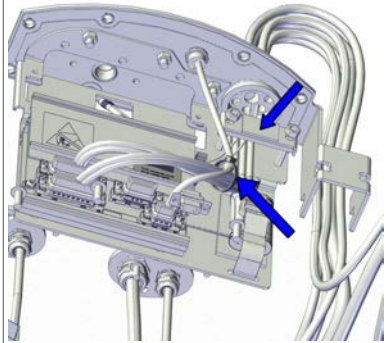
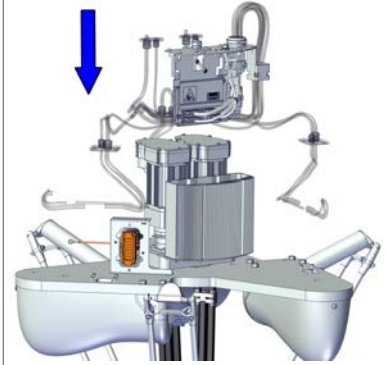
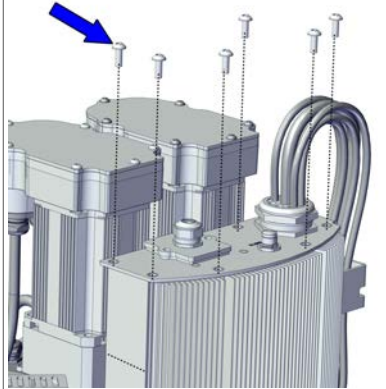
	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) When handling the computer outside of the controller, use the wrist strap button located on the side of the computer.	
2	Fit the new SMB unit on the bracket and tighten 4 nuts.	Tightening torque: 3 Nm  xx2100002813

Continues on next page

5 Repair

5.3.2 Replacing the SMB unit

Continued

	Action	Note
3	Connect cable harness connectors and fit cable straps and the screen grounding plate.	 xx2100001977
4	Connect the battery cables Battery cable connector R2.G.	
5	Push the SMB board in to the SMB box.	 xx2100002749
6	Tighten the attachment screws on the SMB box top cover.	Tighten torque: 10 Nm  xx2100002751

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .

Continues on next page

	Action	Note
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76 .	

5 Repair

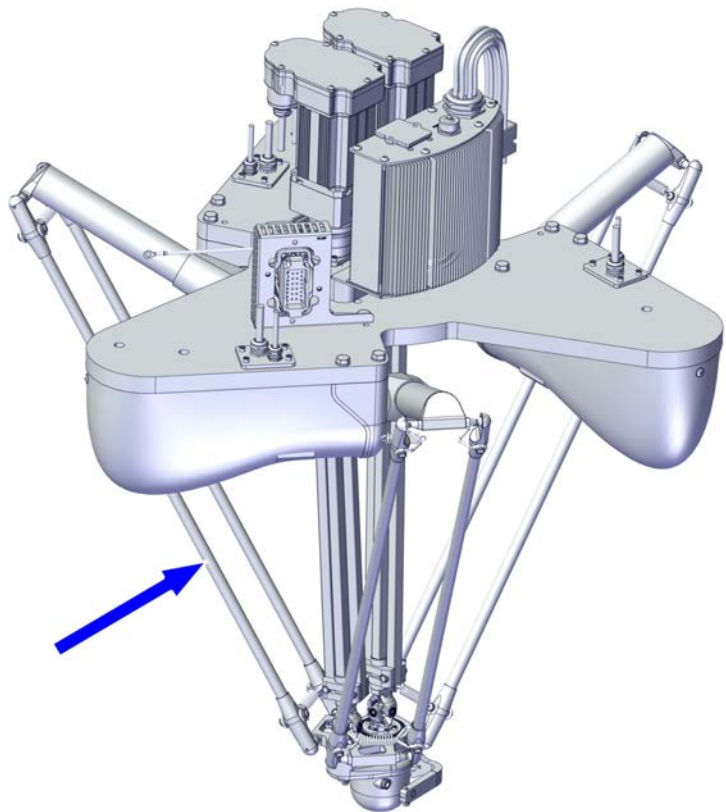
5.4.1 Replacing the lower arms

5.4 Upper and lower arms

5.4.1 Replacing the lower arms

Location of the lower arms

The lower arms are located as shown in the figure.



xx2100000719

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Lower arm	IRB 365-1.5/800: 3HAC084339-001		L1
	IRB 365 1.5/1100: 3HAC079965-001		
	IRB 365-1.5/1300: 3HAC084334-001		
Ball joint	3HAC079978-001		L1

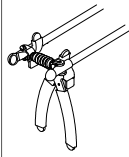
Continues on next page

Service parts

Following parts are affected during the replacement procedure. Replace if damaged or lost.

Spare part	Article number	Note
Ball bearing cup	3HAC079967-001	
Parallel arm spring	3HAC079966-001	
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Required tools and equipment

Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Removing the lower arms

Use these procedures to remove the lower arms.

Preparations before removing the lower arms

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity. Do not move the position of the upper arms during lower arms replacement.	
2	 CAUTION Turn off all supplies for electrical power to the robot, before starting the repair work.	
3	trueRemove any loads or tools attached to the tilt arm. falseRemove any loads or tools attached to the turning disc.	

Removing the lower arm

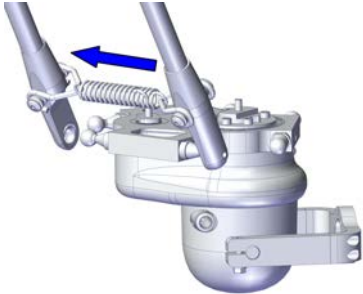
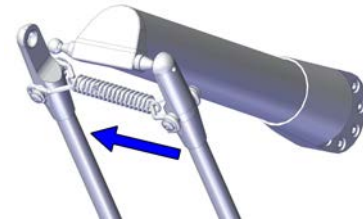
	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	

Continues on next page

5 Repair

5.4.1 Replacing the lower arms

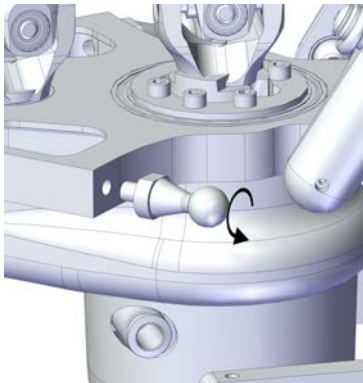
Continued

	Action	Note
2	Remove the lower end of the lower arm from the delta unit with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000722
3	Remove the upper end of the lower arm from the upper arm with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000721
4	Remove the lower arm.	

Replacing ball joint

Use these procedures to replace the ball joint.

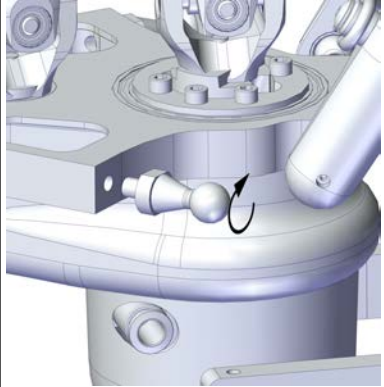
Replacing ball joint

	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Unscrew the ball joint counter clockwise.	 xx2100000781

Continues on next page

5.4.1 Replacing the lower arms

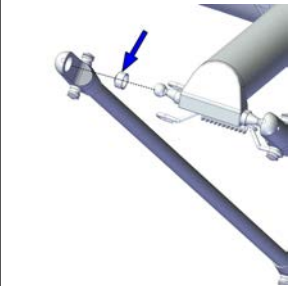
Continued

	Action	Note
3	Add locking liquid to the ball joint. Screw the ball joint clockwise into position.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 12 Nm  xx2100000782

Replacing ball bearing cup

Use these procedures to replace the ball bearing cup.

Replacing ball bearing cup

	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Place the air nozzle in the center of the cup over the hole in the cup and push the cup out with compressed air.	 xx2200000415
3	Replace with a new cup, press it in until you hear a click and the cup is leveled with the cupholder.	 xx2200000417

Refitting the lower arms

Use these procedures to refit the lower arms.

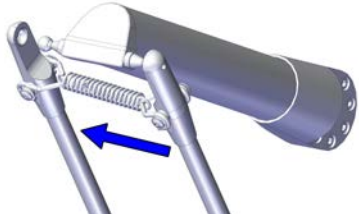
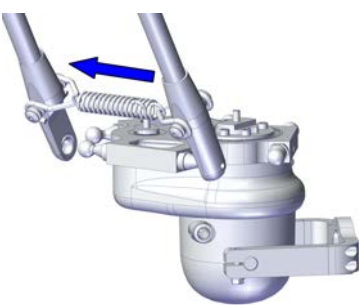
Continues on next page

5 Repair

5.4.1 Replacing the lower arms

Continued

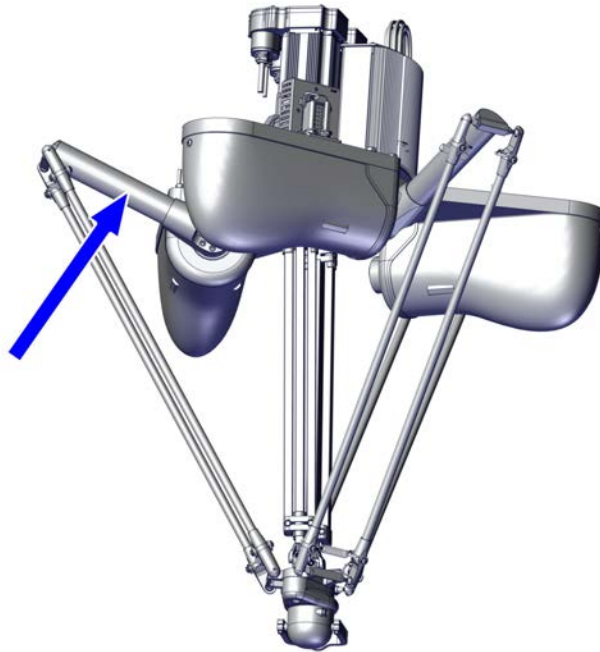
Refitting the lower arm

	Action	Note
1	Refit the lower arm to the upper arm with pliers.  Note Use the pliers either on the left side or the right side of the lower end on the lower arm.  Note Be careful and do not damage the ball bearing cups.	 xx2100000721
2	Repeat the procedure in the lower end of all lower arms and on the delta unit.	 xx2100000722
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 76.	

5.4.2 Replacing the upper arms

Location of the upper arm

The upper arm is located as shown in the figure.



xx2100000720

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 365 via ABB Robotics One, <https://one.robots.ics.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Upper arm	IRB 365-1.5/800 and IRB 365 1.5/1100: 3HAC079964-001 IRB 365-1.5/1300: 3HAC084333-001		L1

Service parts

Following parts are affected during the replacement procedure. Replace if damaged or lost.

Spare part	Article number	Note
Ball bearing cup	3HAC079967-001	

Continues on next page

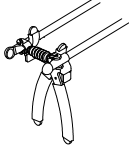
5 Repair

5.4.2 Replacing the upper arms

Continued

Spare part	Article number	Note
Parallel arm spring	3HAC079966-001	
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Required tools and equipment

Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Removing the upper arm

Use these procedures to remove the upper arm.

Preparations before removing the upper arm

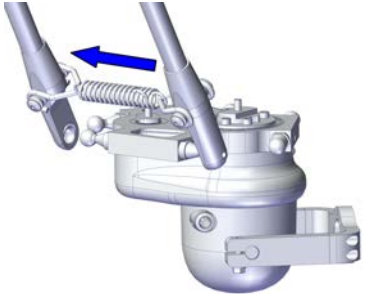
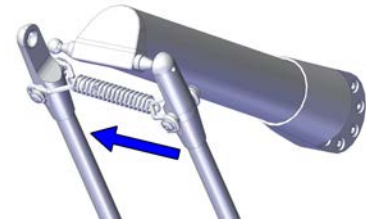
	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

Removing the lower arm

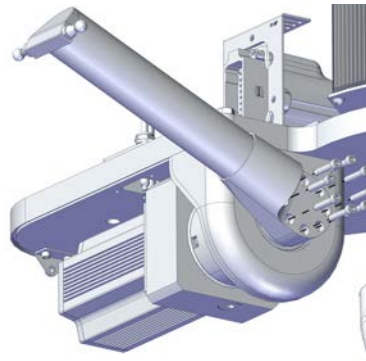
	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	

Continues on next page

5.4.2 Replacing the upper arms Continued

	Action	Note
2	Remove the lower end of the lower arm from the delta unit with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000722
3	Remove the upper end of the lower arm from the upper arm with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000721
4	Remove the lower arm.	

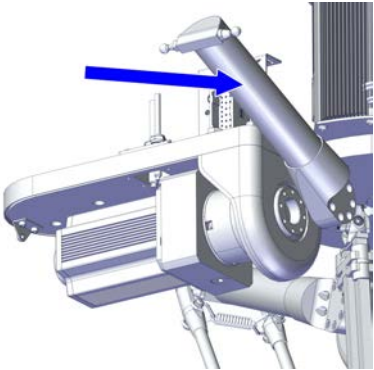
Removing the upper arm

	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Remove the 8 attachment screws holding the upper arm in the base unit.	 xx2100000726

Continues on next page

5 Repair

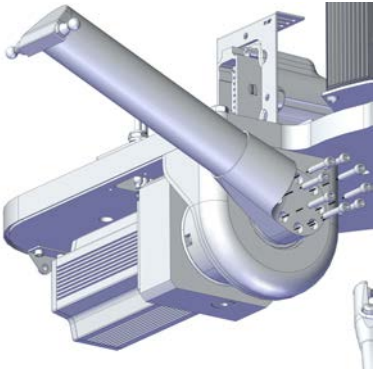
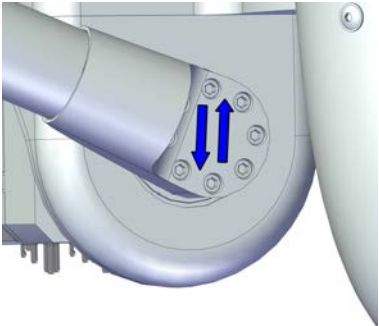
5.4.2 Replacing the upper arms
Continued

	Action	Note
3	Remove the upper arm from the base unit.	 xx2100000727

Refitting the upper arm

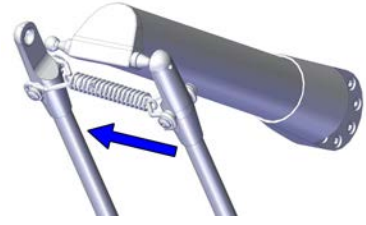
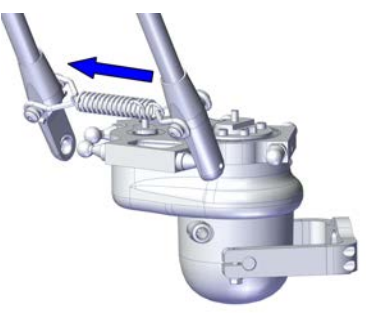
Use these procedures to refit the upper arm.

Refitting the upper arm

	Action	Note
1	Add locking liquid to all screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
2	Fit the upper arm to the base unit.	 xx2100000726
3	Refit the 8 attachment screws opposite each other.	Tightening torque: 16 Nm.  xx2100002383

Continues on next page

Refitting the lower arm

	Action	Note
1	Refit the lower arm to the upper arm with pliers.  Note Use the pliers either on the left side or the right side of the lower end on the lower arm.  Note Be careful and do not damage the ball bearing cups.	 xx2100000721
2	Repeat the procedure in the lower end of all lower arms and on the delta unit.	 xx2100000722
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 76.	

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76.	

5 Repair

5.4.3 Replacing the telescopic shafts and shaft components

5.4.3 Replacing the telescopic shafts and shaft components

Introduction

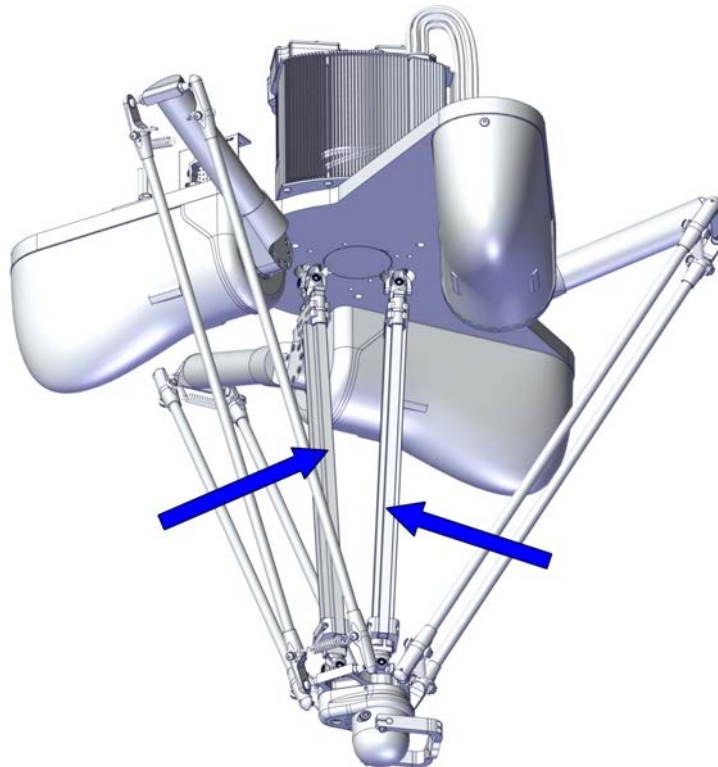
The replacement is separated in two sections.

- [Replacing the telescopic shafts on page 131](#)
- [Replacing the telescopic shaft components on page 138](#)

Location of the telescopic shafts

The telescopic shafts are located as shown in the figure.

The figure shows a 5-axis IRB 365.



xx2100000730

Continues on next page

5.4.3.1 Replacing the telescopic shafts

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Telescope unit	IRB 365-1.5/800: 3HAC084342-001 IRB 365 1.5/1100: 3HAC079972-001 IRB 365-1.5/1300: 3HAC084336-001		L1

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Required service parts

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

Removing the telescopic shaft

Use these procedures to remove the telescopic shaft.

Preparations before removing the telescopic shaft

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity. Do not move the position of the upper arms during rotation axis replacement.	
2	 WARNING Turn off all: - hydraulic pressure supply - air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

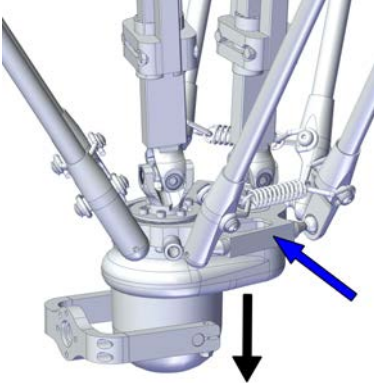
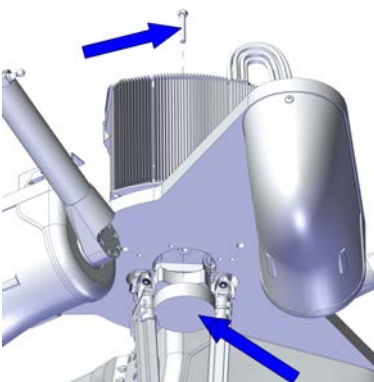
Continues on next page

5 Repair

5.4.3.1 Replacing the telescopic shafts

Continued

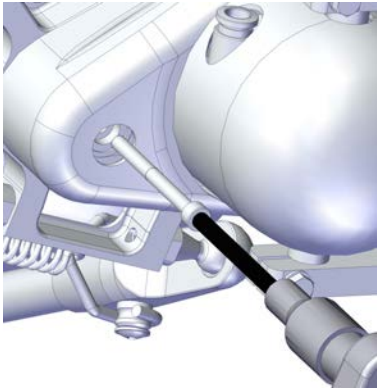
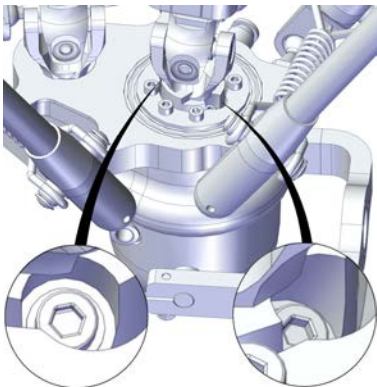
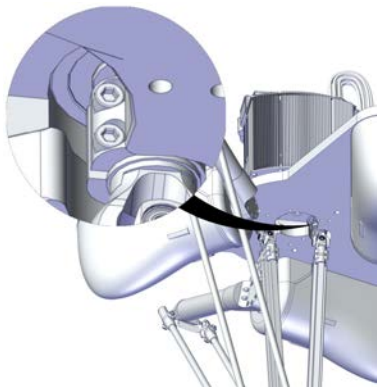
Removing the telescopic shaft

	Action	Note
1	 WARNING Make sure that all supplies for hydraulic pressure and air pressure are turned off.	
2	Push the brake release button and press the delta plate with head downwards to extend the two telescopic shafts.  Note Make sure not to over extend the length of telescope shafts due to slide bearing damage	 xx2100000747
3	 WARNING Turn off all: • electric power supply	
4	Remove the center base cover.	 xx2100000732

Continues on next page

5.4.3.1 Replacing the telescopic shafts

Continued

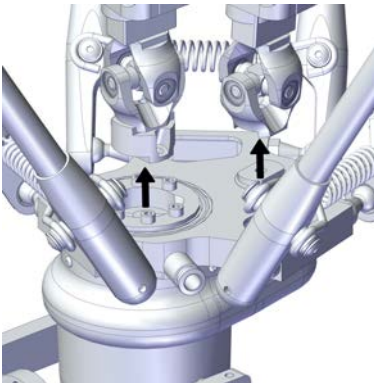
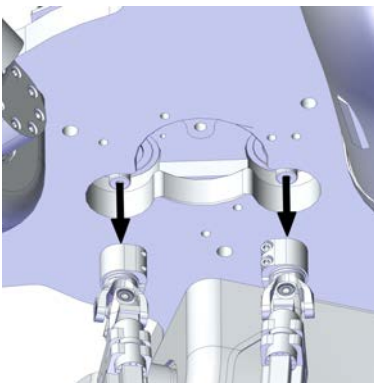
	Action	Note
5	Remove the attachment screw for telescopic shaft (axis-4).	 xx2100000735
6	Remove the two attachment screws with washers for telescopic shaft (axis-5).	 xx2100000736
7	Loosen the two attachment screws on the mounting clamp in the upper end of the telescopic shaft.	 xx2100000729

Continues on next page

5 Repair

5.4.3.1 Replacing the telescopic shafts

Continued

	Action	Note
8	Push the telescopic shaft together.  Note Use light force with mallet if necessary	 xx2100000749
9	Remove the telescopic shaft for axis-4 and -5.	 xx2100000733
10	Loosen the attachment screw, and remove the conical connection from the telescopic shaft for axis-5.	 xx2100000751

Refitting the telescopic shaft

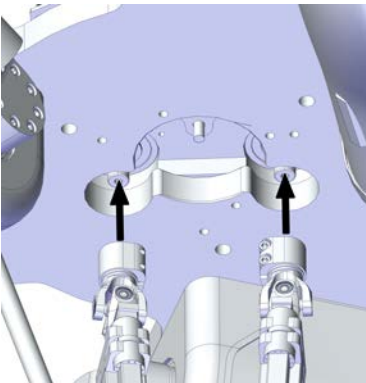
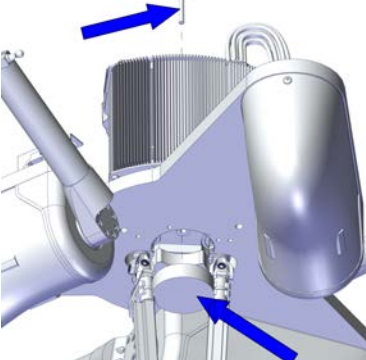
Use these procedures to refit the rotation axis.

Refitting the telescopic shaft

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

Continues on next page

5.4.3.1 Replacing the telescopic shafts *Continued*

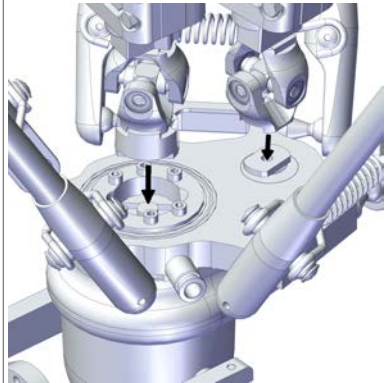
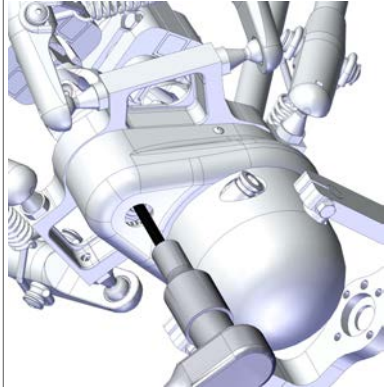
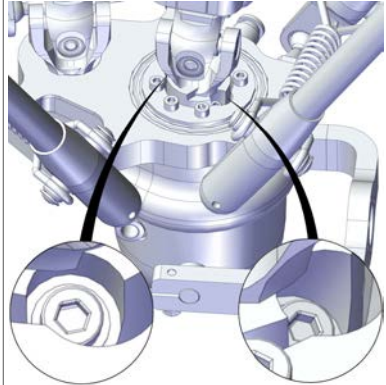
	Action	Note
2	Move the conical connection over to the telescopic shaft axis-5. Add Loctite 638 on the conical surfaces and locking liquid on the threads	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 10 Nm  xx2100000751
3	Refit the two telescopic shafts on motor axis-4 and -5.	 xx2100000750
4	Tighten mounting clamping screws.	Tightening torque: 10 Nm
5	Refit the center base cover.	 xx2100000732

Continues on next page

5 Repair

5.4.3.1 Replacing the telescopic shafts

Continued

	Action	Note
6	Pull out the telescopic shaft and fit the conical coupling into the corresponding coupling on the delta plate Add Loctite 638 on the conical surfaces and locking liquid on the threads	10 Nm  xx2100000752
7	Refit the attachment screw for telescopic shaft and tighten (axis-4). Add Loctite 638 on the conical surfaces and locking liquid on the threads	Tightening torque: 10 Nm  xx2100000748
8	Refit the two attachment screws for telescopic shaft and tighten (axis-5). Add Loctite 638 on the conical surfaces and locking liquid on the threads	Tightening torque: 1.6 Nm  xx2100000736
9	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76.	

Continues on next page

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76 .	

5 Repair

5.4.3.2 Replacing the telescopic shaft components

5.4.3.2 Replacing the telescopic shaft components

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 365 via ABB Robotics One, <https://one.robotics.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Universal joint	3HAC080342-001		L1
Slide bearing	3HAC079975-001		L1

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Required consumables

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

Replacing telescopic shaft parts

The following procedure describes how to disassemble the entire telescopic shaft. The individual components are replaced if they are damaged.

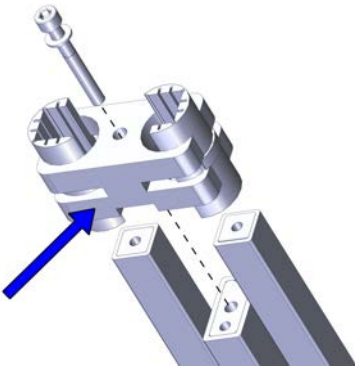
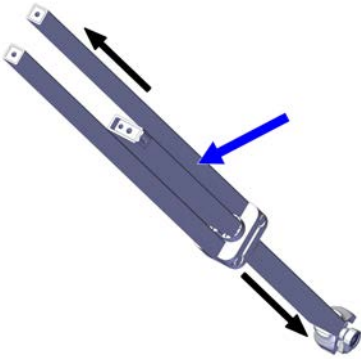
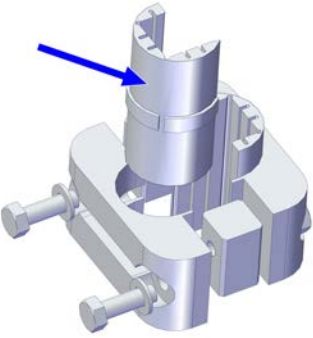
Disassemble the telescopic shaft

	Action	Note
1	Loosen the two attachment screws and remove the universal joint with mounting clamp.	 xx2100000753

Continues on next page

5.4.3.2 Replacing the telescopic shaft components

Continued

	Action	Note
2	Remove the attachment screw, and pull off the telescope bearing housing.	 xx2100000754
3	Pull the upper and lower part of the telescopic arm apart.	 xx2100000755
4	Loosen the two attachment screws on the telescope bearing housing, and pull the slide bearing out and replace.	 xx2100000760

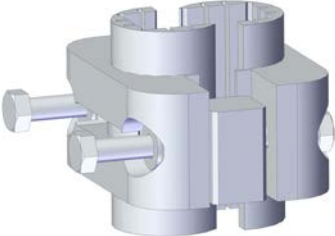
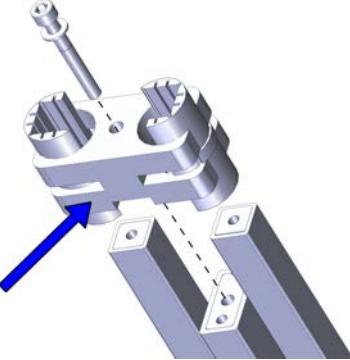
Continues on next page

5 Repair

5.4.3.2 Replacing the telescopic shaft components

Continued

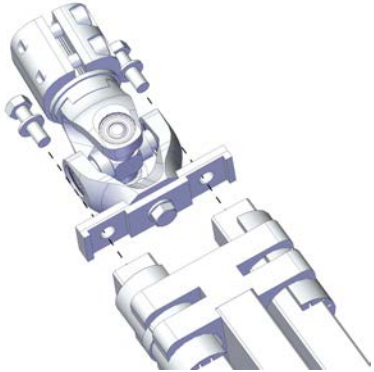
Assembling the telescopic shaft

	Action	Note
1	Add locking liquid on the screws. Tighten the two attachment screws on the telescope bearing housing.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 10 Nm  xx2100000773
2	Push the upper and lower part of the telescopic arm together.	 xx2100000762
3	Add locking liquid on the screws. Fit the telescopic bearing housing and tighten the attachment screw.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 10 Nm  xx2100000754

Continues on next page

5.4.3.2 Replacing the telescopic shaft components

Continued

	Action	Note
4	Add locking liquid on the screws. Fit the universal joint with mounting clamp to telescopic shaft with the two attachment screws, and tighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 10 Nm  xx2100000753

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76.	

5 Repair

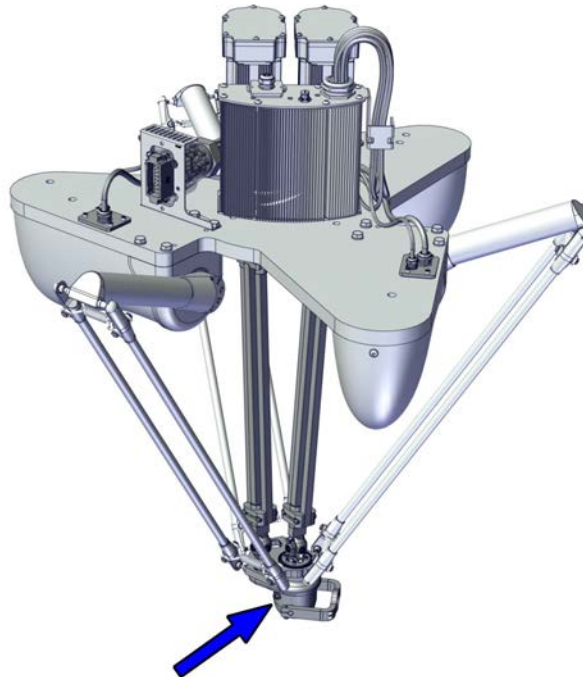
5.4.4 Replacing the delta unit

5.4.4 Replacing the delta unit

Location of the delta unit

The delta unit is located as shown in the figure.

The figure shows a 5-axis IRB 365.



xx2200000124

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

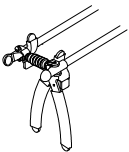
Spare part	Article number	Note	Level
Delta unit, with telescope	3HAC080024-001		L1

Required service parts

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

Continues on next page

Required tools and equipment

Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Removing the delta unit

Use these procedures to remove the delta unit.

Preparations before removing the delta unit

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity. Do not move the position of the upper arms during parallel arm replacement.	
2	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm.	

Removing the lower arm

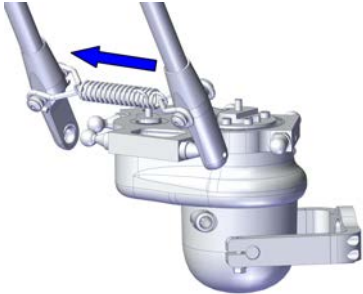
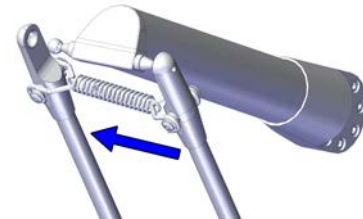
	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	

Continues on next page

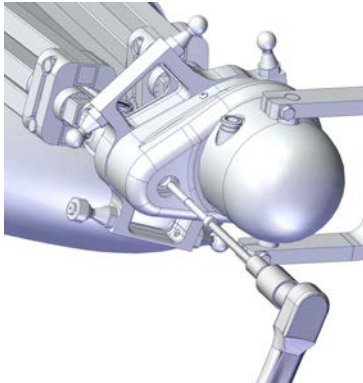
5 Repair

5.4.4 Replacing the delta unit

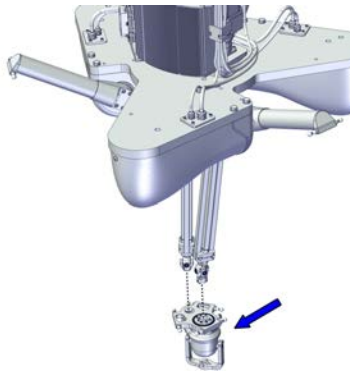
Continued

	Action	Note
2	Remove the lower end of the lower arm from the delta unit with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000722
3	Remove the upper end of the lower arm from the upper arm with pliers.  Note Use the pliers on either the left side or the right side. Do not use the pliers on both sides at the same time.	 xx2100000721
4	Remove the lower arm.	

Removing the delta unit

	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Place a hand to support the weight of the delta unit from below.	
3	Remove the attachment screw for telescopic shaft (axis 4).	 xx2200000208

Continues on next page

	Action	Note
4	Remove the two attachment screws with washers for telescopic shaft (axis 5).	 xx2100000770
5	Remove the delta unit from the telescopic shafts.  Note Use light force with mallet if necessary.	 xx2200000206

Refitting the delta unit

Use these procedures to refit the delta unit.

Refitting the delta unit

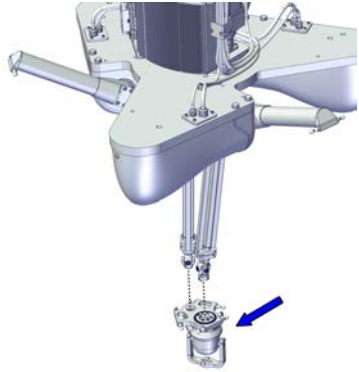
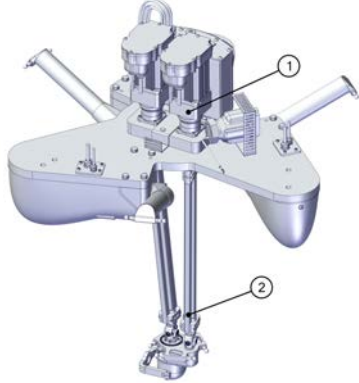
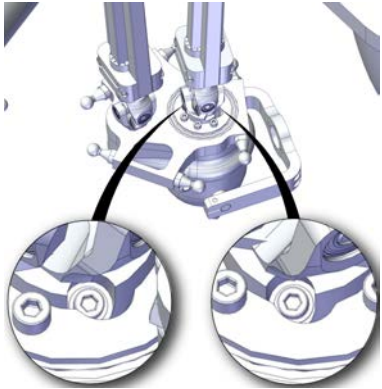
	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	

Continues on next page

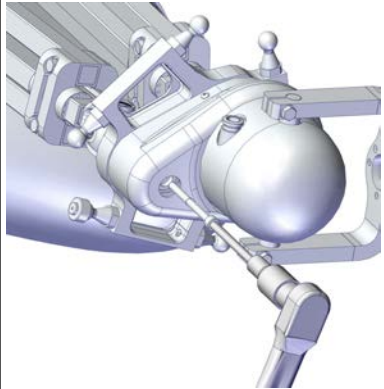
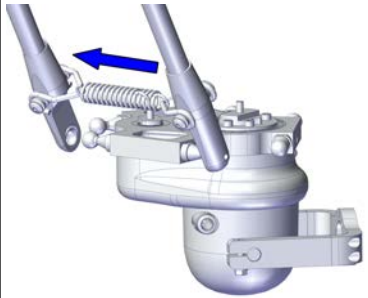
5 Repair

5.4.4 Replacing the delta unit

Continued

	Action	Note
2	Refit delta unit to the telescopic shafts for axis four and axis five.	 xx2200000206
3	 Note Make sure that the telescopic shaft is mounted between the motor shaft 4 and the attachment point for telescopic shaft axis 4 on the delta unit.  Note Do not tighten the mounting clamps screws before refitting the parallel arms.	 xx2100000772
4	Refit the two attachment screws with washers for telescopic shaft (axis 5).	Tightening torque: 1.6 Nm  xx2100000770

Continues on next page

	Action	Note
5	Apply locking liquid, and tighten the attachment screw axis 4.	Tightening torque: 10 Nm  xx2200000208
6	Fit the lower arms to the delta unit by using the pliers, either on the left side or the right side, not both.	 xx2100000722

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76 .	

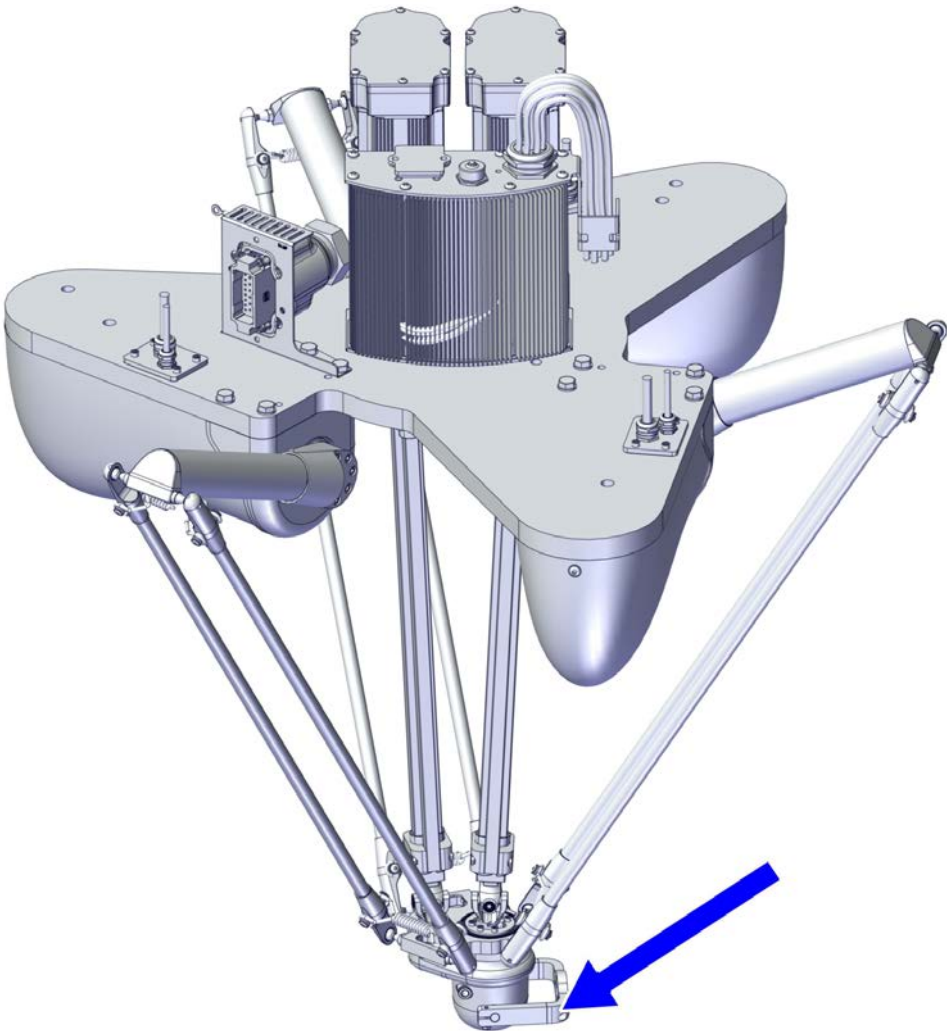
5 Repair

5.4.5 Replacing the tilt arm

5.4.5 Replacing the tilt arm

Location of the tilt arm

The tilt arm is located as shown in the figure.



xx2100000774

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 365 via ABB Robotics One, <https://one.robotics.abb.com/en/knowledge-hub>.

Spare part	Article number	Note	Level
Tilt arm stool	3HAC079970-001		L2
Tilt arm parts	3HAC079969-001		L2

Continues on next page

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

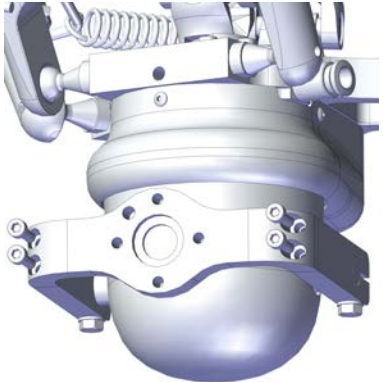
Removing the tilt arm

Use these procedures to remove the tilt arm.

Preparations before removing the tilt arm

	Action	Note
1	Jog the robot to an appropriate working position.	
2	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the tilt arm

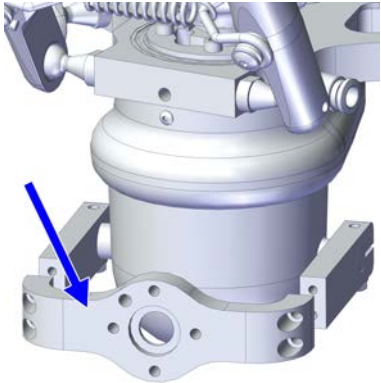
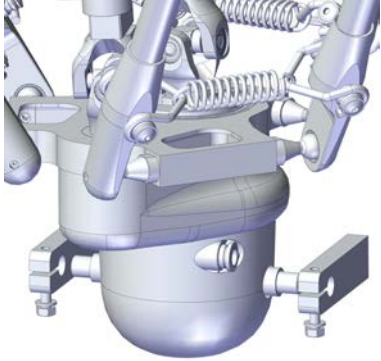
	Action	Note
1	 CAUTION Make sure that all supplies for electrical power are turned off.	
2	Remove the tilt stool attachment screws.	 xx2100000776

Continues on next page

5 Repair

5.4.5 Replacing the tilt arm

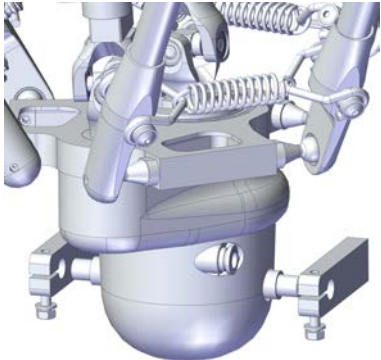
Continued

	Action	Note
3	Remove the tilt stool.	 xx2100000777
4	Loosen the attachment screws, and remove the tilt arm parts from the through shaft.	 xx2100000778

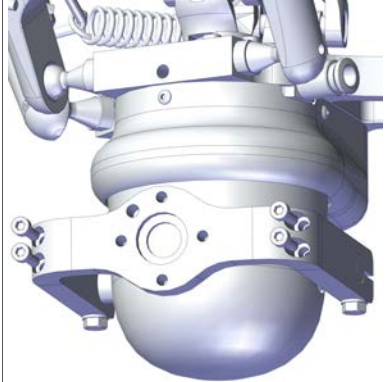
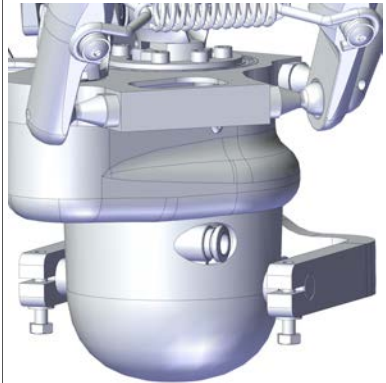
Refitting the tilt arm

Use these procedures to refit the tilt arm.

Refitting the tilt arm

	Action	Note
1	Fit the both tilt arm parts on the through shaft.	 xx2100000778

Continues on next page

	Action	Note
2	Add locking liquid to all screws. Fit the tilt stool to the tilt arm parts, and tighten the attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 3.5 Nm.  xx2100000776
3	Add locking liquid to all screws. Tighten the tilt arm part attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 7 Nm.  xx2100000780

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration information on page 197 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 76 .	

5 Repair

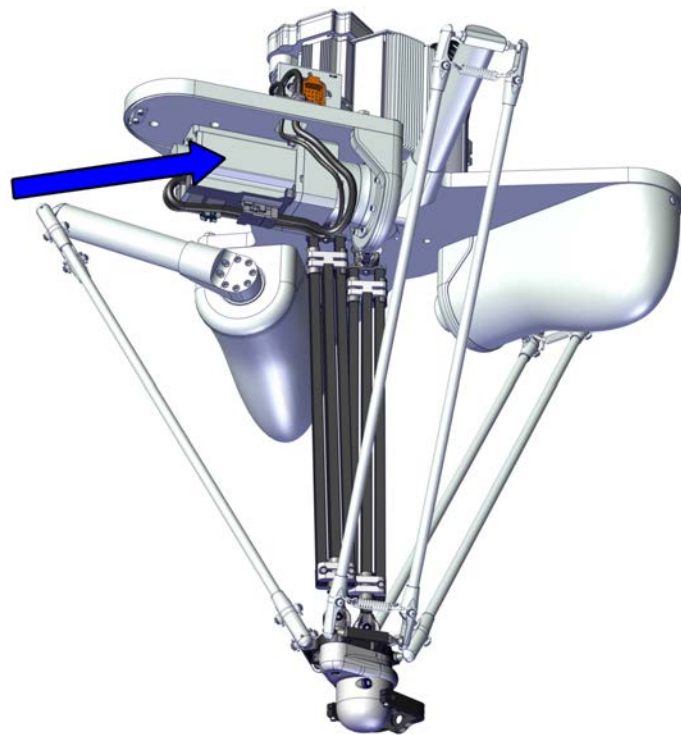
5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

5.5 Motors and gears

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Location of the motor

The motor is located as shown in the figure.



xx2100000966

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note
Rot AC Motor M105.1 w. adapter	3HAC079982-001	

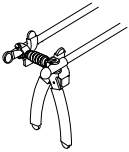
Required tools and equipment

Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	

Continues on next page

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

Equipment	Article number	Note	Image
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Required service parts

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

Removing the motor

Use these procedures to remove the motor.

Preparations before removing the motor

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

Removing the motor

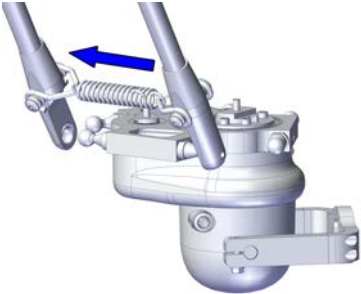
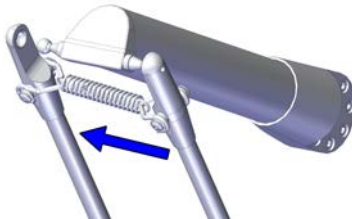
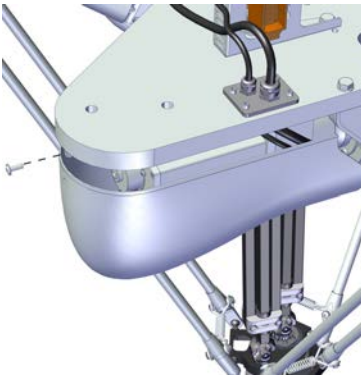
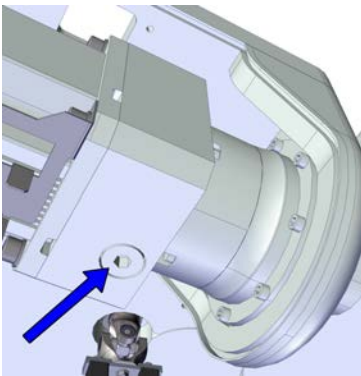
	Action	Note
1	 WARNING Make sure that all supplies for hydraulic pressure and air pressure are turned off.	
2	 WARNING To secure no accidental movement and engagement of drive power, set robot into manual mode and also engage the emergency stop on the FlexPendant.	

Continues on next page

5 Repair

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

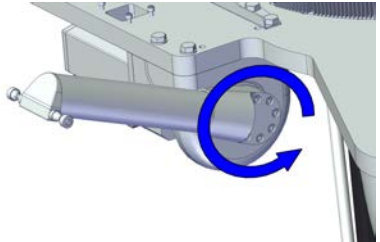
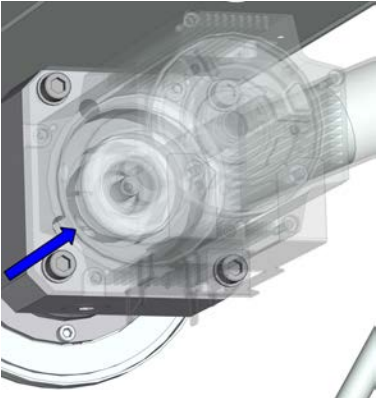
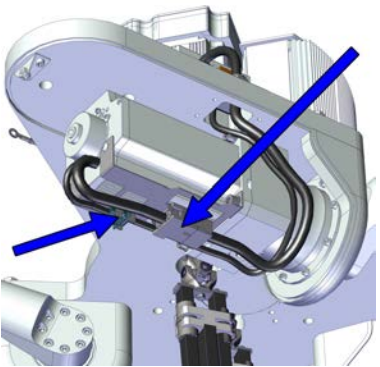
Continued

	Action	Note
3	Remove the lower end of the lower arms from the delta unit by using the pliers, either on the left side or the right side, not both.	 xx2100000722
4	Remove the upper end of the lower arms from the upper arm by using the pliers, either on the left side or the right side, not both.	 xx2100000721
5	Remove the parallel arms.	
6	Remove motor cover and screw.	 xx2100000725
7	Remove the protection plug in adapter plate.	 xx2100000969
8	Look into the hole in adapter plate.	

Continues on next page

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

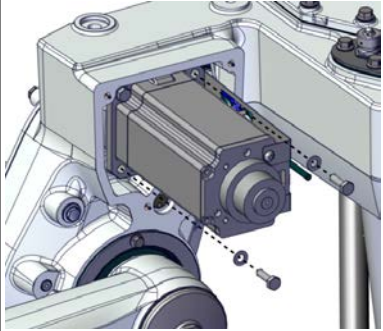
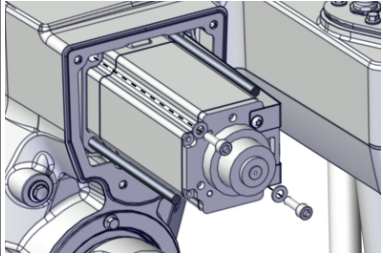
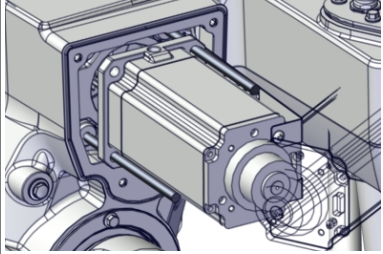
	Action	Note
9	Push the brake release button to release upper arm. Rotate upper arm to align the hex cap screw to the hole in adapter plate.	 xx2100002381
10	Loosen the hex cap screw for motor shaft.	 xx2100002382
11	 WARNING Turn off all: • electric power supply	
12	Disconnect the two cable connectors on motor.	 xx2100000967

Continues on next page

5 Repair

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

	Action	Note
13	Remove two of the screws and washers securing the motor.	 xx1900000760
14	Fasten two guide pins.  Tip Lubricate the guide pins with some grease to make the motor slide better.	 xx1900001835
15	Remove the two remaining screws and washers.	
16	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
17	Remove the motor including the bracket by sliding it out on the guide pins and lift it off.	 xx1900001834

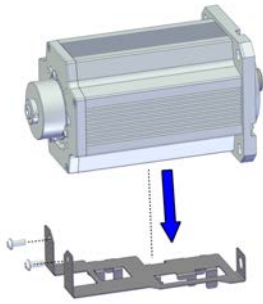
Continues on next page

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

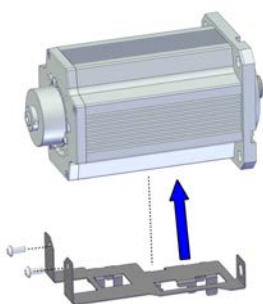
Removing the bracket from the motor

Removing bracket

	Action	Note
1	Loosen the two screws in the front.	 xx2100002680

Refitting the bracket on the motor

Refitting bracket

	Action	Note
1	Refit the two attachment screws in the front.	Tightening torque: 12 Nm  xx2100002681

Refitting the motor

Use these procedures to refit the motor axis-1-3

Refitting the motor

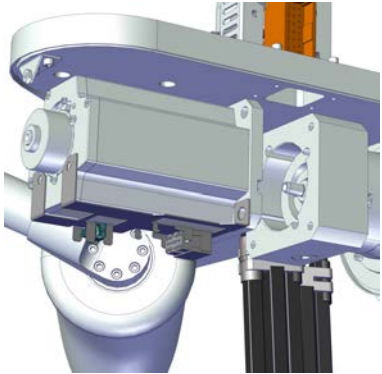
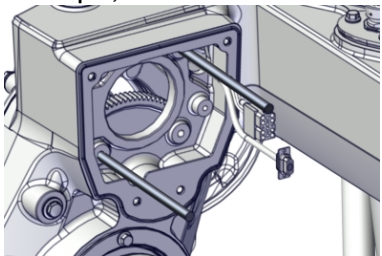
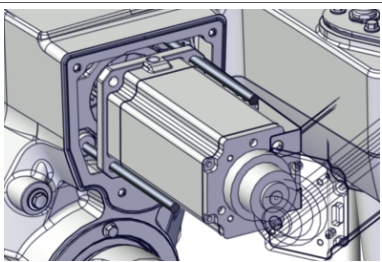
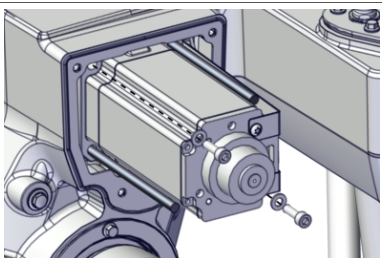
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

5 Repair

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

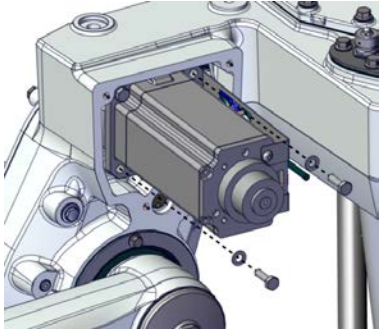
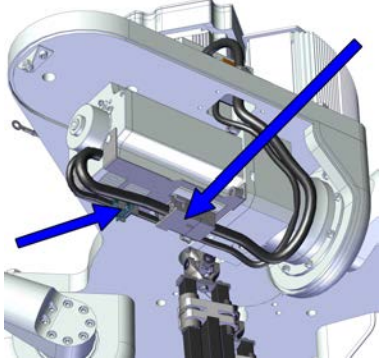
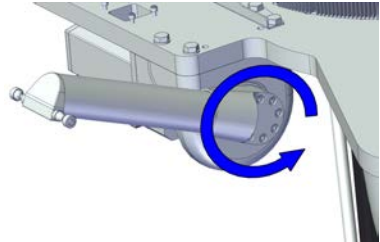
Continued

	Action	Note
2	 Note Clean the mating surface with isopropanol.	
3	Refit the motor including the bracket.	 xx2100000970
4	If not already fitted, fasten two guide pins to opposite screw holes.  Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M8x150: 3HAC15520-2  xx1900001836
5	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
6	Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.  Note Clean the mating surface with isopropanol.	 xx1900001834
7	Fit the attachment screws and washers. Tighten by hand. Do not tighten with a torque yet.	 xx1900001835

Continues on next page

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

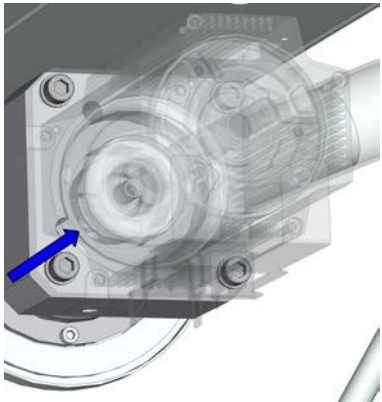
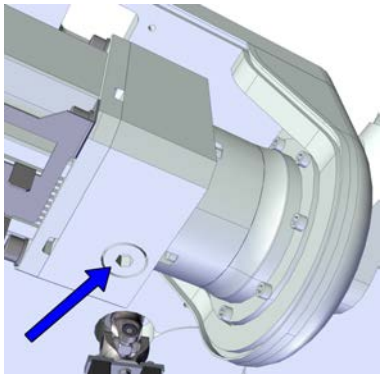
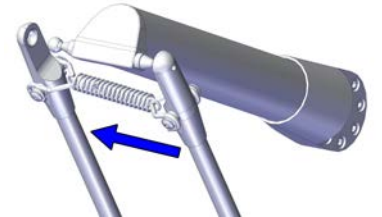
	Action	Note
8	Remove the guide pins and fit the remaining two screws and washers. Tighten by hand. Do not tighten with a torque yet.	 xx1900000760
9	Add locking liquid to all screws. Tighten the four motor attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 17 Nm
10	Connect the two cable connectors on motor.	 xx2100000967
11	 WARNING Turn on all: • electric power supply	
12	Rotate upper arm to align the mounting clamp hole with the adapter plate. If needed push the brake release button to release upper arm.	 xx2100002381

Continues on next page

5 Repair

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

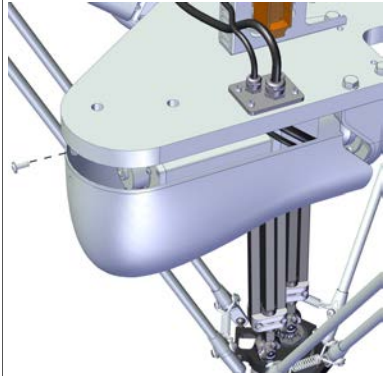
Continued

	Action	Note
13	Refit the blind plug and tighten the coupling screw for motor shaft.	Tightening torque: 14 Nm  xx2100002382
14	Refit the protection plug in adapter plate.	 xx2100000969
15	Refit the lower arms to the upper arms by using the pliers, either on the left side or the right side, not both.  Note Be careful not to damage the ball bearing cups.	 xx2100000721
16	Repeat the procedure in the lower end of the lower arms, on the delta unit.	

Continues on next page

5.5.1 Replacing the axis-1, axis-2, and axis-3 motor

Continued

	Action	Note
17	Refit the motor cover including the gasket and tighten the attachment screw.	Tightening torque: 2 Nm  xx2100000725

Concluding procedure

	Action	Note
1	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
2	Calibrate the robot.	See Calibration information on page 197 .
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 76 .	

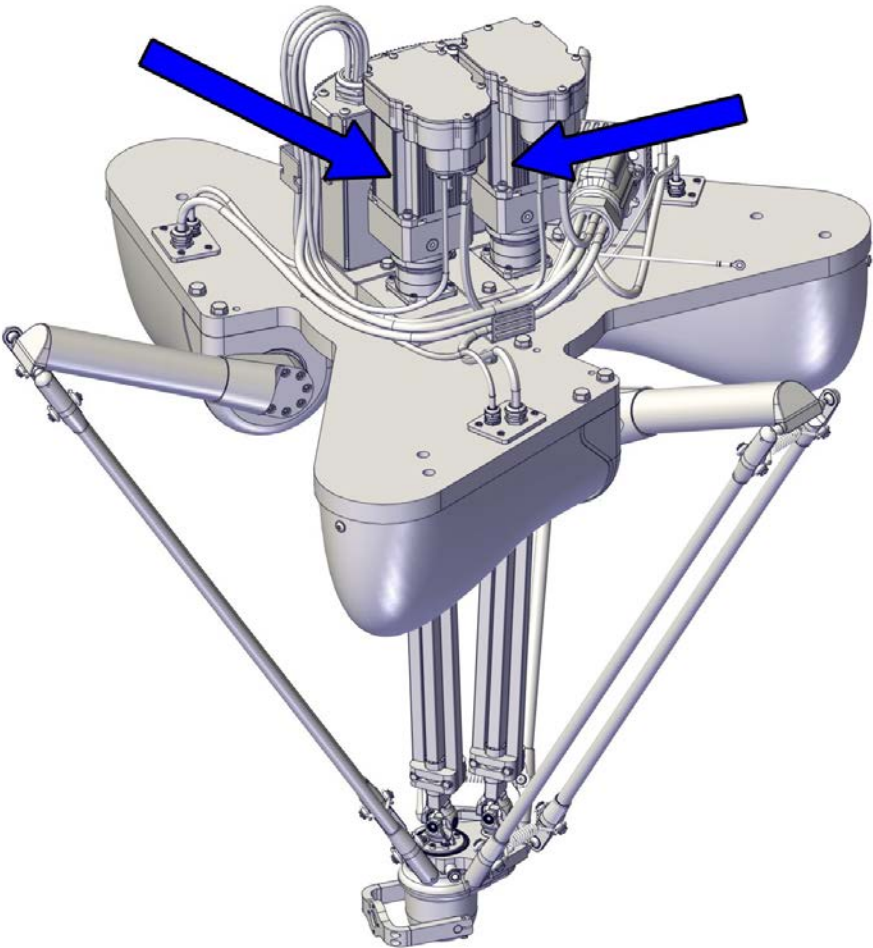
5 Repair

5.5.2 Replacing the axis-4 and axis-5 motor

5.5.2 Replacing the axis-4 and axis-5 motor

Location of the motor

The motor is located as shown in the figure.



xx2100001425

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note
Rot AC motor M104 w. adapter	3HAC078682-001	

Continues on next page

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Required service parts

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

Removing the motor

Use these procedures to remove the motor axis 4 and 5.

Preparations before removing the motor

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

Removing the motor

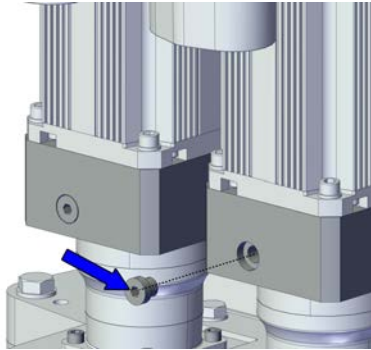
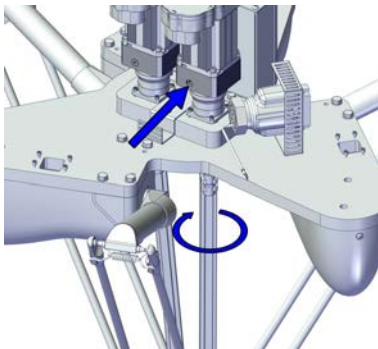
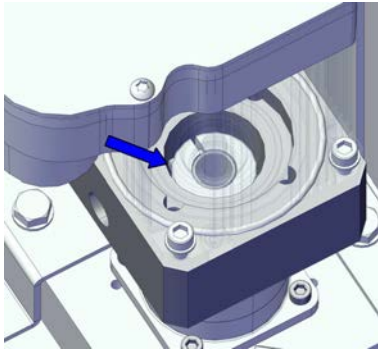
	Action	Note
1	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	 WARNING To secure no accidental movement and engagement of drive power, set robot into manual mode and also engage the emergency stop on the FlexPendant.	

Continues on next page

5 Repair

5.5.2 Replacing the axis-4 and axis-5 motor

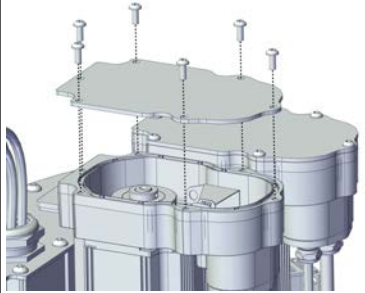
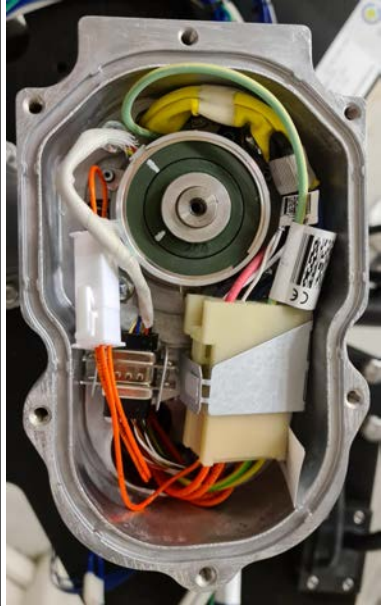
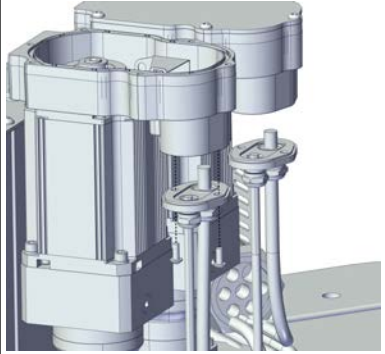
Continued

	Action	Note
3	Remove the protection plug in adapter plate.	 xx2100002706
4	Rotate telescopic arm to align the hex cap screw to the hole in adapter plate. Push the brake release button to release telescopic arm.	 xx2100002687
5	 WARNING Turn off all: • electric power supply	
6	Loosen the hex cap screw for motor shaft.	 xx2100002688

Continues on next page

5.5.2 Replacing the axis-4 and axis-5 motor

Continued

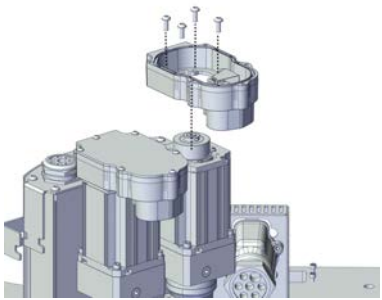
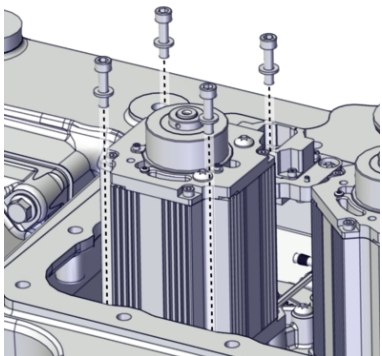
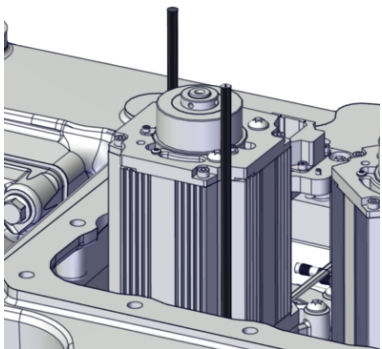
	Action	Note
7	Remove M5-screws and motor cover.	 xx2100001418
8	Disconnect the white connector and the yellow connector on the motor top.	 xx2200000212
9	Remove the two screws and remove the cover with cable glands.	 xx2100001419

Continues on next page

5 Repair

5.5.2 Replacing the axis-4 and axis-5 motor

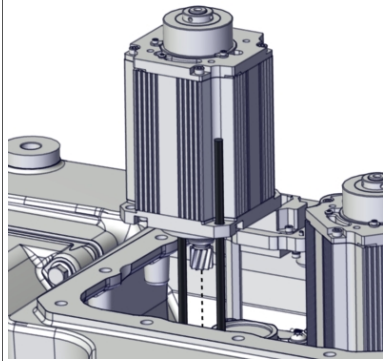
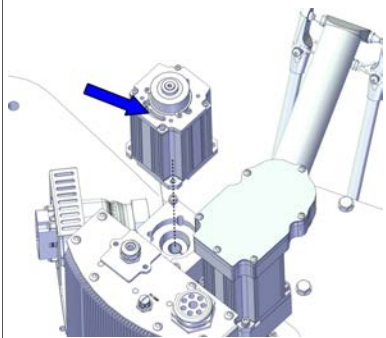
Continued

	Action	Note
10	Remove the M6-screws and the connection box. Clean the contact surface on connection box with isopropanol. Use a lint-free cloth.	 xx2100002700
11	Remove the four attachment screws with washers.	 xx2000001082
12	Fit guide pins in opposite holes.	 xx2000001084
13	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	

Continues on next page

5.5.2 Replacing the axis-4 and axis-5 motor

Continued

	Action	Note
14	Use caution and lift the motor straight up to get the pinion parted from the gear.	 xx2000001083
15	Remove the motor.	 xx2100001422

Refitting the motor

Use these procedures to refit the motor axis 4 and 5.

Refitting the motor

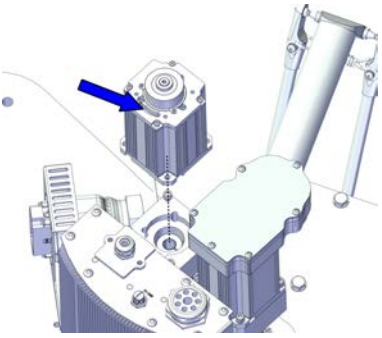
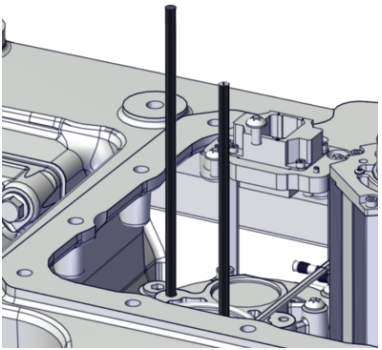
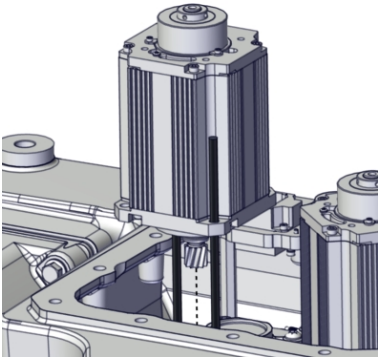
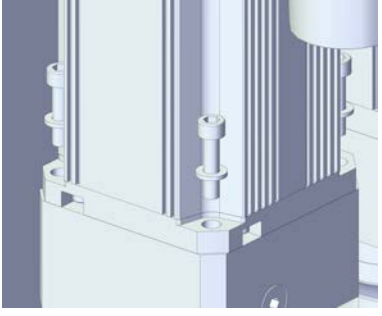
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 Note Clean the mating surface with isopropanol.	

Continues on next page

5 Repair

5.5.2 Replacing the axis-4 and axis-5 motor

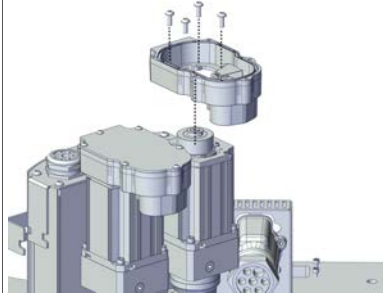
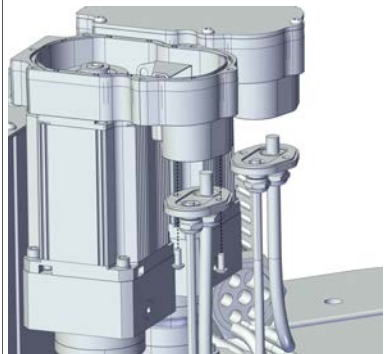
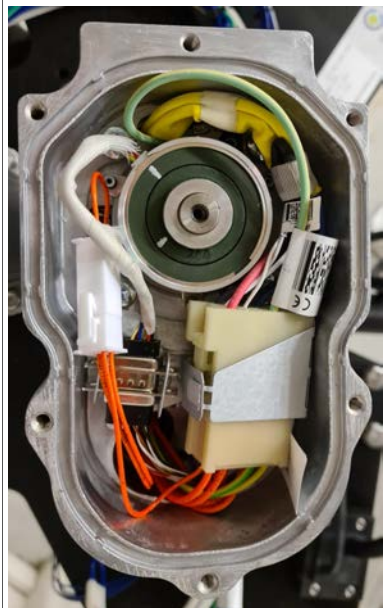
Continued

	Action	Note
3	Refit the motor. The recess on the top of the motor must be opposite oriented from protection plug at the adapter.	 xx2100001422
4	If not already fitted, fit two guide pins to the motor attachment holes.	 xx2000001088
5	Lift the motor into the base.  Note Clean the mating surface with isopropanol.	 xx2000001083
6	Add locking liquid to all screws. Secure the unit with attachment screws and washers.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 7 Nm  xx2100001421

Continues on next page

5.5.2 Replacing the axis-4 and axis-5 motor

Continued

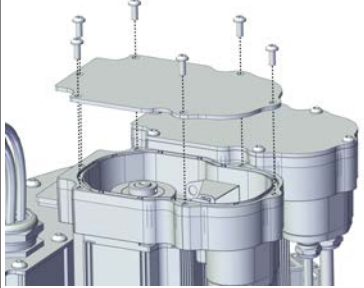
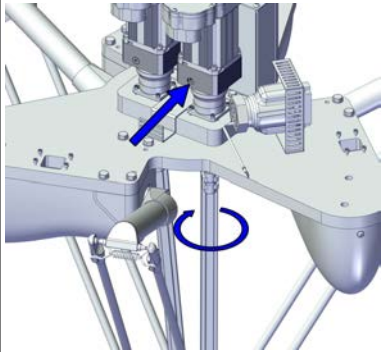
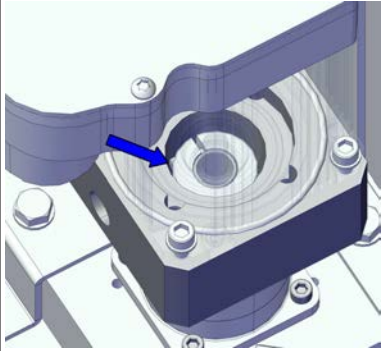
	Action	Note
7	Clean with isopropanol.	
8	Add transclear into the groove for the o-ring.	
9	Refit connection box and the M6-screws.	Tightening torque: 12 Nm  xx2100002700
10	Refit the cover with cable glands and the two M5-screws.	3.5 Nm  xx2100001419
11	Connect the white connector and the yellow connector. The cables must not interfere movement parts.	 xx2200000212

Continues on next page

5 Repair

5.5.2 Replacing the axis-4 and axis-5 motor

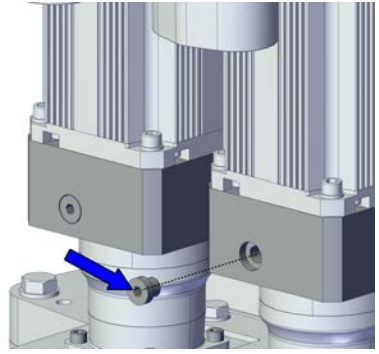
Continued

	Action	Note
12	Refit the motor cover and M5-screws.	Tightening torque: 6 Nm  xx2100001418
13	 WARNING Turn on all: • electric power supply	
14	Rotate telescopic arm to align the hex cap screw to the hole in adapter plate. If needed push the brake release button to release telescopic arm.	 xx2100002687
15	Refit the hex cap screw and tighten the mounting clamp for motor shaft. See tightening torque on the mounting clamp.	Tightening torque: 9.5 Nm  xx2100002688

Continues on next page

5.5.2 Replacing the axis-4 and axis-5 motor

Continued

	Action	Note
16	Refit the protection plug in adapter plate.	 xx2100002706

Concluding procedure

	Action	Note
1	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
2	Calibrate the robot.	See Calibration information on page 197 .
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 76 .	

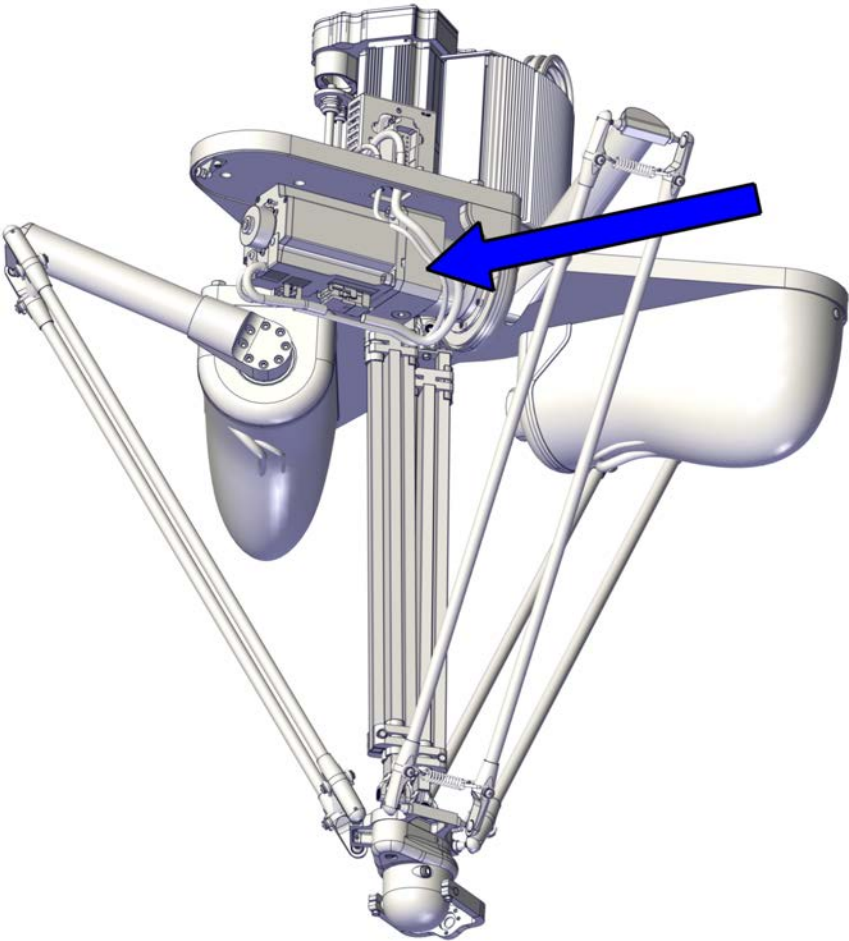
5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Location of the gear unit

The gearbox is located as shown in the figure.



xx2100001427

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

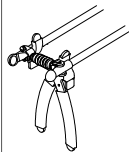
Spare part	Article number	Note
Gear unit	3HAC080023-001	

Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

Required tools and equipment

Equipment	Article number	Note	Image
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .	
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555

Required service parts

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

Removing the gear unit

Use these procedures to remove the gear unit.

Preparations before removing the motor

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

Removing the motor

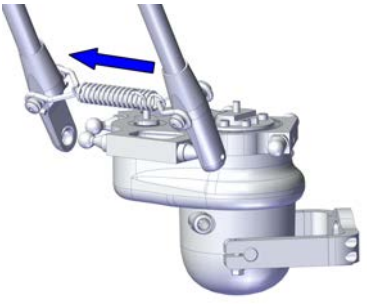
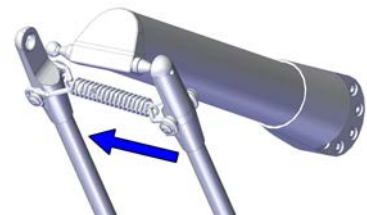
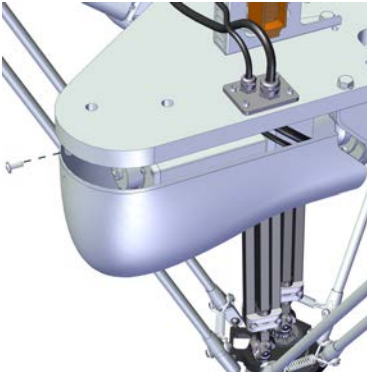
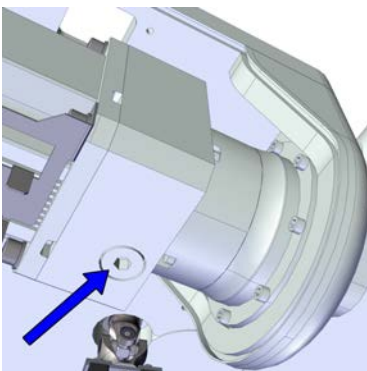
	Action	Note
1	 WARNING Make sure that all supplies for hydraulic pressure and air pressure are turned off.	
2	 WARNING To secure no accidental movement and engagement of drive power, set robot into manual mode and also engage the emergency stop on the FlexPendant.	

Continues on next page

5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

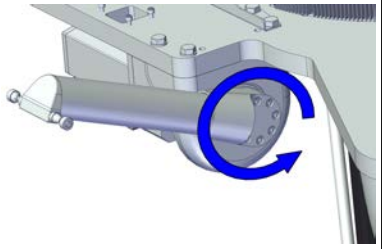
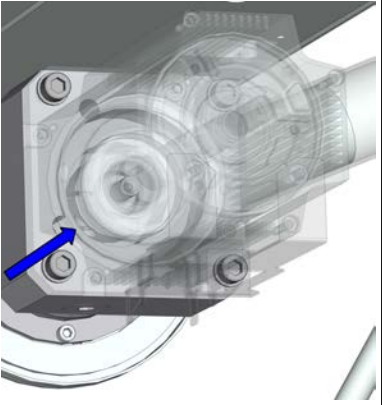
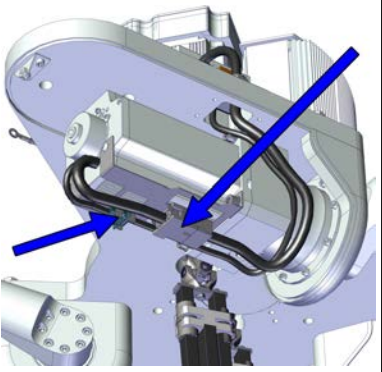
Continued

	Action	Note
3	Remove the lower end of the lower arms from the delta unit by using the pliers, either on the left side or the right side, not both.	 xx2100000722
4	Remove the upper end of the lower arms from the upper arm by using the pliers, either on the left side or the right side, not both.	 xx2100000721
5	Remove the parallel arms.	
6	Remove motor cover and screw.	 xx2100000725
7	Remove the protection plug in adapter plate.	 xx2100000969
8	Look into the hole in adapter plate.	

Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

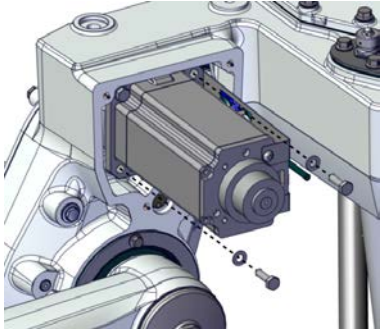
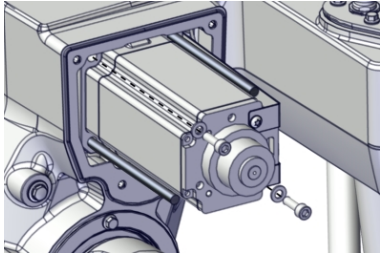
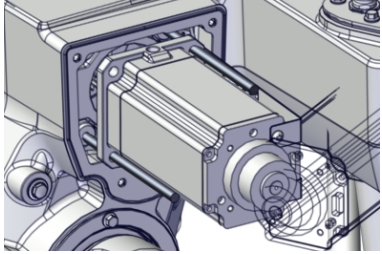
	Action	Note
9	Push the brake release button to release upper arm. Rotate upper arm to align the hex cap screw to the hole in adapter plate.	 xx2100002381
10	Loosen the hex cap screw for motor shaft.	 xx2100002382
11	 WARNING Turn off all: • electric power supply	
12	Disconnect the two cable connectors on motor.	 xx2100000967

Continues on next page

5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

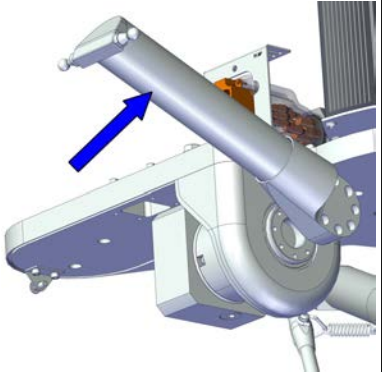
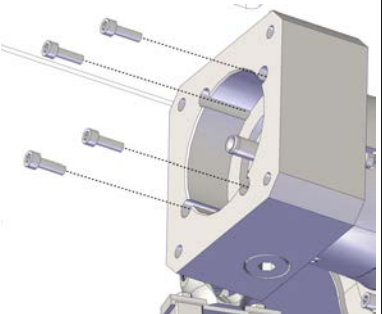
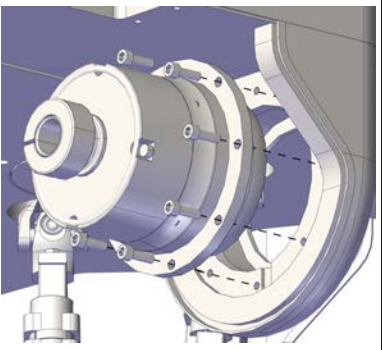
	Action	Note
13	Remove two of the screws and washers securing the motor.	 xx1900000760
14	Fasten two guide pins.  Tip Lubricate the guide pins with some grease to make the motor slide better.	 xx1900001835
15	Remove the two remaining screws and washers.	
16	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
17	Remove the motor including the bracket by sliding it out on the guide pins and lift it off.	 xx1900001834

Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

Removing the gear unit

	Action	Note
1	Remove the upper arm from the base unit	 xx2100002500
2	Remove the four attachment screws with washers and remove the adapter plate.	 xx2100001428
3	Remove the eight attachment screws with washers and remove the gear unit.	 xx2100001701

Refitting the gear unit

Use these procedures to refit the gear unit.

Refitting the gear unit

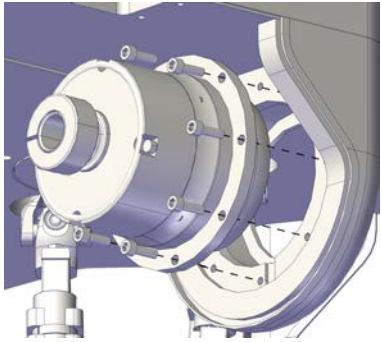
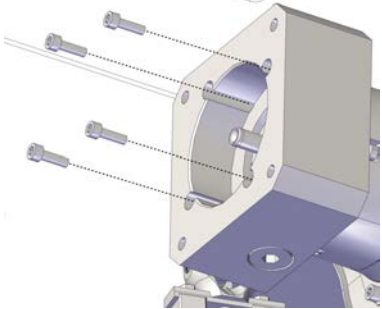
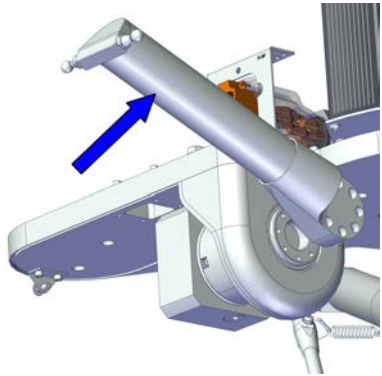
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

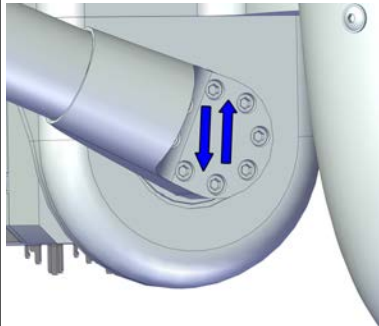
Continued

	Action	Note
2	Add locking liquid to the eight attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the gear unit and tighten the eight attachment screws with washers.	Tightening torque: 7 Nm  xx2100001701
4	Add locking liquid to the four attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
5	Refit the adapter plate and tighten the four attachment screws with washers.	Tightening torque: 4.55 Nm  xx2100001428
6	Fit the upper arm to the base unit.	 xx2100002500

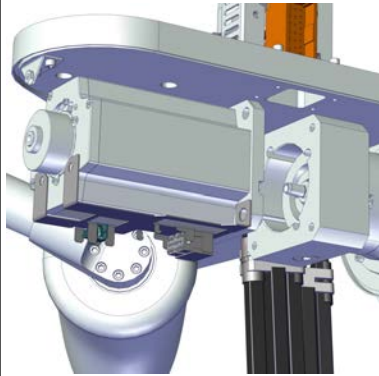
Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

	Action	Note
7	Add locking liquid to the four attachment screws. Refit the eight attachment screws opposite each other.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 16 Nm  xx2100002383

Refitting the motor

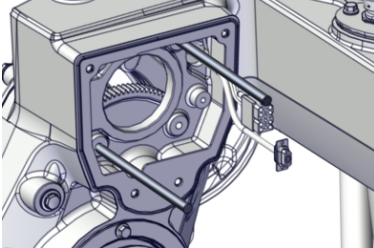
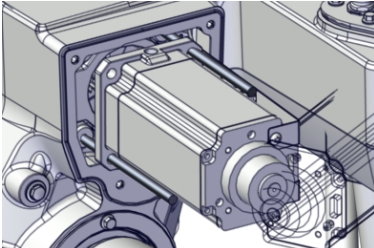
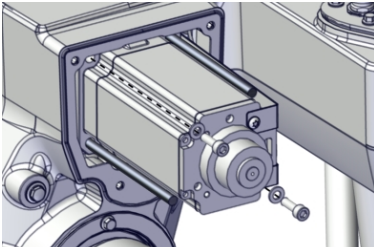
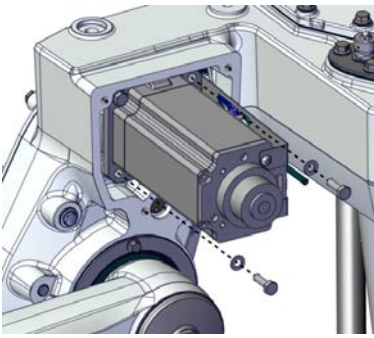
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 Note Clean the mating surface with isopropanol.	
3	Refit the motor including the bracket.	 xx2100000970

Continues on next page

5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

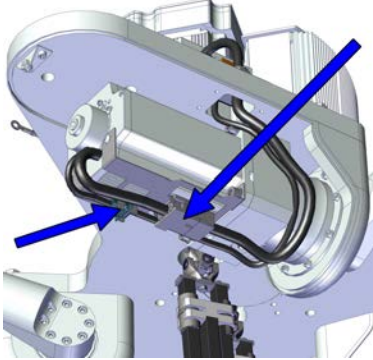
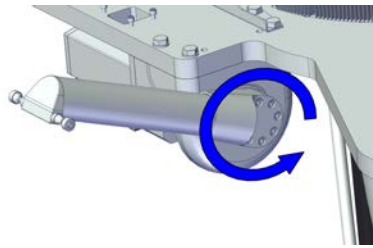
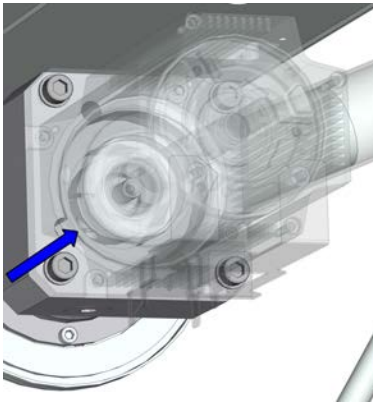
Continued

	Action	Note
4	If not already fitted, fasten two guide pins to opposite screw holes.  Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M8x150: 3HAC15520-2  xx1900001836
5	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
6	Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.  Note Clean the mating surface with isopropanol.	 xx1900001834
7	Fit the attachment screws and washers. Tighten by hand. Do not tighten with a torque yet.	 xx1900001835
8	Remove the guide pins and fit the remaining two screws and washers. Tighten by hand. Do not tighten with a torque yet.	 xx1900000760
9	Add locking liquid to all screws. Tighten the four motor attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 17 Nm

Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

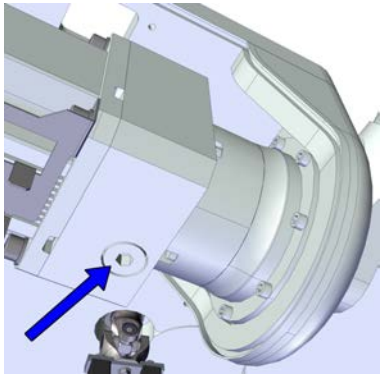
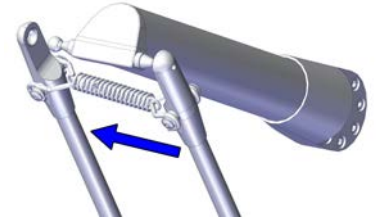
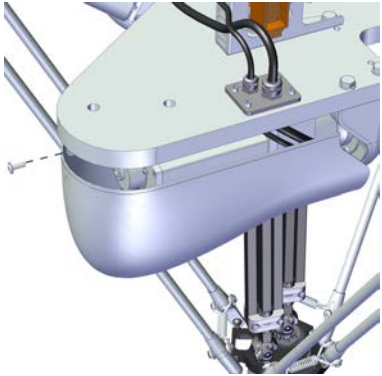
	Action	Note
10	Connect the two cable connectors on motor.	 xx2100000967
11	 WARNING Turn on all: • electric power supply	
12	Rotate upper arm to align the mounting clamp hole with the adapter plate. If needed push the brake release button to release upper arm.	 xx2100002381
13	Refit the blind plug and tighten the coupling screw for motor shaft.	Tightening torque: 14 Nm  xx2100002382

Continues on next page

5 Repair

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

	Action	Note
14	Refit the protection plug in adapter plate.	 xx2100000969
15	Refit the lower arms to the upper arms by using the pliers, either on the left side or the right side, not both.  Note Be careful not to damage the ball bearing cups.	 xx2100000721
16	Repeat the procedure in the lower end of the lower arms, on the delta unit.	
17	Refit the motor cover including the gasket and tighten the attachment screw.	Tightening torque: 2 Nm  xx2100000725

Concluding procedure

	Action	Note
1	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
2	Calibrate the robot.	See Calibration information on page 197 .

Continues on next page

5.5.3 Replacing the axis-1, axis-2, and axis-3 gear unit

Continued

	Action	Note
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 76 .	

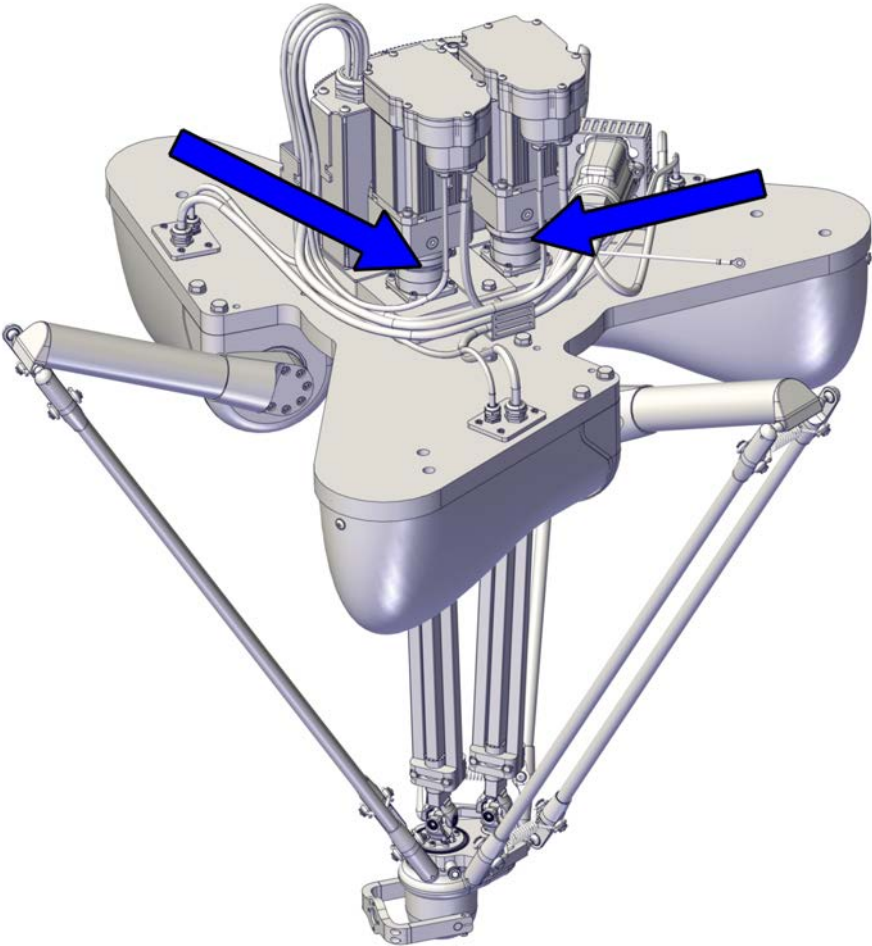
5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

5.5.4 Replacing the axis-4 and axis-5 gear unit

Location of the gear unit

The gear unit is located as shown in the figure.



xx2100001426

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 365 via ABB Robotics One, <https://one.robots.abb.com/en/knowledge-hub>.

Spare part	Article number	Note
Gear unit	3HAC080023-001	

Continues on next page

5.5.4 Replacing the axis-4 and axis-5 gear unit

*Continued***Required tools and equipment**

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 226 .

Required service parts

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

Removing the gear unit

Use these procedures to remove the gear unit.

Preparations before removing the gear unit

	Action	Note
1	The robot does not need to be jogged into any specific position due to repair activity.	
2	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove any loads or tools attached to the tilt arm on the head.	

Loosen the upper mounting clamps for telescopic shaft

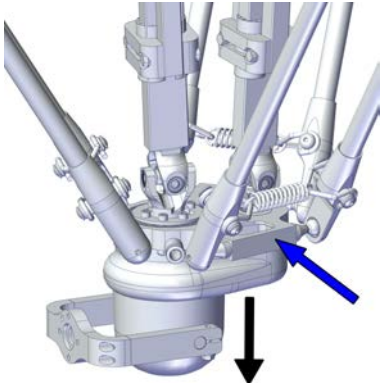
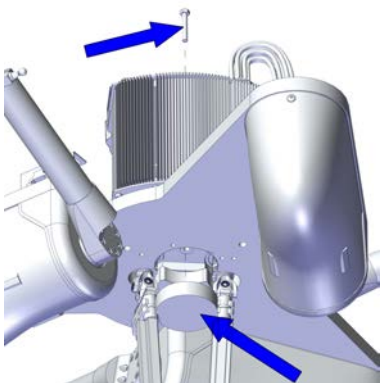
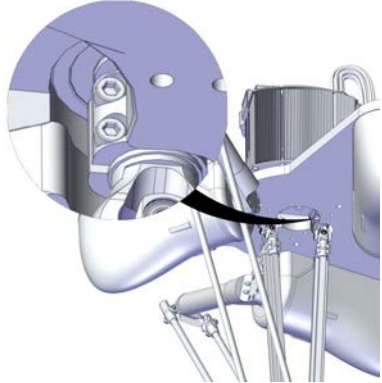
	Action	Note
1	 WARNING Make sure that all supplies for hydraulic pressure and air pressure are turned off.	

Continues on next page

5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

	Action	Note
2	Push the brake release button and press the delta plate with head downwards to extend the two telescopic shafts.	 xx2100000747
3	Remove the center base cover.	 xx2100000732
4	Loosen the two attachment screws on the mounting clamp in the upper end of the telescopic shaft.	 xx2100000729

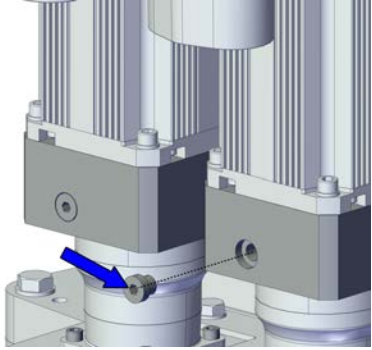
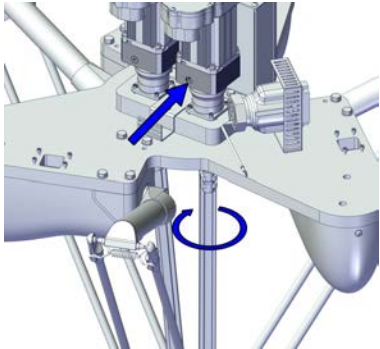
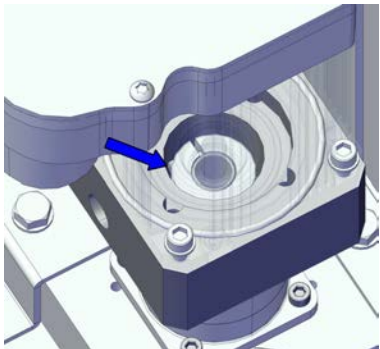
Removing the motor

	Action	Note
1	 WARNING Turn off all: • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

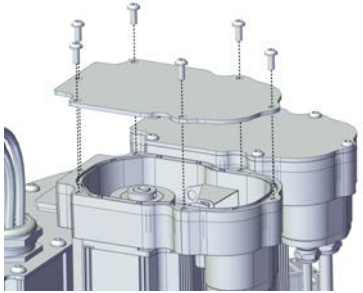
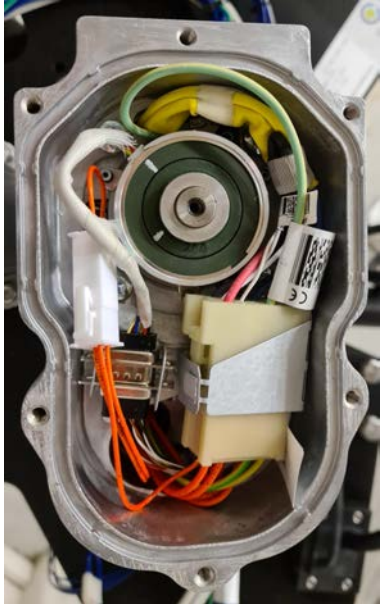
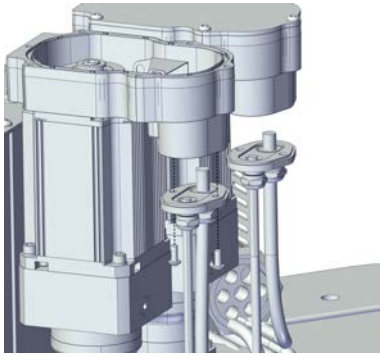
	Action	Note
2	 WARNING To secure no accidental movement and engagement of drive power, set robot into manual mode and also engage the emergency stop on the FlexPendant.	
3	Remove the protection plug in adapter plate.	 xx2100002706
4	Rotate telescopic arm to align the hex cap screw to the hole in adapter plate. Push the brake release button to release telescopic arm.	 xx2100002687
5	 WARNING Turn off all: • electric power supply	
6	Loosen the hex cap screw for motor shaft.	 xx2100002688

Continues on next page

5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

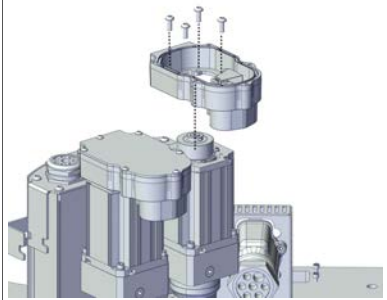
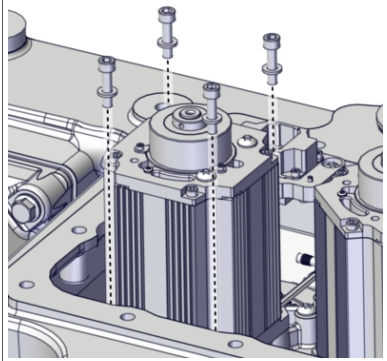
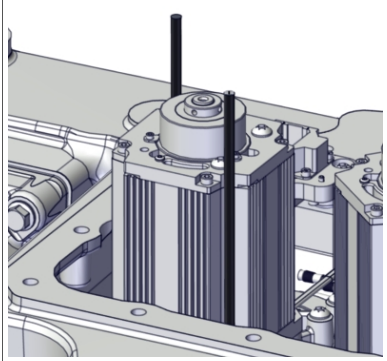
Continued

	Action	Note
7	Remove M5-screws and motor cover.	 xx2100001418
8	Disconnect the white connector and the yellow connector on the motor top.	 xx2200000212
9	Remove the two screws and remove the cover with cable glands.	 xx2100001419

Continues on next page

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

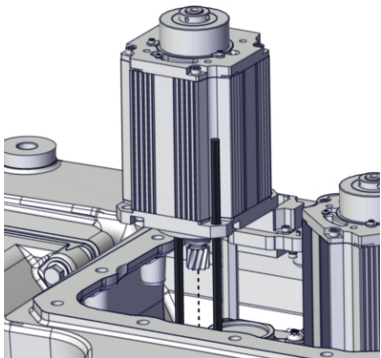
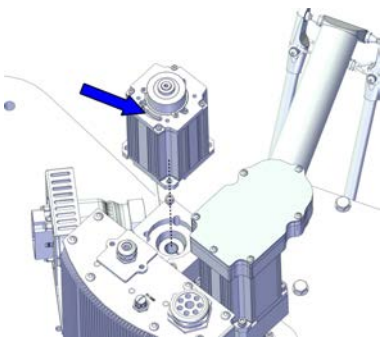
	Action	Note
10	Remove the M6-screws and the connection box. Clean the contact surface on connection box with isopropanol. Use a lint-free cloth.	 xx2100002700
11	Remove the four attachment screws with washers.	 xx2000001082
12	Fit guide pins in opposite holes.	 xx2000001084
13	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	

Continues on next page

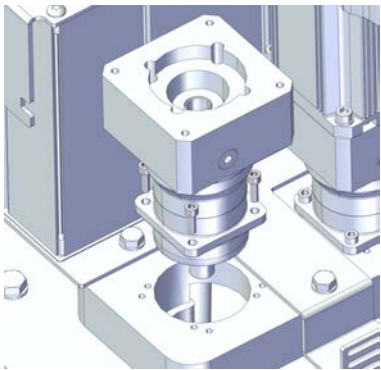
5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

	Action	Note
14	Use caution and lift the motor straight up to get the pinion parted from the gear.	 xx2000001083
15	Remove the motor.	 xx2100001422

Removing the gear unit

	Action	Note
1	Remove the gear unit.	 xx2100001424

Refitting the gear unit

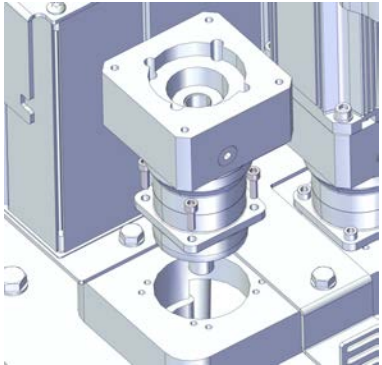
Use these procedures to refit the gear unit.

Continues on next page

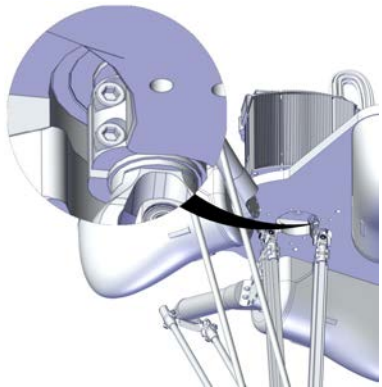
5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

Refitting the gear unit

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Add locking liquid to the four attachment screws.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
3	Refit the gear unit and tighten the four attachment screws.	Tightening torque: 7 Nm  xx2100001424

Refit the upper mounting clamps for telescopic shaft

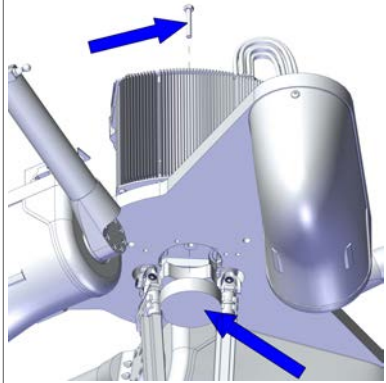
	Action	Note
1	Refit the mounting clamp in the upper end of the telescopic shaft and tighten the two attachment screws.	Tightening torque: 10 Nm  xx2100000729

Continues on next page

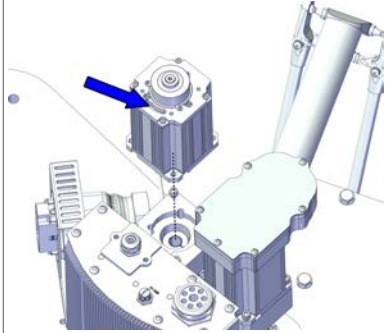
5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

	Action	Note
2	Refit the center base cover.	 xx2100000732

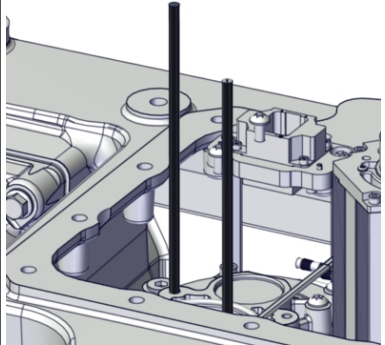
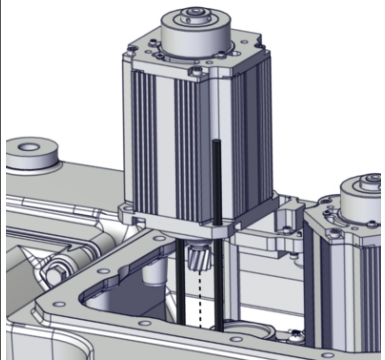
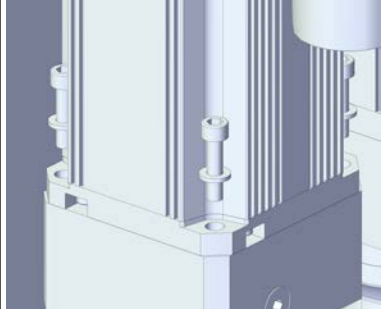
Refitting the motor

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 Note Clean the mating surface with isopropanol.	
3	Refit the motor. The recess on the top of the motor must be opposite oriented from protection plug at the adapter.	 xx2100001422

Continues on next page

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

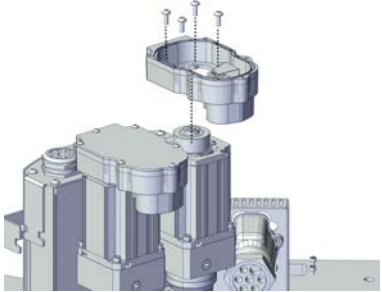
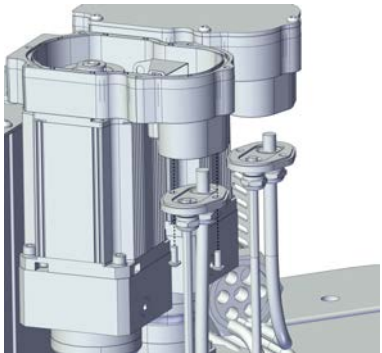
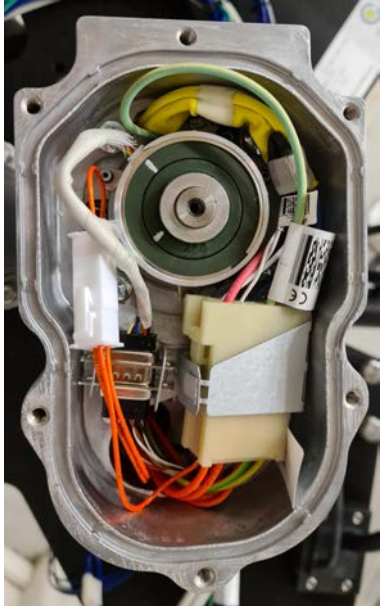
	Action	Note
4	If not already fitted, fit two guide pins to the motor attachment holes.	 xx2000001088
5	Lift the motor into the base.  Note Clean the mating surface with isopropanol.	 xx2000001083
6	Add locking liquid to all screws. Secure the unit with attachment screws and washers.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Tightening torque: 7 Nm  xx2100001421
7	Clean with isopropanol.	
8	Add transclear into the groove for the o-ring.	

Continues on next page

5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

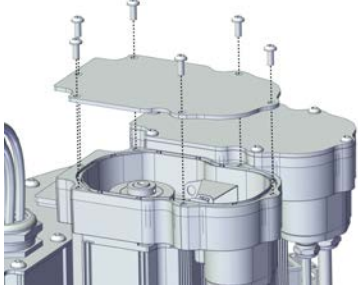
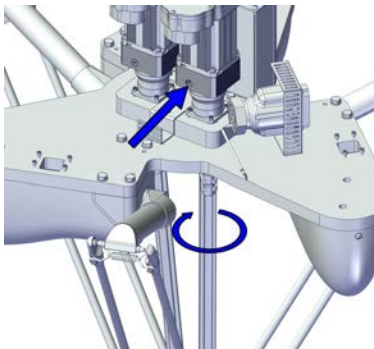
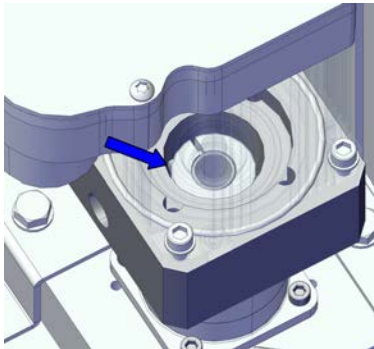
Continued

	Action	Note
9	Refit connection box and the M6-screws.	Tightening torque: 12 Nm  xx2100002700
10	Refit the cover with cable glands and the two M5-screws.	3.5 Nm  xx2100001419
11	Connect the white connector and the yellow connector. The cables must not interfere movement parts.	 xx2200000212

Continues on next page

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

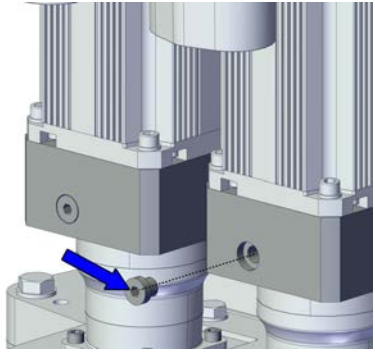
	Action	Note
12	Refit the motor cover and M5-screws.	Tightening torque: 6 Nm  xx2100001418
13	 WARNING Turn on all: • electric power supply	
14	Rotate telescopic arm to align the hex cap screw to the hole in adapter plate. If needed push the brake release button to release telescopic arm.	 xx2100002687
15	Refit the hex cap screw and tighten the mounting clamp for motor shaft. See tightening torque on the mounting clamp.	Tightening torque: 9.5 Nm  xx2100002688

Continues on next page

5 Repair

5.5.4 Replacing the axis-4 and axis-5 gear unit

Continued

	Action	Note
16	Refit the protection plug in adapter plate.	 xx2100002706

Concluding procedure

	Action	Note
1	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
2	Calibrate the robot.	See Calibration information on page 197 .
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 76 .	

6 Calibration information

6.1 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.

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 OmniCore robots on page 208](#). 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.

6 Calibration information

6.2 Introduction and calibration terminology

6.2 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.

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.

6.3 Calibration method

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	Standard calibration is performed if resolver values are changed or the robot is rebuilt (see When to calibrate on page 197). The robot is positioned at calibration position, that is when the positions of the axes 1-3 (angles) are set to parameter values found in <i>Calibration Position</i>, see type <i>Arm</i>, topic <i>Motion</i> in <i>Technical reference manual - System parameters</i>. Standard calibration data is found on the SMB (serial measurement board) in the robot.	Calibration by hand with activated brake release, using the calibration marks.
Factory reset	A factory reset (calibration with a calibration tool) can be performed after a gearbox or an upper arm has been replaced to ensure enhanced robot arm accuracy than when performing standard calibration. Factory reset alters the robot's unique production settings for axis 1-3. To perform tool calibration, the lower arms must first be removed from the robot. The upper arms must then be positioned horizontally so that the calibration tool can be fitted mounted. Making a factory reset with the calibration tool requires specific calibration equipment and software, and is performed by ABB. Please contact ABB. The parameter <i>Calibration Position</i> (cal_position) is set at the ABB factory, and is a robot specific parameter. For more information about parameter <i>Calibration Position</i>, see topic <i>Motion</i>, type <i>Arm</i> in <i>Technical reference manual - System parameters</i>.	Tool calibration

Calibration methods

The calibration method for the IRB 365 is different from other robots, and normal calibration methods are not applicable.

Tool calibration

A factory reset using tool calibration requires specific calibration equipment and is performed by ABB. Please contact ABB.

Tool calibration is measuring each contact point for axis 1-3 and modifies cal_position. The tool calibration method gives a better nominal kinematics and the modified cal_positions will help to get back to the same points when calibrating with Standard calibration.

6 Calibration information

6.4 Calibration movement directions for all axes

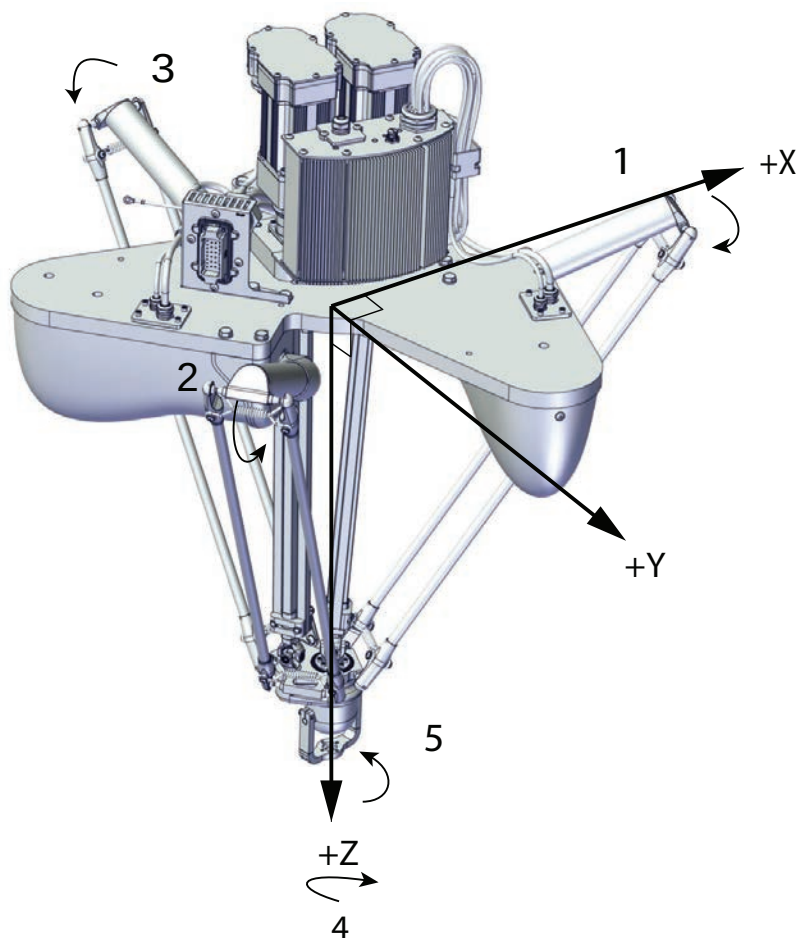
6.4 Calibration movement directions for all axes

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



xx2200000237

6.5 Calibrating axis 1-3

General

This section describes how to perform calibration of axis 1-3. The information is valid for all variants of IRB 365.

If the robot needs to have a factory reset instead, contact ABB.

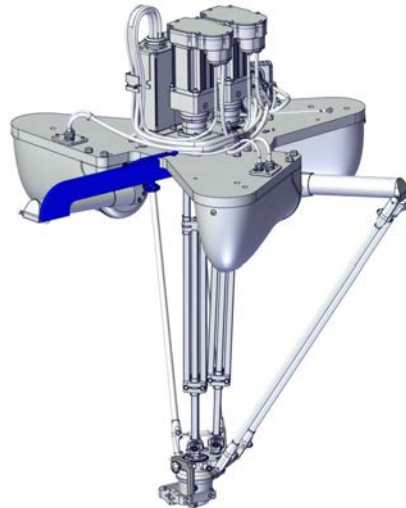


Note

Calibration should be performed by specially trained personnel.

Illustration

The figure shows the calibration tool fitted to the robot.



xx2100002603

Required equipment

Equipment	Article number	Note
Calibration tool	IRB 365-1.5/800 and IRB 365 1.5/1100: 3HAC081390-001 IRB 365-1.5/1300: 3HAC084354- 001	Used when calibrat- ing axis 1-3

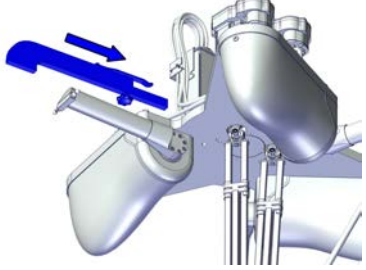
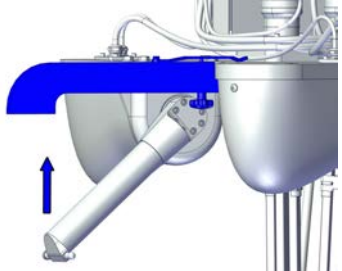
Continues on next page

6 Calibration information

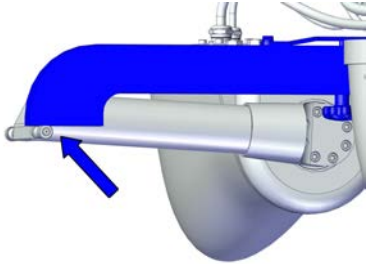
6.5 Calibrating axis 1-3

Continued

Calibrating axes 1-3

	Action	Note
1	Slide the calibration tool onto the base plate, all the way in. The tool should be placed close to the upper arm, so the outer end of the tool can meet the ball joint. Tighten the star knob until the calibration tool is fixed.	Make sure to not scratch surfaces.  xx2100002598  xx2500001637
2	Remove the lower arm. Release the brake, and move the upper arm towards the calibration tool until the ball joint makes contact with the calibration tool.	 xx2100002599  xx2500001638

Continues on next page

	Action	Note
3	Lock the brake when the ball joint makes contact with calibration tool.  Note Make sure that the tool makes contact with the ball joint, not the arm itself.	 xx2100002600  xx2500001639
4	Perform a fine calibration of the upper arm.	See Fine calibration procedure on FlexPendant on page 206 .
5	Remove the calibration tool.	
6	Repeat these steps for all three upper arms.	
7	Verify the application in the operating mode manual reduced speed, before changing mode to automatic and initiating automatic operation.	See Safety on page 15 .
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 76.	

6 Calibration information

6.6 Calibrating axis 4-5

6.6 Calibrating axis 4-5

General

This section describes how to perform calibration of axis 4-5. The information is valid for all variants of IRB 365.

If the robot needs to have a factory reset instead, contact ABB.



Note

Calibration should be performed by specially trained personnel.

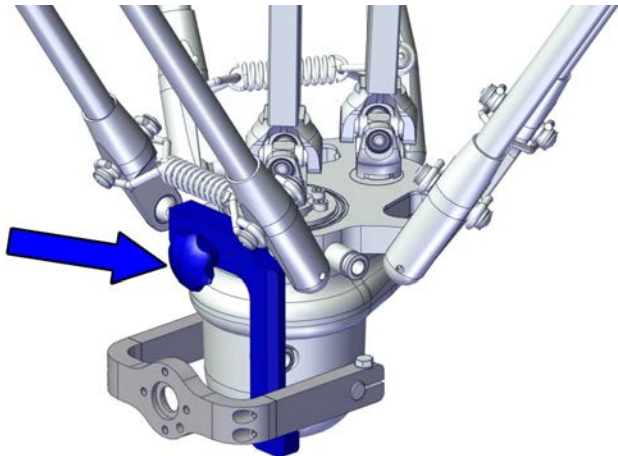


Note

When calibrating axis-4 and -5, both are calibrated simultaneously.

Illustration

The figure shows the calibration tool fitted to the robot.



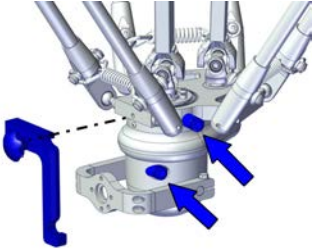
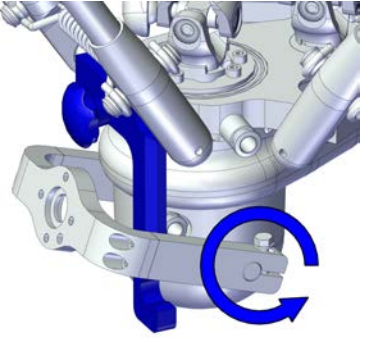
xx2200000017

Required equipment

Equipment	Article number	Note
Calibration tool	3HAC081391-001	Used when calibrating axis 4-5

Continues on next page

Calibrating axis-4-5

	Action	Note
1	Slide the calibration tool onto the delta plate and tighten the star knob until the calibration tool is locked. Align the two pneumatic couplings in same direction.	 xx2100002601
2	Rotate tilt arm until it makes contact with calibration tool.	 xx2100002602
3	Perform a fine calibration of the tilt arm.	See Fine calibration procedure on FlexPendant on page 206 .
4	Remove the calibration tool.	
5	Verify the application in the operating mode manual reduced speed, before changing mode to automatic and initiating automatic operation.	See Safety on page 15 .
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 76 .	

6 Calibration information

6.7 Fine calibration procedure on FlexPendant

6.7 Fine calibration procedure on FlexPendant

Overview

This section describes how to use the FlexPendant when performing a fine calibration of the robot.

The method of fitting the calibration tools to each axis is described in the calibration instruction for the axis. See the product manual for the robot.

Performing the fine calibration procedure when connecting to OmniCore controller



Note

If protective gloves are used, these must be compatible with touchscreens when using the FlexPendant.



Note

If the calibration status is **Not calibrated**, the fine calibration must be performed before running the axis calibration procedure.



WARNING

Before starting the calibration procedure, you must jog each axis and bring the robot to synchronization position and make sure that all the notches are matched.

	Action	Note
1	On the start screen, tap Calibrate .	
2	Select Calibration from the menu. The Mechanical Units page displays a list of available mechanical units.  Note This step is required only if you are not already in the Mechanical Unit page when you open Calibrate .  Note The Mechanical Unit page is displayed only if there are more than one mechanical unit available. Otherwise, the calibration summary page for the available mechanical unit is displayed.	
3	Select the unit that needs to be calibrated from the Mechanical Unit list. The calibration summary for the selected mechanical unit is displayed.	
4	On the right pane tap Calibration Methods .	
5	Tap Calibration Parameters . The calibration parameters are displayed.	

Continues on next page

	Action	Note
6	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 warning that performing fine calibration can change programmed robot positions is also displayed: • Tap Yes to proceed. • Tap No to cancel.	
7	Select the check-box for the current axis/axes to be calibrated.	
8	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.	
9	Tap OK. The fine calibration process is complete.	

6 Calibration information

6.8 Updating revolution counters on OmniCore robots

6.8 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 moving the manipulator to the synchronization position

Use this procedure to manually move the manipulator to the calibration position.



Note

Calibration should be performed by specially trained personnel.

	Action	Note
1	Manually move the manipulator to the calibration position for axes 1-3	
2	Manually move the manipulator to the calibration position for axis 4	
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 208.

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!

7 Troubleshooting

7.1 Introduction to troubleshooting

Introduction

The product manual and the circuit diagram contains information that can be good when troubleshooting.

For OmniCore, all event logs from the software can be seen on the FlexPendant, or in *Technical reference manual - Event logs*.



DANGER

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

Make sure to read through the section [Safety on page 15](#) before starting.



CAUTION

Make sure to use personal protective equipment, such as insulating gloves, when troubleshooting.

Troubleshooting strategies

- 1 Isolate the fault to pinpoint the cause of the problem from consequential problems.
- 2 Divide the fault chain in two.
- 3 Check communication parameters and cables.
- 4 Check that the software version is compatible with the hardware.

Work systematically

- 1 Take a look around to make sure that all screws, connectors, and cables are secured, and that the robot and other parts are clean, not damaged, and correctly fitted.
- 2 Replace one thing at a time.
- 3 Do not replace units randomly.
- 4 Make sure that there are no loose screws, turnings, or other unexpected parts remaining after work has been performed.
- 5 When the work is completed, verify that the safety functions are working as intended.

Keep a track of history

- Make a historical fault log to keep track of problems over time.
- Consult those working with the robot when the problem occurred.

Continues on next page

7 Troubleshooting

7.1 Introduction to troubleshooting

Continued

Basic scenarios

What to look for during troubleshooting depends on when the fault occurred. Was the robot recently installed or was it recently repaired? The following table gives hints on what to look for in specific situations.

The robot has recently been installed	Check: • the configuration files • connectors • options and their configuration • changes in the robot working space/movements.
The robot has recently been repaired	Check: • all connections to the replaced part • power supplies • that the correct part has been fitted • the last repair documents.
The robot recently had a software upgrade	Check: • software versions • compatibilities between hardware and software • options and their configuration
The robot has recently been moved from one site to another (an already working robot)	Check: • connections • software versions

7.2 Mechanical noise or dissonance

Description

Mechanical noise or dissonance that has not been observed before can indicate problems in bearings, motors, gearboxes, or similar. Be observant of changes over time.

A faulty bearing often emits scraping, grinding, or clicking noises shortly before failing.

Consequences

Failing bearings cause the path accuracy to become inconsistent, and in severe cases, the joint can seize completely.

Possible causes

The symptom can be caused by:

- Worn bearings.
- Contaminations have entered the bearing grooves.
- Loss of lubrication in bearings.
- Loose heat sinks, fans, or metal parts.

If the noise is emitted from a gearbox, the following can also apply:

- Overheating.

Recommended actions

The following actions are recommended:

	Action	Info
1	 CAUTION Allow hot parts to cool down.	
2	Verify that the service is done according to the maintenance schedule.	
3	If a bearing is emitting the noise, determine which one and make sure that it has sufficient lubrication.	
4	If possible, disassemble the joint and measure the clearance.	
5	Bearings inside motors are not to be replaced individually, but the complete motor is replaced.	
6	Make sure the bearings are fitted correctly.	
7	Tighten the screws if a heat sink, fan, or metal sheet is loose.	

7 Troubleshooting

7.3 Manipulator collapses on power down

7.3 Manipulator collapses on power down

Description

The manipulator is able to work correctly while Motors ON is active, but when Motors OFF is active, one or more axes drops or collapses under its own weight. The holding brakes (normally one in each motor), is not able to hold the weight of the manipulator arm.

Consequences

For a heavy robot, the collapse can cause severe injury to personnel working in the area or severe damage to the robot and/or surrounding equipment.
For a small robot, the collapse can cause injury to personnel working close to the robot or damage to the robot and/or surrounding equipment.

Possible causes

The symptom can be caused by:

- Faulty brake.
- Faulty power supply to the brake.

Recommended actions

The following actions are recommended:

	Action	Info
1	Determine which motor(s) causes the robot to collapse.	
2	Check the brake power supply to the collapsing motor during the Motors OFF state.	See the circuit diagram.
3	Remove the resolver or resolver cover of the motor to see if there are any signs of oil leaks.	If found faulty, the motor must be replaced as a complete unit.
4	Remove the motor from the gearbox to inspect it from the drive side.	If found faulty, the motor must be replaced as a complete unit.

7.4 Robot is jammed

Description

Take extra precaution if robot is jammed. The mechanical arm or external/auxiliary equipment causing the jam may contain stored potential energy that can result in an unexpected motion or collapse of the manipulator arms.

Consequences

The unexpected motion or collapse can cause injury to personnel working close to the robot or damage to the robot and/or surrounding equipment.

Possible causes

Symptom may be caused by:

- The robot has collided with external equipment in the programmed path, for example, a conveyor belt.

Recommended actions

The following actions are recommended:

	Action	Information
1	Attempt to jog the robot out of stuck position.	
2	Attempt to release the robot from stuck position with brake release.	
3	Attempt to reverse or disengage the mechanism in which the manipulator is stuck.	
4	If step 1-3 has been performed and the manipulator is still stuck, apply other risk reduction to avoid hazardous release of stored energy.	

This page is intentionally left blank

8 Decommissioning

8.1 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 216](#).

Transportation

Prepare the robot or parts before transport, this to avoid hazards.

8 Decommissioning

8.2 Environmental information

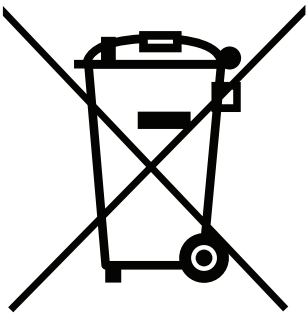
8.2 Environmental information

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 structure, upper arms, tilt arm, gear housing, motors, connection box, cable harness
Batteries, Lithium	Serial measurement board
Cast iron/nodular iron	
Copper	Cables, motor wiring, pins, sockets
Magnesium	Wrist casting, upper arm, back cover, tool flange, etc
Neodymium	Brakes, motors
Oil, grease	Gearboxes
Plastic/rubber	Cable, jackets, clamps, O-rings, plugs, clothes, sealings and gasgets
Steel	Gears, pinions, bearings, shafts, brackets, motors bolts, washers, SMB/BU covers, spacers, locks, sockets

Continues on next page

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 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.

8 Decommissioning

8.3 Scrapping of robot

8.3 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.

9 Reference information

9.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

9 Reference information

9.2 Applicable standards

9.2 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

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.

9.3 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	

9 Reference information

9.4 Screw joints

9.4 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)	<i>Gleitmo 603</i> + <i>Geomet 500</i>	3-5 µm
M6-M20 (any length except M20x60)	<i>Gleitmo 603</i> + <i>Geomet 702</i>	3-5 µm
M20x60	<i>Gleitmo 603</i> + <i>Geomet 500</i>	8-12 µm
M20x60	<i>Gleitmo 603</i> + <i>Geomet 702</i>	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

- 2 Apply lubricant between the plain washer and screw head.
- 3 Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench *if* this is done by trained and qualified personnel.

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

Continues on next page

9 Reference information

9.4 Screw joints

Continued

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
M8	24	34	40
M10	47	67	80
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 Molykote 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 Molykote 1000, Gleitmo 603 or equivalent

9.5 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.	

9 Reference information

9.6 Standard toolkit

9.6 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	Ring-open-end spanner 8-19 mm	
1	Socket head cap 2.5-17 mm	
1	Torx socket no: 20-60	
1	Box spanner set	
1	Torque wrench 10-100 Nm	
1	Torque wrench 75-400 Nm	
1	Ratchet head for torque wrench 1/2	
2	Hexagon-headed screw M10x100	
1	Hexagon-headed screw M16x90	
1	Hex bit socket head cap no. 14 socket 40 mm L=100 mm	
1	Hex bit socket head cap no. 14 socket 40 mm L=20 mm	To be shortened to 12 mm
1	Hex bit socket head cap no. 6 socket 40 mm L=145 mm	
1	Hex bit socket head cap no. 6 socket 40mm bit L=220 mm	
1	Plastic mallet	

9.7 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 226](#), and of special tools, listed directly in the instructions and also gathered in this section.

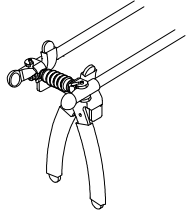
Special tools

**Note**

If the replacing procedure is not listed in the table below, only standard tools are needed for the procedure.

9 Reference information

9.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)				Parallel arms
Removal tools				
Pliers for parallel arms	3HAC6194-1	Used to push the parallel arms apart.	 xx0700000555	1

9.8 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.

This page is intentionally left blank

Index

A

allergenic material, 26
 aluminum
 disposal, 216
 ambient humidity
 operation, 40
 storage, 40
 ambient temperature
 operation, 40
 storage, 40
 assembly instructions, 45
 assessment of hazards and risks, 26
 axis-4-5
 calibrating, 204
 axis-4-5 gear unit
 replacing, 184
 axis-4-5 motor
 replacing, 162
 axis-1-2-3
 calibrating, 201
 axis-1-2-3 gear unit
 replacing, 172
 axis-1-2-3 motor
 replacing, 152

B

batteries
 disposal, 216
 Brake power supply, faulty, 212
 brake releasing, 64
 brakes
 testing function, 34

C

cabinet lock, 27
 cabling between robot and controller, 72
 calibrating
 axis-4-5, 204
 axis-1-2-3, 201
 roughly, 208
 calibration
 fine calibration, 206
 rough, 208
 standard type, 199
 when to calibrate, 197
 carbon dioxide extinguisher, 27
 cast iron
 disposal, 216
 cleaning, 100
 climbing on robot, 30
 Cold environments, 75
 connecting the robot and controller, cabling, 72
 copper
 disposal, 216

D

damaged bearings, 211
 delta unit
 replacing, 142
 dimension
 robot, 69
 direction of axes, 200

E

environmental information, 216
 ESD
 damage elimination, 44
 sensitive equipment, 44
 expected life, 80

F

faulty brake, 212
 fire extinguishing, 27
 FlexPendant
 updating revolution counters, 208
 foundation
 requirements, 40

G

grease, 30
 disposal, 216

H

hanging
 installed hanging, 26
 hazard levels, 17
 hazardous material, 216
 height
 installed at a height, 26
 hot gearbox oil, 211
 hot surfaces, 30
 HRA, 26
 humidity
 operation, 40
 storage, 40

I

inspecting
 lower arms, 93
 telescopic shafts, 85
 upper arms, 81
 installation procedure, 47
 Installing
 Installing a brake release unit, 61
 Installing a brake release unit
 Installing, 61
 instructions for assembly, 45
 integrator responsibility, 26
 intervals for maintenance, 79

J

jammed
 Robot, 213

L

labels
 robot, 19
 lifting accessory, 225
 limitation of liability, 15
 limiting robot motion, 26
 Lithium
 disposal, 216
 loads, 66
 loads on foundation, 39
 lock and tag, 27
 lower arms
 inspecting, 93
 replacing, 120
 lubricants, 30
 lubrication, 99

M

- magnesium
 - disposal, 216
- maintenance intervals, 79
- maintenance schedule, 79
- manipulator harness
 - replacing, 103
- mechanical limiting, 26

N

- national regulations, 26
- negative directions, axes, 200
- neodymium
 - disposal, 216
- nodular iron
 - disposal, 216
- noise, 211

O

- oil, 30
 - disposal, 216
- operating conditions, 40
- original spare parts, 15

P

- pedestal
 - installed on pedestal, 26
- personnel
 - requirements, 16
- plastic
 - disposal, 216
- positive directions, axes, 200
- PPE, 16
- product standards, 220
- protection classes, 41
- protection type, 41
- protective equipment, 16
- protective wear, 16

R

- recycling, 216
- regional regulations, 26
- release brakes, 33
- replacements, report, 101
- replacing
 - axis-4-5 gear unit, 184
 - axis-4-5 motor, 162
 - axis-1-2-3 gear unit, 172
 - axis-1-2-3 motor, 152
 - delta unit, 142
 - lower arms, 120
 - manipulator harness, 103
 - shaft components, 130
 - SMB battery, 95
 - SMB unit, 114
 - telescopic shafts, 130
 - tilt arm, 148
 - upper arms, 125
- report replacements, 101
- requirements on foundation, 40
- requirements on the frame, 49
- responsibility and validity, 15
- revolution counters
 - storing on FlexPendant, 208
 - updating, 208
- risk of burns, 30
- robot

- dimension, 69
- labels, 19
- protection class, 41
- protection types, 41
- symbols, 19
- technical data, 38
- working range, 42

Robot

- jammed, 213
- robot frame, 51
- rubber
 - disposal, 216

S

- safety
 - brake testing, 34
 - ESD, 44
 - fire extinguishing, 27
 - release robot axes, 33
 - signals, 17
 - signals in manual, 17
 - symbols, 17
 - symbols on robot, 19
 - test run, 76
- safety devices, 27
- safety hazard
 - hydraulic system, 28
 - pneumatic system, 28
- safety signals
 - in manual, 17
- safety standards, 220
- schedule of maintenance, 79
- screw joints, 222
- secured robot frame, 51
- securing the robot to foundation, attachment screws, 53
- sensitive protective equipment, SPE, 27
- separation distance, 26
- shaft components
 - replacing, 130
- shipping, 215
- signals
 - safety, 17
- SMB battery
 - replacing, 95
- SMB unit
 - replacing, 114
- software-based limiting, 26
- speed
 - adjusting, 75
- standards, 220
- start of robot in cold environments, 75
- steel
 - disposal, 216
- storage conditions, 40
- symbols
 - safety, 17
- synchronization position, 208
- system integrator requirements, 26

T

- technical data
 - robot, 38
- telescopic shafts
 - inspecting, 85
 - replacing, 130
- temperatures
 - operation, 40

- storage, 40
- testing
 - brakes, 34
- tilt arm
 - replacing, 148
- torques on foundation, 39
- transportation, 215
- troubleshooting
 - safety, 35
- U**
- upcycling, 216
- updating revolution counters, 208
- upper arms

- inspecting, 81
- replacing, 125
- users
 - requirements, 16
- V**
- validity and responsibility, 15
- velocity
 - adjusting, 75
- W**
- weight, 38
 - base unit, 56
- working range
 - robot, 42



ABB Robotics Sweden AB
S-721 71 VÄSTERÅS, Sweden
Telephone +46 10-732 50 00

ABB Robotics Norway AS
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Robotics (Shanghai) Limited
No. 39, 99 Miaoqiao Road,
Pudong New Area,
Shanghai, 201315, China
Telephone: +86 21 6105 6666

ABB Robotics LLC
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics