



ROBOTICS

Product specification

IRB 660



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Product specification

IRB 660-180/3.15

IRB 660-250/3.15

OmniCore

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Revision: H

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Original instructions.

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Overview of this specification

About this product specification

This product specification describes the performance of the manipulator or a complete family of manipulators in terms of:

- The structure and dimensional prints
- The fulfilment of standards, safety, and operating equipment
- The load diagrams, mounting or extra equipment, the motion, and the robot reach
- The specification of available variants and options

The specification covers the manipulator using the OmniCore controller.

Usage

Product specifications are used to find data and performance about the product, for example to decide which product to buy. How to handle the product is described in the product manual.

The specification is intended for:

- Product managers and product personnel
- Sales and marketing personnel
- Order and customer service personnel
- Integrators and customers

References

Reference	Document ID
<i>Product manual - IRB 660</i>	3HAC025755-001
<i>Product manual - OmniCore V250XT Type B</i>	3HAC087112-001
<i>Product specification - OmniCore V line RW 7 (RobotWare 7)</i>	3HAC074671-001
<i>Product specification - OmniCore V line RW 8 (RobotWare 8)</i>	3HAC098717-001
<i>Product specification - Robot stopping distances according to ISO 10218-1</i>	3HAC048645-001

Revisions

Revision	Description
A	First edition.
B	Published in release 23D. The following updates are done in this revision: • New option <i>Servo cable 1 axis - Length</i> [3206-x] added. • Added support for OmniCore V400XT.
C	Published in release 24A. The following updates are done in this revision: • Added DressPack options for CC-Link.
D	Published in release 24B. The following updates are done in this revision: • Added DressPack options for EtherCAT.

Continues on next page

Revision	Description
E	Published in release 24D. The following updates are done in this revision: • Updated the section Technical data on page 22. • Corrected the description of the connector kit options for DressPack.
F	Published in release 25.3. The following updates are done in this revision: • Company name updated to reflect current legal entities. • Updated portal name from myABB to ABB Robotics One.
G	Published in release 26.1. The following updates are made in this revision: • Removed duplication of robot weight specification. • Company name updated to reflect current legal entities. • Added support for RobotWare 8.
H	Published in release 26B. The following updates are made in this revision: • Added section <i>Impacting robot lifetime</i> and section <i>Intended use</i>.

1 Description

1.1 Structure

Robot family

IRB 660 is ABB Robotics latest generation of 4-axis robot, designed with a focus on its high production capacity, short cycle time at a high payload, long reach together with the very high uptime, which is significant for ABB's robots.

It is available in two versions; a handling capacity of 180 kg and 250 kg, both with a reach of 3.15 m.

Customer connections such as power signals, Bus signals and twin air are integrated in the robot, from the robot base to connections at the robot tool flange.

Intended use

IRB 660 is ideal for use in palletizing, material handling, gluing and cutting in food and beverage, Electric Vehicle (EV), automotive, and the general industries.

See [Impacting robot lifetime on page 14](#).

Control system

The robot is equipped with the OmniCore controller and robot control software, RobotWare. RobotWare supports every aspect of the robot system, such as motion control, development and execution of application programs, communication etc. See *Operating manual - OmniCore*.

We have added a range of software products - all falling under the umbrella designation of Active Safety - to protect not only personnel in the unlikely event of an accident, but also robot tools, peripheral equipment and the robot itself.

The IRB 660 manipulator can be connected to the following robot controllers:

- OmniCore V250XT

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support - for example communication features - network communication - and advanced functions such as multitasking, sensor control etc. For a complete description on optional software, see the *Product manual - OmniCore V250XT Type B*.

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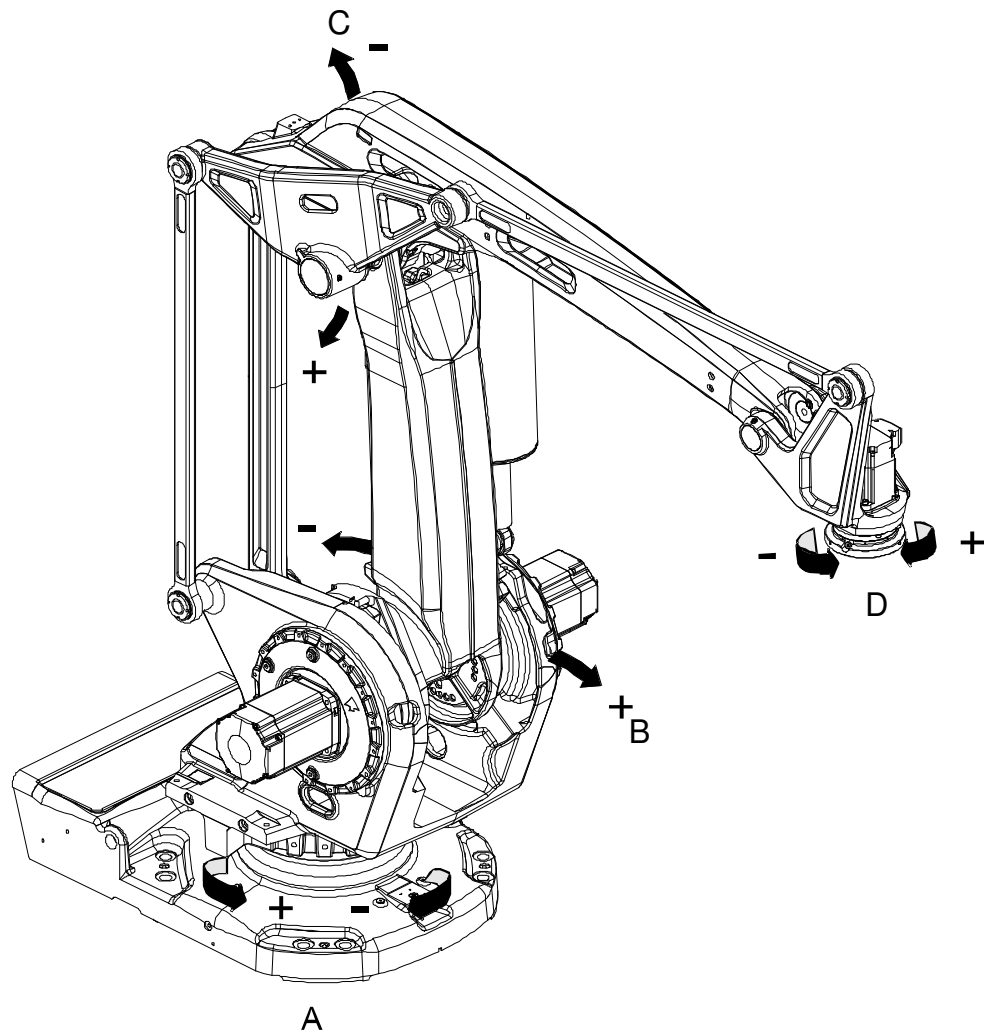
1 Description

1.1 Structure

Continued

Manipulator axes

The IRB 660 manipulator has 4 axes as shown in the following figure.



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Pos.	Description
A	Axis 1
B	Axis 2
C	Axis 3
D	Axis 6

Continues on next page

1.1.1 Different robot versions

General

The IRB 660 is available in two versions.

Robot type	Maximum handling capacity (kg)	Maximum reach at wrist center (m)
IRB 660	180	3.15
IRB 660	250	3.15

1 Description

1.1.2 Definition of version designation

1.1.2 Definition of version designation

IRB 660 Mounting

	Description
Mounting	Floor-mounted manipulator

Airborne noise level

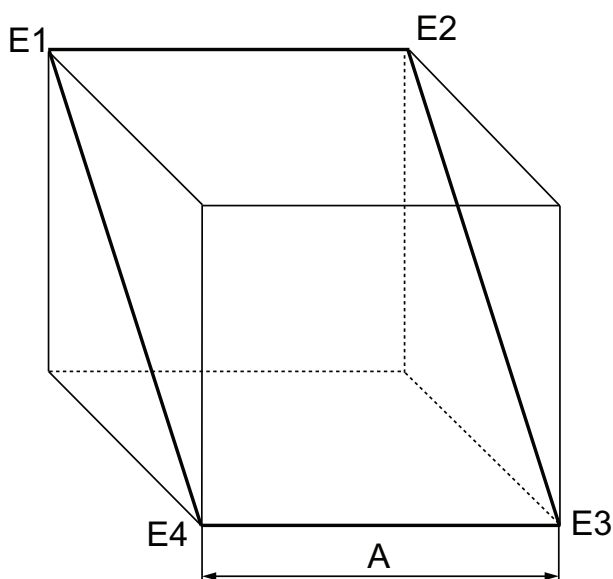
Data	Description	Note
Airborne noise level	The sound pressure level outside the working space	< 70 dB (A) Leq (acc. to Machinery directive 2006/42/EG).

Power consumption at max speed (vmax)

Type of Movement	IRB 660 (all variants)
ISO Cube	1.8 kW

Robot in calibration position	IRB 660 (all variants)
Brakes engaged	0.22 kW
Brakes disengaged	0.84 kW

The path E1-E2-E3-E4 in the ISO Cube is shown in the following figure.



Pos	Description
A	1,000 mm

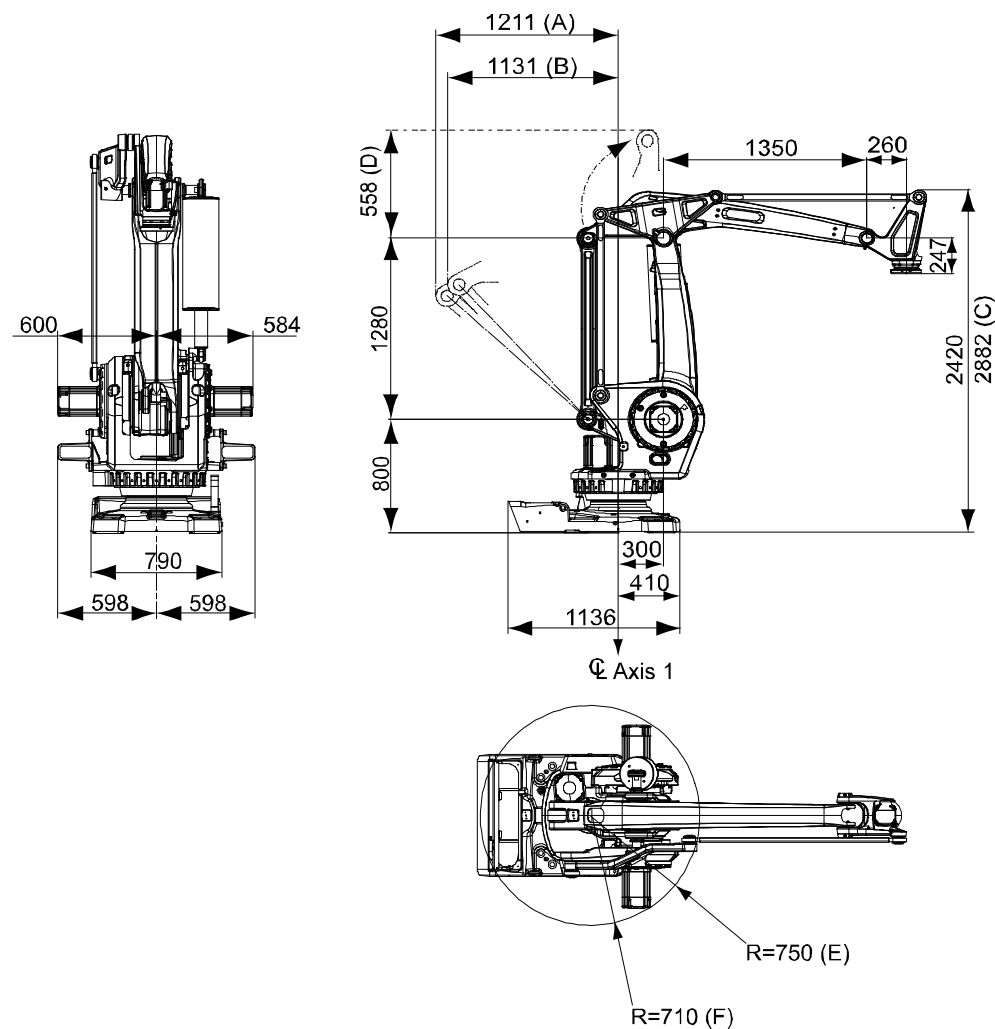
Power factor (cos φ)

The power factor is above 0.95 at a steady state power consumption higher than 2.0 kW, when the IRB 660 is connected to the OmniCore V line.

Continues on next page

Dimensions of IRB 660

The following figure shows the front, side, and top view of the manipulator (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.



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Position	Description
A	At mechanical stop
B	At max. working range axis 2
C	At max. working range axis 3
D	At min. working range axis 3
E	Radius for fork lift pocket
F	Radius for axis 3 motor

1 Description

1.2 Impacting robot lifetime

1.2 Impacting robot lifetime

Introduction

The expected lifetime of a robot is an important factor when planning an installation. This information is aiming to help you to maximize the lifetime of your robot and avoid unnecessary downtime or repair.

The lifetime of a robot is influenced by the following, but not limited to, factors:

- [Robot type selection on page 14](#)
- [Duty factor on page 14](#)
- [Environmental conditions on page 15](#)
- [Application and usage on page 15](#)
- [Design limitations on page 16](#)
- [Maintenance on page 17](#)
- [Individual lifetime variability on page 17](#)
- [Extreme usage on page 17](#)

Robot type selection

Selecting the right robot for the application is generally done based on payload and reach criteria, but other factors can influence the selection, such as the duty factor. Selecting the most suitable variant is crucial to achieve the expected high performance, uptime, and lifetime. Always select a robot in accordance with the intended use, see [Intended use on page 9](#).

ABB robots are capable of high accelerations and speeds. It is generally recommended to use RobotStudio to find out if a robot model is suitable for a specific application and duty factor. RobotStudio is an excellent tool to help with the assessment of the duty factor and the selection of the most suitable robot variant.

This robot is not specifically designed for use in demanding applications with a very high duty factor. If used in such conditions, a significant reduction in lifetime is possible for all axes, depending on the cycle. See [Extreme usage on page 17](#).

When selecting the robot variant, consider using application-specific robot, and suitable protection type.



Note

Use the Mechanical Analysis add-in in RobotStudio (see details below) for help with the assessment, or get technical support from ABB.

Duty factor

Duty factor is the percentage of time the robot is moving divided by the total time, including movement and wait time during the complete robot work cycle. It is a measurement of how much the robot is being used. Gearbox lifetime is reduced more rapidly by a higher duty cycle than by a lower one. See [Extreme usage on page 17](#).

Continues on next page



Note

The duty factor impact on lifetime can be analyzed in the add-in *Mechanical Analysis* in RobotStudio (see details below) and *Service Information System* (SIS) data in the controller. Contact ABB to analyze the SIS data.

Environmental conditions

Following factors within environmental conditions of the robot has an impact on the robot lifetime:

- Temperature:

The robot usage at high temperatures or extreme usage can lead to gearbox and motor cooling problems. Observe operating temperature limits stated in manipulator product manual. Extreme usage normally requires means of reduction of motor and gearbox oil heat.



Note

The add-in *Mechanical Analysis* in RobotStudio (see details below) or technical support from ABB can provide recommendation whether means of reduction of motor and gearbox oil heat is required.

- Exposure to chemicals might impact sealings, which can cause oil leakage.
- Vibrations caused by not following the foundation requirements might cause reduction of lifetime, for example for bearings. See [Requirements, foundation on page 24](#).
- Cleaning. Wrong cleaning can cause particles entering the sealings which can cause oil leakage. Proper cleaning is described in *Product manual - IRB 660*.

Application and usage

Following factors within robot application and usage has an impact on the robot lifetime:

- Payload definition and overload:

It is important to define the payload within specification and correctly defined tool data. See section [Load diagrams on page 37](#), and *Technical reference manual - RAPID Overview*.

The service routine for load identification, *LoadIdentify*, is available to support tool data definition. See *Operating manual - OmniCore*.

- Acceleration/deceleration:

The gearbox lifetime is reduced more rapidly by high accelerations/decelerations than by lower ones.



Note

Smoother movements bring reduced energy consumption.

Continues on next page

1 Description

1.2 Impacting robot lifetime

Continued



Note

Acceleration/deceleration can be modified with the instruction AccSet. See *Technical reference manual - RAPID Overview*.

Acceleration/deceleration is optimized by using automatic path planning functionality, either offline, or in RobotStudio, or using the online software.

- Limited movements:

If the range or the rotation angle for an axis is 10° or less, the expected life of the reduction gears may be reduced due to poor lubrication of internal parts or the internal parts being subject to a concentrated load. Add extra lubrication motion to the robot program or to maintenance schedule.



Note

Use RobotStudio *Signal Analyzer* or get technical support from ABB.

- High forces applied externally to the manipulator:

Some applications or not correctly programmed paths apply external forces to the manipulator, which might reduce its lifetime. Example of external force: gripper under constraint when gripping a part or load sharing between multiple robots.

- Number of collisions:

Collisions, especially at high speed and/or with high loads reduce the lifetime of the gearboxes. Avoid collisions and set collision detection sensitivity to the appropriate level.



Note

See the application manual for the controller software, section *Collision detection*, listed in [References on page 7](#).

- Number of emergency stops:

Emergency stops, especially at high speed and/or high loads reduce the lifetime of the gearboxes. Whenever permitted by risk assessment, set the robot stopping functions to stop category 1.



Note

See the product manual for the robot controller, listed in [References on page 7](#).

Design limitations

See the section *Expected component life* in *Product manual - IRB 660*.

Continues on next page

Maintenance

The maintenance and use of the robot will affect the performance and lifetime. For example:

- Preventive maintenance will optimize the lifetime of the robot. The recommended maintenance activities and intervals are described in *Product manual - IRB 660*.
- Observance of lubricant types and maintenance periods recommended by ABB.
- Possible pollution of the lubricant by an external cause, for example, water in the oil caused by high humidity.
- Extreme usage, for example high duty factor or environmental factors, will affect the maintenance schedule, for example, shorter intervals for oil change.

Contact your local ABB office to get technical support from ABB.

Individual lifetime variability

The lifetime varies with individual robots. For example, a cycle with a lower duty factor may fail earlier than one with a higher duty factor. But a cycle with a higher duty factor is more likely to fail earlier than a cycle with lower duty factor.

Extreme usage

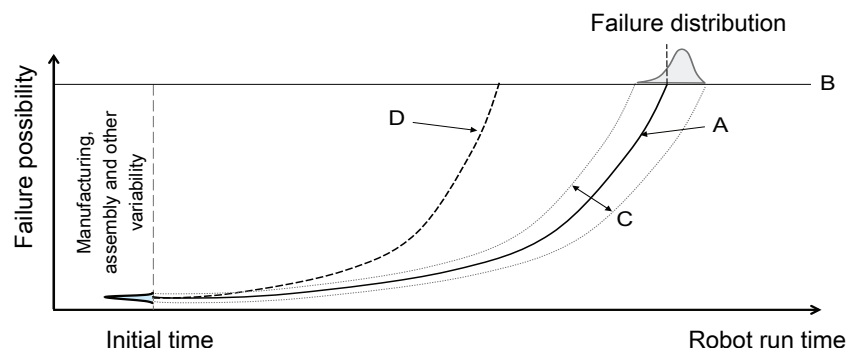
Examples of extreme usage in regard to movement: a stress index range that shows up as red (51) in the RobotStudio add-in *Mechanical Analysis*, press tending application, very severe palletizing applications, major use of axis 1, 2, or 3 movement.

The controller can issue a duty factor warning on the FlexPendant, if applicable. See the chapter *Troubleshooting* in *Product manual - IRB 660*.

Extreme usage requires specific maintenance, for example, shorter interval for oil change. See *Maintenance schedule* in *Product manual - IRB 660*.

Summary

The diagram illustrates the relationship between robot run time and failure possibility.



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A	Design lifetime
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Continues on next page

1 Description

1.2 Impacting robot lifetime

Continued

B	Failure threshold
C	Individual variability
D	Negatively affected lifetime

The curve (A) represents the design lifetime, showing how failure probability increases over time following a normal distribution pattern. The failure threshold (B) indicates the point at which component failure becomes likely.

Individual variability between robots is shown by the dotted lines (C), representing the natural variation in component life due to manufacturing, assembly, and other factors. This variability means that while most robots will follow the design lifetime curve, some individual units may experience earlier or later failures within the normal distribution.

As highlighted with the curve (D) in the diagram, robot lifetime can be negatively affected by not following best practices in the key areas discussed in this chapter:

- [Robot type selection on page 14](#)
- [Duty factor on page 14](#)
- [Environmental conditions on page 15](#)
- [Application and usage on page 15](#)
- [Maintenance on page 17](#)

By adhering to the recommendations outlined in each of these sections, users can maximize their robot's operational lifetime and ensure performance stays within the design lifetime curve, avoiding premature failure and unnecessary downtime.

Available tools

There are several tools available throughout the lifecycle of an ABB robot, from support with selecting the most suitable manipulator and optimizing its lifetime, to operation, maintenance, and repair:

ABB toolbox	Type	Product lifecycle		
		Sales, pre-study	Installation, commissioning	Operation, maintenance, repair
Product specification	Document	x	x	
Product manual	Document		x	x
Mechanical Analysis add-in	Add-in in RobotStudio	x	x	x
Service Information System (SIS) / Condition Based Maintenance (CBM)	RobotWare functionality / Customer service analysis		x	x
Connected Services	Hardware and Software		x	x
Automatic Path Planning	RobotStudio functionality and online software	x	x	(x)

Continues on next page

ABB toolbox	Type	Product lifecycle		
		Sales, pre-study	Installation, commissioning	Operation, maintenance, repair
Signal Analyzer / TuneMaster	RobotStudio functionality / Software	x	x	x
ABB support	Customer support	x	x	x

1 Description

1.3.1 Applicable standards

1.3 Standards

1.3.1 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.

1.4 Installation

1.4.1 Introduction

General

IRB 660 is designed for floor mounting (no tilting allowed around X or Y axis). Depending on the robot version, an end effector with maximum weight of 180 to 250 kg including payload, can be mounted on the mounting flange (axis 6). For more information on Load diagrams, see [Load diagrams on page 38](#).

Working range

The working range of axis 1 can be limited by mechanical stops.

External Mains Transformer

Include an external transformer for mains voltage 200V and 220V.

Explosive environments

The robot must not be located or operated in an explosive environment.

1 Description

1.4.2 Technical data

1.4.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 660	1750 kg



Note

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

Mounting positions

The table shows valid mounting options for the manipulator.

Mounting option	Installation angle	Note
Floor mounted	0°	



Note

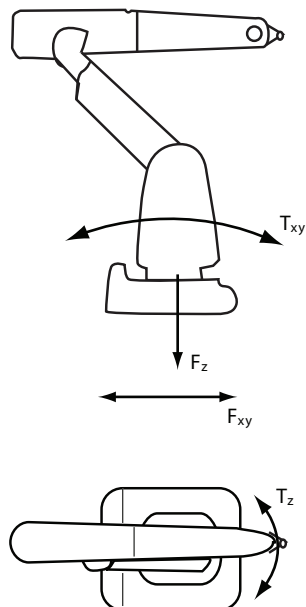
The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See the product manual for details.

Continues on next page

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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



xx1100000521

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

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

**Note**

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

**WARNING**

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

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	$\pm 8.0 \text{ kN}$	$\pm 11.7 \text{ kN}$
Force z	$18.0 \pm 4.9 \text{ kN}$	$18.0 \pm 8.2 \text{ kN}$
Torque xy	$\pm 23.2 \text{ kNm}$	$\pm 31.2 \text{ kNm}$
Torque z	$\pm 7.7 \text{ kNm}$	$\pm 9.9 \text{ kNm}$

Continues on next page

1 Description

1.4.2 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	22 Hz  Note It may affect the manipulator life-time to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment. ⁱ For information about compensating for foundation flexibility, see the application manual of the controller software, section <i>Motion Process Mode</i> .

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	+55° C
Maximum ambient temperature (less than 24 hrs)	+70° C
Maximum ambient humidity	95% at constant temperature (gaseous only)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	0° C
Maximum ambient temperature	+50° C
Maximum ambient humidity	95% at constant temperature

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	IP 67

ⁱ According to IEC 60529.

1 Description

1.4.3 Mounting the manipulator

1.4.3 Mounting the manipulator

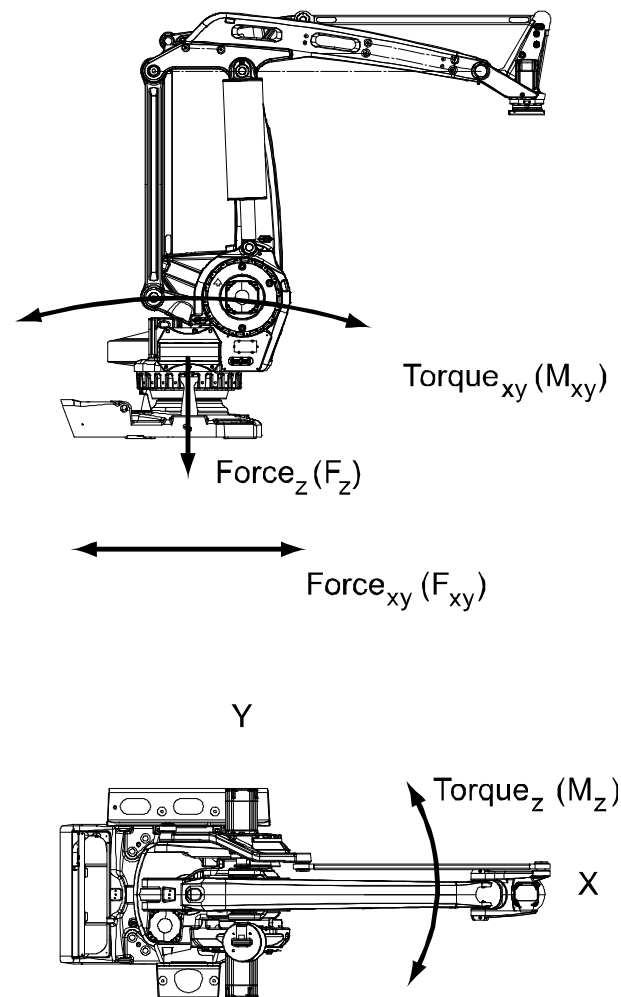
Maximum Load

Maximum load in relation to the base coordinate system.

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	$\pm 8.0 \text{ kN}$	$\pm 11.7 \text{ kN}$
Force z	$18.0 \pm 4.9 \text{ kN}$	$18.0 \pm 8.2 \text{ kN}$
Torque xy	$\pm 23.2 \text{ kNm}$	$\pm 31.2 \text{ kNm}$
Torque z	$\pm 7.7 \text{ kNm}$	$\pm 9.9 \text{ kNm}$

The following figure shows the direction of forces.



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Note regarding M_{xy} and F_{xy}

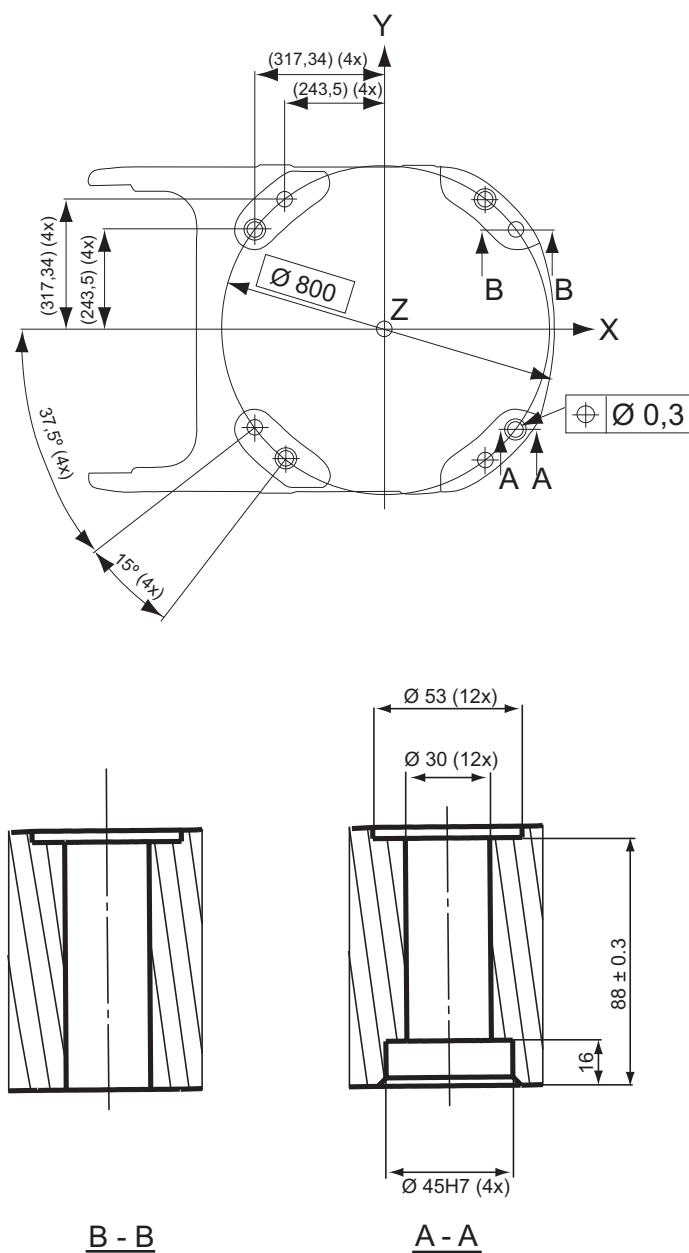
The bending torque (M_{xy}) can occur in any direction in the XY-plane of the base coordinate system.

The same applies to the transverse force (F_{xy}).

Continues on next page

Fastening holes robot base

The following figure shows the hole configuration (dimensions in mm).



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Recommended screws for fastening the manipulator to a base plate:

- M24 x 140 8.8 with 4 mm flat washer. Torque value 725 Nm.



Note

Only two guiding sleeves shall be used. The corresponding holes in the base plate shall be circular and oval according to the following base plate drawing. Regarding AbsAcc performance, the recommended are the chosen guide holes those are according to the following base plate drawing.

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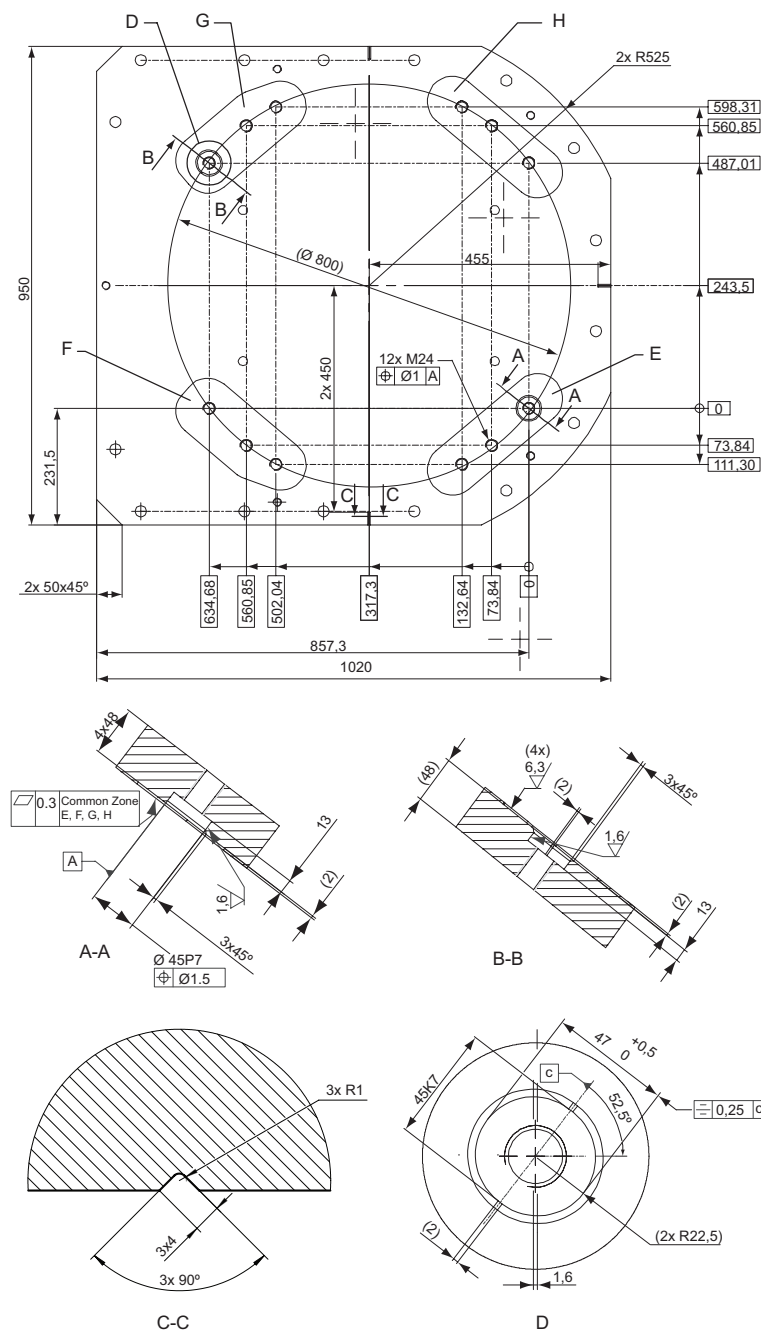
1 Description

1.4.3 Mounting the manipulator

Continued

Base plate drawing

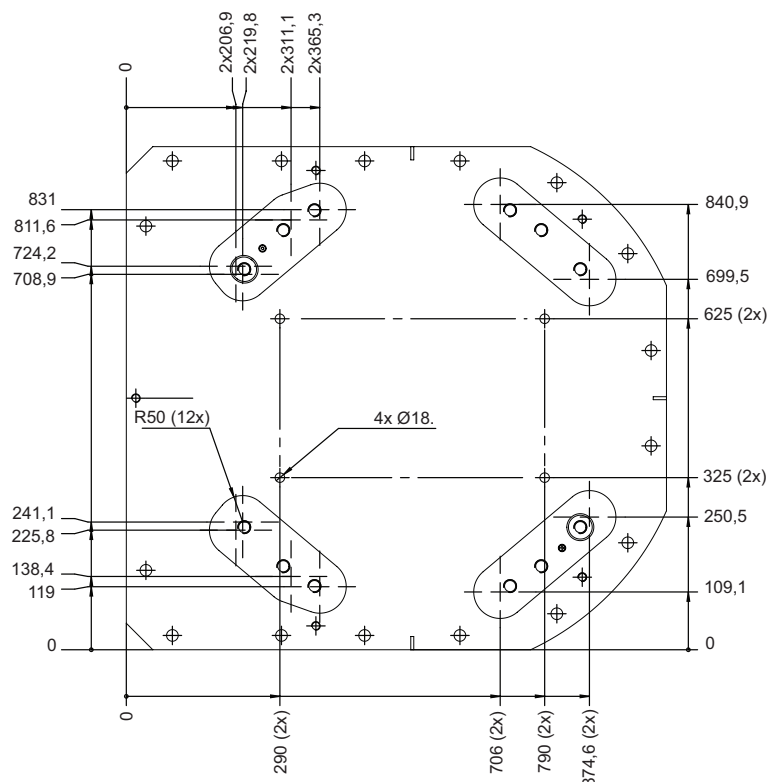
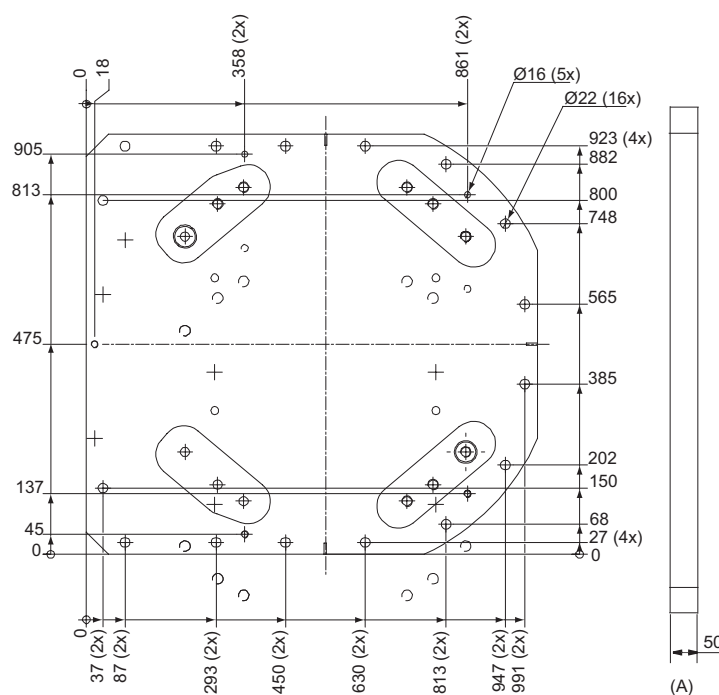
The following figure shows an example of base plate (dimensions in mm).



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E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)
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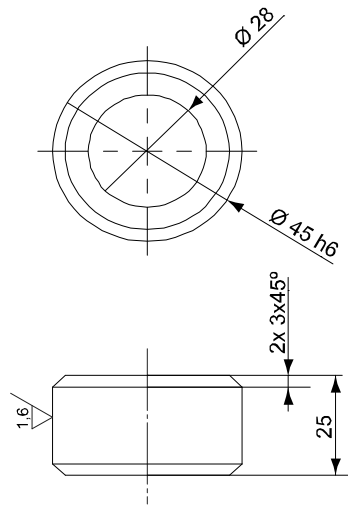
Pos	Description
A	Color: RAL 9005 Thickness: 80-100 μm

Continues on next page

1 Description

1.4.3 Mounting the manipulator

Continued



xx1000001055

Pos	Description
A	Guide sleeve protected from corrosion

1.5 Calibration

1.5.1 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

More information is available in the product manual.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 660. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

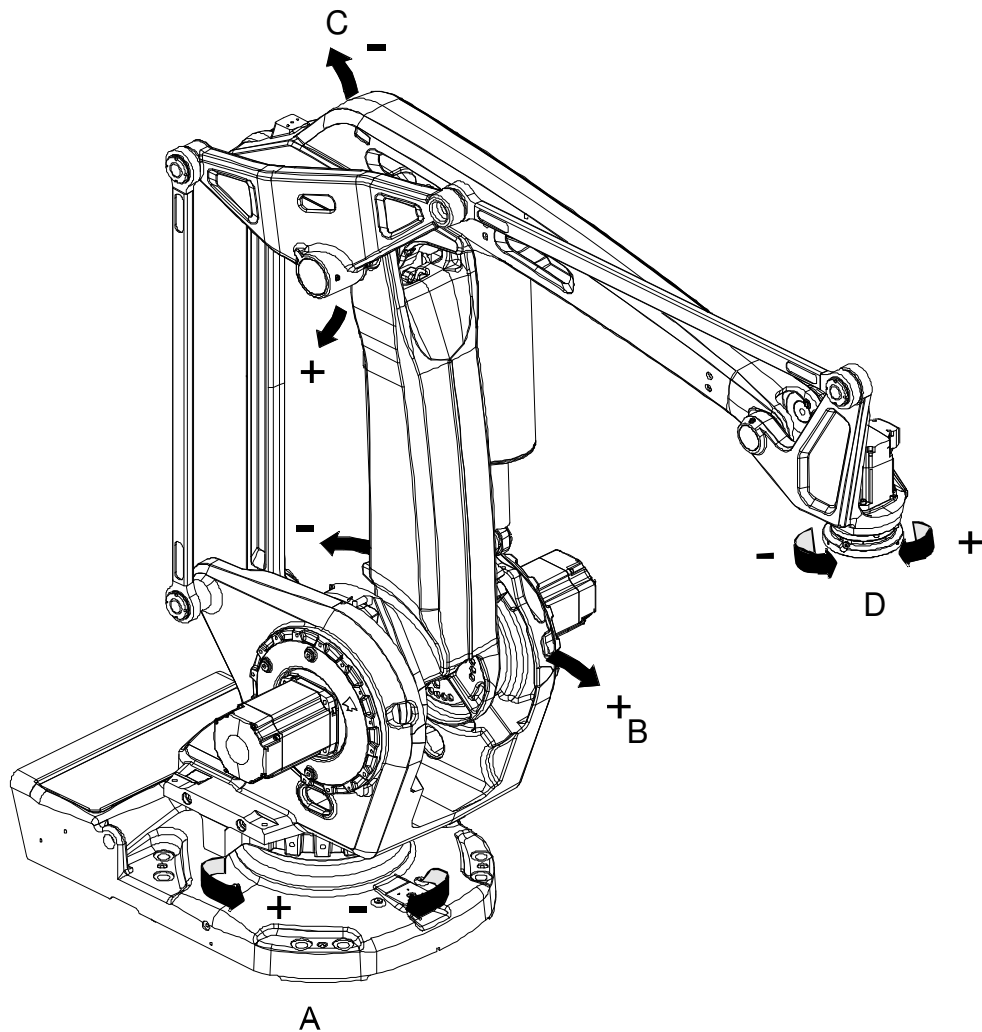
1 Description

1.5.2 Fine calibration

1.5.2 Fine calibration

General

Fine calibration is made using the Axis calibration method. The following figure shows all axes in zero position.



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Position	Description
A	Axis 1
B	Axis 2
C	Axis 3
D	Axis 6

Calibration	Position
Calibration of all axes	All axes are in zero position
Calibration of axis 1 and 2	Axis 1 and 2 in zero position Axis 3 to 6 in any position

Continues on next page

Calibration	Position
Calibration of axis 1	Axis 1 in zero position Axis 2 to 6 in any position

1 Description

1.5.3 Calibration tools for Axis Calibration

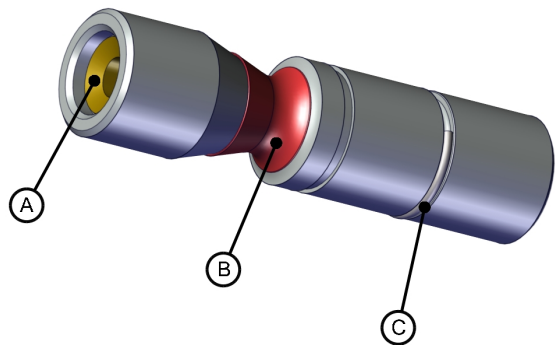
1.5.3 Calibration tools for Axis Calibration

Calibration tools



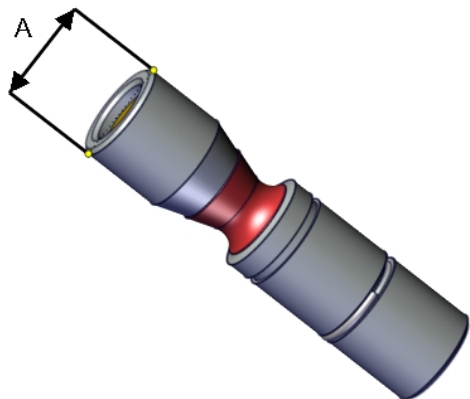
WARNING

If any part is missing or damaged, the tool must be replaced immediately.



xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring



xx1500000951

A	Outer diameter
---	----------------

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within $\varnothing 12g4$ mm, $\varnothing 8g4$ mm or $\varnothing 6g5$ mm (depending on calibration tool size).
- Straightness within 0.005 mm.

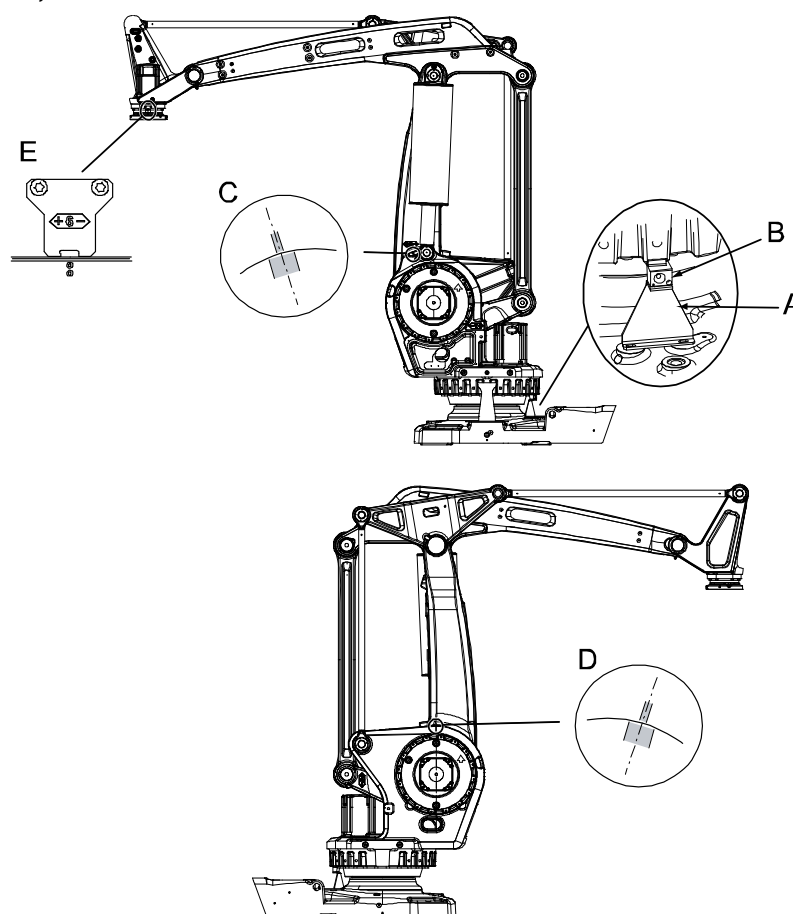
1.5.4 Synchronization marks and axis movement directions

1.5.4.1 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

Synchronization marks, IRB 660



xx0500002487

A	Synchronization plate, axis 1
B	Synchronization tab on robot
C	Synchronization mark, axis 2
D	Synchronization mark, axis 3
E	Synchronization plate and mark, axis 6

Synchronization marks at axes 2 and 3

The synchronization marks at axes 2, 3 and 6, shown in the figure above, consist of two single marks that should be positioned opposite to one another when the robot is standing in its synchronization position. One of the marks is more narrow than the other and should be positioned within the limits of the wider mark.

1 Description

1.5.4.2 Calibration movement directions for all axes

1.5.4.2 Calibration movement directions for all axes

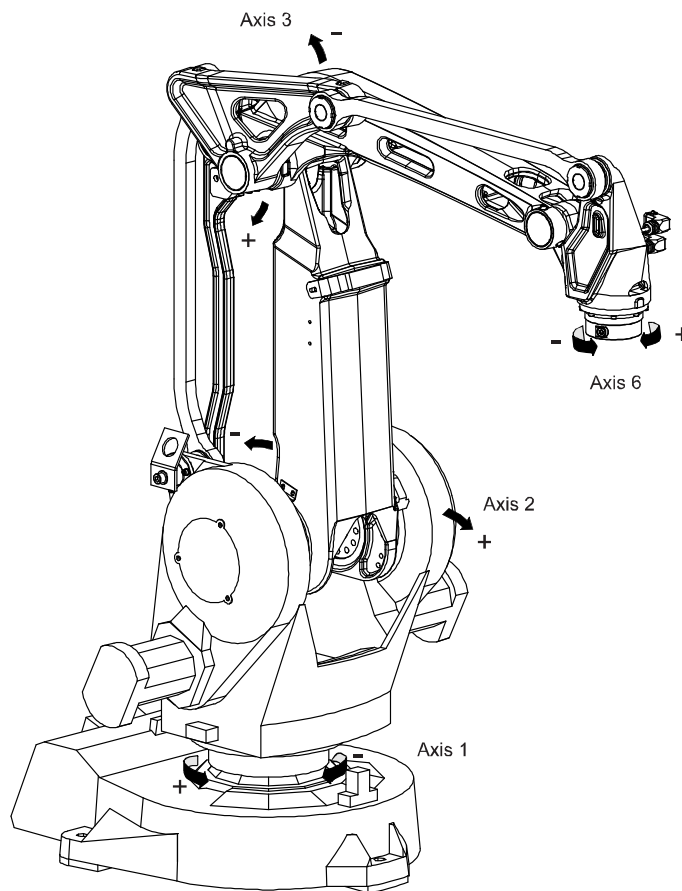
Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

Manual movement directions, 4 axes

Note! The graphic shows an IRB 260. The positive direction is the same for all 4-axis robots



xx0500001927

1.6 Load diagrams

1.6.1 Introduction to Load diagrams

Information

**WARNING**

It is very important to always define correct actual load data and correct payload of the robot. Incorrect definitions of load data can result in overloading of the robot.

If incorrect load data is used, and/or if loads outside the load diagram are used, the following parts can be damaged due to overload:

- motors
- gearboxes
- mechanical structure

**WARNING**

In RobotWare, the service routine LoadIdentify can be used to determine correct load parameters. The routine automatically defines the tool and the load.

See *Operating manual - OmniCore*, for detailed information.

**WARNING**

Robots running with incorrect load data and/or with loads outside the load diagram, will not be covered by robot warranty.

General

The load diagrams include a nominal payload inertia, J_0 of 15 kgm², and an extra load of 50 kg at the upper arm housing.

At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

Control of load case with RobotLoad

To verify a specific load case, use the RobotStudio add-in RobotLoad.

The result from RobotLoad is only valid within the maximum loads and tilt angles. There is no warning if the maximum permitted arm load is exceeded. For over-load cases and special applications, contact ABB for further analysis.

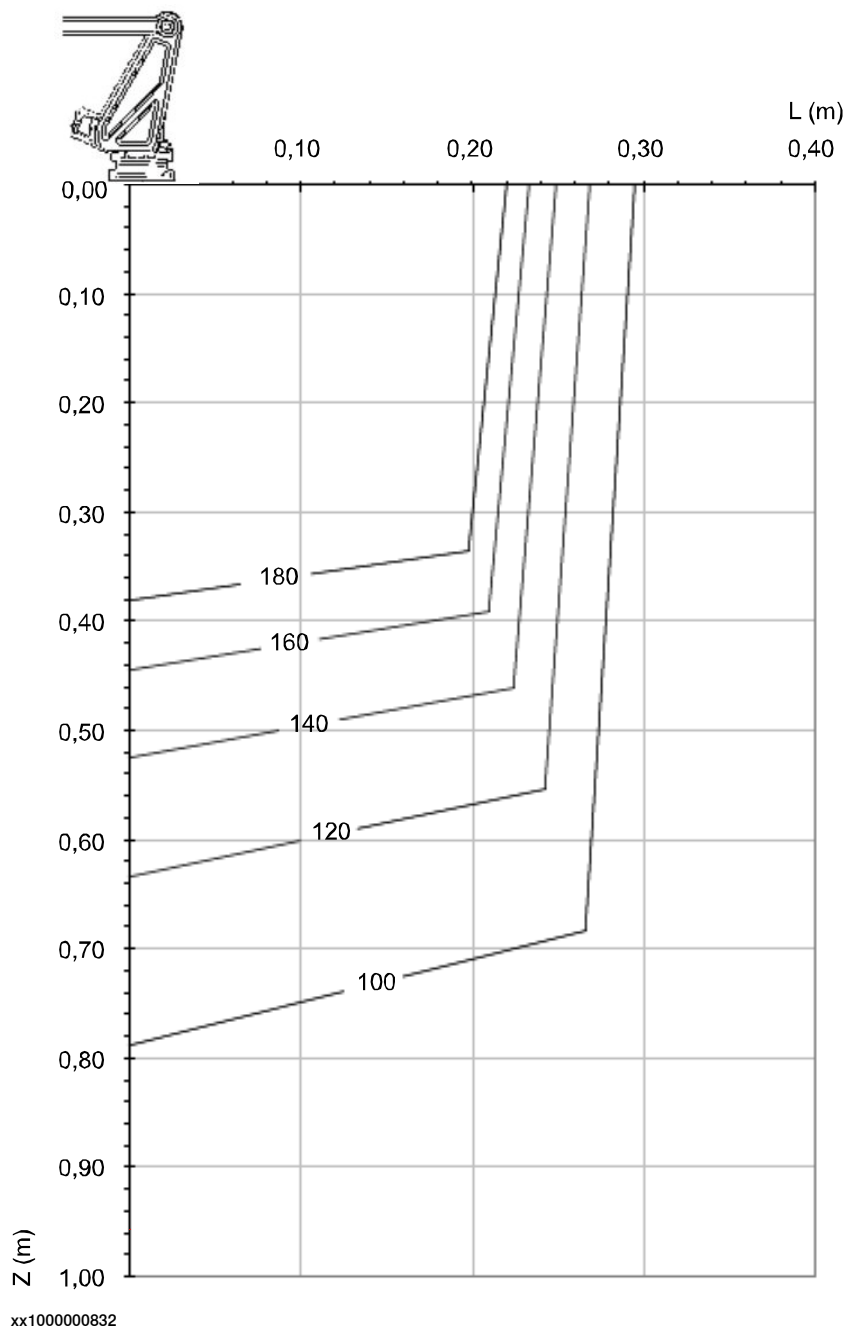
1 Description

1.6.2 Load diagrams

1.6.2 Load diagrams

IRB 660-180/3.15

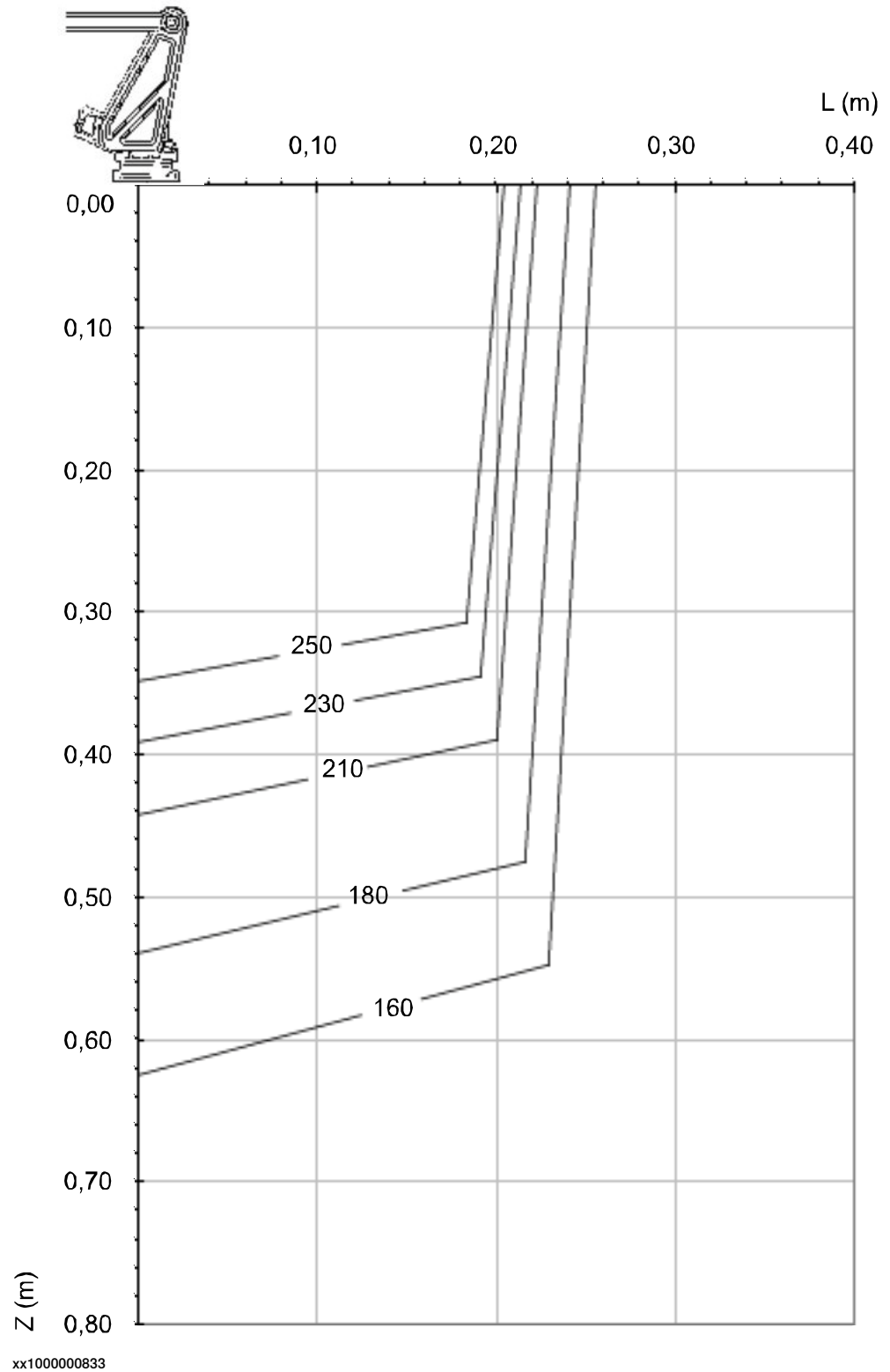
The following figures shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



Continues on next page

IRB 660-250/3.15

The following figures shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



1 Description

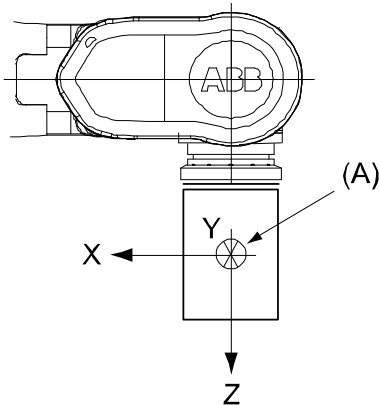
1.6.3 Maximum load and moment of inertia

1.6.3 Maximum load and moment of inertia

Overview

Load in kg, Z and L in m and J in kgm^2 .

Axis	Maximum moment of inertia
6	$Ja_6 = \text{Load} \times L^2 + J_{0Z} \leq 250 \text{ kgm}^2$



xx1000000834

Pos	Description
A	Center of gravity

	Description
J_{0X} , J_{0Y} , J_{0Z}	Max. moment of inertia around the X, Y and Z axes at center of gravity.

1.6.4 Maximum TCP acceleration

General

Higher values can be reached with lower loads than the nominal because of our dynamical motion control QuickMove2. For specific values in the unique customer cycle, or for robots not listed in the table below, we recommend to use RobotStudio.

Maximum Cartesian design acceleration for nominal loads

Robot type	E-stop Max acceleration at nominal load COG [m/s ²]	Controlled Motion Max acceleration at nominal load COG [m/s ²]
IRB 660 - 250/3.15	31	18
IRB 660 - 180/3.15	37	24



Note

Acceleration levels for emergency stop and controlled motion includes acceleration due to gravitational forces. Nominal load is defined with nominal mass and cog with max offset in Z and L (see the load diagram).

1 Description

1.7.1 Overview

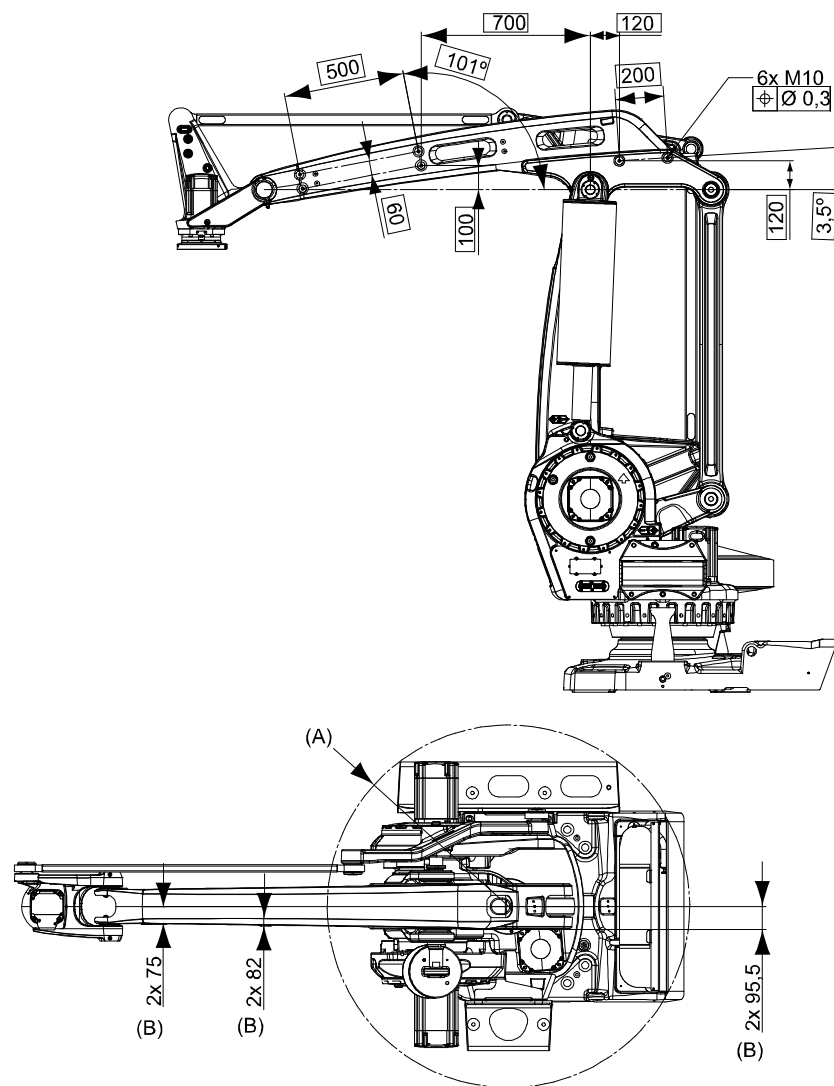
1.7 Mounting of equipment

1.7.1 Overview

General

Extra loads can be mounted on to the upper arm and on to the left side of the frame. Holes and definitions of masses are shown in following figures.

For mounting of an external vacuum hose there are six holes on the upper arm (see the following figure). The maximum weight for the vacuum hose and fastening device is 35kg. When using the holes, the weight of the vacuum hose shall be reduced from the maximum handling capacity, for each variant respectively.



xx1000000835

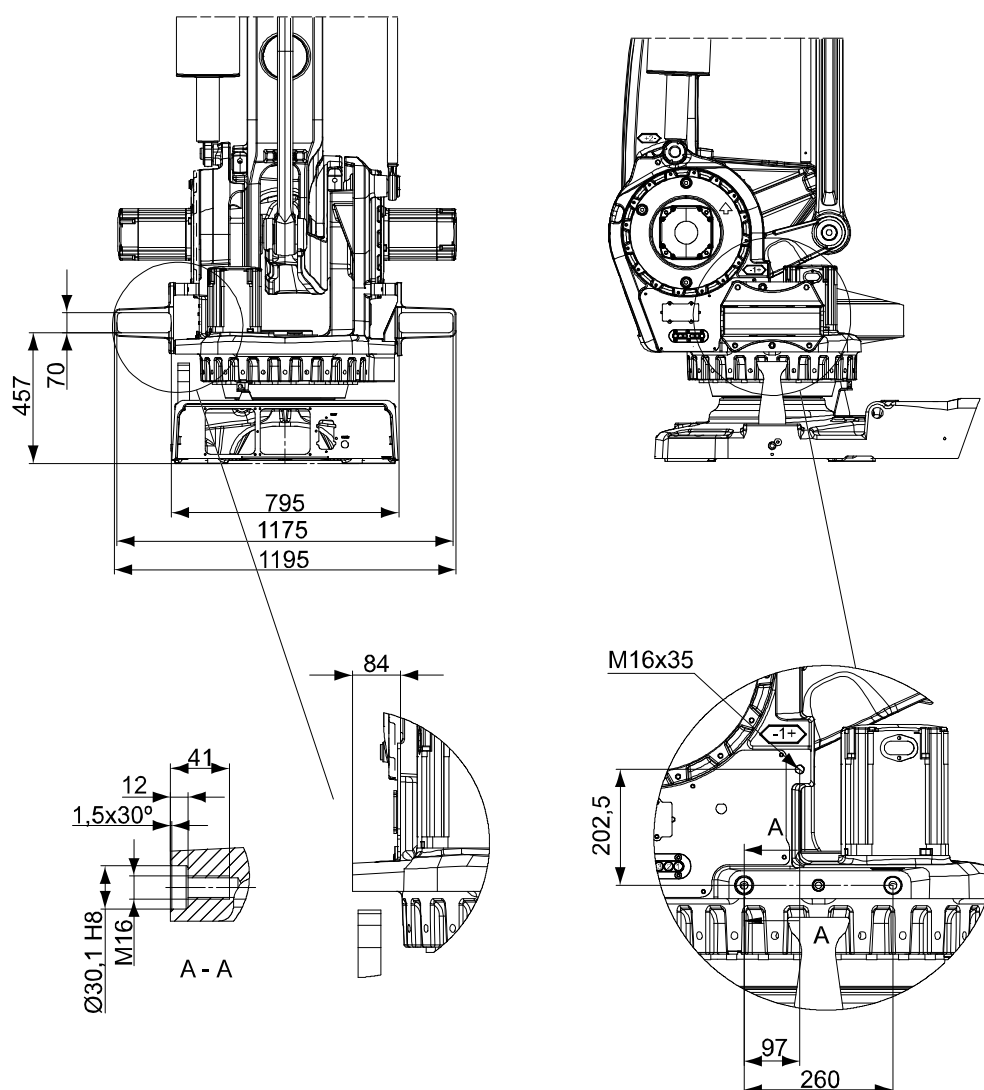
Position	Description
A	R750 Right fork lift pocket
B	M10 Mounting hole, upper arm

Continues on next page

Frame

For mounting of extra load on to the frame there are three holes on the left side (see the following figure). The maximum weight of the extra load is 150kg and the maximum moment of inertia is 120kgm².

Description	Value and definition
Permitted extra load on frame	M = 150 kg
Max. moment of inertia for extra load	$J_H = 120 \text{ kgm}^2$
Recommended position as shown in the following figure	$J_H = J_{H0} + M \times R^2$ J_{H0} is the moment of inertia (kgm ²) for the extra load. R is the radius (m) from the center of axis1. M is the total mass (kg) of the extra load.



xx1000000836

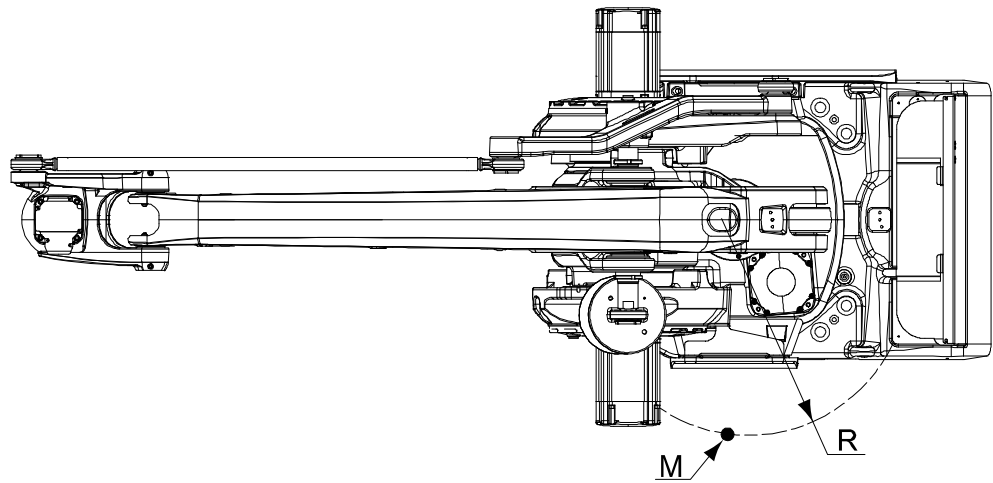
The following figure shows the radius for extra load on frame.

Continues on next page

1 Description

1.7.1 Overview

Continued

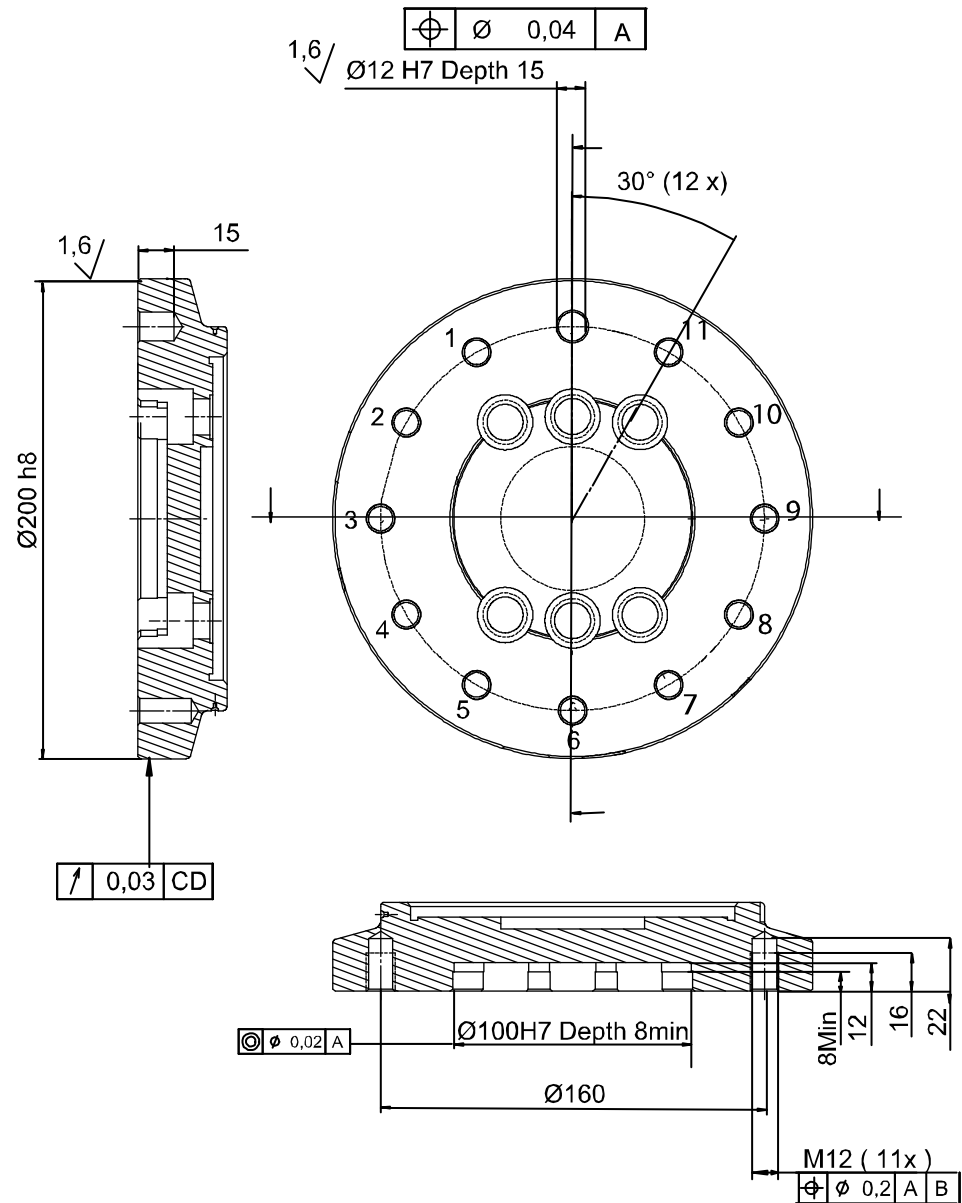


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Robot tool flange

The following figure shows the robot tool flange SS-EN ISO 9409-1;2004 (dimensions in mm).



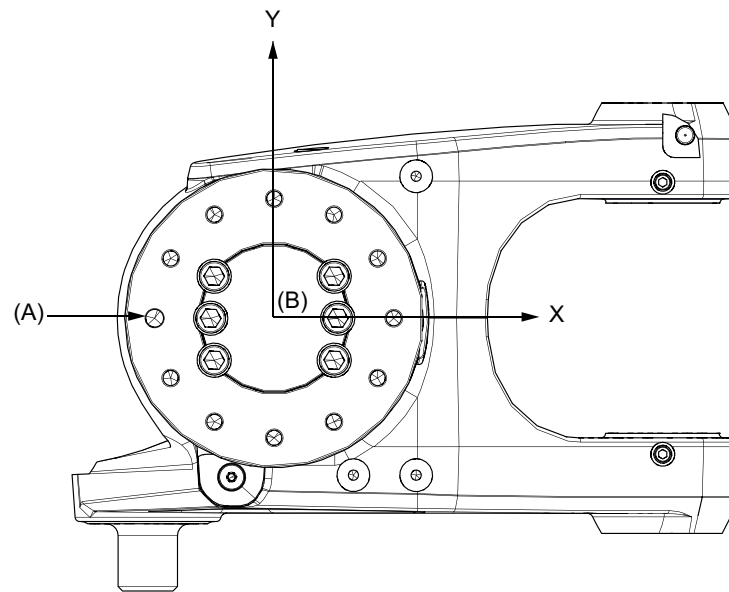
xx0500002292

Continues on next page

1 Description

1.7.1 Overview

Continued



xx1800001377

-	Tool flange in bottom view
A	Locating hole
B	Tool coordinate system

Fastener quality

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

1.8 Robot motion

1.8.1 Introduction

Type of Motion

Axis	Type of motion	Range of movement	Option
1	Rotation motion	+180° to -180°	+220° to -220°
2	Arm motion	+85° to -42°	
3	Arm motion	+120° to -20°	
6	Turn motion	+300° to -300° (default) +150 revolutions to -150 revolutions Max (see the following note)	



Note

- The default working range for axis 6 can be extended by changing parameter values in the software.

Continues on next page

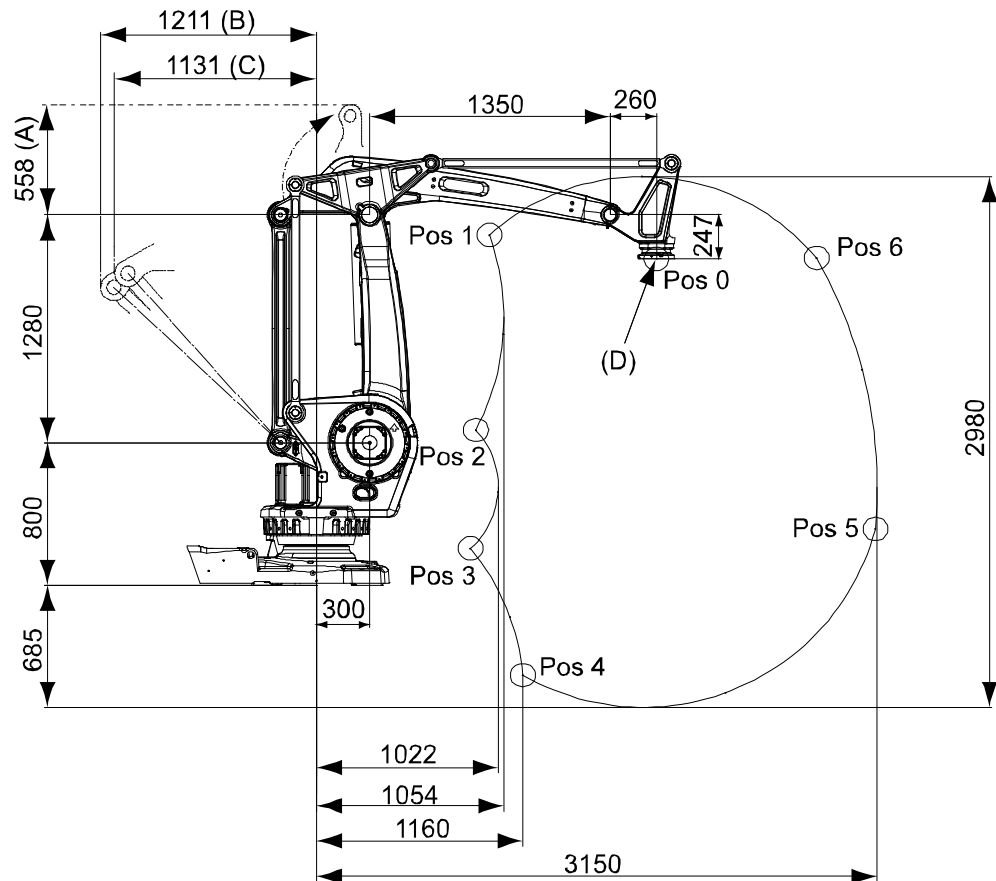
1 Description

1.8.1 Introduction

Continued

Illustration

The following figure shows the extreme positions of the robot arm specified at the tool flange center (dimensions in mm).



xx1000000839

Position	Description
A	Min. working stop
B	Mechanical stop
C	Max. working stop
D	Tool flange center

Positions at wrist center

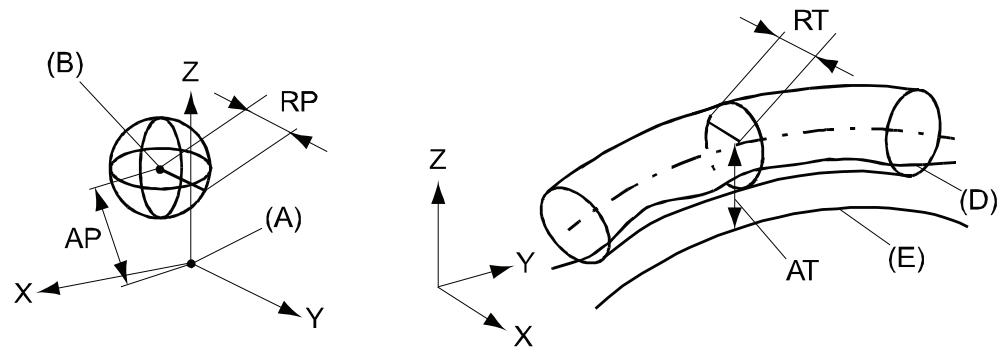
Position number (see preceding figure)	X Position (mm)	Z Position (mm)	Axis2 Angle (degrees)	Axis3 Angle (degrees)
0	1910	1833	0	0
1	972	1966	-42	-20
2	895	870	-42	28
3	866	207	50	120
4	1160	-505	85	120
5	3139	315	85	15
6	2809	1837	50	-20

1.8.2 Performance according to ISO 9283

General

At rated maximum load, maximum offset and 1.6 m/s velocity on the inclined ISO test plane, with all six axes in motion. Values in the table below are the average result of measurements on a small number of robots. The result may differ depending on where in the working range the robot is positioning, velocity, arm configuration, from which direction the position is approached, the load direction of the arm system. Backlashes in gearboxes also affect the result.

The figures for AP, RP, AT and RT are measured according to figure below.



xx0800000424

Pos	Description	Pos	Description
A	Programmed position	E	Programmed path
B	Mean position at program execution	D	Actual path at program execution
AP	Mean distance from programmed position	AT	Max deviation from E to average path
RP	Tolerance of position B at repeated positioning	RT	Tolerance of the path at repeated program execution

Description	IRB 660-180/3.15	IRB 660-250/3.15
Unidirectional pose accuracy, AP ⁱ (mm)	0.20	0.20
Unidirectional pose repeatability, RP (mm)	0.05	0.05
Linear path repeatability, RT (mm)	0.23	0.17
Linear path accuracy, AT (mm)	2.20	2.13
Pose stabilization time PST (s)	0.17	0.22

ⁱ AP according to the ISO test above, is the difference between the taught position (position manually modified in the cell) and the average position obtained during program execution.

The above values are the range of average test results from a number of robots.

1 Description

1.8.3 Velocity

1.8.3 Velocity

Maximum axis speeds

Axis No.	IRB 660-180/3.15	IRB 660-250/3.15
1	130 °/s	95 °/s
2	130 °/s	95 °/s
3	130 °/s	95 °/s
6	300 °/s	240 °/s

There is a supervision function to prevent overheating in applications with intensive and frequent movements.

1.8.4 Robot stopping distances and times

Introduction

The stopping distances and times for category 0 and category 1 stops, as required by EN ISO 10218-1 Annex B, are listed in *Product specification - Robot stopping distances according to ISO 10218-1 (3HAC048645-001)*.

1 Description

1.9.1 Introduction

1.9 Customer connections

1.9.1 Introduction

General

Depending on the choice of options above the DressPack will have different content.
The choice of routing will not affect the content. See tables for signal content below.

DressPack, Parallel, bus and air communication

Type	Application	Specification	Connection type	Harting Article No.	Comment
Power (CP)	Utility power	4x0.75mm ² (5A/250VAC)	3-module Harting, shell size 10B, EE	Female, EE, 8 pin9 140 083 101	1x0.75 mm ² protective earth
Signals (CS)	Parallel communication	16x AWG24 + 10x AWG24 (50V/1A)	3-module Harting, shell size 10B, HD+EE	Female, HD, 25 pin9 140 253 101	4 quad twisted, 5 screened pair twisted
Signals (CS)		5x2AWG24 (50V/1A)	3-module Harting, shell size 10B, HD	Female, HD, 25 pin9 140 253 101	Sep. Screened
Bus Communication (BUS)	BUS power & BUS utility	2x2 AWG24	3-module Harting, shell size 10B, DD	Female, DD, 12 pin9 140 123 101	
	CANBus	2xAWG26, Z=120 Ohm (1MHz)			
Air (AIR)	Utility air	2x12.7 (1/2") P Nom = 16 bar	Parker Push-lock, 1/2" M22x1,5 Brass 24 degree seal		

DressPack, Parallel and Ethernet communication

Type	Application	Specification	Connection type	Supplier Article No.	Comment
Functional Earth (FE)		10mm ²	M8 Cable lug		
Bus communication (BUS)	Ethernet/IP, PROFINET	4x0.4mm ²	M12 PFT Slim Design, 4-poles, D-coded	Male, Harting 21038821425	Ethernet CAT5e 100 Mbit ¹ .
Power (CP)	Utility power	4x0.75mm ² (5A/250VAC)	3-module Harting, shell size 10B, EE	Female, EE, 8 pin9 140 083 101	1x0.75mm ² protective earth
Signals (CS)	Parallel communication	16x AWG24 + 10x AWG24 (50V/1A)	3-module Harting, shell size 10B, HD+EE	Female, HD, 25 pin9 140 253 101	4 quad twisted, 5 screened pair twisted

¹ Ethernet with wire colors according to PROFINET standard

Continues on next page

1 Description

1.9.1 Introduction

Continued

Type	Application	Specification	Connection type	Supplier Article No.	Comment
Air (AIR)	Utility air	2x12.7 (1/2") $P_{\text{Nom}} = 16 \text{ bar}$	Parker Push-lock, 1/2" M22x1,5 Brass 24 degree seal		

1 Description

1.10.1 Introduction

1.10 Maintenance and troubleshooting

1.10.1 Introduction

General

The robot requires only minimum maintenance during operation. It has been designed to make it as easy to service as possible:

- Maintenance-free AC motors are used
- Oil is used for the gear boxes
- The cabling is routed for longevity, and in the unlikely event of a failure, its modular design makes it easy to change

Maintenance

The maintenance intervals depend on the use of the robot, the required maintenance activities also depends on selected options. For detailed information on maintenance procedures, see *Product manual - IRB 660*, chapter *Maintenance*.

2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 660 are described in the following sections. The same option numbers are used here as in the specification form.

The variants and options related to the robot controller are described in the product specification for the controller.

2 Specification of variants and options

2.2 Manipulator

2.2 Manipulator

Manipulator variant

Option	Robot variant	Handling capacity (kg)	Reach (m)
3300-58	660-180/3.15	180	3.15
3300-59	660-250/3.15	250	3.15

Manipulator color

Option	Color	RAL code ⁱ
209-2	ABB white standard	RAL 9003
209-202	ABB Graphite White std Standard color	RAL 7035
209	RAL code should be specified (ABB non-standard colors)	

ⁱ The colors can differ depending on supplier and the material on which the paint is applied.



Note

The delivery time for painted spare parts is longer for non-standard colors.

Manipulator protection

Option	Description
3350-670	Base 67, IP67

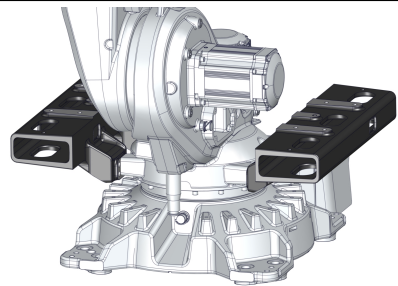


Note

Base 67 includes IP67, according to standard IEC 60529.

Forklift device

The manipulator can be delivered with forklift devices, allowing a forklift to be used when moving the manipulator.

Option	Description	
3318-2	Forklift device on frame Fork lift pockets placed on the frame gives a more balanced lifting point. This can be used together with special tool to invert a robot.	 xx2300001243

Continues on next page

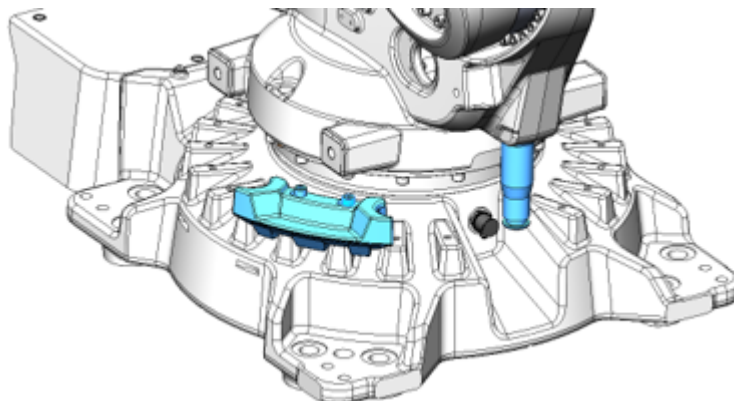
Resolver connection 7th axis

Option	Description
3322-1	On base

Limited working range

Option	Description
3323-1	Axis 1 adjustable 15°
3323-3	Axis 1 adjustable 7.5°

The manipulator can be equipped with adjustable mechanical stops. This is to mechanically limit the working range on axis 1. The mechanical stops are delivered alongside the robot (not installed). The stops can be placed in steps according to the option.



xx2100002595



Tip

An alternative to mechanical stops is to use safe supervision of the working range limitations. This requires the option *SafeMove Standard+*. See the product specification for the respective robot controller.

Extended working range

Option	Description	
3324-1	Axis 1 to $\pm 220^\circ$	The option extends the working range on axis 1 from $\pm 170^\circ$ to $\pm 220^\circ$.

Continues on next page

2 Specification of variants and options

2.2 Manipulator

Continued



CAUTION

The option *Extended work range* enables an extension of the working range for axis 1, through a software configuration. With this option installed, the working range can exceed the range limited by the mechanical stop on axis 1. The working range shall be limited through the option *SafeMove*.

A risk analysis must be done to ensure that no risks remain when using option *Extended work range*, to limit the working range, and before removing the mechanical stops.

For information about the option *SafeMove*, see *Application manual - Functional safety and SafeMove*.

If the mechanical stop is removed, then the manipulator should have a marking for this, for example, a label. If the robot is delivered with the option *Extended work range*, then such a label is included on delivery.

Requirements

This option requires the option *SafeMove* [3043-x].

2.3 Floor cables



Note

To comply with the EMC directive, the total cable length (including cables for the motor connection box) must not exceed 30 m between:

Controller and robot (IRB)

Controller and motor & gear units (MU/GU) or track motion (IRT)

Controller and positioner (IRP)

Manipulator cable length

Option	Lengths
3200-2	7 m
3200-3	15 m
3200-4	22 m
3200-5	30 m

2 Specification of variants and options

2.4 Application manipulator

2.4 Application manipulator

DressPack base-axis 6

Option	Description	Additional information
3337-12	MH DeviceNet	Includes parallel signals
3337-13	MH EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3337-14	MH CC-Link	Includes parallel signals
3337-15	MH EtherCat	Includes parallel signals

2.5 Connector kits manipulator

General

Below is an example of how a connector kit and its parts can look like.



xx1300000223



Note

Some connector kits listed in the overview tables are not available for all manipulators. See the available options in the specification forms.

Continues on next page

2 Specification of variants and options

2.5.1 Base - Connector kits

2.5.1 Base - Connector kits

Available options

Option	Name	3337-x
3330-2	CP/CS, Proc 1 base	X



Note

Servo power connection kits are not available.

Option CP/CS, Proc 1 on base - 3330-2

R1. CP/CS and Proc 1 on base

This option offers a kit with connectors. This must be assembled by the customer.
The kit contains:

- 1 Hose fittings (swivel nut adapter, (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN EMC / M 40
1 pcs Hinged frame (Harting)	Shell size 16
2 pcs Multicontact, female (Harting)	Type HD (25 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
1 pcs Multicontact, female (Harting)	Type EE (8 pin)
10 pcs Female crimp contacts	For 1.5 mm ²
10 pcs Female crimp contacts	For 0.5 mm ²
10 pcs Female crimp contacts	For 1.0 mm ²
10 pcs Female crimp contacts	For 2.5 mm ²
12 pcs Female crimp contacts	For 0.14 - 0.37 mm ²
45 sockets	For 0.2 - 0.56 mm ²
Assembly Accessories to complete connector	
Assembly instruction	

2.5.2 Axis 6 - Connector kits

Available options

Option	Name	3337-x	Description
3334-2	CP/CS bus axis 6	X	UTOW

Option CP/CS/CBus, Proc 1 axis 6 - 3334-2

CP/CS/CBus, Proc 1 axis 6 on tool side for option 3337-x.

This kit offers a kit with connectors to be mounted at tool side of axis 6.

This must be assembled by the customer.

The kit contains:

- 1 Hose fitting (swivel nut adapter (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

CP/CS	
1 pcs UTOW Pin connector 26p, bulkhead	UTOW71626PH05, Shell size 16
26 pcs Pin	RM18W3K, 0.5-0.82 mm ²
CBUS	
1 pcs UTOW Pin connector 10p, bulkhead	UTOW71210PH05, Shell size 12
10 pcs Pin	RM18W3K, 0.5-0.82 mm ²
Ethernet	
1 pcs Socket connector M12	Harting 21 03 881 2425
4 pcs Socket	Harting 09670005476, 0.13-0.33 mm ²

2 Specification of variants and options

2.6 Application floor cables

2.6 Application floor cables

Ethernet cable - Length



Note

Occupies 1 Ethernet port.

Option	Description	Note
3202-2	7 m	Includes Parallel cable
3202-3	15 m	Includes Parallel cable
3202-4	22 m	Includes Parallel cable
3202-5	30 m	Includes Parallel cable

DeviceNet cable - Length

Option	Description	Note
3204-2	7 m	Includes Parallel cable
3204-3	15 m	Includes Parallel cable
3204-4	22 m	Includes Parallel cable
3204-5	30 m	Includes Parallel cable

CC-Link cable - Length

Option	Description	Note
3205-2	7 m	Includes Parallel cable
3205-3	15 m	Includes Parallel cable
3205-4	22 m	Includes Parallel cable
3205-5	30 m	Includes Parallel cable

Servo cable 1 axis - Length

Option	Description	Note
3206-2	7 m	
3206-3	15 m	
3206-4	22 m	
3206-5	30 m	

EtherCat cable - Length



Note

Occupies 1 Ethernet port.

Option	Description	Note
3210-2	7 m	Includes Parallel cable

Continues on next page

2 Specification of variants and options

2.6 Application floor cables

Continued

Option	Description	Note
3210-3	15 m	Includes Parallel cable
3210-4	22 m	Includes Parallel cable
3210-5	30 m	Includes Parallel cable

2 Specification of variants and options

2.7 Warranty

2.7 Warranty

Warranty

For the selected period of time, ABB will provide spare parts and labor to repair or replace the non-conforming portion of the equipment without additional charges. During that period, it is required to have a yearly *Preventative Maintenance* according to ABB manuals to be performed by ABB. If due to customer restrains no data can be analyzed with ABB Connected Services for robots with OmniCore controllers, and ABB has to travel to site, travel expenses are not covered. The *Extended Warranty* period always starts on the day of warranty expiration. Warranty Conditions apply as defined in the *Terms & Conditions*.



Note

This description above is not applicable for option *Stock warranty* [438-8]

Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from <i>Customer Delivery Date</i> or latest 18 months after <i>Factory Shipment Date</i> , whichever occurs first. Warranty terms and conditions apply.
438-2	Standard warranty + 12 months	Standard warranty extended with 12 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-4	Standard warranty + 18 months	Standard warranty extended with 18 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-5	Standard warranty + 24 months	Standard warranty extended with 24 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.
438-7	Standard warranty + 30 months	Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply.
438-8	Stock warranty	Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from <i>Factory Shipment Date</i> or from activation date of standard warranty in WebConfig.  Note Special conditions are applicable, see <i>Robotics Warranty Directives</i>.

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