ROBOTICS

Product specification

IRB 1100

Trace back information:
Workspace 22D version a8
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Skribenta version 5.5.019

Product specification

IRB 1100-4/0.475
IRB 1100-4/0.58

OmniCore

Document ID: 3HAC064993-001

Revision: N

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Original instructions.

Table of contents

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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

References

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

Document name	Document ID
Product manual, spare parts - IRB 1100	*3HAC064994-001*
Product manual - OmniCore C30	*3HAC060860-001*
Product manual - OmniCore C90XT	*3HAC073706-001*
Product manual - OmniCore E10	*3HAC079399-001*
Product specification - OmniCore C line	*3HAC065034-001*
Product specification - OmniCore E line	*3HAC079823-001*
Product manual - IRB 1100	*3HAC064992-001*

Revisions

Revision	Description
A	First edition.
B	Published in release 19D. The following updates are done in this revision: • Minor changes. • Change the description of 3308-1 and 3350-400.
C	Published in release 20B. The following updates are done in this revision: • Change the product data of Absolute Accuracy calibration. • Supported controller OmniCore C90XT is added.

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Revision	Description
D	Published in release 20C. The following updates are done in this revision: • Protection class IP67 (option 3350-670) and protection type Clean Room (option 3351-4) added. • 209-2 ABB white standard added.
E	Published in release 20D. The following updates are done in this revision: • Safety Lamp 3308-1 removed. • Max Armload added. • Warranty section updated.
F	Published in release 21A. The following updates are done in this revision: • Added CRB 1100. • Minor changes. • Maximum TCP acceleration added. • Performance according to ISO 9283 updated. • Updated diameter value of the air hoses inside the robot.
G	Published in release 21B. The following updates are done in this revision: • Text regarding fastener quality is updated. • Updated the description of IP67 protection. • Added a note to remind users that mechanical stop locations cannot be adjusted. See *Adjusting the working range on page 51*. • Removed Axis resolution. • Added a note in manipulator protection chapter.
H	Published in release 21C. The following updates are done in this revision: • Updated the description for 3300-20/21. • Updated the description for 3203-x. • Supported controller OmniCore E10 is added.
J	Published in release 21D. The following updates are done in this revision: • Removed all the information about CRB 1100. See *Product specification - CRB 1100*
K	Published in release 22A. The following updates are done in this revision: • Added information about length of thread engagement for attachment screws.
L	Published in release 22B. The following updates are done in this revision: • Angled type connector [3209-1] added.
M	Published in release 22C. The following updates are done in this revision: • Added RAL code in manipulator color. • Updated values for power consumption.
N	Published in release 22D. The following updates are done in this revision: • Clean room test procedure table updated. • Added Mains cable [3203-x].

1 Description

1.1 Structure

1.1.1 Introduction

General introduction for IRB 1100

The IRB 1100 is one of ABB Robotics latest generation of 6-axis industrial robot, with a payload of 4 kg, designed specifically for manufacturing industries that use flexible robot-based automation, e.g. 3C industry. The robot has an open structure that is especially adapted for flexible use, and can communicate extensively with external systems.

Clean room classification

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Particle emission from the robot (IRB 1100) fulfill Clean room class 4 standard according to DIN EN ISO 14644-1, -14.

According to IPA test result, the robot IRB 1100 is suitable for use in clean room environments.

Classification of airborne molecular contamination, see below:

Test environment parameters				
Cleanroom Air Cleanliness Class (According to ISO 14644-1)	Airflow velocity	Airflow pattern	Temperature	Relative humidity
ISO 1	0.45 m/s	vertical laminar flow	22°C ± 0.5°C	45% ± 0.5%

Test procedure parameters		
Velocity	Attached payload	Operation of each axis
50% and 100%	4 kg	separately

Test result/Classification:

Continues on next page

1.1.1 Introduction
Continued

When operated under the specified test conditions, the IRB 1100 including gripper and suction cup is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1.

Test parameter(s)	Air Cleanliness Class
Velocity=50%	2
Velocity=100%	4
Overall result	4

IP67 protection

IRB 1100 has IP67 as an option. The option will add sealing, machining parts and gasket.

And IRB 1100 fulfill Clean room class 5 standard according to DIN EN ISO 14644-1, -14.

Software product range

The IRB 1100 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.

Operating system

The IRB 1100 is equipped with the OmniCore C30/C90/E10 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*.

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 specification - OmniCore C line* and *Product specification - OmniCore E line*.

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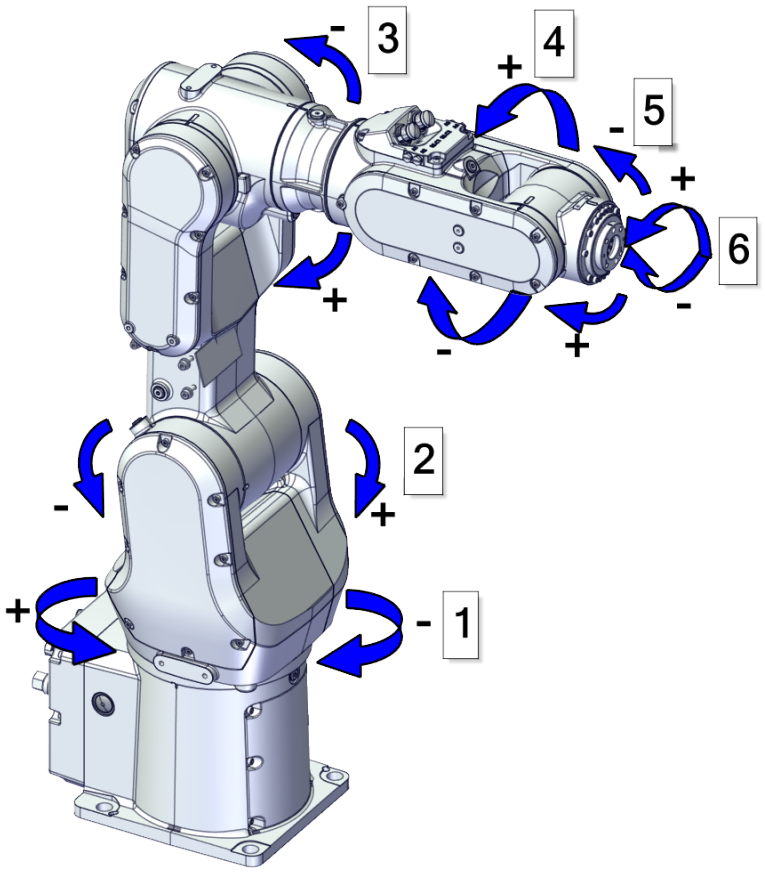
Robot axes



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Pos	Description	Pos	Description
1	Axis 1	2	Axis 2
3	Axis 3	4	Axis 4
5	Axis 5	6	Axis 6

1.1.2 Different robot versions

General

The IRB 1100 is available in two versions.

Robot types

The following robot versions are available.

Robot type	Handling capacity (kg)	Reach (m)
IRB 1100-4/0.475	4 kg	0.475 m
IRB 1100-4/0.58	4 kg	0.58 m

1.1.3 Definition of version designations

1.1.3.1 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 1100	21.1 kg

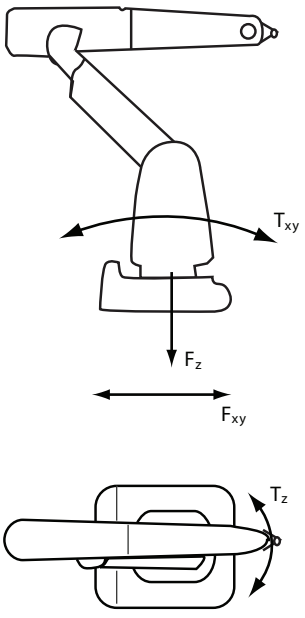
Note

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

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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



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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

Continues on next page

1.1.3.1 Technical data
Continued

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)	Maximum load (emergency stop)
Force xy	±420 N	±710N
Force z	+210 ±380 N	+210 ±510 N
Torque xy	±180 Nm	±330 Nm
Torque z	±90 Nm	±140 Nm

Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	+210 ±370 N	+210 ±660 N
Force z	±370 N	±540 Nm
Torque xy	±200 Nm	±370Nm
Torque z	±90 Nm	±140 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±420 N	±710 N
Force z	-210 ±380 N	-210 ±510 N
Torque xy	±180 Nm	±330 Nm
Torque z	±90 Nm	±140 Nm

Continues on next page

Requirements, foundation

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

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy.
Maximum tilt	5°	
Minimum resonance frequency	22 Hz **Note** It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment. [i] For information about compensating for foundation flexibility, see *Application manual - Controller software OmniCore*, section *Motion Process Mode*.

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

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

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25°C (-13°F)
Maximum ambient temperature	+55°C (+131°F)
Maximum ambient temperature (less than 24 hrs)	+70°C (+158°F)
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	+5°C [i] (41°F)
Maximum ambient temperature	+45°C (113°F)

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1.1.3.1 Technical data
Continued

Parameter	Value
Maximum ambient humidity	95% at constant temperature

i At low environmental temperature (below 10° C) a warm-up phase is recommended to be run with the robot. Otherwise there is a risk that the robot stops or runs with lower performance due to temperature dependent oil and grease viscosity.

Protection classes, robot

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

Protection type	Protection class
Manipulator, protection type Standard	IP40 IP67 (option 3350-670)
Manipulator, protection type Clean Room	ISO 4

Other technical data

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 65 dB(A) Leq (acc. to machinery directive 2006/42/EC)

Power consumption at max load with OmniCore E10

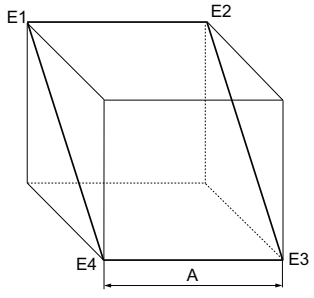
Type of movement	IRB 1100-4/0.475	IRB 1100-4/0.58
ISO Cube Max. velocity (W)	256	249

Robot in calibration position	IRB 1100-4/0.475	IRB 1100-4/0.58
Brakes engaged (W)	58	59
Brakes disengaged (W)	138	130

Power consumption at max load with OmniCore C30/90XT

Type of movement	IRB 1100-4/0.475	IRB 1100-4/0.58
ISO Cube Max. velocity (W)	282	275

Robot in calibration position	IRB 1100-4/0.475	IRB 1100-4/0.58
Brakes engaged (W)	70	79
Brakes disengaged (W)	154	160



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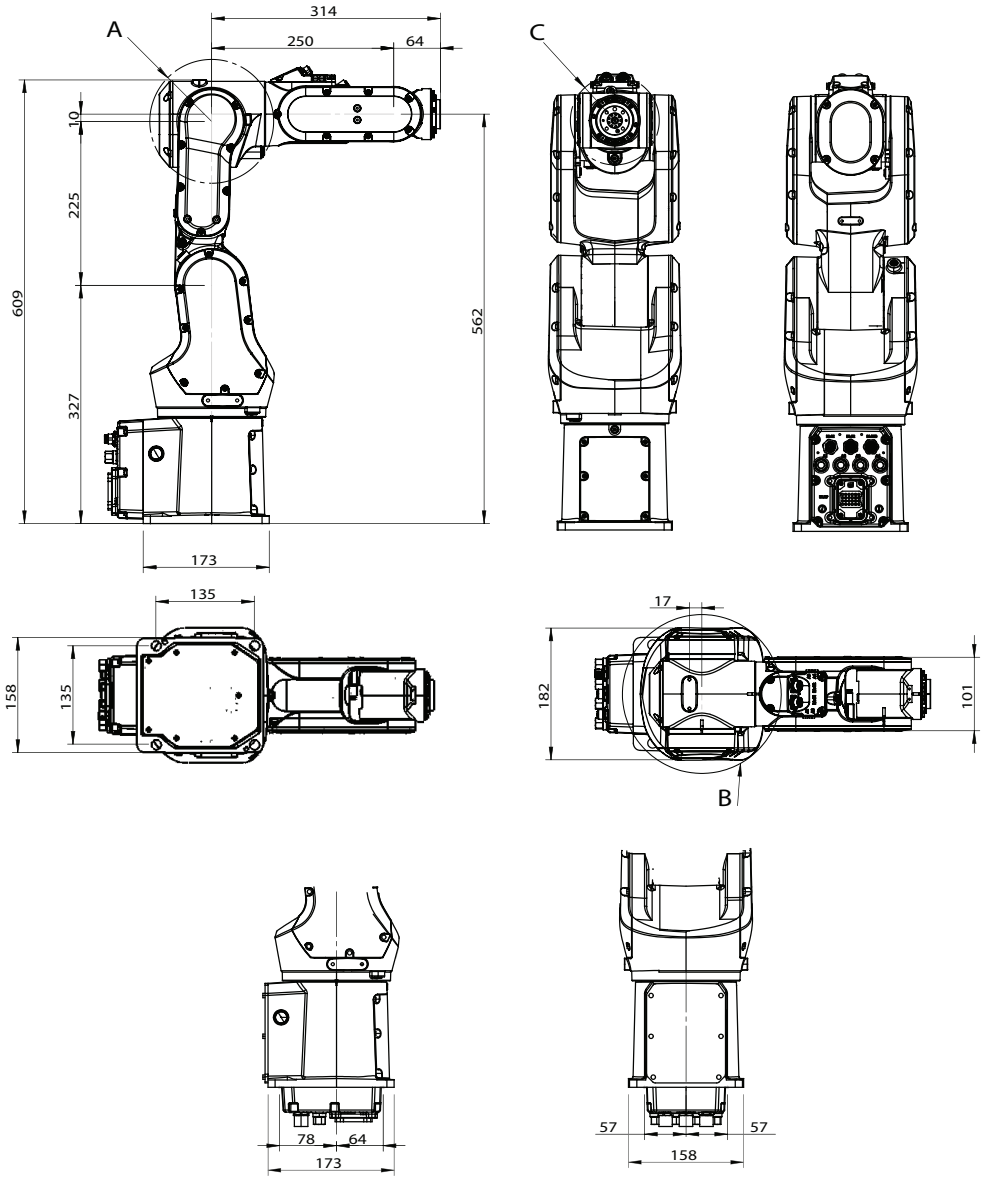
Pos	Description
A	250 mm

1.1.3.1 Technical data
Continued

Main dimensions of IRB 1100-4/0.475



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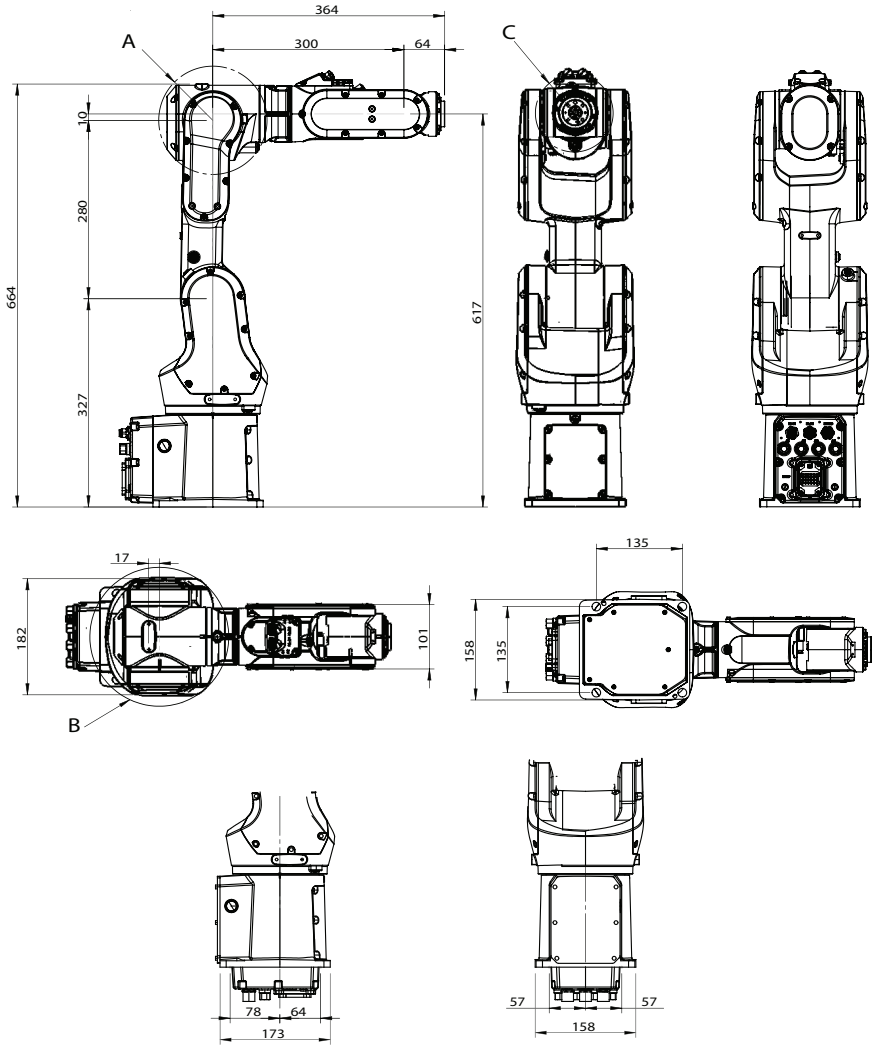
Pos	Description
A	Turning radius: R85
B	Turning radius: R109
C	Turning radius: R61

Main dimensions of IRB 1100-4/0.58



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Pos	Description
A	Turning radius: R85
B	Turning radius: R109
C	Turning radius: R61

1.2 Standards

1.2.1 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, 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
IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1
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
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena - General requirements

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

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Deviations

Deviation for IRB 1100

The IRB 1100 does not provide means of installing adjustable mechanical stops on axis 1. Optional features provided by SafeMove, safety-rated soft axis and space limiting can be used as risk reduction measures in specific applications.

For details about SafeMove, see *Application manual - Functional safety and SafeMove*.

1.3 Installation

1.3.1 Introduction to installation

General

IRB 1100 is available in two variants and all variants can be floor mounted, inverted/suspended, wall mounted, or tilted mounted (any angle) and table mounted. Depending on the robot variant, an end effector with a max. weight of 4 kg including payload, can be mounted on the tool flange (axis 6). See *Load diagrams on page 35*.

Extra loads

The upper arm can handle an additional load of 0.5 kg.

See *Fitting equipment to the robot on page 44*.

Working range limitation

The working range of axes 1 can be limited by mechanical stops as option. See *Working range on page 50*.

1.3.2 Assembling the manipulator

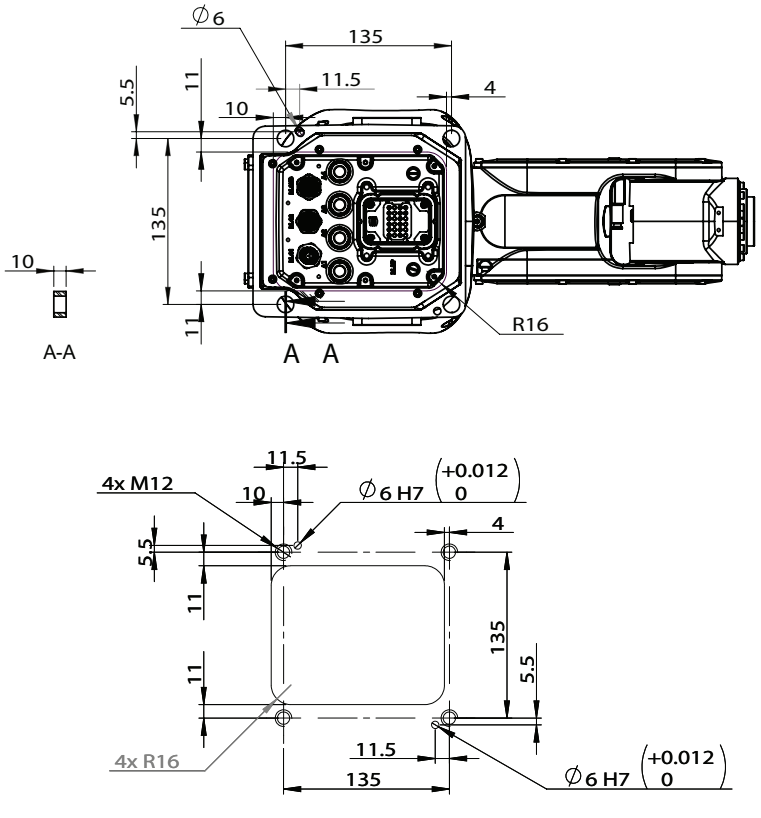
Attachment screws

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

Suitable screws	M12x25 (robot installation directly on foundation)
Quantity	4 pcs
Quality	8.8
Suitable washer	24 x 13 x 2.5, steel hardness class 200HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	50 Nm±5 Nm
Length of thread engagement	Minimum 12.5 mm for ground with material yield strength 150 MPa
Level surface requirements	0.1/500 mm

Hole configuration, base

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



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1.4 Calibration and references

1.4.1 Calibration methods

Overview

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

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

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
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the SMB (serial measurement board) in the robot. A robot calibrated with Absolute accuracy has the option information printed on its name plate. To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.	CalibWare
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4, 5 and 6.	Wrist Optimization

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1100. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration

Continues on next page

- 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.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

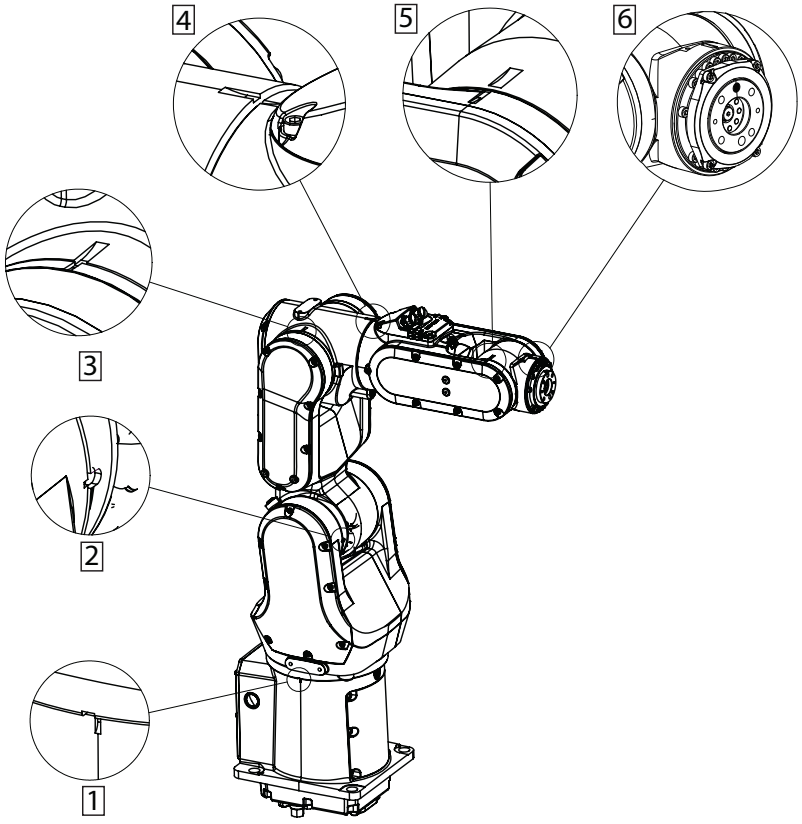
The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

1.4.2 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 1100



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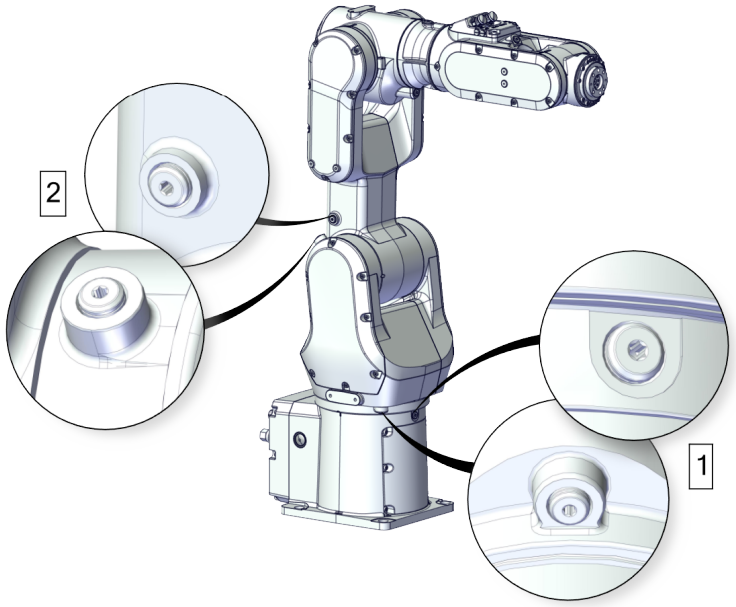
CAUTION

To calibrate the axis 6, the notch on the wrist must be aligned with the marked pin hole on the tool flange. Before installing a tool on the tool flange, make sure a visible mark has been made to the tool at the corresponding position.

1.4.3 Fine calibration

General

The fine calibration is done with the Axis calibration method.



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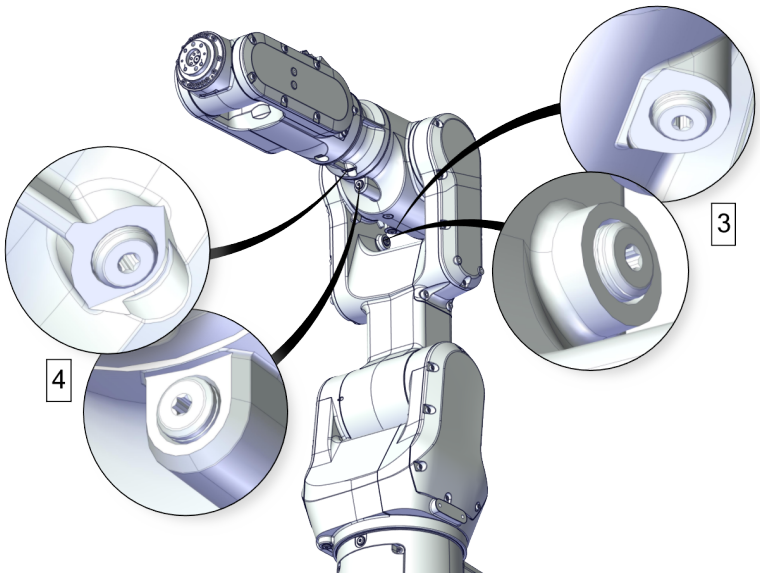

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1.4.3 Fine calibration
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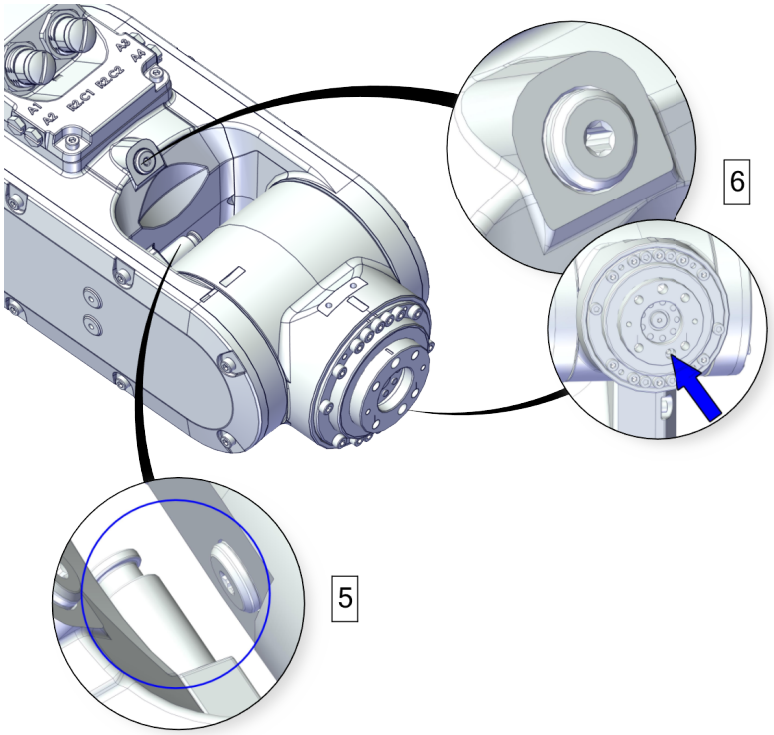

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Axes

Pos	Description	Pos	Description
1	Axis 1	2	Axis 2
3	Axis 3	4	Axis 4
5	Axis 5	6	Axis 6

1.4.4 Absolute Accuracy calibration

Purpose

Absolute Accuracy is a calibration concept that improves TCP accuracy. The difference between an ideal robot and a real robot can be several millimeters, resulting from mechanical tolerances and deflection in the robot structure. *Absolute Accuracy* compensates for these differences.

Here are some examples of when this accuracy is important:

- Exchangeability of robots
- Offline programming with no or minimum touch-up
- Online programming with accurate movement and reorientation of tool
- Programming with accurate offset movement in relation to eg. vision system or offset programming
- Re-use of programs between applications

The option *Absolute Accuracy* is integrated in the controller algorithms and does not need external equipment or calculation.

Note

The performance data is applicable to the corresponding RobotWare version of the individual robot.

What is included

Every *Absolute Accuracy* robot is delivered with:

- compensation parameters saved on the robot's serial measurement board
- a birth certificate representing the *Absolute Accuracy* measurement protocol for the calibration and verification sequence.

A robot with *Absolute Accuracy* calibration has a label with this information on the manipulator.

Absolute Accuracy supports floor mounted, wall mounted and ceiling mounted installations. Compensation parameters saved in the robot's serial measurement board differ depending on which Absolute Accuracy option is selected.

When is *Absolute Accuracy* being used

Absolute Accuracy works on a robot target in Cartesian coordinates, not on the individual joints. Therefore, joint based movements (e.g. `MoveAbsJ`) will not be affected.

If the robot is inverted, the Absolute Accuracy calibration must be performed when the robot is inverted.

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

- Any motion function based on robtargets (e.g. `MoveL`) and ModPos on robtargets
- Reorientation jogging

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1.4.4 Absolute Accuracy calibration
Continued

- Linear jogging
- Tool definition (4, 5, 6 point tool definition, room fixed TCP, stationary tool)
- Work object definition

Absolute Accuracy not active

The following are examples of when Absolute Accuracy is not active:

- Any motion function based on a jointtarget (`MoveAbsJ`)
- Independent joint
- Joint based jogging
- Additional axes
- Track motion

Note

In a robot system with, for example, an additional axis or track motion, the Absolute Accuracy is active for the manipulator but not for the additional axis or track motion.

RAPID instructions

There are no RAPID instructions included in this option.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 1100-4/0.475	0.08	0.25	100
IRB 1100-4/0.58	0.10	0.25	100

Calibration tool

Check prior to usage

Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.

WARNING

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

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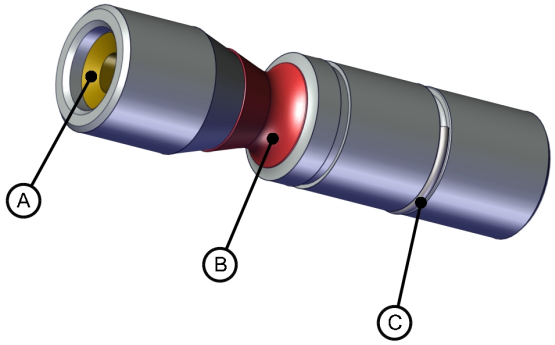

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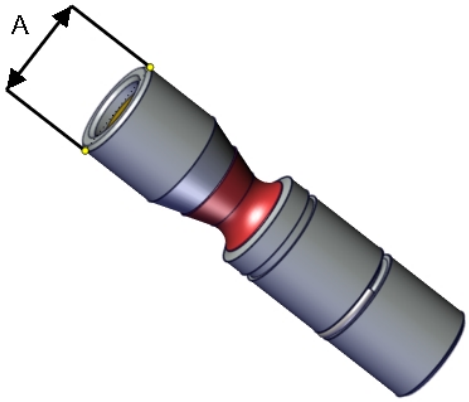
A	Tube insert
B	Plastic protection
C	Steel spring ring

Periodic check of the calibration tool

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

- Outer diameter within Ø12g4 mm, Ø8g4 mm or Ø6g5 mm (depending on calibration tool size).
- Straightness within 0.005 mm.



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A	Outer diameter

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

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

- Outer diameter within Ø5g5 mm.
- Straightness within 0.005 mm.

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1.4.4 Absolute Accuracy calibration
Continued

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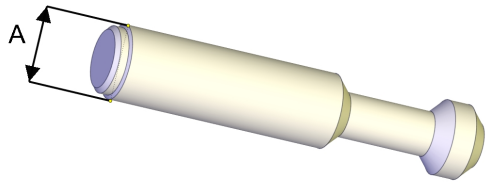

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A	Outer diameter

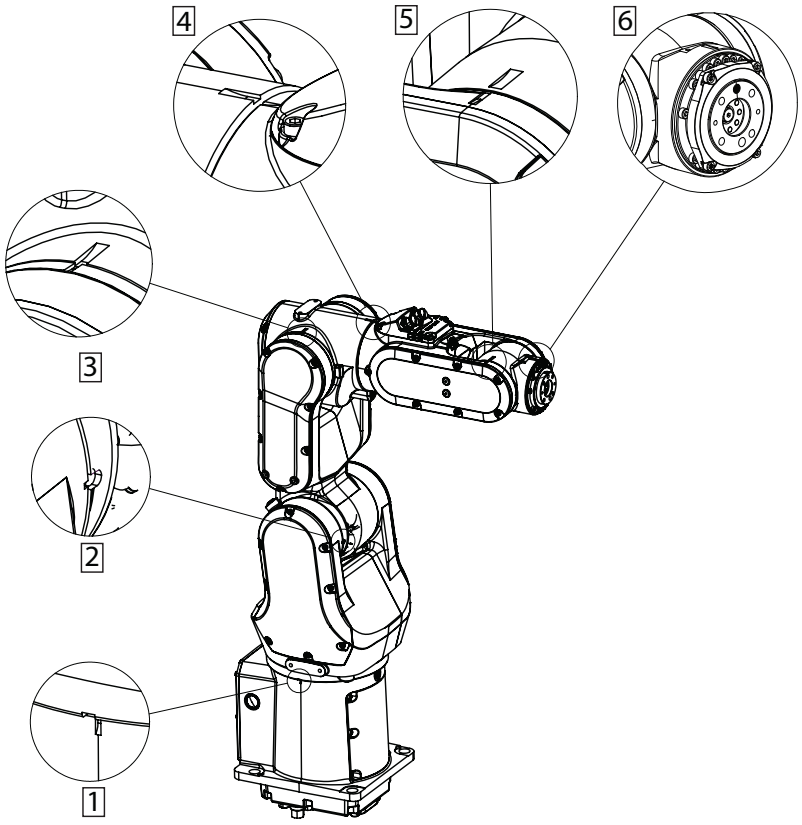
1.4.5 Synchronization marks and axis movement directions

1.4.5.1 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 1100



xx1800002455

CAUTION

To calibrate the axis 6, the notch on the wrist must be aligned with the marked pin hole on the tool flange. Before installing a tool on the tool flange, make sure a visible mark has been made to the tool at the corresponding position.

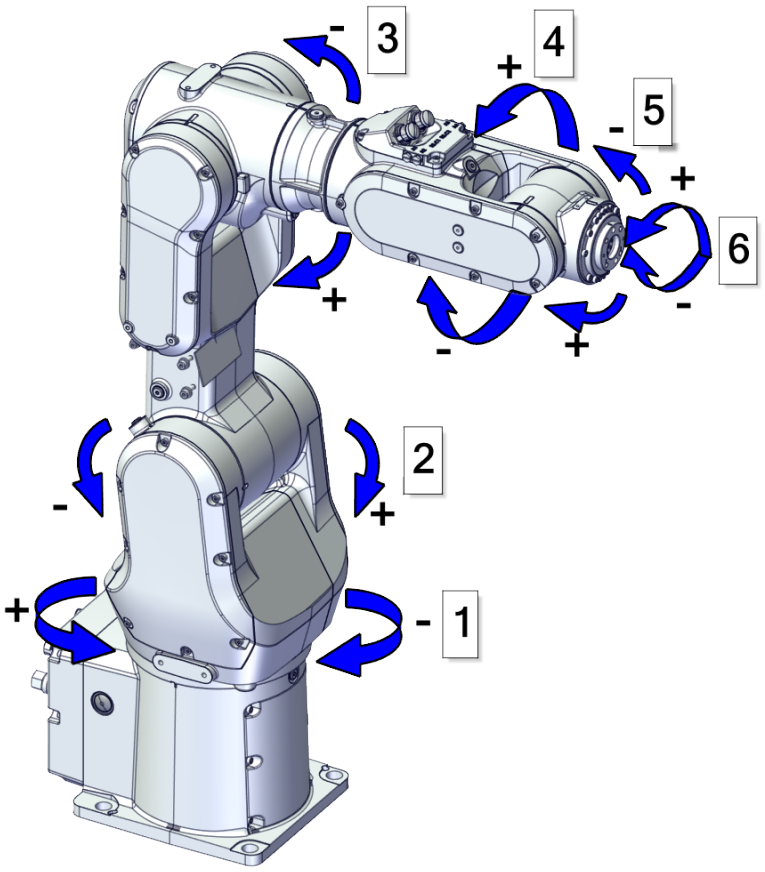
1.4.5.2 Calibration movement directions for all axes

Overview

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

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

Manual movement directions



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1.5 Load diagrams

1.5.1 Introduction

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 0.012 kgm^2, and an extra load of 0.5 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.

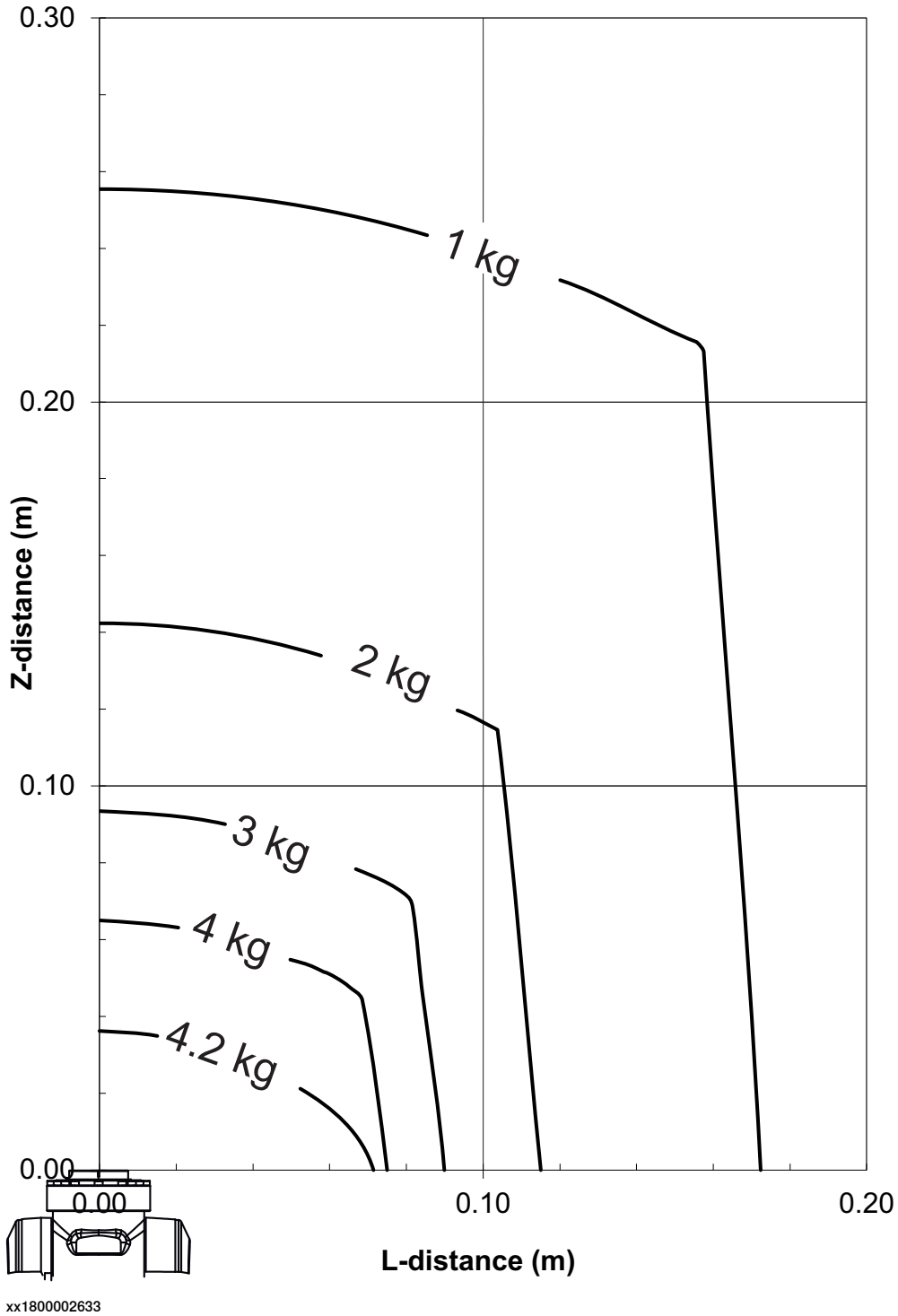
Control of load case with RobotLoad

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.

1.5.2 Diagrams

Diagrams of IRB 1100-4/0.475



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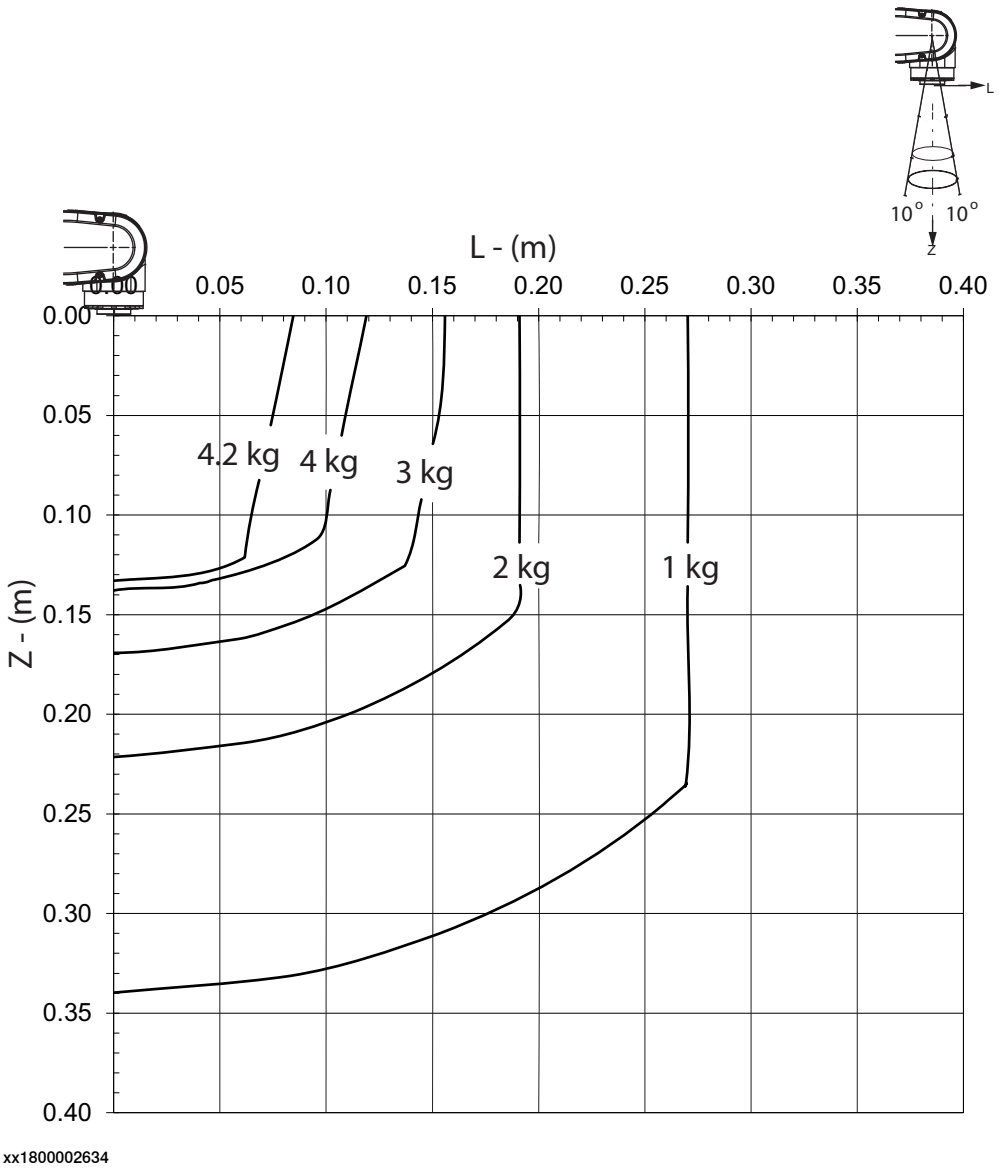
Diagrams of IRB 1100-4/0.475 "Vertical Wrist" (±10°)



xx1800002634

For wrist down (0° deviation from the vertical line).

	Description
Max load	4.2 kg
Z_{max}	0.13 m
L_{max}	0.09 m

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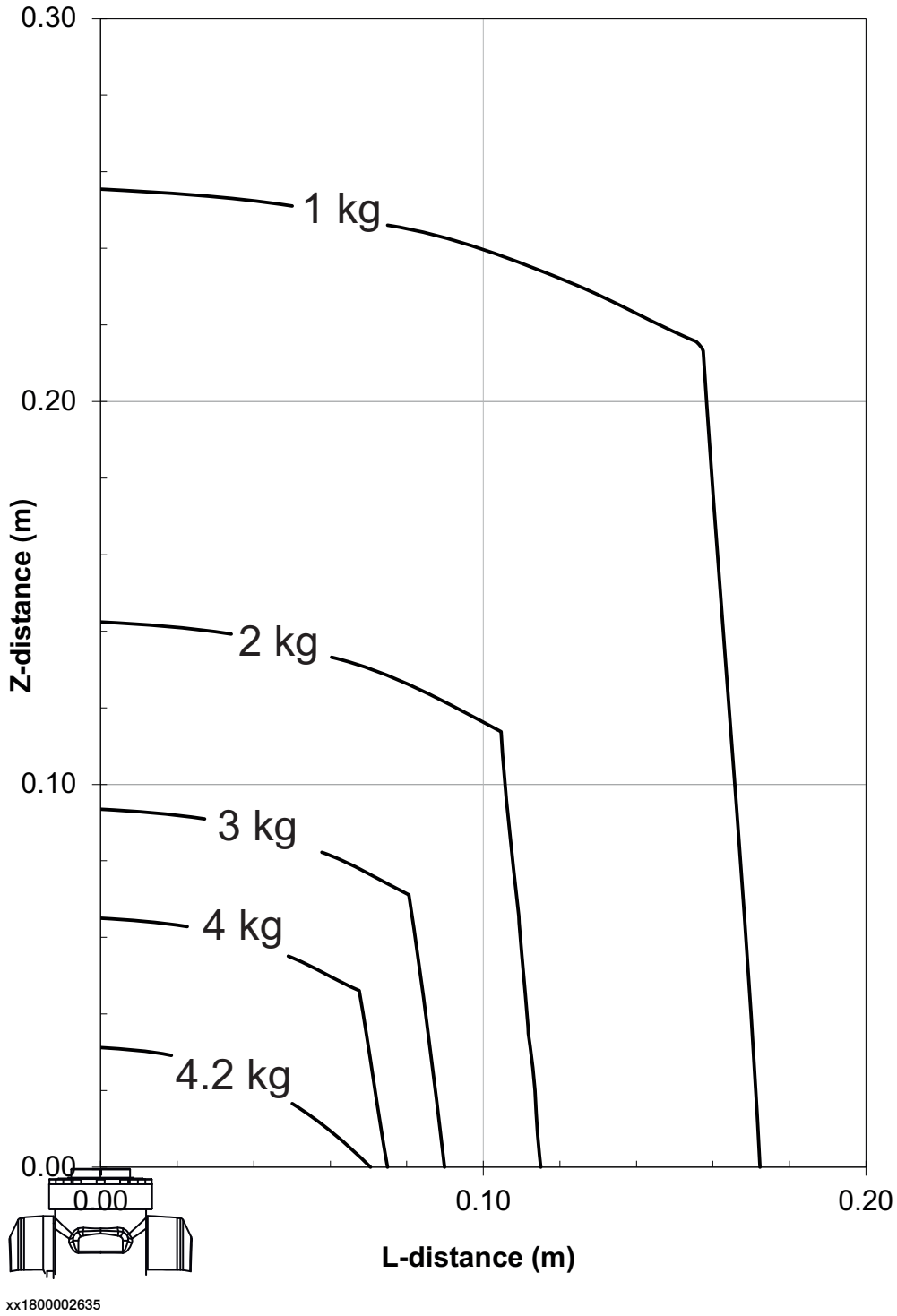
1.5.2 Diagrams
Continued

Diagrams of IRB 1100-4/0.58



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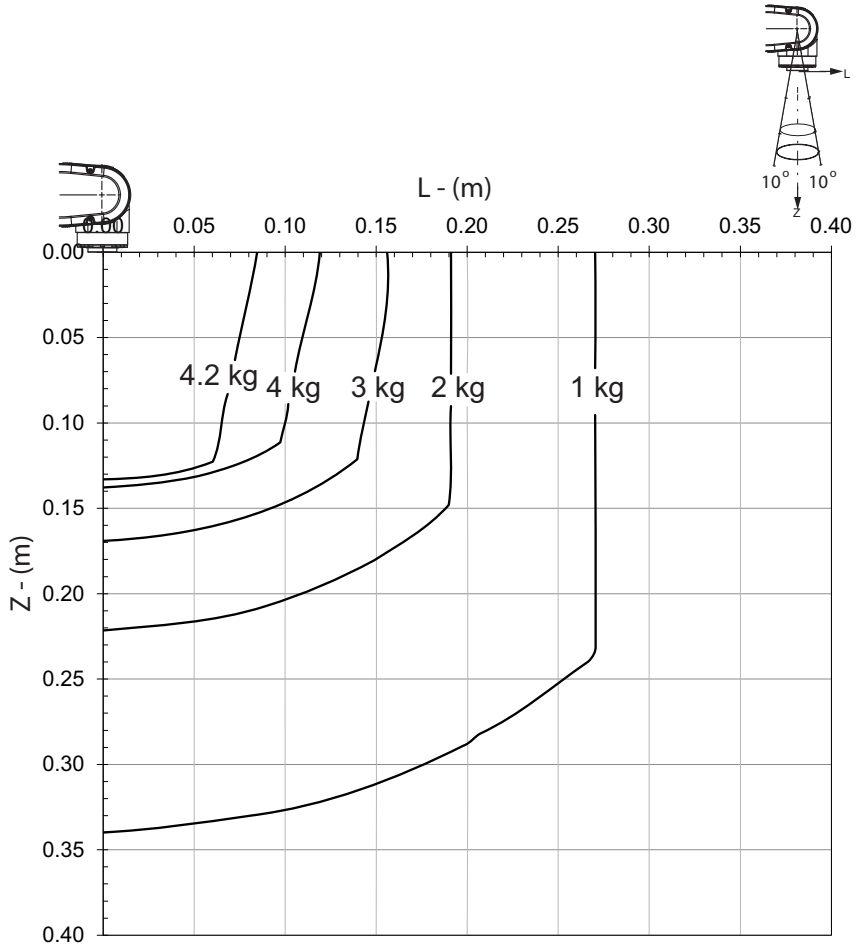
Diagrams of IRB 1100-4/0.58 "Vertical Wrist" (±10°)



xx1800002636

For wrist down (0° deviation from the vertical line).

	Description
Max load	4.2 kg
Z_{max}	0.133 m
L_{max}	0.85 m

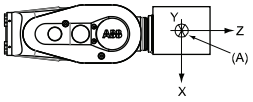
1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

Note

Total load given as: mass in kg, center of gravity (Z and L) in meters and moment of inertia (J_{ox}, J_{oy}, J_{oz}) in kgm^2. L= sqr (X^2 + Y^2), see the following figure.

Full movement of axis 5 (-125°/+120°)

Axis	Robot type	Maximum moment of inertia
5	IRB 1100-4/0.475 IRB 1100-4/0.58	Ja_5 = Load x ((Z + 0.064)^2 + L^2) + max (J_{0x}, J_{0y}) ≤ 0.175 kgm^2
6	IRB 1100-4/0.475 IRB 1100-4/0.58	Ja_6 = Load x L^2 + J_{0Z} ≤ 0.085 kgm^2



xx1400002028

Pos	Description
A	Center of gravity

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

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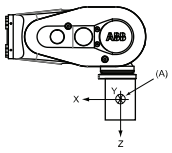
1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement
Continued

Limited axis 5, center line down

Axis	Robot type	Maximum moment of inertia
5	IRB 1100-4/0.475 IRB 1100-4/0.58	Ja_5 = Load x $((Z + 0.064)^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 0.175 kgm^2
6	IRB 1100-4/0.475 IRB 1100-4/0.58	Ja_6 = Load x L^2 + J_{0Z} ≤ 0.085 kgm^2



xx1400002029

Pos	Description
A	Center of gravity

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

1.5.4 Wrist torque

Note

The wrist torque values are for reference only, and should not be used for calculating permitted load offset (position of center of gravity) within the load diagram, since those also are limited by main axes torques as well as dynamic loads. Furthermore, arm loads will influence the permitted load diagram. To find the absolute limits of the load diagram, use the RobotStudio add-in RobotLoad.

Torque

The table below shows the maximum permissible torque due to payload.

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 1100-4/0.475	5.0 Nm	2.9 Nm	4 kg
IRB 1100-4/0.58	5.0 Nm	2.9 Nm	4 kg

1.5.5 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 then 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 1100-4/0.475	144	82
IRB 1100-4/0.58	137	71

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).

1.6 Fitting equipment to the robot

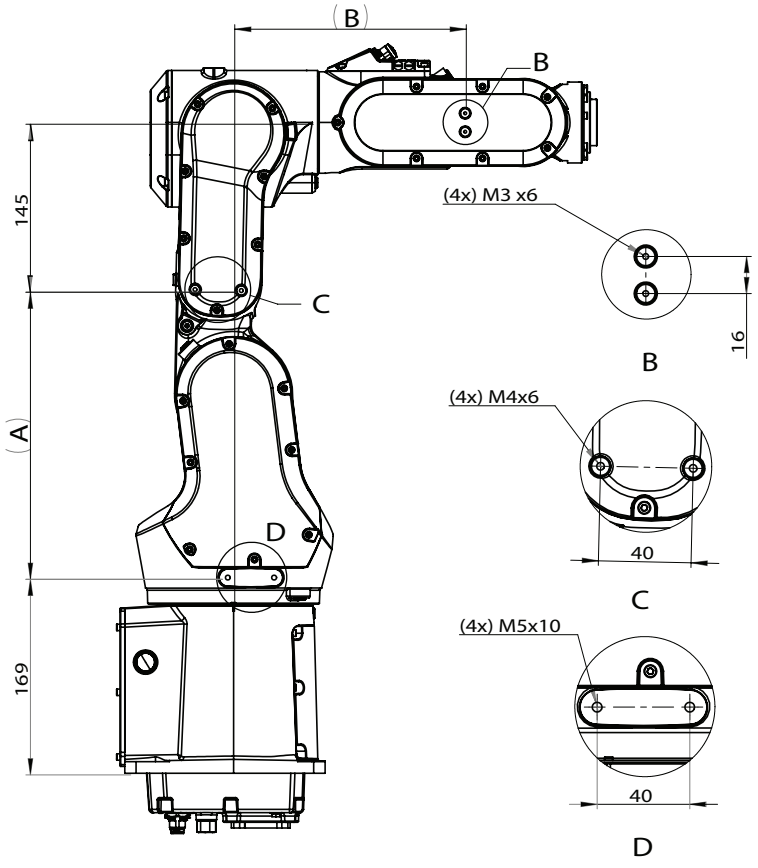
Attachment holes and dimensions

Extra loads can be mounted on robot. Definitions of dimensions and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment.

Maximum allowed arm load depends on center of gravity of arm load and robot payload.

Variant	Max Armload (kg)
IRB 1100-4/0.475	0.5
IRB 1100-4/0.58	0.5

Holes for fitting extra equipment



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Pos	4/0.475	4/0.58
A	248	303
B	200	250

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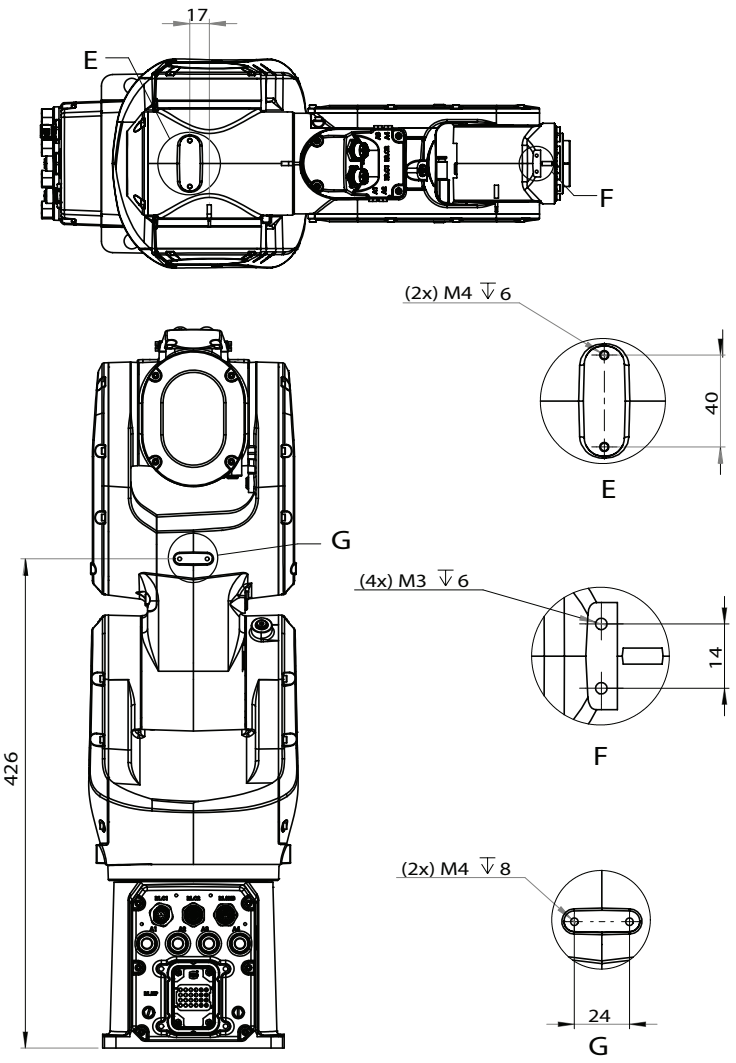

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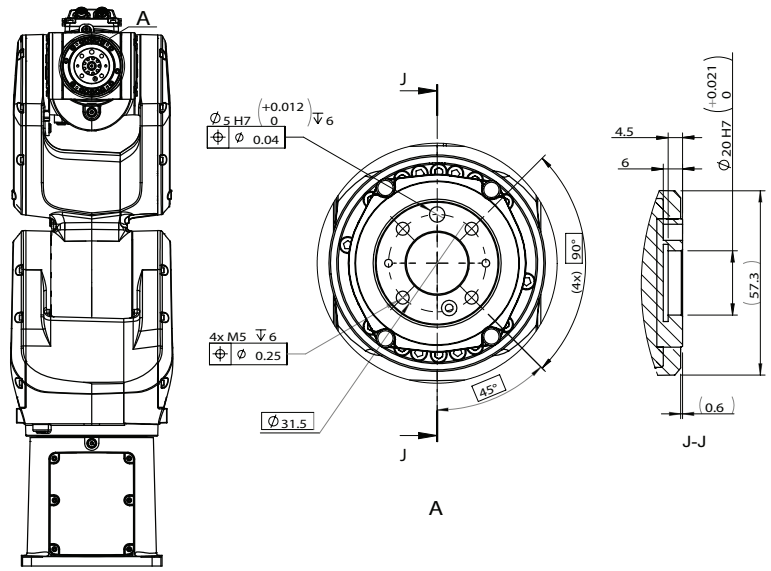
1.6 Fitting equipment to the robot
Continued

Tool flange standard



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CAUTION

To calibrate the axis 6, the notch on the wrist must be aligned with the marked pin hole on the tool flange. Before installing a tool on the tool flange, make sure a visible mark has been made to the tool at the corresponding position.

For details about the synchronization mark, see *Product manual - IRB 1100*.

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.

1.7 Maintenance and troubleshooting

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.
- Grease is used for the gearboxes.
- The cabling is routed for longevity, and in the unlikely event of a failure, its modular design makes it easy to change.

Maintenance

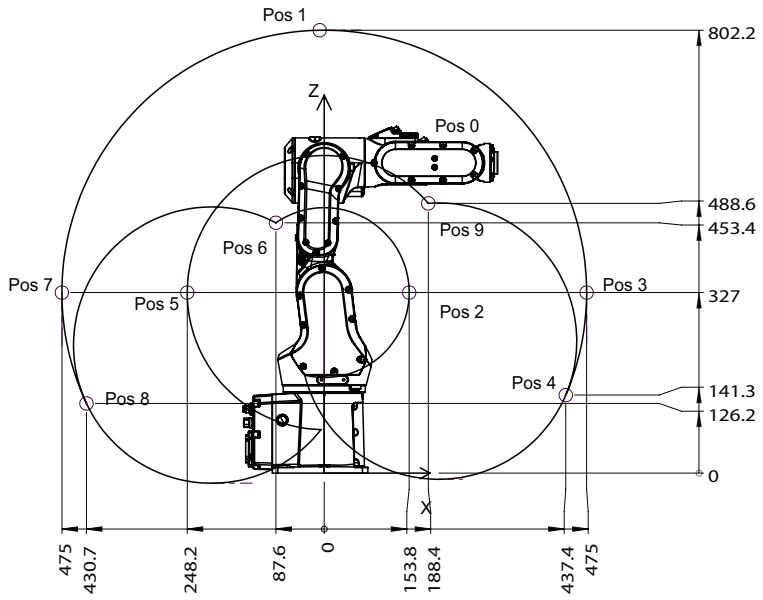
The maintenance intervals depend on the use of the robot. The required maintenance activities also depend on the selected options. For detailed information on maintenance procedures, see the maintenance section in *Product manual - IRB 1100*.

1.8 Robot motion

1.8.1 Working range

Illustration, working range IRB 1100-4/0.475

This illustration shows the unrestricted working range of the robot.



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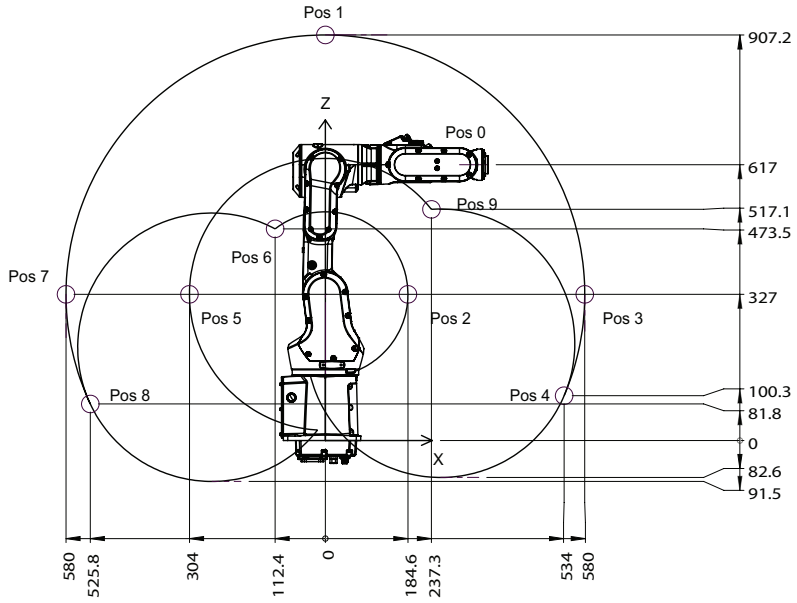
Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	314	562	0°	0°
pos1	0	802	0°	-87.7°
pos2	53.8	327	9.7°	55°
pos3	475	327	90°	-87.7°
pos4	437.4	141.3	113°	-87.7°
pos5	-248.2	327	-26.4°	-205°
pos6	-87.6	453.4	-115°	55°
pos7	-475	327	-90°	-87.7°
pos8	-430.7	126.2	-115°	-87.7°
pos9	188.4	488.6	113°	-205°

Continues on next page

Illustration, working range IRB 1100-4/0.58

This illustration shows the unrestricted working range of the robot.



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Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	364	617	0°	0°
pos1	0	907.2	0°	-88°
pos2	184.6	327	12.5°	55°
pos3	580	327	90°	-88°
pos4	534	100.3	113°	-88°
pos5	-304	327	-28.3°	-205°
pos6	-112.4	473.5	-115°	55°
pos7	-580	327	-90°	-88°
pos8	-525.8	81.8	-115°	-88°
pos9	237.3	517.1	113°	-205°

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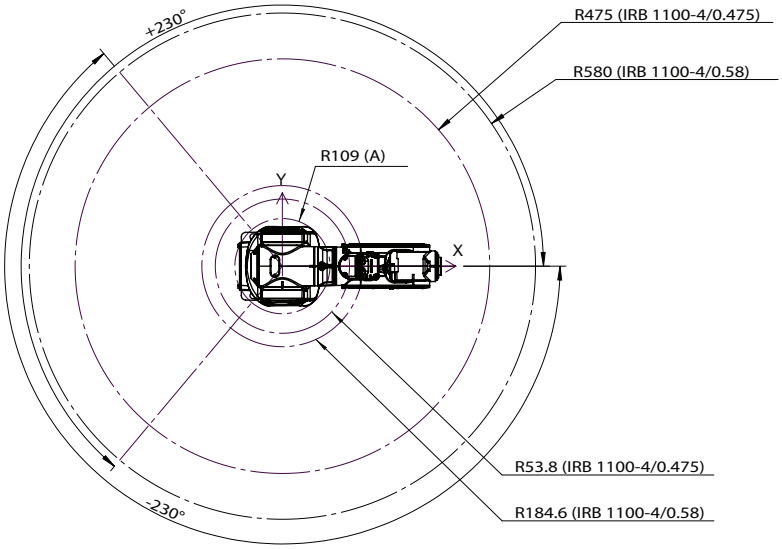
1.8.1 Working range
Continued

Top view of working range



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Working range

Axis	Working range	Note
Axis 1	±230°	Wall mounted robot has a work area for axis 1 that depends on payload and the positions of other axes. Simulation in RobotStudio is recommended.
Axis 2	-115°/+113°	
Axis 3	-205°/+55°	
Axis 4	±230°	
Axis 5	-125°/+120°	
Axis 6	±400°	Default value.
	±242	Maximum revolution value. The default working range for axis 6 can be extended by changing parameter values in the software.

1.8.2 Axes with restricted working range

1.8.2.1 Adjusting the working range

Reasons for adjusting the manipulator working range

The working range of each manipulator axis is configured in the software. If there is a risk that the manipulator may collide with other objects at installation site, its working space should be limited. The manipulator must always be able to move freely within its entire working space.

Working range configurations

The parameter values for the axes working range can be altered within the allowed working range and according to available options for the robot, either to limit or to extend a default working range. Allowed working ranges and available options for each manipulator axis are specified in *Working range on page 50*.

Mechanical stops on the manipulator

Mechanical stops are and can be installed on the manipulator as limiting devices to ensure that the manipulator axis does not exceed the working range values set in the software parameters.

Note

The mechanical stops are only installed as safety precaution to physically stop the robot from exceeding the working range set. A collision with a mechanical stop always requires actions for repair and troubleshooting.

Axis	Fixed mechanical stop[i]	Movable mechanical stop[ii]
Axis 1	yes	no
Axis 2	yes	no
Axis 3	yes	no
Axis 4	no	no
Axis 5	yes	no
Axis 6	no	no

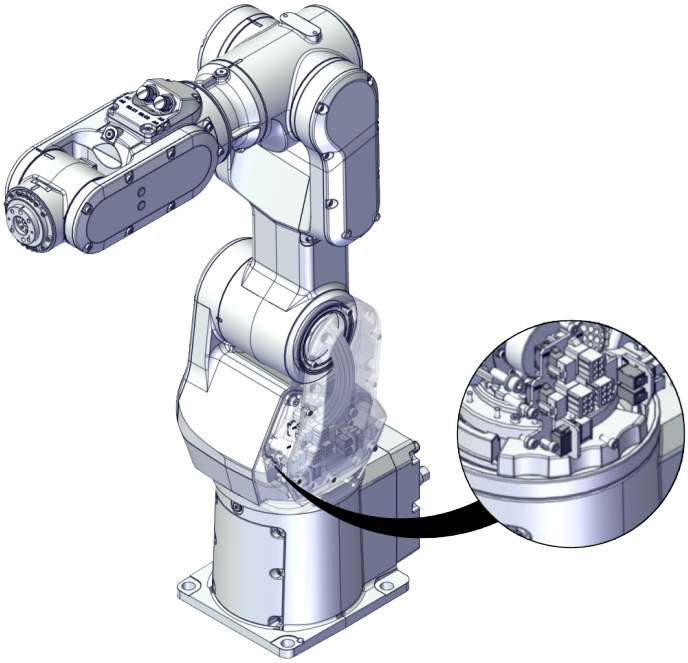
i Part of the casting or fixed on the casting and can not /should not be removed.

ii Can be installed in one or more than one position, to ensure a reduced working range, or be removed to allow extended working range.

1.8.2.2 Mechanically restricting the working range

Location of the mechanical stops

Only axis 1 has a replacable mechanical stop.



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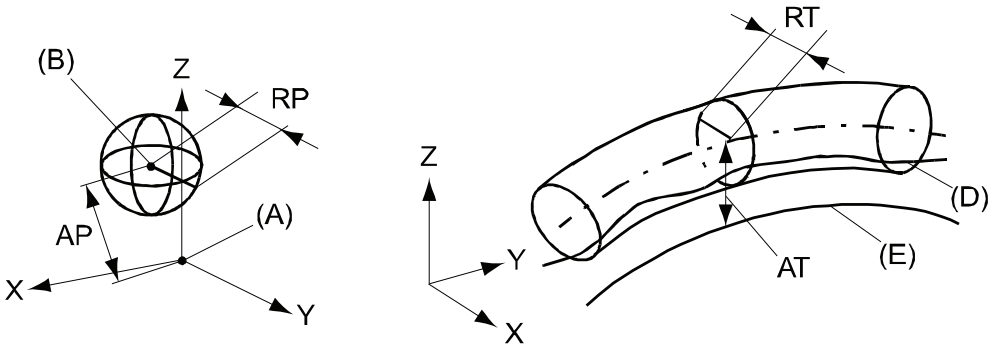
1.8.3 Performance according to ISO 9283

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.



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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

IRB 1100	4/0.475	4/0.58
Pose accuracy, AP[i] (mm)	0.01	0.01
Pose repeatability, RP (mm)	0.01	0.01
Pose stabilization time, PSt (s) within 0.1 mm of the position	0.08	0.19
Path accuracy, AT (mm)	1.03	1.18
Path repeatability, RT (mm)	0.05	0.05

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

1.8.4 Velocity

Maximum axis speed

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 1100-4/0.475	460 °/s	380 °/s	280 °/s	560 °/s	420 °/s	750 °/s
IRB 1100-4/0.58	460 °/s	360 °/s	280 °/s	560 °/s	420 °/s	750 °/s

There is a supervision function to prevent overheating in applications with intensive and frequent movements (high duty cycle).

1.8.5 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*).

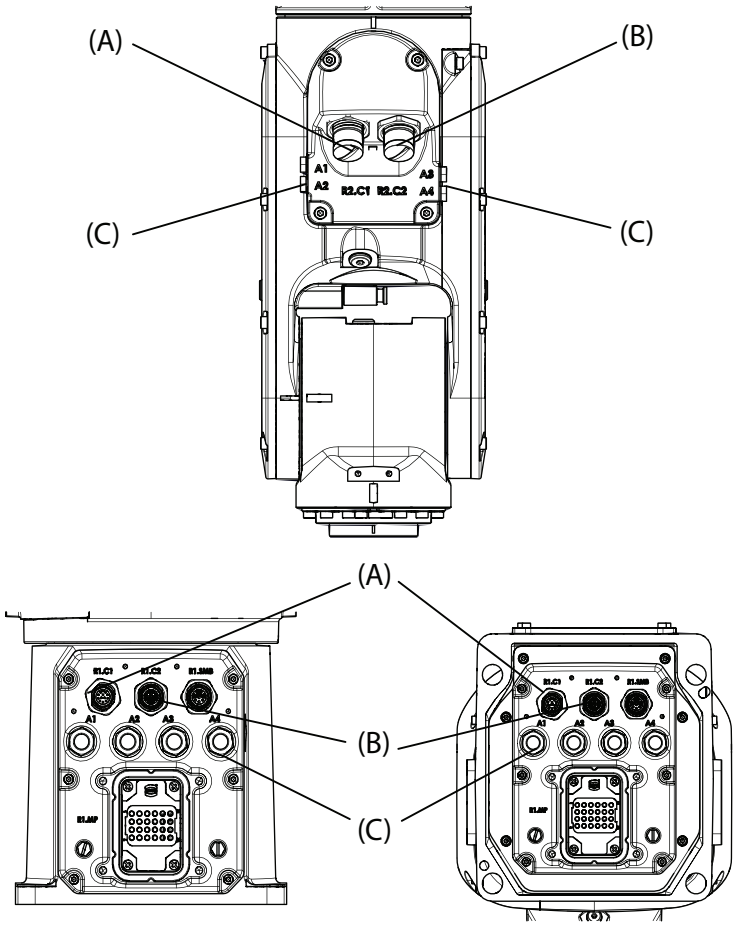
1.9 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the wrist and one at the base. There is one connector R2.C1 at the wrist. Corresponding connector R1.C1 is located at the base.

There is also connections for Ethernet, one connector R2.C2 at the wrist and the corresponding connector R1.C2 located at the base.

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



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Position	Connection	Description	Number	Value
A	(R1)R2.C1	Customer power/signal	8 wires[i]	30 V, 1.5 A
B	(R1)R2.C2	Customer power/signal or Ethernet	8 wires	30 V, 1 A or 1 Gbits/s
C	Air	Max. 6 bar	4	Outer diameter of air hose: 4 mm

[i] The connector has 12 pins. Only pins 1 to 8 are available for use.

Continues on next page

Connector kits (optional)

Connector kits, base

R1.C1 and R1.C2 connectors on the base are parts of the CP/CS cable and Ethernet floor cable, respectively. For details about the robot cabling, see "Robot cabling and connection points" in robot product manual.

Connector kits, wrist

The table describes the CP/CS and Ethernet (if any) connector kits for wrist.

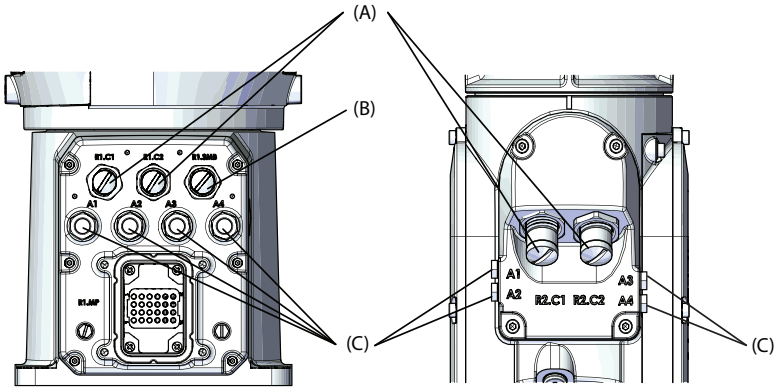
Position	Description		Art. no.
Connector kits	CP/CS	M12 CPCS Male straight connector kits	3HAC066098-001
		M12 CPCS Male angled connector kits	3HAC066099-001
	Ethernet	M12 Ethernet Cat5e Male straight connector kits	3HAC067413-001
		M12 Ethernet Cat5e Male angled connector kits	3HAC067414-001

Protection covers

Protection covers for water and dust proofing

Protection covers are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

Always remember to refit the protection covers after removing them.



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A	CP/CS or Ethernet connector protection covers
B	SMB connector protection cover
C	Air hose connector protection covers

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2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 1100 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.

2.2 Manipulator

Manipulator variants

Option	Type	Handling capacity (kg)	Reach (m)
3300-1	IRB 1100	4	0.475
3300-2	IRB 1100	4	0.58

Manipulator color

Option	Description	RAL code[i]
209-202	ABB Graphite White std	RAL 7035
209-2	ABB white standard (Required 3351-4 clean room)	RAL 9003

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

Manipulator protection

Option	Description
3350-400	Base 40,IP40
3350-670	Base 67,IP67
3351-4	Clean Room 4

Note

Base 40 includes IP40, according to standard IEC 60529.

Base 67 includes IP67, according to standard IEC 60529.

Clean Room class 4 includes ISO class 4 standard, according to DIN EN ISO 14644-1, -14.

Media & Communication

When 3303-1 Parallel & Air is selected then 3304-1 and 3305-1 options are activated for selecting.

When 3303-2 Ethernet, Parallel, Air is selected then 3304-1,3305-1,3306-1 and 3307-1 options are activated for selecting.

Option	Type	Description
3303-1	Parallel & Air	Includes customer power CP and customer signals CS + air.
3303-2	Ethernet, Parallel, Air	Includes CP, CS + air + Ethernet (PROFINET).

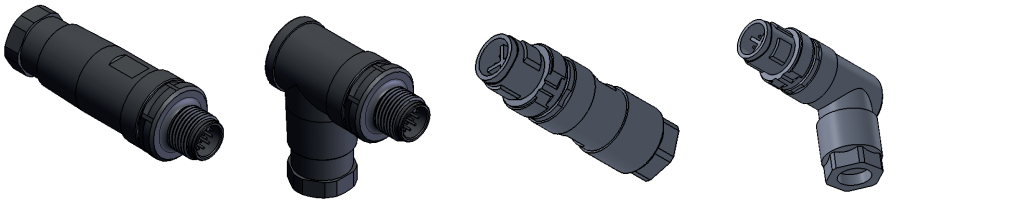
Connector kits manipulator

The kit consists of connectors, pins and sockets.

Option	Description
3304-1	Male-type, Straight arm connector kits

Continues on next page

Option	Description
3305-1	Male-type, Angled arm connector kits
3306-1	Male-type, Straight arm Ethernet connector kits
3307-1	Male-type, Angled arm Ethernet connector kits



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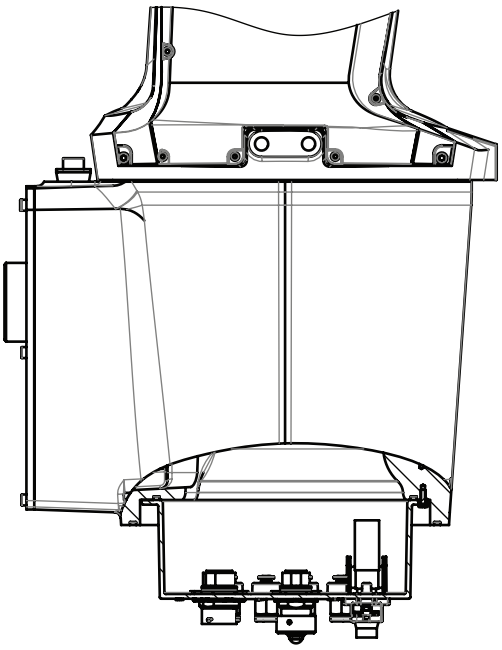
Note

The image shown here is indicative only. If there is inconsistency between the image and the actual product, the actual product shall govern.

The kits are designed and used for connectors on upper arm.

Robot cabling routing

Option	Description
3309-1	Under the base
3309-2	From side of base



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Warranty

For the selected period of time, ABB will provide spare parts and labour 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 in the ABB Ability service *Condition Monitoring & Diagnostics* 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 *Customer Delivery Date* or latest 18 months after *Factory Shipment Date*, 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 *Factory Shipment Date* or from activation date of standard warranty in WebConfig. **Note** Special conditions are applicable, see *Robotics Warranty Directives*.

2.3 Floor cables

Manipulator cable - Straight

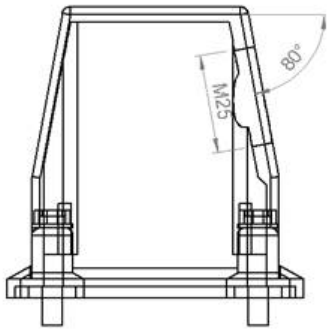
Option	Lengths
3200-1	3 m
3200-2	7 m
3200-3	15 m

xx2100001122

Manipulator cable - Angled

Option	Lengths
3209-1	Angled type connector, requires option *Manipulator cable* - Length [3200-X]

xx2100001123



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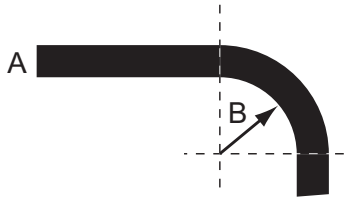
2.3 Floor cables
Continued

Bending radius for static floor cables

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



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A	Diameter
B	Diameter x10

Mains cable

Option	Lengths	Description
3203-1	EU mains cable, 3 m	Cable assembly with CEE7/VII line-side plug
3203-5	CN mains cable, 3 m	Cable assembly with CPCS-CCC line-side plug
3203-6	AU mains cable, 3 m	Cable assembly with AS/NZS 3112 line-side
3203-7	All regions cable, 5 m	Cable assembly without line-side plug

Connection of Ethernet

Required 3303-2 Ethernet, Parallel, Air and occupies 1 Ethernet port.

Option	Lengths
3202-2	7 m
3202-3	15 m

3 Accessories

General

There is a range of tools and equipment available.

Basic software and software options for robot and PC

For more information, see *Application manual - Controller software OmniCore*, *Product specification - OmniCore C line* and *Product specification - OmniCore E line*.

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Index

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