

ROBOTICS

Product specification

IRB 1100/CRB 1100



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Product specification

IRB 1100-4/0.475

IRB 1100-4/0.58

CRB 1100-4/0.475

CRB 1100-4/0.58

OmniCore

Document ID: 3HAC064993-001

Revision: F

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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

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References

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

Document name	Document ID
<i>Product specification - OmniCore C line</i>	<i>3HAC065034-001</i>
<i>Product manual - OmniCore C30</i>	<i>3HAC060860-001</i>
<i>Operating manual - OmniCore</i>	<i>3HAC065036-001</i>
<i>Application manual - Controller software OmniCore</i>	<i>3HAC066554-001</i>
<i>Product manual - IRB 1100</i>	<i>3HAC064992-001</i>
<i>Product manual - CRB 1100</i>	<i>3HAC078007-001</i>
<i>Product manual, spare parts - IRB 1100</i>	<i>3HAC064994-001</i>
<i>Product manual, spare parts - CRB 1100</i>	<i>3HAC078009-001</i>
<i>Circuit diagram - IRB 1100</i>	<i>3HAC066314-009</i>

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Overview of this specification

Continued

Document name	Document ID
Circuit diagram - CRB 1100	3HAC076518-003

Revisions

Revision	Description
A	First edition.
B	Published in release 19D. The following updates are done in this revision: <ul style="list-style-type: none">• Minor changes.• Change the description of 3308-1 and 3350-400.
C	Published in release 20B. The following updates are done in this revision: <ul style="list-style-type: none">• Change the product data of Absolute Accuracy calibration.• Supported controller OmniCore C90XT is added.
D	Published in release 20C. The following updates are done in this revision: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Safety Lamp 3308-1 removed.• Max Armload added.• Warranty section updated.
F	Published in release 21A. The following updates are done in this revision: <ul style="list-style-type: none">• 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.

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.

General introduction for CRB 1100

SWIFTI™ CRB 1100 is a collaborative robot based on the IRB 1100 industrial robot platform. It bridges the gap between collaborative and industrial robots, enabling safe collaborative operation in applications demanding industrial-level speed and lifting capabilities. Combining ABB's SafeMove speed and safety separation technology with a safety laser scanner, SWIFTI™ CRB 1100 ensures workers are never inside its working envelope while it is moving. Offering both lead-through programming via the clip-on lead through device and Wizard easy programming software, SWIFTI™ CRB 1100 can be configured with no specialized training.

Clean room classification



Note

Clean room is not available for CRB 1100 variants.



Fraunhofer

**TESTED[®]
DEVICE**

ABB Engineering (Shanghai) Ltd.
IRB 1100-4/0.58 Cleanroom
Report No. AB 2002-1161

xx2000001201

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.

Continues on next page

1 Description

1.1.1 Introduction

Continued

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		
Capacity	Attached payload	Operation of each axis
50% and 100%	4 kg	separately

Test result/Classification:

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
Capacity=50%	2
Capacity=100%	4
Overall result	4

IP67 protection

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

Software product range

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.

Operating system

The robot is equipped with the OmniCore C30 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.

Collaborative Safety



Note

This chapter is only available for CRB 1100.

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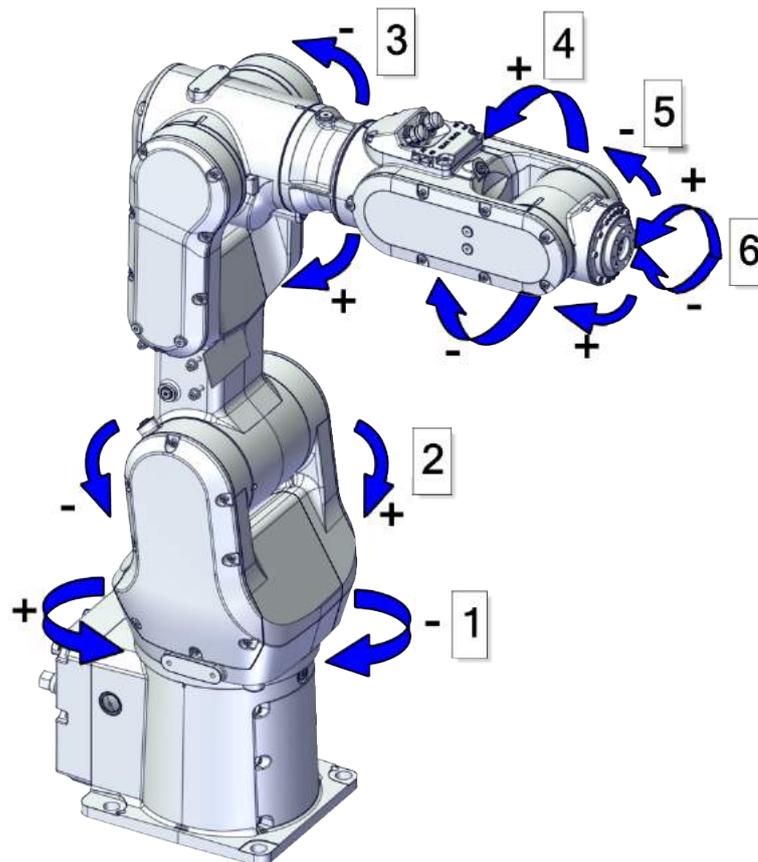
Combining ABB's SafeMove comprehensive safety functionality with a safety laser scanner, SWIFTI™ can be installed without physical fencing and still collaborate safely with people. If a worker is detected within its working area, SWIFTI™ will automatically slow down or halt to allow them to approach safely. An interaction light provides a visual indication of SWIFTI™'s status. It signals human co-workers when people are inside SWIFTI™'s working zone.

Note that a Safety PLC is required for connection with the laser scanner.

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*.

Robot axes



xx1800002456

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

1 Description

1.1.2 Different robot versions

1.1.2 Different robot versions

General

The IRB 1100/CRB 1100 is available in four 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
CRB 1100-4/0.475	4 kg	0.475 m
CRB 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/CRB 1100	21.1 kg



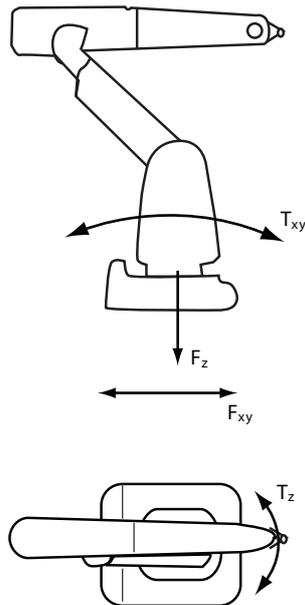
Note

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.



xx110000521

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 Description

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	± 710 N
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	± 370 Nm
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

Table mounted

Force	Endurance load (in operation)	Maximum 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 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 <i>Application manual - Controller software OmniCore</i> , 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 (-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)

Continues on next page

1 Description

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.

The CRB 1100 variants are only available for IP40.

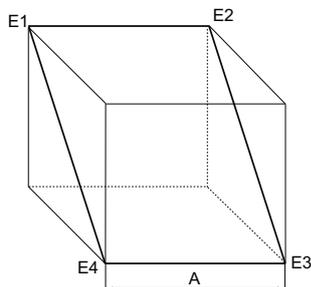
Protection type	Protection class
Manipulator, protection type Standard	IP40 IP67 (option 3350-670)
Manipulator, protection type Clean Room	ISO 4

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

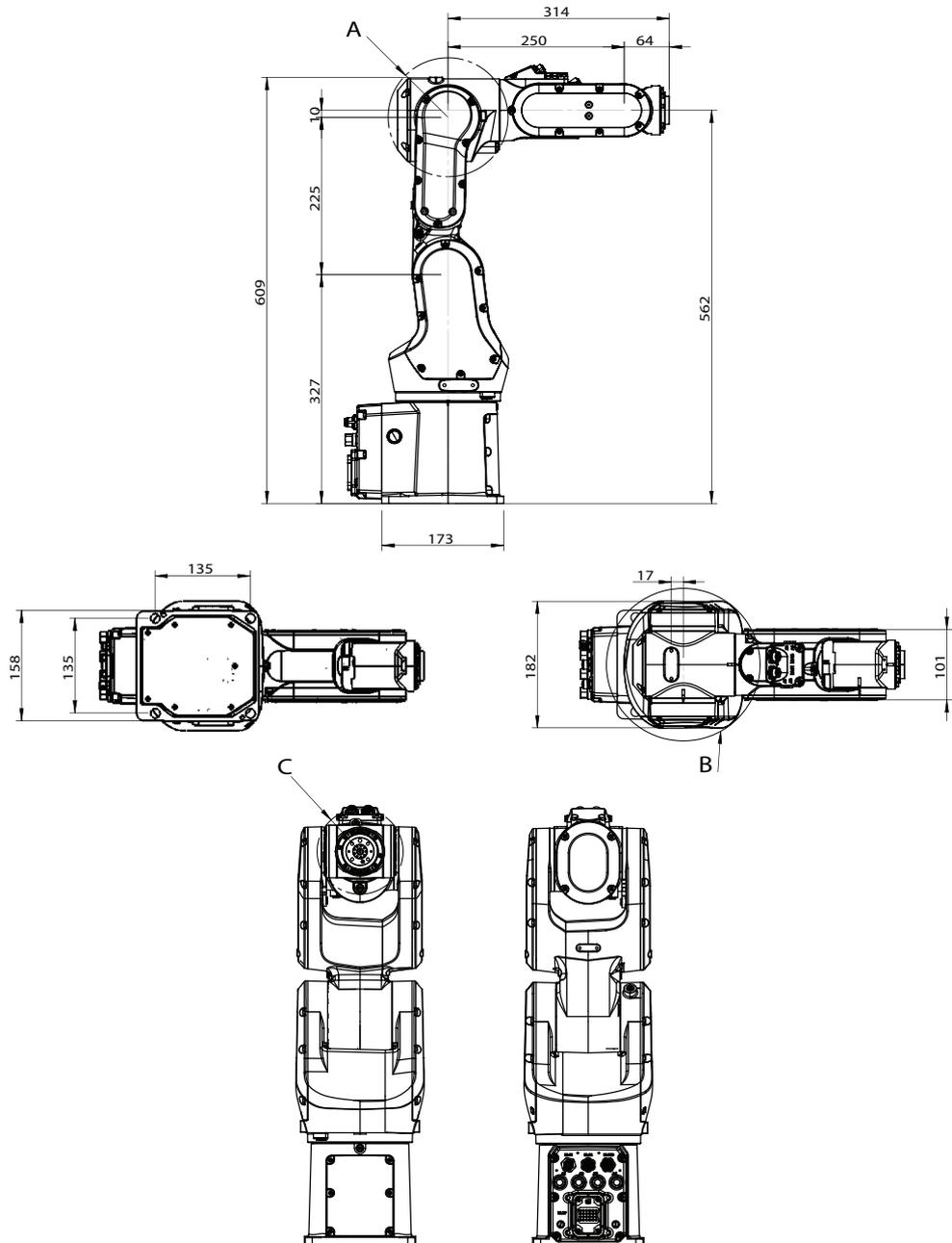
Type of movement	IRB 1100-4/0.475 CRB 1100-4/0.475	IRB 1100-4/0.58 CRB 1100-4/0.58
ISO Cube Max. velocity (W)	282	275
Robot in calibration position	IRB 1100-4/0.475 CRB 1100-4/0.475	IRB 1100-4/0.58 CRB 1100-4/0.58
Brakes engaged (W)	70	79
Brakes disengaged (W)	154	160



xx100000101

Pos	Description
A	250 mm

Main dimensions of IRB 1100-4/0.475



xx1800002606

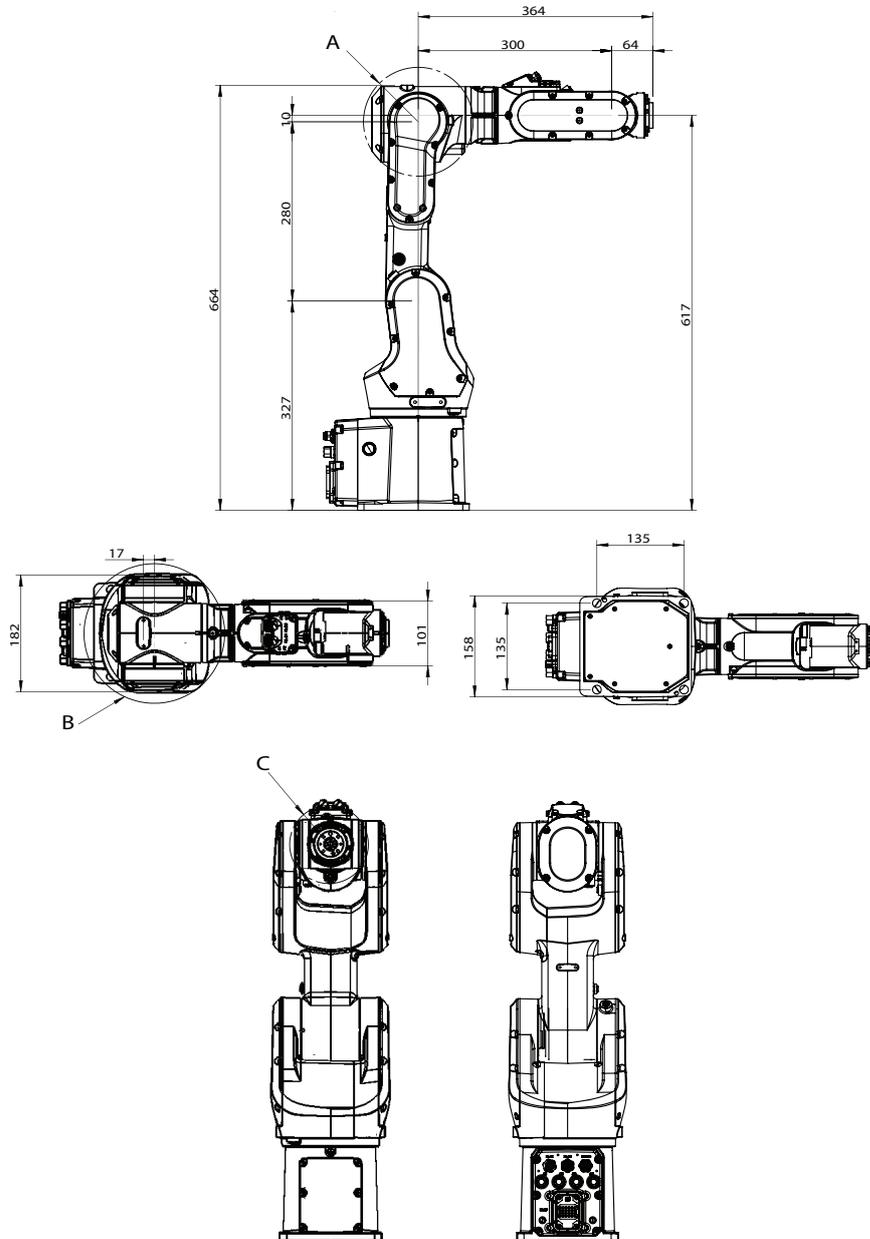
Pos	Description
A	Turning radius: R85
B	Turning radius: R109
C	Turning radius: R61

1 Description

1.1.3.1 Technical data

Continued

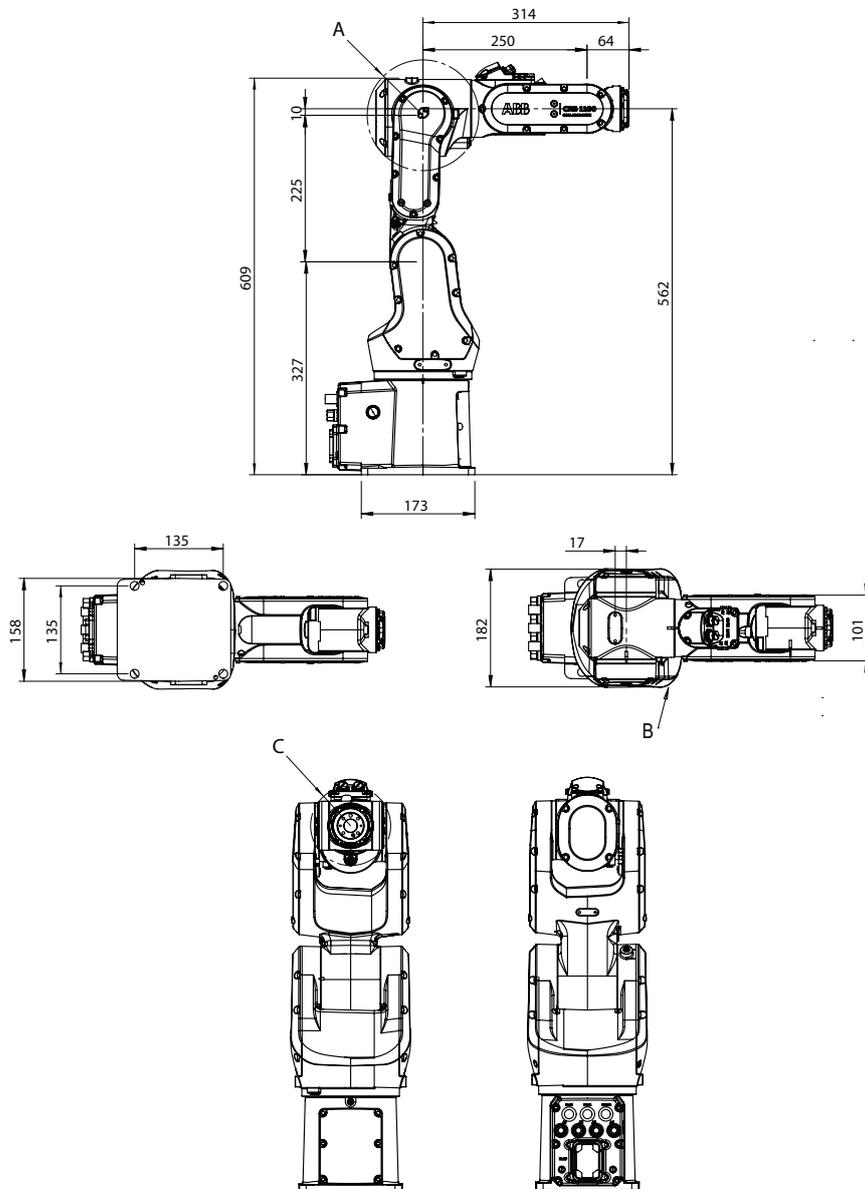
Main dimensions of IRB 1100-4/0.58



xx1800002607

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

Main dimensions of CRB 1100-4/0.475



xx2000002545

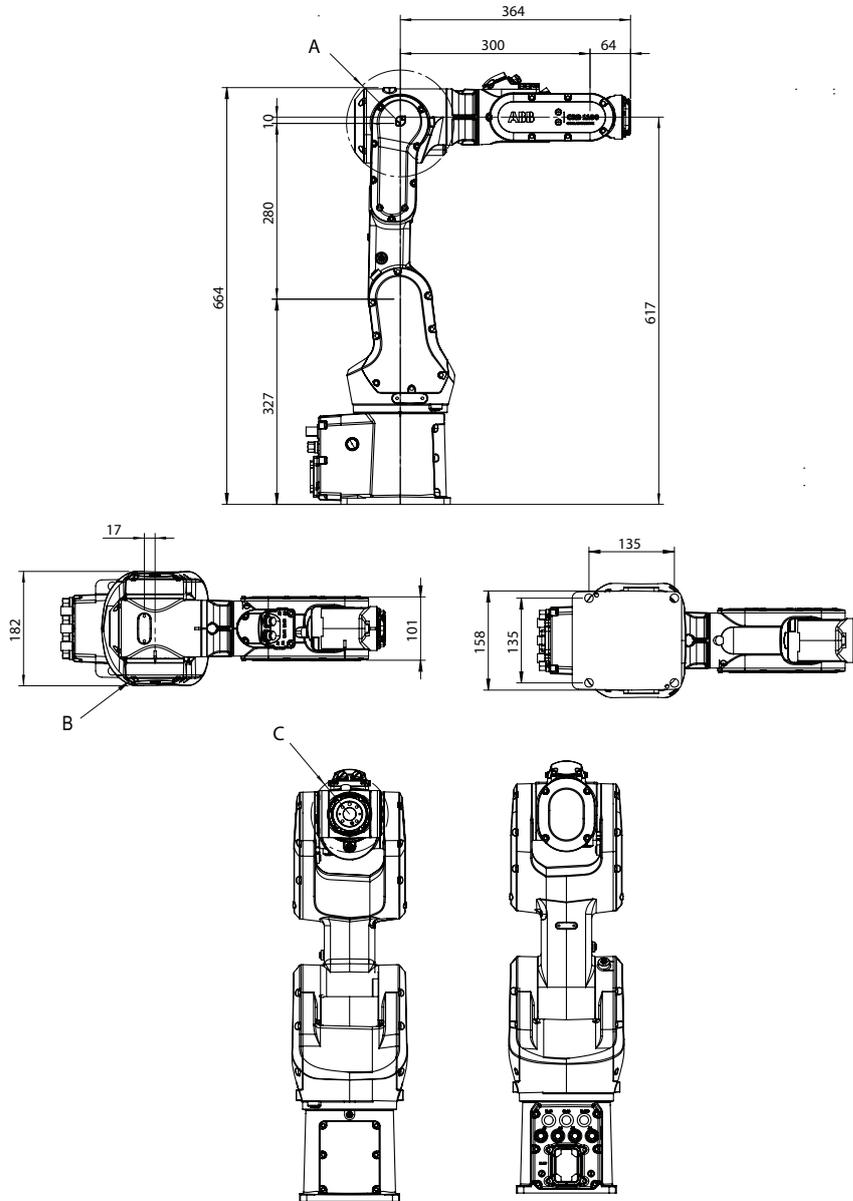
Pos	Description
A	Turning radius: R85
B	Turning radius: R109
C	Turning radius: R61

1 Description

1.1.3.1 Technical data

Continued

Main dimensions of CRB 1100-4/0.58



xx2000002546

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

1.2 Standards

1.2.1 Applicable standards



Note

The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

General

The product is designed in accordance 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 deviations from ISO 10218-1:2011, these are listed in the declaration of incorporation which is part of the product delivery.

Normative standards, ISO

Standard	Description
ISO 9283:1998	Manipulating industrial robots - Performance criteria and related test methods
ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
ISO 13850	Safety of machinery - Emergency stop - Principles for design
IEC 60204-1:2005	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 62061:2005	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

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 434-14	Industrial robots and robot Systems - General safety requirements

Other standards used in design

Standard	Description
ISO 9787:2013	Robots and robotic devices -- Coordinate systems and motion nomenclatures
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments

Continues on next page

1 Description

1.2.1 Applicable standards

Continued

Standard	Description
IEC 61000-6-4 (option 129-1)	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
ISO 13732-1:2008	Ergonomics of the thermal environment - Part 1
IEC 60974-1:2012 ⁱ	Arc welding equipment - Part 1: Welding power sources
IEC 60974-10:2014 ⁱ	Arc welding equipment - Part 10: EMC requirements
ISO 14644-1:2015 ⁱⁱ	Classification of air cleanliness
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)

ⁱ Only valid for arc welding robots. Replaces IEC 61000-6-4 for arc welding robots.

ⁱⁱ Only robots with protection Clean Room.

1.3 Installation

1.3.1 Introduction to installation

General

IRB 1100/CRB 1100 is adapted for normal industrial environment. Depending on the robot version, an end effector with max. weight of 4 kg including payload, can be mounted on the tool flange (axis 6). See [Load diagrams on page 38](#).

Extra loads

The upper arm can handle an additional load of 0.5 kg.
See [Fitting equipment to the robot on page 47](#).

Working range limitation

The working range of axes 1 can be limited by mechanical stops as option. See [Working range on page 55](#).

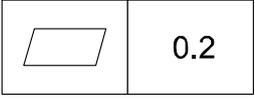
1 Description

1.3.2 Assembling the manipulator

1.3.2 Assembling the manipulator

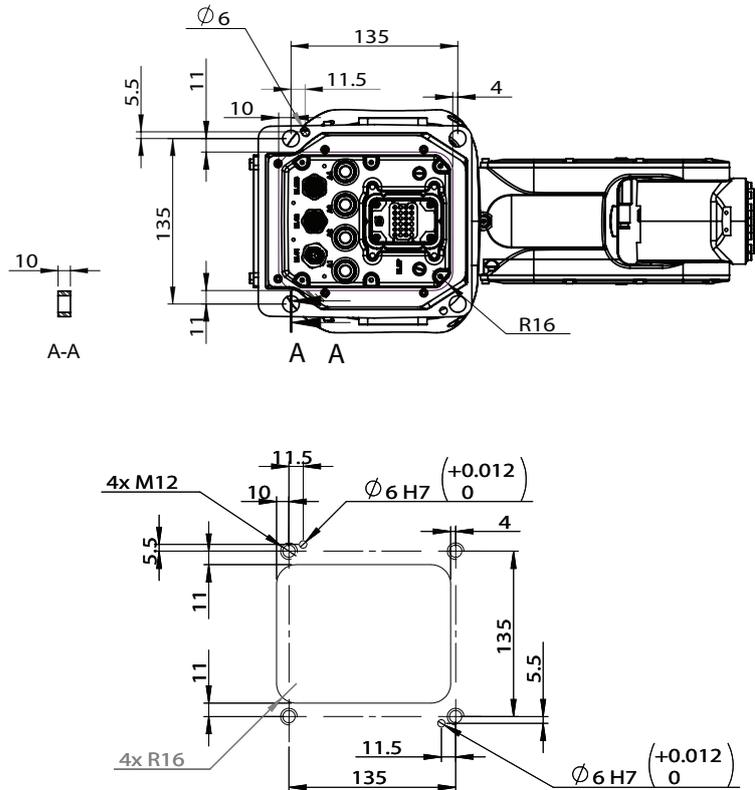
Attachment screws

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 300HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	50 Nm±5 Nm
Level surface requirements	 xx0900000643

Hole configuration, base

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



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1.3.3 Installation the lead-through device



Note

This section is only available for the CRB 1100.

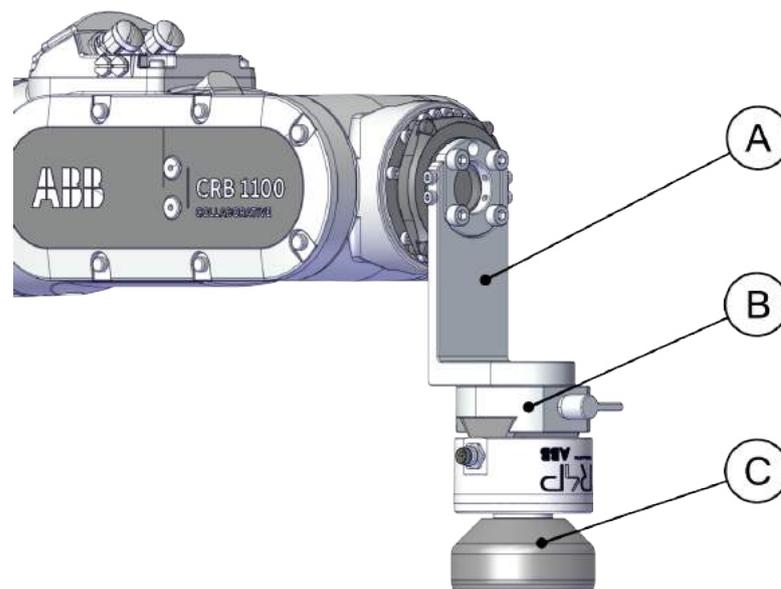
Introduction

The lead-through functionality is available for the CRB 1100 with a lead-through device mounted on axis 6. With the lead-through device, you can hold the handler and move the robot arm manually to the desired position, as an alternative to jogging.

To use the lead-through device, make sure the system is running in manual mode; otherwise, the functionality cannot be enabled.

Location of lead-through device

The lead-through device is located as shown in the figure.



xx2100000159

A	Adapter
B	Lead-through device base
C	Lead-through device

Continues on next page

1 Description

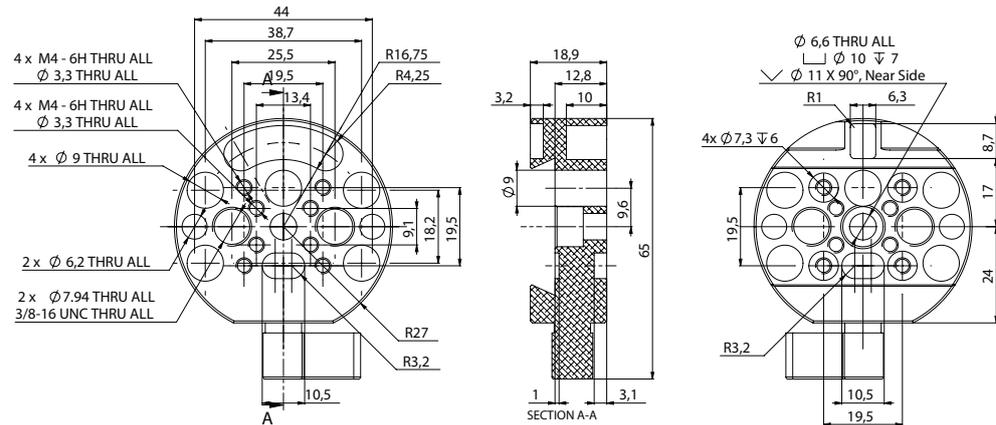
1.3.3 Installation the lead-through device

Continued

Preparing the adapter

The lead-through device is mounted to the device base and then to the robot tool flange through an adapter. An L-shape adapter is delivered with the robot as a default option. Customers can also design adapters according to actual requirements. During adapter design, hole dimensions on the device base and robot tool flange shall be considered.

The following figure illustrates the hole dimensions on lead-through device base.



xx210000164

For the hole dimensions on robot tool flange, see [Tool flange standard on page 49](#).

1.3.4 Installation the laser scanner

**Note**

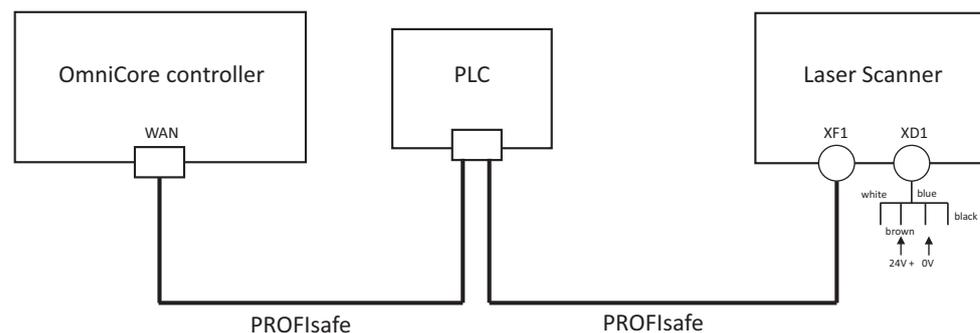
This section is only available for the CRB 1100.

Overview

The safety separation technology for CRB 1100 is based on the connection and communication among a safety laser scanner, a safety PLC that can act as a master and the OmniCore controller with SafeMove.

The laser scanner is delivered with CRB 1100 as a default option, but users shall prepare a safety PLC of their own. The supported laser scanner is *SICK®* microScan 3 Core. Detailed scanner model can be obtained on the scanner nameplate. Other scanner types or models might not provide full functionality.

The laser scanner provides a timely and continuous monitor on the activities within its scanning area and forms a protective field. It must connect to the PLC and then to the OmniCore controller via the PROFINET safe (PROFIsafe) network. The following figure shows the physical connections among them.



xx2100000160

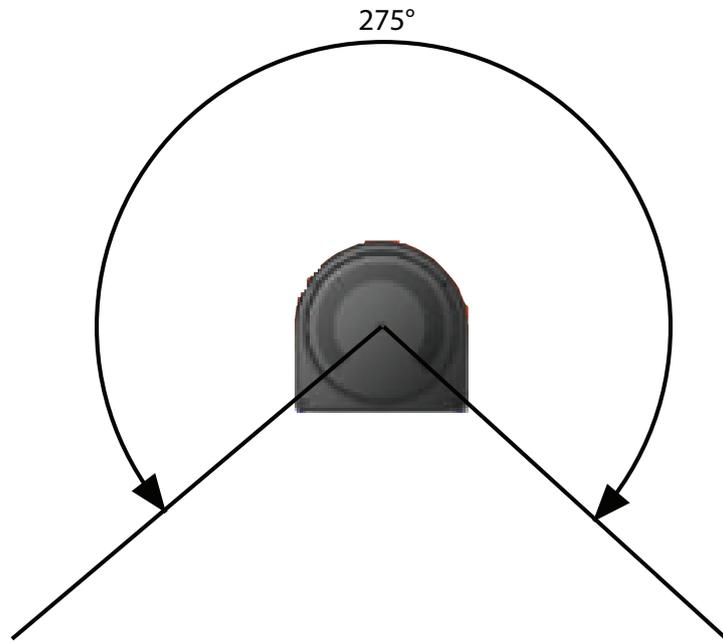
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1 Description

1.3.4 Installation the laser scanner

Continued

The laser scanner provides a scanning range of approximately 275°. System integrator shall investigate the site environment and place the laser scanner to a proper location according to the actual requirements.



xx2100000168

For more details about the safety laser scanner, see the user manual from the vendor.

1.3.5 Indicator lamp



Note

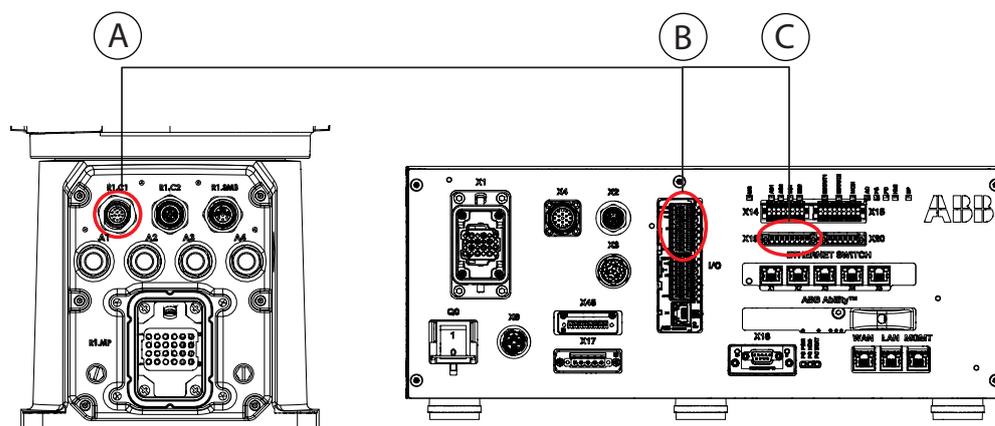
This section is only available for the CRB 1100.

Description

The lamp unit on process hub of CRB 1100 indicates robot status in four colors. Operators should always be aware of the indicator color and handle the situation correspondingly.

Cabling

The lamp unit cabling is integrated in the CP/CS cable. Do not use other types of CP/CS cables that are not provided by ABB; otherwise, the lamp unit will not work. The cable end connecting the manipulator connects to the R1.C1 connector on the robot base; the other end of the cable is divided to two connectors, which connect to the I/O connector and X19 connector on the controller respectively. The following figure illustrates the connectors on the robot and controller. For more details about cabling, see *Circuit diagram - CRB 1100*.



xx210000291

A	R1.C1 connector on robot base	
B	I/O connector on controller	Pins GND, DO1, DO2 and DO3 are occupied for lamp unit
C	X19 connector on controller	Pins 1 and 2 are occupied for lamp unit

Functionality

Color	Manual mode	Automatic mode	Manual full speed mode
White	Standby (in motor on/off state and program is stopped, available for users to perform next actions)		
Green	Program is executing		
Yellow	Lead-through function is enabled	Yellow warning area is triggered (manipulator speed will be limited according to the actual configured value)	

Continues on next page

1 Description

1.3.5 Indicator lamp

Continued

Color	Manual mode	Automatic mode	Manual full speed mode
Red	Emergency stop or error is raised	Emergency stop, error is raised or red protecting area is triggered (the manipulator will reduce to 0% speed and stands still)	

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: <ul style="list-style-type: none"> Mechanical tolerances in the robot structure Deflection due to load <p>Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot.</p> <p>Absolute accuracy calibration data is found on the SMB (serial measurement board) in the robot.</p> <p>A robot calibrated with Absolute accuracy has the option information printed on its name plate.</p> <p>To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.</p>	CalibWare

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1100/CRB 1100 and is the most accurate method for the standard calibration. 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.

Continues on next page

1 Description

1.4.1 Calibration methods

Continued

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.

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.

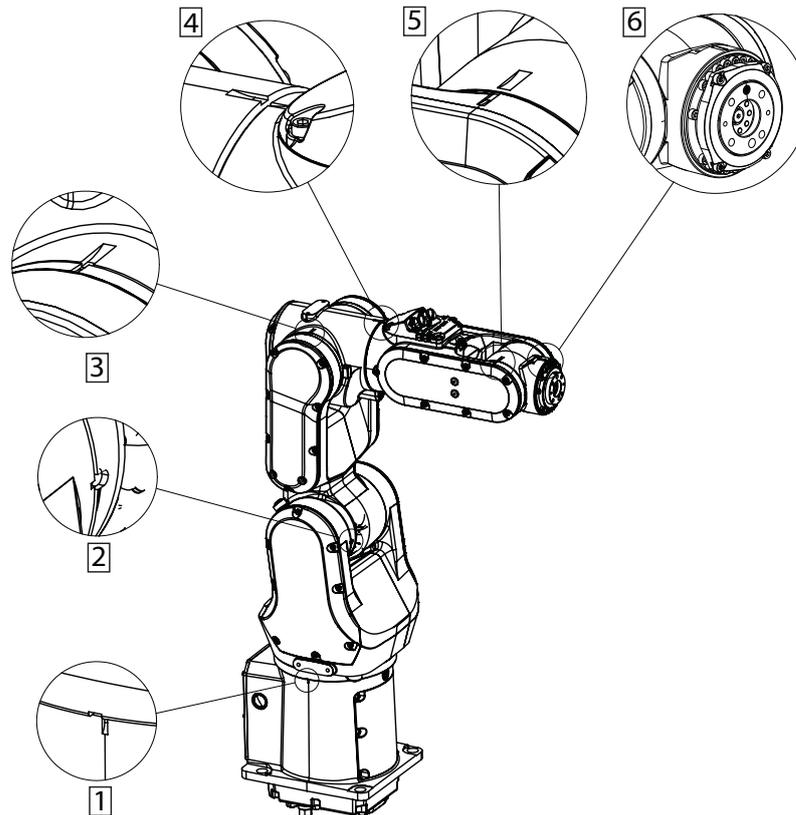
The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

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.

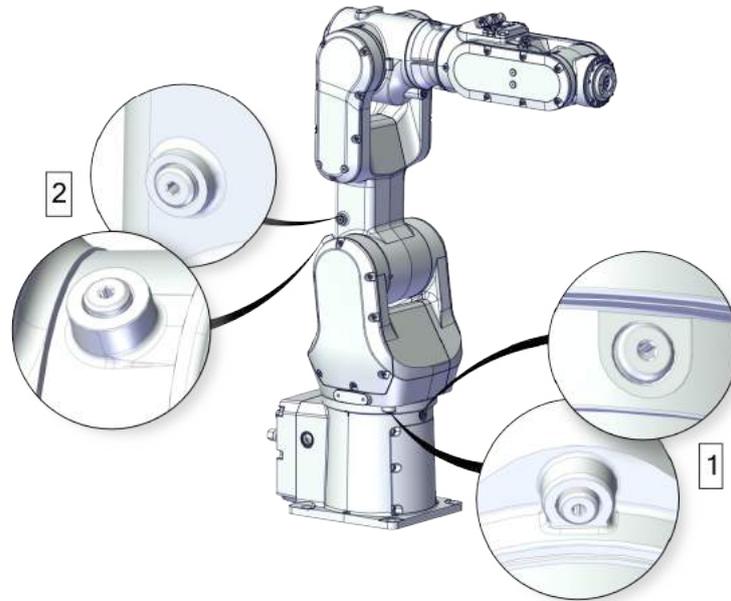
1 Description

1.4.3 Fine calibration

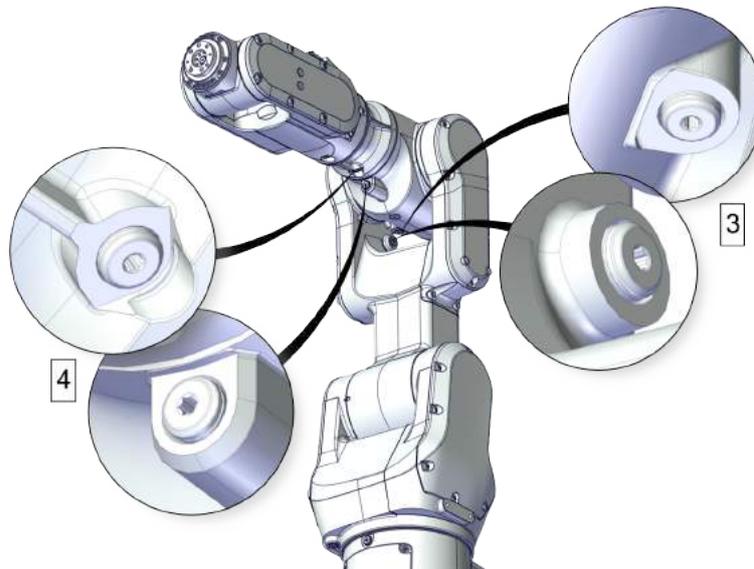
1.4.3 Fine calibration

General

The fine calibration is done with the Axis calibration method.

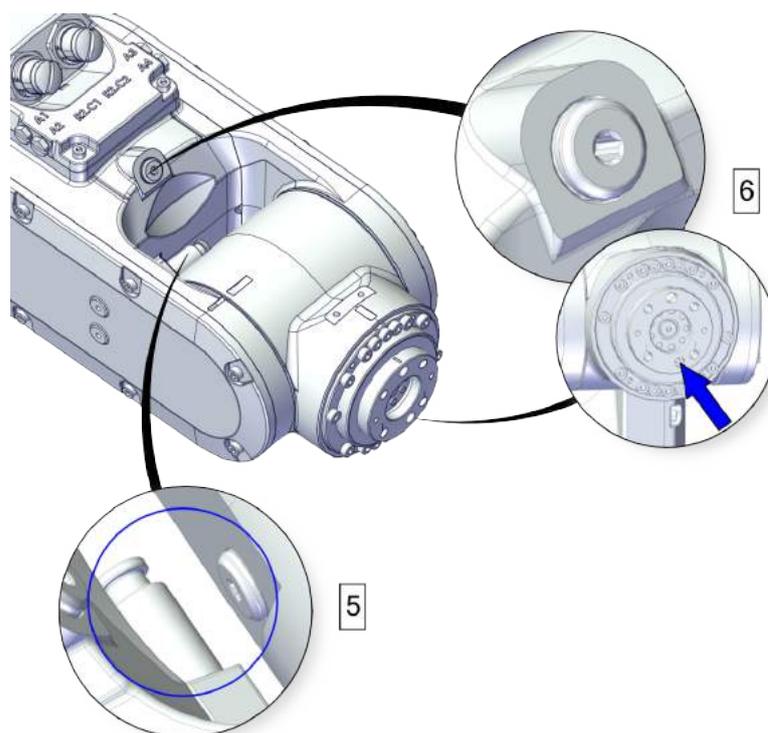


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Axes

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

1 Description

1.4.4 Absolute Accuracy calibration

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:

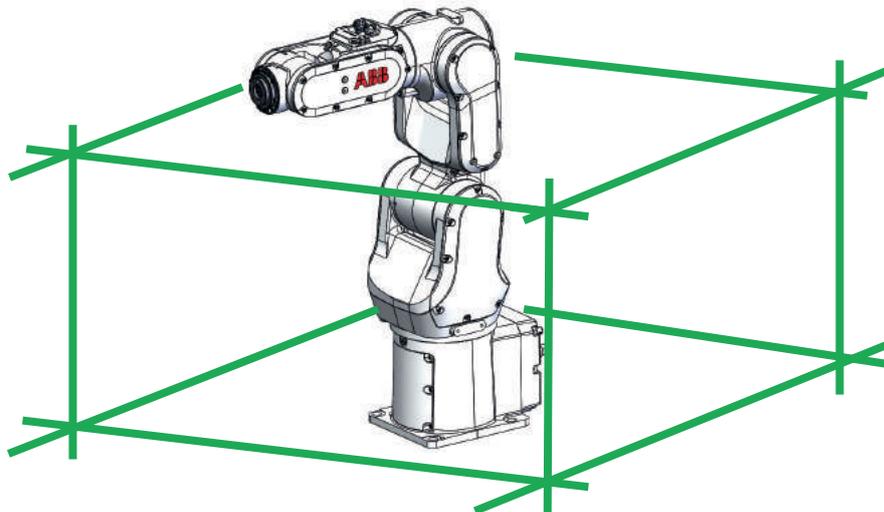
- Exchangeability of robots
- Offline programming with no or minimum touch-up
- Online programming with accurate movement and reorientation of tool
- Programming with accurate offset movement in relation to eg. vision system or offset programming
- Re-use of programs between applications

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.



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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.

Continues on next page

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
- 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 and CRB 1100-4/0.475	0.08	0.25	100
IRB 1100-4/0.58 and CRB 1100-4/0.58	0.10	0.25	100

1 Description

1.5.1 Introduction

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

- motors
- gearboxes
- mechanical structure



WARNING

In the robot system the service routine LoadIdentify is available, which allows the user to make an automatic definition of the tool and load, to determine correct load parameters.

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



WARNING

Robots running with incorrect load data and/or with loads outside 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.

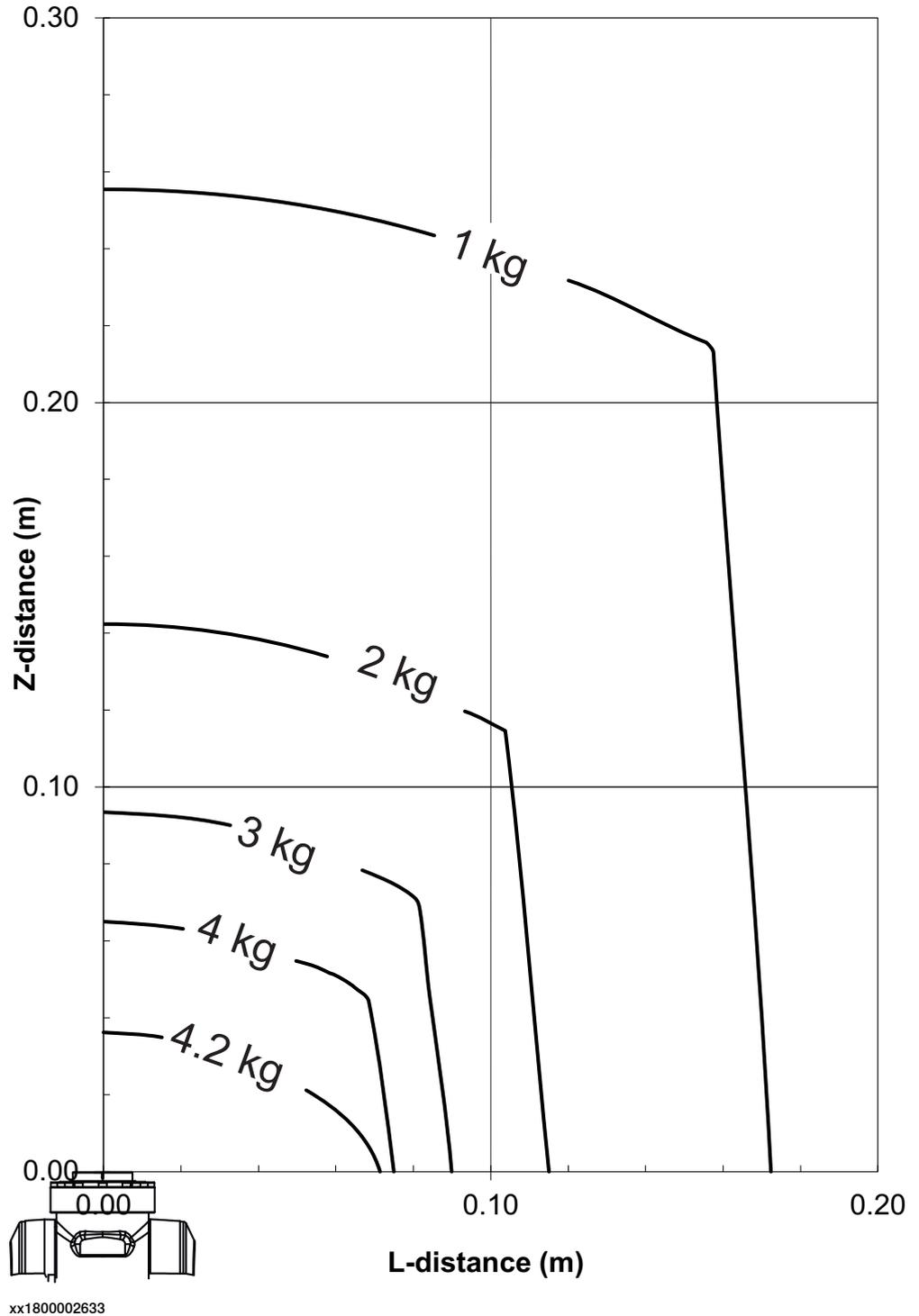
Control of load case by "RobotLoad"

To easily control a specific load case, use the calculation program ABB RobotLoad. Contact your local ABB organization for more information.

The result from RobotLoad is only valid within the maximum loads and tilt angles. There is no warning if the maximum permitted armload 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 and CRB 1100-4/0.475



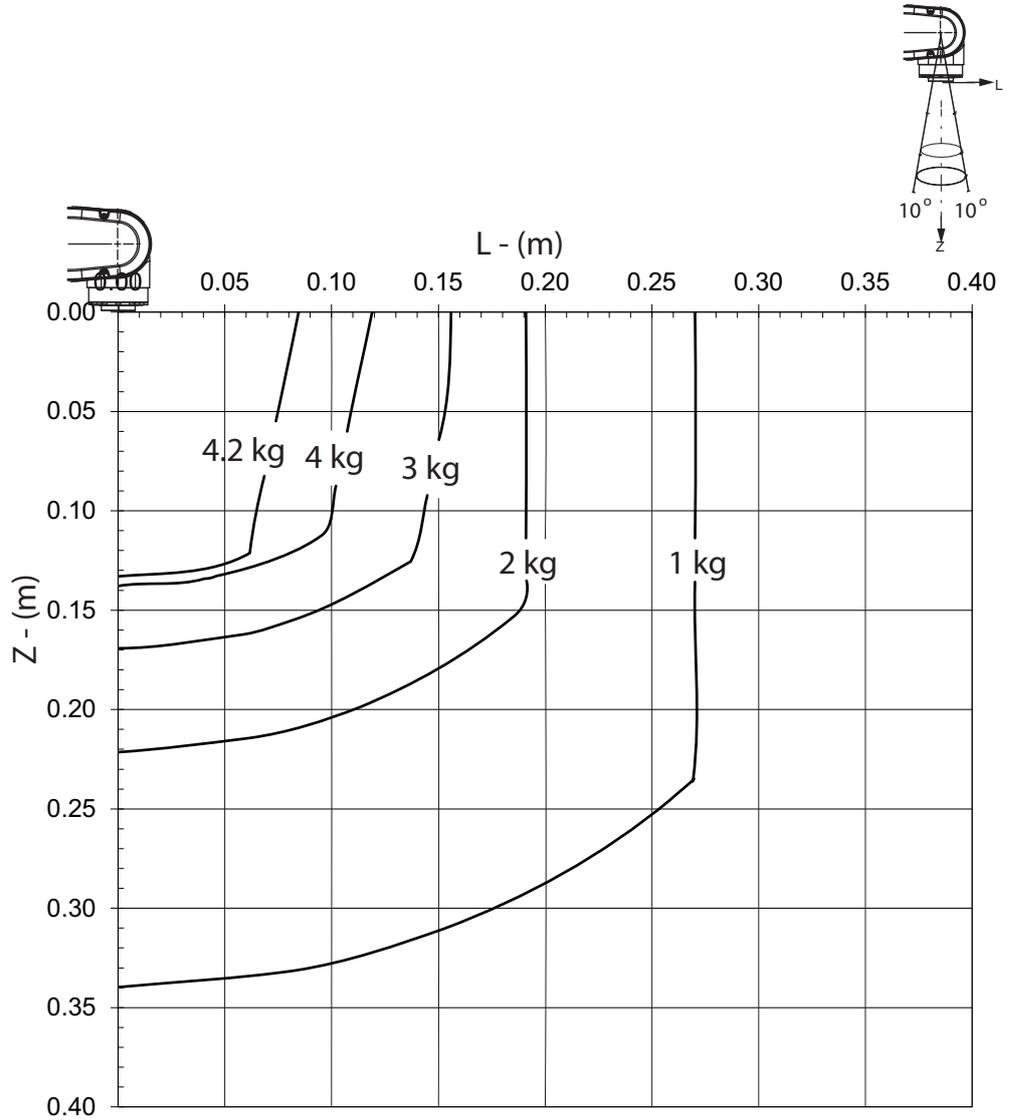
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1 Description

1.5.2 Diagrams

Continued

Diagrams of IRB 1100-4/0.475 and CRB 1100-4/0.475 "Vertical Wrist" ($\pm 10^\circ$)



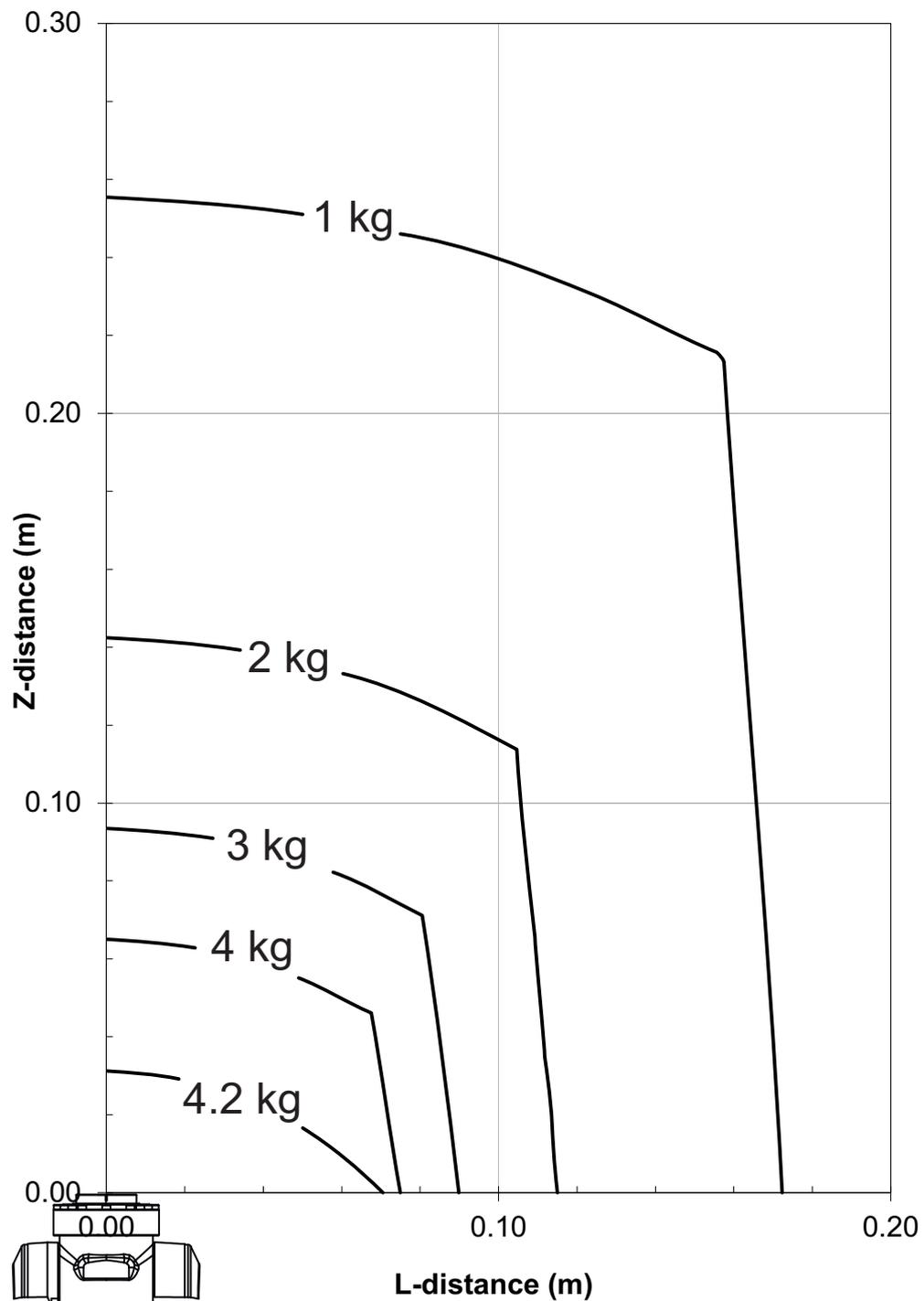
xx1800002634

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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Diagrams of IRB 1100-4/0.58 and CRB 1100-4/0.58



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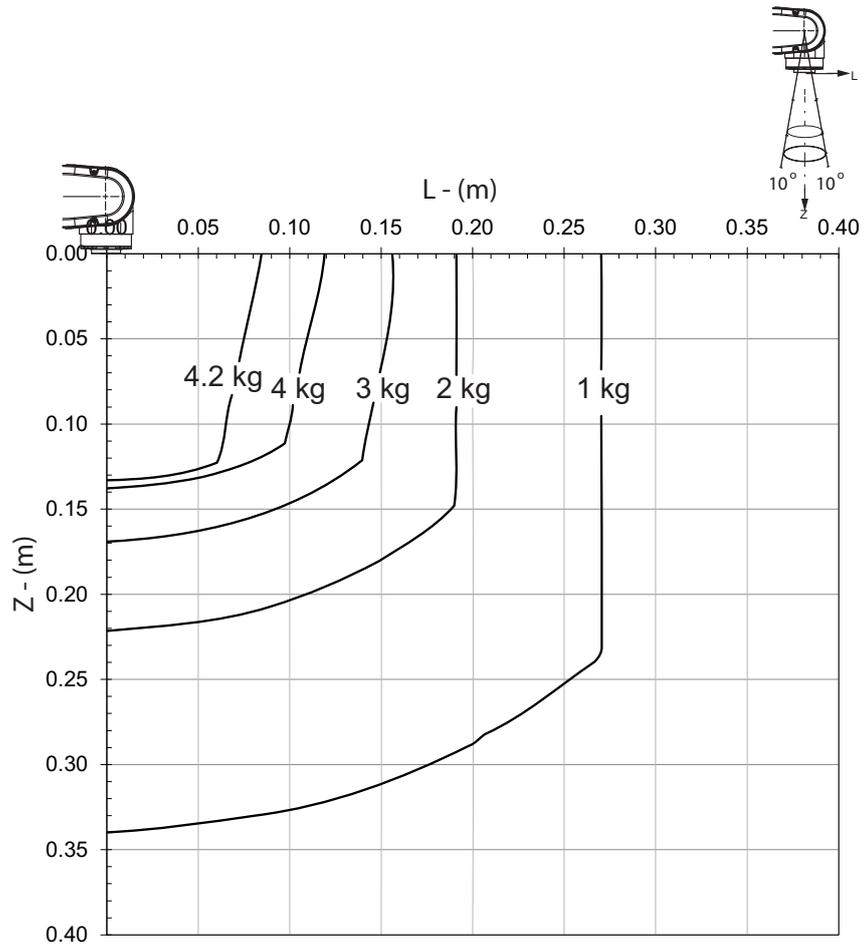
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1 Description

1.5.2 Diagrams

Continued

Diagrams of IRB 1100-4/0.58 and CRB 1100-4/0.58"Vertical Wrist" ($\pm 10^\circ$)



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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

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

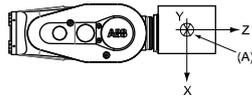


Note

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 . $L = \text{sqr}(X^2 + Y^2)$, 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 CRB 1100-4/0.475 CRB 1100-4/0.58	$Ja_5 = \text{Load} \times ((Z + 0.064)^2 + L^2) + \max(J_{ox}, J_{oy}) \leq 0.175 \text{ kgm}^2$
6	IRB 1100-4/0.475 IRB 1100-4/0.58 CRB 1100-4/0.475 CRB 1100-4/0.58	$Ja_6 = \text{Load} \times L^2 + J_{oz} \leq 0.085 \text{ kgm}^2$



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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.

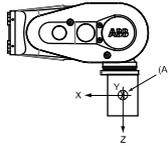
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1 Description

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 CRB 1100-4/0.475 CRB 1100-4/0.58	$Ja_5 = \text{Load} \times ((Z + 0.064)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 0.175 \text{ kgm}^2$
6	IRB 1100-4/0.475 IRB 1100-4/0.58 CRB 1100-4/0.475 CRB 1100-4/0.58	$Ja_6 = \text{Load} \times L^2 + J_{0z} \leq 0.085 \text{ kgm}^2$



xx1400002029

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.

1.5.4 Wrist torque



Note

The 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. Also arm loads will influence the permitted load diagram. For finding the absolute limits of the load diagram, use the ABB RobotLoad. Contact your local ABB organization.

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 and CRB 1100-4/0.475	5.0 Nm	2.9 Nm	4 kg
IRB 1100-4/0.58 and CRB 1100-4/0.58	5.0 Nm	2.9 Nm	4 kg

1 Description

1.5.5 Maximum TCP acceleration

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

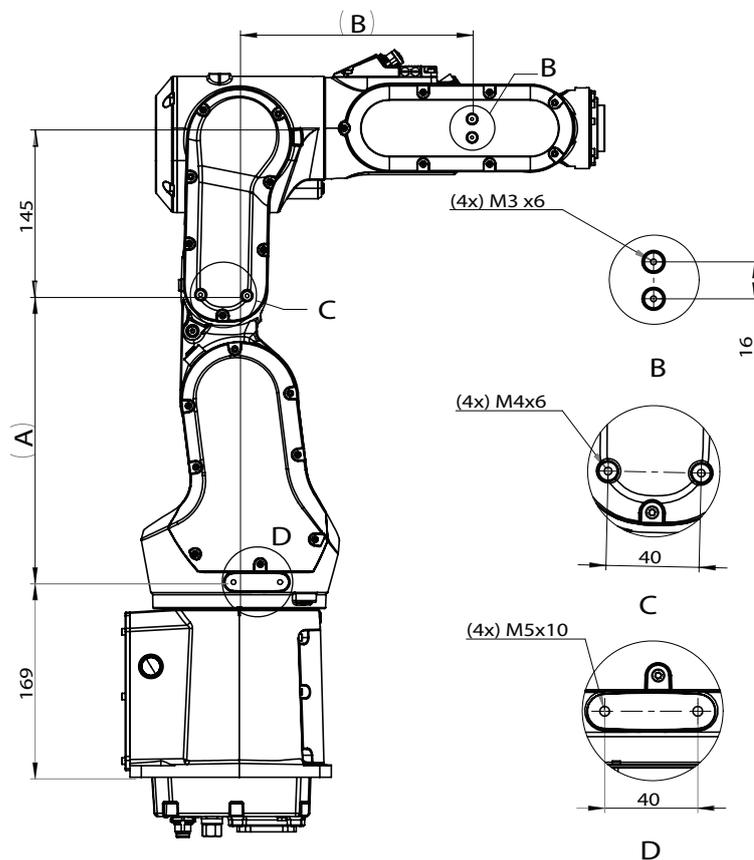
Attachment holes and dimensions

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 and CRB 1100-4/0.475	0.5
IRB 1100-4/0.58 and CRB 1100-4/0.58	0.5

Holes for fitting extra equipment



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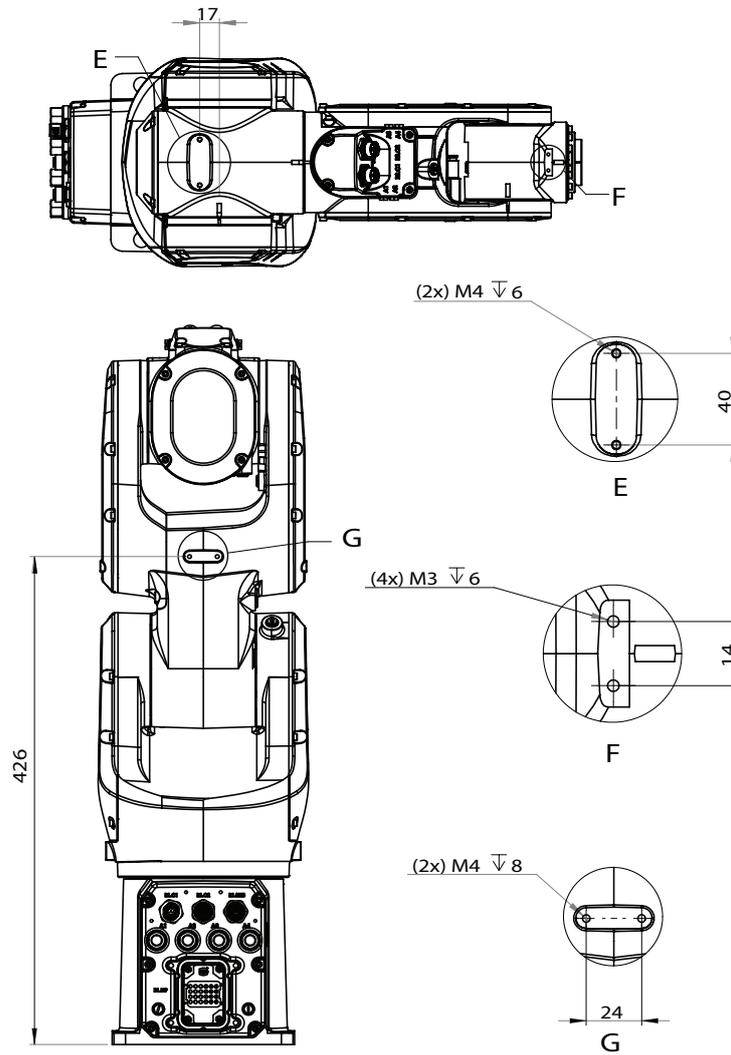
Pos	4/0.475	4/0.58
A	248	303
B	200	250

Continues on next page

1 Description

1.6 Fitting equipment to the robot

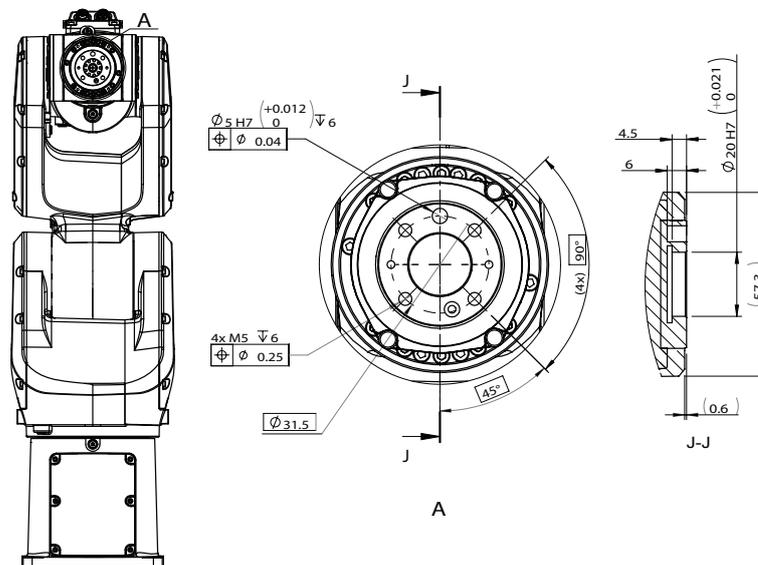
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Tool flange standard



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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

Use suitable screws and tightening torque for your application, screws with quality class 12.9 are recommended.

1 Description

1.7 Maintenance and troubleshooting

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

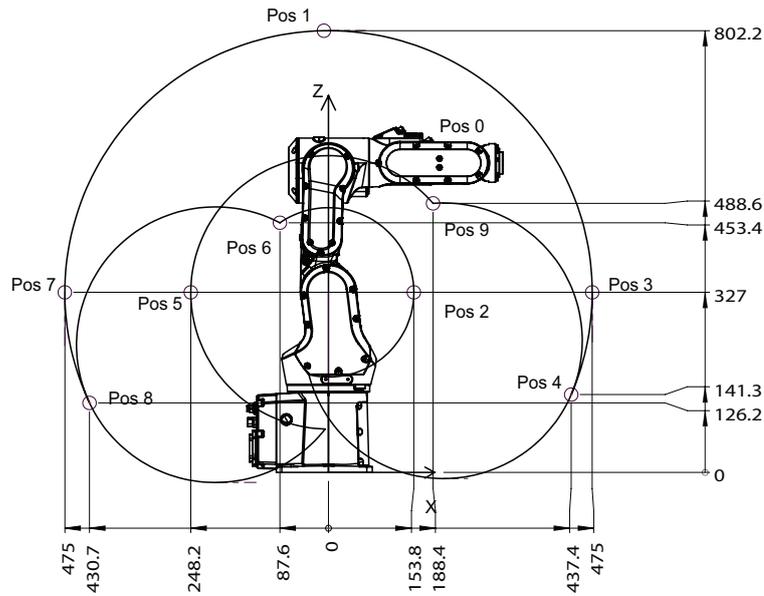
The maintenance intervals depend on the use of the robot. The required maintenance activities also depend on the selected options. For detailed information on maintenance procedures, see the maintenance section in *Product manual - IRB 1100* or *Product manual - CRB 1100*.

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°

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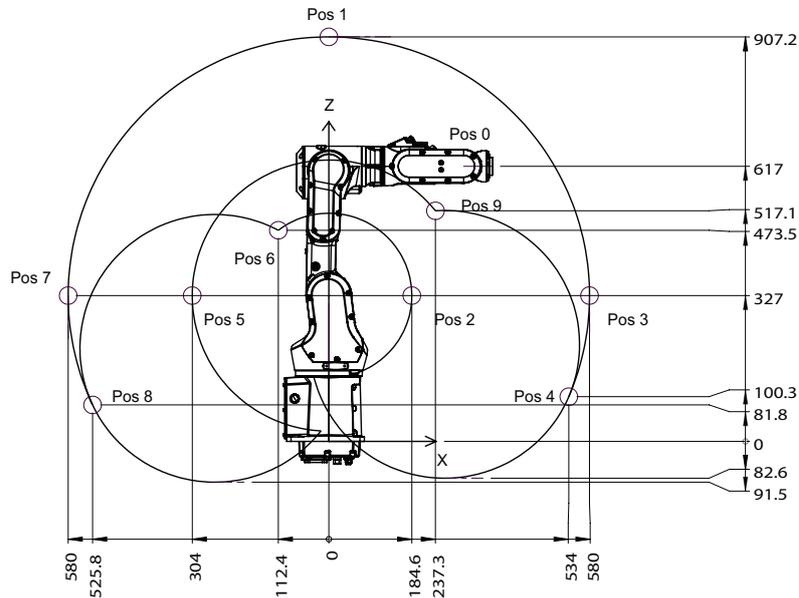
1 Description

1.8.1 Working range

Continued

Illustration, working range IRB 1100-4/0.58

This illustration shows the unrestricted working range of the robot.



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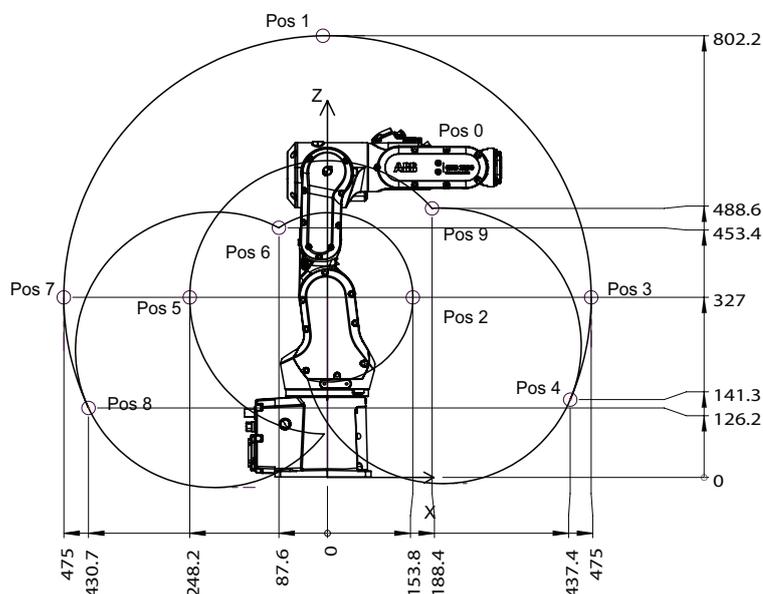
Positions at wrist center and angle of axes 2 and 3

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°

Continues on next page

Illustration, working range CRB 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°

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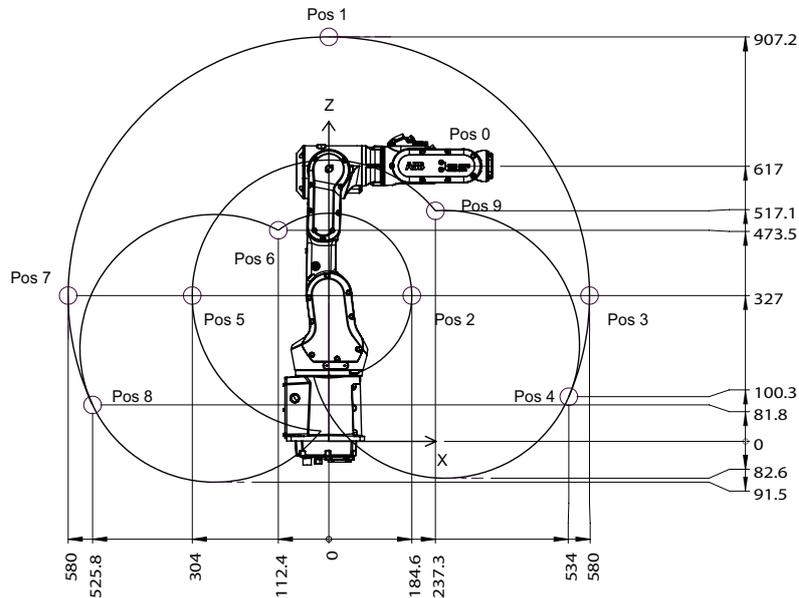
1 Description

1.8.1 Working range

Continued

Illustration, working range CRB 1100-4/0.58

This illustration shows the unrestricted working range of the robot.



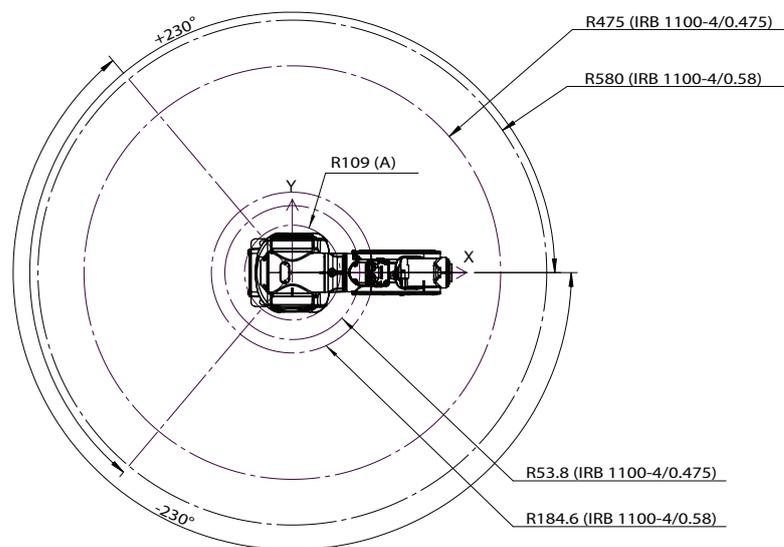
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Positions at wrist center and angle of axes 2 and 3

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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Turning radius



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A	Minimum turning radius of axis 1
---	----------------------------------

Working range

Axis	Working range	Note
Axis 1	$\pm 230^\circ$	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	$-115^\circ/+113^\circ$	
Axis 3	$-205^\circ/+55^\circ$	
Axis 4	$\pm 230^\circ$	
Axis 5	$-125^\circ/+120^\circ$	
Axis 6	$\pm 400^\circ$	Default value.
	$\pm 242^\circ$	Maximum revolution value. The default working range for axis 6 can be extended by changing parameter values in the software.

1 Description

1.8.2.1 Axes with restricted working range

1.8.2 Axes with restricted working range

1.8.2.1 Axes with restricted working range

General

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

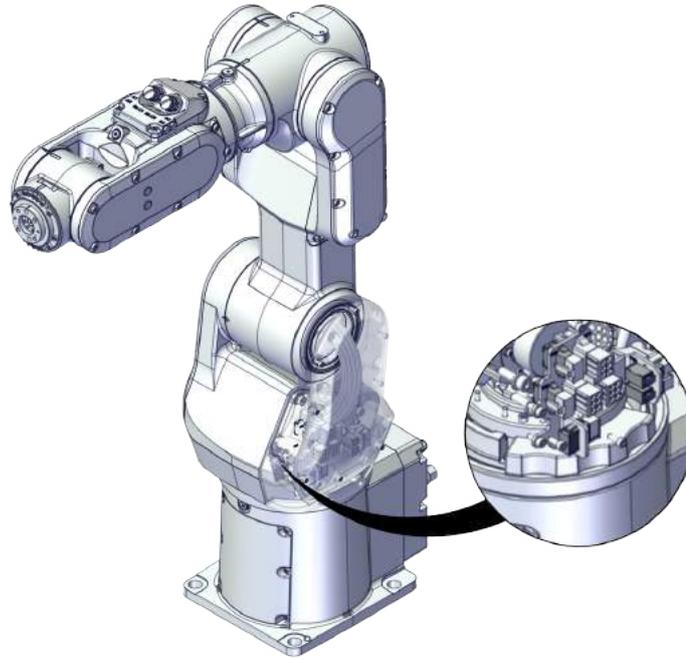
The working range of the following axes may be restricted:

Axis	Mechanical restriction	Software restriction
Axis 1	x	x
Axis 2		x
Axis 3		x
Axis 4		x
Axis 5		x
Axis 6		x

1.8.2.2 Mechanically restricting the working range

Location of the mechanical stops

Only axis 1 has a replaceable mechanical stop.



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1 Description

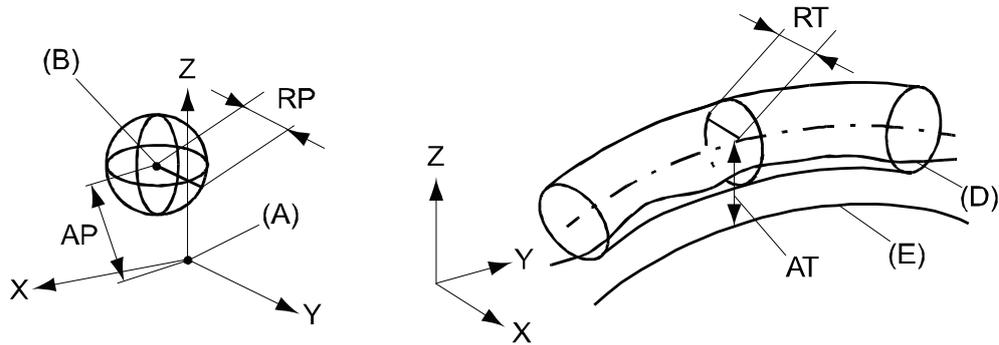
1.8.3 Performance according to ISO 9283

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/CRB 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 taught 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 and CRB 1100-4/0.475	460 °/s	380 °/s	280 °/s	560 °/s	420 °/s	750 °/s
IRB 1100-4/0.58 and CRB 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).

Axis resolution

0.001° to 0.005°.

1 Description

1.8.5 Robot stopping distances and times

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)*.

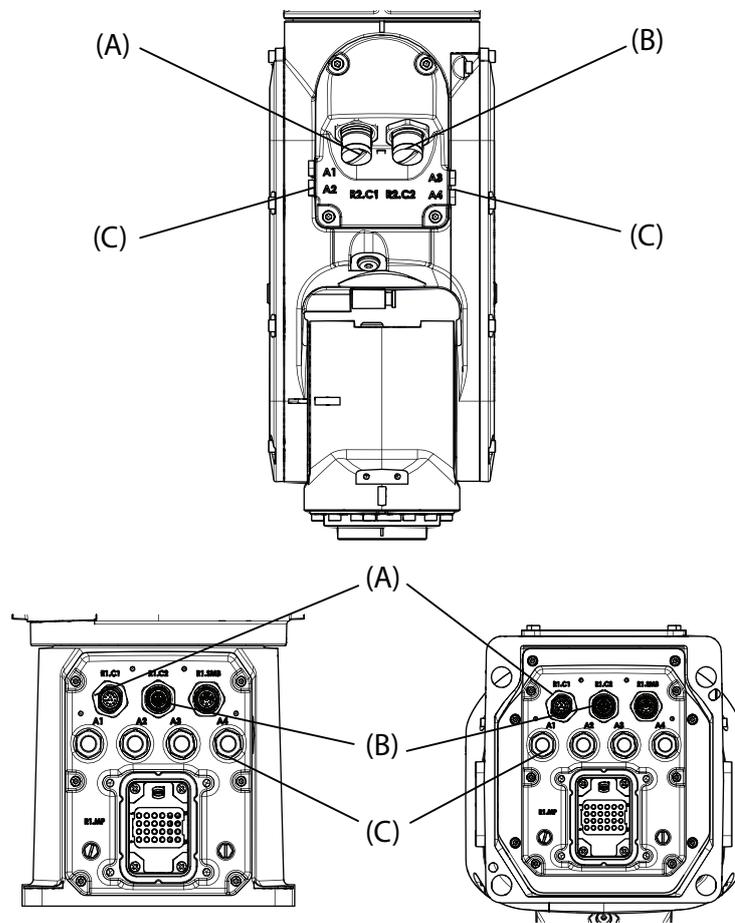
1.9 Customer connections

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	IRB 1100: 8 wires ⁱ CRB 1100: 4 wires ⁱⁱ	30 V, 1.5 A
B	(R1)R2.C2	Customer power/signal or Ethernet	IRB 1100: 8 wires CRB 1100: 4 wires	30 V, 1 A or 1 Gbits/s

Continues on next page

1 Description

1.9 Customer connections

Continued

Position	Connection	Description	Number	Value
C	Air	Max. 6 bar	4	Inner diameter of the hose inside the robot: 2.5 mm Outer diameter of the hose inside the robot: 4 mm

- i The connector has 12 pins. Only pins 1 to 8 are available for use.
- ii The connector has 12 pins. Only pins 1 to 4 are available for use. Pins 5 to 8 are used for LED indicator, and pins 9 to 12 are not connected internally.

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.

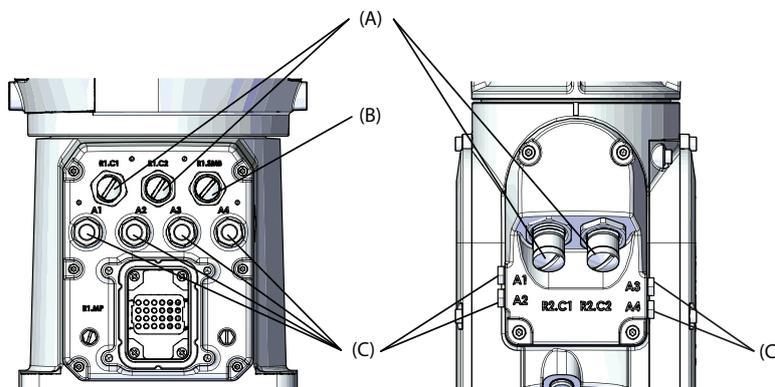
Position	Description	Art. no.	
Connector kits	CP/CS	M12 CPCS Male straight connector kits	3HAC066098-001
		M12 CPCS Male angled connector kits	3HAC066099-001
	Ethernet	M12 Ethernet Cat5e Male straight connector kits	3HAC067413-001
		M12 Ethernet Cat5e Male angled connector kits	3HAC067414-001

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

Continues on next page

1 Description

1.9 Customer connections

Continued

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/CRB 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 Specification of variants and options

2.2 Manipulator

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
3300-20	CRB 1100 REQUIRES: 3063-1 Collaborative package	4	0.475
3300-21	CRB 1100 REQUIRES: 3063-1 Collaborative package	4	0.58

Manipulator color

Option	Description
209-202	ABB Graphite White standard
209-2	ABB white standard (Not available for CRB 1100 Variants and required 3351-4 clean room)



Note

Notice that delivery time for painted spare parts will increase for none standard colors.

Manipulator protection

Option	Description
3350-400	Base 40,IP40
3350-670	Base 67,IP67, not available for CRB 1100 Variants
3351-4	Clean Room 4, not available for CRB 1100 Variants

Signs on manipulator

Option	Description
3302-1	ABB
3302-2	ABB collaborative, only available for CRB 1100 Variants



Note

This option is released from RobotWare 6.03 as IRB1200FGL-5/0.9 and IRB1200FGL-7/0.7.

Continues on next page

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 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
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



Straight connector kits



Angled connector kits



Straight Ethernet connector kits



Angled Ethernet connector kits

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Note

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

Robot cabling routing

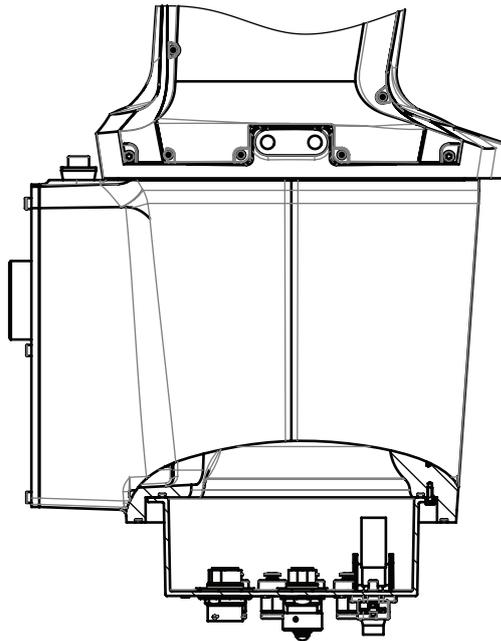
Option	Description
3309-1	Under the base
3309-2	From side of base

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2 Specification of variants and options

2.2 Manipulator

Continued



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Lead through device

This option is only available for CRB 1100 Variants.

Option	Description
3313-1	Lead through device

General introduction

Used for lead-through programming, the clip-on Lead-through device can be attached to the cobot's end effector to allow users to move the cobot arm into the required positions, which can then be set using the FlexPendant. Once the positions have been set, the device can be removed and re-used to program other SWIFTI™ robots.

Mounting bracket

This option is only available for CRB 1100 Variants.

Option	Description
3314-1	Mounting bracket. Used for installing lead through device on the tool flange

Continues on next page

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 <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	<p>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.</p> <div style="margin-top: 10px;"> <p>Note</p> <p>Special conditions are applicable, see <i>Robotics Warranty Directives</i>.</p> </div>

2 Specification of variants and options

2.3 Floor cables

2.3 Floor cables

Manipulator cable length

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

Mains cable

Required 3063-1 Collaborative package and only available for CRB 1100 variants.

Option	Lengths	Description
3203-1	EU mains cable, 3m	Cable assembly with CEE7/VII line-side plug, REQUIRES: 3063-1 Collaborative package
3203-5	CN mains cable, 3m	Cable assembly with CPCS-CCC line-side plug, REQUIRES: 3063-1 Collaborative package
3203-6	AU mains cable, 3m	Cable assembly with AS/NZS 3112 line-side, REQUIRES: 3063-1 Collaborative package

Connection of parallel communication

Required 3303-1 Parallel & Air or 3303-2 Ethernet, Parallel, Air.

Option	Lengths
3201-1	3 m
3201-2	7 m
3201-3	15 m

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

3.1 Introduction to accessories

General

There is a range of tools and equipment available.

Basic software and software options for robot and PC

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

Robot peripherals

- Motor Units

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