ROBOTICS

Product specification

CRB 15000

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Product specification

CRB 15000

OmniCore

Document ID: 3HAC077390-001

Revision: E

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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 - CRB 15000	*3HAC077389-001*
Product manual - OmniCore C30	*3HAC060860-001*
Circuit diagram - CRB 15000	*3HAC074304-003*
Technical reference manual - System parameters	*3HAC065041-001*

Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Revisions

Revision	Description
A	First edition.
B	Published in release 21B. The following updates are made in this revision: • Removed axis resolution data. • Added a note to state Base 54 includes IP54. • Updated temperature for operating conditions. • Added information about robot calibration. • New option 3203-7 All regions cable, 5m added.

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Revision	Description
C	Published in release 21C. The following updates are made in this revision: • Option [438-6] added. • Updated data of Performance according to ISO 9283.
D	Published in release 21D. The following updates are made in this revision: • Add the laser scanner introduction in *Installation* section. • Updated working range for axis 6, see *Working range on page 42*.
E	Published in release 22A. The following updates are made in this revision: • Added screwing depth information to attachment screws for robot foundation. • Added foundation material yield strength data. • Added more information for laser scanners.

1 Description

1.1 Structure

1.1.1 Introduction

General

The CRB 15000 robot is a lightweight, flexible, agile 6-axis articulated robot, with a payload of 5 kg, designed specifically for manufacturing industries that use flexible robot-based automation. The robot has an open structure that is especially adapted for flexible use, and can communicate extensively with external systems.

Intended use

The CRB 15000 robot from ABB is designed for use in industrial applications. For other fields of use, verify whether this robot fulfills the standards required, see *Applicable standards on page 12*.

CAUTION

The integrator of the robot system is required to perform an assessment of the hazards and risks.

Protection

Manipulator, standard protection is rated IP54.

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*.

Note

The CRB 15000 can only be used together with OmniCore C30.

Safety

The listed safety standards are valid for the complete robot, that is, manipulator and controller.

Collaborative Safety

Strong yet safe, designed for handling payloads up to 5 kg, the CRB 15000 has integrated torque sensors in each of its six joints, offering superior power and force limiting performance. Together, these prevent the risk of injury by bring the robot to an immediate stop if it senses any contact with a human worker.

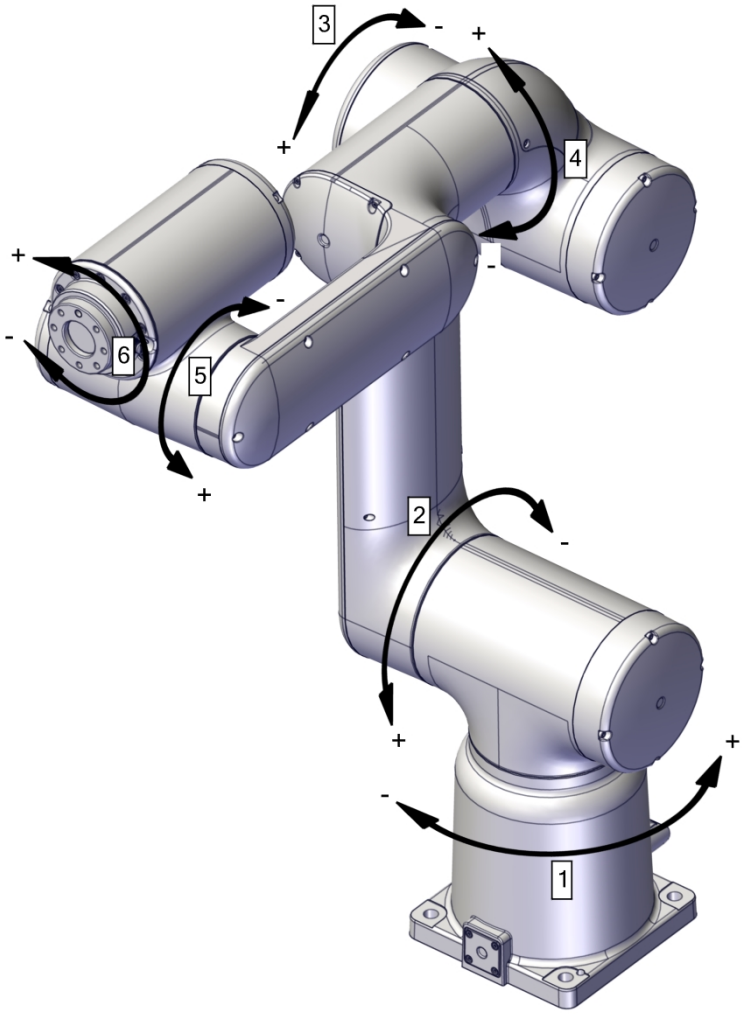
Continues on next page

1.1.1 Introduction
Continued

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support, for example, network communication features, 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



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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 CRB 15000 is available the following versions.

Robot type	Handling capacity (kg)	Reach (m)
CRB 15000-5/0.95	5 kg	0.95 m

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	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
ISO/TS 15066	Robots and robotic devices - Collaborative robots This Technical Specification specifies safety requirements for collaborative industrial robot systems and the work environment, and supplements the requirements and guidance on collaborative industrial robot operation given in ISO 10218-1 and ISO 10218-2.

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
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

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Deviations

Deviations from ISO 10218-1:2011 for CRB 15000

The CRB 15000 is by default always in collaborative operation.

1.3 Installation

1.3.1 Introduction to installation

General

The detailed information for installing the CRB 15000 at the working site is found in *Product manual - CRB 15000* and in *Product manual - OmniCore C30*.

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

Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Extra loads

See *Fitting equipment on the robot (robot dimensions) on page 22*.

More information for the arm-side interface

The arm-side interface has configurable buttons and a light ring that indicates status, see *Configuring the arm-side interface on page 24*. More details on how to configure this is described in *Product manual - CRB 15000*.

It is also possible to configure an external lamp or similar, using I/O signals. This is described in the product manual for the controller (*Product manual - OmniCore C30*, section *Installation and commissioning*, *I/O system*), and in the manuals describing I/O configuration (also listed in the product manual for the robot controller).

More information for the safety configuration

How to configure SafeMove is described in *Application manual - Functional safety and SafeMove*.

The integrator of the robot is responsible for calculating, designing, and verifying safety measures as defined in ISO 10218-2 and ISO/TS 15066.

Note

When starting the robot, a connected FlexPendant or RobotStudio client, will indicate if there is no validated safety configuration.

1.3.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight
CRB 15000	28 kg

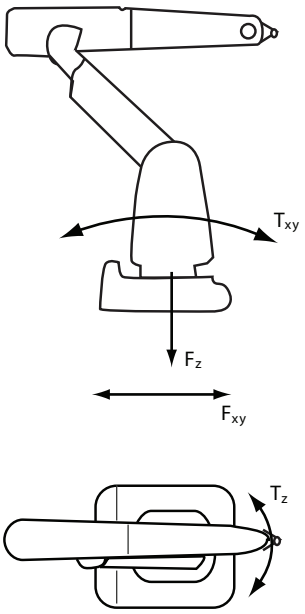
Note

The weight does not include additional options, 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

1.3.2 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	±303 N	±1113 N
Force z	+280 ±147 N	+280 ±857 N
Torque xy	±246 Nm	±711 Nm
Torque z	±145 Nm	±334 Nm

Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	+280 ±130 N	+280 ±1000 N
Force z	±289 N	±944 N
Torque xy	±275 Nm	±768 Nm
Torque z	±162 Nm	±338 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±303 N	±1113 N
Force z	-280 ±147 N	-280 ±857 N
Torque xy	±246 Nm	±711 Nm
Torque z	±145 Nm	±334 Nm

Requirements, foundation

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

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	The value for levelness aims at the circumstance of the anchoring points in the robot base.
Maximum tilt	No restriction	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.

Continues on next page

Requirement	Value	Note
Minimum resonance frequency	22Hz **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*.
Minimum foundation material yield strength	150 Mpa	

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

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

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-40 °C
Maximum ambient temperature	70 °C
Maximum ambient temperature (less than 24 hrs)	70 °C
Maximum ambient humidity	95% at constant temperature (not intended to operate with condensation)
Maximum ambient altitude	0-3,000 m (100-74 kPa)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	5 °C [i]
Maximum ambient temperature	40 °C
Maximum ambient humidity	95% at constant temperature
Maximum ambient altitude	0-2,000 m (100-84 kPa)

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

Continues on next page

1.3.2 Technical data
Continued

Protection classes, robot

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

Protection type	Protection class [i]
Manipulator, protection type Standard	IP54

[i] According to IEC 60529.

Environmental information

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

Joint torques

In collaborative applications, the joint torque must be considered in the risk analysis. The following table shows the maximum torque for each joint. The maximum value can be achieved on one axis at a time.

Axis	Maximum joint torque
1	175.44 Nm
2	175.44 Nm
3	90.6 Nm
4	18.72 Nm
5	21.44 Nm
6	9.2 Nm

Other technical data

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 50.2 dB(A) Leq (acc. to machinery directive 2006/42/EC) Movement: ISO cube (ISO 9283) TCP velocity: 1500 mm/s

Power consumption at max load

Note

The minimum voltage condition and maximum voltage condition are based on 230V input to the controller.

Type of movement	5/0.95
ISO Cube (ISO 9283) Max. velocity (W)	202

Robot in calibration position	5/0.95
Brakes engaged (W)	98

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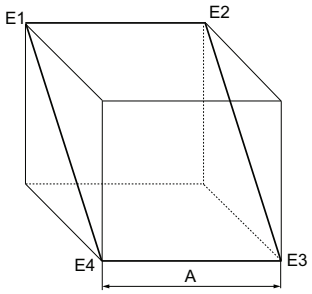
Robot in calibration position	5/0.95
Brakes disengaged (W)	136



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Pos	Description
A	400 mm

Explosive environments

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

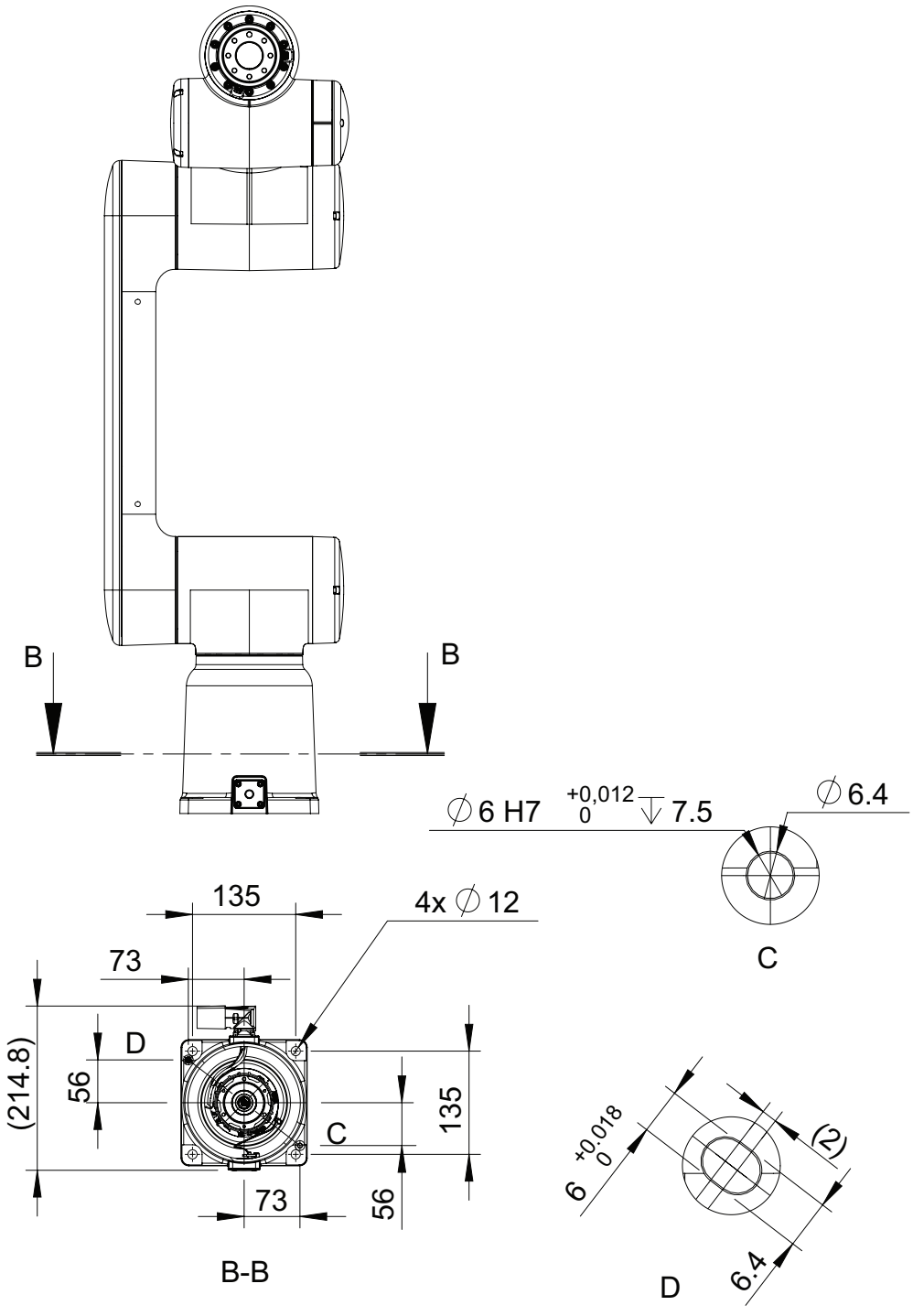
Working range limitations

There is no mechanical limitation available.

1.3.3 Hole configuration and attachment screws

Hole configuration, base

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



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C	Circular hole for locating pin
D	Elongated hole for locating pin

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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.

All hardware is enclosed in the robot delivery.

Suitable screws	M10x35
Quantity	4 pcs
Quality	8.8
Suitable washer	23/10.5/2.5 mm Steel
Guide pins	DIN6325, hardened steel Ø6x24 mm, 2 pcs
Tightening torque	30 Nm ±10%
Level surface requirements	0.1/500 mm
Screwing depth	Minimum 15 mm for ground with material yield strength 150 MPa

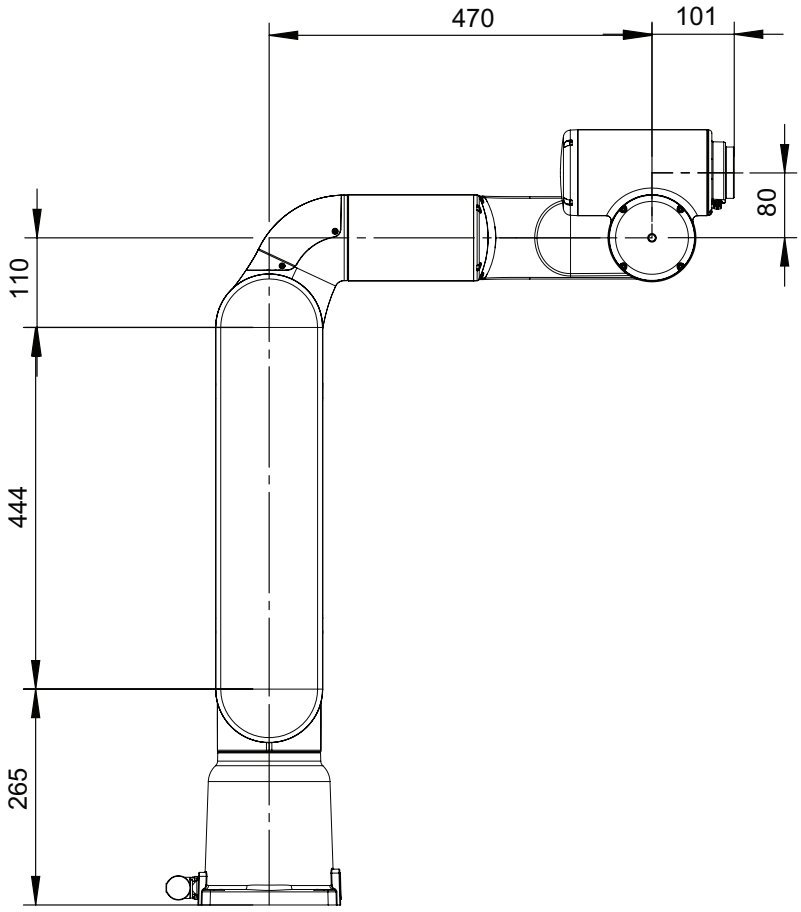
1.3.4 Fitting equipment on the robot (robot dimensions)

Note

Even after the robot is secured to the foundation, do not lean on it or place loads on it, except what is permitted on the tool flange.

Robot dimensions

The figure shows the dimension of the robot.



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Fitting equipment on the robot

Load from equipment on robot arms

The robot arm is not designed with attachment holes for any arm load. However, for light loads such as cables, it is possible to mount them directly on the arm.

Considerations:

- Any external cable routing along the robot arm shall be done in a flexible way allowing for robot motion and taking hazards associated with entanglement into account.
- The brake release points on each axis must be accessible in the end application.

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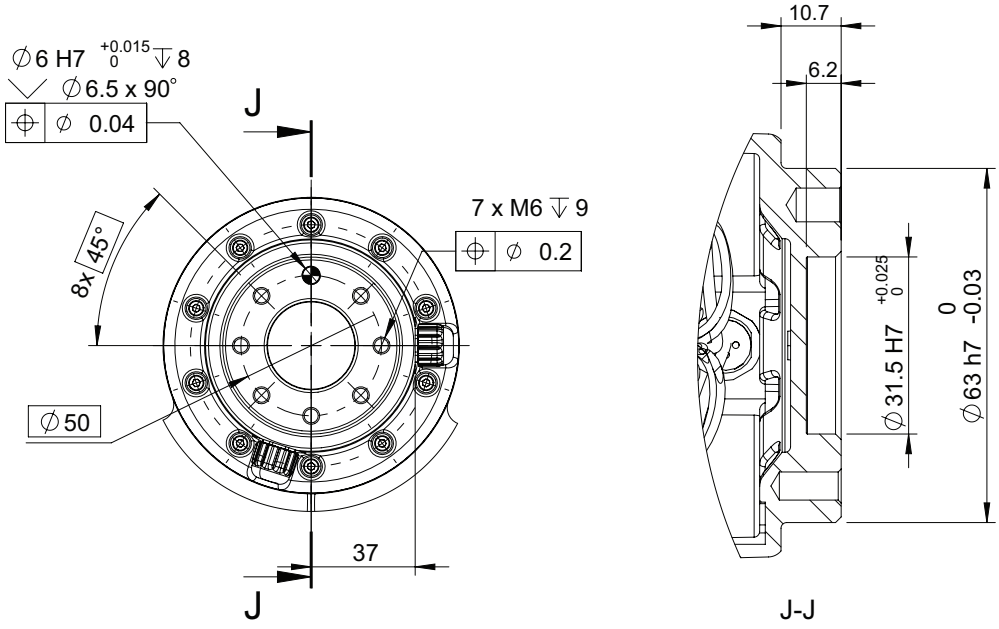
- The upper arm can handle a load of 5 kg. This includes the weight of the cabling, tools, and workpiece (if lifted).

Tool flange



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Fastener quality on tool flange

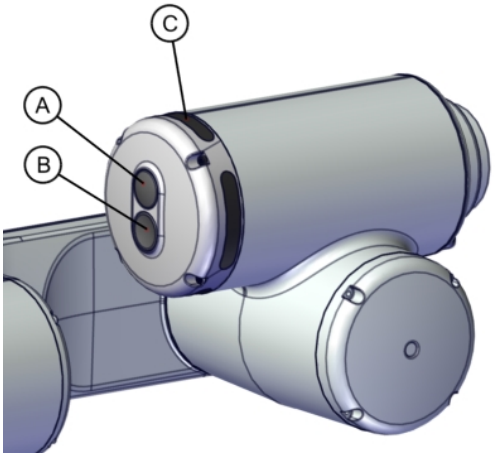
Use screws with suitable length and tightening torque for your application.

Screws with quality class 12.9 are recommended.

1.3.5 Configuring the arm-side interface

Introduction

The arm-side interface is located on axis 5, opposite to the tool flange. The configuration of the arm-side interface is done using the application **ASI Setting** on the FlexPendant.



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A	Up button (convex button)
B	Down button (concave button)
C	Light ring

Prerequisites

A validated safety configuration must be set up before using the arm-side interface. This must be based on a risk assessment of the application. Particular attention should be paid to the risks of impact, crushing and shearing.

The tool and payload must be configured before configuring the arm-side interface. See *Operating manual - OmniCore*.

1.3.6 Lead-through

What is lead-through?

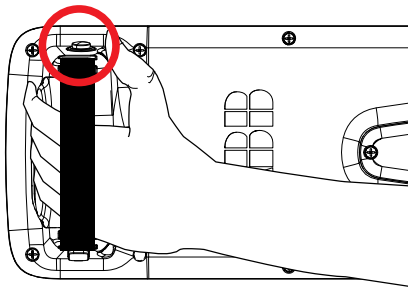
The lead-through functionality is available for robots designed for collaborative applications. If lead-through is available, this is shown on the FlexPendant.

Using lead-through, you can grab the robot arm and move it manually to a desired position, as an alternative to jogging.

Using lead-through

Use the following procedure to jog the robot using the lead-through functionality:

1 Enable lead-through in one of the following ways:
   - Press the thumb button on the FlexPendant.



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   - On the start screen, tap **Jog** and select the **Lead-through** menu.
   - In the **QuickSet** menu, select the **Lead-through** tab.

> **Note**
>
> If the robot is in motors off state, it will automatically go to the motors on state when the lead-through is enabled.

2 In the **Jog Mode** section select a mode.

3 If required, in the **Lead-through lock** section use the lock button next to a axis to lock it.

> **Note**
>
> The **Lead-through lock** section is disabled for the **Axis 1-6** mode.

4 Gently pull the robot arm to the desired position.

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The robot moves to the selected position. If the **Lead-through lock** option is selected, the robot moves in such a way that the movement is restricted in the locked direction.

> **Note**
>
> You can feel if an axis reaches its end position. Do not try to force the axis beyond this position.

5 If desired, save the position.

> **Note**
>
> The speed at which the robot moves when using the Lead-through functionality is managed using the horizontal scroll bar available in the **Lead-through Speed** section.

> **Note**
>
> If lead-through is enabled, it will be temporarily disabled during program execution and jogging. This means that it is possible to combine lead-through, jogging, and testing the RAPID program without having to disable the lead-through.

> **Note**
>
> When using lead-through, it is important that the load is correctly defined. If the load is heavier than defined, the effect will be the same as if you are pulling the robot arm downwards. If the load is lighter than the defined load, the effect will be the same as if you are pulling the robot arm upwards.
>
> For the CRB 15000, there is a button for updating/refreshing the load while lead-through is active.

Limitations

When using lead-through, the path planner is not updated until the program is resumed/restarted or jogging is used. For example, this means that World Zones supervision is not accessible when using lead-through.

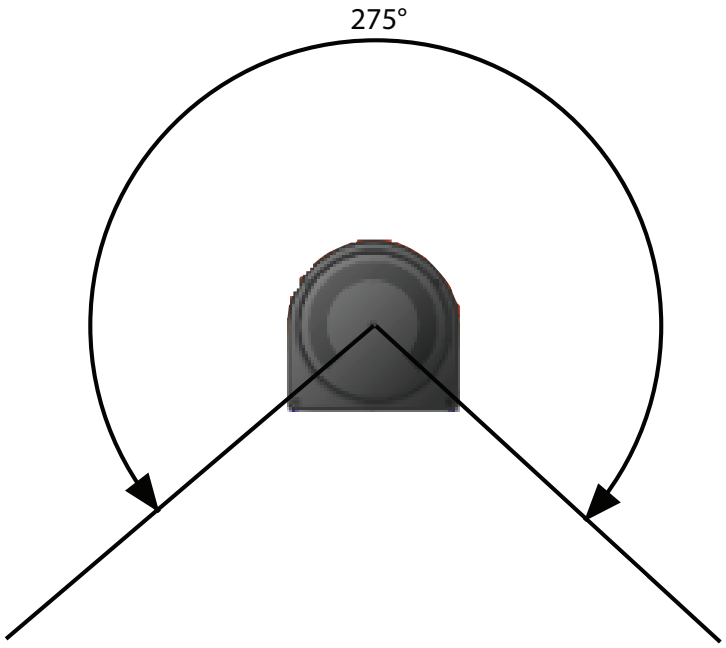
1.3.7 Installation of laser scanner

Overview

The safety separation technology and speed control for CRB 15000 is based on the connection and communication of one or two safety laser scanners in the robot. Laser scanner(s) provides a timely and continuous monitor on the activities within its scanning area and forms a protective field. One laser scanner can provide a scanning range of approximately 275°. The system integrator shall investigate the site environment and place the laser scanner to a suitable location according to the actual requirements.

CAUTION

Safety in the area that not in the scanning range must always be considered. The system integrator shall assess the potential risks within this area and make sure that proper measures have been applied to reduce risks.



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Laser scanner types

The following laser scanner package options are available:

- 1 PROFINET-based laser scanner (option 3051-1 PROFIsafe scanner)
- 2 PROFINET-based laser scanners (option 3051-3 Dual PROFIsafe scanner)
- 1 SafetyIO-based laser scanner (option 3051-2 I/O scanner)
- 2 SafetyIO-based laser scanners (option 3051-4 Dual I/O scanner)

PROFINET-based laser scanners shall connect to a PLC acting as a master first and then to the OmniCore controller with SafeMove via the PROFINET safe (PROFIsafe) network. Users need to prepare a safety PLC of their own.

Continues on next page

1.3.7 Installation of laser scanner
Continued

SafetyIO-based laser scanners connects to the OmniCore controller with SafeMove, installed with the scalable I/O device DSQC1042 Safety digital base (option 3037-1). For details about the scalable I/O device, see the product specification of the controller and *Application manual - Scalable I/O*.

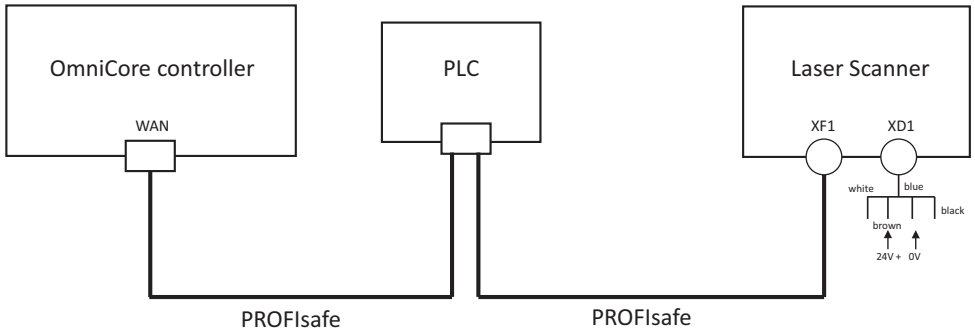
The supported PROFINET- and SafetyIO-base laser scanners are *SICK®* microScan 3 Core and *SICK®* microScan 3 Pro, respectively. Detailed scanner model can be obtained on the scanner nameplate. Other scanner types or models might not provide full functionality.

For more details about the safety laser scanners, see *Operating instructions microScan3 - PROFINET* and *Operating instructions microScan3 - Pro I/O* from the vendor.

Connecting the laser scanner(s)

Safety laser scanners shall be connected properly according to the scanner type and system setup.

1 PROFINET-based laser scanner (option 3051-1)



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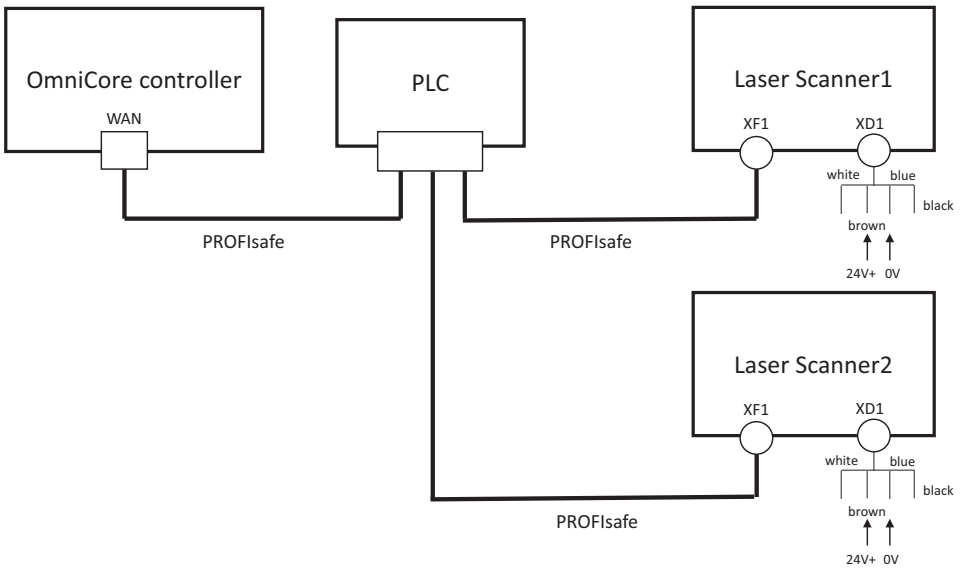
2 PROFINET-based laser scanners (option 3051-3)



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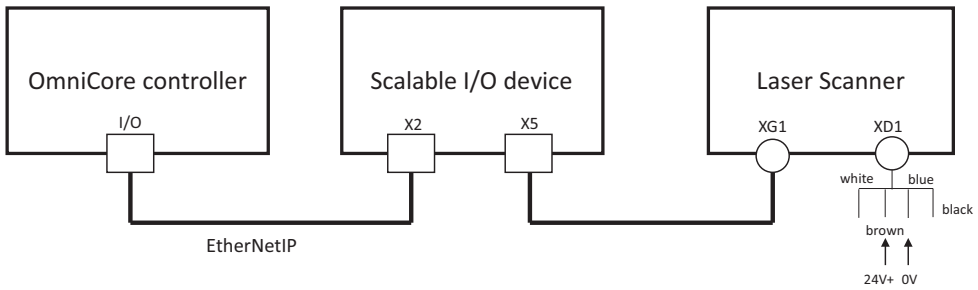
1 SafetyIO-based laser scanner (option 3051-2)



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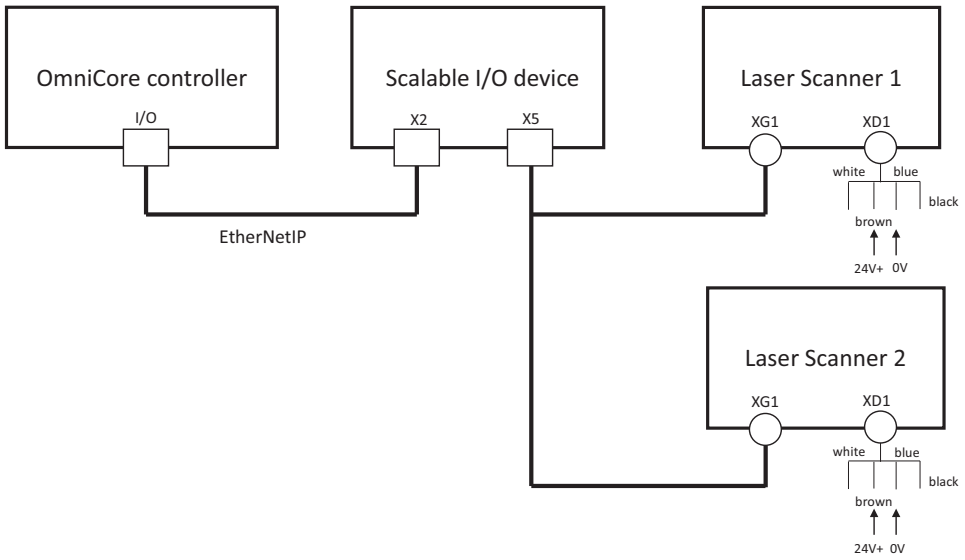
2 SafetyIO-based laser scanners (option 3051-4)



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Configuring the laser scanner(s)

Laser scanner configuration depends on the type and number of scanners connecting to the robot and RobotWare version.

Scanner type	Works with...			Number of connected scanners	RobotWare version	Require...
	PLC	Scalable I/O deviceDSQC1042	OmniCore controller with SafeMove			Collaborative Speed Control add-in
PROFINET-based	Y	N	Y	1	RobotWare 7.5 or earlier	N
PROFINET-based	Y	N	Y	1	RobotWare 7.6 or later	Y

Continues on next page

1.3.7 Installation of laser scanner
Continued

Scanner type	Works with...			Number of connected scanners	RobotWare version	Require...
	PLC	Scalable I/O deviceDSQC1042	OmniCore controller with SafeMove			Collaborative Speed Control add-in
PROFINET-based	Y	N	Y	2	RobotWare 7.6 or later	Y
SafetyIO-based	N	Y	Y	1	RobotWare 7.6 or later	Y
SafetyIO-based	N	Y	Y	2	RobotWare 7.6 or later	Y

1.4 Calibrating the robot

1.4.1 Calibration method and when to calibrate

Calibration method

The CRB 15000 torque sensors are calibrated with the routine TorqueSensorCal which is available in the **System Module** TorqueSensorCalib. No external calibration tools are required.

The calibration method for the robot consists of calibrating the motor torque sensors, which are installed to monitor and measure the motor torque.

When to calibrate

The torque sensor in an axis motor must be calibrated if any of the following situations occur:

- A drift in the sensor values has occurred.

  This is shown on the FlexPendant as error code 90549 **Torque sensor check failure** or 34334 **Arm side torque sensor error**.
- A joint unit has been replaced.
- Repair work that involves removal and refitting of the joint units, has been performed.

No calibration is needed at site at robot installation.

The torque sensor routine only works on floor mounted robots.

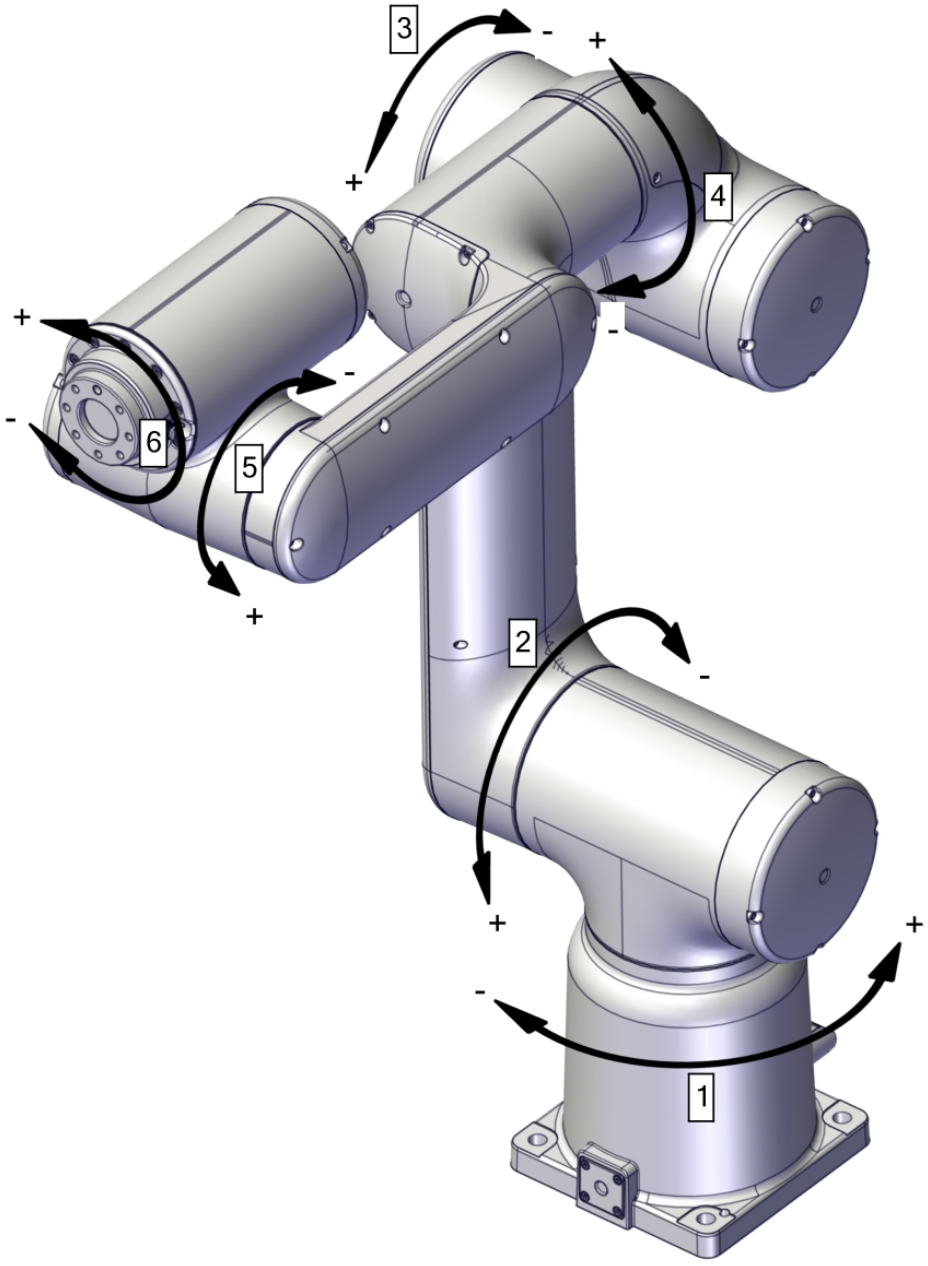
Tip

When designing the robot cell, run the torque sensor routine in RobotStudio to verify that the path and pose are obtainable in the planned design.

1.4.2 Jogging directions

Illustration of axis jogging directions

The figure shows the positive and negative directions for each axis when jogging the robot in the base coordinate system.



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

- motors
- gearboxes
- mechanical structure

Note

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

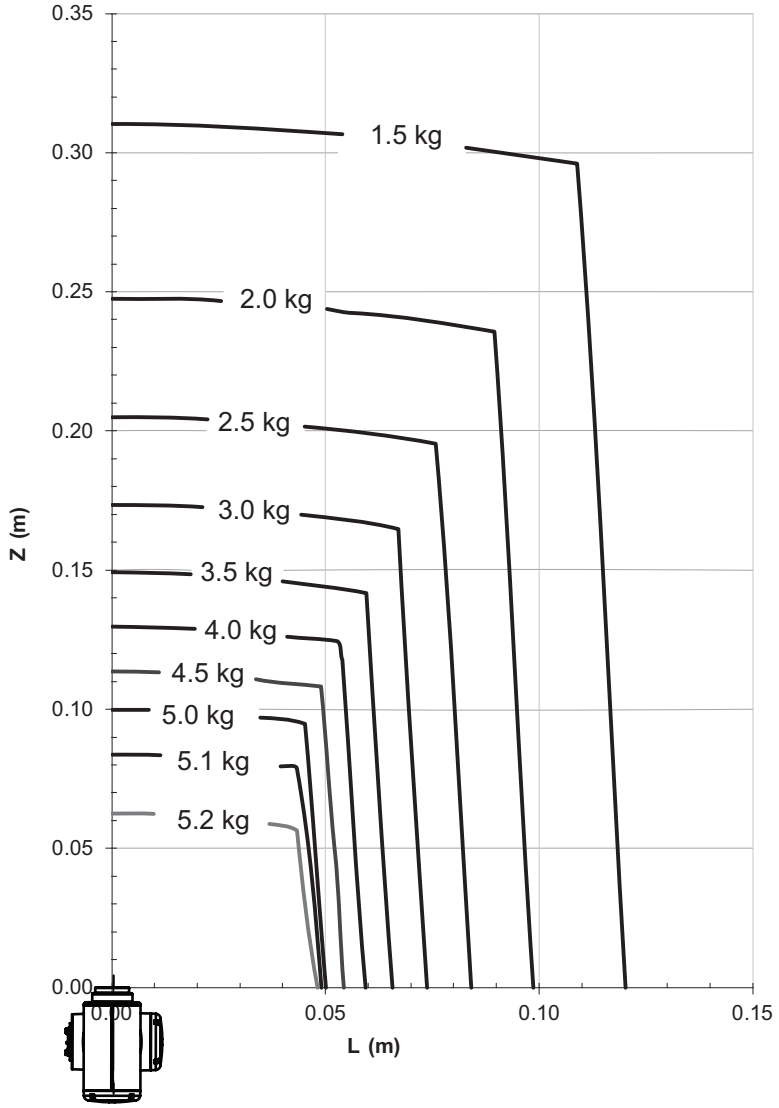
The load diagrams include a nominal payload inertia, J_0 of 0.012 kgm^2.

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.

The accuracy of the power and force limiting safety functions require that the payload is correctly defined.

1.5.2 Diagrams

CRB 15000-5/0.95



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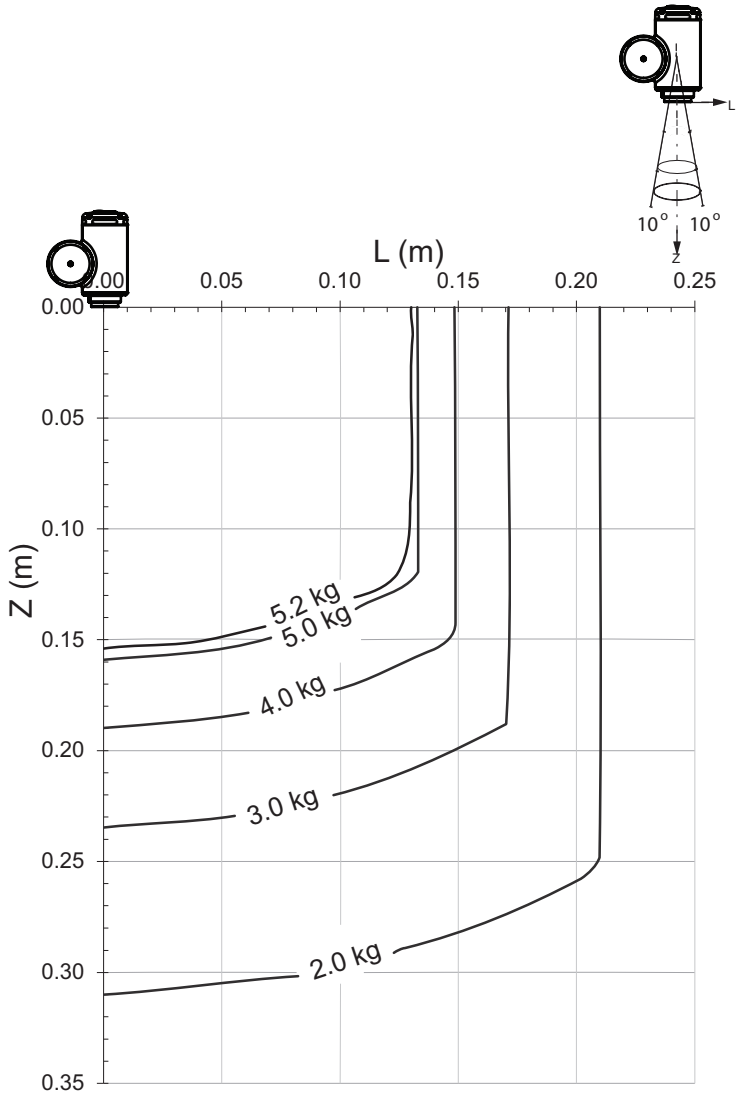
CRB 15000-5/0.95 "Vertical wrist" (± 10°)



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

	Description
Max load	5.2 kg
Z_{max}	0.154 m
L_{max}	0.130 m

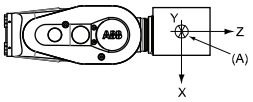
1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

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 (-180°/+180°)

Axis	Robot type	Maximum moment of inertia
5	CRB 15000-5/0.95	Ja_5 = Load x ((Z+0.101)^2 + (L+0.08)^2)) + max (J_{0x}, J_{0y}) ≤ 0.35 kgm^2
6	CRB 15000-5/0.95	Ja_6 = Load x L^2 + J_{0Z} ≤ 0.1 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.

Continues on next page

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.

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
CRB 15000-5/0.95	9.86 Nm	2.45 Nm	5 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	Emergency stop Max acceleration at nominal load COG [m/s^2] (absolute value)	Controlled motion Max acceleration at nominal load COG [m/s^2] (absolute value)
CRB 15000	61.6	36.9

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 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

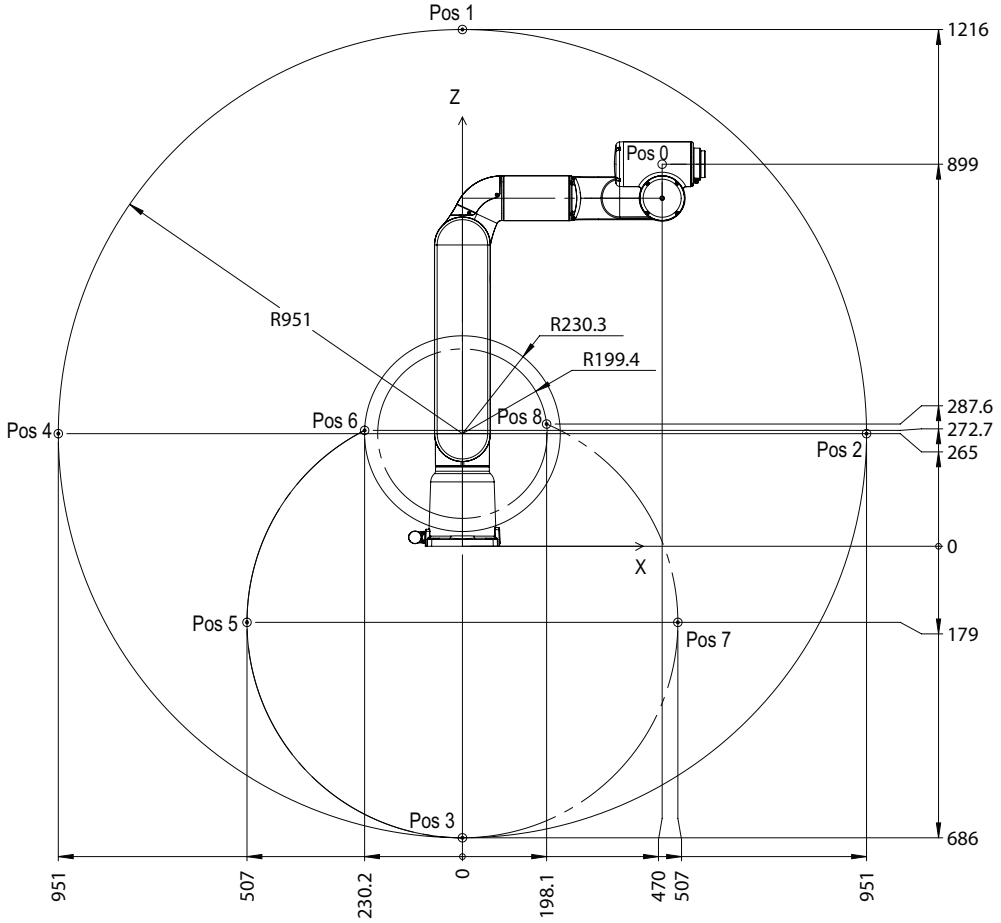
The maintenance intervals depend on the use of the robot. The required maintenance activities also depend on the selected options. For detailed information on maintenance procedures, see the maintenance section in *Product manual - CRB 15000*.

1.7 Robot motion

1.7.1 Working range

Illustration, working range CRB 15000-5/0.95

This illustration shows the unrestricted working range of the robot.



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Positions at intersection point of axes 4-5-6 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	470	899	0°	0°
pos1	0	1216	0°	-68°
pos2	951	265	90°	-68°
pos3	0	-686	180°	-68°
pos4	-951	265	-90°	-68°
pos5	-507	-179	180°	22°
pos6	-230.2	272.7	180°	85°
pos7	507	-179	180°	-158°

Continues on next page

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos8	198.1	287.6	180°	-225°

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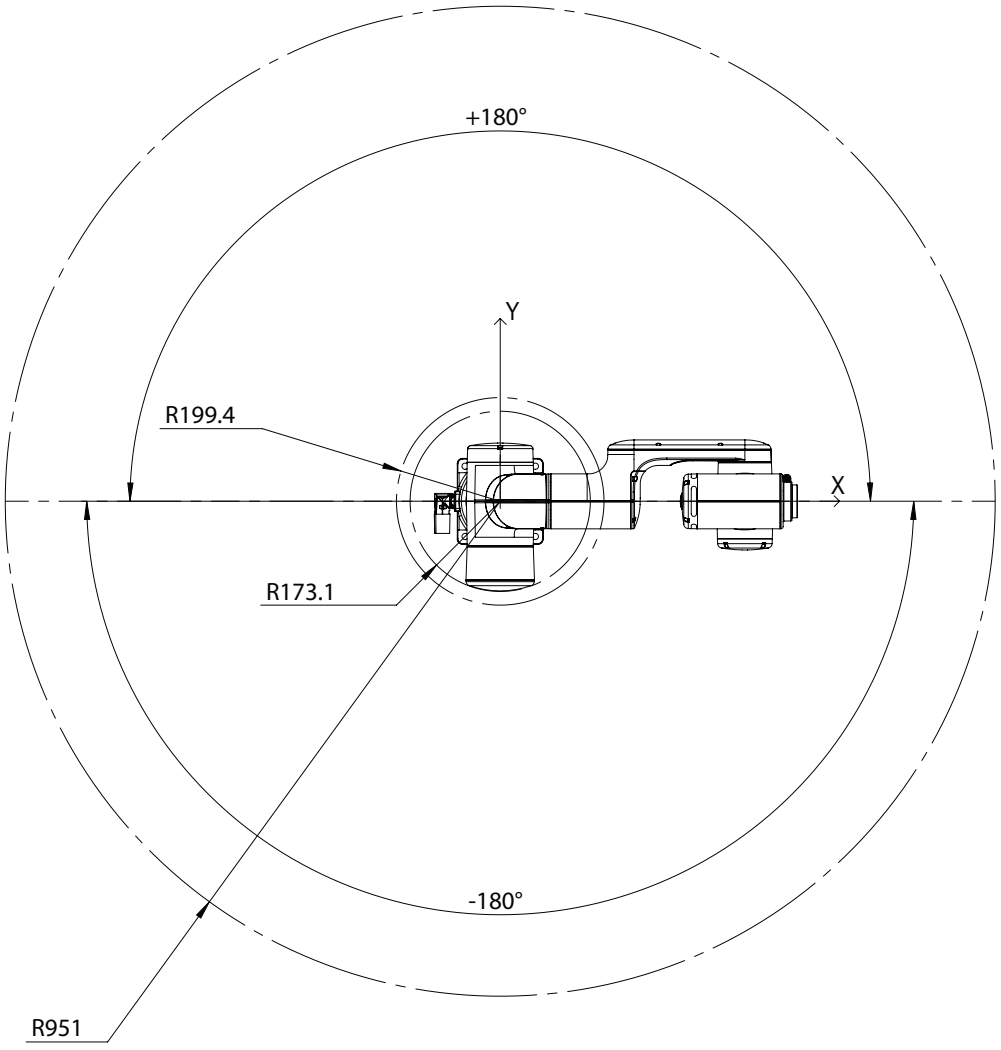
1.7.1 Working range
Continued

Top view of working range



Working range

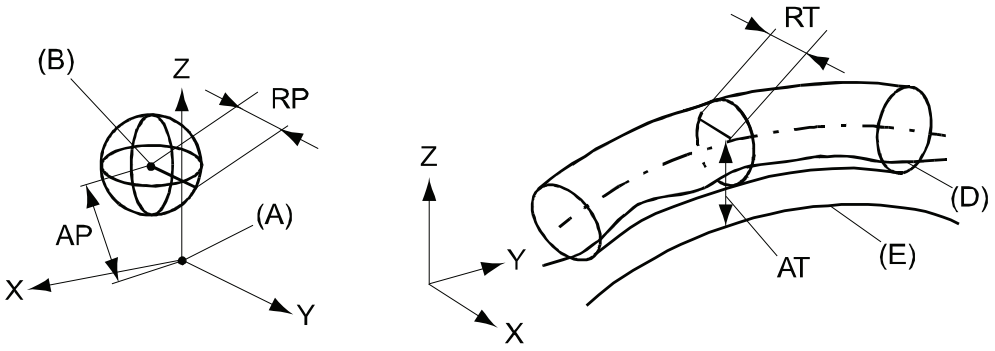
Axis	Working range	Note
Axis 1	±180°	Wall mounted robot has a work area for axis 1 that depends on payload and the positions of other axes. Simulation in RobotStudio is recommended.
Axis 2	±180°	
Axis 3	-225°/+85°	
Axis 4	±180°	
Axis 5	±180°	
Axis 6	±270°	

1.7.2 Performance

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

CRB 15000	5/0.95
Pose accuracy, AP[i] (mm)	0.006
Pose repeatability, RP (mm)	0.05
Pose stabilization time, PSt (s) within 0.1 mm of the position	0.229
Path accuracy, AT (mm)	1.205
Path repeatability, RT (mm)	0.057

[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.

1.7.3 Velocity

Maximum axis speed

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
CRB 15000-5/0.95	125 °/s	125 °/s	140 °/s	200 °/s	200 °/s	200 °/s

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

1.7.4 Robot stopping distances and times

Introduction

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

1.8 Customer connections on the manipulator

Introduction

The customer cables are routed internally with the manipulator cable harness.

Customer cabling

Customer connection	Cable specification	Article number	Rating in each wire[i]	Note
Customer power (CP)	Raw cable is twisted pair 1x2xAWG24	See *Product manual, spare parts - CRB 15000*	24V[ii] 2A	Routed internally with the manipulator cable harness.
Customer signal (CS)	2x2xAWG26 in 4x2XAWG26 cable	See *Product manual, spare parts - CRB 15000*	24V[iii] 500mA	Routed internally with the manipulator cable harness.

i Stresses above the limitation may cause permanent damage to the manipulator.
ii Rated 24V, max 30V
iii Rated 24V, max 30V

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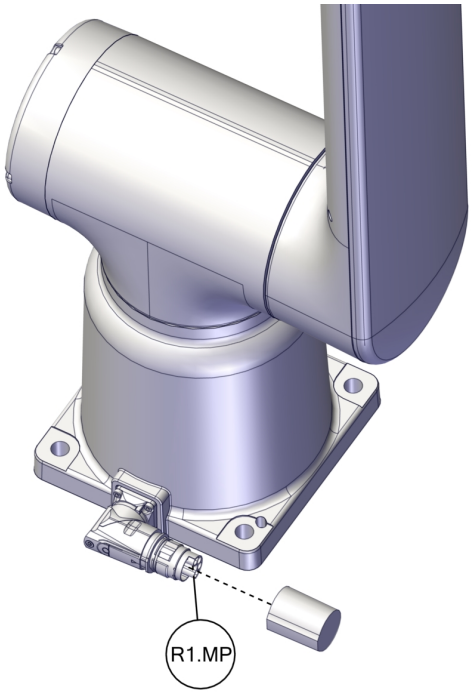
Customer connectors on the manipulator

Connectors at the base

The R1.MP on the base is used for transferring DC bus, EtherCat and customer signals (CP/CS).



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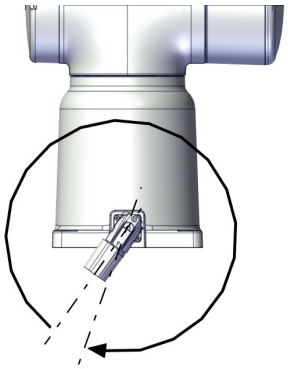

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-	The connector can be rotated 330° clockwise.

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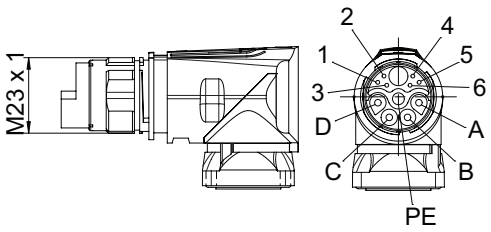
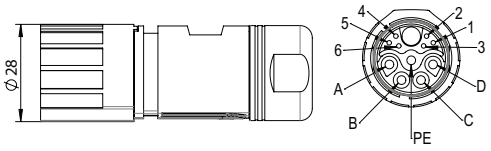
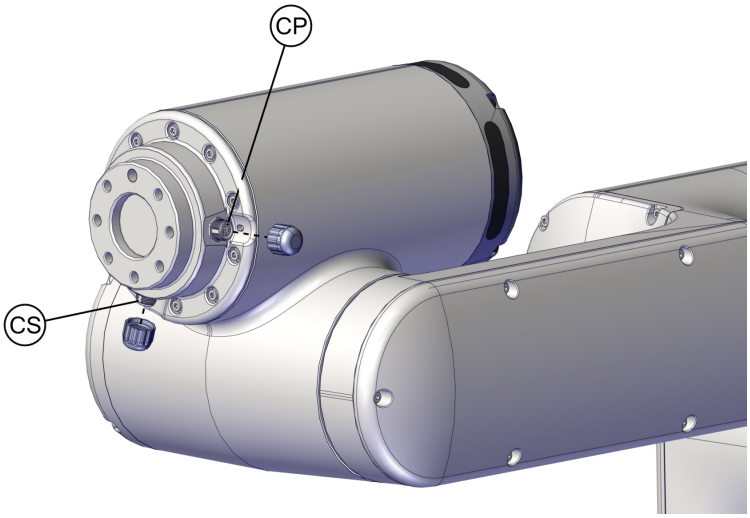
1.8 Customer connections on the manipulator
Continued

Pos	Connector type	Layout
R1.MP	Receptacle angled rotatable male connector with housing and insert.	 xx2100000221
-	Plug with female connector includes housing and insert.	 xx2100000229

Connectors at the tool flange



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CAUTION

Always use protective caps on unused customer connectors to protect the connector and to cover sharp connector edges.

Note

Always inspect the connector for dirt or damage before connecting it. Clean or replace any damaged parts.

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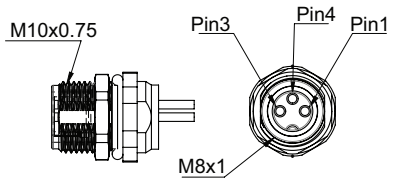
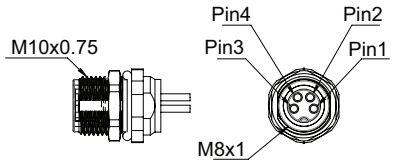
Pos	Connector type	Torque for mating/unmating	Layout
CP	M8 3 pin female, 200 mm wire, straight (two pins for use, one pin is spare)	0.4 Nm	 xx2100000220
CS	M8 4 pin female, 200 mm wire, straight	0.4 Nm	 xx2100000219

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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 CRB 15000 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	Variant	Handling capacity (kg)	Reach (m)
3300-19	CRB 15000-5/0.95	5	0.95

Manipulator protection

Option	Description
3350-540	Base 54, IP54

Note

Base 54 includes IP54, according to standard IEC 60529.

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.
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.

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Option	Type	Description
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 length

Option	Lengths
3200-2	7 m

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

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