Product specification
CRB 15000
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Original instructions.
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Overview of this specification

About this product specification

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

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

The specification covers the manipulator using the OmniCore controller.

Usage

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

The specification is intended for:

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

References

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

<table>
<thead>
<tr>
<th>Document name</th>
<th>Document ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product manual - CRB 15000</td>
<td>3HAC077389-001</td>
</tr>
<tr>
<td>Product manual - OmniCore C30</td>
<td>3HAC060860-001</td>
</tr>
<tr>
<td>Circuit diagram - CRB 15000</td>
<td>3HAC081041-003</td>
</tr>
<tr>
<td>Technical reference manual - System parameters</td>
<td>3HAC065041-001</td>
</tr>
</tbody>
</table>

Tip

All documents can be found via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

Revisions

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

Continues on next page
<table>
<thead>
<tr>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 67. |
| 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. |
| F        | Published in release 22B. The following updates are made in this revision:  
• Corrected wire rating for customer cabling.  
• Updated operating conditions regarding ambient humidity. |
| G        | Published in release 22C. The following updates are made in this revision:  
• Updated description for Collaborative Safety.  
• Added pin specification for the customer connectors at the tool flange.  
• Added protection class for clean room suitability. |
| H        | Published in release 22D. The following updates are made in this revision:  
• Added support for wrist optimization. |
| J        | Published in release 23A. The following updates are made in this revision:  
• Added support for the option Absolute Accuracy.  
• Updated image for 1 SafetyIO-based laser scanner (option 3051-2). |
| K        | Published in release 23B. The following updates are made in this revision:  
• Added new variants CRB 15000-10/1.52 and CRB 15000-12/1.27.  
• Added new option Manipulator cable length - 15 m [3200-3].  
• The updated robot stopping distances and times are moved to this document, and removed from the generic document, see Robot stopping distances and times on page 70. |
| L        | Published in release 23B. The following updates are made in this revision:  
• Removed the stop category 0 data. |
1 Description

1.1 Structure

1.1.1 Introduction

General
The CRB 15000 robot is a flexible, agile 6-axis articulated robot, available in three variants spanning various options for payload from 5 kg to 12 kg, reach from 0.95 m to 1.52 m, and 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.

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

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 13.

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

Protection
Manipulator, CRB 15000-5/0.95 standard protection is rated IP54.
Manipulator, CRB 15000-10/1.52 and CRB 15000-12/1.27 standard protection is rated IP67.

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.

Continues on next page
Collaborative Safety

Strong yet safe, designed for handling payloads up to 5 kg, 10 kg and 12 kg, the CRB 15000 has integrated torque sensors in each of its six joints, offering superior power and force limiting performance, as well as a toolbox of safety functions with SafeMove Collaborative and additional robot software functions including motion supervision. Together these prevent the risk of injury by bringing the robot to an immediate stop if it senses any contact with a human worker, whether in free contact or a clamping situation.

Verify the safety functions

Before the robot system is put into operation, verify that the safety functions are working as intended and that any remaining hazards identified in the risk assessment are mitigated to an acceptable level.

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.
1 Description

1.1.1 Introduction

Robot axes

<table>
<thead>
<tr>
<th>Pos</th>
<th>Description</th>
<th>Pos</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Axis 1</td>
<td>2</td>
<td>Axis 2</td>
</tr>
<tr>
<td>3</td>
<td>Axis 3</td>
<td>4</td>
<td>Axis 4</td>
</tr>
<tr>
<td>5</td>
<td>Axis 5</td>
<td>6</td>
<td>Axis 6</td>
</tr>
</tbody>
</table>
1 Description

1.1.2 Different robot variants

The CRB 15000 is available in the following variants.

<table>
<thead>
<tr>
<th>Robot type</th>
<th>Handling capacity</th>
<th>Wrist reach</th>
<th>Flange reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 15000-5/0.95</td>
<td>5 kg</td>
<td>0.95 m</td>
<td>1.05 m</td>
</tr>
<tr>
<td>CRB 15000-10/1.52</td>
<td>10 kg</td>
<td>1.52 m</td>
<td>1.62 m</td>
</tr>
<tr>
<td>CRB 15000-12/1.27</td>
<td>12 kg</td>
<td>1.27 m</td>
<td>1.37 m</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 9283</td>
<td>Manipulating industrial robots – Performance criteria and re-</td>
</tr>
<tr>
<td>ISO 9787</td>
<td>related test methods</td>
</tr>
<tr>
<td>ISO 9946</td>
<td>Manipulating industrial robots – Presentation of characteristics</td>
</tr>
</tbody>
</table>

Other standards used in design

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60204-1</td>
<td>Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1</td>
</tr>
<tr>
<td>IEC 61000-6-2</td>
<td>Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments</td>
</tr>
<tr>
<td>IEC 61000-6-4</td>
<td>Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments</td>
</tr>
<tr>
<td>ISO 13849-1:2006</td>
<td>Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1</td>
</tr>
</tbody>
</table>
| 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

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI/RIA R15.06</td>
<td>Safety requirements for industrial robots and robot systems</td>
</tr>
<tr>
<td>ANSI/UL 1740</td>
<td>Safety standard for robots and robotic equipment</td>
</tr>
<tr>
<td>CAN/CSA Z 434-03</td>
<td>Industrial robots and robot Systems - General safety requirements</td>
</tr>
<tr>
<td>EN ISO 10218-1</td>
<td>Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots</td>
</tr>
</tbody>
</table>

Continues on next page
Deviations

Deviations from ISO 10218-1:2011 for CRB 15000

The CRB 15000 is intended for collaborative operation. The integrator of the robot system is required to perform an assessment of the hazards and risks.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Deviation for CRB 15000</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>§5.3.5 Single point of control.</td>
<td>The arm side interface can be overridden in automatic mode.</td>
<td>The CRB 15000 robot is intended for collaborative applications where contact between robot and the operator is harmless.</td>
</tr>
</tbody>
</table>

Deviations from IEC 60204-1 for CRB 15000

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Deviation for CRB 15000</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>§12.5 Conductor and cable voltage drop</td>
<td>The voltage drop of customer power (CP) on customer flange interface (CFI) may exceed 5% when using a 15 m-length hybrid floor cable.</td>
<td>CFI can be used when using the 15 m-length hybrid floor cable. The voltage drop of CP can be compensated by increasing input voltage (max. 30V).</td>
</tr>
</tbody>
</table>
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 26.

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 34. 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 Description

1.3.2 Technical data

Weight, robot

The table shows the weight of the robot.

<table>
<thead>
<tr>
<th>Robot model</th>
<th>Nominal weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 15000-5/0.95</td>
<td>28 kg</td>
</tr>
<tr>
<td>CRB 15000-10/1.52</td>
<td>51 kg</td>
</tr>
<tr>
<td>CRB 15000-12/1.27</td>
<td>48 kg</td>
</tr>
</tbody>
</table>

Note

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

Mounting positions

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

<table>
<thead>
<tr>
<th>Mounting position</th>
<th>Installation angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor mounted</td>
<td>0°</td>
</tr>
<tr>
<td>Wall mounted</td>
<td>Any angle</td>
</tr>
<tr>
<td>Suspended</td>
<td>180°</td>
</tr>
</tbody>
</table>

Note

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

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.

![Diagram showing forces and torques](image)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Subscripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F_{xy}$</td>
<td>Force in any direction in the XY plane</td>
<td></td>
</tr>
<tr>
<td>$F_z$</td>
<td>Force in the Z plane</td>
<td></td>
</tr>
<tr>
<td>$T_{xy}$</td>
<td>Bending torque in any direction in the XY plane</td>
<td></td>
</tr>
<tr>
<td>$T_z$</td>
<td>Bending torque in the Z plane</td>
<td></td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Floor mounted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Force</strong></td>
</tr>
<tr>
<td>Endurance load (in operation)</td>
</tr>
<tr>
<td>$F_{xy}$</td>
</tr>
<tr>
<td>$F_z$</td>
</tr>
<tr>
<td>$F_{xy}$</td>
</tr>
<tr>
<td>$F_z$</td>
</tr>
<tr>
<td>$T_{xy}$</td>
</tr>
<tr>
<td>$T_z$</td>
</tr>
</tbody>
</table>

\(^{i}\) Valid for CRB 15000-5/0.95.
1 Description

1.3.2 Technical data

Continued

Wall mounted

<table>
<thead>
<tr>
<th>Force</th>
<th>Endurance load (in operation)</th>
<th>Max. load (emergency stop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force xy</td>
<td>$+280 \pm 130 \text{ N}$ / $+510 \pm 490 \text{ N}$ / $+480 \pm 450 \text{ N}$</td>
<td>$+280 \pm 1000 \text{ N}$ / $+510 \pm 1220 \text{ N}$ / $+480 \pm 1260 \text{ N}$</td>
</tr>
<tr>
<td>Force z</td>
<td>$\pm 289 \text{ N}$ / $\pm 390 \text{ N}$ / $\pm 360 \text{ N}$</td>
<td>$\pm 944 \text{ N}$ / $\pm 900 \text{ N}$ / $\pm 1150 \text{ N}$</td>
</tr>
<tr>
<td>Torque xy</td>
<td>$\pm 275 \text{ Nm}$ / $\pm 700 \text{ Nm}$ / $\pm 677 \text{ Nm}$</td>
<td>$\pm 768 \text{ Nm}$ / $\pm 2000 \text{ Nm}$ / $\pm 1970 \text{ Nm}$</td>
</tr>
<tr>
<td>Torque z</td>
<td>$\pm 162 \text{ Nm}$ / $\pm 400 \text{ Nm}$ / $\pm 370 \text{ Nm}$</td>
<td>$\pm 338 \text{ Nm}$ / $\pm 780 \text{ Nm}$ / $\pm 790 \text{ Nm}$</td>
</tr>
</tbody>
</table>

Suspended

<table>
<thead>
<tr>
<th>Force</th>
<th>Endurance load (in operation)</th>
<th>Max. load (emergency stop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force xy</td>
<td>$\pm 303 \text{ N}$ / $\pm 470 \text{ N}$ / $\pm 470 \text{ N}$</td>
<td>$\pm 1113 \text{ N}$ / $\pm 1460 \text{ N}$ / $\pm 1450 \text{ N}$</td>
</tr>
<tr>
<td>Force z</td>
<td>$-280 \pm 147 \text{ N}$ / $+500 \pm 410 \text{ N}$ / $+480 \pm 420 \text{ N}$</td>
<td>$-280 \pm 857 \text{ N}$ / $+500 \pm 650 \text{ N}$ / $+480 \pm 690 \text{ N}$</td>
</tr>
<tr>
<td>Torque xy</td>
<td>$\pm 246 \text{ Nm}$ / $\pm 570 \text{ Nm}$ / $\pm 580 \text{ Nm}$</td>
<td>$\pm 711 \text{ Nm}$ / $\pm 1280 \text{ Nm}$ / $\pm 1180 \text{ Nm}$</td>
</tr>
<tr>
<td>Torque z</td>
<td>$\pm 145 \text{ Nm}$ / $\pm 200 \text{ Nm}$ / $\pm 210 \text{ Nm}$</td>
<td>$\pm 334 \text{ Nm}$ / $\pm 720 \text{ Nm}$ / $\pm 690 \text{ Nm}$</td>
</tr>
</tbody>
</table>

Requirements, foundation

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

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatness of foundation surface</td>
<td>0.1/500 mm</td>
<td>The value for levelness aims at the circumstance of the anchoring points in the robot base.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Minimum resonance frequency</td>
<td>22Hz</td>
<td>The value is recommended for optimal performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to foundation stiffness, consider robot mass including equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For information about compensating for foundation flexibility, see the description of Motion Process Mode in the manual that describes the controller software option, see References on page 7.</td>
</tr>
</tbody>
</table>

Continues on next page
**1 Description**

1.3.2 Technical data

---

**Storage conditions, robot**

The table shows the allowed storage conditions for the robot:

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

---

**Operating conditions, robot**

The table shows the allowed operating conditions for the robot:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum ambient temperature</td>
<td>5 °C                        (^i)</td>
</tr>
<tr>
<td>Maximum ambient temperature</td>
<td>40 °C (^{ii}) / 45 °C (^{iii})</td>
</tr>
<tr>
<td>Maximum ambient humidity</td>
<td>&lt;75% relative humidity, For limited period of time (&lt;1 month): &lt;95% relative humidity (^{iv})</td>
</tr>
<tr>
<td>Maximum ambient altitude</td>
<td>0-2,000 m (100-84 kPa)</td>
</tr>
</tbody>
</table>

\(^i\) At low environmental temperature < 10°C 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.

\(^{ii}\) Valid for CRB 15000-5/0.95.

\(^{iii}\) Valid for CRB 15000-10/1.52 and CRB 15000-12/1.27.

\(^{iv}\) Depending on climate and robot running conditions, condensation may occur on the inside of plastic covers. The condensation will disappear over time by itself, alternatively the user can open the covers and run a program for 12 hours to accelerate the process.

---

**Protection classes, robot**

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

<table>
<thead>
<tr>
<th>Protection type</th>
<th>Protection class (^{i})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulator, protection type Standard (CRB 15000-5/0.95)</td>
<td>IP54</td>
</tr>
<tr>
<td></td>
<td>Type 12k (^{ii})</td>
</tr>
<tr>
<td></td>
<td>NEMA 12k (^{iii})</td>
</tr>
</tbody>
</table>

\(^{i}\) Continues on next page
1 Description

1.3.2 Technical data

Continued

<table>
<thead>
<tr>
<th>Protection type</th>
<th>Protection class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulator, protection type Standard (CRB 15000-10/1.52 and CRB 15000-12/1.27)</td>
<td>IP67</td>
</tr>
</tbody>
</table>

i According to IEC 60529.  
ii According to UL50/UL50E, CSA C22.2 No 94.2-15.  
iii According to NEMA 250.

Clean room suitability, robot

The table shows the suitability for clean room environment for the valid protection types of the robot.

<table>
<thead>
<tr>
<th>Protection type</th>
<th>Protection class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulator, suitability class (protection type Standard)</td>
<td>ISO Class 4</td>
</tr>
</tbody>
</table>


Harsh environment

The manipulator complies with the following harsh environment.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>According to</th>
</tr>
</thead>
</table>
| Flowing, mixed gas corrosion test | ISA–71.04-2013 G3  
Harsh Group A  
DIN EN 60068-2-60 |

Components and concentrations of the mixed corrosive gas:

- Hydrogen sulphide (H₂S): 50 ppb
- Nitrogen dioxide (NO₂): 1,250 ppb
- Chlorine (Cl₂): 10 ppb
- Sulphur dioxide (SO₂): 300 ppb

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

The following table shows the maximum torque for each joint. The maximum value can be achieved on one axis at a time.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Maximum joint torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>175.44 Nm / 450 Nm / 390 Nm</td>
</tr>
<tr>
<td>2</td>
<td>175.44 Nm / 400 Nm / 400 Nm</td>
</tr>
<tr>
<td>3</td>
<td>90.6 Nm / 160 Nm / 160 Nm</td>
</tr>
<tr>
<td>4</td>
<td>18.72 Nm / 60 Nm / 60 Nm</td>
</tr>
<tr>
<td>5</td>
<td>21.44 Nm / 60 Nm / 60 Nm</td>
</tr>
<tr>
<td>6</td>
<td>9.2 Nm / 60 Nm / 60 Nm</td>
</tr>
</tbody>
</table>

i Valid for CRB 15000-5/0.95.  
ii Valid for CRB 15000-10/1.52.  
iii Valid for CRB 15000-12/1.27.
### Other technical data

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airborne noise level</td>
<td>The sound pressure level outside the working space.</td>
<td>&lt; 50.2 dB(A) Leq (acc. to machinery directive 2006/42/EC) Movement: ISO cube (ISO 9283) TCP velocity: 1500 mm/s</td>
</tr>
</tbody>
</table>

### Power consumption at max load

**Note**

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

<table>
<thead>
<tr>
<th>Type of movement</th>
<th>5/0.95</th>
<th>10/1.52</th>
<th>12/1.27</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO Cube (ISO 9283)</td>
<td>202</td>
<td>231</td>
<td>253</td>
</tr>
<tr>
<td>Max. velocity (W)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Robot in calibration position</th>
<th>5/0.95</th>
<th>10/1.52</th>
<th>12/1.27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes engaged (W)</td>
<td>98</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>Brakes disengaged (W)</td>
<td>136</td>
<td>143</td>
<td>141</td>
</tr>
</tbody>
</table>

Explosive environments

The robot must not be located or operated in an explosive environment.
1.3.3 Hole configuration and attachment screws

Hole configuration, base

CRB 15000-5/0.95

This illustration shows the hole configuration used when securing CRB 15000-5/0.95.

C Circular hole for locating pin
1 Description

1.3.3 Hole configuration and attachment screws

Continued

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Elongated hole for locating pin</td>
</tr>
</tbody>
</table>

CRB 15000-10/1.52

This illustration shows the hole configuration used when securing CRB 15000-10/1.52.

Continues on next page
1 Description

1.3.3 Hole configuration and attachment screws

Continued

CRB 15000-12/1.27

This illustration shows the hole configuration used when securing CRB 15000-12/1.27.

<table>
<thead>
<tr>
<th>C</th>
<th>Circular hole for locating pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Elongated hole for locating pin</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Suitable screws</th>
<th>M10x35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>4 pcs</td>
</tr>
<tr>
<td>Quality</td>
<td>8.8</td>
</tr>
</tbody>
</table>
1 Description

1.3.3 Hole configuration and attachment screws

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable washer</td>
<td>23/10.5/2.5 mm Steel</td>
</tr>
<tr>
<td>Guide pins</td>
<td>DIN6325, hardened steel Ø6x24 mm, 2 pcs</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>32 Nm ±10%</td>
</tr>
<tr>
<td>Length of thread engagement</td>
<td>Minimum 15 mm for ground with material yield strength 150 MPa</td>
</tr>
<tr>
<td>Level surface requirements</td>
<td>0.1/500 mm</td>
</tr>
</tbody>
</table>
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.

CRB 15000-5/0.95

Continues on next page
1 Description

1.3.4 Fitting equipment on the robot (robot dimensions)

Continued
Fitting equipment on the robot arm

**ELECTRICAL SHOCK**

External cable routing where voltages deemed to be hazardous live, ground resistance path shall not exceed 0.1 ohms for all metal parts exposed or likely to be touched by a person during normal operation, and likely to become energized through electrical malfunction.
Upper arm

The robot upper 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, or to replace the four screws on the upper arm cover with hex spacers, as shown in the following figure (taking CRB 15000-5/0.95 as an example).

Definitions of dimensions and masses are shown in Holes for fitting extra equipment on page 30. Requirements on hex spacers are shown in Fastener quality for hex spacers on page 32.

Note

Sharp edges or other hazards related to the hex spacers or fitted equipment must be taken into consideration.

Note

If the gasket screws on the upper arm cover of CRB 15000-5/0.95 are replaced with hex spacers, then the IP54 is no longer fulfilled.

Before fitting equipment to the robot upper arm, special considerations must be taken:

- 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 using the external brake release tool.

CAUTION

The external brake release tool works on robots with RobotWare earlier than 7.10. On robots with RobotWare 7.10 or later, the tool does not work.

Continues on next page
1 Description

1.3.4 Fitting equipment on the robot (robot dimensions)

Continued

- The armload interface can handle loads up to 1 kg. This includes the weight of the cabling, tools, and workpiece (if lifted).

Note

When the arm load is defined, the maximum payload capacity may be reduced in certain poses. A simulation in RobotStudio shall be performed to verify that the combination of arm load and payload works in the intended application.

Housing and lower arm

For CRB 15000-10/1.52 and CRB 15000-12/1.27, robot housing and lower arm can also handle extra loads up to 1 kg respectively. Definitions of dimensions and masses are shown in *Holes for fitting extra equipment on page 30.*

Maximum allowed arm load depends on center of gravity of arm load and robot payload. When an armload is attached, the payload on the wrist is reduced.

Holes for fitting extra equipment

Upper arm, CRB 15000-5/0.95

![Diagram](image1)

Upper arm, CRB 15000-10/1.52

![Diagram](image2)

Continues on next page
1 Description

1.3.4 Fitting equipment on the robot (robot dimensions)

Continued

Upper arm, CRB 15000-12/1.27

Housing and lower arm, CRB 15000-10/1.52

Continues on next page
1 Description

1.3.4 Fitting equipment on the robot (robot dimensions)
Continued

Housing and lower arm, CRB 15000-12/1.27

Fastener quality for hex spacers

The following table shows the requirements on hex spacers for fitting equipment on the upper arm covers.

<table>
<thead>
<tr>
<th></th>
<th>CRB 15000-5/0.95</th>
<th>CRB 15000-10/1.52</th>
<th>CRB 15000-12/1.27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Stainless steel 4.8, or higher</td>
<td>Stainless steel 4.8, or higher</td>
<td></td>
</tr>
<tr>
<td>Tightening torque</td>
<td>0.6 Nm +/-5%</td>
<td>0.6 Nm +/-5%</td>
<td></td>
</tr>
<tr>
<td>Minimum thread length (a)</td>
<td>8 mm</td>
<td>10 mm</td>
<td></td>
</tr>
<tr>
<td>Thread length (b)</td>
<td>8 mm</td>
<td>10 mm</td>
<td></td>
</tr>
<tr>
<td>Screw head width (S)</td>
<td>5 mm</td>
<td>5 mm</td>
<td></td>
</tr>
<tr>
<td>Length (L)</td>
<td>18 mm</td>
<td>25 mm</td>
<td></td>
</tr>
</tbody>
</table>

Continues on next page

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### Tool flange

#### Fastener quality on tool flange

Use screws with suitable length and tightening torque for your application. Screws with quality class 12.9 are recommended. Also note the thread depth on the tool flange. Using too long screws may damage the tool flange and cause the tool to be improperly fastened, which is a safety hazard.
1 Description

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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Up button (convex button)</td>
</tr>
<tr>
<td>B</td>
<td>Down button (concave button)</td>
</tr>
<tr>
<td>C</td>
<td>Light ring</td>
</tr>
</tbody>
</table>

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.
   - 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 an 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.
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.

For the CRB 15000, if varying loads from cables and other disturbances are causing the robot to drift during lead-through, this can often be improved by setting the system parameter Lead through load compensation to Always. See Technical reference manual - System parameters, section Motion, type Robot.

Align to a coordinate system

It is possible to align the robot to a coordinate system either in Auto or Manual mode from the lead-through page for a CRB 15000 robot.

Use the following procedure to align the robot to a coordinate system:

1. In the Lead-through page select the a mode in the Lead-through Mode section.
2. In the Align to coordinate system section, select the required coordinate system.
3 Enable the motors.

**Note**

For collaborative robots, the motors are on by default unless extra safety options are selected in the system.

4 Tap and hold the **Press and Hold Align** button.

The robot is aligned to the selected coordinate system.

**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 Description

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.

Laser scanner types

The following laser scanner package options are available:

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

Continues on next page
Connection between PROFlsafe-based laser scanners and the OmniCore controller differs according to the PROFINET options selected and installed in the system.

- If only options [3020-2] PROFINET Device and [3023-2] PROFlsafe Device are selected and installed, the laser scanners shall connect to a PLC acting as a master first and then to the OmniCore controller with SafeMove via the PROFINET safe (PROFlsafe) network. Users need to prepare a safety PLC of their own.

- If options [3020-1] PROFINET Controller and [3023-1] PROFlsafe Controller are selected and installed, the laser scanner could communicate with the OmniCore controller directly via the WAN port.

SafetyIO-based laser scanners connects to the OmniCore controller with SafeMove and installed with the scalable I/O device DSQC1042 Safety digital base (option 3037-2). 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, which are available on SICK® website.

Connecting the laser scanner(s)

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

Note

External 24V power supply shall be prepared for power connection of laser scanners.

1 PROFlsafe-based laser scanner (option 3051-1), with PLC connected
1 Description

1.3.7 Installation of laser scanner

Continued

1 PROFIsafe-based laser scanner (option 3051-1), without PLC connected

2 PROFIsafe-based laser scanners (option 3051-3), with PLC connected

Continues on next page
1 Description

1.3.7 Installation of laser scanner

Continued

2 PROFIsafe-based laser scanners (option 3051-3), without PLC connected

![Diagram of PROFIsafe-based laser scanners](xx2000000227)

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

![Diagram of SafetyIO-based laser scanner](xx2000000299)

Continues on next page
2 SafetyIO-based laser scanners (option 3051-4)

Note

If there are additional scalable I/O devices available, install and configure the additional devices by following the detailed procedures in Application manual - Scalable I/O.
Connector information

Pin assignment on XG1 of SafetyIO-based laser scanners

XG1 connector on SafetyIO-based laser scanner is a 17-pin, A-coded M12 female connector. Pins 1-4 and pin 17 on XG1 are occupied for connecting the laser scanner and scalable I/O device, while other 12 pins can be used for local inputs and outputs.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Wiring color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OSSD pair 1, OSSD A</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>OSSD pair 1, OSSD B</td>
<td>Blue</td>
</tr>
<tr>
<td>3</td>
<td>OSSD pair 2, OSSD A</td>
<td>White</td>
</tr>
<tr>
<td>4</td>
<td>OSSD pair 2, OSSD B</td>
<td>Green</td>
</tr>
<tr>
<td>5</td>
<td>Universal input 1</td>
<td>Pink</td>
</tr>
<tr>
<td>6</td>
<td>Universal input 2</td>
<td>Yellow</td>
</tr>
<tr>
<td>7</td>
<td>Universal input 3</td>
<td>Black</td>
</tr>
<tr>
<td>8</td>
<td>Universal input 4</td>
<td>Grey</td>
</tr>
<tr>
<td>9</td>
<td>Universal input 5</td>
<td>Red</td>
</tr>
<tr>
<td>10</td>
<td>Universal input 6</td>
<td>Violet</td>
</tr>
<tr>
<td>11</td>
<td>Universal input 7</td>
<td>Grey with pink</td>
</tr>
<tr>
<td>12</td>
<td>Universal input 8</td>
<td>Red with blue</td>
</tr>
<tr>
<td>13</td>
<td>Universal input 9</td>
<td>White with green</td>
</tr>
<tr>
<td>14</td>
<td>Universal input 10</td>
<td>Brown with green</td>
</tr>
<tr>
<td>15</td>
<td>Universal output 1</td>
<td>White with yellow</td>
</tr>
<tr>
<td>16</td>
<td>Universal output 2</td>
<td>Yellow with brown</td>
</tr>
<tr>
<td>17</td>
<td>Voltage 0 V DC</td>
<td>White with grey</td>
</tr>
</tbody>
</table>
1 Description

1.3.7 Installation of laser scanner

Continued

**Configuration scenarios**

Laser scanner configuration depends on the type and number of scanners connecting to the robot and RobotWare version. Refer to the following table for applicable scenario.

<table>
<thead>
<tr>
<th>Scanner type</th>
<th>Works with...</th>
<th>RobotWare version</th>
<th>Require...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Collaborative Speed Control add-in</td>
</tr>
<tr>
<td></td>
<td>PLC</td>
<td>Number of connected scanners</td>
<td></td>
</tr>
</tbody>
</table>

|                   |                |                   |                  |
| PROFIsafe-based   | Y N Y         | 1                  | RobotWare 7.5 or earlier | N |
|                   | Y N Y         | 1                  | RobotWare 7.6 or later | Y |
|                   | Y N Y         | 2                  | RobotWare 7.6 or later | Y |
|                   | N N Y         | 1                  | RobotWare 7.10 or later | Y |
|                   | N N Y         | 2                  | RobotWare 7.10 or later | Y |
| SafetyIO-based    | N Y Y         | 1                  | RobotWare 7.6 or later | Y |
|                   | N Y Y         | 2                  | RobotWare 7.6 or later | Y |

For details about how to configure the scanners and required actions for scenarios such as RobotWare update or rollback, see *Product manual - CRB 1100*. 
### 1.4 Calibrating the robot

#### 1.4.1 Calibration methods and when to calibrate

**Types of calibration**

<table>
<thead>
<tr>
<th>Type of calibration</th>
<th>Description</th>
<th>Calibration method</th>
</tr>
</thead>
</table>
| Absolute accuracy calibration (optional) | Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for:  
  - Mechanical tolerances in the robot structure  
  - Deflection due to load  
  Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot.  
  Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory.  
  A robot calibrated with Absolute accuracy has the option information printed on its name plate (OmniCore).  
  To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure. | CalibWare            |
| Torque sensor calibration                | The CRB 15000 torque sensors are calibrated with the routine TorqueSensorCal which is available in the System Module TorqueSensor-Calib. 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. | Torque sensor calibration |
| Optimization                            | Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing.  
  Wrist optimization will update standard calibration data for axes 4 and 5. | Wrist Optimization    |

**Brief description of calibration methods**

**Torque sensor calibration**

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.
1 Description

1.4.1 Calibration methods and when to calibrate

Continued

- After heavy collisions or uncontrolled stops. This does not apply to collisions or stops which may routinely be experienced as part of a power and force limiting application.

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.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing.

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

CalibWare - Absolute Accuracy calibration

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

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

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

**Purpose**

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

Here are some examples of when this accuracy is important:

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

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

**Note**

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

**What is included**

Every Absolute Accuracy robot is delivered with:

- compensation parameters saved in the robot memory
- a birth certificate representing the Absolute Accuracy measurement protocol for the calibration and verification sequence.

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

Absolute Accuracy supports floor mounted, wall mounted, and ceiling mounted installations. The compensation parameters that are saved in the robot memory 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

Continues on next page
1 Description

1.4.2 Absolute accuracy calibration

Continued

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

Absolute Accuracy not active

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

- Any motion function based on a joint target \texttt{(MoveAbsJ)}
- Independent joint
- Joint based jogging

RAPID instructions

There are no RAPID instructions included in this option.
1.4.3 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.
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 CRB 15000-5/0.95 load diagrams include a nominal payload inertia, $J_o$ of 0.012 kgm$^2$.

The CRB 15000-10/1.52 and CRB 15000-12/1.27 load diagrams include a nominal payload inertia, $J_o$ of 0.05 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
1 Description

1.5.2 Diagrams

Continued

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

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max load</td>
<td>5.2 kg</td>
</tr>
<tr>
<td>Z&lt;sub&gt;max&lt;/sub&gt;</td>
<td>0.154 m</td>
</tr>
<tr>
<td>L&lt;sub&gt;max&lt;/sub&gt;</td>
<td>0.130 m</td>
</tr>
</tbody>
</table>
For wrist down (0° deviation from the vertical line).

<table>
<thead>
<tr>
<th>Description</th>
<th>Max load</th>
<th>Z\text{max}</th>
<th>L\text{max}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max load</td>
<td>12 kg</td>
<td>0.099 m</td>
<td>0.019 m</td>
</tr>
</tbody>
</table>

Continues on next page
For wrist down (0° deviation from the vertical line).

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max load</td>
<td>14 kg</td>
</tr>
<tr>
<td>Z(_{\text{max}})</td>
<td>0.097 m</td>
</tr>
<tr>
<td>L(_{\text{max}})</td>
<td>0.019 m</td>
</tr>
</tbody>
</table>
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$^2$. $L = \sqrt{X^2 + Y^2}$, see the following figure.

Full movement of axis 5 (-180°/+180°)

<table>
<thead>
<tr>
<th>Axis</th>
<th>Robot type</th>
<th>Maximum moment of inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>CRB 15000-5/0.95</td>
<td>$J_{a5} = \text{Load} \times ((Z+0.101)^2 + (L+0.08)^2)) + \max (J_{ox}, J_{oy}) \leq 0.35 \text{ kgm}^2$</td>
</tr>
<tr>
<td></td>
<td>CRB 15000-10/1.52, CRB 15000-12/1.27</td>
<td>$J_{a5} = \text{Load} \times ((Z+0.101)^2 + (L+0.08)^2)) + \max (J_{ox}, J_{oy}) \leq 0.58 \text{ kgm}^2$</td>
</tr>
<tr>
<td>6</td>
<td>CRB 15000-5/0.95</td>
<td>$J_{a6} = \text{Load} \times L^2 + J_{oz} \leq 0.1 \text{ kgm}^2$</td>
</tr>
<tr>
<td></td>
<td>CRB 15000-10/1.52, CRB 15000-12/1.27</td>
<td>$J_{a6} = \text{Load} \times L^2 + J_{oz} \leq 0.2 \text{ kgm}^2$</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Robot type</th>
<th>Max wrist torque axis 4 and 5</th>
<th>Max wrist torque axis 6</th>
<th>Max torque valid at load</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 15000-5/0.95</td>
<td>9.86 Nm</td>
<td>2.45 Nm</td>
<td>5 kg</td>
</tr>
<tr>
<td>CRB 15000-10/1.52</td>
<td>18.9 Nm</td>
<td>4.9 Nm</td>
<td>10 kg</td>
</tr>
<tr>
<td>CRB 15000-12/1.27</td>
<td>23.3 Nm</td>
<td>5.9 Nm</td>
<td>12 kg</td>
</tr>
</tbody>
</table>
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 to use RobotStudio.

Maximum Cartesian design acceleration for nominal loads

<table>
<thead>
<tr>
<th>Robot type</th>
<th>Emergency stop Max acceleration at nominal load COG [m/s²] (absolute value)</th>
<th>Controlled motion Max acceleration at nominal load COG [m/s²] (absolute value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 15000-5/0.95</td>
<td>62</td>
<td>37</td>
</tr>
<tr>
<td>CRB 15000-10/1.52</td>
<td>94</td>
<td>28</td>
</tr>
<tr>
<td>CRB 15000-12/1.27</td>
<td>79</td>
<td>27</td>
</tr>
</tbody>
</table>

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.

Positions at intersection point of axes 4-5-6 and angle of axes 2 and 3

<table>
<thead>
<tr>
<th>Position in the figure</th>
<th>Positions at wrist center (mm)</th>
<th>Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>pos0</td>
<td>470</td>
<td>899</td>
</tr>
<tr>
<td>pos1</td>
<td>0</td>
<td>1216</td>
</tr>
<tr>
<td>pos2</td>
<td>951</td>
<td>265</td>
</tr>
<tr>
<td>pos3</td>
<td>0</td>
<td>-686</td>
</tr>
<tr>
<td>pos4</td>
<td>-951</td>
<td>265</td>
</tr>
<tr>
<td>pos5</td>
<td>-507</td>
<td>-179</td>
</tr>
<tr>
<td>pos6</td>
<td>-230.2</td>
<td>272.7</td>
</tr>
</tbody>
</table>

Continues on next page
### 1 Description

#### 1.7.1 Working range

<table>
<thead>
<tr>
<th>Position in the figure</th>
<th>Positions at wrist center (mm)</th>
<th>Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>pos7</td>
<td>507</td>
<td>-179</td>
</tr>
<tr>
<td>pos8</td>
<td>198.1</td>
<td>287.6</td>
</tr>
</tbody>
</table>

Continues on next page
Illustration, working range CRB 15000-10/1.52

This illustration shows the unrestricted working range of the robot.

positions at wrist center and angle of axes 2 and 3

<table>
<thead>
<tr>
<th>Position in the figure</th>
<th>Positions at wrist center (mm)</th>
<th>Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>pos0</td>
<td>888</td>
<td>1297</td>
</tr>
<tr>
<td>pos1</td>
<td>150</td>
<td>1882.3</td>
</tr>
<tr>
<td>pos2</td>
<td>1632.3</td>
<td>400</td>
</tr>
<tr>
<td>pos3</td>
<td>150</td>
<td>-1082.3</td>
</tr>
<tr>
<td>pos4</td>
<td>-1332.3</td>
<td>400</td>
</tr>
<tr>
<td>pos5</td>
<td>-625.3</td>
<td>-307</td>
</tr>
<tr>
<td>pos6</td>
<td>-48</td>
<td>442.6</td>
</tr>
<tr>
<td>pos7</td>
<td>925.3</td>
<td>-307</td>
</tr>
<tr>
<td>pos8</td>
<td>596.9</td>
<td>326.5</td>
</tr>
</tbody>
</table>
Illustration, working range CRB 15000-12/1.27

This illustration shows the unrestricted working range of the robot.

<table>
<thead>
<tr>
<th>Position in the figure</th>
<th>Positions at wrist center (mm)</th>
<th>Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>pos0</td>
<td>635</td>
<td>1235</td>
</tr>
<tr>
<td>pos1</td>
<td>0</td>
<td>1719</td>
</tr>
<tr>
<td>pos2</td>
<td>1381</td>
<td>338</td>
</tr>
<tr>
<td>pos3</td>
<td>0</td>
<td>-1043</td>
</tr>
<tr>
<td>pos4</td>
<td>-1381</td>
<td>338</td>
</tr>
<tr>
<td>pos5</td>
<td>-674</td>
<td>-369</td>
</tr>
<tr>
<td>pos6</td>
<td>-193</td>
<td>276.8</td>
</tr>
<tr>
<td>pos7</td>
<td>674</td>
<td>-369</td>
</tr>
<tr>
<td>pos8</td>
<td>370.6</td>
<td>194</td>
</tr>
</tbody>
</table>
1 Description

1.7.1 Working range

Top view of working range

CRB 15000-5/0.95

Continues on next page
1 Description

1.7.1 Working range

Continued
1 Description

1.7.1 Working range

Continued

**Working range**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Working range</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis 1</td>
<td>±180° (^{i}) / ±270° (^{ii})</td>
<td>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.</td>
</tr>
<tr>
<td>Axis 2</td>
<td>±180°</td>
<td></td>
</tr>
<tr>
<td>Axis 3</td>
<td>-225°/+85°</td>
<td></td>
</tr>
<tr>
<td>Axis 4</td>
<td>±180°</td>
<td></td>
</tr>
<tr>
<td>Axis 5</td>
<td>±180°</td>
<td></td>
</tr>
<tr>
<td>Axis 6</td>
<td>±270°</td>
<td></td>
</tr>
</tbody>
</table>

\(^{i}\) Valid for CRB 15000-5/0.95.

\(^{ii}\) Valid for CRB 15000-10/1.52 and CRB 15000-12/1.27.
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.

<table>
<thead>
<tr>
<th>A</th>
<th>Programmed position</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Mean position at program execution</td>
</tr>
<tr>
<td>AP</td>
<td>Mean distance from programmed position</td>
</tr>
<tr>
<td>RP</td>
<td>Tolerance of position B at repeated positioning</td>
</tr>
<tr>
<td>D</td>
<td>Actual path at program execution</td>
</tr>
<tr>
<td>E</td>
<td>Programmed path</td>
</tr>
<tr>
<td>AT</td>
<td>Max deviation from E to average path</td>
</tr>
<tr>
<td>RT</td>
<td>Tolerance of the path at repeated program execution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRB 15000</th>
<th>5/0.95</th>
<th>10/1.52</th>
<th>12/1.27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pose accuracy, AP$^i$ (mm)</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Pose repeatability, RP (mm)</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Pose stabilization time, PST (s) within 0.1 mm of the position</td>
<td>0.229</td>
<td>0.398</td>
<td>0.887</td>
</tr>
<tr>
<td>Path accuracy, AT (mm)</td>
<td>1.205</td>
<td>4.392</td>
<td>2.377</td>
</tr>
<tr>
<td>Path repeatability, RT (mm)</td>
<td>0.057</td>
<td>0.056</td>
<td>0.058</td>
</tr>
</tbody>
</table>

$^i$ 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.
1.7.3 Velocity

Maximum axis speed

<table>
<thead>
<tr>
<th>Robot type</th>
<th>Axis 1</th>
<th>Axis 2</th>
<th>Axis 3</th>
<th>Axis 4</th>
<th>Axis 5</th>
<th>Axis 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 15000-5/0.95</td>
<td>125 °/s</td>
<td>125 °/s</td>
<td>140 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
</tr>
<tr>
<td>CRB 15000-10/1.52</td>
<td>120 °/s</td>
<td>120 °/s</td>
<td>125 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
</tr>
<tr>
<td>CRB 15000-12/1.27</td>
<td>120 °/s</td>
<td>120 °/s</td>
<td>125 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
<td>200 °/s</td>
</tr>
</tbody>
</table>

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

1.8 Robot stopping distances and times

1.8.1 Robot stopping distances according to ISO 10218-1

About the data for robot stopping distances and times
All measurements and calculations of stopping distances and times are done according to ISO 10218-1, with single axis motion on axes 1, 2, and 3. If more than one axis is used for the movement, then the stopping distance and time can be longer. Normal delays of the hardware and software are taken into account. See more about the delays and their impact on the results, Reading the data on page 72.

The stopping distances and times are presented using the tool data and extension zones presented for the respected robot variant. These variables are 100%, 66%, and 33% of the maximum values for the robot.

The stop categories 0 and 1 are according to IEC 60204-1.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The category 0 stop is not necessarily the worst case (depending on load, speed, application, wear, etc.).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The stop category 1 is a controlled stop and will therefore have less deviation from the programmed path compared with a stop category 0.</td>
</tr>
</tbody>
</table>

Loads
The tool data that is used is presented for the respective robot variant.
The used loads represent the rated load. No arm load is used. See the Load diagrams on page 50.

Continues on next page
Extension zones

The extension zone for the stop category 1 is based on the tool mounting interface (tool flange) with the axis angles according to the following illustrations. The zone data is presented for the respective robot variant.

The extension zone outer limits are defined by the TCP0 position for the stated angles.

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axis 1</strong></td>
</tr>
<tr>
<td><img src="xx2300000860" alt="Axis 1 Illustration" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axis 2</strong></td>
</tr>
<tr>
<td><img src="xx2300000861" alt="Axis 2 Illustration" /></td>
</tr>
</tbody>
</table>

Continues on next page
1 Description

1.8.1 Robot stopping distances according to ISO 10218-1

Continued

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis 3</td>
</tr>
</tbody>
</table>

**Speed**
The speed in the simulations is based on TCP0.
The TCP0 speed is measured in meters per second when the stop is triggered.

**Stopping distances**
The stopping distance is measured in degrees.

**Stopping times**
The stopping time is measured in seconds.

**Limitations**
The stopping distance can vary depending on additional loads on the robot.
The stopping distance for category 0 stops can vary depending on the individual brakes and the joint friction.

**Reading the data**
The data for stop category 0 is presented in tables, with distance and time for each axis.
The data for stop category 1 is presented as graphs with curves representing the different loads.
There is a short delay in the stop, which means that if the axis is accelerating when the stop is initiated (C), it will continue to accelerate during this delay time. This

Continues on next page
can result in graphs where a higher load (A) gives shorter stopping distance than a smaller load (B).

The tcp speed is the actual speed when the stop is initiated, which is not necessarily the programmed speed.
1.8.2 Measuring stopping distance and time

Preparations before measuring

For measurement and calculation of overall system stopping performance, see ISO 13855:2010.

The measurement shall be done for the selected stop category. The emergency stop button on the robot controller is configured for stop category 1 on delivery. A risk assessment can conclude the need for another stop category. The stop category can be changed through the system parameter Function (topic Controller, type Safety Run Chain).

⚠️ CAUTION

The measurement and calculation of overall stopping performance for a robot must be tested with its correct load, speed, and tools, in its actual environment, before the robot is taken into production. All load and tool data must be correctly defined (weight, CoG, moment of inertia). The load identification service routine can be used to identify the data.

⚠️ CAUTION

Follow the safety instructions in the respective product manual for the robot.

Measuring with TuneMaster

The software TuneMaster can be used to measure stopping distances and times for ABB robots. The TuneMaster software contains documentation on how to use it.

2. Install TuneMaster on a computer. Start the TuneMaster app and select Log Signals.
3. Connect to the robot controller.
4. Define the I/O stop signal to use for measurement, for example, ES1 for emergency stop.
5. Define the signal number to use for measurement, 1298 for axis position. The value is given in radians.
6. Start the logging in TuneMaster.
7. Start the test program on the controller.

⚠️ Tip

Use the tool and zone definitions for the respective variant in this document to get results that are comparable with this document.

8. When the axis has reached maximum speed, press the emergency stop button.
9 In TuneMaster, measure the stopping distance and time.
10 Repeat for all installed emergency stop buttons until the identified hazards due to stopping distance and time for axes have been verified.

Example from TuneMaster
1 Description

1.8.3 CRB 15000-5/0.95

1.8.3 CRB 15000-5/0.95

Used tooldata

PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [5, [0, 0, 100], [1, 0, 0, 0], 0.0083, 0.0083, 0.0083]];  
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [3.3, [0, 0, 67], [1, 0, 0, 0], 0.0037, 0.0037, 0.0037]];  
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [1.7, [0, 0, 33], [1, 0, 0, 0], 0.00093, 0.00093, 0.00093]];  

Category 1, extension zones

For definitions of the zones, see Extension zones on page 71.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>-42°</td>
<td>42°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>6°</td>
<td>-6°</td>
</tr>
</tbody>
</table>

Axis 2

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>48°</td>
<td>30°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>90°</td>
<td>-30°</td>
</tr>
</tbody>
</table>

Axis 3

Only one zone exists.

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time

Continues on next page
1 Description

1.8.3 CRB 15000-5/0.95

Continues on next page

Category 1, Axis 1, Extension zone 1, stopping distance and stopping time

Continues on next page
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time

![Graph showing angle and stop time as a function of velocity]

Continues on next page
1 Description

1.8.3 CRB 15000-5/0.95

Continued

Category 1, Axis 2, Extension zone 1, stopping distance and stopping time

---

The diagrams show the relationship between speed (v [m/s]) and angle for different load conditions (m = 100%, m = 66%, m = 33%). The upper graph displays the angle as a function of speed, while the lower graph shows the stop time as a function of speed.
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time

![Graphs showing stopping distance and time vs. velocity for different load conditions.]

Continues on next page
1 Description

1.8.3 CRB 15000-5/0.95

Continued

Category 1, Axis 3, Extension zone 0, stopping distance and stopping time

![Graph showing stopping distance and stopping time for different speeds and percentages.]

- Angle [°]
- Stop time [s]

Legend:
- m=100%
- m=66%
- m=33%
1.8.4 CRB 15000-10/1.52

Used tooldata

PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [10, [0, 0, 85], [1, 0, 0, 0], 0.012, 0.012, 0.012]];  
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [6.7, [0, 0, 57], [1, 0, 0, 0], 0.0054, 0.0054, 0.0054]];  
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0, 0]], [3.3, [0, 0, 28], [1, 0, 0, 0], 0.0013, 0.0013, 0.0013]];  

Category 1, extension zones

For definitions of the zones, see Extension zones on page 71.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>-42°</td>
<td>42°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>6°</td>
<td>-6°</td>
</tr>
</tbody>
</table>

Axis 2

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>48°</td>
<td>30°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>90°</td>
<td>-30°</td>
</tr>
</tbody>
</table>

Axis 3

Only one zone exists.

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time

Continues on next page
1 Description

1.8.4 CRB 15000-10/1.52

Continued

Category 1, Axis 1, Extension zone 1, stopping distance and stopping time
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time

![Graph 1: Angle vs. Speed](image1)

![Graph 2: Stop Time vs. Speed](image2)

Continues on next page
1 Description

1.8.4 CRB 15000-10/1.52

Continued

Category 1, Axis 2, Extension zone 0, stopping distance and stopping time

![Graph of Angle vs. v (m/s)]

![Graph of Stop Time vs. v (m/s)]
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time
1 Description

1.8.4 CRB 15000-10/1.52

Continued

Category 1, Axis 2, Extension zone 2, stopping distance and stopping time

![Graph of Angle vs. Speed](image1)

![Graph of Stopping Time vs. Speed](image2)

Continues on next page
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time

![Graph showing stopping distance and time for different speeds and load capacities.](image-url)
1.8.5 CRB 15000-12/1.27

Used tooldata

PERS tooldata P100:= [ TRUE, 
[[0, 0, 0], [1, 0, 0, 0]], 
[12, [0, 0, 90], [1, 0, 0, 0], 0.016, 0.016, 0.016]]; 
PERS tooldata P66:= [ TRUE, 
[[0, 0, 0], [1, 0, 0, 0]], 
[8, [0, 0, 60], [1, 0, 0, 0], 0.0072, 0.0072, 0.0072]]; 
PERS tooldata P33:= [ TRUE, 
[[0, 0, 0], [1, 0, 0, 0]], 
[4, [0, 0, 30], [1, 0, 0], 0.0018, 0.0018, 0.0018]]; 

Category 1, extension zones

For definitions of the zones, see Extension zones on page 71.

The zone border is the mounting interface location for axis 2 and axis 3.

### Axis 1

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>-42°</td>
<td>42°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>6°</td>
<td>-6°</td>
</tr>
</tbody>
</table>

### Axis 2

<table>
<thead>
<tr>
<th>Zone border</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>z0-z1</td>
<td>48°</td>
<td>30°</td>
</tr>
<tr>
<td>z1-z2</td>
<td>90°</td>
<td>-30°</td>
</tr>
</tbody>
</table>

### Axis 3

Only one zone exists.

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time

[Graph showing the relationship between angle and velocity with different stopping percentages (m=100%, m=66%, m=33%)]

Continues on next page
Category 1, Axis 1, Extension zone 1, stopping distance and stopping time
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time

**Diagram 1:**
- **Angle [°]**
- **v [m/s]**
- Lines for:
  - $m=100\%$
  - $m=66\%$
  - $m=33\%$

**Diagram 2:**
- **Stop time [s]**
- **v [m/s]**
- Lines for:
  - $m=100\%$
  - $m=66\%$
  - $m=33\%$
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time

1 Description

1.8.5 CRB 15000-12/1.27

Continued
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time

Continues on next page
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time
1.9 Customer connections on the manipulator

**Introduction**

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

<table>
<thead>
<tr>
<th>Customer connection</th>
<th>Cable specification</th>
<th>Article number</th>
<th>Rating in each wire</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer power (CP)</td>
<td>Raw cable is twisted pair 1x2xAWG24</td>
<td>See Product manual, spare parts - CRB 15000</td>
<td>24V(^{ii}) 1.5A</td>
<td>Routed internally with the manipulator cable harness.</td>
</tr>
<tr>
<td>Customer signal (CS)</td>
<td>2x2xAWG26 in 4x2XAWG26 cable</td>
<td>See Product manual, spare parts - CRB 15000</td>
<td>24V(^{iii}) 500mA</td>
<td>Routed internally with the manipulator cable harness.</td>
</tr>
</tbody>
</table>

\(^{i}\) Stresses above the limitation may cause permanent damage to the manipulator.

\(^{ii}\) Rated 24V, max 30V

\(^{iii}\) Rated 24V, max 30V

Continues on next page
1 Description

1.9 Customer connections on the manipulator

Continued

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).

- The connector can be rotated 330° clockwise.

Continues on next page
1.9 Customer connections on the manipulator

<table>
<thead>
<tr>
<th>Pos</th>
<th>Connector type</th>
<th>Layout</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1.MP</td>
<td>Receptacle angled rotatable male connector with housing and insert.</td>
<td><img src="xx2100000221" alt="Receptacle angled rotatable male connector with housing and insert." /></td>
</tr>
<tr>
<td>-</td>
<td>Plug with female connector includes housing and insert.</td>
<td><img src="xx2100000229" alt="Plug with female connector includes housing and insert." /></td>
</tr>
</tbody>
</table>

Connectors at the tool flange

![Connectors at the tool flange](xx2100000125)

**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.
## 1 Description

### 1.9 Customer connections on the manipulator

**Continued**

<table>
<thead>
<tr>
<th>Pos</th>
<th>Connector type</th>
<th>Torque for mating/un-mating</th>
<th>Layout</th>
<th>Pin specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>M8 3 pin female, 200 mm wire, straight (two pins for use, one pin is spare)</td>
<td>0.4 Nm</td>
<td>![Layout Image] (M8x1)</td>
<td>Pins on R2.CP: 1: CP+, 3: CP-, 4: NC</td>
</tr>
<tr>
<td>CS</td>
<td>M8 4 pin female, 200 mm wire, straight</td>
<td>0.4 Nm</td>
<td>![Layout Image] (M10x0.75)</td>
<td>Pins on R2.CS: 1: CS Pair_1 +, 2: CS Pair_1 -, 3: CS Pair_2 +, 4: CS Pair_2 -</td>
</tr>
</tbody>
</table>
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 Specification of variants and options

2.2 Manipulator

### Manipulator variants

<table>
<thead>
<tr>
<th>Option</th>
<th>Variant</th>
<th>Handling capacity</th>
<th>Wrist Reach</th>
<th>Flange Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>3300-19</td>
<td>CRB 15000-5/0.95</td>
<td>5 kg</td>
<td>0.95 m</td>
<td>1.05 m</td>
</tr>
<tr>
<td>3300-69</td>
<td>CRB 15000-10/1.52</td>
<td>10 kg</td>
<td>1.52 m</td>
<td>1.62 m</td>
</tr>
<tr>
<td>3300-70</td>
<td>CRB 15000-12/1.27</td>
<td>12 kg</td>
<td>1.27 m</td>
<td>1.37 m</td>
</tr>
</tbody>
</table>

### Manipulator protection

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3350-540</td>
<td>Base 54, IP54 (standard for CRB 15000-5/0.95)</td>
</tr>
<tr>
<td>3350-670</td>
<td>Base 67, IP67 (standard for CRB 15000-10/1.52 and CRB 15000-12/1.27)</td>
</tr>
</tbody>
</table>

**Note**

Base 54 includes IP54, according to standard IEC 60529.
Base 67 includes IP67, 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 restraints 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]

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>438-1</td>
<td>Standard warranty</td>
<td>Standard warranty is 12 months from <em>Customer Delivery Date</em> or latest 18 months after <em>Factory Shipment Date</em>, whichever occurs first. Warranty terms and conditions apply.</td>
</tr>
<tr>
<td>438-2</td>
<td>Standard warranty + 12 months</td>
<td>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.</td>
</tr>
<tr>
<td>438-6</td>
<td>Standard warranty + 6 months</td>
<td>Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.</td>
</tr>
</tbody>
</table>

Continues on next page
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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>438-8</td>
<td>Stock warranty</td>
<td>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.</td>
</tr>
</tbody>
</table>

Note: Special conditions are applicable, see Robotics Warranty Directives.
2 Specification of variants and options

2.3 Floor cables

2.3 Floor cables

Manipulator cable length

<table>
<thead>
<tr>
<th>Option</th>
<th>Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200-2</td>
<td>7 m</td>
</tr>
<tr>
<td>3200-3</td>
<td>15 m</td>
</tr>
</tbody>
</table>

Mains cable

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