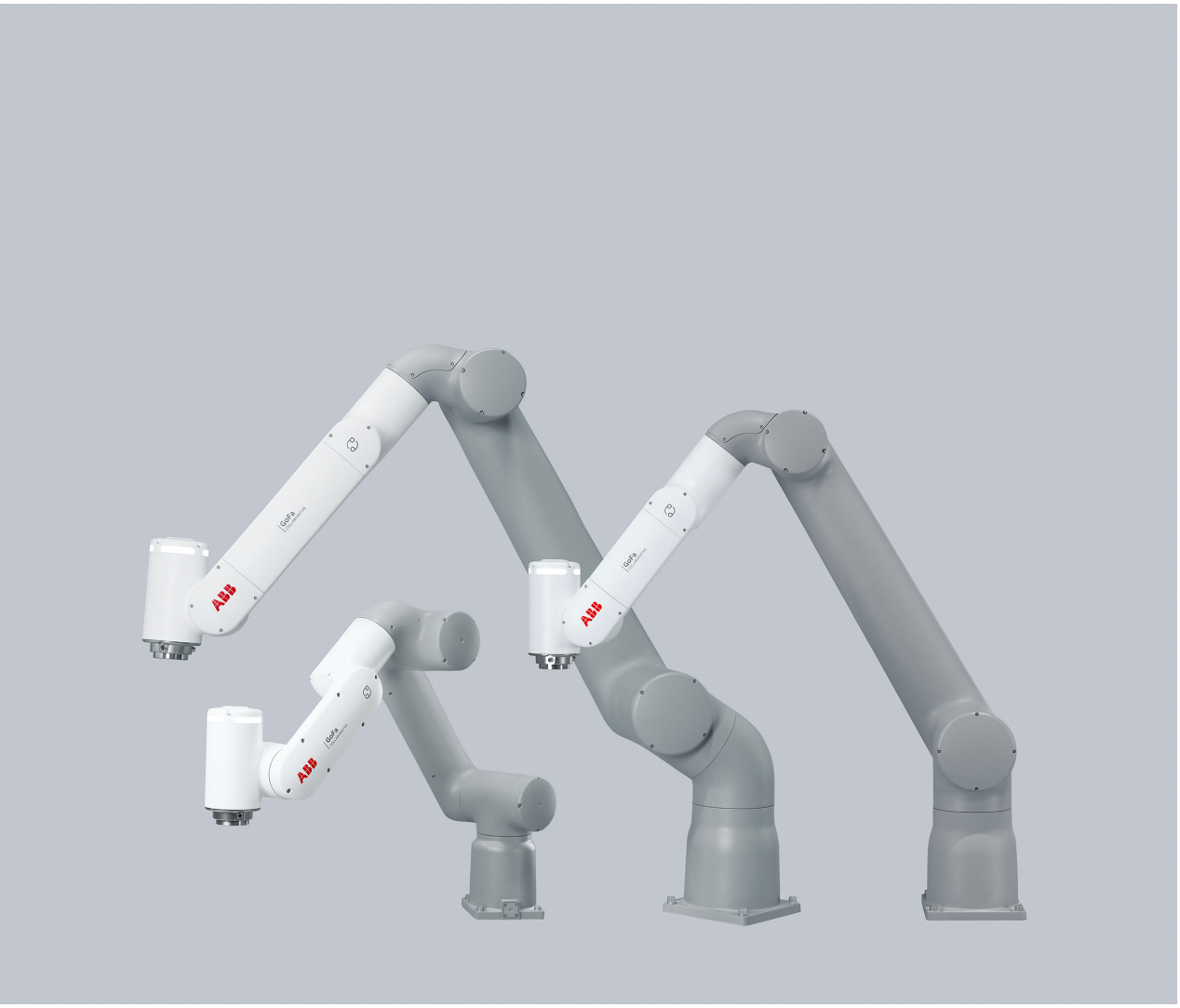
ROBOTICS

Product specification

CRB 15000



Trace back information:
Workspace Main version a809
Checked in 2026-09-18
Skribenta version 5.6.019

Product specification

CRB 15000

OmniCore

Document ID: 3HAC077390-001

Revision: Y

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Table of contents

Overview of this specification ... 7

1 Description 11

1.1 Structure ... 11
1.1.1 Introduction ... 11
1.1.2 Different robot variants ... 14
1.2 Standards ... 15
1.2.1 Applicable standards ... 15
1.3 Installation ... 17
1.3.1 Introduction to installation ... 17
1.3.2 Technical data ... 18
1.3.3 Hole configuration and attachment screws ... 24
1.3.4 Fitting equipment on the robot (robot dimensions) ... 28
1.3.5 Configuring the arm-side interface ... 36
1.3.6 Lead-through ... 37
1.3.7 Installation of laser scanner ... 40
1.4 Calibrating the robot ... 47
1.4.1 Calibration methods and when to calibrate ... 47
1.4.2 Absolute accuracy calibration ... 50
1.4.3 Ultra accuracy calibration ... 52
1.4.4 Jogging directions ... 53
1.5 Load diagrams ... 54
1.5.1 Introduction ... 54
1.5.2 Diagrams ... 55
1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement ... 61
1.5.4 Maximum TCP acceleration ... 62
1.6 Maintenance and troubleshooting ... 63
1.7 Robot motion ... 64
1.7.1 Working range ... 64
1.7.2 Performance ... 70
1.7.3 Velocity ... 71
1.8 Robot stopping distances and times ... 72
1.8.1 Robot stopping distances according to ISO 10218-1 ... 72
1.8.2 Measuring stopping distance and time ... 76
1.8.3 CRB 15000-5/0.95 ... 78
1.8.4 CRB 15000-10/1.52 ... 85
1.8.5 CRB 15000-12/1.27 ... 92
1.9 Customer connections on the manipulator ... 99

2 Specification of variants and options 103

2.1 Introduction to variants and options ... 103
2.2 Manipulator ... 104
2.3 Floor cables ... 106

Index 107

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Overview of this specification

About this product specification

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

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

The specification covers the manipulator using the OmniCore controller.

Usage

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

The specification is intended for:

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

References

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 Type B	*3HAC097281-001*
Product specification - OmniCore C line RW 7 (RobotWare 7)	*3HAC065034-001*
Product specification - OmniCore C line RobotWare 8 (RobotWare 8)	*3HAC098715-001*



Tip

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Revisions

Revision	Description
A	First edition.

Continues on next page

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Continued

Revision	Description
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.
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 69*.
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 72*.
L	Published in release 23B. The following updates are made in this revision: • Removed the stop category 0 data.
M	Published in release 23D. The following updates are made in this revision: • Minor corrections. • Updated the figures of stop category 1, axis 1, extension zone 0 for CRB 15000-12/1.27.
N	Published in release 24A. The following updates are made in this revision: • Added information for Clean room certificate. • Minor changes. • Added new option *Manipulator cable length* - 3 m [3200-1]. • Added new option *drag chain cable* - 15 m [3200-6].
P	Published in release 24B. The following updates are made in this revision: • Added support for OmniCore C30 Type A.

Continues on next page

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Revision	Description
Q	Published in release 24C. The following updates are made in this revision: • Updates images of working range and turning radius for CRB 15000-5/0.95. • Updated the flange reach for CRB 15000-10/1.52 and CRB 15000-12/1.27. • Added new Mains cable options [3203-2], [3203-3] and [3203-4].
R	Published in release 24D. The following updates are made in this revision: • Added support for the option *Ultra Accuracy*.
S	Published in release 25A. The following updates are made in this revision: • Updated load diagrams for 10 kg and 12 kg variants. • Removed the section *Wrist torque*.
T	Published in release R25.2. The following updates are made in this revision: • Changed the maximum allowed weight of loads on the arm side interface from 1 kg to 0.5 kg for CRB 15000-10/1.52 and CRB 15000-12/1.27.
U	Published in release 25.3. The following updates are made in this revision: • Company name updated to reflect current legal entities. • Updated the maximum ambient temperature for storage from 70 °C to 55 °C. • Editorial changes. • Updated portal name from myABB to ABB Robotics One.
V	Published in release 25.3. The following updates are made in this revision: • Minor corrections in section *Technical data on page 18*.
W	Published in release 26.1. The following updates are made in this revision: • Company name updated to reflect current legal entities. • Added note about combination of *Ultra accuracy* and responsive jogging. • Updated references to controller manuals. • Added support for RobotWare 8.
X	Published in release 26B. The following updates are made in this revision: • Updated descriptions about stop categories in section *Robot stopping distances and times on page 72*.
Y	Published in release 26C. The following updates are made in this revision: • Updated the minimum ambient temperature required for robot operation. • Added support for OmniCore C30 Type B controller. • Added a warning about power isolation before disconnecting the R1.MP connector. • Updated the warning of measuring the robot stopping performance. • Removed information of Mains cable options, which can be found in controller manuals.

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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, wrist reach from 0.95 m to 1.52 m (flange reach from 1.05 m to 1.63 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 15*.

CAUTION

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

Clean room certificate



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Particle emission from the robot fulfill Clean room class 4 standard according to DIN EN ISO 14644-1.

According to IPA test result, the robot CRB 15000 is suitable for use in clean room environments.

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1.1.1 Introduction
Continued

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 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, 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.

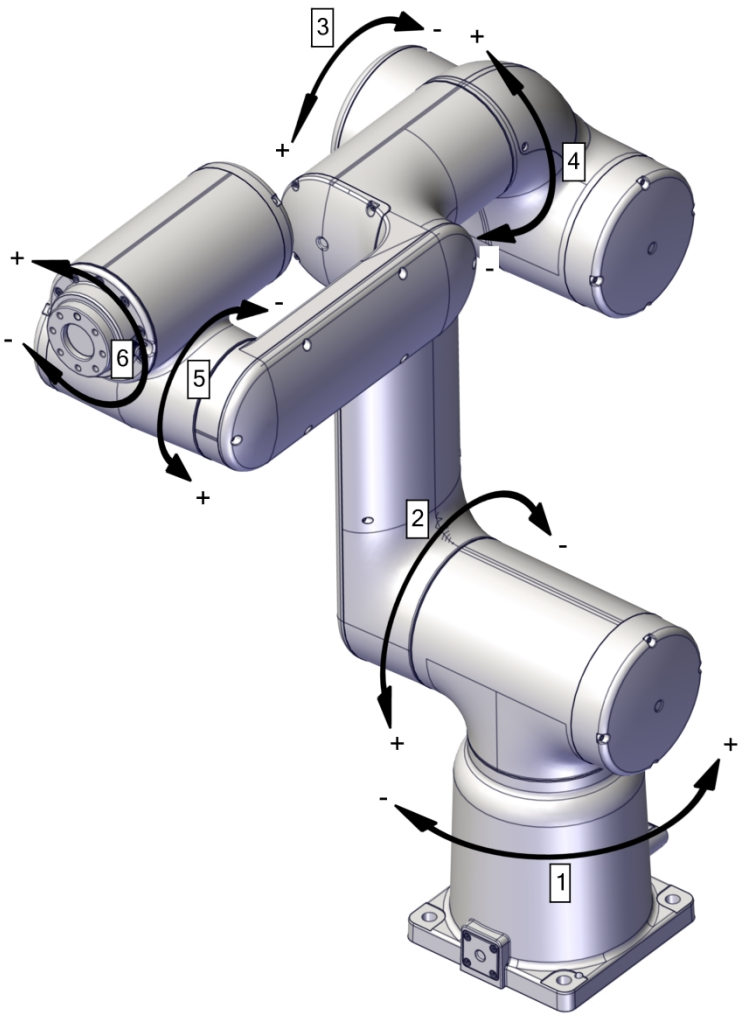
Additional functionality

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 RW 7*.

Continues on next page

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Robot axes



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

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1.1.2 Different robot variants

General

The CRB 15000 is available the following variants.

Robot type	Handling capacity	Wrist reach	Flange reach
CRB 15000-5/0.95	5 kg	0.95 m	1.05 m
CRB 15000-10/1.52	10 kg	1.52 m	1.63 m
CRB 15000-12/1.27	12 kg	1.27 m	1.38 m

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1.2 Standards

1.2.1 Applicable standards

General

This product is designed according to the global product standard ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, 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 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
IEC 61326-3-1	Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications
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

Standard	Description
UL 1740 (option) CSA Z434 (option)	Standards For Safety - Robots and Robotic Equipment Industrial robots and robot Systems - General safety requirements Valid for USA and Canada.

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1.2.1 Applicable standards
Continued

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.

Requirement	Deviation for CRB 15000	Motivation
§5.3.5 Single point of control.	The arm side interface can be overridden in automatic mode.	The CRB 15000 robot is intended for collaborative applications where contact between robot and the operator is harmless.

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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 Type B*.

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 ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Extra loads

See *Fitting equipment on the robot (robot dimensions) on page 28*.

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 36*. 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 Type B*, 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.

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1.3.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight
CRB 15000-5/0.95	28 kg
CRB 15000-10/1.52	51 kg
CRB 15000-12/1.27	48 kg

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.

Mounting position	Installation angle
Floor mounted	0°
Wall mounted	Any angle
Suspended	180°

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.

On robots running RobotWare 8, it is also possible to configure the mounting position on the FlexPendant, see the integrator's guide for the controller.

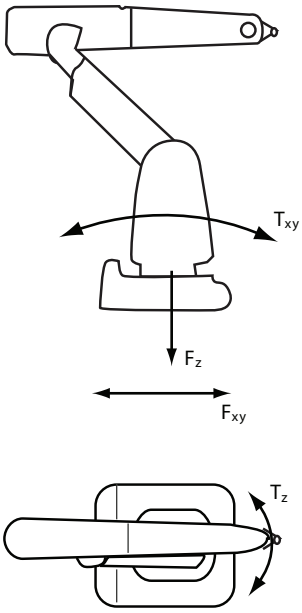
Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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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

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)		
	-5/0.95	-10/1.52	-12/1.27	-5/0.95	-10/1.52	-12/1.27
Force xy	±303 N	±500 N	±470 N	±1113 N	±1480 N	±1470 N
Force z	+280 ±147 N	+510 ±410 N	+480 ±440 N	+280 ±857 N	+510 ±840 N	+480 ±860 N
Torque xy	±246 Nm	±590 Nm	±570 Nm	±711 Nm	±1,380 Nm	±1,220 Nm
Torque z	±145 Nm	±210 Nm	±220 Nm	±334 Nm	±720 Nm	±700 Nm

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1.3.2 Technical data
Continued

Wall mounted

Force	Endurance load (in operation)			Maximum load (emergency stop)		
	-5/0.95	-10/1.52	-12/1.27	-5/0.95	-10/1.52	-12/1.27
Force xy	+280 ±130 N	+510 ±370 N	+480 ±450 N	+280 ±1000 N	+510 ±1230 N	+480 ±1270 N
Force z	±289 N	±400 N	±400 N	±944 N	±1170 N	±1180 N
Torque xy	±275 Nm	±680 Nm	±690 Nm	±768 Nm	±1,510 Nm	±1,360 Nm
Torque z	±162 Nm	±420 Nm	±370 Nm	±338 Nm	±720 Nm	±700 Nm

Suspended

Force	Endurance load (in operation)			Maximum load (emergency stop)		
	-5/0.95	-10/1.52	-12/1.27	-5/0.95	-10/1.52	-12/1.27
Force xy	±303 N	±500 N	±470 N	±1113 N	±1480 N	±1470 N
Force z	-280 ±147 N	-510 ±410 N	-480 ±440 N	-280 ±857 N	-510 ±840 N	-480 ±860 N
Torque xy	±246 Nm	±590 Nm	±570 Nm	±711 Nm	±1,380 Nm	±1,220 Nm
Torque z	±145 Nm	±210 Nm	±220 Nm	±334 Nm	±720 Nm	±700 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. 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 / ultra accuracy.
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 the description of *Motion Process Mode* in the manual that describes the controller software option, see *References on page 7*.
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

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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	55 °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	0 °C / 5 °C [i]
Maximum ambient temperature	40 °C [ii] / 45 °C [iii]
Maximum ambient humidity	<75% relative humidity For limited period of time (<1 month): <95% relative humidity [iv]
Maximum ambient altitude	0-2,000 m (100-84 kPa)

i For robots running RobotWare 8.2 or later, operation at ambient temperatures down to 0 °C is supported.

At ambient temperatures of less than 10 °C , it is recommended to warm up the robot, as with any other machine. Otherwise, there is a risk that the higher lubrication viscosity will cause the robot to stop with the event log message "50204, Motion supervision" and/or to run with lower performance.

For details about the warm-up procedure, see *Product manual - CRB 15000*.

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.

Protection type	Protection class [i]
Manipulator, protection type Standard (CRB 15000-5/0.95)	IP54 Type 12k [ii] NEMA 12k [iii]
Manipulator, protection type Standard (CRB 15000-10/1.52 and CRB 15000-12/1.27)	IP67

i According to IEC 60529.

ii According to UL50/UL50E, CSA C22.2 No 94.2-15.

iii According to NEMA 250.

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1.3.2 Technical data
Continued

Clean room suitability, robot

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

Protection type	Protection class
Manipulator, suitability class (protection type Standard)	ISO Class 4 [i]

[i] According to ISO 14644-1 / ISO 14644-14.

Harsh environment

The manipulator complies with the following harsh environment.

Parameter	According to
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 (H_2S): 50 ppb
- Nitrogen dioxide (NO_2): 1,250 ppb
- Chlorine (Cl_2): 10 ppb
- Sulphur dioxide (SO_2): 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.

Axis	Maximum joint torque		
	CRB 15000-5/0.95	CRB 15000-10/1.52	CRB 15000-12/1.27
1	175.44 Nm	450 Nm	390 Nm
2	175.44 Nm	400 Nm	400 Nm
3	90.6 Nm	160 Nm	160 Nm
4	18.72 Nm	60 Nm	60 Nm
5	21.44 Nm	60 Nm	60 Nm
6	9.2 Nm	60 Nm	60 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

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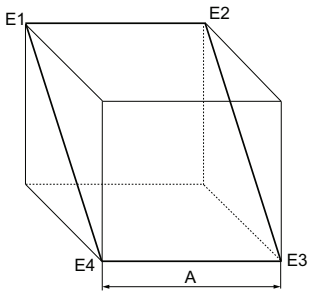
Power consumption at max load

Note

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

Type of movement	CRB 15000 (all variants)
ISO Cube Max. velocity	0.25 kW

Robot in calibration position	CRB 15000 (all variants)
Brakes engaged	0.14 kW
Brakes disengaged	0.10 kW



xx1000000101

Pos	Description
A	400 mm

Explosive environments

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

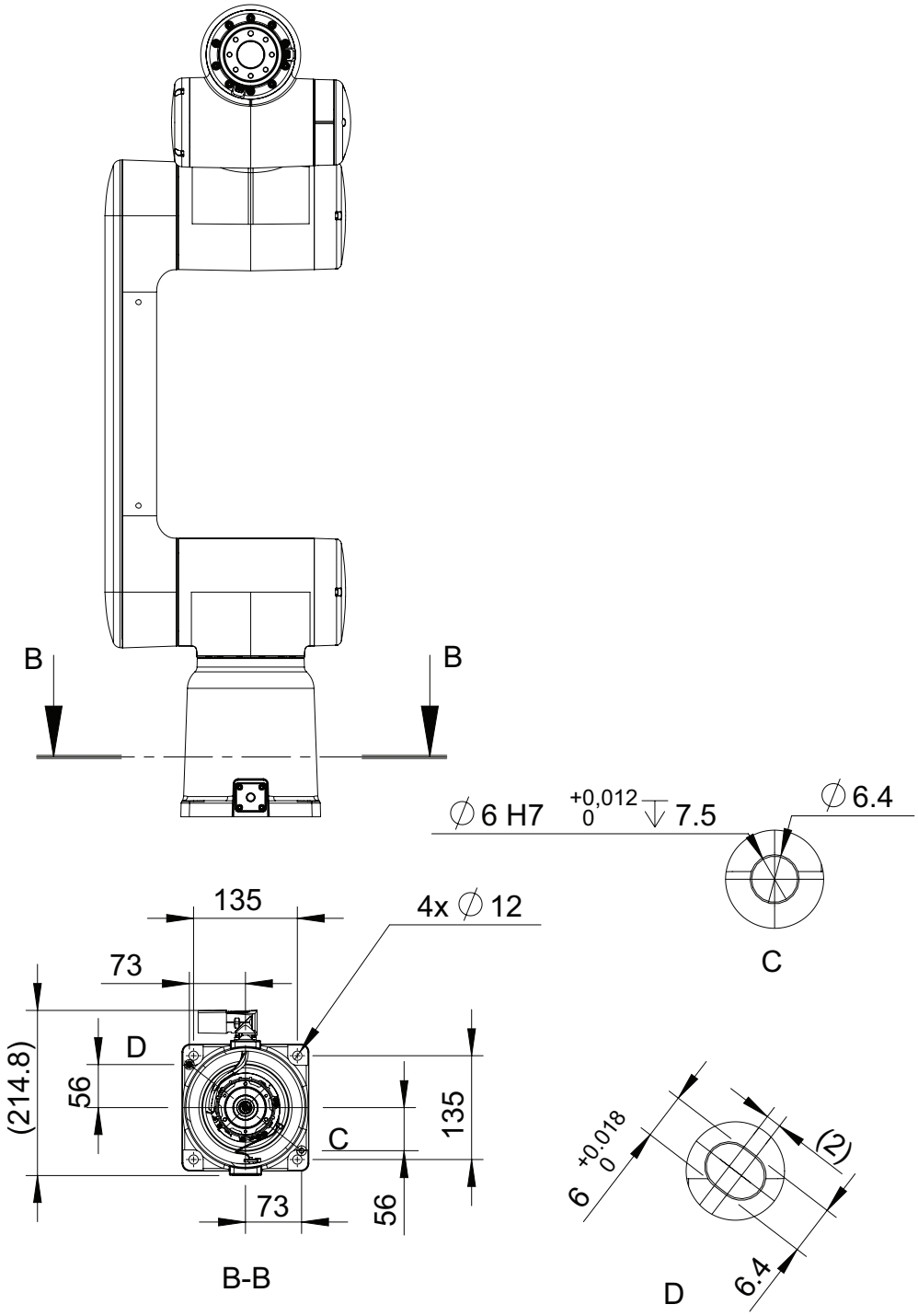
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1.3.3 Hole configuration and attachment screws

Hole configuration, base

CRB 15000-5/0.95

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



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C	Circular hole for locating pin

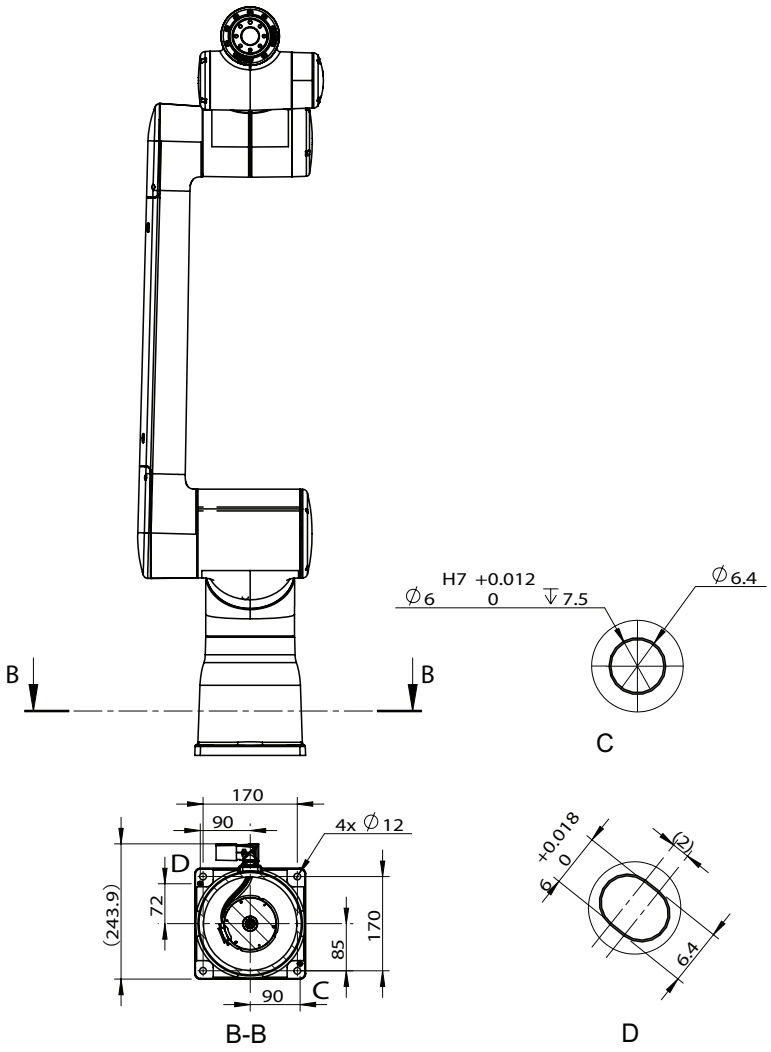
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D	Elongated hole for locating pin

CRB 15000-10/1.52

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



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

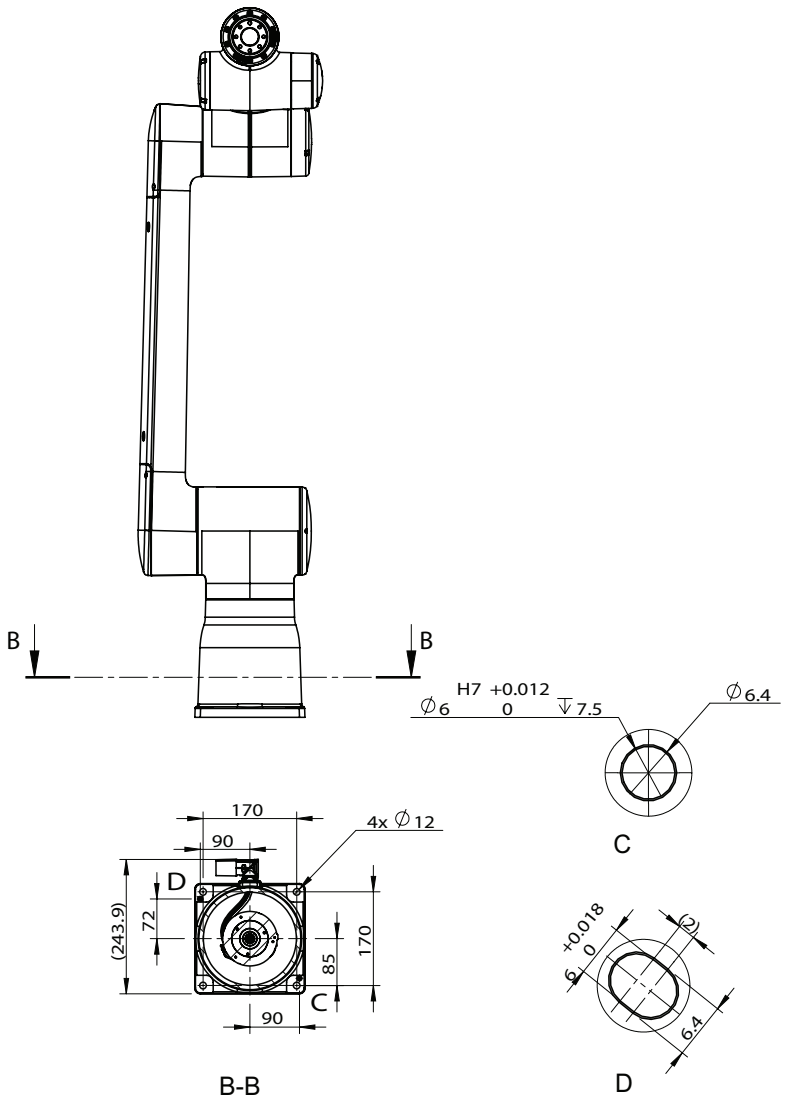
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1.3.3 Hole configuration and attachment screws
Continued

CRB 15000-12/1.27

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



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

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

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Suitable washer	23/10.5/2.5 mm Steel
Guide pins	DIN6325, hardened steel Ø6x24 mm, 2 pcs
Tightening torque	32 Nm ±10%
Length of thread engagement	Minimum 15 mm for ground with material yield strength 150 MPa
Level surface requirements	0.1/500 mm

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1.3.4 Fitting equipment on the robot (robot dimensions)

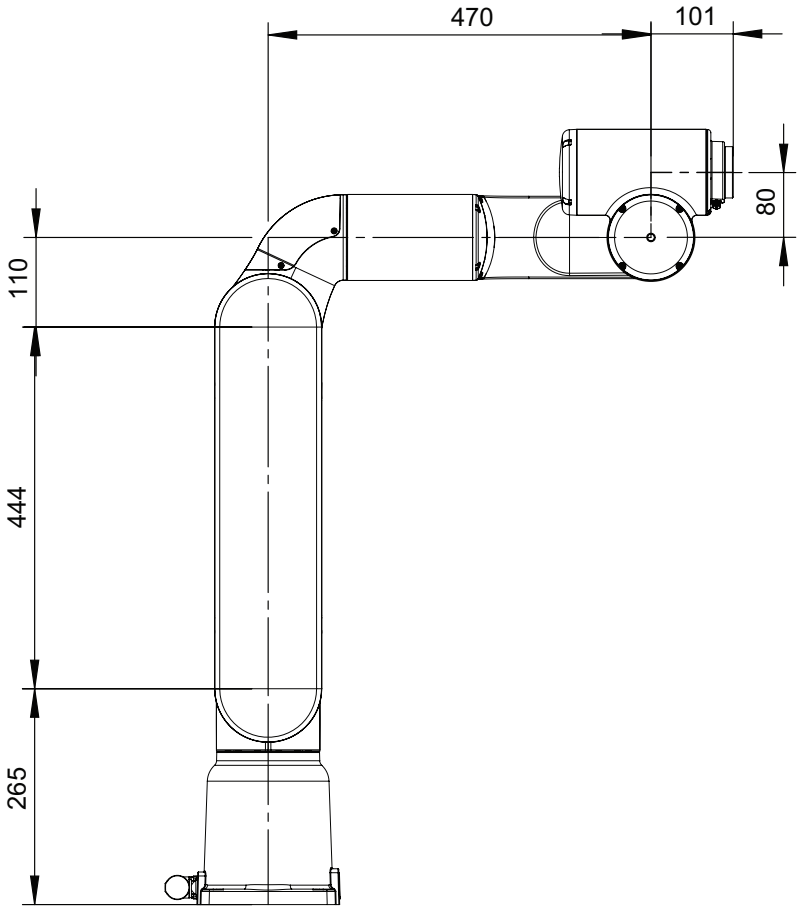
Note

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

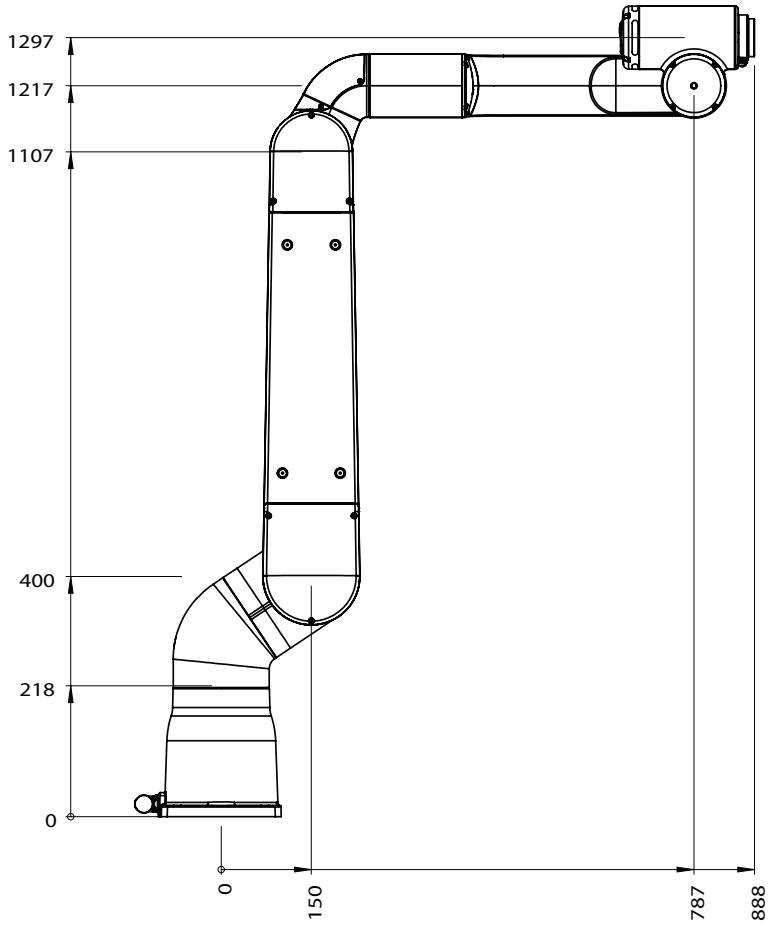


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CRB 15000-10/1.52

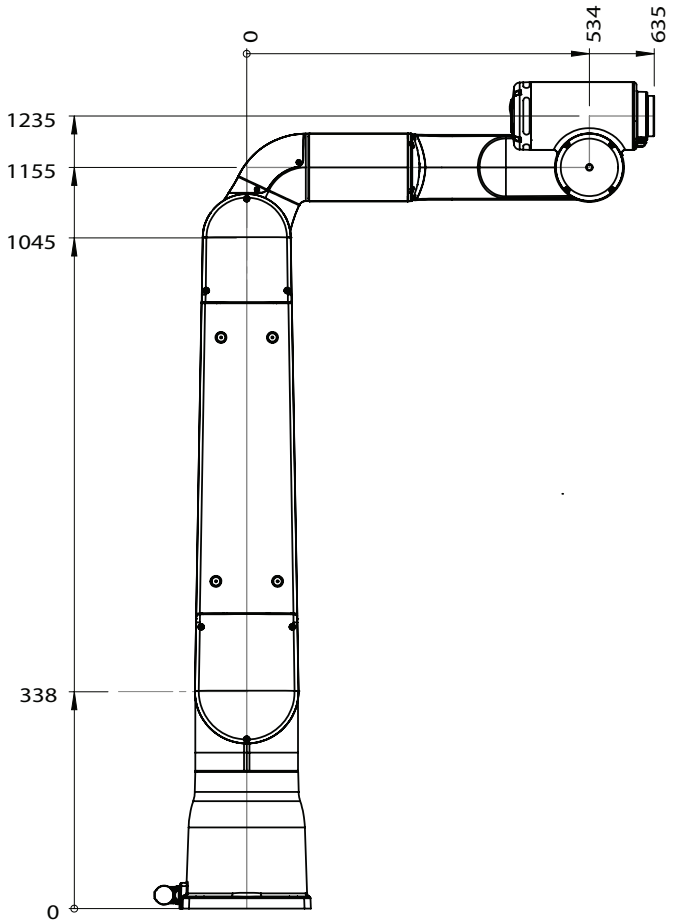


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1.3.4 Fitting equipment on the robot (robot dimensions)
Continued



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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.

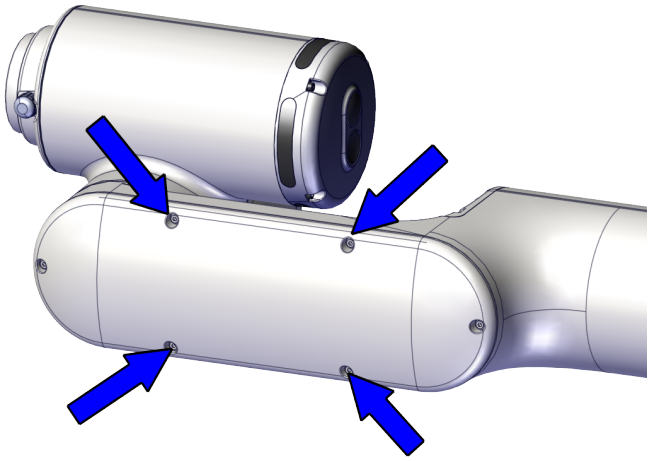
Upper arm

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

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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).



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Definitions of dimensions and masses are shown in *Holes for fitting extra equipment on page 32*. Requirements on hex spacers are shown in *Fastener quality for hex spacers on page 34*.

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.

- The armload interface can handle loads up to 1 kg on CRB 15000-5/0.95, CRB 15000-10/1.52 and CRB 15000-12/1.27. This includes the weight of the cabling, tools, and workpiece (if lifted).

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1.3.4 Fitting equipment on the robot (robot dimensions)
Continued

Note

When the arm load is defined, the maximum payload capacity may be reduced in certain poses. To verify a specific load case, use the RobotStudio add-in RobotLoad. The result from RobotLoad is only valid within the maximum loads. There is no warning if the maximum permitted arm load is exceeded. For overload cases and special applications, contact ABB for further analysis.

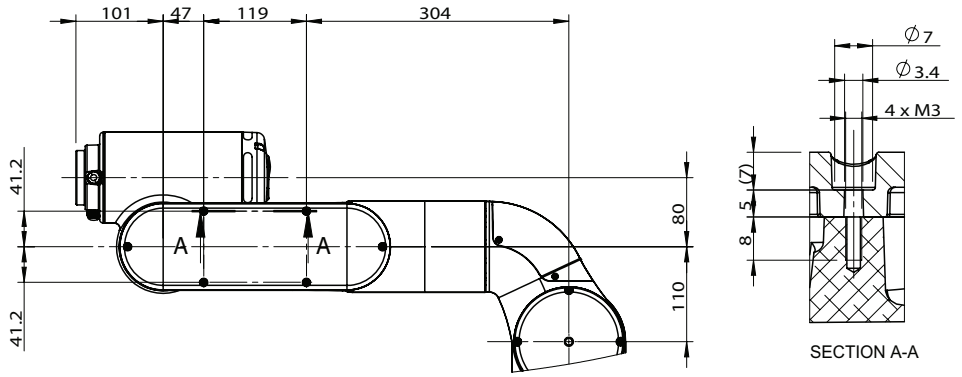
Housing and lower arm

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 32*.

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.

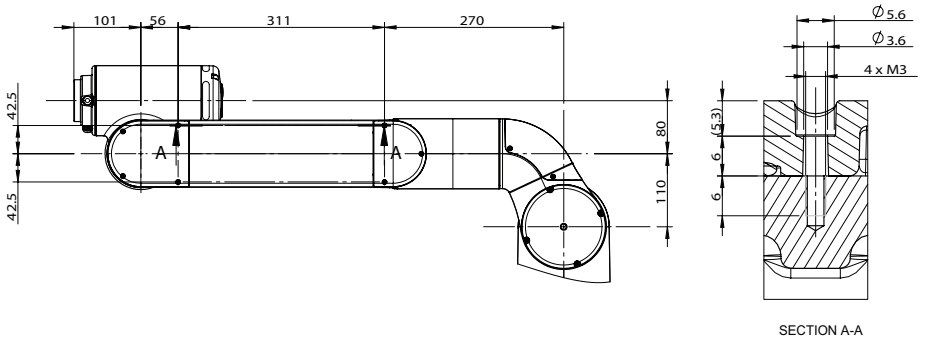
Holes for fitting extra equipment

Upper arm, CRB 15000-5/0.95



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Upper arm, CRB 15000-10/1.52

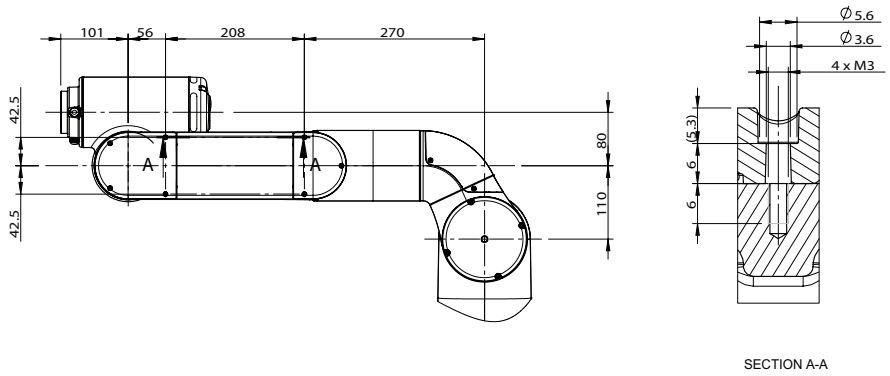


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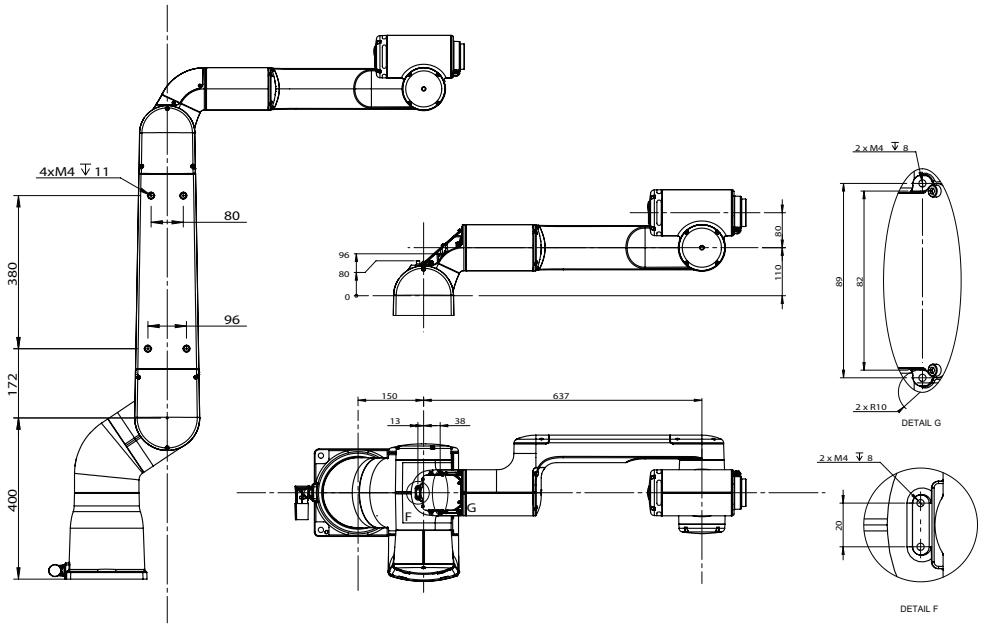
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Upper arm, CRB 15000-12/1.27



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Housing and lower arm, CRB 15000-10/1.52



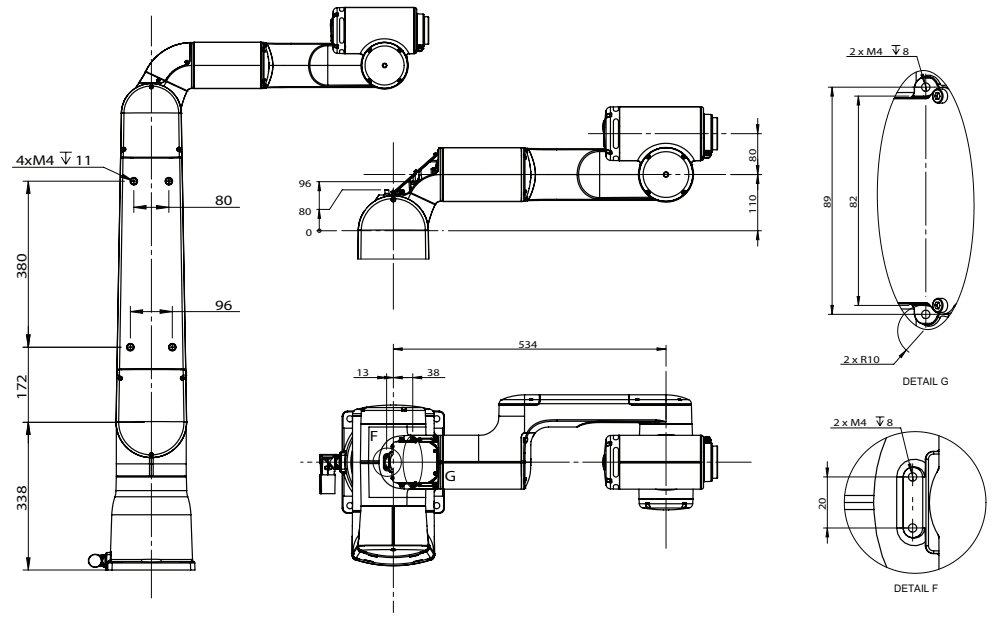
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1.3.4 Fitting equipment on the robot (robot dimensions)
Continued

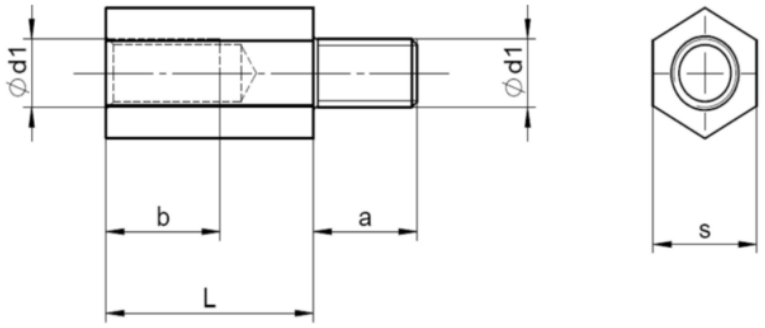
Housing and lower arm, CRB 15000-12/1.27



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Fastener quality for hex spacers

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



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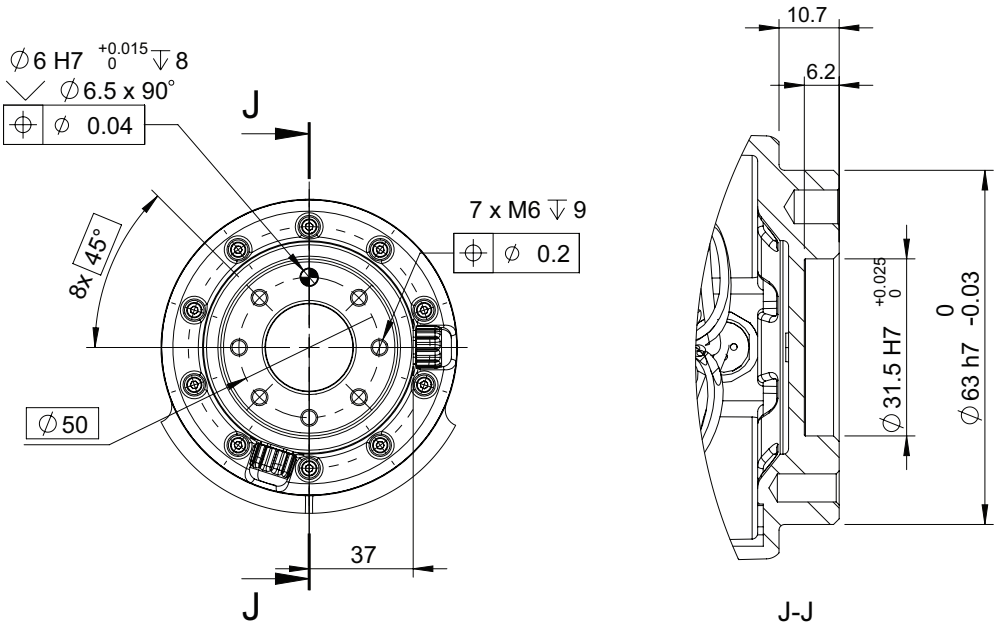
	CRB 15000-5/0.95	CRB 15000-10/1.52 CRB 15000-12/1.27
Material	Stainless steel 4.8, or higher	Stainless steel 4.8, or higher
Tightening torque	0.6 Nm+/-5%	0.6 Nm+/-5%
Minimum thread length (a)	8 mm	10 mm
Thread length (b)	8 mm	10 mm
Screw head width (S)	5 mm	5 mm
Length (L)	18 mm	25 mm

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	CRB 15000-5/0.95	CRB 15000-10/1.52 CRB 15000-12/1.27
Example of suitable hex spacer	Bossard, article number: 304318041152 Keystone, article number: 24289~24294	Bossard, article number: 304325041152 Bossard, article number: 304330041152

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.

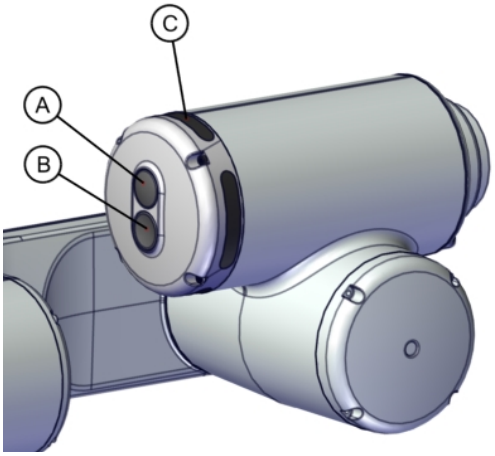
Also note the thread depth on the tool flange. Using too long screws may damage the tool flange and cause the tool to be improperly fastened, which is a safety hazard.

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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

Arm-side interface buttons can be used only when the FlexPendant is connected and has write access. When connected, the arm-side interface functions as an extension of the local control station. The connectors and light ring on the arm-side interface operate regardless of the FlexPendant connection and write access.

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*.

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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 in the OmniCore UI.

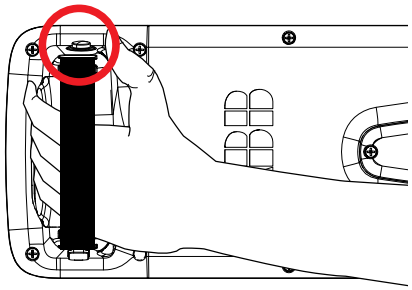
Using lead-through, you can grab the robot arm and move it manually to a desired position, as an alternative to jogging.

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**
>
> Lead-through can only be enabled when the teach pendant has write access. See *Operating manual - Integrator's guide* and the product manual for the robot.

> **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.

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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.
>
> If varying loads from cables and other disturbances are causing the robot to drift during lead-through,
>
> - For the GoFa, 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*.
> - For the PoWa, this can often be increasing *Lead through load compensation deadband*. See *Technical reference manual - System parameters*, section *Motion*, type *Arm*.
>
> 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*.

> **Note**
>
> For Yumi robots with SafeMove, some different behaviors apply, see the product manual for the robot.

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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 the robot.

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

1. In the Lead-through page select the 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.

Differences in behavior between software versions

How to enable lead-through has changed between different versions of RobotWare and the FlexPendant software. From FlexPendant version 1.22.0, distributed with RobotWare 7.21, lead-through is enabled with just press and release. This behavior is used also with older versions of RobotWare 7. From RobotWare 8, lead-through cannot be enabled from arm-side interface but only from FlexPendant with write access.

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.

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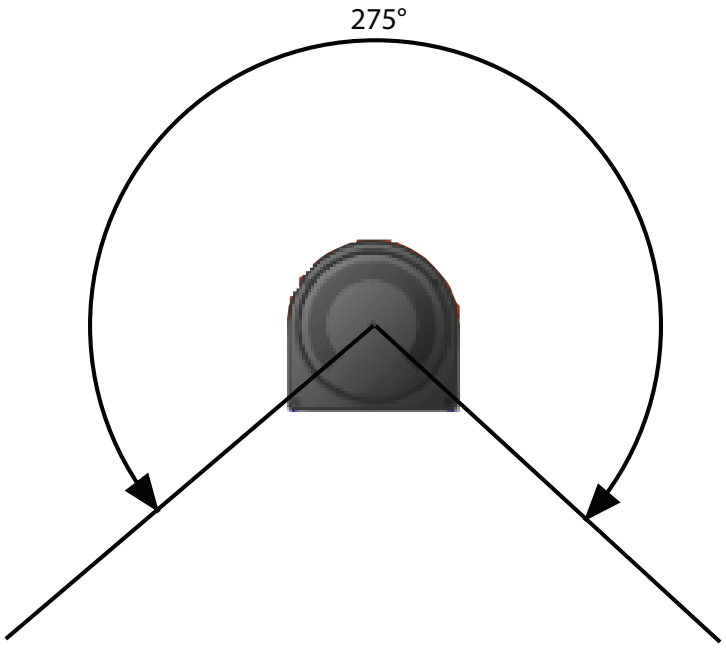
1.3.7 Installation of laser scanner

Overview

ABB provides safety separation and speed control functions to CRB 15000 by installing the Collaborative Speed Control add-in in the robot system and connecting the robot with one or two safety laser scanners. The 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 PROFIsafe-based laser scanner (option 3051-1 PROFIsafe scanner)
- 2 PROFIsafe-based laser scanners (option 3051-3 Dual PROFIsafe scanner)
- 1 Safety IO-based laser scanner (option 3051-2 I/O scanner)
- 2 Safety IO-based laser scanners (option 3051-4 Dual I/O scanner)

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Connection between PROFIsafe-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] PROFIsafe 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 (PROFIsafe) network. Users need to prepare a safety PLC of their own.
- If options [3020-1] PROFINET Controller and [3023-1] PROFIsafe Controller are selected and installed, the laser scanner could communicate with the OmniCore controller directly via the LAN port.

Safety IO-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 Safety IO-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.

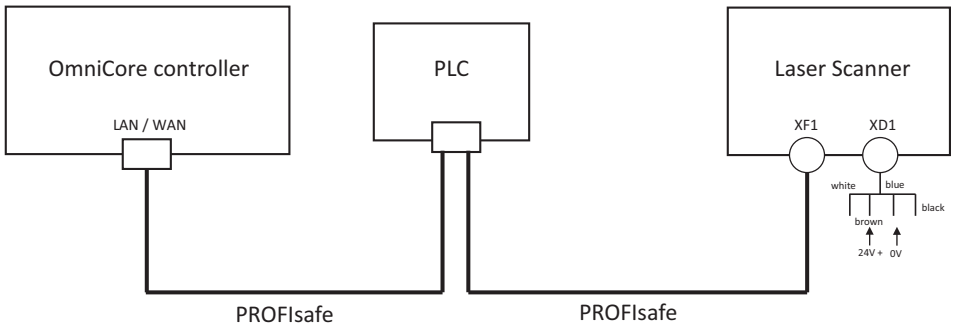
For more details and safety information for the safety laser scanners, see *Operating instructions microScan3 - PROFINET* and *Operating instructions microScan3 - Pro I/O* from the vendor, which are available on *SICK®* website.

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



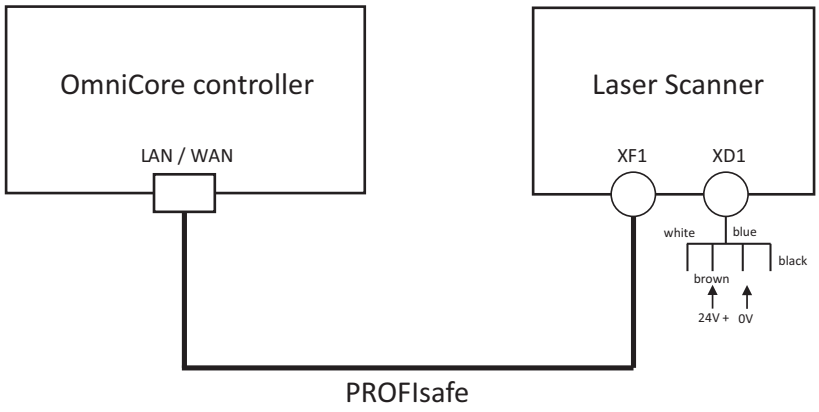
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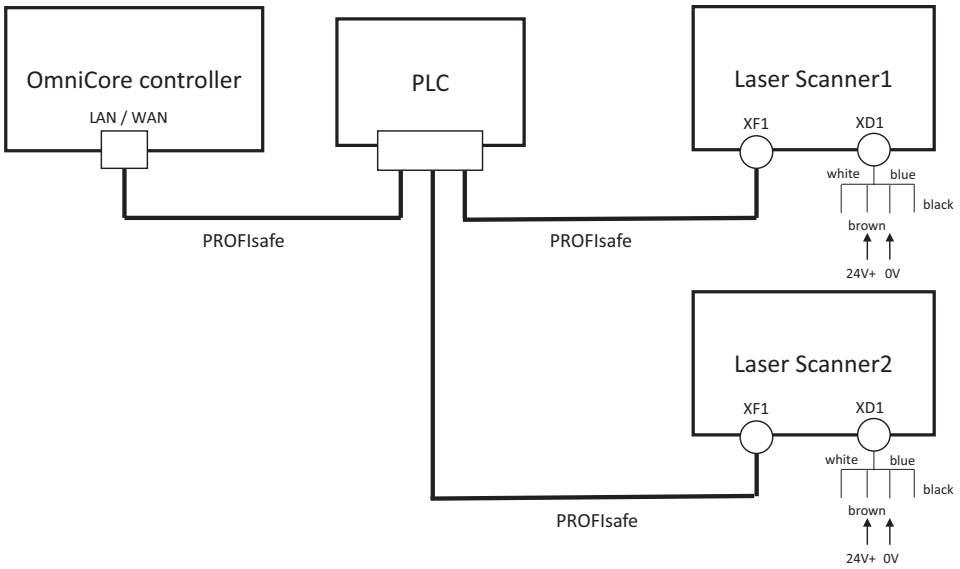
1.3.7 Installation of laser scanner
Continued

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



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

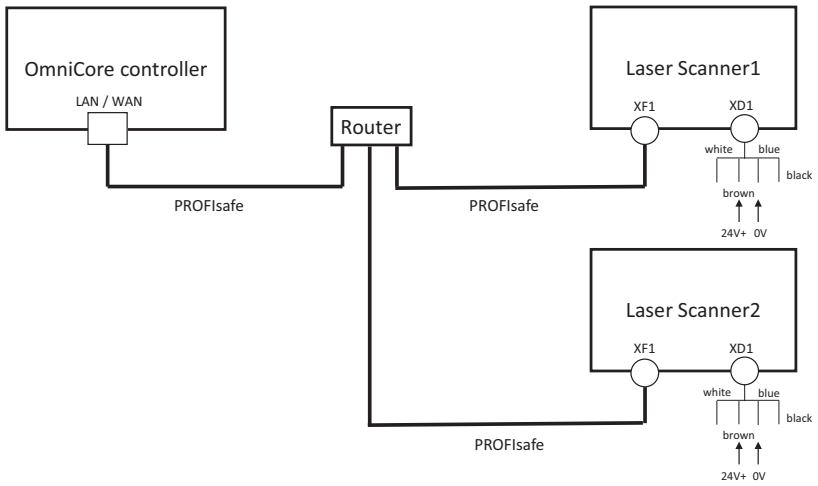


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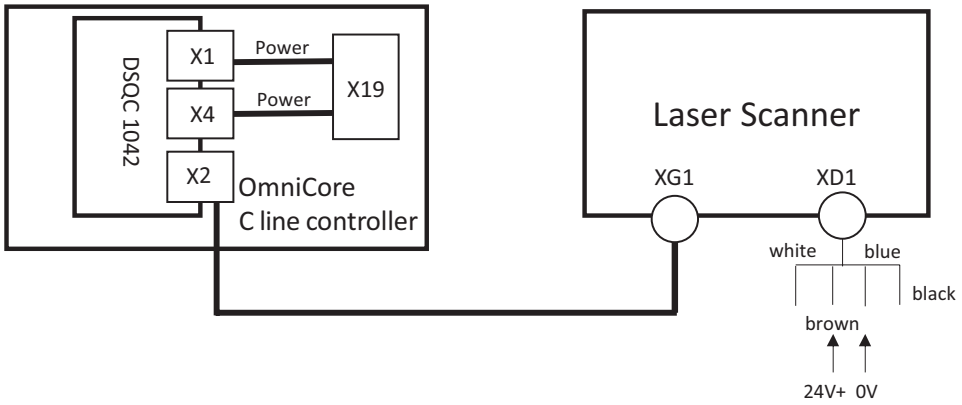
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2 PROFIsafe-based laser scanners (option 3051-3), without PLC connected



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1 SafetyIO-based laser scanner (option 3051-2), with OmniCore C line controller



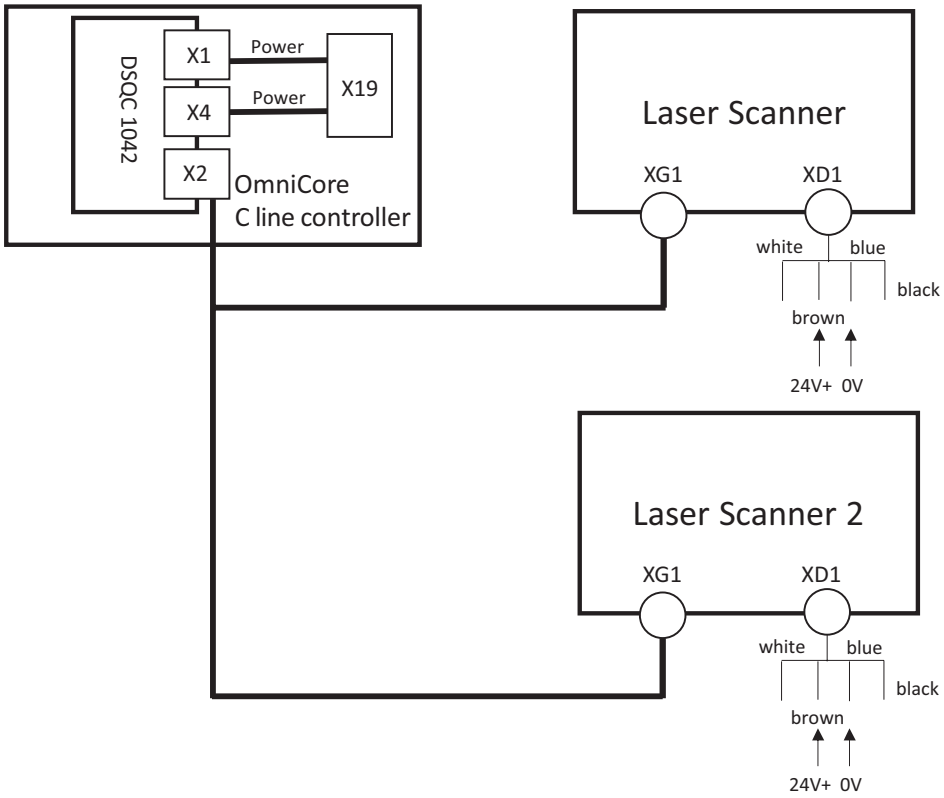
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1.3.7 Installation of laser scanner
Continued

2 SafetyIO-based laser scanners (option 3051-4), with OmniCore C line controller



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Note

When connecting to an OmniCore C line controller, if there are insufficient power supply connections available on the X19 connector, connect X4 to an external 24 V power supply.

Note

For PROFIsafe-based laser scanner, if working with the CRB 15000 installed with a Collaborative Speed Control add-in in a version 1.2.1 or earlier, the scanners should connect to the WAN port on the controller.

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*.

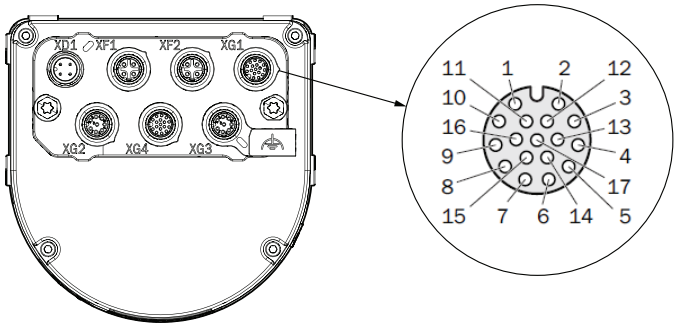
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Connector information

Pin assignment on XG1 of Safety IO-based laser scanners

XG1 connector on Safety IO-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.



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

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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.

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
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
Safety IO-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 *Application manual - Collaborative Speed Control add-in*.

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1.4 Calibrating the robot

1.4.1 Calibration methods and when to calibrate

Types of calibration

Type of calibration	Description	Calibration method
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
Ultra accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Ultra accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Ultra accuracy option is available to the CRB 15000. The purpose is to improve precision with path accuracy and absolute position accuracy even further. A robot calibrated with Ultra accuracy has the option information printed on its name plate (OmniCore). To regain 100% Ultra accuracy performance, the robot must be recalibrated for ultra accuracy after repair or maintenance that affects the mechanical structure. **Note** Responsive jogging is not supported when Ultra Accuracy is active.	CalibWare
Torque sensor calibration	The CRB 15000 torque sensors are calibrated with the service routine *TorqueSensorCal*. No external calibration tools are required. The calibration method for the robot consists of calibrating the joint unit torque sensors, which are installed to monitor and measure the joint torque.	Torque sensor calibration

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1.4.1 Calibration methods and when to calibrate
Continued

Type of calibration	Description	Calibration method
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. **Note** For advanced users, it is also possible to do the wrist optimization using the RAPID instruction `WristOpt`, see *Technical reference manual - RAPID Instructions, Functions and Data types*. This instruction is only available for OmniCore robots.	Wrist Optimization

Brief description of calibration methods

Torque sensor calibration

The torque sensor in a joint unit 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.
- 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 service routine only works on floor mounted robots.

Tip

When designing the robot cell, run the torque sensor service 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 / Ultra 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*.

Continues on next page

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If a service operation is done to a robot with the option Absolute Accuracy or Ultra Accuracy, a new absolute accuracy calibration / ultra 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 / Ultra 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 / ultra accuracy.

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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, for example, vision systems 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.

Note

Singularities might appear in slightly different positions on a real robot compared to RobotStudio, where *Absolute Accuracy* is off compared to the real controller.

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.

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Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

- Any motion function based on robtargets (e.g. `MoveL`) and ModPos on robtargets
- Reorientation jogging
- Linear jogging
- Tool definition (4, 5, 6 point tool definition, room fixed TCP, stationary tool)
- Work object definition

Absolute Accuracy not active

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

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

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

RAPID instructions

There are no RAPID instructions included in this option.

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1.4.3 Ultra accuracy calibration

Purpose

Ultra Accuracy is a control concept for GoFa CRB 15000 robots that improves the TCP path accuracy even further.

Here are some examples of when this kind of accuracy is important:

- Gluing extremely small electronics components.
- Laser welding of car body parts in automotive.
- Positioning of composite material layup in aircraft manufacturing.
- High fidelity 3D printing.
- High precision laser cutting of small metal shapes.

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

Note

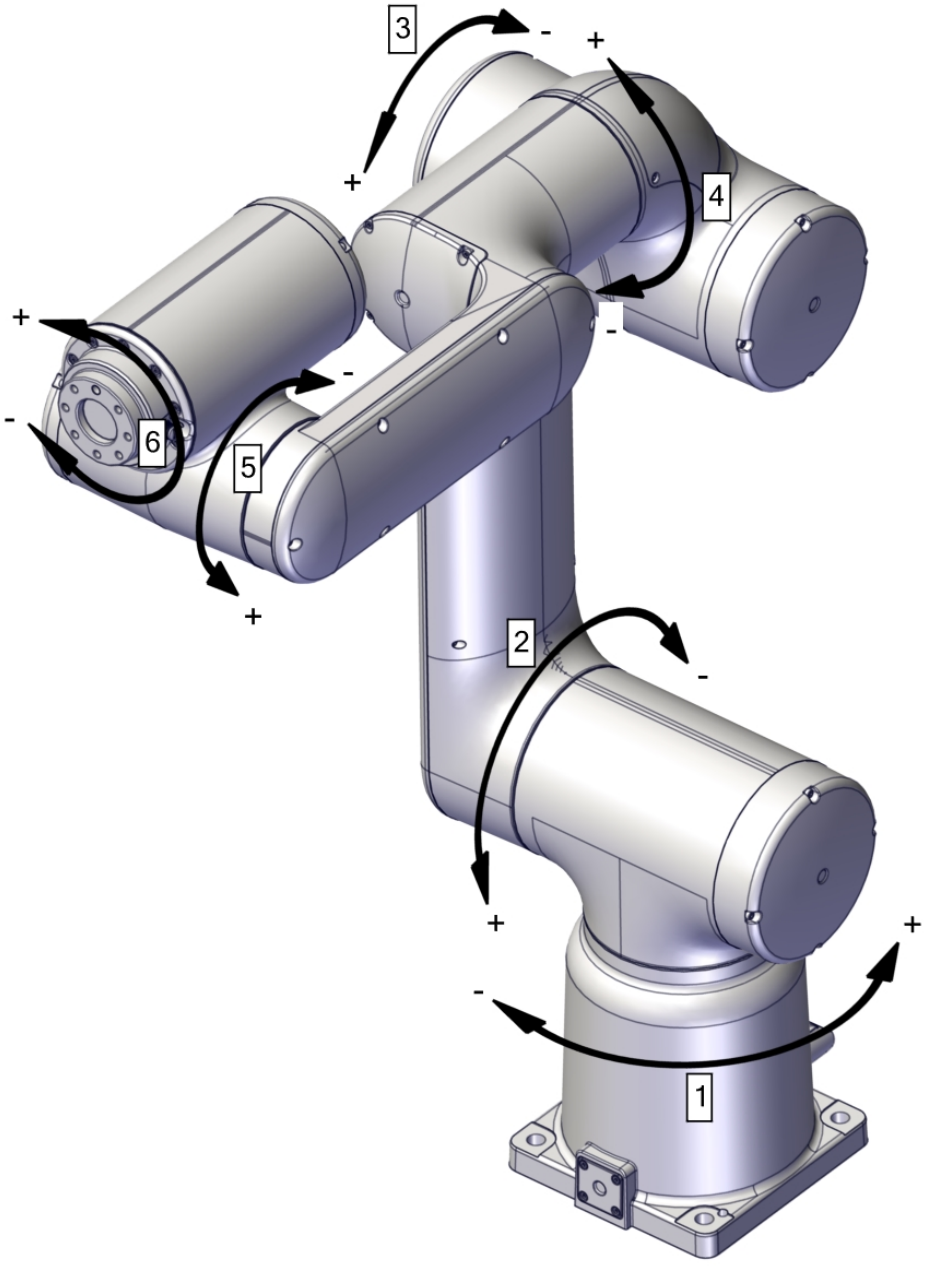
The performance data is applicable to the corresponding RobotWare version of the individual robot.

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1.4.4 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 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.

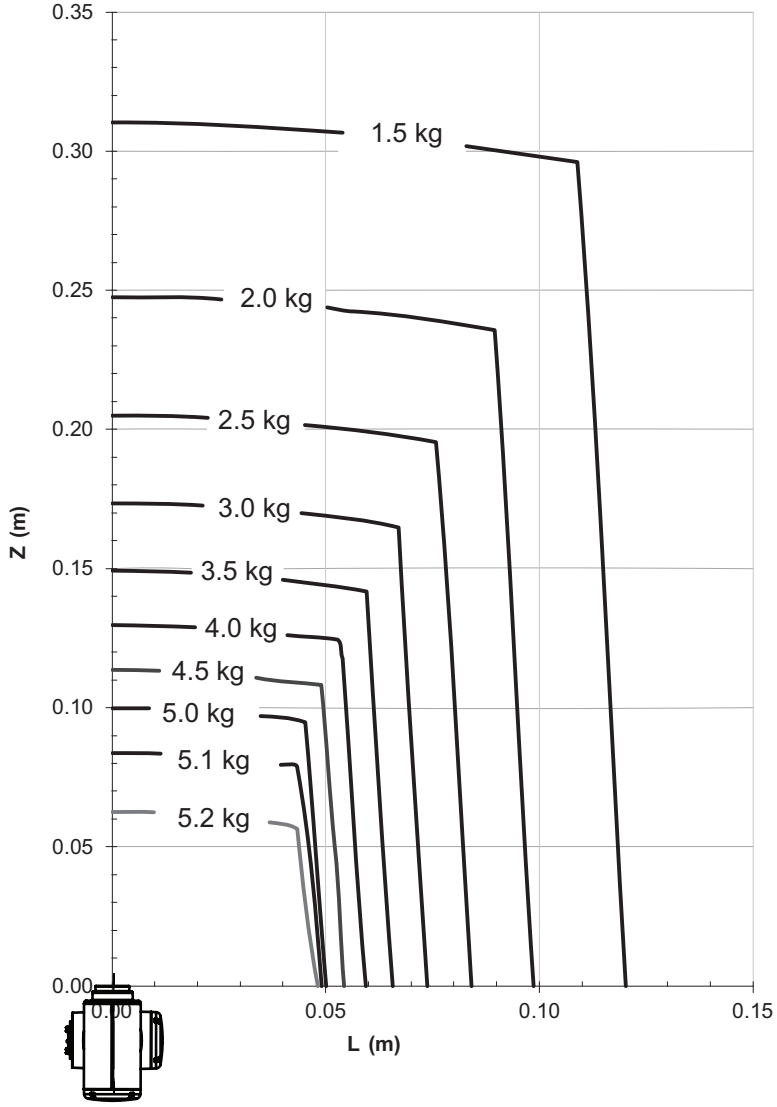
At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid.

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

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1.5.2 Diagrams

CRB 15000-5/0.95

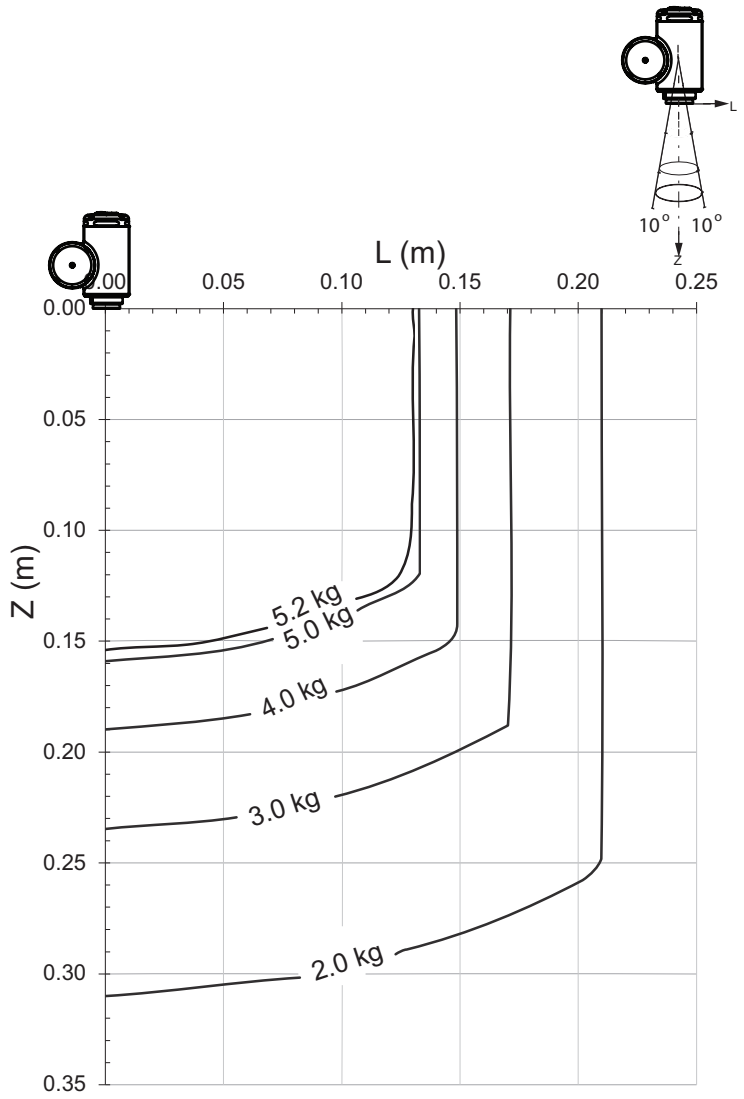


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1.5.2 Diagrams
Continued

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



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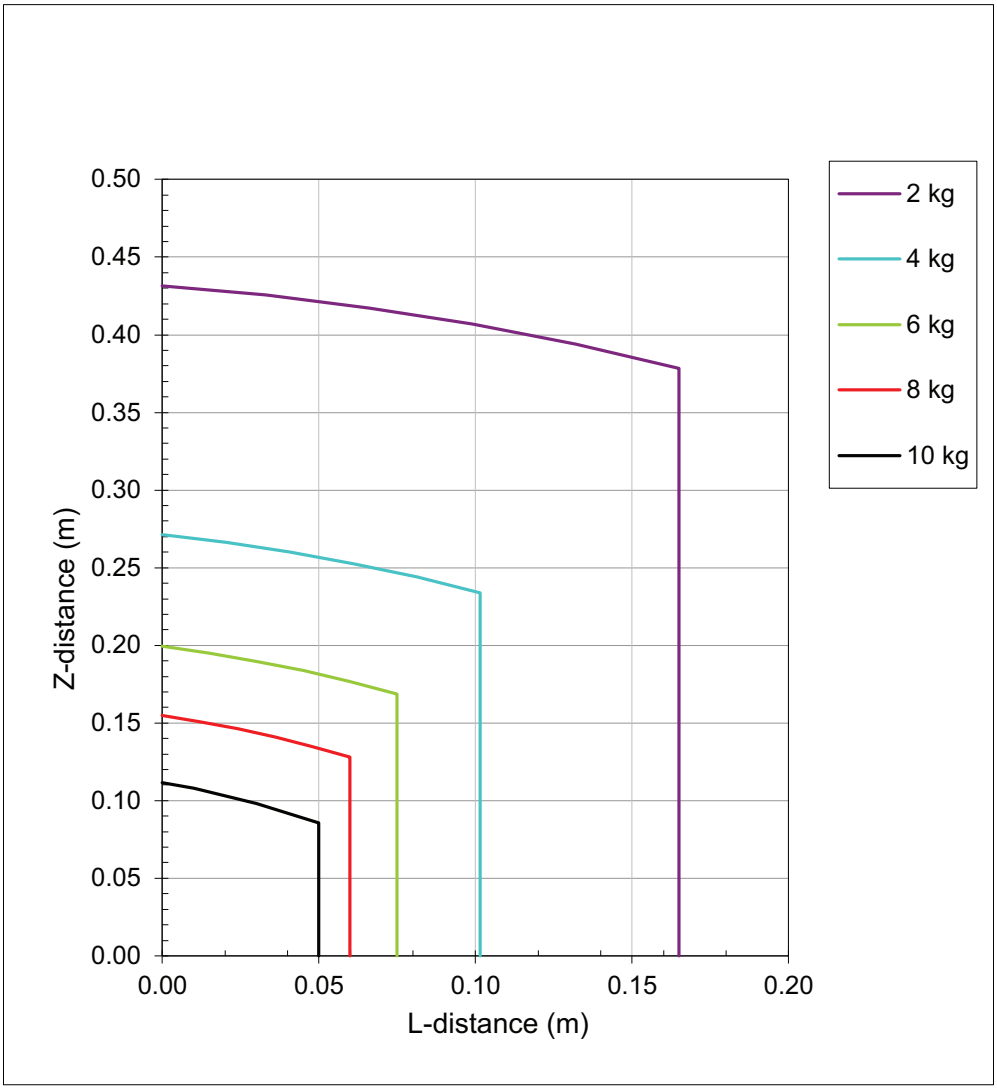
For wrist down (0° deviation from the vertical line).

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

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CRB 15000-10/1.52



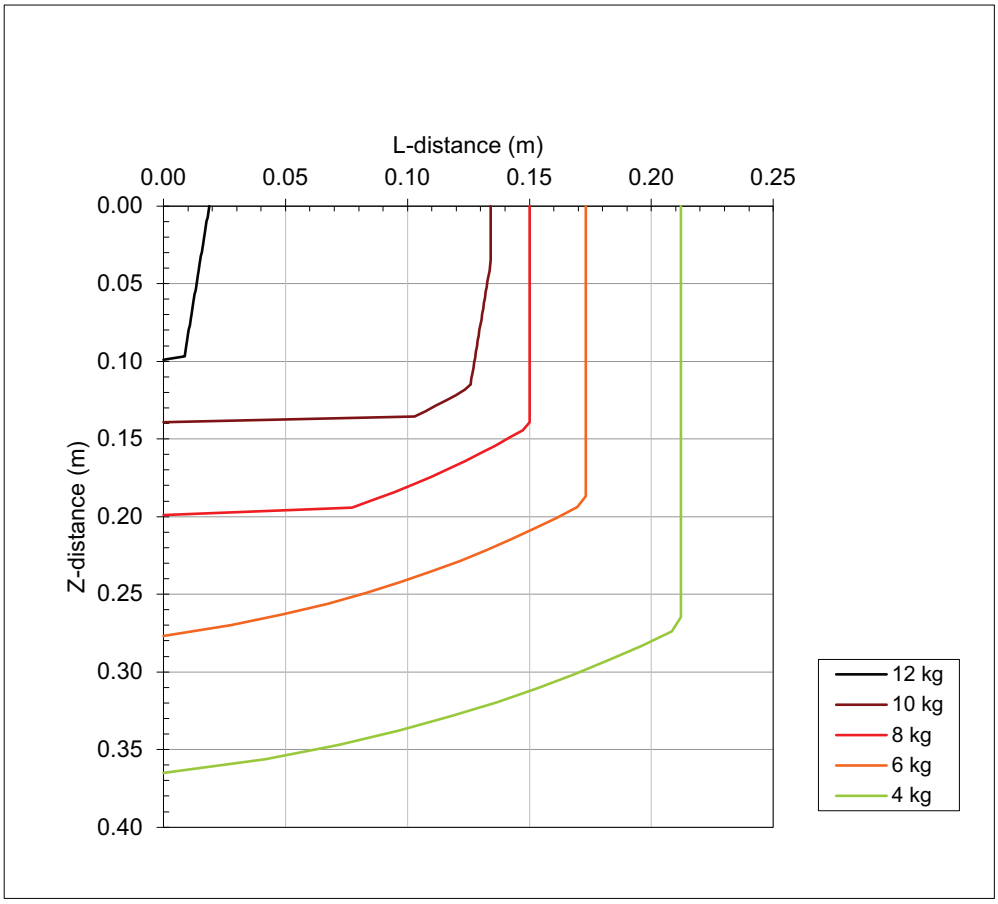
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1.5.2 Diagrams
Continued

CRB 15000-10/1.52 "Vertical wrist" (±5°)



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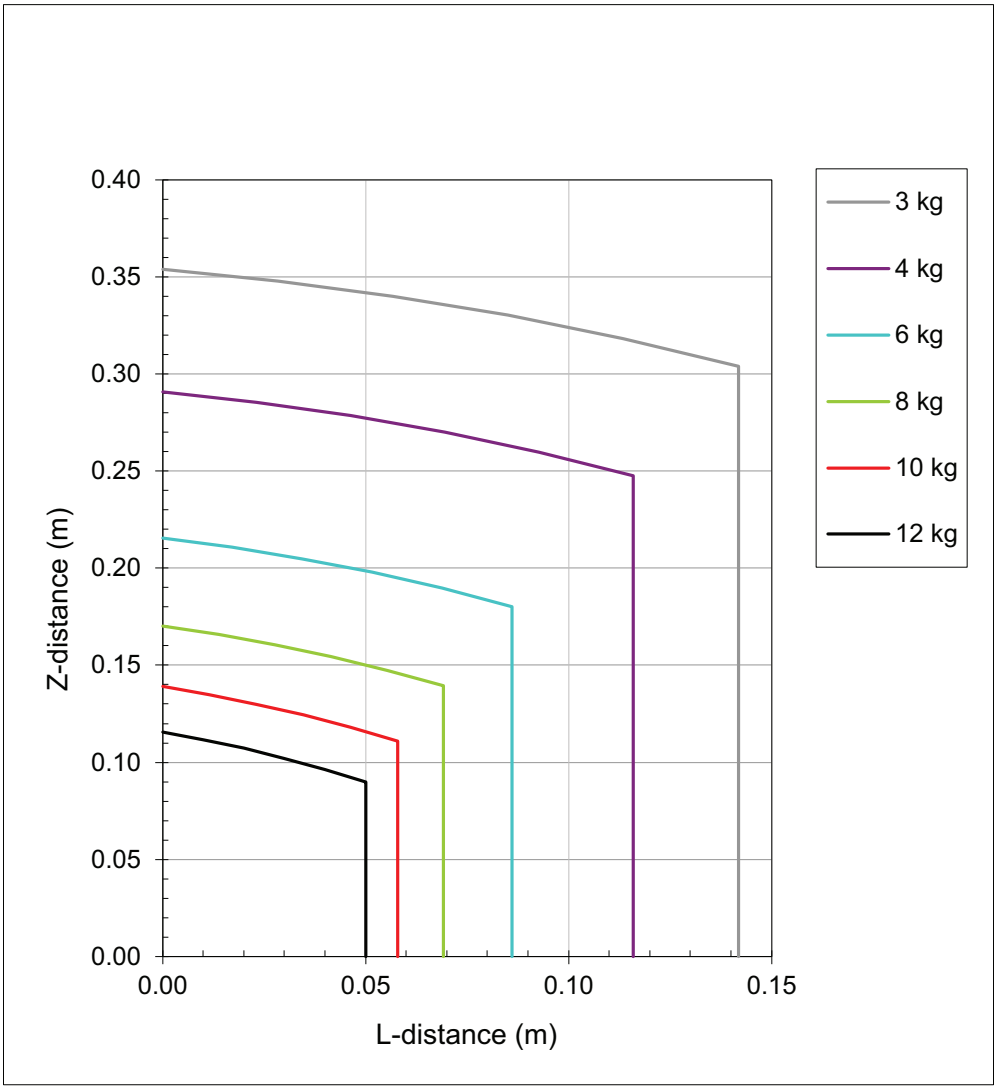
For wrist down (0° deviation from the vertical line).

	Description
Max load	12 kg
Z_{max}	0.099 m
L_{max}	0.019 m

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CRB 15000-12/1.27



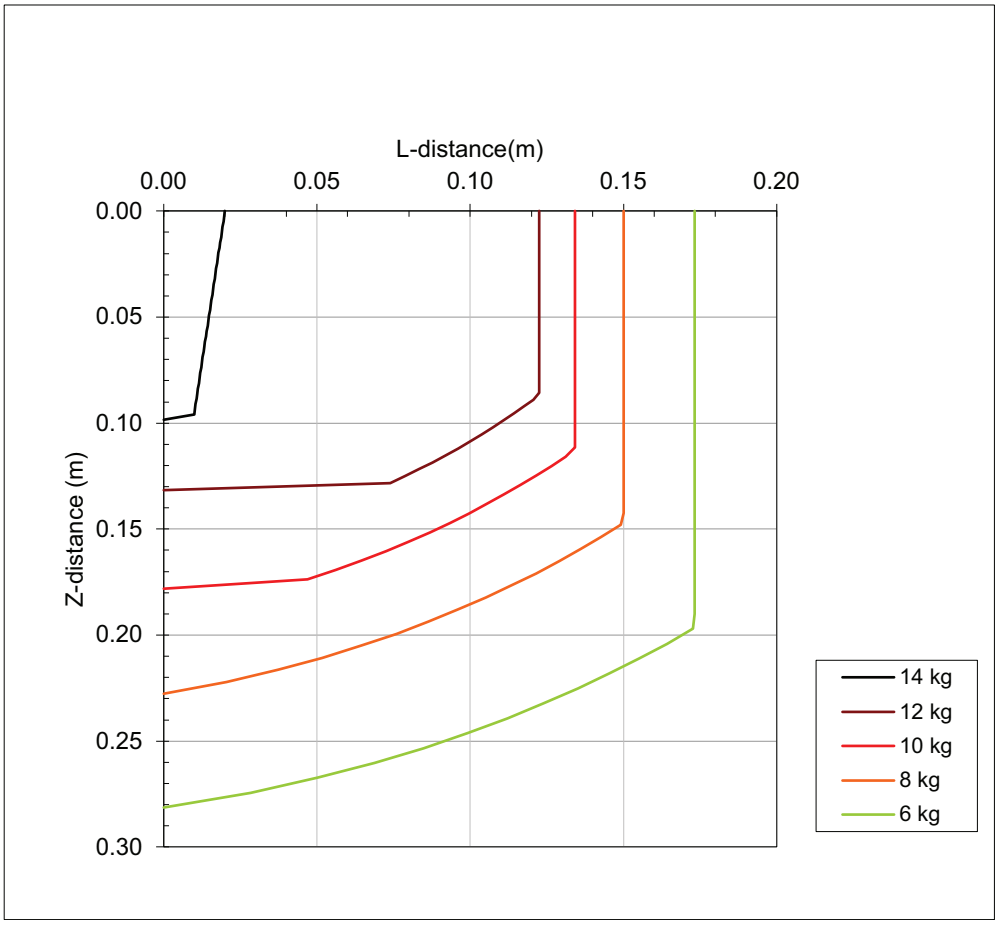
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1.5.2 Diagrams
Continued

CRB 15000-12/1.27 "Vertical wrist" (± 5°)



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

	Description
Max load	14 kg
Z_{max}	0.097 m
L_{max}	0.019 m

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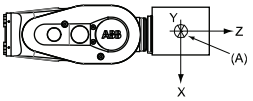
1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

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_{ox}, J_{oy}) ≤ 0.35 kgm^2
	CRB 15000-10/1.52 CRB 15000-12/1.27	Ja_5 = Load x ((Z+0.101)^2 + (L+0.08)^2)) + max (J_{ox}, J_{oy}) ≤ 0.58 kgm^2
6	CRB 15000-5/0.95	Ja_6 = Load x L^2 + Joz ≤ 0.1 kgm^2
	CRB 15000-10/1.52 CRB 15000-12/1.27	Ja_6 = Load x L^2 + Joz ≤ 0.2 kgm^2



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Pos	Description
A	Center of gravity

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

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1.5.4 Maximum TCP acceleration

General

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

Maximum Cartesian design acceleration for nominal loads

Robot type	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 15000-5/0.95	62	37
CRB 15000-10/1.52	94	28
CRB 15000-12/1.27	79	27

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).

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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*.

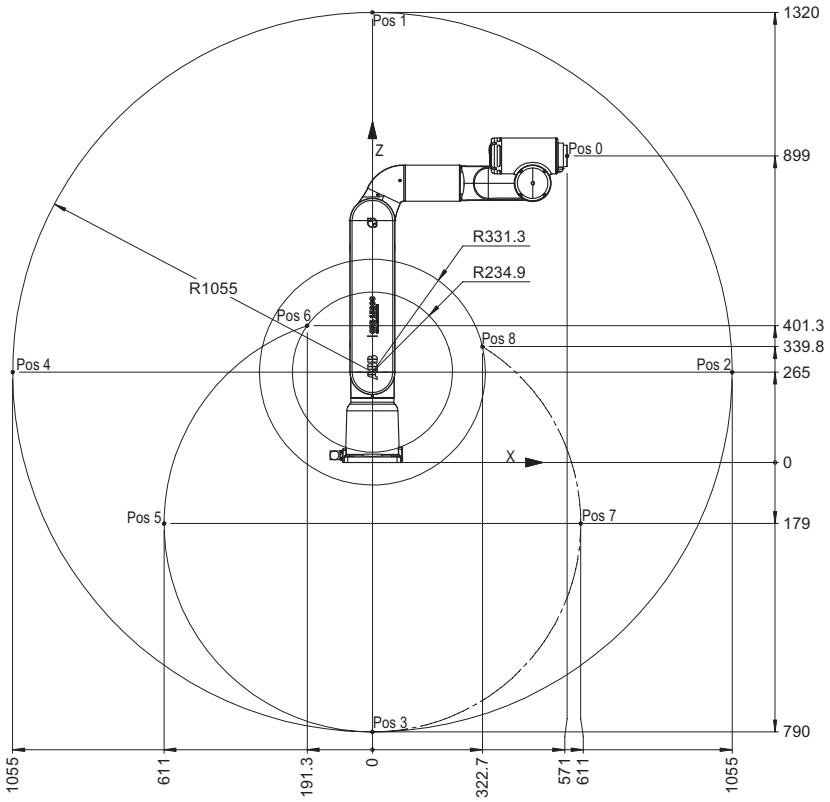
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1.7 Robot motion

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

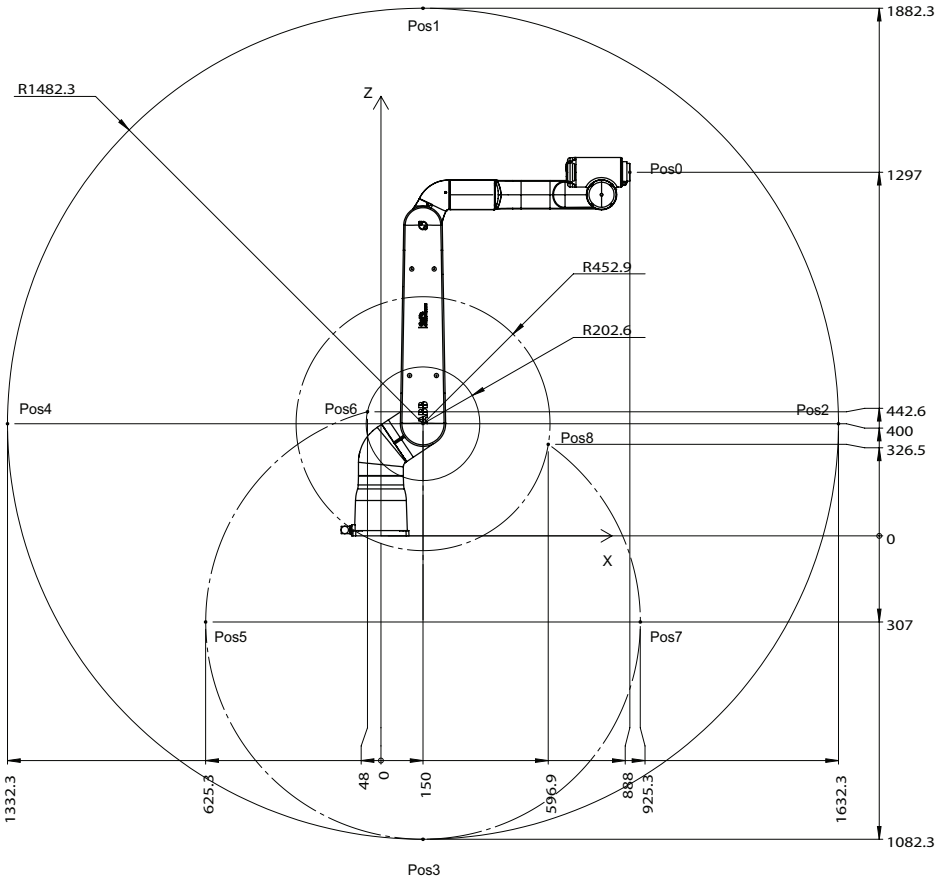
Position in the figure	Positions at wrist center (mm)		Angle (degrees)		
	X	Z	axis 2	axis 3	axis 5
pos0	571	899	0°	0°	0°
pos1	0	1320	0°	-76.8°	25.2°
pos2	1055	265	90°	-76.8°	25.2°
pos3	0	-790	180°	-76.8°	25.2°
pos4	-1055	265	-90°	-76.8°	25.2°
pos5	-611	-179	180°	13.2°	25.2°
pos6	-191.3	401.3	180°	85°	25.2°
pos7	611	-179	180°	-166.8°	25.2°
pos8	322.7	339.8	180°	-225°	25.2°

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Illustration, working range CRB 15000-10/1.52

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	axis 5
pos0	888	1297	0°	0°	0°
pos1	150	1882.3	0°	-80.2°	28.58°
pos2	1632.3	400	90°	-80.2°	28.58°
pos3	150	-1082.3	180°	-80.2°	28.58°
pos4	-1332.3	400	-90°	-80.2°	28.58°
pos5	-625.3	-307	180°	9.8°	28.58°
pos6	-48	442.6	180°	85°	
pos7	925.3	-307	180°	-170.2°	28.58°
pos8	596.9	326.5	180°	-225°	28.58°

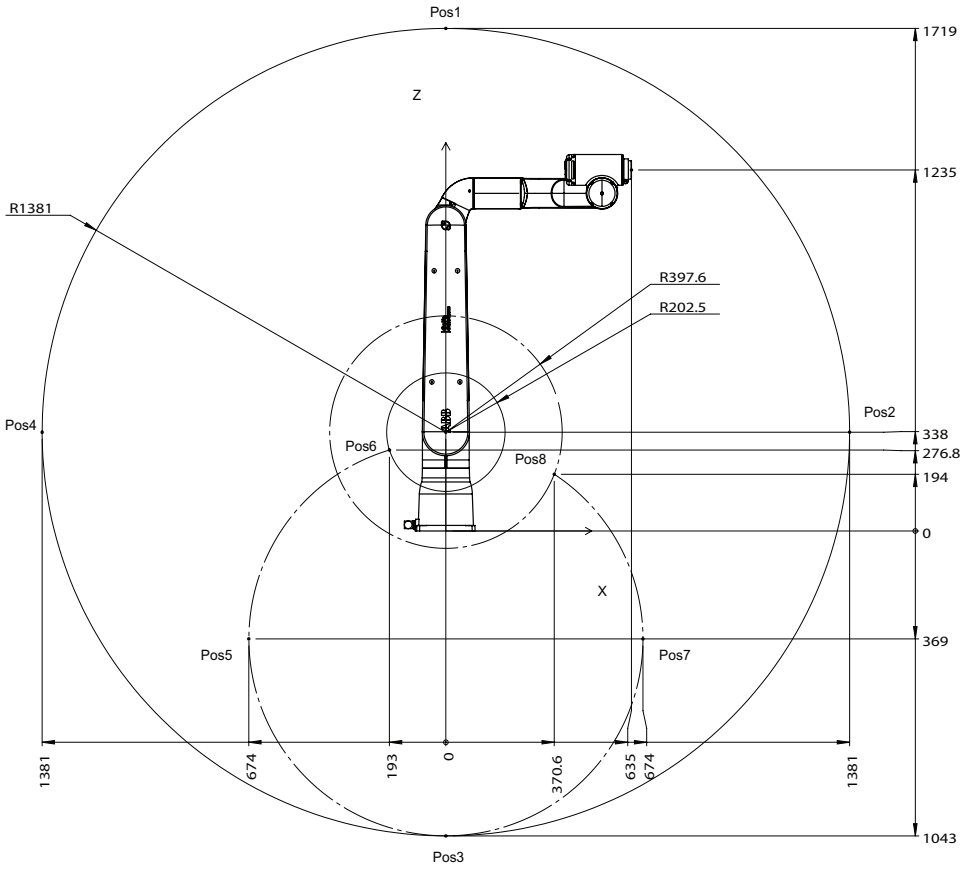
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1.7.1 Working range
Continued

Illustration, working range CRB 15000-12/1.27

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

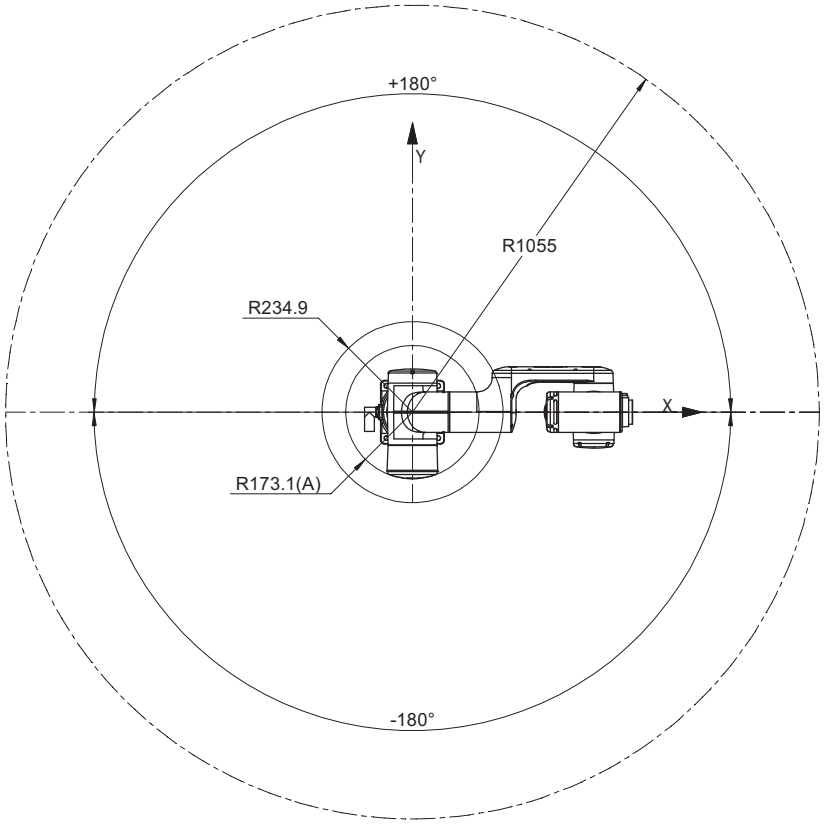
Position in the figure	Positions at wrist center (mm)		Angle (degrees)		
	X	Z	axis 2	axis 3	axis 5
pos0	635	1235	0°	0°	0°
pos1	0	1719	0°	-78.4°	26.7°
pos2	1381	338	90°	-78.4°	26.7°
pos3	0	-1043	180°	-78.4°	26.7°
pos4	-1381	338	-90°	-78.4°	26.7°
pos5	-674	-369	180°	11.6°	26.7°
pos6	-193	276.8	180°	85°	26.7°
pos7	674	-369	180°	-168.4°	26.7°
pos8	370.6	194	180°	-225°	26.7°

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Top view of working range

CRB 15000-5/0.95



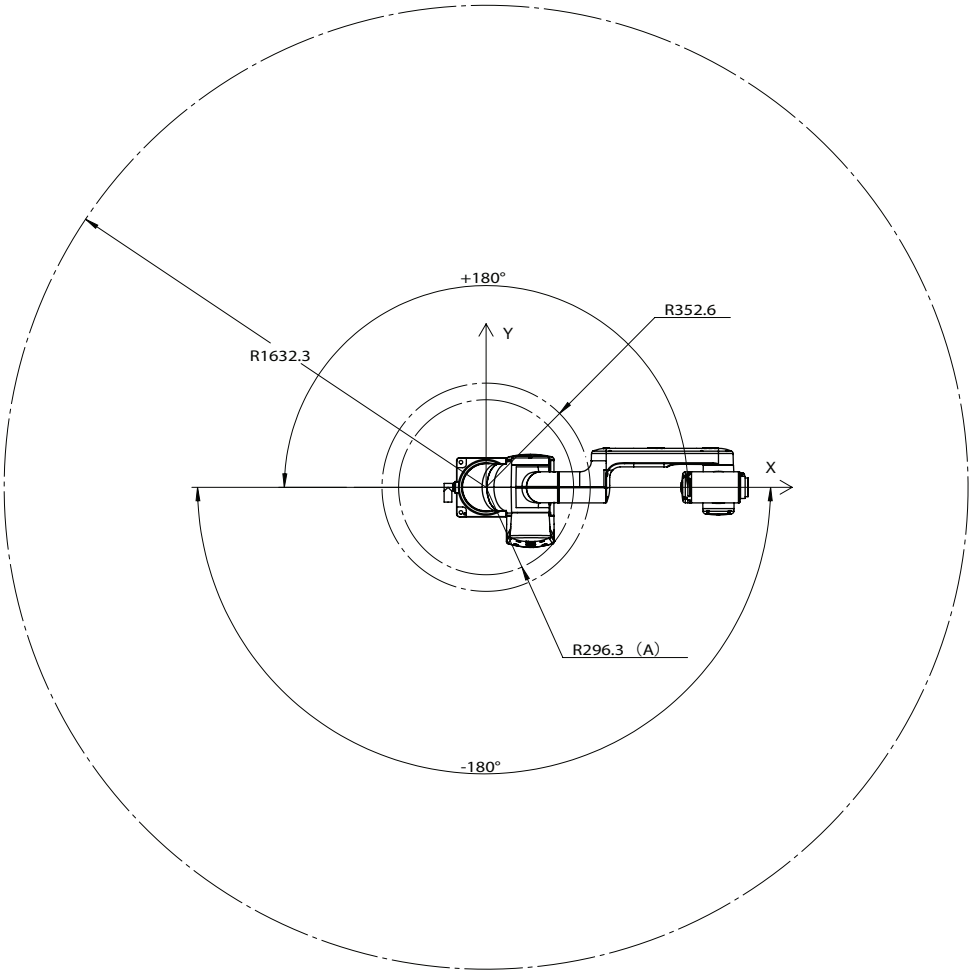
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1.7.1 Working range
Continued

CRB 15000-10/1.52

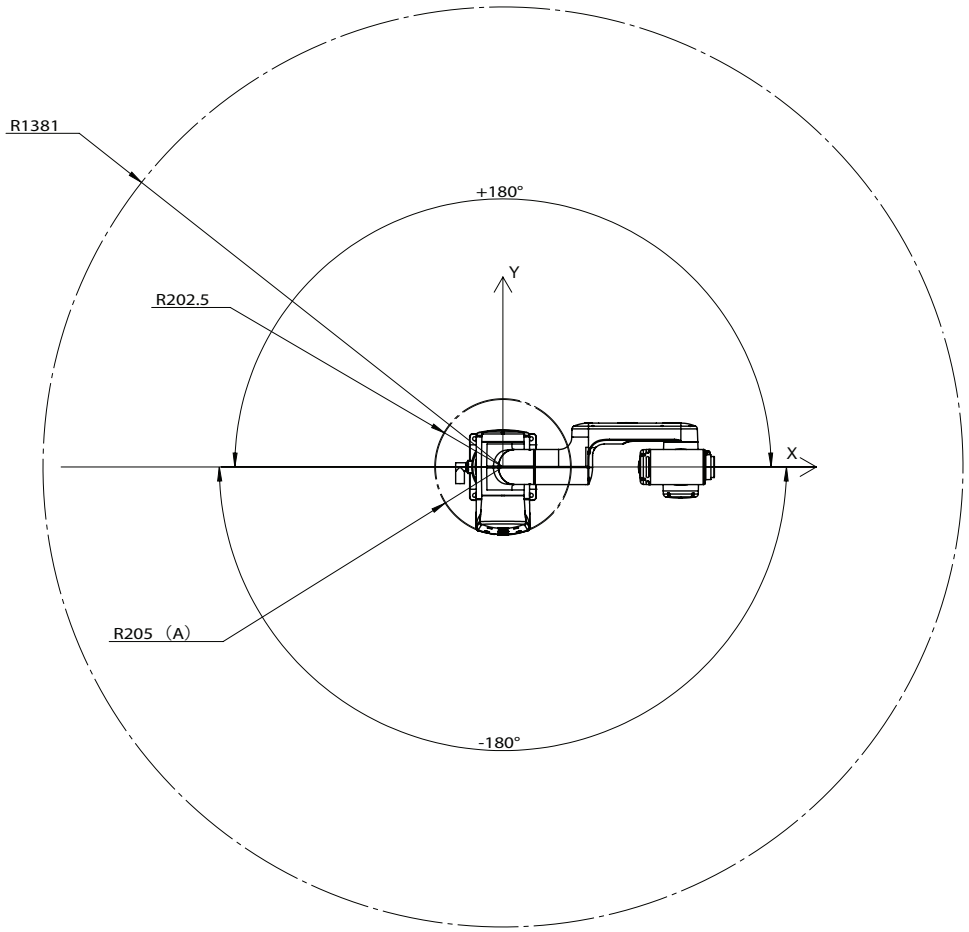


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CRB 15000-12/1.27



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Working range

Axis	Working range	Note
Axis 1	±180° [i] / ±270° [ii]	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°	

i Valid for CRB 15000-5/0.95.
ii Valid for CRB 15000-10/1.52 and CRB 15000-12/1.27.

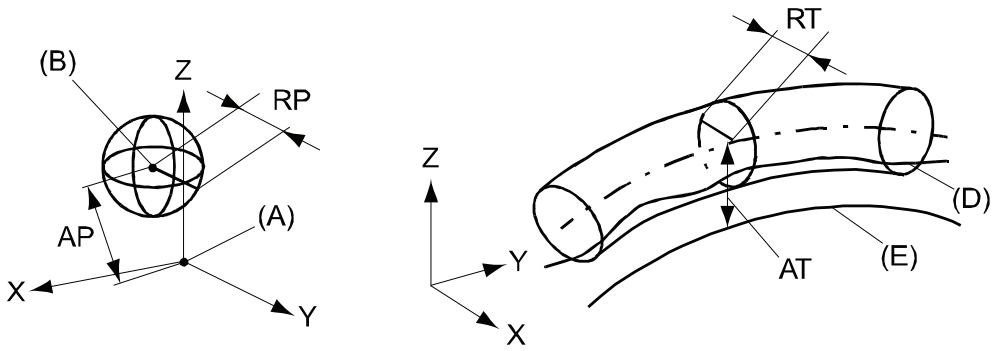
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1.7.2 Performance

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.



xx0800000424

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	10/1.52	12/1.27
Pose accuracy, AP[i] (mm)	0.02	0.02	0.02
Pose repeatability, RP (mm)	0.02	0.02	0.02
Pose stabilization time, PSt (s) within 0.1 mm of the position	0.229	0.398	0.887
Path accuracy, AT (mm)	1.205	4.392	2.377
Path repeatability, RT (mm)	0.057	0.056	0.058

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.

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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
CRB 15000-10/1.52	120 °/s	120 °/s	125 °/s	200 °/s	200 °/s	200 °/s
CRB 15000-12/1.27	120 °/s	120 °/s	125 °/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).

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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 or shorter. The movement of the axes does not necessarily represent the actual application. Therefore, the braking distance must be validated for each application.

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 74*.

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 category 1 is according to IEC 60204-1.

Note

The stop category 1 is a controlled stop and will therefore have less deviation from the programmed path compared with a stop category 0.

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 54*.

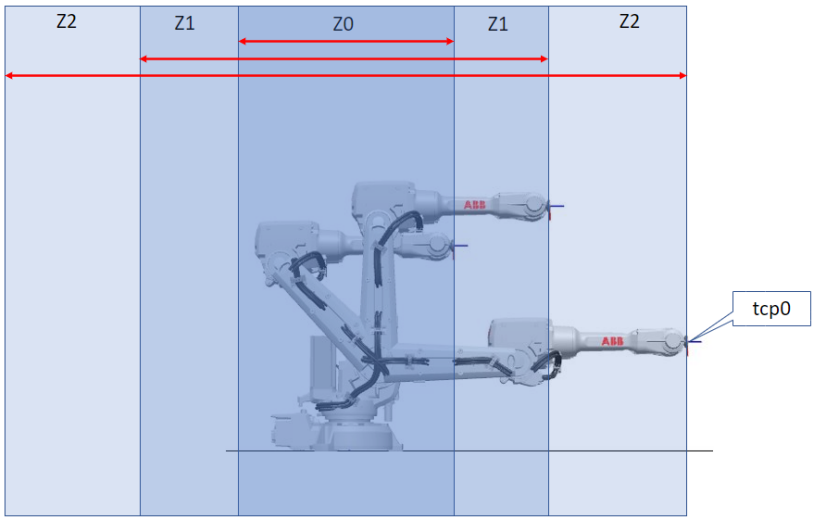
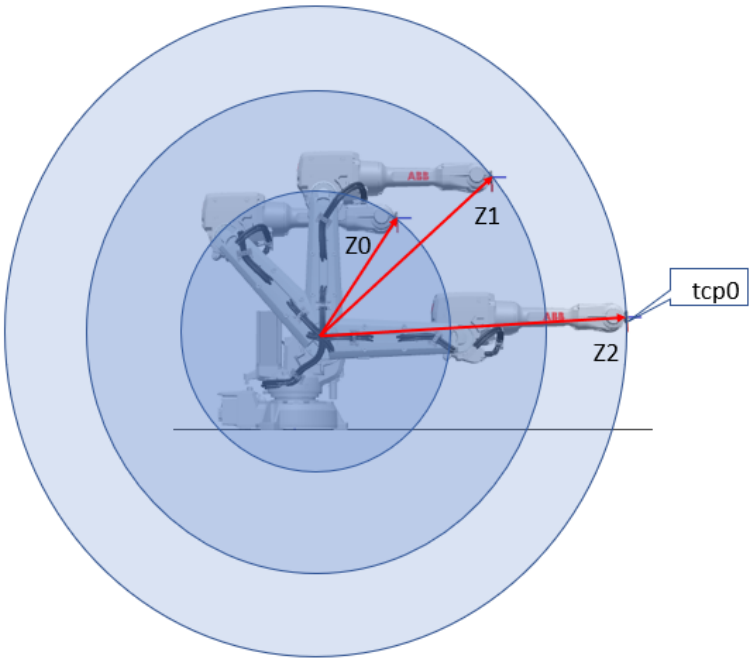
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Extension zones

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.

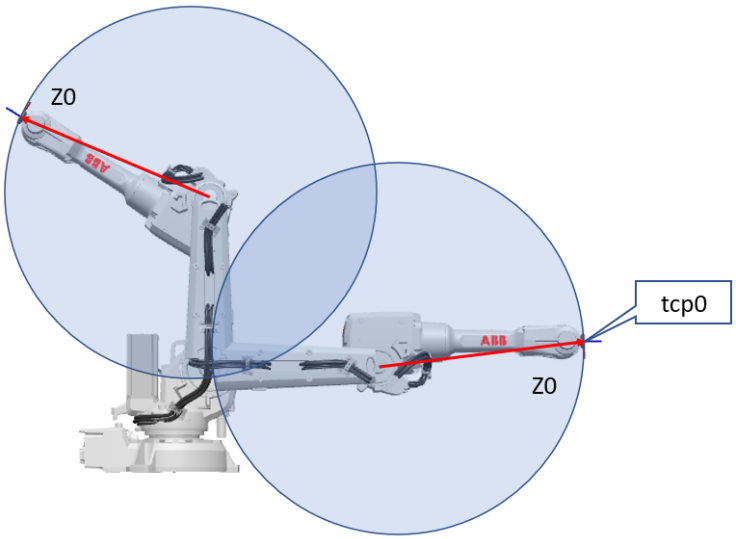
The extension zone outer limits are defined by the TCP0 position for the stated angles.

	Illustration
Axis 1	 xx2300000860
Axis 2	 xx2300000861

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1.8.1 Robot stopping distances according to ISO 10218-1
Continued

	Illustration
Axis 3	

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.

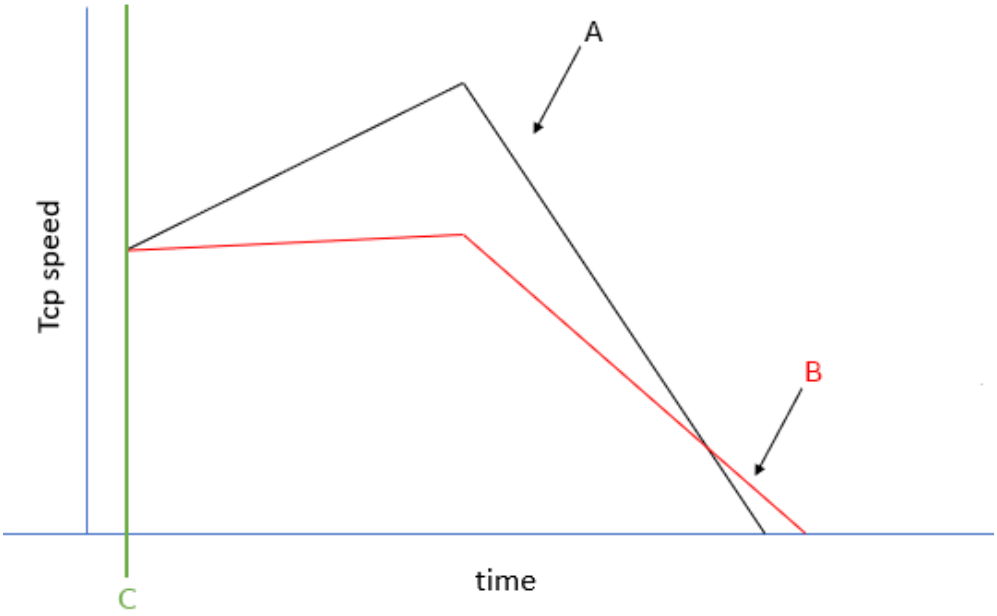
Reading the data

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

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xx2300001041

The tcp speed is the actual speed when the stop is initiated, which is not necessarily the programmed speed.

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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 the overall stopping performance of the robot shall be performed using the correct tool, payload, speed, and application parameters in the actual installation environment before the robot system is placed into service. All load and tool data, including mass, center of gravity (CoG), and moment of inertia, shall be correctly defined. The Load Identification service routine can be used to determine the load data.

The system integrator shall verify that the measured stopping time and stopping distance remain within the values assumed in the application risk assessment. Verification shall be performed during initial commissioning, after modifications affecting robot motion, payload, tooling, safety configuration, or installation conditions, after repair or replacement of safety-related components, and at least once every 12 months as part of the safety verification according to ISO 10218-2:2025.

If the measured stopping time or stopping distance exceeds the values assumed in the application risk assessment, corrective action shall be taken before the robot system is returned to service.

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.

1. Download TuneMaster from *www.abb.com/robotics*, section **RobotStudio - Downloads - RobotWare Tools and Utilities**.
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.

Continues on next page

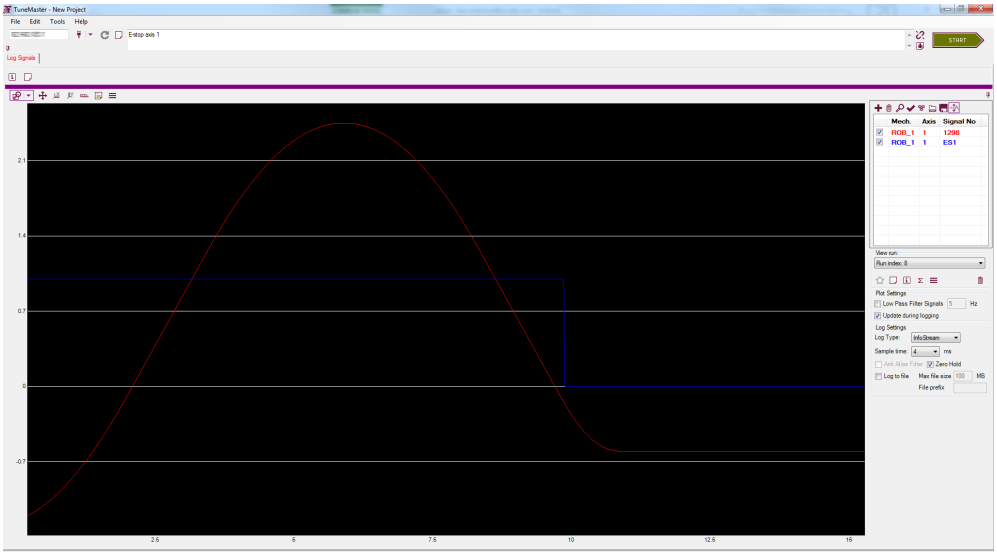
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5 Define the signal number to use for measurement, 1298 for axis position. The value is given in radians.
6 Start the logging in TuneMaster.
7 Start the test program on the controller.

> **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



xx1600000386

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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 73*.

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

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

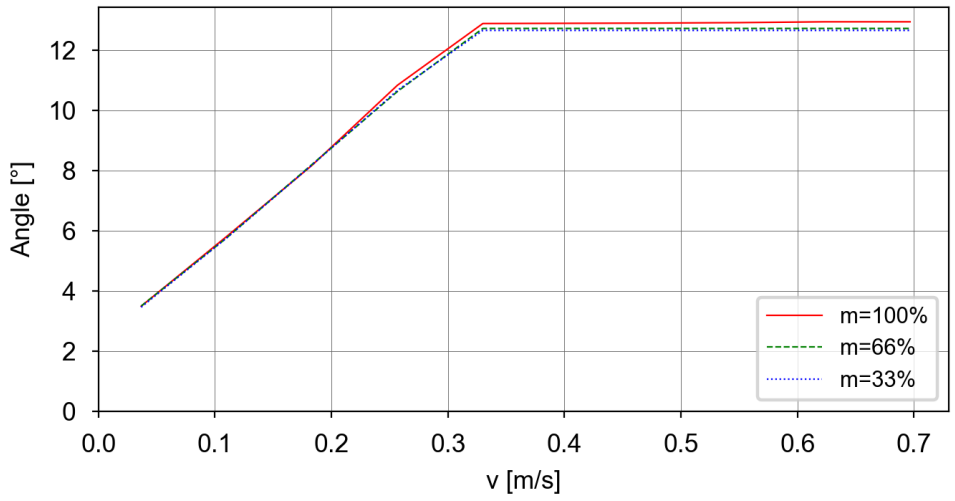
Axis 2

Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

Axis 3

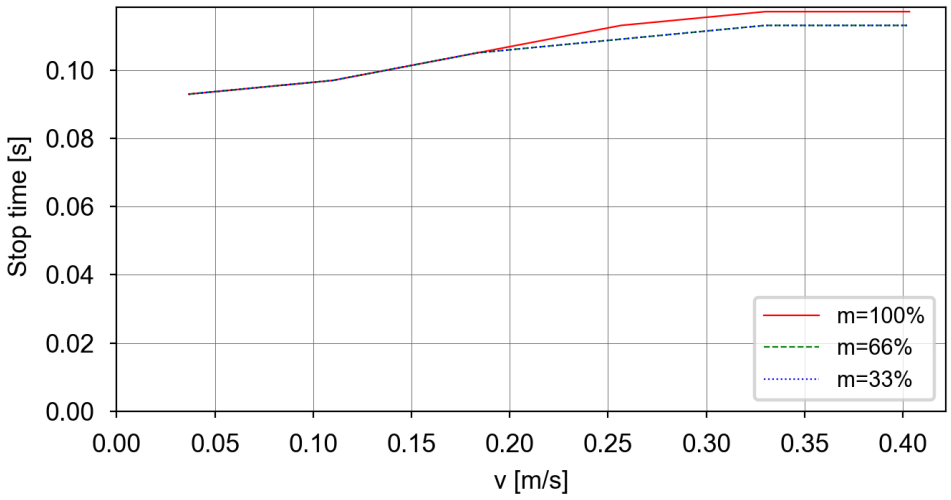
Only one zone exists.

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

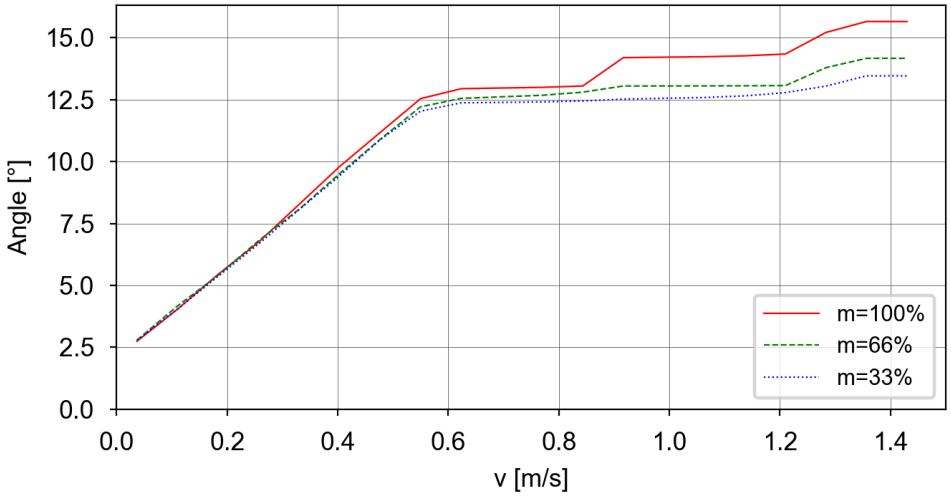


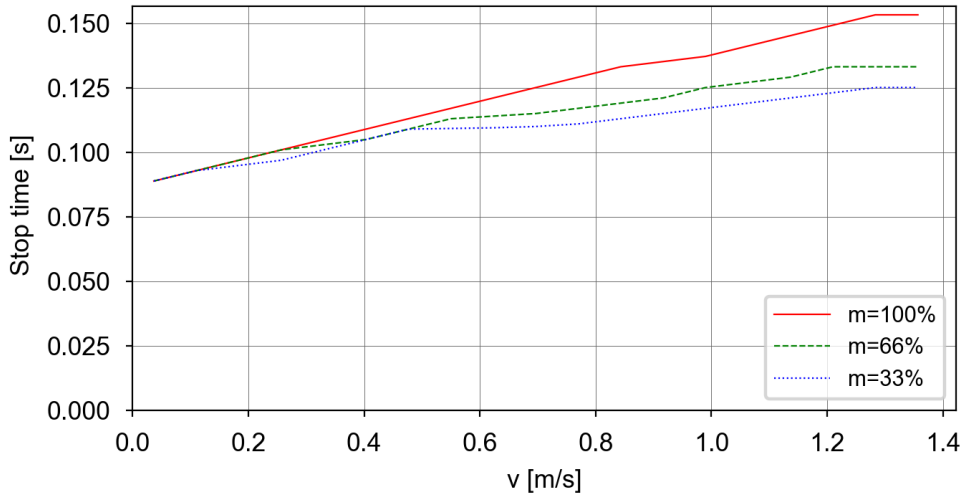
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Category 1, Axis 1, Extension zone 1, stopping distance and stopping time



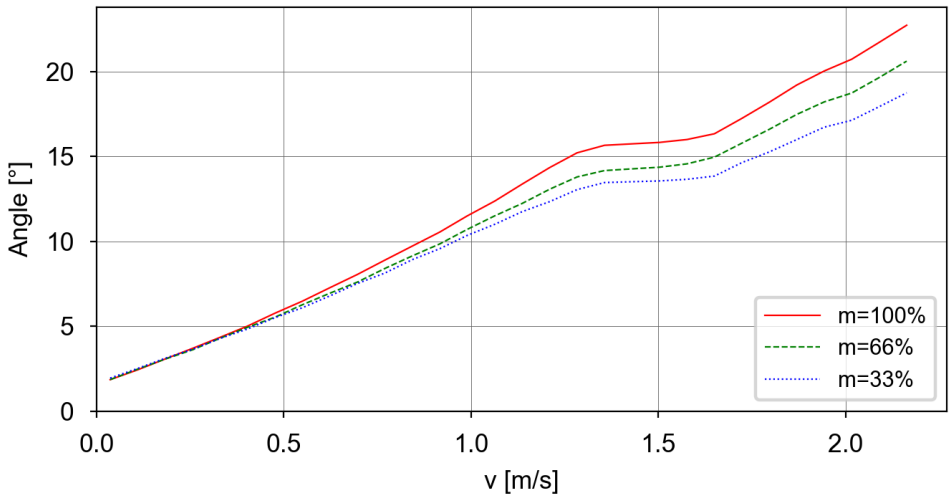


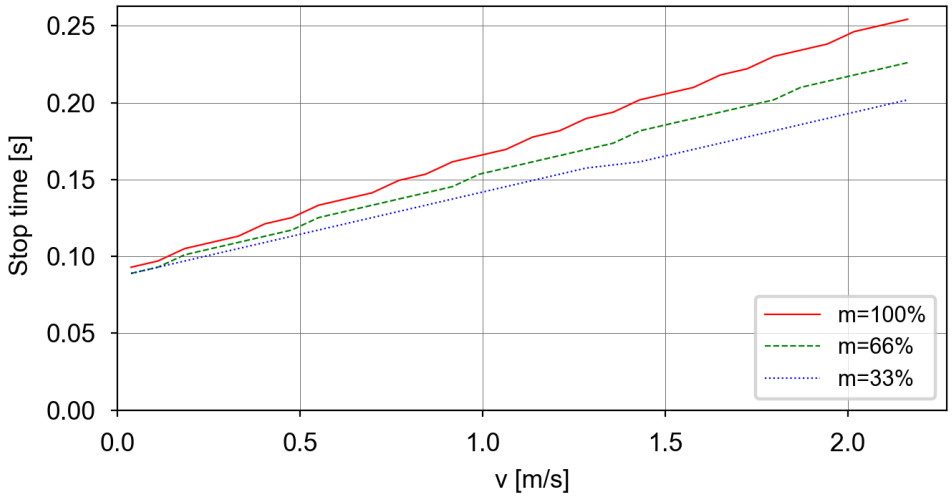
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1.8.3 CRB 15000-5/0.95
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Category 1, Axis 1, Extension zone 2, stopping distance and stopping time

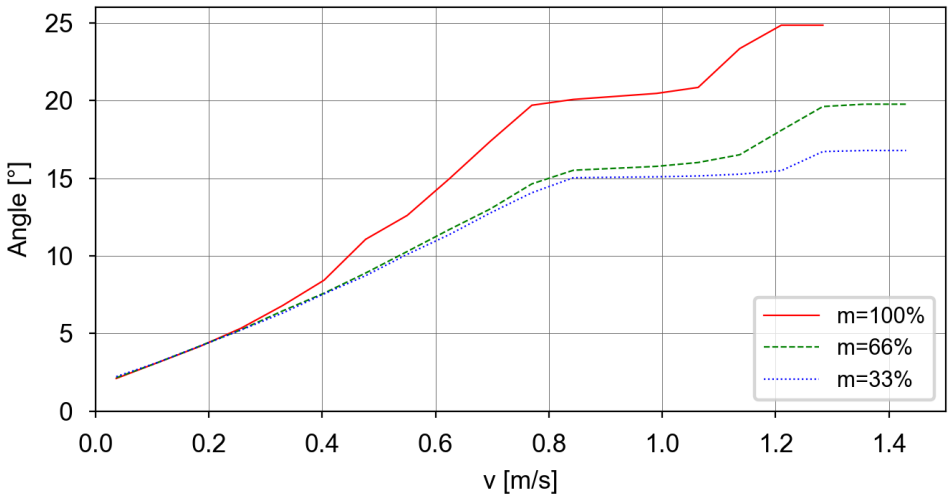


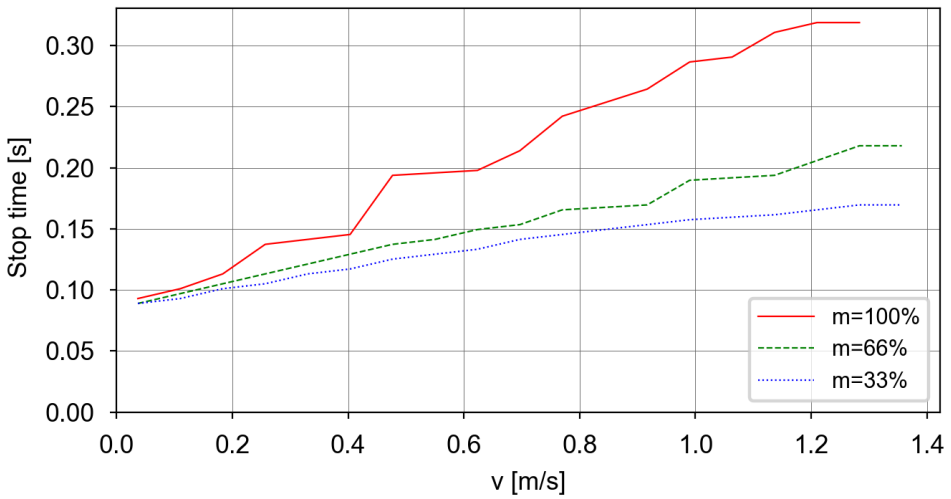


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Category 1, Axis 2, Extension zone 0, stopping distance and stopping time



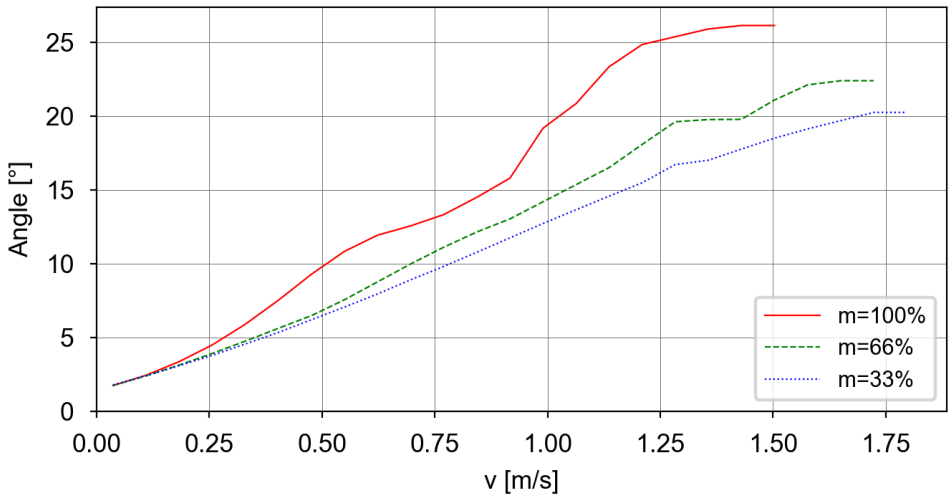


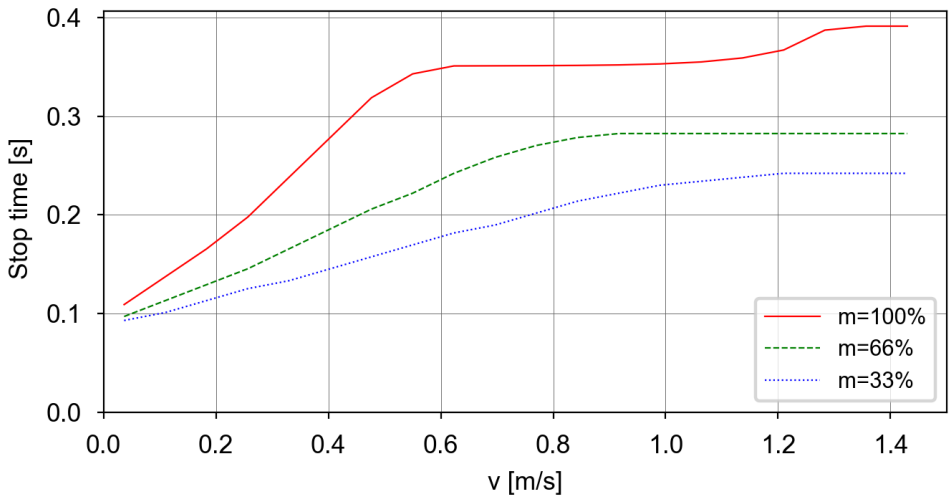
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1.8.3 CRB 15000-5/0.95
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Category 1, Axis 2, Extension zone 1, stopping distance and stopping time

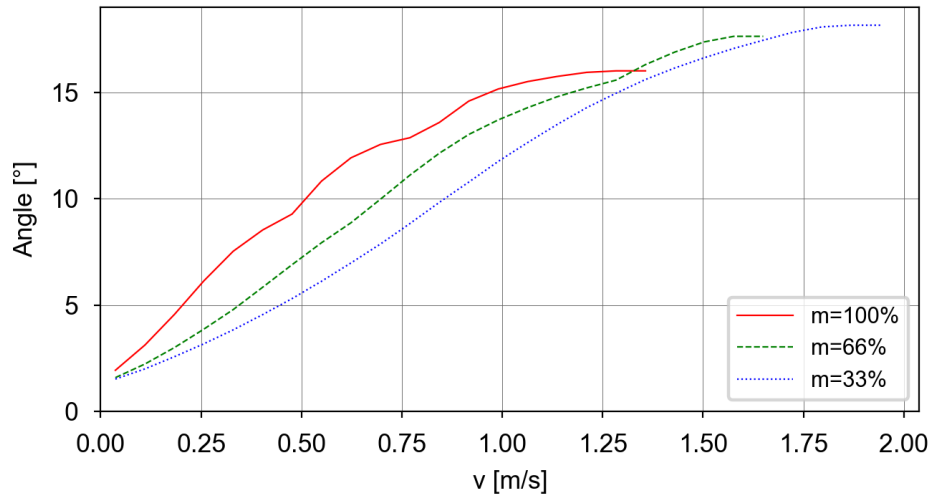


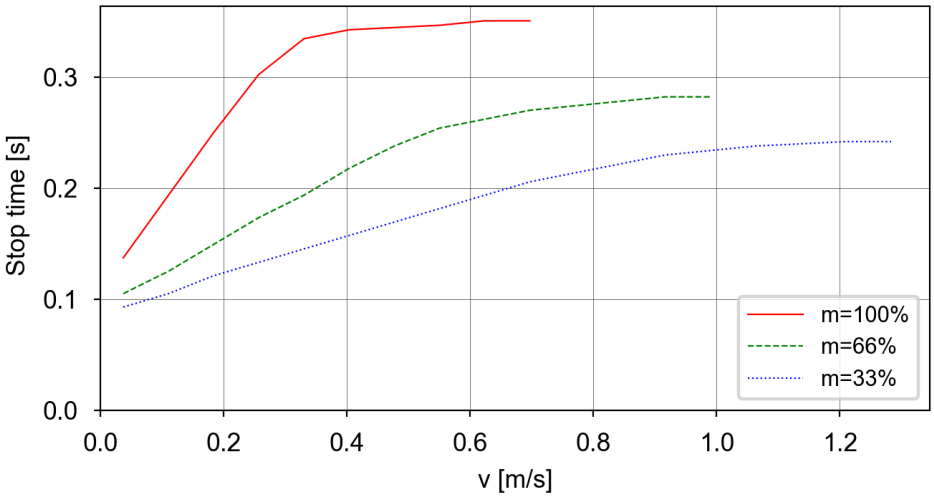


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Category 1, Axis 2, Extension zone 2, stopping distance and stopping time



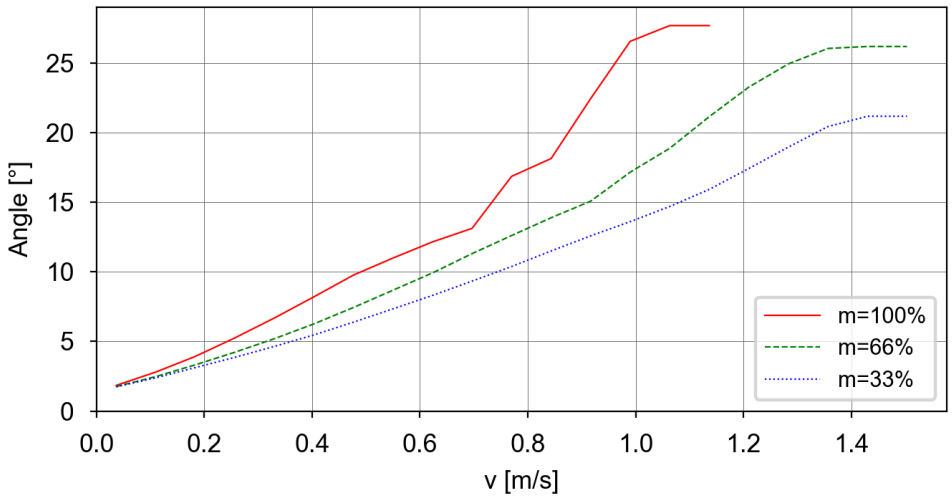


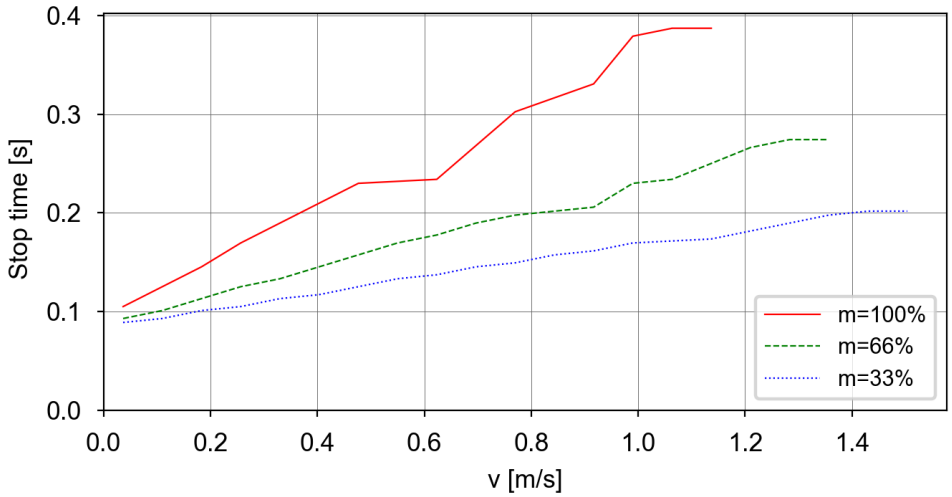
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1.8.3 CRB 15000-5/0.95
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Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





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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 73*.

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

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

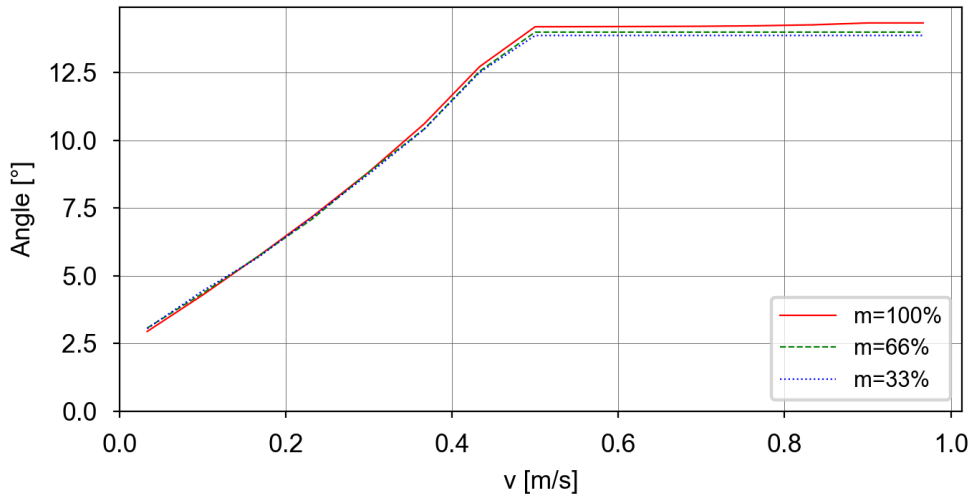
Axis 2

Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

Axis 3

Only one zone exists.

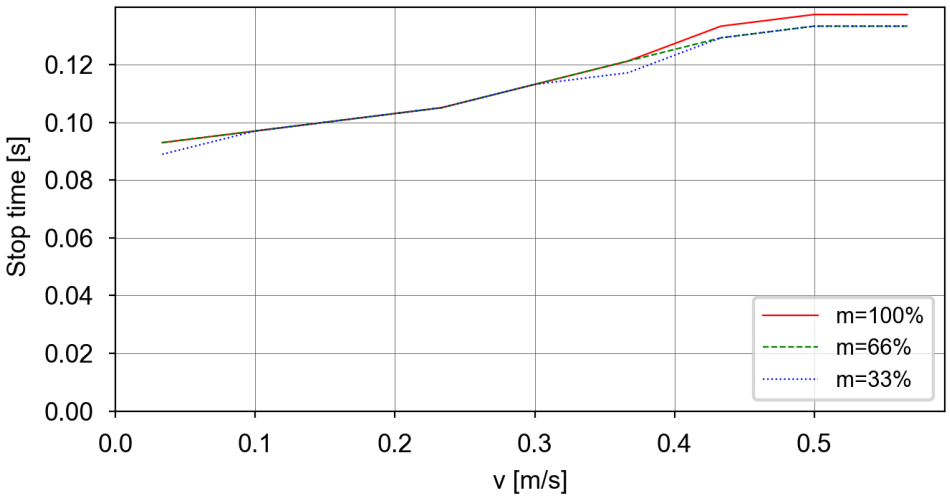
Category 1, Axis 1, Extension zone 0, stopping distance and stopping time



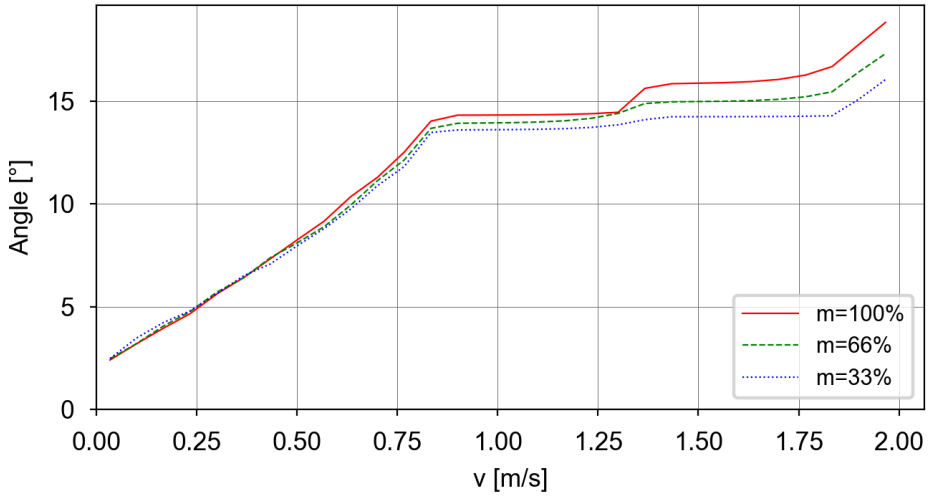
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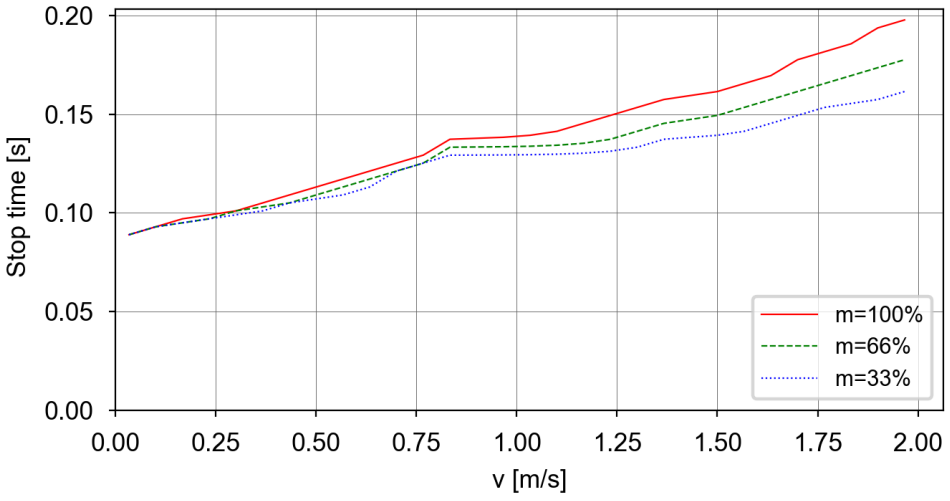
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1.8.4 CRB 15000-10/1.52
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Category 1, Axis 1, Extension zone 1, stopping distance and stopping time

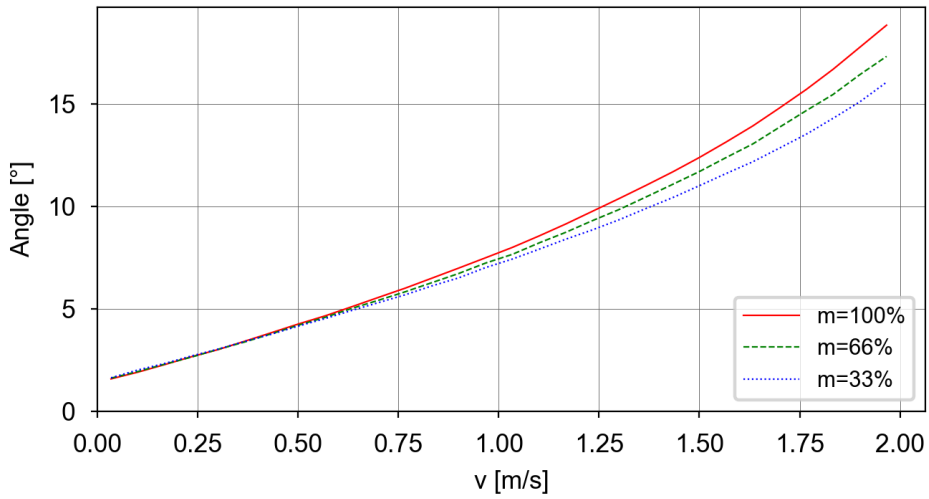


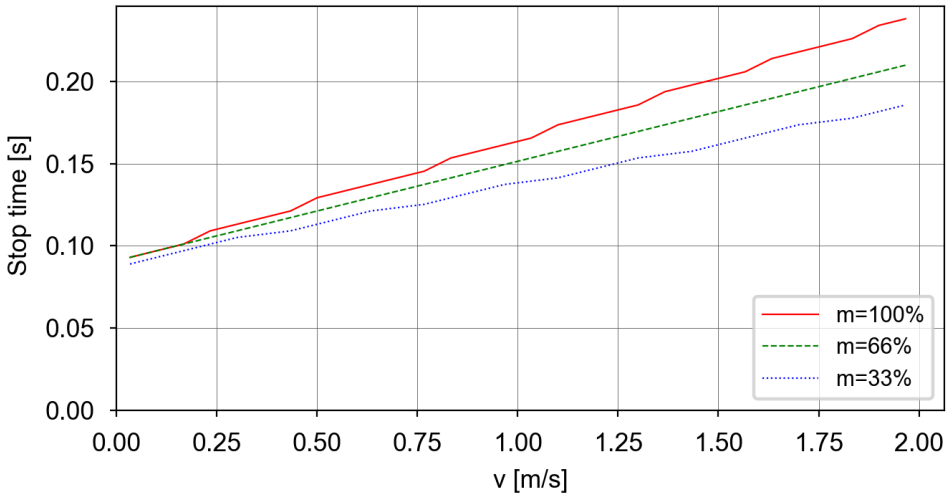


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Category 1, Axis 1, Extension zone 2, stopping distance and stopping time



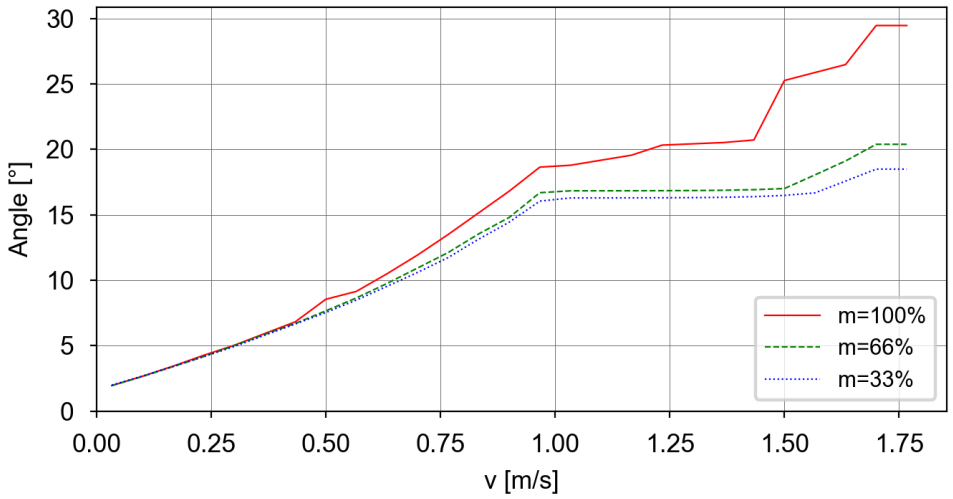


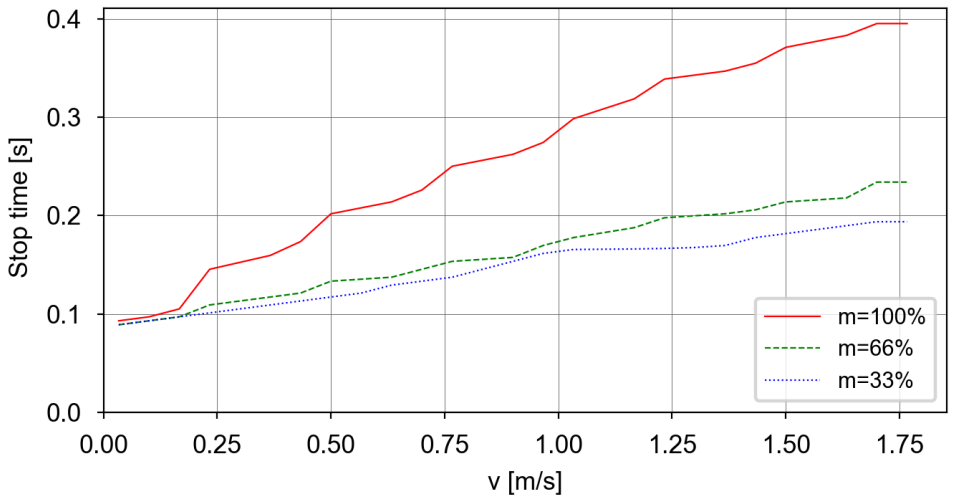
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1.8.4 CRB 15000-10/1.52
Continued

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

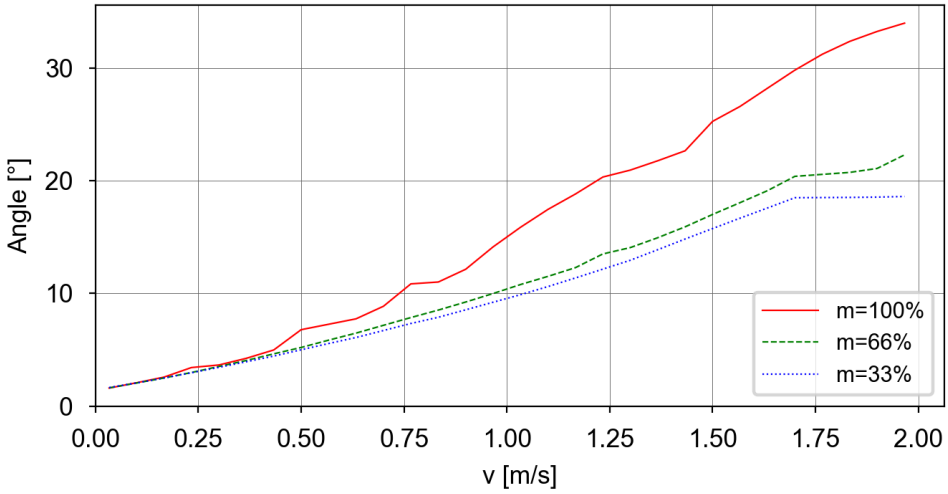


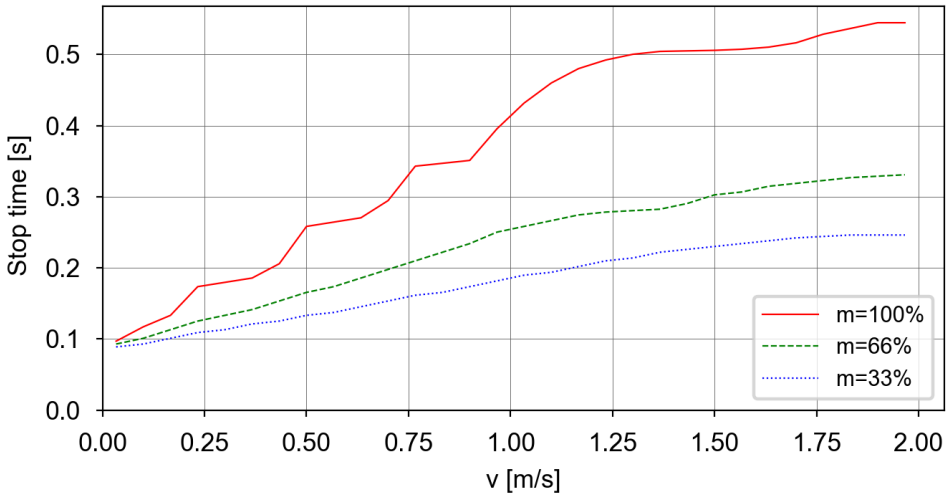


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Category 1, Axis 2, Extension zone 1, stopping distance and stopping time



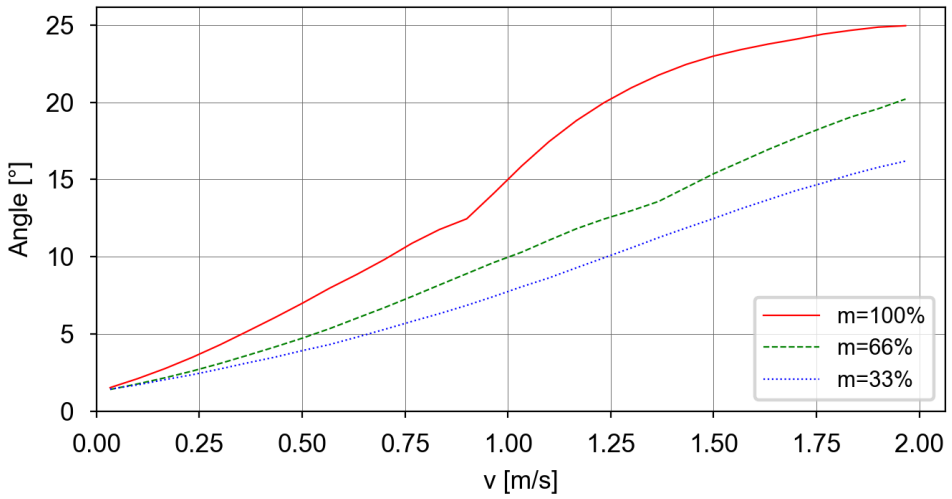


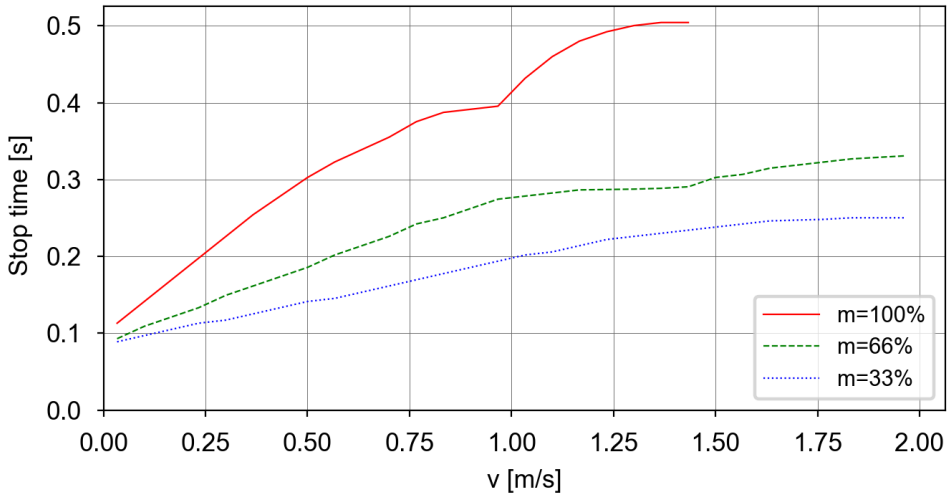
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1.8.4 CRB 15000-10/1.52
Continued

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

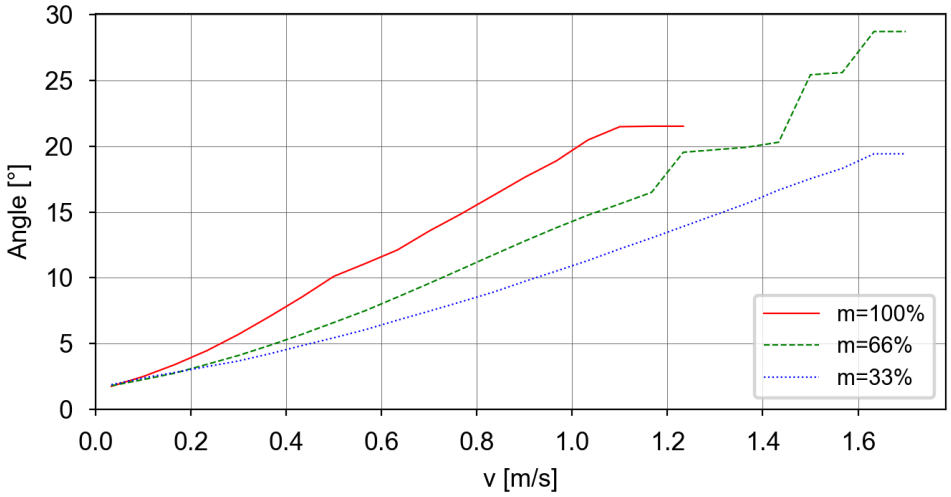


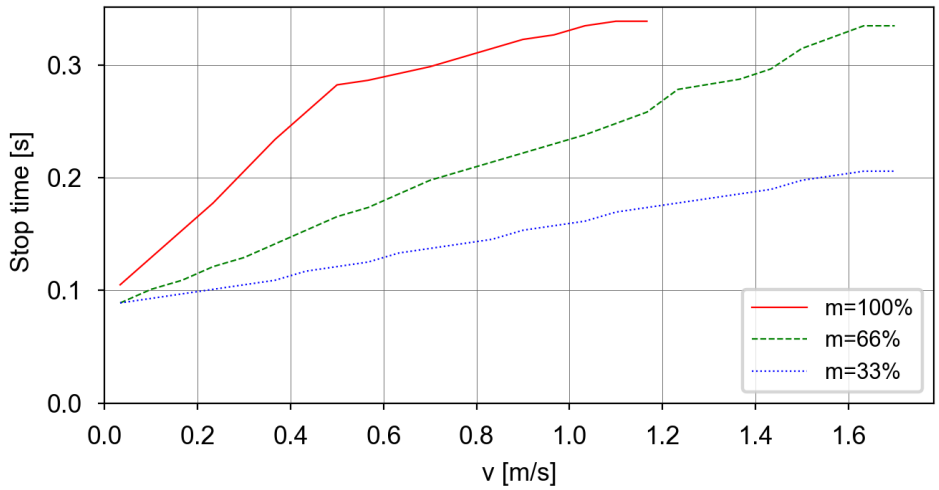


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Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





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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], 0.0018, 0.0018, 0.0018]];
```

Category 1, extension zones

For definitions of the zones, see *Extension zones on page 73*.

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

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

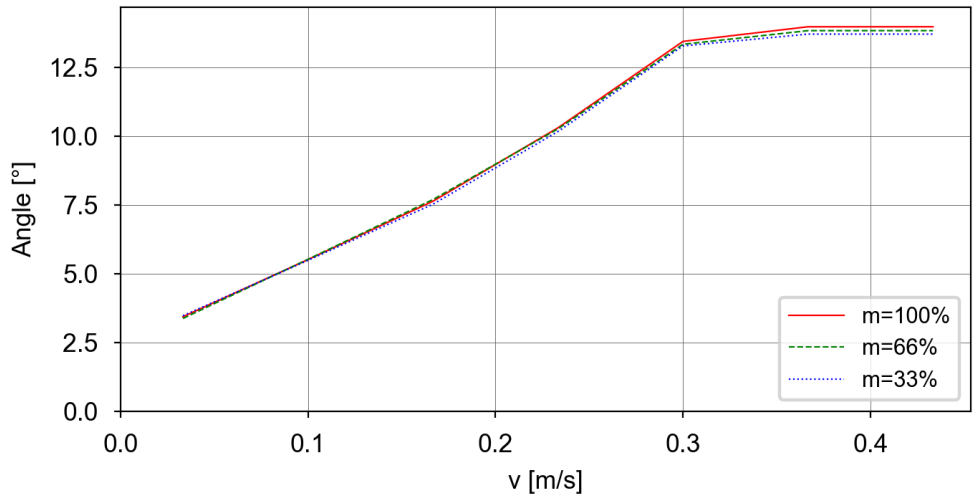
Axis 2

Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

Axis 3

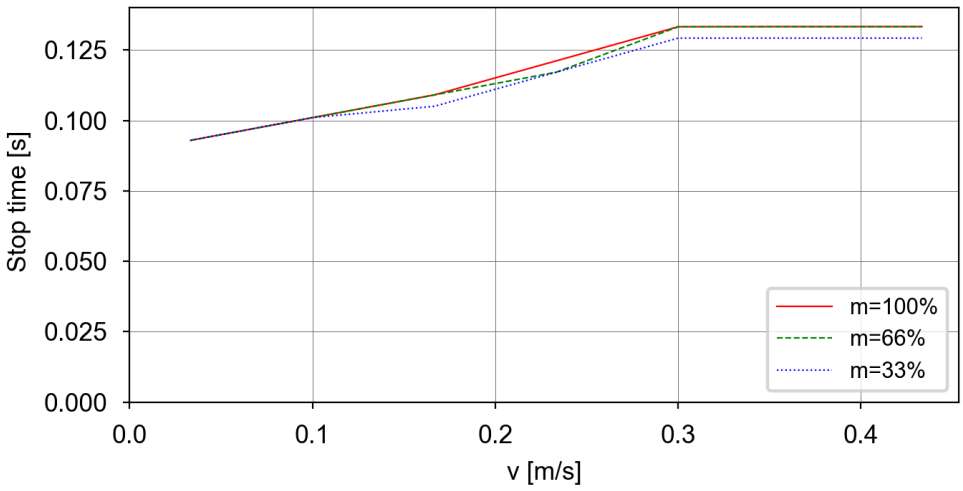
Only one zone exists.

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

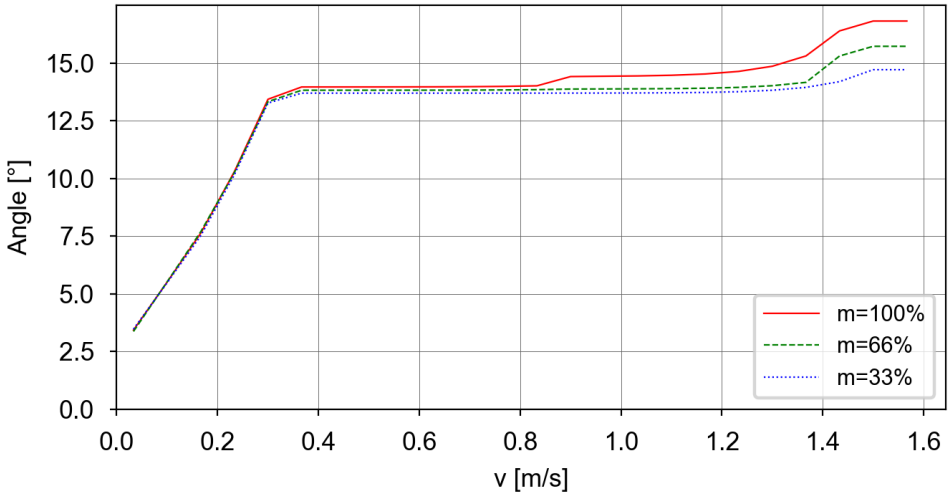


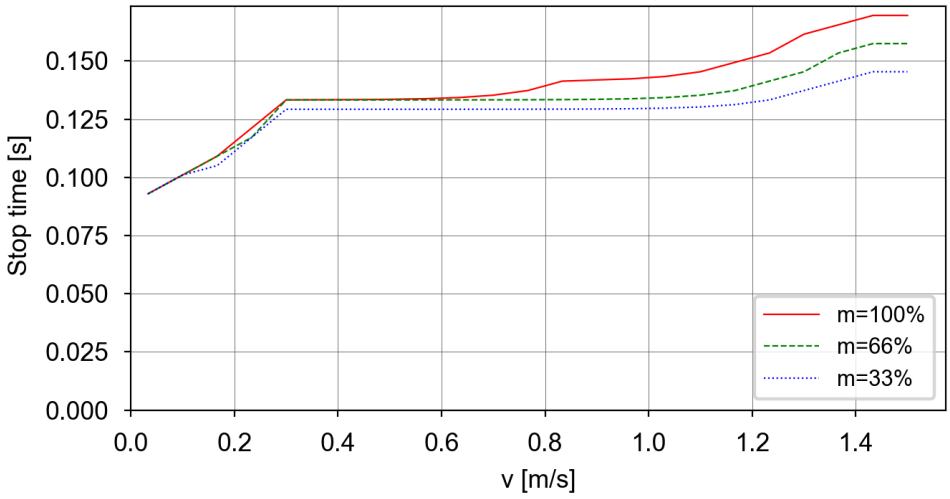
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Category 1, Axis 1, Extension zone 1, stopping distance and stopping time



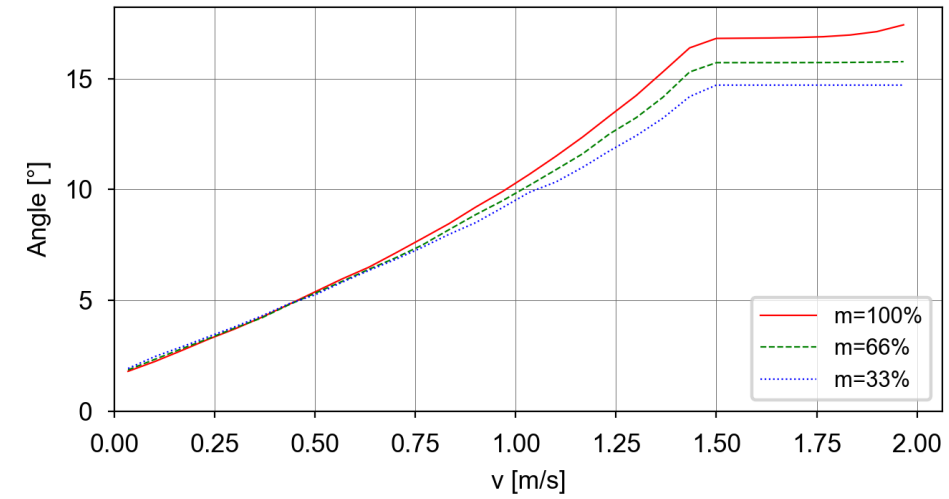


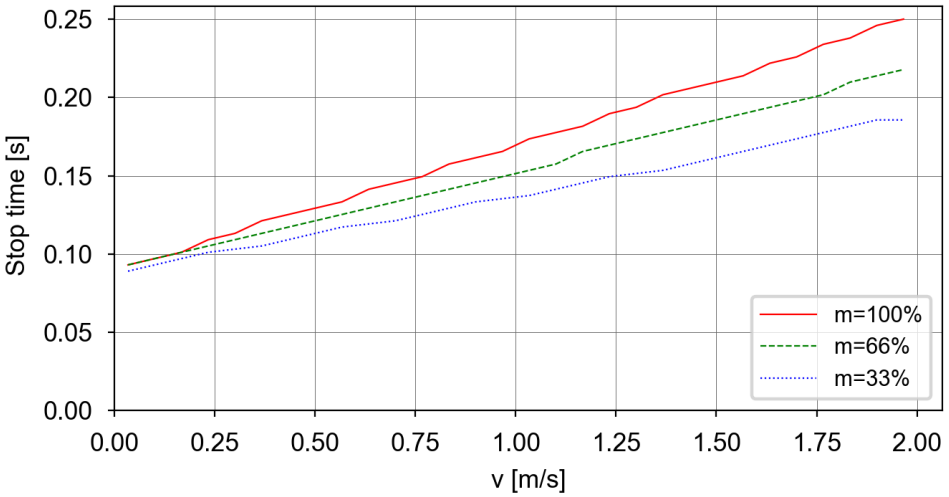
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1.8.5 CRB 15000-12/1.27
Continued

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

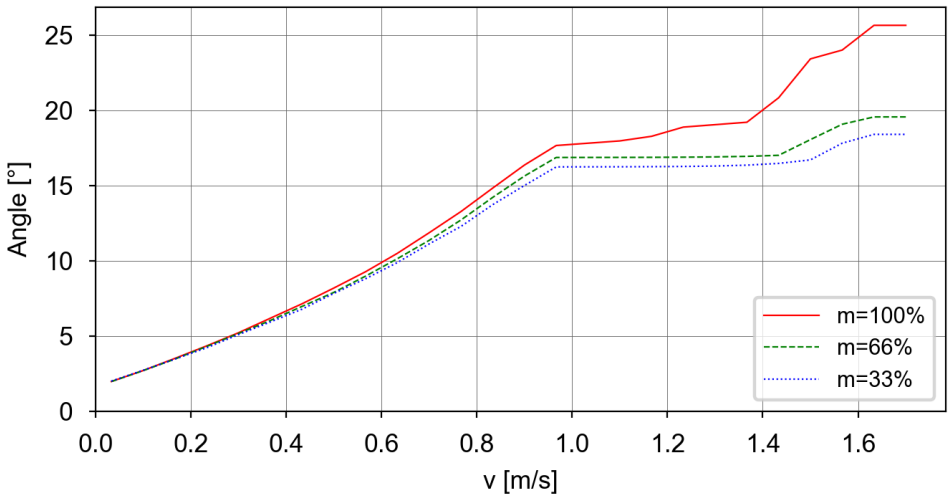


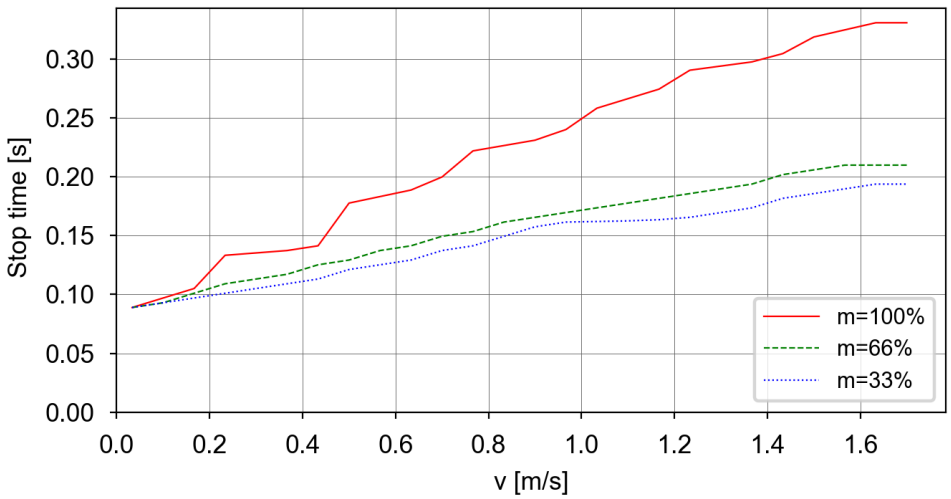


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Category 1, Axis 2, Extension zone 0, stopping distance and stopping time



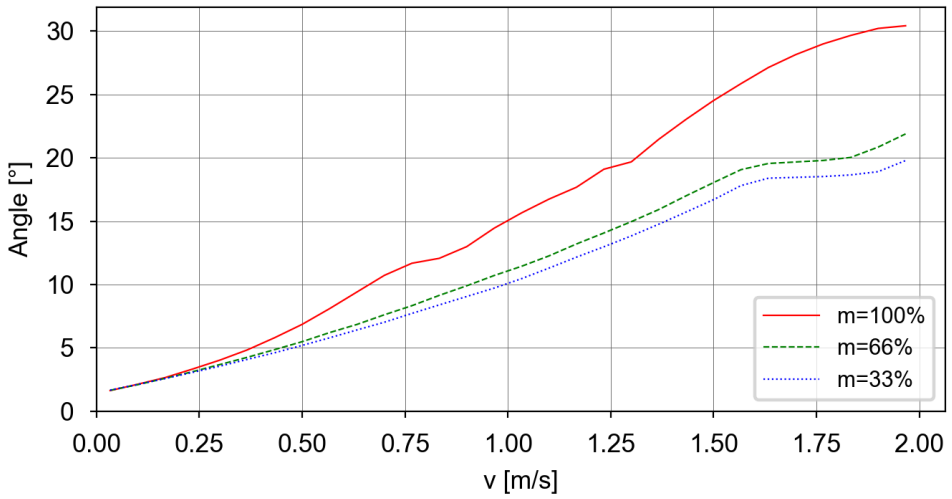


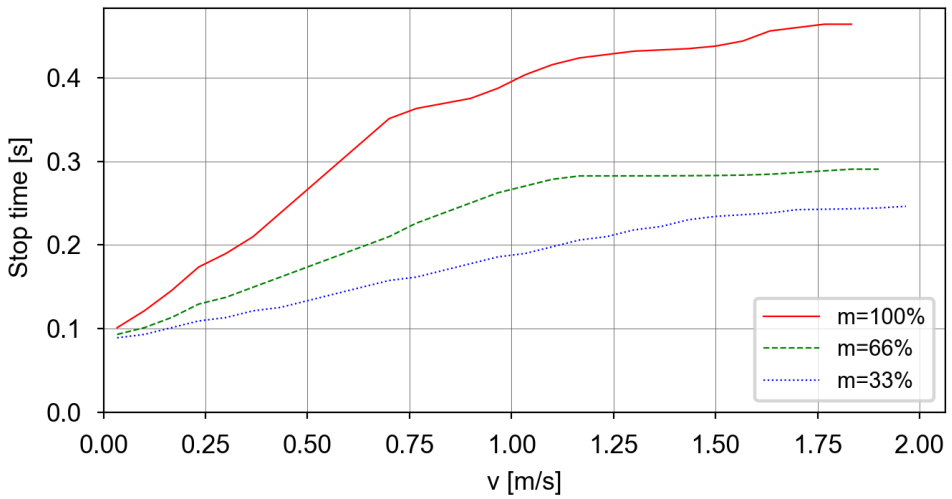
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1.8.5 CRB 15000-12/1.27
Continued

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

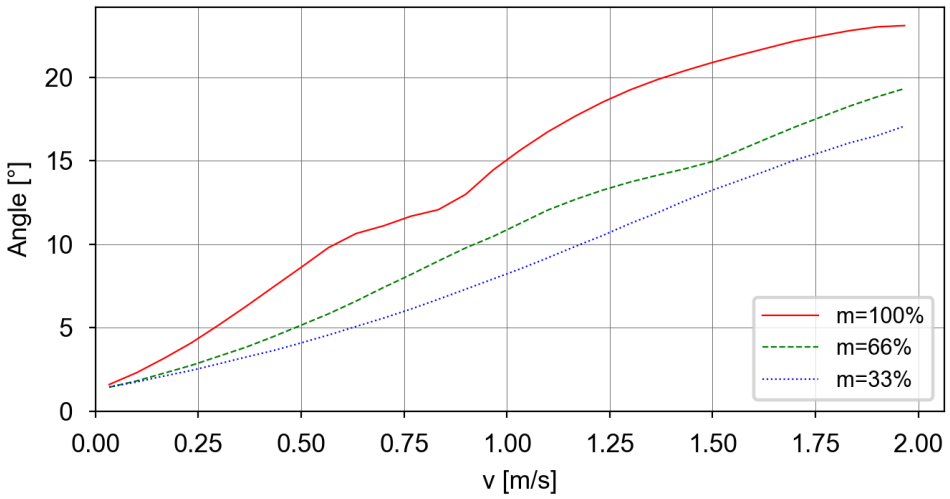


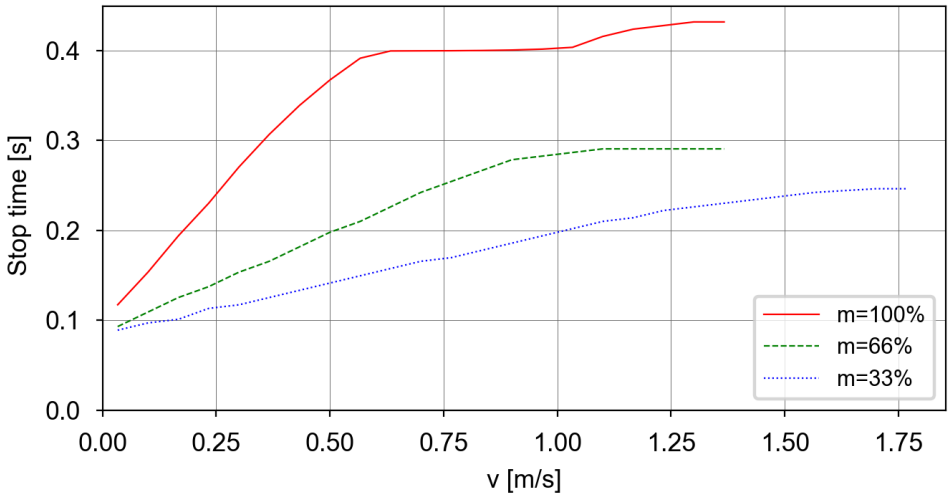


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Category 1, Axis 2, Extension zone 2, stopping distance and stopping time



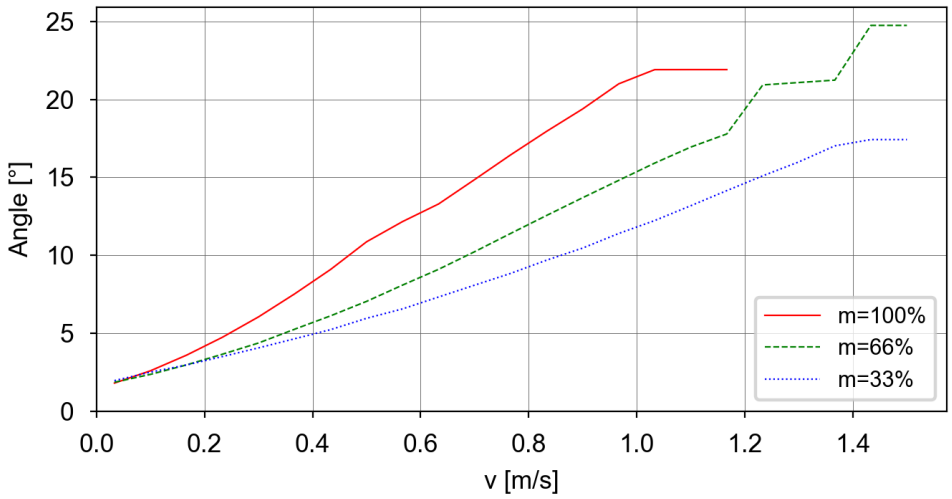


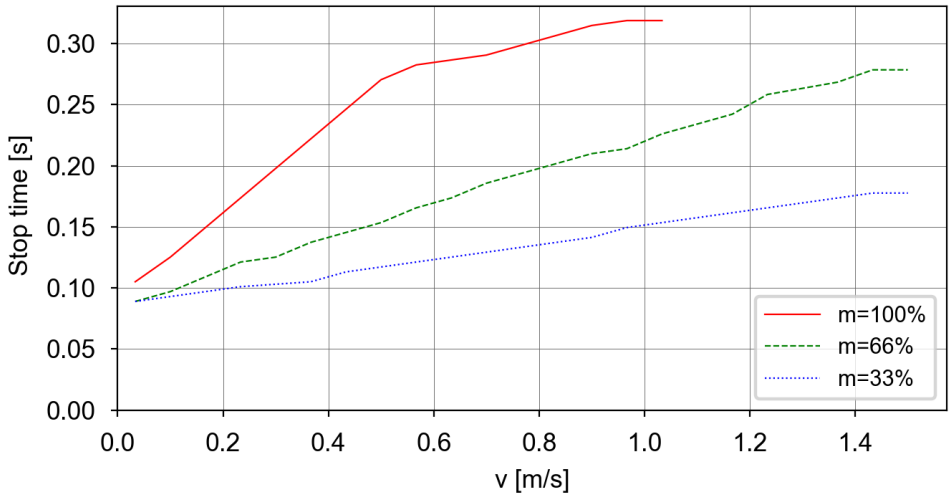
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1.8.5 CRB 15000-12/1.27
Continued

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





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1.9 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] 3A	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

CAUTION

No overcurrent protection is provided for the CP circuit. External fuse protection is required; otherwise, an overload may damage the internal CP cabling in the robot.

More information about the maximum allowable current of the CP connector, see *Product manual - OmniCore C30 Type B*.

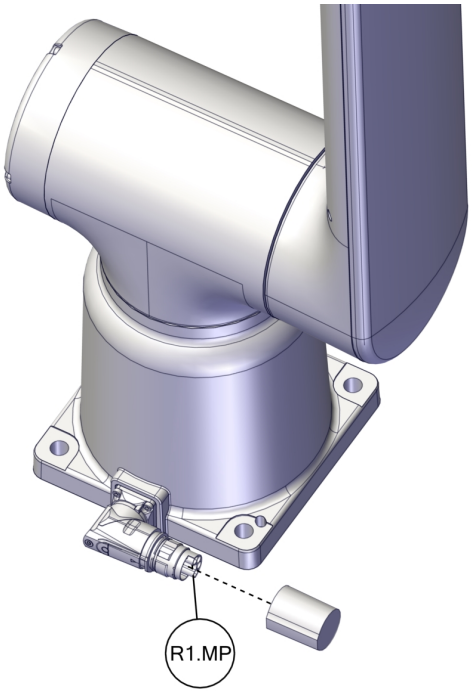
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Customer connectors on the manipulator

Connectors at the base

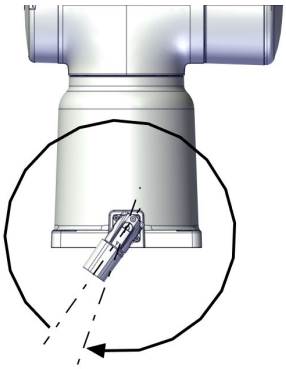
The R1.MP on the base is used for transferring DC bus, EtherCat and customer signals (CP/CS).



xx2100000228

WARNING

This connector is not a disconnecting device. Power shall be isolated at the controller before the connector is disconnected.

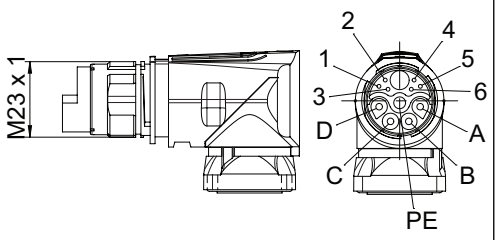
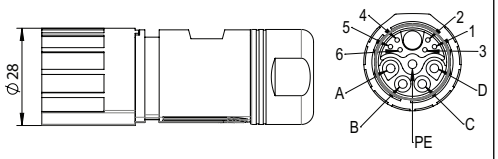


xx2100002065

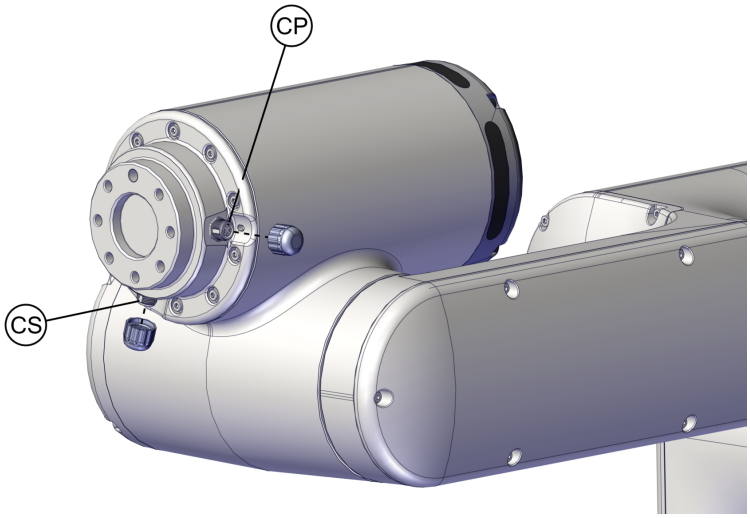
-	The connector can be rotated 330° clockwise.

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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



xx2100000125

CAUTION

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

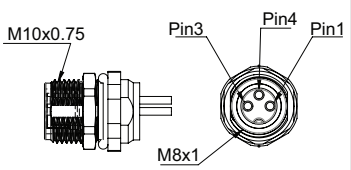
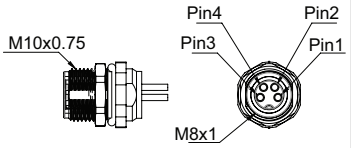
Note

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

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1.9 Customer connections on the manipulator
Continued

Pos	Connector type	Torque for mating/un-mating	Layout	Pin specification
CP	M8 3 pin female, 200 mm wire, straight (two pins for use, one pin is spare)	0.4 Nm	 xx2100000220	Pins on R2.CP: 1: CP+ 3: CP- 4: NC
CS	M8 4 pin female, 200 mm wire, straight	0.4 Nm	 xx2100000219	Pins on R2.CS: 1: CS Pair_1 + 2: CS Pair_1 - 3: CS Pair_2 + 4: CS Pair_2 -

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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.

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2.2 Manipulator

Manipulator variants

Option	Variant	Handling capacity	Wrist Reach	Flange Reach
3300-19	CRB 15000-5/0.95	5 kg	0.95 m	1.05 m
3300-69	CRB 15000-12/1.27	12 kg	1.27 m	1.38 m
3300-70	CRB 15000-10/1.52	10 kg	1.52 m	1.63 m

Manipulator protection

Option	Description
3350-540	Base 54, IP54 (standard for CRB 15000-5/0.95)
3350-670	Base 67, IP67 (standard for CRB 15000-10/1.52 and CRB 15000-12/1.27)

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

Note

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

Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from *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*.

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2.3 Floor cables

Note

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

Controller and robot (IRB)

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

Controller and positioner (IRP)

Manipulator cable length

Option	Lengths
3200-1	3 m
3200-2	7 m
3200-3	15 m
3200-6	15 m drag chain cable

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Index

A
Absolute Accuracy, 50
Absolute Accuracy, calibration, 48
ambient humidity
  operation, 21
  storage, 21
ambient temperature
  operation, 21
  storage, 21
arm-side interface, 17
  description, 36
ASI, 17, 36
ASI Setting, 36
assembly instructions, 17
assessment of hazards and risks, 11

C
calibration
  Absolute Accuracy type, 47
  Ultra Accuracy type, 47
calibration, Absolute Accuracy, 48
calibration, Ultra Accuracy, 48
calibration method, 47
CalibWare, 47
compensation parameters, 50

D
dimensions
  robot, 28
directions of axes, 53
Dual PROFIsafe-based laser scanner
  laser scanner, 42–43
Dual SafetyIO-based laser scanner
  laser scanner, 44

E
equipment, robot, 28
extension zone concept, 73
extension zone limits, 73
extra equipment, 28

F
fitting, equipment, 28
foundation
  requirements, 20

H
HRA, 11
humidity
  operation, 21
  storage, 21

I
installation
  equipment, 28
  laser scanner, 40
instructions for assembly, 17
intended use, 11
ISO/TS 15066, 11

J
jogging directions, 53

L
laser scanner
  installation, 40
Laser scanner
  dual PROFIsafe-based laser scanner, 42–43
  Dual SafetyIO-based laser scanner, 44
  PROFIsafe-based laser scanner, 41–42
  SafetyIO-based laser scanner, 43
lead-through, 37
limitations, 74
load, 38, 72
loads on foundation, 18

M
mounting, equipment, 28

O
operating conditions, 21
options, 103

P
payload, 38
product standards, 15
PROFIsafe-based laser scanner
  laser scanner, 41–42
protection classes, 21
protection type, 21

R
requirements on foundation, 20
robot
  dimensions, 28
  equipment, fitting, 28
  protection class, 21
  protection types, 21
  working range, 64

S
SafetyIO-based laser scanner
  laser scanner, 43
safety standards, 15
securing the robot to foundation, attachment screws, 26
speed, 74
standards, 15
standard warranty, 104
stock warranty, 104
stopping distance, 74
stopping time, 74
storage conditions, 21

T
temperatures
  operation, 21
  storage, 21
torques on foundation, 18
turning radius, 67

U
Ultra Accuracy, calibration, 48

V
variants, 103

W
warranty, 104
wcp, 73
weight, 18
when to calibrate, 47
working range, 69
  robot, 64

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