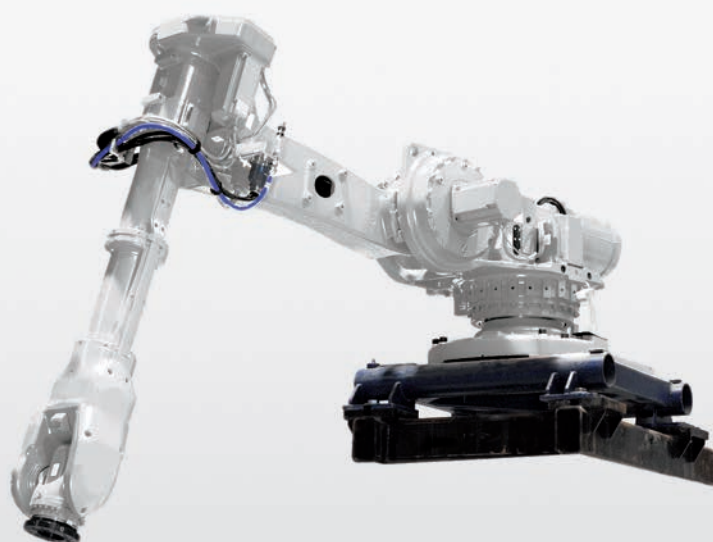


ROBOTICS

Product specification

IRB 6650S



Trace back information:
Workspace 23C version a12
Checked in 2023-09-28
Skribenta version 5.5.019

Product specification

IRB 6650S-200/3.0

IRB 6650S-190/3.0 LID

IRB 6650S-125/3.5

IRB 6650S-100/3.5 LID

IRB 6650S-90/3.9

OmniCore

Document ID: 3HAC081956-001

Revision: C

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Overview of this product specification

About this product specification

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

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

The specification covers the manipulator using the OmniCore controller.

Usage

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

The specification is intended for:

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

References

Reference	Document ID
<i>Product manual - IRB 6650S</i>	3HAC020993-001
<i>Product manual - DressPack/SpotPack IRB 6650S</i>	3HAC055424-001
<i>Product manual - OmniCore V250XT Type A</i>	3HAC084692-001
<i>Product manual - OmniCore V250XT</i>	3HAC073447-001
<i>Product specification - OmniCore V line</i>	3HAC074671-001

Revisions

Revision	Description
A	First edition.
B	Published in release 23B. The following updates are done in this revision: <ul style="list-style-type: none"> • Updated pose repeatability for 90 kg variant. • Added DressPack options for spotwelding.
C	Published in release 23C. The following updates are done in this revision: <ul style="list-style-type: none"> • Corrections done in the DressPack connector kits, see Connector kits on page 72.

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1 Description

1.1 Structure

1.1.1 Introduction

Robot family

The IRB 6650S is ideal for process applications, regardless of industry and offers a unique working envelope. Typical areas can be Material Handling and Machine Tending.

Software product range

We have added a range of software products - all falling under the umbrella designation of Active Safety - to protect not only personnel in the unlikely event of an accident, but also robot tools, peripheral equipment and the robot itself.

Operating system

The robot is equipped with the OmniCore V250XT 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 *Product specification - OmniCore V line*.

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support - for example gluing and welding, communication features - network communication - and advanced functions such as multitasking, sensor control etc.

For a complete description on optional software, see *Product specification - OmniCore V line*.

Protection type Foundry Plus 2

Robots with the option Foundry Plus 2 are designed for harsh environments where the robot is exposed to sprays of coolants, lubricants and metal spits that are typical for die casting applications or other similar applications.

Typical applications are spraying insertion and part extraction of die-casting machines, handling in sand casting and gravity casting, etc. (Please refer to Foundry Prime robots for washing applications or other similar applications). Special care must be taken in regard to operational and maintenance requirements for applications in foundry as well as in other applications areas. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility for the Foundry Plus 2 protected robot.

The robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the corrosion protection additional rust preventive

Continues on next page

1 Description

1.1.1 Introduction

Continued

are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may cause rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned.

The entire robot is IP67 compliant according to IEC 60529 - from base to wrist, which means that the electrical compartments are sealed against water and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Selected Foundry Plus 2 features:

- Improved sealing to prevent penetration into cavities to secure IP67
- Additional protection of cabling and electronics
- Special covers that protect cavities
- Well-proven connectors
- Nickel coated tool flange
- Rust preventives on screws, washers and unpainted/machined surfaces
- Extended service and maintenance program

The Foundry Plus 2 robot can be cleaned with appropriate washing equipment according to the robot product manual. Appropriate cleaning and maintenance is required to maintain the protection, for example can rust preventive be washed off with wrong cleaning method.

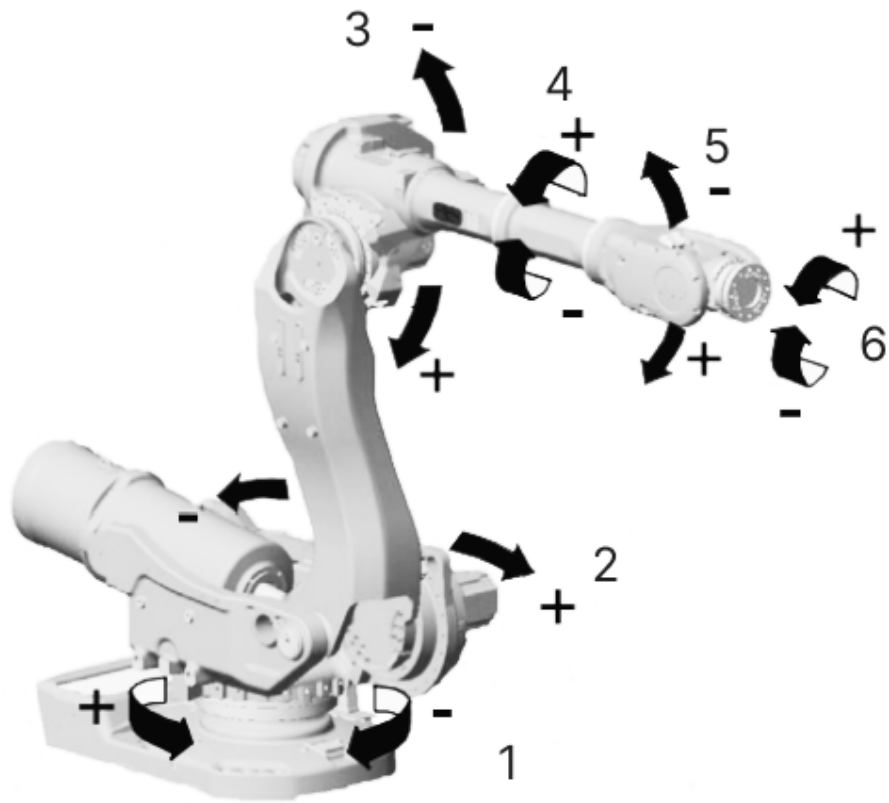
Available robot variants

The option Foundry Plus 2 might not be available for all robot variants.

See [Specification of variants and options on page 79](#) for robot versions and other options not selectable together with Foundry Plus 2.

Continues on next page

Axis movement



xx100000479

1 Description

1.1.2 Different robot versions

1.1.2 Different robot versions

General

The IRB 6650S is available in five versions.

Standard

The following different standard robot types are available:

Robot type	Handling capacity	Reach
IRB 6650S-200/3.0	200 kg	3.0 m
IRB 6650S-190/3.0 LID	190 kg	3.0 m
IRB 6650S-125/3.5	125 kg	3.5 m
IRB 6650S-100/3.5 LID	100 kg	3.5 m
IRB 6650S-90/3.9	90 kg	3.9 m

1.1.3 Definition of version designation

IRB 6650S Mounting

Handling capacity (kg)/ Reach (m)

	Prefix	Description
Mounting	-	Floor-mounted manipulator
Handling capacity (kg)	yyy	Indicates the maximum handling capacity (kg)
Reach (m)	x.x	Indicates the maximum Reach at wrist center (m)

Manipulator weight

Robot type	Weight ⁱ
IRB 6650S-200/3.0	2250 kg
IRB 6650S-190/3.0 LID	2250 kg
IRB 6650S-125/3.5	2250 kg
IRB 6650S-100/3.5 LID	2250 kg
IRB 6650S-90/3.9	2275 kg

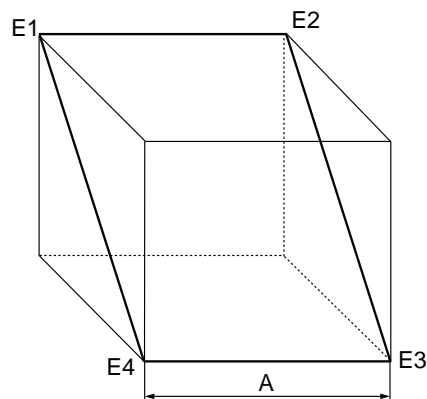
ⁱ Without DressPack

Other technical data

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 73 dB (A) Leq (acc. to Machinery directive 2006/42/EG)

Power consumption at max speed (vmax)

Type of Movement	IRB 6650S
ISO Cube	2.4 kW
Robot in calibration position	IRB 6650S
Brakes engaged	0.25 kW
Brakes disengaged	1.15 kW



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Continues on next page

1 Description

1.1.3 Definition of version designation

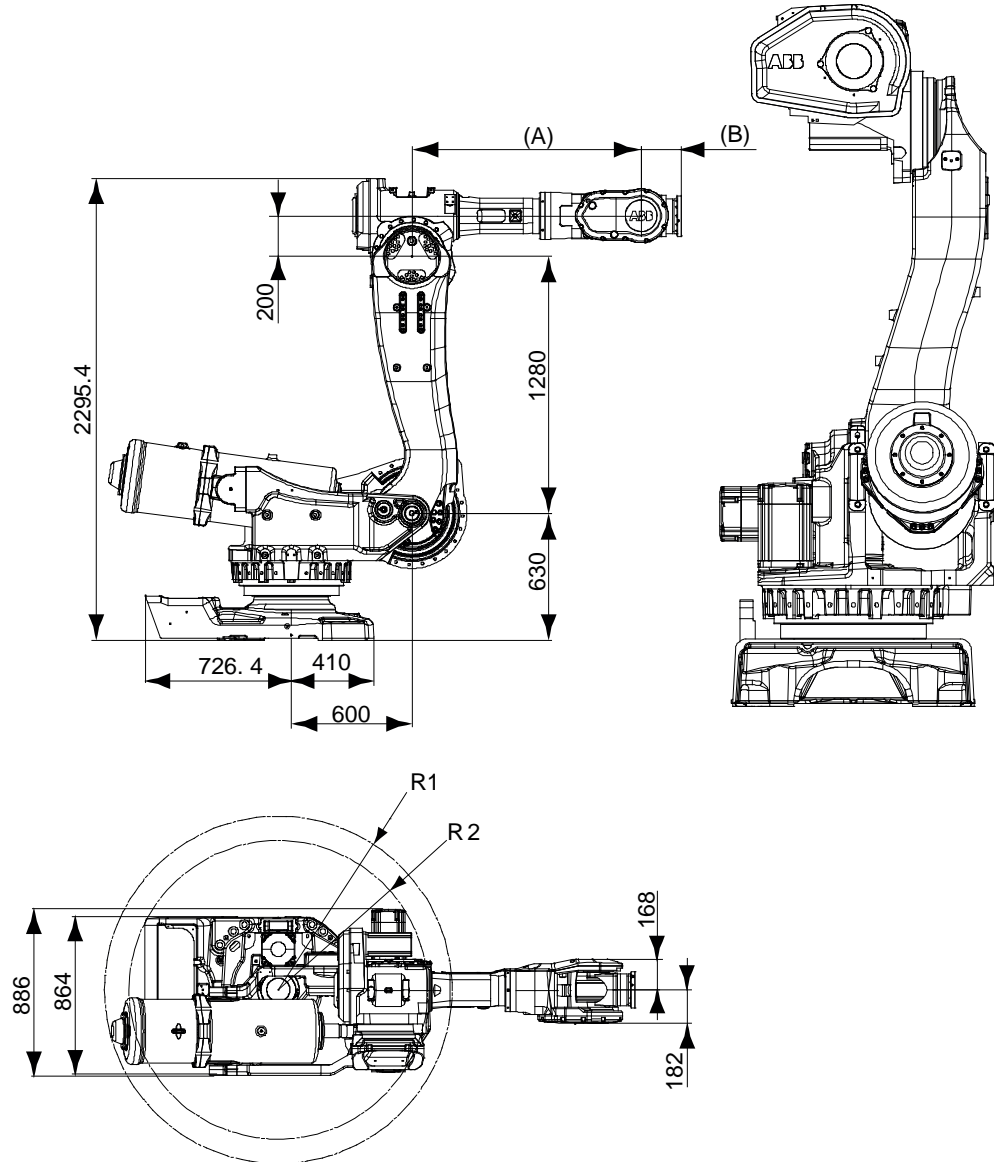
Continued

Pos	Description
A	1,000 mm

Power factor (cos φ)

The power factor is above 0.95 at a steady state power consumption higher than 2.0 kW, when the IRB 6650S is connected to the OmniCore V line.

Dimensions of IRB 6650S



xx100000480

Robot variant	A	B ⁱ
IRB 6650S-90/3.9	2,042 mm	200 mm
IRB 6650S-125/3.5	1,592 mm	200 mm
IRB 6650S-100/3.5 LID	1,592 mm	349 mm
IRB 6650S-200/3.0	1,142 mm	200 mm

Continues on next page

Robot variant	A	B ⁱ
IRB 6650S-190/3.0 LID	1,142 mm	349 mm

ⁱ The different values for B depending on LID or nonLID variant.

Pos	Description
R1	R 960 (Rear side, Balancing device)
R2	R 813 (Front side, Motor axis 2)

1 Description

1.2.1 Applicable standards

1.2 Standards

1.2.1 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

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

Region specific standards and regulations

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

1.3 Installation

1.3.1 Introduction

General

All versions of IRB 6650S are designed for floor mounting (no tilting allowed around X-axis or Y-axis). Depending on the robot version, an end effector with max. weight of 90 to 200 kg including payload, can be mounted on the mounting flange (axis 6). See [Load diagrams on page 32](#) for IRB 6650S generation robots.

Extra Loads

Extra load (valve packages, transformers) of 50 kg, which is included in the load diagrams, can be mounted on the upper arm. An extra load of 500 kg can also be mounted on the frame of axis 1. See [Mounting equipment on page 46](#) on IRB 6650S.

Working Range

The working range of axes 1-3 can be limited by mechanical stops.

1 Description

1.3.2 Operating requirements

1.3.2 Operating requirements

Protection standards

Robot version/ Protection standard	IEC60529
All variants, manipulator	IP67

Explosive environments

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

Ambient temperature

Description	Standard/Option	Temperature
Manipulator during operation	Standard	+ 5 °C ⁱ (41 °F) to + 50 °C (122 °F)
For the controller	Standard/Option	See <i>Product specification - OmniCore V line</i>
Complete robot during transportation and storage	Standard	- 25 °C (- 13 °F) to + 55 °C (131 °F)
For short periods (not exceeding 24 hours)	Standard	up to + 70 °C (158 °F)

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

Relative humidity

Description	Relative humidity
Complete robot during transportation and storage	Max. 95% at constant temperature
Complete robot during operation	Max. 95% at constant temperature

1.3.3 Mounting the manipulator

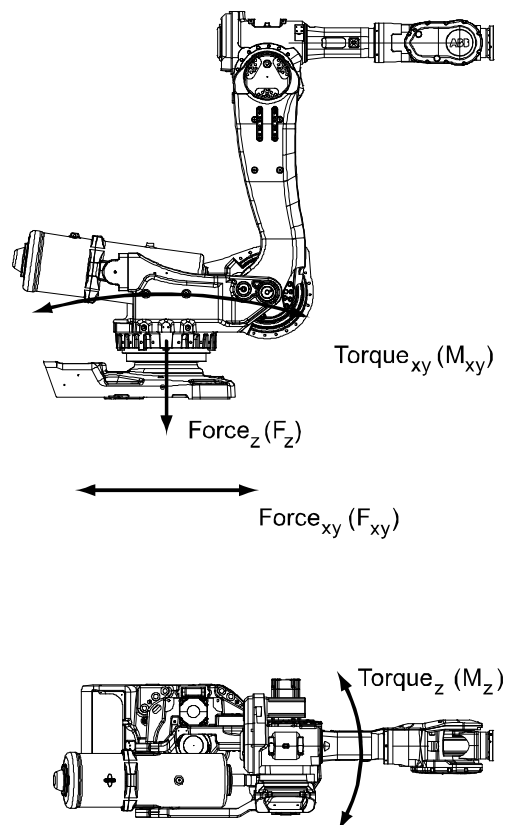
Maximum Load

Maximum load in relation to the base coordinate system.

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 10.6 kN	± 20.9 kN
Force z	28.2 ± 7.7 kN	28.2 ± 16.4 kN
Torque xy	± 28.2 kNm ± 31 kNm ⁱ	± 50.5 kNm ± 55.6 kNm ⁱ
Torque z	± 7.9 kNm	± 13.6 kNm

ⁱ When using base spacers (option).



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Note regarding Mxy and Fxy

The bending torque (M_{xy}) can occur in any direction in the XY-plane of the base coordinate system.

The same applies to the transverse force (F_{xy}).

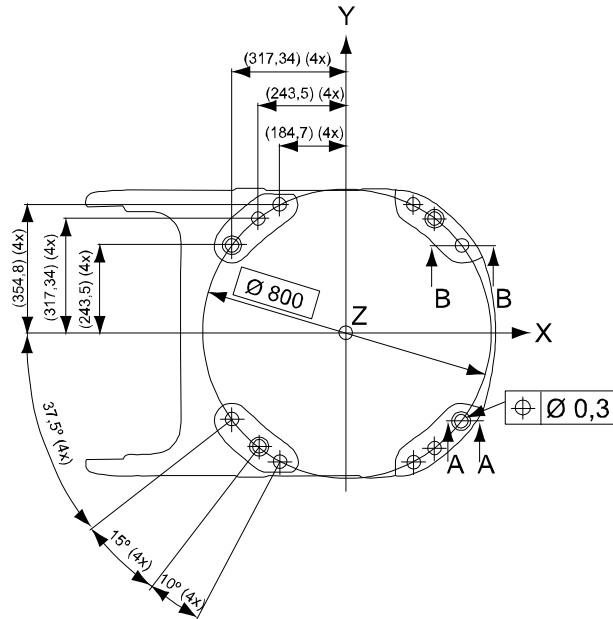
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1 Description

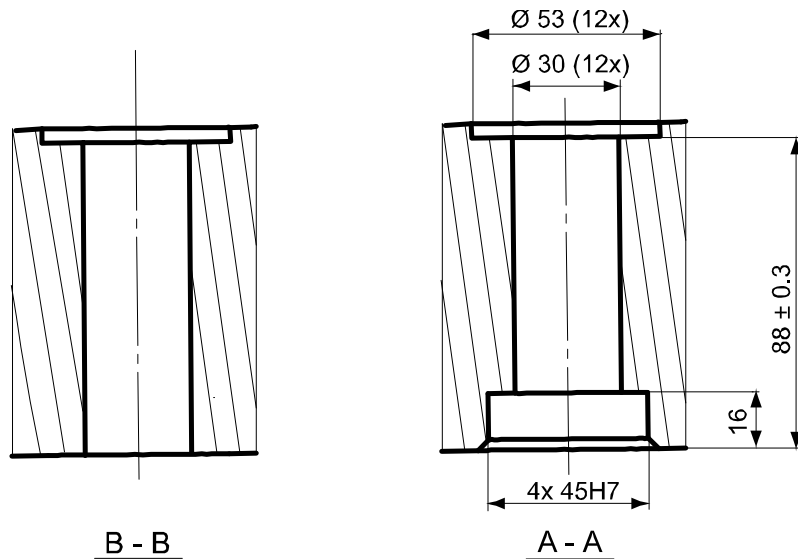
1.3.3 Mounting the manipulator

Continued

Fastening holes robot base - for IRB 6650S



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Recommended screws for fastening the manipulator to the base	M24 x 140 8.8 with 4 mm flat washer
Torque value	725 Nm



Note

Only two guiding sleeves shall be used. The corresponding holes in the base plate shall be circular and oval according to Figures below.

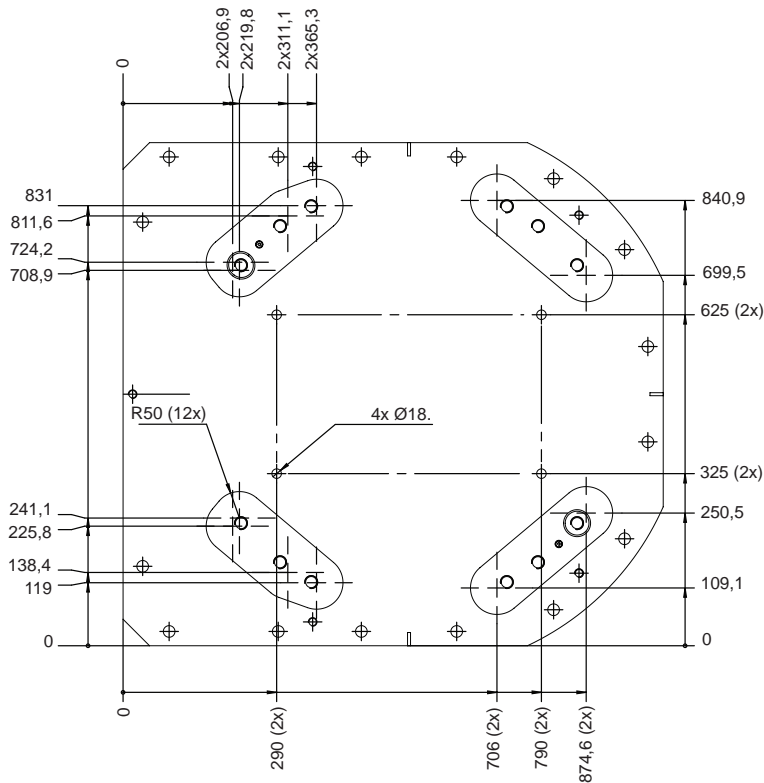
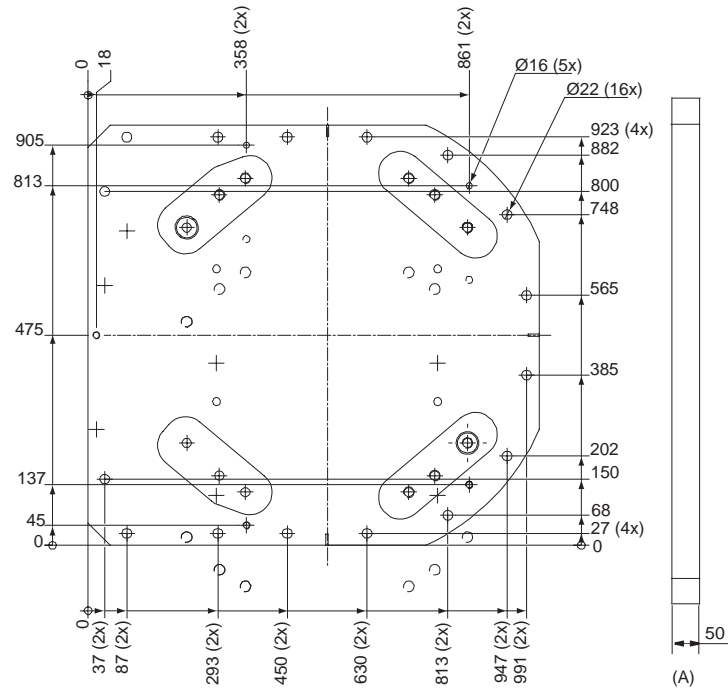
Regarding AbsAcc performance, the chosen guide holes according to Figures below are recommended.

Continues on next page

1 Description

1.3.3 Mounting the manipulator

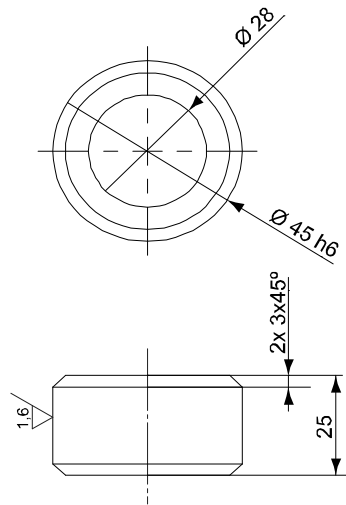
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xx1000001054

Pos	Description
A	Color: RAL 9005 Thickness: 80-100 µm

Continues on next page



xx1000001055

Pos	Description
A	Guide sleeve protected from corrosion

1 Description

1.4.1 Calibration methods

1.4 Calibration and references

1.4.1 Calibration methods

Overview

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

More information is available in the product manual.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: <ul style="list-style-type: none">• Mechanical tolerances in the robot structure• Deflection due to load 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
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4 and 5.	Wrist Optimization

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 6650S. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

Continues on next page

The calibration equipment for Axis Calibration is delivered as a toolkit.

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Wrist Optimization method

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

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

CalibWare - Absolute Accuracy calibration

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

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

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

1 Description

1.4.2.1 Synchronization marks and synchronization position for axes

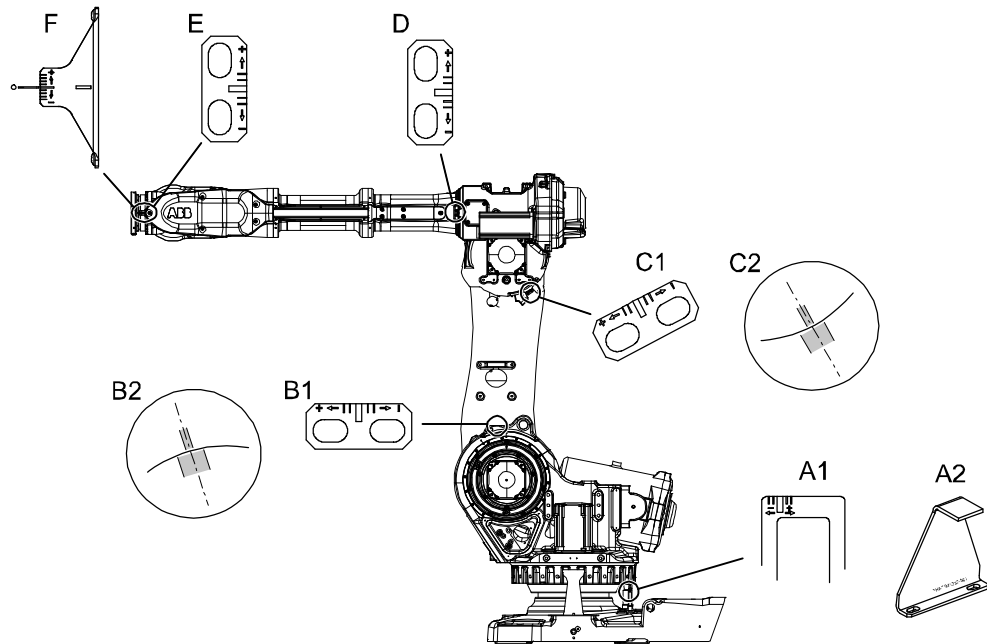
1.4.2 Synchronization marks and axis movement directions

1.4.2.1 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

Synchronization marks



xx0200000176

A1	Synchronization mark, axis 1 (early design)
A2	Synchronization mark, axis 1 (later design)
B1	Synchronization mark, axis 2 (early design)
B2	Synchronization mark, axis 2 (later design)
C1	Synchronization mark, axis 3 (early design)
C2	Synchronization mark, axis 3 (later design)
D	Synchronization mark, axis 4
E	Synchronization mark, axis 5
F	Synchronization mark, axis 6

Synchronization marks at axes 2 and 3

The synchronization marks at axes 2, 3 and 6, shown in the figure above, consist of two single marks that should be positioned opposite to one another when the robot is standing in its synchronization position. One of the marks is more narrow than the other and should be positioned within the limits of the wider mark.

1.4.2.2 Calibration movement directions for all axes

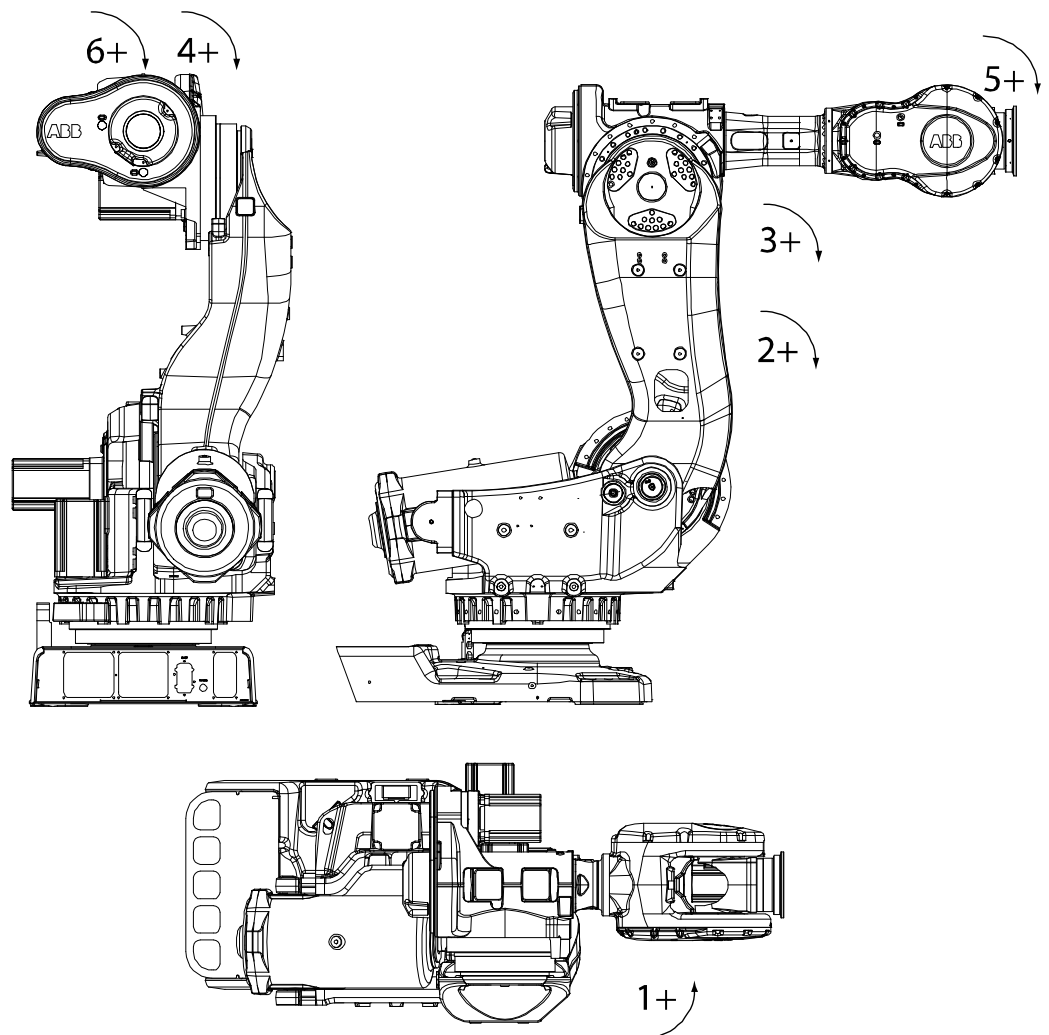
Overview

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

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

Manual movement directions, 6 axes

Note! The graphic shows an IRB 7600. The positive direction is the same for all 6-axis robots, except the positive direction of axis 3 for IRB 6400R, which is in the opposite direction!



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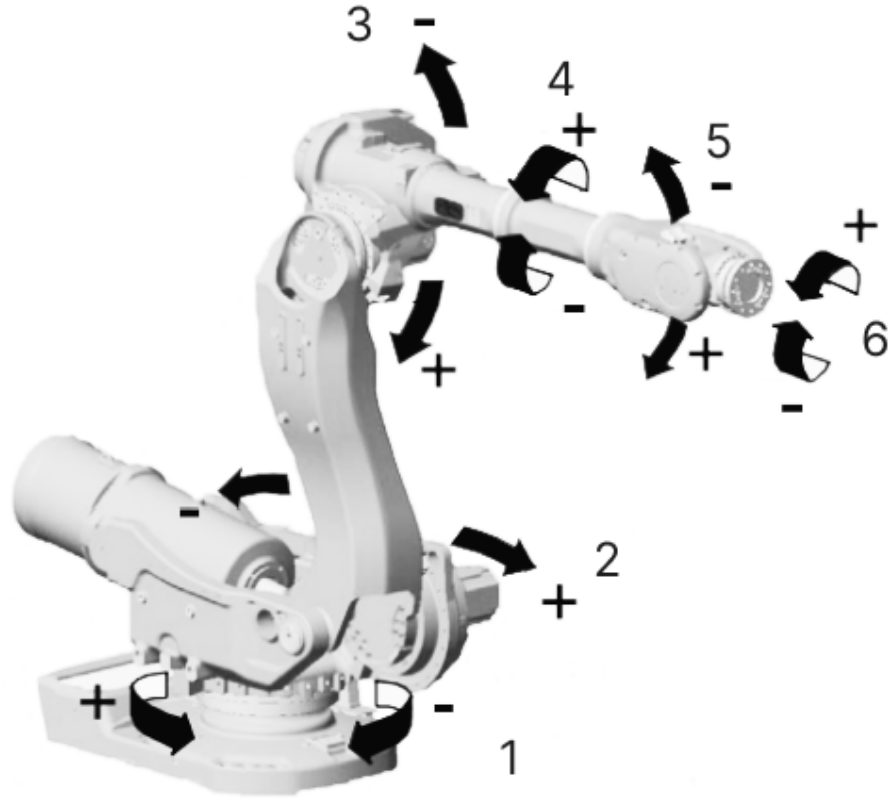
1 Description

1.4.3 Fine calibration

1.4.3 Fine calibration

General

Fine calibration is made using the Axis calibration method. The following figure shows all axes in zero position.



xx100000479

Calibration

Calibration	Position
Calibration of all axes	All axes are in zero position
Calibration of axis 1 and 2	Axis 1 and 2 in zero position
	Axis 3 to 6 in any position
Calibration of axis 1	Axis 1 in zero position
	Axis 2 to 6 in any position

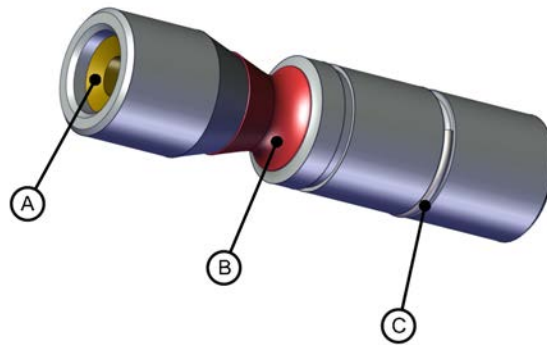
Calibration tools



WARNING

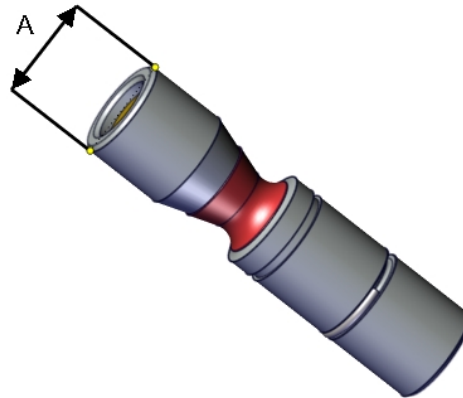
If any part is missing or damaged, the tool must be replaced immediately.

Continues on next page



xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring



xx1500000951

A	Outer diameter
---	----------------

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

- Outer diameter within $\text{Ø}12\text{g}4$ mm, $\text{Ø}8\text{g}4$ mm or $\text{Ø}6\text{g}5$ mm (depending on calibration tool size).
- Straightness within 0.005 mm.

1 Description

1.4.4 Absolute Accuracy calibration

1.4.4 Absolute Accuracy calibration

Purpose

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

Here are some examples of when this accuracy is important:

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

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



Note

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

What is included

Every *Absolute Accuracy* robot is delivered with:

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

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

Absolute Accuracy supports floor mounted, wall mounted, and ceiling mounted installations. The compensation parameters that are saved in the robot memory differ depending on which *Absolute Accuracy* option is selected.

When is *Absolute Accuracy* being used

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

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

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

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

Continues on next page

- 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.

1 Description

1.5.1 Introduction to Load diagrams

1.5 Load diagrams

1.5.1 Introduction to Load diagrams

Information



WARNING

It is very important to always define correct actual load data and correct payload of the robot. Incorrect definitions of load data can result in overloading of the robot.

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

- motors
- gearboxes
- mechanical structure



WARNING

In RobotWare, the service routine LoadIdentify can be used to determine correct load parameters. The routine automatically defines the tool and the load.

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



WARNING

Robots running with incorrect load data and/or with loads outside the load diagram, will not be covered by robot warranty.

General

The load diagrams include a nominal payload inertia, J_0 of 15 kgm^2 , and an extra load of 50 kg at the upper arm housing.

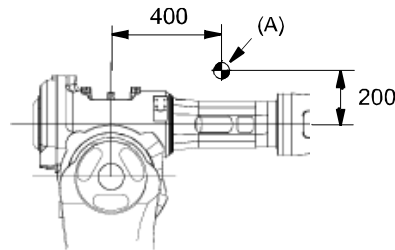
At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

Continues on next page

Control of load case with RobotLoad

To verify a specific load case, use the RobotStudio add-in RobotLoad.

The result from RobotLoad is only valid within the maximum loads and tilt angles. There is no warning if the maximum permitted arm load is exceeded. For over-load cases and special applications, contact ABB for further analysis.



xx100000494

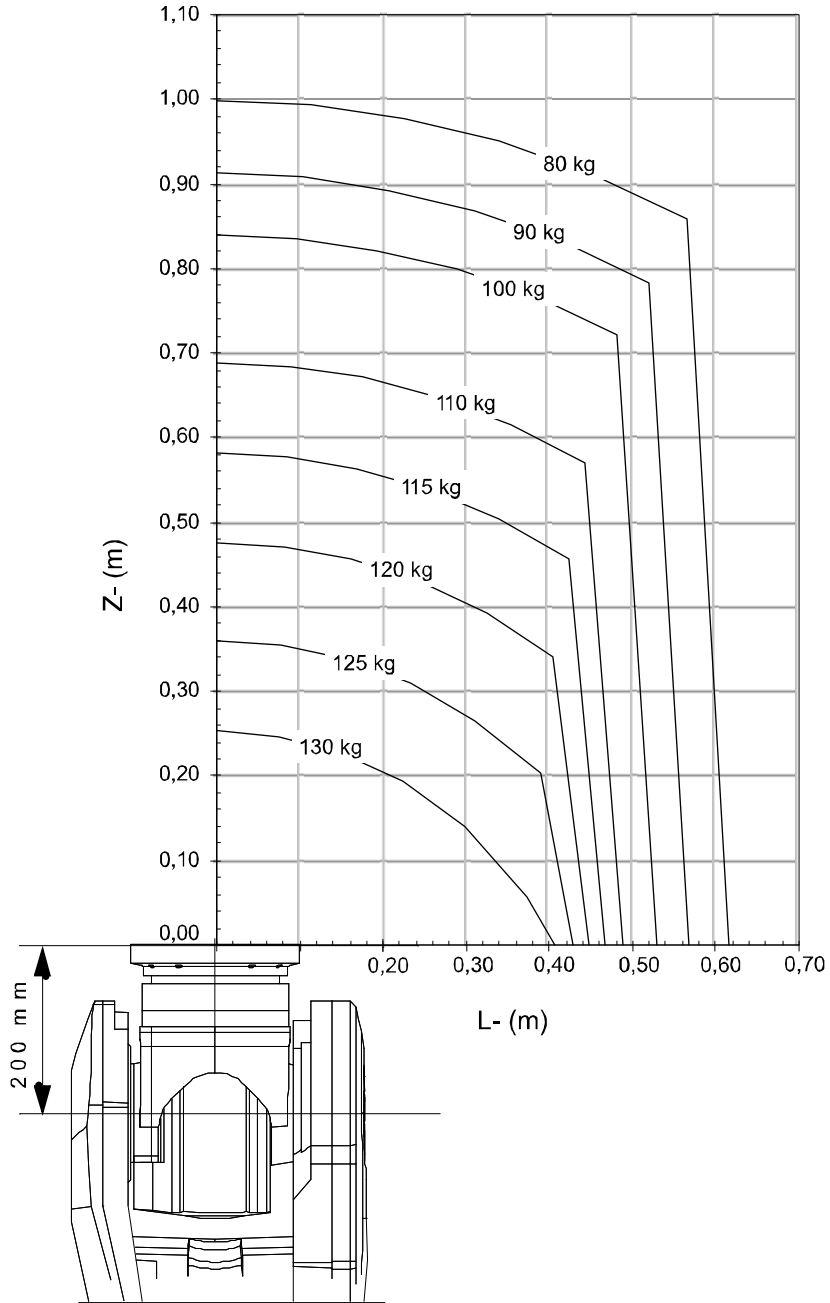
Pos	Description
A	Center of gravity 50 kg

1 Description

1.5.2 Load diagrams

1.5.2 Load diagrams

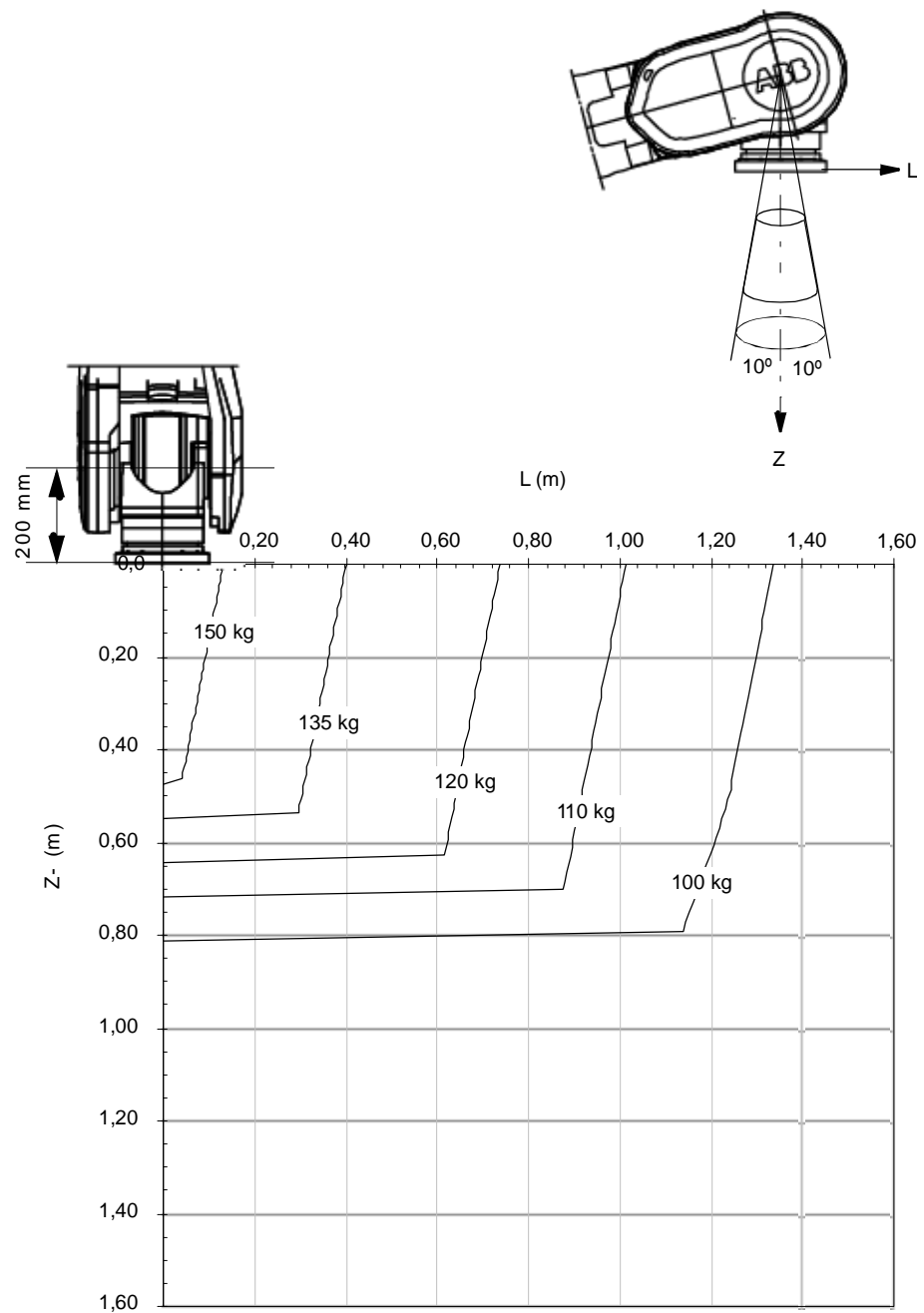
IRB 6650S-125/3.5



xx1000000547

Continues on next page

IRB 6650S-125/3.5 "Vertical Wrist" ($\pm 10^\circ$)



xx100000550

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

	Description
Max load	150 kg
Z _{max}	0,462 m
L _{max}	0,156 m

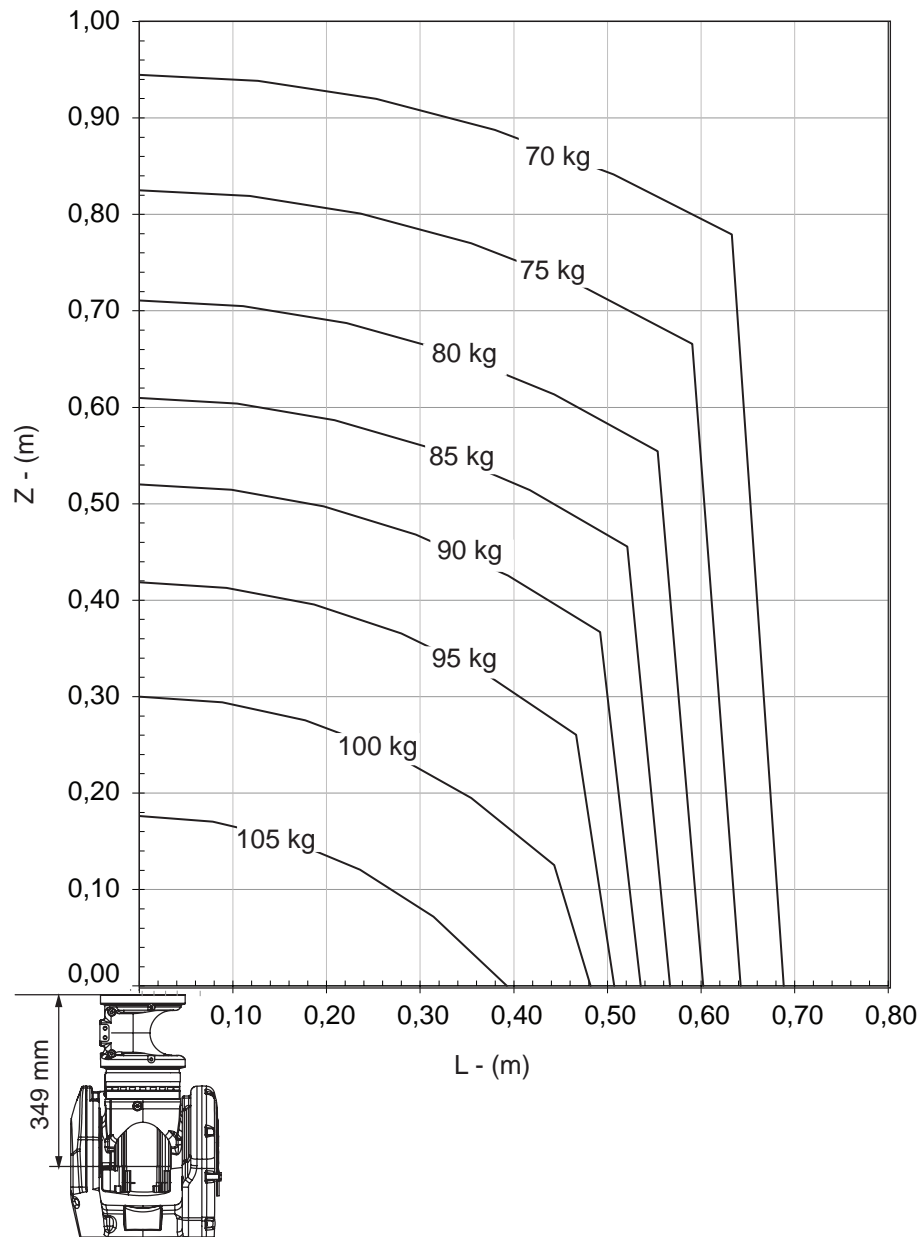
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1 Description

1.5.2 Load diagrams

Continued

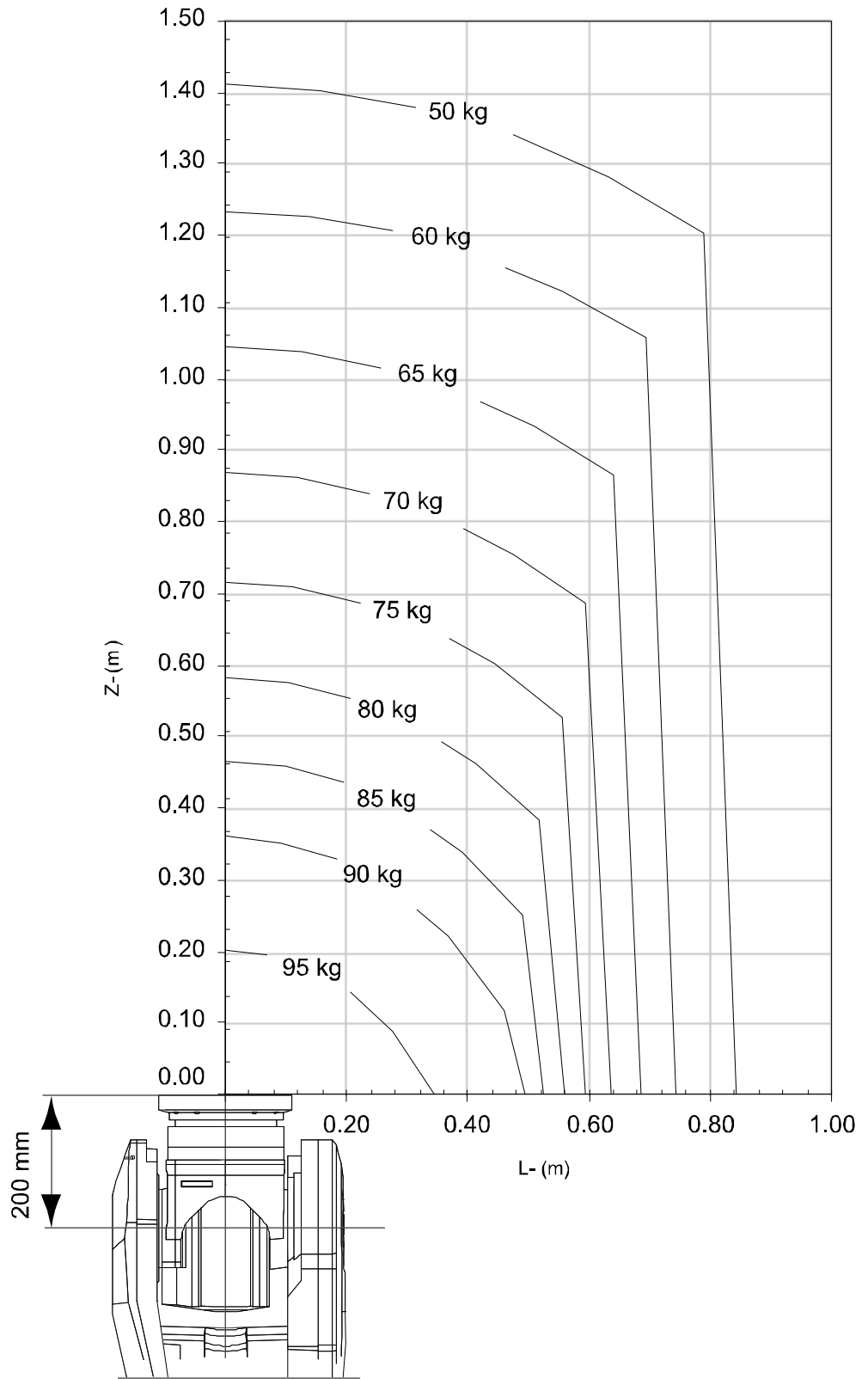
IRB 6650S-100/3.5 LID



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IRB 6650S-90/3.9



xx100000549

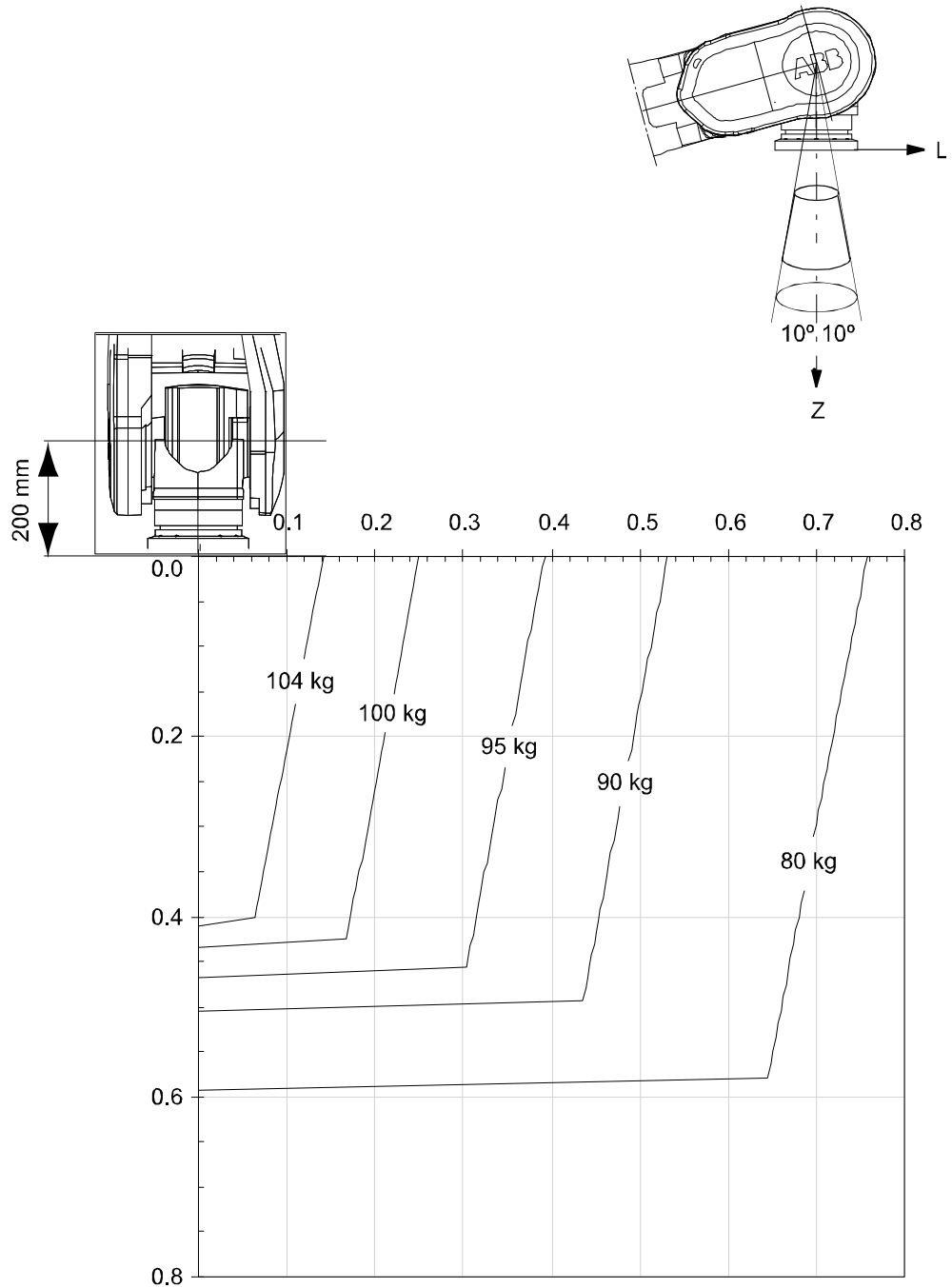
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1 Description

1.5.2 Load diagrams

Continued

IRB 6650S-90/3.9 “Vertical Wrist” ($\pm 10^\circ$)



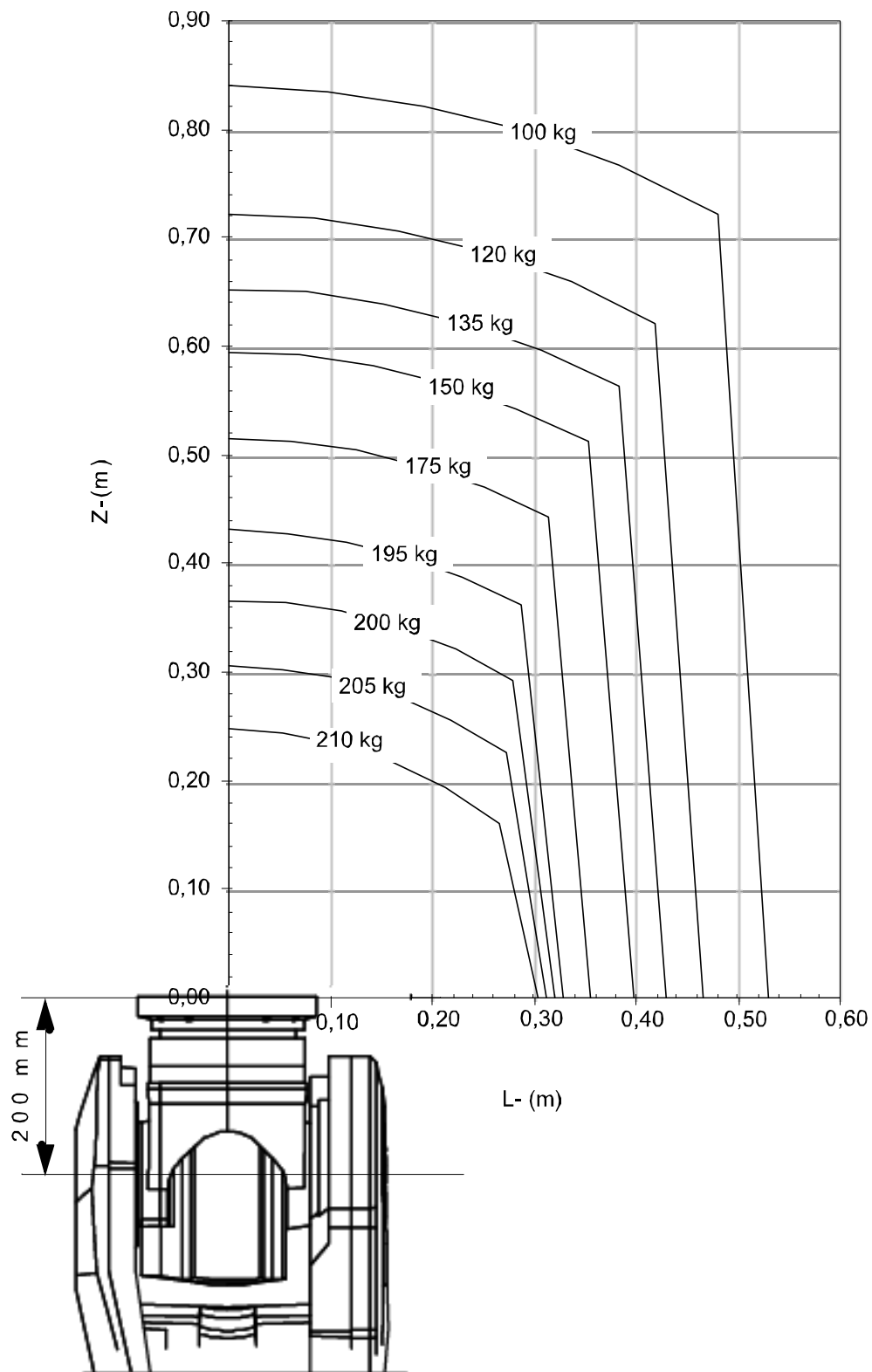
xx1000000551

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

	Description
Max load	107 kg
Z_{\max}	0,2 m
L_{\max}	0.1 m

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IRB 6650S-200/3.0



xx100000548

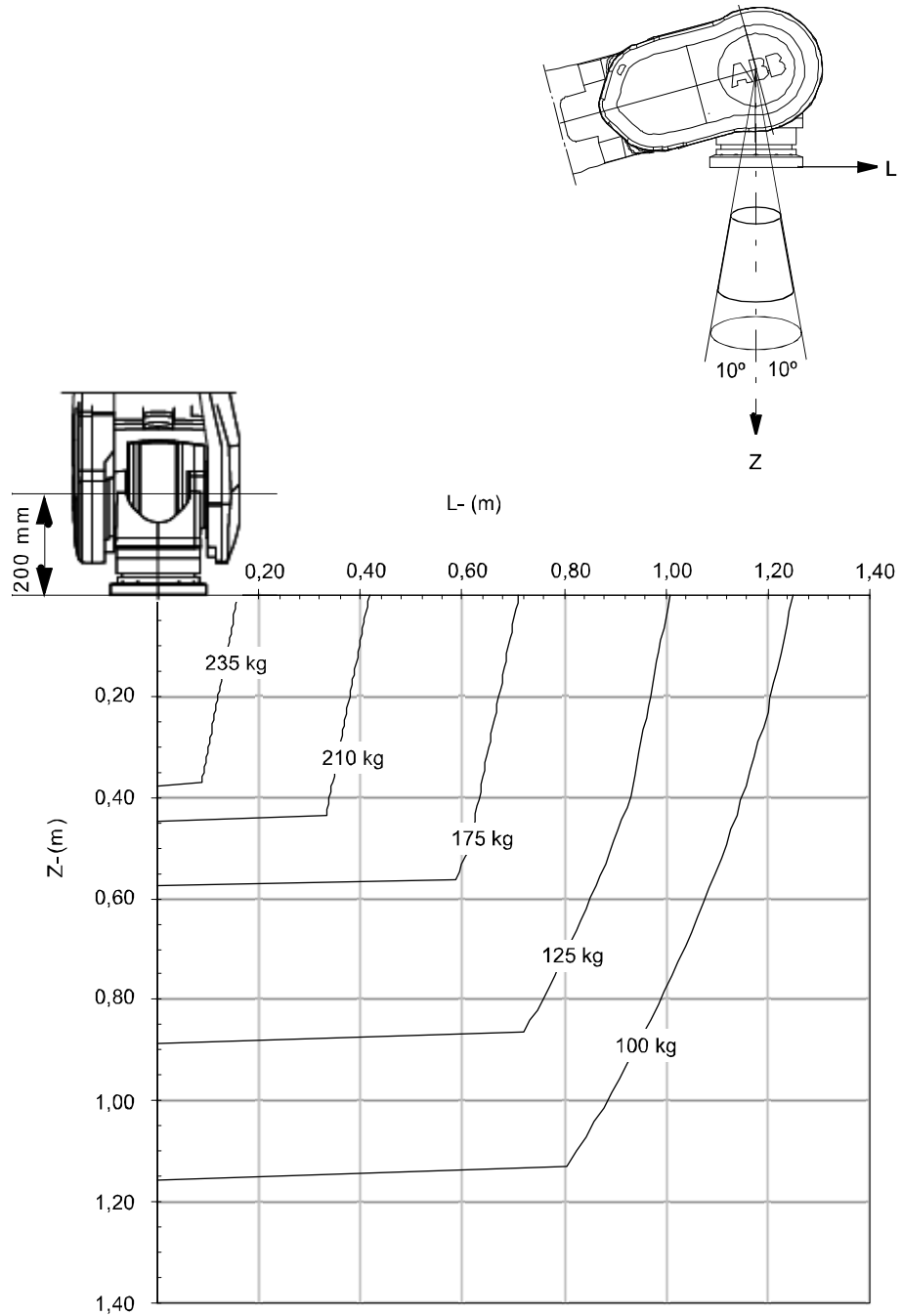
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1 Description

1.5.2 Load diagrams

Continued

IRB 6650S-200/3.0“ Vertical Wrist” ($\pm 10^\circ$)



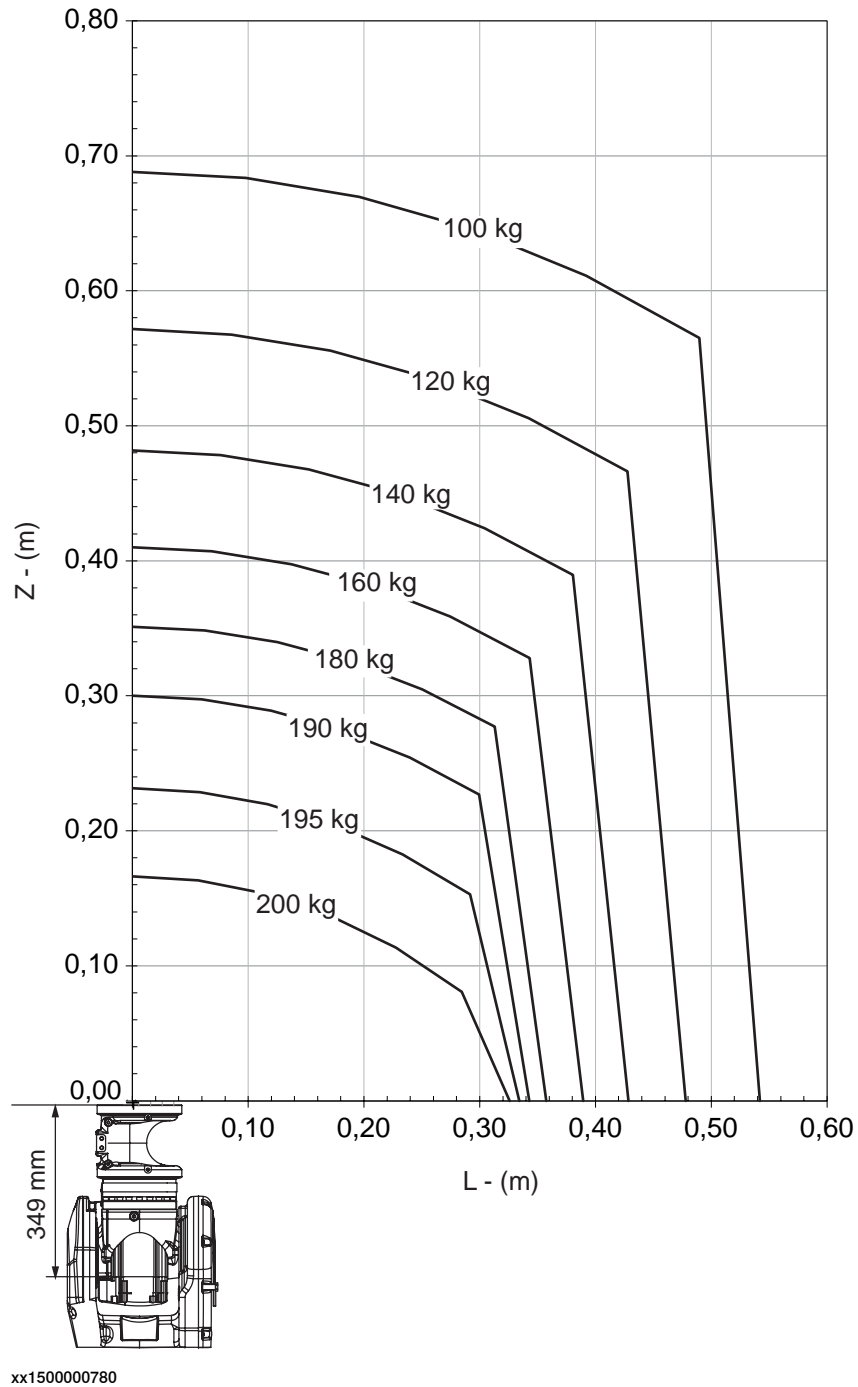
xx1000000552

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

	Description
Max load	245 kg
Z_{\max}	0,345 m
L_{\max}	0,098 m

Continues on next page

IRB 6650S-190/3.0 LID



1 Description

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

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

Note

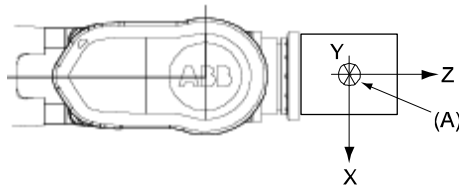


Note

Total load given as: Mass in kg, center of gravity (Z and L) in meter and moment of inertia (J_{0x} , J_{0y} , J_{0z}) in kgm^2 . $L = \sqrt{X^2 + Y^2}$, see Figure below.

Full movement of axis 5 ($\pm 120^\circ$)

Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	$Ja5 = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250 \text{ kgm}^2$
	100/3.5 LID and 190/3.0 LID	$Ja5 = \text{Load} \times ((Z + 0,349)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250 \text{ kgm}^2$
6	125/3.5, 200/3.0 and 90/3.9	$Ja6 = \text{Load} \times L^2 + J_{0z} \leq 185 \text{ kgm}^2$
	100/3.5 LID and 190/3.0 LID	$Ja6 = \text{Load} \times L^2 + J_{0z} \leq 185 \text{ kgm}^2$



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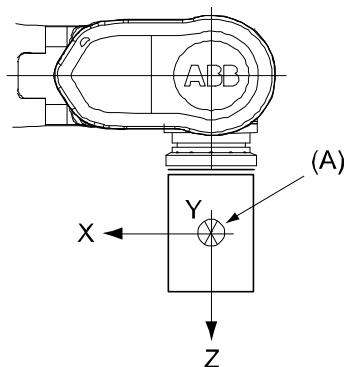
Pos	Description
A	Center of gravity
Description	
J_{0x} , J_{0y} , J_{0z}	Max. moment of inertia around the X, Y and Z axes at center of gravity.

Limited axis 5, center line down

Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	$Ja5 = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 275 \text{ kgm}^2$
	100/3.5 LID and 190/3.0 LID	$Ja5 = \text{Load} \times ((Z + 0,349)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 275 \text{ kgm}^2$
6	125/3.5, 200/3.0 and 90/3.9	$Ja6 = \text{Load} \times L^2 + J_{0z} \leq 250 \text{ kgm}^2$
	100/3.5 LID and 190/3.0 LID	$Ja6 = \text{Load} \times L^2 + J_{0z} \leq 250 \text{ kgm}^2$

Continues on next page

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



xx0900000775

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

1 Description

1.5.4 Wrist torque

1.5.4 Wrist torque

General

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



Note

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

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 6650S-200/3.0	1,264 Nm	625 Nm	192 kg
IRB 6650S-190/3.0 LID	1,259 Nm	639 Nm	189 kg
IRB 6650S-125/3.5	1,037 Nm	526 Nm	105 kg
IRB 6650S-100/3.5 LID	896 Nm	476 Nm	70 kg
IRB 6650S-90/3.9	495 Nm	438 Nm	60 kg

1.5.5 Maximum TCP acceleration

General

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

Maximum Cartesian design acceleration for nominal loads

Robot type	E-stop Max acceleration at nominal load COG [m/s ²]	Controlled Motion Max acceleration at nominal load COG [m/s ²]
IRB 6650S - 200/3.0	53	21
IRB 6650S - 125/3.5	60	25
IRB 6650S - 90/3.9	48	31



Note

Acceleration levels for emergency stop and controlled motion includes acceleration due to gravitational forces. Nominal load is defined with nominal mass and cog with max offset in Z and L (see the load diagram).

1 Description

1.6.1 Introduction

1.6 Mounting equipment

1.6.1 Introduction

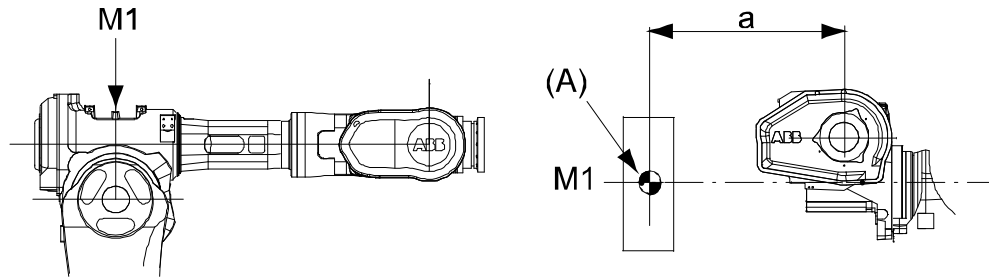
General

Extra loads can be mounted on the upper arm housing, the lower arm, and on the frame. Definitions of distances and masses are shown in the next two Figures. The robot is supplied with holes for mounting extra equipment (see Figure in next chapter). Maximum allowed arm load depends on center of gravity of arm load and robot payload.

Upper arm

Allowed extra load on upper arm housing plus the maximum handling weight(see Figure below):

$M1 \leq 50 \text{ kg}$ with distance $a \leq 500 \text{ mm}$, center of gravity in axis 3 extension.



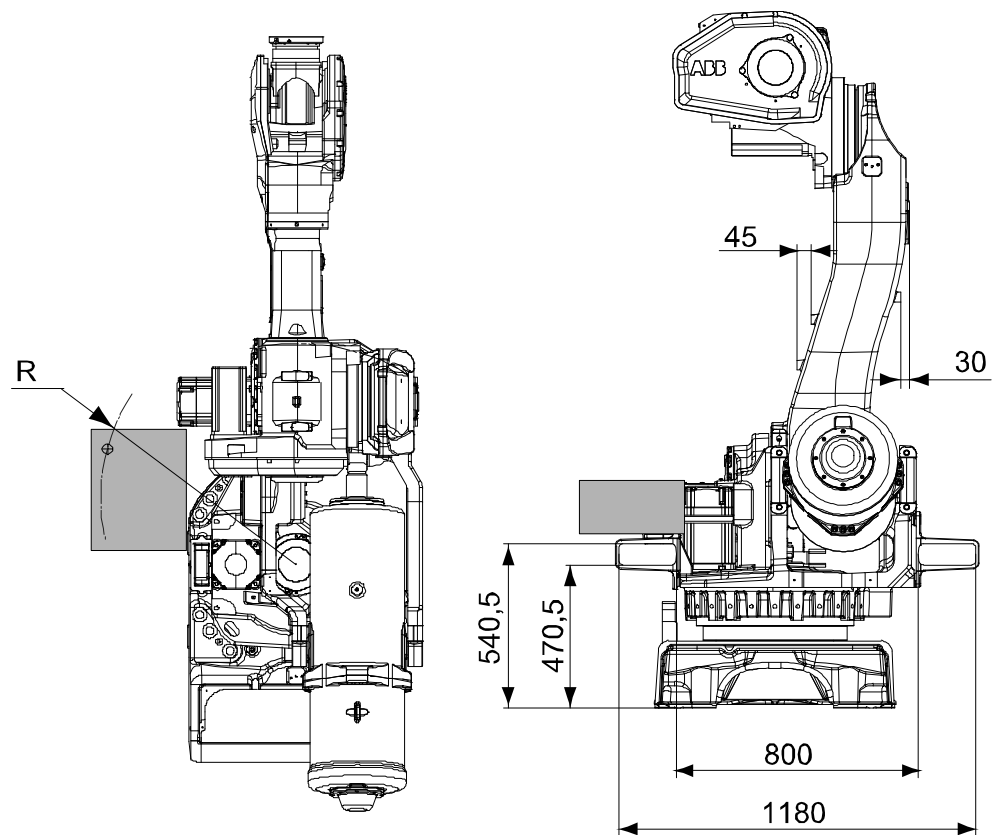
xx1000000495

Pos	Description
A	Mass center

Continues on next page

Frame (Hip Load)

	Description
Permitted extra load on frame	$J_H = 200 \text{ kgm}^2$
Recommended position (see Figure below)	$J_H = J_{H0} + M4 \times R^2$ where: J_{H0} is the moment of inertia of the equipment R is the radius (m) from the center of axis 1 $M4$ is the total mass (kg) of the equipment including bracket and harness ($\leq 500 \text{ kg}$)



xx100000496

Pos	Description
A	View from above
B	View from the rear

1 Description

1.6.2 Mounting of hip load

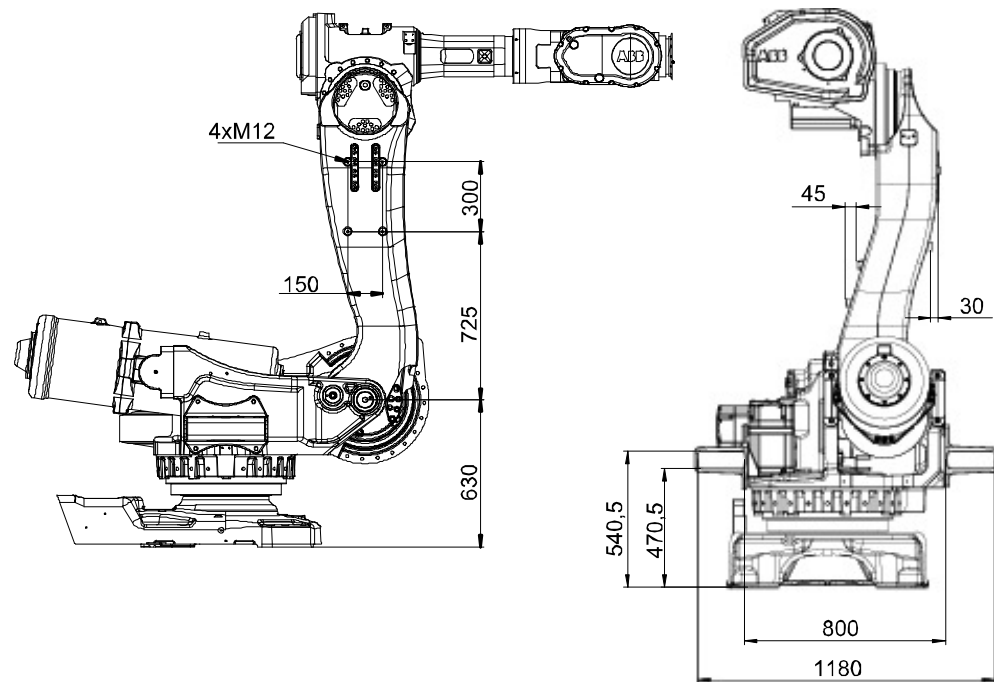
1.6.2 Mounting of hip load

General

The extra load can be mounted on the frame. Holes for mounting see next two Figures. When mounting on the frame all four holes (2x2, Ø 16) on one side must be used.

If loads exceeding 50 kg is required on lower arm, use the calculation program ABB RobotLoad, please contact your local ABB organization.

6650S



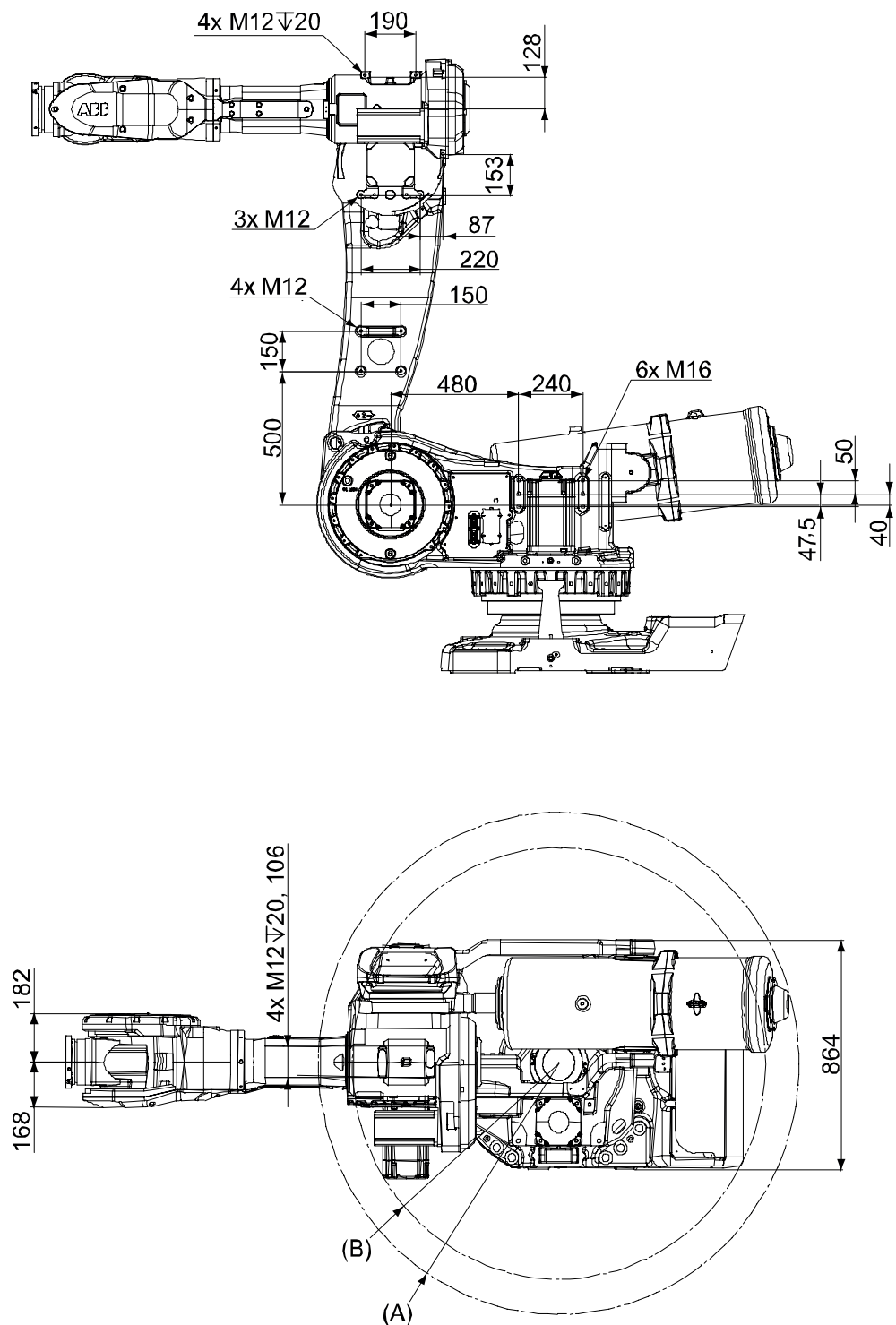
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1 Description

1.6.2 Mounting of hip load

Continued



xx1000000498

Pos	Description
A	R 946 (Rear side, Balancing device)
B	R 813 (Front side, Motor axis 2)

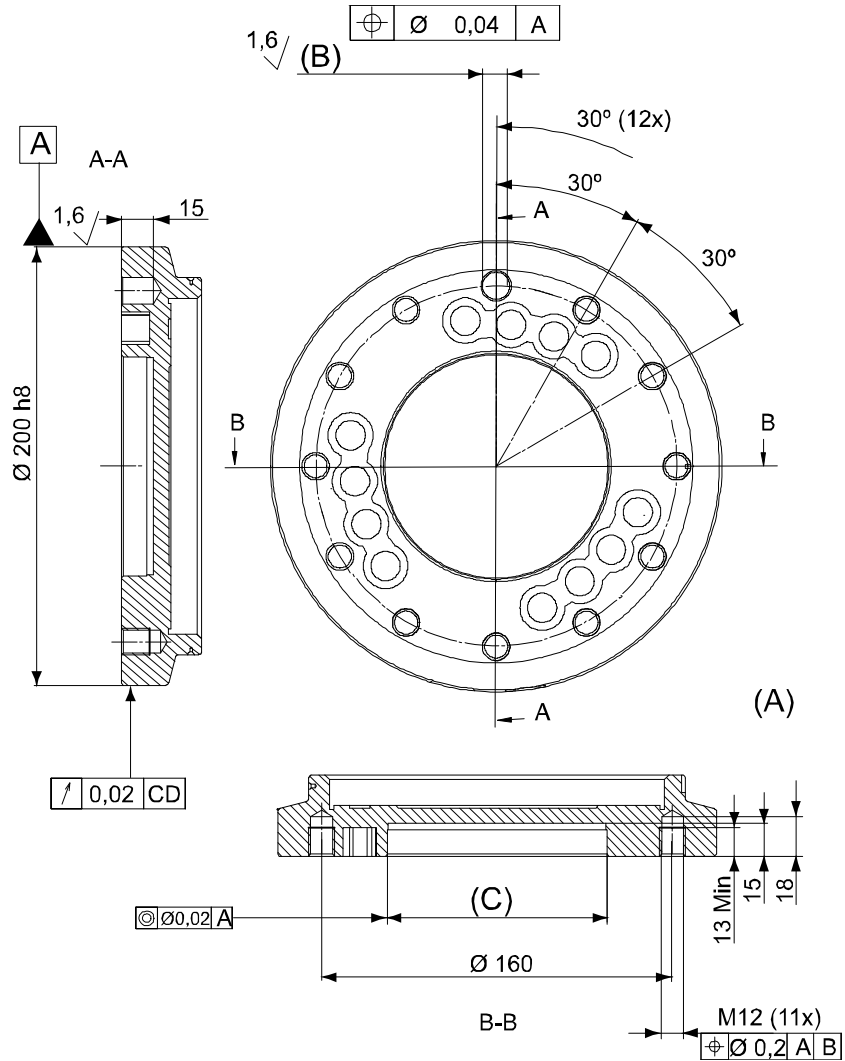
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1 Description

1.6.2 Mounting of hip load

Continued

Tool flange also valid for LeanID.



xx100000499

Pos	Description
A	Minimum thread length for screws in M12-hole is 9 mm.
B	$\text{Ø } 12 \text{ H7 Depth } 15$
C	$\text{Ø } 100 \text{ H7 Depth } 8 \text{ min}$

Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

1.7 Maintenance and troubleshooting

1.7.1 Introduction

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.
- Oil is used for the gear boxes.
- 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 depends on selected options. For detailed information on maintenance procedures, see Maintenance section in the Product Manual.

1 Description

1.8.1 Introduction

1.8 Robot motion

1.8.1 Introduction

Type of Motion

Axis	Type of motion	Range of movement, IRB 6650S
1	Rotation Motion	+ 180° to - 180° + 220° to - 220° (option)
2	Arm motion	+ 160° to - 40°
3	Arm motion	+ 70° to - 180°
4	Wrist motion	+ 300° to - 300°
5	Bend motion	+ 120° to - 120°
6	Turn motion	+ 360° to - 360° default ± 96 Rev ⁱ Max. ⁱⁱ

i Rev. = Revolutions

ii The default working range for axis 6 can be extended by changing parameter values in the software.

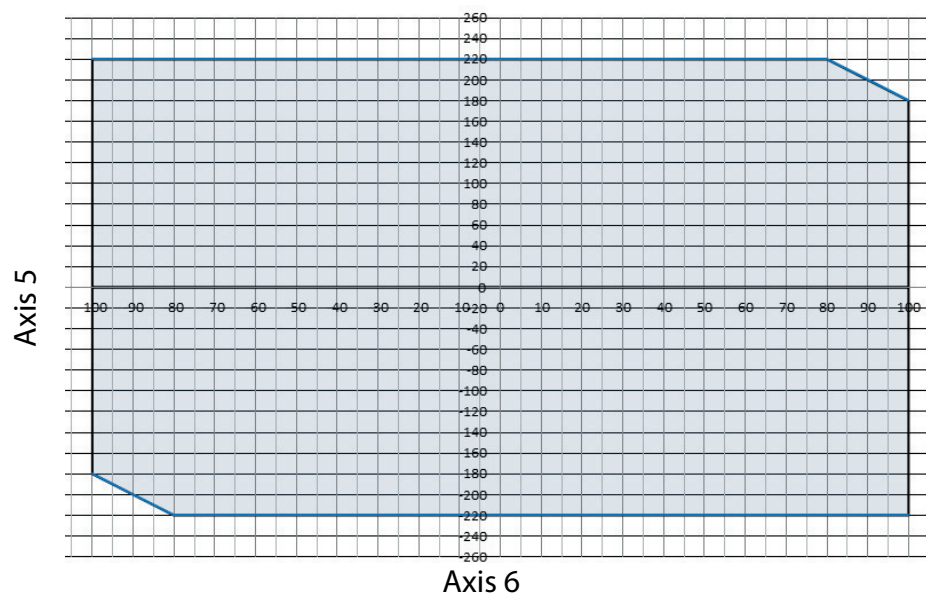


Note

Note! For limitation of range of motion in combination with DressPack see [Introduction on page 52](#).

Working range axis 5 and 6 for LID variants

Allowed working area for axis 6 related to axis 5 position is shown in the figure below.



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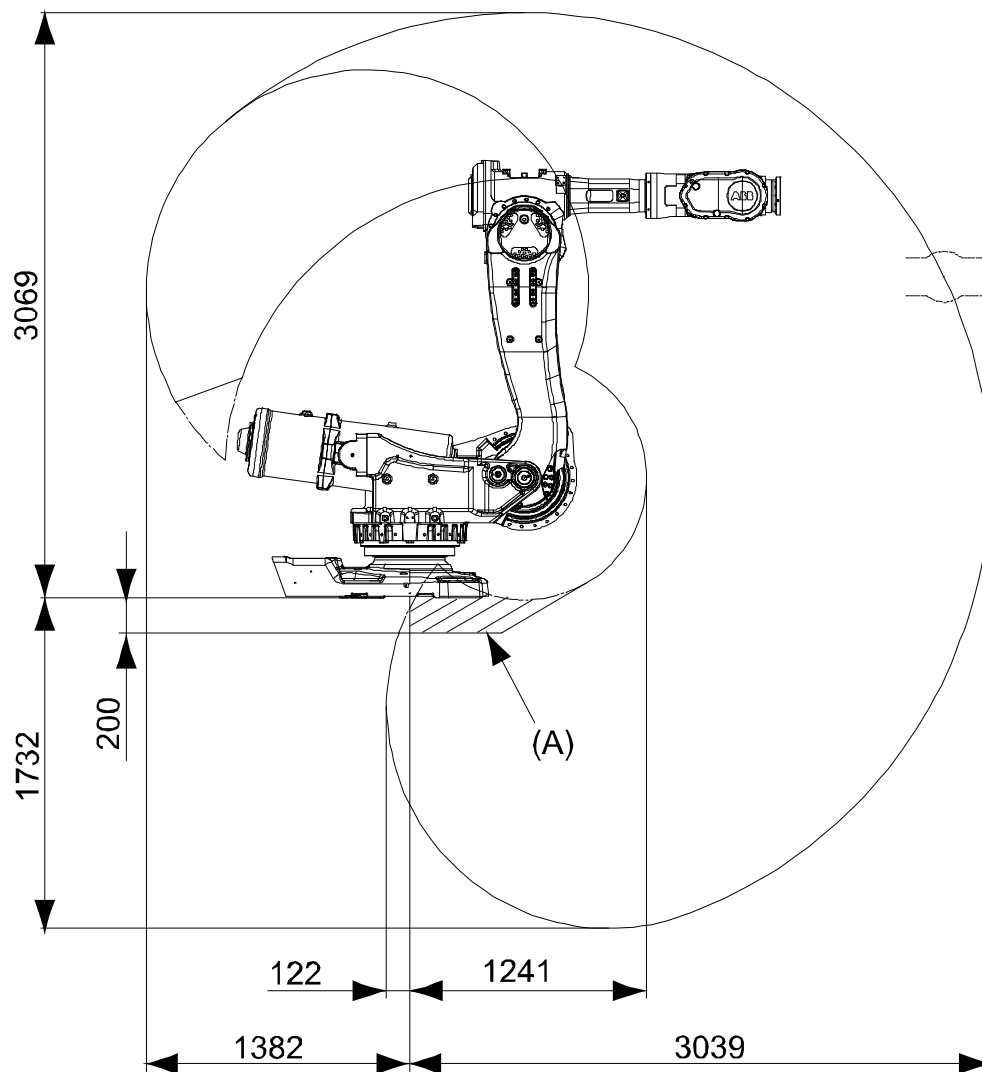
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1 Description

1.8.1 Introduction

Continued

Robot variant	Handling capacity (kg)	Reach (m)
IRB 6650S-200/3.0	200	3.0
IRB 6650S-190/3.0 LID	190	3.0



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Pos	Description
A	Marked area not available under the robot base.

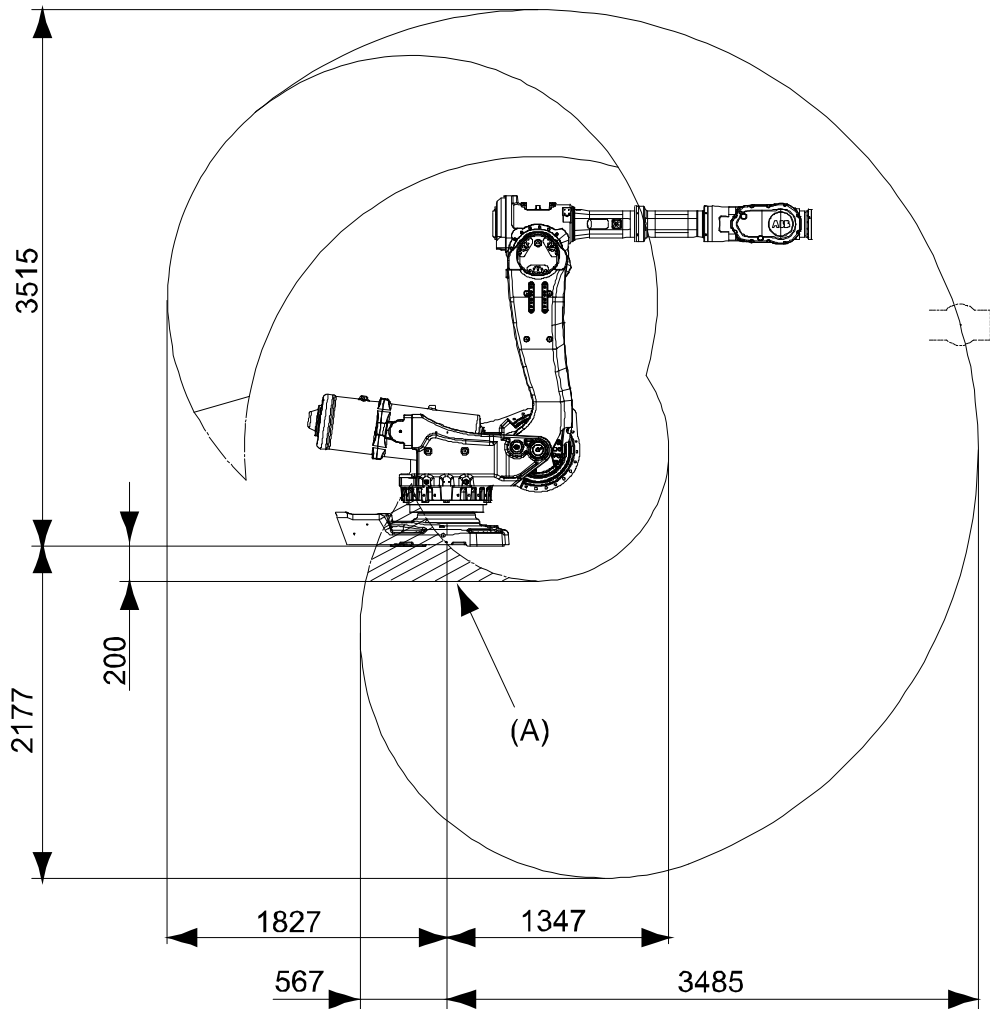
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1 Description

1.8.1 Introduction

Continued

Robot variant	Handling capacity (kg)	Reach (m)
IRB 6650S-125/3.5	125	3.5
IRB 6650S-100/3.5 LID	100	3.5



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Pos	Description
A	Marked area not available under the robot base.

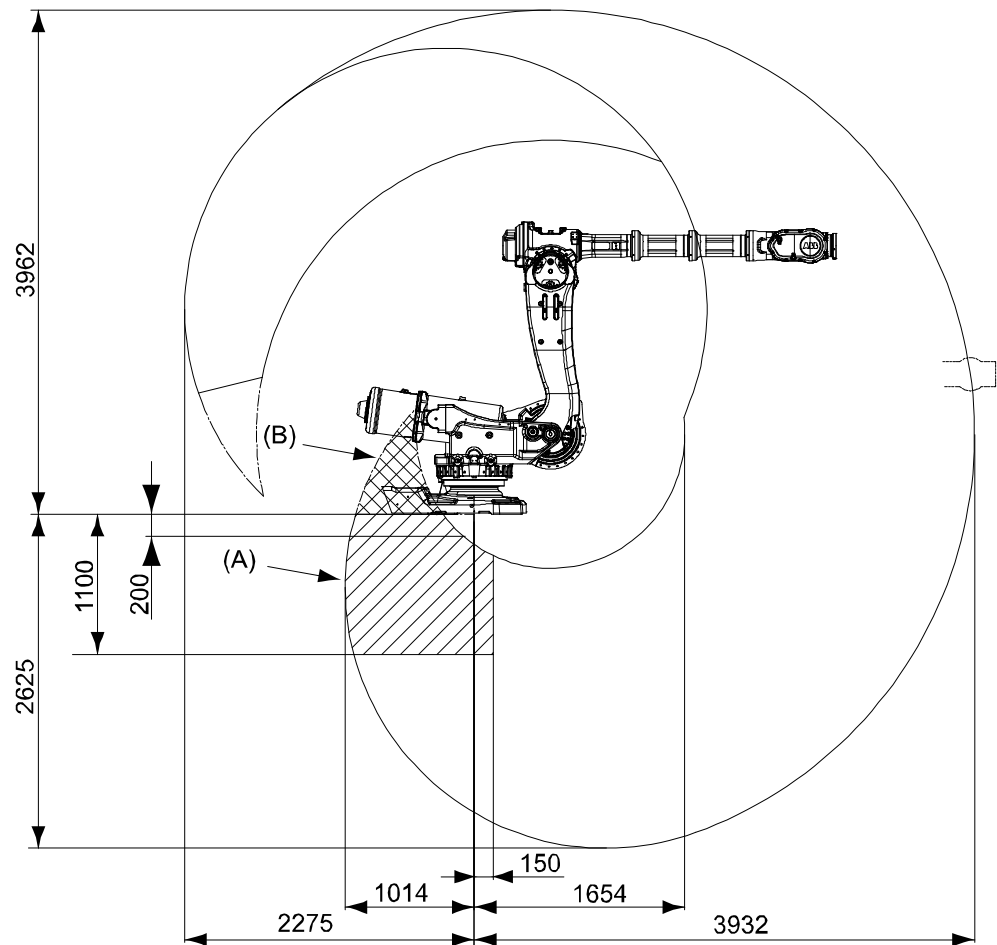
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1 Description

1.8.1 Introduction

Continued

Robot variant	Handling capacity (kg)	Reach (m)
IRB 6650S-90/3.9	90	3.9



xx100000501

Pos	Description
A and B	Marked area, max. payload 50 kg
B	Marked area not available under the robot base

1 Description

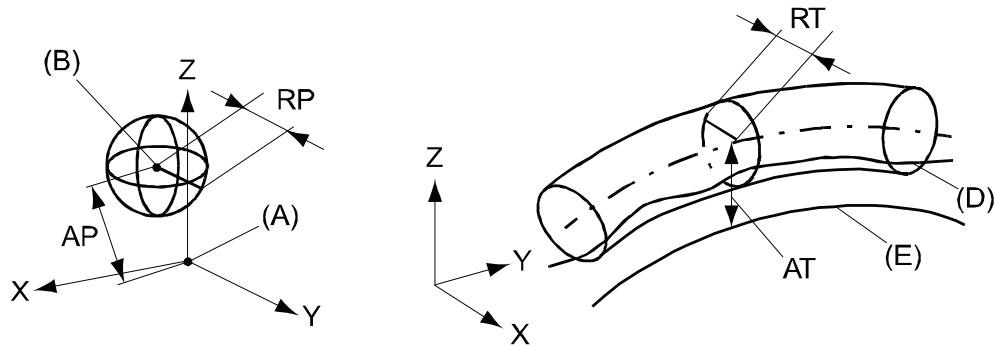
1.8.2 Performance according to ISO 9283

1.8.2 Performance according to ISO 9283

General

At rated maximum load, maximum offset and 1.6 m/s velocity on the inclined ISO test plane, with all six axes in motion. Values in the table below are the average result of measurements on a small number of robots. The result may differ depending on where in the working range the robot is positioning, velocity, arm configuration, from which direction the position is approached, the load direction of the arm system. Backlashes in gearboxes also affect the result.

The figures for AP, RP, AT and RT are measured according to figure below.



xx0800000424

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

IRB 6650S	125/3.5	200/3.0	90/3.9
Pose accuracy, AP ^a (mm)	0.16	0.13	b
Pose repeatability, RP (mm)	0.13	0.14	0.13
Pose stabilization time, PSt (s) within 0.4 mm of the position	0.33	0.18	b
Path accuracy, AT (mm)	2.58	2.98	b
Path repeatability, RT(mm)	0.90	0.70	b

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

b. The values for IRB 6650S-90/3.9 are not available.

The above values are the range of average test results from a number of robots.

1.8.3 Velocity

Maximum axis speeds

Robot Type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 6650S-90/3.9	100°/s	90°/s	90°/s	150°/s	120°/s	235°/s
IRB 6650S-125/3.5	110°/s	90°/s	90°/s	150°/s	120°/s	235°/s
IRB 6650S-100/3.5 LID	110°/s	90°/s	90°/s	150°/s	120°/s	235°/s
IRB 6650S-200/3.0	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6650S-190/3.0 LID	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s

There is a supervision function to prevent overheating in applications with intensive and frequent movements.

1 Description

1.8.4 Robot stopping distances and times

1.8.4 Robot stopping distances and times

Introduction

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

2 DressPack

2.1 Introduction

2.1.1 General

DressPack

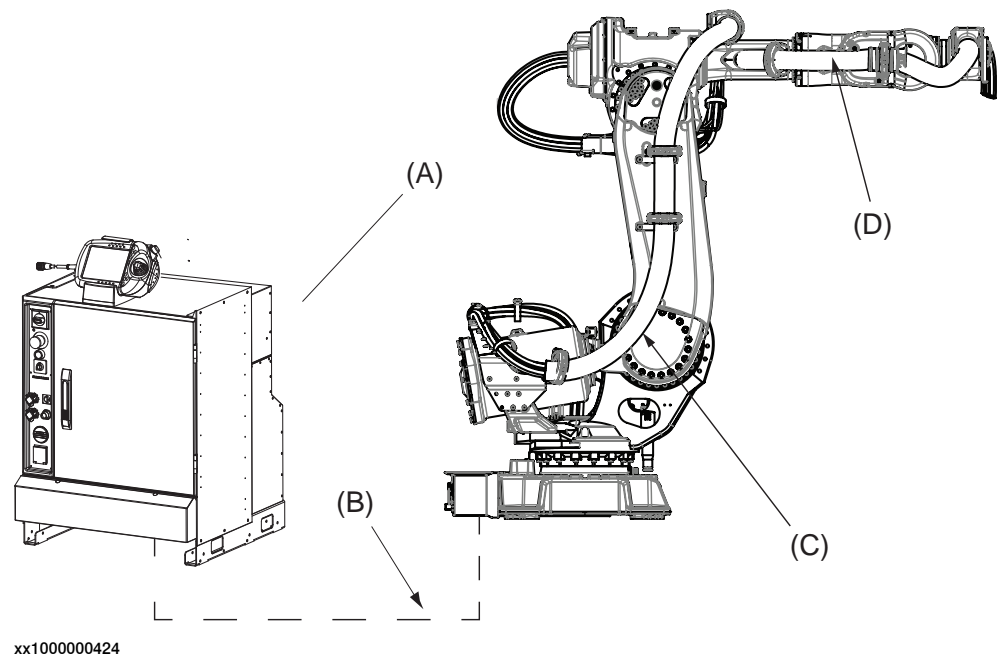
Includes options for Upper arm, Lower arm and Floor pos C, D, see Figure below. These are described separately below but are designed as a complete package for various applications.

The DressPack for the floor contains customer signals.

The DressPack for upper and lower arm contains process cable packages including signals, process media (water and/or air) and power feeding (for Spot Welding power) for customer use.

Necessary supports and brackets are also included.

The routing of the process cable package on the robot is available in different configurations.



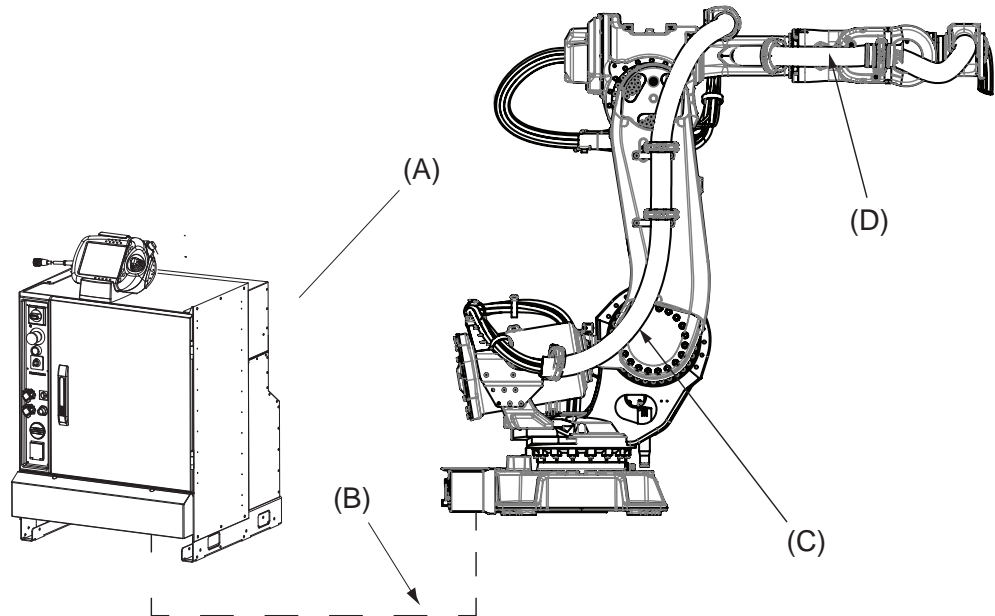
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2 DressPack

2.1.1 General Continued

Spot welding

The package supplies the transformer gun/gripper with necessary media, such as compressed air, cooling water and electrical power. It includes the above described DressPack and software.



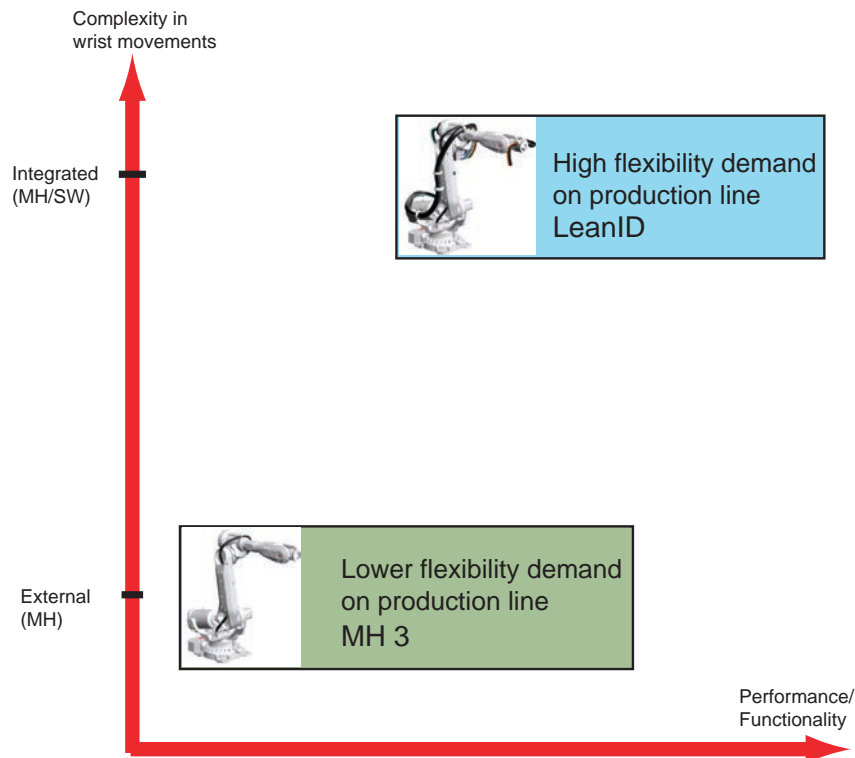
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Pos	Description
A	Robot controller, (including 7th axis drive for servo gun)
B	DressPack, Floor
C	DressPack, Lower arm
D	DressPack, Upper arm

2.1.2 Product range

DressPack solutions for different user's needs

The robot can be equipped with the well integrated cable and hose packages in the DressPack option. The DressPack is designed in close conjunction with the development of the manipulator and is therefore well synchronized with the robot. As there is a big span between different user's need of flexibility, depending of the complexity of the operation/wrist movements, there are three major levels of dress pack solutions available, see Figure below.



Integrated

This type of dress pack is intended for a production where there are many complex wrist movements and the need for flexibility in changing products is high.

Available options are 3325-x and 3326-x for material handling/spot welding, the LeanID concept.

External

This type of dress pack is recommended where there are less complexity in wrist movements. This normally occurs when there are not many different products running in the production cell. This package requires more individual adjustment to optimize towards robot program at set up.

Available options are 3325-11/12/13 and 3326-11/12/13 for material handling.

2 DressPack

2.1.3 Limitations of robot movements

2.1.3 Limitations of robot movements

General

When using DressPack options on the upper arm the robot movements will be limited. The position of bracket installed on axis 6 must be taken in consideration when optimizing the possible robot movements.

- The axis 5 working range is limited to +/- 110 degrees due to the axis 6 bracket attachment (when applicable).
- In bending backwards positions there are limitations due to interference with manipulator or Water and Air unit (if such is mounted).



Note

For more detailed information, contact your local ABB office.

Restrictions for all LID variants

Limitation for axis 5 and 6 depends on how the dresspack is assembled at the tool and how adjustment has been done.

Axis	Working range
Axis 5	+100° to -100°
Axis 6	+220° to -220°

2.1.4 Impact on DressPack lifetime

General

There are some robot movements/positions that shall be avoided in the robot production program. This to improve the lifetime significantly of external upper arm DressPack and wear parts, for example, protection hose, hose reinforcement, and protective sleeves.

- The axis 5 movement is not allowed to press the DressPack against the robot upper arm.
- Combined rotation of the wrist axes must be limited so that the DressPack is not wrapped hard against the upper arm.

See the product manual for more detailed information and recommended adjustments.

2 DressPack

2.2.1 Introduction

2.2 DressPack

2.2.1 Introduction

Available DressPack configurations for Material Handling

The table below shows the different DressPack configurations available for Material Handling.

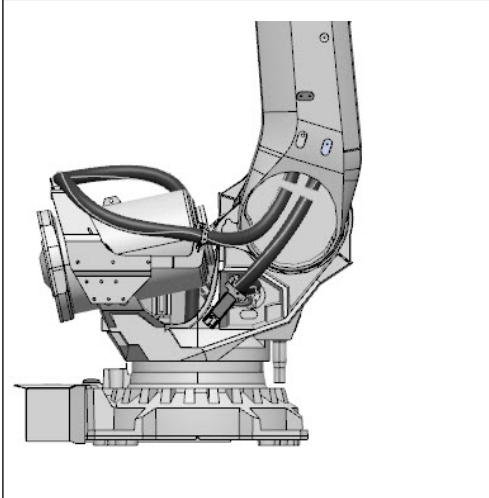
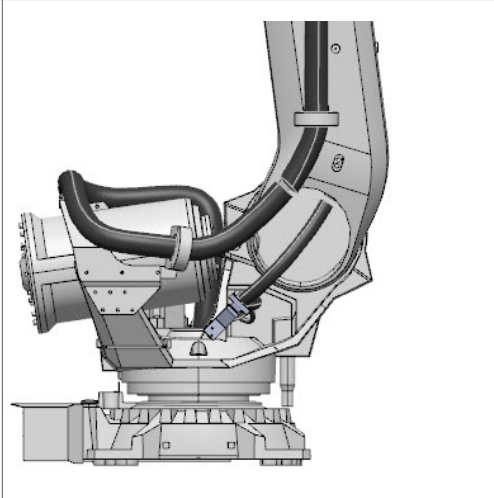
	Lower arm	Upper arm
Material Handling	Option 3325-51/52/53, Base to axis 3 Internal routing in lower arm	Option 3326-11/12/13, Axis 3 to axis 6 External routing
		Option 3326-31/32/33, Axis 3 to axis 6 (LID) Internal routing

Available DressPack configurations for Spot Welding

The table below shows the different DressPack configurations available for Spot Welding.

	Lower arm	Upper arm
Spot Welding	Option 3325-51/52/53/61/62/63 Base to axis 3	Option 3326-51/52/53/61/62/63 Int. Axis 3 to 6 (LeanID) Internal routing

Lower arm

	
Internal routing in lower arm Option 3325-11/12/13, Base to axis 3	External routing Option 3325-11/12/13, Base to axis 3

2.2.2 Built-in features for upper arm DressPack

External

Material handling (option 3326/11/12/13, Axis 3 to axis 6)

- Internal routing through the rear part of the upper arm.
- Protection hose can easily be replaced if damaged.
- One version for all IRB 6650S variants.
- Adjustment for optimal hose/cable lengths.
- Easy exchange of DressPack

Internal

Material handling (option 3326-31/32/33, Axis 3 to axis 6 (LID)), or spot welding (option 3326-51/52/53/61/62/63, Axis 3 to axis 6 (LID))

- Partly internal routing through the upper arm.
- Suitable for complex movements.
- High demands for flexibility and accessibility.
- Longer life time
- Predictable movements
- Easy exchange of DressPack

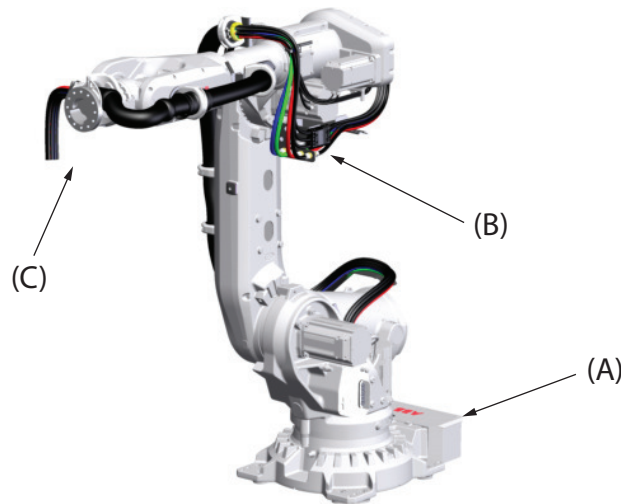
2 DressPack

2.2.3 Interface descriptions for DressPack

2.2.3 Interface descriptions for DressPack

General

Below is an overview showing the different DressPack options connection points, and their locations. For detailed information see the circuit diagram, and product manual for the manipulator.



xx1300000224

Pos	Location	Description	Options
A	Base	FB7, CP/CS/CBUS/Ethernet	3325-11/12/13
B	Axis 3	CP/CS/CBUS/Ethernet	3325-11/12/13
C	Axis 6	CP/CS/CBUS/Ethernet, WELD	3326-11/12/13, 3326-31/32/33

Base

Material handling (option 3325-11/12), see figure below:

- Included are: A, one D (Proc 1).

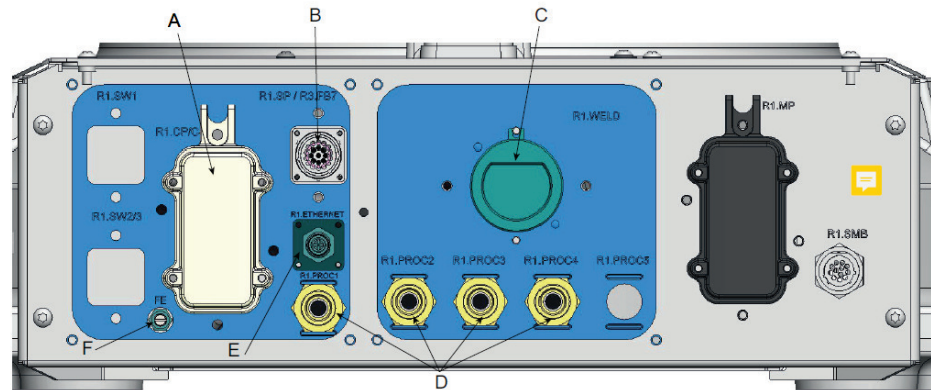
Material handling (option 3325-13), see figure below:

- Included are: A, E, F and one D.

Spot welding (option 3325-51/52/53/61/62/63), see figure below:

- Included are: A, B (if applicable), C, D (Proc 1-4) and E, F (if applicable).

Continues on next page



xx1900001501

For corresponding parts of the tool, see [Connector kits on page 72](#).

Pos	Description
A	R1.CP/CS
B	R1.SP (spot welding servo gun) or FB7 (resolver connection)
C	R1.WELD 3x35mm ² (spot welding)
D	R1.PROC 1 (material handling/spot welding 1/2", M22x1.5, 24 degree seal) R1.PROC 2 - 4 (spot welding 1/2", M22x1.5, 24 degree seal)
E	R1.ETHERNET (M12 connector, when EtherNet communication is selected)
F	FE (functional earth, when EtherNet communication is selected)

Axis 3

Material handling (option 3325-11), see figure below:

- Included are: A and one C (Proc 1).

Material handling (option 3325-12), see figure below:

- Included are: A, G and one C (Proc 1).

Material handling (option 3325-13), see figure below:

- Included are: A, G, B, H and one C (Proc 1).

Spot welding (option 3325-51/52/53/61/62/63), see figure below:

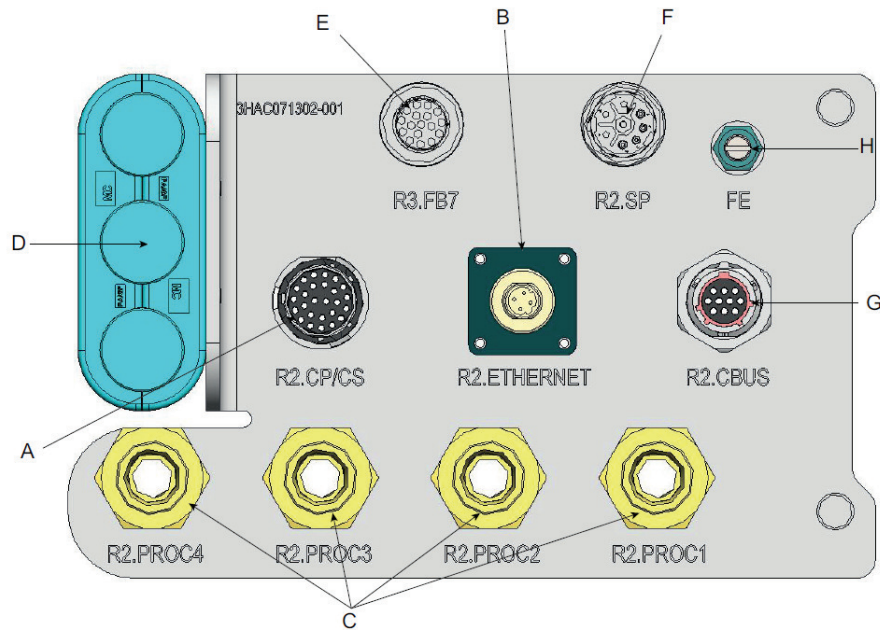
- Included are: A, D, B/E/F/G/H (if applicable) and C (Proc 1-4).

Continues on next page

2 DressPack

2.2.3 Interface descriptions for DressPack

Continued



xx1900001511

For corresponding parts of the tool, see [Connector kits on page 72](#).

Pos	Description
A	R2.CP/CS
B	R2.ETHERNET (M12 connector, when EtherNet communication is selected)
C	R2.PROC 1 (material handling 1/2", M22x1.5, 24 degree seal) R2.PROC 2-4 (spot welding 1/2", M22x1.5, 24 degree seal)
D	R2.WELD 3x35mm ² (spot welding)
E	R2.FB7
F	R2.SP (spot welding servo gun)
G	R2.CBUS (UTOW connector when DeviceNet communication is selected)
H	FE (functional earth, when EtherNet communication is selected)

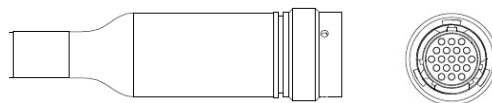
Axis 6

External

Material handling (option 3326-11/12/13), see figure below:

- Hose and cable free length, min. 1,000 mm
- Air hose ends with free end.

The cable ends with a connector, the main parts are described in the list below (for corresponding parts of the tool, see [Connector kits on page 72](#)):



xx0900000728

Continues on next page

Material handling connector

Material handling (option 3326-11/12/13), see figure below:

- Cable free length, min. 1,000 mm
- Signals are connected with an M12 connector.

The connectors are the same as for option 3326-31/32/33. The difference is the free length of the cables.

Name	Harting article
PIN connector, R3.ETHERNET	21 03 881 1405
PIN	61 03 000 0094



xx1100000956

Material handling connector (LeanID)

Material handling option 3326-31/32/33 (LeanID), see figure below:

- Hose and cable free length, min. 1,160 mm
- Hoses with free end.

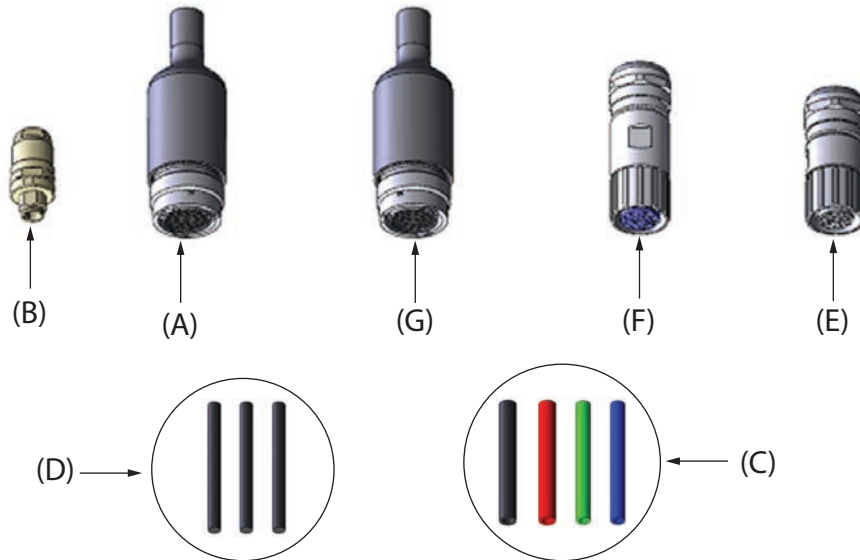
Continues on next page

2 DressPack

2.2.3 Interface descriptions for DressPack

Continued

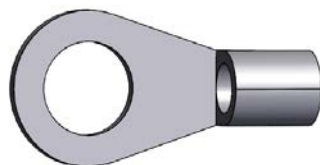
The cable ends with connectors, for corresponding parts of the tool, see [Connector kits on page 72](#) and within the UTOW product offer.



xx1200000117

Pos	Description
A	R3.CP/CS (UTOW connector 26p) Customer signals and power
B	R3.ETHERNET (M12 connector) EtherNet signals (when EtherNet communication is selected)
C	R3.PROC 1-2 (1/2", free end) R3.PROC 2-4 (3/8", free end) Media hoses
D	R3.WELD 3x25mm ² (free end) Spot Welding power
E	R3.FB7 (M23 connector 17p) Servo motor feedback (when Spot Welding Servo gun is selected)
F	R3.SP (M23 connector 8p) Servo motor power (when Spot Welding Servo gun is selected)
G	R3.CBUS (UTOW connector 10p) BUS signals (when DeviceNet communication is selected)

- FE (M8 cable lug), when Ethernet option 3326-13/33 is selected



xx2000000109

2.2.4 Dimensions

General

Dimensions are shown in Figures below.

Dimensions for robot with DressPack



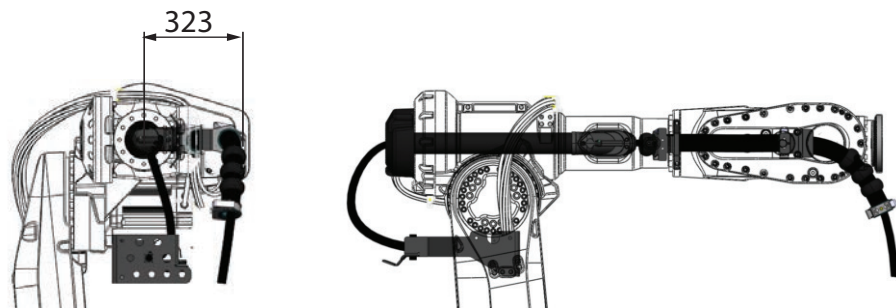
Note

Dimensions for specific variant can be measured in 3D-Cad models.

Dimensions are shown in figures below.

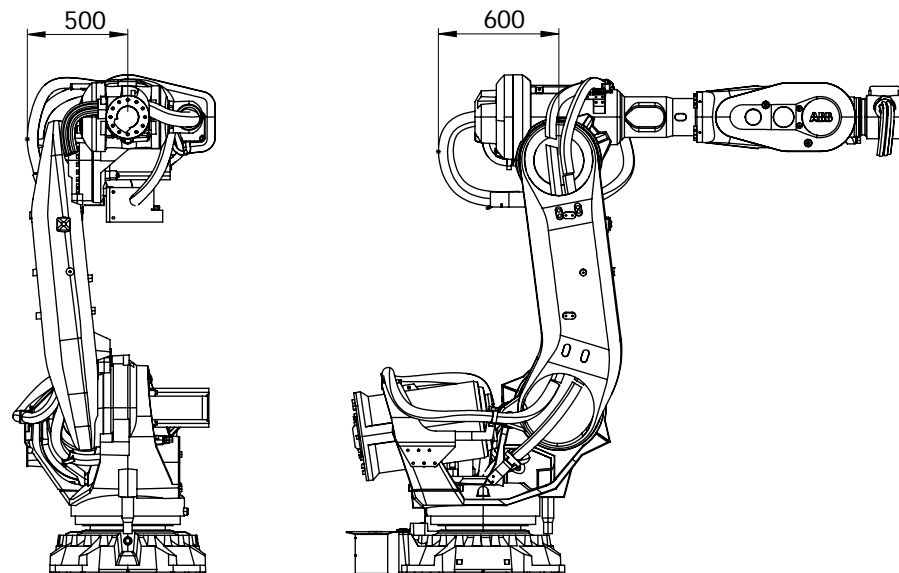
Material handling

Axis 3 to axis 6 (option 3326-11/13)



xx2200000418

Option 3325-11/13 (Base to axis 3) + Option 3326-31/32/33 (Axis 3 to axis 6)



xx2000001776

2 DressPack

2.3 Connector kits

2.3 Connector kits

General

Below is an example of how a connector kit and its parts can look like.



xx130000223

Continues on next page

2.3.1 Base - Connector kits

Available options

Option	Name	DressPack options		
		3325-11/12/13	3325-51/-52/-3	3325-61/-62/-63
3330-2	CP/CS, Proc 1 base	X	X	
3331-1	Weld Proc 2-4 base		X	X
3332-1	FB7 on base			



Note

Servo power connection kits are not available.

Option CP/CS, Proc 1 on base - 3330-2

R1. CP/CS and Proc 1 on base

This option offers a kit with connectors. This must be assembled by the customer. The kit contains:

- 1 Hose fittings (swivel nut adapter, (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN EMC / M 40
1 pcs Hinged frame (Harting)	Shell size 16
2 pcs Multicontact, female (Harting)	Type HD (25 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
1 pcs Multicontact, female (Harting)	Type EE (8 pin)
10 pcs Female crimp contacts	For 1.5 mm ²
10 pcs Female crimp contacts	For 0.5 mm ²
10 pcs Female crimp contacts	For 1.0 mm ²
10 pcs Female crimp contacts	For 2.5 mm ²
12 pcs Female crimp contacts	For 0.14 - 0.37 mm ²
45 sockets	For 0.2 - 0.56 mm ²
Assembly Accessories to complete connector	
Assembly instruction	

Option Weld Proc 2-4 base - 3331-1

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

	Description	Size, material, etc.	Brand
1	Welding connector, female	For 3x35 mm ²	Stäubli
1	Shrinking hose with glue	20 mm	
1	End-housing		Stäubli

Continues on next page

2 DressPack

2.3.1 Base - Connector kits

Continued

	Description	Size, material, etc.	Brand
1	Cable gland	For cable diameter 24-28 mm	
1	Reducing coupling	PG36/PG29	
4	Hose fitting	1/2", M22 x 1.5 Brass	
1	Adapter	M50x1.5 / PG 36	

Option FB7 on base - 3332-1

R3. FB 7 on base

This option offers a kit with a connector. This must be assembled by the customer.

The kit contains:

- Connector with:

1 pcs Multiple connector (pin)	UTOW
1 pcs Adapter	8 pin
8 pcs Pin	For 0.13 - 0.25 mm ²
Assembly Accessories to complete connector	
Assembly instruction	

2.3.2 Axis 3 - Connector kits

Available options

		DressPack options	Description
Option	Name	3325-11/12/13	
3333-2	CP/CS bus, Proc 1 axis 3	X	UTOW
3334-3	CP/CS Proc1, Servo & FB		

Option CP/CS/CBus, Proc 1 axis 3 - 3333-2

CP/CS/CBus, Proc 1 axis 3 on tool side for option 3326-11/12/13 and 3326-31/32/33.

This kit offers a kit with connectors to be mounted at toolside of axis 3.

This must be assembled by the customer.

The kit contains:

- 1 Hose fitting (Parker Push lock (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

CP/CS	
1 pcs UTOW Pin connector 26p, bayonet	UTOW61626PH, Shell size 16
26 pcs Pin	RM18W3K, 0.5-0.82 mm ²
CBUS	
1 pcs UTOW Pin connector 10p, bayonet	UTOW61210PH, Shell size 12
10 pcs Pin	RM18W3K, 0.5-0.82 mm ²
Ethernet	
1 pcs Pin connector M12	Harting 21 03 881 1405
4 pcs Pin	Harting 09670005576, 0.13-0.33 mm ²

Option CP/CS Proc1, Servo & FB - 3334-3

SP (Servo Power)	
1 pc Straight connector M23 8p	
4 pcs Crimp pin 1 mm	AWG 24-17
4 pcs Crimp pin 2 mm	AWG 18-14
SS (Servo Signal)	
1 pcs Straight connector M23 17p	
17 pcs Pin	AWG 28-20
Assembly Accessories to complete connector	
Assembly instruction	

2 DressPack

2.3.3 Axis 6 - Connector kits

2.3.3 Axis 6 - Connector kits

Available options

		DressPack options	DressPack options	Description
Option	Name	3326-11/12/13	3326-30/31/32/33	
3334-2	CP/CS bus axis 6	X	X	UTOW
3334-3	CP/CS Proc1, Servo & FB			
3335-1	Weld Proc 2-4 axis 6			

Option CP/CS/CBus, Proc 1 axis 6 - 3334-2

CP/CS/CBus/SP/SS, Proc 1 axis 6 on tool side for option 3326-11/12/13 and 3326-31/32/33.

This kit offers a kit with connectors to be mounted at toolside of axis 6.

This must be assembled by the customer.

The kit contains:

- 1 Hose fitting (swivel nut adapter (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

CP/CS	
1 pcs UTOW Pin connector 26p, bulkhead	UTOW71626PH05, Shell size 16
26 pcs Pin	RM18W3K, 0.5-0.82 mm ²
CBUS	
1 pcs UTOW Pin connector 10p, bulkhead	UTOW71210PH05, Shell size 12
10 pcs Pin	RM18W3K, 0.5-0.82 mm ²
Ethernet	
1 pcs Socket connector M12	Harting 21 03 881 2425
4 pcs Socket	Harting 09670005476, 0.13-0.33 mm ²

Option CP/CS Proc1, Servo & FB - 3334-3

SP (Servo Power)	
1 pcs Bulkhead contact M23	
4 pcs Crimp pin 1 mm	AWG 24-17
4 pcs Crimp pin 2 mm	AWG 18-14
SS (Servo Signal)	
1 pcs Bulkhead contact M23	
17 pcs Pin	AWG 28-20
Assembly Accessories to complete connector	
Assembly instruction	

Continues on next page

Option Weld Proc 2-4 axis 6 - 3335-1

Weld and Proc 2-4 axis 6 on manipulator side for option 3335-1

The process cable package from axis 6 ends with free end for media and for weld power cable. The option offers a kit for connectors. This must be assembled by the customer when hoses and power cable has been cut to required length.

The kit contains:

- 4 Hose fittings (Swivel Nut adapter, (2 x 1/2", M22x1.5) and (2x 3/8", M16x1.5))
- 1 Multi contact connector (Female) type including:

• 1 pc Welding connector	3x25 mm ²
1 pc Cable gland	Diameter 24-28 mm
1 pc End housing	0.21-0.93 mm ²
1 pcs Reducing coupling	PG36/PG29
Assembly Accessories to complete connector	
Assembly instruction	

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3 Specification of variants and options

3.1 Manipulator

Variants

Option	Variants	Handling capacity	Reach
3300-60	IRB 6650S-200/3.0	200 kg	3.0 m
3300-61	IRB 6650S-190/3.0 LID	190 kg	3.0 m
3300-62	IRB 6650S-125/3.5	125 kg	3.5 m
3300-63	IRB 6650S-100/3.5 LID	100 kg	3.5 m
3300-64	IRB 6650S-90/3.9	90 kg	3.9 m

Manipulator color

Option	Color	RAL code ⁱ
209-1	ABB orange standard Standard color with protection option 3352-10 Foundry Plus2 67	RAL 7032
209-202	ABB Graphite White std Standard color with protection option 3350-670 Base 67	RAL 7035
209	RAL code should be specified (ABB non-standard colors)	

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



Note

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

Manipulator protection

Option	Description
3350-670	Base 67, IP67
3352-10	Foundry Plus2 67, IP67

Requirements

The option *Foundry Plus2 67* [3352-10] requires option *Upper arm cover* [3316-1].



Note

It is strongly recommended, if Foundry Plus robots in another color than ABB orange is required, that only colors in a yellow nuance are selected, if not the robot can look discolored after a while in the foundry environment. The protection is still preserved in any color.

Continues on next page

3 Specification of variants and options

3.1 Manipulator

Continued



Note

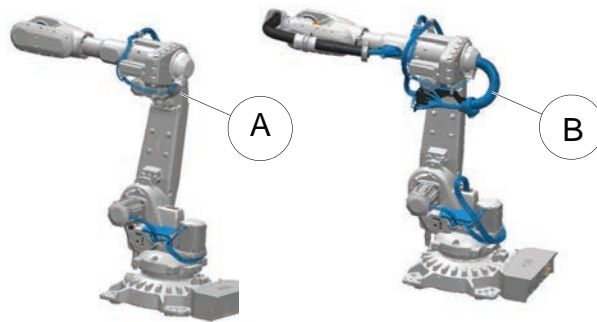
Base 67 includes IP67, according to standard IEC 60529.

Foundry cable guard

Option	Description
3315-1	Foundry cable guard

The manipulator can be equipped with additional cable guards for extra tough environmental conditions, for example, metals spits or frequent weld spatter. These additional covers will prolong cable lifetime and simplify service/maintenance as the robot is kept more clean under the covers.

The option *Foundry Cable Guard* is recommended for *Foundry Plus2*.



xx2100002623

A	Foundry cable guard without DressPack
B	Foundry cable guard with DressPack

Requirements

The option *Foundry Cable Guard* requires option *Upper arm cover* [3316-1].

Upper arm cover

Option	Description
3316-1	Upper arm cover

The manipulator can be equipped with additional upper arm covers for environmental conditions, where you want to further seal off the upper arm in wet

Continues on next page

or dirty conditions. These additional covers will prolong the lifetime of the cables, and simplify service/maintenance as the robot is kept more clean under the covers.



xx2100002592

Requirements

This option is mandatory to order with the option *Foundry Plus2* [3352-10].

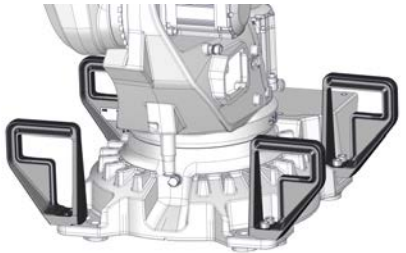
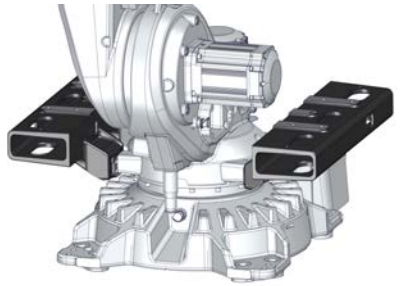
This option is mandatory to order with the option *Foundry Cable Guard* [3315-1].

This option is mandatory to order with the option *DressPack axis 3-6* [3326-x].

Limitations

Forklift device

The manipulator can be delivered with forklift devices, allowing a forklift to be used when moving the manipulator.

Option	Description	
3318-1	Forklift device on base Forklift pockets placed on the base gives a low lifting point.	 <p>xx2300001244</p>
3318-2	Forklift device on frame Fork lift pockets placed on the frame gives a more balanced lifting point. This can be used together with special tool to invert a robot.	 <p>xx2300001243</p>

Continues on next page

3 Specification of variants and options

3.1 Manipulator

Continued

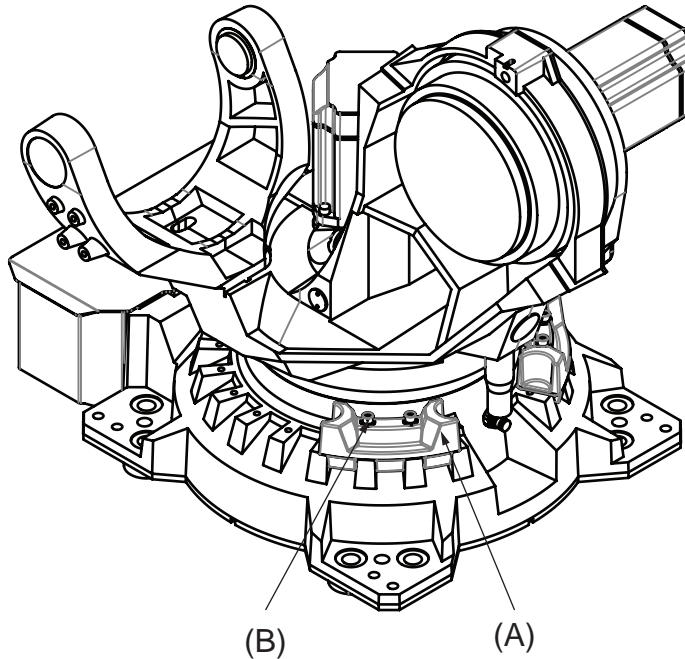
Resolver connection 7th axis

Option	Description
3322-1	On base
3322-2	In servo DressPack Requires options for DressPack base-axis 3.

Working range limitation

To increase the safety of the robot, the working range of axis 1 can be restricted by extra mechanical stops.

Option	Description
3323-1	Axis 1 adjustable 15°
3323-3	Axis 1 adjustable 7.5°



xx1400002035

Pos	Description
A	Two mechanical stops
B	Bolt tightening torque: 60 Nm

Working range limit-Axis 2

Option	Description
3338-1	Axis 2-work range lim

Working range limit-Axis 3

Option	Description
3339-1	Axis 3-work range lim.

Continues on next page

Extended working range

Option	Description	
3324-1	Axis 1 to $\pm 220^\circ$	The option extends the working range on axis 1 from $\pm 170^\circ$ to $\pm 220^\circ$.



CAUTION

The option *Extended work range* enables an extension of the working range for axis 1, through a software configuration. With this option installed, the working range can exceed the range limited by the mechanical stop on axis 1. The working range shall be limited through the option *SafeMove*.

A risk analysis must be done to ensure that no risks remain when using option *Extended work range*, to limit the working range, and before removing the mechanical stops.

For information about the option *SafeMove*, see *Application manual - Functional safety and SafeMove*.

If the mechanical stop is removed, then the manipulator should have a marking for this, for example, a label. If the robot is delivered with the option *Extended work range*, then such a label is included on delivery.

Requirements

This option requires the option *SafeMove* [3043-x].

3 Specification of variants and options

3.2 Floor cables

3.2 Floor cables

Manipulator cable length

Option	Lengths
3200-2	7 m
3200-3	15 m
3200-4	22 m
3200-5	30 m

3.3 Application manipulator

DressPack base-axis 3

Option	Description	Additional information
3325-11	MH Parallel	
3325-12	MH DeviceNet	Includes parallel signals
3325-13	MH EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3325-51	SW Parallel	
3325-52	SW DeviceNet	Includes parallel signals
3325-53	SW EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3325-61	SW Parallel-Servo	
3325-62	SW DeviceNet-Servo	Includes parallel signals
3325-63	SW EtherNet-Servo	Includes parallel signals. Supports ProfiNet, EtherNetIP

DressPack axis 3-6

Option	Description	Additional information
3326-11	MH3 Parallel	
3326-12	MH3 DeviceNet	Includes parallel signals
3326-13	MH3 EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3326-31	MH LID Parallel	
3326-32	MH LID DeviceNet	Includes parallel signals
3326-33	MH LID EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3326-51	SW LID Parallel	
3326-52	SW LID DeviceNet	Includes parallel signals
3326-53	SW LID EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3326-61	SW LID Parallel-Servo	
3326-62	SW LID DeviceNet-Servo	Includes parallel signals
3326-63	SW LID EtherNet-Servo	Includes parallel signals. Supports ProfiNet, EtherNetIP

3 Specification of variants and options

3.4 Connector kits manipulator

3.4 Connector kits manipulator

General

Below is an example of a connector kit and its parts.



xx130000223

Continues on next page

3.4.1 Base - Connector kits

Available options

Option	Name	DressPack options		
		3325-11/13	3325-51/53	3325-61/63
3330-2	CP/CS, Proc 1 base	X	X	
3331-1	Weld Proc 2-4 base		X	X
3332-1	FB7 on base			



Note

Servo power connector kits are not available.

Option 3330-2, CP/CS, Proc 1 on base

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

CP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, female, 12p		Harting
8	Crimp contact female	For 0.5 mm ²	
8	Crimp contact female	For 1.0 mm ²	
8	Crimp contact female	For 1.5 mm ²	
8	Crimp contact female	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

CS

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, female, 8p		Harting
8	Crimp contact female	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting

Media

Amount	Description	Size, material, etc.	Brand
1	Hose coupling	1/2", M22 x 1.5 Brass	

Ethernet

Amount	Description	Size, material, etc.	Brand
1	M12 Connector, Male, D-code	For 0.14–0.34 mm ²	

Continues on next page

3 Specification of variants and options

3.4.1 Base - Connector kits

Continued

Option 3331-1, Weld Proc 2-4 base

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

WELD

Amount	Description	Size, material, etc.	Brand
1	Welding connector, female	For 3x35 mm ²	Stäubli
1	Shrinking hose with glue	20 mm	
1	End-housing		Stäubli
1	Cable gland	For cable diameter 24-28 mm	
1	Reducing coupling	PG36/PG29	
4	Hose fitting	1/2", M22 x 1.5 Brass	
1	Adapter	M50x1.5 / PG 36	

Option 3332-1, FB7 on base

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

FB

Amount	Description	Size, material, etc.	Brand
1	Connector, 8p, Male	UTOW	
15	Pin	For 0.13–0.26 mm ²	
1	Shrink boot adapter		
1	Bottle shaped shrink boot		

3.4.2 Axis 3 - Connector kits

Available options

Option	Name	DressPack options		
		3326-11/13	3326-51/53	3326-61/63
3333-2	CP/CS bus, Proc 1 axis 3	X		
3333-3	CP/CS Proc1, Servo & FB			X

Option 3333-2, CP/CS/CBus, Proc 1 axis 3

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

CP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 12p		Harting
8	Crimp contact male	For 0.5 mm ²	
8	Crimp contact male	For 1.0 mm ²	
8	Crimp contact male	For 1.5 mm ²	
8	Crimp contact male	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

CS

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 8p		Harting
8	Crimp contact male	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting

Media

Amount	Description	Size, material, etc.	Brand
1	Hose coupling Parker Push lock	1/2", M22 x 1.5 Brass	

Ethernet

Amount	Description	Size, material, etc.	Brand
1	M12 Connector, Male, D-code	For 0.14–0.34 mm ²	

Continues on next page

3 Specification of variants and options

3.4.2 Axis 3 - Connector kits

Continued

Option 3333-3, CP/CS Proc1, Servo & FB

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

CP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 12p		Harting
8	Crimp contact male	For 0.5 mm ²	
8	Crimp contact male	For 1.0 mm ²	
8	Crimp contact male	For 1.5 mm ²	
8	Crimp contact male	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

CS

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 8p		Harting
8	Crimp contact male	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting

Media

Amount	Description	Size, material, etc.	Brand
1	Hose coupling Parker Push lock	1/2", M22 x 1.5 Brass	

Ethernet

Amount	Description	Size, material, etc.	Brand
1	M12 Connector, Male, D-code	For 0.14–0.34 mm ²	

SP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 12p		Harting
8	Crimp contact male	For 0.5 mm ²	
8	Crimp contact male	For 1.0 mm ²	
8	Crimp contact male	For 1.5 mm ²	
8	Crimp contact male	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

Continues on next page

3 Specification of variants and options

3.4.2 Axis 3 - Connector kits

Continued

FB

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 8p		Harting
8	Crimp contact male	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting
1	Coding pin, Han D, female		Harting

3 Specification of variants and options

3.4.3 Axis 6 - Connector kits

3.4.3 Axis 6 - Connector kits

Available options

Option	Name	DressPack options		
		3326-11/13	3326-51/53	3326-61/63
3334-2	CP/CS bus axis 6	X	X	
3334-3	CP/CS Proc1, Servo & FB			X
3335-1	Weld Proc 2-4 axis6		X	X

Option 3334-2, CP/CS/CBus, Proc 1 axis 6

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

CP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 12p		Harting
8	Crimp contact male	For 0.5 mm ²	
8	Crimp contact male	For 1.0 mm ²	
8	Crimp contact male	For 1.5 mm ²	
8	Crimp contact male	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

CS

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 8p		Harting
8	Crimp contact male	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting

Media

Amount	Description	Size, material, etc.	Brand
1	Hose coupling Parker Push lock	1/2", M22 x 1.5 Brass	

Ethernet

Amount	Description	Size, material, etc.	Brand
1	M12 Connector, Female, D-code	For cable diameter 5.7–8.8 mm ²	Harting
4	Socket		

Continues on next page

3 Specification of variants and options

3.4.3 Axis 6 - Connector kits

Continued

Option 3334-3, CP/CS Proc 1, Servo & FB

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

CP

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 12p		Harting
8	Crimp contact male	For 0.5 mm ²	
8	Crimp contact male	For 1.0 mm ²	
8	Crimp contact male	For 1.5 mm ²	
8	Crimp contact male	For 2.5 mm ²	
2	Coding pin, Han		Harting
1	Screw M3 with seal		Harting

CS

Amount	Description	Size, material, etc.	Brand
1	Hood pegs, Han 3A		Harting
1	Insert, male, 8p		Harting
8	Crimp contact male	For 0.14–0.37 mm ²	
1	Screw M3 with seal		Harting

Media

Amount	Description	Size, material, etc.	Brand
1	Hose coupling Parker Push lock	1/2", M22 x 1.5 Brass	

Ethernet

Amount	Description	Size, material, etc.	Brand
1	M12 Connector, Female, D-code	For cable diameter 5.7–8.8 mm ²	Harting
4	Socket	For 0.13–0.33 mm ²	

SP

Amount	Description	Size, material, etc.	Brand
1	M23 Hybrid Panel Connector, 8p, Male	For cable diameter 7.0–12.0 mm ²	Hummel
4	Crimp pin 1 mm, AWG 24-17	For 0.25–1.0 mm ²	
4	Crimp pin 2 mm, AWG 18-24	For 0.75–2.5 mm ²	
4	Crimp pin 2 mm, AWG 14-12	For 2.5–4.0 mm ²	

Continues on next page

3 Specification of variants and options

3.4.3 Axis 6 - Connector kits

Continued

FB

Amount	Description	Size, material, etc.	Brand
1	M23 Signal Panel Connector, 12p, Male	For cable diameter 7.0–12.0 mm ²	Hummel
12	Pin AWG 28-20	For 0.08–0.56 mm ²	
12	Pin AWG 26-17	For 0.14–1.0 mm ²	
12	Pin AWG 18-16	For 0.75–1.5 mm ²	

Option 3335-1, Weld Proc 2-4 axis6

This option offers a kit with connectors. This must be assembled by the customer. The kit contains the following components.

WELD

Amount	Description	Size, material, etc.	Brand
1	Welding connector	RobiFix-B-L	Stäubli
3	Socket	For 25 mm ²	Stäubli

Media

Amount	Description	Size, material, etc.	Brand
4	Hose coupling Parker Push lock	1/2", M22 x 1.5 Brass	

3.5 Application floor cables

Parallel cable - Length

Option	Description
3201-2	7 m
3201-3	15 m
3201-5	30 m

Ethernet cable - Length



Note

Occupies 1 Ethernet port.

Option	Description	Note
3202-2	7 m	
3202-3	15 m	
3202-5	30 m	

DeviceNet cable - Length

Option	Description	Note
3204-2	7 m	Includes Parallel cable
3204-3	15 m	Includes Parallel cable
3204-5	30 m	Includes Parallel cable

Servo cable 1 axis - Length

Option	Description	Note
3206-2	7 m	
3206-3	15 m	
3206-5	30 m	

3 Specification of variants and options

3.6 Warranty

3.6 Warranty

Warranty

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



Note

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

Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from <i>Customer Delivery Date</i> or latest 18 months after <i>Factory Shipment Date</i> , whichever occurs first. Warranty terms and conditions apply.
438-2	Standard warranty + 12 months	Standard warranty extended with 12 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-4	Standard warranty + 18 months	Standard warranty extended with 18 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-5	Standard warranty + 24 months	Standard warranty extended with 24 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.
438-7	Standard warranty + 30 months	Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply.
438-8	Stock warranty	<p>Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from <i>Factory Shipment Date</i> or from activation date of standard warranty in WebConfig.</p> <div data-bbox="798 1836 860 1897" data-label="Image"> </div> <div data-bbox="880 1850 946 1883" data-label="Section-Header"> <h4>Note</h4> </div> <div data-bbox="790 1904 1418 1962" data-label="Text"> <p>Special conditions are applicable, see <i>Robotics Warranty Directives</i>.</p> </div>

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Warranty for DressPack



Note

Option 3326-11/13 upper arm DressPack MH3 is not covered by the warranty.

3 Specification of variants and options

3.7 User documentation

3.7 User documentation

User documentation

The user documentation describes the robot in detail, including service and safety instructions.



Tip

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

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