ROBOTICS

Product specification

IRB 6650S

Trace back information:
Workspace OmniCore and R19C version a17
Checked in 2019-09-19
Skribenta version 5.3.012

Product specification

IRB 6650S-90/3.9
IRB 6650S-125/3.5
IRB 6650S-200/3.0

Document ID: 3HAC030822-001
Revision: X

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Overview of this product specification

About this product specification

It 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 requirements
- The load diagrams, mounting of extra equipment, the motion and the robot reach
- The specification of variant and options available

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.

Users

It is intended for:

- Product managers and Product personnel
- Sales and Marketing personnel
- Order and Customer Service personnel

References

Reference	Document ID
Product specification - Controller IRC5 IRC5 with main computer DSQC1000.	*3HAC047400-001*
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 5.6x.	*3HAC050945-001*
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 6.	*3HAC050945-001*
Product manual - IRB 6650S	*3HAC020993-001*
Product specification - Robot user documentation, IRC5 with RobotWare 6	*3HAC052355-001*

Revisions

Revision	Description
-	- New Product Specification.
A	- Changes for Calibration data - Work range - Explanation of ISO values (new figure and table) - Stopping distance - User documentation on DVD
B	- General update for 9.1 release

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Continued

Revision	Description
C	- Foundry Plus 2
D	- Updated Foundry Plus 2 text - ISO-Cube
E	- Text for Standards updated - New document structure
F	- Minor corrections and information added
G	• Table for ambient temperature adjusted • Minor corrections
H	• Machinery directive updated • General corrections
J	• Base plate drawing updated • Drawing for reference holes updated • Minor corrections/update
K	• Minor corrections/update
L	• Minor corrections/update
M	• Text for ISO test adjusted • Robot stopping distances and times for category 0 and category 1 stops are moved to a separate document, *Product specification - Robot stopping distances according to ISO 10218-1*
N	• Text for Foundry Plus updated. • Minor corrections/update
P	• Minor corrections/update
Q	• DressPack LeanID added • Section "SpotWelding cabinet" updated.
R	• Warranty information for DressPack added
S	Phrase *The values for IRB 6650S-90/3.9 are not yet available* is changed to *The values for IRB 6650S-90/3.9 are not available*, in section *Performance according to ISO 9283 on page 56*
T	Published in release R17.1. The following updates are done in this revision: • Restriction of load diagram added.
U	Published in release R17.2. The following updates are done in this revision: • Updated list of applicable standards. • TCP acceleration information added. • Delete option 828-1, 828-2, 768-3 and 782-1 as they were all phased out.
V	Published in release R18.2. The following updates are made in this revision: • New dimensions added on illustration, see *Mounting of hip load on page 48*.
X	• Published in release 19C The following updates are made in this revision: • - Graphics for DressPack changed. See *Base on page 75*. - Updated information about *Absolute Accuracy*.

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1 Description

1.1 Structure

1.1.1 Introduction

Robot family

The IRB 6650S is available in three versions:

The IRB 6650S is ideal for process applications, regardless of industry and offers a unique working envelope. Typical areas can be Spot Welding, 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 IRC5 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 - Controller IRC5 with FlexPendant.

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 the Product specification - Controller software IRC5.

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 are 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

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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 versions

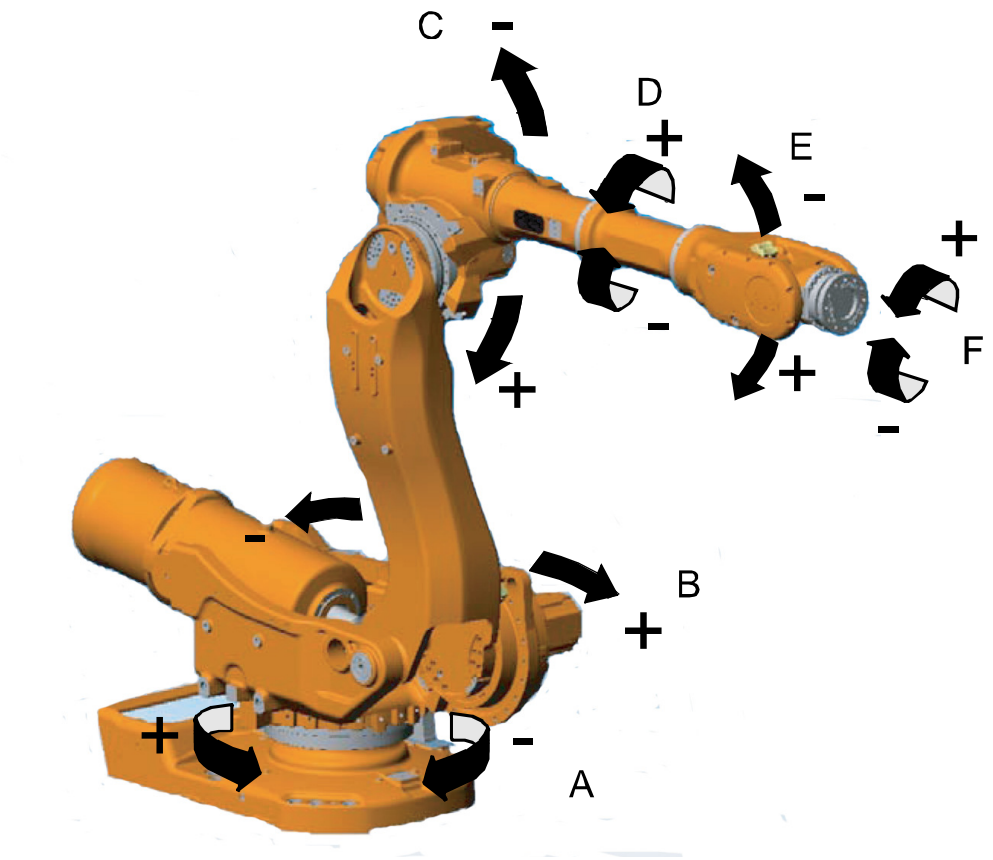
The option Foundry Plus 2 might not be available for all robot versions.

See *Specification of variants and options on page 157* for robot versions and other options not selectable together with Foundry Plus 2.

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Axis movement



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Pos	Description	Pos	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

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1.1.2 Different robot versions

General

The IRB 6650S is available in three versions.

Standard

The following different standard robot types are available:

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

Note

If option 780-4, LeanID is selected, the payload wil ldecrease as stated above, for detailed information see *Load diagrams on page 32*

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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
IRB 6650S-90/3.9	2275 kg [a]
IRB 6650S-125/3.5	2250 kg [a]
IRB 6650S-200/3.0	2250 kg [a]

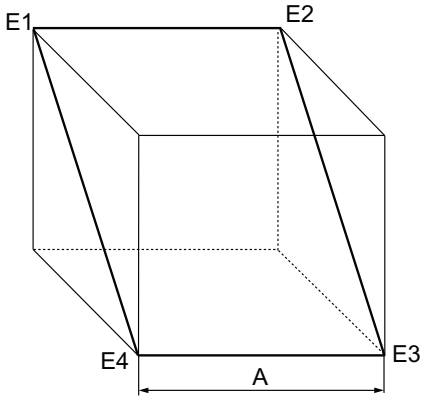
a. Without DressPack

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 load

Type of Movement	IRB 6650S
ISO Cube	2.4 kW



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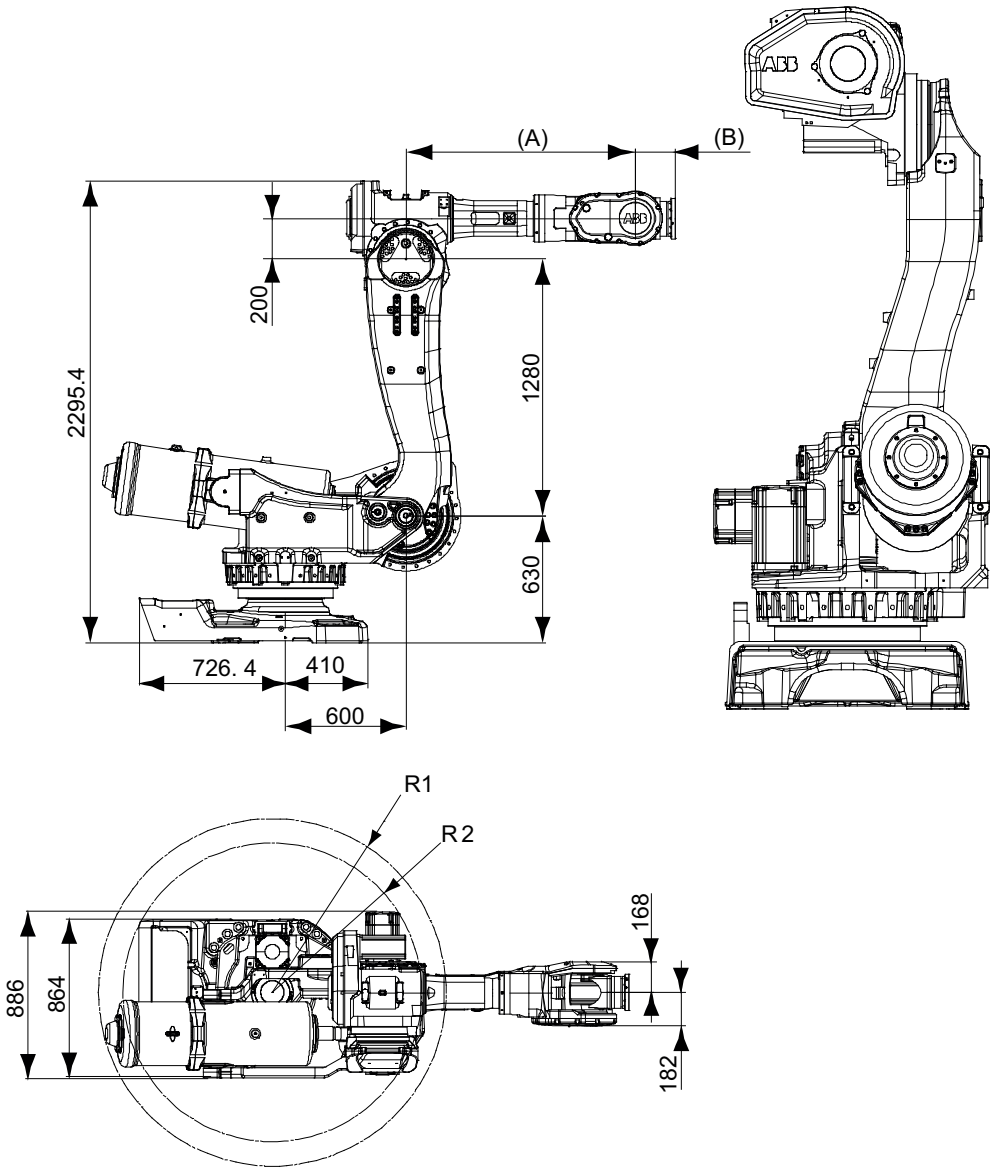
Pos	Description
A	1000 mm

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1.1.3 Definition of version designation

Continued



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Robot variant	A	B
IRB 6650S-90/3.9	2042	-
IRB 6650S-125/3.5	1592	200 mm for standard and 349 mm LeanID
IRB 6650S-200/3.0	1142	200 mm for standard and 349 mm LeanID

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

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1.2 Standards

1.2.1 Applicable standards

Note

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

Standards, EN ISO

The product is designed in accordance with the requirements of:

Standard	Description
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1:2015	Safety of machinery, safety related parts of control systems - Part 1: General principles for design
EN ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
EN ISO 10218-1:2011	Robots for industrial environments - Safety requirements -Part 1 Robot
ISO 9787:2013	Robots and robotic devices -- Coordinate systems and motion nomenclatures
ISO 9283:1998	Manipulating industrial robots, performance criteria, and related test methods
EN ISO 14644-1:2015 [i]	Classification of air cleanliness
EN ISO 13732-1:2008	Ergonomics of the thermal environment - Part 1
EN 61000-6-4:2007 + A1:2011 IEC 61000-6-4:2006 + A1:2010 (option 129-1)	EMC, Generic emission
EN 61000-6-2:2005 IEC 61000-6-2:2005	EMC, Generic immunity
EN IEC 60974-1:2012 [ii]	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10:2014 [ii]	Arc welding equipment - Part 10: EMC requirements
EN IEC 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)

[i] Only robots with protection Clean Room.
[ii] Only valid for arc welding robots. Replaces EN IEC 61000-6-4 for arc welding robots.

European standards

Standard	Description
EN 614-1:2006 + A1:2009	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles

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1.2.1 Applicable standards

Continued

Standard	Description
EN 574:1996 + A1:2008	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements

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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.

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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 *Product specification - Controller IRC5 with FlexPendant*
For the spot welding cabinet	Standard	+ 5°C (41°F) to + 45°C (113°F)
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 humidiy
Complete robot during transportation and storage	Max. 95% at constant temperature
Complete robot during operation	Max. 95% at constant temperature

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1.3.3 Mounting the manipulator

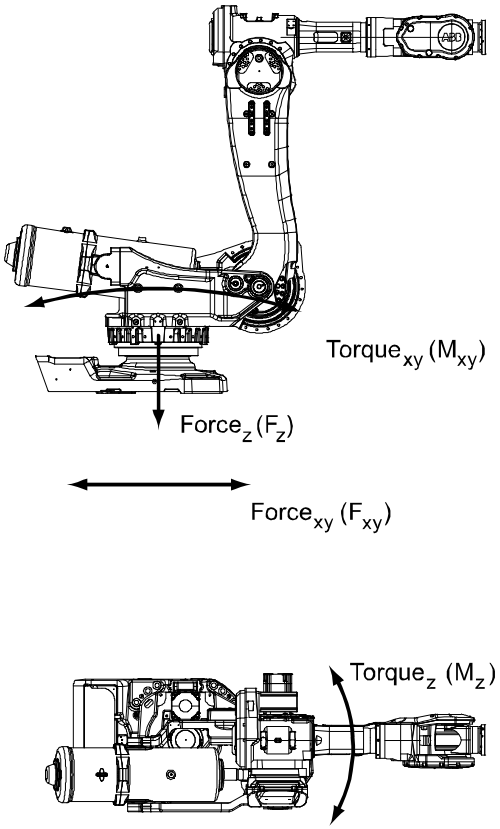
Maximum Load

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*	± 50.5 kNm ± 55.6 kNm*
Torque z	± 7.9 kNm	± 13.6 kNm

* When using base spacers (option 571-1).



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Note regarding Mxy and Fxy

The bending torque (Mxy) can occur in any direction in the XY-plane of the base coordinate system.

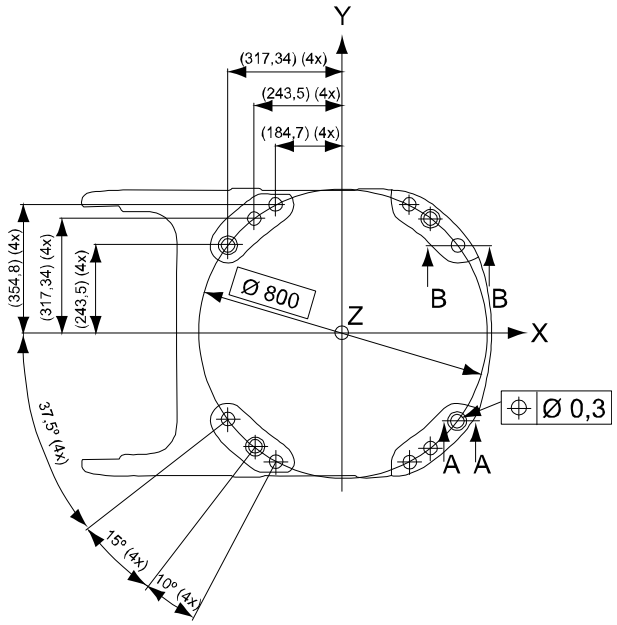
The same applies to the transverse force (Fxy).

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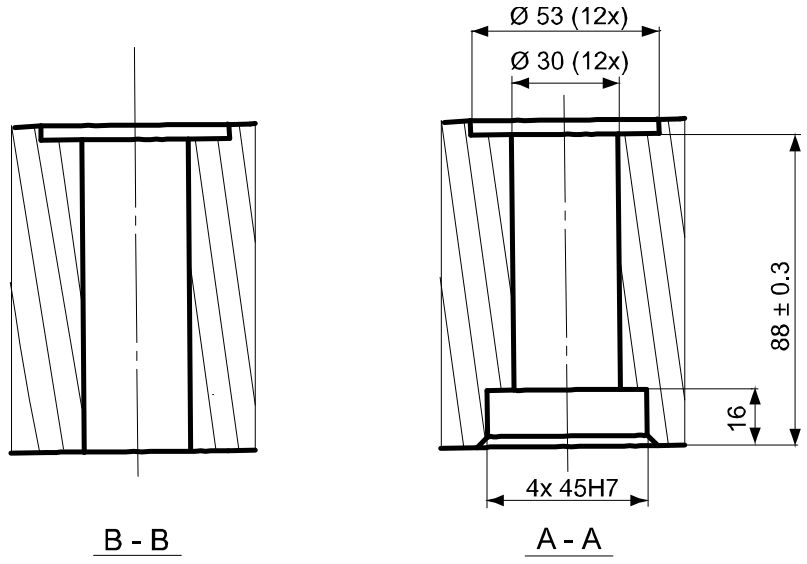
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1.3.3 Mounting the manipulator
Continued

Fastening holes robot base - for IRB 6650S



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Recommended srews 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.

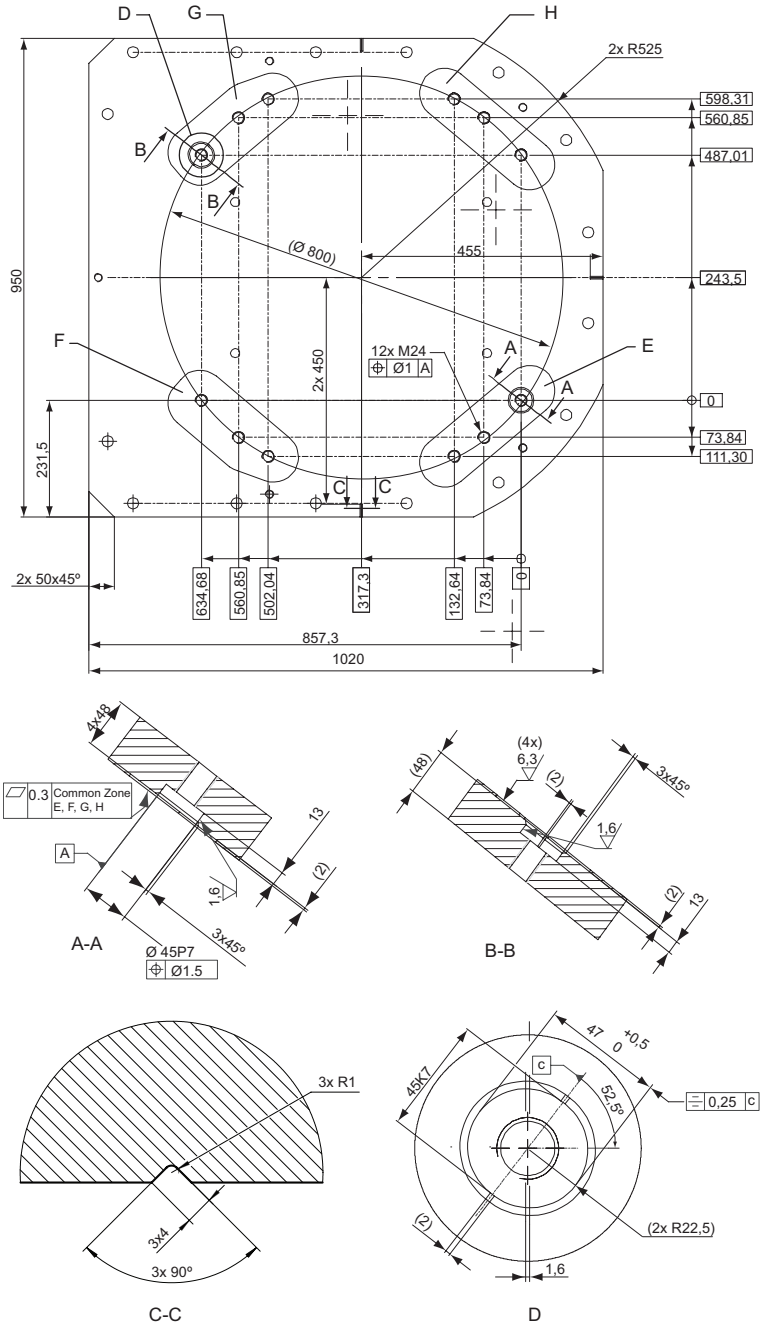
Regarding AbsAcc performance, the chosen guide holes according to Figures below are recommended.

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Base plate drawing

The following figure shows the option base plate (dimensions in mm).



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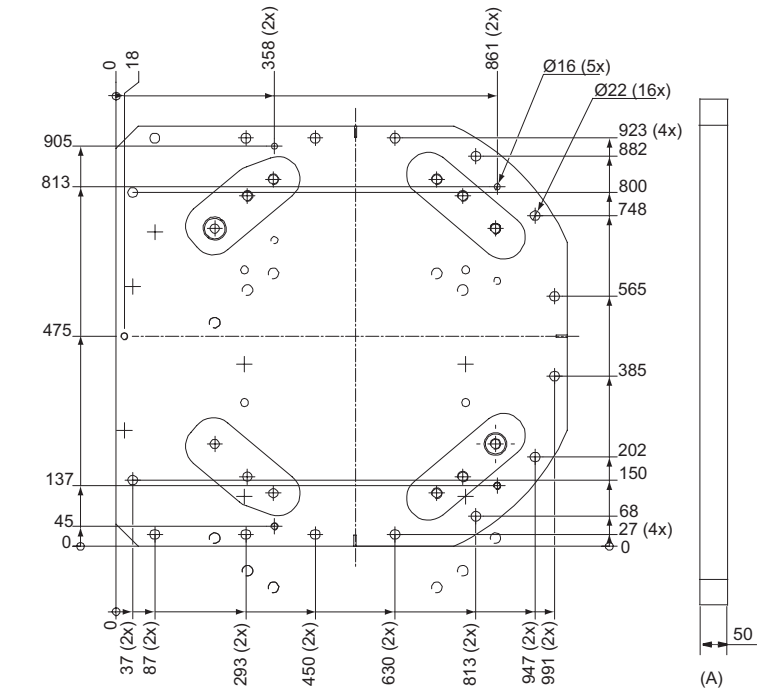
E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)

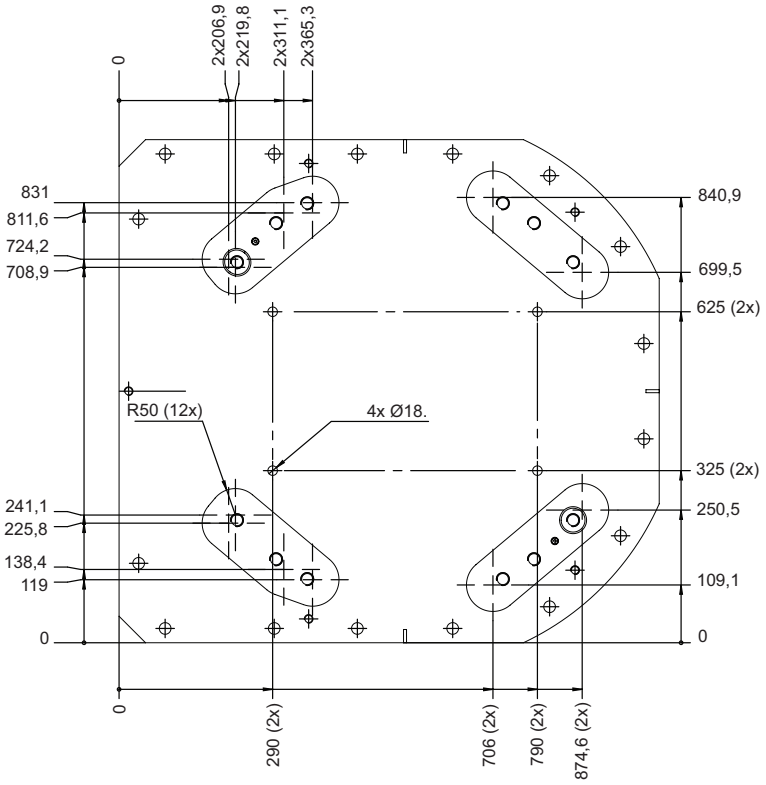
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1.3.3 Mounting the manipulator

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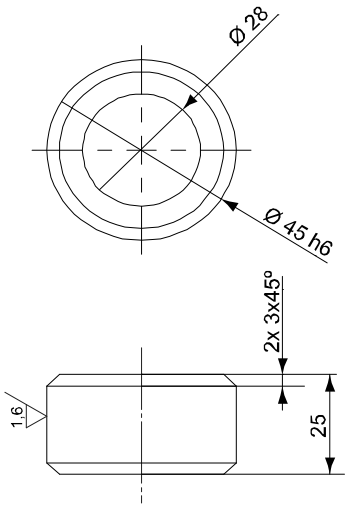


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Pos	Description
A	Color: RAL 9005 Thickness: 80-100 µm

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Pos	Description
A	Guide sleeve protected from corrosion

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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. For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.	Axis Calibration or Calibration Pendulum [i] Levelmeter calibration (alternative 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 SMB (serial measurement board) in the robot. For robots with RobotWare 5.05 or older, the absolute accuracy calibration data is delivered in a file, absacc.cfg, supplied with the robot at delivery. The file replaces the calib.cfg file and identifies motor positions as well as absolute accuracy compensation parameters. A robot calibrated with Absolute accuracy has a sticker next to the identification plate of the robot. To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.  xx0400001197	CalibWare

[i] The robot is calibrated by either Calibration Pendulum or Axis Calibration at factory. Always use the same calibration method as used at the factory.

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Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, Calibration Pendulum is used as default.

Brief description of calibration methods

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of all ABB robots (except IRB 6400R, IRB 640, IRB 1400H, and IRB 4400S).

Two different routines are available for the Calibration Pendulum method:

- Calibration Pendulum II
- Reference calibration

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

Axis Calibration method

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

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

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

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

CalibWare - Absolute Accuracy calibration

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

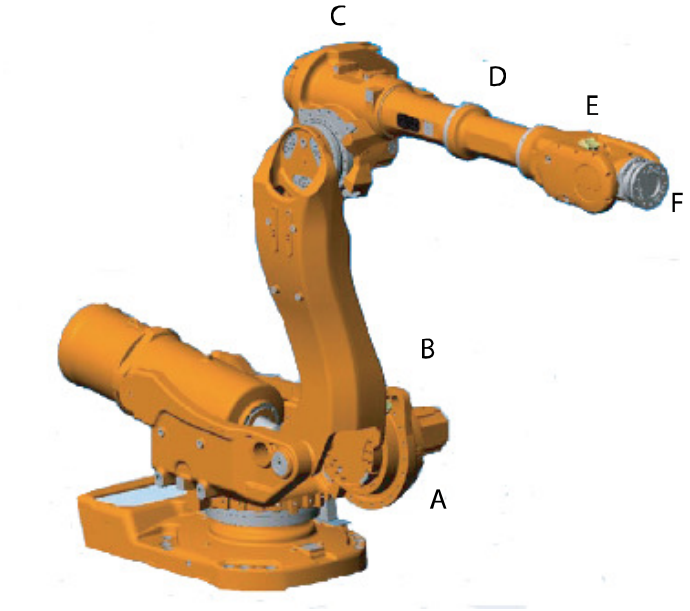
If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

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1.4.2 Fine calibration

General

Fine calibration is made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum* or Axis calibration, see *Product manual - IRB 6650S*.



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Pos	Description	Pos	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

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

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1.4.3 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.

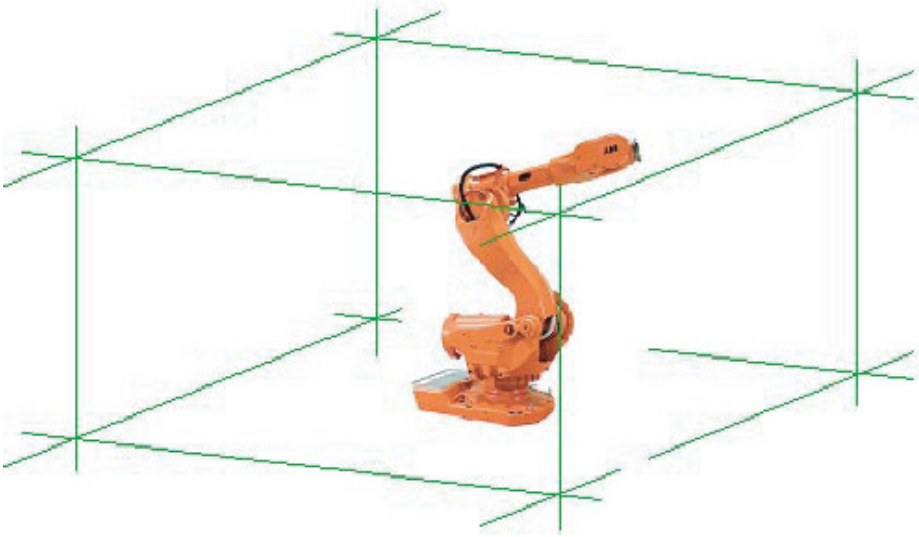
Here are some examples of when this accuracy is important:

- Exchangeability of robots
- Offline programming with non or minimum touch-up
- Online programming with accurate movement and reorientation of tool
- Accurate cell alignment for MultiMove coordinated motion
- Programming with accurate offset movement in relation to eg. vision system or offset programming
- Re-use of programs between applications

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

Note

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



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What is included

Every Absolute Accuracy robot is delivered with:

- compensation parameters saved on the robot's serial measurement board
- a birth certificate representing the Absolute Accuracy measurement protocol for the calibration and verification sequence.

Continues on next page

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1.4.3 Absolute Accuracy calibration
Continued

A robot with Absolute Accuracy calibration is marked on the manipulator.

Absolute Accuracy supports both floor mounted and inverted installations. The compensation parameters differ depending on if the robot is floor mounted or inverted.

When is Absolute Accuracy being used

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

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

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

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

Absolute Accuracy not active

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

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

Note

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

RAPID instructions

There are no RAPID instructions included in this option.

MultiMove

If the main robot in a MultiMove system has the Absolute Accuracy option, it opens up Absolute Accuracy capability for all the robots in the system. However, each robot needs to be calibrated individually.

Note

Note that this is the only RobotWare option that is relevant for an additional robot.

Continues on next page

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Note

It is possible to mix robots with and without the option Absolute Accuracy arbitrarily in a MultiMove system.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 6650S-125/3.50 IRB 6650S-200/3.00	0.50	1.20	97
IRB 6650S-90/3.9	a	a	a

a. For detailed data and data missing in the table, please contact ABB for more information.

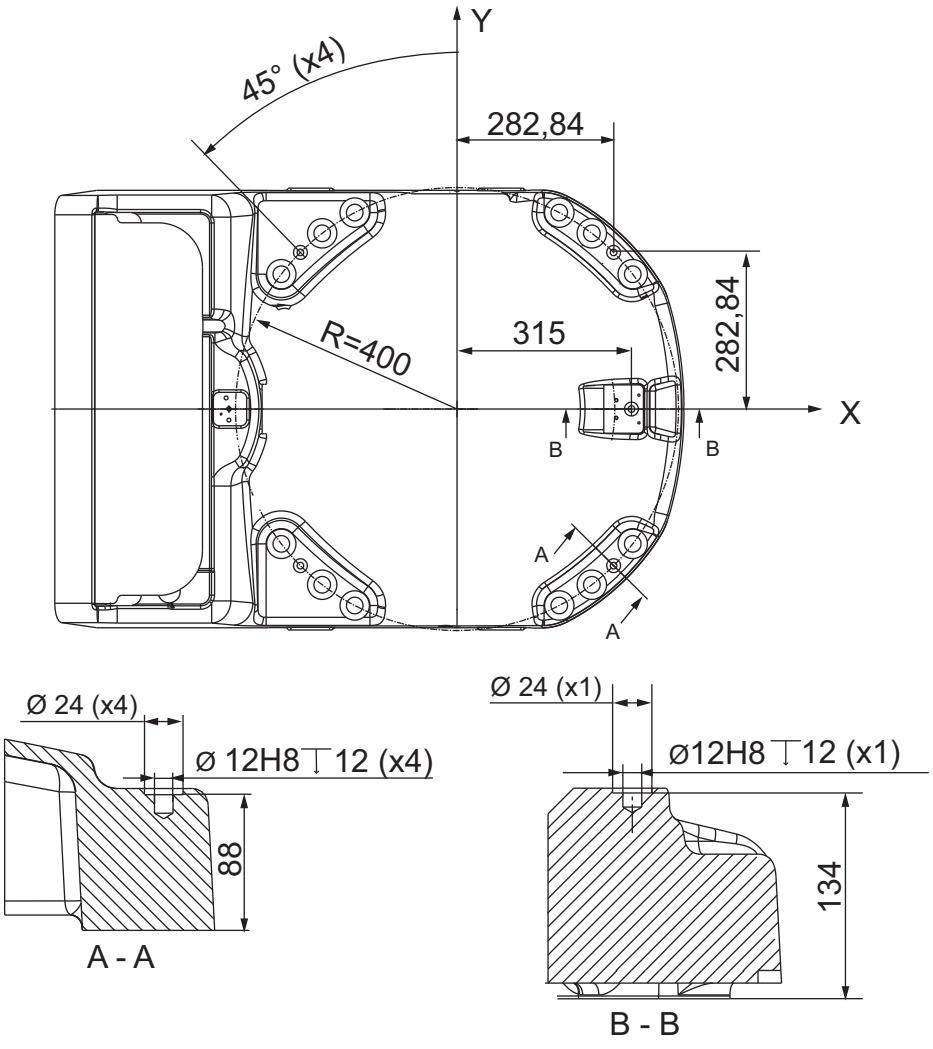
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1.4.4 Robot references

Base

The holes shown in figure below are used for measuring the robot position when integrated in a production cell.

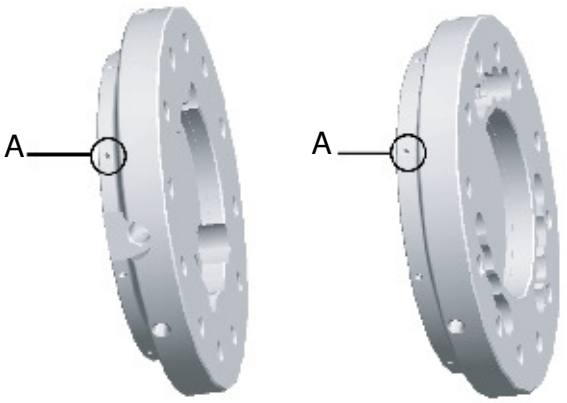
The holes are not available for option Foundry Plus.



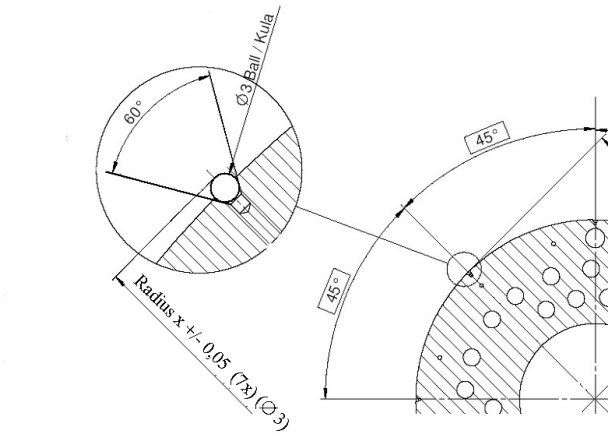
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Robot	Radius X (mm) for references on tool flange
IRB 6650S-90/3.90 IRB 6650S-125/3.50 IRB 6650S-200/3.00	R=87,5

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

- motors
- gearboxes
- mechanical structure

WARNING

In the robot system is the service routine LoadIdentify available, which allows the user to make an automatic definition of the tool and load, to determine correct load parameters. Please see *Operating Manual - IRC5 with FlexPendant*, art. No. 3HAC16590-1, for detailed information.

WARNING

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

General

The load diagrams include a nominal payload inertia, J_0 of 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.

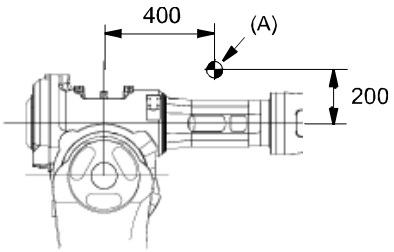
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Control of load case by "RobotLoad"

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

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



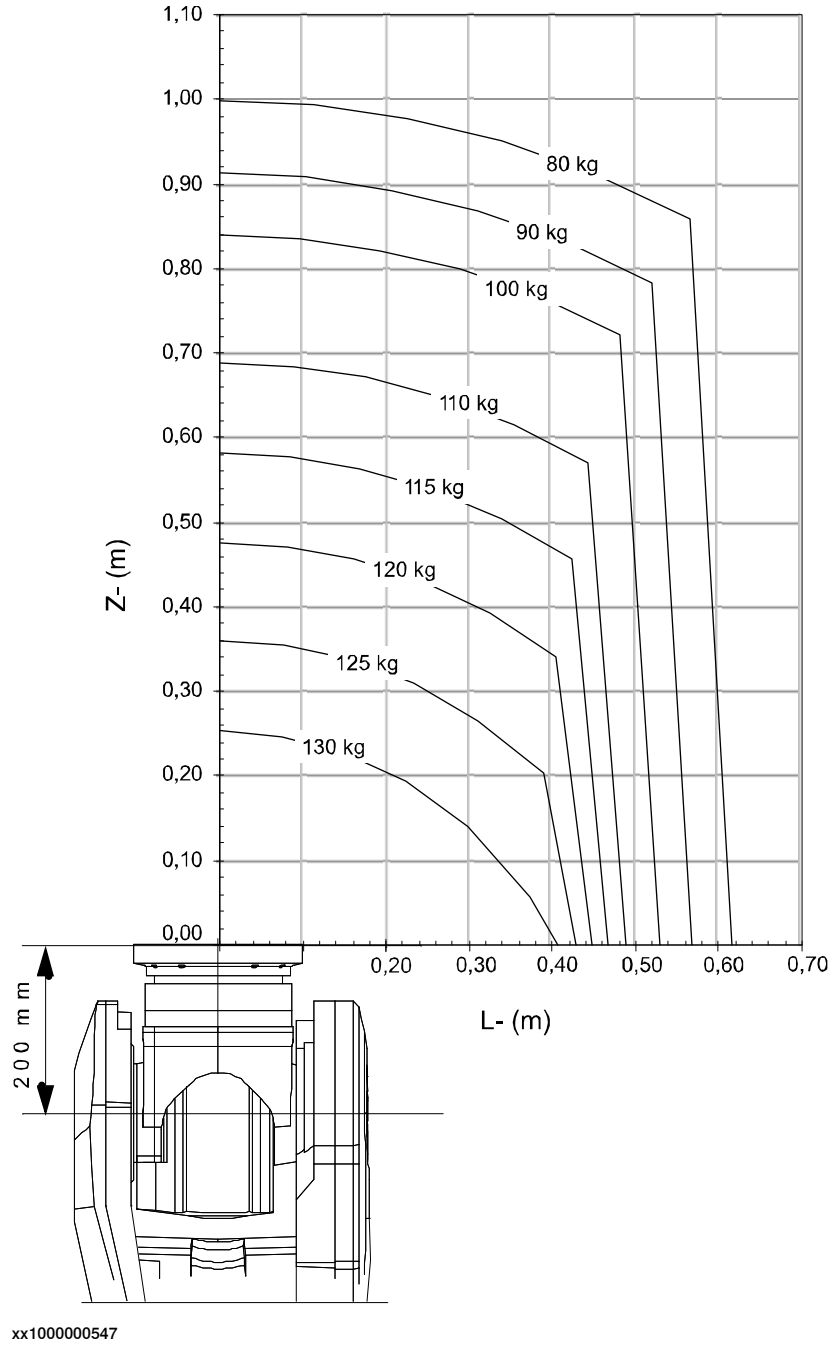
xx1000000494

Pos	Description
A	Center of gravity 50 kg

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1.5.2 Load diagrams

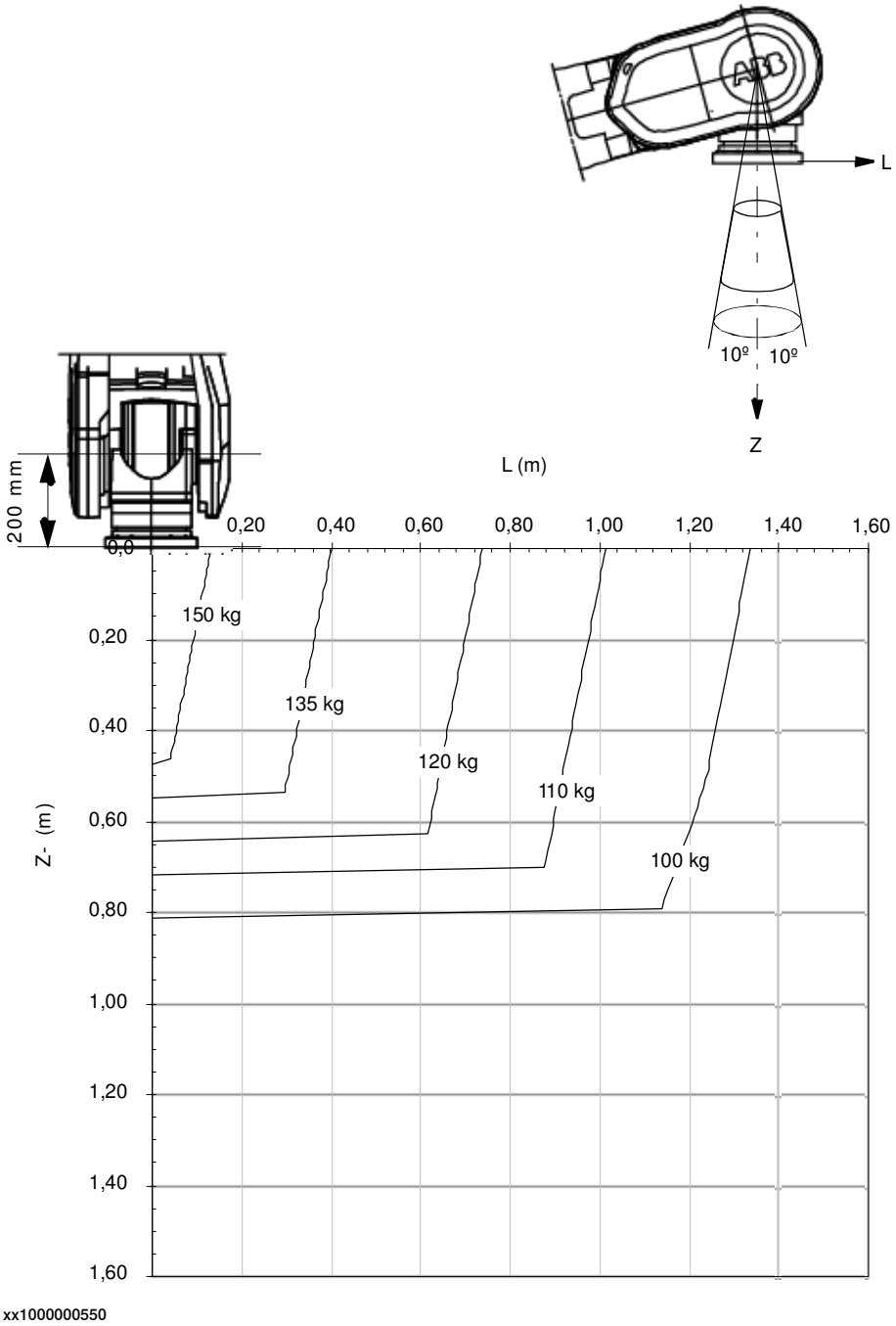
IRB 6650S-125/3.5



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IRB 6650S-125/3.5 “Vertical Wrist” (±10°)



xx1000000550

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

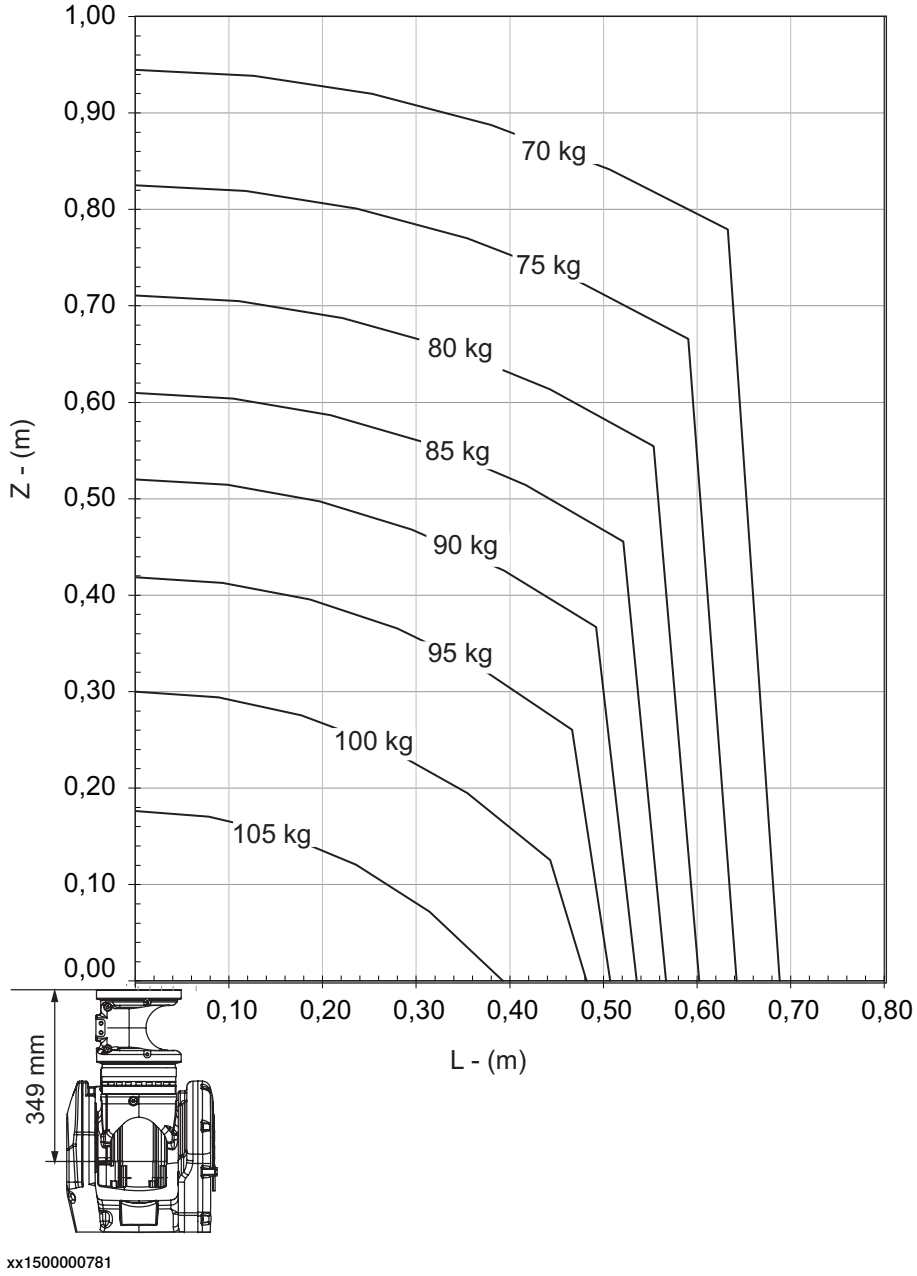
	Description
Max load	150 kg
Z_{max}	0,462 m
L_{max}	0,156 m

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1.5.2 Load diagrams
Continued

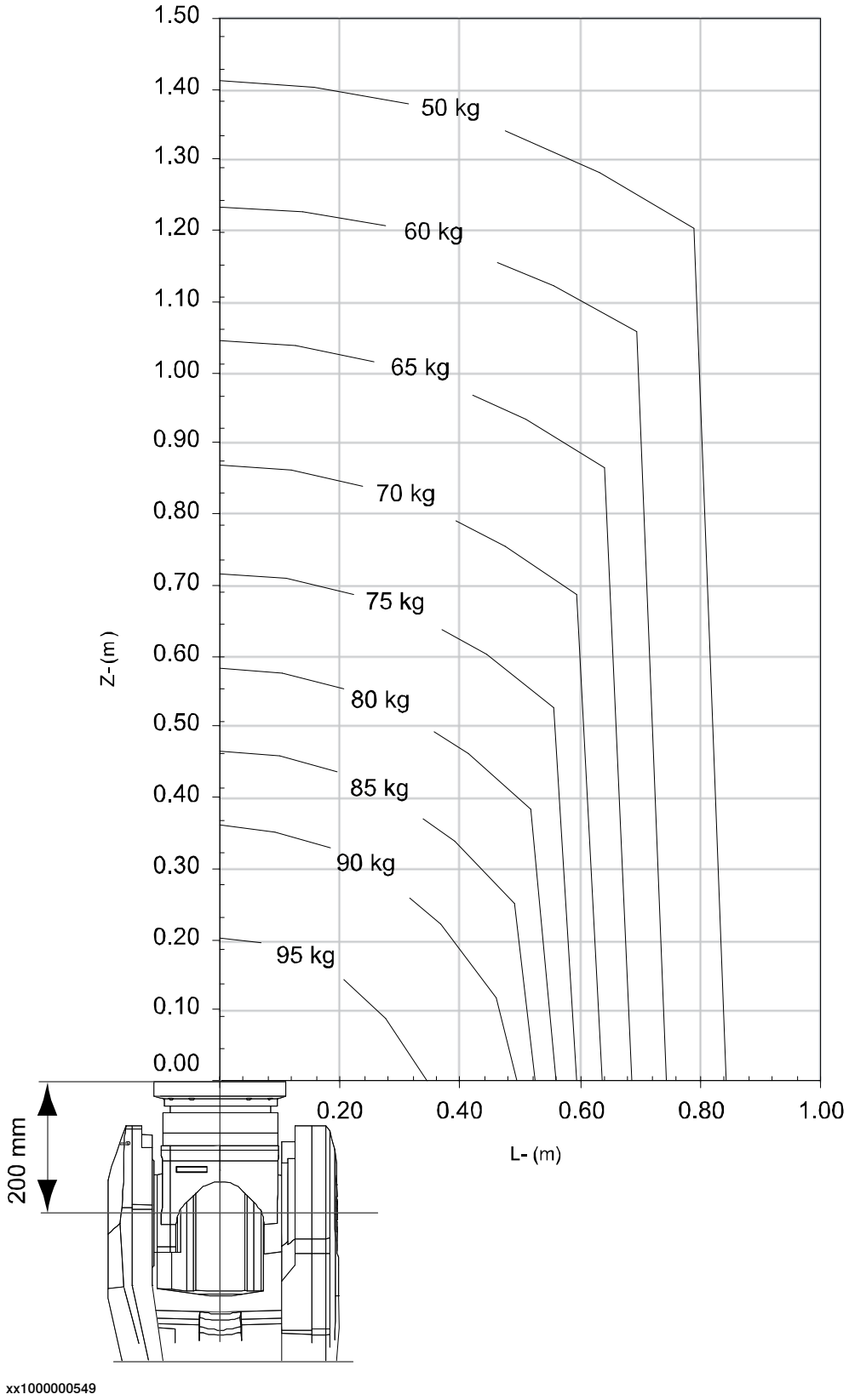
IRB 6650S-125/3.5 LeanID, option 780-4



Continues on next page

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IRB 6650S-90/3.9

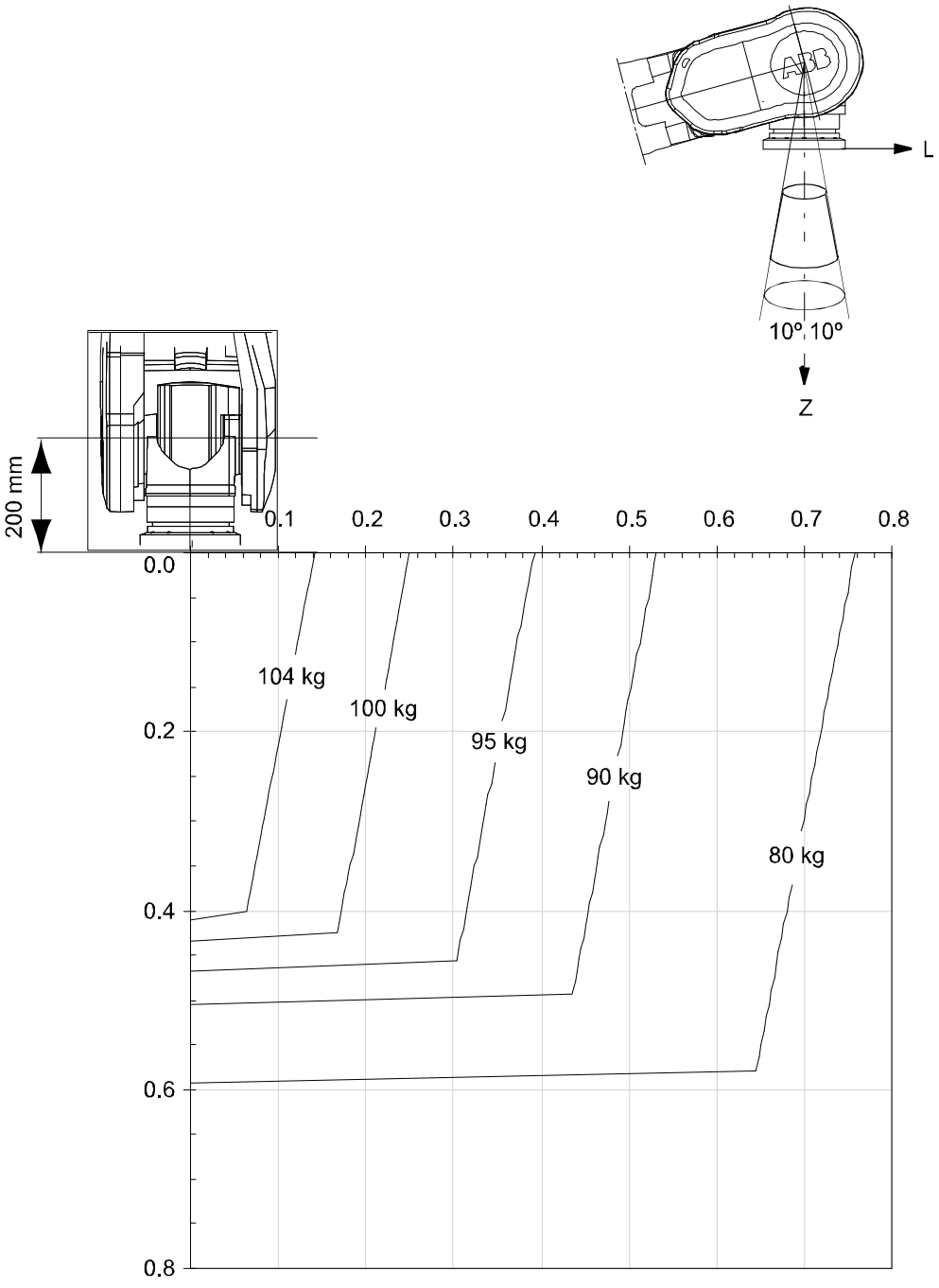


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1.5.2 Load diagrams
Continued

IRB 6650S-90/3.9 “Vertical Wrist” (±10o)



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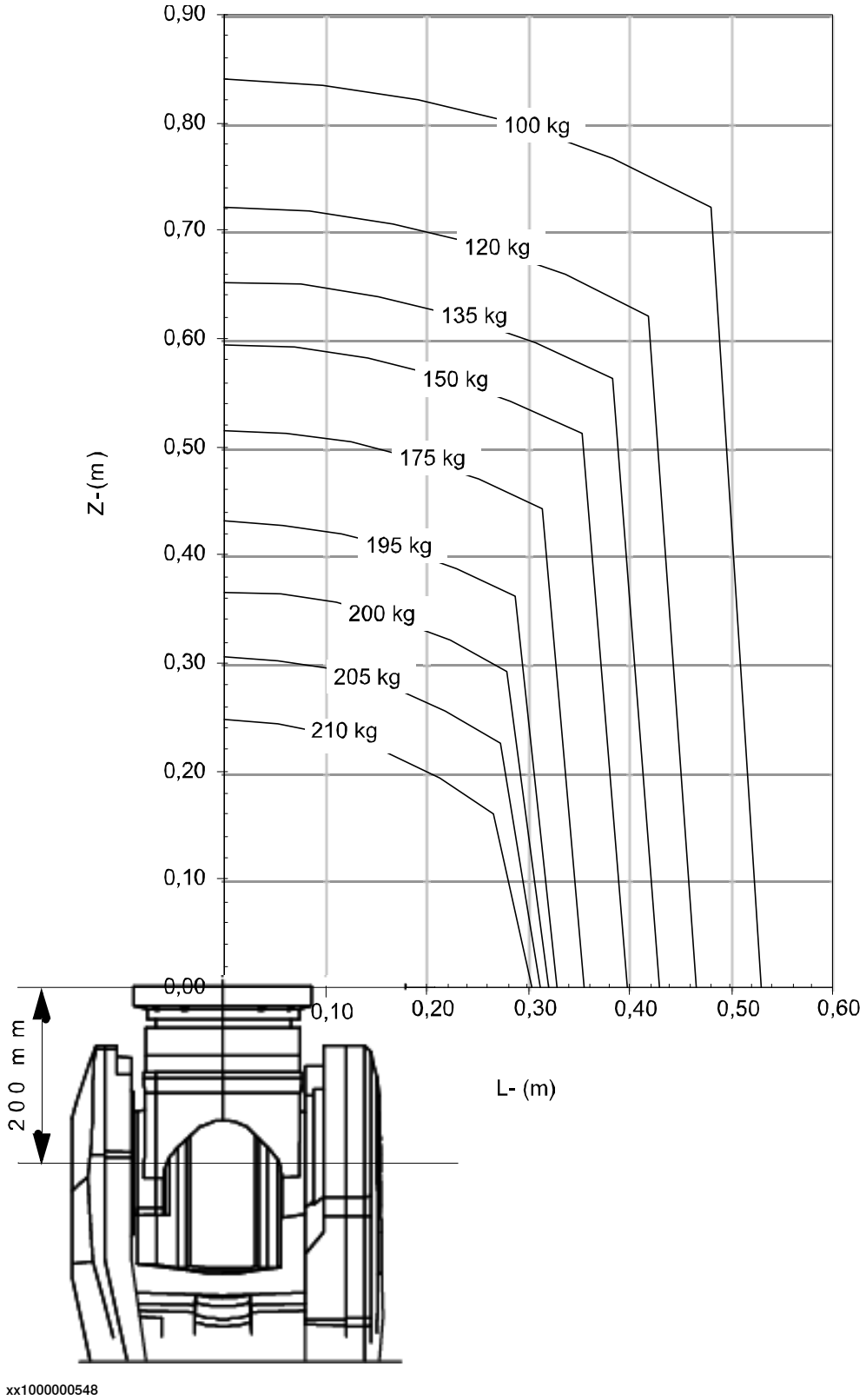
For wrist down (0º deviation from the vertical line).

	Description
Max load	107 kg
Z_{max}	0,2 m
L_{max}	0,1 m

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IRB 6650S-200/3.0



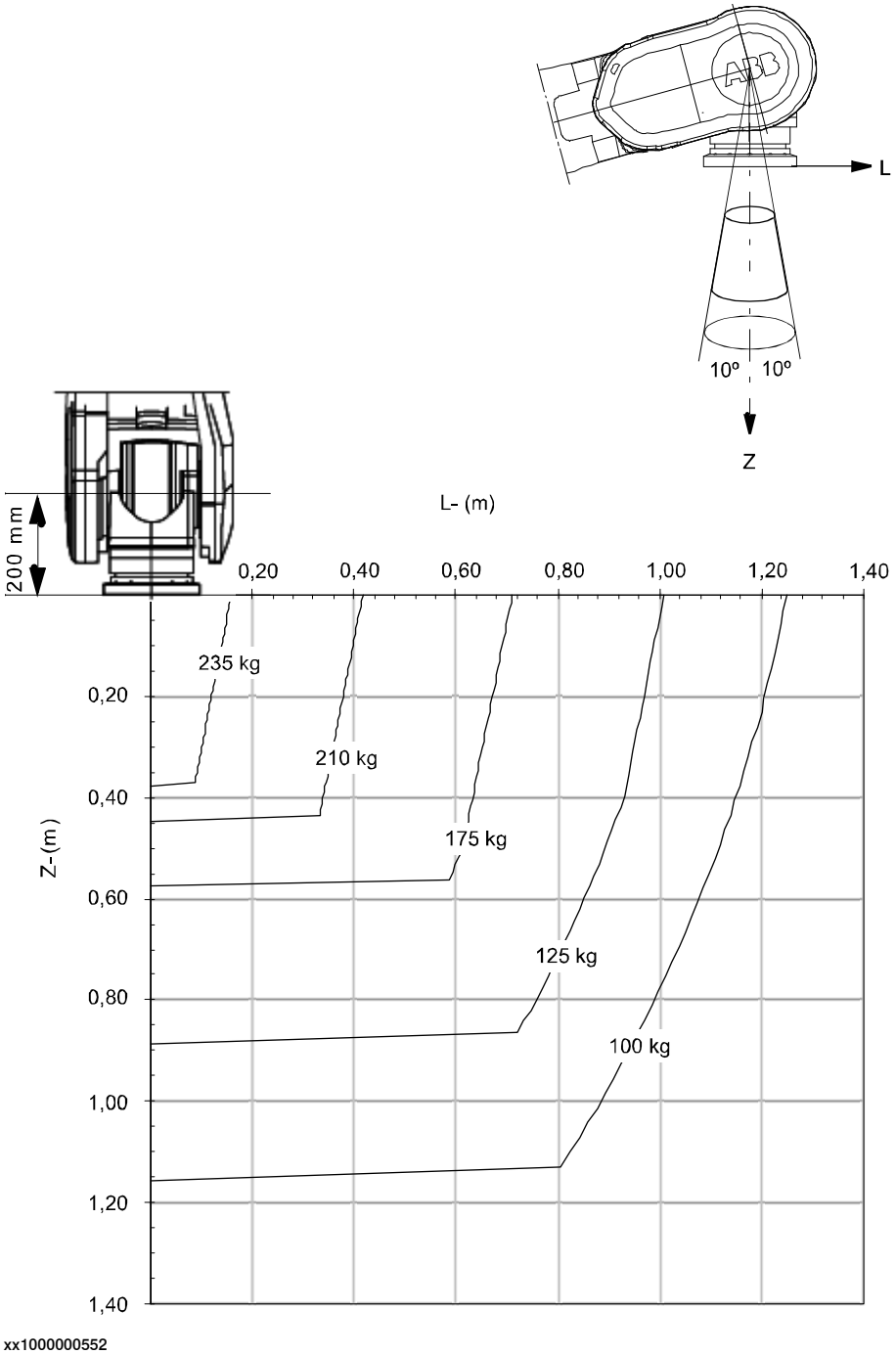
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1.5.2 Load diagrams
Continued

IRB 6650S-200/3.0“ Vertical Wrist” (±10°)



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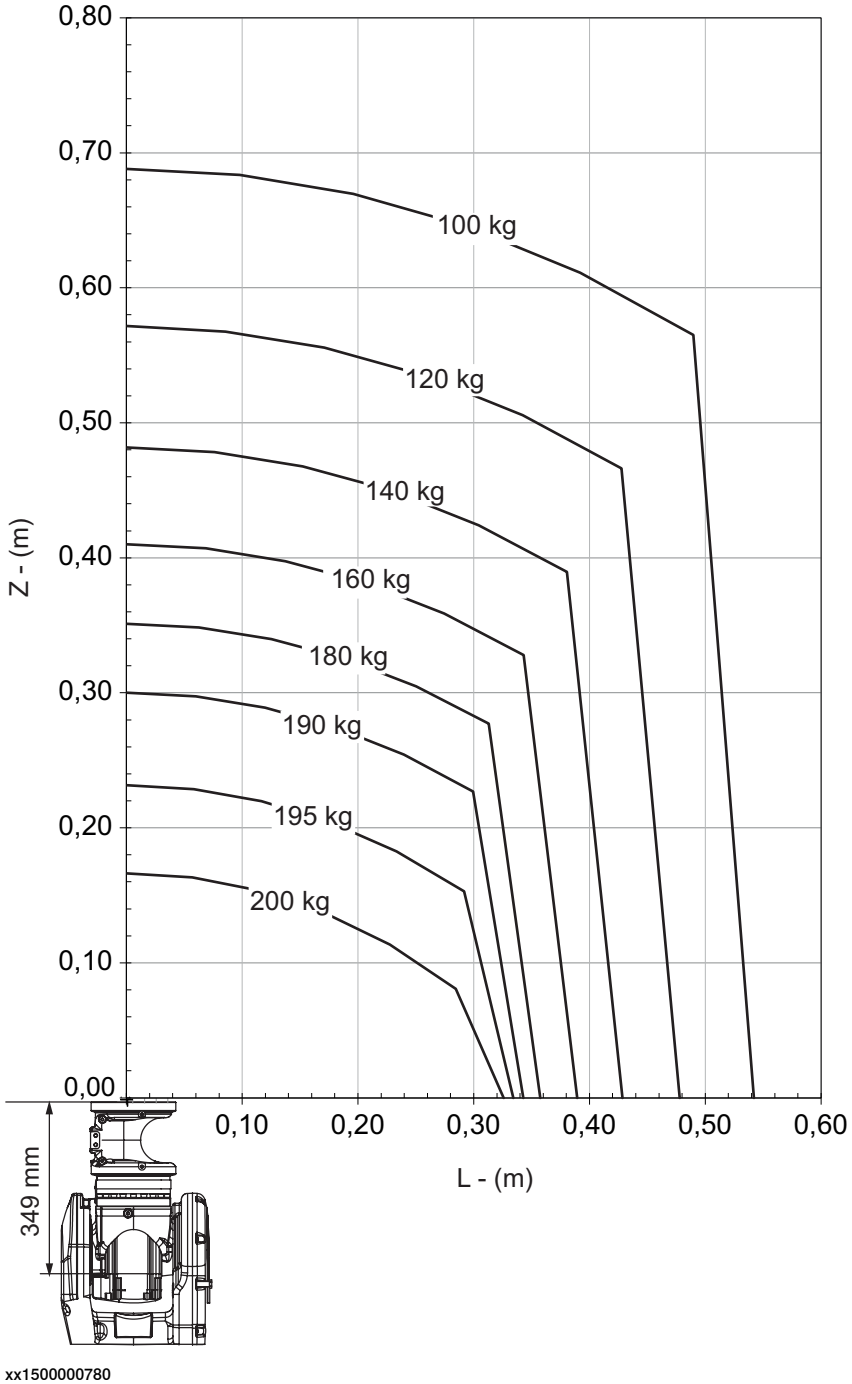
For wrist down (0° deviation from the vertical line).

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

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IRB 6650S-200/3.0 LeanID, option 780-4



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

Note

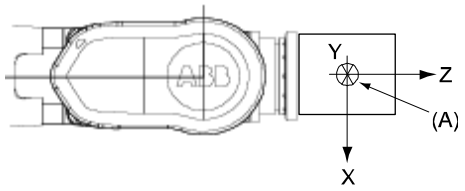
Note

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

Full movement of axis 5 (±120°)

Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	Ja5 = Load x $((Z + 0{,}200^{i})^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 250 kgm^2
6	125/3.5, 200/3.0 and 90/3.9	Ja6 = Load x L^2 + J0Z ≤ 185 kgm^2

i For option 780-4, LeanID=0,349 m



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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.

Limited axis 5, center line down

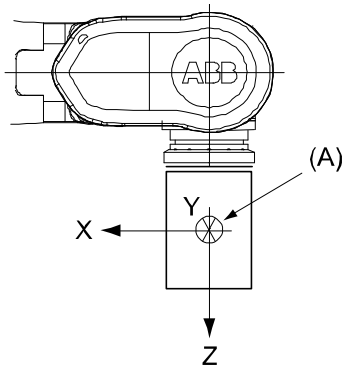
Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	Ja5 = Load x $((Z + 0{,}200^{i})^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 275kgm^2
6	125/3.5, 200/3.0 and 90/3.9	Ja6 = Load x L^2 + J_{0Z} ≤ 250 kgm^2

i For option 780-4, LeanID=0,349 m

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



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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 Wrist torque

General

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

Note

Note! The values are for reference only, and should not be used for calculating permitted load offset (position of center of gravity) within the load diagram, since those also are limited by main axes torques as well as dynamic loads. Also arm loads will influence the permitted load diagram. For finding the absolute limits of the load diagram, please use the ABB RobotLoad. Please contact your local ABB organization.

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 6650S-200/3.0	1264 Nm	625 Nm	192 kg
IRB 6650S-125/3.5	1037 Nm	526 Nm	105 kg
IRB 6650S-90/3.9	495 Nm	438 Nm	60 kg

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1.5.5 Maximum TCP acceleration

General

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

Maximum Cartesian design acceleration for nominal loads

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

Note

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

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1.6 Mounting equipment

1.6.1 Introduction

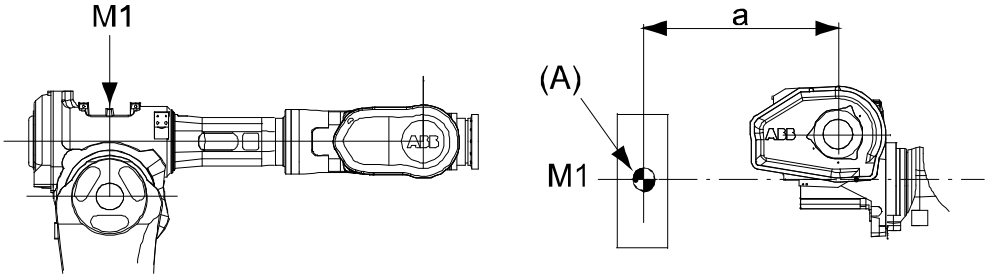
General

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 ≤ 50 kg with distance a ≤ 500 mm, center of gravity in axis 3 extension.



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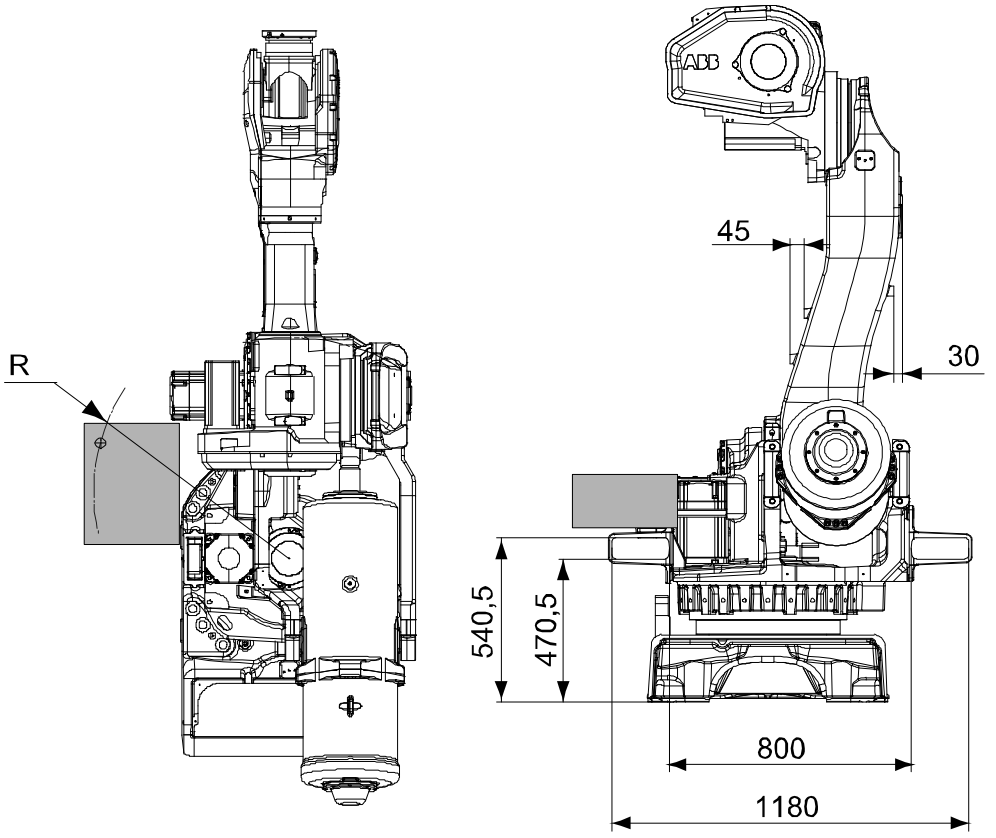
Pos	Description
A	Mass center

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Frame (Hip Load)

	Description
Permitted extra load on frame	J_H = 200 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 (≤ 500 kg)



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Pos	Description
A	View from above
B	View from the rear

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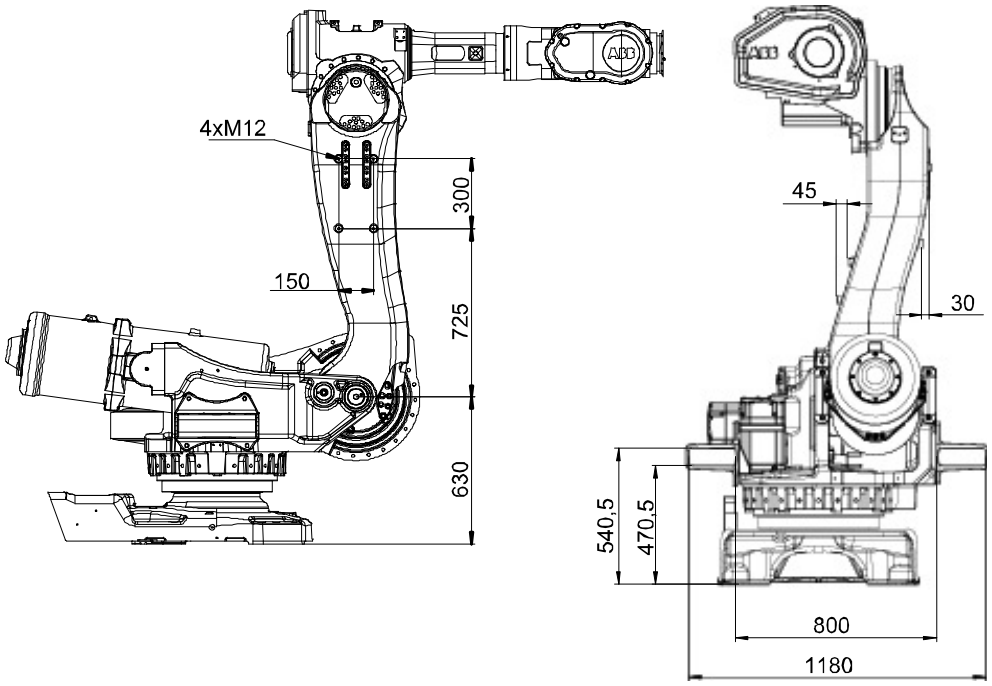
1.6.2 Mounting of hip load

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.

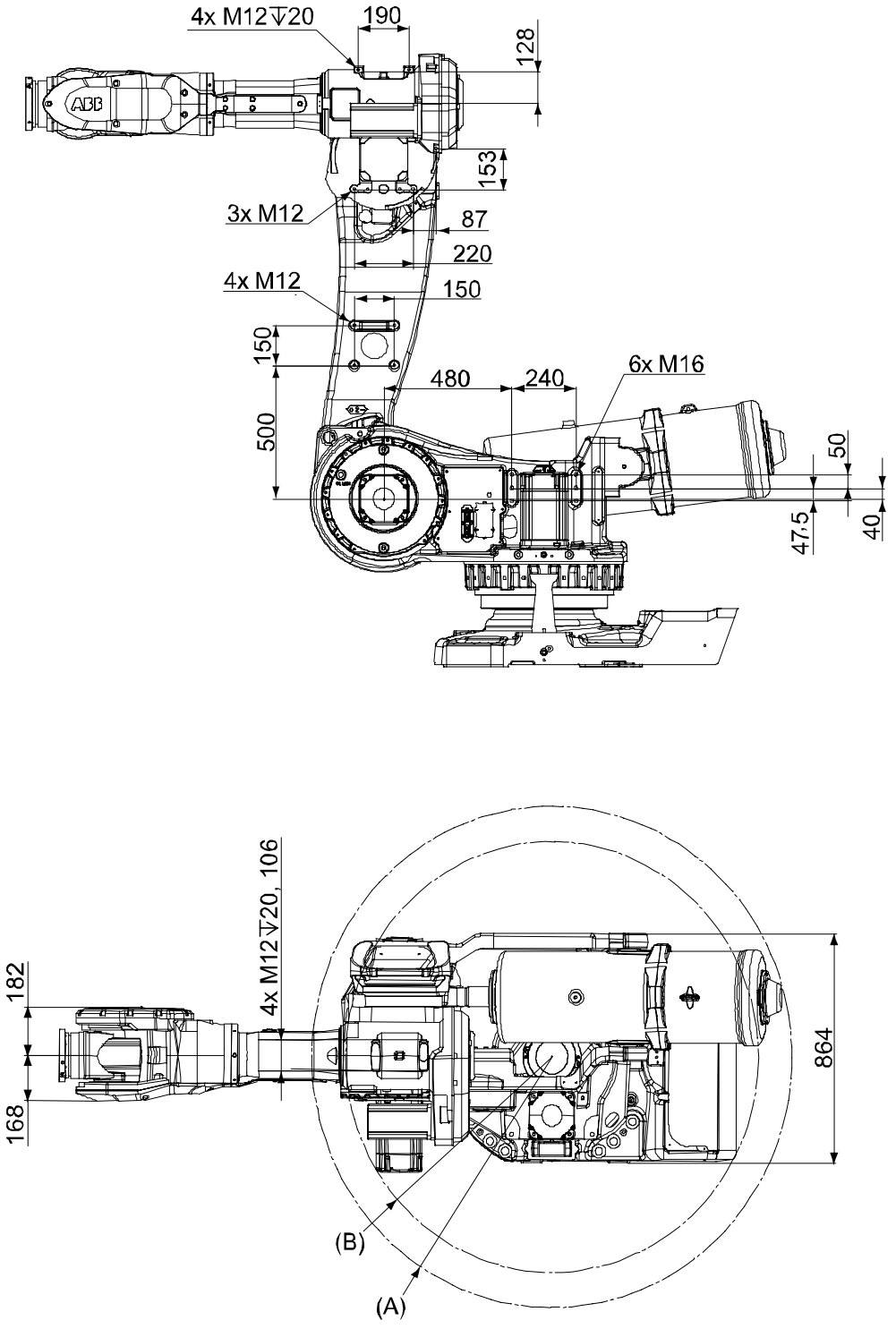
6650S



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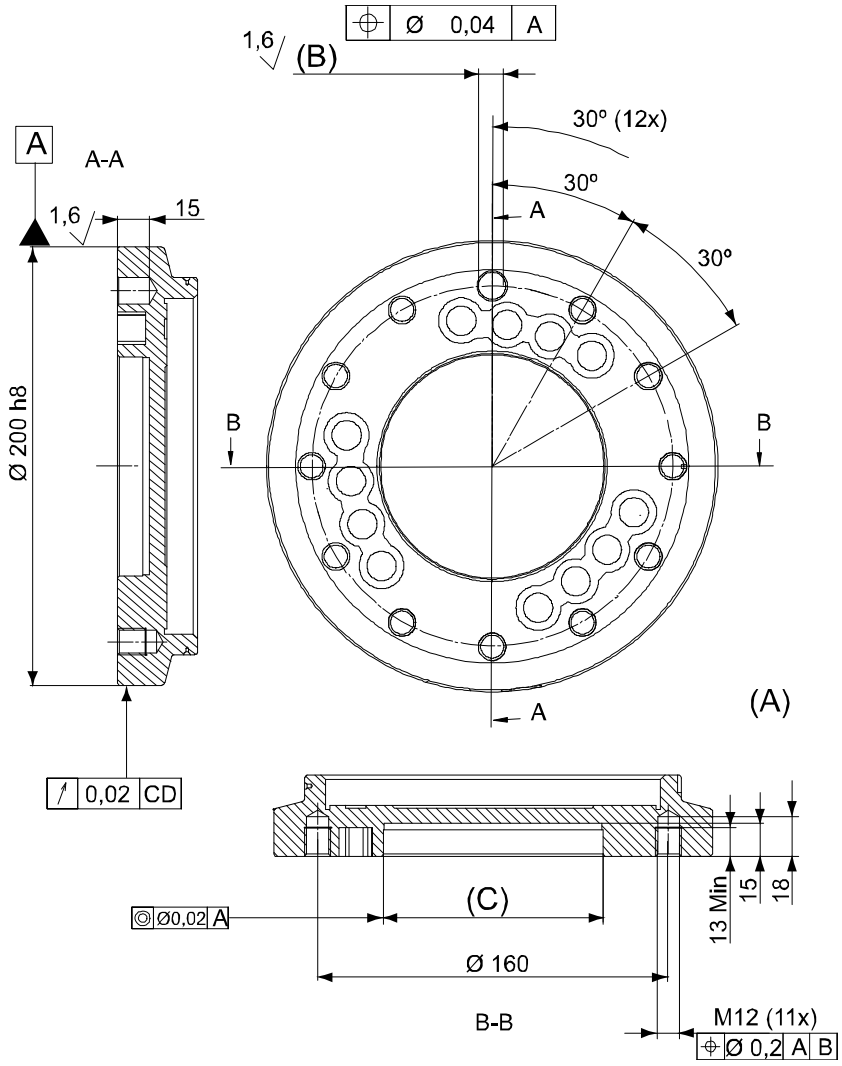
Pos	Description
A	R 946 (Rear side, Balancing device)
B	R 813 (Front side, Motor axis 2)

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1.6.2 Mounting of hip load
Continued

Tool flange also valid for LeanID.



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

For fastening of gripper-tool-flange to robot-tool-flange (see Figure above) all bolt holes for 11 bolts quality class 12.9 shall be used.

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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.

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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

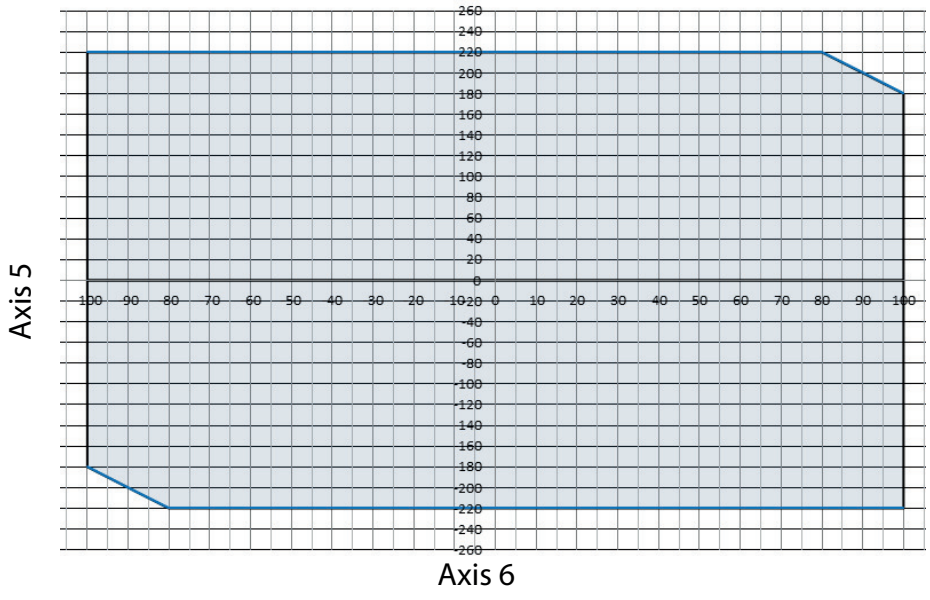
ii The default working range for axis 6 can be extended by changing parameter values in the software. Option 610-1 “Independent axis” can be used for resetting the revolution counter after the axis has been rotated (no need for “rewinding” the axis).

Note

Note! For limitation of range of motion in combination with DressPack see *Introduction on page 52*.

Working range axis 5 and 6 for LeanID, option 780-4

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

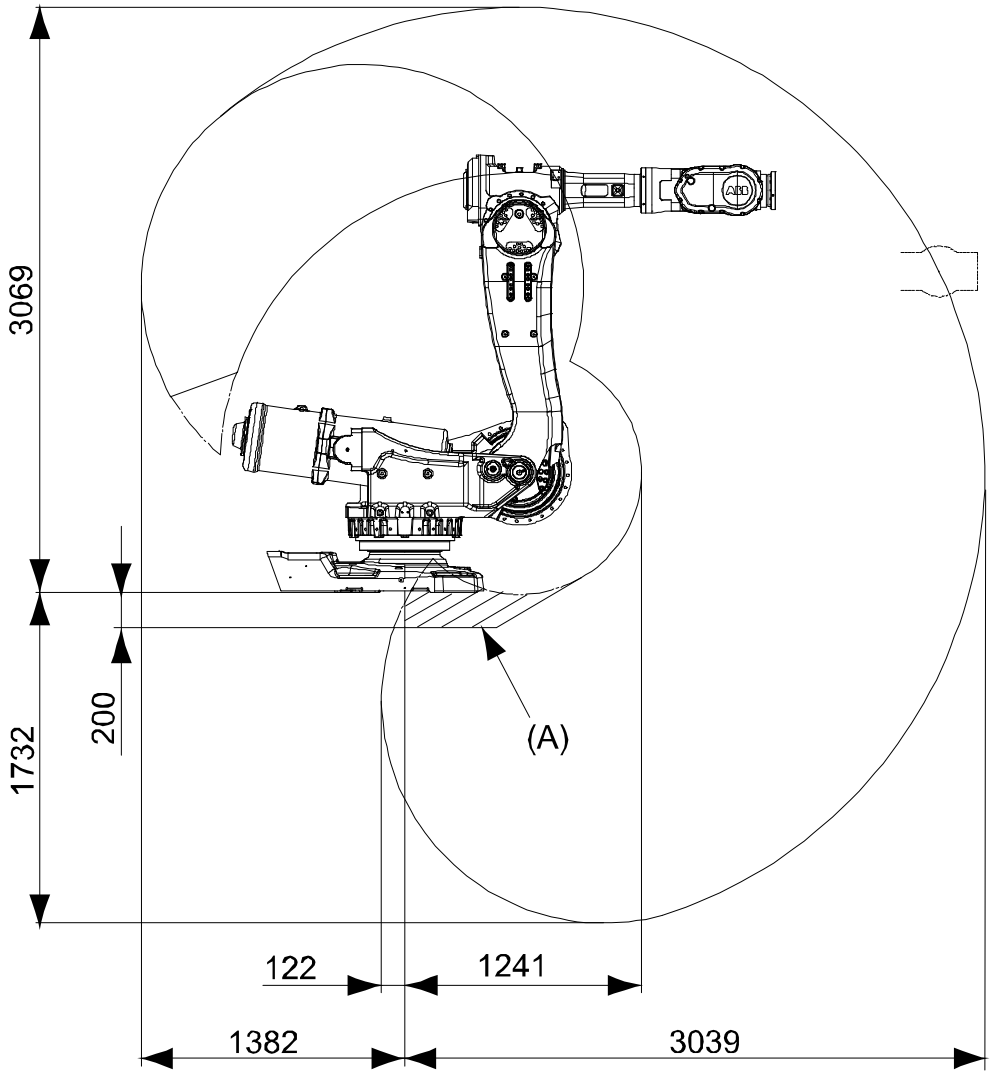


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Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650S	200	3.0



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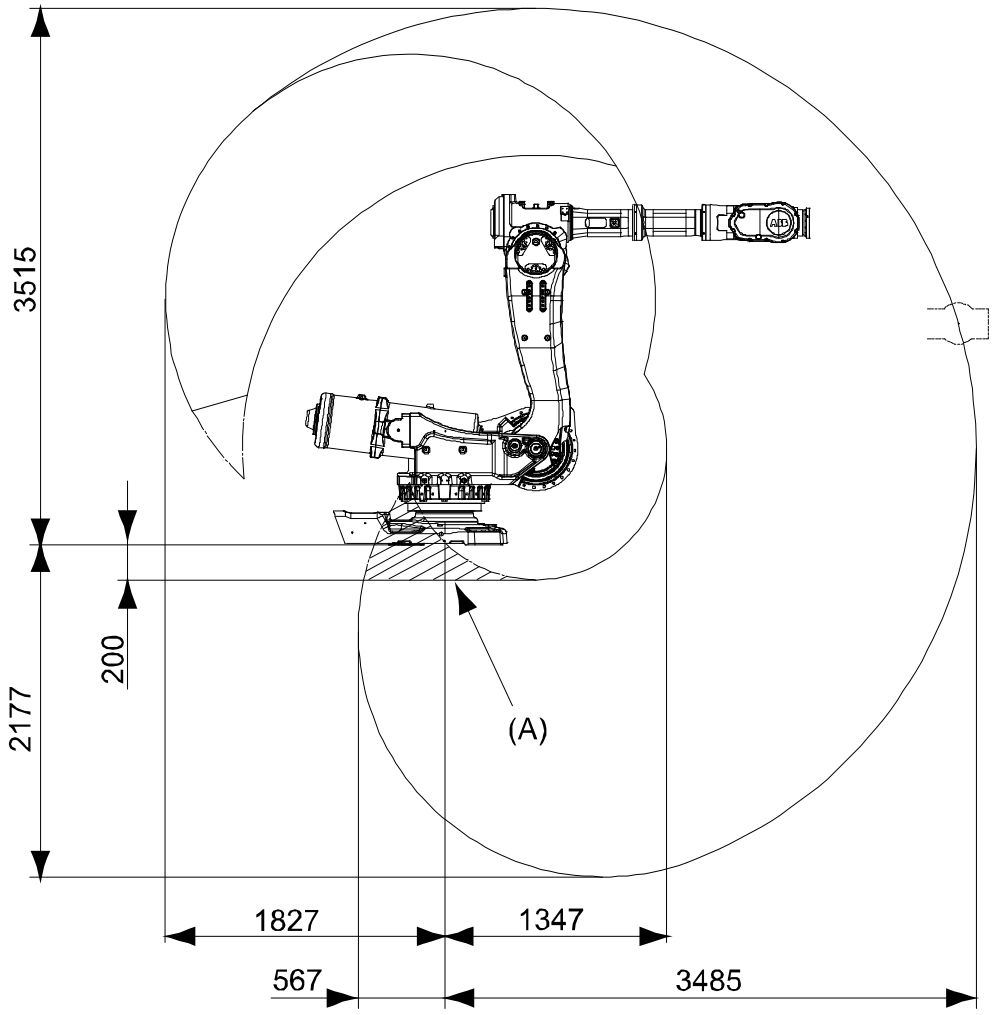
Pos	Description
A	Marked area not available under the robot base.

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1.8.1 Introduction
Continued

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650S	125	3.5



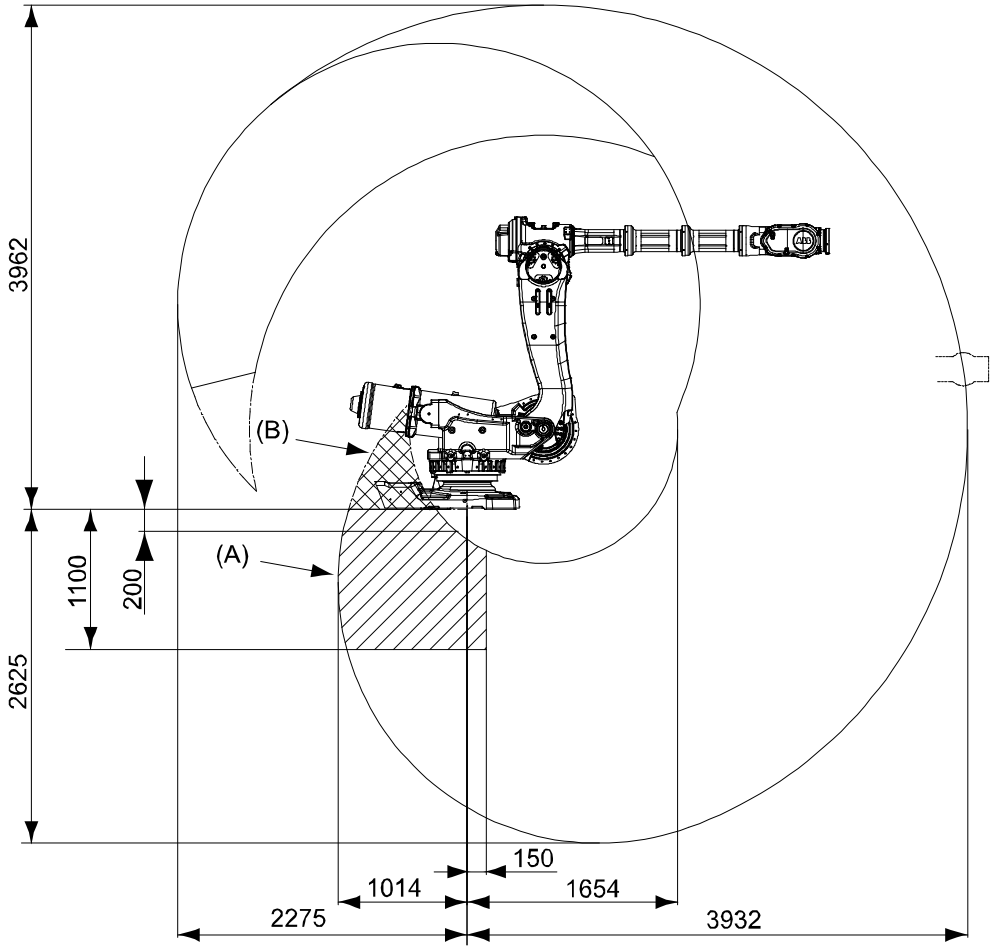
xx1000000502

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

Continues on next page

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Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650S	90	3.9



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

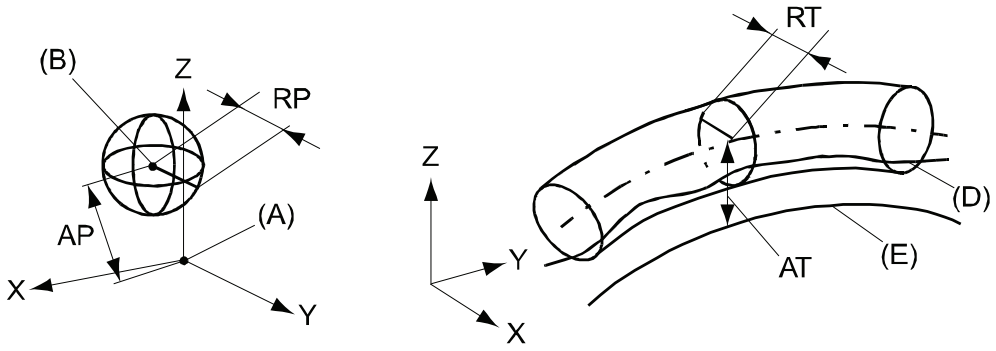
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1.8.2 Performance according to ISO 9283

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	[b]
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 teached 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.

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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-200/3.0	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.

Axis Resolution

0.001° to 0.005°.

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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*).

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1.9 Cooling fan for axis 1 and 2 motor

1.9.1 Introduction

Option 87-1, 88-1

To be used to avoid overheating of motors and gears in applications with intensive motion (high average speed and /or high average torque and/or short wait time) of axis 1 and/or axis 2.

Valid protection for cooling fan is IP54. Fan failure stops the robot. The option is not allowed to select when the robot is placed on a track motion, IRBT.

To determine the use of cooling fans for axis 1 and/or axis 2 motor use the “Gearbox Heat Prediction Tool” in RobotStudio. Reliable facts for the decision of need for fan or not will be achieved by entering the ambient temperature for a specific cycle. Please contact your local ABB organization.

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1.10 Servo gun

1.10.1 Introduction

General

The robot can be supplied with hardware and software for control of the following configurations:

- Stationary Gun
- Robot Gun
- Robot Gun and Track Motion
- Track motion

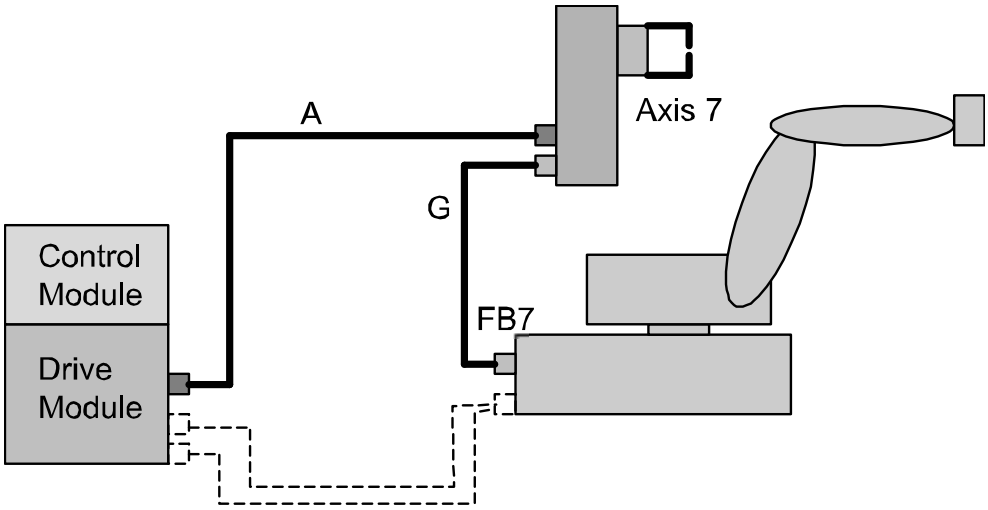
The specific parts related to the servo motor control for electrical welding guns and for track motion configurations are shown in the conceptual pictures below. The major parts and required options are also stated in the configurations lists below each picture.

The cables for control of the basic robot are shown in the pictures with dotted lines.

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1.10.2 Stationary Gun

General



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Options

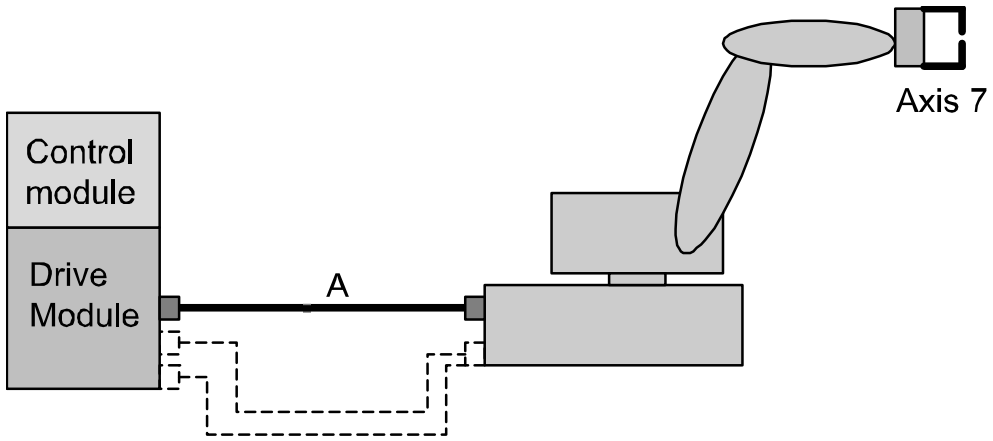
Options according to the table below are required to complete the delivery. For further details on each option see corresponding Product specification.

Option	Description	Product specification
785-5	Stationary gun. This option includes: Cable G (7 m length) for resolver signals from robot base (FB7) to stationary gun/axis 7.	
770-4	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
786-1,-2,-3,-4	Connection to first drive. Cable A (7-30 m) between Drive Module and stationary gun/axis 7 for servo drive power.	
635-3, -4 or -5	Spot Servo, Spot Servo Multiple Guns or Spot Servo Equalizing.	Controller software IRC5

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1.10.3 Robot Gun

General



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Options

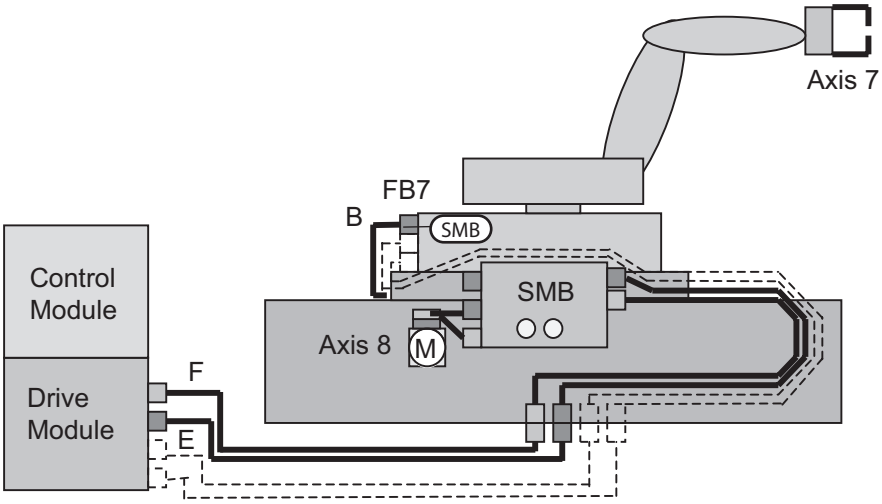
Options according to table below are required to complete the delivery. For further details on each option see corresponding Product specification.

Option	Description	Product specification
785-1	Robot gun. This option includes: Cables within manipulator for servo power signals (servo gun/axis 7).	
770-4	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
786-1,-2,-3,-4	Connection to first drive. Cable A (7-30 m) between Drive Module and robot base for servo drive power.	
635-3, -4 or -5	Spot Servo, Spot Servo Multiple Guns or Spot Servo Equalizing.	Controller software IRC5

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1.10.4 Robot Gun and Track Motion IRBT 6004

General



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Options

Options according to table below are required to complete the delivery. For further details on each option see corresponding Product specification.

Option	Description	Product specification
785-1+1002-2 [i]	Robot Gun - Track Motion. This option includes:Cables within manipulator for servo power signals (servo gun/axis 7).	Track motionIRBT 6004 + IRB 6600
Track motion delivery includes	Serial measurement box (SMB2, Split box) for distribution of servo power to axis 8. The box is placed on the track motion. Cables from serial measurement box to track motion. Cable B for servo power (1,5 m length).Connection to first and second drive. Cable E and F (7-22 m) between Drive Module and serial measurement box for dual servo drive power/resolver signals.	Track motionIRBT 6004/IRBT 7004
907-1	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
907-1	Second additional drive. Drive unit for 8th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
635-3, -4 or -5	Spot Servo, Spot Servo Multiple Guns or Spot Servo Equalizing.	Controller software IRC5
864-1	Resolver connection, axis 7, on base (FB7).	

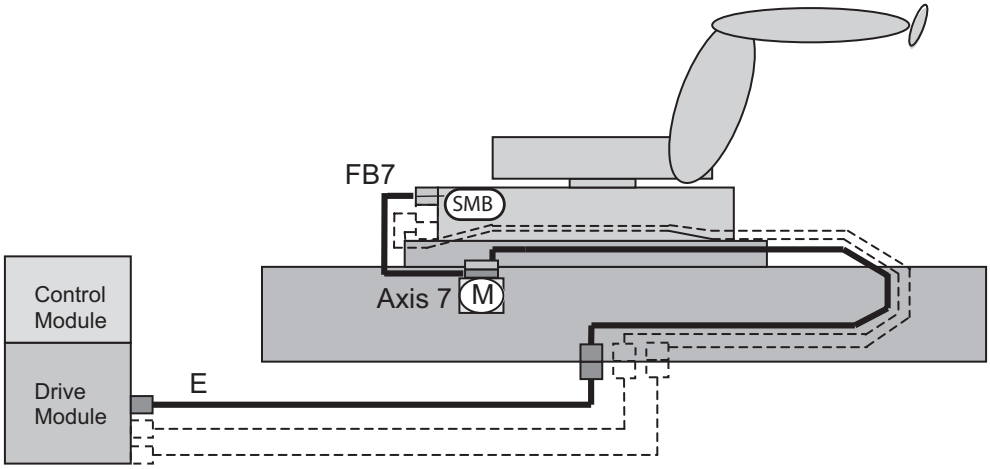
[i] To specify robot on track equipped with servo gun. Option 1002-2 from specification form for Track Motion.

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1.10.5 Track Motion IRBT 6004

General

The robot can be supplied with a Track Motion, see Product specification - IRBT 6004. For configuration and specification of hardware see Figure below.



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Note

General. The robot can be combined with a Track Motion, for further details see Product specification - IRBT 6004/IRBT 7004.

Options

Options according to table below are required to complete the delivery. For further details on each option see corresponding Product specification.

Option	Description	Product specification
Track motion delivery includes	Serial measurement (SMB) in manipulator is used, together with option 864-1, FB7 for signals to axis 7/Track motion. Cable E for between Drive Module and track motion servo for drive power.	Track motionIRBT 6004/IRBT 7004
907-1	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	
864-1	Resolver connection, axis 7, on base (FB7).	

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2 SpotPack and DressPack

2.1 Introduction

2.1.1 General

DressPack

Includes options for Upper arm, Lower arm and Floor pos C, D and E, 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.

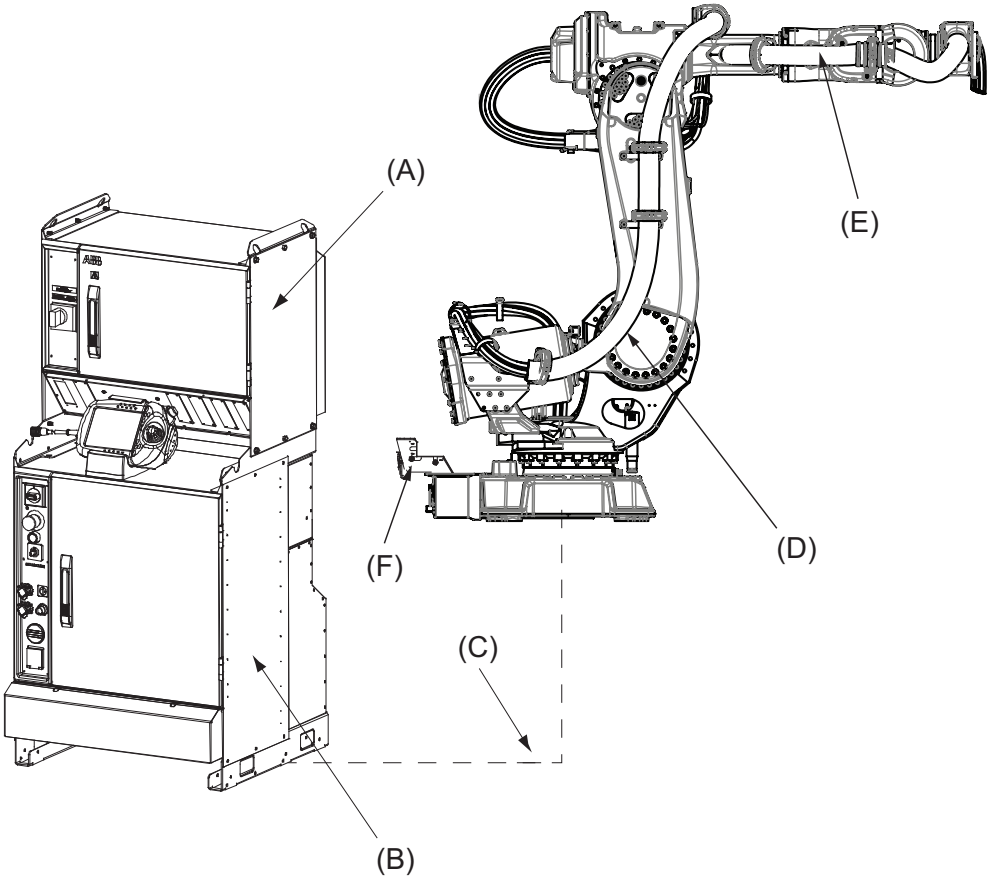
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2.1.1 General
Continued

Spotpack

The package supplies the transformer gun/gripper with necessary media, such as compressed air, cooling water and electrical power. It includes aboved descrided DressPack + Spot Welding cabinet, Water And Air unit pos A and F (if included) and SoftWare, see Figure below.



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Pos	Description
A	SpotPack, Spot Welding cabinet
B	Robot controller, (including 7th axis drive for servo gun)
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	SpotPack, Water and Air unit

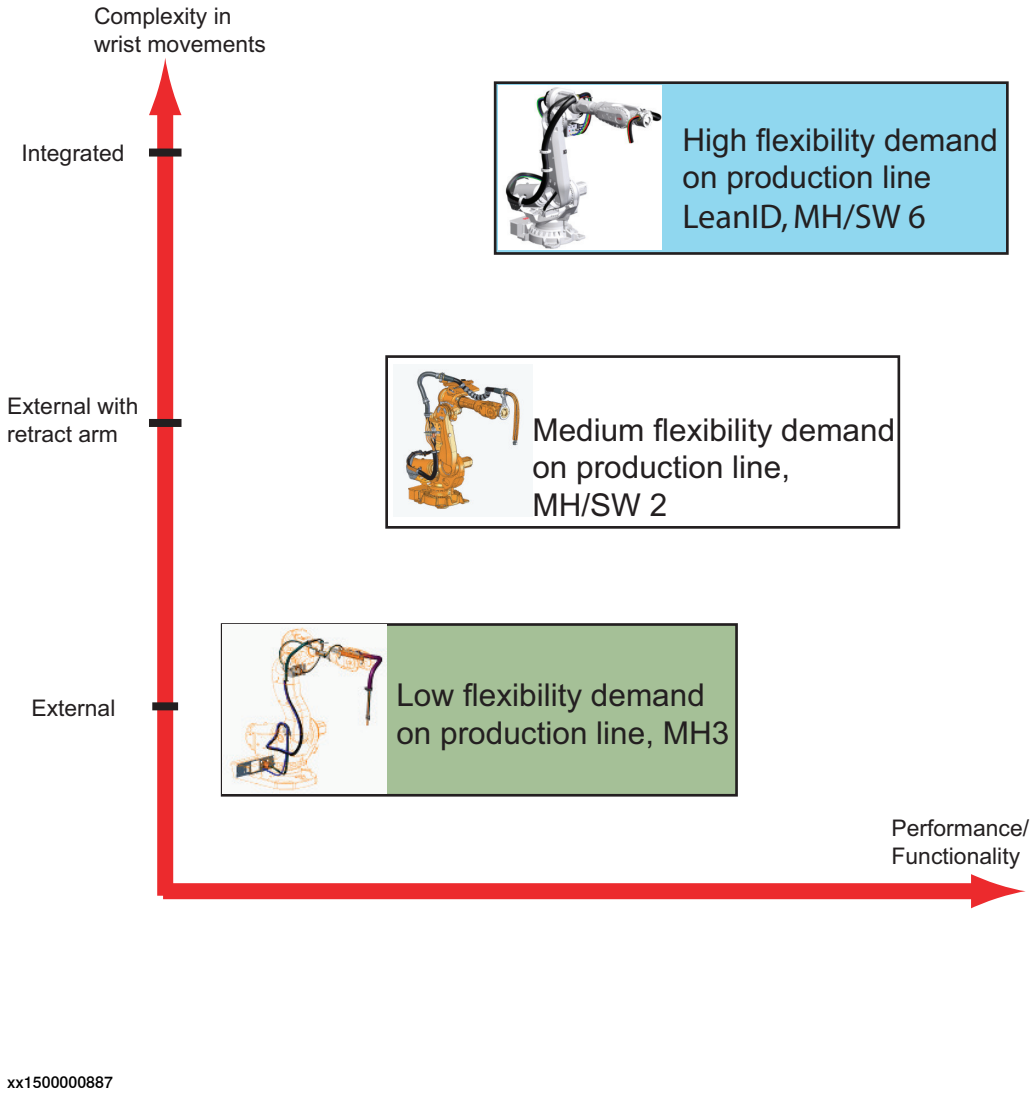
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2.1.2 Product range

DressPack solutions for different user's needs

The robot can be equipped with the well integrated cable and hose packages in the SpotPack or DressPack options. 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.



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2.1.2 Product range
Continued

External with retract arm

This type of dress pack is recommended for production where there are limited complexity in wrist movements. This normally occurs when there are not to many different products running in the same production cell.

Available option are 798-2 and 780-2 for both material handling/spot welding.

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 798-3 and 780-4 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 798-3 and 780-3 for material handling.

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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 inteference with manipulator or Water and Air unit (if such is mounted).

Note

For more detail information please contact Serop Product support/SEROP/ABB.

E-mail address: serop.product_support@se.abb.com

Restrictions for LeanID, option 780-4

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°

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2.1.4 Impact on dress pack lifetime

General

There are some robot movements/positions that shall be avoided in the robot production program. This will improve the lifetime significantly of external upper arm dress pack and wear parts e.g. 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 set-up adjustments

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2.1.5 Chapter Structure

General

The Chapters for SpotPack and DressPack are structured in the following way.

The SpotPack and DressPack can be delivered in five versions developed for two different applications. Each type is described under separate chapter.

Chapter	Option	Description
2.2	DressPack	DressPack includes general description DressPack with common information.

Material Handling application / DressPack

Chapter	Option	Description
2.3	Type H	DressPack for Material Handling.

Spot Welding application / SpotPack and DressPack

Chapter	Option	Description
2.4	Type S	SpotPack for pneumatic transformer guns carried by the robot manipulator.
2.5	HS	
2.6	Type Se	SpotPack for electrical servo driven transformer guns carried by the robot manipulator.
2.7	Type HSe	SpotPack for handling the part against electrical servo driven transformer guns stationary mounted.
2.8	Spot Welding Cabinet	Includes general description of Spot Welding cabinet with common information.
2.9	Water and Air unit	Includes general description of Water and Air unit with common information.

Connector Kits

Chapter	Option	Description
2.10	Connetor Kits	Includes general description of Connector kits for SpotPack and DressPack.

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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
Option 778-1, Material Handling	Option 798-3, Base to axis 3	Option 780-3, Axis 3 to 6 External routing
		Option 780-4 Axis 3 to 6 Internal routing
	Option 798-2, Base to axis 2	Option 780-2, Axis 2 to 6 External routing

Available DressPack configurations for Spot Welding

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

	Lower arm	Upper arm
Option 778-2, Spot Welding	Option 798-2, Base to axis 2	Option 780-2, Ext. Axis 2 to axis 6 External routing
	Option 798-3, Base to axis 3	Option 780-4, Int. Axis 3 to 6 (LeanID) Internal routing

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2.2.2 Build-in features for upper arm DressPack

External

Material handling (option 780-3):

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

External with retract arm

Spot welding and Material handling (option 780-2):

- Adjustable bracket axis 6 with position marking.
- Adjustable retracting force to optimize the system depending on cycle and hose package.

Internal

Spot welding and Material handling (option 780-4):

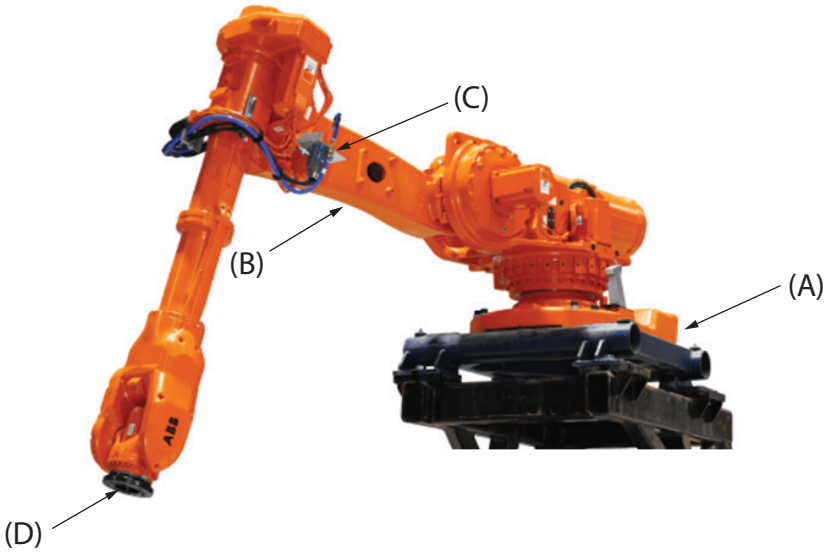
- Partly internal routing through the upper arm.
- Suitable for complex movements.
- High demands for flexibility and accessibility.
- Longer life time
- Predictable movements
- Easy exchange of DressPack

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2.2.3 Interface descriptions for DressPack

General

Below is an overview showing the different dresspack interfaces. For detailed information see the circuit diagram included in *Product manual - DressPack/SpotPack IRB 6650S/7600*.



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Pos	Location	Options
A	Base	798-2, 798-3 and 864-1
B	Axis 2	798-2
C	Axis 3	798-3
D	Axis 6	780-2, 780-3 and 780-4

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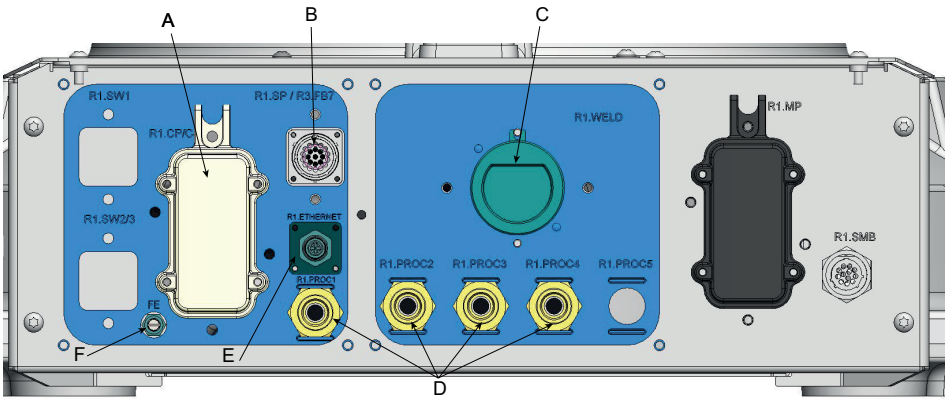
Base

Material handling (option 798-3), see figure below:

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

Spot welding (option 798-3), see figure below:

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



xx1900001501

For corresponding parts of the tool, see *Axis 6 - Connector kits on page 155*.

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)

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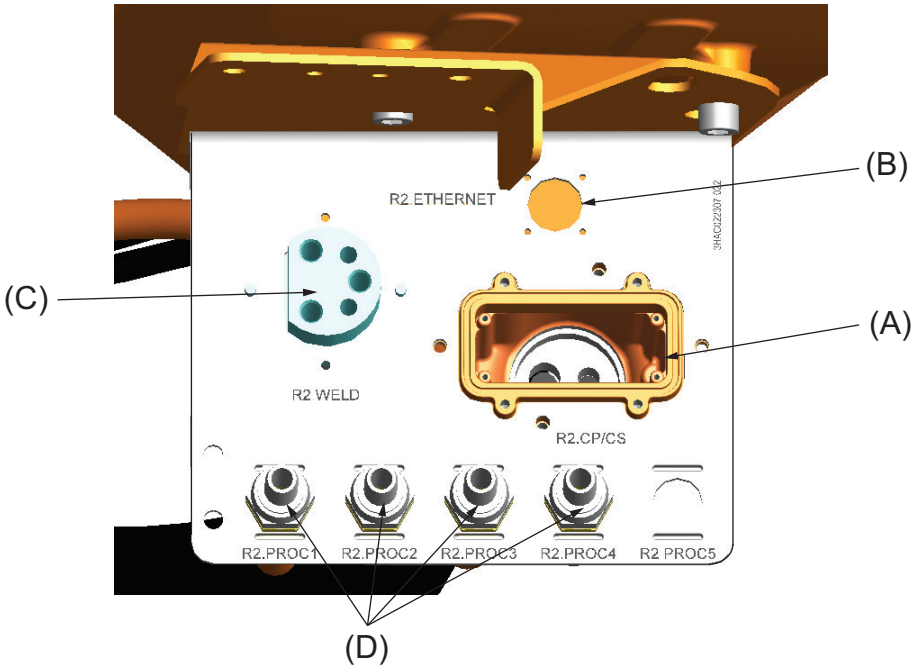
Axis 2

Material handling (option 798-2), see figure below:

- Included are: A, B (if applicable) and one D (Proc 1).

Spot welding (option 798-2), see figure below:

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



xx1100000957

For corresponding parts of the tool, see *Connection kits on page 151*.

Pos	Description
A	R2.CP/CS
B	R2.ETHERNET (M12 connector, when EtherNet communication is selected)
C	R2.WELD 3x35 mm2. (Spot Welding)
D	R2.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)

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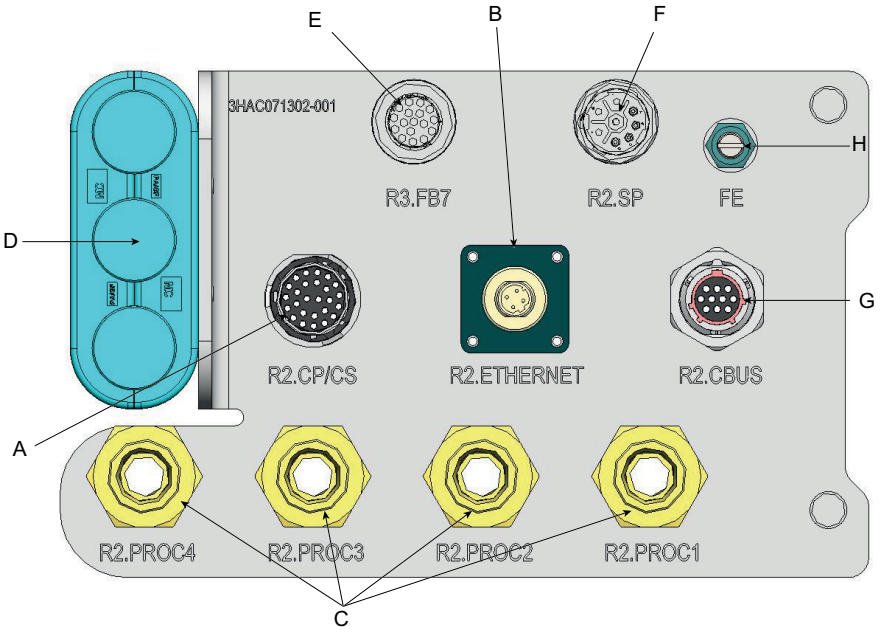
Axis 3

Material Handling (option 798-3), see figure below:

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

Spot welding (option 798-3), see figure below:

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



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For corresponding parts of the tool, see *Axis 6 - Connector kits on page 155*.

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 Profibus or DeviceNet communication is selected)
H	FE (Functional Earth, when EtherNet communication is selected)

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2.2.3 Interface descriptions for DressPack
Continued

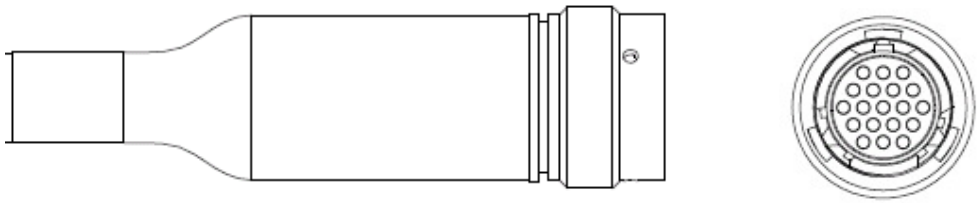
Axis 6

External

Material handling (option 780-3), see figure below:

- Hose and cable free length, min. 1000 mm.
- Air hose ends with free end.

The cable ends with a connector, for corresponding parts of the tool, see *Connection kits on page 151*:



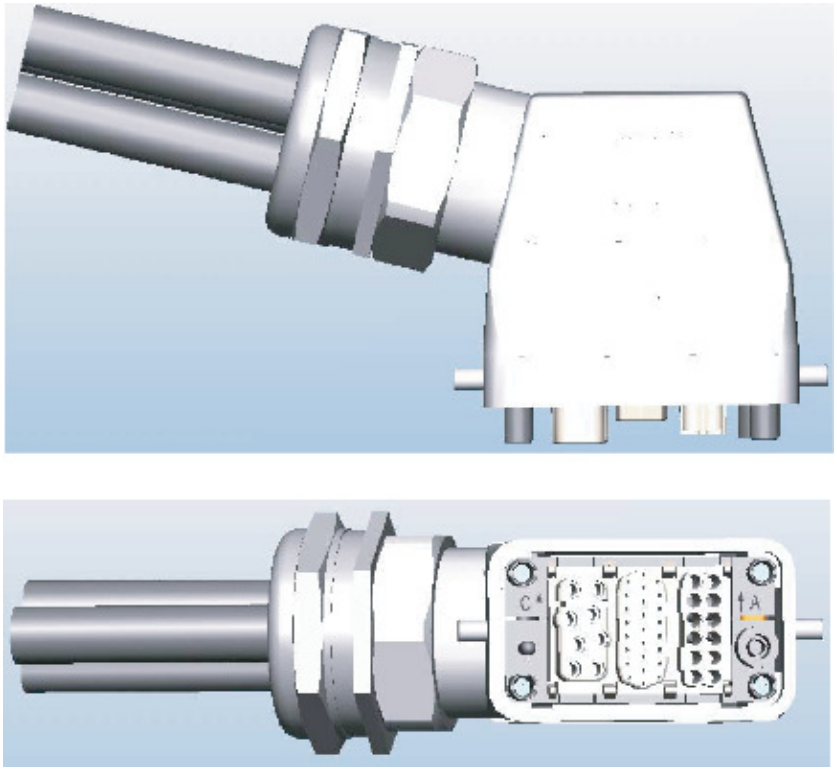
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External with retract arm

Spot welding/Material handling (option 780-2), see figure below:

- Hose and cable free length, min. 1000 mm.
- Hoses and weld power cable (only for spot welding) end with free end.
- All signals are connected with a Harting connector.

The cable ends with a connector, for corresponding parts of the tool, see *Connection kits on page 151* and within the Harting product offer.



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EtherNet connector

Spot welding/Material handling (option 780-2/-3), see figure below:

- Cable free length, min. 1000 m.
- Signals are connected with a M12 connector.

The cable ends with a connector, the different main parts within the connector are described in the list below, for corresponding parts of the tool, see within the Phoenix product offer.

Name	Harting article
PIN connector, R3.ETHERNET	21 03 882 1405
PIN	61 03 000 0094
Sealing cap M12x1	3HAC033600-001 ABB article



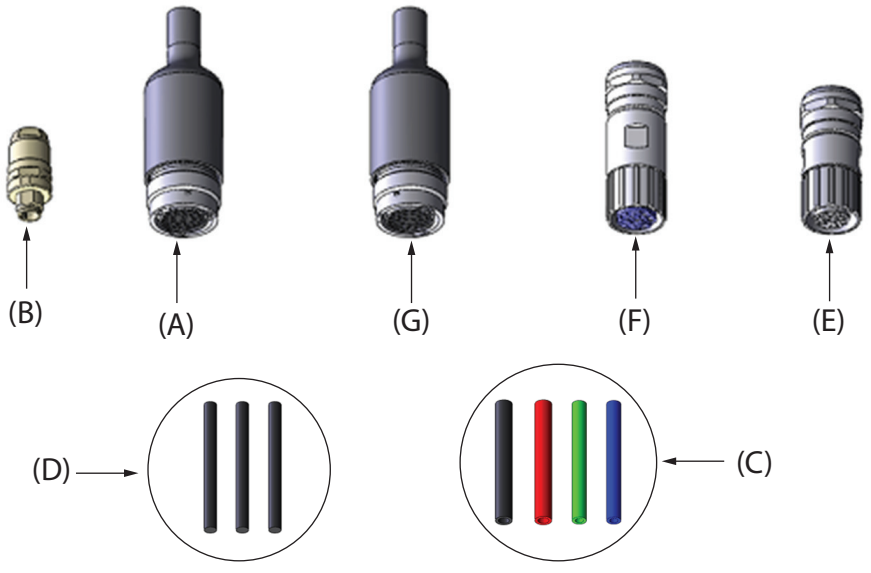
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Integrated

Material Handling/Spot Welding option 780-4 (LeanID), see figure below:

- Hose and cable free length, min. 1160 mm.
- Hoses and weld power cable (only for spot welding) end with free end.

The cable ends with connectors, for corresponding parts of the tool, see *Axis 6 - Connector kits on page 155* and within the UTOW product offer.



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2.2.3 Interface descriptions for DressPack
Continued

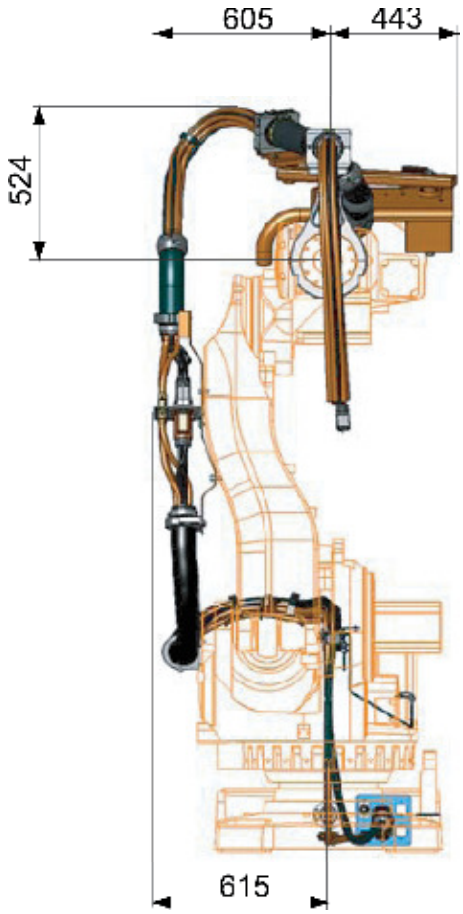
Pos	Description
A	R3.CP/CS (UTOW connector 26p) Customer signals and power
B	R3.ETHERNET (M12 connector) EtherNet signals (when EtherNet communication is selected)
C	R3.PROC 1-2 (1/2”, freeend) R3.PROC 2-4 (3/8”, free end) Media hoses
D	R3.WELD 3x25mm^2 (Free end) Spot Welding power
E	R3.FB7 (M23 connector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

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2.2.4 Dimensions

General

Dimensions are shown in Figures below.

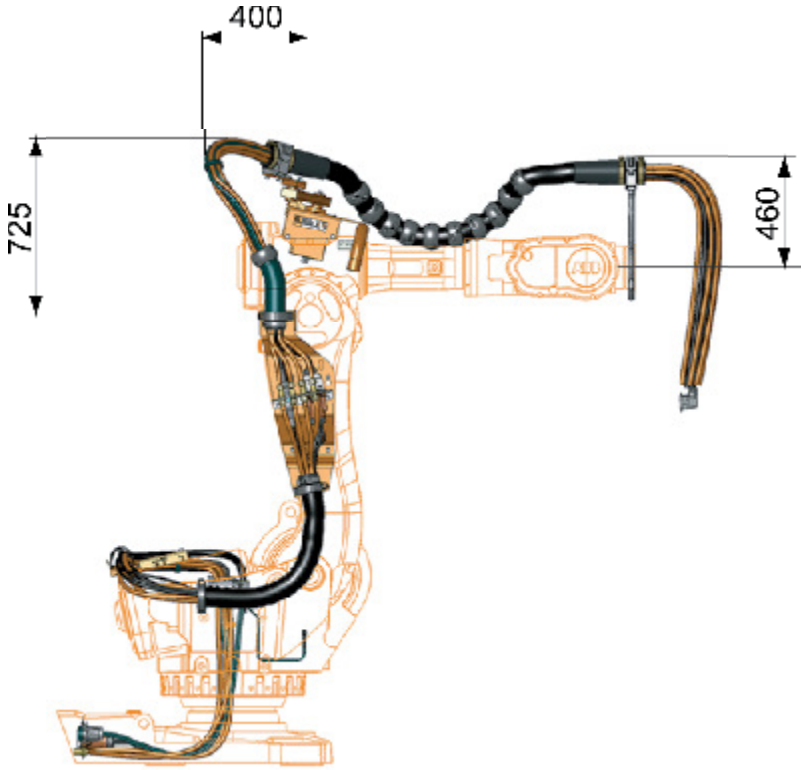


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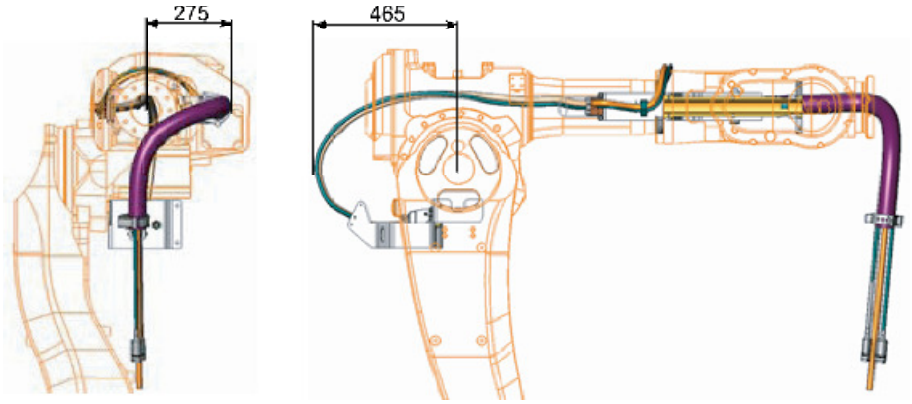
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2.2.4 Dimensions
Continued



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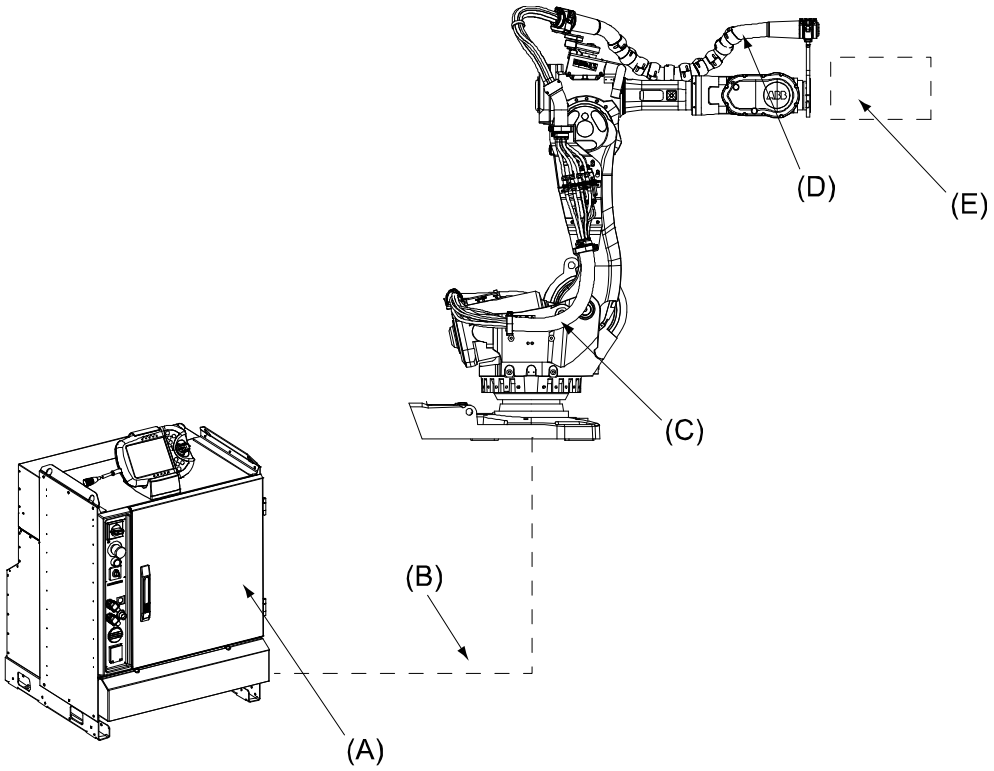
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2.3 Type H

2.3.1 Introduction

General

Variant Type H is designed for Material Handling (MH) application. Included modules are shown in Figure below.



xx1000000516

Pos	Name
A	Robot Cabinet IRC5
B	DressPack, Floor
C	DressPack, Lower arm
D	DressPack, Upper arm
E	Robot Gripper

Available configurations with linked option numbers are described below.

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2.3.1 Introduction
Continued

Option description

Option	Type	Description
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. Option 94-1,-2,-3,-4 for parallel communication. Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet. Option 92-2,-3 for parallel communication and field bus communication with Profibus.
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4,-5.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3.
455-8	Parallel and Ethernet	Offers the signal cables needed for the Ethernet communication in combination in lower and upper arm DressPack. To be combined with option 859-1,-2,-3,-4. Requires selection of option 94-X.

The available alternatives and allowed combinations are shown in the schematic table below.

Application Interface connected to Option 16-1, Cabinet	Option 455-1, Parallel communication	Option 94-1,-2,-3,-4 Cable length, Parallel communication	Option 778-1, Material handling
	Option 455-4, Parallel and bus communication	Option 90-2,-3,-4,-5 Option 92,2,-3 Cable length, Parallel and bus communication	
	Option 455-8, Parallel and Ethernet communication	Option 859-1, -2, -3, -4 Cable length, Ethernet communication	

Continued

	Lower arm	Upper arm
Option 778-1, Material Handling	Option 798-3, Base to axis 3	Option 780-3, Axis 3 to 6 External routing
		Option 780-4, Axis 3 to 6 Internal routing
	Option 798-2, Base to axis 2	Option 780-2, Axis 2 to 6 External routing

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2.3.2 Configuration result for Type H

General

Depending on the choice of options above the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below.

DressPack Type H. Parallel communication

- Option 16-1 with Connection to cabinet
- (Option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1. Parallel communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3 or 780-4 (and option 798-3). External/Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [a]
Protective earth		1	0,5 mm^2	250 VAC [b]
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2) [b]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. For option 780-3 50 VAC / 60 VDC.

b. For option 780-3 8 signals instead of 20.

Continues on next page

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2.3.2 Configuration result for Type H
Continued

DressPack Type H. Parallel and field bus communication, Can/DeviceNet

- Option 16-1 with Connection to cabinet
- (Option 90-2,-3,-4,-5 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3 Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3 or 780-4 (and option 798-3). External/Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [a]
Protective earth		1	0,5 mm^2	250 VACb
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2) [b]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair	6	6(3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. For option 780-3 50 VAC / 60 VDC.

b. For option 780-2 8 signals instead of 20.

Continues on next page

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DressPack Type H. Parallel and field bus communication, Profibus

- Option 16-1 with Connection to cabinet
- (Option 92-2,-3 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Optiion 780-3 or 780-4 (and Option 798-3). External/Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [a]
Protective earth		1	0,5 mm^2	250 VACb
Customer Signals (CS)				
Signals twisted pair	22	22(11x2) [b]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. For option 780-3 50 VAC / 60VDC.

b. For option 780-3 8 singals instead of 22.

Continues on next page

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2.3.2 Configuration result for Type H
Continued

DressPack Type H, Parallel and field bus communication, Ethernet

- Option 16-1 with Connection to cabinet
- (Option 859-1,-2, -3, -4 to specify cable length)
- (Option 94-1, -2, -3, -4 to specify cable length)
- Option 455-8. Parallel and Ethernet communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3 or 780-4 (and option 798-3). External/Internal routing.

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [i]
Protective earth		1	0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	20	20(10x2) [ii]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Bus signals	4	4	0,4 mm^2	Ethernet CAT 5e, 100 Mbit [iii]
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

i For option 780-3 50 VAC / 60 VDC.
ii For option 780-3 8 signals instead of 20.
iii Ethernet with wire colors according to PROFINET standard, M12-connectors.

Continues on next page

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Summary Type H

The following options are required to form a complete DressPack Type H:

- Option 16-1. Connection to cabinet, (Cable length and communication type to be stated)
- Option 455-1, 455-4. Parallel or Parallel and Bus communication
- (Communication type to be stated)
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm
- (Routing type to be stated)
- Option 780-2. External routing Axis 2 to 6, option 780-3, -4 External routing Axis 3 to 6, DressPack Upper arm (Routing type to be stated)

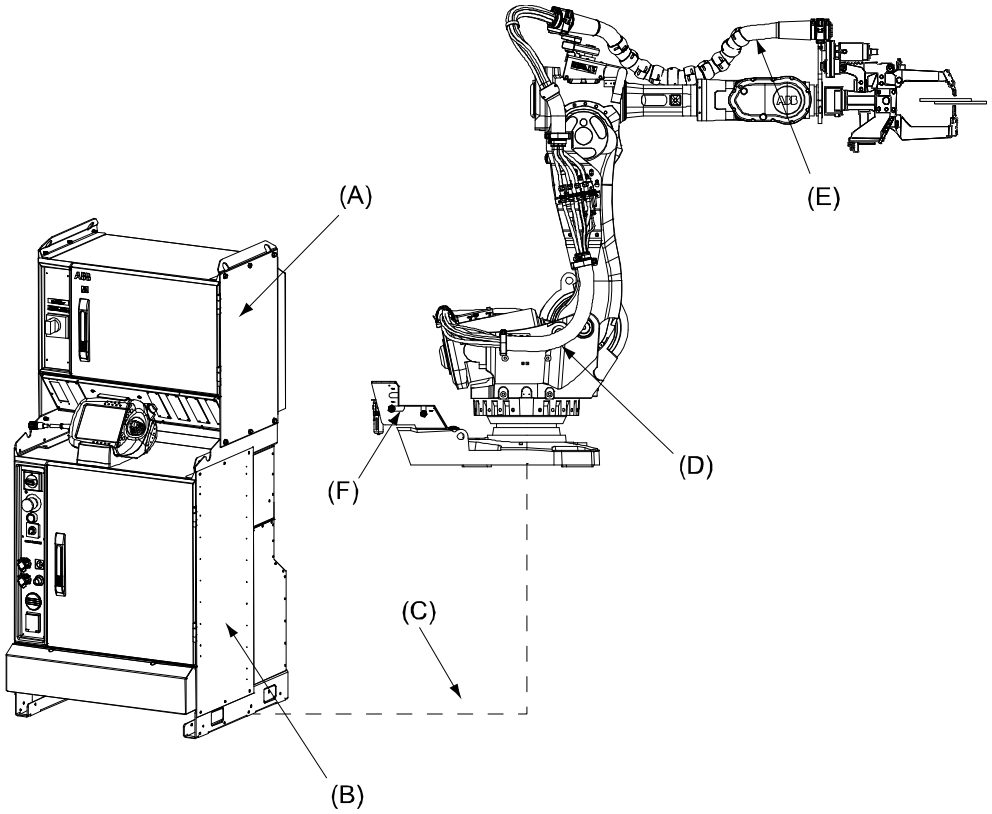
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2.4 Type S

2.4.1 Introduction

General

Variant Type S is designed for Spot Welding application with robot handled pneumatic gun. Included modules are shown in Figure below. Available configurations with linked option numbers are described below.



xx1000000517

Pos	Name
A	Spot Welding cabinet
B	Robot Cabinet IRC5
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses

Available configurations and allowed combinations with linked option numbers are described below.

Continues on next page

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Option Description

Option	Type	Description
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. Option 94-1,-2,-3,-4 for parallel communication Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet Option 92-2,-3 for parallel communication and field bus communication with Profibus
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in combination in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3.
455-8	Parallel and Ethernet	Offers the signal cables needed for the Ethernet communication in combination in lower and upper arm DressPack. To be combined with option 859-1,-2,-3,-4. Requires selection of option 94-X.

The available alternatives and allowed combinations are shown in the schematic table below.

Application Interface connected to Option 16-1	Option 455-1, Parallel communication	Option 94-1,-2,-3,-4 Cable length, Parallel and Bus communication	Option 778-2, Spot Welding
	Option 455-1, Parallel and Bus communication	Option 90-2,-3,-4,-5 Option 92-2,-3 Cable length, Parallel and Bus commnication	
	Option 455-8, Parallel and Ethernet communication	Option 859-1, -2, -3, -4 Cable length, Ethernet communication	

Continued

	Lower arm	Upper arm
Option 778-2, Spot Welding	Option 798-2, Base to axis 2 External routing	Option 780-2, Axis 2 to 6 External routing
	Option 798-3, Base to axis 3 External routing	Option 780-4, Axis 3 to 6 Internal routing

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2.4.2 Configuration result for Type S

General

Depending on the choice of options above the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below.

DressPack Type S. Parallel communication

- Option 16-1 with Connection to cabinet
- (Option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1. Parallel communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing.

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [i]	Max. air pressure 16 bar/ 230 PSI Max. water pressure 10 bar/ 145 PSI
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

i For LeanID 2x1/2" + 2x3/8", only upper arm
ii For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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DressPack Type S. Parallel and field bus communication, Can/DeviceNet

- Option 16-1 with Connection to cabinet
- (Option 90-2,-3,-4,-5 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing.

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	1 mm2	250 VAC
Customer signals (CS)				
Signals twisted pair	20	20 (10x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [i]	Max. air pressure 16 bar/230 PSI Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

i For LeanID 2x1/2" + 2x3/8", only upper arm
ii For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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2.4.2 Configuration result for Type S
Continued

DressPack Type S. Parallel and field bus communication, Profibus

- Option 16-1 with Connection to cabinet
- (Option 92-2,-3 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing.

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	22	22 (11x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter[i]	Max. air pressure 16 bar/230 PSI Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

i For LeanID 2x1/2" + 2x3/8", only upper arm
ii For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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DressPack Type S. Parallel and field bus communication, Ethernet

- Option 16-1 with Connection to cabinet
- (Option 859-1,-2, -3, -4 to specify cable length)
- (Option 94-1, -2, -3, -4 to specfiy cable length)
- Option 455-8. Parallel and Ethernet communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing.

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	202	20 (10x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Bus signals	4	4	0,4 mm^2	Ethernet CAT 5e, 100 Mbit [i]
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [ii]	Max. air pressure 16 bar/230 PSI Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [iii]	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1		

[i] Ethernet with wire colors according to PROFINET standard, M12-connectors.
[ii] For LeanID 2x1/2" + 2x3/8", only upper arm
[iii] For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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2.4.2 Configuration result for Type S
Continued

Required general options for Type S

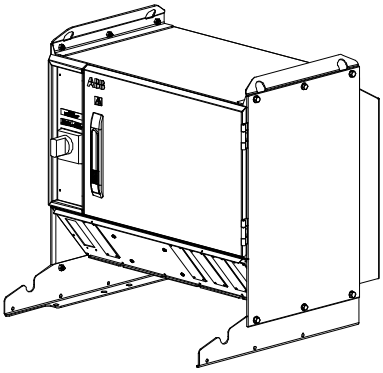
To enable the SpotPack IRB 6650S to perform as intended, general standard robot options are required. These standard options are further described under other chapters and are also mentioned in this chapter.

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply
- Option 635-1. Spot. Software option for pneumatic guns

Required Spot Welding cabinet options for Type S

There are two different variants (see below) of Spot Welding cabinet available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variant.

All these options are further described under chapter *Spot Welding cabinet on page 134* and are also mentioned in this chapter.



xx0900000740

Option	Type	Description
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.
782-11	Bosch MFDC ProfiNet	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 61C0.751OEM.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see *Spot Welding cabinet on page 134*.

Option	Type	Description
788-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter.
789-1	Earth fault protection unit	Offers an earth fault protection integrated with the circuit breaker for the weld power.
790-1	Contactor for weld power	Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet.

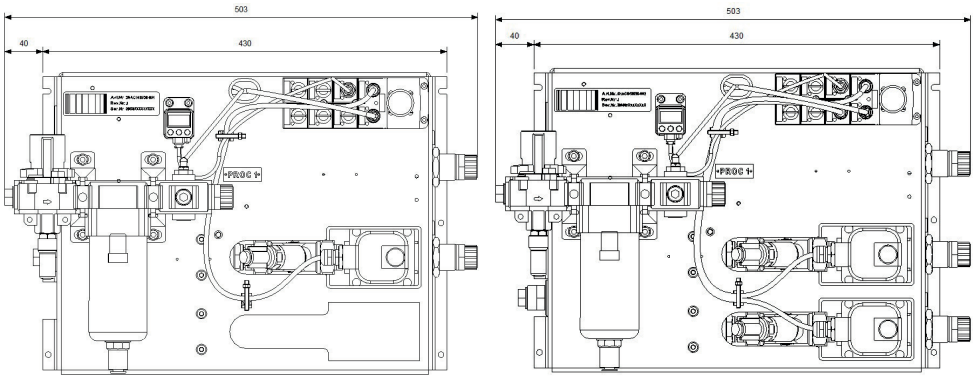
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Option	Type	Description
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
858-1	Bosch Adaptive control	Offers additional functionality for adaptive welding regulation. Only possible with option 782-11.

Required Water and Air unit options for Type S

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 1.9 Water and Air unit and are also mentioned in this chapter.



xx0900000738

Option	Type	Description
792-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
793-1	Second water return	Offers an additional water return circuit.
796-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.

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2.4.3 Summary Type S

General

The following options are the minimum required to form a complete SpotPack Type S:

DressPack

- Option 16-1. Connection to cabinet, (Cable length and communication type to be stated)
- Option 455-1, 455-4. Parallel or Parallel and Bus communication (Communication type to be stated)
- Option 778-2. Spot Welding
- Option 798-2 or 798-3. DressPack Lower arm
- Option 780-2 or 780-4. DressPack Upper arm (Routing type to be stated)

General options

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply
- Option 635-1. Spot

Spot Welding cabinet

- Option 768-3. Spot Welding small
- Option 782-1,-7, -11. Weld timer capacity
- Option 791-1. Power cable 7 m (other lengths available)

Water and air unit

- Option 792-1. Water and air unit, Type S
- Option 797-1. Splitbox cable 7 m. (other lengths available)

Other described options depends on specific system need and performance.

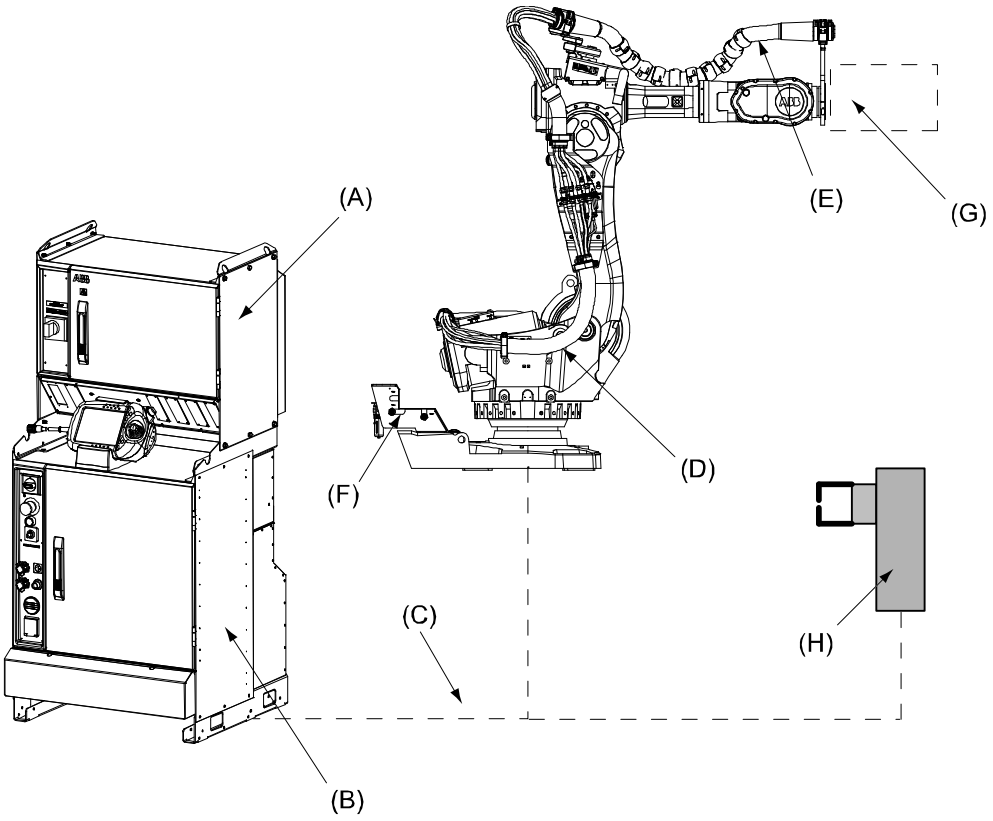
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2.5 Type HS

2.5.1 Introduction

General

Variant Type HS is designed for handling against a stationary mounted Spot Welding pneumatic gun. Included main modules are shown in Figure below. Available configurations with linked option numbers are described below starting at the DressPack.



xx1000000519

Pos	Name
A	Spot Welding cabinet
B	Robot Cabinet IRC5
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses
G	Robot Gripper
H	Stationary gun

Available configurations with linked option numbers are described below.

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2.5.1 Introduction
Continued

Option description

Option	Type	Description
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. Option 94-1,-2,-3,-4 for parallel communication. Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet. Option 92-2,-3 for parallel communication and field bus communication with Profibus.
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4,-5.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3.
455-8	Parallel and Ethernet	Offers the signal cables needed for the Ethernet communication in combination in lower and upper arm DressPack. To be combined with option 859-1,-2,-3,-4. Requires selection of option 94-X.

The available alternatives and allowed combinations are shown in the schematic table below.

Application Interface connected to Option 16-1, Cabinet	Option 455-1, Parallel communication	Option 94-1,-2,-3,-4 Cable length, Parallel communication	Option 778-1, Material Handling
	Option 455-4, Parallel and bus communication	Option 90-2-,3-,4-,5 Option 92-2,-3 Cable length, Parallel and bus communication	
	Option 455-8, Parallel and Ethernet communication	Option 859-1, -2, -3, -4 Cable length, Ethernet communication	

Continued

	Lower arm	Upper arm
Option 778-1 Material Handling	Option 798-3, Base to axis 3	Option 780-3, Axis 3 to 6 External routing
		Option 780-4, Axis 3 to 6 Internal routing
	Option 798-2, Base t o axis 2	Option 780-2, Axis 2 to 6 External routing

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2.5.2 Configuration result for Type HS

General

Depending on the choice of options above the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below.

DressPack Type HS. Parallel communication

- Option 16-1 with Connection to cabinet
- (Option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1. Parallel communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+21 [a]	0,5 mm^2	250 VAC, 5 A rms [b]
Protective earth			0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	20	20(10x2) [c]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60VAC.

c. For option 780-3 8 signals instead of 20.

Continues on next page

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2.5.2 Configuration result for Type HS
Continued

DressPack Type HS. Parallel and field bus communication, Can/DeviceNet

- Option 16-1 with Connection to cabinet
- (Option 90-1,-2,-3,-4 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms[b]
Protective earth		1[a]	0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	208	20 (10x2)[c]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded		8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,23 mm^2	50 V DC, 1 A rms50 V DC, 1 A rms
Signals twisted pair	6	6(3x2)	0,14 mm^2	
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60 VAC.

c.For option 780-3 8 signals instead of 20.

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DressPack Type HS. Parallel and field bus communication, Profibus

- Option 16-1 with Connection to cabinet
- (Option 92-1,-2,-3 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms[b]
Protective earth		1[a]	0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	22	22(11x2)[c]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60 VDC.

c. For option 780-3 8 signals instead of 22.

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2.5.2 Configuration result for Type HS
Continued

DressPack Type HS. Parallel and field bus communication, Ethernet

- Option 16-1 with Connection to cabinet
- (Option 859-1,-2,-3, -4 to specify cable length)
- (Option 94-1, -2, -3, -4 to specify cable length)
- Option 455-8. Parallel and Ethernet communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [i]
Protective earth		1	0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	20	20(10x2) [ii]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Bus signals	4	4	0,4 mm^2	Ethernet CAT 5e, 100 Mbit [iii]
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

i For option 780-3 50 VAC / 60 VDC.
ii For option 780-3 8 signals instead of 20.
iii Ethernet with wire colors according to PROFINET standard, M12-connectors.

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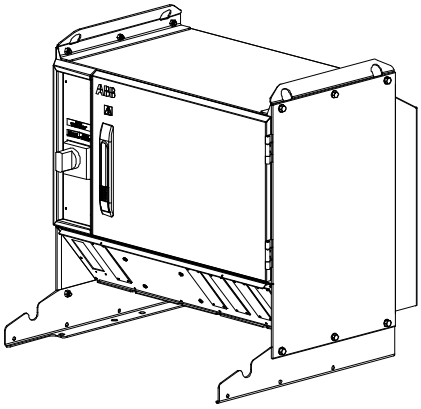
Required general options for Type HS

To enable the SpotPack 6650S to perform as intended, general standard robot options are required. These standard options are further described under other chapters and are also mentioned in this chapter.

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply
- Option 635-1. Spot. Software option for pneumatic guns.

Required Spot Welding cabinet options for Type HS

There are two different variants (see below) of Spot Welding cabinet available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variant. All these options are further described under chapter 1.8 Spot Welding cabinet but are also mentioned in this chapter.



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Option	Type	Description
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.
782-11	Bosch MFDC ProfiNet	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 61C0.751OEM.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 1.8 Spot Welding cabinet

Option	Type	Description
788-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter.
789-1	Earth fault protection unit	Offers an earth fault protection integrated with the circuit breaker for the weld power.
790-1	Contactor for weld power	Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet.

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2.5.2 Configuration result for Type HS
Continued

Option	Type	Description
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
809-1	Process cable to stationary gun, 7 m	Offers floor cable of 7 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for process signals between the Spot Welding cabinet and to the stationary gun.
858-1	Bosch Adaptive control	Offers additional functionality for adaptive welding regulation. Only possible with option 782-11.

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2.5.3 Interface description stationary gun

General

The interface towards the stationary gun includes 3 parts.

- Signal interface with a signal connector type modular Harting
- (Cable option 809-1, -2). The connector configurations are described in the tables below. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type HS is ordered.
- Power cable with a Multi Contact interface (Cable option 791-1 or option 791-2)
- (Ending Multi contact type MC TSB 150/35).
- Water and air connections made by the customer directly on the water and air unit. (See chapter *Water and Air unit on page 142*)

The connector configurations are described in the circuit diagram included in the Product Manual DressPack/SpotPack IRB 6600/7600, art No. 3HAC025058-001.

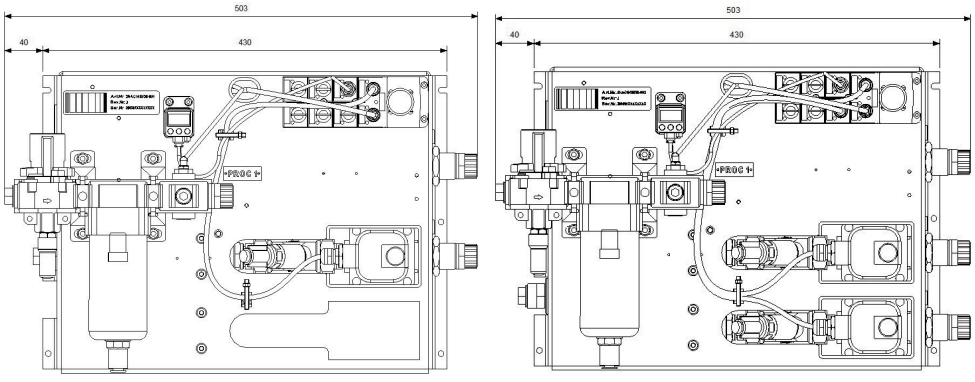
The Harting connector is shown below. The different main parts within the connector are shown both with name and Harting article number. Corresponding parts at the tool are available within the Harting product offer.

Name	Harting article No.
Hood	09 30 010 0543
Hinged frame, hood	09 14 010 0303
Multicontact, female (HD)	09 14 025 3101
Multicontact, female (EE)	09 14 012 3101
Multicontact, female (DD)	09 14 008 3101

For the contacts above corresponding female crimp-contacts for the different cable diameters are required.

Required Water and Air unit options for Type HS

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 1.9 Water and Air unit and are also mentioned in this chapter.



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2.5.3 Interface description stationary gun
Continued

Option	Type	Description
792-2	Water and Air unit, type HS	Offers the basic water and air unit for type HS including splitbox for signal distribution.
793-1	Second water return	Offers an additional water return circuit.
796-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the cabinet and to the split box placed on the water and air unit.

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2.5.4 Summary Type HS

General

The following options are the minimum required to form a complete SpotPack Type HS:

DressPack

- Option 16-1. Connection to cabinet, (Cable length and communication type to be stated)
- Option 455-1, 455-4. Parallel or Parallel and Bus communication (Communication type to be stated)
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm (Routing type to be stated)
- Option 780-2, 780-3, 780-4. External routing, DressPack Upper arm (Routing type to be stated)

General options

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply
- Option 635-1. Spot

Spot Welding cabinet

- Option 768-3. Spot Welding small
- Option 782-1,-7 and -11. Weld timer capacity
- Option 791-1. Power cable 7 m (other lengths available)
- Option 809-1. Process cable to stationary gun (other lengths available)

Water and air unit

- Option 792-2. Water and air unit, Type HS
- Option 797-1. Splitbox cable 7 m. (other lengths available)
- Option 796-1 is also normally required for pneumatic gun handling.

Other described options depend on specific system need and performance.

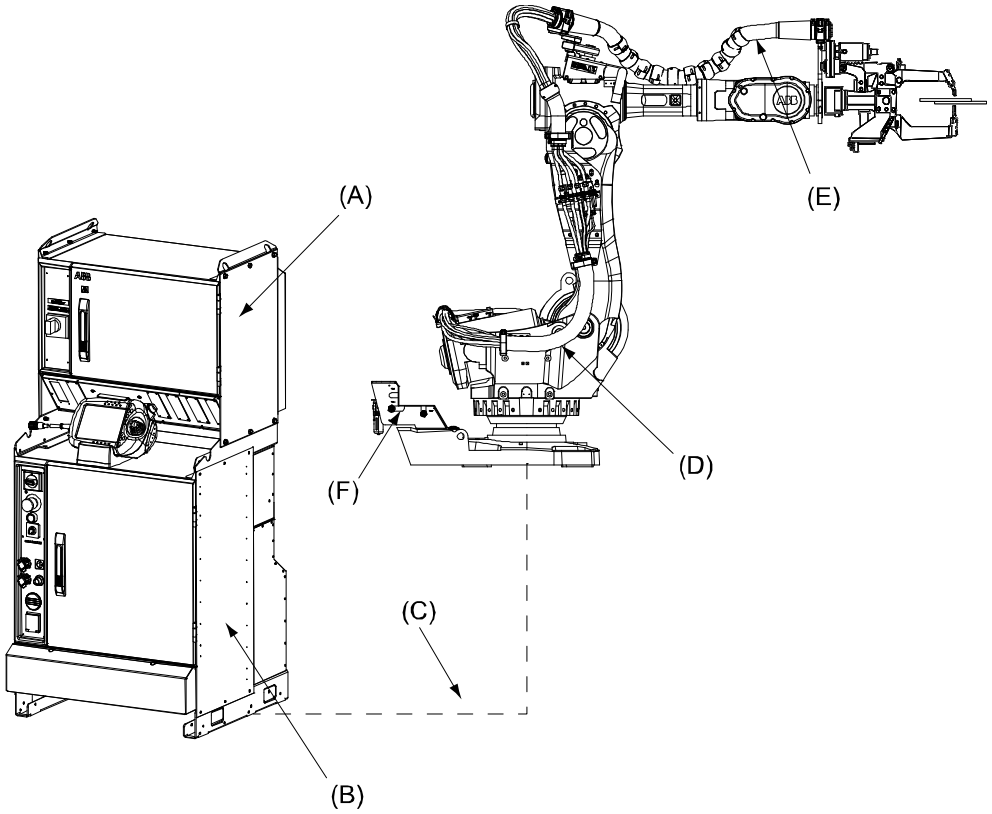
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2.6 Type Se

2.6.1 Introduction

General

Variant Type Se is designed for Spot Welding application with robot handled servo-controlled tool (electrical gun). Included modules are shown in Figure below. Available configurations with linked option numbers are described below.



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Pos	Name
A	Spot Welding cabinet
B	Robot Cabinet IRC5 (including 7th axis drive)
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses

Available configurations with linked option numbers are described below. To achive the specific servo motor connections within the DressPack option 785-1 Robot gun must also to be chosen. See *Robot Gun on page 62*.

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Option description

Option	Type	Description
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. Option 94-1,-2,-3,-4 for parallel communication Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet Option 92-2,-3 for parallel communication and field bus communication with Profibus
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in combination in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3.
455-8	Parallel and Ethernet	Offers the signal cables needed for the Ethernet communication in combination in lower and upper arm DressPack. To be combined with option 859-1,-2,-3,-4. Requires selection of option 94-X.

The available alternatives and allowed combinations are shown in the schematic table below.

Application Interface connected to Option 16-1, Cabinet	Option 455-1, Parallel communication	Option 94-1,-2,-3,-4 Cable length, Parallel communication	Option 778-2 Spot Welding
	Option 455, Parallel and Bus communication	Option 90-2,-3,-4,-5 Option 92-2,-3 Cable length, Parallel and Bus communication	
	Option 455-8, Parallel and Ethernet communication	Option 859-1, -2, -3, -4 Cable length, Ethernet communication	

Continued

	Lower arm	Upper arm
Option 778-2, Spot Welding	Option 798-2, Base to axis 2 External routing	Option 780-2, Axis 2 to 6 External routing
	Option 798-3, Base to axis 3 External routing	Option 780-4, Axis 3 to 6 (LeanID) Internal routing

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2.6.2 Configuration result for Type Se

General

Depending on the choice of options above (combined with option 785-1 Robot gun) the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below.

DressPack Type Se. Parallel communication

- Option 16-1 with Connection to cabinet
- (Option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1. Parallel communication
- Option 778-2 .Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing

The table below shows the available type of wires/media.

Type Se	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter[i]	Max. air pressure 16 bar/ 230 PSI. Max. water pressure 10 bar/ 145 PSI
Welding power (WELD)				

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Type Se	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1		

[i] For LeanID 2x1/2" + 2x3/8", only upper arm
[ii] For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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2.6.2 Configuration result for Type Se
Continued

DressPack Type Se. Parallel and field bus communication, Can/DeviceNet

- Option 16-1 with Connection to cabinet
- (Option 90-2,-3, -5, -5 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	14	14 (7x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6 [a]	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [i]	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

[i] For LeanID 2x1/2" + 2x3/8", only upper arm

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ii For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

a. Interface only at axis 3 or axis 6.

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2.6.2 Configuration result for Type Se
Continued

DressPack Type Se. Parallel and field bus communication, Profibus

- Option 16-1 with Connection to cabinet
- (Option 92-2,-3 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	1+1	1+1	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6 [a]	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [i]	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [ii]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

i For LeanID 2x1/2" + 2x3/8", only upper arm
ii For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

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a. Interface only at axis 3 or axis 6.

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2.6.2 Configuration result for Type Se
Continued

DressPack Type Se. Parallel and field bus communication, Ethernet

- Option 16-1 with Connection to cabinet
- (Option 859-1, -2,-3, -4 to specify cable length)
- (Option 94-1, -2, -3, -4 to specify cable length)
- Option 455-8. Parallel and Ethernet communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm
- Option 798-3. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-4 (and Option 798-3). Internal routing

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	20	20 (10x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Bus signals	4	4	0,4 mm^2	Ethernet CAT 5e, 100 Mbit [i]
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6 [ii]	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12.5 mm inner diameter [iii]	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2 [iv]	600 VAC, 150 A rms at 20 °C (68 °F)
Protective earth (Lower and Upper arm)		1		

i Ethernet with wire colors according to PROFINET standard, M12-connectors.
ii Interface only at axis 3 or axis 6.

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iii For LeanID 2x1/2" + 2x3/8", only upper arm
iv For LeanID upper arm 25 mm^2, only upper arm, 135 A rms

Required general options for Type Se

To enable the SpotPack IRB 6650S to perform as intended, general standard robot options are required. These standard options are further described under other chapters and are also mentioned in this chapter.

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply

Required options for servo gun

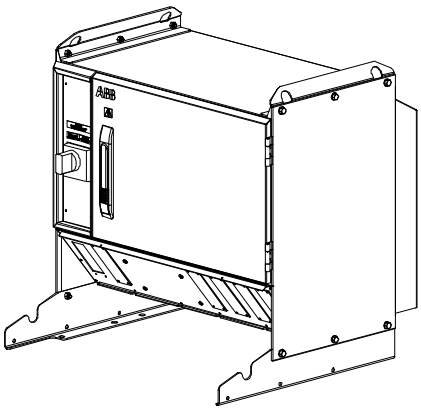
To enable the spot welding function package SpotPack 6650S to run with a servo controlled gun, some additional (additional to those described in previous section "Required general options for Type Se") servo drive options are required. These standard options are described under other chapters and are also mentioned below in this chapter.

- Option 770-4. First additional drive, W Drive
- Option 864-1. Resolver connection, axis 7
- Option 785-1. Robot Gun
- Option 786-1,-2,-3,-4. Connection to first drive (cable length to be stated)
- Option 635-3. Spot Servo. Software option for servo controlled guns.
- (Software option 635-4 and option 635-5 could also be used)

Also option 630-1, Servo tool change, should be added if servo gun tool change is required.

Required Spot Welding cabinet options for Type Se

The SpotPack IRB 6650S also requires a Spot Welding cabinet (option 768-3) to perform as intended. There are three different variants (see below) of Spot Welding cabinets available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each cabinet variant. All these options are further described under *Spot Welding cabinet on page 134* and are also mentioned in this chapter.



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2.6.2 Configuration result for Type Se
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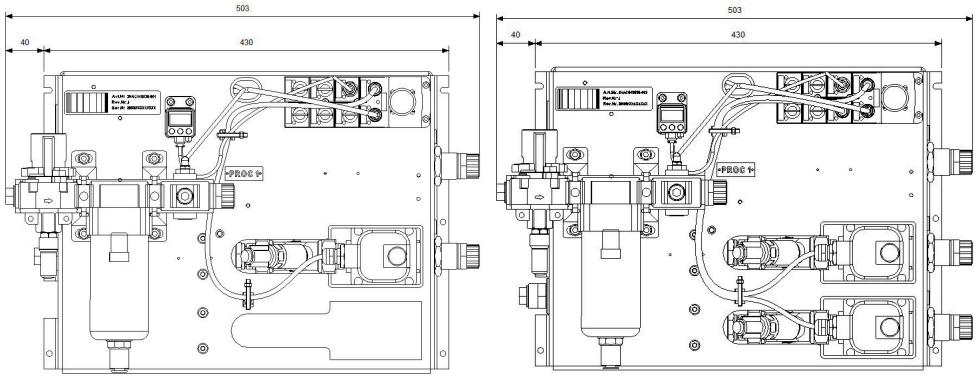
Option	Type	Description
782-1	Bosch Basic AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 6100.630L1.
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.
782-11	Bosch MFDC ProfiNet	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 61C0.751OEM.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 1.8 Spot Welding cabinet

Option	Type	Description
788-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter.
789-1	Earth fault protection unit	Offers an earth fault protection integrated with the circuit breaker for the weld power.
790-1	Contactor for weld power	Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet.
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
858-1	Bosch Adaptive control	Offers additional functionality for adaptive welding regulation. Only possible with option 782-11.

Required Water and Air unit options for Type Se

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 1.9 Water and Air unit and are also mentioned in this chapter.



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Option	Type	Description
792-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
793-1	Second water return	Offers an additional water return circuit.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.

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2.6.3 Summary Type Se

General

The following options are the minimum required to form a complete SpotPack Type Se.

DressPack

- Option 16-1. Connection to cabinet, (Cable length and communication type to be stated)
- Option 455-1, 455-4. Parallel or Parallel and Bus communication (Communication type to be stated)
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm (Routing type to be stated)
- Option 780-2. External routing, DressPack Upper arm (Routing type to be stated)

Note

See *Robot Gun on page 62* for further drive details.

General options

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply

Required options for servo gun

- Option 770-4. First additional drive, W Drive
- Option 785-1. Robot Gun
- Option 786-1,-2,-3,-4. Connection to first drive (cable length to be stated)
- Option 635-3. Spot Servo

Spot Welding cabinet

- Option 782-7, -11. Weld timer capacity
- Option 791-1 Power cable 7 m (other lengths available)

Water and air unit

- Option 792-1. Water and air unit, Type S
- Option 797-1. Splitbox cable 7 m (other length available)

Other described options depend on specific system need and performance.

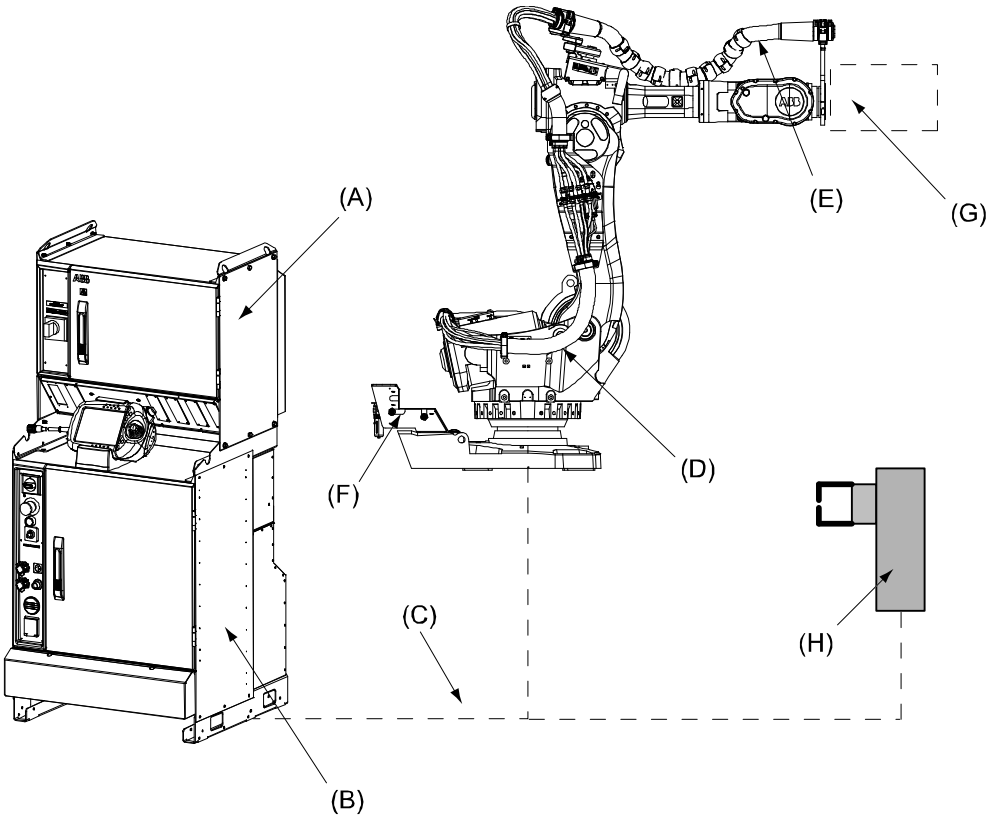
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2.7 Type HSe

2.7.1 Introduction

General

Variant Type HSe is designed for handling against a stationary mounted Spot Welding servo controlled tool (electrical gun). Included main modules are shown in Figure below. Available configurations with linked option numbers are described below with starting with the DressPack.



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Pos	Name
A	Spot Welding cabinet
B	Robot Cabinet IRC5 (incl. 7 th axis drive)
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses
G	Robot Gripper
H	Stationary gun with axis 7

Available configurations with linked option numbers are described below.

Continues on next page

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2.7.1 Introduction
Continued

Option description

Option	Type	Description
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. Option 94-1,-2,-3,-4 for parallel communication. Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet. Option 92-2,-3 for parallel communication and field bus communication with Profibus.
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4,-5.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3.
455-8	Parallel and Ethernet	Offers the signal cables needed for the Ethernet communication in combination in lower and upper arm DressPack. To be combined with option 859-1,-2,-3,-4. Requires selection of option 94-X.

The available alternatives and allowed combinations are shown in the schematic table below.

Application Interface connected to Option 16-1, Cabinet	Option 455-1, Parallel communication	Option 94-1,-2,-3,-4 Cable length, Parallel communicaiton	Option 778-1, Material Handling
	Option 455-4, Parallel and bus communication	Option 90-2,-3,-4,-5 Option 92-2,-3 Cable length, Parallel and bus communication	
	Option 455-8, Parallel and Ethernet communication	Option 859-1, -2, -3, -4 Cable length, Ethernet communication	

Continued

	Lower arm	Upper arm
Option 778-1, Material Handling	Option 798-3, Base to axis 3	Option 780-3, -4, Axis 3 to 6 External routing
	Option 798-2, Base to axis 2	Option 780-2, Axis 2 to 6 External routing

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2.7.2 Configuration result for Type HSe

General

Depending on the choice of options above the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below.

DressPack Type HSe. Parallel communication

- Option 16-1 with Connection to cabinet
- (Option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1. Parallel communication
- Option 778-1 Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms[b]
Protective earth		1[a]	0,5 mm^2	250 VACa
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2)[c]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60 VDC.

c. For option 780-3 8 signals instead of 20.

Continues on next page

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2.7.2 Configuration result for Type HSe
Continued

DressPack Type HSe. Parallel and field bus communication, Can/DeviceNet

- Option 16-1 with Connection to cabinet
- (Option 90-1,-2,-3,-4 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At Connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [b]
Protective earth		1 [a]	0,5 mm^2	250 VAC [a]
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2) [c]	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair	6	6(3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60 VAC.

c. For option 780-3 8 signals instaed of 20.

Continues on next page

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DressPack Type HSe. Parallel and field bus communication, Profibus

- Option 16-1 with Connection to cabinet
- (Option 92-1,-2 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms[b]
Protective earth		1[a]	0,5 mm^2	250 VAC[a]
Customer Signals (CS)				
Signals twisted pair	22	22 (11x2)[c]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

a. Not included in option 780-3.

b. For option 780-3 50 VAC / 60 VDC.

c. For option 780-3 8 signals instead of 22.

Continues on next page

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2.7.2 Configuration result for Type HSe
Continued

DressPack Type HSe. Parallel and field bus communication, Ethernet

- Option 16-1 with Connection to cabinet
- (Option 859-1,-2, -3, -.4 to specify cable length)
- (Option 94-1, -2, -3, -4 to specify cable length)
- Option 455-8. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing with retract arm
- Option 780-3, -4 (and Option 798-3). External routing, DressPack Upper arm

The table below shows the available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, Axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms [i]
Protective earth		1	0,5 mm^2	250 VAC [a]
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2) [ii]	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Bus signals	4	4	0,4 mm^2	Ethernet CAT 5e, 100 Mbit [iii]
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI

i For option 780-3 50 VAC / 60 VDC.
ii For option 780-3 8 signals instead of 20.
iii Ethernet with wire colors according to PROFINET standard, M12-connectors.

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Required general options for Type HSe

To enable the SpotPack 6650S to perform as intended, general standard robot options are required. These standard options are further described under other chapters and are also mentioned in this chapter.

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply

Required options for servo gun

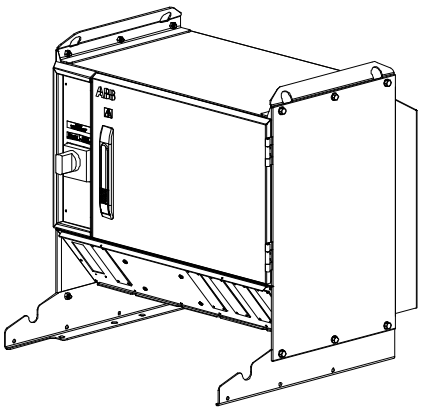
To enable the spot welding function package SpotPack 6650S to run with a servo controlled gun, some additional (additional to those described in previous section "Required general options for Type Se") servo drive options are required. These standard options are described under other chapters and are also mentioned below in this chapter.

- Option 770-4. First additional drive, W Drive
- Option 864-1. Resolver connection, axis 7
- Option 785-5. Stationary gun
- Option 786-1,-2,-3,-4. Connection to first drive (cable length to be stated)
- Option 635-3. Spot Servo. Software option for servo controlled guns.
- (Software option 635-5 could also be used)

Also option 630-1, Servo tool change, should be used if servo gun tool change is required.

Required Spot Welding cabinet options for Type HSe

There are two different variants (see below) of Spot Welding cabinets available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variants. All these options are further described under *Spot Welding cabinet on page 134* and are also mentioned in this chapter.



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Option	Type	Description
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.

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2.7.2 Configuration result for Type HSe
Continued

Option	Type	Description
782-11	Bosch MFDC ProfiNet	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 61C0.751OEM.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 1.8 Spot Welding cabinet.

Option	Type	Description
788-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter.
789-1	Earth fault protection unit	Offers an earth fault protection integrated with the circuit breaker for the weld power.
790-1	Contactor for weld power	Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet.
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
809-1	Process cable to stationary gun, 7 m	Offers floor cable of 7 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for process signals between the Spot Welding cabinet and to the stationary gun.
858-1	Bosch Adaptive control	Offers additional functionality for adaptive welding regulation. Only possible with option 782-11.

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2.7.3 Interface description stationary gun

General

The interface towards the stationary gun includes 3 parts.

- Signal interface with a signal connector type modular Harting
- (Cable option 809-1, -2). The connector configurations are described in the tables below. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type HS is ordered.
- Power cable with a Multi Contact interface (Cable option 791-1 or option 791-2)
- (Ending Multi contact type MC TSB 150/35).
- Water and air connections made by the customer directly on the water and air unit. (See chapter *Water and Air unit on page 142*)

The connector configurations are described in the circuit diagram included in the Product Manual DressPack/SpotPack IRB 6600/7600, art No. 3HAC025058-001.

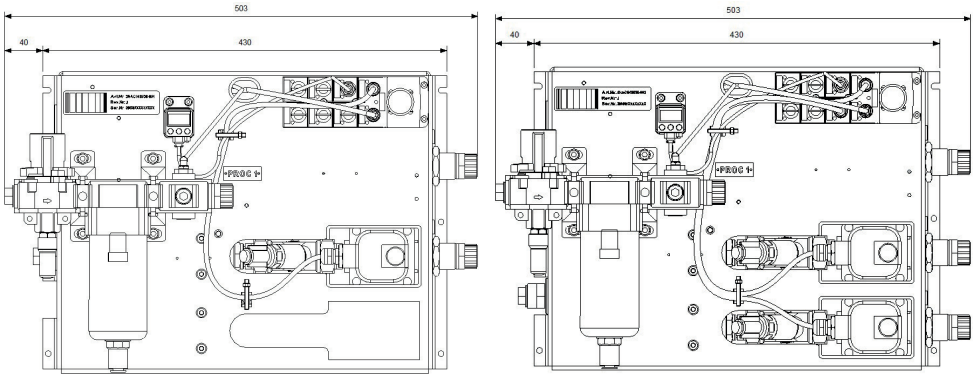
The Harting connector is shown below. The different main parts within the connector are shown both with name and Harting article number. Corresponding parts at the tool are available within the Harting product offer.

Name	Harting article No.
Hood	09 30 010 0543
Hinged frame, hood	09 14 010 0303
Multicontact, female (HD)	09 14 025 3101
Multicontact, female (EE)	09 14 012 3101
Multicontact, female (DD)	09 14 008 3101

For the contacts above corresponding female crimp-contacts for the different cable diameters are required.

Required Water and Air unit options for Type HS

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 1.9 Water and Air unit and are also mentioned in this chapter.



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2.7.3 Interface description stationary gun
Continued

Option	Type	Description
792-2	Water and Air unit, type HS	Offers the basic water and air unit for type HS including splitbox for signal distribution.
793-1	Second water return	Offers an additional water return circuit.
796-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the cabinet and to the split box placed on the water and air unit.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the cabinet and to the split box placed on the water and air unit.

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2.7.4 Summary Type HSe

DressPack

The following options are the minimum required to form a complete SpotPack Type HSe:

- Option 16-1. Connection to cabinet, (Cable length and communication type to be stated)
- Option 455-1, 455-4. Parallel or Parallel and Bus communication (Communicationtype to be stated)
- Option 778-1. Material Handling
- Option 798-2 or Option 798-3. Internal routing, DressPack Lower arm (Routing type to be stated)
- Option 780-2, 780-3, 780-4. External routing, DressPack Upper arm (Routing type to be stated)

General options

- Option 716-1. 1 pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 727-1. 24V 8 Amps power supply

Required options for servo gun

- Option 770-4. First additional drive, W Drive
- Option 785-5. Stationary gun
- Option 786-1. Connection to first drive (other lengths available)
- Option 635-3. Spot Servo. Software option for servo controlled guns

Spot Welding cabinet

- Option 782-7 and -11. Weld timer capacity
- Option 791-1. Power cable 7 m (other lengths available)
- Option 809-1. Process cable to stationary gun (other lengths available)

Water and air unit

- Option 792-2. Water and air unit, Type HS
- Option 797-1. Splitbox cable 7 m. (other lengths available)

Other described options depend on specific system need and performance.

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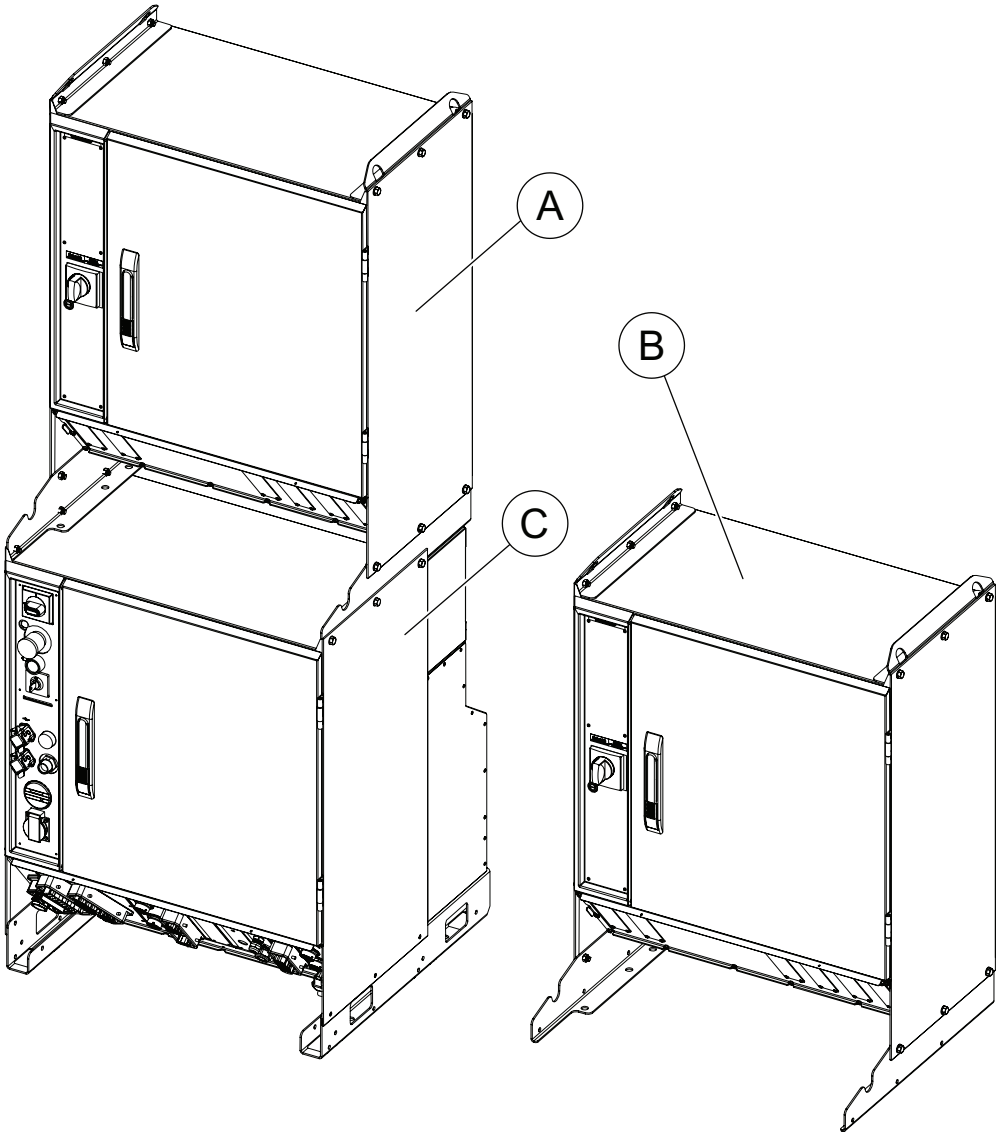
2.8 Spot Welding cabinet

2.8.1 Introduction to Spot Welding cabinet

General

The Spot Welding cabinet for SpotPack contains the electric components and circuits needed for spot welding application. The Spot Welding cabinet, with the welding controller build in, is controlled from the robot controller via the processor software. The capacity and functionality depends on the choice of different option combinations.

The Spot Welding cabinet is designed to be placed on top of the robot controller cabinet (Single cabinet version option 700-3), see Figure below. This is also how it is assembled at delivery.



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A	Spot welding cabinet, mounted on IRC5 controller

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B	Spot welding cabinet, standing on the floor
C	IRC5 controller

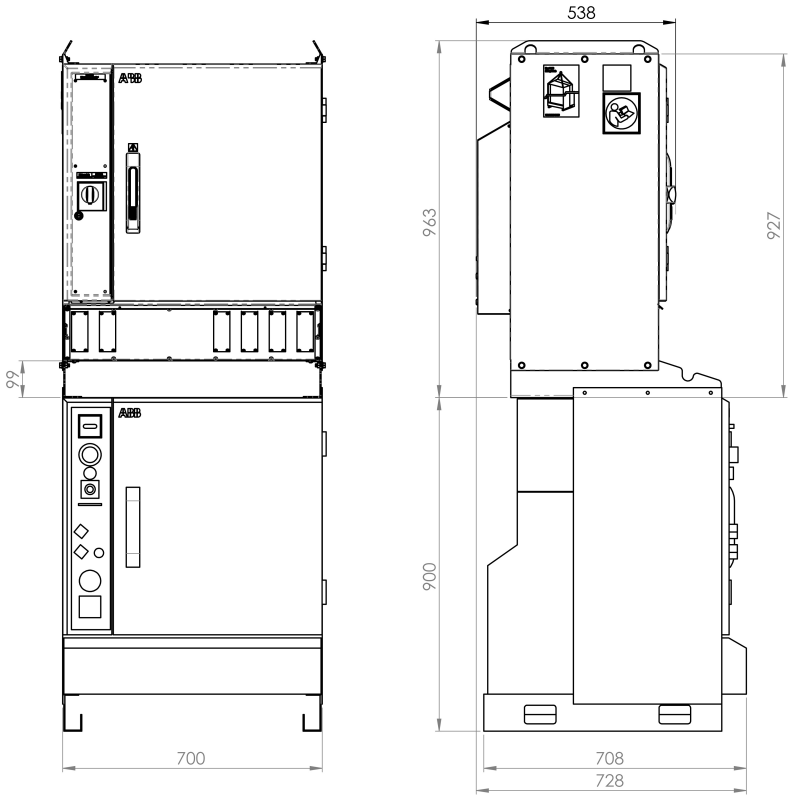
There are interface cables between the robot controller cabinet and the Spot Welding cabinet (cable length 1.5 m, connected at rear of the control cabinet and at front of Spot Welding cabinet). These cables includes power feeding for control circuits, process signals to the welding gun, safety signals, communication towards weld timer and I/O:s for indication and control. Depending on chosen options wiring will differ (see option descriptions below for further details).

The Spot Welding cabinet has the following common main features.

- Modular build for easy repair and installation (see Figure below)
- Rotary switch with adjustable thermal release and short circuit release
- Cross connection of signal handling with separate fusing for different circuits to achieve selectivity
- Programmable weld timer with proportional valve control
- A compact cabinet family based on a common platform prepared for additional options and for easy exchange

Note

Dimensions of the large cabinet within brackets.



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2.8.1 Introduction to Spot Welding cabinet
Continued

Weld power circuit

The electrical circuits of the Spot Welding cabinet consists of weld power circuit and control circuits to control the welding. The welding power for the welding gun is fed through a circuit breaker and inverter (for MFDC welding) and further out to the welding power cable. The cabinet is prepared for power feeding from the floor or from top. The welding power cable (outgoing feeding) is connected, via cable gland, directly to terminals inside the Spot Welding cabinet.

The circuit breaker has a built in thermal release that could be adjusted for customer specific needs to protect welding equipment and to get selectivity in the power circuit. The thermal release is set at 100 A at delivery. The maximum level should not exceed 100 A.

Control Circuits

Power feeding 240/115 V AC and 24V DC for the control circuits is fed from the robot controller cabinet. Also, the safety circuits in the robot controller cabinet are used to interlock the welding timer.

A welding timer (Bosch), integrated with the air cooled inverted, controls the welding current. The welding timer includes control program that gives possibility to program different weld sequences. The programming is normally done on a programming device or a PC that is connected directly to the welding timer. The interface between the robot system and the welding timer is handled via a field bus interface (ProfiNet). Examples of signals are weld start, weld ready, weld programs choice and error handling.

Also, cross connections, of interface signals and interlocking between the robot system (I/O-boards), the water and air unit, signals to DressPack or stationary gun, are done within the Spot Welding cabinet.

Programming device for the welding timer is not included in the delivery.

If the option 744-1 is chosen there will follow a door interlock with the Spot Welding cabinet.

Note

For more information see:

- Product manual for DressPack/SpotPack
- Circuit diagrams
- Separate manuals for the Bosch equipment

The welding capacity as well as the weld timer brand described below. Additional features could then be added to each of the cabinet variants.

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Option 782-13 Bosch MFDC ProfiNet

This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity.

General technical data

Technical data	IEC
Weld timer and inverter	Bosch PSI 61C0.751OEM
Max wire range, incoming power	3x70 mm^2
Power feeding	400-480 V AC
Max welding current	110 A rms, 20 kA weld current
Protection class	IP54

Specific technical data large cabinet

Technical data	IEC
Main breaker (ABB Sace XT1), thermal release	100 A (adjustable) 70-100 A
Main breaker, magnetic release	36 kA

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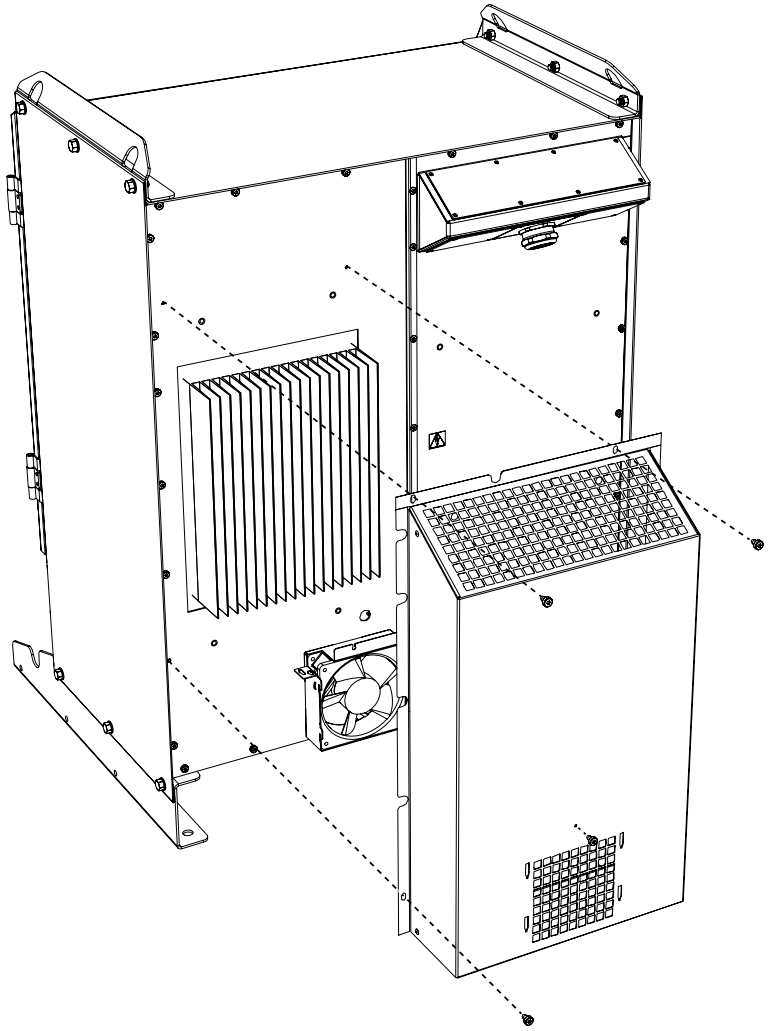
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2.8.1 Introduction to Spot Welding cabinet
Continued

Option 788-1 Forced air cooling

Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter (see pictures below). Cabling to the fan goes via a cable gland at the rear of the Spot Welding cabinet. The fan runs continuously when the welding system is powered up.

The fan is required to be used together with Bosch MFDC (option 782-13).



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Option 789-1 Earth fault protection unit

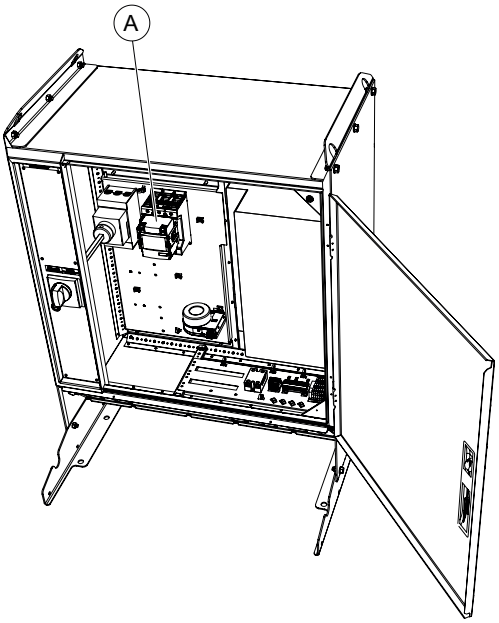
Offers an earth fault protection integrated with the circuit breaker for the weld power. If an earth fault occurs the circuit breaker is tripped.

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Option 790-1 Contactor for weld power

Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet. The contactor is mounted after the inverter and opens up the weld circuit out from the cabinet. It is recommended to be used for increasing safety or when using tool change for weld guns. The contactor is open when the robot system is in motor off mode or when an specific I/O is set.



xx0900000747

Pos	Description
A	Weld contactor

Option 791-1 Weld power cable, 7 m

Offers floor cable of 7 m length for weld power (3x35 mm^2). One end of the weld power cable is connected at terminal to the weld timer (Bosch) or the contactor (when option 790-1 is chosen). The cable enters the Spot Welding cabinet cia cable gland. The other end is equipped with an MC connector TSB160/35 and is connected at either the manipulator base (for robot gun Type S or Se) or to the stationary gun (for Type HSe).

Option 791-2 Weld power cable, 15 m

Offers floor cable of 15 m length for weld power (3x35 mm^2). See option 791-1 for further details.

Option 809-1 process cable to stationary gun, 7 m

Offer floor cable of 7 m length for process signals between the Spot Welding cabinet and the stationary gun. This option also includes internal cross connections between I/O, weld timer and power feeding etc.

One end of the process cable enters the Spot Welding cabinet via cable gland and is connected at Phoenix terminals. The other end is equipped with a HD Harting 3 modules and is connected to the stationary gun (for Type HSe).

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2.8.1 Introduction to Spot Welding cabinet
Continued

Option 809-2 process cable to stationary gun, 15 m

Offer floor cable of 15 m length for process signals between the Spot Welding cabinet and the stationary gun. See option 809-1 for further details.

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2.8.2 Interface description Spot Welding cabinet

General

The interface towards the Spot Welding cabinet is described in the tables below.

Connections for Spot Welding cabinet

Type	Pcs	Specification	Allowed capacity
Incoming power from line[a]	1		400-480 VAC, Max. 110 A rms, 50/60 Hz
Outgoing power to robot	1	Cable gland (min 24 mm / max 28 mm cable diameter)	Max. 150 A rms, 50/60 Hz
Floor cable	2	35 mm^2	Max. 600 VAC, 150 A rms at + 20°C (68°F) ambient temperature
Floor cable protective earth	1	35 mm^2	Max. 600 VAC, 150 A rms at + 20°C (68°F) ambient temperature

a. Incoming power connection made by customer. For incoming power and safety recommendations see the Product Manual DressPack/SpotPack IRB 6600/7600 3HAC025058-001.

Connections for Signals

Type	Pcs	Specification	Allowed capacity
Water and air unit (XS 103)	1	Modular Harting connector, type DD	24 V DC, Max 0,5 A / output
Stationary gun (XS 104)	1	Modular Harting connector, type HD	24 V DC, Max 0,5 A / output See interface description Stationary gun type HS and HSe

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2.9 Water and Air unit

2.9.1 Introduction

General

The Water and Air unit contains components for water and air distribution and control within the SpotPack. The water and air unit is controlled from the robot controller via the process software. Wiring is made via the Spot Welding cabinet.

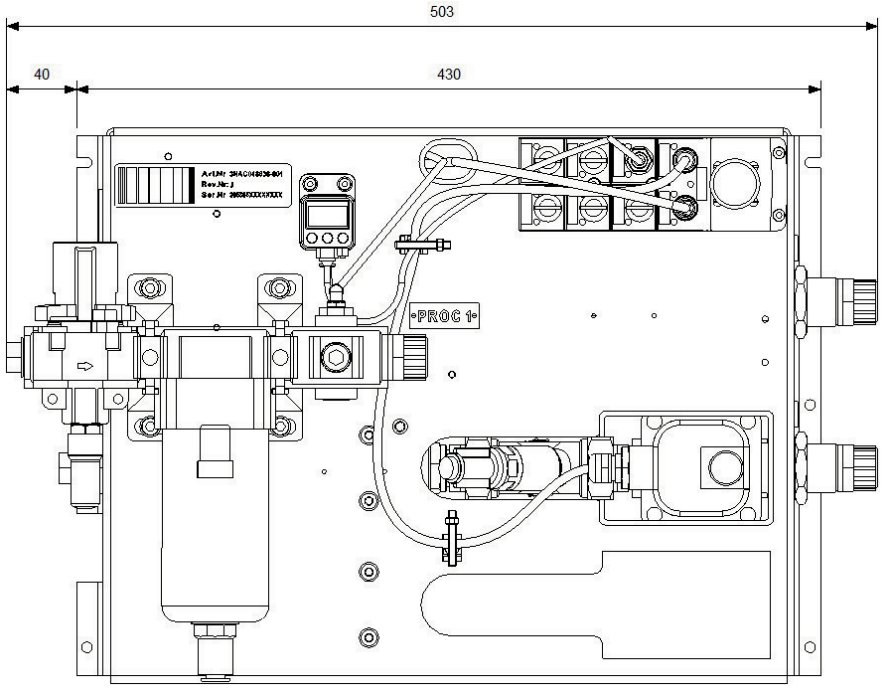
The capacity and functionality depends on the choice of different option combinations, see water and air unit options under this chapter.

The unit is only used for the spot welding application

The Water and Air unit

The Water and Air unit has the following main features (See Figure below):

- Adjustable, high speed water flow sensors.
- Adjustable digital pressure switch for air.
- Air filter with auto draining.
- Possibility to balance water flow for complete package and for individual circuits.
- Preparation for additional options and preparation for easy exchange of complete unit or separate circuits.
- Equipped with extra (plugged) air outlets.



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The standard water and air unit consists of four main assemblies.

- Water in circuit

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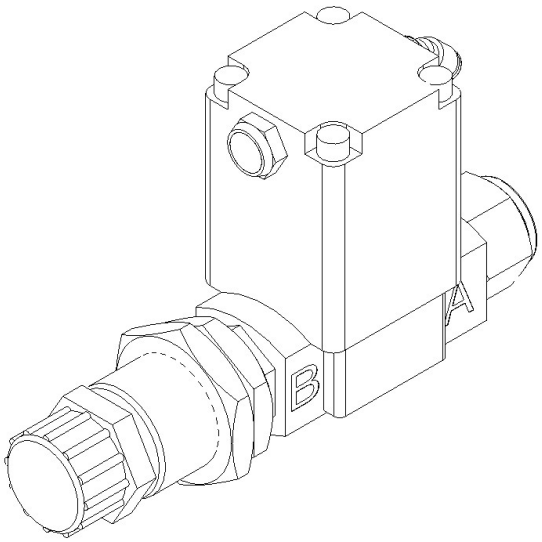
- Water return circuit
- Air supply circuit
- Split box

Cables and hoses required for Water and Air unit are defined and described under each option for water and air unit.

Water in circuit

The function of the water in circuit is to open / close the cooling water supply to the Spot welding gun (see Figure below). An electrical 2 port solenoid valve is used. The valve is controlled by a digital signal from the robot control system.

The circuit begins from left to right with a lead in hole in the mounting plate, a G ½" thread is used for the connection of the factory water supply system, electrical 2 port solenoid valve and ends with a Parker Pushlock adapter. (Suitable for a Parker Pushlock DIN 20 078 A, we recommend a Parker Pushlock 39C82-15-8BK fitting). From this point the water is led to the gun/robot base.



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Water return circuit

The water return circuit monitors the flow of the returning cooling water from the Spot welding gun (see Figure below). The flow switch detects if the water flow is too low in the cooling water circuit.

The flow switch gives a digital signal to the robot control system, which automatically shuts off the electrical shut off valve in the water in circuit if the flow is too low.

The system and the supply of cooling water are then automatically stopped to minimize risk of damage to the system.

The water return circuit is delivered with a pre-set flow limit, set to 8 liters per minute at 0.2 MPa water pressure.

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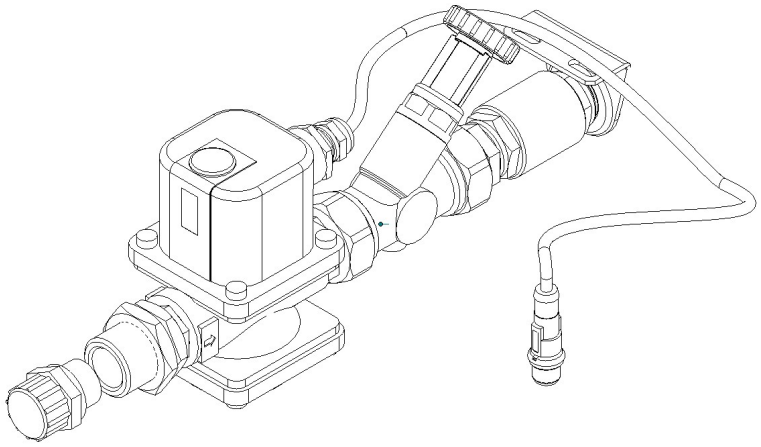
2.9.1 Introduction
Continued

The water return circuit begins from right with a Parker Pushlock adapter (suitable for a Parker Pushlock DIN 20 078 A, we recommend a Parker Pushlock 39C82-15-8BK fitting).

It is also equipped with a flow control valve; the flow control can adjust the water flow to the desired flow level. The flow rate can be monitored by the scale on the flow control valve. The scale can be rotated so that easy reading can be performed. This will serve as a rough function check in the flow range between 1 to 8 litres per minute.

The flow control valve is when delivered adjusted for maximum flow.

The circuit ends with a check-valve that will stop any reversing water flow and ends with an internal G ½" thread. From this point the water is led to the factory water system.



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A second water return, option 793-1, is also available with the same specification as above.

Air supply circuit

The air supply circuit provides the function package with filtered air (see Figure below).

The air supply circuit begins with a internal G ½" thread, manually operated shut off valve with residual pressure release though a silencer, air filter with nominal filtration of 5 µm with a metal protection of the bowl, a digital pressure switch and a cross interface containing plugged air outlet ports (internal G 3/8" thread).

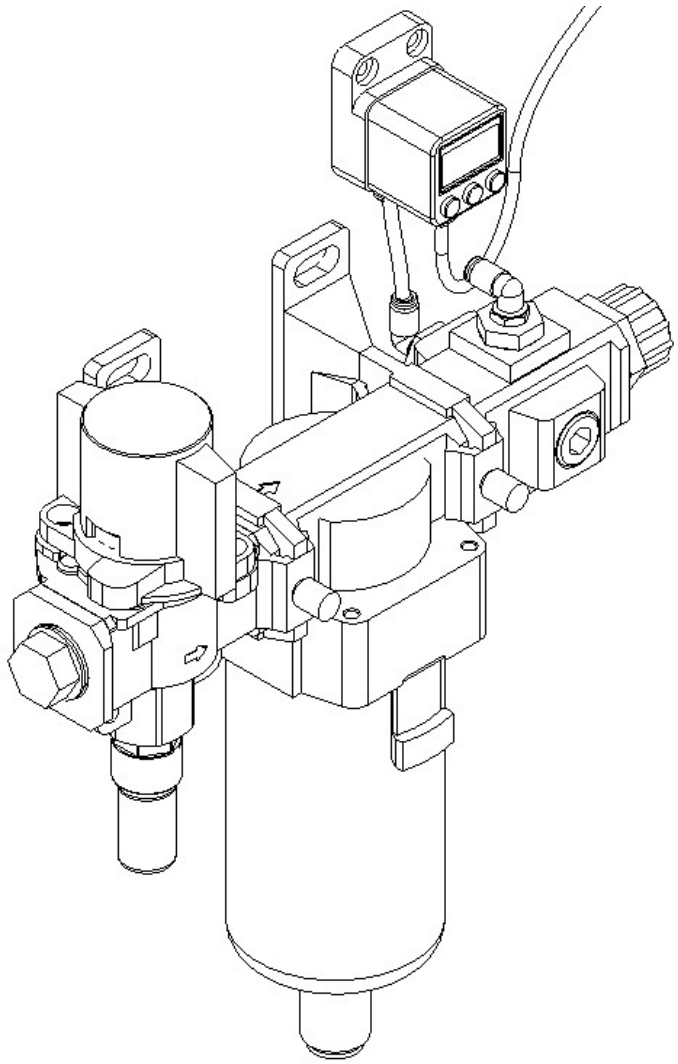
There is a digital pressure switch to monitor the air pressure and to give a signal to the control system if the pressure becomes too low.

The pressure switch is delivered with pre-set pressure limit, set to 0.6 MPa.

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The air supply circuit ends with a Parker Pushlock adapter (suitable for a Parker Pushlock DIN 20 078 A, we recommend a Parker Pushlock 39C82-15-8BK fitting).



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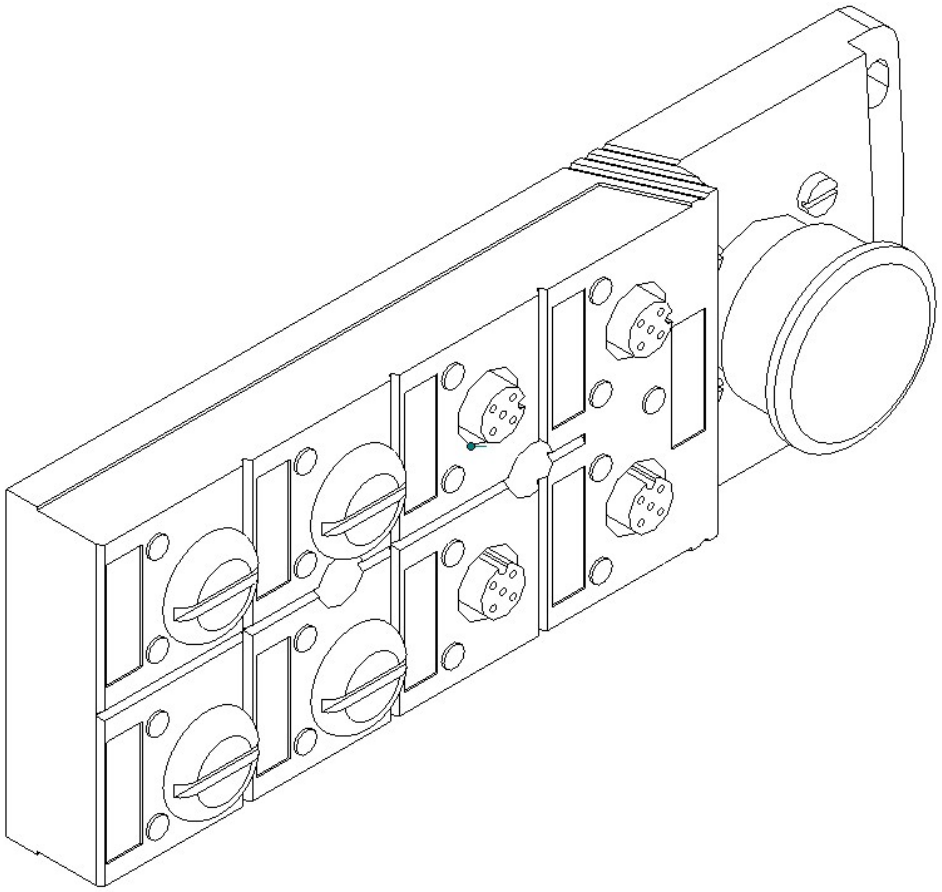
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2.9.1 Introduction
Continued

Split box/Connection box

With the split box, the 24VDC supply and signals are connected and distributed to the different units on the water and air unit, see Figure below. The design makes disconnection of separate items for service and repair on the water and air unit very easy. The split box has a protection class IP67, which means it is well protected against dust and water leakage.



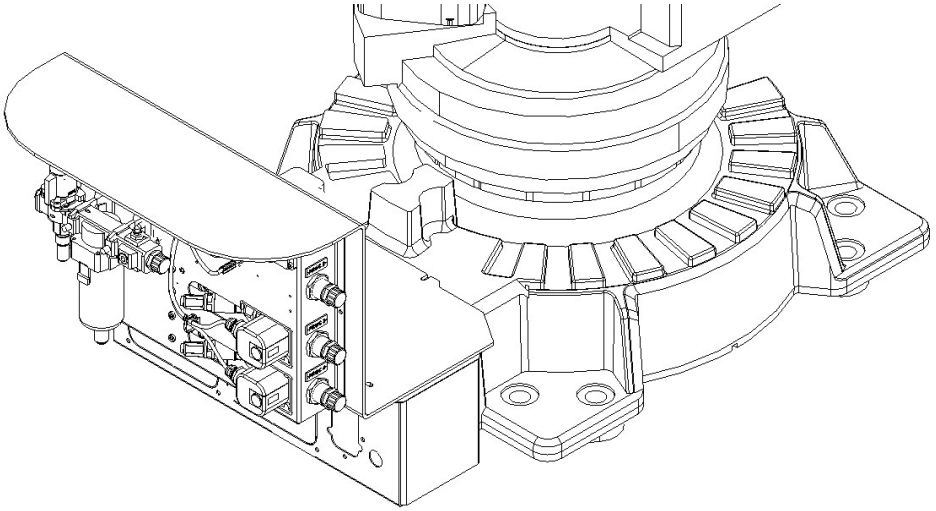
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Mounting

Type S, robot mounted spot welding gun, is mounted at the robot at factory and water and air hoses are included and connected to the robot base.



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Type HS, robot handles part against a pedestal mounted spot welding gun, the Water and Air panel is delivered in a together with the robot.

Signals for water and air unit

Electrical connections to robot I/O board are made via the Split box on the Water and Air unit or to connection box at robot base (Figure below shows Split box. For connection box see Circuit diagram.)

8 x M12 connections (4 pins) are available. The number in use depends on option choices. But at least two are free connection and can be used for customer purposes.

The Split box has six connections prepared for the following units:

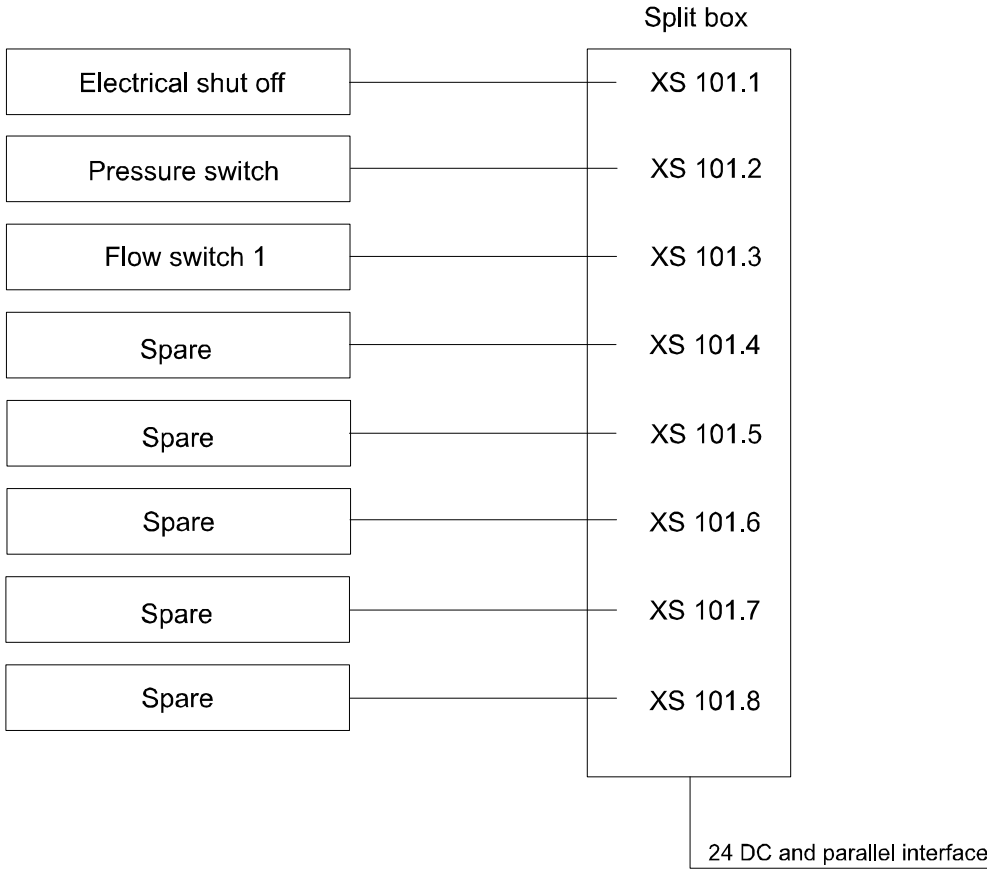
- 1. Electric water shut off valve
- 2. Pressure switch
- 3. Flow switch 1
- 4. Flow switch 2 (Option 793-1 Second Water Return)
- 5. Proportional valve: Prop. ref. signal & pressure OK signal (Option796-1 Electrical proportional valve for air)
- 5. Proportional valve: Power supply
- (Option796-1Proportional valve for air)

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2.9.1 Introduction
Continued

The cable and cable length between the Split box and the Spot Welding cabinet must be specified (see option 797-1,-2,-3,-4).



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Option	Type	Description
792-1	Water and Air unit, type S	The basic water and air unit for type S is equipped for a robot handled gun and with the following components: Water in circuit Water return circuit Air supply circuit Split box 1/2 " hose between air supply circuit and manipulator base (PROC 1)1/2 " hose between water in circuit and manipulator base (PROC 2) 1/2 " hose between water return circuit and manipulator base (PROC 3)
792-2	Water and Air unit, type HS	The basic water and air unit for type HS is equipped for a pedestal/stationary gun. Hoses between water and air unit, welding equipment and robot are not supplied. These have to be arranged by the customer.

Continues on next page

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Option	Type	Description
793-1	Second water return	Yhe option adds an additional water return circuit. See Water return circuit. An additonal 1/2” water hose (PROC 4) from the Water and Air unit to manipulator base is included.
796-1	Electrical proportional valve air Eq.	Offers a proportional valve with integrated control circuit and connection cable to the splitbox.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box placed on the water and air unit. This cable is connected to the cabinet with a modular Harting and it ends with a quick connector at the split box.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for the split box. See description of option 797-1.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for the split box. See description of option 797-1.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for the split box. See description of option 797-1.

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2.9.2 Technical data Water and Air unit

Media interface description

The interface towards the Water and Air unit is described in table below.

Type	Pcs	Specification
Incoming water	1	G 1/2” thread[a]
Outgoing water	1	G 1/2” thread[a]
Incoming air	1	G 1/2” thread[a]
Extra air outlet	1	G 3/8” thread[b]

a. Connection to be made by customer.

b. Plugged at delivery (to be used for tip-dresser or other equipment).

General data

Water	Description
Operating pressure	Max. 0.6 MPa / 87PSI
Proof pressure	1.2 MPa / 174 PSI
Maximum pressure drop	< 0.2 MPa at 8 litre/minute[a]
Flow regulating (each circuit)	1 - 16 l/min
Flow setting range	-0.100 - 1.000 MPa
Water quality	Normal filtred industrial water 80 to 100 mesh.

a. The pressure drop is measured under the following conditions:

Measuring point 1: Incoming water connection at water and air unit.

Measuring point 2: Outgoing water connection at water and air unit.

The water hoses (Proc 2 and Proc 3) are cross-connected at the end at axis 6 (the pressure drop is measured without any tool).

Air	Description
Operating pressure	Max. 1.0 MPa / 145 PSI
Flow capacity	Max. 5800 litres/min. (at 0.7 MPa with a 0.1 MPa pressure drop
Pressure switch set range	- 0.100 - 1.000 MPa
Air quality	Use clean air. When there is excessive condensate, install a device that eliminates water such as dryer or water separator (Drain Catch) on the inlet side of the air filter.

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2.10 Connection kits

General

For detailed information on connection location see *Interface descriptions for DressPack on page 74*

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



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2.10 Connection kits
Continued

Base - Connector kits

		DressPack options		Resolver conn., axis 7	Description
Option	Name	798-2	798-3	864-1	
459-1	CP/CS, Proc 1 on base	X	X		
453-1	FB 7			X	

Option 459-1, CP/CS, Proc 1 on base

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 (Parker Pushlock, (½", 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 453-1, FB 7

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)	Souriau
1 pcs Adaptor	8 pin
15 pcs Pin	for 0,13-0,25 mm^2
Assembly Accessories to complete connector	
Assembly instruction	

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Axis 2 - Connector kits

		DressPack option	Description
Option	Name	798-2 (MH/SW 2)	
458-1	CP/CS, Proc 1 axis 3	X	4 module Harting
479-1	Weld, Proc 2-4 axis 3	X	MC

Option 458-1, CP/CS, Proc 1 axis 3

R2. CP/CS and Proc 1 on axis 2/3

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

The kit contains:

- 1 Hose fittings (Parker Pushlock, (½", 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, male (Harting)	Type HD (25 pin)
1 pcs Multicontact, male (Harting)	Type DD (12 pin)
1 pcs Multicontact, male (Harting)	Type EE (8 pin)
10 pcs Male crimp contacts	For 1,5 mm^2
10 pcs Male crimp contacts	For 0,5 mm^2
10 pcs Male crimp contacts	For 1,0 mm^2
10 pcs Male crimp contacts	For 2,5 mm^2
12 pcs Male crimp contacts	For 0,14 – 0,37 mm^2
45 pin	For 0,2 – 0,56 mm^2
Assembly Accessories to complete connector	
Assembly instruction	

Option 479-1, Weld, Proc 2-4 axis 3

R2. Weld and Proc 2-4 on axis 2/3

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

The kit contains:

- 3 Hose fittings (Parker Pushlock, (½", M22x1,5 Brass, 24 degree seal))
- Weld connector with:

1 pcs Welding connector pin with flange (MC)	3x35 mm2 (25 mm2 pin)
1 pcs Cable gland, plastic	Diameter 24-28 mm
Assembly Accessories to complete connector	
Assembly instruction	

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Axis 3 - Connector kits

		DressPack options	Description
Option	Name	798-3	
458-1	CP/CS,CBUS/SP/SS, Proc 1 axis 3	X	UTOW

Option 458-1, CP/CS/CBus/SP/SS, Proc 1 axis 3

CP/CS/CBus/SP/SS, Proc 1 axis 3 on tool side for option 780-3 and 780-4.

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, bulkhead	UTOW71626PH05, Shell size 16
26 pcs Pin	RM18W3K, 0.21-0.93 mm^2
CBUS	
1 pcs UTOW Pin connector 10p, bulkhead	UTOW71210PH05 Shell size 12
10 pcs Pin	RM18W3K, 0.21-0.93 mm^2
Ethernet	
1 pcs Socket connector M12	Harting 2103 88
4 pcs Socket	Harting 61 03 0, 0.13-0.33 mm^2
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

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Axis 6 - Connector kits

					Description
Option	Name	780-2 (MH/SW 2)	780-3 (MH 3)	480-4(LeanID)	
452-1	Weld, Proc 1-4 axis 6	X		X	MC
543-1	CP/CS/CBUS/SP/SS Proc 1 axis 6	X	X	X	UTOW

Option 543-1, CP/CS/CBus, Proc 1 axis 6

Harting

CP/CS/CBus, Proc 1 axis 6 on tool side for option 780-2.

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 (Parker Push lock (1/2”, M22x1,5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN
1 pcs Hinged frame (Harting)	Shell size 10
1 pcs Multicontact, male (Harting)	Type HD (25 pin)
1 pcs Multicontact, male (Harting)	Type DD (12 pin)
1 pcs Multicontact, male (Harting)	Type EE (8 pin)
10 pcs Male crimp contacts	For 1,5 mm^2
10 pcs Male crimp contacts	For 0,5 mm^2
10 pcs Male crimp contacts	For 1,0 mm^2
10 pcs Male crimp contacts	For 2,5 mm^2
15 pcs Male crimp contacts	For 0,14 – 0,37 mm^2
30 pins	For 0,2 – 0,56 mm^2
Assembly Accessories to complete connector	
Assembly instruction	

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2.10 Connection kits
Continued

Souriau

CP/CS/CBus/SP/SS, Proc 1 axis 6 on tool side for option 780-3 and 780-4.

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 (Parker Push lock (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	RM81W3K, 0.21-0.93 mm^2
CBUS	
1 pcs UTOW Pin connector 10p, bulkhead	UTOW71210PH05 Shell size 12
10 pcs Pin	RM18W3K, 0.21-0.93 mm^2
Ethernet	
1 pcs Socket connector M12	Harting 2103 88
4 pcs Socket	Harting 61 03 0, 0.13-0.33 mm^2
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	

Option 452-1, Weld, Proc 1-4 axis 6

Weld and Proc 1-4 axis 6 on manipulator side

The process cable package from axis 2 to axis 6 (option 780-2) ends with free end for media and for weld power cable. The option 452-1 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 (Parker Pushlock, (½”, M22x1,5 Brass, 24 degree seal))
- 1 Multi contact connector (Female) type including:

1 pc Welding connector socket incl. housing	3x35 mm^2 (35 mm^2 socket)
1 pc Cable gland	
1 pc End housing	
Assembly Accessories to complete connector	
Assembly instruction	

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3 Specification of variants and options

3.1 Introduction to variants and options

General

The different variants and options for the IRB 6650S 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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3.2 Manipulator

Variants

Option	IRB Type	Handling capacity (kg)/Reach (m)
435-69	6650S	90/3.9
435-50	6650S	125/3.5
435-51	6650S	200/3.0

Manipulator color

Option	Description	Note
209-1	ABB Orange standard	
209-202	ABB Graphite White standard	Standard color
209-4 --192	Colors according to RAL-codes	

Note

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

Protection types

Option	Protection type	Note
287-4	Standard	IP 67
287-3	Foundry Plus 2	See *Protection type Foundry Plus 2 on page 9* for a complete description of protection type Foundry Plus 2.

Warranty

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.
438-4	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.

Continues on next page

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Option	Type	Description
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	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*.

Warranty for DressPack

Note

Option 780-2 upper arm DressPack SW/HM2 is not covered by warranty.

Note

Option 780-3 upper arm DressPack HM3 is not covered by warranty.

Note

Option 780-4 DressPack LeanID is covered by the warranty.

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3.3 Equipment

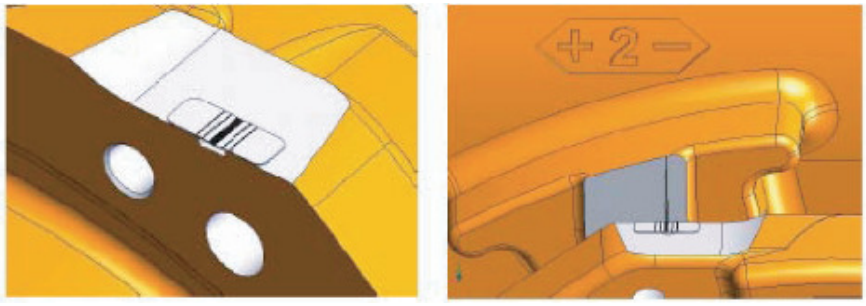
General

Option	Type	Description
213-1	Safety lamp	A safety lamp with an orange fixed light can be mounted on the manipulator. The lamp is active in MOTORS ON mode. The safety lamp is required on a UL/UR approved robot.
159-1	Fork lift device	Lifting device on the manipulator for fork-lift handling. Note. When Cooling Fan for axis 1 motor unit is used, this must be disassembled in order to use fork lift device.
37-1	Base plate	Can be used for IRB 6650S and IRB 7600. See *Installation on page 17*, for dimension drawing.
87-1	Cooling fan for axis 1 motor (IP 54)	Cannot be combined with Cooling fan for axis 2 motor option 88-1. For in use recommendations see *Cooling fan for axis 1 and 2 motor on page 59*. Not for protection Foundry Plus. Not together with track motion.
88-1	Cooling fan for axis 2 motor (IP 54)	For in use recommendations see *Cooling fan for axis 1 and 2 motor on page 59*. Not for protection Foundry Plus. Not together with track motion.
430-1	Upper arm covers	See Figure in *Upper arm covers on page 162*. Included in protection Foundry Plus.
804-1	Labels for synchronization markings	For a more accurate marking of the synchronization position of the robot. Assembly instructions are included. See Figures for Synchronize lables, axis 2 - 6.

Synchronize lables

The option contains synchronize lables for each axis.

Synchronize lables for Axis 2

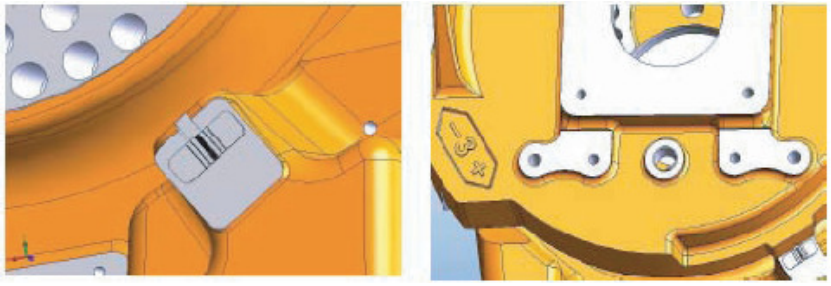


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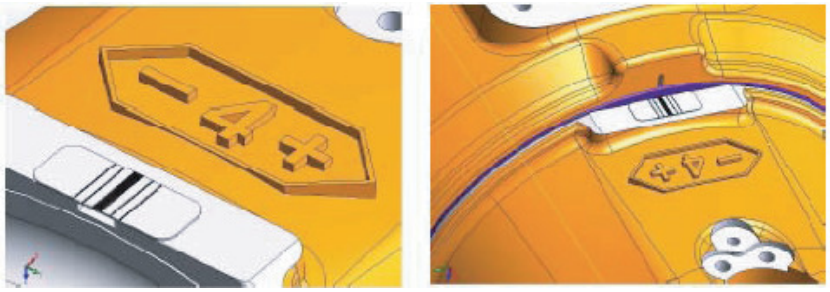
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Synchronize lables for Axis 3



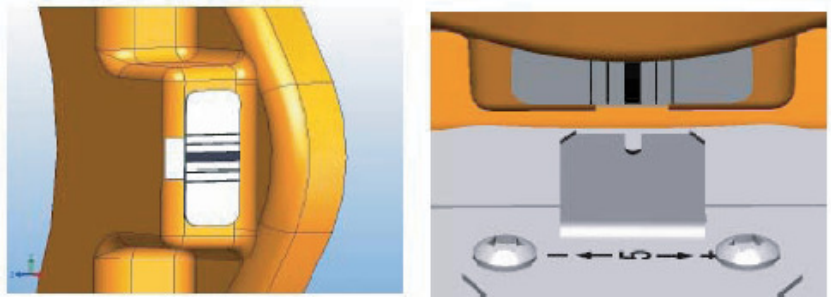
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Synchronize lables for Axis 4



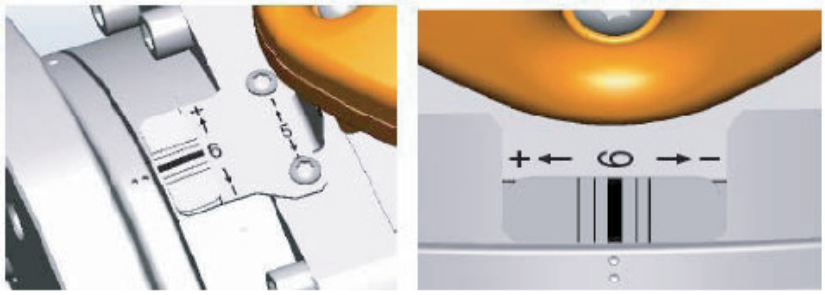
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Synchronize lables for Axis 5



xx1000000527

Synchronize lables for Axis 6



xx1000000528

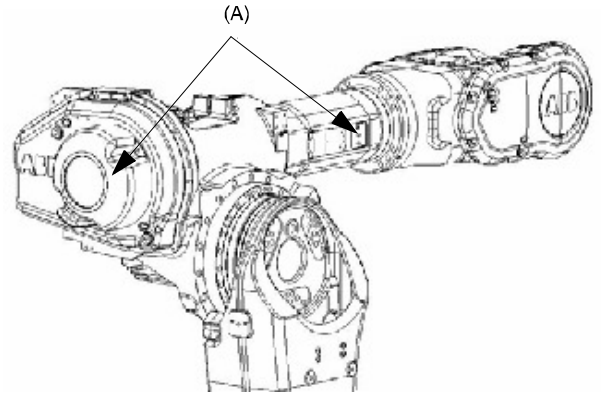
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Resolver connection, axis 7

Option	Description	Note
864-1	On base	Used together with first additional drive, option 907-1.

Upper arm covers



xx1000000529

Pos	Description
A	Option 430-1

Electronic Position Switches (EPS)

The mechanical position switches indicating the position of the three main axes are replaced with electronic position switches for up to 7 axes, for increased flexibility and robustness. For more detailed information, see *Product specification - Controller IRC5* and *Application manual - Electronic Position Switches*.

Foundry Plus Cable Guard

The manipulator cables are equipped with an additional protection of aluminized leather against e.g. aluminium spitz and flashes and chips from machining. Process cable for material handling from base to axis 3, option 798-3 has the same protection

Option	Description	Remark
908-1	Foundry Plus Cable Guard	For extra protection of cables. Requires option 287-3 Foundry Plus.

Working Range Limit

To increase the safety of the robot, the working range of axes 1, 2 and 3 can be restricted by extra mechanical stops.

Option	Type	Description
29-1	Axis 1,15 degrees	Two stops which allow the working range to be restricted in increments of 15°.
29-2	Axis 1, 7.5 degrees	Two stops which allow the working range to be restricted in increments of 7,5°.

Continues on next page

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Option	Type	Description
32-1	Axis 2	Six stops which allow the working range to be restricted in increments of 15° at both end positions. Each stop decreases the motion by 15°.
34-1	Axis 3	Six stops which allow the working range to be restricted in increments of 20° at both end positions. Each stop decreases the motion by 20°.

Extended work range

Option	Type	Description
561-1	Extended work range axis 1	To extend the working range on axis 1 from ± 180° to ± 220°. When the option is used the mechanical stop shall be disassembled. EPS (Electronic Position Switches) functionality (option 810-1 or -2) is required.

Standard calibration method

Option	Type	Description
1999-1	Axis calibration	Preferred standard calibration method. Robust, high performance axis calibration using only mechanical calibration stops and software.
1999-2	Calibration Pendulum	Previous standard calibration method only to be used in special cases if customers would like to harmonize calibration with already installed base.

Note

The calibration methods are not interchangeable.

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3.4 Floor cables

General

Additional floor cables for SpotPack options, see *DressPack Floor on page 166*.

Manipulator cable length

Option	Lengths
210-2	7 m
210-3	15 m
210-4	22 m
210-5	30 m

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3.5 Process DressPack

Connection to

Option	Connection to	Description
16-1	Cabinet	The signals CP/CS are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, in the controller. The cable between R1.CP/CS and the controller is supplied. For information about the limited number of signals available, see *Type H on page 83* to *Type S on page 90*

Communication

Option	Type	Description
455-1	Parallel communication	Includes customer power CP, customer signals CS.
455-4	Parallel and bus communication	Includes CP, customer signals and CAN/DeviceNet or Profibus for process cable package.
455-8	Parallel and Ethernet communication	Includes CP, customer signals and PROFINET or Ethernet/IP for process cable package

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3.6 DressPack Floor

Connection to Parallel/CAN DeviceNet/Profibus/Ethernet

Following information specifies the cable length for Parallel/CANDeviceNet/Profibus for connection to cabinet.

Option	Lengths	Description
94-1/90-2/92-2/859-1	7 m	
94-2/90-3/92-3/859-2	15 m	
90-4/92-4/859-3	22 m	
94-4/90-5/92-5/859-4	30 m	

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3.7 DressPack Lower and Upper arm

DressPack process configuration

Note

For more information about the process cable packages, see 1.2 DressPack.

Option	Description	Note
778-1	Material Handling	Includes signals and one air hose.
778-2	Spot Welding	Includes signals, weld power cable, one air hose and three media hoses.

DressPack lower arm

Option	Description	Note
798-2	Routing from base to axis 2	
798-3	Routing from base to axis 3	

DressPack upper arm

Option	Description	Note
780-2	External routing from axis 2 to axis 6	Requires option 798-2.
780-3	External routing from axis 3 to axis 6	Requires option 778-1 and 798-3.
780-4	Internal routing from axis 3 to axis 6	Requires option 798-3.

Note

If option 780-4, LeanID, is selected the payload will decrease, for detailed information see Load diagrams.

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3.8 Connection Kits

General

The connectors fit to the connectors at the manipulator base, axis 2/3 and 6 respectively.

Content

The kit consists of connectors, pins and sockets. For technical description, see *Connection kits on page 151*.

Option	Type	Description
459-1	R1.CP/CS and PROC1	For the Customer Power/Customer Signal connector and one Process connector on the manipulator base. Sockets for bus communication are included.
453-1	R3.FB7	For the 7-axis connector on the manipulator base.
458-1	R2.CP/CS and PROC1	For the Customer Power/Customer Signal connector and one Process connector at axis 2/3. Pins for bus communication are included.
452-1	WELD and PROC1-4 axis 6	Weld connector and four Process connectors at axis 6, the manipulator side.
543-1	CP/CS/BUS, PROC1 axis 6	Connector for customer power/customer signal/customer bus at axis 6 tool side.

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3.9 Servo Gun

Content

For technical description see *Servo gun on page 60*.

Option	Lengths
785-1	For robot handled Servo Gun.
785-5	For Stationary Servo Gun.

Connection to first drive

Following information specifies the cable length for Connection to first drive. For further information see *Servo gun on page 60*.

Option	Lengths
786-1	7 m
786-2	15 m
786-3	22 m
786-4	30 m

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3.10 SpotPack Floor Cables

Weld Power Cable

Following information specifies the cable length for the Weld Power cable, from the Spot Welding process cabinet to the manipulator base.

Option	Lengths	Description
791-1	7 m	
791-2	15 m	

Process Cable to Stationary Gun

Following information specifies the cable length for the Process Cable to the Stationary Gun, from the Spot Welding process cabinet to the Stationary Gun.

Option	Lengths
809-1	7 m
809-2	15 m

Cable to Split Box

Following information specifies the cable length for the cable to Split Box, from the Spot Welding process cabinet to the Split box on the manipulator base.

Option	Lengths
797-1	7 m
797-2	15 m
797-3	22 m
797-4	30 m

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3.11 Process Cabinet

Empty Cabinet

Option	Type	Description
768-1	Empty cabinet small	See Product specification - Controller IRC5 with FlexPendant, chapter 2.2.1
768-2	Empty cabinet large	See Product specification - Controller IRC5 with FlexPendant, chapter 2.2.1
715-1	Installation kit	See Product specification - Controller IRC5 with FlexPendant, chapter 2.2.1

Process Cabinet

Option	Type	Description
788-1	Forced air cooling	*Spot Welding cabinet on page 134*
789-1	Earth fault protection unit	*Spot Welding cabinet on page 134*
790-1	Contactor for weld power	*Spot Welding cabinet on page 134*

Weld Timer capacity

Option	Type	Description
782-1	Bosch Basic AC S/SE	*Spot Welding cabinet on page 134*
782-7	Bosch Basic MFDC S/SE	*Spot Welding cabinet on page 134*
782-11	Bosch MFDC Profinet	*Spot Welding cabinet on page 134*

Adaptive control

Option	Type	Description
858-1	Bosch Adaptive control	Offers additional functionality for adaptive welding regulation. Only together with option 782-13.

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3.12 Water and Air

Water and Air unit

Option	Type	Description
792-1	Type S	*Water and Air unit on page 142*
792-2	Type HS	*Water and Air unit on page 142*

Second water return

Option	Type	Description
793-1	Second water return	*Water and Air unit on page 142*

Electrical proportional valve for air

Option	Type	Description
796-1	Electrical proportional valve for air	*Water and Air unit on page 142*

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3.13 User documentation

User documentation

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

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

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4 Accessories

4.1 Introduction to accessories

General

There is a range of tools and equipment available, especially designed for the manipulator.

Basic software and software options for robot and PC

For more information, see *Product specification - Controller IRC5 with FlexPendant* and *Product specification - Controller software IRC5*.

Robot peripherals

- The Track Motion is not adapted for the remote connector plate on IRB 6790 and the air supply needed for the overpressure in manipulator and the air pressure supervision.
- Motor Units

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