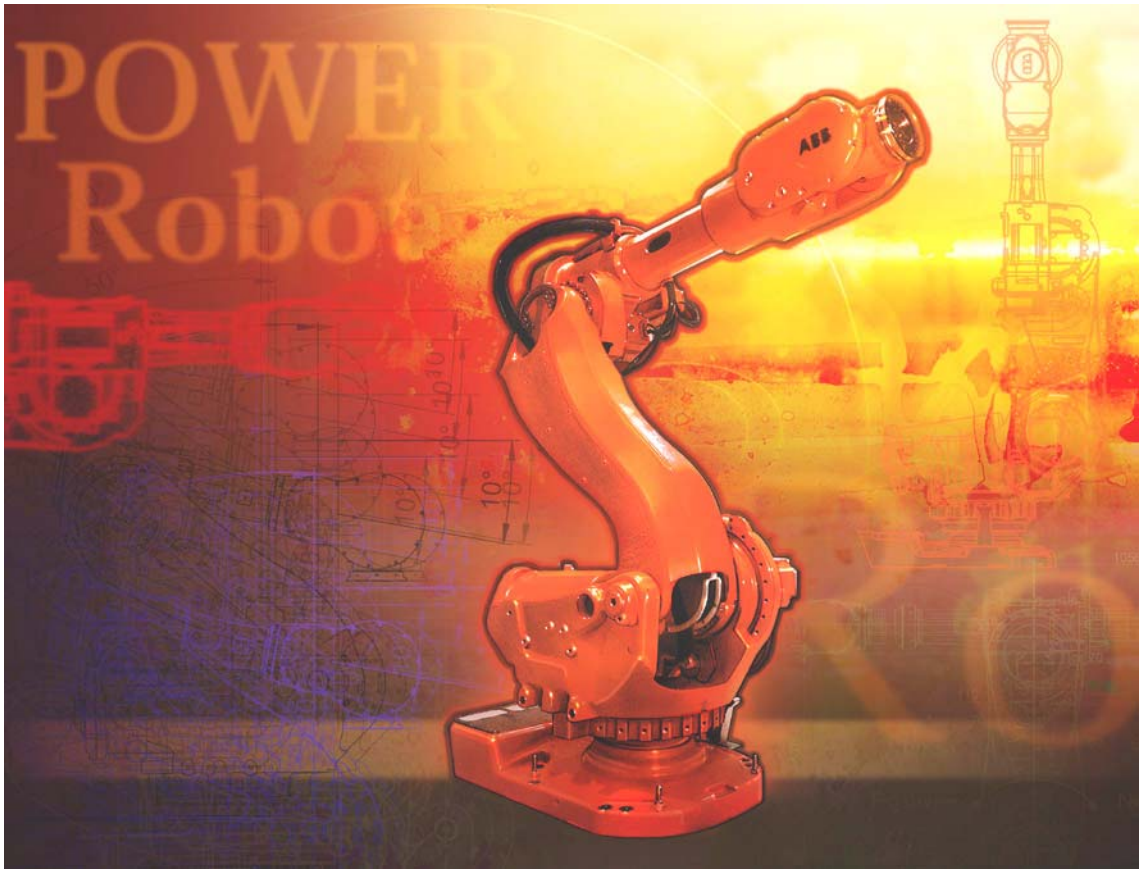
The heart of Robotics

Product specification

Articulated robot

IRB 6600 - 175/2.55
IRB 6600 - 225/2.55
IRB 6600 - 175/2.8
IRB 6650 - 125/3.2
IRB 6650 - 200/2.75
IRB 6650S - 125/3.5
IRB 6650S - 200/3.0
M2000/M2000A



Product specification

Articulated robot
3HAC 14064-1
Rev.H
IRB 6600 - 175/2.55
IRB 6600 - 225/2.55
IRB 6600 - 175/2.8
IRB 6650 - 125/3.2
IRB 6650 - 200/2.75
IRB 6650S - 125/3.5
IRB 6650S - 200/3.0
M2000/M2000A

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Overview

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 integrated auxiliary equipments as i.e: Customer Connections, Servo Gun, Dress-Pack and SpotPack
- The specifiaction of variant and options available

Users

It is intended for:

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

Contents

Please see Table of Content on page 3

Revisions

Revision	Description
Revision 8	• Data added for IRB 6650S: • -The power consumption -Not clean room classed -The fastening holes for the robot base -The production data for Absolute Accuracy -The range of movements -The work area for -125/3.5. • The new web address for ABB Robot Load. • The radius for Type B added. • Option No 457-1, contactor for weld power corrected.

Complementary Product specifications

Product specification	Description
Controller	S4Cplus, 3HAC9039-1
Controller Software	RobotWare 4.0, 3HAC9218-1
Robot User Documentation	S4Cplus/IRC M2000, 3HAC024788-001

1 Description

1.1 Structure

1.1.1 Introduction

Robot family

A new world of possibilities opens up with ABB’s IRB 6600 robot family. It comes in seven versions:

Handling capacity (kg)	Reach (m)
175 kg	2.55 m
225 kg	2.55 m
175 kg	2.8 m
125 kg	3.2 m
200 kg	2.75 m
125 kg	3.5 m
200 kg	3.0 m

The IRB 6600 is ideal for process applications, regardless of industry. Typical areas can be spotwelding, 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 operating system BaseWare OS. BaseWare OS controls every aspect of the robot, like motion control, development and execution of application programs, communication etc. See Product Specification - Controller, S4Cplus.

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support - for example spot welding, communication features - network communication - and advanced functions such as multi-tasking, sensor control, etc. For a complete description on optional software, see the Product Specification - RobotWare 4.0.

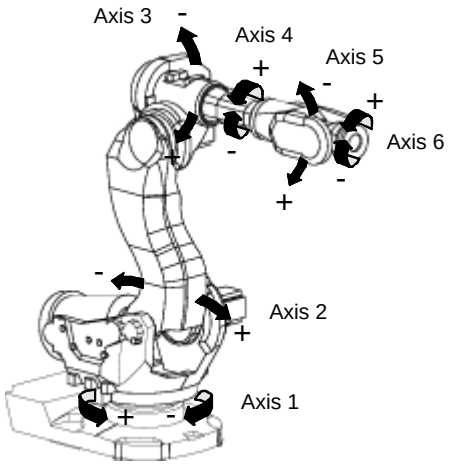


Figure 1 The IRB 6600 manipulator has 6 axes.

1.1.2 Different robot versions

General

The IRB 6600 is available in seven versions.

Standard

The following different standard robot types are available:

Robot type	Handling capacity (kg)	Reach (m)
IRB 6600	175 kg	2.55 m
IRB 6600	225 kg	2.55 m
IRB 6600	175 kg	2.8 m
IRB 6650	125 kg	3.2 m
IRB 6650	200 kg	2.75 m
IRB 6650S	125 kg	3.5 m
IRB 6650S	200 kg	3.0 m

1.1.3 Definition of version designation

IRB 6600 Mounting

Handling capacity/ Reach

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

Manipulator weight

Robot type	Handling capacity	Reach	Weight
IRB 6600	175 kg	2.55 m	1700 kg[a]
IRB 6600	225 kg	2.55 m	1700 kg[a]
IRB 6600	175 kg	2.8 m	1725 kg[a]
IRB 6650	125 kg	3.2 m	1750 kg[a]
IRB 6650	200 kg	2.75 m	1725 kg[a]
IRB 6650S	125 kg	3.5 m	2175 kg[a]
IRB 6650S	200 kg	3.0 m	2150 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 98/37/EEC)

Power consumption at max load

Type of Movement	IRB 6600/ 6650	IRB 6650S
ISO Cube	2.6 kW	2.4 kW
Normal robot movements	3.8 kW	-

1.1.3 Definition of version designation

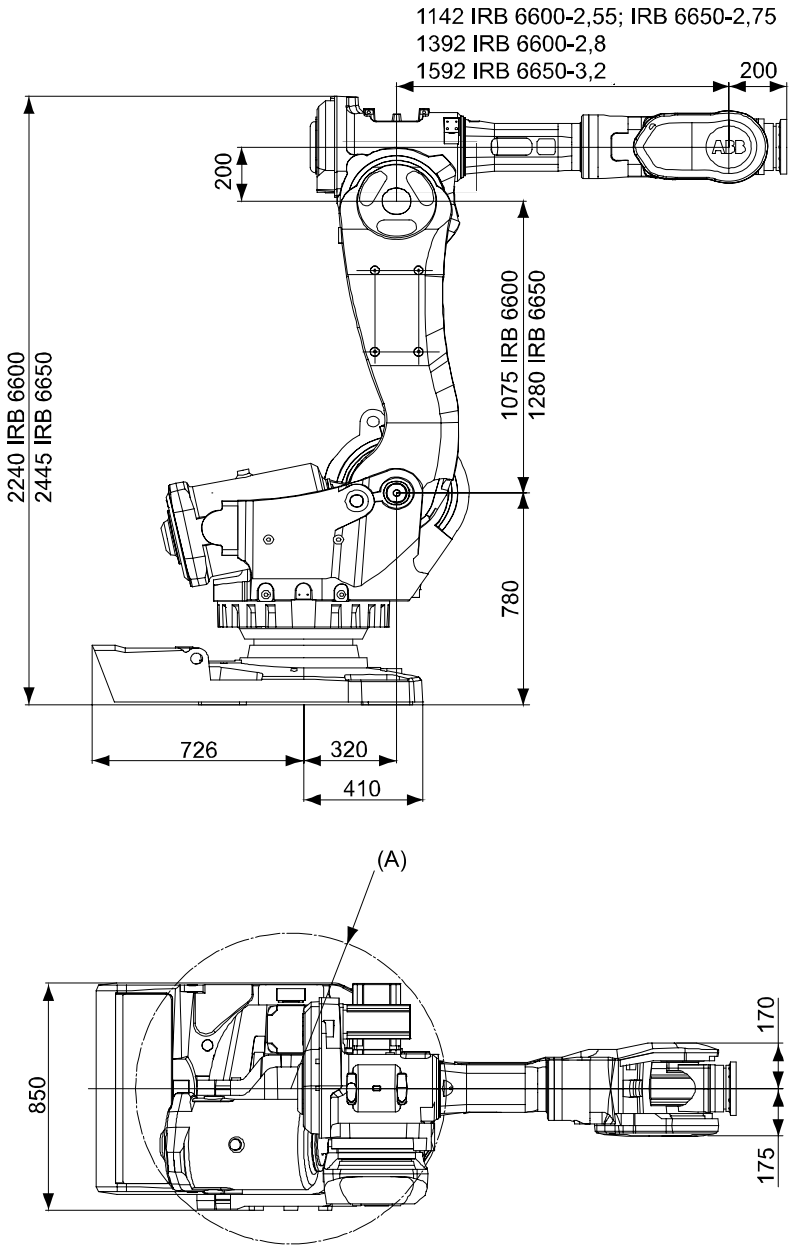


Figure 2 View of the IRB 6600 and IRB 6650 manipulator from the side and above (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.

Pos	Description
A	R 580 for type A R 595 for type B (front side, motor axis 2) R 690 with fork lift

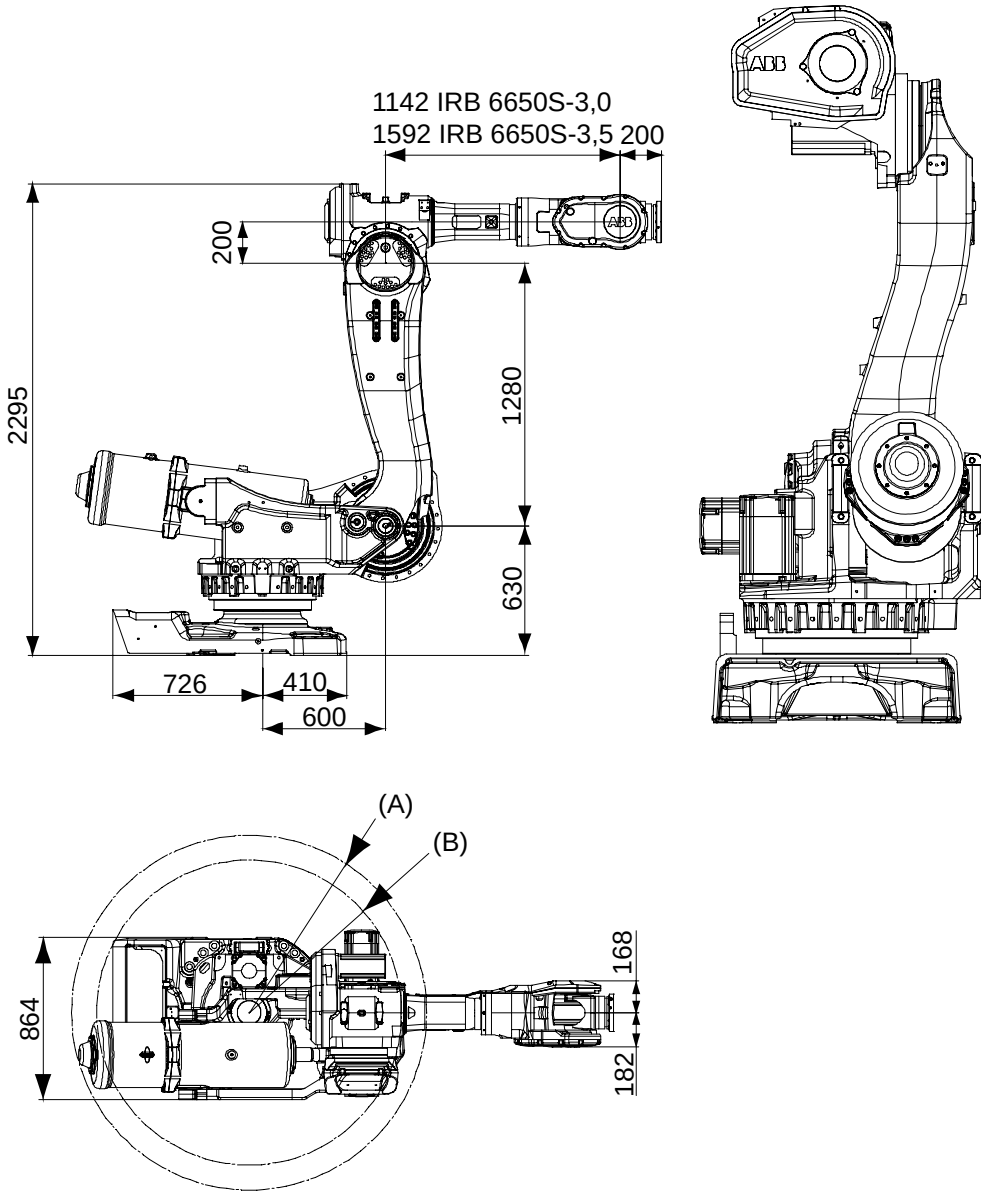


Figure 3 View of the IRB 6650S Manipulator from side and above (dimensions in mm). Allow 200 mm behind the manipulator foot for DressPack.

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

1.2 Safety/Standards

1.2.1 Standards

The robot conforms to the following standards:

Standard	Description
EN ISO 12100 -1	Safety of machinery, terminology
EN ISO 12100 -2	Safety of machinery, technical specifications
EN 954-1	Safety of machinery, safety related parts of control systems
EN 60204	Electrical equipment of industrial machines
EN 775	Electrical equipment of industrial machines
EN 61000-6-4 (option)	EMC, Generic emission
EN 61000-6-2	EMC, Generic immunity

Standard	Description
IEC 60204-1	Electrical equipment of industrial machines
IEC 60529	Degrees of protection provided by enclosures

Standard	Description
ISO 10218	Manipulating industrial robots, safety
ISO 9787	Manipulating industrial robots, coordinate systems and motions

Standard	Description
ANSI/RIA 15.06/1999	Safety Requirements for Industrial Robots and Robot Systems.
ANSI/UL 1740-1998 (option)	Safety Standard for Robots and Robotic Equipment
CAN/CSA Z 434-03 (option)	Industrial Robots and Robot Systems - General Safety Requirements

The robot complies fully with the health and safety standards specified in the EEC’s Machinery Directives.

The Service Information System (SIS)

The service information system gathers information about the robot’s usage and determines how hard the robot is used. The usage is characterized by the speed, the rotation angles and the load of every axis.

With this data collection, the service interval of every individual robot of this generation can be predicted, optimizing and planning ahead service activities. The collection data is available via the teach pendant or the network link to the robot.

The Process Robot Generation is designed with absolute safety in mind. It is dedicated to actively or passively avoid collisions and offers the highest level of safety to the operators and the machines as well as the surrounding and attached equipment. These features are presented in the active and passive safety system.

1.2.2 The Active Safety System

General

The active safety system includes those software features that maintain the accuracy of the robot's path and those that actively avoid collisions which can occur if the robot leaves the programmed path accidentally or if an obstacle is put into the robot's path.

The Active Brake System (ABS)

All robots run with an active brake system that supports the robots to maintain the programmed path even in emergency situations.

The ABS is active during all stop modes, braking the robot to a stop with the power of the servo drive system along the programmed path. After a specific time the mechanical brakes are activated ensuring a safe stop.

The stopping process is in accordance with a class 1 stop. The maximal applicable torque on the most loaded axis determines the stopping distance.

In case of a failure of the drive system or a power interruption, a class 0 stop turns out. While programming the robot in manual mode, the enabling device has a class 0 stop. ES and GS still have a class 1 stop.

The Self Tuning Performance (STP)

The Process Robot Generation is designed to run at different load configurations, many of which occur within the same program and cycle.

The robot's installed electrical power can thus be exploited to lift heavy loads, create a high axis force or accelerate quickly without changing the configuration of the robot.

Consequently the robot can run in a "power mode" or a "speed mode" which can be measured in the respective cycle time of one and the same program but with different tool loads. This feature is based on QuickMove™.

The respective change in cycle time can be measured by running the robot in NoMotionExecution with different loads or with simulation tools like RobotStudio.

The Electronically Stabilised Path (ESP)

The load and inertia of the tool have a significant effect on the path performance of a robot. The Process Robot Generation is equipped with a system to electronically stabilize the robot's path in order to achieve the best path performance.

This has an influence while accelerating and braking and consequently stabilizes the path during all motion operations with a compromise of the best cycle time. This feature is secured through TrueMove™.

Over-speed protection

The speed of the robot is monitored by two independent computers.

Restricting the working space

The movement of each axis can be restricted using software limits.

As options there are safeguarded space stops for connecting position switches to restrict the working space for axes 1-3.

Axes 1-3 can also be restricted by means of mechanical stops.

Collision detection (option)

In case of an unexpected mechanical disturbance , such as a collision, electrode sticking, etc., the robot will detect the collision, stop on the path and slightly back off from its stop position, releasing tension in the tool.

1.2.3 The Passive Safety System

General

The Process Robot Generation has a dedicated passive safety system that, by hardware construction and dedicated solutions, is designed to avoid collisions with surrounding equipment. It integrates the robot system into the surrounding equipment safely.

Compact robot arm design

The shape of the lower and upper arm system is compact, avoiding interference into the working envelope of the robot.

The lower arm is shaped inward, giving more space under the upper arm to re-orientate large parts and leaving more working space while reaching over equipment in front of the robot.

The rear side of the upper arm is compact, with no components projecting over the edge of the robot base even when the robot is moved into the home position.

Moveable mechanical limitation of main axes (option)

All main axes can be equipped with moveable mechanical stops, limiting the working range of every axis individually. The mechanical stops are designed to withstand a collision even under full load.

Position switches on main axes (option)

All main axes can be equipped with position switches. The double circuitry to the cam switches is designed to offer personal safety according to the respective standards.

1.2.4 The Internal Safety Concept

General

The internal safety concept of the Process Robot Generation is based on a two-channel circuit that is continuously monitored. If any component fails, the electrical power supplied to the motors shuts off and the brakes engage.

Safety category 3

Malfunction of a single component, such as a sticking relay, will be detected at the next MOTOR OFF/MOTOR ON operation. MOTOR ON is then prevented and the faulty section is indicated. This complies with category 3 of EN 954-1, Safety of machinery - safety related parts of control systems - Part 1.

Selecting the operating mode

The robot can be operated either manually or automatically. In manual mode, the robot can only be operated via the teach pendant, i.e. not by any external equipment.

Reduced speed

In manual mode, the speed is limited to a maximum of 250 mm/s (600 inch/min.). The speed limitation applies not only to the TCP (Tool Center Point), but to all parts of the robot. It is also possible to monitor the speed of equipment mounted on the robot.

Three position enabling device

The enabling device on the teach pendant must be used to move the robot when in manual mode. The enabling device consists of a switch with three positions, meaning that all robot movements stop when either the enabling device is pushed fully in, or when it is released completely. This makes the robot safer to operate.

Safe manual movement

The robot is moved using a joystick instead of the operator having to look at the teach pendant to find the right key.

Emergency stop

There is one emergency stop push button on the controller and another on the teach pendant. Additional emergency stop buttons can be connected to the robot’s safety chain circuit.

Safeguarded space stop

The robot has a number of electrical inputs which can be used to connect external safety equipment, such as safety gates and light curtains. This allows the robot's safety functions to be activated both by peripheral equipment and by the robot itself.

Delayed safeguarded space stop

A delayed stop gives a smooth stop. The robot stops in the same way as at a normal program stop with no deviation from the programmed path. After approx. 1 second the power supplied to the motors is shut off.

Hold-to-run control

"Hold-to-run" means that you must depress the start button in order to move the robot. When the button is released the robot will stop. The hold-to-run function makes program testing safer.

Fire safety

Both the manipulator and control system comply with UL's (Underwriters Laboratories Inc.) tough requirements for fire safety.

Safety lamp (option)

As an option, the robot can be equipped with a safety lamp mounted on the manipulator. This is activated when the motors are in the MOTORS ON state.

This option is not available for S4Cplus Automotive

1.3 Installation

1.3.1 Introduction

General

All versions of IRB 6600 are designed for floor mounting. Depending on the robot version, an end effector with max. weight of 175 to 225 kg including payload, can be mounted on the mounting flange (axis 6). See Load diagram for IRB 6600 generation robots on page 32.

Extra Loads

Extra loads (valve packages, transformers) can be mounted on the upper arm with a maximum weight of 50 kg. All versions can mount an extra load of 500 kg on the frame of axis 1. Holes for mounting extra equipment on IRB 6600/6650, see page 47.

Working Range

The working range of axes 1-3 can be limited by mechanical stops. Position switches can be supplied on axes 1-3 to indicate the position of the manipulator.

External Mains Transformer

For mains voltage 200V and 220V an external transformer will be included.

1.3.2 Operating requirements

Protection standards

Standard and Foundry Manipulator IP67

Cleanroom standards

Cleanroom class 100 for manipulator except IRB 6650S according to:

Standards	Description
DIN EN ISO 14644	Cleanrooms and associated controlled environments
US Federal Standard 209	e-Air-clean-classes

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 ºC (+ 41ºF) to + 50ºC (+ 122ºF)
For the controller	Standard Option S4Cplus Automotive	 + 45ºC (+ 113ºF)
For the controller	Option	+ 52ºC (+ 126ºF)
Complete robot during transportation and storage	Standard	- 25ºC (- 13ºF) to + 55ºC (+ 131ºF)
For short periods (not exceeding 24 hours)	Standard	up to + 70ºC (+ 158ºF)

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

1.3.3 Mounting the manipulator

Maximum Load

Maximum load in relation to the base coordinate system.

	Endurance load in operation all IRB 6600/ 6650	Max. load at emergency stop all IRB 6600/ 6650
Force xy	± 10.1 kN	± 20.7 kN
Force z	18.0 ± 13.8 kN	18.0 ± 22.4 kN
Torque xy	± 27.6 kNm	± 50.6 kNm
Torque z	± 7.4 kNm	± 14.4 kNm

	Endurance load in operation IRB 6650S	Max. load at emergency stop IRB 6650S
Force xy	± 10.6 kN	± 20.9 kN
Force z	28.2 ± 7.7 kN	28.2 ± 16.4 kN
Torque xy	28.2 kN	50.5 kNm
Torque z	7.9 kN	13.6 kNm

When using Base spacers (option 571-1) the Torque xz on the floor is for IRB 6600/6650, 30,4 kNm and for IRB 6650S, 31 kNm for Endurance load in operation and for IRB 6600/ 6650, 55,7 kNm and for IRB 6650S, 55,6 kNm for Max. load at emergency stop. The other values above are the same as without Base spacers.

Fastening holes robot base - for all variants except IRB 6650S

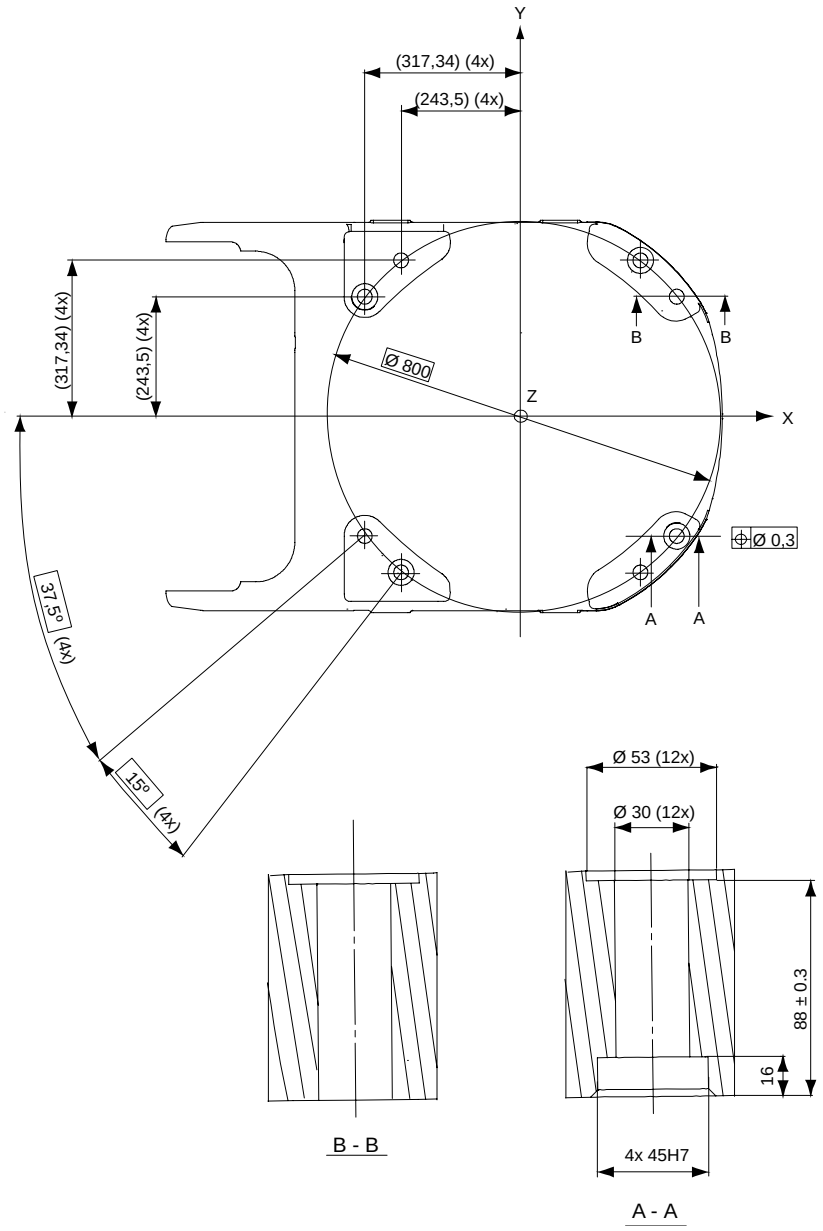


Figure 4 Hole configuration (dimensions in mm).

Recommended screws for fastening the manipulator to the base	M24 x 140 8.8 with 4 mm flat washer
Torque value	775 Nm

Only two guiding pins shall be used. The corresponding holes in the base plate shall be circular and oval according to Figure 6 and Figure 9.

Regarding AbsAcc performance, the chosen guide holes according to Figure 6 and Figure 9 are recommended.

Fastening holes robot base - for IRB 6650S

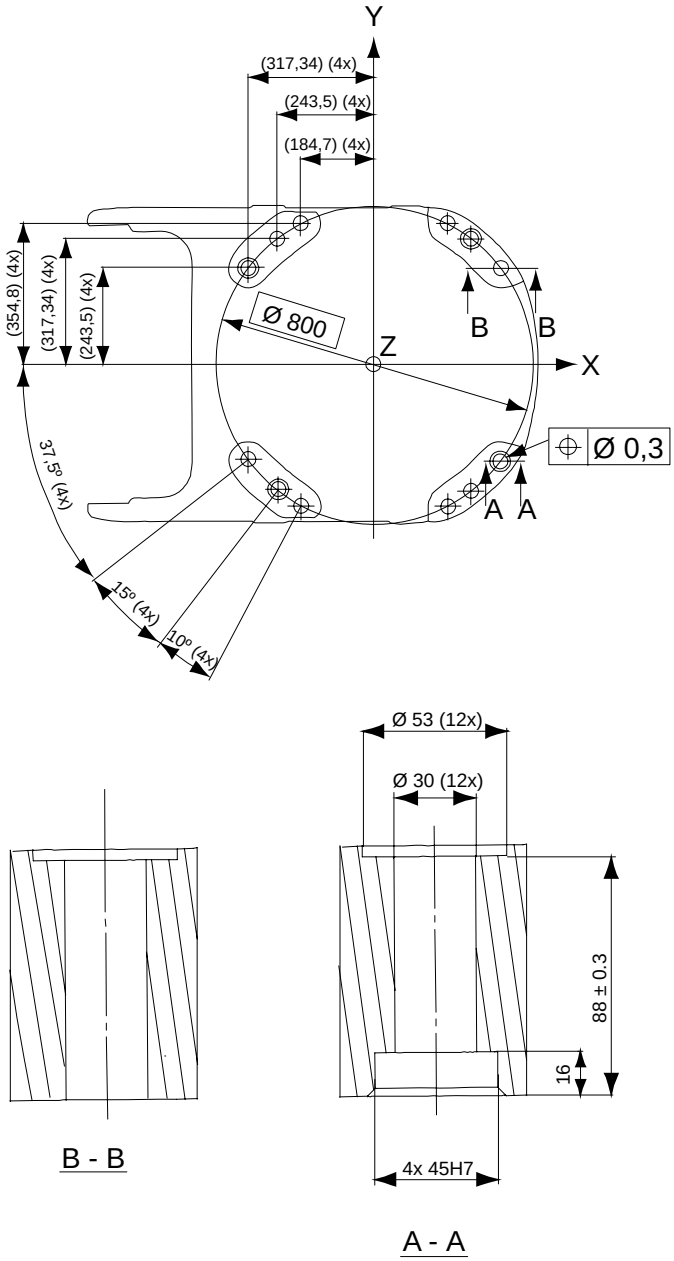


Figure 5 Hole configuration (dimensions in mm).

Recommended screws for fastening the manipulator to the base	M24 x 140 8.8 with 4 mm flat washer
Torque value	775 Nm

Only two guiding pins shall be used. The corresponding holes in the base plate shall be circular and oval according to Figure 6 and Figure 9.

Regarding AbsAcc performance, the chosen guide holes according to Figure 6 and Figure 9 are recommended.

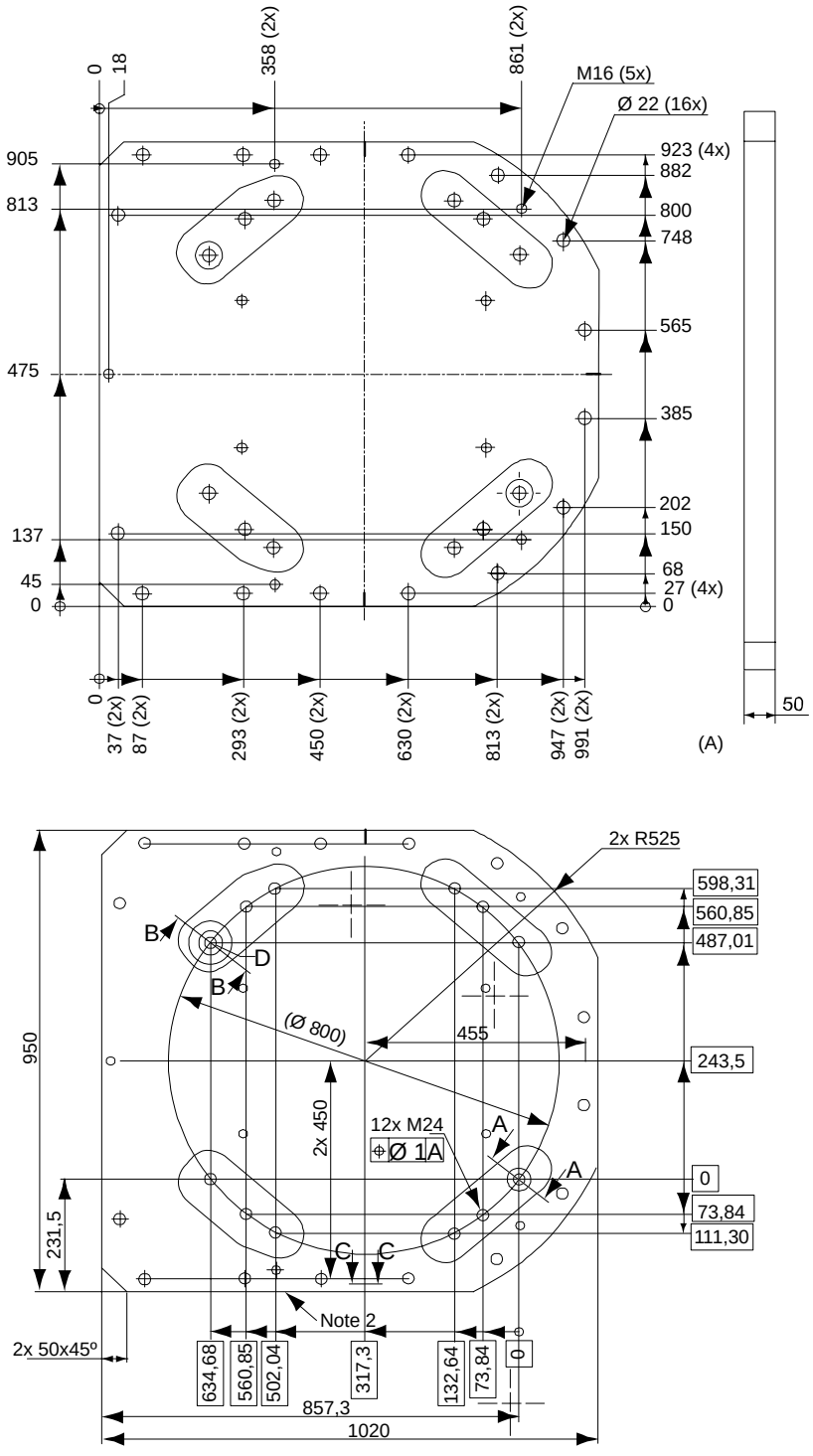


Figure 6 Base plate dimension print, main dimensions and holes measurements (dimensions in mm).

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

1.3.3 Mounting the manipulator

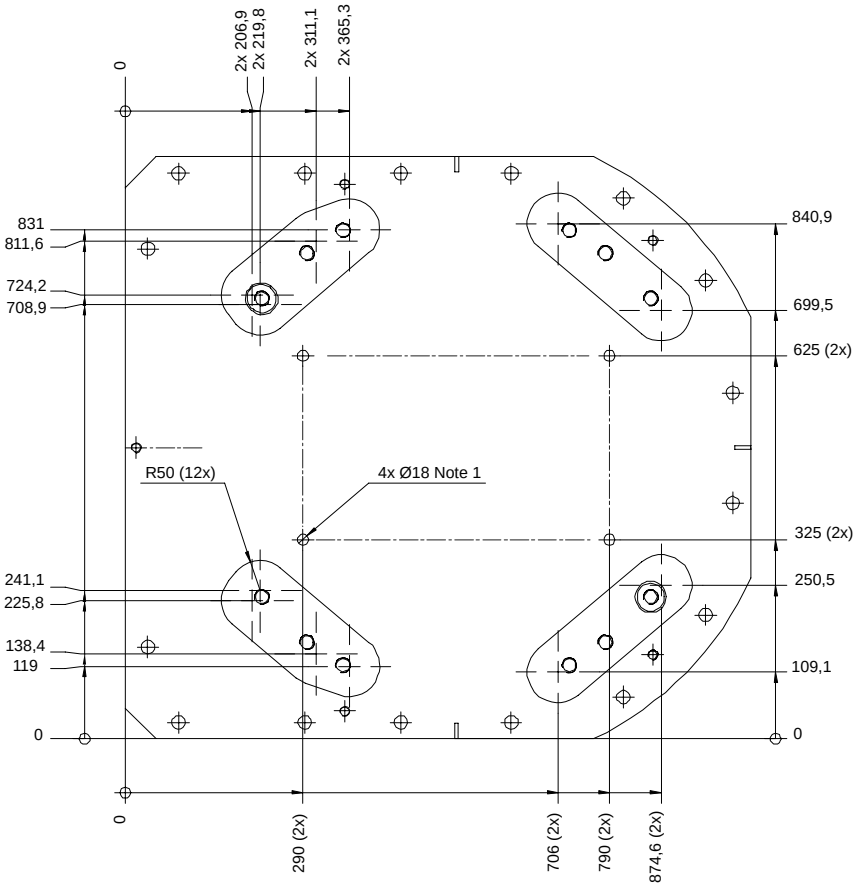


Figure 7 Base plate dimension print, measurements of the adaption for the robot base (dimension in mm).

Two guiding pins required, dimensions see Figure 8.

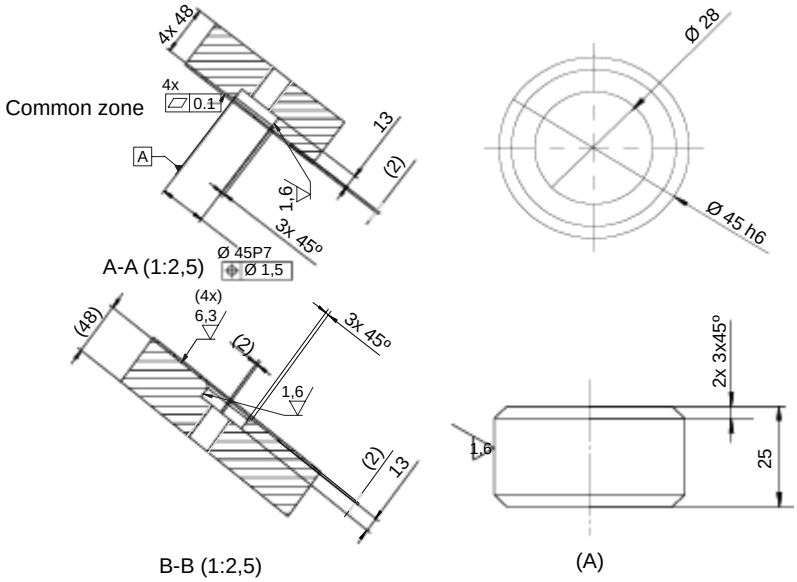


Figure 8 Sections of base plate and guide sleeve (dimensions in mm).

Pos	Description
A	Guide sleeve protected from corrosion

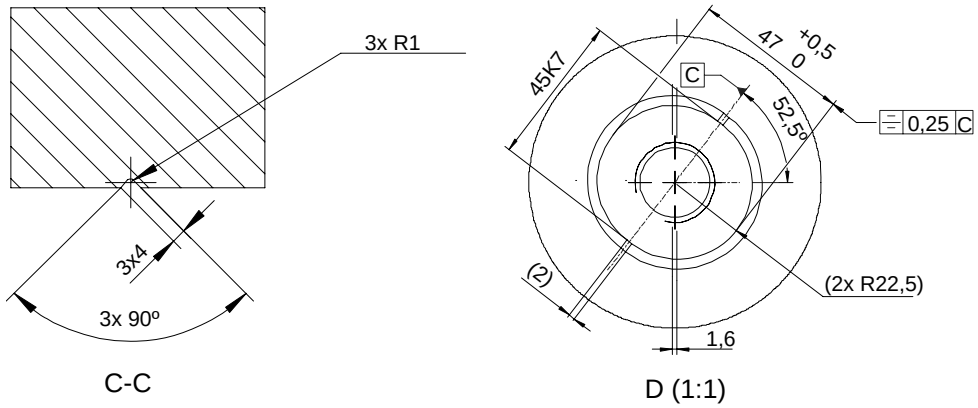


Figure 9 Sections of base plate (dimensions in mm).

1.4 Calibration and references

1.4.1 Fine calibration

General

Fine calibration is made using the Calibration Pendulum, please see Operating manual - Calibration Pendulum.

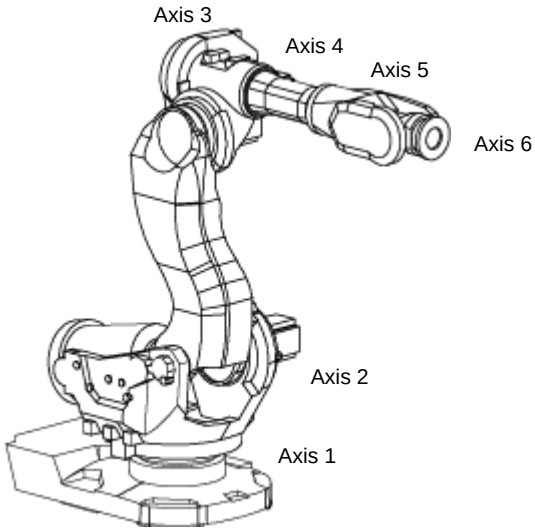


Figure 10 All axes in zero position.

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

1.4.2 Absolute Accuracy calibration

General

Requires RobotWare option Absolute Accuracy, please see Product Specification - RobotWare 4.0 for more details.

The calibration concept

Absolute Accuracy (AbsAcc) is a calibration concept, which ensures a TCP absolute accuracy of better than ± 1 mm in the entire working range (working range of bending backward robots, eg IRB 6600, are limited to only forward positions).

Absolute accuracy compensates for:

- Mechanical tolerances in the robot structure
- Deflection due to load

Absolute accuracy calibration is focusing on positioning accuracy in the cartesian coordinate system for the robot. It also includes load compensation for deflection caused by the tool and equipment. Tool data from robot program is used for this purpose. The positioning will be within specified performance regardless of load.

Calibration data

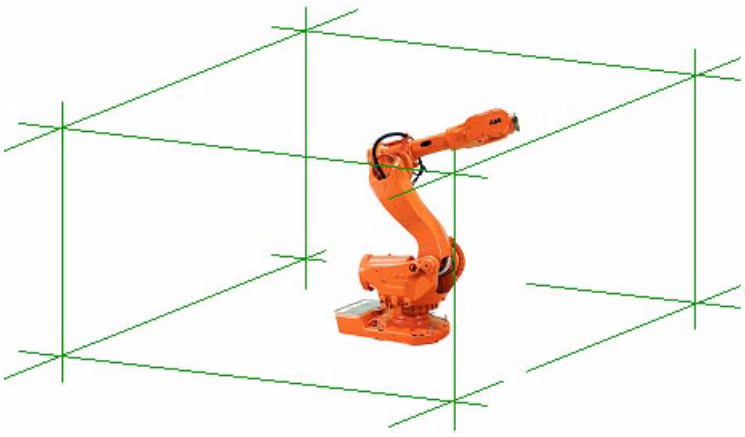
The user is supplied with robot calibration data (compensation parameter file, absacc.cfg) and a certificate that shows the performance (Birth certificate). The difference betwenn an ideal robot and a real robot without AbsAcc can typically be 8 mm, resulting from mechanical tolerances and deflection in the robot structure.

Absolute Accuracy option

Absolute Accuracy option is integrated in the controller algorithms for compensation of this difference and does not need external equipment or calculation.

Absolute Accuracy is a RobotWare option and includes an individual calibration of the robot (mechanical arm).

Absolute Accuracy is a TCP calibration in order to reach a good positioning in the Cartesian coordinate system.



1.4.2 Absolute Accuracy calibration

Figure 11 The Cartesian coordinate system.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 6600 - 175/2.55 225/2.55 175/2.80 125/3.20 200/2.75	0,50	1,20	97
IRB 6650 - 125/3.20 200/2.75	0,50	1,20	97
IRB 6650S - 125/3.50 200/3.00	0,50	1,20	97

1.4.3 Robot references

Figure 12 Four Ø12 H8 (depth 12) on radius 400 mm from axis 1 center on robot base.

Figure 13 One Ø12 H8 (depth 12) in +x- direction from axis 1 center of robot base.

1.4.3 Robot references

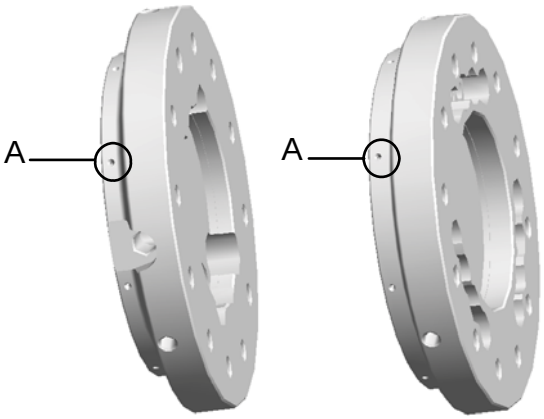


Figure 14 Seven holes (A) on a radius of x mm from axis 6 center on the two standard tool flanges.

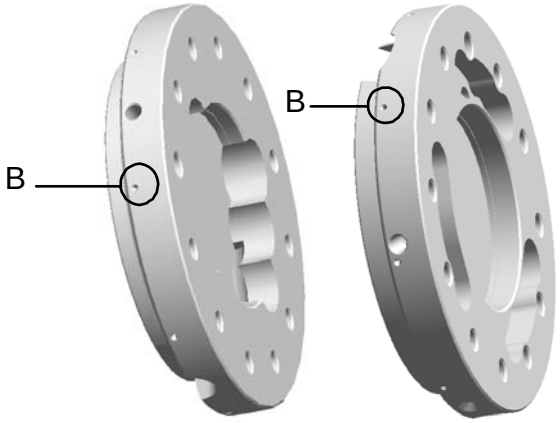


Figure 15 Seven holes (B) on a radius of x mm from axis 6 center on the two insulated tool flanges.

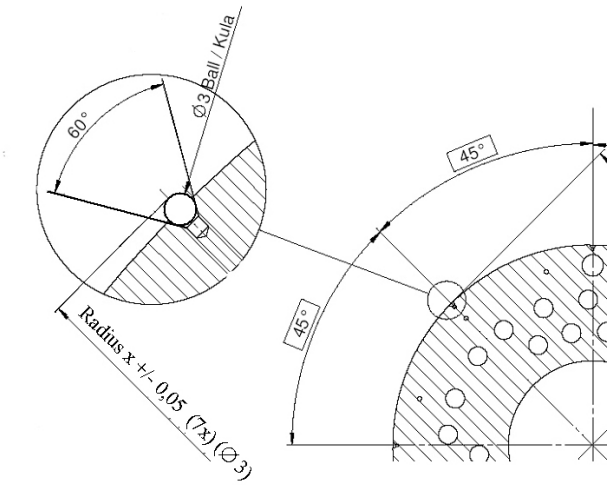


Figure 16 Detailed view of Tool Flange.

Robot	Radius X (mm) for references on tool flange	
	Standard	Insulated
IRB 6600 - 175/2.55	R=81,5	R=101,5
IRB 6600 -225/2.55 175/2.80 125/3.20 200/2.75	R=87,5	R=101,5
IRB 6650 - 125/3.20 200/2.75	R=87,5	R=101,5
IRB 6650S - 125/3.50 200/3.00	R=87,5	R=101,5

1.5 Load diagrams

1.5.1 Introduction

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, see Figure 17.

At different arm load, payload and moment of inertia, the load diagram will be changed.

Accurate Load Diagram

For an accurate load diagram, please use the calculation program ABB RobotLoad IRB 6600/7600 on:

- inside.abb.com/atma,click on Services --> Robotics --> Product Support --> RobotLoad --> IRB 6600.
- External web-address not yet available

ABB RobotLoad is an Stand alone application, which requires Microsoft.NET Framework and Microsoft Excel 9.0 software.

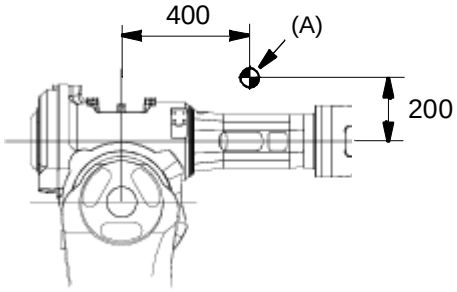


Figure 17 center of gravity for 50 kg extra load at arm housing (dimensions in mm).

Pos	Description
A	Center of gravity 50 kg

1.5.2 Diagrams

IRB 6600-175/2.55

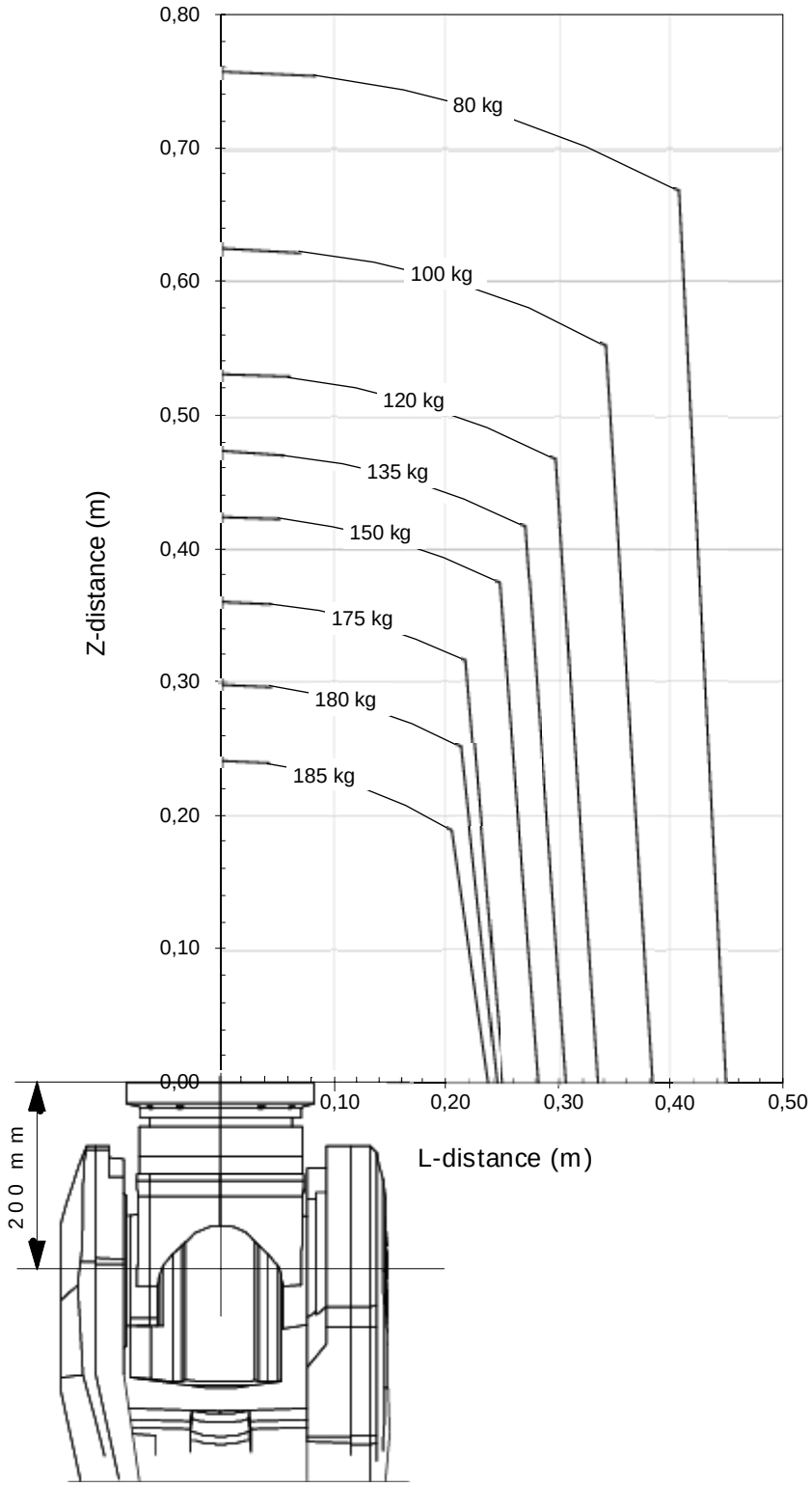


Figure 18 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

1.5.2 Diagrams

IRB 6600-175/2.55 “Vertical Wrist” (±10^{o})

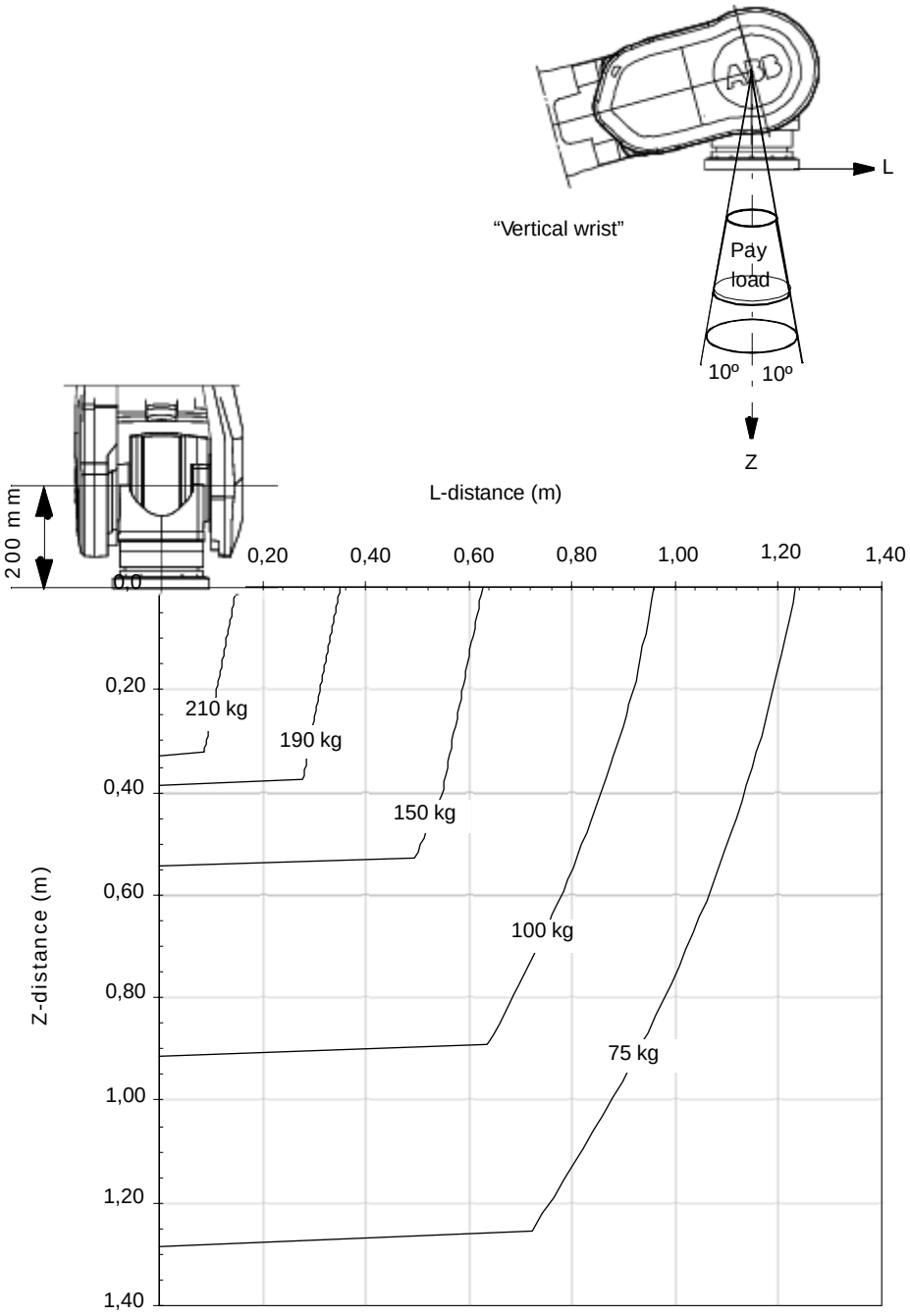


Figure 19 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10^{o}), J_0 =15 kgm^2.

	Description
Max load	215 kg
Z_{max}	0,310 m
L_{max}	0,133 m

IRB 6600-225/2.55

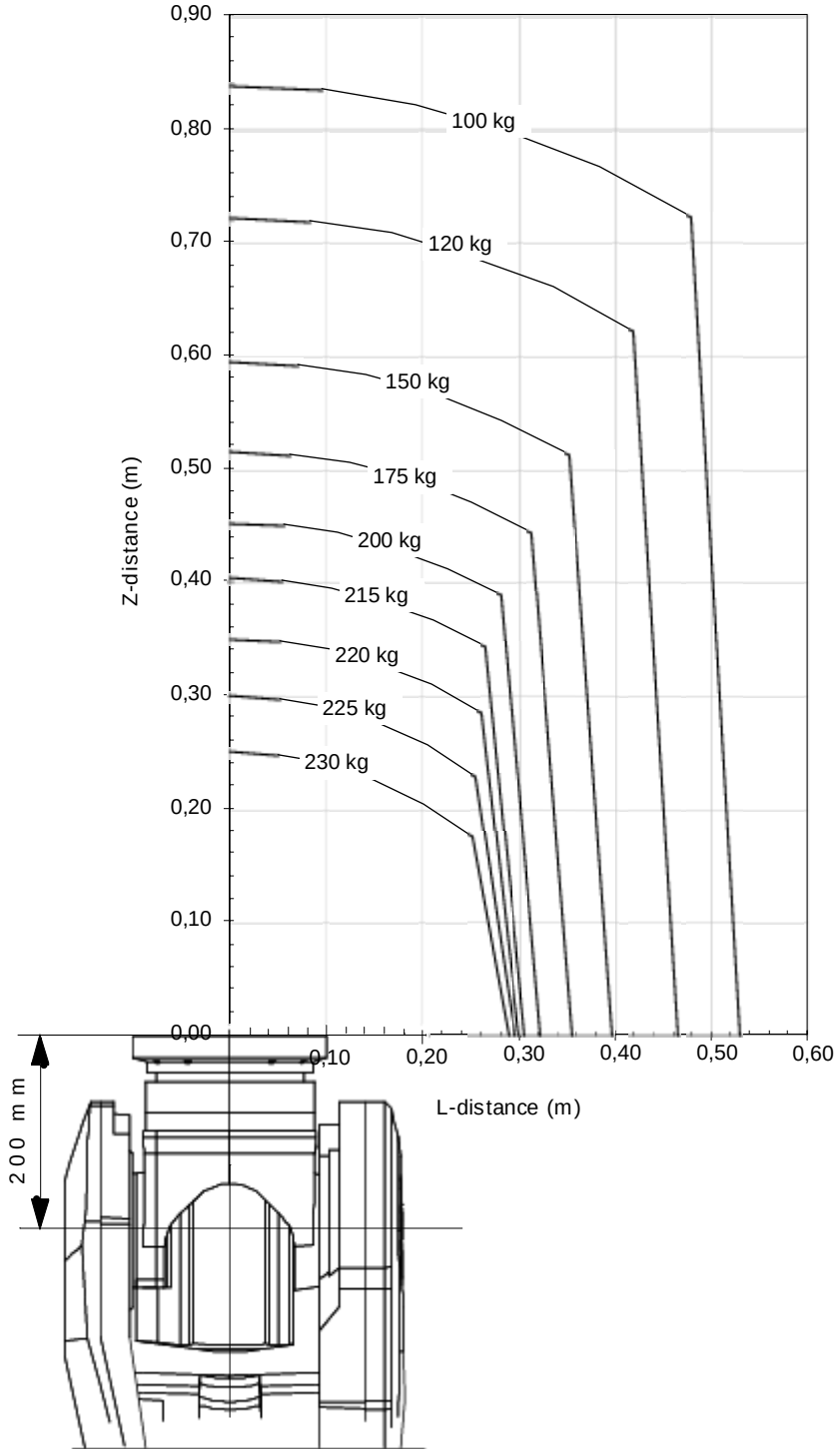


Figure 20 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

1.5.2 Diagrams

IRB 6600-225/2.55 “Vertical Wrist” (±10°)

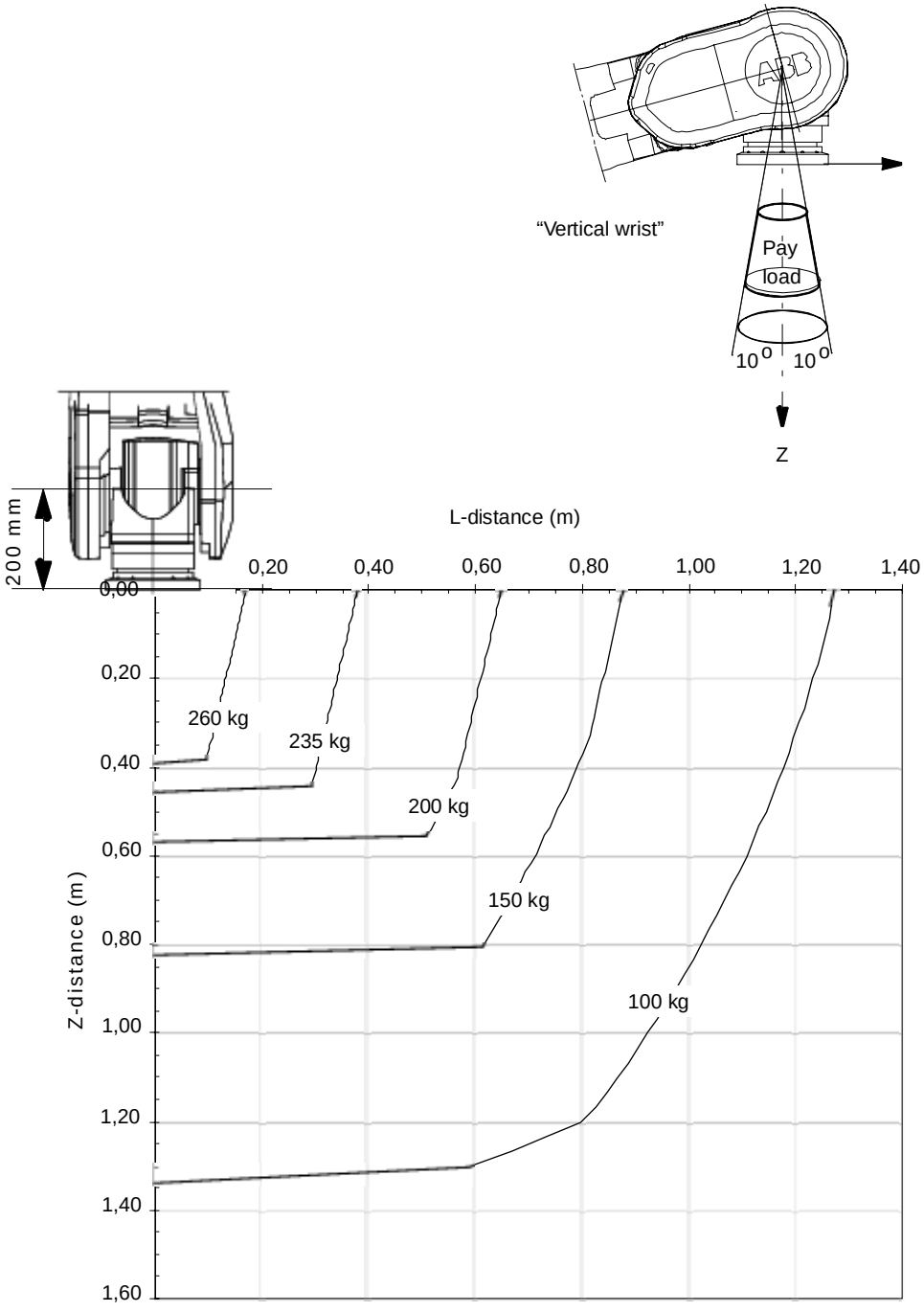


Figure 21 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

	Description
Max load	270 kg
Z_{max}	0,359 m
L_{max}	0,124 m

IRB 6600-175/2.8

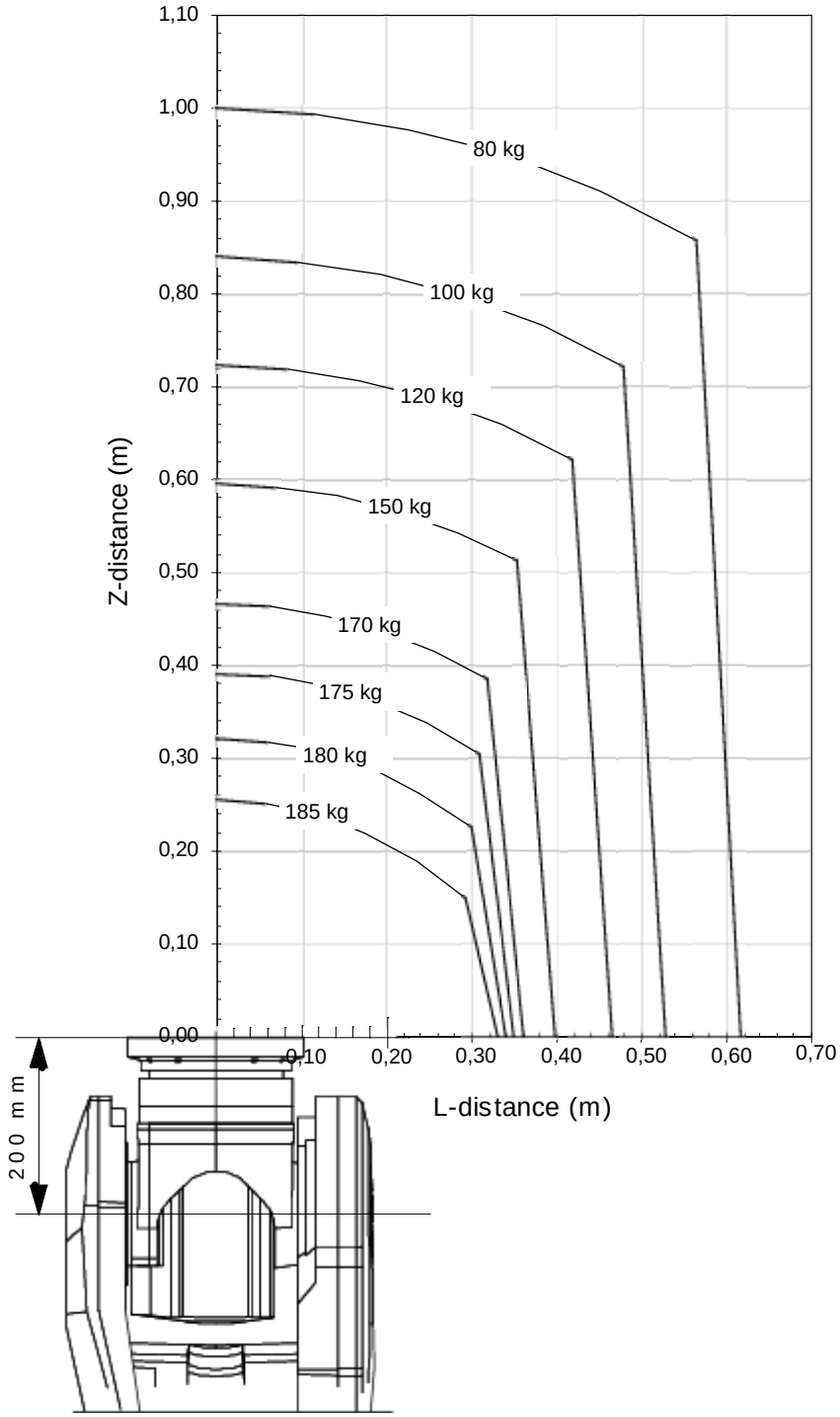


Figure 22 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

IRB 6600-175/2.8 “Vertical Wrist” (±10°)

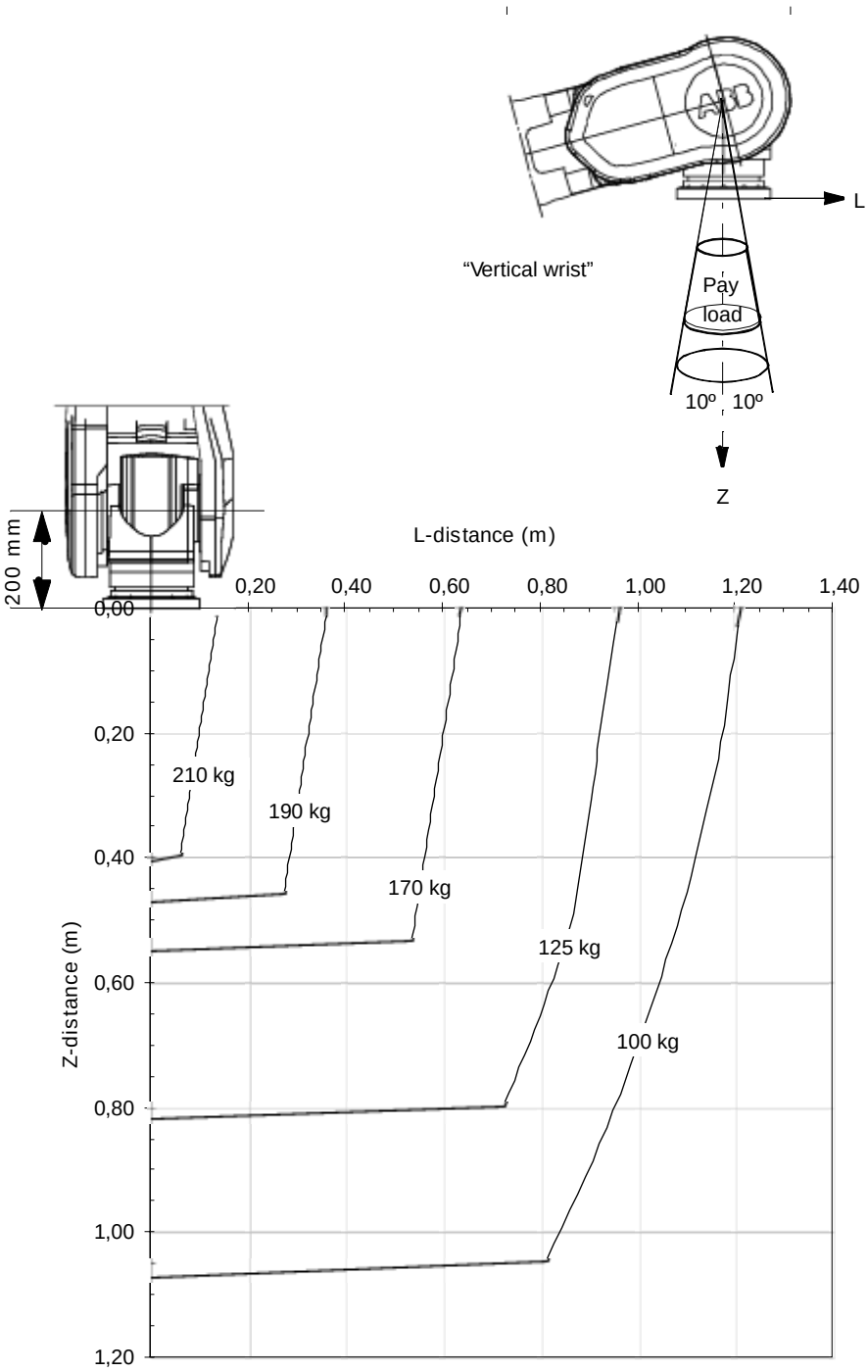


Figure 23 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

	Description
Max load	215 kg
Z_{max}	0,382 m
L_{max}	0,116 m

IRB 6650-125/3.2 and IRB 6650S-125/3.5

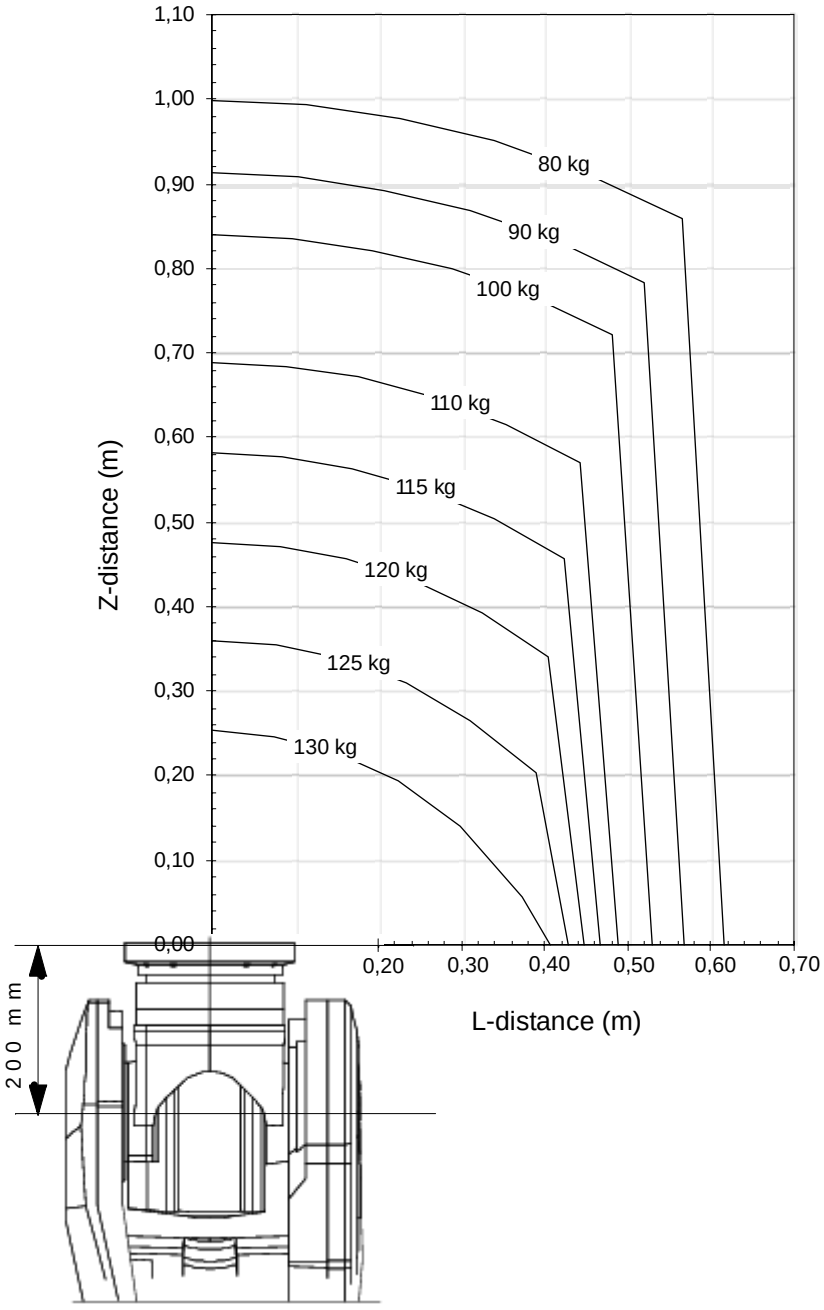


Figure 24 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

1.5.2 Diagrams

IRB 6650-125/3.2 and IRB 6650S-125/3.5 “Vertical Wrist” (±10°)

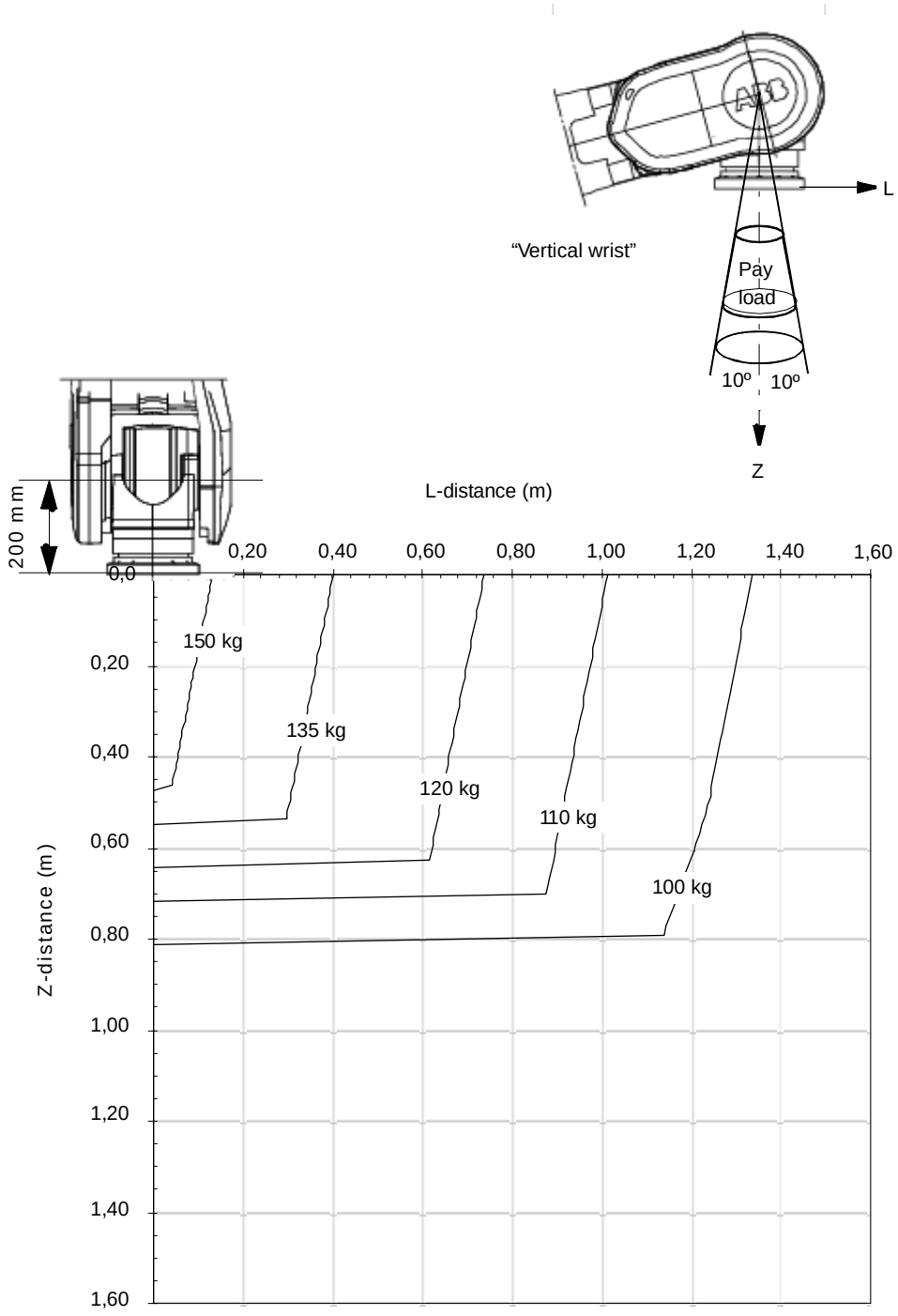


Figure 25 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

IRB 6650-200/2.75 and IRB 6650S-200/3.0

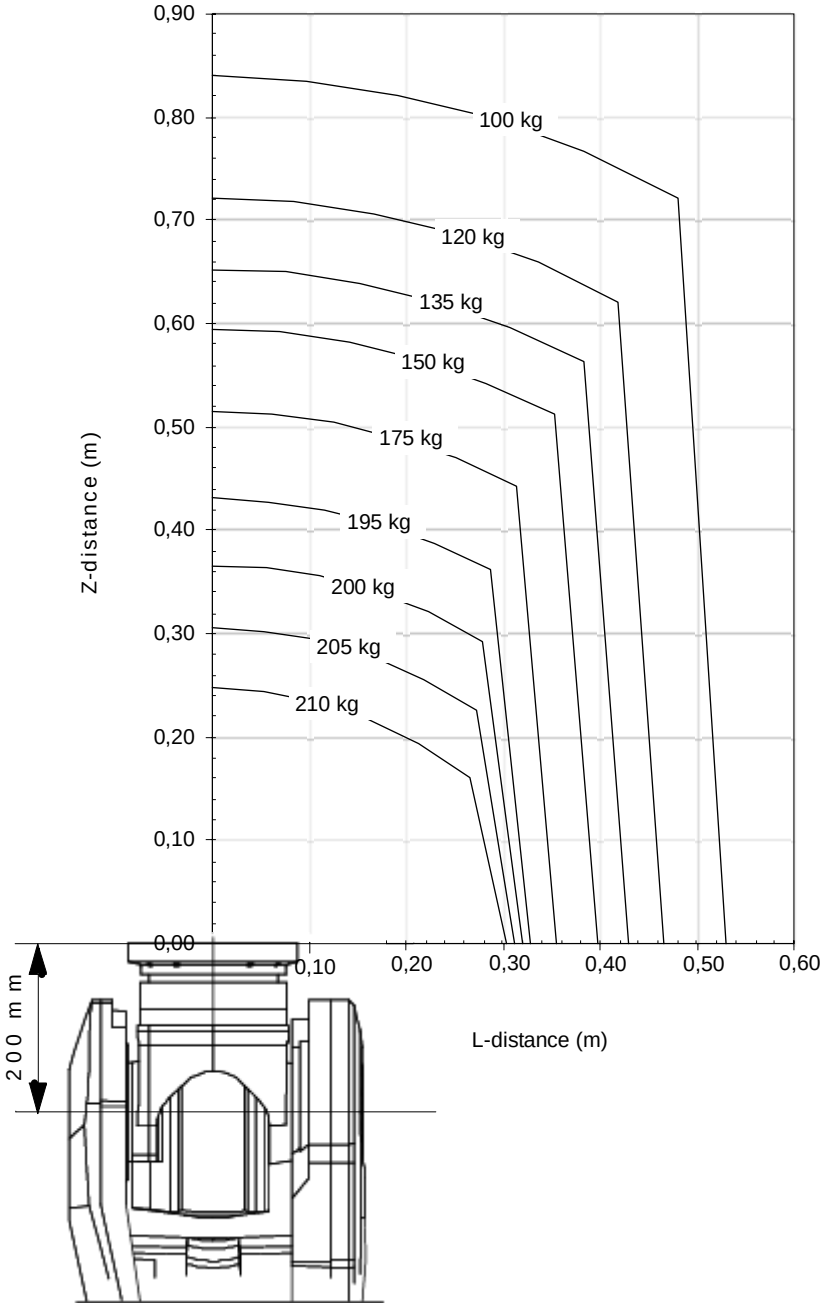


Figure 26 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

1.5.2 Diagrams

IRB 6650-200/2.75 and IRB 6650S-200/3.0 “Vertical Wrist” (±10°)

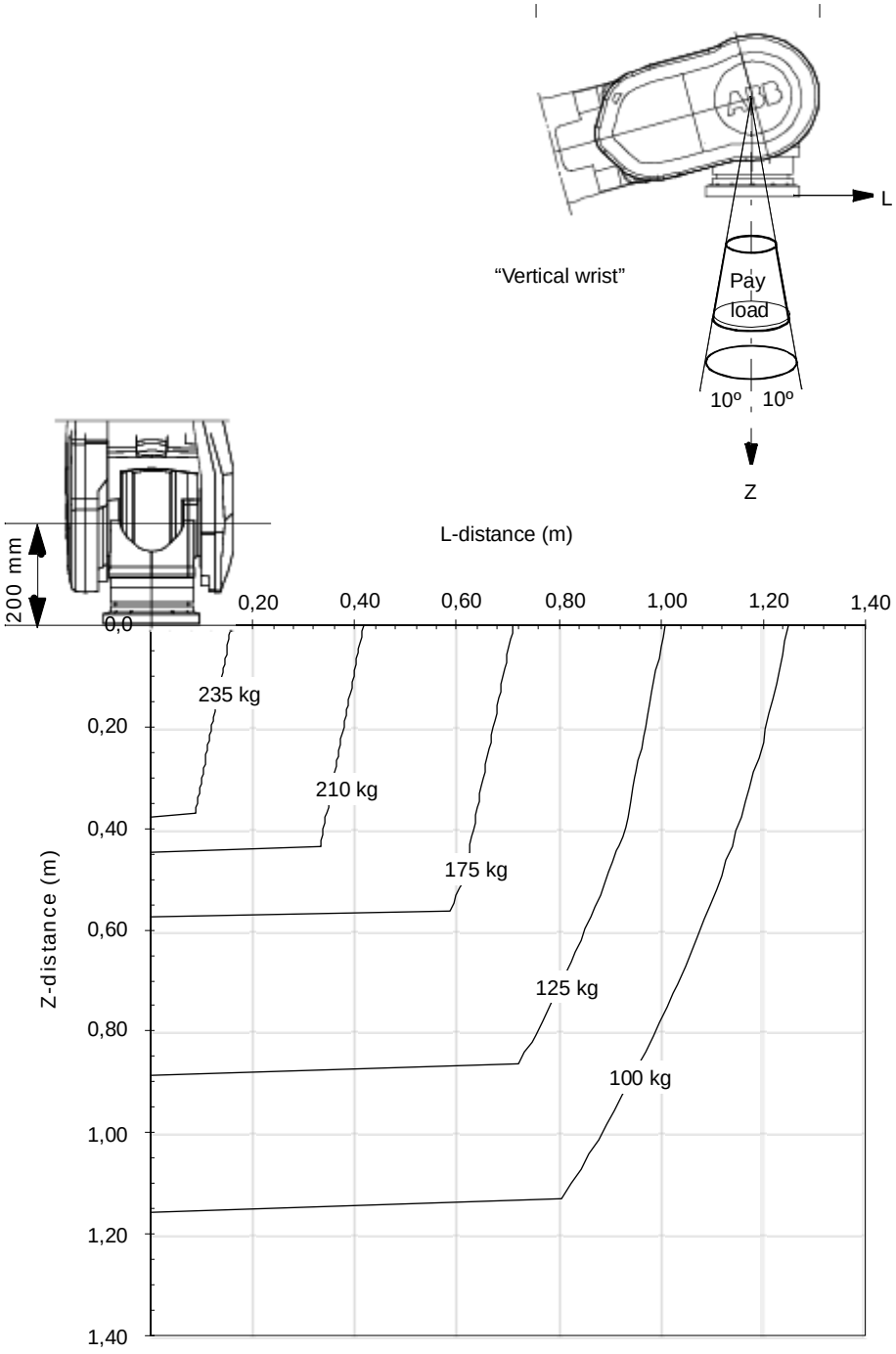


Figure 27 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

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

Load in kg, Z and L in m and J in kgm^2

Full movement of axis 5 (±120°)

Axis	Robot Type	Maximum moment of inertia
5	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	$Ja5 = Load \times ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 250\ kgm^2$
	175/2.55	$Ja5 = Load \times ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 195\ kgm^2$
6	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	$Ja6 = Load \times L^2 + J_{0Z} \leq 185\ kgm^2$
	175/2.55	$Ja6 = Load \times L^2 + J_{0Z} \leq 145\ kgm^2$

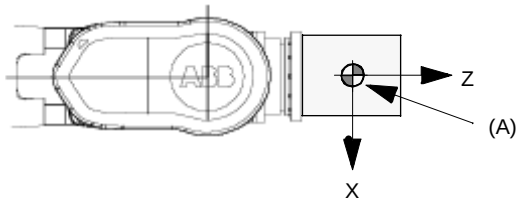


Figure 28 Moment of inertia when full movement of axis 5.

Pos	Description
A	Center of gravity.

	Description
J_{0L}	Maximum own moment of inertia around the maximum vector in the X-Y-plane.
J_{0Z}	Maximum own moment of inertia around Z.

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

Limited axis 5, center line down

Axis	Robot Type	Maximum moment of inertia
5	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	Ja5 = Load x $((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 275 kgm^2$
	175/2.55	Ja5 = Load x $((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 215\ kgm^2$
6	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	Ja6 = Load x $L^2 + J_{0Z} \leq 250\ kgm^2$
	175/2.55	Ja6 = Load x $L^2 + J_{0Z} \leq 195\ kgm^2$

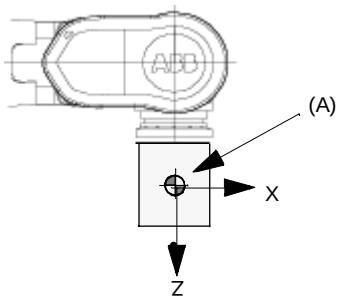


Figure 29 Moment of inertia when axis 5 center line down.

Pos	Description
A	Center of gravity.

	Description
J_{0L}	Maximum own moment of inertia around the maximum vector in the X-Y-plane.
J_{0Z}	Maximum own moment of inertia around Z.

1.5.4 Mounting equipment

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 Figure 30 and Figure 31. The robot is supplied with holes for mounting extra equipment (see Figure 32). 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 30):

M1 ≤ 50 kg with distance a ≤500 mm, center of gravity in axis 3 extension.

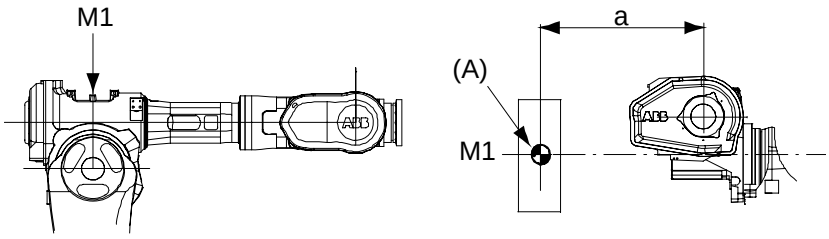


Figure 30 Permitted extra load on upper arm

Pos	Description
A	Mass center

Frame (Hip Load)

	Description
Permitted extra load on frame	J_H = 200 kgm^2
Recommended position (see Figure 31)	$J_H = J_{H0} + M4 \times R^2$ 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).

1.5.4 Mounting equipment

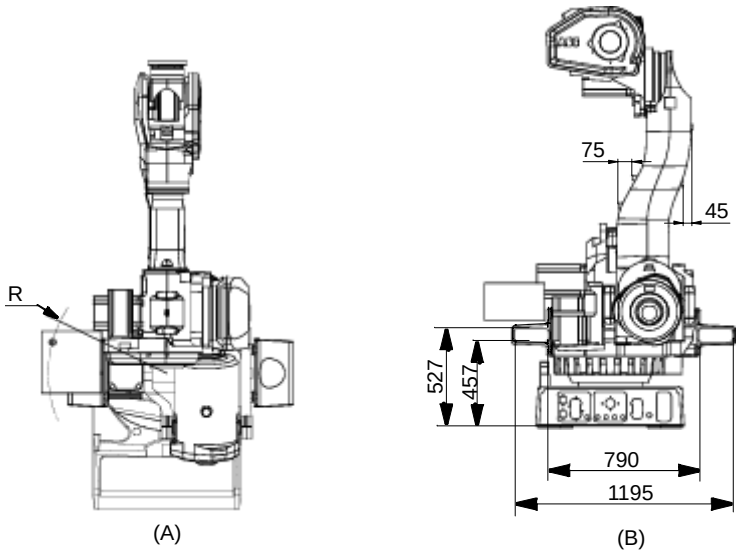


Figure 31 Extra load on the frame of IRB 6600 (dimensions in mm).

Pos	Description
A	View from above
B	View from the rear

1.5.5 Mounting of hip load

General

The extra load can be mounted on the frame. Holes for mounting see Figure 32 and Figure 33. When mounting on the frame all four holes (2x2, ∅16) on one side must be used.

Holes for mounting extra equipment on IRB 6600/6650

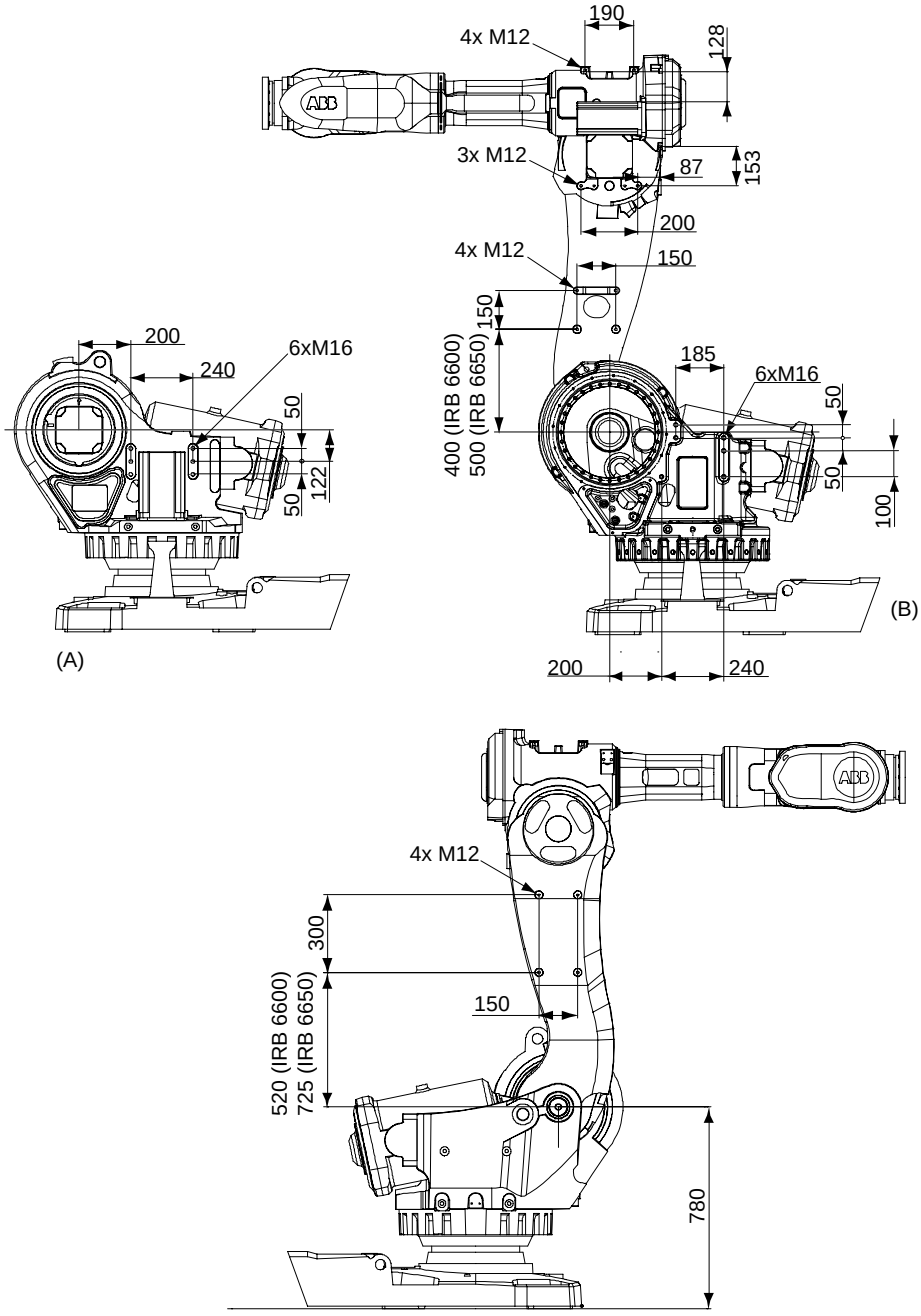


Figure 32 Holes for mounting extra equipment on the upper and the lower arm, and the frame on IRB 6600/ 6650 (dimensions in mm).

1.5.5 Mounting of hip load

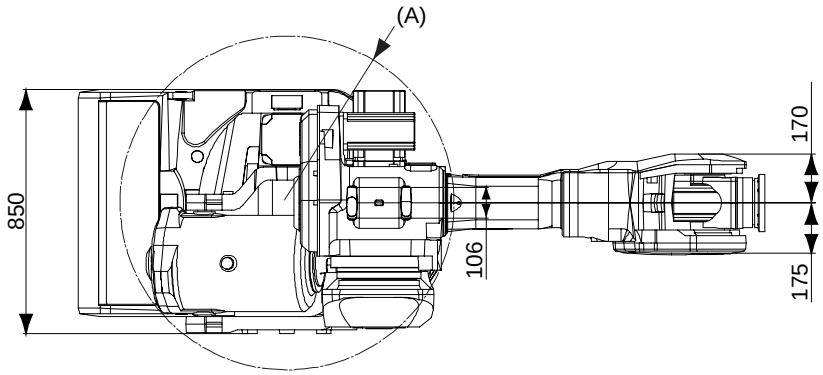


Figure 33 Holes for mounting of extra load on the upper arm on IRB 6600/6650 (dimensions in mm).

Pos	Description
A	R580 for Type A R595 for Type B R690 with fork lift

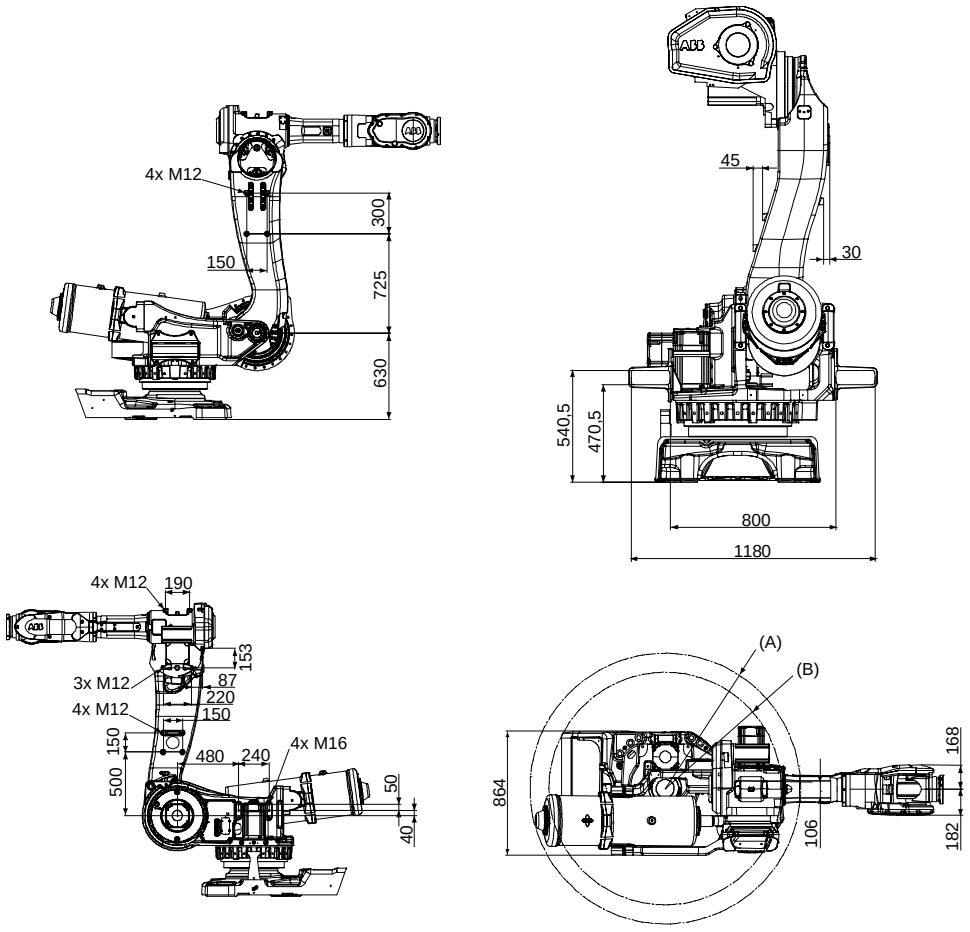


Figure 34 Holes for mounting extra load on upper arm on IRB 6650S (dimensions in mm).

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

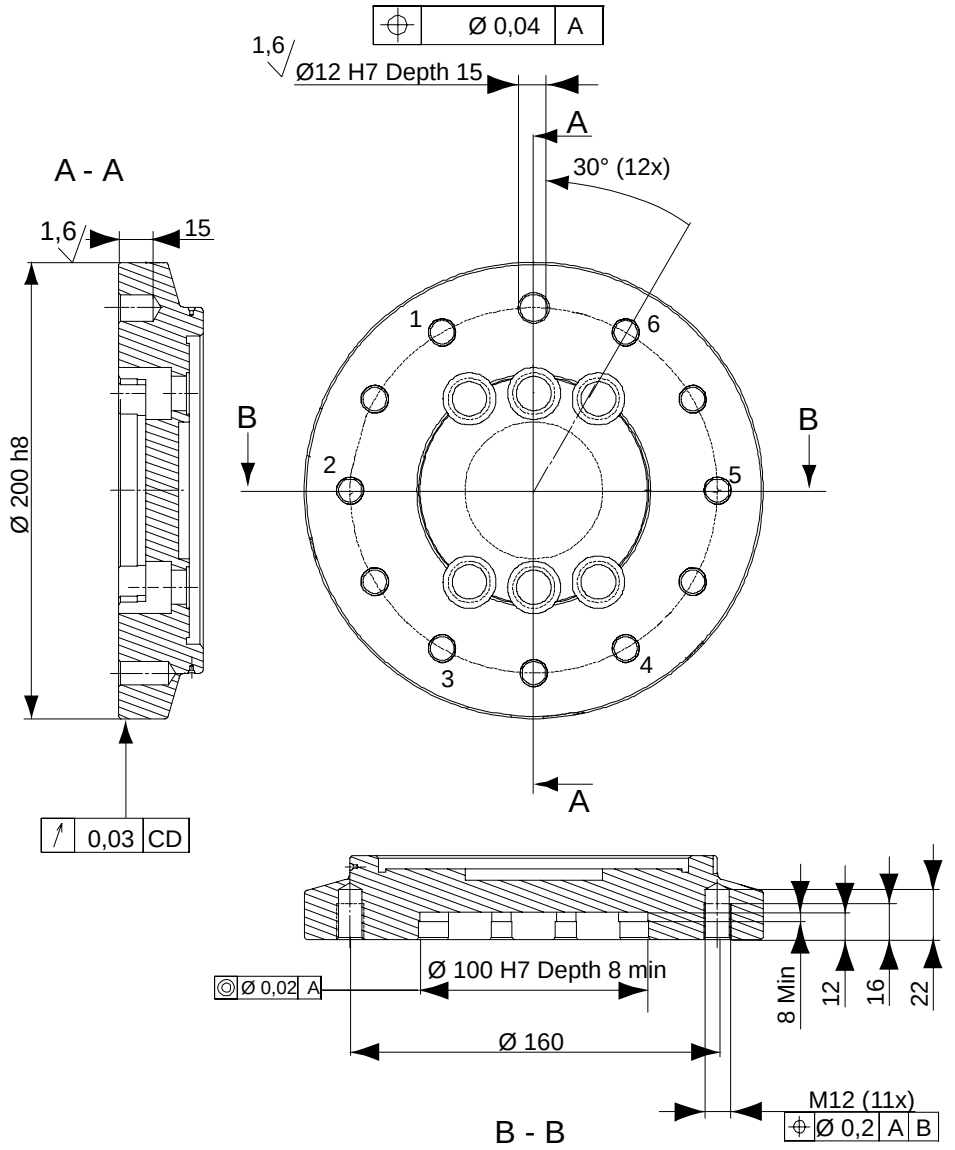


Figure 35 Robot tool flange ISO/DIS 9409-1:2002 (dimensions in mm).

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6600	175	2.55

For fastening of gripper-tool-flange to robot-tool-flange every other one (see Figure 35) of the bolt holes for 6 bolts quality class 12.9 shall be used.

1.5.5 Mounting of hip load

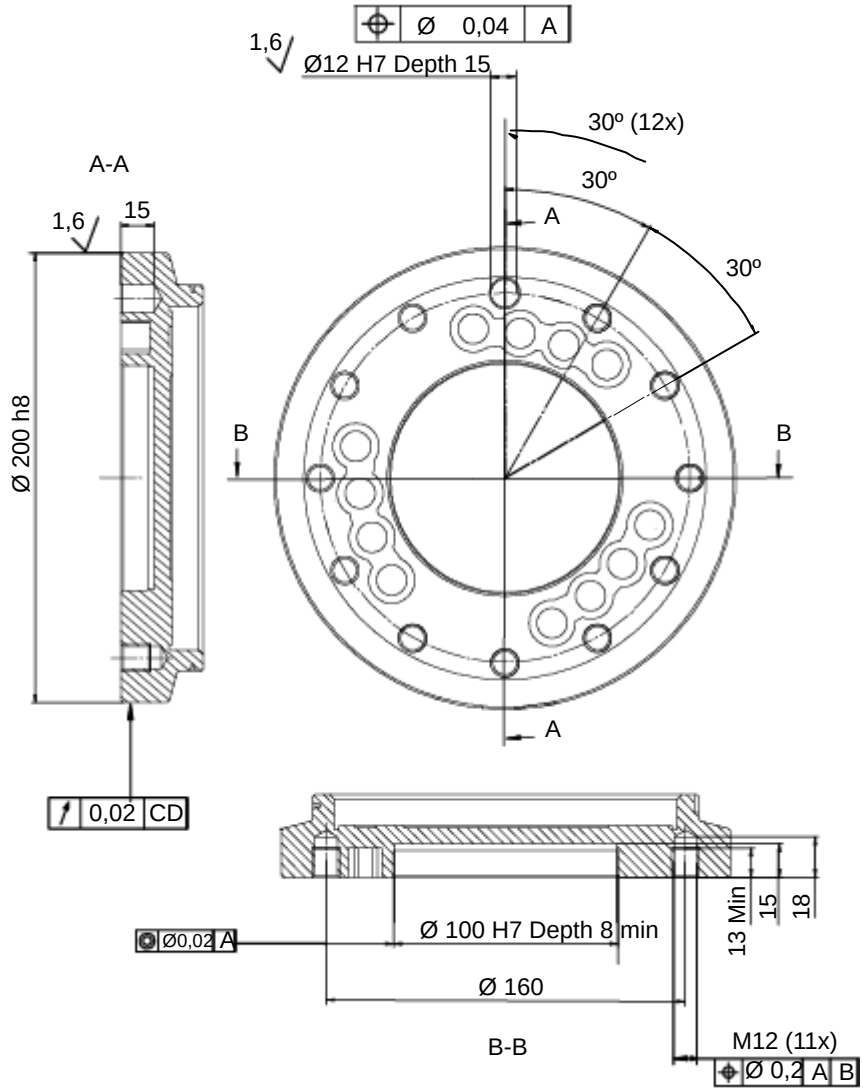


Figure 36 Robot tool flange ISO/DIS 9409-1:2002 (dimensions in mm).

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6600	225	2.55
IRB 6600	175	2.8
IRB 6650	125	3.2
IRB 6650	200	2.75
IRB 6650S	125	3.5
IRB 6650S	200	3.0

For fastening of gripper-tool-flange to robot-tool-flange all bolt holes for 11 bolts quality class 12.9 shall be used. (See Figure 36).

1.6 Maintenance and Troubleshooting

1.6.1 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 following maintenance is required:

- Changing filter for the transformer/drive unit cooling every year.
- Changing batteries every third year.

The maintenance intervals depend on the use of the robot. For detailed information on maintenance procedures, see Maintenance section in the Product Manual.

1.7 Robot Motion

1.7.1 Introduction

Type of Motion

Axis	Type of motion	Range of movement	
		IRB 6600/6650	IRB 6650S
1	Rotation motion	+ 180º to - 180º + 220º to - 220º (option)	+ 180º to - 180º + 220º to - 220º (option)
2	Arm motion	+ 85º to - 65º	+ 160º to - 40º
3	Arm motion	+ 70º to - 180º	+ 70º to - 180º
4	Wrist motion	+ 300º to - 300º	+ 300º to - 300º
5	Bend motion	+ 120º to - 120º	+ 120º to - 120º
6	Turn motion	+ 360º to - 360º default ± 96 Rev[a]	+ 360º to - 360º default ± 96 Rev[a]

a. Rev. = Revolutions

Note! For limitation of range of motion in combination with DressPack see chapter 2.2 DressPack.

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6600	175	2.55
	225	2.55

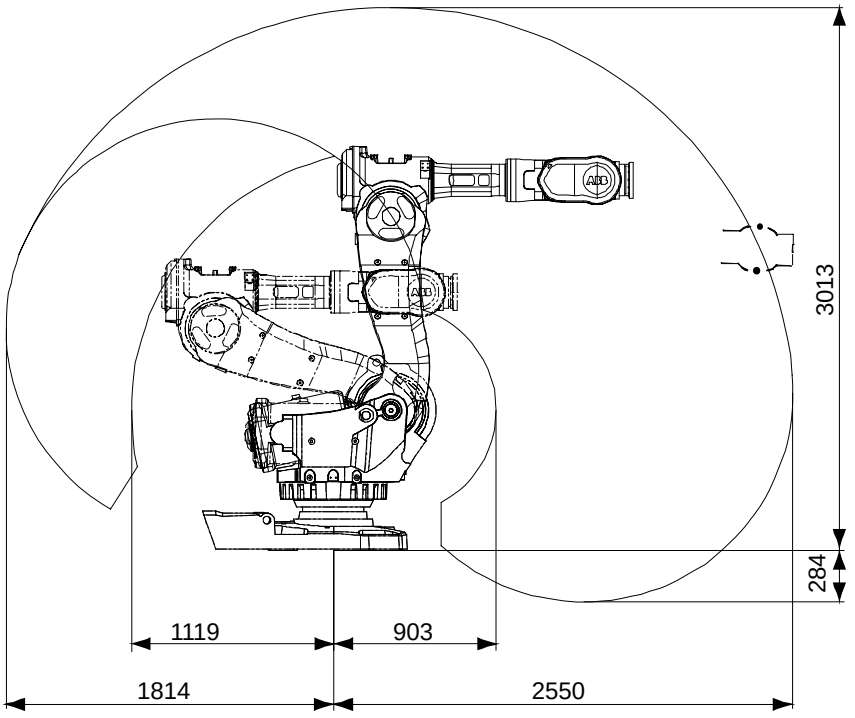


Figure 37 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6600	175	2.8

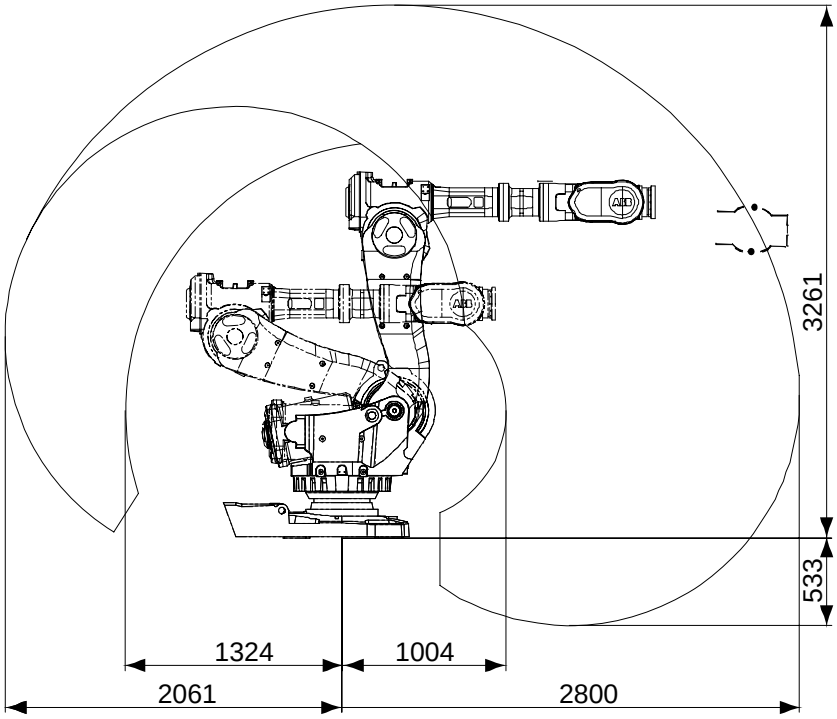


Figure 38 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

1.7.1 Introduction

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650	125	3.2

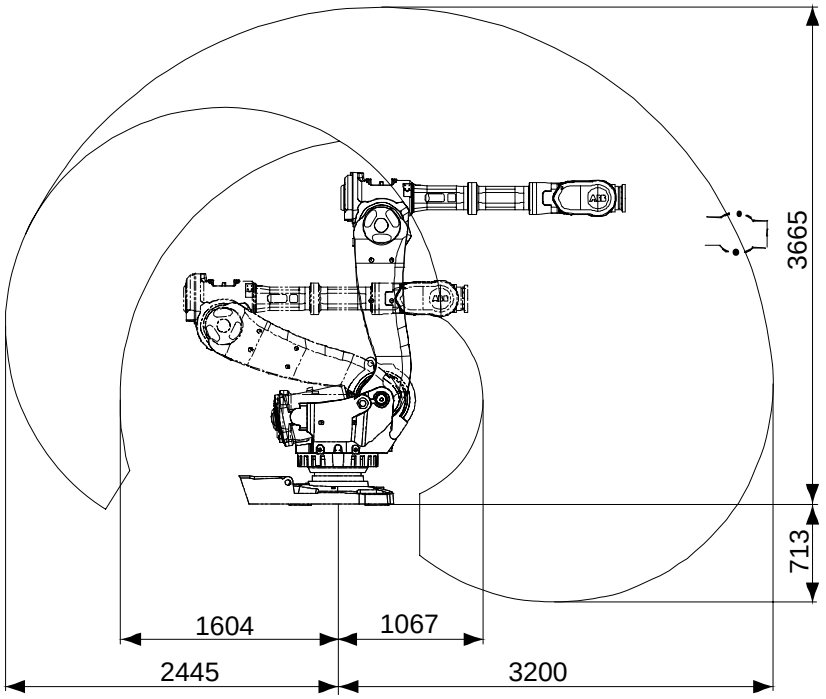


Figure 39 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650	200	2.75

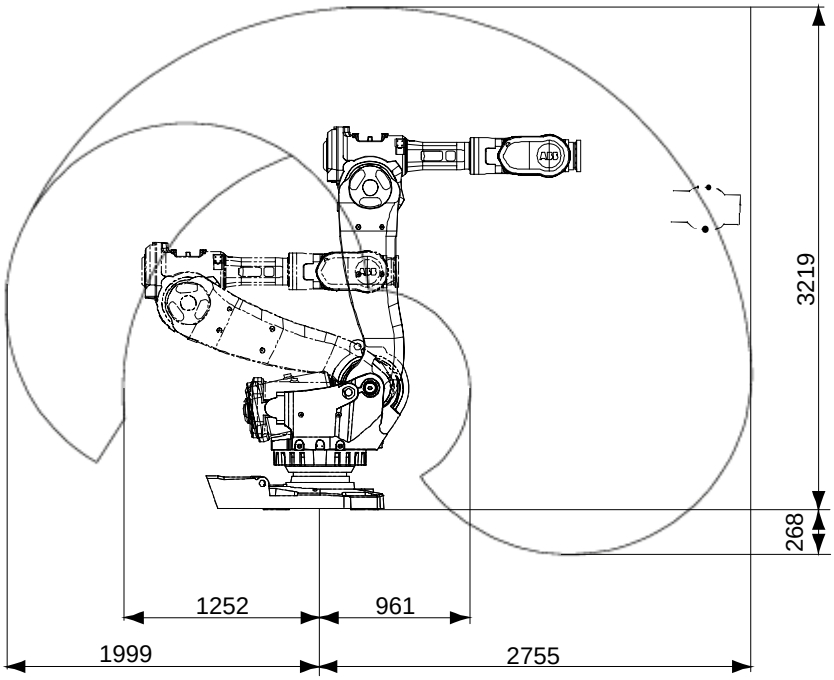


Figure 40 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

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

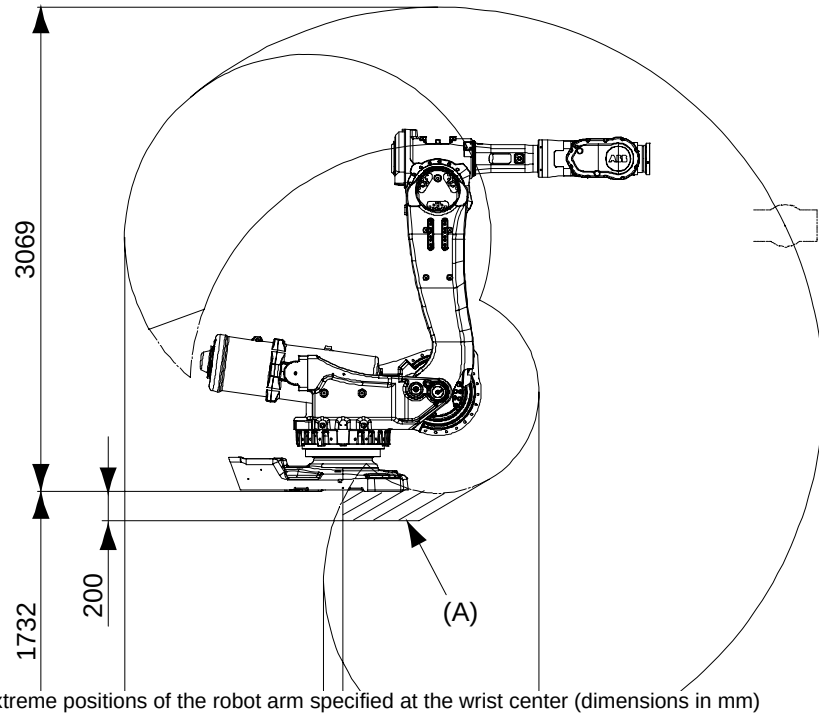


Figure 41 The extreme positions of the robot arm specified at the wrist center (dimensions in mm)

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

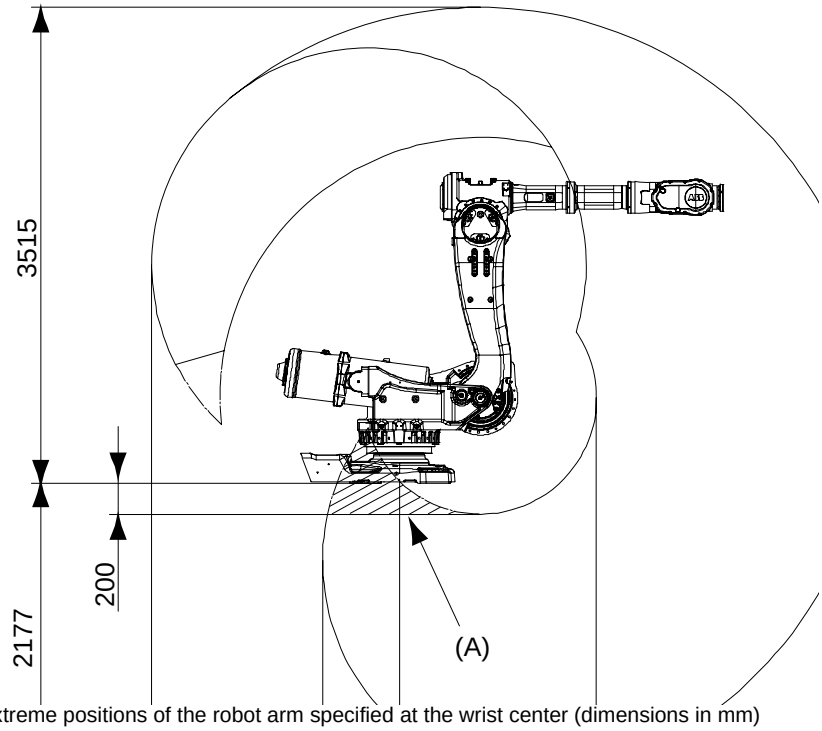


Figure 42 The extreme positions of the robot arm specified at the wrist center (dimensions in mm)

1.7.2 Performance according to ISO 9283

General

At rated maximum load, maximum offset and 1.6 m/s velocity (for IRB 6600-225/2.55, 1.0 m/s velocity) on the inclined ISO test plane, 1 m cube with all six axes in motion.

IRB 6600/6650	175/2.55	225/2.55	175/2.8	125/3.2	200/2.75
Pose accuracy, AP (mm)	0.02-0.09	0.02-0.18	0.03-0.13	0.04-0.11	0.03-0.11
Pose repeatability., RP (mm)	0.08-0.18	0.14-0.28	0.08-0.20	0.10-0.27	0.09-0.29
Pose stabilization time, PSt (s)	0.02-0.03	0.46	0.21	0.30	0.17
Path accuracy, T (mm)	1.96-2.33	3.56	2.25	1.59	2.40
Path repeatability, RT(mm)	0.67-1.05	0.22	0.32	0.37	0.38

IRB 6650S	125/3.5	200/3.0
Pose accuracy, AP (mm)	0.16	0.13
Pose repeatability, RP (mm)	0.13	0.14
Pose stabilization time, PSt (s)	0.33	0.18
Path accuracy, T (mm)	0.82	0.67
Path repeatability, RT(mm)	0.90	0.70

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

1.7.3 Velocity

Maximum axis speeds

Robot Type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 6600-175/2.55	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6600-225/2.55	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6600-175/2.8	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6650-200/2.75	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6650S-200/3.0	100°/s	90°/s	90°/s	150°/s	120°/s	190°/s
IRB 6650-125/3.2	110°/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

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

Axis Resolution

0.001° to 0.005°.

1.8 Cooling fan for axis 1-3 motor

1.8.1 Introduction

Option 87-1, 88-1, 89-1

A motor of the robot needs a fan to avoid overheating if the average speed over time exceeds the value given in the table below. The maximum allowed average speed depends on the load.

Average Speed

The average speed can be calculated with the following formula:

$$\text{Average speed} = \frac{\text{Total axis movement, number of degrees, in one cycle}}{\text{360 x cycle time (minutes) incl. waiting time}}$$

Maximum Average Speed

The maximum allowed average speed for axis 1-3 at the maximum ambient temperature of 50°C according to table below. IP 54 for cooling fan. Fan failure stops the robot.

Variant	Maximum average speed axis 1 (rpm)	Maximum average speed axis 2 (rpm)	Maximum average speed axis 3 (rpm)
IRB 6600-175/2.55	8.1 - 10.5	2.4 - 2.6	4.7 - 6.1
IRB 6600-225/2.55	7.8 - 10.1	2.1 - 2.3	3.1 - 4.0
IRB 6600-175/2.8	7.8 - 10.1	2.1 - 2.3	3.1 - 4.0
IRB 6650-125/3.2	4.9 - 6.3	2.1 - 2.3	3.1 - 4.0
IRB 6650-200/2.75	7.8 - 10.1	2.1 - 2.3	3.1 - 4.0
IRB 6650S-125/3.5	7.8 - 10.1	2.1 - 2.3	3.1 - 4.0
IRB 6650S-200/3.0	7.8 - 10.1	2.1 - 2.3	3.1 - 4.0

1.9 Servo Gun (option)

1.9.1 Introduction

General

The robot can be supplied with hardware and software for:

- Stationary Gun
- Robot Gun
- Stationary and Robot Gun
- Twin Stationary Guns
- Stationary Gun and Track Motion
- Robot Gun and Track Motion
- Track Motion

For configuration and specification of hardware and software respectively, see each section below.

1.9.2 Stationary Gun (SG)

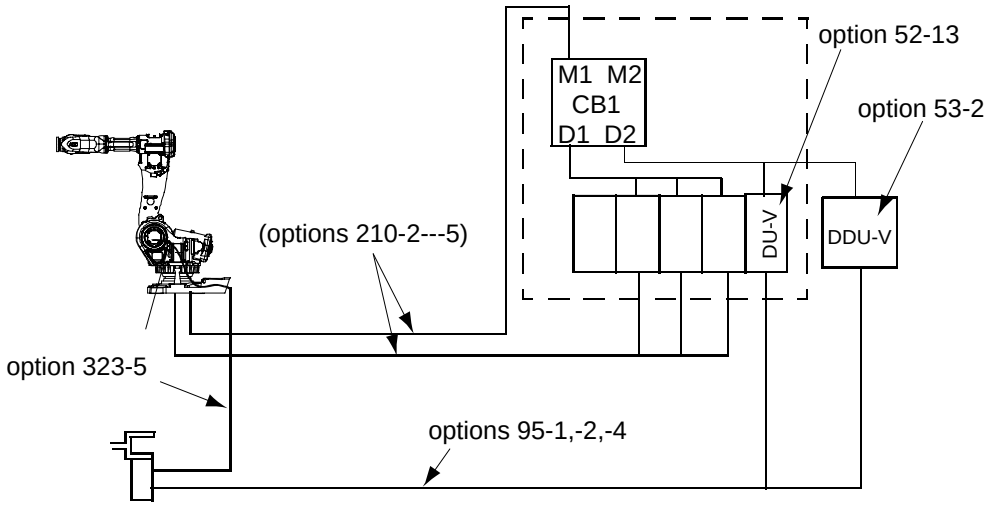


Figure 43 Configuration of Stationary Gun.

Options

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

Option	Description	Product specification
53-2	DDU in a separate box and cable to cabinet	Controller, S4Cplus
52-13	DU-V inside cabinet	Controller, S4Cplus Automotive
95-1,-2,-4	Cables (7-30m) between DDU/DU and SG	Controller, S4Cplus and Controller, S4Cplus Automotive
323-5	Cables inside the manipulator and manipulator foot to SG. Requires option 538-1	Controller, S4Cplus and Controller, S4Cplus Automotive
341-5	Software SpotWare Servo	RobotWare 4.0

1.9.3 Robot Gun (RG)

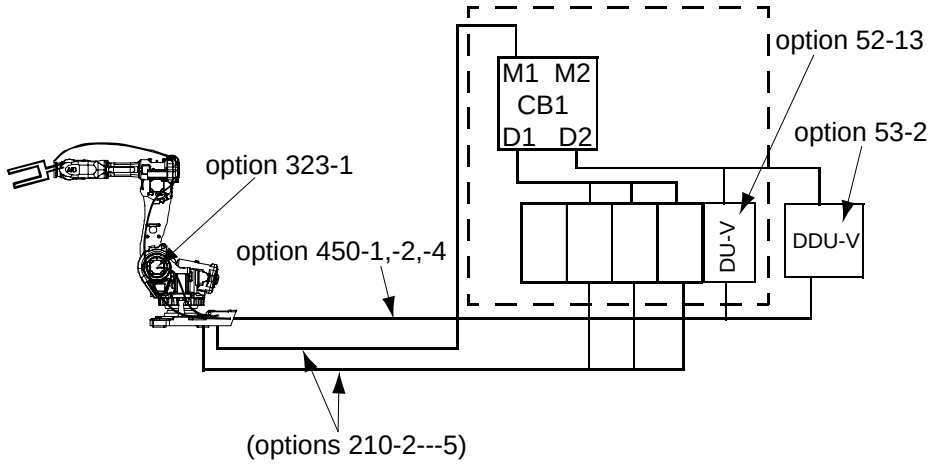


Figure 44 Configuration of Robot Gun.

Options

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

Option	Description	Product specification
53-2	DDU in a separate box and cable to cabinet	Controller, S4Cplus
52-13	DU-V inside cabinet	Controller, S4Cplus Automotive
450-1,-2, -3[a], -4	Extended cables (7-30m) between DDU/DU and RG	Controller, S4Cplus and Controller, S4Cplus Automotive
323-1	Cabling inside the manipulator. Requires option 455-1 and 476-1	Controller, S4Cplus and Controller, S4Cplus Automotive
341-5	Software SpotWare Servo	RobotWare 4.0

a. 450-3 not available for S4Cplus

1.9.4 Stationary and Robot Gun (SG + RG)

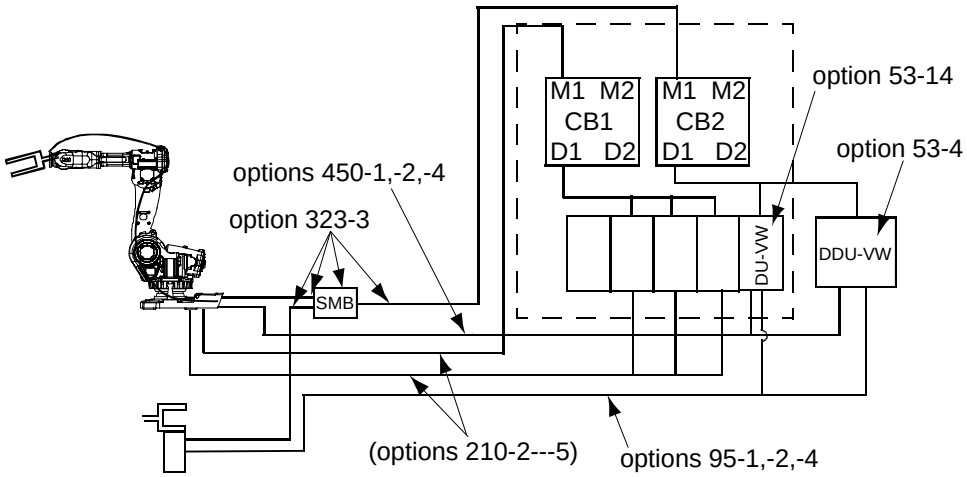


Figure 45 Configuration of Stationary and Robot Gun.

Options

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

Option	Description	Product specification
53-4	DDU in separate box and cable to the cabinet	Controller, S4Cplus
53-14	DU-VW inside cabinet	Controller, S4Cplus Automotive
95-1,-2,-4	Cables (7-30m) between DDU/DU and SG	Controller, S4Cplus and Controller, S4Cplus Automotive
450-1,-2, -3[a], -4	Extended cables (7-30m) between DDU/DU and RG	Controller, S4Cplus and Controller, S4Cplus Automotive
323-3	SMB box with cabling. Requires option 455-1 and 476-1	Controller, S4Cplus and Controller, S4Cplus Automotive
341-5	Software SpotWare Servo	RobotWare 4.0

a. 450-3 not available for S4Cplus

1.9.5 Twin Stationary Guns (SG + SG)

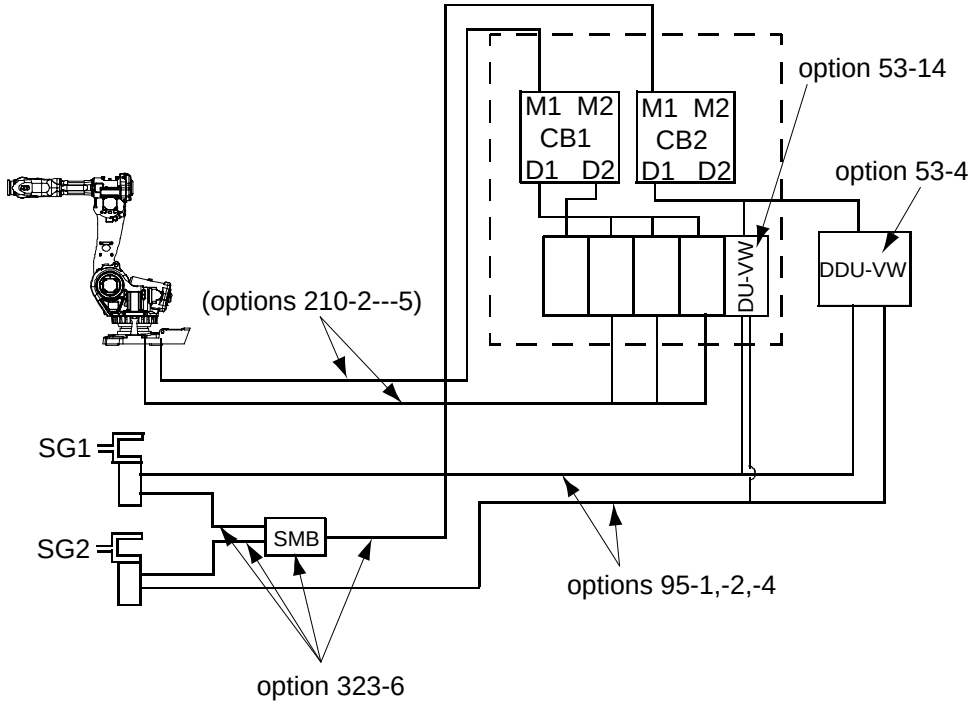


Figure 46 Configuration of Twin Stationary Guns.

Options

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

Option	Description	Product specification
53-4	DDU in separate box and cable to the cabinet	Controller, S4Cplus
53-14	DU-VW inside cabinet	Controller, S4Cplus Automotive
95-1,-2,-4	Cables (7-30m) between DDU/DU and SGs	Controller, S4Cplus and Controller, S4Cplus Automotive
323-6	SMB box with cablings	Controller, S4Cplus and Controller, S4Cplus Automotive
341-5	Software SpotWare Servo	RobotWare 4.0

1.9.6 Stationary Gun and Track Motion (SG + TM)

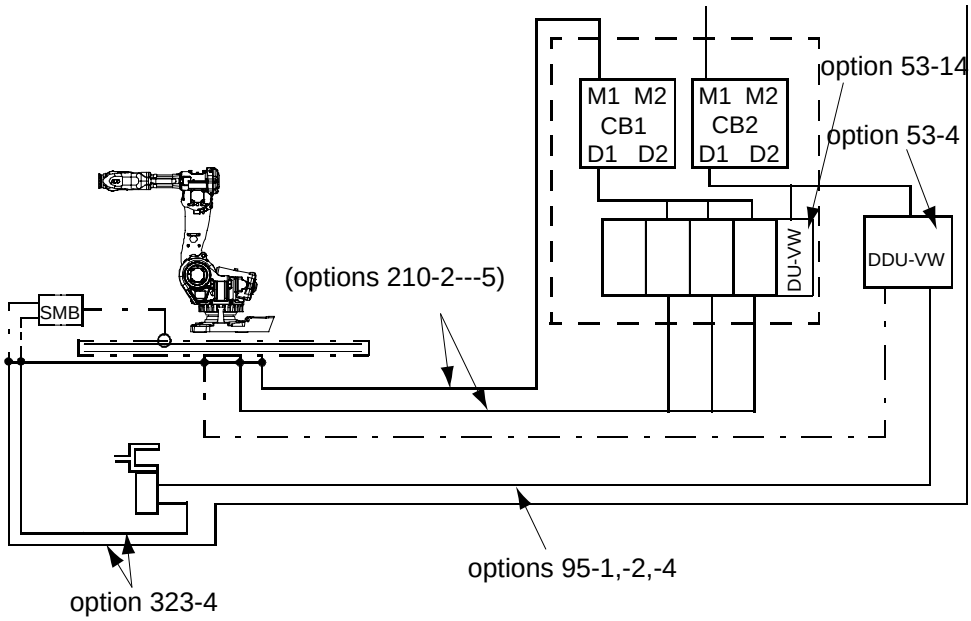


Figure 47 Configuration of Stationary Gun and Track Motion.

Options

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

Track Motion SMB box and cables to the control cabinet are included in the IRBT 6003S delivery.

Option	Description	Product specification
53-4	DDU in separate box and cable to the cabinet[a]	Controller, S4Cplus
53-14	DU-VW inside cabinet	Controller, S4Cplus Automotive
95-1,-2,-4	Cables (7-30m) between DDU and SG	Controller, S4Cplus and Controller, S4Cplus Automotive
323-4	Cable between the cabinet and TM, and cable between TM and SG	Controller, S4Cplus and Controller, S4Cplus Automotive
Incl. in TM delivery	SMB box with cablings. Cable between DDU/DU and TM	IRBT 6003S
341-5	Software SpotWare Servo	RobotWare 4.0

a. 450-3 not available for S4Cplus

1.9.7 Robot Gun and Track Motion (RG + TM)

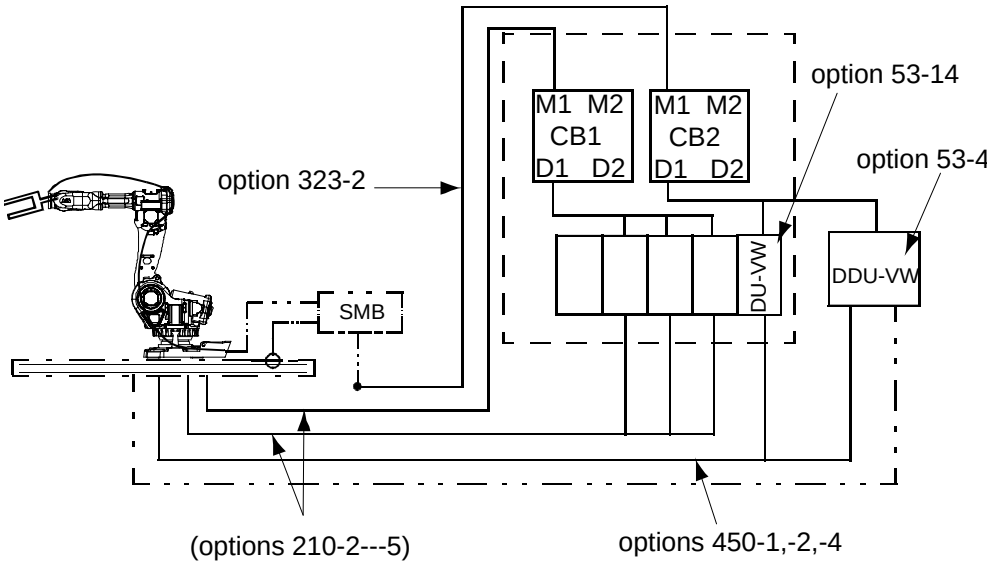


Figure 48 Configuration of Robot Gun and Track Motion.

Options

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

Track Motion SMB box, cables to the control cabinet and cable between SMB and DDU are included in the IRBT 6003S delivery.

Option	Description	Product specification
53-4	DDU in a separate box and cable to the cabinet	Controller, S4Cplus
53-14	DU-VW inside cabinet	Controller, S4Cplus Automotive
450-1,-2, -3[a], -4	Extended cables (7-30m) between DDU and RG	Controller, S4Cplus and Controller, S4Cplus Automotive
323-2	Cable between the cabinet and TM. Requires option 455-1 and 476-1	Controller, S4Cplus and Controller, S4Cplus Automotive
455-1	Parallel communication	IRB 6600
Incl. in TM delivery	SMB box with cablings Cable between DDU/DU and TM	IRBT 6003S
341-5	Software SpotWare Servo	RobotWare 4.0

a. 450-3 not available for S4Cplus

1.9.8 Track Motion

General

The robot can be supplied with a Track Motion, see Product specification - IRBT 6003S. For configuration and specification of hardware see Figure 49.

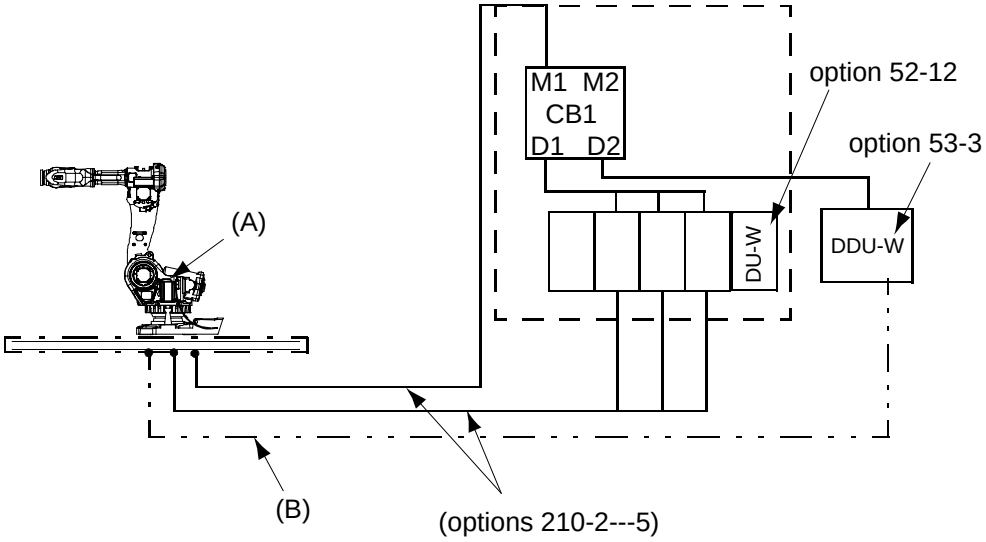


Figure 49 Configuration of Track Motion.

Pos	Description
A	Included in option 538-1 or option 476-1 when option 53-3 is selected.
B	TM delivery

Options

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

Option	Description	Product specification
53-3	DDU in a separate box and cable to the cabinet	Controller, S4Cplus
52-12	DU-W inside cabinet	Controller, S4Cplus Automotive
538-1 or 476-1	Cable from manipulator foot to SMB 7-axis	IRB 6600
TM delivery	Cable between DDU/DU and TM	IRBT 6003S
455-1	Parallel communication	IRB 6600

1.9.8 Track Motion

2 SpotPack and DressPack

2.1 Introduction

2.1.1 General

The different robot types can be equipped with the SpotPack or DressPack options. The SpotPack is designed for spot welding and handling applications. The function package supplies the transformer gun or the robot gripper with necessary media, such as compressed air, cooling water and electrical power.

The SpotPack contains the modules shown in Figure 50 below.

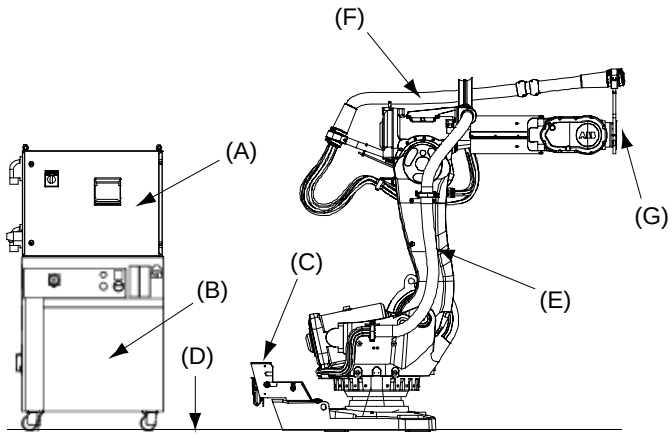


Figure 50 SpotPack main modules.

SpotPack

Pos.	Name	Description
A	Power unit	Power unit with power cable and signal cables between Power unit and Water and Air unit are required.
B	Robot Cabinet S4Cplus	
C	Water and Air unit	Water and Air unit with hoses.
D	DressPack, floor	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
E	DressPack, lower arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
F	DressPack, upper arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
G	Robot Gun	

The Power unit is not available for S4Cplus Automotive

2.1.2 Chapter Structure

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

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

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

Material Handling application / DressPack

Chapter	Option	Description
2.3	Type H	Designed for material handling.

Spot Welding application / SpotPack and DressPack

Chapter	Option	Description
2.4	Type S	Designed for pneumatic transformer guns carried by the robot manipulator.
2.5	Type HS	Designed for handling the part against pneumatic transformer guns mounted on a pedestal.
2.6	Type Se	Designed for electrical servo driven transformer guns carried by the robot manipulator.
2.7	Type HSe	Designed for handling the part against electrical servo driven transformer guns mounted on a pedestal.
2.8	Power Unit	Includes general description of Power unit with common information.
2.9	Water and Air Unit	Includes general description of Water and Air unit with common information.
2.10	Connection Kits	Includes general description of Connection kits for SpotPack and DressPack.

2.2 DressPack

2.2.1 Introduction

General

Dress Pack includes options for Upper arm, Lower arm and Floor. These are described separated below but are designed as a complete package for various applications. The DressPack for upper and lower arm contains signals, process media (water and/or air) and power feeding (for Spot Welding power) for customer use.

The DressPack for the floor contains customer signals.

DressPack upper arm

The Upper Arm part between axis 3 and axis 6 consists of a process cable package with supports, clamps, brackets and a retractor arm.

The cable and hose package has a 1000-mm free length at axis 6 for connection to a robot tool. The retractor arm unit keeps hose package close to the robot upper arm.

The Upper Arm part has the following main features:

- Adjustable bracket axis 6 with position marking.
- Adjustable retracting force to optimize the system depending on cycle and hose package.
- Hose guiding to support bending backwards movement.

For more information see the Installation and Service Manual SpotPack and DressPack.

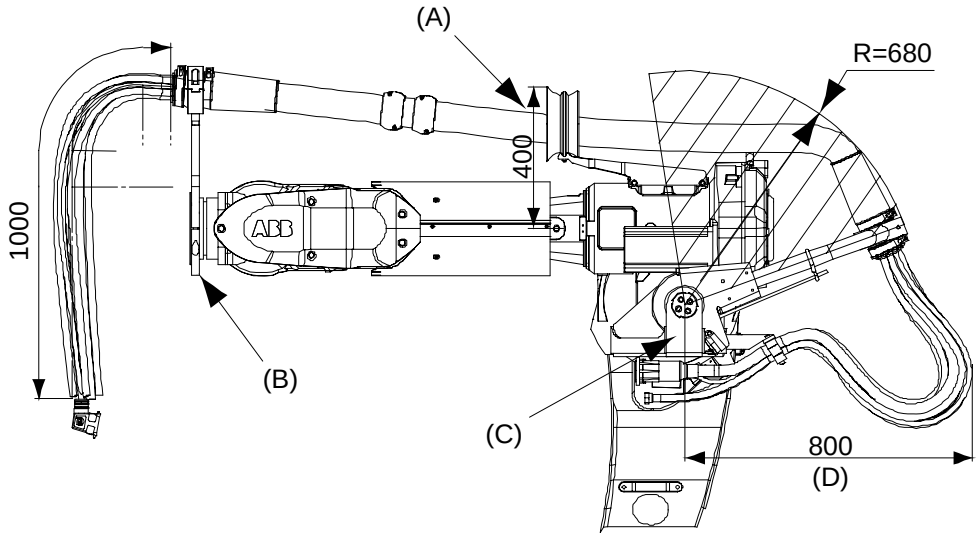


Figure 51 DressPack Upper arm side view Spot Welding version (dimensions in mm).

Pos	Description
A	Hose support
B	Bracket axis 6
C	Retractor arm
D	Maximum distance for hose package

Limitation of movements of axes

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

Note: Maximum movement of axis 5 is ± 110º.

For more detail information please contact Serop Product support/SEROP/ABB.
E-mail address: serop.product_support@se.abb.com

DressPack lower arm

The Lower Arm part between the connection point at the base and axis 3 consists of a process cable package with supports, clamps and brackets. The process cable package contains signals, process media (water and/or air) and power feeding (Spot Welding power) for customer use.

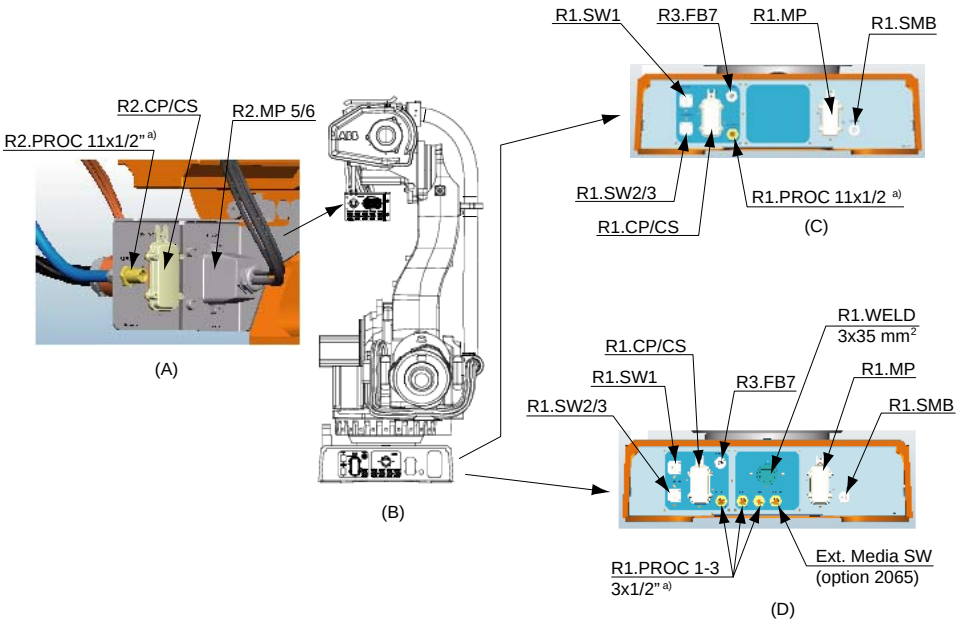


Figure 52 DressPack interface at base and axis 3.

a) Fitting type M22x1,5; 24 degree seal

Pos	Description
A	Axis 3 interface
B	Base interface
C	Material Handling
D	Spot Welding

DressPack floor

The floor part consists of signal cables for customer signals. This part is connected to the interface plate at the manipulator base and the robot control cabinet.

Routing for Material handling

The process cable package has one internal routing thru the lower arm for the Material Handling application, see Figure 53 for MH routing.

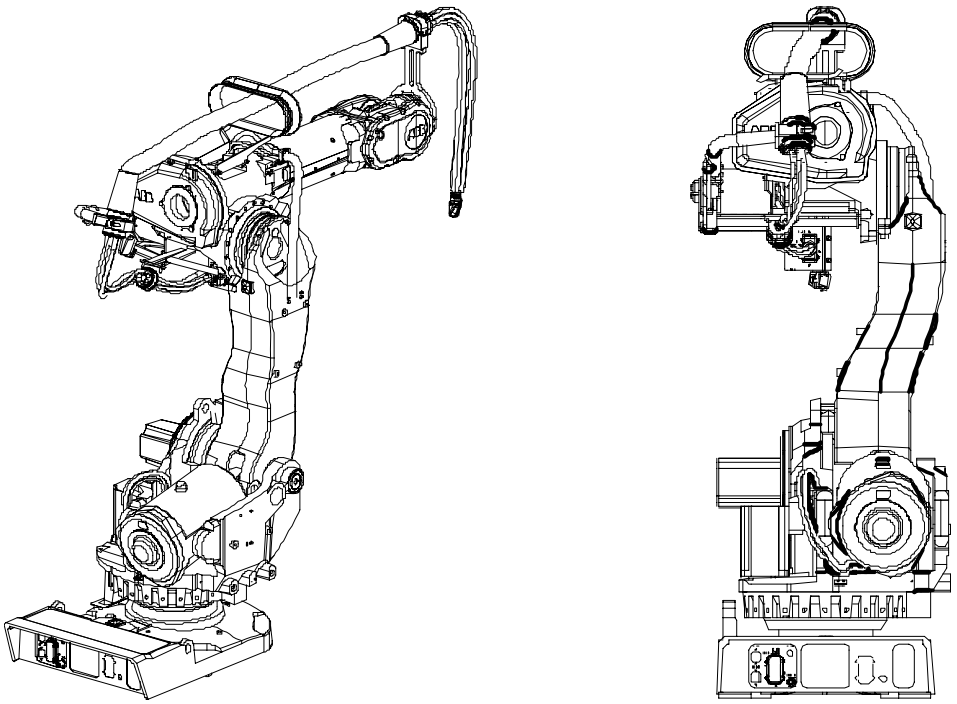


Figure 53 Routing for TypeH (material handling version).

Routing for SpotWelding

For the Spot Welding application the process cable package has a routing along the lower arm. See Figure 54 for SW routing.

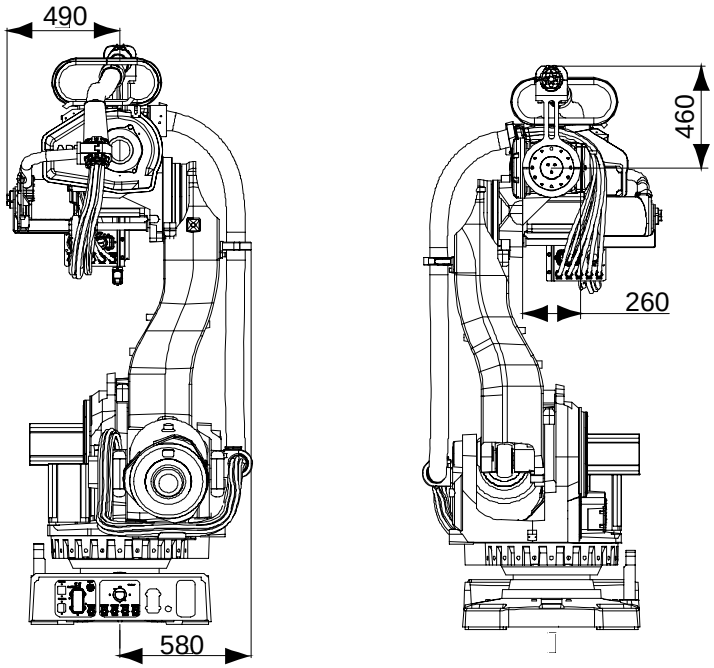


Figure 54 Routing for TypeS/Se, spot welding version (dimensions in mm).

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 55. Available configurations with linked option numbers are described below.

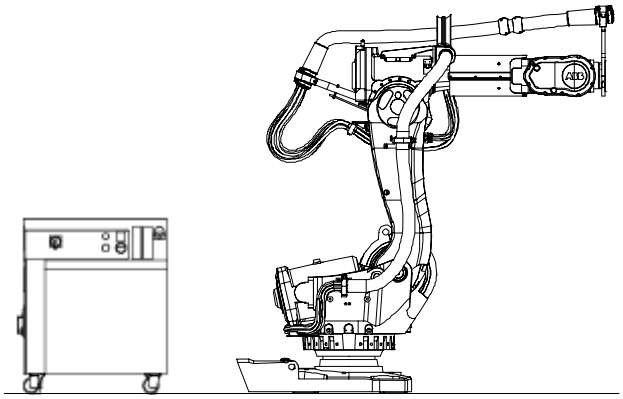


Figure 55 DressPack Type H for IRB 6600/6650/7600 main modules.

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified on the specification form: Option 94-1,-2,-4 for parallel communication Option 90-2,-3,-5 for bus communication with Can/ DeviceNet Option 92-2,-3,-5 for bus communication with Profibus Option 91-2,-3,-4 for bus communication with Interbus
455-1	Parallel communication	Offers the process cable package needed for parallel communication.
455-2	Bus communication	Offers the process cable package needed for bus communication. This option includes both the signals for the bus communication as well as some parallel signals. The type of bus is defined by the choice of floor cabling (see option 16-1 above).
455-3	Basic Parallel communication	Offers the process cable package needed for basic parallel communication.
538-1	Material Handling base to axis 3	Offers DressPack from robot base to axis 3 for Material Handling application.
466-1	Material Handling axis 3 to axis 6	Offers DressPack from axis 3 to axis 6 for Material Handling application.

Depending on the choice of Parallel or Bus communication the process cable package for option 538-1 and option 466-1 will have different content. See tables below.

Dress Pack Type H. Basic Parallel communication

- Option 16-2 or Option 16-1 with Connection to cabinet (option 94-1, -2, -4 to specify cable length)
- Option 455-3 Basic Parallel communication
- Option 538-1 Material Handling base to axis 3

This configuration could not be combined with Option 466-1 Material Handling axis 3 to axis 6.

Type	At terminals in cabinet	At Connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2	2	0,96 mm^2	250 VAC, 6 A rms
Protective Ground	1	1	0,96mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	14 (7x2)	14 (7x2)	0,23mm^2	50 VAC, 1 A rms
Signals twisted pair and separate shielded	2 (1x2)	2 (1x2)	0,23 mm^2	50 VAC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar /230 PSI

a. Interface at manipulator base or axis 3 (option 538-1)

DressPack Type H. Parallel communication

- Option 16-2 or Option 16-1 with Connection to cabinet (option 94-1,-2,-4 to specify cable length)
- Option 455-1 Parallel communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Utility Power	3	3	1,5 mm^2	250 VAC, 12 A rms
Protective Ground	1	1	1,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	16 (8x2)	16 (8x2)	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8 (4x2)	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.3.1 Introduction

DressPack Type H. Can/DeviceNet communication

- Option 16-2 or Option 16-1 with Connection to cabinet (Option 90-2,-3,-5 to specify cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	2	0,14 mm^2	Can/DeviceNet spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	2	2	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

DressPack Type H. Interbus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-5 to specify cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	1	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	4	0,14 mm^2	Interbus spec
Signals twisted pair	4 (2x2)	4 (2x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	3	3	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.3.1 Introduction

DressPack Type H. Profibus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-5 to specify cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard 6 (3x2)	2	0,14 mm^2	Profibus 12 Mbits/s spec
Signals twisted pair	4	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals		4	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.3.2 Interface description DressPack

Customer Interface

Possible customer interface points are shown in Figure 56.

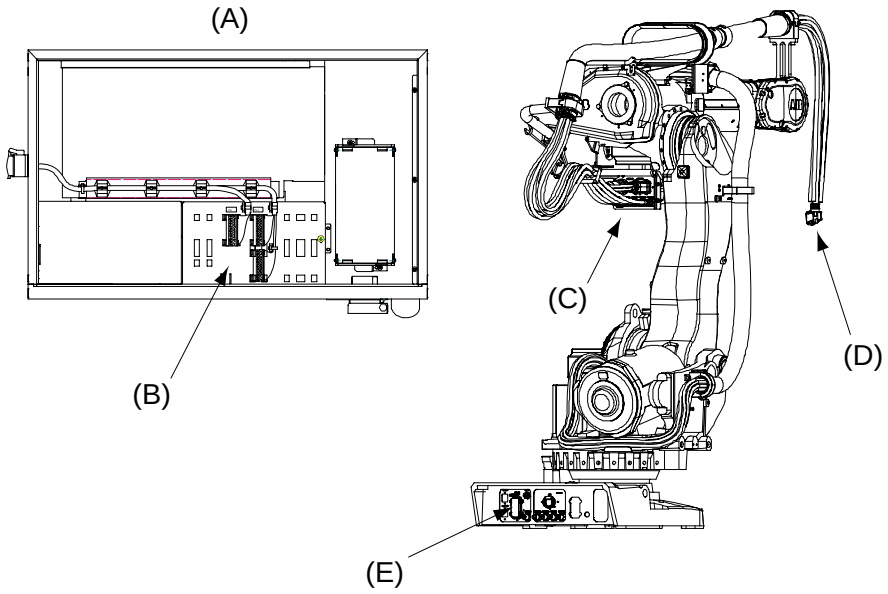


Figure 56 Robot with base, axis 3, axis 6 and terminals inside cabinet shown.

Pos	Description
A	Top view cabinet without cover
B	Terminals in cabinet
C	Interface axis 3
D	Interface axis 6
E	Interface base

The interface at axis 6 has a hose with a free end and a signal connector type modular Harting. The connector configurations are described in table below. Signals with (parentheses) are to be connected by customer. For option 455-3 Basic parallel communication interface description on axis 6 is not valid.

2.3.2 Interface description DressPack

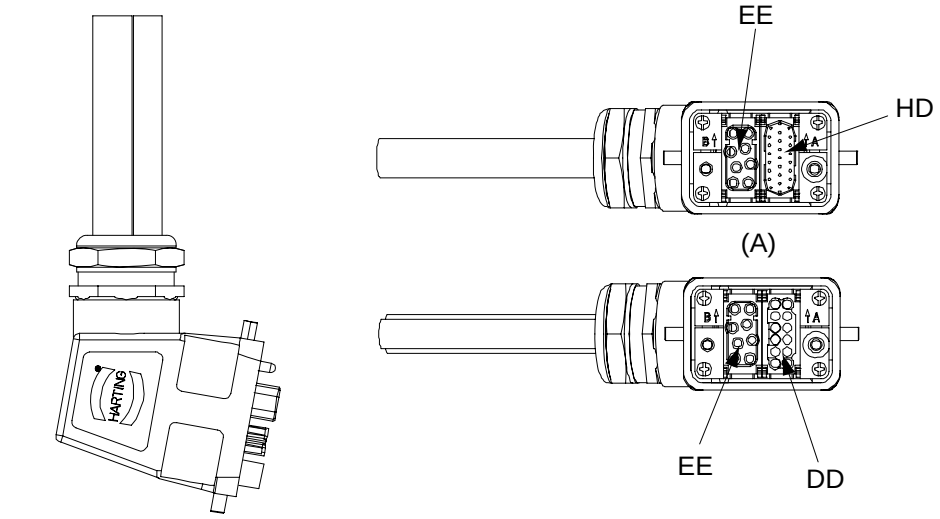


Figure 57 Modulharting axis 6.

Pos	Description
A	Module version

Connection

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can Device-Net	Inter-bus	Profi-bus
Harting module type (see page 82)				EE+HD	EE+HD	EE+DD	EE+DD	EE+DD

Customer power signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device Net	Inter-bus	Profi-bus
(+24 V)	XT 6:1/1	D1	B4	Yes	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/2	D6	B5	Yes	Yes	Yes	Yes	Yes
(+24 V)	XT 6:1/3	D3	B6	-	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/4	D4	B7	-	Yes	Yes	Yes	Yes
Ground (in housing)	GND	GND	GND	Yes	Yes	Yes	Yes	Yes
(Spare)	XT 6:1/5	D5	B1	-	Yes	-	-	-
(Spare)	XT 6:1/6	D2	B2	-	Yes	-	-	-
(Spare)	XT 6:1/7	D7	B3	-	Yes	-	-	-

Customer Signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device Net	Inter-bus	Profi-bus
(Spare)	XT 5:1/1	B1	A18	Yes	Yes	-	-	-
(Spare)	XT 5:1/2	B2	A19	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/17	B3	A20	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/18	B4	A21	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/21	B5	A22	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/22	B6	A23	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/13	B7	A24	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/14	B8	A25	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/15	B9	A16	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/16	B10	A17	Yes*	Yes	-	-	-
(Spare)	XT 5:1/3	B11	A1	Yes*	Yes	-	-	-
(Spare)	XT 5:1/4	B12	A2	Yes*	Yes	-	-	-
(Spare)	XT 5:1/5	B13	A3	Yes*	Yes	-	-	-
(Spare)	XT 5:1/6	B14	A4	Yes*	Yes	-	-	-
(Spare)	XT 5:1/7	B15	A5	Yes*	Yes	-	-	-
(Spare)	XT 5:1/8	B16	A6	Yes*	Yes	-	-	-
(Spare)	XT 5:1/9	B18	A7	-	Yes	-	-	-
(Spare)	XT 5:1/10	B19	A8	-	Yes	-	-	-
(Spare)	XT 5:1/11	B20	A9	-	Yes	-	-	-
(Spare)	XT 5:1/12	B21	A10	-	Yes	-	-	-
(Spare)	XT 5:2/19	C1	A11	-	Yes	-	-	-
(Spare)	XT 5:2/20	C2	A12	-	Yes	-	-	-
(Spare)	XT 5:2/23	C3	A13	-	Yes	-	-	-
(Spare)	XT 5:2/24	C4	A14	-	Yes	-	-	-
Not in use	-	-	-	-	-	-	-	-

CBus signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Par-allel	Par-allel	Can/ DeviceNet	Interbus	Profibus
(Spare) or Bus signals	See valid bus	B22	A1			+24VCAN	GNDIM	XT 5:2/21
(Spare) or Bus signals	See valid bus	B23	A2			0V CAN	XT 5:2/18	XT 5:2/22
(Spare)	See valid bus	B24	A3			XT 5:2/19	XT 5:2/19	XT 5:2/19
(Spare)	See valid bus	B25	A4			XT 5:2/20	XT 5:2/20	XT 5:2/20
(Spare) or Bus signals	See valid bus	A3	A7			CAN1X H	XT 5:2/15	XT 5:2/13
(Spare) or Bus signals	See valid bus	A4	A8			CAN1X L	XT 5:2/16	XT 5:2/14
(Spare) or Bus signals	See valid bus	A5	A9			XT 5:2/13	XT 5:2/13	RXD/ TXD-P
(Spare) or Bus signals	See valid bus	A6	A10			XT 5:2/14	XT 5:2/14	RXD/ TXD-N
(Spare) or Bus signals	See valid bus	A9	A5			XT 5:2/15	DO	XT 5:2/15
(Spare) or Bus signals	See valid bus	A10	A6			XT 5:2/16	DO_N	XT 5:2/16
(Spare) or Bus signals	See valid bus	A11	A11			XT 5:2/17	DO	XT 5:2/17
(Spare) or Bus signals[a]	See valid bus	A12	A12			XT 5:2/18	DO_N	XT 5:2/18

a. Customer signals marked with * are not separately screened

Harting Connector

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

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 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.

2.3.3 Summary Type H

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

Option	Description
16-1	Connection to cabinet (Cable length and communication type to be stated)
455-1, 455-2, 455-3	Basic Parallel, Parallel or Bus communication (Communication type to be stated)
538-1	Material Handling base to axis 3 (DressPackage lower arm)
466-1	Material Handling axis 3 to axis 6 (DressPackage upper arm)

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 58. Available configurations with linked option numbers are described below starting with DressPack.

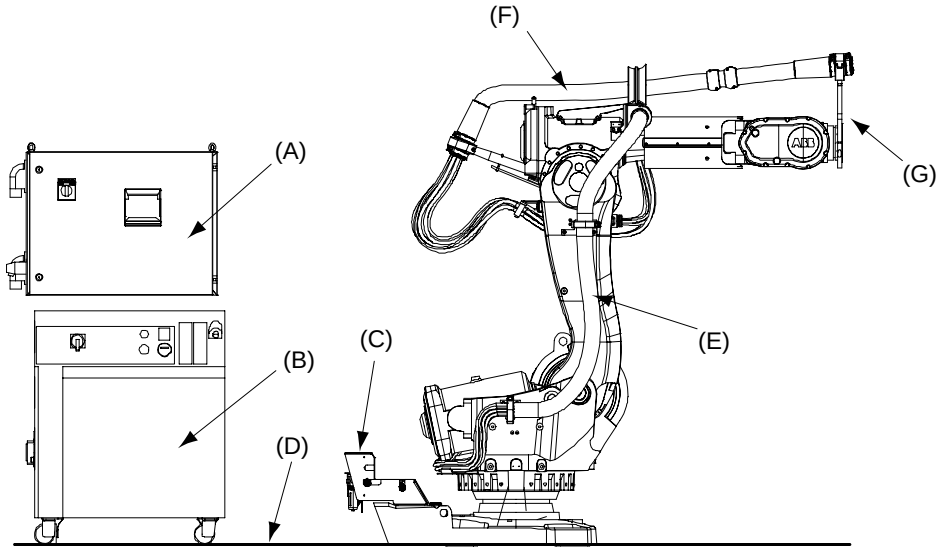


Figure 58 SpotPack Type S for IRB 6600/6650/7600 main modules.

SpotPack

Pos.	Name	Description
A	Power unit	Power unit with power cable and signal cables between Power unit and Water and Air unit are required.
B	Robot Cabinet S4Cplus	
C	Water and Air unit	Water and Air unit with hoses.
D	DressPack, floor	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
E	DressPack, lower arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
F	DressPack, upper arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
G	Robot Gun	

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified in the specification form: Option 94-1,-2,-4 for parallel communication Option 90-2,-3,-5 for bus communication with Can/ DeviceNet Option 92-2,-3,-5 for bus communication with Profibus Option 91-2,-3,-5 for bus communication with Interbus
455-1	Parallel communication	Offers the process cable package needed for parallel communication.
455-2	Bus communication	Offers the process cable package needed for bus communication. This option includes both the signals for the bus communication as well as some parallel signals. The type of bus is defined by the choice of floor cabling (see option 16-1 above).
476-1	Spot Welding base to axis 3	Offers Dresspack from robot base to axis 3 for Spot Welding application.
475-1	Spot Welding axis 3 to axis 6	Offers DressPack from robot axis 3 to axis 6 for Spot Welding application.

Depending on the choice of Parallel or Bus communication the process cable package for option 476-1 and option 475-1 will have different content. See the following tables.

DressPack Type S. Parallel communication

- Option 16-2 or 16-1 with Connection to cabinet (option 94-1,-2,-4 for cable length)
- Option 455-1 Parallel communication
- Option 476-1 Spot Welding base to axis 3
- Option 475-1 Spot Welding axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Utility Power	3	3	1,5 mm^2	250 VAC, 12 A rms
Protective Ground	1	1	1,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	16 (8x2)	16 (8x2)	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8 (4x2)	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-3)		3	12,5 mm inner diameter	Max. air pressure 16 bar/ 230 PSI. Max. water pressure 10 bar/ 145 PSI
Welding power (WELD)				
Lower arm		2	35 mm^2	600 VAC, 150 A rms at 20°C (68F)
Lower arm, protective ground		1	35 mm^2	
Upper arm		2	25 mm^2	600 VAC, 135 A rms at 20°C (68F)
Upper arm, protective ground		1	25 mm^2	

a. Interface at manipulator base or axis 3 (option 476-1) or axis 6 (option 475-1)

DressPack Type S. Can/DeviceNet communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 90-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 476-1 Spot Welding base to axis 3
- Option 475-1 Spot Welding axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	2	0,14 mm^2	Can/DeviceNet spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	2	2	0,23 mm^2	50 V DC, 2 A rms
Media				
Water/Air (PROC 1-3)		3	12,5 mm inner diameter	Max. air pressure 16 bar/ 230 PSI. Max. water pressure 10 bar/ 145 PSI
Welding power (WELD)				
Lower arm		2	35 mm^2	600 VAC, 150 A rms at 20°C (68F)
Lower arm, protective ground		1	35 mm^2	
Upper arm		2	25 mm^2	600 VAC, 135 A rms at 20°C (68F)
Upper arm, protective ground		1	25 mm^2	

a. Interface at manipulator base or axis 3 (option 476-1) or axis 6 (option 475-1)

2.4.1 Introduction

DressPack Type S. Interbus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 476-1 Spot Welding base to axis 3
- Option 475-1 Spot Welding axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	2	0,14 mm^2	Interbus spec
Signals twisted pair	4 (2x2)	4 (2x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	3	3	0,23 mm^2	50 V DC, 2 A rms
Media				
Water/Air (PROC 1-3)		3	12,5 mm inner diameter	Max. air pressure 16 bar / 230 PSI. Max. water pressure 10 bar / 145 PSI
Welding power (WELD)				
Lower arm		2	35 mm^2	600 VAC, 150 A rms at 20°C (68F)
Lower arm, protective ground		1	35 mm^2	
Upper arm		2	25 mm^2	600 VAC, 135 A rms at 20°C (68F)
Upper arm, protective ground		1	25 mm^2	

a. Interface at manipulator base or axis 3 (option 476-1) or axis 6 (option 475-1)

DressPack Type S. Profibus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 476-1 Spot Welding base to axis 3
- Option 475-1 Spot Welding axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	3	3	0,23 mm^2	50 V DC, 2 A rms
Media				
Water/Air (PROC 1-3)		3	12,5 mm inner diameter	Max. air pressure 16 bar / 230 PSI. Max. water pressure 10 bar / 145 PSI
Welding power (WELD)				
Lower arm		2	35 mm^2	600 VAC, 150 A rms at 20°C (68F)
Lower arm, protective ground		1	35 mm^2	
Upper arm		2	25 mm^2	600 VAC, 135 A rms at 20°C (68F)
Upper arm, protective ground		1	25 mm^2	

a. Interface at manipulator base or axis 3 (option 476-1) or axis 6 (option 475-1)

Option 463-1 Extended media

Offers the process cable package with one extra media hose. This can only be chosen in combination with DressPack for Spot welding application (option 476-1 and option 475-1). This option has the following specification:

- Hose 1/2" (Proc 4) with connection at base and axis 6 with free end.

2.4.2 Interface description DressPack

Customer Interface

Possible customer interface points are shown in Figure 59.

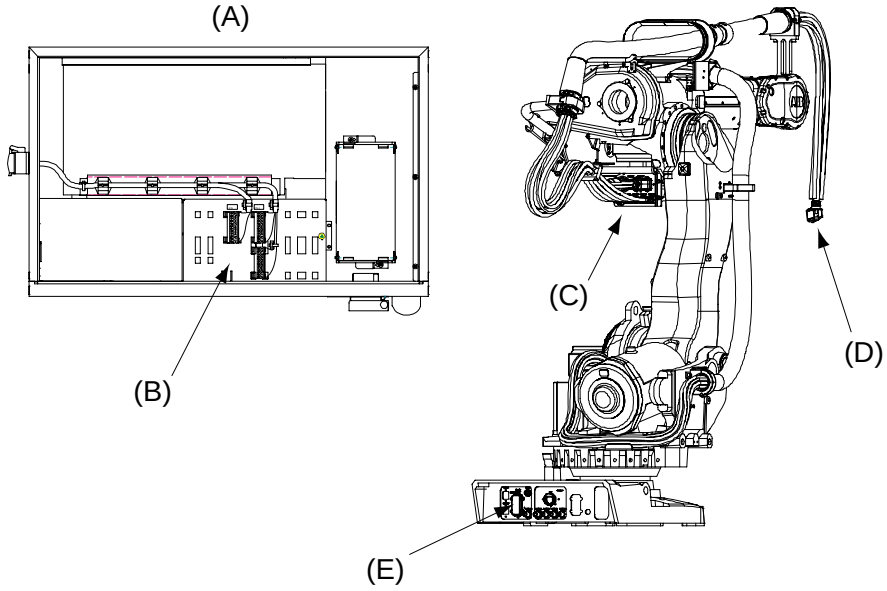


Figure 59 Robot with base, axis 3, axis 6 and terminals inside cabinet shown.

Pos	Description
A	Top view cabinet without cover
B	Terminals in cabinet
C	Interface axis 3
D	Interface axis 6
E	Interface base

The interface at axis 6 has a hose with free end and a signal connector type modular Harting. See Figure 60. The connector configurations are described in the table below. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type S is ordered.

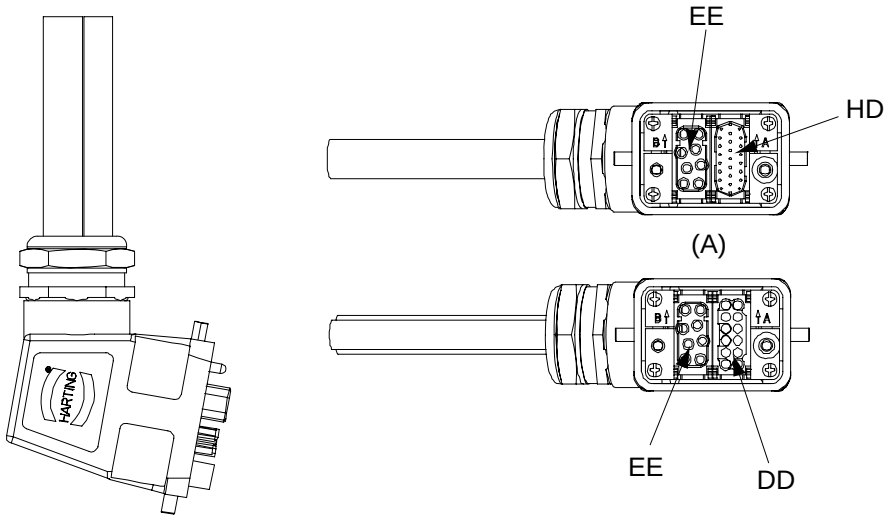


Figure 60 Modul harting axis 6.

Pos	Description
A	Module version

Connection

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel	Can/ Device-Net	Interbus	Profibus
Harting module type (see *Harting Connector* on page 93)				EE+HD	EE+DD	EE+DD	EE+DD

Customer power signals

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel	Can/ Device-Net	Interbus	Profibus
+24 V	XT 6:1/1	D1	B4	Yes	Yes	Yes	Yes
0 V	XT 6:1/2	D6	B5	Yes	Yes	Yes	Yes
+24 V	XT 6:1/3	D3	B6	Yes	Yes	Yes	Yes
0 V	XT 6:1/4	D4	B7	Yes	Yes	Yes	Yes
Ground (in housing)	GND	GND	GND	Yes	Yes	Yes	Yes
(Spare)	XT 6:1/5	D5	B1	Yes	-	-	-
(Spare)	XT 6:1/6	D2	B2	Yes	-	-	-
(Spare)	XT 6:1/7	D7	B3	Yes	-	-	-

Customer signals

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel	Can/ Device-Net	Inter-bus	Profi-bus
(Spare)	XT 5:1/1	B1	A18	Yes	-	-	-
(Spare)	XT 5:1/2	B2	A19	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/17	B3	A20	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/18	B4	A21	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/21	B5	A22	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/22	B6	A23	Yes	-	-	-
KSR Sep. screened	XT 5:2/13	B7	A24	Yes	-	-	-
KSR Sep. screened	XT 5:2/14	B8	A25	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/15	B9	A16	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/16	B10	A17	Yes	-	-	-
Close_tip1 (DO 1)	XT 5:1/3	B11	A1	Yes	-	-	-
Temp_ok (DI 8)	XT 5:1/4	B12	A2	Yes	-	-	-
Work_select (DO 8)	XT 5:1/5	B13	A3	Yes	-	-	-
Tip1_open (DI 9)	XT 5:1/6	B14	A4	Yes	-	-	-
Tip1_retract (DI 10)	XT 5:1/7	B15	A5	Yes	-	-	-
(Spare)	XT 5:1/8	B16	A6	Yes	-	-	-
(Spare)	XT 5:1/9	B18	A7	Yes	-	-	-
(Spare)	XT 5:1/10	B19	A8	Yes	-	-	-
(Spare)	XT 5:1/11	B20	A9	Yes	-	-	-
(Spare)	XT 5:1/12	B21	A10	Yes	-	-	-
(Spare)	XT 5:2/19	C1	A11	Yes	-	-	-
(Spare)	XT 5:2/20	C2	A12	Yes	-	-	-
(Spare)	XT 5:2/23	C3	A13	Yes	-	-	-
(Spare)	XT 5:2/24	C4	A14	Yes	-	-	-
Not in use	-	-	-	-	-	-	-

CBus signals

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Par-allel	Can/ DeviceNet	Interbus	Profibus
(Spare) or Bus signals	See valid bus	B22	A1		+24VCAN	GNDIM	XT 5:2/21
(Spare) or Bus signals	See valid bus	B23	A2		0V CAN	XT 5:2/18	XT 5:2/22
(Spare)	See valid bus	B24	A3		XT 5:2/19	XT 5:2/19	XT 5:2/19
(Spare)	See valid bus	B25	A4		XT 5:2/20	XT 5:2/20	XT 5:2/20
(Spare) or Bus signals	See valid bus	A3	A7		CAN1X H	XT 5:2/15	XT 5:2/13/ KSR
(Spare) or Bus signals	See valid bus	A4	A8		CAN1X L	XT 5:2/16	XT 5:2/14/ KSR
(Spare) or Bus signals	See valid bus	A5	A9		XT 5:2/13/ KSR	XT 5:2/13	RXD/TXD-P
(Spare) or Bus signals	See valid bus	A6	A10		XT 5:2/14/ KSR	XT 5:2/14	RXD/TXD-N
(Spare) or Bus signals	See valid bus	A9	A5		XT 5:2/15	DO	XT 5:2/15
(Spare) or Bus signals	See valid bus	A10	A6		XT 5:2/16	DO_N	XT 5:2/16
(Spare) or Bus signals	See valid bus	A11	A11		XT 5:2/17	DO	XT 5:2/17
(Spare) or Bus signals	See valid bus	A12	A12		XT 5:2/18	DO_N	XT 5:2/18

Harting Connector

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

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 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 general options for Type S

To enable the SpotPack IRB 6600/6650/7600 to perform as intended, general standard robot options are required. These standard options are further described under other chapters but are also mentioned in this chapter.

Option	Description
64-5	No upper cover on robot control cabinet
61-1	1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
191-3	Internal connection of I/O
309-3	Option Internal connection of safety signals
341-1	Option SpotWare (software option for pneumatic guns)

Required Power unit options for Type S

The SpotPack IRB 6600/6650/7600 also requires Power unit options to perform as intended. These options are further described under Chapter 2.8 but are also mentioned in this chapter.

The power unit and below mentioned options are not available for S4Cplus Automotive

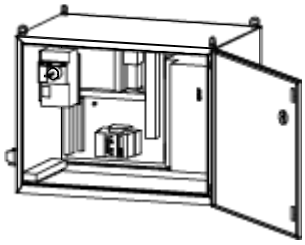


Figure 61 Power unit overview.

Option	Type	Description
468-1	Power unit, AC welding type S	The basic power unit for type S is equipped with a weld timer and Thyristor AC type Bosch PST 6100.100L.
465-1	MFDC welding S and HS	Offers a replacement of the thyristor unit in option 468-1 with a MFDC inverter type Bosch PSI 6100.100L. This option requires forced air cooling (option 464-1).
464-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the power unit which forces air on the cooling surface of the thyristor or MFDC inverter.
461-1	Ground fault protection	Offers a ground fault protection to the circuit breaker.
457-1	Contactor for weld power	Offers a contactor with necessary wiring and relays inside the power unit.
478-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
478-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.

Required Water and Air unit options for Type S

The SpotPack IRB 6600/6650/7600 also requires Water and Air unit options to perform as intended. See Figure 62. These options are further described under chapter 2.9 Water and Air Unit but are also mentioned in this chapter.

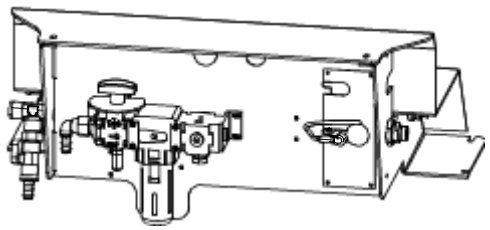


Figure 62 Water and air unit basic.

Option	Type	Description
477-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
473-1	Second water return	Offers an additional water return circuit.
460-1	Digital flow meter, One water return	Offers a digital flow meter instead of a flow switch.
460-2	Digital flow meter, Two water returns	Offers digital flow meter if the option second water return (option 473-1) is chosen.
469-1	Pressure switch and regulator for air	Offers filter regulator and pressure switch.
462-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses. This option requires extended media (option 463-1).
454-1[a]	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box sitting on the water and air unit.
454-2[a]	Cable to split box, 15 m	Offers floor cable of 15 m length for signals to the split box sitting on the water and air unit.
454-4[a]	Cable to split box, 30 m	Offers floor cable of 30 m length for signals to the split box sitting on the water and air unit.

a. Not available for S4Cplus Automotive since power unit not available

2.4.3 Summary Type S

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

DressPack

Option	Description
16-1	Connection to cabinet (Cable length and communication type to be stated)
455-1 or -2	Parallel or Bus communication (Communication type to be stated)
476-1	Spot Welding base to axis 3 (DressPackage lower arm)
475-1	Spot Welding axis 3 to axis 6 (DressPackage upper arm)

General options

Option	Description
64-5	No upper cover on robot control cabinet
61-1	1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
191-3	Internal connection of I/O
309-3	Internal connection of safety signals
341-1	SpotWare (software option for pneumatic guns)

Power unit

Option	Description
468-1	Power unit AC
478-1	Power cable 7 m (other length available)

The power unit is not available for S4Cplus Automotive

Water and air unit

Option	Description
477-1	Water and air unit
454-1[a]	Splitbox cable 7 m. (other length availible)

a. Not available for S4Cplus Automotive

(Also, option 462-1 and 463-1 at the water and air unit are normally required for pneumatic gun handling).

Other described options depends on specific system need and performance.

2.5 Type HS

2.5.1 Introduction

General

Variant Type HS is designed for handling against a pedestal mounted Spot Welding pneumatic gun. Included modules are shown in Figure 63. Available configurations with linked option numbers are described below starting with DressPack.

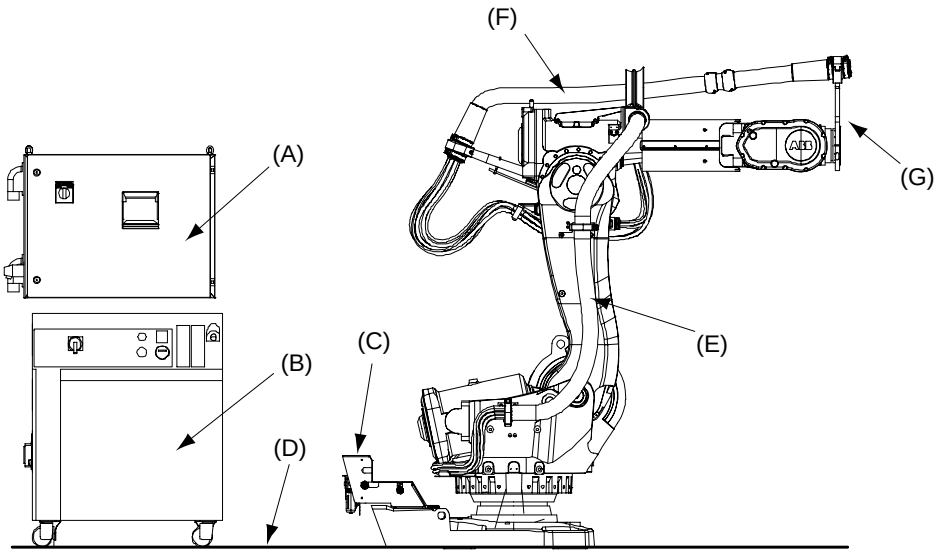


Figure 63 SpotPack Type HS for IRB 6600/6650/7600 main module.

SpotPack

Pos.	Name	Description
A	Power unit	Power unit with power cable and signal cables between Power unit and Water and Air unit are required.
B	Robot Cabinet S4Cplus	
C	Water and Air unit	Water and Air unit with hoses.
D	DressPack, floor	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
E	DressPack, lower arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
F	DressPack, upper arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
G	Robot Gripper	

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified in the specification form: Option 94-1,-2,-4 for parallel communication Option 90-2,-3,-5 for bus communication with Can/ DeviceNet Option 92-2,-3,-5 for bus communication with Profibus Option 91-2,-3,-4 for bus communication with Interbus
455-1	Parallel communication	Offers the process cable package needed for parallel communication.
455-2	Bus communication	Offers the process cable package needed for bus communication. This option includes both the signals for the bus communication as well as some parallel signals. The type of bus is defined by the choice of the floor cabling (see option 16-1 above).
455-3	Basic Parallel communication	Offers the process cable package needed for the basic parallel communication.
538-1	Material handling base to axis 3	Offers DressPack from robot base to axis 3 for Material Handling application.
466-1	Material handling axis 3 to axis 6	Offers DressPack from axis 3 to axis 6 for Material Handling application.

Depending on the choice of Parallel or Bus communication the process cable package for option 538-1 and option 466-1 will have different content. See tables for:

- DressPack Type HS. Parallel communication
- DressPack Type HS. Can/DeviceNet communication
- DressPack Type HS. Interbus communication
- DressPack Type HS. Profibus communication below

Dress Pack Type H. Basic Parallel communication

- Option 16-2 or Option 16-1 with Connection to cabinet (option 94-1, -2, -4 to specify cable length)
- Option 455-3 Basic Parallel communication
- Option 538-1 Material Handling base to axis 3

This configuration could not be combined with Option 466-1 Material Handling axis 3 to axis 6.

Type	At terminals in cabinet	At Connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2	2	0,96 mm^2	250 VAC, 6 A rms
Protective Ground	1	1	0,96mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	14 (7x2)	14 (7x2)	0,23mm^2	50 VAC, 1 A rms
Signals twisted pair and separate shielded	2 (1x2)	2 (1x2)	0,23 mm^2	50 VAC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1)

2.5.1 Introduction

DressPack Type HS. Parallel communication

- Option 16-2 or Options 16-1 with Connection to cabinet (option 94-1,-2,-4 for cable length)
- Option 455-1 Parallel communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Utility Power	3	3	1,5 mm^2	250 VAC, 12 A rms
Protective Ground	1	1	1,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	16 (8x2)	16 (8x2)	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8 (4x2)	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

DressPack Type HS. Can/DeviceNet communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 90-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	2	0,14 mm^2	Can/DeviceNet spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	2	2	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.5.1 Introduction

DressPack Type HS. Interbus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	1	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	4	0,14 mm^2	Interbus spec
Signals twisted pair	4 (2x2)	4 (2x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	3	3	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar/ 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

DressPack Type HS. Profibus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,14 mm^2	Profibus 12 Mbits/s spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	4	4	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.5.2 Interface description DressPack

Customer Interface

Possible customer interface points are shown in Figure 64.

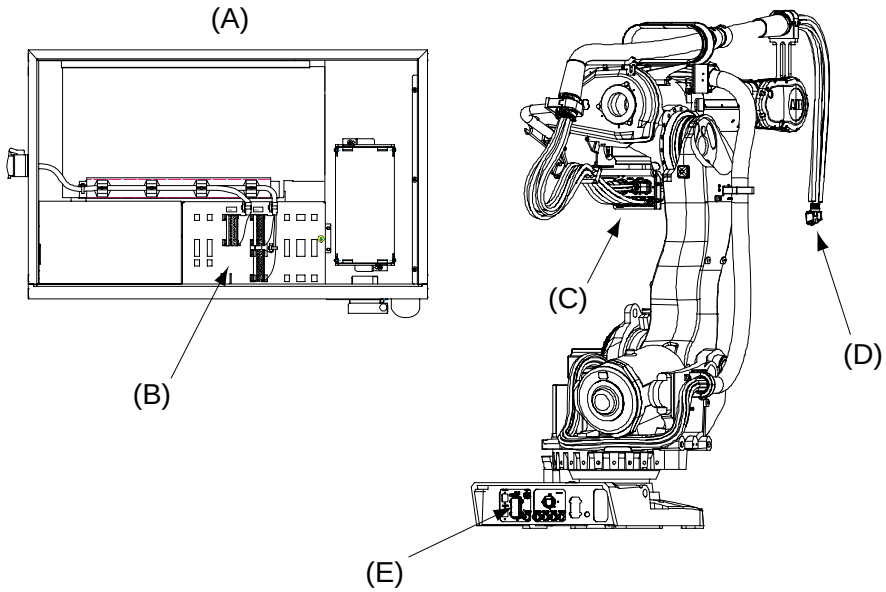


Figure 64 Robot with base, axis 3, axis 6 and terminals inside cabinet shown.

Pos	Description
A	Top view cabinet without cover
B	Terminals in cabinet
C	Interface axis 3
D	Interface axis 6
E	Interface base

The interface at axis 6 has a hose with free end and a signal connector type modular Harting. The connector configurations are described in the table Connection below. Signals with (parentheses) are to be connected by customer.

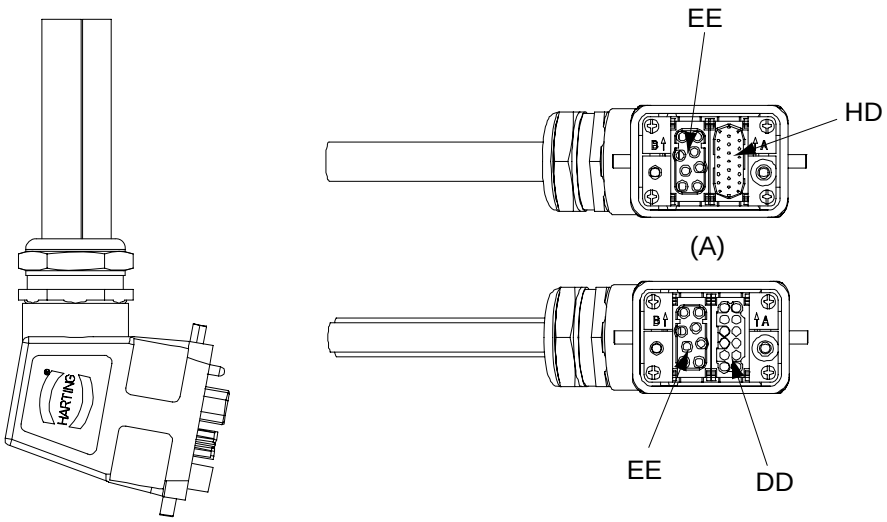


Figure 65 Modulharting axis 6.

Pos	Description
A	Module version

Connection

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device-Net	Inter-bus	Profi-bus
Harting module type[a] (see *Harting Connector* on page 109)				EE+HD	EE+HD	EE+DD	EE+DD	EE+DD

a. Customer signals marked with * are not separatly screened.

2.5.2 Interface description DressPack

Customer power signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device-Net	Inter-bus	Profi-bus
(+24 V)	XT 6:1/1	D1	B4	Yes	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/2	D6	B5	Yes	Yes	Yes	Yes	Yes
(+24 V)	XT 6:1/3	D3	B6	-	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/4	D4	B7	-	Yes	Yes	Yes	Yes
Ground (in housing)	GND	GND	GND	Yes	Yes	Yes	Yes	Yes
(Spare)	XT 6:1/5	D5	B1	-	Yes	-	-	-
(Spare)	XT 6:1/6	D2	B2	-	Yes	-	-	-
(Spare)	XT 6:1/7	D7	B3	-	Yes	-	-	-

Customer signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device-Net	Inter-bus	Profi-bus
(Spare)	XT 5:1/1	B1	A18	Yes	Yes	-	-	-
(Spare)	XT 5:1/2	B2	A19	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/17	B3	A20	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/18	B4	A21	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/21	B5	A22	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/22	B6	A23	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/13	B7	A24	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/14	B8	A25	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/15	B9	A16	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/16	B10	A17	Yes*	Yes	-	-	-
(Spare)	XT 5:1/3	B11	A1	Yes*	Yes	-	-	-
(Spare)	XT 5:1/4	B12	A2	Yes*	Yes	-	-	-
(Spare)	XT 5:1/5	B13	A3		Yes	-	-	-
(Spare)	XT 5:1/6	B14	A4	Yes*	Yes	-	-	-
(Spare)	XT 5:1/7	B15	A5	Yes*	Yes	-	-	-
(Spare)	XT 5:1/8	B16	A6	Yes*	Yes	-	-	-
(Spare)	XT 5:1/9	B18	A7	-	Yes	-	-	-
(Spare)	XT 5:1/10	B19	A8	-	Yes	-	-	-
(Spare)	XT 5:1/11	B20	A9	-	Yes	-	-	-
(Spare)	XT 5:1/12	B21	A10	-	Yes	-	-	-
(Spare)	XT 5:2/19	C1	A11	-	Yes	-	-	-
(Spare)	XT 5:2/20	C2	A12	-	Yes	-	-	-
(Spare)	XT 5:2/23	C3	A13	-	Yes	-	-	-
(Spare)	XT 5:2/24	C4	A14	-	Yes	-	-	-

CBus signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Par-allel	Par-allel	Can/ DeviceNet	Interbus	Profibus
(Spare) or Bus signals	See valid bus	B22	A1			+24VCAN	GNDIM	XT 5:2/21
(Spare) or Bus signals	See valid bus	B23	A2			0V CAN	XT 5:2/18	XT 5:2/22
(Spare)	See valid bus	B24	A3			XT 5:2/19	XT 5:2/19	XT 5:2/19
(Spare)	See valid bus	B25	A4			XT 5:2/20	XT 5:2/20	XT 5:2/20
(Spare) or Bus signals	See valid bus	A3	A7			CAN1X H	XT 5:2/15	XT 5:2/13
(Spare) or Bus signals	See valid bus	A4	A8			CAN1X L	XT 5:2/16	XT 5:2/14
(Spare) or Bus signals	See valid bus	A5	A9			XT 5:2/13	XT 5:2/13	RXD/TXD-P
(Spare) or Bus signals	See valid bus	A6	A10			XT 5:2/14	XT 5:2/14	RXD/TXD-N
(Spare) or Bus signals	See valid bus	A9	A5			XT 5:2/15	DO	XT 5:2/15
(Spare) or Bus signals	See valid bus	A10	A6			XT 5:2/16	DO_N	XT 5:2/16
(Spare) or Bus signals	See valid bus	A11	A11			XT 5:2/17	DO	XT 5:2/17
(Spare) or Bus signals	See valid bus	A12	A12			XT 5:2/18	DO_N	XT 5:2/18

Harting Connector

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

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 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 general options for Type HS

To enable the SpotPack IRB 6600/6650/7600 to perform as intended, general standard robot options are required. These standard options are further described under other chapters but are also mentioned in this chapter.

- Option 64-5 No upper cover on robot control cabinet
- Option 61-1 1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 191-3 Internal connection of I/O
- Option 309-3 Internal connection of safety signals
- Option 341-1 SpotWare (software option for pneumatic guns)

Required Power unit options for Type HS

The SpotPack IRB 6600/6650/7600 also requires Power unit options to perform as intended. These options are further described under chapter 2.8 Power Unit but are also mentioned in this chapter

The power unit and below mentioned options are not available for S4Cplus Automotive.

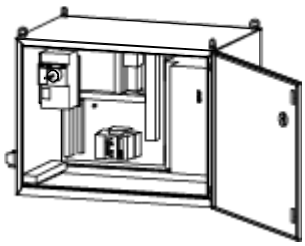


Figure 66 Power unit overview.

Option	Type	Description
468-2	Power unit, AC welding type HS	The basic power unit for type HS is equipped with a weld timer and Thyristor AC type Bosch PST 6100.100L.
465-1	MFDC welding type S and type HS	Offers a replacement of the thyristor unit in option 2088 with a MFDC inverter type Bosch PSI 6100.100L. This option requires forced air cooling (option 464-1).
464-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the power unit which forces air on the cooling surface of the thyristor or MFDC inverter.
461-1	Ground fault protection	Offers a ground fault protection to the circuit breaker.
457-1	Contactor for weld power	Offers a contactor with necessary wiring and relays inside the power unit.
478-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
478-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
472-1	Process cable to stationary gun, 7 m	Offers floor cable of 7 m length for signals to pedestal gun.
472-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for signals to pedestal gun.
472-4	Process cable to stationary gun, 30 m	Offers floor cable of 30 m length for signals to pedestal gun.

2.5.3 Interface description pedestal gun

Interface

The interface towards the pedestal gun includes 3 parts.

- Signal interface with a signal connector type modular Harting (Cable option 472-1, option 472-2 or option 472-4). 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 478-1 or option 478-2) (Ending Multi contact type MC TSB 150/35).
- Water and air connections made by the customer directly on the water and air unit.

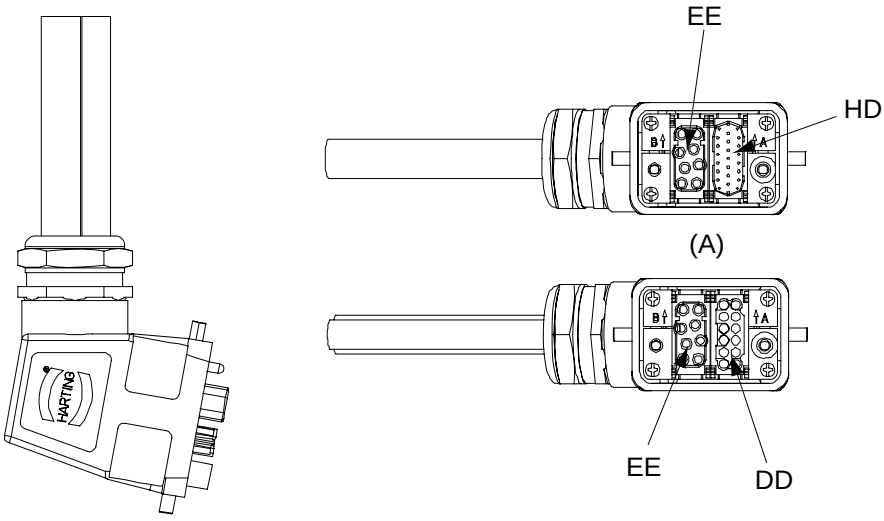


Figure 67 Modulharting pedestal gun.

Pos	Description
A	Module version

Customer power signals

Name	Connector pin	Connector Pin No.
	Power unit	Pedestal gun
Harting module type (see *Harting Connector* on page 112)	HD	EE+HD
+24 V		B4
0 V		B5
+24 V		B6
0 V		B7

Customer signals

Name	Connector pin	Connector Pin No.
	Power unit	Pedestal gun
Harting module type	HD	EE+HD
(Spare)		A18
(Spare)		A19
(Spare)		A20
(Spare)		A21
(Spare)		A22
(Spare)		A23
KSR Sep. screened		A24
KSR Sep. screened		A25
(Spare) Sep. screened		A16
(Spare) Sep. screened		A17
Close_tip1 (DO 1)		A1
Temp_ok (DI 8)		A2
Work_select (DO 8)		A3
Tip1_open (DI 9)		A4
Tip1_retract (DI 10)		A5
(Spare)		A6

Harting Connector

The Harting connector is shown in Figure 67. The different main parts within the connector are shown both with the name and Hartings article number. Corresponding parts at the tool are available within the Harting product offer.

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 0303
Multicontact, female (HD)	09 14 025 3101
Multicontact, female (EE)	09 14 012 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 6600/6650/7600 also requires Water and Air unit options to perform as intended. These options are further described under chapter 2.9 Water and Air Unit but are also mentioned in this chapter.

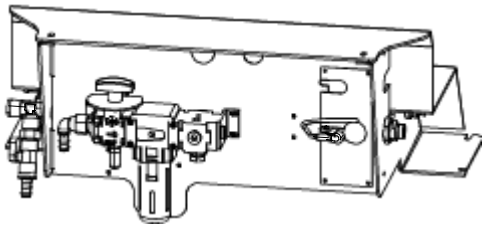


Figure 68 Water and air unit basic.

Option	Type	Description
477-2	Water and Air unit, type HS	Offers the basic water and air unit for type HS including splitbox for signal distribution.
473-1	Second water return	Offers an additional water return circuit.
460-1	Digital flow meter, One water return	Offers a digital flow meter instead of a flow switch.
460-2	Digital flow meter, Two water returns	Offers digital flow meter if the optional second water return (option 473-1) is chosen.
469-1	Pressure switch and regulator for air	Offers filter regulator and pressure switch.
462-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses. This option requires extended media (option 463-1).
454-1[a]	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box sitting on the water and air unit.
454-2[a]	Cable to split box, 15 m	Offers floor cable of 15 m length for signals to the split box sitting on the water and air unit.
454-4[a]	Cable to split box, 30 m	Offers floor cable of 30 m length for signals to the split box sitting on the water and air unit.

a. Not available for S4Cplus Automotive since power unit not available

2.5.4 Summary Type HS

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

DressPack

Option	Description
16-1	Connection to cabinet (Cable length and communication type to be stated)
455-1, 455-2, 455-3	Basic parallel, Parallel or Bus communication (Communication type to be stated)
538-1	Material Handling base to axis 3 (DressPackage lower arm)
466-1	Material Handling axis 3 to axis 6 (DressPackage upper arm)

General options

Option	Description
64-5	No upper cover on robot control cabinet
61-1	1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
191-3	Internal connection of I/O
309-3	Internal connection of safety signals
341-1	SpotWare (software option for pneumatic guns)

Power unit

Option	Description
468-2	Power unit AC type HS
478-1	Power cable 7 m (other length available)
472-1	Process cable to stationary gun, 7 m (other length available)

The power unit is not available for S4Cplus Automotive

Water and air unit

Option	Description
477-2	Water and air unit type HS
454-1[a]	Splitbox cable 7 m. (other length available)

a. Not available for S4Cplus Automotive

(Also option 462-1 and 463-1 at water and air unit are normally required for pneumatic gun handling).

Other described options depend on specific system need and performance.

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 69. Available configurations with linked option numbers are described below starting with Dress-Pack.

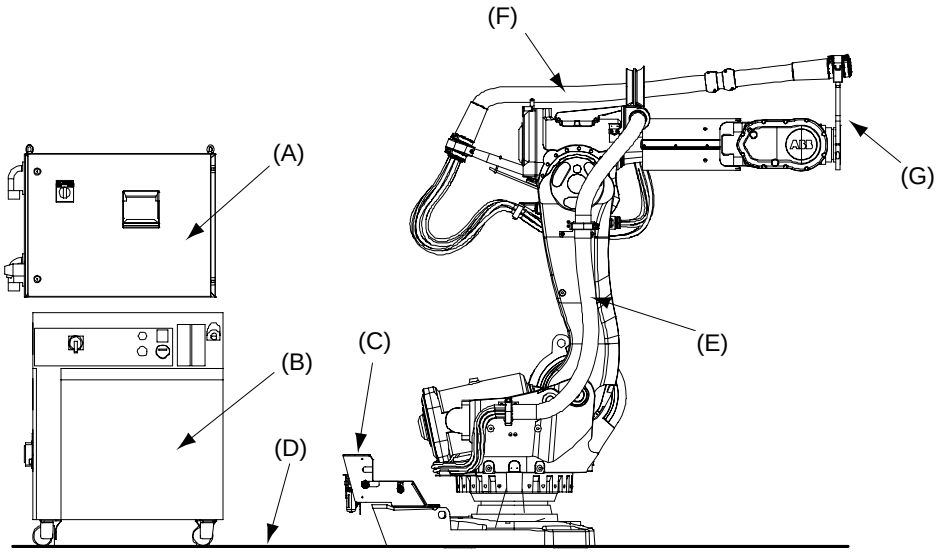


Figure 69 SpotPack Type Se for IRB 6600/6650/7600 main modules.

SpotPack

Pos	Name	Description
A	Power unit	Power unit with power cable and signal cables between Power unit and Water and Air unit are required.
B	Robot Cabinet S4Cplus	
C	Water and Air unit	Water and Air unit with hoses.
D	DressPack, floor	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
E	DressPack, lower arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
F	DressPack, upper arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
G	Robot Gun	

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified in the specification form: • Option 450-1,-2,-4 for parallel communication with servo gun.
455-1	Parallel communication	Offers the process cable package needed for parallel communication.
476-1	Spot Welding base to axis 3	Offers DressPack from robot base to axis 3 for Spot Welding application.
475-1	Spot Welding axis 3 to axis 6	Offers DressPack from axis 3 to axis 6 for Spot Welding application.

The process cable package for option 476-1 and option 475-1 will have the content as shown in table DressPack Type S. Parallel communication below.

DressPack Type Se. Parallel communication with servo gun

- Option 16-2 or Options 16-1 with Connection to cabinet (option 450-1,-2,-4 for cable length)
- Option 455-1 Parallel communication
- Option 476-1 Spot Welding base to axis 3
- Option 475-1 Spot Welding axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Servo Power	-	3	1,5 mm^2	600 VAC, 12 A rms
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,5 mm^2	600 VAC
Customer Signals (CS)				
Signals twisted pair	10 (5x2)	10 (5x2)	0,23 mm^2	50 V DC, 1 A rms
Servo, Resolver signals	-	6[b]	0,23 mm^2	50 V DC, 1 A rms
Servo Brake	-	3[b]	0,23 mm^2	50 V DC, 1 A rms
Servo, PTC	-	2[b]	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4 (2x2)	4 (2x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-3)		3	12,5 mm inner diameter	Max. air pressure 16 bar / 230 PSI. Max. water pressure 10 bar / 145 PSI
Welding power (WELD)				
Lower arm		2	35 mm^2	600 VAC, 150 A rms at 20°C (68F)
Lower arm, protective ground		1	35 mm^2	
Upper arm		2	25 mm^2	600 VAC, 135 A rms at 20°C (68F)
Upper arm, protective ground		1	25 mm^2	

a. Interface at manipulator base or axis 3 (option 476-1) or axis 6 (option 475-1)
b. Interface only at axis 3 (option 476-1) or axis 6 (option 475-1)

Option	Type	Description
463-1	Extended media	Offers the process cable package with one extra media hose. This can only be chosen in combination with DressPack for Spot welding application (option 476-1 and option 475-1). This option has the following specification: • Hose 1/2" (Proc 4) with connection at base and axis 6 with free end.

2.6.2 Interface description DressPack

Customer interface

Possible customer interface points are shown in Figure 70.

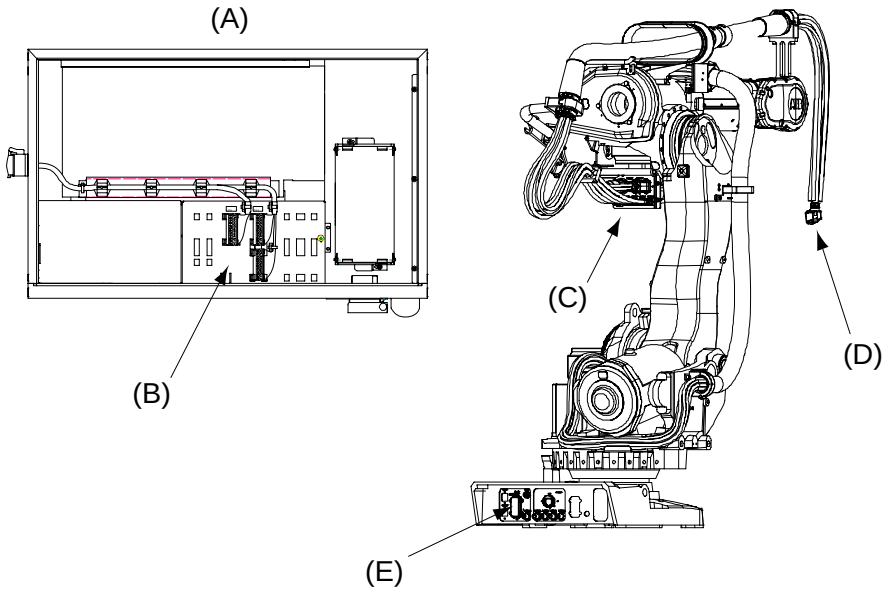


Figure 70 Robot with base, axis 3, axis 6 and terminals inside cabinet.

Pos	Description
A	Top view cabinet without cover
B	Terminals in cabinet
C	Interface axis 3
D	Interface axis 6
E	Interface base

The interface at axis 6 has a hose with a free end and a signal connector type modular Harting. See Figure 71. The connector configurations are described in the table Connectionbelow. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type Se is ordered.

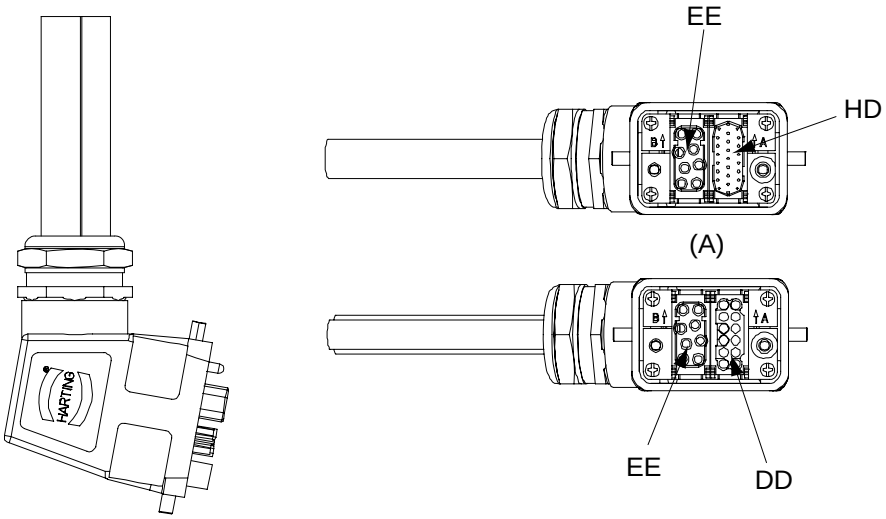


Figure 71 Modulharting axis 6.

Pos	Description
A	Module version

Connection

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel			
Harting module type (see *Harting connection* on page 120)				EE+HD			

Customer power signals

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel			
Servo W		D5	B1	Yes			
Servo V		D2	B2	Yes			
ServoU		D7	B3	Yes			
Ground (in housing)		GND	GND	Yes			
+24 V	XT 6:2/1	D1	B4	Yes			
0 V	XT 6:2/2	D6	B5	Yes			
+24 V	XT 6:2/3	D3	B6	Yes			
0 V	XT 6:2/4	D4	B7	Yes			

Customer signals

Name	Terminal	Pin No.	Pin No.	Communication types			
	Cabinet	Base and Axis 3	Axis 6	Parallel			
CS1/X7		B1	A18	Yes			
CS2/0V X7		B2	A19	Yes			
CS3/Y7		B3	A20	Yes			
CS3/0V Y7		B4	A21	Yes			
CS5/0V EXC 2		B5	A22	Yes			
CS6/EXC 2		B6	A23	Yes			
KSR Sep. screened	XT 5:3/5	B7	A24	Yes			
KSR Sep. screened	XT 5:3/6	B8	A25	Yes			
(Spare) Sep. screened	XT 5:3/7	B9	A16	Yes			
(Spare) Sep. screened	XT 5:3/8	B10	A17	Yes			
(Spare)	XT 5:1/1	B11	A1	Yes			
(Spare)	XT 5:1/2	B12	A2	Yes			
g1_equalize	XT 5:1/3	B13	A3	Yes			
g1_temp_ok	XT 5:1/4	B14	A4	Yes			
(Spare)	XT 5:1/5	B15	A5	Yes			
(Spare)	XT 5:1/6	B16	A6	Yes			
(Spare)	XT 5:1/7	B18	A7	Yes			
(Spare)	XT 5:1/8	B19	A8	Yes			
(Spare)	XT 5:1/9	B20	A9	Yes			
(Spare)	XT 5:1/10	B21	A10	Yes			
EXT PTC		C1	A11	Yes			
0V Ext PTC		C2	A12	Yes			
Ext Brake Rel		C3	A13	Yes			
Ext Brake PB		C4	A14	Yes			
0V Ext Brake		C5	A15	Yes			

Harting connection

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 0303
Multicontact, female (HD)	09 14 025 3101
Multicontact, female (EE)	09 14 012 3101

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

Required general options for Type Se

To enable the SpotPack IRB 6600/6650/7600 to perform as intended, general standard robot options are required. These standard options are further described under other chapters but are also mentioned in this chapter.

- Option 64-5 No upper cover on robot control cabinet
- Option 61-11pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 191-3 Internal connection of I/O
- Option 309-3 Internal connection of safety signals

Required options for servo gun

To enable the spot welding function package SpotPack IRB 6600/6650/7600 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. For more information see chapter 1.9 Servo Gun (option).

SpotPack Type Se with servo requires the following additional options

- Option 53-2 Drive unit type DDU-V
- Option 323-1 Robot Gun
- Option 450-1,-2,-4 Connection of servo gun (7 - 30 m), see also above
- Option 341-5 SpotWare Servo (software option for servo guns)

Also, option 325-1, Servo tool change, should be added if servo gun tool change is required.

Required Power unit options for Type Se

The SpotPack IRB 6600/6650 also requires Power unit options to perform as intended. See Figure 72. These options are further described under chapter 2.8 Power Unit but are also mentioned in this chapter.

The power unit and below mentioned options are not available for S4Cplus Automotive

2.6.2 Interface description DressPack

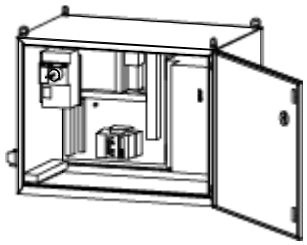


Figure 72 Power unit overview.

Option	Type	Description
468-1	Power unit, AC welding type S	The basic power unit for type S is equipped with a weld timer and Thyristor AC type Bosch PST 6100.100L.
465-1	MFDC welding S and HS	Offers a replacement of the thyristor unit in option 468-1 with a MFDC inverter type Bosch PSI 6100.100L. This option requires forced air cooling (option 464-1).
464-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the power unit which forces air on the cooling surface of the thyristor or MFDC inverter.
461-1	Ground fault protection	Offers a ground fault protection to the circuit breaker.
457-1	Contactor for weld power	Offers a contactor with necessary wiring and relays inside the power unit.
478-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
478-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.

Required Water and Air unit options for Type Se

The SpotPack IRB 6600/6650/7600 also requires Water and Air unit options to perform as intended. See Figure 73. These options are further described under chapter 2.9 Water and Air Unit but are also mentioned in this chapter.

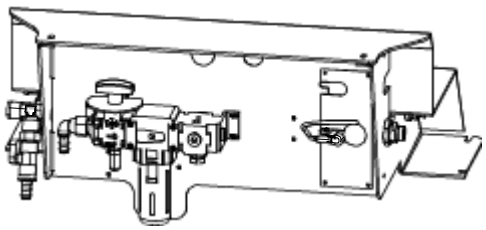


Figure 73 Water and air unit basic.

Option	Type	Description
477-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
473-1	Second water return	Offers an additional water return circuit.
460-1	Digital flow meter, One water return	Offers a digital flow meter instead of a flow switch.
460-2	Digital flow meter, Two water returns	Offers digital flow meter if the option second water return (option 473-1) is chosen.
469-1	Pressure switch and regulator for air	Offers filter regulator and pressure switch.
454-1[a]	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box sitting on the water and air unit.
454-2[a]	Cable to split box, 15 m	Offers floor cable of 15 m length for signals to the split box sitting on the water and air unit.
454-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals to the split box sitting on the water and air unit.

a. Not available for S4Cplus Automotive since power unit not available

2.6.3 Summary Type Se

General

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

DressPack

Option	Description
16-1	Connection to cabinet (Cable length and communication type to be stated)
455-1	Parallel (Communication type to be stated)
476-1	Spot Welding base to axis 3 (DressPackage lower arm)
475-1	Spot Welding axis 3 to axis 6 (DressPackage upper arm)

General options

Option	Description
64-5	No upper cover on robot control cabinet
61-1	1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
191-3	Internal connection of I/O
309-3	Internal connection of safety signals

Servo gun options

Option	Description
53-2	Drive unit type DDU/DU-V
323-1	Robot Gun
450-1, 450-2, 450-4	Connection of servo gun (7 - 30 m)
341-5	SpotWare Servo

Also option 325-1, Servo tool change, should be added if servo gun tool change is required.

Power unit

Option	Description
468-1	Power unit AC
478-1	Power cable 7 m (other length available)

Water and air unit

Option	Description
477-1	Water and air unit
454-1	Splitbox cable 7 m. (other length available)

The power unit and the water and air unit are not available for S4Cplus Automotive

Other described options depend on specific system need and performance.

2.7 Type HSe

2.7.1 Introduction

General

Variant Type HSe is designed for handling on a pedestal mounted Spot Welding servo controlled (electrical) gun. Included modules are shown in Figure 23 below. Available configurations with linked option numbers are described below starting with DressPack.

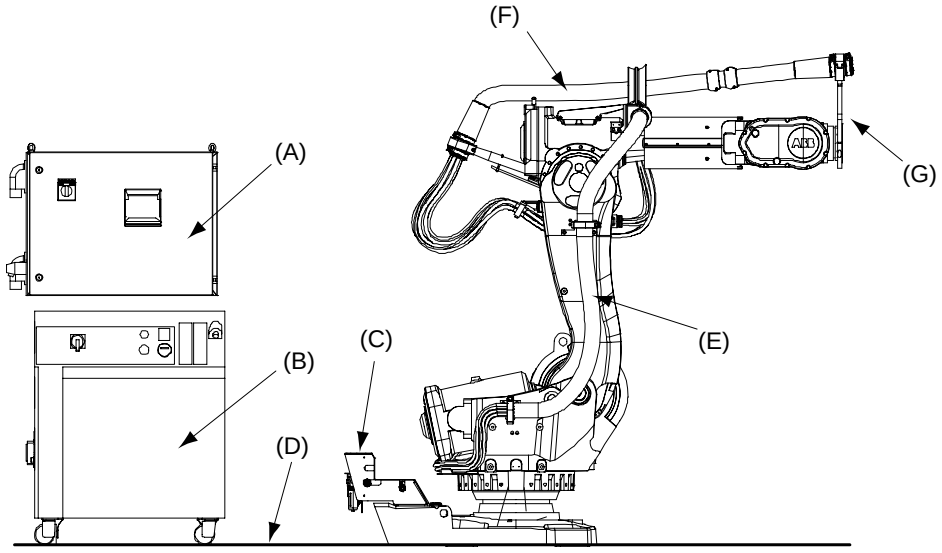


Figure 74 SpotPack Type HSe for IRB 6600/6650/7600 main modules.

SpotPack

Pos.	Name	Description
A	Power unit	Power unit with power cable and signal cables between Power unit and Water and Air unit are required.
B	Robot Cabinet S4Cplus	
C	Water and Air unit	Water and Air unit with hoses.
D	DressPack, floor	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
E	DressPack, lower arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
F	DressPack, upper arm	The DressPack is available in different combinations and contains three modules: Upper arm, Lower arm and Floor.
G	Robot Gripper	

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified in the specification form: Option 94-1,-2,-4 for parallel communication Option 90-2,-3,-5 for bus communication with Can/ DeviceNet Option 92-2,-3,-5 for bus communication with Profibus Option 91-2,-3,-5 for bus communication with Interbus
455-1	Parallel communication	Offers the process cable package needed for parallel communication.
455-2	Bus communication	Offers the process cable package needed for bus communication. This option includes both the signals for the bus communication as well as some parallel signals. The type of bus is defined by the choice of floor cabling (see option 16-1 above).
455-3	Basic parallel communication	Offers the process cable package needed for basic parallel communication.

Dress Pack Type H. Basic Parallel communication

- Option 16-2 or Option 16-1 with Connection to cabinet (option 94-1, -2, -4 to specify cable length)
- Option 455-3 Basic Parallel communication
- Option 538-1 Material Handling base to axis 3

This configuration could not be combined with Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At Connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2	2	0,96 mm^2	250 VAC, 6 A rms
Protective Ground	1	1	0,96 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	14 (7x2)	14 (7x2)	0,23mm^2	50 VAC, 1 A rms
Signals twisted pair and separate shielded	2 (1x2)	2 (1x2)	0,23 mm^2	50 VAC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1)

Option	Type	Description
538-1	Material Handling base to axis 3	Offers DressPack from robot base to axis 3 for Material Handling application.
466-1	Material Handling axis 3 to axis 6	Offers DressPack from axis 3 to axis 6 for Material Handling application.

Depending on the choice of Parallel or Bus communication the process cable package for option 538-1 and option 466-1 will have different content.

See table for:

- DressPack Type HSe. Parallel communication
- DressPack Type HSe. Can/DeviceNet communication
- DressPack Type HSe. Interbus communication
- DressPack Type HSe. Profibus communication

DressPack Type HSe. Parallel communication

- Option 16-2 or Options 16-1 with Connection to cabinet (option 94-1,-2,-4 for cable length)
- Option 455-1 Parallel communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Utility Power	3	3	1,5 mm^2	250 VAC, 12 A rms
Protective Ground	1	1	1,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	16 (8x2)	16 (8x2)	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8 (4x2)	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.7.1 Introduction

DressPack Type HSe. Can/DeviceNet communication

- Option 16-2 or 16-1 with Connection to cabinet (Option 90-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	2	0,14 mm^2	Can/DeviceNet spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	2	2	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

DressPack Type HSe. Interbus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	1	0,23 mm^2	50 V DC, 2 A rms
Bus signals	At busboard	4	0,14 mm^2	Can/DeviceNet spec
Signals twisted pair	4 (2x2)	4 (2x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	3	3	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

DressPack Type HSe. Profibus communication

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-5 for cable length)
- Option 455-2 Bus communication
- Option 538-1 Material Handling base to axis 3
- Option 466-1 Material Handling axis 3 to axis 6

Type	At terminals in cabinet	At connection point[a]	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective Ground	1	1	1,0 mm^2	250 VAC
Customer Bus (Cbus)				
Bus signals	At busboard	2	0,14 mm^2	Profibus 12 Mbits/s spec
Signals twisted pair	6 (3x2)	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Utility signals	4	4	0,23 mm^2	50 V DC, 2 A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. pressure 16 bar / 230 PSI

a. Interface at manipulator base or axis 3 (option 538-1) or axis 6 (option 466-1)

2.7.2 Interface description DressPack

Customer Interface

Possible customer interface points are shown in the Figure 75.

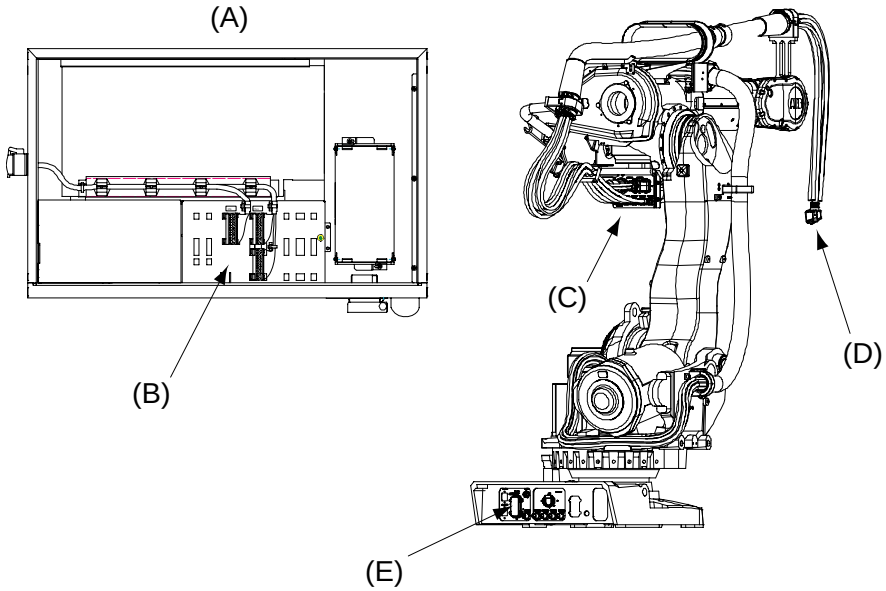


Figure 75 Robot with base, axis 3, axis 6 and terminals inside cabinet shown.

Pos	Description
A	Top view cabinet without cover
B	Terminals in cabinet
C	Interface axis 3
D	Interface axis 6
E	Interface base

The interface at axis 6 has a hose with a free end and a signal connector type modular Harting. See Figure 76. The connector configurations are described in the table Connection below. Signals with (parentheses) are to be connected by customer.

2.7.2 Interface description DressPack

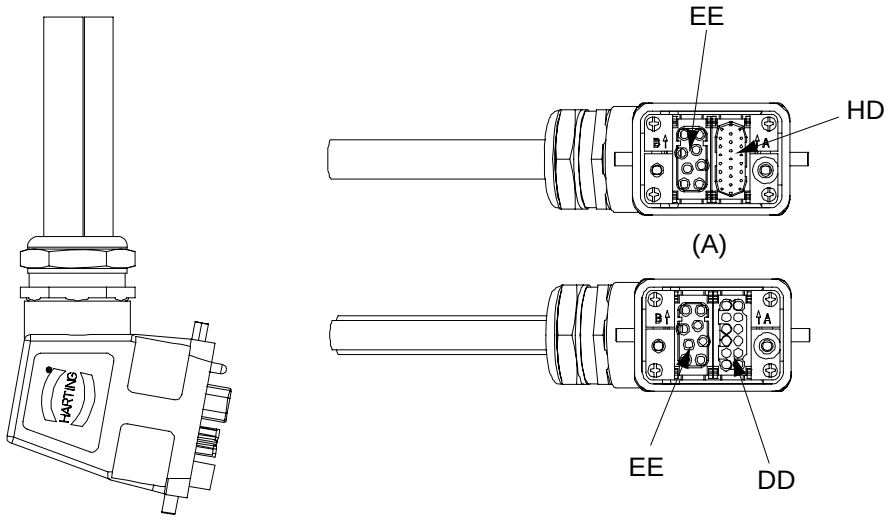


Figure 76 Modulharting axis 6.

Pos	Description
A	Module version

Connection

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device Net	Inter-bus	Profi-bus
Harting module type (see *Harting connection* on page 136)				EE+HD	EE+HD	EE+DD	EE+DD	EE+DD

Customer power signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device Net	Inter-bus	Profi-bus
(+24 V)	XT 6:1/1	D1	B4	Yes	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/2	D6	B5	Yes	Yes	Yes	Yes	Yes
(+24 V)	XT 6:1/3	D3	B6	-	Yes	Yes	Yes	Yes
(0 V)	XT 6:1/4	D4	B7	-	Yes	Yes	Yes	Yes
Ground (in housing)	GND	GND	GND	Yes	Yes	Yes	Yes	Yes
(Spare)	XT 6:1/5	D5	B1	-	Yes	-	-	-
(Spare)	XT 6:1/6	D2	B2	-	Yes	-	-	-
(Spare)	XT 6:1/7	D7	B3	-	Yes	-	-	-

Customer signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Parallel	Parallel	Can/ Device Net	Inter-bus	Profi-bus
(Spare)	XT 5:1/1	B1	A18	Yes	Yes	-	-	-
(Spare)	XT 5:1/2	B2	A19	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/17	B3	A20	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/18	B4	A21	Yes	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/21	B5	A22	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/22	B6	A23	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/13	B7	A24	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/14	B8	A25	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/15	B9	A16	Yes*	Yes	-	-	-
(Spare) Sep. screened	XT 5:2/16	B10	A17	Yes*	Yes	-	-	-
(Spare)	XT 5:1/3	B11	A1	Yes*	Yes	-	-	-
(Spare)	XT 5:1/4	B12	A2	Yes*	Yes	-	-	-
(Spare)	XT 5:1/5	B13	A3	Yes*	Yes	-	-	-
(Spare)	XT 5:1/6	B14	A4	Yes*	Yes	-	-	-
(Spare)	XT 5:1/7	B15	A5	Yes*	Yes	-	-	-
(Spare)	XT 5:1/8	B16	A6	Yes*	Yes	-	-	-
(Spare)	XT 5:1/9	B18	A7	-	Yes	-	-	-
(Spare)	XT 5:1/10	B19	A8	-	Yes	-	-	-
(Spare)	XT 5:1/11	B20	A9	-	Yes	-	-	-
(Spare)	XT 5:1/12	B21	A10	-	Yes	-	-	-
(Spare)	XT 5:2/19	C1	A11	-	Yes	-	-	-
(Spare)	XT 5:2/20	C2	A12	-	Yes	-	-	-
(Spare)	XT 5:2/23	C3	A13	-	Yes	-	-	-
(Spare)	XT 5:2/24	C4	A14	-	Yes	-	-	-
Not in use	-	-	-	-	-	-	-	-

CBus signals

Name	Terminal	Pin No.	Pin No.	Communication types				
	Cabinet	Base and Axis 3	Axis 6	Basic Par-allel	Par allel	Can/ DeviceNet	Interbus	Profibus
(Spare) or Bus signals	See valid bus	B22	A1			+24VCAN	GNDIM	XT 5:2/21
(Spare) or Bus signals	See valid bus	B23	A2			0V CAN	XT 5:2/18	XT 5:2/22
(Spare)	See valid bus	B24	A3			XT 5:2/19	XT 5:2/19	XT 5:2/19
(Spare)	See valid bus	B25	A4			XT 5:2/20	XT 5:2/20	XT 5:2/20
(Spare) or Bus signals	See valid bus	A3	A7			CAN1X H	XT 5:2/15	XT 5:2/13
(Spare) or Bus signals	See valid bus	A4	A8			CAN1X L	XT 5:2/16	XT 5:2/14
(Spare) or Bus signals	See valid bus	A5	A9			XT 5:2/13	XT 5:2/13	RXD/TXD-P
(Spare) or Bus signals	See valid bus	A6	A10			XT 5:2/14	XT 5:2/14	RXD/TXD-N
(Spare) or Bus signals	See valid bus	A9	A5			XT 5:2/15	DO	XT 5:2/15
(Spare) or Bus signals	See valid bus	A10	A6			XT 5:2/16	DO_N	XT 5:2/16
(Spare) or Bus signals	See valid bus	A11	A11			XT 5:2/17	DO	XT 5:2/17
(Spare) or Bus signals	See valid bus	A12	A12			XT 5:2/18	DO_N	XT 5:2/18

Harting connection

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

Name	Harting article No.
Hood	09 30 006 0543
Hinged frame, hood	09 14 006 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 general options for Type HSe

To enable the SpotPack IRB 6600/6650/7600 to perform as intended, general standard robot options are required. These standard options are further described under other chapters but are also mentioned in this chapter.

SpotPack Type HSe standard requires following general robot options

- Option 64-5 No upper cover on robot control cabinet
- Option 61-1 1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs
- Option 191-3 Internal connection of I/O
- Option 309-3 Internal connection of safety signals

Servo gun options

- Option 53-2 Drive unit type DDU-V
- Option 323-5 Stationary Gun
- Option 95-1,-2,-4 Connection of servo gun (7 - 30 m)
- Option 341-5 SpotWare Servo (software option for servo guns)

Required Power unit options for Type HSe

The SpotPack IRB 6600/6650/7600 also requires Power unit options to perform as intended. See Figure 77. These options are further described under chapter 2.8 Power Unit but are also mentioned in this chapter.

The power unit and below mentioned options are not available for S4Cplus Automotive

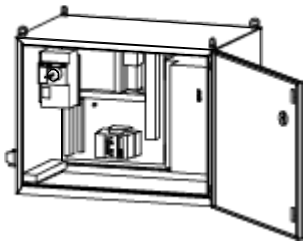


Figure 77 Power unit overview.

Option	Type	Description
468-1	Power unit, AC welding type S	The basic power unit for type HSe is equipped with a weld timer and Thyristor AC type Bosch PST 6100.100L.
465-1	MFDC welding S and HS	Offers a replacement of the thyristor unit in option 2087 with a MFDC inverter type Bosch PSI 6100.100L. This option requires forced air cooling (option 464-1).
464-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the power unit which forces air on the cooling surface for the thyristor or MFDC inverter.
461-1	Ground fault protection	Offers a ground fault protection to the circuit breaker.
457-1	Contactor for weld power	Offers a contactor with necessary wiring and relays inside the power unit.
478-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
478-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.

Interface description pedestal gun

The interface towards the pedestal gun includes 4 parts.

- Power cable with a Multi Contact interface (Cable option 478-1 or 478-2) (Ending Multi contact type MC TSB 150/35).
- Water and air connections made by the customer directly on the water and air unit.
- Servo power cable and servo signals (Goes from DDU to pedestal gun Cable option 95-1,-2,-4), (Ending with Harting type HAN EMC, M40 with inserts type EE, DD, 2xHD).
- Resolver signal cable, 7 m (goes from robot foot R3.FB7 to pedestal gun, included in option 323-5, ending with 12 pin Burndy).

The connector configurations are described in the table Connection below. Signals with (parentheses) are to be connected by customer.

Connection

Name	Connector pin	Connector Pin No.	Connector Pin No.
	Control cabinet	Pedestal gun, R1CP/CS	Pedestal gun, FB.M7
Harting module type (see *Harting connection* on page 140)		EE+2xHD+DD	

Customer power signals

Name	Connector pin	Connector Pin No.	Connector Pin No.
	Control cabinet	Pedestal gun, R1CP/CS	Pedestal gun, FB.M7
+24 V	XT 6:2/1	D1	
0 V	XT 6:2/2	D6	
+24 V	XT 6:2/3	D3	
0 V	XT 6:2/4	D4	
GND		GND, chassis	
Servo power W		D5	
Servo power V		D2	
Servo power U		D7	

Customer signals

Name	Connector pin	Connector Pin No.	Connector Pin No.
	Control cabinet	Pedestal gun, R1CP/CS	Pedestal gun, FB.M7
Ext PTC		C1	
0V Ext PTC		C2	
Ext Brake Rel		C3	
Ext Brake PB		C4	
0V Ext Brake		C5	
g1_equalize	XT 5:3/1	C7	
g1_temp_ok	XT 5:3/2	C8	
(spare)	XT 5:3/3	C9	
(spare)	XT 5:3/4	C10	
CS KSR Sep. screened	XT 5:3/5	B7	
CS KSR Sep. screened	XT 5:3/6	B8	
CS (voltage control) Sep. screened	XT 5:3/7	B9	
CS (volatage control) Sep. screened	XT 5:3/8	B10	

Resolver signals

Name	Connector pin	Connector Pin No.	Connector Pin No.
	Control cabinet	Pedestal gun, R1CP/CS	Pedestal gun, FB.M7
X7			A
0V X7			B
Y7			C
0V Y7			D
0V EXC 2			E
EXC 2			F

Harting connection

Name	Harting article No.
Hood	19 39 016 0408
Hinged frame, hood	09 14 016 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 HSe

The SpotPack IRB 6600/6650/7600 also requires Water and Air unit options to perform as intended. See Figure 78. These options are further described under chapter 2.9 Water and Air Unit but are also mentioned in this chapter.

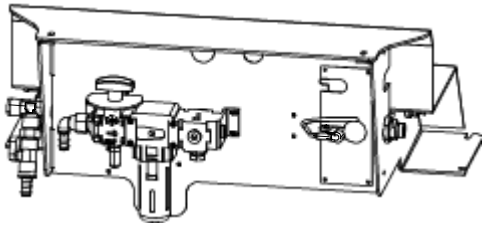


Figure 78 Water and air unit basic.

Option	Type	Description
477-2	Water and Air unit, type HS	Offers the basic water and air unit for type HS including splitbox for signal distribution.
473-1	Second water return	Offers an additional water return circuit.
460-1	Digital flow meter, One water return	Offers a digital flow meter instead of a flow switch.
460-2	Digital flow meter, Two water returns	Offers digital flow meter if the option second water return (option 2177) is chosen.
469-1	Pressure switch and regulator for air	Offers filter regulator and pressure switch.
454-1[a]	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box sitting on the water and air unit.
454-2[a]	Cable to split box, 15 m	Offers floor cable of 15 m length for signals to the split box sitting on the water and air unit.
454-4[a]	Cable to split box, 30 m	Offers floor cable of 30 m length for signals to the split box sitting on the water and air unit.

a. Not available for S4Cplus Automotive since power unit not available

2.7.3 Summary Type HSe

General

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

DressPack

Option	Description
16-1	Connection to cabinet (Cable length and communication type to be stated).
455-1,455-2, 455-3	Parallel, Basic Parallel or Bus communication (Communication type to be stated)
538-1	Material Handling base to axis 3 (DressPackage lower arm)
466-1	Material Handling axis 3 to axis 6 (DressPackage upper arm)

General options

Option	Description
64-5	No upper cover on robot control cabinet
61-1	1pc. Digital 24 VDC I/O 16 inputs/ 16 outputs.
191-3	Internal connection of I/O
309-3	Internal connection of safety signals

Servo gun options

Option	Description
53-2	Drive unit type DDU/DU-V
323-5	Stationary Gun.
95-1,-2,-4	Connection of servo gun (7 - 30 m)
341-5	SpotWare Servo

Power unit

Option	Description
468-2	Power unit AC type HS
478-1	Power cable 7 m (other length available)

The power unit is not available for S4Cplus Automotive.

Water and air unit

Option	Description
477-2	Water and air unit type HS
454-1[a]	Splitbox cable 7 m. (other length available)

a. Not available for S4Cplus Automotive

Other described options depends on specific system need and performance.

2.8 Power Unit

The power unit is not available for S4Cplus Automotive

2.8.1 Introduction

General

The Power unit for SpotPack contains the electric components and circuits needed for Spot Welding application. The Power unit, with the welding controller built in, is via the process software controlled from the robot controller.

The capacity and functionality depends on the choice of different option combinations.

Cabinet

The power unit cabinet is designed to be placed on top of the robot controller cabinet, see Figure 79. All cables are connected on the left hand side of the power unit.

The Power unit has the following main features.

- Adjustable thermal release and short circuit release.
- Cross connection of signal handling with fusing for selectivity.
- Programmable weld timer with KSR regulation and proportional valve control.
- Preparation for additional options and preparation for easy exchange.

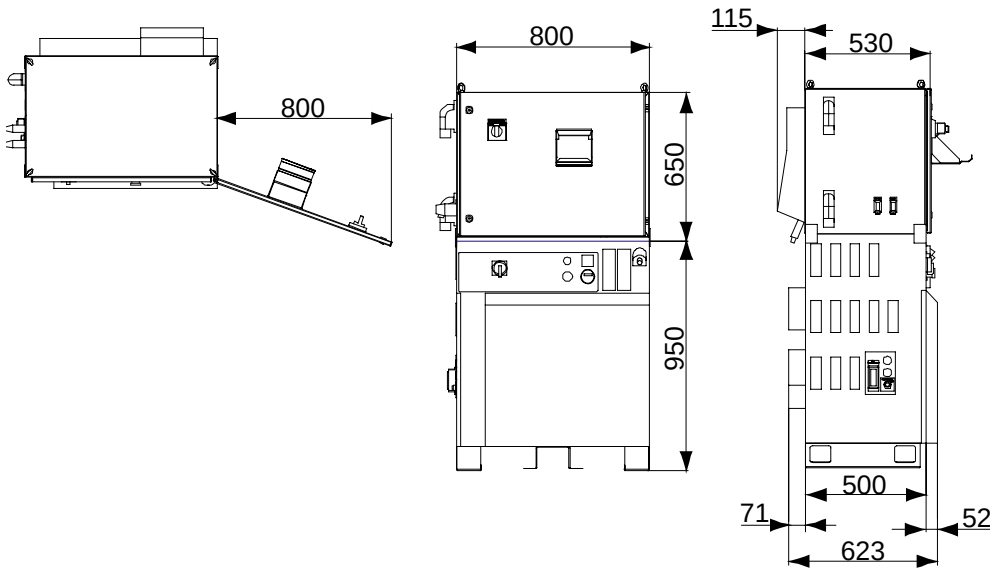


Figure 79 Power unit from different view incl. dimensions and connections (dimensions in mm).

The electrical circuits of the power unit consist of weld power circuit and control circuits to control the welding.

Weld power circuit

The welding power for the welding gun is fed through a circuit breaker and welding thyristor (for AC welding) or inverter (for MFDC welding) and further out to the welding power cable. The welding power cable is connected, via cable gland, directly to terminals inside the power unit.

Control Circuits

Power 240 V AC and 24 V 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 thyristor or inverter, controls the welding current. The welding timer includes control program that gives the possibility to program different weld sequences. The programming is normally done on a PC that is connected directly to the welding timer. The interface between the robot system and the welding timer is handled via a digital signal interface. Example of signals are weld start, weld ready, weld program 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 pedestal gun, are done within the power unit.

For further information see the Installation and Service Manual SpotPack and DressPack, circuit diagrams and separate manuals for the Bosch equipment.

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

Option	Type	Description
468-1	Power unit, AC welding type S	The basic power unit for type S (see Figure 80) is equipped for a robot handled AC Spot Welding gun and with the following components: Cable gland for incoming power (X100) Circuit Breaker type ABB SACE, T1 Welding Timer and Thyristor type Bosch PST 6100.100L / 76kVA Fuse terminal for 24 V distribution Connector to Water and air unit, Modular Harting (HD). (XS103) Cable gland for outgoing power (X101). (For power cable see option 478-1/478-2)

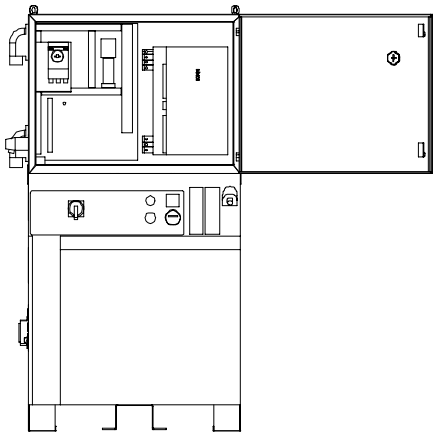


Figure 80 Cabinet layout inside with component.

Option	Type	Description
468-2	Power unit, AC welding type HS	The basic power unit for type HS (See Figure 81) is equipped for a stationary / pedestal mounted AC Spot Welding gun and with the following components: Cable gland for incoming power (X100) Circuit Breaker type ABB SACE, T1 Welding Timer and Thyristor type Bosch PST 6100.100L / 76kVA Fuse terminal for 24 V distribution Connector to Water and air unit, Modular Harting (HD). (XS103) Connector to pedestal gun, Modular Harting (DD) (XS 104). (For process cables to Stationary gun see option 2117, 2118 and 2119) Cable gland for outgoing power (X101). For power cable (see option 478-1/478-2)

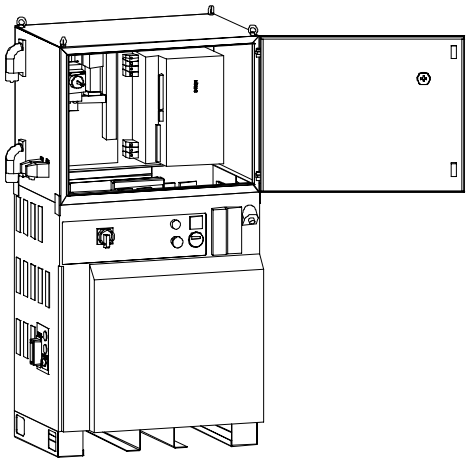


Figure 81 Cabinet layout inside with component and interface specification.

2.8.1 Introduction

Option	Type	Description
465-1	MFDC welding S and HS	Offers a replacement of the thyristor unit in option 468-1 or 468-2, with a MFDC inverter type Bosch PSI 6100.100L. This option requires forced air cooling (option 464-1).
464-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the power unit (See Figure 82). The fan forces air on the cooling surface for the thyristor or MFDC inverter. For the MFDC inverter this is mandatory. For the AC thyristor the need of the forced air-cooling depends on the load and the ambient temperature. The fan has quick-connector for easy replacement.

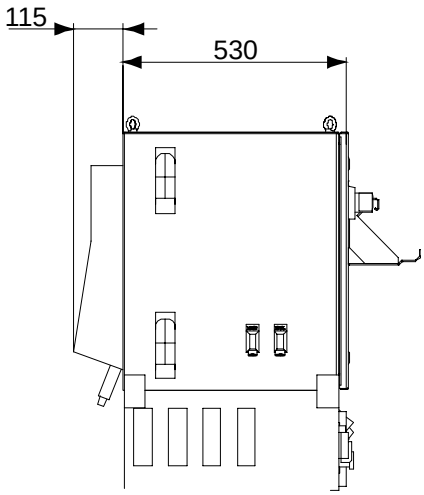


Figure 82 Cabinet layout showing fan at rear incl. dimensions and cable connection (dimensions in mm).

Option	Type	Description
461-1	Ground fault protection	Offers a ground fault protection added to the circuit breaker (See Figure 83). This protection could be used for AC welding or MFDC welding. The sensitivity of the ground fault protection could be adjusted. If a ground fault occurs the circuit breaker is tripped.
457-1	Contactor for weld power	Offers a contactor with necessary wiring and relays inside the power unit (See Figure 83). This contactor could be used to disconnect power to the gun at, for example, tool change.

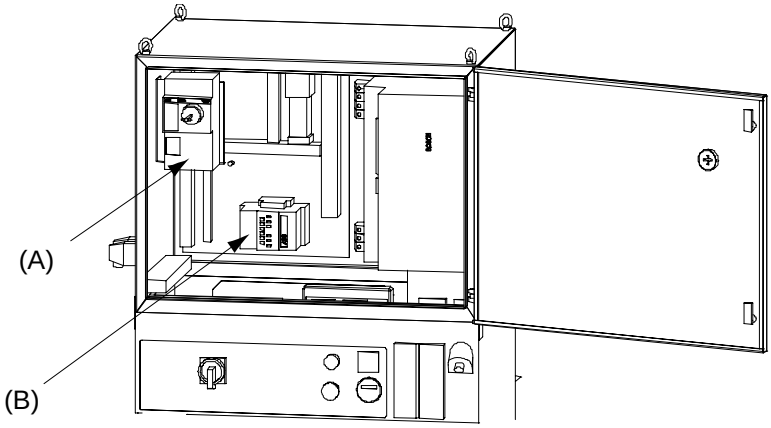


Figure 83 Cabinet layout showing ground fault protection and contactor inside.

Pos	Description
A	Option 461-1
B	Option 457-1

Option	Type	Description
478-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power. This is connected at terminals inside the control cabinet and with an MC connector at manipulator base.
478-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power. See description for option 478-1.
472-1	Process cable to stationary gun, 7 m	Offers floor cable of 7 m length for process signals to the pedestal gun. This cable is connected to the Power unit (option 468-2) with a modular harting. The cable ends with a modular harting where the customer can connect control signals for the gun.
472-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for weld power. See description for option 472-1.
472-4	Process cable to stationary gun, 30 m	Offers floor cable of 30 m length for weld power. See description for option 472-1.

2.8.2 Interface description Power unit

General

The interface towards the Power unit is described in table below.

Type	Pcs	Specification	Allowed capacity
Connections for power unit			
Incoming power from line	1	Cable gland (min 23 mm/ max 34 mm cable diameter)[a]	400-480 VAC, Max 110 A rms, 50-60 Hz
Outgoing power to robot	1	Cable gland (min 23 mm/ max 34 mm cable diameter)[a]	400-480 VAC, Max 110 A rms, 50-60 Hz
Floor cable	2	35 mm^2	Max 600 VAC, 150 A rms at +20°C (68F) ambient temperature
Floor cable protective ground	1	35 mm^2	Max 600 VAC, 150 A rms at +20°C (68F) ambient temperature
Signals			
Water and air unit (XS 103)	1	Modular Harting connector, type DD	24 V DC, Max 0,5 A/output
Pedestal gun (XS 104)	1	Modular Harting connector, type HD	24 V DC, Max 0,5 A/output See 2.5.3 Interface description pedestal gun

a. Incoming power connection made by customer. For incoming power and safety recommendations see the Installation and Service Manual SpotPack and DressPack.

General Technical data

Data	Values
Power feeding	400-480 V AC
Max welding current	110 A rms, 76 kVA transformer
Main breaker, thermal release	160 A (adjustable) 87-125A
Main breaker, magnetic release	35 kA
Protection class	IP54

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 power unit.

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

The unit is mounted at the manipulator base. Control cables to the unit have quick connectors in both ends. The unit is only used for the Spot Welding applications.

The Water and Air Unit

The Water and Air unit has the following main features (See Figure 84):

- Adjustable, high speed water flow sensors (switch or digital type)
- Adjustable pressure switch for air
- 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 manual cut off valves to make exchange/maintenance easier
- Equipped with measuring points
- Equipped with extra (plugged) air outlets

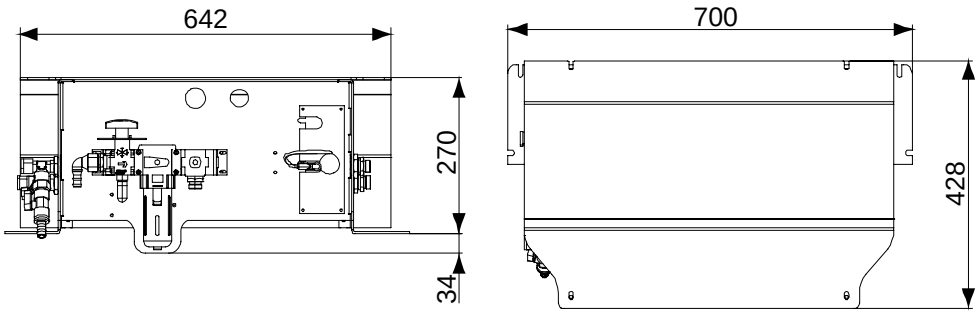


Figure 84 Water and air unit with outer dimensions, media connections, signal connection (dimensions in mm).

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

- Water in circuit
- 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 85). An electrically controlled valve with indication LED is used. The valve is controlled by a digital signal from the robot control system.

The circuit begins from left with a Parker Pushlock 33482-8-8BK fitting for ½" hose (hose assembled by customer), manual shut off valve for the cooling water flow, electrical shut off 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.

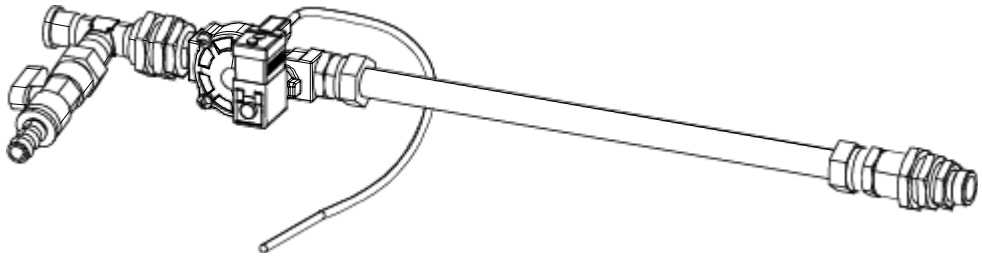


Figure 85 Water in circuit.

Water return circuit

The water return circuit monitors the flow of the returning cooling water from the Spot welding gun (See Figure 86). 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 approx. 3,5 liters per minute.

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), flow switch with a switching point between 2-12 liters per minute.

It's also equipped with a flow control valve; the flow control can adjust the water flow to the desired flow level. The flow-value can be monitored through a small window on the flow control valve. This will serve as a rough function check in the approximate flow range of 3-15 liters per minute. The circuit ends with a check-valve that will stop any reversing water flow, manual shut off valve and a Parker Pushlock 33482-8-8BK fitting for ½" hose (hose assembled by customer). From this point the water is led to the factory water system.

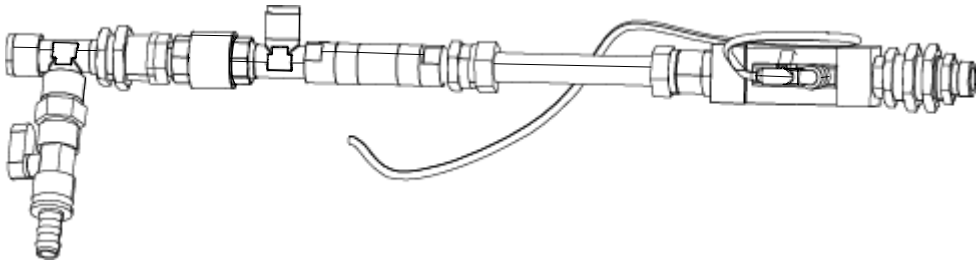


Figure 86 Water return circuit.

Air supply circuit

The air supply circuit provides the function package with filtered air. (See Figure 87).

The air supply circuit begins with a Parker Pushlock 39C82-15-8BK fitting (hose assembled by customer). Manually operated shut off valve to vent the system through a silencer, air filter 25 microns and a water separator equipped with a metal bowl protection, distribution block containing plugged air outlet ports.

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).

Maximum flow capacity is 3000 litres per minute at 6.3 bar and $\Delta P = 1.0$ bar. Maximum allowed pressure is 16 bar.

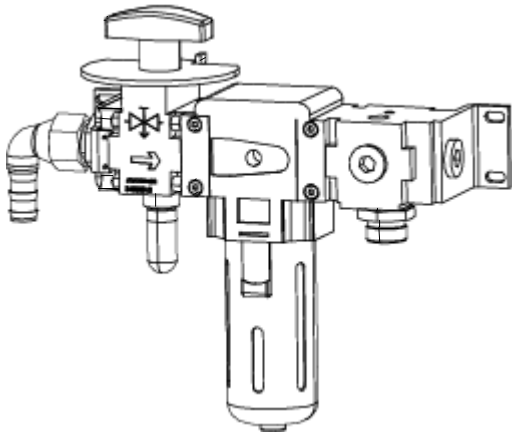


Figure 87 Air Supply Circuit.

Split 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 picture 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 IP68, which means it is well protected against dust and water leakage.

Signals for water and air unit

Electrical connections to robot I/O board are made via the splitbox on the water and air unit.

Total 6 x M12 connections (4 pins) are available. The number in use depends on option choices but a minimum of 2 are in use within the SpotPack. Free connections can be used for customer purpose like tip-dresser control.

The split box has six connections prepared for the following units.

- 1. Electric water shut off valve
- 2. Flow switch 1
- 3. Flow switch 2 (Option 473-1 Second Water Return)
- 4. Pressure switch (Option 469-1 Pressure switch and Regulator for air)
- 5. Proportional valve (Option 462-1 Electrical proportional valve for air)
- 6. Spare

The cable and cable length between the Split box and the Power unit must be specified (see option 454-1, 454-2 and 454-4).

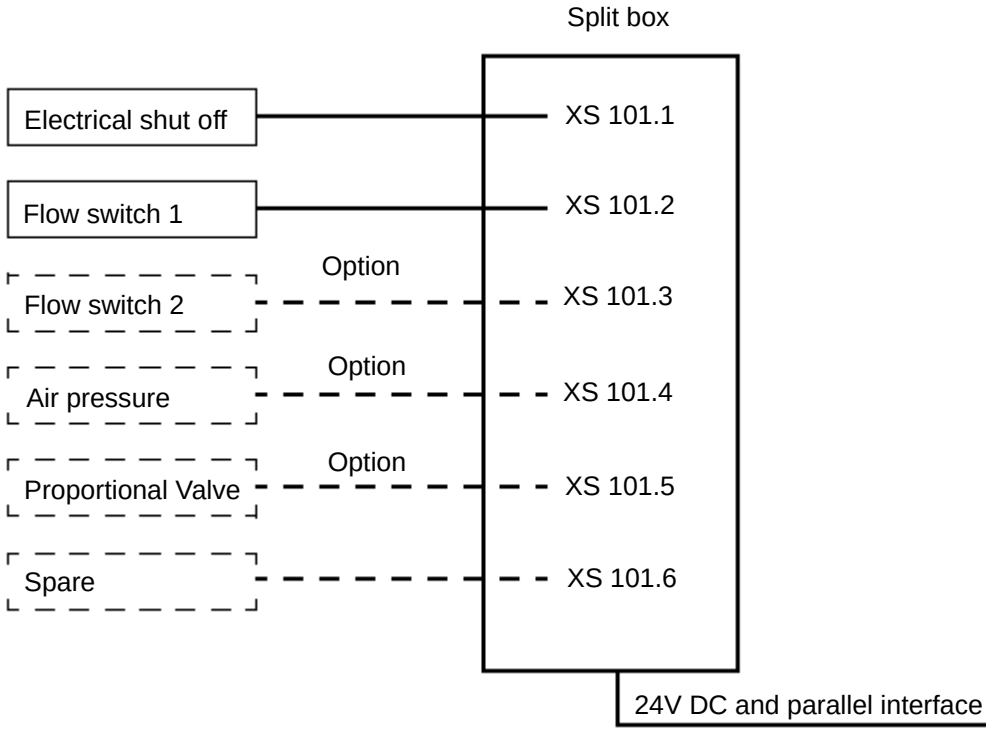


Figure 88 Block diagram.

Option	Type	Description
477-1	Water and Air unit, type S	The basic water and air unit for type S (See Figure 40) 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)

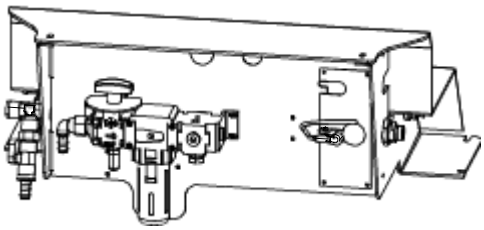


Figure 89 Water and air unit basic.

Option	Type	Description
477-2	Water and Air unit, type HS	The basic water and air unit for type HS is equipped for a pedestal/stationary 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) Hoses between water in circuit and water return circuit are not supplied. These have to be arranged by the customer.
473-1	Second water return	Offers an additional water return circuit (See Figure 90). The option contains an extra flow switch to monitor the water coming from the second circuit and a flow control valve. For more information see under Flow switch in water return circuit.

Please note that for type S and Se there are some restrictions. Option 473-1 requires option 463-1 and can not be combined with option 462-1.
Additional 1/2" water hose (PROC 4) from Water and Air unit to manipulator base is included.

2.9.1 Introduction

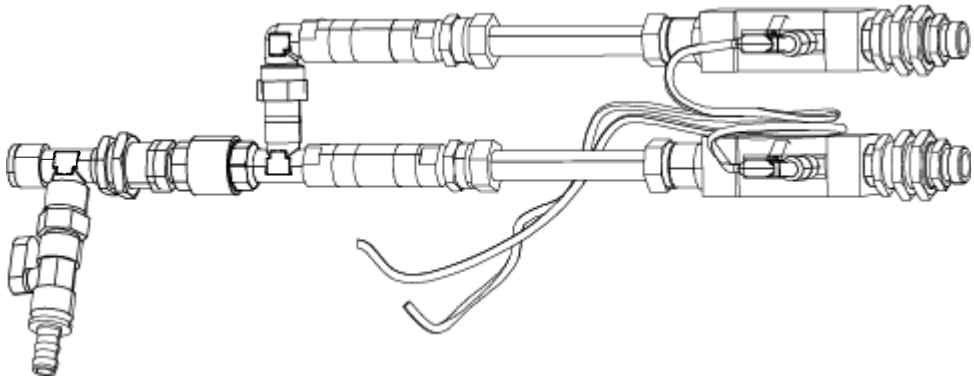


Figure 90 Second Water Return.

Option	Type	Description
460-1	Digital flow meter, One water return	Offers a digital flow meter instead of a flow switch (See Figure 91). This option is valid for one water return (if second water return see option 460-2). This option means that the flow switch and the flow control valve with visible flow indication is replaced by the digital flow meter and a flow control valve without visible flow indication (not required as adjustments can be seen on the digital flow meter). The digital flow meter gives the following advantages compared to flow switch The biggest advantage is that the flow switch is mechanical function safe, which means that if something damages the flow switch you will notice that immediately The actual flow could be seen direct on the display The flow switch level and the tolerance could be set with high tolerance The flow value can be monitored at distance with a remote display.

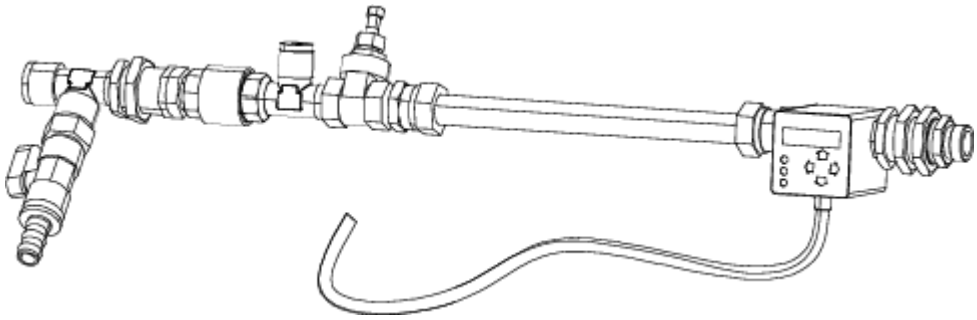


Figure 91 Digital flow meter.

Option	Type	Description
460-2	Digital flow meter, Two water returns	Offers digital flow meter if the option second water return (option 473-1) is chosen. For more information see option 460-1.

Option	Type	Description
469-1	Pressure switch and regulator for air	Offers, filter regulator, pressure switch and a manually operated pressure regulator to set the incoming pressure to the Spot welding gun. The pressure can be monitored on the included pressure gauge. This option also includes a Pressure Switch to monitor the air pressure and to give a signal to the control system if the pressure becomes to low.
462-1	Electrical proportional valve for air	Offers a proportional valve with integrated control circuit and connection cable to the splitbox (See Figure 92). The proportional valve controls the welding force of the pneumatic spot welding gun. The proportional valve is controlled by the welding timer in the Power unit. The included distribution block can be used for two additional non-regulated compressed air circuits. An analog signal 0-10V, controls the proportional valve and the air pressure is in the range of 0-12 bar.

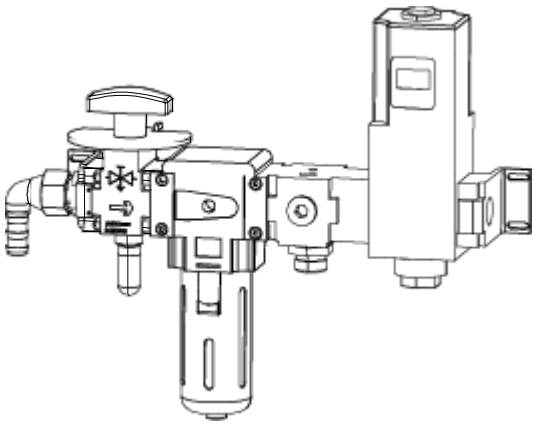


Figure 92 Electric Proportional Valve.

Option	Type	Description
454-1	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 Power unit (option 468-1/468-2) with a modular harting. The cable ends with a quick connector at the split box.
454-2	Cable to split box, 15 m	Offers floor cable of 15 m length for the split box. See description of option 454-1.
454-4	Cable to split box, 30 m	Offers floor cable of 30 m length for the split box. See description of option 454-1.

2.9.2 Interface description Water and Air unit

General

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

Type	Pcs	Specification
Connections for media		
Incoming water	1	Parker Pushlock 33482-8-8BK fitting for ½″ hose[a]
Outgoing water	1	Parker Pushlock 33482-8-8BK fitting for ½″ hose[a]
Incoming air	1	Parker Pushlock 33482-8-8BK fitting for ½″ hose[a]
Extra air outlet	1	½″ connection[b]

a. Connection to be made by customer.
b. Plugged at delivery (to be used for tip-dresser or other equipment). (Fitting 1/2" BSP 1,5).

General Technical data

Data	Description
Maximum water pressure	10 bar / 145 PSI
Maximum air pressure	16 bar / 230 PSI
Maximum pressure drop	0,35 bar at 6 liter/minute[a]
Water quality	Normal filtered industrial water quality
Air quality	

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).

2.10 Connection kits

2.10.1 Options

Option 459-1

CP/CS, 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 EE (8 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
10 pcs Female crimp contacts	For 1,5 mm²
10 pcs Female crimp contacts	For 0,5 mm²
10 pcs Female crimp contacts	For 0,75-1,0 mm²
10 pcs Female crimp contacts	For 2,5 mm²
12 pcs Female crimp contacts	For 0,14 – 0,37 mm²
45 sockets	For 0,2 – 0,56 mm²
Assembly Accessories to complete connector	
Assembly instruction	

Option 480-1

Weld, Proc 2-4 on base

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 socket (MC)	3x35 mm²
1 pcs Cable gland, plastic	Diameter 24-28 mm
Assembly Accessories to complete connector	
Assembly instruction	

Option 474-1

SW1, SW 2/3 on base

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

- Connector for SW1 with:

1 pcs Socket connector (32p)	Souriau UTOW
1 pcs Adaptor	Used with form shrink
35 pcs Sockets Souriau UTOW	for 0,13-0,25 mm²
Assembly Accessories to complete connector	
Assembly instruction	

- Connector for SW2/3 with:

1 pcs Socket connector (32p)	Souriau UTOW, Rotated version (85 degrees)
1 pcs Adaptor	Used with form shrink
35 pcs Sockets Souriau UTOW	for 0,13-0,25 mm²
Assembly Accessories to complete connector	
Assembly instruction	

Option 453-1

FB 7

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)	Burndy
1 pcs Adaptor	12 pin
15 pcs Pin	For 0,13-0,25 mm²
Assembly Accessories to complete connector	
Assembly instruction	

Option 458-1

CP/CS, Proc 1 axis 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, female (Harting)	Type HD (25 pin)
1 pcs Multicontact, female (Harting)	Type EE (8 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
10 pcs Male crimp contacts	For 1,5 mm²
10 pcs Male crimp contacts	For 0,5 mm²
10 pcs Male crimp contacts	For 0,75-1,0 mm²
10 pcs Male crimp contacts	For 2,5 mm²
12 pcs Male crimp contacts	For 0,14 – 0,37 mm²
45 pins	For 0,2 – 0,56 mm²

Option 479-1

Weld, Proc 2-4 axis 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	

Option 452-1

Connection kit, Axis 6 robot side SW

The process cable package from axis 3 to axis 6 (option 475-1) 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:

Welding contactor socket (MC)	3x25 mm²
Cable gland plastic	PG 29 diam 28-24
End housing	Eg-TS Pg29/100

2.10.1 Options

3 Specification of Variants and Options

3.1 Introduction

3.1.1 General

The different variants and options for the IRB 6600 are described following sections.

The same numbers are used here as in the Specification form. For controller options, see Product specification - Controller, S4Cplus, and Controller, S4Cplus Automotive and for software options, see Product specification - RobotWare 4.0.

3.1.2 Manipulator

Variants

Option	IRB Type	Handling capacity (kg)/Reach (m)
435-22	6600	175/2.8
435-17	6600	225/2.55
435-16	6600	175/2.55
435-30	6650	125/3.2
435-19	6650	200/2.75
435-50	6650S	125/3.5
435-51	6650S	200/3.0

Manipulator color

Option	Description	Note
209-1	Standard	The manipulator is painted in ABB orange.
209-4 --192	RAL code	Colors according to RAL-codes.

Protection

Option	Description	Note
287-4	Standard (IP 67)	
287-3	Foundry	Robot adapted for foundry or other harsh environments. The robot has the FoundryPlus protection which means that the whole manipulator is steam washable. The excellent corrosion protection is obtained by a special coating. The connectors are designed for severe environment, and bearings, gears and other sensitive parts are highly protected.

3.1.2 Manipulator

Options

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[a].
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 also be used for IRB 7600. See chapter 1.3 Installation, 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 chapter 1.8 Cooling fan for axis 1-3 motor Not for protection Foundry.
88-1	Cooling fan for axis 2 motor (IP 54)	For in use recommendations see chapter 1.8 Cooling fan for axis 1-3 motor Not for protection Foundry.
89-1	Cooling fan for axis 3 motor (IP 54)	For in use recommendations see chapter 1.8 Cooling fan for axis 1-3 motor Not for protection Foundry.
430-1	Upper arm covers	See Figure 94. Included in protection Foundry.

a. Not available for S4Cplus Automotive

Cooling fan

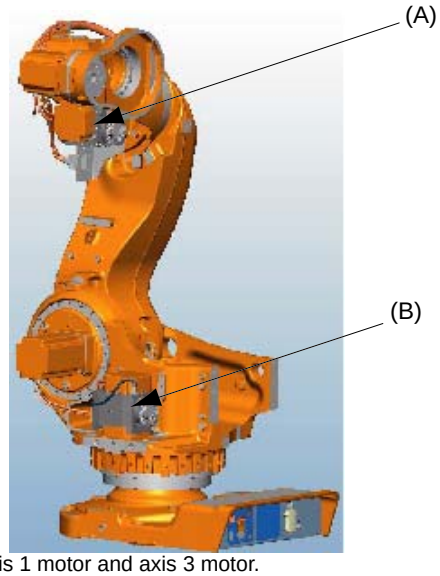


Figure 93 Cooling fan for axis 1 motor and axis 3 motor.

Pos	Description
A	Option 89-1
B	Option 88-1

Upper arm covers

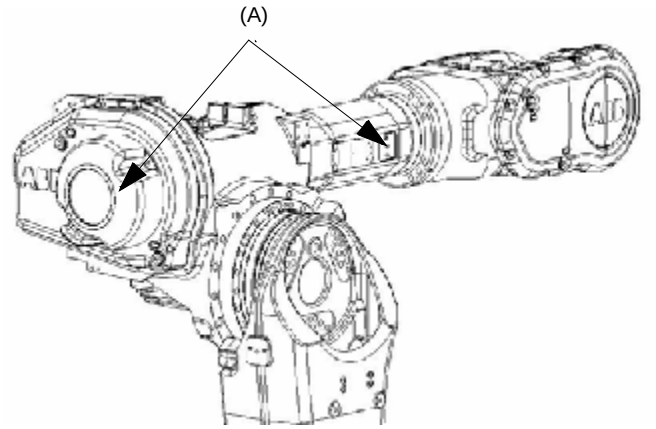


Figure 94 Upper arm covers.

Pos	Description
A	Option 430-1

Option	Type	Description
536-1	Chip protection (A)	The mechanical protection prevents chips created at applications, for instance, deburring, sawing and milling, to be accumulated on the robot and secure its movable functionality. Only together with protection Foundry. See Figure 95.

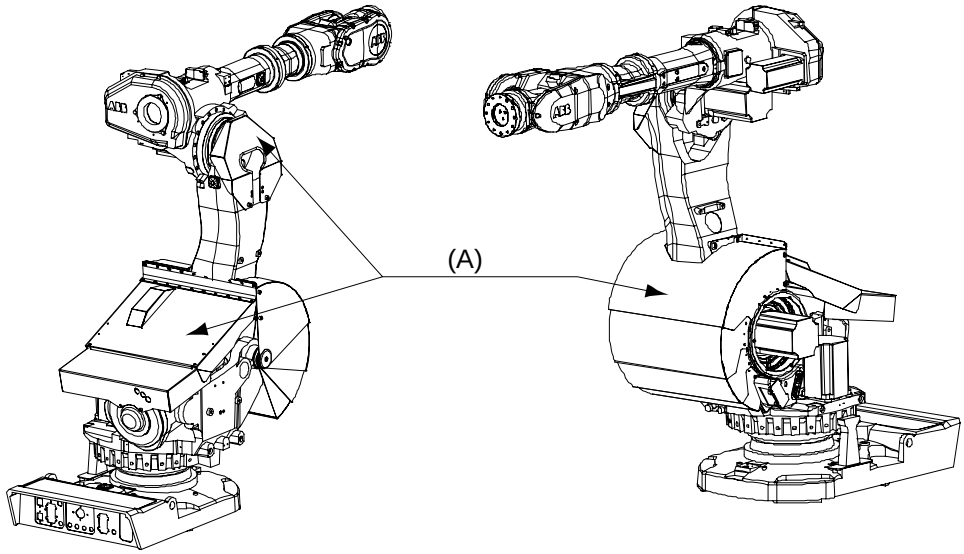


Figure 95 Chip protection.

3.1.2 Manipulator

Option	Type	Description
571-1	Base Spacers (A)	Four spacers to raise the robot 100 mm from the floor or the base plate. See Figure 96.

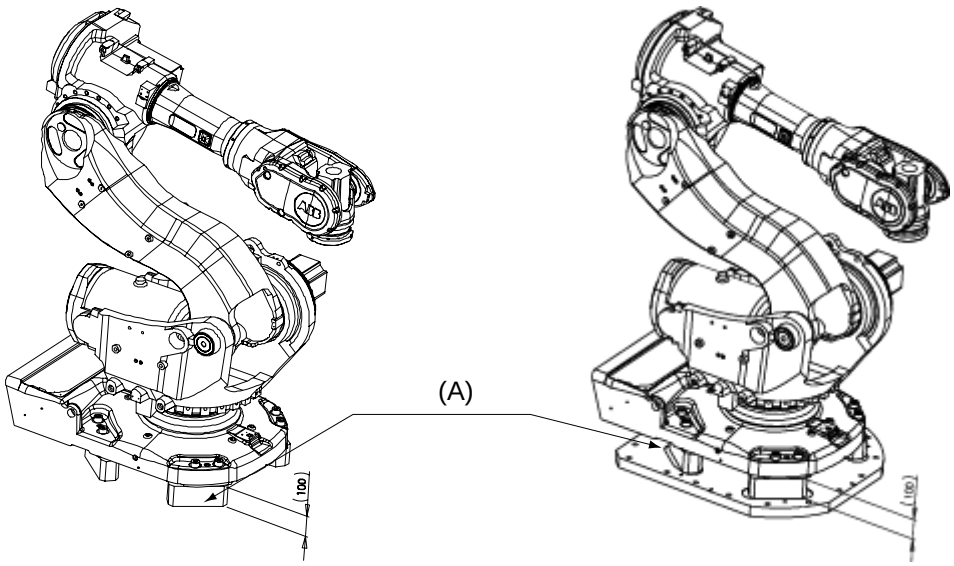


Figure 96 Base spacers.

Insulated tool flange

Option	Type	Description
184-1	Insulated tool flange (A)	The electrically insulated tool flange, according to European Standard EN 60204-1, withstands dangerous voltage (in case of an electrical fault in the spot welding equipment mounted on the Insulated tool flange) of 500 V DC during 30 seconds in non water applications without passing it further to the electronics in the manipulator and the controller. Not available together with Protection Foundry, option 287-4. Connection holes and all dimensions are the same as for the standard tool flange except for the distance from c/c 5th axis to the end surface of the Insulated tool flange. The distance is 0,7 mm longer compared to the standard tool flange, see Figure 97. The countersinked holes for the fastening bolts to the gear box are larger, and the bolts are insulated from the tool flange, see Figure 97.

The Insulated tool flange option can be ordered in combination with the Absolute Accuracy option, and the robot will then be factory calibrated.
When the Insulated tool flange is mounted after the robot delivery, the robot must be re-calibrated for absolute accuracy.

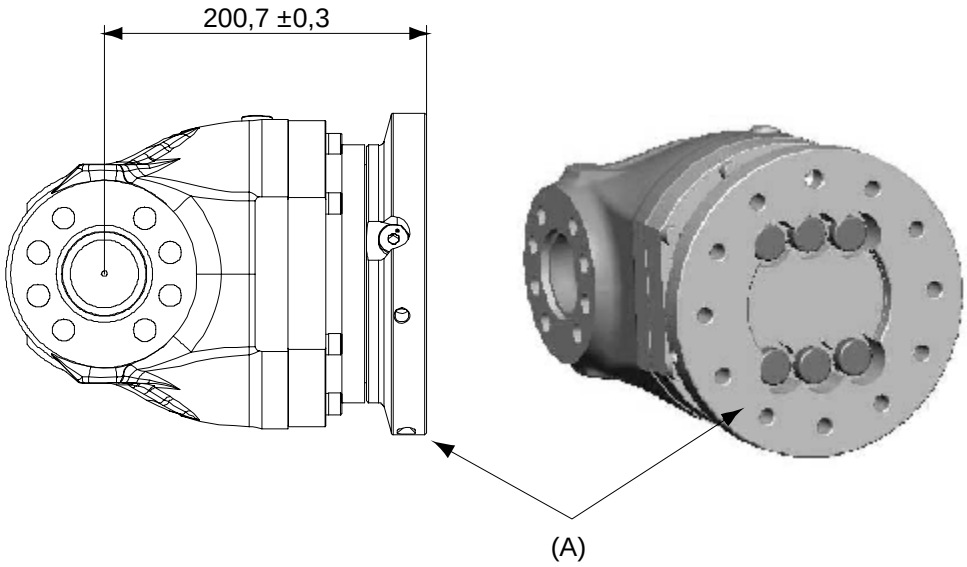


Figure 97 Insulated tool flange (dimensions in mm).

3.1.3 Position Switches

General

Position switches indicating the position of the three main axes. Rails with separate adjustable cams are attached to the manipulator. The cams, which have to be adapted to the switch function by the user, can be mounted in any position in the working range for each switch. No machining operation of the cams is necessary for the adaptation, simple hand tools can be used.

Function

For axis 1, there are three redundant position zones available, each with two independent switches and cams. For axes 2 and 3, two channels position zones are available, each with two independent switches and cams.

Each position zone consists of two switches mechanically operated by separate cams. Each switch has one normally open and one normally closed contact. The design and components fulfill the demands to be used as safety switches. These options may require external safety arrangements, e.g. light curtains, photocells or contact mats.

The switches can be connected either to the manipulator base (R1.SW1 and R1.SW2/3, see Figure 52), or to the controller. In the controller the signals are connected to screw terminal XT8 Phoenix MSTB 2.5/12-ST-5.08. Switch type Balluff Multiple position switches BNS, according to EN 60947-5-1 and EN 60947-5-2.

Position switches

Option	Type	Description
25-3	Position switches axis 1	Three redundant position zones are available, each with two independent switches and cams. Two plus one zone.
30-1	Position switches axis 2	Two redundant position zones are available, one with two independent switches and cams, and the other with one independent switch and cam. Not for protection foundry, (option 287-3).
33-1	Position switches axis 3	Two redundant position zones are available, one with two independent switches and cams, and the other with one independent switch and cam. Not for protection foundry, (option 287-3).

Connection to

Option	Type	Description
271-2	Manipulator	Connection on the manipulator base with one/two Souriau 32-pin connector.
271-1	Cabinet	Connection inside the cabinet wall. See Product specification - Controller, S4Cplus. Position switch cables are included.

Connection of signals axis 1(cable lengths)

Option	Lengths
273-1	7 m
273-2	15 m
273-4	30 m

Connection of signals axes 2 and 3 (cable lengths)

Option	Lengths
274-1	7 m
274-2	15 m
274-4	30 m

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
29-2	Axis 1, 7,5 degrees	Four stops, two which allow the working range to be restricted in increments of 15º and two stops of 7,5º.
29-1	Axis 1, 15 degrees	Two stops which allow the working range to be restricted in increments of 15º.
32-1	Axis 2	Six stops which allow the working range to be restricted in increments of 15º at both end positions. Each stop decreases the motion by 15º.
34-1	Axis 3	Six stops which allow the working range to be restricted in increments of 20º at both end positions. Each stop decreases the motion by 20º.

Extended work range

Option	Type	Description
561-1	Extended work range axis 1	To extend the working range on Axis 1 from ± 180º to ± 220º. When the option is used the mechanical stop shall be disassembled. Position switches axis 1, option 25-3, are required.

3.1.4 Process DressPack

Material handling

For more information, see DressPack on page 69 and Type H on page 73

Option	Description	Note
538-1	Material Handling from base to axis 3	Requires Communication Basic Parallel, Parallel or Bus option 455-1/455-2.
466-1	Material Handling from axis 3 to axis 6	Requires Material Handling from base to axis 3, option 538-1, and Communication Parallel or Bus, option 455-1/455-2/455-3.

Spot Welding

For more information see Chapters DressPack on page 69, Type S on page 84 and Type Se on page 115

Option	Description	Note
476-1	Spot Welding from base to axis 3	Requires Communication, Parallel or Bus option 455-1/455-2. See Figure 99.
475-1	Spot Welding from axis 3 to axis 6	Requires Spot Welding from base to axis 3, option 476-1, and communication Parallel or Bus, options 455-1/455-2. See Figure 99.
463-1	Extended Media SW	Requires communication Parallel or Bus. Includes one Media hose. Only for option 476-1 Spot Welding from base to axis 3 and option 475-1 Spot Welding from axis 3 to axis 6.

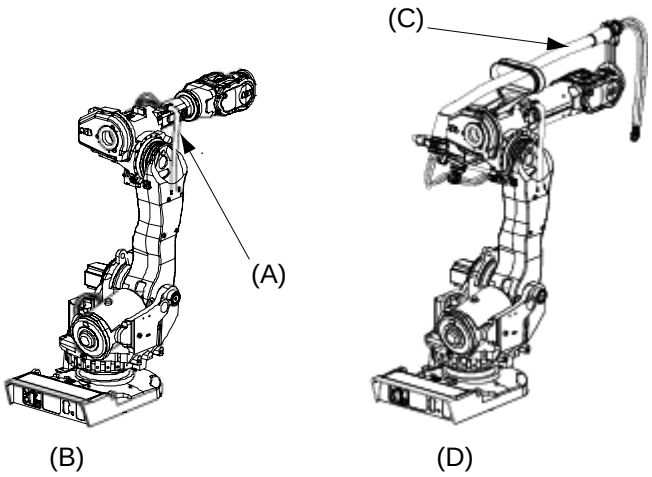


Figure 98 Material Handling from base to axis 3, and Material Handling fromaxis 3 to axis 6.

Pos	Description
A	Option 538-1
B	From base to axis 3
C	Option 466-1
D	From axis 3 to axis 6

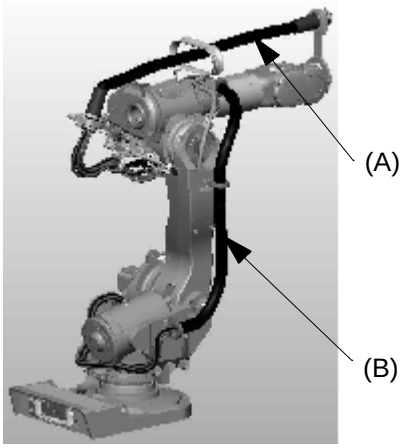


Figure 99 Spot Welding from base to axis 3 , and Spot Welding from axis 3 to axis 6.

Pos	Description
A	Option 475-1
B	Option 476-1

Communication

Option	Type	Description
455-1	Parallel	Includes customer power CP, customer signals CS and Air for MH-process cable package. Includes CP, CS, Air and two Media hoses for SW-process cable package.
455-2	Bus	Includes CP, Air and CAN/DeviceNet, Profibus or Interbus for MH-process cable package. Includes CP, Air, two Media hoses and CAN/DeviceNet, Profibus or Interbus for SW-cable package.
455-3	Basic Parallel	Includes customer power CP, customer signals CS and Air for MH-process cable package. A lean variant of option 455-1 Parallel, for MH-process cable.

Connections

Option	Connection to	Description
16-2	Manipulator	The signals are connected directly to the manipulator base to one heavy duty industrial housing with a Harting modular connector R1.CP/CS see Figure 52. The cables from the manipulator base are not supplied.
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 2.3 Type H to 2.7 Type HSe

Connection kits

The connectors fit to the connectors at the manipulator base, axis 3 and 6 respectively. The kit consists of connectors, pins and sockets. For technical description, see chapter 2.10 Connection kits.

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.
480-1	R1.WELD and PROC2-4	For the Weld connector and three Process connectors on the manipulator base.
474-1	R1.SW1 and SW2/3	For the position switch axis 1 connector and the position axis 2/3 connector on the manipulator base.
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 3. Pins for bus communication are included.
479-1	R2.WELD and PROC2-4	For the Weld connector and three Process connectors at axis 3.
452-1	WELD and PROC1-4 axis 6	Weld connector and four Process connectors at axis 6, the manipulator side.

3.1.5 Floor cables

Standard/CAN DeviceNet/Interbus/Profibus

Option	Lengths
94-1/90-2/91-2/92-2	7 m
94-2/90-3/91-3/92-3	15 m
94-4/90-5/91-5/92-5	30 m

Robot Servo Gun Extended/Stationary Servo Gun

Following information specifies the cable length for Robot Servo Gun Extended/ Stationary Servo Gun.

Option	Lengths
450-1/95-1	7 m
450-2/95-2	15 m
450-4/95-4	30 m

3.1.6 SpotPack

Power Unit

For more information see chapter 2.8 Power Unit

Option	Description
468-1	Power unit AC welding type S
468-2	Power unit AC welding type HS
465-1	MFDC welding S and HS
461-1	Earth fault protection
464-1	Forced air cooling
457-1	Contactor for welding power

Weld power cable

Option	Lengths
478-1	7 m
478-2	15 m

3.1.6 SpotPack

Process cable to Stationary Gun

Option	Lengths
472-1	7 m
472-2	15 m
472-4	30 m

Water and Air

For more information see chapter 2.9 Water and Air Unit

Option	Description
477-1	Water and Air unit type S
477-2	Water and Air unit type HS
473-1	Second water return
460-1	Digital flow meter, one water return
460-2	Digital flow meter, two water returns
469-1	Pressure switch and regulator for air
462-1	Electrical proportional valve for air

Cable to split box

Option	Lengths
454-1	7 m
454-2	15 m
454-4	30 m

The cable to split box is not available for S4Cplus Automotive.

3.1.7 Documentation

CD User Documentation

Option	Type	Description
808-1	Documentation on CD	See Product specification - Robot User Documentation

Printed User Documentation

Option	Type	Description
428-1	English documentation	See Product specification - Robot User Documentation
358-1	Swedish documentation	See Product specification - Robot User Documentation
165-1	German documentation	See Product specification - Robot User Documentation
162-1	French documentation	See Product specification - Robot User Documentation
336-1	Spanish documentation	See Product specification - Robot User Documentation
97-1	Danish documentation	See Product specification - Robot User Documentation
195-1	Italian documentation	See Product specification - Robot User Documentation
234-1	Dutch documentation	See Product specification - Robot User Documentation
270-1	Portuguese documentation	See Product specification - Robot User Documentation

3.1.8 Warranty

Option	Type	Description
438-1	Standard Warranty	Standard warranty is 18 months (1 1/2 years)
438-2	Standard + 12 months	18 + 12 months (2 1/2 years)
438-4	Standard + 18 months	18 + 18 months (3 years)
438-5	Standard + 24 months	18 + 24 months (3 1/2 years)
438-6	Standard + 6 months	18 + 6 months (2 years)

DressPack options 538-1, 466-1, 476-1 and 475-1 are not included in the warranty options.

3.1.8 Warranty

4 Accessories

General

There are a range of tools and equipment available, specially designed for the robot.

Basic software and software options for robot and PC

For more information, see Product Specification - Controller, S4Cplus, and Product Specification - RobotWare 4.0.

Robot Peripherals

- Track Motion
- Motor Units

3HAC 14064-1, Revision H, en

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