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
M2004

Product Specification

Articulated robot
3HAC 023933-001
Rev.-
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
M2004

ABB Automation Technologies AB
Robotics
SE-721 68 Västerås
Sweden

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, 175kg /2.55m, 225kg /2.55 m, 175kg /2.8m, 125kg/3.2m, 125kg/ 3.5m, 200kg/2.75m and 200 kg/3.0 m handling capacities.
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 IRC5.

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 Options.

Illustration

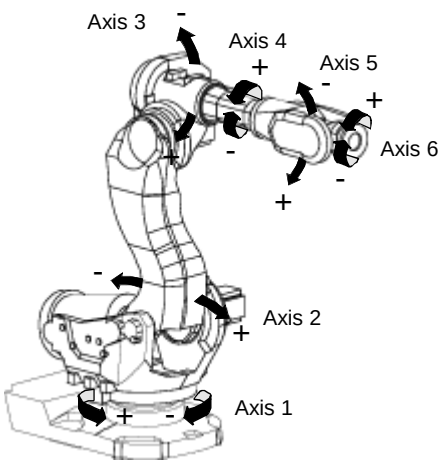


Figure 1 The IRB 6600 manipulators have 6 axes.

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	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 (kg)/ Reach (m)

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

Manipulator weight

Robot type	Handling capacity (kg)	Reach (m)	Weight
IRB 6600	175 kg	2.55 m	1700 kg[1]
IRB 6600	225 kg	2.55 m	1700 kg[1]
IRB 6600	175 kg	2.8 m	1725 kg[1]
IRB 6650	125 kg	3.2 m	1750 kg[1]
IRB 6650	200 kg	2.75 m	1725 kg[1]
IRB 6650S	125 kg	3.5 m	2175 kg[1]
IRB 6650S	200 kg	3.0 m	2150 kg[1]

1. 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 6650
ISO Cube	2.6 kW	not yet available
Normal robot movements	3.8 kW	not yet available

1.1.3 Definition of version designation

Illustration

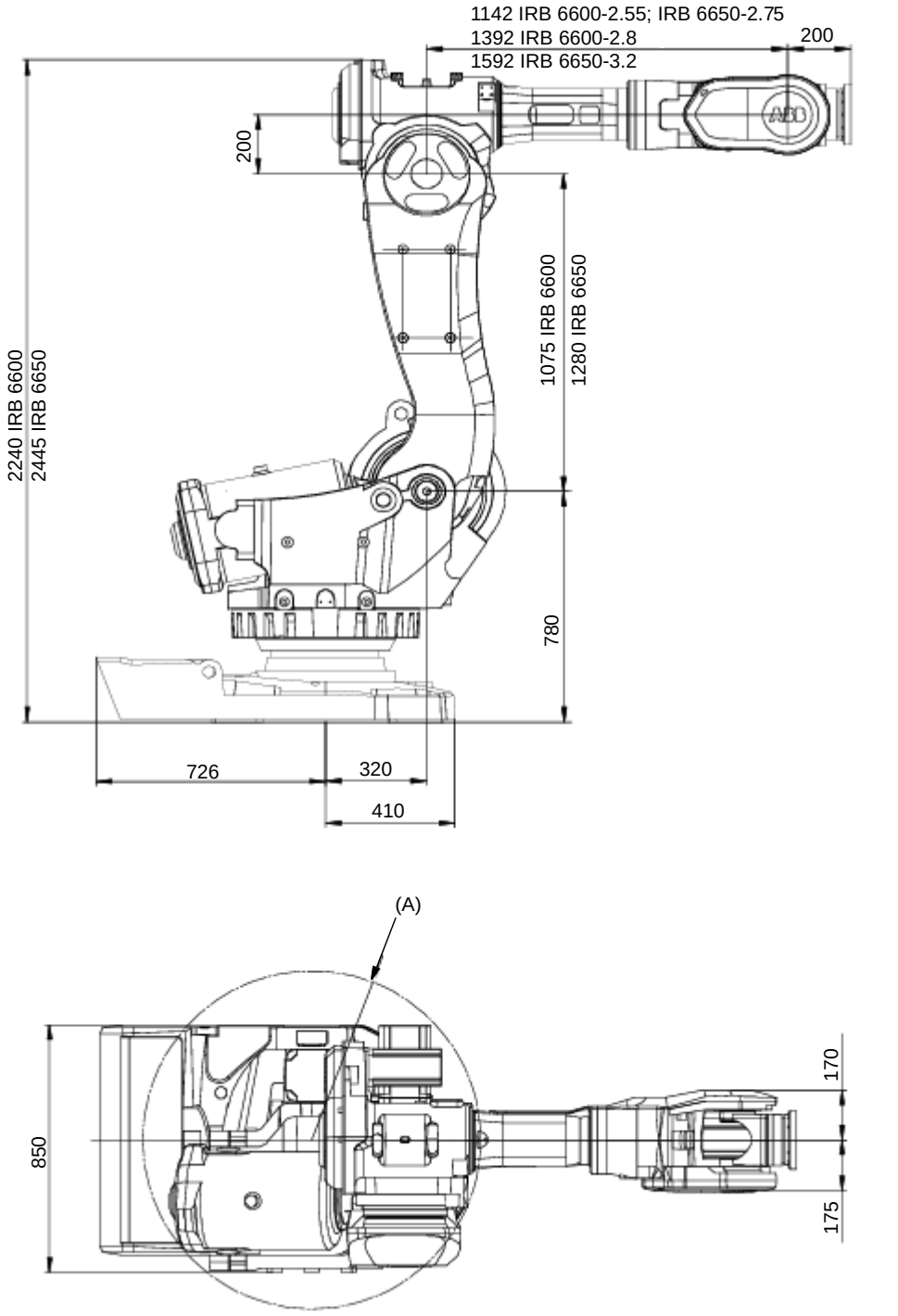


Figure 2 View of the IRB 6600 and IRB 6650 manipulator from the side and above (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.

Pos	Description
A	R 580 for type A. R 595 for type B (front side, motor axis Z). R690 with fork lift.

Illustration

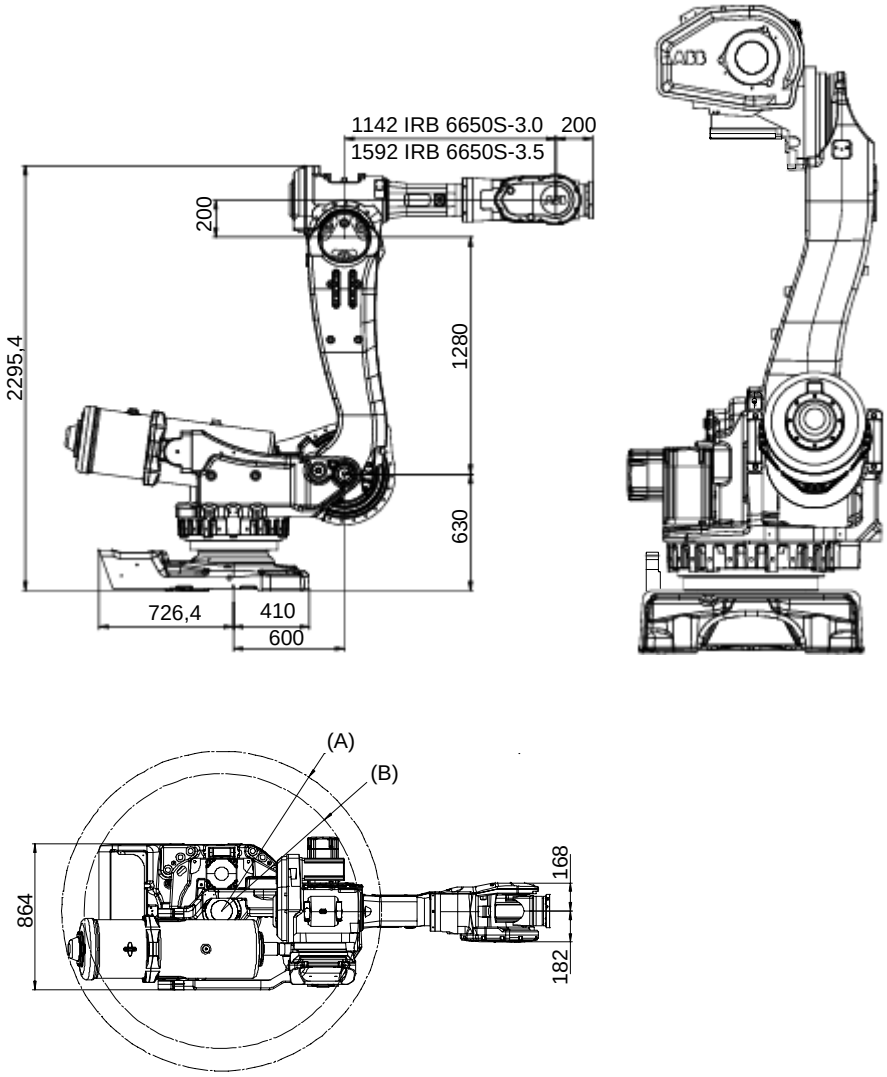


Figure 3 View of the IRB 6650S Manipulator from side and above (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.

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 conforrms 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 systerms
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 204-1	Electrical equipment of industrial machines
IEC 529	Degrees of protection provided by enclosures

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

Standard	Description
ANSI/RIA 15.06/1999	Safety Requirementsfor Industrial Robots and Robot Sys-terms.
ANSI/UL 1740-1998 (option)	Safety Standard for Robots and Robotic Equipment
CAN/CSA Z 434-03 (option)	Industrial Robots and Robot Systerms - 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 characterised 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 are delivered with an active brake system that supports the robots to maintain the programmed path in General Stop (GS), Auto Stop (AS) and Superior Stop (SS).
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. Emergency Stop (ES) is a class 0 stop. All stops (GS, AS, SS and ES) are reconfigurable.
While programming the robot in manual mode, the enbling device has a class 0 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 connection of position switches to restrict the working space for the 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 Reach (m)ing 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 monitored continuously. 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 systerms - 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.

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 1.5.2 Diagrams.

Extra Loads

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

Working Range

The working range of axes 1-3 can be limited by mechanical stops. Position switches can be supplied on axes 1-3 for position indication 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 according to:

Standards	Description
DIN EN ISO 14644	Cleanroorms 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°C (41°F) to +50°C (122°F)
For the controller	Standard	+45ºC (113ºF)
For the controller	Option	+52°C (126°F)
Complete robot during transportation and storage	Standard	-25°C (-13°F) to +55°C (131°F)
For short periods (not exceeding 24 hours)	Standard	up to +70°C (158°F)

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	±10.6kN	±20.9 kN
Force z	28.2±7.7kN	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 (opt. 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

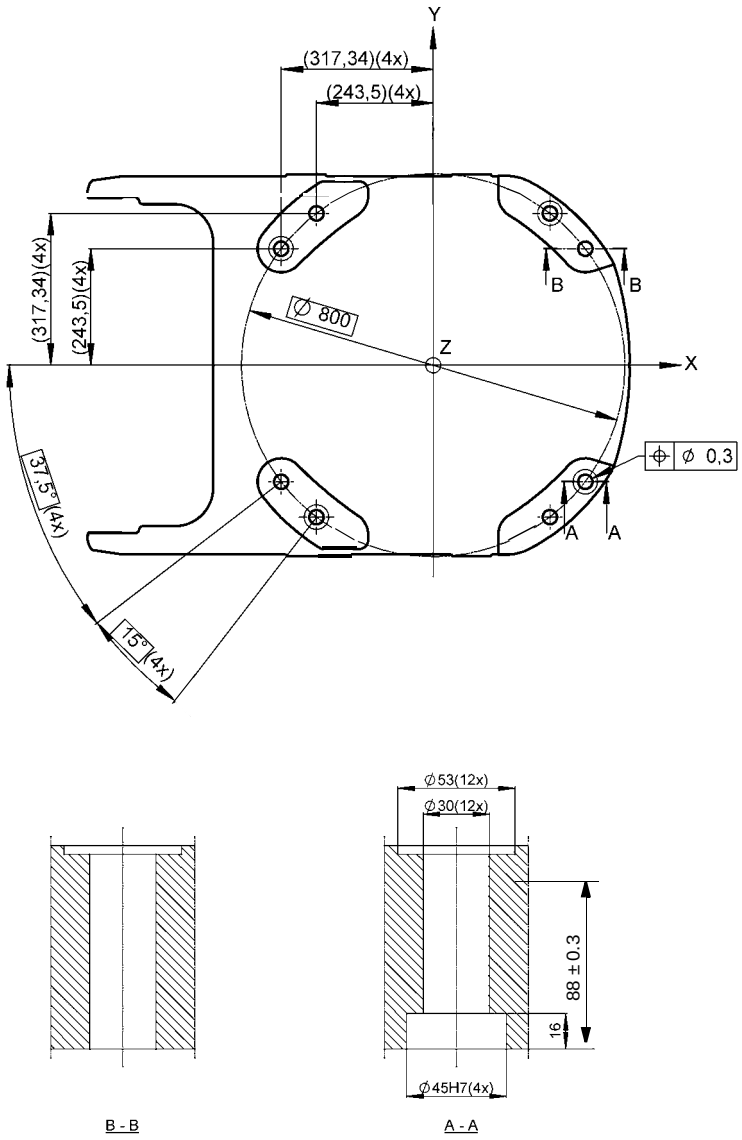


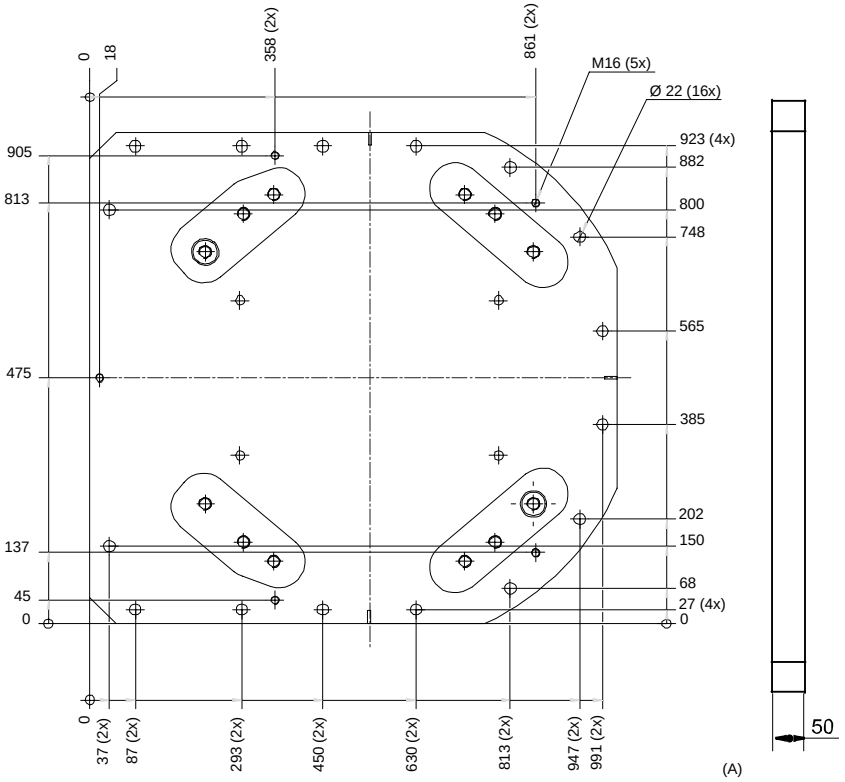
Figure 4 Hole configuration (dimensions in mm).

Recommended screws for fastening the manipulator to a base plate:
M24 x 120 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 5 and Figure 8.

Regarding AbsAcc performance, the chosen guide holes according to Figure 5 and Figure 8 are recommended.

Base plate drawing



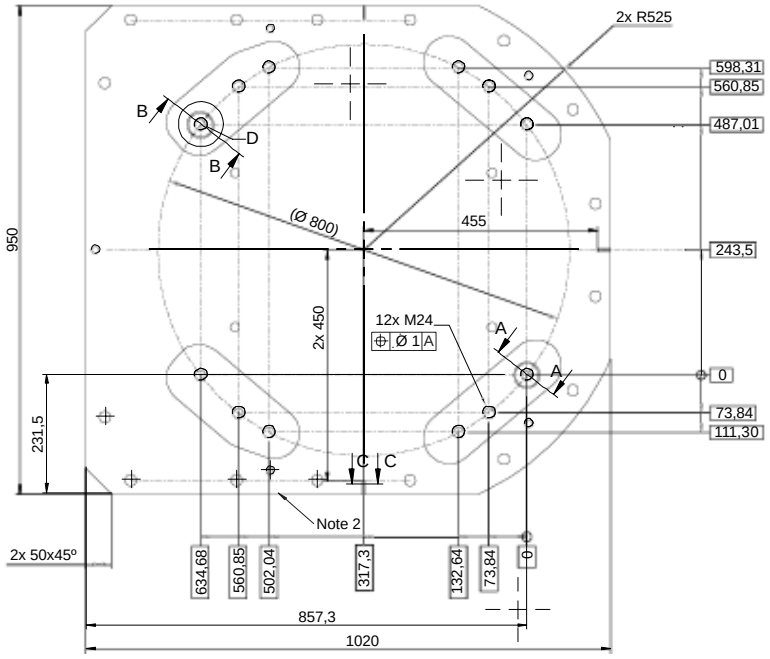


Figure 5 Option Base plate (dimensions in mm).

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

Illustration

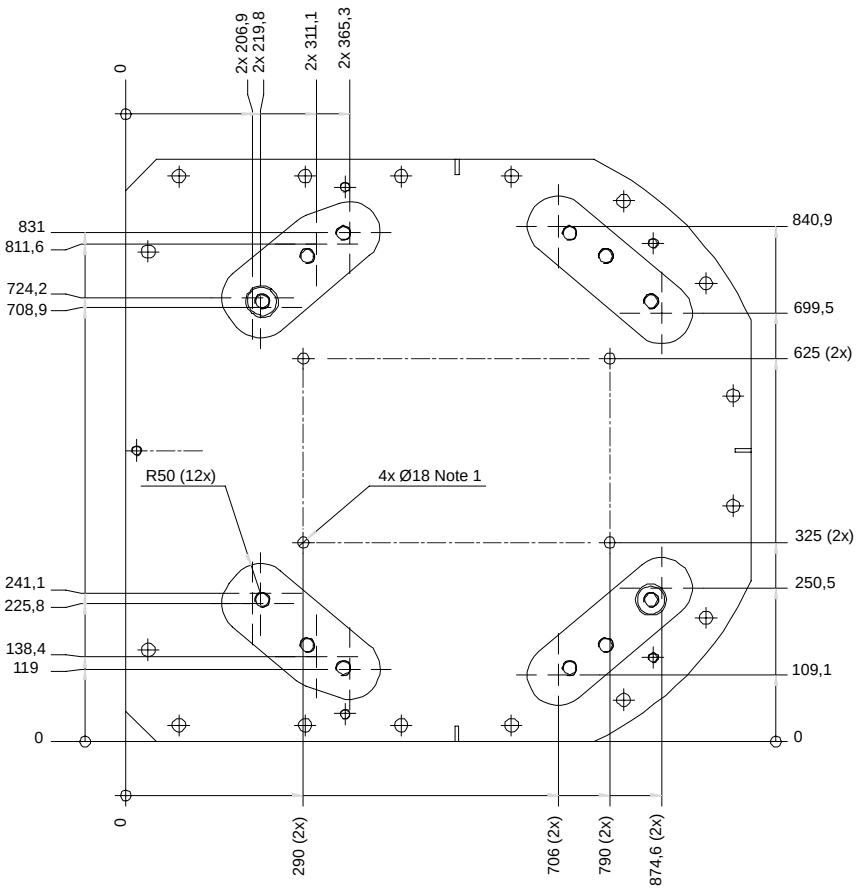


Figure 6 Option Base plate (dimension in mm).

Two guiding pins required, dimensions see Figure 7

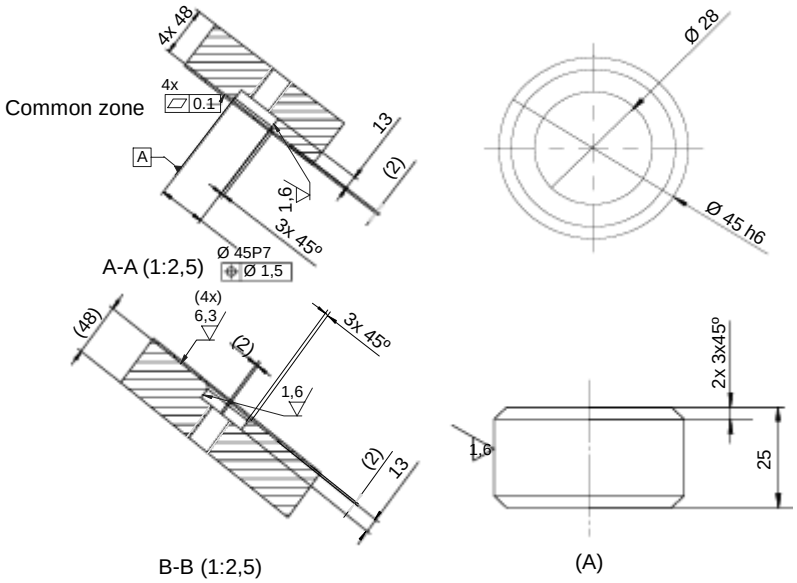


Figure 7 Sections of base plate and guide sleeve (dimensions in mm).

Pos	Description
A	Guide sleeve Protected from corrosion

Illustration

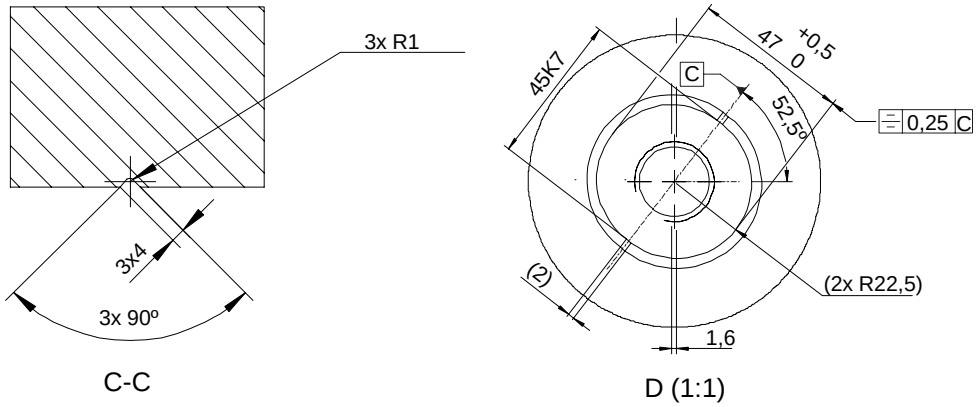


Figure 8 Sections of base plate (dimensions in mm).

1.4 Calibration and references

1.4.1 Fine calibration

General

Fine calibration is made using the Calibration Pendulum, please see separate manual Calibration Pendulum instruction.

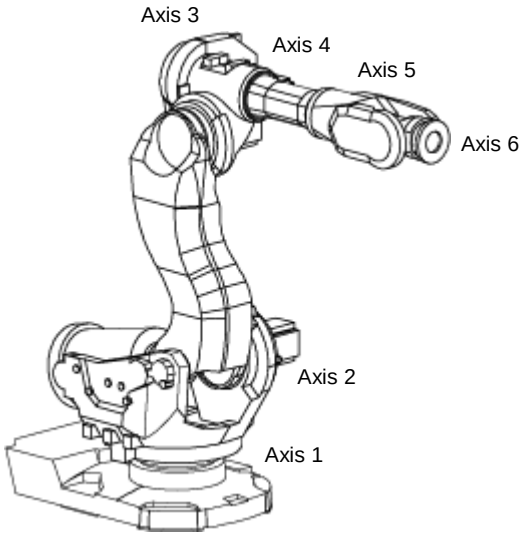


Figure 9 All axes in zero position.

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 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 porformance (Birth certificate). The difference betwenn an ideal robot and a real robot without AbsAcc can be typically 8 mm, resulting from mechanical tolerances and deflection in the robot structure.

Absolute Accuracy option

Absolute Accuracy option is integrated in the controller algorithrms 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 (m) a good positioning in the Cartesian coordinate system.

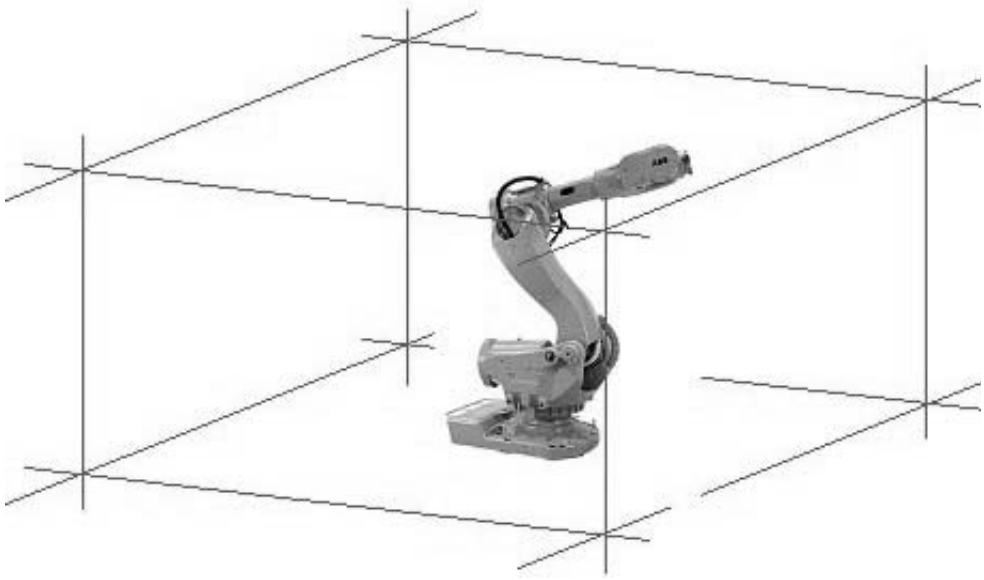


Figure 10 The Cartesian coordinate system

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	*)	*)	*)

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

1.4.3 Robot references

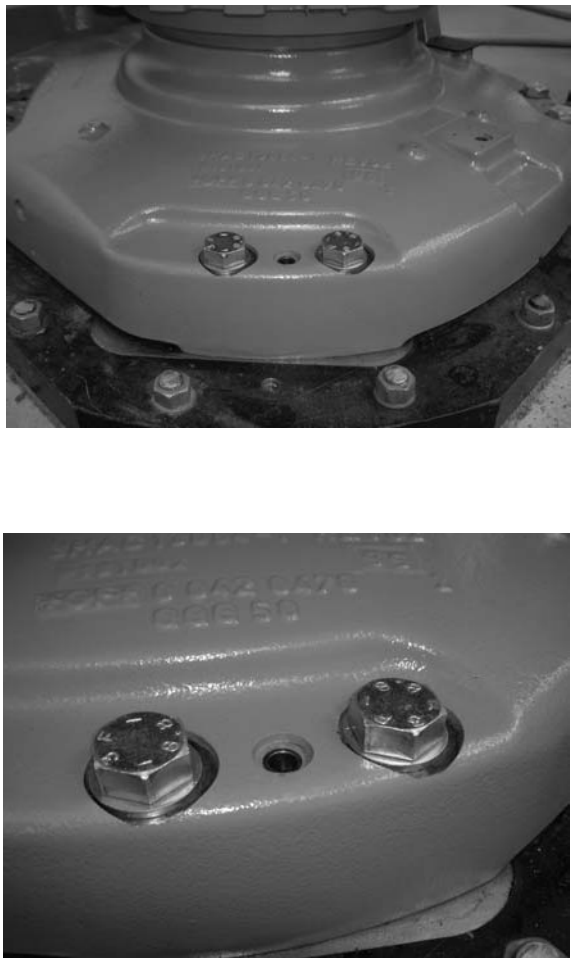


Figure 11 Four Ø12 H8 (depth 12) on radius 400 mm from axis 1 center on robot base.

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

1.4.3 Robot references

Figure 13 Seven holes on a radius of x mm from axis 6 center on the two standard tool flanges.

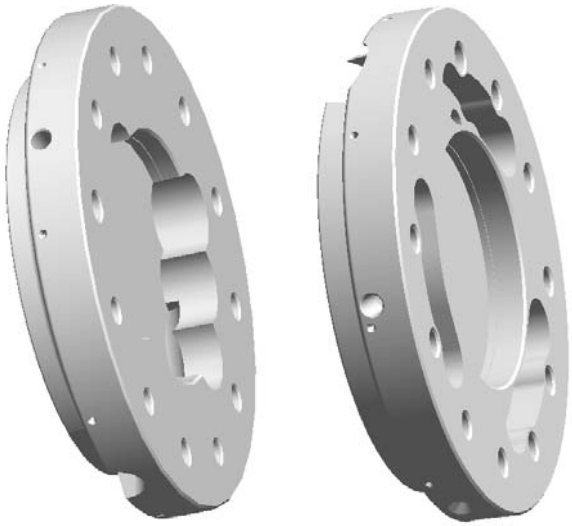


Figure 14 Seven holes on a radius of x mm from axis 6 center on the two insulated tool flanges.

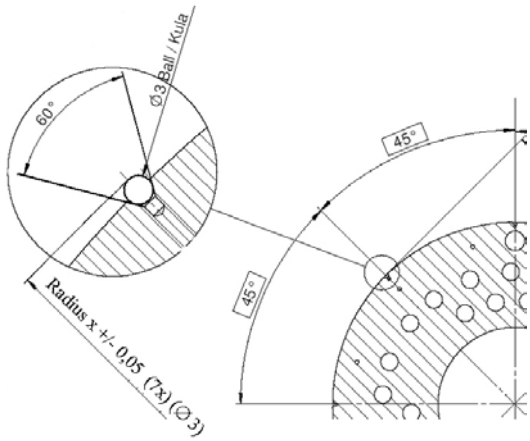


Figure 15 Detailed view of Tool Flange.

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 diagrarms

1.5.1 Introduction

General

The load diagrarms 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 16.

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 one of the calculation prograrms, ABB RobotLoad IRB 6600/7600, the Excel application or the Stand alone application on:

- inside.abb.com/atrm, click on Products --> Robots --> IRB 6600/7600 or
- http://www.abb.com/roboticspartner, click on Product range --> Robots --> IRB 6600/7600.

The Stand alone application, which is more complete, requires Microsoft.NET Framework and Microsoft Excel 9.0 software.

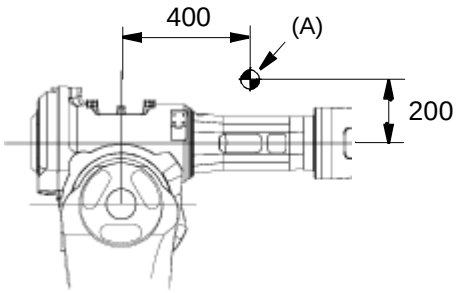


Figure 16 center of gravity for 50 kg extra load at arm housing (dimensions in mm).

Pos	Description
A	Center of gravity 50 kg.

1.5.2 Diagrams

IRB 6600-175/2.55

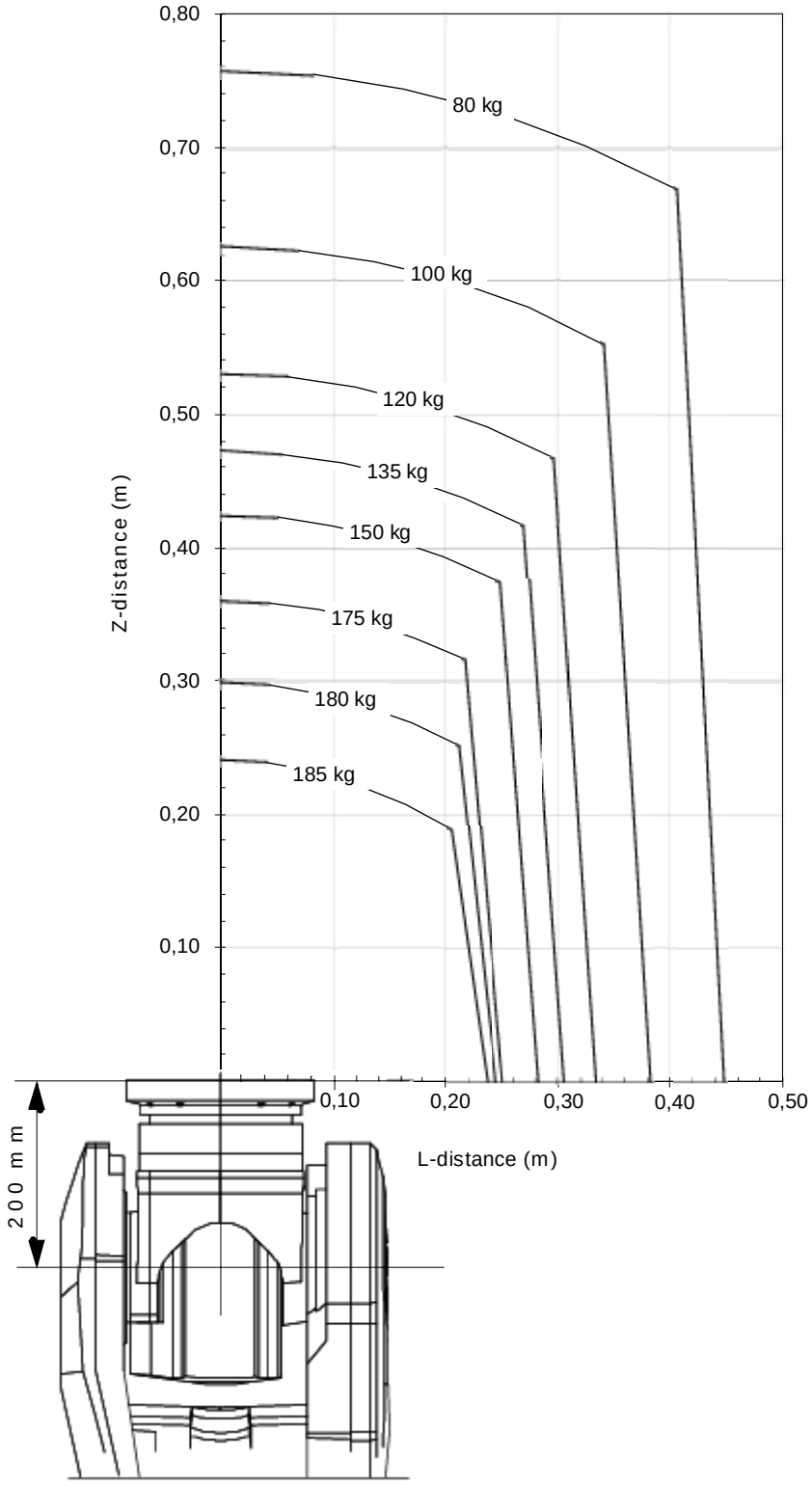


Figure 17 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

IRB 6600-175/2.55 “Vertical Wrist” (±10°)

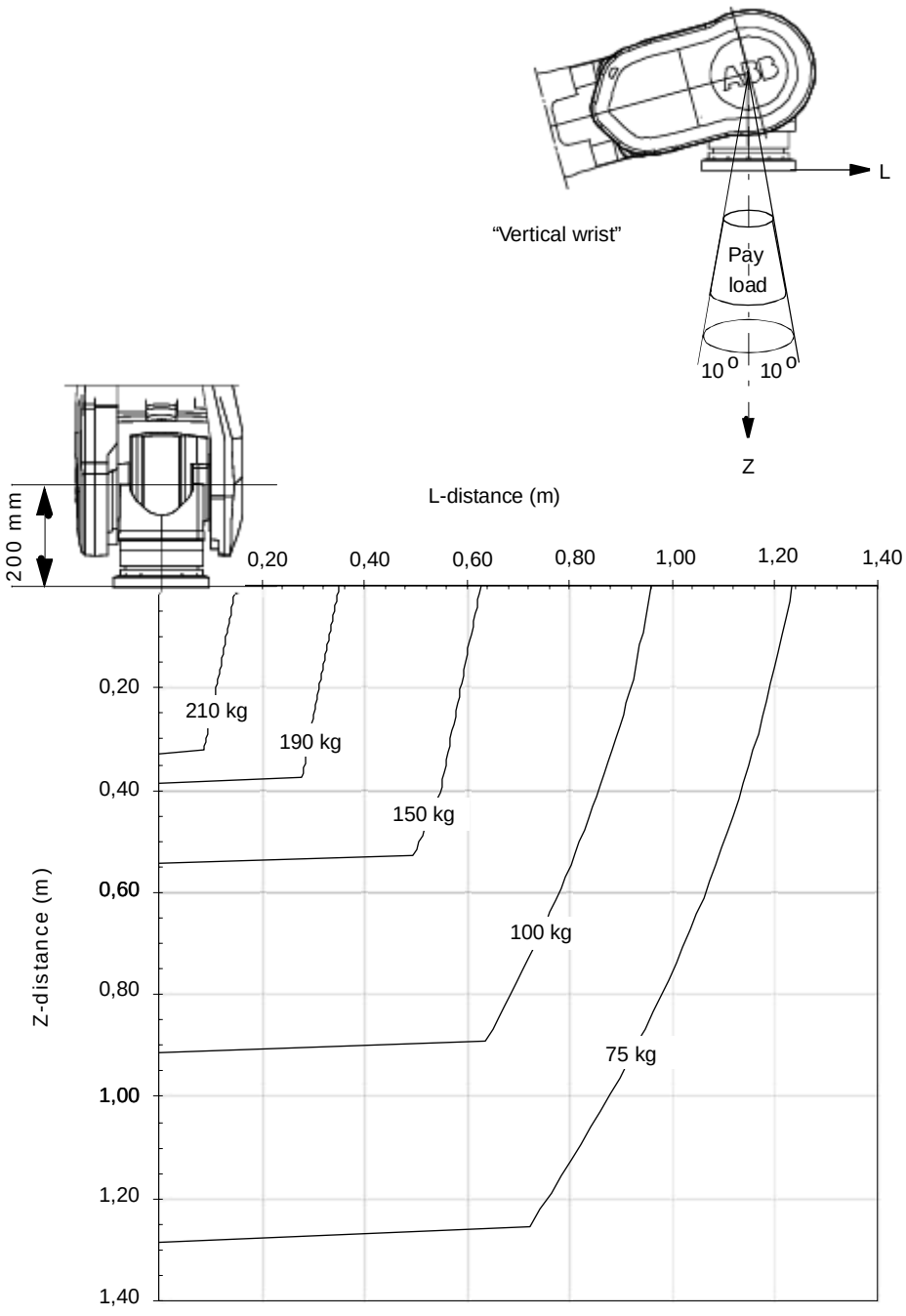


Figure 18 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°), J_0 =15 kgm^2.

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

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

IRB 6600-225/2.55

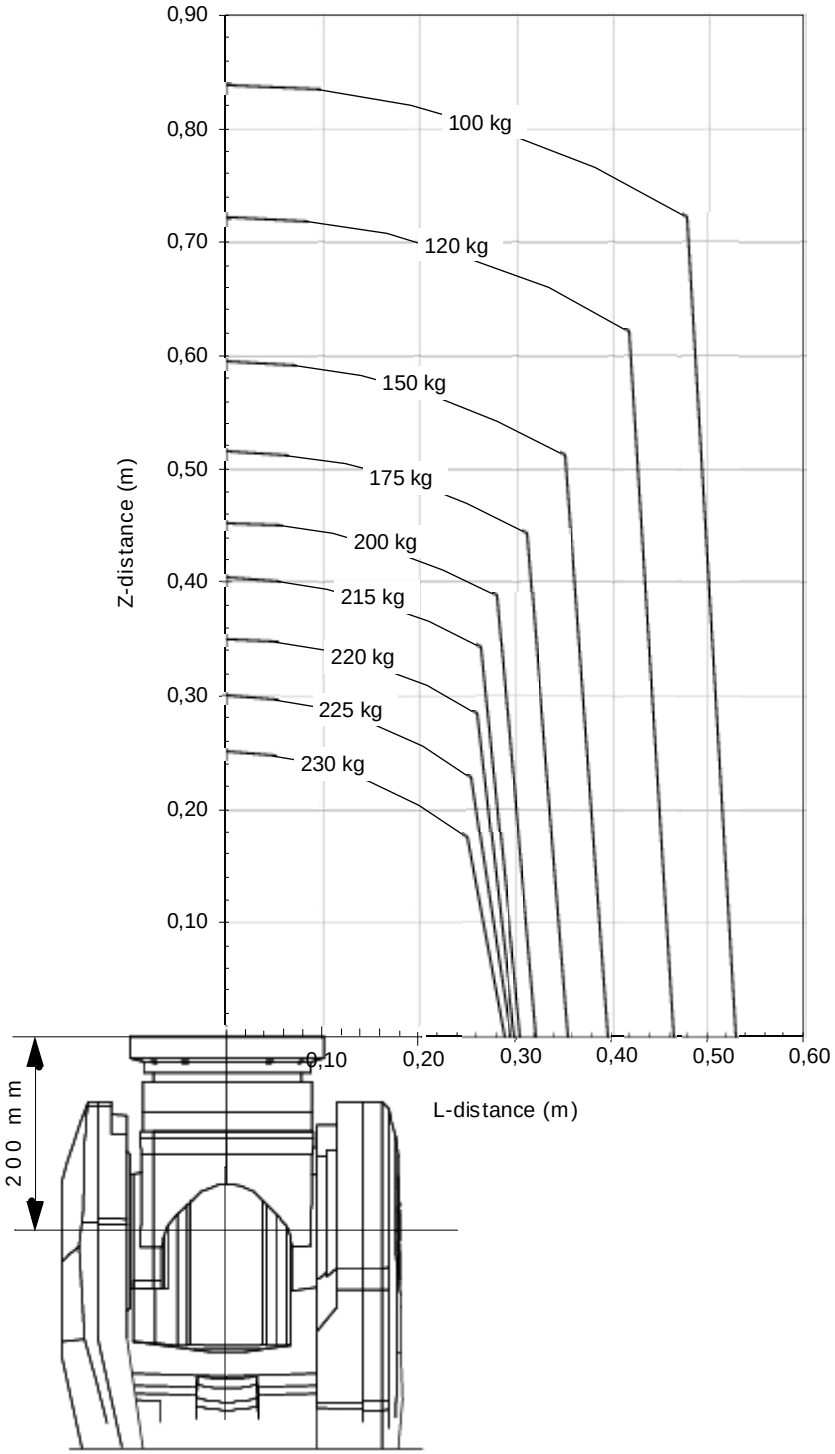


Figure 19 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

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

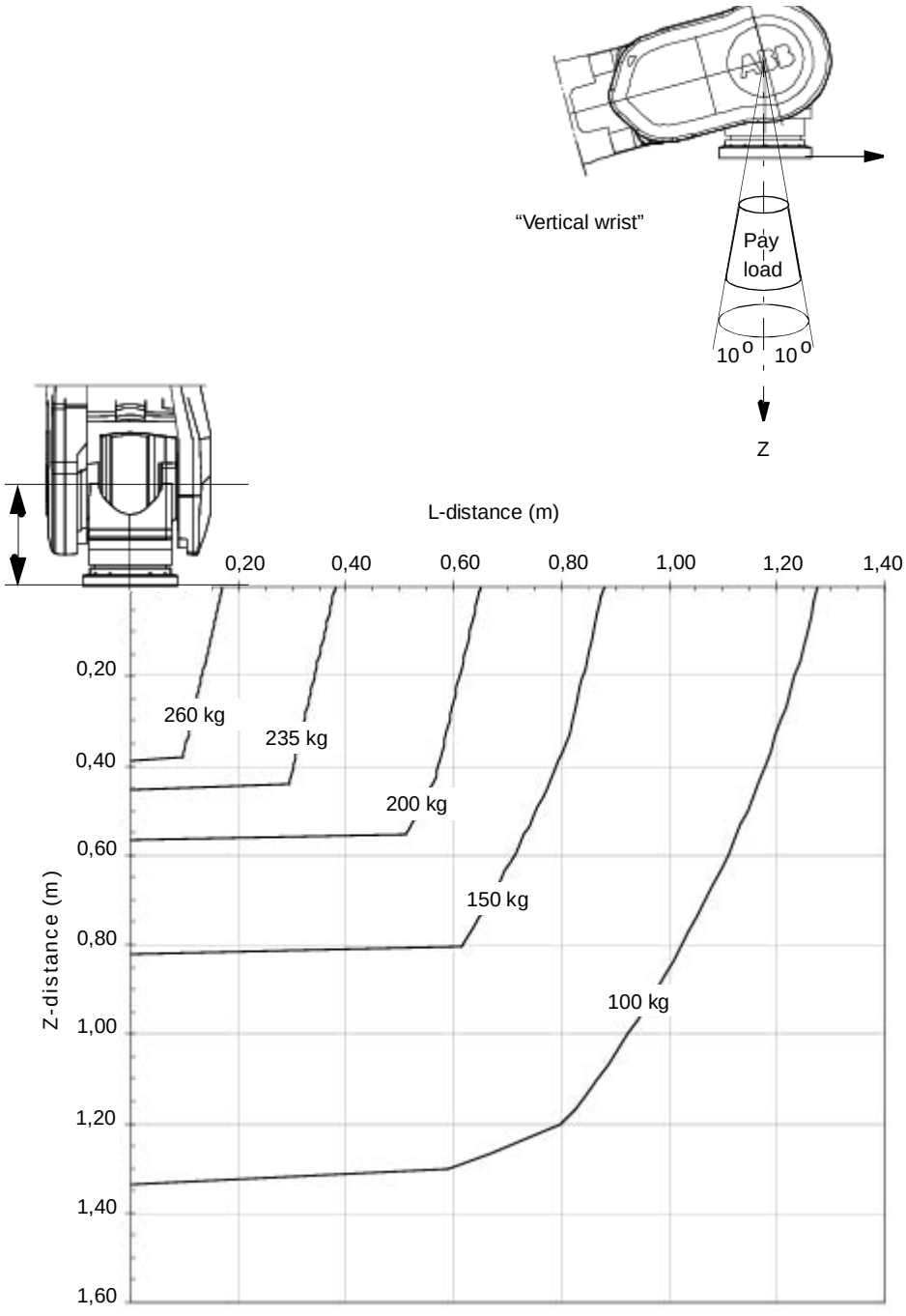


Figure 20 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

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

IRB 6600-175/2.8

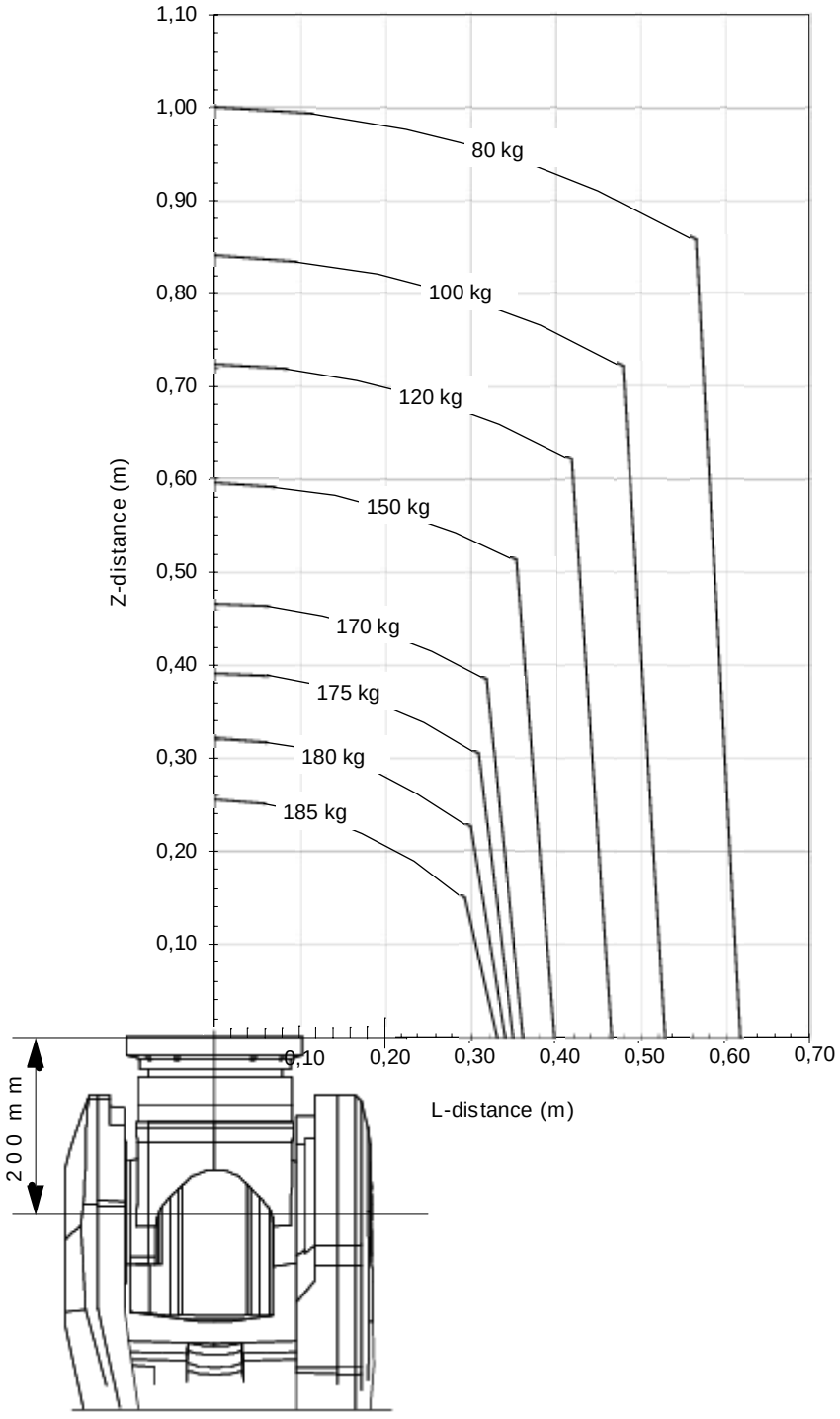


Figure 21 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

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

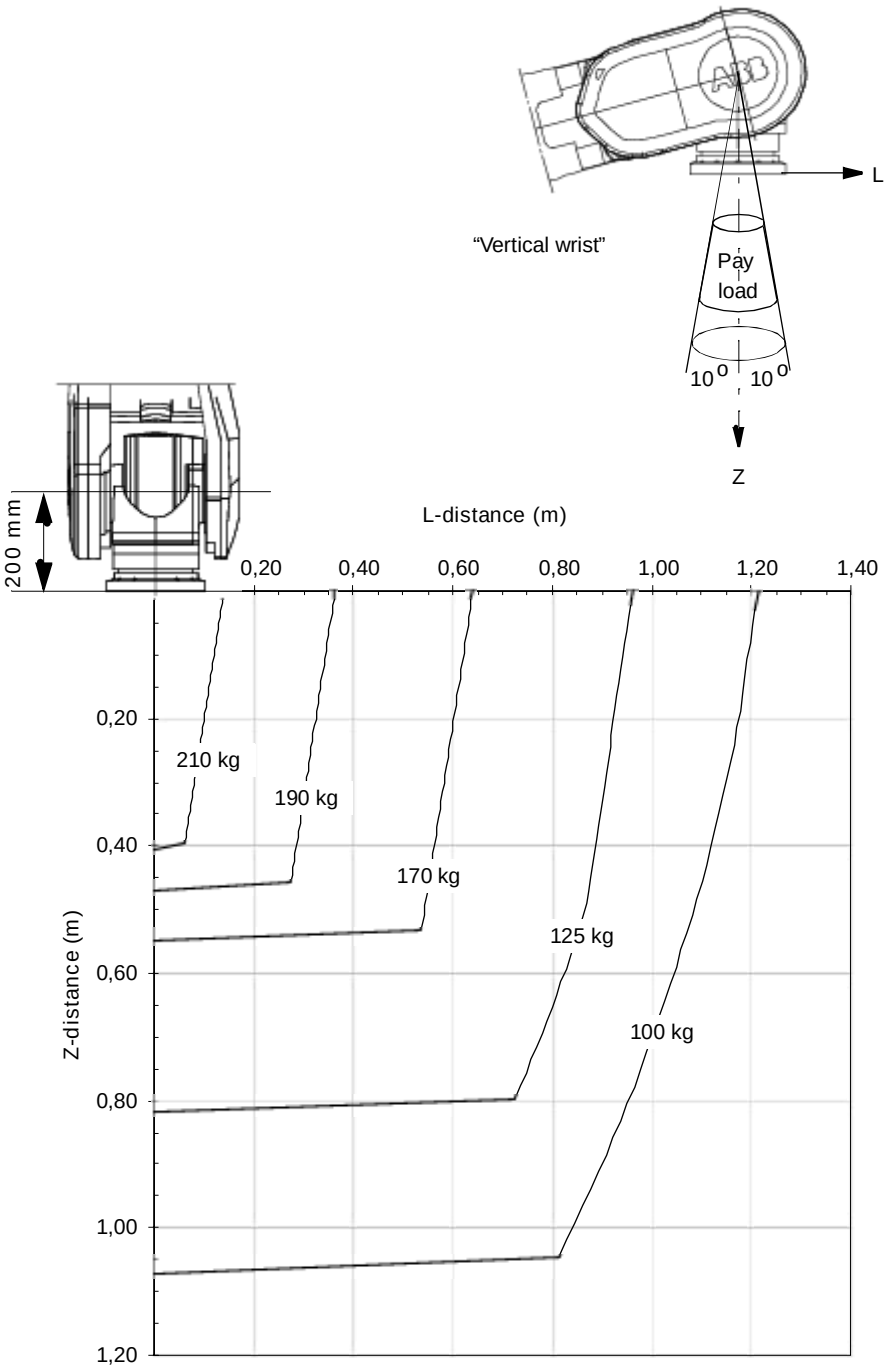


Figure 22 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

	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

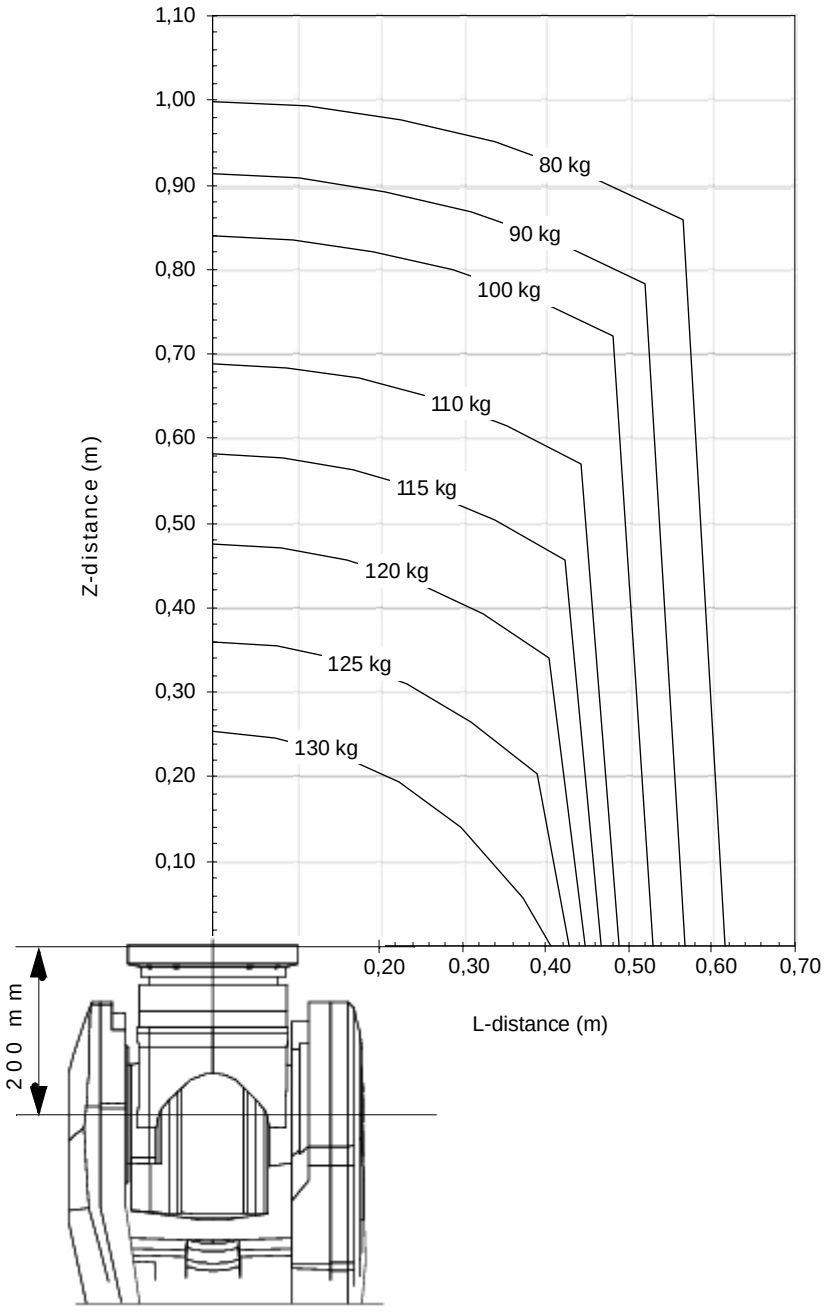


Figure 23 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

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

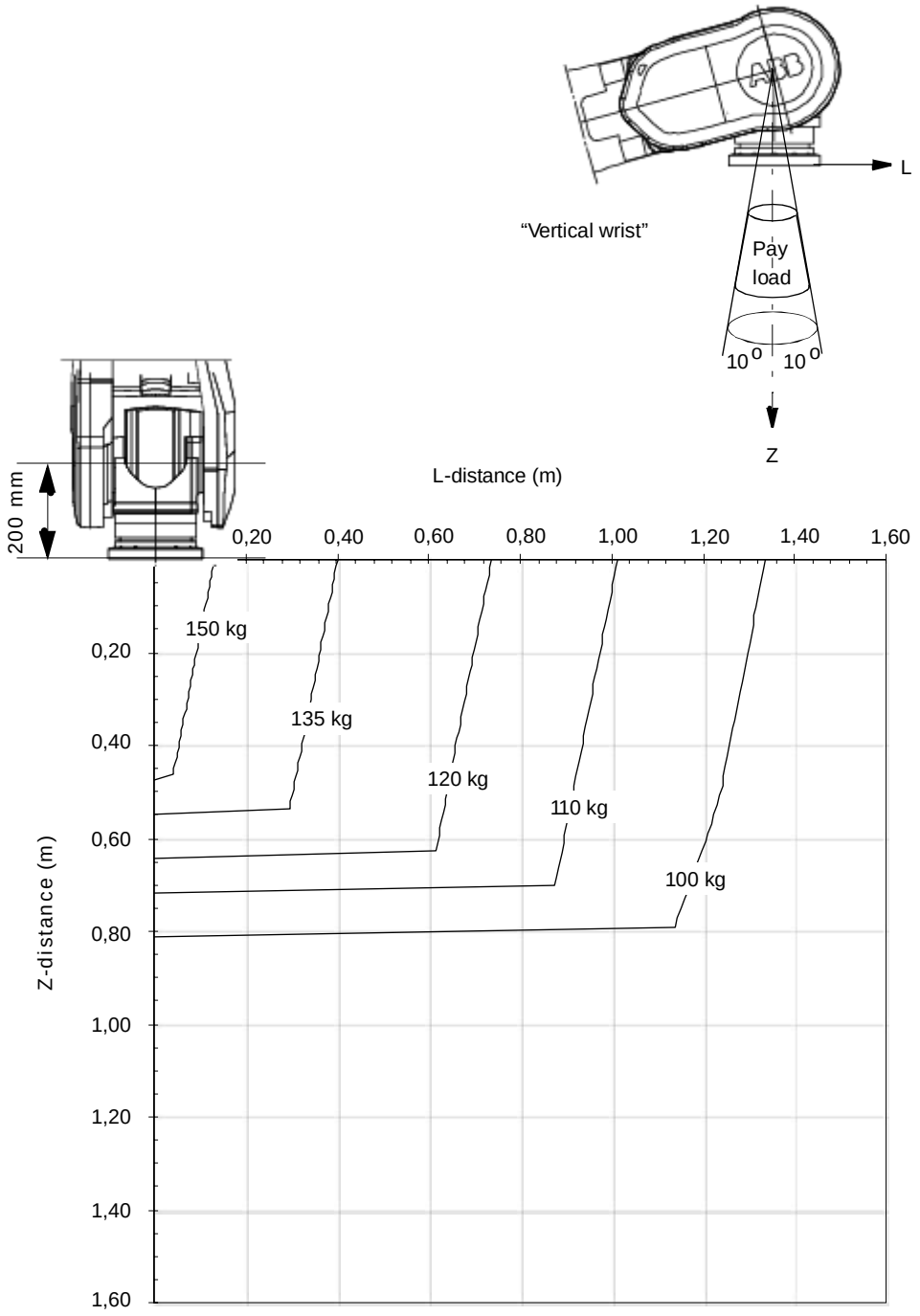


Figure 24 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

	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

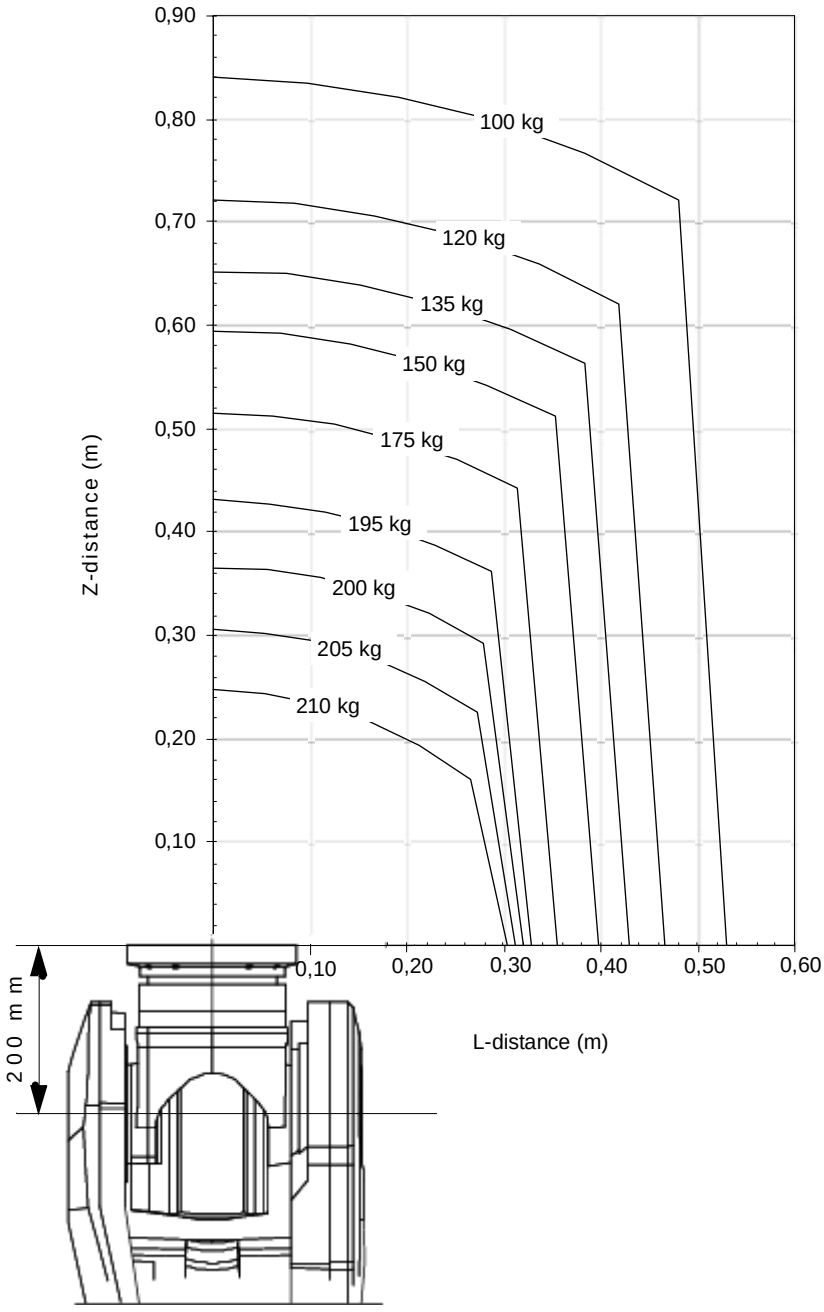


Figure 25 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

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

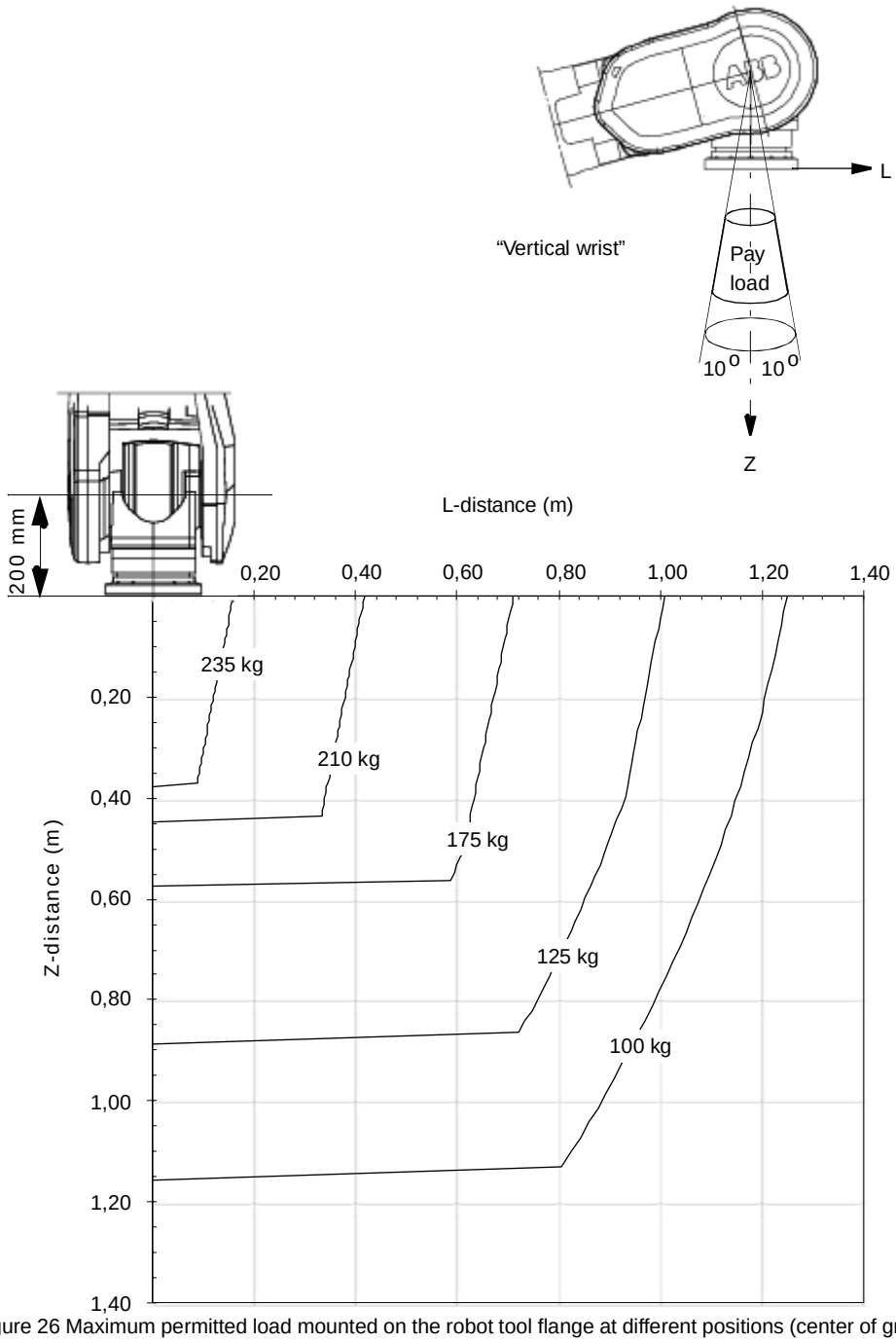


Figure 26 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at “Vertical Wrist” (±10°).

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

	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	$Ja5 = Load \cdot ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 250\ kgm^2$
	175/2.55	$Ja5 = Load \cdot ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 195\ kgm^2$
6	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	$Ja6 = Load \cdot L^2 + J_{0Z} \leq 185\ kgm^2$
	175/2.55	$Ja6 = Load \cdot L^2 + J_{0Z} \leq 145\ kgm^2$

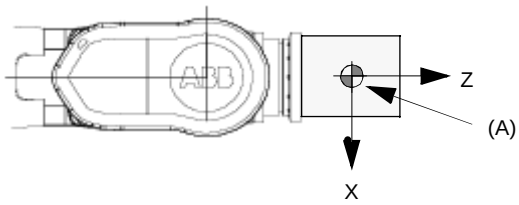


Figure 27 Moment of inertia when full movement of axis 5.

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.

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	$Ja5 = Load \cdot ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 275 kgm^2$
	175/2.55	$Ja5 = Load \cdot ((Z + 0{,}200)^2 + L^2) + J_{0L} \leq 215\ kgm^2$
6	225/2.55, 175/2.8, 125/3.2, 125/3.5, 200/2.75 and 200/3.0	$Ja6 = Load \cdot L^2 + J_{0Z} \leq 250\ kgm^2$
	175/2.55	$Ja6 = Load \cdot L^2 + J_{0Z} \leq 195\ kgm^2$

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

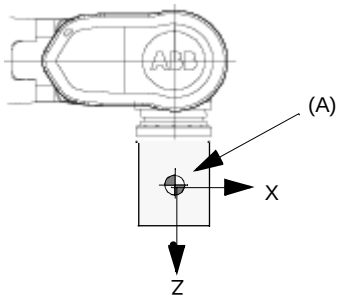


Figure 28 Moment of inertia when axis 5 center line down.

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 29 and Figure 30. The robot is supplied with holes for mounting extra equipment (see Figure 31). 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 29):
M1 ≤50 kg with distance a ≤500 mm, center of gravity in axis 3 extension.

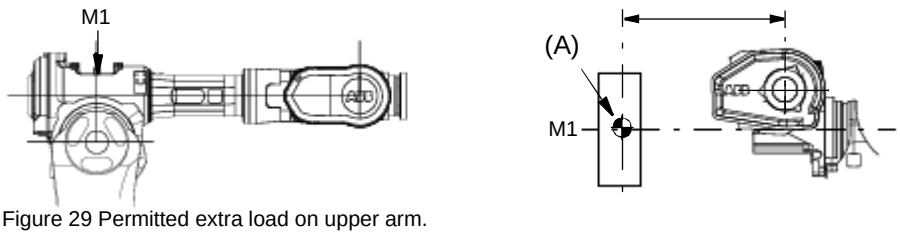


Figure 29 Permitted extra load on upper arm.

Pos	Description
A	Mass center

Frame (Hip Load)

	Description
Permitted extra load on frame	J_H = 200 kgm^2
Recommended position (see Figure 30)	$J_H = J_{H0} + M4 \bullet R^2$ where: J_{H0} is the moment of inertia of the equipment. R is the radius (m) from the center of axis 1. M4 ir the total mass (kg) of the equipment including bracket and harness (≤ 500 kg).

1.5.4 Mounting equipment

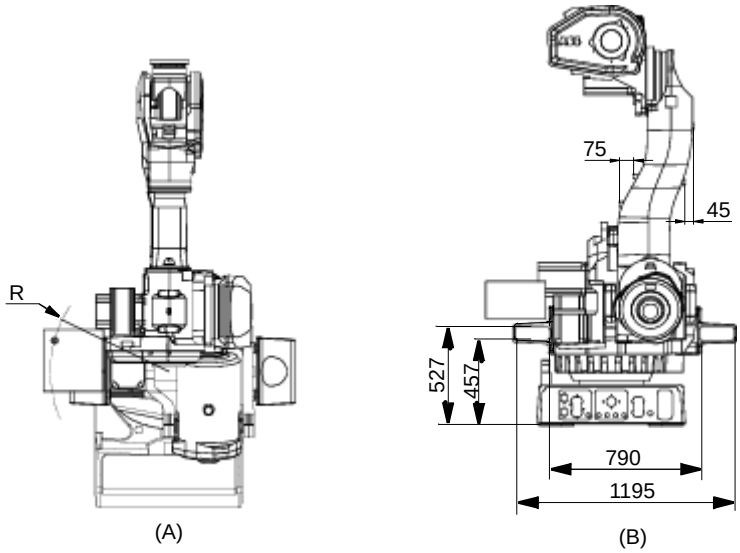


Figure 30 Extra load on the frame of IRB 6600 (dimensions in mm).

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 31 and Figure 32. 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

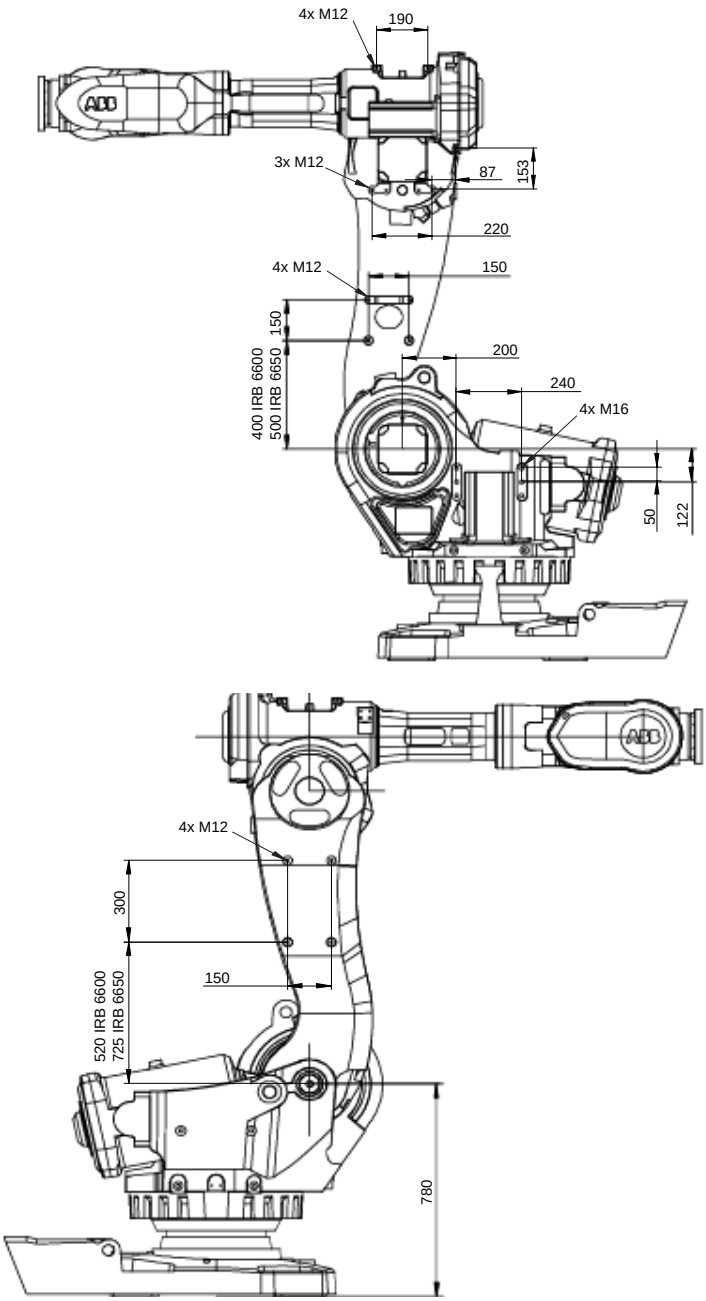


Figure 31 Holes for mounting extra equipment on the upper and the lower arm, and the frame on IRB 6600/6650 (dimensions in mm).

1.5.5 Mounting of hip load

Illustration

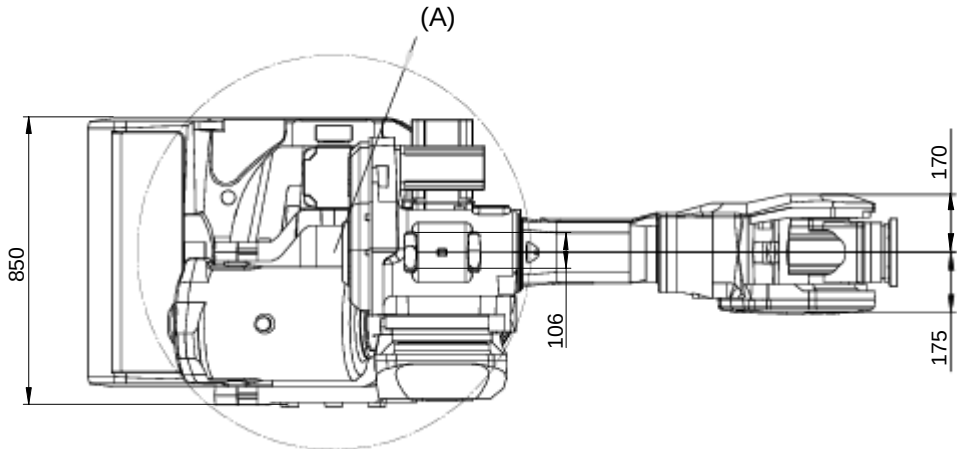


Figure 32 Holes for mounting of extra load on the upper arm on IRB 6600/6650 (dimensions in mm).

Pos	Description
A	R 580 R 690 with fork lift

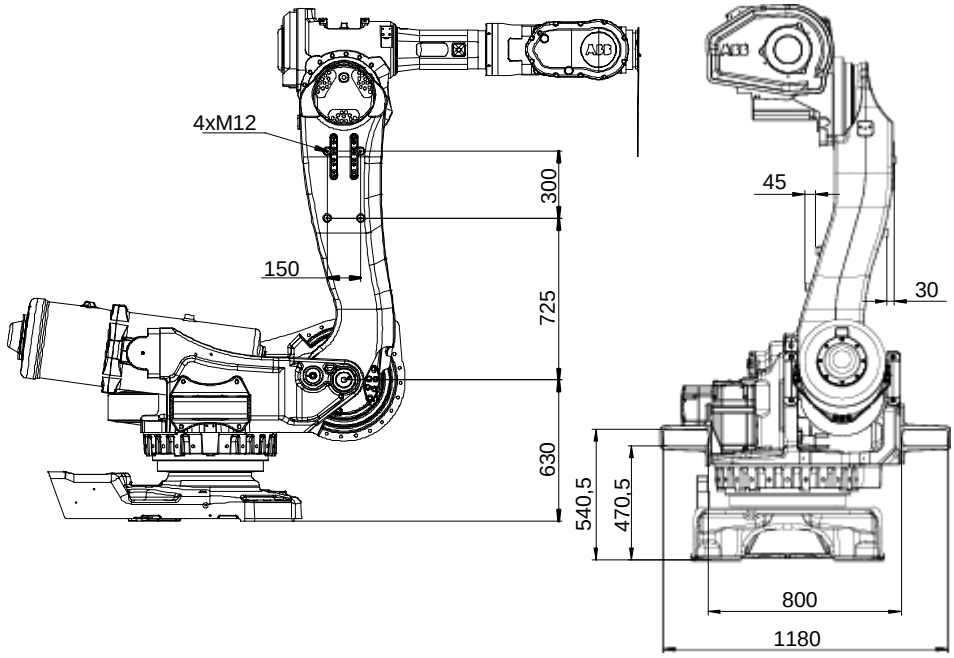


Figure 33 Holes for mounting extra load on upper arm on IRB 6650S (dimensions in mm).

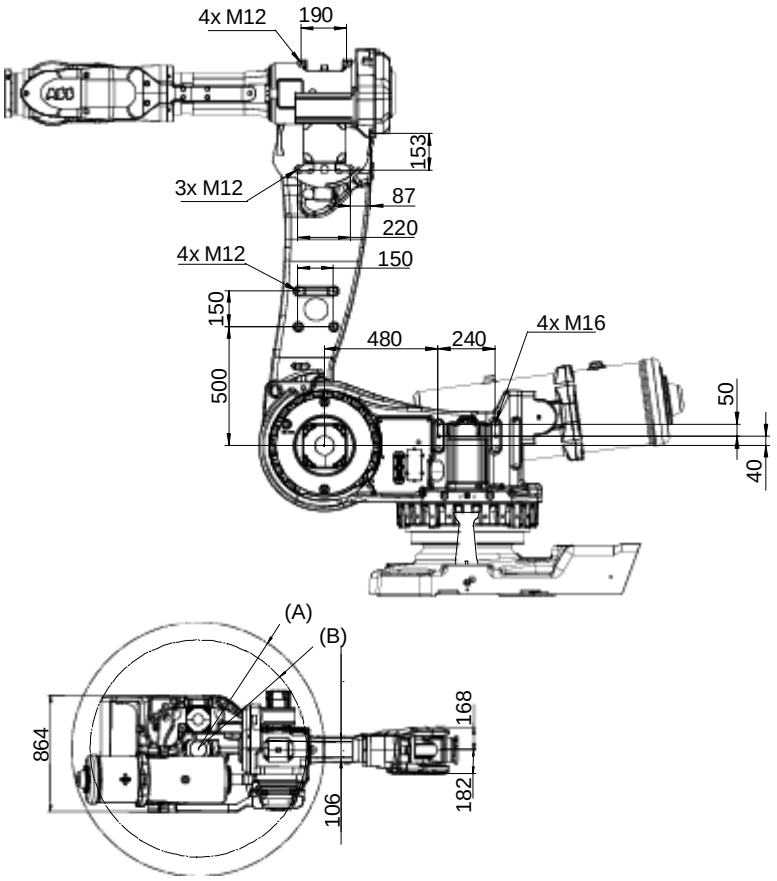


Figure 34 Holes for mounting extra load on upper arm on IRB 6650S (dimensions in mm).

1.5.5 Mounting of hip load

Illustration

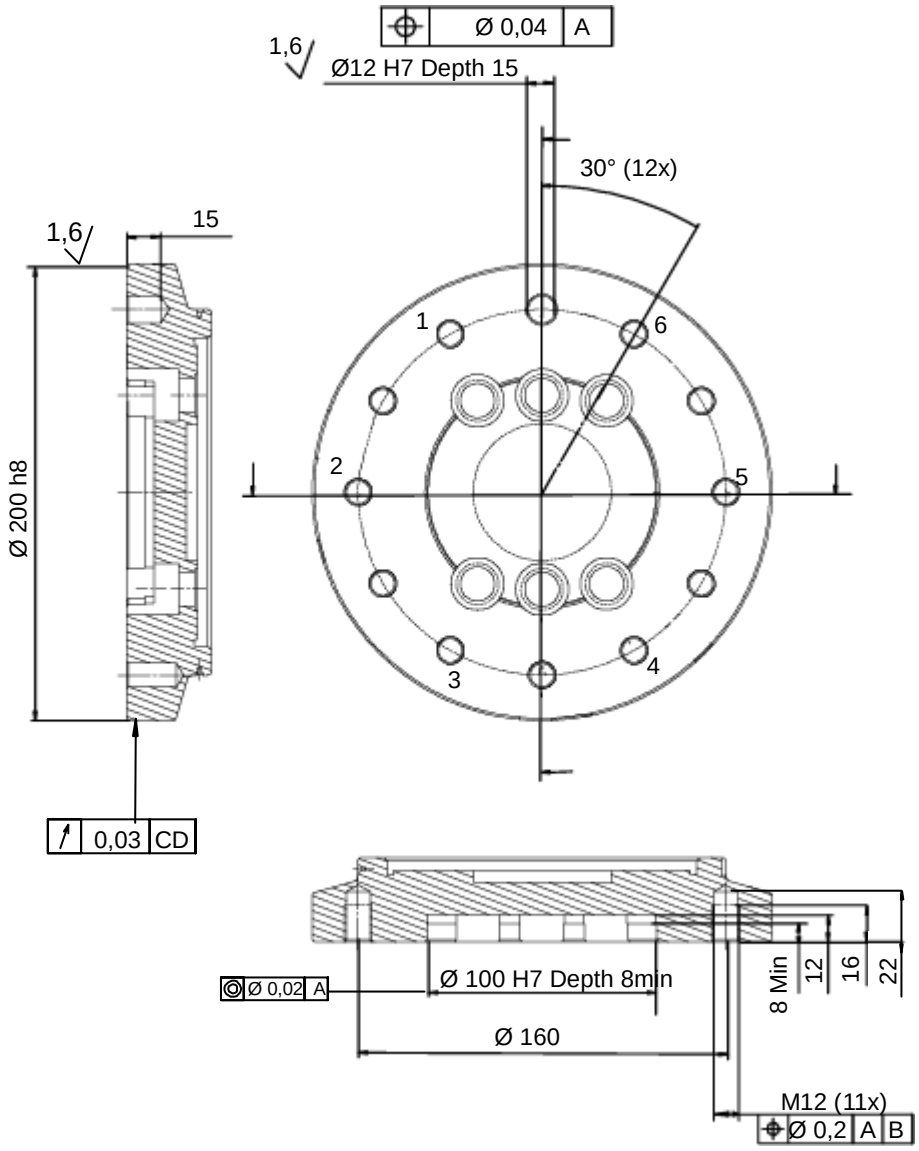


Figure 35 Robot tool flange ISO/DIS 9409-1:2002 (dimensions in mm).

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 fig.) of the bolt holes for 6 bolts quality class 12.9 shall be used.

Illustration

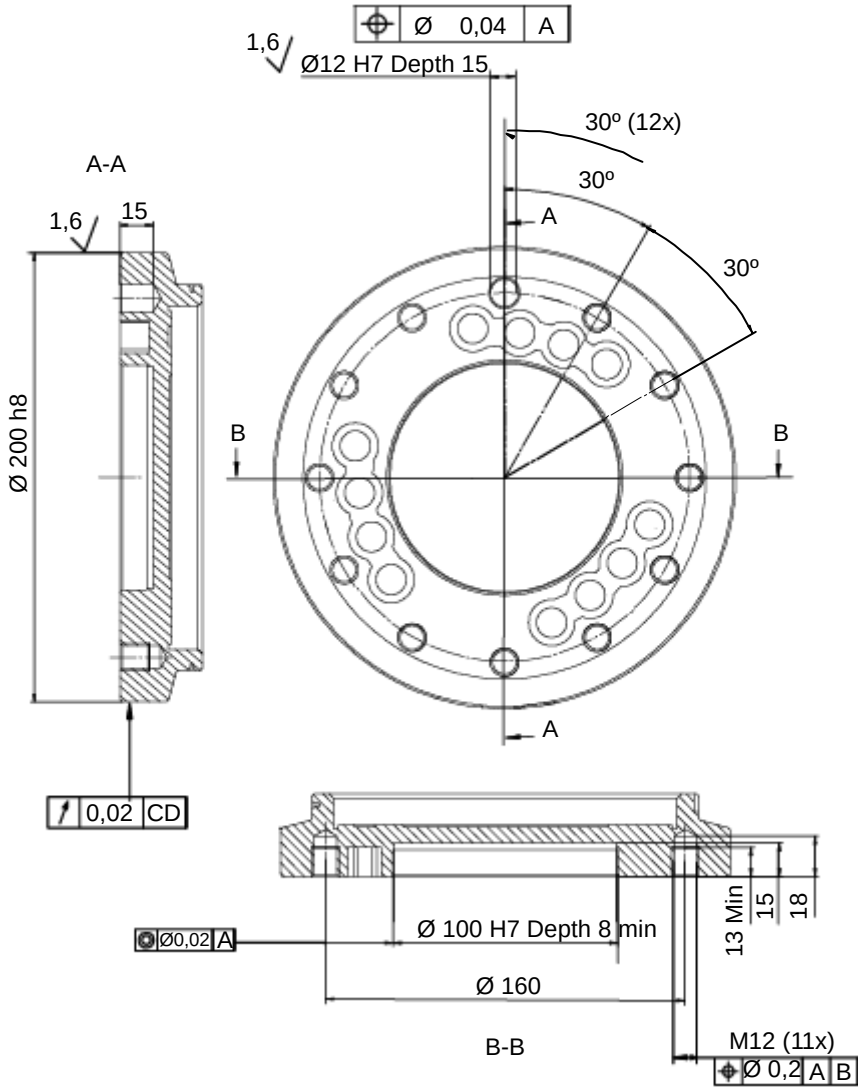


Figure 36 Robot tool flange ISO/DIS 9409-1:2002 (dimensions in mm).

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.

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	
1	Rotation motion	+180° to -180°	+220° to -220° option
2	Arm motion	+85° to -65°	
3	Arm motion	+70° to -180°	
4	Wrist motion	+300° to -300°	
5	Bend motion	+120° to -120°	
6	Turn motion	+300° to -300°	

Illustration

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

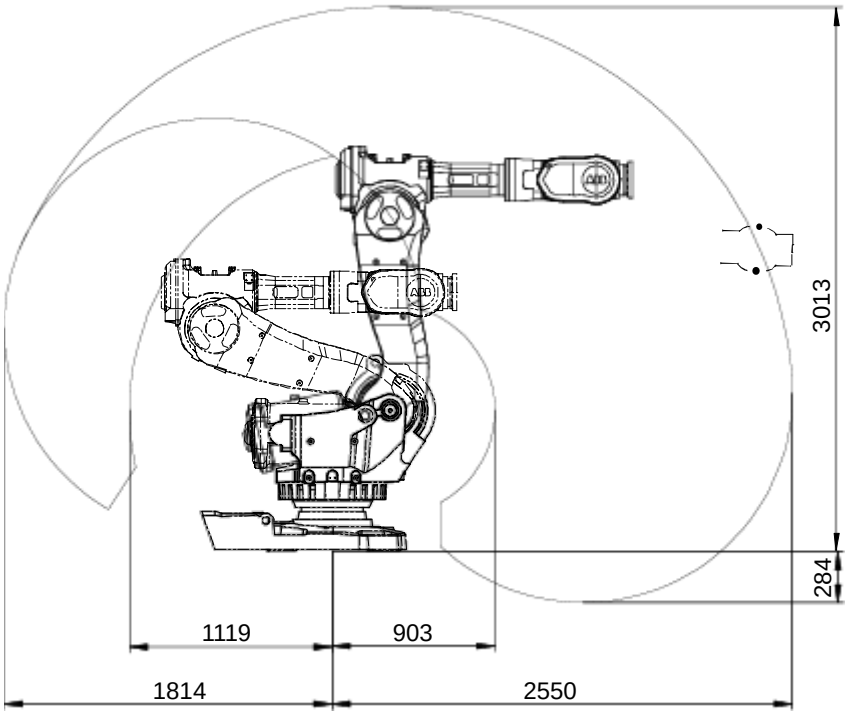


Figure 37 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

1.7.1 Introduction

Illustration

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

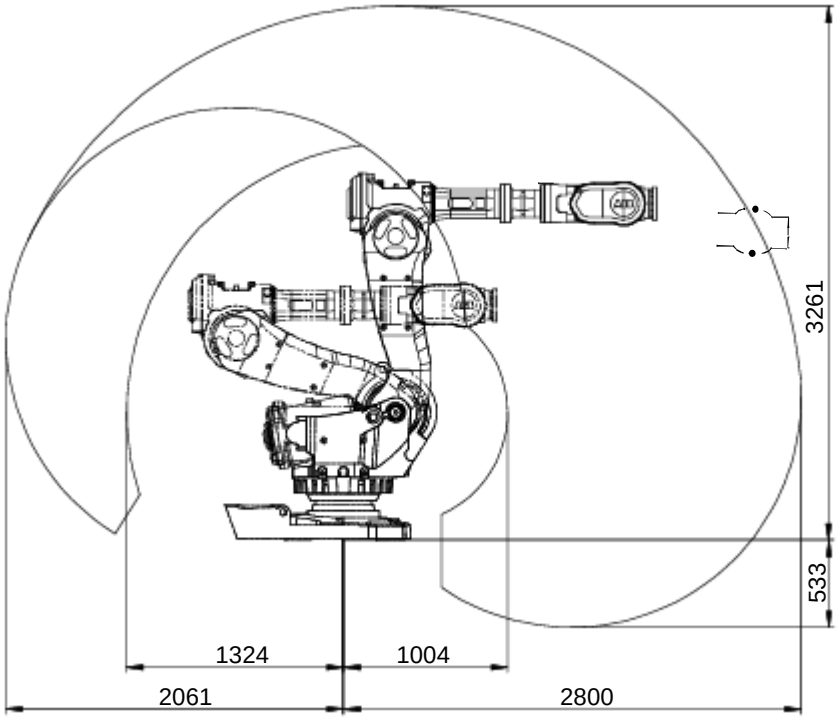


Figure 38 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

Illustration

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

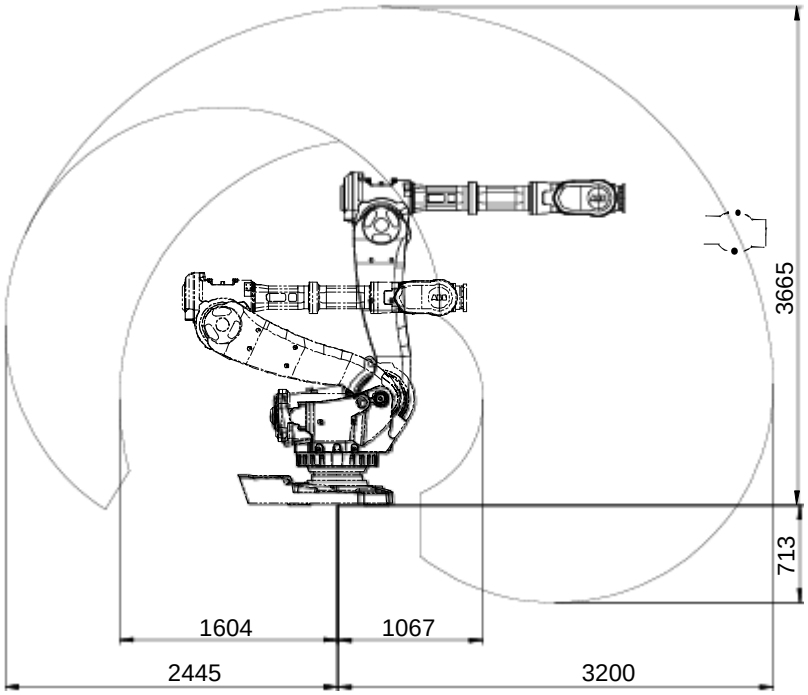


Figure 39 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

1.7.1 Introduction

Illustration

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

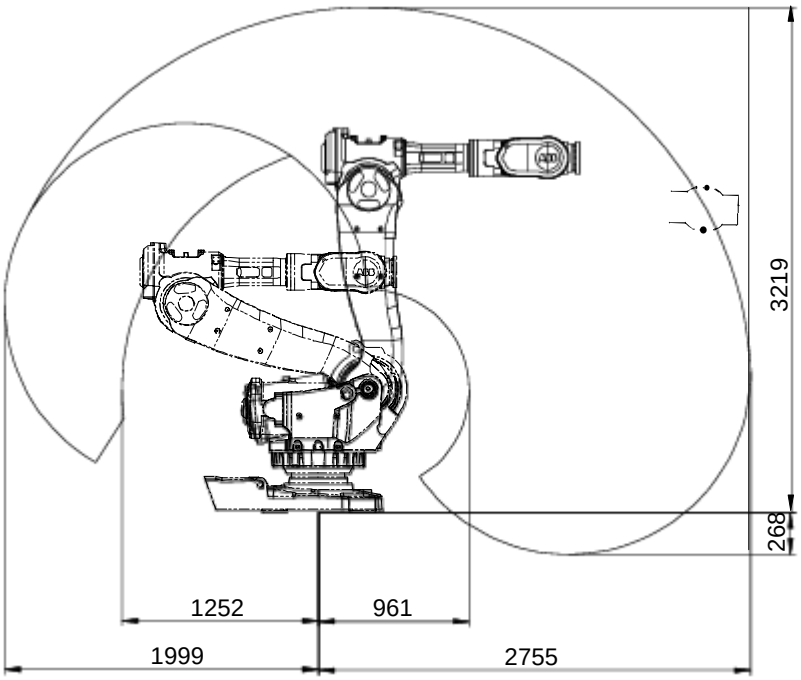


Figure 40 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

Illustration

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

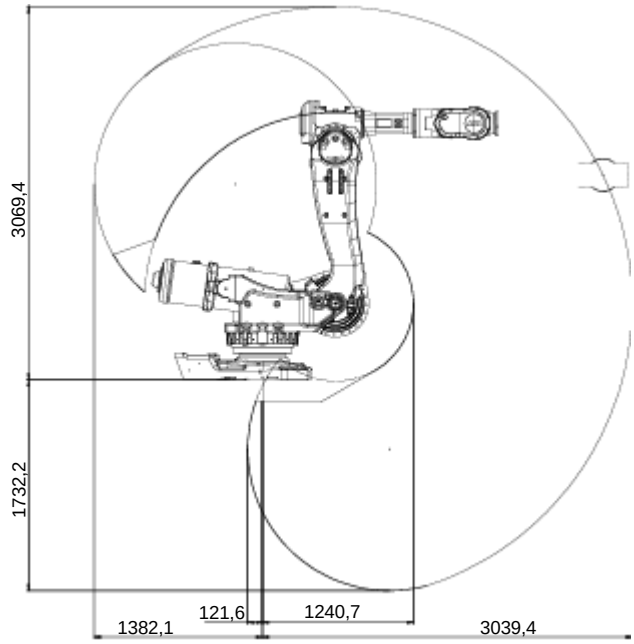


Figure 41 The extreme positions of the robot arm specified at the wrist center (dimensions in mm)

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

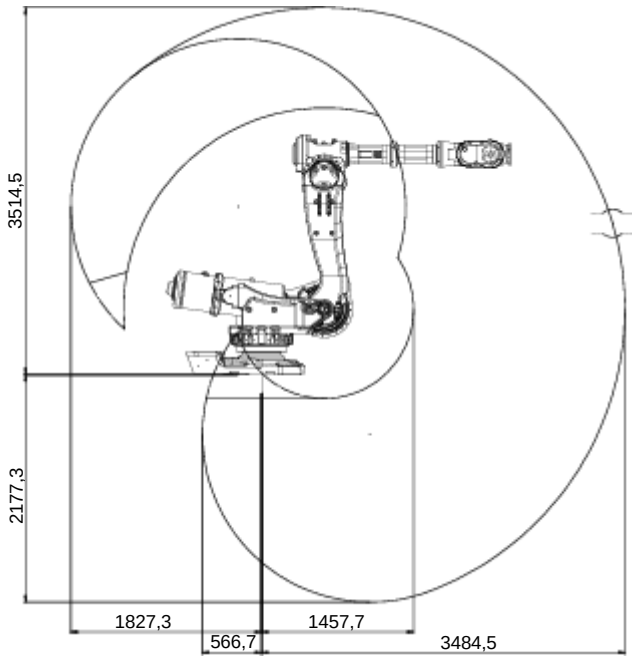


Figure 42 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

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

* The values for IRB 6650S-125/ and IRB 6650S-200/3.0 not yet available.

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

1.9.1 Introduction

General

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

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

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

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

1.9.2 Stationary Gun

Illustration

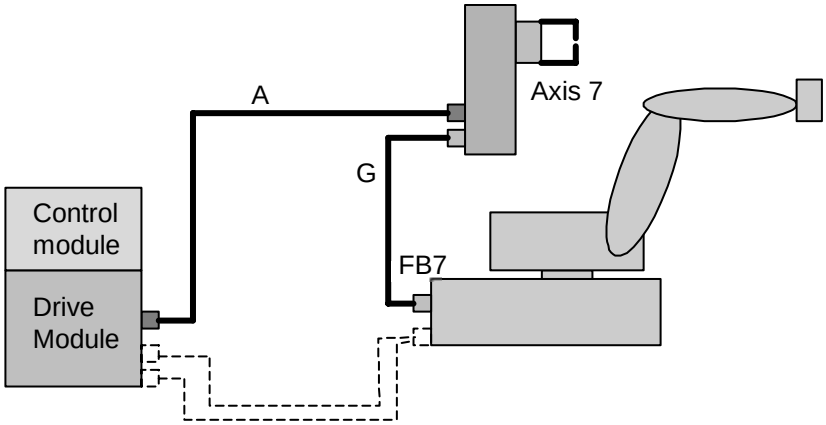


Figure 43 Configuration of Stationary Gun.

Options

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

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

1.9.3 Robot Gun

Illustration

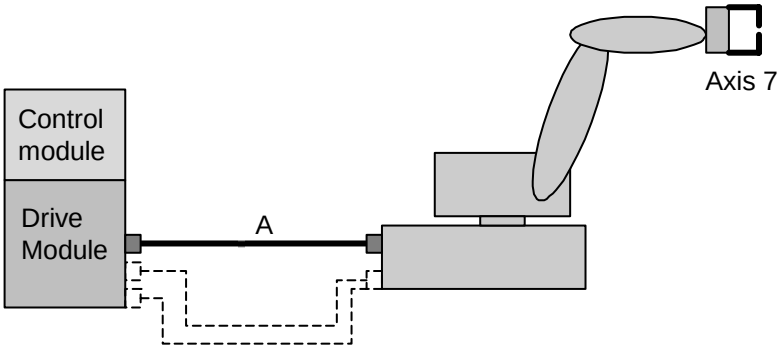


Figure 44 Configuration of Robot Gun.

Options

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

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

1.9.4 Stationary and Robot Gun

Illustration

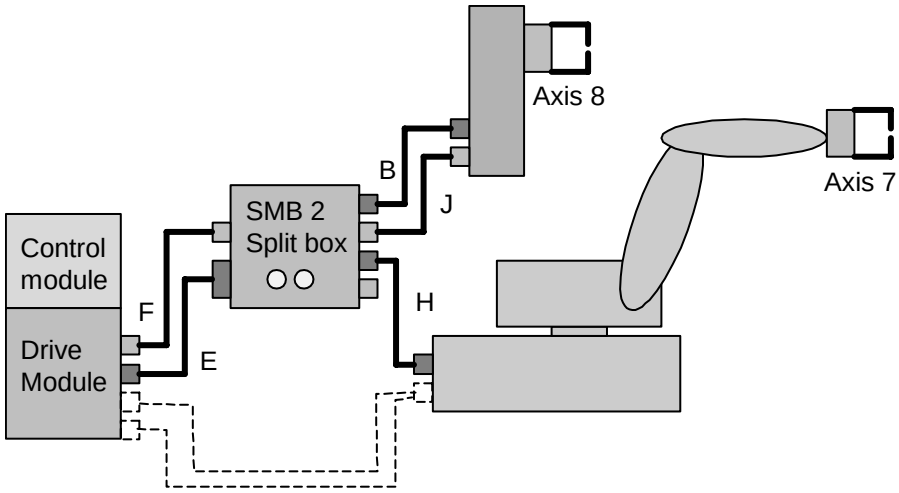


Figure 45 Configuration of Stationary and Robot Gun.

Options

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

Option	Description	Product Spec.
785-3	Stationary and Robot gun. This option includes: Cables within manipulator for servo power signals (servo gun/axis 7). Serial measurement box (SMB2, Split box) for distribution of servo power to axis 7 and 8 and resolver signals to axis 8. The box is intended to be placed on stationary gun stand. Cables from serial measurement box to stationary gun/axis 8 and to servo gun/axis 7. Cable **B** for servo power (1,5 m length). Cable **J** for resolver signals (1,5 m length). Cable for servo power to robot gun **H** (7 m length).	
770-4	First additional drive. Drive unit for 7:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
771-4	Second additional drive. Drive unit for 8:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
787-1,-2,-3,-4	Connection to first and second drive. Cable **E** and **F** (7-30 m) between Drive Module and serial measurement box for dual servo drive power/resolver signals.	
635-1	Spot Servo. Software for control of a servo gun.	Controller software IRC5

1.9.5 Twin Stationary Guns

Illustration

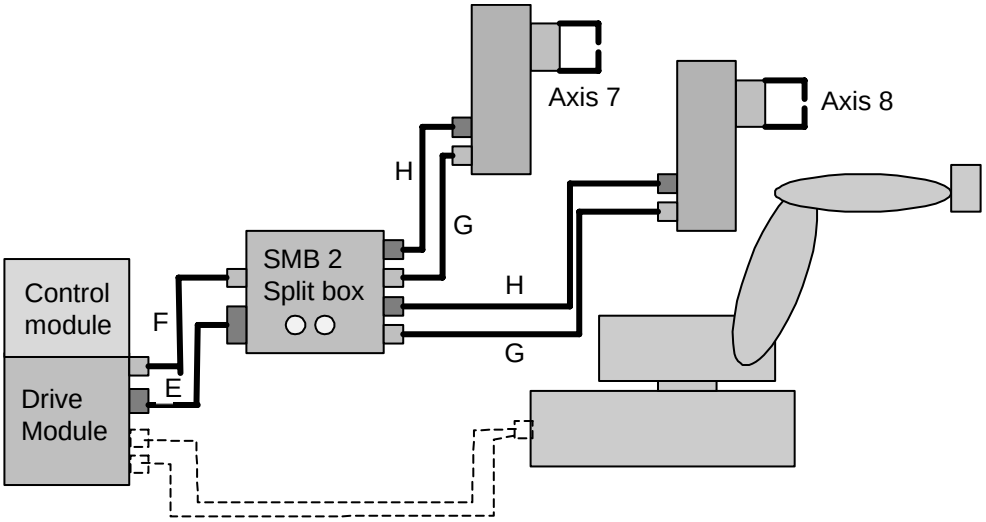


Figure 46 Configuration of Twin Stationary Guns.

Options

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

Option	Description	Product Spec.
785-6	Twin Stationary guns. This option includes: Serial measurement box (SMB2, Split box) for distribution of servo power to axis 7 and 8 and resolver signals to axis 7 and 8. The box is intended to be placed on one of the stationary gun stands. Cables from serial measurement box to stationary guns/axis 7 and axis 8. Cables **H** for servo power (7 m length). Cables **G** for resolver signals (7 m length).	
770-4	First additional drive. Drive unit for 7:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
771-4	Second additional drive. Drive unit for 8:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
787-1,-2,-3,-4	Connection to first and second drive. Cable **E** and **F** (7-30 m) between Drive Module and serial measurement box for dual servo drive power/resolver signals.	
635-1	Spot Servo. Software for control of a servo gun. (For simultameous welding Spot Servo Multiple Guns are required).	Controller software IRC5

1.9.6 Stationary Gun and Track Motion

Illustration

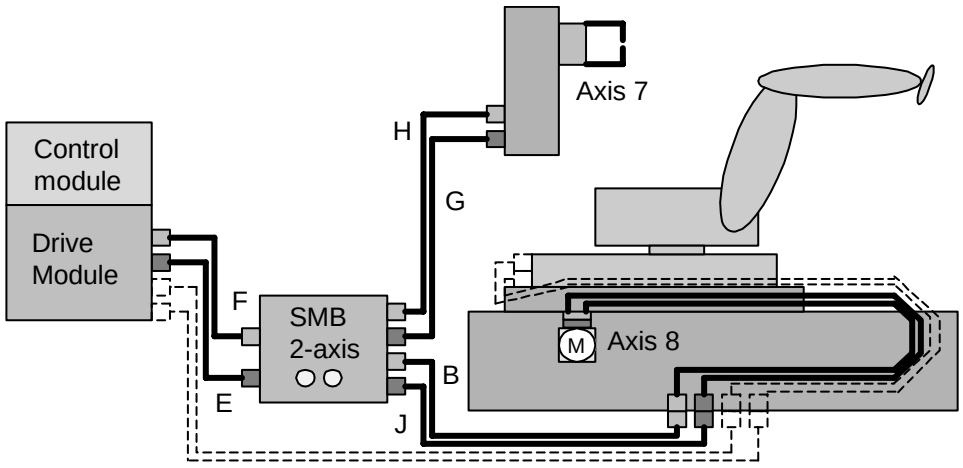


Figure 47 Configuration of Stationary Gun and Track Motion.

Options

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

Option	Description	Product Spec.
785-4	Stationary gun - Track motion. This option includes: Cables from serial measurement box to stationary gun/axis 7. Cable **H** for servo power (7 m length). Cable **G** for resolver signals (7 m length).	
Track motion delivery includes	Serial measurement box (SMB2, Split box) for distribution of servo power and resolver signals to axis 7 and 8. The box is placed on the track motion base. Cables from serial measurement box to track motion. Cable **B** for servo power (1,5 m length). Cable **J** for resolver signals (1,5 m length).	Track motion IRBT 6003S/ IRBT 7003S
770-4	First additional drive. Drive unit for 7:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
771-4	Second additional drive. Drive unit for 8:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
787-1,-2,-3,-4	Connection to first and second drive. Cable **E** and **F** (7-30 m) between Drive Module and serial measurement box for dual servo drive power/ resolver signals.	
635-1	Spot Servo. Software for control of a servo gun.	Controller software IRC5

1.9.7 Robot Gun and Track Motion

Illustration

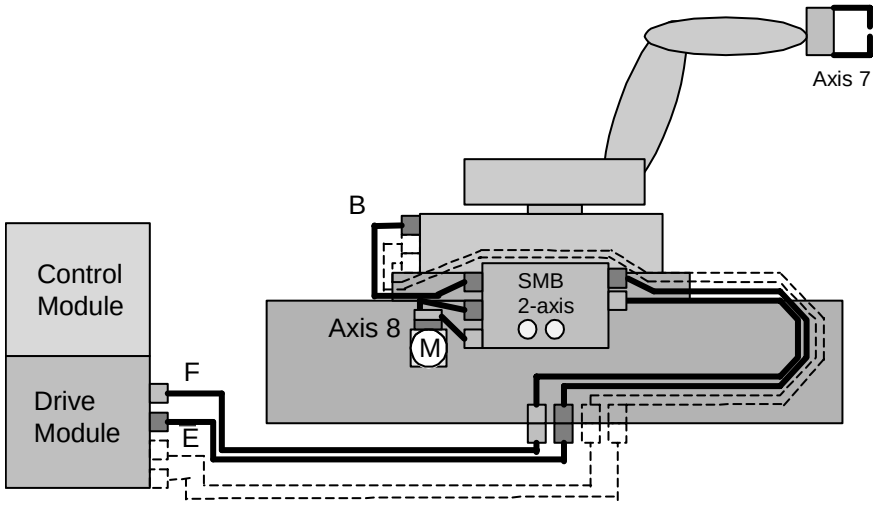


Figure 48 Configuration of Robot Gun and Track Motion.

Options

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

Option	Description	Product Spec.
785-2	Robot Gun - Track Motion. This option includes: Cables within manipulator for servo power signals (servo gun/axis 7).	
Track motion delivery includes	Serial measurement box (SMB2, Split box) for distribution of servo power and resolver signals to axis 7 and 8. The box is placed on the track motion. Cables from serial measurement box to track motion. Cable **B** for servo power (1,5 m length).	Track motion IRBT 6003S/ IRBT 7003S
770-4	First additional drive. Drive unit for 7:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
771-4	Second additional drive. Drive unit for 8:th axis with corresponding cables assembled inside Drive Module.	Controller, IRC5
787-1,-2,-3,-4	Connection to first and second drive. Cable **E** and **F** (7-30 m) between Drive Module and serial measurement box for dual servo drive power/resolver signals.	
635-1	Spot Servo. Software for control of a servo gun.	Controller software IRC5

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.

Illustration

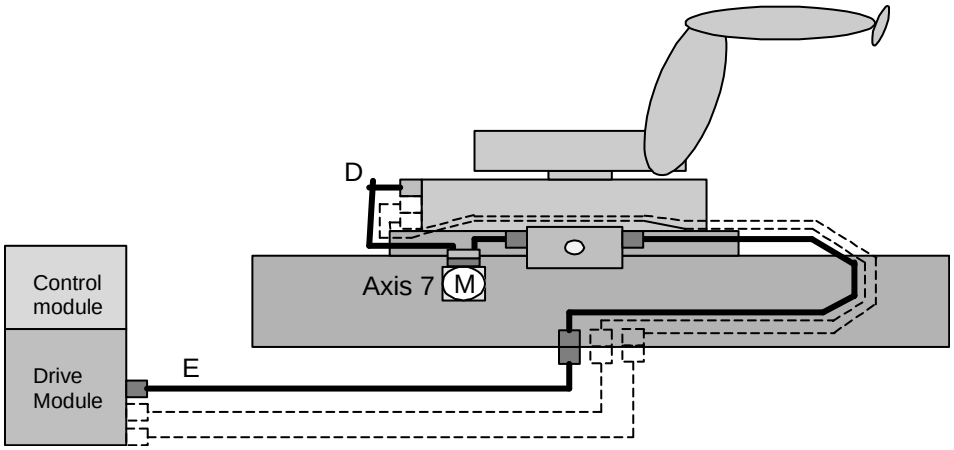


Figure 49 Configuration of Track Motion.

General. The robot can be combined with a Track Motion, for further details see Product Specification IRBT 6003S/IRBT 7003S.

Options

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

Option	Description	Product Spec.
Track motion delivery includes	Serial measurement box (SMB, Split box) for distribution of servo power signals to axis 7/Track motion. The box is placed on the track motion. Cable **D** for resolver signals (1,5 m length). From robot base to serial measurement box. Cable **E** for between Drive Module and track motion servo for drive power.	Track motion IRBT 6003S/ IRBT 7003S
770-4	First additional drive. Drive unit for 7:th axis with corresponding cables assembled inside Drive Module.	

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.

Details for the modules within DressPack are shown in Figure 51.

Illustration SpotPack

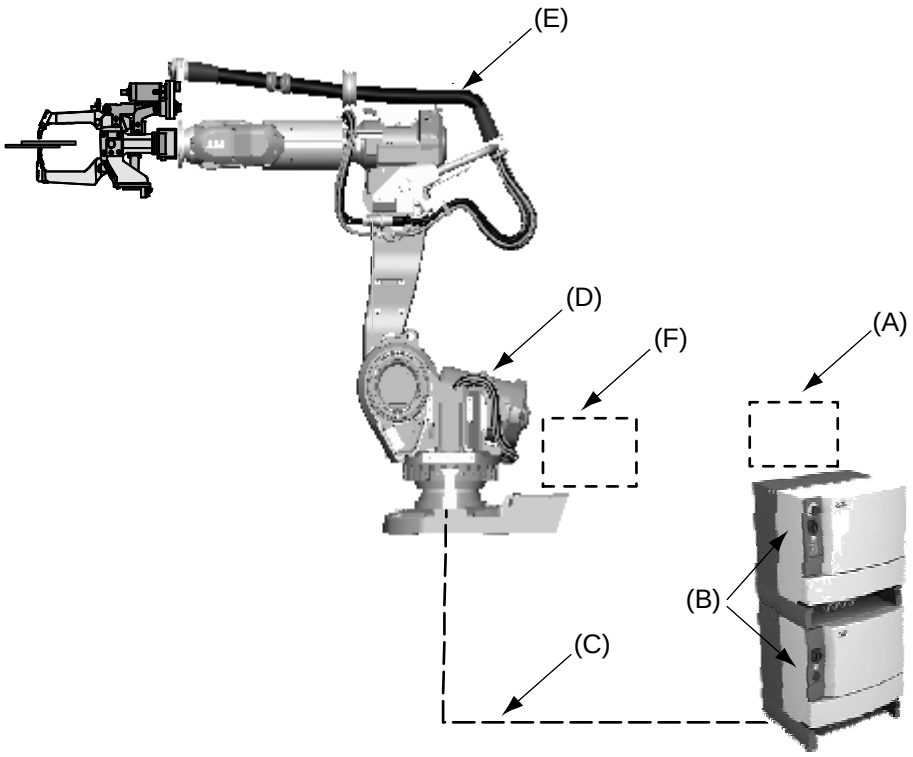


Figure 50 SpotPack M2004

Pos.	Name
A	Process cabinet (not available)
B	Robot Cabinet IRC5
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses (not available)

Illustration DressPack

Figure 51 “Orange line”.

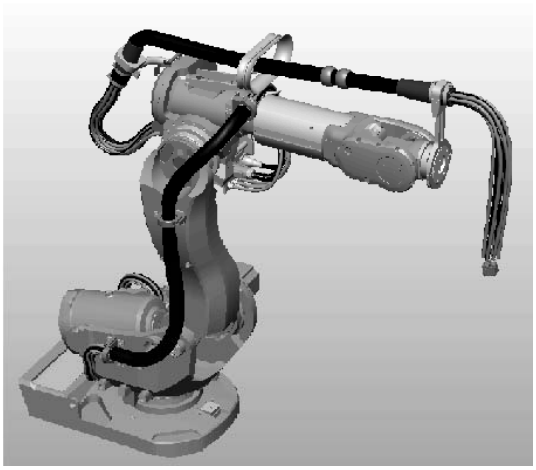


Figure 52 “Silver line”.

2.1.2 Chapter Structure

The Chapters for SpotPack and DressPack are structured in the following way. The SpotPack and DressPack can be delivered in three different versions developed for two different applications. Each type is described under separate chapter.

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

Material Handling application / DressPack

Chapter	Option	Description
2.3	Type H	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 Se	Designed for electrical servo driven transformer guns carried by the robot manipulator.
2.6	Connection Kits	Includes general description of Connection kits for SpotPack and DressPack.

Note! At present Type S (Chapter 2.4) and Type Se (Chapter 2.5) only includes DressPack description.

2.2 DressPack

2.2.1 Introduction

General

Dress Pack includes options for Upper arm, Lower arm and Floor see Figure 50 pos. C, D and E. These are described separated below but are designed as a complete package for various applications.
The DressPack for the floor contains customer signals.
The DressPack for upper and lower arm contains process cable packages including signals, process media (water and/or air) and power feeding (for Spotwelding power) for customer use.
Necessary supports, brackets and for the upper arm also a retractor arm.

The routing of the process cable package on the robot is available in different configurations. There are two main alternatives named the “Silver line” and the “Orange line” to divide them. Brackets and retractor arm for “Silver line” are mainly done in metallic color and for the “Orange line” the main color is orange.

DressPack lower arm

For the material handling application there are two internal routing alternatives for the lower arm. The “Orange line” is shown in Figure 53 (routing) below. This is designed to fit to the upper arm “Orange line” routing. The alternative “Silver line” is shown in Figure 54 (routing).

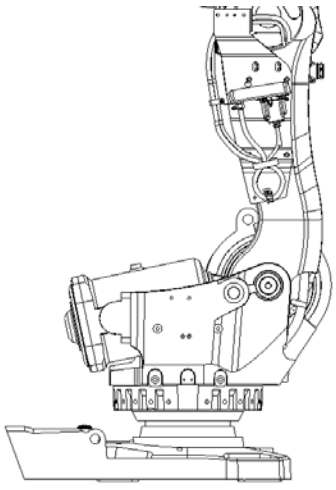


Figure 53 .“Orange line” DressPack Lower arm right side view Material handling version.

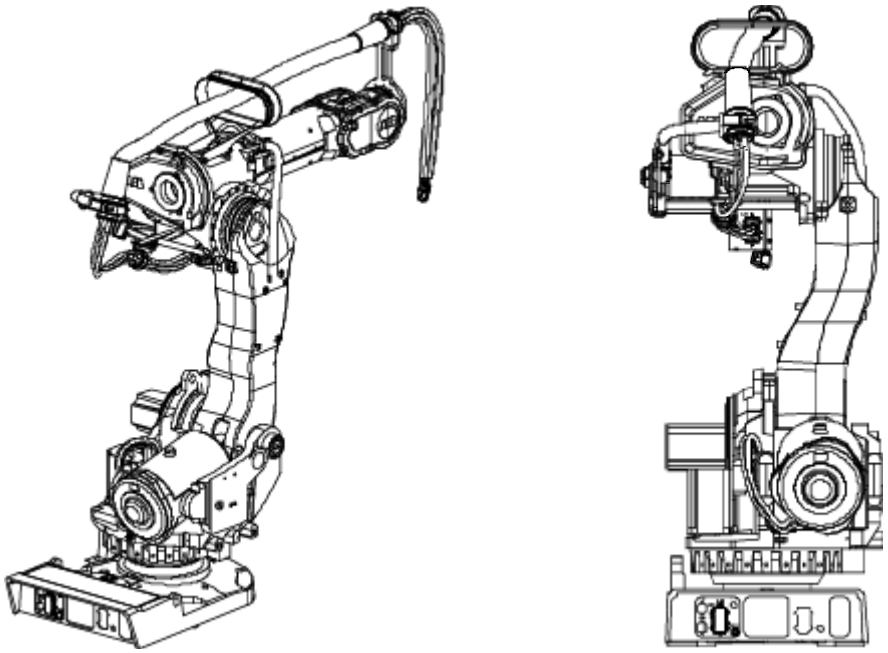


Figure 54 “Silver line” DressPack Lower arm left side view Material handling.

For Spotwelding application there are also two external routing alternatives for the lower arm. The “Orange line”is shown in Figure 55 (routing) below. This is designed to fit to the upper arm “Orange line” routing. The alternative “Silver line” is shown in Figure 56 (routing).

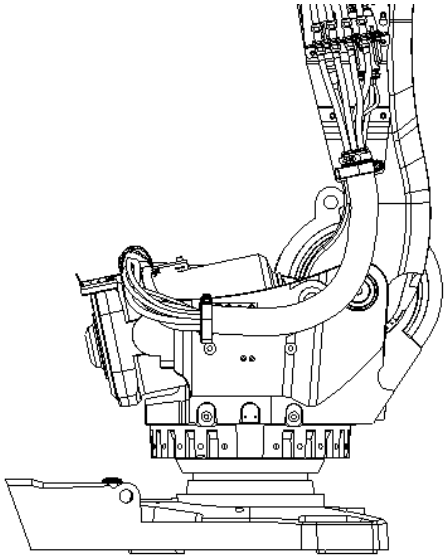


Figure 55 “Orange line” DressPack Lower arm left side view Spotwelding.

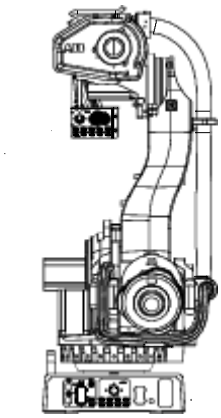


Figure 56 “Silver line” DressPack Lower rear side view Spot Welding version (interface axis 2/3 included).

DressPack Upper arm

For the material handling and Spotwelding application there are two external routing alternatives for the upper arm. The “Orange line” is shown in Figure 57 below. The alternative “Silver line” is shown in Figure 58.

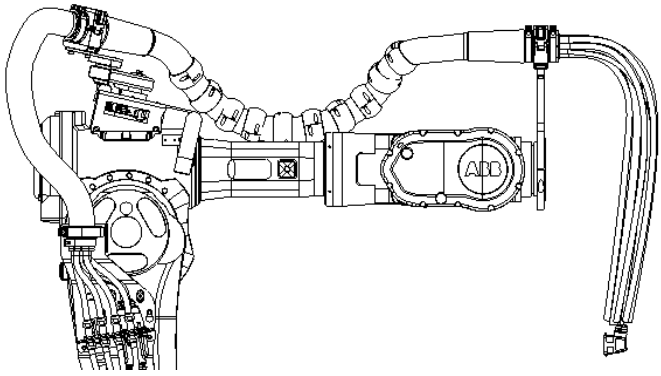


Figure 57 “Orange line” DressPack Upper arm right arm side view Spot Welding version.

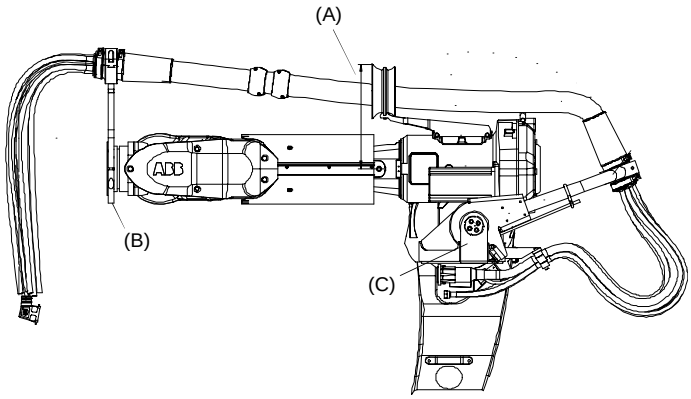


Figure 58 “Silver line” DressPack Upper arm left arm side view Spot Welding version.

DressPack Upper/ Lower arm

For Spotwelding application within “Orange line” there is one additional alternative without connection point between lower and upper arm available.

Figure 59 “Orange line” DressPack Upper/Lower arm.

The process cable package for both “Orange and Silver line” 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 optimise the system depending on cycle and hose package.
- Hose guiding to support bending backwards movement are used for the “Silver line”.

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

The DressPack Lower arm part has a connection point at the manipulator base. The configuration, which is valid both for “Orange and Silver line”, is shown in Figure 60 below.

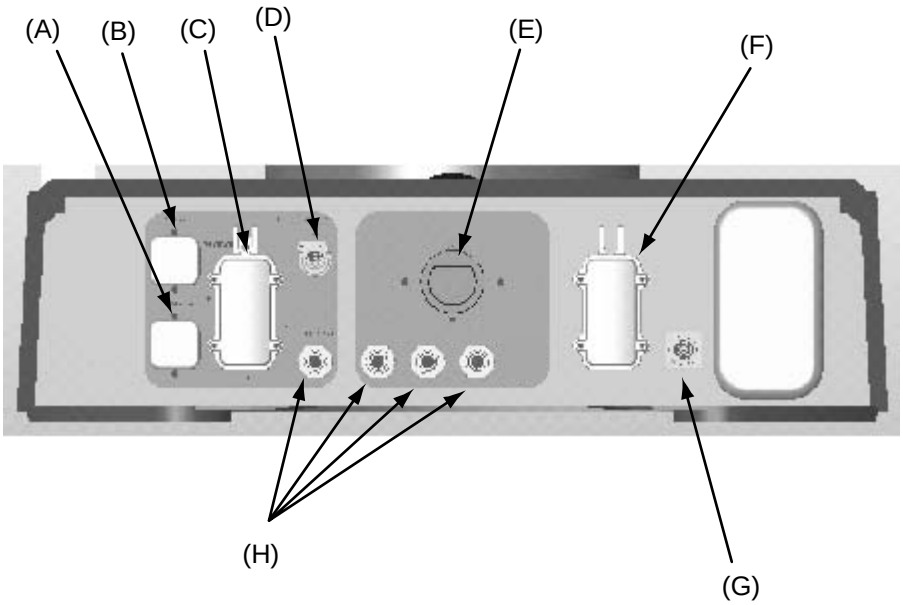


Figure 60 Connection point at base.

Pos	Description
A	R1.SW2/3
B	R1.SW1
C	R1.CP/CS
D	R3.FB7 or R1.SP (Spotwelding Servo gun)
E	R1.WELD 3x35mm^2. (Spotwelding)
F	R1.MP
G	R1-SMB
H	R1.PROC 1 R1.PROC 2-4 (Spotwelding Servo gun)

The DressPack floor has a connection point inside the robot controller where connections can be made to terminals. This configuration is valid both for “Orange and Silver line”.

Dimensions for “Orange line” and “Silver line” are shown in Figure 61, Figure 62, Figure 63 and Figure 64 .

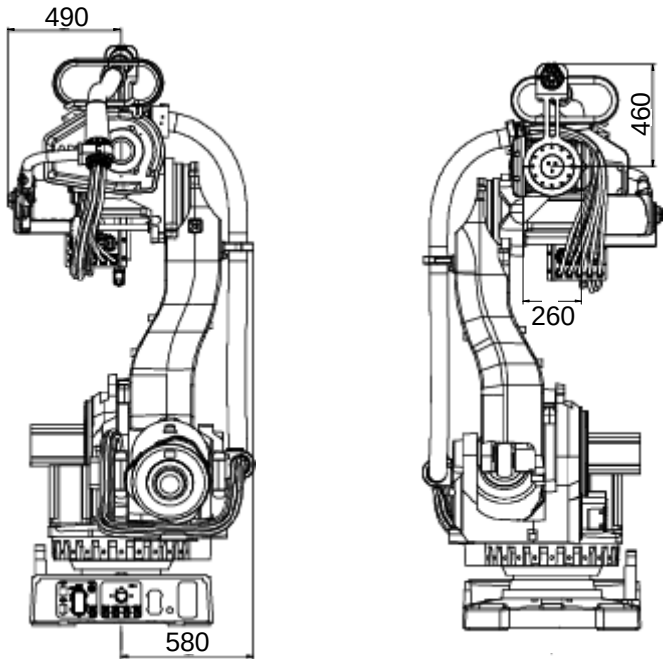


Figure 61 “Silver line” (Dimensions in mm).

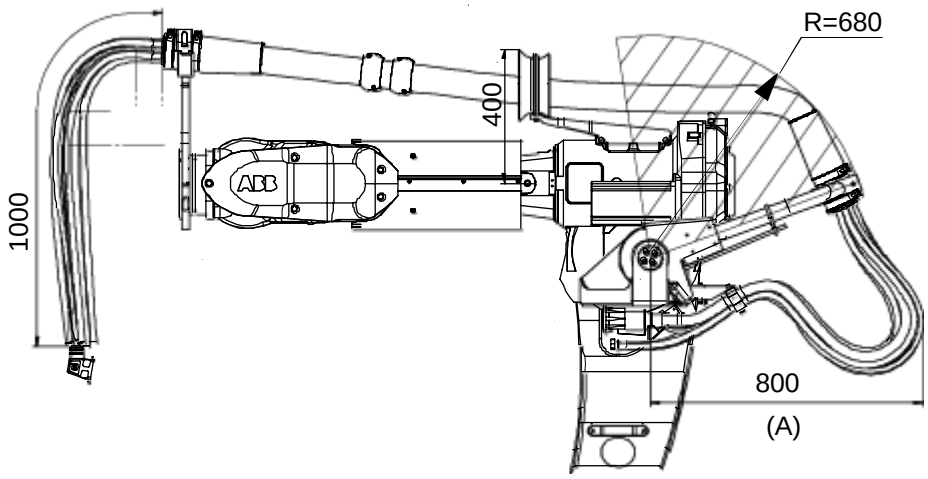


Figure 62 “Silver line” (Dimensions in mm).

Pos	Description
A	Maximum distance for hose package.

2.2.1 Introduction

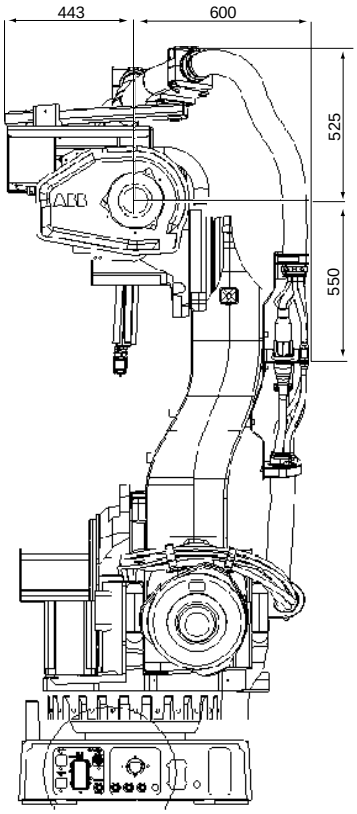


Figure 63 “Orange line” (Dimensions in mm).

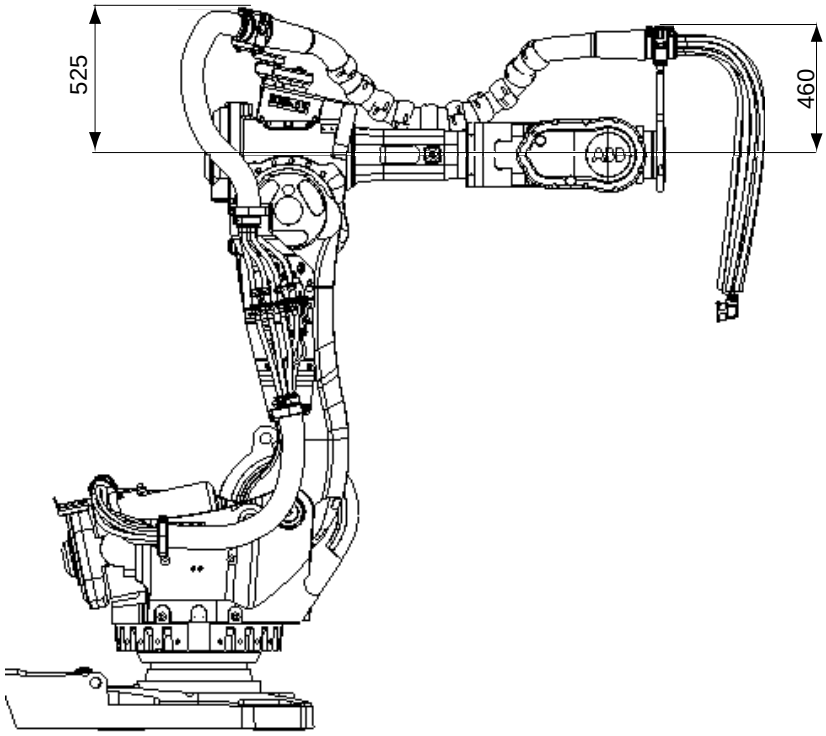


Figure 64 “Orange line” (Dimensions in mm).

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 65.

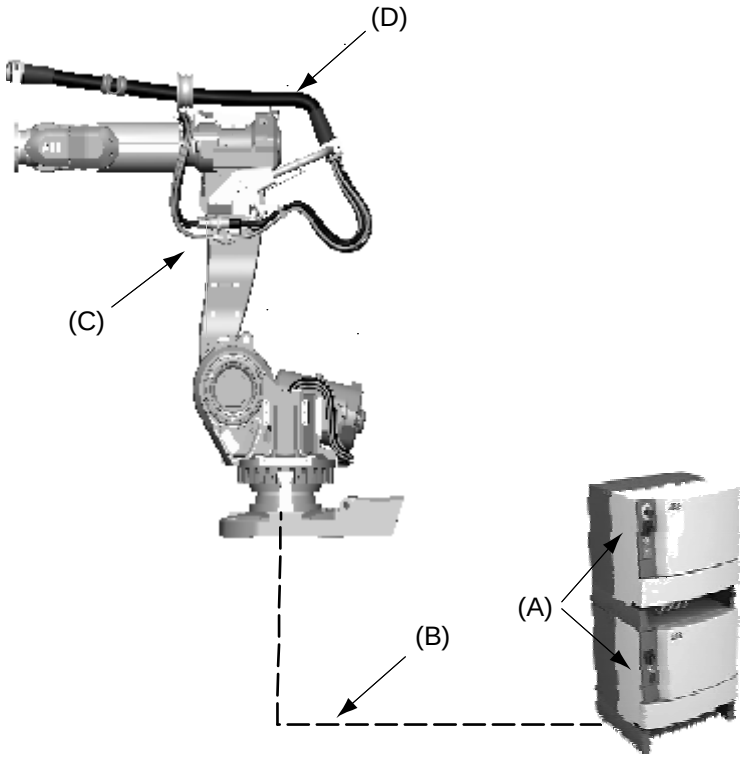


Figure 65

Pos	Description
A	Robot Cabinet IRC5
B	DressPack, Floor
C	DressPack, Lower arm
D	DressPack, Upper arm

Available configurations with linked option numbers are described below.

Option description

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified (see options below). Option 94-1,-2,-3,-4 for parallel communication. Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet. Option 92-2,-3,-4,-5 for parallel communication and field bus communication with Profibus. Option 91-2,-3,-4,-5 for parallel communication and field bus communication with Interbus.
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4,-5.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3,-4,-5 or 91-2,-3,-4,-5.

- Option 778-1. for the application Material handling
- Option 798-1. Internal routing, (Silver line). Offers DressPack Lower arm for Material Handling application with internal routing according to “Silver line”.
- Option 798-2. Internal routing, (Orange line). Offers DressPack Lower arm for Material Handling application with internal routing according to “Orange line”.
- Option 780-2 and option 798-1. External routing, (Silver line). Offers DressPack Upper arm for Material handling application with external routing according to “Silver line”.
- Option 780-2 and option 798-2. External routing, (Orange line). Offers DressPack Upper arm for Material handling application with external routing according to “Orange line”.

2.3.2 Configuration result for Type H

General

Depending on the choice of options above the DressPack will have different content. The choice of routing (“Silver line” or “Orange line”) will not affect the content. See tables for signal content below.

DressPack Type H. Parallel communication

- Option 16-2 or Option 16-1 with Connection to cabinet (option 94-1,-2,-3,-4 to specify cable length).
- Option 455-1 Parallel communication
- Option 778-1 Material Handling
- Option 798-1 or Option 798-2. Internal routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-1). External routing, DressPack Upper arm

The table below is showing available type of wires/media.

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

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

- Option 16-2 or Option 16-1 with Connection to cabinet (Option 90-2,-3,-4,-5 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-1. Material Handling
- Option 798-1 or Option 798-2. Internal routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2). External routing, DressPack Upper arm

The table below is showing available type of wires/media.

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

DressPack Type H. Parallel and field bus communication, Profibus

- Option 16-2 or Option 16-1 with Connection to cabinet (Option 92-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-1 Material Handling
- Option 798-1 or Option 798-2. Internal routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2). External routing, DressPack Upper arm

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At Connection point. Base, Axis 3 or axis 6	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	22	22 (11x2)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI.

2.3.2 Configuration result for Type H

DressPack Type H. Parallel and field bus communication, Interbus

- Option 16-2 or Option 16-1 with Connection to cabinet (Option 91-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-1 Material Handling
- Option 798-1 or Option 798-2. Internal routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2). External routing, DressPack Upper arm

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At Connection point. Base, Axis 3 or axis 6	Cable part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	21	21 (10x2+1)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Interbus spec
Bus signals	At bus board	1	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair	4	4 (2x)	0,14 mm^2	50 V DC, 1A rms
Media				
Air (PROC 1)		1	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI

2.3.3 Interface description DressPack for Type H

General

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 below. Signals with (parentheses) are to be connected by customer.

Connection

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
Harting module type*						HD+DD +EE	HD+DD +EE	HD+DD +EE	HD+DD +EE

Customer power signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Inter-bus	Parallel and Profibus
(+24 V)		XP6 / 1	D1	D1	C4	Yes	Yes	Yes	Yes
(0 V)		XP6 / 2	D6	D6	C5	Yes	Yes	Yes	Yes
(+24 V)		XP6 / 3	D3	D3	C6	Yes	Yes	Yes	Yes
(0 V)		XP6 / 4	D4	D4	C7	Yes	Yes	Yes	Yes
PE (in housing)			GND	GND	GND	Yes	Yes	Yes	Yes

Customer signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
(Spare)		XP5:1/1	B1	B1	B18	Yes	Yes	Yes	Yes
(Spare)		XP5:1/2	B2	B2	B19	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/1	B3	B3	B20	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/2	B4	B4	B21	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/3	B5	B5	B22	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/4	B6	B6	B23	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/9	B7	B7	B24	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/10	B8	B8	B25	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/11	B9	B9	B16	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/12	B10	B10	B17	Yes	Yes	Yes	Yes
(Spare)		XP5:1/3	B11	B11	B1	Yes	Yes	Yes	Yes
(Spare)		XP5:1/4	B12	B12	B2	Yes	Yes	Yes	Yes
(Spare)		XP5:1/5	B13	B13	B3	Yes	Yes	Yes	Yes
(Spare)		XP5:1/6	B14	B14	B4	Yes	Yes	Yes	Yes
(Spare)		XP5:3/1	B15	B15	B5	Yes	Yes	Yes	Yes
(Spare)		XP5:3/2	B16	B16	B6	Yes	Yes	Yes	Yes
(Spare)		XP5:3/3	B18	B18	B7	Yes	Yes	Yes	Yes
(Spare)		XP5:3/4	B19	B19	B8	Yes	Yes	Yes	Yes
(Spare)		XP5:3/5	B20	B20	B9	Yes	Yes	Yes	Yes
(Spare)		XP5:3/6	B21	B21	B10	Yes	Yes	Yes	Yes
(Spare)		XP5:2/5	C16	C16	B11	not used	Yes	Yes	Yes
(Spare)		XP5:2/6	C17	C17	B12	not used	Yes	Yes	Yes
(Spare)		XP5:2/7	C18	C18	B13	Yes	Yes	Yes	Yes
(Spare)		XP5:1/7	C19	C19	B14	Yes	Yes	Yes	Yes
Spare		XP5:2/8	C20	C20	B15	Yes	Yes	Yes	Yes
Spare		XP5:1/8	C21	C21	C8	Yes	Yes	Yes	Yes

Cbus signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Inter-bus	Parallel and Profibus
(Spare) or Bus signal		See comm. types	B22	B22	A1	XP5:2/9	+24V Can	GNDIM	XP5:2/9
(Spare) or Bus signal		See comm. types	B23	B23	A2	XP5:2/10	0V Can	XP5:2/10	XP5:2/10
(Spare) or Bus signal		See comm. types	B24	B24	A3	XP5:2/11	XP5:2/11	XP5:2/11	XP5:2/11
(Spare) or Bus signal		See comm. types	B25	B25	A4	XP5:2/12	XP5:2/12	XP5:2/12	XP5:2/12
(Spare) or Bus signal		See comm. types	A9	A9	A5	not used	XP5:3/9	DO	XP5:3/9
(Spare) or Bus signal		See comm. types	A10	A10	A6	not used	XP5:3/10	DO_N	XP5:3/10
(Spare) or Bus signal		See comm. types	A3	A3	A7	not used	Can_H	XP5:3/9	XP5:3/7
(Spare) or Bus signal		See comm. types	A4	A4	A8	not used	Can_L	XP5:3/10	XP5:3/8
(Spare) or Bus signal		See comm. types	A5	A5	A9	not used	XP5:3/7	XP5:3/7	RXD/TXD-P
(Spare) or Bus signal		See comm. types	A6	A6	A10	not used	XP5:3/8	XP5:3/8	RXD/TXD-N
(Spare) or Bus signal		See comm. types	A11	A11	A11	not used	XP5:3/11	DI	XP5:3/11
(Spare) or Bus signal		See comm. types	A12	A12	A12	not used	XP5:3/12	DI_N	XP5:3/12

Harting Connector

The Harting connector is shown in the Figure 66. The different main parts within the connector are described in the list below, both with name and Harting article number. (Corresponding parts at the tool are available with a Connection kit (see chapter 2.6 Connection kits.) and within the Harting product offer). For the contacts above corresponding female crimp-contacts for the different cable diameters are required.

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

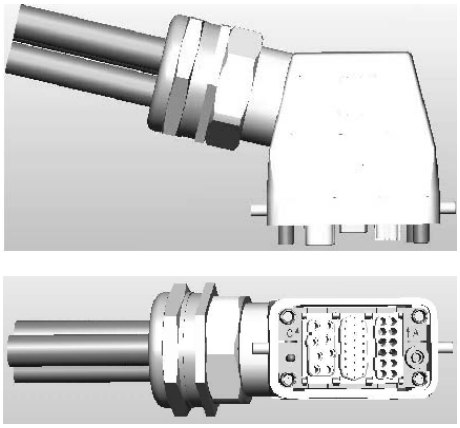


Figure 66 Harting connector.

2.3.4 Summary Type H

General

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

- Option 16-1 Connection to cabinet, (Cable legth and communication type to be stated)
- Option 455-1, 455-4 Parallel or Parallel and Bus communication (Communication type to be stated)
- Option778-1 Material Handling
- Option 798-1 or Option 798-2 Internal routing, DressPack Lower arm (Routing type to be stated)
- Option 780-1 External routing, DressPack 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 67. Available configurations with linked option numbers are described below. The offer only contains DressPack at present.

Illustration SpotPack

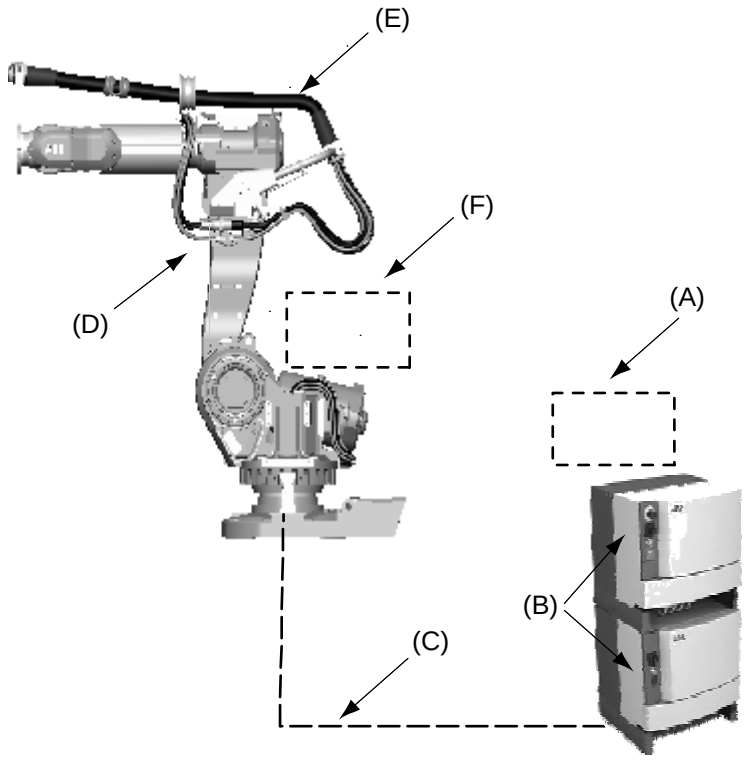


Figure 67

Pos.	Name
A	Process cabinet (not available)
B	Robot Cabinet IRC5
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses (not available)

Available configurations with linked option numbers are described below.

Option Description

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified (see options below). Option 94-1,-2,-3,-4 for parallel communication Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet Option 92-2,-3,-4,-5 for parallel communication and field bus communication with Profibus Option 91-2,-3,-4,-5 for parallel communication and field bus communication with Interbus
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in combination in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3,-4,-5 or 91-2,-3,-4,-5.

- Option 778-2. for the application SpotWelding
- Option 798-1. External routing, (Silver line). Offers DressPack Lower arm for SpotWelding application with external routing according to “Silver line”.
- Option 798-2. External routing, (Orange line). Offers DressPack Lower arm for SpotWelding application with external routing according to “Orange line”.
- Option 780-2 and option 798-1. External routing, (Silver line). Offers DressPack Upper arm for SpotWelding application with external routing according to “Silver line”.
- Option 780-2 and option 798-2. External routing, (Orange line). Offers DressPack Upper arm for SpotWelding application with external routing according to “Orange line”.
- Option 781-1. Routing base to axis 6. External routing (Orange line). Offers DressPack Lower and Upper arm external routing without intermediate connection point.

2.4.2 Configuration result for Type S

General

Depending on the choice of options above the DressPack will have different content. The choice of routing (“Silver line” or “Orange line”) will not affect the content. See tables for signal content below.

DressPack Type S. Parallel communication

- Option 16-2 or 16-1 with Connection to cabinet (option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1 Parallel communication.
- Option778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	20	20 (10x2)	0,23 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12,5 mm inner diameter	Max. air pressure 16 bar/ 230 PSI. Max water pressure 10 bar/ 145 PSI
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2	600 VAC, 150 A rms at 20ºC (68F)
Protective earth (Lower and Upper arm)		1	35 mm^2	

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

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 90-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	1 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	20	20 (10x2)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Can/DeviceNet spec
Bus signals	At bus board	2	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1A rms
Media				
Water/Air (PROC 1-4)		4	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI. Max. Water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2	600 VAC, 150 A rms at 20ºC (68F)
Protective earth (Lower and Upper arm)		1	35 mm^2	

DressPack Type S. Parallel and field bus communication, Profibus

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 3 or axis 6	Cable/ part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals (CS)				
Signals twisted pair	22	22 (11x2)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1A rms
Media				
Water/Air (PROC 1-4)		4	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI. Max. Water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2	600 VAC, 150 A rms at 20ºC (68F)
Protective earth (Lower and Upper arm)		1	35 mm^2	

DressPack Type S. Parallel and field bus communication, Interbus

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 3 or axis 6	Cable/ part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals(CS)				
Signals twisted pair	21	21 (10x2+1)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Interbus spec
Bus signals	At bus board	1	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair	4	4 (2x2)	0,14 mm^2	50 V DC, 1A rms
Media				
Water/Air (PROC 1-4)		4	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI. Max. Water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2	600 VAC, 150 A rms at 20ºC (68F)
Protective earth (Lower and Upper arm)		1	35 mm^2	

2.4.3 Interface description DressPack for Type S

Customer Interface

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

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
Harting module type*						HD+DD +EE	HD+DD +EE	HD+DD +EE	HD+DD +EE

Customer power signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
(+24 V)		XP6 / 1	D1	D1	C4	Yes	Yes	Yes	Yes
(0 V)		XP6 / 2	D6	D6	C5	Yes	Yes	Yes	Yes
(+24 V)		XP6 / 3	D3	D3	C6	Yes	Yes	Yes	Yes
(0 V)		XP6 / 4	D4	D4	C7	Yes	Yes	Yes	Yes
PE (in housing)			GND	GND	GND	Yes	Yes	Yes	Yes

Customer signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
(Spare)		XP5:1/1	B1	B1	B18	Yes	Yes	Yes	Yes
(Spare)		XP5:1/2	B2	B2	B19	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/1	B3	B3	B20	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/2	B4	B4	B21	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/3	B5	B5	B22	Yes	Yes	Yes	Yes
(Spare)	X	XP5:2/4	B6	B6	B23	Yes	Yes	Yes	Yes
KSR	X	XP5:1/9	B7	B7	B24	Yes	Yes	Yes	Yes
KSR	X	XP5:1/10	B8	B8	B25	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/11	B9	B9	B16	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/12	B10	B10	B17	Yes	Yes	Yes	Yes
(Spare)		XP5:1/3	B11	B11	B1	Yes	Yes	Yes	Yes
(Spare)		XP5:1/4	B12	B12	B2	Yes	Yes	Yes	Yes
(Spare)		XP5:1/5	B13	B13	B3	Yes	Yes	Yes	Yes
(Spare)		XP5:1/6	B14	B14	B4	Yes	Yes	Yes	Yes
(Spare)		XP5:3/1	B15	B15	B5	Yes	Yes	Yes	Yes
(Spare)		XP5:3/2	B16	B16	B6	Yes	Yes	Yes	Yes
(Spare)		XP5:3/3	B18	B18	B7	Yes	Yes	Yes	Yes
(Spare)		XP5:3/4	B19	B19	B8	Yes	Yes	Yes	Yes
(Spare)		XP5:3/5	B20	B20	B9	Yes	Yes	Yes	Yes
(Spare)		XP5:3/6	B21	B21	B10	Yes	Yes	Yes	Yes
(Spare)		XP5:2/5	C16	C16	B11	not used	Yes	Yes	Yes
(Spare)		XP5:2/6	C17	C17	B12	not used	Yes	Yes	Yes
(Spare)		XP5:2/7	C18	C18	B13	Yes	Yes	Yes	Yes
(Spare)		XP5:1/7	C19	C19	B14	Yes	Yes	Yes	Yes
(Spare)		XP5:2/8	C20	C20	B15	Yes	Yes	Yes	Yes
(Spare)		XP5:1/8	C21	C21	C8	Yes	Yes	Yes	Yes

Cbus signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can Device Net	Parallel and Interbus	Parallel and Profibus
(Spare) or Bus signal		See comm. types	B22	B22	A1	XP5:2/9	+24 V Can	GNDIM	XP5:2/9
(Spare) or Bus signal		See comm. types	B23	B23	A2	XP5:2/ 10	0V Can	XP5:2/ 10	XP5:2/ 10
(Spare) or Bus signal		See comm. types	B24	B24	A3	XP5:2/ 11	XP5:2/ 11	XP5:2/ 11	XP5:2/11
(Spare) or Bus signal		See comm. types	B25	B25	A4	XP5:2/ 12	XP5:2/ 12	XP5:2/ 12	XP5:2/ 12
(Spare) or Bus signal	X	See comm. types	A9	A9	A5	not used	XP5:3/9	DO	XP5:3/9
(Spare) or Bus signal	X	See comm. types	A10	A10	A6	not used	XP5:3/ 10	DO_N	XP5:3/ 10
(Spare) or Bus signal	X	See comm. types	A3	A3	A7	not used	Can_H	XP5:3/9	XP5:3/7
(Spare) or Bus signal	X	See comm. types	A4	A4	A8	not used	Can_L	XP5:3/ 10	XP5:3/8
(Spare) or Bus signal	X	See comm. types	A5	A5	A9	not used	XP5:3/7	XP5:3/7	RXD/ TXD-P
(Spare) or Bus signal	X	See comm. types	A6	A6	A10	not used	XP5:3/8	XP5:3/8	RXD/ TXD-N
(Spare) or Bus signal	x	See comm. types	A11	A11	A11	not used	XP5:3/ 11	DI	XP5:3/11
(Spare) or Bus signal	X	See comm. types	A12	A12	A12	not used	XP5:3/ 12	DI_N	XP5:3/ 12

Harting Connector

The Harting connector is shown in Figure 68 below. The different main parts within the connector are described in the list below, both with name and Hartings article number. (Corresponding parts at the tool are available with a Connection kit (see chapter 2.6 Connection kits.) and within the Harting product offer). For the contacts above corresponding female crimp-contacts for the different cable diameters are required.

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

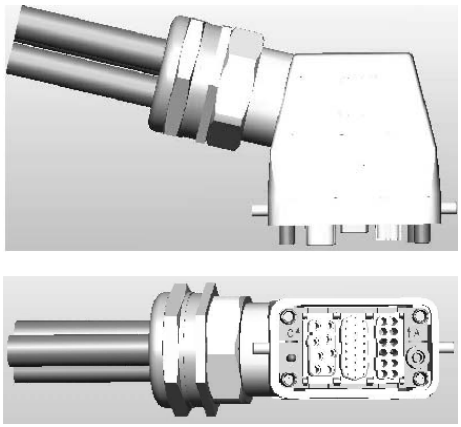


Figure 68 Harting connector.

2.4.4 Summary Type S

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

- Option 16-1 Connection to cabinet, (Cable legth and communication type to be stated)
- Option 455-1, 455-4 Parallel or Parallel and Bus communication (Communication type to be stated)
- Option778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm (Routing type to be stated)
- Option 780-1 External routing, DressPack Upper arm (Routing type to be stated)

Another routing alternative is:

- Option 781-1 (and Option 798-2). Routing base to axis 6

2.5 Type Se

2.5.1 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. The offer contains DressPack at present.

Illustration SpotPack

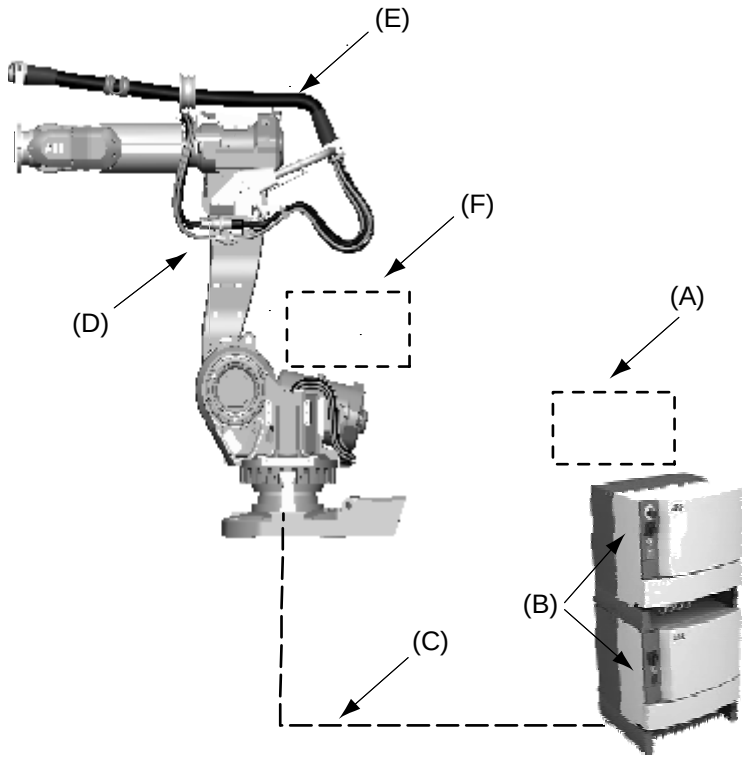


Figure 69

Pos.	Name
A	Process cabinet (not available)
B	Robot Cabinet IRC5 (including 7th axis drive)
C	DressPack, Floor
D	DressPack, Lower arm
E	DressPack, Upper arm
F	Water and Air unit with hoses (not available)

Available configurations with linked option numbers are described below.

Option description

Option	Type	Description
16-2	Connection to manipulator	No Floor harness for the DressPack is chosen.
16-1	Connection to cabinet	Floor cables and connections inside the I/O section for the DressPack are chosen. The length and configuration of the floor harness is specified under the options below. The required options must be specified (see options below). Option 94-1,-2,-3,-4 for parallel communication Option 90-2,-3,-4,-5 for parallel communication and field bus communication with Can/DeviceNet Option 92-2,-3,-4,-5 for parallel communication and field bus communication with Profibus Option 91-2,-3,-4,-5 for parallel communication and field bus communication with Interbus
455-1	Parallel communication	Offers the signal cables needed for parallel communication in lower and upper arm DressPack. To be combined with option 94-1,-2,-3,-4.
455-4	Parallel and Bus communication	Offers the signal cables needed for the combination of parallel and bus communication in combination in lower and upper arm DressPack. To be combined with option 90-2,-3,-4,-5 or 92-2,-3,-4,-5 or 91-2,-3,-4,-5.

- Option 778-2 for the application SpotWelding
- Option 798-1. External routing, (Silver line). Offers DressPack Lower arm for SpotWelding application with external routing according to “Silver line”.
- Option 798-2. External routing, (Orange line). Offers DressPack Lower arm for SpotWelding application with external routing according to “Orange line”.
- Option 780-2 and option 798-1. External routing, (Silver line). Offers DressPack Upper arm for SpotWelding application with external routing according to “Silver line”.
- Option 780-2 and option 798-2. External routing, (Orange line). Offers DressPack Upper arm for SpotWelding application with external routing according to “Orange line”.
- Option 781-1. Routing base to axis 6. External routing (Orange line). Offers DressPack Lower and Upper arm external routing without intermediate connection point.

2.5.2 Configuration result for Type Se

General

Depending on the choice of options above the DressPack will have different content. The choice of routing (“Silver line” or “Orange line”) will not affect the content. See tables for signal content below.

DressPack Type Se. Parallel communication

- Option 16-2 or 16-1 with Connection to cabinet (option 94-1,-2,-3,-4 to specify cable length)
- Option 455-1 Parallel communication.
- Option778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

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

1. Interface only at axis 3 or axis 6

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

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 90-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

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

1. Interface only at axis 3 or axis 6

DressPack Type Se. Parallel and field bus communication, Profibus

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 92-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

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

1. Interface only at axis 3 or axis 6

DressPack Type Se. Parallel and field bus communication, Interbus

- Option 16-2 or Options 16-1 with Connection to cabinet (Option 91-2,-3,-4,-5 to specify cable length)
- Option 455-4 Parallel and bus communication
- Option 778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm
- Option 780-2 (and Option 798-1 or Option 798-2) External routing, DressPack Upper arm
- Option 781-1 (and Option 798-2). Routing base to axis 6

The table below is showing available type of wires/media.

Type	At terminals in cabinet	At connection point. Base, axis 3 or axis 6	Cable/ part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer signals(CS)				
Signals twisted pair	15	15 (7x2+1)	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,23 mm^2	50 V DC, 1A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm^2	Interbus spec
Bus signals	At bus board	1	0,23 mm^2	50 V DC, 1A rms
Signals twisted pair	4	4 (2x2)	0,14 mm^2	50 V DC, 1A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6[1]	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water/Air (PROC 1-4)		4	12,5 mm inner diameter	Max. Air pressure 16 bar/230 PSI. Max. Water pressure 10 bar/145 PSI.
Welding power (WELD)				
Lower and Upper arm		2	35 mm^2	600 VAC, 150 A rms at 20ºC (68F)
Protective earth (Lower and Upper arm)		1	35 mm^2	

1. Interface only at axis 3 or axis 6

2.5.3 Interface description DressPack for Type Se

Customer Interface

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

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can DeviceNet	Parallel and Interbus	Parallel and Profibus
Harting module type*						HD+DD+EE	HD+DD+EE	HD+DD+EE	HD+DD+EE

Customer power signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can DeviceNet	Parallel and Interbus	Parallel and Profibus
(+24 V)		XP6 / 1	D1	D1	C4	Yes	Yes	Yes	Yes
(0 V)		XP6 / 2	D6	D6	C5	Yes	Yes	Yes	Yes
(+24 V)		XP6 / 3	D3	D3	C6	Yes	Yes	Yes	Yes
(0 V)		XP6 / 4	D4	D4	C7	Yes	Yes	Yes	Yes
PE (in housing)			GND	GND	GND	Yes	Yes	Yes	Yes
Servo W (T-fase)		At drive	E	D5	C1	Yes	Yes	Yes	Yes
Servo V (S-fase)		At drive	C	D2	C2	Yes	Yes	Yes	Yes
Servo U (R-fase)		At drive	A	D7	C3	Yes	Yes	Yes	Yes
			G	GND	GND	Yes	Yes	Yes	Yes

Customer signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can DeviceNet	Parallel and Interbus	Parallel and Profibus
X7/(S1)	X			B1	B18	Yes	Yes	Yes	Yes
0V X7/ (S3)	X			B2	B19	Yes	Yes	Yes	Yes
Y7/(S4)	X			B3	B20	Yes	Yes	Yes	Yes
0V Y7/ (S2)	X			B4	B21	Yes	Yes	Yes	Yes
0V EXC2/ (R2)	X			B5	B22	Yes	Yes	Yes	Yes
EXC2/ (R1)	X			B6	B23	Yes	Yes	Yes	Yes
KSR	X	XP5:1/9	B7	B7	B24	Yes	Yes	Yes	Yes
KSR	X	XP5:1/10	B8	B8	B25	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/11	B9	B9	B16	Yes	Yes	Yes	Yes
(Spare)	X	XP5:1/12	B10	B10	B17	Yes	Yes	Yes	Yes
(Spare)		XP5:1/3	B11	B11	B1	Yes	Yes	Yes	Yes
(Spare)		XP5:1/4	B12	B12	B2	Yes	Yes	Yes	Yes
(Spare)		XP5:1/5	B13	B13	B3	Yes	Yes	Yes	Yes
(Spare)		XP5:1/6	B14	B14	B4	Yes	Yes	Yes	Yes
(Spare)		XP5:3/1	B15	B15	B5	Yes	Yes	Yes	Yes
(Spare)		XP5:3/2	B16	B16	B6	Yes	Yes	Yes	Yes
(Spare)		XP5:3/3	B18	B18	B7	Yes	Yes	Yes	Yes
(Spare)		XP5:3/4	B19	B19	B8	Yes	Yes	Yes	Yes
(Spare)		XP5:3/5	B20	B20	B9	Yes	Yes	Yes	Yes
(Spare)		XP5:3/6	B21	B21	B10	Yes	Yes	Yes	Yes
PTC			J	C1	B11	Yes	Yes	Yes	Yes
0V PTC			K	C2	B12	Yes	Yes	Yes	Yes
24 V Brake release			L	C3	B13	Yes	Yes	Yes	Yes
(Spare)		XP5:1/7	C19	C19	B14	Yes	Yes	Yes	Yes
0 V Brake			M	C5	B15	Yes	Yes	Yes	Yes
(Spare)		XP5:1/8	C21	C21	C8	Yes	Yes	Yes	Yes

Cbus signals

Name	Sep. screened	Terminal in cabinet	Pin no at base	Pin no at axis 3	Pin no at axis 6	Communication types			
						Parallel	Parallel and Can DeviceNet	Parallel and Interbus	Parallel and Profibus
(Spare) or Bus signal		See comm. types	B22	B22	A1	XP5:2/9	+24V Can	GNDIM	XP5:2/9
(Spare) or Bus signal		See comm. types	B23	B23	A2	XP5:2/10	0V Can	XP5:2/10	XP5:2/10
(Spare) or Bus signal		See comm. types	B24	B24	A3	XP5:2/11	XP5:2/11	XP5:2/11	XP5:2/11
(Spare) or Bus signal		See comm. types	B25	B25	A4	XP5:2/12	XP5:2/12	XP5:2/12	XP5:2/12
(Spare) or Bus signal	X	See comm. types	A9	A9	A5	not used	XP5:3/9	DO	XP5:3/9
(Spare) or Bus signal	X	See comm. types	A10	A10	A6	not used	XP5:3/10	DO_N	XP5:3/10
(Spare) or Bus signal	X	See comm. types	A3	A3	A7	not used	Can_H	XP5:3/9	XP5:3/7
(Spare) or Bus signal	X	See comm. types	A4	A4	A8	not used	Can_L	XP5:3/10	XP5:3/8
(Spare) or Bus signal	X	See comm. types	A5	A5	A9	not used	XP5:3/7	XP5:3/7	RXD/TXD-P
(Spare) or Bus signal	X	See comm. types	A6	A6	A10	not used	XP5:3/8	XP5:3/8	RXD/TXD-N
(Spare) or Bus signal	x	See comm. types	A11	A11	A11	not used	XP5:3/11	DI	XP5:3/11
(Spare) or Bus signal	X	See comm. types	A12	A12	A12	not used	XP5:3/12	DI_N	XP5:3/12

Harting connection

The Harting connector is shown in Figure 70. The different main parts within the connector are described in the list below, both with name and Hartings article number. (Corresponding parts at the tool are available with a Connection kit (see chapter 2.6 Connection kits.) and within the Harting product offer). For the contacts above corresponding female crimp-contacts for the different cable diameters are required.

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

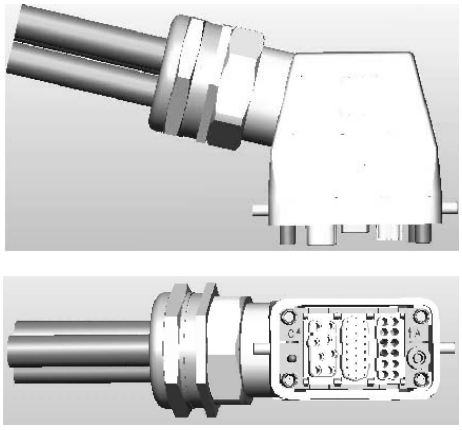


Figure 70 Harting connector.

2.5.4 Summary Type Se

General

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

- Option 16-1 Connection to cabinet, (Cable legth and communication type to be stated)
- Option 455-1, 455-4 Parallel or Parallel and Bus communication (Communication type to be stated)
- Option778-2 SpotWelding
- Option 798-1 or Option 798-2 External routing, DressPack Lower arm (Routing type to be stated)
- Option 780-2 External routing, DressPack Upper arm (Routing type to be stated)

Another routing alternative is:

- Option 781-1 (and Option 798-2). Routing base to axis 6

See Chapter 1.9.3 Robot gun for further drive details.

2.6 Connection kits

2.6.1 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 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 1-4 on base

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

- 4 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 Pos switch on base

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

- Connector for position switch axis1 (SW 1) 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 position switch axis 2/3 (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	8 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, male (Harting)	Type HD (25 pin)
1 pcs Multicontact, male (Harting)	Type EE (8 pin)
1 pcs Multicontact, male (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 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
Assembly Accessories to complete connector	
Assembly instruction	

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:

1 pc Welding connector socket incl. housing	3x35 mm² (35 mm² socket)
1 pc Cable gland	
1 pc End housing	
Assembly Accessories to complete connector	
Assembly instruction	

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

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

This must be assembled by the customer.

The kit contains:

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

1 pcs Hood Foundry (Harting)	HAN
1 pcs Hinged frame (Harting)	Shell size 10
1 pcs Multicontact, male (Harting)	Type HD (25 pin)
1 pcs Multicontact, male (Harting)	Type EE (8 pin)
1 pcs Multicontact, male (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 1,0 mm²
10 pcs Male crimp contacts	For 2,5 mm²
15 pcs Male crimp contacts	For 0,14 – 0,37 mm²
30 pins	For 0,2 – 0,56 mm²
Assembly Accessories to complete connector	
Assembly instruction	

2.6.1 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 IRC5 and for Controller software IRC5.

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.

3.1.3 Process cable package

Material handling

For more information about the process cable packages, see 2.2 DressPack. and 2.3 Type H.

Option	Description	Note
778-1	Material Handling from base to axis 3	Available in “Silver line” and “Orange line” routing.
780-2	Material Handling from axis 3 to axis 6	Available in “Silver line” and “Orange line” routing.

Spot Welding

For more information see Chapters 2.2 DressPack., 2.4 Type S. and 2.5 Type Se.

Option	Description	Note
778-2	Spot Welding from base to axis 3	Available in “Silver line” and “Orange line” routing.
780-2	Spot Welding from axis 3 to axis 6	Available in “Silver line” and “Orange line” routing.
781-1	Spot Welding from base to axis 6	Available in “Orange line” routing only.

Communication

Option	Type	Description
455-1	Parallel communication	Includes customer power CP, customer signals CS and Air for MH-process cable package. Includes CP, CS, Air and three Media hoses for SW-process cable package.
455-4	Parallel and bus communication	Includes CP, Air and CAN/DeviceNet, Profibus or Interbus for MH-process cable package. Includes CP, Air, three Media hoses and CAN/DeviceNet, Profibus or Interbus for SW-cable package.

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 65. The cables from the manipulator base are not supplied.
16-1	Cabinet	The signals CP/CS are connected to 12-pole screw terminals, Phoenix rmsTB 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 2.5 Type Se.

3.1.4 Connection to cabinet (cabel lengths)

Parallel/CAN DeviceNet/ Interbus/Profibus

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

Option	Lengths
94-1/90-2/91-2/92-2	7m
94-2/90-3/91-3/92-3	15m
94-3/90-4/91-4/92-4	22m
94-4/90-5/91-5/92-5	30m

Connection to first drive/ Connection to first & second drive

Following information specifies the cable length for Connection to first drive/ Connection to first & second drive. For further information see chapter 1.9 Servo Gun.

Option	Lengths
786-1/787-1	7m
786-2/787-2	15m
786-3/787-3	22m
786-4/787-4	30m

3.1.5 Equipment

Option	Type	Description
213-1	Safety lamp	A safety lamp with an orange fixed light can be mounted on the manipulator. The lamp is active in MOTORS ON mode. The safety lamp is required on a UL/UR approved robot.
159-1	Fork lift device	Lifting device on the manipulator for fork-lift handling. **Note**. When Cooling Fan for axis 1 motor unit is used, this must be disassembled in order to use fork lift device.
37-1	Base plate	Can also be used for IRB 7600. See 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 Figure 71, 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 Figure 71, 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 Figure 71, 1.8 Cooling fan for axis 1-3 motor. Not for protection Foundry.
430-1	Upper arm covers	See Figure 72. Included in protection Foundry

Cooling fan

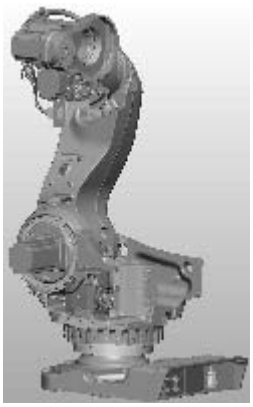


Figure 71 Cooling fan for axis 1 motor and axis 3 motor.

Upper arm covers

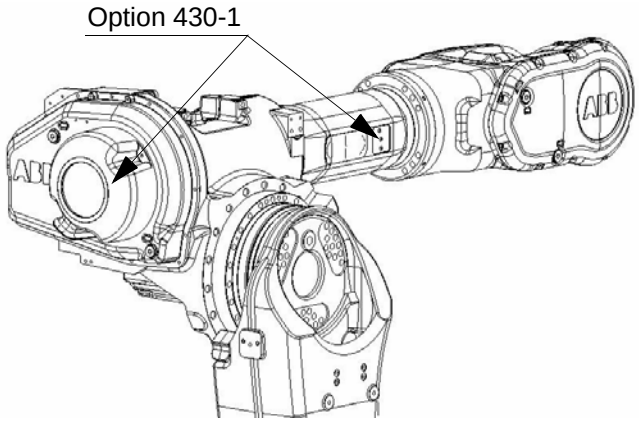


Figure 72 Upper arm covers.

Option	Type	Description
536-1	Chip protection	The mechanical protection prevents chips created at applications as for instance, deburring, sawing and milling to be accumulated on the robot and secure its movable functionality. Only together with protection Foundry. See Figure 73.

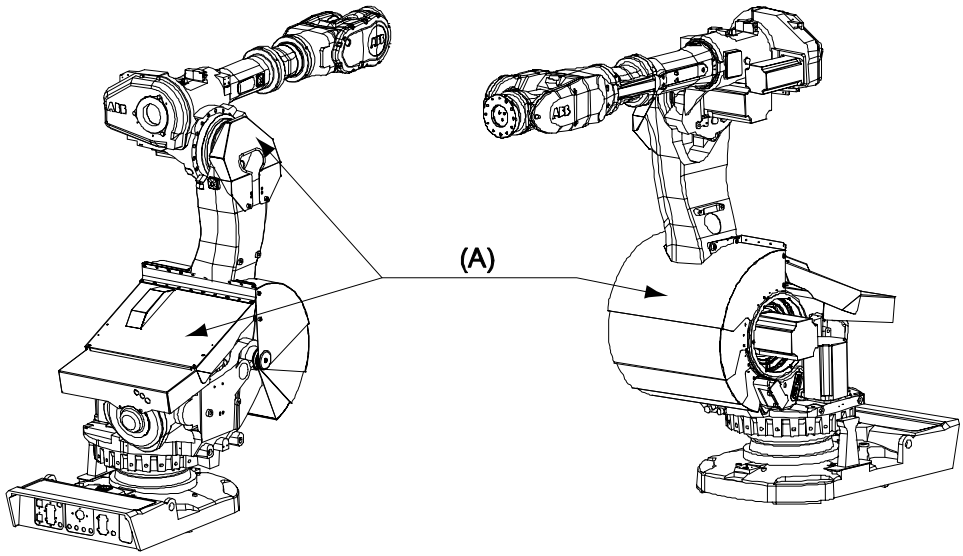


Figure 73 Chip protection.

Pos	Description
A	Option 538-1

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

Option	Type	Description
571-1	Base Spacers	Four spacers to raise the robot 100mm from the floor or the base plate. See Figure 74.

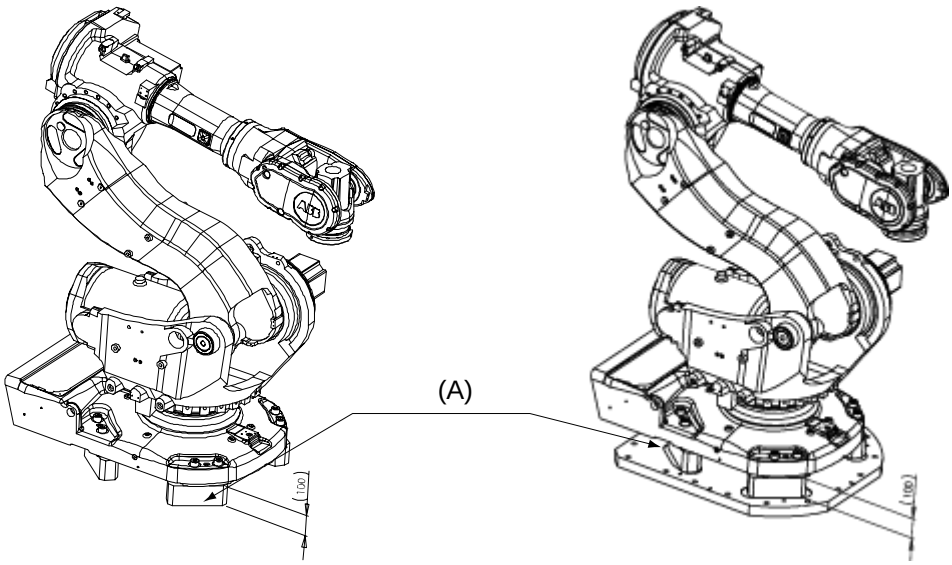


Figure 74 Base spacers.

Pos	Description
A	Option 571-1

Option	Type	Description
184-1	Insulated tool flange	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 500V 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 75. The countersinked holes for the fastening bolts to the gear box are larger, and the bolts are insulated from the tool flange, see Figure 75.

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.

Insulated tool flange

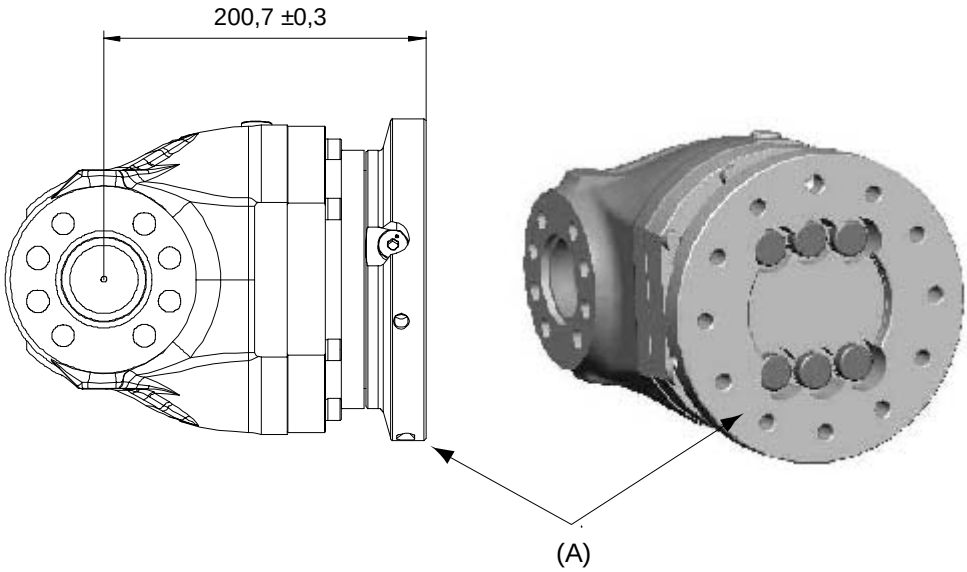


Figure 75 Insulated tool flange (dimensions in mm).

Pos	Description
A	Insulated tool flange.

3.1.6 Connection Kits

General

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

Content

The kit consists of connectors, pins and sockets. For technical description, see 2.6 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.
453-1	CP/CS/BUS, PROC1 axis 6	Connector for customer power/customer signal/customer bus at axis 6 tool side.

3.1.7 Position Switches

General

Position switches indicating the position of the three main axes. Rails with separate adjustable carms are attached to the manipulator. The carms, 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 carms 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 carms. For axes 2 and 3, two channels position zones are available, each with two independent switches and carms.

Each position zone consists of two switches mechanically operated by separate carms. 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 65), or to the controller. In the controller the signals are connected to screw terminal XT8 Phoenix rmsTB 2.5/12-ST-5.08. Switch type Balluff Multiple position switches BNS, according to EN 60947-5-1 and EN 60947-5-2.

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 IRC5. Position switch cables are included.
25-3	Position switches axis 1	Three redundant position zones are available, each with two independent switches and carms. Two plus one zone.

Connection of switches axis 1 (cable lengths)

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

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

Connection of switches axes 2 and 3 (cable lengths)

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

3.1.8 Working Range Limit

Extra mechanical stops

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

3.1.9 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 778-1, 778-2, 780-2 and 781-1 are not included in the warranty options.

4 Accessories

General

There is 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 IRC5, and for Controller software IRC5.

Robot Peripherals

- Track Motion
- Motor Units

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ABB Automation Technologies AB
Robotics
S-721 68 VÄSTERÅS
SWEDEN
Telephone: +46 (0) 21 344000
Telefax: +46 (0) 21 132592