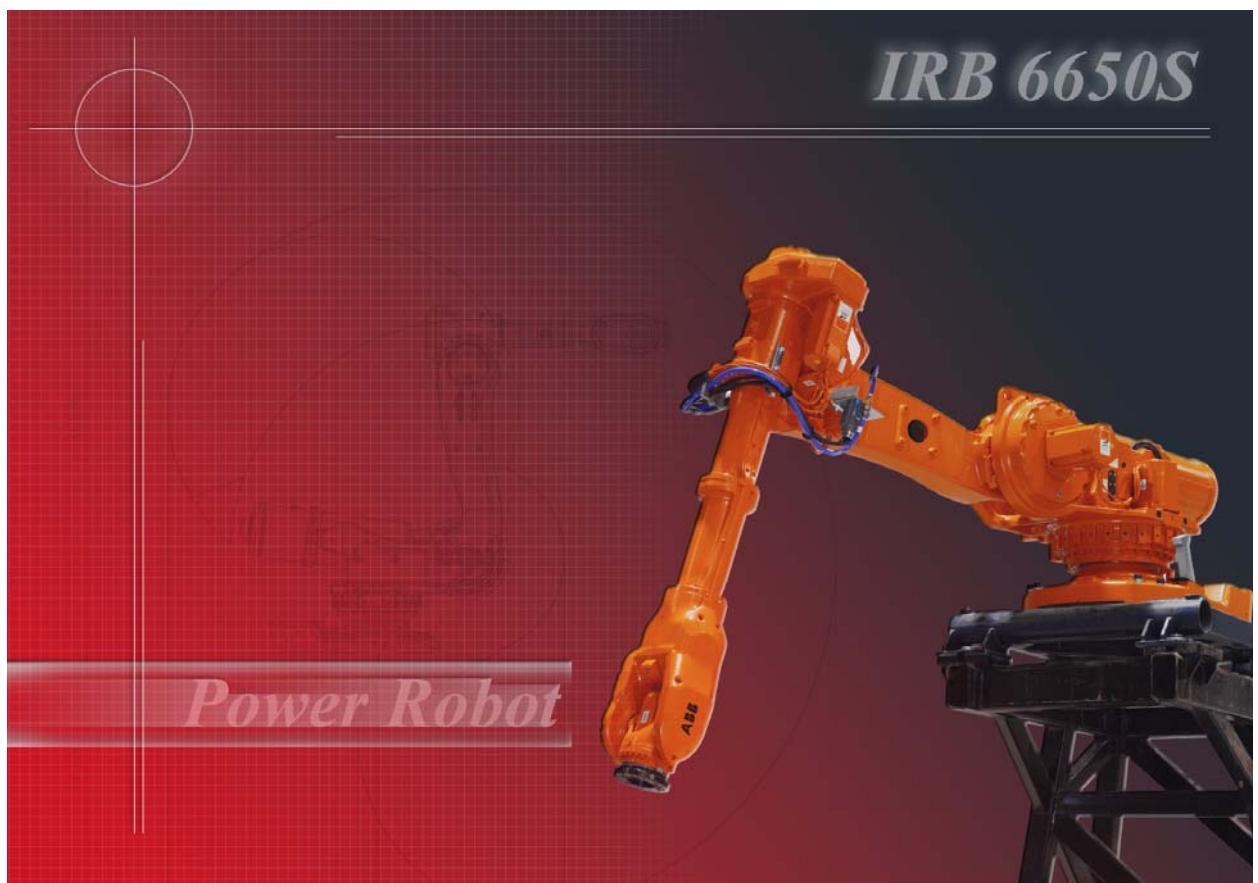


## Product specification

### Articulated robot

IRB 6650S-90/3.9  
IRB 6650S-125/3.5  
IRB 6650S-200/3.0  
M2004



**ABB**



# **Product specification**

Articulated robot  
3HAC 030822-001  
Rev.D

IRB 6650S-90/3.9  
IRB 6650S-125/3.5  
IRB 6650S-200/3.0  
M2004

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# Overview

## About this Product specification

It describes the performance of the manipulator or a complete family of manipulators in terms of:

- The structure and dimensional prints
- The fulfilment of standards, safety and operating requirements
- The load diagrams, mounting of extra equipment, the motion and the robot reach
- The integrated auxiliary equipments as that is: Customer Connections, Servo Gun, DressPack and SpotPack
- The specification of variant and options available

---

## Users

It is intended for:

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

---

## Contents

Please see Table of Contents on page 3.

---

## Revisions

Revision	Description
Revision -	- New Product Specification.
Revision A	- Changes for Calibration data - Work range - Explanation of ISO values (new figure and table) - Stopping distance - User documentation on DVD
Revision B	- General update for 9.1 release
Revision C	- Foundry Plus 2
Revision D	- Updated Foundry Plus 2 text - ISO-Cube

---

## Complementary documentation

Product specification	Description
Controller	IRC5 with FlexPendant, 3HAC021785-001
Controller Software IRC5	RobotWare 5.12, 3HAC022349-001
Robot User Documentation	IRC5 and M2004, 3HAC024534-001
Product Manual	Description

## Overview

---

Product specification	Description
Manipulator	IRB 6650S, 3HAC020993-001

# 1 Description

## 1.1 Structure

### 1.1.1 Introduction

---

**Robot family**

The IRB 6650S is available in three versions:

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

---

**Software product range**

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

---

**Operating system**

The robot is equipped with the operating system RobotWare RW. RobotWare RW controls every aspect of the robot, like motion control, development and execution of application programs, communication etc. see Product specification - Controller IRC5 with FlexPendant.

---

**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 Product specification - Controller software IRC5.

---

**Foundry Plus 2**

The Foundry Plus option is designed for harsh environments where the robot is exposed to sprays of coolants, lubricants and metal spits that are typical for die casting applications or other similar applications. Typical applications are spraying insertion and part extraction of die-casting machines, cast cleaning, handling in sand casting and gravity casting, etc. Special care must be taken in regard to operational and maintenance requirements for applications in foundry are as well as in other applications areas. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility for the Foundry Plus protected robot. The Foundry Plus robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust

# **1 Description**

---

## **1.1.1 Introduction**

formation fluids may cause rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned. The entire robot is IP67 compliant according to IEC 60529 - from base to wrist, which means that the electrical compartments are sealed against liquid and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Selected Foundry Plus/Foundry Plus 2 features:

- Improved sealing to prevent penetration into cavities to secure IP67
- Additional protection of cabling and electronics
- Special covers protecting cavities
- Well-proven connectors
- Nickel coated tool flange (Foundry Plus 2)
- Rust preventives on screws, washers and unpainted/machined surfaces

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

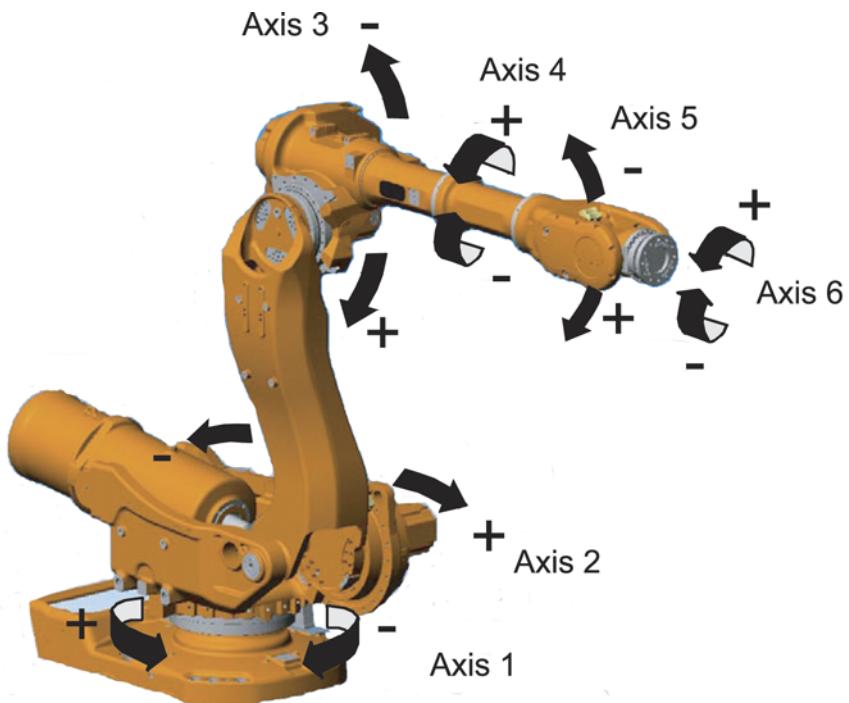


Figure 1 The IRB 6650S manipulator has 6 axes.

### 1.1.2 Different robot versions

---

#### General

The IRB 6650S is available in three versions.

---

#### Standard

The following different standard robot types are available:

Robot type	Handling capacity (kg)	Reach (m)
IRB 6650S	90 kg	3.9 m
IRB 6650S	125 kg	3.5 m
IRB 6650S	200 kg	3.0 m

# 1 Description

## 1.1.3 Definition of version designation

### 1.1.3 Definition of version designation

#### IRB 6650S Mounting

Handling capacity (kg)/ Reach (m)

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

#### Manipulator weight

Robot type	Handling capacity (kg)	Reach (m)	Weight
IRB 6650S	90 kg	3.9 m	2275 kg <sup>a</sup>
IRB 6650S	125 kg	3.5 m	2250 kg <sup>a</sup>
IRB 6650S	200 kg	3.0 m	2250 kg <sup>a</sup>

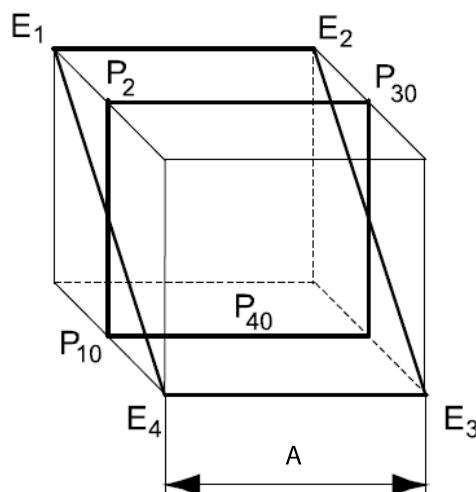
a. Without DressPack

#### Other technical data

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 73 dB (A) Leq (acc. to Machinery directive 98/37/EEC)

#### Power consumption at max load

Type of Movement	IRB 6650S
ISO Cube	2.4 kW



Pos	Description
A	1000 mm

## 1.1.3 Definition of version designation

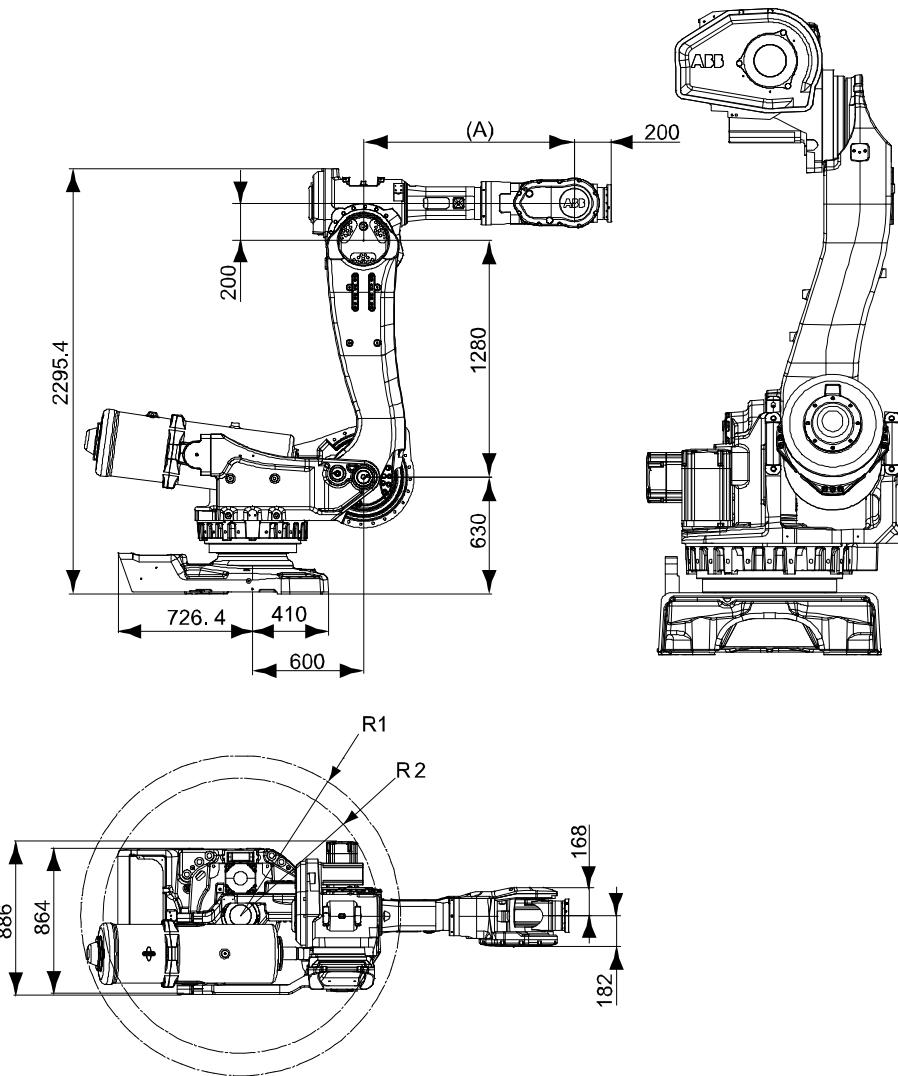


Figure 2 View of the IRB 6650S Manipulator from side and above (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.

Robot variant	A
IRB 6650S-90/3.9	2042
IRB 6650S-125/3.5	1592
IRB 6650S-200/3.0	1142

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

## **1 Description**

---

### **1.2.1 Standards**

## **1.2 Safety/Standards**

### **1.2.1 Standards**

The robot conforms to the following standards:

<b>Standard</b>	<b>Description</b>
EN ISO 12100 -1	Safety of machinery, terminology
EN ISO 12100 -2	Safety of machinery, technical specifications
EN 954-1	Safety of machinery, safety related parts of control Systems
EN 60204	Electrical equipment of industrial machines
EN ISO 60204-1:2005	Safety of machinery - Electrical equipment of machines
EN ISO 10218-1:2006 <sup>a</sup>	Robots for industrial environments - Safety requirements
EN 61000-6-4 (option)	EMC, Generic emission
EN 61000-6-2	EMC, Generic immunity

- a. There is a deviation from paragraph 6.2 in that only worst case stop distances and stop times are documented.

<b>Standard</b>	<b>Description</b>
IEC 60529	Degrees of protection provided by enclosures

<b>Standard</b>	<b>Description</b>
ISO 9787	Manipulating industrial robots, coordinate Systems and motions

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

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

### Safety function

Safety function	Description
The Service Information System (SIS)	<p>The service information system gathers information about the robot's usage and determines how hard the robot is used. The usage is characterized by the speed, the rotation angles and the load of every axis.</p> <p>With this data collection, the service interval of every individual robot of this generation can be predicted, optimized and service activities planned ahead. The collection data is available via the FlexPendant or the network link to the robot.</p> <p>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.</p> <p>The time the robot is in operation (brakes released) is indicated on the FlexPendant. Data can also be monitored over network, using for example WebWare.</p>

### The Active Safety System

The Active Safety System	Description
General	<p>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.</p>
The Active Brake System (ABS)	<p>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).</p> <p>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.</p> <p>The stopping process is in accordance with a class 1 stop. The maximum applicable torque on the most loaded axis determines the stopping distance.</p> <p>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.</p> <p>While programming the robot in manual mode, the enabling device has a class 0 stop.</p>

# 1 Description

## 1.2.1 Standards

The Active Safety System	Description
The Self Tuning Performance (STP)	<p>The Process Robot Generation is designed to run at different load configurations, many of which occur within the same program and cycle.</p> <p>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.</p> <p>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™.</p> <p>The respective change in cycle time can be measured by running the robot in NoMotionExecution with different loads or with simulation tools like RobotStudio.</p>
The Electronically Stabilised Path (ESP)	<p>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.</p> <p>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™.</p>
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. 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.

---

**The Passive Safety system**

<b>The Passive Safety System</b>	<b>Description</b>
General	The Process Robot Generation has a dedicated passive safety system that by hardware construction and dedicated solutions is designed to avoid collisions with surrounding equipment. It integrates the robot system into the surrounding equipment safely.
Compact robot arm design	The shape of the lower and upper arm system is compact, avoiding interference into the working envelope of the robot. The lower arm is shaped inward, giving more space under the upper arm to re-orientate large parts and leaving more working space while reaching over equipment in front of the robot. The rear side of the upper arm is compact, with no components projecting over the edge of the robot base even when the robot is moved into the home position.
Moveable mechanical limitation of main axes (option)	All main axes can be equipped with moveable mechanical stops, limiting the working range of every axis individually. The mechanical stops are designed to withstand a collision even under full load.

---

**The Internal Safety Concept**

<b>The Internal Safety Concept</b>	<b>Description</b>
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 Systems - Part 1.
Selecting the operating mode	The robot can be operated either manually or automatically. In manual mode, the robot can only be operated via the FlexPendant, that is 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 FlexPendant 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 FlexPendant to find the right key.
Emergency stop	There is one emergency stop push button on the controller and another on the FlexPendant. 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.

# 1 Description

---

## 1.2.1 Standards

The Internal Safety Concept	Description
Delayed safeguarded space stop	A delayed stop gives a smooth stop. The robot stops 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 6650S are designed for floor mounting. Depending on the robot version, an end effector with max. weight of 90 to 200 kg including payload, can be mounted on the mounting flange (axis 6). See Load diagram for IRB 6650S generation robots on page 30.

---

#### Extra Loads

Extra load (valve packages, transformers) of 50 kg, which is included in the load diagrams, can be mounted on the upper arm. An extra load of 500 kg can also be mounted on the frame of axis 1. See Holes for mounting extra equipment on IRB 6650S on page 41.

---

#### 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.

# 1 Description

---

## 1.3.2 Operating requirements

### 1.3.2 Operating requirements

#### Protection standards

Robot version/ Protection standard	IEC60529
All variants, manipulator	IP67

#### Explosive environments

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

#### Ambient temperature

Description	Standard/Option	Temperature
Manipulator during operation	Standard	+ 5°C (41°F) to + 50°C (122°F)
For the controller	Standard/Option	See Product specification - Controller IRC5 with FlexPendant
For the spot welding cabinet	Standard	+ 5°C (41°F) to + 45°C (113°F)
Complete robot during transportation and storage	Standard	- 25°C (- 13°F) to + 55°C (131°F)
For short periods (not exceeding 24 hours)	Standard	up to + 70°C (158°F)

#### 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.

	<b>Endurance load in operation all IRB 6650S</b>	<b>Max. load at emergency stop all IRB 6650S</b>
Force xy	$\pm 10.6$ kN	$\pm 20.9$ kN
Force z	$28.2 \pm 7.7$ kN	$28.2 \pm 16.4$ kN
Torque xy	28.2 kNm	50.5 kNm
Torque z	7.9 kNm	13.6 kNm



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

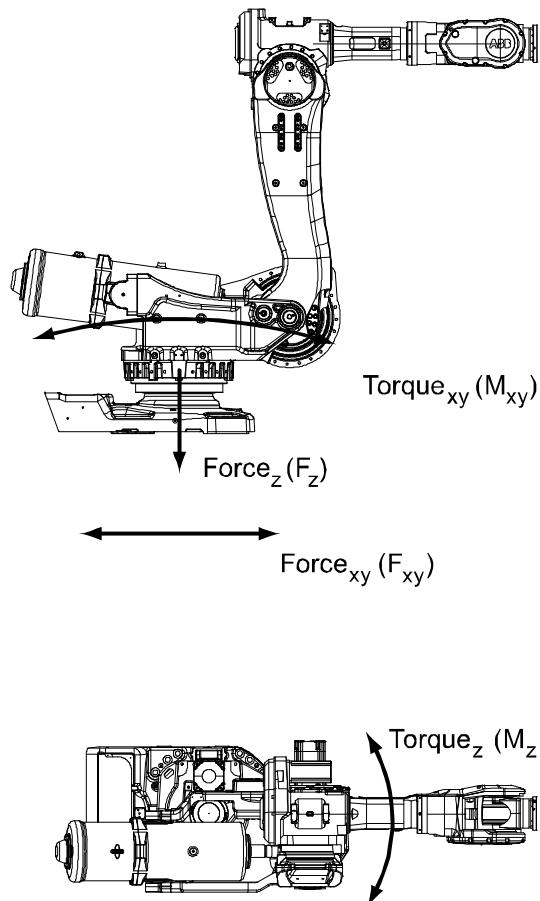


Figure 3 Directions of forces.

#### Note regarding $M_{xy}$ and $F_{xy}$

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

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

# 1 Description

## 1.3.3 Mounting the manipulator

### Fastening holes robot base - for IRB 6650S

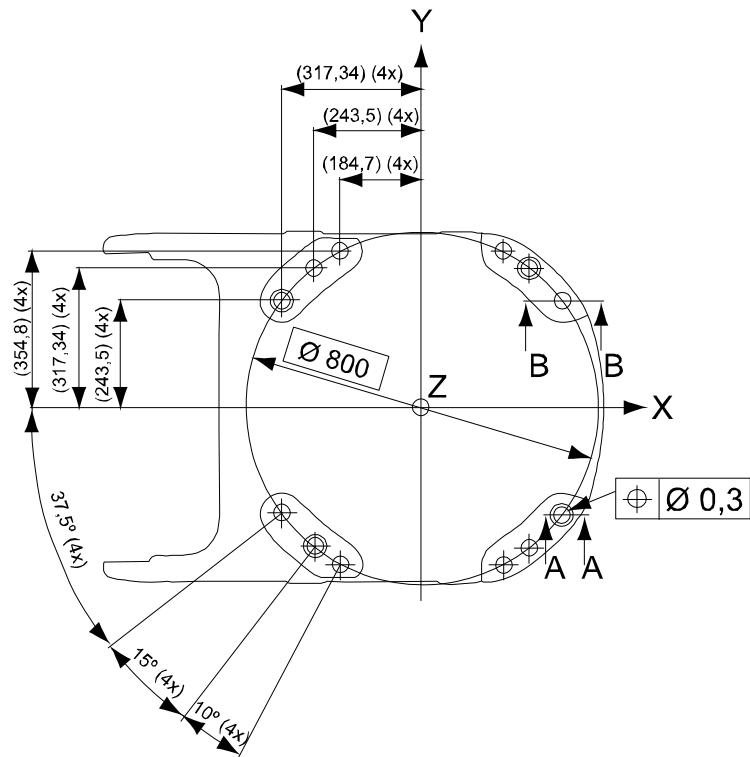


Figure 4 Hole configuration (dimensions in mm).

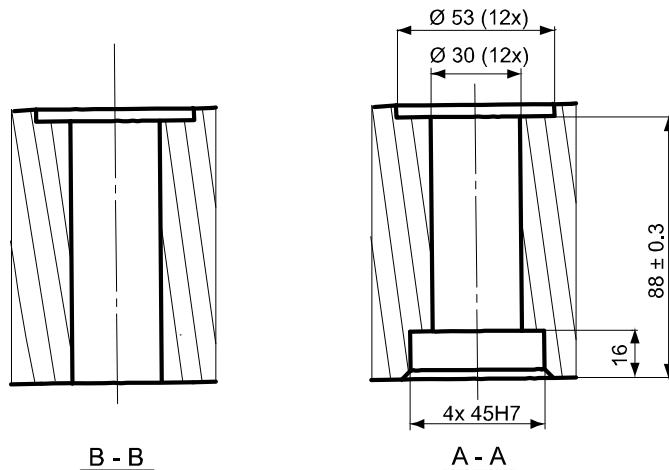


Figure 5

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

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

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

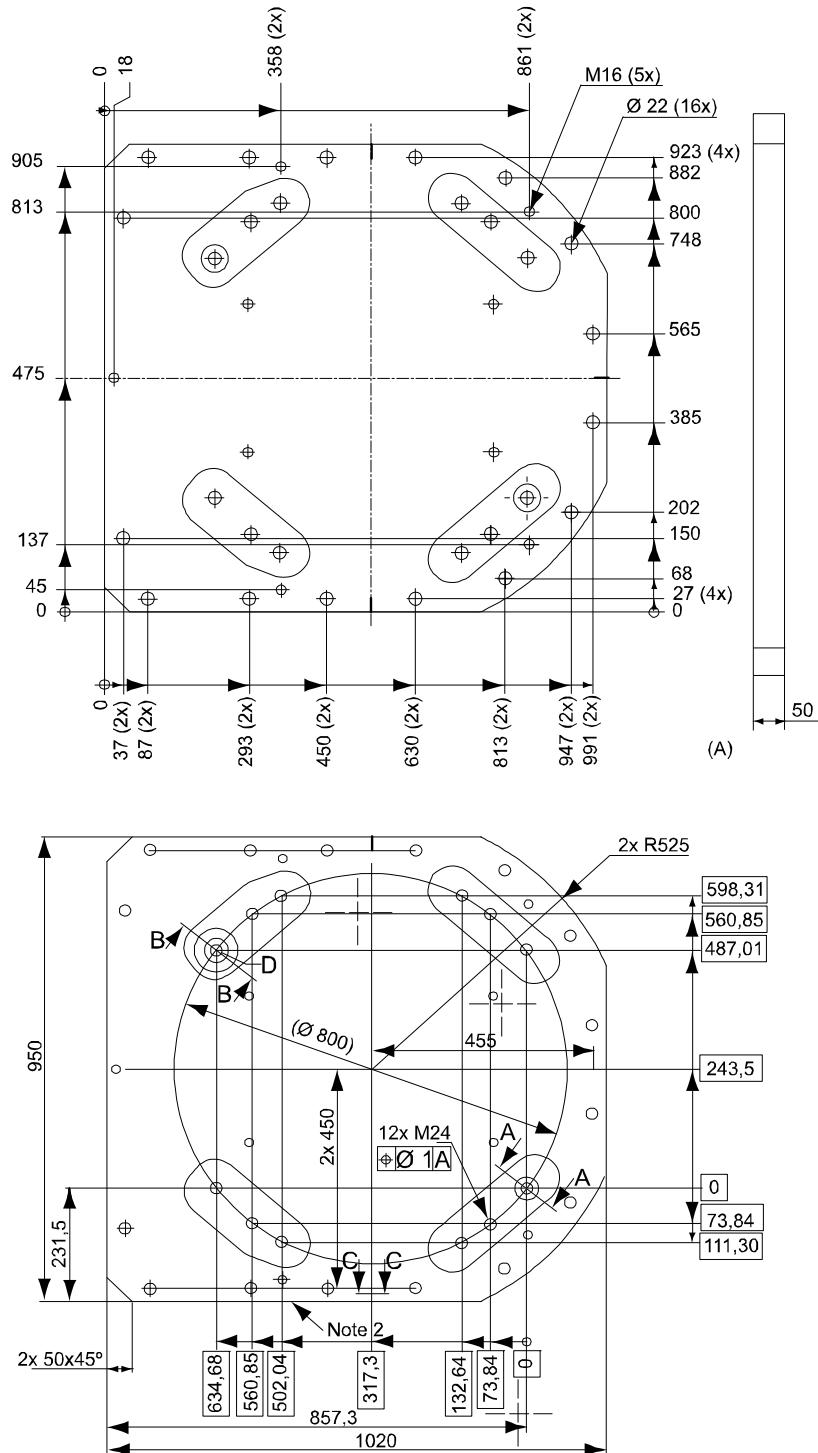
**Base plate drawing**

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

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

## 1 Description

### 1.3.3 Mounting the manipulator

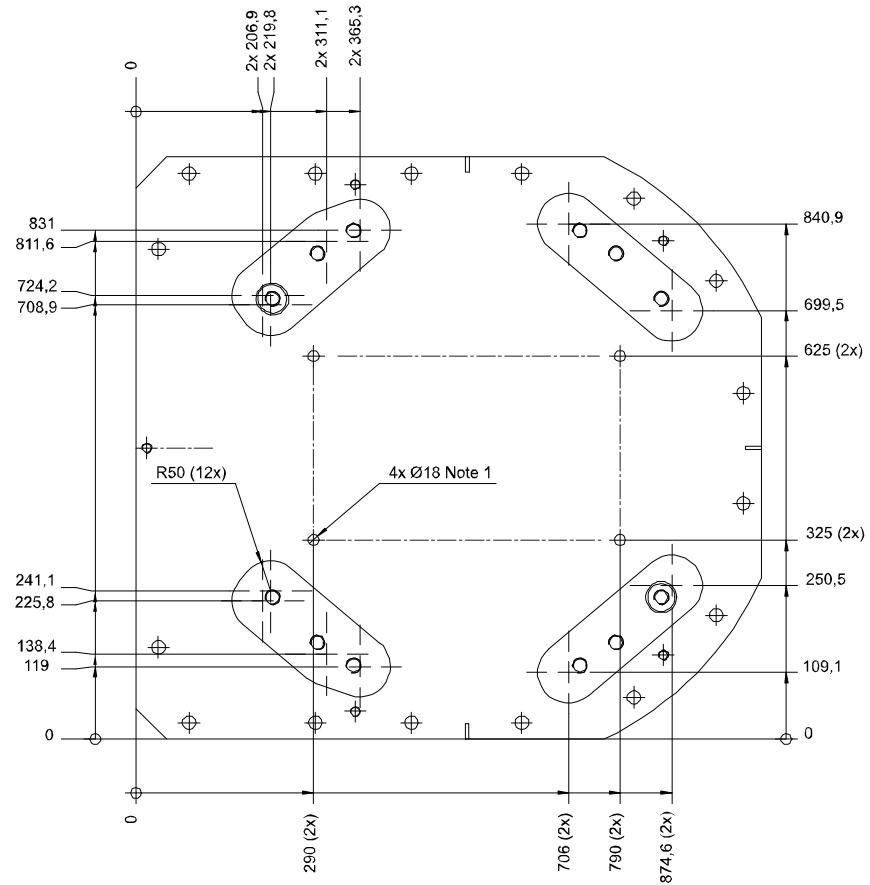


Figure 7 Base plate dimension print, measurements of the adaption for the robot base (dimension in mm).

Two guiding sleeves required, dimensions see Figure 8.

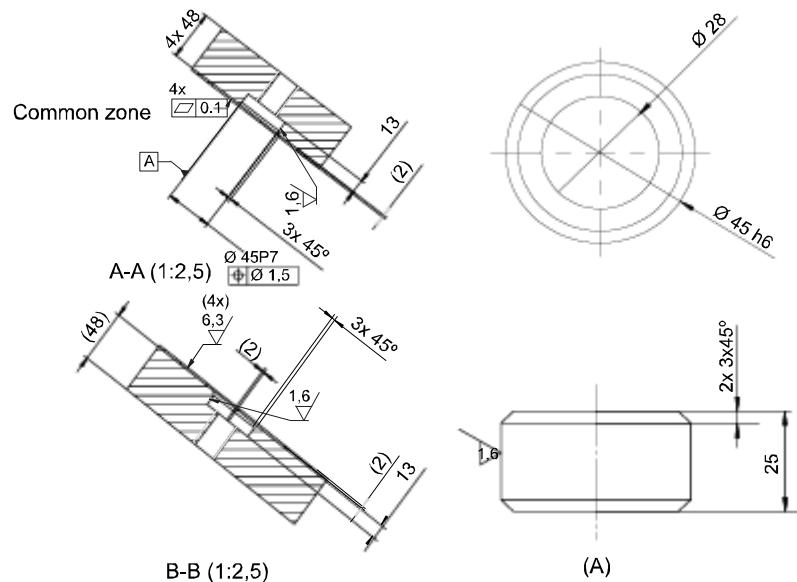


Figure 8 Sections of base plate and guide sleeve (dimensions in mm).

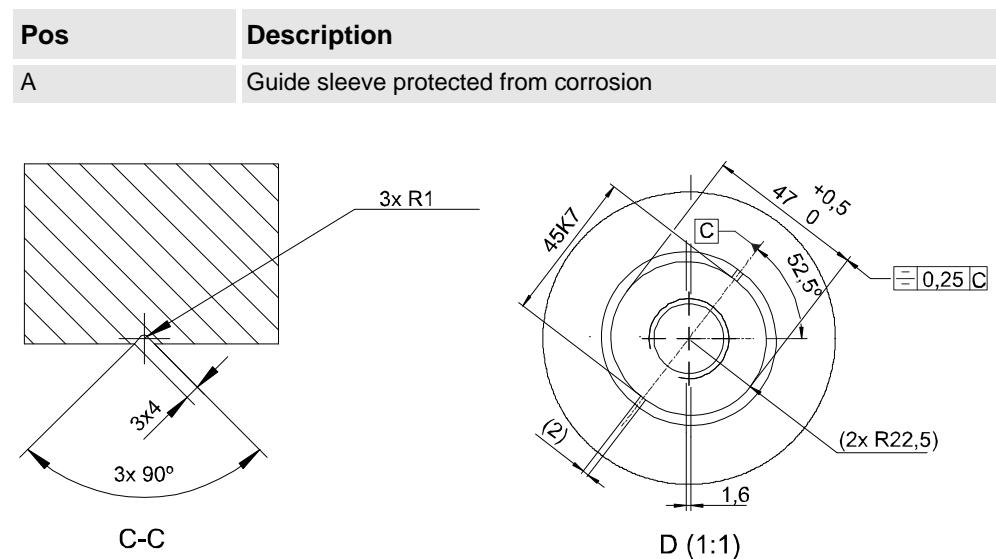


Figure 9 Sections of base plate (dimensions in mm).

## **1 Description**

---

### **1.4.1 Fine calibration**

## **1.4 Calibration and references**

### **1.4.1 Fine calibration**

---

#### **General**

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

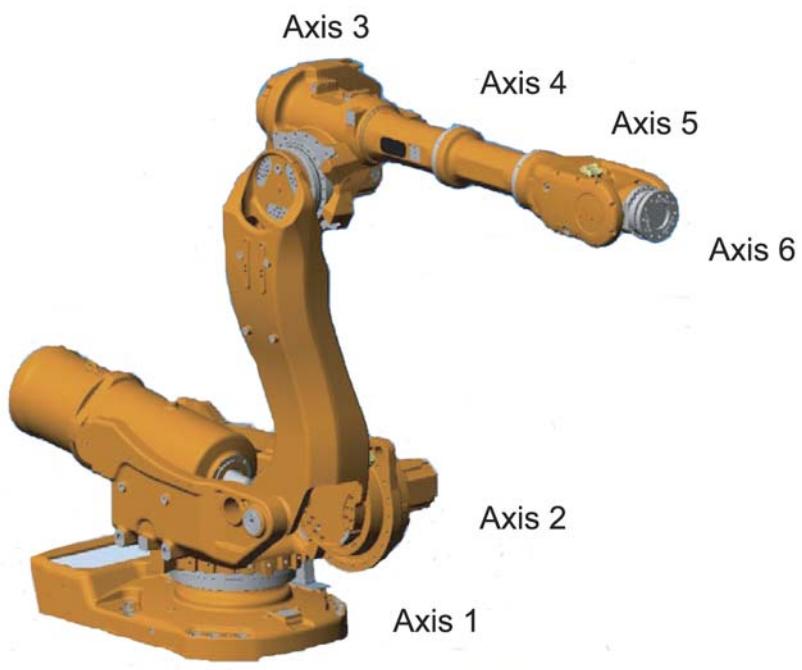


Figure 10 All axes in zero position.

---

#### **Calibration**

<b>Calibration</b>	<b>Position</b>
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 - Controller software IRC5 for more details.

---

### The calibration concept

Absolute Accuracy (AbsAcc) is a calibration concept, which ensures a TCP absolute accuracy of better than  $\pm 1$  mm in the entire working range (working range of bending backward robots, for example IRB 6650S, 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 parameters saved on the manipulator SMB) and a certificate that shows the performance (Birth certificate). The difference between an ideal robot and a real robot without AbsAcc can typically be 8 mm, resulting from mechanical tolerances and deflection in the robot structure.

If there is a difference, at first start-up, between calibration data in controller and the robot SMB, correct by copying data from SMB to controller.

# 1 Description

---

## 1.4.2 Absolute Accuracy calibration

### Absolute Accuracy option

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

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

Absolute Accuracy is a TCP calibration in order to Reach (m) a good positioning in the Cartesian coordinate system.

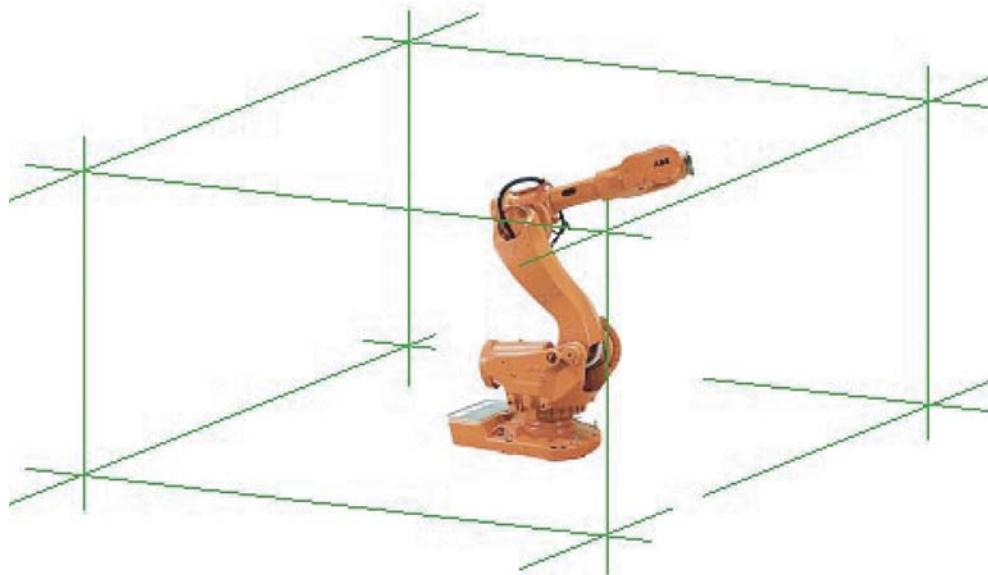


Figure 11 The Cartesian coordinate system.

---

### Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 6650S-125/3.50 -200/3.00	0,50	1,20	97
IRB 6650S-90/3.9	a	a	a

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

### 1.4.3 Robot references

#### General

The holes shown in Figure 12 to Figure 16 are used for measuring the robot position when integrated in a production cell.

The holes are not available for options Foundry Plus.



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



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

# 1 Description

## 1.4.3 Robot references

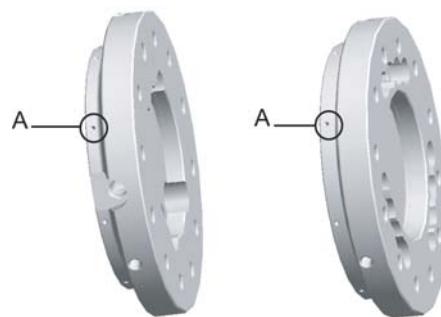


Figure 14 Seven holes A, on a radius of x mm from axis 6 center on the two standard tool flanges.

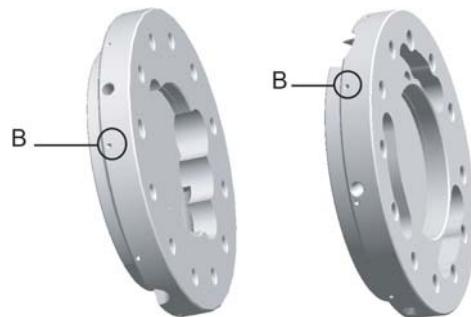


Figure 15 Seven holes B, on a radius of x mm from axis 6 center on the two insulated tool flanges.

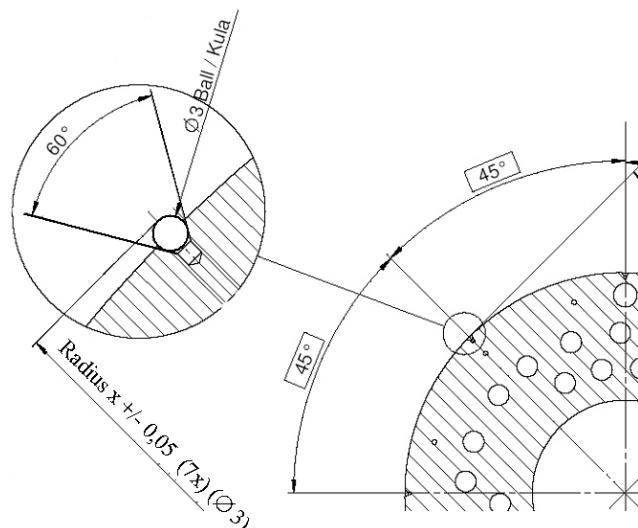


Figure 16 Detailed view of Tool Flange.

Robot	Radius X (mm) for references on tool flange	
	Standard	Insulated
IRB 6650S-90/3.90 125/3.50 200/3.00	R=87,5	R=101,5

## 1.5 Load diagrams

### 1.5.1 Introduction



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

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

- motors
- gearboxes
- mechanical structure



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



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

#### General

The load diagrams include a nominal payload inertia,  $J_0$  of  $15 \text{ kgm}^2$ , and an extra load of 50 kg at the upper arm housing, see Figure 17.

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

#### Control of load case by “RobotLoad”

For an easy check of a specific load case, use the calculation program ABB RobotLoad. Please contact your local ABB organization.

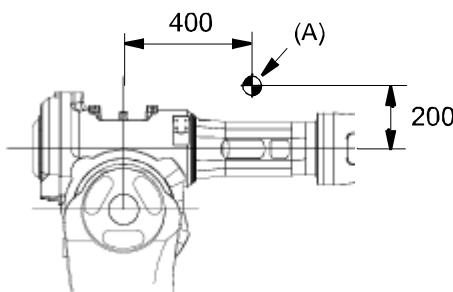


Figure 17 Center of gravity for 50 kg extra load at arm housing (dimensions in mm).

Pos	Description
A	Center of gravity 50 kg

# 1 Description

## 1.5.2 Load diagrams

### 1.5.2 Load diagrams

IRB 6650S-125/3.5

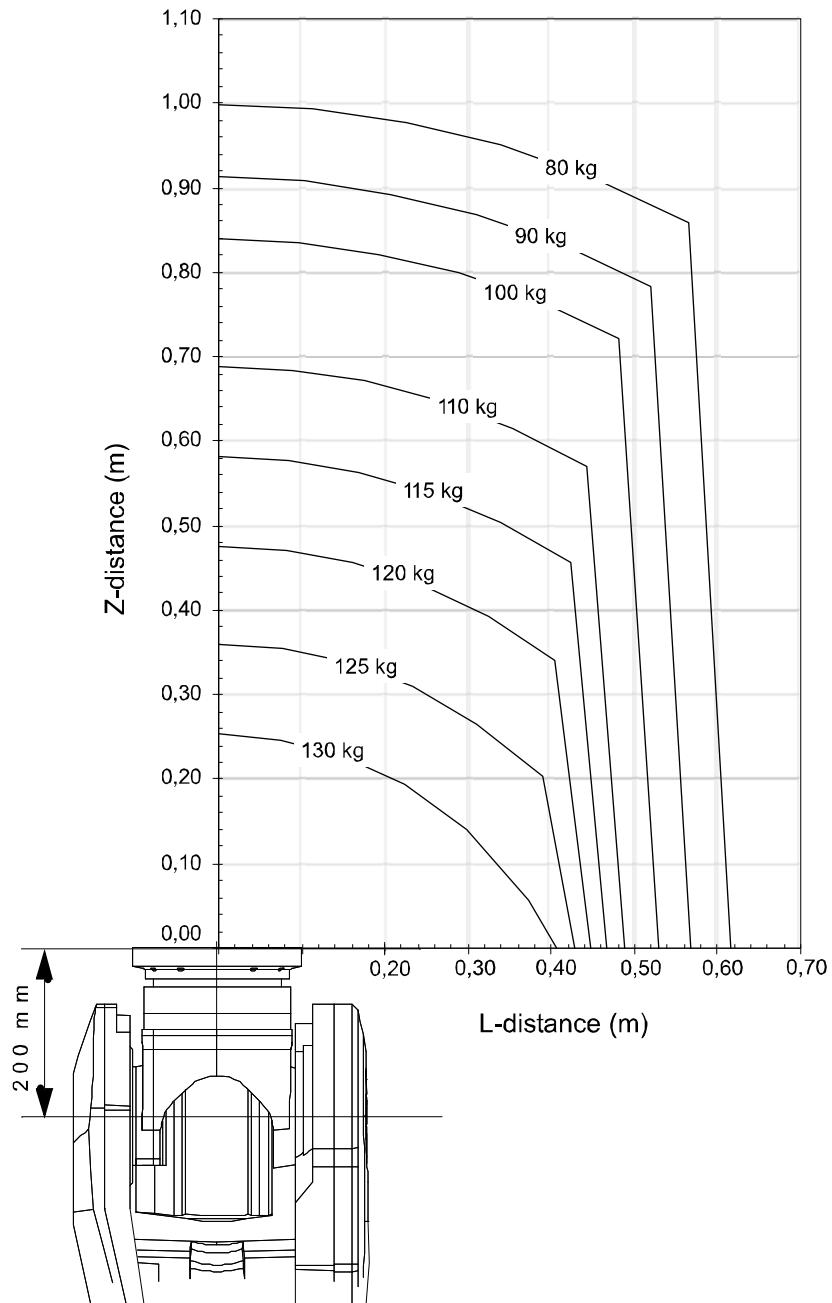


Figure 18 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

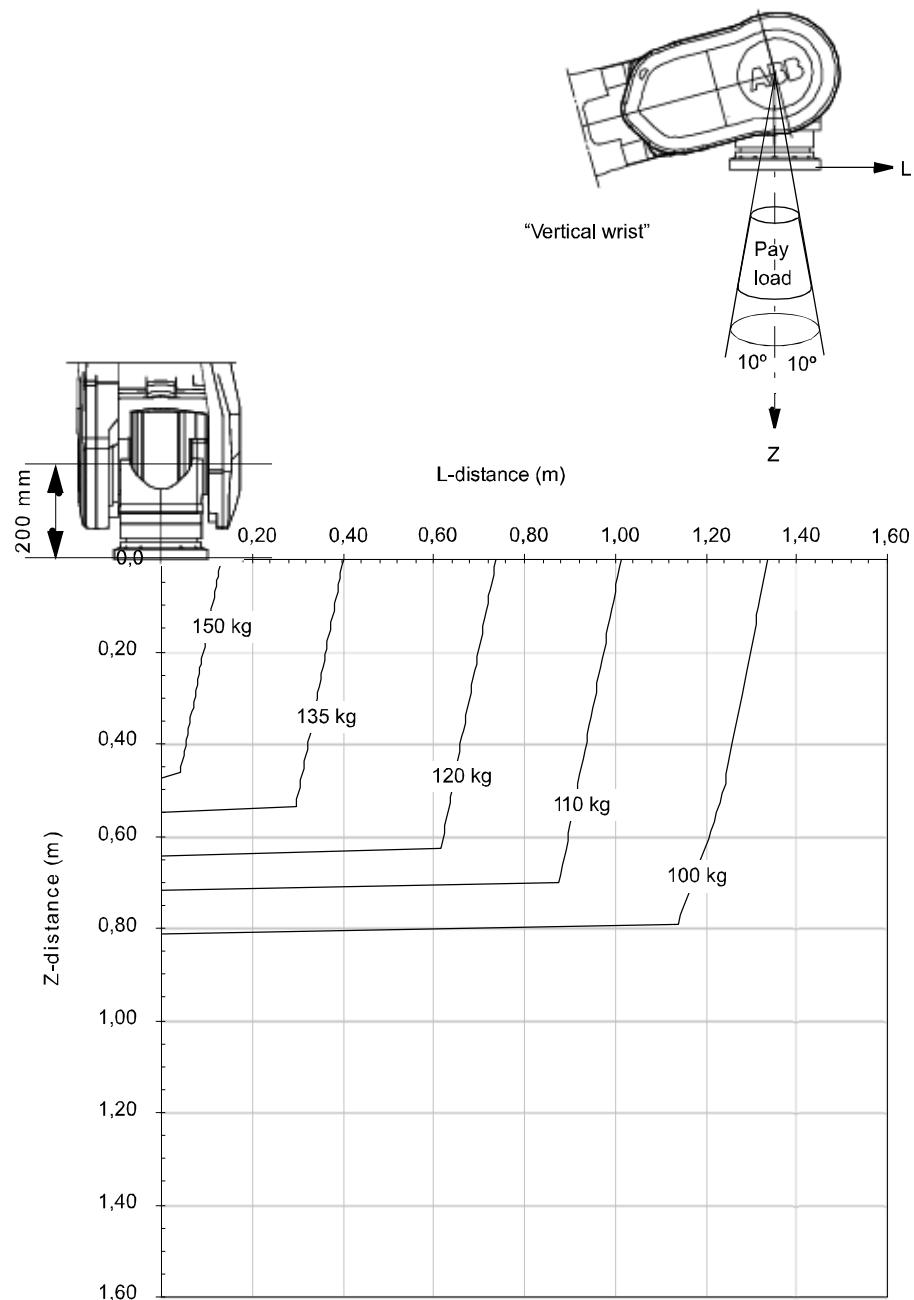
**IRB 6650S-125/3.5 "Vertical Wrist" ( $\pm 10^\circ$ )**

Figure 19 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at "Vertical Wrist" ( $\pm 10^\circ$ ).

For wrist down ( $0^\circ$  deviation from the vertical line).

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

# 1 Description

## 1.5.2 Load diagrams

IRB 6650S-90/3.9

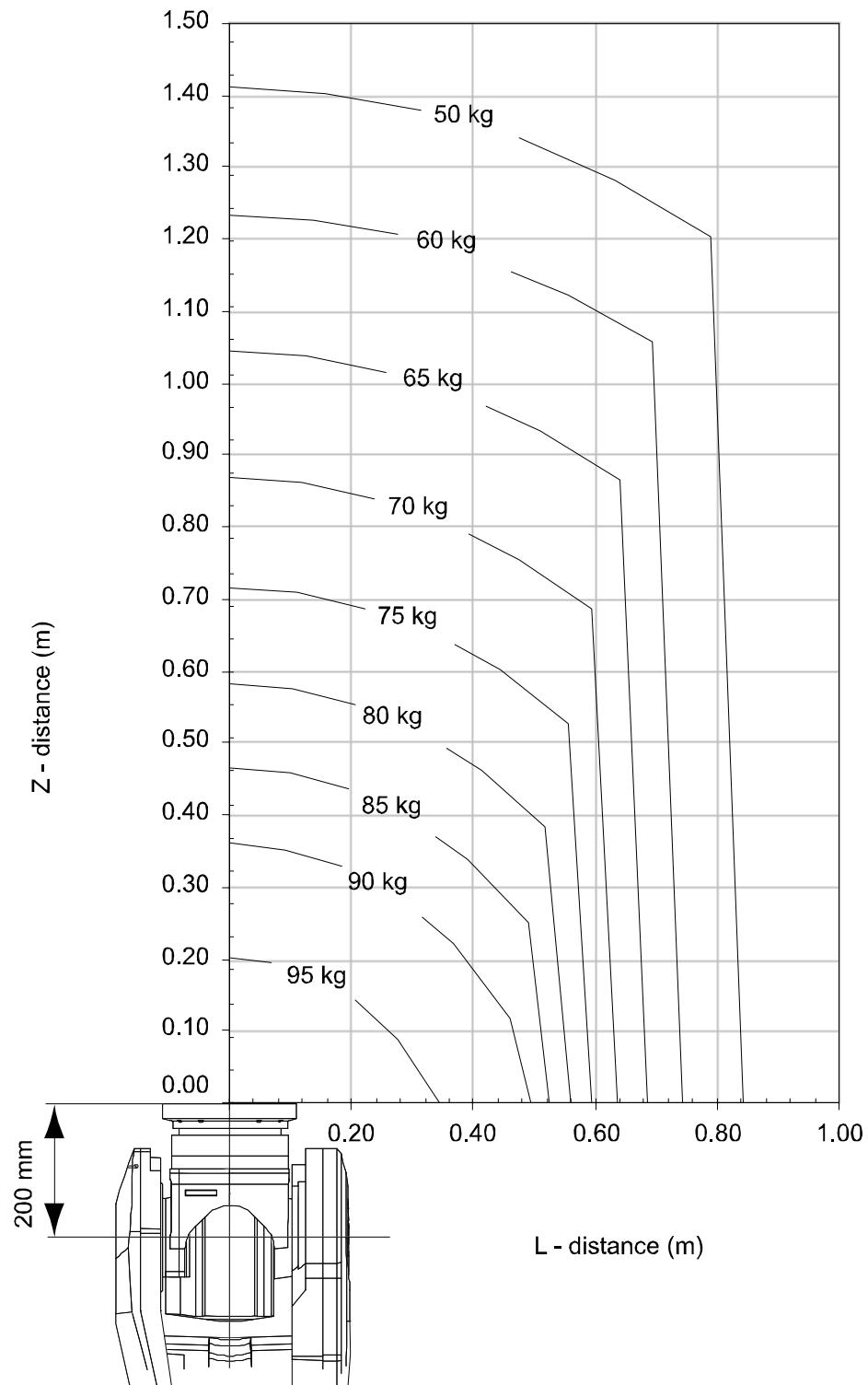


Figure 20 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

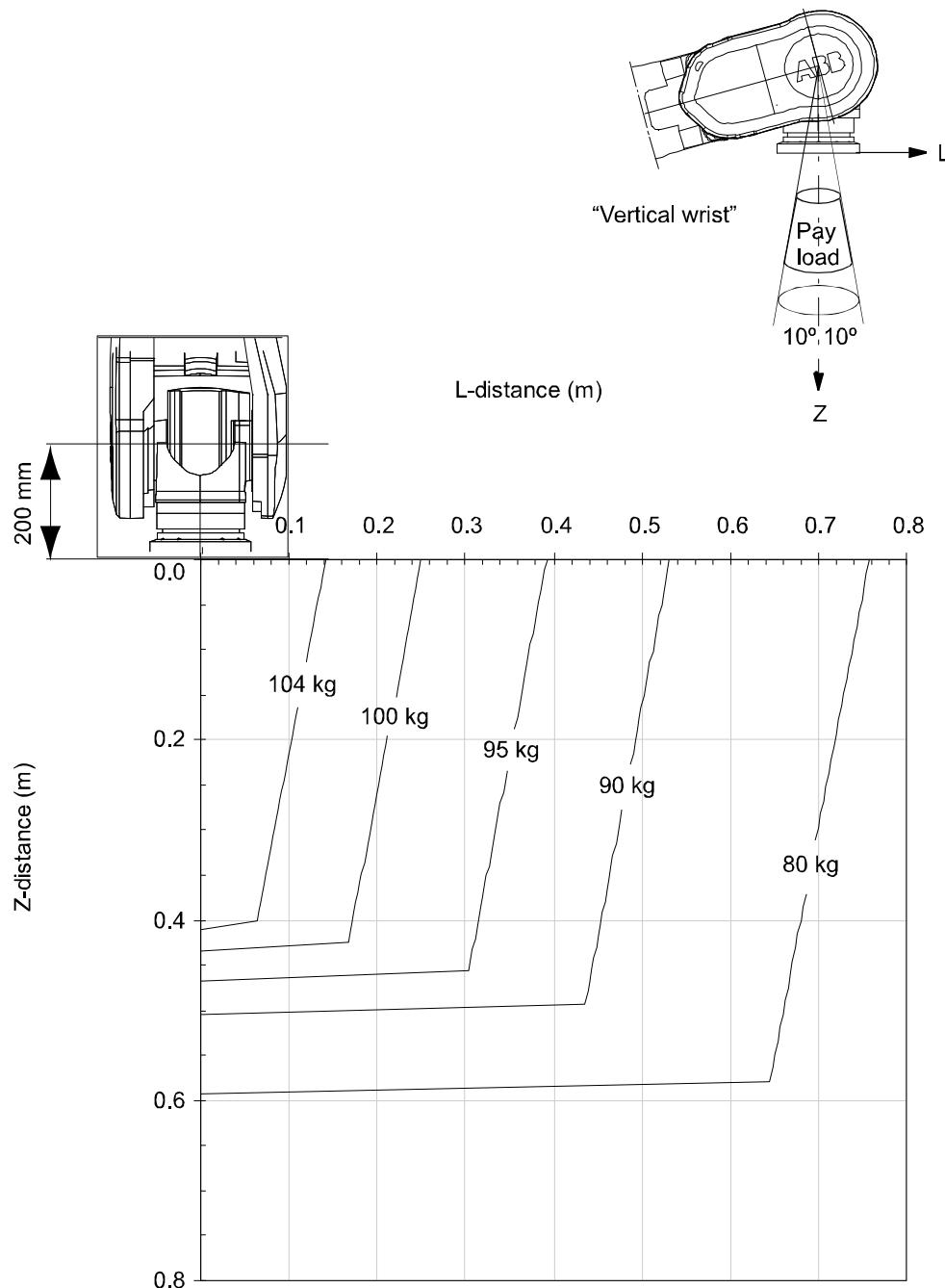
IRB 6650S-90/3.9 "Vertical Wrist" ( $\pm 10^\circ$ )

Figure 21 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at "Vertical Wrist" ( $\pm 10^\circ$ ).

For wrist down ( $0^\circ$  deviation from the vertical line).

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

# 1 Description

## 1.5.2 Load diagrams

IRB 6650S-200/3.0

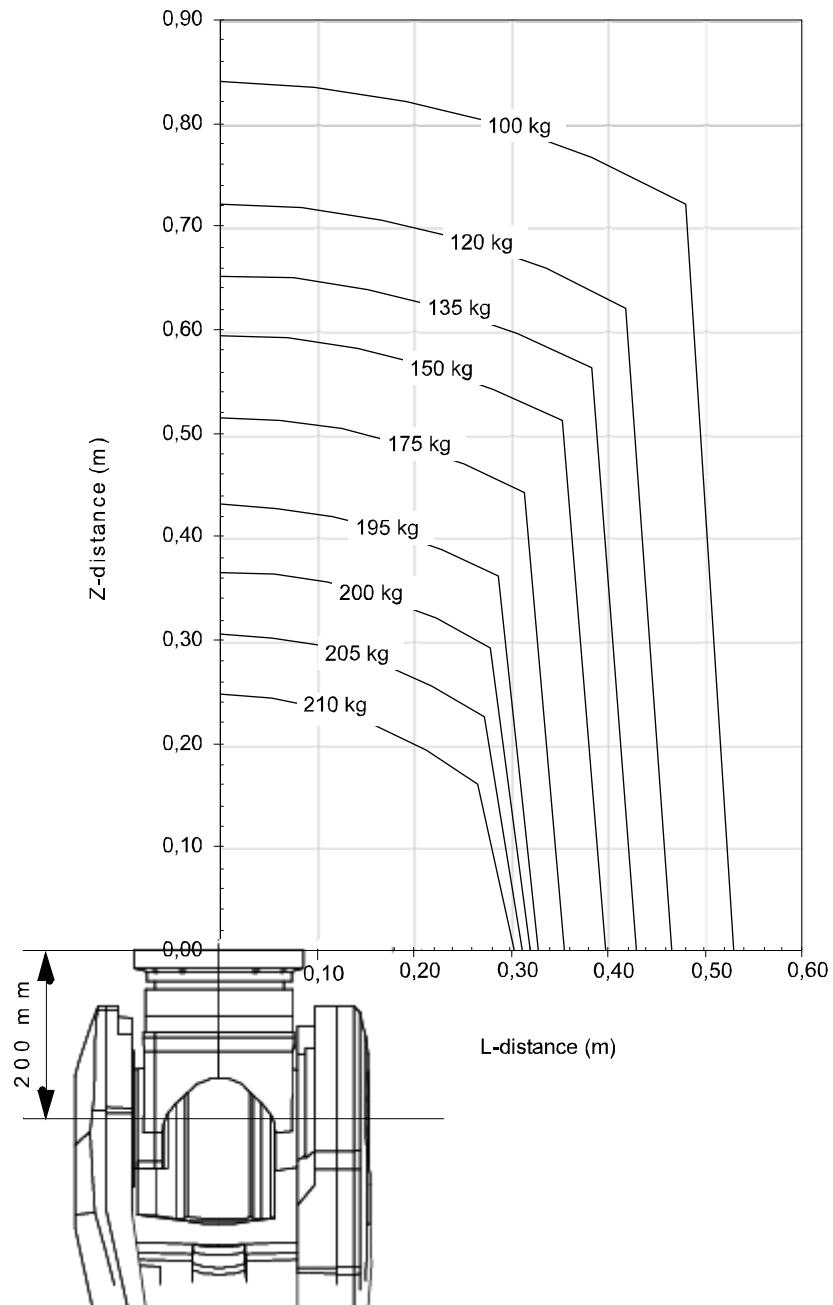


Figure 22 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity).

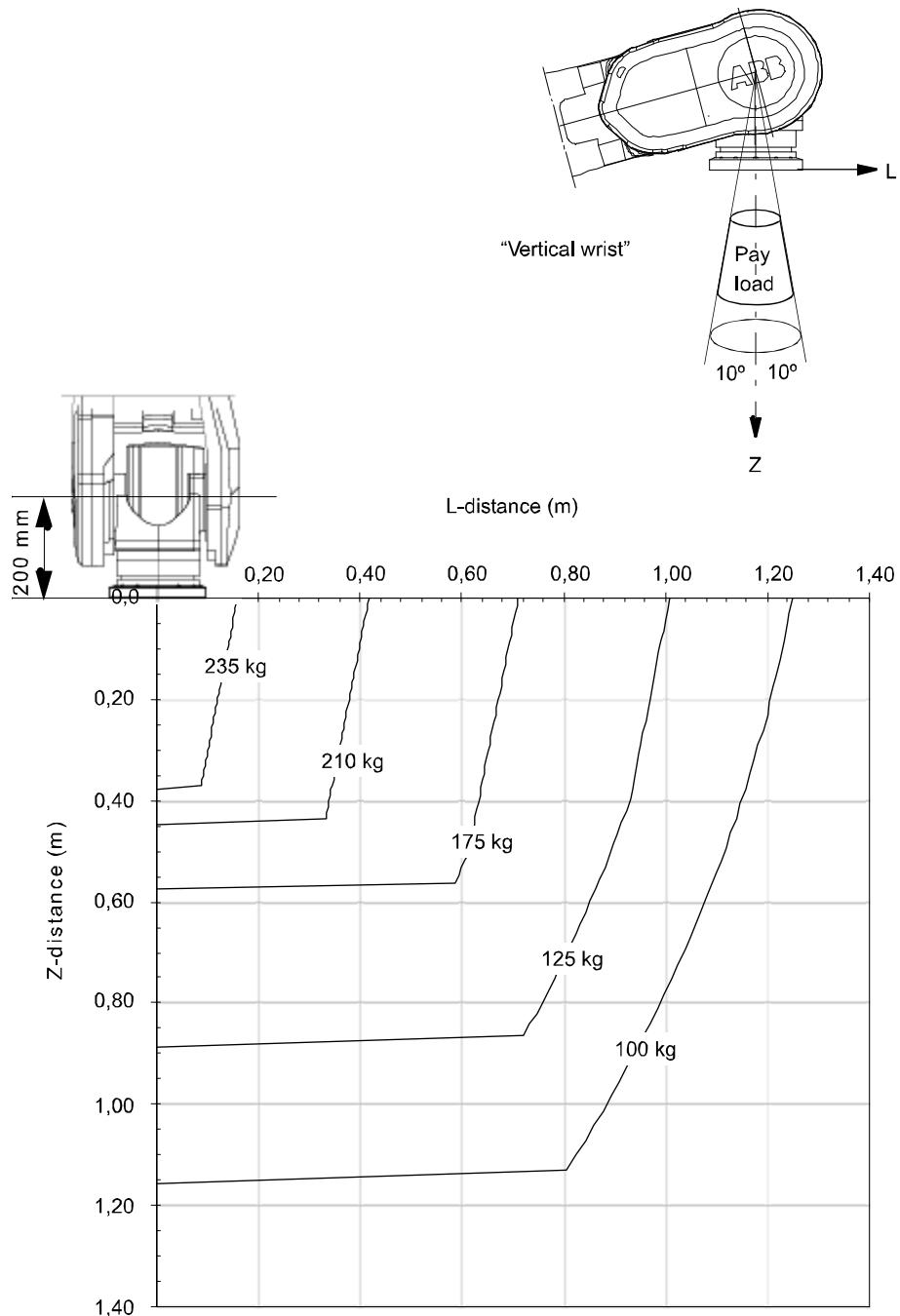
**IRB 6650S-200/3.0 "Vertical Wrist" ( $\pm 10^\circ$ )**

Figure 23 Maximum permitted load mounted on the robot tool flange at different positions (center of gravity) at "Vertical Wrist" ( $\pm 10^\circ$ ).

For wrist down ( $0^\circ$  deviation from the vertical line).

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

## 1 Description

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

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



Total load given as: Mass in kg, center of gravity (Z and L) in meter and moment of inertia ( $J_{ox}$ ,  $J_{oy}$ ,  $J_{oz}$ ) in  $\text{kgm}^2$ .  $L = \sqrt{(X^2 + Y^2)}$ , see Figure 24.

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

Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	$Ja_5 = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250 \text{ kgm}^2$
6	125/3.5, 200/3.0 and 90/3.9	$Ja_6 = \text{Load} \times L^2 + J_{0z} \leq 185 \text{ kgm}^2$

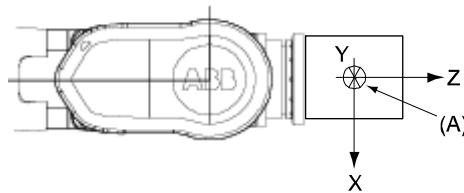


Figure 24 Moment of inertia when full movement of axis 5.

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

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

### Limited axis 5, center line down

Axis	Robot Type	Maximum moment of inertia
5	125/3.5, 200/3.0 and 90/3.9	$J_{a5} = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 275 \text{kgm}^2$
6	125/3.5, 200/3.0 and 90/3.9	$J_{a6} = \text{Load} \times L^2 + J_{0z} \leq 250 \text{ kgm}^2$

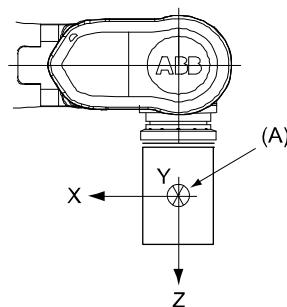


Figure 25 Moment of inertia when axis 5 center line down.

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

## 1 Description

---

### 1.5.4 Wrist torque

#### 1.5.4 Wrist torque

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



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

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

## 1.6 Mounting equipment

### 1.6.1 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 26 and Figure 27. The robot is supplied with holes for mounting extra equipment (see Figure 28). 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 26):

$M_1 \leq 50 \text{ kg}$  with distance  $a \leq 500 \text{ mm}$ , center of gravity in axis 3 extension.

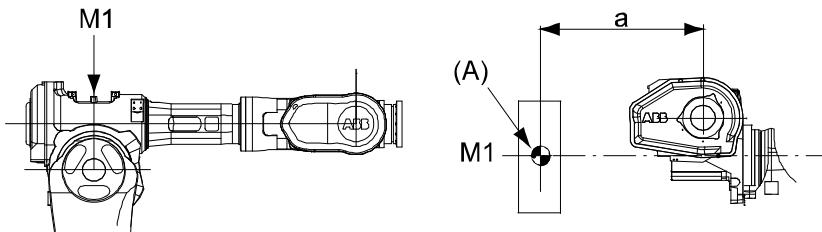


Figure 26 Permitted extra load on upper arm.

Pos	Description
A	Mass center

# 1 Description

## 1.6.1 General

### Frame (Hip Load)

Description	
Permitted extra load on frame	$J_H = 200 \text{ kgm}^2$
Recommended position (see Figure 27)	$J_H = J_{H0} + M_4 \times R^2$ where: $J_{H0}$ is the moment of inertia of the equipment $R$ is the radius (m) from the center of axis 1 $M_4$ is the total mass (kg) of the equipment including bracket and harness ( $\leq 500 \text{ kg}$ )

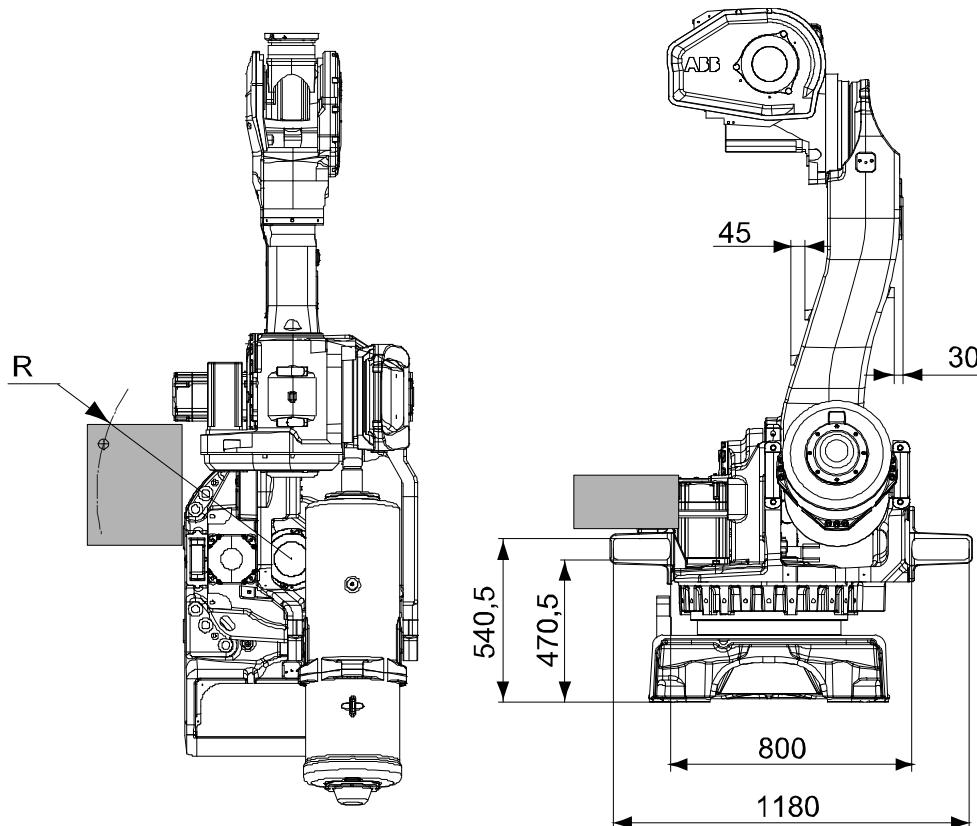


Figure 27 Extra load on the frame of IRB 6650S (dimensions in mm).

Pos	Description
A	View from above
B	View from the rear

## 1.6.2 Mounting of hip load

### General

The extra load can be mounted on the frame. Holes for mounting see Figure 28 and Figure 29. When mounting on the frame all four holes (2x2, Ø16) on one side must be used.

### 6650S

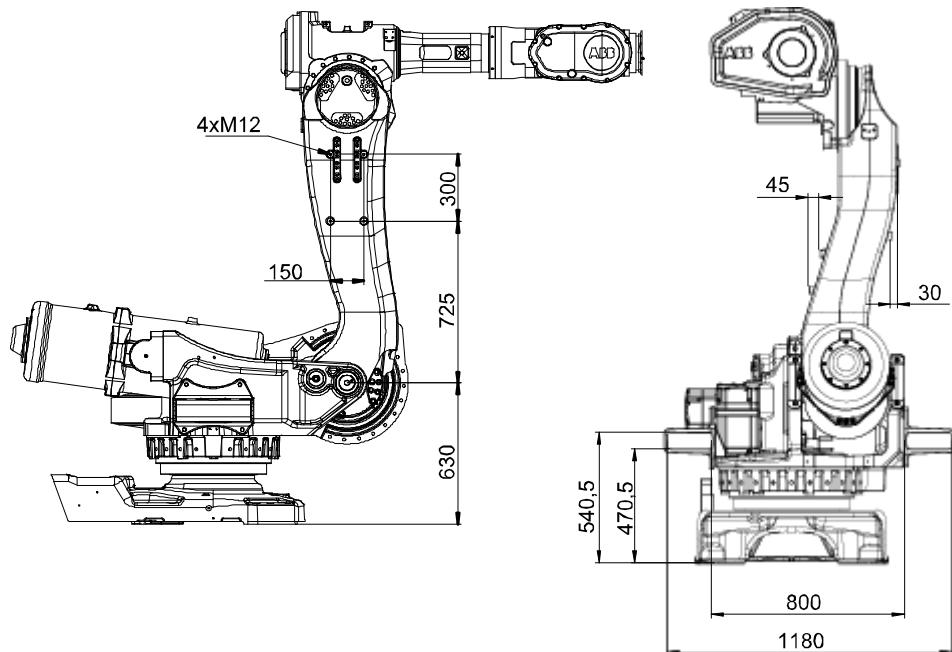


Figure 28 Holes for mounting extra load on upper arm on IRB 6650S (dimensions in mm).

# 1 Description

## 1.6.2 Mounting of hip load

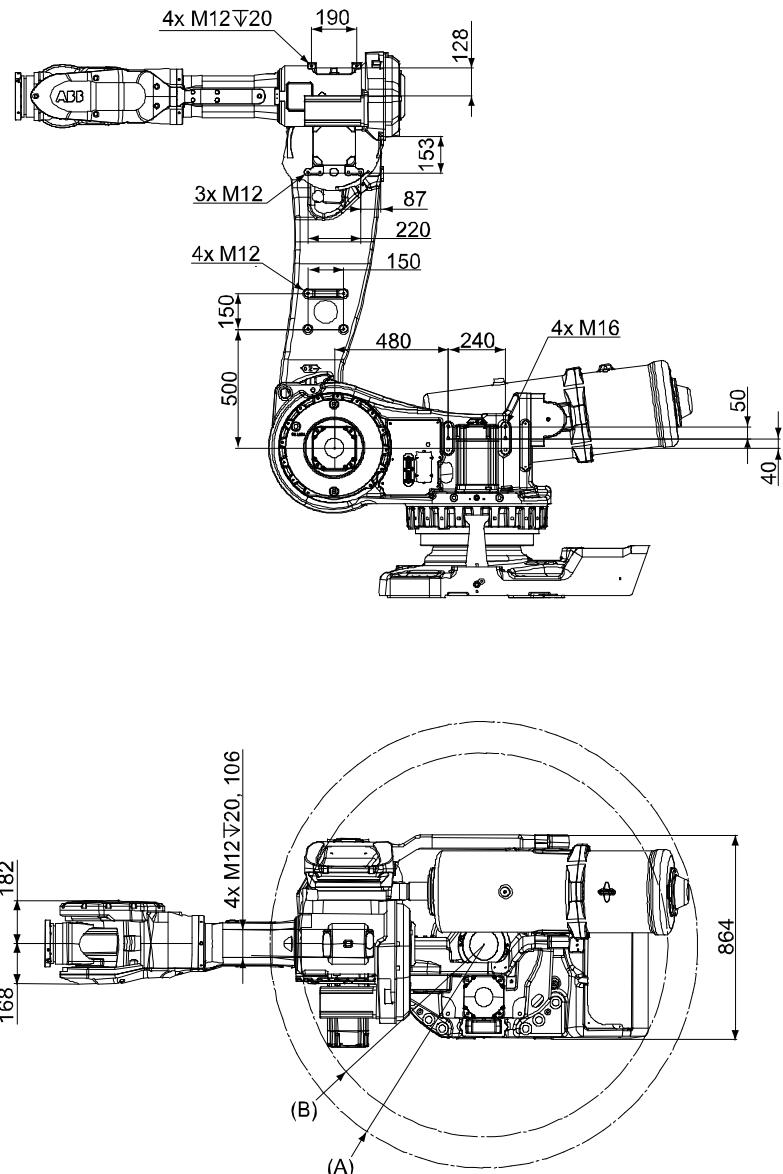


Figure 29 Holes for mounting extra load on upper arm on IRB 6650S (dimensions in mm).

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

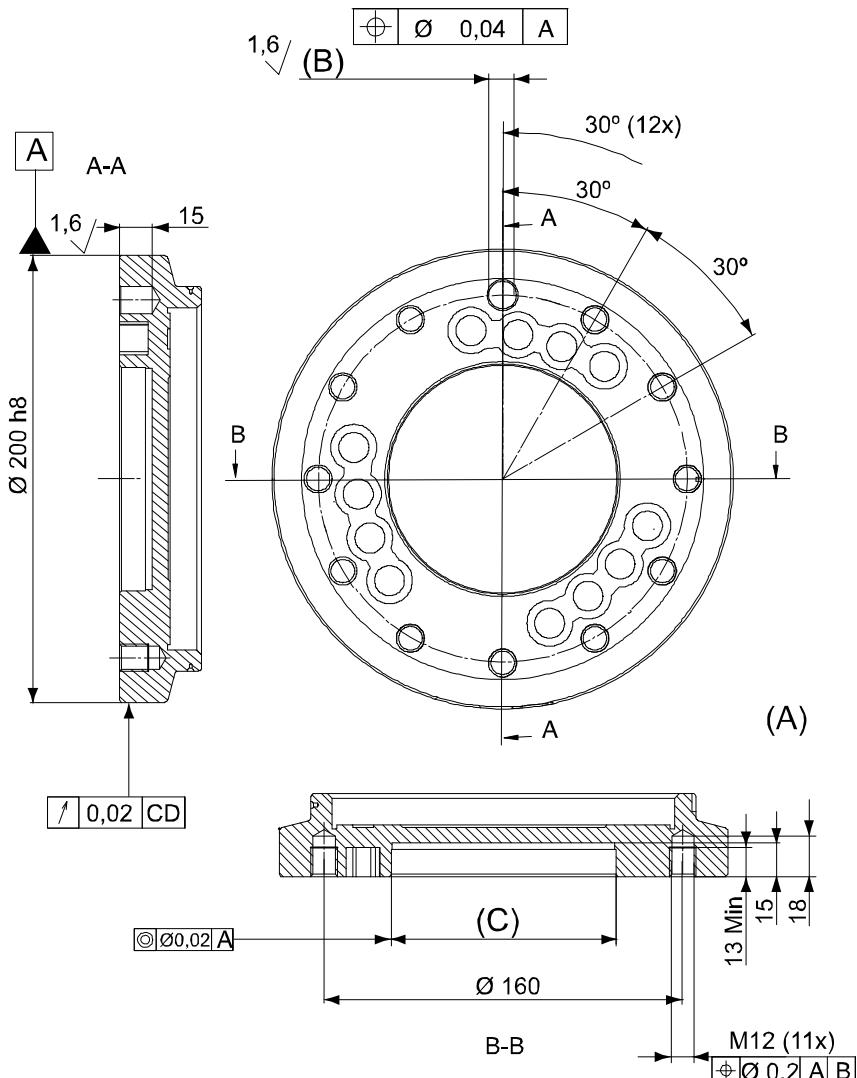


Figure 30 Robot tool flange ISO/DIS 9409-1:2002 (dimensions in mm).

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

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6650S	90	3.9
IRB 6650S	125	3.5
IRB 6650S	200	3.0

For fastening of gripper-tool-flange to robot-tool-flange (see Figure 30) all bolt holes for 11 bolts quality class 12.9 shall be used.

## **1 Description**

---

### 1.7.1 Introduction

## **1.7 Maintenance and Troubleshooting**

### **1.7.1 Introduction**

---

#### **General**

The robot requires only minimum maintenance during operation. It has been designed to make it as easy to service as possible:

- Maintenance-free AC motors are used.
- Oil is used for the gear boxes.
- The cabling is routed for longevity, and in the unlikely event of a failure, its modular design makes it easy to change.

---

#### **Maintenance**

The maintenance intervals depend on the use of the robot, the required maintenance activities also depends on selected options. For detailed information on maintenance procedures, see Maintenance section in the Product Manual.

## 1.8 Robot Motion

### 1.8.1 Introduction

#### Type of Motion

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

a. Rev. = Revolutions.

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

Option 610-1 “Independent axis” can be used for resetting the revolution counter after the axis has been rotated (no need for “rewinding” the axis).



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

# 1 Description

## 1.8.1 Introduction

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

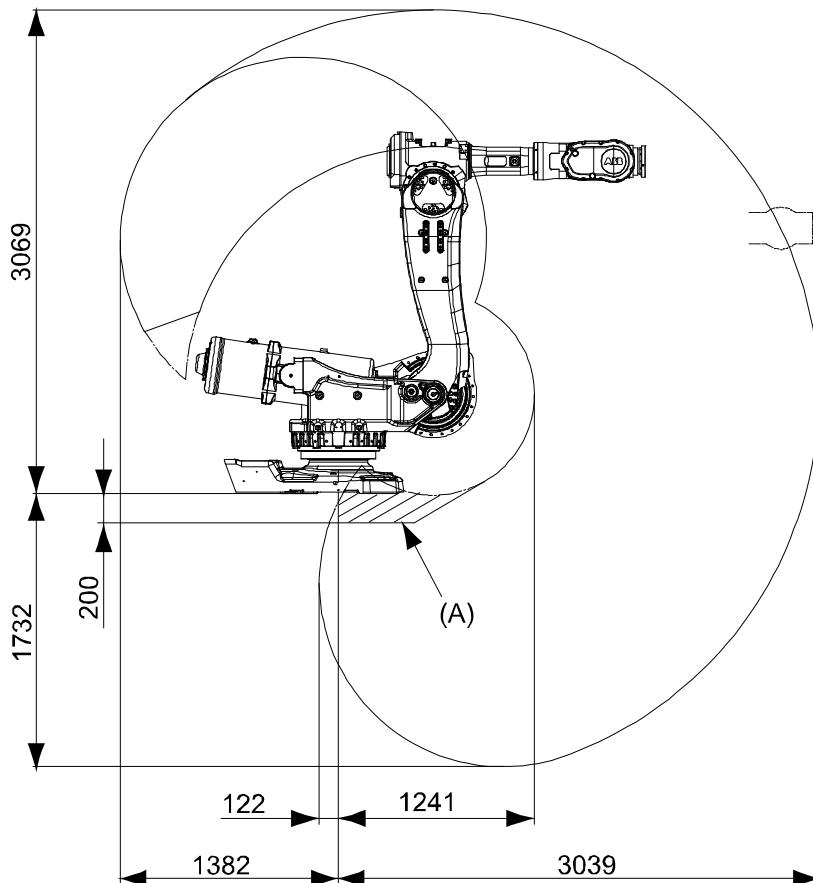


Figure 31 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

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

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

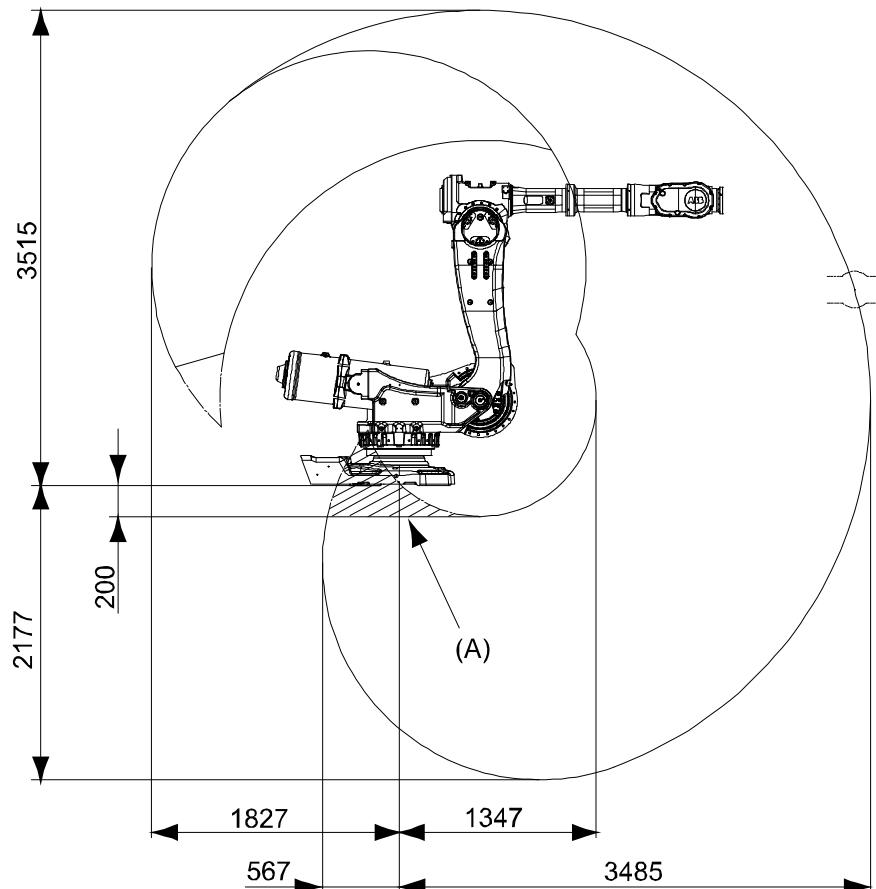


Figure 32 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

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

# 1 Description

## 1.8.1 Introduction

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

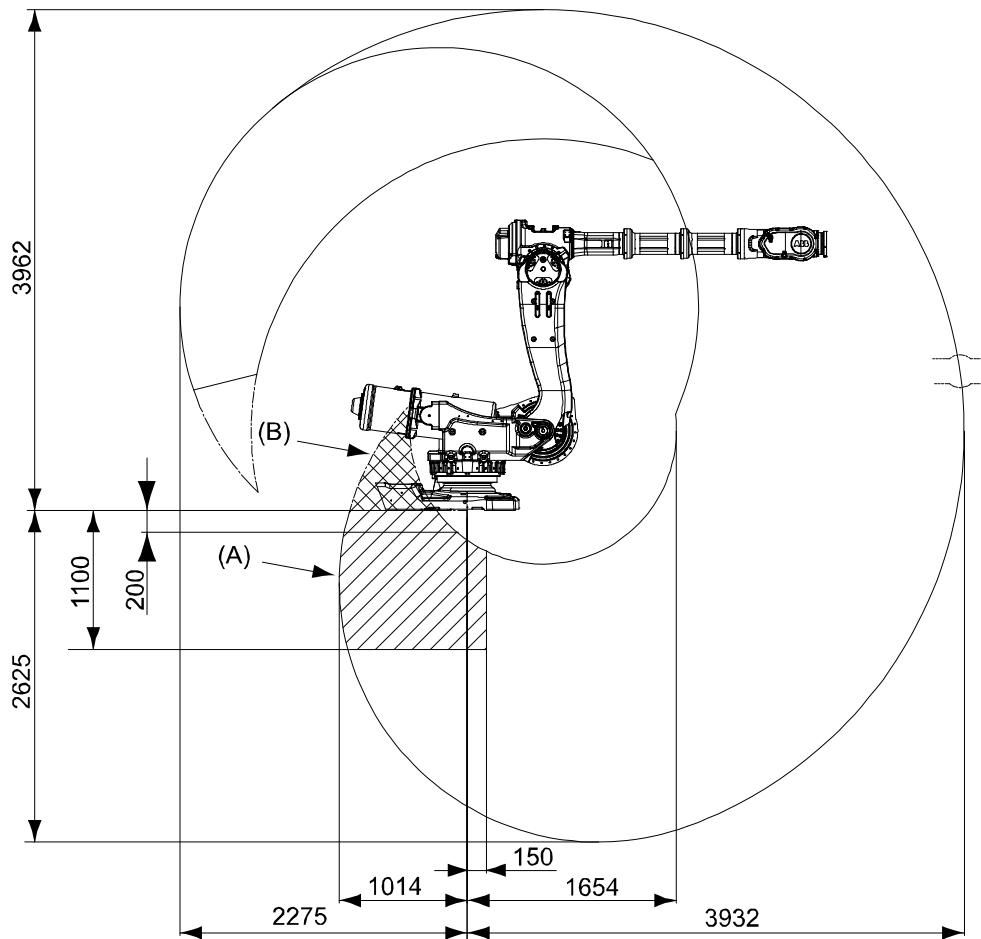


Figure 33 The extreme positions of the robot arm specified at the wrist center (dimensions in mm).

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

## 1.8.2 Performance according to ISO 9283

### General

At rated maximum load, maximum offset and 1.6 m/s velocity on the inclined ISO test plane, 1 m cube with all six axes in motion.

The figures for AP, RP, AT and RT are measured according to Figure 34.

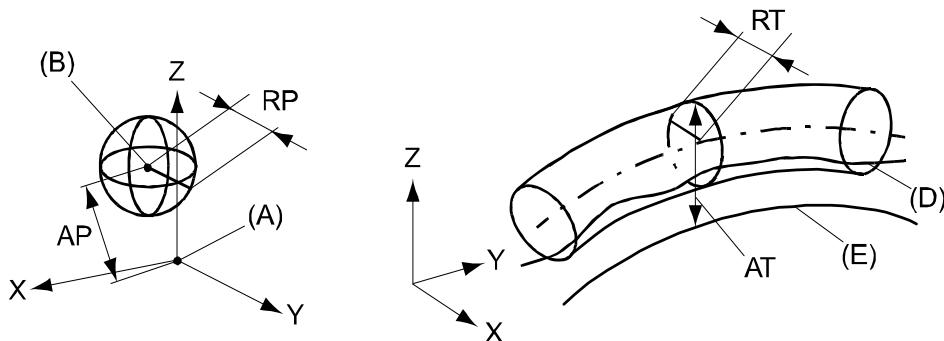


Figure 34 Explanation of ISO values.

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

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

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

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

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

## **1 Description**

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### 1.8.3 Velocity

#### **1.8.3 Velocity**

---

##### **Maximum axis speeds**

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

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

---

##### **Axis Resolution**

0.001° to 0.005°.

### 1.8.4 Stopping distance/time

Stopping distance/time for emergency stop (category 0), program stop (category 1) and at mains power supply failure at max speed, max stretched out and max load, categories according to EN 60204-1. All results are from tests on one moving axis. All stop distances are valid for floor mounted robot, without any tilting.

<b>Robot Type</b>	<b>Axis</b>	<b>Category 0</b>		<b>Category 1</b>		<b>Main power failure</b>	
		<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>
IRB 6650S-90/3.9	1	42	0.9	57	1.2	46	1.0
	2	30	0.6	53	1.1	34	0.7
	3	17	0.4	31	0.7	22	0.4

<b>Robot Type</b>	<b>Axis</b>	<b>Category 0</b>		<b>Category 1</b>		<b>Main power failure</b>	
		<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>
IRB 6650S-125/3.5	1	53	1.0	104	1.6	41	0.7
	2	23	0.5	47	1.0	30	0.6
	3	12	0.3	25	0.6	18	0.3

<b>Robot Type</b>	<b>Axis</b>	<b>Category 0</b>		<b>Category 1</b>		<b>Main power failure</b>	
		<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>
IRB 6650S-200/3.0	1	47	1.0	65	1.2	54	0.7
	2	26	0.6	51	1.1	31	0.4
	3	12	0.3	23	0.5	17	0.3

	<b>Description</b>
<b>A</b>	Distance in degrees
<b>B</b>	Stop time (s)

## **1 Description**

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### **1.9.1 Introduction**

## **1.9 Cooling fan for axis 1 and 2 motor**

### **1.9.1 Introduction**

---

#### **Option 87-1, 88-1**

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

IP54 valid for cooling fan. Fan failure stops the robot.

## 1.10 Servo Gun

### 1.10.1 Introduction

---

#### General

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

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

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

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

# 1 Description

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## 1.10.2 Stationary Gun

### 1.10.2 Stationary Gun

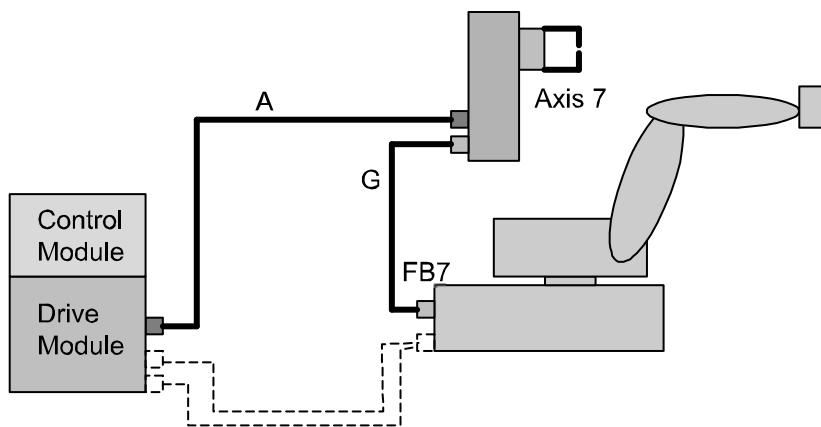


Figure 35 Configuration of Stationary Gun.

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#### Options

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

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

### 1.10.3 Robot Gun

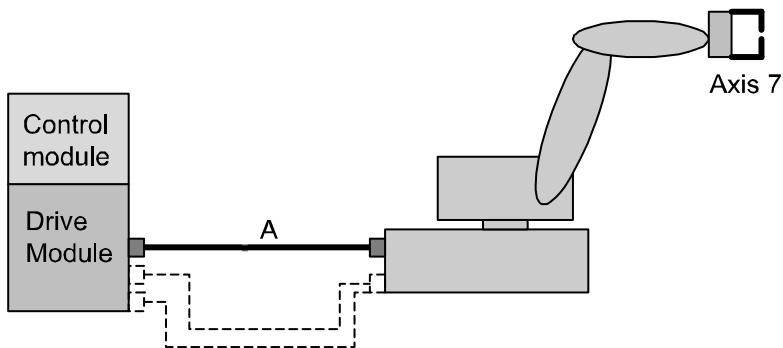


Figure 36 Configuration of Robot Gun.

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#### Options

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

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

## 1 Description

### 1.10.4 Robot Gun and Track Motion IRBT 6004

#### 1.10.4 Robot Gun and Track Motion IRBT 6004

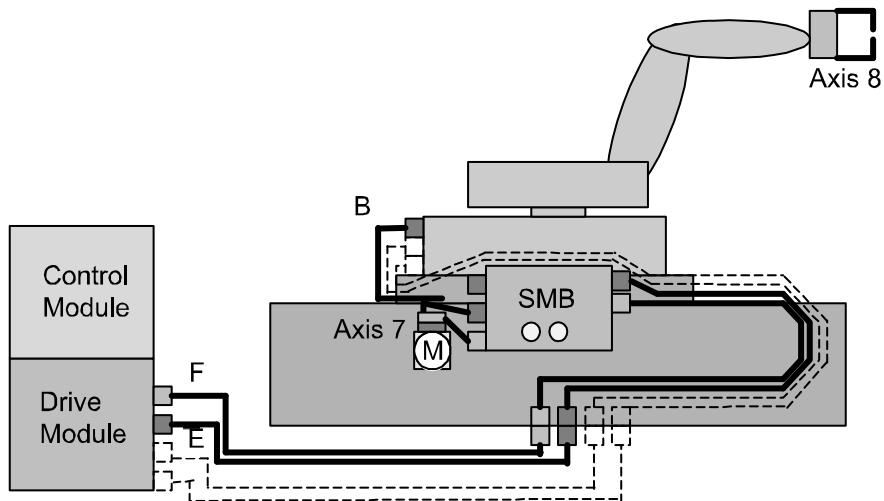


Figure 37 Configuration of Robot Gun and Track Motion.

#### 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 specification
785-1+1002-8 <sup>a</sup>	Robot Gun - Track Motion. This option includes: Cables within manipulator for servo power signals (servo gun/axis 7).	Track motion IRBT 6004 + IRB 6600
Track motion delivery includes	Serial measurement box (SMB2, Split box) for distribution of servo power 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). Connection to first and second drive. Cable E and F (7-22 m) between Drive Module and serial measurement box for dual servo drive power/resolver signals.	Track motion IRBT 6004/ IRBT 7004
770-4	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
771-4	Second additional drive. Drive unit for 8th axis with corresponding cables assembled inside Drive Module.	Controller IRC5 with FlexPendant
635-3, -4 or -5	Spot Servo, Spot Servo Multiple Guns or Spot Servo Equalizing.	Controller software IRC5

a. To specify robot on track equipped with servo gun. Option 1002-8 from specification form for Track Motion.

## 1.10.5 Track Motion IRBT 6004

### General

The robot can be supplied with a Track Motion, see Product specification - IRBT 6004. For configuration and specification of hardware see Figure 38.

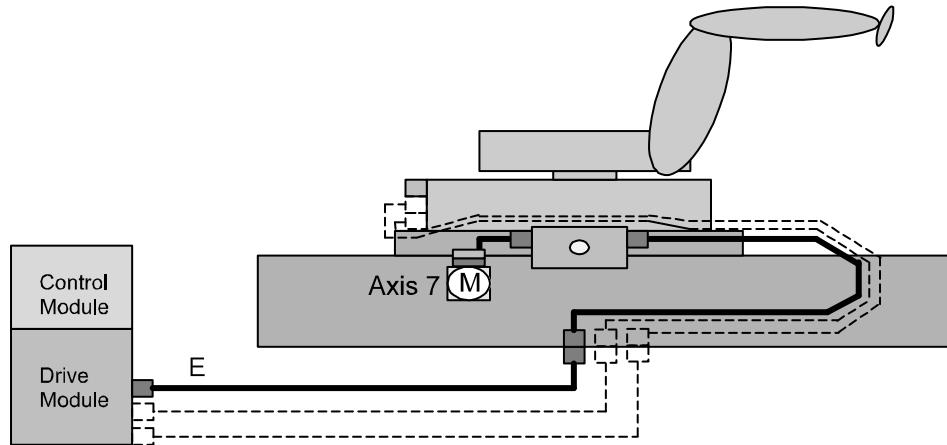


Figure 38 Configuration of Track Motion.



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

### Options

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

Option	Description	Product specification
Track motion delivery includes	Serial measurement box (SMB, Split box) for distribution of servo power signals to axis 7/Track motion. The box is placed on the track motion. Cable E for between Drive Module and track motion servo for drive power.	Track motion IRBT 6004/ IRBT 7004
770-4	First additional drive. Drive unit for 7th axis with corresponding cables assembled inside Drive Module.	

## **1 Description**

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1.10.5 Track Motion IRBT 6004

## 2 SpotPack and DressPack

### 2.1 Introduction

#### 2.1.1 General

---

**DressPack**

Includes options for Upper arm, Lower arm and Floor pos C, D and E, see Figure 39. These are described separately below but are designed as a complete package for various applications.

The DressPack for the floor contains customer signals.

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

Necessary supports and brackets are also included.

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

---

**Spotpack**

The package supplies the transformer gun/gripper with necessary media, such as compressed air, cooling water and electrical power. It includes above described DressPack + Spot Welding cabinet, Water And Air unit pos A and F (if included) and SoftWare, see Figure 39.

## 2 SpotPack and DressPack

### 2.1.1 General

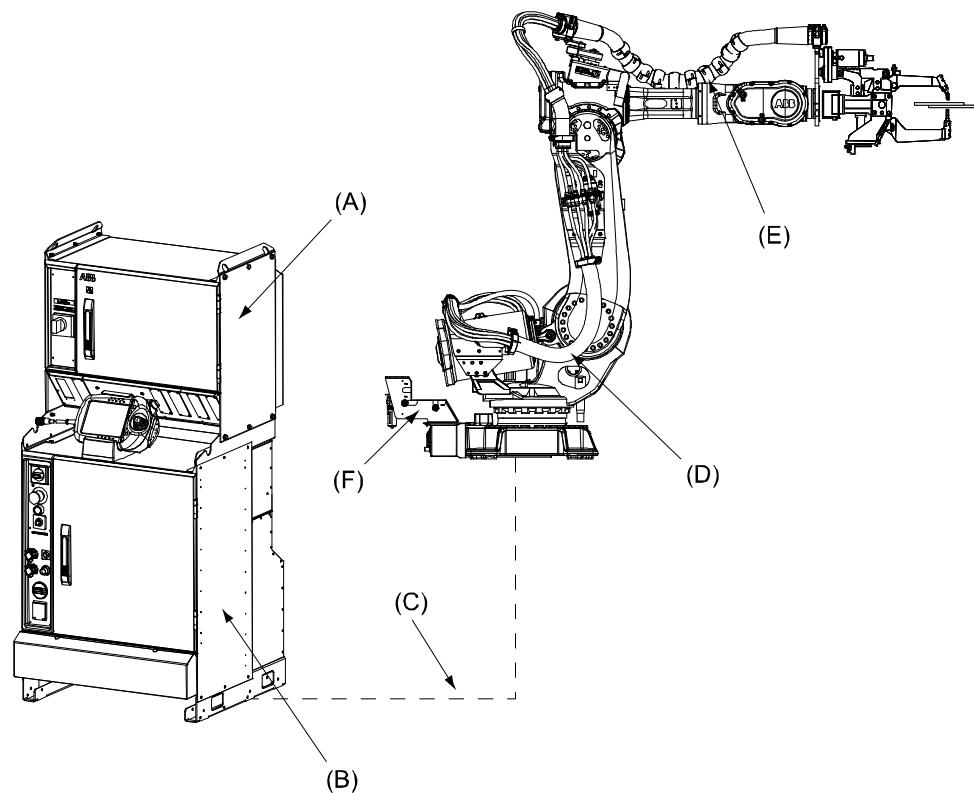


Figure 39 DressPack/Spotpack. (IRB 6600 shown)

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

## 2.1.2 Product range

### DressPack solutions for different user's needs

The robot can be equipped with the well integrated cable and hose packages in the SpotPack or DressPack options. The DressPack is designed in close conjunction with the development of the manipulator and is therefore well synchronized with the robot.

As there is a big span between different user's need of flexibility, depending of the complexity of the operation/wrist movements, there are three major levels of dress pack solutions available, see Figure 40.

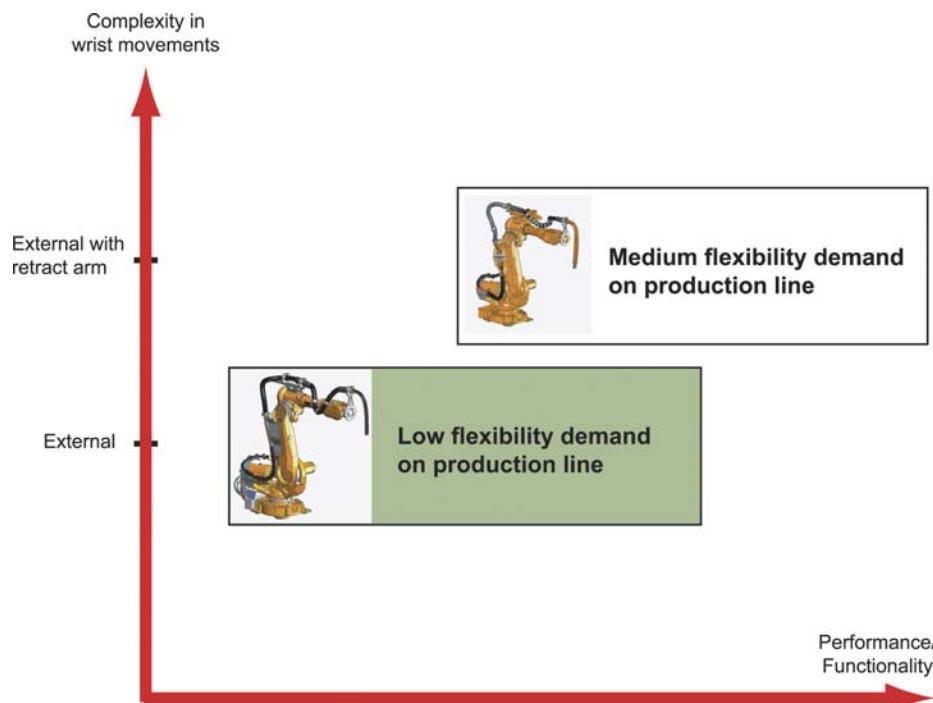


Figure 40 Suitable solutions for different operations.

#### External with retract arm

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

Available option are 798-2, 780-2 for both material handling/spot welding and 781-1 for spot welding.

## **2 SpotPack and DressPack**

---

### **2.1.3 Limitations of robot movements**

#### **External**

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

Available options are 798-1, 780-3 for material handling and 781-2 for spot welding.

### **2.1.3 Limitations of robot movements**

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

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

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

E-mail address: serop.product\_support@se.abb.com



### **2.1.4 Impact on dress pack lifetime**

There are some robot movements/positions that shall be avoided in the robot production program. This will improve the lifetime significantly of external upper arm dress pack and wear parts e.g. protection hose, hose reinforcement and protective sleeves.

- Axis 3 must not be moved backwards more than -90 degrees (valid for 781-2 for spot welding).
- The axis 5 movement is not allowed to press the DressPack against the robot upper arm.
- Combined rotation of the wrist axes must be limited so that the DressPack is not wrapped hard against the upper arm.
- When moving the robot so the DressPack is moved from side to side of the upper arm must sharp turning and whip lashing of the DressPack be avoided. This can be solved by first moving axis 5 forward before rotating axis 4 and/or axis 6 (valid for 781-2 for spot welding).

See the Product Manual for more detailed information and recommended set-up adjustments

## 2.1.5 Chapter Structure

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

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

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

---

### Material Handling application / DressPack

Chapter	Option	Description
2.3	Type H	DressPack for Material Handling.

---

### Spot Welding application / SpotPack and DressPack

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

---

### Connector Kits

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

## 2 SpotPack and DressPack

---

### 2.2.1 Introduction

## 2.2 DressPack

### 2.2.1 Introduction

#### Available DressPack configurations for Material Handling

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

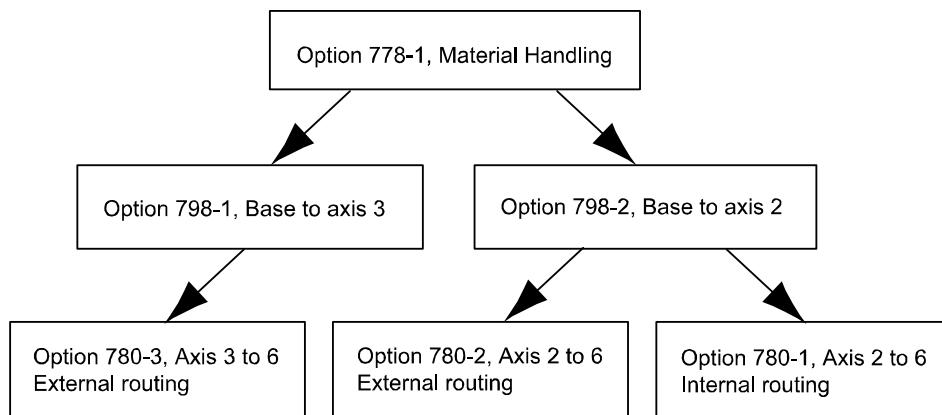


Figure 41 Available options for Material handling.

#### Available DressPack configurations for Spot Welding

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

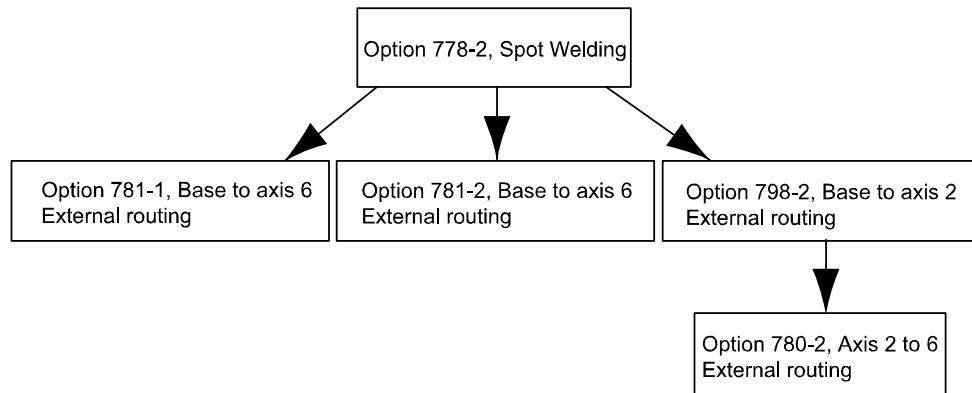


Figure 42 Available options for Spot welding.

**DressPack lower arm**

Figures within chapter 2 show the IRB 6600 instead of the IRB 6650S. Principles and dimensions are equal between IRB 6600 and IRB 6650S.

For the Material Handling application there are two alternative routings for the lower arm, shown below in Figure 43 and Figure 44. This is designed to fit to the upper arm routing.

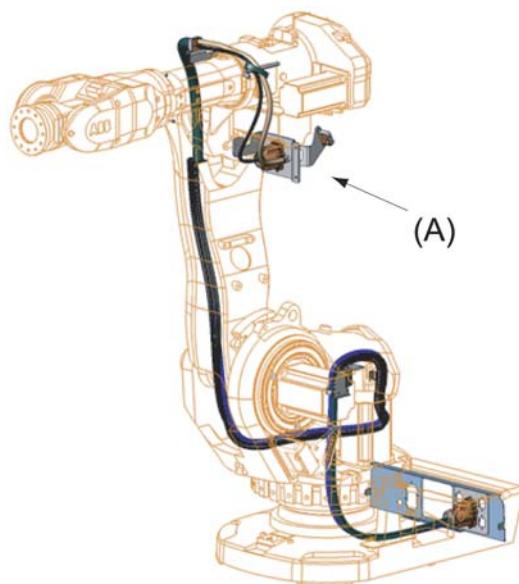


Figure 43 DressPack Lower arm right side view Material Handling (option 778-1 and option 798-1).

Pos	Description
A	Connection point

## 2 SpotPack and DressPack

---

### 2.2.1 Introduction

The routing of the DressPack lower arm for Spot Welding or Material Handling application is shown below in Figure 44. This is designed to fit to the upper arm routing.

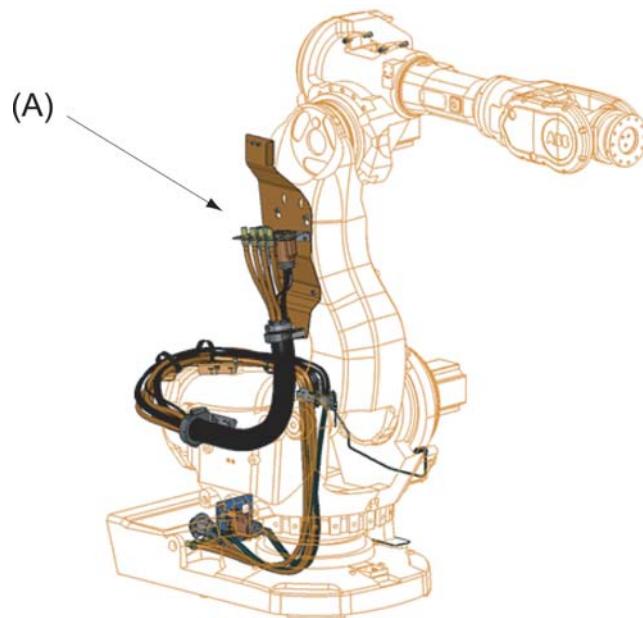


Figure 44 DressPack Lower arm left side view Spot Welding (option 778-1/778-2 and option 798-2). Spot welding application shown above.

Pos	Description
A	Connection point

---

### DressPack Upper arm

There are three alternatives for the Material Handling and two for the Spot Welding application and they are shown in Figure 45 and Figure 46 below.

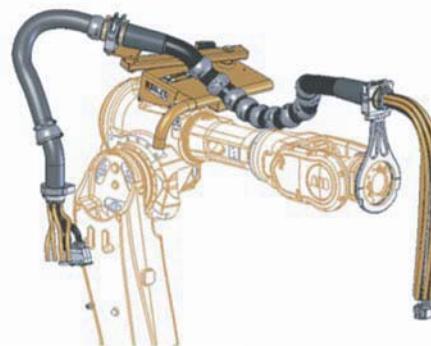


Figure 45 DressPack Upper arm, external with retract arm. Axis 2 to 6, Spot Welding and Material Handling (option 778-1 (778-2), option 780-2 and option 798-2).

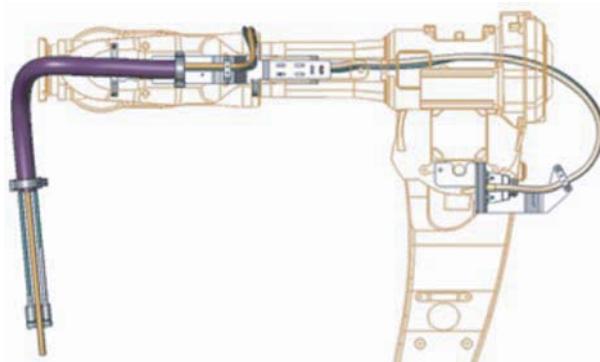


Figure 46 DressPack Upper arm, external. Axis 3 to 6, Material Handling (option 778-1, option 780-3 and option 798-1).

## 2 SpotPack and DressPack

### 2.2.1 Introduction

#### DressPack Upper arm/Lower arm

For Spot Welding application there are two additional alternative available, one without connection point between lower and upper arm and one with connection point only for signals, see Figure 47 and Figure 48.

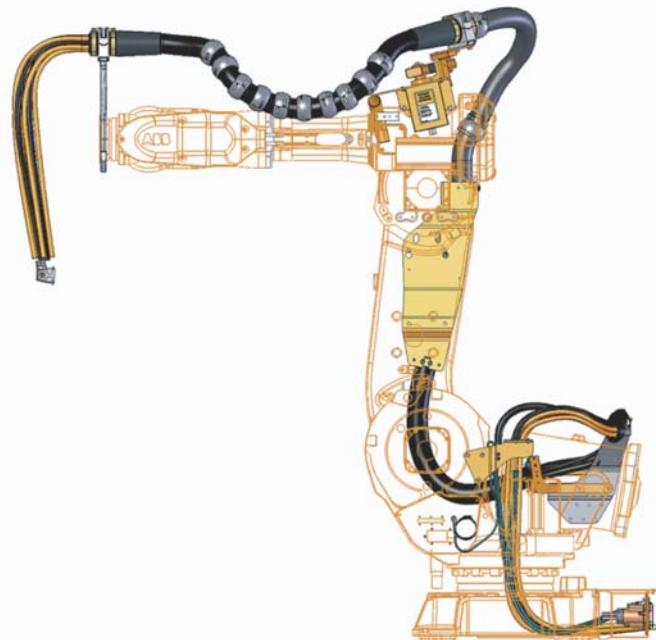


Figure 47 External with retract arm (option 778-2 and option 781-1).

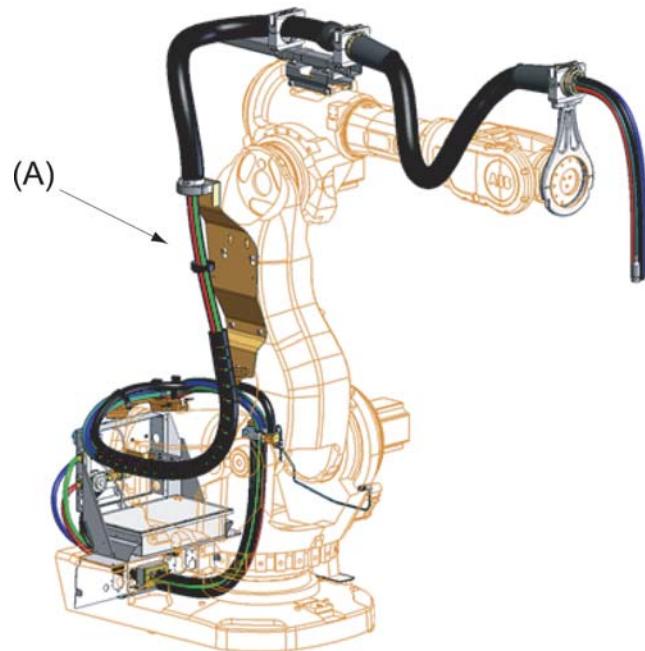


Figure 48 DressPack Upper/Lower arm. External routing for spot welding (option 778-2 and option 781-2).

Pos	Description
A	Connection point for signals

#### 2.2.2 Build-in features for upper arm DressPack

---

##### External

Material handling (option 780-3):

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

Spot welding (option 781-2):

- Adjustable bracket axis 6 with position marking.
- Protection hose can easily be replaced if damaged.
- One version for all IRB 6650S versions.

---

##### External with retract arm

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

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

## 2 SpotPack and DressPack

### 2.2.3 Interface description for DressPack

Below is an overview showing the different dresspack interfaces. For detailed information see the circuit diagram included in the Product Manual DressPack/SpotPack IRB 6600/7600, art No. 3HAC025058-001.

#### 2.2.3.1 Connection at robot base

Material handling (option 798-1 / -2), see Figure 49:

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

Spot welding (option 798-2 and 781-1), see Figure 49:

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

Spot welding (option 781-2), see Figure 50:

- Included are: A, B (if applicable), C and F (Proc 1-4 are to be connected to Water and Air unit).

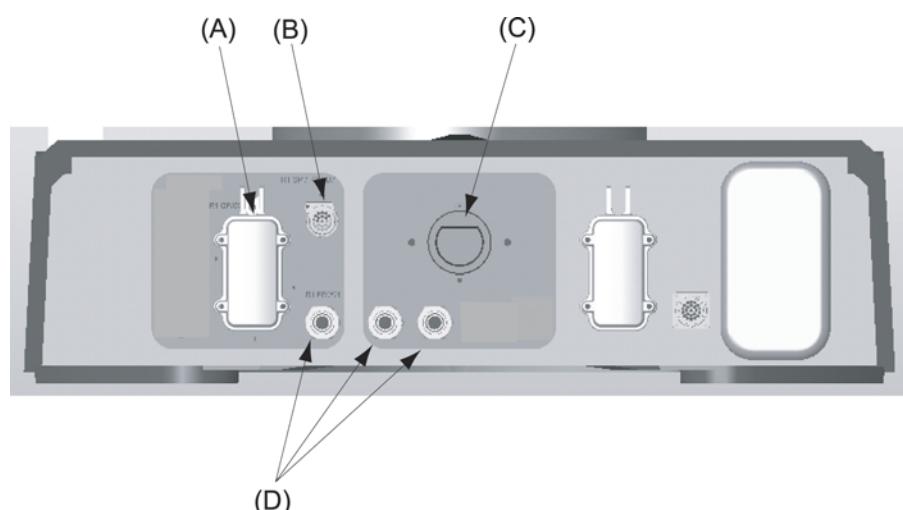


Figure 49 Connection point at base.

For corresponding parts of the tool, see chapter 2.10 Connection kits.

Pos	Description
A	R1.CP/CS
B	R3.FB7 (only for spot welding stationary servo gun) or R1.SP (Spot Welding Servo gun)
C	R1.WELD 3x35mm <sup>2</sup> . (Spot Welding)
D	R1.PROC 1 (Material Handling/Spot Welding 1/2", M22x1.5, 24 degree seal) R1.PROC 2 - 4 (Spot Welding 1/2", M22x1.5, 24 degree seal)

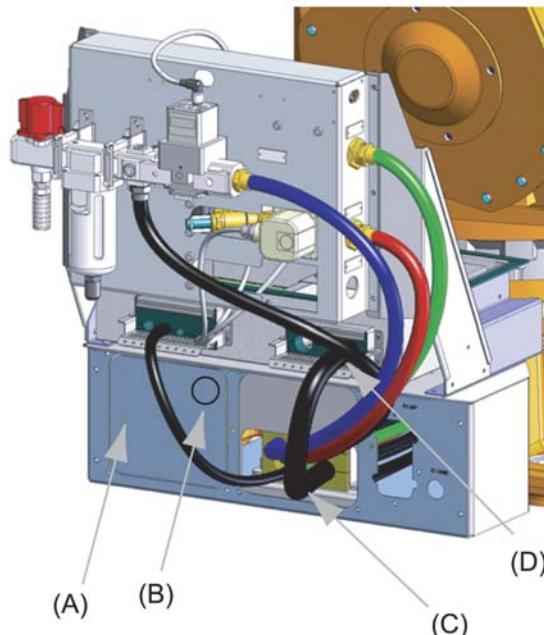


Figure 50 Connection point at base for option 781-2.

Pos	Description
A	R1.CP/CS
B	R1.SP (Spot Welding Servo gun)
C	R1.PROC 1 (Material Handling/Spot Welding 1/2", M22x1.5, 24 degree seal) R1.PROC 2 - 4 (Spot Welding 1/2", M22x1.5, 24 degree seal)
D	R1.WELD 3x25mm <sup>2</sup> . (Spot Welding)

### 2.2.3.2 Connection at axis 6

#### External

Material handling (option 780-3), see Figure 51:

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

The cable ends with a connector, the main parts are described in the list below (for corresponding parts of the tool, see chapter 2.10 Connection kits):

Name	Souriau article No.
Socket connector, R3.CPS	UTOW61832SH
Shrink boot adapter, R3.CPS	UTO18AD
Sockets, R3.CPS	RC18W3k
Socket connector, R3.CBUS	UTOW61419SH
Shrink boot adapter, R3.CBUS	UTO14AD
Sockets, R3.CBUS	SC24W3S25

## 2 SpotPack and DressPack

### 2.2.3 Interface description for DressPack

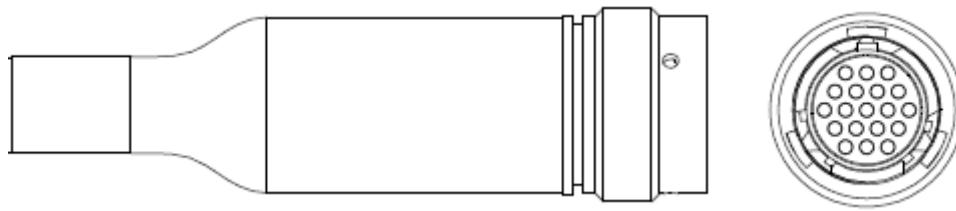


Figure 51 Souriau connector external routing (UTOW61419SH shown).

Spot welding (option 781-2), see Figure 52:

- Hose and cable free length, 1000 mm.
- Hoses and weld power cable end with free end.
- Servo power and feed back cables (option) end with free end.

The customer signal cable end with a connector, the main parts are described in the list below (for corresponding parts of the tool, see chapter 2.10 Connection kits):

Name	Souriau article No.
Socket connector, R3.CPS	UTOW61832SH
Shrink boot adapter, R3.CPS	UTO18AD
Sockets, R3.CPS	RC18W3k

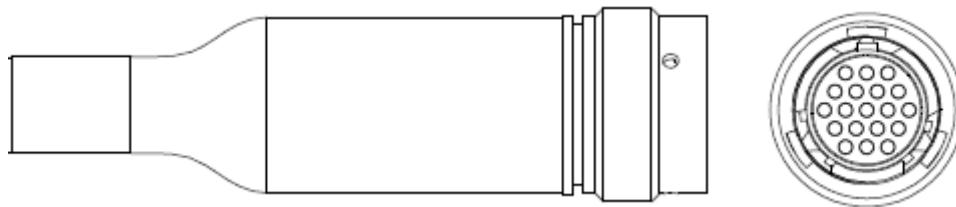


Figure 52 Souriau connector external routing (UTOW61419SH shown)

### External with retract arm

Spot welding/Material handling (option 780-2), see Figure 53:

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

The different main parts within the connector are described in the list below, both with name and Harting article number (for corresponding parts of the tool, see chapter 2.10 Connection kits and within the Harting product offer).

Name	Harting article No.
Hood	09 30 010 0543
Hinged frame, hood	09 14 010 0303
Multicontact, female (HD) (25 pin)	09 14 025 3101
Multicontact, female (EE) (12 pin)	09 14 012 3101
Multicontact, female (DD) (8 pin)	09 14 008 3101

### 2.2.3 Interface description for DressPack

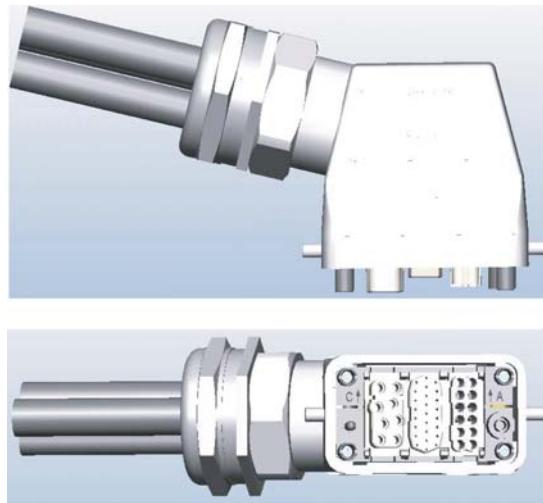


Figure 53 Harting connector external routing

## 2 SpotPack and DressPack

### 2.2.3 Interface description for DressPack

#### Dimensions

Dimensions are shown in Figure 54 to Figure 56.

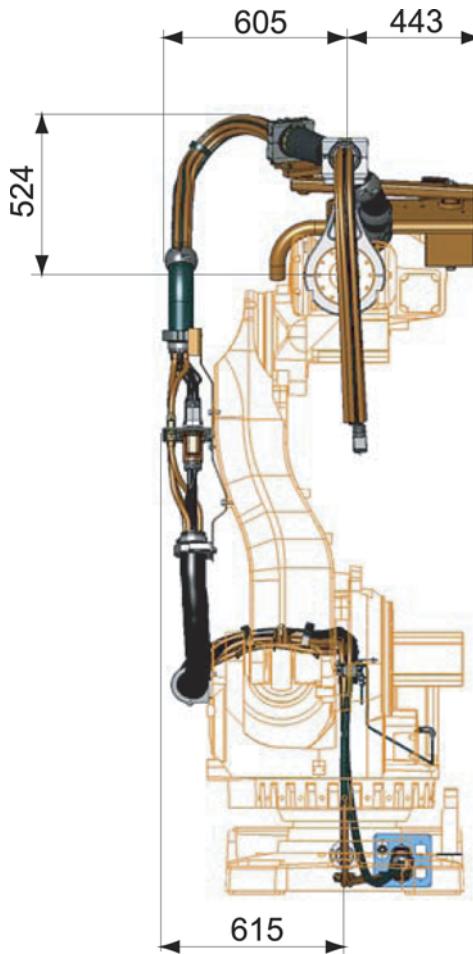


Figure 54 External with retract arm, option 780-2 and 781-1 (Dimensions in mm).

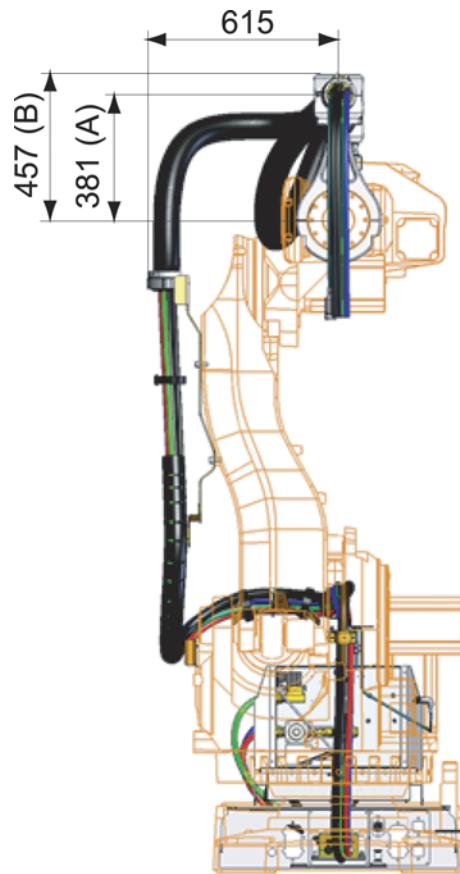


Figure 55 External, 781-2. (Dimensions in mm).

Pos	Description
A	Holder arm house
B	Holder axis 6

## 2 SpotPack and DressPack

### 2.2.3 Interface description for DressPack

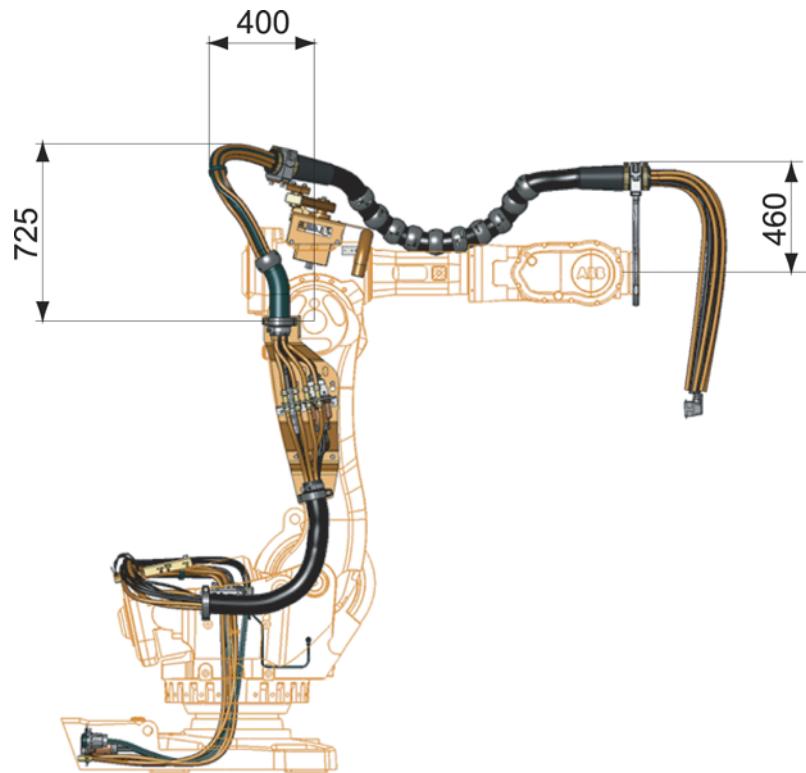


Figure 56 External routing option 780-2 and 781-1 (Dimensions in mm).

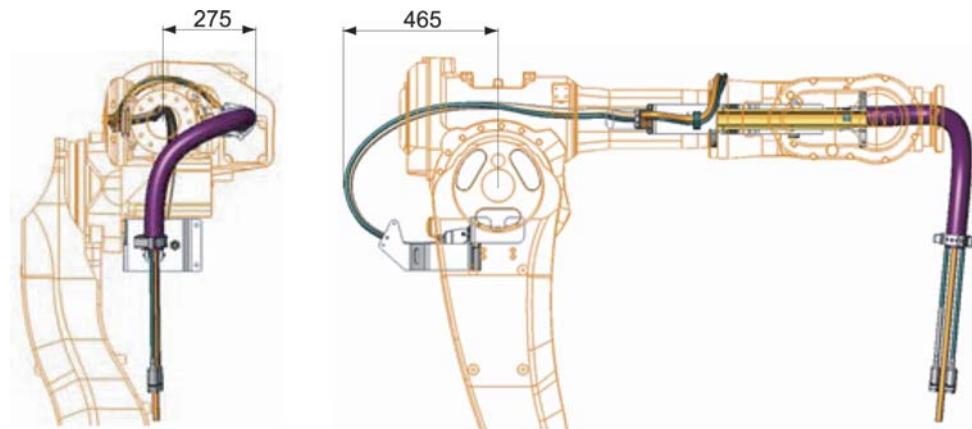


Figure 57 External routing Material Handling, option 798-1 and 780-3 (Dimensions in mm).

## 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 58.

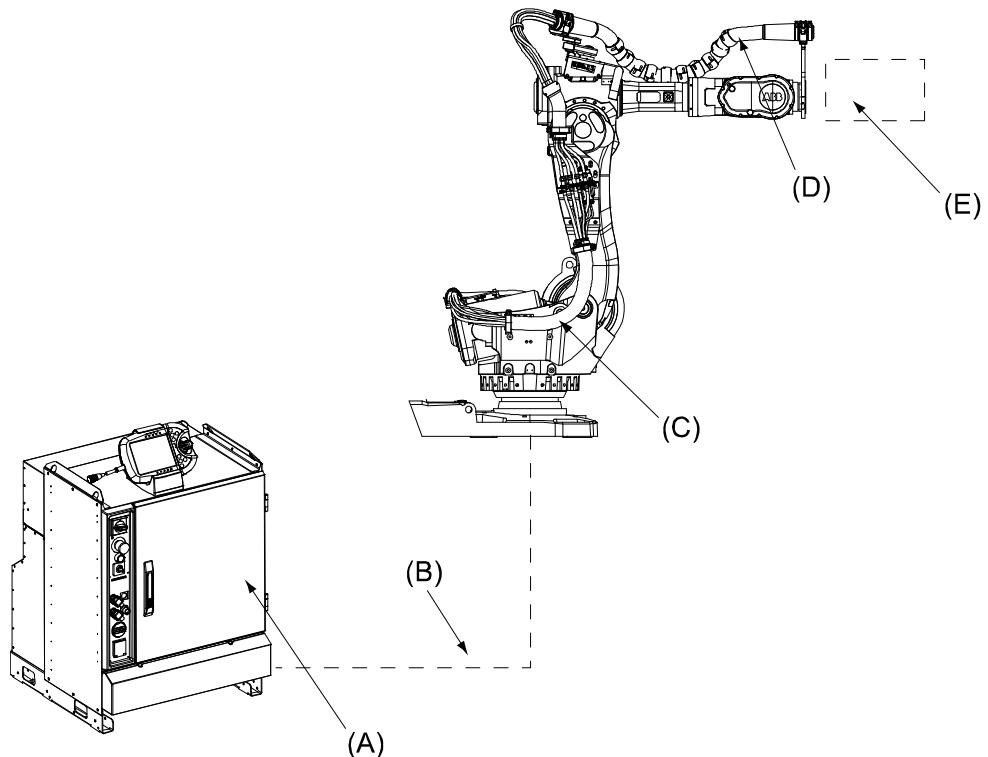


Figure 58 Dresspack configuration.

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

Available configurations with linked option numbers are described below.

## 2 SpotPack and DressPack

---

### 2.3.1 Introduction

#### Option description

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

- Option 778-1. For the application Material Handling.
- Option 798-1. Base to axis 3. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 3.
- Option 798-2. Base to axis 2. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 2.
- Option 780-3 (and option 798-1). Axis 3 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 3 to 6.
- Option 780-2 (and option 798-2). Axis 2 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 2 to 6.

The available alternatives and allowed combinations are shown in the schematic Figure 59 below.

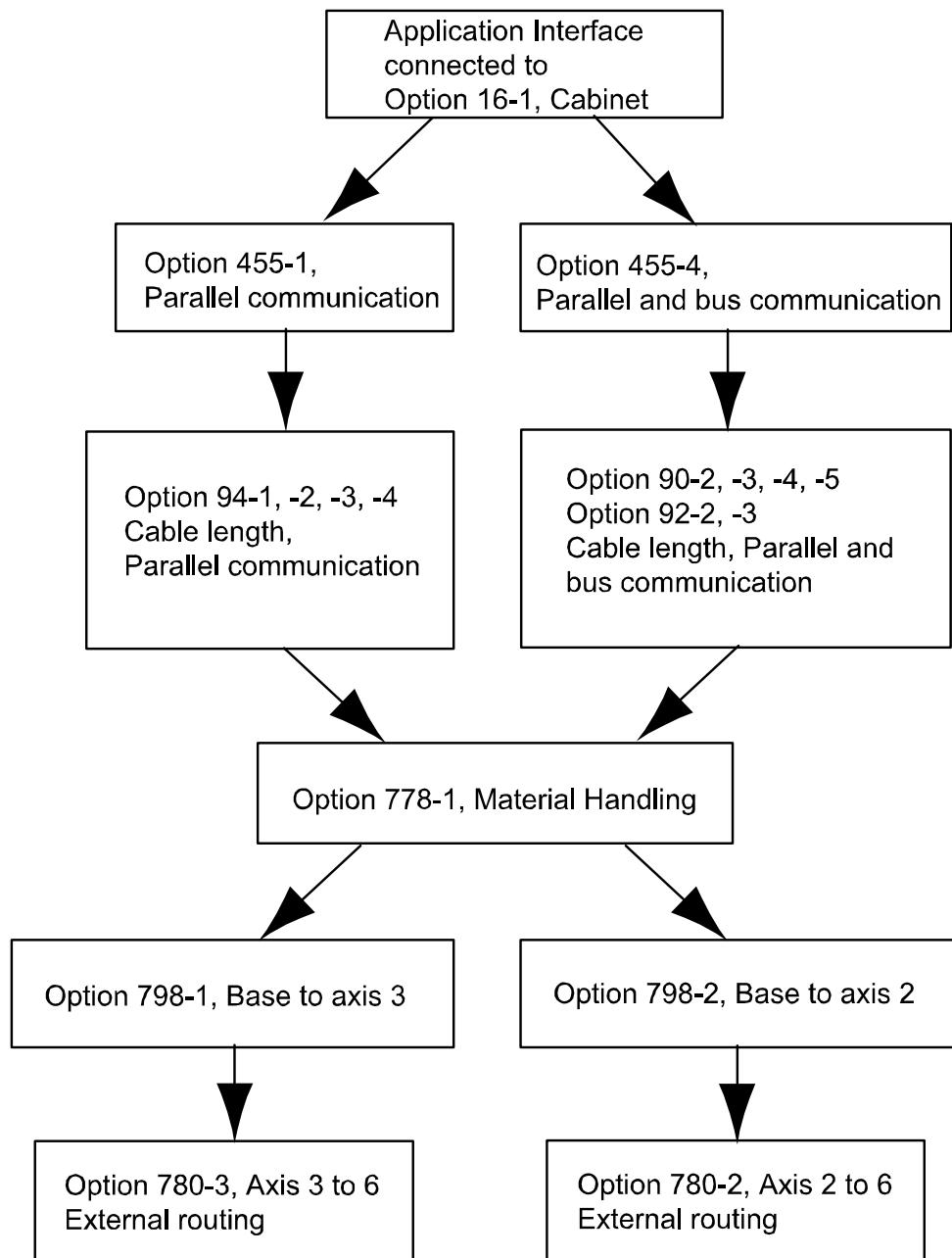


Figure 59 Schematic picture for configuration of DressPack for Material Handling application.

## 2 SpotPack and DressPack

### 2.3.2 Configuration result for Type H

#### 2.3.2 Configuration result for Type H

##### General

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

##### DressPack Type H. Parallel communication

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and option 798-1). External routing

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

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

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

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

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

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing

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

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

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

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

## 2 SpotPack and DressPack

### 2.3.2 Configuration result for Type H

#### DressPack Type H. Parallel and field bus communication, Profibus

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing

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

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

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

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

#### Summary Type H

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

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

## 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 60. Available configurations with linked option numbers are described below.

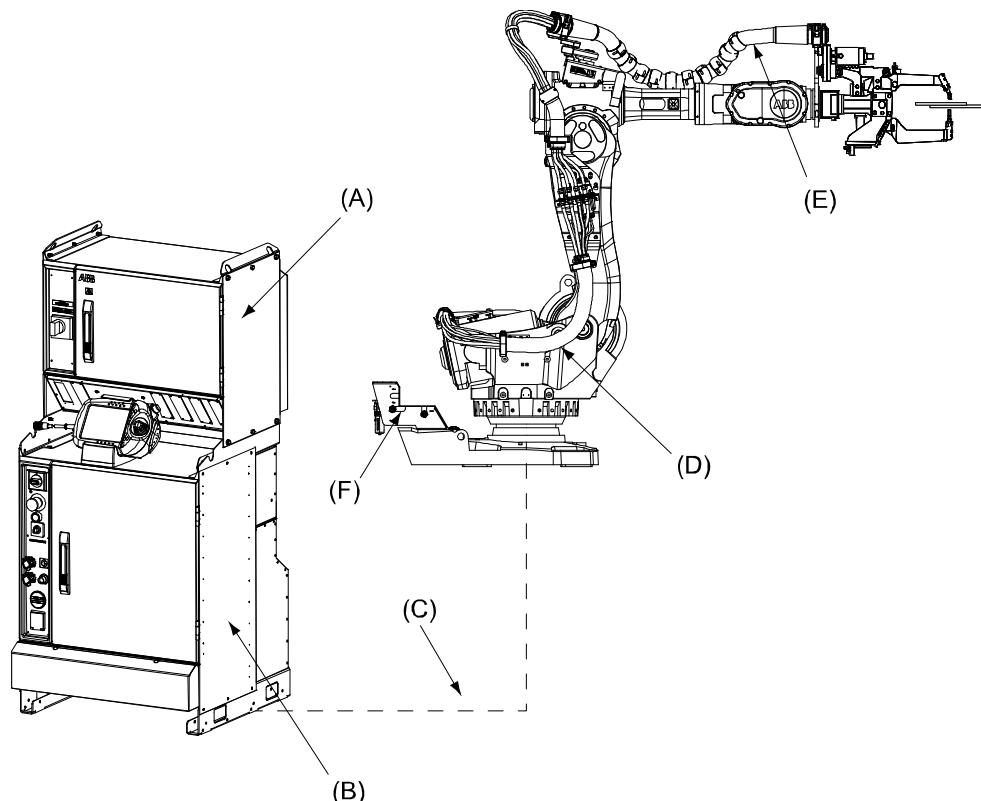


Figure 60 Type S DressPack.

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

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

## 2 SpotPack and DressPack

---

### 2.4.1 Introduction

#### Option Description

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

- Option 778-2. For the application Spot Welding.
- Option 798-2. Base to axis 2. Offers DressPack Lower arm for Spot Welding application with external routing.
- Option 780-2 (and option 798-2). External Axis 2 to 6. Offers DressPack Upper arm for Spot Welding application with external routing.
- Option 781-1 (and option 778-2). External base to axis 6. Offers DressPack Lower and Upper arm external routing without intermediate connection point.
- Option 781-2 (and Option 778-2). External base to axis 6. Offers DressPack Lower and Upper arm external routing with intermediate connection point for signals

The available alternatives and allowed combinations are shown in the schematic Figure 61 below.

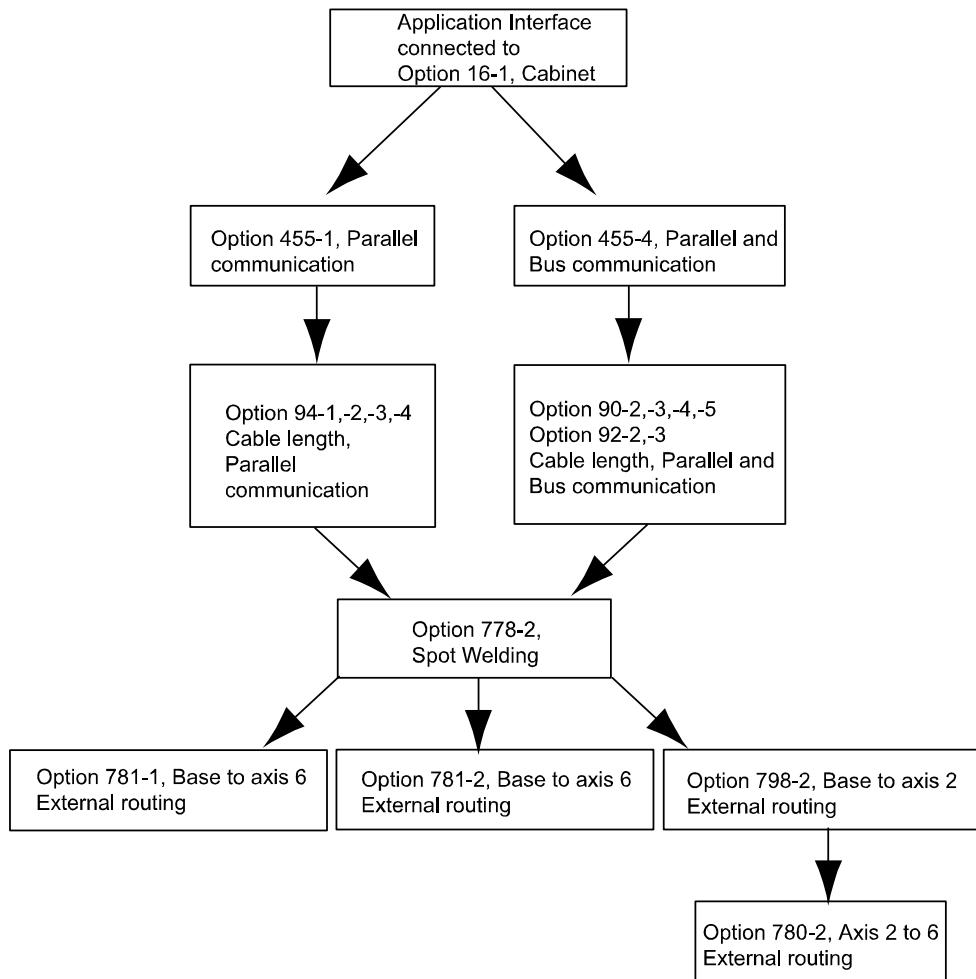


Figure 61 Schematic picture for configuration of DressPack for Spot Welding application.

## 2 SpotPack and DressPack

### 2.4.2 Configuration result for Type S

#### 2.4.2 Configuration result for Type S

##### General

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

##### DressPack Type S. Parallel communication

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

One of the options:

- Option 780-2 (and Option 798-2). External routing, DressPack Upper arm
- Option 781-1 (and Option 778-2). Routing base to axis 6
- Option 781-2 (and Option 778-2). Routing base to axis 6

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

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP) Utility Power <sup>a</sup> Protective earth	2+2  1	2+2  1	0,5 mm <sup>2</sup> 0,5 mm <sup>2</sup>	250 VAC, 5 A rms  250 VAC
Customer Signals (CS) Signals twisted pair <sup>b</sup>	20	20 (10x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Signals twisted pair and separate shielded <sup>c</sup>	8	8 (4x2)	0,24 mm <sup>2</sup>	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 <sup>d</sup>		2	35 mm <sup>2</sup>	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm) <sup>d</sup>		1	35 mm <sup>2</sup>	

a. For option 781-2, 2 signals

b. For option 781-2, 18 signals in cabinet and 12 at base axis 2/3 or axis 6

c. For option 781-2, 0 signals in cabinet and 10 at base axis 2/3 or axis 6

d. For option 781-2, 25 mm<sup>2</sup> instead of 35 mm<sup>2</sup>

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

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 781-1 (and Option 778-2). Routing base to axis 6

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

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP) Utility Power Protective earth	2+2	2+2 1	0,5 mm <sup>2</sup> 1 mm <sup>2</sup>	250 VAC, 5 A rms 250 VAC
Customer signals (CS) Signals twisted pair	20	20 (10x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Customer bus (CBus) Bus signals	At bus board	2	0,14 mm <sup>2</sup>	Can/DeviceNet spec
Bus signals Signals twisted pair	At bus board 6	2 6 (3x2)	0,23 mm <sup>2</sup> 0,14 mm <sup>2</sup>	50 V DC, 1 A rms 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 <sup>2</sup>	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1	35 mm <sup>2</sup>	

## 2 SpotPack and DressPack

### 2.4.2 Configuration result for Type S

---

#### DressPack Type S. Parallel and field bus communication, Profibus

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 781-1 (and Option 778-2). Routing base to axis 6

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

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP) Utility Power Protective earth	2+2	2+2 1	0,5 mm <sup>2</sup> 0,5 mm <sup>2</sup>	250 VAC, 5 A rms 250 VAC
Customer signals (CS) Signals twisted pair	22	22 (11x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Signals twisted pair and separate shielded	8	8 (4x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Customer bus (CBus) Bus signals	At bus board	4	0,14 mm <sup>2</sup>	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm <sup>2</sup>	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 <sup>2</sup>	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1	35 mm <sup>2</sup>	

---

#### Required general options for Type S

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

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

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**Required Spot Welding cabinet options for Type S**

The SpotPack 6650S also requires a Spot Welding cabinet (option 768-3) to perform as intended. There are three different variants (see below) of Spot Welding cabinet available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variant.

All these options are further described under chapter 2.8 Spot Welding cabinet and are also mentioned in this chapter.

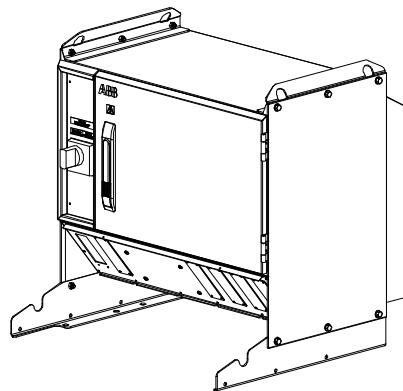


Figure 62 Spot Welding cabinet overview.

Option	Type	Description
782-1	Bosch Basic AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 6100.630L1.
782-2	Bosch Compact AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 610E.
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 2.8 Spot Welding cabinet.

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

## 2 SpotPack and DressPack

### 2.4.2 Configuration result for Type S

Option	Type	Description
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
791-4	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power. Only together with option 781-2.
791-5	Weld power cable, 15 m	Offers floor cable of 7 m length for weld power. Only together with option 781-2.

### Required Water and Air unit options for Type S

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 2.9 Water and Air unit and are also mentioned in this chapter.

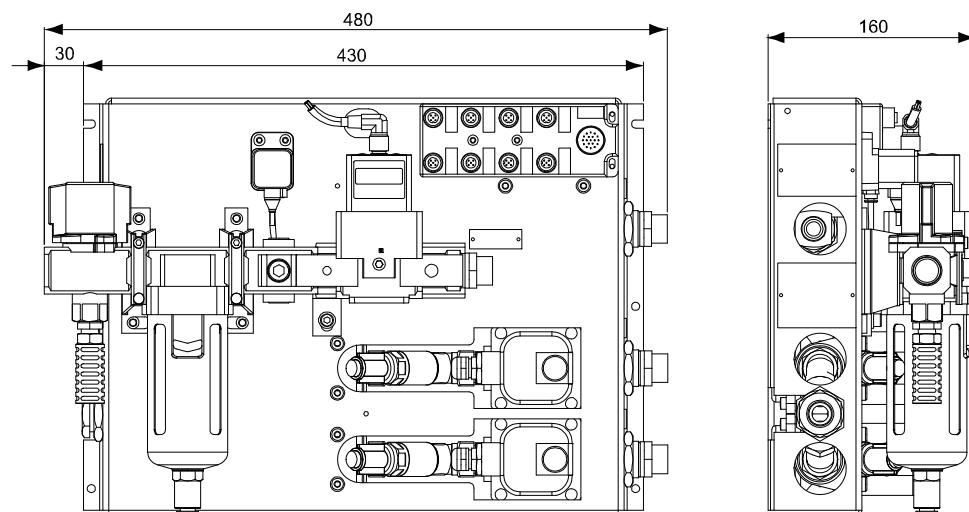


Figure 63 Water and Air unit overview.

Option	Type	Description
792-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
792-6	Water and Air unit, type Sb	Offers the basic water and air unit for type S. Only together with option 781-2.
793-1	Second water return	Offers an additional water return circuit.
796-1	Electrical proportional valve for air	Offers a proportional valve with cables and additional hoses.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.

Option	Type	Description
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.

### 2.4.3 Summary Type S

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

---

#### DressPack

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

Another routing alternative without change over connection point is:

- Option 781-1 or 781-2. Routing base to axis 6

---

#### General options

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

---

#### Spot Welding cabinet

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

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#### Water and air unit

- Option 792-1. Water and air unit, Type S
- Option 792-6. Water and air unit, Type Sb (only for option 781-2)
- Option 797-1. Splitbox cable 7 m. (other lengths available)  
(not together with option 781-2)

Other described options depends on specific system need and performance.

## 2 SpotPack and DressPack

### 2.5.1 Introduction

## 2.5 Type HS

### 2.5.1 Introduction

#### General

Variant Type HS is designed for handling against a stationary mounted Spot Welding pneumatic gun. Included main modules are shown in Figure 64 below. Available configurations with linked option numbers are described below starting at the DressPack.

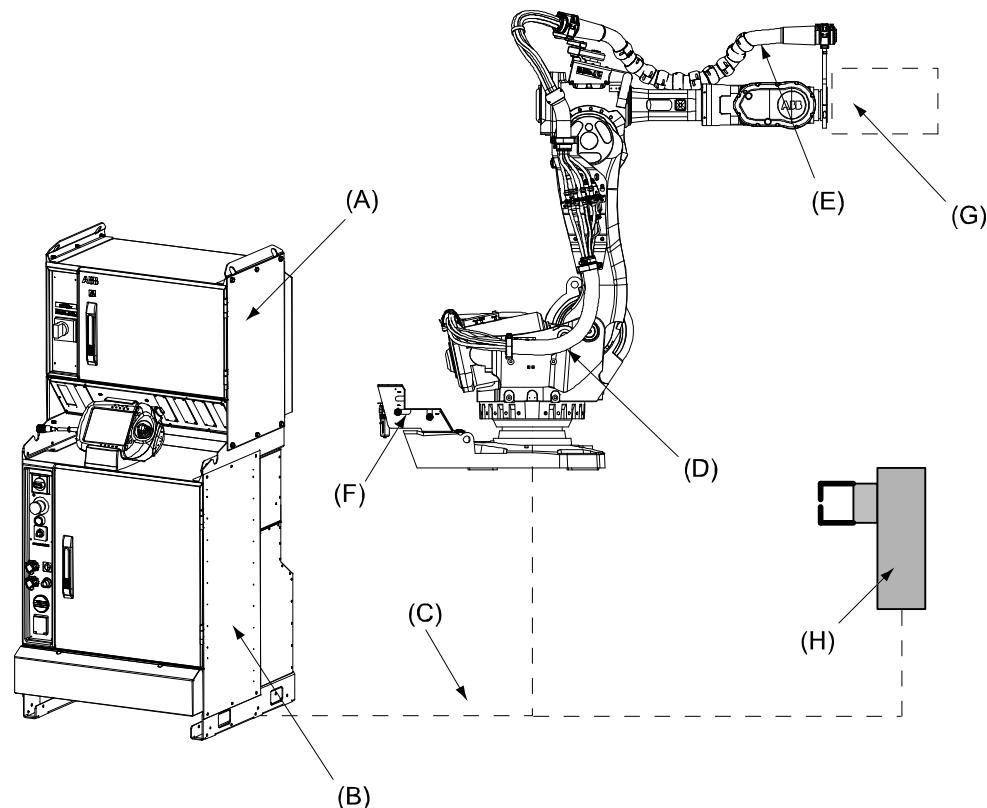


Figure 64 Type HS DressPack.

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

Available configurations with linked option numbers are described below.

#### Option description

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

- Option 778-1. for the application Material Handling.
- Option 798-1. Base to axis 3. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 3.
- Option 798-2. Base to axis 2. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 2.
- Option 780-3 (and option 798-1). Axis 3 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 3 to 6.
- Option 780-2 (and option 798-2). Axis 2 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 2 to 6.

## 2 SpotPack and DressPack

### 2.5.1 Introduction

The available alternatives and allowed combinations are shown in the schematic Figure 65 below.

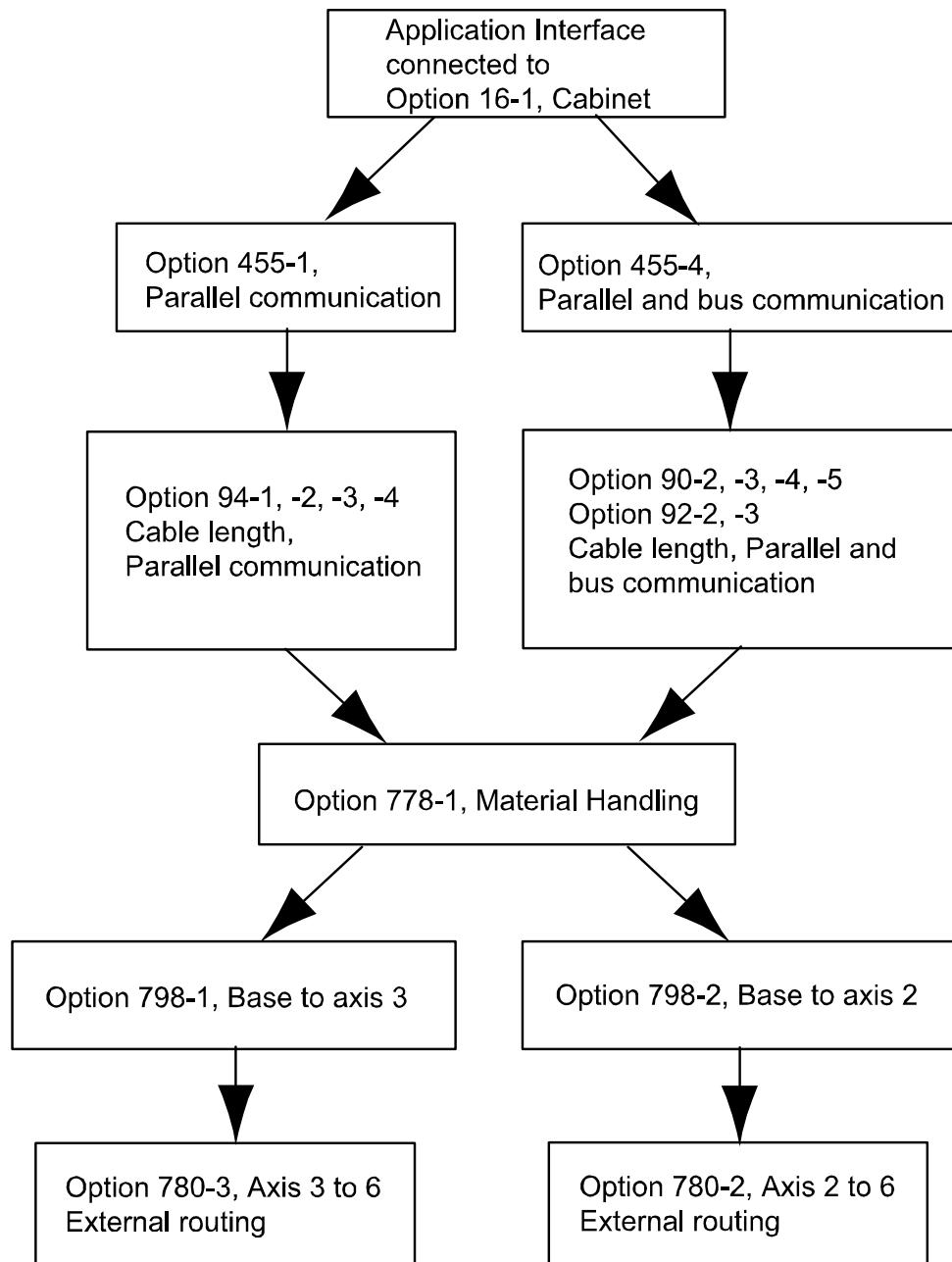


Figure 65 Schematic picture for configuration of DressPack for Material Handling application.

## 2.5.2 Configuration result for Type HS

### General

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

#### DressPack Type HS. Parallel communication

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

## 2 SpotPack and DressPack

### 2.5.2 Configuration result for Type HS

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

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

**DressPack Type HS. Parallel and field bus communication, Profibus**

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

## 2 SpotPack and DressPack

### 2.5.2 Configuration result for Type HS

#### Required general options for Type HS

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

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

#### Required Spot Welding cabinet options for Type HS

The SpotPack IRB 6650S also requires a Spot Welding cabinet (option 768-3) to perform as intended. There are two different variants (see below) of Spot Welding cabinet available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variant. All these options are further described under chapter 2.8 Spot Welding cabinet but are also mentioned in this chapter.

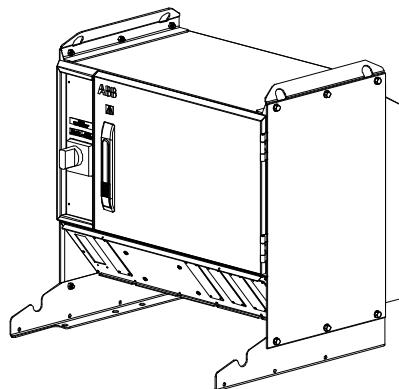


Figure 66 Spot Welding cabinet overview.

Option	Type	Description
782-1	Bosch Basic AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 6100.630L1.
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 2.8 Spot Welding cabinet

Option	Type	Description
788-1	Forced air cooling	Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter.

Option	Type	Description
789-1	Earth fault protection unit	Offers an earth fault protection integrated with the circuit breaker for the weld power.
790-1	Contactor for weld power	Offers a weld contactor with necessary wiring placed inside the Spot Welding cabinet.
791-1	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power.
791-2	Weld power cable, 15 m	Offers floor cable of 15 m length for weld power.
809-1	Process cable to stationary gun, 7 m	Offers floor cable of 7 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-3	Process cable to stationary gun, 22 m	Offers floor cable of 22 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-4	Process cable to stationary gun, 30 m	Offers floor cable of 30 m length for process signals between the Spot Welding cabinet and to the stationary gun.

### 2.5.3 Interface description stationary gun

#### General

The interface towards the stationary gun includes 3 parts.

- Signal interface with a signal connector type modular Harting (Cable option 809-1,-2,-3 or -4). The connector configurations are described in the tables below. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type HS is ordered.
- Power cable with a Multi Contact interface (Cable option 791-1 or option 791-2) (Ending Multi contact type MC TSB 150/35).
- Water and air connections made by the customer directly on the water and air unit. (See chapter 2.9 Water and Air unit)

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

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

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

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

## 2 SpotPack and DressPack

### 2.5.3 Interface description stationary gun

#### Required Water and Air unit options for Type HS

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 2.9 Water and Air unit and are also mentioned in this chapter.

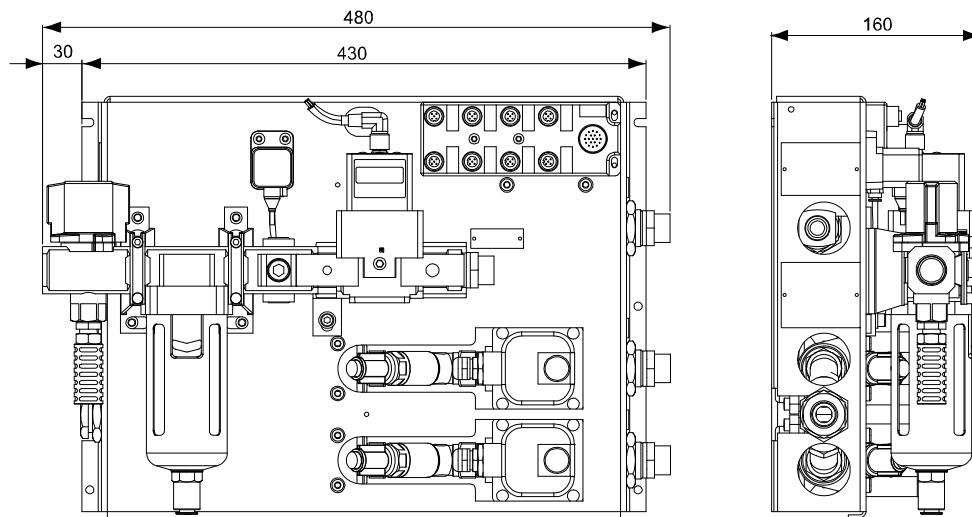


Figure 67 Water and Air unit overview.

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

## 2.5.4 Summary Type HS

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### General

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

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### DressPack

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

---

### General options

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

---

### Spot Welding cabinet

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

---

### Water and air unit

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

Other described options depend on specific system need and performance.

## 2 SpotPack and DressPack

### 2.6.1 Introduction

## 2.6 Type Se

### 2.6.1 Introduction

#### General

Variant Type Se is designed for Spot Welding application with robot handled servo-controlled tool (electrical gun). Included modules are shown in Figure 68. Available configurations with linked option numbers are described below.

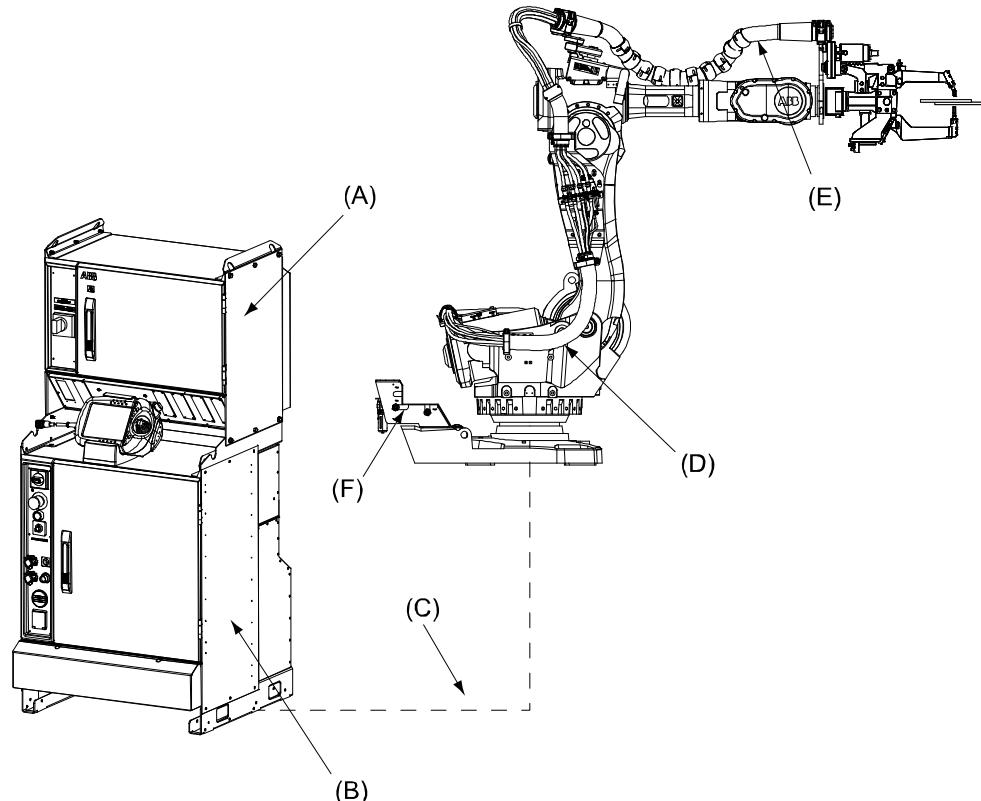


Figure 68 Type Se DressPack.

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

Available configurations with linked option numbers are described below. To achieve the specific servo motor connections within the DressPack option 785-1 Robot gun must also to be chosen. See chapter 1.9.3 Robot Gun for details.

---

**Option description**

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

- Option 778-2. For the application Spot Welding.
- Option 798-2. Base to axis 2. Offers DressPack Lower arm for Spot Welding application with external routing.
- Option 780-2 (and option 798-2). Axis 2 to 6. Offers DressPack Upper arm for Spot Welding application with external routing.
- Option 781-1 (and option 778-2). Base to axis 6. Offers DressPack Lower and Upper arm external routing without intermediate connection point.
- Option 781-2 (and Option 778-2). External base to axis 6. Offers DressPack Lower and Upper arm external routing with intermediate connection point for signals

## 2 SpotPack and DressPack

### 2.6.1 Introduction

The available alternatives and allowed combinations are shown in the schematic Figure 69 below.

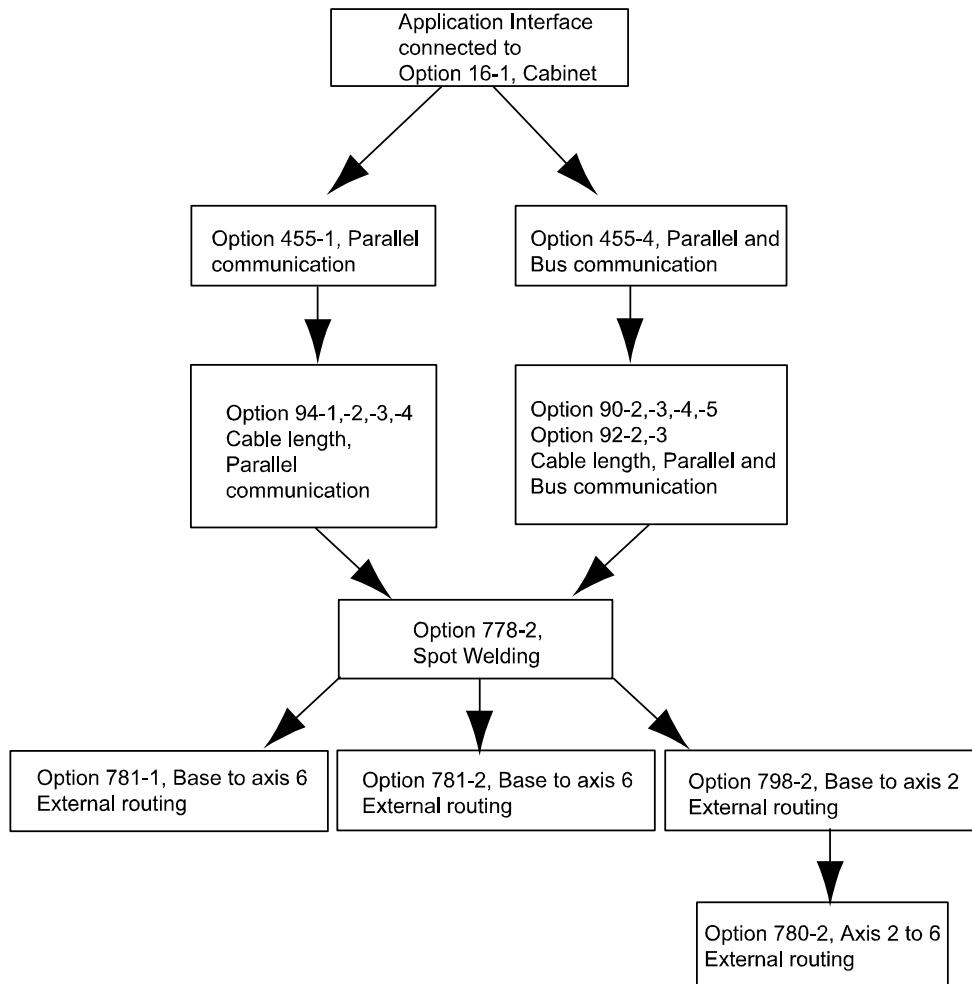


Figure 69 Schematic picture for configuration of DressPack for Spot Welding application.

## 2.6.2 Configuration result for Type Se

### General

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

### DressPack Type Se. Parallel communication

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

One of the options:

- Option 780-2 (and Option 798-2). External routing, DressPack Upper arm
- Option 781-1 (and Option 778-2). Routing base to axis 6
- Option 781-2 (and Option 778-2). Routing base to axis 6

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

Type Se	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP) Utility Power <sup>a</sup> Protective earth	2+2	2+2 1	0,5 mm <sup>2</sup> 0,5 mm <sup>2</sup>	250 VAC, 5 A rms 250 VAC
Customer Signals (CS) Signals twisted pair <sup>b</sup> Signals twisted pair and separate shielded <sup>c</sup>	8 8	8 (4x2) 4 (2x2)	0,24 mm <sup>2</sup> 0,24 mm <sup>2</sup>	50 V DC, 1 A rms 50 V DC, 1 A rms
Servo motor signals Servo motor power	At drive	3	1,5 mm <sup>2</sup>	600 VAC, 12 A rms
Protective earth Signals twisted pair for resolver	At drive -	1 6 <sup>d</sup>	1,5 mm <sup>2</sup> 0,23 mm <sup>2</sup>	600 VAC 50 V DC, 1 A rms
Brake Temperature control/PTC	-	2 2	0,23 mm <sup>2</sup> 0,23 mm <sup>2</sup>	50 V DC, 1 A rms 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

## **2 SpotPack and DressPack**

---

### 2.6.2 Configuration result for Type Se

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

- a. For option 781-2, 2 signals
- b. For option 781-2, 18 signals in cabinet and 12 at base axis 2/3 or axis 6
- c. For option 781-2, 0 signals in cabinet and 10 at base axis 2/3 or axis 6
- d. Interface only at axis 3 or axis 6.
- e. For option 781-2, 25 mm<sup>2</sup> instead of 35 mm<sup>2</sup>

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

- Option 16-1 with Connection to cabinet  
(Option 90-2,-3, -5, -6 to specify cable length)
- Option 455-4. Parallel and bus communication
- Option 778-2. Spot Welding
- Option 798-2. External routing, DressPack Lower arm

One of the options:

- Option 780-2 (and Option 798-2). External routing, DressPack Upper arm
- Option 781-1 (and Option 778-2). Routing base to axis 6

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

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP) Utility Power Protective earth	2+2	2+2 1	0,5 mm <sup>2</sup> 0,5 mm <sup>2</sup>	250 VAC, 5 A rms 250 VAC
Customer signals (CS) Signals twisted pair Signals twisted pair and separate shielded	14 4	14 (7x2) 4 (2x2)	0,24 mm <sup>2</sup> 0,24 mm <sup>2</sup>	50 V DC, 1 A rms 50 V DC, 1 A rms
Customer bus (CBus) Bus signals Bus signals Signals twisted pair	At bus board At bus board 6	2 2 6 (3x2)	0,14 mm <sup>2</sup> 0,23 mm <sup>2</sup> 0,14 mm <sup>2</sup>	Can/DeviceNet spec 50 V DC, 1 A rms 50 V DC, 1 A rms
Servo motor signals Servo motor power Protective earth Signals twisted pair for resolver Brake Temperature control/PTC	At drive At drive - - -	3 1 6 <sup>a</sup> 2 2	1,5 mm <sup>2</sup> 1,5 mm <sup>2</sup> 0,23 mm <sup>2</sup> 0,23 mm <sup>2</sup> 0,23 mm <sup>2</sup>	600 VAC, 12 A rms 600 VAC 50 V DC, 1 A rms 50 V DC, 1 A rms 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 <sup>2</sup>	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1	35 mm <sup>2</sup>	

a. Interface only at axis 3 or axis 6.

## 2 SpotPack and DressPack

### 2.6.2 Configuration result for Type Se

#### DressPack Type Se. Parallel and field bus communication, Profibus

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

One of the options:

- Option 780-2 (and Option 798-2). External routing, DressPack Upper arm
- Option 781-1 (and Option 778-2). Routing base to axis 6

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

Type	At terminals in cabinet	At connection point. Base, axis 2/3 or axis 6	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	1+1	1+1	0,5 mm <sup>2</sup>	250 VAC, 5 A rms
Protective earth		1	0,5 mm <sup>2</sup>	250 VAC
Customer signals (CS)				
Signals twisted pair	8	8 (4x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,24 mm <sup>2</sup>	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	4	0,14 mm <sup>2</sup>	Profibus 12 Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm <sup>2</sup>	50 V DC, 1 A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm <sup>2</sup>	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm <sup>2</sup>	600 VAC
Signals twisted pair for resolver	-	6 <sup>a</sup>	0,23 mm <sup>2</sup>	50 V DC, 1 A rms
Brake	-	2	0,23 mm <sup>2</sup>	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm <sup>2</sup>	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 <sup>2</sup>	600 VAC, 150 A rms at 20°C (68°F)
Protective earth (Lower and Upper arm)		1	35 mm <sup>2</sup>	

a. Interface only at axis 3 or axis 6.

---

#### Required general options for Type Se

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

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

---

#### Required options for servo gun

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

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

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

## 2 SpotPack and DressPack

### 2.6.2 Configuration result for Type Se

#### Required Spot Welding cabinet options for Type Se

The SpotPack IRB 6650S also requires a Spot Welding cabinet (option 768-3) to perform as intended. There are three different variants (see below) of Spot Welding cabinets available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each cabinet variant. All these options are further described under chapter 2.8 Spot Welding cabinet and are also mentioned in this chapter.

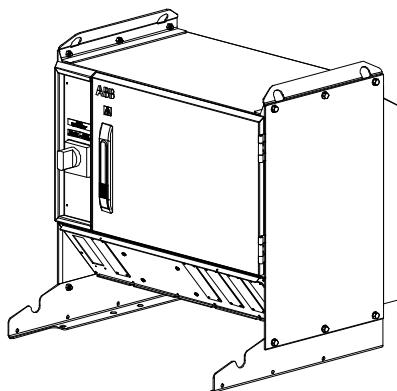


Figure 70 Spot Welding cabinet overview.

Option	Type	Description
782-1	Bosch Basic AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 6100.630L1.
782-2	Bosch Compact AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 610E.
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 2.8 Spot Welding cabinet

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

Option	Type	Description
791-4	Weld power cable, 7 m	Offers floor cable of 7 m length for weld power. Only together with option 781-2.
791-5	Weld power cable, 15 m	Offers floor cable of 7 m length for weld power. Only together with option 781-2.

#### Required Water and Air unit options for Type Se

The SpotPack IRB 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapter 2.9 Water and Air unit and are also mentioned in this chapter.

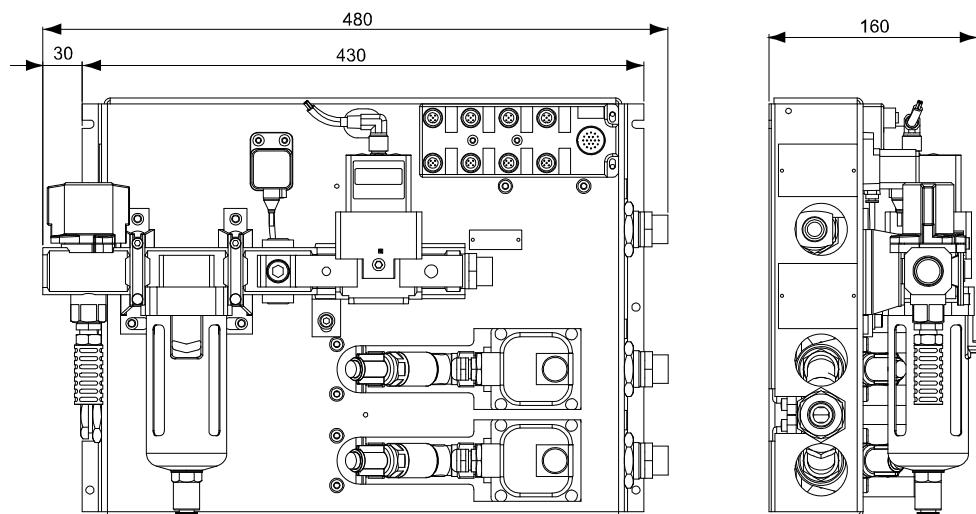


Figure 71 Water and Air unit overview.

Option	Type	Description
792-1	Water and Air unit, type S	Offers the basic water and air unit for type S including splitbox for signal distribution.
792-6	Water and Air unit, type Sb	Offers the basic water and air unit for type S. Only together with option 781-2.
793-1	Second water return	Offers an additional water return circuit.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for signals between the Spot Welding cabinet and to the split box placed on the water and air unit.

## **2 SpotPack and DressPack**

---

### 2.6.3 Summary Type Se

#### **2.6.3 Summary Type Se**

---

##### **General**

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

---

##### **DressPack**

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

Another routing alternative without change over connection point is:

- Option 781-1 or 781-2 (and Option 778-2). Routing base to axis 6

See chapter 1.10.3 Robot Gun for further drive details.



---

##### **General options**

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

---

##### **Required options for servo gun**

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

---

##### **Spot Welding cabinet**

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

---

##### **Water and air unit**

- Option 792-1. Water and air unit, Type S
- Option 792-6. Water and air unit, Type Sb (only for option 781-2)
- Option 797-1. Splitbox cable 7 m (other length available)  
(not together with option 781-2)

Other described options depend on specific system need and performance.

## 2.7 Type HSe

### 2.7.1 Introduction

#### General

Variant Type HSe is designed for handling against a stationary mounted Spot Welding servo controlled tool (electrical gun). Included main modules are shown in Figure 72 below. Available configurations with linked option numbers are described below with starting with the DressPack.

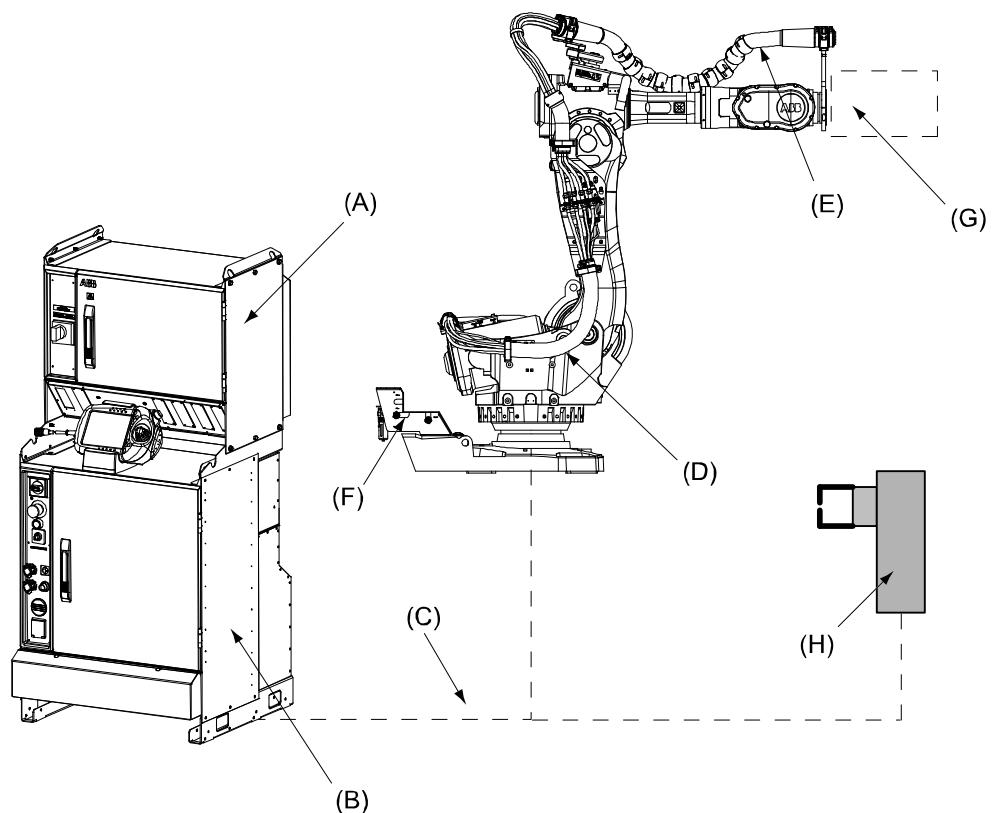


Figure 72 Type HSe DressPack.

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

## 2 SpotPack and DressPack

---

### 2.7.1 Introduction

Available configurations with linked option numbers are described below.

#### Option description

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

- Option 778-1. for the application Material Handling.
- Option 798-1. Base to axis 3. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 3.
- Option 798-2. Base to axis 2. Offers DressPack Lower arm for Material Handling application with internal routing from base to axis 2.
- Option 780-3 (and option 798-1). Axis 3 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 3 to 6.
- Option 780-2 (and option 798-2). Axis 2 to 6. Offers DressPack upper arm for Material Handling application with external routing from axis 2 to 6.

The available alternatives and allowed combinations are shown in the schematic Figure 73 below.

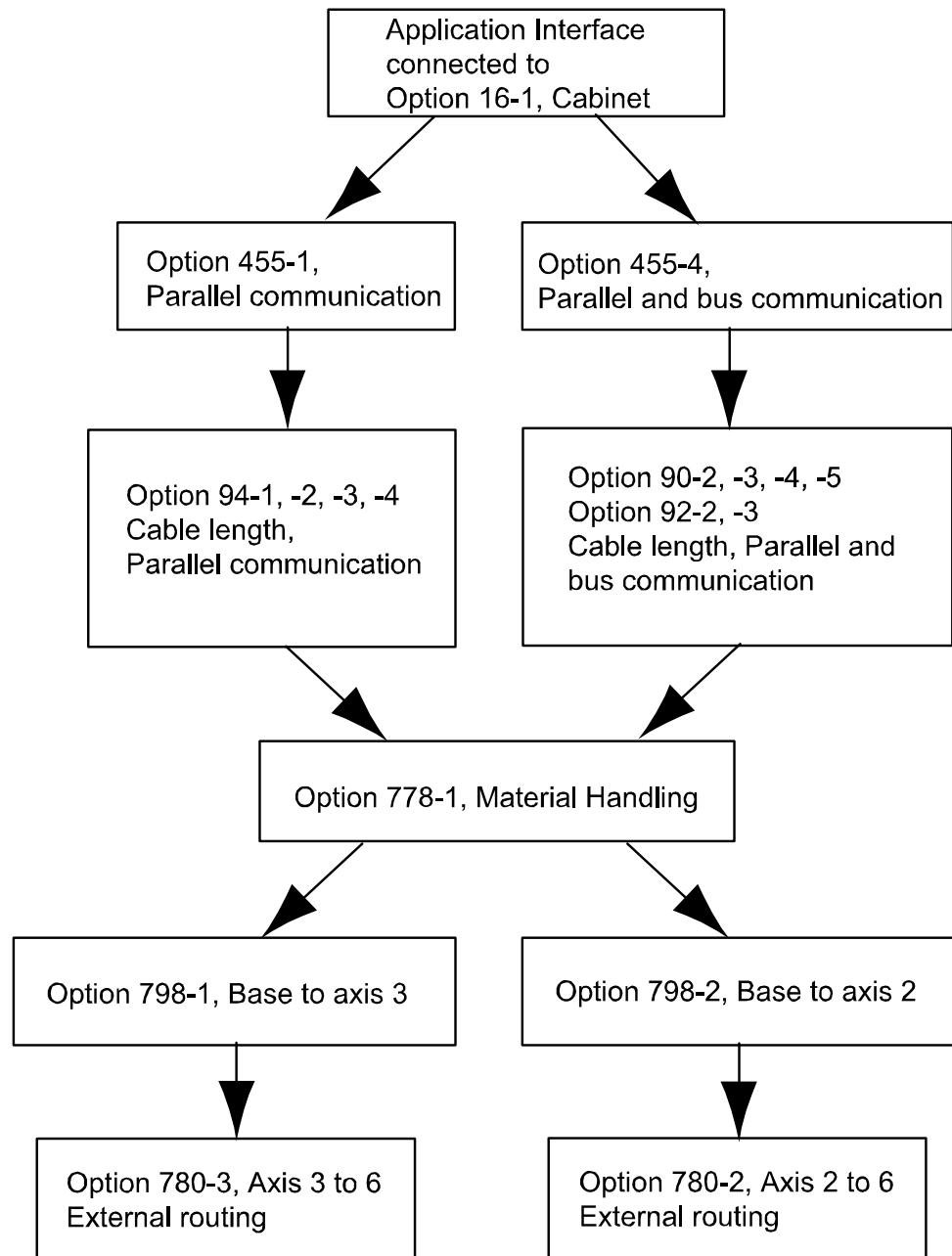


Figure 73 Schematic picture for configuration of DressPack for Material Handling application.

## 2 SpotPack and DressPack

### 2.7.2 Configuration result for Type HSe

#### 2.7.2 Configuration result for Type HSe

##### General

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

##### DressPack Type HSe. Parallel communication

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

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

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

## 2 SpotPack and DressPack

### 2.7.2 Configuration result for Type HSe

#### DressPack Type HSe. Parallel and field bus communication, Profibus

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

One of the options:

- Option 780-2 (and Option 798-2). External routing
- Option 780-3 (and Option 798-1). External routing, DressPack Upper arm

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

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

a. Not included in option 780-3.

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

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

---

#### Required general options for Type HSe

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

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

---

#### Required options for servo gun

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

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

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

## 2 SpotPack and DressPack

### 2.7.2 Configuration result for Type HSe

#### Required Spot Welding cabinet options for Type HSe

The SpotPack 6650S also requires a Spot Welding cabinet (option 768-3) to perform as intended. There are two different variants (see below) of Spot Welding cabinets available. Weld timer brand and weld capacity are stated by choosing one of the optional variants. Additional features could then be added to each of the cabinet variants. All these options are further described under chapter 2.8 Spot Welding cabinet and are also mentioned in this chapter.

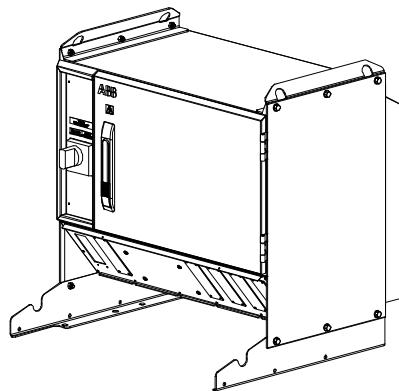


Figure 74 Spot Welding cabinet overview.

Option	Type	Description
782-1	Bosch Basic AC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated AC-thyristor with basic capacity. Type Bosch PST 6100.630L1.
782-7	Bosch Basic MFDC	This option gives a basic Spot Welding cabinet equipped with a weld timer from Bosch with an integrated inverter with basic capacity. Type Bosch PSI 6100.630L1.

Additional options to the different Spot Welding cabinets are mentioned below. For further technical details as well as restrictions in combinations see chapter 2.8 Spot Welding cabinet.

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

Option	Type	Description
809-2	Process cable to stationary gun, 15 m	Offers floor cable of 15 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-3	Process cable to stationary gun, 22 m	Offers floor cable of 22 m length for process signals between the Spot Welding cabinet and to the stationary gun.
809-4	Process cable to stationary gun, 30 m	Offers floor cable of 30 m length for process signals between the Spot Welding cabinet and to the stationary gun.

## 2.7.3 Interface description stationary gun

### General

The interface towards the stationary gun includes 5 parts.

- Servo power cable (option 786-1,-2,-3 or -4). Cable goes from robot control cabinet to stationary gun and ends with a 23 pin Souriau connector (Type UT 061823SH)
- Resolver signal cable, 7 m length (included in option 785-5). Cable goes from robot foot R3.FB7 to stationary gun and ends with a 8 pin Souriau connector (Type UT 06128SH)
- Signal interface with a signal connector type modular Harting (Cable option 809-1,-2,-3 or -4). The connector configurations are described in the tables below. Signals with (parentheses) are to be connected by customer. Other signals are connected if a complete SpotPack Type HS is ordered
- Power cable with a Multi Contact interface (Cable option 791-1 or option 791-2) (Ending Multi contact Type MC TSB 150/35)
- Water and air connections made by the customer directly on the water and air unit

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

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

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

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

## 2 SpotPack and DressPack

### 2.7.3 Interface description stationary gun

#### Required Water and Air unit options for Type HSe

The SpotPack 6650S also requires Water and Air unit options to perform as intended. These options are further described under chapters 2.9 Water and Air unit and are also mentioned in this chapter.

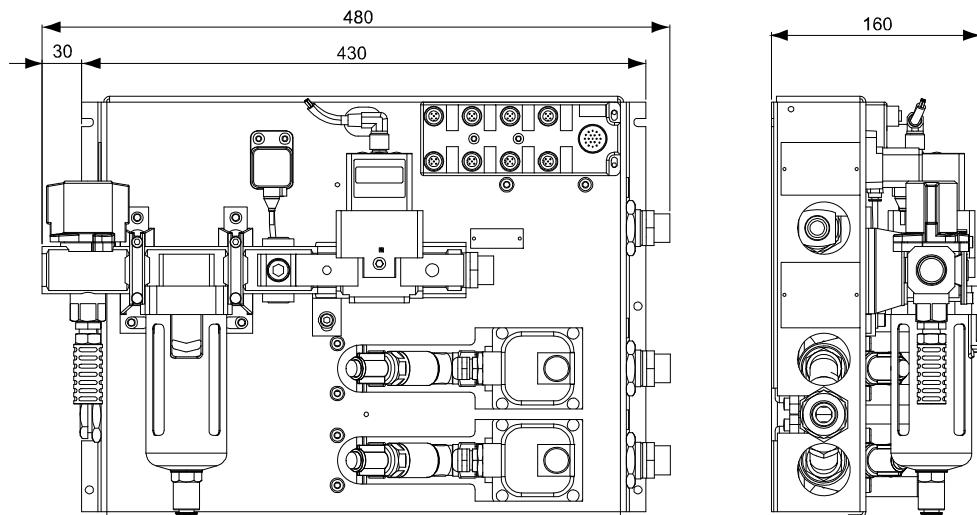


Figure 75 Water and Air unit overview.

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

#### 2.7.4 Summary Type HSe

---

##### DressPack

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

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

---

##### General options

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

---

##### Required options for servo gun

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

---

##### Spot Welding cabinet

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

---

##### Water and air unit

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

Other described options depend on specific system need and performance.

### 2.8.1 Introduction

## 2.8 Spot Welding cabinet

### 2.8.1 Introduction

#### General

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

The Spot Welding cabinet is designed to be placed on top of the robot controller cabinet (Single cabinet version option 700-3), see Figure 76 below. This is also how it is assembled at delivery.

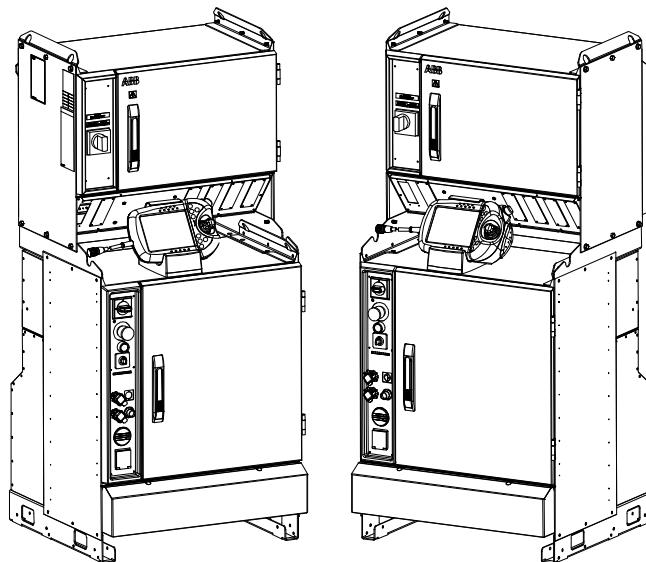


Figure 76 Spot Welding cabinet with robot controller cabinet.

There are interface cables between the robot control cabinet and the Spot Welding cabinet (cable length 1,5 m, connected at rear of the control cabinet and at front of Spot Welding cabinet). These cables includes power feeding for control circuits, process signals to the welding gun, safety signals, communication towards weld timer and I/O:s for indication and control. Depending on chosen options wiring will differ (see option descriptions below for further details).

The Spot Welding cabinet has the following common main features.

- Modular built for easy repair and installation (see Figure 77 below)
- Rotary switch with adjustable thermal release (not for UL option) and short circuit release
- Cross connection of signal handling with separate fusing for different circuits to achieve selectivity
- Programmable weld timer with proportional valve control
- A compact cabinet family based on a common platform prepared for additional options and for easy exchange

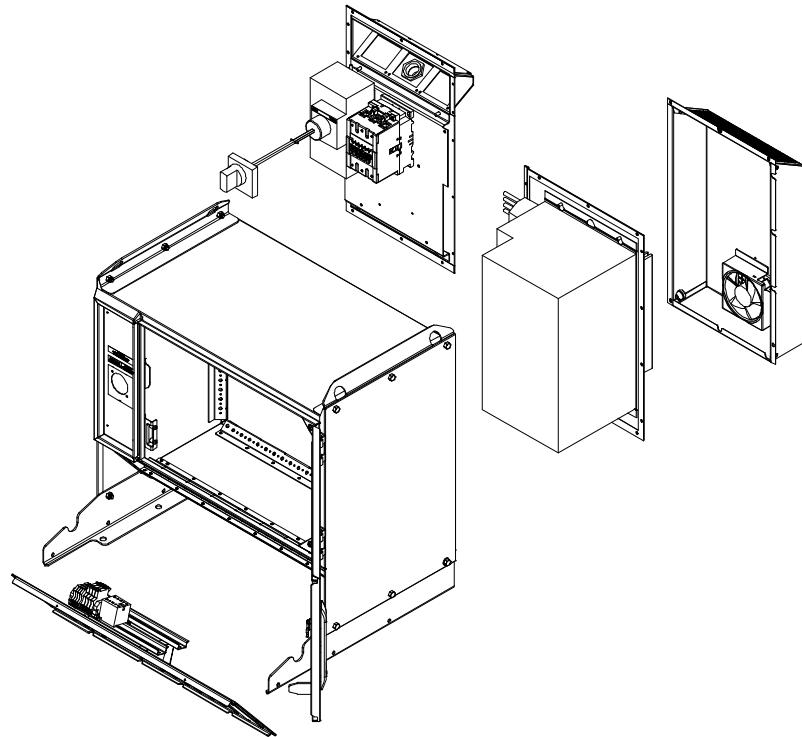


Figure 77 Exploded view drawing of the Spot Welding cabinet.

## 2 SpotPack and DressPack

### 2.8.1 Introduction

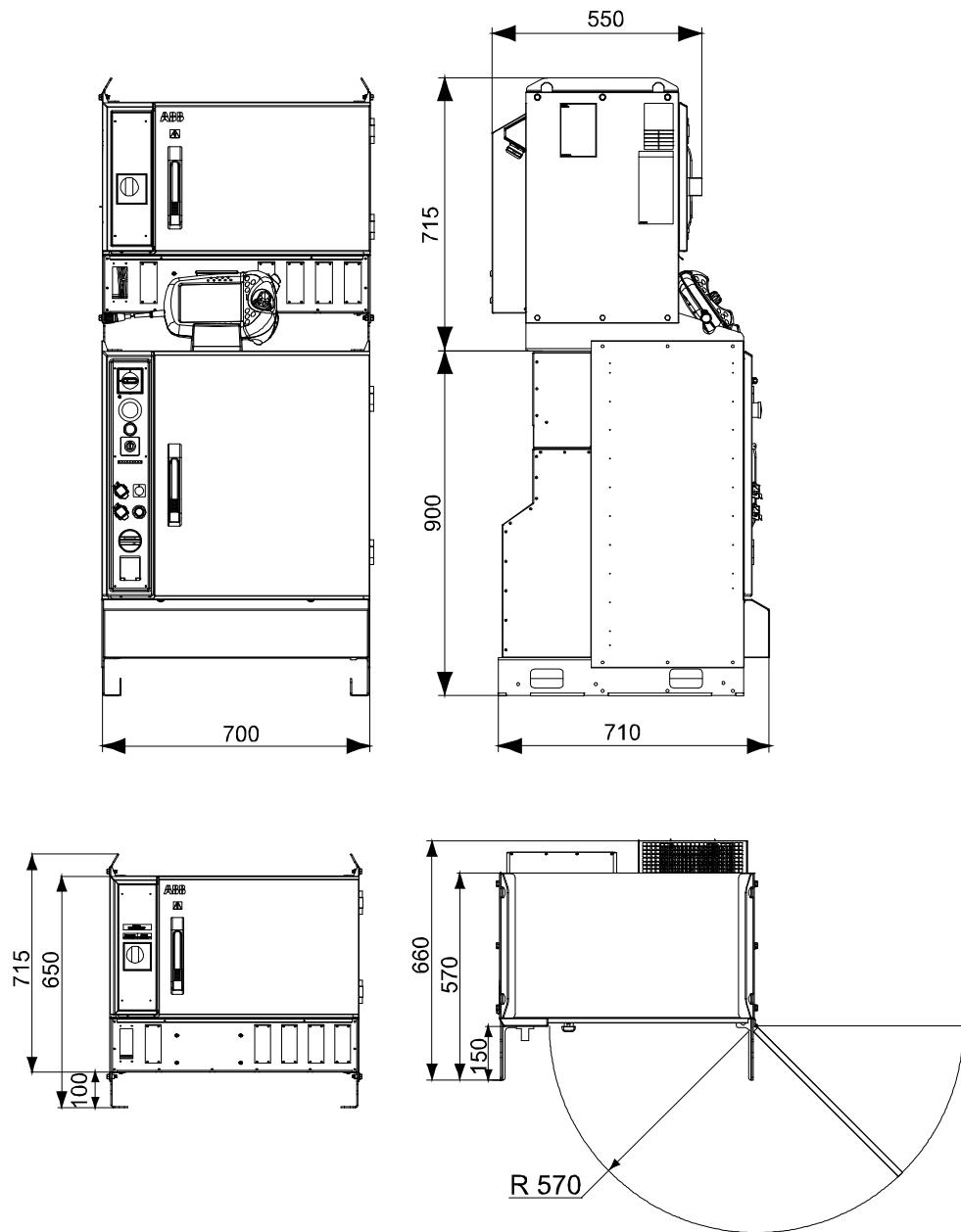


Figure 78 Different views of the Spot Welding cabinet (dimensions in mm).

The electrical circuits of the Spot Welding cabinet consist of weld power circuit and control circuits to control the welding.

---

#### Weld power circuit

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

The circuit breaker has a built in thermal release that could be adjusted (not for UL version) for customer specific needs to protect welding equipment and to get selectivity in the power circuit. The thermal release is set at 110 A at delivery. The maximum level should not exceed 150 A.

---

#### Control Circuits

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

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

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

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

If the option 744-1 is chosen there will follow a door interlock with the Spot Welding cabinet. If option 429-1 is chosen a circuit breaker type T3 will be supplied.

For further information see:



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

The welding capacity as well as the weld timer brand could be chosen among the 3 versions described below. Additional features could then be added to each of the cabinet variants.

## 2 SpotPack and DressPack

### 2.8.1 Introduction

#### Option 782-1 Bosch Basic AC

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

General technical data	Description
Weld timer and thyristor	Bosch PST 6100.630L1
Power feeding	400-600 V AC
Max welding current	130 A rms, 100 kVA transformer
Max wire range, incoming power	3 x 70 mm <sup>2</sup>
Main breaker (ABB Sace T1), thermal release	160 A (adjustable) 110-160 A
Main breaker, magnetic release	36 kA
Protection class	IP54

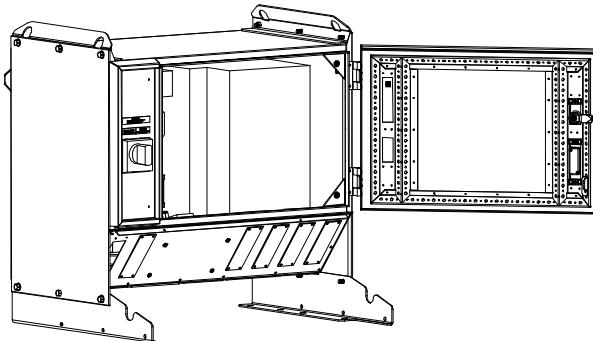


Figure 79 Spot Welding cabinet equipped with a weld timer from Bosch.

#### Option 782-2 Bosch Compact AC

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

General technical data	Description
Weld timer and thyristor	Bosch PST 610E
Power feeding	400-480 V AC
Max welding current	110 A rms, 95 kVA transformer
Max wire range, incoming power	3 x 70 mm <sup>2</sup>
Main breaker (ABB Sace T1), thermal release	160 A (adjustable) 110-160 A
Main breaker, magnetic release	36 kA
Protection class	IP54

---

**Option 782-7 Bosch Basic MFDC**

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

General technical data	Description
Weld timer and inverter	Bosch PSI 6100.630L1
Max wire range, incoming power	3 x 70 mm <sup>2</sup>
Power feeding	400-480 V AC
Max welding current	110 A rms, 20 kA weld current
Main breaker (ABB Sace T1), thermal release	160 A (adjustable) 110-160 A
Main breaker, magnetic release	36 kA
Protection class	IP54

---

**Option 828-1 Region A**

Offers 120 V power supply. Can not be combined with service outlet 230 V (option 736-1).

Mainly for the North American market.

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**Option 828-2 Region E**

Offers 230 V power supply. Can not be combined with service outlet 120 V (option 736-2).

## **2 SpotPack and DressPack**

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### **2.8.1 Introduction**

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#### **Option 788-1 Forced air cooling**

Offers a cooling fan with housing placed on the rear of the Spot Welding cabinet which forces air on the cooling surface/grids of the thyristor or MFDC inverter (see pictures below). Cabling to the fan goes via a cable gland at the rear of the Spot Welding cabinet. The fan runs continuously when the welding system is powered up. The fan is required to be used together with Bosch MFDC (option 782-7). For the AC option (option 782-1) the need will depend on the welding conditions and surrounding temperature.

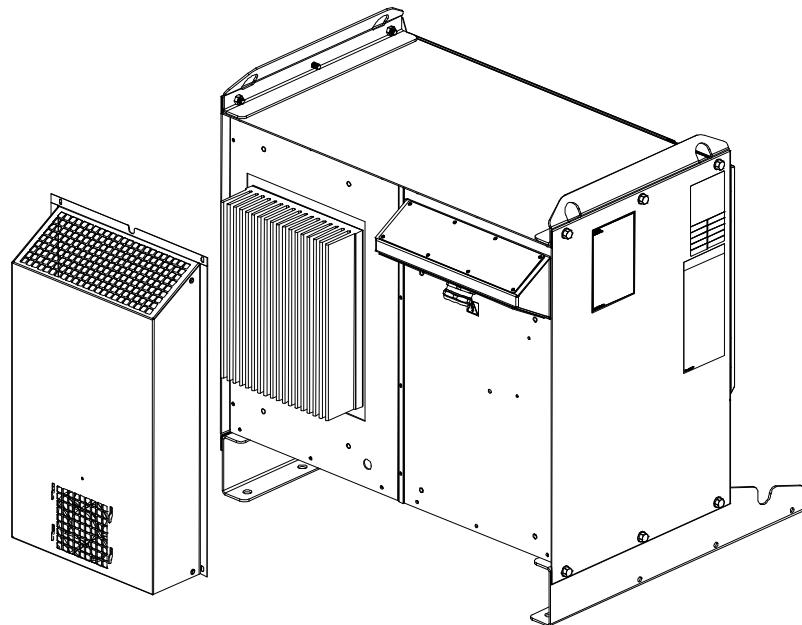


Figure 80 Exploded view drawing showing fan assembly at the rear of the Spot Welding cabinet.

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#### **Option 789-1 Earth fault protection unit**

Offers an earth fault protection integrated with the circuit breaker for the weld power. This protection could be used for AC welding or MFDC welding. The sensitivity of the earth fault protection could be adjusted. If an earth fault occurs the circuit breaker is tripped.

**Option 790-1 Contactor for weld power**

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

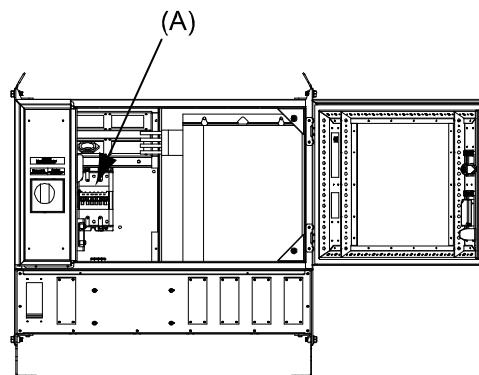


Figure 81 Cabinet with weld contactor, front view.

Pos	Description
A	Weld contactor

**Option 791-1 Weld power cable, 7 m**

Offers floor cable of 7 m length for weld power ( $3 \times 35 \text{ mm}^2$ ). One end of the weld power cable is connected at terminals to the weld timer (Bosch) or the contactor (when option 790-1 is chosen). The cable enters the Spot Welding cabinet via cable gland. The other end is equipped with an MC connector TSB 150/35 and is connected at either the manipulator base (for robot handled gun Type S or Se) or to the stationary gun (for Type HS or HSe).

**Option 791-2 Weld power cable, 15 m**

Offers floor cable of 15 m length for weld power ( $3 \times 35 \text{ mm}^2$ ). See option 791-1 for further details.

**Option 791-4 Weld power cable, 7 m**

Offers floor cable of 7 m length for weld power ( $3 \times 35 \text{ mm}^2$ ). One end of the weld power cable is connected at terminals to the weld timer (Bosch). The cable enters the Spot Welding cabinet via cable gland. The other end enters a connection box via cable gland at the manipulator base.

Only available together with option 781-2.

**Option 791-5 Weld power cable, 15 m**

Offers floor cable of 15 m length for weld power ( $3 \times 35 \text{ mm}^2$ ). See option 791-4 for further details.

## 2 SpotPack and DressPack

### 2.8.2 Interface description Spot Welding cabinet

---

#### Option 809-1 Process cable to stationary gun, 7 m

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

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

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#### Option 809-2, 3 and 4 Process cable to stationary gun

Offers floor cable of 15, 22 or 30 m length for process signals between the Spot Welding cabinet and to the stationary gun. See option 809-1 for further details.

### 2.8.2 Interface description Spot Welding cabinet

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#### General

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

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#### Connections for Spot Welding cabinet

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

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

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#### Connections for Signals

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

a. For option 782-2 (Bosch Compact) are signals for controlling the Water and Air unit included in the dress pack floor cabling and go via cable glands into terminals.

## 2.9 Water and Air unit

### 2.9.1 Introduction

#### General

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

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

The unit is only used for the spot welding application

#### The Water and Air unit

The Water and Air unit has the following main features (See Figure 82):

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

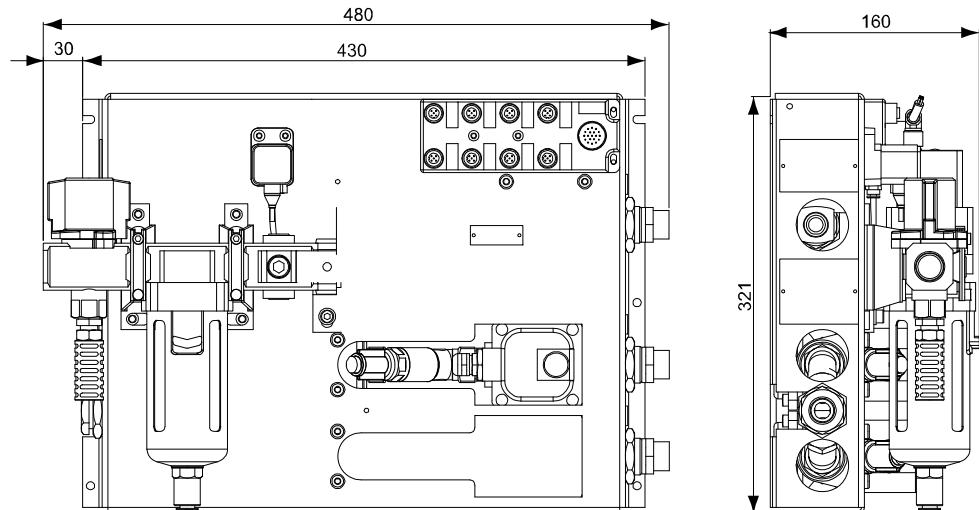


Figure 82 Water and air unit with outer dimensions (mm), media connections, signal connection.

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

- Water in circuit
- Water return circuit
- Air supply circuit
- Split box (Not available for option 792-6)

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

## **2 SpotPack and DressPack**

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### **2.9.1 Introduction**

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#### **Water in circuit**

The function of the water in circuit is to open / close the cooling water supply to the Spot welding gun (see Figure 83). An electrical 2 port solenoid valve is used. The valve is controlled by a digital signal from the robot control system.

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

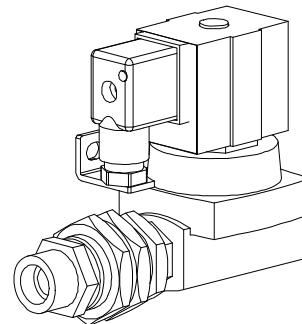


Figure 83 Water in circuit.

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**Water return circuit**

The water return circuit monitors the flow of the returning cooling water from the Spot welding gun (see Figure 84). The flow switch detects if the water flow is too low in the cooling water circuit.

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

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

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

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

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

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

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

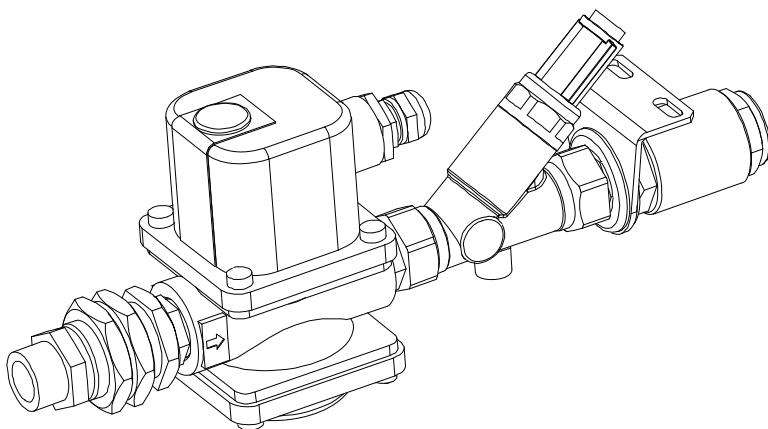


Figure 84 Water return circuit.

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

## **2 SpotPack and DressPack**

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### **2.9.1 Introduction**

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#### **Air supply circuit**

The air supply circuit provides the function package with filtered air (see Figure 85).

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

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

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

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

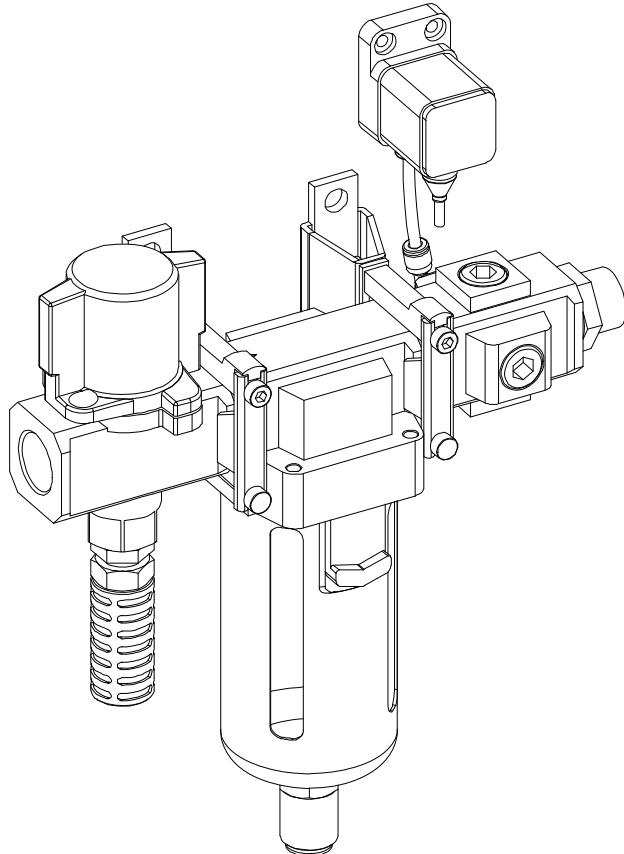


Figure 85 Air Supply Circuit.

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**Split box/Connection box**

With the split box, the 24VDC supply and signals are connected and distributed to the different units on the water and air unit, see Figure 86. The design makes disconnection of separate items for service and repair on the water and air unit very easy. The split box has a protection class IP67, which means it is well protected against dust and water leakage.

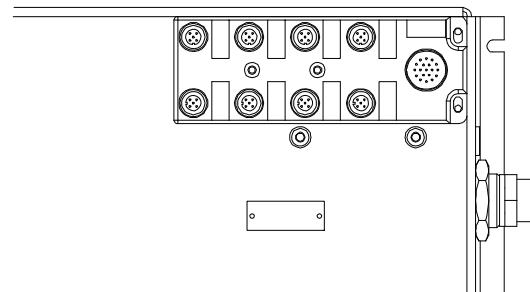


Figure 86 Split box connections.

Cables for option 781-2 are routed directly from the Water And Air unit to the connection box at the robot base, see Figure 87.

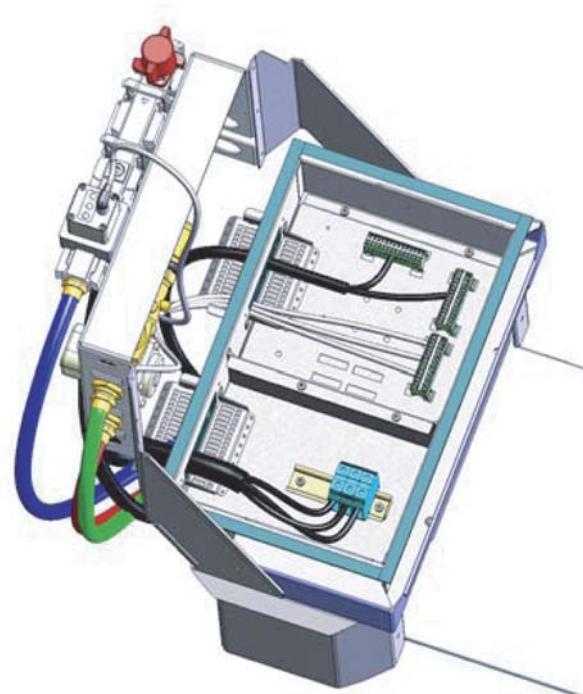


Figure 87 Connection box.

## 2 SpotPack and DressPack

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### 2.9.1 Introduction

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#### Mounting

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

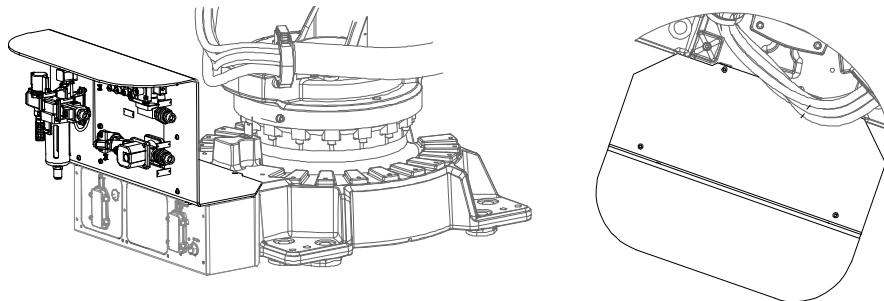


Figure 88 Water and air unit mounted on the base.

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

Type Sb, for robot mounted spot welding gun, is mounted at the robot at factory and water and air hoses are roated directly from DressPack.

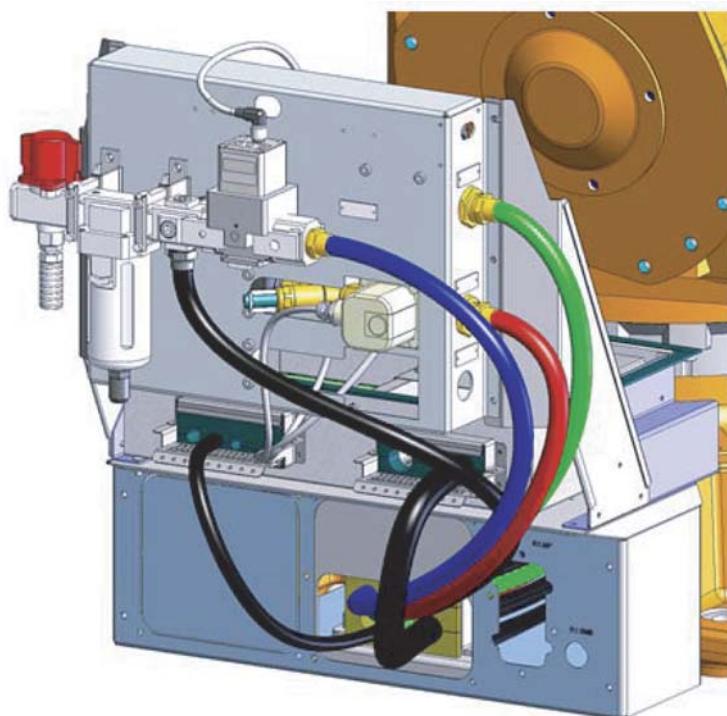


Figure 89 Water and air unit on the base valid for option 781-2.

#### Electric proportional valve (option 796-1)

The proportional valve controls the welding force of the pneumatic spot welding gun. The proportional valve is controlled by the welding timer in the Spot welding cabinet.

An analogue signal 0 - 10V, controls the proportional valve and the air pressure in the range of 0.05 - 0.9MPa.

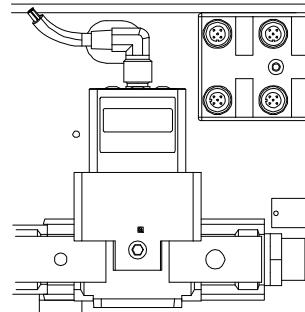


Figure 90 Electric proportional valve unit.

## 2 SpotPack and DressPack

### 2.9.1 Introduction

#### Signals for water and air unit

Electrical connections to robot I/O board are made via the Split box on the Water and Air unit or to connection box at robot base (Figure 91 shows Split box. For connection box see Circuit diagram.)

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

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

- 1. Electric water shut off valve
- 2. Pressure switch
- 3. Flow switch 1
- 4. Flow switch 2 (Option 793-1 Second Water Return)
- 5. Proportional valve: Prop. ref. signal & pressure OK signal  
(Option 796-1 Electrical proportional valve for air)
- 6. Proportional valve: Power supply  
(Option 796-1 Electrical proportional valve for air)

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

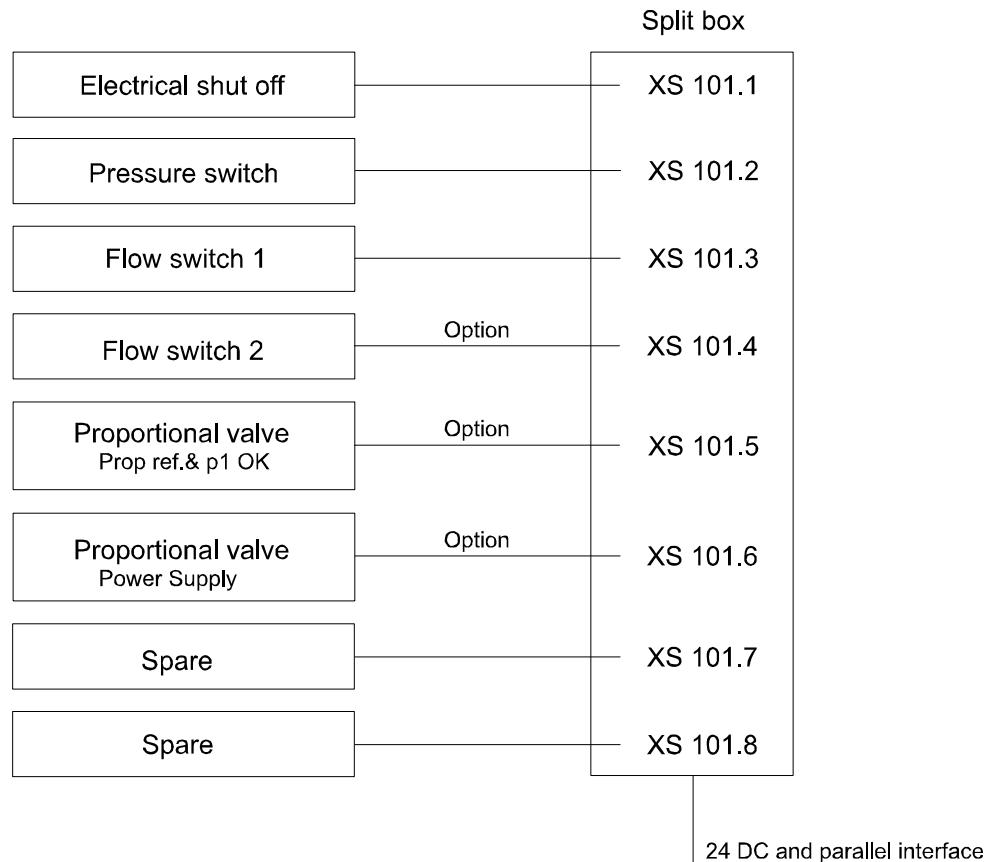


Figure 91 Block diagram.

Option	Type	Description
792-1	Water and Air unit, type S	The basic water and air unit for type S is equipped for a robot handled gun and with the following components: Water in circuit Water return circuit Air supply circuit Split box 1/2 " hose between air supply circuit and manipulator base (PROC 1) 1/2 " hose between water in circuit and manipulator base (PROC 2) 1/2 " hose between water return circuit and manipulator base (PROC 3)
792-2	Water and Air unit, type HS	The basic water and air unit for type HS is equipped for a pedestal/stationary gun. Hoses between water and air unit, welding equipment and robot are not supplied. These have to be arranged by the customer.
792-6	Water and Air unit, type Sb	The basic water and air unit for type S is equipped for a robot handled gun and with the following components: Water in circuit Water return circuit Air supply circuit Hoses connected directly from Dress Pack. Only together with option 781-2.
793-1	Second water return	This option adds an additional water return circuit. See Water return circuit. An additional 1/2" water hose (PROC 4) from the Water and Air unit to manipulator base is included.
796-1	Electrical proportional valve air Eq.	Offers a proportional valve with integrated control circuit and connection cable to the splitbox.
797-1	Cable to split box, 7 m	Offers floor cable of 7 m length for signals to the split box placed on the water and air unit. This cable is connected to the Spot Welding cabinet with a modular Harting and it ends with a quick connector at the split box.
797-2	Cable to split box, 15 m	Offers floor cable of 15 m length for the split box. See description of option 797-1.
797-3	Cable to split box, 22 m	Offers floor cable of 22 m length for the split box. See description of option 797-1.
797-4	Cable to split box, 30 m	Offers floor cable of 30 m length for the split box. See description of option 797-1.

## **2 SpotPack and DressPack**

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### 2.9.2 Technical data Water and Air unit

#### **2.9.2 Technical data Water and Air unit**

##### **Media interface description**

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

Type	Pcs	Specification
Incoming water	1	G 1/2" thread <sup>a</sup>
Outgoing water	1	G 1/2" thread <sup>a</sup>
Incoming air	1	G 1/2" thread <sup>a</sup>
Extra air outlet	1	G 3/8" thread <sup>b</sup>

a. Connection to be made by customer.

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

---

##### **General data**

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

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

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

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

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

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

## 2.10 Connection kits

### 2.10.1 Options

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

R1. CP/CS and Proc 1 on base.

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

The kit contains:

- 1 Hose fittings (Parker Pushlock, (½", M22x1,5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN EMC / M 40
1 pcs Hinged frame (Harting)	Shell size 16
2 pcs Multicontact, female (Harting)	Type HD (25 pin)
1 pcs Multicontact, female (Harting)	Type EE (8 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
10 pcs Female crimp contacts	For 1,5 mm <sup>2</sup>
10 pcs Female crimp contacts	For 0,5 mm <sup>2</sup>
10 pcs Female crimp contacts	For 1,0 mm <sup>2</sup>
10 pcs Female crimp contacts	For 2,5 mm <sup>2</sup>
12 pcs Female crimp contacts	For 0,14 – 0,37 mm <sup>2</sup>
45 sockets	For 0,2 – 0,56 mm <sup>2</sup>
Assembly Accessories to complete connector	
Assembly instruction	

---

#### Option 480-1, Weld, Proc 2-4 on base

R1. Weld and Proc 2-4 on base

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

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

1 pcs Welding connector socket (MC)	3x35 mm <sup>2</sup>
1 pcs Cable gland, plastic	Diameter 24-28 mm
Assembly Accessories to complete connector	
Assembly instruction	

## **2 SpotPack and DressPack**

---

### 2.10.1 Options

---

#### **Option 474-1, Pos switch on base**

##### R1. SW1 and SW2/3 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 mm <sup>2</sup>
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 mm <sup>2</sup>
Assembly Accessories to complete connector	
Assembly instruction	

---

#### **Option 453-1, FB 7**

##### R3. FB 7 on base

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

- Connector with:

1 pcs Multiple connector (pin)	Souriau
1 pcs Adaptor	8 pin
15 pcs Pin	for 0,13-0,25 mm <sup>2</sup>
Assembly Accessories to complete connector	
Assembly instruction	

---

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

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

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

The kit contains:

- 1 Hose fittings (Parker Pushlock,  $\frac{1}{2}$ ", M22x1,5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN EMC / M 40
1 pcs Hinged frame (Harting)	Shell size 16
2 pcs Multicontact, 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 mm <sup>2</sup>
10 pcs Male crimp contacts	For 0,5 mm <sup>2</sup>
10 pcs Male crimp contacts	For 1,0 mm <sup>2</sup>
10 pcs Male crimp contacts	For 2,5 mm <sup>2</sup>
12 pcs Male crimp contacts	For 0,14 – 0,37 mm <sup>2</sup>
45 pin	For 0,2 – 0,56 mm <sup>2</sup>
Assembly Accessories to complete connector	
Assembly instruction	

---

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

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

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

The kit contains:

- 3 Hose fittings (Parker Pushlock,  $\frac{1}{2}$ ", M22x1,5 Brass, 24 degree seal))
- Weld connector with:

1 pcs Welding connector pin with flange (MC)	3x35 mm <sup>2</sup> (25 mm <sup>2</sup> pin)
1 pcs Cable gland, plastic	Diameter 24-28 mm
Assembly Accessories to complete connector	
Assembly instruction	

## **2 SpotPack and DressPack**

---

### 2.10.1 Options

---

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

Weld and Proc 1-4 axis 6 on manipulator side

The process cable package from axis 2 to axis 6 (option 780-2 or option 781-1 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,  $\frac{1}{2}$ ", M22x1,5 Brass, 24 degree seal))
- 1 Multi contact connector (Female) type including:

1 pc Welding connector socket incl. housing	3x35 mm <sup>2</sup> (35 mm <sup>2</sup> 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****Harting**

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

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

This must be assembled by the customer.

The kit contains:

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

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



Figure 92 Connector for CP/CS/CBUS, Proc 1 axis 6.

## **2 SpotPack and DressPack**

---

### 2.10.1 Options

#### **Souriau**

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

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 UTOW Pin connector 32p (Souriau)	Shell size 18
1 pcs Backshell (Souriau)	Shell size 14
1 pcs Cable gland, EMC (Souriau)	M20 D=11,0-14,0
1 pcs UTOW Pin connector 19p (Souriau)	Shell size 14
1 pcs Backshell (Souriau)	Shell size 18
1 pcs Cable gland, EMC	M25 D=13,0-16,0
40 pcs Pin	0.21-0.93 mm <sup>2</sup>
Assembly Accessories to complete connector	
Assembly instruction	

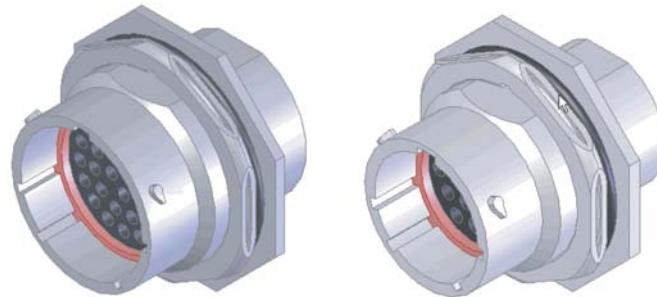


Figure 93 Connector for CP/CS/CBUS, Proc 1 axis 6.

# **3 Specification of Variants and Options**

## **3.1 Introduction**

### **3.1.1 General**

The different variants and options for the IRB 6650S are described in the following sections.

The same numbers are used here as in the Specification form. For controller options, see Product specification - Controller IRC5 with FlexPendant and Product specification - Controller software IRC5.

### **3.1.2 Manipulator**

---

#### **Variants**

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

---

#### **Manipulator color**

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

### 3 Specification of Variants and Options

#### 3.1.2 Manipulator

##### Protection

Option	Description	Note
287-4	Standard	IP 67
287-3	Foundry Plus	<p>The Foundry Plus option is designed for harsh environments where the robot is exposed to sprays of coolants, lubricants and metal spits that are typical for die casting applications or other similar applications. Typical applications are spraying insertion and part extraction of die-casting machines, cast cleaning, handling in sand casting and gravity casting, etc. Special care must be taken in regard to operational and maintenance requirements for applications in foundry are as well as in other applications areas. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility for the Foundry Plus robot. The Foundry Plus robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may cause rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned. The entire robot is IP67 compliant according to IEC 60529 - from base to wrist, which means that the electrical compartments are sealed against liquid and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.</p> <p>Selected Foundry Plus/Foundry Plus 2 features:</p> <ul style="list-style-type: none"><li>- Improved sealing to prevent penetration into cavities to secure IP67</li><li>- Additional protection of cabling and electronics</li><li>- Special covers protecting cavities</li><li>- Well-proven connectors</li><li>- Rust preventives on screws, washers and unpainted/machined surfaces</li><li>- Extended service and maintenance program</li></ul> <p>The Foundry Plus 2 robot can be cleaned with appropriate washing equipment.</p>

### 3.1.3 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. <b>Note.</b> When Cooling Fan for axis 1 motor unit is used, this must be disassembled in order to use fork lift device.
37-1	Base plate	Can be used for IRB 6650S and IRB 7600. See 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 1.9 Cooling fan for axis 1 and 2 motor. Not for protection Foundry Plus.
88-1	Cooling fan for axis 2 motor (IP 54)	For in use recommendations see 1.9 Cooling fan for axis 1 and 2 motor. Not for protection Foundry Plus.
430-1	Upper arm covers	See Figure 99. Included in protection Foundry Plus.
804-1	Labels for synchronization markings	For a more accurate marking of the synchronization position of the robot. Assembly instructions are included. See Figure 94 to Figure 98.

#### Synchronize lables

The option contains synchronize lables for each axis.

#### Synchronize lables for Axis 2

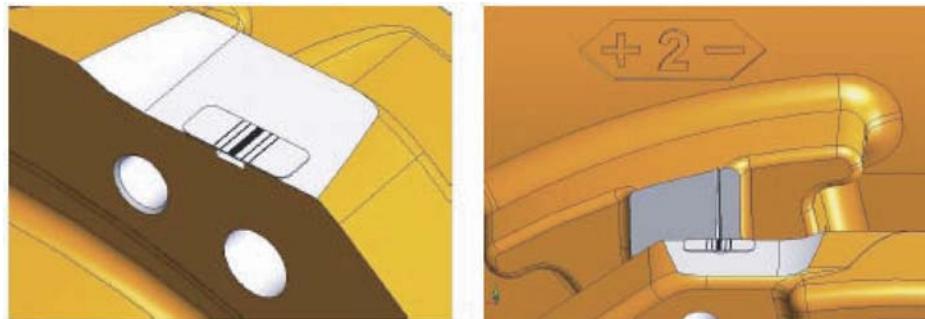


Figure 94 Position for synchronize lables, Axis 2.

### **3 Specification of Variants and Options**

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#### **3.1.3 Equipment**

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##### **Synchronize lables for Axis 3**

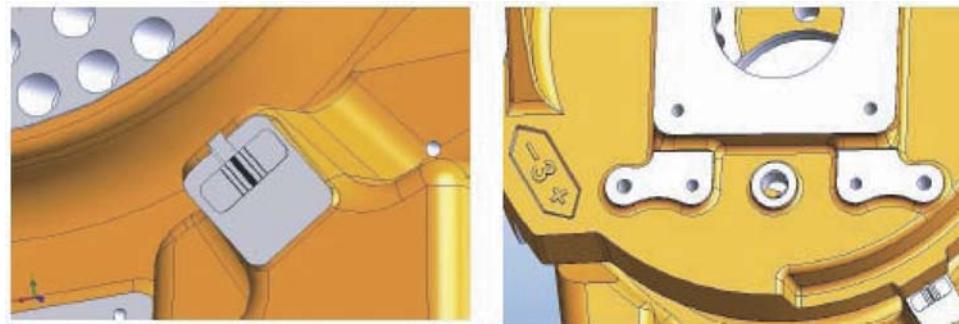


Figure 95 Position for synchronize lables, Axis 3.

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##### **Synchronize lables for Axis 4**

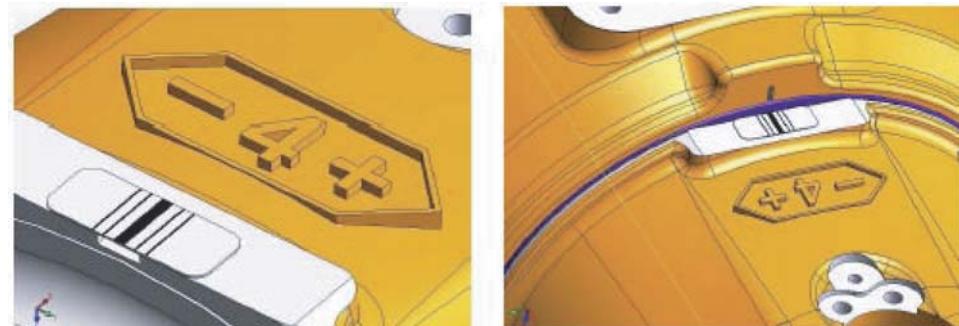


Figure 96 Position for synchronize lables, Axis 4.

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##### **Synchronize lables for Axis 5**

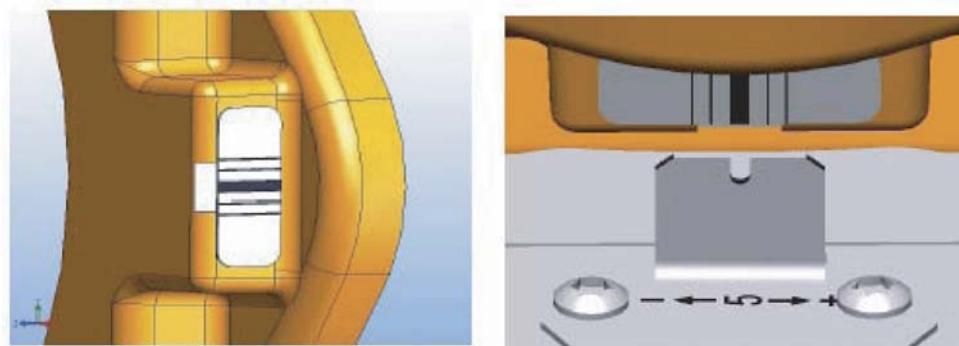


Figure 97 Position for synchronize lables, Axis 5.

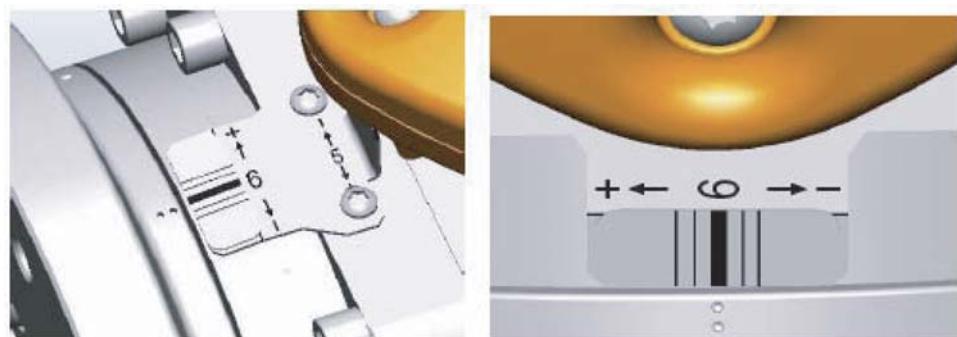
**Synchronize lables for Axis 6**

Figure 98 Position for synchronize lables, Axis 6.

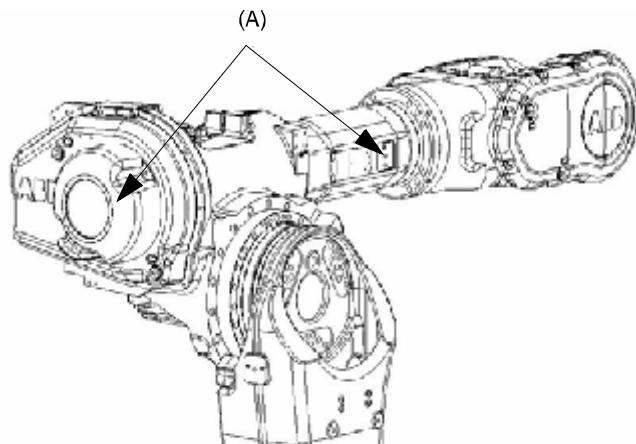
**Upper arm covers**

Figure 99 Upper arm covers.

Pos	Description
A	Option 430-1

### 3 Specification of Variants and Options

#### 3.1.3 Equipment

##### Insulated tool flange

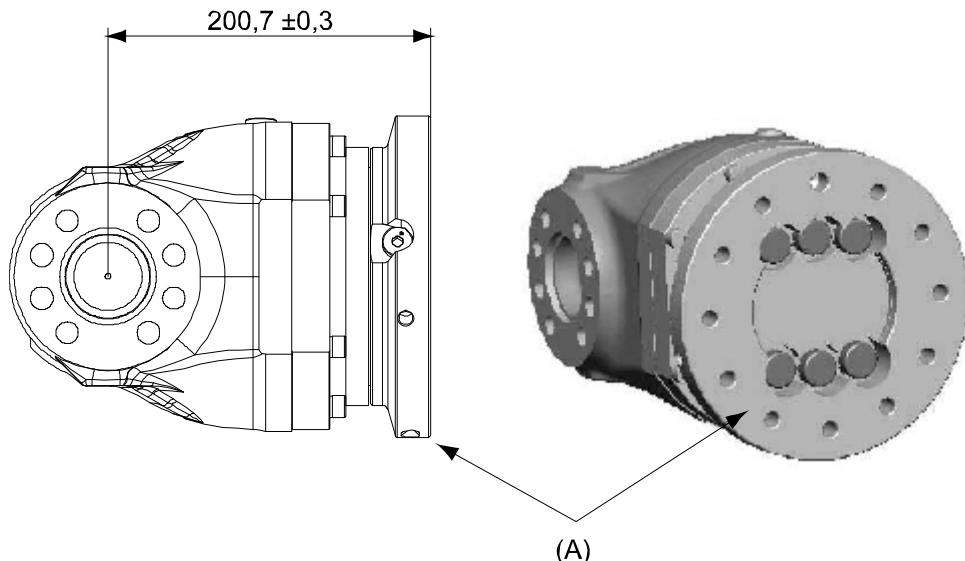


Figure 100 Insulated tool flange (dimensions in mm).

Option	Type	Description
184-1	Insulated tool flange (A)	<p>The electrically insulated tool flange, according to European Standard EN 60204-1, withstands dangerous voltage (in case of an electrical fault in the spot welding equipment mounted on the Insulated tool flange) of 500 V DC during 30 seconds in non water applications without passing it further to the electronics in the manipulator and the controller.</p> <p>Not available together with Protection Foundry, option 287-4.</p> <p>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 100. The countersunk holes for the fastening bolts to the gear box are larger, and the bolts are insulated from the tool flange, see Figure 100.</p>

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.



##### Base Spacers

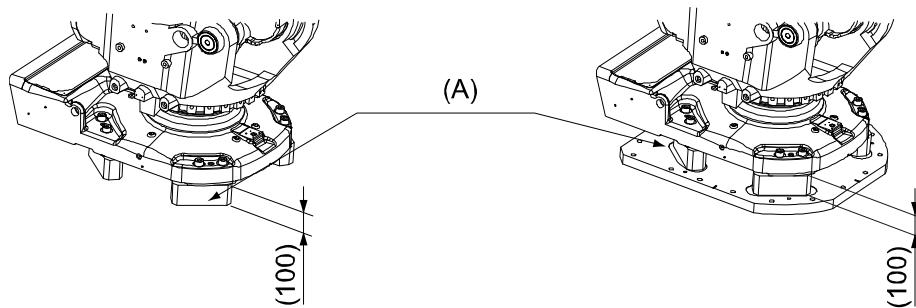


Figure 101 Base spacers.

Option	Type	Description
571-1	Base Spacers (A)	Four spacers to raise the robot 100 mm from the floor or the base plate. See Figure 101.

### **3 Specification of Variants and Options**

---

#### **3.1.4 Position Switches**

##### **3.1.4 Position Switches**

###### **Electronic Position Switches (EPS)**

Electronic position switches for up to 7 axes, for increased flexibility and robustness. For more detailed information see Product specification - IRC5 with FlexPendant and Application Manual EPS, art. No. 3HAC027709-001.

###### **Foundry Plus Cable Guard**

The manipulator cables are equipped with an additional protection of aluminized leather against e.g. aluminium spitz and flashes and chips from machining. Process cable for material handling from base to axis 3, option 798-1 has the same protection.

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

###### **Working Range Limit**

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

<b>Option</b>	<b>Type</b>	<b>Description</b>
29-1	Axis 1, 15 degrees	Two stops which allow the working range to be restricted in increments of 15°.
29-2	Axis 1, 7,5 degrees	Two stops which allow the working range to be restricted in increments of 7,5°.
32-1	Axis 2	Six stops which allow the working range to be restricted in increments of 15° at both end positions. Each stop decreases the motion by 15°.
34-1	Axis 3	Six stops which allow the working range to be restricted in increments of 20° at both end positions. Each stop decreases the motion by 20°.

###### **Extended work range**

<b>Option</b>	<b>Type</b>	<b>Description</b>
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. Electronic Position Switches, option 810-1, are required.

###### **Warranty**

<b>Option</b>	<b>Type</b>	<b>Description</b>
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)

Option	Type	Description
438-5	Standard + 24 months	18 + 24 months (3 1/2 years)
438-6	Standard + 6 months	18 + 6 months (2 years)
438-8	Stock Warranty	Maximum 6 months postponed warranty starting from shipment date ABB Robotics Production unit (PRU) + Option 438-1. Warranty commences automatically after 6 months or from activation date of standard warranty. (See ABB Robotics BA Warranty Rules).



General warranty for upper arm DressPack not valid.

#### 3.1.5 Floor cables

---

##### General

Additional floor cables for SpotPack options, see chapter 3.1.7 DressPack Floor.

---

##### Manipulator cable length

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

### **3 Specification of Variants and Options**

---

#### 3.1.6 Process DressPack

##### **3.1.6 Process DressPack**

---

###### **Connection to**

Option	Connection to	Description
16-1	Cabinet	The signals CP/CS are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, in the controller. The cable between R1.CP/CS and the controller is supplied. For information about the limited number of signals available, see 2.3 Type H to 2.6 Type Se.

---

###### **Communication**

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

#### **3.1.7 DressPack Floor**

---

###### **Connection to Parallel/CAN DeviceNet/Profibus**

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

Option	Lengths	Description
94-1/90-2/92-2	7 m	
94-2/90-3/92-3	15 m	
94-3/90-4	22 m	
94-4/90-5	30 m	
94-7	7 m	Only available together with option 781-2.
94-8	15 m	Only available together with option 781-2.

## 3.1.8 DressPack Lower and Upper arm

### DressPack process configuration



For more information about the process cable packages, see 2.2 DressPack.

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

### DressPack lower arm

Option	Description	Note
798-1	Material Handling from base to axis 3	Requires option 778-1.
798-2	Routing from base to axis 2	

### DressPack upper arm

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

### DressPack lower and upper arm

Option	Description	Note
781-1	Routing base to axis 6	Routing without change-over connection.
781-2	Routing base to axis 6	Routing with change-over connection for signals. SpotPack Basic.

### **3 Specification of Variants and Options**

---

#### 3.1.9 Connection Kits

##### **3.1.9 Connection Kits**

---

###### **General**

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

---

###### **Content**

The kit consists of connectors, pins and sockets. For technical description, see chapter 2.10 Connection kits.

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

## 3.1.10 Servo Gun

### Content

For technical description see chapter 1.10 Servo Gun.

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

### Connection to first drive

Following information specifies the cable length for Connection to first drive. For further information see chapter 1.10 Servo Gun.

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

## 3.1.11 SpotPack Floor Cables

### Weld Power Cable

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

Option	Lengths	Description
791-1	7 m	
791-2	15 m	
791-4	7 m	Only available together with Spotpack Basic, option 781-2
791-5	15 m	Only available together with Spotpack Basic, option 781-2

### Process Cable to Stationary Gun

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

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

### **3 Specification of Variants and Options**

---

#### **3.1.11 SpotPack Floor Cables**

---

##### **Cable to Split Box**

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

<b>Option</b>	<b>Lengths</b>
797-1	7 m
797-2	15 m
797-3	22 m
797-4	30 m

#### 3.1.12 Process Cabinet

##### Empty Cabinet

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

##### Process Cabinet

Option	Type	Description
768-3	Spot Welding small	See chapter 2.8.1
788-1	Forced air cooling	See chapter 2.8.1
789-1	Earth fault protection unit	See chapter 2.8.1
790-1	Contactor for weld power	See chapter 2.8.1

##### Weld Timer capacity

Option	Type	Description
782-1	Bosch Basic AC S/SE	See chapter 2.8.1
782-2	Bosch Compact AC	See chapter 2.8.1
782-7	Bosch Basic MFDC S/SE	See chapter 2.8.1

##### Weld cabinet prepared for

Option	Type	Description
828-1	Region A	See chapter 2.8.1
828-2	Region E	See chapter 2.8.1

### **3 Specification of Variants and Options**

---

#### **3.1.13 Water and Air**

##### **3.1.13 Water and Air**

---

###### **Water and Air unit**

<b>Option</b>	<b>Type</b>	<b>Description</b>
792-1	Type S	See chapter 2.9.1
792-2	Type HS	See chapter 2.9.1
792-6	Type Sb	See chapter 2.9.1. For SpotPack Basic.

---

###### **Second water return**

<b>Option</b>	<b>Type</b>	<b>Description</b>
793-1	Second water return	See chapter 2.9.1

---

###### **Electrical proportional valve for air**

<b>Option</b>	<b>Type</b>	<b>Description</b>
796-1	Electrical proportional valve for air	See chapter 2.9.1

#### **3.1.14 Documentation**

---

###### **DVD User Documentation**

<b>Option</b>	<b>Type</b>	<b>Description</b>
808-1	Documentation on DVD	See Product specification - Robot User Documentation

# 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 - Controller IRC5 with FlexPendant and Product specification - Controller software IRC5.

## Robot Peripherals

- Track Motion
- Motor Units



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