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</tr>
<tr>
<td>4 Index</td>
<td>45</td>
</tr>
</tbody>
</table>
1 Description

1.1 Structure

IRB 6400R is a 6-axis industrial robot, designed specifically for manufacturing industries that use flexible robot-based automation. The robot has an open structure that is specially adapted for flexible use, and can communicate extensively with external systems.

The robots with Foundry protection are designed for harsh environment and have special surface treatment and paint for excellent corrosion protection. The connectors are designed for severe environment, and bearings, gears and other sensitive parts are high protected. The robots have the FoundryPlus protection which means that the whole manipulator is IP67 classified and steam washable.

The robot is equipped with the operating system BaseWare OS. BaseWare OS controls every aspect of the robot, like motion control, development and execution of application programs communication etc. See Product Specification S4Cplus.

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

Figure 1 The IRB 6400R manipulator has 6 axes.
Description

Different robot versions

The IRB 6400R is available in several different versions. The following different robot types are available:

Standard: Foundry:

<table>
<thead>
<tr>
<th>IRB 6400R/2.5-120</th>
<th>IRB 6400RF/2.5-120</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRB 6400R/2.5-150</td>
<td>IRB 6400RF/2.5-150</td>
</tr>
<tr>
<td>IRB 6400R/2.5-200</td>
<td>IRB 6400RF/2.5-200</td>
</tr>
<tr>
<td>IRB 6400R/2.8-150</td>
<td>IRB 6400RF/2.8-150</td>
</tr>
<tr>
<td>IRB 6400R/2.8-200</td>
<td>IRB 6400RF/2.8-200</td>
</tr>
<tr>
<td>IRB 6400R/3.0-100</td>
<td>IRB 6400RF/3.0-100</td>
</tr>
</tbody>
</table>

Definition of version designation

IRB 6400R Mounting/ Reach - Handling capacity

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>Floor-mounted manipulator</td>
</tr>
<tr>
<td>Reach</td>
<td>Indicates the maximum reach at wrist centre (m)</td>
</tr>
<tr>
<td>Handling capacity</td>
<td>Indicates the maximum handling capacity (kg)</td>
</tr>
<tr>
<td>Application</td>
<td>Manipulator adapted for use in harsh environments (e.g. foundry)</td>
</tr>
</tbody>
</table>

Manipulator weight

<table>
<thead>
<tr>
<th>IRB 6400R /2.5-120</th>
<th>2060 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRB 6400R /2.5-150</td>
<td>2060 kg</td>
</tr>
<tr>
<td>IRB 6400R /2.5-200</td>
<td>2230 kg</td>
</tr>
<tr>
<td>IRB 6400R /2.8-150</td>
<td>2240 kg</td>
</tr>
<tr>
<td>IRB 6400R /2.8-200</td>
<td>2390 kg</td>
</tr>
<tr>
<td>IRB 6400R /3.0-100</td>
<td>2250 kg</td>
</tr>
</tbody>
</table>

Airborne noise level:

The sound pressure level outside the working space < 70 dB (A) Leq (acc. to Machinery directive 98/37/EEC)
**Description**

IRB 6400R /2.5-120, /2.5-150, /2.5-200, /2.8-150, /2.8-200 and /3.0-100

Figure 2 View of the manipulator from the side, rear and above (dimensions in mm).

Product Specification IRB 6400R M2000
1.2 Safety/Standards

The robot conforms to the following standards:

- **EN 292-1**: Safety of machinery, terminology
- **EN 292-2**: Safety of machinery, technical specifications
- **EN 954-1**: Safety of machinery, safety related parts of control systems
- **EN 60204**: Electrical equipment of industrial machines
- **IEC 204-1**: Electrical equipment of industrial machines
- **ISO 10218, EN 775**: Manipulating industrial robots, safety
- **ANSI/RIA 15.06/1999**: Industrial robots, safety requirements
- **ISO 9409-1**: Manipulating industrial robots, mechanical interface
- **ISO 9787**: Manipulating industrial robots, coordinate systems and motions
- **IEC 529**: Degrees of protection provided by enclosures
- **EN 50081-2**: EMC, Generic emission
- **EN 50082-2**: EMC, Generic immunity
- **ANSI/UL 1740-1996 (option)**: Standard for Industrial Robots and Robotic Equipment
- **CAN/CSA Z 434-94 (option)**: Industrial Robots and Robot Systems - General Safety Requirements

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

The robot is designed with absolute safety in mind. It has a dedicated safety system based on a two-channel circuit which 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 teach pendant, i.e. not by any external equipment.

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

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

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

**Over-speed protection**
The speed of the robot is monitored by two independent computers.

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

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

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

**Collision detection** (option)
In case an unexpected mechanical disturbance like a collision, electrode stik etc appears, the robot will stop and slightly back off from its stop position.

**Restricting the working space**
The movement of each axis can be restricted using software limits. There are safeguarded space stops for connection of limit switches to restrict the working space. Axes 1-3 can also be restricted by means of mechanical stops.

**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 Laboratory) 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

All the versions of IRB 6400R are designed for floor mounting. Depending on the robot version an end effector of max. weight 100 to 200 kg, including payload, can be mounted on the mounting flange (axis 6). See Load diagrams on page 10.

Extra loads (valve packages, transformers) can be mounted on the upper arm. On all versions an extra load can also be mounted on the frame of axis 1. Holes for mounting extra equipment on page 17.

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.

Operating requirements

Protection standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Manipulator</th>
<th>IP54</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wrist</td>
<td>IP55</td>
</tr>
<tr>
<td>Foundry</td>
<td>Manipulator</td>
<td>IP67</td>
</tr>
<tr>
<td></td>
<td>Upper arm</td>
<td>IP67</td>
</tr>
<tr>
<td></td>
<td>Wrist</td>
<td>IP67</td>
</tr>
</tbody>
</table>

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

Ambient temperature
Manipulator during operation +5°C (41°F) to +50°C (122°F)
Complete robot during transportation and storage, -25°C (13°F) to +55°C (131°F) for short periods (not exceeding 24 hours) up to +70°C (158°F)

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

Mounting the manipulator

Maximum load in relation to the base coordinate system.

<table>
<thead>
<tr>
<th></th>
<th>Endurance load in operation</th>
<th>Max. load at emergency stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force xy</td>
<td>±14000 N</td>
<td>±38000 N</td>
</tr>
<tr>
<td>Force z</td>
<td>22000 ±8000 N</td>
<td>22000 ±19000 N</td>
</tr>
<tr>
<td>Torque xy</td>
<td>±34000 Nm</td>
<td>±61000 Nm</td>
</tr>
<tr>
<td>Torque z</td>
<td>±7000 Nm</td>
<td>±15000 Nm</td>
</tr>
</tbody>
</table>
Figure 3 Hole configuration (dimensions in mm).
Description

Load diagrams

Load diagram for **IRB 6400R /2.5-120 and /3.0-100**
(The curve for 120 kg is not valid for /3.0-100, max. handling capacity limited to 100 kg).

The load diagram is valid for $J_0 < 100 \text{ kgm}^2$.

$J_0$ = the maximum component ($J_{X0}$, $J_{Y0}$, $J_{Z0}$) of the moment of inertia of the handling weight at its centre of gravity.

*Figure 4 Maximum weight permitted for load mounted on the mounting flange at different positions (centre of gravity).*
The load diagram is valid for \( J_0 < 100 \text{ kgm}^2 \).

\( J_0 \) = the maximum component \((J_{X0}, J_{Y0}, J_{Z0})\) of the moment of inertia of the handling weight at its centre of gravity.

*Figure 5 Maximum weight permitted for load mounted on the mounting flange at different positions (centre of gravity).*

Load diagram for **IRB 6400R /2.5-150 and /2.8-150**
The load diagram is valid for $J_0 < 100 \text{ kgm}^2$.

$J_0$ = the maximum component ($J_{X0}$, $J_{Y0}$, $J_{Z0}$) of the moment of inertia of the handling weight at its centre of gravity.

Figure 6 Maximum weight permitted for load mounted on the mounting flange at different positions (centre of gravity).
Handling capacity for IRB 6400R /2.8-150 in press-tending application

**Note!** Option 090, Cooling for axis 1 motor, must be installed.

The weight and dimensions of the part and gripper are limited by the maximum static torque and moment of inertia.

![Figure 7 A-movement (inward movement).](image1)

![Figure 8 B-movement.](image2)

Static torque:  
- A-movement Axis 5 $M_a < 900 \text{ Nm}$
- B-movement Axis 4 $M_b < 900 \text{ Nm}$

Moment of inertia:  
- A-movement Axis 5, $J_a < 105 \text{ kgm}^2$
  
- A-movement Axis 6, $J_a < 120 \text{ kgm}^2$
- B-movement Axis 4, $J_b < 105 \text{ kgm}^2$
  
- B-movement Axis 5, $J_b < 120 \text{ kgm}^2$

Approximations of $M$ and $J$ can be calculated using the following formula:

- $M_a = 9.81 \times (m_g \times r + m_p \times s)$ (Nm)
- $M_b = 9.81 \times (m_g \times (r + 0.2) + m_p \times (s + 0.2))$ (Nm)
- $J_a = m_g / 12 \times c^2 + m_g \times r^2 + m_p / 12 \times a^2 + m_p \times s^2$ (kgm$^2$)
- $J_a = m_g / 12 \times c^2 + m_g \times (r + 0.2)^2 + m_p / 12 \times (a^2 + b^2) + m_p \times (s + 0.2)^2$ (kgm$^2$)
- $J_b = m_g / 12 \times c^2 + m_g \times (r + 0.2)^2 + m_p / 12 \times (a^2 + b^2) + m_p \times (s + 0.2)^2$ (kgm$^2$)

$m_g =$ weight of gripper (kg)  
$m_p =$ weight of part (kg)

Distances $a$, $b$, $c$, $r$ and $s$ (m) are shown in Figure 9.
Description

A-movement, gripper perpendicular to axis 6

B-movement, gripper parallel to axis 6

Dimensions of gripper and part

*Figure 9 Distances r and s (m).*
Mounting equipment

Extra loads can be mounted on the upper arm and the frame. Definitions of distances and masses are shown in Figure 10 and Figure 11. The robot is supplied with holes for mounting extra equipment (see Figure 12).

**Upper arm - Balancing unit type A**

**IRB 6400R /2.5-120, /2.5-150, /2.5-200, /2.8-150 and /2.8-200**

Permitted extra load on upper arm plus the maximum handling weight (See Figure 10):

- M1 ≤50 kg with distance a ≤500 mm, centre of gravity in axis 3 extension
- or
- M2 ≤50 kg with distance b ≤400 mm
- or
- M3 ≤15 kg with distance c ≥300 mm

If the handling weight is lower than the maximum weight, M1 alt. M2 can be increased as follows:

\[(M1 \text{ alt. } M2 + \text{handling weight}) \leq (50 \text{ kg} + \text{max. handling weight}).\]

For example, if the handling weight for 2.5-150 is only 120 kg, M2 can be 80 kg.

**IRB 6400R /3.0-100**

Permitted extra load on upper arm (See Figure 10):

- M1 ≤50 kg with distance a ≤500 mm, centre of gravity in axis 3 extension
- or
- M2 ≤20 kg with distance b ≤400 mm
- or
- M3 ≤5 kg with distance c ≥300 mm

**Upper arm - Balancing unit type B**

**IRB 6400R /2.5-120, /2.5-150, /2.5-200 and /2.8-150**

Permitted extra load on upper arm plus the maximum handling weight (See Figure 10):

- M1 ≤70-155 kg with distance a ≤ 500 mm, centre of gravity in axis 3 extension, see Note 1.
- or
- M2 ≤50 kg with distance b ≤400 mm, see Note 1.
- or
- M3 ≤15 kg with distance c ≥300 mm, see Note 1.

If the handling weight is lower than the maximum weight, M1 alt. M2 can be increased as follows:

\[(M1 + \text{handling weight}) \leq (155 \text{ kg} + \text{max. handling weight}).\]

\[(M2 + \text{handling weight}) \leq (50 \text{ kg} + \text{max. handling weight}).\]

For example, if the handling weight for 2.5-150 is only 120 kg, M2 can be 80 kg.

**Note 1.** Handling weight + extra load on upper arm must always be >70kg

![Figure 10 Permitted extra load on upper arm.](image)
Description

Frame (Hip Load)

Permitted extra load on frame is $J_H = 120 \text{ kgm}^2$.
Recommended position (see Figure 11).

\[
J_H = J_{H0} + M4 \cdot R^2
\]

where
- $J_{H0}$ is the moment of inertia of the equipment
- $R$ is the radius (m) from the centre of axis 1
- $M4$ is the total mass (kg) of the equipment including bracket and harness ($\leq 320 \text{ kg}$)

Mounting of hip load

The extra load can be mounted either on the fork lift device or on the frame. Holes for mounting see Figure 13.

When mounting on the frame all the six holes (2x3, $\varnothing 18$) on one side must be used.
Holes for mounting extra equipment

Figure 12 Holes for mounting extra equipment on the upper arm (dimensions in mm).
**Description**

*Figure 13* Holes for mounting of extra load on the fork lift device and the frame (dimensions in mm).

*Figure 14* The mechanical interface (mounting flange) ISO 9409-1-A125 (dimensions in mm).

As an option there is an electrically insulated tool flange.
For more information see page 40 and Figure 28.
1.4 Maintenance and Troubleshooting

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

- Maintenance-free AC motors are used.
- Liquid grease or 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.

The following maintenance is required:

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

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

1.5 Robot Motion

<table>
<thead>
<tr>
<th>Type of motion</th>
<th>Range of movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis 1 Rotation motion</td>
<td>+180° to -180°</td>
</tr>
<tr>
<td>Axis 2 Arm motion</td>
<td>+85° to -70°</td>
</tr>
<tr>
<td>Axis 3 Arm motion</td>
<td>+110° to -28°</td>
</tr>
<tr>
<td>Axis 4 Wrist motion</td>
<td>+300° to -300°</td>
</tr>
<tr>
<td>Axis 5 Bend motion</td>
<td>+120° to -120°</td>
</tr>
<tr>
<td>Axis 6 Turn motion</td>
<td>+300° to -300°</td>
</tr>
</tbody>
</table>

Figure 15 The extreme positions of the robot arm

All dimensions refer to the wrist centre (mm)

<table>
<thead>
<tr>
<th>Positions at wrist centre (mm)</th>
<th>Angle ( \varphi_2, \varphi_3 ) (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos.</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>1415</td>
</tr>
<tr>
<td>1</td>
<td>185</td>
</tr>
<tr>
<td>2</td>
<td>415</td>
</tr>
<tr>
<td>3</td>
<td>766</td>
</tr>
<tr>
<td>4</td>
<td>1096</td>
</tr>
<tr>
<td>5</td>
<td>2467</td>
</tr>
<tr>
<td>6</td>
<td>1804</td>
</tr>
</tbody>
</table>
**Performance according to ISO 9283**

At rated load and 1 m/s velocity on the inclined ISO test plane with all six robot axes in motion.

Unidirectional pose repeatability:
RP = 0.1 mm

Linear path accuracy:
AT = 1.6 - 2.1 mm

Linear path repeatability:
RT = 0.4 - 0.6 mm (IRB 6400R/2.5-120, 2.5-150, 2.8-150)
RT = 0.8 - 1.0 mm (Others)

Minimum positioning time, to within 0.4 mm of the position:
0.2 - 0.25 sec. (IRB 6400R/2.5-120, 2.5-150 on 35 mm linear path)
0.5 - 0.6 sec. (IRB 6400R/2.5-120, 2.5-150 on 350 mm linear path)
0.25 - 0.35 sec. (Others, on 35 mm linear path)
0.6 - 0.7 sec. (Others, on 350 mm linear path)

The above values are the range of average test-results from a number of robots. If guaranteed values are required, please contact your nearest ABB office.

**Velocity**

**IRB 6400R versions:**
- 2.5-120
- 2.5-150
- 2.8-200
- 3.0-100
- 2.5-200
- 2.8-150

**Axis no.**
- 1: 110°/s 100°/s 90°/s
- 2: 100°/s 90°/s 70°/s
- 3: 100°/s 90°/s 70°/s
- 4: 210°/s 120°/s 110°/s
- 5: 150°/s 120°/s 110°/s
- 6: 210°/s 190°/s 110°/s

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

**Resolution**

Approx. 0.01° on each axis.
Description

1.6 Application Interface

The robot can be supplied with integrated power, signals, customer buses, servo signals and air hose to the upper arm housing (options 041, 043 and 177/178) or power, signals, customer buses and air hose to the upper arm axis 4 (option 042).

Specification

Standard signals at upper arm housing and upper arm axis 4 (options 041 and 042)

Table 1

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (CP)</td>
<td>2 + 1 earth</td>
<td>1,0 mm²</td>
<td>250 V AC, 8 A</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>10</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 250 mA</td>
</tr>
<tr>
<td>Cust.Bus* Power</td>
<td>2</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 2 A</td>
</tr>
<tr>
<td>Cust.Bus* Signals</td>
<td>4 + 1 shield**</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 250 mA</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>13 mm inner dia.***</td>
<td>Max 10 bar</td>
</tr>
</tbody>
</table>

* CAN/DeviceNet or Profibus
** Only 2+1 shield are used for CAN/DeviceNet and Profibus
*** G1/2” - 14 outer thread

Servo Gun cabling (option 043)

Table 2

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo signals (CFB)</td>
<td>8</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 250 mA</td>
</tr>
<tr>
<td>Servo Power (CMP)</td>
<td>6 + 2 earth</td>
<td>1,5 mm² 0,5 mm²</td>
<td>250 V AC, 10 A* 250 V AC, 5 A</td>
</tr>
</tbody>
</table>

* Each phase RMS = 20 A, max. peak 26 A

Extended signals (options 177 or 178)

Table 3

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (CP)</td>
<td>4 + 2 earth</td>
<td>0,5 mm²</td>
<td>250 V AC, 5 A</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>19</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 250 mA</td>
</tr>
<tr>
<td>Customer Bus*</td>
<td>8</td>
<td>0,24 mm² (AWG 24)</td>
<td>50 V AC/DC, 250 mA</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>13 mm inner dia.**</td>
<td>Max. 10 bar</td>
</tr>
</tbody>
</table>

* Profibus
** M22 x 1,5 outer thread
1.7 Spotweld Base Harness and Spotweld Base Harness Extended

The robot can be supplied with an integrated spotweld base harness (option 047), or an integrated spotweld base harness extended (option 044).

The integrated spotweld base harness (hose fittings: G1/2”-14 outer thread) or the integrated spotweld base harness extended (hose fittings: M22 x 1,5 outer thread) is used to supply primary current and cooling water to the upper arm. Connections at the manipulator base and at the upper arm housing. For more information, see Figure 23 and Figure 24.

Specification

Spotweld base harness (option 047)

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (WELD)</td>
<td>2 + 1</td>
<td>25 mm²</td>
<td>Max. aver. curr. 135 A*</td>
</tr>
<tr>
<td>Process (PROC 1-3)</td>
<td>3</td>
<td>13 mm inner dia.**</td>
<td>Max. 10 bar</td>
</tr>
</tbody>
</table>

* at +20°C ambient temperature and 100 A at +50°C ambient temperature.
Max. current 2.5 kA/1s, (short-circuit current) 1.5 kA/3s.
Max. voltage 600 V, frequency 50-1000 Hz.
** G1/2”- 14 outer thread.

Spotweld base harness extended (option 044)

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (WELD)</td>
<td>2 + 1</td>
<td>25 mm²</td>
<td>Max. aver. curr. 135 A*</td>
</tr>
<tr>
<td>Process (PROC 1-3)</td>
<td>3</td>
<td>13 mm inner dia.**</td>
<td>Max. 10 bar</td>
</tr>
</tbody>
</table>

* at +20°C ambient temperature and 100 A at +50°C ambient temperature.
Max. current 2.5 kA/1s, (short-circuit current) 1.5 kA/3s.
Max. voltage 600 V, frequency 50-1000 Hz.
** M22 x 1,5 outer thread.
1.8 Upper Arm Harness

The upper arm harness is available for material handling (MH) application (for 2.5, 2.8 and 3.0 m manipulator) and spotwelding (SW) application (for 2.5 and 2.8 m manipulator).

The upper arm harness for material handling is available in two different variants:

- MH Standard (option 066)
- MH Extended (option 067)

The upper arm harness for spotwelding is available in four different variants:

- SW Pneumatic Standard (option 106)
- SW Pneumatic Extended (option 107)
- SW Servo Standard (option 108)
- SW Servo Extended (option 109)

Specification

**MH Standard (option 066)**

*Table 6*

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (CP)</td>
<td>2 + 1 earth</td>
<td>1.0 mm²</td>
<td>250 V AC, 8 A</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>10</td>
<td>1.0 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>12.5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
</tbody>
</table>

* Max. allowed current due to less area in cables between base to axis 3.
** G1/2” - 14 outer thread.

**MH Extended (option 067)**

*Table 7*

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (CP)</td>
<td>6</td>
<td>1.0 mm²</td>
<td>250 V AC, 5 A*</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>18 + 1 shield</td>
<td>1.0 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>12.5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
</tbody>
</table>

* Max. allowed current due to less area in cables between base to axis 3.
** M22 x 1.5 mm outer thread.
SW Pneumatic Standard (option 106)

* Max. allowed current due to less area in cables between base to axis 3.
** G1/2" - 14 outer thread.
*** At +20°C ambient temperature and 100 A at +50°C ambient temperature.
Max. current 2.5 kA/1s, (short-circuit current) 1.5 kA/3s.
Max. voltage 600 V, frequency 50-1000 Hz.

## Table 8

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld (WELD)</td>
<td>2 + 1 earth</td>
<td>25 mm²</td>
<td>Max. aver. curr. 135 A***</td>
</tr>
<tr>
<td>Power (CP)</td>
<td>2 + 1 earth</td>
<td>1.0 mm²</td>
<td>250 V AC, 8 A</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>10</td>
<td>1.0 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>12,5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
<tr>
<td>Process (PROC 1-3)</td>
<td>3</td>
<td>12,5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
</tbody>
</table>

## SW Servo Standard (option 108)

Additional to “SW Pneumatic Standard” (option 106)

* Max. allowed current due to less area in cables between base to axis 3.
** Each phase RMS = 20 A

## Table 9

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo signals (CFB)</td>
<td>6</td>
<td>0,5 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Servo power (CMP)</td>
<td>10 +2 earth</td>
<td>1,0 mm²</td>
<td>6+2 earth 250 V AC, 7 A**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 250 V AC, 5 A</td>
</tr>
</tbody>
</table>

## SW Pneumatic Extended (option 107)

## Table 10

<table>
<thead>
<tr>
<th>Type</th>
<th>Pcs</th>
<th>Area</th>
<th>Allowed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld (WELD)</td>
<td>2 + 1 earth</td>
<td>25 mm²</td>
<td>Max. aver. curr. 135 A***</td>
</tr>
<tr>
<td>Power (CP)</td>
<td>4 + 2 earth</td>
<td>1,0 mm²</td>
<td>250 V AC, 5 A</td>
</tr>
<tr>
<td>Signals (CS)</td>
<td>19</td>
<td>1,0 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Air (CAIR)</td>
<td>1</td>
<td>12,5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
<tr>
<td>Process (PROC 1-3)</td>
<td>3</td>
<td>12,5 mm inner dia.**</td>
<td>Max 10 bar</td>
</tr>
</tbody>
</table>

* Max. allowed current due to less area in cables between base to axis 3.
** M22 x 1,5 outer thread.
*** At +20°C ambient temperature and 100 A at +50°C ambient temperature.
Max. current 2.5 kA/1s, (short-circuit current) 1.5 kA/3s.
Max. voltage 600 V, frequency 50-1000 Hz.
Description

**SW Servo Extended (option 109)**
Additional to “SW Pneumatic Extended” (option 107)

<table>
<thead>
<tr>
<th>Table 11</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Pcs</td>
<td>Area</td>
<td>Allowed capacity</td>
</tr>
<tr>
<td>Servo signals (CFB)</td>
<td>6</td>
<td>0,5 mm²</td>
<td>50 V AC/DC, 250 mA*</td>
</tr>
<tr>
<td>Servo power (CMP)</td>
<td>10 +2 earth</td>
<td>1,0 mm²</td>
<td>6+2 earth 250 V AC, 7 A** 250 V AC, 5 A</td>
</tr>
</tbody>
</table>

* Max. allowed current due to less area in cables between base to axis 3.
** Each phase RMS = 14 , max. peak 26 AA

1.9 Dresspack examples

The tables below (12-13) are examples showing which options are included in typical Dresspack solutions.

<table>
<thead>
<tr>
<th>Table 12</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option for</td>
<td>Dresspack</td>
<td>MH Standard</td>
<td>SW Pneumatic Standard</td>
</tr>
<tr>
<td>Total IRB</td>
<td>Opt. 056 or 057</td>
<td>Opt. 056 or 057</td>
<td>056 or 057 + 681-684</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 13</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option for</td>
<td>Dresspack</td>
<td>MH Extended</td>
<td>SW Pneumatic Extended</td>
</tr>
<tr>
<td>Total IRB</td>
<td>Opt. 177 or 178</td>
<td>Opt. 177 or 178</td>
<td>177 or 178 + 681-684</td>
</tr>
<tr>
<td>Axes 1-3</td>
<td>Opt. 177 or 178</td>
<td>Opt. 177/178 + 044</td>
<td>177 or 178 + 044 + 043</td>
</tr>
</tbody>
</table>
1.10 Servo Gun

The robot can be supplied with hardware and software for Stationary Gun, Robot Gun, Stationary and Robot Gun, Twin Stationary Guns, Stationary Gun and Track Motion or Robot Gun and Track Motion.

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

1.10.1 Stationary Gun (SG)

Figure 16 Configuration of Stationary Gun.

Options according to Table 14 are required to complete the deliver. For further details see corresponding Product Specification.

Table 14

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl. cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>686-689</td>
<td>Cables (7-30m) between control cabinet and SG SMB box</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>701</td>
<td>SG Serial measurement box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>625</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
Description

1.10.2 Robot Gun (RG)

Options according to Table 15 below are required to complete the delivery. For further details see corresponding Product Specification.

Table 15

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl.cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>681-684</td>
<td>Cables (7-30m) between control cabinet and RG SMB box</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>043</td>
<td>Servo cable from robot foot to upper arm housing</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>108</td>
<td>Servo cable from upper arm housing to axis 6 (Std)</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>109</td>
<td>Extended servo from upper arm housing to axis 6</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>702</td>
<td>RG SMB box, bracket and cable SMB to robot foot</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>625</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
1.10.3 Stationary and Robot Gun (SG + RG)

Options according to Table 16 below are required to complete the delivery. For further details see corresponding Product Specification.

Table 16

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl. cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>681-684</td>
<td>Cables (7-30m) between control cabinet and RG SMB box</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>043</td>
<td>Servo cable from robot foot to upper arm housing</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>108</td>
<td>Servo cable from upper arm housing to axis 6 (standard)</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>109</td>
<td>Extended servo from upper arm housing to axis 6</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>703</td>
<td>RG SMB box, bracket, cable to robot foot and SG SMB box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>380</td>
<td>DDU in separate box and cable (1m) to SG SMB box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>686-689</td>
<td>Cables (7-30m) between control cabinet and SG SMB box</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>626</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
Description

1.10.4 Twin Stationary Guns (SG + SG)

Figure 19  Configuration of Twin Stationary Guns.

Options according to Table 17 below are required to complete the delivery.
For further details see corresponding Product Specification.

Table 17

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl. cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>686-689</td>
<td>Cables (7-30m) between control cabinet and SG1 SMB box, SG2 SMB box and SG2 DDU</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>704</td>
<td>SG1 SMB box and SG2 SMB box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>380</td>
<td>DDU in separate box and cable (1m) to SG2 SMB box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>625</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
1.10.5 Stationary Gun and Track Motion

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

**Note!** Track Motion SMB box and cables to the control cabinet are included in the IRBT 6002/6003 delivery.

**Table 18**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl. cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>686-689</td>
<td>Cables (7-30m) between control cabinet, SG SMB box and Track Motion DDU</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>705</td>
<td>SG SMB box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>380</td>
<td>Track Motion DDU in separate box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>625</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
Description

1.10.6 Robot Gun and Track Motion (RG + TM)

Options according to Table 19 below are required to complete the delivery. For further details see corresponding Product Specification.

**Note!** Track Motion SMB box, cables to the control cabinet and cable between SMB and DDU are included in the IRBT 6002/6003 delivery.

**Table 19**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Product Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>397</td>
<td>Drive unit in control cabinet incl. cables to cabinet wall</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>681-684 and 706</td>
<td>Cables (7-30m) between control cabinet and Track Motion DDU</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>043</td>
<td>Servo cable from robot foot to upper arm housing</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>108</td>
<td>Servo cable from upper arm housing to axis 6 (standard)</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>109</td>
<td>Extended servo cable from upper arm housing to axis 6</td>
<td>IRB 6400R</td>
</tr>
<tr>
<td>380</td>
<td>Track motion DDU in separate box</td>
<td>S4Cplus</td>
</tr>
<tr>
<td>625</td>
<td>Software SpotWare Servo</td>
<td>RobotWare Options</td>
</tr>
</tbody>
</table>
2 Specification of Variants and Options

The different variants and options for the IRB 6400R are described below.
The same numbers are used here as in the Specification form. For controller options,
see Product Specification S4Cplus, and for software options, see Product Specification
RobotWare Options.

1 MANIPULATOR

VARIANTS

<table>
<thead>
<tr>
<th>Variant</th>
<th>Standard</th>
<th>Foundry</th>
</tr>
</thead>
<tbody>
<tr>
<td>022</td>
<td>IRB 6400R/2.5-120</td>
<td>IRB 6400RF/2.5-120</td>
</tr>
<tr>
<td>023</td>
<td>IRB 6400R/2.5-150</td>
<td>IRB 6400RF/2.5-150</td>
</tr>
<tr>
<td>024</td>
<td>IRB 6400R/2.5-200</td>
<td>IRB 6400RF/2.5-200</td>
</tr>
<tr>
<td>025</td>
<td>IRB 6400R/2.8-150</td>
<td>IRB 6400RF/2.8-150</td>
</tr>
<tr>
<td>026</td>
<td>IRB 6400R/2.8-200</td>
<td>IRB 6400RF/2.8-200</td>
</tr>
<tr>
<td>027</td>
<td>IRB 6400R/3.0-100</td>
<td>IRB 6400RF/3.0-100</td>
</tr>
</tbody>
</table>

IRB 6400R/Reach-Handling capacity

Reach: Specifies the max. reach at the wrist centre.
Handling capacity: Specifies the max. handling capacity.

Manipulator colour

330 ABB standard
The manipulator is painted with ABB orange.

352 RAL code
The manipulator is painted with chosen RAL-colour.

Protection

035 Standard

036 Foundry
Robot adapted for foundry or other harsh environments.
The robot has the FoundryPlus protection which means that the whole manipulator is
IP67 classified and steam washable. An excellent corrosion protection is obtained by a
special coating. The connectors are designed for severe environment, and bearings,
gears and other sensitive parts are high protected
Only available colour is ABB orange Foundry.

039 Extra load upper arm
This option should be chosen if the weight of extra equipment on the upper arm exceeds
50 kg. (The manipulator is then equipped with different balancing cylinders for axis 2).
For more information, see Mounting equipment on page 15.
Not available for options 026, 027.
APPLICATION INTERFACE

Air supply and signals for extra equipment to upper arm

A hose for compressed air is integrated into the manipulator. There is an inlet at the base, see Figure 23, and an outlet on the upper arm housing or on the upper arm axis 4, see Figure 22.
Connection: G 1/2”-14 in the upper arm housing/upper arm and G 1/2”-14 at the base.

For connection of extra equipment on the manipulator, there are cables running parallel to the manipulator’s cable harness with connectors on the upper arm axis 4 or on the upper arm housing. The connectors are:

- one FCI 12-pin UT071412 SH44N (CS)
- one FCI 4-pin UT07104 SH44N (CP)
- one fieldbus (opt. 053/054)


For connection of servo gun on the manipulator there are cables running in parallel to the manipulator’s cable harness with connectors on the upper arm housing (only). The connectors are:

- one FCI 12-pin UT071412 SH44N (CMP)
- one FCI 12-pin UT071412 SH44N (CFB)

Air supply and extended signals for extra equipment to upper arm

A hose for compressed air is integrated into the manipulator. There is an inlet at the base, see Figure 23, and an outlet on the upper arm housing (only), see Figure 22.
Connection: M 22 x 1,5 mm, cone angle 24° (ISO 8434-1) both at the base and at the upper arm housing.

For connection of extra equipment which requires extended signals on the manipulator, there are cables running in parallel to the manipulator’s cable harness with connectors on the upper arm housing (only). The connectors are:

- one FCI 19-pin MSK07C1419S (CS)
- one FCI 6-pin MSK07C106S (CP)
- one FCI 10-pin MSK07C1210S (opt. 053/054)

For connection of servo gun which requires extended signals on the manipulator there are cables running in parallel to the manipulator’s cable harness with connectors on the upper arm housing (only). The connectors are:

- one FCI 12-pin UT071412SH44N (CMP)
- one FCI 12-pin UT071412SH44N (CFB)
Media outlet

**041** At upper arm housing
For specification of connections, see Chapter 1.6, Table 1.

**042** At upper arm axis 4
For specification of connections, see Chapter 1.6, Table 1.

**043** Servo Gun cabling
For specification of connections, see Chapter 1.6, Table 2.

**Extended signals with connection to**

**177** **Manipulator** (Cables from robot base to axis 3)
The extended signals are connected directly to the manipulator base to one heavy duty industrial housing with three D-sub connector inserts, R1 CP/CS (see Figure 23). The cables from the cabinet to the manipulator base are not supplied. For specification of connections, see Chapter 1.6, Table 3.

**178** **Cabinet** (Cables from controller to axis 3)
The extended signals CP/CS comes from the cabinet, through cable glands, and are connected to the manipulator base. The cables between the controller and R1 CP/CS are supplied. For specification of connections, see Chapter 1.6, Table 3.

*Figure 22 Location of customer connections on upper arm/armhouse.*
Connection to

**056** Manipulator
The signals are connected directly to the manipulator base to one heavy duty industrial housing with three D-sub connector inserts, R1.CP/CS (see Figure 23). The cables from the manipulator base are not supplied.
(The foundry version, option 036, has a housing for extra harsh environment)

**057** 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.

Connectors type
Type of fieldbus connectors on the upper arm

**053** Can/DeviceNet, R3.CANBUS

**054** Profibus, R3.PBUS
9-pin connector with M23 connection thread.

Connection to cabinet (Cable lengths)

CanDeviceNet/Profibus/Robot ServoGun/Stational ServoGun

- 660/665/681/686 7m
- 661/666/682/687 15m
- 662/667/683/688 22m
- 663/668/684/689 30m
047 **Spotweld Base Harness**
Integrated spotweld base harness with primary current (R1.WELD) and media supplies (R1.PROC1-3), connected to the upper arm housing, see Figure 24 and to the manipulator base, see Figure 23.
The harness remains within the manipulator’s max. radius envelope for axis 1.
Connection on the manipulator base: Current; Multi-Contact TSS+2/25 Water; G1/2”-14 outer thread, cone angle 60° (BSPP)
Connection on the upper arm housing: Current; Multi-Contact TSB+2/25 Water; G1/2”-14 outer thread, cone angle 60° (BSPP)
Customer connection sets for R1.Weld and R2.Weld are available as options.

This option is only available if option 041 is chosen.
This option is not available for option 036 Foundry, neither if option 044 nor 050 Process media conduit is chosen.
For specification of connections, see Chapter 1.7, Table 4.

044 **Spotweld Base Harness Extended**
Integrated spotweld base harness extended with primary current (R1.WELD) and media supplies (R1.PROC1-3). Connected to the upper arm housing, see Figure 24, and to the manipulator base, see Figure 23.
The harness remains within the manipulator’s max. radius envelope for axis 1.
Connection on the manipulator base: Current; Multi-Contact TSS+2/25 Media supplies fittings; M22 x 1,5 outer thread, cone angle 24° (ISO 8434-1).
Connection on the upper arm housing: Current; Multi-Contact TSB+2/25 Media supplies fittings; M22 x 1,5 outer thread, cone angle 24° (ISO 8434-1).

This option is only available if option 177 or 178 is chosen.
This option is not available for option 036 Foundry, neither if option 047 Spotweld base harness nor option 050 Process media conduit is chosen.
For specification of connections, see Chapter 1.7, Table 5.

*Figure 24 Mounted Spotweld base harness and Spotweld base harness extended.*
050 Process media conduit

An external flexible conduit for supplying process media from the base up to the upper arm housing. The flexible hose has the diameter of 80/67 mm. The harness remains within the manipulators max envelope for axis 1 of 530 mm. The flexible hose is attached to the base, frame and lower arm. See Figure 25.

The hoses/cables inside the conduit is to be designed by the user. Cable hose clamps in both ends. The clamps are included.

This option is not available if option 047 Spotweld Base Harness or option 044 Spotweld Base Harness Extended is chosen.

![Figure 25 Mounted Process media conduit and cable hose clamp (dimensions in mm).](image)

UPPER ARM HARNESS

The upper arm harness consists of cables and hoses inside a protective hose, see Figure 26. Cables, hoses and the protective hose are designed to follow the robot arm movements without causing any damages to the harness or to the manipulator arm. The hose package is adapted to the robot structure with special designed supports, clamps, brackets etc. The complete harness is tested and proven to be well suited for material handling as well as spotwelding applications with the same type of movements and very high requirements.

The cables and the hose package has a 800 mm free end at axis 6 for connection to a gripper or a transformer spotwelding gun. A tension arm unit keeps the hose package in the right position for any manipulator arm movement approved for the Dresspack. A protection kit consists of covers for the arm and the wrist and will prevent wear on the protective hose and on the arm itself.

For more information see Product Manual IRB 6400R, Installation and Maintenance.

066 MH Standard

For specification of connections for material handling with standard signals, see Chapter 1.8, Table 6.

067 MH Extended

For specification of connections for material handling with extended signals, see Chapter 1.8, Table 7.
106 **SW Pneumatic Standard**  
For specification of connections for spotwelding with pneumatic gun and standard signals, see Chapter 1.8 Table 8.

107 **SW Pneumatic Extended**  
For specification of connections for spotwelding with pneumatic gun and extended signals, see Chapter 1.8 Table 10.

108 **SW Servo Standard**  
For specification of connections for spotwelding with servo gun and standard signals, see Chapter 1.8 Table 9.

109 **SW Servo Extended**  
For specification of connections for spotwelding with servo gun and extended signals, see Chapter 1.8 Table 11.

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**Figure 26  Principal drawing of mounted upper arm harness.**

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**CONNECTOR KITS**

Detached connectors are suitable to the connectors for the application interface, position switches and spotweld harness.

The kit consists of connectors, pins and sockets.

045 **Upper arm**  
For the connectors on the upper arm housing, option 041 and upper arm axis 4, option 042.

046 **On foot**  
For the application interface connectors on the foot with connection to manipulator, option 056 and media outlet at upper arm housing, option 041 or at upper arm axis 4, option 042.
**Specification of Variants and Options**

048 **Position switches**
For the position switches connectors on the base with connection to manipulator, option 075 and position switches.

049 **SW harness**
For the spotweld harness connectors on the base, option 047.

**EQUIPMENT**

691 **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.

092 **Fork lift device**
Lifting device on the manipulator for fork-lift handling is mounted at delivery.
Lifting eyes for use with an overhead crane are integrated as standard.

090 **Cooling for axis 1 motor**
Extra cooling of axis 1 motor is recommended in heavy duty application e.g. in press tending application.
This option is not available for option 036 Foundry.

091 **Brake release cover**
Protective cover over push-buttons on brake release unit.
Always included for Foundry versions.

089 **Insulated flange**
Electrically insulated tool flange. In case of an electrical fault in the spot welding equipment mounted on the tool flange, the tool flange withstands dangerous voltage (100V AC during 60 seconds or 300V AC during 10 seconds) in non water applications without passing it further to electronics in the robot and controller.
See Figure 28.
Not available with option 036, Foundry.
POSITION SWITCHES

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

For axis 1 there are three position switch functions available. For axes 2 and 3 one position switch function each.
Each position switch function consists of two switches mechanically operated by separate cams. Each switch has one normal open and one normal closed contact. See the exception for axis 1. The design and components fulfill the demands to be used as safety switches. This options may require external safety arrangements, e.g. light curtains, photocells or contact mats.

The switches can be connected either to the manipulator base (R1.SW1 and R1.SW2/3, see Figure 23), or to the controller. In the controller the signals are connected to screw terminal XT8 Phoenix MSTB 2.5/12-ST-5.08.
Switch type Balluff Multiple position switches BNS, according to EN 60947-5-1 and EN 60947-5-2.

Connection to

075 Manipulator
Connection on the manipulator base with one/two FCI 23-pin connector.
Customer connection sets for R1.SW1 and R1.SW2/3 are available as option.

076 Cabinet
Connection on the cabinet wall. Position switch cables are included.

Position switches axis 1

069 One switch
071 Three switches
Connection of signals axis 1 (cable lengths)
078 7m
079 15m
080 22m
081 30m

072 Position switches axis 2
Only available if option 041 or 042 is chosen.
Not available with option 036 (foundry).

073 Position switches axis 3
Only available if options 041 or 042, and 072 are chosen.
Not available with option 036 (foundry).

Connection of signals axes 2 and 3 (cable lengths)
083 7m
084 15m
085 22m
086 30m

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.

Axis 1
061 Stops which allow the working range to be restricted in increments of 7,5°.
062 Stops which allow the working range to be restricted in increments of 15°.

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°.

Axis 3
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°.
3 Accessories

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 S4Cplus, and Product Specification RobotWare Options.

**Robot Peripherals**

- Track Motion
- Tool System
- Motor Units
- Spot welding system for transformer gun
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