
ROBOTICS

User manual

FlexPendant



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**User manual
FlexPendant**

OmniCore, FlexPendant

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Revision: A

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1 Description

1.1 Handling of FlexPendant

Detached FlexPendant

A FlexPendant that is not connected to the robot must be stored out of sight so that it cannot be mistaken for being in use.

Handling and cleaning

- The FlexPendant may only be used for the purposes mentioned in this manual.
- Always use the hand-strap while holding the FlexPendant.
- Handle with care. Do not drop, throw, or give the FlexPendant strong shock. It can cause breakage or failure.
- If the FlexPendant is subjected to shock, always verify that the safety functions (three-position enabling device and emergency stop) work and are not damaged.
- Always use and store the FlexPendant in such a way that the cable does not become a tripping hazard.
- When not using the device, place it in its holder.
- Never use sharp objects (such as screwdriver or pen) for operating the touch screen. This could damage the touch screen. Instead use your finger or a stylus.
- Never clean the FlexPendant with solvents, scouring agent, or scrubbing sponges.

See the product manual for the robot controller, section *Cleaning the FlexPendant*.

- Always close the protective cap on the USB port when no USB device is connected. The port can break or malfunction if exposed to dirt or dust.
- Do not squeeze and thus damage the cable.
- Do not lay the cable over sharp edges.



CAUTION

The FlexPendant touch screen is made of glass. If the device is dropped on a hard surface or receives a significant impact the glass could break. To reduce the risk of cuts if the glass chips or cracks, do not touch or attempt to remove the broken glass.

FCC statement

Changes or modification to the FlexPendant not expressly approved by ABB will void the user's authority to operate the equipment.

Continues on next page

1 Description

1.1 Handling of FlexPendant

Continued

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference, and**
- 2 This device must accept any interference received, including interference that may cause undesired operation.**

1.2 Mounting the FlexPendant holder

**Note**

To avoid dropping the FlexPendant from height, the holder should be placed in a comfortable working height.

Always use and store the FlexPendant in such a way that the cable does not become a tripping hazard.

When not using the device, place it so it does not accidentally fall.

Required equipment

| Equipment | Spare part number | Note |
|-------------------------------------|-------------------|--|
| Standard toolkit | | See Standard toolkit for controller on page 38 . |
| FlexPendant Holder w/t E-stop cover | 3HAC064927-001 | |

**Note**

The FlexPendant should always be placed in the holder when it is not used and it is not allowed to use by unauthorized person.

Continues on next page

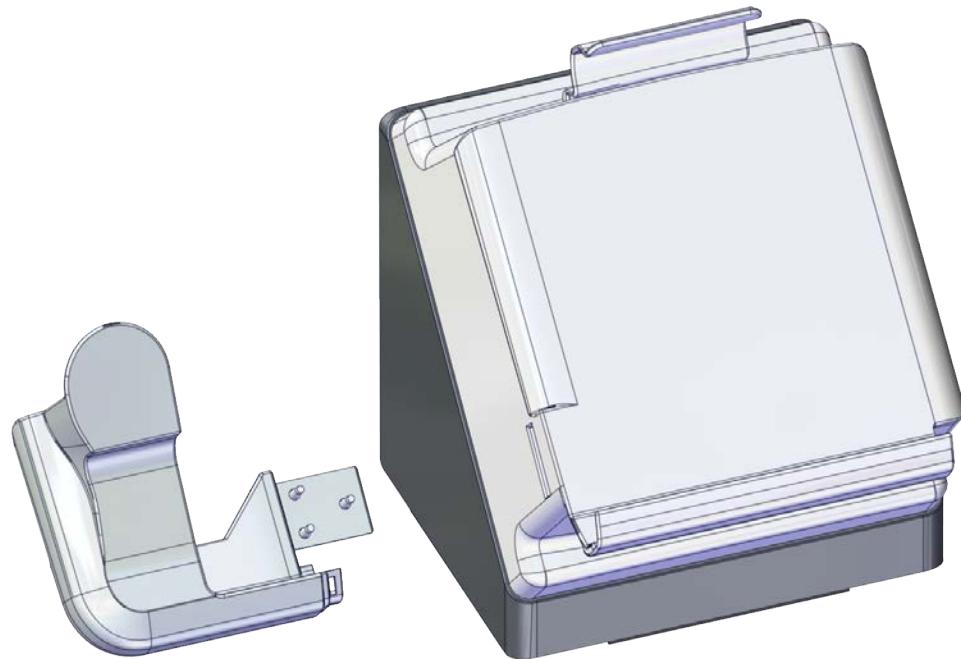
1 Description

1.2 Mounting the FlexPendant holder

Continued

Mounting the bracket for the emergency stop on the FlexPendant holder

The FlexPendant holder is shipped without the bracket for the emergency stop assembled to the holder. They are separated as two parts.

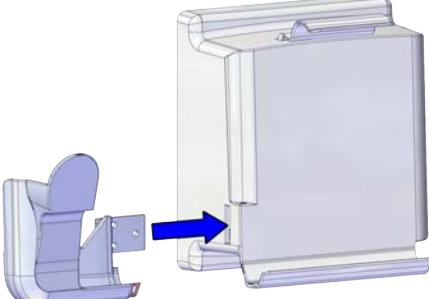


xx2100000767

Use this procedure to mount the bracket for the emergency stop to the FlexPendant holder.

| | Action | Note/illustration |
|---|---|--|
| 1 | Remove the four screws. | |
| 2 | Separate the rear part from the FlexPendant holder. |  <p>xx2000002356</p> |

Continues on next page

| Action | Note/illustration |
|--------|--|
| 3 | <p>Insert the bracket into the FlexPendant holder.</p>  <p>xx2100000765</p> |
| 4 | <p>Secure with the screws.</p> <p>Screws: BN33 Phillips pan head tapping screw ST2.9x13 (3 pcs) Tightening torque: 6 Nm-7.8 Nm</p>  <p>xx2100000766</p> |
| 5 | <p>Refit the rear part and secure with the screws.</p> <p>Screws: BN33 Phillips pan head tapping screw ST3.5x16 (4 pcs) Tightening torque: 9.4 Nm-12.2 Nm</p>  <p>xx2000002356</p> |

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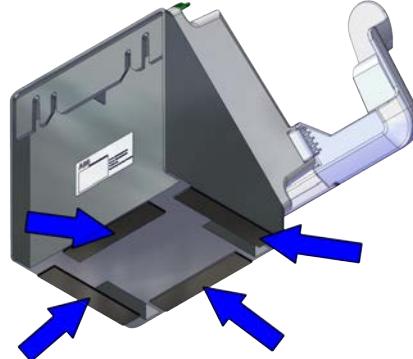
1 Description

1.2 Mounting the FlexPendant holder

Continued

Mounting the FlexPendant holder onto a flat surface (Horizontally)

Use this procedure to mount the FlexPendant holder onto a flat surface, like the top of the controller or a desktop.

| | Action | Note/illustration |
|---|--|---|
| 1 | Clean the surface and make sure it is dry. | |
| 2 | Remove the protective liner from the tape. |  xx2000002352 |
| 3 | Press the holder onto the desired place. |  xx2000002353 |

Hanging the FlexPendant holder with the bracket

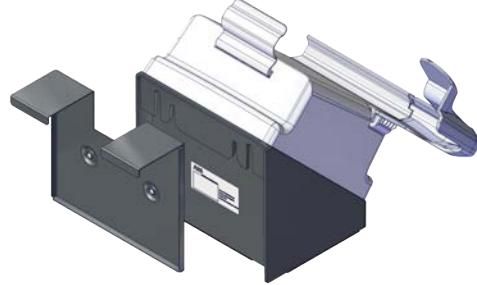
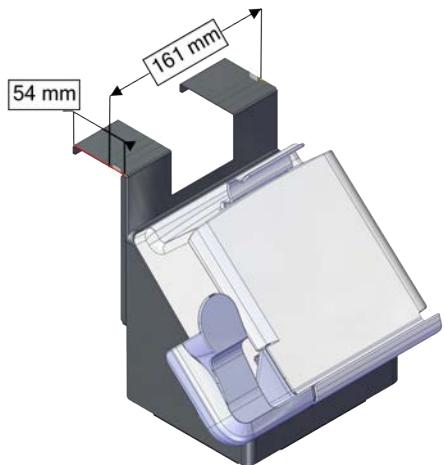
Use this procedure to hang the FlexPendant holder on any place that can hold the bracket, like the door of the equipment.



Tip

The bracket is included on delivery.

Continues on next page

| Action | Note/illustration |
|--|---|
| 1 Hang the FlexPendant holder to the bracket according to the screws on the bracket. |  xx2000002354 |
| 2 Hang the holder with the bracket to the desired place. |  xx2000002355 |

Hanging the front part of the FlexPendant holder with screws (Vertically)

Use this procedure to hang the front part of the FlexPendant holder to the desired place.

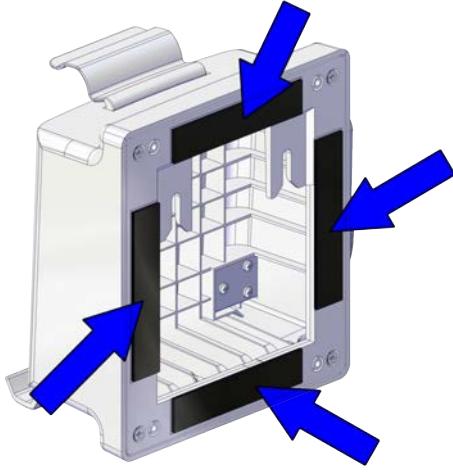
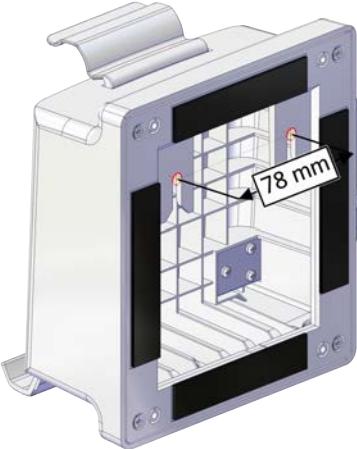
| Action | Note/illustration |
|---|--|
| 1 Remove the four screws. | |
| 2 Separate the rear part from the FlexPendant holder. |  xx2000002356 |
| 3 Clean the surface and make sure it is dry. | |

Continues on next page

1 Description

1.2 Mounting the FlexPendant holder

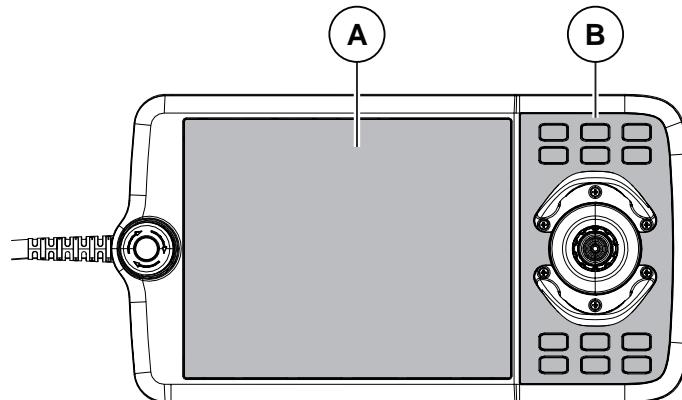
Continued

| Action | Note/illustration |
|--------|--|
| 4 | <p>Remove the protective liner from the tape.</p>  <p>xx2000002357</p> |
| 5 | Press the holder onto the desired place. |
| 6 | <p>Use two M5 screws to secure the holder.</p>  <p>xx2000002358</p> |

1.3 Cleaning the FlexPendant

Location

The surfaces to clean are shown in the illustration below.



xx1800000128

| | |
|---|--------------|
| A | Touch screen |
| B | Hard buttons |

Required equipment

| Equipment, etc. | Note |
|---------------------------|---------------|
| Soft cloth | ESD protected |
| Water/Mild cleaning agent | |

Clean the touch screen

This section describes how to clean the touch screen.

| | Action | Info/Illustration |
|---|--|-------------------|
| 1 | Lock the screen. | |
| 2 | It is safe to clean the FlexPendant when the Lock screen appears. | |
| 3 | Clean the touch screen and hardware buttons using a soft cloth and water or a mild cleaning agent. | |
| 4 | Unlock the screen, by tapping the buttons. | |

Cleaning considerations

The section below specifies some special considerations when cleaning the FlexPendant:

- Use ESD Protection
- Use cleaning equipment as specified above. Any other cleaning equipment may shorten the life time of the touch screen.
- Check that all protective covers are fitted to the device before cleaning.
- Make sure that no foreign objects or liquids can penetrate into the device.

Continues on next page

1 Description

1.3 Cleaning the FlexPendant

Continued

- Do not remove any covers before cleaning the FlexPendant.
- Do not spray with a high pressure cleaner.
- Do not clean the device, operating panel and operating elements with compressed air, solvents, scouring agent or scrubbing sponges.

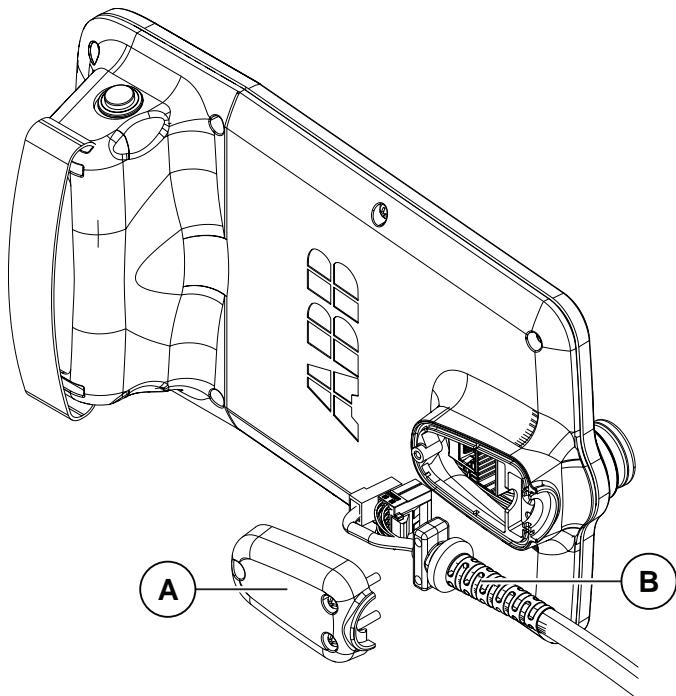
1.4.1 Replacing the power cable and power cable cover

1.4 Replacing parts on the FlexPendant

1.4.1 Replacing the power cable and power cable cover

Location

The illustration shows the location of the power cable, power cable gasket, and power cable cover in the FlexPendant.



xx1800001154

| | |
|---|-------------------|
| A | Power cable cover |
| B | Power cable |

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the FlexPendant via myABB Business Portal, www.abb.com/myABB.

| Spare part | Article number | Note |
|------------------------|----------------|-------------|
| Harness TPU connection | 3HAC058870-001 | Harness-TPU |

Required tools and equipment

| Equipment | Article number | Note |
|------------------|----------------|--|
| Standard toolkit | - | Content is defined in section Standard toolkit for controller on page 38 . |

Continues on next page

1 Description

1.4.1 Replacing the power cable and power cable cover

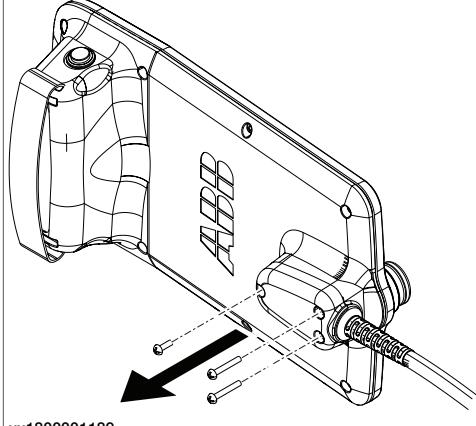
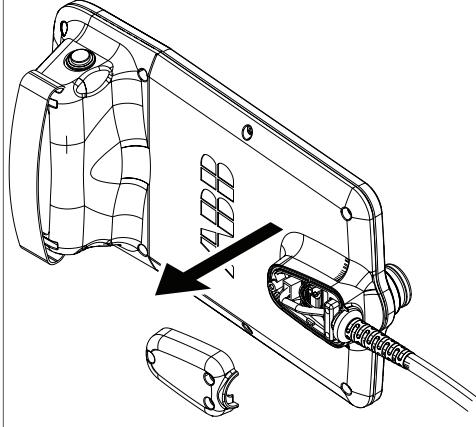
Continued

| Equipment | Article number | Note |
|---------------------------|----------------|------|
| ESD protective wrist band | - | |

Required documents

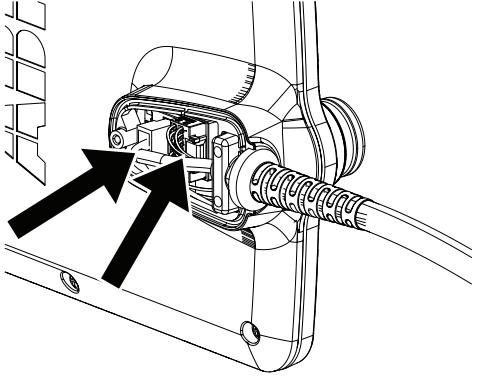
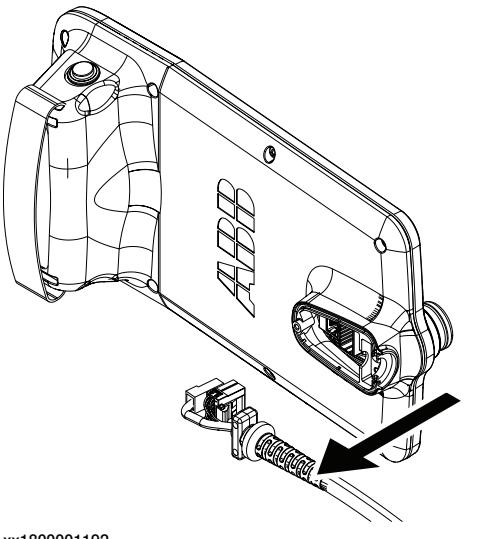
| Document | Article number | Note |
|---|--|------|
| <i>Circuit diagram - OmniCore C30, Circuit diagram - OmniCore C30 for IRB 14050, Circuit diagram - OmniCore C30 for CRB 15000</i> | 3HAC059896-009, 3HAC063898-009, 3HAC072448-009 | |

Removing the power cable and power cable cover

| | Action | Note/Illustration |
|---|---|--|
| 1 | | |
| 2 | Disconnect the FlexPendant from the controller. | |
| 3 | Remove the attachment screws for the power cable cover. |  xx1800001189 |
| 4 | Remove the power cable cover. |  xx1800001190 |

Continues on next page

1.4.1 Replacing the power cable and power cable cover
Continued

| | Action | Note/Illustration |
|---|--|---|
| 5 | Disconnect two connectors to the Flex-Pendant. |  xx1800001748 |
| 6 | Remove the power cable. |  xx1800001192 |

Refitting the power cable and power cable cover

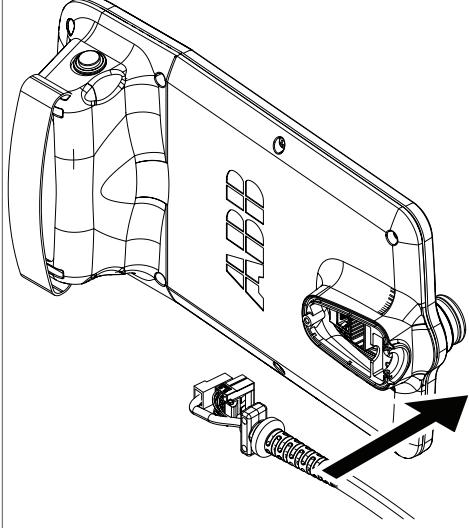
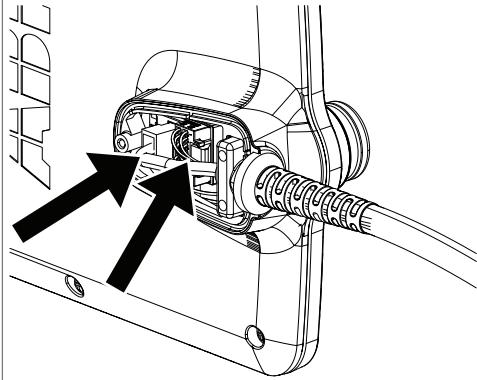
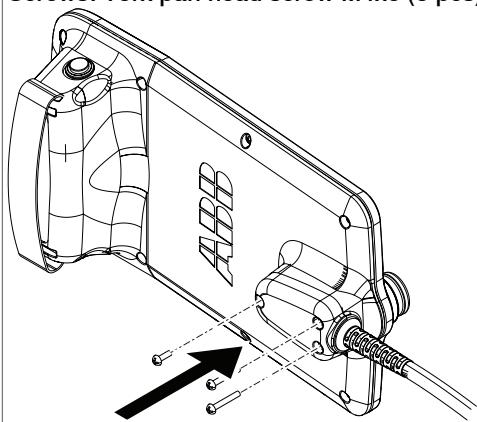
| | Action | Note/Illustration |
|---|--------|-------------------|
| 1 | | |

Continues on next page

1 Description

1.4.1 Replacing the power cable and power cable cover

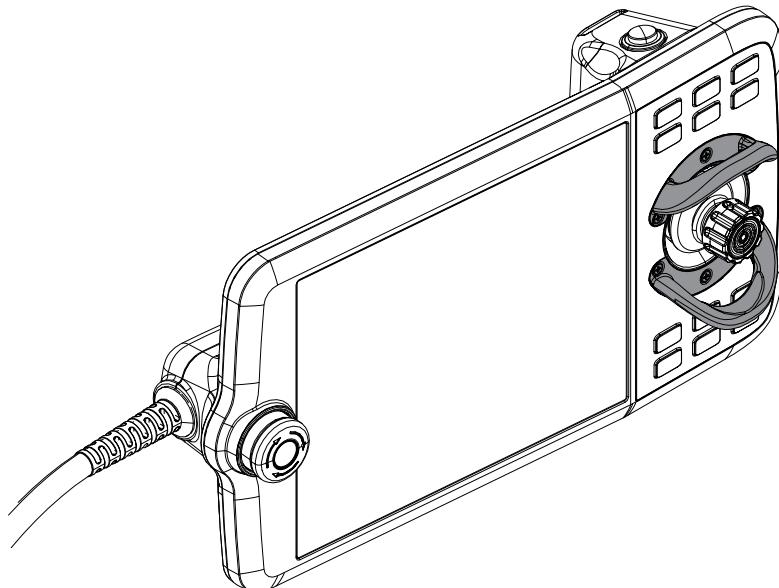
Continued

| | Action | Note/Illustration |
|---|--|--|
| 2 | Refit the power cable. |  xx1800001193 |
| 3 | Reconnect the power cable to the FlexPendant. |  xx1800001748 |
| 4 | Refit the power cable cover and tighten the screws. | <p>Screws: Torx pan head screw M4x8 (3 pcs)</p>  xx1800001196 |
| 5 | Perform the function tests to verify that the safety features work properly, see Function tests on page 25 . | |

1.4.2 Replacing the joystick protection

Location

The illustration shows the location of the joystick protection on the FlexPendant.



xx1800001197

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the FlexPendant via myABB Business Portal, www.abb.com/myABB.

| Spare part | Article number | Note |
|----------------|----------------|------|
| Joystick guard | 3HAC065408-001 | |

Required tools and equipment

| Equipment | Article number | Note |
|------------------|----------------|--|
| Standard toolkit | - | Content is defined in section Standard toolkit for controller on page 38 . |

Required documents

| Document | Article number | Note |
|---|--|------|
| <i>Circuit diagram - OmniCore C30, Circuit diagram - OmniCore C30 for IRB 14050, Circuit diagram - OmniCore C30 for CRB 15000</i> | 3HAC059896-009, 3HAC063898-009, 3HAC072448-009 | |

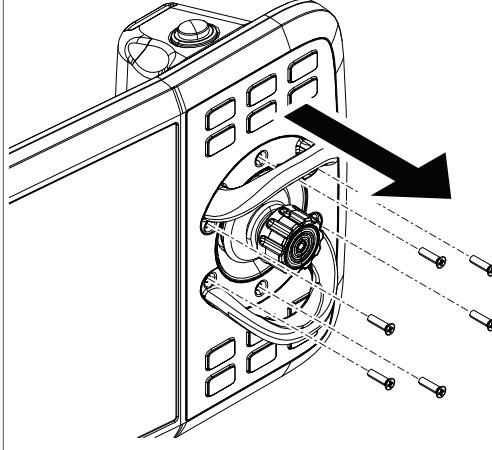
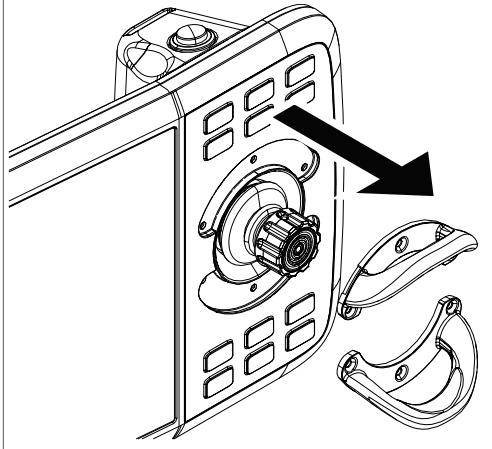
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1 Description

1.4.2 Replacing the joystick protection

Continued

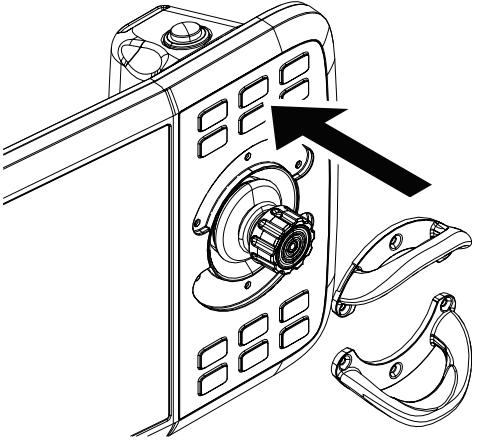
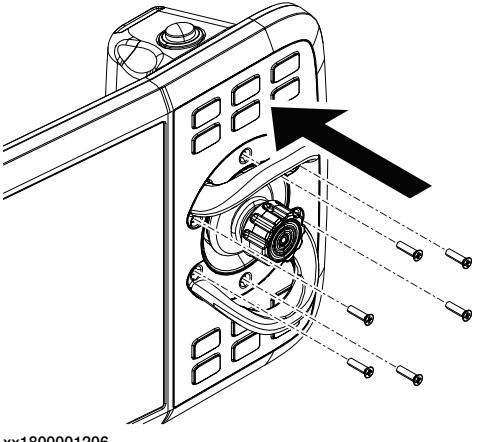
Removing the joystick protection

| | Action | Note/Illustration |
|---|---|---|
| 1 | | |
| 2 | Disconnect the FlexPendant from the controller. | |
| 3 | Remove the attachment screws. |  xx1800001198 |
| 4 | Remove the joystick protection. |  xx1800001199 |

Refitting the joystick protection

| | Action | Note/Illustration |
|---|--------|-------------------|
| 1 | | |

Continues on next page

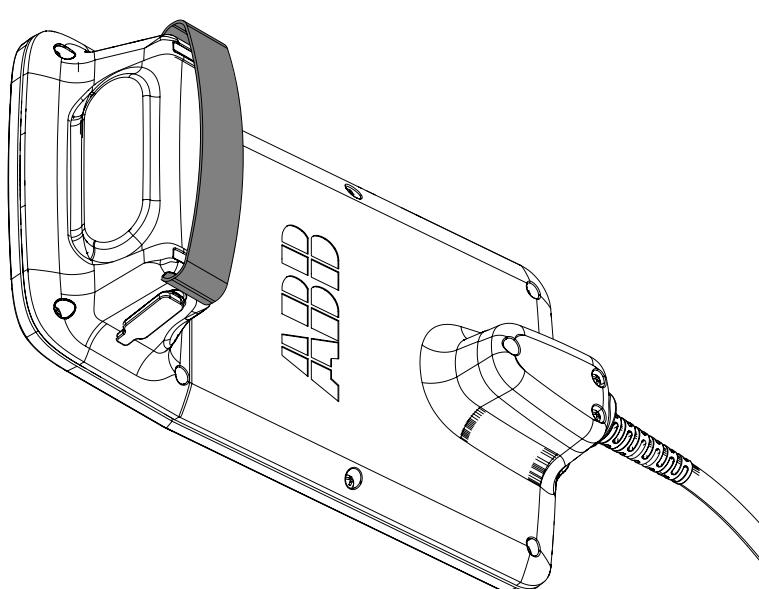
| | Action | Note/Illustration |
|---|--------------------------------|---|
| 2 | Refit the joystick protection. |  xx1800001200 |
| 3 | Secure the screws. |  xx1800001206 Countersunk head screw: ST2.9 X 10 (6 pcs) |

1 Description

1.4.3 Replacing the fasten strip

Location

The illustration shows the location of the fasten strip on the FlexPendant.



xx1900000771

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the FlexPendant via myABB Business Portal, www.abb.com/myABB.

| Spare part | Article number | Note |
|--------------|----------------|------|
| Fasten strip | 3HAC065419-001 | |

Replacing the fasten strip

| | Action | Note/Illustration |
|---|--|-------------------|
| 1 | Open the velcro on the fasten strip. | |
| 2 | Take the fasten strip out from the holes. | |
| 3 | Insert the new fasten strip into the holes one by one. | |
| 4 | Secure the velcro in a suitable length. | |

2.1 Function test of manual, auto, and manual full speed mode with FlexPendant

2 Function tests

2.1 Function test of manual, auto, and manual full speed mode with FlexPendant

Overview

Perform this function test to change the mode on the FlexPendant using the following operation:

- Status bar > Common Settings > Operating Mode (Auto/Manual/Man FS).

For more detailed information, see *Operating manual - OmniCore, 3HAC065036-001*.

Performing the function test

| | Action | Note |
|---|---|---|
| 1 | Start the robot system. | |
| 2 | Change to Automatic operating mode and Motors ON state, and then run the robot in auto mode. | This test is passed if it is possible to run the robot program in auto mode. If it is not possible to run the robot program, this test is failed and the root cause of the failure must be found. |
| 3 | Change to Manual operating mode and Motors ON state, and then run the robot in manual mode. | This test is passed if it is possible to run the robot program in manual mode. If it is not possible to run the robot program, this test is failed and the root cause of the failure must be found. |
| 4 | Change to Manual Full Speed mode and Motors ON state, and then run the robot in manual full speed mode.  Note Manual full speed mode is not available in USA or Canada. | This test is passed if it is possible to run the robot program in manual full speed mode. If it is not possible to run the robot program, this test is failed and the root cause of the failure must be found. |

2 Function tests

2.2 Function test of three-position enabling device

2.2 Function test of three-position enabling device

Performing the function test

| | Action | Note |
|---|---|--|
| 1 | Start the robot system and turn the mode switch to manual mode. | |
| 2 | Press the three-position enabling device to the middle position and then hold the enabling device in this position. | <p>This test is passed if the event message 10011 Motors ON state appears in the event log.</p> <p>If either of the following happens, then the test is failed and the root cause must be found:</p> <ul style="list-style-type: none">• if the event message 10011 Motors ON state does not appear• if the event message 90780 Two-channel fault in Safety Controller appears |
| 3 | While still holding the three-position enabling device pressed, press the enabling device harder to the enable the device's third position. | <p>This test is passed if the event message 10012 Safety guard stop state appears in the event log.</p> <p>If either of the following happens, then the test is failed and the root cause must be found:</p> <ul style="list-style-type: none">• if the event message 10012 Safety guard stop state does not appear• if the event message 90780 Two-channel fault in Safety Controller appears |

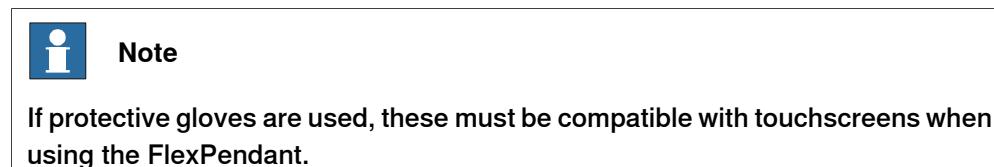
3 Troubleshooting

3.1 Problem starting or connecting the FlexPendant

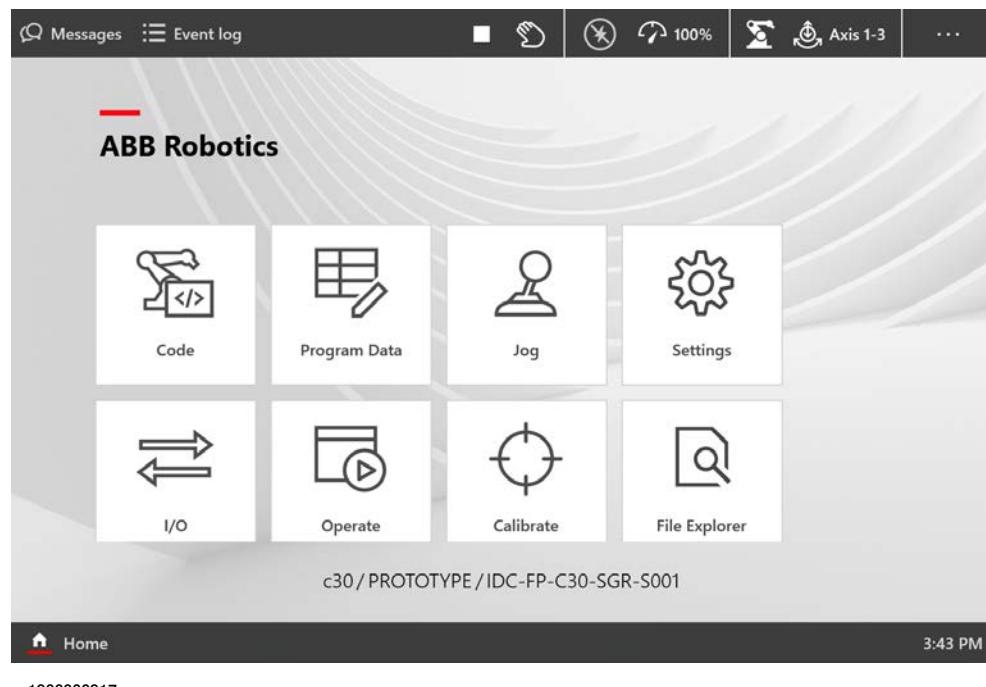
Description

The FlexPendant is not responding, either completely or intermittently.

No entries are possible, and no functions are available.



The FlexPendant starts but does not display the main interface.



Required test equipment

Equipment needed for troubleshooting:

| Equipment | Note |
|---|---|
| Multimeter | |
| Insulating gloves | |
| <i>Circuit diagram - OmniCore C30, Circuit diagram - OmniCore C30 for IRB 14050, Circuit diagram - OmniCore C30 for CRB 15000</i> | <i>3HAC059896-009, 3HAC063898-009, 3HAC072448-009</i> |

Continues on next page

3 Troubleshooting

3.1 Problem starting or connecting the FlexPendant

Continued

Preparations

| Action | |
|--------|--|
| 1 | Make sure that the controller is switched on. Wait 30 s - 1 min to enable start-up sequence. |
| 2 | Check the FlexPendant for errors and warnings. |
| |  DANGER Troubleshooting on the controller while powered on must be performed by personnel trained by ABB or by ABB field engineers. |

Recommended working procedure

If the FlexPendant starts but does not display the main interface during the start-up, use this procedure to troubleshoot what might cause the problem.

Look at the following block diagram to understand how power is connected from incoming and forward.

Detailed working procedure

| | Action | Note |
|---|---|---|
| 1 | Try resetting the FlexPendant using the reset button located next to the USB port. | See <i>Operating manual - OmniCore</i> . |
| 2 | Check that the FlexPendant cable is correctly connected to the controller through the HMI signal connector, X4. | If it is not connected, repair the connection and go to step six. Check the pins in the connector. If it is ok, go to the next step. |
| 3 | Check the LED PC and LED HMI, they should be green. | For more details about the LEDs, see controller manual for troubleshooting of the robot signal exchange proxy. <ul style="list-style-type: none">If the LEDs are not green, see controller manual for troubleshooting of the robot signal exchange proxyIf they are ok, go to the next step. |
| 4 | Check the FlexPendant cable for any damage. | <ul style="list-style-type: none">If damage is found, replace the FlexPendant cable and go to step six.If it is ok, go to the next step. |
| 5 | Check that the connection from the robot signal exchange proxy to the HMI signal connector is ok, K2.X9, 13 - X4. | <ul style="list-style-type: none">If it is not ok, repair the connection and go to step six.If it is ok, go to the next step. |
| 6 | Check that the connection from the robot signal exchange proxy to the main computer is ok: <ul style="list-style-type: none">K2.X8 - A2.X6K2.X2 - A2.X1K2.X12 - A2.K3.X6,7K2.X3 - A2.K3.X1 | <ul style="list-style-type: none">If any connection fails, repair the connection and go to step six.If the connections are ok, go to the next step. |

Continues on next page

| | Action | Note |
|---|--|--|
| 7 | If possible, test by connecting another FlexPendant. This is to eliminate the FlexPendant and cable as error sources; Test the FlexPendant with a different controller to eliminate the controller as error source. | |
| 8 | Check that the FlexPendant works normally.  Tip This is detailed in section Troubleshooting the FlexPendant on page 31 . | If it is not ok, contact your local ABB. |

3 Troubleshooting

3.2 Problem using the joystick

3.2 Problem using the joystick

Description

The FlexPendant is started and responds when you push the buttons or tap on the touchscreen. However, the joystick does not work and no warnings or messages show up. It is therefore not possible to jog the robot.

Recommended working procedure

| | Action | Information |
|---|--|---|
| 1 | Make sure that the joystick lock is not activated. | See <i>Operating manual - OmniCore</i> . |
| 2 | Make sure the controller is in manual mode. | |
| 3 | Make sure the FlexPendant is connected correctly to the controller. | |
| 4 | Press the reset button located next to the USB port on the back of the FlexPendant. | If the joystick is still not working, then replace the FlexPendant. |
| |  Note The reset button only resets the FlexPendant, not the system on the controller. | |

3.3 Troubleshooting the FlexPendant

Description

The FlexPendant communicates with the main computer. The FlexPendant is physically connected to the panel board. The cable contains the +24 V supply, two enabling device chains and emergency stop.

Procedure

The procedure below describes what to do if the FlexPendant does not work correctly.

| | Action | Note |
|---|---|--|
| 1 | Try resetting the FlexPendant using the reset button located next to the USB port. | See <i>Operating manual - OmniCore</i> . |
| 2 | If the FlexPendant is not responding or does not operate correctly, see Problem starting or connecting the FlexPendant on page 27 . |  Note If protective gloves are used, these must be compatible with touch-screens when using the FlexPendant. |
| 3 | Check the cable for connections and integrity. | |
| 4 | Check the 24 V power supply. | |
| 5 | Read the error event log message and follow any instructions of references. | |

For more information on the FlexPendant, see *Operating manual - OmniCore*.

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4 Spare parts

Spare part level

ABB spare parts are categorized into two levels, L1 and L2. Always check the part level before conducting a service work on a spare part.

- L1 spare parts

The L1 parts can be replaced in the field. The maintenance and replacement instructions given in the related product manuals must be strictly followed. If there are any problems, contact your local ABB for support.

- L2 spare parts

To replace the L2 parts require specialized training and might need special tools. Only ABB field service personnel or qualified personnel trained by ABB can replace L2 parts.

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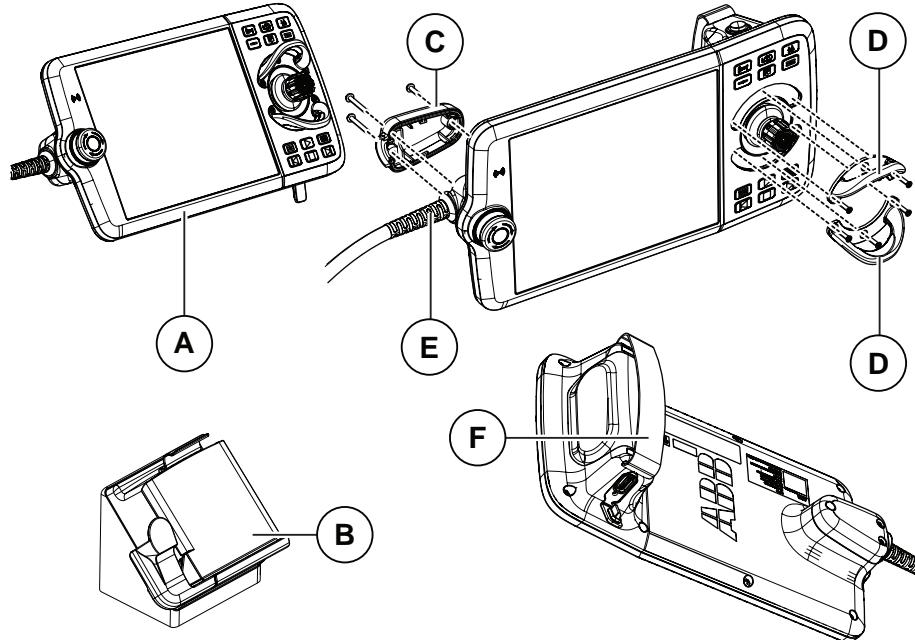
4 Spare parts

4.1 FlexPendant parts

4.1 FlexPendant parts

FlexPendant parts

The illustration below shows the placement of the parts in the recommended spare part list.



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| | Spare part num- ber | Description | Type | Spare part level |
|---|------------------------|-------------------------------------|----------|---------------------|
| A | 3HAC064211-001 | FlexPendant | DSQC3060 | L1 |
| B | 3HAC064927-001 | FlexPendant Holder w/t E-stop cover | | L1 |
| C | 3HAC065401-001 | Power cable cover | | L1 |
| D | 3HAC065408-001 | Joystick guard | | L1 |
| E | 3HAC064448-002 | FlexPendant power cable 3 m | | L1 |
| | 3HAC064448-001 | FlexPendant power cable 10 m | | L1 |
| | 3HAC064448-003 | FlexPendant power cable 30 m | | L1 |
| F | 3HAC065419-001 | Fasten strip | | L1 |
| - | 3HAC068915-001 | FlexPendant extension cable 15 m | | L1 |
| - | 3HAC068915-002 | FlexPendant extension cable 22 m | | L1 |
| - | 3HAC068915-005 | FlexPendant extension cable 30 m | | L1 |

5 Reference information

5.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

5 Reference information

5.2 Applicable standards

5.2 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

| Standard | Description |
|----------|--|
| ISO 9283 | Manipulating industrial robots – Performance criteria and related test methods |
| ISO 9787 | Robots and robotic devices – Coordinate systems and motion nomenclatures |
| ISO 9946 | Manipulating industrial robots – Presentation of characteristics |

Other standards used in design

| Standard | Description |
|------------------|---|
| IEC 60204-1 | Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1 |
| IEC 61000-6-2 | Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments |
| IEC 61000-6-4 | Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments |
| ISO 13849-1:2006 | Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1 |

Region specific standards and regulations

| Standard | Description |
|------------------|---|
| ANSI/RIA R15.06 | Safety requirements for industrial robots and robot systems |
| ANSI/UL 1740 | Safety standard for robots and robotic equipment |
| CAN/CSA Z 434-03 | Industrial robots and robot Systems - General safety requirements |
| EN ISO 10218-1 | Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots |

5.3 Unit conversion

Converter table

Use the following table to convert units used in this manual.

| Quantity | Units | | |
|----------|-------|--------------|----------|
| Length | 1 m | 3.28 ft. | 39.37 in |
| Weight | 1 kg | 2.21 lb. | |
| Weight | 1 g | 0.035 ounces | |
| Pressure | 1 bar | 100 kPa | 14.5 psi |
| Force | 1 N | 0.225 lbf | |
| Moment | 1 Nm | 0.738 lbf-ft | |
| Volume | 1 L | 0.264 US gal | |

5 Reference information

5.4 Standard toolkit for controller

5.4 Standard toolkit for controller

General

All service (repair, maintenance and installation) instructions contain lists of tools required to perform the specified activity. All special tools, that is, all tools that are not considered as standard tools as defined below, are listed in their instructions respectively.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instructions.

Standard toolkit for controller

| Tool | Description |
|--------------------------------|-------------|
| Screw driver, Torx | Tx10 |
| Screw driver, Torx | Tx20 |
| Screw driver, Torx | Tx25 |
| Ball tipped screw driver, Torx | Tx25 |
| Screw driver, flat blade | 4 mm |
| Screw driver, flat blade | 8 mm |
| Screw driver, flat blade | 12 mm |
| Screw driver | Phillips-1 |
| Box spanner | 8 mm |

Toolkit recommended for troubleshooting

| Tool | Note |
|-------------------|------------------------------------|
| Normal shop tools | Contents as specified above. |
| Multimeter | - |
| Camera | To document problems or procedures |

5.5 Screw joints

General

This section details how to tighten the various types of screw joints on the controller. The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

Tightening torque

Before tightening any screw, note the following:

- Determine whether a standard tightening torque or special torque is to be applied. The standard torques are specified in the tables below. Any special torques are specified in the Repair, Maintenance or Installation procedure description. Any special torque specified overrides the standard value.
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, i.e. *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is 10%!

The table below specifies the recommended standard tightening torque for *oil-lubricated screws with slotted or cross-recess heads*.

| Dimension | Tightening torque (Nm) Class 4.8, oil-lubricated |
|-----------|---|
| M2.5 | 0.25 |
| M3 | 0.5 |
| M4 | 1.2 |
| M5 | 2.5 |
| M6 | 5.0 |

5 Reference information

5.6 Weight specifications

5.6 Weight specifications

Definition

In all repair and maintenance instructions, weights of the components handled are sometimes specified. All components exceeding 22 kg (50 lbs) are high-lighted in this way.

To avoid injury, ABB recommends the use of lifting equipment when handling components with a weight exceeding 22 kg.

Example

Below is an example of how a weight specification is presented:



CAUTION

The transformer weighs 55 kg! All lifting equipment used must be sized accordingly!

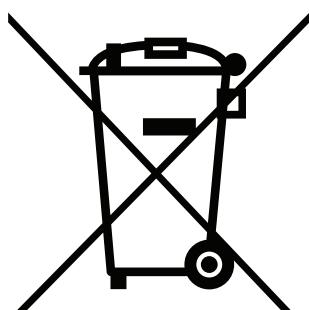
5.7 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials should be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards. Robots or parts that can be reused or upcycled helps to reduce the usage of natural resources.

Symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



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Materials used in the product

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly according to local regulations to prevent health or environmental hazards.

| Material | Example application |
|----------|---------------------|
| | |

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ABB AB
Robotics & Discrete Automation
S-721 68 VÄSTERÅS, Sweden
Telephone +46 10-732 50 00

ABB AS
Robotics & Discrete Automation
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.
Robotics & Discrete Automation
No. 4528 Kangxin Highway
PuDong New District
SHANGHAI 201319, China
Telephone: +86 21 6105 6666

ABB Inc.
Robotics & Discrete Automation
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics