

UNIVERSAL ROBOTS

Service Manual e-Series

Original instructions (EN)

Version: 1.1.6

Robot:

UR3e, UR5e, UR10e and UR16e

Control Box:

e-Series Control box, OEM AC and OEM DC

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1. General Information

1.1 Purpose

The purpose of the Service Manual is to help Universal Robots (UR) users and integrators to safely perform service-related operations and troubleshooting.

Universal Robots industrial robots are designed using high quality components to ensure a long lifetime. However, improper use of a robot or robot parts can potentially cause failures. If, for example, the robot is overloaded, dropped during relocation, damaged by collision, or any other improper usage, the warranty will be void.

Universal Robots recommends the user does not attempt repair, adjustment, or make other interventions in the mechanical or electrical systems of the robot without first consulting a UR certified service engineer. Any unauthorized intervention voids the warranty. Service-related operations and troubleshooting should only be performed by qualified personnel.

Before performing service-related operations, stop the robot program and disconnect the main power to any potential dangerous tool on the robot or in the surroundings.

In the event of a defect, Universal Robots recommends ordering new parts from the Universal Robot distributor where the robot was originally purchased. Alternatively, parts can be ordered from the nearest distributor, details of which can be obtained from Universal Robots official website at www.universal-robots.com

1.2 Company Details

Universal Robots A/S
Energivej 25
DK-5260 Odense Denmark
Tel.: +45 89 93 89 89
Fax: +45 38 79 89 89

1.3 Disclaimer

Universal Robots continues to improve reliability and performance of its products, and therefore reserves the right to upgrade the product without prior warning. Universal Robots takes every care that the contents of this manual are precise and correct, but takes no responsibility for any errors or missing information.

1.4 Safety message types

Safety messages in this document contain information that helps you avoid injuries or equipment damage. This document contains the following safety message types.



DANGER

This safety message indicates a hazardous situation that, if not avoided, will result in death or serious injury.



WARNING

This safety message indicates a hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION

This safety message indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.



NOTICE

This safety message indicates a situation that, if not avoided, could result in damage to equipment or property.



This warning sign contains references to safety-related information or general safety measures. This warning sign does not refer to individual hazards or individual precautionary measures.

This warning draws attention to procedures which serve to prevent or remedy emergencies or malfunctions:



MANDATORY ACTION

Procedures marked with this warning must be followed exactly.

2. Handling ESD-Sensitive Parts

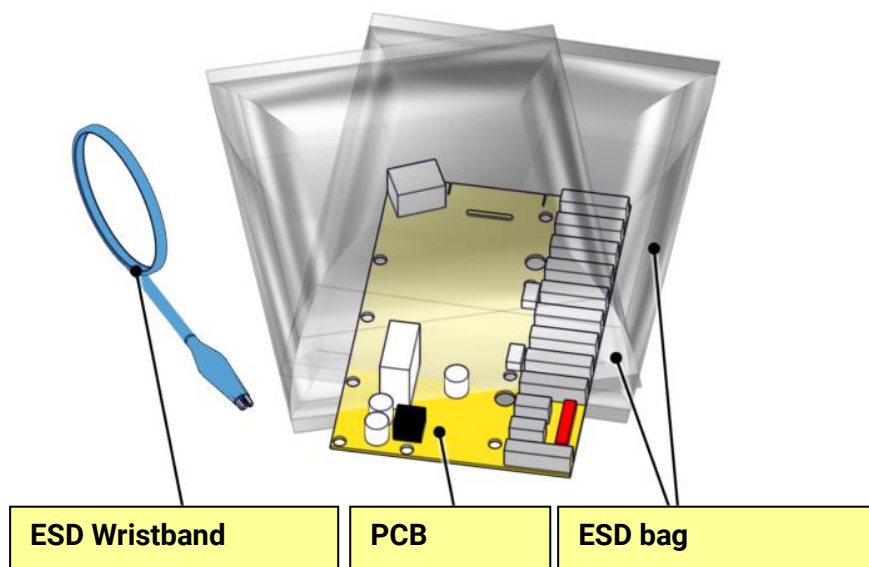


To prevent damage to ESD-sensitive parts i.e. Printed Circuit Board, follow the instructions below in addition to all the usual precautions, such as turning off the power before removing the circuit boards. See section 6.5 Complete rebooting sequence.



NOTICE

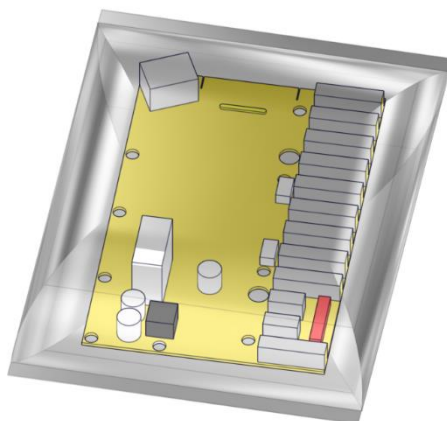
Be sure you have intact ESD Wristband and a spare ESD bag before replacing any ESD-sensitive parts.





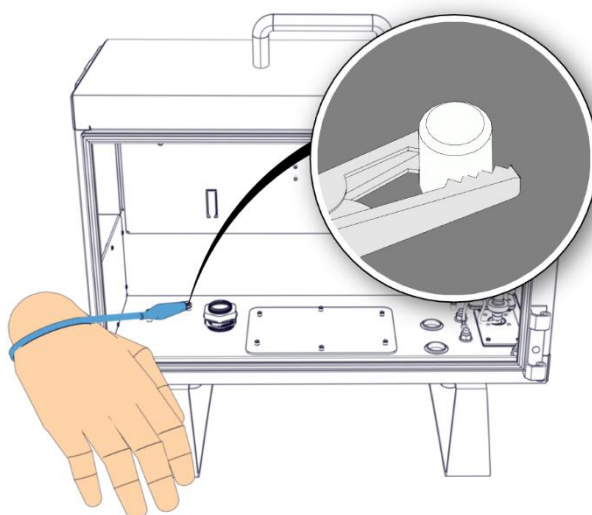
NOTICE

Keep the ESD-sensitive part in its original shipping container. (a special "ESD bag") until the part is ready to be installed.



NOTICE

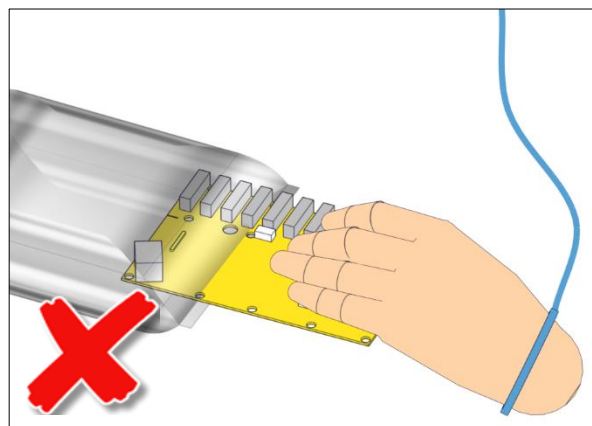
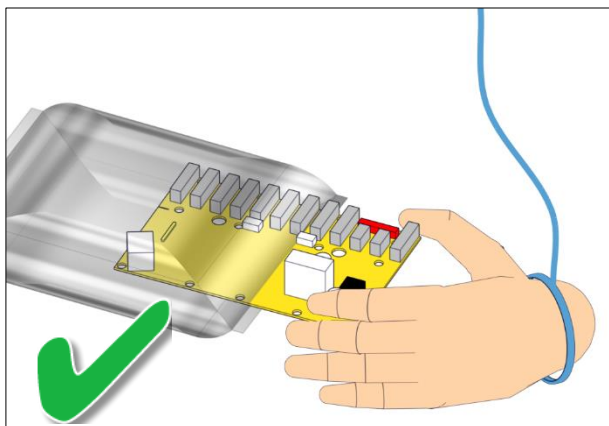
Put the ESD wristband on your wrist. Connect the wristband to the system ground point. It discharges any static electricity in your body to ground.



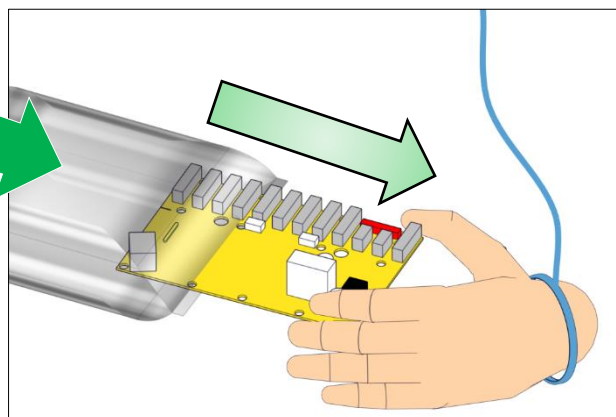
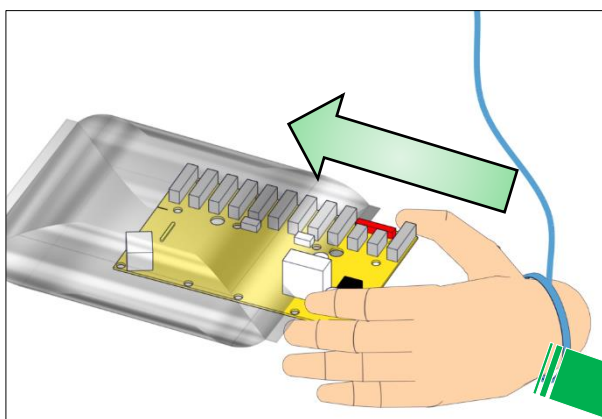
Replacing an ESD-sensitive part in a safe way is important to avoid damage to the part. It is important to take precautions when handling the ESD-sensitive part.


NOTICE

Hold the ESD-sensitive part by its edges.
Do not touch its pins or hold directly on any exposed prints.


NOTICE

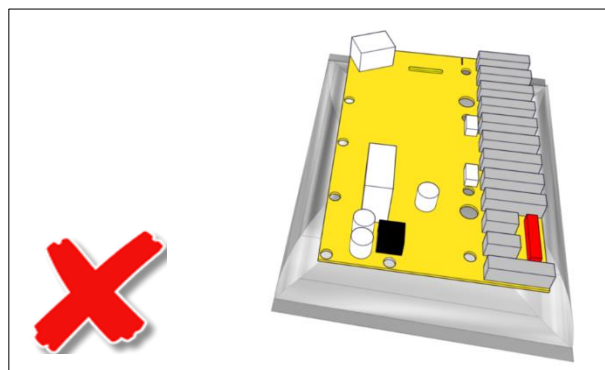
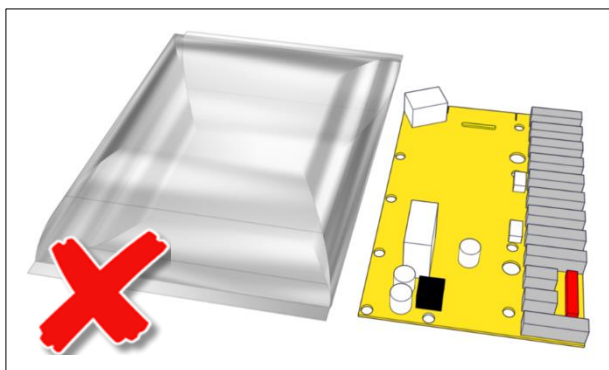
First place the OLD part in the spare ESD bag, then take out the NEW part of the ESD bag.





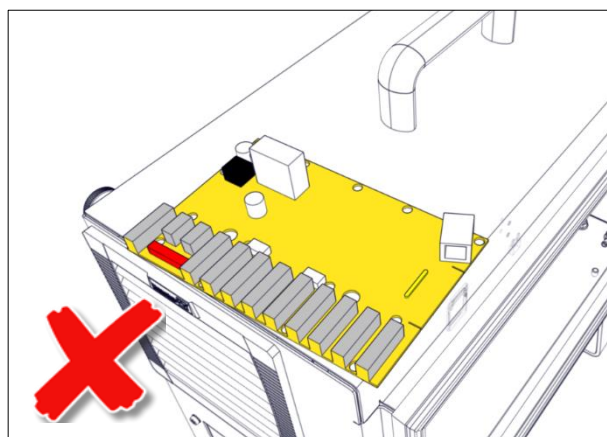
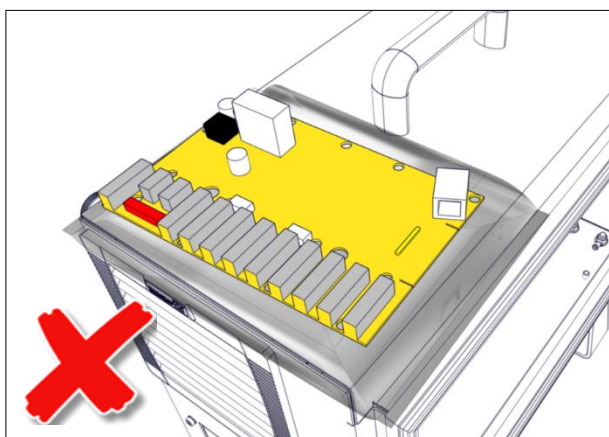
NOTICE

Do not place the ESD-sensitive part on nonconductive material or on metal tables/surfaces.
If you must put down the ESD-sensitive part for any reason, then first place it into the ESD bag.



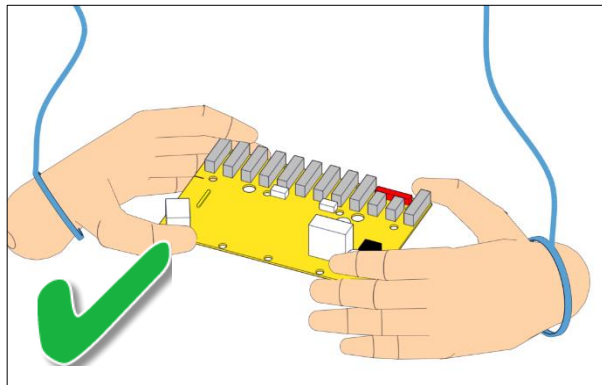
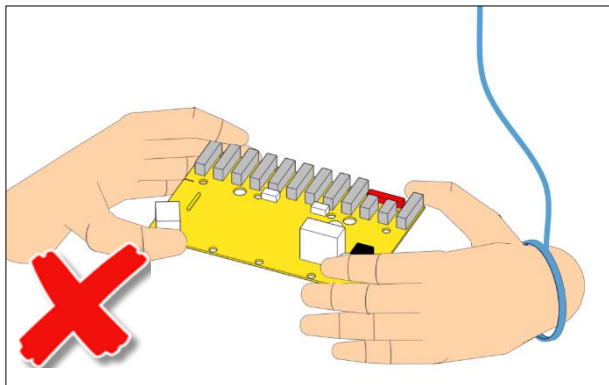
NOTICE

Machine covers and metal tables/surfaces are electrical grounds. They increase the risk of damage because they make a discharge path from your body through the ESD-sensitive part. (Large metal objects can be discharge paths without being grounded.).



**NOTICE**

If passing an ESD-sensitive part to another person, ensure both are wearing ESD wristband and the ESD wristband is attached to the system grounding point.

**NOTICE**

Be extra careful in working with ESD-sensitive parts when cold-weather and heating is used, because low humidity increases static electricity.

3. Recommended Inspection activities

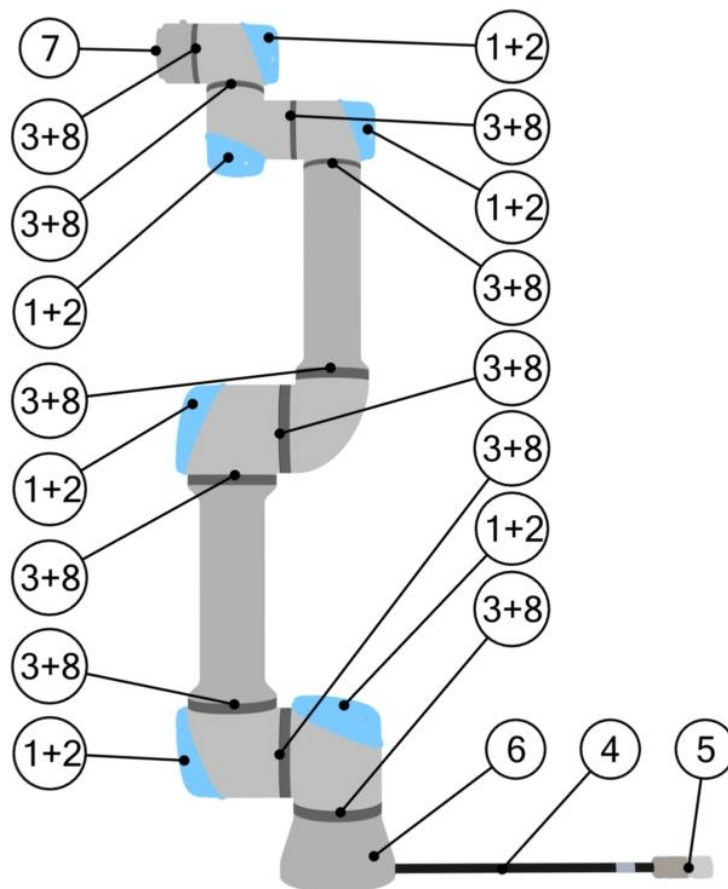
3.1 Robot Arm

3.1.1 Inspection Plan

Set forth below is a check list of inspections that Universal Robots recommends be performed according to the marked time interval. If upon inspection, the referenced parts are not in an acceptable state, please rectify immediately.

Use the following sections as guide: 3.1.1 Visual Inspection 4.0.1 Pre-Use Assessment 4.1 Robot Arm			Monthly	Semi-annually	Annually
1	Check blue lids *	V		X	
2	Check blue lid screws	F		X	
3	Check flat rings	V		X	
4	Check robot cable	V		X	
5	Check robot cable connection	V		X	
6	Check Robot Arm mounting bolts *	F	X		
7	Check Tool mounting bolts *	F	X		
8	Check screws/bolts on joints *	F		X	

V = Visual inspection F = Functional inspection * = Must also be checked after heavy collision



3.1.2 Visual Inspection



NOTICE

Never use compressed air to clean the Robot Arm as it can damage components.

1. Move the Robot Arm to ZERO position, if possible.
2. Turn off and disconnect the power cable from Control Box.
3. Inspect the cable between Control Box and Robot Arm for any damage.
4. Check the base mounting bolts are properly tightened.
5. Check the tool flange bolts are properly tightened.
6. Inspect the flat rings for wear and damage.
 - Replace the flat rings if they are worn out or damaged.
7. Inspect the blue lids on all the joints for any cracks or damage.
 - Replace the blue lids if they cracked or damaged.
8. Inspect the screws used for the blue lids are in place and properly tightened.
 - Replace or tighten screws, if necessary.
 - Correct the torque value for screws on the blue lids to $0.4 \text{ Nm} \begin{smallmatrix} +0.05Nm \\ -0.05Nm \end{smallmatrix}$



NOTICE

If any damage is observed on a robot within the warranty period, contact the distributor where the robot was purchased.

3.1.3 Functional Inspection

The purpose of the functional inspection is to ensure that screws, bolts, tools and robot arm are not loose. The screws/bolts mentioned in the inspection plan should be checked with a torque wrench with the correct torque, specified in 4.1.4 Torque values.

For the robot arm mounting bolts, these specifications can be found in the User Manual under the Mounting section.

3.1.4 Cleaning

You can wipe away any dust/dirt/oil observed on the Robot Arm using a cloth and one of the following cleaning agents: Water, Isopropyl alcohol, 10% Ethanol alcohol or 10% Naphtha. In rare cases, very small amounts of grease can be visible from the joint. This does not affect the function, use, or lifetime of the joint.

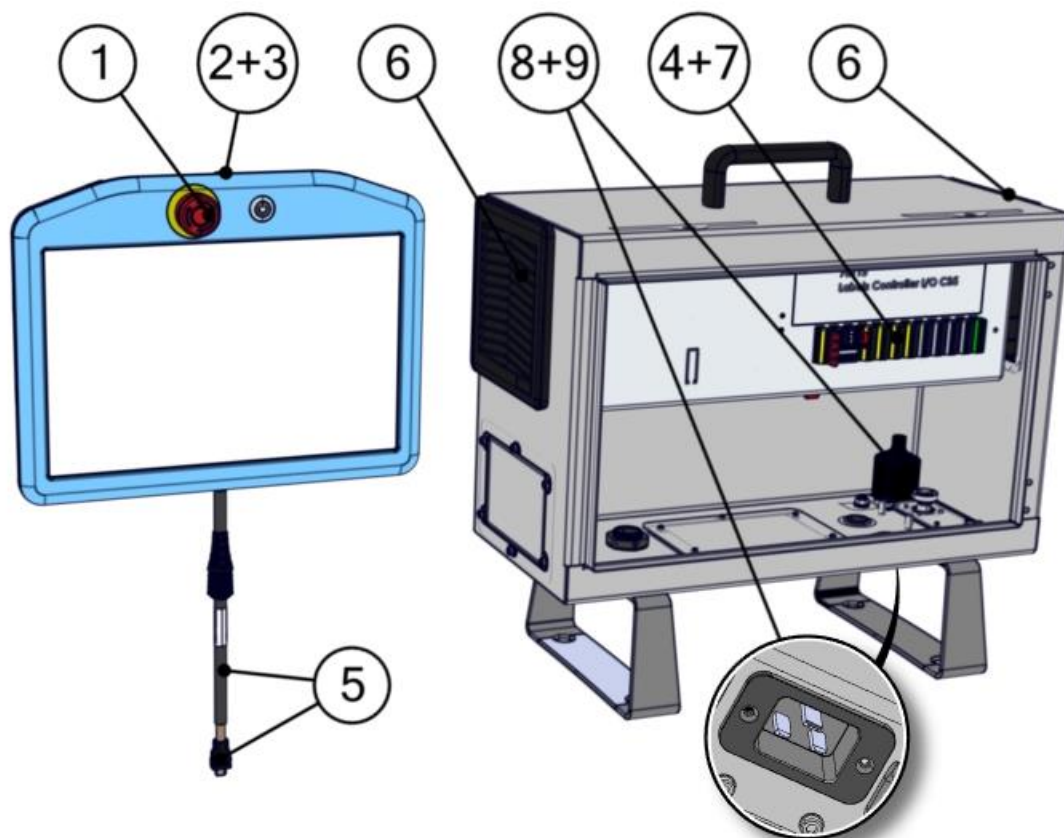
3.2 Control Box and Teach Pendant

3.2.1 Inspection Plan

Set forth below is a check list of inspections that Universal Robots recommends be performed according to the marked time interval. If upon inspection, the referenced parts are not in an acceptable state, please rectify immediately

Use the following sections as guide: 3.2.2 Functional and safety inspection 3.2.3 Visual Inspection 4.0.1 Pre-Use Assessment 4.2 Control Box			Monthly	Semi-annually	Annually
1	Check Emergency stop on Teach Pendant	F	X		
2	Check Backdrive mode	F	X		
3	Check Freedrive mode	F		X	
4	Check safety inputs and outputs(if connected)	F	X		
5	Check Teach Pendant cable and connector	V		X	
6	Check and clean air filters on Control Box	V	X		
7	Check terminals in Control Box	F		X	
8	Check electrical grounding $1 < \Omega$ to Control Box	F			X
9	Check main power to Control Box	F			X

V = Visual inspection F = Functional inspection



3.2.2 Functional and safety inspection

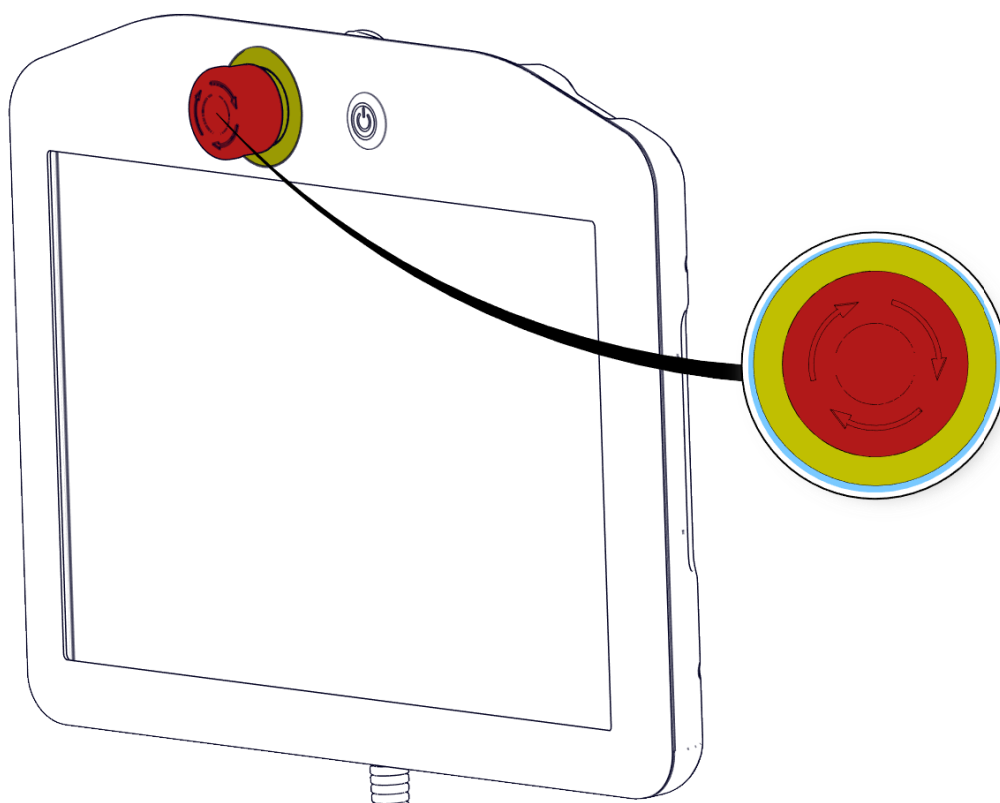


NOTICE

Robot safety functions is highlight recommended be tested monthly to ensure correct function.

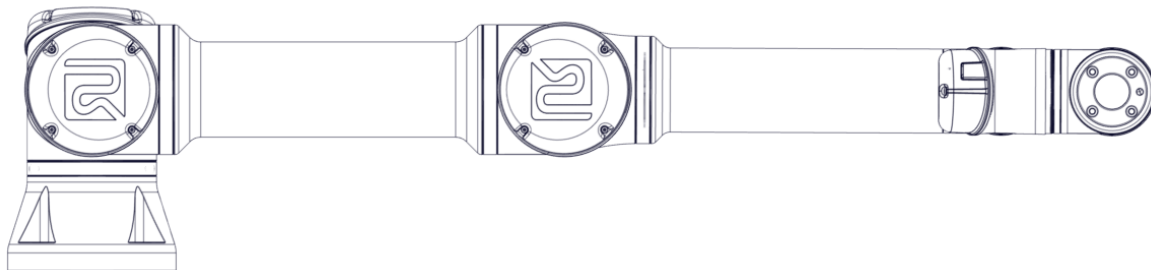
Emergency Stop button on the Teach Pendant:

1. Press the Emergency Stop button on the Teach Pendant.
2. Observe the robot stops and shuts off power to the joints.
3. Power on robot again.

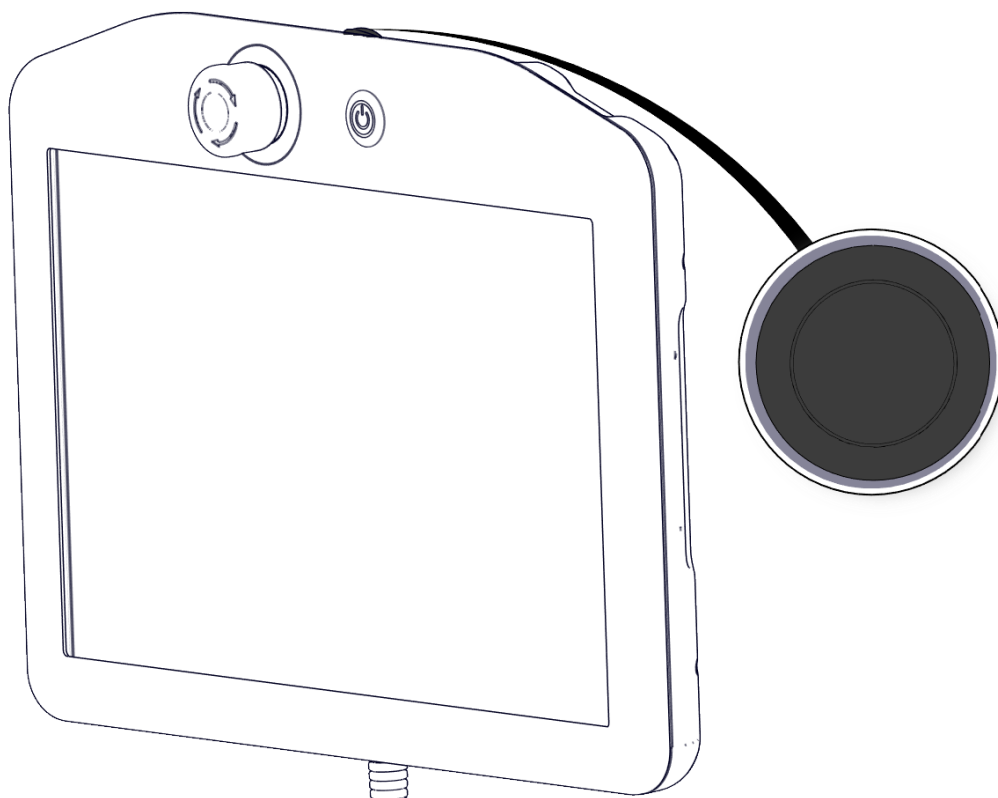


Freedrive Mode:

1. Unmount attachment or set TCP/Payload/CoG according to tool specifications.
2. On the Teach Pendant, press the Freedrive button to set the robot to Freedrive mode.
3. Move the robot to a horizontally elongated position and release.



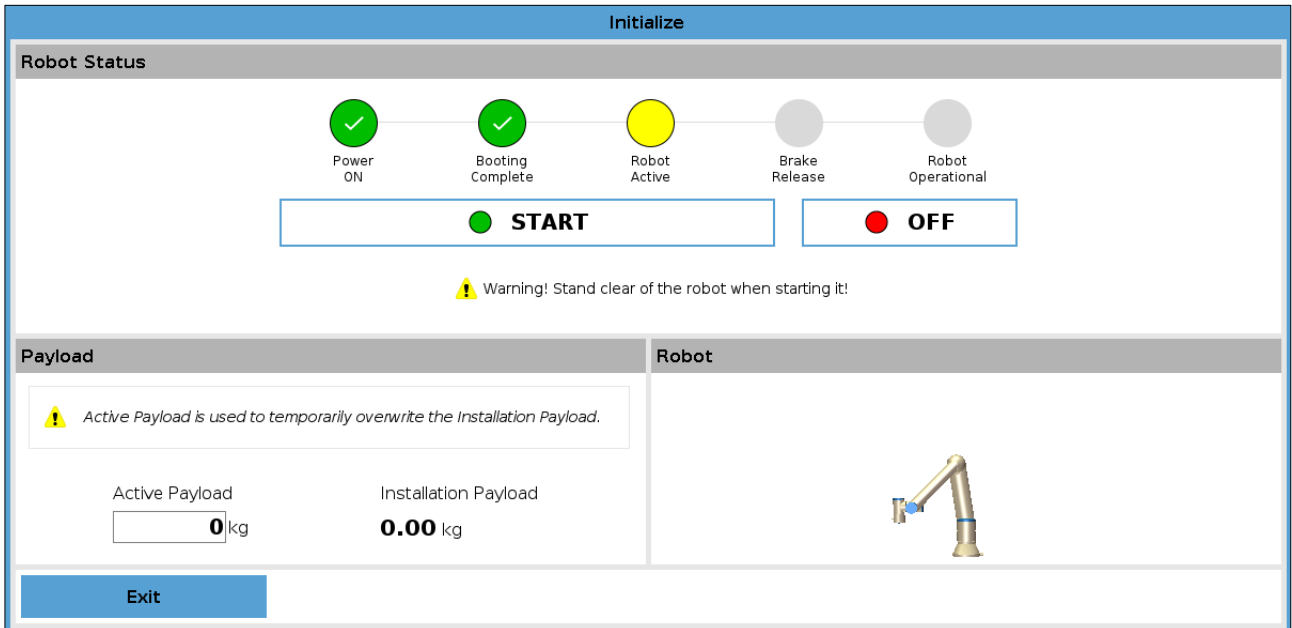
4. Verify the robot can maintain its position when not being held with the Freedrive button still pressed.



Backdrive Mode:

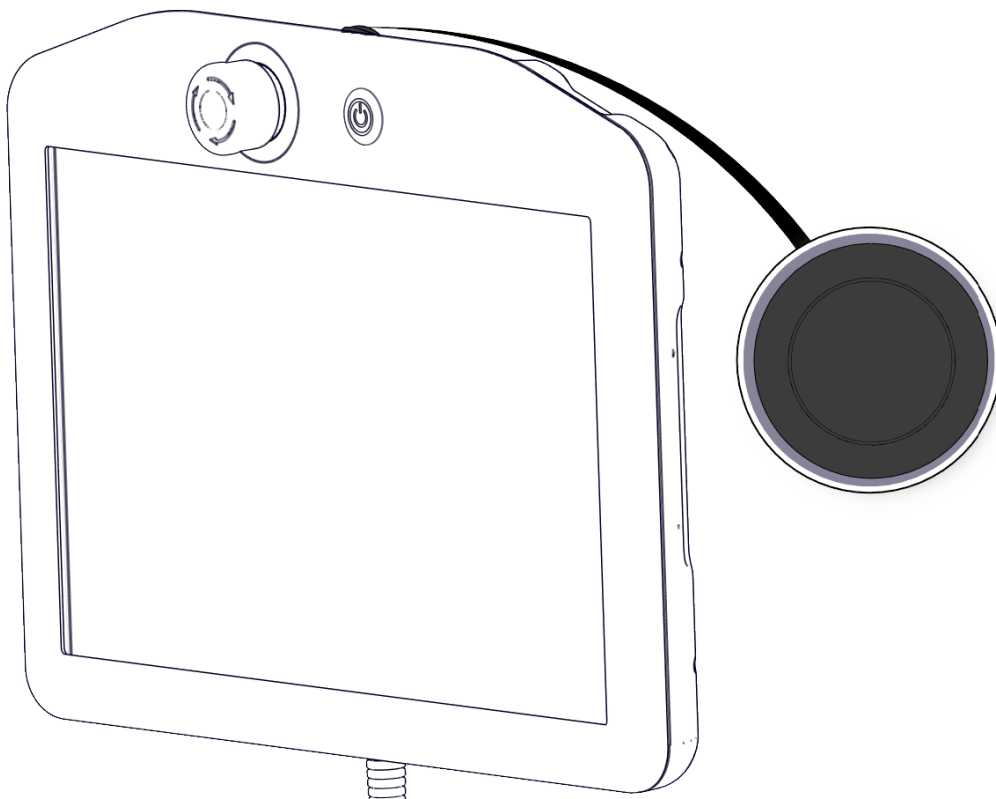
If the robot is close to colliding with something, you can use the Backdrive function to move the Robot Arm to a safe position before initializing.

1. Press ON to enable power. Status changes to *Robot Active*



The screenshot shows the 'Initialize' screen of the Universal Robots interface. At the top, there's a 'Robot Status' section with five indicators: 'Power ON' (green checkmark), 'Booting Complete' (green checkmark), 'Robot Active' (yellow circle), 'Brake Release' (grey circle), and 'Robot Operational' (grey circle). Below these are two buttons: a green 'START' button and a red 'OFF' button. A warning message states: 'Warning! Stand clear of the robot when starting it!'. The screen is divided into two main sections: 'Payload' and 'Robot'. The 'Payload' section has a warning icon and text: 'Active Payload is used to temporarily overwrite the Installation Payload.' Below this, there are two input fields: 'Active Payload' (set to 0 kg) and 'Installation Payload' (set to 0.00 kg). The 'Robot' section shows a 3D model of a robotic arm. At the bottom left, there is an 'Exit' button.

2. Press and hold Freedrive. Status changes to *Backdrive*



Initialize

Robot Status

BACKDRIVE

●

OFF

Payload

Robot

Active Payload is used to temporarily overwrite the Installation Payload.

Active Payload
 kg

Installation Payload
0.00 kg

Power ON the robot first

Exit

3. Move robot as in Freedrive mode. Joint brakes are released where needed once the Freedrive button is activated.


NOTICE

In Backdrive Mode the robot is “heavy” to move around.


MANDATORY ACTION

You must test Backdrive mode on all joints.

Safety settings:

Verify the robot safety settings comply with the robot installation risk assessment.

Additional safety inputs and outputs are still functioning:

Check which safety inputs and outputs are active and that they can be triggered via PolyScope or external devices.

Backup data

See section 5.3 Backup of data

3.2.3 Visual Inspection

1. Disconnect the power cable from Control Box.
2. Check the Control Board terminals are properly inserted and do not have loose wires
3. Check for any dirt/dust inside Control Box. Clean with ESD vacuum cleaner if needed.



NOTICE

Never use compressed air to clean inside the Control Box as it can damage components

3.2.4 Cleaning

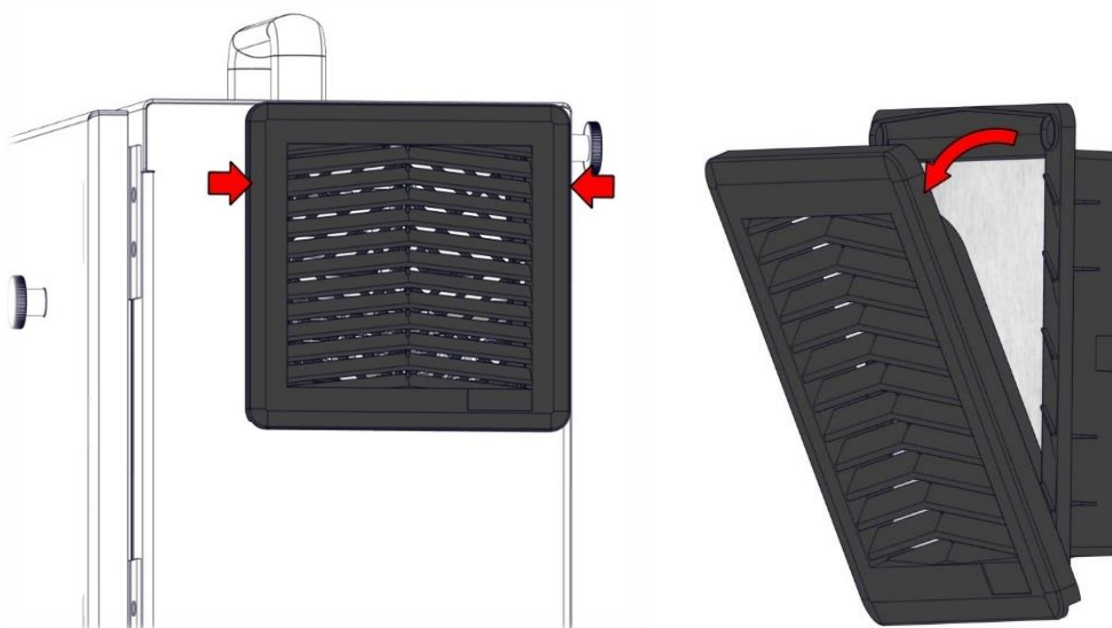
Teach Pendant

It may become necessary to clean the Teach Pendant screen. A standard mild industrial cleaning agent without a thinning agent or any aggressive additives is recommended. Do not use an abrasive material to wipe down the screen. Universal Robots does not promote a specific cleaning agent.

Control Box

Control box contains two filters, one on each side of Control Box.

1. Gently remove the outer plastic frame, by pulling where the red arrows are shown. The frame will tilt out.
2. Remove the filter to clean it. Clean using low pressure air or replace filters if necessary. Remember to clean each side.



4. Service and Replacement of Parts



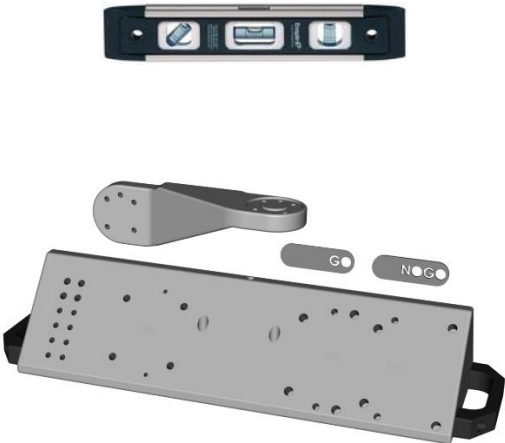

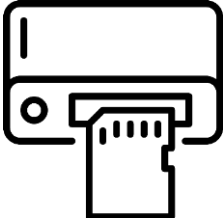
4.0.1 Pre-Use Assessment

Verify all safety inputs and outputs are correctly connected. Test all connected safety inputs and outputs, including devices common to multiple machines or robots, are functioning. The following tests must be conducted before using the robot for the first time or after any modifications are made:

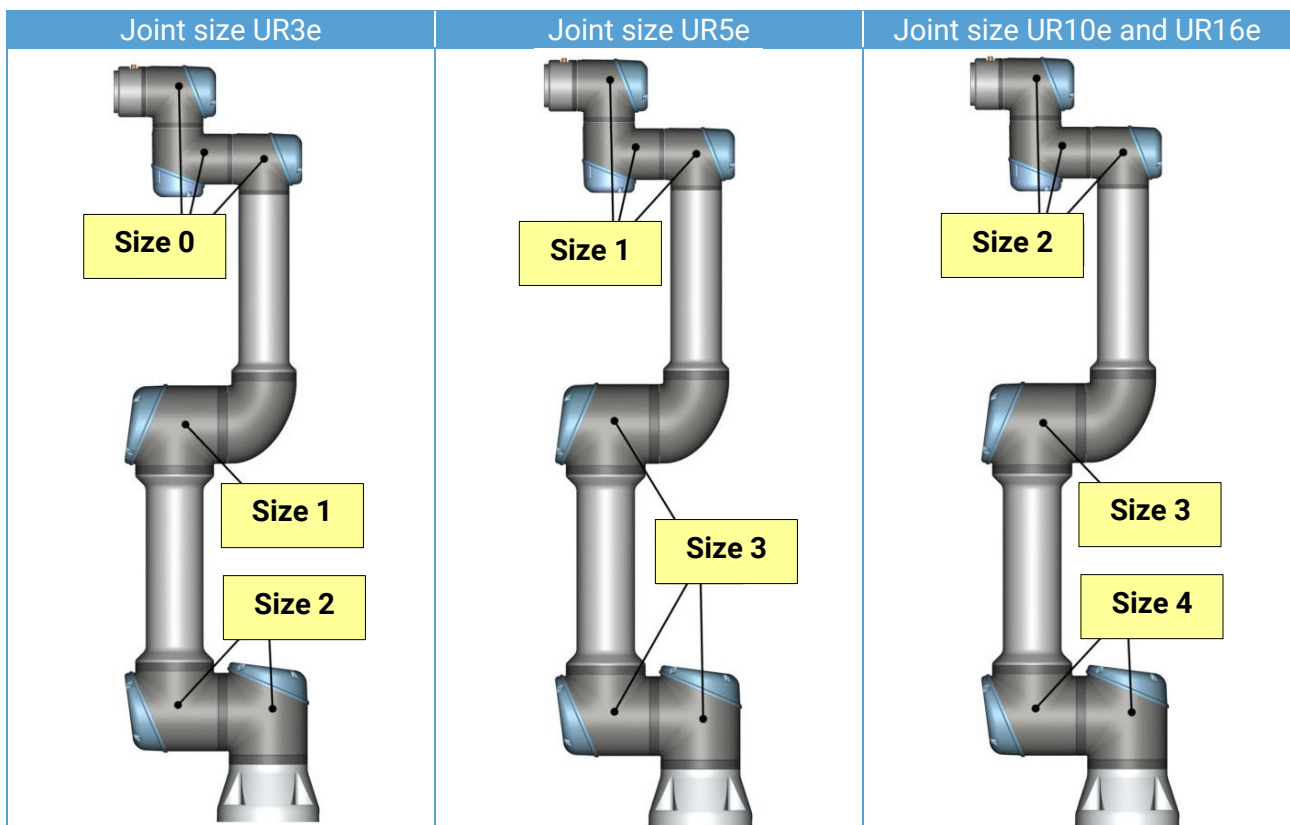
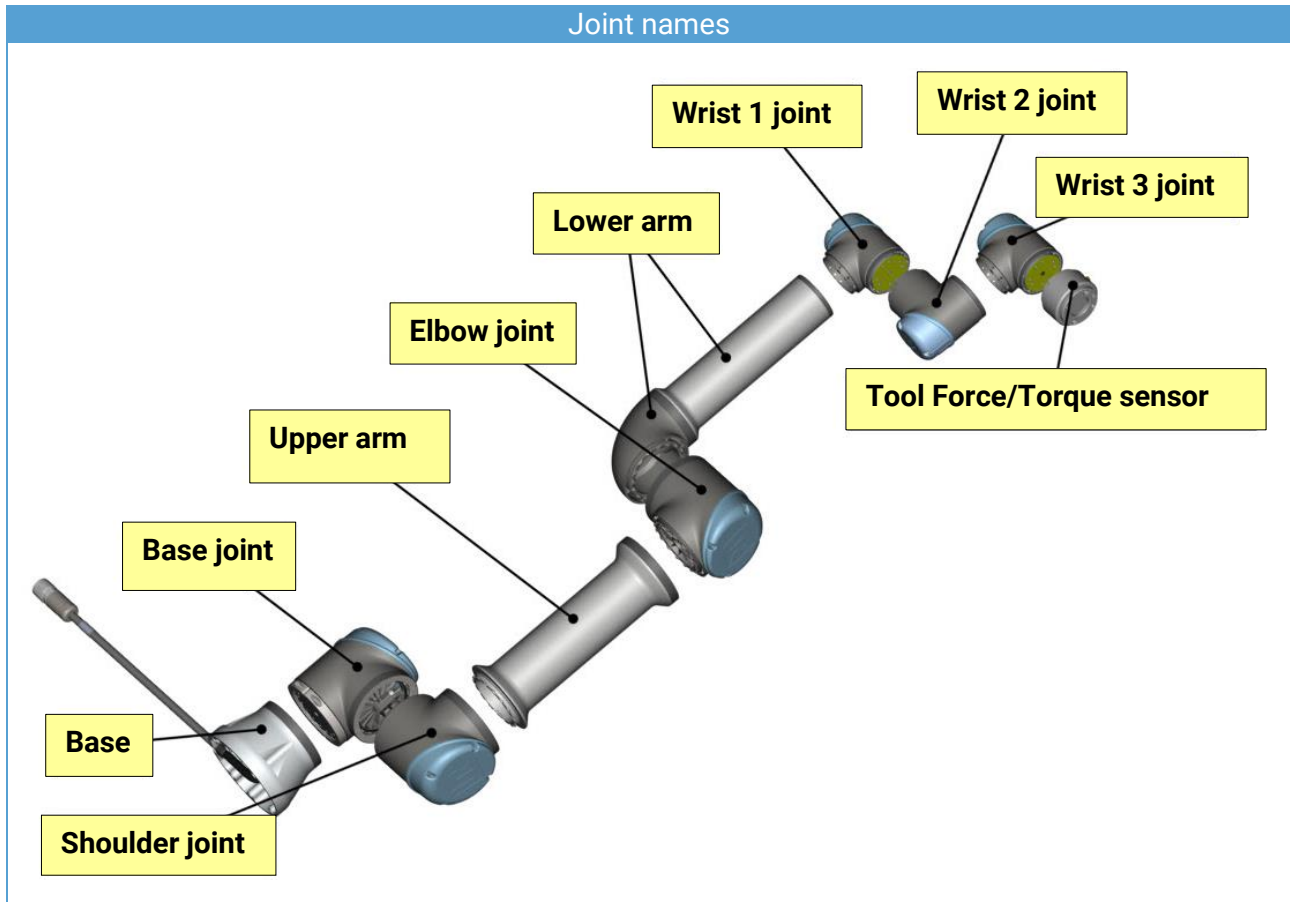
- Test the emergency stop buttons. Check the robot is stopped and the brakes are engaged.
- Test the safeguard input stops the robot's motion. If a safeguard reset is configured, check that it must be activated before motion can resume.
- Test safety boundaries to ensure that Reduced Mode can switch the safety mode and back.
- Test the Operational Mode switches (if connected), see icon in top right corner of user interface to ensure the mode is changing.
- Test the Three-Position Enabling Device (if connected) to enable motion in manual mode and test that the robot is under reduced speed control.
- Test that the System Emergency Stop Outputs can bring the entire system to a safe state.
- Test that the system connected to Robot Moving Output, Robot Not Stopping Output, Reduced Mode Output, or Not Reduced Mode Output can detect the output changes.

Read Section 9. Packing and Shipping of Robot/Spare Parts to learn how to pack down and ship the robot and/or spare parts.

4.0.2 Recommended Tools

Robot Arm	Control Box
<p>Service tools – part no.: 109011</p> 	<p>Service tools – part no.: 109011</p> 
<p>Spirit level or Dual Robot Calibration tooling part no.: 185500</p> 	<p>Cabinet key (double-bit key)</p>  <p>SD card reader</p> 

4.1 Robot Arm



4.1.1 Movement Without Drive Power

In the unlikely event of an emergency, when the robot power is either impossible or unwanted, you can use forced back-driving or contact your Universal Robots distributor if this is not possible.

To perform forced back-driving you must push, or pull, the Robot Arm hard to move the joint. Each joint brake has a friction clutch that enables movement during high forced torque.



NOTICE

- Moving the Robot Arm manually is intended for urgent emergency and service purposes only.
- The brake inside each joint is not designed for manual release. Attempting to do so without proper training may cause damage to the brake and other joint components. This will make the joint un-usable.
- Do not move the joint more than necessary.
Not more than 160 degrees to ensure the robot can find its original physical position.



CAUTION

Attempting to release a joint brake manually may result in injuries personnel or damage to equipment

4.1.2 General Guidance to Separate Joint from Counterpart



WARNING

Before replacing ANY components inside the Control Box, it is important to completely shut it down first. Follow the first 3 steps in 6.5 Complete rebooting sequence.



NOTICE

Exercise caution when handling ESD sensitive parts. See *Section 2. Handling ESD-Sensitive Parts*

Disassemble:

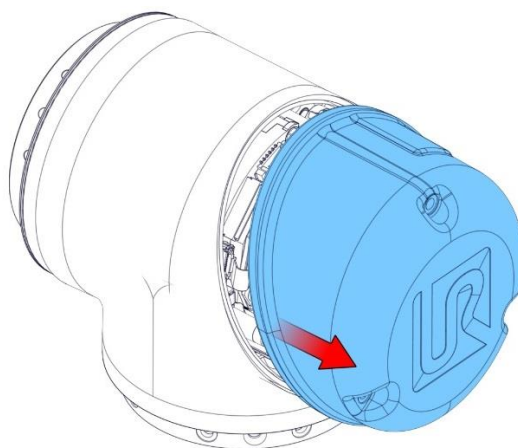
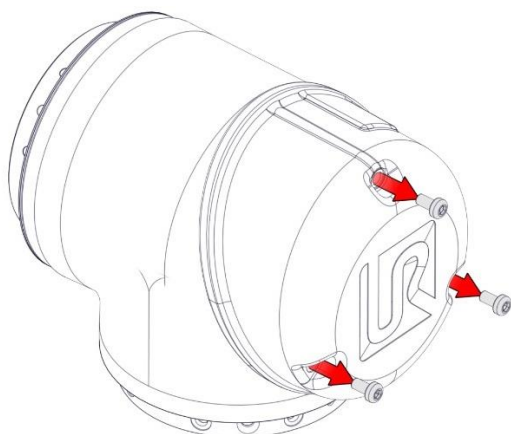
1. Before repairing the robot, make sure the necessary tools are available.
 - 1.1. Service tools with torque tools, ESD Wristband, etc.
 - 1.2. If you must disassemble the Robot Arm you will need:
new flat rings, wear rings, M3 and M4 tap tool ("roll tap" or "forming tap") for threads, pre-coated screws, or Loctite.



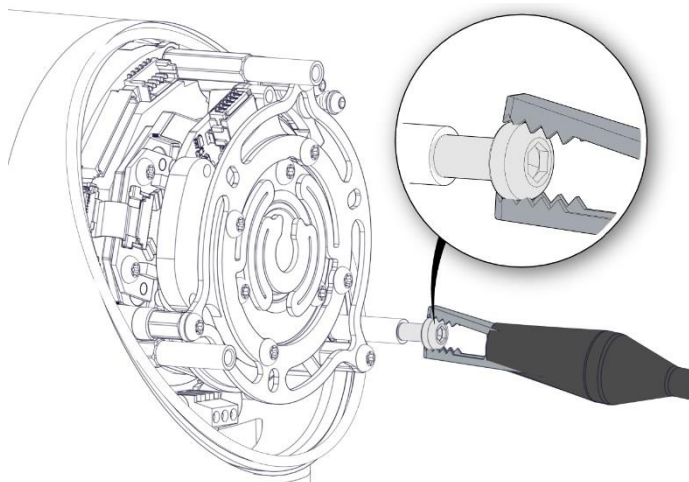
MANDATORY ACTION

Before continuing, read the complete guide in this manual.

2. Move the robot to an appropriate position for disassembly.
3. Shut down the Control Box and remove the main power.
4. If necessary, dismount the entire Robot Arm from the work cell and place on a solid surface.
5. Remove screws and the blue lid.



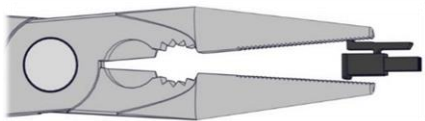
6. Now reattach one of the screws, on one of the standoffs and mount the alligator clip on your ESD wristband, as shown below.



NOTICE

Some connectors have a lock that must be engaged before it is pulled out of the printed circuit board.


7. **GENTLY** unplug the cable connectors without bending the printed circuit board.



4.1.3 Joint Connection Types

There are two different ways the joints are assembled.

Screw Connection		
		
Head Size	Torque	
Torx T10	1.3Nm	+0.10Nm -0.10Nm
Torx T20	3.0Nm	+0.30Nm -0.30Nm

Bracket Connection		
		
Head Size	Torque	
Hex key 4	5.0Nm	+0.00Nm -1.00Nm

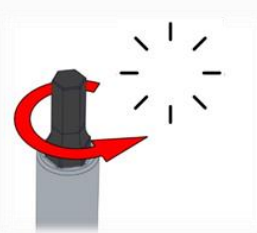
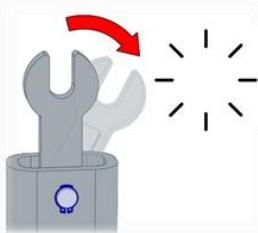
4.1.4 Torque values

Connection	Head size	Torque	
Screw Connection	Torx T10	1.3Nm	+0.10Nm -0.10Nm
Screw Connection	Torx T20	3.0Nm	+0.30Nm -0.30Nm
Bracket Connection	Hex key 4	5.0Nm	+0.00Nm -1.00Nm
Blue lid screws	Torx T10	0.4Nm	+0.05Nm -0.05Nm
Tool connector	No tools to be used	0.4Nm	
Tool mounting		Max. 8.0Nm	



NOTICE

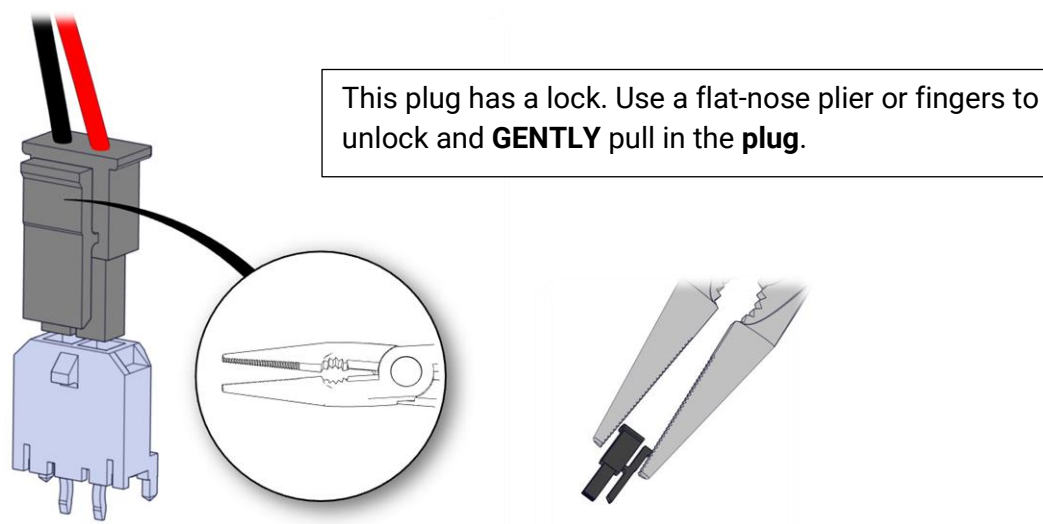
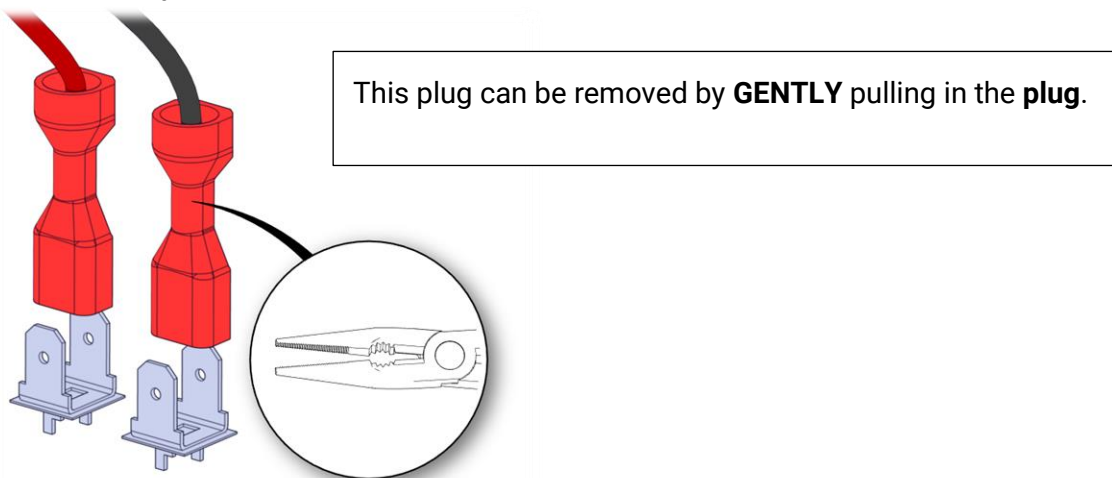
Click the torque tools a minimum of three times before use, to get the correct calibrated torque.



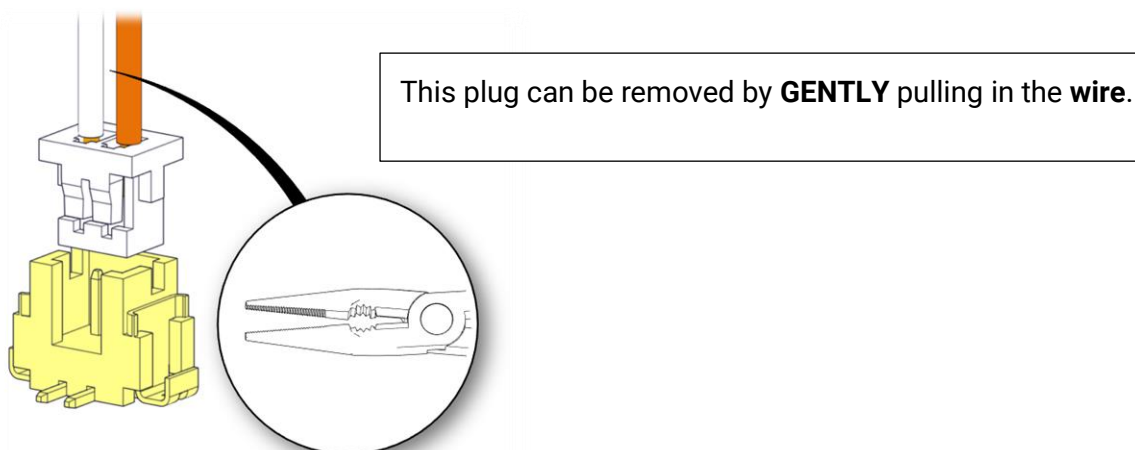
4.1.5 Power and Communication Connector Types on the Joint

There are two different power plug types and one plug type for communication.

Power Plug Types

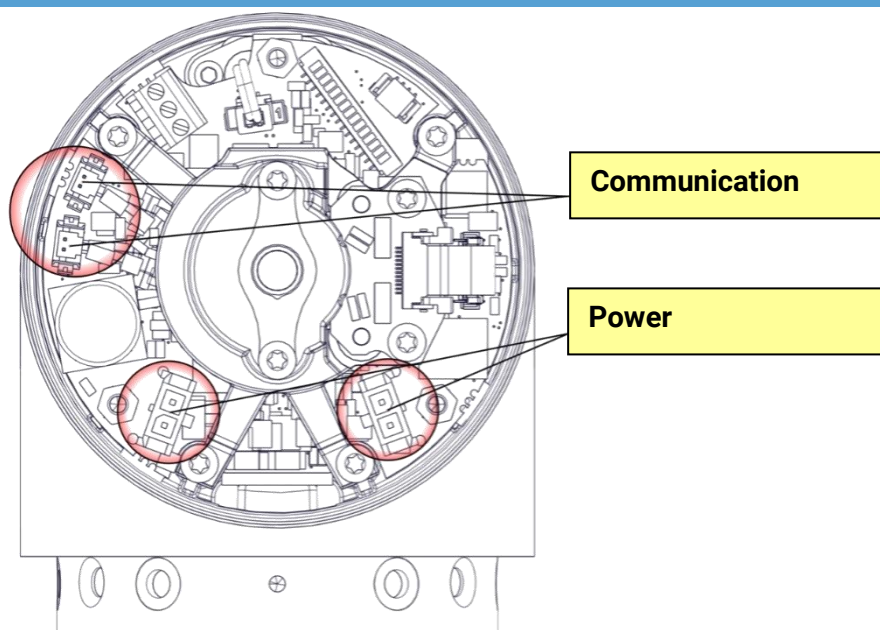


Communication Plug Type

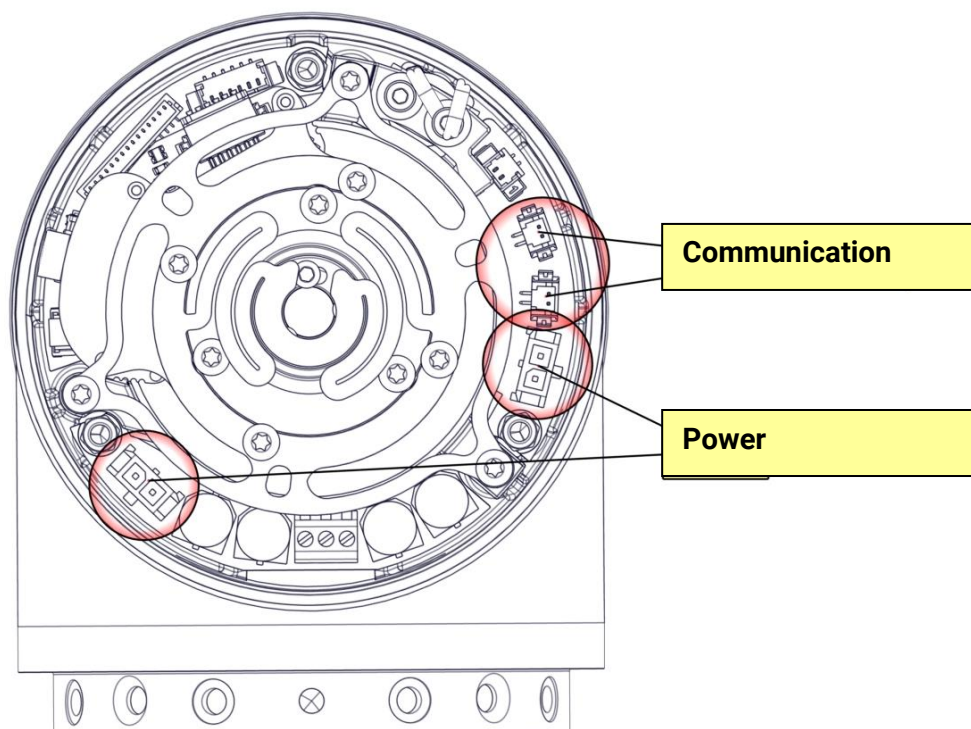


4.1.6 Connector Location on joints

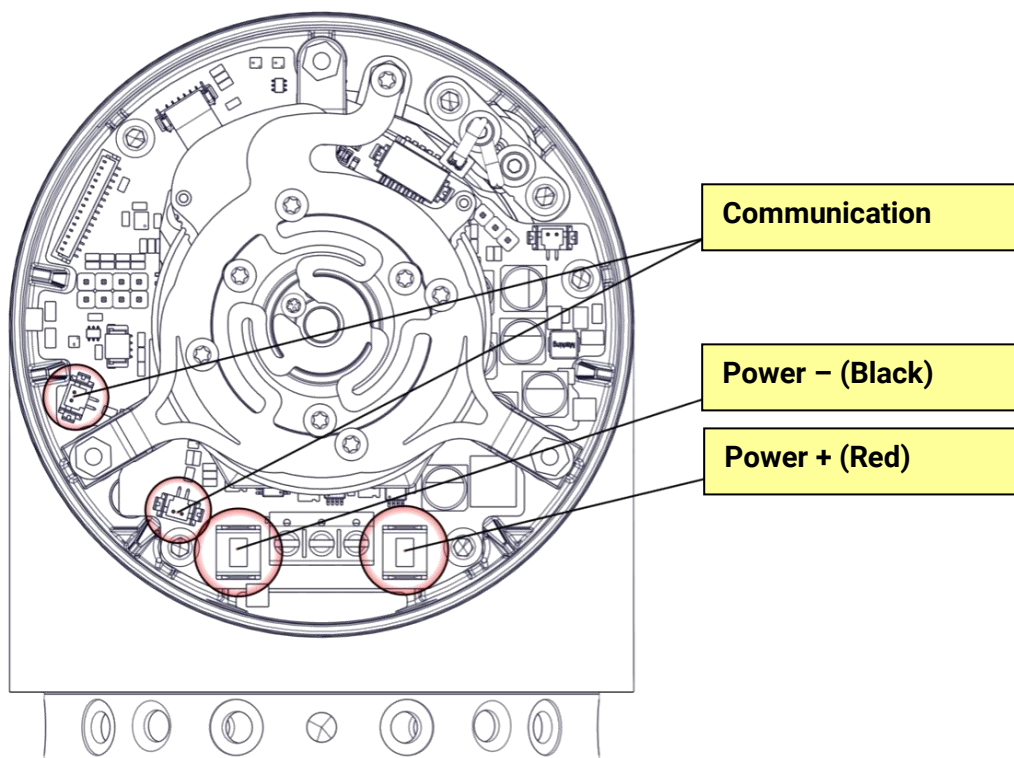
Size 0



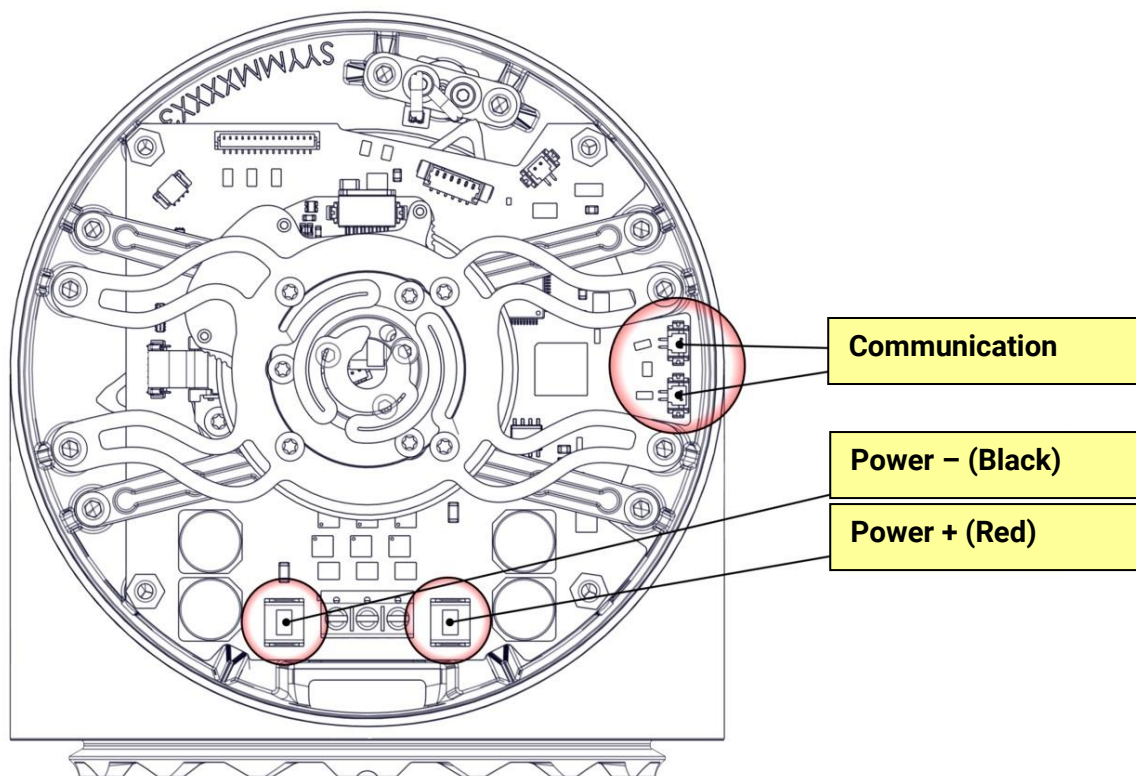
Size 1



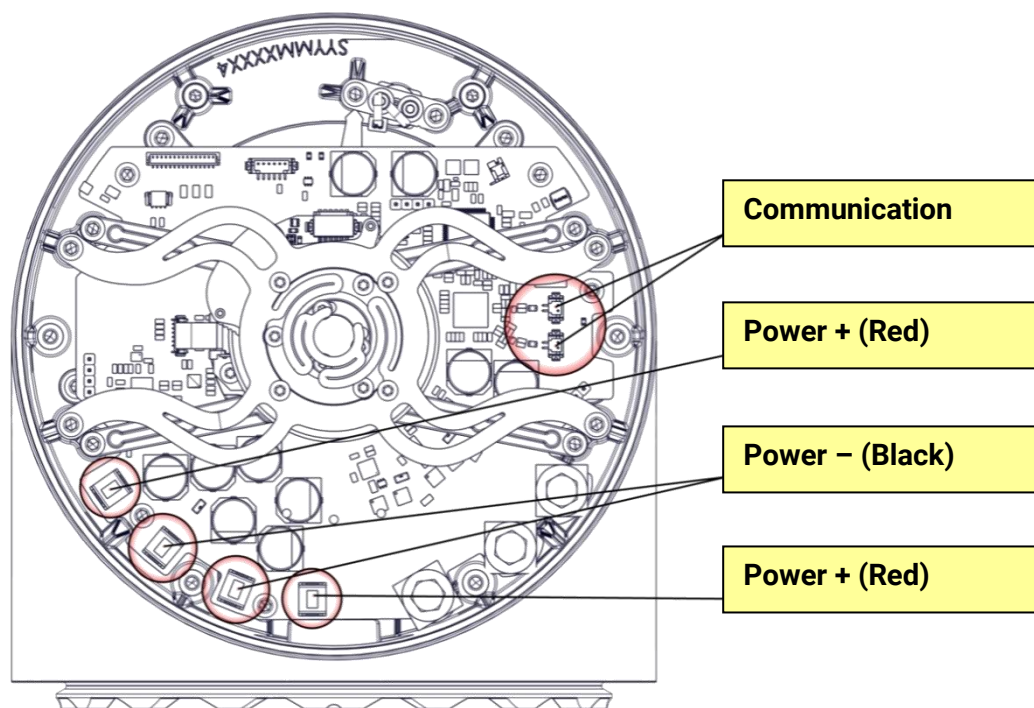
Size 2



Size 3

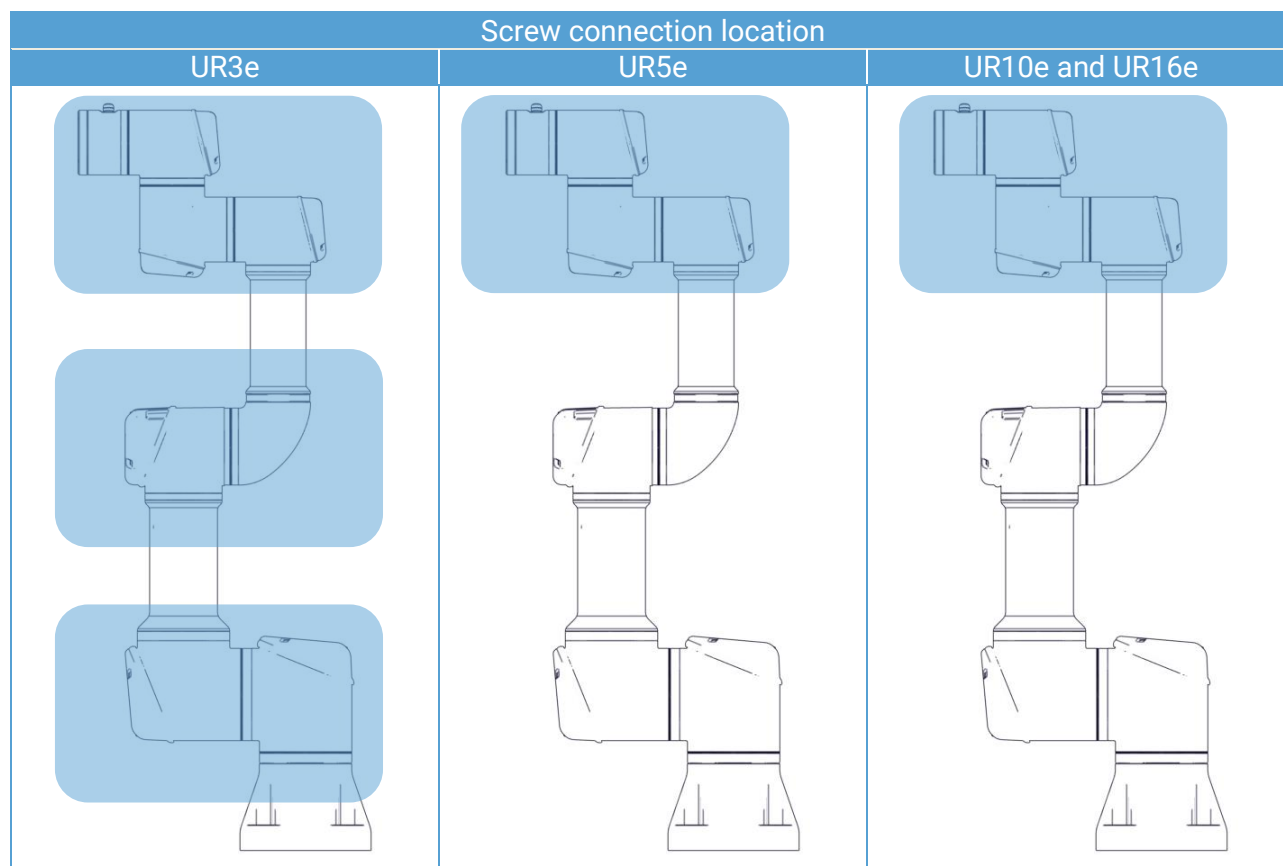


Size 4



4.1.7 Screw Connection

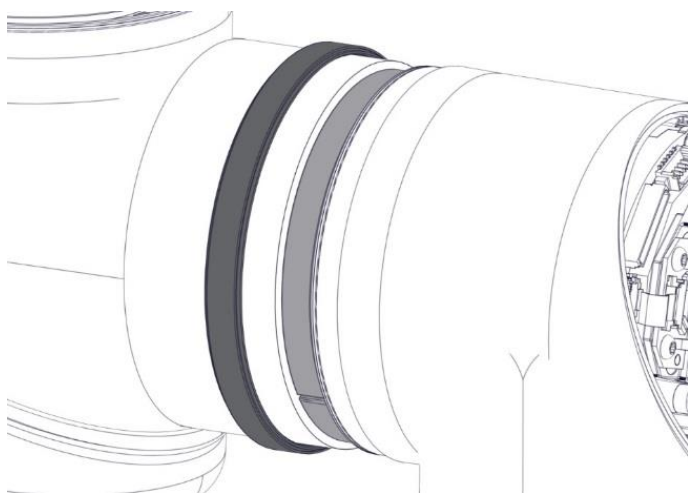
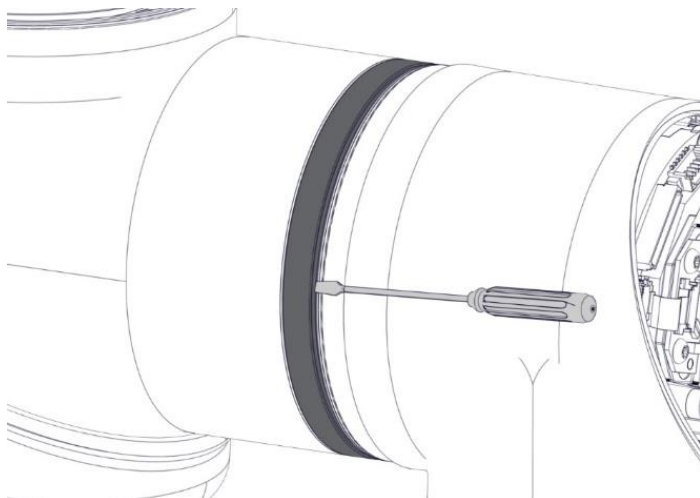
The following two sections describe how to disassemble and assemble a joint with a screw-connection.



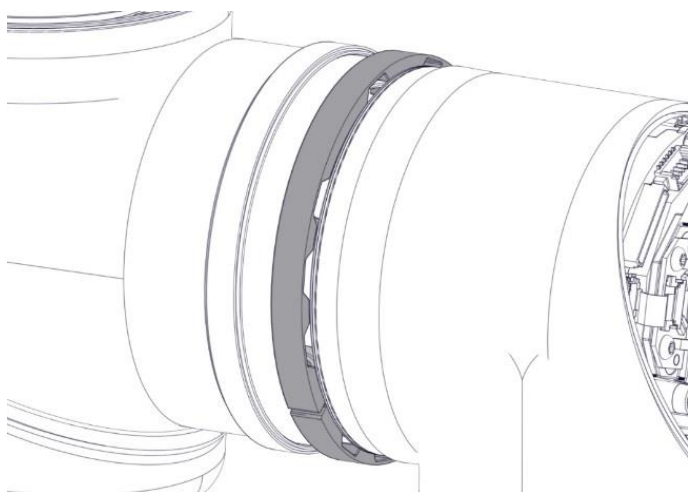
4.1.7.1 Disassembling Screw Connection

1. Remove the screws in the blue lid, then remove the blue lid as shown in Section 4.1.2 General Guidance to Separate Joint from Counterpart
2. **GENTLY** remove the power and communications wires from the terminals as shown in Section 4.1.5 Power and Communication Connector Types on the Joint and 4.1.6 Connector Location on joints

3. You can use a small flathead screwdriver to push-off the flat-ring. Then slide the flat-ring over the joint.



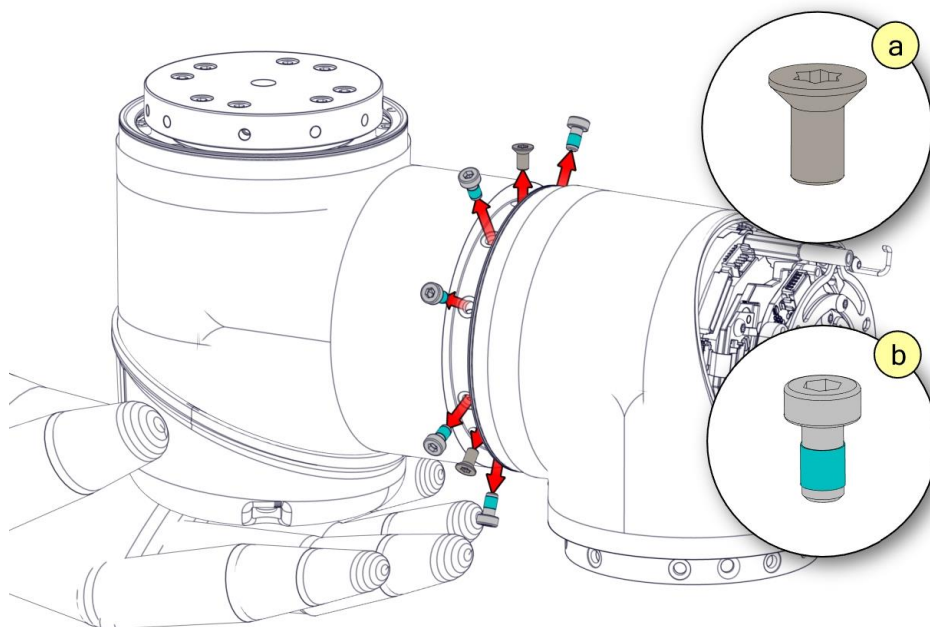
4. Remove Teflon-ring.



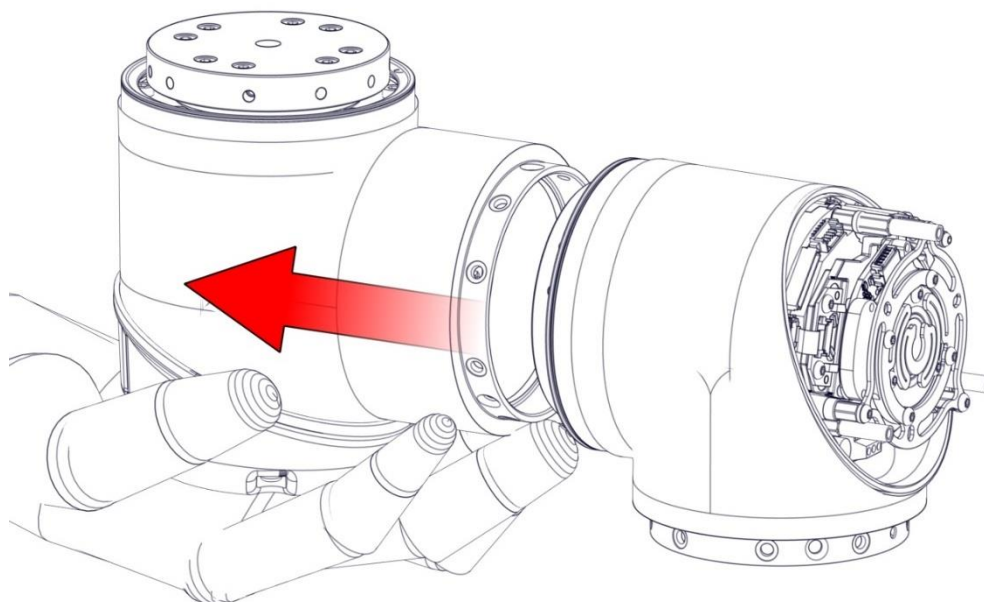

MANDATORY ACTION

The joint can fall off if not supported when removing the screws.

5. First remove the countersunk screws(a) then the remaining(b) screws.



6. The joint is now loose and can be removed. Remember to pull the wires out.



4.1.7.2 Assemble Screw Connection Joint

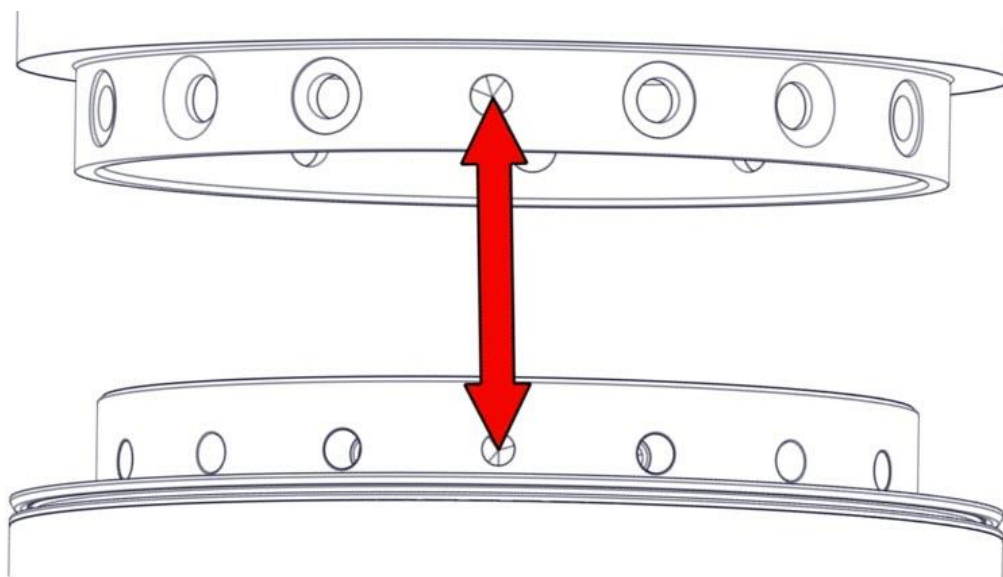
The assembly is done in reverse of the disassembly. However, a few things must be noted before assembly is begun.



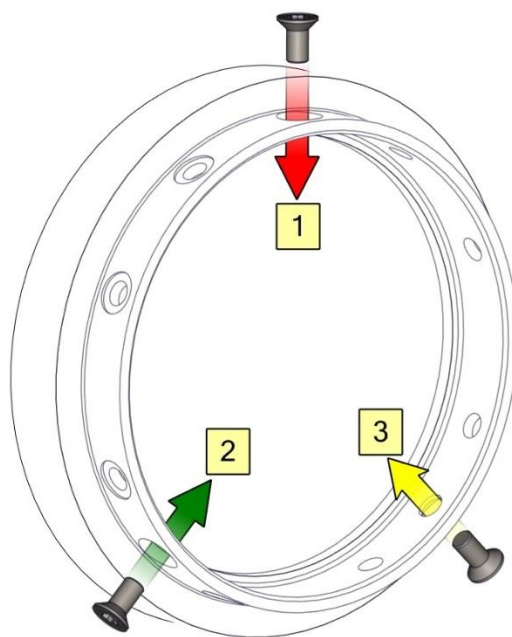
NOTICE

- Remove old Loctite residue in the screw holes with a roll tap or forming tap (Size 2 M4 the rest M3) for threads before assembling the joint to get the correct torque on the new screws.
- Always use new pre-coated screws when possible. If you must assemble with old screws, carefully clean the screws and add Loctite 243 to the screws before assembly.
- Always replace the black flexible flat ring with a new one to maintain the IP classification.
- Replace the wear rings if extensive wear or damage is shown

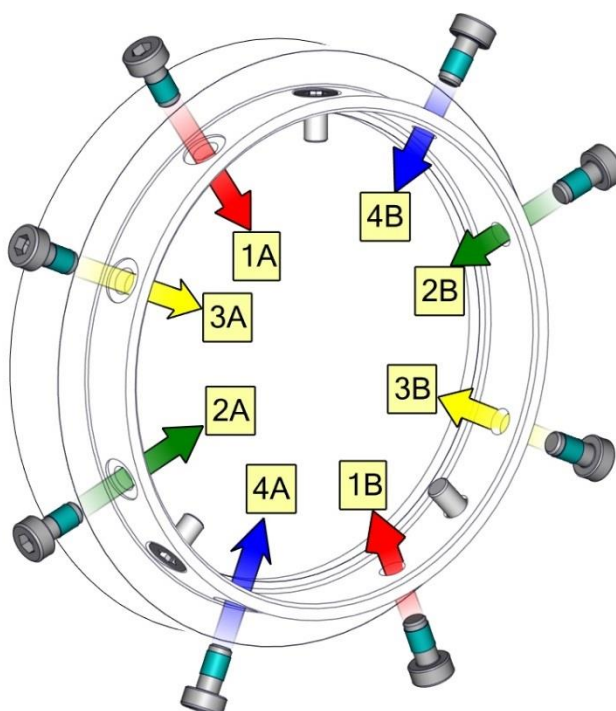
1. Orient the joints according to the marks (indicated by red arrows in the image below) and gently push the two joints together.



2. Insert and tighten the hex countersunk screws according to the image below.
Example: 1, 2, 3

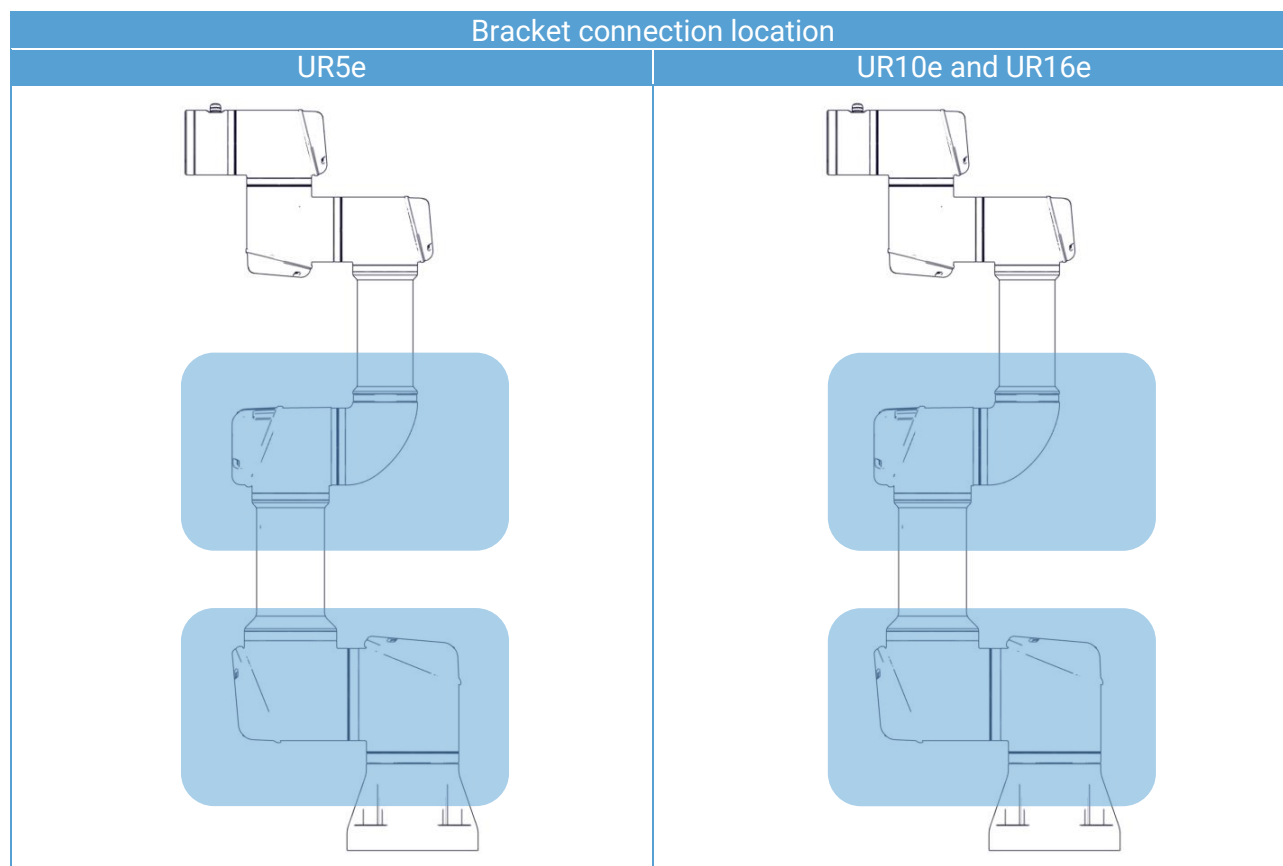


3. Insert and tighten the hex countersunk screws according to the image below.
Example: 1A, 1B, 2A, 2B etc.



4.1.8 Bracket Connection

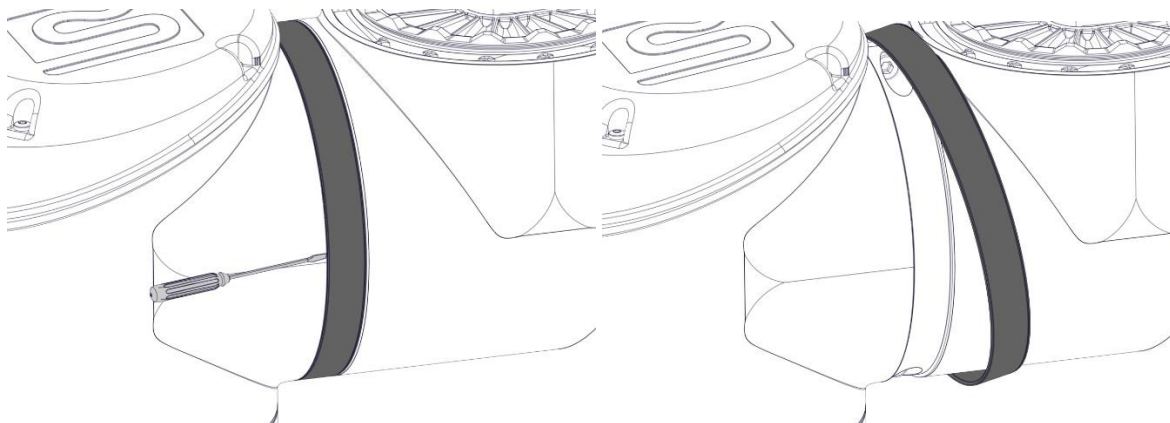
The following two sections describe how to disassemble and assemble a joint with a bracket-connection.



4.1.8.1 Disassembly Bracket Connection

1. Remove the screws in the blue lid, then remove the blue lid as shown in Section 4.1.2 General Guidance to Separate Joint from Counterpart
2. **GENTLY** remove the power and communications wires from the terminals as shown in Section 4.1.5 Power and Communication Connector Types on the Joint and 4.1.6 Connector Location on joints

3. Remove the black flat-ring. You can use a small flathead screwdriver.

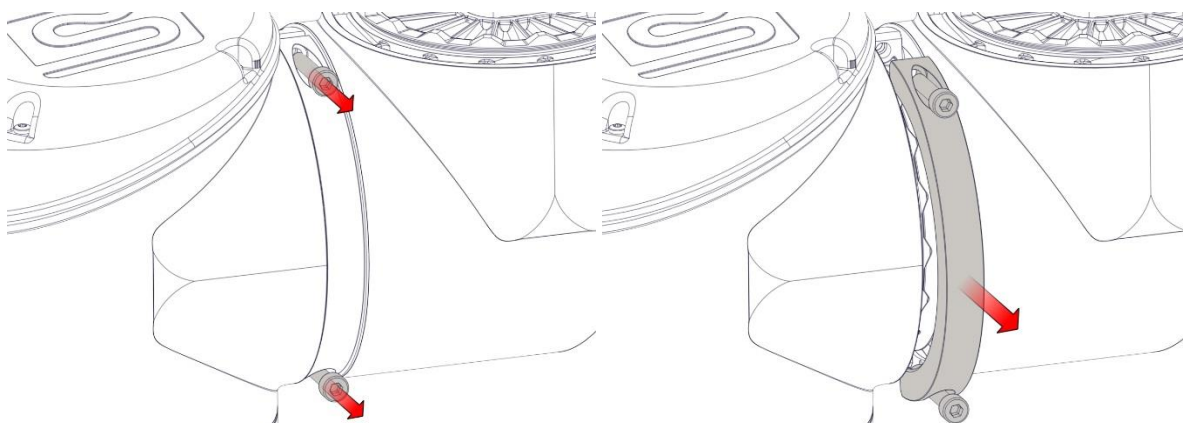


4. Remove the screws and the bracket on one side.

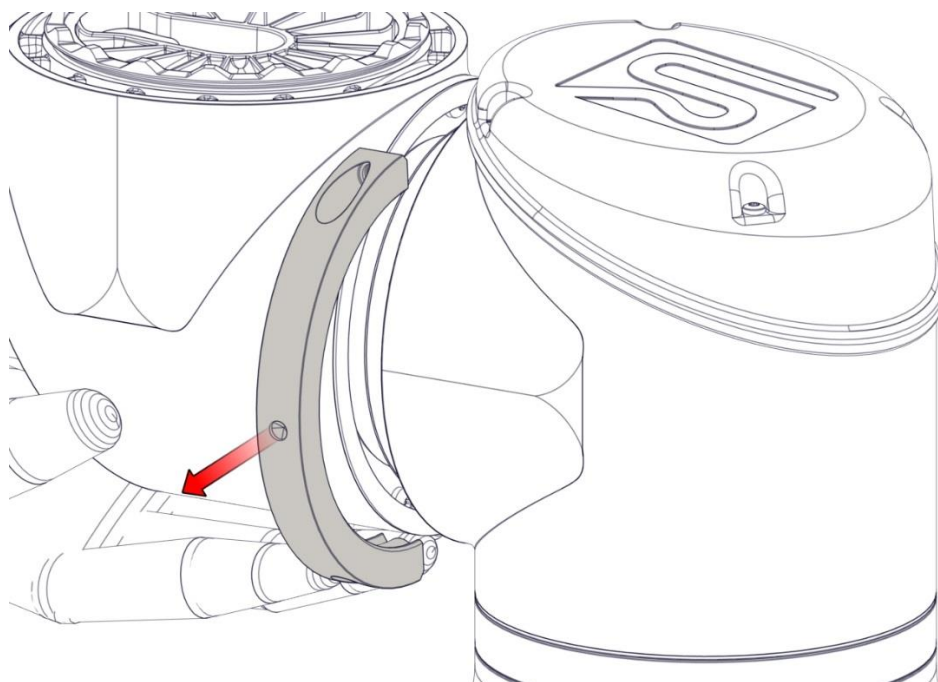


MANDATORY ACTION

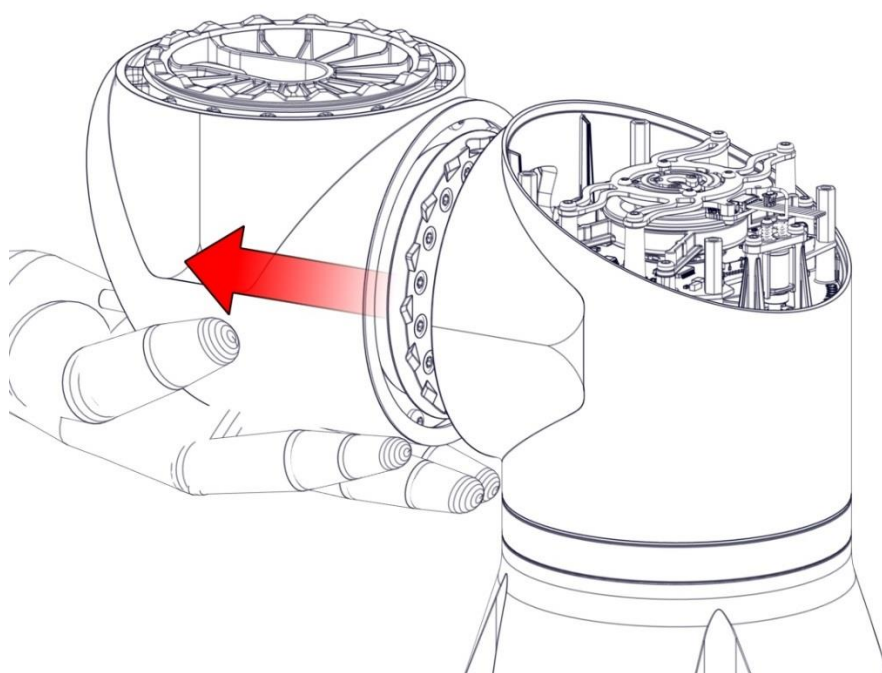
The joint can fall off if not supported when removing the bracket.



5. Support the joint as you remove the second side of the bracket.



6. The joint is now loose and can be removed. Remember to pull the wires out as well.



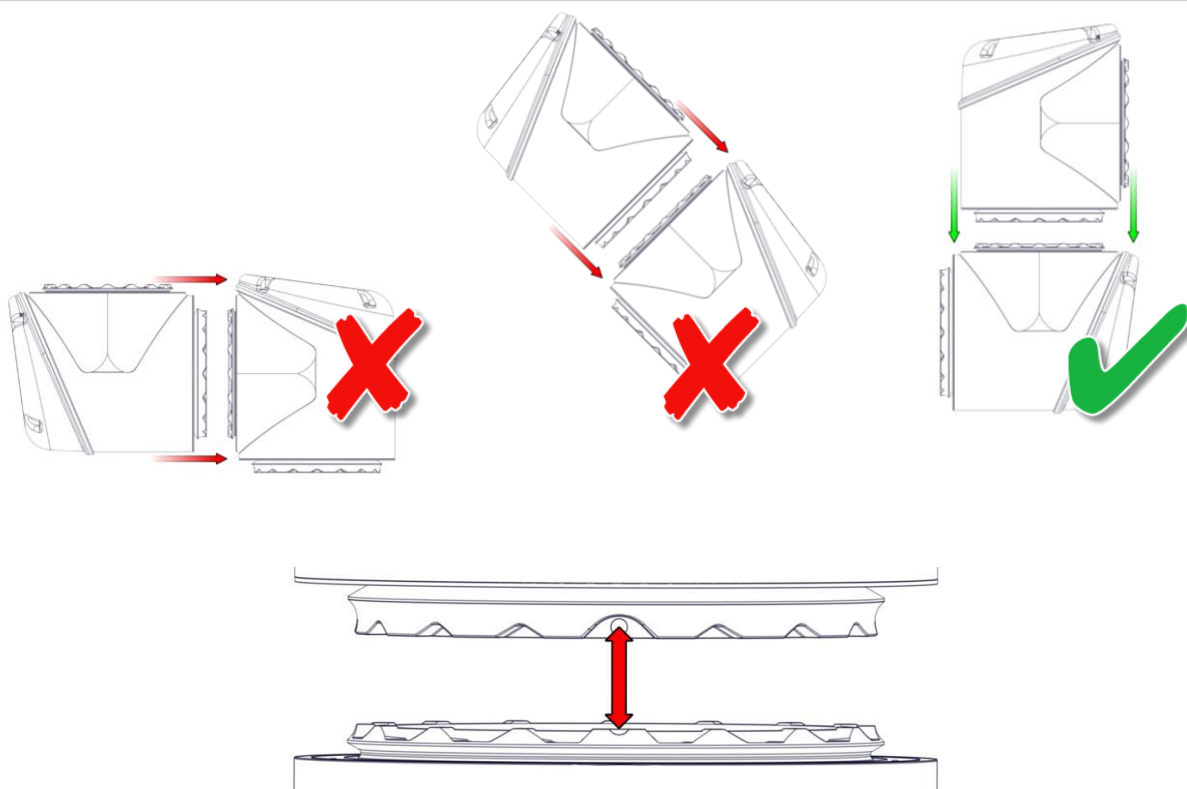
4.1.8.2 Assembling Bracket-Connection

The assembly is done in reverse of the disassembly. However, a few things must be noted before assembly is begun.



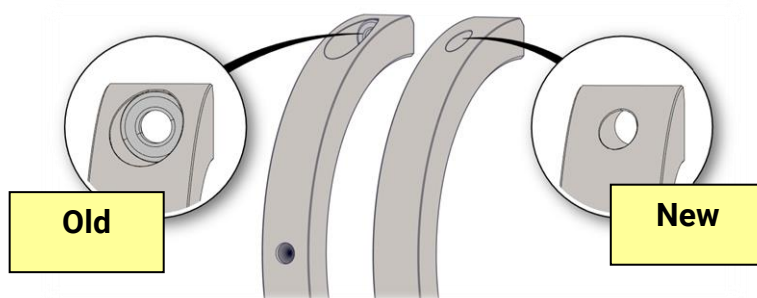
NOTICE

- Always replace the black flexible flat ring with a new one to maintain the IP classification.
- Replace the foam seal on the brackets if damaged to maintain the IP classification.
- Replace the wear rings if extensive wear or damage is shown.
- The dots must be aligned otherwise the connection cannot be made.



CAUTION

- Joints should be assembled in a vertical position to ensure proper mating between the joints.
- Ensure the screws are inserted in the correct bracket.
Only apply to early version of brackets where one side has a circular marker.



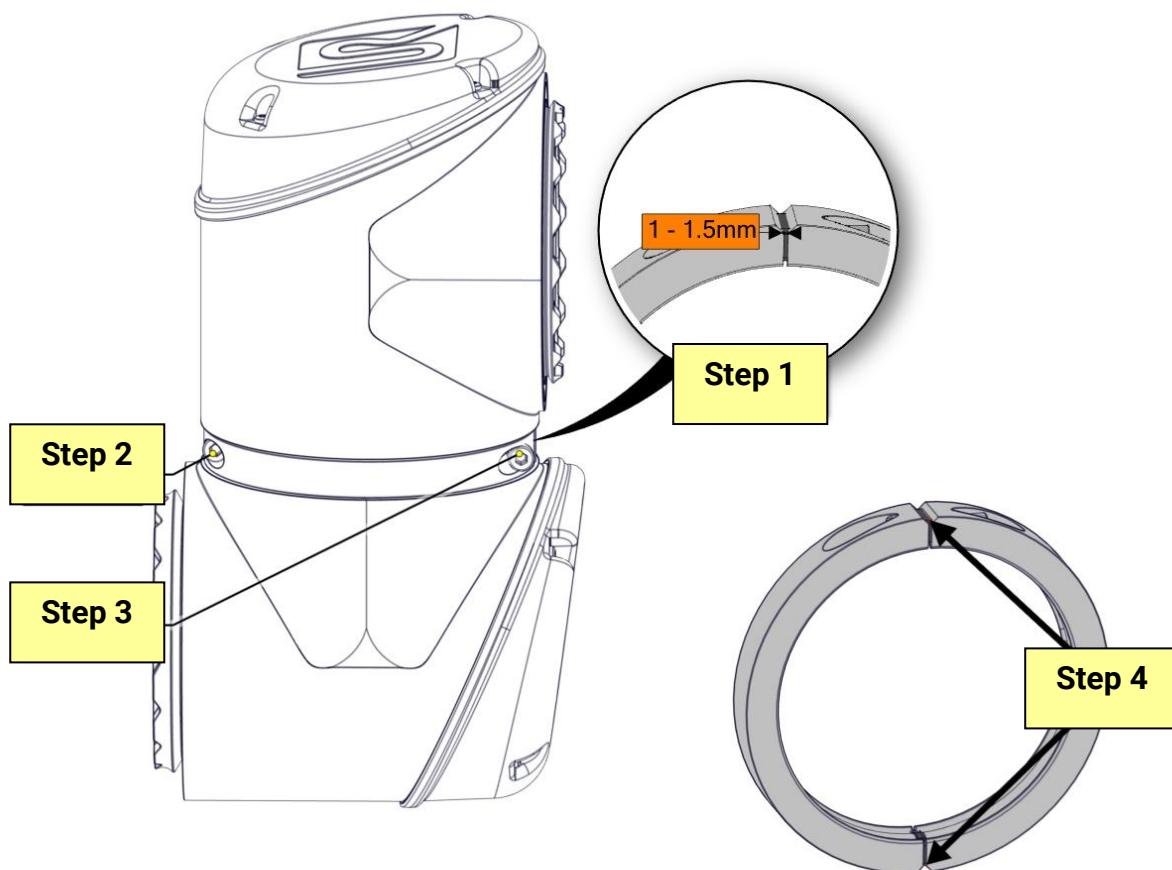
- When tightening the brackets, it must be done in steps

Step 1: Tighten one side so there is a gap of 1.0mm to 1.5mm.

Step 2: Tighten the other side completely with $5.0 \frac{+0.0}{+1.0}$ Nm

Step 3: Tighten the first side with $5.0 \frac{+0.0}{+1.0}$ Nm

Step 4: Ensure same gap at both ends.

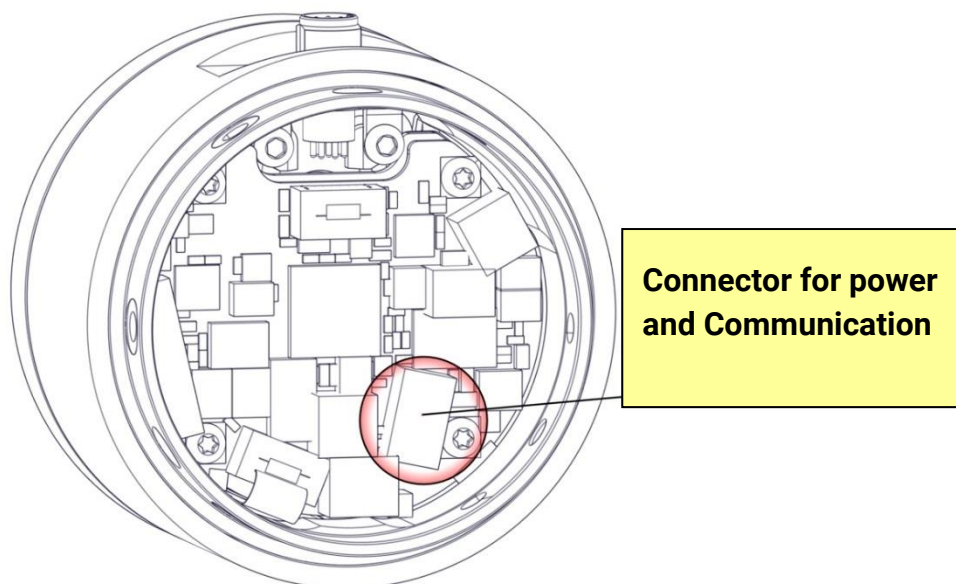


4.1.9 Tool Flange

The tool flange is a Screw Connection and is disassembled like a joint with this connection.

See section 4.1.7 Screw Connection

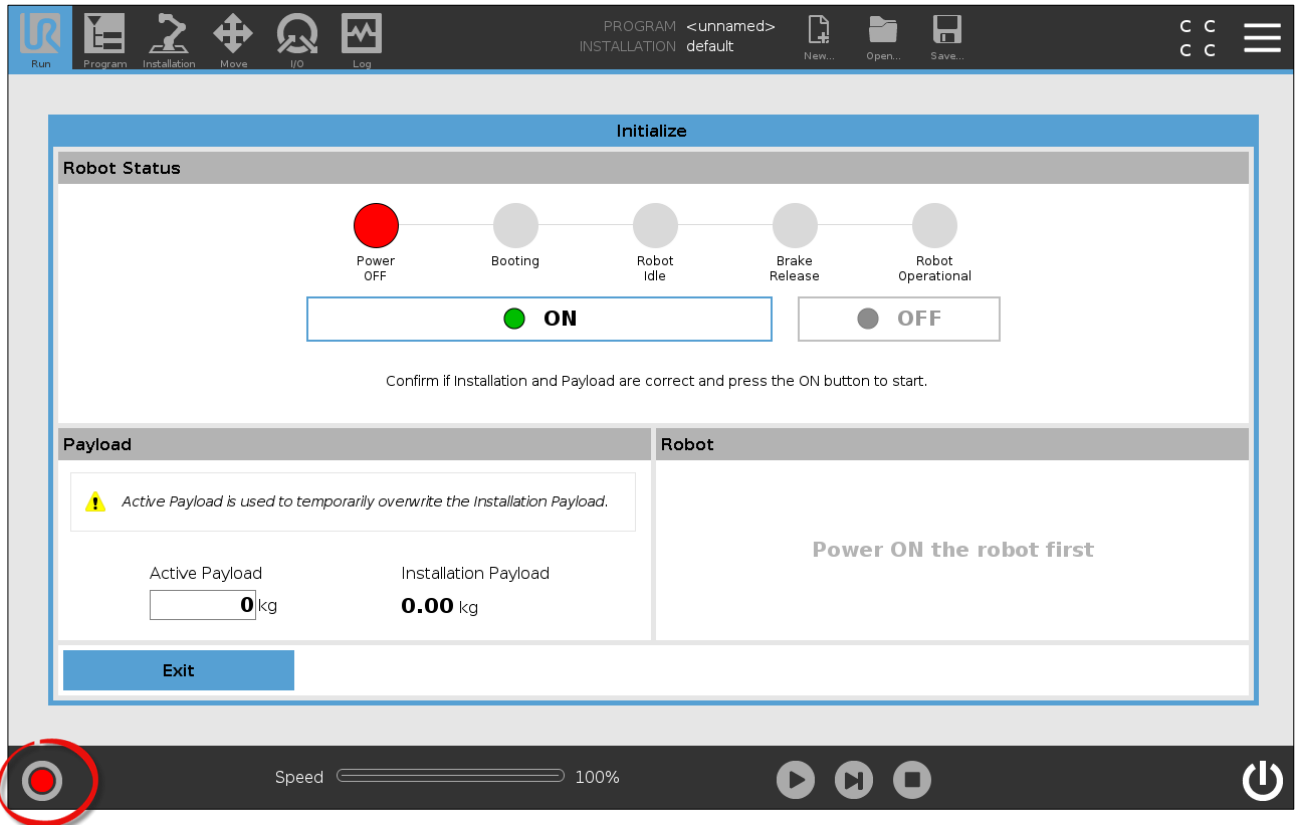
Power and communication plug is in the same plug.



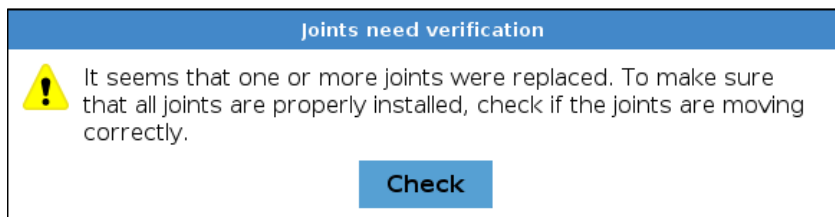
4.1.10 Joint Verification

When a joint is replaced it needs to be verified by the controller to be assigned the correct ID. The steps below appear automatically when the Robot Arm is powered on for the first time.

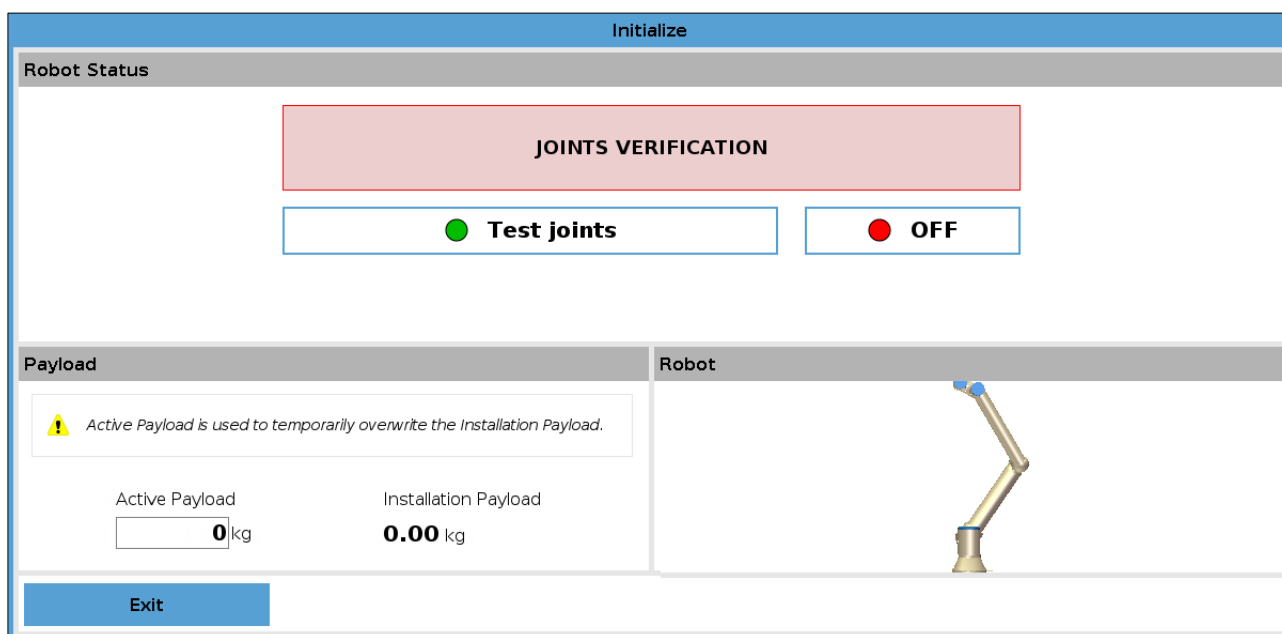
1. Go to Initialize screen and press ON



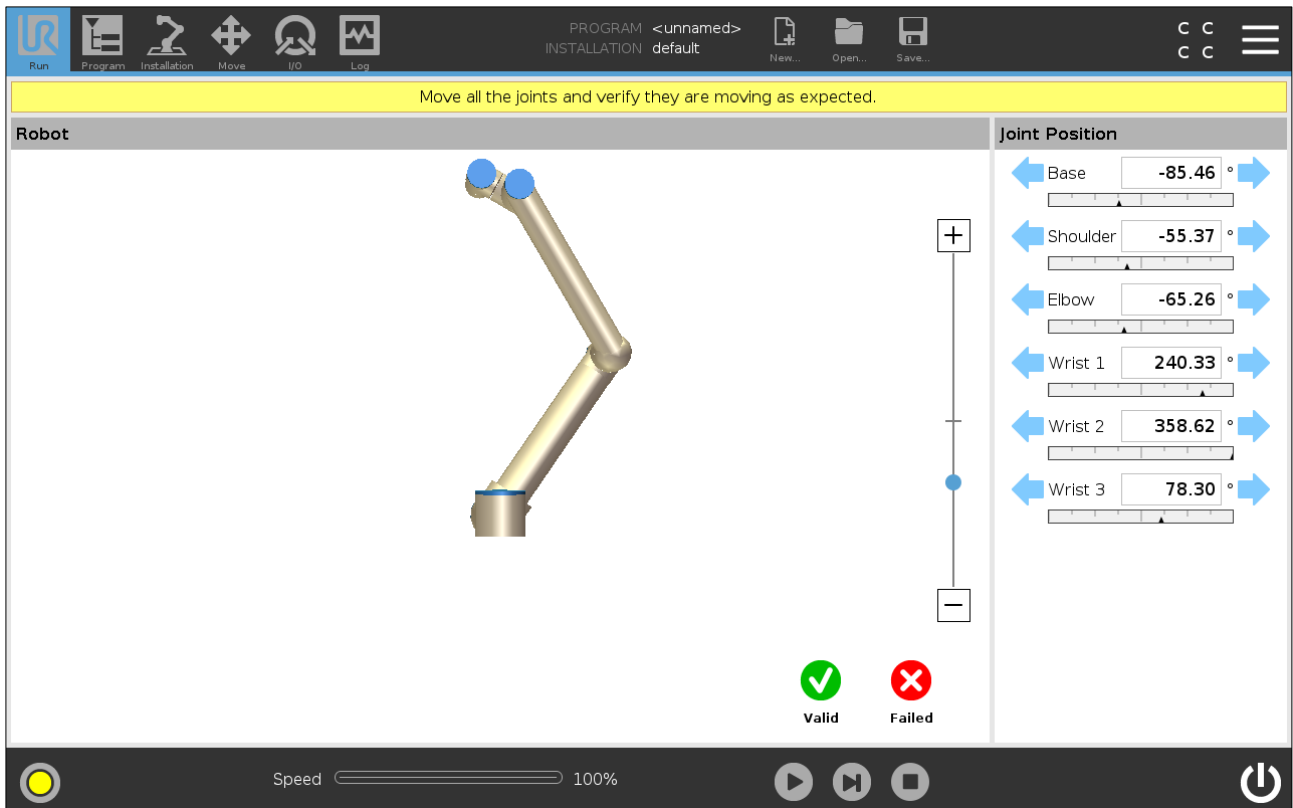
2. A popup appears saying that joints need verification. Confirm the popup message by pressing Check



3. Press Test Joints to start joint verification.



4. Move all joints with the arrows respective to each joint.
 - a. If joints move as expected, press Valid and a popup appears. Follow the popup instructions.
 - b. If joints did not move as expected (i.e., wrong joint moves or incorrect direction), press Failed and a popup appears. Follow the popup instructions.



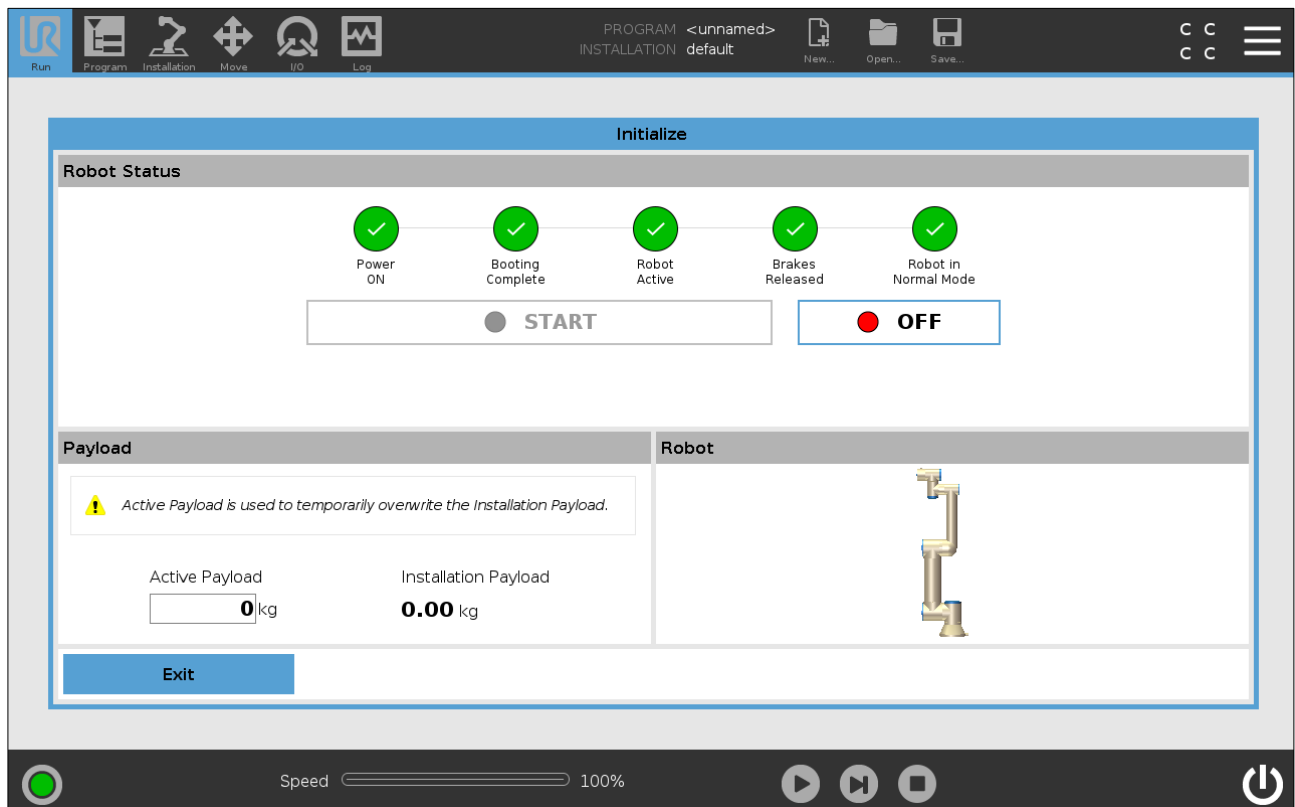
4.1.11 Zeroing of joints

When a joint has been replaced and verified it may be necessary to zero the joint so that it is aligned with the rest of the robot arm. There are two ways this can be done.

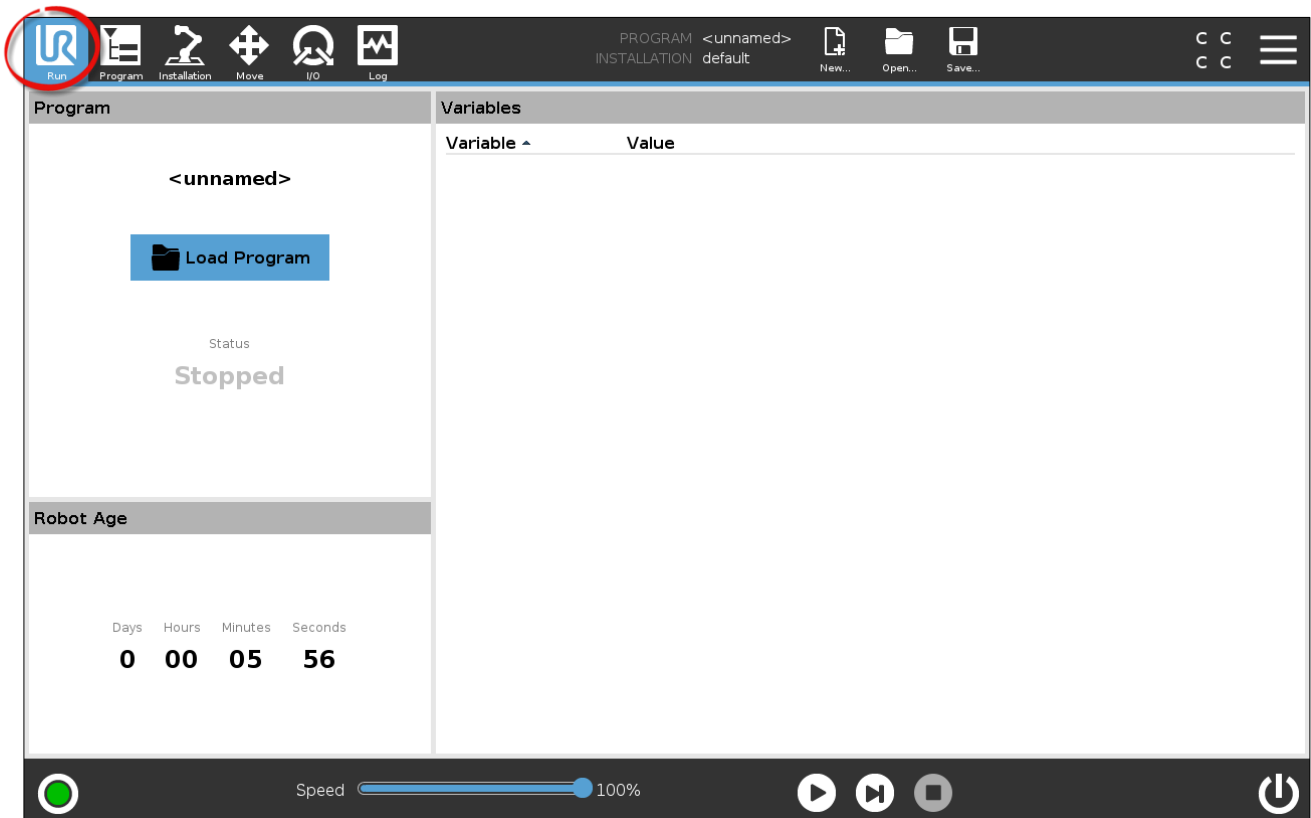
- Automatically - Dual robot calibration – this is recommended method as it is done via controlled procedure and removes human errors.
Please consult Calibration manual for this process.
- Manually - Access Expert mode and use a spirit level, to level the joint.

The following step guides how to zero the joint(s) manually.

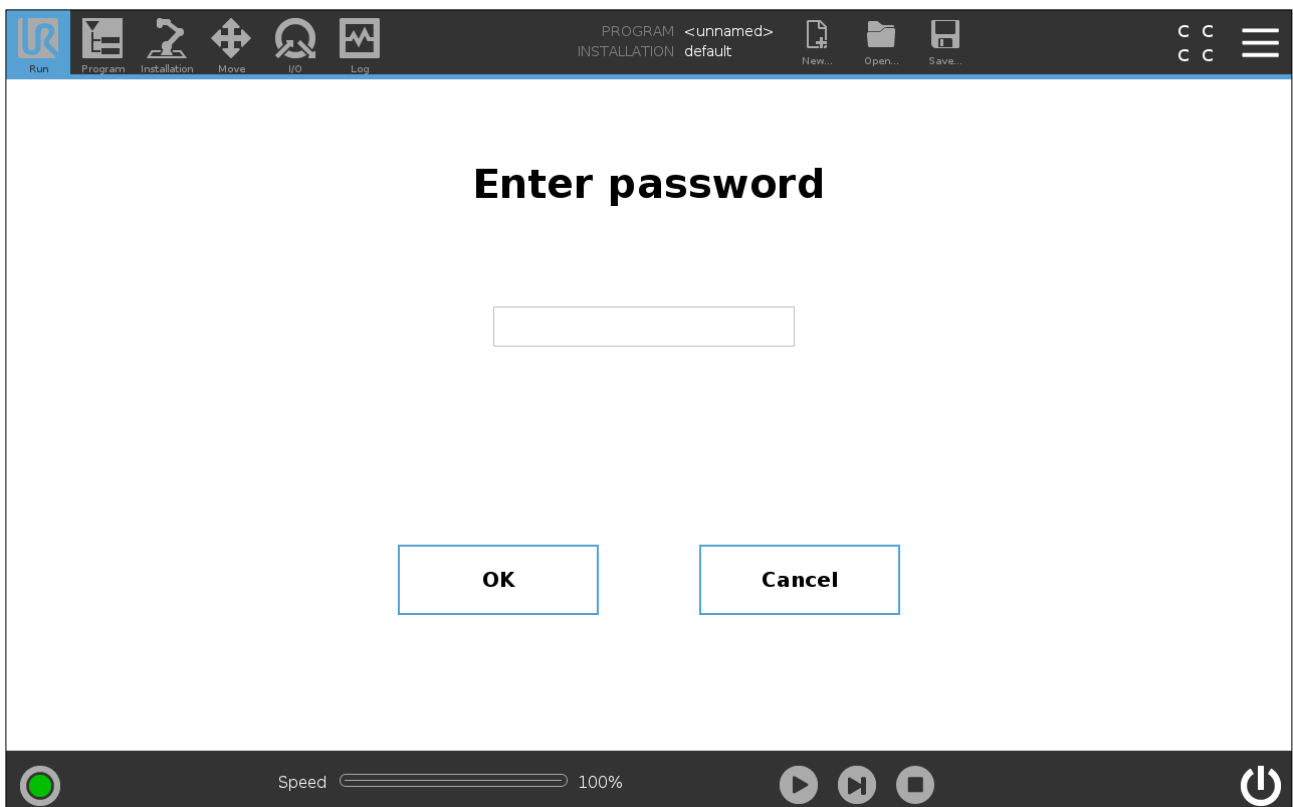
1. Power on the robot and ensure the brakes are released.



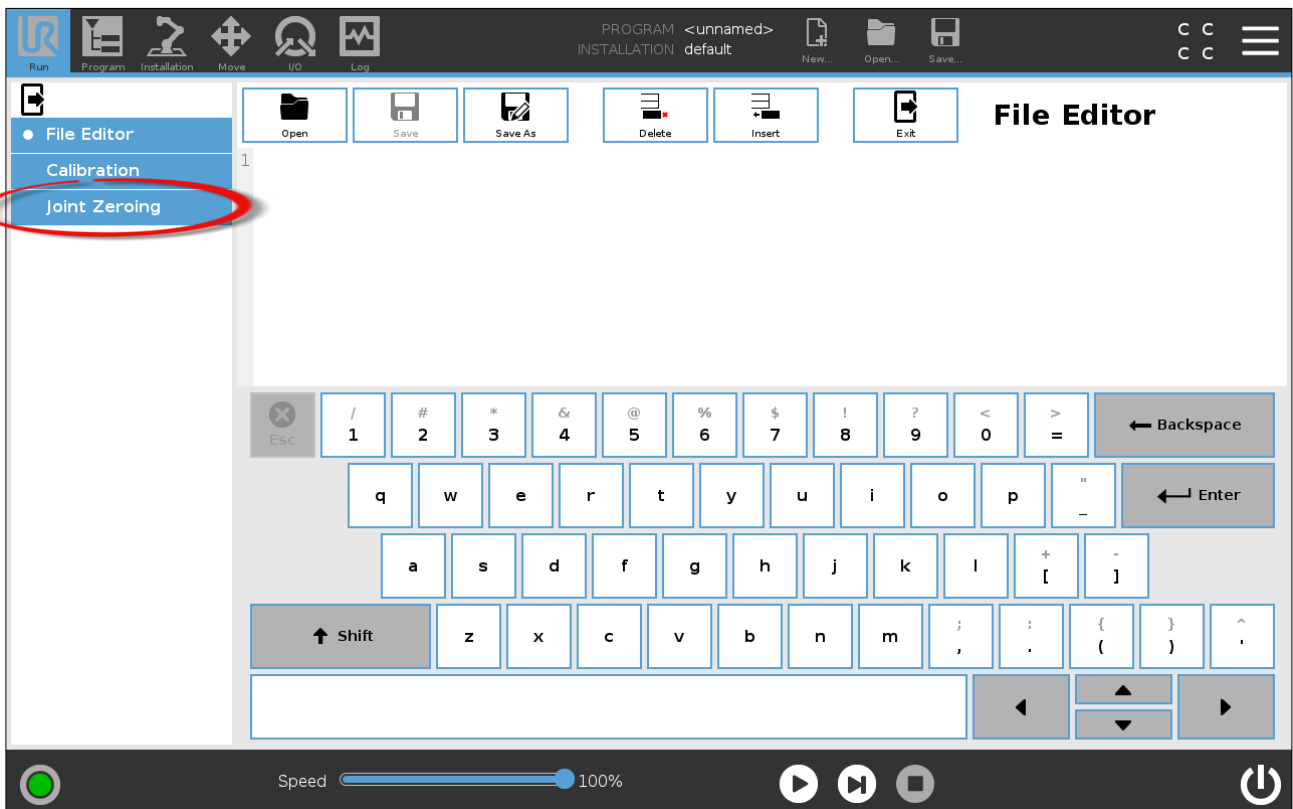
2. Press and hold the UR logo for approximately 5 seconds. The screen will change.



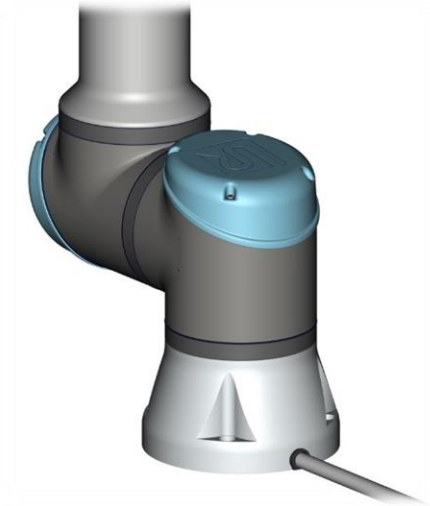
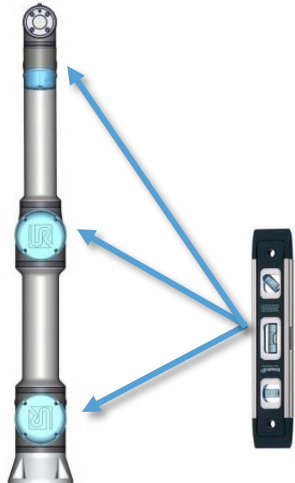
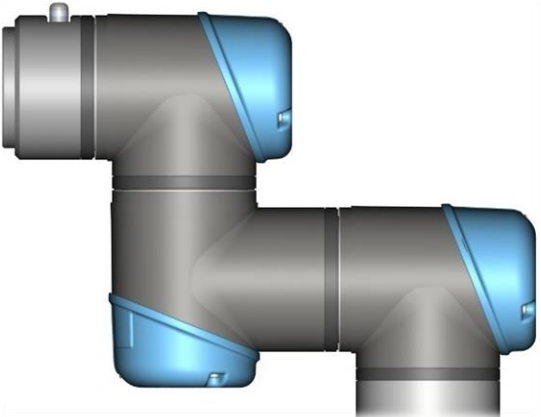
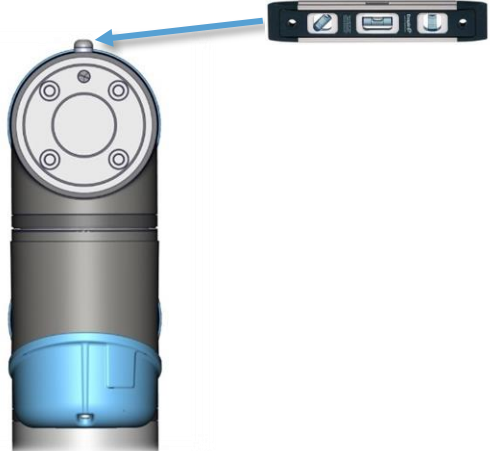
3. Press the gray box and type the password **lightbot** and press OK



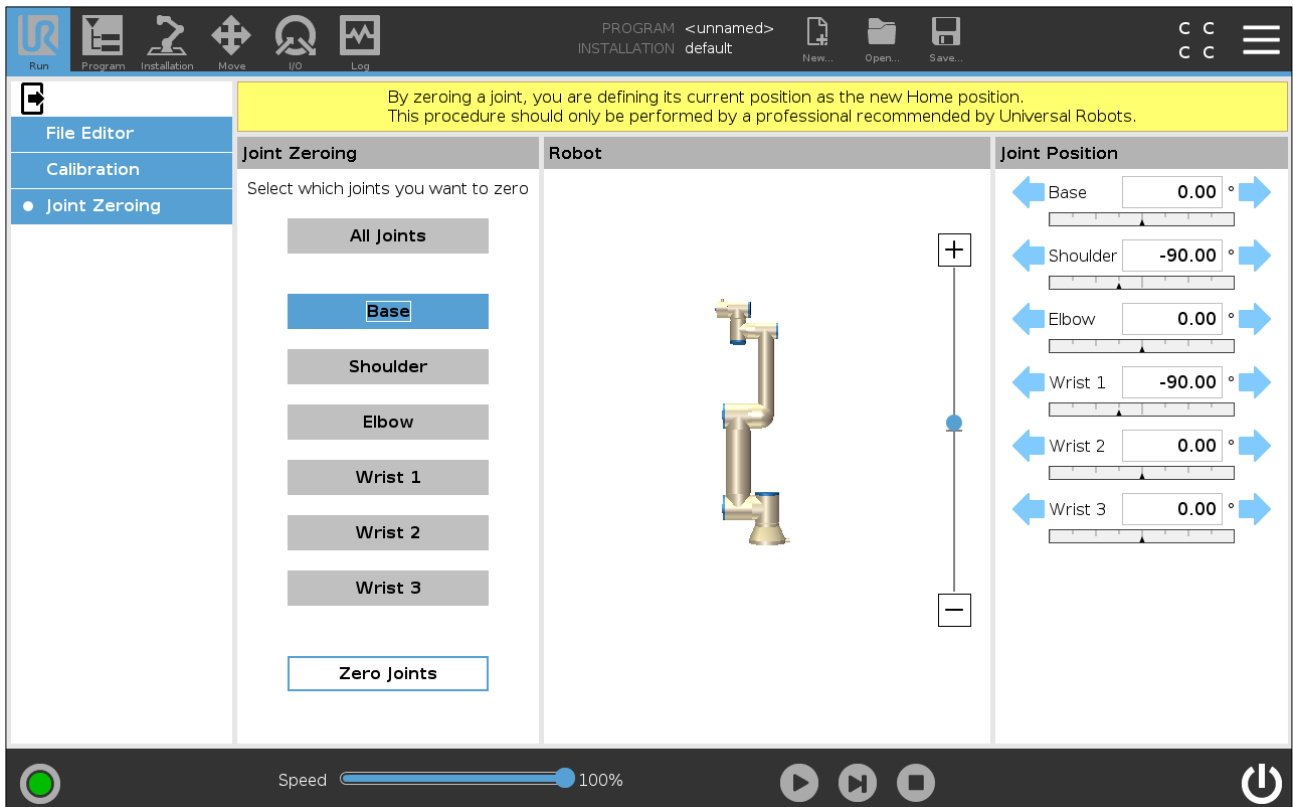
4. Select Joint Zeroing in the menu to the left.



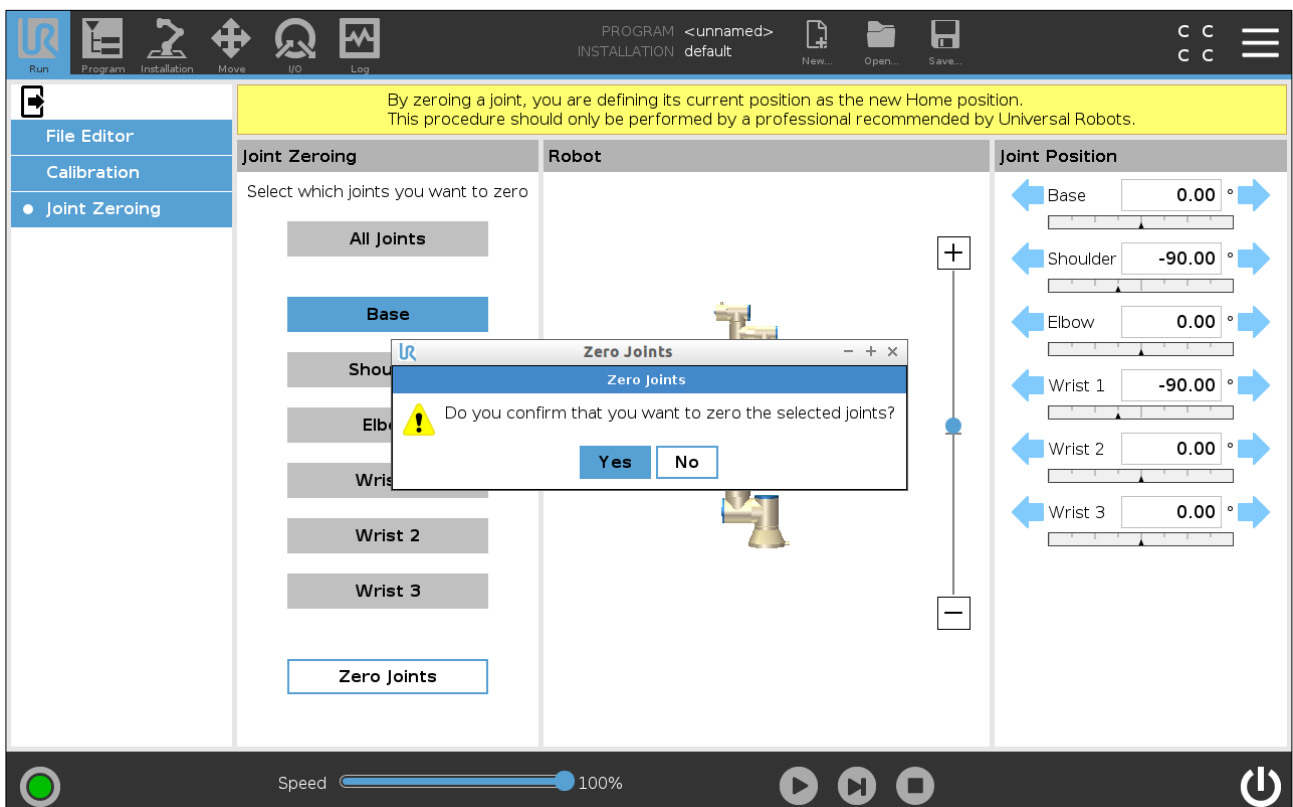
5. Use the arrows in the Joint Position window on the right side of the screen to move each joint to align as shown in the images below. The Speed Slider can be used to reduce the speed of movement.

Base	Shoulder, Elbow, Wrist 1
	
<p>Base zero position is aligned so the Base joint is offset 180 degrees from the cable at the back of the robot base.</p>	<p>Shoulder, Elbow and Wrist 1 zero output flange vertically align (assuming Base is horizontal). Make sure that Base of the robot is horizontal, use spirit level to align joints.</p>
Wrist 2	Wrist 3
	
<p>Wrist 2 zero position is aligned like the Base joint, with tool flange parallel with Wrist 1 output flange.</p>	<p>Wrist 3 zero position is aligned so the tool connector is pointing upward. Mount two bolts in tool holes and use spirit level to align joint.</p>

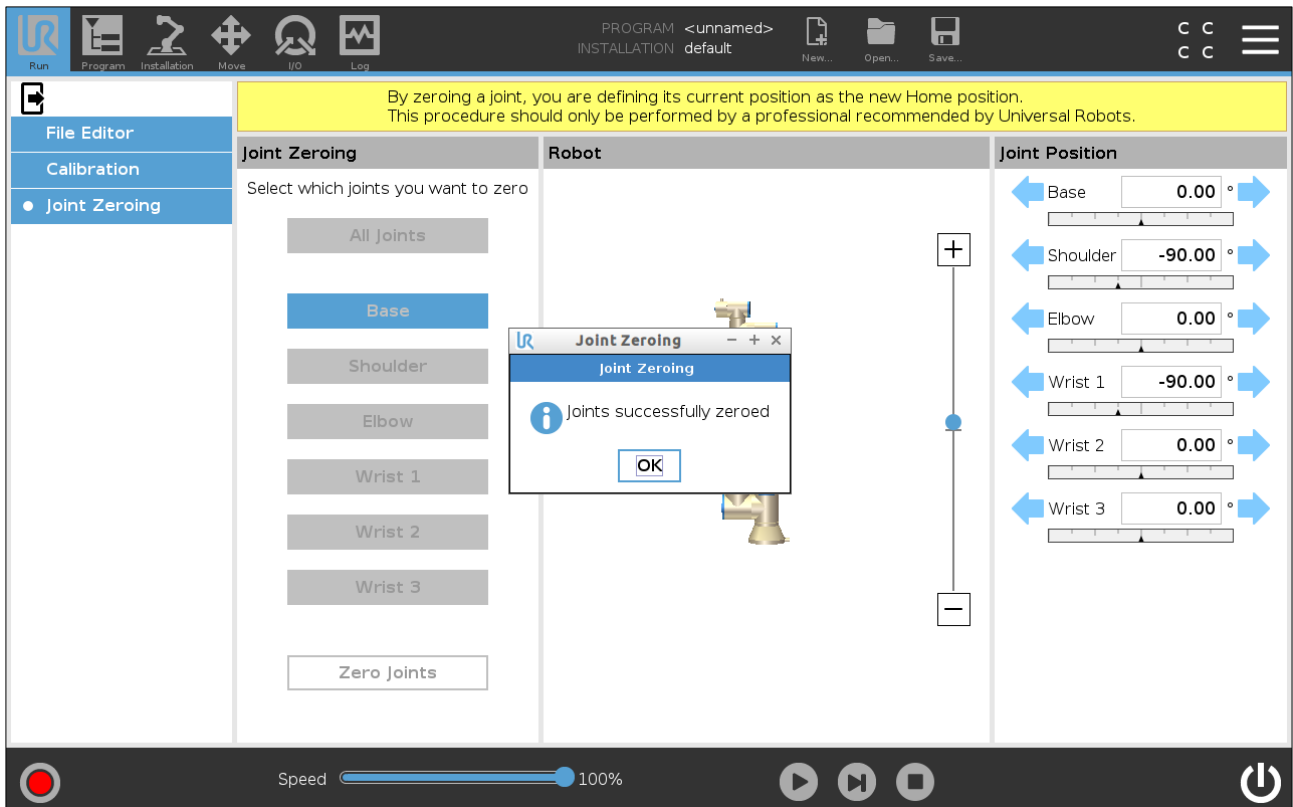
- In the Joint Zeroing window select the joint you want to zero. When selected the box will change from gray to blue. Press Zero Joints



- Confirm you want to zero the joint. The robot will power down after confirmation.



8. A popup shows to confirm that the joint(s) has now been zeroed. Press OK to close the popup and return it to normal.



4.1.12 Dual Robot Calibration

Dual Robot Calibration calibrates the robot in the full work space. Each new robot is Dual Robot Calibrated as part of final assembly.



NOTICE

If a joint is replaced on a calibrated robot the calibration is no longer valid.

Performing a Dual Robot Calibration after replacement of a joint allows the robot to continue in the production line without modifying waypoints in the robot program.

To perform a Dual Robot Calibration, you need:

- 2 robots (same size and same generation)
- Dual Robot Calibration Tooling Complete (Part no: 185500)

You can download the Calibration Manual from the Universal Robots Support site www.universal-robots.com/support/

4.1.13 Program Correction by Key Waypoints

Program Correction by Key Waypoints helps adjusting programs waypoints when a program is moved from an uncalibrated robot to another. The technique can also be used to make programs work after replacements of joints.

Please refer to the Calibration Manual from the Universal Robots Support site www.universal-robots.com/support/ for detailed description on how to use this feature.



NOTICE

Program Correction by Key Waypoints does not currently support the following:

- Other types of waypoints with the exception fixed waypoints.
- Move node with Use Joint Angles selected.

The unsupported program nodes above may need to be corrected manually after the Program Correction by Key Waypoints process is complete.

4.2 Control Box

4.2.1 Dismantling the Control Box



WARNING

Before replacing ANY components inside the Control Box, you MUST do a complete shutdown.

Follow the first 3 steps in section 6.5 Complete rebooting sequence.



NOTICE

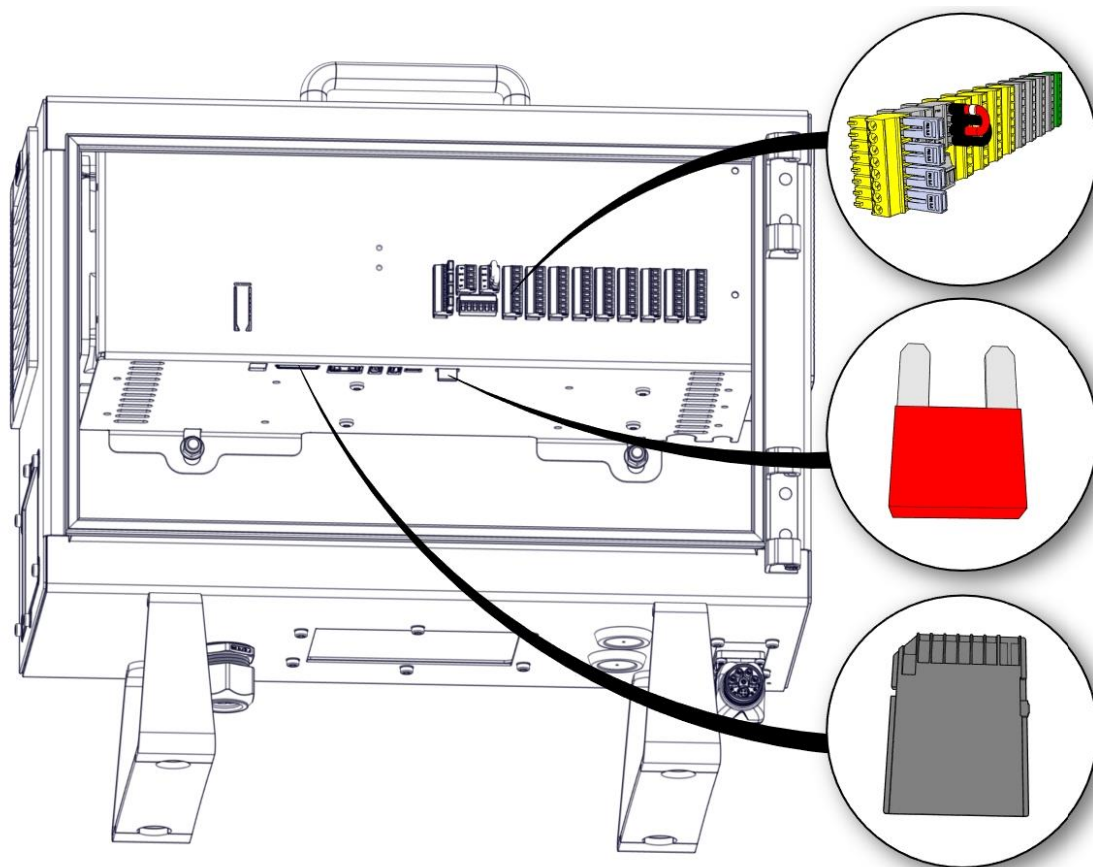
Exercise caution when handling ESD sensitive parts.

See section 2. Handling ESD-Sensitive Parts

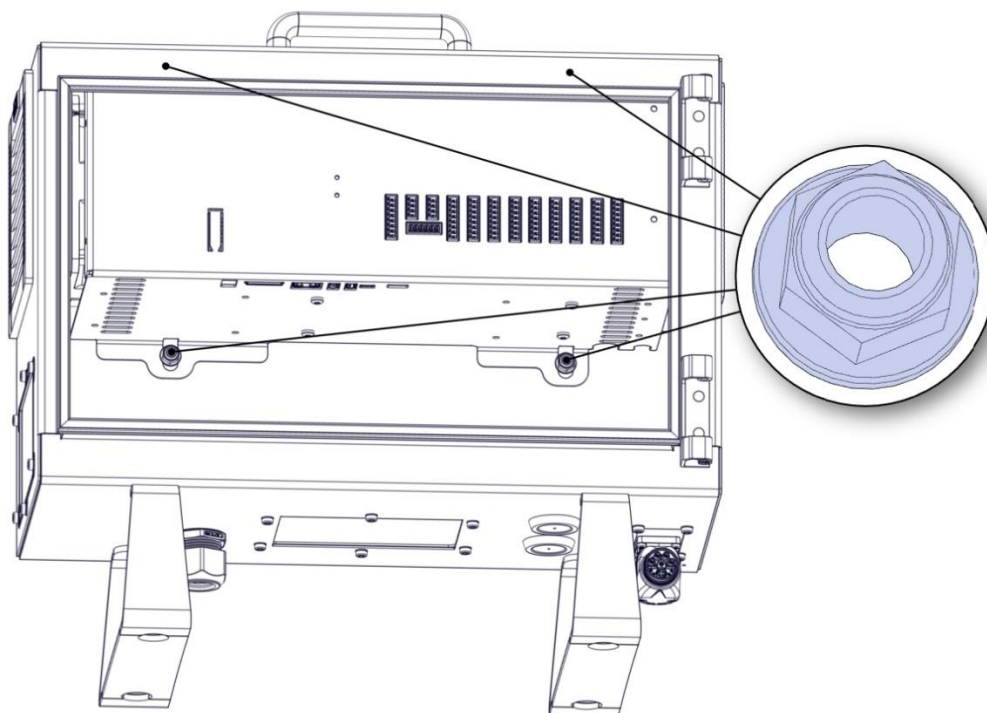
If possible, lay the Control Box on its back.

Assembling is done in reverse from the steps shown.

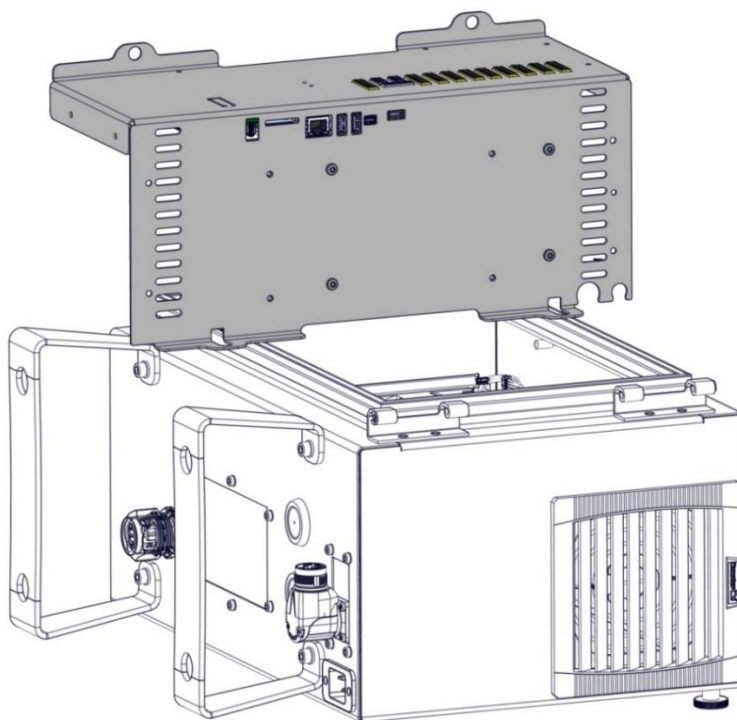
1. Power off Control Box – follow step 1 to 3 in section 6.5 Complete rebooting sequence.
2. Remove all the I/O Terminals, the Fuse, SD-card and any other I/O etc. that may be connected.



3. Remove the Teach Pendant, see Section 4.2.4 Replacing of Teach Pendant
4. Lay the Control Box on the backside and remove the four nuts.

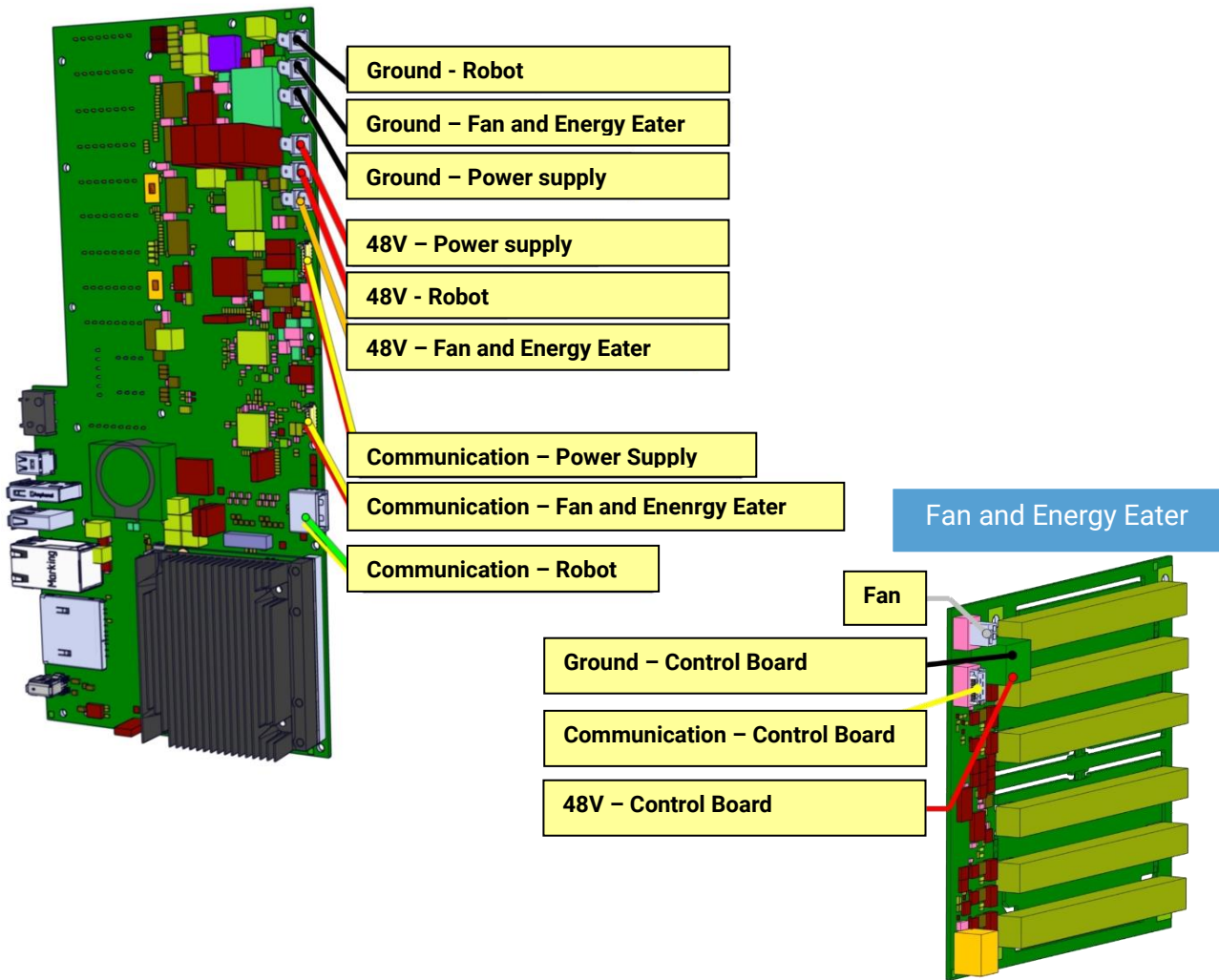


5. Take out the Control Box bracket and place it on the edge of the Control Box as shown below.

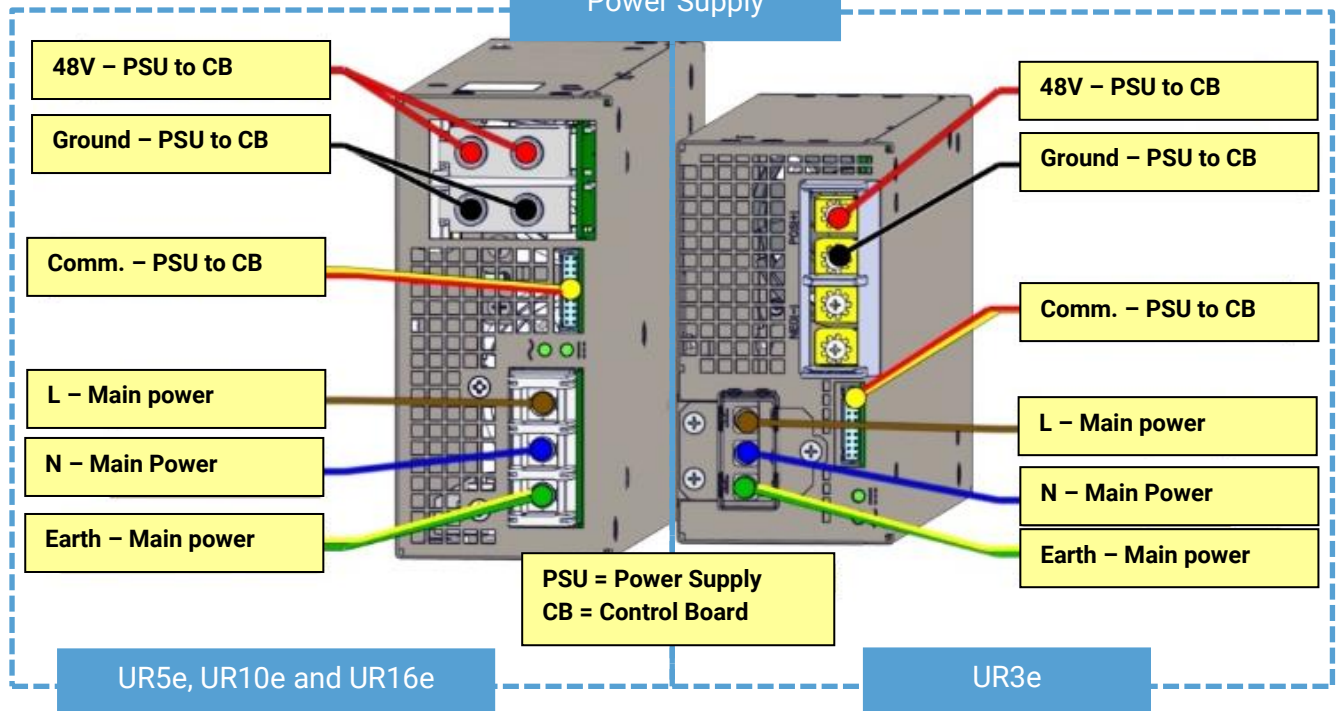


6. Remove the wires connecting the Control Box bracket and the Control Box. Take note of the connections or consult the electrical diagram in Section 7. Electrical drawing

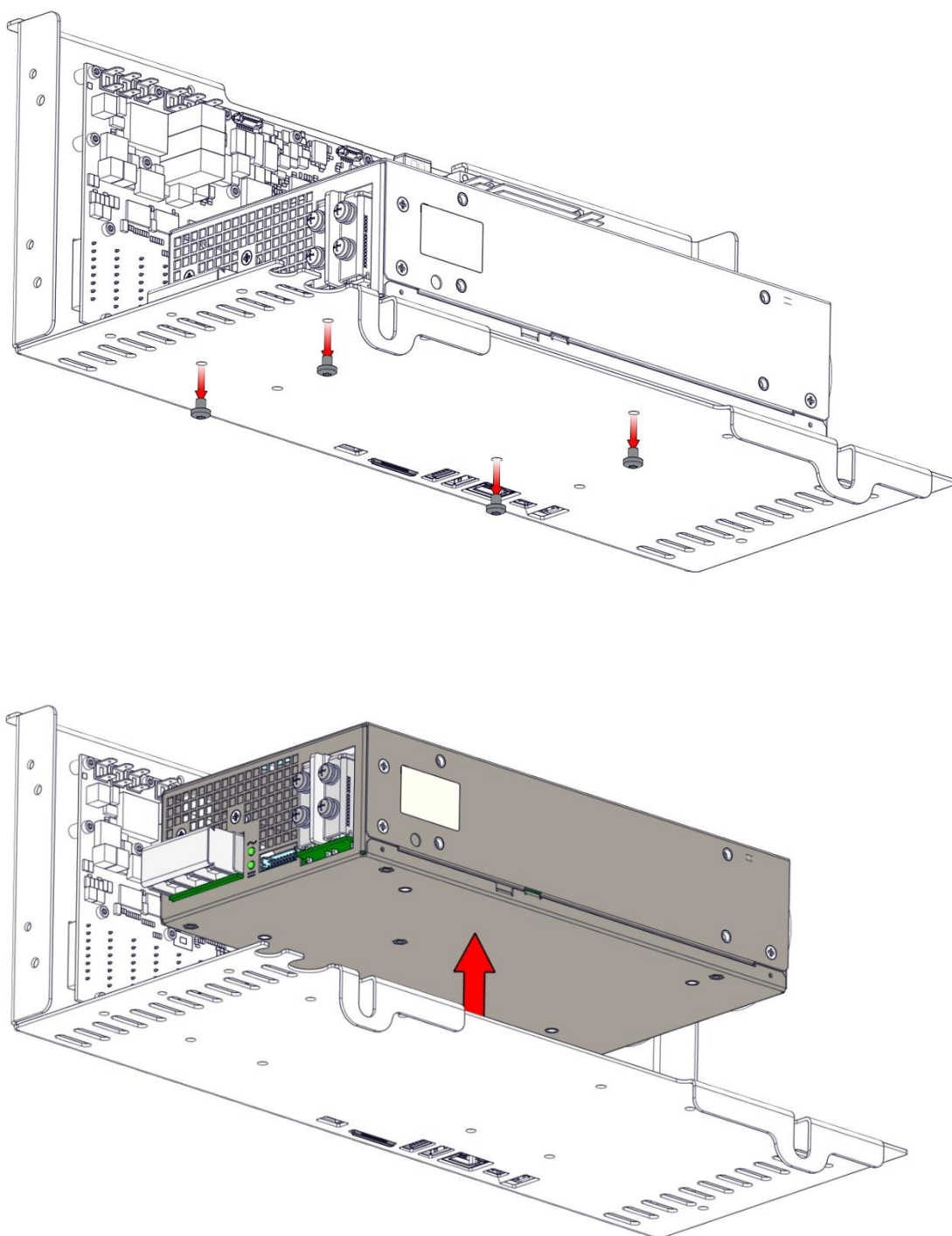
Control Board



Power Supply



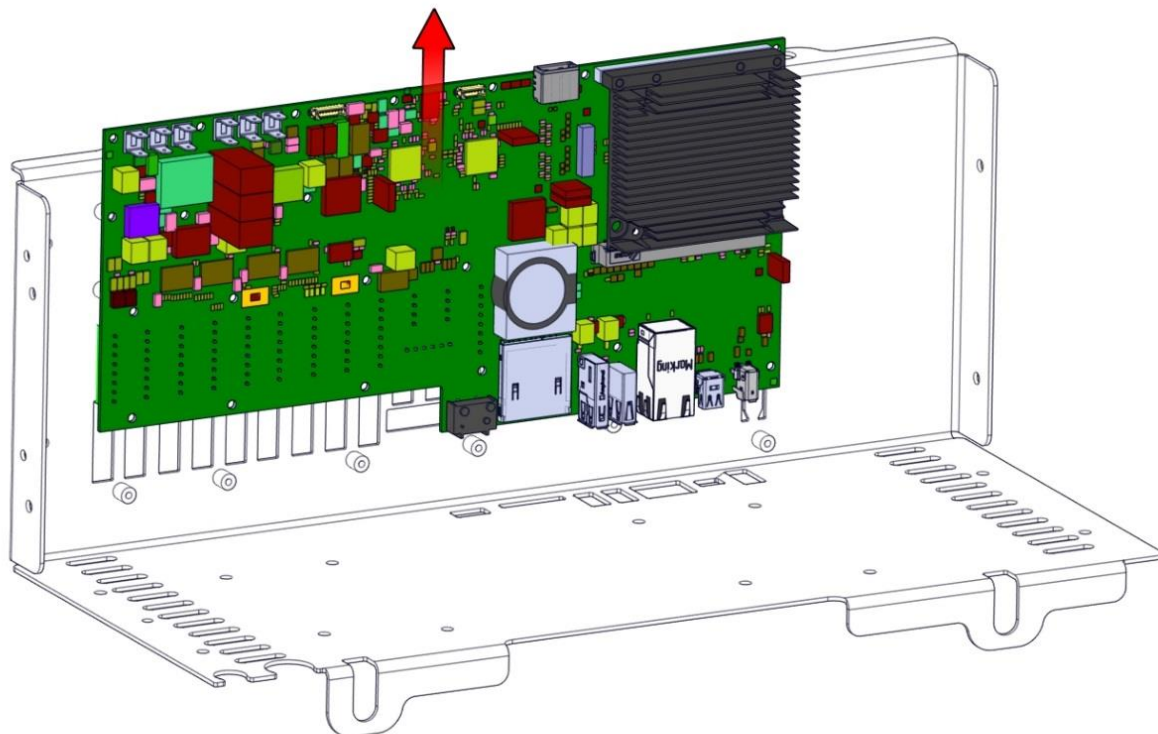
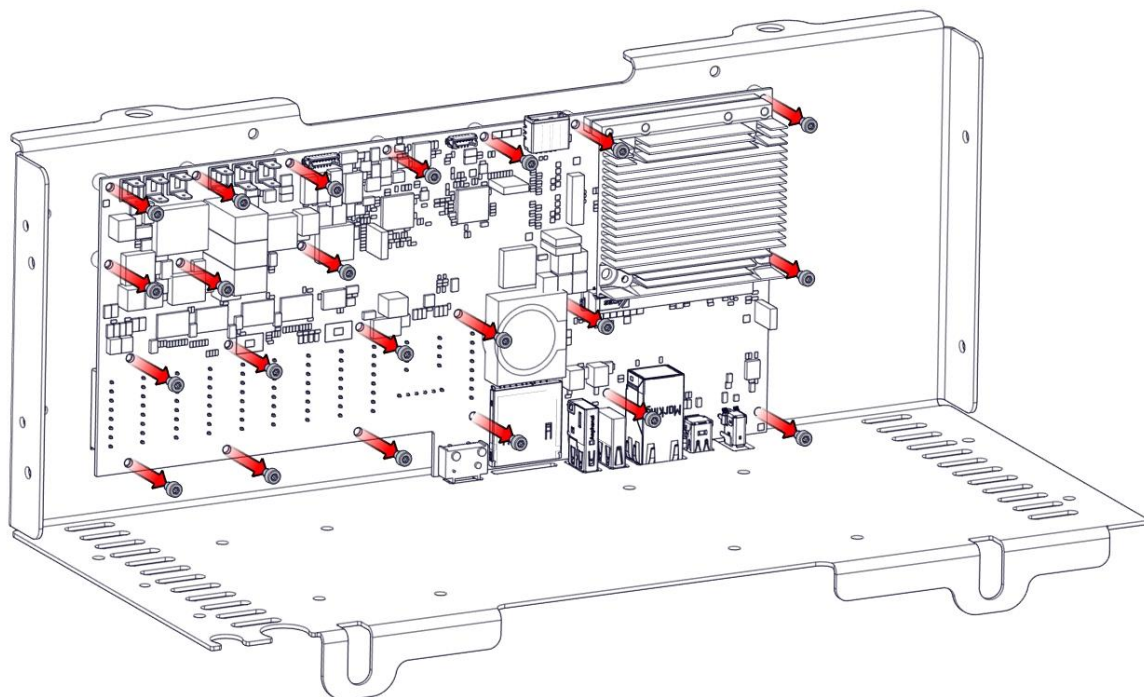
7. Remove the four screws on the bottom of the power supply, then remove the power supply.



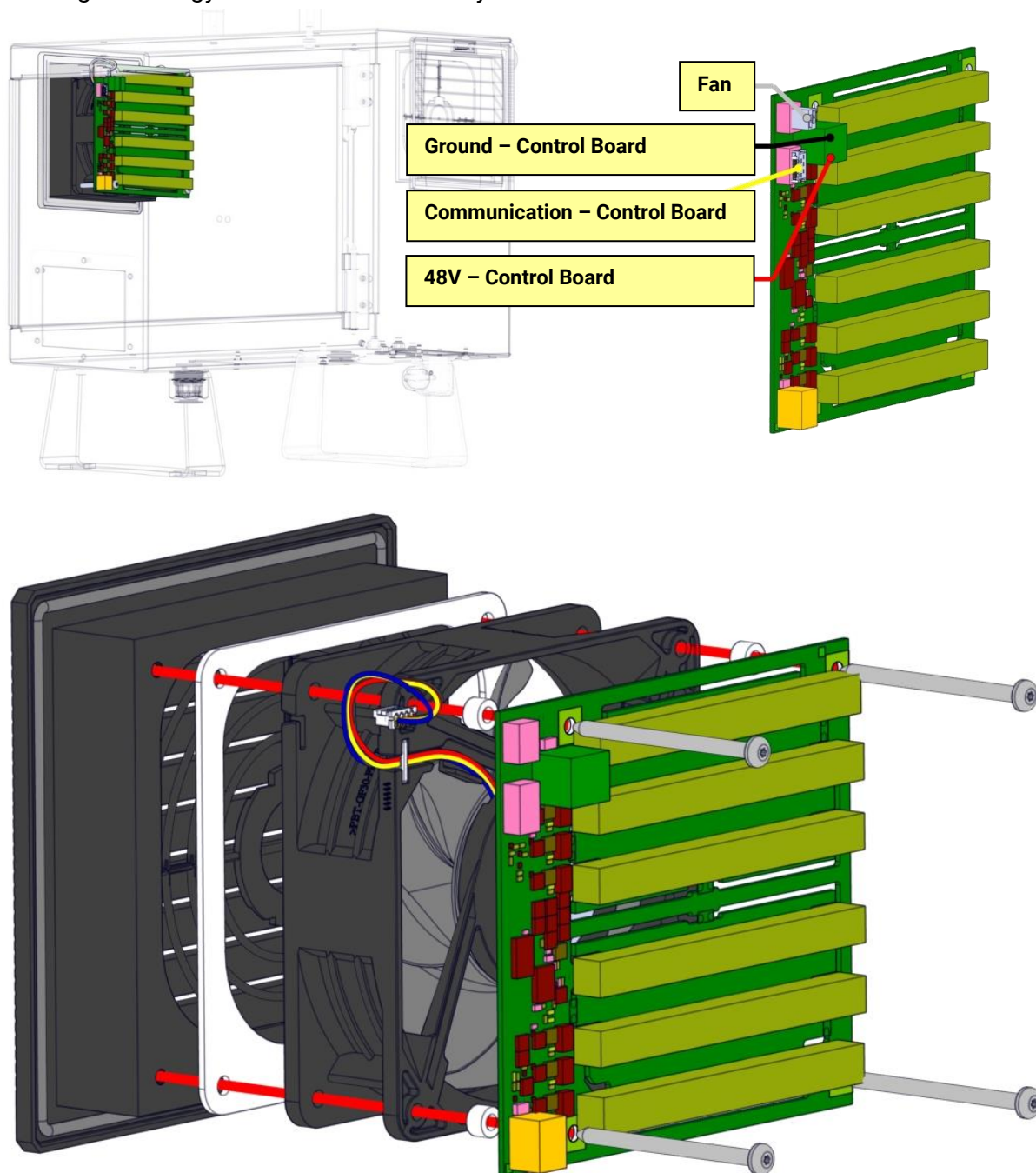
NOTICE

When assembling, the screws must not be tightened with a torque greater than $1.0 \frac{+0.1}{-0.1} \text{ Nm}$

8. Remove the twenty-two screws and remove the Control Board upward.



9. Removing the Energy Eater and fan assembly. Remove the four screws.

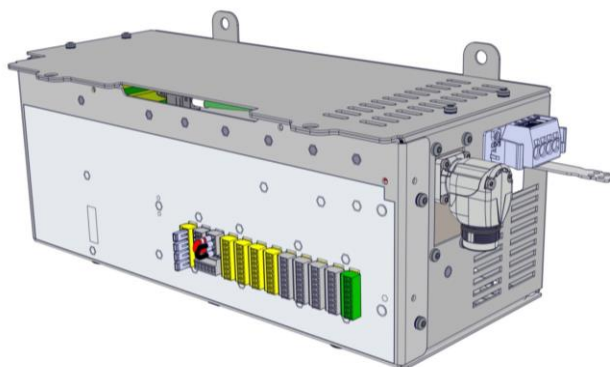


NOTICE

When assembling, remember to place the round spacers behind the Energy Eater board.

4.2.2 Dismantling the OEM AC and DC Control Box

The OEM AC and DC version are special Control Box units made for OEM installation in AC and DC environments.



WARNING

Before replacing ANY components inside the Control Box, you **MUST** do a complete shutdown.
Follow the first 3 steps in section 6.5 Complete rebooting sequence.



NOTICE

Exercise caution when handling ESD sensitive parts.
See section 2. Handling ESD-Sensitive Parts
If possible, lay the Control Box on its back.
Assembling is done in revers from the steps shown.

OEM DC Control Box special precautions



WARNING

- In case of a battery failure, (for example, due to a short circuit) the current can cause fire or explosion. To avoid injury while performing service:
 - Wear safety glasses.
 - Wear fireproof protective gloves.
- Do not perform service or maintenance work on the OEM DC Control Box if a circuit breaker, or a power switch and a fuse are not installed.
- Ensure that the circuit breaker or the power switch is off and there is no voltage on the power connector before connecting or disconnecting the connector.

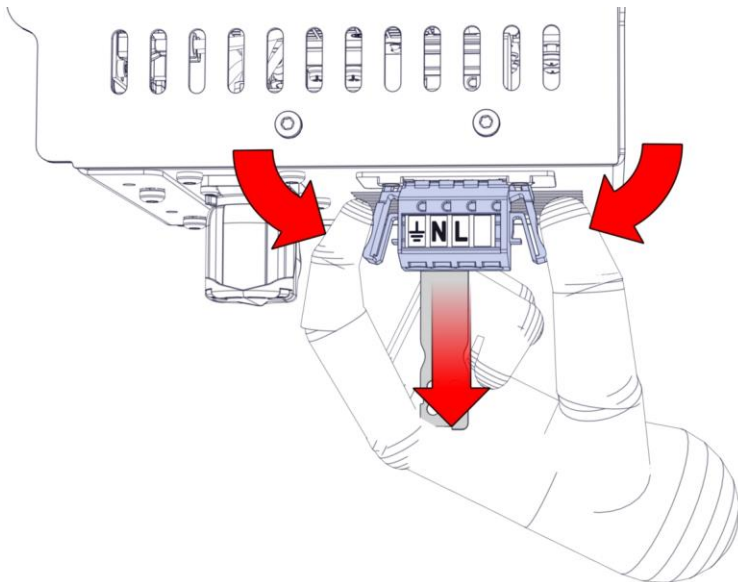


NOTICE

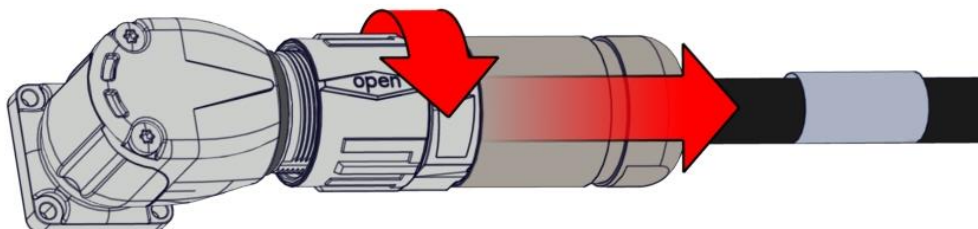
- Since the control box does not have the reverse polarity protection, reversing the DC source polarity causes permanent damage to the control box. Such damage requires the replacement of the DC-DC PSU. To ensure that the polarity of the power source wiring is correct:
 - Doublecheck the polarity of wires in the power connector using a multimeter. Do not rely on the wire colors unless you have access to the battery terminals and can see where the wires are connected.
- Ensure that the wires are installed correctly in the connector terminals. Ensure that:
 - Wires are not loose.
 - Wires are fully inserted in terminals.
- Ensure that the control box is grounded properly. For information on grounding, see the OEM Control Box Installation Guide.
- Ensure that the wires in the power connector can sustain the short circuit cut-off current of the circuit breaker or fuse. For example, an AWG12 wire is rated up to 34A, so the cut-off current of the protective device must be at least 34A or lower to protect the wire and the system.

Dismantling the OEM AC and DC Control Box

- 1) Follow step 1 and 2 as described in 4.2.1 Dismantling the Control Box
- 2) Remove main power connection by pushing in on the two clips and pull backwards.



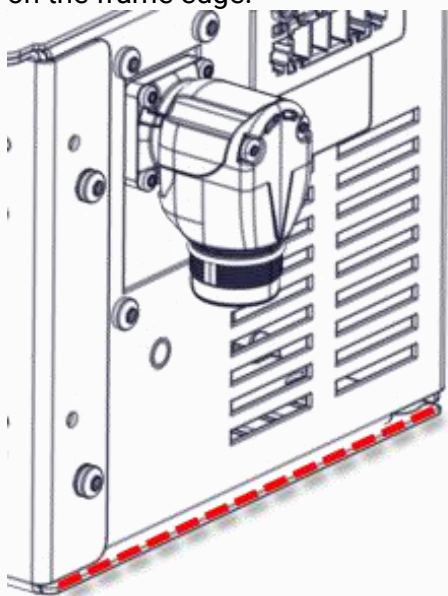
- 3) Remove robot cable by unscrew the top part clock-wise then pull the plug out.



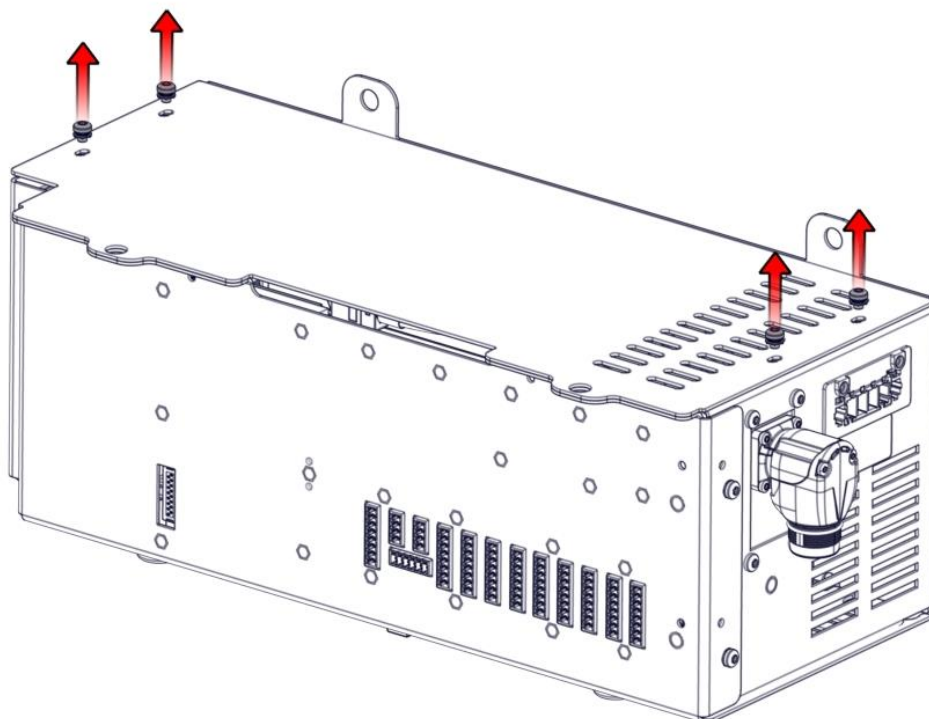


CAUTION

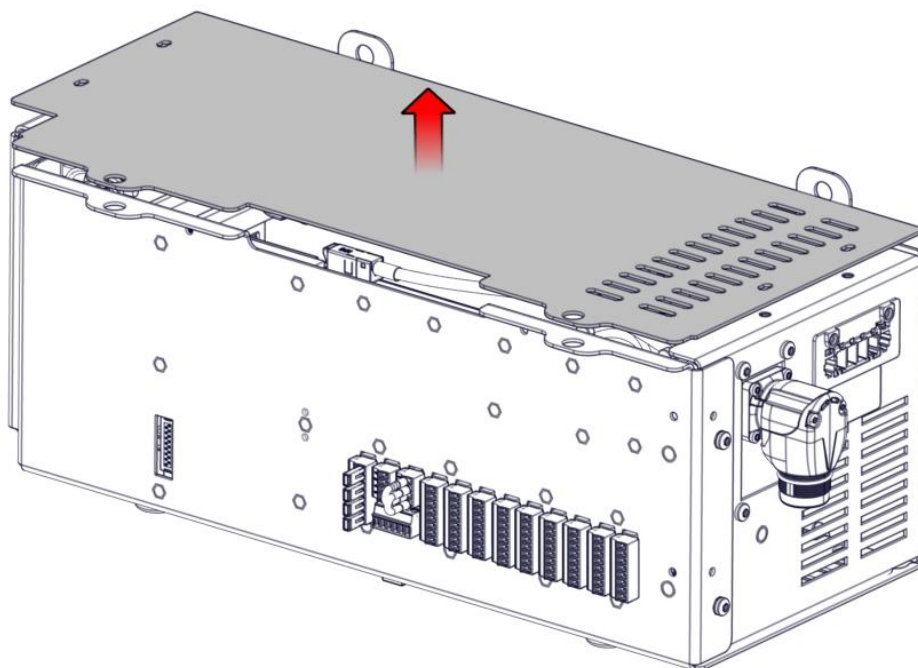
When pulling the robot arm cable connector, be careful not to scrape your hand/fingers on the frame edge.



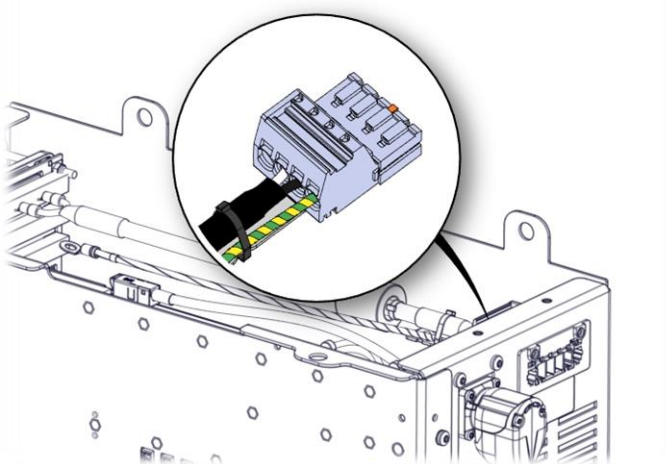
- 4) Remove the OEM Control Box from its installation and place it on a table or similar.
- 5) Remove the 4 screws(T20) shown below, remember the washers as well.



6) Remove the top lid.

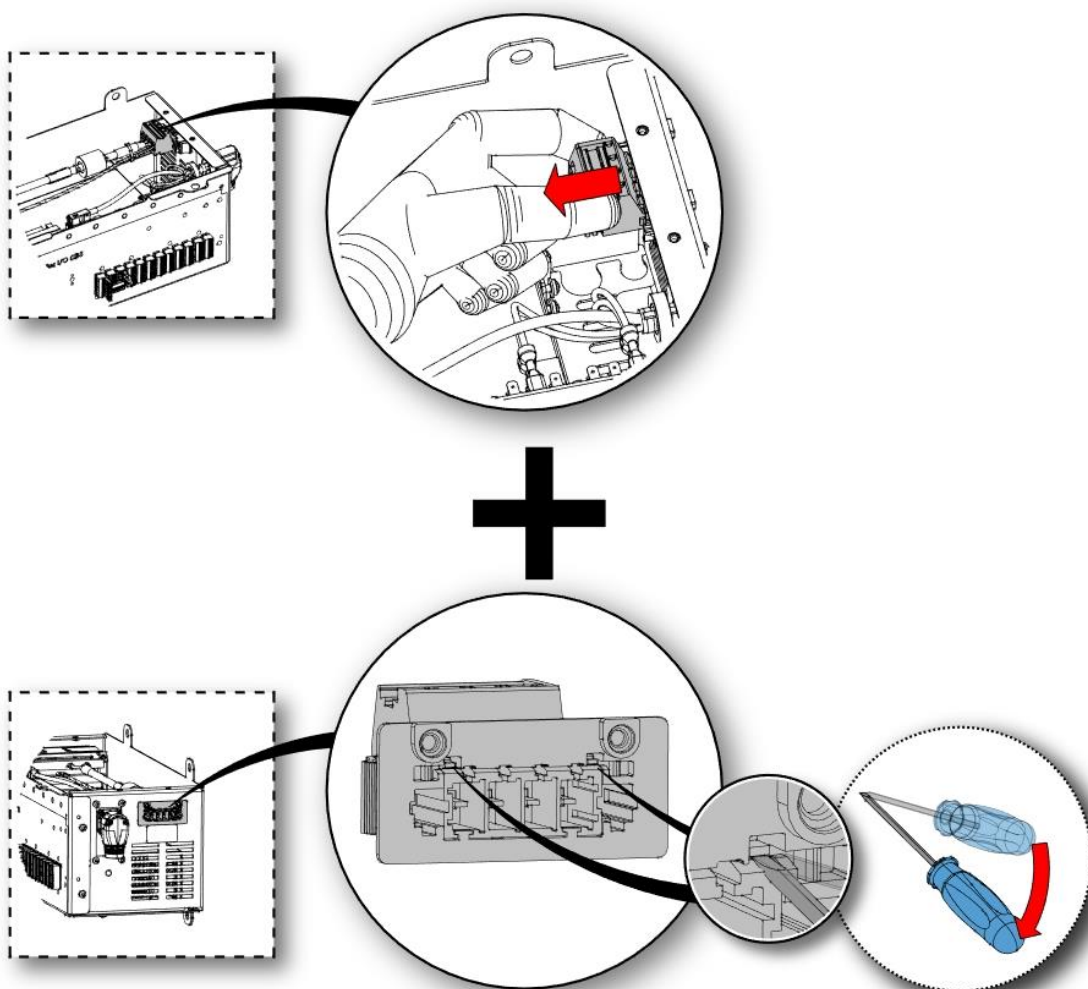


- 7) Now the power plug on the inside needs to be disconnected from the frame, how to do this correctly is shown in Step 8.

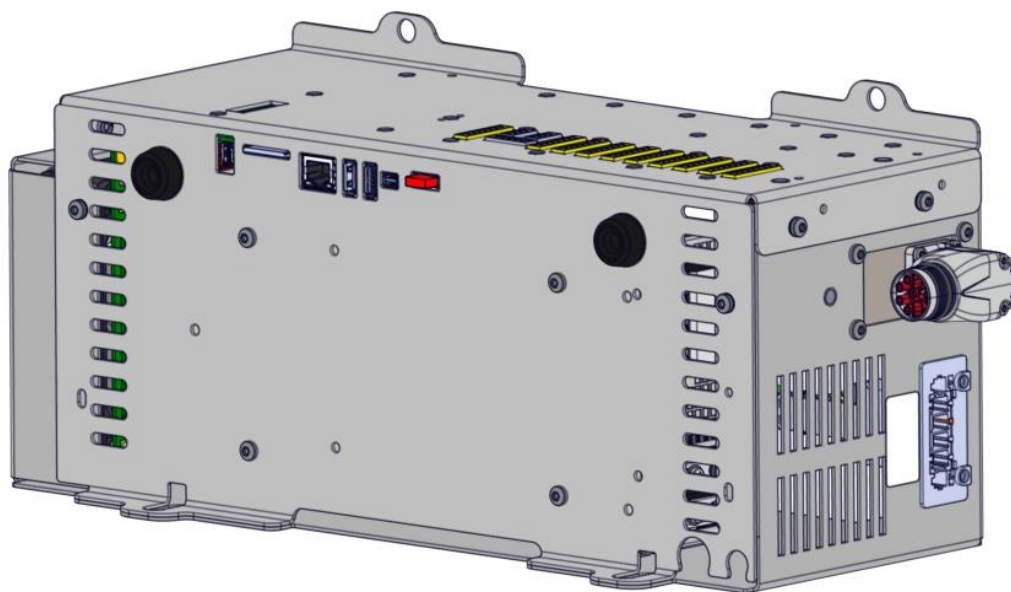


- 8) For removing the power plug, you will need a small 2mm flathead screwdriver.

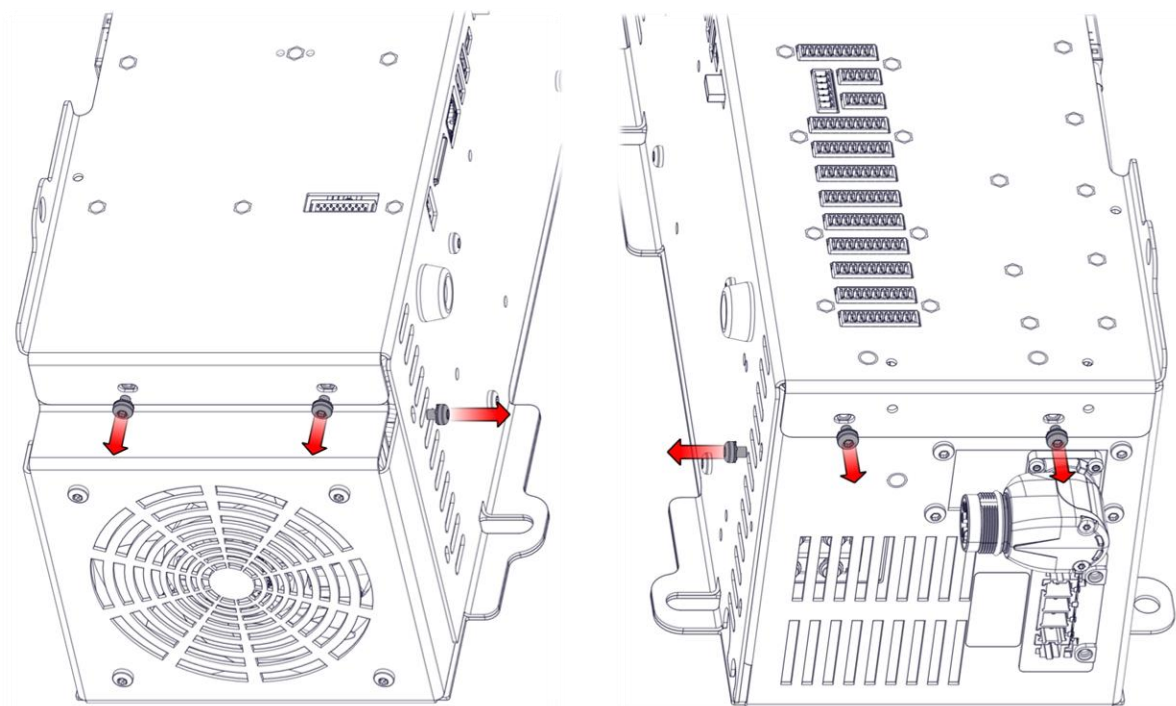
Pull in the power plug AND tip the two front locks upwards at the same time



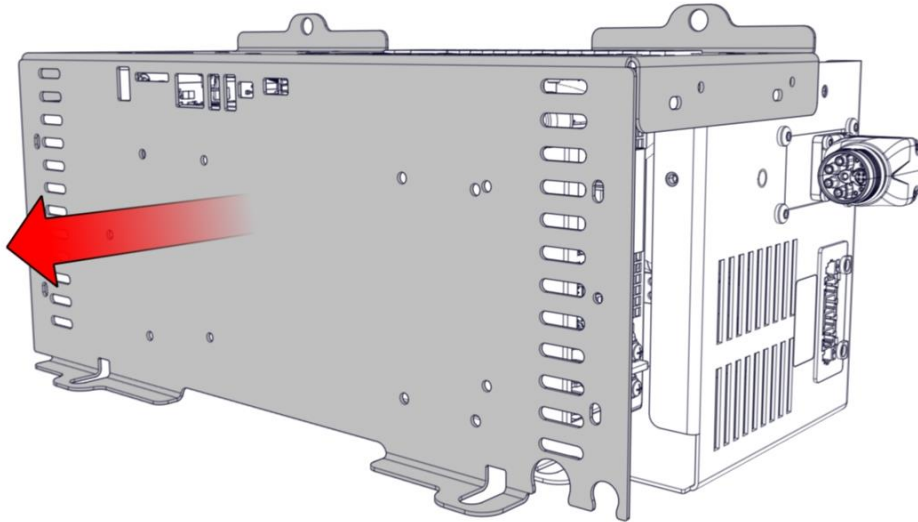
- 9) Remove all connections to the Control Board.
- 10) Lay the Control Box on the "back"



- 11) Remove the 6 screws(T20) shown below.



12) Pull out the front part where the power supply and Control Board is attached.



13) There are now two possibilities:

- Remove Power Supply and/or Control Board

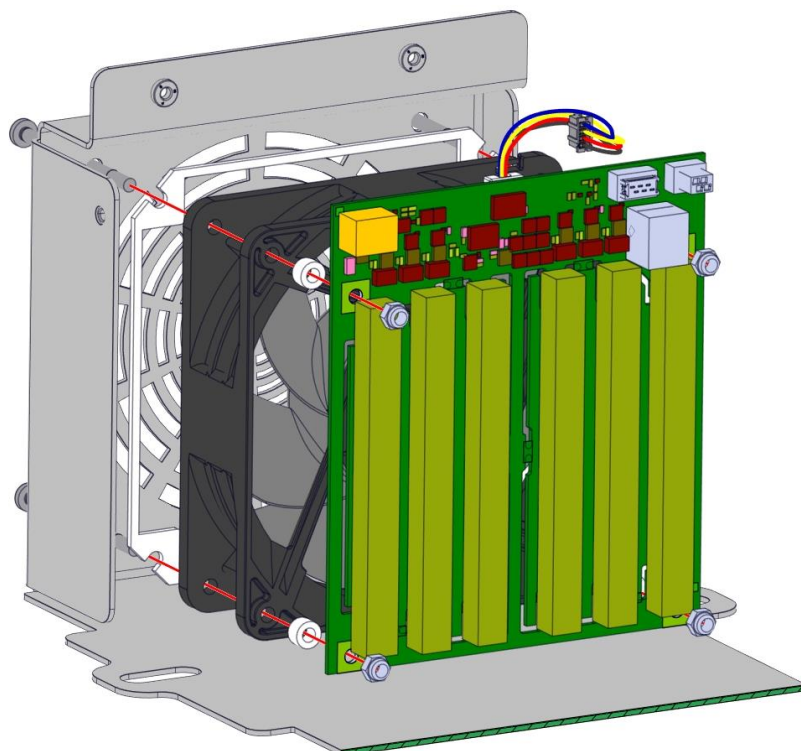
see step 7 and 8 in section 4.2.1 Dismantling the Control Box

NOTE: Remember to cable tie the energy eater cable to the power cable when assembly the unit.

- Remove Energy Eater and/or Fan

see next step

- 14) Remove the 4 nuts(7mm) on the Energy eater side and pull the individually part off the screws(T20).



4.2.3 Assembling the Control Box incl. OEM AC and OEM DC

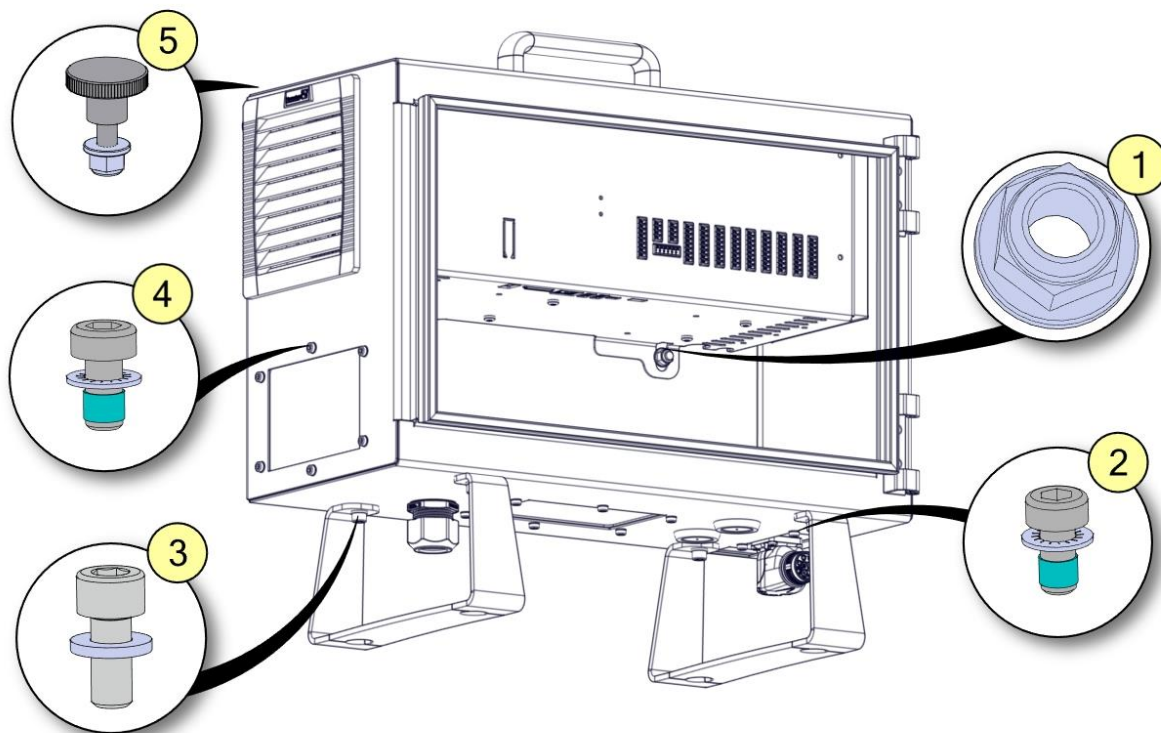


NOTICE

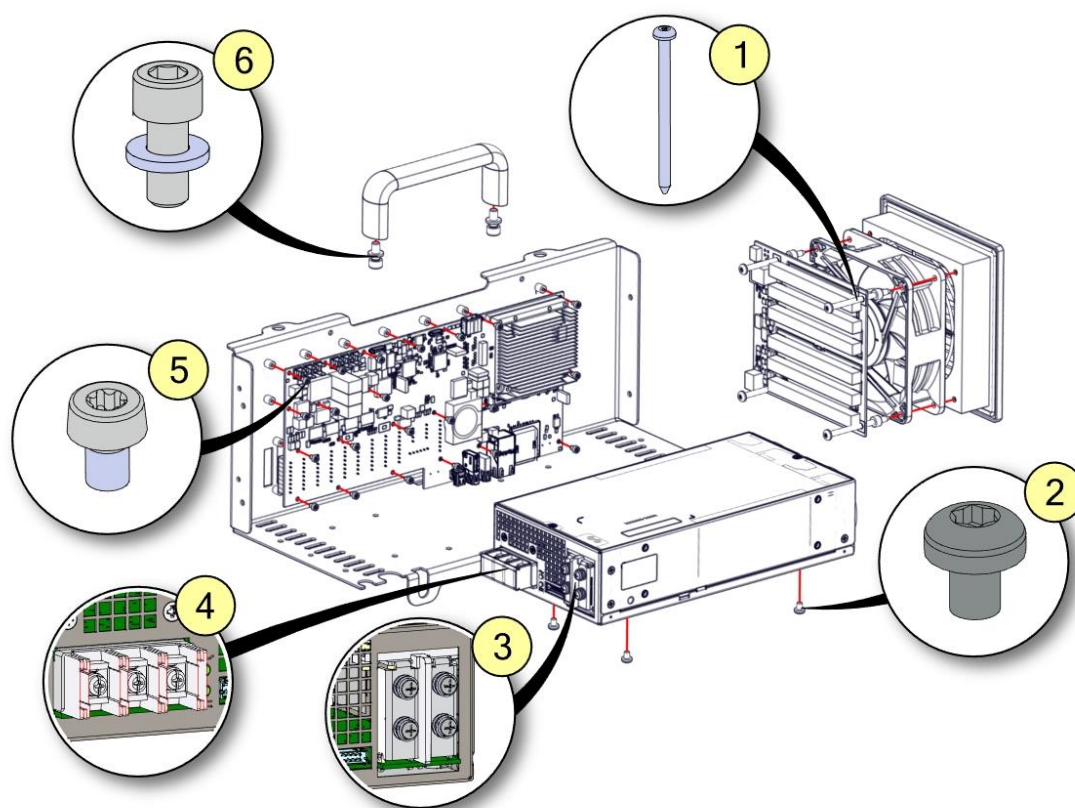
Assembling is done in revers from the steps shown in section 4.2.1 and 4.2.2.

4.2.3.1 Torque values and notes for Control Box

Below are the torque values used in the Control Box.



NO.	DESCRIPTION	Tool size	Torque
1	Nut for internal CB bracket	10mm	2.25Nm
2	Robot connector screw	Torx T20	1.5Nm
3	Screw for feet bracket	Hex key 5	4.0Nm
4	Screw and washer for cover plate	Torx T20	1.5Nm
5	Control Box and Teach pendant mounting nut	10mm	2.25Nm



NO.	DESCRIPTION	Tool size	Torque
1	Screw for fan and energy eater assembly	Torx T20	0.6Nm
2	Screw for mounting power supply	Torx T20	1.0Nm
3	Internal power terminal screws	PZ2	1.2Nm
4	External power terminal screws	PZ2	1.2Nm
5	Control Board mounting screws	Torx T10	0.6Nm
6	Bolt for Control Box handle	Hex key 5	4.0Nm

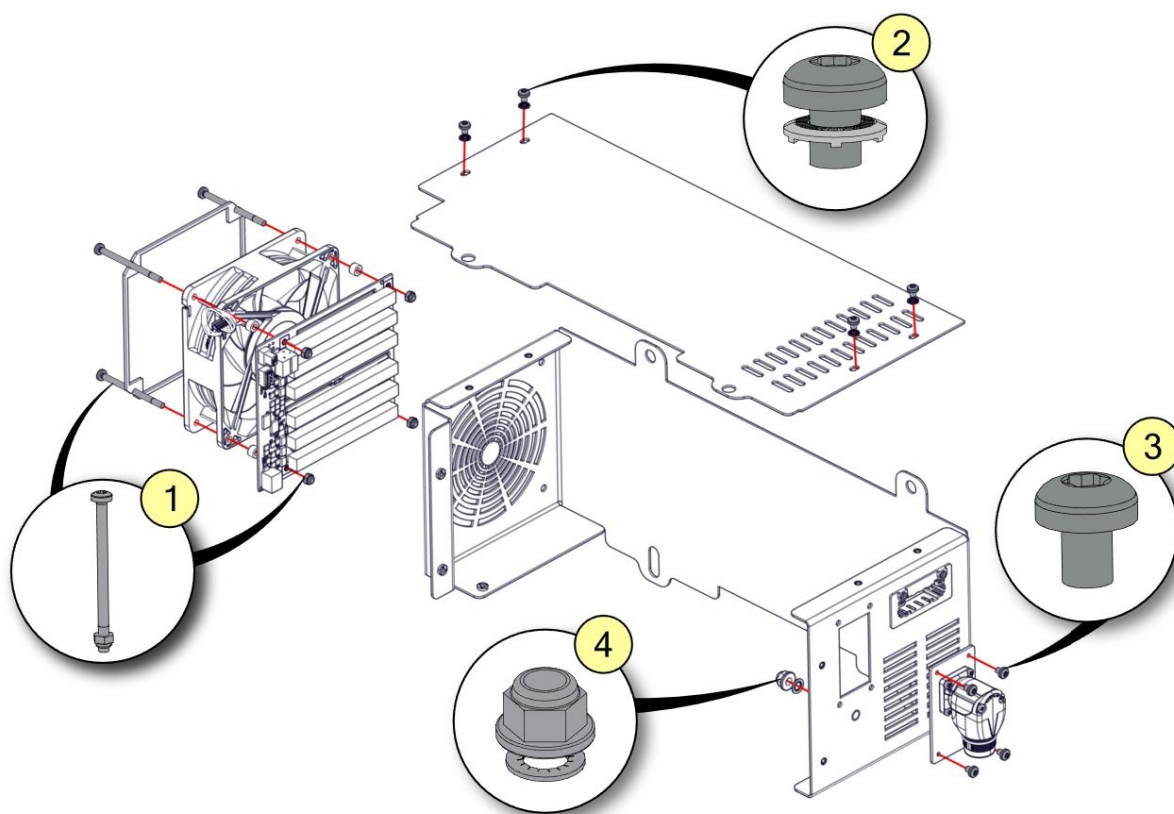
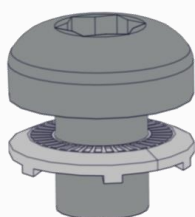
4.2.3.2 Torque values and notes for OEM AC and DC Control Box

Below are the torque values used in the OEM AC and DC Control Box.

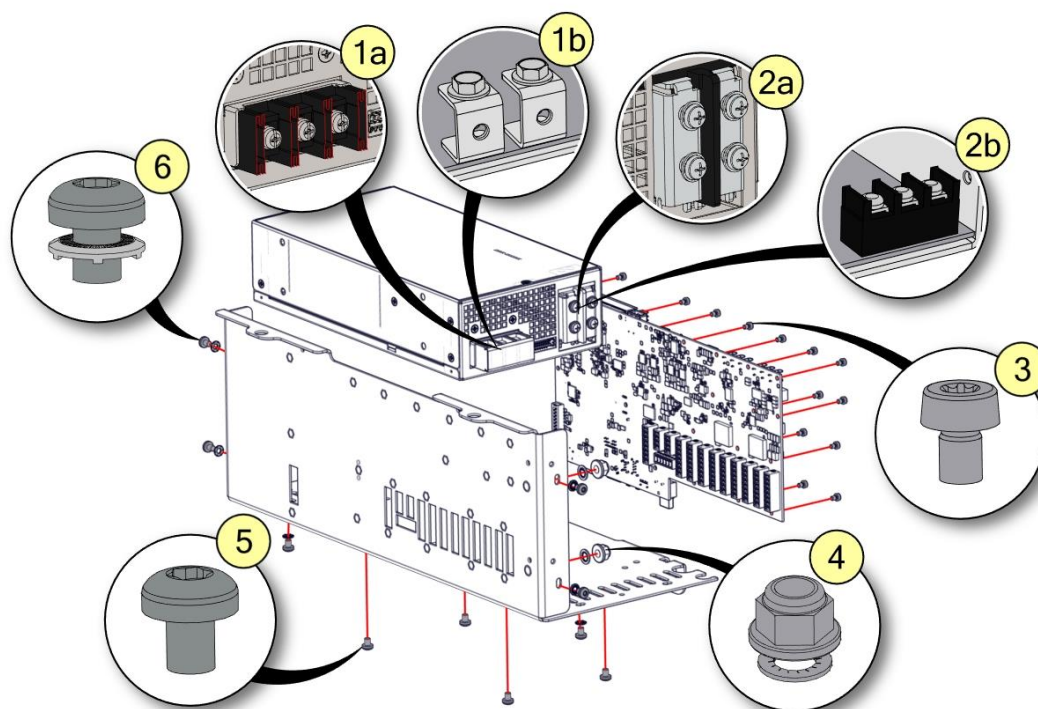


NOTICE

The washer, when present, need to have the spikes facing downwards.



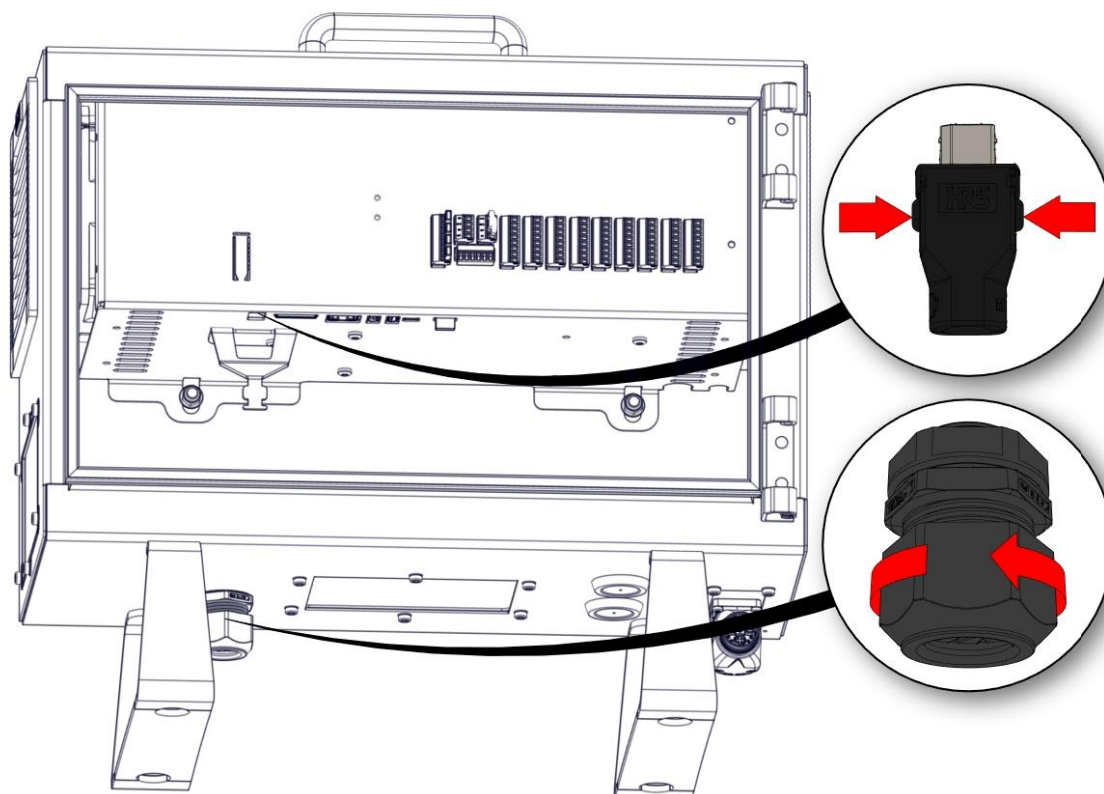
NO.	DESCRIPTION	Tool size	Torque
1	Bolt and nut for fan and energy eater	Torx T20/7mm	0.6Nm
2	Panel screw and washer	Torx T20	1.6Nm
3	Robot connector screw	Torx T20	1.6Nm
4	Shield connecting bold and washer	10mm	2.25Nm



NO.	DESCRIPTION	Tool size	Torque
1a	AC external power terminal screws	PZ2	1.2Nm
1b	DC external power terminal bolts	8mm	1.6Nm
2a	AC internal power terminal screws	PZ2	1.2Nm
2b	DC internal power terminal screws	PZ2	1.6Nm
3	Control Board mounting screws	Torx T10	0.6Nm
4	Bolt and nut for fan and energy eater	10mm	2.25Nm
5	Power supply mounting screw	Torx T20	1.0Nm
6	Panel screw and washer	Torx T20	1.6Nm

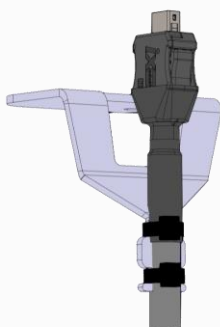
4.2.4 Replacing of Teach Pendant

1. Power off the Control Box
2. Press in the clips (as seen in the image below with red arrows), on both sides of the Teach Pendant plug and pull down.
3. Fully open/loosen the plastic grommet at the bottom of the Control Box and remove the plug and cable.
4. Gently pull out the Teach Pendant cable.



NOTICE

Remember to add two cable ties when mounting the Teach pendant cable.



5. Software

5.1 Software Updates

Universal Robots software is called PolyScope.



NOTICE


- Read the complete section prior to updating your software.
- Control Box power **MUST NOT** be turned off during software update process.
- Universal Robots assume no responsibility for any failed update caused by improper operation.
- Updating the software may cause changes or restrictions to functionality

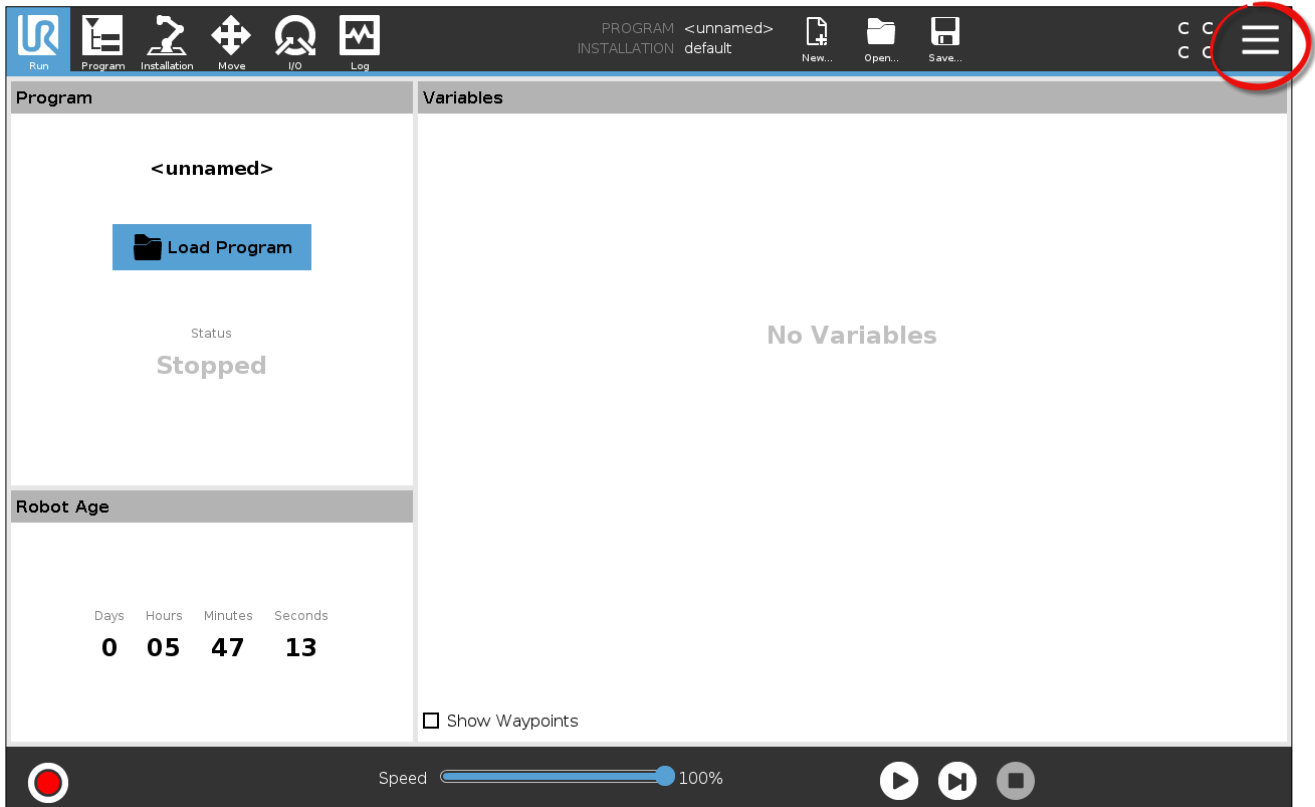


NOTICE

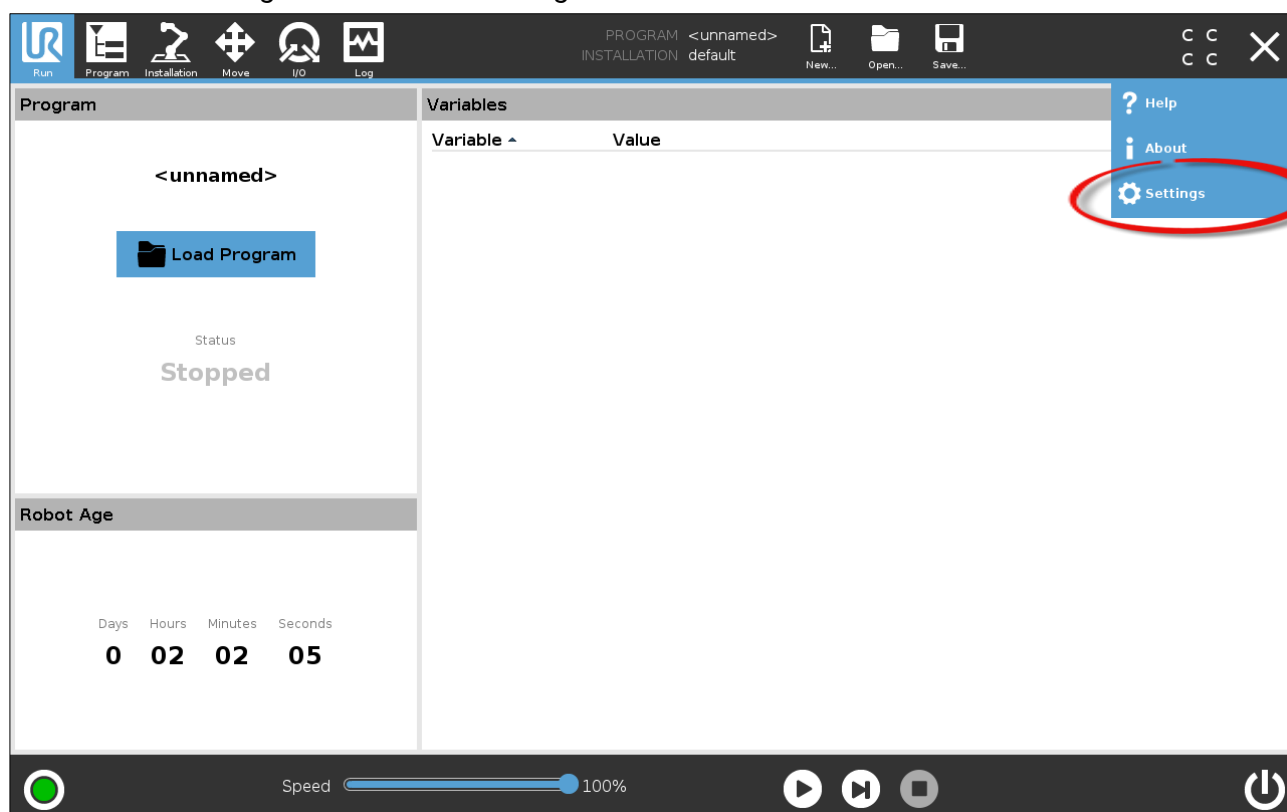
- Do not downgrade the software to an earlier version than the version the robot was produced with.
- Universal Robots advise to update the software only if you can benefit from new features or fixed issues.
- Universal Robots advise to thoroughly read the release notes before updating software, to avoid unwanted or unexpected situations caused by changed or added functionality.
- In case of concerns related to your actual or planned applications, please contact your supplier for advice and assistance.
- Follow the instructions in the download section of the support web site. Find it under www.universal-robots.com/support

Updating Software:

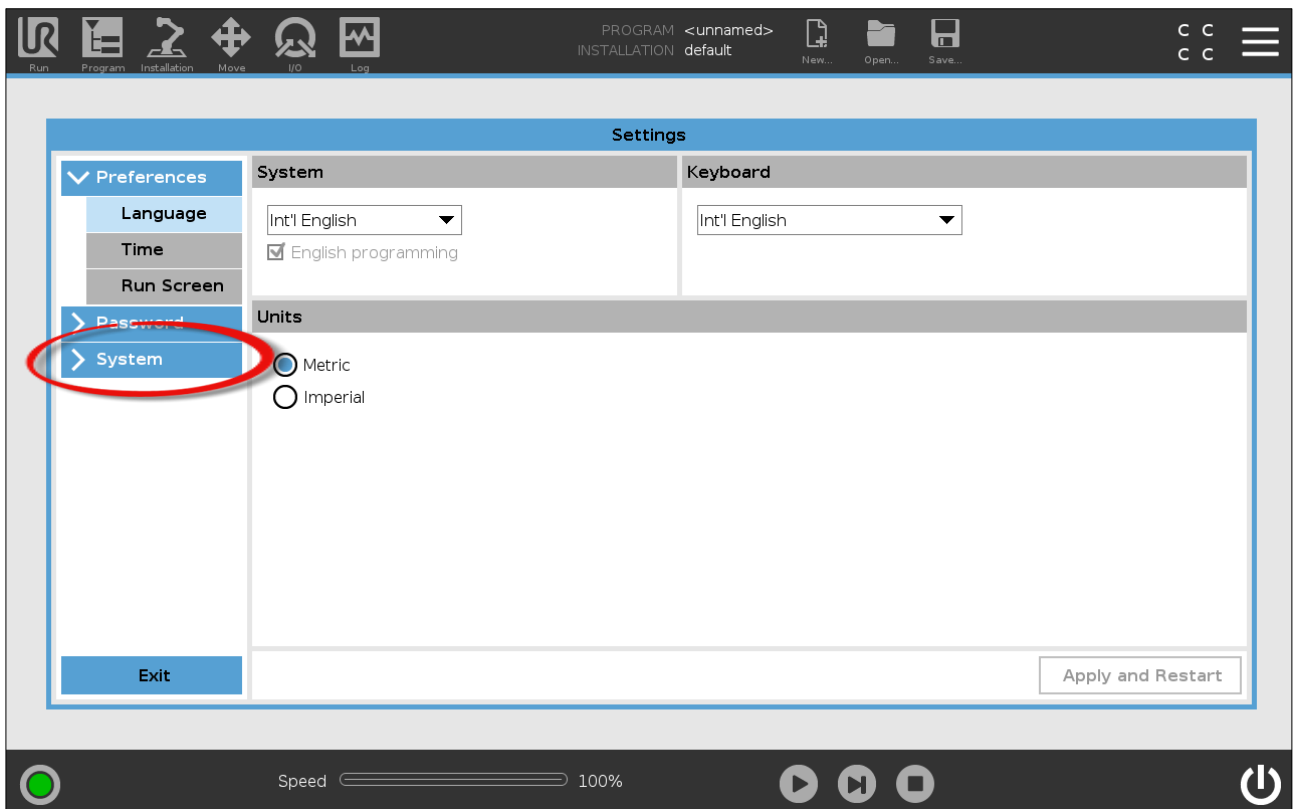
1. Download software update. Carefully read requirements on support site relating to which software must be installed on the robot prior to updating to the downloaded version.
2. Save it in the root folder on a USB stick.
3. On the top right side of the Teach Pendant, insert USB stick into the USB connector.
4. Press  to access the settings menu.



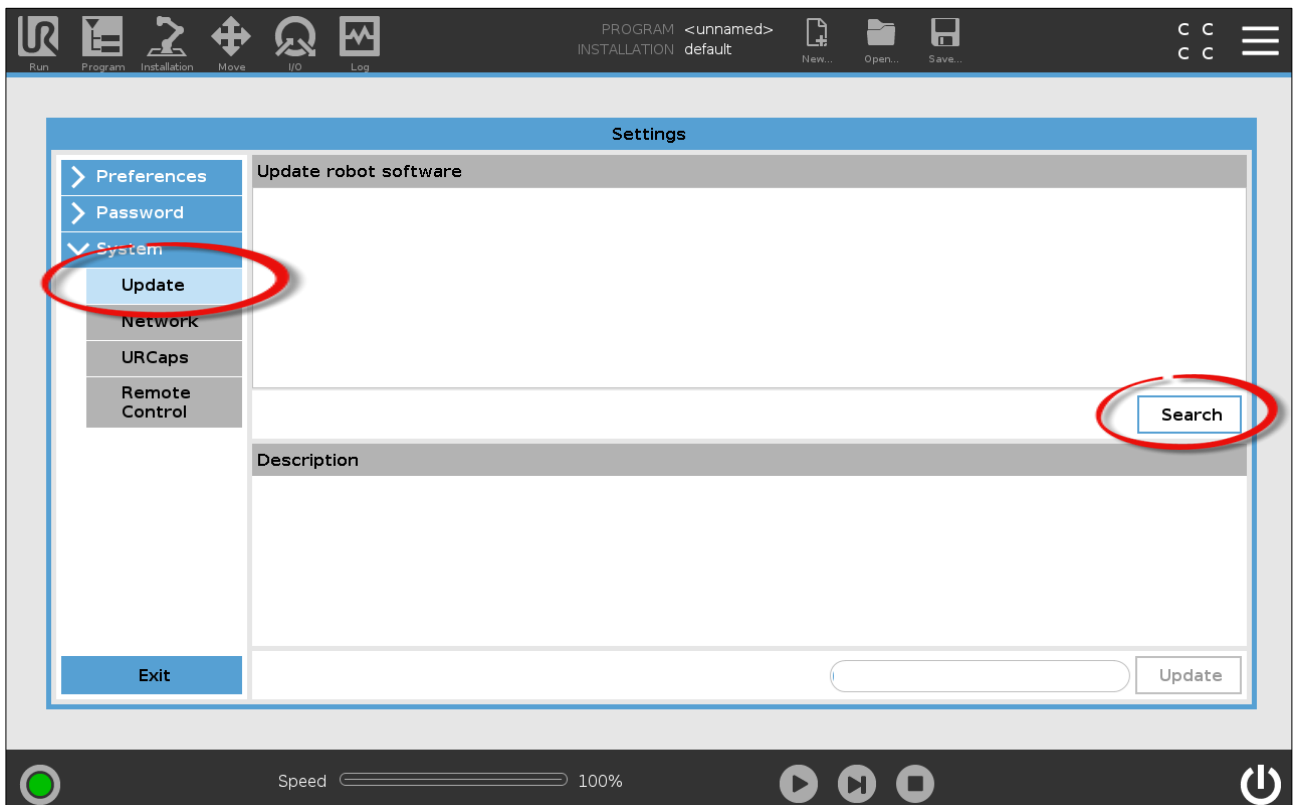
5. Press Settings to access the settings menu.



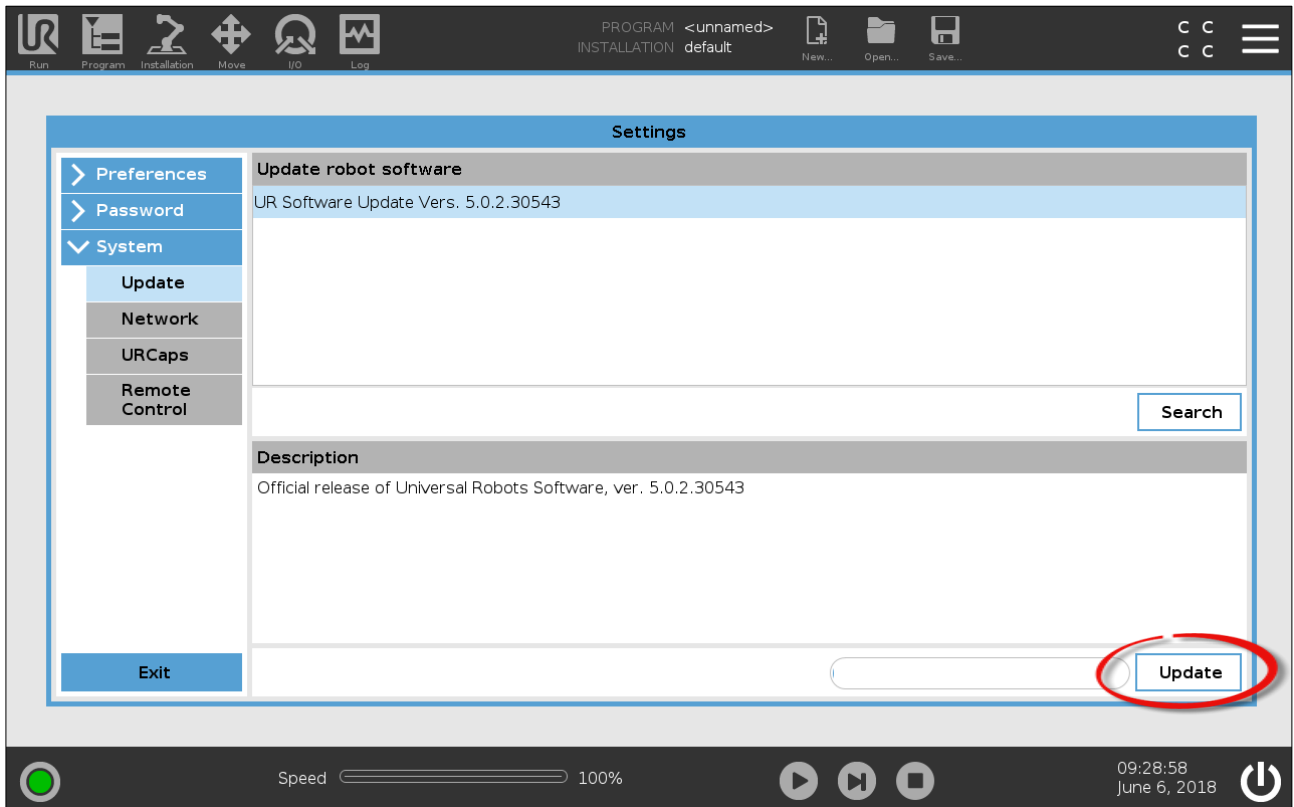
6. On the left side menu, select System.



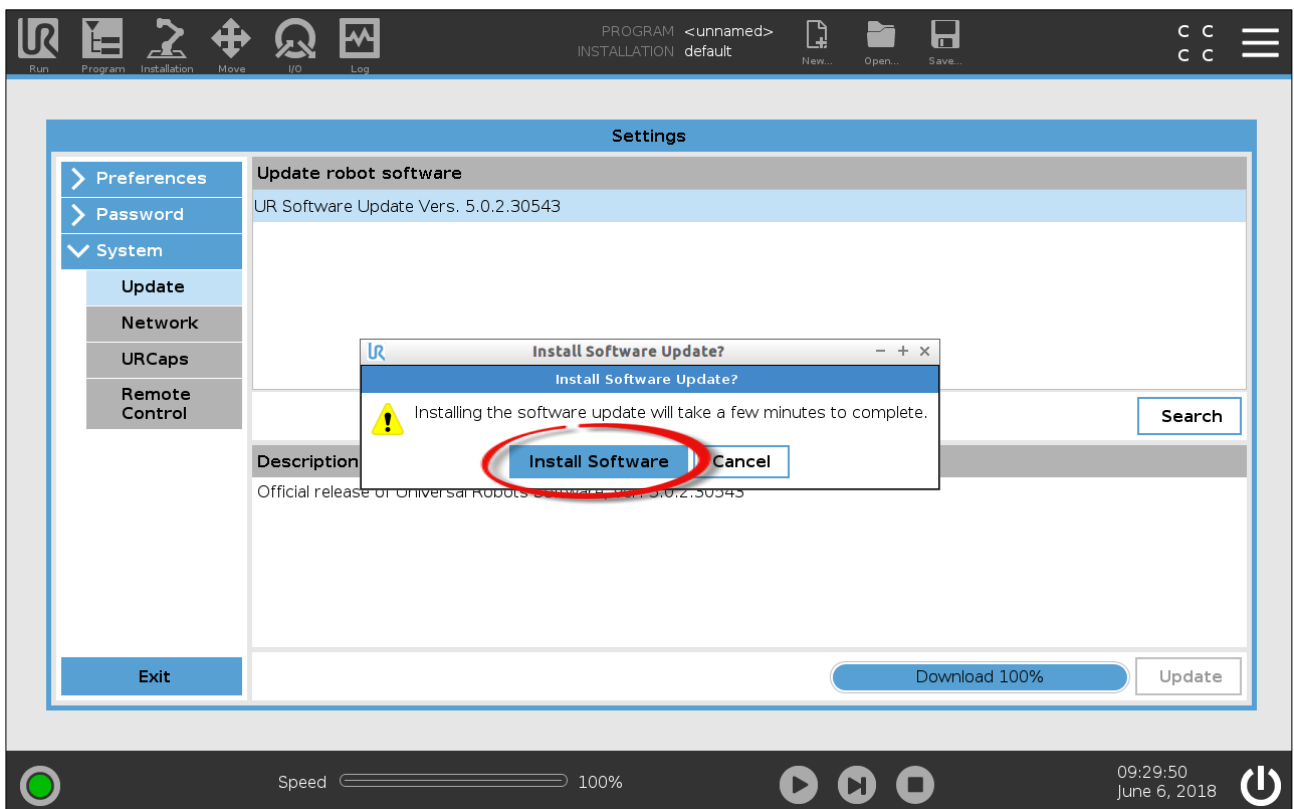
7. Press Update, then Search to locate software update on USB stick.



8. Select the desired software update and press Update.

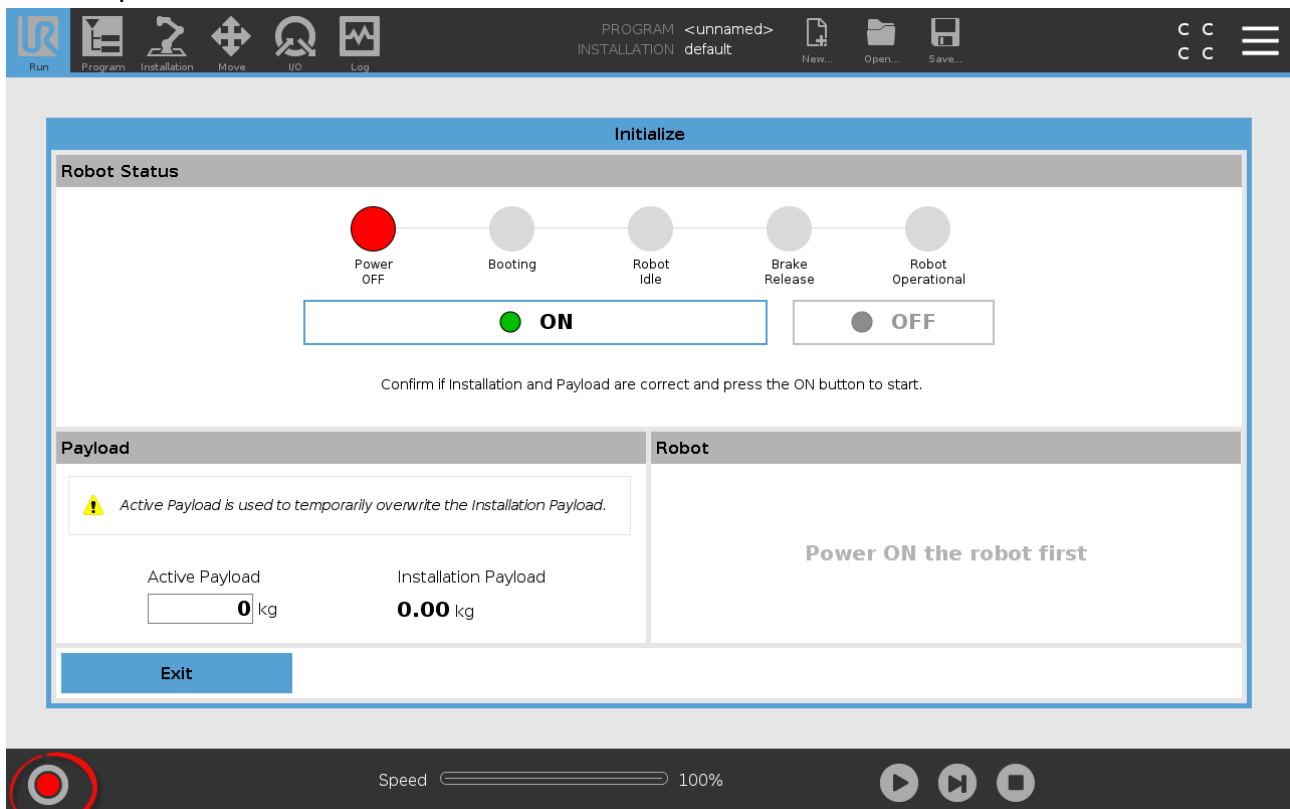


9. Press Install Software to update the software.



10. The robot powers off. Once the update is complete, the Control Box automatically reboots.

11. After the reboot is complete, the firmware for the control Box and Tech Pendant are updated.
12. When complete, enter the Initialize screen and press ON, If available joint firmware is updated.



13. Remove USB stick and the update is complete.

5.2 Using Magic Files

For easy backup, Universal Robots provides Magic Files to automatically copy data from Control Box to USB stick.

AVAILABLE FILE	FUNCTION
URmagic log file	Copies the entire log history file to USB stick
URmagic backup programs	Copies all programs and installation files to USB stick
URmagic configuration files	Copies all configuration files to USB stick
URmagic upload programs	Copies all programs and installation files from a USB-stick
URmagic screenshot	Generates a screenshot of GUI when USB stick is inserted

You can download Magic Files at: www.universal-robots.com/support

Using Magic Files.

1. Download and save Magic Files to the root folder on a USB stick. If more than one Magic File is on the USB stick, they run in sequence. Warnings appear for each file. Do not remove the USB stick until the last file has finished. Multiple folders are created and named with serial number as well as a sequence number (e.g., 201855xxxx_0, 201855xxxx_1).
2. Insert a USB stick into the USB connector located on the top right side of the Teach Pendant.
3. A red **! USB !** -sign appears on the screen. Do not remove the USB stick.
4. Wait for a green **← USB** -sign to appear. If more than one Magic File is on the USB stick, proceed to Step 3. NOTE: Large files (e.g., history log) may take up to 2 minutes to download.
5. After the last Magic File is completed the USB stick can be safely removed.

The Magic File creates a folder on the USB stick named with the serial number of the robot.

5.3 Backup of data



NOTICE

- When copying/moving files and folders, incorrect use might corrupt the file system.
- Contact your IT professional for assistance if you are not comfortable with this process.

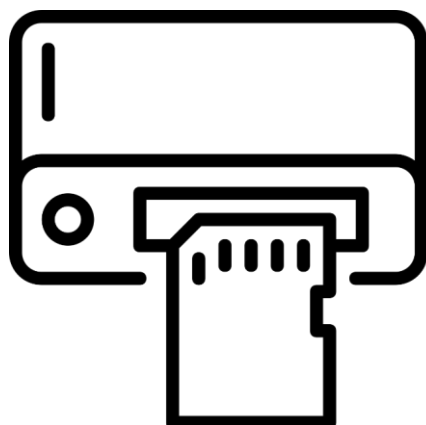
This section explains the process of moving required files during a robot backup.

From software 5.5 a backup/restore function is build into PolyScope. Please see User Manual.

5.3.1 Hardware Requirements

The following hardware is needed:

- SD Card (Universal Robots 4GB Industrial grade SD card)
- A standard SD card reader



5.3.2 Software Requirements

When using Windows operation system, to read a Linux partition a software file system driver is required; in this example we are using "Linux File Systems for Windows" by Paragon but other Windows Linux reader can be used as well (these are however not tested by Universal Robots).



NOTICE

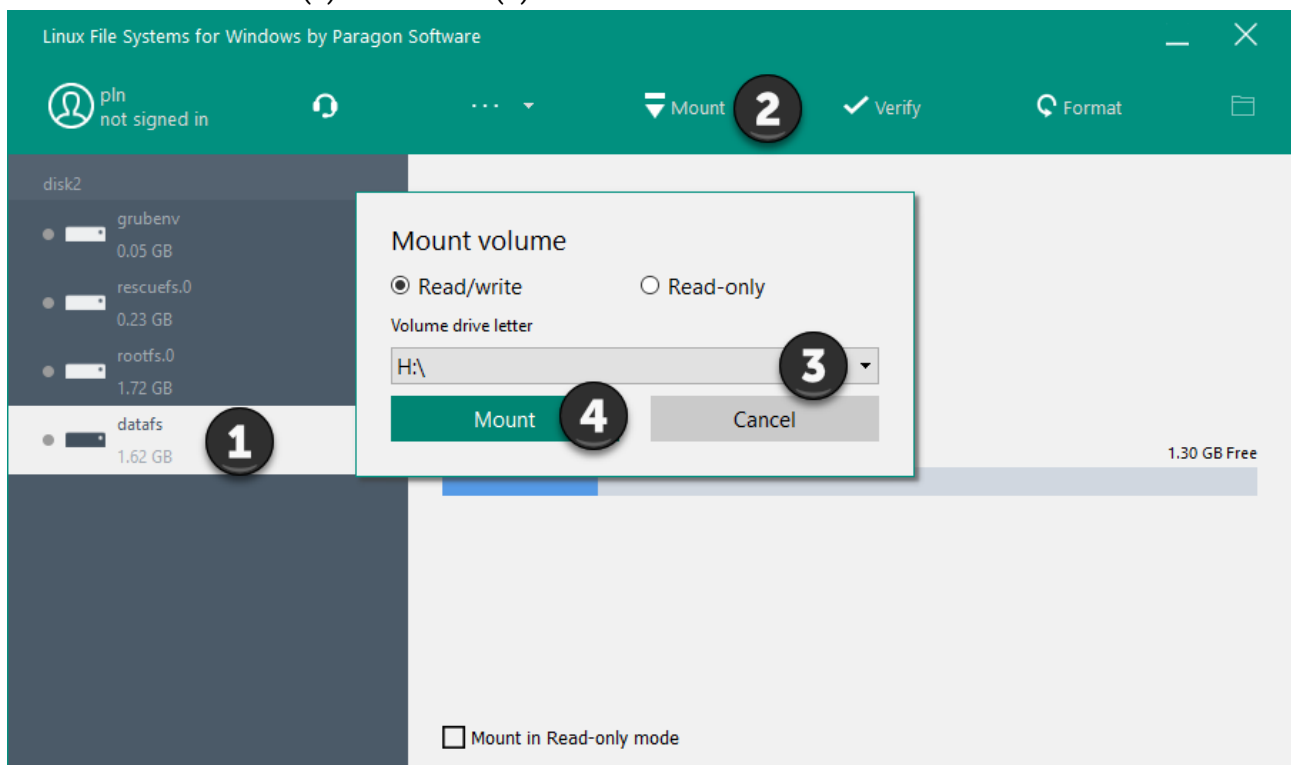
"Linux File Systems for Windows" by Paragon software is a third-party software. Universal Robot take no responsibility for this software.

5.3.3 How to Access Linux Partition from Windows

With the software from Paragon you can access all partitions on the SD-card.
The files needed are located on the partition called **datafs**

If the partition is not shown, it could be it is not mounted automatically.

To correct this, open the Paragon software, select the partition(1), select the Mount icon(2), select the Volume drive letter(3) then Mount(4).



5.3.4 Copy the data from SD card

Navigate to the SD card partition called **datafs** and copy the below listed files/folders.



NOTICE

Do not alter any files. You must only take backup copies as needed.

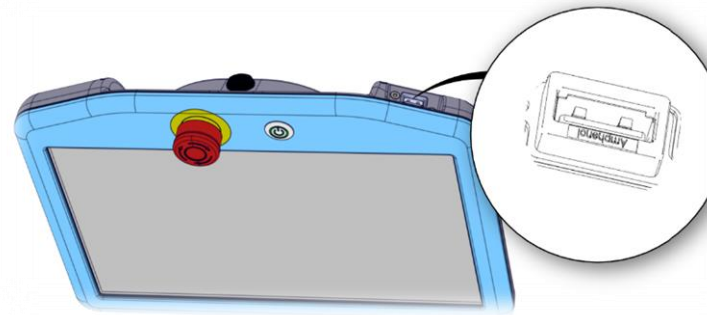
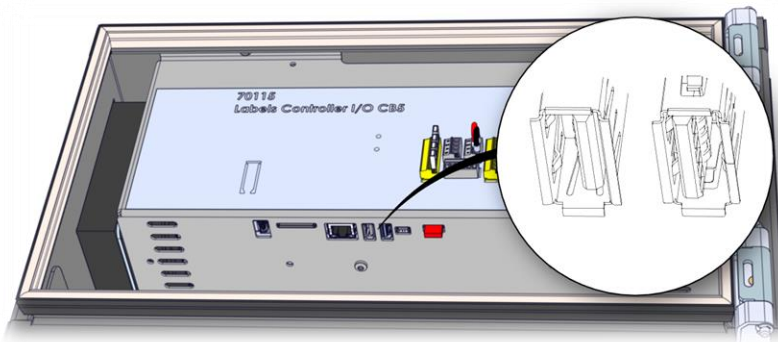
- programs/ [all of the following files: .urp, .txt, .script, .installation, .variable, .old]
- root/ur-serial
- root/log_history.txt
- root/log_history.bak [if existing]
- root/histogram.properties
- root/flightreports [Complete folder if existing]
- root/.urcontrol/calibration.conf
- root/.urcontrol/calibration.log
- root/.urcontrol/robot_calibration_summary.txt

6. Troubleshooting

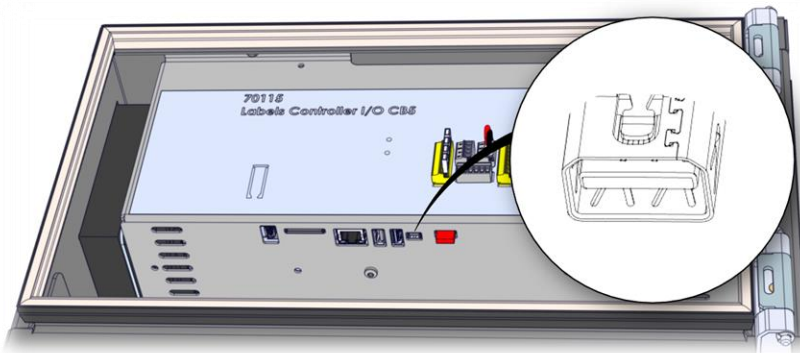
6.1 Adding external equipment for troubleshooting purpose

For troubleshooting it can be useful to add a mouse, keyboard or monitor.

Most USB mouse and keyboards are supported. Plug in the mouse or keyboard in one of the available USB ports. It may be required to restart the Control Box for it to work.



In the Control Box, a Mini Display Port is available. When a monitor is connected, it will display the same content as the Teach Pendant and can be connected at the same time as the Tech Pendant. It may be required to restart the Control Box for it to work.



6.2 Support Log Reader(SLR)

Open log files with the Universal Robots Support Log Reader(SLR).

Go to www.universal-robots.com/support to download the Support Log Reader

1. Filter;

Select what filter to activate



= Info filter



= Warning filter



= Error filter

2. Tool bar;

Load log files, export error codes, change language

3. Text search;

Type error code or text

4. Log start Info bar*;

Created every time the robot is powered on.

5. Highlighted text;

When tapped, gives more detailed Information.

6. PolyScope time

7. Reporter;

Where the info is reported from "safety, PolyScope, etc."

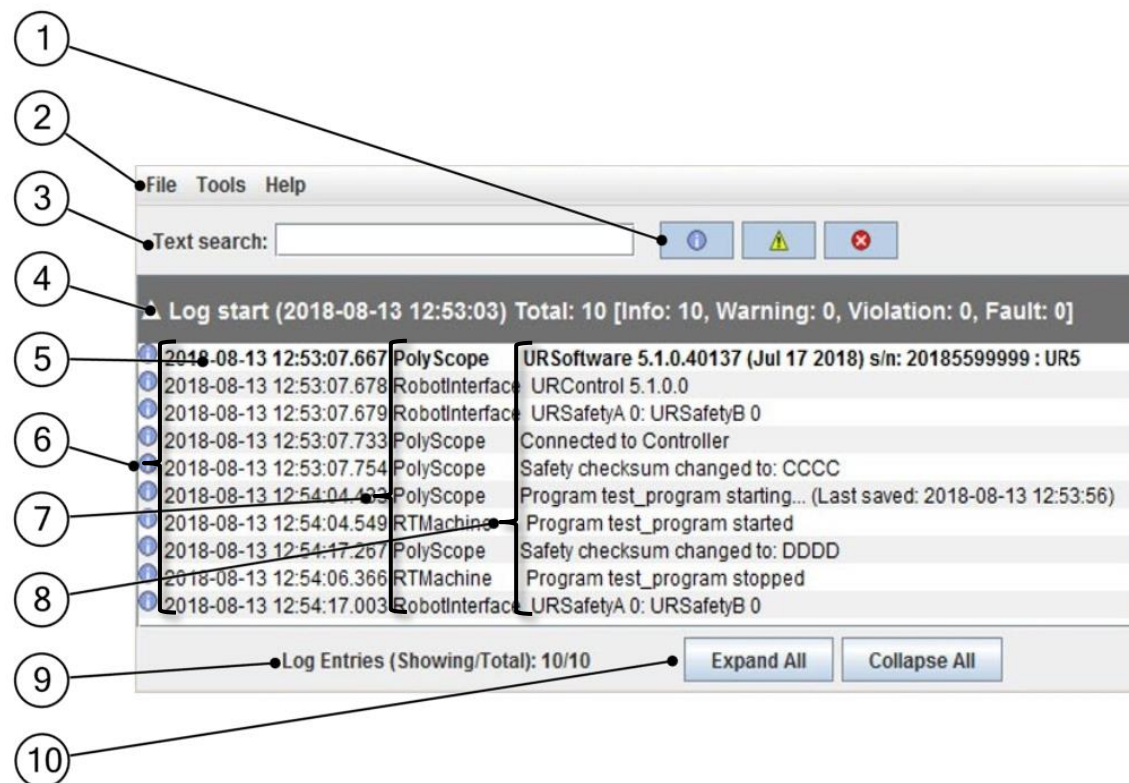
8. Message;

Text with the Cxxxx refers to the error codes.

9. Log Entries;

Shown and total

10. Expand or collapse all Info bars (point 4)



Note: After loading the log file every Log Start Info Bar (4) is collapsed and only the summary for each log start is visible.

6.3 Error codes

In the error codes, multiple terms are used for the same components and codes until C271 are shared between robot generations.

- On the Safety Control Board: Processor A = A uP = SafetySys1
- On the Safety Control Board: Processor B = B uP = SafetySys2
- PSU = Power Supply
- PC = Controller

Error code	Description	Explanation	Suggestion
C0A	No error		
C1A	Outbuffer overflow		
C1A1	Buffer of stored warnings overflowed		
C1A2	Outbuffer to RS485 overflowed (problem with Controller message)		
C2A	Inbuffer overflow		
C3A	Processor overloaded		
C4A	Communication issue		
C4A1	Communication with Controller lost.	Between Control Board and Motherboard	a) Check Ethernet cable between Control Board and Motherboard, check that a script or UR+ software is not overloading the communication between the Control Board and Motherboard. b) Do a Complete rebooting sequence. c) Update the software
C4A2	Communication with Safety Control Board A uP lost		a) Check TCP/IP connection between Motherboard and Control Board. b) Do a Complete rebooting sequence. c) Replace Safety Control Board
C4A3	Communication with Safety Control Board B uP lost		a) Check TCP/IP connection between Motherboard and Control Board. b) Do a Complete rebooting sequence. c) Replace Safety Control Board
C4A4	Communication with primary Teach Pendant uP lost		a) Check RS485-12V connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant

C4A5	Communication with secondary Teach Pendant uP lost		a) Check RS485-12V connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant
C4A6	Communication with primary EUROMAP67 uP lost		a) Check Euromap67 connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant
C4A7	Communication with secondary EUROMAP67 uP lost		a) Check Euromap67 connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant
C4A8	Primary EUROMAP67 uP present, but euromap67 is disabled	Incorrect safety configuration	a) Update the miscellaneous settings in the Safety Configuration. b) Do a Complete rebooting sequence
C4A9	Secondary EUROMAP67 uP present, but euromap67 is disabled	Incorrect safety configuration	a) Update the miscellaneous settings in the Safety Configuration. b) Do a Complete rebooting sequence
C4A10	Primary Teach Pendant present, but Teach Pendant safety is disabled	Incorrect safety configuration	a) Update the miscellaneous settings in the Safety Configuration. b) Do a Complete rebooting sequence
C4A11	Secondary Teach Pendant uP present, Teach Pendant safety is disabled	Incorrect safety configuration	a) Update the miscellaneous settings in the Safety Configuration. b) Do a Complete rebooting sequence
C4A12	Communication with joint 0 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A13	Communication with joint 1 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A14	Communication with joint 2 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A15	Communication with joint 3 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A16	Communication with joint 4 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A17	Communication with joint 5 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A18	Communication with tool lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence

C4A65	Lost package from Primary Teach Pendant	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A66	Lost package from Secondary Teach Pendant	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A67	Lost package from Primary Euromap67	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A68	Lost package from Secondary Euromap67	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A69	Lost package from Secondary Masterboard	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A70	Lost package from joint 0	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A71	Lost package from joint 1	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A72	Lost package from joint 2	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A73	Lost package from joint 3	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A74	Lost package from joint 4	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A75	Lost package from joint 5	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence

C4A76	Lost package from tool	Serial communication problem with one or more joints	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A77	Lost package from uPA to joints	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A78	Lost package from uPA to teach pendant	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A79	Lost package from uPA to uPB	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A80	Lost package from uPB	1 package lost	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A81	Packet counter disagreement in packet from Primary Screen	Safety processor 1 in Teach Pendant has a packet disagreement	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A82	Packet counter disagreement in packet from Secondary Screen	Safety processor 2 in Teach Pendant has a packet disagreement	If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A83	Packet counter disagreement in packet from Primary Euromap67		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A84	Packet counter disagreement in packet from Secondary Euromap67		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A85	Packet counter disagreement in packet from Safety Control Board B		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A86	Packet counter disagreement in packet from joint 0		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence

C4A87	Packet counter disagreement in packet from joint 1		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A88	Packet counter disagreement in packet from joint 2		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A89	Packet counter disagreement in packet from joint 3		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A90	Packet counter disagreement in packet from joint 4		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A91	Packet counter disagreement in packet from joint 5		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A92	Packet counter disagreement in packet from tool		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A93	Packet counter disagreement in packet from processor A to joints		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A94	Packet counter disagreement in packet from processor A to B		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A95	Packet counter disagreement in packet from processor A to Teach Pendant and EUROMAP		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A100	Communication lost due to Packet counter disagreements		If this happens often: a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C5A	Heavy processor load warning		
C10A	Controller communication issue		
C10A1	Lost packet from Controller		
C10A101	Controller packet received too early		

C10A102	Packet counter does not match		
C10A103	Controller is sending packets too often		
C11A	Bad CRC	Serial communication problem with joint	Check black 2-wire connectors and wires in joints
C12A	Unknown message error		
C14A	Debug message		
C14A1	{float}		
C14A2	{signed}		
C14A3	{unsigned}		
C17A	Communication error between Safety Control Board and Motherboard	a) Check Ethernet connection between circuit boards. b) Do a Complete rebooting sequence. c) Update the software	
C26A	Motor Encoder index drift detected	Joint mechanical problem	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C27A	Calibration data is invalid or does not exist, selftest is needed!		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C29A	Online Calibration data checksum failed		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C30A	Master received data from too many joints		
C31A	Caught wrong message (not from master)	Serial communication problem with joint	Check black 2-wire connectors and wires on joints
C32A	Flash write verify failed		
C33A	Calibration flash checksum failed		
C34A	Program flash checksum failed		Update Firmware
C34A0	Program flash checksum failed during bootloading		
C34A1	Program flash checksum failed at runtime		
C35A	Joint ID is undefined		
C36A	Illegal bootloader command		
C37A	Inbuffer parse error	Serial communication problem with joint	Check black 2-wire connectors and wires on joints
C38A1	Data-bus test failed		
C38A2	Address-bus stuck-high test failed		
C38A3	Address-bus stuck-low test failed		
C38A4	Address-bus shorted test failed		
C38A5	Memory-cell test failed		

C38A	Online RAM test failed		Check the log file for what item is reporting this error. Replace the reporting item
C39A	Logic and Temporal Monitoring Fault		
C39A1	Max current deviation failure		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A2	Max joint-encoder speed exceeded		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A3	Max motor-encoder speed exceeded		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A4	Illegal state change in joint detected		
C39A5	A timing issue occurred during startup.	Too fast state change in joint detected	Do a Complete rebooting sequence
C39A6	5V regulator voltage too low		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A7	5V regulator voltage too high		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A100	Watchpoint fault: ADC task timeout		
C39A101	Watchpoint fault: Motor-Control task timeout		
C39A102	Watchpoint fault: Motor-encoder task timeout		
C39A103	Watchpoint fault: Joint-encoder task timeout		
C39A104	Watchpoint fault: Communication task timeout		
C39A105	Watchpoint fault: RAM-test task timeout		
C39A106	Watchpoint fault: CalVal-test task timeout		
C39A107	Watchpoint fault: ROM-test task timeout		
C40A	AD-Converter hit high limit joint	EMC issue external or electronics internal	Check grounding and shielding for EMC problems
C41A	RC Oscillator Trim register hit high limit		
C42A	RC Oscillator Trim register hit low limit		
C43A	Change in invariant memory detected		
C43A1	Current sensor gain		
C44A	CRC check failure on primary bus	Serial communication problem with joint or secondary bus node	a) Check black 2-wire connectors and wires in joints. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, contact your local service provider for assistance.
C44A0	Base		
C44A1	Shoulder		

C44A2	Elbow		
C44A3	Wrist 1		
C44A4	Wrist 2		
C44A5	Wrist 3		
C44A6	Tool		
C44A80	CRC Check failure on primary bus.	Most likely an interference on the communication bus.	
C45A	AD-Converter error		
C46A	Loose gearbox or bad encoder mounting	Mechanical problem in gear related to encoder mounting	a) Do a Complete rebooting sequence b) If this happens more than two times in a row, replace joint
C47A	AD-Converter hit low limit	EMC issue external or electronics internal	Check grounding and shielding for EMC problems
C49A	RS485 receive warning		
C49A200	Secondary RS485 bus is down	Bus for: Teach Pendant, Processor A and Processor B on Control Board	Check TCP/IP-12V cable to Teach Pendant
C50A	Robot powerup issue	Electrical error control box	Remove all external connections to I/O-interface of Safety Control Board. Check for short circuit
C50A1	Voltage detected at 24V rail before startup		
C50A2	Voltage present at unpowered robot		
C50A5	Powersupply voltage too low		Check 48 V cable between power supply and Control Board
C50A6	Powersupply voltage too high		
C50A11	Voltage not detected at 24V rail after startup		
C50A15	Warning, waiting for SafetySYS2		
C50A16	The Teach Pendant does not respond	Loose wire or incorrect safety configuration	a) Check the Teach Pendant cable and connections. b) Check the settings in the miscellaneous tab in the Safety menu
C50A17	The Euromap67 interface does not respond	Loose wire or incorrect safety configuration	a) Check the Euromap67 cable and connections. b) Check the settings in the miscellaneous tab in the Safety menu
C50A18	Warning, waiting for SafetySYS1	SafetySYS1 = Processor A on Safety Control Board	
C50A19	Warning, Waiting for a valid 'euromap67 activated' status bit from secondary Safety Control Board"		
C50A20	5V, 3V3 or ADC error (5V too high)		
C50A21	5V, 3V3 or ADC error (5V too low)		
C50A22	Robot current sensor reading too high		
C50A23	Robot current sensor reading too low		
C50A24	48V not present (Check internal connection)		

C50A25	Robot voltage present at 48V PSU powereup		
C50A26	Voltage present on unpowered 48V power supply		
C50A27	12V, 3V3 or ADC error (12V too high)		
C50A28	12V, 3V3 or ADC error (12V too low)		
C50A29	Analog I/O error (-12V too high)		
C50A30	Analog I/O error (-12V too low)		
C50A31	The other safetySYS do not initialize		
C50A40	Wrong voltage from PSU1		
C50A41	Wrong voltage from PSU2		
C50A42	Voltage will not disappear from PSU		
C50A43	Warning, waiting for CB2 type answer from primary processor		
C50A50	Processor A 3.3V supply voltage out of bounds		
C50A51	Robot voltage below threshold		
C50A52	Robot voltage above threshold		
C50A53	58V generator deviation error		
C50A54	5V regulator too low		
C50A55	5V regulator too high		
C50A56	-4V generator too low		
C50A57	-4V generator too high		
C50A80	Last CPU reset caused by Low-Power-Reset		
C50A81	Last CPU reset caused by Window-Watchdog-Reset		
C50A82	Last CPU reset caused by Independent-Watchdog-Reset		
C50A83	Last CPU reset caused by Software-Reset	The Control Board was reset on explicit request.	
C50A84	Last CPU reset caused by External-Pin-Reset		
C50A85	Last CPU reset caused by Brown-Out-Reset		
C50A99	Wrong software on PCB		
C50A100	Cable not connected		Check cable and connections between robot and control box
C50A101	Short circuit in robot detected or wrong robot connected to control box		Check robot type. Look for short circuit in cable and in robot arm
C50A102	Voltage rising too slowly		

C50A103	Voltage failed to reach acceptable level		
C51A	CRC check failure on secondary bus		
C51A0	Processor B		
C51A1	Primary screen processor	CRC check failure on safety processor 1 in Teach Pendant	
C51A2	Secondary screen processor	CRC check failure on safety processor 2 in Teach Pendant	
C51A3	Primary E67		
C51A4	Secondary E67		
C53A	IO overcurrent detected	Control Board error	Remove all external connections to I/O-interface of Safety Control Board. Check for short circuit
C53A1	, max is 800mA		
C53A2	, max is 600mA		
C55A	Safety system error	Safety system malfunction	a) Check Motherboard, Control Board, Screenboard, Current distributor (Euromap, if installed). b) Check safety devices and cables/connections to these devices. c) Do a Complete rebooting sequence
C55A23	Safety relay error (minus connection)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A24	Safety relay error (plus connection)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A33	Safety relay error (a relay is stuck)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A34	Safety relay error (relays are not on)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A50	Voltage present at unpowered robot	Safety Control Board hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A51	Voltage will not disappear from robot	Safety Control Board hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A52	5V, 3V3 or ADC error (5V too low)	Safety Control Board hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board

C55A53	5V, 3V3 or ADC error (5V too high)	Safety Control Board hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A90	Bootloader error, robot voltage too low or current too high		
C55A91	Bootloader error, robot voltage too high		
C55A100	Safety violation		
C55A101	Safety Channel Error In Safety Control Board		
C55A102	Safety Channel Error In Screen		
C55A103	Safety Channel Error In Euromap67 Interface		
C55A109	Received fault message from Controller		
C55A110	Safety State is changing too often		
C55A111	On/Off State is changing too often		
C55A112	Robot current sensors readings differ		
C55A120	Robot current is too high while emergency stopped		
C55A121	Robot current is too high while safeguard stopped		
C56A	Overvoltage shutdown	Voltage exceeded 55V	a) Check Energy Eaters cable and connections. b) Check Energy. c) Replace Energy Eater
C57A	Brake release failure		a) Check Brake, solenoid. b) Check TCP configuration, payload and mounting settings
C57A1	Joint did not move or motor encoder is not functioning		
C57A2	Large movement detected during brake release		
C57A3	Robot was not able to brake release, see log for details		
C58A	Motor encoder not calibrated		
C59A	Overcurrent shutdown	Overcurrent in joint. Argument = Current in Amps	a) Check for short circuit. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, replace joint
C62A	Thermal issue		a) Check nothing is hindering free movement of the joints. b) Check TCP configuration, payload and mounting settings
C62A1	Joint temperature: High (80 C)		
C62A3	Warning: Static load too high		

C62A11	Joint temperature: Shut down (85 C)		
C62A13	Shutdown: Static load too high		
C63A	Motor test failed in step {unsigned}.		
C68A	SPI error	Joint: Absolut encoder on joint communication error	a) Check for short circuit. b) Do a Complete rebooting sequence. c) If this happens more than several times in a row, replace joint
C70A	Close to gearbox shear limit	Acceleration / deceleration to high. Mechanical problem in gear related to encoder mounting	a) Reduce acceleration in user program. b) Do a Complete rebooting sequence. c) If this happens more than several times in a row, replace joint
C71A	Startup check error		
C71A0	Hardware is size0, wrong firmware at the joint		Update firmware
C71A1	Hardware is size1, wrong firmware at the joint		Update firmware
C71A2	Hardware is size2, wrong firmware at the joint		Update firmware
C71A3	Hardware is size3, wrong firmware at the joint		Update firmware
C71A4	Hardware is size4, wrong firmware at the joint		Update firmware
C71A5	Invalid hardware revision		
C71A6	ADC calibration failed		
C71A7	Unknown error result	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A8	Motor short circuit to ground or H-bridge problems	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A9	Motor indication signal does not work	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A10	Phase 1 is unconnected or not working	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A11	Phase 2 is unconnected or not working	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A12	Phase 3 or multiple phases is unconnected or not working	The wire is (1) damaged or (2) has been disconnected from the PCB (not likely) or (3) defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A50	Current sensor test failed	Sensor reported wrong current when probed	a) Check joint for damaged or loose connections. b) Replace the joint
C71A51	Current sensor test failed	Sensor reported wrong current when probed	a) Check joint for damaged or loose connections. b) Replace the joint

C71A52	Current sensor test failed	Sensors reported different currents when probed	a) Check joint for damaged or loose connections. b) Replace the joint
C71A101	Wrong firmware on RLS encoder		
C72A	Power Supply Unit failure		
C72A1	0 PSUs are active	Power Supply was not able to deliver 48V	Check power connection between power supply and Control Board
C72A2	1 PSU active, but we expect 2 (UR10)	Power Supply was not able to deliver 48V or UR10 flash card in UR5 robot	Check power connection between power supply and Control Board and check that the flash card and robot match
C72A3	2 PSUs active, but we expect 1 (UR5)	UR5 flash card in UR10 robot	Check that the flash card and robot match
C73A	Brake test failed during selftest, check brakepin		
C74A	Joint encoder warning	Magnetic encoder error (absolute encoder). Argument = sum of C74 errors	
C74A1	Invalid decode: Readhead misalignment, ring damaged or external magnetic field present.		Check grounding and shielding for EMC problems
C74A2	Speed reading is not valid		
C74A4	System error=malfunction or inconsistent calibration detected		
C74A8	Supply voltage is out of range		
C74A16	Temperature is out of range		
C74A32	Signal lost =Misaligned readhead or damaged ring		
C74A64	Signal low =Too far from magnetic ring		
C74A128	Signal saturation =Too close to magnetic ring		
C75A	Joint encoder error	Magnetic encoder error (absolute encoder). Argument = sum of C75 errors	
C75A1	Invalid decode: Readhead misalignment, ring damaged or external magnetic field present.		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A2	Speed reading is not valid		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C75A4	System error=malfunction or inconsistent calibration detected		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C75A8	Supply voltage is out of range		
C75A16	Temperature is out of range		

C75A32	Signal lost =Misaligned readhead or damaged ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A64	Signal low =Too far from magnetic ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A128	Signal saturation =Too close to magnetic ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A200	Position from joint encoder does not change while motor is running		
C76A	Joint encoder communication CRC issue	Error between sensor and joint circuit	Check connections or very heavy electrical noise
C77A	Sudden position change detected on the joint-encoder	The position reading from the encoder was different than expected.	
C78A	Large sudden position change detected on the joint-encoder	The position reading from the encoder was severely different than expected, the latest measurement was discarded. The argument relates to the size of the position change.	
C85A200	Position from motor encoder does not change while motor is running		
C85A	Motor encoder error		
C100A	Robot changed mode	Status warning, general modus change	Check preceding errors in log history
C101A	Real Robot Connected		
C102A	Real Robot not connected - Simulating Robot		
C103A	Communication issue		
C103A1	Connection to Safety Control Board lost	PC did not receive 3 packets in a row	a) Check that the Ethernet cable between Motherboard and Control Board is connected. b) Do a Complete rebooting sequence
C103A2	Package lost from Safety Control Board		
C103A3	Ethernet connection initialization with Safety Control Board failed		
C104A	Error=Empty command sent to robot		
C111A	Something is pulling the robot		Check TCP configuration, payload and mounting settings
C115A	Unknown robot type	The robot type specified in the configuration is unknown	

C116A	Realtime part warning	Possible CPU-overload due to structure of user program	Restructure user program
C117A	Restart SCB failed	The Control Board couldn't be rebooted from the controller.	Do a Complete rebooting sequence
C150A	Protective Stop: Position close to joint limits		
C151A	Protective Stop: Tool orientation close to limits		
C152A	Protective Stop: Position close to safety plane limits		
C153A	Protective Stop: Position deviates from path		
C153A0	(base). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A1	(shoulder). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A2	(elbow). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A3	(wrist 1). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A4	(wrist 2). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A5	(wrist 3). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C154A	Protective Stop: Position in singularity	Robot cannot move linear near a singularity	Use MoveJ or change the motion
C155A	Protective Stop: Robot cannot maintain its position, check if payload is correct		
C156A	Protective Stop: Wrong payload or mounting detected, or something is pushing the robot when entering Freedrive mode	The robot may move unexpected due to wrong settings	Verify that the TCP configuration and mounting in the used installation is correct
C157A	Protective Stop: Collision detected by joint		

C157A0	(base). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A1	(shoulder). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A2	(elbow). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A3	(wrist 1). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A4	(wrist 2). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A5	(wrist 3). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C158A	Protective Stop: Collision detected by joint		
C158A0	(base). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A1	(shoulder). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A2	(elbow). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A3	(wrist 1). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A4	(wrist 2). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.

C158A5	(wrist 3). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A	Protective Stop: Position deviates from path		
C159A0	(base). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A1	(shoulder). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A2	(elbow). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A3	(wrist 1). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A4	(wrist 2). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A5	(wrist 3). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C160A	Protective stop: The robot was powered off last time due to a joint position disagreement		<p>a) Verify that the robot position in the 3D graphics matches the real robot, to ensure that the encoders function before releasing the brakes. Stand back and monitor the robot performing its first program cycle as expected.</p> <p>b) If the position is not correct, the robot must be repaired. In this case, click Power Off Robot.</p> <p>c) If the position is correct, please tick the check box below the 3D graphics and click Robot Position Verified</p>

C161A	Protective stop: Large movement of the robot detected while it was powered off. The joints were moved while it was powered off, or the encoders do not function		<p>a) Verify that the robot position in the 3D graphics matches the real robot, to ensure that the encoders function before releasing the brakes. Stand back and monitor the robot performing its first program cycle as expected.</p> <p>b) If the position is not correct, the robot must be repaired. In this case, click Power Off Robot.</p> <p>c) If the position is correct, please tick the check box below the 3D graphics and click Robot Position Verified</p>
C162A	The protective stop was likely caused by incorrectly specified payload mass and/or center of gravity.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correct.
C171A	Issue with blends		
C171A0	A MoveC-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A1	Blend radius too small in a MoveC		Increase blend in MoveC
C171A3	A ServoC-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A4	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A5	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A6	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A7	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A9	A MoveP-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A10	Blend radius too small error in a MoveP		
C171A11	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A12	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A13	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.

C171A14	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C172A	Illegal control mode		
C184A	Joint self test not received by controller		
C185A1	START_NORMAL_OPERATION is not allowed on selftest firmware		
C185A2	GOTO_BACKDRIVE_COMMAND is not allowed on selftest firmware		
C186A1	joint_mode == JOINT_RUNNING_MODE is not allowed on selftest firmware		
C187A	Temperature sensor test failed		
C187A1	Starting temperature were lower than expected		
C187A2	Starting temperature were higher than expected		
C187A3	Temperature increased less than expected during warm up		
C187A4	Temperature increased more than expected during warm up		
C190A	Joint failed during selftest		
C190A0	Motor encoder index mark not found		
C190A1	Phases not mounted correctly		
C190A2	Motor encoder counting the wrong way		
C190A3	Joint encoder counting the wrong way		
C190A4	No movement detected while trying to move the motor		
C190A11	Temperature alignment did not warm up to 45 degrees C within 30 minutes		
C190A12	Temperature alignment did not cool down to 45 degrees C within 60 minutes		
C191A	Safety system violation		
C191A1	Joint position limit violated		
C191A2	Joint speed limit violated		
C191A3	TCP speed limit violated		
C191A4	TCP position limit violated		

C191A5	TCP orientation limit violated		
C191A6	Power limit violated		
C191A7	Joint torque window violated		
C191A8	Joint torque window too large		
C191A9	Reduced mode output violation		
C191A10	Safeguard stop output violation		
C191A11	Emergency stop output violation		
C191A12	Momentum limit violation		
C191A13	Robot moving output violation		
C191A14	Robot is not braking in stop mode	During the braking process, the safety system monitors if the robot brakes as expected. If this is not the case, this error is generated	Check TCP configuration, payload and mounting settings
C191A15	Robot is moving in stop mode	When the robot is stopped due to a safety violation or a safeguard stop, the safety system generates this error, if the robot moves while in this mode	a) Check if the robot is physically pushed while safeguard stopped. b) Check TCP configuration, payload and mounting settings
C191A16	Robot did not stop in time		
C191A17	Received a null vector for TCP orientation		
C191A18	Robot not stopping output violation		
C191A19	Invalid safety IO configuration		
C191A20	Configuration information or limit sets not received		
C191A21	The other safety processor detected a violation		
C191A22	Received unknown command from Controller		
C191A23	Invalid setup of safety limits		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A24	Reduced Mode Output set, while it should not be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A25	Reduced Mode Output not set, while it should be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A26	Not Reduced Mode Output set, while it should not be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A27	Not Reduced Mode Output not set, while it should be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence

C191A28	Robot Emergency Stop exceeded maximum stop time	Too high payload	a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A29	System Emergency Stop exceeded maximum stop time	Too high payload	a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A30	Safeguard Stop exceeded maximum stop time	Too high payload	a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A31	Operation mode switch is present while the three position switch is missing		
C191A32	Joint speed limit violated - Base		
C191A33	Joint speed limit violated - Shoulder		
C191A34	Joint speed limit violated - Elbow		
C191A35	Joint speed limit violated - Wrist 1		
C191A36	Joint speed limit violated - Wrist 2		
C191A37	Joint speed limit violated - Wrist 3		
C192A	Safety system fault		
C192A1	Robot still powered in emergency stop	When the emergency stop is active, the robot arm powers off. The controller is responsible for sending the power off command. This error is generated if the safety system detects that the robot arm still has power	
C192A2	Robot emergency stop disagreement	E-stop in teach pendant or in robot E-stop circuit problem	Check safety devices and cables/connections to these devices.
C192A3	System emergency stop disagreement	System E-stop circuit problem	Check safety devices and cables/connections to these devices.
C192A4	Safeguard stop disagreement	Safeguard circuit problem	Check safety devices and cables/connections to these devices.
C192A5	Euromap safeguard stop disagreement	Euromap circuit problem	Check cables from Control Board to Euromap and to external machine
C192A6	Joint position disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A7	Joint speed disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A8	Joint torque disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A9	TCP speed disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected

C192A10	TCP position disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A11	TCP orientation disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A12	Power disagreement	Power calculation: uP-A and uP-B disagreement	
C192A13	Joint torque window disagreement		
C192A14	Reduced mode input disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A15	Reduced mode output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A16	Safety output failed	The safety output did not reach the correct value in the expected time	Check for short circuit on I/O or for wrong connection to output.
C192A17	Safeguard stop output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A18	The other safety processor is in fault		
C192A19	Emergency stop output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A20	SPI output error detected	Power supply for the I/O is not detected	Check if the connection to the internal power supply is correct. If an external power supply is being used, check if it is powered on and at the correct voltage.
C192A21	Momentum disagreement		
C192A22	Robot moving output disagreement		Check safety devices and cables/connections to these devices
C192A23	Wrong processor ID		
C192A24	Wrong processor revision		
C192A25	Potential brownout detected	Voltage drop on Control Board or defect Safety Control Board	
C192A26	Emergency stop output disagreement		Check safety devices and cables/connections to these devices
C192A27	Safeguard stop output disagreement		Check safety devices and cables/connections to these devices
C192A28	Robot not stopping output disagreement		Check safety devices and cables/connections to these devices
C192A29	Safeguard reset input disagreement		Check safety devices and cables/connections to these devices
C192A30	Safety processor booted up in fault mode		
C192A31	Reduced Mode Output disagreement		Check safety devices and cables/connections to these devices
C192A32	Not Reduced Mode Output disagreement		Check safety devices and cables/connections to these devices

C192A33	A timing issue occurred during startup. Please restart to proceed	Checksum disagreement between safety processors uA and uB	
C192A34	User safety config checksum disagreement between uA and GUI		
C192A35	Robot config checksum disagreement between uA and GUI		
C192A36	Online RAM test failed		
C192A37	Not all safety related functionalities are running		
C192A38	Package too short for CRC calculation		
C192A39	Three position switch input disagreement		
C192A40	Operation mode switch input disagreement		
C193A	One of the nodes is in fault mode		
C193A0	Base Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A1	Shoulder Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A2	Elbow Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A3	Wrist 1 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A4	Wrist 2 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A5	Wrist 3 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A6	Tool		a) See previous error. b) Do a Complete rebooting sequence
C193A7	Screen 1	Control Board has detected an error on Safety processor 1 in Teach pendant	a) See previous error. b) Do a Complete rebooting sequence
C193A8	Screen 2	Control Board has detected an error on Safety processor 2 in Teach pendant	a) See previous error. b) Do a Complete rebooting sequence

C193A9	Euomap 1		a) See previous error. b) Do a Complete rebooting sequence
C193A10	Euomap 2		a) See previous error. b) Do a Complete rebooting sequence
C194A	One of the nodes is not booted or not present		
C194A0	Base Joint		
C194A1	Shoulder Joint		
C194A2	Elbow Joint		
C194A3	Wrist 1 Joint		
C194A4	Wrist 2 Joint		
C194A5	Wrist 3 Joint		
C194A6	Tool		
C194A7	Screen 1	Control Board has detected an error on Safety processor 1 in Teach pendant	
C194A8	Screen 2	Control Board has detected an error on Safety processor 2 in Teach pendant	
C194A9	Euomap 1		
C194A10	Euomap 2		
C194A128	Base not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A129	Shoulder not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A130	Elbow not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A131	Wrist 1 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A132	Wrist 2 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A133	Wrist 3 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A134	Tool not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C195A	Conveyor speed too high	Conveyor speed higher than robot can run	Make sure that conveyor tracking is set up correctly
C195A1	for joint speed safety limit		

C195A2	for TCP speed safety limit		
C195A3	for momentum safety limit		
C196A	MoveP speed too high	Too high speed in relation to blend radius	Reduce speed or increase blend radius in user program
C197A	Blend overlap warning		
C200A	Safety Control Board hardware error		
C200A1	Hardware ID is wrong	Safety Control Board: uP-A has detected an error: Wrong Safety Control Board	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A2	MCU type is wrong	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A3	Part ID is wrong	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A4	RAM test failed	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A5	Register test failed	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A6	pRom Crc test failed	Safety Control Board: uP-A has detected an error: firmware error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A7	Watchdog reset the processor	Safety Control Board: uP-A has detected an error	
C200A8	OVG signal test not passed	Safety Control Board: uP-A has detected an error: over voltage generator	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A9	3V3A power good pin is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A10	3V3B power good pin is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board

C200A11	5V power good is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A12	3V3 voltage too low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A13	3v3 voltage too high	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A14	48V input is too low		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributor, energy eater and Control Board for issues
C200A15	48V input is too high		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributor, energy eater and Control Board for issues
C200A16	24V IO short circuited	Too high current	a) Do a Complete rebooting sequence. b) Disconnect external I/O connections and check external power supply if connected
C200A17	PC current is too high	Motherboard takes too high current	a) Do a Complete rebooting sequence. b) Check cable between Control Board and Motherboard and check all connections to Motherboard. Also check for short circuit
C200A18	Robot voltage is too low		a) Do a Complete rebooting sequence. b) Check for short circuit in robot arm. c) Check 48 V Power supply, current distributor, energy eater and Control Board for issues
C200A19	Robot voltage is too high		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributor, energy eater and Control Board for issues
C200A20	24V IO voltage is too low		a) Do a Complete rebooting sequence. b) Disconnect I/O, check external power supply if connected and check Control Board for issues
C200A21	12V voltage is too high		a) Do a Complete rebooting sequence. b) Check 12 V Power supply, cables and Control Board for issues

C200A22	12V voltage is too low		a) Do a Complete rebooting sequence. b) Check 12 V Power supply, cables and Control Board for issues
C200A23	It took too long to stabilize 24V		a) Do a Complete rebooting sequence. b) Check 24 V and Control Board for issues
C200A24	It took too long to stabilize 24V IO		a) Do a Complete rebooting sequence. b) Check 24 V and Control Board for issues
C200A25	24V voltage is too high		a) Check external 24 V and Control Board for issues. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, replace Safety Control Board.
C200A26	24V IO voltage is too high		a) Disconnect I/O's. b) Do a Complete rebooting sequence. c) Check external 24 V and Control Board for issues
C201A	Setup of Safety Control Board failed		
C201A0	Setup of Safety Control Board failed	No data was received from the Control Board at initialization or invalid safety parameters have been received	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C201A1	SCB uA is not responding	No data or invalid data was received from the Control Board uA at initialization	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C201A2	SCB uB is not responding	No data or invalid data was received from the Control Board uB at initialization	Do a Complete rebooting sequence.
C201A3	SCB is not responding	No data or invalid was received from Control Board when requested for configuration parameters	Do a Complete rebooting sequence.
C202A	SCE configuration was illegal, after applying tolerances		
C203A	PolyScope detected a mismatch between the shown and (to be) applied safety parameters	PolyScope continuously verifies that the shown safety parameters are equal to the running parameters	a) Check that the software version is the same or newer than the firmware on the Safety Control Board. b) Reload the installation. c) Do a Complete rebooting sequence
C204A	Protective Stop: Path sanity check failed		
C204A1	Sudden change in target position		

C204A2	Inconsistency between target position and speed	Controller is detecting that position in current cycle has changed much more than it should based on expected joint speed.	a) Either an incorrect payload is mounted, or an external force is pushing the robot. b) Check TCP configuration, payload and mounting settings.
C204A3	Sudden stop	The program contains motions that are not ramped correctly down	To abort a motion, use \stopj\" or \"stopl\" script commands to generate a smooth deceleration before using \"wait\". Avoid aborting motions between waypoints with blend
C204A4	Robot has not stopped in the allowed reaction and braking time		
C204A5	Robot program resulted in invalid setpoint		
C204A6	Blending failed and resulted in an invalid setpoint		Try changing the blend radius or contact technical support
C204A7	Robot approaching singularity - Acceleration threshold failed		
C205A	Target speed does not match target position		
C205A0	Inconsistency between target position and speed		
C206A-1	Sanity check failed		
C206A0	Target joint speed does not match target joint position change - Base		
C206A1	Target joint speed does not match target joint position change - Shoulder		
C206A2	Target joint speed does not match target joint position change - Elbow		
C206A3	Target joint speed does not match target joint position change - Wrist 1		
C206A4	Target joint speed does not match target joint position change - Wrist 2		
C206A5	Target joint speed does not match target joint position change - Wrist 3		
C207A	Fieldbus input disconnected		Check fieldbus connections (RTDE, ModBus, EtherNet/IP and Profinet) or disable the fieldbus in the installation. Check RTDE watchdog feature. Check if a URCap is using this feature.
C208A	Debug Assertion failed	An assert was executed. Notice: The functionality is exclusively used for testing purposes.	

C209A	A protective stop was triggered (for test purposes only)	A protective stop was triggered. Notice: The functionality is exclusively used for testing purposes.	
C210A	Socket is read-only when the robot is in local (Teach pendant) control		Set the robot in remote control in PolyScope to enable receiving scripts in the controller
C211A	Operational mode changed		
C211A0	Disabled		
C211A1	Automatic		
C211A2	Manual		
C212A	Name conflict in loaded program		
C212A1	{unsigned} name conflict(s) occurred between feature names and program variables	Some feature names and program variables share the same name, which may cause confusion.	Rename the program variables.
C213A	No Kinematic Calibration found (calibration.conf file is either corrupt or missing)	Calibration.conf file is either corrupt or missing	A new kinematics calibration may be needed if the robot needs to improve its kinematics, otherwise, ignore this message.
C214A	Kinematic Calibration for the robot does not match the joint(s)	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A1	The Kinematic Calibration checksum does not match the Base checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A2	The Kinematic Calibration checksum does not match the Shoulder checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A3	The Kinematic Calibration checksum does not match the Elbow checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A4	The Kinematic Calibration checksum does not match Wrist 1 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A5	The Kinematic Calibration checksum does not match for Wrist 2 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A6	The Kinematic Calibration checksum does not match for Wrist 3 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C215A	Kinematic Calibration does not match the robot	The calibration checksum stored in the calibration.conf does not match the values from the joints	Check if the serial number of the robot arm matches the Control Box

C216A	The offset of the joint has changed		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A1	Base		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A2	Shoulder		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A3	Elbow		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A4	Wrist 1		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A5	Wrist 2		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A6	Wrist 3		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C259A	Filesystem related issue		
C259A0	Critical error	A critical error occurred in the filesystem	a) Do a Complete rebooting sequence b) Reimage SD card c) Contact your local Universal Robots service provider for assistance.
C260A	Brake Release		
C260A0	Critical error	A critical error occurred during Brake Release	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) For further assistance, contact your local Universal Robots service provider.
C261A	Temperature Sensor		
C261A0	Critical error	A critical error occurred in the temperature sensor	a) Do a Complete rebooting sequence b) Contact your local Universal Robots service provider for assistance.
C261A4	Temperature is too high (degrees Celsius)	Ambient temperature is too high or robot is overloaded	a) Cool down the robot's environment and make sure the robot is operating within recommended limits. b) Do a Complete rebooting sequence
C261A5	Temperature is too low (degrees Celsius)	Ambient temperature is too low	a) Make sure the robot is operating within recommended limits. a) Do a Complete rebooting sequence
C262A	Communication		
C262A0	Critical error	A critical error occurred in the communication framework	a) Do a Complete rebooting sequence b) Check for ESD noise c) Update software d) Contact your local Universal Robots service provider for assistance.
C263A	Motor Encoder		

C263A0	Critical error	A critical error occurred in the Motor Encoder.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C263A21	Validation of the detected Index Mark failed	The absolute Motor Encoder position cannot be validated because the Motor position calculated by the Joint Encoder is invalid.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C264A	Task Manager		
C264A0	Critical error	A critical error occurred in the task manager	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C265A	Joint Encoder		
C265A0	Critical error	A critical error occurred in the Joint Encoder	a) Do a Complete rebooting sequence b) Check for ESD noise c) Update software d) Contact your local Universal Robots service provider for assistance.
C265A6	Not present. Status: {hex}	The Joint Encoder is not responding to commands	a) Do a Complete rebooting sequence b) Check for ESD noise c) Update software d) Contact your local Universal Robots service provider for assistance.
C266A	Self-test		
C266A0	Critical error	A critical error occurred in the Joint Self-test	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C267A1	Bootloader error		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C267A0	Critical error	A critical error occurred during Firmware upgrade.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C267A11	Hardware configuration issue	Hardware configuration mismatch	Contact your local Universal Robots service provider for assistance.
C269A	Transceiver		
C269A70	Flash device is not supported, JEDEC data for device is: {hex}	The flash device's JEDEC ID does not match a supported flash device	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C271	Low-level runtime thread	Process running behind	a) Check that the program and client interface is not taking unnecessary resources.
C272A	Missing joint calibration		

C272A0	Critical error - the calibration is missing	Joint calibration could not be loaded	Contact your local Universal Robots service provider for assistance.
C273A	Cross monitoring		
C273A0	Critical error	A critical disagreement error occurred in the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A5	Disagreement on Safety Control Board State	A critical disagreement occurred within the safety system.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A6	Disagreement on Robot State	A critical disagreement occurred within the safety system.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A7	Disagreement on Safety State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A8	Disagreement on position	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A9	Disagreement on velocity	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A10	Disagreement on current	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A11	Disagreement on temperature	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A12	Disagreement on Teach Pendant State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A13	Disagreement on Teach Pendant Emergency Stop	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A14	One processor entered Fault State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A15	One processor entered Violation State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A16	Joint State disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A17	Joint Constant Data CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A18	Joint target current disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A19	Torque Window disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A20	Torque Error disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A21	Target Velocity disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A22	Target Acceleration disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A23	Recovery Mode CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A24	Robot Configuration CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A25	User Configuration CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A26	Maximum stopping time disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A27	Stopping Time Torque Overload disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A28	Disagreement error on joint {unsigned}	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A29	Tool speed disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A30	Safety Mode Limit disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A31	Hand Protection Distance disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A32	Elbow Sphere speed disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A33	Momentum disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A34	Power disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A35	Elbow position disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A36	Workpiece Rotation disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A37	Disagreement on Workpiece Position	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A38	Disagreement on motor parameter (R_pp)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A39	Disagreement on motor parameter (L_pp)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A40	Disagreement on motor parameter (Kb)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A41	Disagreement on motor parameter (Kt)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A42	Disagreement on motor parameter (T)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C276A	Uart between microprocessor		
C276A0	Critical error	A critical error occurred in the UART driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C278A	Servo in Joint A processor		

C278A0	Critical error	A critical error occurred in the servo module	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C279A	Flash in joint		
C279A0	Critical error	A critical error occurred in the flash driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C280A	Real-time error		
C280A0	Critical error	A critical real-time error occurred	a) Do a Complete rebooting sequence b) Update software c) Check communication between joints d) Contact your local Universal Robots service provider for assistance.
C281A	Robot State Machine		
C281A0	Critical error	A critical State Machine error occurred	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A3	{unsigned} joint entered the Fault State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A4	{unsigned} joint entered the Violation State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A7	Teach Pendant entered the Fault State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A8	Teach Pendant entered the Violation State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A9	{unsigned} joint moved too far before robot entered RUNNING State	A Joint moved more than the permissible range during the Brake Release procedure.	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.
C283A	Safety system		
C283A0	Critical error	A critical error occurred in the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A1	Robot is not braking when in Stop Mode		
C283A2	Robot is moving when in Stop Mode		

C283A3	Power not removed from the motors while in Emergency Stop		
C283A4	Failed to power on the Robot arm		
C283A5	Invalid pin-configuration received: {hex}		
C283A6	Trying to reassign pin configuration with configuration {hex}		
C283A7	{unsigned} joint exceeded the velocity limit		
C283A8	The System Emergency Stop Output is not active	Failed to activate the System Emergency Stop Output. The output is active when voltage is low	a) Make sure output is not short circuited to a power supply
C283A9	System Emergency Stop Output disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A10	Robot Emergency Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A11	System Emergency Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A12	Safeguard Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A13	Safeguard Reset Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A14	Operation Mode input disagreement within the safety system.	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A15	Three-Positional Enabling Device Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A17	Lost {unsigned} Teach Pendant safety packages in a row		a) Check that the teach pendant is proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.
C283A18	Lost too many Joint safety packages in a row. Diagnostic data: {unsigned}		a) Check that the joints are proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.

C283A22	Teach Pendant is connected while it is disabled in robot configuration	If the Teach Pendant is enabled, it is connected. If it is disabled, it is not connected.	Disconnect the Teach Pendant or enable it in the configuration.
C283A26	Force limitation: exceeded torque window by: {float}		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Contact your local Universal Robots service provider for assistance.
C283A27	Mismatch on Robot Configuration CRC between the safety system and PolyScope		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A28	Mismatch on User Configuration CRC between the safety system and PolyScope		a) Do a Complete rebooting sequence b) Make new .installation c) Update software d) Contact your local Universal Robots service provider for assistance.
C283A34	Error while trying to apply safety configuration		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A35	Reduced Mode Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A36	Not Reduced Mode Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A37	Robot Moving Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A38	Robot Not Stopping Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A40	Reduced Mode Input disagreement within the safety systems	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are correctly connected. b) Contact your local Universal Robots service provider for assistance.
C283A41	TCP Velocity violates limits of maximum stopping time		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.



C283A42	TCP Velocity violates limits of maximum stopping distance		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A43	{unsigned} joint moved too quickly toward a Joint position limit		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A44	The tool moved too fast towards an orientation limit		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A45	The Elbow moved too fast towards a safety plane		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A46	The tool moved too fast towards a safety plane		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A47	{unsigned} joint position limit exceeded		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A48	Tool position limit exceeded		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.

C283A49	Tool orientation limit exceeded		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A50	Elbow position limit exceeded		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A51	Tool moved with a speed of {float} mm/s, which exceeds the speed limit		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A52	Elbow moved with a speed of {float} mm/s, which exceeds the speed limit		<ul style="list-style-type: none"> a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A53	Maximum Tool Center Point Speed in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode limit.
C283A54	Maximum Elbow Speed in Reduced Mode is invalid		Ensure the Reduced Mode limit is less than or equal to the Normal Mode Limit.
C283A55	Maximum Joint Speed of joint {unsigned} in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A56	Maximum Momentum in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A57	Maximum stopping time in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A58	Maximum stopping distance in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A59	Reduced Mode Output is not active	Failed to activate the Reduced Mode Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply

C283A60	Reduced Mode Output is not inactive	Failed to deactivate the Reduced Mode Output. The output is inactive when voltage is high	Make sure output is not short circuited to ground
C283A61	Not Reduced Mode Output is not active	Failed to activate the Not Reduced Mode Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply
C283A62	Not Reduced Mode Output is not inactive	Failed to deactivate the Not Reduced Mode Output. The output is inactive when voltage is high	Make sure output is not short circuited to ground
C283A63	Robot is moving while Robot Moving Output is not active	Failed to activate the Robot Moving Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply
C283A64	Tool Direction Vector Length for Normal Mode is {float}, not 1.0		Reconfigure Tool orientation
C283A65	Tool Direction Vector Length for Reduced Mode is {float}, not 1.0		Reconfigure Tool orientation
C283A66	Robot Momentum reached {float} kg * m/s, which exceeds the Momentum limit		
C283A67	Robot Power reached {float} W, which exceeds the Power limit		
C283A68	Error caused by the {unsigned} Joint	A critical safety error	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A72	The motor configuration sent by the Control Box is invalid	The motor configuration sent is unusable with this firmware revision.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C285A	Joint Keep-Alive System		
C285A0	Critical error	A critical error occurred in the Joint Keep-Alive System	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C285A10	Lost {unsigned} Keep-Alive System message(s) in a row from Safety Control Board-uPA	An invalid amount of Keep-Alive System messages have been lost from the Control Board Processor A	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C285A11	Lost {unsigned} Keep-Alive System message(s) in a row from Safety Control Board-uPB	A invalid amount of Keep-Alive messages have been lost from the Control Board Processor B	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C287A	Saved files in tool		
C287A0	Critical error	A critical error occurred during file loading/saving	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C289A	Tool Connector		
C289A1	Short circuit detected on Digital Output: {unsigned} high side	Tool Digital Output pin has been turned off due to either a short-circuit or an overload was detected.	Check connections to make sure Tool Digital Output currents are within specified limits.
C289A2	Short circuit detected on Digital Output: {unsigned} low side	Tool Digital Output pin has been turned off due to either a short-circuit or an overload was detected.	Check connections to make sure Tool Digital Output currents are within specified limits.
C289A4	10 second Average tool IO Current of {float} A is outside of the allowed range.	The average current sum of the Tool Connector Power and Digital Output pins is outside of the allowed range.	Check connections to make sure tool Digital Output currents are within specified limits.
C289A5	Unable to remove tool Digital Output fault.	Unable to remove the overload on tool Digital Output, therefore the robot powered down.	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A6	Current of {float} A on the POWER pin is outside of the allowed range.	Too high current on tool connector power pin	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A7	Current of {float} A on the Digital Output pins is outside of the allowed range.	Too high current on tool connector Digital Output pins.	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A8	Current of {float} A on the ground pin is outside of the allowed range.	Too high current on tool ground pin	Check connections to make sure the Tool Digital Output currents are within specified limits.
C292A	Online RAM test		
C292A0	Critical error	A critical error occurred during RAM test	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C294A	ADC	Analog to Digital converter	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C294A0	Critical error	A critical error occurred in the ADC driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C295A	PCB	Wrong PCB type. Likely a hardware error.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C295A0	Wrong PCB type ({hex})	The printed circuit board is defective	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C296A	Start up check		
C296A0	Critical error	A critical error occurred during startup	a) Check 10A fuse b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.

C297A	Joint validation	Validation during power up.	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.
C297A0	Critical error	A critical error occurred during Joint validation	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.
C297A11	The Robot arm does not match the Control Box	One or more joints do not match stored Robot Configuration	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.
C298A	Hand protection		
C298A0	Tool is too close to the lower arm: {float_2_4} meter.	The tool is too close to the lower Robot arm	<ul style="list-style-type: none"> a) Check wrist position. b) Verify mounting c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C299A	Tool communication		
C299A0	Communication error detected	A problem with the Tool communication was detected.	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C299A3	RX framing error	Framing error detected on received data	<ul style="list-style-type: none"> a) Check external equipment connection b) Verify the communication configuration matches the hardware. c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C299A4	RX Parity error	Parity error detected on received data	<ul style="list-style-type: none"> a) Check external equipment connection b) Verify the communication configuration matches the hardware. c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C301A	Safety message monitor	Safety processors does not agree.	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C301A0	Critical error	A critical error occurred in safety message monitoring	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C303A	System status		<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C303A0	Critical error	A critical system error occurred	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C304A	Self monitoring		
C304A0	Critical error	A critical error occurred in physical, logical, and temporal monitoring (PLATM)	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C304A3	Close to the gearbox shear limit. Encoders disagree {float} [rad] on the Joint position	The Joint acceleration or deceleration is too high, or there is a mechanical problem in the gear related to encoder mounting.	<ul style="list-style-type: none"> a) Reduce acceleration in the user program. b) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance or Replace Joint if necessary.
C304A4	Either the encoder was inappropriately mounted, or the gearbox is loose or broken. Difference between the encoders is {float} [rad].	Mechanical problem in gear related to encoder mounting.	<ul style="list-style-type: none"> a) Reduce acceleration in the user program. b) Check TCP/Payload and Cog c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance or Replace Joint if necessary.
C304A6	Motor phase {unsigned}'s resistance is too high.	The lead/connector is broken, or the Motor phase lead has become disconnected or loose.	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C305A	Robot Power Control		
C305A0	Critical error	A critical error in power control module	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C305A1	Power supply voltage too low	Robot voltage is lower than 40V.	<ul style="list-style-type: none"> a) Check for loose connections b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C305A2	Robot cable not connected		<ul style="list-style-type: none"> a) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. b) Check for loose connections c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance Contact your local Universal Robots service provider for assistance.

C305A3	Short circuit in Robot detected or the wrong Robot is connected to the Control Box.		<ul style="list-style-type: none"> a) Check for loose connections b) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. c) Check for loose connections d) Do a Complete rebooting sequence e) Update software f) Contact your local Universal Robots service provider for assistance.
C305A6	Power supply voltage too high: {float} V	Power supply is higher than 56V	<ul style="list-style-type: none"> a) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. b) Check for loose connections c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance.
C305A8	The Robot Voltage is too high ({float})V when powering on the Robot		<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C305A9	The Power State was not OFF ({unsigned}) when trying to power on the Robot		<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C306A	Joint	Joint error	
C306A0	Critical error	A critical error occurred in a Joint	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C306A1	Not stopping fast enough	Joint was unable to come to a full stop fast enough.	<ul style="list-style-type: none"> a) Either an incorrect payload is mounted, or an external force is pushing the robot b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C306A9	Joint moved more than allowable limit	Potential mechanical failure of the joints brakes	<ul style="list-style-type: none"> b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C312A	Data validation		
C312A0	Critical error	A critical error occurred during data validation	<ul style="list-style-type: none"> a) Do a Complete rebooting sequence b) Check for ESD noise. c) Update software d) Contact your local Universal Robots service provider for assistance.
C314A	SPI IO	IO sanity check error.	

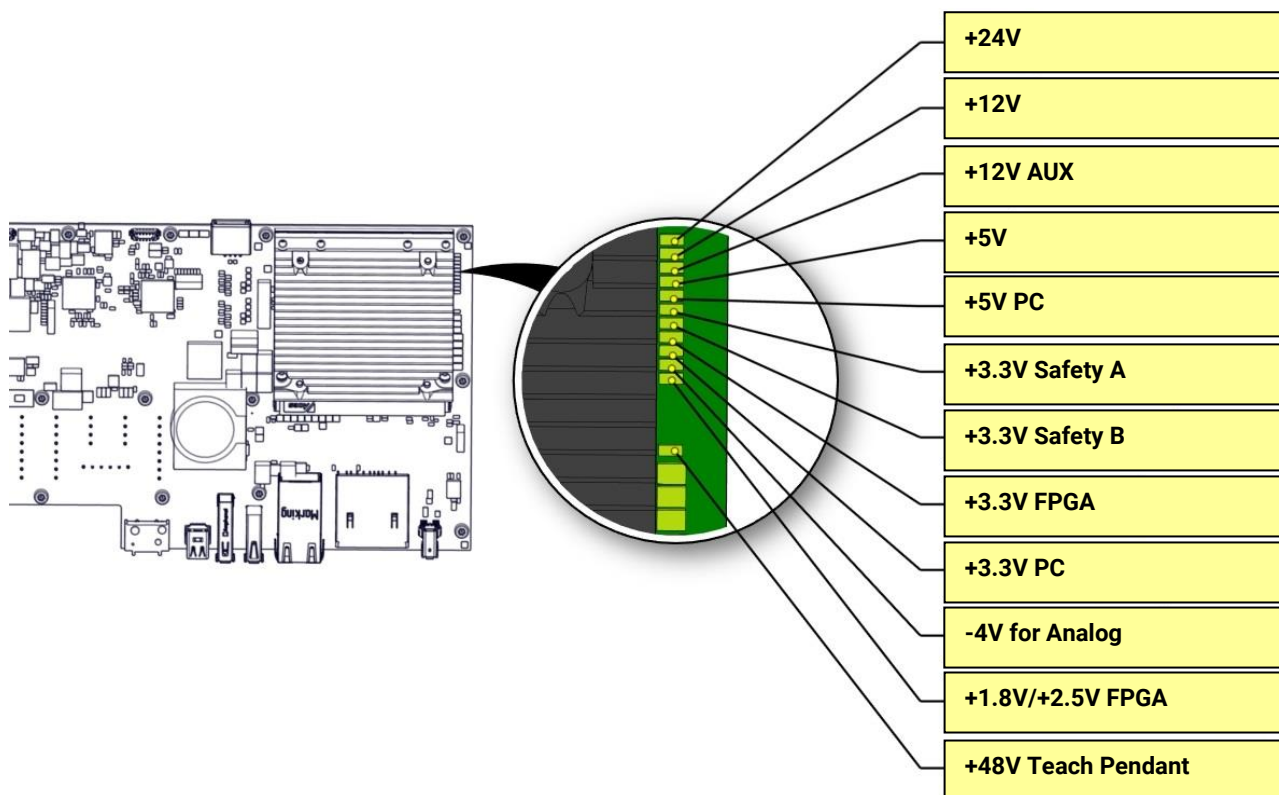
C314A0	Critical error	A critical error occurred related to IO	a) Do a Complete rebooting sequence b) Check IO connections c) Update software d) Contact your local Universal Robots service provider for assistance.
C315A	Watchdog		
C315A0	Self-test failed	The system watchdog is not working as expected	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C316A	MCU	Micro Control Unit	
C316A0	Unknown ID	The Microcontroller Identifier does not match an expected value. Firmware does not match hardware.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C316A1	This version of the firmware is obsolete and needs to be updated	The firmware in the robot is too old and needs to be updated	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C400A	Protective Stop: Elbow position close to safety plane limits		
C401A	Protective Stop: Exceeding user safety settings for stopping time		
C402A	Protective Stop: Exceeding user safety settings for stopping distance		
C403A	Protective Stop: Danger of clamping between the Robot's lower arm and tool		
C404A	Unexpected behavior		
C404A0	Runtime sends data too often		
C404A1	Runtime tries to receive data too often		
C450A	Force-Torque sensor		
C450A0	Sensor data invalid	Force-Torque sensor is defective or not mounted correctly	a) Do a Complete rebooting sequence b) Check for loose connections c) Update software d) Contact your local Universal Robots service provider for assistance.
C450A1	Sensor cannot be used, therefore it is disabled	Force-Torque sensor version is newer than the Robot software	a) Do a Complete rebooting sequence b) Check for loose connections c) Update software d) Contact your local Universal Robots service provider for assistance

C450A4	Force-Torque sensor is expected, but it cannot be detected	Force-Torque sensor is expected, but no signals from the sensor can be detected.	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance.
C500A	Self-test step		
C500A19	Awaiting acceptance started	The Self-test awaits acceptance using serial number.	
C710A	ROM Test		
C710A0	Critical error	A critical error occurred during ROM validation	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C740A	Hardware monitoring		
C740A0	Critical error	A critical error occurred during hardware monitoring	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C740A20	24V SPI IO voltage	24V voltage IO is outside its limits (Below 23,0V above 25,7V)	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance
C740A21	24V SPI IO current	24V current IO is outside its limits	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance

6.4 LED indicators and Fuse on Safety Control Board

6.4.1 LED Indicators on Safety Control Board

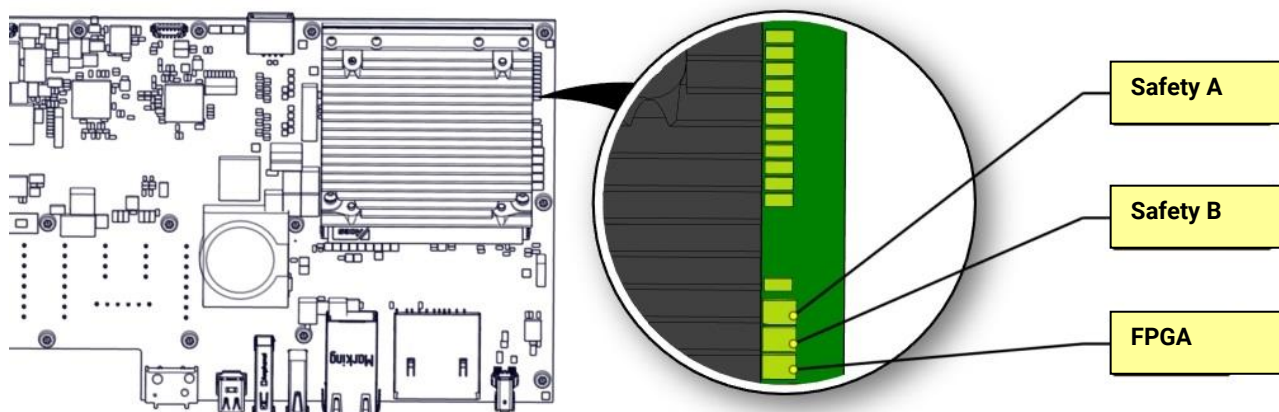
The below LEDs are “power” LEDs. They are either on or off.



LED for power

- Green permanent = Power on
- No color permanent = Error or no power


Below are “communication” LEDs. They flash in different patterns, depending on the status.




LED for Safety A and Safety B


.....  Green fast flash = Bootloader

• • • •  Green slow flash = Normal communication

————  Red permanent = Error (Red flash can happen during bootup/power on, this is normal.)

LED for FPGA

————  Green/Red permanent = Normal communication

• • • •  Green slow flash = No communication/trying to establish communication

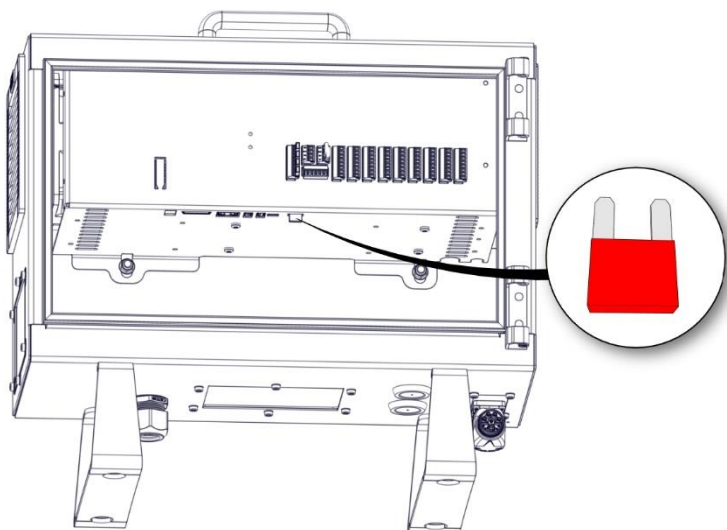
6.4.2 Fuse

Fuse is a 10A fast-acting mini blade fuse.



WARNING

Never use a different fuse than specified. Only use high grade components.

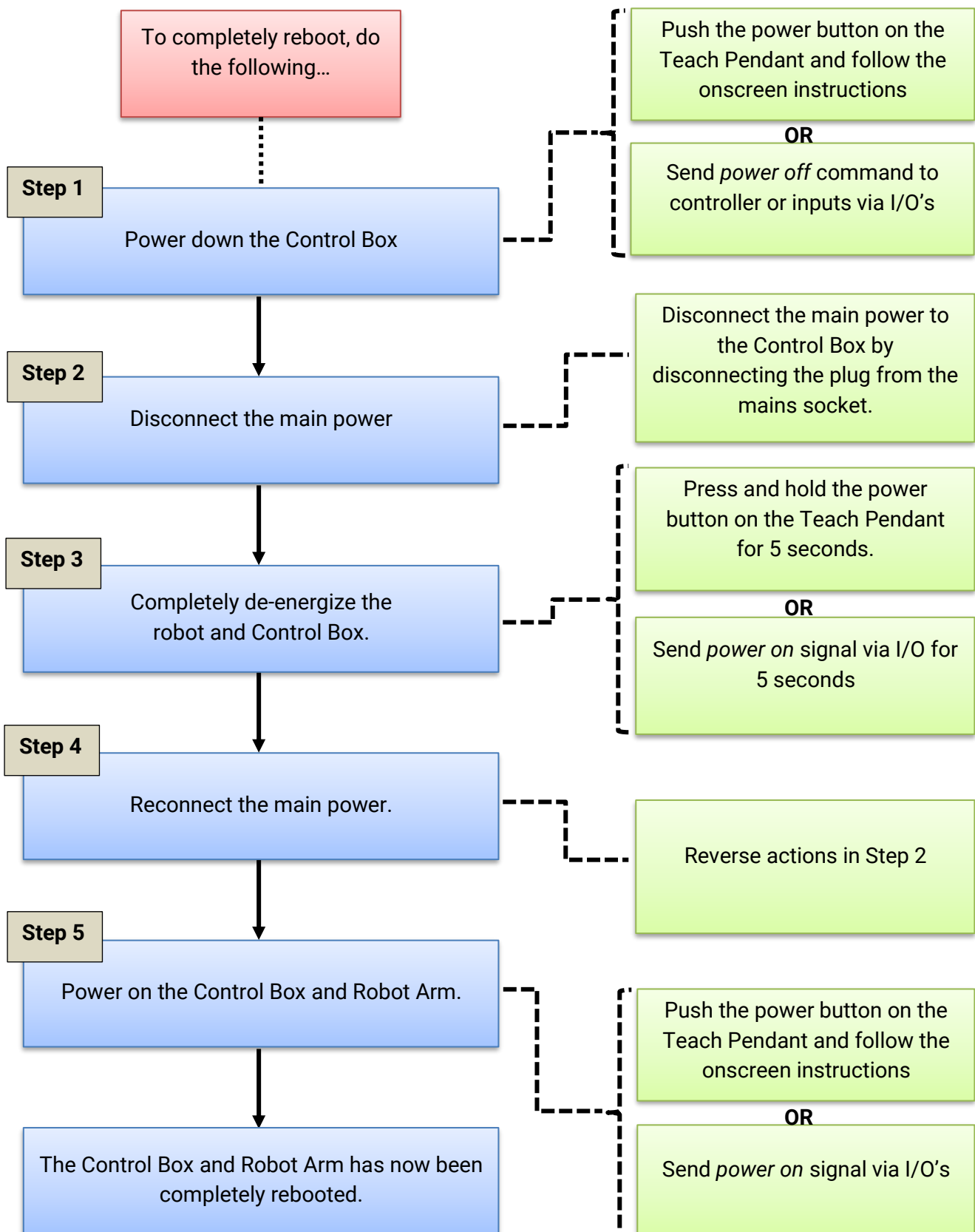


Fuse specifications:

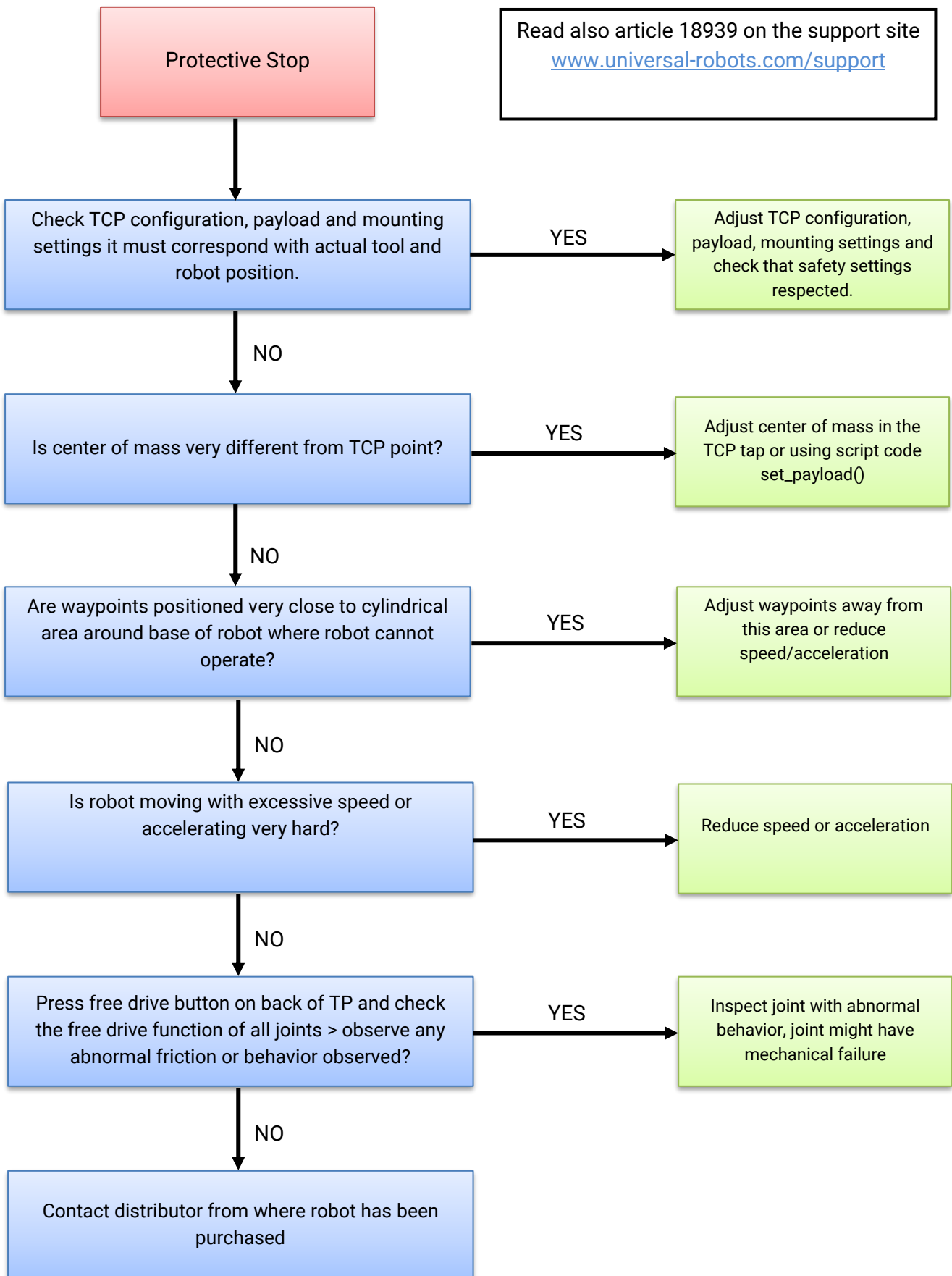
- Interrupting Rating: 1000A @ 32 VDC
- Voltage Rating: 32 VDC
- Component Level Temperature Range: -40°C to +125°C
- System Level Temperature Range: -40°C to +105°C
- Terminals: Ag plated zinc alloy
- Housing Material: PA66
- Complies with: SAE J2077, ISO 8820-3
- UL 248 Special Purpose Fuses

6.5 Complete rebooting sequence.

To completely reboot the robot system, follow the following steps:



6.6 Protective stop



Ignoring protective stops is considered abuse of the robot which voids the warranty.

These faults can be hidden from view under the following two circumstances:

- 1) Personnel simply resetting a fault without review of why the fault has happened.



WARNING:

Ignoring protective stops masks fault detection!
Pay careful attention to protective stops.
Learn why they happen to improve your programs and preserve fault detection!

Protective stops must never be acknowledged and reset automatically, it must always be a deliberate action by a user to resume after a protective stop.

In general, protective stops are designed to inform the user that the robot has stopped due to an external event such as hitting an obstacle or similar. In case the robots are pushed close to the limits, the robots can generate protective stops to indicate that they are not capable of following the desired trajectory. After a protective stop, the following must be done before resuming operation:

- i. **If there has been a collision or similar:**
Remove the obstacle and ensure that operators are out of the way before resuming operation. See Section 2 of Service Manual (see link below).
- ii. **If there has been NO collision or similar:**
The robot is operating too close to the limits, the application should be adjusted to reduce the load on the robot, for instance by reducing accelerations, by correct use of blends or similar measures.

Protective stops are indications of issues, including program or production issues – not only safety issues. An application which results in daily protective stops is not designed correctly and needs to be modified.

- 2) If an automatic acknowledgement and reset of a protective stop has been programmed – no one will see the protective stop.



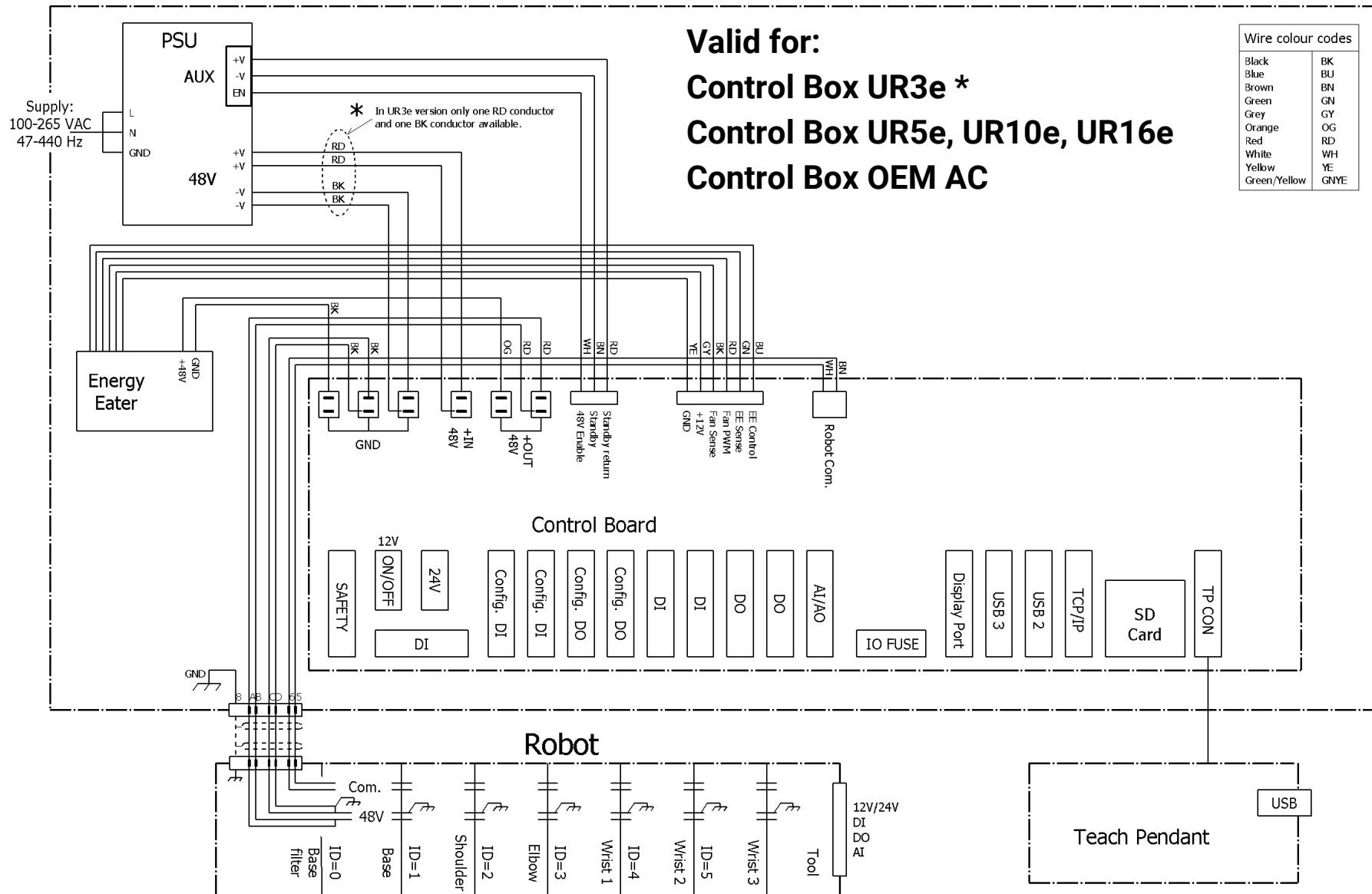
WARNING:

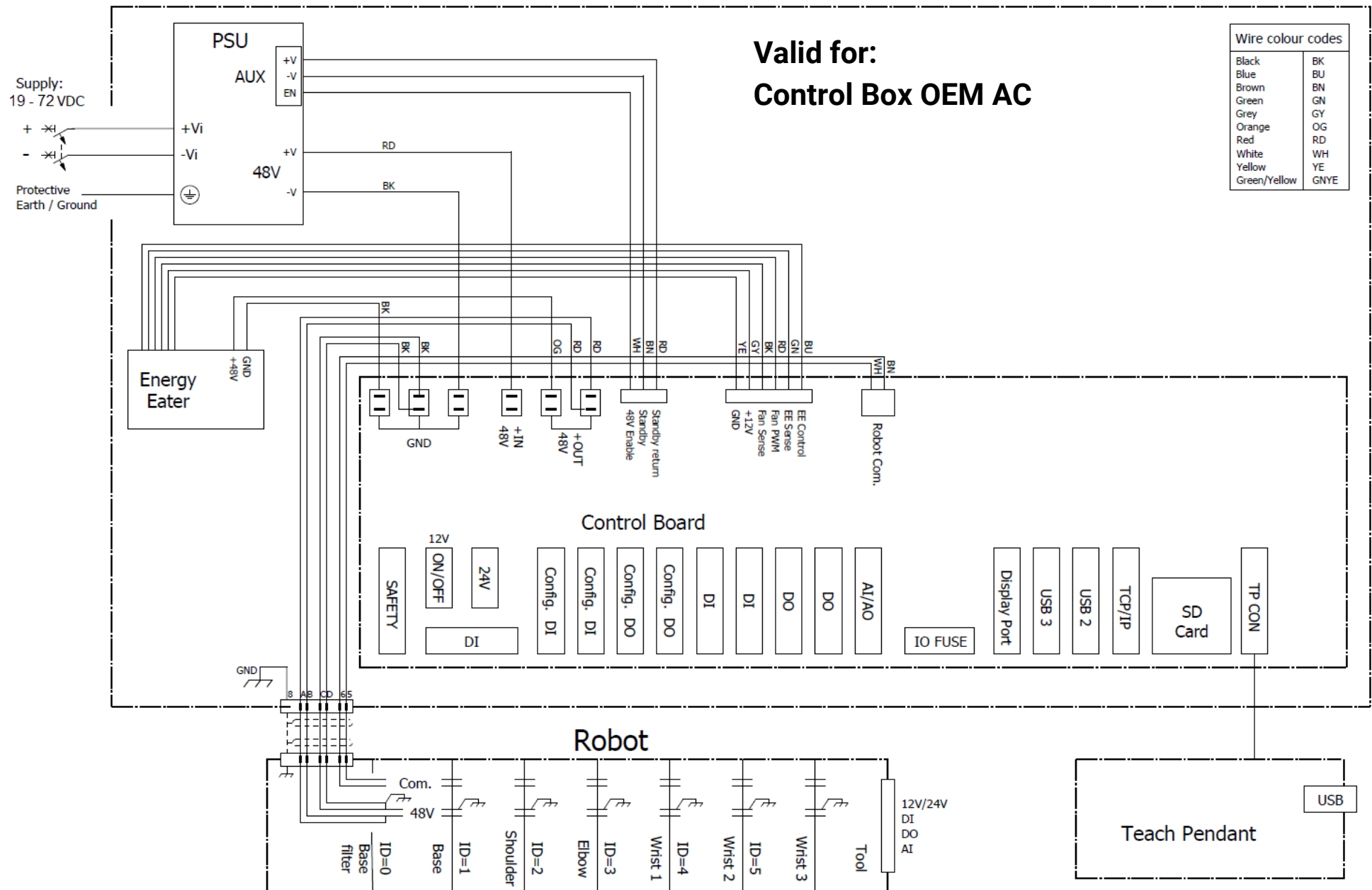
Automatic acknowledgement and reset of protective stops masks faults that will lead to a failure condition.

When there is a protective stop, verify the cause.
If there has been no collision, then adjust the program

If an integrator has set-up the application program to do automatic acknowledgement and reset of protective stops, the customer should contact the integrator change the program immediately, as such override voids the product warranty and masks fault detection.

7. Electrical drawings





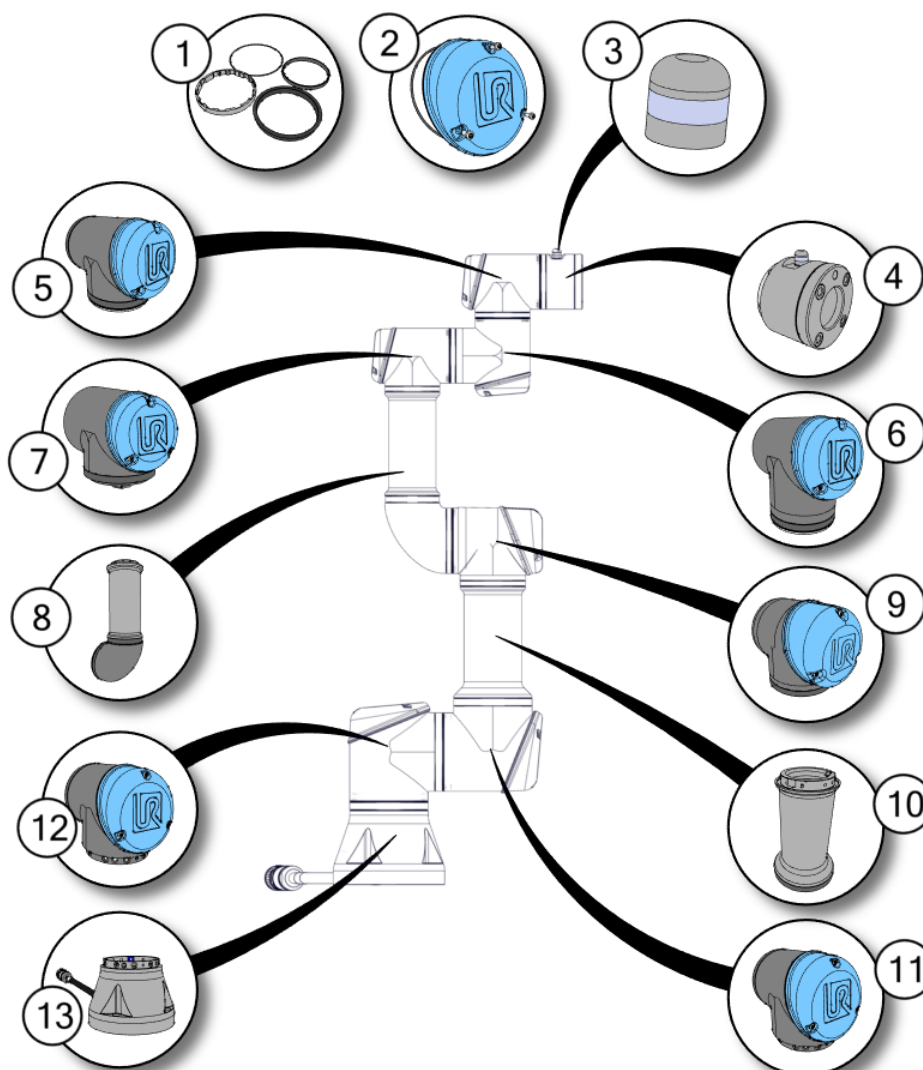
8. Spare Parts



NOTICE

Ensure you have the correct part numbers when ordering spare parts.

8.1 Robot Arm

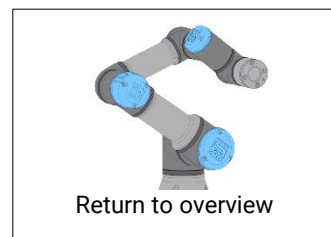
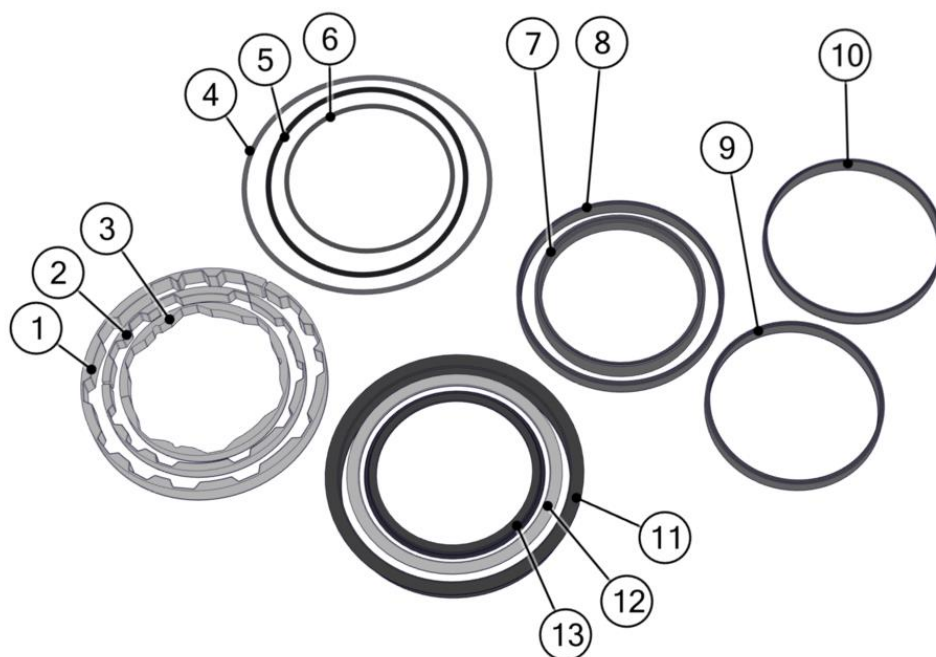


Click on the page no. in the right column to see part in detail or go to the page.

NO.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	Sealing ring set	103703/103705/103700	143-145
2	Lid set	103413/103405/103410	146-148
3	Protective cap for tool connector	131095	149
4	Tool mount with Force/Torque sensor	124083/124085/124080	150-152
5	Wrist joint 3	124002/102414/102412	153-155
6	Wrist joint 2	124110/124111/124112	156-158
7	Wrist joint 1	124001/102413/102411	159-161
8	Lower arm assembly	N/A	162
9	Elbow joint	124011/124031/124031	163-165
10	Upper arm	N/A	166
11	Shoulder joint	124021/124031/124041	167-169
12	Base joint	124021/124031/124041	170-172
13	Base with Robot Arm cable	122083/122085/122080	173-175

Refer to Section 4.1 Robot Arm for joint name and size.

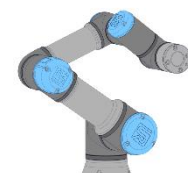
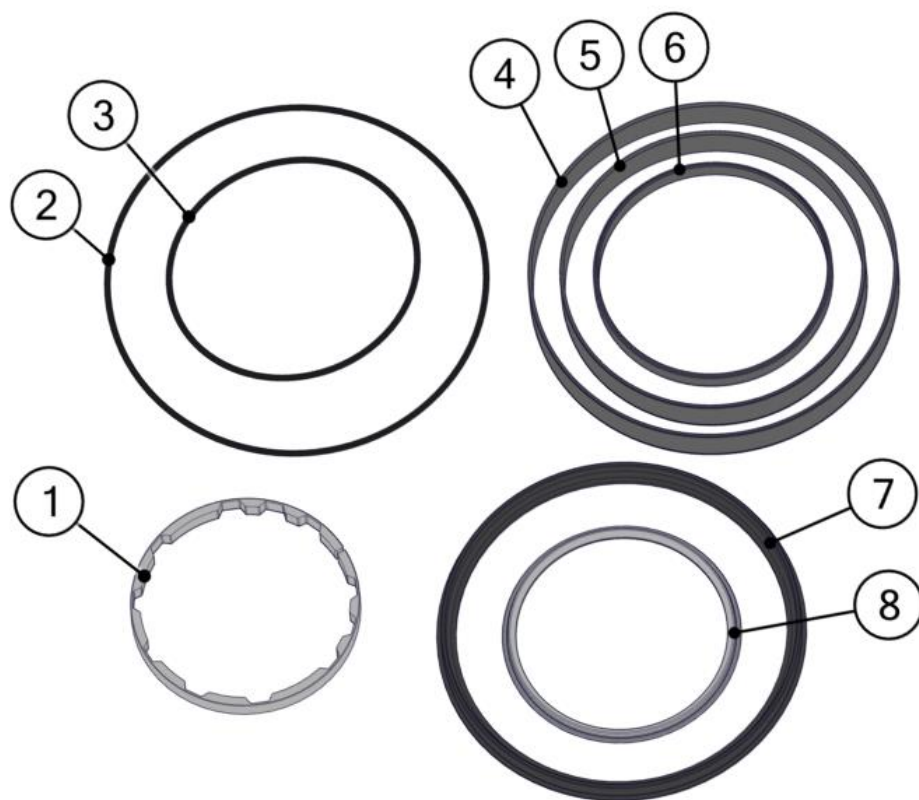
Sealing ring set UR3e – 103703



Sealing ring set UR3e – 103703

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	3	Form-ring for Size 2 joints	N/A	N/A
2	2	Form-ring for Size 1 joints	N/A	N/A
3	4	Form-ring for size 0 joints	N/A	N/A
4	2	O-ring for size 2 lids	N/A	N/A
5	1	O-ring for size 1 lids	N/A	N/A
6	3	O-ring for size 0 lids	N/A	N/A
7	2	Flat ring for lower arm	N/A	N/A
8	1	Flat ring for size 1 joints	N/A	N/A
9	4	Flat ring for size 0 joints	N/A	N/A
10	3	Flat ring for size 2 joints	N/A	N/A
11	2	Wear ring for size 2 joints	N/A	N/A
12	1	Wear ring for size 1 joints	N/A	N/A
13	3	Wear ring for size 0 joints	N/A	N/A

Sealing ring set UR5e – 103705

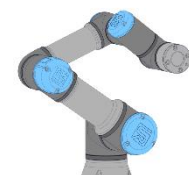
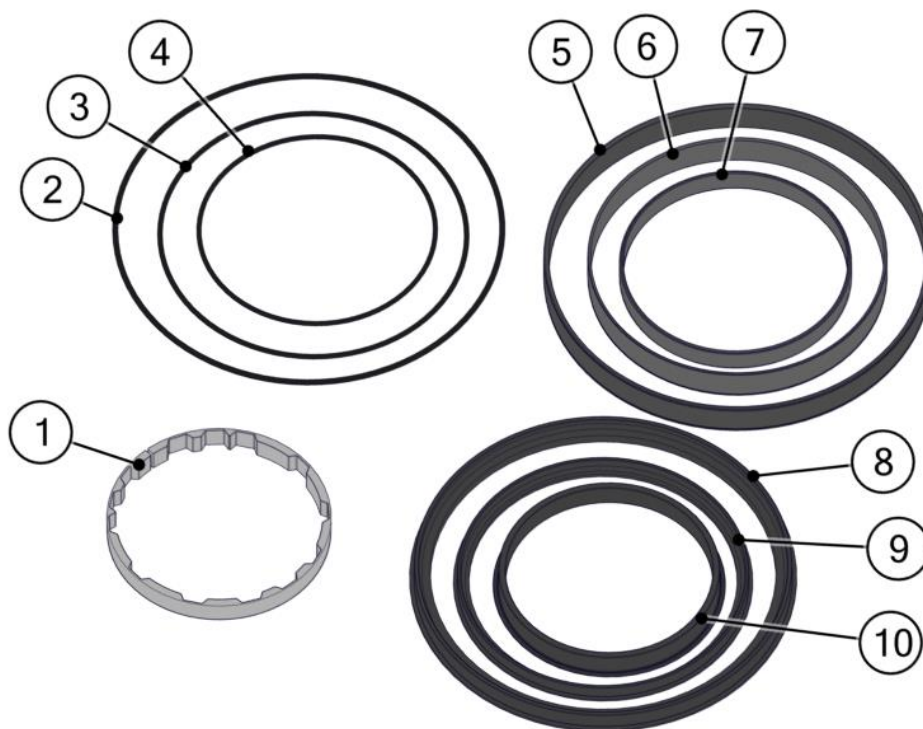


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Sealing ring set UR5e – 103705

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	4	Form-ring for Size 1 joints	N/A	N/A
2	3	O-ring for size 3 lids	N/A	N/A
3	3	O-ring for size 1 lids	N/A	N/A
4	5	Flat ring for size 3 joints	N/A	N/A
5	1	Flat ring for lower arm	N/A	N/A
6	4	Flat ring for size 1 joints	N/A	N/A
7	2	Wear ring for size 3 joints	N/A	N/A
8	3	Wear ring for size 1 joints	N/A	N/A

Sealing ring set UR10e/UR16e –103700

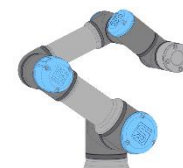
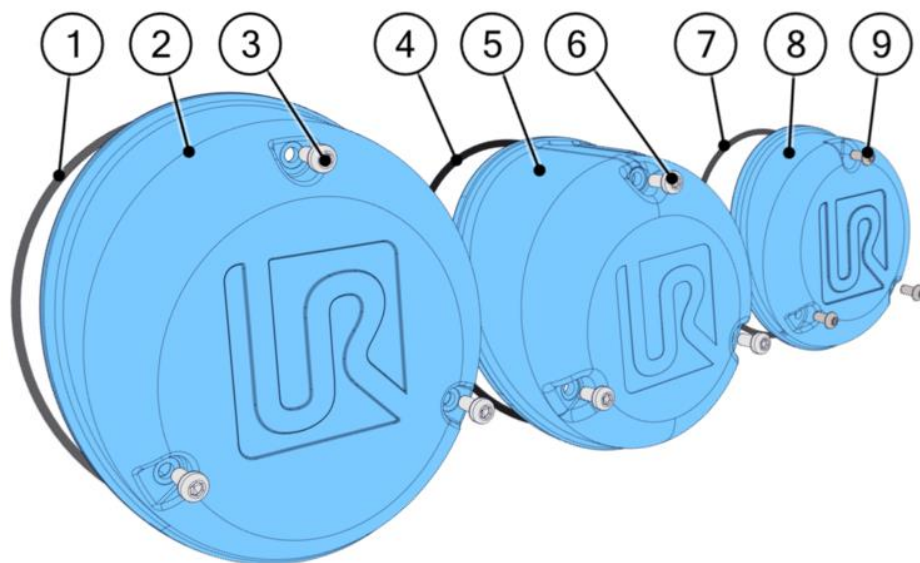


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Sealing ring set UR10e/UR16e –103700

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	4	Form-ring for Size 2 joints	N/A	N/A
2	2	O-ring for size 4 lids	N/A	N/A
3	1	O-ring for size 3 lids	N/A	N/A
4	3	O-ring for size 2 lids	N/A	N/A
5	3	Flat ring for size 4 joints	N/A	N/A
6	3	Flat ring for size 3 joints	N/A	N/A
7	4	Flat ring for size 2 joints	N/A	N/A
8	2	Wear ring for size 4 joints	N/A	N/A
9	1	Wear ring for size 3 joints	N/A	N/A
10	3	Wear ring for size 2 joints	N/A	N/A

Lid set for UR3e – 103413

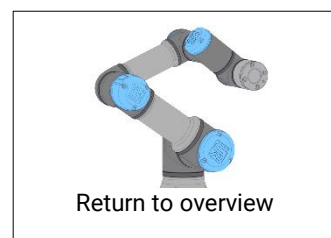
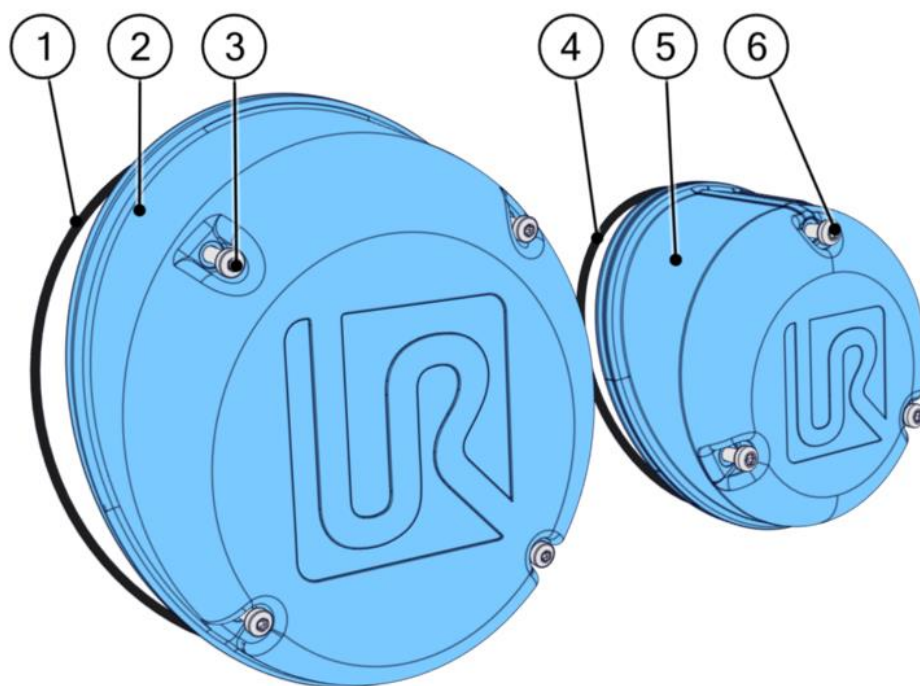


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Lid set for UR3e – 103413

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	O-ring for size 2	N/A	N/A
2	2	Lid for size 2	N/A	N/A
3	6	Screws for size 2 lid	N/A	N/A
4	1	O-ring for size 1	N/A	N/A
5	1	Lid for size 1	N/A	N/A
6	3	Screws for size 1	N/A	N/A
7	3	O-ring for size 0	N/A	N/A
8	3	Lid for size 0	N/A	N/A
9	9	Screws for size 0	N/A	N/A

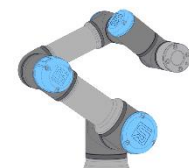
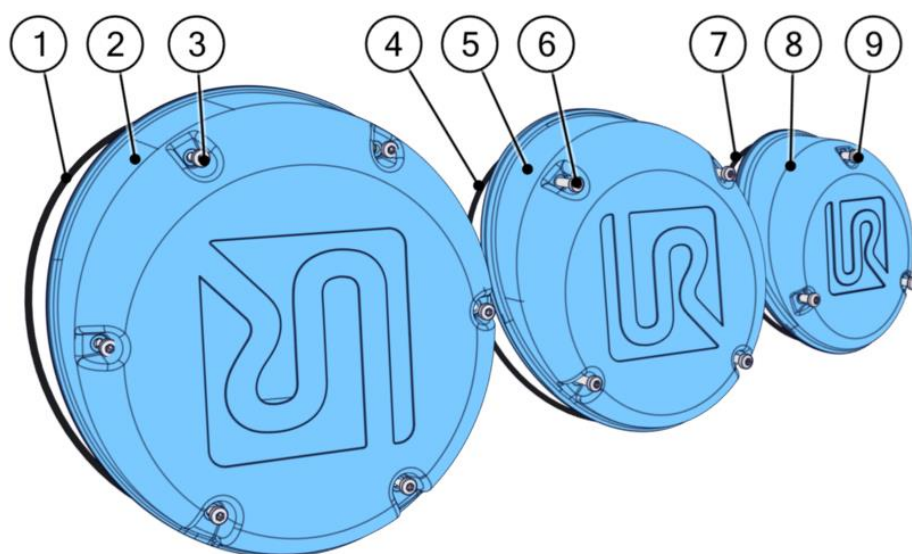
Lid set for UR5e – 103405



Lid set for UR5e – 103405

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	3	O-ring for size 3	N/A	N/A
2	3	Lid for size 3	N/A	N/A
3	12	Screws for size 3 lid	N/A	N/A
4	3	O-ring for size 1	N/A	N/A
5	3	Lid for size 1	N/A	N/A
6	9	Screws for size 1	N/A	N/A

Lid set for UR10e/UR16e – 103410

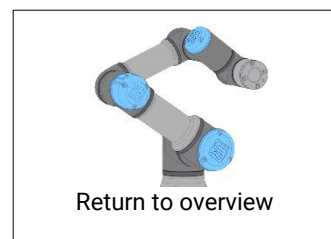
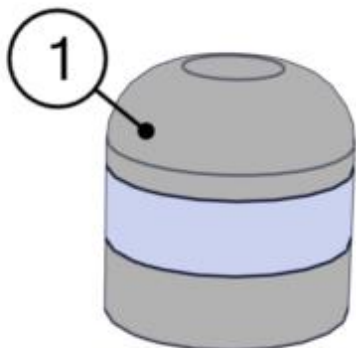


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Lid set for UR10e/UR16e – 103410

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	O-ring for size 4	N/A	N/A
2	2	Lid for size 4	N/A	N/A
3	12	Screws for size 4 lid	N/A	N/A
4	1	O-ring for size 3	N/A	N/A
5	1	Lid for size 3	N/A	N/A
6	4	Screws for size 3	N/A	N/A
7	3	O-ring for size 2	N/A	N/A
8	3	Lid for size 2	N/A	N/A
9	9	Screws for size 2	N/A	N/A

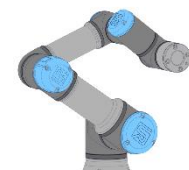
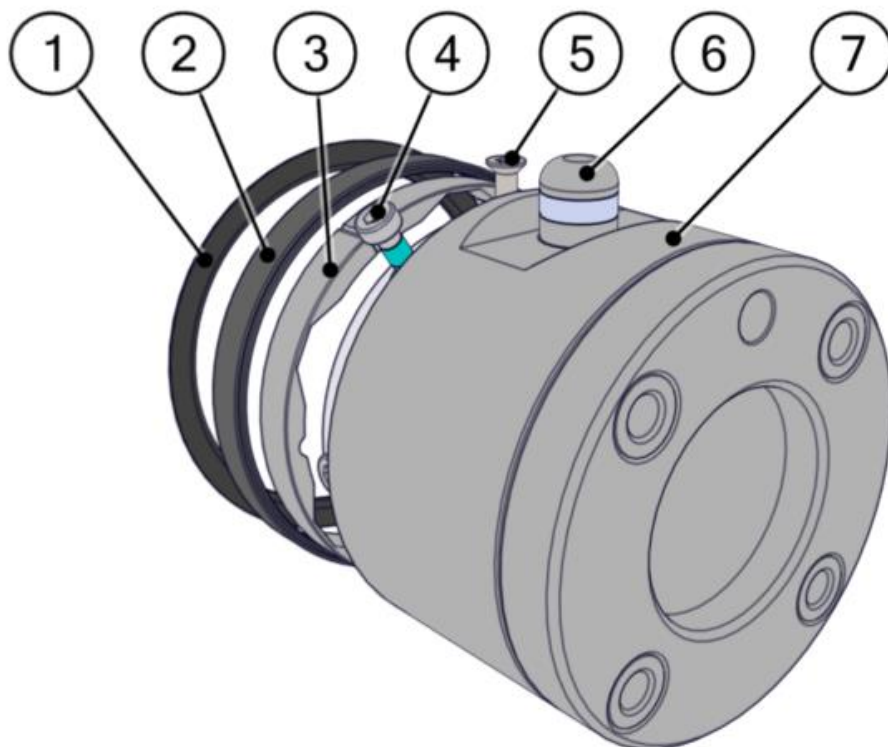
Protective cap for tool connector - 131095



Protective cap for tool connector - 131095

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Protective cap for tool connector	131095	149

Tool mount with Force/Torque sensor for UR3e – 124083

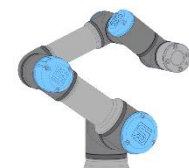
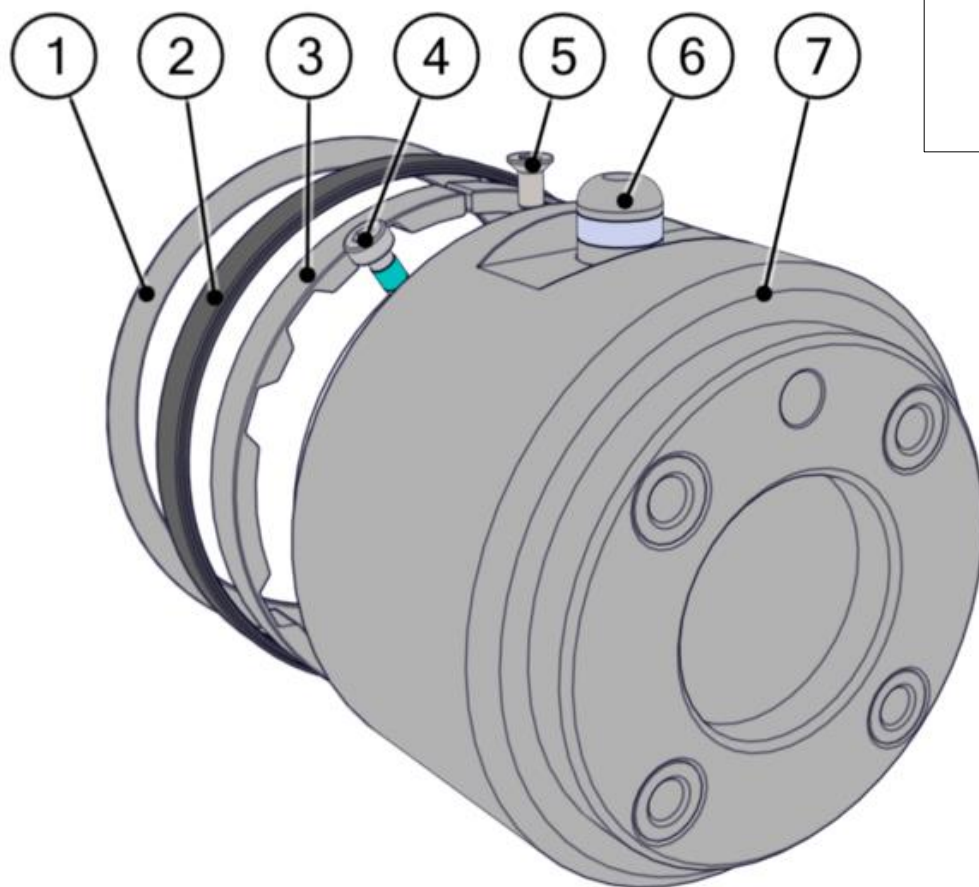


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Tool mount with Force/Torque sensor for UR3e – 124083

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Wear ring	103703	143
2	1	Flat ring	103703	143
3	1	Form ring	103703	143
4	6	Screw	N/A	N/A
5	3	Screw counter sunk	N/A	N/A
6	1	Tool connector lid	131095	149
7	1	Tool mount with Force/Torque sensor	124083	150

Tool mount with Force/Torque sensor for UR5e –124085

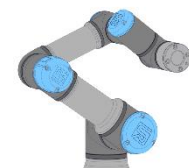
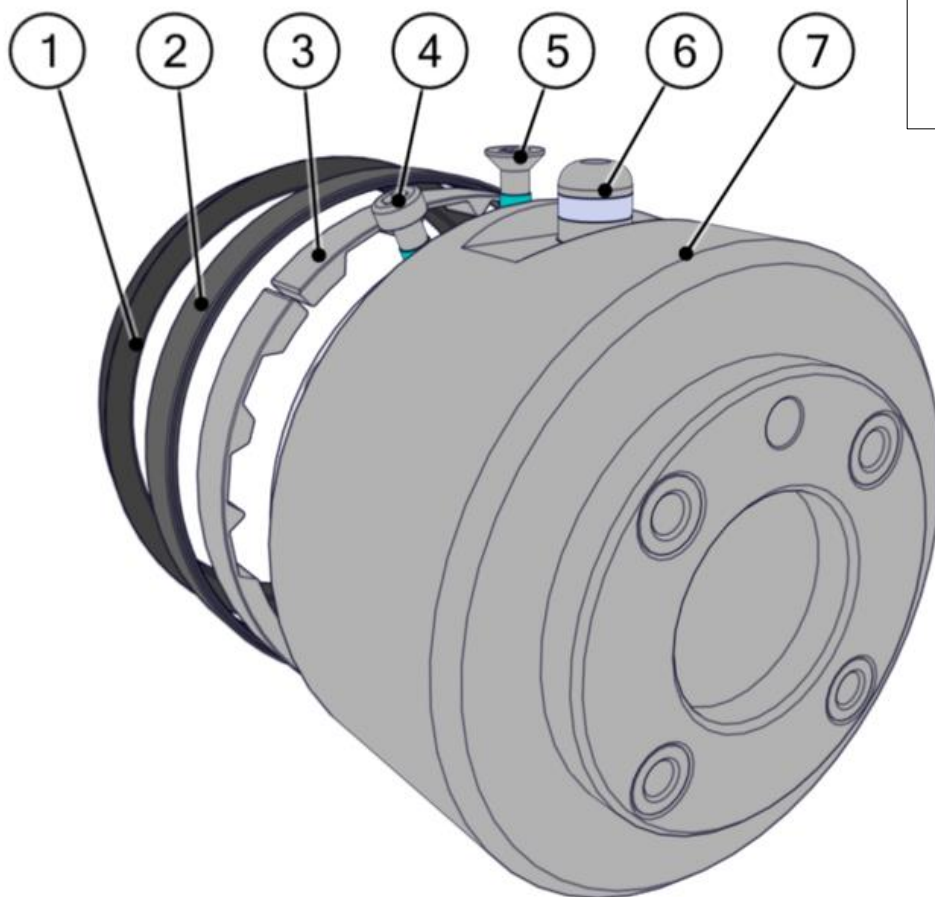


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Tool mount with Force/Torque sensor for UR5e –124085				
NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Wear ring	N/A	144
2	1	Flat ring	N/A	144
3	1	Form ring	N/A	144
4	8	Screw	N/A	N/A
5	3	Screw counter sunk	N/A	N/A
6	1	Tool connector lid	131095	149
7	1	Tool mount with Force/Torque sensor	124085	151

Tool mount with Force/Torque sensor for UR10e/UR16e – 124080

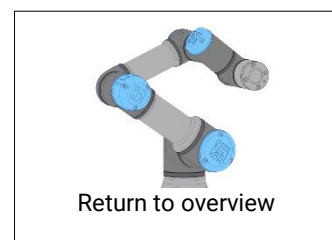
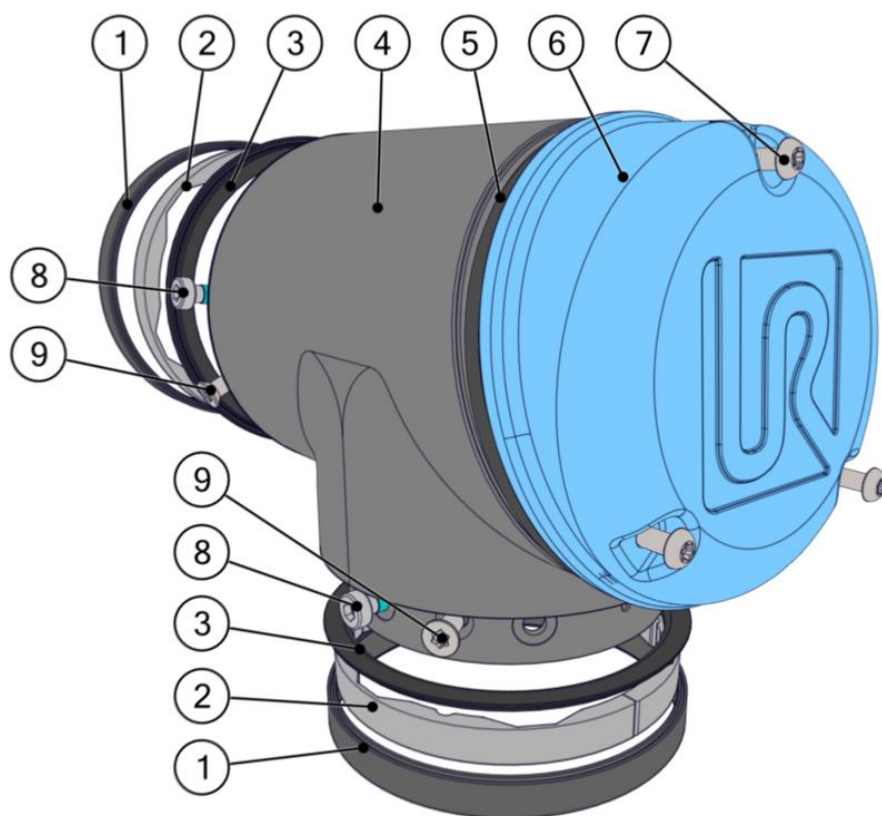


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Tool mount with Force/Torque sensor for UR10e/UR16e – 124080

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Wear ring	N/A	145
2	1	Flat ring	N/A	145
3	1	Form ring	N/A	145
4	10	Screw	N/A	N/A
5	3	Screw counter sunk	N/A	N/A
6	1	Tool connector lid	131095	149
7	1	Tool mount with Force/Torque sensor	124080	152

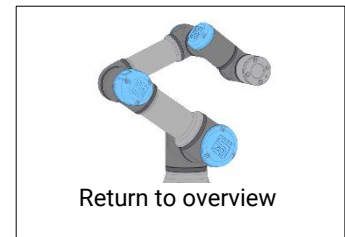
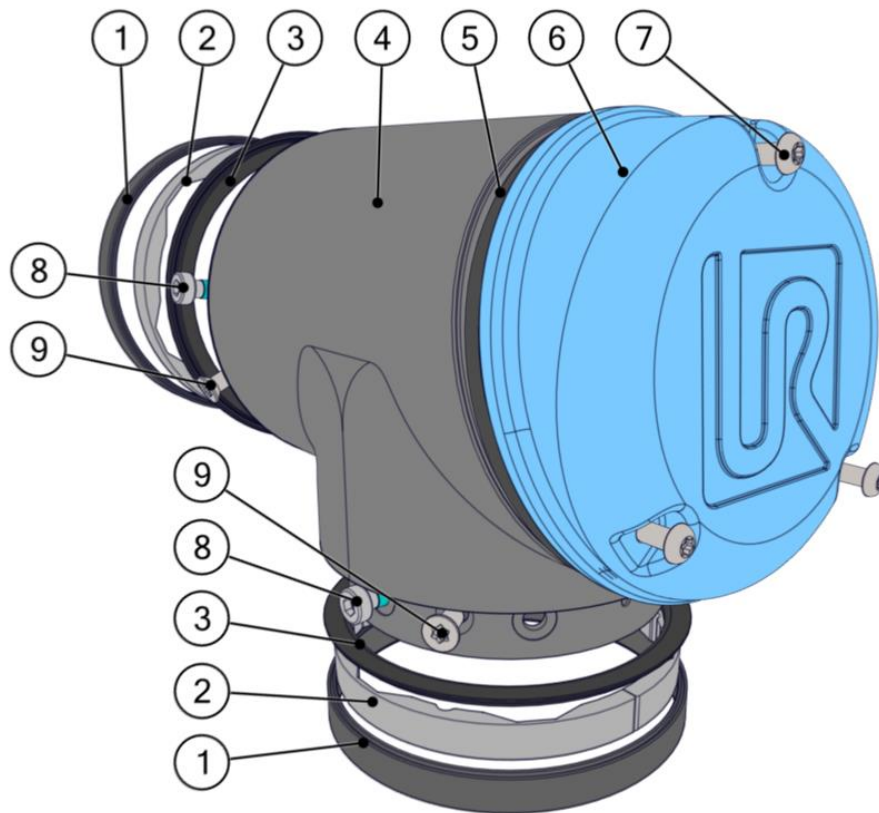
Wrist joint 3 for UR3e – 124002



Wrist joint 3 for UR3e – 124002

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 0	103703	143
2	2	Form ring for size 0	103703	143
3	2	Wear ring for size 0	103703	143
4	1	Wrist 3, size 0	N/A	N/A
5	1	O-ring for lid size 0	103413	146
6	1	Lid size 0	103413	146
7	3	Screws for lid size 0	103413	146
8	12	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

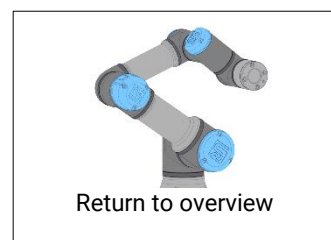
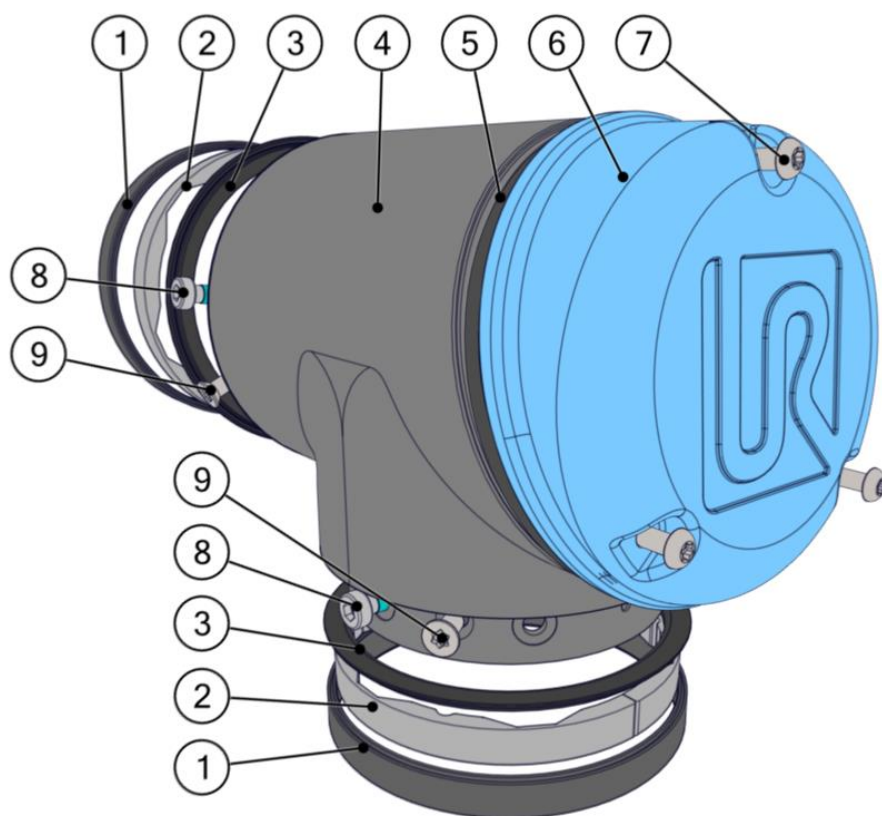
Wrist joint 3 for UR5e – 102414



Wrist joint 3 for UR5e – 102414

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 1	103705	144
2	2	Form ring for size 1	103705	144
3	2	Wear ring for size 1	103705	144
4	1	Wrist 3, size 1	N/A	N/A
5	1	O-ring for lid size 1	103405	147
6	1	Lid size 1	103405	147
7	3	Screws for lid size 1	103405	147
8	16	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

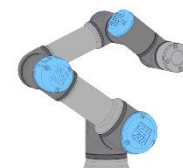
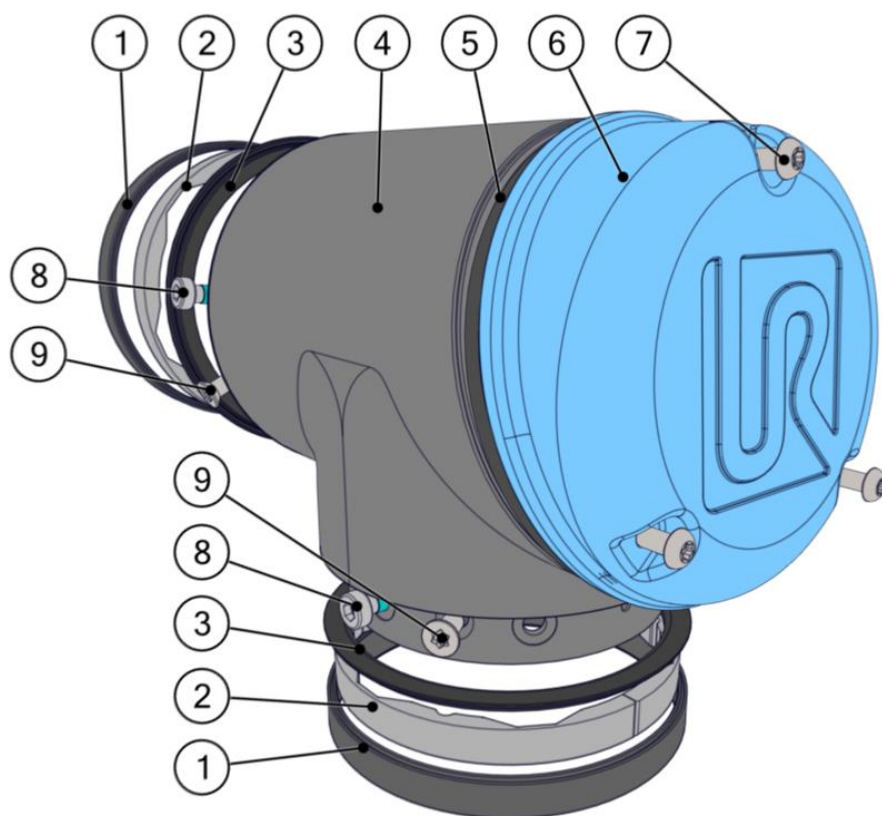
Wrist joint 3 for UR10e/UR16e – 102412



Wrist joint 3 for UR10e/UR16e – 102412

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 2	103700	145
2	2	Form ring for size 2	103700	145
3	2	Wear ring for size 2	103700	145
4	1	Wrist 3, size 2	N/A	N/A
5	1	O-ring for lid size 2	103410	148
6	1	Lid size 2	103410	148
7	3	Screws for lid size 2	103410	148
8	20	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Wrist joint 2 for UR3e – 124110

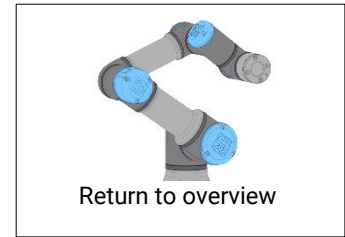
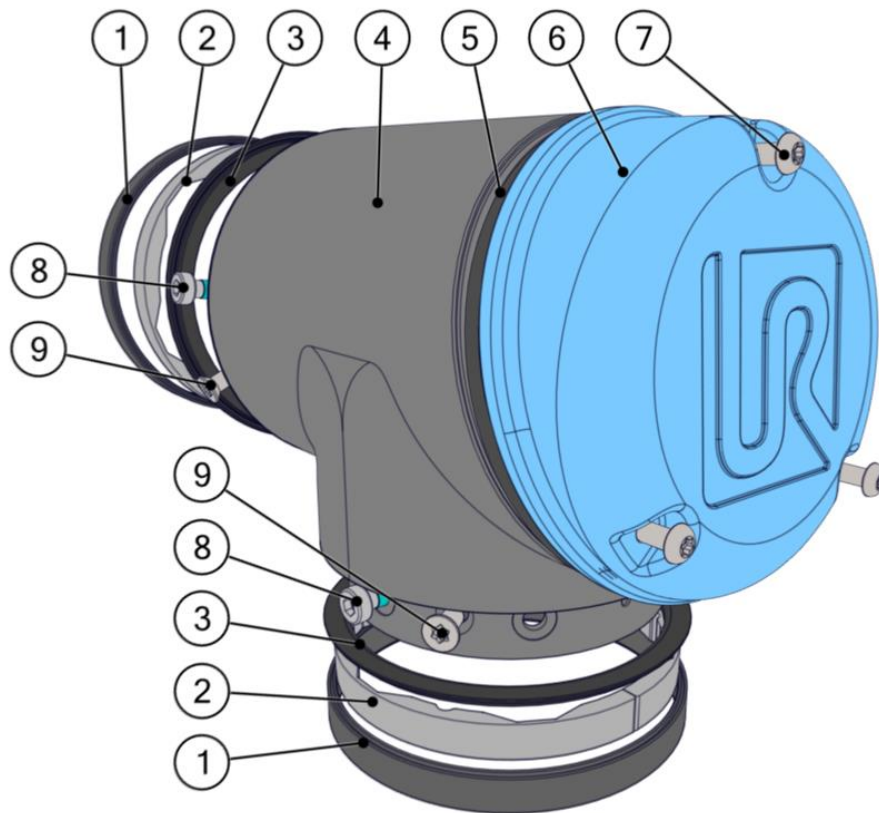


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Wrist joint 2 for UR3e – 124110

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 0	103703	143
2	2	Form ring for size 0	103703	143
3	2	Wear ring for size 0	103703	143
4	1	Wrist 2, size 0	N/A	N/A
5	1	O-ring for lid size 0	103413	146
6	1	Lid size 0	103413	146
7	3	Screws for lid size 0	103413	146
8	12	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

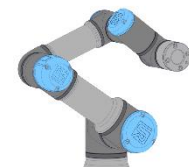
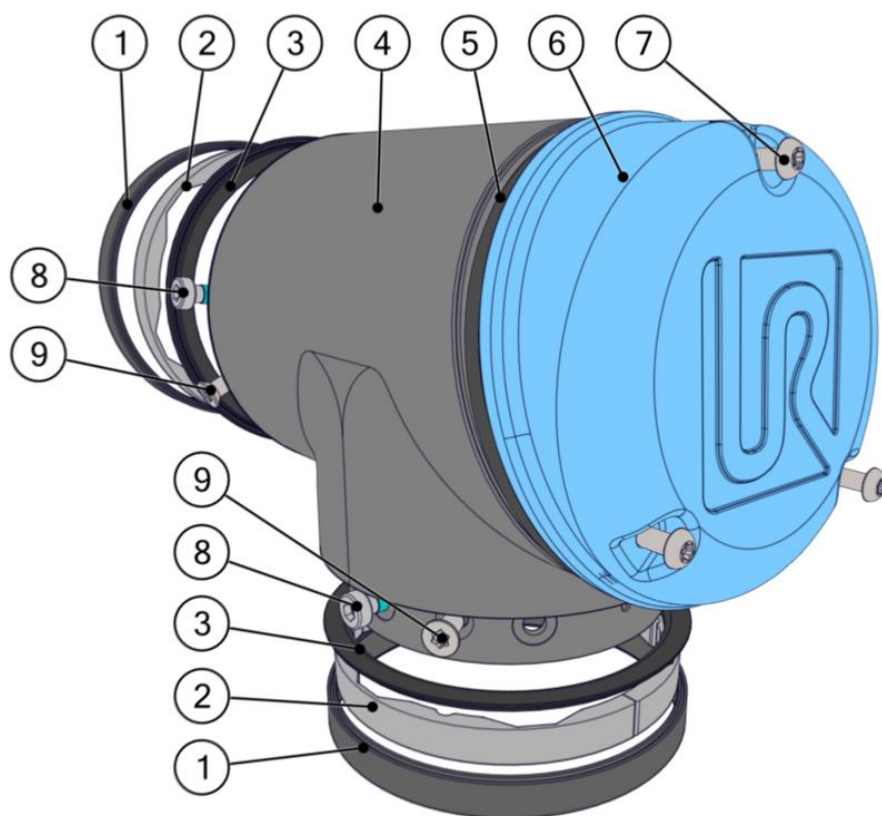
Wrist joint 2 for UR5e –124111



Wrist joint 2 for UR5e –124111

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 1	103705	144
2	2	Form ring for size 1	103705	144
3	2	Wear ring for size 1	103705	144
4	1	Wrist 2, size 1	N/A	N/A
5	1	O-ring for lid size 1	103405	147
6	1	Lid size 1	103405	147
7	3	Screws for lid size 1	103405	147
8	16	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Wrist joint 2 for UR10e/UR16e –124112

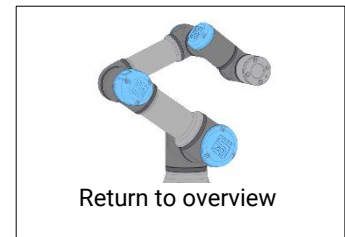
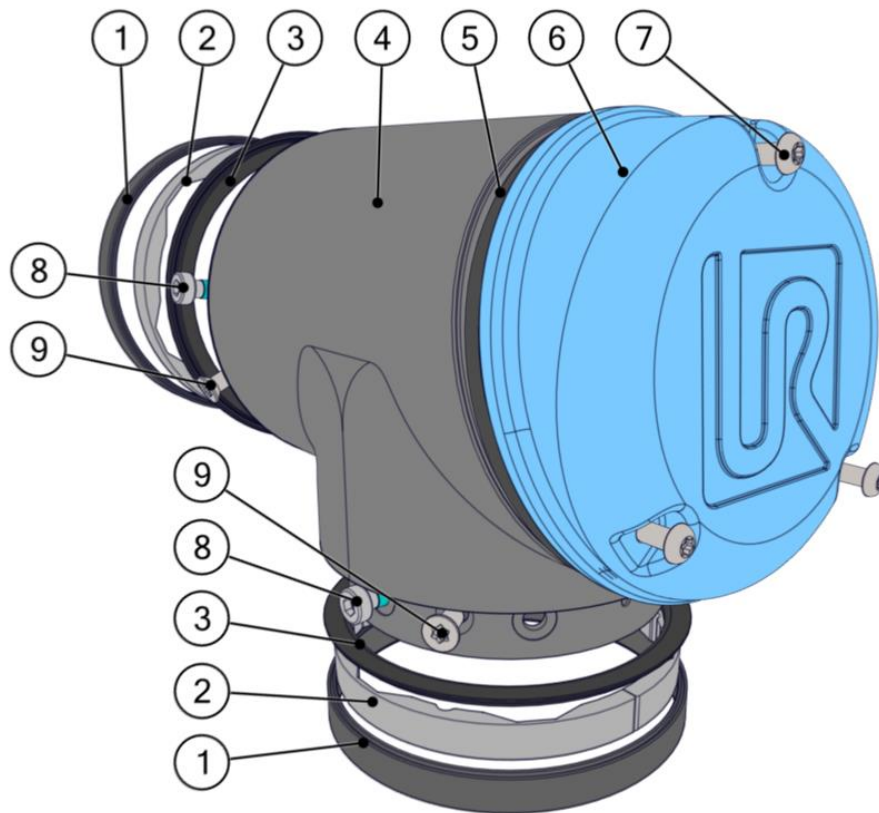


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Wrist joint 2 for UR10e/UR16e –124112

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 2	103700	145
2	2	Form ring for size 2	103700	145
3	2	Wear ring for size 2	103700	145
4	1	Wrist 2, size 2	N/A	N/A
5	1	O-ring for lid size 2	103410	148
6	1	Lid size 2	103410	148
7	3	Screws for lid size 2	103410	148
8	20	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

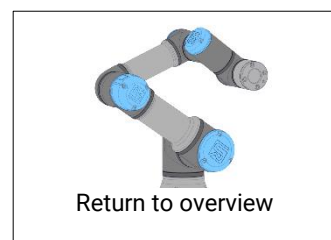
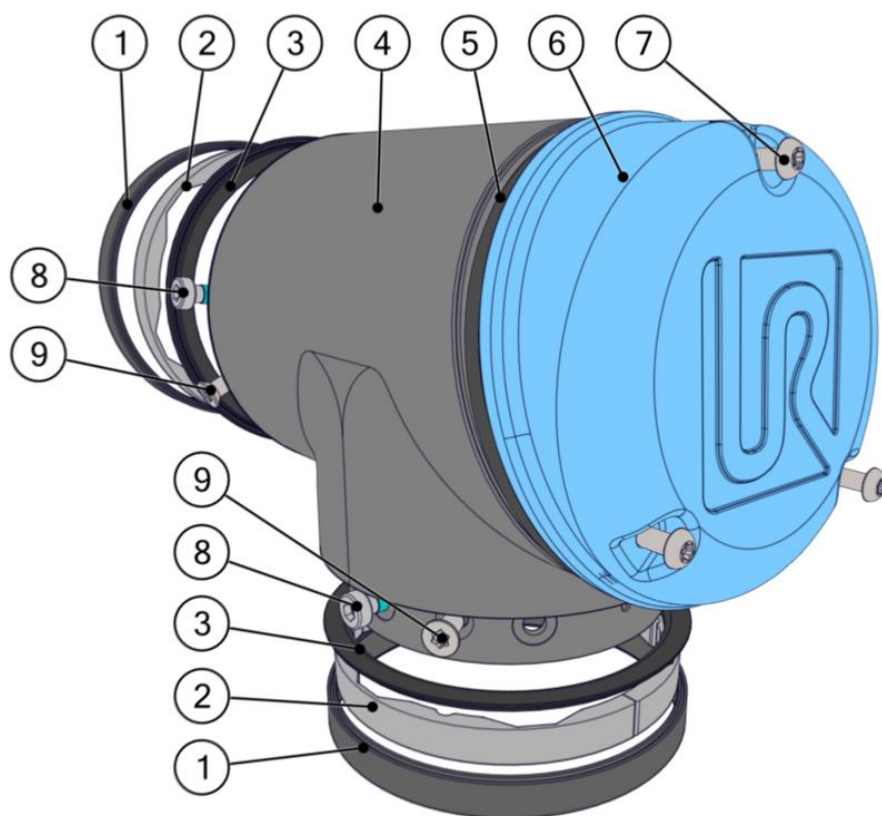
Wrist joint 1 for UR3e – 124001



Wrist joint 1 for UR3e – 124001

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 0	103703	143
2	2	Form ring for size 0	103703	143
3	2	Wear ring for size 0	103703	143
4	1	Wrist 1, size 0	N/A	N/A
5	1	O-ring for lid size 0	103413	146
6	1	Lid size 0	103413	146
7	3	Screws for lid size 0	103413	146
8	12	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

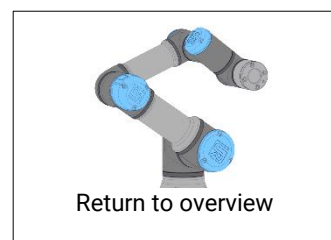
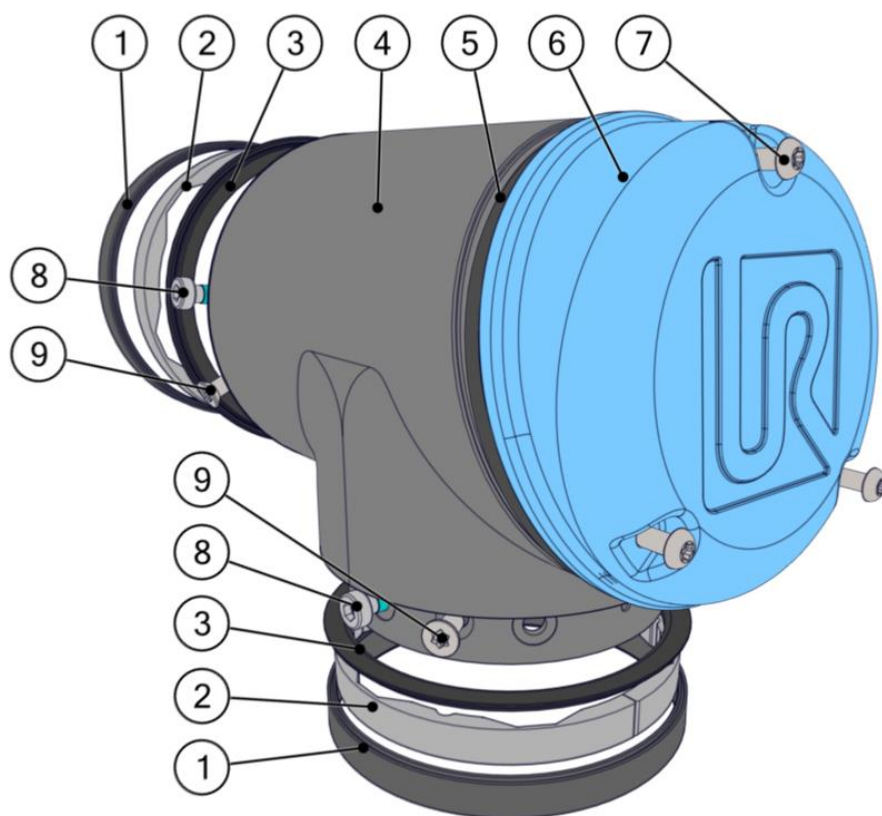
Wrist joint 1 for UR5e –102413



Wrist joint 1 for UR5e –102413

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 1	103705	144
2	2	Form ring for size 1	103705	144
3	2	Wear ring for size 1	103705	144
4	1	Wrist 1, size 1	N/A	N/A
5	1	O-ring for lid size 1	103405	147
6	1	Lid size 1	103405	147
7	3	Screws for lid size 1	103405	147
8	16	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

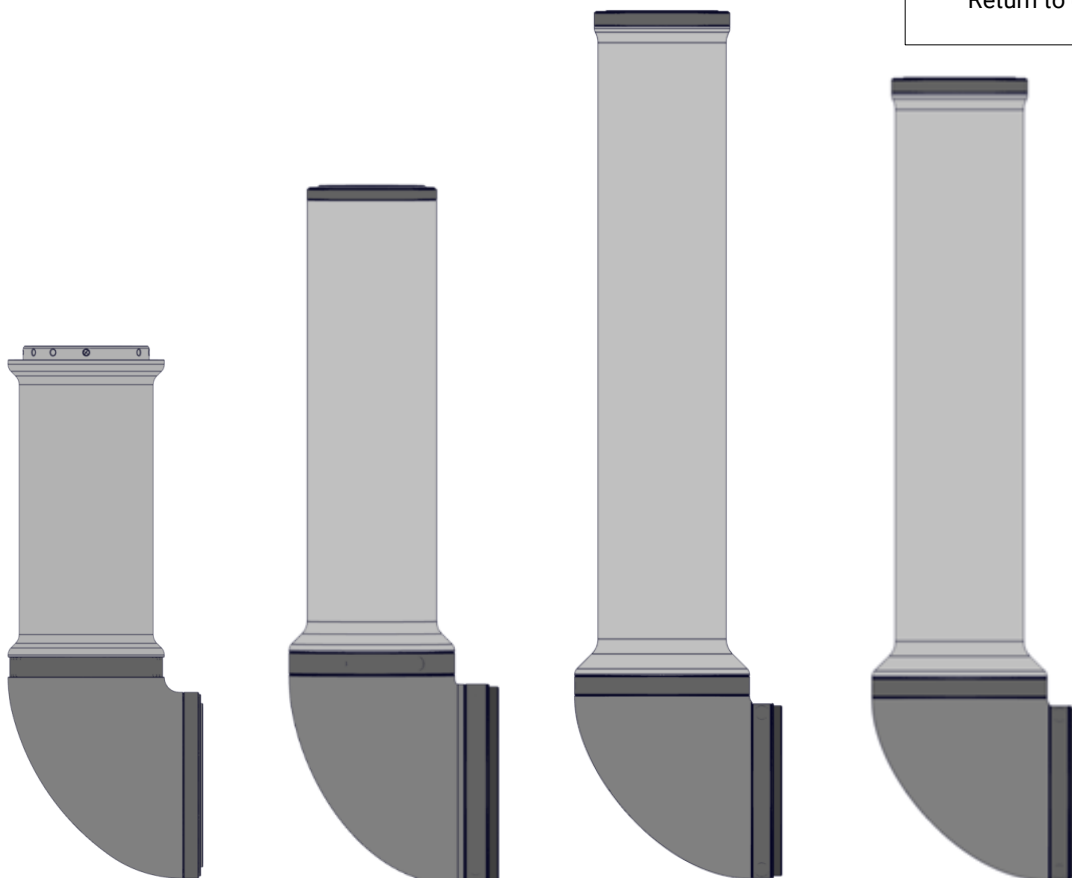
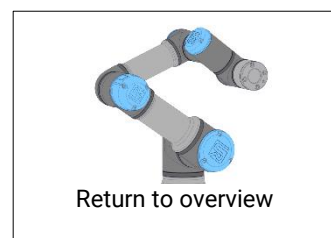
Wrist joint 1 for UR10e/UR16e –102411



Wrist joint 1 for UR10e/UR16e –102411

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 2	103700	145
2	2	Form ring for size 2	103700	145
3	2	Wear ring for size 2	103700	145
4	1	Wrist 1, size 2	N/A	N/A
5	1	O-ring for lid size 2	103410	148
6	1	Lid size 2	103410	148
7	3	Screws for lid size 2	103410	148
8	20	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Lower arm assembly – N/A

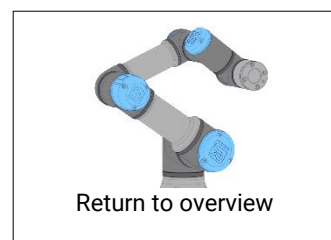
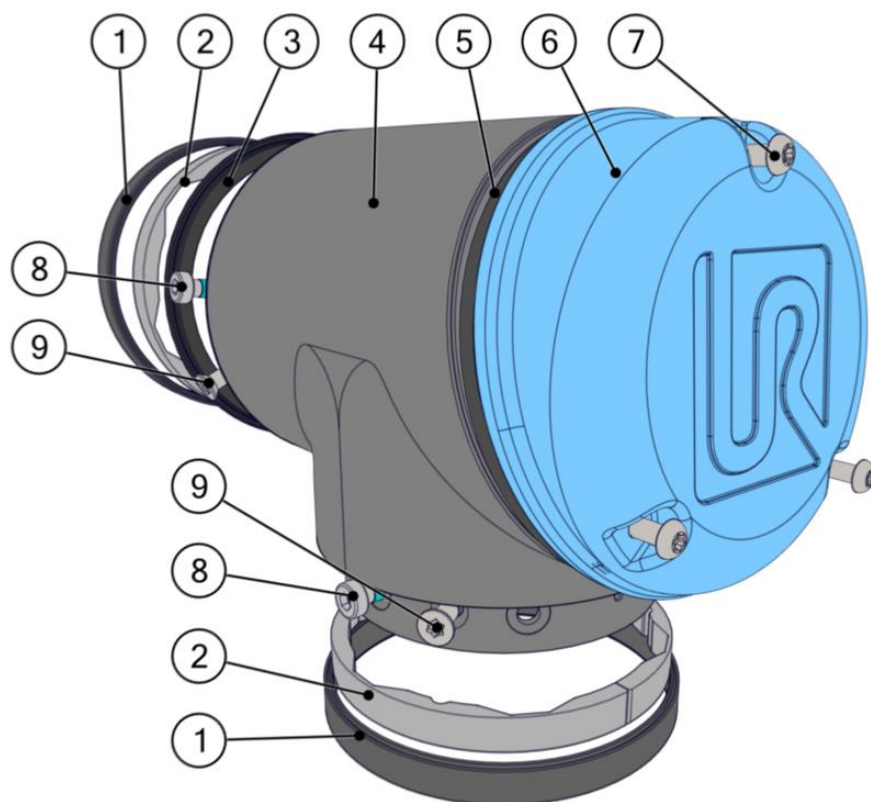


Lower arm assembly – N/A

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
	1	Lower arm assembly UR3e	N/A	N/A
	1	Lower arm assembly UR5e	N/A	N/A
	1	Lower arm assembly UR10e	N/A	N/A
	1	Lower arm assembly UR16e	N/A	N/A

Contact your preferred distributor for part number and availability.

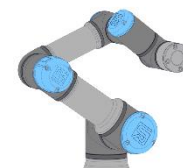
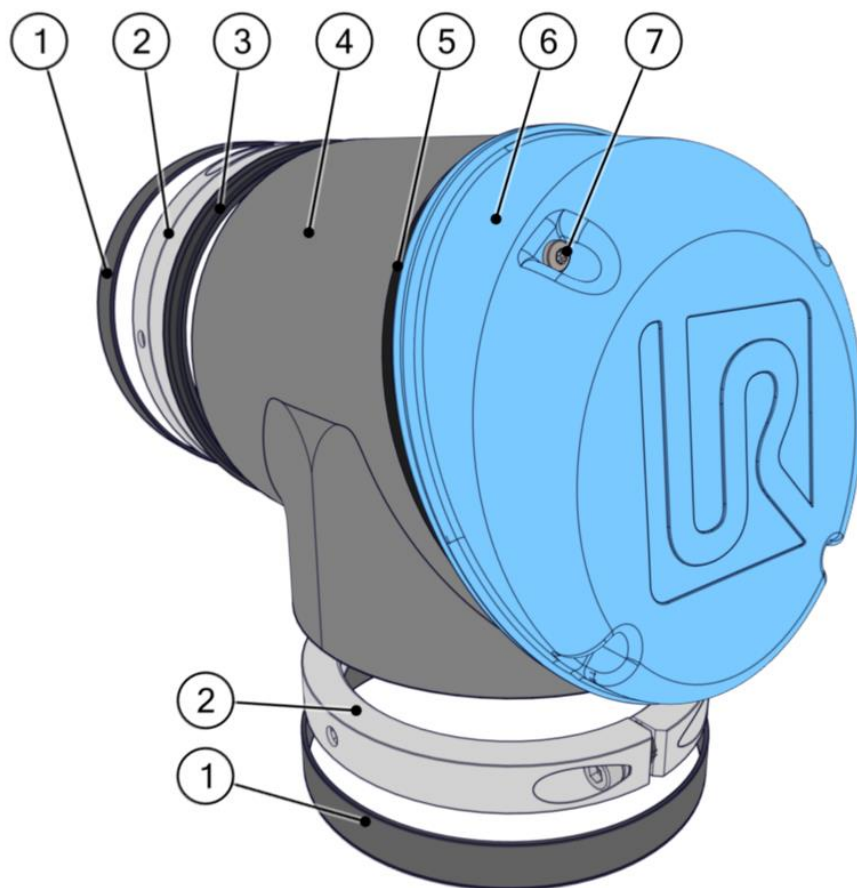
Elbow joint for UR3e– 124011



Elbow joint for UR3e– 124011

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 1	103703	143
2	2	Form ring for size 1	103703	143
3	1	Wear ring for size 1	103703	143
4	1	Elbow, size 1	N/A	N/A
5	1	O-ring for lid size 1	103413	146
6	1	Lid size 1	103413	146
7	3	Screws for lid size 1	103413	146
8	16	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Elbow joint for UR5e –124031

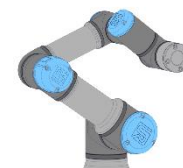
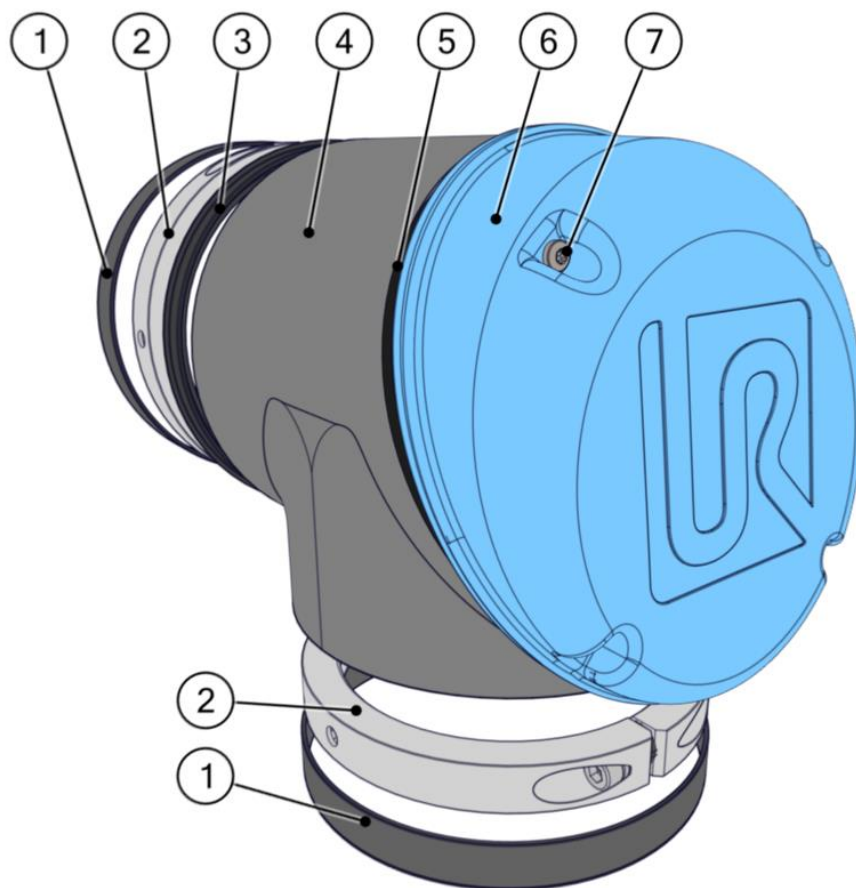


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Elbow joint for UR5e –124031

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 3	103705	144
2	2	Bracket connection incl. bolts and seals size 3	N/A	N/A
3	1	Wear ring size 3	103705	144
4	1	Elbow, size 3	N/A	N/A
5	1	O-ring for lid size 3	103405	147
6	1	Lid size 3	103405	147
7	4	Screws for lid size 3	103405	147

Elbow joint for UR10e/UR16e –124031

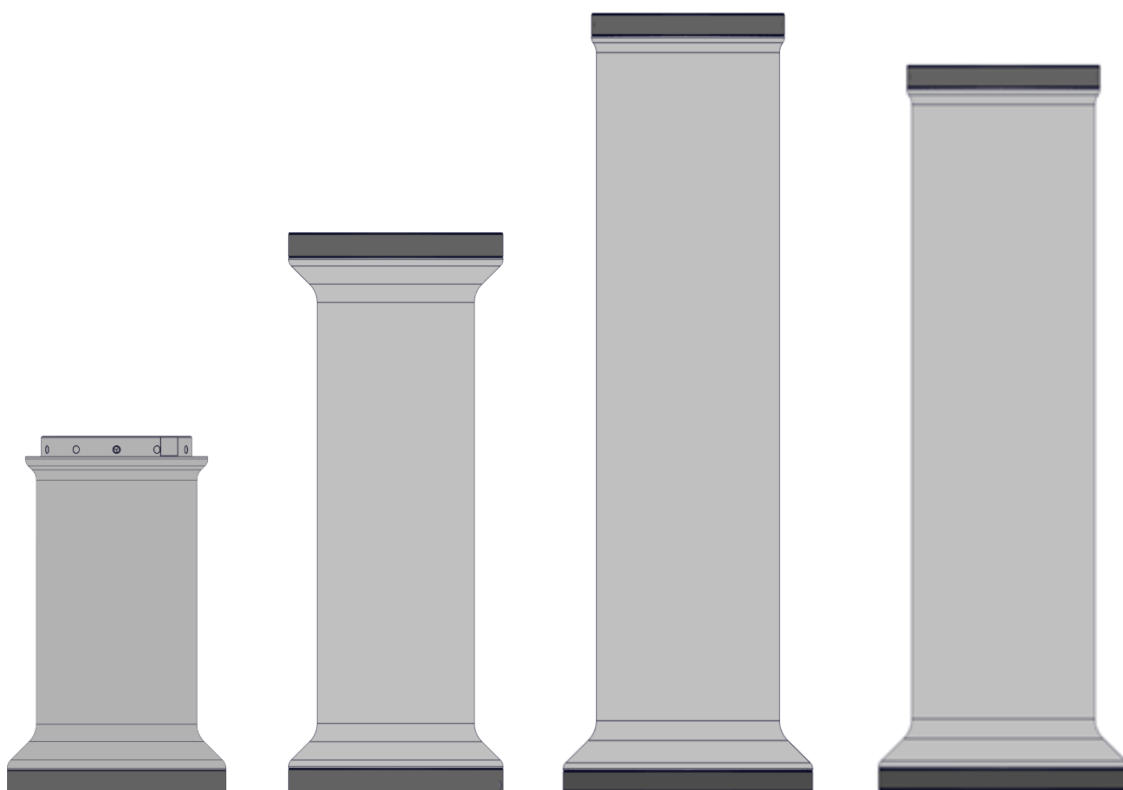
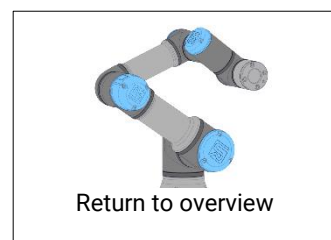


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Elbow joint for UR10e/UR16e –124031

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 3	103700	145
2	2	Bracket connection incl. bolts and seals size 1	N/A	N/A
3	1	Wear ring size 3	103700	145
4	1	Elbow, size 3	N/A	N/A
5	1	O-ring for lid size 3	103410	148
6	1	Lid size 3	103410	148
7	3	Screws for lid size 3	103410	148

Upper arm – N/A

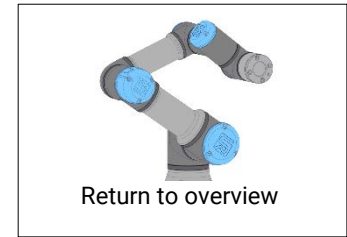
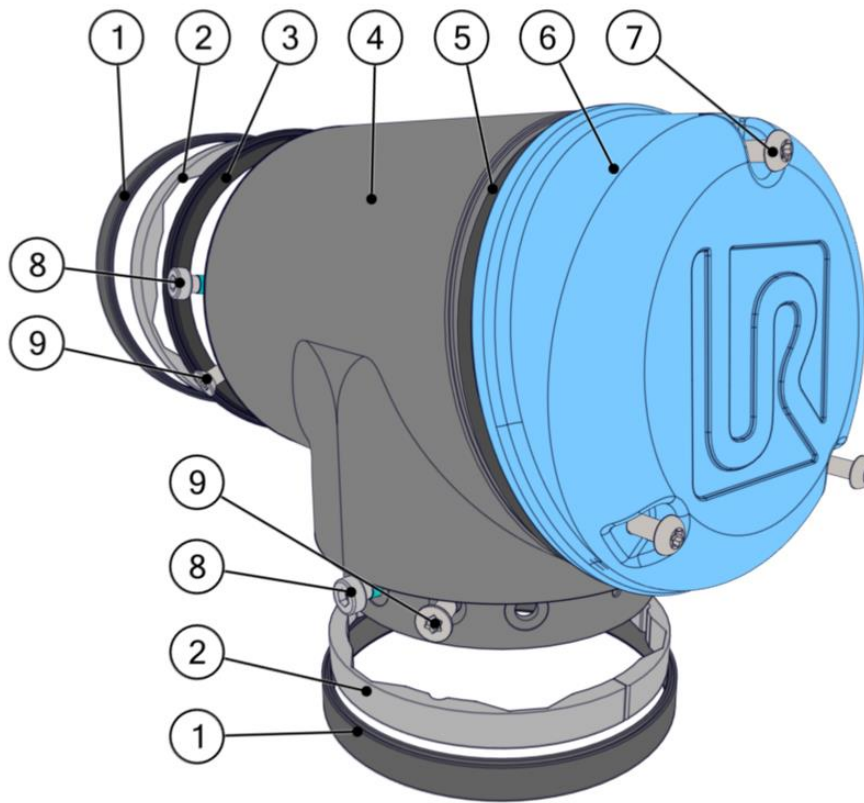


Upper arm assembly – N/A

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
	1	Upper arm assembly UR3e	N/A	N/A
	1	Upper arm assembly UR5e	N/A	N/A
	1	Upper arm assembly UR10e	N/A	N/A
	1	Upper arm assembly UR16e	N/A	N/A

Contact your preferred distributor for part number and availability.

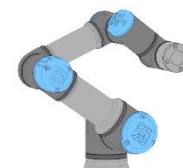
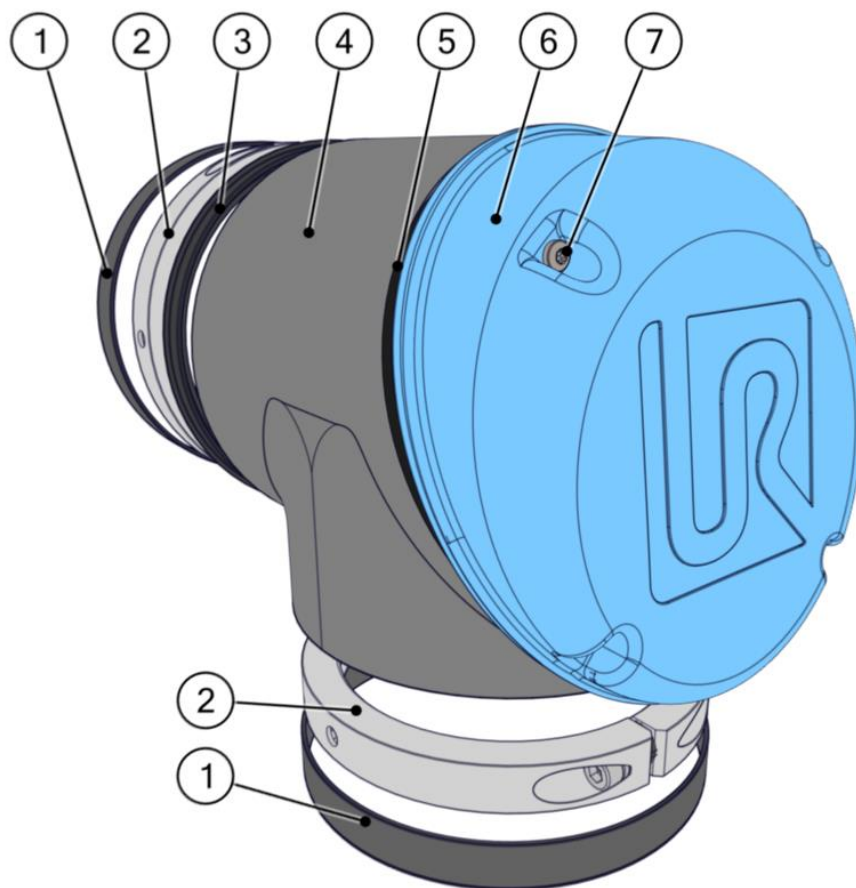
Shoulder joint for UR3e – 124021



Shoulder joint for UR3e – 124021

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 2	103703	143
2	2	Form ring for size 2	103703	143
3	1	Wear ring for size 2	103703	143
4	1	Shoulder, size 2	N/A	N/A
5	1	O-ring for lid size 2	103413	146
6	1	Lid size 2	103413	146
7	3	Screws for lid size 2	103413	146
8	20	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Shoulder joint for UR5e – 124031

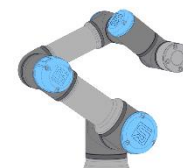
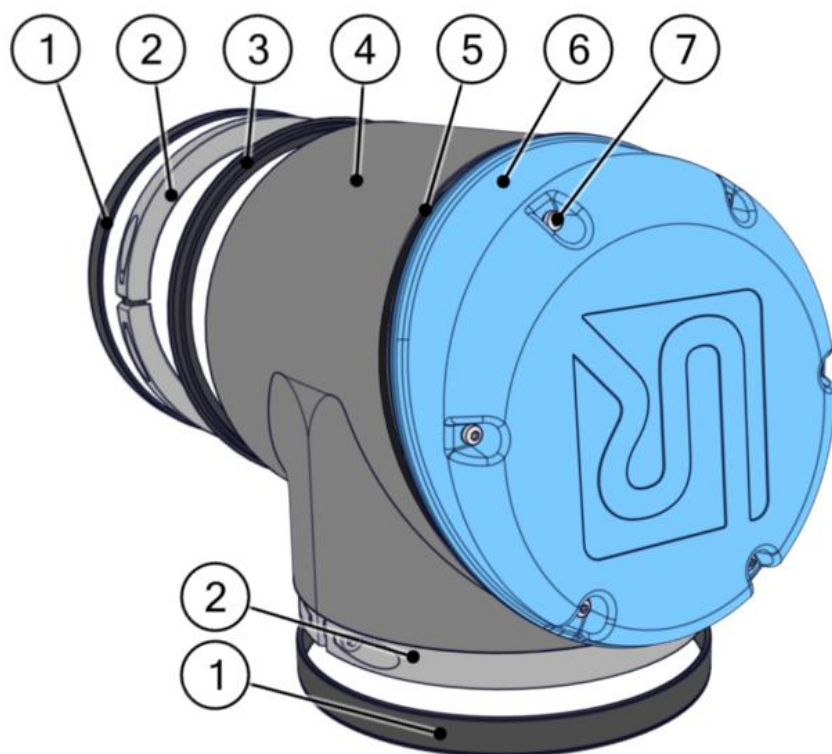


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Shoulder joint for UR5e – 124031

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 3	103705	144
2	2	Bracket connection incl. bolts and seals size 3	N/A	N/A
3	1	Wear ring size 3	103705	144
4	1	Shoulder, size 3	N/A	N/A
5	1	O-ring for lid size 3	103405	147
6	1	Lid size 3	103405	147
7	4	Screws for lid size 3	103405	147

Shoulder joint for UR10e/UR16e – 124041

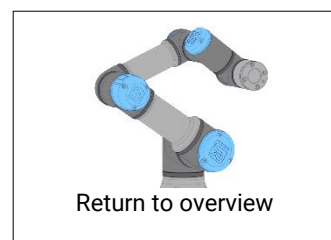
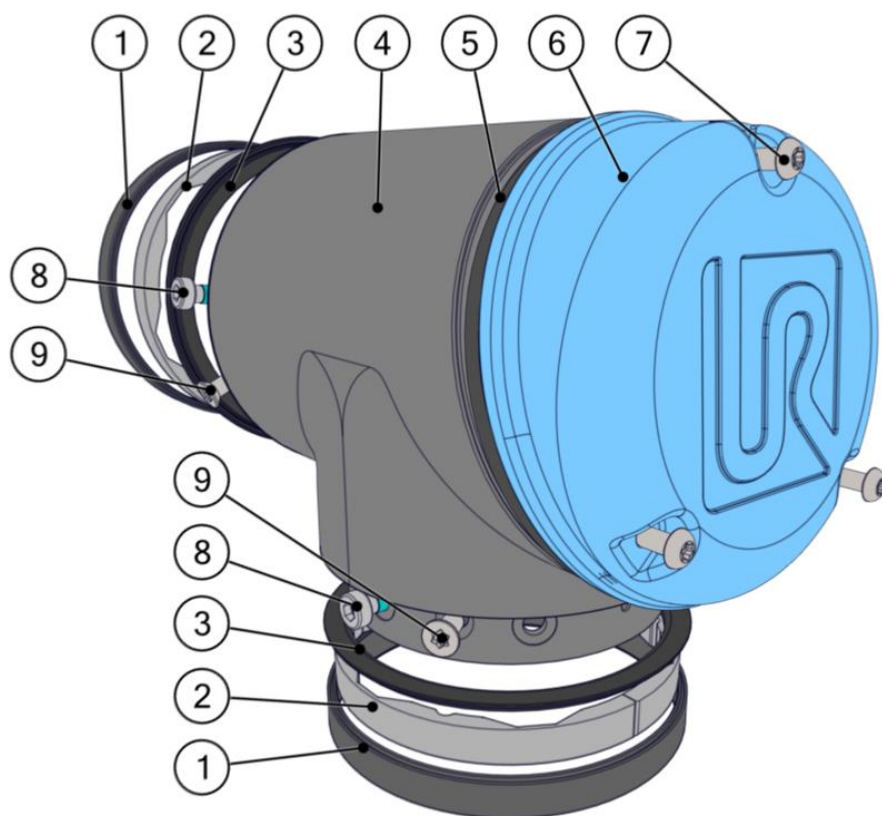


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Shoulder joint for UR10e/UR16e – 124041

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 4	103700	145
2	2	Bracket connection incl. bolts and seals size 4	N/A	N/A
3	1	Wear ring size 4	103700	145
4	1	Shoulder, size 4	N/A	N/A
5	1	O-ring for lid size 4	103410	148
6	1	Lid size 4	103410	148
7	6	Screws for lid size 4	103410	148

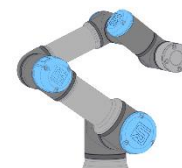
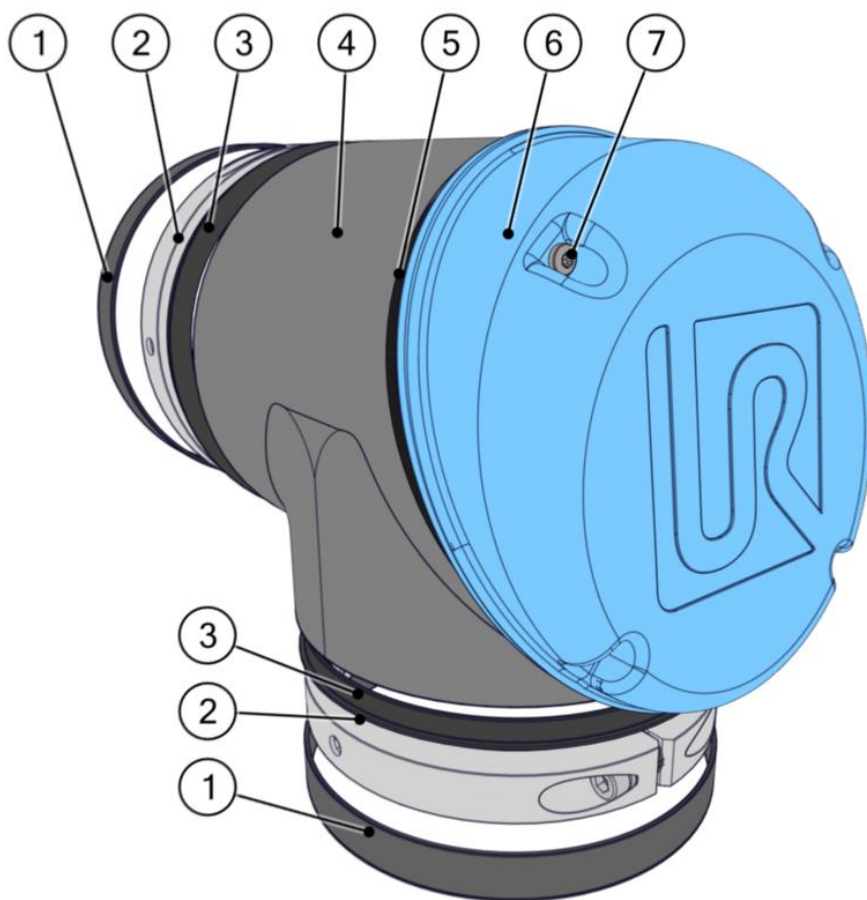
Base joint for UR3e – 124021



Base joint for UR3e – 124021

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 2	103703	143
2	2	Form ring for size 2	103703	143
3	2	Wear ring for size 2	103703	143
4	1	Base joint, size 2	N/A	N/A
5	1	O-ring for lid size 2	103413	146
6	1	Lid size 2	103413	146
7	3	Screws for lid size 2	103413	146
8	20	Screws	N/A	N/A
9	6	Screws counter sunk	N/A	N/A

Base joint for UR5e – 124031

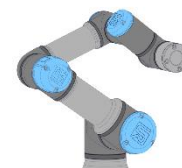
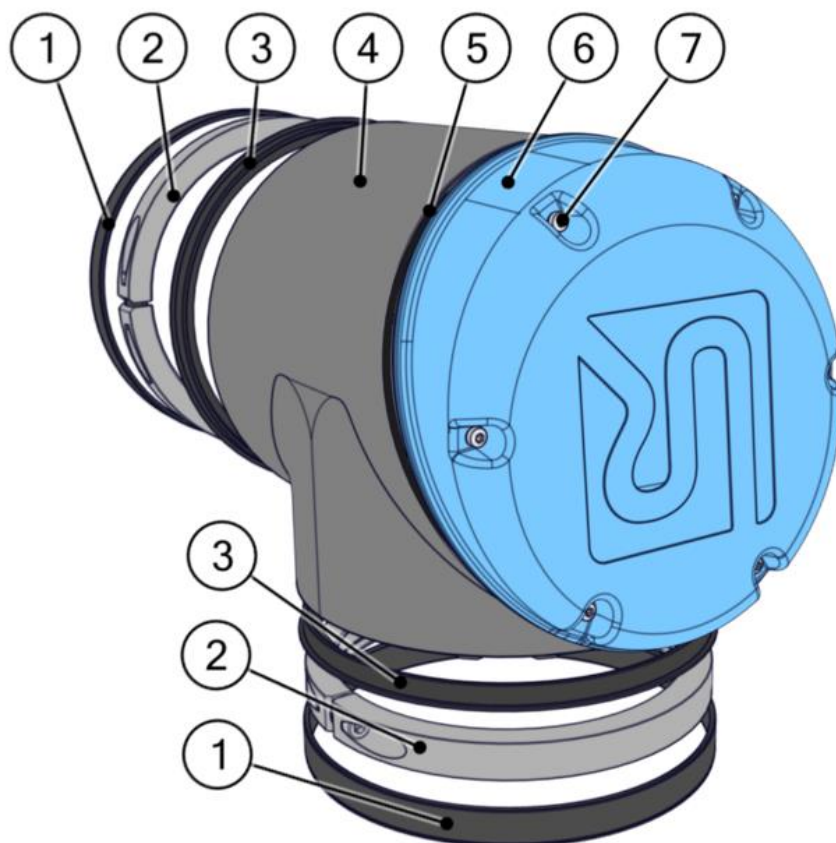


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Base joint for UR5e – 124031

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 3	103705	144
2	2	Bracket connection incl. bolts and seals size 3	N/A	N/A
3	2	Wear ring size 3	103705	144
4	1	Base joint, size 3	N/A	N/A
5	1	O-ring for lid size 3	103405	147
6	1	Lid size 3	103405	147
7	3	Screws for lid size 3	103405	147

Base joint for UR10e/UR16e –124041

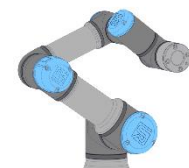
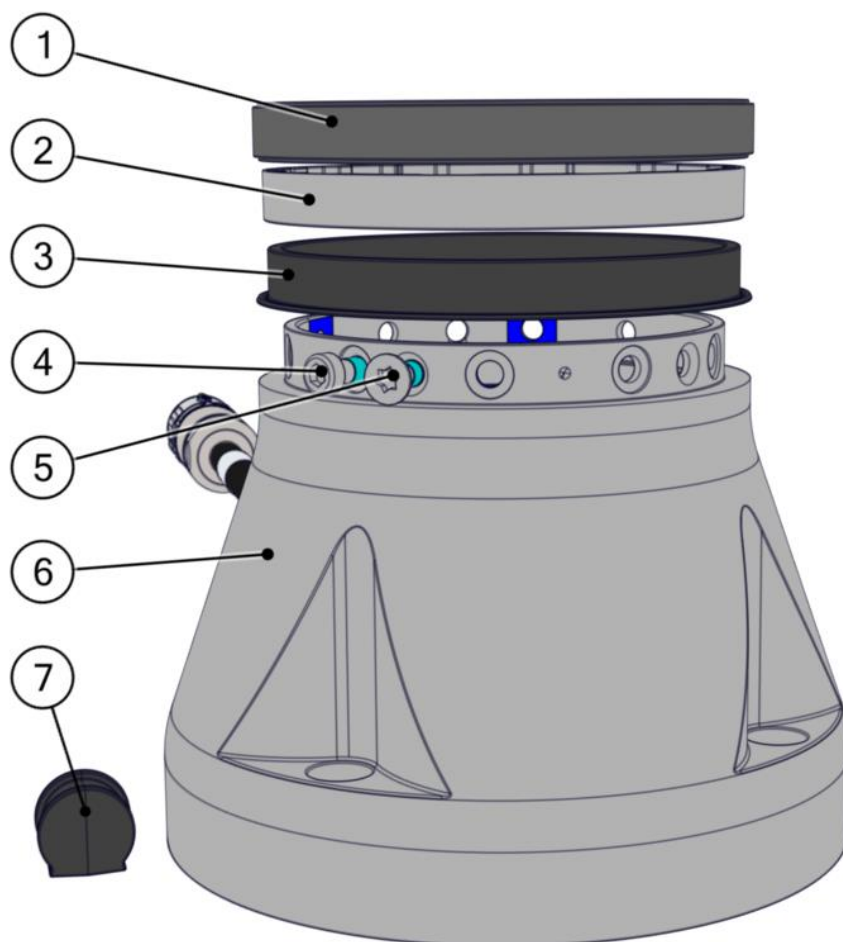


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Base joint for UR10e/UR16e –124041

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Flat ring for size 4	103700	145
2	2	Bracket connection incl. bolts and seals size 4	N/A	N/A
3	2	Wear ring size 4	103700	145
4	1	Base joint, size 4	N/A	N/A
5	1	O-ring for lid size 4	103410	148
6	1	Lid size 4	103410	148
7	6	Screws for lid size 4	103410	148

Base with Robot Arm cable for UR3e – 122083

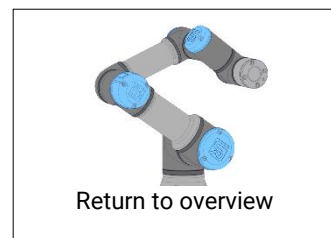
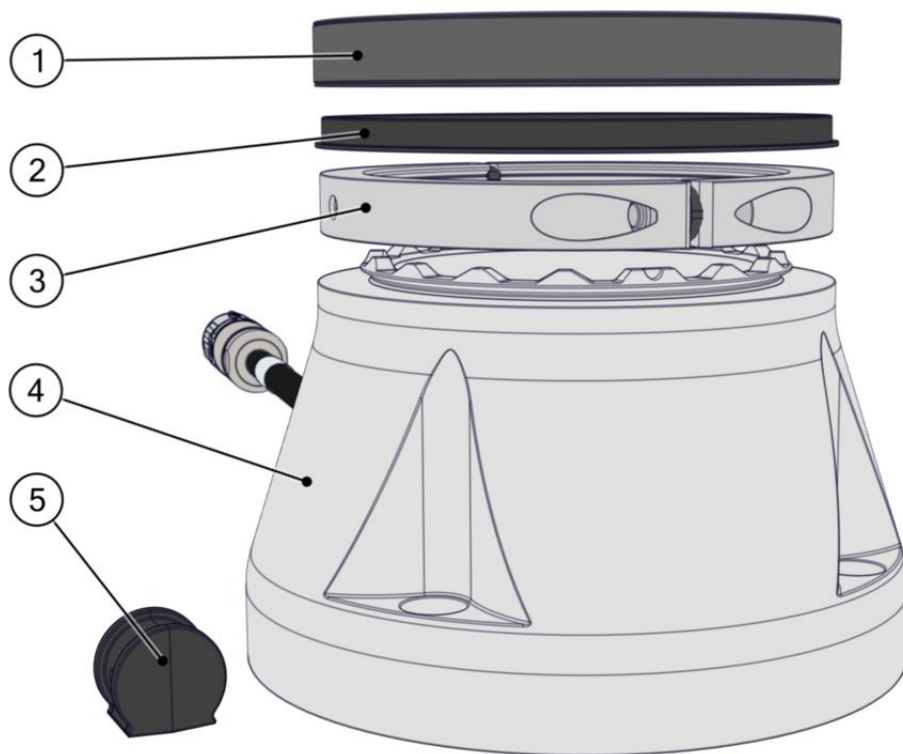


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Base with Robot Arm cable for UR3e – 122083

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Flat ring for size 2	103703	143
2	1	Form ring for size 2	103703	143
3	1	Wear ring for size 2	103703	143
4	10	Screws	N/A	N/A
5	3	Screws counter sunk	N/A	N/A
6	1	Base incl. cable, size 2	N/A	N/A
7	1	Plug for Base	N/A	N/A

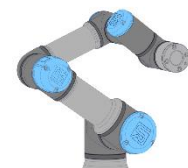
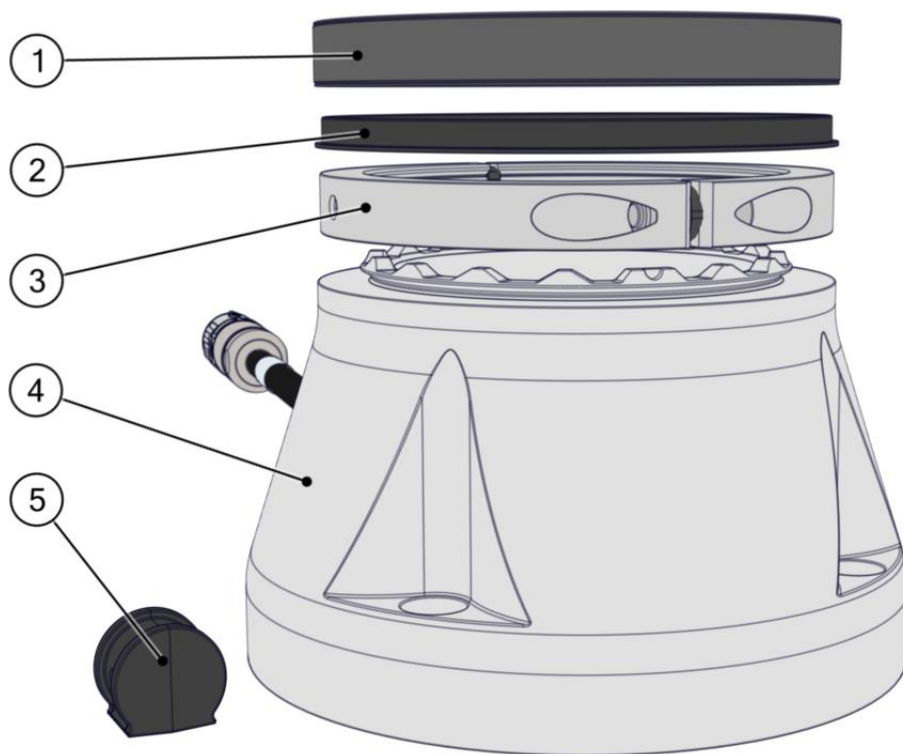
Base with Robot Arm cable for UR5e – 122085



Base with Robot Arm cable for UR5e – 122085

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Flat ring for size 3	103705	144
2	1	Wear ring for size 3	103705	144
3	1	Bracket connection incl. bolts and seals size 3	N/A	N/A
5	1	Base incl. cable, size 3	N/A	N/A
6	1	Plug for Base	N/A	N/A

Base with Robot Arm cable for UR10e/UR16e – 122080

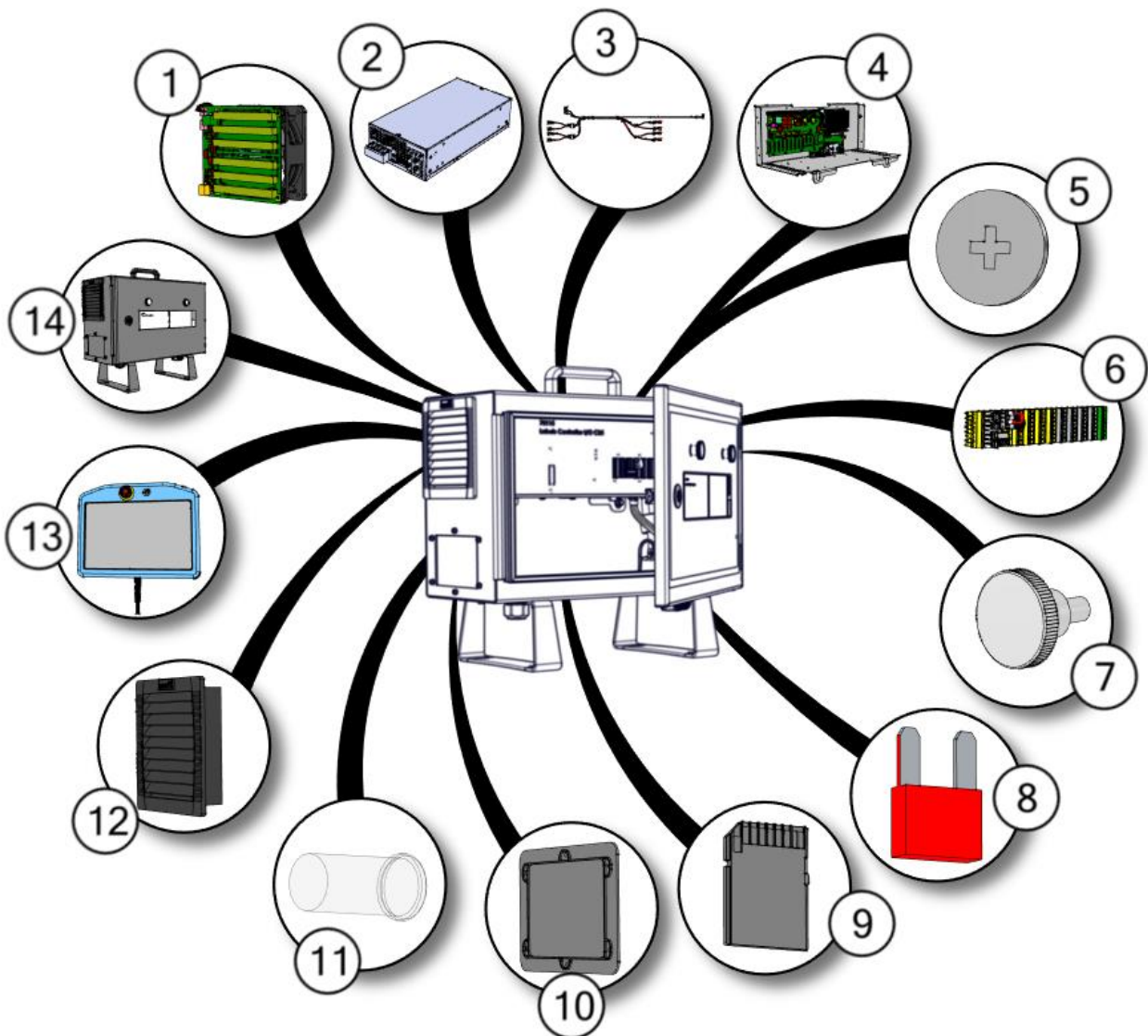


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Base with Robot Arm cable for UR10e/UR16e – 122080

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Flat ring for size 4	103700	145
2	1	Wear ring for size 4	103700	145
3	1	Bracket connection incl. bolts and seals size 4	N/A	N/A
5	1	Base incl. cable, size 4	N/A	N/A
6	1	Plug for Base	N/A	N/A

8.2 Control Box

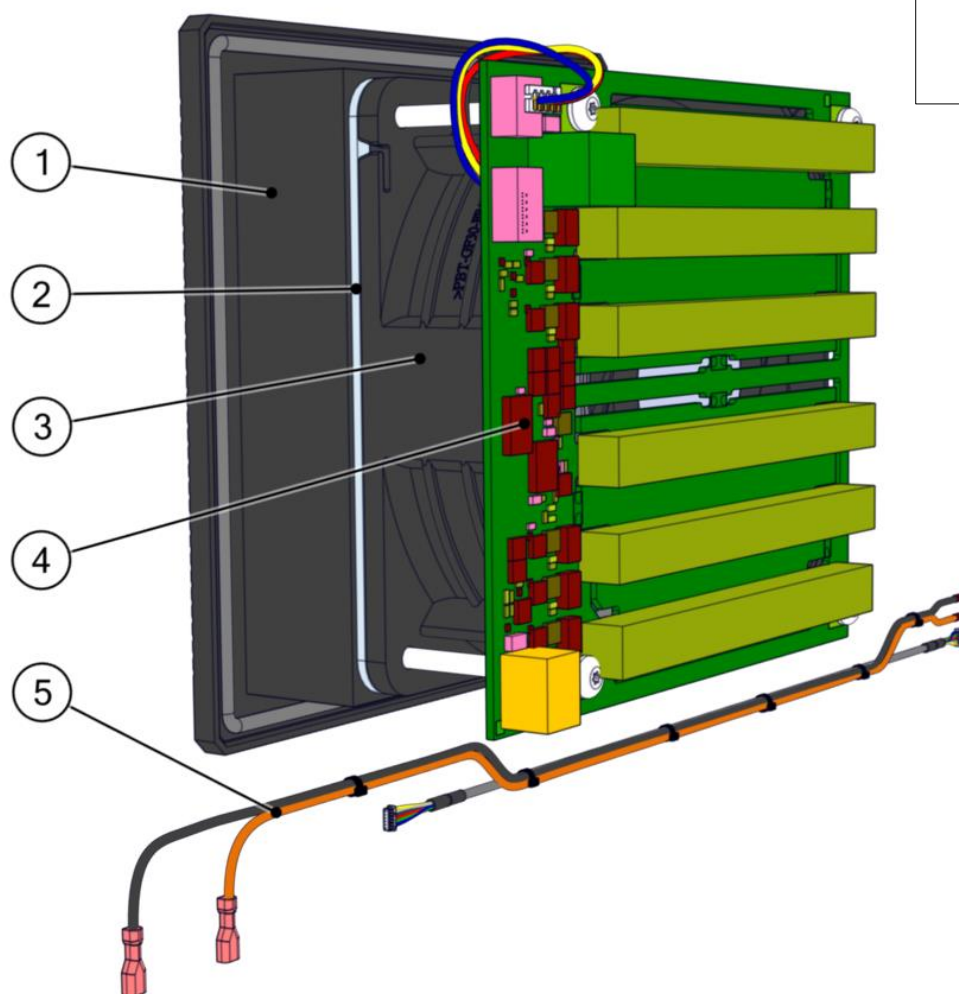
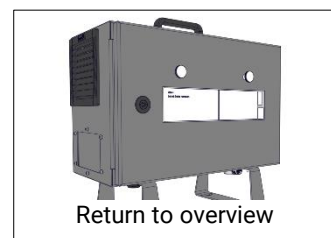


Click on the page no. in the right column to see part in detail or go to the page.

NO.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	Fan & Energy Eater	122750	177
2	Power Supply	177525/177526/177005	178
3	Wire bundle Power Supply Unit	164071/164072	180
4	Control Board	124511	181
5	Battery for Control Board	170009	182
6	Terminals for Control Board	104007	183
7	Teach Pendant and Control Box mounting bolt	105202	184
8	Fuse for Control Board	170008	185
9	SD Card for Control Board	170010/170013	186
10	Cover plate with seal for Control Box	103240	187
11	Light Pipe for Control Box	170007	188
12	Fan housing and filter for Control Box	104008/170020	189
13	Teach Pendant	124091	190
14	Control Box	124500/124510	191

NOTE: If nothing is mentioned, the parts will also fit OEM version Control Box.

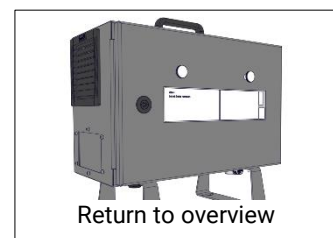
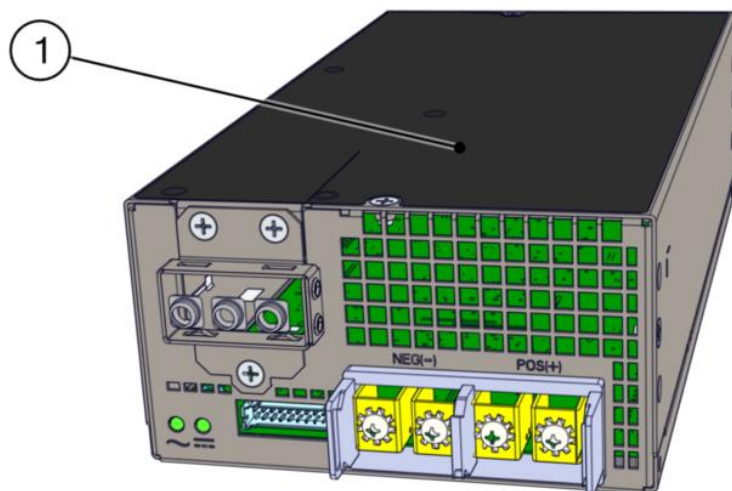
Fan & Energy Eater assembly – 122750



Fan & Energy Eater assembly – 122750

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Housing for filter incl. filter sheet	104008	189
2	1	Plate Fan Spacer Disc	N/A	N/A
3	1	Fan	N/A	N/A
4	1	Energy Eater PCB	N/A	N/A
5	1	Wire bundle	N/A	N/A

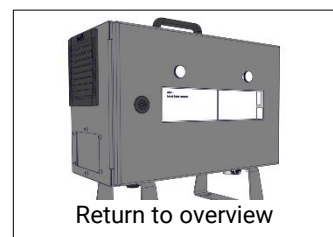
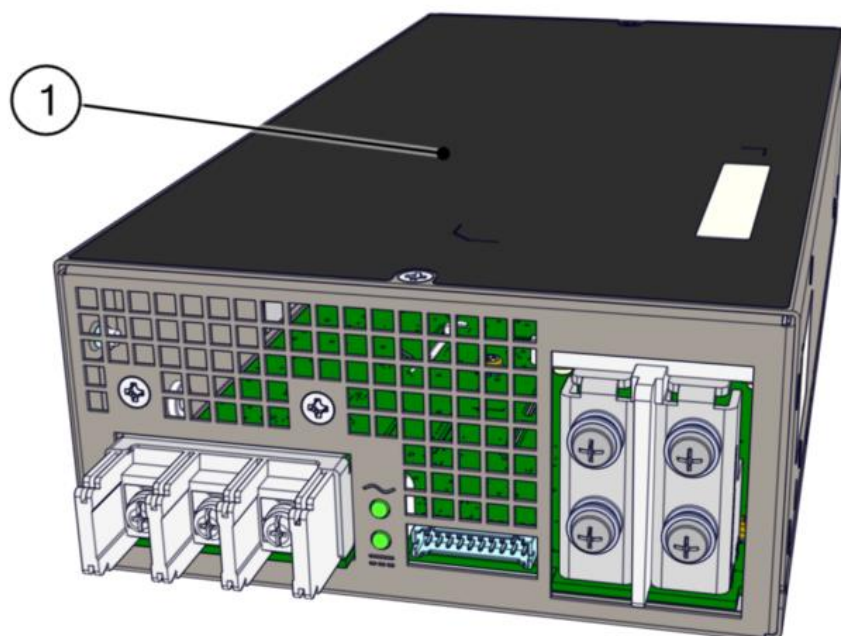
Power Supply for UR3e – 177525



Power Supply for UR3e – 177525

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Power Supply for UR3e	177525	178

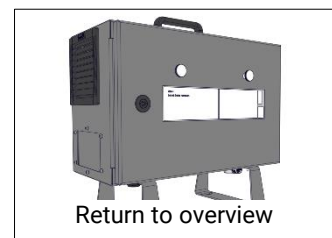
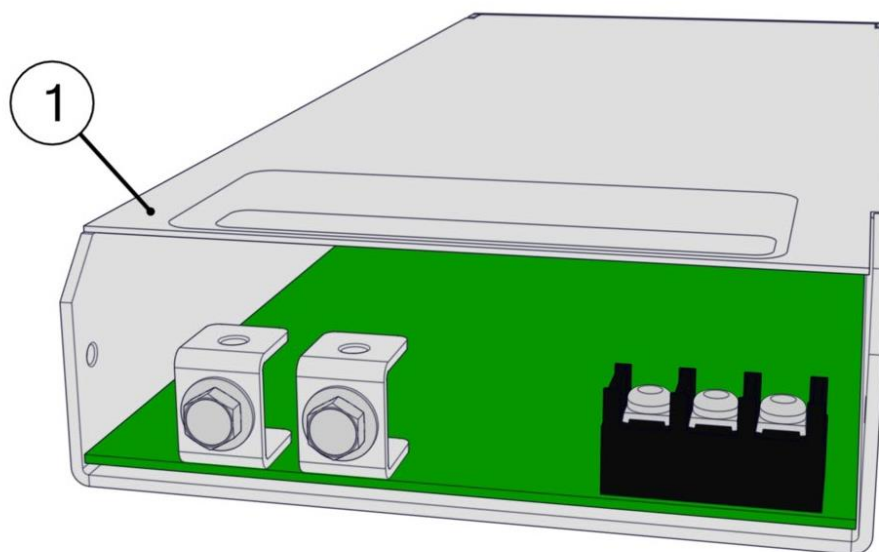
Power Supply for UR5e/UR10e/UR16e/OEM AC – 177526



Power Supply for UR5e/UR10e/UR16e/OEM AC – 177526

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Power Supply for UR5e/UR10e/UR16e/OEM AC	177526	178

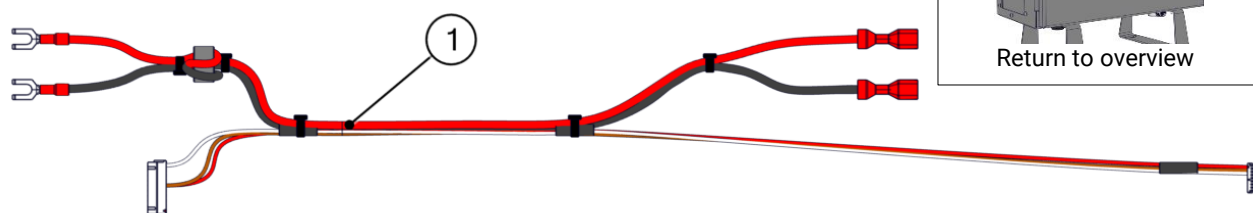
Power Supply for OEM DC – 177005



Power Supply for OEM DC – 177005

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Power Supply for OEM DC	177005	179

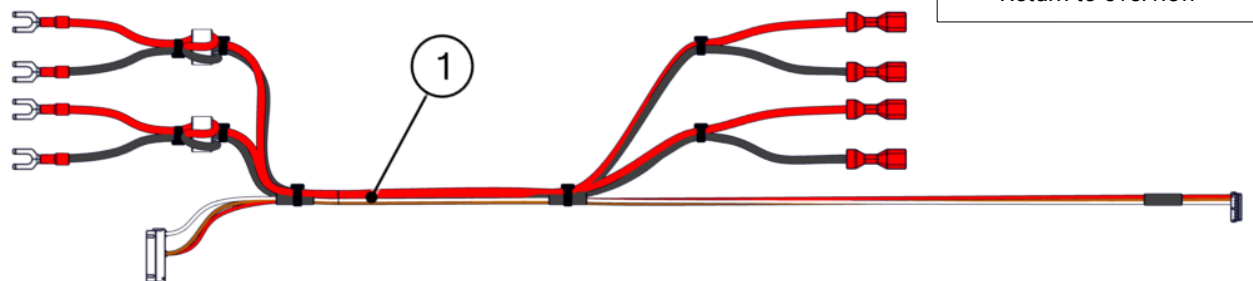
Wire bundle from Power Supply to Control Board UR3e – 164071



Wire bundle from Power Supply to Control Board UR3e – 164071

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Wire bundle from Power Supply to Control Board UR3e	164071	180

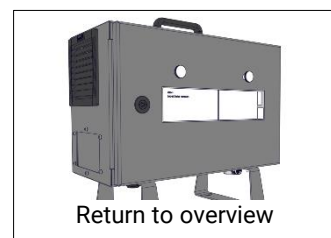
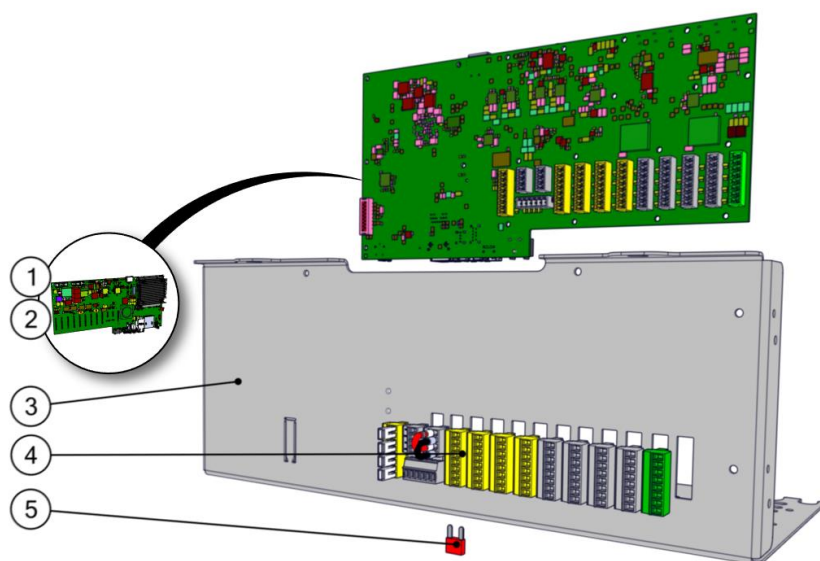
Wire bundle from Power Supply to Control Board UR5e/UR10e/UR16e/OEM AC – 164072



Wire bundle from Power Supply to Control Board UR5e/UR10e/UR16e/OEM AC – 164072

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Wire bundle from Power Supply to Control Board UR5e, UR10e, UR16e, OEM AC	164072	180

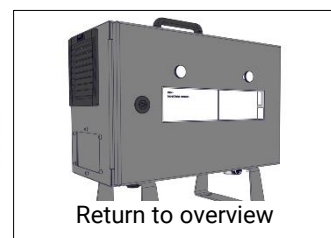
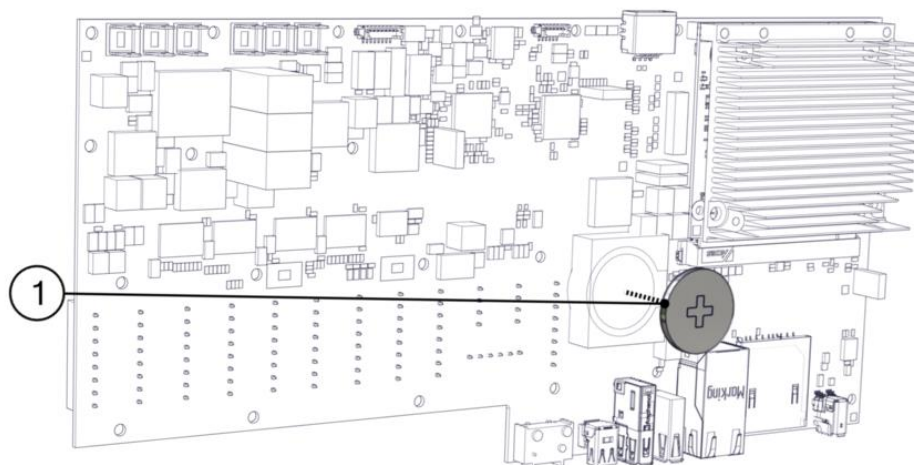
Control Board Assembly – 124511



Control Board Assembly – 124511

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Control Board PCB	N/A	N/A
2	1	Battery for Control Board PCB	170009	182
3	1	Control Board Bracket	N/A	N/A
4	1	Control Board Terminal set	104007	183
5	1	Fuse Mini Blade 10A	170008	185

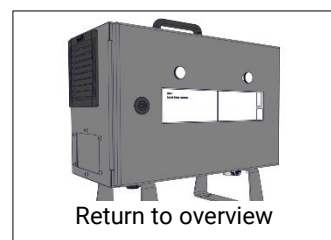
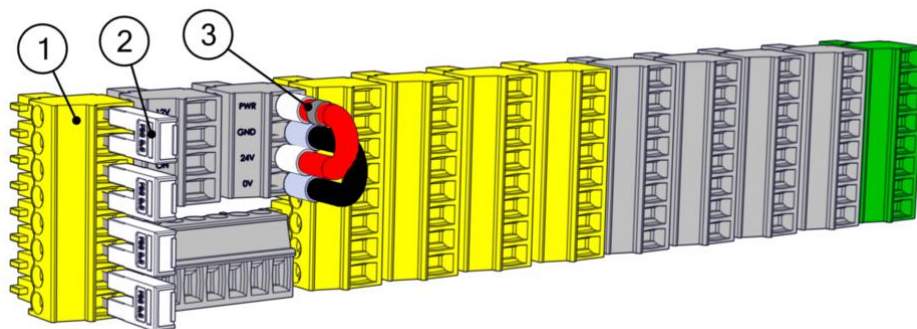
Battery for Control Board PCB - 170009



Battery for Control Board PCB - 170009

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Battery for Control Board PCB	170009	182

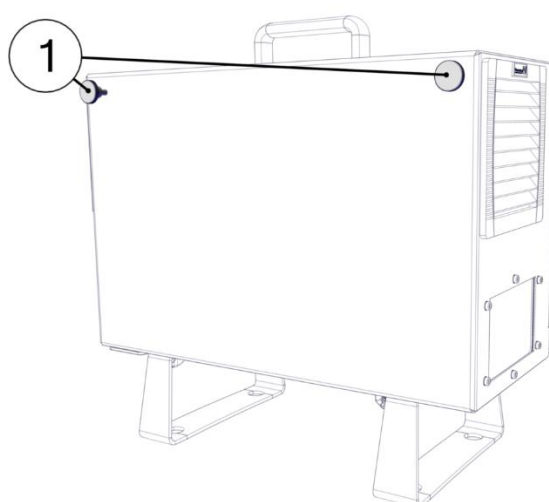
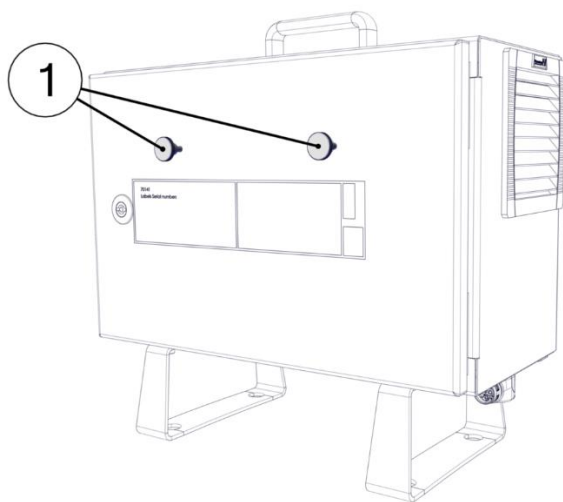
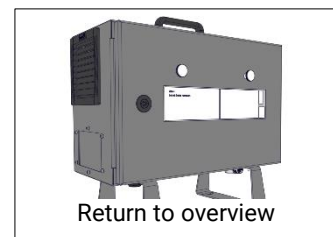
Terminal set for Control Board – 104007



Terminal set for Control Board – 104007

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	13	Terminals for Control Board	104007	183
2	4	Jumpers for Safety Terminal	N/A	N/A
3	2	Jumpers for external 24V power	N/A	N/A

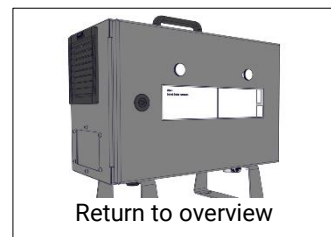
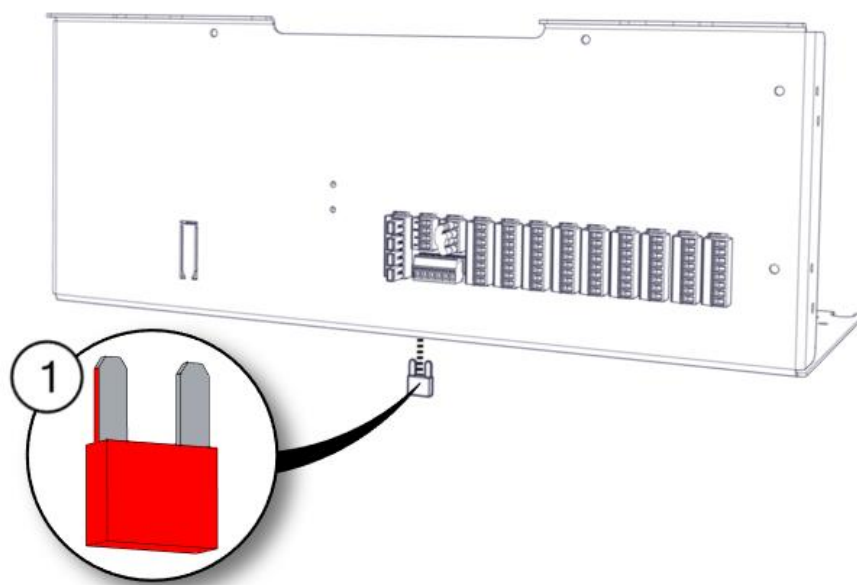
Teach Pendant and Control Box mounting bolts – 105202



Teach Pendant and Control Box mounting bolts – 105202

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	10	Teach Pendant and Control Box mounting bolts	105202	184

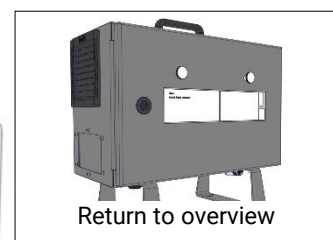
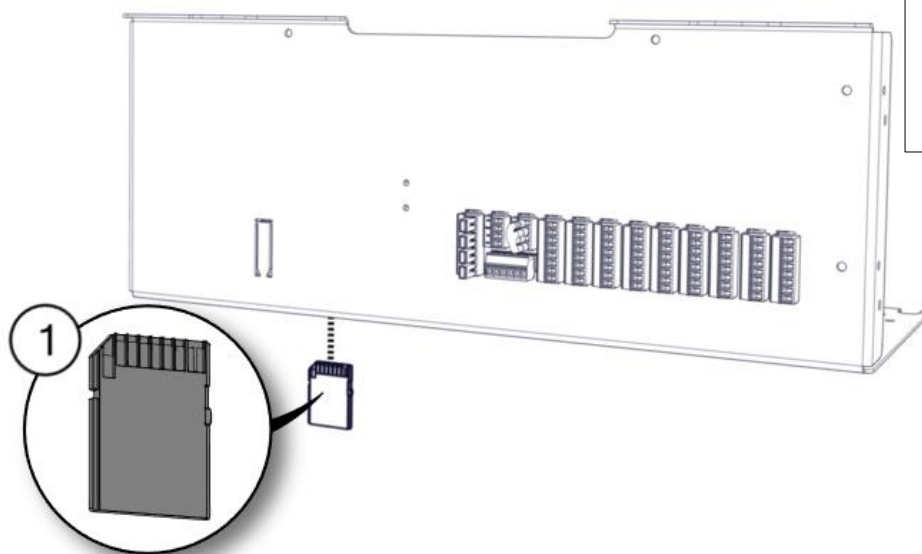
Fuse for Control Board – 170008



Fuse for Control Board – 170008

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	10	Fuse Mini Blade 10A	170008	185

SD card for Control Board – 170010/170013



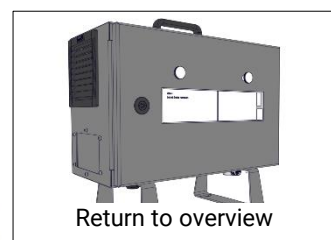
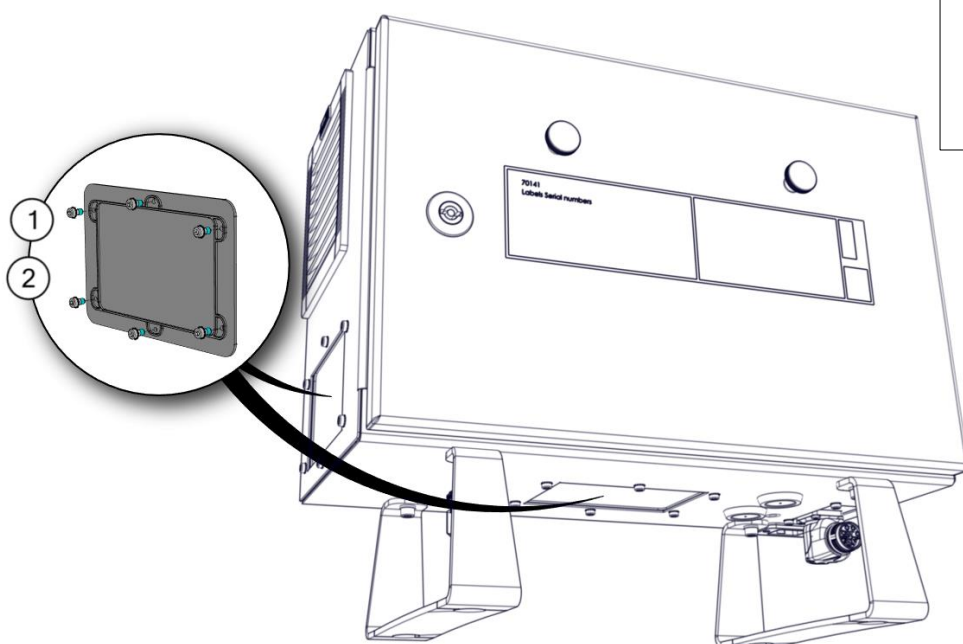
SD Card for Control Board incl. Software and License - 170010

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	SD Card for Control Board excl. software	170010	186

SD Card for Control Board excl. software - 170013

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	SD Card for Control Board incl. Software and License	170013	186

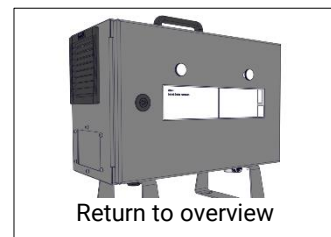
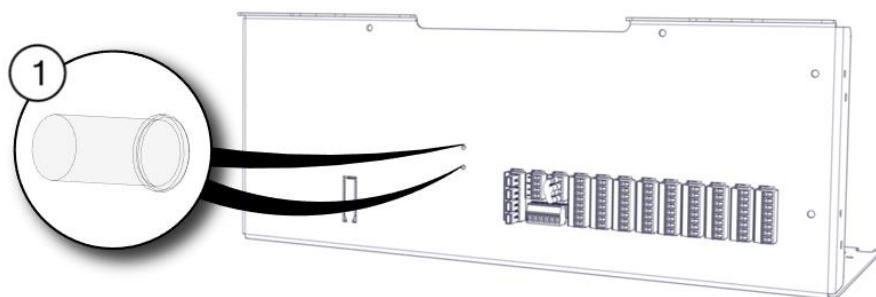
Cover plate with seal – 103240



Cover plate with seal for Control Box - 103240

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Cover plate with seal for Control Box	103240	187
2	12	Screw and tooth washer for cover plate	N/A	N/A

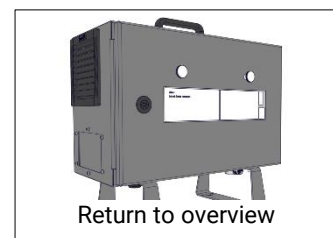
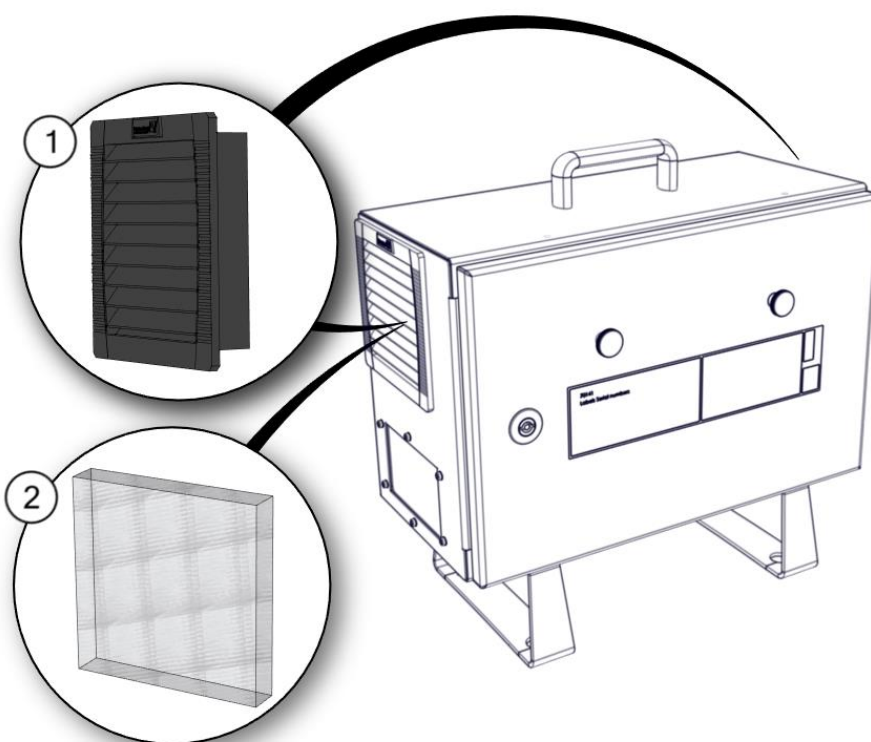
Light pipes for control box - 170007



Light pipes for control box - 170007

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	2	Light Pipes for Control Box	170007	188

Fan housing and filter for Control Box – 104008/170020



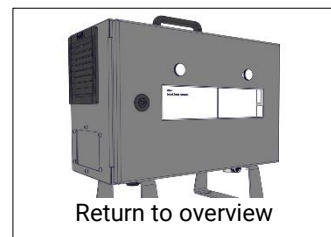
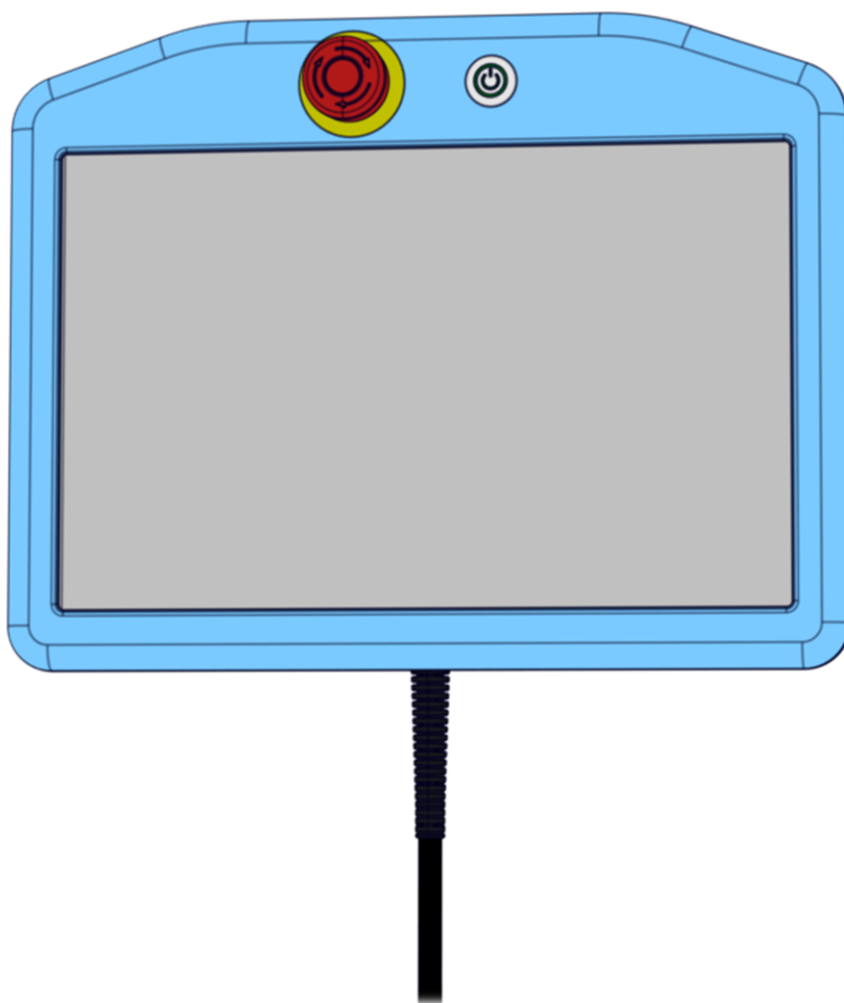
Housing and filter for Control Box incl. filter sheets - 104008

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Housing for Control Box	104008	189
2	5	Filter material sheets	170020	189

Filter material sheets - 170020

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
2	5	Filter material sheets	170020	189

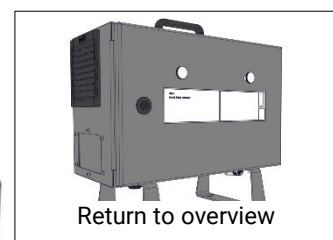
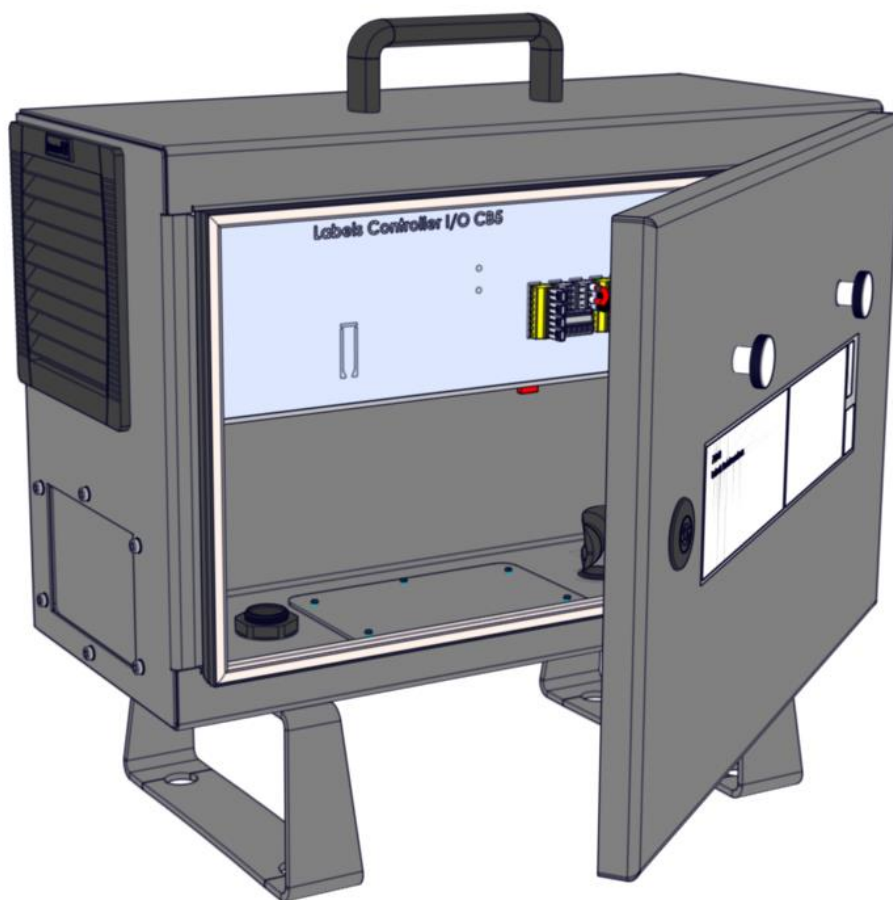
Teach Pendant - 124091



Teach Pendant - 124091

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Teach Pendant	124091	190

Control Box – 124500/124510



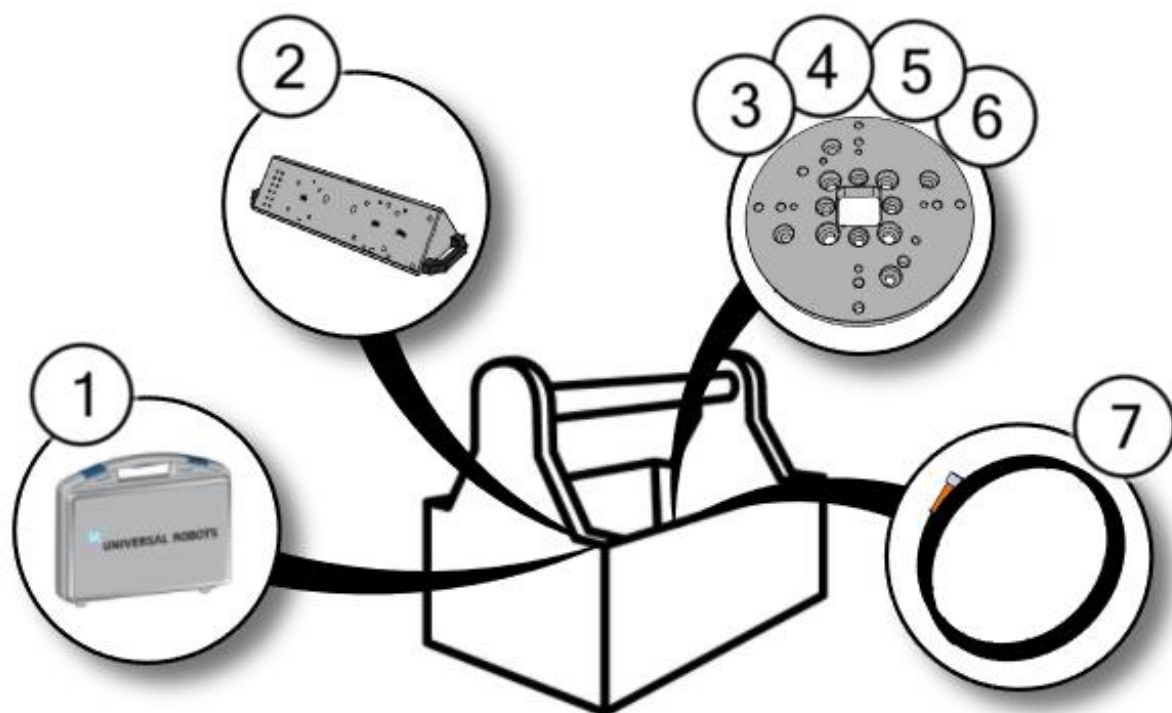
Control Box for UR3e excl. Teach Pendant - 124500

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Control Box for UR3e excl. Teach Pendant	124500	191

Control Box for UR5e/UR10e/UR16e excl. Teach Pendant - 124510

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Control Box for UR5e/UR10e/UR16e excl. Teach Pendant	124510	191

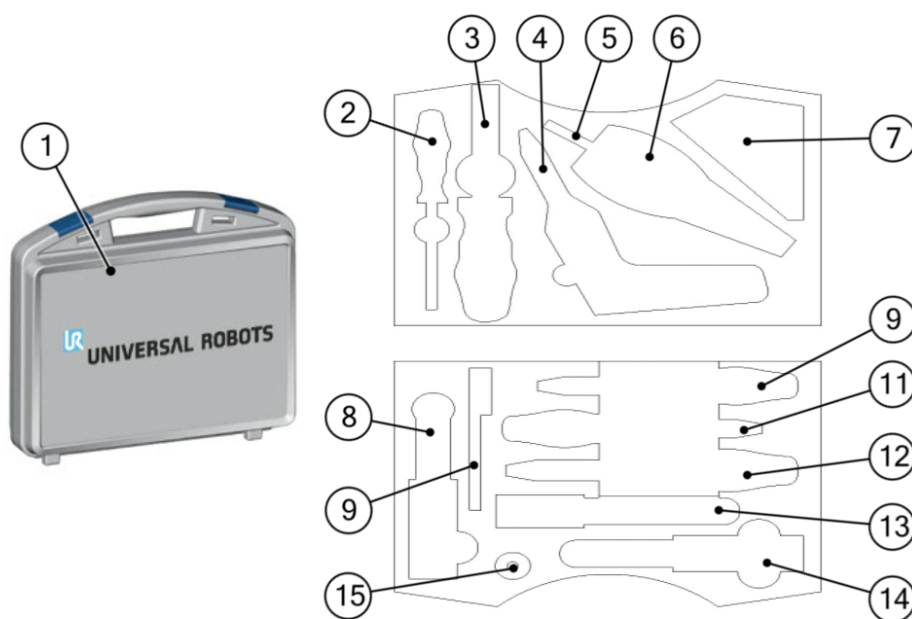
8.3 Tools



Click on the page no. in the right column to see part in detail or go to the page.

NO.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	Service Tools - UR3e/UR5e/UR10e/UR16e	109011	193
2	Dual Robot Calibration Tooling Complete	185500	194
3	Mounting plate Robot Arm UR5e (Item profile)	131501	195
4	Mounting plate Robot Arm UR5e (BOSCH profile)	131501	196
5	Mounting plate Robot Arm UR3e (Item & BOSCH profile)	131502	197
6	Mounting plate Robot Arm UR5e/UR10e/UR16e (Item & BOSCH profile)	131503	198
7	Cable for tool external	131510	199

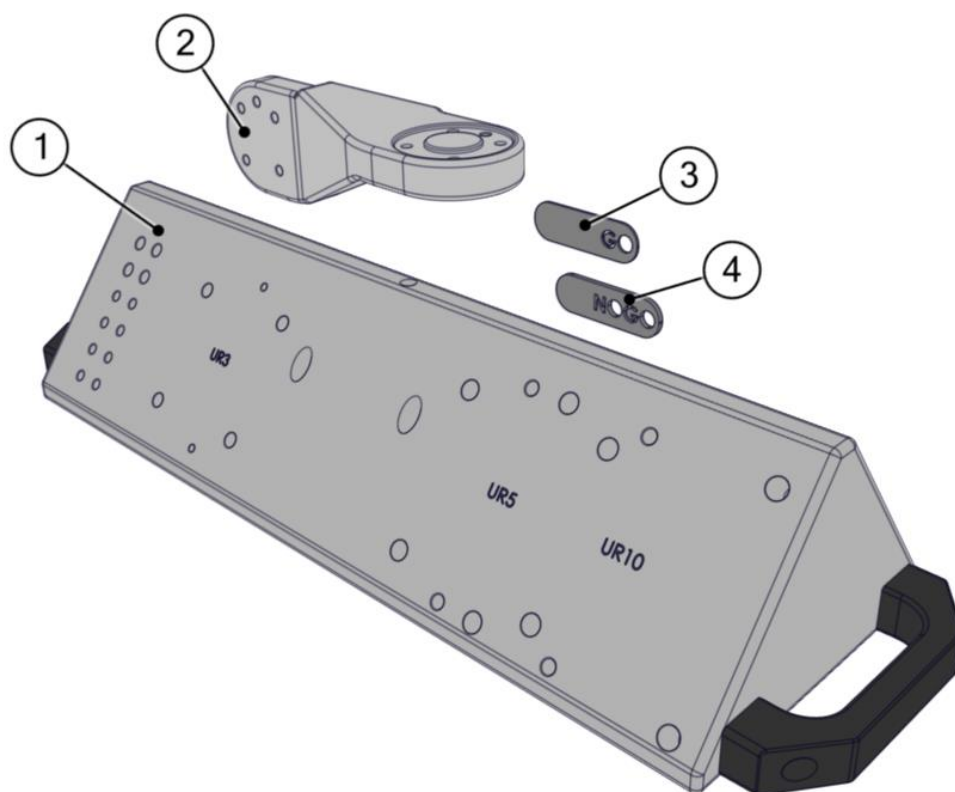
Service tool set – 109011



Service Tool set - 109011

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Service tool set	109011	193
2	1	Screwdriver Flat 2.5	N/A	N/A
3	1	Multi-bit tool incl. bits	109117	N/A
4	1	Screwdriver hex key 4mm. – 5.0Nm for e-Series	109113	N/A
5	1	Socket bit 10mm. for Control Box	109118	N/A
6	1	Needle nose pliers ESD	109122	N/A
7	1	ESD Wrist band	109180	N/A
7	1	By-pass cable	N/A	N/A
8	1	Torque wrench hex 10.0mm. – 8.0Nm for CB-Series	109107	N/A
9	1	Spanner 5.5mm.	109101	N/A
9	1	Spanner 7.0mm.	109102	N/A
9	1	Spanner 10.0mm.	109110	N/A
10	1	Torque screwdriver ESD TX8 – 0.4Nm	109114	N/A
11	1	Torque screwdriver ESD TX10 – 1.3Nm	109115	N/A
12	1	Torque screwdriver ESD TX20 – 3.0Nm	109116	N/A
13	1	Torque wrench hex 5.5mm. – 1.3Nm for CB-Series	109105	N/A
14	1	Torque wrench hex 7.0mm. – 2.6Nm for CB-Series	109106	N/A
15	1	Torx TX10 bit for 109114	109120	N/A

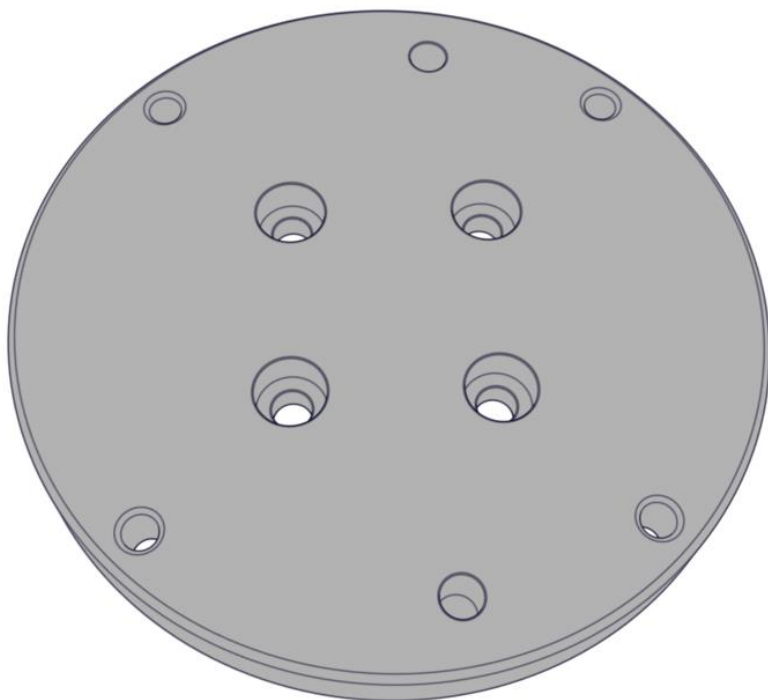
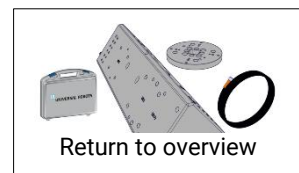
Dual Robot Calibration Tooling - 185500



Dual Robot Calibration Tooling - 185500

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Tooling Dual Robot Calibration Horse complete with mounting screws	N/A	N/A
2	1	Tooling Dual Robot Calibration Tool Connector complete with mounting screws	N/A	N/A
3	1	Tooling Calibration GO tool	N/A	N/A
4	1	Tooling Calibration NAGO tool	N/A	N/A

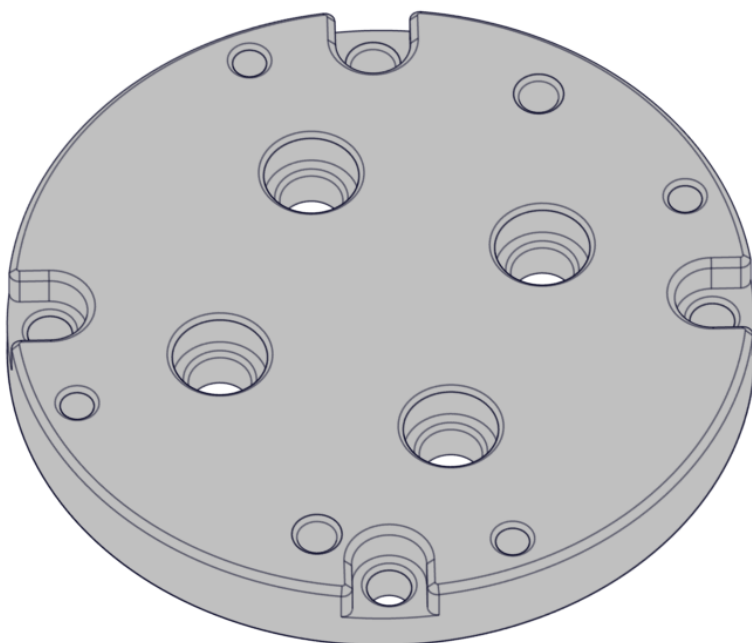
Mounting plate Robot Arm UR5e(Item profile) - 131501



Mounting plate Robot Arm UR5e(Item profile) - 131501

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Mounting plate Robot Arm UR5e(Item profile)	131501	195

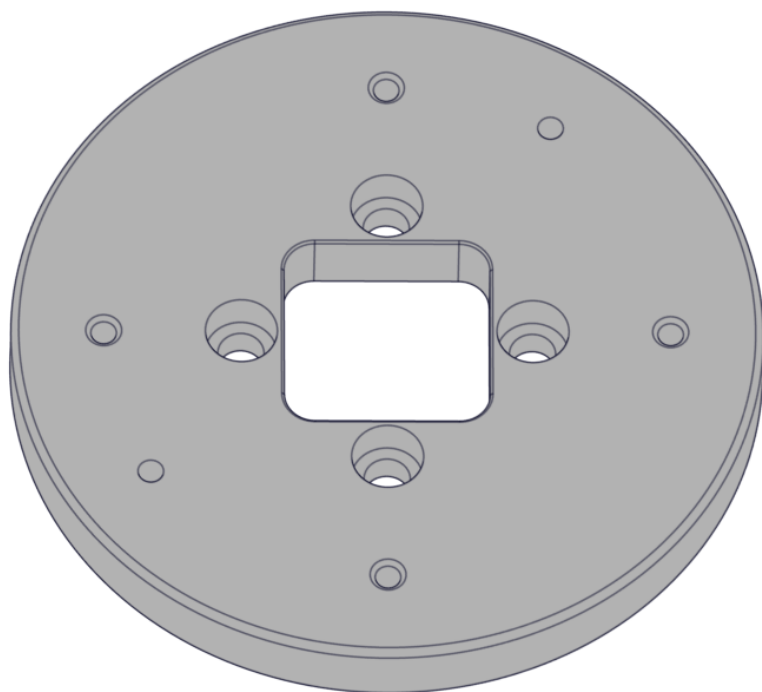
Mounting plate Robot Arm UR5e(BOSCH profile) - 131502



Mounting plate Robot Arm UR5e(BOSCH profile) - 131502

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Mounting plate Robot Arm UR5e(BOSCH profile)	131502	196

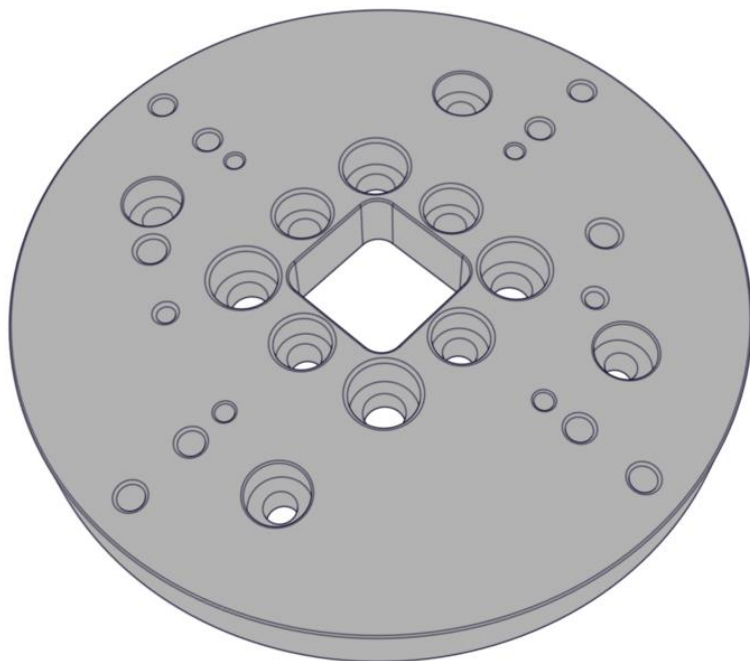
Mounting plate Robot Arm UR3e(Item & BOSCH profile) - 135103



Mounting plate Robot Arm UR3e(Item & BOSCH profile) - 135103

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Mounting plate Robot Arm UR3e (Item & BOSCH profile)	131503	197

Mounting plate Robot Arm UR5e/UR10e/UR16e(Item & BOSCH profile) - 131510



Mounting plate Robot Arm UR5e/UR10e/UR16e(Item & BOSCH profile) - 131510				
NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Mounting plate Robot Arm UR5e/UR10e/UR16e (Item & BOSCH profile)	131510	198

Cable for tool external - 173101



Cable for tool external - 173101

NO.	QTY.	DESCRIPTION	PART NUMBER(S)	PAGE NO.
1	1	Cable for tool external	173101	199

NOTE: Cable is with 90° bend connector – not shown on above image

9. Packing and Shipping of Robot/Spare Parts

BEFORE SHIPPING ANY ROBOTS OR SPARE PARTS BACK TO UNIVERSAL ROBOTS, PLEASE NOTE THE FOLLOWING



NOTICE

- Remove external tools and external electrical connections before shipment.
- Universal Robots may reject the shipment if third party products cannot be unmounted safely, or if they prohibit the execution of required post repair tests.
- Universal Robots assumes no responsibility for the return shipment of third party goods.
- Ensure the robot, Control Box, and Teach Pendant are packed responsibly.
- Universal Robots will return Universal Robots products in original Universal Robots packaging.



NOTICE

The robot software/firmware is updated when repaired. New parts are also updated to their newest versions (hardware/software). Therefore, updating PolyScope may be necessary when new parts are mounted.



MANDATORY ACTION

If the robot/part(s) has been in contact with, or worked in environments, where dangerous chemicals or materials are present, it must be cleaned before shipment. If this is not possible, the shipment must be accompanied by an MSDA (Material Safety Data Sheet) in English and include instructions for cleaning. The amount of labor hours needed for cleaning will be billed at the standard rate.

If Universal Robots finds the robot/part unsafe to service, UR reserves the right to get the robot/part(s) cleaned or decline the case and send the part(s) back at customers expense.

Packing Down the Robot and Control Box for Shipment

1. Download the put_in_box program at: www.universal-robots.com/support
2. Upload the put_in_box program. See Section 5.2 Using Magic Files on how to do this.
3. Load the program and follow the instructions when running the program.
4. Power down, disconnect main power, and disconnect the Robot Arm from controller.
5. Pack the Robot Arm and Control Box in designated boxes. Ensure the Robot Arm is orientated correctly in the box.

10. Change log

Date	Revision	Action	Changes
June 2018	1.0.0	Started	Service Manual e-Series English
August 2018	1.0.1	Corrected	Service tool part number
September 2018	1.0.2	Added	Descriptions to error codes
		Added	Inspection plan to section 3
October 2018	1.0.2	Added	Detailed spare parts list
March 2019	1.0.3	Correction	New icons for Notice and reading instructions
	1.0.3	Correction	Various text and image corrections
June 2019	1.1.4	Added	UR16e ref.
		Added	OEM AC and DC
		Correction	Various text and image corrections
October 2019	1.1.5	Change	Title and wording in section 3
November 2019	1.1.6	Corrected	Joint part numbers and references.