UNIVERSAL ROBOTS

OEM Control Box

Installation Guide

Compatible robots: UR3e, UR5e, UR10e, UR16e

Original instructions (en)

Contents

1. Introduction

1.1. About this Document

This document describes how to install the OEM Control Box.

> **NOTICE**
> Universal Robots disclaims any liability, even if all guidelines in this document are followed.

1.2. What Does the Box Contain

The box contains the following items:

- The OEM Control Box
- This document
- WAGO 831 four-pole female connector

1.3. Company Details

Universal Robots A/S

Energivej 25, 5260 Odense S, Denmark

+45 89 93 89 89

https://www.universal-robots.com

2. Safety

2.1. 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.

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.

2.2. General Safety Precautions

This section contains general safety precautions, read it before installing or operating the OEM Control Box.

For more information on safety, refer to the Safety section in the robot User Manual.

WARNING

Performing installation or maintenance of equipment connected to a power source can lead to electric shock.

- Ensure that the equipment is disconnected from the power source before performing installation or maintenance.

WARNING

Incorrect connection of the power source or ground wires can result in equipment damage or personnel injury.
Damage caused by invalid power source connection is not covered by warranty. Before starting the operation:

- Ensure that the power source wiring is correct.
- Ensure that the grounding is correct.

CAUTION

Failure to perform installation or maintenance correctly can result in equipment damage or personnel injury.

- Only qualified personnel must perform installation, start-up, and maintenance.

NOTICE

ESD can damage sensitive components in the OEM Control Box.

- Always wear an ESD wrist strap when working with the OEM Control Box electrical interfaces.

CAUTION

Failure to perform a risk assessment before installing and operating the OEM Control Box can result in equipment damage or personnel injury.

- Perform a risk assessment before installing and operating the OEM Control Box.

3. Electrical Installation: AC Mains

This section describes how to connect the OEM Control Box to AC mains. For information on connecting the product to the DC source, see 4. Electrical Installation: DC Source on page 8.

For information on electrical specifications, see section 7.1. Electrical Specifications on page 18.

WARNING

Performing installation or maintenance of equipment connected to a power source can lead to electric shock.

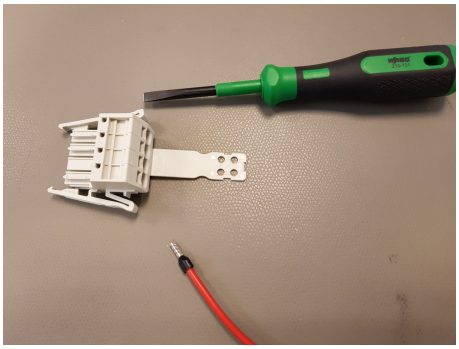
- Ensure that the equipment is disconnected from the power source before performing installation or maintenance.

3.1. Required Items

You need the following items to connect the wires:

- The WAGO 831 four-pole female connector (included with OEM Control Box).
- A flat-bladed screwdriver, blade 5.5 x 0.8 mm. For example, WAGO 210-721.
- Three wires with ferrules.

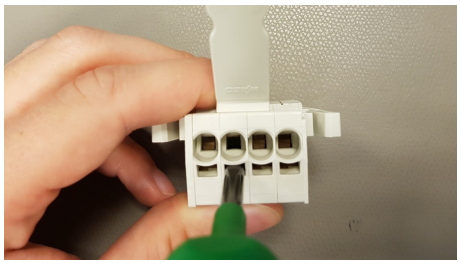
The following illustration shows the required items.



3.2. How to Connect Wires to the Connector

This section describes how to connect wires to a connector with locking levers:

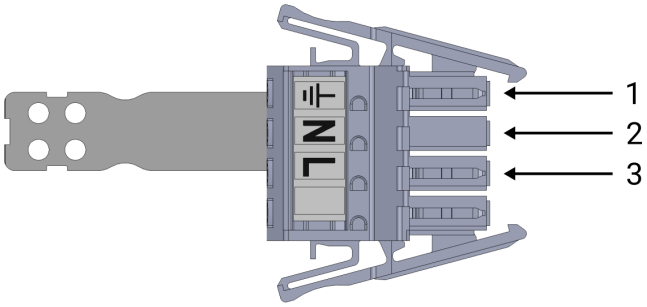
1. Insert the screwdriver into a flat slot next to a connector hole.
2. Push the screwdriver until the clamp inside the hole opens. Keep the screwdriver in the slot.



3. Insert the wire ferrule into the open hole.
4. Ensure that the wire ferrule is firmly placed, remove the screwdriver to close the hole.

3.3. Power Source Wiring

Use the following scheme to attach wires to the connector.



1	Ground	2	Neutral
3	Line		

To connect the OEM Control Box to the power source:

1. Connect the following three wires to the connector:
   - Neutral
   - Line
   - Ground
2. Connect the neutral, and line wires to mains. Connect the ground wire to the facility ground.
3. Plug the connector into the power source socket on the OEM Control Box.

NOTICE

Connecting wires to poles without labels can interfere with the operation of the robot.

- Do not connect wires to poles without labels.

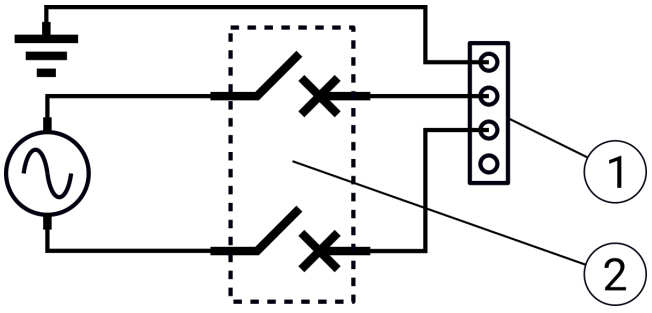
3.4. Robot Connection

The Robot Arm connector is next to the power supply connector. For details on connecting the Robot Arm cable, refer to the robot user manual.

3.5. Circuit Breaker Installation

Use a double pole circuit breaker to protect the power input connector, as it can also be used as a switch. If a fuse is used, then a two-pole switch must be installed between the fuse and power input connector.

The following illustration shows the circuit breaker wiring scheme.



1	Power input	2	Circuit breaker

CAUTION

The installation must comply with the standard IEC 60364. Failure to install appropriate fuses or circuit breakers can result in equipment damage or personnel injury.

4. Electrical Installation: DC Source

This section describes how to connect the OEM Control Box to a DC source. For information on connecting the product to the AC mains, see 3. Electrical Installation: AC Mains on page 4.

For information on electrical specifications, see section 7.1. Electrical Specifications on page 18.

WARNING

Performing installation or maintenance of equipment connected to a power source can lead to electric shock.

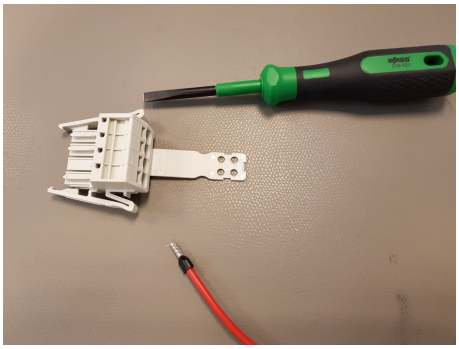
- Ensure that the equipment is disconnected from the power source before performing installation or maintenance.

4.1. Required Items

You need the following items to connect the wires:

- The WAGO 831 four-pole female connector (included with OEM Control Box).
- A flat-bladed screwdriver, blade 5.5 x 0.8 mm. For example, WAGO 210-721.
- Three wires with ferrules.

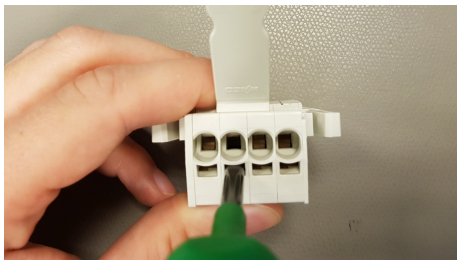
The following illustration shows the required items.



4.2. How to Connect Wires to the Connector

This section describes how to connect wires to a connector with locking levers:

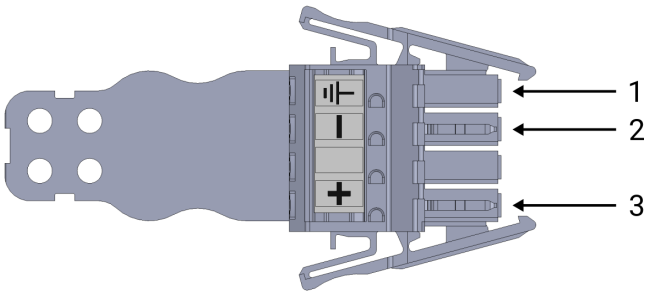
1. Insert the screwdriver into a flat slot next to a connector hole.
2. Push the screwdriver until the clamp inside the hole opens. Keep the screwdriver in the slot.



3. Insert the wire ferrule into the open hole.
4. Ensure that the wire ferrule is firmly placed, remove the screwdriver to close the hole.

4.3. Power Source Wiring

Use the following scheme to attach wires to the connector.



1	Ground	2	Negative
3	Positive		

NOTICE

Reversing the DC source polarity causes permanent damage to the OEM Control Box. Damage caused by invalid power source connection is not covered by warranty.

- Ensure that the polarity is correct before powering up the Control Box.

To connect the OEM Control Box to the power source:

1. Connect the following three wires to the connector:
   - Negative
   - Positive
   - Ground (if the application supports such connection)

2. Connect the negative, and positive wires to the DC source. Ensure that the polarity is correct. Connect the ground wire to the facility ground if the application supports such connection.
3. Plug the connector into the power source socket on the OEM Control Box.

NOTICE

Connecting wires to poles without labels can interfere with the operation of the robot.

- Do not connect wires to poles without labels.

4.3.1. Soft Start Circuit

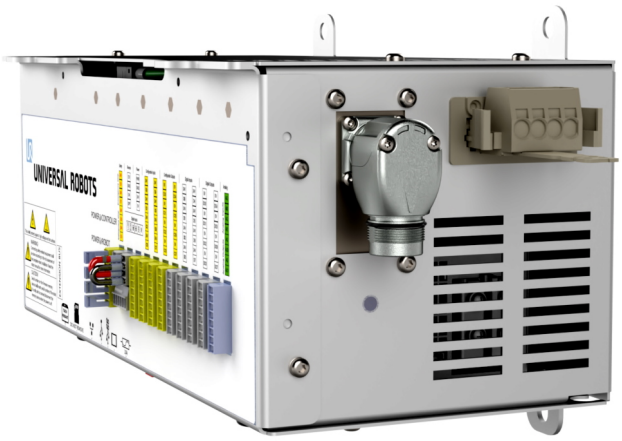
NOTICE

When the OEM Control Box is connected to a DC source, the inrush current can reach up to 400 A for 200 µs. This can cause damage to the DC source or shut down other electronics connected to it.

- Install a soft start circuit when using a DC source.

4.4. Robot Connection

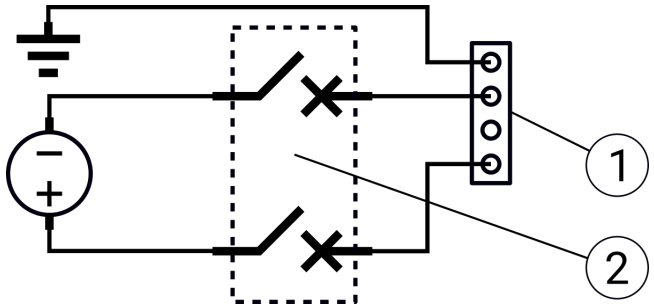
The Robot Arm connector is next to the power supply connector. For details on connecting the Robot Arm cable, refer to the robot user manual.



4.5. Circuit Breaker Installation

Use a double pole circuit breaker to protect the power input connector, as it can also be used as a switch. If a fuse is used, then a two-pole switch must be installed between the fuse and power input connector.

The following illustration shows the circuit breaker wiring scheme.



1	Power input	2	Circuit breaker

CAUTION

The installation must comply with the standard IEC 60364. Failure to install appropriate fuses or circuit breakers can result in equipment damage or personnel injury.

5. Mechanical Installation

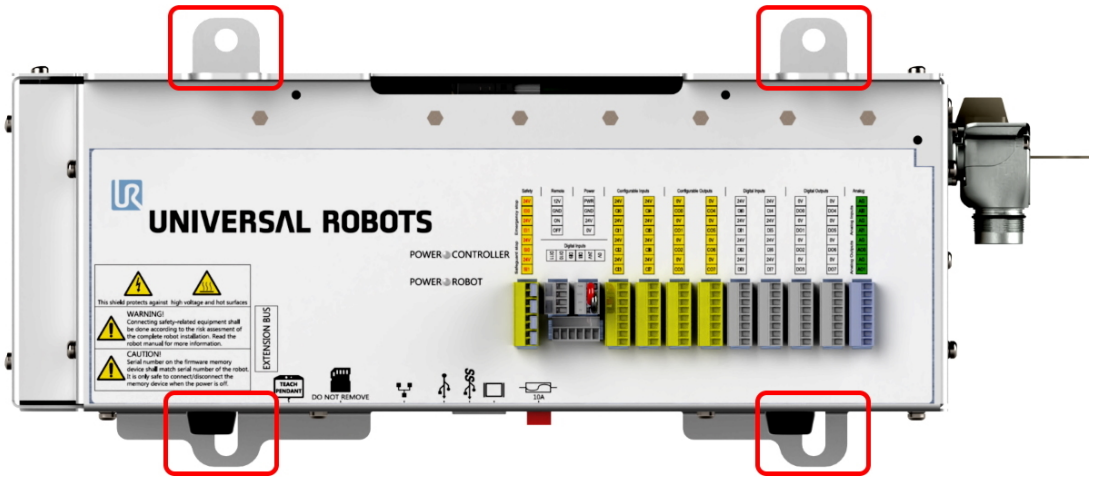
5.1. Working Environment Guidelines

Follow these guidelines to ensure reliable operation of the OEM Control Box:

- Keep free from dust and dirt.
- Keep away from water, solvents, and chemicals.
- Keep ambient air temperatures flowing into the fan within 0–50°C.
- Keep the aluminum controller frame temperature within 0–65°C.

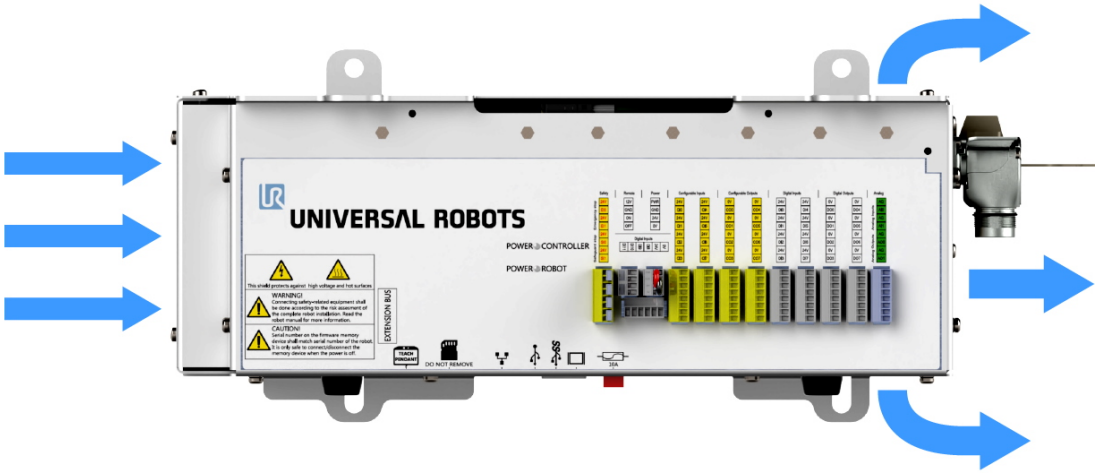
5.2. Mounting the OEM Control Box

Use the four mounting brackets to mount the OEM Control Box, see the following illustration. For dimensional drawings, refer to section 7.4. Dimensional Drawings [mm] on page 20.



For the product dimensions, refer to section 7.3. Dimensions on page 19.

Ensure that there is enough space for cables and sufficient air circulation around the Control Box. For information about the heat dissipation, see 7.2. Control Unit Heat Dissipation on page 18. The following illustration shows the airflow.



NOTICE

Insufficient airflow or warm air circulation can cause the OEM Control Box to overheat and shut down.

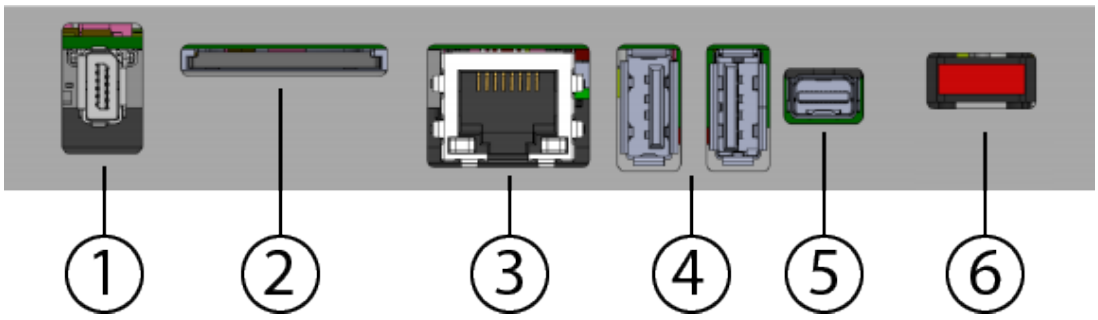
5.2.1. Grounding

The OEM Control Box casing is electrically connected to the ground pin of the power source connector. Any conductive mounting surface must also be connected to the ground.

6. Connecting External Devices

6.1. Control Ports

The bottom side of the OEM Control Box contains a bracket with ports for connecting external devices. The following illustration shows the bracket.



1	Teach Pendant port	2	SD card slot
3	Ethernet port	4	USB ports
5	Mini DisplayPort	6	10 A Mini Blade Fuse

The following table describes the ports.

Port	Description
Teach Pendant	The port for connecting the Teach Pendant (Teach Pendant sold separately).
SD card	The SD card is already in the SD card port. Do not remove the card.
Ethernet	Connect external devices supporting MODBUS, Ethernet/IP, or PROFINET.
USB ports	Connect USB devices, for example a mouse, keyboard, a USB flash drive.
Mini DisplayPort	Connect a monitor. The output video stream is the same as in the Teach Pendant port. Supported connection types: • DP (direct connection). • Active DVI (using an active DP to DVI converter). • Active HDMI (using an active DP to HDMI converter).
10 A Mini Blade Fuse	Connect a fuse. The fuse must be UL-marked and have a 10 A current rating.

6.1.1. Connecting a Mouse, Keyboard, or Monitor

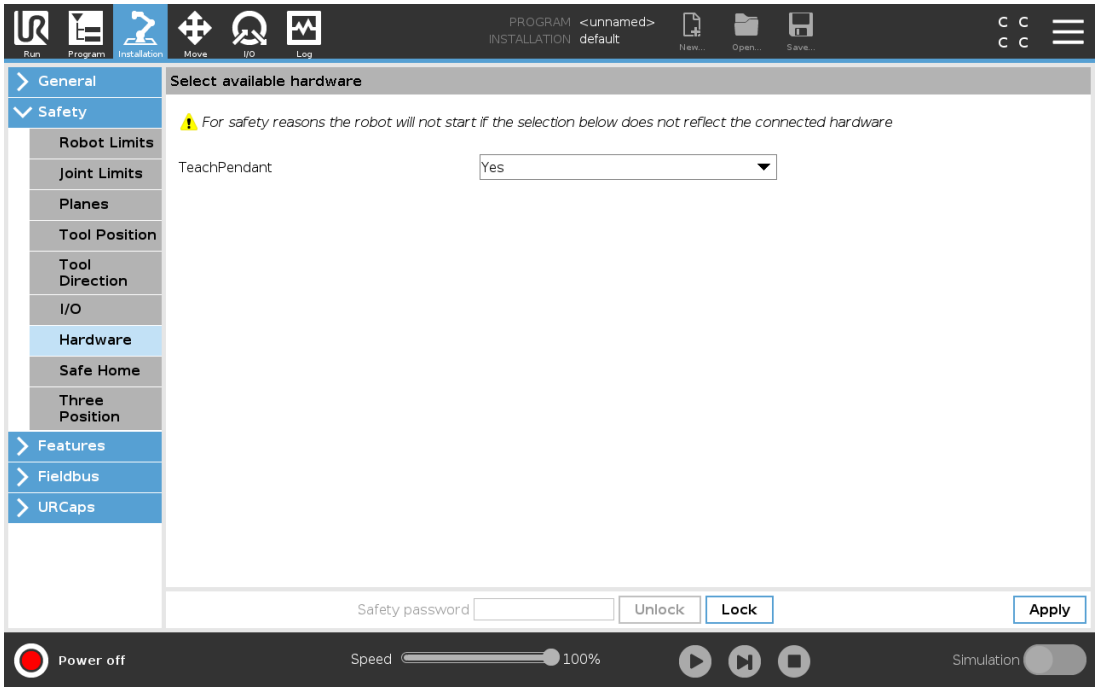
Use a USB port to connect a keyboard or a mouse.

Use the Mini DisplayPort to connect a monitor. The output video stream is the same as in the Teach Pendant port.

6.1.2. Teach Pendant, Remote Control, Local Control

Connecting a Teach Pendant

1. Connect the Teach Pendant cable to the Teach Pendant port.
   The Teach Pendant powers on in a fault state and the Robot Arm brakes engage.
2. Press **Re-Initialize** to clear the fault state and power on the Teach Pendant.
3. Once the Teach Pendant is restarted, exit the start-up screen.
4. In the Header, tap **Installation** and select **Safety**.
5. Under Safety, tap **Hardware**.
6. In the Teach Pendant drop-down menu, select **Yes**.
   If you are prompted to use a password, insert the **Safety Password** and tap **Unlock**.



Enabling Remote Control

1. On PolyScope, in the Header, tap the **Hamburger Menu**.
2. Select **Settings**, tap **System** and select **Remote Control**.
3. On the Remote Control screen, select **Enable** to activate Remote Control.

To activate Local Control, in the **Header**, tap the Remote Control icon and select **Local Control**.

NOTE

For more information, refer to the robot User Manual available on the support website:

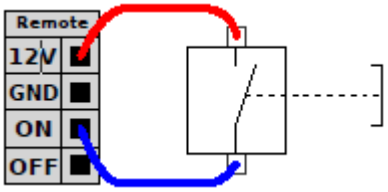
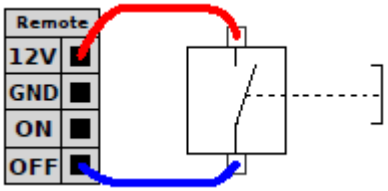
- https://www.universal-robots.com/support/

6.2. Setting up Remote ON/OFF Control and Emergency Stop

The OEM Control Box requires a remote ON/OFF control and an emergency stop pushbutton. The following sections describe how to install them using the I/O ports.

6.2.1. Connecting the ON/OFF Control

The table below shows how to connect a remote ON/OFF control.

State	Connection
ON	
OFF	

NOTE

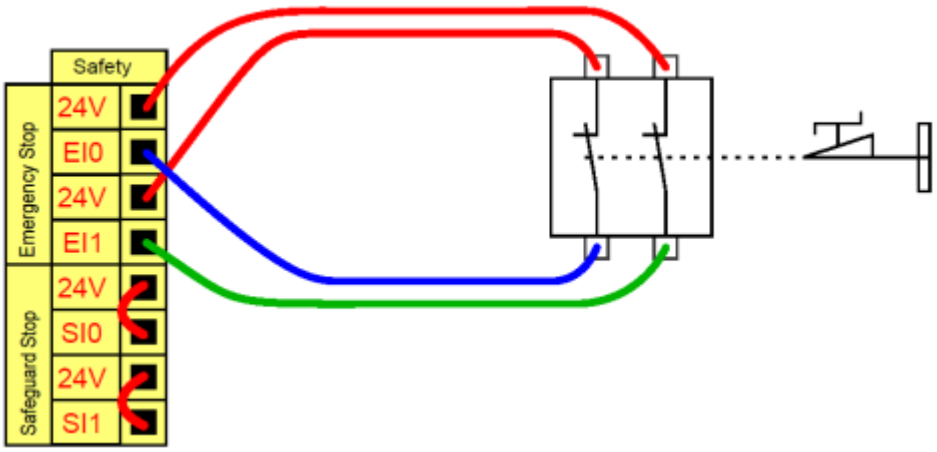
For more information, refer to the robot User Manual available on the support website:

- https://www.universal-robots.com/support/

6.2.2. Connecting Remote Emergency Stop

Install an external Emergency Stop (E-stop) if the Teach Pendant with the default Emergency Stop is not connected to the Control Box.

The following illustration shows the minimum required Emergency Stop installation.



NOTE

For more information, refer to the robot User Manual available on the support website:

- https://www.universal-robots.com/support/

7. Specifications

7.1. Electrical Specifications

OEM Control Box AC

Property	Min	Max	Unit
Input Voltage	100	265	VAC
External Mains Fuse (@ 100-200V)	15	16	A
External Mains Fuse (@ 200-265V)	8	16	A
Input Frequency	47	440	Hz
Stand-by Power	–	<1.5	W
Power consumption, average (UR3e)	–	300	W
Power consumption, average (UR5e)	–	570	W
Power consumption, average (UR10e)	–	615	W
Power consumption, average (UR16e)	–	615	W

OEM Control Box DC

Property	Min	Max	Unit
Input Voltage (24–48)	19	72	VDC
Stand-by Power	–	<7	W
Power consumption, average (UR3e)	–	300	W
Power consumption, average (UR5e)	–	570	W
Power consumption, average (UR10e)	–	615	W
Power consumption, average (UR16e)	–	615	W

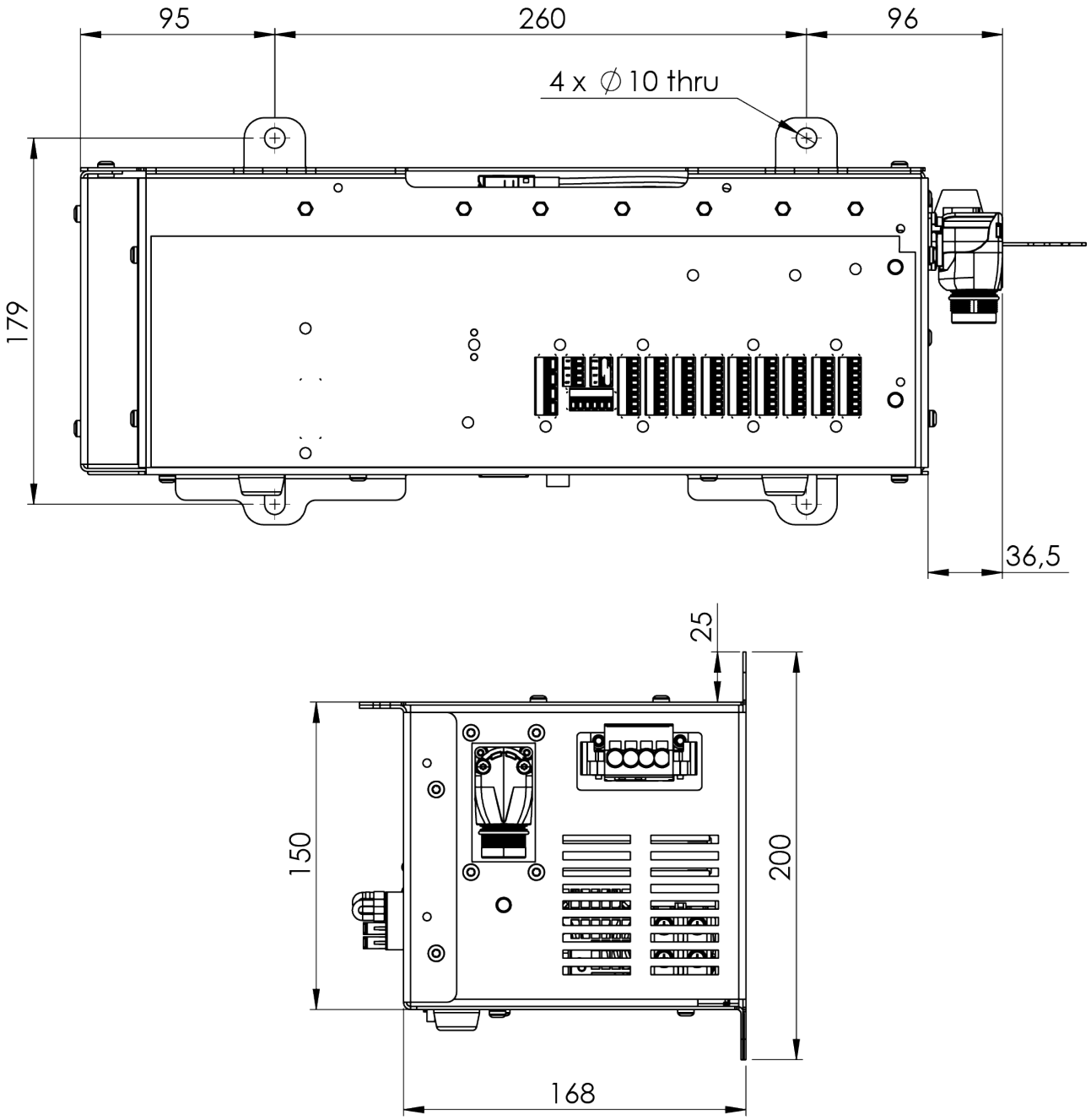
7.2. Control Unit Heat Dissipation

Robot Type	Max. Heat Dissipation
UR3e	100 W
UR5e	100 W
UR10e	130 W
UR16e	130 W

7.3. Dimensions

Property	Value
Height (without mounting brackets)	150 mm
Width	451 mm
Depth	168 mm
Weight (AC version)	4.7 kg
Weight (DC version)	4.3 kg

7.4. Dimensional Drawings [mm]



8. Troubleshooting

8.1. OEM Control Box AC

Symptom	Possible Solution
The Control Box does not turn on.	Check that the power source is wired correctly (see 3.3. Power Source Wiring on page 5).
The Control Box turns on for a few seconds then shuts down.	Pressing the Power ON button for more than 5 seconds shuts the Control Box down. Press the button for 1-2 seconds only.
The robot performance is unstable.	• Check that the input voltage is within specifications in 7.1. Electrical Specifications on page 18. • Check grounding (avoid ground-loops or loose screws).

8.2. OEM Control Box DC

Symptom	Possible Solution
The Control Box does not turn on.	• Check that the power source is wired correctly (see 4.3. Power Source Wiring on page 9). • Ensure that the DC source connection polarity is correct. Reverse polarity causes permanent damage to the OEM Control Box.
The Control Box turns on for a few seconds then shuts down.	Pressing the Power ON button for more than 5 seconds shuts the Control Box down. Press the button for 1-2 seconds only.
The Control Box does not turn on or the robot performance is unstable.	• Check that the DC input is within specifications in 7.1. Electrical Specifications on page 18. • Check that the DC supply has enough charge to supply the initial current to the system.

NOTE

For more information, refer to the robot User Manual available on the support website:

- https://www.universal-robots.com/support/

9. Certificates

This section contains information about certificates and declarations valid for Universal Robots e-Series robots with OEM controllers.

This document contains the following certificates and declarations:

- 9.4. EU Declaration of Incorporation.
- 9.5. China RoHS.

9.1. Shipping Materials

As stated by our suppliers, Universal Robots e-Series robots shipping materials comply with the ISPM-15 requirements for producing wood packaging material and are marked accordingly.

9.2. Certification of Quality

Universal Robots e-Series robots undergo continuous internal testing and end-of-line test procedures. UR testing processes undergo continuous review and improvement.

9.3. Declarations According to EU directives

Universal Robots robots are certified according to the following directives.

- **2006/42/EC – Machinery Directive (MD)**
  According to the Machinery Directive 2006/42/EC, Universal Robots e-Series robots are partly completed machinery, and do not have a CE mark on them.
  The declaration of incorporation according to 2006/42/EC annex II 1.B. is in section 9.4. EU Declaration of Incorporation.
- **2011/65/EU – Restriction of the use of certain Hazardous Substances (RoHS)**
  See section 9.5. China RoHS.
- **2012/19/EU – Waste of Electrical and Electronic Equipment (WEEE)**
  For information on disposal of electrical and electronic equipment waste, refer to chapter 7, Disposal and Environment in the robot user manual.

9.4. EU Declaration of Incorporation

UNIVERSAL ROBOTS

EU Declaration of Incorporation *(in accordance with ISO/IEC 17050-1:2010)* *Original EN*

Manufacturer:	**Person in the Community Authorized to Compile the Technical File:**
Universal Robots A/S Energivej 25 DK-5260 Odense S Denmark	**David Brandt** Technology Officer, R&D Universal Robots A/S, Energivej 25, DK-5260 Odense S

Description and Identification of the Partially-Completed Machine(s):

Product and Function:	**Industrial robot** *(multi-axis manipulator with AC or DC powered OEM controller)* Function is determined by the completed machine (with end-effector and intended use).
Model:	**e-Series robots with either AC or DC OEM controllers:** **UR3e OEM AC, UR5e OEM AC, UR10e OEM AC, UR16e OEM AC** **UR3e OEM DC, UR5e OEM DC, UR10e OEM DC, UR16e OEM DC**
Serial Number:	**Starting 2019 5 0 00000 and higher** *Effective 1 September 2019* *year* / *e-Series*; *Sequential numbering, restarting at 0 each year*; *3 = UR3e, 5 = UR5e, 0 = UR10e*
Incorporation:	**Universal Robots e-Series OEM robots (UR3e, UR5e, UR10e and UR16e) shall only be put into service upon being integrated into a final complete machine (robot system, cell or application), which conforms with the provisions of the Machinery Directive and other applicable Directives**.

It is declared that the above products, for what is supplied, fulfil the following directives as detailed below:
When this incomplete machine is integrated and becomes a complete machine, the integrator is responsible for determining that completed machine fulfils all applicable Directives and update the harmonized and other standards.

I. Machinery Directive 2006/42/EC	**The following essential requirements have been fulfilled:** 1.1.2, 1.1.3, 1.1.5, 1.2.6, 1.3.4, 1.3.8.1, 1.5.2, 1.5.10, 1.7.2, 1.7.4, 4.1.2.3 It is declared that the relevant technical documentation has been compiled in accordance with Part B of Annex VII of the Machinery Directive.
II. Low-voltage Directive 2014/35/EU	Reference the Low-voltage Directive.
III. EMC Directive 2014/30/EU	Reference the EMC Directive.
IV. RoHS Directive 2011/65/EU	Reference the RoHS Directive 2011/65/EU.
V. WEEE Directive 2012/19/EU	Reference the WEEE Directive 2012/19/EU

Reference the Harmonized Standards Used, as Referred to in Article 7(2) of the MD & LV Directives and Article 6 of the EMC Directive:

(I) EN ISO 13732-1:2008, *as applicable*	**(II)** EN 60204-1:2006/ A1:2010, *as applicable* **(II)** EN 60320-1:2001/ A1:2007	**(II)** EN 61140:2002/ A1:2006

Reference to Other Technical Standards and Specifications Used:

(I) ISO 9409-1:2004	**(II)** EN 60664-1:2007 **(II)** IEC 60664-5:2007	**(II)** IEC 61784-3:2010 *[SIL2]* ISO 14664-1:2015 *[Class 5 for UR3e, UR5e and UR10e manipulators (not controllers)]*

The manufacturer, or his authorised representative, shall transmit relevant information about the partly completed machinery in response to a reasoned request by the national authorities.

Approval of full quality assurance system (ISO 9001), by the notified body Bureau Veritas, certificate #DK008850.

Odense Denmark, 1 September 2019

Name: Roberta Nelson Shea

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www.universal-robots.com

9.5. China RoHS

Management Methods for Controlling Pollution
by Electronic Information Products
Product Declaration Table
For Toxic or Hazardous Substances
表1 有毒有害物质或元素名称及含量标识格式

Product/Part Name 产品/**部件名称**	Toxic and Hazardous Substances and Elements **有毒有害物**质或元素					
	铅 Lead (Pb)	**汞** Mercury (Hg)	**镉** Cadmium (Cd)	**六价** Hexavalent Chromium (Cr+6)	**多溴**联苯 Polybrominated biphenyls (PBB)	**多溴二苯醚** Polybrominated diphenyl ethers (PBDE)
UR Robots **UR3 / UR5 / UR10** **UR机器人** **UR3/UR5/UR10**	X	O	X	O	X	X

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.
O: **表示**该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006规定的限量要求以下。

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.
X: **表示**该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006规定的限量要求。

（**企**业可在此处，根据实际情况对上表中打"X"**的技**术原因进行进一步说明。）

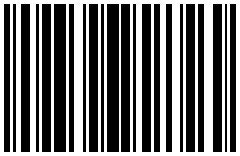
Items below are wear-out items and therefore can have useful lives less than environmental use period:
下列项目是损耗品,**因而它**们的使用寿命可能短于环境使用时间:

Drives, Gaskets, Probes, Filters, Pins, Cables, Stiffener, Interfaces
驱动器, 垫圈, **探**针, 过滤器, 别针, 缆绳, **加**强筋, **接口**

Refer to product manual for detailed conditions of use.
详细使用情况请阅读产品手册.

Universal Robots encourages that all Electronic Information Products be recycled but does not assume responsibility or liability.
Universal Robots **鼓励回收再循**环利用所有的电子信息产品, **但** Universal Robots **不**负任何责任或义务

To the maximum extent permitted by law, Customer shall be solely responsible for complying with, and shall otherwise assume all liabilities that may be imposed in connection with, any legal requirements adopted by any governmental authority related to the Management Methods for Controlling Pollution by Electronic Information Products (Ministry of Information Industry Order #39) of the Peoples Republic of China otherwise encouraging the recycle and use of electronic information products. Customer shall defend, indemnify and hold Universal Robots harmless from any damage, claim or liability relating thereto. At the time Customer desires to dispose of the Products, Customer shall refer to and comply with the specific waste management instructions and options set forth at http://www.teradyne.com/about-teradyne/corporate-social-responsibility, as the same may be amended by Teradyne or Universal Robots.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