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ActiNav

AUTONOMOUS BIN PICKING



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ActiNav Autonomous Bin Picking Quick Start Guide

Original instructions (en)

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1. Introduction

1.1. About this document

This guide provides the essential information you need to get started with ActiNav Autonomous Bin Picking.

1.2. What's in the boxes

The product is shipped in several boxes that contain the following parts:

- Autonomous Motion Module (AMM).
 - AMM power cable.
- 3D sensor.
 - 3D sensor power adapter with cable.
 - 3D sensor Ethernet adapter.
 - Mounting bracket.
 - M2.5 screws (4 pcs).
- USB flash drive containing the ActiNav Autonomous Bin Picking URCap software.
- Alignment marker kit.
 - M6 hex screws (2 pcs), and a hex key.
- CAT6 Ethernet cable, 25 ft (2 pcs).
- This document.
- Universal Robots e-Series robot (purchased separately from the kit).

For more information on the parts included in the boxes, see section [7. Specifications on page 13](#).

1.3. Related materials

This section contains the extra resources related to ActiNav Autonomous Bin Picking:

- Universal Robots e-Series robot User Manual:
<https://www.universal-robots.com/download/>

1.4. Business Contact Details

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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 ActiNav Autonomous Bin Picking.

NOTICE

This product is used exclusively with the Universal Robots e-Series robot. General safety considerations valid for the Universal Robots e-Series robot are also valid for this product.

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.

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.

CAUTION

Failure to perform a risk assessment before installing and operating the ActiNav Autonomous Bin Picking can result in equipment damage or personnel injury.

- Perform a risk assessment before installing and operating the ActiNav Autonomous Bin Picking.

2.3. Application-specific safety precautions

This section contains safety precautions specific to bin picking applications.

CAUTION

The 3D sensor is a class 3R laser product. This class of laser has a low risk of injury.

- Avoid looking directly into the beam.





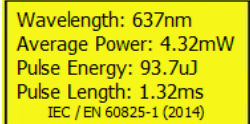
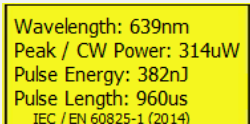

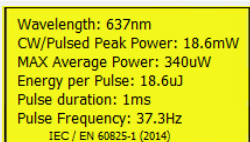
WARNING

In Autonomous operating mode, the robot arm can resume motion at any time because of a programmed or an external command, or when a safeguard stop condition is cleared. Sudden start during service or repair work can cause injury or equipment damage.

- Disconnect the robot from the power supply when performing service or repair work.

2.4. 3D sensor-specific safety precautions

This section lists labels and warnings specific to the 3D sensor. All labels are located on the back panel of the 3D sensor, except for the Laser aperture label.

Label	Description	Laser class
	Laser radiation hazard warning symbol.	
	Laser aperture label. Designates the place from which laser radiation is emitted.	
	Label with manufacturer address, product name, and model, CE and FCC marks, disposal directions and country of origin.	
	Laser radiation warning with laser class label. The serial number of the device can be found above the warning labels.	3R
	Label specifying wavelength, average power, pulse energy and pulse length of the laser. User on scanner models M, L, XL.	3R
	Label specifying wavelength, average power, pulse energy and pulse length of the laser. User on scanner models M, L, XL.	3R
	Laser radiation warning with laser class label. The serial number of the device can be found above the warning labels.	2
	Label specifying wavelength, average power, pulse energy and pulse length of the laser. User on scanner models M, L, XL.	2

2.5. Intended use

ActiNav Autonomous Bin Picking is designed for performing the following operations:

- Locating objects in a container.
- Picking the objects using a tool attached to a robot arm.
- Moving the objects to a destination location.
- Placing objects in a specific way at the destination location.

Use the product only within the range of its technical specifications. Any other use of the product is considered improper and unintended.

NOTICE

Universal Robots is not liable for any damage resulting from any improper or unintended use.

NOTICE

Damage to equipment resulting from any improper or unintended use is not covered by warranty.

NOTICE

ActiNav Autonomous Bin Picking is not intended to handle ESD sensitive parts or items.

NOTICE

ActiNav Autonomous Bin Picking is not intended to operate under intense, harsh or direct light.

- Intense light can result in reduced performance.

2.6. Foreseeable misuse

Use of the product for a purpose other than the intended use is considered to be a misuse.

This includes, but is not limited to:

- Failure to follow the safety precautions written in the product documentation.
- Failure to perform the risk assessment.
- Failure to install visual indicators around the product workspace informing the personnel that the robot arm moves automatically.
- Overloading the robot arm.
- Use of the product outdoors.
- Operating the product in conditions where the environment parameters exceed the values specified in the technical specifications of the product.
- Use in potentially explosive environments.
- Use in medical and life critical applications.

2.7. Risk assessment

For information on residual risks, refer to section Risk Assessment in the Universal Robots e-Series robot User Manual.

3. Product description

ActiNav Autonomous Bin Picking is an industrial bin picking solution for unstructured picking and accurate placement of metal and plastic parts.

3.1. Components

A typical ActiNav Autonomous Bin Picking kit consists the following components:

- AMM.
- 3D sensor.
- Tool for bin picking (purchased separately from the kit).
- Frame for mounting the 3D sensor (purchased separately from the kit).
- Bin (purchased separately from the kit).
- Universal Robots e-Series robot, consisting of the robot arm and the control box (purchased separately from the kit).

3.2. Requirements: Parts

This section describes which properties the parts must have for the system to pick and place them successfully.

Characteristic	Suitable	Not suitable
Rigidity	Rigid	Flexible
Surface texture	Matte Diffuse	Shiny
Transparency	Solid	Translucent Transparent
Minimum part size	See section 7. Specifications on page 13	

4. Configuring the workspace

This section contains guidelines and suggestions for configuring a bin picking application.

4.1. Positioning the robot arm

When positioning the robot arm, ensure the following:

- The robot arm can reach the parts with the tool.
- The robot arm can reach the destination for placing parts.
- The robot arm and the tool have enough space for maneuvering at the pick location and at the place target.
- The robot arm can move the tool with the part from the pick location to the place target as freely as possible.

Since each pick is unique, the robot arm assumes different poses to place the part at the place target. Position the robot arm and other components so that the arm has as much free space to move as possible.

4.2. Positioning the 3D sensor

When positioning the 3D sensor, ensure the following:

- The 3D sensor has unobstructed view of the parts in the bin.
- The parts are within the scanning volume of the 3D sensor. The scanning volume is in [section 7. Specifications on page 13](#).
- The 3D sensor leaves the robot arm enough space for maneuvering.
- The 3D sensor does not vibrate during the system operation.

4.3. Positioning the Autonomous Motion Module

When positioning the Autonomous Motion Module (AMM), ensure the following:

- The environment around the AMM is suitable for an IP40 device.
- The Ethernet cables from the 3D sensor and the robot control box can reach the AMM. If the supplied cable length is not enough, use a longer Cat 6 Ethernet cable.

4.4. Personnel interacting with or passing by the system

- Train all personnel interacting with the system properly.
- Inform the personnel interacting with or passing by the system about how the system works and about any residual risks identified in the application risk assessment.
- Put visual markers on floors and other surfaces indicating areas where physical contact with the robot arm is possible or where eye contact with the laser beam is possible.
- Make the personnel aware of how to stop the system in case of emergency.

5. Installation

This section describes the installation of the components of the ActiNav Autonomous Bin Picking kit. Before the installation, consider the guidelines in section 4. [Configuring the workspace on page 7](#).

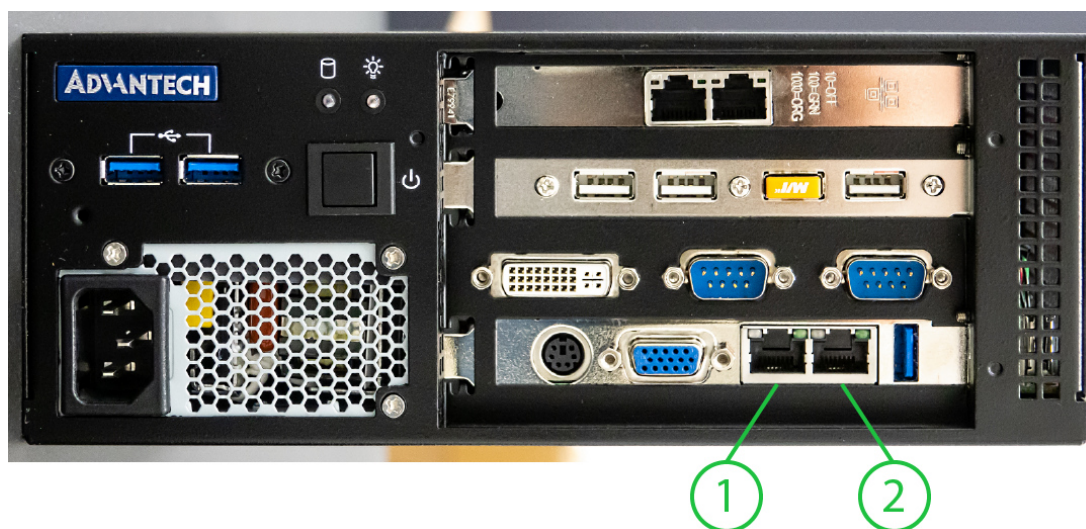
5.1. Installing the robot arm

For mechanical and electrical installation instructions of the robot arm and the control box, refer to the Universal Robots e-Series robot User Manual.

5.2. Installing the Autonomous Motion Module (AMM)

1. Place the AMM in a location where:
 - The environment around the AMM is suitable for an IP40 device.
 - The Ethernet cables from the 3D sensor and the robot control box can reach the AMM. If the supplied cable length is not enough, use a longer Cat 6 Ethernet cable.
2. Using the supplied Ethernet cable, connect the AMM with the robot control box. See [Figure 8.1 below](#).
3. Connect the supplied power cable to the AMM.

The following illustration shows the back of the AMM:



1	3D sensor Ethernet port	2	UR control box Ethernet port
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Figure 8.1: *Back of the Autonomous Motion Module*

5.3. Installing the 3D sensor

To install the 3D sensor:

1. Mount the 3D sensor using the mounting holes on the mounting plate, refer to section 8. [Dimensional drawings on page 15](#).
2. Using the supplied Ethernet adapter and the Ethernet cable, connect the 3D sensor and the AMM. See [Figure 8.1 on the previous page](#), and [Figure 8.2: 3D sensor ports below](#). If the supplied cable length is not enough, use a longer Cat 6 Ethernet cable.
3. Connect the 3D sensor power adapter to the power port on the 3D sensor.

The following illustration shows the 3D sensor ports:

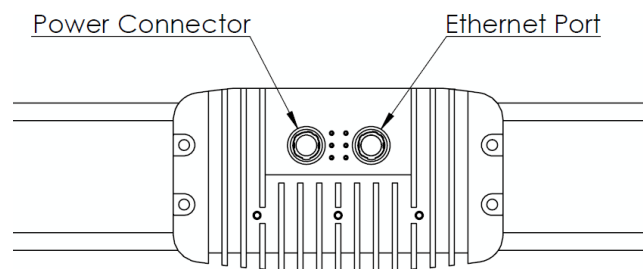
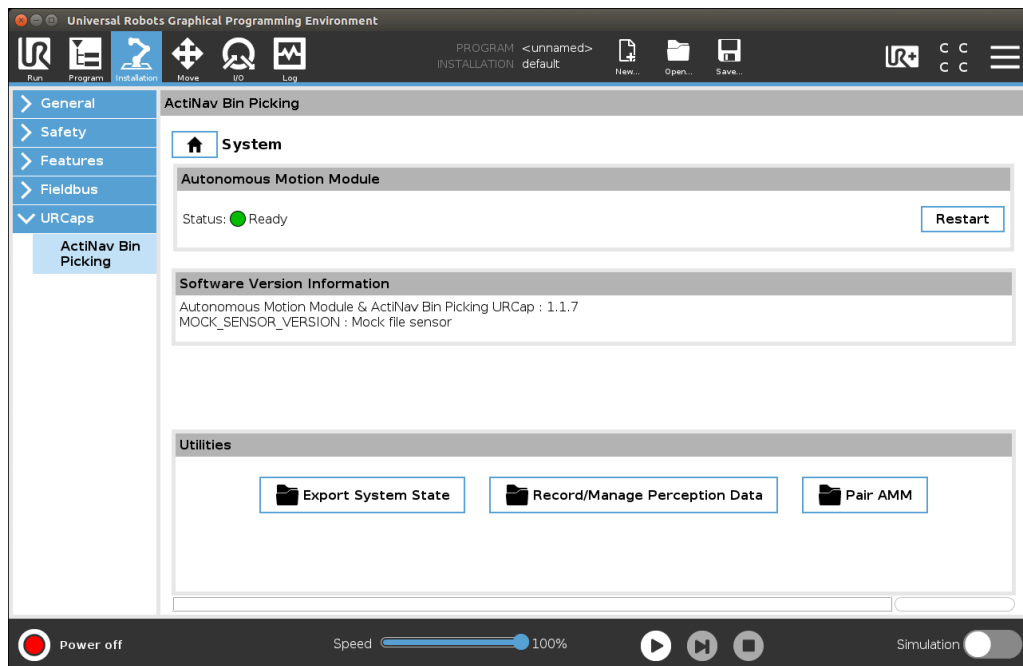


Figure 8.2: 3D sensor ports

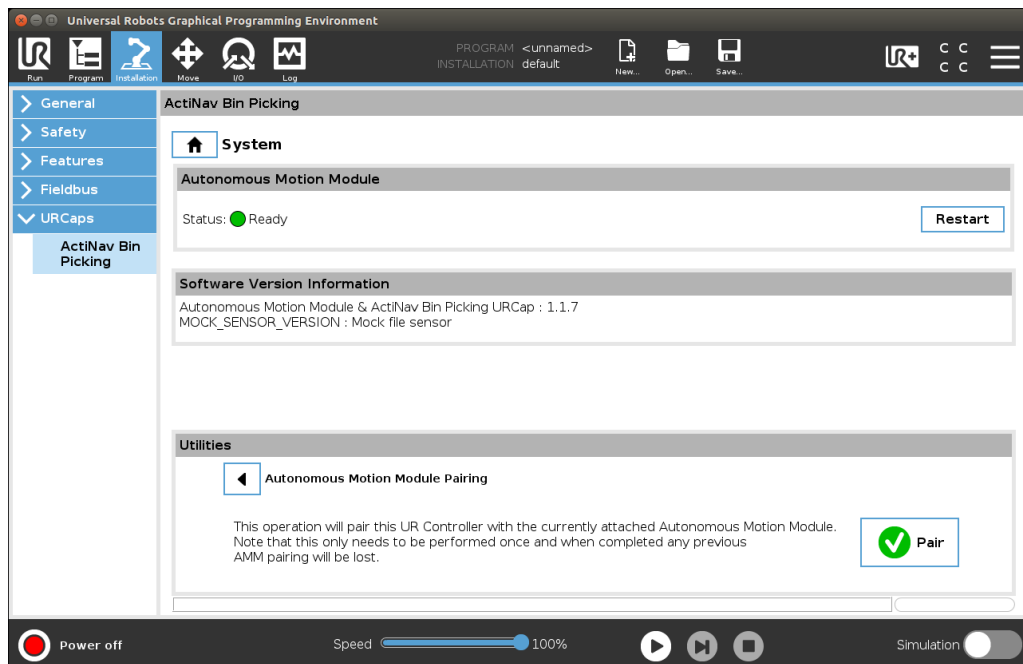
5.4. Installing the ActiNav Autonomous Bin Picking URCap

To install the ActiNav Autonomous Bin Picking URCap:

1. Power on the robot and the AMM.
2. Ensure that the robot control box and the AMM are connected with the Ethernet cable.
3. On the Teach Pendant, go to **Settings > System > Network**. In the **Network** group, select **Static Address**. In **Network detailed settings**, enter the following:
 - **IP address:** 192.168.0.2.
 - **Subnet mask:** 255.255.255.0.
4. Plug the supplied USB flash drive into the Teach Pendant.
5. Go to **Settings > System > URCaps**.
6. Select **+**, navigate to the ActiNav Autonomous Bin Picking URCap file, select **Open**.
7. In the installation dialog box, select **Restart**. PolyScope installs the URCap and restarts.
8. On the Teach Pendant, go to **Installation > URCaps > Bin Picking > System**. In the **Utilities** group, select **Autonomous Motion Module Pairing**. Tap **Pair AMM**.



ActiNav Autonomous Bin Picking is ready for operation.



6. Maintenance

This section describes maintenance tasks necessary for ensuring the continued reliability and efficiency of the product.

6.1. 3D sensor maintenance

6.1.1. Optical component cleaning

To maintain the performance of the 3D sensor, keep the glass covering the optical components of the sensor clean. The optical components are the sensor lens and the glass covering the laser projector.

Avoid touching the glass with fingers.

The following table contains the maintenance tasks and their intervals.

Interval	Task
On every shift	Inspect the glass covering the optical components of the sensor. If there is visible dust or smudges, wipe the glass with lint free wipes intended for optical components.
Monthly	Clean the glass using lint free wipes intended for optical components.

NOTICE

If there are sharp or hard particles on the glass, wiping the glass can cause scratches.

- To remove sharp or hard particles, clean the glass with a special cleaning solution for optical components.

7. Specifications

Universal Robots e-Series robot

Property	UR5e	UR10e
Maximum reach (robot arm)	850 mm	1300 mm
Power supply (control box)	100-240 V AC, 47-440 Hz	

3D sensor

Property	Sensor size M	Sensor size L
Minimum part size	15 × 15 × 2 mm	20 × 20 × 5 mm
Minimum thickness	2 mm	5 mm
Maximum bin size (W × L × D)	630 × 490 × 450 mm	1100 × 970 × 850 mm
Optimum scanning distance (focus)	650 mm	1239 mm
Scanning range (depth of field)	458-1118 mm	870-2150 mm
Scanning area (at focus distance)	590 × 421 mm	1082 × 802 mm
Dimensions	77 × 68 × 416 mm	77 × 68 × 616 mm
Weight	950 g	1100 g
Light source	Visible red light	
Wavelength	638 nm	
Laser class	3R (IEC/EN 60825-1, 2014)	
IP rating	IP40	
Operating temperature	0-30 °C	
Operating humidity	10-85% at 40 °C non-condensing	
EMC	CE/FCC Class A, CCC, BSMI	
Safety certificates	UL/CB, CCC, BSMI	
Power supply	100-240 V AC	



Autonomous Motion Module (AMM)

Property	Value
Power supply input voltage	100-240 V AC
Power supply putput power	250 W
Operating temperature	0-40 °C
Operating humidity	85% at 40 °C non-condensing
Operating vibration	1 Grms
Operating shock	10 G
Dimensions (W × H × D)	232 × 90 × 232 mm
EMC	CE/FCC Class A, CCC, BSMI
Safety certificates	UL, CB, CCC, BSMI

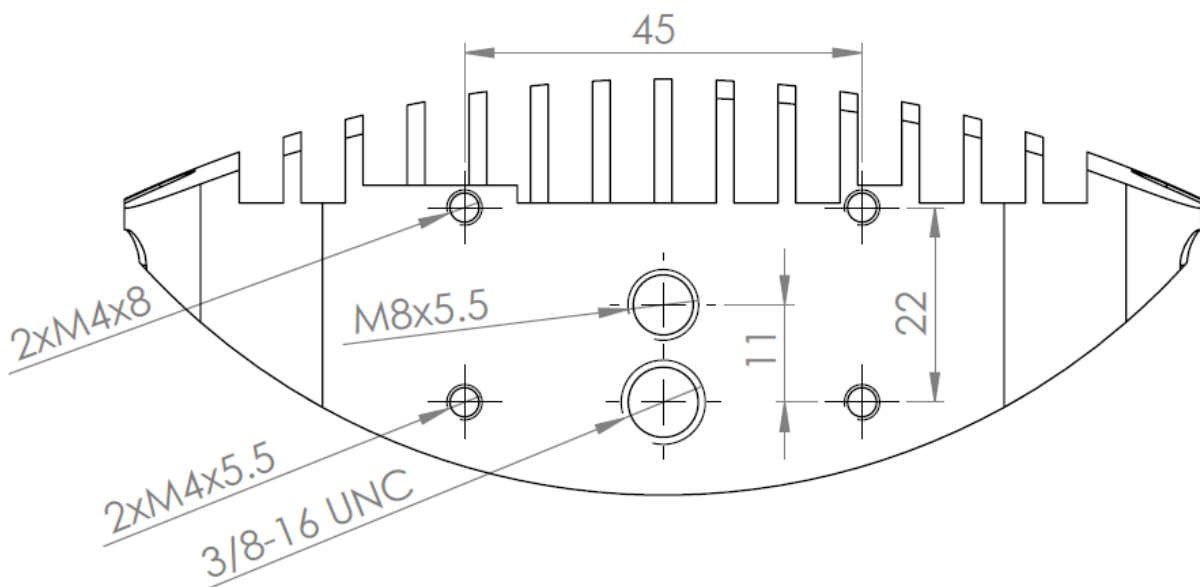
8. Dimensional drawings

8.1. Robot arm and control box

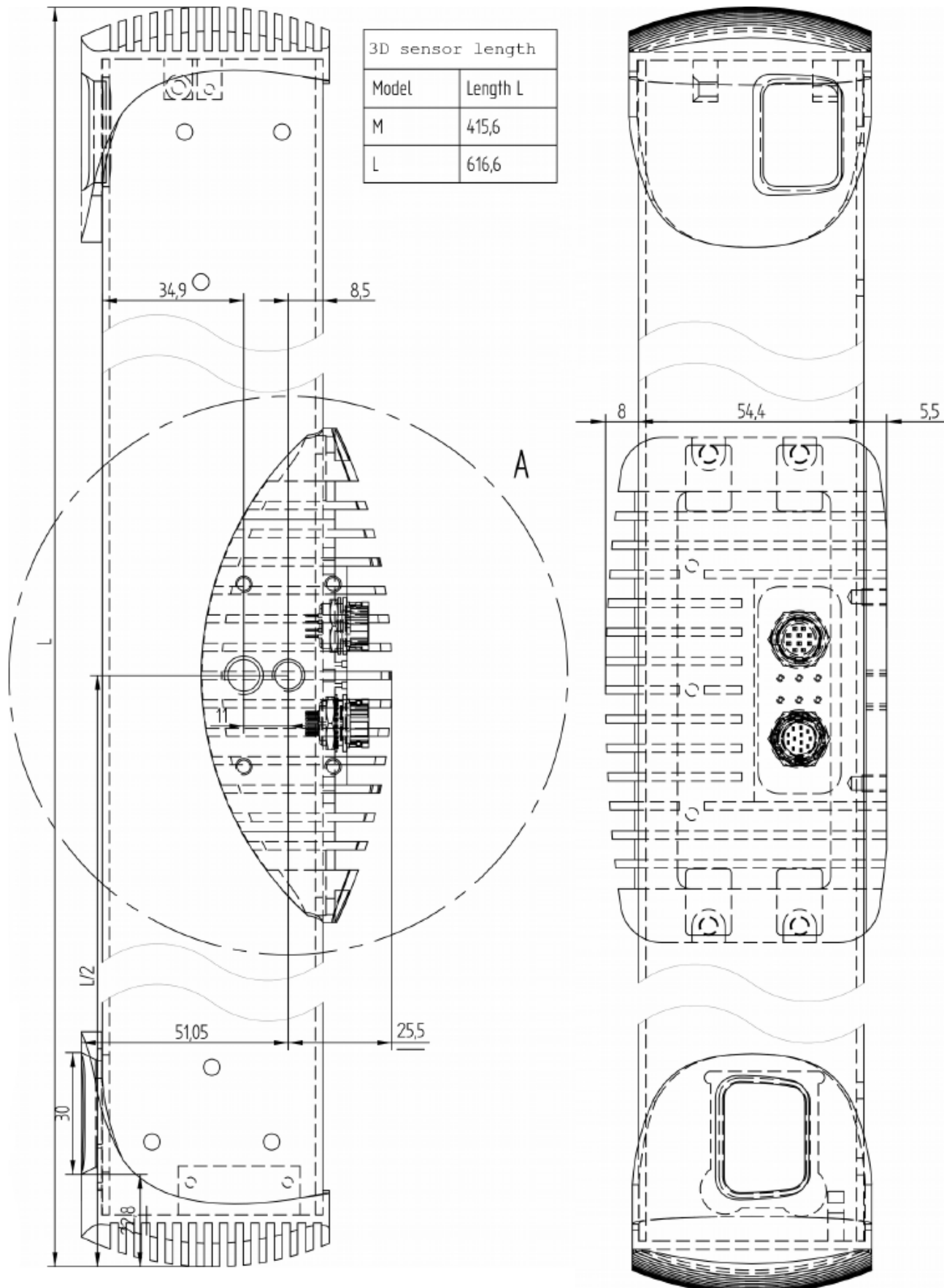
Find the dimensional drawings of the robot arm and the control box at the Universal Robots support site: <https://www.universal-robots.com/download/>.

8.2. 3D sensor

3D sensor mounting plate



3D sensor bottom and front view



9. Copyright and disclaimers

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