Commissioning instructions

EGU/EGK/EZU for Universal Robots (e-series)

SCHUNK software module URCap

Translation of original commissioning instructions

Hand in hand for tomorrow

Imprint

Technical changes:
We reserve the right to make alterations for the purpose of technical improvement.

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Dear Customer,

Thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

Customer Management
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cmg@de.schunk.com

Please read the operating manual in full and keep it close to the product.

Table of Contents

1 General

1.1 About this manual

This manual contains information about the SCHUNK software module "URCap" and its use in the robot control interface UR Polyscope.

The software is used to easily integrate and control the following products in Universal Robots applications:

- EGU MB: with Modbus RTU interface
- EGK MB: with Modbus RTU interface

NOTE

The compatibility of the product with the robot depends on the current carrying capacity, for compatibility overview see ▸ 14.2 [🗋 56].

Definition of terms "Product"

The term "product" replaces the product names listed above in this manual.

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

This manual describes the software environment for an e-series UR robot. Follow the instructions for the robot.

In addition to these instructions, the documents listed under ▸ 1.5 [🗋 6] are applicable.

Abbreviations

The following abbreviations are used:

- GPE: Gripping force and position maintenance Variant "M" products are equipped with gripping force and position maintenance (GPE). When sending control commands with these products, you can specify whether workpieces and positions are to be maintained by the drive control or GPE.
- SG: Single Gripper
- DG: Double Gripper
- TCP: Tool Center Point
- COM: Center of Mass (center of gravity)

1.2 Target group

This manual is intended for robot integrators who have basic mechanical and electrical training skills and who are also familiar with elementary programming concepts.

Commissioning and troubleshooting may only be performed by qualified personnel with appropriate training.

The following knowledge is required:

- Basic knowledge of robotics
- Knowledge in handling UR robots

Electrical installations may only be carried out by a suitably trained electrician.

1.3 Symbol definition

The following symbols are used in this manual:

■ Prerequisite for an action

1. Action 1
2. Action 2

   ⇨ Intermediate results

⇨ Final results

▸ 1.3 [🗋 5]: chapter number and [page number] in hyperlinks

1.4 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.

⚠ DANGER

Dangers for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

1.5 Applicable documents

- Assembly and operating manual for the product:
  - Universal gripper EGU, electric *
  - Gripper for small components EGK, electric *
  - Electric centric gripper EZU *
- Commissioning instructions:
  - EGU with Modbus RTU interface *
  - EGK with Modbus RTU interface *
  - EZU with Modbus RTU interface *
- Operating manual for the UR robot

The documents labeled with an asterisk (*) can be downloaded from **schunk.com/downloads**.

2 Functional description of "URCap"

The "URCap" software module facilitates operation and application creation for SCHUNK products on a robot from Universal Robots.

All necessary controls are installed via the software module. After the installation is complete, the programming elements are deployed within the Polyscope graphical user interface (GUI). The GUI supports the entire configuration of SCHUNK products as well as the necessary control and programming options.

To avoid compatibility problems, check the operating software of the UR control unit before using "URCap" and update it if necessary.

EGU 50

NOTE

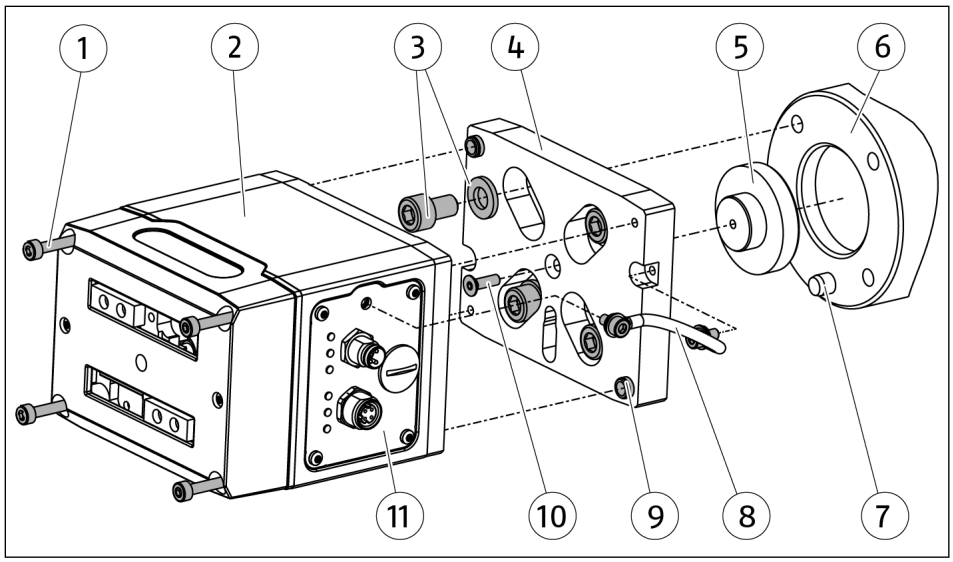
Restrictions for EGU 50

- To prevent the electrical performance data of the robot from being exceeded and to ensure a continuous program sequence, the maximum traverse speed in the software module is limited to 80 mm/s.
- The command "Workpiece gripping at expected position" is deactivated.

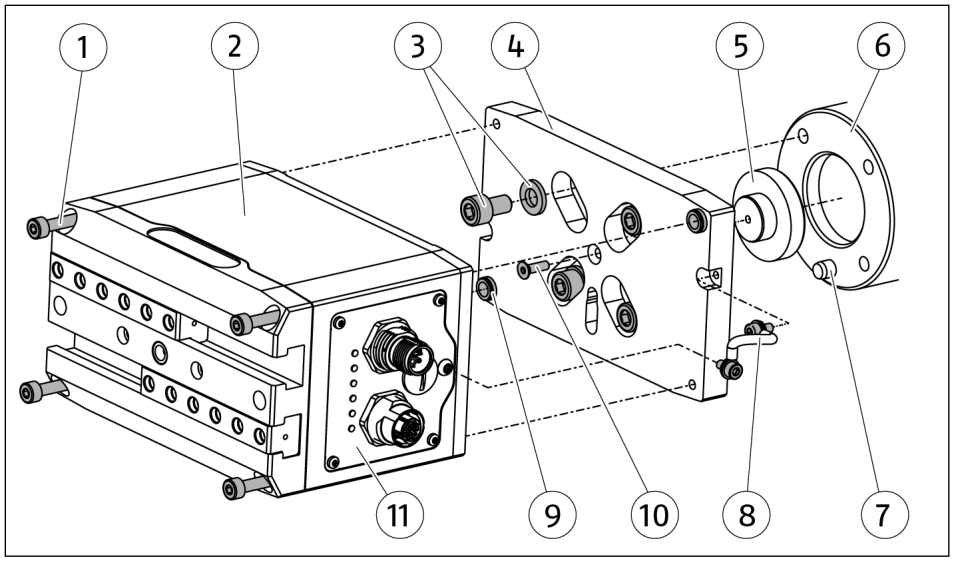
3 Mounting the product to the robot

SCHUNK provides robot adaptation packages as accessories for mounting the product on robots. These packages include matching screws, centering pins and centering collar for fastening to the desired robot flange. For more information, see the catalog data sheet at **schunk.com**.

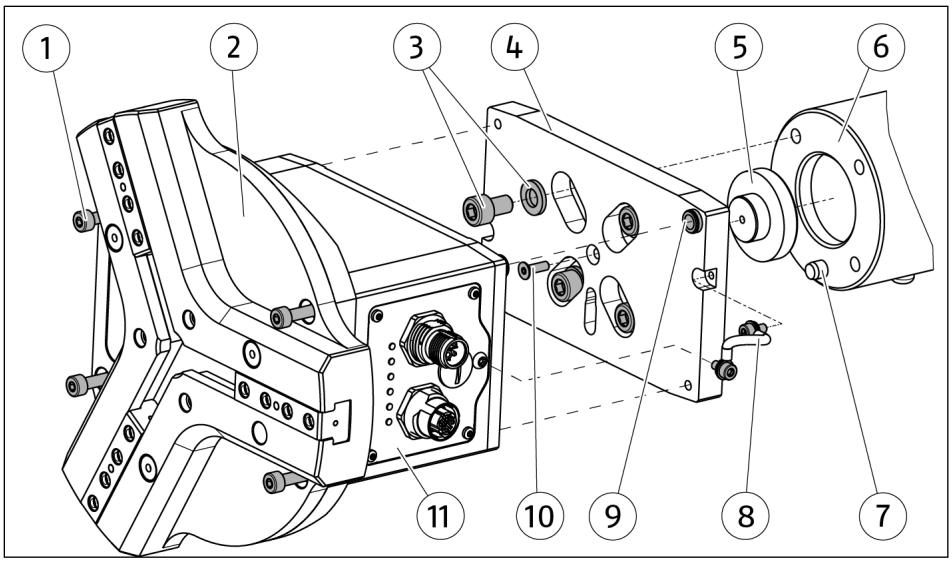
Single gripper (SG)



EGK-SG: Mounting on the robot



EGU-SG: Mounting on the robot



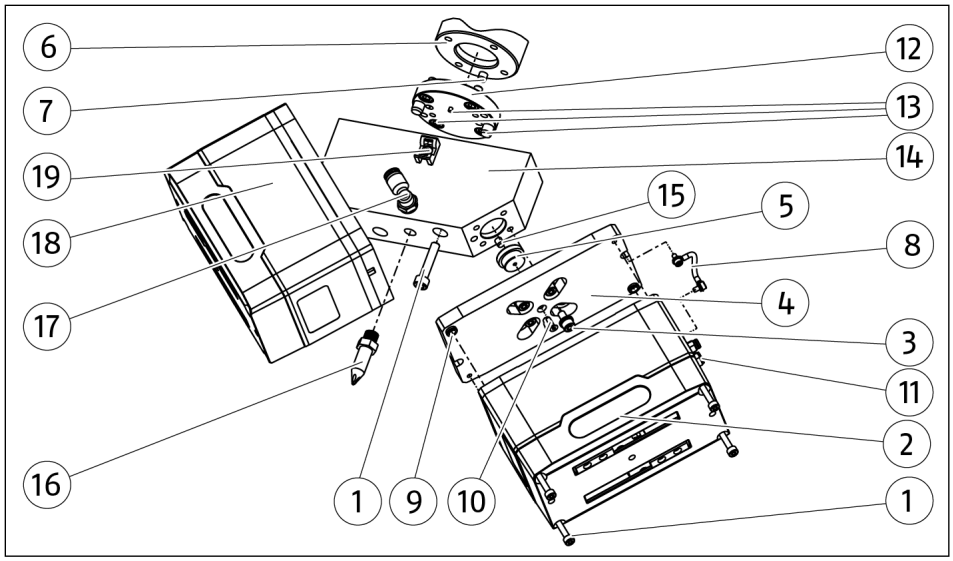
EZU-SG: Mounting on the robot

1. Insert centering pin (7) in robot flange (6).
2. Mount centering collar (5) with screw (10) on adapter plate (4).
3. Fasten adapter plate (4) to robot flange (6) with screws (3) and, if necessary, with washers.
4. Mount the functional earth (8) cable to the adapter plate (4) with screw and toothed lock washer.
5. Insert centering sleeves (9) into adapter plate (4).
6. Fasten the product (2) to the adapter plate (4) with screws (1). Note: Circuit board (11) and functional earth cable (8) must be on the same side.
7. Connect the functional earth cable (8) to the equipotential bonding of the product using a screw and toothed lock washer.

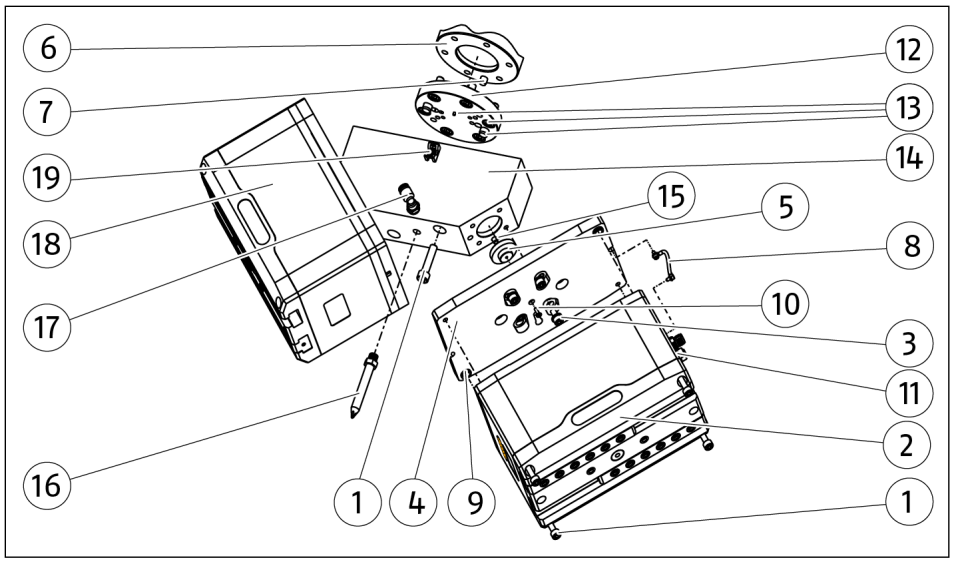
Double gripper (DG)

Note: When used as a double gripper, a blow-off nozzle can be mounted. In the process, the outgoing air from the blow-off nozzle cleans the workpiece of chips or other impurities.

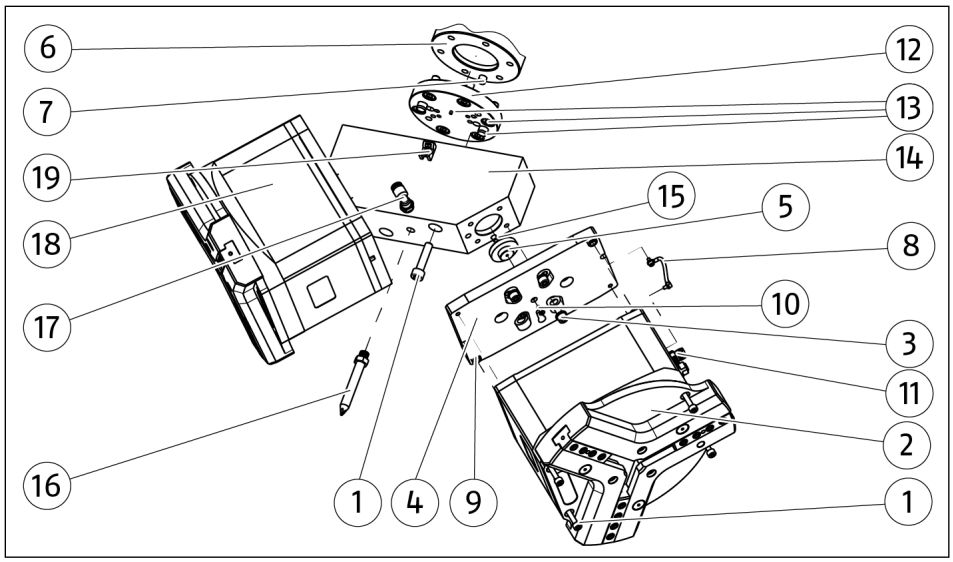
Blow-off nozzle and cable holder are available as accessories from SCHUNK, see catalog data sheet at **schunk.com**.



EGK-DG: Mounting on the robot



EGU-DG: Mounting on the robot



EZU-DG: Mounting on the robot

1. Insert centering pin (7) in robot flange (6).
2. Fasten ISO flange (12) to the robot flange (6) using screws (13).
3. Insert centering pins (13) in ISO flange (12).
4. Fasten elbow adapter (14) with screws (1) to ISO flange (12) in correct position.
5. Insert centering pin (15) into elbow adapter (14).
6. Mount centering collar (5) with screw (10) on adapter plate (4).
7. Fasten the adapter plate (4) with screws (3) and if necessary with washers to the elbow adapter (14).
8. Mount the functional earth (8) cable to the adapter plate (4) with screw and toothed lock washer. Make sure that the functional earth cable (8) points outwards.
9. Insert centering sleeves (9) into adapter plate (4).
10. Fasten the product (2) to the adapter plate (4) with screws (1). Note: Circuit board (11) and functional earth cable (8) must be on the same side.
11. Connect the functional earth cable (8) to the equipotential bonding of the product using a screw and toothed lock washer.
12. Mount the second gripper (18) to the elbow adapter (14) in the same way.
13. Optional: Glue the blow-off nozzle (16) with the enclosed O-ring into the Z-axis of the elbow adapter (14) with liquid, medium-strength threadlocker (tightening torque 1 Nm). Screw the elbow fitting (17) into the elbow adapter (14).
14. Optional: Fasten cable holder (19) to elbow adapter (14) with enclosed screw.

4 Connecting the product to the robot control system

Before connecting or commissioning the product, read the operating manual of the robot and observe the instructions in this manual!

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

⚠ CAUTION

Risk of injury from electric shock due to contact with live parts!

- Follow the operating manual for the robot.
- Before starting any work on the product: Switch off the energy supply and secure against re-connection.

NOTE

Safety-relevant signals (e.g. emergency stop) must be wired externally, e.g. via safety relays, thus completely disconnecting the product from the power supply.

- Perform a risk assessment for the entire robotic application based on legal requirements to evaluate all safety-related aspects of the application.

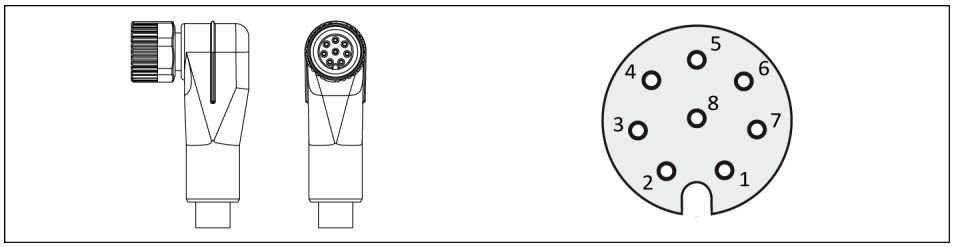
NOTE

The number of installed software modules influences the performance of the overall system. In individual cases, this can lead to communication breakdowns between the gripper and the controller even during the program sequence.

If communication breaks down, the gripper automatically switches to the error state and does not execute subsequently sent commands. This error requires acknowledgment.

- SCHUNK recommends having a maximum of three URCaps installed simultaneously.

Connection assignment



Pin allocation of connecting plug EGU/EGK/EZU on UR robot

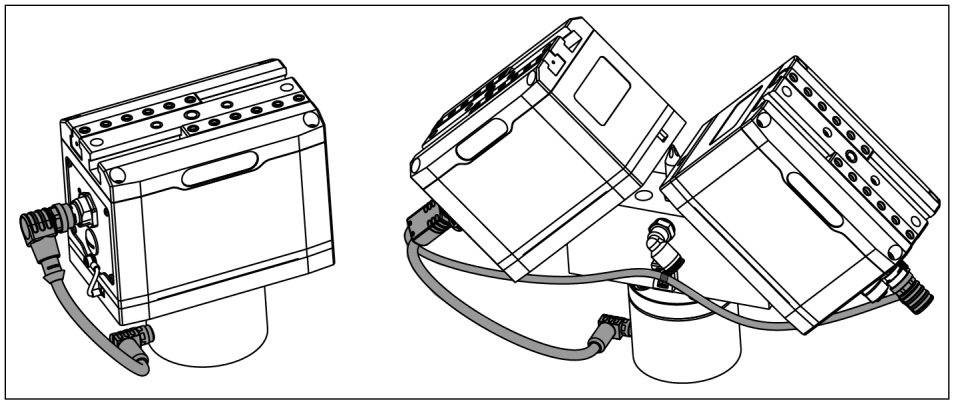
Signal	Gripper Pin	Robot Pin
V+	1	5, 7
BUS_A	2	1
GND	3	6, 8
BUS_B	4	2
n.c.	5	3,4

Tab.: Connection assignment EGU/EGK/EZU on UR robot

Connecting the product

- There is **no** energy supply.
- Product is mounted on the robot.
- Gripper fingers are mounted. Cables is connected to the product (see product assembly and operating manual).

1. Connect the cable to the robot.
2. When using 2 products: Fix the cable to the elbow adapter with a cable tie.



Connecting cables, shown as an example on the EGU

5 Installing the software module

NOTICE

Possible damage to product!

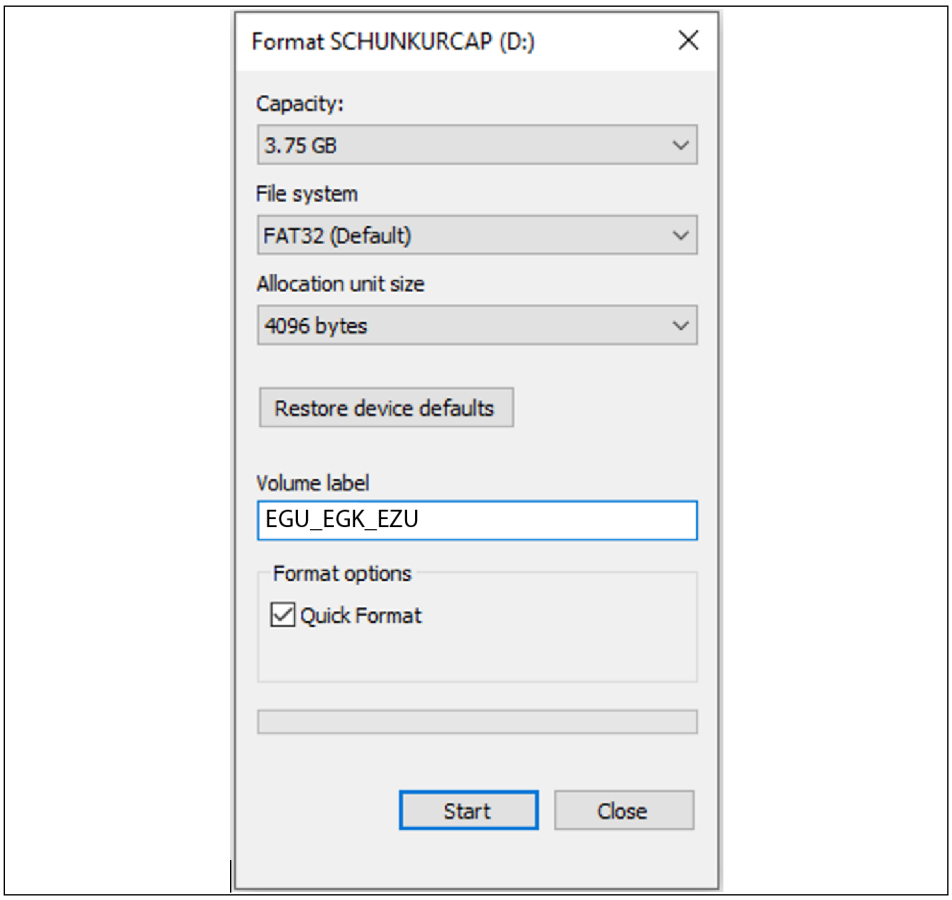
The product or the robot may get damaged if electrical cables are connected or disconnected during operation.

- Connect or disconnect electrical connections only when the device is switched off.

Preparing the installation

NOTE

A USB data carrier (type A) is required for installation.



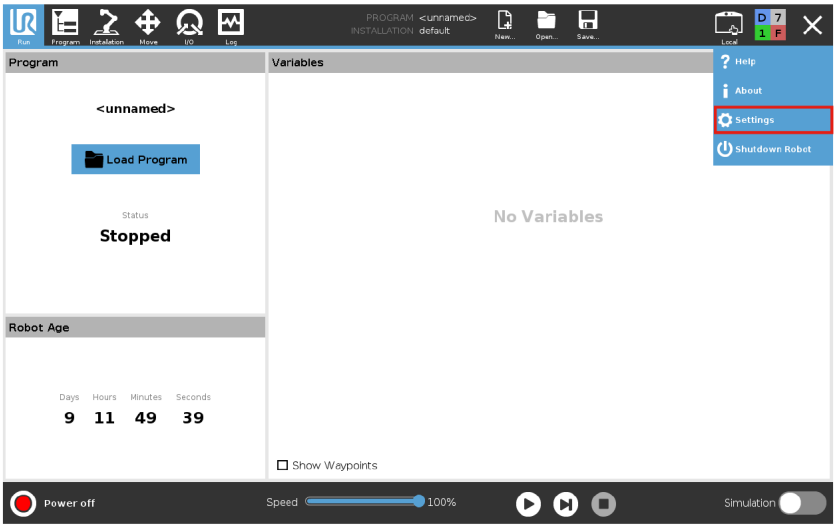
1. Format the USB data carrier as shown.
2. Go to the SCHUNK website: **https://schunk.com/downloads-software**
3. Use the search term "EGU", "EGK" or "EZU".
4. Select the download for "URCap EGU, EGK and EZU for Universal Robots" and save to the USB data carrier.

Installing

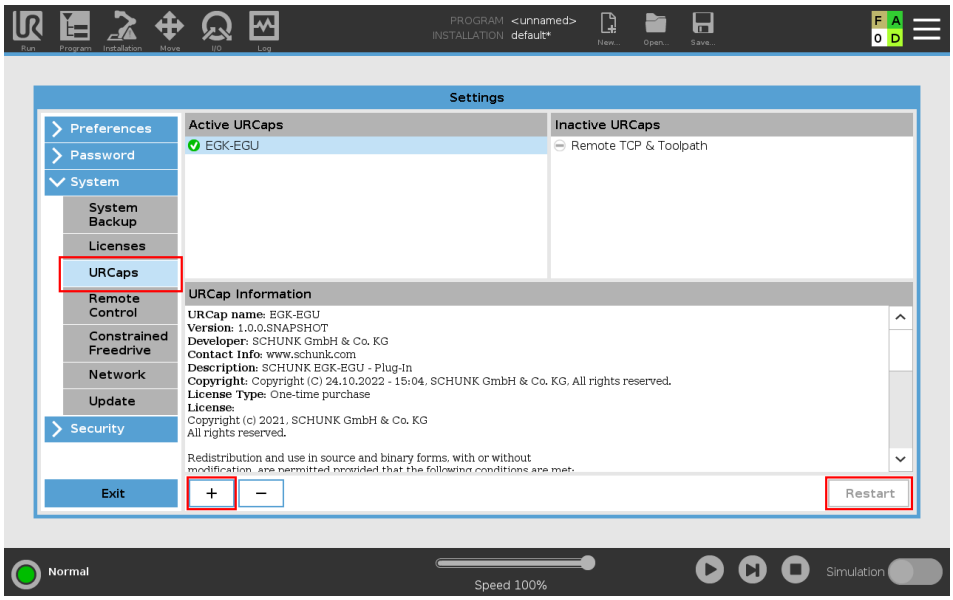
NOTE

To avoid malfunctions, SCHUNK recommends installing the current version of the software module.

1. Connect the USB data carrier to the robot control system. The USB interface is located on the rear side.
2. Switch on the robot control system.
   ⇨ The robot control system is started.



3. Open the menu at the top right and choose "Settings".



4. Select the "System" button in the left menu.
   ⇨ A sub-menu opens.
5. Select the "URCaps" button.
6. Select the "+" button.
   ⇨ SCHUNK recommends having a maximum of three software modules installed simultaneously.
7. Select URCaps software module.
8. Select the "Open" button.
   ⇨ The software module is added and displayed in the Explorer window.
9. Select the "Restart" button to complete the installation.
   ⇨ The system restarts.

6 Uninstalling the software module

1. Switch on the robot control system.
   ⇨ The robot control system is started.
2. Open the menu at the top right and choose "Settings".
3. Select the "System" button in the left menu.
   ⇨ A sub-menu opens.
4. Select the "URCaps" button.
5. Select URCaps software module.
6. Select the "-" button.
7. Select the "Restart" button to complete the deinstallation.
   ⇨ The system restarts.

7 Parameterizing and testing products

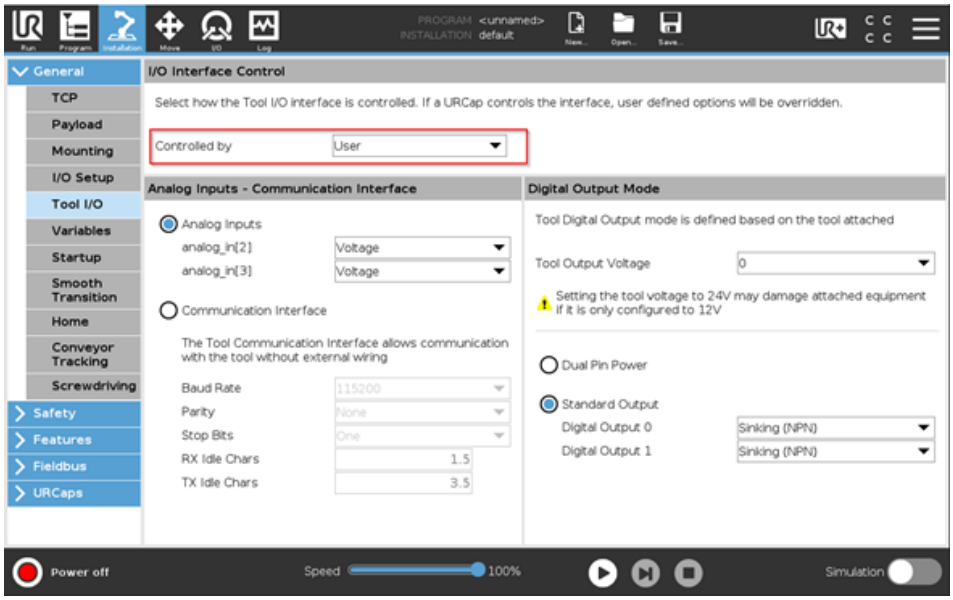
⚠ CAUTION

Risk of injury due to sudden movements!

Components could move unexpectedly and result in serious injuries.

- Observe the safety notes for the grippers.
- Configure safety-relevant signals (such as emergency stop) for the system's safety system.
- Only switch on the power supply when the gripper is attached to the robot and nobody is in the danger zone.

Establish access for the control system

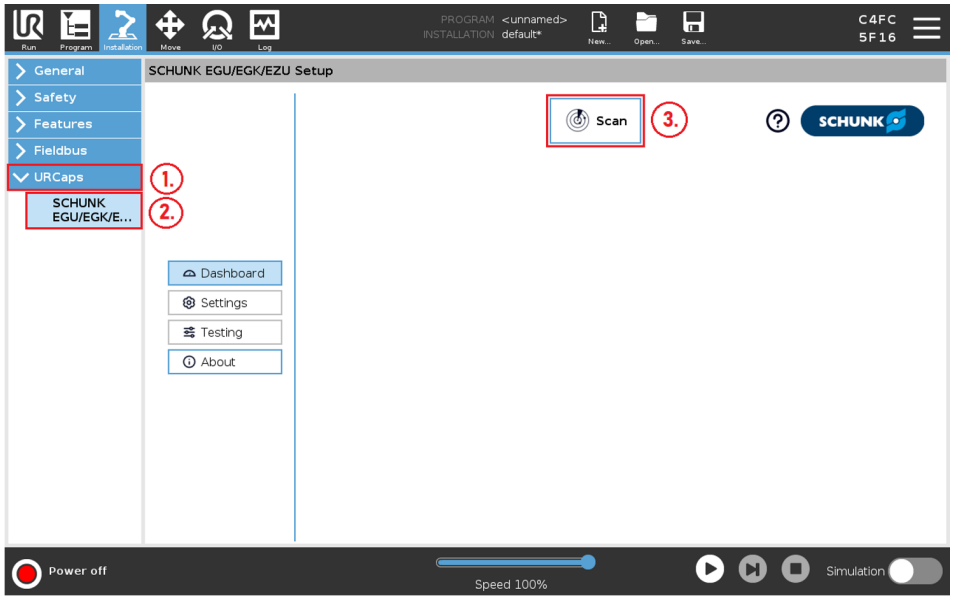


1. Select the "Installation" button in the header line.
2. Select the "General" button.
   ⇨ A sub-menu opens.
3. Select the "Tool I/O" button.
4. Open the drop-down menu next to "Controlled by".
5. Select "EGU/EGK/EZU".
   ⇨ Access to the gripper has been established.

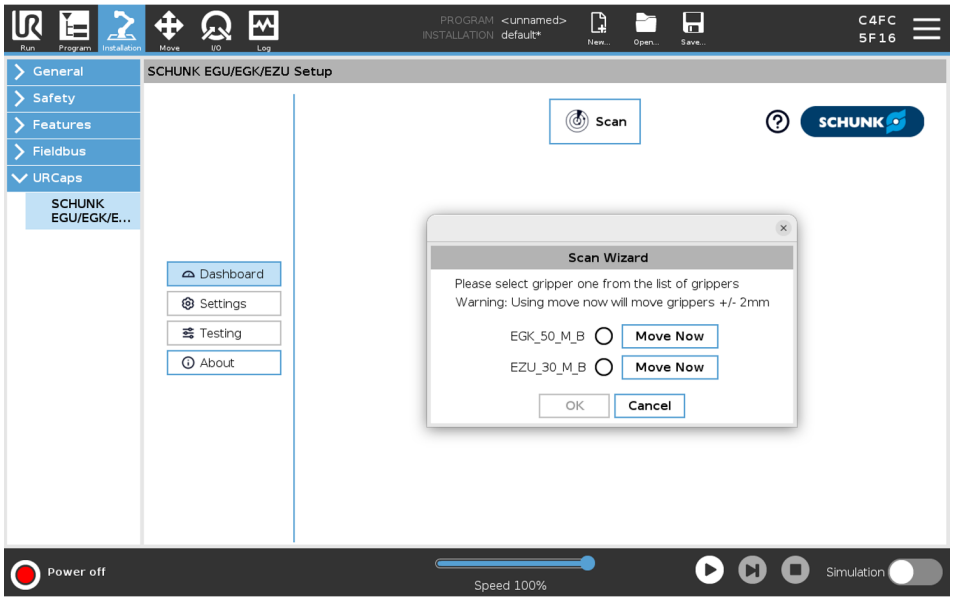
The following steps automatically connect the UR controller to all connected EGU/EGK/EZU gripper(s).

Connecting the grippers

- Ensure that all grippers are correctly mounted.

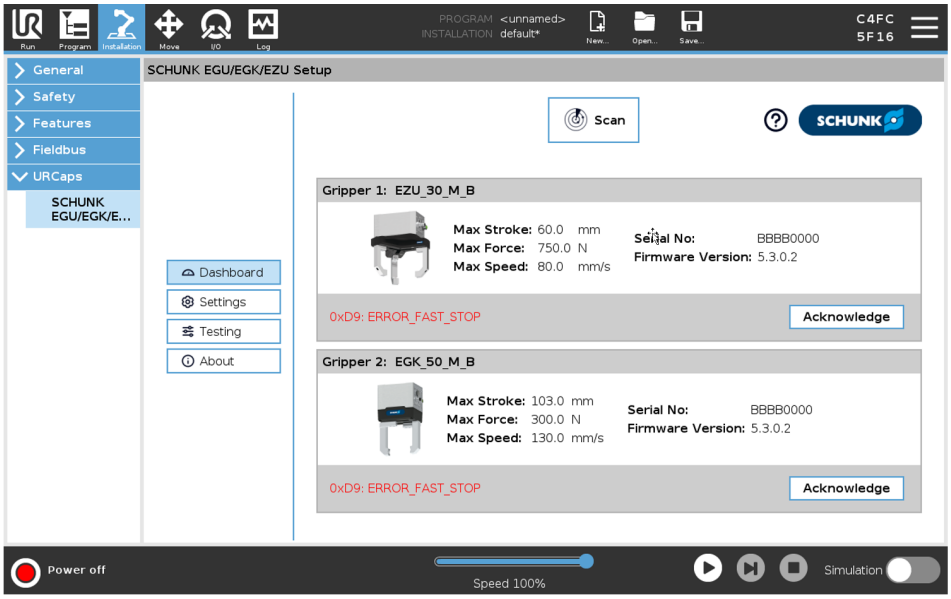


1. Select the "URCaps" button.
   ⇨ A sub-menu opens.
2. Select the "EGU/EGK/EZU" button.
3. Select the "Scan" button to start the configuration wizard

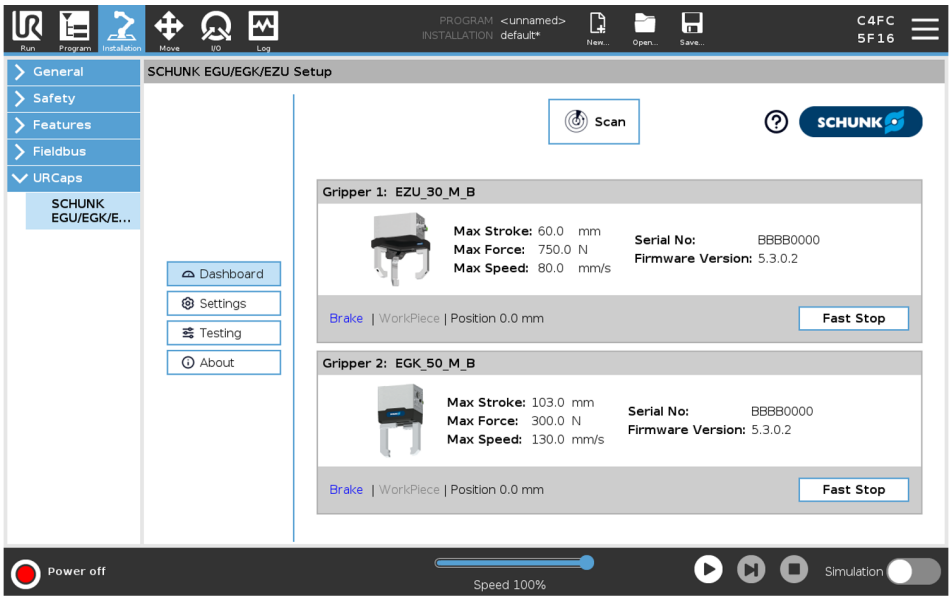


   ⇨ When the scan is complete, a window appears with the available grippers.
4. If 2 grippers with identical names are detected, buttons are available for identification. **CAUTION! When the "Move Now" button is selected, the gripper fingers move by 2 mm in both directions.**
5. Use the radio buttons to select which gripper is to be designated as gripper 1 in the configuration and programming.

6. Select "OK" to complete the scan.

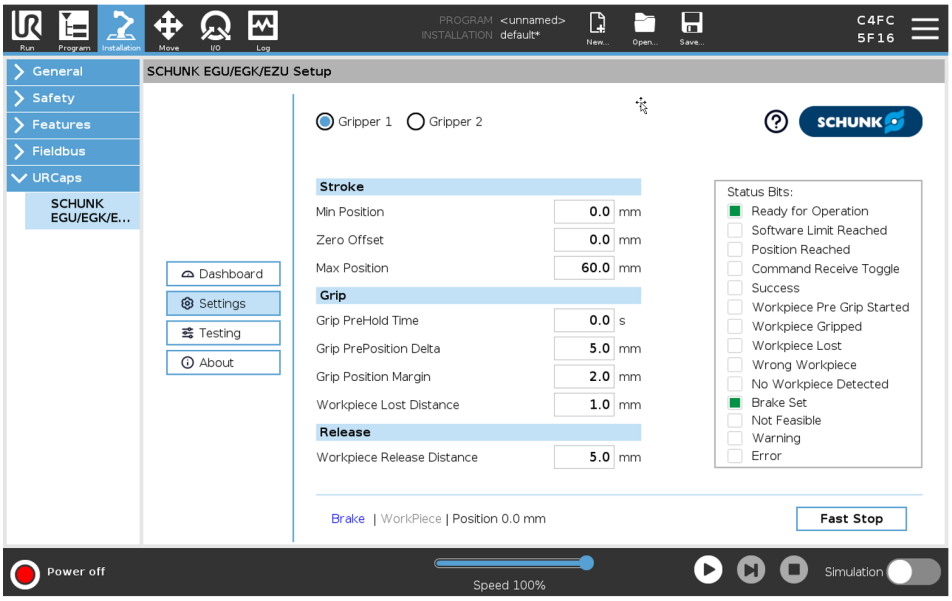


7. The connected grippers are displayed.
   ⇨ Possible error states are displayed in the status line.
8. When the grippers have been successfully connected, they are in the "FAST STOP" state. Acknowledge this state by selecting "Acknowledge".
9. Possible other error states:
   ⇨ `"Tool I/O Not Available"`
   Check whether "EGU/EGK/EZU" is selected in the menu on the left under "General -> Tool I/O"
   or
   restart the robot and perform the scan again.
   ⇨ `Disconnected`
   Check that the communication and/or power cables are properly connected.



⇨ After acknowledging the error messages, the parameters of the grippers can be set.

Parameterizing the product



1. Select the "Settings" button.
2. Setting parameters.
   ⇨ These settings are automatically activated. No restart is required.

Designation	Description
Min Pos	• The parameter can be used to define the position limit within which movements are permitted. The value of the parameter corresponds to the smallest position value that can be approached.

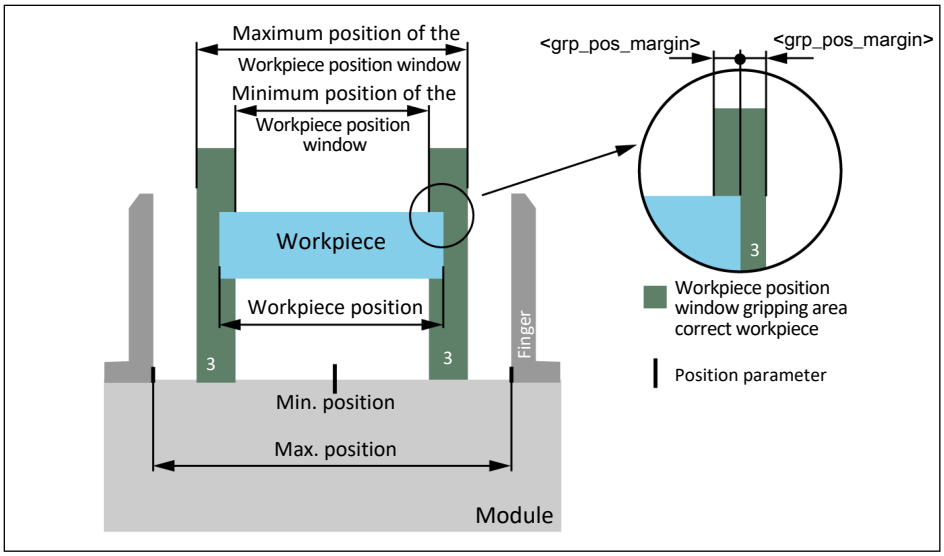
Designation	Description
Zero Offset	• The parameter can be used to parameterize the distance by which the zero point is shifted with a sign.
Max Pos	• The parameter can be used to define the position limit within which movements are permitted. The value of the parameter corresponds to the largest position value that can be approached.
Grip Prehold Time	• The parameter can be used to parameterize the time span of the re-gripping. The maximum time span for re-gripping is 60,000 ms (1 minute). In StrongGrip mode, the maximum gripping time is 2000 ms.
Grip Pre-Position Delta	• The parameter can be used to set the difference in position amount between the workpiece position window and the pre-position, see the following section "Pre-position", ▸ 7 [🗋 23].
Grip Position Margin	• The parameter can be used to parameterize the value from which the minimum and maximum positions of the workpiece position window are calculated, see the following section "Minimum and maximum position", ▸ 7 [🗋 23].
Workpiece Release Distance	• The parameter can be used to parameterize the relative distance that the module moves during release.
Workpiece Lost Distance	• The parameter can be used to parameterize the distance that the gripper fingers are allowed to travel after the workpiece is lost before a workpiece loss is detected.

Minimum and maximum position

The parameter <grp_pos_margin> can be used to parameterize the value from which the minimum and maximum positions of the workpiece position window are calculated.

NOTE

- The minimum position of the workpiece position window is calculated according to: *workpiece position* **-** <grp_pos_margin>.
- The maximum position of the workpiece position window is calculated according to: *workpiece position* **+** <grp_pos_margin>.



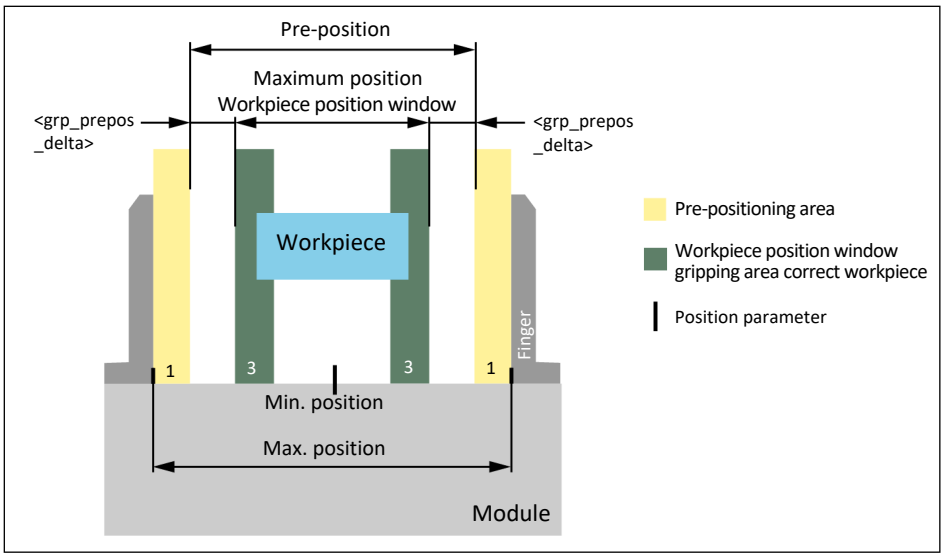
Minimum and maximum position of the workpiece position window

Pre-position

The parameter <grp_prepos_delta> can be used to parameterize the difference in position amount between the workpiece position window and the pre-position.

NOTE

- The pre-position is calculated from the minimum or maximum position of the workpiece position window depending on the direction from which a workpiece is gripped.
- The pre-position during I.D. gripping is calculated according to: minimum position workpiece position window **-** <grp_prepos_delta>.
- The pre-position during O.D. gripping is calculated according to: maximum position workpiece position window **+** <grp_prepos_delta>



Pre-positioning area for O.D. gripping

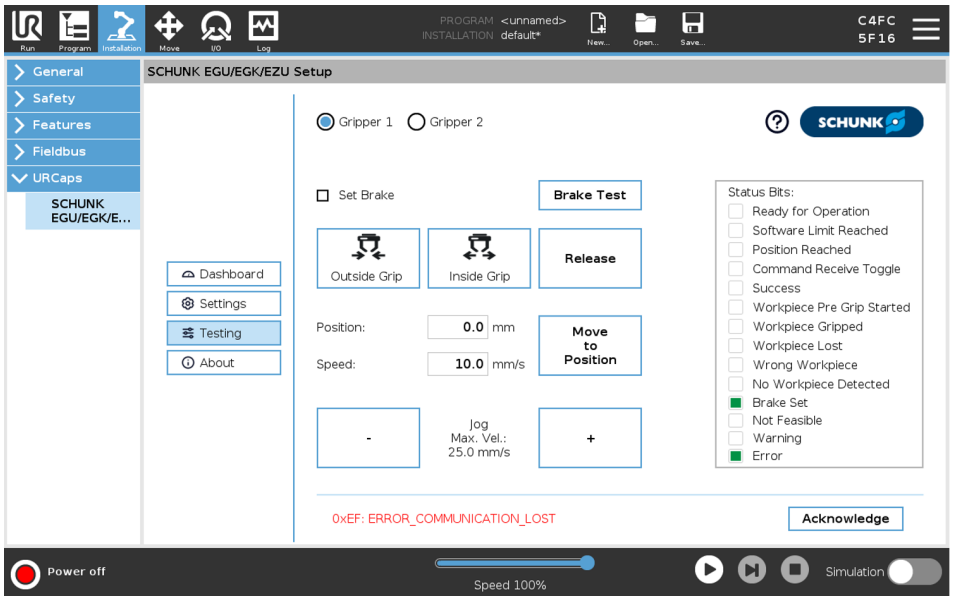
Example of a gripping sequence with "Grip Pre-position Delta":

Start position of the gripping process = [Workpiece Position] + (<Workpiece Tolerance> + <grp_prepos_delta>)

Example: If a workpiece with a gripping width of 50 mm has a tolerance of 2 mm and a "Grip Pre-position Delta" of 18 mm, this results in the following gripping sequence:

1. The gripper fingers move at a higher speed up to position 70 mm (if possible).
2. The gripper fingers move at the gripping speed and approach the target position of the workpiece (50 mm).
3. If the workpiece is detected within the tolerance of 2 mm (48 mm to 52 mm), the gripping process was successful.
4. If the workpiece is not detected, the gripper attempts to re-grip for 2 seconds.
5. After 2 seconds, the gripping process is reported back either as "Success" or as "Workpiece not detected".

Testing the settings

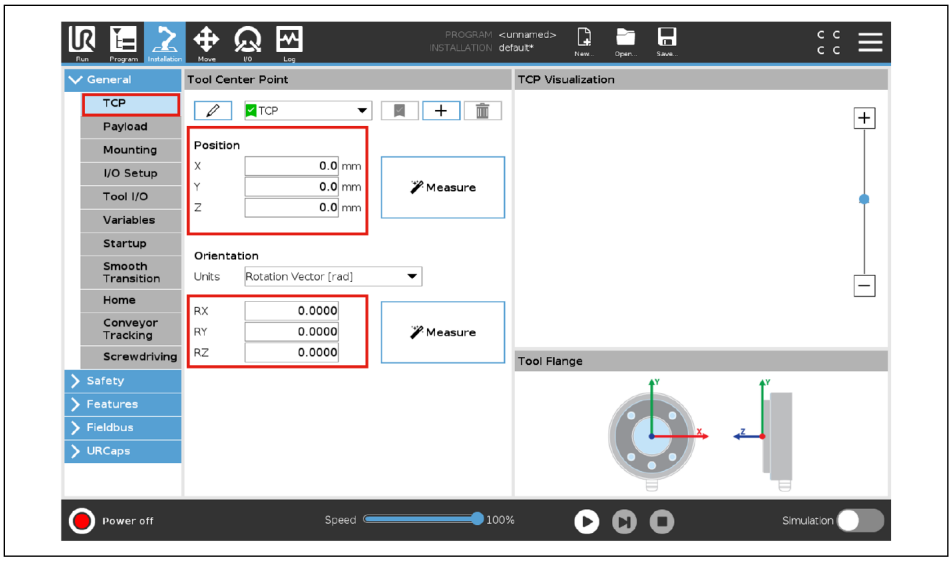


1. Select the "Testing" button.
   ⇨ Grippers can be controlled from this window.
2. Select one of the displayed grippers.
3. Test functions:
   Adjust the gripping direction, jog mode of the base jaws (Jog), execute the "Grip" and "Release" functions, approach the finger position, trigger "Fast Stop" (the brake engages, if present), perform "Brake/GPE Test" (if the gripper supports this function).

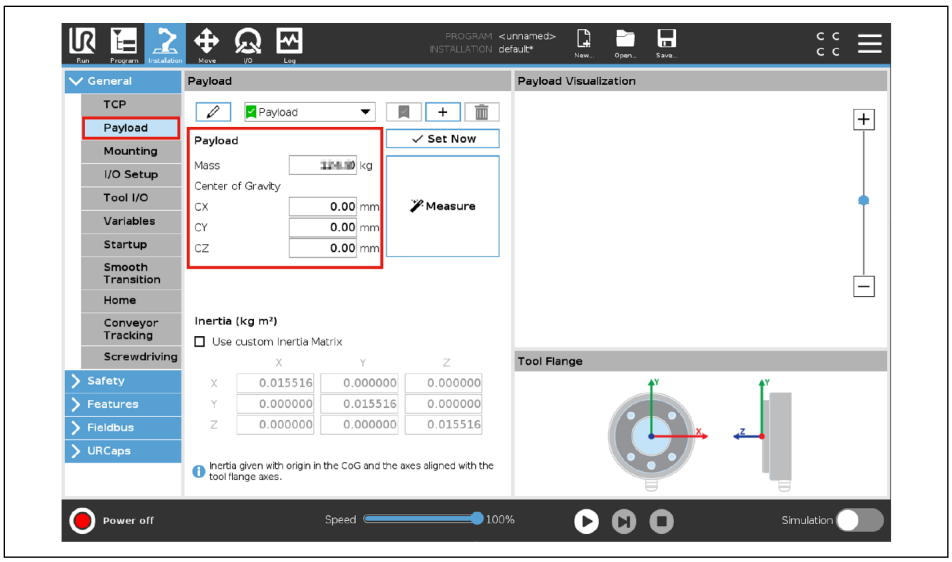
8 Setting the Tool Center Point (TCP) and gripper weight

For proper use of the gripper on a UR robot, it is recommended to store the Tool Center Point (TCP) and the gripper weight in the robot settings.

1. Select the "Installation" button in the header line.
2. Select the "General" button in the left menu.
   ⇨ A sub-menu opens.



3. Select the "TCP" button.
4. Enter the corresponding values in the "Position" and "Orientation" area (see the following table).
5. Select the "Payload" button.



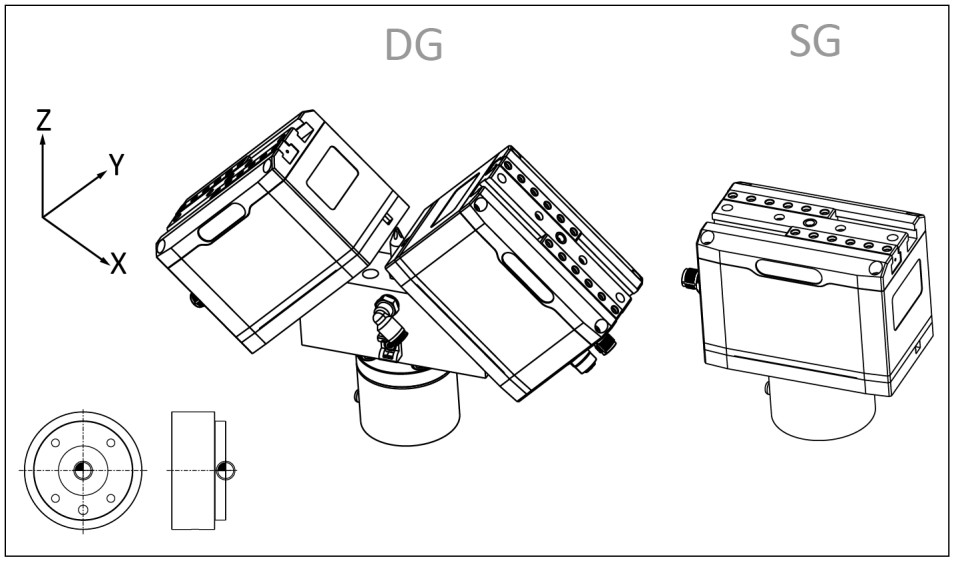
6. In the "Payload" area, enter the gripper weight and the center of gravity coordinates (see the following table).

NOTE

If a workpiece with a certain weight is gripped, the total useful load can be dynamically adjusted within the robot program under "Program" > "Basic".

The operating manual of the UR robot contains further information on TCP, ▸ 1.5 [🗋 6].

8.1 Values for EGU



EGU: Tool Center Point, DG: two products mounted, SG: one product mounted

ISO 50

Size	TCP				Center of gravity			
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	Weight [kg]
SG: one mounted product								
EGU 50	–	–	93.5	–	−0.3	−0.3	47.9	1.8
EGU 60	–	–	119	–	1.6	−0.7	61.3	3.3
DG: two mounted products								
EGU 50	±114.1	–	116.9	±45°	0	0	75.2	4.2
EGU 60	±143.6	–	149.9	±45°	0	0	99.7	7.7

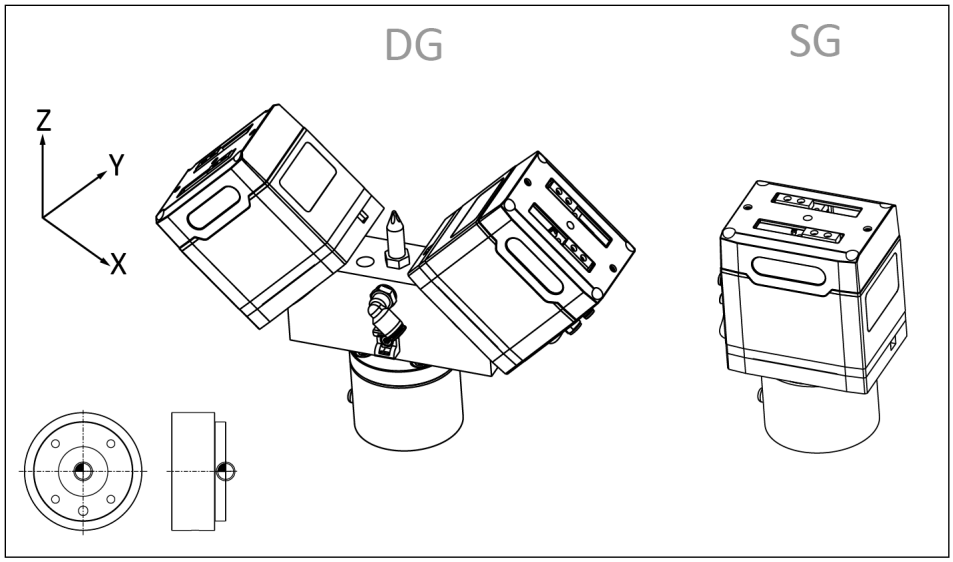
Tab.: EGU: TCP, center of gravity and weight with ISO flange 50

ISO 80

Size	TCP				Center of gravity			
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	Weight [kg]
DG: two mounted products								
EGU 50	±114.1	–	120.9	±45°	0	0	74.6	4.5
EGU 60	±143.6	–	153.9	±45°	0	0	100.2	8

Tab.: EGU: TCP, center of gravity and weight with ISO flange 80

8.2 Values for EGK



EGK: Tool Center Point, DG: two products mounted, SG: one product mounted

ISO 50

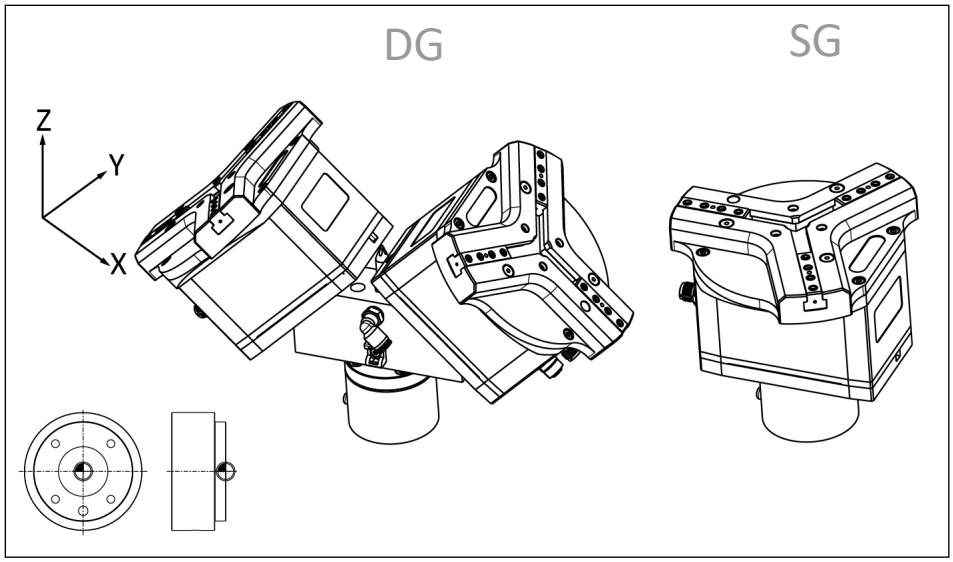
Size	TCP				Center of gravity			
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	Weight [kg]
SG: one mounted product								
EGK 25	–	–	90.2	–	-1.5	-0.1	42.7	0.8
EGK 40	–	–	94.5	–	-0.5	-0.3	44.9	1.3
EGK 50	–	–	102	–	0.5	-0.2	49.1	2.1
DG: two mounted products								
EGK 25	±111.8	–	114.6	±45°	0	0	64.7	2.3
EGK 40	±114.8	–	117.6	±45°	0	0	71	3.3
EGK 50	±131.6	–	137.9	±45°	0	0	87.3	5.3

Tab.: EGK: TCP, center of gravity and weight with ISO flange 50

ISO 80

Connection to an ISO 80 flange is not possible with EGK.

8.3 Values for EZU



EZU: Tool Center Point, DG: two products mounted, SG: one product mounted

ISO 50

Size	TCP				Center of gravity			Weight [kg]
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	
SG: one mounted product								
EZU 30	–	–	107	–	−0.9	−0.3	62	2.6
EZU 35	–	–	135.5	–	0.5	−0.7	79.2	4.9
EZU 40	–	–	156.9	–	0	−0.8	94.3	8.2
DG: two mounted products								
EZU 30	±123.7	–	126.5	±45°	0	0	86.3	5.9
EZU 35	±155.3	–	161.6	±45°	0	0	113.4	10.9

Tab.: EZU: TCP, center of gravity and weight with ISO flange 50

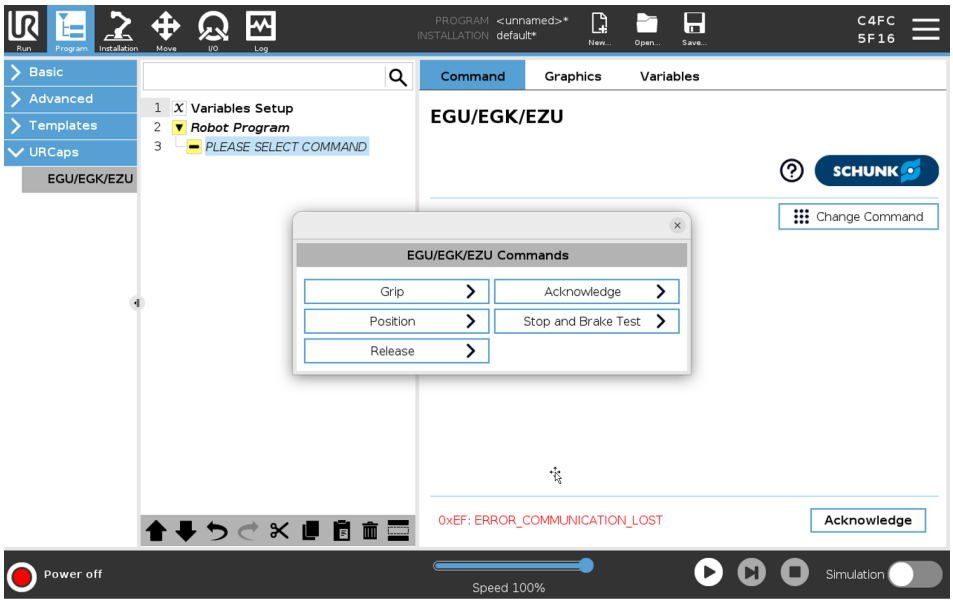
ISO 80

Size	TCP				Center of gravity			Weight [kg]
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	
SG: one mounted product								
EZU 40	–	–	156.9	–	0	−0.8	93.5	8.3
DG: two mounted products								
EZU 30	±123.7	–	130.5	±45°	0	0	87.1	6.1
EZU 35	±155.3	–	165.6	±45°	0	0	114.5	11.2
EZU 40	±193.4	–	197.7	±45°	0	0	136.2	19.7

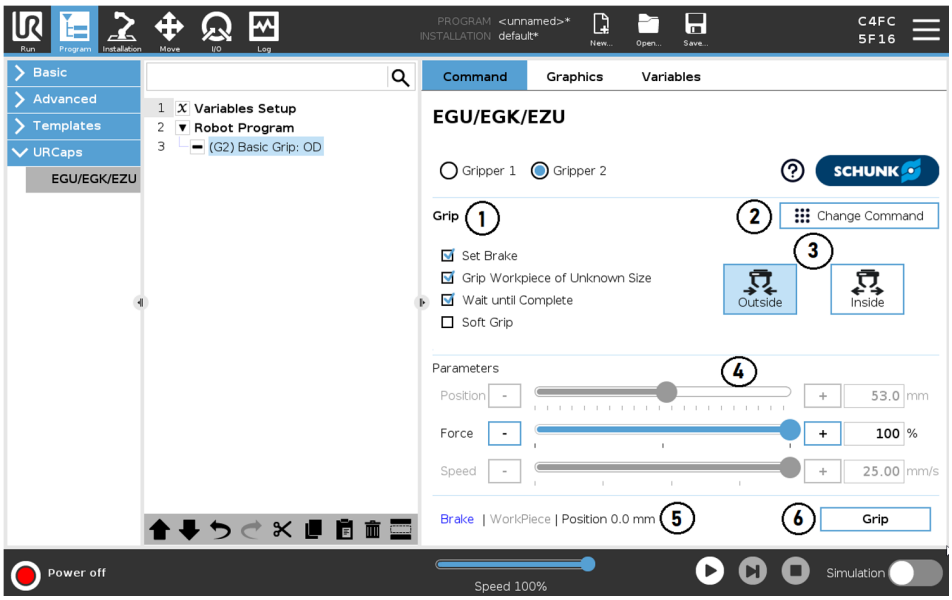
Tab.: EGU: TCP, center of gravity and weight with ISO flange 80

9 Creating the robot program

After installing the software module, commands can be added to a robot program.



1. Select the "Program" button in the header line.
   ⇨ In the Explorer window, the robot program is displayed on the left and a short description for creating the program on the right.
2. Select the "URCaps" > "EGU/EGK/EZU" button.
   ⇨ The right window displays the possible commands.
3. Select the command to be added to the program.
   ⇨ Details of the selected command are displayed in the right window.

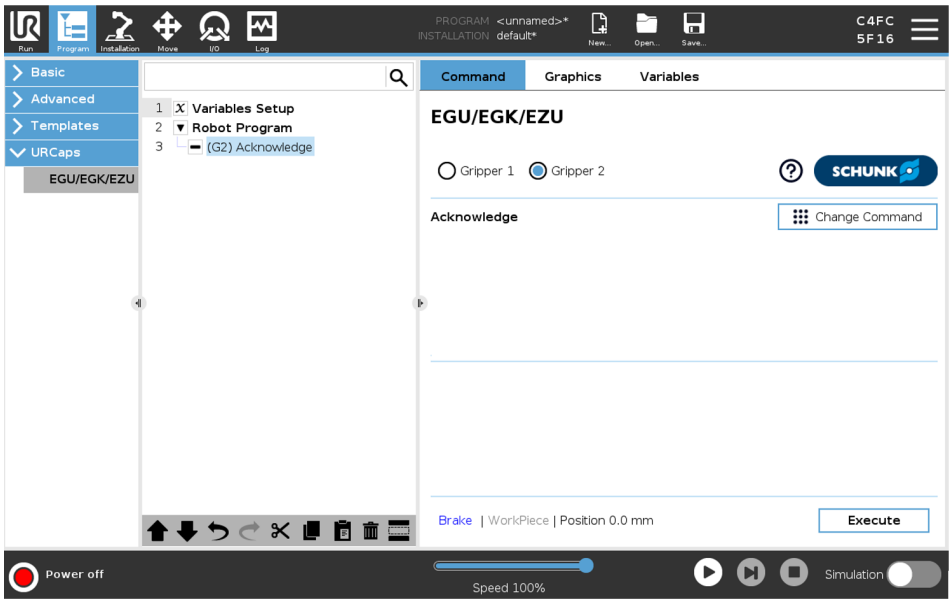


1	Name of the program command
2	Opens the "Change Command" menu
3	Selection of options
4	Adjusting the parameters for position, gripping force and speed
5	Status line: shows the gripper status and the position of the gripper fingers
6	Buttons for testing: display depends on the gripper status and the currently selected command

The following commands can be selected:

- "Acknowledge" – acknowledge error ▶ 9.1 [🗋 32]
- "Grip" – grip workpiece, ▶ 9.2 [🗋 33]
- "Release" – release workpiece, ▶ 9.3 [🗋 37]
- "Position" – approach gripper finger position, ▶ 9.4 [🗋 38]
- "Stop and Brake/GPE Test" – stop the movement of the gripper fingers or perform a brake test (if the gripper supports this function), ▶ 9.5 [🗋 40]

9.1 Acknowledge – Acknowledge



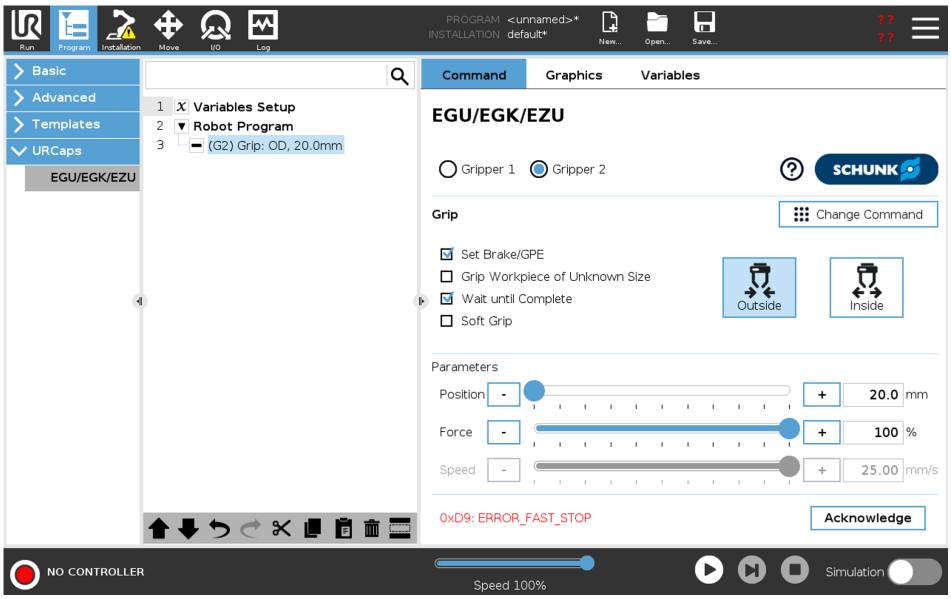
Command	Description
Acknowledge	When an error requiring acknowledgement occurs, the "Communication Status" LED on the gripper changes from green to red. The status bar displays the error message and a button to acknowledge the error. The gripper is switched from the error state to the normal operating state.

1. Select the gripper.
   ⇨ The robot program indicates which gripper is acknowledged.
2. Select the "Acknowledge" button in the status bar to test the action.

9.2 Grip – Grip workpiece

Parameter	Description
Wait until Complete	• If this parameter is selected, the system waits until the sent command has been completely processed by the gripper or the maximum time of 10 s is exceeded. Only then will the robot program continue to be executed. • If this parameter is *not* selected, the next command in the robot program is executed in parallel with the current grip command. This makes it possible, for example, to move the gripper and the robot at the same time.
Set Brake/GPE	If this parameter is selected, the gripping force maintenance (GPE) is activated after the movement is finished.
Outside	O.D. gripping The base jaws move from the outside to the inside. The workpiece is gripped from the outside.
Inside	I.D. gripping The base jaws move from the inside to the outside. The workpiece is gripped from the inside.
Position	Target position between 0.0 mm and maximum stroke The target position indicates how far the gripper is to be opened or closed.
Force	Gripping force 50% to 100% Percentage of the maximum gripping force used for the current grip. Values for minimum and maximum force can be found in the assembly and operating instructions for the gripper.
Speed	Gripping velocity The speed depends on the gripper used. Gripping velocity up to the target position before reducing the speed of the base jaws to protect the gripped workpiece from damage. Values for minimum and maximum speed can be found in the assembly and operating instructions for the gripper.

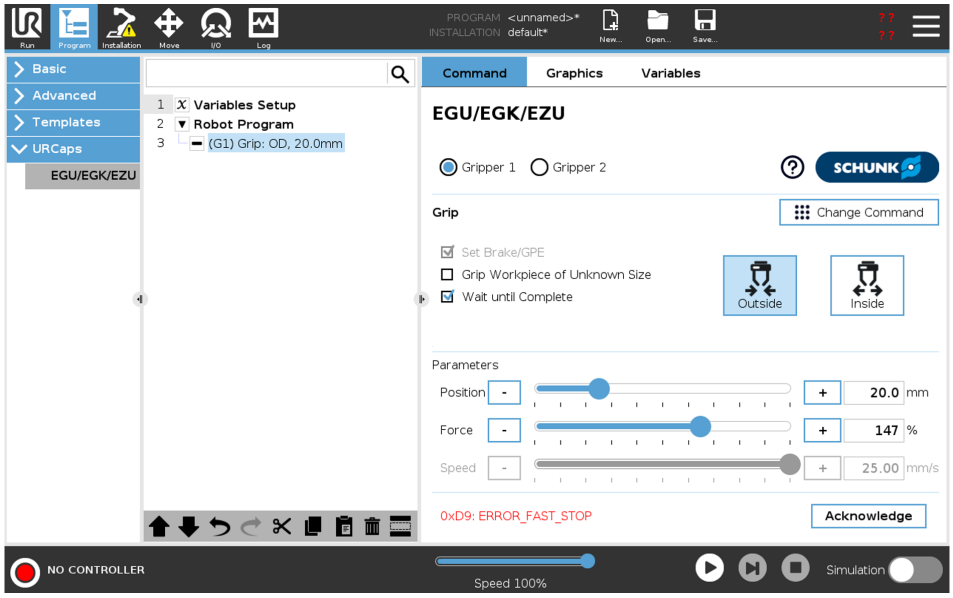
Soft Grip (EGK gripper only)



1. Select the "Soft Grip" checkbox.
   ⇨ Makes it possible to control the gripping velocity independently of the set force, reducing the impulse forces on a workpiece.
2. Adjusting gripping parameters for speed.
   ⇨ The maximum speed is adjusted based on the selected force value.
   ⇨ For more information on the "Soft Grip" mode, refer to the appendix or the assembly and operating manual of the gripper.

Strong Grip (EGU, EZU gripper with GPE only)

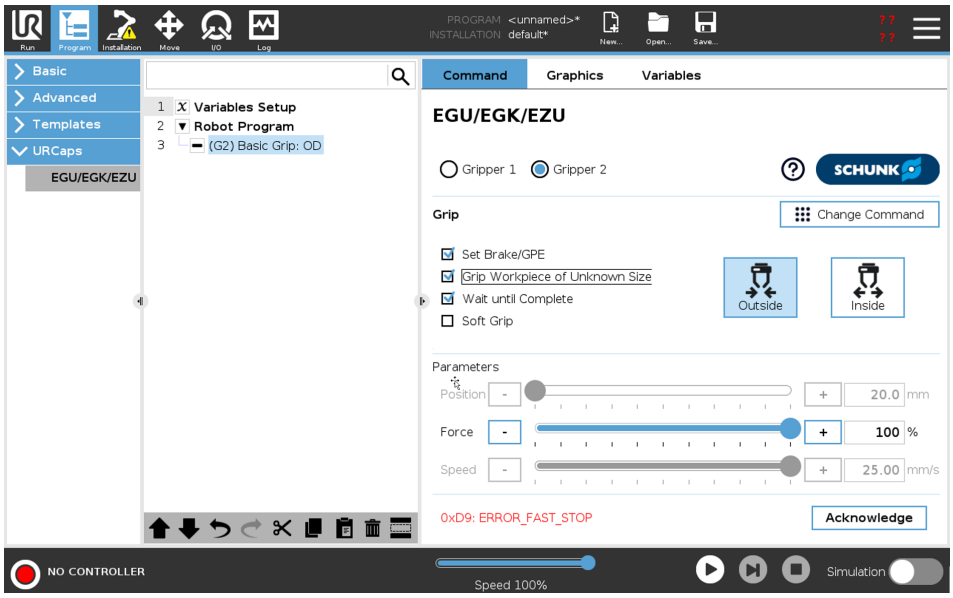
The Strong Grip mode can be used to grip workpieces with a gripping force greater than 100%. The range for the adjustable gripping force is automatically extended to 150 or 200%.



- Move the slider or use the input field to set the percentage of force to any value above 100%.
  - ⇨ The "Set brake/GPE" checkbox is activated when a gripping force higher than 100% is set. The checkbox is deactivated again when a gripping force of 100% or less is set.

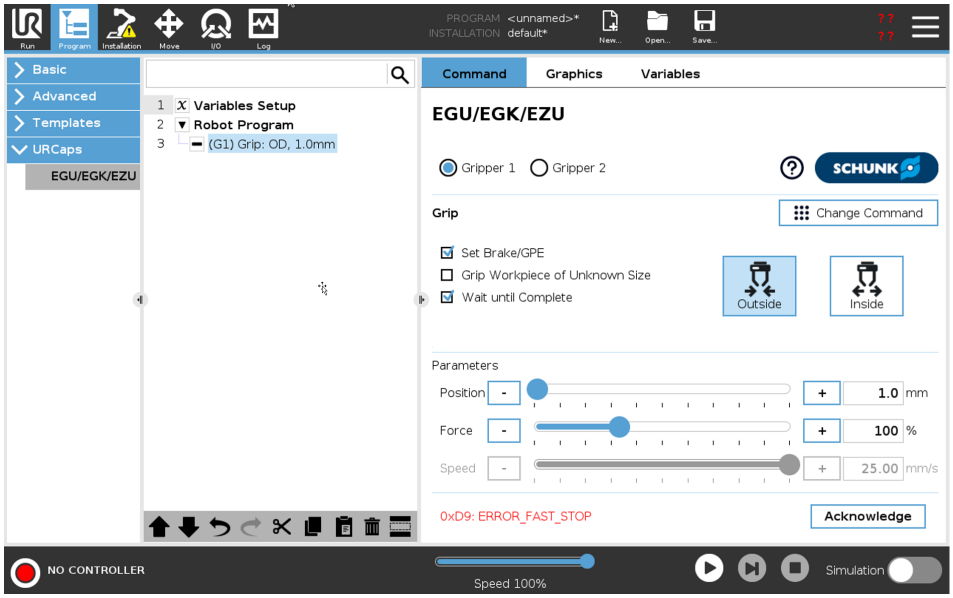
The Assembly and Operating Manual contains more information about the gripping speed in "Strong Grip" mode.

Workpiece gripping (simple gripping movement)



1. Select the gripping direction.
   ⇨ In the robot program, the gripping direction is displayed as OD (Outside) or ID (Inside).
2. Adjust the gripping force (in %).
   ⇨ The movement is added to the robot program.
3. Select the "Grip" button to test the movement.

Grip with position

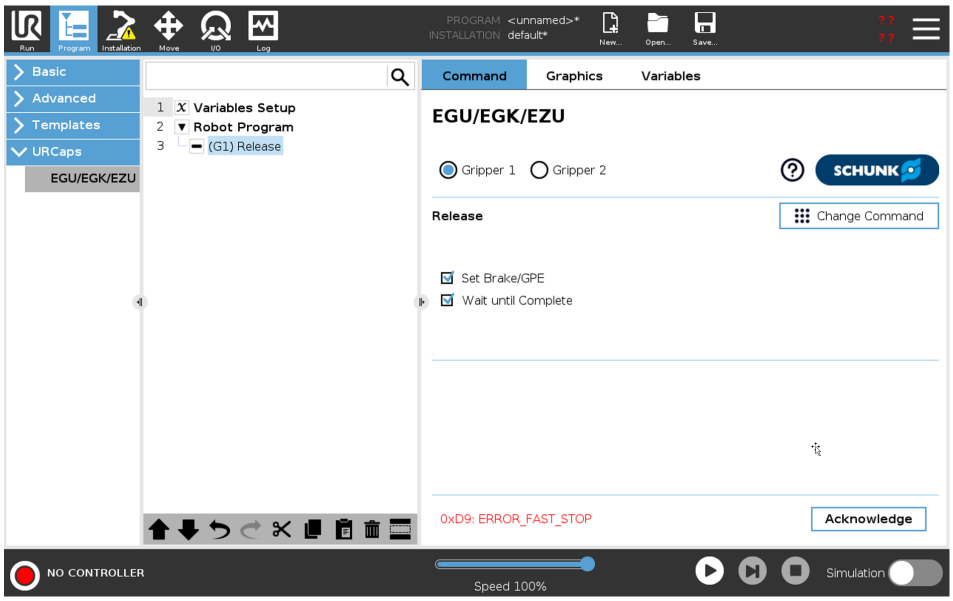


In workpiece gripping at an expected position, a workpiece is gripped at the specified workpiece position with the specified gripping force value using a combined gripping movement.

- Select the gripping direction.
  ⇨ The gripping speed is automatically determined by the gripping force.

9.3 Release – Release the workpiece

The release distance of the workpiece can be set in the "Installation" tab. In a program, the gripper fingers move away from the workpiece by the desired relative distance.



Parameter	Description
Wait until Complete	• If this parameter is selected, the system waits until the sent command has been completely processed by the gripper or the maximum time of 10 s is exceeded. Only then will the robot program continue to be executed. • If this parameter is *not* selected, the next command in the robot program is executed in parallel with the current grip command. This makes it possible, for example, to move the gripper and the robot at the same time.
Set Brake/GPE	If this parameter is selected, the gripping force maintenance (GPE) is activated after the movement is finished.

9.4 Position

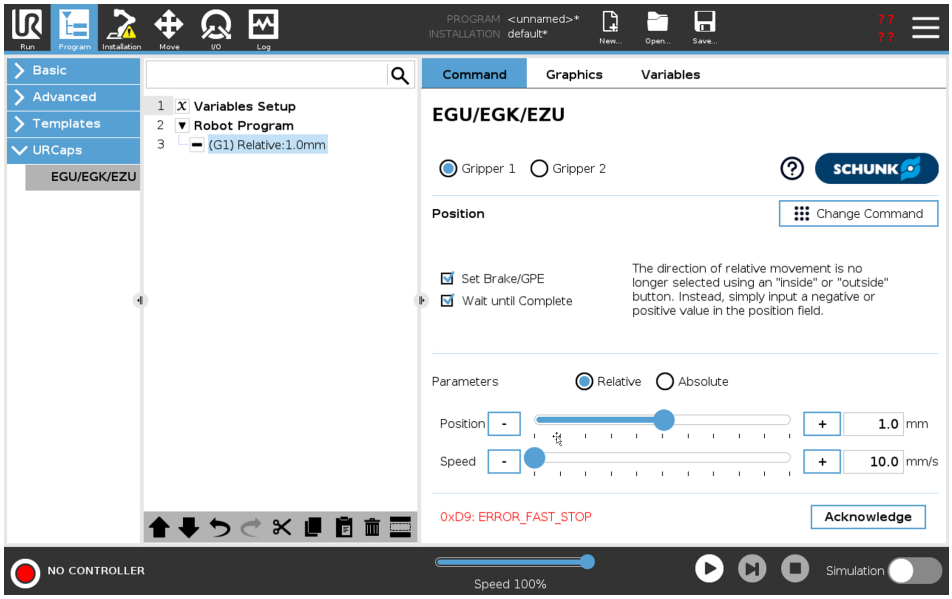
NOTICE

Possible material damage to the workpiece!

This function is not suitable for gripping.

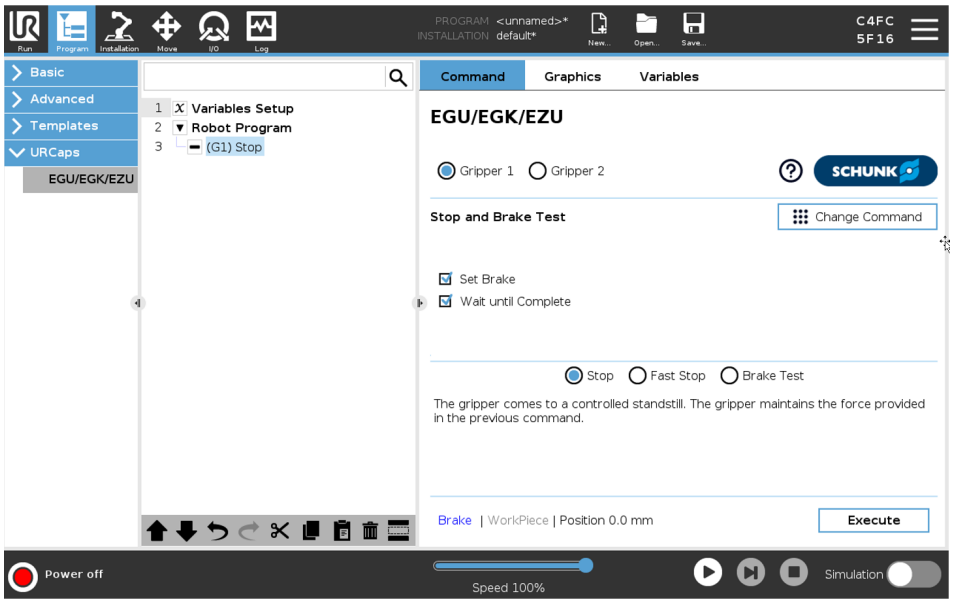
NOTE

If the "Position" action is interrupted by a blockage, the drive switches off. The error message "Move Blocked", which requires acknowledgment, is displayed in the status line. The drive remains de-energized until the next travel command.



Parameter	Description
Wait until Complete	• If this parameter is selected, the system waits until the sent command has been completely processed by the gripper or the maximum time of 10 s is exceeded. Only then will the robot program continue to be executed. • If this parameter is *not* selected, the next command in the robot program is executed in parallel with the current grip command. This makes it possible, for example, to move the gripper and the robot at the same time.
Absolute	Absolute Position The base jaws move to the position defined under "Target position".
Relative	Relative Position The base jaws move to a position determined by the relative distance to the current position of the base jaws. The relative distance is defined in the "Target distance" field.
Outside	Relative movement outward The base jaws move from the inside to the outside. This option is only available for the "Relative positioning movement" command.
Inside	Relative movement inward The base jaws move from the outside to the inside. This option is only available for the "Relative positioning movement" command.

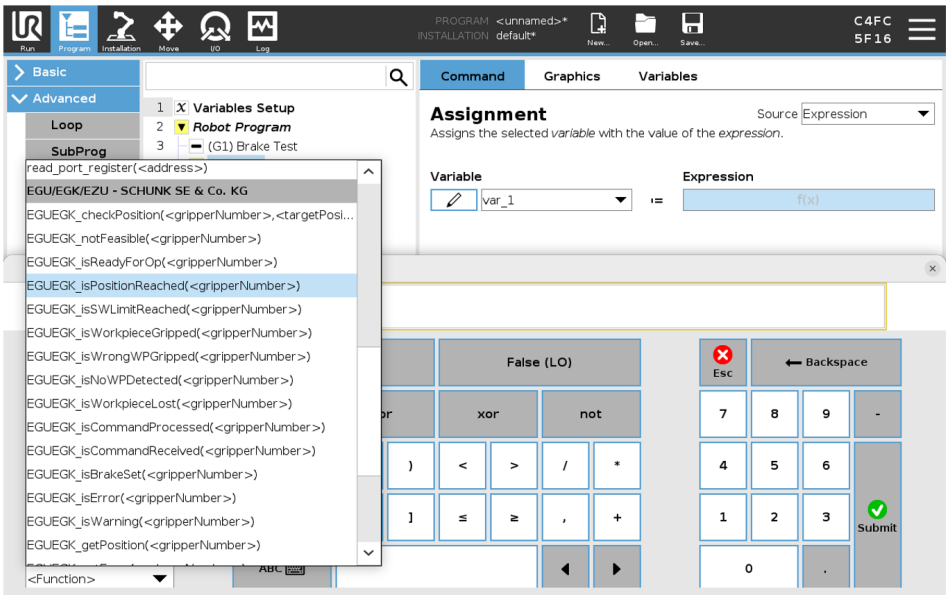
9.5 Stop and Brake/GPE Test



Parameter	Description
Wait until Complete	• If this parameter is selected, the system waits until the sent command has been completely processed by the gripper or the maximum time of 10 s is exceeded. Only then will the robot program continue to be executed. • If this parameter is *not* selected, the next command in the robot program is executed in parallel with the current grip command. This makes it possible, for example, to move the gripper and the robot at the same time.
Set Brake/GPE	If this parameter is selected, the gripping force maintenance (GPE) is activated after the movement is finished.
Stop	The gripping movement is brought to a controlled stop. The gripping force is maintained.
Fast Stop	The power supply is interrupted immediately and the gripper is stopped in an uncontrolled manner. An error message requiring acknowledgment is generated. **Caution! Possible material damage to the workpiece! Ensure that all workpieces have been removed and that the base jaws can move freely in the reference direction up to the end stop.**
Brake/GPE test	*NOTE: This command is only available for products of variant "M" and with firmware version 5.2 or higher.* The holding force of the brake is checked by applying a defined moment alternately in both directions against the applied brake.

10 Monitoring the gripper status

The "URCap" software provides functions with which the execution status of a running command or the gripper status in general can be monitored.



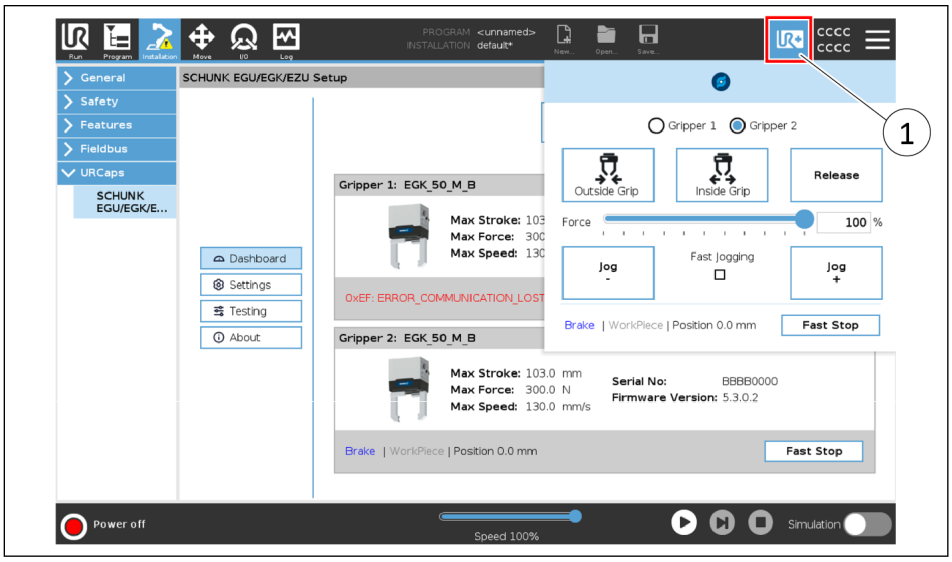
1. Select the "Program" button in the header line.
2. Select the "Advanced" button in the left menu.
   ⇨ A sub-menu opens.
3. Select the "Assignment" command.
   ⇨ The command appears in the robot program.
4. Specify the function further in the drop-down menu.
5. Select the function to be assigned to the command.
   ⇨ The drop-down menu "<Function>" opens.
   ⇨ The drop-down menu shows the various functions.
6. Select the desired function.

Function	Return value	Description
EGUEGK_checkPosition(gripper number, target position, position tolerance)	True / False	Enter the number of the gripper, position and tolerance for the position reached. **True:** Position reached. **False:** Position not reached.
EGUEGK_notFeasible(gripper #)	True / False	Control commands sent to the gripper may be permissible or impermissible. **True:** An invalid control command was sent. Gripper returns "not feasible". **False:**Gripper can execute the command with the given parameters.
EGUEGK_isReadyForOperation(gripper #)	True / False	**True:** Ready for operation. **False:** An error must be acknowledged.
EGUEGK_isPositionReached(gripper #)	True / False	Indicates whether the target position has been reached.
EGUEGK_isSoftwareLimitReached (gripper #)	True / False	**True:** Gripper fingers cannot move beyond the set minimum/maximum position. **False:** Gripper fingers can move beyond the minimum/maximum position.
EGUEGK_isWorkpieceGripped (gripper #)	True / False	**True:** Workpiece gripped **False:** Workpiece not gripped
EGUEGK_isWrongWorkpieceGripped (gripper #)	True / False	**True:** Wrong workpiece gripped **False:** Correct workpiece gripped
EGUEGK_isNoWorkpieceDetected (gripper #)	True / False	**True:** No workpiece detected. **False:** Workpiece detected.
EGUEGK_isWorkpieceLost(gripper #)	True / False	**True:** Workpiece lost. **False:** Workpiece gripped.
EGUEGK_isCommandProcessed (gripper #)	True / False	**True:** Command processed successfully. **False:** Command failed.
EGUEGK_isCommandReceived (gripper #)	True / False	Toggle after issuing a command: Command received.
EGUEGK_isBrakeSet(gripper#)	True / False	For products of variant "M" (with brake), the gripping force and position maintenance (GPE) is activated.

Function	Return value	Description
		True: Brake is activated -> GPE is active. **False:** Brake is not activated -> GPE is not active.
EGUEGK_isError(gripper #)	True / False	**True:** An error has occurred. **False:** Ready for operation.
EGUEGK_isWarning(gripper #)	True / False	**True:** A warning has occurred. **False:** Ready for operation.
EGUEGK_getPosition(gripper #)	Float	Returns the current position, which is also displayed in the status bar.
EGUEGK_getError(gripper #)	Integers	Returns the last pending error as a number. Example: 217 -> ERROR_FAST_STOP.
EGUEGK_getWarning(gripper #)	Integers	Returns the last pending warning as a number. Example: 148 -> WARNING_CMD_NOT_FEASIBLE.
EGUEGK_moveToPos(gripper#, position, isWaitComplete)	-	Executes an absolute position movement of the corresponding gripper with the parameters "position" and "isWaitComplete".
EGUEGK_moveAbs(gripper#, position, speed, isWaitComplete)	-	Executes an absolute position movement of the corresponding gripper with the parameters "position", "speed" and "isWaitComplete".
EGUEGK_moveRel(gripper#, position, speed, isWaitComplete)	-	Executes a relative position movement of the corresponding gripper with the parameters "position", "speed" and "isWaitComplete".
EGUEGK_outsideGripAtPos(gripper#, position, force, speed, isWaitComplete)	-	Executes an external grip of the corresponding gripper at a certain position with the parameters "position", "speed" and "isWaitComplete".
EGUEGK_outsideGripUnknwWP(gripper#, force, speed, isWaitComplete)	-	Executes an external grip of the corresponding gripper with the parameters "force", "speed" and "isWaitComplete".

Function	Return value	Description
EGUEGK_insideGripAtPos(gripper#,, position, force, speed, isWaitComplete)	-	Executes an internal grip of the corresponding gripper at a certain position with the parameters "position", "speed" and "isWaitComplete".
EGUEGK_insideGripUnknwWp(gripper#,, force, speed, isWaitComplete)	-	Executes an internal grip of the corresponding gripper with the parameters "force", "speed" and "isWaitComplete" from the "position" and "isWaitComplete" parameters.

11 Toolbar



1. Select the button (1) at the top right.
   ⇨ Grippers can be controlled from this window regardless of the selected menu.
2. Select the desired function:
   ⇨ Jog mode of the base jaws (*Jog*) with two different speeds *Fast jogging* increases the jog speed to the maximum
   ⇨ Execute the "*Grip*" and "*Release*" function
   ⇨ Adjusting the gripping force
   ⇨ Apply "*Fast Stop*" (the brake engages, if available)
   ⇨ Acknowledge

12 Troubleshooting

12.1 Error messages

Error	Possible cause	Corrective action
"Workpiece lost"	The gripping force was not sufficient to hold the workpiece.	Increase the gripping force. If necessary, check the gripper design.
"Blocked"	The base jaws of the gripper cannot reach the target.	Check if the guide of the base jaws is blocked or inspect the working environment for objects that obstruct the movement of the fingers.
"Workpiece not detected: Gripping an item outside of the workpiece tolerance "	The gripper holds a workpiece that is too large or too small	Check whether the correct workpiece is located between the gripper fingers. Otherwise, check and correct the workpiece tolerance settings in the installation screen.
"Command not feasible"	The gripper cannot execute the command.	Adjust the command parameters or check the gripper status.
Sporadic error "ERROR_COMMUNICATION_LOST" during the program sequence	System performance limited due to the number of installed software modules.	Uninstall software modules that are not needed in the program. Use the latest firmware version for grippers and the latest plug-in version for robots. Observe the example program for error handling, ▶ 13.2 [🗋 49].

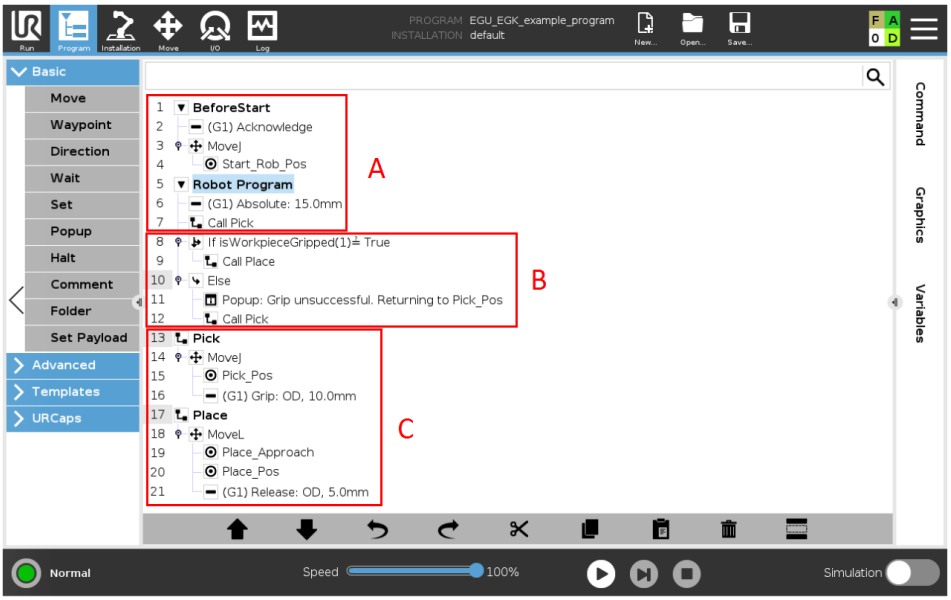
12.2 FAQ

Question/Problem	Answer/Solution
Connection fails	• During the installation process, make sure that under "Tool I/O" for "I/O Interface Control", the "EGU/EGK/EZU" value is set in the "Controlled by" selection field ▶ 7 [🗋 18]. • If there is a problem with the connection between the gripper and the robot arm, the cable and the connector on the joint should be checked first. 1. Visually check cables for damage. The cable insulation must not have any cracks. 2. Remove the gripper connector from the tool connection on the joint. When removing the cable, be careful not to unscrew the connector at an angle, as this may bend the pins and cause connection problems. 3. Check that the pins are straight and not dirty. 4. Reconnect the cable and tighten according to the robot manufacturer's specifications. 5. Add a gripping command to a new program and observe whether warnings or errors are displayed in the status bar. 6. If no warnings or errors are displayed, execute a test gripping process in the status bar and observe the result. 7. If the gripper still does not respond, there may be a connection problem in the cable or robot arm. In this case, contact SCHUNK Service.
What do you do if "Scan" does not recognize the connected gripper(s)?	• Make sure that the robot is fully switched on and that the emergency stop has not been triggered. • Check if the latest version of the EGU/EGK/EZU URCap software is installed ▶ 5 [🗋 14]. • If the current version is installed, make sure that "Tool I/O" is set to the URCap "SCHUNK EGU/EGK/EZU" to allow access to the tool connection. Then go back to "URCaps" > "SCHUNK EGU/EGK/EZU Setup" and run the scan again. • If several URCap plug-ins are installed on the robot: – delete all URCaps, – restart the robot, – install EGU/EGK/EZU URCap, – check whether the gripper has been found. • If the problem persists, contact SCHUNK service.

13 Examples of robot programs

13.1 General structure of a robot program

The following program demonstrates a simple Pick&Place application with an EGU-EGK gripper using the functionality provided by the URCap. Similar templates can be found on the Universal Robots website under the keyword "Application Builder".



Program module A ("BeforeStart") configures the gripper:

- If robot and gripper have just been switched on, the "FastStop" is acknowledged to activate the gripper (line 2).
- Before the program loop starts, the arm is moved to the starting position - Start_Robot_Pos - (line 4).

In the following lines, the gripper fingers are pre-positioned (line 6), e.g. to be able to grip at a closer distance. Meanwhile, the robot arm is moved to the gripping position - Pick_Pos (line 15). In line 16, an object is gripped via the EGU-EGK gripping program node.

Program module B contains an If-Else construction to monitor the gripping status:

- When an object is gripped, the function "is WorkpieceGripped()" returns the value TRUE.
- The program calls the subprogram "Place" and the robot arm moves to the end position Place_Pos (line 17) to place the object (line 20).

If no object is gripped, the robot calls the "Pick" program again (line 12). Further measures are the pre-positioning of the gripper fingers (line 6) and a notification popup (line 11)

Program module C contains the subprograms for Pick and Place. This is where the pick and place positions can be defined and the EGU-EGK commands for gripping or releasing can be used.

13.2 Error handling in the program

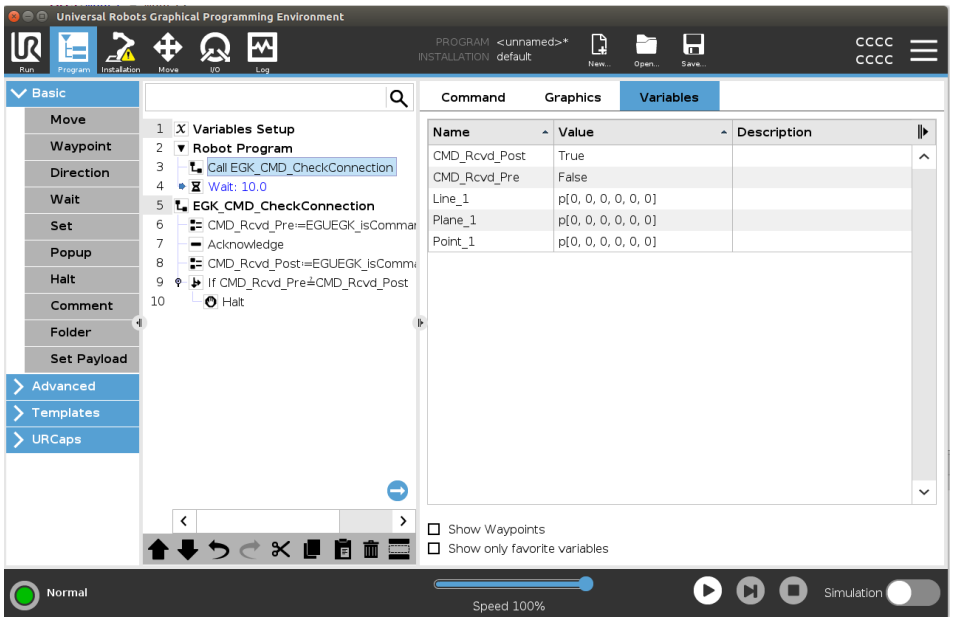
The following examples show how to check in the program whether sent commands have been received or whether errors or warnings are present.

NOTE

The program examples are located in a ZIP folder in the download file of the software module. This can be downloaded from **schunk.com/downloads-software**.

Checking whether a sent command was received by the gripper

To check whether a command has been received by the gripper and the gripper is still communicating with the robot control system, the status bit "command received toggle" can be used via the function "EGUEGK_isCommandReceived(gripper #)". In the following program example the command "Acknowledge" is executed in a subroutine.



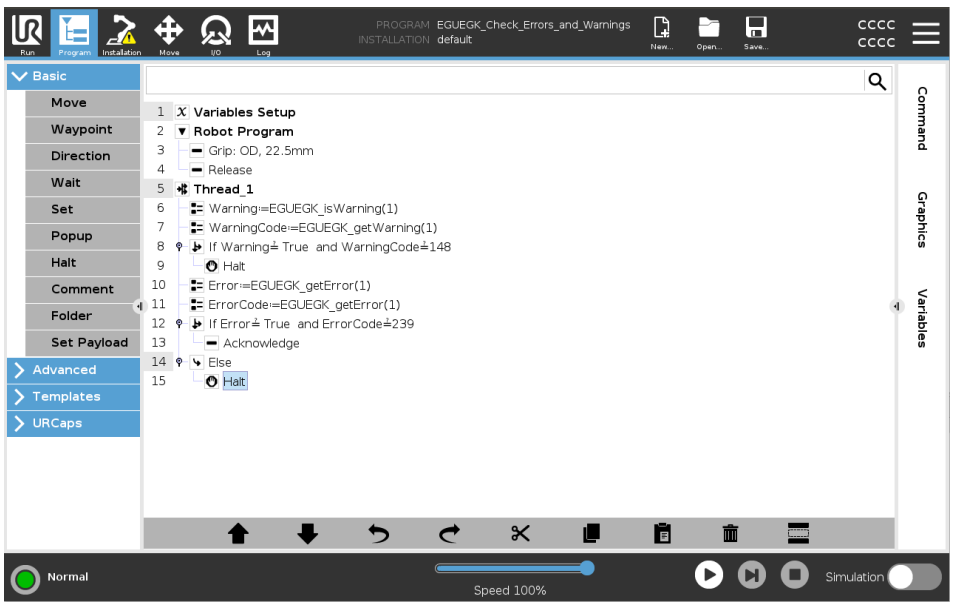
- Before executing the command, the state of the status bit "command received toggle" is stored in the variable *CMD_Rcvd_Pre*.
- After the command has been sent, the new state of the status bit is stored in the variable *CMD_Rcvd_Post*.
- The state of the status bit is now checked to see whether it has changed.

  - The previous illustration shows that the gripper has received the command because *CMD_Rcvd_Pre≠CMD_Rcvd_Post*.
  - If, for example, there were a cable break in one of the communication lines, then *CMD_Rcvd_Pre=CMD_Rcvd_Post* and the program would be stopped.
- In order to recognize when the new gripper is ready for use during an automatic gripper change, the subroutine can be executed in a loop until the status bit "command received toggle" changes its value after a command has been sent.

Checking whether errors or warnings are present

The functions "EGUEGK_isError(gripper #)" and "EGUEGK_isWarning(gripper #)" are used to generally check whether an error or a warning is present on the gripper. In addition, the functions "EGUEGK_getError(gripper #)" or "EGUEGK_getWarning(gripper #)" can be used to retrieve the last error or warning code.

- In the following example, a thread is started and the state of the status bit "warning" is stored in the variable *warning* or the last warningCode in the variable *warningCode*.
- If a warning is present and the last warningCode has the value 148 (WARNING_CMD_NOT_FEASIBLE), the program execution is stopped because the gripper could not execute the last command sent.



- In the second step, the state of the status bit "error" is stored in the variable *Error* and the last error code in the variable *errorCode*.

- If the gripper is currently in an error state and the last errorCode has the value 239 (ERROR_COMMUNICATION_LOST), the error should be acknowledged in this example ("Acknowledge" command). Otherwise, the execution of the robot program is stopped.

NOTE

An overview of the possible warning and error codes are contained in the commissioning instructions for Modbus RTU interface, ▶ 1.5 [🗋 6].

13.3 Program example CNC machine operation

This example program is based on the UR web app "Application Builder" and is designed for automating your own CNC machine loading and unloading. Ensure that all waypoints are taught in again in your own program to match your own setup. Names should also be changed and the correct I/Os selected to best match your setup. This sketch is only a guide for a setup with a storage rack for unfinished parts and a container for the finished parts.

Use this program template to start creating your machine maintenance application. The yellow nodes are incomplete, below is a description of their function so that the yellow nodes can be completed. Unlike this template with a single gripper, the robot can perform different tasks, the sequence does not have to be followed.

The main loop of the robot program constantly checks the status of three variables:

- Part_to_load is True if gripper 1 has gripped a new workpiece for loading the machine.
- Part_unloaded is True if gripper 2 has unloaded a finished workpiece from the machine.
- Part_in_Machine is True if there is a workpiece in the machine.

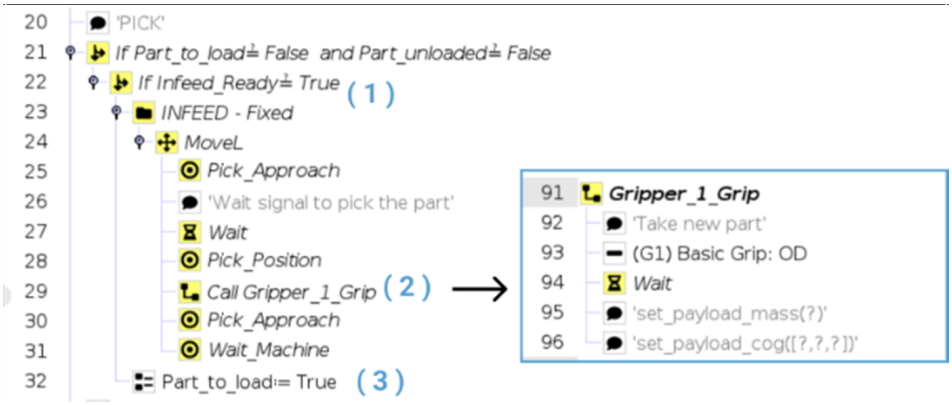
NOTE

UR Academy

Detailed information on programming the e-series is provided in the UR Academy on the Universal Robots website. This teaches the basics as well as the advanced application for machine operation

Gripping program section (Pick)

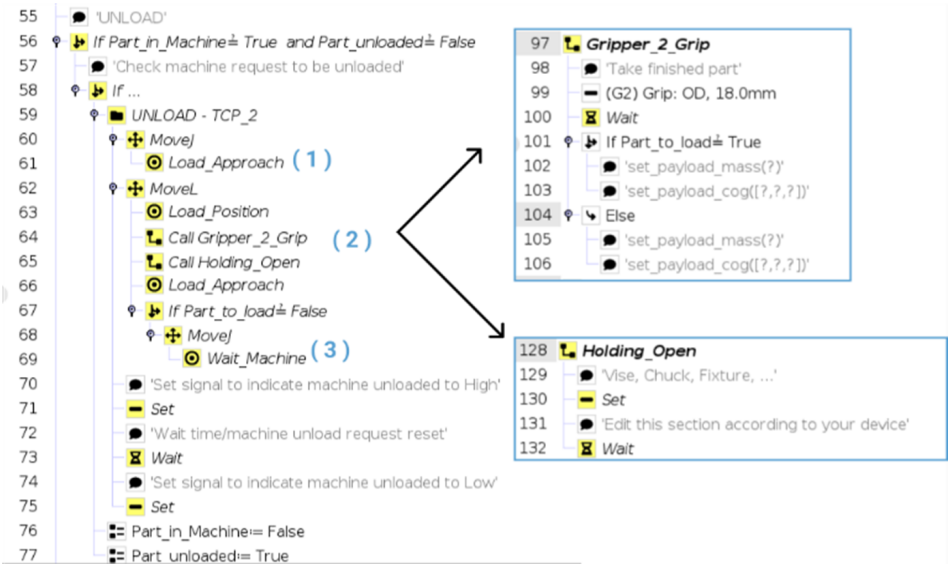
This section contains the sequence that the robot goes through to remove new parts from a feeder.



1. If the variable *Infeed_Ready* is True (1), move from *Pick_Approach* to *Pick* position
2. Call subprogram *Gripper_1_Grip* with a *Basic Grip* (2) to remove the new workpiece.
   Set a new payload and center of gravity.
3. Move to waypoint *Wait_Machine* to be closer to the machine and shorten the time to load the workpiece into the machine when it is ready.
4. Set variable *Part_to_load* to True (3), which initiates the steps for unloading.

Unloading program section (UNLOAD)

This section contains the sequence that the robot goes through to unload the machine when the status conditions are met and the machine has requested unloading.

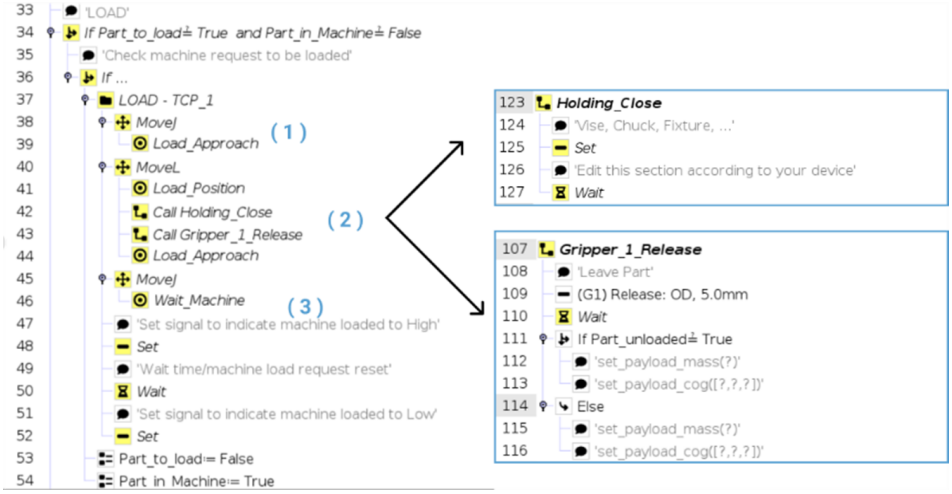


1. Move to the loading position of the machine (1).
2. Call the subprogram *Gripper_2_Grip* (2) to grip the machined workpiece.

3. Call *Holding_Open* to completely release the finished workpiece from the lathe chuck, vise or other device.
4. If there is no new workpiece, move robot to position *Wait_Machine*(3);
   otherwise remain in the machine to load the workpiece directly after this sequence.
5. Set a signal to indicate that the machine is unloaded.
   Do not clear the display until the machine request is reset.

Loading program section (LOAD)

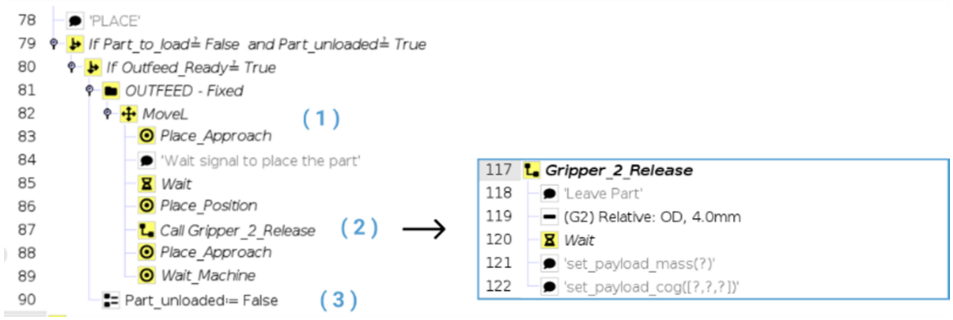
This section contains the sequence that the robot goes through to load the machine when the status conditions are met and the machine has requested loading.



1. Load_Approach (1) ensures that the robot reaches Load_Position (2) to place a part into the machine without collision. These are fixed waypoints that must be taught in order to move the workpiece with gripper 1.
2. (3) Call *Vise Close* to close the lathe chuck, vise, or other device holding the workpiece.
   Call *Gripper_1_Release* to leave the workpiece in the machine: This ensures that the workpiece does not move during the transfer from the gripper to the machine.
3. Go via *Load_Approach* to *Wait_Machine*, another fixed waypoint that must be taught in a position where the robot is outside the machine.
4. Set a signal to indicate that the machine is loaded.
   Wait until the machine request is reset, then clear this display.

Placing program section (PLACE)

This section contains the sequence that the robot goes through to place the finished workpieces into a container. Alternatively, the *palettizing template* can be used to place workpieces in a tray or on a discharge conveyor.



1. Call subprogram *Gripper_2_Release* (2), which uses a relative movement of 4.0 mm and returns to the Place_Approach position (1).
2. If no new part is available for removal, approach *Wait_Machine* or another suitable waiting position.
3. Set variable *Part_unloaded* to *False* (3). When a new part is present, the robot arm moves back to the feeder and starts the PICK sequence.

14 Appendix

14.1 Definition of gripping force mode

BasicGrip

This gripping mode is available for all variants of the product. In BasicGrip, the workpiece is gripped with the nominal gripping force or less. The motor is permanently energized, which allows the workpieces to be continuously re-gripped.

Note: The gripping velocity changes depending on the set gripping force.

SoftGrip

This gripping mode is available for all EGK variants.

The SoftGrip mode can be used to gently grip delicate, fragile or fracture-sensitive workpieces such as electronics, glass and ceramics.

To influence the force pulse at SoftGrip, a gripping velocity value must be transferred. This gripping velocity value must be between the minimum gripping velocity <min_vel> and the calculated gripping velocity used in BasicGrip mode with the same gripping force.

Note: The gripping force changes depending on the set gripping velocity.

StrongGrip

This gripping mode is only available for the "M" variant with the EGU and EZU.

In StrongGrip mode, the workpiece is gripped with a gripping force greater than 100 percent, which makes it possible to grip heavy workpieces.

In this mode, the motor briefly activates a higher power level, and an elastomer stores the high gripping force. After an adjustable time, the motor brake engages and the workpiece is held.

14.2 Compatibility overview regarding current carrying capacity

The following tables show the compatibility of the grippers with the robot. The maximum power consumption of the gripper and the maximum power output of the robot are considered. The payload and the dead weight of the gripper unit are not balanced. SCHUNK recommends that the payload of the robot will be considered in detail.

NOTE

Due to technical changes, the compatibility overviews may be outdated. Therefore, SCHUNK recommends performing a detailed comparison with the current data sheets of the robot model. For further questions please contact SCHUNK!

Compatibility overview: EGK with UR robots

Size	Gripping force mode/ Nominal gripping force	UR								
		3e	5e	7e	10e	12e	15	16e	20	30
SG: one mounted product										
EGK 25	BasicGrip / 100%	✓	✓	✓	✓	✓	✓	✓	✓	✓
EGK 40	BasicGrip / 100%	✓	✓	✓	✓	✓	✓	✓	✓	✓
EGK 50	BasicGrip / 100%	✓	✓	✓	✓	✓	✓	✓	✓	✓
DG: two mounted products										
EGK 25	BasicGrip / 100%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EGK 40	BasicGrip / 100%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EGK 50	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!

Legend:

- ✓ The power consumption of the gripper is within the range of the power delivered by the robot.
- ! The power consumption of the gripper exceeds the power delivered by the robot. Compatibility could be possible through restrictions of gripping parameters, e.g. by reducing the gripping force.
- ✗ The power consumption of the gripper exceeds the power delivered by the robot. Gripper and robot are not compatible.

Compatibility overview: EGU with UR robots

Size	Gripping force mode/ Nominal gripping force	UR 3e	UR 5e	UR 7e	UR 10e	UR 12e	UR 15	UR 16e	UR 20	UR 30
SG: one mounted product										
EGU 50	BasicGrip / 100%	✓	✓	✓	✓	✓	✓	✓	✓	✓
EGU 50	StrongGrip / 200%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EGU 60	BasicGrip / 100%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EGU 60	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EGU 70	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!
EGU 70	StrongGrip / 150%	✗	✗	✗	!	!	!	!	!	!
EGU 80	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!
EGU 80	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
DG: two mounted products										
EGU 50	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!
EGU 50	StrongGrip / 200%	✗	✗	✗	!	!	!	!	!	!
EGU 60	BasicGrip / 100%	✗	✗	✗	!	!	!	!	!	!
EGU 60	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EGU 70	BasicGrip / 100%	✗	✗	✗	!	!	!	!	!	!
EGU 70	StrongGrip / 150%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EGU 80	BasicGrip / 100%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EGU 80	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗

Legend:

✓ The power consumption of the gripper is within the range of the power delivered by the robot.

! The power consumption of the gripper exceeds the power delivered by the robot. Compatibility could be possible through restrictions of gripping parameters, e.g. by reducing the gripping force.

✗ The power consumption of the gripper exceeds the power delivered by the robot. Gripper and robot are not compatible.

Compatibility overview: EZU with UR robots

Size	Gripping force mode/ Nominal gripping force	UR								
		3e	5e	7e	10e	12e	15	16e	20	30
SG: one mounted product										
EZU 30	BasicGrip / 100%	✓	✓	✓	✓	✓	✓	✓	✓	✓
EZU 30	StrongGrip / 200%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EZU 35	BasicGrip / 100%	✗	✓	✓	✓	✓	✓	✓	✓	✓
EZU 35	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EZU 40	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!
EZU 40	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
DG: two mounted products										
EZU 30	BasicGrip / 100%	✗	!	!	!	!	!	!	!	!
EZU 30	StrongGrip / 200%	✗	✗	✗	!	!	!	!	!	!
EZU 35	BasicGrip / 100%	✗	✗	✗	!	!	!	!	!	!
EZU 35	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗
EZU 40	BasicGrip / 100%	✗	✗	✗	!	!	!	!	!	!
EZU 40	StrongGrip / 200%	✗	✗	✗	✗	✗	✗	✗	✗	✗

Legend:

✓ The power consumption of the gripper is within the range of the power delivered by the robot.

! The power consumption of the gripper exceeds the power delivered by the robot. Compatibility could be possible through restrictions of gripping parameters, e.g. by reducing the gripping force.

✗ The power consumption of the gripper exceeds the power delivered by the robot. Gripper and robot are not compatible.

14.3 Brands

- UR is a registered trademark of Universal Robots A/S (Denmark).

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