

Software manual

SCHUNK software module for URCap

Flexible gripper EGH for cobot



Superior Clamping and Gripping



Imprint

Copyright:

This manual is protected by copyright. The author is SCHUNK GmbH & Co. KG. All rights reserved. Any reproduction, processing, distribution (making available to third parties), translation or other usage - even excerpts - of the manual is especially prohibited and requires our written approval.

Technical changes:

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

Document number: 1433429

Version: 01.00 | 12/03/2020 | en

© SCHUNK GmbH & Co. KG

All rights reserved.

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

SCHUNK GmbH & Co. KG
Clamping and gripping technology
Bahnhofstr. 106 - 134
D-74348 Lauffen/Neckar
Tel. +49-7133-103-0
Fax +49-7133-103-2399
info@de.schunk.com
schunk.com

Table of Contents

1	General.....	4
1.1	About this manual	4
1.2	Applicable documents	4
2	Functional description of "URCap"	5
3	Installing the software module	6
3.1	Uninstalling the software module	8
4	Configure the software module	9
4.1	Configuring the IP address.....	10
4.2	Configuring the referencing of the gripper	10
4.3	Configuring digital outputs	11
5	Creating the robot program	12
5.1	EGH commands	13
5.2	EGH grip.....	14
5.3	EGH position	16
5.4	EGH color light band.....	18
6	Monitoring the gripper status	19
7	Setting the Tool Center Point (TCP) and gripper weight.....	22
8	Example of a robot program	23

1 General

1.1 About this manual

This manual contains information on the "URCap" software.

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

- Flexible gripper EGH for cobot

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under [Applicable documents](#) [► 4] are applicable.

This manual describes the software environment on an e-Series UR robot. The described plug-in is also designed for use with the CB-Series robots, although the content may vary. Follow the instructions for the robot.

1.2 Applicable documents

- Assembly and operating manual for the product *
- Software guide "SCHUNK gripper with IO-Link" *
- Operating manual for the UR robot

The documents marked with an asterisk (*) can be downloaded on our homepage **[schunk.com](https://www.schunk.com)**

2 Functional description of "URCap"

The "URCap" software is used for the simple commissioning and programming of the SCHUNK gripper EGH in combination with robots from Universal Robots. The "URCap" software is integrated seamlessly into the "Polyscope" programming environment of Universal Robots. The programming and configuration of the gripper are supported via the control panel of the robot.

The "URCap" software has been tested under the Polyscope version 5.5 of Universal Robots. SCHUNK recommends installing the current Polyscope version on the robot used.

3 Installing the software module

CAUTION

Damage to the product possible!

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.

NOTE

To install the software, use the enclosed USB stick.

NOTE

The latest URCap version can be downloaded from schunk.com. SCHUNK recommends using the latest software version to avoid malfunctions.

NOTE

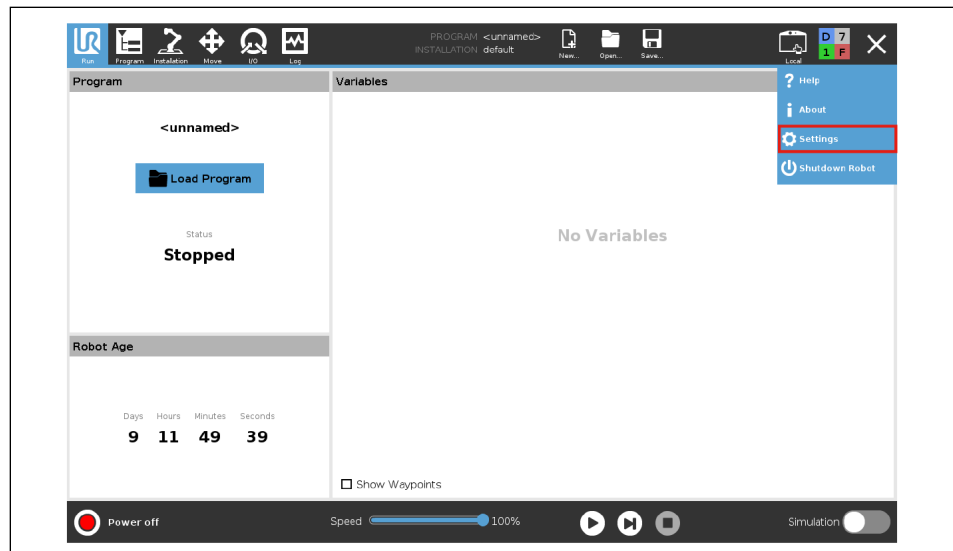
For command execution of the "URCap" software, a background process uses the Universal Robots daemon port 40408. When using other URCap modules, make sure that the same daemon port is not used.

Installing the software module

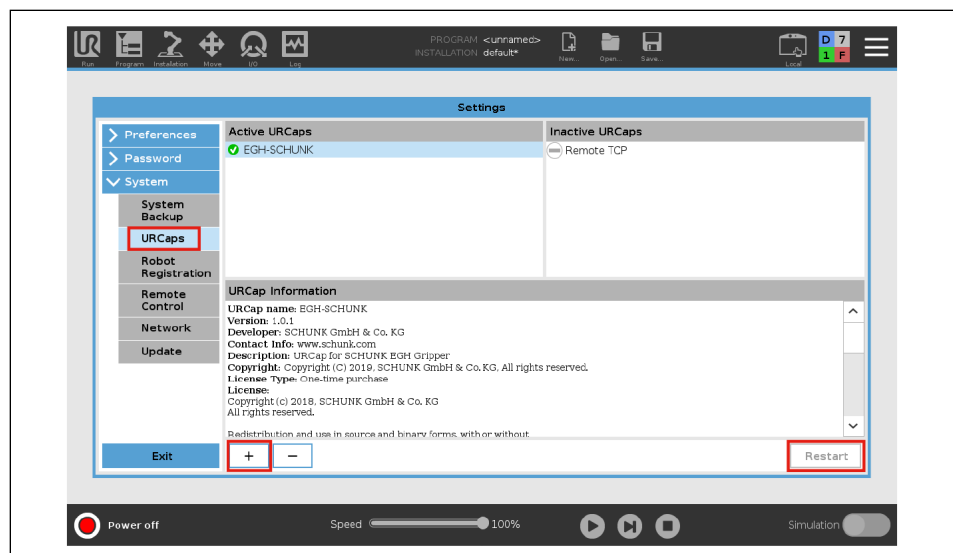
- Connect the USB stick to the robot control system. The USB interface is located at the back.



- Switch on the robot control system.
 - ✓ The robot control system is started.



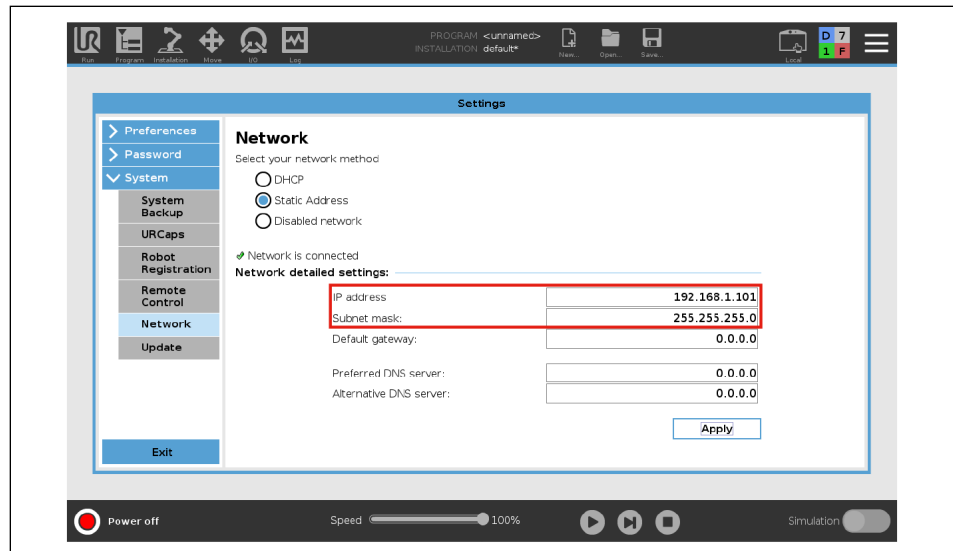
- Open the menu at the top right and choose "Settings".



- Select the "System" button in the left menu.
 - ✓ A submenu opens.
- Select the "URCaps" button.
- Select the "+" button.
- Select software module "EGH-SCHUNK".
- Select the "Open" button.
 - ✓ The software module is added and displayed in the Explorer window.
- Select the "Restart" button to complete the installation.
 - ✓ The system restarts.

Configuring network settings

- Open the menu at the top right and choose "Settings".
- Select the "System" button in the left menu.
 - ✓ A submenu opens.
- Select the "Network" button.
 - ✓ The network settings are displayed in the Explorer window on the right.



- Configure the connection via "Static IP Address".

NOTE

SCHUNK recommends the following information for error-free communication with the product.

- Enter an IP address for the robot control system in the "IP address" input field, e.g. 192.168.1.101.
- Enter the subnet mask of the network in the "Subnet mask" input field, e.g. 255.255.255.0.
- Select the "Apply" button.
- Select the "Exit" button in the left menu to close the network settings.

3.1 Uninstalling the software module

- Open the menu at the top right and choose "Settings".
- Select the "System" button in the left menu.
 - ✓ A submenu opens.
- Select the "URCaps" button.
- Select software module "EGH-SCHUNK".
- Select the "-" button.
- Select the "Restart" button to complete the deinstallation.
 - ✓ The system restarts.

4 Configure the software module



⚠ CAUTION

Risk of injury possible!

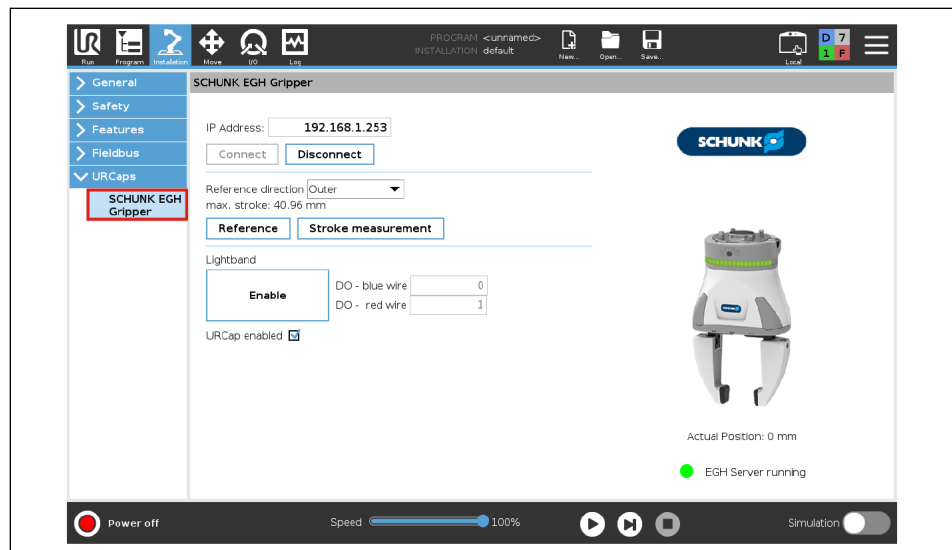
Safety-relevant signals (e.g. emergency stop) must be transmitted externally, e.g. using a safety relay. In this configuration the product would not be energized in the event of a safety incident.

- Review safety aspects within a risk assessment.

NOTE

Directly after the robot has started up or after the product has been switched on for the first time, the message "FAST STOP" must be acknowledged twice in the installation node. This is an internal safety function that only enables the product after the control system in use has been completely started up. Even if the "URCap" software is deactivated, the product is still placed in a security state and the "FAST STOP" must be acknowledged twice if URCap is activated again.

- Select the "Installation" button in the header line.
- Select the "URCaps" button.
 - ✓ A submenu opens.
- Select the "SCHUNK EGH Gripper" button.
 - ✓ The Explorer window displays the settings to be configured and an image of the product.



- Perform the configuration.

The following details can be configured:

- IP address, [Configuring the IP address](#) [► 10]
- Referencing of the gripper, [Configuring the referencing of the gripper](#) [► 10]
- Digital outputs, [Configuring digital outputs](#) [► 11]

4.1 Configuring the IP address

- Connect the product to port 1 of the FEN20-4IOL IO-Link master.
- Enter the default IP address: 192.168.1.253

For further configurations please refer to the software offered by TURCK, www.turck.de/de/productgroup/Downloads

4.2 Configuring the referencing of the gripper

NOTE

Referencing the product takes some time. During this time, it is recommended not to perform any other operations on the product and robot.

NOTE

A stroke measurement should be performed if the stroke of the base jaws is limited, for instance, by specific gripper finger shapes. The stroke measurement moves contrary to the referencing direction. If no stroke measurement is performed, a stored default value for a stroke of 40 mm per base jaw is used.

- All workpieces have been removed.
- The base jaws are unobstructed as far as the end stop in the referencing direction.
- Set the reference direction of the base jaws to "Inner" or "Outer" in the drop-down menu.
- Select the "Reference" button
 - ✓ The product moves in a set direction up to the mechanical end stop, zero position is set.
- Select the "Stroke measurement" button.
 - ✓ Maximum stroke is determined

4.3 Configuring digital outputs

NOTE

Control of the light band is only possible via the separate digital supply lines. If the light band is deactivated, the digital outputs are not used in the program.

- Connect the light band to the robot control system.
- Press the "Enable" button to use the light band.
 - ✓ The input fields "DO - blue wire" and "DO - red wire" are now active.
- Enter the address of the digital outputs into the input fields "DO - blue wire" and "DO - red wire".
- In the LED program node, select the corresponding color and test the configuration if necessary, [EGH color light band](#) [► 18].

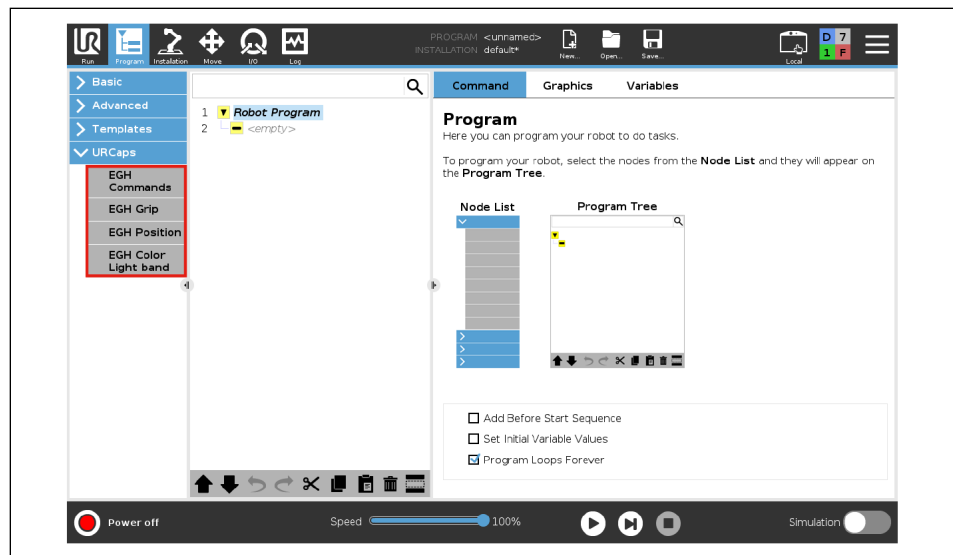
SCHUNK recommends using the digital outputs of the "Digital I/O" group for general purposes to control the light band. The output address to be configured refers to the numbering of the ports shown above.

Safety			Remote			Power			Configurable Inputs				Configurable Outputs				Digital Inputs				Digital Outputs				Analog			
Emergency Stop	24V	■	12V	■	PWR	■	■	■	24V	■	24V	■	0V	■	0V	■	24V	■	24V	■	0V	■	0V	■	AG	■	■	■
	EI0	■	GND	■	GND	■	■	■	C10	■	C14	■	CO0	■	CO4	■	D10	■	D14	■	DO0	■	DO4	■	AI0	■	■	■
	24V	■	ON	■	24V	■	■	■	24V	■	24V	■	0V	■	0V	■	24V	■	24V	■	0V	■	0V	■	AG	■	■	■
Safeguard Stop	EI1	■	OFF	■	0V	■	■	■	C11	■	C15	■	CO1	■	CO5	■	D11	■	D15	■	DO1	■	DO5	■	AI1	■	■	■
	24V	■							24V	■	24V	■	0V	■	0V	■	24V	■	24V	■	0V	■	0V	■	AG	■	■	■
	SI0	■							C12	■	C16	■	CO2	■	CO6	■	D12	■	D16	■	DO2	■	DO6	■	AO0	■	■	■
	24V	■							24V	■	24V	■	0V	■	0V	■	24V	■	24V	■	0V	■	0V	■	AG	■	■	■
	SI1	■							C13	■	C17	■	CO3	■	CO7	■	D13	■	D17	■	DO3	■	DO7	■	AO1	■	■	■

Recommended use of the digital outputs to control the light band

5 Creating the robot program

After installing the software module "SCHUNK EGH URCap", URCap actions can be inserted into a robot program.

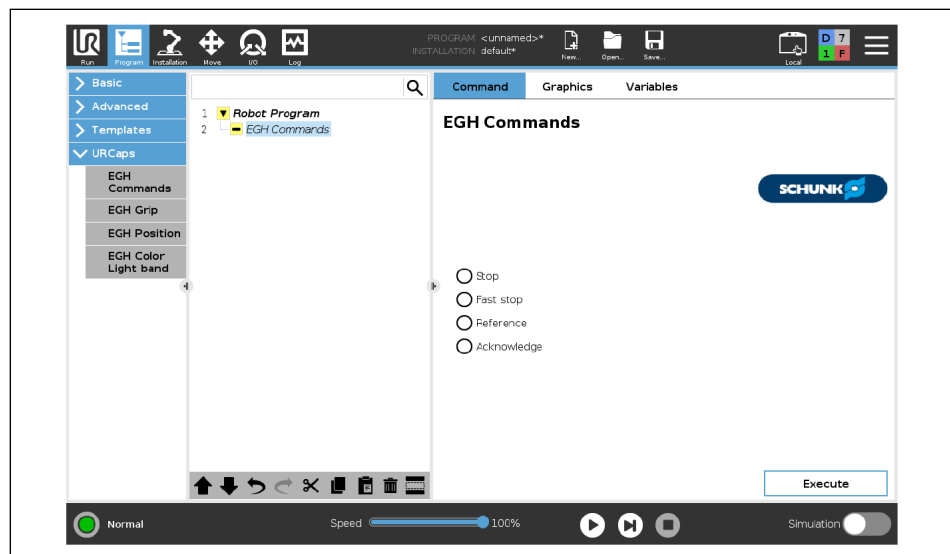


- Select the "Program" button in the header line.
 - ✓ The robot program and a short description for creating the program are displayed in the Explorer window.
- Select and configure the desired action.

The following actions can be selected:

- EGH commands
 - Stop
 - Fast stop
 - Reference
 - Acknowledge
- EGH grip (or EGH release)
- EGH position (or EGH relative travel)
- EGH color light band

5.1 EGH commands



Command	Description
Stop	The gripper is brought to a controlled standstill. The gripping force is maintained.
Fast stop	The electrical power supply is interrupted immediately, the gripper is stopped uncontrolled. An error message requiring acknowledgment is generated. IMPORTANT! Material damage to the workpiece possible! Ensure that all workpieces have been removed and that the base jaws are free to move in the reference direction up to the end stop
Reference	The gripper moves in the configured referencing direction up to the mechanical end stop, Configuring the referencing of the gripper [► 10].
Acknowledge	If an error has been eliminated, the gripper is switched from the error state to the normal operating state. The actuator remains de-energized until the next command. In the event of an error that needs to be acknowledged, the first of the three indicator LEDs on the gripper changes from green to red.

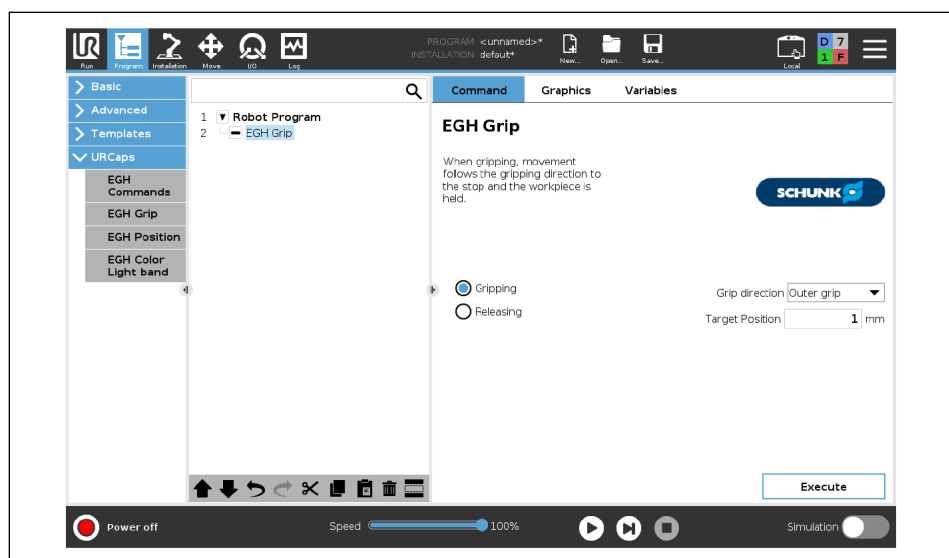
- Select a command.
 - ✓ The action has been added to the robot program.
- Select the "Execute" button to test the action.

5.2 EGH grip

With the "grip" action, the set gripping direction is moved to the stop and the workpiece is held. Before reaching the entered target position, the motor current and thus the speed of the base jaws is reduced. This protects the gripped workpiece from damage.

NOTE

During the first gripping process, the complete stroke is driven at a reduced speed and current. The position of the last successful grip is accepted as the intended workpiece position for the next grip command. The intended workpiece position is reset to blockage after referencing, stroke measurement as well as after positioning.



Gripping parameters	Value	Remark
Grip direction	Inner grip	The base jaws move from the inside to the outside. The workpiece is gripped from the inside. With this setting, the gripper moves the base jaws together when released.
	Outer grip	The base jaws move from the outside to the inside. The workpiece is gripped from the outside. With this setting, the gripper moves the base jaws apart when released.
Target position	between 0.0 and max. stroke	The target position indicates up to where the gripper is to be opened or closed. The maximum stroke can be determined when referencing the gripper, Configuring the referencing of the gripper [► 10].

- Select "Gripping" or "Releasing".
- Set gripping parameters.
 - ✓ The action has been added to the robot program.
- Select the "Execute" button to test the action.

5.3 EGH position

CAUTION

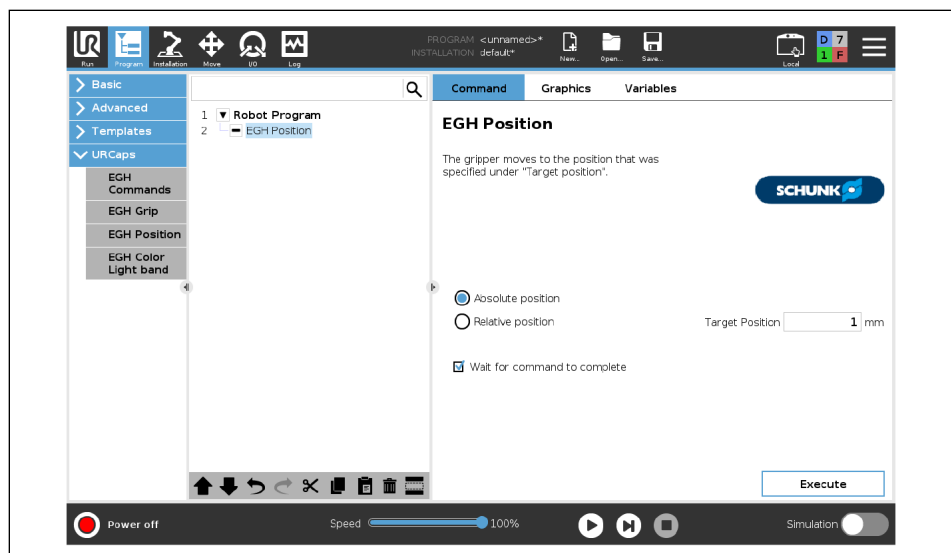
Material damage to the workpiece possible!

This action is not suitable for gripping, because the movement always takes place at maximum speed.

- For positioning on an end stop, select the commands "Gripping" and "Releasing".

NOTE

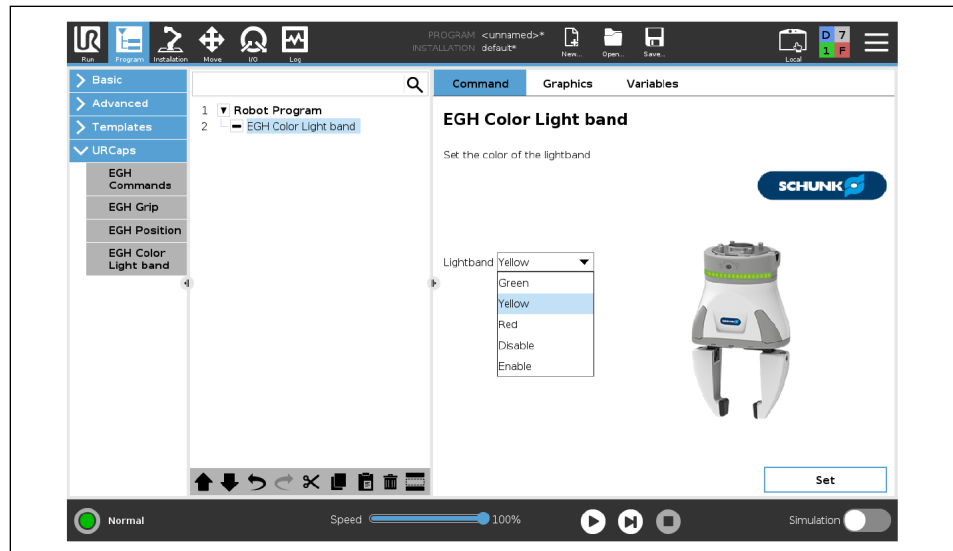
If the action "EGH position" is interrupted by a blockage, the drive switches off and an error message requiring acknowledgment is generated. The actuator remains de-energized until the next motion command.



Command	Description
Absolute position	The base jaws move to the position defined under "Target position".
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 position" field.
Wait for command to complete	<p>If the command is selected, the entire movement waits before the next action in the robot program is executed.</p> <p>If the command is not selected, the next action is performed before the movement is complete.</p> <p>For example, the robot arm is then moved while the base jaws are moved into position.</p> <p>No other gripping commands should follow in direct succession. Otherwise, the corresponding follow-up gripping command is executed before the movement is completed.</p>

- Select "Absolute position " or "Relative position".
- Enter the desired value in the "Target position" input field.
- If necessary, select "Wait for command to complete".
 - ✓ The action has been added to the robot program.
- Select the "Execute" button to test the action.

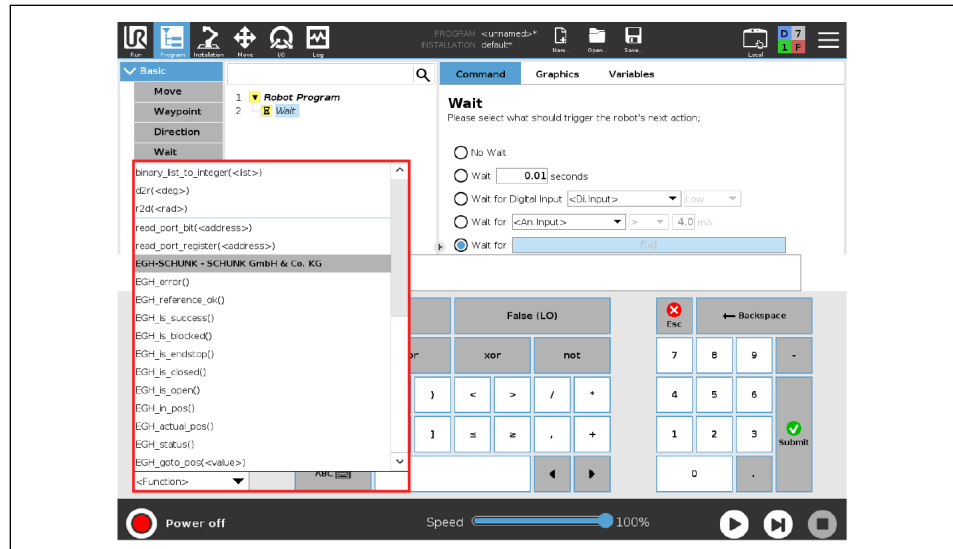
5.4 EGH color light band



- Select an option from the "Lightband" drop-down menu.
 - ✓ "Disable" switches the light band off, "Enable" switches the light band to green.
 - ✓ The action has been added to the robot program.
- Select the "Set" button to test the action.

6 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.



- Select the "Program" button in the header line.
- Select the "Basic" button in the left menu.
 - ✓ A submenu opens.
- Select basic command.
 - ✓ The command appears in the robot program.
- Specify the command in the Explorer window.
- Select the function to be assigned to the command.
 - ✓ The drop-down menu "<Function>" opens.
 - ✓ The drop-down menu shows the various functions.
- Select the desired function.

Function	Return value	Description
EGH_status()	0 to 3	The current status of the product is displayed: 0: Error 1: Outside of specification 2: Maintenance required 3: Ready for operation
EGH_reference_ok()	True / False	True: Gripper is referenced False: Gripper is not referenced Note: The gripper should always be referenced within a program.

Function	Return value	Description
EGH_actual_pos()	Float	The current gripping position is displayed. The position (in mm) is the distance of a base jaw from the referenced zero point.
EGH_goto_pos(<value>)	True / False	<p>The gripper moves the base jaws to the position corresponding to the transferred <value> (in mm). This function corresponds to the action "EGH position movement".</p> <p>Recommendation: If you want to wait until the position is reached, a "Wait" command must be attached, which contains the function "EGH_in_pos()".</p>
EGH_in_pos()	True / False	<p>True: The gripper has reached the last specified position (± 0.1 mm).</p> <p>False: The gripper has not reached the last specified position.</p> <p>Recommendation: Use the monitoring after the direct execution of a position or reference movement</p>
EGH_is_open()	True / False	<p>"True" is returned when the base jaws are at the maximum position in the correspondingly configured gripping direction. Otherwise, "False" is returned.</p> <p>Recommendation: Use the monitoring after the direct execution of a gripping command</p>
EGH_is_closed()	True / False	<p>"True" is returned when the base jaws are at the minimum position in the correspondingly configured gripping direction. Otherwise, "False" is returned.</p> <p>Recommendation: Use the monitoring after the direct execution of a gripping command</p>

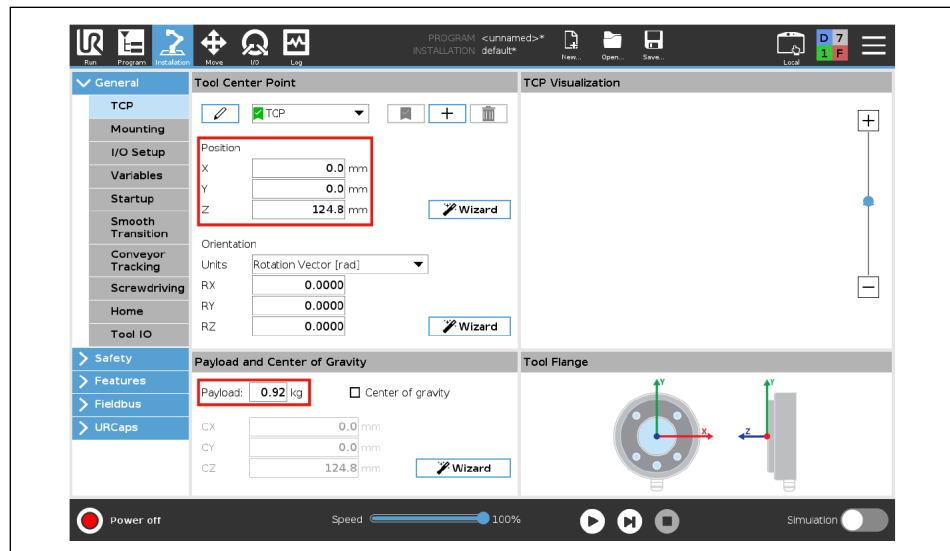
Function	Return value	Description
EGH_is_endstop()	True / False	"True" is returned when the gripper is positioned at the end stop. The end stop matches the position "0.0" ± tolerance or "Maximum stroke" ± tolerance. Otherwise, "False" is returned.
EGH_is_blocked()	True / False	"True" is returned if the base jaws are blocked and the gripper does not move although the actuator is energized. Otherwise, "False" is returned.
EGH_is_success()	True / False	<p>"True" is returned when a command is successfully executed. If a new command is executed, this command is reset to false. If the command was not executed successfully, "False" is returned.</p> <p>Note: The monitoring is applicable to all commands. For an adequate check, SCHUNK recommends the other functions. For more information, see the software manual "SCHUNK Grippers with IO-Link," Applicable documents [► 4].</p>
EGH_error()	unit8	<p>0: There is an error.</p> <p>In case of an error, the error code is transferred. For more information, see the software manual "SCHUNK Grippers with IO-Link."</p>

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

NOTE

For further information on Tool Center Point (TCP), see the operating manual of the UR robot, [Applicable documents](#) [► 4].

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.



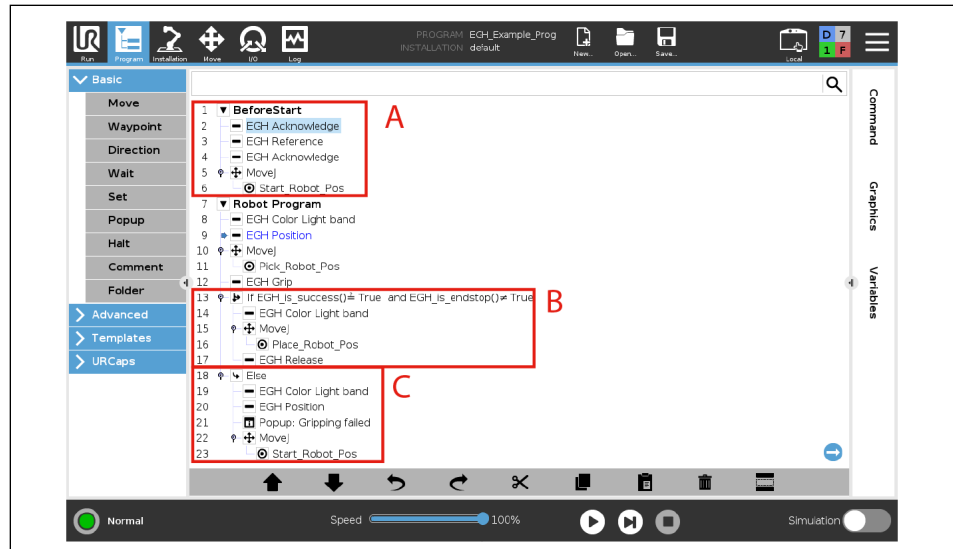
- Select the "Installation" button in the header line.
- Select the "General" button in the left menu.
 - ✓ A submenu opens.
- Select the "TCP" button.
- Enter the following values in the X, Y and Z fields in the "Tool Center Point" section:
 - ✓ X = 0.0 mm
 - ✓ Y = 0.0 mm
 - ✓ Z = 124.8 mm + length of gripper fingers
- Enter the gripper weight of 0.95 kg in the "Payload and center of gravity" section in the "Payload" field.

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" > "Adjust".

8 Example of a robot program

The following program demonstrates a simple pick and place application with an EGH gripper using the functionality provided by the URCap.



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).
- The gripper is referenced (line 3).
- Before the program loop starts, the arm is moved to the starting position - Start_Robot_Pos - (line 6).

In the following lines, the light band color is set to yellow (line 8) and the gripper fingers are pre-positioned (line 9), e.g. to be able to grip at a closer distance. Meanwhile, the robot arm is moved to the gripping position - Pick_Robot_Pos (line 11). In line 12, an object is gripped via the program node EGH grip.

Program modules B and **C** contain an If-Else construction to monitor the gripping status:

- If an object was gripped, the function EGH_is_success() returns the value TRUE while the end stop has not been reached (EGH_is_endstop()≠TRUE) (line 13).
- The success of this monitoring is acknowledged by setting the light band to green (line 14).
- At the end, the robot arm moves to the end position Place_Robot_Pos (line 16) to place the object (line 17).

If no object has been gripped, the light band turns red (line 19). Further measures are the pre-positioning of the gripper fingers (line 20) and a notification popup (line 21). If the user decides to continue the program, the robot arm moves to the starting position Start_Robot_Pos (line 23).

