Commissioning instructions EGU/EGK/EZU for CRX cobots

SCHUNK software module FANUC CRX

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

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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 for FANUC CRX cobots and how to use it.

The software is used for simple integration and control of the following products in FANUC CRX applications:

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

NOTE

The compatibility of the product with the robot depends on the current carrying capacity, for compatibility overview see ▸ 13.2 [🗋 58].

Definition of terms "Product"

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

This manual describes the software environment for a FANUC CRX robot.

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

In addition to these instructions, the documents listed under ▸ 1.5 [🗋 7] 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 FANUC 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 [🗋 6]: 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:
  - Electric universal gripper EGU *
  - Gripper for small components, electric EGK *
  - Electric centric gripper EZU*
- Commissioning instructions:
  - EGU with Modbus RTU interface *
  - EGK with Modbus RTU interface *
  - EZU with Modbus RTU interface *
- Operating manual for FANUC CRX robots

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

2 Functional description

The software module facilitates operation and creation of applications for SCHUNK products on a collaborative FANUC CRX robot.

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

The following functions are available in the software module and can be used in the SCHUNK app:

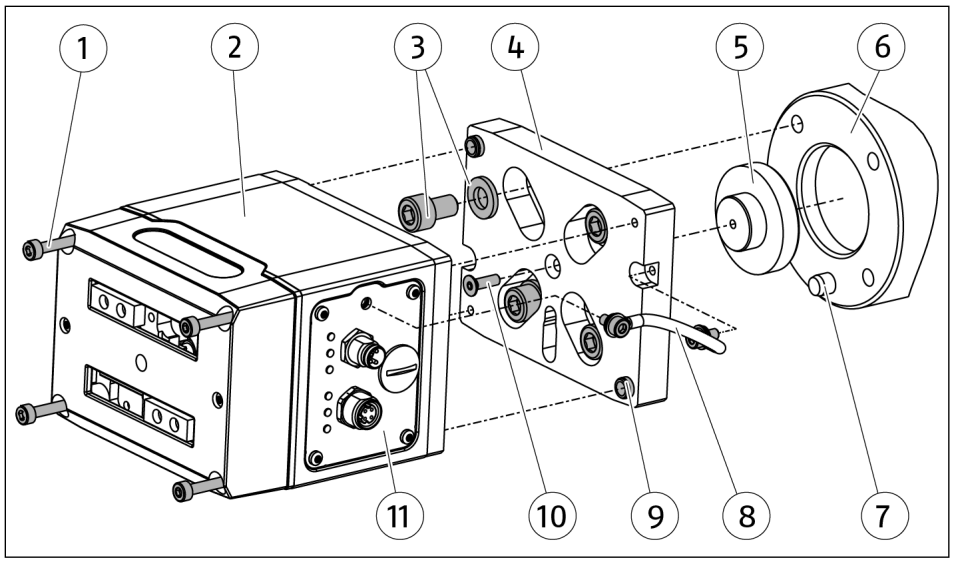
- **Grip Unknown**: During workpiece gripping (simple gripping movement), a workpiece is gripped with a specified gripping force value **without** specifying the workpiece position.
- **Grip Position**: During workpiece gripping at an expected position, a workpiece is gripped at the specified workpiece position with the specified gripping force value using a combined gripping movement.
- **Release**: When releasing a workpiece, the product executes a relative positioning movement. Starting from the current position, a defined distance is moved in the opposite direction to the gripping direction.
- **Absolute position**: Absolute positioning of the gripper fingers
- **Relative Position**: Relative positioning of the gripper fingers
- **Acknowledge**: Acknowledge pending warnings and errors
- **Stop/Fast Stop**: Controlled stop/stop movements
- **Get Status**: Validate gripping process and/or workpiece loss detection
- **Tool Attach**: Switch on voltage on the flange during a tool change
- **Tool Detach**: De-energize the gripper during a tool change
- **Test Brake/GPE**: Perform brake test (*only for products of variant "M" and with firmware version 5.2 or higher*)

For more information on inserting the commands into the program code, see ▸ 9 [🗋 30].

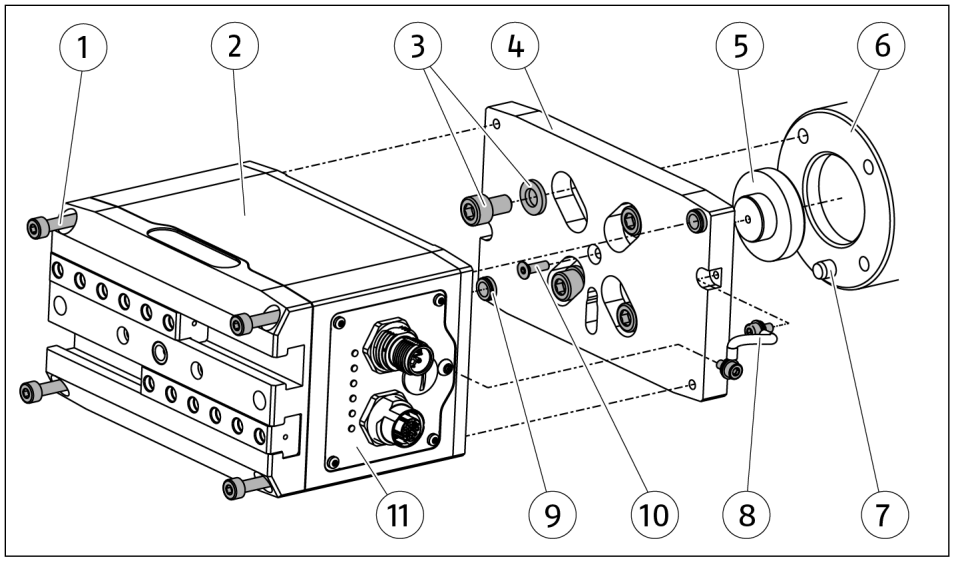
3 Mounting the product to the robot

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**.

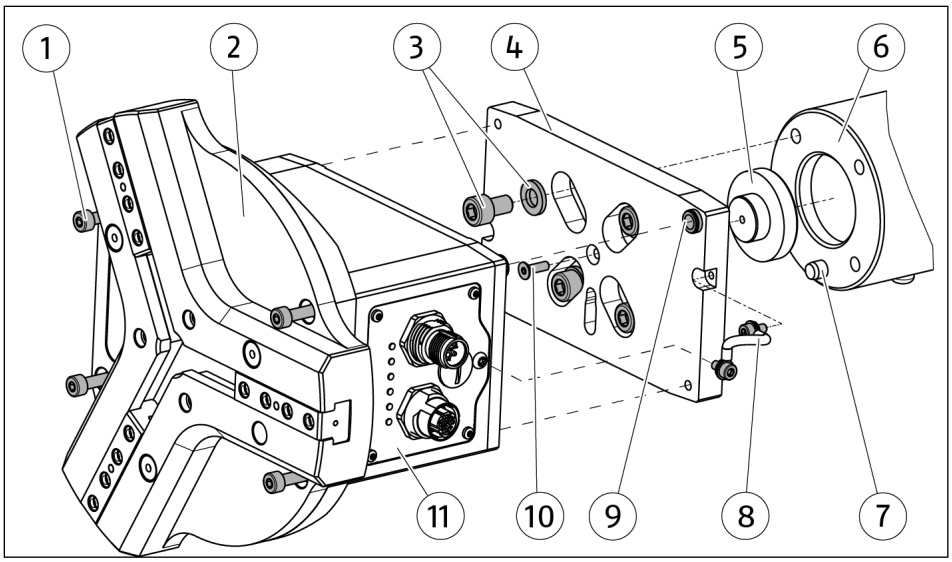
Single gripper (SG)



EGK-SG: Mounting on the robot



EGU-SG: Mounting on the robot



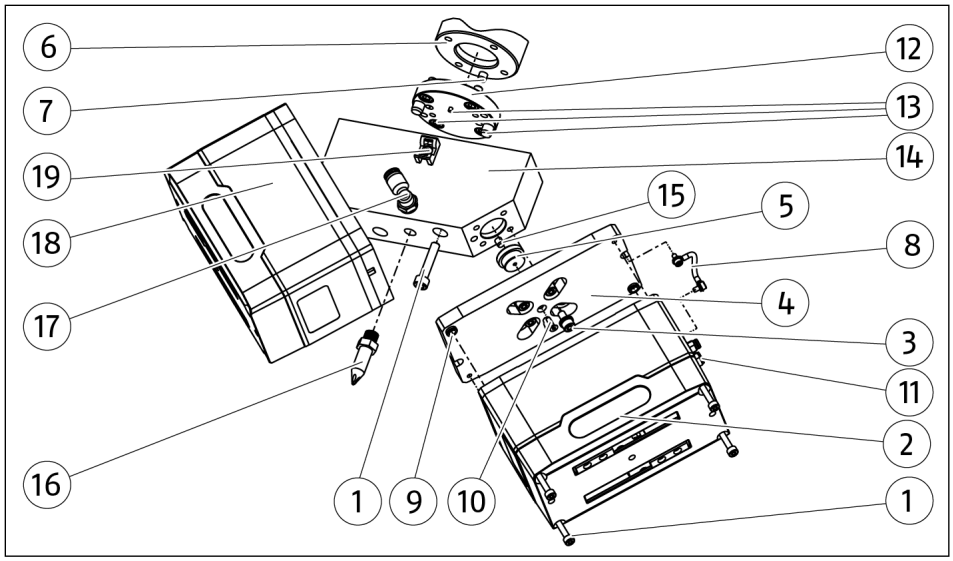
EZU-SG: Mounting on the robot

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.

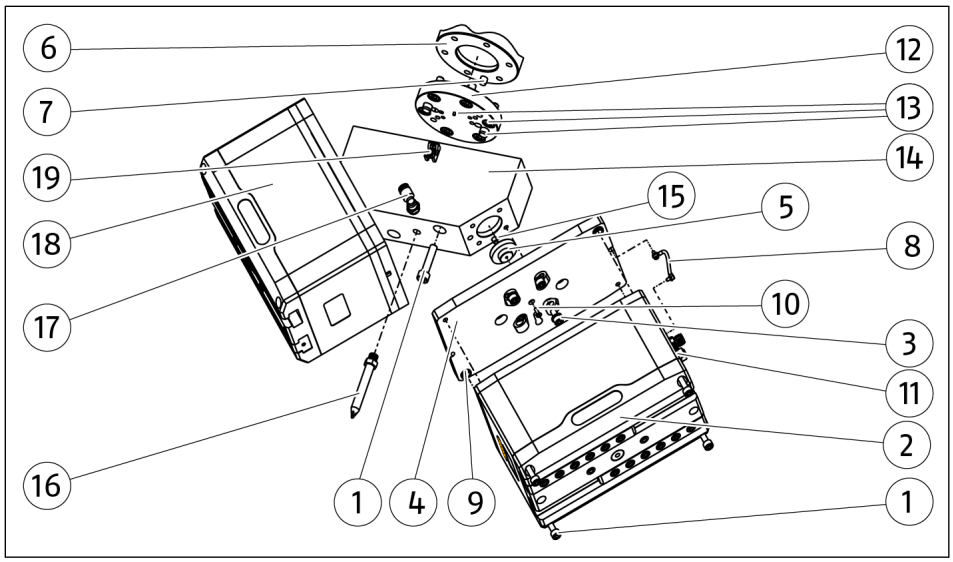
Double gripper (DG)

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.

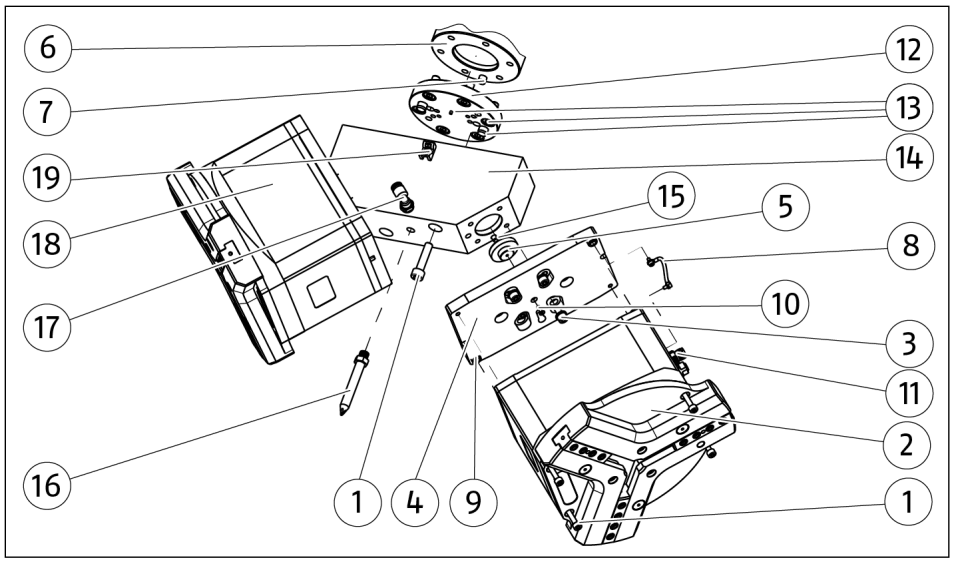
Blow-off nozzle and cable holder are available as accessories from SCHUNK, see catalog data sheet at **schunk.com**.



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.

NOTICE

Possible damage to product!

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

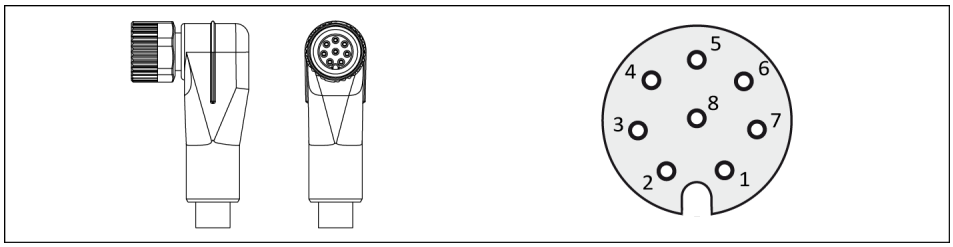
- Connect or disconnect electrical connections only when the device is switched off.

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.

Connection assignment



Pin allocation of connecting plug EGU/EGK on robot

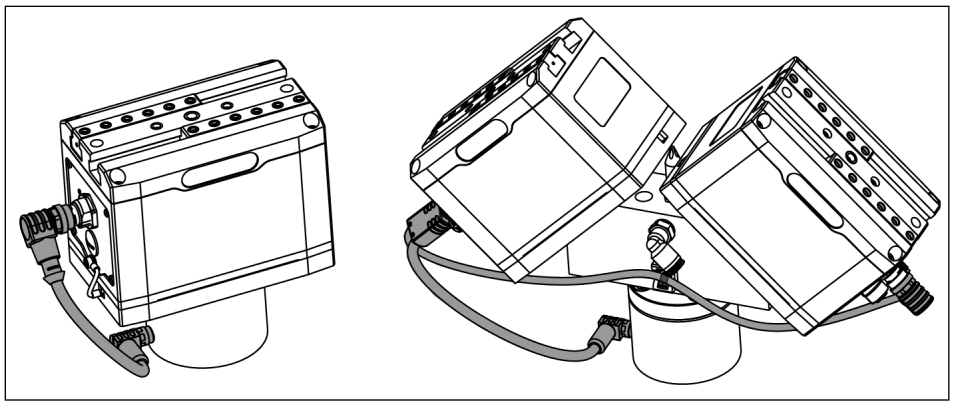
Signal	Gripper Pin	Robot Pin
V+	1	5
BUS_A	2	1
GND	3	8
BUS_B	4	2
n.c.	5	3, 4, 6, 7

Tab.: Connection assignment EGU/EGK on FANUC CRX 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.



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.

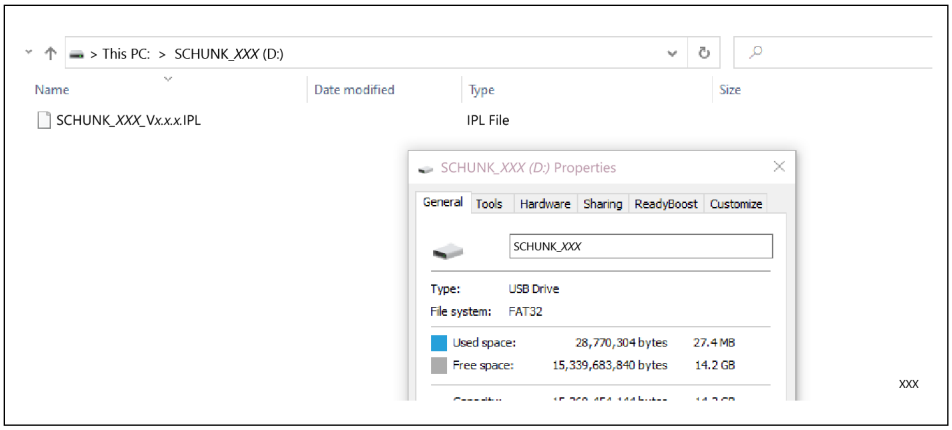
Preparing the installation

NOTE

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

The USB data carrier must comply with the following requirements:

- Formatted in FAT32 format
- Designation: "SCHUNK_*XXX*", (*XXX* = product type)



Installing

NOTE

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

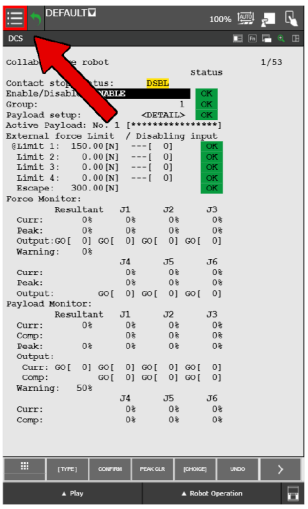
■ Product is mounted and connected to the robot control system.

1. Download the current version of the software module at **schunk.com/downloads** and copy it to the USB stick.

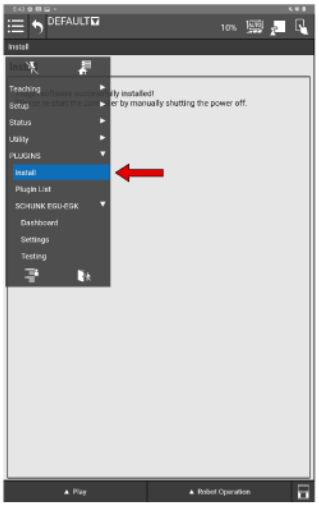
   ⇨ The CRX control software must be compatible with the version of the software module. Information on this can be found in the download area.

2. Connect the USB stick to the robot control system (not to the USB port of the Tablet Teach Pendant).

3. Select the "Menu" button at the top left of the Tablet Teach Pendant screen.



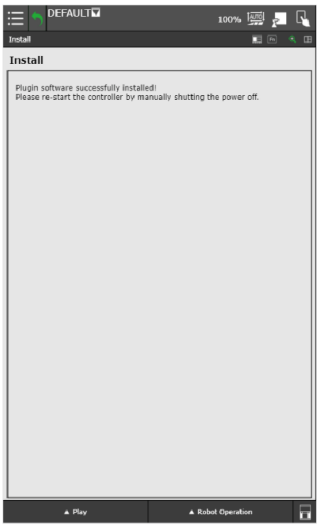
4. Select "PLUGINS" > "Install" in the menu.



5. Select the "Install" button.

⇨ The installation is executed.

6. Restart the robot controller as soon as the installation is complete.



6 Uninstalling the software module

1. Select the "Menu" button at the top right of the Tablet Teach Pendant screen.
2. In the "PLUGINS" menu > "select Plugin List".
3. Select software module from the list.
4. Select "Uninstall" on the lower right-hand side.
5. Confirm selection.
   ⇨ The message appears saying the software module has been uninstalled.
6. Restart the robot controller.

7 Parameterizing and testing products

⚠ WARNING

Risk of injury due to sudden movements!

This can cause components to move unexpectedly when being dismantled, which may result in serious injuries.

- Keep a safe distance and wear suitable protective equipment.

The following functions are included in the configuration menu:

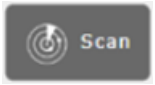
- Dashboard, ▸ 7 [🗋 19]
  - Search for product(s)
  - Show connection status
- Settings, ▸ 7 [🗋 21]
  - Setting parameters
  - Show status changes
- Testing, ▸ 7 [🗋 25]
  - Manual operation
  - Show status changes

Dashboard

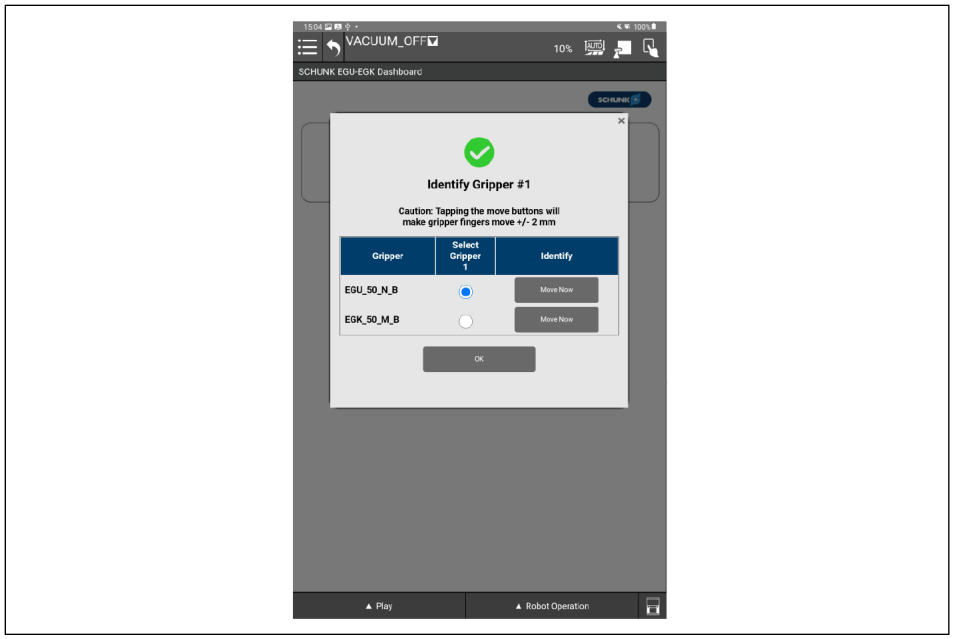
Connected grippers can be searched for under "Dashboard".

Search product

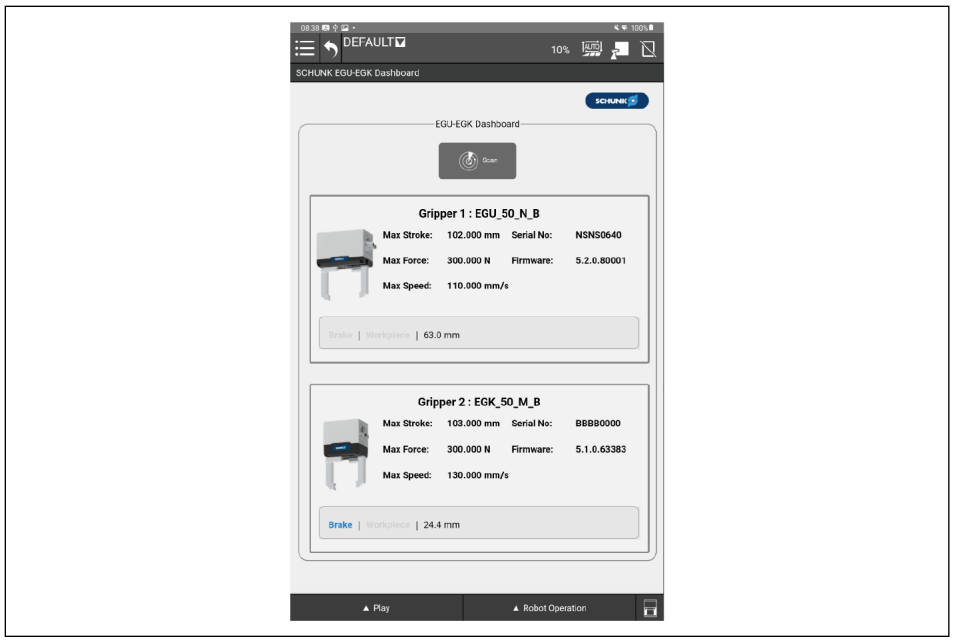
1. Select the "Menu" button at the top left of the Tablet Teach Pendant screen.
2. Select *PLUGINS > SCHUNK EGU-EGK-EZU> Dashboard*.

3. Select the 

button.
4. If several grippers have been found, select the gripper that is to be configured as "gripper 1".
5. **CAUTION! Risk of injury due to moving parts!** Optional: Select the "Move Now" button to identify the gripper.
   ⇨ The gripper fingers of the selected gripper move.
6. Select the "OK" button to continue with the configuration.



⇨ The connected grippers are displayed



7. If `Fehler` is displayed in the status bar:

⇨ Check that the communication and/or power cables are properly connected.

⇨ Restart the robot and perform the scan again.

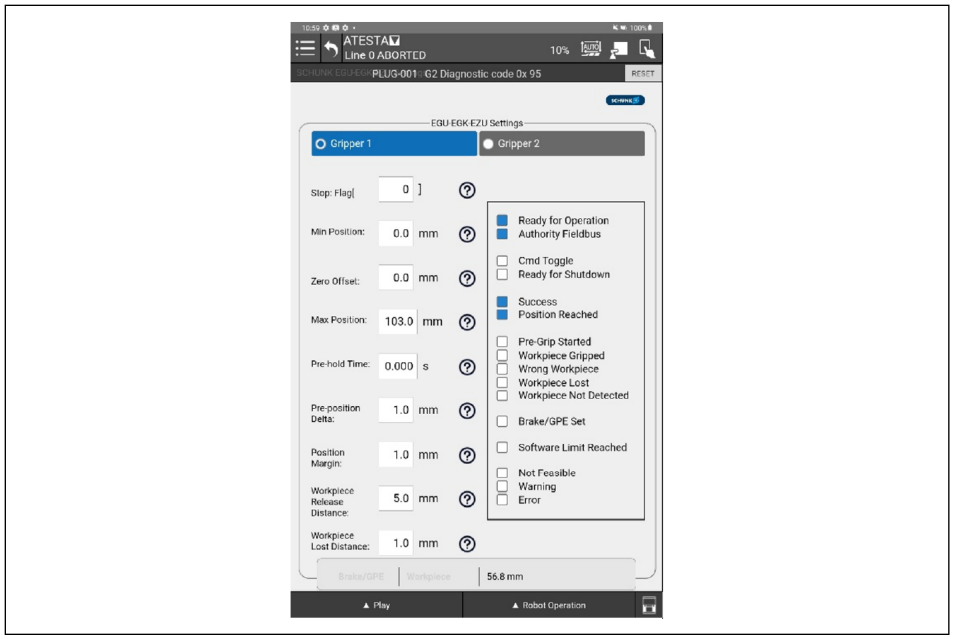
Parameterizing the product

Settings

The product can be parameterized under "Settings".

1. Select *PLUGINS > SCHUNK EGU-EGK-EZU > Settings*.

2. Select the desired product.
   ⇨ Parameters are displayed.
   ⇨ Activated bits are indicated by elements illuminated in blue.
3. Enter parameter values. For more information about the parameters, see the following table or select the help button.



Designation	Description
Stop	• If the configured OFF flag is set, the gripper is stopped (CMD STOP) • This allows you to freely configure when the gripper movement should be stopped automatically (emergency stop, workspace violation ...) • See code examples, ▶ 10 [🗋 46]

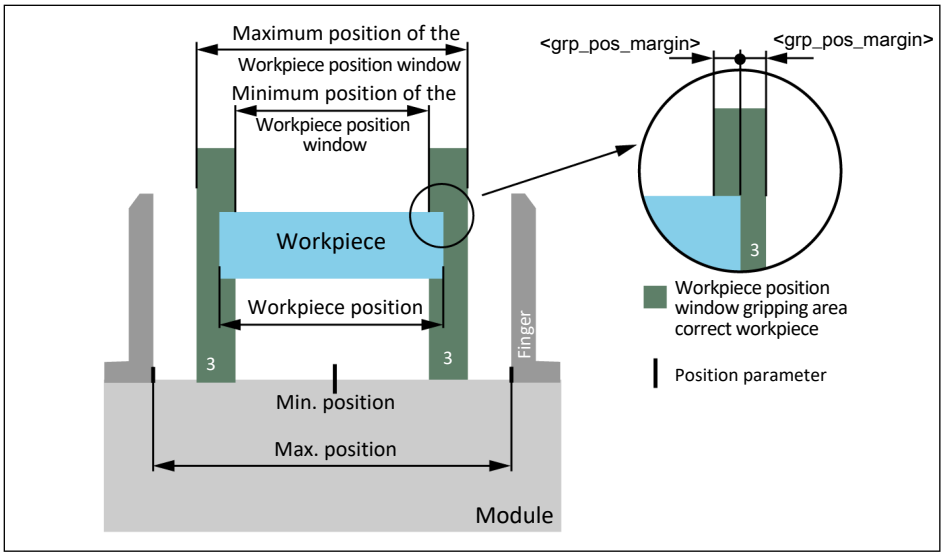
Designation	Description
Min Pos	• The parameter can be used to define the position limit within which movements are permitted. The value of the parameter corresponds to the smallest position value that can be approached.
Zero Offset	• The parameter can be used to parameterize the distance by which the 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 [🗋 24].
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>.



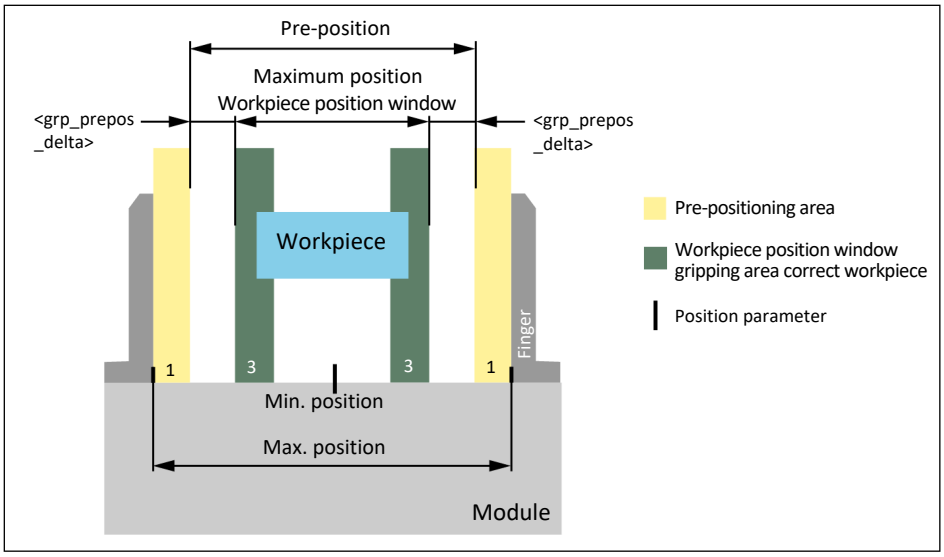
Minimum and maximum position of the workpiece position window

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

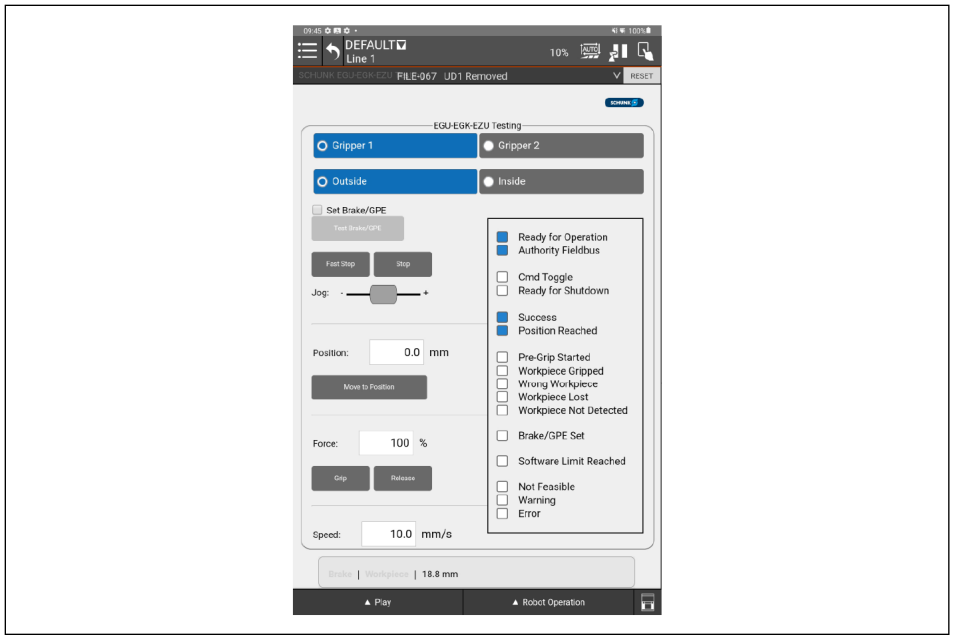
Testing products

Testing

Under "Testing" the product can be tested.

1. Select *PLUGINS > SCHUNK EGU-EGK-EZU > Testing*.

2. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
3. Select gripping direction.
   - ⇨ *Outside*: A workpiece is gripped from the outside. The gripper fingers move toward each other.
   - ⇨ *Inside*: A workpiece is gripped from the inside. The gripper fingers move away from each other.
4. **CAUTION! Risk of injury due to moving parts!**
   Select the desired buttons to test the command. For further information, see the following table.
   - ⇨ Activated bits are indicated on the right by elements illuminated in blue.



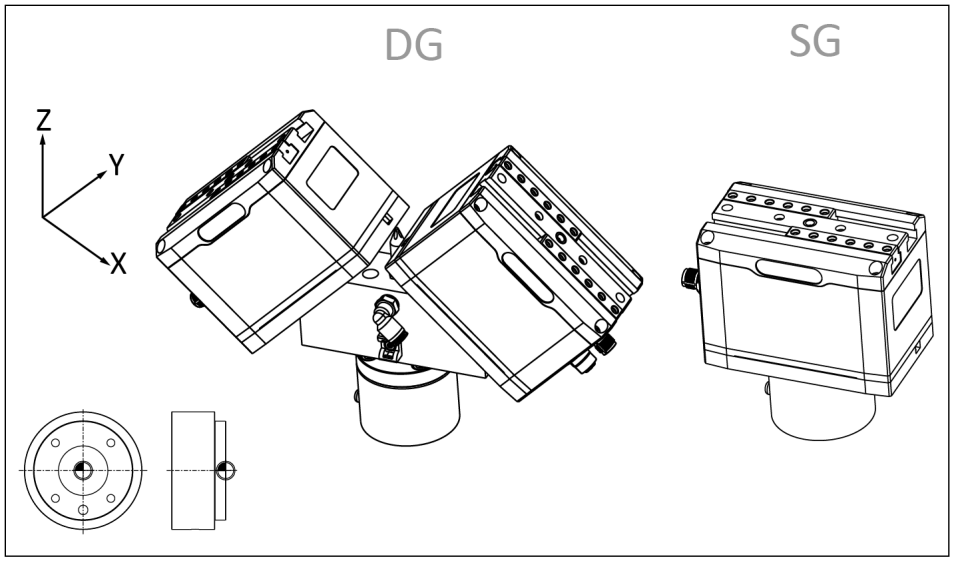
Button/input field	Description
Set Brake/GPE	*For products of variant "M" (with brake):* Gripping force and position maintenance (GPE) is activated.
Test Brake/GPE	*For products of variant "M" and with firmware version 5.2 or higher:*Brake test During the brake test, the holding force of the brake is checked by applying a defined moment alternately in both directions against the applied brake.
Fast Stop	The movement is stopped immediately.
Jog: – / +	Move slider to the right (+): Gripper fingers move away from each other Move slider to the left (+): Gripper fingers move towards each other The gripper movement stops when released.
Stop	The movement is brought to a controlled end.
Position	Target position for absolute position travel
Move Absolute	Move the gripper finger to an absolute position.
Force	Gripping force [%], value between 50% and 100% in BasicGrip mode, Value >100% in StrongGrip mode
Grip	Grip workpiece in set gripping direction and gripping force
Release	Releasing a workpiece
Speed	Traverse speed [mm/s]

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

For information on adjusting the TCP and the gripper weight, refer to the operating manual of the robot.

The values from the following chapters can be used to adjust the TCP and the gripper weight.

8.1 Values for EGU



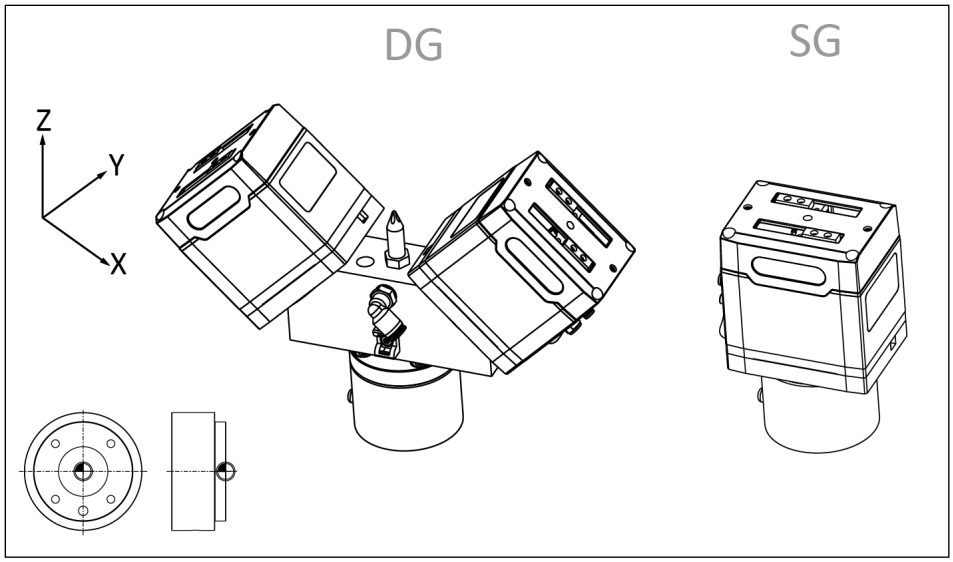
EGU: Tool Center Point, DG: two products mounted, SG: one product mounted

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

8.2 Values for EGK



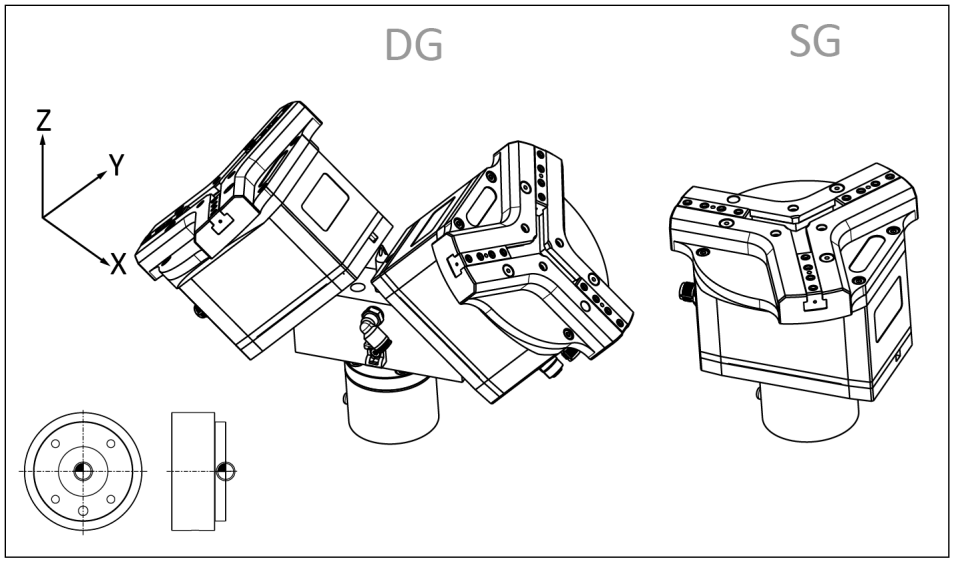
EGK: Tool Center Point, DG: two products mounted, SG: one product mounted

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

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

9 Inserting the functions into the program code

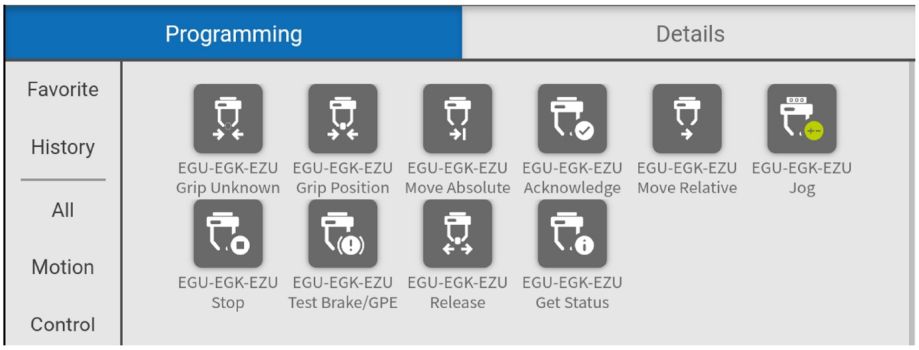
After installing the software module, the following functions can be inserted into a robot program.

Function	Description
Acknowledge, ▶ 9.1 [🗋 32]	Acknowledge pending warnings and errors
Grip Unknown, ▶ 9.2 [🗋 33]	Gripping the workpiece without specifying the workpiece position
Grip Position, ▶ 9.3 [🗋 35]	Grip a workpiece
Move Absolute, ▶ 9.5 [🗋 38]	Approach absolute position
Move Relative, ▶ 9.6 [🗋 39]	Approach relative position
Release, ▶ 9.4 [🗋 37]	Releasing a workpiece
Stop, ▶ 9.7 [🗋 40]	Finish movement
Test Brake/GPE, ▶ 9.8 [🗋 41]	Test brake
Get Status, ▶ 9.9 [🗋 42]	Validate gripping process and/or workpiece loss detection
Tool Attach, ▶ 9.10 [🗋 44]	Voltage is switched on at the flange. Gripper is active. Required for tool changes.
Tool Detach, ▶ 9.11 [🗋 44]	Gripper is de-energized and can be replaced. Required for tool changes.
Wrist button, ▶ 9.12 [🗋 45]	calls up robot programs. Gripper commands can be used with the correctly set parameters.

Refer to the FANUC CRX manuals for more information about programming using the visual editor.

Add function to robot program

1. Select the "PlugIn" button in the CRX program editor.
   ⇨ All available functions are displayed in the menu.



2. Drag the desired command into the program.
3. Adjust parameters. To do this, select the command in the program and choose the "Details" tab.
   ⇨ For further information on the functions, see the following sections.

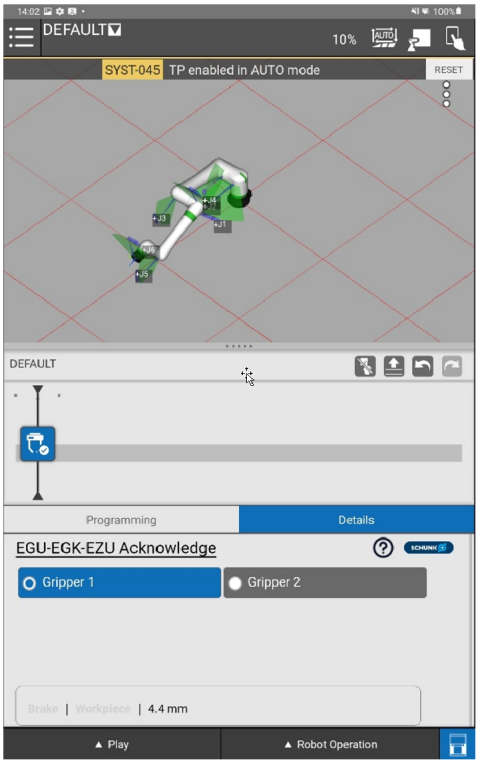
NOTE

Depending on the selected products, the display in the different menu items may vary.

- For example, the "Set brake" symbol only appears for products of the "M" variant (with GPE).
- The display of gripping force and speed also depend on product and size.

9.1 Acknowledge

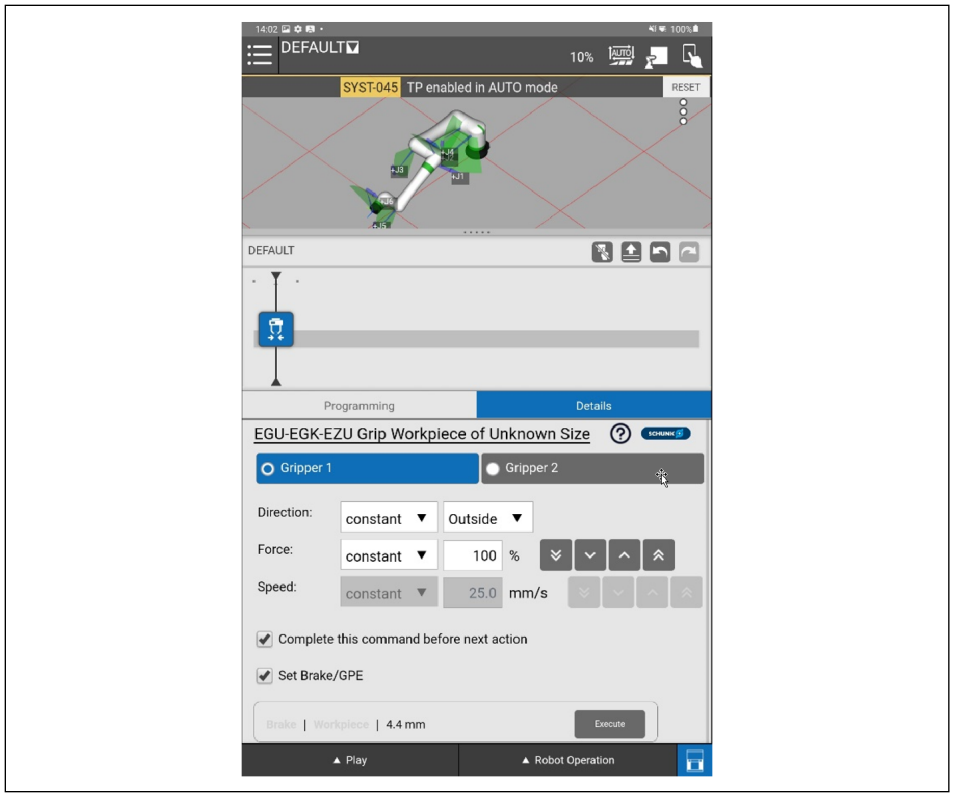
This command is used to acknowledge an error status. After acknowledgment, the gripper is ready for operation again.



- Select the desired product.

9.2 Grip Workpiece of Unknown Size

With this command, a workpiece is gripped with the specified gripping force, without specifying the workpiece position.



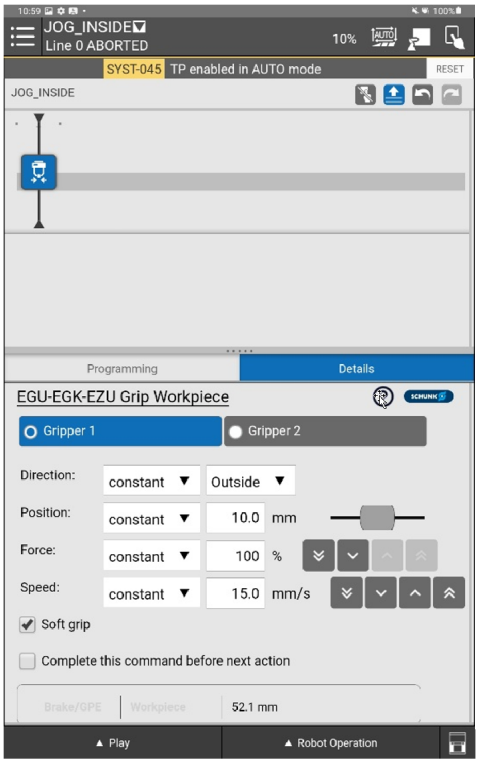
1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Select gripping direction.
   - ⇨ *Outside*: A workpiece is gripped from the outside. The gripper fingers move toward each other.
   - ⇨ *Inside*: A workpiece is gripped from the inside. The gripper fingers move away from each other.
   - ⇨ *R* : The gripping direction is read from the numerical register ("0": Outside, "1": Inside).
3. Enter gripping force as a percentage; for exact limits, see product Assembly and Operating Manual.
   - ⇨ *constant*: The limits are monitored during entry of parameters.
   - ⇨ *R*: The gripping force value is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".

4. *Only with EGK*: Enter speed, for exact limits, see Assembly and Operating Manual for the product.
   - ⇨ *constant*: The limits are monitored during entry of parameters.
   - ⇨ *R*: The speed value is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".
5. Optional: Select desired options by activating the check box.
   - ⇨ *SoftGrip*: With EGK grippers, the control of gripper speed is independent of the set force, reducing the impulse forces on a workpiece. The maximum possible speed depends on the selected gripping force.
   - ⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.
   - ⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
     Note for EGU, EZU: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.3 Grip Position

With this command, a workpiece is gripped at the specified workpiece position with the specified gripping force value using a combined gripping movement.

The combination consists of optional pre-positioning and the gripping movement. The decision as to whether the correct or wrong workpiece has been gripped is made on the basis of the gripping position detected:



1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Select gripping direction.
   - ⇨ *Outside*: A workpiece is gripped from the outside. The gripper fingers move toward each other.
   - ⇨ *Inside*: A workpiece is gripped from the inside. The gripper fingers move away from each other.
   - ⇨ *R* : The gripping direction is read from the numerical register ("0": Outside, "1": Inside).
3. Enter workpiece position.
   - ⇨ *constant*: The limits are monitored during entry of parameters.

- ⇨ *R*: The position value is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".

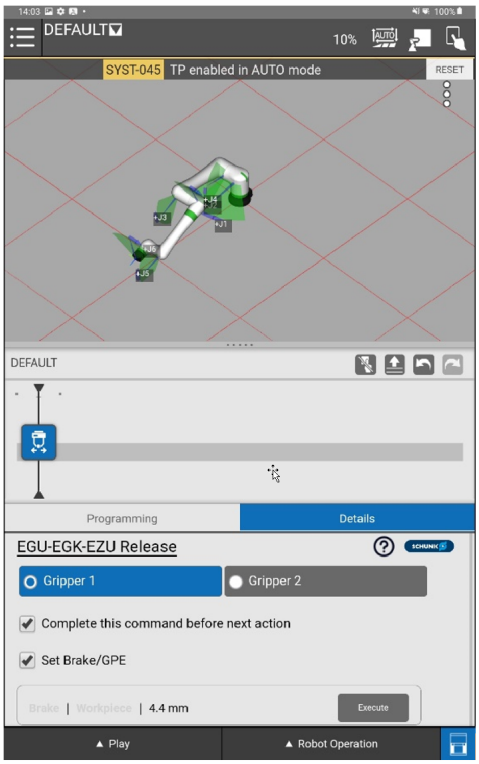
4. Enter gripping force as a percentage; for exact limits, see product Assembly and Operating Manual.
   - ⇨ *constant*: The limits are monitored during entry of parameters.
   - ⇨ *R*: The gripping force value is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".
5. *Only with EGK*: Enter speed, for exact limits, see Assembly and Operating Manual for the product.
   - ⇨ *constant*: The limits are monitored during entry of parameters.
   - ⇨ *R*: The speed value is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".
6. Optional: Select desired options by activating the check box.
   - ⇨ *SoftGrip*: With EGK grippers, the control of gripper speed is independent of the set force, reducing the impulse forces on a workpiece. The maximum possible speed depends on the selected gripping force.
   - ⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.
   - ⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
     Note for EGU, *EZU*: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.4 Release

When releasing the workpiece, the gripper carries out a relative positioning movement. Starting from the current position, a defined distance is moved in the opposite direction to the gripping direction of the last gripping movement.

NOTE

Workpiece release is only permitted in "workpiece holding" state.



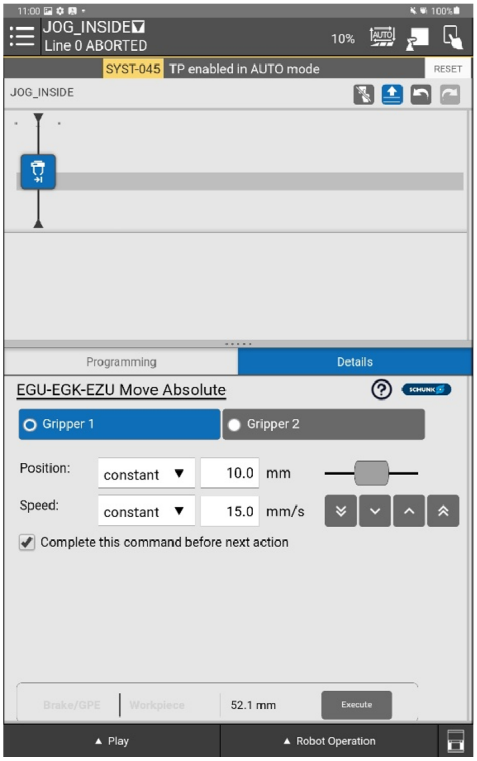
1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Enter distance.
   ⇨ A defined distance is moved from the current position in the opposite direction to the gripping direction.
3. Optional: Select desired options by activating the check box.
   ⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.
   ⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
   Note for EGU, EZU: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.5 Move Absolute

With absolute positioning, the gripper moves to the cyclically transferred position value. This position value refers to the gripper's parameter zero point.

NOTICE

Do not use this command to grip a workpiece. This is misuse and triggers a gripper error message (MOVE_BLOCKED)!



1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Enter position and speed of movement.
   - ⇨ *constant*: The limits are monitored during entry of parameters.
   - ⇨ *R*: The value for position or speed is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".
3. Optional: Select desired options by activating the check box.
   - ⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.

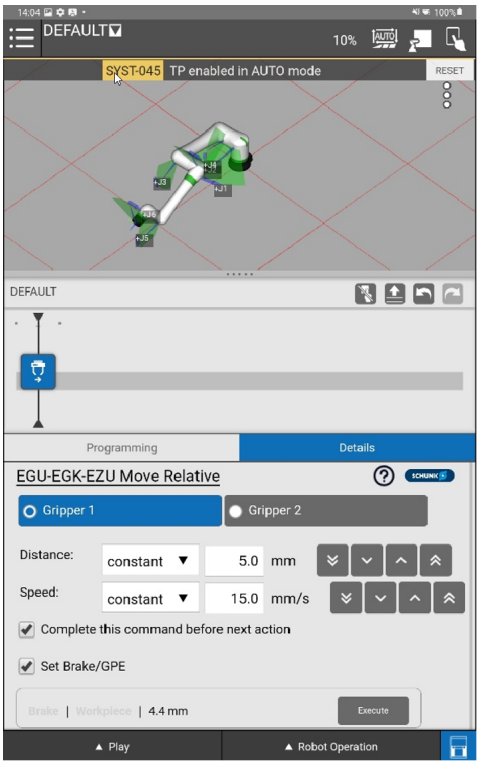
⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
Note for EGU, EZU: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.6 Move Relative

With relative positioning, the gripper moves from the current position by the cyclically transferred and signed position value.

NOTICE

Do not use this command to grip a workpiece. This is misuse and triggers a gripper error message (MOVE_BLOCKED)!



1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Enter distance and speed of movement.
   ⇨ *constant*: The limits are monitored during entry of parameters.
   ⇨ *R*: The value for position or speed is read from the numerical register. Value range monitoring takes place in the gripper. Error handling should be implemented, e.g. via a query of the status double word "not feasible".
3. Optional: Select desired options by activating the check box.

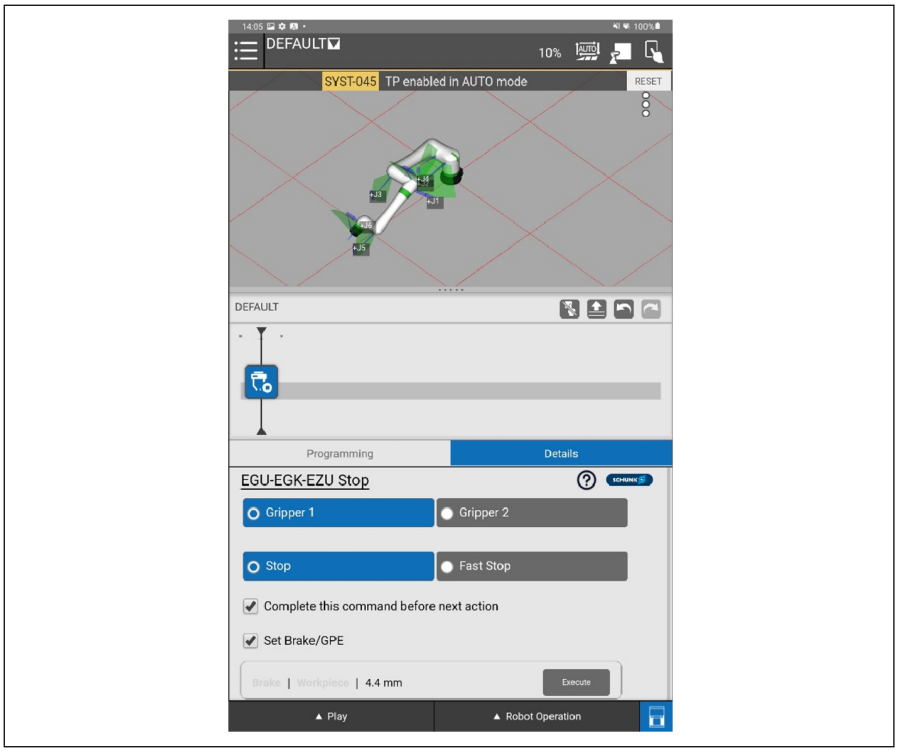
⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.

⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
Note for EGU, EZU: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.7 Stop

This command stops the movement of the gripper.

- "Stop": The current movement is brought to a controlled end.
- "Fast Stop": The current is stopped immediately and forced to a standstill. An error requiring acknowledgment is set.
  For safety reasons, the fast stop automatically applies the brake when it is available.



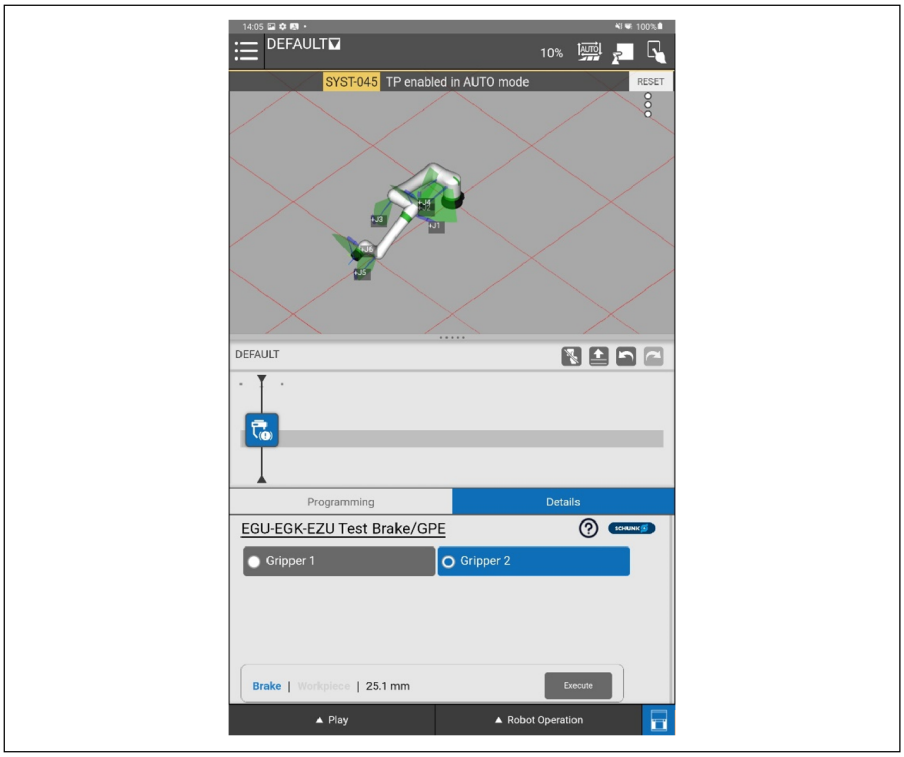
1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Select the "Stop" or "Fast Stop" button.
   ⇨ Stop: The gripper is brought to a controlled stop. The gripping force is maintained.
   ⇨ Fast stop: The gripper is stopped in an uncontrolled manner. An error message requiring acknowledgment is generated. An existing brake engages.

3. Optional: Select desired options by activating the check box.
   ⇨ *Complete gripper motion before next action*: The following command is only executed after the inserted gripping command has been completely processed or the maximum waiting time of 15 seconds has been reached.
   ⇨ *Set brake/GPE*: For products of the "M" variant, the brake is activated, GPE is active.
   Note for EGU, EZU: This selection is always active if a gripping force greater than 100% (StrongGrip mode) is set.

9.8 Test Brake/GPE

NOTE
This command is only available for products of variant "M" and with firmware version 5.2 or higher.

With this command, the holding force of the brake is checked by applying a defined moment alternately in both directions against the applied brake.



1. Select the desired product.
2. The result can be queried using the "Get-Status" command.

9.9 Get Status

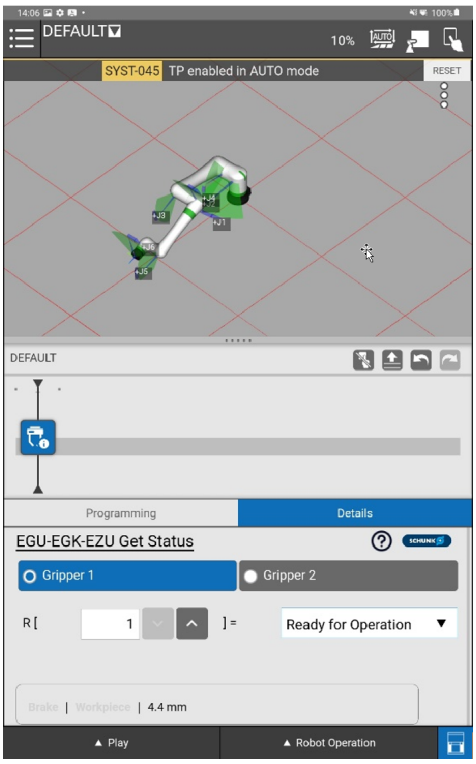
This command validates a gripping operation and detects a workpiece loss.

The "configured" registers are updated automatically. If the value is written as "-999", no gripper could be found.

- Check connection to gripper (electrical)
- Is the gripper attached?
- Conduct scan

The registers are given a name when the command is executed for the first time.

NOTE: Currently the name is only displayed in English. The configuration can be deleted at any time by setting the register to "0". (The register name is also deleted).



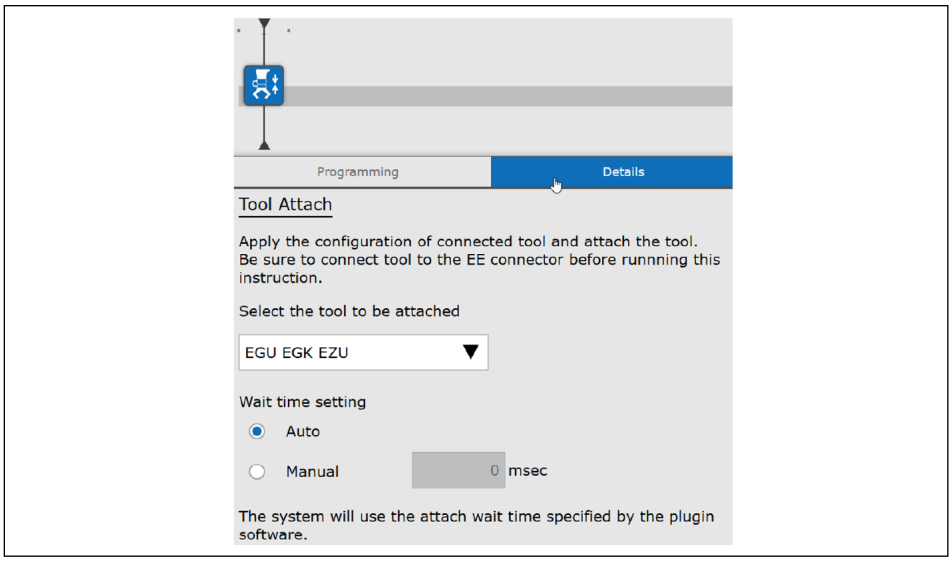
1. NOTE: Depending on the product selection made, the display may vary. Only parameter values permitted for the product will appear.
2. Use the drop-down menu to select the status to be monitored.
3. Use the "arrow" buttons to select the register number.

Status	Return value	Description
Ready for Operation	1/0	**1:** Gripper is ready for operation **0:** Gripper is in error state

Status	Return value	Description
Cmd Toggle	1/0	Toggle after issuing a command: Command received
Success	1/0	**1:** Command successful **0:** command error state
Brake Set	1/0	**1:** Brake is activated. **0:** Brake is not activated.
Get Current Position	REAL [mm]	Returns the current position, which is also displayed in the status bar.
Error	1/0	**1:** An error must be acknowledged. **0:** Ready for operation.
Error code	INTEGER	Returns the last pending error as a number.
No Workpiece Detected	1/0	**1:** Workpiece not detected. **0:** Workpiece detected.
Not feasible	1/0	**1:** An invalid control command was sent.
Position Reached	1/0	**1:**Target position has been reached.
Software Limit Reached	1/0	**1:** The gripper fingers cannot move beyond the set min/max position. **0:** The gripper fingers can move further.
Warning	1/0	**1:** A warning has occurred. **0:** Ready for operation.
Warning Code	INTEGER	Returns the last pending warning as a number. Example: 148 -> WARNING_CMD_NOT_FEASIBLE
Warning Detail	INTEGER	Returns extended information on the pending warning as a number. Example: 15 -> The command is not allowed while holding a workpiece
Workpiece Gripped	1/0	**1:** Workpiece gripped. **0:** Workpiece not gripped.
Workpiece Lost	1/0	**1:** Workpiece lost. **0:** Workpiece gripped.
Pre-Grip Started	1/0	**1:** The module has started re-gripping.
Wrong Workpiece Gripped	1/0	**1:**Incorrect workpiece gripped. **0:** Correct workpiece gripped.

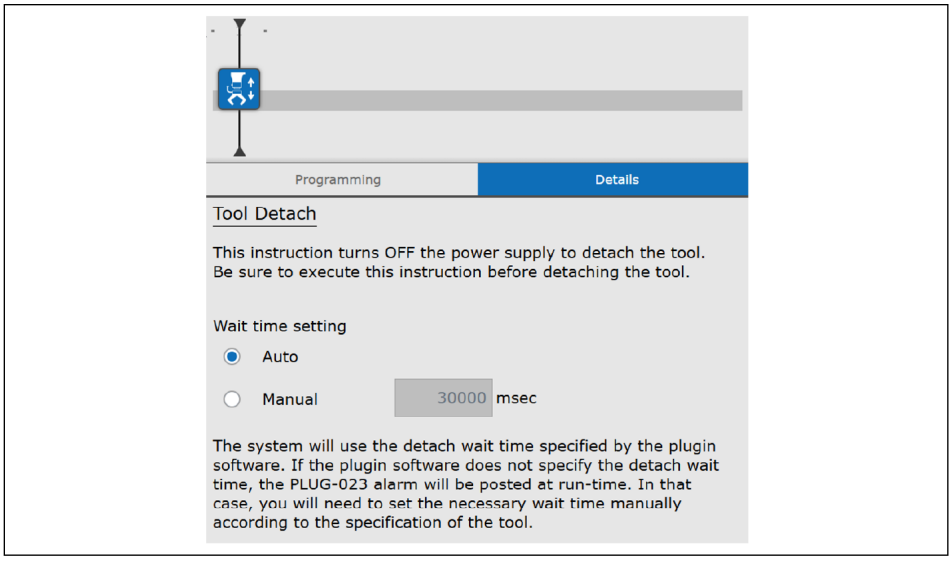
9.10 Tool Attach

This command is required for a tool change. The flange connection is correctly configured and activated.



9.11 Tool Detach

This command is required for an automatic tool change. The flange connection is de-energized. This allows the gripper to be replaced.

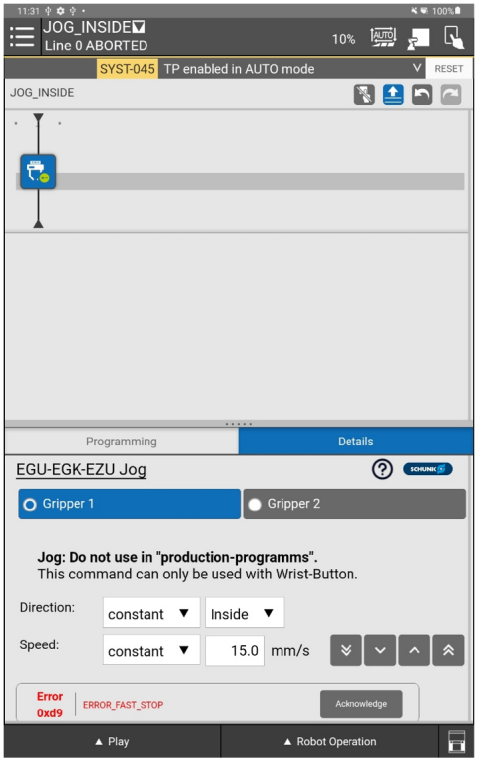


Note: The same functionality is available for manual changes in the "Tool I/F" menu.

9.12 Wrist button

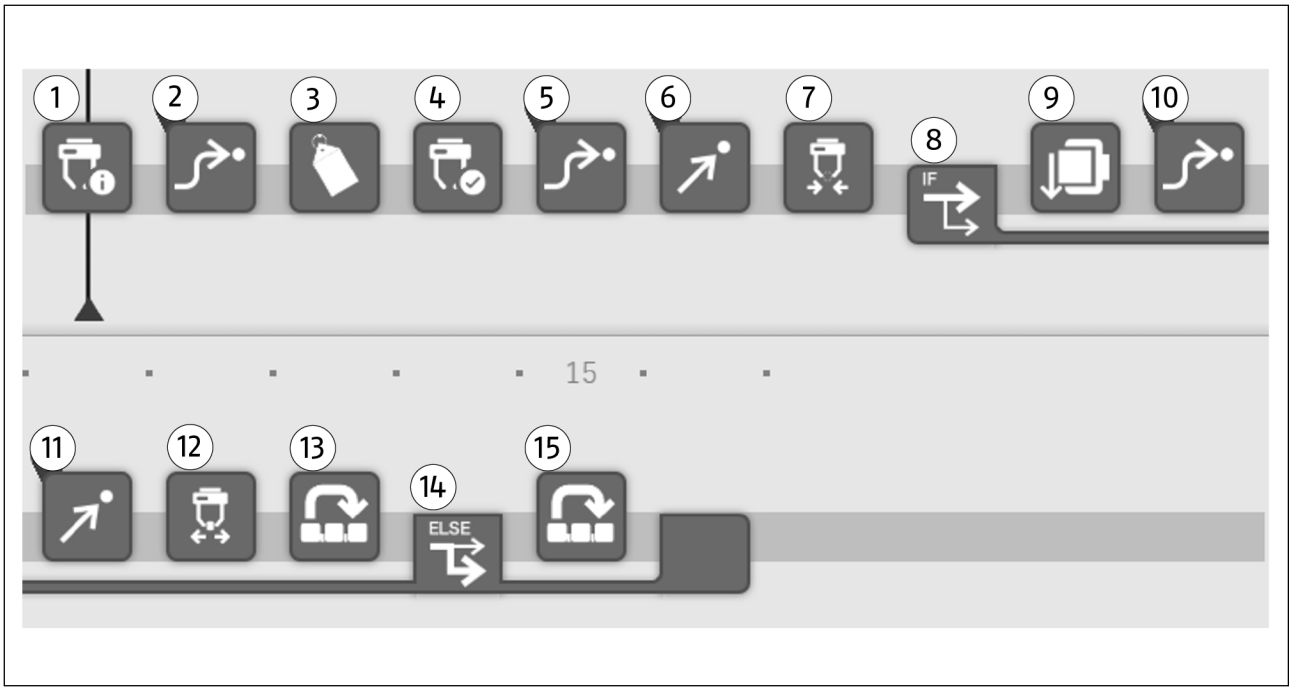
Note the following when using the wrist buttons:

- Integrate gripper commands into a program.
  This allows gripper commands to be used with the correctly set parameters.
- Check gripper stop flag if necessary, ▶ 7 [🗋 21].
- Jog is only intended for wrist button use.

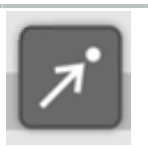
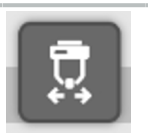


10 Example of a robot program

This "Pick&Place" example program can be used as a guide for creating individual applications.



1.	Get Status		Use up arrow to set the register number to "1". Select "Workpiece gripped" from the drop-down menu. Register 1 is automatically filled with the current status. (Here: if a workpiece is successfully gripped)
2.	Home position		Move gripper to the starting position.
3.	Label		Set up marking, by selecting the number "1" in the drop-down menu. The program will return to this step later in the timeline.
4.	Acknowledge		Acknowledge gripper to clear any errors such as "Fast stop" or "Movement blocked".
5.	Pick Approach Position		Move gripper over the "Pick" position.
6.	Pick Position		Move the gripper to the gripping position to grip the workpiece.

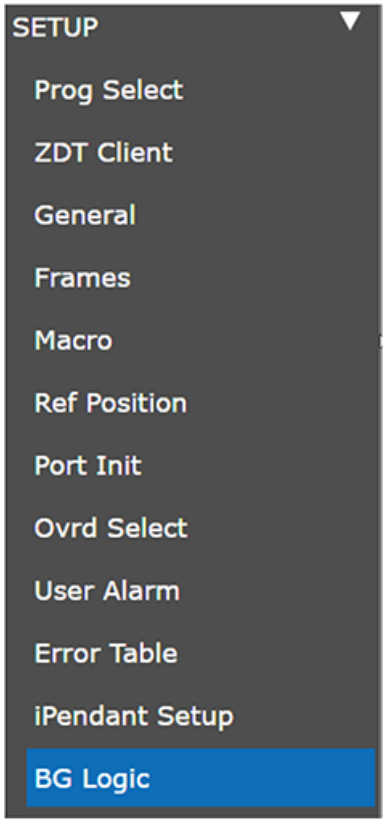
7.	Grip		Grip with the appropriate percentage force required to hold the workpiece securely.
8.	If		Insert block with an if statement. Select "Details" and select radio button for register. Use the arrow to set the register to "1".
9.	Payload		Adjust the payload so that it matches the weight of the workpiece.
10.	Place Approach Position		Move the robot arm over the "Place" position.
11.	Place Position		Lower the workpiece to the place position.
12.	Release		Release the workpiece by the desired distance. In the basic setting, this distance is 5 mm. In the configuration menu *Plugins > EGU-EGK-EZU > Settings* the specified release distance can be changed.
13.	Jump		Return the robot arm to the removal position for the next workpiece. Use the drop-down menu to select the label no. "1". Instructions for the feeder system used have to be added to the program here.
14.	Else		If the workpiece was not gripped successfully, the program executes the following instruction.
15.	Jump		Return the robot arm to the program's start position to acknowledge any errors and repeat the removal process.

10.1 Gripper stops when robot is not ready for operation

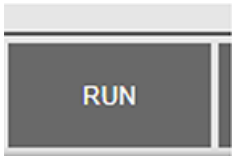
1. Write "Background logic" with the desired behavior. In this example, the flag [5] is set to OFF if the robot is not ready for operation (Busy).

```
  1:  F[5]=(UO[10:Busy])
[End]
```

2. Start the program as BG logic.




```
Normal mode scan time:    8msec
    PROGRAM          STATUS          MODE
  1 BLA              Stop            Normal
  2                  Stop            Normal
  3                  Stop            Normal
  4                  Stop            Normal
```



3. Configure the stop flag for the gripper.

```
Stop: Flag[   5 ]
```

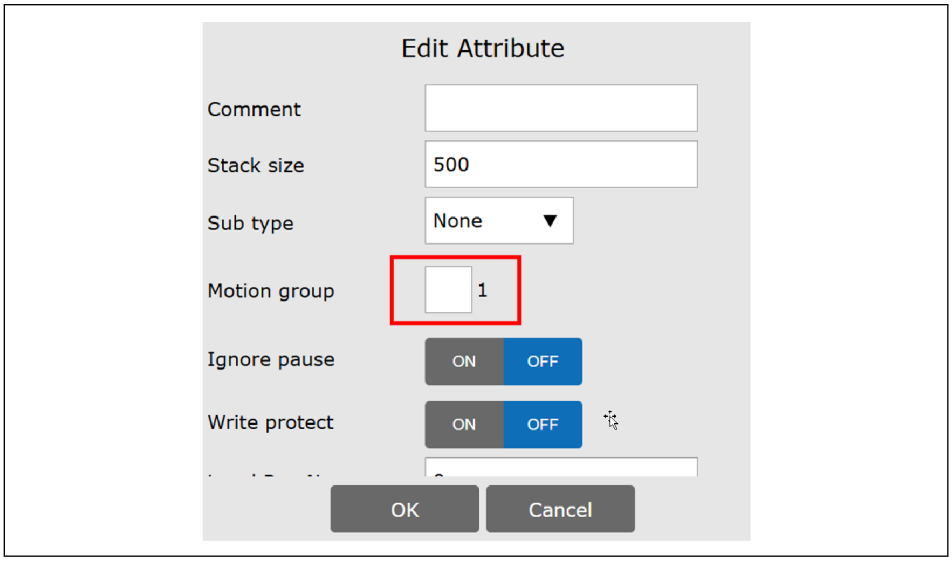
⇨ The gripper now stops every movement if the robot is not ready for operation.

⇨ Background logic can be used to freely program when a "CMD STOP" is to be sent to the gripper.

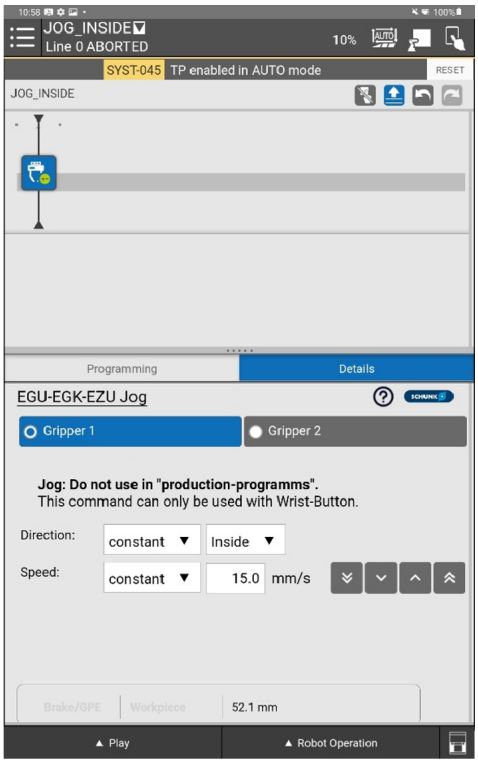
10.2 Wrist button 1 Jog+ / button 2 Jog–

In principle, any robot program can be called up via the wrist buttons. As an example, an application is created here whereby a gripper moves in a negative direction when the 1 button is pressed and moves in a positive direction when the 2 button is pressed.

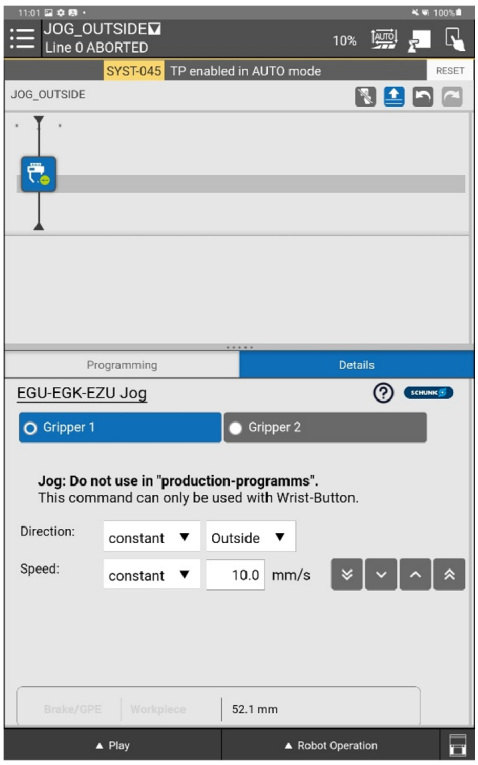
In order to be able to transfer all parameters correctly for gripping applications, it is advisable to always integrate the desired gripper commands into a higher-level program. When so doing, make sure that the program does not belong to a motion group.



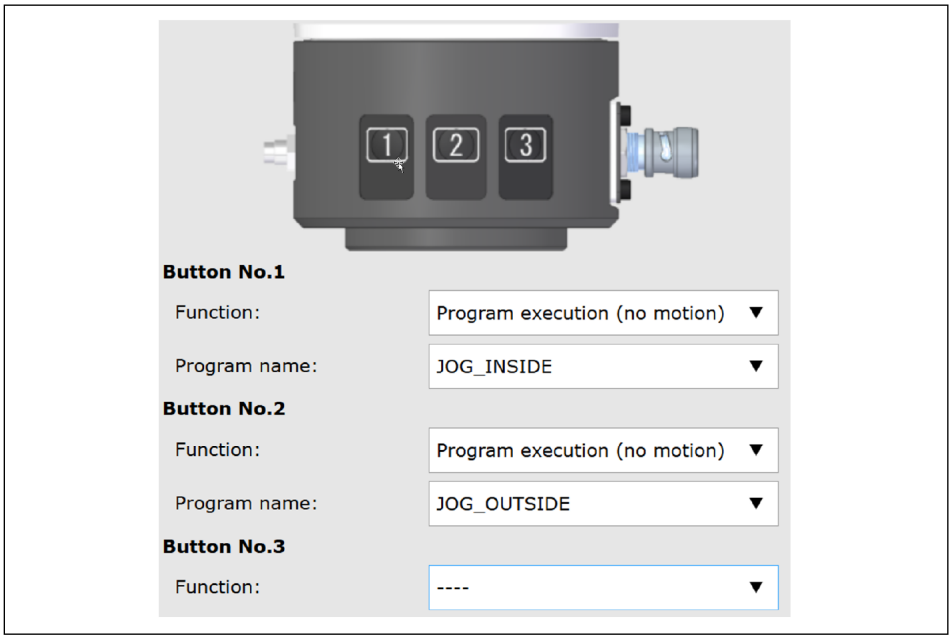
1. Create the JOG_INSIDE program. (Remove Motion Group.) Set the desired parameters.



2. Create the JOG_OUTSIDE program. (Remove Motion Group.) Set the desired parameters.



3. Configure the wrist button.



⇨ The desired function has been assigned to the button.

11 Error handling in the program

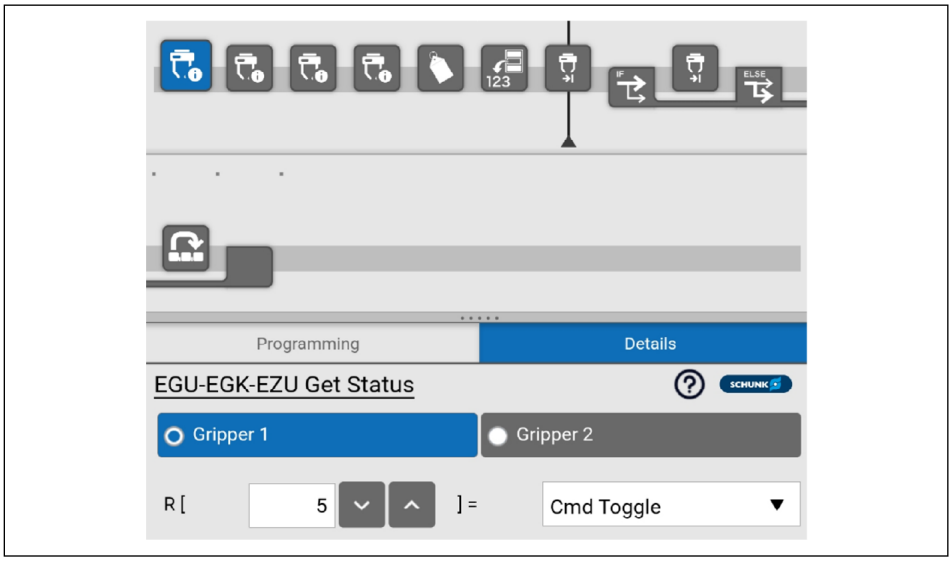
The following examples show how to check whether sent commands have been received or whether errors or warnings are present in the program.

Gripper errors can also be read in the alarm log.

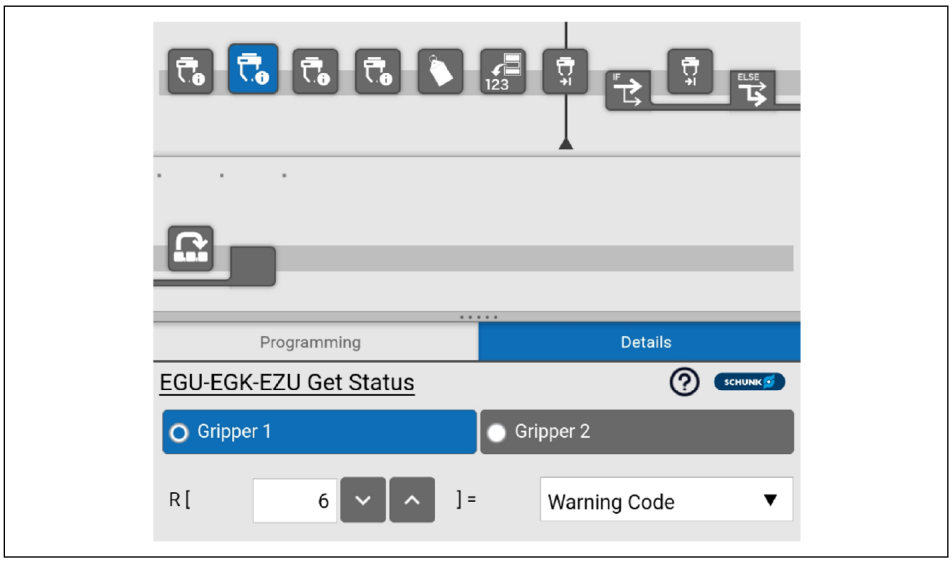
11.1 Checking whether a sent command was received by the gripper

In the following program example, the "Absolute Position" command is executed.

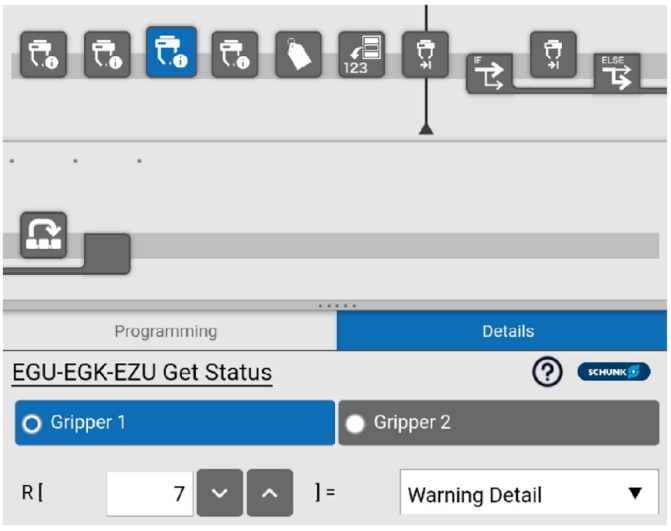
1. "cmd Toggle" is used to check whether a command from the gripper was received.



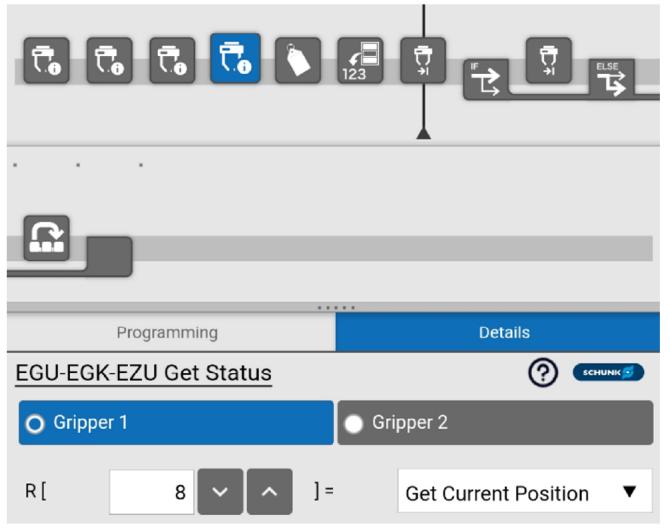
⇨ "Warning Code" is used to detect whether an error has occurred.



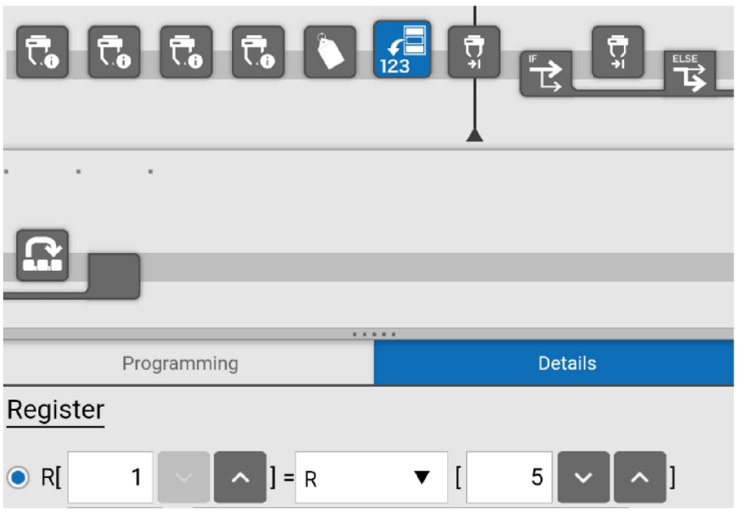
⇨ "Warning Detail" is used to understand the reason for the warning.



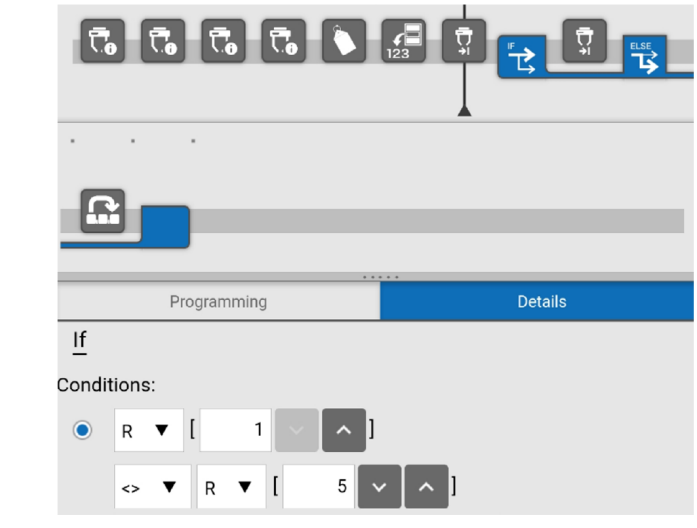
⇨ "Current position" is used for monitoring, visualizing the current position.



2. The state of the cmd toggle bit is temporarily saved in register 1.



3. The state of the status bit is now checked to see whether it has changed:
   - ⇨ If the gripper has received the command, the program sequence is continued with the command "Absolute Position" because the values in register 1 and 5 are different.
   - ⇨ If, for example, a cable were to break in one of the communication lines, the values in the registers would be identical and the program pointer would be set to the end of the program, thus stopping the program.



NOTE
Combination with the "background logic" is also possible.

NOTE
This procedure can be executed for all status bits, error and warning codes to influence the program flow, depending on the current status word of the gripper.

12 Error messages

Error messages must be acknowledged by selecting the "Reset" button.

Alarm code	Possible cause	Corrective action
SCHUNK-EGx-001	Internal plugin error	1. Update to the latest plugin and CRX robot software. 2. Clear cache and restart the CRX control manually.
SCHUNK-EGx-002	Tool interface error	1. Check whether the correct tool has been selected. 2. Check whether the tool is connected.
SCHUNK-EGx-003	No tool attached	1. Check whether the gripper is correctly connected to the flange (electrically).
SCHUNK-EGx-004	Wrong tool attached	1. Check whether the gripper tool configuration matches SCHUNK grippers (EGU-EKG-EZU)
SCHUNK-EGx-005	Serial Comm error	1. Check communication to the gripper. 2. Check whether the gripper is connected. 3. Check the wiring.
SCHUNK-EGx-100	Gripper configuration changed	1. A new/another gripper has been found. 2. Restart the gripper search.
SCHUNK-EGx-101	Diagnostic code gripper 1	1. The last gripping command could not be executed. 2. Send command again. 3. Eliminate the cause using the diagnostic code. 4. Check connection to gripper (electrical)
SCHUNK-EGx-102	Diagnostic code gripper 2	1. The last gripping command could not be executed. 2. Send command again. 3. Eliminate the cause using the diagnostic code. 4. Check connection to gripper (electrical)
SCHUNK-EGx-103	Tool detached	1. The tool has been switched off.
SCHUNK-EGx-104	Timeout	1. Check whether the gripper is attached. 2. Check whether the gripper assembly is supplied with power. 3. Check cable at end effector. 4. Restart CRX control.

Alarm code	Possible cause	Corrective action
SCHUNK-EGx-105	Gripper stop by FLAG	1. A gripper was stopped due to the configured flag.
SCHUNK-EGx-255	Unknown xxx error	1. Contact SCHUNK Service with a precise description of the fault.

13 Appendix

13.1 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.

13.2 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 FANUC robots

Size	Gripping force mode/ Nominal gripping force	FANUC				
		CRX 5iA	CRX 10iA/10iA/L	CRX 20	CRX 25	CRX 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.

Compatibility overview: EGU with FANUC robots

Size	Gripping force mode/ Nominal gripping force	FANUC				
		CRX 5iA	CRX 10iA/10iA/L	CRX 20	CRX 25	CRX 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 FANUC robots

Size	Gripping force mode/ Nominal gripping force	FANUC				
		CRX 5iA	CRX 10iA/10iA/L	CRX 20	CRX 25	CRX 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.

13.3 Brands

- FANUC is a registered trademark of FANUC CORPORATION (Japan).

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