WEISS ROBOTICS

FLEXGRIP
FOR KASSOW ROBOTS

Version 1.1.0
July 2024

Content

1 Introduction

The GRIPKIT-Easy with activated FLEXGRIP interface (OPT-GKEASY-MB license required!) has an easy-to-use interface that enables flexible gripping with adjustable parameters. This means that complex robot applications can be realized in no time at all with minimal effort.

These instructions describe the functions of the FLEXGRIP plug-in for robots by Kassow Robots. For information on installation, commissioning, and operation of the GRIPKIT-Easy gripping module, please refer to the operating instructions. These can be found online at **www.weiss-robotics.com/gripkit-easy/**.

1.1 Notation and Symbols

For a better overview, the following symbols are used in these instructions:

Functional or safety-relevant information. Non-compliance may endanger the safety of personnel and the system, damage the device, or impair the function of the device.

Additional information for a better understanding of the facts described.

Reference to further information.

1.2 Intended Use

The “FLEXGRIP plug-in” software is intended for communication between the gripping system GRIPKIT-Easy from WEISS ROBOTICS and a robot controller. The requirements of the applicable directives and the installation and operating instructions in this manual must be observed and complied with. Any other or additional use is considered improper use. The manufacturer is not liable for any resulting damage.

1.3 System Requirements

This plugin is compatible with GRIPKIT-Easy from firmware version 2.0.0. The license option "OPT-GKEASY-MB" must be activated on the gripping systems used. Contact our technical sales department for further information.

One of the following Kassow Robots robot controllers is required for operation:

- Kassow Robots Gen 1
- Kassow Robots Gen 2

1.4 Terms of License

The FLEXGRIP plug-in is protected by copyright. The applicable license terms are included with the software package. With the installation you accept these license terms.

1.5 Demo programs

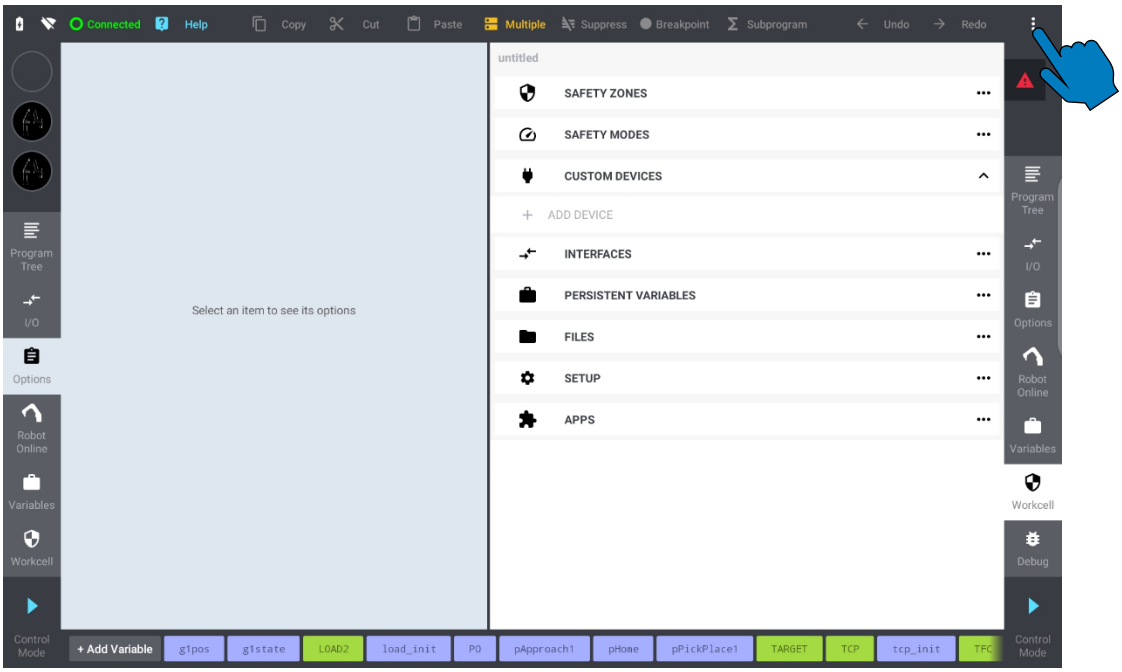
The demo programs provided by the software package are demonstrating the usage of the plug-in only. They are meant for evaluation only!

2 Installation

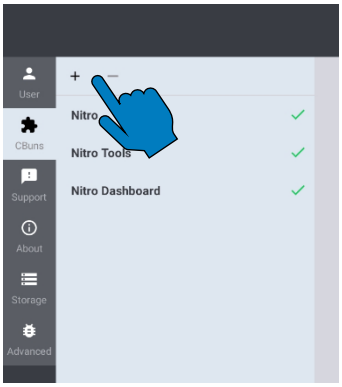
2.1 Install software

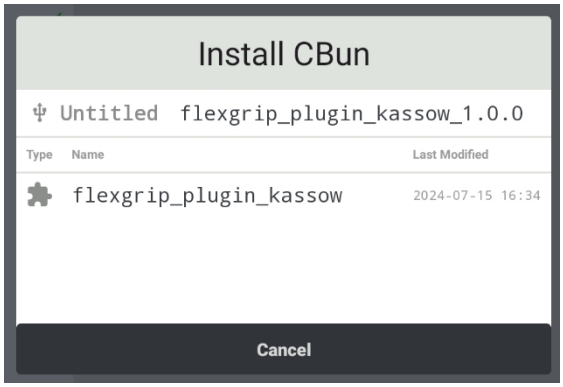
Make sure that you are using the latest version of the FLEXGRIP plug-in. The latest version can be found at **www.weiss-robotics.com/gripkit-easy/**.

1. Download the plugin file “flexgrip_plugin_kassowrobots_<version>.zip”.
2. Unpack the previously downloaded ZIP archive with the GRIPLINK plug-in into the root directory of a USB stick and insert it into the USB slot of the robot controller.
3. open the settings page by pressing ⋮ in the top right corner of the display

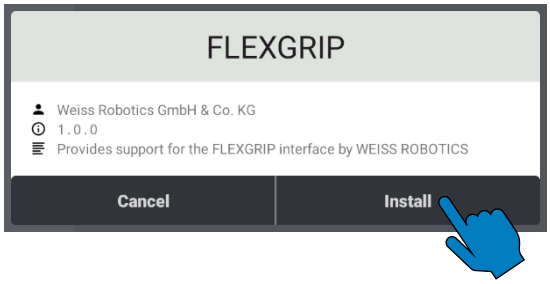


4. Select the “CBuns” tab and press the “+” button at the top left corner. Navigate to the USB drive and select the plug-in file “flexgrip_plugin_kassowrobots“





5. Install the plug-in by pressing the “Install” button



6. After successful installation, the “FLEXGRIP” entry appears in the CBun list with a green check icon

2.2 Uninstall software

To remove the FLEXGRIP plug-in from your robot, follow the instructions in the robot controller manual.

3 Hardware-Setup

3.1 Power supply

If several gripping modules are used, the power supply must be dimensioned sufficiently high, as otherwise the function of the gripping modules cannot be guaranteed.

To reduce the current consumption during current peaks, the acceleration for fast movement commands can be reduced. To do this, the corresponding parameter must be set when activating a FLEXGRIP instance (refer to section 4.2.1).

A separate power supply must be routed to the gripping modules if the total power consumption of all gripping modules used exceeds the robot's limitations.

Follow the instructions in the operating instructions for your robot and the information in the operating instructions for the gripping module!

3.2 Data connection

If several gripping modules are used, the termination of the data lines must only be activated on the gripping module that has the longest data line to the robot flange.

It can be activated/deactivated on the top side of the flange adapter using a slide switch.

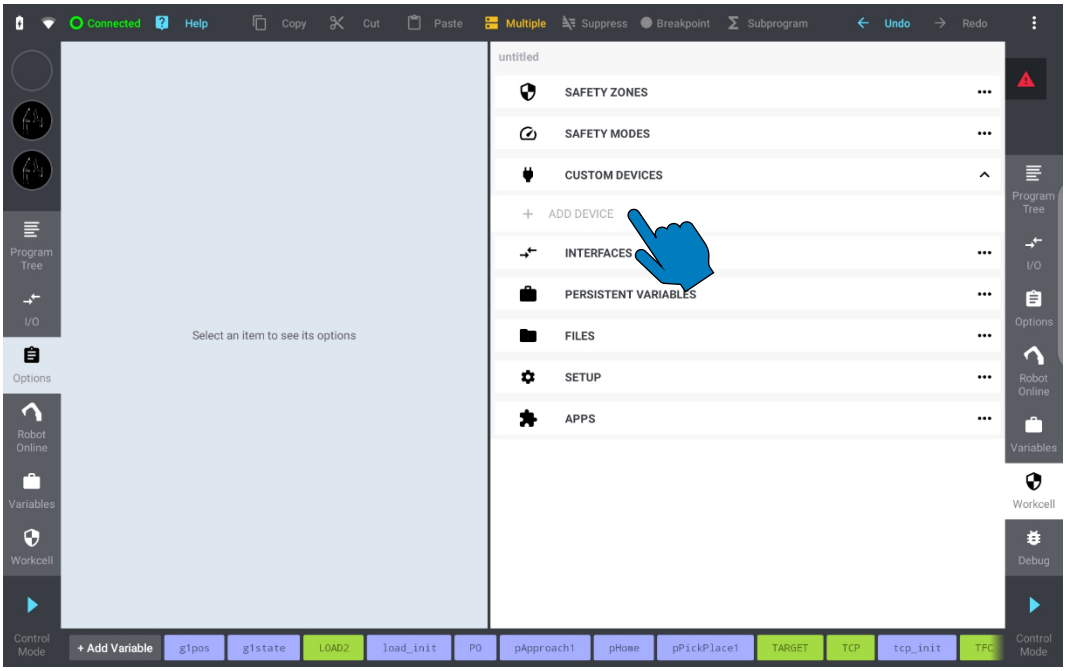
Activating the termination for the data lines is described in the operating instructions for the gripping module.

4 Integration of gripper modules

4.1 Create a device

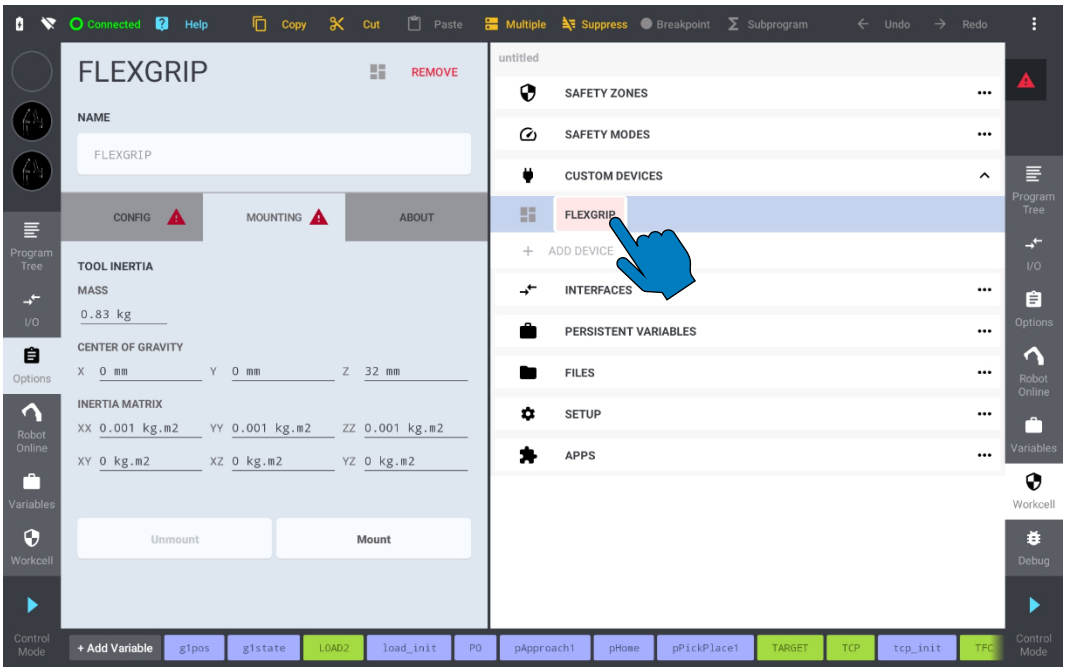
To be able to control gripping modules with the FLEXGRIP plug-in, they must be added to the workcell as a “Custom Device”.

To do this, switch to the “Workcell” tab in the sidebar and open the “CUSTOM DEVICES” section. Then click on “+ ADD DEVICE”.



Select the CBun by clicking on “FLEXGRIP”. Now you can add a new device by clicking on the “+” button.

A new instance now appears in the device list. If several grippers have been created, a number is added, e.g. “FLEXGRIP2”. Errors are still displayed here as the configuration has not yet been completed (refer to section 4.2).



4.2 Configure a device

Before using the gripping modules via FLEXGRIP, they must be configured. Settings for the FLEXGRIP interface can be made in the “CONFIG” tab. The mechanical data of the gripping module and the attached fingers are set in the “MOUNTING” tab.

4.2.1 Configuration of the FLEXGRIP interface

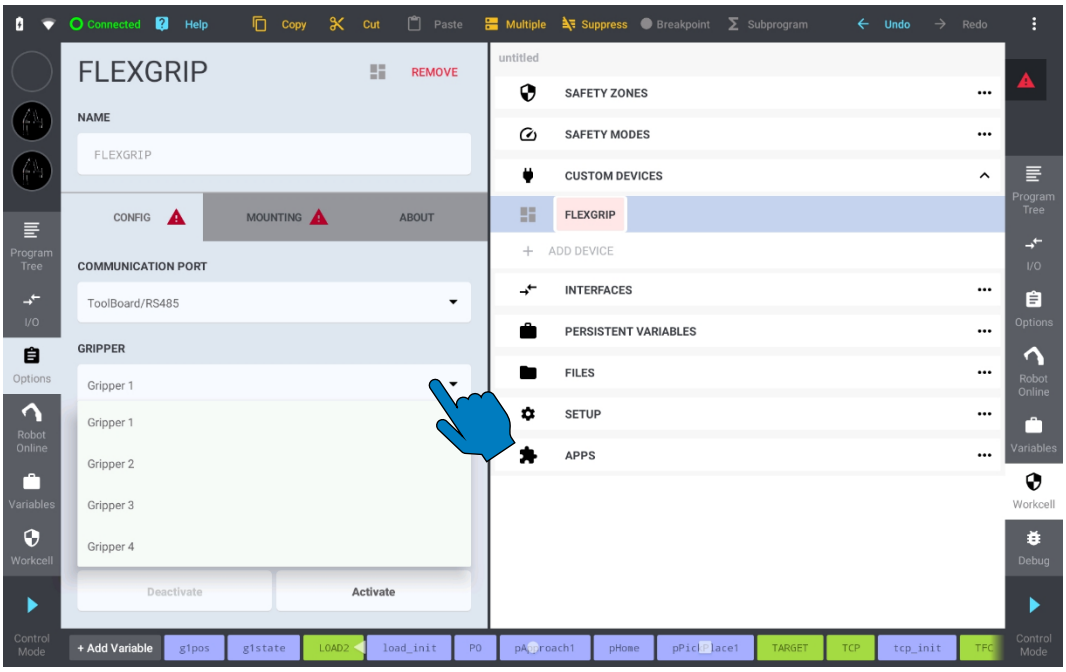
Select the address of the connected gripping module from the “GRIPPER” selection list.

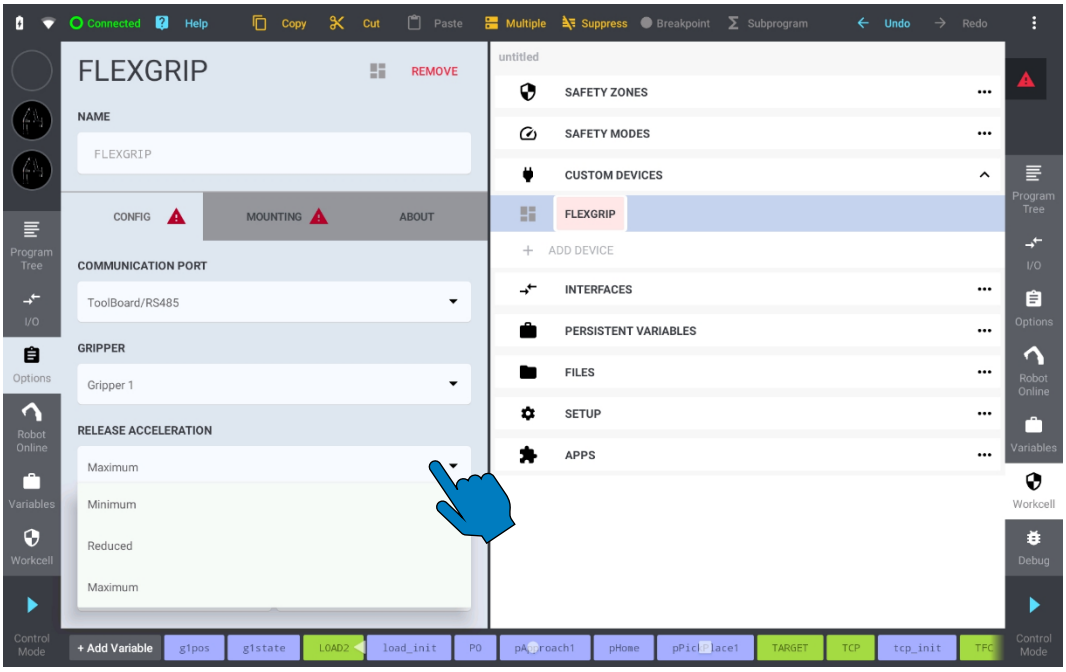
The address of the gripping module can be set using the GRIPKIT-Easy Configurator software. Follow the instructions in the operating instructions for the gripping module.

Select the desired maximum acceleration of the fingers when executing a RELEASE command from the “RELEASE ACCELERATION” selection list.

Only reduce the acceleration if you observe problems in the power supply, e.g. jolting movement when executing a RELEASE command.

The default acceleration is “Maximum“.





Once you have configured the interface, click on the “Activate” button below.

When activated, the power supply is switched on at the robot's tool connection!

If the configuration is valid, the red triangle is replaced by a green tick.

4.2.2 Configuration of the mounting parameters

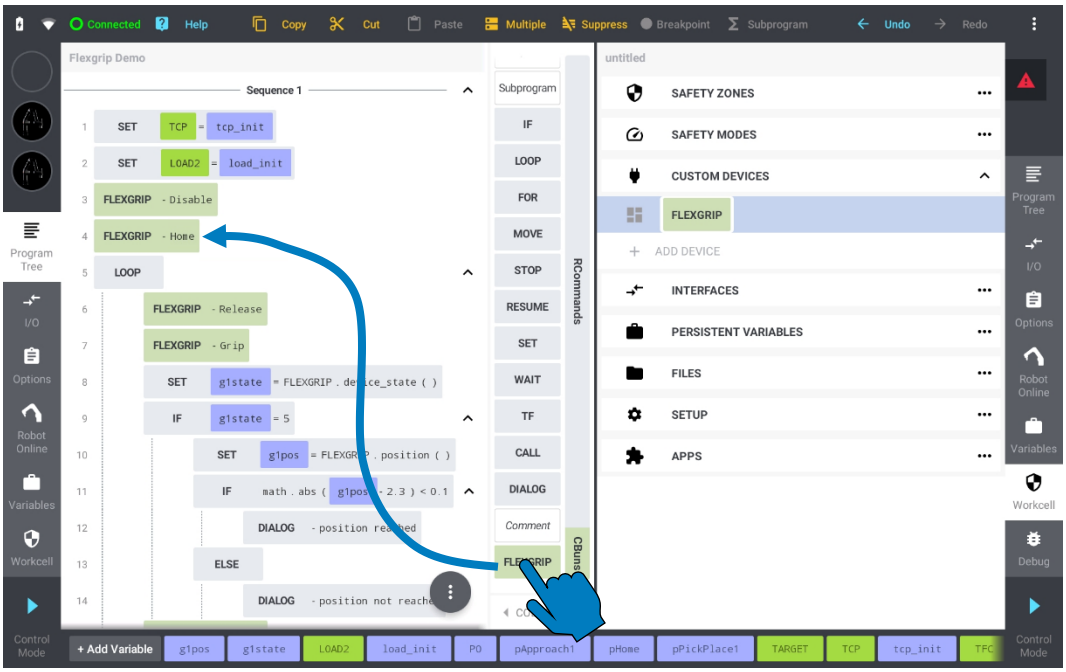
Set the mechanical nominal data of the gripping module and the tool center point in the “MOUNTING” tab.

Further information on this can be found in the operating instructions for the robot controller.

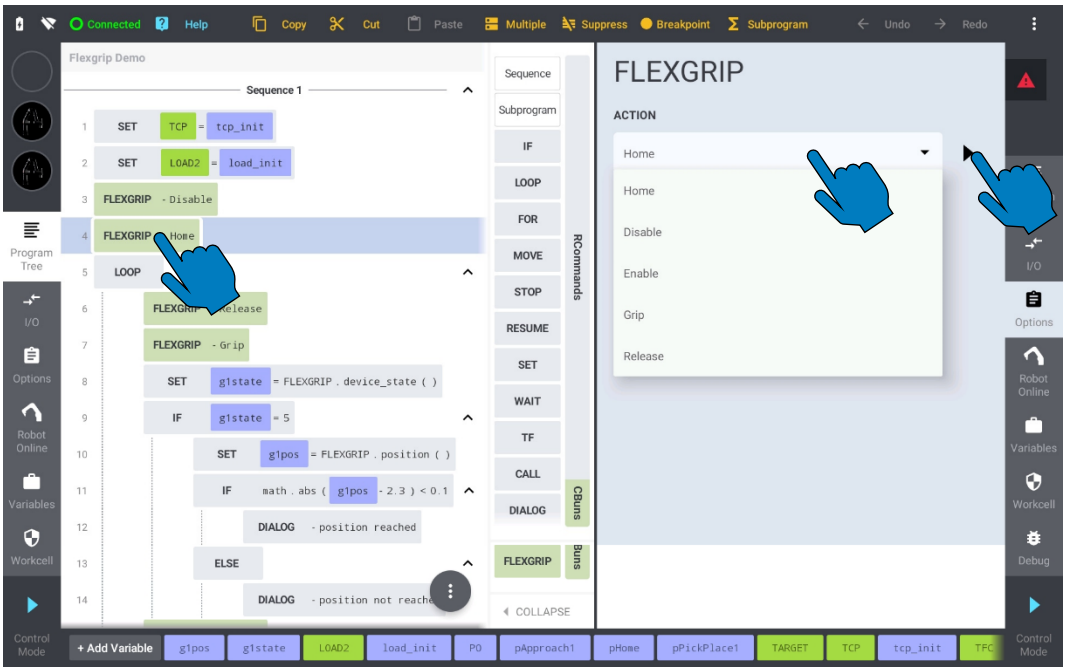
5 Program Nodes (Nodes)

The CBun provides various program nodes and functions for programming a robot application, which can either be dragged and dropped into the program or used when assigning values to a variable.

To insert commands using program nodes, scroll to “FLEXGRIP” in the “Program Tree” view on the right-hand side. Click and hold the icon and drag it to the desired position in your program.



Click on a FLEXGRIP program node to select the type of command from the selection list.



Click on the play-button to the right of the selected action to test it.

Depending on the action, a gripped workpiece may fall down!
Caution! Risk of injury!

5.1 Basic program sequence

When using the GRIPKIT-Easy gripping modules, the following design guidelines should be followed.

5.1.1 Program

Before a GRIPKIT-Easy gripping module can be used in the program for gripping/releasing, it must be referenced (refer to section 5.1.3).

Further information on this can be found in the operating instructions for the gripping module.

After referencing, the other gripping commands can then be executed.

5.1.2 Global Variables

CBun provides script functions that can be used to load gripper data into global variables. The variables can be created via the variable bar at the bottom of the screen.

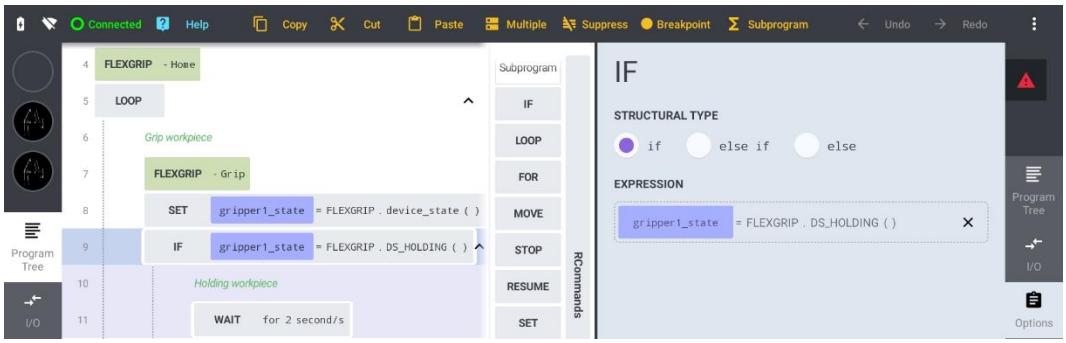
When creating the variables, note the data types for the respective functions.

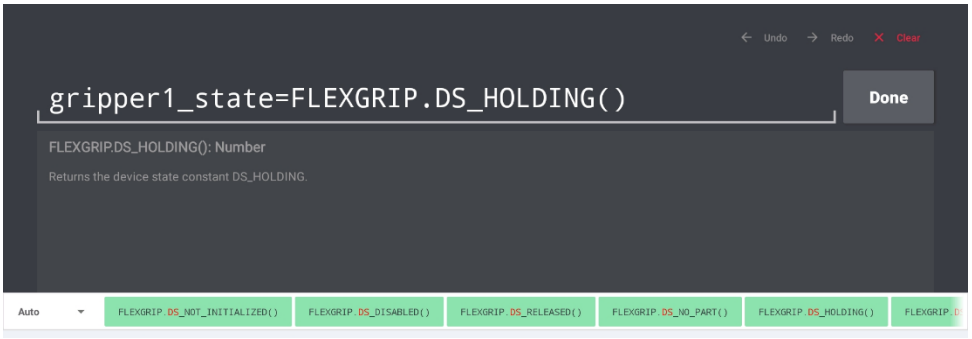
5.1.3 Constants for device states

In the text editor, the device state values can be used as constants provided by the plug-in instead of using numerical constants. The following table lists all states that are available as constants.

Device state	Value	Name of function
NOT INITIALIZED	1	DS_NOT_INITIALIZED()
DISABLED	2	DS_DISABLED()
RELEASED	3	DS_RELEASED()
NO PART	4	DS_NO_PART()
HOLDING	5	DS_HOLDING()
OPERATING	6	DS_OPERATING()
FAULT	7	DS_FAULT()

The functions can be used like this:



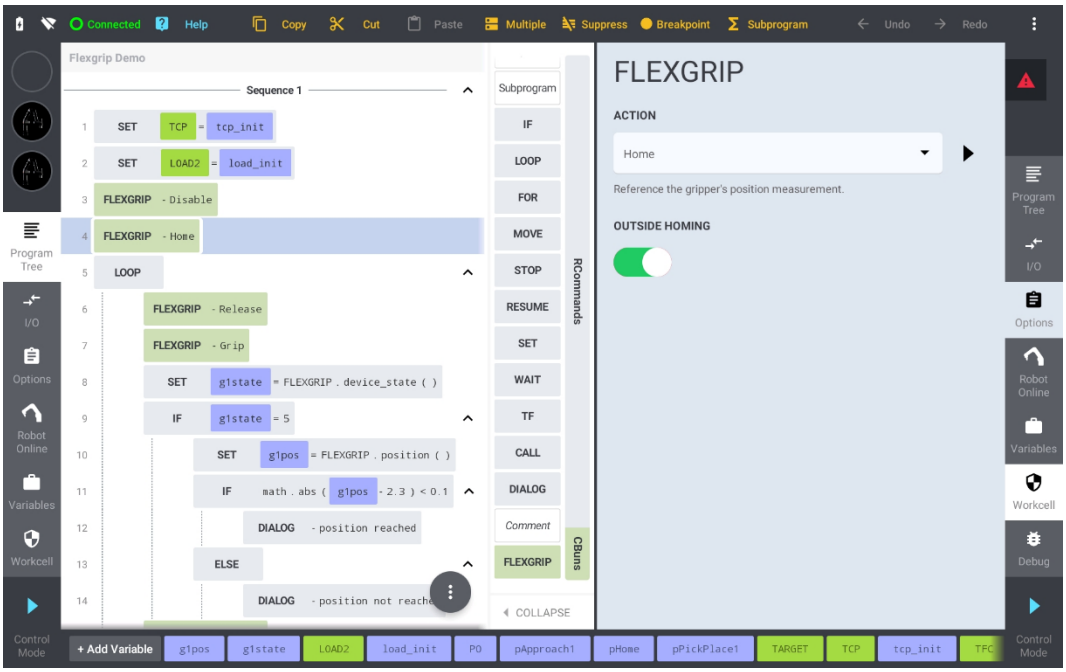


5.2 Referencing – HOME

Before gripping commands can be executed, the position measuring system must be initialized. The “HOME” action is used for this.

When referencing, the base jaws of the fingers must reach the physical end positions. The finger design must allow the outer or inner end stop to be reached.

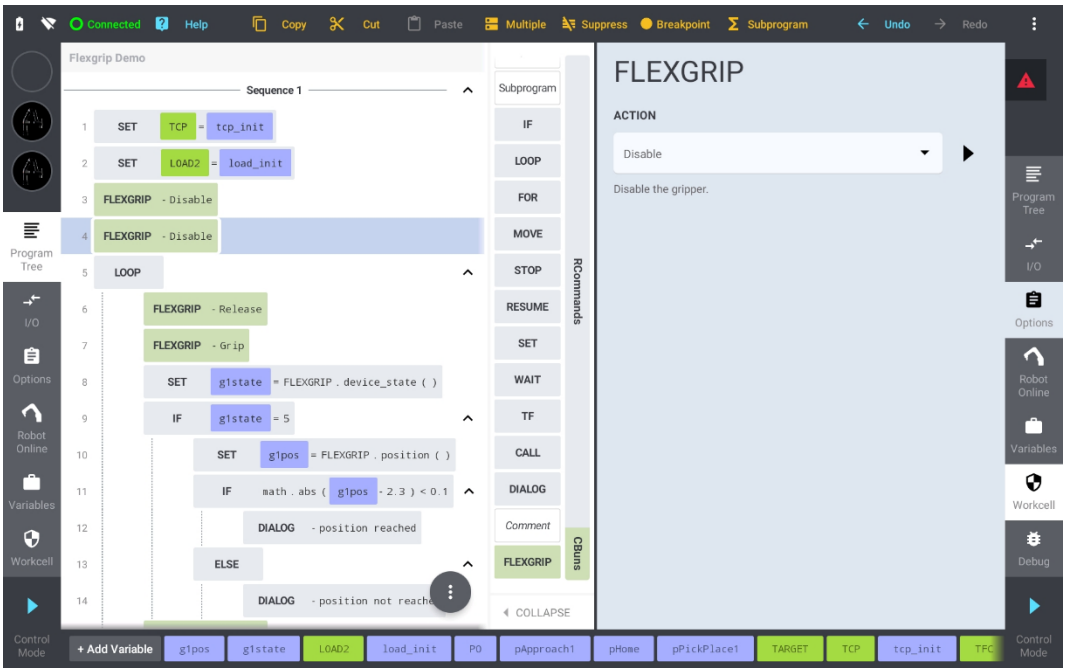
Select the referencing direction so that the base jaws of the fingers reach an end stop when referencing.

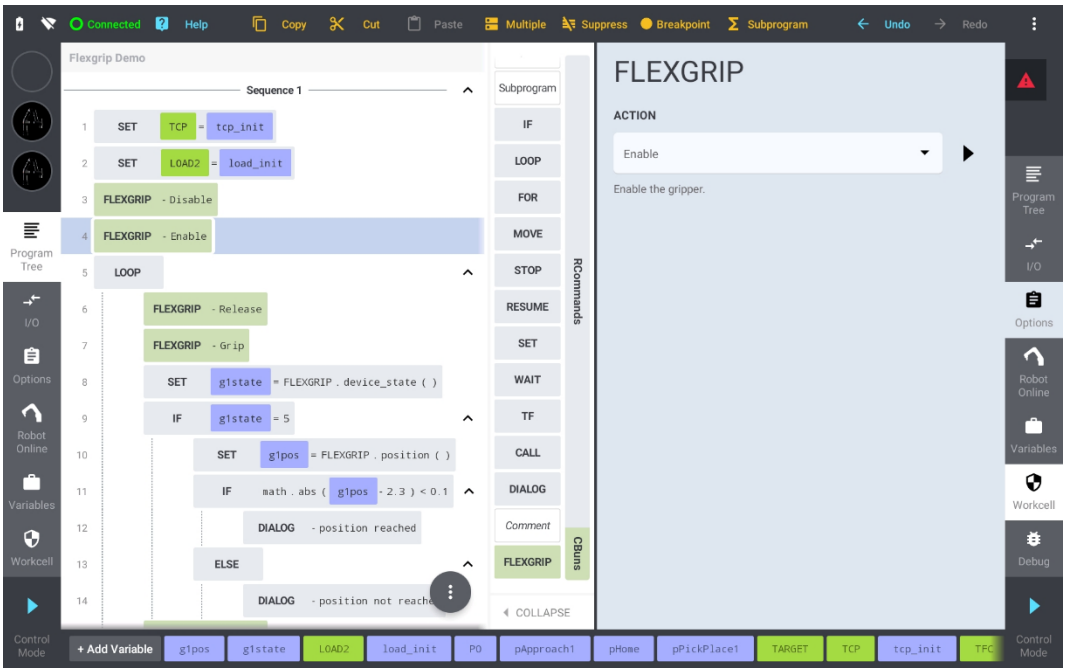


The command is blocked until the referencing run has been completed.

5.3 Enable and Disable – ENABLE/DISABLE

Grippers can be activated and deactivated during operation, for example to operate them on a changer. Select the corresponding command via the action selection field.





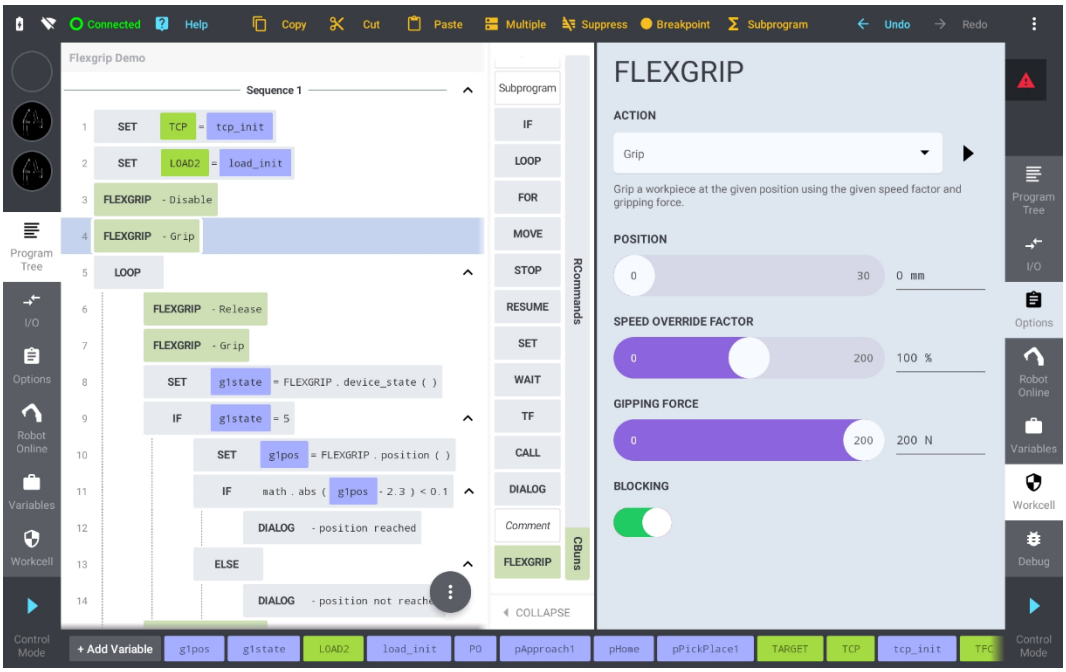
Both commands block until either a state change or a timeout occurs. In the event of a timeout, an error message is displayed and the program is interrupted.

5.4 Grip – GRIP

The GRIPKIT-Easy can execute gripping commands based on the set movement parameters.
The gripping position determines how far the fingers move together. If they block before reaching this position, the set gripping force is built up and the gripping module switches to the “HOLDING” state. If the position is reached without a workpiece being gripped, the gripping module switches to the “NO PART” state.
The gripping force-dependent speed can be scaled using the speed factor. This allows sensitive parts to be gripped particularly gently (values <100%). For robust gripped parts, the gripping time can be reduced through higher scaling (values >100%).

Speed factors > 100% with high gripping forces can shorten the service life of the gripper mechanism!

Further information on the movement parameters can be found in the operating instructions for the gripping module.

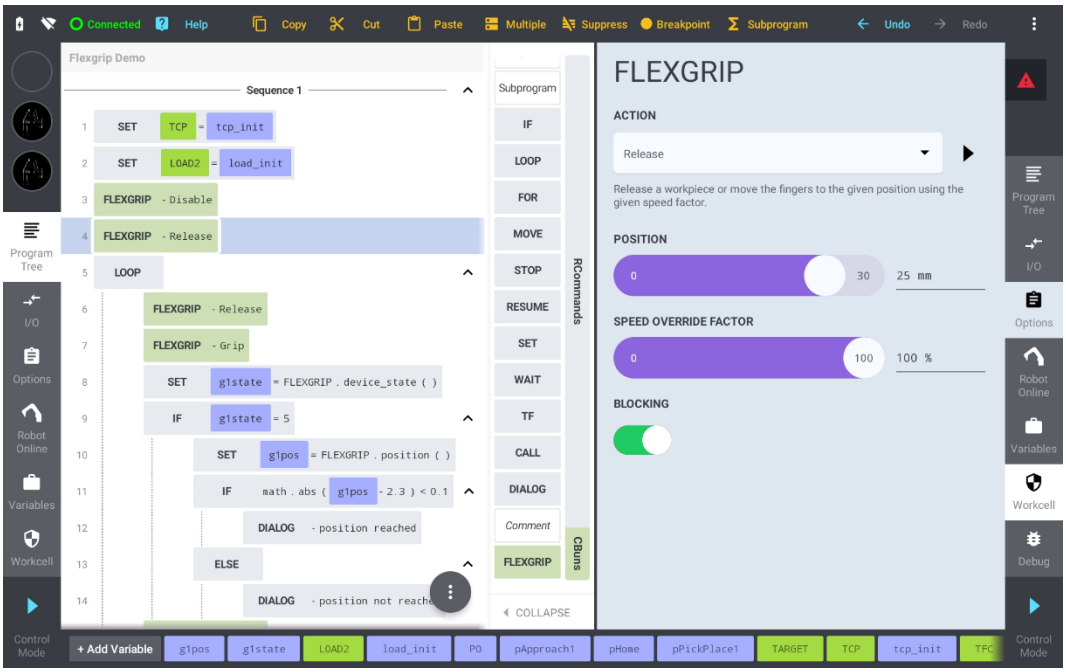


If the “BLOCKING” switch is activated, the command blocks until either a state change or a timeout occurs. In the event of a timeout, an error message is displayed and the program is interrupted.

5.5 Release and Preposition – RELEASE

The “RELEASE” action can be used to release gripped workpieces or to pre-position the fingers.
The target position determines the position to which the fingers move.
The traversing speed can be scaled using the speed factor. For example, it is possible to pre-position at a high speed and then grip with a low gripping force. This shortens cycle times and protects sensitive gripping parts.

Further information on the movement parameters can be found in the operating instructions for the gripping module.



If the “BLOCKING” switch is activated, the command blocks until either a state change or a timeout occurs. In the event of a timeout, an error message is displayed and the program is interrupted.

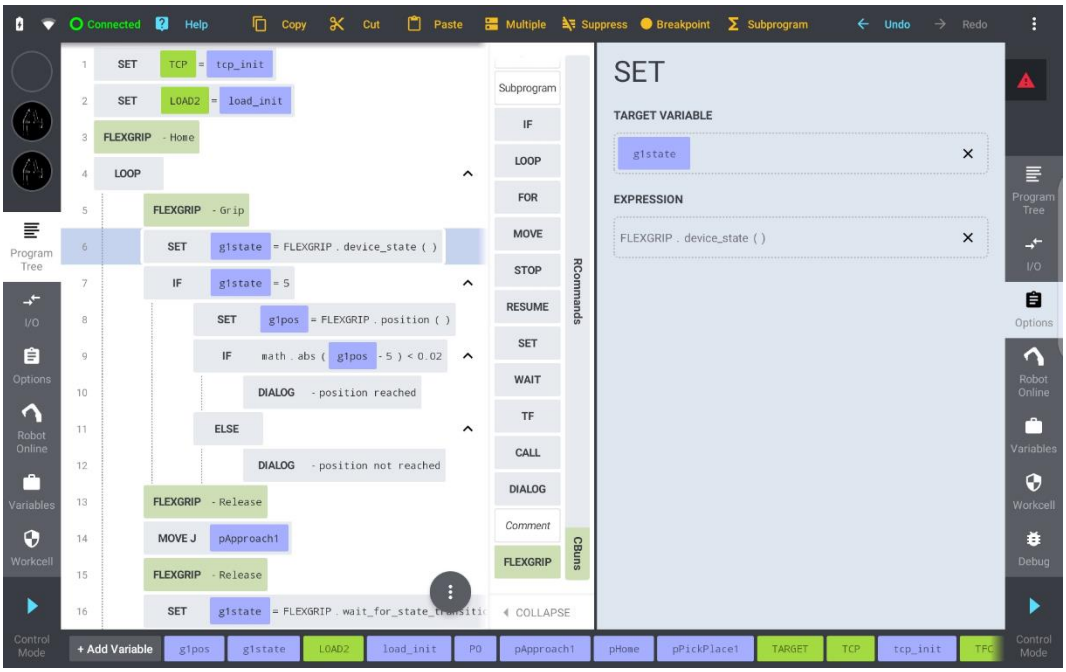
The “BLOCKING” mode is also helpful if the command is to be started and then a movement of the robot arm is to be executed directly.

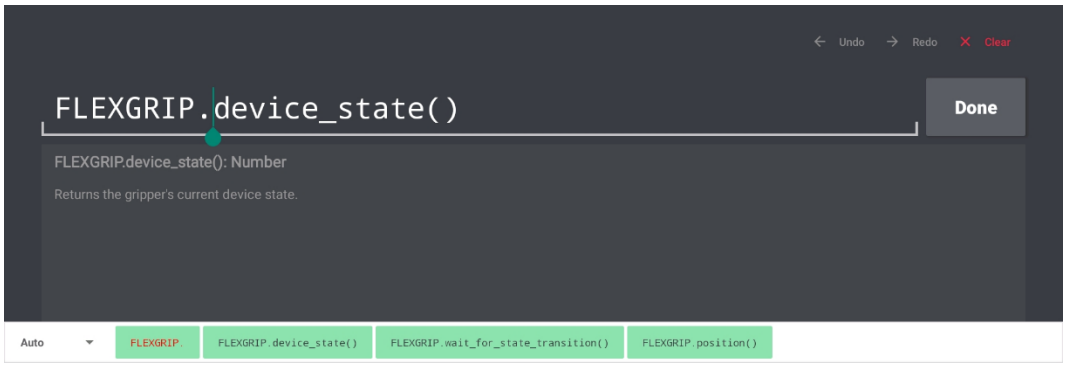
To check afterwards whether the target position has been reached, you can wait separately for the state change. Refer to section 5.7 for further information.

5.6 Device State Query – DEVSTATE

The script function `device_state()` is used to query the status of a gripping module. The function returns the current device state.

The “SET” program node can be used to select the return variable from the global variables (refer to section 5.1.2). The function of the respective FLEXGRIP instance is then entered in the “EXPRESSION” input field.





There are no arguments required for this function.

The available device state values can be found in Appendix A.

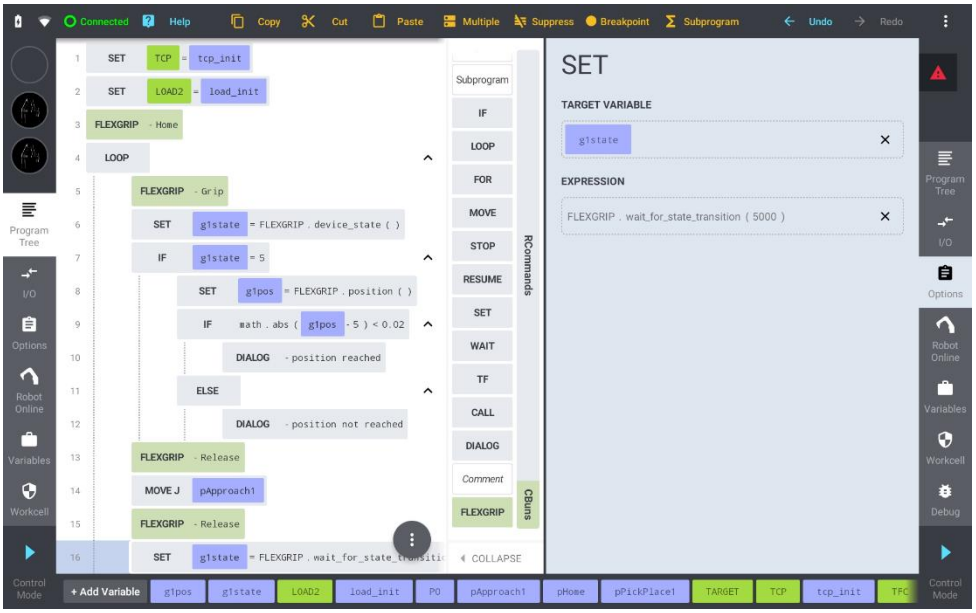
The return variable must first be defined in the global variables (refer to section 5.1.2)

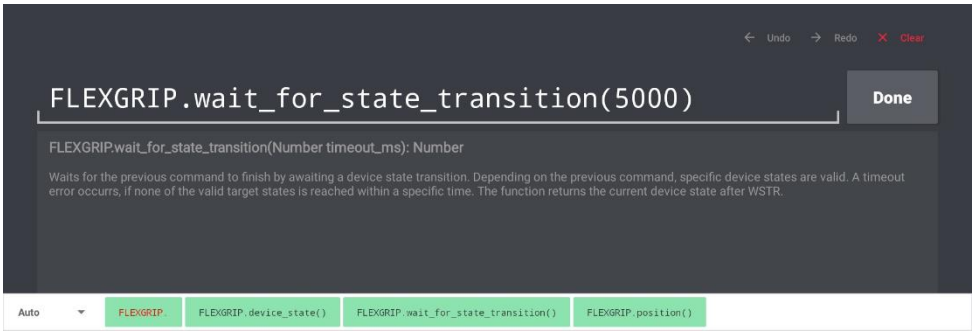
5.7 Wait for State Transition – WAIT FOR STATE TRANSITION (WSTR)

The script function `wait_for_state_transition(<timeout_ms>)` is used to wait for a gripping module to reach the target state after a non-blocking command. The function returns the current device state after the state transition. The function argument `timeout_ms` can be used to define a maximum time to wait for the target state to be reached.

The “SET” program node can be used to select the return variable from the global variables (refer to section 5.1.2). The function of the respective FLEXGRIP instance is then entered in the “EXPRESSION” input field.

Before waiting for a state change, another command (e.g. GRIP or RELEASE) must be executed. Otherwise the timeout will occur.





The following table lists the required function arguments:

Argument	Description
timeout_ms	Maximum time in milliseconds to wait for a state change. An error is generated if this maximum waiting time is exceeded.

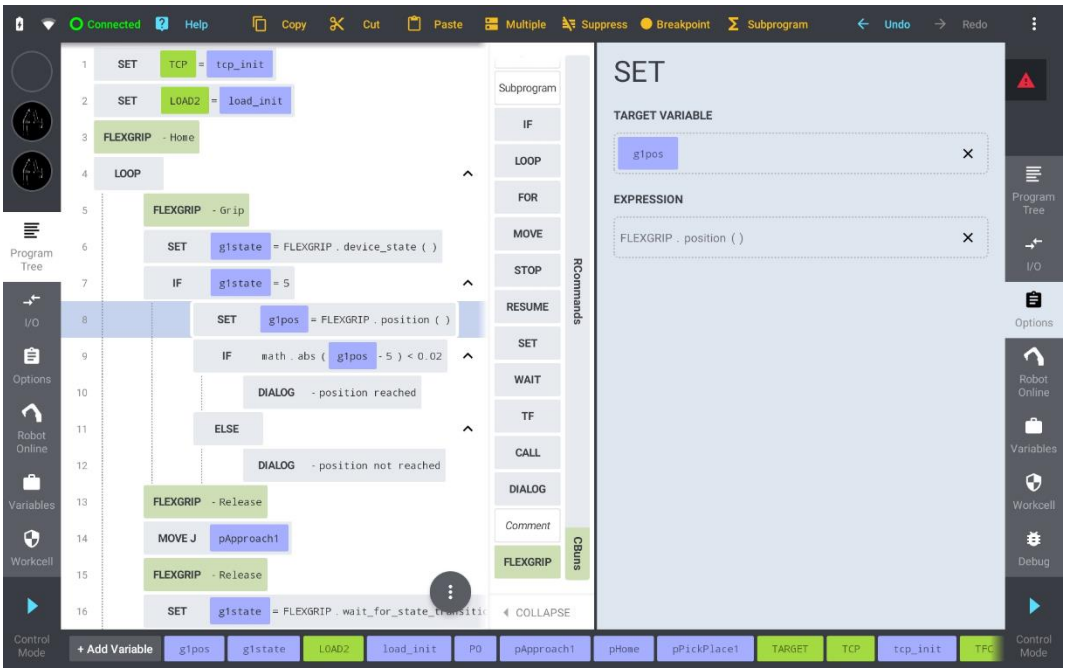
The available device state values can be found in Appendix A.

The return variable must first be defined in the global variables (refer to section 5.1.2)

5.8 Evaluation of the finger position – POSITION

The `position()` function can be used to read out the position of the finger jaws, for example to check the gripped component based on its size. This writes the current position of the finger jaws of the selected gripping module in millimeters to the selected global variable.

The “SET” program node can be used to select the return variable from the global variables (sirefer to section 5.1.2). The function of the respective FLEXGRIP instance is then entered in the “EXPRESSION” input field.



The return variable must first be defined in the global variables (refer to section 5.1.2)

6 Troubleshooting

Errors that occur at runtime are displayed with an error message (“Program Failure”). An error code is listed in the error details.

6.1.1.1 Message „Command <NAME> failed“

Error code 10 (INVALID_PARAMETER):

Possible cause	Remedy
A transferred function or command parameter is invalid	• Check function or command call

Error code 13 (READ_ERROR):

Possible cause	Remedy
Error when receiving the data	• Check connection cables and plug connectors • Check whether all connected gripping modules have unique addresses • Check whether the addressed gripping module is connected • Check the termination of the data lines on the flange board (refer to section 3.2)

Error code 14 (WRITE_ERROR):

Possible cause	Remedy
Error when sending the data	• Check connection cables and plug connectors • Check whether all connected gripping modules have unique addresses • Check whether the addressed gripping module is connected • Check the termination of the data lines on the flange board (refer to section 3.2)

6.1.1.2 Message „Waiting for target states failed“

Error code 5 (TIMEOUT):

Possible cause	Remedy
Waiting for a state transition lead to a timeout	• Check timeout value if necessary or reduce travel distance.

Error code 12 (IO_ERROR):

Possible cause	Remedy
Access to communication interface failed	• Check connection cables and plug connectors • Check whether all connected gripping modules have unique addresses • Check whether the addressed gripping module is connected • Check the termination of the data lines on the flange board (refer to section 3.2)

Error code 19 (STATE_CONFLICT):

Possible cause	Remedy
An attempt was made to execute a gripping command although the gripping module has not yet been referenced	• Check the program sequence: the HOME action must be executed at the beginning of the program before all other gripping commands
Error while executing the command or function	• The gripping module is in the FAULT state. The cause of the error (e.g. blocking of the fingers with the RELEASE command) must be rectified and the gripping module deactivated.

Appendix A Device State

The following table lists the possible status values of connected GRIPKIT-Easy gripping modules.

Device state	Value	Description
NOT CONNECTED	0	Gripping module not connected
NOT INITIALIZED	1	Gripping module not initialized
DISABLED	2	Drive inactive Fingers can be moved manually
RELEASED	3	Workpiece released
NO PART	4	No workpiece gripped
HOLDING	5	Workpiece gripped
OPERATING	6	Drive active Finger position is held
FAULT	7	Fault state