WEISS ROBOTICS

GRIPLINK-PLUGIN FOR FANUC

Version 3.1.0

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Content

1 Introduction 3

1.1 Notation and Symbols 3
1.2 Intended use 3
1.3 System requirements 3
1.4 Terms of License 4

2 Installation 5

2.1 Robot Preparation 5
2.2 Installing the Software on Robot Controllers without Tablet Teach Pendant 5
2.3 Installing the CRX plug-in on Robot Controllers with Tablet Teach Pendant 7
2.4 Uninstalling the Software 8
2.5 Configuration of the Socket Messaging Interface 9
2.6 Behavior in Case of Error 9

3 Command Reference 10

3.1 Establish Connection – CONNECT 11
3.2 Disconnect – BYE 12
3.3 Device Assertion – ASRTDEV 13
3.4 Enable Device – ENABLE 14
3.5 Disable Device – DISABLE 15
3.6 Reference Gripper Module – HOME 16
3.7 Grip a Workpiece – GRIP 17
3.8 Simultaneously grip multiple Workpieces – MGRIP 18
3.9 Release a workpiece – RELEASE 19
3.10 Simultaneously release a Workpiece – MRELEASE 20
3.11 Configure a Grip Preset – SET GRIPCFG 21
3.12 Query Device State – STATE 22
3.13 Query the current Finger Position – POS 23
3.14 Query a Device Value – VALUE 24
3.15 Set a Device Value – SETVAL 25
3.16 Wait for a device value – WAITVAL 26
3.17 Control Gripping Force Retention – CLAMP 27
3.18 Control the Status LED – LED 28

4 Usage of the CRX Plug-In 29

4.1 Functionality 29
4.2 Preparation of the Plug-In 29
4.3 Create Programs using Instructions 31
4.4 Troubleshooting 52

Appendix A Device state 57

1 Introduction

With GRIPLINK technology, IO-Link compatible automation components can be connected to robot systems from leading manufacturers via a network connection. The GRIPLINK plug-in for FANUC robots is the control-side link and enables simple integration of GRIPLINK technology from WEISS ROBOTICS into robot systems of FANUC robots.

This manual describes the GRIPLINK plug-in's functions. For more information about mounting, initial setup, and operation of the GRIPLINK controller, please refer to the GRIPLINK controller manual. It can be found on **www.griplink.de**.

1.1 Notation and Symbols

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

Function or safety-relevant note. Non-observance may endanger the safety of personnel and the system, damage the device or impair the function of the device. damage the device or impair the function of the device.

Additional information for better understanding of the context.

Note on further information.

1.2 Intended use

The "GRIPLINK Plugin" software is intended for communication between the GRIPLINK Controller from WEISS ROBOTICS and a FANUC robots robot controller. The requirements of the applicable directives as well as the installation and operating instructions in this manual must be observed and complied with. Any other use or use beyond the scope of this manual is considered improper use. The manufacturer is not liable for any damage resulting from this.

1.3 System requirements

This plugin is compatible with GRIPLINK controllers with at least firmware version 4.1.0.
For operation, one of the following FANUC robots robot controllers is required:

- R-30iB with software version 8.30 (or above)
- R-30iB plus with software version 9.10 (or above)

For operation with a FANUC robots CRX series cobot, the following robot controller is required:

- R-30iB plus with software version V9.40P/06 (or above) together with the Tablet Teach Pendant option

The following software options must be installed on the robot controller in order to use this software

- R632 KAREL
- R648 User Socket Msg

Contact your FANUC robots representative for more information on the software options.

The IP addresses of GRIPLINK controller and robot controller must be in the same subnet. The GRIPLINK controller manual describes in detail how to change the GIPLINK controller's IP address.

1.4 Terms of License

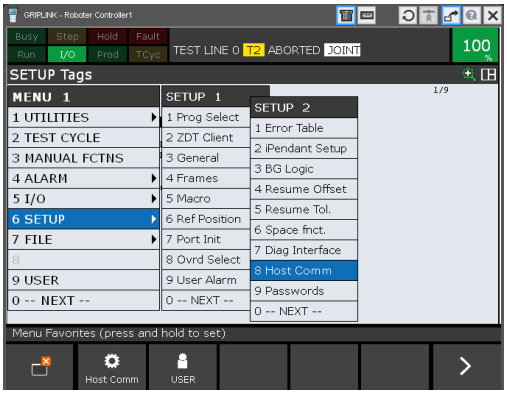
The GRIPLINK plug-in is protected by copyright. The respective valid license terms are enclosed with the software package. By installing this plug-in you accept these license terms.

2 Installation

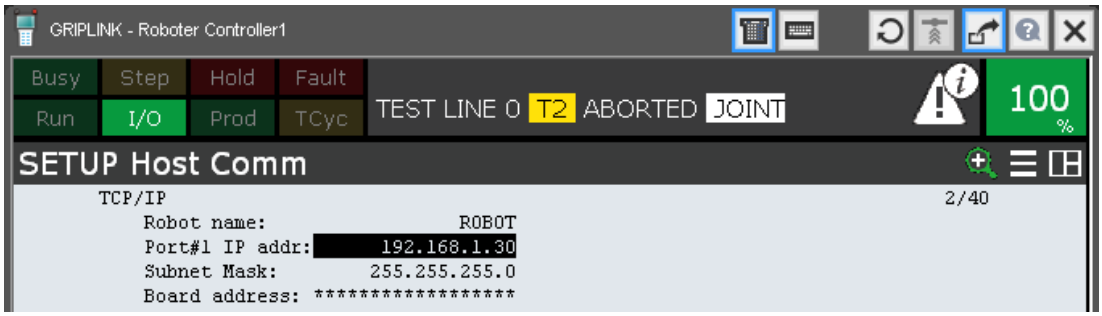
2.1 Robot Preparation

Power on the robot controller and configure the IP address (e.g. 192.168.1.30). Make sure, that robot controller and GRIPLINK controller are in the same subnet.
Perform the following steps:

1. Select MENU → 6 (SETUP) → 0 (--NEXT--) →0 (--NEXT--) → 7 (Host Comm).
2. Select „TCP/IP“ and press ENTER.



3. Enter the IP address and subnet (here: IP 192.168.1.30, subnet mask 255.255.255.0).

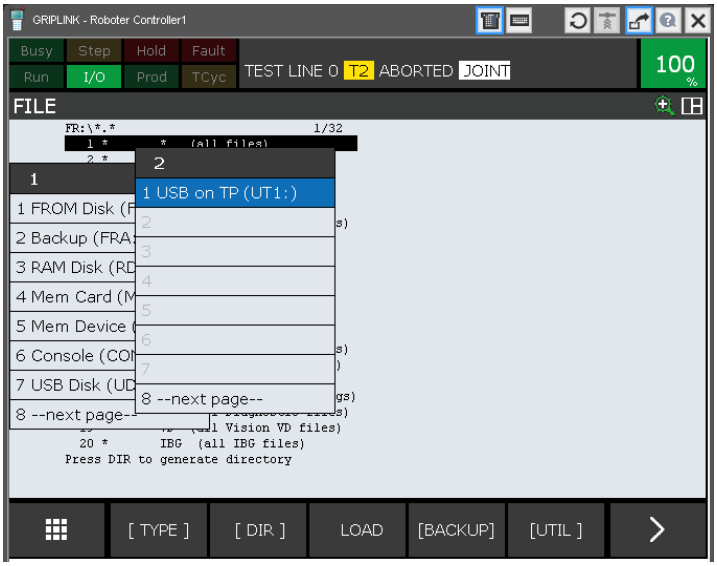


2.2 Installing the Software on Robot Controllers without Tablet Teach Pendant

Ensure, that the latest GRIPLINK plug-in is used. Find the plug-in on **www.griplink.de/software**.

1. Download the plug-in archive “griplink_fanuc_<version>.zip“ from the link above.
2. Unzip the archive previously downloaded to the root directory of a USB stick. Put the USB stick in the USB slot of the Teach Pendant.
3. Press Menu → 7 (FILE) → 1 (File)

4. Press the soft key [UTIL] → 1 (Set Device)
5. Select 8 (-- next page --) → 1 (USB on TP (UT1:))



6. Select „All Files“. You should now see the installation file “SETUP.CM”.
7. Execute the setup file. R-30iB series robot controllers require a cold start after installation in order to apply new parameters.

2.2.1 Installation Validation

After the installation process has finished, press SELECT on the Teach Pendant. You should now see the programs “GRIPLINK.PC” and “GRIPLINK_DEMO.TP”.

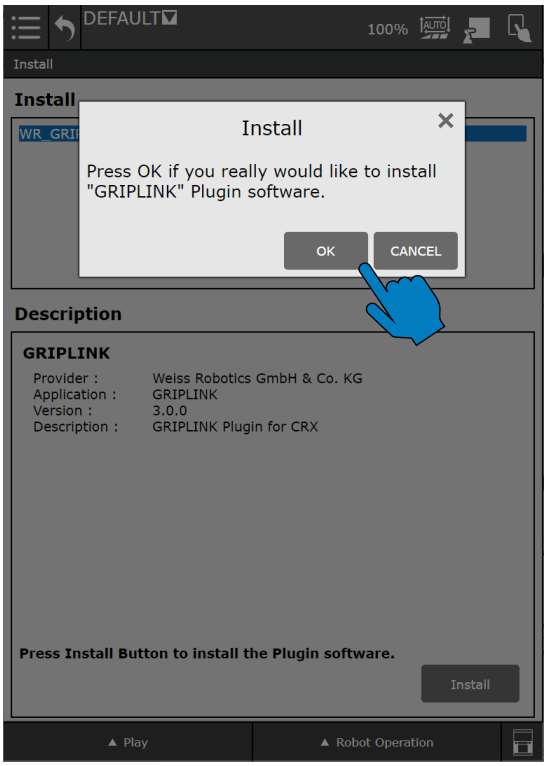
2.3 Installing the CRX plug-in on Robot Controllers with Tablet Teach Pendant

On robots of the CRX series, an additional UI plug-in can be installed. It provides easy to use instruction blocks that can be inserted in a robot program by drag & drop.

Ensure, that the latest GRIPLINK plug-in is used. Find the plug-in on **www.griplink.de/software**.

1. Download the plugin file “griplink_fanuc_crx_<version>.zip”.
2. Unzip the archive previously downloaded to the root directory of a USB stick. Put the USB stick in the USB slot of the Teach Pendant.

For installation, power on the robot controller and the Tablet Teach Pendant. Wait until the app started and the connection between robot controller and tablet was established. Perform the following steps:



After the prompt to restart the robot controller, turn off the mains switch and back on again after ten seconds. Alternatively, the restart function on the teach pendant can be used (refer to the robot controller's manual for further information). Restarting the Tablet Teach Pendant is not required. Wait until tablet and robot controller reconnected.

2.4 Uninstalling the Software

To remove the GRIPLINK plug-in from your robot again, run the uninstall script. This is also part of the software distribution. To do this, follow the steps in chapter 2.2 and select the uninstall script "UNINSTALL.CM" instead of the installation script "SETUP.CM".

For uninstalling the CRX plugin, navigate to the menu "Plugin List", select the plugin from the list and press the button "Uninstall". For additional information refer to the instructions in the robot controller's manual.

2.5 Configuration of the Socket Messaging Interface

The socket messaging interface is required for communication between the robot and the GRIPLINK controller. This must be configured as follows:

3. Press the „MENU“ key and navigate to 6 (SETUP) → (Type) → 0 (NEXT) → 8 (HOST COMM). The „SETUP Protocols“ menu appears. In it, select 3 (SM Socket Messaging Device) and press the SHOW softkey. Select 2 (Clients).
4. Socket Messaging offers you eight TAGs for free use. Select the TAG you want to use for communication with the GRIPLINK controller (TAG 1 in the example).
5. Enter the following data in the input mask:

Comment:	GRIPLINK (user selectable)
Protocol:	SM
Startup-State:	START
Server IP/Hostname:	IP address of GRIPLINK controller (factory setting 192.168.1.40)
Remote Port:	10001

The fields “Remote Path/Share”, “Port”, “Username” and “Password“ are not required and should be left blank.

6. Press the softkey [ACTION] and select 1 (DEFINE).
   The field Current State must now show “DEFINED“
7. Press the softkey [ACTION] and select 1 (START).
   The field Current State must now show “STARTED“

2.6 Behavior in Case of Error

If an error occurs within the GRIPLINK plug-in or during communication with the GRIPLINK controller, the running robot program is basically stopped by means of an error. This usually leads to the fact that running movements of the robot are aborted. The same also applies if the addressed device is in FAULT state or changes to this state due to a command.

Errors are also stored in the log file of the robot and can be retrieved via the teach pendant, key MENU → 4 (ALARM) → 4 (Appl Log).
Some USER-Log messages provide more detailed information.
Also refer to the information on the TELNET console in section 4.4.1

Section **Fehler! Verweisquelle konnte nicht gefunden werden.** lists frequent errors and possible s olutions.

3 Command Reference

The GRIPLINK plug-in provides the user with a collection of gripping module-specific functions. Both single and multiple commands are available. The commands are implemented via an interface program (GRIPLINK.PC), which receives the command together with the necessary parameters as transfer values. To execute a command, the interface program GRIPLINK.PC must be inserted into the robot program via a CALL. The command to be executed is selected via a parameter.

When using the plugin in controllers for the CRX robot series, the function names explained in section 4 (starting with „IPL_WR_GRIPLINK") shall be used.
Installing the plugin using the ipl-file is mandatory.

Argument Wizard

On controllers with software version 9.10 (R-30iB plus series), command and parameters can be selected directly via the Argument Wizard.
On controllers with software version 8.30 (R-30iB series), the command can be selected via the Argument Wizard. The parameter values required for the command must be entered via the parameters A to K. Parameters that are not required can be set to 0.

Return Values

The return values of the commands are stored in a register. The index of this register or the start index of the register area can be specified via the "RETREGIDX" parameter (Return Register Index).

Multi-Device Commands

With the multi-device commands (prefix M), several gripping modules can be addressed simultaneously in parallel. These commands are particularly suitable for handling large or bendable workpieces with several gripping modules.

Basic Program Flow

1. Connect to the GRIPLINK controller with CONNECT
2. Servo-electric grippers without absolute position sensing: reference device with HOME
3. Enable device with ENABLE
4. Grip/Release with GRIP/MGRIP and RELEASE/MRELEASE
5. Before terminating the robot program, disconnect with BYE

This program flow must be used for the plug-in and connected devices to work properly.

The following section describes all available commands of the GRIPLINK plug-in.

3.1 Establish Connection – CONNECT

This command establishes the connection between the GRIPLINK controller and the robot controller. Pass the index of the previously configured COM tag as a parameter. The command waits until the connection is established. If the GRIPLINK controller cannot be reached at the specified address, an error is triggered and the program execution is stopped. The command checks, if the connected GRIPLINK controller fulfils the minimum requirements on the GRIPLINK protocol (see section 1.3).

Syntax

R-30iB plus:	GRIPLINK(CONNECT, < COM_TAG >)
R-30iB:	GRIPLINK(CONNECT, A=< COM_TAG >, B=0, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< COM_TAG >	Index des COM-Tags (1 bis 8)

Return Values

none

Frequent Errors

Invalid COM tag configuration
→Check Host Comm settings

GRIPLINK Controller is not connected to the robot controller
→Check network and power supply connections

GRIPLINK Controller configuration does not match robot controller configuration
→Check network settings on GRIPLINK controller and robot controller

Example

Establish connection between GRIPLINK controller and robot controller using COM tag 1:

```
CALL GRIPLINK(CONNECT=1,COM_TAG=1)
```

If other GRIPLINK commands are issued before the CONNECT command, an error will be caused.
The CONNECT command is mandatory!

3.2 Disconnect – BYE

This command disconnects the robot controller from the GRIPLINK controller. Disconnecting is not required in normal operation and should only be used with caution.

Syntax

R-30iB plus: GRIPLINK(BYE=2)

R-30iB: GRIPLINK(BYE=2, A=0, B=0, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

none

Return Values

none

Example

Disconnect robot controller from GRIPLINK controller:

```
CALL GRIPLINK(BYE=2)
```

3.3 Device Assertion – ASRTDEV

This command asserts, that the expected device is connected to the selected port. If the connected device does not have the expected vendor and product ID, the robot program halts immediately.

Syntax

R-30iB plus:	GRIPLINK(ASRTDEV=3, < PORT >, < VID >, < PID >)
R-30iB:	GRIPLINK(ASRTDEV=3, A=< PORT >, B=< VID >, C=< PID >, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripping module (0 bis 31)
< VID >	In the expected device's IODD specified Vendor ID
< PID >	In the expected device's IODD specified Product ID

Return Values

none

Example

Assert, that an IEG 55-020 by Weiss Robotics (VID 815, PID 20) is connected to port 3::

```
CALL GRIPLINK(ASRTDEV=3,PORT=3,VID=815,PID=20)
```

Vendor and product ID can be found of the device description and IODD of the device that are provided by the vendor.

3.4 Enable Device – ENABLE

This command activates the connected device. Gripping modules change to the state RELEASED and perform the release action of the most recently selected grip preset.

Syntax

R-30iB plus:	GRIPLINK(ENABLE=11, < PORT >, < RETREGIDX >)
R-30iB:	GRIPLINK(ENABLE=11, A=< PORT >, B=< RETREGIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripping module (0 bis 31)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return values

R[< RETREGIDX >]	Current device state

Example

Enable device at port 0:

```
CALL GRIPLINK(ENABLE=11,PORT=0,RETREGIDX=1)
```

The enable behavior can vary depending on the connected device. Please take care of the notes in the device driver manual!

3.5 Disable Device – DISABLE

This command deactivates the connected device. The command can be used for example in a tool changer application to bring the connected device into a safe state before the tool is changed.

Syntax

R-30iB plus:	CALL GRIPLINK(DISABLE=12, < PORT >, < RETREGIDX >)
R-30iB:	CALL GRIPLINK(DISABLE=12, A=< PORT >, B=< RETREGIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripping module (0 bis 31)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return values

R[< RETREGIDX >]	Current device state

Example

Disable device at port 0:

```
CALL GRIPLINK(DISABLE=12,PORT=0,RETREGIDX=1)
```

3.6 Reference Gripper Module – HOME

References the gripper module on the selected port. This command triggers a reference drive of the gripper module and awaits its execution. After executing the HOME command, the gripper module's fingers are forceless.

The referencing direction can be configured using the web app of the GRIPLINK controller.

Syntax

R-30iB plus:	CALL GRIPLINK(HOME=13, < PORT >, < RETREGIDX >)
R-30iB:	CALL GRIPLINK(HOME=13, A=< PORT >, B=< RETREGIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameter

< PORT >	Index of the gripping module (0 bis 31)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return Values

R[< RETREGIDX >]	Current device state

Example

Reference the gripping module on port 2:

```
CALL GRIPLINK(HOME=13,PORT=2,RETREGIDX=1)
```

The referencing behavior can vary depending on the connected device. Please take care of the notes in the device driver manual!

3.7 Grip a Workpiece – GRIP

This command triggers a grip action with the gripper module on the selected port using the selected grip preset. The WSTR command can be used to await a device state transition after the GRIP command.

The grip preset parameters can be configured using the GRIPLINK controller web app.

Syntax

R-30iB plus:	CALL GRIPLINK(GRIP=20, < PORT >, < PRESETIDX >)
R-30iB:	CALL GRIPLINK(GRIP=20, A=< PORT >, B=< PRESETIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripping module (0 bis 31)
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)

Return Values

none

Example

Perform a grip action using the gripper module on port 2. If no workpiece was gripped, the gripper should open and try again:

```
LBL[1]
CALL GRIPLINK(GRIP=20,PORT=0,PRESETIDX=2)
! Wait until the gripper changed its state
CALL GRIPLINK(WSTR=80,PORT=0,RETREGIDX=1)
...
IF R[1]=4,JMP LBL[2]
CALL GRIPLINK(RELEASE=22,PORT=0,PRESETIDX=2)
! Wait until the gripper changed its state
CALL GRIPLINK(WSTR=80,PORT=0,RETREGIDX=1)
...
WAIT 0.5(sec)
JMP LBL[1]
LBL[2]
! Part gripped!
```

3.8 Simultaneously grip multiple Workpieces – MGRIP

This command triggers a simultaneous grip action with the gripper modules on the selected ports using the selected grip preset. The MWAITFOR command can be used to await device state transitions after the MGRIP command.

The grip preset parameters can be configured using the GRIPLINK controller web app.

Syntax

R-30iB plus:	CALL GRIPLINK(MGRIP=21, < PORTS >, < PRESETIDX >)
R-30iB:	CALL GRIPLINK(MGRIP=21, A=< PORTS >, B=< PRESETIDX >, C=0 D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORTS >	Selected gripper modules as 32-Bit-Vektor: Bit x = 1: Device at port (1 << x) is selected Bit x = 0: Device at port (1 << x) is not selected Example: Select grippers at ports 0 and 3 →Set bits 0 and 3 →Ports = (1 << 0) + (1 << 3) = 1 + 8 = 9
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)

Return Values

none

Example

Grip a workpiece with the grippers at port 0 and 3 simultaneously and await state transitions afterwards:

```
! Grip with grippers at ports 0 and 3
CALL GRIPLINK(MGRIP=21,PORTS=9,PRESET=2)
CALL GRIPLINK(MWAITFOR=81,PORTS=9)
! Get states of the grippers
CALL GRIPLINK(STATE=10,PORT=0,RETREGIDX=1)
CALL GRIPLINK(STATE=10,PORT=3,RETREGIDX=4)
...
! Release with grippers at ports 0 and 3
CALL GRIPLINK(MRELEASE=23,PORTS=9,PRESET=2)
CALL GRIPLINK(MWAITFOR=81,PORTS=9)
! Get actual states of the grippers
CALL GRIPLINK(STATE=10,PORT=0,RETREGIDX=1)
CALL GRIPLINK(STATE=10,PORT=3,RETREGIDX=4)
```

3.9 Release a workpiece – RELEASE

This command triggers a release action with the gripper module on the selected port using the selected grip preset. The WSTR command can be used to await a device state transition after the GRIP command.

The grip preset parameters can be configured using the GRIPLINK controller web app.

Syntax

R-30iB plus:	CALL GRIPLINK(RELEASE=22, < PORT >, < PRESETIDX >)
R-30iB:	CALL GRIPLINK(RELEASE=22, A=< PORT >, B=< PRESETIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameter

< PORT >	Index of the gripping module (0 bis 31)
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)

Return Values

none

Example

Refer to example in 3.7

3.10 Simultaneously release a Workpiece – MRELEASE

This command triggers a simultaneous release action with the gripper modules on the selected ports using the selected grip preset. The MWAITFOR command can be used to await device state transitions after the MGRIP command.

The grip preset parameters can be configured using the GRIPLINK controller web app.

Syntax

R-30iB plus:	CALL GRIPLINK(MRELEASE=23, < PORTS >, < PRESETIDX >)
R-30iB:	CALL GRIPLINK(MRELEASE=23, A=< PORTS >, B=< PRESETIDX >, C=0 D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameter

< PORTS >	Selected gripper modules as 32-Bit-Vektor: Bit x = 1: Device at port (1 << x) is selected Bit x = 0: Device at port (1 << x) is not selected Example: Select grippers at ports 0 and 3 →Set bits 0 and 3 →Ports = (1 << 0) + (1 << 3) = 1 + 8 = 9
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)

Return Values

none

Example

Refer to example in 3.8

3.11 Configure a Grip Preset – SET GRIPCFG

This command changes the parameters of the selected grip preset. Up to eight parameters can be set, of which all must be transmitted to the device. This also applies to devices that only support less than eight parameters per preset.
Depending on the device, each parameter has an individual purpose which can be found in the respective GRIPLINK device driver manual.

Syntax

R-30iB plus:	CALL GRIPLINK(SGRIPCFG=60, < PORT >, < PRESETIDX >, < PRM0 >, < PRM1 >, < PRM2 >,< PRM3 >,< PRM4 >,< PRM5 >,< PRM6 >,< PRM7 >)
R-30iB:	CALL GRIPLINK(SGRIPCFG=60, A=< PORT >, B=< PRESETIDX >, C=< PRM0 >, D=< PRM1 >, E=< PRM2 >, F=< PRM3>, G=< PRM4 >, H=< PRM5 >, I=< PRM6 >, J=< PRM7>, K=0)

Parameters (generally)

< PORT >	Index of the gripping module (0 bis 31)
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)
< PRM0..7 >	Gerätespezifische Preset-Parameter 0 bis 7

Parameters (Weiss Robotics gripper modules)

< PORT >	Index of the gripping module (0 bis 31)
< PRESETIDX >	Index of the grip preset (valid value range depends on the device)
< PRM0 >	No Part Limit (valid value range depends on the device type, in 1/1000 mm)
< PRM1 >	Release Limit (valid value range depends on the device type, in 1/1000 mm)
< PRM2 >	Force Factor (valid value range depends on the device type, in 1/1000 %)
< PRM3..7 >	*not used*

Return Values

none

Example

Set the grip preset with index 1 of the gripper module on port 3 to the following parameters:

No Part Limit = 31 mm	→in 1/1000 mm:	31000
Release Limit = 41 mm	→in 1/1000 mm:	41000
Force Factor = 59 %:	→in 1/1000 %:	59000

```
CALL GRIPLINK(SGRIPCFG=60,PORT=3,PRESETIDX=1,PRM0=31000,PRM1=41000,
PRM2=59000)
```

3.12 Query Device State – STATE

This command returns the current device state of the selected device.

Syntax

R-30iB plus:	GRIPLINK(STATE=10, < PORT >, < RETREGIDX >)
R-30iB:	GRIPLINK(STATE=10, A=< PORT >, B=< RETREGIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the device (0 bis 31)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return Values

R[< RETREGIDX >]	Current device state

Example

Wait for the device state of the gripper module at port 2 switch to “HOLDING”:

```
LBL[1]
CALL GRIPLINK(STATE=10,PORT=2,RETREGIDX=1)
IF R[1]=4,JMP LBL[2]
WAIT 0.01(sec)
! Timeout processing, e.g. using a counter variable
JMP LBL[1]
...
LBL[2]
! Gripper at port 2 is in HOLDING state
```

3.13 Query the current Finger Position – POS

This command returns the current finger position of the selected gripper module.

Syntax

R-30iB plus:	CALL GRIPLINK(POS=40, < PORT >, < RETREGIDX >)
R-30iB:	CALL GRIPLINK(POS=40,A=< PORT >, B=< RETREGIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameter

< PORT >	Index of the gripping module (0 bis 31)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return Values

R[< RETREGIDX >]	Current finger position in 0,01 mm Example: R[< RETREGIDX >] = 10.000 →Finger position = 10.000 mm / 1.000 = 10 mm

Example

Call program “PROG“, when the current finger position of the gripper module on port 2 is greater than 10.5 mm:

```
CALL GRIPLINK(POS,PORT=2,RETREGIDX=42)
IF R[42]>1050, CALL PROG
```

3.14 Query a Device Value – VALUE

This command returns an indexed device value.

The return value will be written to the Numeric Register with the given register index.

The valid value range for the value index can be found in the respective GRIPLINK device driver manual.

Syntax

R-30iB plus:	CALL GRIPLINK(VALUE=41, < PORT >, < VALUEIDX >, < RETREGIDX >)
R-30iB:	CALL GRIPLINK(VALUE=41, A=< PORT >, B=< VALUEIDX >, C=< RETREGIDX >, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the device (0 bis 31)
< VALUEIDX >	Index of the value to be read (0 bis 9)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return Values

R[< RETREGIDX >]	Current value of the indexed value

Example

Read the primary value (value index 0) of the device on port 3 and store it in the Numeric Register 31:

```
CALL GRIPLINK(VALUE=41,PORT=3,VALUEIDX=0,RETREGIDX=31)
```

The value 2147483647 is used by the KAREL language for un-initialized data. GRIPLINK processes sensor data that are out of range with the same value.
Explicitly check this value when reading values from a device!

3.15 Set a Device Value – SETVAL

With this command, a device specific value can be set. The value is selectable using the value index, which has a device dependent range. The value to be written can have different meanings depending on the connected device.

The ranges of value index and value to be written can be found in the driver's manual of the respective device.

The GRIPLINK protocol specifies, that numeric values are transmitted with a factor of 1000.
If the value 1.234 is to be set, it must be transmitted with the factor of 1,000 (corresponds to 1,234).

Syntax

R-30iB plus:	CALL GRIPLINK(SETVAL=42, < PORT >, < VALUEIDX >, < VALUE >)
R-30iB:	CALL GRIPLINK(GRIP=20, A=< PORT >, B=< VALUEIDX >, C=< VALUE >, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the device (0 bis 31)
< VALUEIDX >	Index of the value to be written (value range depending on device)
< VALUE >	Value to be written (value range depending on device)

Return Values

none

Example

Set value with index 2 of device connected to port 0 to 10:

```
CALL GRIPLINK(SETVAL=42,PORT=0,VALUEIDX=2,VALUE=10000)
; Wait for value reached the set value
CALL GRIPLINK(WAITVAL=43,PORT=0,VALUEIDX=2,RETREGIDX=100)
```

3.16 Wait for a device value – WAITVAL

This command waits until the value with the given index has reached its latest set value. The reached value is then written in the numeric register with the given index.
An application might consist of a vacuum generator, which was configured using the SETVAL command to generate a specific vacuum level. With WAITVAL it is possible, to wait until the vacuum generator has reached the desired level within a specific time or a timeout occurred.

Syntax

R-30iB plus:	CALL GRIPLINK(SETVAL=42, < PORT >, < VALUEIDX >, < VALUE >)
R-30iB:	CALL GRIPLINK(GRIP=20, A=< PORT >, B=< VALUEIDX >, C=< VALUE >, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the device (0 bis 31)
< VALUEIDX >	Index of the value to be written (value range depending on device)
< RETREGIDX >	Index of the return value register (1 bis 100)

Return Values

none

Example

Refer to example in 3.15

3.17 Control Gripping Force Retention – CLAMP

Using the CLAMP command, gripper modules with integrated gripping force retention can disable the power train in state HOLDING to minimize power consumption. The workpiece will be held safely though.
When CLAMP is activated, the motor is disabled in state HOLDING. When deactivated, the force controller continues to control the gripping force during HOLDING permanently.

CLAMP is not available on all devices.

Syntax

R-30iB plus:	CALL GRIPLINK(CLAMP=24, < PORT >, < ENABLE >)
R-30iB:	CALL GRIPLINK(CLAMP=24, A=< PORT >, B=< ENABLE >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripper module (0 bis 31)
< ENABLE >	Force retention: 1 = activated, 0 = deactivated

Return Values

none

Example

Activate force retention of the gripper module on port 2:

```
CALL GRIPLINK(CLAMP=24,PORT=2,STATE=1)
```

3.18 Control the Status LED – LED

This command sets preset of the status LED on the selected CRG gripping module.

LED presets can be configured using the GRIPLINK controller web app.

The LED command is not available on all gripper modules.

Syntax

R-30iB plus:	CALL GRIPLINK(LED=25, < PORT >, < PRESETIDX >)
R-30iB:	CALL GRIPLINK(LED=25, A=< PORT >, B=< PRESETIDX >, C=0, D=0, E=0, F=0, G=0, H=0, I=0, J=0, K=0)

Parameters

< PORT >	Index of the gripping module (0 bis 31)
< PRESETIDX >	Index of the LED preset (0 bis 7)

Return Values

none

Example

Perform a grip action with the gripper module on port 3 and read the grip position. Change the LED preset to 0 when the grip position is larger than or equal to 8.1 mm or to preset 1 if less than 8.1 mm:

```
! Grip with gripper at port 3 and preset 0, wait for state transition
CALL GRIPLINK(GRIP=20,PORT=3,PRESETIDX=0)
CALL GRIPLINK(WSTR=80,PORT=3,RETREGIDX=1)
! Read finger position and set respective LED preset
CALL GRIPLINK(POS=40,PORT=3,RETREGIDX=2)
IF(R[2]>=810) THEN
CALL GRIPLINK(LED,PORT=3,PRESETIDX=1
ELSE
CALL GRIPLINK(LED,PORT=3, PRESETIDX=2
ENDIF
```

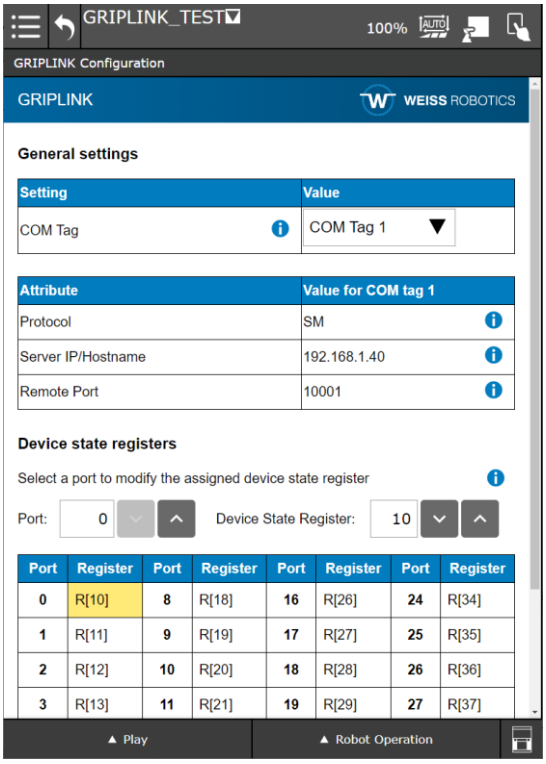
4 Usage of the CRX Plug-In

4.1 Functionality

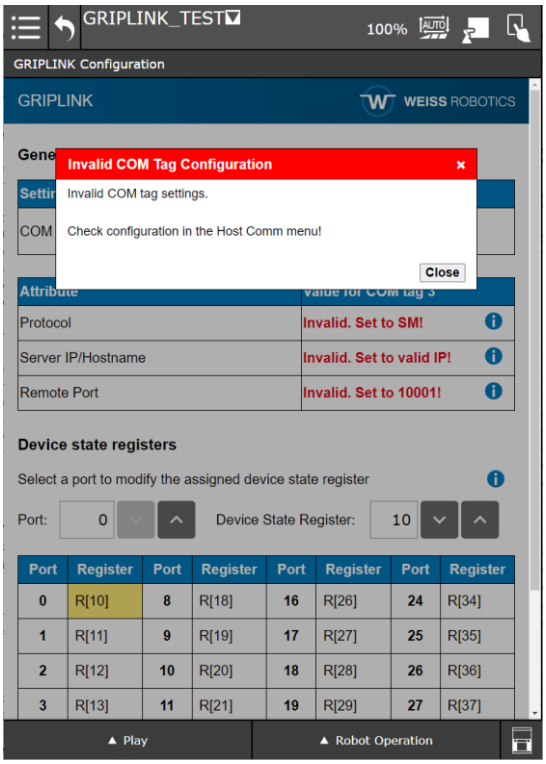
The plug-in provides a configuration page and several dedicated program instructions, that are used for interacting with GRIPLINK.
Instructions can be added to a robot program via drag & drop. When creating a robot program by hand using a text editor, pay attention to the notes in the following sections.
Instructions that return values alter Numeric Registers with pre-defined indices. Configuration of these indices can be done either on the plugin configuration page or on the program instruction itself. If an instruction leads to a state change of the respective device, the configured device state register will be updated immediately.

4.2 Preparation of the Plug-In

Open the configuration page by navigating to the menu entry “Plugins” and selecting the entry “GRIPLINK”.



Use the dropdown “COM Tag” to select the previously configured COM tag. If the selected COM tag does not have a proper configuration, an error message is displayed.



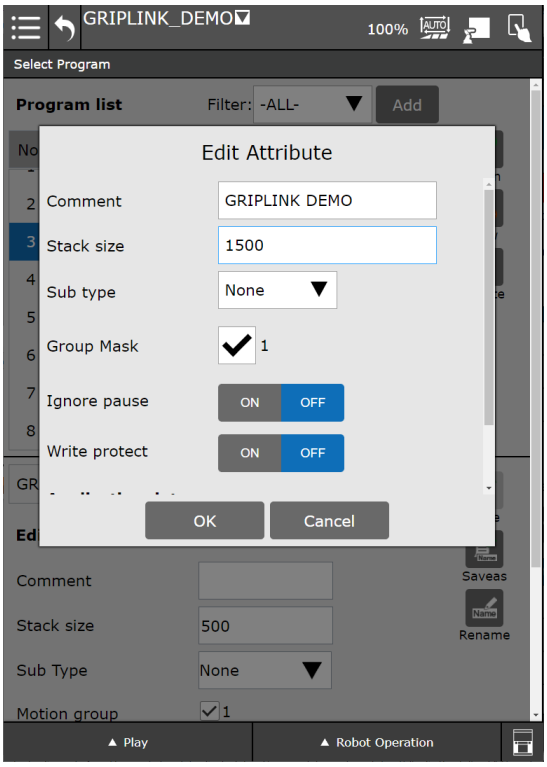
Commands that alter the device state (e.g. GRIP, RELEASE, DISABLE) store the device state after command execution in a Numeric Register. The index of this register can be set port specific.
To change the register index, select the desired port using the “Port” input on the left and set the index via the input field on the right.

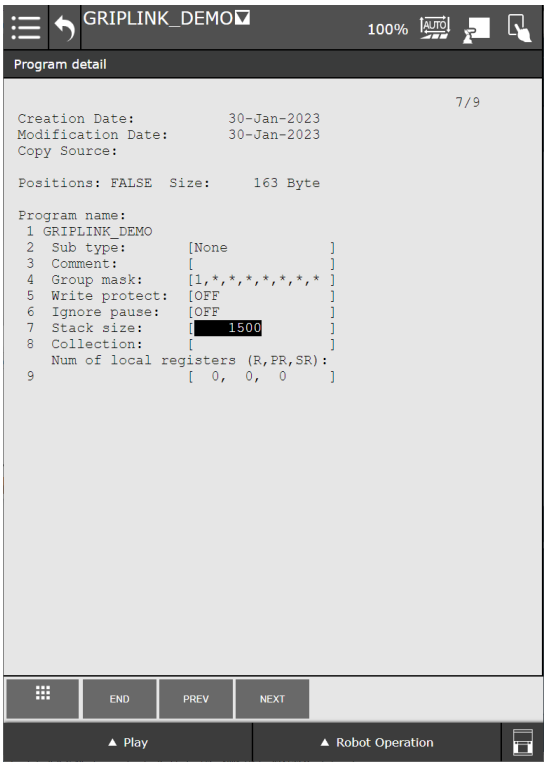
Further information on the Numeric Registers can be found in the operation manual of the robot controller.

Further information on the available device states can be found in the manual of the GRIPLINK controller.

4.3 Create Programs using Instructions

Programs that use the GRIPLINK plug-in, should be created with a sufficient stack size.





Increase the “Stack size” parameter, if a “Stack overflow” error occurs during program execution.

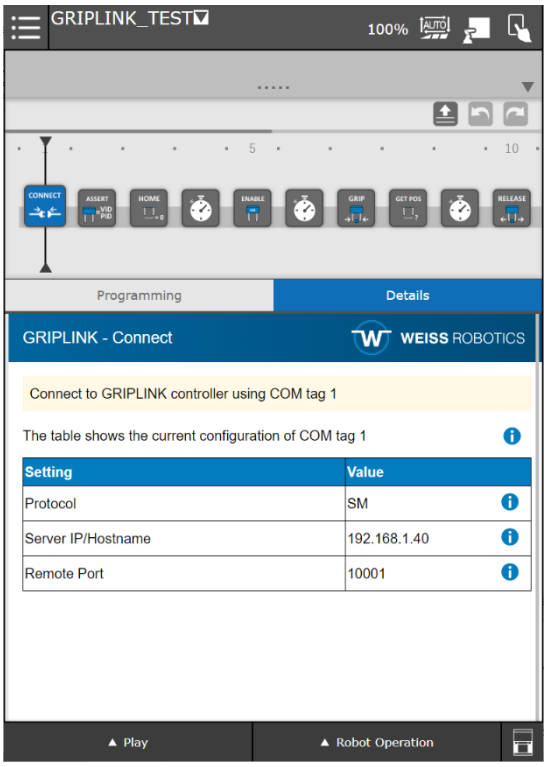
To interact with the various supported devices, GRIPLINK provides several instructions. These can be inserted into the robot program using drag & drop. The GRIPLINK instructions can be found in the “Motion” section of the program editor.

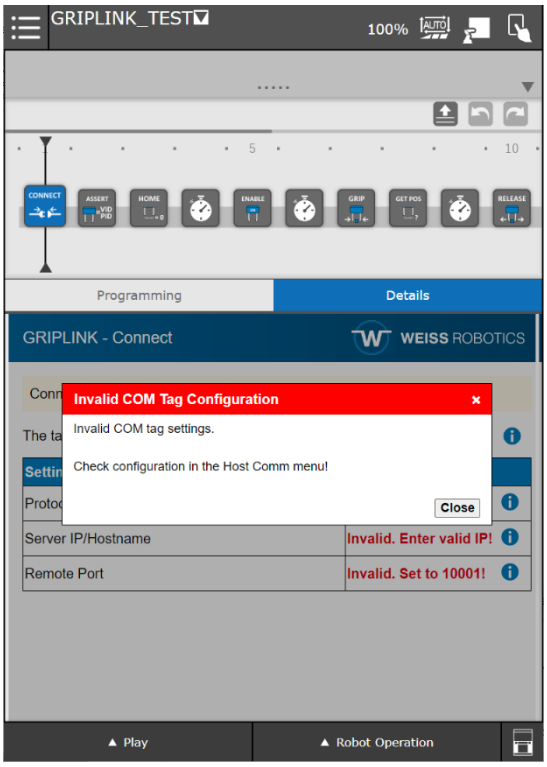
When an instruction is inserted into the program, the tab “Details” shows further settings of this specific instruction. The available options vary depending on the selected instruction type.

4.3.1 Establish a Connection

At the beginning of each robot program with GRIPLINK functionality, a connection to the GRIPLINK controller has to be established. Drag the instruction “GRIPLINK Connect” into the robot program. On the details page, the COM tag selected on the plug-in configuration is shown. Any errors will be displayed here analogously.

Any robot program shall connect to the GRIPLINK controller using the “Connect” instruction!





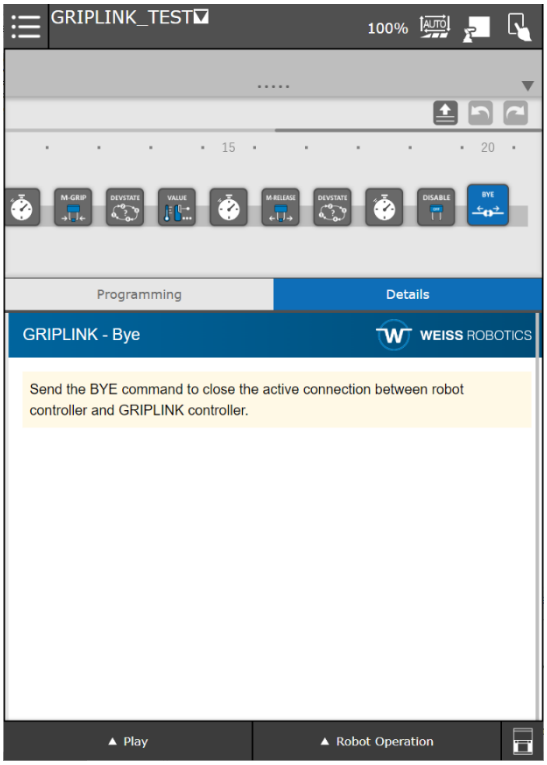
Program usage in plain text editor

```
CALL IPL_WR_GRIPLINK_CONNECT
```

4.3.2 Close a Connection

The „Bye“ instruction can be used at the very end of a robot program, to close the connection to the GRIPLINK controller in a safe way.

Use this instruction within a robot program only with pre-caution!

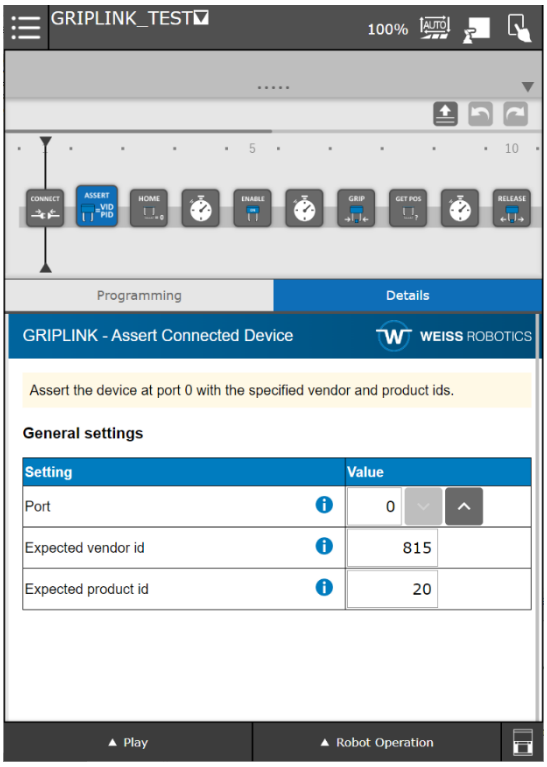


Program usage in plain text editor

```
CALL IPL_WR_GRIPLINK_BYE
```

4.3.3 Assert connected Devices

Before activating a device, it is good practice to ensure, the expected device is also connected. The “Assert Device” instruction checks, if the currently connected device fulfils the expectations. The robot program is halted immediately, if this is not the case.
The details page of this instruction allows the specification of Vendor and Product ID of the expected device. The example shows, how to ensure that an IEG 55-020 by Weiss Robotics (VID 815, PID 20) is connected to port 0.

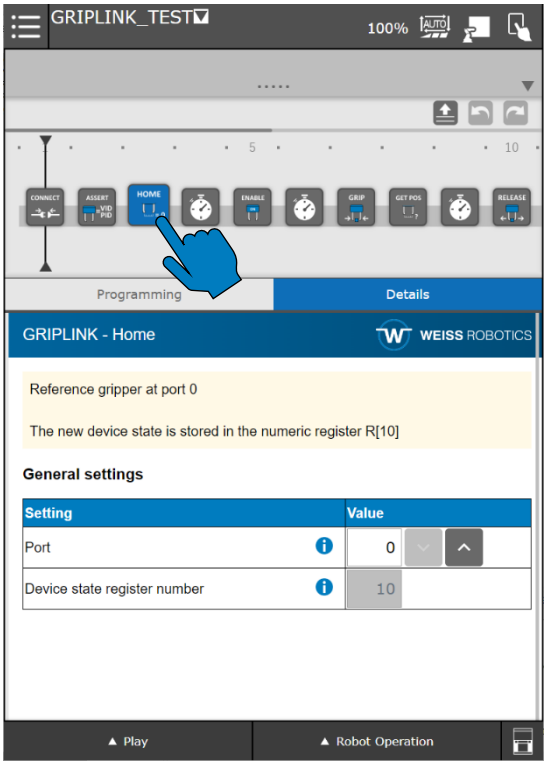


Program usage in plain text editor

```
CALL IPL_WR_GRIPLINK_ASSERTDEV(<Port>,<VID>,<PID>)
```

4.3.4 Referencing

Referencing of gripping modules can be done using the “GRIPLINK Home” instruction.

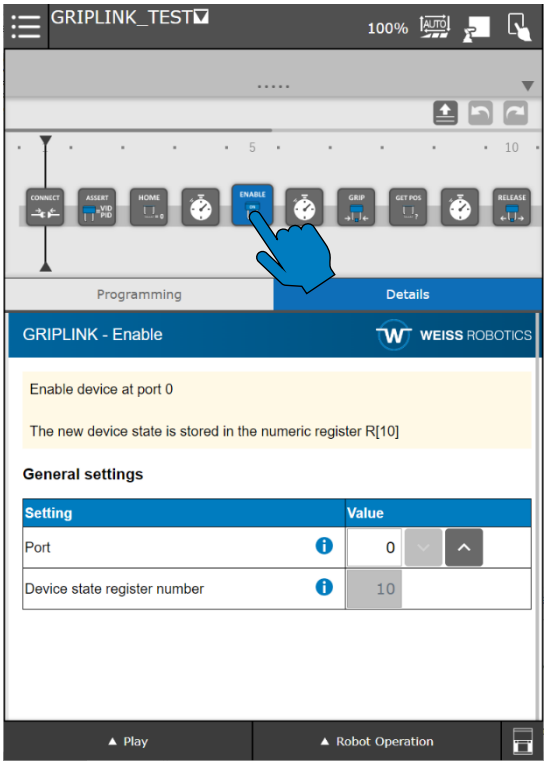


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_HOME(<Port>)
```

4.3.5 Enable a Device

Activating a device can be done using the “GRIPLINK Enable” instruction.

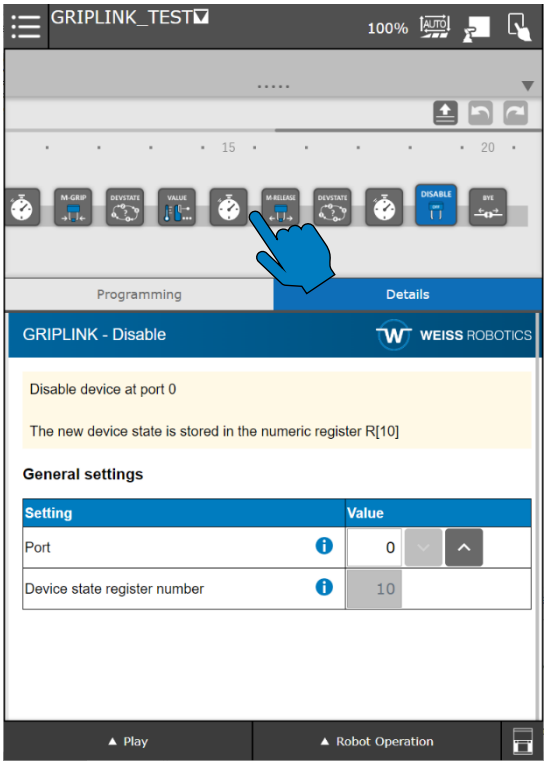


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_ENABLE(<Port>)
```

4.3.6 Disable a Device

Deactivating a device can be done using the “GRIPLINK Disable” instruction.

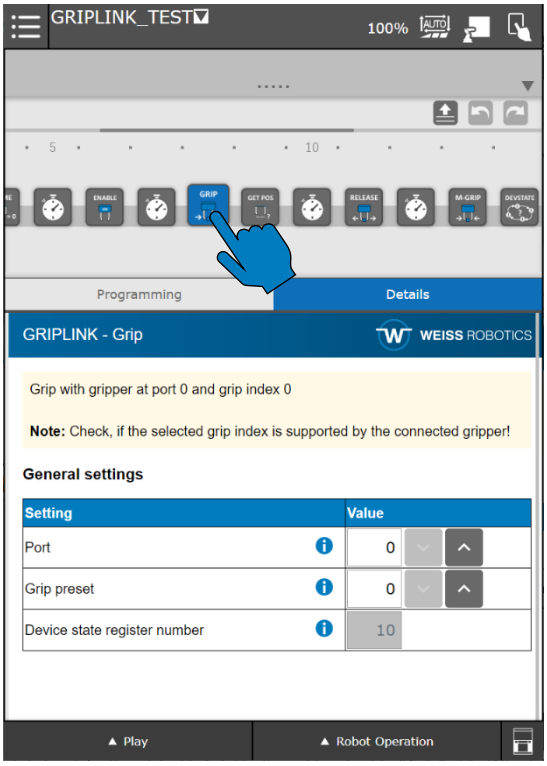


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_DISABLE(<Port>)
```

4.3.7 Grip and Release

The details page of the “GRIPLINK Grip” and “GRIPLINK Release” instructions provide inputs for the desired ports and preset indices.

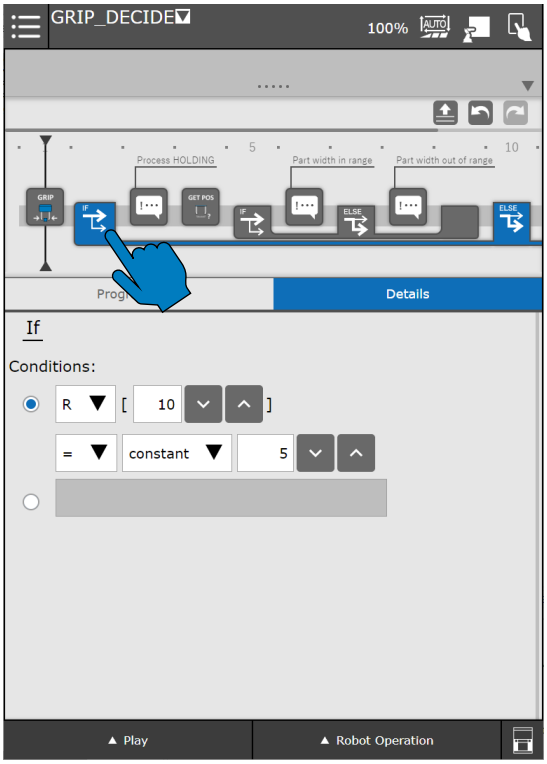


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_GRIP(<Port>,<Preset-Index>)
CALL IPL_WR_GRIPLINK_RELEASE(<Port>,<Preset-Index>)
```

4.3.7.1 Evaluating the Device State

After gripping a workpiece, the device state register can be used to determine, whether the part has been gripped or not.
The program below shows an example, where a gripper on port 0 is used to grip a workpiece and Numeric Register 10 holds the device state. If the register value is 5 (corresponds to “HOLDING”), the position of the fingers is read.



Usage in the text editor

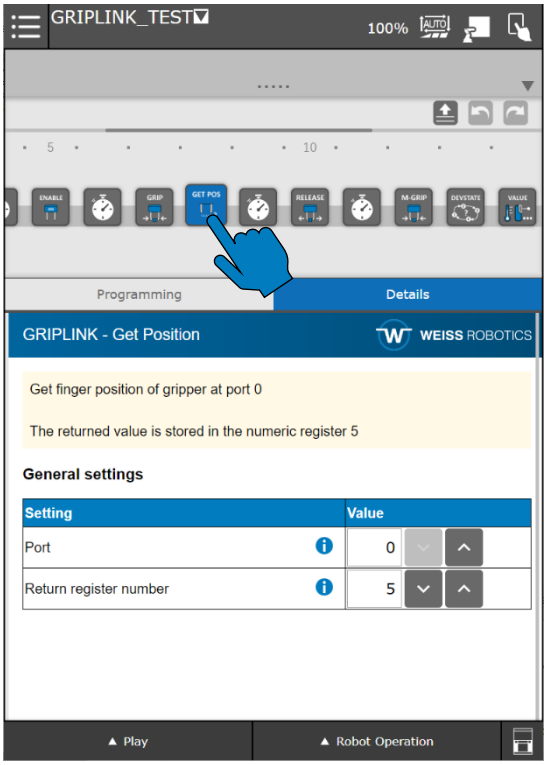
There is no specific function for this feature. Use simple register comparison like this:

```
IF (R[10]=5) THEN
ELSE
ENDIF
```

4.3.7.2 Evaluating the Finger Position

To read the current finger position, use the instruction „GRIPLINK Get Position“. The current position in 1/1000 mm is stored in the Numeric Register with the selected index.

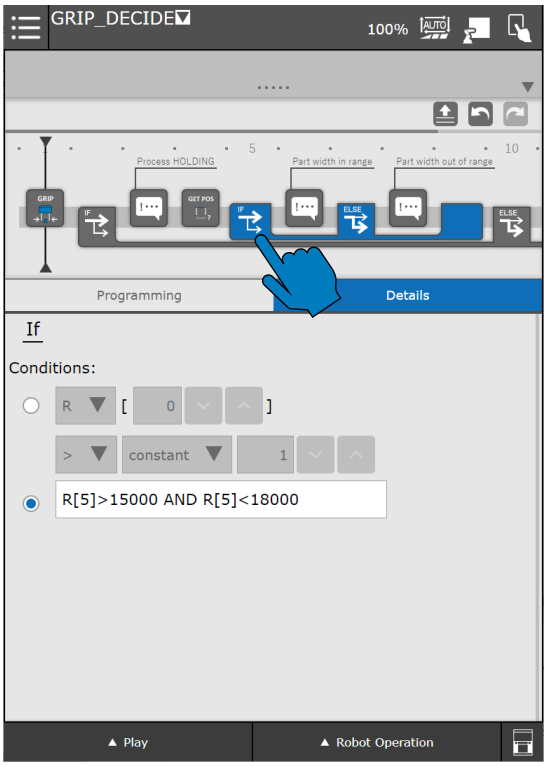
Ensure, that the selected register is only used for evaluating the finger position!



Usage in the text editor

```
CALL IPL_WR_GRIPLINK_GETPOS(<Port>,<Register Index>)
```

The program outline below shows, how the gripping width is fetched using the „GRIPLINK Get Position“ instruction. The value is stored in the Numeric Register with index 5. The IF statement checks the register value. If greater than 12 mm (corresponds to a register value of 12.000), the robot moves to position 1. Else, position 2 is approached.



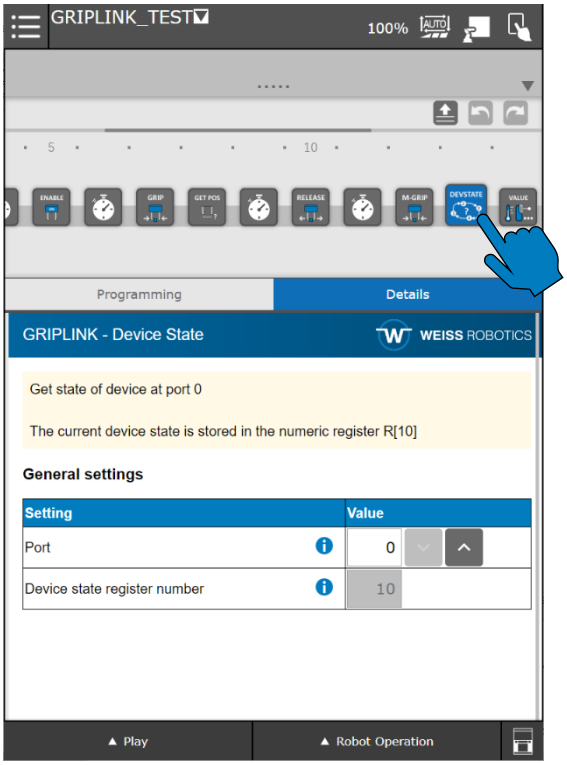
Usage in the text editor

There is no specific function for this feature. Use simple register comparison like this:

```
IF (R[5]>15000 AND R[5]<18000) THEN
ELSE
ENDIF
```

4.3.8 Evaluating the Device State

To get the current device state anywhere in a program, use the “GRIPLINK Get State” instruction. The state value is written to the Numeric Register configured via the plug-in configuration page.

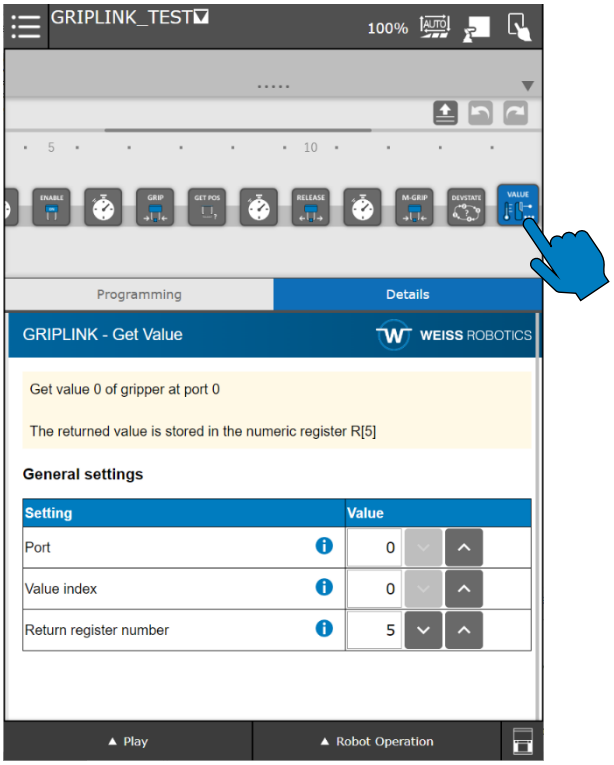


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_DEVSTATE(<Port>,<Register Index>)
```

4.3.9 Evaluating a Device Value

To read a device value, use the “GRIPLINK Get Value“ instruction. The example below shows, how the primary value (index 0) is read from the device on port 0 and stored in Numeric Register 5.

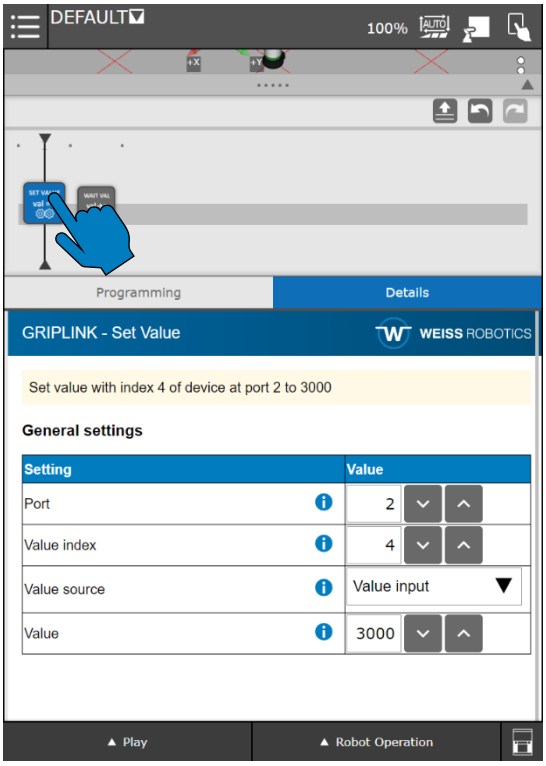


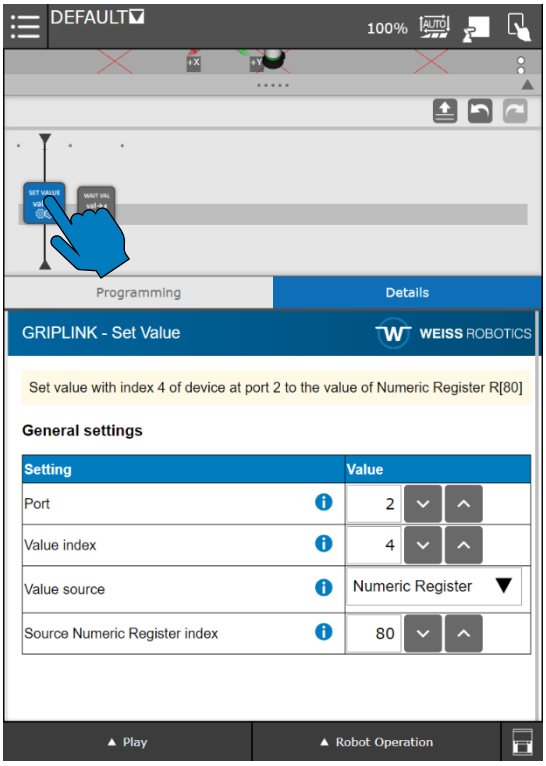
Usage in the text editor

```
CALL IPL_WR_GRIPLINK_VALUE(<Port>,<Value Index>,<Register Index>)
```

4.3.10 Set a Device Value

To read a device value, use the “GRIPLINK Get Value“ instruction. The example below shows, how the primary value (index 0) is read from the device on port 0 and stored in Numeric Register 5.





Usage in the text editor

Write value directly:

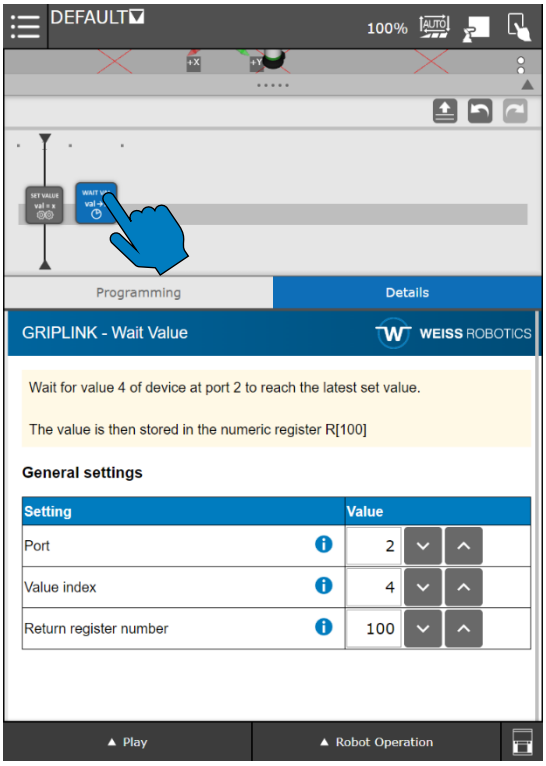
```
CALL IPL_WR_GRIPLINK_SETVALUE(<Port>,<Value Index>,0,<Value>)
```

Write value from Numeric Register:

```
CALL IPL_WR_GRIPLINK_SETVALUE(<Port>,<Value Index>,1,<Register
Index>)
```

4.3.11 Wait for a Device Value

To wait for a specific device value reached its target value, the “GRIPLINK WAIT VALUE” instruction can be used.



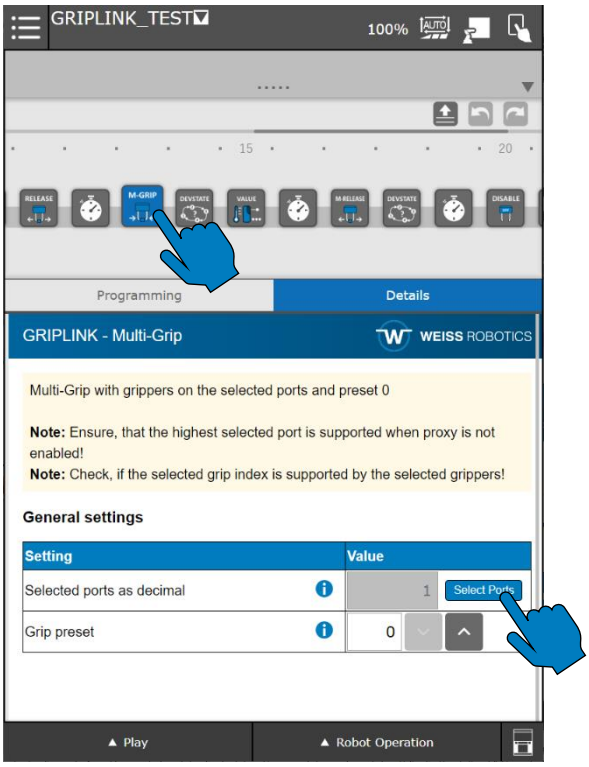
Usage in the text editor

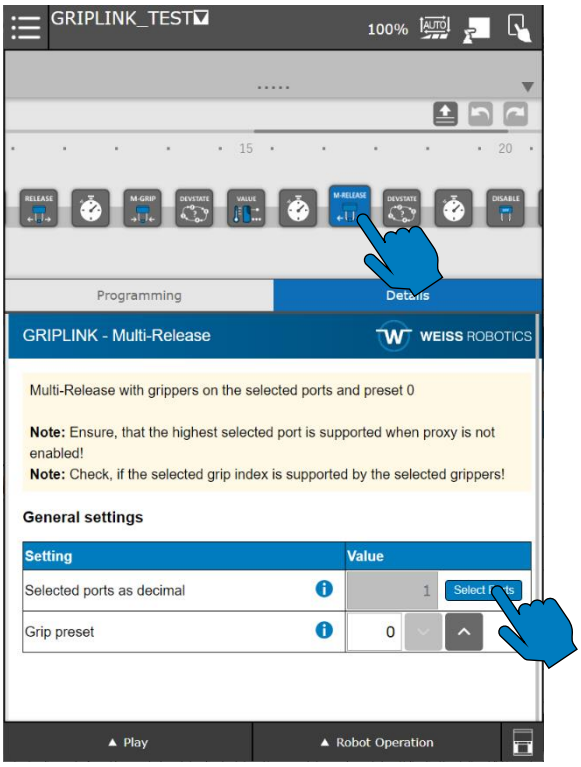
```
CALL IPL_WR_GRIPLINK_WAITVALUE(<Port>,<Value Index>,<Register Index>)
```

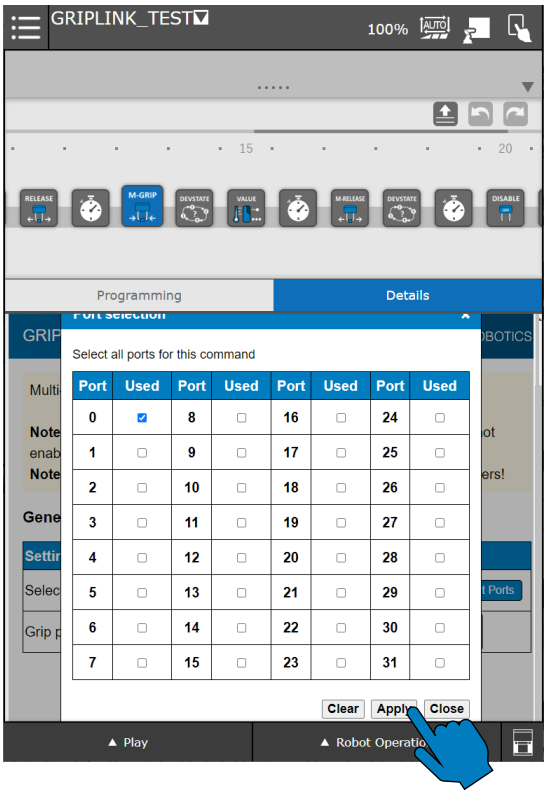
4.3.12 Simultaneous Grip and Release with multiple Grippers

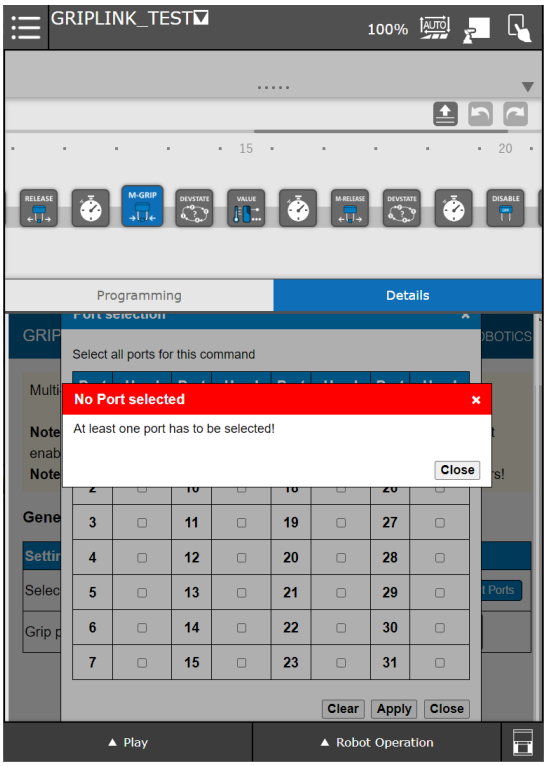
To grip and release with multiple gripper modules simultaneously, “GRIPLINK Multi-Grip” and “GRIPLINK Multi-Release” instructions should be used. Open the input dialog by pressing “Select Ports” to select all grippers for this instruction.

At least one port has to be selected via the input dialog!







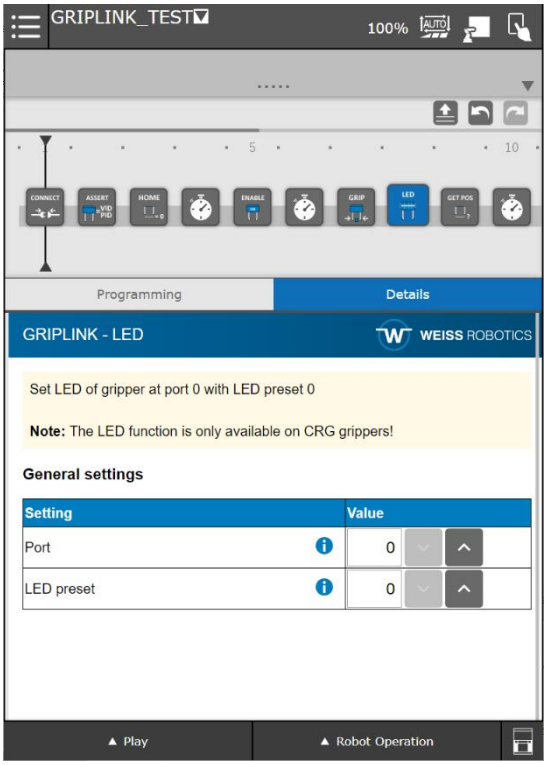


Usage in the text editor

```
CALL IPL_WR_GRIPLINK_MGRIP(<Ports>,<Preset Index>)
CALL IPL_WR_GRIPLINK_MRELEASE(<Ports>,< Preset Index>)
```

4.3.13 Control the Status LED

On the details page, device index and LED preset index for this instruction can be selected.



Usage in the text editor

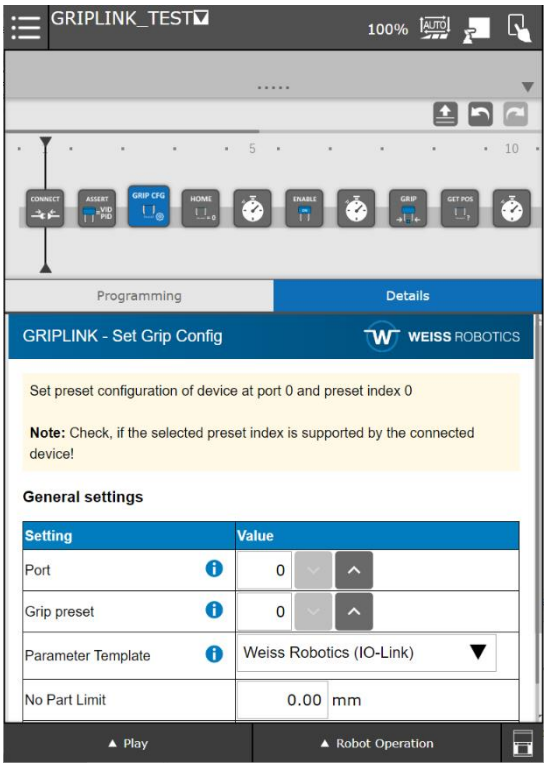
```
CALL IPL_WR_GRIPLINK_LED(<Port>,<Preset Index>)
```

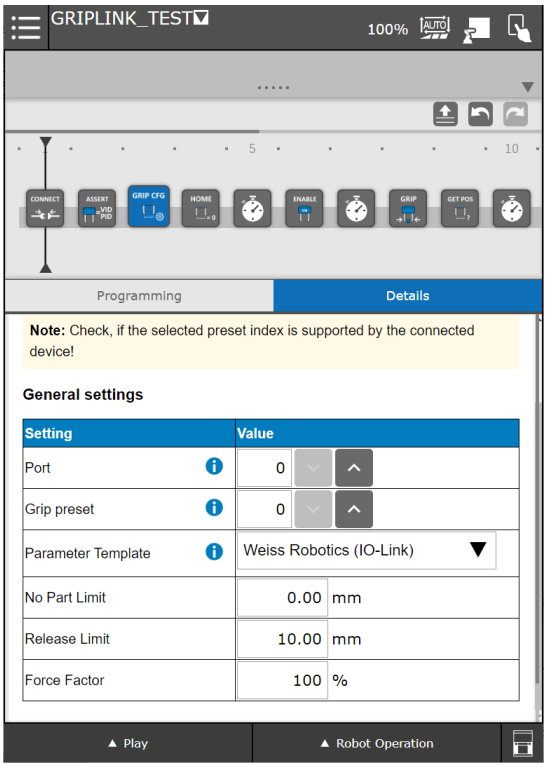
The LED function is only available on CRG gripper modules!

4.3.14 Configure a Grip Preset

The details page of the “GRIPLINK Set Grip Config” instruction allows the selection of the device port, preset index and up to eight preset parameters.
Using the parameter template, meaning and unit of parameters can be displayed. Parameters, that are not relevant for the template, are hidden. Depending on the template, valid value ranges are checked as well.

For gripper modules by Weiss Robotics, choose the „Weiss Robotics“ templates for proper parameter checks.






```
CALL IPL_WR_GRIPLINK_SGRIPCFG(<Port>,<Preset Index>,<Template>,
<Param 1>,<Param 2>,<Param 3>,<Param 4>,<Param 5>,<Param 6>,
<Param 7>,<Param 8>)
```

The “Template” parameter shall have one of the following values:
0: show generic UI template
1: show Weiss Robotics UI template (to be used with Weiss Robotics IO-Link grippers)
2: show Weiss Robotics UI template (to be used with Weiss Robotics WPG grippers)
3: show generic vacuum picker UI template
4: show Integer UI template (dimensionless parameters, values are scaled with 1,000)

Note, that depending on the device there might be less than eight available presets!

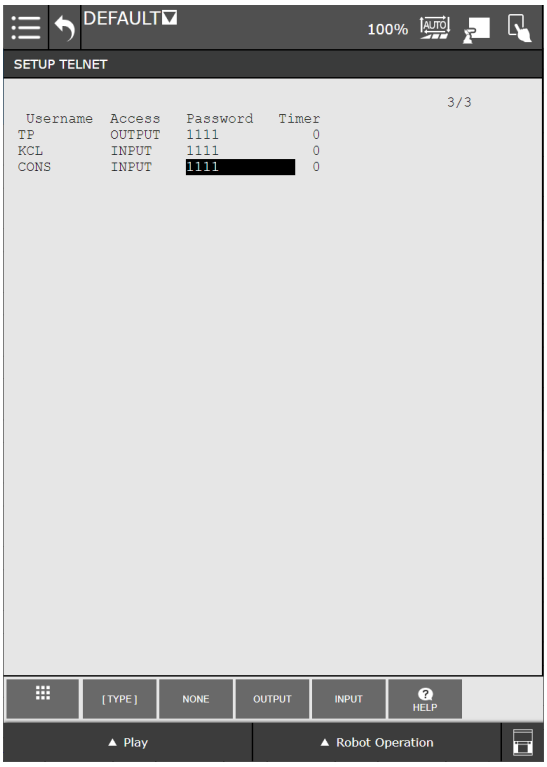
4.4 Troubleshooting

The GRIPLINK plug-in shows error messages. The following section summarizes important messages and solving procedures.

4.4.1 TELNET Console

To analyse errors while running a robot program, activate the TELNET console output. Navigate to the respective setup menu via SETUP – Host Comm – 2 TELNET. Click in the “Password” field in line “CONS” and enter a password (e.g. 1111).

Note for RoboGuide: For controllers with software version R-30iB, entering a password shall be done using the emulated old teach pendant. User the number field and the “ENTER” button to enter and confirm the password.

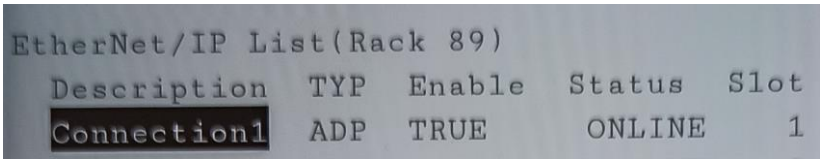


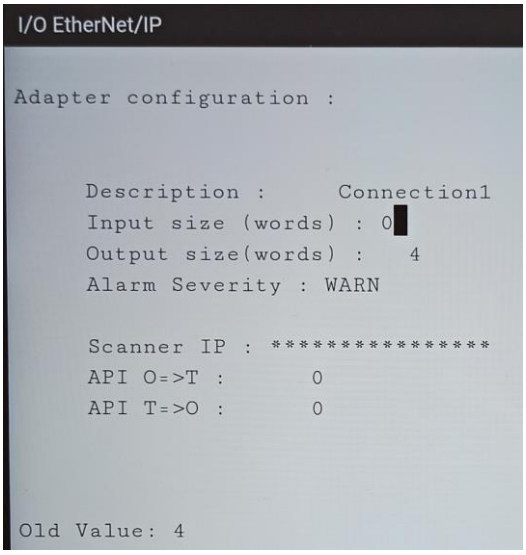
By using a terminal program (such as PuTTY), you can connect to the robot controller via TELNET. This also applies to RoboGuide.

4.4.2 Troubleshooting

4.4.2.1 System error “EtherNet Adapter Error (1)“

Possible cause	Remedy
Per default, an ethernet adapter is activated, that has to be disabled first	• Navigate to the menu “I/O” → “EtherNet/IP” • In the first row (Connection 1), set the ENABLED field from “True” to “False” • Open the configuration page using the “Config” softkey • Set the values for “Input size” and “Output size” to 0 It might be necessary to use the legacy teach pendant with the button on the bottom right screen and to enter the value using the teach pendant’s num pad • Power-cycle the robot controller





4.4.2.2 Message „Could not write <cmd> to file: 12328“

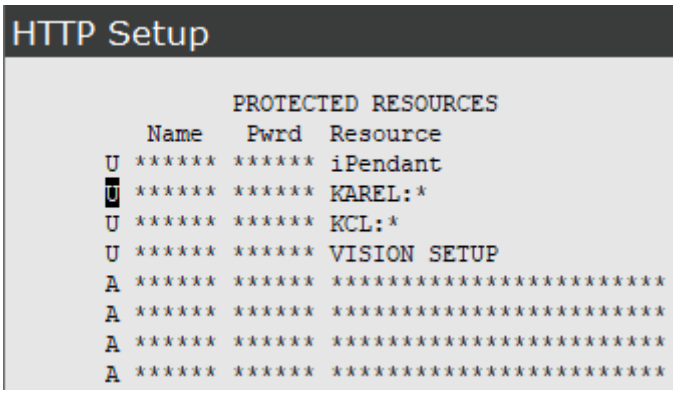
Possible cause	Remedy
GRIPLINK command has been performed without calling GRIPLINK Connect in advance	• Insert program node GRIPLINK Connect (refer to sections 3.1 and 4.3.1)
The program pointer does not point to the program start node	• Move the program pointer to the first instruction

4.4.2.3 Message “GRIPLINK Version not supported“

Possible cause	Remedy
The GRIPLINK controller version is outdated	• Update all GRIPLINK controllers used to the values specified in the system requirements (refer to section 1.3)

4.4.2.4 Message “GL_COMM 190: undefined built-in“

Possible cause	Remedy
The KAREL-option has not been activated	• Check, if the KAREL-option has been activated via the setup menu “Host Comm”. Navigate to the HTTP menu. Ensure, a “U” is written in the first column of the row with the entry “KAREL:*”. If this is not the case, press the short-key “UNLOCK”



4.4.2.5 Message “GRIPLINK could not connect via SM slot Cx:“

Possible cause	Remedy
GRIPLINK is not active	• Check the GRIPLINK controller’s power supply
The socket connection between robot controller and GRIPLINK could not be established	• Enter the settings of the selected client tag (Cx) via the setup menu „Host Comm” (refer to chapter 2.5) • Select the action „UNDEFINE” via the [ACTION] button • Select the action „DEFINE” via the [ACTION] button • Select the action „START” • Terminate all programs using the command „ABORT (ALL)“: Button FCTN → 1 ABORT (ALL) • Restart the current program • If necessary, disconnect the GRIPLINK’s power supply

4.4.2.6 Message “Listen failed:“

Possible cause	Remedy
GRIPLINK is not active	• Check the GRIPLINK controller’s power supply

4.4.2.7 Message “Device x not connected“

Possible cause	Remedy
The selected GRIPLINK port is not connected to a device	• Check the ports and the connected gripping modules • Check the connection wires between the gripping modules and the GRIPLINK

4.4.2.8 Message “Stack Overflow“

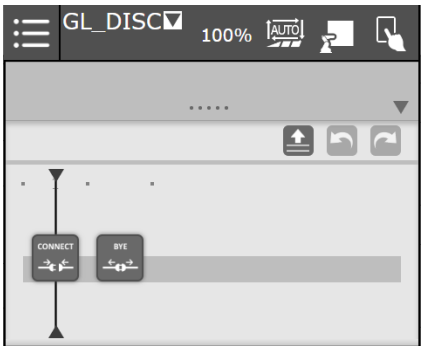
Possible cause	Remedy
The stack size of the current program is not chosen large enough	• Increase the stack size via the robot program settings

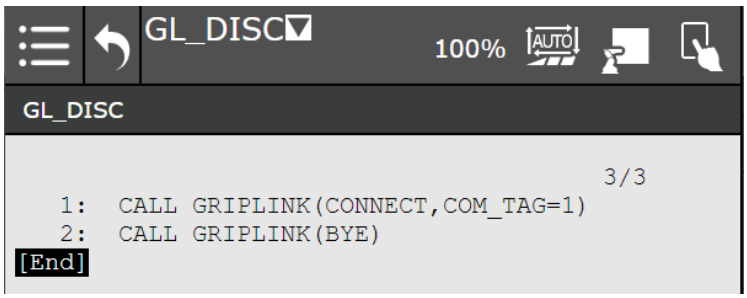
4.4.2.9 Message “GRIPLINK: Failed to listen on socket“

Possible cause	Remedy
The socket connection between robot controller and GRIPLINK has been interrupted	• Check the network connection (network cable) between robot controller and GRIPLINK controller. Also check the power supply and ensure that it fulfils the requirements • Restart the desired robot program. It has to start with a „Connect” node. • This message is also displayed, when a user deliberately closes the connection.

4.4.2.10 Connection between robot controller and GRIPLINK controller cannot be disconnected via web interface

Possible cause	Remedy
The socket connection between robot controller and GRIPLINK is still activated because the robot program was stopped in the middle	• Disconnect the GRIPLINK controller from the power supply for a short time • Create a separate robot program and insert only the CONNECT and BYE instructions. Select the program and execute it. This establishes a connection to the GRIPLINK controller and terminates it again correctly.





Appendix A Device state

Device state	Code	Description
NOT CONNECTED	0	Gripper module not connected
NOT INITIALIZED	1	Gripper module not initialized
IDLE	2	Ready for operation, not active
RELEASED	3	Workpiece released
NO PART	4	No workpiece found
HOLDING	5	Workpiece is held
OPERATING	6	Sensor ready for operation
FAULT	7	Error condition