



**GRIPLINK-PLUG-IN**  
**FOR YASKAWA MOTOMAN**  
Version 2.0.0



# Content

- 1 Introduction ..... 2
- 1.1 Notation and symbols ..... 2
- 1.2 Intended use ..... 2
- 1.3 System requirements ..... 2
- 1.4 License terms ..... 3
  
- 2 Installing the GRIPLINK plug-in ..... 4
- 2.1 User variables ..... 5
- 2.2 Behavior in case of error ..... 5
  
- 3 Command Reference ..... 6
- 3.1 Establish connection - CONNECT ..... 7
- 3.2 Activate device - ENABLE ..... 8
- 3.3 Query device state - GET STATE ..... 9
- 3.4 Deactivate device - DISABLE ..... 10
- 3.5 Reference gripping module - HOME ..... 11
- 3.6 Gripping workpiece - GRIP ..... 12
- 3.7 Simultaneous gripping of workpieces - MGRIP ..... 13
- 3.8 Release workpiece - RELEASE ..... 14
- 3.9 Simultaneous release of workpieces - MRELEASE ..... 15
- 3.10 Control gripping force holding - HOLD ..... 16
- 3.11 Control of the LED display - LED ..... 17
- 3.12 Query of position and sensor values - VALUE ..... 18
  
- Appendix A. Device state ..... 19

# 1 Introduction

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



These instructions describe the functions of the GRIPLINK plug-in. For information on mounting, commissioning and operation of the GRIPLINK controller, refer to the operating instructions of the respective module. These can be found online at [www.griplink.de/manuals](http://www.griplink.de/manuals)

## 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 plant, damage the device or impair the function of the device.



Additional information for a better understanding of the described facts.



Reference to further information.

## 1.2 Intended use

The "GRIPLINK Plug-in" software is intended for communication between the GRIPLINK Controller from WEISS ROBOTICS and a robot controller. The requirements of the applicable directives and the installation and operating instructions in these instructions 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 plug-in is compatible with GRIPLINK from firmware version 2.0.0.

One of the following YASKAWA robot controllers is required for operation:

- DX 100
- DX 200
- YRC 1000

The following robot options are required to run the software:

- MotoPlus software option.



Contact your YASKAWA distributor to obtain robot options.



The IP address of the GRIPLINK controller must be in the same subnet as that of the robot controller. The GRIPLINK controller manual describes the exact procedure for changing the IP address.

#### **1.4 License terms**

The GRIPLINK plug-in is protected by copyright. The respective valid license terms are included in the software package. With the installation you accept these license terms.

## 2 Installing the GRIPLINK plug-in

To operate the GRIPLINK-ET4, the GRIPLINK plug-in is required on the robot controller. To install the GRIPLINK plug-in, follow points 1 to 4.



Make sure that you are using the latest version of the GRIPLINK plug-in. The current version can be downloaded from [www.griplink.de/plug-ins](http://www.griplink.de/plug-ins).

1. 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 teach pendant.
2. Copy the GRIPLINK plug-in (MotoPlus program) "griplink\_xxx.out" from the USB stick to the robot controller, where xxx stands for the controller used:
  - Start the control in maintenance mode by pressing and holding the MENU key on the teach pendant when switching on.
  - Switch to the management mode. To do this, select the "SECURITY" option in the "Main Menu" under "SYSTEM" and select the "MANAGEMENT MODE" with the SELECT key.
  - Enter the password. The default password is 16 times the nine (9999999999999999)
  - Load the GRIPLINK plug-in software package in the Main Menu under "MotoPlus APL." at the option "LOAD (USER APPLICATION)" with the Select button.

NOTE: The GRIPLINK plug-in must not be located in a subfolder.

3. Restart the controller.
4. Copy the GRIPLINK jobs from the USB stick to the robot controller.

## 2.1 User variables

The GRIPLINK plug-in uses a block of eight user variables of type "double" for communication between GRIPLINK plug-in and robot program. The variable block is stored from address 90 by default. The purpose of each variable is listed in the following table.

Address offset	Content
0	Return value (RETVL0) of the called function
1	Return value (RETVL1) of the called function
2	Return value (RETVL2) of the called function
3	Return value (RETVL3) of the called function
4	Diagnostic counter
5	
6	Reserved for communication with the GRIPLINK plug-in software package
7	

The variables 0 to 3 return the return values of the executed command.

With variable 4 a diagnostic counter is realized, which is periodically incremented by the GRIPLINK plug-in and gives information about its state.

Variables 5 to 7 are reserved for internal communication between the library commands and the GRIPLINK plug-in and must not be changed.

### ***Change range of user variables***

Depending on the robot program, it may be necessary to move the memory area used by the GRIPLINK plug-in. To do this, proceed as follows:

1. Select the "JOB" field in the Main Menu and then the "SELECT JOB" field.
2. Now select the job "GRIPLINK\_EXECUTE\_CMD" in the "JOB LIST" and confirm your selection with the SELECT button.
3. Set the start address of the variable block (default value is 90).
4. Restart the robot controller (the GRIPLINK plug-in will apply the changes on restart).

## 2.2 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 applies if the addressed device is in FAULT state or changes to this state due to a command.

### 3 Command Reference

The GRIPLINK plug-in provides the user with a collection of generic motion and gripping functions as well as functions for reading connected sensors. The commands are realized as robot jobs, which receive their parameters as transfer values and communicate with a MotoPlus program in the background via a common register area. The return values of the commands are stored in the user variables (see section 2.1). To execute a command, the corresponding robot job must be called. Some jobs are available as single as well as multiple commands.

***The basic program flow with the GRIPLINK plug-in is always as follows:***

1. Establish connection with GRIPLINK\_CONNECT
2. Activate gripping module or sensor with GRIPLINK\_ENABLE
3. For servo gripping modules without absolute encoder: Reference gripping module with GRIPLINK\_HOME
4. Grasp/release with GRIPLINK\_GRIP or GRIPLINK\_RELEASE
5. Query position or measured value with GRIPLINK\_VALUE

The available commands of the GRIPLINK plug-in are described below.

### 3.1 Establish connection - CONNECT

This command establishes the connection between the GRIPLINK controller and the robot controller. The IP address of the GRIPLINK controller is passed as the transfer parameter. The command waits until the connection is established. If the GRIPLINK controller cannot be reached at the specified address, a user alarm is triggered and program execution is stopped.

If GRIPLINK-ET4 commands are executed before a GRIPLINK\_CONNECT, this will trigger a User Alarm.



The IP address of the GRIPLINK controller can be changed via the GRIPLINK-ET4 website.

#### **Syntax**

```
CALL GRIPLINK_CONNECT(< IPADDR. 0 > , < IPADDR. 1 > , < IPADDR. 2 > , < IPADDR. 3 > , < RES > )
```

#### **Parameter**

< IPADDR. 0 >	First byte of the IP address
< IPADDR. 1 >	Second byte of the IP address
< IPADDR.2 >	Third byte of the IP address
< IPADDR.3 >	Fourth byte of the IP address
< Res >	Reserved, set to 0

#### **Return values**

RETVAL 0 to 3	not used (0)
---------------	--------------

#### **Example**

Establish connection between robot and the GRIPLINK with IP address 192.168.1.40:

```
CALL GRIPLINK_CONNECT(192,168,1,40,0)
```



### 3.2 Activate device - ENABLE

This command activates the device connected to the specified device port.

GRIPLINK\_ENABLE must be executed after GRIPLINK\_CONNECT for all devices.

If GRIPLINK commands are executed before a GRIPLINK\_ENABLE, this will trigger a User Alarm.

#### **Syntax**

```
CALL GRIPLINK_ENABLE(< PORT >)
```

#### **Parameter**

< PORT >                    Index of the device port (0 to 3)

#### **Return values**

RETVAL 0                    actual device state (see Appendix A)  
RETVAL 1 to 3                not used (0)

#### **Example**

Activate drive and gripping module at port 0:

```
CALL GRIPLINK_ENABLE (0)
```

### 3.3 Query device state - GET STATE

This command returns the state of the selected device.

#### **Syntax**

```
CALL GRIPLINK_GET_STATE(< PORT >)
```

#### **Parameter**

< PORT >                    Index of the device port (0 to 3)

#### **Return values**

RETVAL 0                    actual device state (see Appendix A)  
RETVAL 1 to 3                not used (0)

#### **Example**

Wait until the device state of the gripping module at port 2 is "HOLDING" (4):

```
*WAIT  
TIMER T=0.01  
CALL GRIPLINK_GET_STATE(2)  
IF(D090<>4) THEN  
    JUMP *WAIT  
ENDIF
```

### 3.4 Deactivate device - DISABLE

Deactivates the device connected to the selected device port. This command can be used, for example, to change tools. The device can be reactivated via GRIPLINK\_ENABLE.

#### **Syntax**

```
CALL GRIPLINK_DISABLE(< PORT >)
```

#### **Parameter**

< PORT >                    Index of the device port (0 to 3)

#### **Return values**

RETVAL 0                    actual device state (see Appendix A)  
RETVAL 1 to 3                not used (0)

#### **Example**

Change the gripping module at port 1:

```
'Connect to GRIPLINK  
CALL GRIPLINK_CONNECT(192,168,1,40,0)  
'Activate gripper 1  
CALL GRIPLINK_ENABLE(1)  
'DO something  
'...  
'Prepare tool change:  
'Disable gripper 1:  
CALL GRIPLINK_DISABLE(1)  
'Operate the tool changer here  
'Activate new gripper:  
CALL GRIPLINK_ENABLE(1)
```

### 3.5 Reference gripping module - HOME

References the selected servo gripper. The command executes a reference run of the gripping module and waits until this is completed. After the GRIPLINK\_HOME command has been executed, the fingers of the gripping module are powerless and must be moved to a defined position with a GRIPLINK\_GRIP/MGRIP or GRIPLINK\_RELEASE/MRELEASE.



The reference run can be configured via the web interface of the GRIPLINK controller.

#### **Syntax**

```
CALL GRIPLINK_HOME(< PORT >)
```

#### **Parameter**

< PORT >	Index of the device port (0 to 3)
----------	-----------------------------------

#### **Return values**

RETVAL 0	actual device state (see Appendix A)
RETVAL 1 to 3	not used (0)

#### **Example**

Reference the gripping module to port 2:

```
CALL GRIPLINK_HOME (2)
```

### 3.6 Grip a workpiece - GRIP

Grips a workpiece with the selected gripping module and the selected handle. The command waits until the device state changes to either "HOLDING" or "NO PART".



The gripping parameters can be configured via the web interface of the GRIPLINK interface converter.

#### **Syntax**

```
CALL GRIPLINK_GRIP(< PORT >, < PRESET >)
```

#### **Parameter**

< PORT >	Index of the device port (0 to 3)
< PRESET >	Selected handle (range depends on selected gripper model)

#### **Return values**

RETVAL 0	actual device state (see Appendix A)
RETVAL 1 to 3	not used (0)

#### **Examples**

Gripping module at port 0 is to grip with grip 2. If no workpiece was found, the gripper should open again and try again:

```
*LOOP
CALL GRIPLINK_GRIP(0,2)
IF(D090<>5) THEN'No
part, open and try again:
CALL GRIPLINK_RELEASE(0,2) JUMP *LOOP
ENDIF
'Part gripped!
```

### 3.7 Simultaneous gripping of workpieces - MGRIP

This command executes a grip with the selected gripping modules. The command waits until all gripping modules have each reached one of the states "HOLDING" or "NO PART".



The gripping parameters can be configured via the web interface of the GRIPLINK interface converter.

#### **Syntax**

```
CALL GRIPLINK_MGRIP(< PORTS >, < PRESET >)
```

#### **Parameter**

< PORTS >	Selected gripping modules as bit vector: Bit 0: 1 = gripping module selected at port 0, 0 = not selected Bit 1: 1 = gripping module selected at port 1, 0 = not selected Bit 2: 1 = gripping module selected at port 2, 0 = not selected Bit 3: 1 = gripping module selected at port 3, 0 = not selected Bit 31...4: reserved (set to 0)
< PRESET >	Selected grip recipe (range depends on selected gripper model).

#### **Return values**

RETVAL 0	actual device state of gripping module at port 0 (see Appendix A)
RETVAL 1	actual device status of gripping module at port 1 (see Appendix A)
RETVAL 2	actual device status of gripping module at port 2 (see Appendix A)
RETVAL 3	actual device status of gripping module at port 3 (see Appendix A)

#### **Examples**

Gripping modules at port 1 and 2 (0110 binary => 6 decimal) grip workpiece with grip recipe 2:

```
CALL GRIPLINK_MGRIP(6,2)
```

### 3.8 Release workpiece - RELEASE

Releases the workpiece gripped with the selected gripping module. The command waits until the workpiece has been released.



The gripping parameters can be configured via the web interface of the GRIPLINK interface converter.

#### **Syntax**

```
CALL GRIPLINK_RELEASE(< PORT >, < PRESET >)
```

#### **Parameter**

< PORT >	Index of the device port (0 to 3)
< PRESET >	Selected grip recipe (range depends on selected gripper model).

#### **Return values**

RETVAL 0	actual device state (see Appendix A)
RETVAL 1 to 3	not used (0)

#### **Examples**

Release the workpiece gripped with the gripping module at port 0 and grip recipe 2:

```
CALL GRIPLINK_RELEASE(0,2)
```

### 3.9 Simultaneous release of workpieces - MRELEASE

Simultaneously releases the workpiece gripped with the selected gripping modules. The command waits until all gripping modules have each reached the "RELEASED" state.

#### **Syntax**

```
CALL GRIPLINK_MRELEASE(< PORTS >, < PRESET >)
```

#### **Parameter**

< PORTS >	Selected gripping modules as bit vector: Bit 0: 1 = gripping module selected at port 0, 0 = not selected Bit 1: 1 = gripping module selected at port 1, 0 = not selected Bit 2: 1 = gripping module selected at port 2, 0 = not selected Bit 3: 1 = gripping module selected at port 3, 0 = not selected Bit 31...4: reserved (set to 0)
< PRESET >	Selected grip recipe (range depends on selected gripper model).

#### **Return values**

RETVAL 0	actual device state of gripping module at port 0 (see Appendix A)
RETVAL 1	actual device state of the gripping module at port 1 (see Appendix A)
RETVAL 2	actual device state of the gripping module at port 2 (see Appendix A)
RETVAL 3	actual device state of the gripping module at port 3 (see Appendix A)

#### **Examples**

Gripping module at port 1,2 and 3 (1110 binary => 14 decimal) release their workpiece with grip recipe 3:

```
CALL GRIPLINK_MRELEASE (14, 3)
```



### 3.10 Control gripping force holding - HOLD

The innovative gripping force safety device developed by WEISS ROBOTICS maintains the gripping force on the workpiece even if the power supply to the gripping module is unexpectedly interrupted. Thanks to the integrated absolute sensor technology, production can continue immediately when the power supply is restored, even without referencing. Furthermore, HOLD enables permanent gripping without the gripping module becoming hot.

This command activates or deactivates the gripping force safety device for the selected gripping module.



HOLD is not available with all gripping modules.

#### **Syntax**

```
CALL GRIPLINK_HOLD(< PORT >, < HOLD_EN >)
```

#### **Parameter**

< PORT >	Index of the device port (0 to 3)
< HOLD_EN >	Gripping force hold: 1 = on, 0 = off

#### **Return values**

RETVAL 0 to 3	not used (0)
---------------	--------------

#### **Example**

Activates gripping force retention for gripping module at port 2 if the gripping state is "HOLDING":

```
CALL GRIPLINK_GRIP(2,0)
IF(D090=5) THEN
  CALL GRIPLINK_HOLD(2,1)
ENDIF
```

### 3.11 Control of the LED display - LED

This command changes the color and pattern of the light ring of a selected gripping module. This function is only available for gripping modules of the CRG series from WEISS ROBOTICS.



Light patterns can be configured via the web interface of the GRIPLINK controller.

#### **Syntax**

```
CALL GRIPLINK_LED(< PORT >, < PATTERN >)
```

#### **Parameter**

< PORT >	Index of the device port (0 to 3)
< PATTERN >	Index of the predefined light pattern

#### **Return values**

RETVAL 0 to 3	not used (0)
---------------	--------------

#### **Example**

Grasp with the gripping module at port 3 and change the color of the light ring to light pattern 0, if the finger position (Value Index 0) is greater than or equal to 8.1 mm afterwards and to light pattern 1, if smaller:

```
CALL GRIPLINK_GRIP(3,0)
CALL GRIPLINK_VALUE(3,0)
IF(D090>=8100) THEN
    CALL GRIPLINK_LED(3,0)
ELSE
    CALL GRIPLINK_LED(3,1)
ENDIF
```

### 3.12 Query of position and sensor values - VALUE

Reads a measured value from the connected device. Depending on the device, one or more measured values are available, which can be selected via the index to be specified.



For gripping modules and similar actuators, index 0 always corresponds to the finger position/gripping distance in micrometers.

#### **Syntax**

```
CALL GRIPLINK_VALUE(< PORT >, < INDEX >)
```

#### **Parameter**

< PORT > Index of the device port (0 to 3)

< INDEX > Index of the measured value to be queried

#### **Return values**

RETVAL 0 returns the measured value

#### **Example 1**

Query the distance to the workpiece (measured value index 0) of the laser distance sensor connected to port 1 and grip with the gripper at port 3 if the distance is smaller than 42 mm. Otherwise, call the "SKIP" sub program:

```
CALL GRIPLINK_VALUE(1,0)
IF(D090<42000) THEN
    CALL GRIPLINK_GRIP(3,0)
ELSE
    CALL SKIP
ENDIF
```

#### **Example 2**

Execute the subroutine "PROG" if the finger position of the gripping module at port 2 is greater than 10.5 mm:

```
CALL GRIPLINK_VALUE(2,0)
IF(D090>10500) THEN
    CALL PROG
ENDIF
```

## Appendix A. Device state

Device status	Code	Description
NOT CONNECTED	0	No device connected
NOT INITIALIZED	1	Not initialized
DISABLED	2	Ready for operation, but not activated
RELEASED	3	Workpiece released
NO PART	4	No workpiece found
HOLDING	5	Workpiece is held
OPERATING	6	Ready for operation
FAULT	7	Error condition

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