WEISS ROBOTICS

GRIPLINK PLUG-IN FOR EPSON

Version 1.0.0

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1 Introduction

With the GRIPLINK technology, servo-electric and smart pneumatic gripping modules from WEISS ROBOTICS can be controlled by robot controllers of all leading robot brands via simple TCP/IP network connections.
The GRIPLINK plug-in for EPSON is the software link between the GRIPLINK-ET4 interface converter and the robot controller and enables the easy integration of WEISS ROBOTICS' GRIPLINK technology into EPSON robot systems.

This manual describes the functions of the GRIPLINK plug-in. For information about installation and operation of the GRIPLINK-ET4 interface converter please refer to the GRIPLINK-ET4 user's manual. The manual can be found online on **www.griplink.de/manuals**

1.1 Notation and symbols

For a better understanding, the following symbols are used in this manual:

⚠	Functional or safety relevant information. Non-compliance may endanger the safety of personnel and the system, damage the device or impair its function.
❗	Additional information for a better understanding of the described facts.
☞	Reference to further information.

1.2 Intended use

The software "GRIPLINK plug-in" is intended for communication between the GRIPLINK-ET4 interface converter from WEISS ROBOTICS and a robot controller. The requirements of the applicable guidelines as well as the installation and operation instructions in this manual must be noted and adhered to. Any other use or use beyond that is considered improper use. The manufacturer is not liable for any damage resulting from this.

1.3 System requirements

In order to run the GRIPLINK plug-in, the following EPSON products are required:

- EPSON Robot Controller RC700-A or RC90-B
- EPSON RC+ 7.0 programming environment, version 7.4.5 or higher

Please contact EPSON or your EPSON distributor in order to purchase these products.

1.4 License terms

The GRIPLINK plug-in is protected by copyright. The software package includes the applicable license terms. By installing and using the GRIPLINK plug-in, the user accepts these license terms.

2 Installation

2.1 Software installation

To operate the GRIPLINK-ET4, the GRIPLINK plug-in provided by WEISS ROBOTICS is required on the robot controller. To install the GRIPLINK plug-in, please execute the following steps:

Please make sure the most recent version of the GRIPLINK plug-in is used. It can be downloaded from **www.griplink.de/software**.

1. Unzip the previously downloaded ZIP archive with the GRIPLINK plug-in into a directory of your choice
2. Create a new project in the EPSON RC+ programming environment or open an existing project to add the GRIPLINK plug-in.
3. Import the extracted files into your EPSON RC+ project using the menu item "File" -> "Import". Please note that the package contains several files with the extensions *.prg and *.inc. Both file types must be imported separately.
4. The necessary functions for using the GRIPLINK-ET4 in your project are now available.

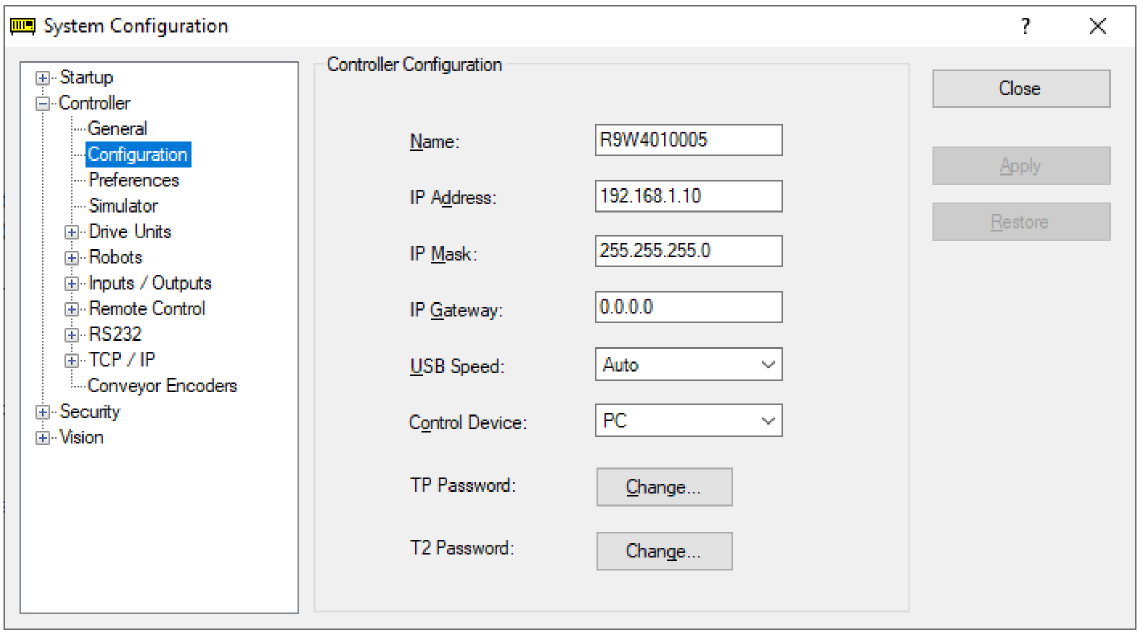
2.2 Network configuration

The connection between the GRIPLINK-ET4 and the robot controller is established via TCP/IP networking. To use TCP/IP networking, the robot controller must be assigned an IP address in the system settings. Please note that the IP address of the robot controller must be in the same subnet as the IP address of the GRIPLINK-ET4.
The IP address of the GRIPLINK is set to 192.168.1.40 by default and can be adjusted via its web interface. To do this, connect the GRIPLINK-ET4 to a PC or laptop and open the web interface in your favorite browser by entering ***http://192.168.1.40*** into the address bar. You can access the IP settings by pressing the "Config" button.
The GRIPLINK command interface accepts incoming connections on port 10001 (TCP).

For more information about the configuration of the GRIPLINK-ET4, please refer to the associated user’s manual.

The IP address of the robot controller can be set in the EPSON RC+ programming environment via the menu item "Settings" → "System Settings" in "Controller" → "Configuration" (cf. Figure 1).

The IP addresses of both the robot controller and the GRIPLINK-ET4 interface converter must be located within the same subnet range. Please contact your network administrator if you experience any problems assigning appropriate IP addresses to the devices.



Name: R9W4010005
IP Address: 192.168.1.10
IP Mask: 255.255.255.0
IP Gateway: 0.0.0.0
USB Speed: Auto
Control Device: PC
TP Password: Change...
T2 Password: Change...

Figure 1: Setting the IP address for the robot controller

2.3 Workpiece detection and monitoring

Gripping modules from WEISS ROBOTICS have integrated workpiece detection and monitoring, which makes it possible to permanently monitor the entire gripping process without additional sensors, thus significantly increasing the reliability of the handling process.
The GRIPLINK plug-in permanently communicates with the gripping module in the background and continuously queries its status. This way, the robot program can react immediately to workpieces that are not available or have been lost.

2.3.1 Workpiece detection

The workpiece detection makes it possible to immediately recognize whether a workpiece has been gripped correctly or not. If the gripping fingers are blocked within the specified position window and the desired gripping force has been reached, the gripping module changes to HOLDING state. Otherwise the gripping module changes to NO PART state. The gripping state after gripping the workpiece is given by the function *Griplink_Grip()* (cf. chapter 3.9) as return value. In addition, the gripping state can be queried at any time using the function *Griplink_GetState()* (cf. chapter 3.3).

☞ A detailed description of the gripping states can be found in the operating instructions for the respective gripping module.

2.3.2 Workpiece monitoring

After a workpiece has been gripped correctly, i. e. the HOLDING state has been reached, the integrated workpiece monitoring starts automatically on the gripping module. If the workpiece now gets lost or removed before the *Griplink_Release()* command (see chapter 3.11) is executed to release the workpiece intentionally, the status of the gripping module changes to PART LOST.
The behavior of the robot program in case of a lost workpiece can be specified when the gripping module is activated using the *Griplink_Enable()* command (see chapter 3.2). If the workpiece monitoring is activated here, the robot program will be interrupted throwing an error. If, on the other hand, the workpiece monitoring is not activated, the GRIPLINK plug-in will silently ignore the lost workpiece and the robot program will continue without an error message.

3 Command set reference

The GRIPLINK plug-in provides a number of gripping functions. Both single and multi-gripper commands are available.

Multi-gripper commands

With the multi-gripper commands, several gripping modules can be addressed at once. These commands are particularly suitable for handling large or flexible workpieces with multiple gripping modules simultaneously.

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

1. Establish connection with CONNECT
2. Activate gripping module and connection monitoring with ENABLE
3. For servo gripping modules without absolute encoder: Reference gripping module with HOME / MHOME
4. Gripping / releasing with GRIP / MGRIP or RELEASE / MRELEASE

The following chapters describe the available commands provided by the plug-in in detail.

Function	Description
Griplink_Connect()	Open connection
Griplink_Enable()	Enable gripping module
Griplink_Disable()	Disable gripping module
Griplink DisableAll()	Disable all connected gripping modules
Griplink_GetState()	Query gripping state
Griplink_Home()	Reference gripping module
Griplink_MulitHome	Reference multiple gripping modules
Griplink_Grip()	Grip workpiece
Griplink_MultiGrip()	Grip workpiece with multiple grippers
Griplink_Release()	Release workpiece
Griplink_MultiRelease()	Release workpiece with multiple grippers
Griplink_GetPos()	Get finger position
Griplink_Permagrip()	Control gripping force retention PERMAGRIP®
Griplink_MultiPermagrip()	Control gripping force retention for multiple grippers
Griplink_LED()	Control LED display

3.1 Open connection - CONNECT

This command establishes the connection between the GRIPLINK-ET4 interface converter and the robot controller. To open a network connection, one of 16 available so-called Ports (range 201 to 216) on the robot controller must be selected. In order to be able to permanently monitor the connection and the status of the connected gripping modules, a separate task will be started on the robot controller that runs in background and continuously checks the gripping state. The identification number of this task can be selected freely within the allowed range. In addition, a Timer and a SyncLock object provided by the robot controller will be used. The IDs of these objects can also be selected freely within the allowed range.

Please note that the selected Port as well as the Task ID, Timer ID and SyncLock ID must be available exclusively for the GRIPLINK plug-in and must not be used anywhere else in the robot program.

The IP address of the GRIPLINK-ET4 can be changed via the web interface.

Signature

```
Function Griplink_Connect(strIPAddr$ As String, intControllerPortNo As
Integer, intTaskId As Integer, intTimerId As Integer, intSyncLockId As
Integer)
```

Parameters

strIPAddr$	IP adress of the GRIPLINK interface converter as string
intControllerPortNumber	Port number to be used for the TCP/IP connection. Range between 201 und 216.
intTaskId	Task ID to be used for the background task (daemon). Must be between 1 and 31. Usually Task ID 1 is used by the main program, so at least Task ID 2 or higher must be used.
intTimerId	Timer ID of the timer to be used. Range between 0 and 63.
intSyncLockId	Lock ID of the SyncLock object to be used. Range between 0 and 63.

Return value

-

Example

Open a connection to the GRIPLINK with IP address 192.168.0.40 by using Port 201, Task ID 2, Timer 0 and SyncLock ID 0:

```
Griplink_Connect(“192.168.0.40”, 201, 2, 0, 0)
```

3.2 Enable drive - ENABLE

This command activates the gripping module and the connection monitoring. If the connection to the gripping module gets lost (e.g. due to a cable break), an error will be raised and the robot program will be stopped. In addition, all ongoing robot motions will be stopped. After enabling, the connection monitoring can be disabled with the command *Griplink_Disable()* (cf. chapter 3.4), e. g. to perform a tool change.

Workpiece monitoring

The workpiece monitoring can be switched on or off by setting the function's *boolEnableGripMonitoring* argument. If the workpiece monitoring is active and the gripping module loses a previously picked workpiece, an error will be raised and the robot program will be stopped. If this behavior is not desired, the workpiece monitoring must be disabled.
Griplink_Enable() must be executed after *Griplink_Connect()* for all connected gripping modules. If GRIPLINK commands are executed before *Griplink_Enable()* is executed, an error will be raised and the robot program will be stopped.

Signature

```
Function Griplink_Enable(ubGripperID As UByte, boolEnableGripMonitoring
As Boolean) As Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)
boolEnableGripMonitoring	Workpiece monitoring: *True* = on, *False* = off

Return value

Current gripping state (cf. 4)

Example

Enable drive and workpiece monitoring for the gripping module connected at GRIPLINK port 0:

```
Integer intGripState
intGripState = Griplink_Enable(0, True)
```

3.3 Get Grip State – GET STATE

This function returns the gripping state of the selected gripping module. The gripping state is provided as an integer value. To simplify and improve readability, the file *Griplink.inc* defines constants that can be used for processing gripping states.

Signature

```
Function Griplink_GetState(ubGripperID As UByte) As Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)

Return value

Current gripping state (cf. 4)

Example

Wait until the gripping state of the gripping module at port 2 changes to HOLDING (4):

```
#include "Griplink.inc"
'Query gripping state of gripping module at port 2
Integer intGripState
'The constant GS_HOLDING is defined in Griplink.inc
Do While intGripState <> GS_HOLDING
   intGripState = Griplink_GetState(2)
Loop
```

3.4 Read gripping state from global variable

The GRIPLINK plug-in provides four global status variables which, if a gripping module is connected and activated via *Griplink_Enable()*, permanently provide the gripping status of the respective gripping module as an integer value:

1. *Griplink_intGripperState0* - Gripping state of the gripping module at port 0
2. *Griplink_intGripperState1* - Gripping state of the gripping module at port 1
3. *Griplink_intGripperState2* - Gripping state of the gripping module at port 2
4. *Griplink_intGripperState3* - Gripping state of the gripping module at port 3

These global variables can be used for example to interrupt ongoing robot motions in case of a lost workpiece or faulty gripping module. Especially if the integrated workpiece monitoring (cf. chapter 2.3) is *not* used, customer-specific behavior in the event of workpiece loss can be implemented using the commands *Sense* and *Till* (see SPEL + reference manual of the EPSON robot system).

Example

The following program interrupts the motion performed using *Jump P4* if the global variable *Griplink_intGripperState0*, which permanently contains the gripping status of the gripping module at port 0, reaches a value other than *GS_HOLDING*. The *JS* command can then be used to determine whether the motion has been completed or interrupted. If the motion was interrupted, error 8101 will be raised.

```
Sense Griplink_intGripperState0 <> GS_HOLDING
Jump P4 Sense
If JS = True Then
  Error 8101
EndIf
```

For more information on the *Jump* and *Sense* commands, please refer to the documentation of the EPSON robot system.

3.5 Disable drive - DISABLE

This function can be used, for example, when using an automatic tool changer. It deactivates the drive of the selected gripping module. If the drive is deactivated, the connection monitoring is also switched off and an interruption of the connection between the GRIPLINK and the gripping module no longer leads to an error. The connection monitoring can be reactivated via *Griplink_Enable()*.

Signature

```
Function Griplink_Disable(ubGripperID As UByte) As Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)

Return value

Current gripping state (cf. Table 1)

Example

Change gripping module at port 1:

```
'Open connection between robot controller and GRIPLINK
Griplink_Connect("192.168.1.40", 201, 2, 0, 0)
'Enable drive and workpiece monitoring for gripping module at port 1
Griplink_Enable(1, True)
'Execute program (e. g. pick & place)
'…
'Disable gripping module at port 1
Griplink_Disable(1)
'Now the gripping module can be removed without raising an error.
'Enable new gripping module
Griplink_Enable(1, True)
'Continue with program
```

Gripping State	Constant	Code	Description
NOT CONNECTED	GS_NOT_CONNECTED	0	Gripper not connected
NOT INITIALIZED	GS_NOT_INITIALIZED	1	Gripper not initialized
IDLE	GS_IDLE	2	Gripper idle, ready for operation
RELEASED	GS_RELEASED	3	Workpiece released
NO PART	GS_NO_PART	4	Workpiece not found
HOLDING	GS_HOLDING	5	Holding workpiece
PART LOST	GS_PART_LOST	6	Workpiece lost
FAULT	GS_FAULT	7	Error

Table 1: Grip States

3.6 Disable drives of all modules connected – DISABLE ALL

This function disables the drives of all connected gripping modules. It can be used for example in case of an emergency stop to switch off all gripping modules. If the drive is deactivated, the connection monitoring is also switched off and an interruption of the connection between the GRIPLINK and the gripping module does not lead to an error. The connection monitoring can be reactivated via *Griplink_Enable()* (see section 3.2).

Signature

```
Function Griplink_DisableAll As Boolean
```

Parameters

-

Return value

True on successful execution
False on error

Example

Disable drives of all gripping modules during an emergency stop:

```
'Function to be executed on emergency stop
Function EmergencyStop
    Print "Emergency stop, disabling all grippers"
    Griplink_DisableAll()
Fend
'Exectute function EmergencyStop on emergency stop
Trap Emergency Xqt EmergencyStop
```

3.7 Reference gripper - HOME

References the selected servo gripper. The command executes a reference run of the gripping module and waits until it’s completed. After the command has been executed, the fingers of the gripping module are without force and must be moved to a defined position by using *Griplink_Grip()* / *Griplink_MultiGrip()* or *Griplink_Release()* / *Griplink_MultiRelease()*.

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

Signature

```
Function Griplink_Home(ubGripperID As UByte) As Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)

Return value

Current gripping state (cf. 4)

Example

Reference gripping module at port 3:

```
#include “Griplink.inc”
Integer intGripState
'Reference gripping module at port 3
intGripState = Griplink_Home(3)
If intGripState = GS_IDLE Then
    'Gripping module is referenced
Else
    'Gripping module is not referenced
EndIf
```

3.8 Reference multiple grippers – MHOME

References the selected gripping modules. The function executes a reference run for all selected gripping modules and waits until it's completed. After the command has been executed, the fingers of the gripping modules are without force and must be moved to a defined position by using *Griplink_Grip()* / *Griplink_MultiGrip()* or *Griplink_Release()* / *Griplink_MultiRelease()*.

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

Signature

```
Function Griplink_MultiHome(boolGripper0 As Boolean, boolGripper1 As
Boolean, boolGripper2 As Boolean, boolGripper3 As Boolean)
```

Parameters

boolGripper0	*True*	Gripping module at port 0 is selected and will be referenced
	False	Gripping module at port 0 is not selected
boolGripper1	*True*	Gripping module at port 1 is selected and will be referenced
	False	Gripping module at port 1 is not selected
boolGripper2	*True*	Gripping module at port 2 is selected and will be referenced
	False	Gripping module at port 2 is not selected
boolGripper3	*True*	Gripping module at port 3 is selected and will be referenced
	False	Gripping module at port 3 is not selected

Return value

-

Example

Reference the gripping modules at ports 0 und 2:

```
'Reference the gripping modules at ports 0 and 2
Griplink_MultiHome(True, False, True, False)
```

3.9 Grip part - GRIP

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

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

Signature

```
Function Griplink_Grip(ubGripperID As UByte, ubGripIndex As UByte) As
Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)
ubGripIndex	Grip to be executed (range depends on gripper type)

Return value

Current gripping state (cf. Table 1)

Example

Gripping module at port 0 shall execute grip preset 2. If no part is found, display a message:

```
#include Griplink.inc
Integer intGripState
intGripState = Griplink_Grip(0, 2)
'The constants GS_NO_PART and GS_HOLDING are defined in Griplink.inc
If intGripState = GS_NO_PART Then
    Print "No part found"
ElseIf intGripState <> GS_HOLDING Then
    Print "Unexpected grip state"
EndIf
```

3.10 Grip part with multiple grippers – MGRIP

This function executes a grip command with the selected gripping modules. The function waits until all gripping modules have reached either "HOLDING" or "NO PART" state.

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

Signature

```
Function Griplink_MultiGrip(boolGripper0 As Boolean, boolGripper1 As
Boolean, boolGripper2 As Boolean, boolGripper3 As Boolean, ubGripIndex
As UByte)
```

Parameters

boolGripper0	*True*	Gripping module at port 0 is selected, workpiece will be gripped
	False	Gripping module at port 0 is not selected
boolGripper1	*True*	Gripping module at port 1 is selected, workpiece will be gripped
	False	Gripping module at port 1 is not selected
boolGripper2	*True*	Gripping module at port 2 is selected, workpiece will be gripped
	False	Gripping module at port 2 is not selected
boolGripper3	*True*	Gripping module at port 3 is selected, workpiece will be gripped
	False	Gripping module at port 3 is not selected
ubGripIndex	Selected grip preset (range depends on gripper type)	

Return value

-

Example

Gripping modules at port 1 and 2 shall grip a workpiece. Display a message if both workpieces were gripped correctly:

```
#include Griplink.inc
Griplink_MultiGrip(False, True, True, False, 2)
'The constants GS_NO_PART and GS_HOLDING are defined in Griplink.inc
If Griplink_GetState(1) = GS_HOLDING And Griplink_GetState(2) =
GS_HOLDING Then
    Print "Holding parts"
EndIf
```

3.11 Release part - RELEASE

Releases the workpiece previously 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.

Signature

```
Function Griplink_Release(ubGripperID As UByte, ubGripIndex As UByte) As
Integer
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)
ubGripIndex	Selected grip preset (range depends on gripper type)

Return value

Current gripping state (cf. Table 1)

Example

Gripping module at port 0 shall release a workpiece previously gripped with grip preset 2:

```
#include Griplink.inc
Integer intGripState
intGripState = Griplink_Release(0, 2)
'The constant GS_RELEASED is defined in Griplink.inc
If intGripState = GS_RELEASED Then
   Print “Part released”
EndIf
```

3.12 Release part with multiple grippers – MRELEASE

Releases the workpiece(s) gripped with the selected gripping modules. The function waits until all gripping modules have reached the RELEASED state.

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

Signature

```
Function Griplink_MultiRelease(boolGripper0 As Boolean, boolGripper1 As
Boolean, boolGripper2 As Boolean, boolGripper3 As Boolean, ubGripIndex
As UByte)
```

Parameters

boolGripper0	*True*	Gripping module at port 0 is selected, workpiece will be released
	False	Gripping module at port 0 is not selected
boolGripper1	*True*	Gripping module at port 1 is selected, workpiece will be released
	False	Gripping module at port 1 is not selected
boolGripper2	*True*	Gripping module at port 2 is selected, workpiece will be released
	False	Gripping module at port 2 is not selected
boolGripper3	*True*	Gripping module at port 3 is selected, workpiece will be released
	False	Gripping module at port 3 is not selected
ubGripIndex	Selected grip preset (range depends on gripper type)	

Return value

-

Example

Gripping module at ports 1, 2 and 3 release a workpiece previously gripped with grip preset 3:

```
#include Griplink.inc
Griplink_MultiRelease(True, True, True, False, 3)
```

3.13 Get finger position – GET POSITION

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

Signature

```
Function Griplink_GetPos(ubGripperID As UByte) As Real
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)

Return value

Finger position in mm

Example

Read the current finger position of the gripper at port 0:

```
Real rlPos
rlPos = Griplink_GetPos(0)
```

3.14 Control gripping force retention - PERMAGRIP

The innovative gripping force retention developed by WEISS ROBOTICS keeps up the gripping force on the workpiece, even if the power supply to the gripping module is interrupted unexpectedly. Thanks to the integrated absolute position sensors, production can be continued without a reference run after the power supply has been restored. PERMAGRIP also enables permanent gripping without the gripping module overheating.
This command activates or deactivates the PERMAGRIP gripping force retention for the selected gripping module.

PERMAGRIP is not available on all gripping modules.

Signature

```
Function Griplink_Permagrip(ubGripperID As UByte, boolEnable As Boolean)
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)
boolEnable	Enable (*True*) oder disable (*False*) PERMAGRIP

Return value

-

Example

Grip workpiece with grip preset 0 on the gripper connected at port 2. Activate PERMAGRIP if a workpiece has been detected:

```
#include Griplink.inc
Integer intGripState
'Grip workpiece
intGripState = Griplink_Grip(2, 0)
'The constant GS_HOLDING is defined in Griplink.inc
If intGripState = GS_HOLDING Then
   'Activate PERMAGRIP
   Griplink_Permagrip(2, True)
EndIf
```

3.15 Control gripping force retention for multiple grippers – MPERMAGRIP

The innovative gripping force retention developed by WEISS ROBOTICS keeps up the gripping force on the workpiece, even if the power supply to the gripping module is interrupted unexpectedly. Thanks to the integrated absolute position sensors, production can be continued without a reference run after the power supply has been restored. PERMAGRIP also enables permanent gripping without the gripping module overheating.
This command enables or disables PERMAGRIP on multiple selected gripping modules.

PERMAGRIP is not available on all gripping modules.

Signature

```
Function Griplink_MultiPermagrip(boolGripper0 As Boolean, boolGripper1
As Boolean, boolGripper2 As Boolean, boolGripper3 As Boolean, boolEnable
As Boolean)
```

Parameters

boolGripper0	*True*	Gripping module at port 0 is selected
	False	Gripping module at port 0 is not selected
boolGripper1	*True*	Gripping module at port 1 is selected
	False	Gripping module at port 1 is not selected
boolGripper2	*True*	Gripping module at port 2 is selected
	False	Gripping module at port 2 is not selected
boolGripper3	*True*	Gripping module at port 3 is selected
	False	Gripping module at port 3 is not selected
boolEnable	PERMAGRIP aktivieren (*True*) oder deaktivieren (*False*)	

Return value

-

Example

Disable PERMAGRIP for the gripping module at ports 0 and 1:

```
#include Griplink.inc
'Disable PERMAGRIP
Griplink_MultiPermagrip(True, True, False, False, False)
```

3.16 Control of the LED display –LED

This command changes the color and the pattern of the illuminated ring of a selected CRG gripping module.

Light patterns and colors can be configured via the web interface of the GRIPLINK interface converter.

This function is only available for CRG gripping modules.

Signature

```
Function Griplink_LED(ubGripperID As UByte, ubLEDIndex As UByte)
```

Parameters

ubGripperID	Index of the gripping module (0 to 3)
ubLEDIndex	Index of the pre-configured light pattern (range 0 to 7)

Return value

-

Example

Use the gripping module at port 3 and change the color of the light ring according to the finger position. Display light pattern 0 if the finger position is greater than or equal to 8.1 mm, otherwise display light pattern 1:

```
#include “Griplink.inc”
Integer intGripState
Real rlPos
intGripState = Griplink_Grip(3, 0)
If intGripState = GS_HOLDING Then
    rlPos = Griplink_GetPos(3)
    If rlPos > 8.1 Then
        'Set light pattern 0
        Griplink_LED(0)
    Else
        'Set light pattern 1
        Griplink_LED(1)
    EndIf
Else
    Print “Failed to grip part”
EndIf
```

4 Error Handling

If a problem occurs within the GRIPLINK plug-in, an error will be raised on the robot controller. If this error won't be caught by the user, the robot program will stop. A running robot motion will be completed before the robot stops.

It is the responsibility of the user to handle these errors and to bring the system into a safe state after an error occured. The EPSON programming environment provides appropriate commands to catch errors, for example *OnErr* (see documentation of the EPSON robot controller).

In order to differentiate between different types of errors, the GRIPLINK plug-in uses several different error numbers from the robot controller's range of user-defined error numbers. Table 1 shows the predefined error numbers and their meaning. In order to avoid conflicts with existing robot programs, these error numbers can be adjusted in the *GriplinkConfig.inc* file.

Error	Error Number	Description
GRIPLINK_DAEMON_ERROR	8100	Communication with background program (daemon) failed
GRIPLINK_CONNECTION_ERROR	8101	Connection error between GRIPLINK interface converter and gripping module
GRIPLINK_COMMAND_ERROR	8102	Failed to execute command
GRIPLINK_PART_LOST_ERROR	8103	Part lost – workpiece lost while holding
GRIPLINK_DEVICE_ERROR	8104	Device error on connected gripping module (e.g. overtemperature)

Table 2: Error numbers defined by the GRIPLINK plug-in

4.1 Handle errors in GRIPLINK functions

Errors that might be raised while executing the GRIPLINK functions described in chapter 3 can be caught using the usual error handling of SPEL+. The following code snippet gives an example:

```
#include Griplink.inc
Integer intGripState
OnErr GoTo errorHandler
intGripState = Griplink_Grip(0, 2)
'The constants GS_NO_PART and GS_HOLDING are defined in Griplink.inc
If intGripState = GS_NO_PART Then
    Print "No part found"
ElseIf intGripState <> GS_HOLDING Then
    Print "Unexpected grip state"
EndIf
```

```
errorHandler:
   MsgBox "Failed to execute grip command"
```

For more information on error handling in SPEL +, please refer to the documentation of your EPSON robot controller.

4.2 Handle errors in GRIPLINK background daemon

For continuous status monitoring of the connected gripping modules, the GRIPLINK plug-in starts a background program (daemon) which continuously queries and monitors the status of the connected gripping modules in a separate task independently of the rest of the robot program. If an error occurs within this background program, a predefined function is called in which the error can be handled by the user.
This function is defined in the *GriplinkConfig.inc* file:

```
'
' Daemon error handler function
'
#define GRIPLINK_DAEMON_ERROR_HANDLER Griplink_DefaultDaemonErrorHandler
```

By default, GRIPLINK_DAEMON_ERROR_HANDLER refers to the predefined plug-in function *Griplink_DefaultDaemonErrorHandler()*. This reference can be changed at any time by replacing *Griplink_DefaultDaemonErrorHandler()* with a user-defined function. It is important to make sure that the replacing function takes the same arguments as the original function, i. e. one variable of type *Integer* (representing the error number) and one of type *UByte* (representing the gripper ID). The following example shows such a function, which outputs a message depending on the type of error triggered:

```
'
' Custom daemon error handler
'
Function MyErrorHandler(intErrNo As Integer, ubGripperID As UByte)
   Select intErrNo
      Case GRIPLINK_CONNECTION_ERROR
        MsgBox "Connection at port " + Str$(ubGripperID) + " lost"
      Case GRIPLINK_PART_LOST_ERROR
        MsgBox "Part lost at port " + Str$(ubGripperID)
      Case GRIPLINK_DEVICE_ERROR
        MsgBox "Gripper fault detected at port " +  Str$(ubGripperID)
   Send
Fend
```