WEISS ROBOTICS

GRIPLINK CONTROLLER

USER'S MANUAL

April 2021

Contents

1 Preface

This user's manual is part of the GRIPLINK Controller and describes the safe and proper use in all phases of operation. It is only valid for this model and contains important information on installation, commissioning, maintenance and service.

1.1 Product description

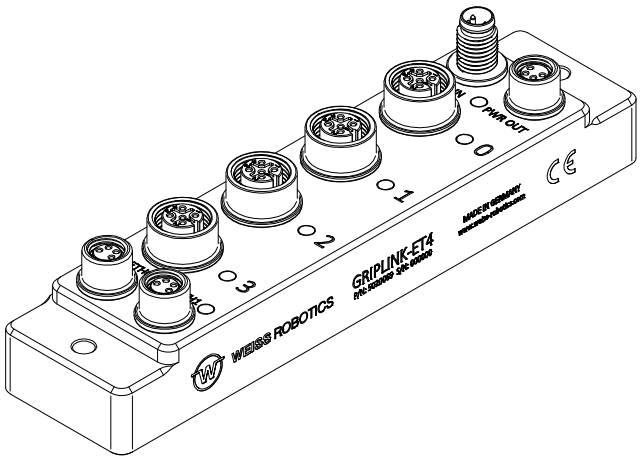
The GRIPLINK Controller is a network-enabled interface converter for the use in smart handling solutions. It simplifies the integration of IO-Link based sensors and actuators into robot systems. For this purpose, the GRIPLINK Controller has a driver-based architecture that makes it possible for the first time to implement a universal, cross-device command protocol on automation components from different manufacturers and thus to provide a uniform interface on the robot controller.
A list of the supported sensors and actuators can be found here:

www.griplink.de/devices

WEISS ROBOTICS offers extensively tested plug-ins for GRIPLINK on various robot platforms. For a list of supported robot platforms, see

www.griplink.de/plugins

Various sensors and actuators can be connected to GRIPLINK via up to four device ports. Communication with the higher-level controller takes place via Ethernet TCP/IP using an open text-based communication protocol. The connected automation components can be conveniently parameterized and monitored via the integrated web interface of the GRIPLINK Controller. A power output and an integrated Ethernet switch allow several GRIPLINK Controllers to be cascaded easily to set up larger gripper heads. Figure 1 shows the connections of the GRIPLINK Controller.



Overall view of the GRIPLINK Controller

1.2 Further documents

The following additional documents for the operation of the GRIPLINK Controller are available for download on the Internet at **www.griplink.de**:

- Technical drawing
- 3D model (STEP)
- GRIPLINK Controller Command Set Reference Manual
- GRIPLINK Plugins for various robot controllers (incl. documentation)
- List of compatible IO-Link devices
- Sample programs

Information on warranty can be found in our general terms and conditions, available at **www.weiss-robotics.com/agb**.

1.3 Target groups

The target groups of this user manual are, on the one hand, system manufacturers and operators who must keep this and other accompanying documents accessible to staff at all times and who should also encourage them to read and observe the safety and warning notices in particular. In addition, it is aimed at qualified personnel, programmers and fitters who must read these instructions and, in particular, observe and follow the safety and warning instructions at all times.

1.4 Notation and symbols

The following symbols are used in these instructions for a better overview:

Function or safety-related information. Failure to observe can endanger the safety of personnel and the system, damage the device or impair the function of the device.

Additional information for a better understanding of the facts described.

Reference to further information.

2 Basic safety information

2.1 Intended use

The GRIPLINK Controller was designed as a link between IO-Link capable automation components and a higher-level controller via Ethernet TCP/IP and is intended for installation in a machine. The requirements of the applicable guidelines as well as the assembly and operating instructions in this manual must be observed and complied with. The GRIPLINK Controller must only be used within the given specification and only in industrial applications.
Any other or additional use is considered improper, e.g., the operation of devices that are not on the compatibility list or that have not been approved by WEISS ROBOTICS for operation with the GRIPLINK Controller. The manufacturer is not liable for any resulting damage.

2.2 Environmental and usage conditions

The GRIPLINK Controller must only be used within its defined application parameters. Ensure that the supply voltage is stable and that it can carry sufficient current. The controller's housing must be grounded. To achieve the specified protection class, the unused connectors must be sealed with cover caps.

2.3 Product safety

The GRIPLINK Controller corresponds to the state of the art and the recognized safety rules at the time of delivery. However, dangers can arise if, for example:

- the module is not used as intended
- the EC machine guidelines, the VDE guidelines, the safety and accident prevention regulations applicable at the place of use or the safety and assembly instructions are not observed

2.3.1 Structural changes, additions or modifications

Additional bores, threads or attachments that are not offered as accessories by WEISS ROBOTICS must only be attached after written approval by WEISS ROBOTICS.

2.3.2 Special standards

- The following standards are observed:
- Radio interference voltage, interference field strength and radiation according to EN 61000-6-3
- Fast transients on signal and data lines according to EN 61000-4-4

- HF current feed on signal and data lines according to EN 61000-4-6
- HF radiation according to EN 61000-4-3
- Emitted interference according to EN 61000-6-4 class A
- Discharge of static electricity according to EN 61000-4-2
- IO-Link communication standard according to IEC 61131-9

2.4 Personal qualifications

The assembly, commissioning, maintenance and repair of the GRIPLINK Controller must only be carried out by trained specialist personnel.
Every person who is assigned to work by the operator must have read and understood the entire operating manual, in particular Chapter 2 "Basic safety instructions". This also applies to temporarily deployed personnel, such as maintenance personnel.

2.5 Safety conscious working

Observe the safety and accident prevention regulations applicable at the place of use.

Disconnect the power supply to the GRIPLINK Controller before starting any work.

3 Warranty

The warranty is 12 months from the delivery date from the factory if used as intended in one-shift operation. Please also note the general terms and conditions (GTC).

4 Scope of delivery and accessories

The scope of delivery includes:

- GRIPLINK Controller in the version ordered
- Accessory pack (protective caps for M8 and M12 sockets)
- Quick start guide

GRIPLINK size	ET4
GRIPLINK Controller	5020069
Accessory pack	5020070
Quick start guide	5080035

Table 1: Part numbers of the package content

The following accessories are available separately:

- Ethernet data cable
- Connection cables for power supply
- Connection cables for sensors and actuators

Please order accessories separately. Further accessories can be found on our website at **www.griplink.de**

5 System requirements

A PC or a mobile device with a current web browser is required to use the configuration interface of GRIPLINK. The following browsers are compatible with GRIPLINK:

- Google Chrome version 89.0 or newer
- Mozilla Firefox Version 88.0 or newer
- Microsoft Edge version 90.0 or newer
- iOS 12.4 or newer

- Android 7 (Nougat) or newer

It is recommended that you always use an up-to-date browser.

6 Technical specifications

6.1 Mechanical characteristics

Mechanical characteristics	Unit	GRIPLINK-ET4
Operating temperature	°C	-5 ... 60
Humidity	%	0 ... 90 (non-condensing)
Protective class (using the provided protective caps)	IP	65
Dimensions (L x W x H)	mm	145 x 34 x 32.5
Mass	g	220
Outer materials		Aluminum, Epoxy resin
Surface		Chem. Nickel
Sealing materials (connector)		NBR, FKM 75

Table 2: Mechanical characteristics

6.2 Electrical characteristics

If the specified nominal data is exceeded, the GRIPLINK Controller and / or the connected devices can be damaged. If in doubt, check your application with our technical sales department.

Electrical characteristics	Einheit	GRIPLINK-ET4
Supply voltage	V	18 ... 30
Typ. Power consumption (communication over Ethernet, all device ports open)	mA	70
Power supply via connector (X2)		
Max. output current	A	6
Device ports (X3 to X6)		
Max. continuous output current at L+	A	2
Max. continuous output current at C/Q	A	0.2
Communication standard		IO-Link V1.1
Supported bit rates	kBit/s	4.8 (COM1), 38.4 (COM2), 230.4 (COM3)
Typ. startup time GRIPLINK Controller ready[1]	s	0.2
Typ. Startup time device connected to ready[2]	s	0.3

Table 3: Electrical characteristics

6.2.1 Pin assignment

The GRIPLINK Controller has four device ports for connecting automation components, an input and an output for the power supply as well as two Ethernet connections. The connectors are shown in Figure 2.

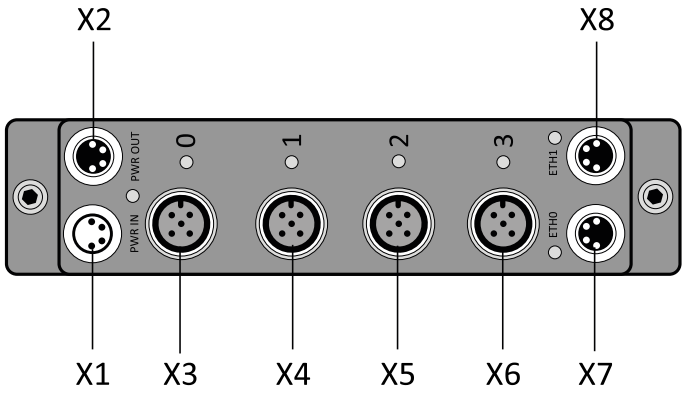
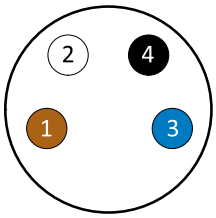


Figure 2: Connectors

[1] Time from supply voltage >= 18V to operational readiness of the GRIPLINK controller

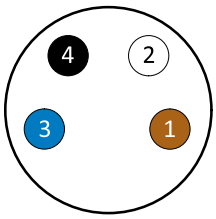
[2] Time from connecting a WEISS ROBOTICS IEG 55-020 gripping module to an unoccupied device port until the gripping module is ready for operation

X1 (power supply input), M8 male connector



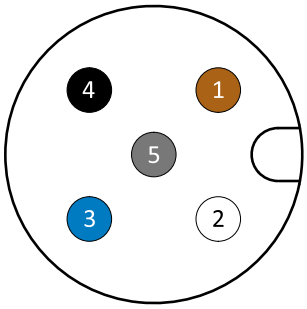
Pin	Wire color	Signal	Function
1	Brown	+UB	Power supply +24 V
2	White	+UB	Power supply +24 V
3	Blue	GND	Power supply 0 V
4	Black	GND	Power supply 0 V

X2 (power supply output), M8 female connector



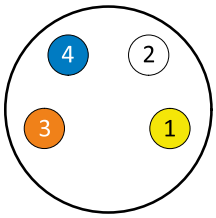
Pin	Wire color	Signal	Function
1	Brown	+UB	Power supply +24 V
2	White	+UB	Power supply +24 V
3	Blue	GND	Power supply 0 V
4	Black	GND	Power supply 0 V

X3 to X6 (device port 0 to 3), M12 female connector



Pin	Wire color	Signal	Function
1	Brown	L+	Power supply +24 V
2	White	RES0	Reserved
3	Blue	L-	Power supply 0 V
4	Black	C/Q	IO-Link communication
5	Grey	RES1	Reserved

X7, X8 (Ethernet 0 and 1), M8 female connector



Pin	Wire color	Signal	Function
1	Yellow	TD+	Ethernet wire pair transmit
2	White	RD+	Ethernet wire pair receive
3	Orange	RD-	Ethernet wire pair receive
4	Blue	TD-	Ethernet wire pair transmit

6.3 Nameplate

The nameplate (Figure 3) is located on the side of the GRIPLINK Controller and contains the serial number (C), part number (B) and the exact type designation (A).

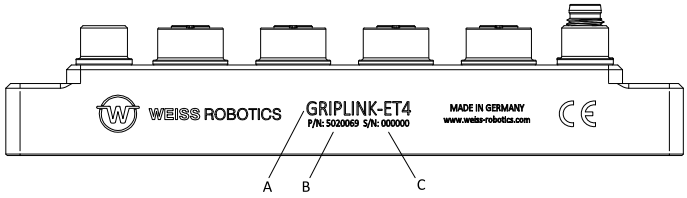


Figure 3: Nameplate

6.4 Display of the operating state

The operating state is displayed via several, partly multicolored, light-emitting diodes, see Figure 4.

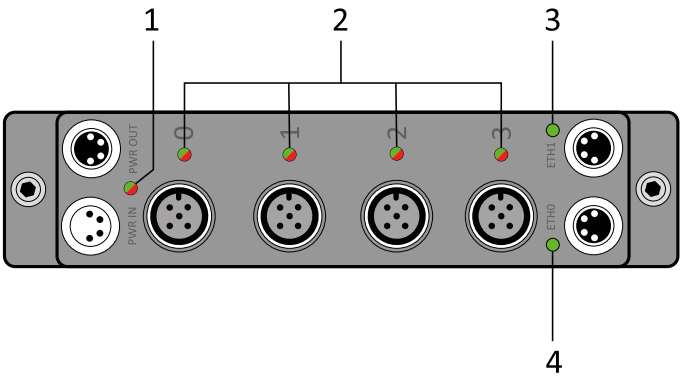


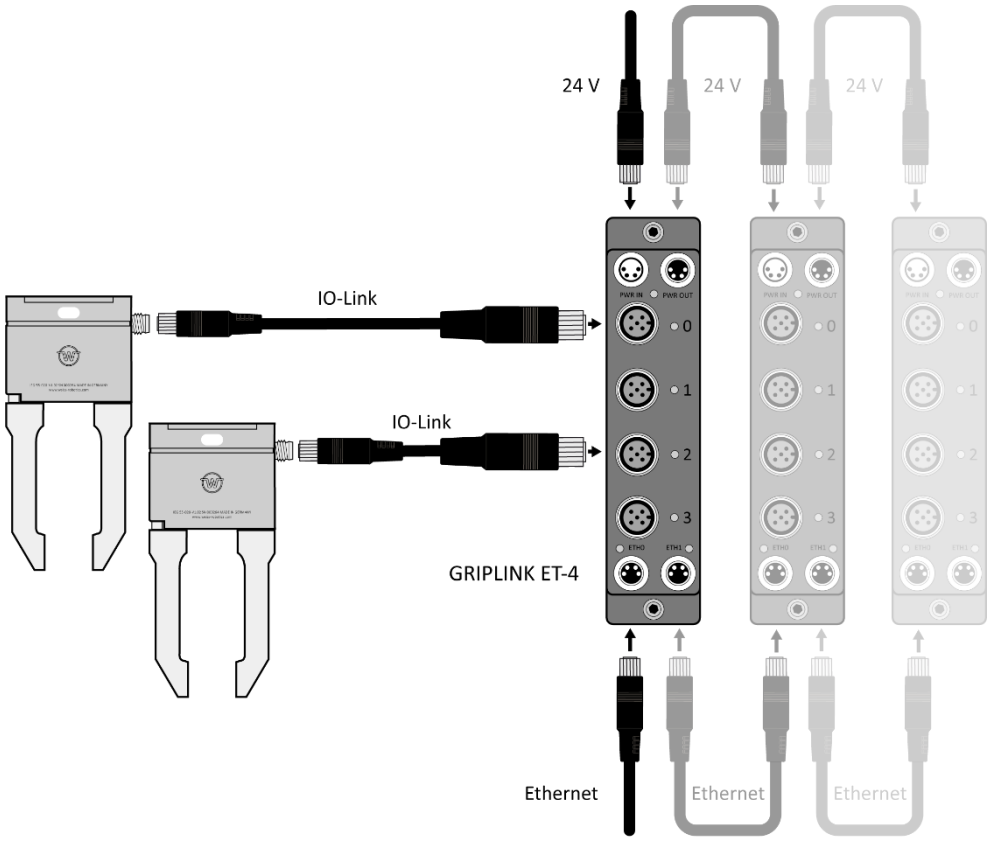
Figure 4: Display of the operating state

LED	Display	Meaning
Module state (1)	Continuous green	GRIPINK Controller is in operating state
	Single orange flash	GRIPLINK Controller has received an erroneous command
	Continuous red	GRIPLINK Controller error
Device port (2)	Green blinking	Connected device is going to be initialized
	Continuous green	Connected device is ready
	Continuous red	No driver found for the connected device
	Red blinking	Device driver error
	Red fast blinking	Port hardware error (over-temperature, over-current)
Ethernet (3, 4)	Continuous green	Network connected
	Green blinking	Network activity

If the LEDs (1) and (2) flash alternately red-green, the GRIPLINK Controller is in firmware update mode (see Chapter 8).

7 Installation and setup

Connect the GRIPLINK Controller to the robot controller using the Ethernet cable. Connect up to four supported IO-Link devices. Now connect the GRIPLINK Controller to the power supply.



Make sure that the housing of the GRIPLINK Controller is grounded (installation on a conductive surface or a separate grounding cable with a cable lug under one of the two mounting screws).

Make sure that the power supply can permanently provide the required maximum operating current of all IO-Link devices in total.

7.1 Cascading of several GRIPLINK Controllers

Several GRIPLINK Controllers can be cascaded via the power supply output X2 and the Ethernet connection X8.

Possible damage to the controller. Make sure that the current consumption at X2 is not exceeded.

The current consumption of a GRIPLINK Controller is determined from its quiescent current consumption and the current consumption of the connected IO-Link devices. If the value exceeds the current carrying capacity of X2, connect the GRIPLINK Controller to a separate power supply.

7.2 Setup and configuration

For easy setup and configuration, the GRIPLINK Controller has an integrated web-based configuration interface that enables configuration via a common web browser. To do this, connect the GRIPLINK Controller to a local network or directly to the network interface of your computer and open the web interface by typing the IP address of the GRIPLINK Controller into the address bar of your web browser. By default, the IP address is set to 192.168.1.40 so that the web interface can be accessed at **http://192.168.1.40**.

In order to be able to access the web interface, your computer must be in the same subnet as the GRIPLINK Controller. For this, the network settings of your computer may have to be adjusted. Please contact your system administrator.

The web app is not compatible with Microsoft Internet Explorer. For best performance, use an actual version of Google Chrome or Mozilla Firefox.

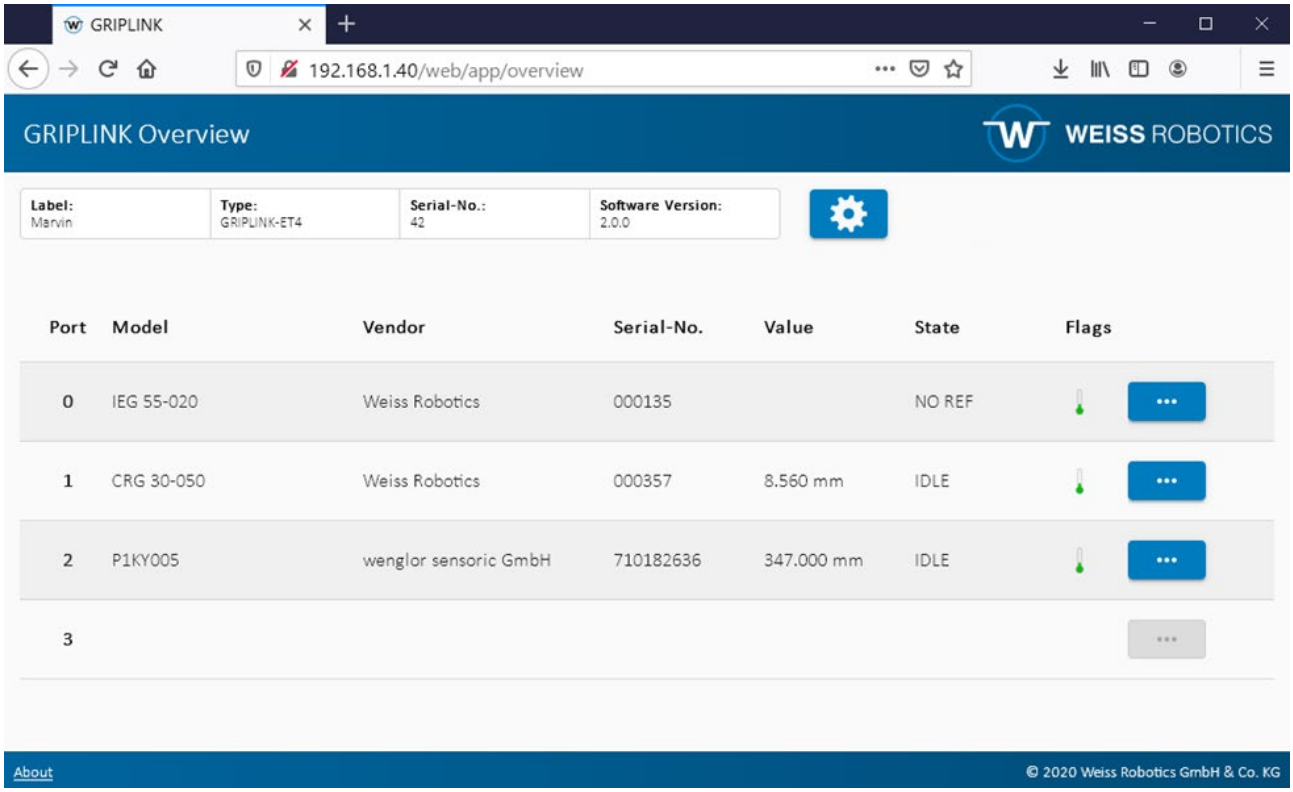


Figure 5: GRIPLINK Controller web interface

For operation with a robot controller, it may be necessary to change the IP address of the GRIPLINK Controller. The button on the start page of the web interface takes you to the configuration page of the GRIPLINK Controller, where the relevant settings can be made.

Incorrect settings can mean that the GRIPLINK Controller and its configuration interface can no longer be reached.

7.2.1 Configuration of the GRIPLINK Controller

Open the web interface of the GRIPLINK Controller and press the button on the overview page. The following settings can be changed on the configuration page that now appears:

- Configuration of the network interface
- Name of the GRIPLINK Controller
- Adding licenses

7.2.2 Configuration of connected devices

Connected gripping modules can also be parameterized and monitored via the web interface of the GRIPLINK Controller. To do this, first select the desired gripping module on the overview page using the button and then configure general settings, gripping parameters and visualization settings conveniently via your web browser.

The configuration of connected devices is currently only possible for gripper modules.

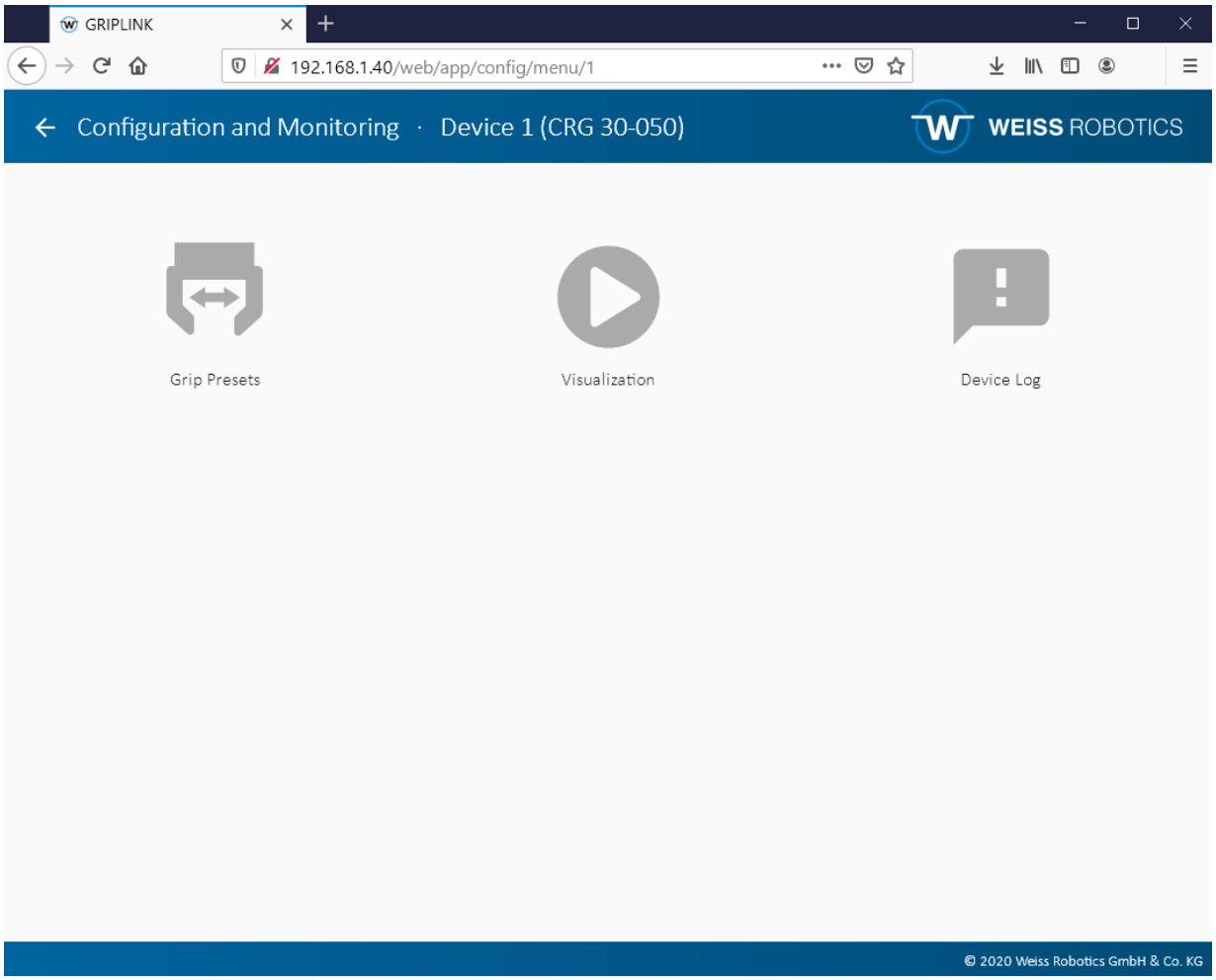


Figure 6: Device configuration menu

7.3 Connecting with a robot controller

Ready-to-use GRIPLINK PLUGINs for selected robot controllers

WEISS ROBOTICS provides ready-made and tested software modules for robot controllers from leading manufacturers, with which the GRIPLINK technology can be quickly and conveniently integrated into your own robot applications.

A continuously growing list of supported manufacturers and control models can be found at **www.griplink.de/plugins**

For more information on operating the GRIPLINK Controller with the respective software modules, please refer to the documentation for the respective GRIPLINK PLUGIN, which can also be downloaded from the above address.

Operation without GRIPLINK PLUGIN

In addition to the ready-to-use GRIPLINK PLUGIN integration solutions, the GRIPLINK Controller can generally be used with any robot controller that is able to send and receive text-based data via TCP/IP network connections (socket connections) thanks to its open protocol specification. For self-integration purposes, the command protocol of GRIPLINK is described in the separate document "GRIPLINK Controller Command Set Reference Manual".

7.4 Control concept

The GRIPLINK controller makes the functions of the connected devices available via a generic command set. A text-based communication protocol via Ethernet TCP / IP is used for this. The generic commands are converted into device-specific commands using a Command Unifier on the GRIPLINK controller. These Unifiers are part of the scope of delivery and are already preinstalled.

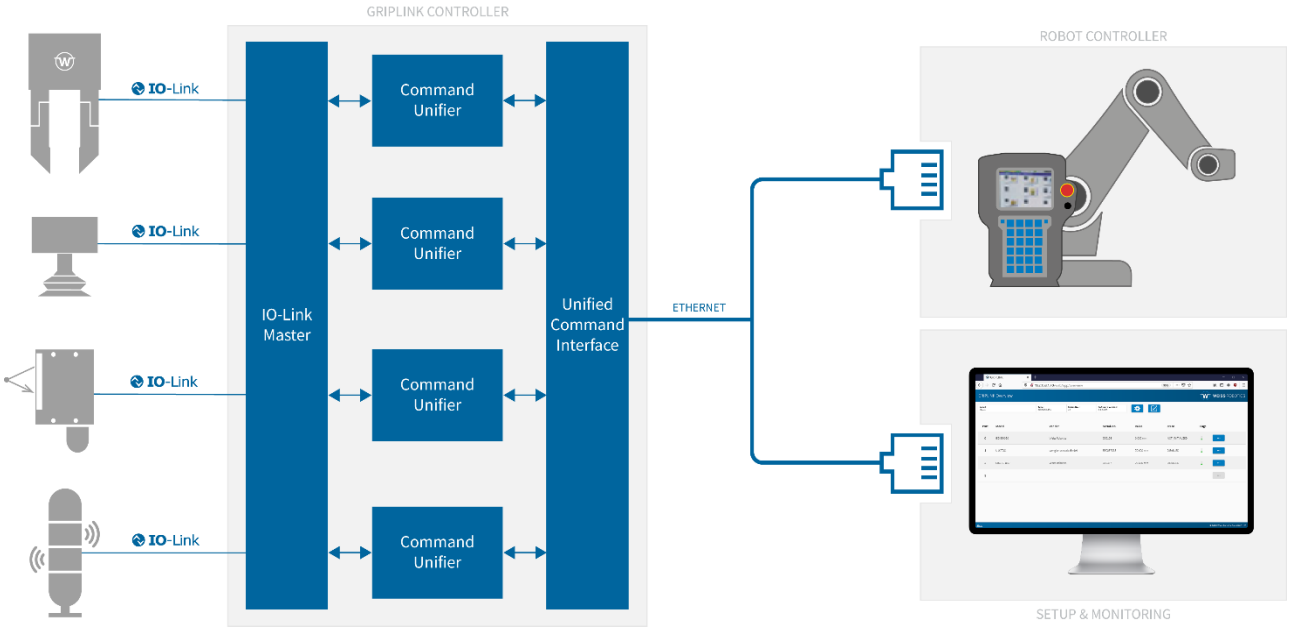


Figure 7: GRIPLINK Controller Architecture

7.4.1 Supported devices

GRIPLINK supports a number of IO-Link based automation components. The specific Command Unifiers required for operating a compatible device are part of the GRIPLINK firmware and are already installed on the GRIPLINK controller.

You can find an overview of GRIPLINK-compatible devices at
www.griplink.de/devices

Gripping modules

GRIPLINK-compatible gripping modules use the device status to display the current status of the gripping process. The device status changes according to the action performed.

Further actuators

Other GRIPLINK-compatible actuators as e.g., vacuum pickers and rotary or linear axis, are treated in the same way as gripping modules. The respective scope of functions can be found in the documentation belonging to the actuator module.

Sensors

In addition to controlling gripping modules, GRIPLINK also supports reading out sensors. Depending on the model, sensors provide one or more measured values that can be read out using the VALUE command. The measured value is always transmitted as an integer, which is why the measured values are usually scaled with a factor.

The number of sensor values, type of value, scaling and unit can be found in the documentation of the respective sensor.

7.4.2 Device state

Each connected device has a device state. In addition to universal states (e.g., DISABLED), states are also available for certain device classes. Table 4 provides an overview of the possible device states:

Code	Device state	Description	Device class
0	NOT CONNECTED	No device connected	Universal
1	NOT INITIALIZED	Not initialized	Gripper
2	DISABLED	Operational but not activated	Universal
3	RELEASED	Workpiece released	Gripper
4	NO PART	No workpiece found	Gripper
5	HOLDING	Holding a workpiece	Gripper
6	OPERATING	Device is in operating state	Sensors
7	FAULT	Severe device fault	Universal

Table 4: Possible device states

7.4.3 Commands

During operation, the connected device changes its state depending on the command received. A status change can also take place via an external event, e.g., if the connected gripping module loses its workpiece or if a device error occurs (overtemperature, malfunction, etc.). The possible status changes are shown for sensors in Figure 8 and for gripping modules in Figure 9.

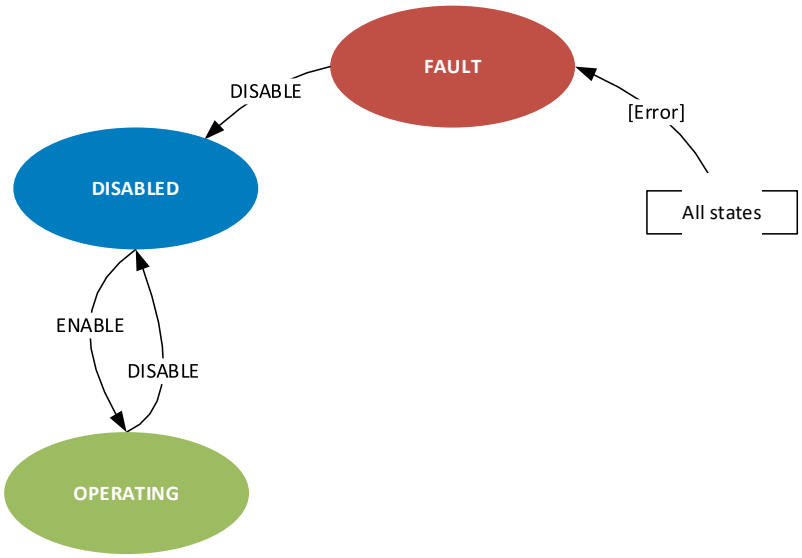


Figure 8: State transitions of a sensor device

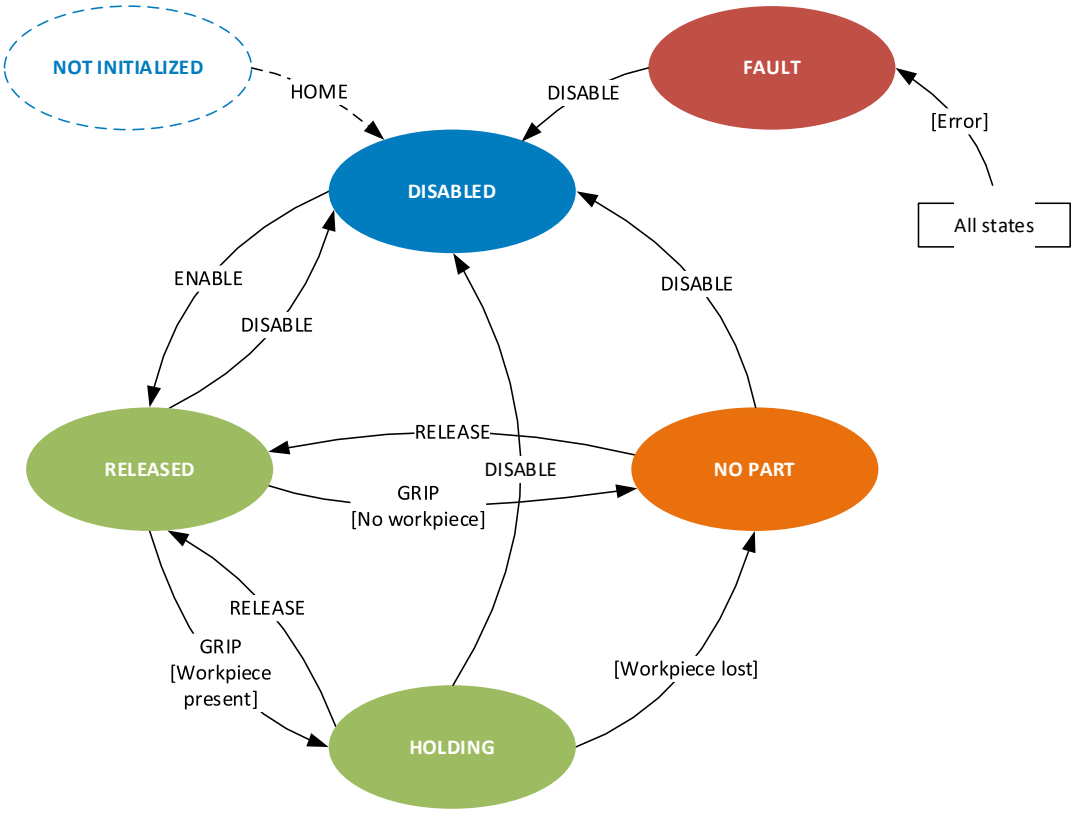


Figure 9: State transitions of a gripper device

A command consists of the actual triggering of the action and the waiting for a change in status. This is shown in Figure 10 using the example of gripping a workpiece. The robot controller initiates the gripping command for the gripping module on device port 0 with parameter set 1 by sending the command word "GRIP (0,1)". The successful end of the gripping process is recognized by cyclical polling of the device status with the command word "DEVSTATE [0]?" (Device status changes from RELEASED (3) to HOLDING (5)). Note: If no part to be gripped was found, the device status would change to NO_PART (4) or, in the event of an error such as overtemperature or device malfunction, to FAULT (7).

The detailed list of the available commands can be found in the separate document "GRIPLINK Controller Command Set Reference Manual".

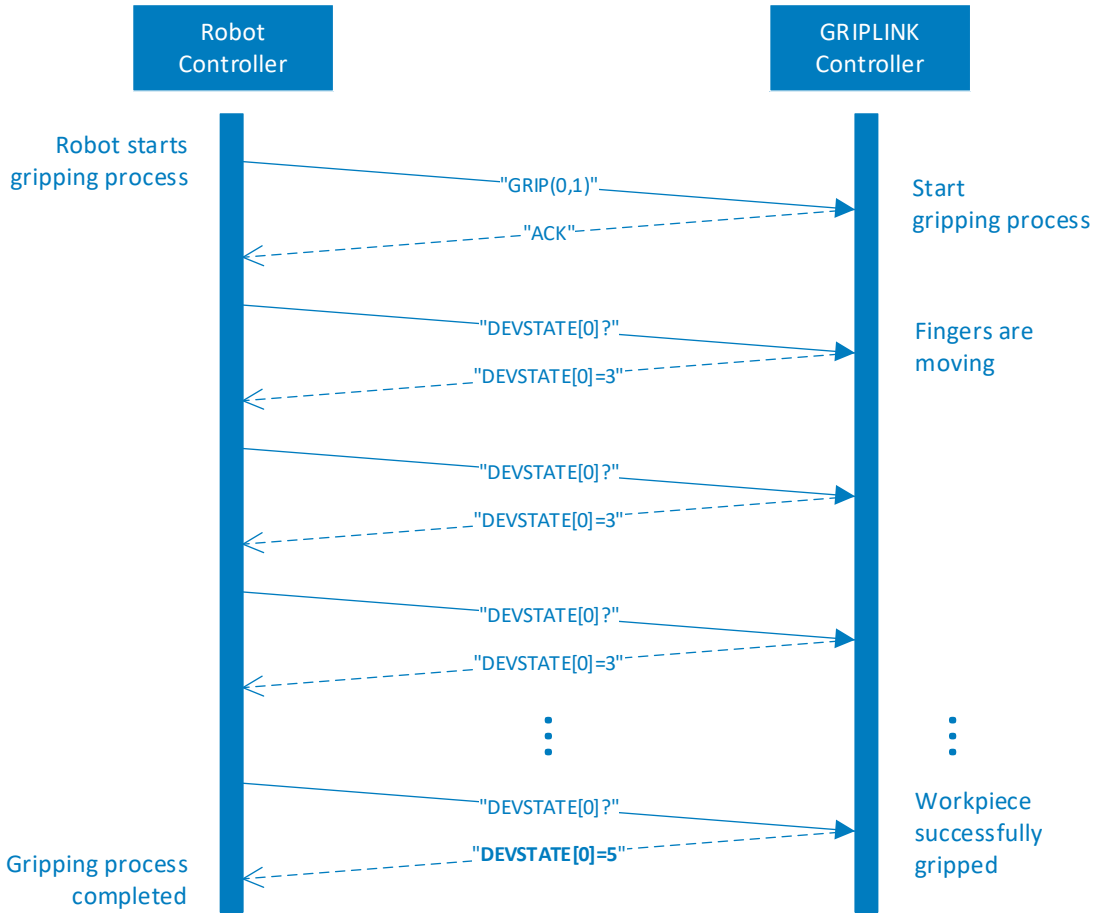


Figure 10: Gripping process sequence diagram

8 Firmware Update

The firmware of the GRIPLINK Controller can be updated via the web interface. To do this, open the web interface and go to the GRIPLINK configuration page using the button. The update process can be started using the “Firmware Update” button. The LEDs (1) and (2) flash alternately red-green, see chapter 6.4.

Never update the firmware during operation!
This will lead to undesirable behavior!

The GRIPLINK Controller must be restarted for the firmware update. The connection to a connected robot controller will be lost.

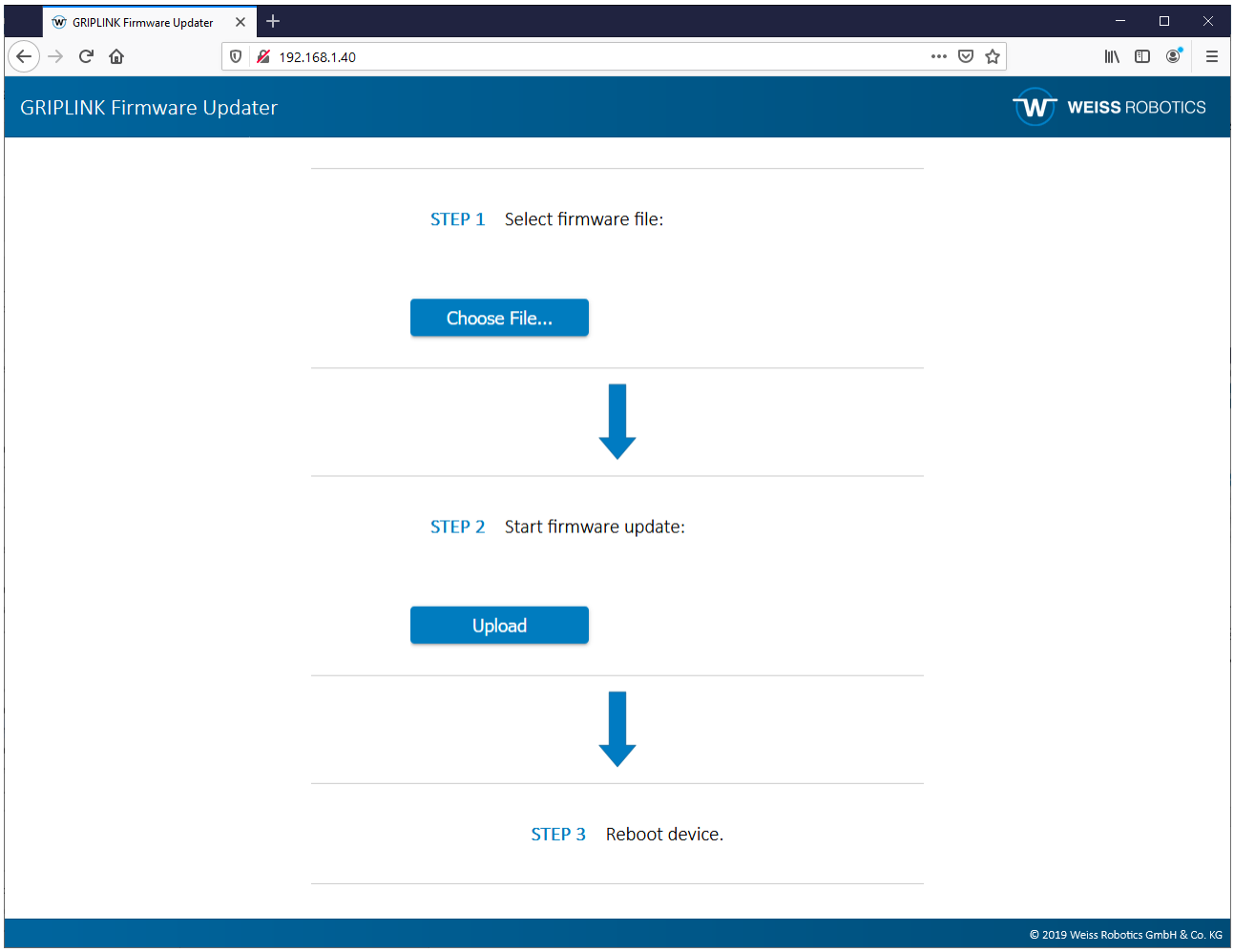


Figure 11: Firmware Update

First select the update package via "Choose File". This consists of a file with the extension * .wup. Then click on "Upload" to start the update. This process can take a few minutes. If the update was successful, the GRIPLINK Controller can then be restarted using the "Reboot" button. The updated firmware is now active.

The update package with the latest firmware is available for download at **www.griplink.de**.

9 Troubleshooting

9.1 No communication with the GRIPLINK Controller

Possible cause	Solution
Power supply interrupted	• Check power supply
No communication, Ethernet LED does not light up	• Check communication cable and connections
No communication but Ethernet LED is on	• Check the controller's IP settings. Ensure the GRIPLINK Controller must be in the same subnet as your robot controller/computer.
GRIPLINK is in UPDATE mode (LEDs flash alternately RED/GREEN)	• The module is in UPDATE mode. Switch to the web interface and upload the latest firmware. • If the UPDATE mode was not actively started: Interrupt the power supply and restart the GRIPLINK Controller.

9.2 No communication with the connected device

Possible cause	Solution
Operating voltage too low or insufficient power supply	• Check power supply • Check the maximum current consumption of the connected device
Connection is not fully established (port LED flashes GREEN)	• Check communication cable and connections • Check compatibility • Check the device version
Device is not supported (port LED lights up RED)	• Check compatibility • Check the device version • Check the version of the GRIPLINK Controller firmware
Device driver error (port LED is blinking RED)	• Check the device version • Check the version of the GRIPLINK Controller firmware
Over-Current, over-temperature or connection fault (port LED is fast-blinking RED)	• Check communication cable and connectors • Check the power requirements of the connected device • Unplug device and let the GRIPLINK cool down

9.3 GRIPINK Controller reports a port error

The port LED lights up RED or blinks RED.

Possible cause	Solution
Connected device is not supported (port LED lights up red)	• Check compatibility • Check the device version • Check the version of the GRIPLINK Controller firmware
Device driver error (port LED is blinking RED)	• Check the device version • Check the version of the GRIPLINK Controller firmware
Over-Current, over-temperature or connection fault (port LED is fast-blinking RED)	• Check communication cable and connectors • Check the power requirements of the connected device • Unplug device and let the GRIPLINK cool down

9.4 GRIPINK Controller reports an error

The status LED lights up RED or blinks RED.

Possible cause	Solution
Command format error (Status LED lights up RED when receiving)	An error occurred while evaluating the incoming command. • Check the version of the GRIPLINK Controller firmware • When using an official GRIPLINK plug-in: Make sure that the version of the GRIPLINK plug-in works with the version of the GRIPLINK firmware. • When using your own software: check protocol implementation
Component malfunction (Status LED flashes RED continuously)	At least one internal component required for operation could not be initialized. • Restart the GRIPLINK Controller. If the error persists, send in the GRIPLINK Controller with a repair order.

9.5 GRIPLINK Web app does not load

The web page is not loading.

Possible cause	Solution
Wrong IP address	Ensure, that the correct IP address is entered in the browser search field. The default IP address of the GRIPLINK is 192.168.1.40
Incompatible Browser	The web app is not compatible with Internet Explorer. For best performance use Google Chrome or Mozilla Firefox.

10 EC Declaration of Incorporation

According to EC Machinery Directive 2006/42/EG, appendix II B

Manufacturer	Weiss Robotics GmbH & Co. KG Karl-Heinrich-Kaeferle-Str. 8 D-71640 Ludwigsburg
Distributor	Weiss Robotics GmbH & Co. KG Karl-Heinrich-Kaeferle-Str. 8 D-71640 Ludwigsburg

We hereby declare that the following product:

Product designation:	GRIPLINK Controller
Type:	GRIPLINK-ET4
Part numbers	5020069 (GRIPLINK-ET4)

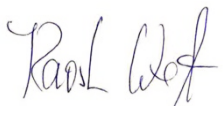
meets the applicable basic requirements of the **Machinery Directive (2006/42/EC)**.
The incomplete machine may not be put into operation until it is confirmed that the machine into which the incomplete machine is to be installed meets the provisions of the Machinery Directive (2006/42/EC).
Applied harmonized standards, especially:

EN ISO 12100-1	Safety of machines – Basic concepts, general principles for design – Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machines – Basic concepts, general principles for design – Part 2: Technical principles

The manufacturer agrees to forward the special technical documents for the incomplete machine to state offices on demand. The special technical documents according to Annex VII, Part B, belonging to the incomplete machine have been created.

Person responsible for documentation: Dr.-Ing. Karsten Weiß, Tel.: +49(0)7141/94702-0

Location, Date/Signature: Ludwigsburg, May 15, 2020



Details of the signatory: Weiss Robotics GmbH & Co. KG