



Collaborative servo-electric gripping module

GRIPKIT CR EASY

April 2021



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1 Introduction

These instructions are part of the gripping module and describe its safe and proper use in all operating phases. They are exclusively valid for the gripping module GRIPKIT CR EASY and contain important information on installation, commissioning, maintenance and service.

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 Product description

The GRIPKIT CR EASY gripping module is a collaborative, servo-electric gripping module with innovative gripping force control and digital IO interface. **Fehler! Verweisquelle konnte nicht gefunden werden.** and Figure 2 show the connections and components of a GRIPKIT CR EASY gripping module. The gripping module is optionally configured via the configuration tool “GRIPKIT Easy Configurator” available at www.weiss-robotics.com/cr-easy.

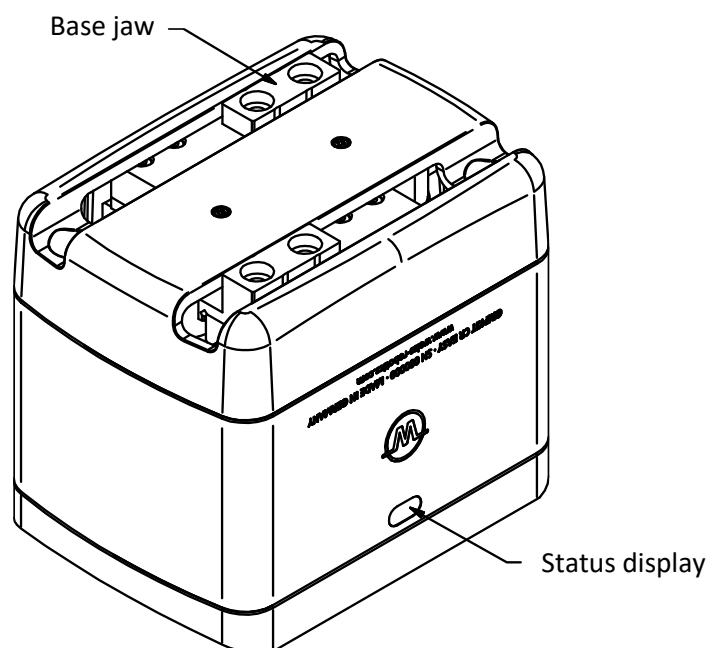


Figure 1: Components and connections of the gripping module (top view)

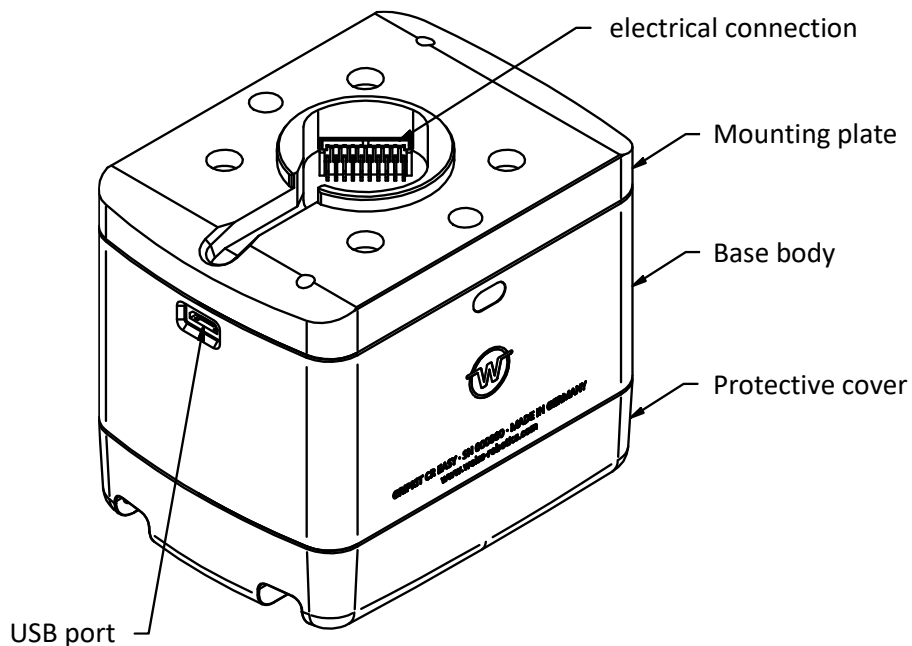


Figure 2: Components and connections of the gripping module (bottom view)

1.3 Related documents

Further documents for the operation of the gripping module are available for download on our website at www.weiss-robotics.com/cr-easy.

For additional warranty information, please refer to our General Terms and Conditions, available at www.weiss-robotics.com/agb.

1.4 Target groups

The target group for these instructions are, on the one hand, plant manufacturers and operators who should keep this and other documents supplied accessible to personnel at all times and, in addition, encourage them to read and observe the safety and warning instructions in particular.

In addition, it is intended for qualified personnel and fitters who should read these instructions and observe and comply with the safety and warning instructions at all times.

2 Basic safety instructions

2.1 Intended use

The gripping module is designed for gripping and reliably holding workpieces or objects and is intended for installation in a machine. The requirements of the applicable directives as well as the assembly and operating instructions in this manual must be observed and complied with. The gripping module may only be used within the scope of its defined application parameters and only in industrial applications. Any other use or use beyond this is considered improper, e.g. if the gripping module is used as a pressing, cutting, lifting or punching tool or as a clamping device or guiding aid for tools. The manufacturer is not liable for any damage resulting from this.

2.2 Ambient and operating conditions

The gripping module may only be used within its defined application parameters. It must be ensured that the gripping module and the fingers are sufficiently dimensioned according to the application, and that the environment is clean and the ambient temperature corresponds to the specifications in the data sheet. Observe the maintenance instructions (see chapter 9). Furthermore, it must be ensured that the environment is free of splash water and vapors as well as abrasion or process dusts. Exceptions to this are gripping modules that are specially designed for dirty environments.

2.3 Product safety

The gripping module corresponds to the state of the art and the recognized safety rules at the time of delivery. However, hazards may emanate from it if, for example:

- the gripping module is not used as intended
- the gripping module is improperly mounted, modified or incorrectly maintained
- the EC Machinery Directive, the VDE Directives, the safety and accident prevention regulations applicable at the place of use or the safety and assembly instructions are not observed

2.3.1 Protective devices



Protective devices must be provided in accordance with the EC Machinery Directive.

2.3.2 Structural changes, additions and conversions

Additional holes, threads or attachments that are not offered as accessories by Weiss Robotics may only be attached after written approval by Weiss Robotics.

2.3.3 Special standards

The following standards are complied with:

- 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 injection on signal and data lines according to EN 61000-4-6
- RF irradiation according to EN 61000-4-3
- Interference emission according to EN 61000-6-4 Class A
- Magnetic field with power frequency according to EN 61000-4-8
- Discharge of static electricity according to EN 61000-4-2

2.4 Personnel qualification

Installation, initial startup, maintenance and repair of the gripping module may only be performed by trained specialists.

Every person assigned by the operator to work on the gripping module must have read and understood the complete operating manual, in particular chapter 2 “Basic safety instructions”. This also applies to personnel who are only occasionally deployed, for example maintenance personnel.

2.5 Safety conscious work

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



Do not move any parts by hand when the power supply is connected.



Do not reach into the open mechanics and the movement range of the gripping module.



Disconnect the power supply of the gripping module before carrying out any work.

2.6 Notes on special hazards



Risk of injury from falling and ejecting objects!
Provide guards to prevent falling or ejection of objects, for example, machined workpieces, tools, chips, fragments, waste.



Risk of injury due to unexpected movements of the machine/plant!

3 Warranty

The warranty period is 12 months from the date of delivery to the factory, assuming proper use in single-shift operation and observance of the prescribed maintenance and lubrication intervals or 10 million gripping cycles. Parts in contact with the workpiece and wear parts are not covered by the warranty. Please also refer to the General Terms and Conditions (GTC).

The gripping module is considered defective if its basic function, gripping, is no longer available.

4 Scope of delivery and accessories

The scope of delivery includes the parts listed in Table 1.

Table 1: Scope of delivery

Designation	Part number
Gripping module GRIPKIT CR EASY	5010018
Connecting cables gripping module	5070018
USB cable, A male to Micro-B male (1.8 m)	4020023
GRIPKIT CR EASY accessory pack	5020066
Quick Start Guide GRIPKIT CR EASY	5080031
Safety instructions	5080032

The following accessories are available separately for the gripping module:

- Connection lines
- Gripping fingers

GRIPKIT CR EASY does not contain any gripping fingers, as these are usually highly application-dependent.



Accessories can be ordered separately.

Additional accessories can be found on our website at www.weiss-robotics.com.

5 Technical data

5.1 Mechanical nominal data



If the specified nominal data are exceeded, the gripping module may be damaged. In case of doubt, clarify your application with our technical sales department.

Table 2: Mechanical nominal data

Designation	Unit	Value
Total stroke	mm	30
Nominal gripping force (100%)	N	200
Recommended minimum gripping force (25%)	N	50
Max. relative finger speed	mm/s	140
Min. relative finger speed	mm/s	10
Dead weight	g	830
Workpiece weight (form closure/force closure)	g	4300/1000
Permissible finger length (L) ¹	mm	100
Permissible mass per finger	g	300
Protection class	-	IP 40
Ambient temperature	°C	5 to 50
Humidity	%	0 to 90, non-condensing
Mechanical repeatability	mm	±0,03
Resolution of the displacement encoder	mm	0,01
Mode of operation of the displacement encoder	-	Relatively

¹ At nominal force; further details in chapter 5.1.1

5.1.1 Permissible finger length

The permissible finger length L corresponds to the distance between the screw-on surface of the base jaw and the effective gripping force application point, see Figure 3. Maximum values for L can be taken from the mechanical nominal data of the size used.



If the maximum finger length is exceeded, a reduction of the gripping force is mandatory. In addition, this can shorten the service life of the gripping module.

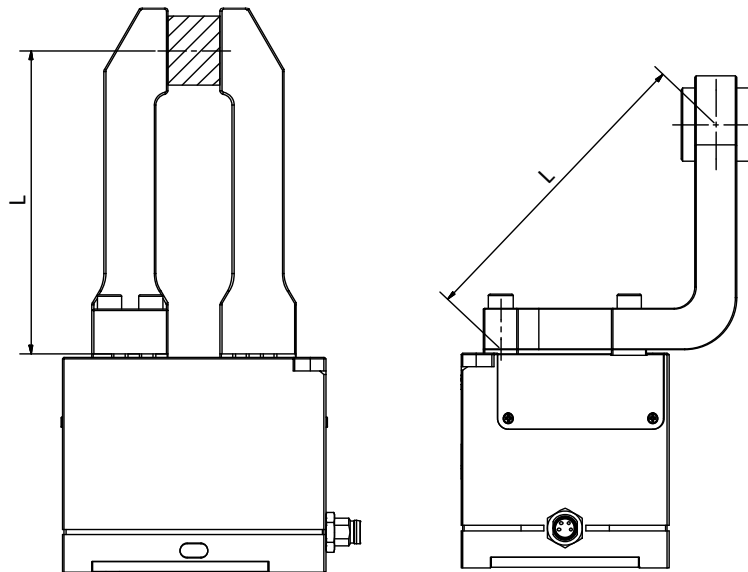


Figure 3: Determination of finger length L . Left: straight fingers, right: cranked fingers.

5.1.2 Gripping force and finger speed

The gripping force can be set as a percentage of the nominal gripping force. The recommended minimum gripping force is 25% of the nominal gripping force.

5.1.3 Cycle times

The following diagrams show the typical course of the gripping duration and the release duration for different gripping force settings.



The values shown indicate the typical duration from the processing of the command at the gripping module to the change of the gripping state. The actual duration varies depending on the gripping part (rigid or elastic), finger weight, grip height, etc. For a more precise estimation of the possible cycle times, tests must be carried out in individual cases.

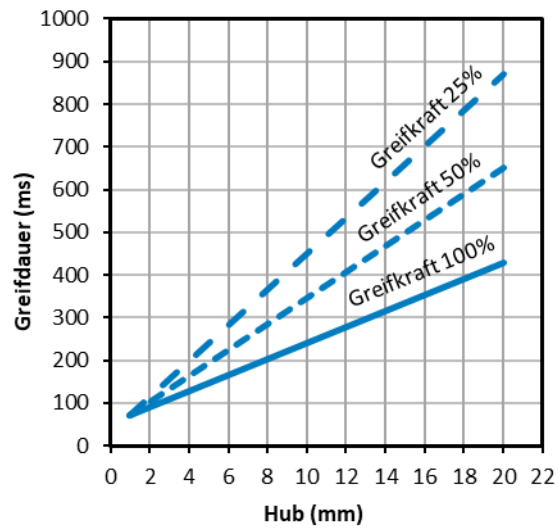


Figure 1: Gripping time as a function of stroke

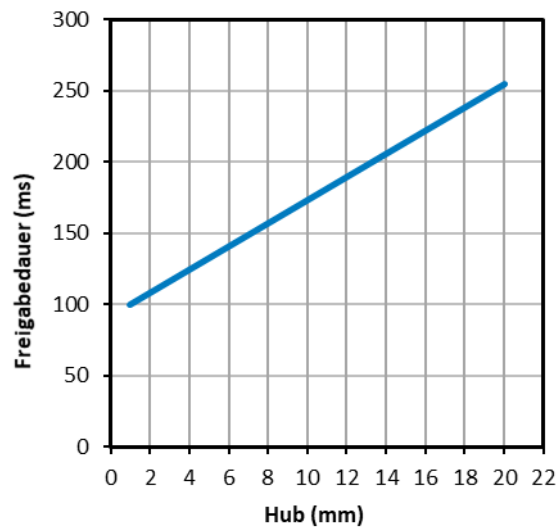


Figure 2: Release duration depending on stroke

5.1.4 Permissible finger loads

The following table shows the permissible static loads on the base jaw guide.

Table 3: Static guide loads

Last	Unit	Value
C_0	N	1890
T_x	Nm	6,9
T_y	Nm	26,0
T_z	Nm	23,6

In the case of superimposed forces and moments, the load carrying capacity of the guide must be recalculated according to equation (12)

$$\frac{M_x}{T_x} + \frac{M_y}{T_y} + \frac{M_z}{T_z} + \frac{F_z}{C_0} \leq 1,0 \quad (12)$$

Here, C_0 and T are the permissible guide loads according to Table 3 and M is the sum of all moments occurring at each base jaw (gripping, weight, inertia and process forces) in the application. The moments are plotted in Figure 3.

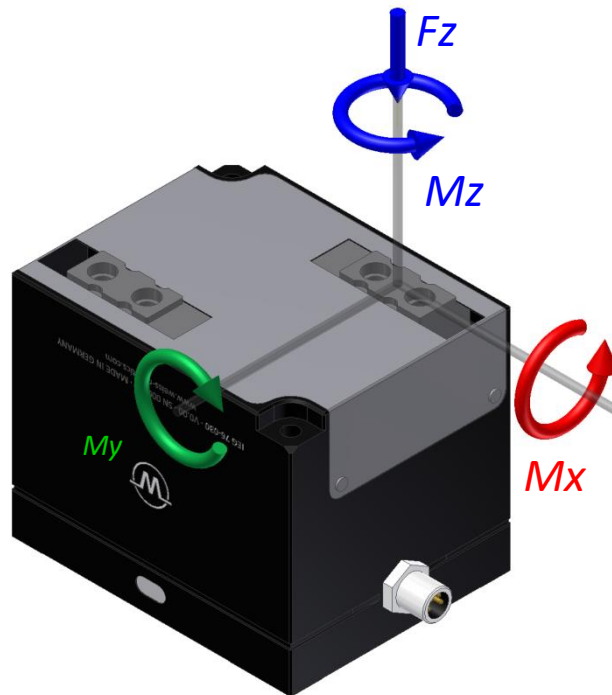


Figure 3: Finger loads

5.2 Electrical nominal data



If the specified nominal data are exceeded, the gripping module may be damaged. In case of doubt, clarify your application with our technical sales department.

Table 4: Electrical nominal data

Designation	Unit	Value
Supply voltage	V	18 up to 30
Typ. current consumption (state INACTIVE)	mA	60

Typ. current consumption (HOLDING state, 100% gripping force)	mA	300
Max. current consumption (moving, peak current)	mA	500
<u>Digital inputs</u>		
Max. Signal voltage (active high)	V	30
Min. signal voltage (active low)	V	0
<u>Digital outputs</u>		
Signal voltage (signal "HIGH")	V	24
Signal voltage (signal "LOW")	V	0
Max. Signal current	mA	100

Table 5: Electrical ratings of the USB port

Designation	Unit	Value
Supply voltage	V	5
Type. Current consumption	mA	50

5.2.1 Electrical interface

The gripping module has a ten-pin PCB terminal for electrical contacting. It is attached to the underside of the flange and shown in Figure 4. The pin assignment is listed in Table 6.

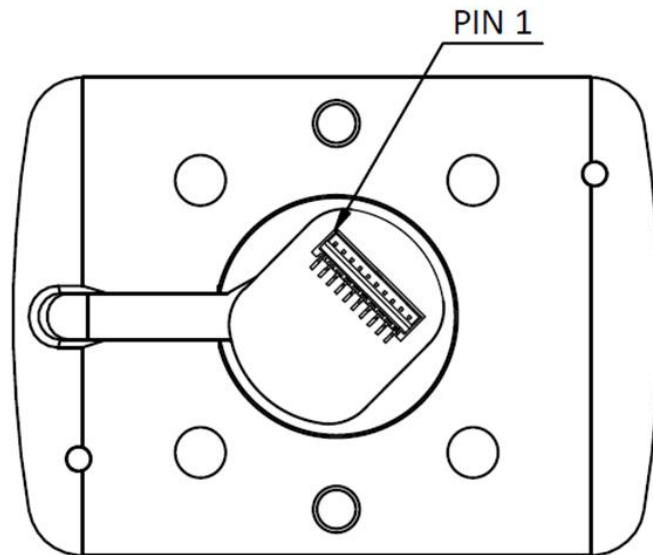


Figure 4: Connection terminal on the underside of the flange

Table 6: Terminal assignment

Pin	Function
1	Not connected
2	IN 1
3	IN 0
4	Not connected
5	Not connected
6	GND
7	+24 V/1.5 A IN
8	Not connected
9	OUT 1
10	OUT 0

5.2.2 Switching signals of the digital inputs

The inputs IN 0 and IN 1 of the gripping module support both NPN and PNP signals. The passive state is detected when the input is not actively driven (inactive). The active state is detected when the input is actively driven with either 0 V (NPN, “sinking”) or 24 V (PNP, “sourcing”). The function of the inputs is listed in Table 7.

Table 7: Function of inputs IN 0 and IN 1

Input	Signal Inactive	Signal Active
IN 0	Gripper deactivated	Gripper activated
IN 1	Release workpiece ²	Grip workpiece ²

5.2.3 Switching signals of the digital outputs

The gripping module signals the current gripping state via the digital outputs. The outputs are designed as push-pull circuit. Table 8 shows the coding of the state.

Table 8: Coding of the gripping state via the digital outputs

State OUT 1	State OUT 0	Gripping state
0 V	0 V	Gripper deactivated or error present (IDLE, ERROR)
0 V	24 V	Workpiece released (RELEASED)
24 V	0 V	No workpiece detected (NO PART)
24 V	24 V	Workpiece gripped (HOLDING)

5.2.4 Fusible link to protect against increased gripping force

The gripping module is equipped with a fuse to protect the operator from impermissibly high gripping forces. This fuse is a safety-related component and must not be replaced/modified under any circumstances.



If the fuse has tripped, the gripping module must be sent to WEISS ROBOTICS for repair.

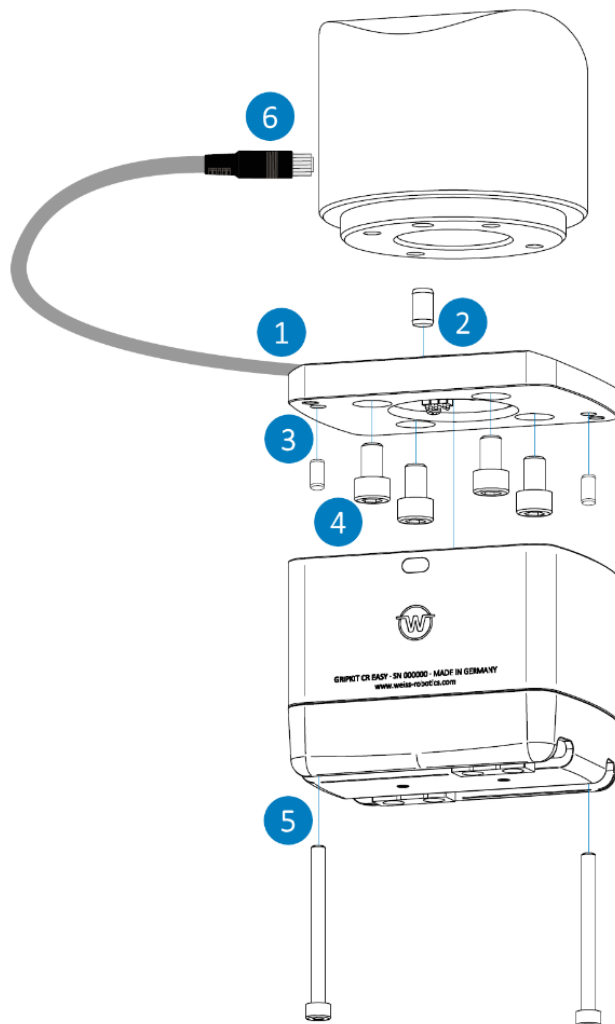
² The preconfigured grip parameters are used. See chapter 7.

6 Assembly instruction



Only use the screws and dowel pins supplied to mount the gripping module.

1. Plug the enclosed cable, suitable for the robot used, into the flange.
2. Insert the cylindrical pin (\varnothing 6mm) into the flange and position it on the robot.
3. Screw the flange to the robot.
4. Insert the two dowel pins (\varnothing 4mm) into the flange.
5. Screw the gripping module to the flange.
6. Connect the connection cable to the robot



During assembly, also observe the robot-specific mechanical properties of the tool flange.

7 Configuration of the gripping module

To configure your gripping module, you need the “GRIPKIT Easy Configurator” program and a Windows-compatible computer. The program is available for download at www.weiss-robotics.com/cr-easy. Install the program and open it afterwards.

Connect the gripping module to your computer with the included USB cable (A connector to Micro-B connector). The voltage supply of the gripping module is also external during configuration. For this purpose, the connection cable must be connected to the robot and its voltage output must be activated.

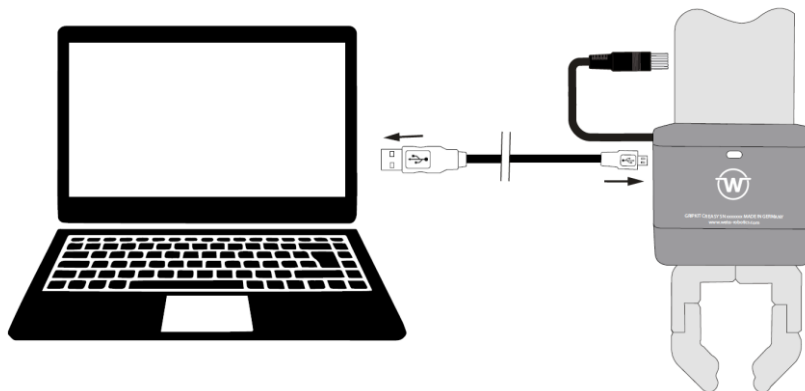


Figure 5: Connecting the gripping module for configuration



Make sure that during configuration the gripping module does not pose any danger due to careless gripping or release.

Now start the “GRIPKIT Easy Configurator” program and connect the gripping module by clicking on the “Connect” button.

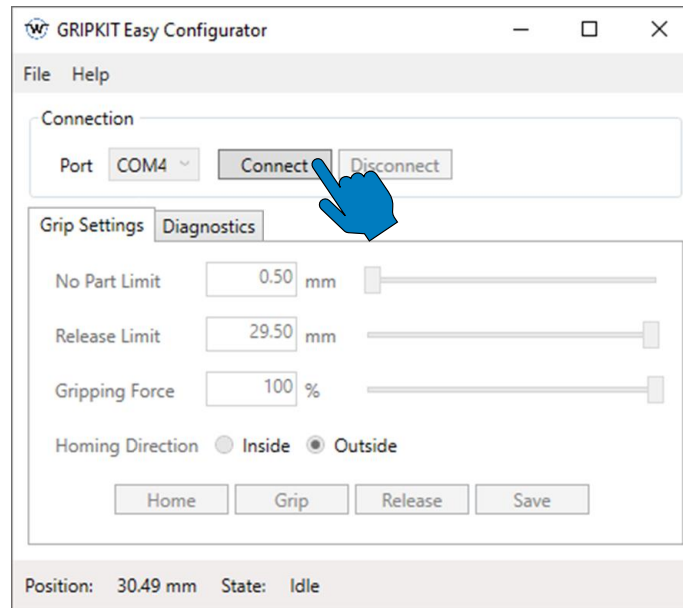


Figure 6: Establishing a connection with the gripping module

7.1 Referencing

The gripping module may have to be referenced after the connection has been established. To do this, click on the “Home” button. Depending on the grip parameters set, referencing is performed inwards (option “Inside” activated) or outwards (option “Outside” activated). After successful referencing, the state changes to IDLE.

7.2 Parameterization of a grip

By adjusting the sliders or entering the values in the input fields, you can set the grip parameters. With a click on the “Save” button, the parameters are stored non-volatile on the gripping module.

A grip consists of a position window with the limit values “Release Limit” and “No Part Limit”. When releasing, the gripper jaws are moved up to the Release Limit, the gripping state changes to RELEASED. During gripping, the gripper jaws are moved up to a maximum of the “No Part Limit”. If a component is gripped and held before this, the gripping state changes to HOLDING. If no component is gripped up to the “No Part Limit”, the status changes to NO PART.

You can use the “Grip” and “Release” keys to test the currently set parameters.

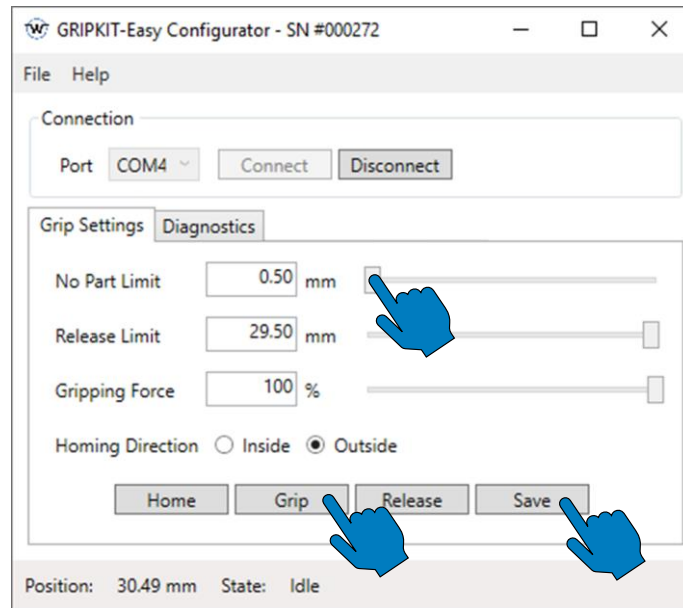


Figure 7: Configuration and test of the gripping parameters

7.2.1 Gripping direction

The gripping direction is determined by the relation of the position limit values to each other. If the “No Part Limit” limit value is greater than the “Release Limit”, an inside grip is executed, but if the “Release Limit” limit value is greater than the “No Part Limit”, an outside grip is executed.



When gripping and releasing, electric gripping modules stop at the positions “No Part Limit” or “Release Limit”.

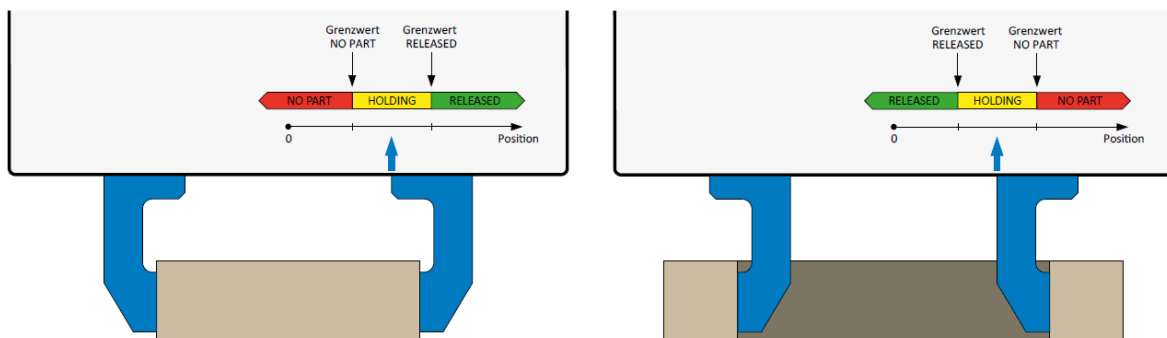


Figure 8: Outer grip and inner grip

7.2.2 Gripping force

GRIPKIT CR EASY has an integrated gripping force control. The gripping force can be specified as a percentage depending on the nominal gripping force of the gripping module.

7.2.3 Diagnostic data

Under the “Diagnostics” tab, you will find the firmware version used, a temperature display and warnings about the status of the gripping module.

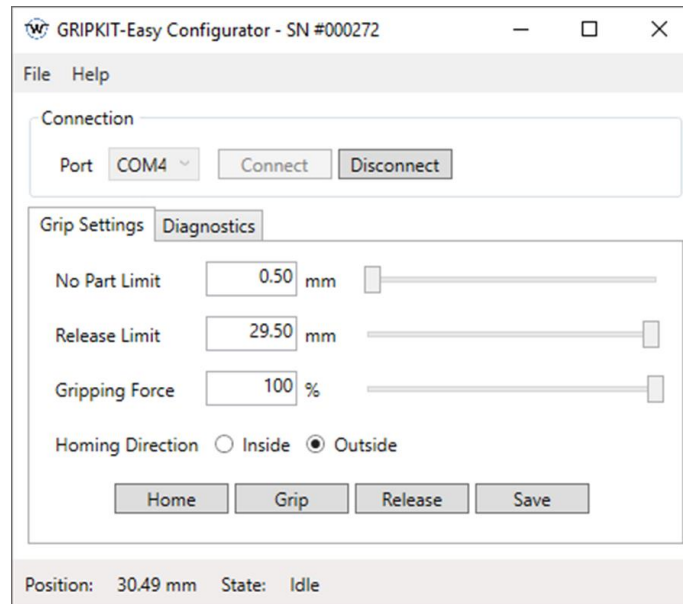


Figure 9: Diagnostic data



If you detect a problem with your gripping module, first connect it to a computer and read out the diagnostic data via the “GRIPKIT-Easy Configurator”.

8 Create applications

The gripping module is used in a robot program according to the instructions of the plug-in software available for the robot used.

9 Maintenance and cleaning

Clean the gripping module at regular intervals with a dry cloth to remove all dirt and, depending on the area of application, any chips. These typically also accumulate underneath the protective cover. Remove the protective cover as shown in Figure 10 clean the motion apparatus of the gripping module with a brush.

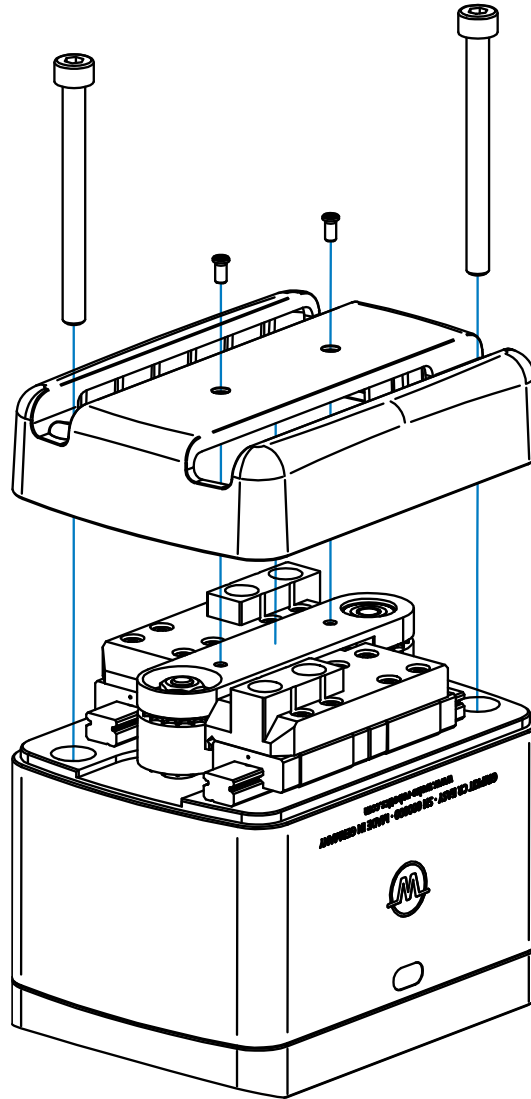


Figure 10: Removing the protective cover



The gripping module is adjusted at the factory. Base jaws and belts must not be disassembled!

9.1 Adjustment of the maintenance interval

The maintenance intervals must be adapted to the ambient and operating conditions. The following factors must be taken into account:

- Increased operating temperatures
- Condensation and condensation water effects
- High vibration stress
- Use in vacuum
- Highly dynamic operation
- Influence of foreign substances (e.g. vapors, acids, etc.)



The guideways are lubricated for life. In individual cases, relubrication may be necessary. Contact our technical sales department for assistance.

10 Troubleshooting

10.1 Base jaws do not move

Table 9: Possible sources of error when the base jaws are stuck

Possible cause	Remedy
Operating voltage too low or power supply insufficient	<ul style="list-style-type: none">• Check power supply• Check whether power supply meets the requirements according to chapter Electrical nominal data5.2
Cable connection interrupted	<ul style="list-style-type: none">• Check connection line
IO configuration of the robot faulty	<ul style="list-style-type: none">• Check IO configuration of the robot
Component failure, e.g. due to overload	<ul style="list-style-type: none">• Send the gripping module with a repair order to WEISS ROBOTICS.• Ensure that the gripping module is only used within the scope of its defined application parameters.
Fuse has tripped	<ul style="list-style-type: none">• Send the gripping module with a repair order to WEISS ROBOTICS.

10.2 Gripping module stops abruptly or does not travel the entire stroke

Table 10: Possible sources of error in abnormal motion behavior

Possible cause	Remedy
Faulty parameterization	<ul style="list-style-type: none">• Check parameterization with the "GRIPKIT Easy Configurator"
Power supply interrupted	<ul style="list-style-type: none">• Check power supply
Foreign parts in the motion system or module dirty	<ul style="list-style-type: none">• Check the mobility with the gripping module switched off by moving the fingers by hand.• Remove foreign objects. Check for damage to the gripping module!• Perform maintenance and cleaning (see chapter 9)

11 EC Declaration of Incorporation

In the sense of the EC Machinery Directive 2006/42/EC, Annex II B

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

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

We hereby declare that the following product:

Product name Servo-electric gripping module
Type designation GRIPKIT CR EASY
Part numbers 5010018

complies with the applicable essential requirements of the **Machinery Directive (2006/42/EC)**.

The partly completed machinery must not be put into service until it has been established that the machine into which the partly completed machinery is to be incorporated complies with the provisions of the Machinery Directive (2006/42/EC).

Applied harmonized standards, in particular:

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

The manufacturer undertakes to submit the special technical documents relating to the partly completed machinery to national authorities on request. The special technical documents belonging to the partly completed machinery according to Annex VII Part B have been prepared.

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

Place, Date/Signature: Ludwigsburg, February 18, 2020



Signatory details Weiss Robotics GmbH & Co KG

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