Mounting and Operating Instructions

CLG Series - Electrical Gripping Modules with IO-Link

Hardware Version: 1

September 2021

Content

1 Introduction

These instructions are part of the gripping module and describe the safe and proper use in all operating phases. It is exclusively valid for gripping modules of the CLG series and contains important information on installation, commissioning, maintenance and service.

1.1 Product Description

The CLG series gripping modules are ultra-compact servo-electric gripping modules with innovative gripping force control and integrated IO-Link technology. Figure 1shows the connectors and components of a CLG gripping module. The gripping module can be configured either via the configuration software of the IO-Link master or via the GRIPLINK device configurator, which is available separately.

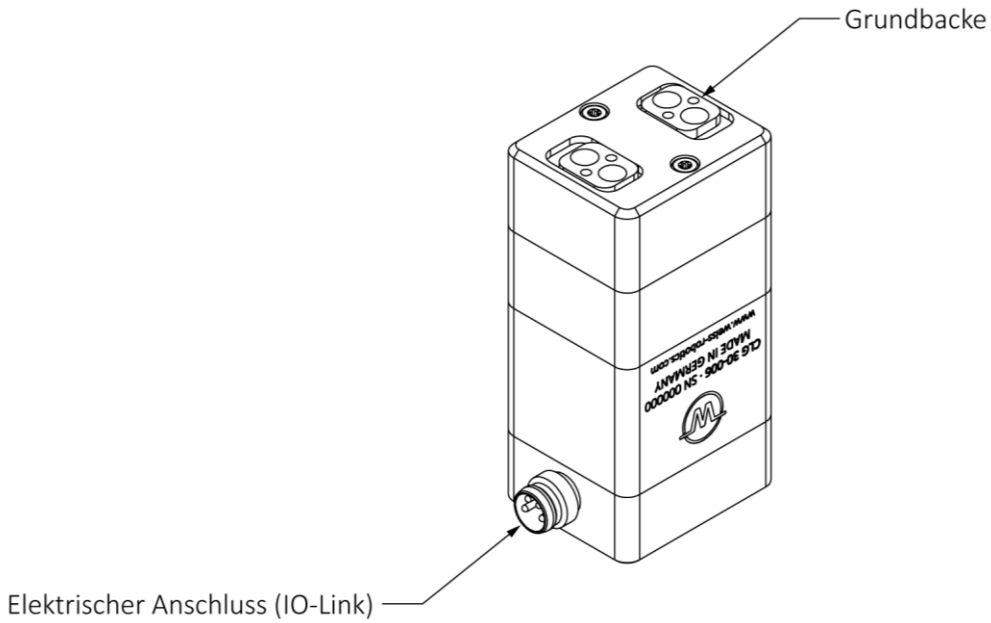


Figure 1: Components and connectors of the gripping module

1.2 Related Documents

The following additional documents for the operation of the gripping module are available for download on our website at **https://www.weiss-robotics.com/clg/:**

- Technical drawing
- 3D model (STEP)
- IO-Link device description file (IODD)

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

1.3 Target Groups

The target group of these instructions are plant manufacturers and operators, who should keep this and other documents supplied accessible to the personnel at all times and also encourage them to read and observe the safety and warning instructions in particular.
It is also intended for qualified personnel and fitters who should read this manual and observe and comply with the safety and warning instructions at all times.

1.4 Notation and Symbols

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

Functional or safety-related information. 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.

2 Basic Safety Instructions

2.1 Intended Use

The gripping module is designed for gripping and reliably holding workpieces or objects. The module is intended for installation in a machine/system. The requirements of the applicable guidelines as well as the mounting 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 or further use 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 such use.

2.2 Environmental 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. Please observe the maintenance instructions (see chapter 10). Furthermore, it must be ensured that the environment is free of spray water and vapors as well as from abrasion or process dust. This does not apply to modules that are specially designed for dirty environments.

2.3 Product Safety

The gripping module corresponds to the state of the art and complies with the recognized safety rules and regulations 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 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 Safety Devices

⚠ **Provide safety devices in accordance with the EC Machinery Directive.**

2.3.2 Structural Changes, Extensions or Modifications

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

2.3.3 Special Standards

The following standards are complied with:

- RFI voltage, interference field strength and emission according to EN 61000-6-3
- Fast transients on signal and data lines according to EN 61000-4-4
- HF power input on signal and data lines according to EN 61000-4-6
- HF radiation according to EN 61000-4-3
- Emissions according to EN 61000-6-4 Class A
- Power frequency magnetic field according to EN 61000-4-8
- Discharge of static electricity according to EN 61000-4-2
- IO-Link communication standard according to IEC 61131-9

2.4 Personnel Qualification

Assembly, initial commissioning, 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 Considerations

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

⚠ **Do not move any parts by hand when the module is connected to the power supply.**

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

⚠ **Disconnect the power supply of the gripping module before any installation, modification or adjustment work.**

2.6 Indications of Particular Hazards

⚠ **Risk of injury from falling and ejected objects! Provide protective devices to prevent objects from falling or being thrown out, e.g. processed workpieces, tools, shavings, fragments, waste.**

⚠ **Risk of injury due to unexpected movements of the machine,**

3 Warranty

The warranty period is 12 months from the date of delivery to the factory, provided that the device is used for its intended purpose in single-shift operation and in compliance with the specified maintenance and lubrication intervals or up to 10 million gripping cycles. Parts touching 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 gripping function is no longer available.

4 Scope of Delivery and Accessories

The scope of delivery includes:

- CLG gripping module in the ordered version
- Accessory kit (centering sleeves or dowel pins matching the gripping module's diameter)

Size	CLG 30-060
Gripping module	5120014
Accessory kit	5020071

Table 1: Part numbers scope of delivery

The following accessories for the gripping module are available separately:

- Flange adapter for robots with ISO standard flange
- Device configurator for gripping modules of the Integration Line, GRIPLINK-U1, part no. 5020009
- Robot integration solution, GRIPLINK-ET4, part no. 5020069
- Connecting cables

☞ **Please order accessories separately.**
Additional accessories can be found on our website at https://www.weiss-robotics.com.

5 Technical Data

5.1 Nominal Mechanical Data

⚠ **If the specified nominal data are exceeded, the gripping module may be damaged. If in doubt, please discuss your application with our technical sales department in advance.**

Mechanical operating data	Unit	CLG 30-060
Total stroke	mm	6
Nominal gripping force (100%)	N	30
Recommended minimum gripping force (25%)	N	7,5
Max. relative finger speed	mm/s	100
Min. relative finger speed	mm/s	5
Max. recommended workpiece weight	g	200
Permissible finger length (L) [1]	mm	40
Permissible mass per finger	g	60
Protection class	IP	40
Ambient temperature	°C	5-50
Air humidity	%	0..90 non-condensing
Mechanical repeatability	mm	+/- 0,03
Weight	g	120

Table 2: Nominal mechanical data

5.1.1 Permissible Finger Length

The permissible finger length *L* corresponds to the distance between the mounting surface of the base jaw and the effective gripping force application point, see Figure 2. Maximum values for *L* can be found in the nominal mechanical data of the respective gripping module. If the maximum finger length is exceeded, a reduction of the gripping force is mandatory. In addition, the service life may be reduced.

[1] For nominal force, see dimension "L" in Figure 2

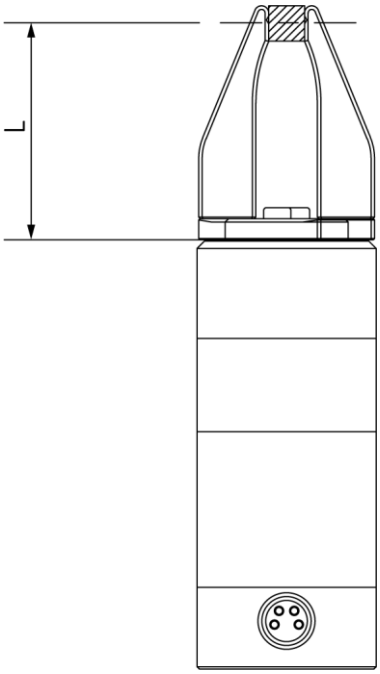


Figure 2: Determination of finger length "L

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.

The gripping module adjusts the finger speed depending on the parameterized gripping force according to Figure 3This minimizes gripping impulse and rebound effects during undamped gripping. The central override parameter (see chapter 8.2.2.1) can be used to manually increase or reduce the speed during gripping and thus to adapt it to the gripping part (area with gray background). In order to ensure proper movement of the fingers, the minimum possible gripping speed is limited to 5 mm/s.

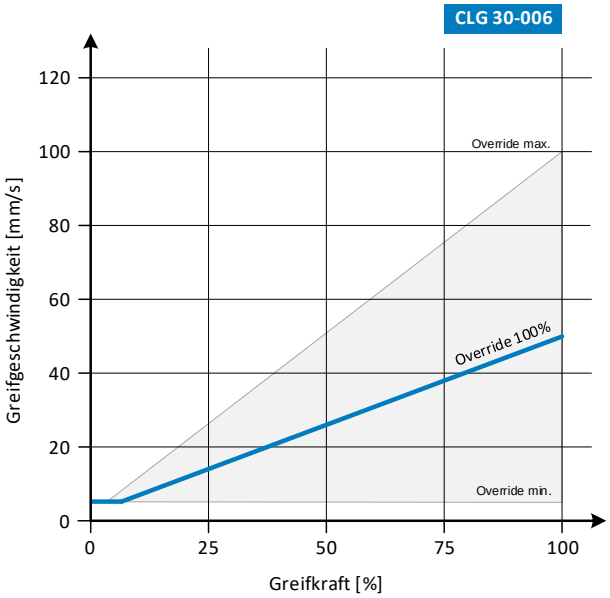


Figure 3: Gripping speed depending on the parameterized gripping force

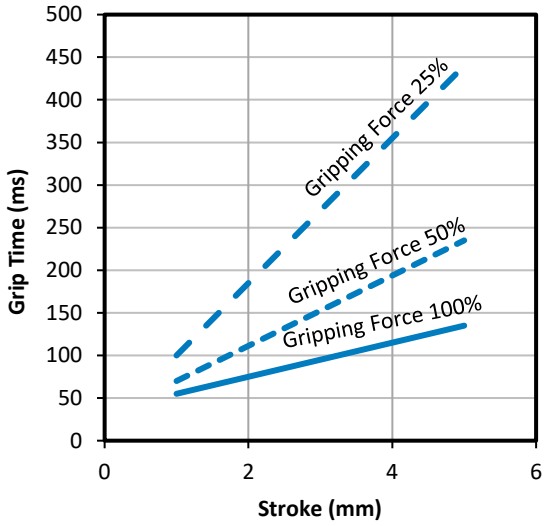
Gripping speeds above 100% (override) lead to an increased gripping impulse, which can damage the workpiece and the gripper mechanics.

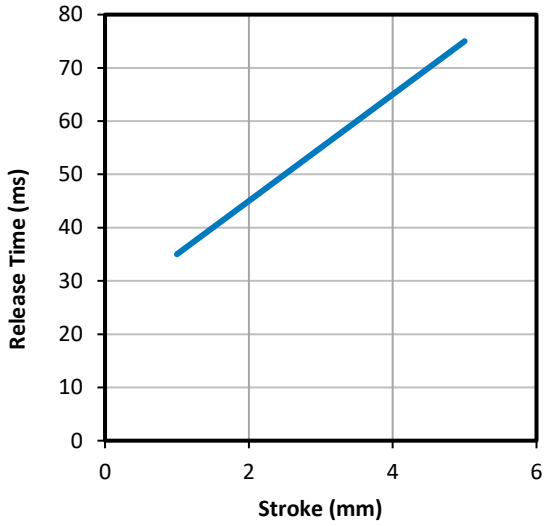
5.1.3 Cycle Times

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 workpiece (rigid or elastic), finger weight, gripping height, etc. For a more precise estimation of the possible cycle times, tests must be carried out in individual cases.

CLG 30-006





5.1.4 Permissible Finger Loads

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

Last	Unit	CLG 30-060
C0	N	632
TX	Nm	1,0
TY	Nm	1,1
TZ	Nm	1,3

Table 3: Static guide loads

In the case of superimposed forces and moments, the load carrying capacity of the guide must be recalculated according to the following equation:

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

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

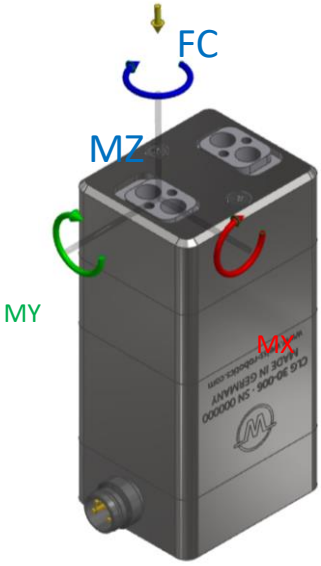


Figure 4: Finger loads

5.2 Nominal Electrical Data

⚠ **If the specified nominal data are exceeded, the gripping module may be damaged. If in doubt, clarify your application with our technical sales department in advance.**

Electrical operating data	Unit	CLG 30-006
Supply voltage	V	18 ... 30
Current consumption IDLE (inactive)	mA	40
Current consumption HOLDING (25% force)	mA	40
Current consumption HOLDING (100% force)	mA	60
Peak current max. (moving)	mA	800
C/Q pin		
Input voltage range	V	0 ... 30
Threshold value "HIGH	V	13
Threshold value "LOW	V	8
Hysteresis	V	2,2

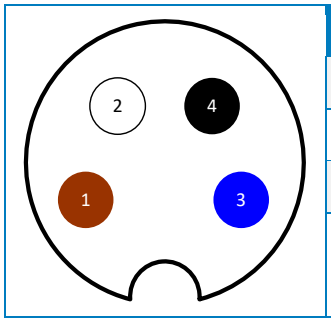
Communication	Unit	Value
Standard		IO-Link V1.1
Transmission speed	bit/s	38,400 (COM2)
Min. cycle time	ms	4,0
Max. start time IO-Link [2]	ms	280
Max. start time operational readiness [3]	ms	750

Table 4: Nominal Electrical Data

5.2.1 Electrical Interface

The gripping module has an M8 connector for electrical contact. The pin assignment corresponds to the IO-Link standard Class A connector. It is shown in Figure 5

⚠ **Depending on the model, the current consumption of the gripping module exceeds the 200 mA limit specified in the IO-Link 1.1 standard. It is therefore essential to check whether the IO-Link master used can permanently supply the rated current specified in Table 4**



Pin	Strand colour	Signal	Function
1	brown	L+	Power supply +24 V
2	white	RES	reserved, do not connect
3	blue	L-	Power supply 0 V
4	black	C/Q	IO-Link communication

Figure 5: Pin assignment (view of device connector)

5.3 Name Plate

The type label is located on the transverse side of the gripping module and contains the serial number and the exact type designation.

[2] Time from supply voltage >= 18V to communication readiness via IO-Link

[3] Time from supply voltage >= 18V to readiness for operation of the gripping module (without referencing)

6 Assembly and Commissioning

Risk of injury in case of unexpected movements of the machine. Disconnect the power supply during all assembly and maintenance work and ensure the module is force-free!

6.1 Mounting

The dimensions of the threads and centering holes that can be used to mount the gripping module can be found in the technical drawing. The following maximum torques and minimum screw-in depths must be observed during assembly:

Thread	M2 base jaw (steel)	M3 housing (aluminium)
Max. Torque	0.3 Nm	0.7 Nm
Minimum screw-in depth	2 mm	3 mm

Table 5: Tightening torques for screws (min. strength class 8.8)

Maximum permissible unevenness of the mounting surface: 0.02 mm

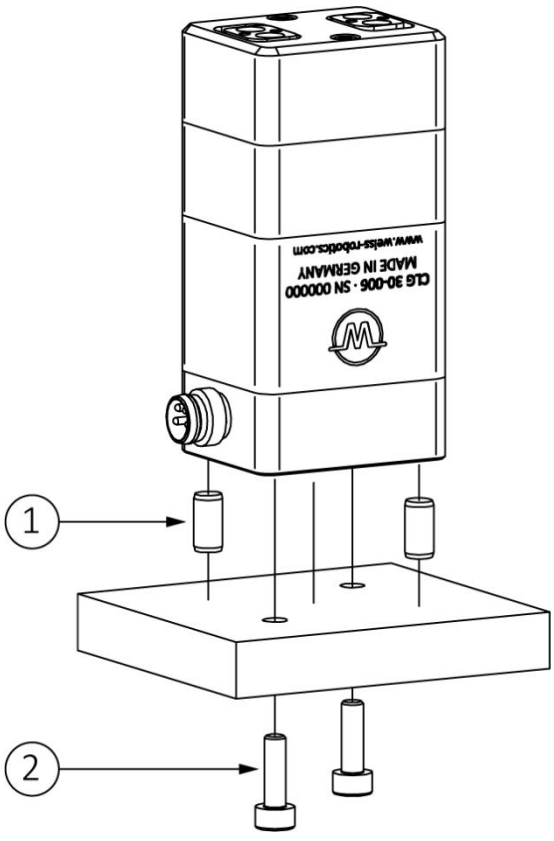


Figure 6: Mounting the gripping module

The mounting of the fingers is shown in Figure 7dowel pins must be used for mounting and are included in the accessory kit of the gripping module.

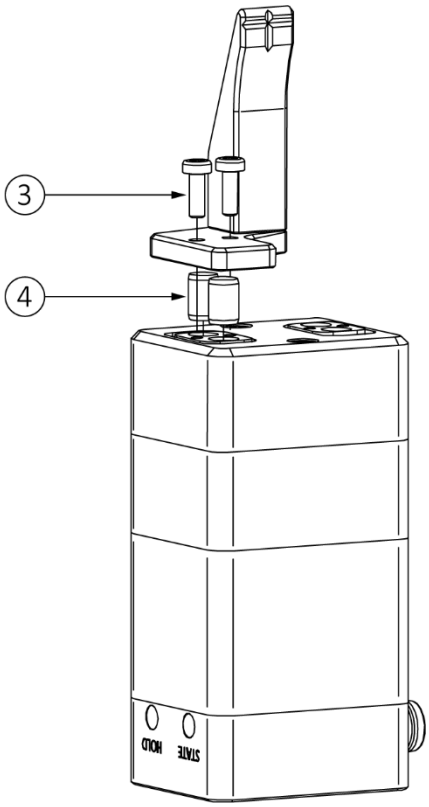


Figure 7: Mounting the fingers

The recommended mounting materials are listed in Table 6

Position	CLG 30-006
1	2 pcs. Dowel pin ISO 2338 4h8 X 6
2	2 pcs. Screw ISO 4762 M3
3	2 pcs. Screw ISO 4762 M2
4	2 pcs. Dowel pin ISO 2338 4h8 X6

Table 6: Screws and centering sleeves

7 Working Principle of the Gripping Module

The gripping modules of the CLG series are servo-electrical two-finger parallel grippers with integrated gripping control, a high-performance brushless drive and a high-resolution position measuring system. Movement and synchronisation of the base jaws, which are guided by roller bearings, are effected via pinion-rack kinematics. The pre-positioning capability of the gripper fingers as well as the innovative gripping force control allow the use in a variety of different handling applications in modern automation. Power supply and connection to the process control system are provided directly via the integrated IO-Link interface. Figure 8shows the functional structure of the CLG gripping modules.

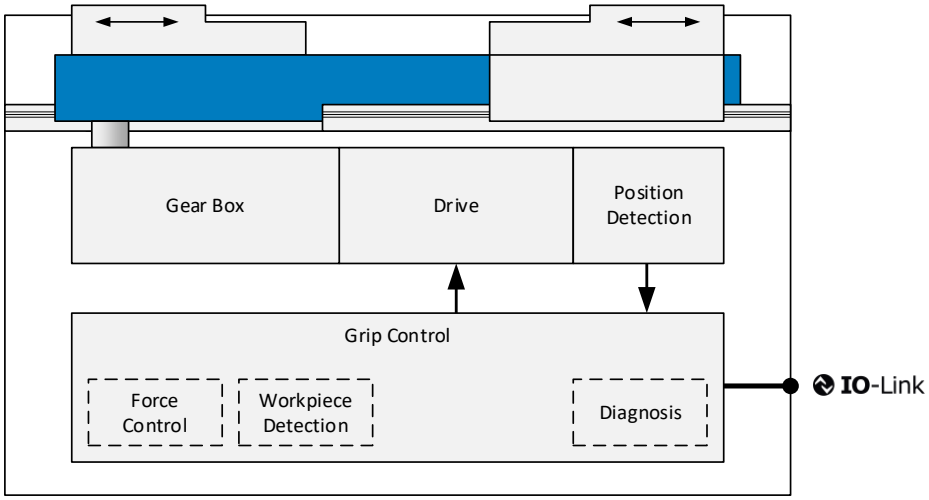


Figure 8: Functional diagram of the CLG gripping module

The integrated gripping control features highly optimized workpiece detection. Up to two different parameter sets can be configured via IO-Link to reliably grip multiple workpieces. A position window is defined for each workpiece, in which the gripper must adjust itself. If the CLG grips within this range, it changes from the state RELEASED to HOLDING, which signals a successful grip to the process control.
The CLG continuously monitors the function-relevant components such as position sensors and drive and provides detailed diagnostic information via IO-Link during operation. This helps to detect faults.
The gripping module is realized in a torsion-resistant housing made of high-strength aluminum. It has rolling bearing guided base jaws with ground finger flange.

7.1 Typical Application

Figure 9shows a typical control-side setup with gripping modules of the CLG series, as controlled via PLC or robot control and decentralized IO-Link master coupler (for example, a GRIPLINK ET-4 by Weiss Robotics). If you need assistance in selecting the IO-Link components, please contact our technical support.

⚠ **Damage to the IO-Link master possible. Make sure that the IO-Link master can permanently provide the required operating current of the gripping module.**

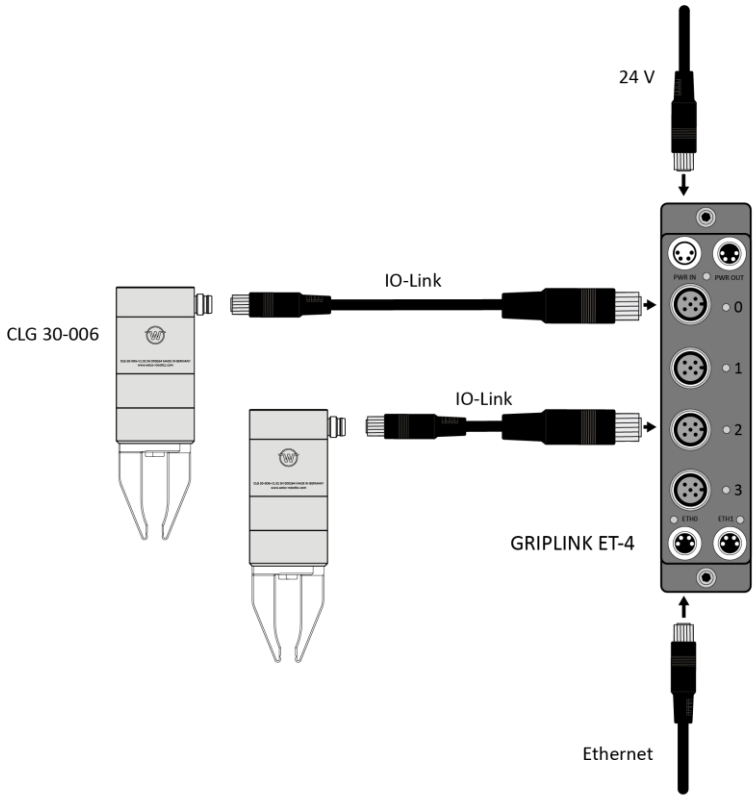


Figure 9: Typical application

7.2 Display of the Operating State

The gripping module has two status LEDs on the side, which visualize the general status (STATE) and the handling status (HOLD). The states are indicated by the display color as listed in Table 7 and Table 9, and the IO-Link connection status is indicated by flashing or steady light of the display.

STATE	Meaning
green	Ready for operation
red	Not ready / Error
LED flashes	No IO-Link communication
LED light continuously	Cyclic data exchange via IO-Link

Table 7: Signalized states LED STATE

HOLD	Meaning
On	Grip state HOLD
Off	Grip state NO PART / RELEASED / ERROR

Table 8: Signalized states LED HOLD

Example

STATE flashes red: An error has occurred and there is no IO-Link connection.

STATE permanently lights red: Error occurred and IO-Link connection established.

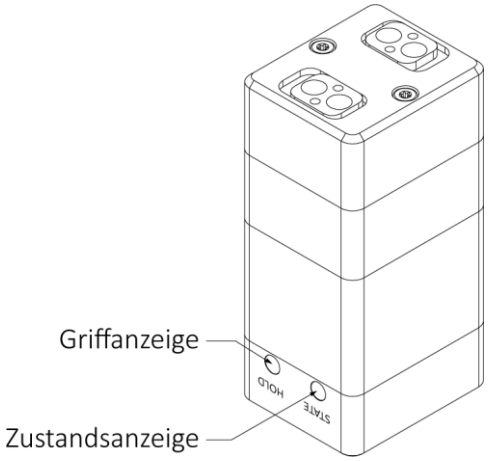


Figure 10: Display of the operating state

7.3 Volatile Configuration Memory

The gripping module has an integrated configuration memory in which the parameterization of the gripping module is stored. This memory is volatile, i. e. the configuration data stored will be lost when turning off or disconnecting the power supply. The gripping module must therefore be re-parameterized after each restart. For this purpose, common IO-Link masters can be configured in a way that the parameterization is retained in the master and automatically reloaded when the gripping module is started. Please refer to the documentation of your IO-Link master for further information.

8 Interface Description IO-Link

The interface description for the IO-Link interface is defined in the device description file (IODD file) associated with the gripping module. The device description file (IODD file) required for configuring the gripping module can be found on our website at **https://www.weiss-robotics.com/clg/** in the "Downloads" section.

8.1 Cyclic Process Data

Note the byte order. The data is transferred in big-endian format according to the IO-Link standard.

8.1.1 Output Data (IO-Link Master to Gripping Module)

Table 9 describes the cyclic process data (2 bytes) that the gripping module expects from the IO-Link master.

BYTE 0

15	14	13	12	11	10	9	8
RES					HOME	EN	CMD

BYTE 1

7	6	5	4	3	2	1	0
INDEX							

Table 9: Process data word IO-Link master to gripping module

RES - Reserved data bits (bit 15...11)

These data bits are reserved and are currently not evaluated by the gripping module. Their value should always be set to 0 by the master.

HOME - Reference gripping module (bit 10, BooleanT)

If this bit is set and the gripping module is activated (EN = 1), a reference run is performed. In normal operation, this bit must be reset. The reference run is described in chapter 9.3

EN - Activate gripping module (bit 9, BooleanT)

This bit must be set in order to be able to execute movement commands. If the bit is not set, the drive is deactivated and the fingers are force-free.

CMD - Gripping command (Bit 8, BooleanT)

This bit controls the gripping and releasing of workpieces. If the bit is set, the gripping module grips with the grip preset selected via INDEX, otherwise the gripping module releases the workpiece that has been gripped.

The actual direction of movement of the base jaws during GRIP and RELEASE is determined by the parameters RELEASE LIMIT and NO PART LIMIT, which are stored in the acyclic process parameters of the gripping module (see chapter 8.2.2).

INDEX - Grip index (Bit 7...0, UIntegerT)

The grip index identifies one out of two pre-parameterized grip presets (cf. chapter 9.5and chapter 8.2.2), which is used for the execution of the next grip command.

8.1.2 Input Data (Gripping Module to IO-Link Master)

Table 10 describes the cyclic process data word (4 bytes) that is transmitted from the gripping module to the IO-Link master.

BYTE 0

31	30	29	28	27	26	25	24
POS							

BYTE 1

23	22	21	20	19	18	17	16
POS							

BYTE 2

15	14	13	12	11	10	9	8
RES				PARTLOST	RES		

BYTE 3

7	6	5	4	3	2	1	0
RES	TEMPWARN	TEMPFAULT	FAULT	HOLDING	NO PART	RELEASED	IDLE

Table 10: Process data word gripping module to IO-Link master

POS - Current position (Bit 31...16, IntegerT)

Returns the current position of the base jaws in 1/100 mm.

RES - reserved data bits (bit 15...12)

These data bits are reserved and are currently not used by the gripping module. Their value should be ignored by the master.

PARTLOST – Lost workpiece detected (Bit 11, BooleanT)

This bit is set by the gripping module if a loss of the workpiece was detected during handling. This corresponds to a state transition from HOLDING to NO PART. The bit is automatically reset with the execution of the *RELEASE* command.

RES - reserved data bits (bit 10...7)

These data bits are reserved and are currently not used by the gripping module. Their value should be ignored by the master.

TEMPWARN - Temperature warning (Bit 6, BooleanT)

This bit is set if the temperature inside the gripping module falls below a value of 0° C or exceeds a value of 55 °C. If the module regularly exceeds the maximum temperature, the heat dissipation from the gripping module and the ambient conditions should be checked.

The bit is automatically reset when the temperature is back within the permissible range (hysteresis: 2 °C).

TEMPFAULT - Temperature error (Bit 5, BooleanT)

If the temperature inside the gripping module exceeds 70 °C, this bit is set. It is recommended to stop the gripping module immediately and to continue operation only after it has cooled down significantly. If necessary, the heat dissipation from the gripping module should be checked.

The bit is automatically reset when the temperature falls below 68 °C.

⚠ **Temperature values above 70 °C can lead to malfunctions and permanent damage to the gripping module!**

FAULT - Device error (Bit 4, BooleanT)

If this bit is set, the gripping module is in error state. More detailed information on the cause of the error can be obtained by checking the active system events (see chapter 8.3) or by evaluating the event log.

☞ **For troubleshooting see chapter 9.9.**

HOLDING - Hold (Bit 3, BooleanT)

Indicates whether a workpiece has been gripped. This is the case when the base jaws of the gripping module are blocked within the defined gripping range, i.e. between the parameterized values RELEAS LIMIT and NO PART LIMIT, and the gripping force has been built up.

NO PART - no workpiece detected (bit 2, BooleanT)

If the base jaws of the gripping module reach the parameterized value NO PART LIMIT or move beyond, no workpiece has been detected and this bit is set.

RELEASED - Gripping part enabled (bit 1, BooleanT)

If the base jaws of the gripping module reach the parameterized value RELEASE LIMIT move beyond, the workpiece is considered released and this bit is set.

IDLE - gripping module inactive (bit 0, BooleanT)

If this bit is set, the gripping module is inactive and force-free. No gripping commands can be executed.

☞ **For more information about activating the gripping module, see chapter 9.5.1.**

8.2 Acyclic Process Parameters and System Commands

For the operation of the gripping module, several acyclic process parameters can be set and queried. These process parameters include identification, configuration and diagnostic data as well as system commands. These data are addressed via index (8 or 16 bit value) and subindex (8 bit value). Some of the parameters are specified by the IO-Link standard, while other parameters are device- or manufacturer-specific or . All parameters are defined in the IO-Link Device Description (IODD) file.
The acyclic process parameters can be set and read out during configuration using a suitable configuration software. This configuration software is available from the manufacturer of your IO-Link master or fieldbus coupler. Changing parameters and issuing system commands during system operation is possible on many PLCs with pre-defined function blocks (e.g. function block IO_LINK_CALL from Siemens). For more information, please contact the manufacturer of your IO-Link master, your PLC or your fieldbus coupler.

⚠ **Acyclic process data are not stored permanently in the gripping module. They must be re-configured on the gripping module with each restart. For this purpose, common IO-Link masters offer the option of storing an image of the acyclic process data in the master and transferring it automatically when the gripping module is started. For more information, please refer to the documentation of your IO-Link master.**

8.2.1 Standardized Acyclic Process Parameters

Table 11 lists the acyclic process parameters defined in the IO-Link standard that are supported by the gripping module. More detailed information on the meaning and use of the individual parameters can be found in the IO-Link system description[4], which can be obtained from the IO-Link community.[5]

Index	Function	Access	Data type	Description
0x02	System Command	Write only	UIntegerT(8)	*Execution of system commands*
0x0C	Device Access Locks	Read/ write	RecordT	*Standardized device protection function*
0x10	Vendor Name	Read only	StringT	*Manufacturer name*
0x11	Vendor Text	Read only	StringT	*Manufacturer text*
0x12	Product Name	Read only	StringT	*Product name*
0x13	Product ID	Read only	StringT	*Product ID*
0x14	Product Text	Read only	StringT	*Product text*
0x15	serial number	Read only	StringT	*Serial number*

[4] IO-Link Interface and System Specification, Appendix B

[5] http://www.io-link.com

0x16	Hardware revision	Read only	StringT	*Hardware revision*
0x17	Firmware revision	Read only	StringT	*Firmware revision*
0x20	Error Count	Read only	UIntegerT(16)	*Number of errors since start or reset of the gripping module*
0x24	Device Status	Read only	UIntegerT(8)	*Device status*
0x25	Detailed Device Status	Read only	ArrayT of Octet-StringT3	*Detailed device status*

Table 11: Standardized process parameters

8.2.2 Device-Specific Acyclic Process Parameters

The gripping module is configured and diagnosed via device-specific acyclic process parameters. A summary of the parameters is printed in chapter 12

8.2.2.1 Motion Parameters

Override Gripping Speed in percent

Reduces or increases the gripping speed automatically calculated from the specified gripping force. The suitable gripping speed is automatically determined by the gripping module and is optimized for a hard grip (steel on steel), see chapter 5.1.2. This predefined value corresponds to an override factor of 100%. The set value applies to all grips.

⚠ **Damage to the workpiece and gripping module possible. An excessive gripping speed can result in rebound effects and increased force peaks (gripping impulse) during gripping.**

Unsteady movement ("chattering") possible if gripping speed is too low.

Address

Index 0x0040, Subindex 0x01

Data type

UIntegerT(8) - Value range: 10 to 200

Factory setting

100

Example:

Gripping with 100 % of the calculated gripping speed: Set the value to 100

Gripping with double the calculated gripping speed: Set the value to 200

Override Release speed in percent

Limits the finger speed when releasing the workpiece. By default, the workpiece is released at maximum travel speed (100%). The set value applies to all handles.

Address

Index 0x0040, Subindex 0x02

Data type

UIntegerT(8) - Value range: 10 to 100

Factory setting

100

Example:

Releasing with 10 % of the maximum speed: Set the value to 10

Releasing with maximum speed: Set the value to 100

Reverse Reference Run direction

By default, the gripping module performs its reference run (chapter 9.3) to the outside. By setting this value to "TRUE", the direction of the reference run can be reversed to make the gripping module reference to the inside.

Address

Index 0x0040, Subindex 0x03

Data type

BooleanT

Factory setting

FALSE

Example:

Referencing run to the inside: Set the value to TRUE

8.2.2.2 Grip Presets

Two grip presets can be configured. The factory settings depend on the size and are given in Table 12

Size	Limit value NO PART	Limit value PART RELEASED	Gripping force
CLG 30-006	50 (0.5 mm)	550 (5.5 mm)	100%

Table 12 : Factory settings of the grip presets

All grip presets have the parameters described below.

NO PART LIMIT

Specifies the NO PART LIMIT value for the respective grip preset. When gripping a workpiece, the gripping module tries to move the base jaws to this target position. If the base jaws block due to a workpiece between the its fingers before NO PART LIMIT position is reached, the workpiece is considered gripped (gripping state turn to HOLDING). If NO PART LIMIT position can be reached without blocking the fingers, the workpiece is considered as not gripped (gripping state turns to NO PART). The position is specified in 1/100 mm.

Address

Grip Preset 0: Index 0x0060, Subindex 0x01

Grip Preset 1: Index 0x0061, Subindex 0x01

Data type

IntegerT(16)

Factory setting

see Table 12

Example:

The nominal workpiece width when gripping from the outside is 7 mm, the tolerance is selected as 2 mm. Thus, the NO PART LIMIT must be set to 5 mm which corresponds to a value of 500.

RELEASE LIMIT

Indicates the RELEASE LIMIT for the respective grip preset. This position is approached when the workpiece is released. If it can be reached, the workpiece is considered released (gripping state RELEASED). The position is specified in 1/100 mm.

Address

Grip Preset 0: Index 0x0060, Subindex 0x02

Grip Preset 1: Index 0x0061, Subindex 0x02

Data type

IntegerT(16)

Factory setting

see Table 12

Example:

The RELEASE LIMIT value for releasing a workpiece should be 10 mm: Set the value to 1000.

Gripping Force

Specifies the required gripping force as a percentage of the nominal gripping force. The gripping speed is also determined via the gripping force, see chapter 5.1.2

The recommended minimum gripping force is 25% of the nominal gripping force. If you need to grip your workpiece with a lower gripping force, please run suitable tests with your application-specific fingers mounted. Keep batch variations in mind. If in doubt, discuss your application with our technical support team.

Address

Grip Preset: Index 0x0060, Subindex 0x03

Grip Preset: Index 0x0061, Subindex 0x03

Data type

UIntegerT(8)

Factory setting

see Table 12

Example:

Gripping with nominal gripping force: Set the value to 100

Gripping with minimum gripping force [6]: Set the value to 25

8.2.2.3 Diagnostic Parameters

Duration of the last successful gripping operation

Returns the duration of the last successful gripping operation in milliseconds.

Address

Index 0x00A0, Subindex 0x01

Data type

UIntegerT(16)

Factory setting

(not available)

Example:

The last gripping operation took 42 ms. Reading the parameter returns the value 42.

Duration of the last successful release operation

Returns the duration of the last successful release operation in milliseconds.

Address

Index 0x00A0, Subindex 0x02

[6] The recommended value for the minimum gripping force is 25%. See chapter 5.1.2.

Data type

UIntegerT(16)

Factory setting

(not available)

Example:

The last release operation took 116 ms. Reading the parameter returns the value 116.

Current Module Temperature

Returns the current temperature inside the gripping module in 1/10 °C.

Address

Index 0x00A0, Subindex 0x03

Data type

IntegerT(16)

Factory setting

(not available)

Example:

A read value of 451 corresponds to a temperature of 45.1 °C.

8.2.2.4 Protocol Memory

The protocol memory comprises ten entries that can be read out via the device-specific acyclic process parameters. All entries are identical and are structured as follows.

⚠ **The contents of the log memory are volatile and are lost when the voltage is lost or the gripping module is restarted.**

Timestamp

System time when the event occurred measured in seconds since the boot-up of the module.

Address

Index 0x0100 (oldest entry) to 0x109 (newest entry), subindex 0x01

Data type

UIntegerT(32)

Factory setting

0 (0 s)

Example:

A read-out value of 110678 indicates that the logged event occurred 110678 seconds or approximately 31 hours after the start.

Message text

Returns the message text of the log entry. This message has a maximum of 140 characters. If there is no event logged at the queried index, the string "(not set)" will be returned.

Address

Index 0x0100 (oldest entry) to 0x0109 (newest entry), Subindex 0x02

Data type

StringT(140)

Factory setting

"(not set)"

Example:

A temperature error event returns the message text "Temperature Error. Please check device ".

8.2.3 System Commands

System commands are sent by writing the corresponding code (1 byte) to index 0x02 of the standardized process parameters (see section 8.2.1). If necessary, the system commands can be sent directly via the configuration software of the IO-Link master. The available commands are listed below.

Restart the gripping module (code 0x80)

This command can be used to restart the gripping module without having to disconnect it from the power supply (warm start).

⚠ **All process parameters configured will be lost during a warm start!**

Reset to factory settings (code 0x82)

This command can be used to reset the configuration of the gripping module to factory settings.

⚠ **All changed process parameters will be overwritten by the default settings.**

8.3 System Events (IO-Link Events)

Table 13describes the system events that can be triggered by the gripping module.

☞ **For troubleshooting see chapter 11.4.**

Code	Event	Description
0x0000	No Malfunction	*No more malfunction. Previous fault conditions were resolved.*

Code	Event	Description
0x1000	General Malfunction	*General error* Is triggered when a general error occurs that cannot be specified further, e.g. in case of a restart after watchdog reset. Further information can be found in the event log, if applicable.
0x1800	Motion Fault	*Motion errors* Occurs when the base jaws do not move despite movement command because the drive is blocked or defective.
0x4000	Temperature Fault	*Temperature error* The temperature inside the gripping module exceeds 70 °C. It is strongly recommended to stop the gripping module and not to continue operating until it has cooled down significantly. If necessary, the heat dissipation from the gripping module should be checked. ⚠ **Continued operation in case of a temperature error can lead to malfunctions and permanent damage to the gripping module!**
0x4210	Device Temperature Overrun	*Temperature warning - overtemperature* The temperature inside the gripping module is above 55 °C. The heat dissipation from the gripping module should be checked.
0x4220	Device Temperature Underrun	*Temperature warning - Undertemperature* The temperature inside the gripping module is below 0 °C.
0x5010	Component Malfunction	*Malfunction of a component* Is triggered if an error occurs when starting the gripping module or during operation.
0x8C00	Technology Specific Application Fault	*Technology-specific application error* Motor current out of range or position sensor readings invalid.

Table 13: System events (IO-Link events)

9 Control of the Gripping Module

The gripping module is controlled via a standardized data format according to IO-Link specification V1.1 (IEC 61131-9). This is a powerful point-to-point communication in which the process data is exchanged cyclically between the IO-Link master and the gripping module.
The gripping module is also parameterized via IO-Link and can either be configured using the project planning software of the IO-Link master or using the separately available GRIPLINK-U1 device configurator from Weiss Robotics.

☞ **The device description file (IODD) file required to configure the gripping module can be found on our website at https://www.weiss-robotics.com/clg/.**

☞ **A configuration example based on Siemens TIA Portal can be found in chapter 12**

9.1 Gripping Commands

The movement of the base jaws is controlled via the command bits of the cyclic process data. The following commands are available:

ENABLE

The gripping module is activated and the drive is switched on. The selected GRIP, RELEASE or REFERENCE command will be executed.

DISABLE

The gripping module is deactivated and the drive is switched off. The base jaws are force-free.

RELEASE

The jaws are opened and the workpiece will be released.

GRIP

The jaws are closed and the workpiece will be gripped.

HOME

The gripping module will be referenced

The direction of movement of the base jaws when gripping and releasing is determined by the parameterization of the grip preset.

After starting the gripping module, the drive is initially deactivated and the base jaws are force-free. To move the base jaws, the gripping module must be activated and referenced. Only then can the gripping and releasing commands be executed.

9.2 Position sensors

The gripping module has an integrated position measuring system with which the position of the base jaws is measured relatively. The position value corresponds to the distance between the two base jaws, with the inner stop corresponding to the value 0 mm. Figure 11shows the relationship between position value and position of the base jaws. The current position value is transmitted in the cyclic process data.

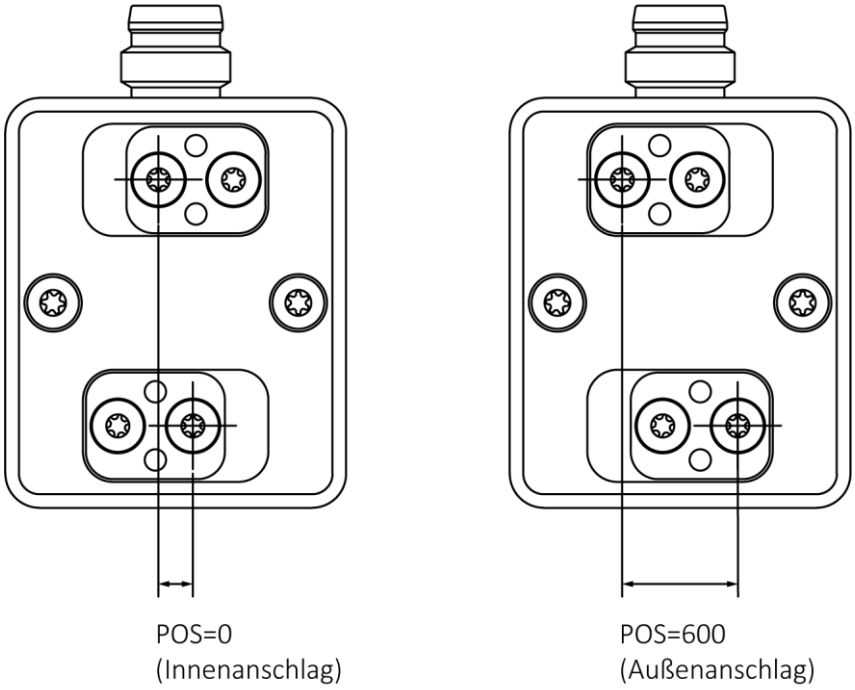


Figure 11: Position value of the CLG 30-006

9.3 Reference Run

Due to the relative position measuring, the finger position is yet unknown when the gripping module is switched on. The module must be referenced before it can execute movement commands. During the reference run, the gripping module moves the base jaws to the outer stop with a defined force and speed and uses the position reached as a reference value from then on.

⚠ **During the reference run, keep the traversing range of the fingers free in order to avoid collisions and incorrect referencing.**

If an individual application makes it impossible to move the base jaws to the outer limit, e.g. because a collision with the workpiece or the environment would occur, the referencing direction can be reversed as described in chapter 8.2.2.1and the inside stop can be used instead.

9.4 Gripping State

The gripping module provides the so-called gripping state for detecting end positions and gripped/ungripped workpieces. The gripping state is generated by the integrated workpiece detection and transmitted to the process control via the cyclic process data. It can be used for the sequence control of the handling process. Table 14 lists the possible gripping states. Immediately after startup, the module is in a special "NOT INITIALIZED" state, which is not reached during normal operation. The module remains in this state until a reference run has been initiated.

State	Status flag	Description
NOT INITIALIZED	**all flags = 0**	**Initial state** The gripping module has been switched on and is waiting for the command to perform the reference run.
IDLE	**IDLE = 1**	**Gripper is idle** The gripping module is inactive and the fingers are force-free.
RELEASED	**RELEASED = 1**	**Part released** The workpiece is released, i.e. the parameterized RELEASE LIMIT has been reached. The base jaws remain position-controlled with reduced force.
NO PART	**NO PART = 1**	**No part gripped** No workpiece was detected during gripping, i.e. the parameterized NO PART LIMIT has been reached. The base jaws remain position-controlled with reduced force.in this position with reduced force.
HOLDING	**HOLDING = 1**	**Part is held** The gripping module has been blocked between the RELEASE LIMIT and the NO PART LIMIT position and the base jaws do not move. The workpiece is held with the set force, the workpiece monitoring is activated.
ERROR	**FAULT = 1**	**An error has occurred** An internal error has occurred that prevents the gripping module from functioning correctly. For error reasons, see chapter 11.4. In addition, a corresponding system event is triggered, see Table 13.

Table 14: Gripping states

In regular operation, depending on the last executed command and the current position of the base jaws, one of four gripping states can be reached: IDLE, RELEASED, NO PART or HOLDING. The FAULT state indicates a device error. The possible transitions between the states are shown in Figure 12.
A state transition is initiated by the gripping commands GRIP/RELEASE and ENABLE/DISABLE, which are set by the master via the cyclic process data. If the gripping module receives a new command, it is executed and, depending on the result, the gripping state changes accordingly. Each command leads to a change of state, so that the completion of a command can be detected by waiting for a change of state.
The gripping state thus provides a simple way of mapping the gripping process into the higher-level controller. After triggering a new gripping command, it is only necessary to wait for the change in the gripping state

in order to detect the correct or incorrect execution of the command and to execute the next process step accordingly.

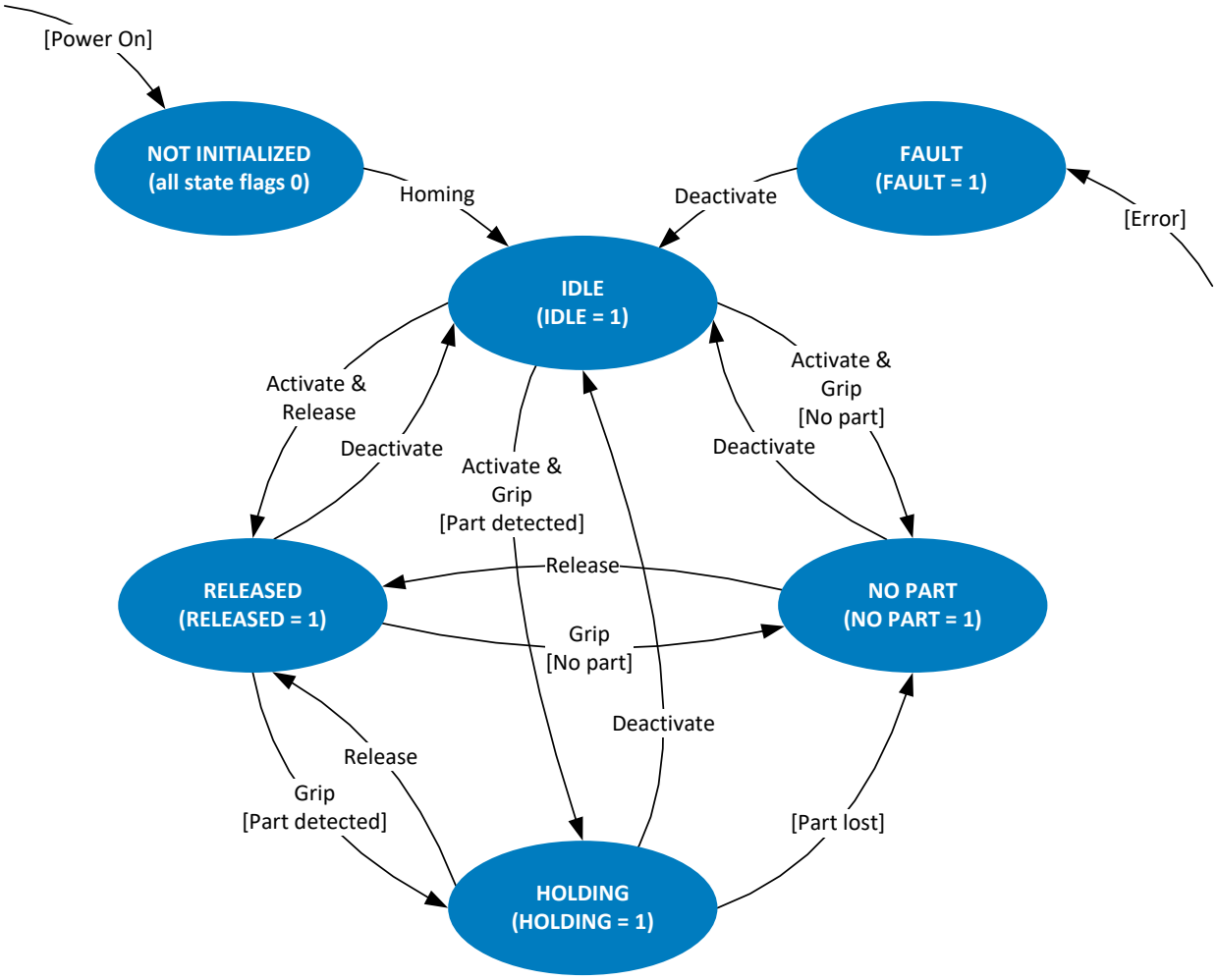


Figure 12: Gripping state

9.5 Parametrizable Grip Presets

A total of two different grip presets can be parameterized for gripping different workpieces. The grip preset is selected via the grip index value transferred in the cyclic process data and executed with the gripping commands GRIP or RELEASE.

For parameterization, a position window is specified for each grip preset by the values RELEASE LIMIT and NO PART LIMIT, in which the workpiece must be located, as shown in Figure 13. If the base jaws block within this window when gripping, the gripping module recognizes a valid grip and changes to the gripping state HOLDING. If, on the other hand, the base jaws reach the specified NO PART LIMIT value, the gripping state changes to NO PART to indicate that no workpiece was gripped. In case of RELEASE, the gripping state changes to RELEASED as soon as the RELEASE LIMIT position is reached. If the RELEASE LIMIT is not reached, the gripping state changes to ERROR.

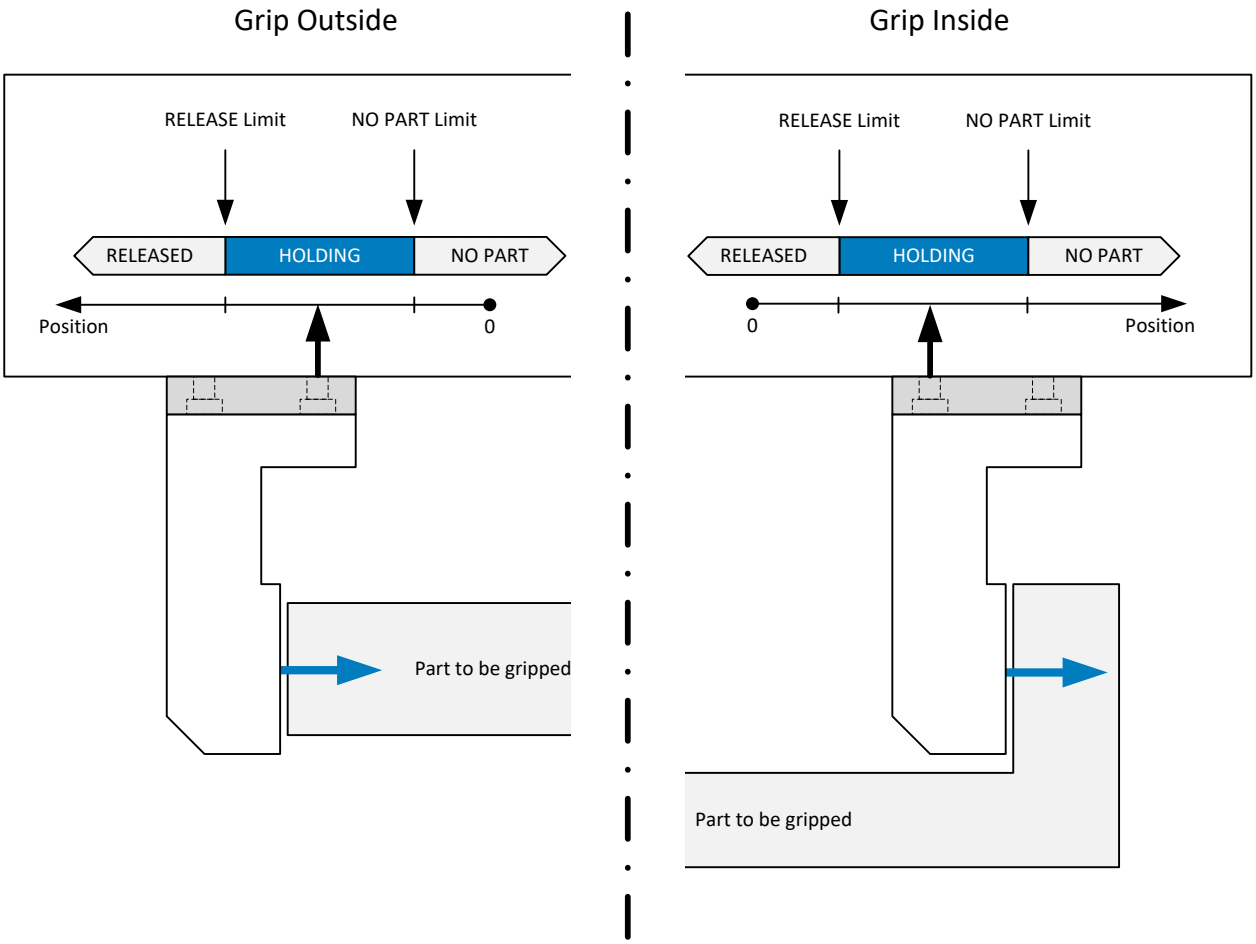


Figure 13: Gripping range and direction of grip

If the base jaws block outside the position window, e. g. at the end stop of the movement, the workpiece is considered to be released or no part was detected, depending on the direction of movement.

Danger of collision. If the gripping range is not large enough, workpieces that are too small or too large may be gripped, although the gripping state is NO PART or RELEASED. If in doubt, please evaluate the current jaw position.

9.5.1 Gripping Direction

The gripping direction is determined by the RELEASE LIMIT and the NO PART LIMIT position values: If the position for the NO PART LIMIT is smaller than that for the RELEASE LIMIT, the gripping module grips to the inside (Figure 13, "Grip Outside"). If the position for the NO PART LIMIT is larger than that for RELEASE LIMIT, the gripping module grips to the outside (Figure 13, "Grip Inside ").

9.6 Initialize gripping module and perform a reference run

After switching on the power supply, the gripping module is in the NOT INITIALIZED state. In this state, the fingers are force-free and the gripping module waits for the command for the initial reference run. The reference run is performed according to Figure 14.

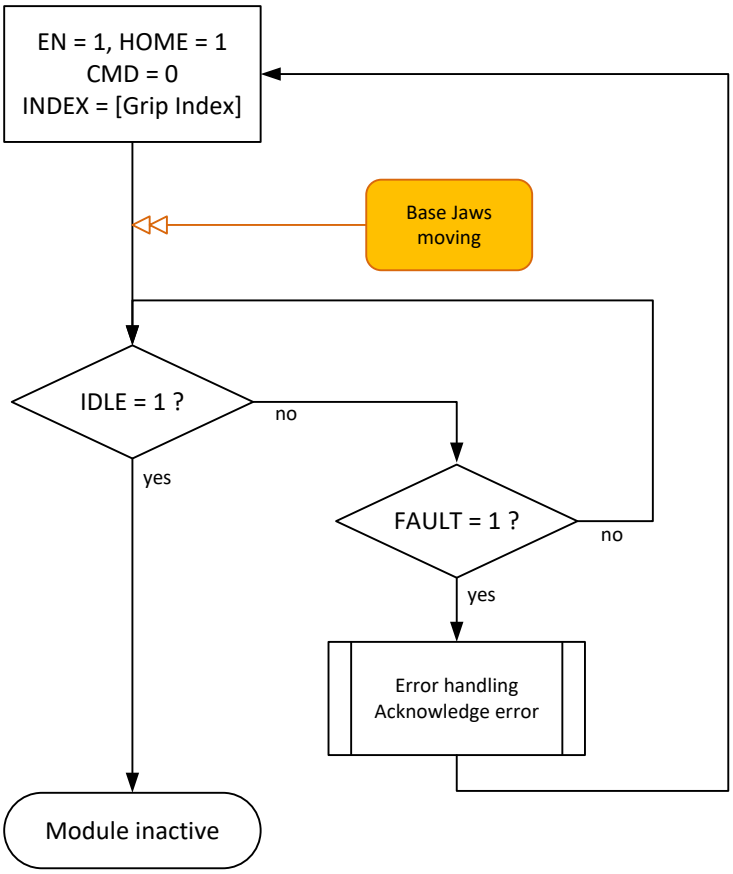


Figure 14: Initialization of the gripping module

The reference run can be interrupted at any time by resetting the EN bit. Then the gripping module remains in the NOT INITIALIZED state. If the reference run was completed successfully, the gripping module changes to the IDLE state. After resetting the HOME bit, the command selected by the CMD bit will be executed.
If an error occurs during referencing, the FAULT state will be set. This can be acknowledged by resetting the module with EN = 0 and HOME = 0. The gripping module then changes back to the NOT INITIALIZED state (all status flags are reset). Once this state has been reached, the reference run can be executed again.

The reference run can also be performed during regular operation by setting the HOME bit. In this case, the gripping state will be set to NOT INITIALIZED during the reference run.

9.7 Grip Part

The program sequence for gripping a part is shown in Figure 15. The gripping module must be initialized and enabled (see chapter 9.5.1). The grip preset is selected via the grip index and initiated by setting the CMD

flag. The gripping direction depends on the parameterization of the selected grip preset. The end of the gripping process or a possible error can be determined by continuously checking the gripping state. If the configured NO PART LIMIT position is reached, no part was gripped and the base jaws remain in this position.
If an error has occurred during gripping, it must be acknowledged as described in chapter 9.9

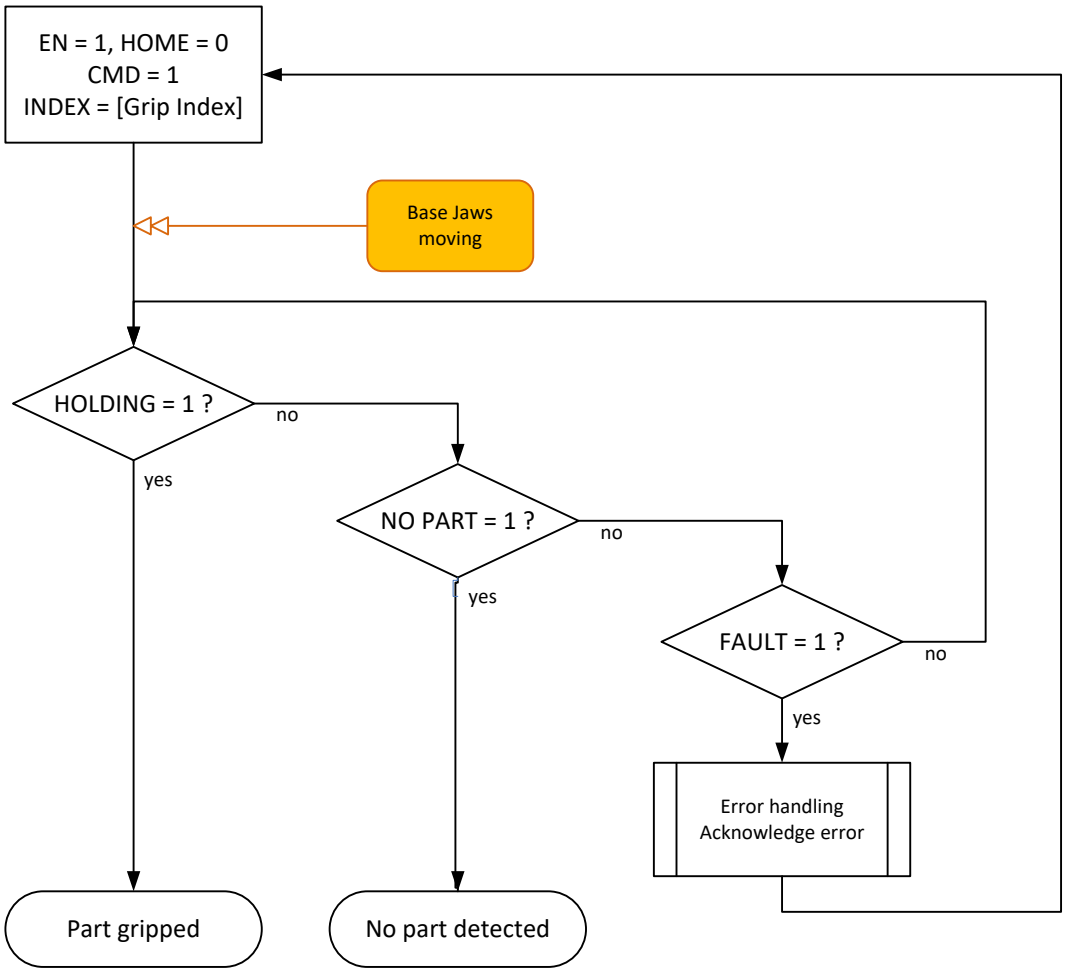


Figure 15: Gripping program sequence

9.8 Release Part

In order to release a previously gripped workpiece or to open the fingers after an unsuccessful grip, the program sequence in Figure 16 must be executed. Releasing is initiated by resetting the CMD flag to 0. The direction of movement depends on the selected grip preset. The grip index value should not be changed during holding (grip index during release = grip index during gripping).

To switch between different grip presets, first release the workpiece and then change the grip index value.

The workpiece is considered released (state transition from HOLDING to RELEASED) as soon as the base jaws have reached the RELEASE LIMIT position. The base jaws remain in this position, position-controlled but with reduced force.

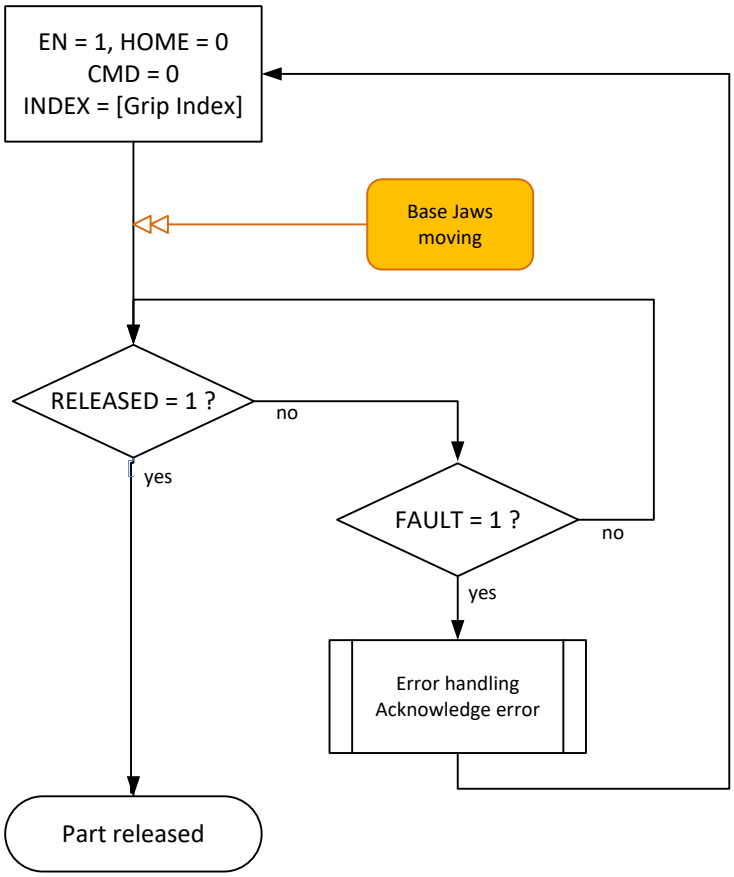


Figure 16: Program flow release part

9.9 Troubleshooting

If the gripping module is in the FAULT state during normal operation, an internal error has occurred that prevents the correct function of the gripping module. Possible error causes are listed in chapter 11.4In addition to theFAULT state, a corresponding system event is triggered that describes the cause of the error in more detail, see Table 13.

To acknowledge an error, the gripping module must be disabled and then enabled again.

Figure 17 shows the required program sequence for acknowledging an error. If the error cannot be acknowledged, try to restart the gripping module by interrupting the power supply. If the error persists, contact Weiss Robotics technical support. There may be a defect in the gripping module.

Possible loss of workpieces. Move the module into a safe position before acknowledging the error.

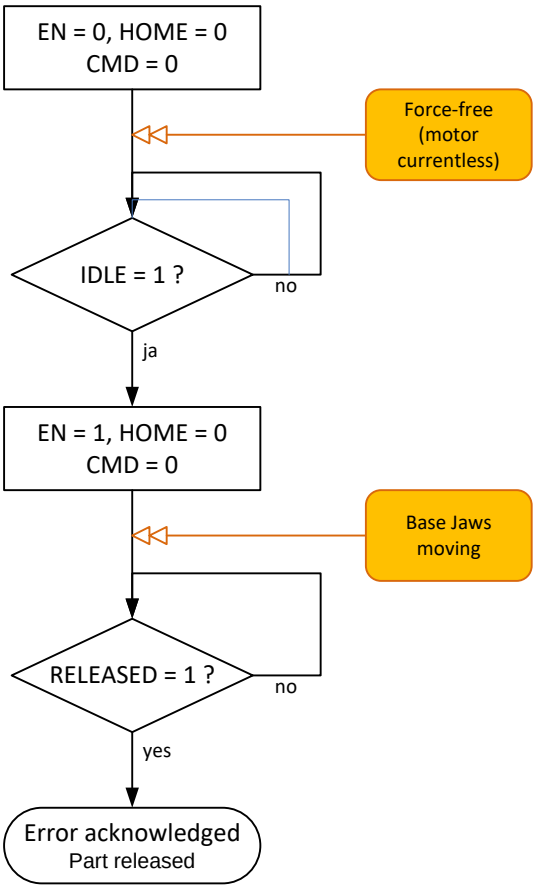


Figure 17: Program sequence acknowledging an error and releasing a workpiece

9.10 Activating and Deactivating the Module (Setup Mode)

Especially while setting up the gripping process, it can be useful to deactivate the gripping module. The fingers are then force-free, but the logic of the gripping module and the position detection are still active. In this way, for example, gripping positions can be taught manually or workpieces can be removed manually. The control sequences for the two states are shown in Figure 18.

⚠ **Always observe the safety instructions when working directly on the gripping module.**

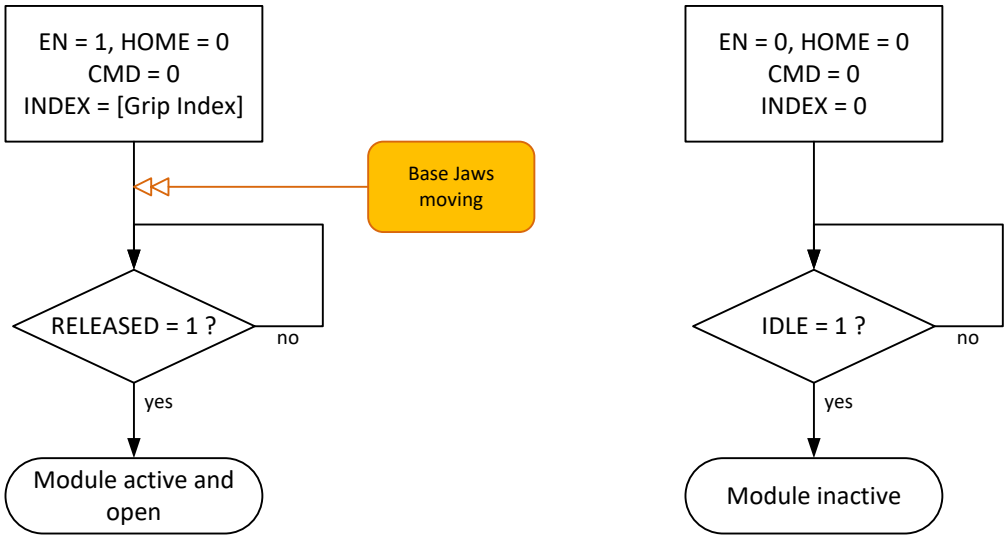


Figure 18: Activating (left) and deactivating (right) the gripping module program sequence

9.11 Design of the Gripping Process

The design of the gripping process is decisive for the reliability of the production process. The following points have proven to be helpful:

- Place the gripping point in the center of the stroke range of the base jaws by constructively designing the fingers, if the process allows it.
- If possible, secure the position of the workpiece by establishing a form-fit connection between the fingers and the workpiece.
- Avoid inaccuracies in the contact with the part by constructing the contact areas accordingly.
- Use a compensatory element if lateral forces can occur on the gripping module due to gripping or positioning tolerances. This is the case, for example, if a clamped workpiece is to be picked up by a gripping module positioned by a robot.
- Choose a sufficiently large gripping range (recommended distance between RELEASE LIMIT and NO PART LIMIT ≥ 2 mm) to maximize the reliability of the gripping process.
- Always maintain a distance to the inner and outer limit with the positions for RELEASE LIMIT and NO PART LIMIT, so that a safe detection of the grip is possible and the gripping module does not grip itself.
- During holding, the continuous application of the gripping force generates heat that must be dissipated from the gripping module. Make sure that the mounting surface has sufficient heat dissipation. Avoid permanent holding and do not block the fingers beyond the actual gripping process (e.g. by setting the RELEASE LIMIT value outside the stroke range) in order not to heat up the module unnecessarily..
- Perform some empty strokes over the entire range of motion every 1000 gripping cycles to distribute the lubricant in the linear guides.

The following application examples describe the implementation of simple handling tasks and the associated parameterization and use of the gripping module via IO-Link.

9.11.1 Application Example External Gripping

Figure 19 shows an example of external gripping with the CLG 30-006 gripping module. A syringe base body is to be gripped and placed in a fixture. The syringe has a nominal diameter in the gripping area of 5 mm. The gripper fingers were designed so that the nominal diameter corresponds to a jaw distance on the gripping module of 5.5 mm. To ensure the reliability of the gripping process, a position tolerance of ±0.2 mm is specified. Due to the low weight of the workpiece, a gripping force of 15 N is specified. For the CLG 30-006, this corresponds to a force setting of 50%. The part is parameterized as GRIP 0 of the gripping module. For this purpose, the following parameters are set either via the configuration software of the IO-Link master or via the GRIPLINK-U1 device configurator available from Weiss Robotics:

GRIP 0:

NO PART LIMIT(Index 0x60, Subindex 0x01):	120	(= 1.20 mm)
RELEASE LIMIT (Index 0x60, Subindex 0x02):	370	(= 3.70 mm)
Gripping force (index 0x60, subindex 0x03):	50	(= 50%, corresponds to 15 N)

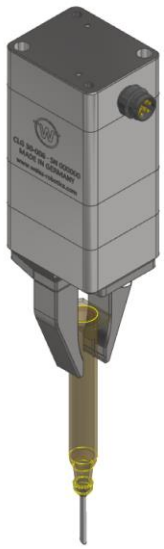


Figure 19: Gripping example external gripping

If the gripping module was restarted, it must first be referenced. In this example, a reference run to the outside makes sense (factory setting). The gripping module is initialized via the program sequence in Figure 14. The gripping process is executed via the program sequences in Figure 15 (gripping part) and Figure 16(releasing part). Since GRIP 0 has been configured, the grip index 0 is to be used in the program sequence. The gripping state is also visualized via the status display on the gripping module: In HOLDING state, the LED HOLD lights up permanently.

9.11.2 Application Example Internal Gripping

In an assembly process, a CLG 30-006 is to be used to pick up and insert a protective cover. Since the bushing is to be inserted into a recess, it must be gripped on the inner surface. The gripping application is shown in Figure 20. The illustration of the attachment to the movement axes and any compensating elements has been omitted here. The cover with an inner dimension of 25 mm is gripped using the standard fingers (Figure 20).

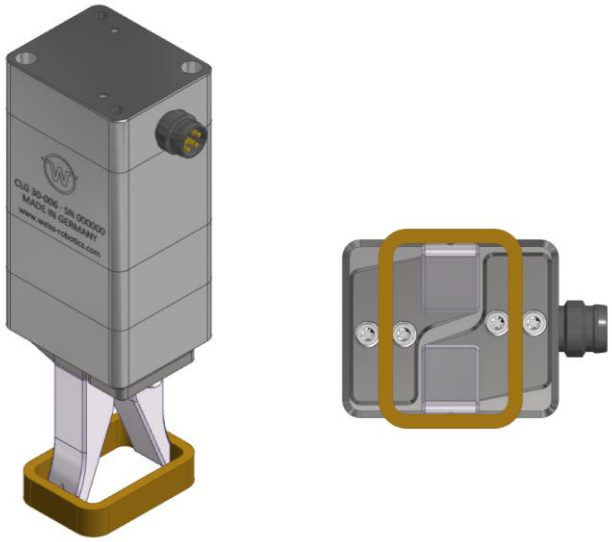


Figure 20: Application example internal gripping

The gripper fingers are designed to hold the workpiece at a jaw position of 0.2 mm. To ensure the reliability of the gripping process, a position tolerance of ±0.1 mm is specified. Gripping is to be performed with nominal gripping force.
Since GRIP 0 is already occupied, the part is configured as GRIP 1 of the gripping module. For this purpose, the following parameters are set either via the configuration software of the IO-Link master or via the GRIPLINK-U1 device configurator available from Weiss Robotics:

GRIP 1:

NO PART LIMIT (Index 0x61, Subindex 0x01):	30	(= 0.3 mm)
RELEASE LIMIT (Index 0x61, Subindex 0x02):	0	(= 0 mm)
Gripping force (Index 0x61, Subindex 0x03):	100	(= 100%, corresponds to 30 N)

If the gripping module has been restarted, it must first be referenced. In this example, referencing to the outside makes sense (= factory setting), since the fingers slightly overhang the inner edge of the base jaws. This would result in referencing to the inside of the mounted gripper fingers, and the position value would be subject to an offset. The initialization of the gripping module is carried out via the program sequence in Figure 14. To grip the workpiece, the program sequence in Figure 15executed on the control side. With the

GRIP command, the fingers move apart, since the NO PART LIMIT value is greater than the RELEASE LIMIT value. To release the workpiece, execute the program sequence in Figure 16. Since GRIP 1 has been configured in this example, grip index 1 must also be used when executing the above program sequences. The gripping state is visualized via the HOLD display on the gripping module.

10 Maintenance and cleaning

Maintenance interval: every 2 million cycles
Maintenance scope: Cleaning of the movement apparatus and inspection of the gripping module.

Clean the gripping module at regular intervals with a damp cloth to remove all dirt.

⚠ **The gripping module is adjusted at the factory. Do not disassemble base jaws and belts!**

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. vapours, acids, etc.)

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

11 Troubleshooting

11.1 Base jaws do not move

Possible cause	Remedy
Operating voltage too low or power supply insufficient	• Check power supply • Check power supply requirements
No communication with the gripping module possible (status display on the gripping module flashes)	• Check communication cable and connections • Check compatibility with the IO-Link master (gripping module only supports V1.1 master)
Error message in the system	• Checking the operating status of the gripping module • Gripper module reports an error -> section 11.4 • Restart the gripping module, in case of repeated error send the gripping module with a repair order to Weiss Robotics for repair.
Failure of a component, e.g. due to overload	• Send 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.

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

Possible cause	Remedy
Parameterization incorrect	• Check parameterization
Power supply interrupted	• Check power supply
No communication with the gripping module possible	• Check communication cable and connections
Error message in the system (status indicator on the gripping module lights up red)	• Checking the operating status of the gripping module • Gripper module reports an error -> section 11.4
Foreign objects in the movement system or module soiled	• With the gripping module switched off, check the mobility by moving the fingers by hand. • Remove foreign objects • Perform cleaning and maintenance
Uneven mounting surface	• Check the evenness of the mounting surface

11.3 No communication with the gripping module

Possible cause	Remedy
Power supply interrupted	• Check power supply
IO-Link connection cannot be established	• Check communication cable and connections • Check compatibility with the IO-Link master (gripping module only supports V1.1 master)

Status indicator flashes	• No IO-Link communication with the master. Check settings of the master/configuration

11.4 The gripping module reports an error

The status display lights up or flashes red. The gripping module has triggered a system event (IO-Link event according to Table 13).

Error code from the gripping module	Remedy
Motion error	Occurs when the base jaws do not move despite a movement command. If this error occurs repeatedly, there is a defect in the drive. Send the gripping module with a repair order to Weiss Robotics for repair.
Temperature fault	The temperature inside the gripping module exceeds 70 °C. **It is strongly recommended to stop the gripping module and to continue operating it only after it has cooled down significantly.** • Check environmental conditions • Improve heat dissipation • Shorten holding cycles or reduce gripping force • Make sure that the base jaws are at a distance from the end stop in the RELEASED state. • Reduce heat input from outside. The error will by reset automatically when the gripping module has cooled down. The gripping module remains ready for operation, even if further operation is not recommended.
Component Malfunction	At least one component of the controller required for operation could not be initialized. • Restart the gripping module. If the error persists, send the gripping module in with a repair order.
General error	Restart by watchdog reset • Acknowledge error. If error occurs regularly, contact technical support.
Technology-specific application error	Motor current out of range or position sensor readings invalid. • Restart the gripper. If the error persists, send the gripping module in with a repair order.

Error handling see chapter 9.5.1.

12 ANNEX A - Equipment specific process parameters

Table 15 lists the device-specific process parameters of the gripping module. A detailed description can be found in chapter 8.2.2.

Index	Function	Access	Subindex	Data type	Description	Factory setting
0x40	Motion parameters	Read/write	1	UIntegerT(8)	*Override gripping speed in percent*	100
		Read/write	2	UIntegerT(8)	*Override release speed in percent*	100
		Read/write	3	BooleanT(8)	*Reverse reference run direction*	false
0x60	Grip 0	Read/write	1	IntegerT(16)	*NO PART LIMIT in 1/100 mm*	see Table 12
			2	IntegerT(16)	*RELEASE LIMIT in 1/100 mm*	
			3	UIntegerT(8)	*Gripping force in percent*	
0x61	Grip 1	Read/write	1	IntegerT(16)	*NO PART LIMIT in 1/100 mm*	
			2	IntegerT(16)	*RELEASE LIMIT in 1/100 mm*	
			3	UIntegerT(8)	*Gripping force in percent*	
0xA0	Diagnosis	Read only	1	UIntegerT(16)	*Duration of the last successful gripping process in milliseconds*	-
			2	UIntegerT(16)	*Duration of the last successful release process in milliseconds*	-
			3	IntegerT(16)	*Current module temperature in 1/10 °C*	-
0x100	Protocol Entry 0	Read only	1	UIntegerT(32)	*Time stamp measured in seconds from switch-on time*	0
			2	StringT(140)	*Message text (max. 140 characters)*	"(not set)"
…						
0x109	Protocol Entry 9	Read only	1	UIntegerT(32)	*Time stamp measured in seconds from switch-on time*	0
			2	StringT(140)	*Message text (max. 140 characters)*	"(not set)"

Table 15: Device-specific process parameters

13 ANNEX B - Project Configugration Example

The following section describes the configuration of Integration Line gripping modules via IO-Link using a suitable IO-Link master on a PLC.

Components used

- PLC SIEMENS Simatic S7-1500 1511C-1 PN, part no. 6ES7 511-1CK01-0AB0
- IO-Link master SIEMENS ET200eco-PN, part no. 6ES7 148-6JD00-0AB0
- Engineering software SIEMENS TIA Portal / STEP 7 Professional V15.1
- Port configurator SIEMENS S7-PCT 3.5 HF2

Requirements

This example assumes that the PLC has been commissioned and set up to the extent that it can be accessed using the TIA Portal. The configuration software and port configurator must be installed. The basic handling of the TIA Portal should be mastered. Furthermore, it is assumed that the gripping module is completely wired to the IO-Link master. Information on the pin assignment can be found in chapter 5.2.1.

13.1 Preparation

Create a new project in the TIA Portal and configure the PLC. Set the IP address of the PLC so that you can access the PLC via PROFINET. Then configure the ET200eco PN IO-Link master (see Figure 21).

The IO-Link master maps the cyclic process data of the gripping module in the I/O address range of the PLC. The address range is assigned automatically during project planning and can be taken from the device configuration.

13.2 Configuration of the IO-Link master

In the configuration view, the S7-PCT port configurator can be started by right-clicking on the configured IO-Link master (Figure 22).
In S7-PCT, the device description file (IODD file) of the gripping module must first be imported (menu item "Extras" -> "Import IODD"). The gripping module then appears in the device catalog on the right. Using "Drag & Drop", the suitable gripping module can now be dragged from the catalog to the IO-Link port of the master to be used (Figure 23).
Clicking the "Load" button in the S7-PCT toolbar transfers the port configuration to the IO-Link master. The IO-Link master now establishes a connection to the gripping module. The corresponding LEDs on the IO-Link master change to green, the "State" display on the gripping module changes from flashing green to permanently lit green.

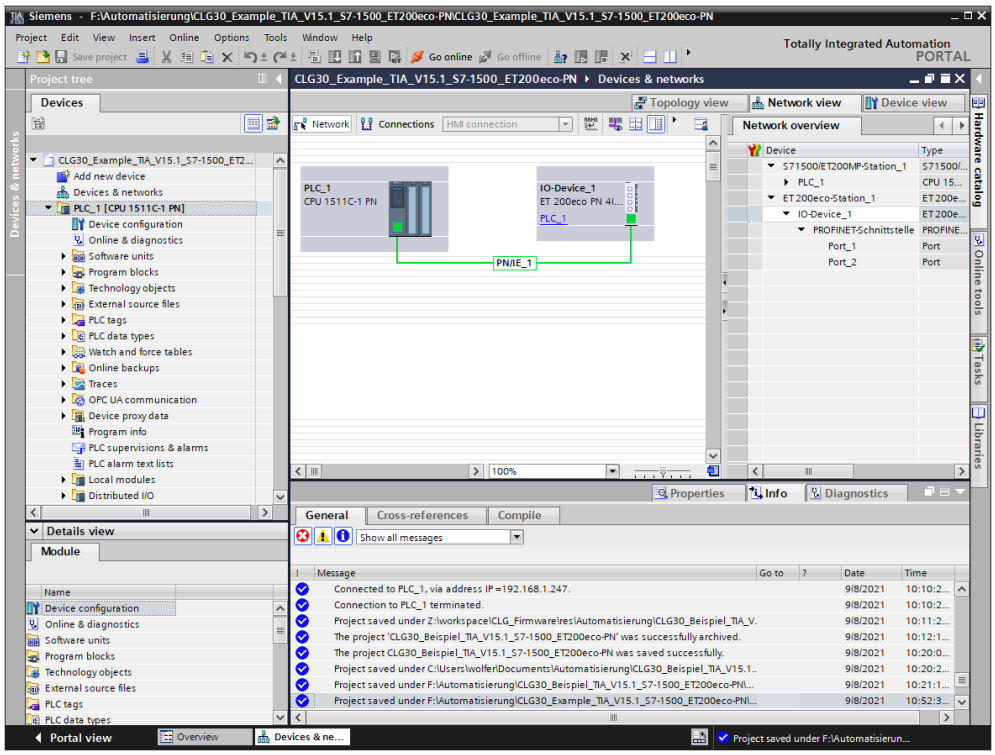


Figure 21: Configuration of the IO-Link master

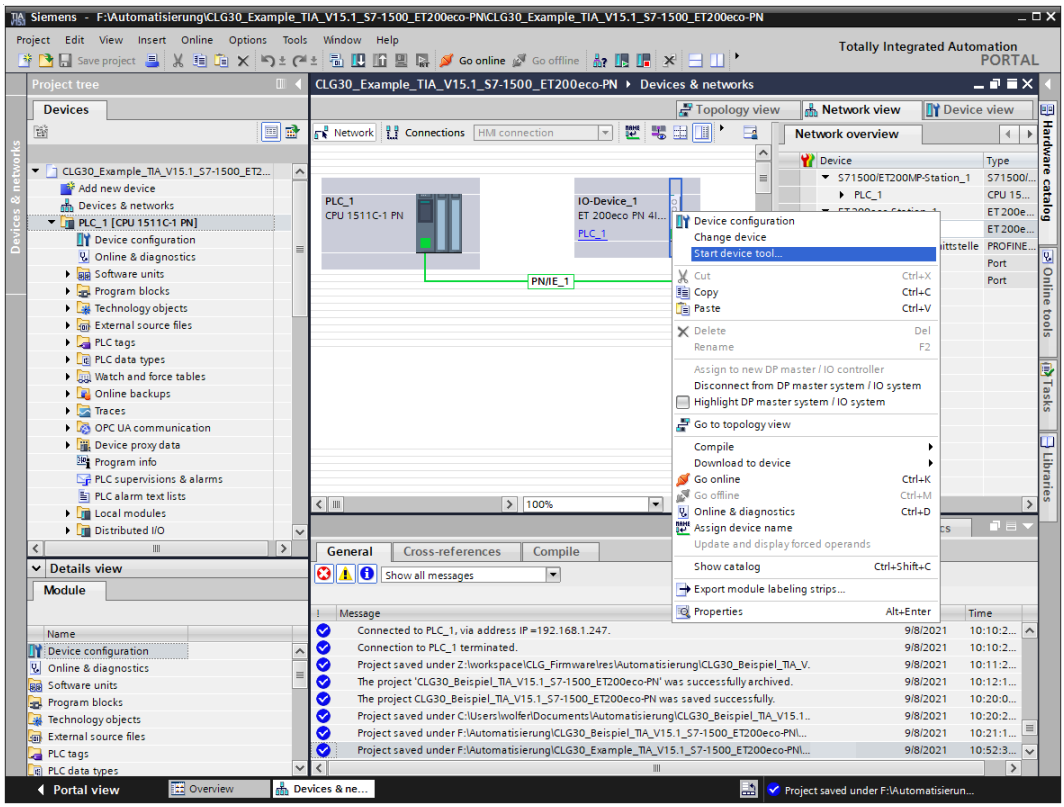


Figure 22: Starting the S7-PCT Port Configurator (Device Tool)

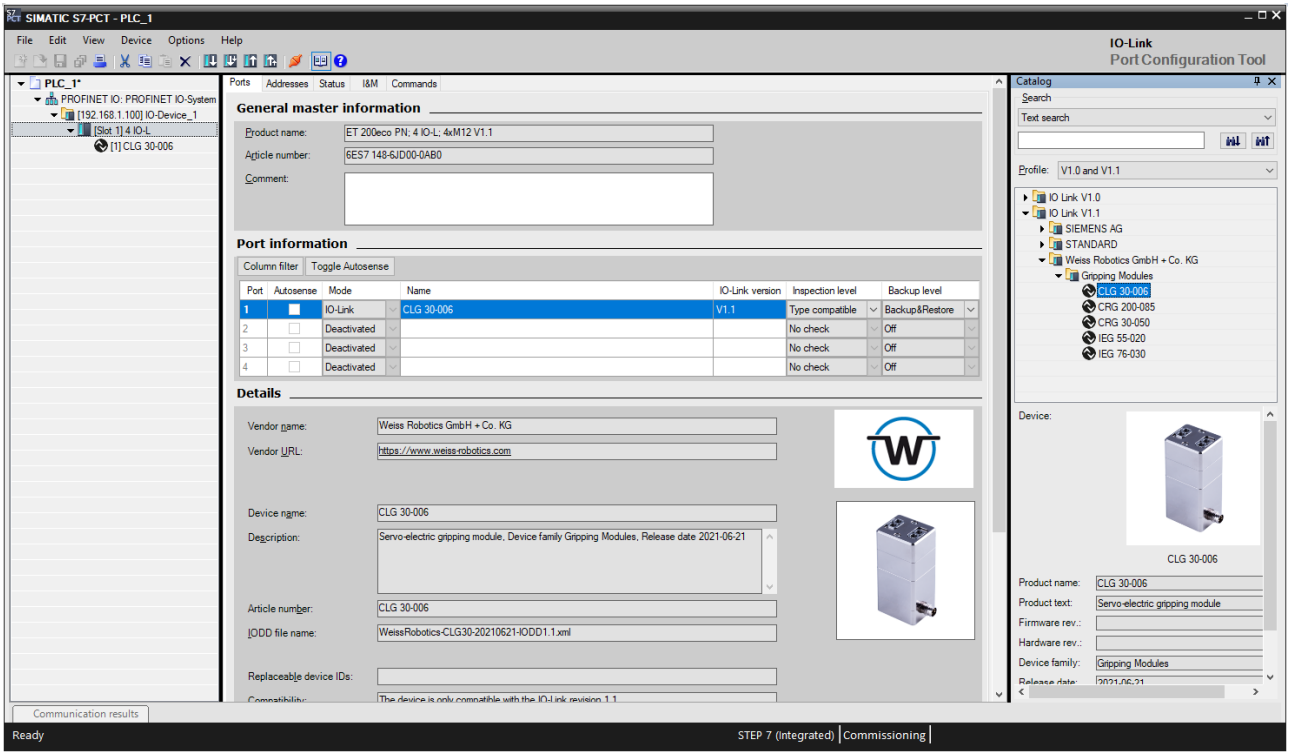


Figure 23: Configuration of the IO-Link port

13.3 Configuration of the gripping module

The gripping module can now be configured via the S7-PCT port configurator. By clicking the "Online" button (IO-Link port selected in the selection tree on the left), the port configurator establishes a connection to the IO-Link master. Selecting the gripping module in the tree view on the left loads the configuration of the gripping module. The "Identification", "Parameters" and "Diagnostics" tabs appear.

The "Identification" tab (Figure 24) shows the manufacturer, type description, firmware version, etc. of the gripping module. This information can only be read.

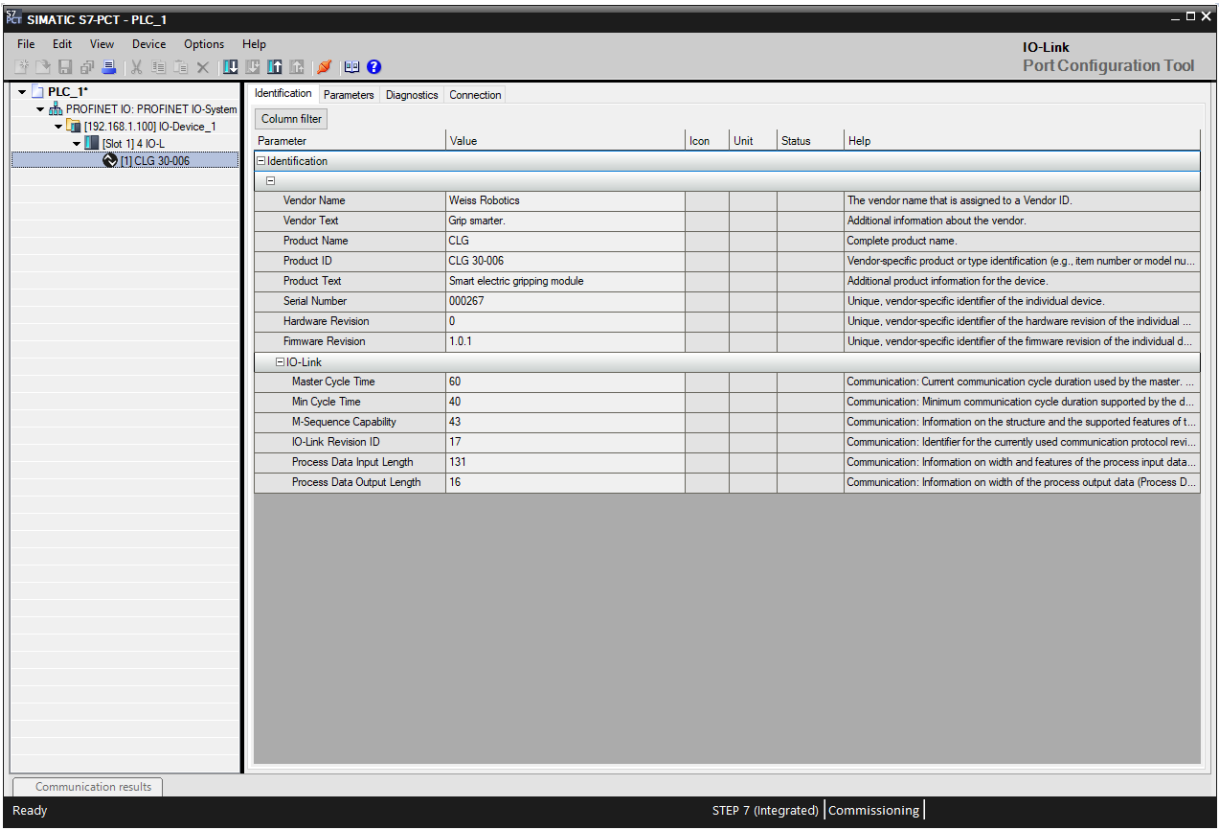


Figure 24: Identification of the gripping module in S7-PCT

13.4 Configuration of the Gripping Module

The "Parameters" tab (Figure 25) shows the set gripping parameters of the available grip presets. These values can be adjusted to the handling task to be performed.
System commands can be started via buttons, for example to reset the gripping module to the delivery state.

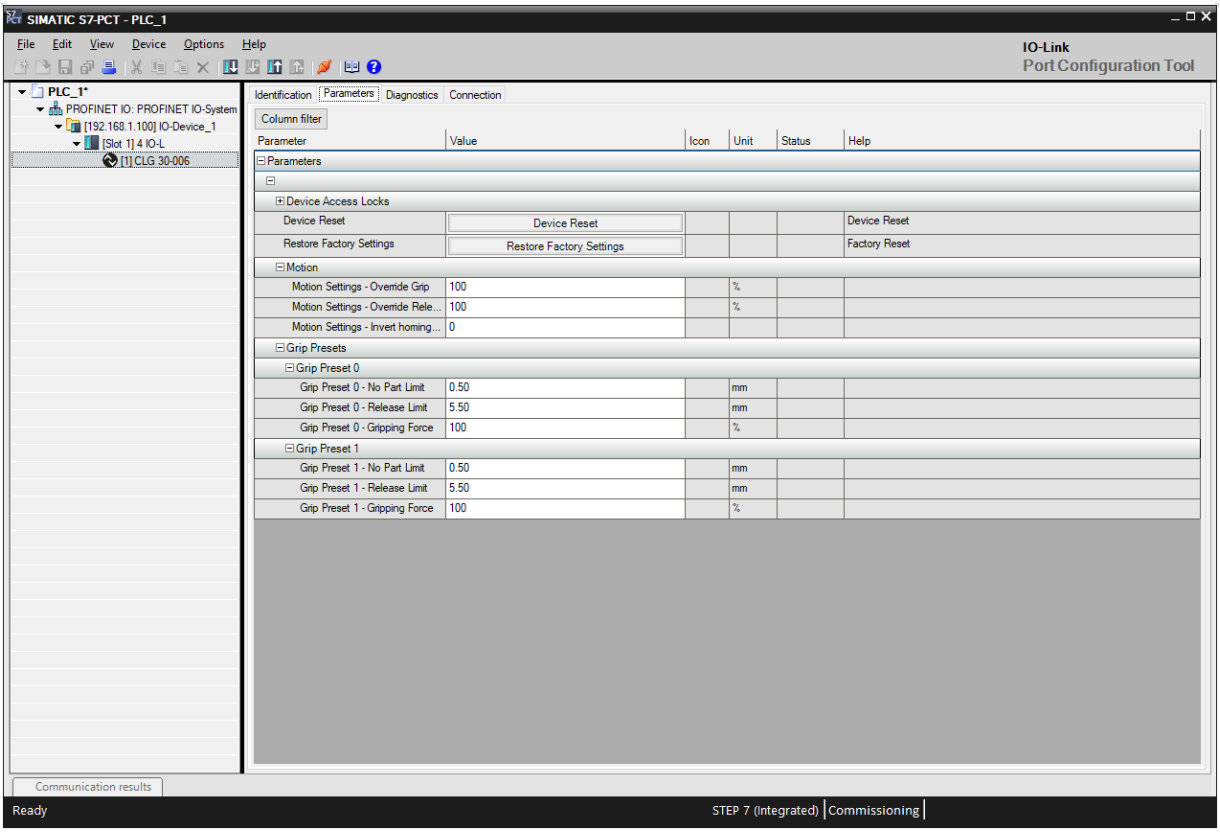


Figure 25: Parameters of the gripping module in S7-PCT

13.5 Diagnostics

The "Diagnostics" tab (Figure 26) shows various diagnostic data of the gripping module. This information can only be read and provides information about the current status.

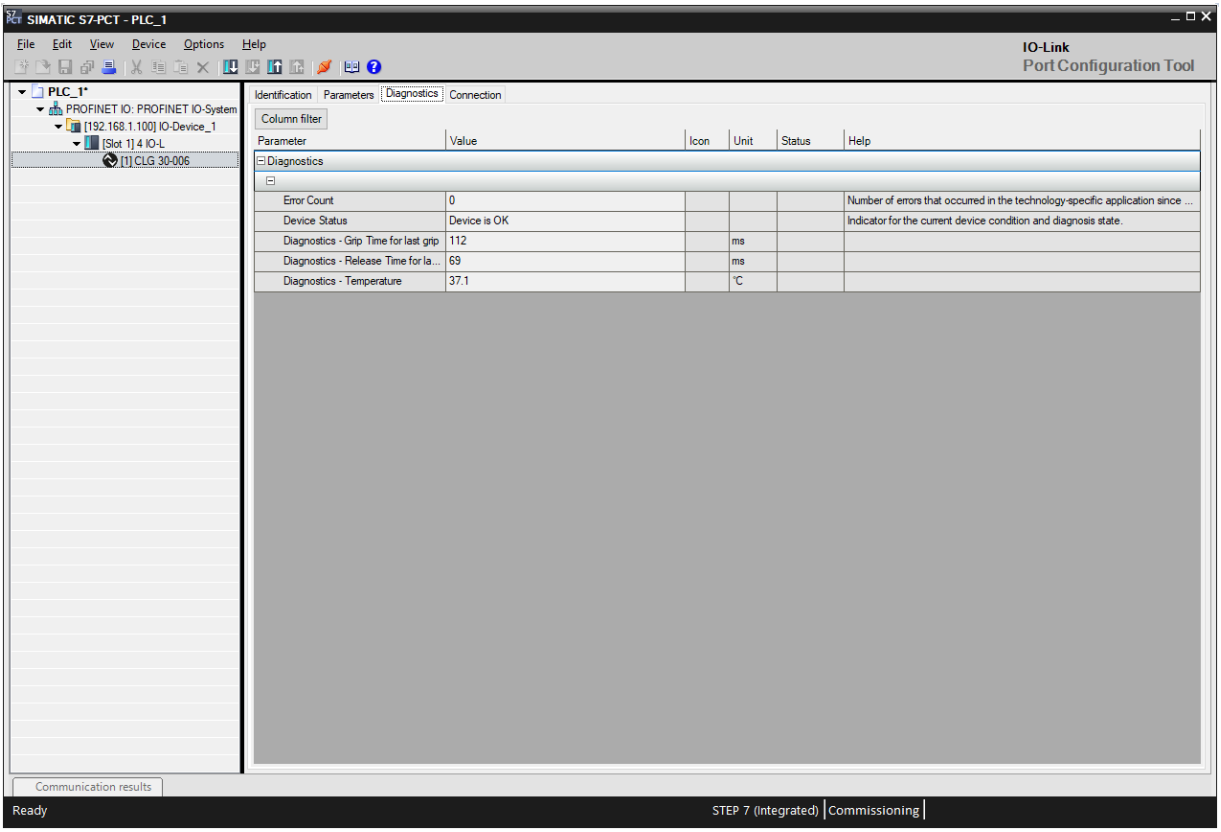


Figure 26: Diagnostic data of the gripping module in S7-PCT

13.6 Generation of a Data Type for the PLC Program

The port configurator enables the generation of a UDT data type that can be used later in the PLC program. The corresponding button is located in the "Addresses" tab in the configuration of the master (Figure 27). The generated file can later be imported in the TIA Portal as an external source and converted into a data type that represents the interface of the gripping module (Figure 28).

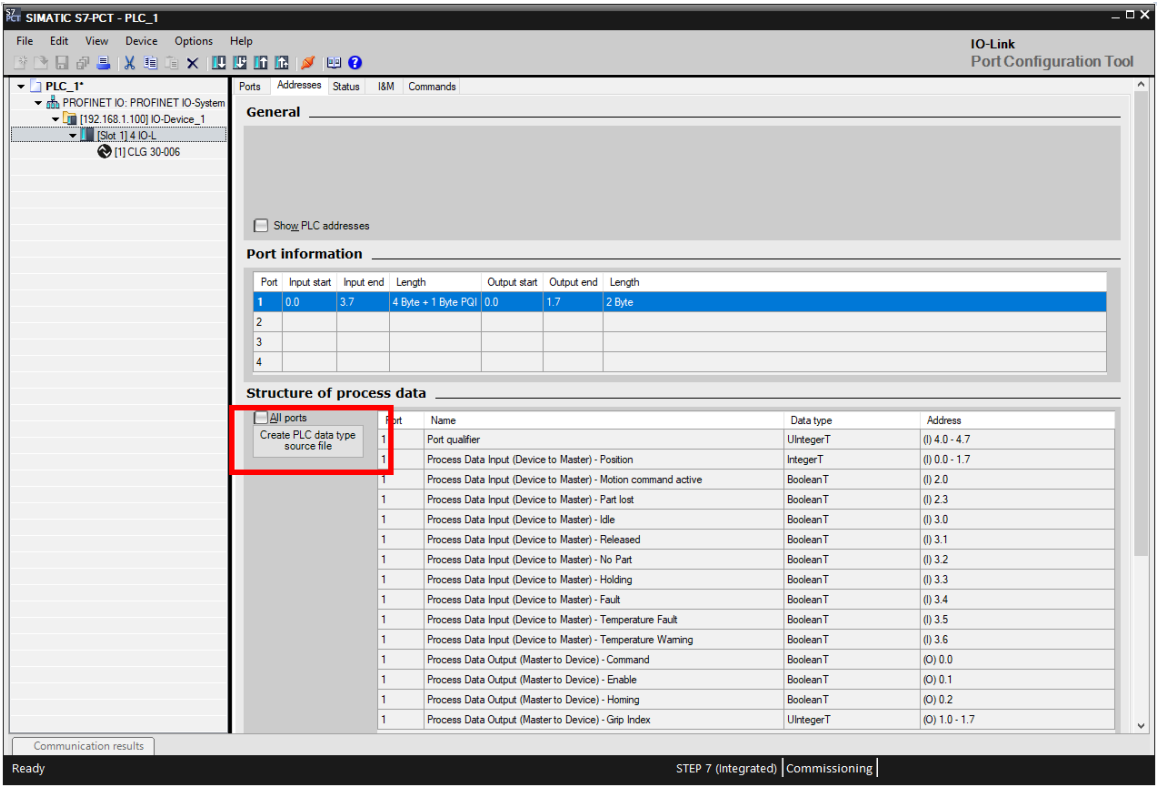


Figure 27: Generation of a UDT data type for TIA Portal

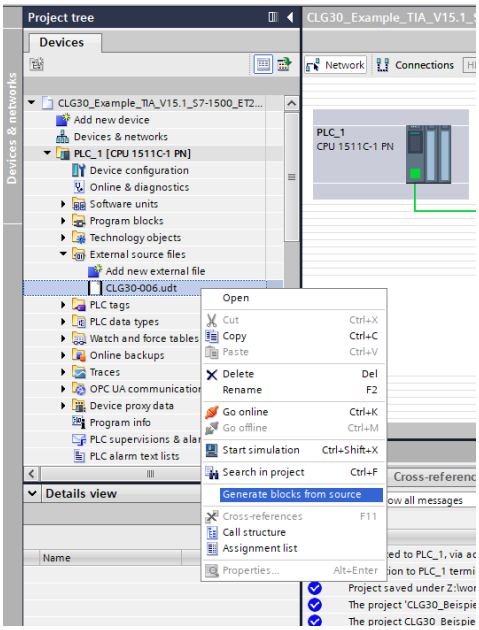


Figure 28: Import and generate block from source

14 EC Declaration of Incorporation

According to EC Machinery Directive 2006/42/EG, appendix 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:	CLG
Part numbers:	5120014 (CLG 30-006)

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	EN ISO 12100-1
EN ISO 12100-2	EN ISO 12100-2

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, Phone: +49(0)7141/94702-0

Location, Date/Signature:	Ludwigsburg, December 1, 2020
Details of the signatory	Weiss Robotics GmbH & Co KG

www.weiss-robotics.com