INSTALLATION AND OPERATING INSTRUCTIONS

GEP2000 series
Gripper, electric

DDOC00245

THE KNOW-HOW FACTORY

Parameter explanation (glossary)

Parameter	Explanation
ControlWord	The gripper is controlled using the "ControlWord". The "ControlWord" is bit-exclusive, which means that only one bit at a time can be active in the "Word". The value "NULL" is also permitted.
DeviceMode	The "DeviceMode" is used to select gripping profiles as well as the additional help modes in the gripper.
Workpiece No.	Using this parameter, workpiece recipes stored in the gripper can be selected or saved.
TeachPosition	The "TeachPosition" is the actual workpiece position.
WorkPosition	The "WorkPosition" is the inner jaw position on the gripper. Depending on the application, for example with internal grippers, this can also be the standby position.
GripForce	The "GripForce" parameter is used to configure the gripping force.
PositionTolerance	This is the tolerance window for the "TeachPosition", "BasePosition" and "WorkPosition". The value of the parameter acts in both directions.
BasePosition	The "BasePosition" is the outer "JawPosition". Depending on the gripper profile, this can also be a work position!
ShiftPosition	The "ShiftPosition" is a switching position between pre-positioning and gripper movement.
StatusWord	In its bits, the "StatusWord" supplies the most important information about the status of the gripper back to the control system.
Diagnosis	If an error should occur, the "Diagnosis" outputs a diagnostic code which can be compared with the error list.
ActualPosition	The value of the current position of the gripper [1/100 mm].
Error	Fault, error message
DIR	Direction/24V cable connection - Depending on the gripper, this signal is used to move the gripper.
Teach/Adjust	Program/Configure Using this signal, depending on the gripper type, the current position of the gripper jaws can be taught in as the new workpiece position. "Adjust" is used as a command to define the reachable end positions of the gripper jaws.
GND	Abbreviation for ground connection
Offset	Correction value
Traversing routine	Defined procedure for movement of the gripper jaws
Travel path	Path on which the gripper jaws travel

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1. Supporting documents

NOTICE:

Read through the installation and operating instructions carefully before installing the product!
The installation and operating instructions contain important notes for your personal safety. They must be read and understood by all persons who work with or handle the product during any phase of the product life time.

The documents listed below are available for download on our website.
⇨ www.zimmer-group.com
Only those documents currently available on the website are valid.

- Catalogs, drawings, CAD data, performance data
- Information on accessories
- Detailed installation and operating instructions
- Technical data sheets
- General Terms and Conditions of Business, including warranty information

2. Safety instructions

CAUTION:

Non-compliance may result in severe injuries!

1. Installation, commissioning, maintenance and repairs may only be performed by qualified specialists in accordance with these installation and operating instructions.
2. The gripper is state-of-the-art. It is fitted to industrial machines and is used to hold workpieces. The following are examples of situations in which the gripper may cause a hazard:
   - The gripper is not properly fitted, used or maintained
   - The gripper module is not used for its intended purpose
   - Local regulations (legislation, ordinances, guidelines), such as the EC Machinery Directive, accident prevention regulations and the installation and operating instructions, are not observed.
3. The gripper may be used only in accordance with its proper use and technical data. Zimmer GmbH shall accept no liability for any damage caused by improper use.
4. Any use other than the intended use requires written approval from Zimmer GmbH.
5. Make sure that the power cables are disconnected before you install, modify, maintain or repair the gripper.
6. In case of maintenance, conversion or expansion work, remove the gripper from the machine and perform the work outside the danger zone.
7. Make sure that the gripper cannot be accidentally operated when commissioning or testing.
8. Modifications to the gripper, such as adding drilled holes or threads, may be made only with prior approval from Zimmer GmbH.
9. The specified maintenance intervals are to be observed; also refer to the “Maintenance” section. When the gripper is used under extreme conditions, the maintenance interval must be adapted depending on the extent of the contamination. Please contact our hotline for this purpose.
10. Use of the gripper under extreme conditions, such as aggressive liquids and abrasive dusts, is subject to prior approval from Zimmer GmbH.
11. Do not reach into the operational range of the gripper!

3. Proper use

NOTICE:

The gripper is to be used only in its original state with its original accessories, without any unauthorized changes and within the scope of its defined parameters of use.
Zimmer GmbH shall accept no liability for any damage caused by improper use.

Use outside of the defined parameters is not permitted. Unauthorized electrical or mechanical modifications must not be made.
The gripper is designed exclusively for electric operation using a supply voltage of 24 VDC.
The gripper is used as defined under “Proper use” in enclosed rooms to temporarily grip, handle and hold parts.
The gripper is not suitable for clamping workpieces during a machining process.
Direct contact with perishable goods/food is not permitted.

4. Personnel qualification

Installation, commissioning and maintenance may only be performed by qualified personnel. These personnel must have read and understood the installation and operating instructions in full.

5. Product description

NOTICE:

To ensure that the gripper jaws do not get deformed, care must be taken to ensure that the configuration of the gripping force and the selection of the gripper finger length is correct.
An incorrect configuration or selection can lead to malfunction.

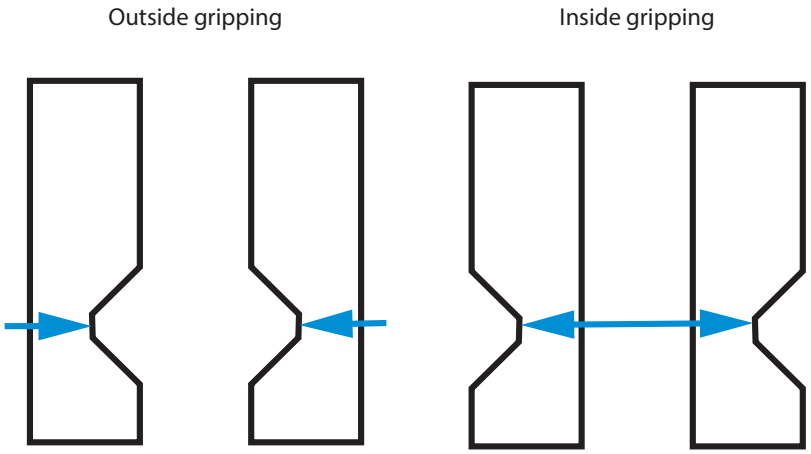
CAUTION:

Reduction of gripping force
Reduce the gripping force of the gripper when gripping flexible components.
A reduced gripping force can lead to material damage or injury to personnel, because the components that are being gripped can no longer be securely gripped and transported.

5.1 Possible applications

Inside gripping:
The gripper can be used for inside gripping.

Outside gripping:
The gripper can be used for outside gripping.



5.2 Forces and torques

INFORMATION:

For information on forces and torques, please refer to our website.

If you have any further questions, please contact Zimmer Customer Service.

5.3 Type plate

A type plate is attached to the housing of the gripper.
The serial number and the article number are shown on this type plate.

- ▶ The serial number ensures that the unit has an unambiguous, continuous classification in the event of an update or an overhaul.
- ▶ You should assign the serial number to your project when possible.
- ⇨ Example: Serial number 01-12345678

INFORMATION:

Please state the serial number in the event of damage or a complaint.

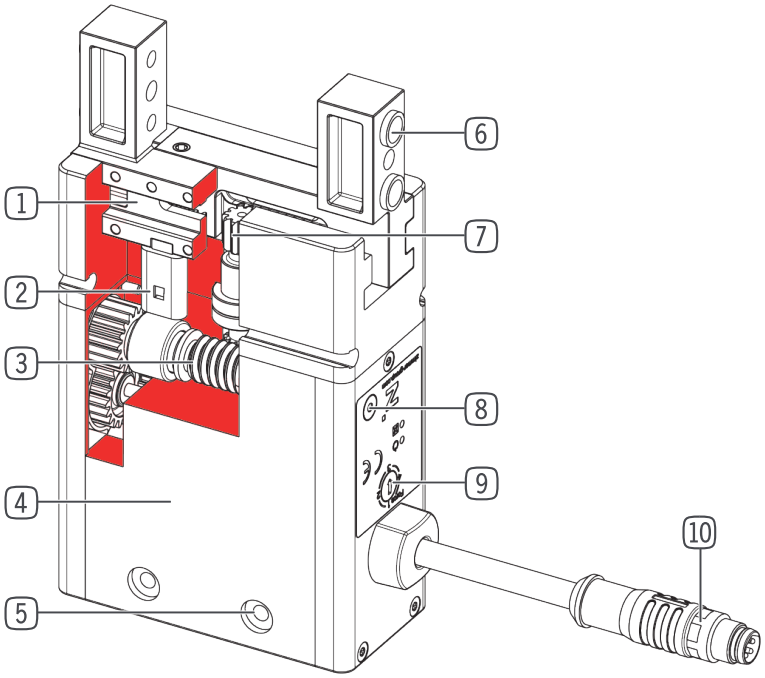
If you have any further questions, please contact Zimmer Customer Service.

6. Function

The gripper fingers of the parallel gripper are arranged parallel to each other on two opposing guide rails and can be moved relative to each other. The force of the motor is transmitted over a worm drive. Racks and a pinion generate the movement of the gripper jaws and synchronize these movements.
Despite its small installation space, the gripper is suited for the gripping of a wide range of form fit and frictional fit parts. As an option, the gripping force can be adapted to the workpiece by means of the integrated potentiometer or over the control system via IO-Link. The gripper can be controlled like a valve via I/O ports or an IO-Link. Both versions are easy to integrate into the control system.

Fig. 1: Cutaway view of the GEP2000 series gripper

1	Gripper jaws
2	Position sensing
3	Helical worm gear
4	Drive
5	Mounting and positioning
6	Removable centering sleeve
7	Synchronization
8	Emergency release
9	Adjustable gripping force
10	Energy supply



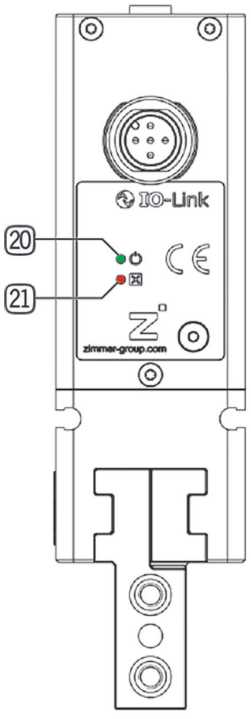
6.1 Electrical specifications

INFORMATION:

Please refer to our website for information on the electrical specifications.
This data varies within the series, depending on the specific design.
If you have any further questions, please contact Zimmer Customer Service.

6.2 LED display

20	Power / communication
21	Error



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6.3 Fuse-equipped configuration

INFORMATION:

Please refer to our website for information on the fuse-equipped configuration.

If you have any further questions, please contact Zimmer Customer Service.

6.4 Protection classes

NOTICE:

The gripper achieves protection class IP40 in all mounted positions of installation.

6.5 Technical data

INFORMATION:

Please refer to our website for information on the technical data.
This data varies within the series, depending on the specific design.
If you have any further questions, please contact Zimmer Customer Service.

6.6 Self locking mechanism

INFORMATION:

The gripper has a mechanical self locking mechanism to ensure that the workpiece is still held by the gripper in the event of situations of power supply loss or failure (such as an emergency stop).
If you have any further questions, please contact Zimmer Customer Service.

7. Installation

7.1 Safety instructions

NOTICE:

Switch off the energy supply for the electronics before any assembly, installation or maintenance work.

► Electronics may get damaged.

CAUTION:

Switch off the energy supply for the electronics before any assembly, installation or maintenance work.

► Injuries are possible.

WARNING:

Risk of injury in case of unexpected movement of the machine or system into which the gripper is to be installed.

► Switch off the power supply to the machine before all work.

► Secure the machine against being switched on unintentionally.

► Check the machine for any residual energy.

7.2 Installation of the mechanical system

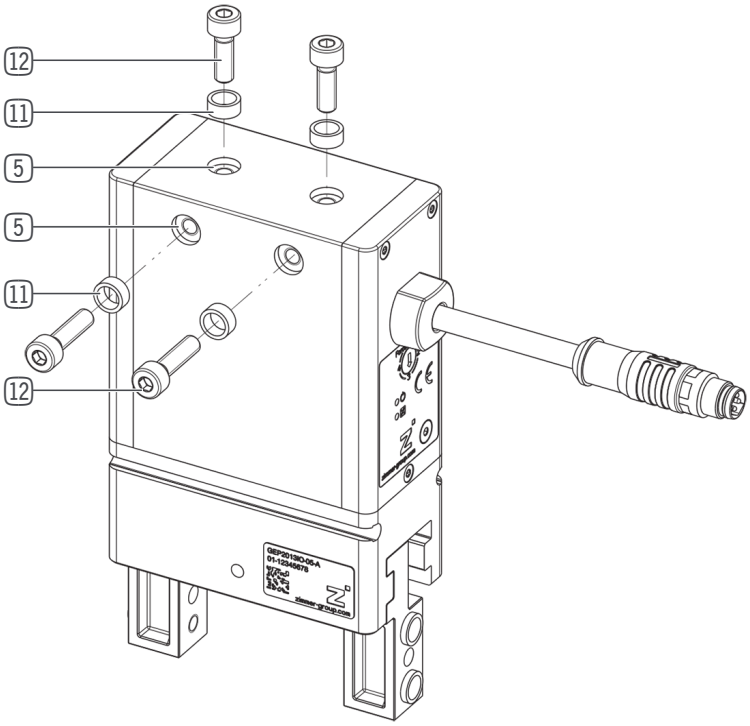
The gripper must be installed on a mounting surface in accordance with the levelness specifications.

Length < 100 mm → permitted unevenness < 0.02 mm

Length < 100 mm → permitted unevenness < 0.05 mm

The gripper can be installed with its base or laterally onto the mounting piece.

The following work steps must be observed during installation:



► Insert centering sleeves (11) in the designated fits (5) on the gripper.

► Position the gripper on the designated mounting piece using the centering sleeves (11).

► Use the mounting screws (12) to secure the gripper onto the mounting piece.

⇨ Screw-in depth = min. 1.5 x Ø

⇨ The mounting screws are not included in the scope of delivery.

⇨ Strength class of the mounting screws at least 8.8 ⇨ DIN EN ISO 4762.

⇨ Observe the tightening torque of the mounting screws.

⇨ Make sure the mounting surface is sufficiently rigid and level.

⇨ Use an adapter plate as needed. For information on adapter plates, please refer to the accessories list, available on our website.

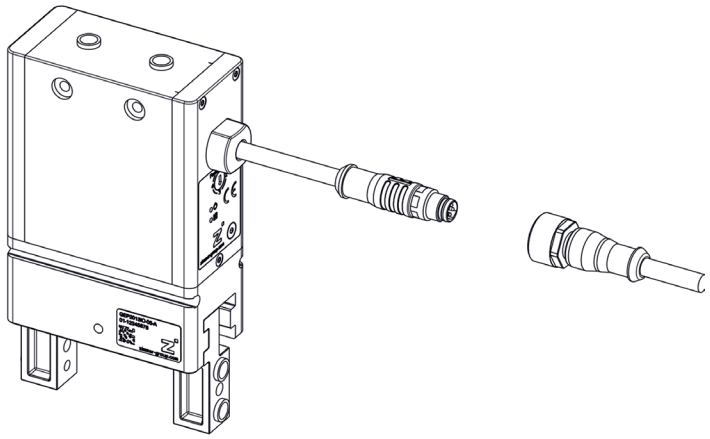
NOTICE:

Non-compliance may result in property damage.

7.3 Installation of the electrical system

7.3.1 Installation of the wiring

► Connect the supply cable to the gripper and the control system.
  ⇨ You can find the corresponding supply cable on our website
  ⇨ www.zimmer-group.com



INFORMATION:

The cables that are used by Zimmer GmbH feature a minimum bending radius of 10 x the outer diameter.
This bending radius must not be undershot!

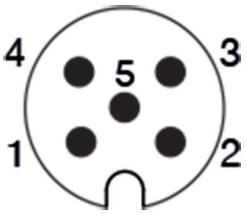
⇨ All IO-Link cables that are installed in grippers have an outer diameter of 5 mm and thus have a bending radius of 50 mm.
⇨ Freely suspended cables must be secured to prevent excessive motion loads or pinching.

7.3.2 "IO-Link" installation

GEP2000IL-00-A

PIN assignment of the power supply line:

PIN	Color	Function	Explanation
1	Brown	Sensor + 24 V DC	Power supply for IO-Link communication
2	White	Actuator + 24 V DC	Actuator supply voltage
3	Blue	GND sensor	Sensor 0 V DC supply voltage
4	Black	C/Q	IO-Link communication
5	Gray	GND actuator	Actuator 0 V DC supply voltage



The following steps must be carried out for commissioning or installation of the gripper with IO-Link:

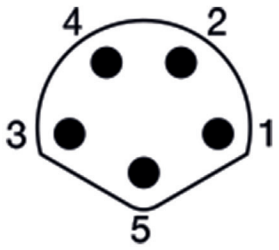
► Connect the gripper to the IO-Link master.
► Ensure the voltage supply.
  ⇨ For Port Class A, additional power supply via Y-cable.

7.3.3 “Analog” installation

GEP2000IO-05-A (digital + integrated analog sensing)

PIN assignment of the power supply line:

PIN	Color	Function	Explanation
1	Brown	+ 24 V DC	+ 24 V DC supply voltage
2	White	Move command	Input, control input, outer move command
3	Blue	GND	0 V DC supply voltage
4	Black	Move command	Input, control input, inner move command
5	Gray	Analog output	0 - 10 V output



The following steps must be carried out for commissioning or installation of the “analog” gripper:

- ▶ Connect the gripper to the power supply.
- ▶ Ensure the voltage supply.
  - ⇨ A voltage supply between PIN 1 and PIN 3 is necessary for operation.
  - ⇨ A jaw movement is triggered by a voltage level between PIN 2 or PIN 4.

Control logic:

Movement	PIN 2 (open)	PIN 4 (close)
Gripper in rest mode	0	0
Open gripper	1	0
Close gripper	0	1

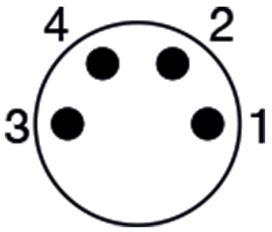
A movement in the desired direction takes place via a high level of the corresponding signal. After the high level is detected, the gripper movement proceeds all the way to the end of the gripping process.
It is important to ensure that, after a movement has taken place, the corresponding signal is reset.
This must happen before a signal is executed in the opposite direction.
A break time of 10 ms must be maintained between the revocation of the signal and the next command.

7.3.4 “Digital” installation

GEP2000IO-00-A

PIN assignment of the power supply line:

PIN	Color	Function	Explanation
1	Brown	+ 24 V DC	+ 24 v DC supply voltage
2	White	Move command	Input, control input, outer move command
3	Blue	GND	0 V DC supply voltage
4	Black	Move command	Input, control input, inner move command



The following steps must be carried out for commissioning or installation of the “digital” gripper:

- ▶ Connect the gripper to the power supply.
- ▶ Ensure the voltage supply.
  - ⇨ A voltage supply between PIN 1 and PIN 3 is necessary for operation.
  - ⇨ A jaw movement is triggered by a voltage level between PIN 2 or PIN 4.

Control logic:

Movement	PIN 2 (open)	PIN 4 (close)
Gripper in rest mode	0	0
Open gripper	1	0
Close gripper	0	1

A movement in the desired direction takes place via a high level of the corresponding signal. After the high level is detected, the gripper movement proceeds all the way to the end of the gripping process.
It is important to ensure that, after a movement has taken place, the corresponding signal is reset.
This must happen before a signal is executed in the opposite direction.

A break time of 10 ms must be maintained between the revocation of the signal and the next command.

7.4 Static charge

The movement of the gripper jaws create low voltages as a result of static charging. These charges cannot be dissipated if the gripper is installed on an insulated surface and discharge is also not possible through the workpiece.

NOTICE:

Non-compliance may result in damage to the system

Grounding the gripper attachment / gripper jaws is recommended if ESD-sensitive parts come into contact with the gripper.

7.5 Heat dissipation

In the event of high ambient temperatures, the gripper has to be installed on heat-dissipating materials.
If the gripper is permanently operated under very high ambient temperatures and with fast cycle times, the service life may be reduced.

7.6 Installation of accessories

NOTICE:

Before installing an accessory, make sure it is suitable for use with the selected variant.
Please refer to our website for information on all available accessories.
If you have any further questions, please contact Zimmer Customer Service.

8. Commissioning

8.1 “Analog” and “digital” commissioning

8.1.1 Restart “Analog“ and “digital“

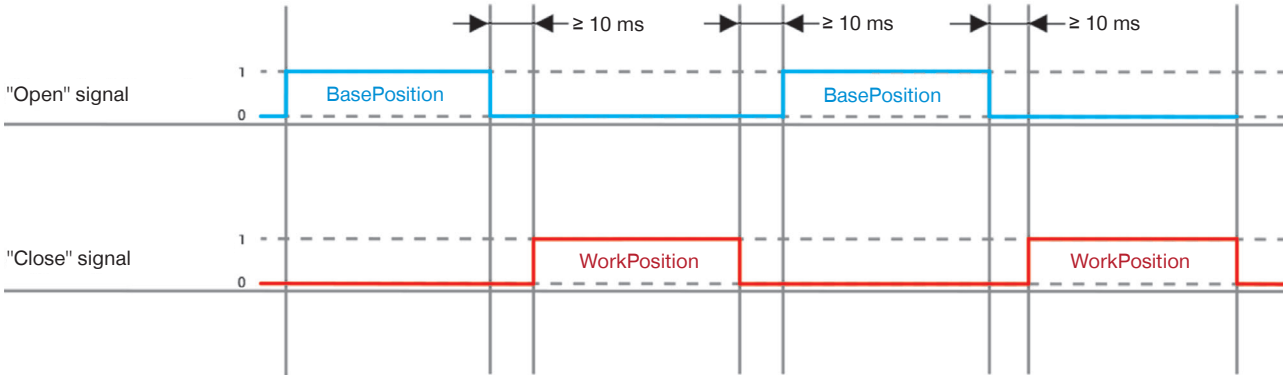
INFORMATION:

When restarting the gripper, no signal must be present at PINS “DIR1” and “DIR2”.

Condition for a cold start:
„DIR1“ and „DIR2“ = 0 V
As soon as the green LED on the gripper lights up, it is ready for operation.
The gripper can be moved within a few ms of the power supply.

8.1.2 “Analog” and “digital” switching sequence

A movement in the desired direction takes place via a high level of the corresponding signal. After the high level is detected, the gripper movement proceeds all the way to the end of the gripping process.
It is important to ensure that, after a gripper run has taken place, the corresponding signal is reset before a signal in the opposite direction is provided.
A break time of 10 ms must be maintained between revoking the signal and the next command.



NOTICE:

In order to prevent damage to the gripper, the resistance between the analog output and GND must be at least 10 kΩ.

INFORMATION:

⇨ The movement profile only applies to the GEP2000 series digital gripper.

The current jaw position is scaled from 0 V to 10 V and is output via Pin 5 (analog output).

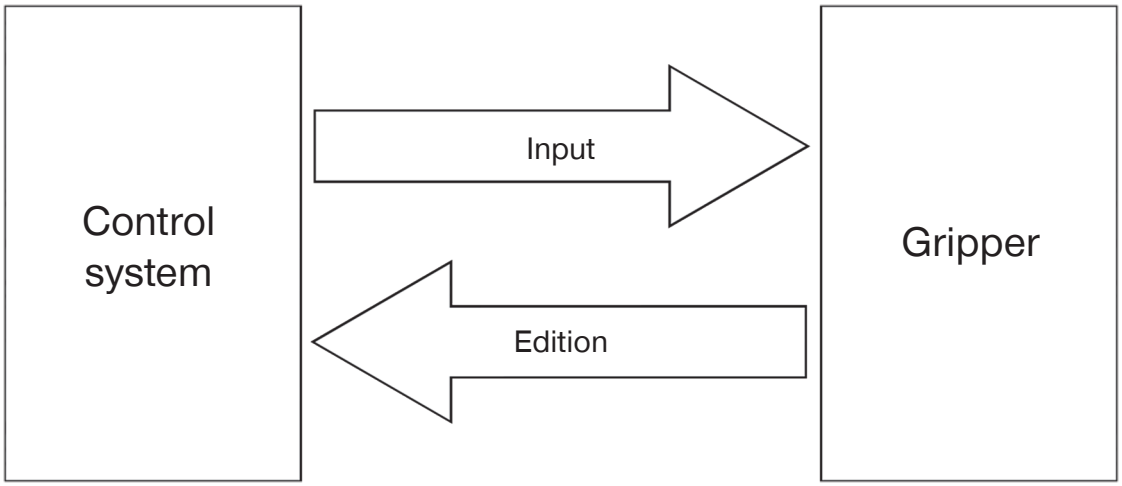
8.2 IO-Link commissioning

8.2.1 Process data

The option exists for the gripper to be controlled only by the process data transmitted in each cycle.

Outputs: Process data from the IO-Link master to the gripper

Name	Data type
ControlWord	UINT 16
DeviceMode	UINT 8
Workpiece No.	UINT 8
TeachPosition	UINT 16
GripForce	UINT 8
PositionTolerance	UINT 8



Name	Data type
StatusWord	UINT 16
Diagnosis	UINT 16
ActualPosition	UINT 16

8.2.2 IODD import

▶ Importing the IODD (device description) into the control system.
- ⇨ Call up our website at ⇨ www.zimmer-group.com
- ⇨ Select the desired gripper and download the corresponding .zip file via the “Download IODD” link.
- ⇨ The “.zip file” is required for importing into the control system.

When the hardware configuration is complete and the IO-Link connection to the gripper is established, some data must be visible in the process input data.

⇨ Some control systems demand a byte swap to bring this process data into a logical sequence.

▶ To determine whether a byte swap is necessary, you can view bit 6 (GripperPLCActive) in the “StatusWord”.

▶ For this purpose, it is necessary to determine whether bit 6 is active in the first or second status byte.
- ⇨ If bit 6 is active in the first byte, the bytes already have the correct sequence and commissioning can be continued.
- ⇨ If bit 6 is active in the second byte, a ByteSwap still has to be applied here.
- ⇨ For further information, refer to the “StatusWord” section.

INFORMATION:

It is mandatory to verify the process data.

The control of the gripper takes place via IO-Link by means of the cyclical process data as well as the acyclical service data with a cycle time of 5 ms.

8.3 “Handshake” data transmission method

All process data that is transmitted to the gripper and is described in the sections that follow must be transmitted using the “handshake” method.

INFORMATION:

This method is referred to as a “handshake” because it enables “clean” transmission.
The process data transmission takes place, so to speak, from “hand to hand” - from the control system to the gripper.

The following steps are required for the “handshake”:

The data transmission starts with the transmission of ➔ "ControlWord" = 0x01 ➔ to the gripper.
Subsequently, the response of the gripper must be tested by means of ➔ "Statusbit" 12 = TRUE ➔ (data transmission OK).
Afterwards, the “ControlWord” = 0 ➔ can be sent, which ends the data transmission.
With the ➔ “ControlWord” = 0x00 ➔ and the corresponding response of the gripper by the ➔ “Statusbit” 12 = FALSE, ➔ the data transmission finalizes automatically.

8.4 Parameter

8.4.1 “ControlWord” parameter

NOTICE:

In the “ControlWord” parameter, only one single bit or the value 0 may be set at a time. Only the values listed in the following table are valid:

Parameter	Decimal value	Hexadecimal value
Data transfer	1	0 x 1
WritePDU	2	0 x 2
Teach	8	0 x 8
Adjust	128	0 x 80
MoveToBase	256	0 x 100
MoveToWork	512	0 x 200
ErrorReset	32768	0x8000

Name	"ControlWord"
Data format	UINT16
Permission	Write
Transmission	Cyclical
Value range	0 to 65535

“ControlWord” structure:

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Byte 1	“Error Reset”	-	-	-	-	-	"MoveToWork"	"MoveToBase"
	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 2	"Adjust"	-	-	-	"Teach"	"ResetDirection-Flag"	"WritePDU"	"Datatransfer"

Bit 0: „Datatransfer“

- ▶ Setting this bit causes the gripper to take over the data transmitted in the process data (“WorkpieceNo” = 0) or the data stored in the workpiece data records (“WorkpieceNo” = 1 to 32) as the active data record.

Bit 1: „WritePDU“

- ▶ Setting this bit communicates to the gripper that it should write the current process data to the selected tool recipe.

Bit 2: „ResetDirectionFlag“

- ▶ Setting this bit informs the gripper that the direction flag needs to be reset.
- ▶ This makes a repeated movement to a position possible.
- ▶ This is logical during a switchover of workpiece recipes.

Bit 3: „Teach“

- ▶ Setting this bit informs the gripper to save the current position as the “TeachPosition” in the selected “WorkpieceNo”.

INFORMATION:

This only works if there is no “0” that is transmitted in the workpiece number!

Bit 7: „Adjust“

- ▶ If no other bit is set in the control word, the “AdjustBit” can be used to readjust the end position of the fingers.

Bit 8: „MoveToBase“

- ▶ Setting this bit communicates to the gripper that it should move towards the “BasePosition”.

Bit 9: „MoveToWork“

- ▶ Setting this bit communicates to the gripper that it should move towards the “WorkPosition”.

Bit 15: “ErrorReset”

- ▶ This bit can be used to acknowledge all errors that can be reset and thus reset them.
- ▶ You can find out whether an error is present from the error list.

INFORMATION:

Please refer to the “error diagnostics” section for the error list.

8.4.2 “DeviceMode” parameter

“DeviceMode” can be used to select the driving mode from the following options: universal operation, Outside gripping and Inside gripping.

Input	Mode	Description
100	Universal mode	Inside and outside gripping, both movements at the same speed.
60	Outside gripping	Inward with the desired gripping force and speed, outward with fast movement.
70	Inside gripping	Outward with the desired gripping force and speed, inward with fast movement.

Name	“DeviceMode”
Data format	UINT8
Permission	Write
Transmission	Cyclical
Value range	60, 70, 100

8.4.3 “WorkpieceNo” parameter

This workpiece number is used for selecting the previously stored workpiece data, as well as for selecting the “WorkpieceNo” data record in which the current process data is stored.
This “WorkpieceNo” data record enables individual workpieces to be taught-in to the gripper very quickly.

INFORMATION:

An example of a code can be found in the “Quickstart Basic Parameters” section (recipe examples).
⇨ “Store recipe” and “Load recipe”

With a value > 0, the corresponding workpiece recipe is loaded into the gripper.

Name	"WorkpieceNo"
Data format	UINT8
Permission	Write
Transmission	Cyclical
Value range	0 to 32

8.4.4 “PositionTolerance” parameter

This parameter is used to configure the position tolerance with a resolution of 0.01 mm.
Thus the value range of 0 to 255 can be used to set a maximum tolerance of 2.55 mm in both directions.

INFORMATION:

Example:
If the “Teach position” has a value of 1500 (i.e. 15.00 mm), a tolerance of 1.50 mm in both directions can be set with a value of 150 in the “Position tolerance” parameter.
By doing this, the TeachPosition window starts at 13.50 mm and goes all the way up to 16.50 mm.

Name	"PositionTolerance"
Data format	UINT8
Permission	Write
Transmission	Cyclical
Value range	0 to 255

8.4.5 “GripForce” parameter

The gripper can use various gripping forces and speeds for an optimized gripping process sequence. Since the gripper generates the gripping force from its gripping speed in combination with the amperage, the setting of the gripping force also conversely influences the gripping speed and the amperage. The gripping force can be set at various levels. The user can set the required gripping force in 4 increments.

INFORMATION:

The values for the gripping force can be found on the technical data sheet on our website.
This data varies within the series, depending on the specific design.
If you have any further questions, please contact Zimmer Customer Service.

Name	"GripForce"	
Data format	UINT8	
Permission	Write	
Transmission	Cyclical	
Value range	1	Level 1
	2	Level 2
	3	Level 3
	4	Level 4

8.4.6 “TeachPosition” parameter

The “TeachPosition” tells the gripper which position the workpiece is expected to be at. The “PositionTolerance” acts around this position. Thus the gripper can distinguish whether a correct or incorrect workpiece has been gripped. Confirmation that the correct workpiece has been gripped is communicated to the control system via the “StatusWord” parameter. If the detection is correct, the “Teach” bit is set, thereby giving the user the option to monitor this work step.

With the help of the position measuring system used, it is possible to achieve a teach position accuracy of +/- 0.05 mm.

The following values are to be used:

Product	**"BasePosition"**	**"WorkPosition"**	**"TeachPosition"**
GEP2006IL	0	1200	0 to 1200
GEP2010IL	0	2000	0 to 2000
GEP2013IL	0	2600	0 to 2600
GEP2016IL	0	3200	0 to 3200

Name	"TeachPosition"
Data format	UINT16
Permission	Write
Transmission	Cyclical
Value range	0 to max. jaw stroke of the gripper

8.4.7 “StatusWord” parameter

	Bit 15	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Byte 1	"Error"	"Control-Word" 0x200	"Control-Word" 0x100	"DataTrans-ferOK"	“Undefined-Position”	"WorkPosi-tion"	"TeachPosi-tion"	"BasePosi-tion"
	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 0	-	“Gripper-PLC Active”	-	-	-	-	-	-

Bit 6: „GripperPLCActive“
- ▶ Active as soon as the gripper has booted up after the cold start.
- ▶ This bit can be used to verify a byte swap.

Bit 8: „BasePosition“
- ▶ Active if the gripper is set to “BasePosition”.

Bit 9: „TeachPosition“
- ▶ Active if the gripper is set to “TeachPosition”.

Bit 10: „WorkPosition“
- ▶ Active if the gripper is set to “WorkPosition”.

Bit 11: “UndefinedPosition”
- ▶ Active if the gripper is not set to any Teach Position.

Bit 12: „DataTransferOK“
- ▶ This bit signals the successful data transfer, which is initiated with the “ControlWord” = 1 (DataTransfer).
- ▶ As soon as data from the gripper has been taken over by the parameter “ControlWord” =1 (decimal), the bit is active.

Bit 13: „ControlWord 0x100”
- ▶ This bit is a direction flag and is active when the last movement order was made in the “BasePosition” direction.

Bit 14: “ControlWord 0x200”
- ▶ This bit is a direction flag and is active when the last movement order was made in the “WorkPosition” direction.

Bit 15: „Error“

► Error in the gripper.
► If this bit is active, the error message can be determined using the “Diagnosis” parameter.

The following steps are required for the “error handshake”:

If the gripper has a fault, the error bit is set in the status word.
This fault can be ➔ reset by sending the ➔ “ControlWord” = 0x8000 .

NOTICE:

Not all faults can be reset. There are faults for which the error message is not reset after acknowledgment. The user must wait until the correct value is sent to the gripper. For example: Overtemperature fault case.

INFORMATION:

It is recommended to use the “StatusWord” to verify correct gripping.
The “TeachPosition” tolerance can be adjusted in a further process parameter.
When sensing the correct position via the ACTUAL position, the tolerances and fluctuations of the value must be observed during programming!

Name	"StatusWord"
Data format	UINT16
Permission	Read
Transmission	Cyclical
Value range	0 to 65535

8.4.8 “Diagnosis” parameter

The value returned in the “Diagnosis” parameter corresponds to the error code.

⇨ Refer to the “Troubleshooting” section

Name	"Diagnosis"
Data format	UINT16
Permission	Read
Transmission	Cyclical
Value range	0 to 65535

8.4.9 "ActualPosition" parameter

The parameter "ActualPosition" corresponds to the current position of the gripper jaws relative to the full stroke.
The value is specified with a resolution of 0.01 mm.
The values can move between the "BasePosition" (minimum values) and the "WorkPosition" (maximum values).
With the position measuring system used, it is possible to achieve a position accuracy of +/- 0.05 mm.

Product	"BasePosition"	"WorkPosition"
GEP2006IL	0	1200
GEP2010IL	0	2000
GEP2013IL	0	2600
GEP2016IL	0	3200

Name	"ActualPosition"
Data format	UINT16
Permission	Read
Transmission	Cyclical
Value range	0 to max. jaw stroke of the gripper

INFORMATION:

The "StatusWord" of the gripper should be used to check whether a workpiece has been gripped correctly.

⇨ The position measurement resolution is: 0.01 mm

⇨ The position measurement accuracy is: 0.1 mm

If the "ActualPosition" parameter is used for detecting the workpiece, then fluctuations around the exact value must be taken into consideration during commissioning!

8.5 "Cold start"

For proper function, we recommend that the actuator and sensor voltage be supplied with power separately.
Pins 1 and 3 are intended for the sensor power supply and must be switched on first.
Once the gripper is able to communicate with the PLC, the supply voltage can then be activated via pins 2 and 5.
Please observe the following:
If pin 1 is disconnected, pin 4 (IO-Link) must also be disconnected.

8.6 Minimum travel path

The gripper requires a certain "minimum travel path" to accelerate to the desired gripping force.
This minimum travel path depends on:

- The desired gripping force
- The dimensions of the gripper fingers

Design size	Minimum travel path
GEP2006IL	0.5 mm per gripper jaw
GEP2010IL	0.5 mm per gripper jaw
GEP2013IL	0.5 mm per gripper jaw
GEH2016IL	0.5 mm per gripper jaw

8.7 "Easy Startup"

⇨ **From switching the gripper on to the initial movement.**

The gripper is to be connected in accordance with its assignment diagram.
The gripper reports the "StatusWord", "Diagnosis" and "ActualPosition" process data immediately after the internal controller is booted up.
Once the "PLCActive" bit is registered in the "StatusWord", the communication process can start. To move the gripper, the process parameters must first be transmitted.
The following process parameters are to be transmitted:

- "DeviceMode"
- "GripForce"

A "Handshake" is required so the process parameters are transmitted to the gripper.

INFORMATION:

Please refer to section 8.3 for information on the "Handshake".
⇨ Code example "Handshake"

8.7.1 "Easy Startup" GEP2000IL series

In the following example code, you see the first initialization of the gripper and the transmission of the process parameters.

```
(*Initialization of the gripper, first move command = EasyStartUp Example*)

IF bStart = TRUE THEN
      iStep := 10;
END_IF

CASE iStep OF

10:
   IF StatusWord.6 THEN          (*Queries "PLCActive" bit in the StatusWord*)
      ControlWord := 1;          (*Sends "DataTransfer" in the ControlWord for initialization*)
      iStep := 20;               (*Jump to the next step*)
END_IF
20:
   IF StatusWord.12 THEN         (*Queries "DataTransferOK" bit in the StatusWord*)
      ControlWord := 0;          (*Initialization reset*)
      iStep := 30;               (*Jump to the next step*)
END_IF
30:
   IF.NOT StatusWord.12 THEN
   DeviceMode := 100;            (*Command to select the universal mode*)
   GripForce := 1;               (*Gripping force adjustment*)
      ControlWord := 1;          (*Data transfer to the gripper*)
      iStep := 40;               (*Jump to the next step*)
END_IF
40:
IF StatusWord.12 THEN            (*Queries "DataTransferOK" bit in the StatusWord *)
       ControlWord := 0;         (*ControlWord reset*)
       iStep := 50;              (*Jump to the next step*)
END_IF
50:
   IF.NOT StatusWord.12 THEN
      ControlWord := 512;        (*Handshake is complete, gripper now moves to WorkPosition (0x200
                                 or 512(dec) = MoveToWork)*)
      iStep := 100;
END_IF
100:
; (*Continue with the program*)
END_CASE
```

8.8 Starting gripping movement

The gripper receives the move command by ➔ sending the “ControlWord” = 0x0100 ➔ or “ControlWord” = 0x0200 .
▶ The movement order must be pending for as long as it takes until the desired position is reached.
When the gripper reaches the corresponding position, this is displayed in the “StatusWord” as follows: ➔ “Statusbit” 8 or 9 or 10 = TRUE

8.9 Repeated movements in the same direction

The “StatusWord” includes two static “flag bits”, each of which is set in alternation when the gripper moves in one direction. This prevents a move command in one direction from being carried out repeatedly as a result of fluctuation of the signals on the line.
Depending on the location of the positions, it is possible to move the gripper multiple times in the same direction. For this purpose, the direction flags must be reset.

Sending the ➔ "ControlWord" = 0x04 ➔ activates the deletion of the direction flags.
The direction flag is reset when the gripper ➔ answers with ➔ "Statusbit" 13 AND 14 = FALSE.

For multiple movements in the same direction, a schematic program example is shown in the following.

```
(*Multiple movement in one direction in Structured Text (ST)
The gripper is not able to accept multiple move commands in the same direction.
Therefore, the direction flag must be reset in the StatusWord.
In this example, all process parameters were already correctly transferred. The last move command towards the
WorkPosition could not be carried out, because the gripper is blocked by a workpiece. After the workpiece is
removed, the direction flag will be reset and the move command will be started once again.*)

IF bReset = TRUE THEN
    iStep := 10;
END_IF

CASE iStep OF

10:
IF diagnosis = 16#307 THEN                    (*move command could not be executed*)
    iStep := 20;                              (*Jump to the error step to reset the
                                               direction flag*)
END_IF
20:
    ControlWord := 4;                         (*Reset the direction flag (Bit
                                               “ResetDirectionFlag” = TRUE in the ControlWord) *)
    iStep := 30;                              (*Jump to the next step*)
30:
IF NOT StatusWord.13 AND NOT StatusWord.14 THEN   (*Queries whether both direction flags (Bit
                                                   “ControlWord0x100” AND “ControlWord0x200”
                                                   =FALSE in the ControlWord)   *)
    ControlWord := 512;                       (*Moves back towards WorkPosition*)
    iStep :=100;
END_IF;
100:
; (*Continue with the program*)

END_CASE
```

8.9.1 “Store recipe”

For storing a new recipe, a schematic program example is shown in the following

```
(*Store tool workpiece recipes in Structured Text (ST)*)

IF bSave = TRUE THEN
        iStep := 10;
END_IF

CASE iStep OF

10:
DeviceMode := 100;                  (*Allocation of the desired process parameters*)
WorkpieceNo := 3;                   (*Recipe is to be stored as the third workpiece recipe*)
PositionTolerance := 50;
GripForce := 3;
TeachPosition := 500;
        iStep := 20;                (*Jump to the next step*)
20:
        ControlWord := 1;           (*Begins with the Handshake*)
        iStep := 30;                (*Jump to the next step.*)
30:
IF StatusWord.12 THEN               (*Queries the “DataTransferOK” =TRUE bit from StatusWord, this is
                                    the response of the gripper to the transferred data*)
        ControlWord := 0;           (*ControlWord reset*)
        iStep := 40;                (*Jump to the next step*)
END_IF;
40:
IF NOT StatusWord.12 THEN           (*Queries the ending of the data transmission, “DataTransferOK” =
                                    FALSE*)
        ControlWord := 2;           (*Handshake is complete, the storage begins here via
                                    “WritePDU” bit in the ControlWord*)
        iStep := 50;                (*Jump to the next step*)
END_IF;
50:
IF StatusWord.12 THEN               (*Queries the “DataTransferOK”=TRUE bit from StatusWord*)
        ControlWord := 0;           (*ControlWord reset*)
        iStep := 60;                (*Jump to the next step*)
END_IF;
60:
IF NOT StatusWord.12 THEN           (*Queries the ending of the data transmission, “DataTransferOK”=
                                    FALSE, this process can take several seconds*)
        iStep := 0;                 (*Storage is complete?*)
END_IF;

END_CASE
```

8.10 “Load recipe” recipe examples

For loading a new recipe, a schematic program example is shown in the following.

```
(*Load workpiece recipes in Structured Text (ST)*)

IF bLoad = TRUE THEN
    iStep := 10;
END_IF

CASE iStep OF
10:
WorkpieceNo := 3;                    (*Third workpiece recipe is to be loaded*)
    iStep := 20;                     (*Jump to the next step*)
20:
    ControlWord := 1;                (*Begins with the Handshake*)
    iStep := 30;                     (*Jump to the next step*)
30:
IF StatusWord.12 THEN                (*Queries the “DataTransferOK”=TRUE bit from StatusWord, this is
                                     response of the gripper to the transmitted data*)
    ControlWord := 0;                (*ControlWord reset*)
    iStep := 40;                     (*Jump to the next step*)
END_IF;
40:
IF NOT StatusWord.12 THEN            (*Queries the ending of the data transmission, “DataTransferOK”=
                                     FALSE*)
    iStep := 0;                      (*Handshake is complete, the parameters from the third
                                     recipe are now taken over into the current process parameters*)
END_IF;

END_CASE
```

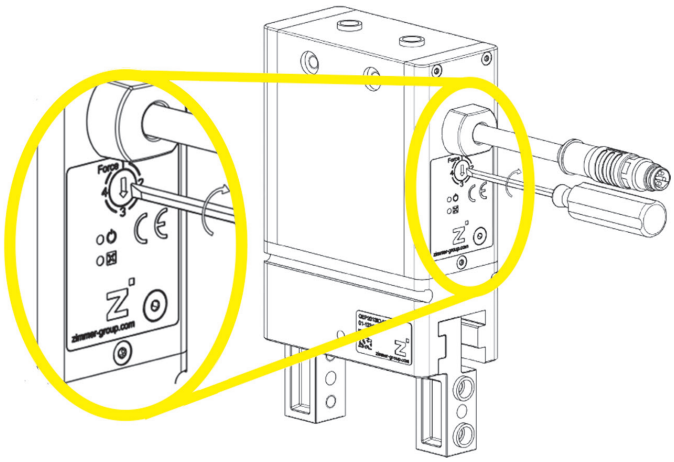
9. Operation

NOTICE:

In the event of a power failure, the position of the gripper jaws and gripping force of the gripper remain intact.
The gripper jaws can be opened using the emergency release if the energy supply drops off.
If you have any further questions, please contact Zimmer Customer Service.

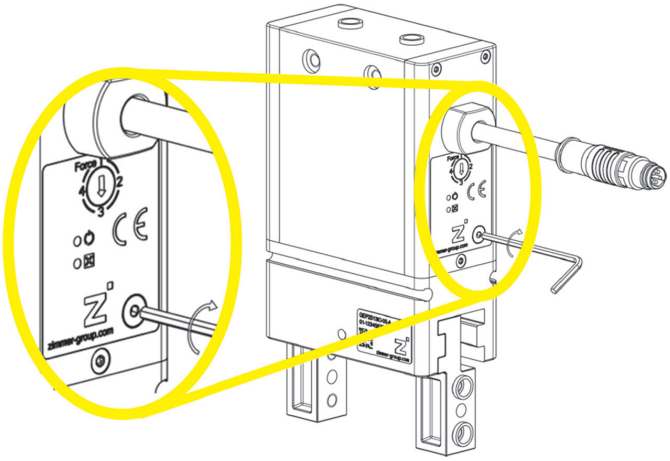
9.1 "Analog" and "digital" adjustable gripping force

The gripping force can be adjusted in four levels using a rotary switch.



9.2 "Analog" and "digital" emergency release

The gripper features an emergency release that can be mechanically opened by means of an Allen key in the event of a power failure.

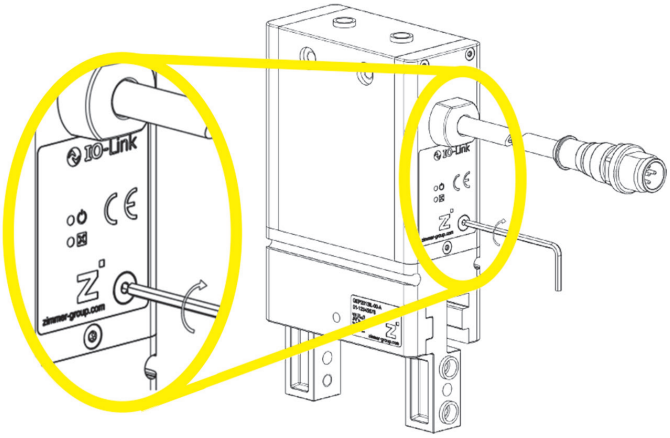


9.3 "IO-Link" adjustable gripping force

The adjustment of the gripping force in the IO-Link variant is done conveniently by means of the control system.

9.4 "IO-Link" emergency release

The gripper features an emergency release that can be mechanically opened by means of an Allen key in the event of a power failure.



10. Gripping force charts

INFORMATION:

Please refer to our website for information on the gripping force charts.

If you have any further questions, please contact Zimmer Customer Service.

11. Error diagnosis

11.1 Troubleshooting display

Error code	Error	Possible cause	Measure
0x0	No error	-	-
0x100	Actuator supply is not present or is too low.	• Actuator power supply not connected • Cable break • Actuator power supply not sufficient	▶ Check the actuator power supply
0x101	Max. permitted temperature exceeded.	• Surrounding temperature too high • Overload of the gripper	▶ Provide adequate ventilation/ cooling/connection
0x102	Temperature below min. permitted temperature.	• Ambient temperature is too low	▶ Provide a sufficient operating temperature
0x300	The configured "ControlWord" is implausible.	• Multiple bits are set in the "ControlWord"	▶ Only one bit is permitted to be active in the “ControlWord”
0x301	The configured “TeachPosition” is outside the permitted range.	• Wrong value on the "TeachPosition"	▶ Verification of the “TeachPosition” parameters ▶ Permissible range, depending on the model ▶ Maximum position value corresponds to the jaw stroke x 200, e.g.: GEP2016 with approx.16.1 mm gripper jaw: 0 ≤ "TeachPosition" ≤ 3220
0x302	The configured gripping force is outside the permitted range.	• Incorrect value in the "GripForce" parameter	▶ Verification of the “GripForce” parameters ▶ Permitted range: 0 < "GripForce" ≤ 4
0x304	The configured tolerance value is outside the permitted range.	• Incorrect value in the "PositionTolerance" parameter	▶ Verification of the “PositionTolerance” parameters ▶ Permitted range: 0 < "PositionTolerance" ≤ 255
0x305	The device has an incorrect reference position.	• Gripper does not have a reference position	▶ ☎ Zimmer Customer Service
0x306	The configured "DeviceMode" is implausible.	• Incorrect value in the "DeviceMode" parameter	▶ Adjusting the “DeviceMode” • Universal = 100 • Grip workpiece outside = 60 • Grip workpiece inside = 70

Error code	Error	Possible cause	Measure
0x307	Movement order cannot be executed.	• Multiple move commands in the same direction • Move command transmitted despite an existing error	▶ Reset the direction flag and resend the move command
0x308	"WorkpieceNo." not available.	• Transmitted workpiece number is outside the permitted range 0 to 32	▶ Check the values of the "WorkpieceNo" parameter ▶ Apply the process data via a "Handshake"
0x309	“TeachPosition” not transmitted	• Process data sent by the master has been changed	▶ Confirm the newly transmitted process data via a "Handshake" ControlWord = 0x1
0x030D	“GripForce” not transmitted	• Process data sent by the master has been changed	▶ Confirm the newly transmitted process data via a "Handshake" ControlWord = 0x1
0x030F	“TeachTolerance” not transmitted	• Process data sent by the master has been changed	▶ Confirm the newly transmitted process data via a "Handshake" ControlWord = 0x1
0x0310	“DeviceMode" not taken over	• Process data sent by the master has been changed	▶ Confirm the newly transmitted process data via a "Handshake" ControlWord = 0x1
0x0311	"WorkpieceNo." not transmitted	• Process data sent by the master has been changed	▶ Confirm the newly transmitted process data via a "Handshake" ControlWord = 0x1
0x0312	Initial “Handshake” missing	• After a cold start, a one-time data acquisition via ControlWord= 1 must be carried out	▶ Confirm the current process data via a "Handshake" ControlWord = 0x1
0x400	Gripper is blocked	• The gripper is difficult to move • The travel path of the gripper is impeded	▶ Re-establish the free movement of the gripper ▶ Reset via “ControlWord” =0x8000
0x406	System error	• Internal system error	▶ ☎ Zimmer Customer Service

11.2 “IO-Link” LED status display for errors

GEP2000IL-00-A		
	Green LED lights up continuously	No error
	Red LED flashes every second Green LED lights up continuously	No IO-Link communication
	Red LED lights up continuously	Actuator supply not OK
	Red LED flashes every second Green LED does not light up	Internal error
	Red LED flashes every second Green LED flashes every second (at the same time)	No reference position Reference run must be performed
	Red LED flashes every second Green LED flashes every second (alternating)	Reference run is being performed

11.3 “Digital” + “Analog” LED status display for errors

GEP2000IO-00-A		
	Green LED lights up continuously	No error
	Red LED lights up continuously	Actuator supply not OK
	Red LED flashes every second Green LED does not light up	Internal error
	Red LED flashes every second Green LED flashes every second (at the same time)	No reference position Reference run must be performed
	Red LED flashes every second Green LED flashes every second (alternating)	Reference run is being performed

12. Maintenance

Maintenance-free operation of the gripper is guaranteed for up to **10 million cycles**.
The maintenance interval may shorten under the following circumstances:

- Dirty environment
- Improper use and use that does not comply with the power specifications.
- Observe ambient temperature; lubricants harden faster!

Even though the gripper is, as mentioned, maintenance-free, perform a regular visual inspection to check for any corrosion, damage or contamination.
We recommend using the Zimmer Customer Service for maintenance and the replacement of seals.
Dismantling and reassembling the gripper without authorization may result in complications, as special installation equipment is required in some cases.
Zimmer GmbH shall not be liable in the event of unauthorized dismantling and reassembling of the gripper or in the event of any malfunction or damage resulting from this.

13. Accessories/scope of delivery

INFORMATION:

If any accessories not marketed or authorized by Zimmer GmbH are used, the function of the gripper cannot be guaranteed.
The accessories from Zimmer GmbH are specifically fitted for the individual grippers.
Please refer to our website for information on corresponding accessories.

14. Transportation/storage/preservation

- ▶ The transport and storage of the gripper must take place exclusively in the original packaging.
- ▶ If the gripper has already been installed on the higher-level machine unit, it must be ensured during transport that no unintentional movements may take place. Before commissioning the machine after transport, check all power and communication connections as well as all mechanical connections.
- ▶ If the product is stored for an extended period, the following points are to be observed:
  - ⇨ Keep the storage location as dust-free and dry as possible.
  - ⇨ Avoid temperature fluctuations/observe and adhere to the temperature range.
  - ⇨ Avoid wind/drafts/water condensation formation.
  - ⇨ Package the product.
  - ⇨ During storage, it must be kept from direct sunlight.
- ▶ Clean all components. There must be no impurities left on the components.
- ▶ Visually inspect all of the components.
- ▶ Remove all foreign objects.
- ▶ Properly remove potential corrosion spots.
- ▶ Close electrical connections using suitable covers.

15. Decommissioning and disposal

INFORMATION:

If the gripper reaches the end of its utilization phase, the gripper can be completely disassembled and disposed of. Disconnect the gripper from the power supply completely. The gripper can be disassembled and properly disposed of according to material groups. When disposing of it, observe the locally applicable environmental regulations and codes and regulations for disposal.

16. RoHS declaration

In terms of the EU Directive 2011/65/EU

Name and address of the manufacturer:

Zimmer GmbH
77866 Rheinau, Im Salmenkopf 5
☎ +49 7844 9138 0
+49 7844 9138 80
www.zimmer-group.com

We hereby declare that the incomplete machine described below
Product designation: 2-jaw parallel gripper, electric
Type designation: GEP2☐☐☐ series
conforms to the requirements of the directive in its design and the version we put on the market.

Authorized representative for the compilation of relevant technical documents

Michael Hoch	See manufacturer's address	Rheinau, Germany, 2019-09-02	Martin Zimmer
First name, last name	Address	(Place and date of issuance)	(Legally binding signature) Managing Partner

17. REACH declaration

In terms of the EU Regulation 1907/2006

Name and address of the manufacturer:

Zimmer GmbH
77866 Rheinau, Im Salmenkopf 5
☎ +49 7844 9138 0
+49 7844 9138 80
www.zimmer-group.com

REACH stands for **R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emicals.
A full declaration of REACH can be obtained from the manufacturer due to the duty to notify in accordance with Art. 33 of the REACH regulation (“Duty to communicate information on substances in articles”).

Authorized representative for compiling the relevant technical documents

Michael Hoch	See manufacturer's address	Rheinau, Germany, 2019-09-02	Martin Zimmer
First name, last name	Address	(Place and date of issuance)	(Legally binding signature) Managing Partner

DDOC00245 / h EN / 24.01.2020

18. Declaration of Incorporation

In terms of the EU Machinery Directive 2006/42/EC (Annex II 1 B)

Name and address of the manufacturer:

Zimmer GmbH
77866 Rheinau, Im Salmenkopf 5
☎ +49 7844 9138 0
+49 7844 9138 80
www.zimmer-group.com

We hereby declare that the incomplete machines described below
Product designation: 2-jaw parallel gripper, electric
Type designation: GEP2☐☐☐ series
conform to the requirements of the Machinery Directive, 2006/42/EC, Article 2g, Annex VII.b – Annex II.b, in its design and the version we put on the market.

The following harmonized standards have been used:
Basic health and safety requirements:
No. 1.1.2, No. 1.1.3, No. 1.1.5, No. 1.3.1, No. 1.3.2, No. 1.3.4, No. 1.3.7, No. 1.5.1, No. 1.5.3, No. 1.5.4, No. 1.6.4, No. 1.7.1, No. 1.7.3.

DIN EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 60204-1	Safety of machinery – Electrical equipment of machines, part 1
DIN EN ISO 13849-1	Safety of machinery – Safety-related parts of control systems
DIN EN ISO 13849-2	Safety related parts of control system

A full list of applied standards can be obtained from the manufacturer.

Commissioning of the incomplete machine is prohibited until it has been found that—where applicable—the machine in which the above-mentioned incomplete machine is to be installed complies with the Machinery Directive (2006/42/EC).

Authorized representative for compiling the relevant technical documents

Kurt Ross	See manufacturer's address	Rheinau, Germany, 2020-01-24	Martin Zimmer
First name, last name	Address	(Place and date of issuance)	(Legally binding signature) Managing Partner

19. Declaration of Conformity

In terms of the EC Directive 2014/30/EC on electromagnetic compatibility

Name and address of the manufacturer:

Zimmer GmbH
77866 Rheinau, Im Salmenkopf 5
☎ +49 7844 9138 0
+49 7844 9138 80
www.zimmer-group.com

We hereby declare that the products described below
Product designation: 2-jaw parallel gripper, electric
Type designation: GEP2☐☐☐ series
conform to the requirements of the Electromagnetic Compatibility Directive 2014/30/EU in its design and the version we put on the market.

The following harmonized standards have been used:

DIN EN ISO 12100:2011-03	Safety of machinery – General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-3	EMC Generic standard, Emission standard for residential, commercial and light-industrial environments
DIN EN 61000-6-2	EMC Generic standard, Immunity for industrial environments
DIN EN 61000-6-4	EMC Generic standard, Emission standard for industrial environments

A full list of applied standards can be obtained from the manufacturer.

Authorized representative for compiling the relevant technical documents

Kurt Ross	See manufacturer's address	Rheinau, Germany, 2020-01-24	Martin Zimmer
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