

# **Software manual**

## **SCHUNK Grippers with IO-Link**

### **IO-Link Protocol**

Translation of original software  
manual

**Hand in hand for tomorrow**

## Imprint

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**Please read the operating manual in full and keep it close to the product.**

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# 1 General

## 1.1 About this document

This software manual describes the operating and parameterization options of a SCHUNK gripper with an IO-Link interface.

### Validity

This version of the software manual describes the functions of firmware versions that bear the main version number 3.XX.

The firmware version can be read out. Information on the corresponding parameter can be found in section ► 4.1 [ 25].

### Applicable documents

- General terms of business \*
- Documentation for the products used \*

The documents labeled with an asterisk (\*) can be downloaded from [schunk.com](https://www.schunk.com).

## 1.2 IO-Link Basics

### Fieldbus independent interface

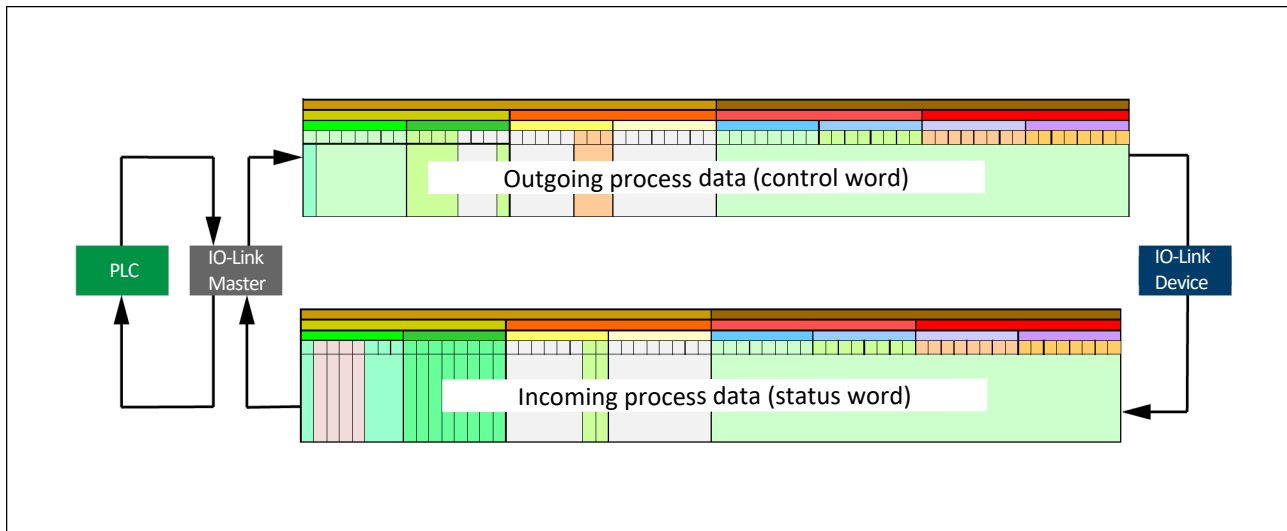
IO-Link is a point-to-point interface for connecting a SCHUNK product (IO-Link device) to a control system (IO-Link master). Via this interface it is possible to transfer parameters, process data and diagnostic data. Parameter data are transferred to the IO-Link device from the master (actuator or sensors). In the opposite direction, the master receives cyclical process data and, if required, service and diagnostic data.

Further information on IO-Link can be found at [www.io-link.com](http://www.io-link.com).

## 1.3 Data exchange

### Cyclical data exchange

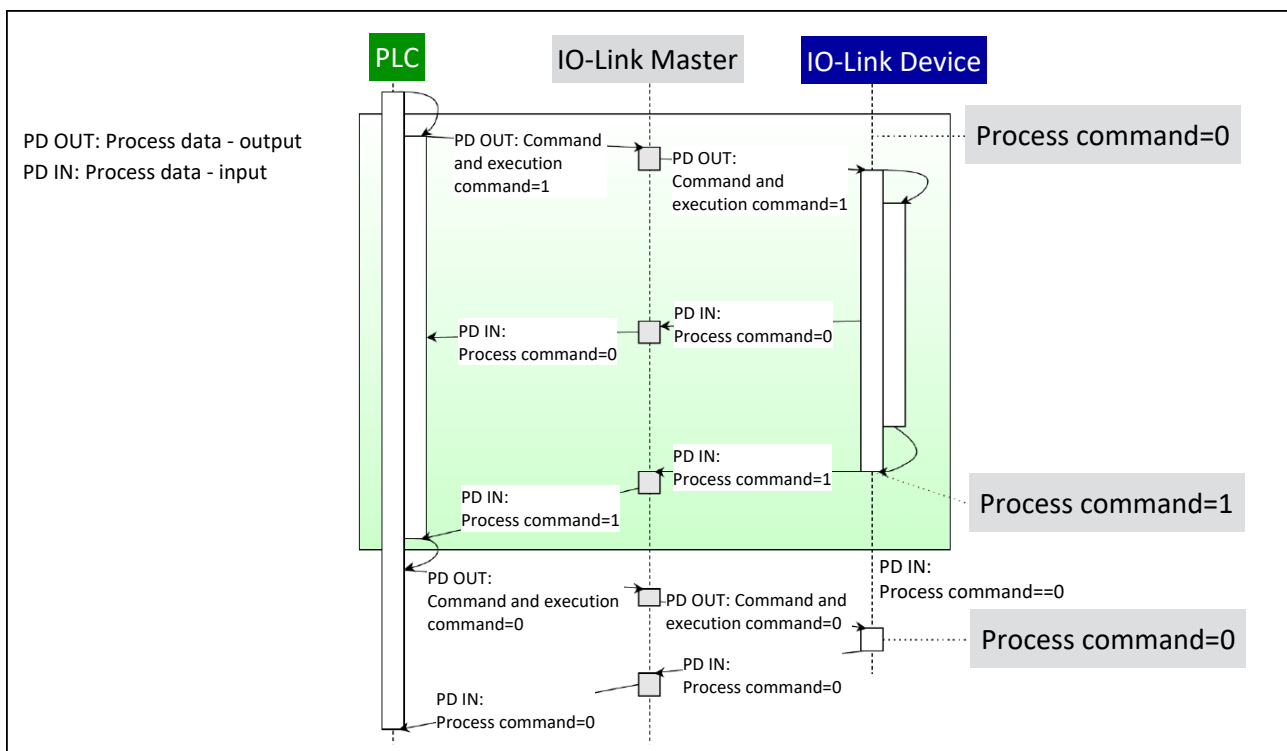
To exchange cyclic process data between an IO-Link device and a controller, the IO-Link data are transferred from the IO-Link master to the previously set address ranges. The user program of the controller accesses the process values via these addresses and processes them. Conversely, the cyclic data exchange is performed from the controller to the IO-Link device.



Cyclical data exchange

### Handshake

The following illustration shows the sequence between the execution command and the process command. The IO-Link device confirms the processing of the received data (handshake) to the sender.



Execution command and process command

PLC Execution command	IO-Link device Process command	Description
0	0	Original state
1	0	Command is sent from PLC to IO-Link device and waits for its response.
1	1	IO-Link device has processed the command.
0	1	PLC has detected that the command has been processed.
0	0	IO-Link device detects that PLC has set the execution command to "0" and also sets the execution command to "0". Handshake is complete.

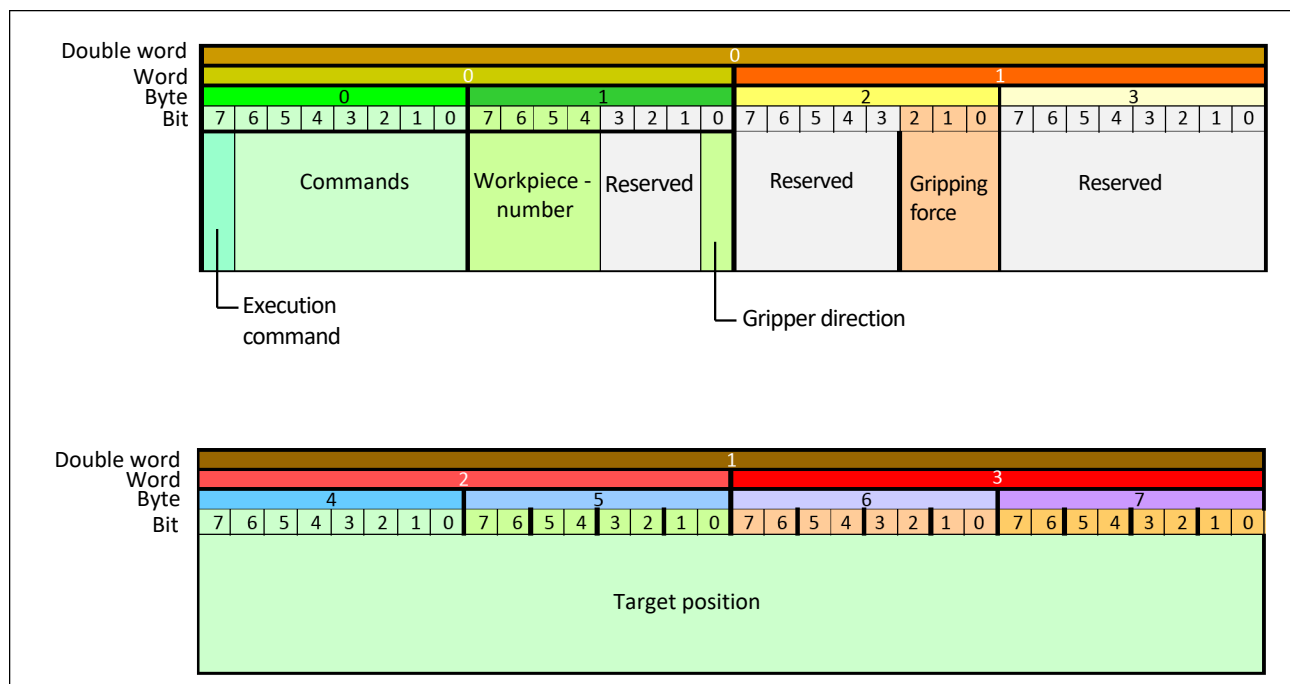
Tab.: Truth table – communication between PLC and IO-Link device

### Acyclical data exchange

The exchange of acyclic data, such as parameters or events, takes place over a specified index and sub-index range. Using the index and sub-index range, it is possible to access the data of the device in a targeted manner (e.g. for a reparameterization of the device or master during operation).

Further information, ► 4 [25].

## 2 Outgoing process data (control word)



Outgoing process data



## 2.1 Commands

### 2.1.1 Execution command

- Commands are executed by changing the status of the bit from 0 to 1.  
Exception: FastStop
- A currently executed command has been interrupted.  
Exception: Referencing, Calibration

### 2.1.2 Acknowledging

After an error has been rectified, the gripper is set to the normal operating status by acknowledging the error from the error status.

The actuator remains de-energized until the next command.

Control word	Value
Command	1 (0b x000.0001): Acknowledge
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	n.a.	n.a.
End stop	n.a.	n.a.	n.a.
Success	n.a.	n.a.	n.a.
Referenced	n.a.	n.a.	n.a.
Status	n.a.	≠0	0
Position	n.a.	n.a.	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.3 Referencing

The zero position is set during the referencing process. In the referencing direction set (► 4.2 [6 25]), the gripper moves to the mechanical end stop.

- A referencing run can only be stopped with a FastStop.
- For the referencing run, a fixed defined gripping force and speed is set for electric grippers.
- For modules with an absolute measuring system, referencing is an optional function.
- Referencing must be performed when the referencing direction has been changed or the stroke of the base jaws is restricted in the referencing direction, e. g. with specific gripper finger shapes.
- Before a referencing run, make sure that
  - all workpieces have been removed and
  - the base jaws are unobstructed as far as the end stop in the referencing direction.

Control word	Value
Command	2 (0b x000.0010): Referencing
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6 6]</li> </ul>

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	1
End stop	n.a.	1	n.a.
Success	n.a.	1	0
Referenced	n.a.	1	0
Status	n.a.	≠0	n.a.
Position	n.a.	0	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.4 Stroke measurement

Stroke measurement is an optional function. During the stroke measurement, the maximum stroke of the gripper is set relative to the referencing position. A stroke measurement should be performed if the stroke of the base jaws is limited, for instance, by specific gripper finger shapes.

The recognition of the ▶ **end stop** [23] bit or the ▶ **success** [23] bit depends, among other things, on the ▶ **Maximum stroke** [25] parameter. If the stroke measurement is not performed, the standard saved parameter "Maximum stroke" is used. A stroke measurement overwrites the previous value "Maximum stroke. This is stored in the gripper and is available after a restart.

- The stroke measurement moves contrary to the referencing direction, ▶ 4.2 [25].
- For the stroke measurement, a fixed defined force and speed is set for electric grippers.

Control word	Value
Command	7 (0b x000.0111): Stroke measurement
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ▶ 1.3 [6]</li> </ul>

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	0
End stop	n.a.	1	n.a.
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	≠0.0	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.5 Calibration

Calibration is an optional function. For calibration, the functions "Referencing" and "Stroke measurement" are performed one after the other. For modules with an absolute measuring system, the offset and slope are determined.

Note: This function is currently not available with PGN-plus-E and EGP.

Control word	Value
Command	9 (0b x000.1001): Calibration
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	0
End stop	n.a.	1	n.a.
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	≠0.0	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.6 Gripping

When gripping, movement follows the gripping direction to the stop and the workpiece is held. With electric grippers, the workpiece is held with the configured gripping force.

#### **Pulse reduction (for PGN-plus-E):**

In order to protect the workpiece from damage, electric grippers reduce the speed and current internally before reaching the intended workpiece position. The pulse decreases.

- **Workpiece position unknown:** During the first gripping process, the complete stroke is driven at a reduced speed and current. The position of the last successful grip is accepted as the intended workpiece position for the next grip command. The intended workpiece position is reset to the block following referencing, stroke measurement and after positioning.
- **Workpiece position known:** When gripping with a workpiece specification or a specified target position, pulse reduction is performed before reaching the predefined target position.

#### **FastGrip and SoftGrip (for EGP)**

The gripping modes FastGrip and SoftGrip can be set in the IO-Link process data.

- **FastGrip:** Robust gripping mode for industrial applications with optimized cycle times (e.g. Pick&Place applications)
- **SoftGrip:** Gripping mode with pulse reduction of the gripping force for gripping sensitive, fragile or highly breakable workpieces (e.g. electronics, glasses, ceramics).

For further information, see the Assembly and Operating Manual for the product.

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#### **NOTE**

The gripping mode SoftGrip is available as of firmware version 03.02.xxx.

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### 2.1.6.1 Gripping without workpiece indication

The command reports success if the gripper is blocked before the end position is reached.

Control word	Value
Command	4 (0b x000.0100): Gripping
Execute command	<ul style="list-style-type: none"> <li>Change from 0 to 1</li> <li>Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ▶ 1.3 [6]</li> </ul>
Workpiece number	0 (no specification)
Gripper direction	▶ 2.2.2 [21]

Tab.: Control word, pneumatic grippers

Control word	Value
Command	4 (0b x000.0100): Gripping
Execute command	<ul style="list-style-type: none"> <li>Change from 0 to 1</li> <li>Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ▶ 1.3 [6]</li> </ul>
Workpiece number	0 (no specification)
Gripper direction	▶ 2.2.2 [21]
Gripping force	▶ 2.2.3 [22]
Target position	▶ 2.2.4 [22]

Tab.: Control word, electric grippers

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	1
End stop	n.a.	0	1
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	≠ End stop	End stop
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.6.2 Gripping with workpiece indication

When gripping with workpiece indication, parameterized workpieces are gripped. The values that are saved in the parameter workpiece [x] overwrite the currently applied process data. The command reports success if the gripper is blocked within the stored workpiece tolerance at the target position.

Control word	Value
Command	4 (0b x000.0100): Gripping
Execute command	<ul style="list-style-type: none"> <li>Change from 0 to 1</li> <li>Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>
Workpiece number	1 ... 8

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	1
End stop	n.a.	0	1
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	Target position ± Tolerance	≠ Target position ± Tolerance
Workpiece [x]	n.a.	1	0

Tab.: Truth table

n.a.: not applicable

### 2.1.7 Releasing

When releasing, movement occurs in the opposite direction to gripping, up until the end stop. The command signals success when the end stop is reached. The smallest gripping force adjustment is set for the releasing process with electric grippers, ▶ 2.2.3 [22].

Control word	Value
Command	3 (0b x000.0011): Release
Execution command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ▶ 1.3 [6]</li> </ul>
Gripper direction	▶ 2.2.2 [21]

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	1	1
End stop	n.a.	1	0
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	End stop	≠ End stop
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable



### 2.1.8 Positioning run

The gripper moves to the position that was specified under "Target position". If the run is interrupted by a blockage, the drive switches off. An error message requiring acknowledgment is generated. The actuator remains de-energized until the next motion command.

Note: for positioning on an end stop, select the commands "Gripping" or "Release".

Control word	Value
Command	5 (0b x000.0101: Positioning run)
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>
Target position	► 2.2.4 [22]

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	0	0
End stop	n.a.	0	n.a.
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	= Target position ± Tolerance *	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED "STATUS"	Green	Green	Red

Tab.: Truth table

n.a.: not applicable

\* see assembly and operating manual for the respective product

### 2.1.9 Relative run

The gripper moves to a position determined using relative distance from the last current position. The parameter "Target position" in this case is the relative distance. If the run is interrupted by a blockage, the drive switches off. An error message requiring acknowledgment is generated. The actuator remains de-energized until the next command.

Note: for positioning on an end stop, select the commands "Gripping" or "Release".

Control word	Value
Command	6 (0b x000.0110): Relative run
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>
Target position	► 2.2.4 [22]

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	0	0
End stop	n.a.	0	n.a.
Success	n.a.	1	0
Referenced	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	= Target position ±Tolerance *	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED "STATUS"	Green	Green	Red

Tab.: Truth table

n.a.: not applicable

\* see assembly and operating manual for the respective product

### 2.1.10 Stop

This command may only be used with electric grippers. The gripper is brought to a controlled standstill. The gripper remains in a controlled standstill while retaining the force provided in the previous command.

Control word	Value
Command	8 (0b x000.1000): Stop
Execute command	<ul style="list-style-type: none"> <li>• Change from 0 to 1</li> <li>• Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	0	0	1
End stop	n.a.	n.a.	n.a.
Success	0	1	0
Referenced	1	1	n.a.
Status	≠0	≠0	n.a.
Position	n.a.	n.a.	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

### 2.1.11 Ventilation

This command may only be used with pneumatic grippers.

All valves are opened and the gripper is brought to a uncontrolled standstill. After two seconds, the valves are closed again. The command reports success when the valves are closed again.

Control word	Value
Command	10 (0b x000.1010): Ventilation
Execute command	<ul style="list-style-type: none"> <li>Change from 0 to 1</li> <li>Change from 1 to 0 (as soon as process command changes from 1 to 0) see Fig.: Execution command and process command, ► 1.3 [6]</li> </ul>

Tab.: Control word

### 2.1.12 FastStop

The electrical power supply to the actuator is interrupted immediately, the gripper is stopped uncontrolled. A FastStop occurs independently of the status change of the "Execution command" bit.

An error message requiring acknowledgment is generated. A FastStop does not increase the error count and is not saved as the most recent error.

Note: To depressurize a pneumatic gripper, select "Ventilation".

Control word	Value
Command	0 (0b x000.0000): FastStop

Tab.: Control word

Status word	Initial conditions – Enable	Feedback signal success	Feedback signal failure
Blocked	n.a.	n.a.	n.a.
End stop	n.a.	n.a.	n.a.
Success	n.a.	1	0
Referenced	n.a.	n.a.	n.a.
Status	n.a.	0	≠0
Position	n.a.	n.a.	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab.: Truth table

n.a.: not applicable

## 2.2 Command specifications

### 2.2.1 Workpiece number

The gripper can store the parameters (position and tolerance, gripping force, gripping direction) of eight workpieces (workpiece 1. .. workpiece 8). When gripping with indication of the workpiece number, these parameters are used.

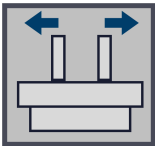
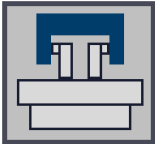
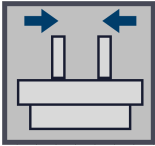
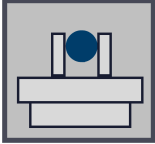
Parameters are defined:

- when teaching in the workpiece, ▶ 4.4 [27] or
- by specifying acyclic parameter data, ▶ 4.2 [26].

Process data	Value
Workpiece number	4 bit unsigned Integer

### 2.2.2 Gripper direction

This bit determines whether the gripper is an internal or external gripper.

Process data	Value	Description	Illustration
Gripper direction	1 (I.D. gripping)	The base jaws move from the inside to the outside.	
		The workpiece is gripped from the inside.	
Gripper direction	0 (O.D. gripping)	The base jaws move from the outside to the inside.	
		The workpiece is gripped from the outside.	

### 2.2.3 Gripping force

The following settings are possible depending on the gripper used:

#### Gripping force settings for PGN-E and EGH

Process data	Value
Gripping force	0: 100% (standard) 1: 75% 2: 50% 3: 25%

Tab.: Gripping force settings

#### Gripping force settings for EGP

Process data	Value
Gripping force	0: 100% (FastGrip standard) 1: 75% (FastGrip) 2: 50% (FastGrip) 3: 25% (FastGrip) 4. 100% (SoftGrip) 5. 75% (SoftGrip) 6. 50% (SoftGrip) 7. 25% (SoftGrip)

Tab.: Gripping force settings

### 2.2.4 Target position

The target position value is between the two end stops "0.0" (+Tolerance) and the parameter "Maximum stroke" (–Tolerance).

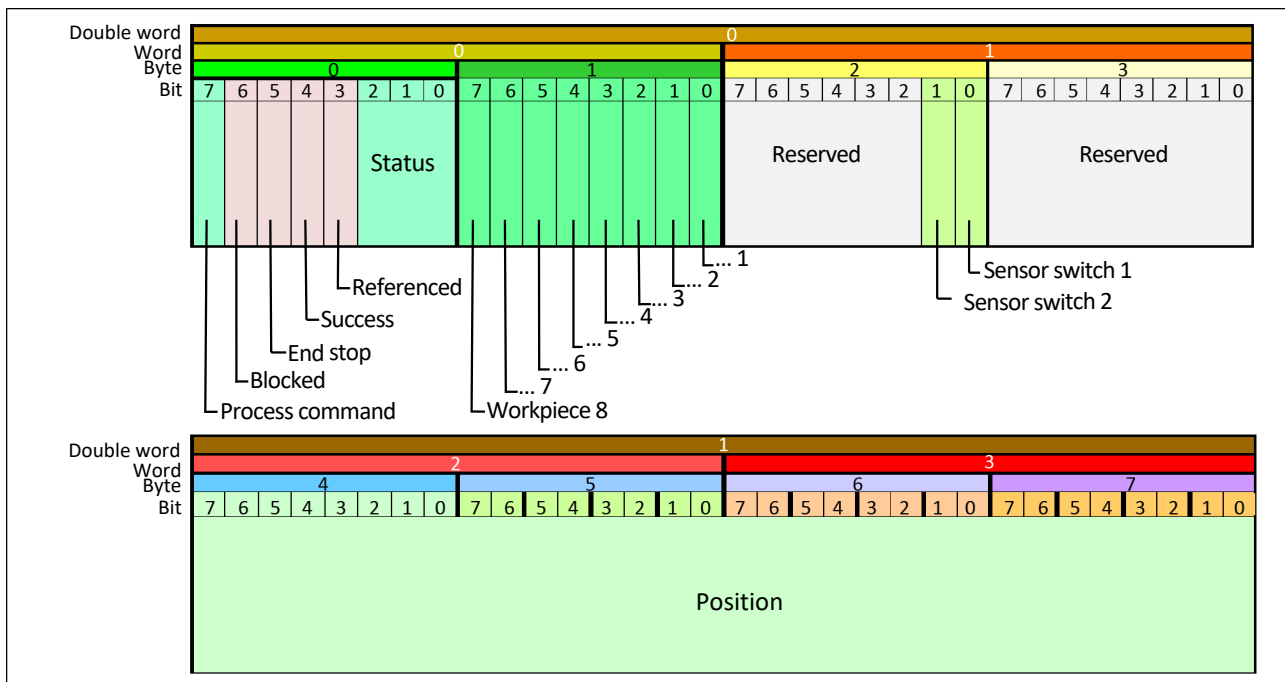
- For further information on the parameter "Maximum stroke", see ▶ 4.2 [25]. For further information on the end stop, see ▶ 3.4 [23].

#### NOTE

If a target position specification is outside the valid range, the corresponding movement command is ignored and an info message is generated.

Process data	Value
Target position	4 Byte Float IEEE754

### 3 Incoming process data (status word)



Incoming process data

#### 3.1 Status

The current status of the product is displayed. Further information is provided about acyclic device data and events, ► 4.6 [ 29].

Process data	Value
Status	0 (0b xxxx.x000): Error
	1 (0b xxxx.x001): Out of specification
	2 (0b xxxx.x010): Maintenance required
	3 (0b xxxx.x011): Ready for operation

#### 3.2 Referenced

Gripper is referenced = 1, otherwise = 0

#### 3.3 Success

When a new command is executed, the "Success" bit is reset to 0. If the command is successful, the bit is set to 1, see the truth table of the listed command.

The bit "Success" is valid if the execution command = 0.

#### 3.4 End stop

When the gripper is positioned at the end stop, it is = 1, otherwise = 0.

The position of the end stop corresponds to the position  $0.0 \pm \text{Tolerance}$  or the position "Maximum stroke"  $\pm \text{Tolerance}$ .

The tolerances of the end position detection are contained in the operating manual for the respective product.

Position	Tolerance
0.0	$\pm 0.05$ mm (after referencing/calibration)
Maximum stroke	$\pm 0.5$ mm (at factory settings) $\pm 0.05$ mm (after stroke measurement/ calibration)

Tab.: End position detection tolerances using the PGN-plus-E 80 example

### 3.5 Blocked

Active if the gripper does not move even though the actuator is energized, otherwise = 0.

### 3.6 Process command

Process command = 1 if the execute command is 1 and the process data has been processed.

Process command = 0 if the execute command changes to 0.

Information on data exchange (handshake), ► 1.3 [6].

### 3.7 Workpieces

If workpieces are parameterized, the incoming process data indicates which workpiece has been gripped after a gripping command. If the current position is within the workpiece tolerance at the target position, the relevant bit changes to 1.

- Workpieces are only recognized after a gripping command if Blocked = 1 and End stop = 0. Otherwise, all workpiece bits are set to 0.
- Overlapping workpiece tolerances can lead to the detection of multiple workpieces.

### 3.8 Sensor switch

Active if the gripper is in the position of the sensor switch, otherwise = 0.

Note: Internal hardware switches are not integrated on all grippers with IO-Link, see the operating manual for the respective product.

### 3.9 Position

The position is the current distance [mm] from a base jaw to the referenced zero point of the gripper (4 Byte Float IEEE754).



## 4 Acyclic device data and events

### 4.1 Identification data

The following acyclic data is provided for identification:

Index	Sub index	Parameter	Access	Data size	Description
0x0010	0	Manufacturer name	R	63 Byte	Manufacturer name: Schunk GmbH & Co.KG
0x0011	0	Manufacturer text	R	63 Byte	Additional information about the manufacturer: schunk.com
0x0012	0	Product name	R	63 Byte	Product description, e.g. PGN-plus-E 080-1-IOL
0x0013	0	Product ID	R	63 Byte	ID
0x0014	0	Product text	R	63 Byte	Grippers with IO-Link
0x0015	0	Serial number	R	15 Byte	Alphanumeric serial number of the gripper
0x0016	0	Hardware version	R	63 Byte	HW XX.xx (electronic)
0x0017	0	Firmware version	R	63 Byte	FW XX.xx
0x0018	0	Application-specific marking	R/W	31 Byte	Free text field for application-specific identification

### 4.2 Parameter

Index	Sub index	Parameter	Access	Data size/Data type	Description
0x000C	0	Device access lock	R/W	2 bit	Controls the read/write access of parameters and the Data Storage (DS) from the IO-Link master to the device. The DS contains the following parameters: all workpiece parameters, referencing direction and user-specific marking. Bit 0: Parameter: 0 –unlocked Bit 0: Parameter: 1 –locked Bit 1: Data Storage: 0 –unlocked Bit 1: Data Storage: 1 –locked Delivery status: Bit 0: 0 Bit 1: 0

Index	Sub index	Parameter	Access	Data size/Data type	Description
0x0054	0	Referencing direction	R/W	Boolean	Direction of the referencing run is defined 1: inner 0: outer When changing the parameter "Referencing direction", the gripper must be re-referenced. Delivery status: 0
0x00CC	0	Maintenance interval	R/W	int32	The parameter determines how many gripping cycles are to be performed before the next maintenance. Delivery status: see operating manual for the respective product By setting the maintenance interval=0; <i>Maintenance counter (0)</i> the maintenance counter is deactivated.
0x00CD	0	Maximum stroke	R	4 Byte Float IEEE754	During a ► <a href="#">stroke measurement</a> [11], when the mechanical stop (Blocked= 1) is reached, the current position takes over the new value "maximum stroke". The tolerances for the end position detection are contained in the operating manual for the respective product.

### Workpiece parameters

The parameters of the workpieces are set when teaching in the workpiece, ► [4.4](#) [27]. The default values are overwritten.

Tab.: Workpiece parameters 1 (0x0065) to 8 (0x006C)

Index	Sub index	Parameter	Access	Data size/Data type	Description
0x0065 to 0x006C	1	Target position	R/W	4 Byte Float IEEE754	Delivery status: 0 mm
	2	tolerance [ +/- ]	R/W	4 Byte Float IEEE754	Delivery status: ±0.5 mm
	3	Gripping force	R/W	3 bit	Delivery status: 100%
	4	Gripper direction	R/W	Boolean	Delivery status: 0

### 4.3 System commands

Index	Command	Access	Code	Data type	Description
0x0002	Restore delivery status	W	0x0082	uint8	Set workpiece parameters and maximum stroke to the default values.
0x0002	Reset maintenance counter	W	0x00A1	uint8	Reset maintenance counter to the value "maintenance interval".
0x0002	Teach in workpiece	W	0x00A0	uint8	The parameters of a workpiece are written. All undefined workpiece parameters are set to their default values.

### 4.4 Teach in workpiece

#### Parameterize workpiece

To teach in a workpiece, after it has been successfully gripper with a workpiece indication (► 2.1.6.2 [15]), the acyclical parameter [teach in workpiece] is used in order to save the current process data for the workpiece.

When teaching in the workpiece, the current position is saved as position parameter value "Target position". The current values for reaching the position are taken from the cyclic process data as "Gripper direction" and "Gripping force". The values can be changed manually.

At the time of teach-in, the correct values for gripping force, gripping direction and the required workpiece number must be present in the process data.

#### NOTE

If the referencing direction is changed after the workpiece has been taught in, correct workpiece recognition is no longer guaranteed. As the referencing direction changes, the counting direction of the positions changes. The workpieces must be taught in again.

## 4.5 Measured values

Index	Sub index	Measured value	Access	Data size/ Data type	Description
0x0046	0	Position [mm]	R	4 Byte Float IEEE754	Display current gripper position
0x0048	0	Current current [A]	R	4 Byte Float IEEE754	Display current power current
0x0051	0	Current voltage [V DC]	R	4 Byte Float IEEE754	Display current actuator voltage
0x0050	0	Current temperature [°C]	R	4 Byte Float IEEE754	Display current temperature
0x00AE	0	Sensor switch 1 [1/0]	R	Boolean	Display sensor switch S1 1: Switch is active 0: Switch inactive
0x00AF	0	Sensor switch 2 [1/0]	R	Boolean	Display sensor switch S2 1: Switch is active 0: Switch inactive
0x0020	0	Error counter	R	uint16	The error counter increases by 1 if a new error is present. An error is an event that results in a device status 4 (type error). Note: FastStop is ignored for counting errors.
0x00C9	0	Cycle counter	R	uint32	Total number of cycles is counted and recorded. Every second change of direction of the gripper defines one cycle.
0x00CA	0	Impulse counter	R	uint32	If a "blockage" is detected, this counter is incremented.
0x00CB	0	Maintenance counter	R	int32	The maintenance counter determines how many gripping cycles are to be performed before the next maintenance. The counter is reduced by 1 for every complete gripping cycle. If it falls below 0, it will continue to count up to a maximum of -1,000,000. The counter can be reset with the parameter "Reset maintenance counter". The maintenance interval can be defined product- and application-specifically, see the Assembly and Operating Manual for the respective product.

## 4.6 Device status

IO-Link generates acyclic EventCodes (events). These codes are divided as follows:

Index	Sub index	Event type	Access	Code	Data size	Description
0x0024	0	Message 1	R	0	uint8	<b>Ready for operation:</b> The gripper is ready for operation. All voltages are present, there is no error.
0x0024	0	Message 2	R	1	uint8	<b>Maintenance required:</b> A notification is pending. Example: maintenance interval has expired
0x0024	0	Warning 1	R	2	uint8	<b>Outside of specification:</b> There is a warning. Example: under/over voltage
0x0024	0	Warning 2	R	3	uint8	<b>Functional inspection:</b> There is a warning. Example: calibration
0x0024	0	Error	R	4	uint8	<b>Error:</b> There is an error. Example: FastStop, invalid process data due to malfunction
0x0024	0	–	–	5 – 255	–	Reserved

## 4.7 Detailed device status

The last four events (errors, warnings or messages) and the last error are displayed.

Index	Sub index	Event type	Access	Data size
0x0025	0	Messages 1 to 4	R	octet
0x0025	1	Message 1	R	3 octets
0x0025	2	Message 2	R	3 octets
0x0025	3	Message 3	R	3 octets
0x0025	4	Message 4	R	3 octets
0x00C8	–	Last error	R	uint8

### Errors, warnings and messages

Errors (EventCode 4) must be confirmed with the "acknowledge" command after rectifying the cause of the error.

Warnings (EventCode 2) and messages (EventCode 1 and 0) do not require confirmation.

Event code	Event type	Code	Display	Description
4	Error	0x1000	UNKNOWN ERROR	active if an unknown, unassignable error has occurred
		0x4000	TEMPERATUR FAIL	<ul style="list-style-type: none"> <li>• <b>PGN-plus-E:</b> active when the temperature is &gt;70 °C</li> <li>• <b>EGP / EGH:</b> active when the temperature is &gt;99 °C</li> </ul>
		0x18D2	ERROR CONFIG MEMORY	Each time the software is started, the non-volatile memory is read. active if the non-volatile memory is not readable Remedy: Switch the voltage supply off and on, restart the gripper. If the error continues to be listed: send gripper to SCHUNK for repair.
		0x18D9	ERROR FAST STOP	active if a FastStop has been triggered, ► 2.1.12 [20].
		0x18DE	ERROR CURRENT	active if the current for the electronics has exceeded 5.5 A for more than 30 seconds
		0x187A	ERROR LIFE SIGN	active if communication has been aborted, e.g. by <ul style="list-style-type: none"> <li>• cable breakage in the wiring within the gripper</li> <li>• voltage supply to actuator interruption (port B)</li> </ul>
		0x187E	ERROR VALVE	active if a valve stops working properly
		0x18DA	ERROR PRESSURE	active if the air supply pressure is not between 2 bar and 8 bar
		0x18E5	ERROR POS SYSTEM	active if the position measurement system is not working properly
		0x18F3	ERROR BOOT NOT SUCCESSFUL	At device start: Actuator voltage not present or Technosoft controller not available. <ul style="list-style-type: none"> <li>• The drive has no current.</li> <li>• After switching on the actuator voltage: Continuous illumination of the "ERROR" LED</li> </ul>

Event code	Event type	Code	Display	Description
		0x1858	ERROR POSITION BLOCKED	active when a blockage is detected during positioning <ul style="list-style-type: none"> <li>The drive is switched to no current.</li> <li>Continuous illumination of the "ERROR" LED</li> </ul>
		0x1874	ERROR MOTOR VOLTAGE LOW	Supply voltage falls below 18.8 volts <ul style="list-style-type: none"> <li>The drive has no current.</li> <li>Continuous illumination of the "ERROR" LED</li> </ul>
		0x1875	ERROR MOTOR VOLTAGE HIGH	Supply voltage falls below 28.8 volts <ul style="list-style-type: none"> <li>The drive has no current.</li> <li>Continuous illumination of the "ERROR" LED</li> </ul>
3	Warning	0x1801	BOOT MODE	active when gripper starts Device status: undefined, as process data is temporarily invalid
2	Warning	0x4210	Device temperature too high	active if device temperature $\geq 85\text{ °C}$ inactive if device temperature $< 67\text{ °C}$
		0x5110	Supply voltage too high	active if supply voltage $> 28.8\text{ V}$
		0x5111	Supply voltage too low	active if supply voltage $> 18.8\text{ V}$
		0x1822	WARNING POSITION NOT REACHABLE	active as soon as a position outside the valid range is to be approached
		0x1856	Gripping force outside of specification	active if invalid gripping force settings are transmitted via cyclic process data (control word) (only for EGP): active if SoftGrip setting (4 to 7) was used with firmware version $< 03.02.xxx$
		0x1857	Workpiece selection outside the specification	active if an invalid workpiece selection is transmitted via cyclic process data (control word)

Event code	Event type	Code	Display	Description
1	Message	0x8C42	Maintenance required – change wearing parts	active if maintenance counter < 0 inactive if maintenance counter >= 0
0	Message	0x1806	Not referenced	active if gripper is not referenced inactive if gripper was successfully referenced
		0xFF99	Request upload	active as soon as the gripper wants to initiate an upload via the master Message is sent from the gripper if one or more workpiece parameters have changed or the referencing direction has been changed.
		0x0000	No malfunction	active if there are no errors The gripper is ready for operation.



## 5 Startup behavior

To enable a defined restart of the gripper, the gripper is in the following status when restarting:

Restart: Switching off and on the actuator and logic voltage

Process data (Status word)	Value
Blocked	0
End stop	0
Success	0
Referenced	0
Status	0 (error)

To put the gripper in the operating status, the following steps are required:

1. Acknowledge.
2. Carry out referencing run if necessary.

The gripper then has the status:

Process data (Status word)	Value
Blocked	n.a.
End stop	n.a.
Success	1
Referenced	1
Status	≠0 (no error)

n.a.: not applicable

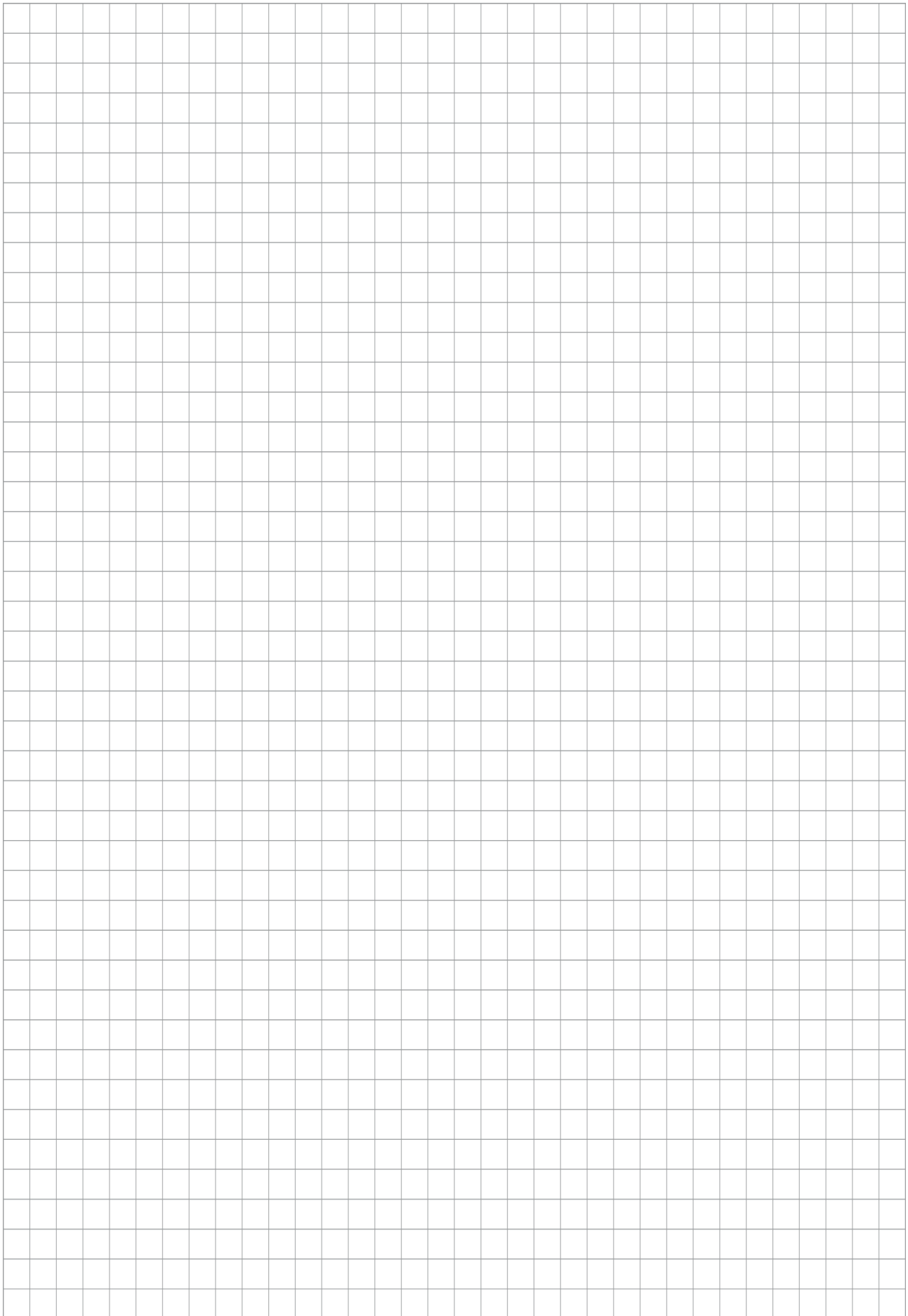
## 5.1 Startup behavior on loss of actuator voltage

If the actuator voltage has been switched off/deactivated, the gripper switches to the error state.

- *Firmware version FW3.2.x*: The status bits remain in the same status as at the time before the actuator lost power.
- *Firmware version FW3.1.x*: All status bits are set to 0.

To put the gripper in the operating status, the following steps are required:

1. Switch on actuator voltage.
2. Wait five seconds after starting the actuators.
  - ⇒ Status LED lights up red.
  - ⇒ Device remains in the error state.
  - ⇒ *cyclical*: Device status *Error*
  - ⇒ *acyclic message*: ERROR BOOT NOT SUCCESSFUL or ERROR LIFE SIGN
3. Acknowledge after 5 seconds.
  - ⇒ Device remains in the error state.
  - ⇒ *cyclical*: Device status *Error*
  - ⇒ *acyclic message*: ERROR FAST STOP
4. Acknowledge again.
  - ⇒ Device is no longer in the error state.
  - ⇒ The following device statuses can be displayed: Ready for operation, Maintenance required or Out of specification
  - ⇒ *cyclical*: Device status  $\neq$  Error status
  - ⇒ *acyclic message*: Ready for operation, Maintenance required or Out of specification
  - ⇒ The cyclical status bits are updated.
5. Perform reference run.





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