

# Software Manual

## SCHUNK Gripper with IO-Link

## Imprint

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## 1 General

### 1.1 Applicable documents

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

The documents marked with an asterisk (\*) can be downloaded on our homepage **schunk.com**

### 1.2 IO-Link Basics

#### Fieldbus independent interface

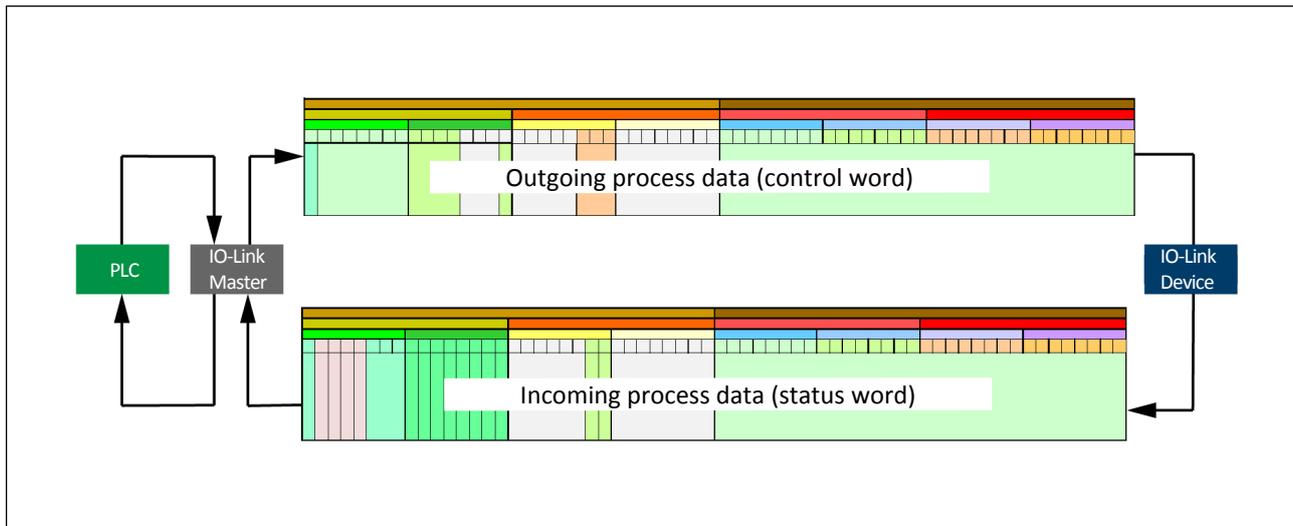
IO-Link is a point-to-point interface for connecting a SCHUNK product (IO-Link device) to a control system (IO-Link master). Via this interface it is possible to transfer parameters, process data and diagnostic data. Parameter data are transferred to the IO-Link device from the master (actuator or sensors).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

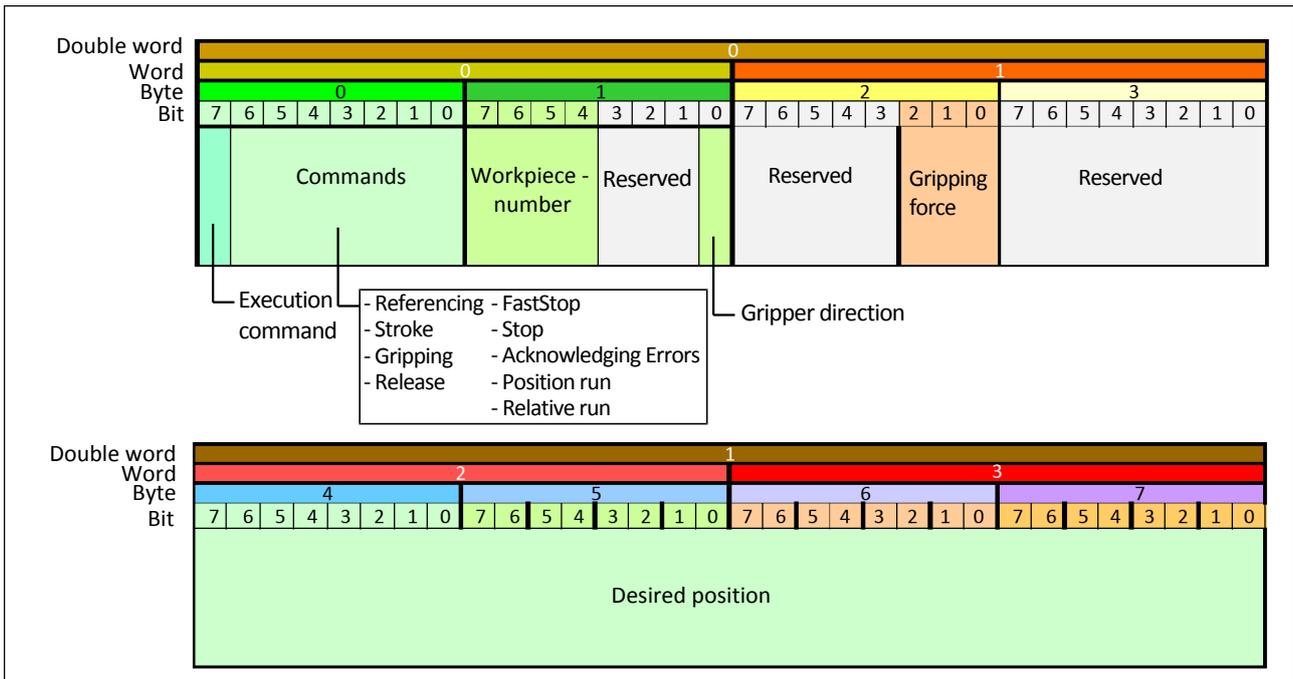
### Cyclical data exchange

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

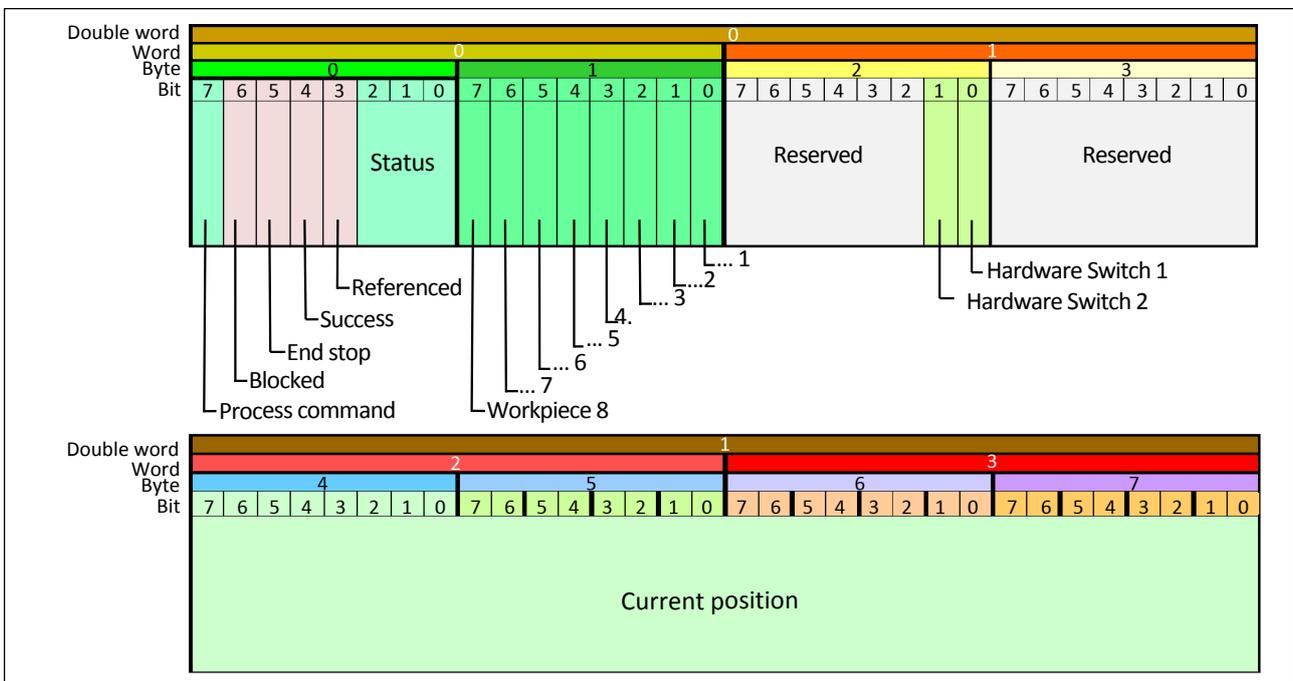
### Outgoing process data (control word)



Outgoing process data

Further information, [Outgoing process data \(control word\)](#) [► 8].

### Incoming process data (status word)



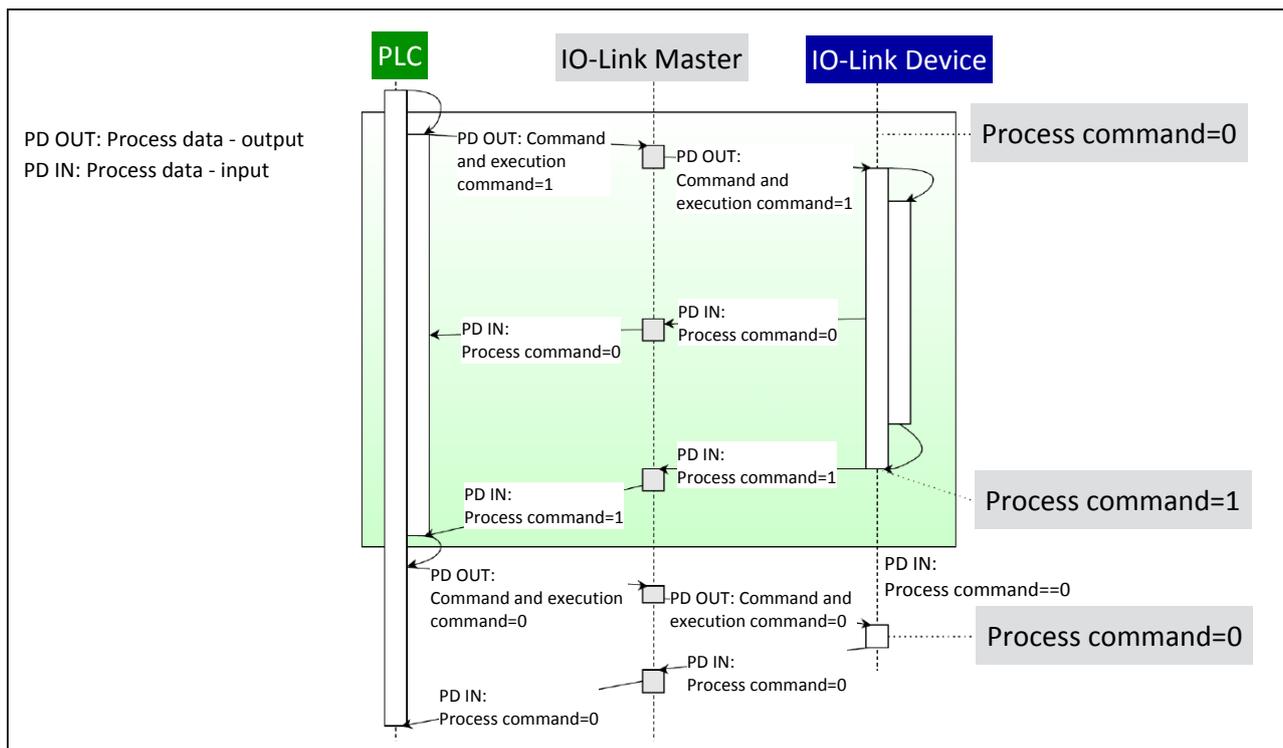
Incoming process data (status word)

Further information, [Incoming process data \(status word\)](#) [► 22].

## Handshaking

The following illustration shows the sequence between the execution command and the process command. The receiver confirms the receipt and processing of data (handshaking) to the sender.

The PLC cannot send another new command until the IO-Link device is ready to receive a command (process command = 1). Thereafter, the execution command and the process command are reset to 0. A new command can be sent from the PLC.



Execution command and process command

## Acyclical data exchange

The exchange of acyclical 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, [Acyclical device data and events](#) [► 26].

## 2 Outgoing process data (control word)

Byte number	Bit number	Designation	For additional information, see chapter
0	0 - 6	Command: Referencing Stroke Gripping Release FastStop Stop Acknowledge error Positioning run Relative run	<a href="#">Referencing</a> [▶ 10] <a href="#">Stroke</a> [▶ 11] <a href="#">Gripping</a> [▶ 12] <a href="#">Release</a> [▶ 16] <a href="#">FastStop</a> [▶ 20] <a href="#">Stop</a> [▶ 19] <a href="#">Acknowledge error</a> [▶ 9] <a href="#">Positioning run</a> [▶ 17] <a href="#">Relative run</a> [▶ 18]
	7	Execution command	<a href="#">Execution command</a> [▶ 8]
1	0	Gripper direction	<a href="#">Gripper direction</a> [▶ 21]
	1 - 3	Reserved	-
	4 - 7	Workpiece number	<a href="#">Workpiece number</a> [▶ 21]
2	0 - 2	Gripping force	<a href="#">Gripping force</a> [▶ 21]
	3 - 7	Reserved	-
3	0 - 7	Reserved	-
4 ... 7	0 ... 31	Desired position	<a href="#">Desired position</a> [▶ 21]

### 2.1 Commands

#### 2.1.1 Execution command

Commands are executed by the state change of the bit from "0" (false) to "1" (true).

Exception: FastStop

### 2.1.2 Acknowledge error

After an error has been corrected, the gripper is set to the normal operating state by acknowledging the error from the error state. Acknowledgment changes the current status into the process data, [Incoming process data \(status word\)](#) [► 22].

The drive remains de-energized until the next command.

Process data	Value
Command	0b 000.0001: Acknowledge error

Truth table "Acknowledge error"

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.
LED "STATUS"	Red	Green	Red

n.a.: not applicable

### 2.1.3 Referencing

When referencing, the zero position is set. The gripper moves to the mechanical end stop.

- Referencing takes place in the set referencing direction ([Parameter](#) [▶ 27]).
- For referencing, the gripping force is set at 25%.
- Before a referencing run, make sure that
  - all workpieces have been removed,
  - gripper fingers, attachments or the like are not blocked, and
  - Base jaws are free to the end stop in referencing direction.
- A referencing run can only be stopped by FastStop.
- After referencing, the first two gripping operations (gripping and releasing) take place at reduced speed without impulse reduction, [Gripping](#) [▶ 12].

Process data	Value
Command	0b 000.0010: Referencing

Truth table "Referencing"

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	≠0	≠0	n.a.
Position	n.a.	0	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

n.a.: not applicable

### 2.1.4 Stroke

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

The recognition of the bit "End stop" or the bit "Success" depends, among other things, on the parameter "Maximum stroke". If the stroke does not take place, the parameter "Maximum stroke" saved as standard is used. A stroke overwrites the previous value "Maximum stroke", [Parameter](#) [▶ 27]. This is stored in the gripper and is available after a restart.

- The stroke moves contrary to the referencing direction, [Parameter](#) [▶ 27].
- For the stroke, the gripping force is set at 25%.
- The stroke moves at reduced speed. Subsequent movement without position and workpiece indication also takes place at reduced speed.
- The stroke can be interrupted by another travel command (e.g. Referencing, Gripping, Release, Positioning run, Relative run).

Process data	Value
Command	0b 000.0111: Stroke

Truth table "Stroke"

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.

n.a.: not applicable

### 2.1.5 Gripping

When gripping, it is moved in the gripping direction to the end stop and the workpiece is held with the set gripping force. The command reports success if the gripper is blocked before the end position is reached.

The gripping command can be interrupted by another travel command (e.g. Referencing, Stroke, Release, Relative run, Positioning run).

#### Impulse reduction

In order to protect the workpiece and the gripper from overloading and thus from damage, the speed and the current are reduced before reaching the stop position, the impulse is reduced. The gripper moves smoothly without momentum into the stop position.

- Stop position is unknown: when gripping without position indication (Desired position = 0.0) the system moves during the first gripping procedure with reduced speed and current. The position of the last successful grip is accepted for the next grip command.
- Stop position is known: when gripping with position and workpiece indication, the speed and the current are reduced before the expected stop position.

### 2.1.5.1 Gripping without position indication

When gripping without position indication, the position of the last successful gripping is assumed to be the position for the next gripping.

An impulse reduction is performed before reaching the expected stop position, [Gripping](#) [▶ 12].

Process data	Value
Command	0b 000.0100: Gripping
Workpiece number	0 (no specification)
Gripper direction	<a href="#">Gripper direction</a> [▶ 21]
Gripping force	<a href="#">Gripping force</a> [▶ 21]
Desired position	0.0

Truth table "Gripping"

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.	n.a.	End stop position *
Workpiece [x]	n.a.	n.a.	n.a.

n.a.: not applicable

\* The end stop position corresponds to position 0.0 or the maximum stroke position (parameter 0xCD: Maximum stroke, [Parameter](#) [▶ 27])

### 2.1.5.2 Gripping with position indication

When gripping with position indication, the stop position is transmitted with cyclical process data (Desired position). The impulse reduction is performed before reaching this position.

Position values are always positive values (between 0 and maximum stroke).

Process data	Value
Command	0b 000.0100: Gripping
Workpiece number	0 (no specification)
Gripper direction	<a href="#">Gripper direction</a> [► 21]
Gripping force	<a href="#">Gripping force</a> [► 21]
Desired position	Position indication <> 0.0, <a href="#">Desired position</a> [► 21]

Truth table "Gripping with position indication"

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 position *	End stop position *
Workpiece [x]	n.a.	n.a.	n.a.

n.a.: not applicable

\* The end stop position corresponds to position 0.0 or the maximum stroke position (parameter 0xCD: Maximum stroke, [Parameter](#) [► 27])

### 2.1.5.3 Gripping with workpiece indication

When gripping with workpiece indication, a parameterized workpiece with defined gripping force and gripping direction is gripped. The gripper moves in the gripping direction and holds the workpiece with the set gripping force. The impulse reduction is performed before reaching this position.

A workpiece is parameterized when the position, tolerance, gripping force and gripping direction have been assigned to the workpiece with the number "x", [Teach in workpiece](#) [► 30]. The values that are saved in the parameter workpiece [x], overwrite currently applied process data.

Process data	Value
Command	0b 000.0100: Gripping
Workpiece number	1 ... 8

Truth table "Gripping with workpiece indication"

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.	Workpiece position ± tolerance	≠ Workpiece position ± tolerance
Workpiece [x]	n.a.	1	0

n.a.: not applicable

### 2.1.6 Release

When releasing, it moves contrary to the gripping direction to the end stop and the workpiece is completely released.

- The command signals success when the limit stop is reached.
- For the release, the gripping force is set at 25%.
- The command can be interrupted by another travel command (e.g. Referencing, Stroke, Gripping, Positioning run, Relative run).

Process data	Value
Command	0b 000.0011: Release
Gripper direction	<a href="#">Gripper direction</a> [► 21]

Truth table "Release"

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 position *	≠ End stop position *
Workpiece [x]	n.a.	Position	n.a.

n.a.: not applicable

- \* The end stop position corresponds to position 0.0 or the maximum stroke position (parameter 0xCD: Maximum stroke, [Parameter](#) [► 27])

### 2.1.7 Positioning run

The gripper moves to the position that was specified under "Desired position".

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

- The position run can be interrupted by another travel command (e.g. Referencing, Stroke, Gripping, Release, Relative run).
- If the position run is interrupted by a blockage, the drive switches off. An acknowledgment-requiring error message is generated, [Acknowledge error](#) [► 9]. The drive remains de-energized until the next travel command.
- After positioning on blockade, the impulse reduction function is reset (impulse reduction: "stop position is unknown", [Gripping](#) [► 12]).
- If a position indication is outside the valid range, the corresponding travel command is ignored. The valid range is between position 0 and maximum stroke. An information alert is generated, [Detailed device status](#) [► 34].

Process data	Value
Command	0b 000.0101: Positioning run
Desired position	<a href="#">Desired position</a> [► 21]

Truth table "Positioning run"

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.	≠ End stop position *	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED "STATUS"	Green	Green	Red

n.a.: not applicable

\* The end stop position corresponds to position 0.0 or the maximum stroke position (parameter 0xCD: Maximum stroke, [Parameter](#) [► 27])

### 2.1.8 Relative run

The gripper moves to a position determined with a relative distance from the last current position. The parameter "desired position" in this case is the relative distance.

- The relative run can be interrupted by another travel command (e.g. Referencing, Stroke, Gripping, Release, Positioning run).

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

Process data	Value
Command	0b 000.0110: Relative run
Gripping force	<a href="#">Gripping force</a> [► 21]
Desired position	<a href="#">Desired position</a> [► 21]

Truth table "Relative run"

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.	≠ End stop position *	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED "STATUS"	Green	Green	Red

n.a.: not applicable

- \* The end stop position corresponds to position 0.0 or the maximum stroke position (parameter 0xCD: Maximum stroke, [Parameter](#) [► 27])

### 2.1.9 Stop

This command causes the gripper to stop during a movement: Gripping, Release, Stroke, Positioning run, Relative run.

- A stop is not executed immediately and depends on the state change of the "Execution command" bit. Only when the bit is set to 1 is the command released.
- The gripper stops while maintaining the force set in the previous travel command.
- The drive is brought to a controlled standstill and remains controllable at standstill.

Application:

- Interrupt the travel command based on the process status (jog mode, enabling button, workpiece presence, etc.).

Process data	Value
Command	0b 000.0100: Stop

Truth table "Stop"

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.

### 2.1.10 FastStop

This command causes the gripper to stop immediately during a movement: Referencing, Gripping, Release, Stroke, Positioning run, Relative run

- FastStop is independent of the state change of the "Execution command" bit.
- The power supply to the drive is interrupted immediately, the drive is stopped uncontrolled.
- As long as a FastStop is present, no other commands are executed. A FastStop must be confirmed with the "Acknowledge error" command before another travel command is executed.
- A FastStop does not increase the error count and is not saved as the most recent error.

Applications:

- Defined conduct after communication failure or signal loss.
- Switch off the drive if necessary to save energy and avoid heat generation.

Process data	Value
Command	0b 000.0000: FastStop

## 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, [Teach in workpiece](#) [▶ 30] or
- by specifying acyclic parameter data, [Parameter](#) [▶ 28].

### 2.2.2 Gripper direction

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

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

### 2.2.3 Gripping force

The gripping force is adjusted in 4 increments from 25% - 100%. By default, the gripping force is set to 100%.

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

### 2.2.4 Desired position

Process data	Value
Desired position	4 Byte Float IEEE754

### 3 Incoming process data (status word)

Byte number	Bit number	Designation	Description
0	0 - 2	Status	The current status is transmitted. Further information, <a href="#">Status</a> [► 24]
	3	Referenced	Gripper is referenced = 1, otherwise = 0 Further information, <a href="#">Referenced</a> [► 24]
	4	Success	Command completed successfully = 1, otherwise = 0 Further information, <a href="#">Success</a> [► 24]
	5	End stop	End stop of the gripper has been reached = 1, otherwise = 0 Further information, <a href="#">End stop</a> [► 24]
	6	Blocked	Gripper does not move, although the engine is energized = 1, otherwise = 0 Further information, <a href="#">Blocked</a> [► 24]
	7	Process command	Process data applied = 1, otherwise = 0 Further information, <a href="#">Process command</a> [► 24].
	1	0	Workpiece 1
1		Workpiece 2	Workpiece 2 detected = 1, otherwise = 0
2		Workpiece 3	Workpiece 3 detected = 1, otherwise = 0
3		Workpiece 4	Workpiece 4 detected = 1, otherwise = 0
4		Workpiece 5	Workpiece 5 detected = 1, otherwise = 0
5		Workpiece 6	Workpiece 6 detected = 1, otherwise = 0
6		Workpiece 7	Workpiece 7 detected = 1, otherwise = 0
7		Workpiece 8	Workpiece 8 detected = 1, otherwise = 0

Byte number	Bit number	Designation	Description
2	0	Hardware switch 1 *	Gripper is in position of sensor signal 1 = 1, otherwise = 0 Further information, <a href="#">Hardware switch</a> [▶ 24].
	1	Hardware switch 2 *	Gripper is in position of sensor signal 2 = 1, otherwise = 0
	*		
	2	Reserved	
	3		
	4		
	5		
	6		
7			
3	0	Reserved	
	1		
	2		
	3		
	4		
	5		
	6		
	7		
4 ... 7	0 ... 31	Current position	Current position of the gripper is displayed (4 bytes Float IEEE754). Further information, <a href="#">Current position</a> [▶ 25].

\* Hardware switches are not integrated on all grippers with IO-Link, see the Assembly and Operating Manual of the product.

### 3.1 Status

The current status of the product is displayed. Further information is provided about acyclic device data and events, [Device status](#) [► 33].

Process data	Value
Status	0b000: Error 0b001: Outside of the specification 0b010: Maintenance required 0b011: Operational

### 3.2 Referenced

Active if the gripper is referenced, 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.

### 3.4 End stop

During referencing, the position of the first end stop is determined. The tolerance of the position value for the detection of the end stop is  $\pm 0.05$  mm. The default setting for the tolerance of the second end stop is  $\pm 0.5$  mm. This can be reduced to  $\pm 0.05$  mm by a stroke.

As soon as the base jaws are positioned on the end stop, the bit is set to 1.

### 3.5 Blocked

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

### 3.6 Process command

Active if the "execute command" changes to 1. Inactive if the data processing is completed internally and the "execute command" changes to 0.

### 3.7 Workpiece recognition

If workpieces are parameterized, the cyclic status word indicates which workpieces correspond to the current gripper position. If the current position is within the workpiece tolerance, the bit changes to 1.

### 3.8 Hardware switch

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

### **3.9 Current position**

Indicates the current position of the gripper (4 bytes Float IEEE754).

## 4 Acyclic device data and events

Diagnostic information (device status, measured values), parameters and identification data are transmitted acyclically upon request of the IO-Link master.

The acyclic device data can be set individually. For this, IO-Link provides the corresponding acyclic indexes. The parameterization is possible for the user via PLC or corresponding commissioning tool of the IO-Link master manufacturer.

### 4.1 Identification data

The following acyclic data is provided for identification:

Code	Data size	Parameter	Description
0x0010	63 Byte	Vendor Name	Manufacturer name: Schunk GmbH & Co.KG
0x0011	63 Byte	Vendor Text	Additional information about the manufacturer: schunk.com
0x0012	63 Byte	Product Name	Product designation, e. g. PGN-plus-E 080-1-IOL
0x0013	63 Byte	Product ID	ID
0x0014	63 Byte	Product Text	Electric Gripper with IO-Link
0x0015	15 Byte	Serial Number	Serial number
0x0016	63 Byte	Hardware version	Hardware Version
0x0017	63 Byte	Firmware version	Firmware Version
0x0018	31 Byte	Application Specific Tag	Free text field for application-specific identification

## 4.2 Parameter

Code	Data type	Parameter	Description
0x000C	2 bit	Device Access Lock	Controls the read/write access of parameters and the Data Storage (DS) Index_List from the IO-Link master to the device. The DS Index_List contains the following parameters: all workpiece parameters, referencing direction and user-specific free text field.  Bit 0: Parameter: 0 -unlocked Bit 0: Parameter: 1 -locked Bit 1: Data Storage: 0 -unlocked Bit 1: Data Storage: 1 -locked
0x0054	boolean	Referencing direction	Direction of the referencing run is defined 1: inner 0: outer  When changing the parameter "Referencing direction", the gripper must be re-referenced.
0x00CC	int32	Maintenance interval	The parameter determines after how many gripping cycles the next maintenance is to be performed.
0x00DC	int32	Maximum stroke	During a stroke, when the mechanical stop (Blocked = 1) is reached, the current position value (current position) is taken over as the new value "maximum stroke".

### Workpiece parameters

The parameters of the workpieces are set when the teaching in the workpiece, [Teach in workpiece](#) [▶ 30]. The default values are overwritten.

Code	Sub index	Data type	Parameter	Description
<b>Workpiece 1</b>				
0x0065	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 2</b>				
0x0066	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 3</b>				
0x0067	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 4</b>				
0x0068	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 5</b>				
0x0069	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 6</b>				
0x006A	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 7</b>				
0x006B	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: ± 0.5 mm
	3	3 bit	Gripping force	Standard value: 100%

Code	Sub index	Data type	Parameter	Description
	4	boolean	Gripper direction	Standard value: 0
<b>Workpiece 8</b>				
0x006C	1	float32	Desired position	Standard value: 0 mm
	2	float32	tolerance	Standard value: $\pm 0.5$ mm
	3	3 bit	Gripping force	Standard value: 100%
	4	boolean	Gripper direction	Standard value: 0

### 4.3 System commands

Code	Data type	Parameter	Description
0x0082	uint8	Establish factory settings	Reset to factory settings
0x00A1	uint8	Maintenance counter re-set	Reset maintenance counter, <a href="#">Measured values</a> [▶ 31]
0x00A0	uint8	Teach in workpiece	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 ([Gripping with workpiece indication](#) [▶ 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 "Desired 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

**Observation** The following acyclic data is provided for observation:

Code	Data type	Measured value	Description
0x0046	float 32	Current position [mm]	Display current gripper position
0x0048	float 32	Current current [A]	Display current current
0x0051	float 32	Current voltage [V DC]	Display current voltage
0x0050	float 32	Current temperature [°C]	Display current temperature
0x00AE	boolean	Hardware Switch 1 [1/0]	Display hardware switch S1 1: Switch is active 0: Switch inactive
0x00AF	boolean	Hardware Switch 2 [1/0]	Display hardware switch S2 1: Switch is active 0: Switch inactive

**Logging** The following acyclic data is provided for recording:

Code	Data type	Measured value	Description
0x0020	uint 16	Error counter	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 when counting errors.
0x00C9	uint 32	Cycle counter	Total number of cycles is counted and recorded. Every second change of direction of the gripper defines one cycle.
0x00CA	uint 32	Impulse counter	If a "Blocked" is detected, this counter is incremented.

Code	Data type	Measured value	Description
0x00CB	uint 32	Maintenance counter	<p>The maintenance counter indicates after how many gripping cycles the next maintenance is to be performed.</p> <p>The counter is reduced by 1 for every "Blocked" or complete gripping cycle. If it falls below 0, it will continue to count up to a maximum of -1,000,000.</p> <p>The counter can be reset with the parameter "Maintenance counter reset".</p> <p>The maintenance interval can be defined product- and application-specifically, see the Assembly and Operating Manual of the product.</p>

## 4.6 Device status

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

EventCode Value *	EventCode Type	Description
0	Message 1	Operational The gripper is ready for operation. All voltages are present, there is no error.
1	Message 2	Maintenance required A notification is pending. Example: maintenance interval has expired
2	Warning 1	Outside of specification There is a warning. Example: under / over voltage
3	Warning 2	Functional inspection There is a warning. Example: calibration
4	Error	There is an error. Example: FastStop, invalid process data due to malfunction
5 - 255	-	Reserved

\* The most significant EventCode determines the status that is transmitted.

Device status can be displayed in detail, [Detailed device status](#) [► 34]

#### 4.7 Detailed device status

- Errors, warnings or messages that led to the current device status are displayed in detail.
- A maximum of four events are displayed.
- Errors (EventCode 4) must be confirmed with the "Acknowledge error" command. If the reason for the error has not been eliminated, the error will continue to be listed.
- Warnings (EventCode 2) and messages (EventCode 1 and 0) are self-acknowledging events.

EventCode value	EventCode Type	Code	Display	Description
4	Error	0x1000	UNKNOWN ERROR	active if an unknown, unassignable error has occurred
		0x4000	TEMPERATURE FAIL	active when the temperature is >75 °C
		0x18D2	ERROR CONFIG MEMORY	Each time the software is started, the non-volatile memory is read out. active if the non-volatile memory is not readable Remedy: Switch the power 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, <a href="#">FastStop</a> [► 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>
2	Warning	0x4210	Device temperature too high	active, if device temperature >= 70 °C inactive if supply voltage < 67 °C
		0x5110	Supply voltage too high	active if supply voltage > 28.8 V
		0x5111	Supply voltage too low	active if supply voltage > 18.8 V

EventCode value	EventCode Type	Code	Display	Description
		0x1856	Gripping force outside of specification	active if invalid gripping force settings are transmitted via cyclic process data (control word)
		0x1857	Workpiece selection outside the specification	active if an invalid workpiece selection is transmitted via cyclic process data (control word)
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.

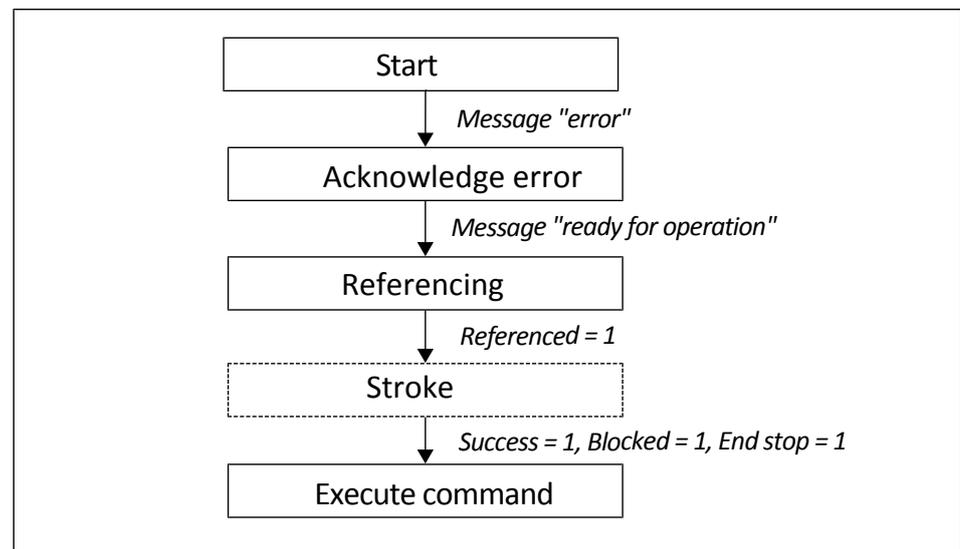
## 5 Startup behavior

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

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

To put the gripper in the operating state, the following steps are prescribed:

1. Acknowledge error
2. Perform referencing run
3. Perform stroke run (optional)



*Starting sequence*

The gripper is then in the state:

Process data (Status word)	Value
Blocked	1
End stop	1
Success	1
Referenced	1
Status	4 (ready for operation)