Software Manual

Smart Gripper
SGE-40-P-IOL

Translation of the Original Software Manual EN

- SGE-40-P-IOL

Dear Customer

Thank you for choosing our products and placing your trust and confidence in our company!

This software manual contains all essential information you need about your product. Our aim is to provide the required information as concisely and clearly as possible. If, however, you still have any questions on the contents or suggestions, please do not hesitate to contact us. We are always grateful for any feedback.

Our team will also be glad to answer any further question you may have regarding the smart gripper or other options.

We wish you every success with our products!

With kind regards

Your Afag team

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The smart gripper has been designed by Afag Automation AG according to the state of the art. Due to the constant technical development and improvement of our products, we reserve the right to make technical changes at any time.

Updates of our documentations

Unlike the printed documents, our digital instructions manuals, product data sheets and catalogues are being continuously updated on our website.

Please keep in mind that the digital documents on our website are always the latest versions.

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1 General

1.1 About this document

This software manual describes the operation and parametrisation of the smart gripper SGE-40-P-IOL.

This version of the software manual describes the functions for the firmware versions with the main version number 3.XX.

The firmware version can be read out. For information on the corresponding parameter, see ➲Chap. 4.1.

1.2 IO-Link Basics

IO-Link

IO-Link is a worldwide standardised I/O technology (IEC 61131-9 / SDCI) for communicating with sensors and actuators. IO-Link technology provides a simple, uniform and cost-effective point-to-point connection with sensors and actuators.

General information on the IO-Link interface is available at *io-link.com*.

IO-Link Version	1.1
Transmission speed	COM2 (38.4 kBaud)

1.3 Data exchange

1.3.1 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.

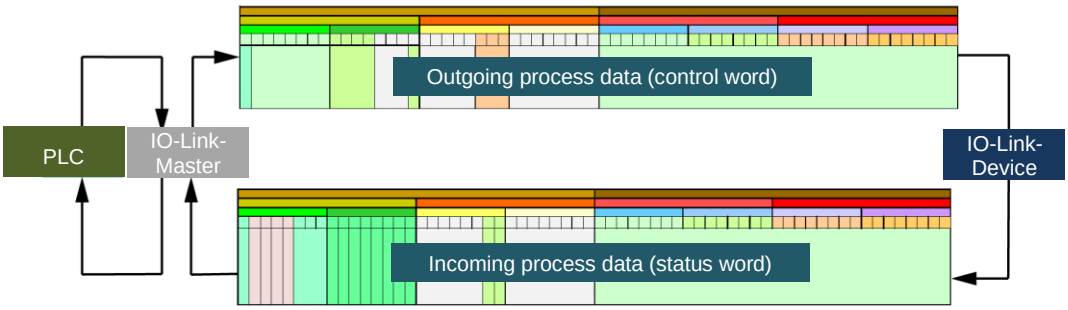


Fig. 1 Cyclical data exchange

1.3.2 Handshake

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

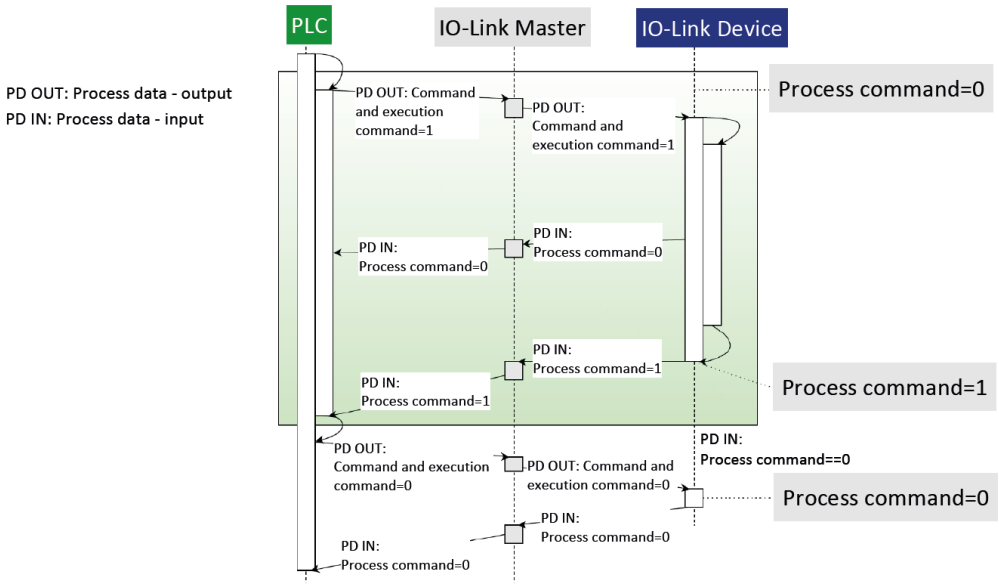


Fig. 2 Execution command and process command

PLC Execute command	IOLink device process command	Description
0	0	Initial state:
1	0	Command is sent to IO-Link device and the PLC 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 recognises that PLC has set the command to "0" and also sets the execute command to "0". Handshake is completed.

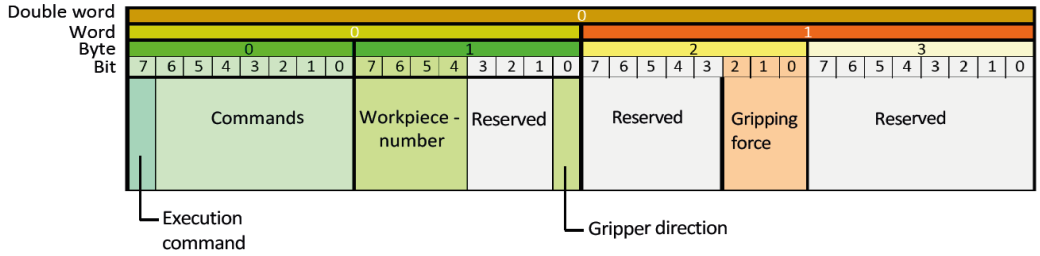
Tab. 1: Truth table - communication between PLC and IO-Link device

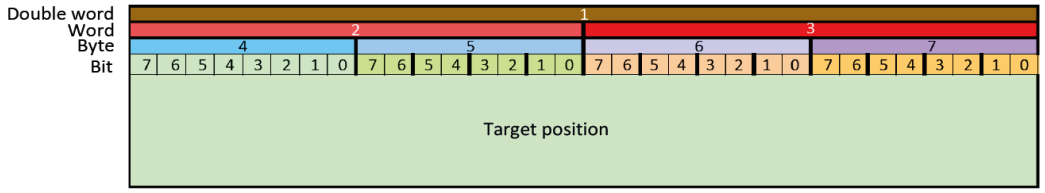
1.3.3 Acyclical data exchange

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 during operation). Further information ➲Chap. 4.

2 Outgoing process data (control word)





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, calibrating

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 x 000.0001): Acknowledge
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3

Tab. 2: 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. 3: Truth table (n.a.: not applicable)

2.1.3 Referencing

The zero position is set during the referencing process. The gripper moves to the mechanical end stop in the referencing direction set (➲ 4.2).

- A referencing run can only be stopped with a FastStop.
- A fixed gripping force and speed is set for referencing runs.
- Referencing must be performed when the referencing direction has been changed or the stroke of the base jaw 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 clear to the end stop in the referencing direction.

Control word	Value
Command	2 (0b x 000.0010): Referencing
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲ Chap 1.3

Tab. 4: 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. 5: 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. stroke measurement should be performed if the stroke of the base jaws is limited, e.g. for specific gripper finger shapes.

The recognition of the bit "End stop" or the bit "Success" depends on factors such as the parameter "Maximum stroke".

If the stroke measurement does not take place, the standard saved parameter "Maximum stroke" is used. A stroke measurement overwrites the previous value "Maximum stroke". This value is stored in the gripper and is available after a restart.

- The stroke measurement moves in the opposite direction to the referencing (➲4.2).
- For electric grippers, a fixed force and speed is set for the stroke measurement.

Control word	Value
Command	7 (0b x 000.0111): Stroke measurement
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲ Chap 1.3

Tab. 6: 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	1	1	1
Status	≠0	≠0	n.a.
Position	n.a.	≠0.0	n.a.
Workpiece [x]	n.a.	n.a.	n.a.

Tab. 7: Truth table

(n.a.: not applicable)

2.1.5 Gripping

When gripping, movement follows the gripping direction to the stop and the workpiece is held. The workpiece is held with the gripping force set.

FastGrip and SoftGrip

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

- **FastGrip:** Robust gripping mode for cycle time optimised industrial applications (e.g., pick & place applications)
- **SoftGrip:** Gripping mode with impulse reduction of the gripping force for gripping delicate, fragile or sensitive workpieces such as electronics, glass, ceramics.

For further information, please refer to the assembly and operating instructions of the Smart gripper.

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 x 000.0100): Acknowledge
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3
Workpiece no.	▪ 0 (not specified)
Gripper direction	▪ ➲ Chap 2.2.2
Gripping force	▪ ➲ Chap 2.2.3
Target position	▪ ➲ Chap 2.2.4

Tab. 10: 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.	≠End stop	End stop
Workpiece [x]	n.a.	n.a.	n.a.

Tab. 11: Truth table

(n.a.: not applicable)

2.1.6.2 Gripping with workpiece specification

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 x 000.0100): Gripping
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3
Workpiece no.	▪ 1 … 8

Tab. 12: 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.	Target pos. +/- tolerance	≠ Target pos. +/- tolerance
Workpiece [x]	n.a.	1	0

Tab. 13: Truth table

(n.a.: not applicable)

2.1.6 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. For releasing the smallest gripping value is set ➲ Chap. 2.2.3.

Control word	Value
Command	3 (0b x 000.0011): Releasing
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3
Gripper direction	▪ ➲ Chap. 2.2.2

Tab. 14: 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. 15: Truth table

(n.a.: not applicable)

2.1.7 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 acknowledgement is generated. The actuator remains de-energized until the next run command.

For positioning on an end stop, select the commands "Gripping" or "Release".

Control word	Value
Command	5 (0b x 000.0101): Positioning run
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3
Target position	▪ ➲ Chap 2.2.4

Tab. 16: 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 pos. +/- tolerance*	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED “status”	Green	Green	Red

Tab. 17: Truth table

(n.a.: not applicable)

* see assembly and operating manual for the product.

2.1.8 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 acknowledgement is generated. The actuator remains de-energized until the next command.

For positioning on an end stop, select the commands "Gripping" or "Release".

Control word	Value
Command	6 (0b x 000.0110): Relative run
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3
Target position	▪ ➲Chap. 2.2.4

Tab. 18: 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 pos. +/- tolerance*	n.a.
Workpiece [x]	n.a.	n.a.	n.a.
LED“status”	Green	Green	Red

Tab. 19: Truth table

(n.a.: not applicable)

* see assembly and operating manual for product.

2.1.9 Stop

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 x 000.1000): Stop
Execution command	▪ Change from 0 to 1 ▪ Change from 1 to 0 (as soon as process command changes from 1 to 0) Execute command and process command, ➲Chap 1.3

Tab. 20: 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. 21: Truth table

(n.a.: not applicable)

* see assembly and operating manual for the product.

2.1.10 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 acknowledgement is generated. A FastStop does not increase the error count and is not saved as the most recent error.

Control word	Value
Command	0 (0b x 000.0000): FastStop

Tab. 22: 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. 23: 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.

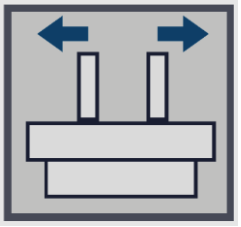
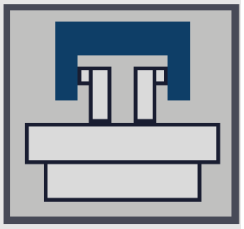
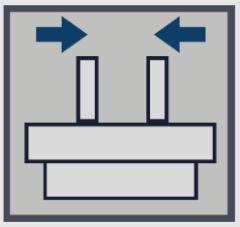
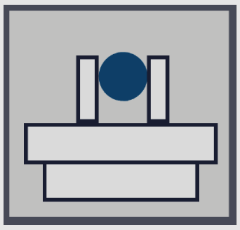
Parameters are defined:

- when removing the workpiece, ➲Chap. 4.4 or
- by specifying acyclic parameter data, ➲Chap. 4.2.

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	Symbol
Gripper direction	1 (inner grip)	The base jaws move from the inside to the outside.	
		The workpiece is gripped from the inside.	
Gripper direction	0 (outside gripping)	The base jaws move from the outside to the inside.	
		The workpiece is gripped from the outside.	

2.2.3 Gripping force

Gripping force settings for gripper SGE

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. 24: Gripping force settings

2.2.4 Target position

The value of the target position is between the two end stops "0.0" (+tolerance and the parameter “maximum stroke (-tolerance).

- For more information on the "Maximum stroke" parameter see ➲Chap. 4.2 and the end stop see ➲Chap. 3.4.

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

Process data	Value
Target position	4 Byte float IEEE754

3 Incoming process data (status word)

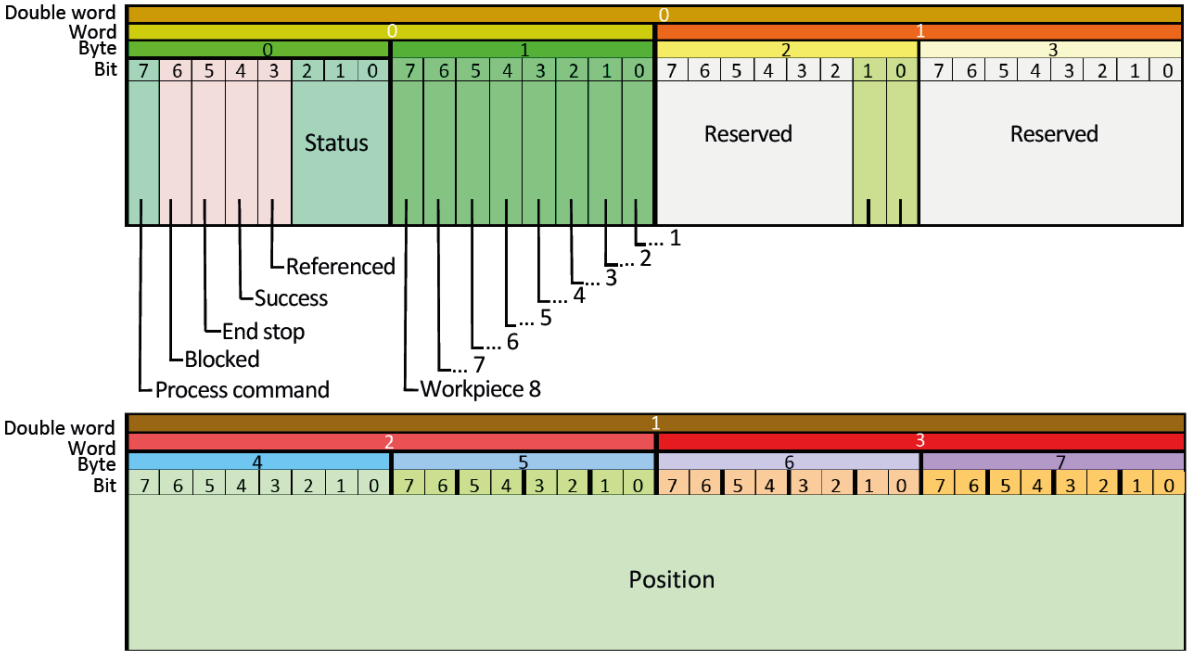


Fig. 3 Incoming process data

3.1 Status

The status of the product is displayed. Further information is provided via acyclic data and events, ➲Chap. 4.6.

Process data	Value
Status	0 (0b xxx.x000): Error 1 (0b xxx.x001): Outside the specification 2 (0b xxx.x010): Maintenance required 3 (0b xxx.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 Execute 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 ± Tolerance or the position "Maximum stroke" ± Tolerance.

The tolerance of the end position detection is 0.5 mm.

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), ➲chap. 1.3.

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 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	Parameter	Access	Data size	Description
0x0010	Manufacturer name	R	63 Byte	Manufacturer name: Afag
0x0011	Manufacturer text	R	63 Byte	Additional information about the manufacturer: www.afag.com
0x0012	Product name	R	63 Byte	Product description: Smart Gripper SGE-40-P-IOL
0x0013	Product ID	R	63 Byte	Identification number
0x0014	Product text	R	63 Byte	Smart electrical gripper with parallel jaws SGE-40-P-IOL
0x0015	Serial number	R	15 Byte	Alphanumeric serial number of the gripper
0x0016	Hardware version	R	63 Byte	HW XX.xx (electronic)
0x0017	Firmware version	R	63 Byte	FW XX.xx
0x0018	Application-specific marking	R/W	31 Byte	Free text field for application specific identification

4.2 Parameter

Index	Parameter	Access	Data size/ Data type	Description
0x000C	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
0x0054	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	Maintenance interval	R/W	int32	The parameter determines how many gripping cycles are to be performed before the next maintenance. Delivery condition: 5'000'000
0x00DC	Maximum stroke	R	4 byte float IEEE754	During a stroke measurement, when the mechanical stop (Blocked = 1) is reached, the current position takes over the new value "maximum stroke".

Workpiece parameters

The parameters of the workpieces are set when teaching in the workpiece, ➲Chap. 4.4. The default values are overwritten.

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: 0mm
	2	Tolerance	R/W	4 byte float IEEE754	Delivery status: +/- 0.5 mm
	3	Gripping force	R/W	3 bit	Delivery status: 100% FastGrip
	4	Gripping direction	R/W	Boolean	Delivery status: 0

4.3 System commands

Index	Command	Access	Code	Data type	Description
0x0002	Reset to delivery status	R/W	0x0082	uint8	Set workpiece parameters and max. stroke to the default values.
0x0002	Reset maintenance counter	R/W	0x00A1	uint8	Reset maintenance counter to the value "maintenance interval".
0x0002	Teach in workpiece	R/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 (Gripping with workpiece indication ➲Chap. 2.1.6.2), the acyclical parameter [teach in workpiece] is used 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.

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 position changes. The workpieces must be taught in again.

4.5 Measured values

Index	Measured values	Access	Data size/ Data type	Description
0x0046	Position [mm]	R	4 Byte Float IEEE 754	Display current gripper position
0x0048	Current current	R	4 Byte Float IEEE 754	Display current power current
0x0051	Current voltage [V DC]	R	4 Byte Float IEEE 754	Display current actuator voltage
0x0050	Current temperature [°C]	R	4 Byte Float IEEE 754	Display current temperature
0x0020	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	Cycles counter	R	uint32	Total number of cycles is counted and recorded. Every second change of direction of the gripper defines one cycle.
0x00CA	Impulse counter	R	uint32	If a "blockage" is detected, this counter is incremented.
0x00CB	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 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 product.

4.6 Device status

Index	Event type	Access	Code	Data size	Description
0x0024	Message 1	R	0	uint8	**Ready for operation:** The gripper is ready for operation. All voltages are present, there is no error.
0x0024	Message 2	R	1	uint8	**Maintenance required:** A notification is pending. Example: maintenance interval has expired
0x0024	Warning 1	R	2	uint8	**Outside of specification:** There is a warning. Example: under/over voltage
0x0024	Warning 2	R	3	uint8	**Functional inspection:** There is a warning. Example: Calibration
0x0024	Error	R	4	uint8	**Error:** There is an error. Example: Example: FastStop, invalid process data due to malfunction
0x0024	-	-	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) are self-acknowledging events.

Event code	Event type	Code	Display	Description
4	Error	0x1000	UNKNOWN ERROR	active, if an unknown, unassignable error has occurred
		0x4000	TEMPERATURE FAIL	active, if the temperature >99 °C is
		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 voltage supply off and on, restart the gripper. If the error continues to be listed: send gripper to AFAG for repair.
		0x18D9	ERROR FAST STOP	active if a FastStop has been triggered, ➲Chap. 2.1.10
		0x18DE	ERROR CURRENT	active if the current for the electronics has exceeded 5.5 A for more than 30 seconds

Event code	Event type	Code	Display	Description
4		0x187A	ERROR LIFE SIGN	active if communication has been aborted, e.g. by • cable breakage in the wiring within the gripper • voltage supply to actuator interruption (port B)
		0x18E5	ERROR POS SYSTEM	active if a valve stops working properly
		0x18F3	ERROR BOOT NOT SUCCESFUL	At device start: Actuator voltage is not present or TechnosoftController not present. • The drive is de-energized. • After switching on actuator voltage: Continuous illumination of the "ERROR" LED
		0x1858	ERROR POSITION BLOCKED	active if a blockage is detected during positioning • The drive is de-energized. • Continuous illumination of the "ERROR" LED
		0x1874	ERROR MOTOR VOLTAGE LOW	Supply voltage falls below 18.8 volts • The drive is de-energized. • Continuous illumination of the "ERROR" LED
		0x1875	ERROR MOTOR VOLTAGE HIGH	Supply voltage falls below 28.8 volts • The drive is de-energized. • Continuous illumination of the "ERROR" LED
3	Warning	0x1801	BOOT MODE	active when gripper starts Device status: undefined, since process data temporarily invalid

Event code	Event type	Code	Display	Description
2	Warning	0x4210	Device temperature too high	active if device temperature >= 85 °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 < 28.8 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)
		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 wear 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 by the master Message is sent by the gripper if one or more workpiece parameters have changed or the referencing direction has been changed.
		0x0000	no faults	active when no errors are present. 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)

Initial start-up or retrofitting

1. Acknowledge the error

   Acknowledge error again if necessary, e.g., if actuator voltage (P24/Act-) is activated after logic voltage (Pin1/L+).

2. Perform the reference run.
3. Perform lift travel (optional).

Establish operating status

1. Acknowledge the error

   Acknowledge error again if necessary, e.g., if actuator voltage (P24/Act-) is activated after logic voltage (Pin1/L+).

2. Perform the reference run.

The gripper is then in the status:

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

(n.a.: not applicable)

After switching the actuator voltage off and on again, the gripper requires approx. 5 seconds until the applied "fault messages" can be acknowledged one after the other. Due to the system, 2 acknowledgements are required. After that, the "operational readiness" of the gripper is restored.

Subsequently, the referencing of the gripper is required.

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