Baumer
Passion for Sensors

Description of functions and interfaces

OE60, OE60C

Edge sensor

EN-US

V1 | 6/28/2024

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1 About this document

1.1 Purpose and scope of application

This document enables safe and efficient sensor parameterization using various interfaces. The manual describes the available functions to support installation and software use via the interfaces.

The illustrations are examples only. Deviations are at the discretion of Baumer at all times. This manual is a supplement to the existing product documentation.

1.2 Applicable documents

- Available for download at www.baumer.com:
  - Data sheet
  - EU Declaration of Conformity
- Attached to product:
  - Quickstart
  - General information sheet (11042373)

1.3 Labels in this manual

Identifier	Usage	Example
Dialog element	Indicates dialog elements.	Click the ***OK*** button.
Unique name	Indicates the names of products, files, etc.	*Internet Explorer* is not supported in any version.
`Code`	Indicates entries.	Enter the following IP address: `192.168.0.250`

1.4 Warnings in this manual

Warnings draw attention to potential personal injury or material damage. The warnings in this manual indicate different hazard levels:

Symbol	Warning term	Explanation
	**DANGER**	Indicates an imminent potential danger with high risk of death or serious personal injury if not being avoided.
	WARNING	Indicates potential danger with medium risk of death or (serious) personal injury if not being avoided.
	CAUTION	Indicates a danger with low risk, which could lead to light or medium injury if not avoided.
	NOTE	Indicates a warning of material damage.
	**INFO**	Indicates practical information and tips that enable optimal use of the devices.

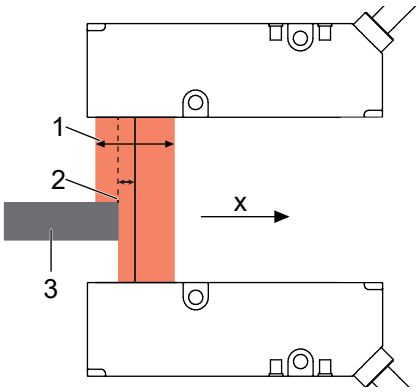
2 General functionality

OE60_60C is a so-called through-beam sensor. The sensor features transmitter and receiver. The transmitter emits a parallel band of laser light, slightly smaller than its front glass. This band of light hits the receiver and inside a light-sensitive element inside.

Any object present between sensor and receiver interrupts the band of light, shading the receiver. The transition between light and shade is called edge and evaluated by the sensor.

The sensor measures edge positions within the measuring field in a parallel axis to the front glass of receiver and transmitter.

Measurement field

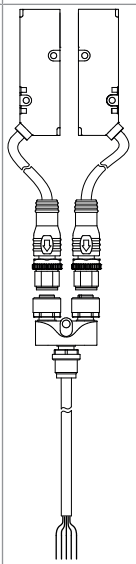
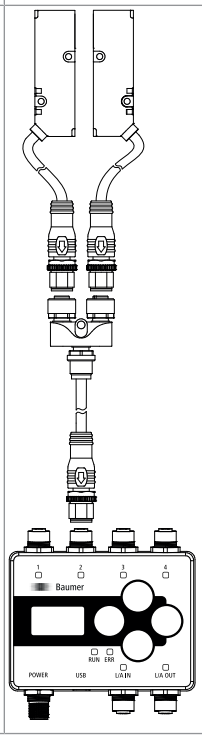


Pos.	Designation	Description
1	Measurement field	A parallel band of laser light defines the sensor's measuring field. The measurement object or the edge position must be in this area so that the sensor can take measurements.
2	Edge position	Measured edge position in x-direction, i.e. parallel to the sensor front. Measurement result: Edge position in x-direction
3	Measured object	Opaque object.
x	Measuring direction	The sensor's measuring direction runs parallel to the sensor front.

INFO

The distance between transmitter and receiver is restricted. For the maximum distance please see the sensor data sheet.

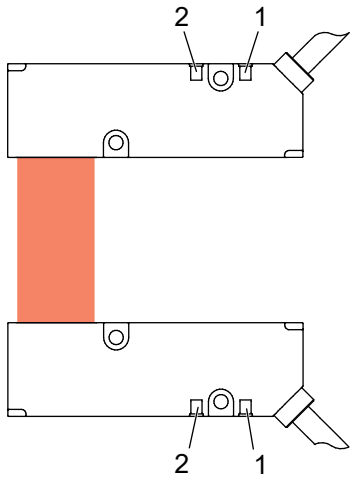
The sensor heads *OE60* can be operated autonomously or in conjunction with the controller box *OE60C*. Hence, the following channels are available to output the edge position and for sensor parameterization:

	Sensor heads *OE60* autonomous:	*OE60* when used with controller box *OE60C*:
Output	Direct readout via RS485 interface with Modbus RTU	Sensor head reading via the OE60C controller box with display or integration via EtherCat.
Structure		

3 Operating and display elements

3.1 Operating and display elements of the sensor heads

Sensor head LED



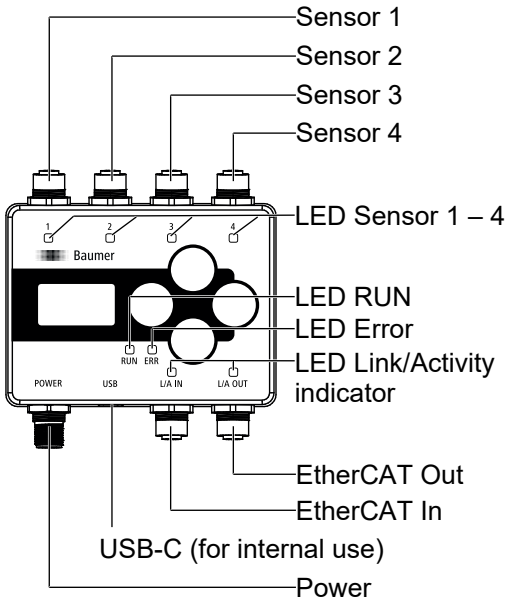
LED	Color	Continuous	Flashing
POWER (1)	Green	Sensor is operational	–
ALARM (2)	Red	No valid signal within measuring range	Critical signal quality

INFO

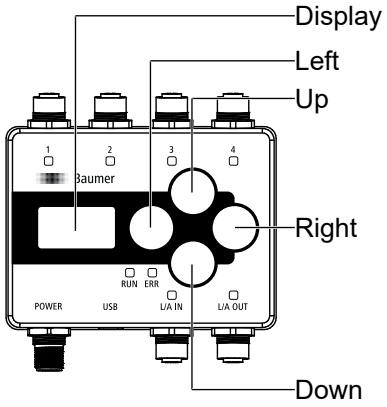
With enabled alignment assistant, the LED indication changes significance (see chapter *Alignment assistant [▶ 18]*).

3.2 Controller box: control and display elements

Connections/LEDs



Display/buttons



LEDs

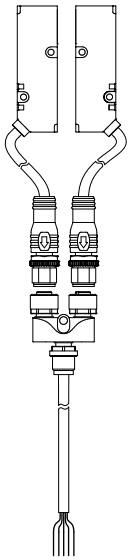
Designation	Status	Description
Link/ Activity	*GREEN* continuous	Connection active No data transfer in this moment.
	flashing *GREEN*	Connection active Data is being transferred.
	off	Connection inactive No data transfer.
RUN	*GREEN* continuous	Status: *OPERATIONAL*
	flashing at 2.5 Hz *GREEN*	Status: *PRE-OPERATIONAL*
	flashing once *GREEN*	Status: *SAFE-OPERATIONAL*
	off	Status: *INITIALISATION*
Error	*RED* continuous	Application controller error
	flashing at 2.5 Hz *RED*	Invalid configuration
	flashing once *RED*	Local error: EtherCAT status unwantedly changed by slave.
	flashing twice *RED*	Process data watchdog timeout/ EtherCAT watchdog timeout
	off	No errors
Sensor 1-4	*GREEN* continuous	Sensor in operation
	RED continuous	Alarm
	flashing *RED*	Connection to sensor expected, but not present.
	off	No sensor connection.

4 Commissioning

4.1 Connecting the sensor heads

If not used with the controller box, the sensor heads directly integrate into a RS485 network. For doing so, connect the sensor heads to the included T-adapter.

When attached to the T-adaptor, the sensor heads can be integrated into the RS485 network. Both ports of the T-adapter can be connected to emitter and receiver. Alignment will not change at all.



Ill. 1: Sensor heads *OE60* with T-adapter

Check proper alignment of transmitter and receiver with function ***alignment assistant***(see chapter *Alignment assistant [▶ 18]*).

INFO

Operation requires retrieving the measured value via Modbus RTU.

4.1.1 Measured value readout via Modbus RTU

This function is for reading the measured values.

The sensor supports Modbus RTU via RS485 for retrieving measured values and for parameterization.

Communication via RS485 interface is serial master-slave communication, reason why first the serial communication parameters must be known for every user.

Example:

Instruction:

a) Set the communication parameters at master:
Slave address: 1 (factory setting)
Data bits: 8
Number of stop bits: 2 bits
Parity: None
Baud rate (bps): 115200 (factory setting)

b) Read input register.
Function ID: 04 (Read Input Register)
Address 114: Measurement value
Number of registers: 2

Result:

✓ You are provided with the measured value in format mid-little endian.

For example, the following data (hexadecimal) is read out for the measured value:

- 114 = 5F90
- 115 = 0000

The measured value is divided between 2 Modbus registers (Little Endian). Thus, the less significant bits are located at the smaller address, in this case 114. The more significant bits are located at the larger address, in this case 115. As a consequence, the measured value is evaluated as `00 00 5F 90`. This results in a measured value of 24464 nm or 0.024464 mm

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

There are two options for measured value readout (see table below).

- Measured value and additional information via address 105.
- Measured value only via address 114.

Modbus access - Input Register: All measurement values

Read adress 105 - length: 9 registers

Adresse	Access	Number of registers	Data type	Description
105	Read	1	uint_16	Alarm: ▪ 0 = Low - Measurement OK ▪ 1 = High - No measurement possible
106-107	Read	2	int_32	Measurement value: Measured edge position in nm
108-109	Read	2	int_32	Contamination indicator: Value range from 0 to 100. ▪ 0 = No contamination ▪ 100 = Strong contamination
110-113	Read	4	int_64	Timestamp: Timestamp of measurement in 10 µs

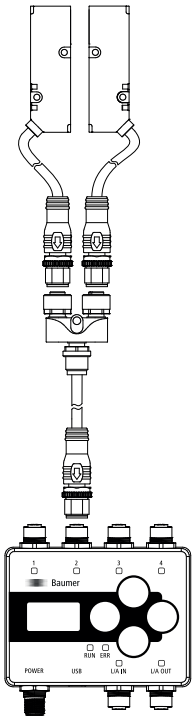
Modbus access - Input Register: Measurement value

Read adress 114 - length: 2 registers

Adresse	Access	Number of registers	Data type	Description
114-115	Read	2	int_32	Measurement value: Measured edge position in nm

4.2 Connecting the controller box

Sensor head connection to the controller box is established by M12 connector. First, connect the sensor heads to the T-adapter. The T-adapter enables direct connection to the controller box. Both connectors of the T-adapter can be connected to both emitter and receiver. Alignment will not change at all.



Ill. 2: Sensor heads *OE60* with controller box *OE60C*

4.2.1 Controller box menu navigation

Both display and buttons act as controller user interface.

Display

- Activate the display by briefly pressing any button
- Display will be automatically inactive after 5 minutes
- The display is reset after 7 minutes: display goes back to the home screen

Buttons

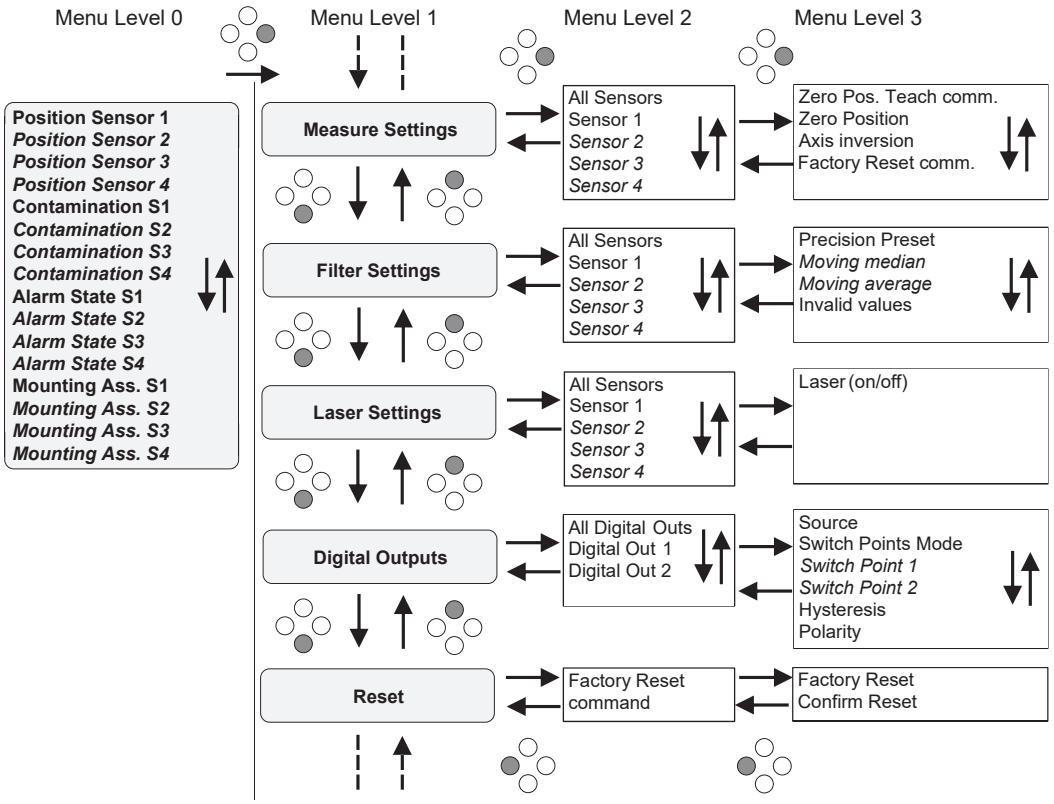
- Button lock/unlock: Press and hold any button (> 1 second)

Button	Navigation	Value setting
	In upward direction within the menu structure	Increase value
	in downward direction within the menu structure	Reduce value
	Call up submenu	**Confirm**: save new value and exit value setting
	Exit submenu	**Back**: Do not save value and exit value settings

The start screen provides the edge position of a connected sensor. If several sensors are connected, their edge positions of can be read using the "Up" and "Down" buttons.

Sensor parameterization is the menu. For detailed information on functions please see chapter *Operating functions [▶ 25]*.

Menu structure



⚠ CAUTION

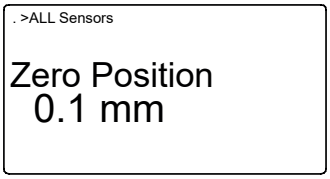
Entries in italics are only visible with the selected settings or correspondingly connected sensors.

Change settings/values

The following describes how to change settings/values using function ***Zero Position*** as an example.

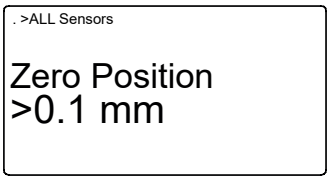
a. With buttons , , you can navigate to function ***Zero Position*** (see menu structure).

On the display you the current setting.

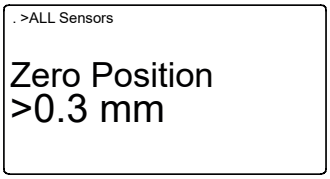


b. Enable edit mode with button .

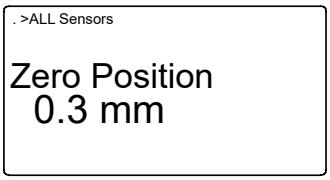
The sign > comes in the first digit of the current setting.



c. Select the required setting using the buttons / .



d. Confirm with .



The setting in ***Zero Position*** changes to the new value.

4.2.2 Readout measured value via EtherCat

Function *Sensor X Measurement Value* will read the measured value of the selected sensor via *EtherCat*.

Name	Online	Typ	Größe	>Adre...	Ein/A...	User ID
Sensor 1 Status	1	UDINT	4.0	39.0	Einga...	0
Sensor 1 Measurement Value	2147483646	DINT	4.0	43.0	Einga...	0
Sensor 1 Contamination Indicator	2147483647	UDINT	4.0	47.0	Einga...	0
Sensor 1 Timestamp	817102928	ULINT	8.0	51.0	Einga...	0
Sensor 2 Status	1	UDINT	4.0	59.0	Einga...	0
Sensor 2 Measurement Value	2147483647	DINT	4.0	63.0	Einga...	0
Sensor 2 Contamination Indicator	2147483647	UDINT	4.0	67.0	Einga...	0
Sensor 2 Timestamp	0	ULINT	8.0	71.0	Einga...	0

Ill. 3: Measured value output - using TwinCat as an example

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

EtherCAT access: Measurement values

Name	Index	Subindex	Description
Sensor 1 Measurement Value	1A01	02	Measurement value for sensor 1.
Sensor 2 Measurement Value	1A02	02	Measurement value for sensor 2.
Sensor 3 Measurement Value	1A03	02	Measurement value for sensor 3.
Sensor 4 Measurement Value	1A04	02	Measurement value for sensor 4.

4.3 Alignment assistant

If proper sensor head alignment is not clear or when changing the sensor head installation, we recommend to verify the alignment.

⚠ CAUTION

The alignment can only be verified if the measuring range is free from any object.

a) Take all objects out of the sensor's measuring range.

First, activate the alignment assistant. Now, the alignment can be verified/corrected supported by the LED indicator (sensor LED).

LED behavior			Receiver beam position
Green	Red	Alignment	How to proceed
On	Off	Alignment assistant is enabled. Once the alignment assistant has been disabled, the sensor is operational to perform reliable measurements.	Beam hits receiver. No action required.
On	Flashing	Any misalignment may lead to measurement errors. Beam hits the upper front glass section of the receiver.	Beam does not hit the destination field of the receiver Move the transmitter towards the cable outlet.
Flashing	On	Any misalignment may lead to measurement errors. Beam hits the lower front glass section of the receiver.	Beam does not hit the destination field of the receiver. Move the transmitter upwards in the opposite direction to the cable outlet.
Flashing	Flashing	Any sensor misalignment leads into alarm status since measurements cannot be executed. Transmitter is inclined or offset in relation to the receiving axis.	Incline transmitter or correct the offset between the installation positions.

Tab. 1: LED indication with active alignment assistant

NOTICE

Any misalignment may lead to measurement errors. Once alignment verification has been completed, disable the alignment assistant.

With disabled alignment assistant, the LED indicator changes significance as described in chapter *Operating and display elements of the sensor heads [▶ 9]*.

Display access: mounting assistant

Condition:

⇨ You see the start screen.

- Use button ⁘ to navigate to menu item ***Mounting Assist*** of the sensor to be aligned.

Result:

✓ The alignment assistant is enabled.

✓ The LEDs on the respective sensor light up/flash (activity and alarm indicator) according to the light reception status.

⚠ CAUTION

Exit menu to close the alignment assistant.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Coils: Mounting assistant

Write address 4 - length: 1 registers

Address	Access	Number of registers	Data type	Description
4	Write	1	1 Bit	**Mounting assistant:** The mounting assistant will be disabled (when on, a yellow LED indicates incorrect alignment), if 0 gets written to this coil.

Modbus access - Input Register: Status Mounting assistant

Read adress 121 - length: 1 registers

Address	Access	Number of registers	Data type	Description
121	Read	1	int_8	**Status Mountain assistant:** ▪ 0 = Inactive ▪ 1 = Active *Unused Byte (uint_8)*

EtherCAT access: Mounting Assistant

Name	Index	Subindex	Description
Mounting Assistant	80X11	10	Activate/deaktivate mounting assistant for sensor 1. ▪ FALSE = Deactivate ▪ TRUE = Activate
	80X12	10	Activate/deaktivate mounting assistant for sensor 2. ▪ FALSE = Deactivate ▪ TRUE = Activate
	80X13	10	Activate/deaktivate mounting assistant for sensor 3. ▪ FALSE = Deactivate ▪ TRUE = Activate
	80X14	10	Activate/deaktivate mounting assistant for sensor 4. ▪ FALSE = Deactivate ▪ TRUE = Activate

5 Interfaces

This section describes the available interfaces for operator to sensor communication.

5.1 Modbus RTU

Modbus RTU is a standardized protocol, here based on serial master-slave communication via RS485.

Access to sensor functionality is by parameter read or write in tables *Coils*, *Discrete Inputs*, *Input Registers* and *Holding Registers*. The following Modbus function codes (FC) are supported:

- Read Coils (FC 01)
- Read Discrete Inputs (FC 02)
- Read Holding Registers (FC 03)
- Read Input Registers (FC 04)
- Write Single Coils (FC 05)
- Write Single Holding Register (FC 06)
- Write Multiple Holding Registers (FC 16)

Below is an overview of the available registers. Both tables are independent of each other, so that the same address can represent different functions in different tables. The number of registers to be read or written by Modbus command must correspond to the length specified for the respective sensor functionality. Partial reading or writing of parameters is not possible.

INFO

1 Modbus register corresponds to 2 bytes. If the data type of a sensor parameter is wider than a 2 byte Modbus register, the parameter is divided among several Modbus registers. The less significant bits are located at the smaller address and the more significant bits at the larger address (Little Endian).

In general, all registers enable write and read. Reading a register with write access only will reply `0xFFFF`.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Discrete Inputs: FC 02

Address	Number of registers	Command	Description
0	1	Alarm	Measured value OK/NOK

Input register: FC 04

Address	Number of registers	Command	Description
0	33	Vendor name	Manufacturer name
40	65	Product information	Product information, e.g. article number, name
105	9	All measurements	Measured value and secondary information (e.g. contamination warning)
114	2	Measurement value	Measured value
116	5	Scaling factors	Scaling factor of output measured value
121	1	Status mounting assistant	Alignment assistant (enabled/disabled)

Holding register: FC 03/06/16

Address	Number of registers	Command	Description
2	2	Zero Position	Numerical zero point position
4	1	Precision filter preset	Select signal filtering
5	2	Custom precision filter	For Precision filter preset "Custom": Filter length Median and Average Filter
12	4	Invalid value handling	Sensor behavior with invalid measured values
1100	1	Modbus slave address	Slave Address
1101	1	Modbus baudrade ID	Baudrate

Coils: FC 01/05

Address	Command	Description
0	Teach zero position	Teaching the zero point position
1	Laser OFF	Laser ON/OFF
2	Axis inversion	Invert measuring axis
3	Factory reset	Restore default
4	Mounting assistant	Enable/disable alignment assistant

5.1.1 Communication parameters

Slave address and baud rate must be defined for successful communication. The sensor default as follows:

- Slave Address `1`
- Baudrate: `57600 Bd`

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Holding Register: Modbus Slave Address

Read/write adress 1100 - length: 1 registers

Adresse	Access	Number of registers	Data type	Description
1100	Read/write	1	uint8	The slave address of the sensor. The sensor will answer with its old address and afterwards act only on messages to the new address. *Unused byte (uint8)*

Modbus access - Holding Register: Modbus Baudrate

Read/write adress 1101 - length: 1 registers

Adresse	Access	Number of registers	Data type	Description
1101	Read/write	1	uint8	The ID of the sensor's baudrate. Upon writing this value, the sensor will answer with the old baudrate and then set its interface to the new baudrate. Afterwards communication is only possible using the new baudrate. Possible values are: ▪ 0 = 19200 ▪ 1 = 38400 ▪ 2 = 57600 ▪ 3 = 115200 ▪ 4 = 128000 ▪ 5 = 256000 ▪ 6 = 2000000 *Unused byte (uint8)*

5.2 EtherCat

EtherCAT is a real-time Ethernet protocol and suits both hard and soft real-time requirements. *EtherCAT* operates on MainDevices and SubDevices similar to the master-slave principle.

Unlike other Industrial Ethernet systems, telegrams transmitted by MainDevice run through all nodes in the *EtherCAT* chain. Each SubDevice extracts its output data from the telegram "on the fly"while inserting its input data into the running telegram. This enables a very fast refresh rate at every node in the network.

Topology

EtherCAT communication allows for different topologies:

- Line
- Tree
- Star

Communication profiles

For user configuration and diagnostic, acyclic communication (SDO) provides access to network-specific variables. This is based on a reliable mailbox protocol with auto-recover function for faulty telegrams. Based on this mailbox channel, the following communication profiles are defined for *EtherCAT*:

- CAN applications protocol over EtherCAT (CoE)
- Servo drive profile, according to IEC 61800-7-204 (SoE)
- Ethernet over EtherCAT
- File Access over EtherCAT (FoE)

The controller box *OE60C* provides communication via CoE and hence the following standardized communication mechanisms are available: Object dictionary, PDO Mapping (Process Data Objects) and SDO (Service Data Objects).

PDOs are used for the rapid transmission of real-time data, whereas SDOs are used for device configuration and parameterization. PDOs transmission is cyclic and automatic, while SDO transmission require specific requests by functions.

Thanks to the integrated object directory, *OE60C* commissioning does not require any additional description files. To integrate the sensor functions into the control system even without an existing device or if otherwise necessary, the *EtherCAT* interface description is in the form of ESI file (EtherCat Subdevice information). The ESI file is available on the *OE60C* product detail page at the website "Downloads" section.

INFO

The ESI file is available for download at the Baumer website on the sensor page (download section).

See also chapter *Annex [▶ 50]* for a detailed overview on all *EtherCAT* functions.

6 Operating functions

6.1 Filter

Using the filter function, noise can be reduced while repeatability precision is improved.

The number of measured values per string of numbers (filter length) can be adjusted as follows via the parameter settings:

- Option 1: Select the required filter length from predefined filter lengths.
  - `Standard`
  - `High`
  - `Very High`
- Option 2: Enter the required filter length as a numerical value.
  - `Custom`

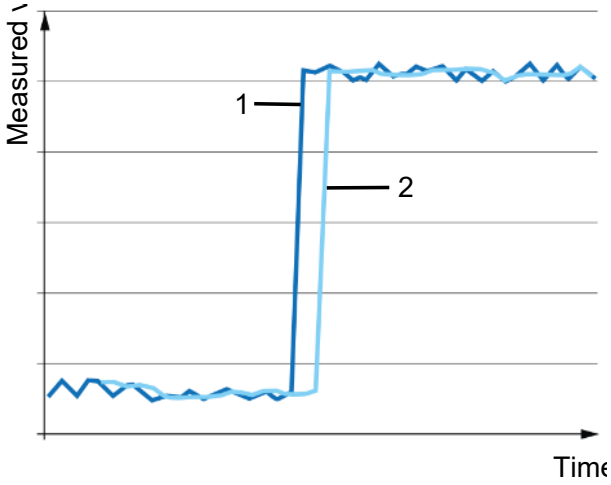
General

The response and drop-off times are increased and moving objects detected with a delay as a result. The precision filter calculates the results in the form of floating values. The oldest measured value will be removed as soon as a new one is added. Therefore the measuring frequency is not affected by the precision filter.

In general, the more measured values per filter, the better the repeatability and the higher the reproducibility of the results.

Moving Median filter

This filter allows the suppression of individual measurement errors by calculating the median of a specified number of measured values in a string of numbers. The median value is the measured value located right “in the center” if the measured values are sorted by size.

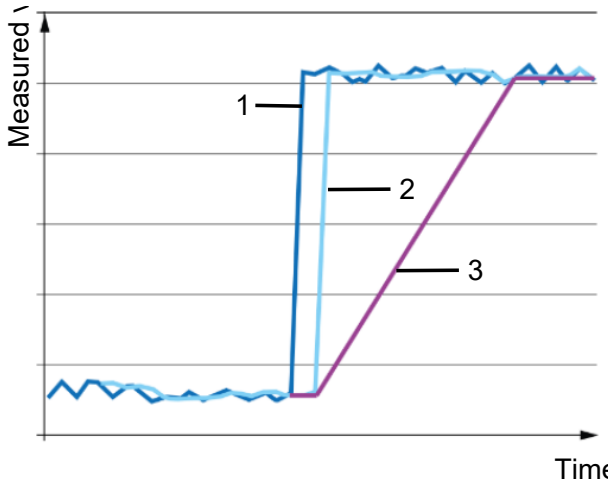


Ill. 4: Moving Median filter

1	Raw data	2	Data after filtering with Moving Median

Moving Average filter

This filter smoothes the signal course by calculating the average of a specified number of measured values in a string of numbers. The calculated average will indicate any change in the measured value in ascending order.



Ill. 5: Moving Average filter

1	Raw data	2	Data after filtering with Moving Median
3	Data after filtering with Moving Average and Moving Median		

The higher the number of measured values per filter, the longer the response time of the sensor. This means that providing a changed measured value at the output is delayed in time.

Option 1: Select the required filter length from predefined filter lengths

The following selection options are available:

Value	Number of measured values	
	Moving Median	**Moving Average**
`Standard`	1	1
`High`	5	16
`Very High`	16	64

Option 2: Enter the filter length as a numerical value

If the predefined filter lengths are not suitable, an individual filter length can be entered for the *Moving Average* and *Moving Median* filters. You can specify the length of the *Moving Average* and *Moving Median* filters after selecting the *Custom* filter.

- *Moving Median* filter: 1 - 18 values
- *Moving Average* filter: 1 - 128 values

Display access: filter

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Filter Settings***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons / to navigate to function ***Precision Preset***.

e) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

f) Select the required setting using the buttons /.

g) Confirm with .

Result:

✓ The selected setting has been changed.

✓ Selecting ***Custom*** allows for editing the settings in ***Moving median*** and ***Moving average*** in menu ***Filter settings***.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Holding Register: Precision Filters

Read/Write adress 4 - length: 1 registers

Adresse	Access	Number of registers	Data type	Description
4	Read/Write	1	uint_8	**Select Precision filter preset** ▪ 0 = Standard ▪ 1 = High ▪ 2 = Very High ▪ 3 = Custom Reserved (uint_8): Unused byte

Modbus access - Holding Register: Custom Precision Filters

Read/Write adress 5 - length: 2 registers

Adresse	Access	Number of registers	Data type	Description
5	Read/Write	2	uint_8	**"Custom" precision filter:** Only possible to parametrize if precision filter preset "Custom" is choosen: ▪ Moving median length (uint16): Length of the moving median filter, min. 1 - max. 18 values ▪ *Unused byte (uint_8)* ▪ Moving average length (uint16): Length of the moving average filter, min. 1 - max. 128 values

EtherCAT access: Filter

Name	Index	Subindex	Description
Precision	80X1*	0A	Select Precision filter preset. ▪ 0 = Standard ▪ 1 = High ▪ 2 = Very High ▪ 3 = Custom
Moving Average Length	80X1*	0B	Length of the moving average filter kernel. Can only be written with "Precision" is set to manual.
Moving Median Length	80X1*	0C	Length of the moving median filter kernel. Can only be written with "Precision" is set to manual.

* The X in the index stands for the sensor number. As example: for sensor 1, the index is 8011.

6.2 Laser on/off

This function is for laser on or off.

For example, maintenance work on a machine or system may require the laser sensor being off.

Display access: Laser Settings

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Laser Settings***.

b) Select with .

c) Use the buttons / to select whether the setting shall apply to the laser of a specific or of every sensor.

d) Confirm with .

✓ On the display you see the current setting.

e) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

f) Select the required setting using the buttons /.

g) Confirm with .

Result:

✓ The lasers of the selected sensors are on or off according to the setting made.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Coils: Laser OFF

Write adress 1 - length: 1 register

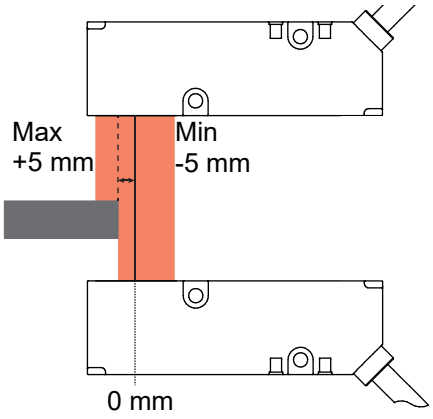
Adresse	Access	Number of registers	Data type	Description
1	Write	1	1 Bit	Laser OFF ▪ 0 = Laser ON (default) ▪ 1 = Laser OFF The sensor will turn off the laser and thus stops to measure. The sensor only starts to measure again, if 0 gets written to this coil (or if the sensor gets restarted).

EtherCAT access: Laser ON/OFF

Name	Index	Subindex	Description
Read only:			
Sensor 1 Laser Off	1601	01	Indicates if laser is on or off.
Sensor 2 Laser Off	1602	01	Indicates if laser is on or off.
Sensor 3 Laser Off	1603	01	Indicates if laser is on or off.
Sensor 4 Laser Off	1604	01	Indicates if laser is on or off.
Read/Write:			
Sensor 1 Laser Off	2001	01	Switch off the laser for the individual sensor pairs.
Sensor 2 Laser Off	2001	01	Switch off the laser for the individual sensor pairs.
Sensor 3 Laser Off	2001	01	Switch off the laser for the individual sensor pairs.
Sensor 4 Laser Off	2001	01	Switch off the laser for the individual sensor pairs.

6.3 Measuring axis configuration

This function is for defining the orientation of the measuring axis.



Ill. 6: Measuring axis, standard setting

Inverting the axis will rotate the orientation - Inverted (max-to-min). Here,-5 mm on the left and +5 mm on the right.

Display access: Axis inversion

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Measure Settings***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons and to navigate to menu item ***Axis inversion***.

e) Select with .

✓ On the display you see the current setting.

f) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

g) Select the required setting using the buttons /.

h) Confirm with .

Result:

✓ The selected sensors will adopt the measuring axis setting.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access (coils): Axis inversion

Adresse	Access	Number of registers	Data type	Description
2	Write	1	1 Bit	The axis inversion can be set to: ▪ 0 = min-to-max ▪ 1 = max-to-min

EtherCAT access: Axis inversion

Name	Index	Subindex	Description
Axis Inversion	8011	03	Axis inversion for sensor 1 - 4.
	8021	03	The axis inversion can be set to: ▪ 0 = min-to-max ▪ 1 = max-to-min
	8031	03	
	8041	03	

Also see about this

Controller box menu navigation [▶ 14]

6.4 Switching points

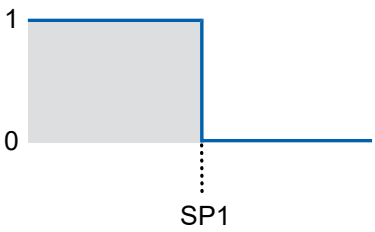
Function *switching points* defines the measured values (switching points) the switching output will be activated at.

INFO
This function is only available if used with controller box.

The function can be configured via the following parameters:

- Select switching mode (point mode or window mode).
- Define the position of the switching points (SP1 and SP2):
  - Point mode: SP1
  - Window mode: SP1 and SP2

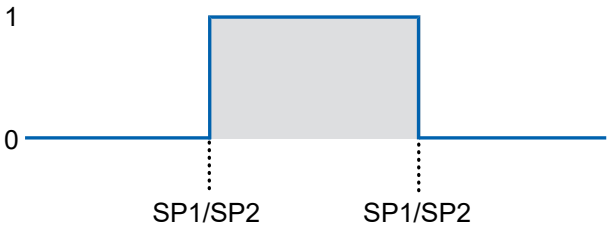
Point mode



Ill. 7: Sensor in switching mode Point mode

- Purpose/application (example):
  - Align the object until it is in the required edge position.

Window mode



Ill. 8: Sensor in switching mode Window mode

- Purpose/application (example):
  - Quality control: Checking the object width within a tolerance window.

Display access: Switching points

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

a) Use the buttons and to navigate to menu item ***Digital Outputs***.

b) Use the buttons / to select whether the setting shall apply to a output or to every output.

c) Confirm with .

d) Use the buttons and to navigate to function***(Source***, ***Switch Point Mode*** or ***Switch Point X***).

e) Select with .

✓ On the display you see the current setting.

f) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

g) Select the required setting using the buttons /.

h) Confirm with .

Result:

✓ The new setting is applied to polarity.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

EtherCAT access: switch point

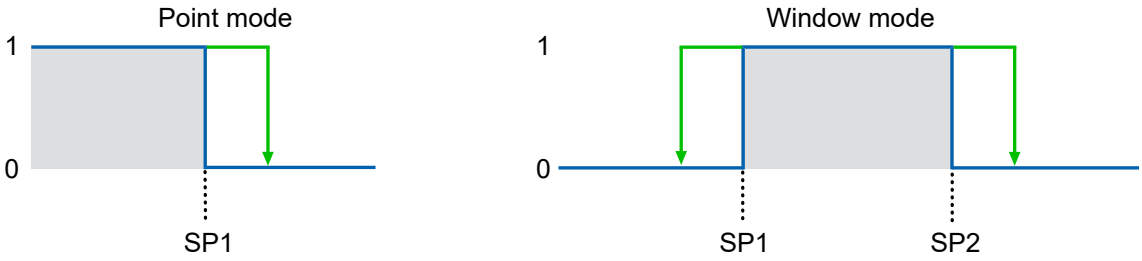
Name	Index	Subindex	Description
Switching Output 1	F800	0	
Source	F800	01	The signal to be applied to the switching output can be set. This applies to all sensor head pairs S1-S4: ▪ None ▪ Position S1 ▪ Alarm S1 ▪ Contamin. S1
Mode	F800	02	Mode for switch points.
Switch Point 1	F800	03	Switch point 1.
Switch Point 2	F800	04	Switch point 2.

Name	Index	Subindex	Description
Switching Output 2	F801	0	
Source	F800	01	The signal to be applied to the switching output can be set. This applies to all sensor head pairs S1-S4: ▪ None ▪ Position S1 ▪ Alarm S1 ▪ Contamin. S1
Mode	F800	02	Mode for switch points.
Switch Point 1	F800	03	Switch point 1.
Switch Point 2	F800	04	Switch point 2.

6.4.1 Hysteresis

The function prevents unwanted switching operations at the switching output. The parameterized value of the hysteresis is the difference in distance between the points at which the switching output is activated and deactivated. Baumer recommends always setting the hysteresis not equal to 0.

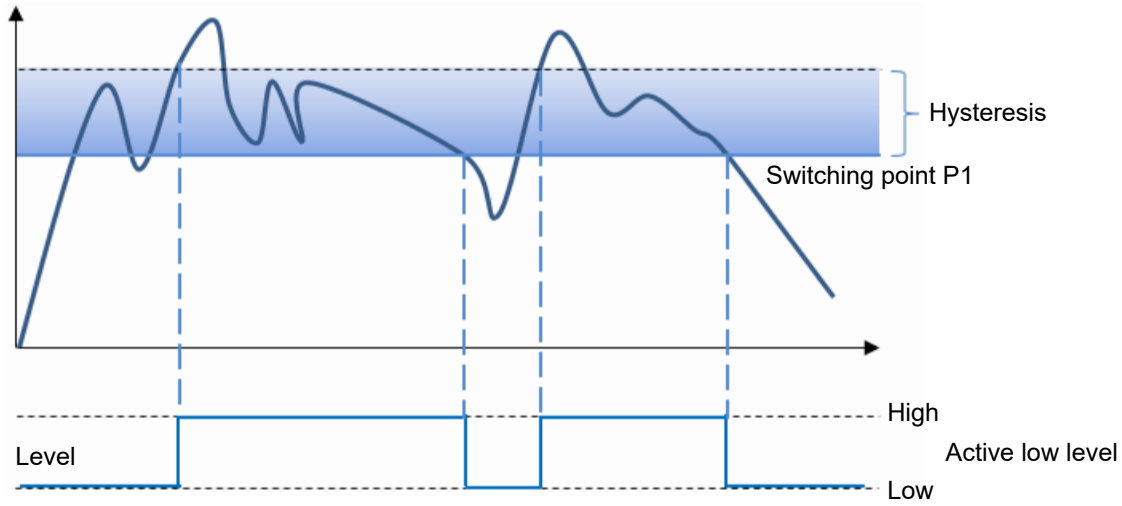
Positive hysteresis



Ill. 9: Positive hysteresis

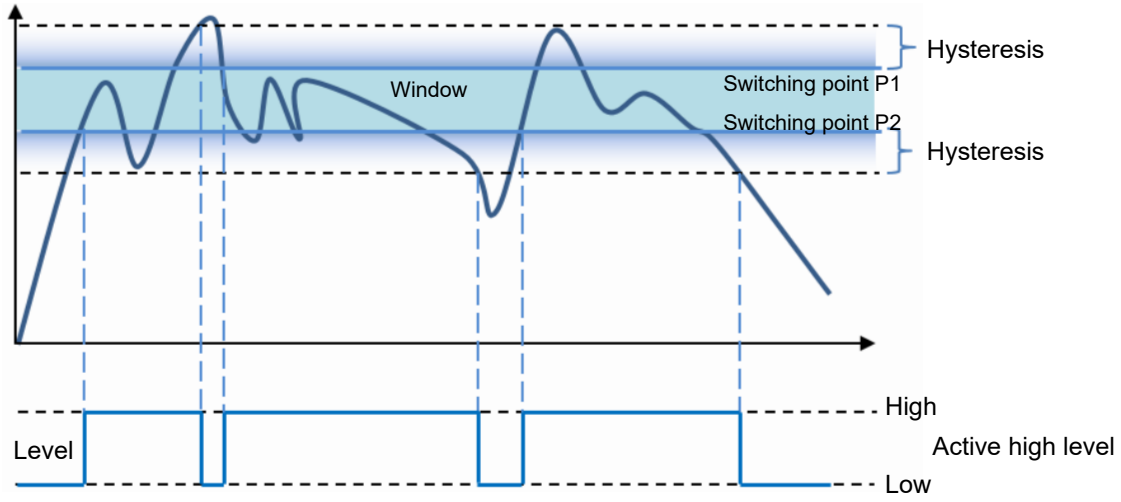
- Switching output in point mode: A positive hysteresis value corresponds to a right-justified hysteresis.
- Switching output in window mode: A positive hysteresis value corresponds to a hysteresis aligned outside of the window.

Point mode (switching output behavior)



Ill. 10: Behavior of the switching output in point mode (positive hysteresis)

Window mode (switching output behavior)



Ill. 11: Behavior of the switching output in window mode (positive hysteresis)

Display access: hysteresis

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Digital Outputs***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons and to navigate to menu item ***Hysteresis***.

e) Select with .

✓ On the display you see the current setting.

f) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

g) Select the required setting using the buttons /.

h) Confirm with .

Result:

✓ The new setting is applied to hysteresis.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

EtherCAT access: Hysteresis

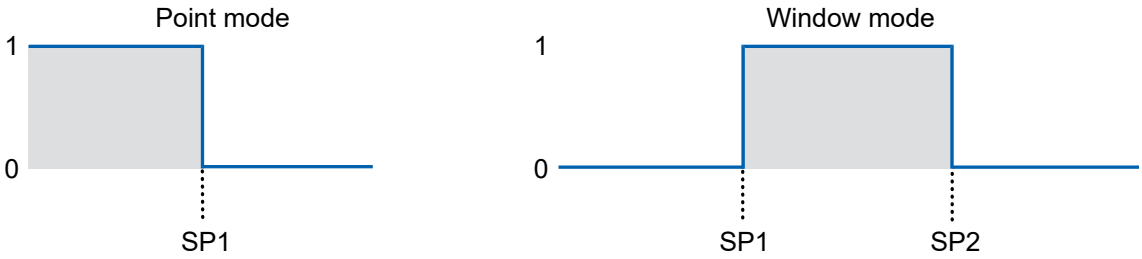
Name	Index	Subindex	Description
Hysteresis	F800	05	Hysteresis for switching output 1.
Hysteresis	F801	05	Hysteresis for switching output 2.

6.4.2 Polarity

Using this function you define the switching output behavior in relation to the output level.

In parameterization you can choose between *Active High* and *Active Low*.

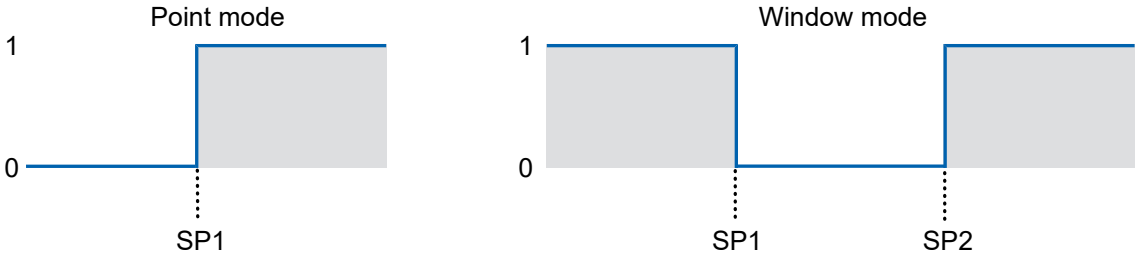
Active High



Ill. 12: Polarity – Active High

- Point mode: switching output is enabled when dropping below the defined measured value SP1.
- Window mode: The switching output is activated as soon as the measured value is within the window of SP1 and SP2.

Active Low



Ill. 13: Polarity – Active Low

- Point mode: switching output is enabled when exceeding the defined measured value SP1.
- Window mode: The switching output is activated as soon as the measured value is outside the window of SP1 and SP2.

Display access: Polarity

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Digital Outputs***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons and to navigate to menu item ***Polarity***.

e) Select with .

✓ On the display you see the current setting.

f) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

g) Select the required setting using the buttons /.

h) Confirm with .

Result:

✓ The new setting is applied to polarity.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

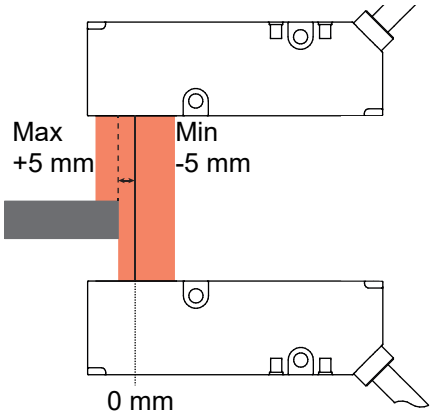
EtherCAT access: Polarity

Name	Index	Subindex	Description
Polarity	F800	06	Polarity for switching output 1.
Polarity	F801	06	Polarity for switching output 2.

6.5 Zero position

The measured value relates to the defined zero position. By default, the sensor's zero position is congruent to the center of the measuring range. It can be set to any value within the sensor's measuring range.

Measured value and switching point positions are calculated by reference to the zero point position.



Ill. 14: Zero point position, standard setting

There are two options for setting the zero position:

- by input as a numerical value
- by teach-in

Teaching the zero position:

Instruction:

a) Place the object in the required zero position.

b) Teach-i the zero position.

Example 1:

- Physical edge position within the measuring range: -5 mm
- Set zero position: 0 mm (default)
- Output measured value: -5 mm

Example 2:

- Physical edge position within the measuring range: -5 mm
- Set zero position: -3 mm
- Output measured value: -2 mm

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Display access: Zero point teaching

This function is used for zero point teaching by reference to an object.

Condition:

⇨ You see the start screen.

⇨ The object is in teaching position within the measuring range.

a) Use the buttons and to navigate to menu item ***Measure Settings***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons and to navigate to menu item ***Zero Pos. Teach com.***.

e) Select with .

✓ The distance towards the object in the measuring range is measured and saved as new zero point.

Result:

✓ Zero point teaching completed.

Display access: zero point setting

This function is for zero point entry as numerical value.

Condition:

⇨ You see the start screen.

a) Use the buttons and to navigate to menu item ***Measure Settings***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons and to navigate to menu item ***Zero Position***.

e) Select with .

✓ On the display you see the current setting.

f) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

g) Select the required numerical value with buttons /.

h) Confirm with .

Result:

✓ Zero point has been set to the new value.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Coils: Teach zero position

Write adress 0 - length: 1 registers

Adresse	Access	Number of registers	Data type	Description
0	Write	1	1 Bit	**Teach zero position** The sensor will take the current position as new zero position, if ANY value gets written.

Modbus access - Holding register: Zero position

Read/Write adress 2 - length: 2 registers

Adresse	Access	Number of registers	Data type	Description
2	Read/Write	2	int_32	**Zero Position** The zero position of the sensor in [mm].

EtherCAT access: Zero point

Name	Index	Subindex	Description
Teach zero position	80X1*	01	Teach the zero position.
Zero position	80X1*	06	Set value for zero position.

* The X in the index stands for the sensor number. As example: for sensor 1, the index is 8011.

6.6 Factory settings

This function will restore the default sensor values and parameterization. Default will be restored in the entire user settings.

Restore default of sensor and controller box is individually.

Overview on default settings OE60 (sensor)

Adjustable parameters		Factory setting in the sensor
Axis inversion		`false`
Zero position		`0`
Precision	Preset	`Very high`
	Moving median length (for preset custom)	`16`
	Moving average length (for preset custom)	`64`
Invalid value handling	Activated	`false`
	Value after dropout	`last valid`
	Hold time	`500µs`
Modbus	Address	`1`
	Baudrate	`115200`

Overview on factory settings OE60C (controller box)

Adjustable parameters		Factory setting in the sensor
DigitalOut1	Source	`None`
	Mode	`Point`
	Polarity	`Active high`
	SP1	`0`
	SP2	`-5`
	Hysteresis	`0.1`
DigitalOut2	Source	`None`
	Mode	`Point`
	Polarity	`Active high`
	SP1	`0`
	SP2	`-5`
	Hysteresis	`0.1`

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Display access: Factory reset command (reset sensor settings)

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Measure Settings***.

b) Use the buttons / to select whether default is to be restored in a specific or every sensor.

c) Confirm with .

d) Use the buttons / to select function ***Factory Reset comm.***.

e) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

f) Use the button to restore default in the selected sensors.

Result:

✓ Default has been restored in the selected sensors.

Display access: Factory reset command (reset sensor settings)

Condition:

⇨ You see the start screen.

a) Use the buttons and to navigate to menu item ***Reset***.

b) Confirm with .

c) Use the button to select function ***Factory Reset command***.

d) Enable editing with .

✓ > ***Reset*** appears.

e) Use the button to restore default in the controller box.

Result:

✓ Default has been restored in the controller box.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Coils: Factory reset

Read adress 3 - length: 1 register

Adresse	Access	Number of registers	Data type	Description
3	Write	1	1 Bit	**Factory reset** The sensor will perform a factory reset, if 1 gets written to this coil.

EtherCAT access: Factory reset

Name	Index	Subindex	Description
Factory reset	80X1	04	The X in the index stands for the sensor number. As example: for sensor 1, the index is 8011.
Restore all default parameters	1011	01	Reset controller box (incl. switching outputs that are only available on the box).

6.7 Behavior in the event of incorrect measured values

This function defines the sensor behavior in the event of invalid measured values. This function can be used, for example, to mask recurring reflections of machine parts or reflections of measurement objects in a dynamic application. Invalid measured values occur when

- no object present in the measuring range (MR) or
- signal too weak as a result of reflections or non-detectable objects.

Options:

This function may be used to define the sensor behavior in the event of invalid measured values. You have the following options:

Function *Invalid Value Handling* is disabled by default and must be enabled first. In the next step, the function is ready for configuration via parameters *Hold time* and *Dropout value*.

Hold time defines the time for which an invalid measured value should be suppressed. The time is for hiding invalid measured values at the outputs. This time having elapsed will set the output.

Options for *Dropout value*:

- min - sensor holding time of the min. measured value.
- max - sensor holding time of the max. measured value.
- last valid - sensor holding time of the last valid measured value.

Display access: Invalid values

For detailed information on menu structure and display please see chapter *Controller box menu navigation [▶ 14]*.

Condition:

⇨ You see the start screen.

Instruction:

a) Use the buttons and to navigate to menu item ***Filter Settings***.

b) Use the buttons / to select whether the setting shall apply to a specific or every sensor.

c) Confirm with .

d) Use the buttons / to navigate to function ***Invalid values***.

e) Select with .

✓ On the display you see the current setting.

f) Use the buttons / to navigate to function ***Hold time*** or ***Dropout value***.

g) Enable editing with .

✓ The sign > comes in the first digit of the current setting.

h) Select the required setting using the buttons /.

i) Confirm with .

Result:

✓ The selected setting has been changed.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Holding Register: Invalid value handling

Read/Write adress 12 - length: 4 registers

Adresse	Access	Number of registers	Data type	Description
12	Read/Write	4	1 Bit	**Product information:** ▪ Activate Invalid Value Handling (bool): Defines whether the invalid value handling is being used or not. ▪ *Unused byte (uint8)* ▪ Hold Time (uint32): Defines how long invalid values are being suppressed after the last valid value in us. ▪ Dropout value (uint8): Invalid values are replaced with this value: ▪ 0: min ▪ 1: max ▪ 2: last valid ▪ *Unused byte (uint8)*

EtherCAT access: Invalid value handling

Name	Index	Subindex	Description
Invalid Value Handling	80X1*	07	Whether the invalid value handling is being used or not.
Invalid Value Handling - Hold Time	80X1*	08	Set hold time. Specifies how long invalid values are suppressed after the last valid value.
Invalid Value Handling - Dropout Value	80X1*	09	Dropout value (uint8): Invalid values are replaced with this value: ▪ 0: min ▪ 1: max ▪ 2: last valid

* The X in the index stands for the sensor number. As example: for sensor 1, the index is 8011.

7 Diagnostic functions

7.1 Identification

These functions read or write sensor identification information.

For more detailed information on the following please refer to chapter *Annex [▶ 50]*.

Modbus access - Input Register: Identification

Read adress 0 - length: 33 registers

Adresse	Access	Number of registers	Data type	Description
0	Read	33	string_65	Vendor Name

Modbus access - Input Register: Product Information

Read adress 40 - length: 65 registers

Adresse	Access	Number of registers	Description
40	Read	65	**Product information:** ▪ Product ID (string[9]) ▪ Sensor Type (string[65]) ▪ Serial Number (string[20]) ▪ *Unused byte (uint8)* ▪ Firmware Version (string[30]) ▪ *Unused byte (uint8)*

EtherCAT access:

Name	Index	Subindex	Description
Device Type	1000	0	Vendor-specific product or type identification, e. g. item number or model number.
Device Name	1008	0	Complete product name.
Hardware Version	1009	0	Unique, vendor-specific identifier of the hardware revision of the individual device, e. g. 00.00.01
Software Version	100A	0	Unique, vendor-specific identifier of the firmware revision of the individual device, e .g. 00.00.04
Restore default parameters	1011	0	Reset controller box.
Restore all default parameters	1011	01	Reset controller box (incl. switching outputs that are only available on the box)
Identify Object	1018	0	
Vendor ID	1018	01	Unique, vendor-specific identifier of the individual device.
Product Code	1018	02	Unique, vendor-specific product code.
Revision Number	1018	03	

Name	Index	Subindex	Description
Serial Number	1018	04	
Timestamp Object	10F8	0	

8 Annex

8.1 Modbus

8.1.1 Discrete Inputs

Address	Name	Description
0	value_alarm	Signals the current measurement alarm state. Reads 1 if the current measurement value is not value.

8.1.2 Coils

Address	Name	Description
0	teach_zero_pos	Command "Teach zero position" The sensor will take the current position as new zero position, if any value gets written here.
1	laser_off	Command "Laser off data hold" The sensor will stop to measure (and thus the laser will be off) if 1 gets written to this coil. The sensor only starts to measure again, if 0 gets written to this coil (or if the sensor gets restarted).
2	axis_inversion	The axis inversion can be set to: ▪ 0 = min-to-max ▪ 1 = max-to-min
3	factory_reset	The sensor will perform a factory reset, if 1 gets written to the coil.
4	mounting_assistant_enabled	The mounting assistant will be disabled (when on, a yellow LED indicates incorrect allignment), if 0 gets written to this coil.

8.1.3 Input registers

Address	Length	Name	Description
0	33*	vendor_info	▪ **vendor_name** ▪ (string[65]): Name of the vendor

40	60*	device_info	▪ **product_id**
			  ▪ (string[9]): Product ID
			▪ **sensor_type**
			  ▪ (string[65]): Name of the sensor
			▪ **serial_number**
			  ▪ (string[20]): Serial number
			▪ **padding2**
			  ▪ (uint8): Unused byte
			▪ **firmware_version**
			  ▪ (string[20]): Firmware version
			▪ **padding4**
			  ▪ (uint8): Unused byte

105	9*	all_measure-ment_values	▪ **status**
			  ▪ (uint16): Status of the measurement value
			▪ **measurement_value**
			  ▪ (int32): Measurement value scaled by posi-tion_scaling_32bit [mm divided by scaling]
			▪ **contamination_indicator**
			  ▪ (int32): Value of the contamination indicator (0 to 100)
			▪ **timestamp**
			  ▪ (int64): Timestamp of taking the laser frame

114	2*	measure-ment_values	▪ **measurement_value** ▪ (int32): Measurement value scaled by posi-tion_scaling_32bit [mm divided by scaling]

116	5*	scaling_factors	▪ **position_scaling_32bit**
			  ▪ (uint32): position_scaling_32bit
			▪ **padding**
			  ▪ (uint8): Unused byte

121	1	mounting_assis-tant	▪ **state**
			  ▪ (uint8): state of the mounting assistant
			▪ **padding0**
			  ▪ (uint8): Unused byte

* Data volume exceeds 16 bits (corresponding to a register); reading only by function call. Select the corresponding registers by function call via *Function Code 03* or *Function Code 04*. No access to individual registers.

8.1.4 Holding register

Address	Length	Name	Description
2	2*	zero_position	▪ **zero_position** ▪ (int32): The zero position of the sensor scaled by position_scaling_32bit [mm divided by scaling].
4	1*	precision	▪ **preset** ▪ (uint8): The preset for the precision. May be one of the following: ▪ 0 = standard ▪ 1 = high ▪ 2 = very high ▪ 3 = manual ▪ **padding0** ▪ (uint8): Unused byte
5	2*	temporal_filters	▪ **moving_median_length** ▪ (uint16): Length of the moving median filter kernel. Can only be written with "preset" is set to 3 (manual). ▪ **moving_average_length** ▪ (uint16): Length of the moving average filter kernel. Can only be written with "preset" is set to 3 (manual).
12	4*	invalid_value_handling	▪ **use_invalid_value_handling** ▪ (bool): Whether the invalid value handling is being used or not. ▪ **padding0** ▪ (uint8): Unused byte ▪ **hold_time** ▪ (uint32): How long invalid values are being suppressed after the last valid value. ▪ **value_after_dropout** ▪ (uint8): With which value invalid ones are to be replaced: ▪ 0 = min ▪ 1 = max ▪ 2 = last valid ▪ **padding3** ▪ (uint8): Unused byte
1100	1	modbus_slave_address	▪ **modbus_slave_address** ▪ (uint8): The modbus slave address of the sensor. The sensor will answer with its old address and afterwards act only on messages to the new address. ▪ **padding0** ▪ (uint8): Unused byte

Address	Length	Name	Description
1101	1	modbus_baudrade	▪ **modbus_baudrate_id** ▪ (uint8): The ID of the sensors baud rate. Upon writing this value, the sensor will answer with the old baud rate and then set its interface to teh new baud rate. Possible values: ▪ 0 = 19200 ▪ 1 = 38400 ▪ 2 = 57600 ▪ 3 = 115200 ▪ 4 = 128000 ▪ 5 = 256000 ▪ 6 = 2000000 ▪ **padding0** ▪ (uint8): Unused byte

* Data volume exceeds 16 bits (corresponding to a register); reading only by function call. Select the corresponding registers by function call via *Function Code 03* or *Function Code 04*. No access to individual registers. Sensor access denied.

8.2 EtherCat

8.2.1 Standard objects

Index	Subindex	Name	Data type	Access rights	Value range	Description
1000	0	Device Type	UDINT	R		Vendor-specific product or type identification, e. g. item number or model number.
1008	0	Device Name	STRING(5)	R	ASCII	Complete product name.
1009	0	Hardware Version	STRING(27)	R	ASCII	Unique, vendor-specific identifier of the hardware revision of the individual device, e. g. 00.00.01
100A	0	Software Version	STRING(27)	R	ASCII	Unique, vendor-specific identifier of the firmware revision of the individual device, e .g. 00.00.04
1011		Restore default parameters				Reset controller box.
	0	Number of entries	USINT	R		
	01	Restore all default parameters	UDINT	R/W		Reset controller box (incl. switching outputs that are only available on the box)
1018		Identify Object				Unique, vendor-specific identifier of the individual device.
	0	Number of entries	USINT	R		
	01	Vendor ID	UDINT	R		
	02	Product Code	UDINT	R		Unique, vendor-specific product code.
	03	Revision Number	UDINT	R		
	04	Serial Number	UDINT	R		
10F8	0	Timestamp Object	ULINT	R		

8.2.2 Cyclical output data RxPDO

Index	Subindex	Name	Data type	Access rights	Value range	Description
17ff	1	Device Control	UDINT	R		Control Value: Alarm if the box would be defective. ▪ 0 = OK ▪ 1 = Error, box must be checked
1601		Sensor 1 Values				
	0	Number of entries	USINT	R	0/1	Switch off the laser for the individual sensor pairs.
	01	Sensor 1 Laser Off	UDINT	R	0...4294967295	
1602		Sensor 2 Values				
	0	Number of entries	USINT	R	0/1	Switch off the laser for the individual sensor pairs.
	01	Sensor 2 Laser Off	UDINT	R	0...4294967295	
1603		Sensor 3 Values				
	0	Number of entries	USINT	R	0/1	Switch off the laser for the individual sensor pairs.
	01	Sensor 3 Laser Off	UDINT	R	0...4294967295	
1604		Sensor 4 Values				
	0	Number of entries	USINT	R	0/1	Switch off the laser for the individual sensor pairs.
	01	Sensor 4 Laser Off	UDINT	R	0...4294967295	

8.2.3 Cyclical input data TxPDO

Index	Subindex	Name	Data type	Access rights	Value range	Description
1A00		Device TxPDO				
	0	Number of entries	USINT	R		
	01	Control Value	UDINT	R	0...4294967295	
1A01		Sensor 1 TxPDO				
	0	Number of entries	USINT	R		
	01	Sensor 1 Status	UDINT	R	0...4294967295	Status for sensor 1
	02	Sensor 1 Measurement Value	DINT	R	-2147483648 ... 2147483647	Measurement value for sensor 1
	03	Sensor 1 Contamination Indicator	UDINT	R	0...4294967295	Contamination index for sensor 1
	04	Sensor 1 TimestaSensor 3 Status mp	ULINT	R		Timestamp for sensor 1
1A02		Sensor 2 TxPDO				
	0	Number of entries	USINT	R		
	01	Sensor 2 Status	UDINT	R	0...4294967295	Status for sensor 2
	02	Sensor 2 Measurement Value	DINT	R	-2147483648 ... 2147483647	Measurement value for sensor 2
	03	Sensor 2 Contamination Indicator	UDINT	R	0...4294967295	Contamination index for sensor 2
	04	Sensor 2 Timestamp	ULINT	R		Timestamp for sensor 2

Index	Subindex	Name	Data type	Access rights	Value range	Description
1A03		Sensor 3 TxPDO				
	0	Number of entries	USINT	R		
	01	Sensor 3 Status	UDINT	R	0...4294967295	Status for sensor 3
	02	Sensor 3 Measurement Value	DINT	R	-2147483648 ... 2147483647	Measurement value for sensor 3
	03	Sensor 3 Contamination Indicator	UDINT	R	0...4294967295	Contamination index for sensor 3
	04	Sensor 3 Timestamp	ULINT	R		Timestamp for sensor 3
1A04		Sensor 4 TxPDO				
	0	Number of entries	USINT	R		
	01	Sensor 4 Status	UDINT	R	0...4294967295	Status for sensor 4
	02	Sensor 4 Measurement Value	DINT	R	-2147483648 ... 2147483647	Measurement value for sensor 4
	03	Sensor 4 Contamination Indicator	UDINT	R	0...4294967295	Contamination index for sensor 4
	04	Sensor 4Timestamp	ULINT	R		Timestamp for sensor 4

8.2.4 Acyclic output data

Index	Subindex	Name	Data type	Access rights	Value range	Description
2000		Device OUTPUT				
	0	Number of entries	USINT	R		
	01	Control Value	UDINT	R/W	0...4294967295	
2001		Sensor 1 OUTPUT				
	0	Number of entries	USINT	R		
	01	Sensor 1 Laser Off	UDINT	R/W	0...4294967295	
2002		Sensor 2 OUTPUT				
	0	Number of entries	USINT	R		
	01	Sensor 2 Laser Off	UDINT	R/W	0...4294967295	
2003		Sensor 3 OUTPUT				
	0	Number of entries	USINT	R		
	01	Sensor 3 Laser Off	UDINT	R/W	0...4294967295	
2004		Sensor 4 OUTPUT				
	0	Number of entries	USINT	R		
	01	Sensor 4 Laser Off	UDINT	R/W	0...4294967295	

8.2.5 Acyclic input data

Index	Subindex	Name	Data type	Access rights	Value range	Description
3000		Device INPUT				
	0	Number of entries	USINT	R		
	01	Control Value	UDINT	R	0...4294967295	
3001		Sensor 1 INPUT				
	0	Number of entries	USINT	R		
	01	Sensor 1 Status	UDINT	R/W	0...4294967295	Status for sensor 1: ▪ 0 = OK ▪ 1 = NOK, no valid measured value can be recorded, e.g. no measurement object in the measurement range
	02	Sensor 1 Measurement Value	DINT	R/W	-2147483648 ... 2147483647	Measurement value for sensor 1
	03	Sensor 1 Contamination Indicator	UDINT	R/W	0...4294967295	Contamination index for sensor 1
	04	Sensor 1 Timestamp	ULINT	R/W		Timestamp for sensor 1
3002		Sensor 2 INPUT				
	0	Number of entries	USINT	R		
	01	Sensor 2 Status	UDINT	R/W	0...4294967295	Status for sensor 2: ▪ 0 = OK ▪ 1 = NOK, no valid measured value can be recorded, e.g. no measurement object in the measurement range
	02	Sensor 2 Measurement Value	DINT	R/W	-2147483648 ... 2147483647	Measurement value for sensor 2
	03	Sensor 2 Contamination Indicator	UDINT	R/W	0...4294967295	Contamination index for sensor 2
	04	Sensor 2 Timestamp	ULINT	R/W		Timestamp for sensor 2

Index	Subindex	Name	Data type	Access rights	Value range	Description
3003		Sensor 3 INPUT				
	0	Number of entries	USINT	R		
	01	Sensor 3 Status	UDINT	R/W	0...4294967295	Status for sensor 3: ▪ 0 = OK ▪ 1 = NOK, no valid measured value can be recorded, e.g. no measurement object in the measurement range
	02	Sensor 3 Measurement Value	DINT	R/W	-2147483648 ... 2147483647	Measurement value for sensor 3
	03	Sensor 3 Contamination Indicator	UDINT	R/W	0...4294967295	Contamination index for sensor 3
	04	Sensor 3 Timestamp	ULINT	R/W		Timestamp for sensor 3
3004		Sensor 4 INPUT				
	0	Number of entries	USINT	R		
	01	Sensor 4 Status	UDINT	R/W	0...4294967295	Status for sensor 4: ▪ 0 = OK ▪ 1 = NOK, no valid measured value can be recorded, e.g. no measurement object in the measurement range
	02	Sensor 4 Measurement Value	DINT	R/W	-2147483648 ... 2147483647	Measurement value for sensor 4
	03	Sensor 4 Contamination Indicator	UDINT	R/W	0...4294967295	Contamination index for sensor 4
	04	Sensor 4Timestamp	ULINT	R/W		Timestamp for sensor 4

8.2.6 Acyclic parameterization options

Index	Subindex	Name	Data type	Access rights	Value range	Description
9000		Device Info				
	0	Number of entries	USINT	R		
	01	Product ID	STRING(9)	R		
	02	Product Type	STRING(65)	R		
	03	Serial Number	STRING(20)	R		
	04	Firmware Version	STRING(30)	R		
8010		Sensor 1 Device Info				
	0	Number of entries	USINT	R		
	01	Product ID	STRING(9)	R		
	02	Product Type	STRING(65)	R		
	03	Serial Number	STRING(20)	R		
	04	Firmware Version	STRING(30)	R		

Index	Subindex	Name	Data type	Access rights	Value range	Description
8011		Sensor 1 Configuration				
	0	Number of entries	USINT	R		
	01	Teach Zero Position	BOOL	R/W		
	02	Laser Off	BOOL	R/W		
	03	Axis Inversion	BOOL	R/W		
	04	Factory Reset	BOOL	R/W		
	05	Reserve	UINT	R/W		
	06	Zero Position	DINT	R/W		
	07	Invalid Value Handling	BOOL	R/W		Whether the invalid value handling is being used or not.
	08	Invalid Value Handling - Hold Time	UDINT	R/W		Set hold time. Specifies how long invalid values are suppressed after the last valid value.
	09	Invalid Value Handling - Dropout value	EN32	R/W		
	0A	Precision	EN32	R/W		
	0B	Moving Average Length	UINT	R/W		
	0C	Moving Median Length	UINT	R/W		
	0D	Position Scaling Factor	UDINT	R		
	0E	Reserve	UDINT	R		
	0F	Timestamp Resolution USec	UDINT	R		
	10	Mounting Assistant	BOOL	R/W		

Index	Subindex	Name	Data type	Access rights	Value range	Description
8020		Sensor 2 Device Info				
	0	Number of entries	USINT	R		
	01	Product ID	STRING(9)	R		
	02	Product Type	STRING(65)	R		
	03	Serial Number	STRING(20)	R		
	04	Firmware Version	STRING(30)	R		
8021		Sensor 2 Configuration				
	0	Number of entries	USINT	R		
	01	Teach Zero Position	BOOL	R/W		
	02	Laser Off	BOOL	R/W		
	03	Axis Inversion	BOOL	R/W		
	04	Factory Reset	BOOL	R/W		
	05	Reserve	UINT	R/W		
	06	Zero Position	DINT	R/W		
	07	Invalid Value Handling	BOOL	R/W		Whether the invalid value handling is being used or not.
	08	Invalid Value Handling - Hold Time	UDINT	R/W		Set hold time. Specifies how long invalid values are suppressed after the last valid value.
	09	Invalid Value Handling - Dropout value	EN32	R/W		
	0A	Precision	EN32	R/W		
	0B	Moving Average Length	UINT	R/W		
	0C	Moving Median Length	UINT	R/W		
	0D	Position Scaling Factor	UDINT	R		
	0E	Reserve	UDINT	R		
	0F	Timestamp Resolution USec	UDINT	R		
	10	Mounting Assistant	BOOL	R/W		

Index	Subindex	Name	Data type	Access rights	Value range	Description
8030		Sensor 3 Device Info				
	0	Number of entries	USINT	R		
	01	Product ID	STRING(9)	R		
	02	Product Type	STRING(65)	R		
	03	Serial Number	STRING(20)	R		
	04	Firmware Version	STRING(30)	R		
8031		Sensor 3 Configuration				
	0	Number of entries	USINT	R		
	01	Teach Zero Position	BOOL	R/W		
	02	Laser Off	BOOL	R/W		
	03	Axis Inversion	BOOL	R/W		
	04	Factory Reset	BOOL	R/W		
	05	Reserve	UINT	R/W		
	06	Zero Position	DINT	R/W		
	07	Invalid Value Handling	BOOL	R/W		Whether the invalid value handling is being used or not.
	08	Invalid Value Handling - Hold Time	UDINT	R/W		Set hold time. Specifies how long invalid values are suppressed after the last valid value.
	09	Invalid Value Handling - Dropout value	EN32	R/W		
	0A	Precision	EN32	R/W		
	0B	Moving Average Length	UINT	R/W		
	0C	Moving Median Length	UINT	R/W		
	0D	Position Scaling Factor	UDINT	R		
	0E	Reserve	UDINT	R		
	0F	Timestamp Resolution USec	UDINT	R		
	10	Mounting Assistant	BOOL	R/W		

Index	Subindex	Name	Data type	Access rights	Value range	Description
8040		Sensor 4 Device Info				
	0	Number of entries	USINT	R		
	01	Product ID	STRING(9)	R		
	02	Product Type	STRING(65)	R		
	03	Serial Number	STRING(20)	R		
	04	Firmware Version	STRING(30)	R		
8041		Sensor 4 Configuration				
	0	Number of entries	USINT	R		
	01	Teach Zero Position	BOOL	R/W		
	02	Laser Off	BOOL	R/W		
	03	Axis Inversion	BOOL	R/W		
	04	Factory Reset	BOOL	R/W		
	05	Reserve	UINT	R/W		
	06	Zero Position	DINT	R/W		
	07	Invalid Value Handling	BOOL	R/W		Whether the invalid value handling is being used or not.
	08	Invalid Value Handling - Hold Time	UDINT	R/W		Set hold time. Specifies how long invalid values are suppressed after the last valid value.
	09	Invalid Value Handling - Dropout value	EN32	R/W		
	0A	Precision	EN32	R/W		
	0B	Moving Average Length	UINT	R/W		
	0C	Moving Median Length	UINT	R/W		
	0D	Position Scaling Factor	UDINT	R		
	0E	Reserve	UDINT	R		
	0F	Timestamp Resolution USec	UDINT	R		
	10	Mounting Assistant	BOOL	R/W		

8.2.7 Controller box -specific parameters

Index	Subindex	Name	Data type	Access rights	Value range	Description
F000		Modular Device Profile				Describes the module structure.
	0	Number of entries	USINT	R		
	01	Index distance	UINT	R		
	02	Maximum number of modules	UINT	R		
F800		Switching Output 1				Parameterization of the switching output 1.
	0	Number of entries	USINT	R		
	01	Source	EN32	R/W		The signal to be applied to the switching output can be set. This applies to all sensor head pairs S1-S4: ▪ None ▪ Position S1 ▪ Alarm S1 ▪ Contamin. S1
	02	Mode	EN32	R/W		Mode for switch points.
	03	Switch Point 1	DINT	R/W		Switch point 1.
	04	Switch Point 2	DINT	R/W		Switch point 2.
	05	Hysteresis	DINT	R/W		Hysteresis for switching output 1.
	06	Polarity	EN32	R/W		Polarity for switching output 1.
F801		Switching Output 2				Parameterization of the switching output 2.
	0	Number of entries	USINT	R		
	01	Source	EN32	R/W		The signal to be applied to the switching output can be set. This applies to all sensor head pairs S1-S4: ▪ None ▪ Position S1 ▪ Alarm S1 ▪ Contamin. S1
	02	Mode	EN32	R/W		Mode for switch points.

Index	Subindex	Name	Data type	Access rights	Value range	Description
	03	Switch Point 1	DINT	R/W		Switch point 1.
	04	Switch Point 2	DINT	R/W		Switch point 2.
	05	Hysteresis	DINT	R/W		Hysteresis for switching output 2.
	06	Polarity	EN32	R/W		Polarity for switching output 2.
F802	0	Touch lock	BOOL	R/W		The control panel (buttons) can be locked to prevent the parameterization of the sensors via the control panel. ▪ TRUE = Panel locked ▪ FALSE = Panel unlocked

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