



## Operating Instructions

### Ultrasonic proximity switch with one switched output

pico+15/F	pico+15/WK/F
pico+25/F	pico+25/WK/F
pico+35/F	pico+35/WK/F
pico+100/F	pico+100/WK/F

### Product description

The pico+sensor offers a non-contact measurement of the distance to an object which must be positioned within the sensor's detection zone. The switched output is set conditional upon the adjusted detect distance.

Via the Teach-in procedure, the detect distance and operating mode can be adjusted. Two LEDs indicate operation and the state of the switched output.

The pico+sensors are IO-Link-capable in accordance with IO-Link specification V1.0.

### Safety instructions

- Read the operating instructions prior to start-up.

- Connection, installation and adjustments may only be carried out by qualified staff.
- No safety component in accordance with the EU Machine Directive

**Use for intended purpose only**  
pico+ultrasonic sensors are used for non-contact detection of objects.

### Installation

- Mount the sensor at the place of fitting.
- Connect a connection cable to the M12 device plug.

					colour
1	3	4	2	5	
+U <sub>B</sub>	-U <sub>B</sub>	F	-	Com	brown
					blue
					black
					white
					grey

Fig. 1: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cables

### Factory setting

- Detect point operation
- Switched output on NOC
- Detect distance at operating range
- Multi-function input »Com« set to »Teach-in«
- Filter at F01
- Filter strength at P00

### Operating modes

Three operating modes are available for the switched output:

- Operation with one detect point  
The switched output is set when the object falls below the set detect point.
- Window mode  
The switched output is set when the object is within the set window.
- Two-way reflective barrier  
The switched output is set when the

object is between sensor and fixed reflector.

### Synchronisation

If under multiple sensor operation the assembly distance falls below the values shown in Fig. 2, the internal synchronisation should be used. For this purpose set the switched outputs of all sensors in accordance with the diagram »Sensor adjustment with the Teach-in procedure«. Then change the multi-function output »Com« to »synchronisation« (see »Further settings«). Finally interconnect each pin 5 of the sensors to be synchronised.

≥0.25 m	≥1.30 m	≥0.35 m	≥2.50 m
≥0.40 m	≥2.50 m	≥0.70 m	≥4.00 m

Fig. 2: Assembly distances

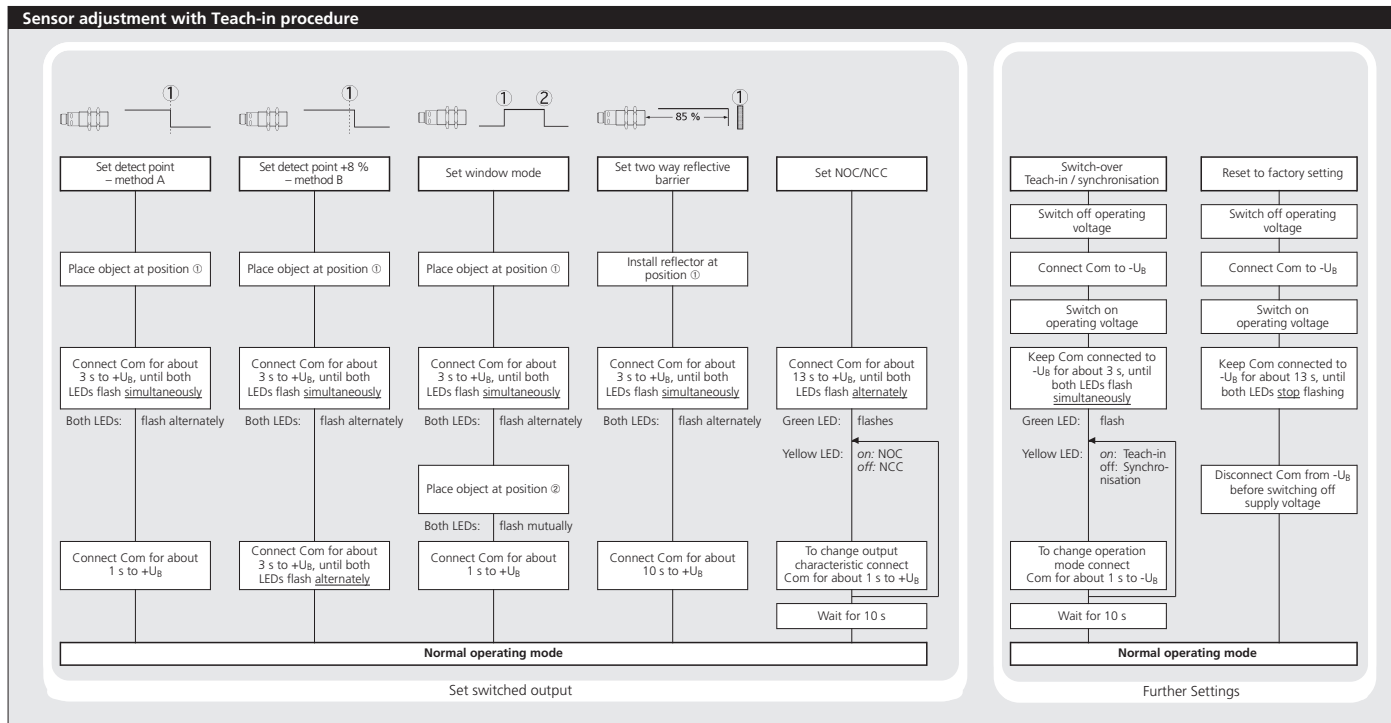
## Contact

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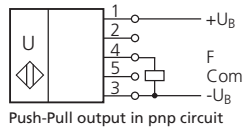
### Maintenance

microsonic sensors are maintenance-free. In case of excess caked-on dirt we recommend cleaning the white sensor surface

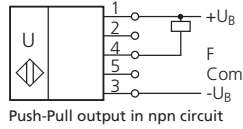
### Notes

- The sensors of the pico+ family have a blind zone, within which a distance measurement is not possible.
- The pico+ sensors are equipped with an internal temperature compensation. Due to the sensors self heating, the temperature compensation reaches its optimum working-point after approx. 20 minutes of operation.
- In the normal operating mode, an illuminated yellow LED signals that the switched output is switched through.
- The pico+sensors have a push-pull switched output.
- In the »Two-way reflective barrier« operating mode, the object has to

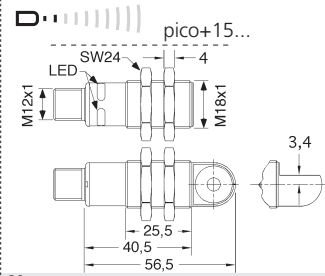
**Technical data**



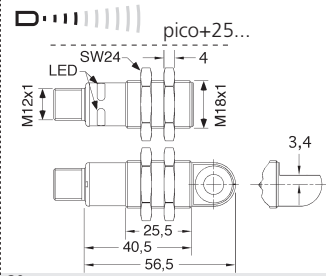
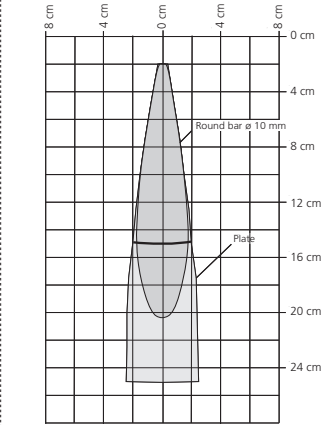
Push-Pull output in pnp circuit



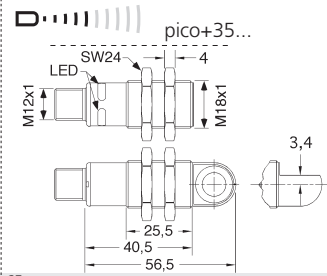
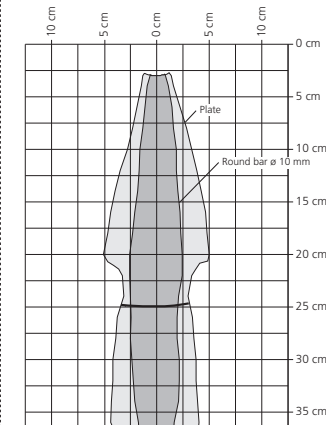
Push-Pull output in npn circuit



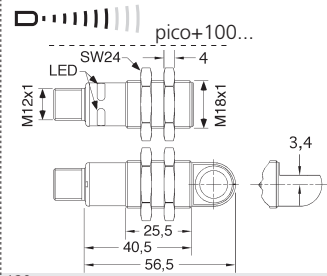
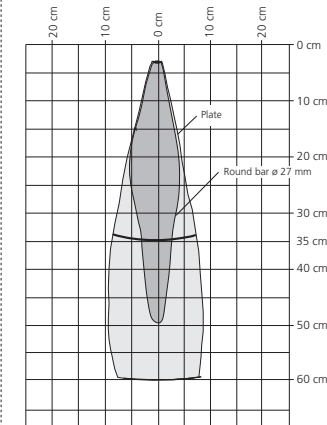
**blind zone** 20 mm  
**operating range** 150 mm  
**maximum range** 250 mm  
**angle of beam spread** see detection zone  
**transducer frequency** 380 kHz  
**resolution** 0.069 mm  
**reproducibility** ± 0.15 %



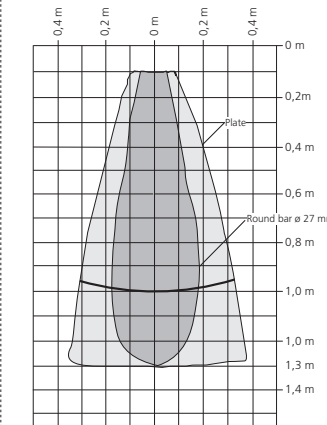
**blind zone** 30 mm  
**operating range** 250 mm  
**maximum range** 350 mm  
**angle of beam spread** see detection zone  
**transducer frequency** 320 kHz  
**resolution** 0.069 mm  
**reproducibility** ± 0.15 %



**blind zone** 65 mm  
**operating range** 350 mm  
**maximum range** 600 mm  
**angle of beam spread** see detection zone  
**transducer frequency** 400 kHz  
**resolution** 0.069 mm  
**reproducibility** ± 0.15 %



**blind zone** 120 mm  
**operating range** 1,000 mm  
**maximum range** 1,300 mm  
**angle of beam spread** see detection zone  
**transducer frequency** 200 kHz  
**resolution** 0.069 mm  
**reproducibility** ± 0.15 %



**detection zones** for different objects:  
 The dark grey areas represent the zone where it is easy to recognise the normal reflector (round bar). This indicates the typical operating range of the sensors. The light grey areas represent the zone where a very large reflector – for instance a plate – can still be recognized. The requirement here is for an optimum alignment to the sensor. It is not possible to evaluate ultrasonic reflections outside this area.

**accuracy** ± 1 % (temperature drift internally compensated)  
**operating voltage U<sub>B</sub>** 10 - 30 V DC, reverse polarity protection (Class 2)  
**voltage ripple** ± 10 %  
**no-load current consumption** < 40 mA  
**housing** brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
**max. tightening torque of nuts** 15 Nm  
**class of protection per EN 60 529** IP 67  
**type of connection** 5-pin M12 circular plug  
**controls** Teach-in via pin 5 (Com)  
**indicators** LED green (operation)  
 LED yellow (state of output)  
**programmable** Teach-in, LinkControl  
**synchronisation** internal synchronisation up to 10 sensors  
**operating temperature** -25°C to +70°C  
**storage temperature** -40°C to +85°C  
**switched output** Push-Pull, U<sub>B</sub>-4 V, -U<sub>B</sub>+2 V, I<sub>max</sub> = 100 mA switchable NOC/NCC, short-circuit-proof  
**switching hysteresis** 1) 2 mm  
**switching frequency** 1) 25 Hz  
**response time** 1) 32 ms  
**time delay before availability** 1) < 300 ms  
**norm conformity** EN 60947-5-2

**accuracy** ± 1 % (temperature drift internally compensated)  
**operating voltage U<sub>B</sub>** 10 - 30 V DC, reverse polarity protection (Class 2)  
**voltage ripple** ± 10 %  
**no-load current consumption** < 40 mA  
**housing** brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
**max. tightening torque of nuts** 15 Nm  
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**synchronisation** internal synchronisation up to 10 sensors  
**operating temperature** -25°C to +70°C  
**storage temperature** -40°C to +85°C  
**switched output** Push-Pull, U<sub>B</sub>-4 V, -U<sub>B</sub>+2 V, I<sub>max</sub> = 100 mA switchable NOC/NCC, short-circuit-proof  
**switching hysteresis** 1) 3 mm  
**switching frequency** 1) 25 Hz  
**response time** 1) 32 ms  
**time delay before availability** 1) < 300 ms  
**norm conformity** EN 60947-5-2

**accuracy** ± 1 % (temperature drift internally compensated)  
**operating voltage U<sub>B</sub>** 10 - 30 V DC, reverse polarity protection (Class 2)  
**voltage ripple** ± 10 %  
**no-load current consumption** < 40 mA  
**housing** brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
**max. tightening torque of nuts** 15 Nm  
**class of protection per EN 60 529** IP 67  
**type of connection** 5-pin M12 circular plug  
**controls** Teach-in via pin 5 (Com)  
**indicators** LED green (operation)  
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**synchronisation** internal synchronisation up to 10 sensors  
**operating temperature** -25°C to +70°C  
**storage temperature** -40°C to +85°C  
**switched output** Push-Pull, U<sub>B</sub>-4 V, -U<sub>B</sub>+2 V, I<sub>max</sub> = 100 mA switchable NOC/NCC, short-circuit-proof  
**switching hysteresis** 1) 5 mm  
**switching frequency** 1) 12 Hz  
**response time** 1) 64 ms  
**time delay before availability** 1) < 300 ms  
**norm conformity** EN 60947-5-2

**accuracy** ± 1 % (temperature drift internally compensated)  
**operating voltage U<sub>B</sub>** 10 - 30 V DC, reverse polarity protection (Class 2)  
**voltage ripple** ± 10 %  
**no-load current consumption** < 40 mA  
**housing** brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
**max. tightening torque of nuts** 15 Nm  
**class of protection per EN 60 529** IP 67  
**type of connection** 5-pin M12 circular plug  
**controls** Teach-in via pin 5 (Com)  
**indicators** LED green (operation)  
 LED yellow (state of output)  
**programmable** Teach-in, LinkControl  
**synchronisation** internal synchronisation up to 10 sensors  
**operating temperature** -25°C to +70°C  
**storage temperature** -40°C to +85°C  
**switched output** Push-Pull, U<sub>B</sub>-4 V, -U<sub>B</sub>+2 V, I<sub>max</sub> = 100 mA switchable NOC/NCC, short-circuit-proof  
**switching hysteresis** 1) 20 mm  
**switching frequency** 1) 10 Hz  
**response time** 1) 80 ms  
**time delay before availability** 1) < 300 ms  
**norm conformity** EN 60947-5-2

**order no. directly radiating weight** **pico+15/F** 30 g  
**order no. angular head weight** **pico+15/WK/F** 35 g

**order no. directly radiating weight** **pico+25/F** 30 g  
**order no. angular head weight** **pico+25/WK/F** 35 g

**order no. directly radiating weight** **pico+35/F** 30 g  
**order no. angular head weight** **pico+35/WK/F** 35 g

**order no. directly radiating weight** **pico+100/F** 30 g  
**order no. angular head weight** **pico+100/WK/F** 35 g

1) Can be programmed with LinkControl

be within the range of 0-85 % of the set distance.

- In the »Set detect point – method A« Teach-in procedure the actual distance to the object is taught to the sensor as the detect point. If the object moves towards the sensor (e.g. with level control) then the taught distance is the level at which the sensor has to switch the output.
- If the object to be scanned moves into the detection area from the side, the »Set detect point +8 % – method B« Teach-in procedure should be used. In this way the switching distance is set 8 % further than the actual measured distance to the object. This ensures a reliable switching distance even if the height of the objects varies slightly.

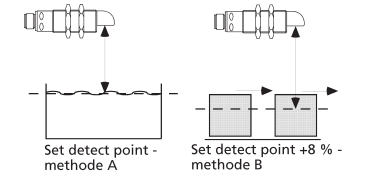


Fig. 4: Setting the detect point for different directions of movement of the object

- If synchronization is activated the Teach-in is disabled (see »Further settings«).
- The sensor can be reset to its factory setting (see »Further settings«).
- Using the LinkControl adapter (optional accessory) and the LinkControl software for Windows, all Teach-in and additional sensor parameter settings can be optionally undertaken.

CE 2014/30/EU  
 Enclosure Type 1  
 For use only in industrial machinery NFPA 79 applications.  
 LISTED

## IO-Link mode

### IO-Link mode

The pico+ sensors are IO-Link-capable in accordance with IO-Link specification V1.0.

### Pointer

- In IO-Link mode Teach-in, LinkControl and synchronization via pin 5 are not available.
- In IO-Link mode pin 5 must not be connected to any potential.
- For current information about IO-Link please contact the microsonic sales department.

### Synchronisation in IO-Link mode

In IO-Link mode each sensor is synchronized on the protocol of the IO-Link master.

In multiple sensor operation the sensors are synchronous if the master protocols are synchronous.

### Process data

The pico+ cyclically transmits the measured distance value with a resolution of 0,1 mm and the state of

the switched output.

### Service data

The following sensor parameters may be set via IO-Link interface using the IO-Link device description (IODD).

### Detect point 1

The switched output is activated when the distance to an object is under that of the present detect point.

### Return detect point 1

The switched output is reactivated when the distance to an object is greater than the present return detect point (detect point + hysteresis).

### Pointer

- The return detect point 1 must always be greater than the detect point 1.

### Detect point 2, return detect point 2

By programming these two detect distances the window mode is activated.

### Pointer

- The return detect point 2 must always be smaller than the detect point 2.

### NOC/NCC operation

The NCC or NOC output function can be present for the switched output.

### Measurement filter

pico+ ultrasonic sensors provide for a choice of 3 filter settings:

- F00  
No filter, each ultrasonic measurement acts in an unfiltered manner on the output.
- F01  
Standard filter, on the object continuously approaching the sensor, the ongoing interval is immediately taken on and the output correspondingly activated. The effect of the object abruptly moving away from the sensor is for the existing distance to be saved for a retaining time dependent on the filter strength and for the switched

output state to be maintained.

- F02  
Average value filter, forms the arithmetic mean across a number of measurements. The output is activated in keeping with the average value. The number of measurements, from which the average value is formed, depends on the selected filter strength.

### Filter strength

A filter strength between 0 – weak filter effect – and 9 – pronounced filter effect – can be selected for each measurement filter.

### Foreground suppression

Spurious reflections, caused by objects in the foreground of the sensor may be blocked out by the foreground suppression.

### Pointer

- Check that the object in the foreground does not cause multiple reflections.

- The object in the foreground must not cover the sensor in a way that the detection zone is influenced.

### System commands

With 4 system commands the following settings may be carried out:

- Teach-in detect point – method A.
- Teach-in detect point – method B.
- Teach-in two way reflective barrier.
- Reset sensor to factory settings.

### Pointer

To achieve the maximum resolution the Master Cycle Time has to comply with the following requirements:

- Min Cycle Time ≤ Master Cycle Time ≤ Min Cycle Time + 1.2 ms.
- If this condition can not be fulfilled, sporadic discontinuities of the measurement value can occur. In this case the Master Cycle Time has to be increased in 400 μs steps until the discontinuities of the measurement disappear.

### Pointer

- If the pico+ sensor was set using Teach-in or LinkControl it is recommended to reset the sensor to the factory setting prior to using it in IO-Link mode (s. »Further settings«).

### IODD file

The latest IODD file you will find on the internet under [www.microsonic.de/en/IODD](http://www.microsonic.de/en/IODD).

For further informations on IO-Link see [www.io-link.com](http://www.io-link.com).

## IO-Link data

	pico+15...				pico+25...				pico+35...				pico+100...					
physical layer	yes				yes				yes				yes					
SIO mode support	8.4 ms				8.4 ms				16 ms				20.4 ms					
min cycle time	COM 2 (38.400 Bd)				COM 2 (38.400 Bd)				COM 2 (38.400 Bd)				COM 2 (38.400 Bd)					
baud rate	16 Bit, R, UNI16				16 Bit, R, UNI16				16 Bit, R, UNI16				16 Bit, R, UNI16					
format of process data	Bit 0: state of switched output; Bit 1-15: distance value with 0,1 mm resolution				Bit 0: state of switched output; Bit 1-15: distance value with 0,1 mm resolution				Bit 0: state of switched output; Bit 1-15: distance value with 0,1 mm resolution				Bit 0: state of switched output; Bit 1-15: distance value with 0,1 mm resolution					
content of process data																		
service data IO-Link specific	<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>			
Vendor name	0x10	R	microsonic GmbH		0x10	R	microsonic GmbH		0x10	R	microsonic GmbH		0x10	R	microsonic GmbH			
Vendor text	0x11	R	www.microsonic.de		0x11	R	www.microsonic.de		0x11	R	www.microsonic.de		0x11	R	www.microsonic.de			
Product name	0x12	R	pico+		0x12	R	pico+		0x12	R	pico+		0x12	R	pico+			
Product ID	0x13	R	15/F;15/WK/F		0x13	R	25/F;25/WK/F		0x13	R	35/F;35/WK/F		0x13	R	100/F;100/WK/F			
Product text	0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor			
service data sensor specific	<b>index</b>	<b>format</b>	<b>access</b>	<b>range (dez)</b>			<b>index</b>	<b>format</b>	<b>access</b>	<b>range (dez)</b>			<b>index</b>	<b>format</b>	<b>access</b>	<b>range (dez)</b>		
detect point 1	0x40	UINT16	R/W	306-3,609 (21-248 mm) 1)			0x40	UINT16	R/W	436-5,065 (30 - 348 mm) 1)			0x40	UINT16	R/W	946-8,704 (65 - 598 mm) 1)		
return detect point 1	0x41	UINT16	R/W	320-3,624 (22-249 mm) 1)			0x41	UINT16	R/W	451-5,080 (31 - 349 mm) 1)			0x41	UINT16	R/W	961-8,718 (66 - 599 mm) 1)		
detect point 2	0x47	UINT16	R/W	335-65,512 (23 - 250 mm) 1)			0x47	UINT16	R/W	466-65,512 (32 - 350 mm) 1)			0x47	UINT16	R/W	975-65,512 (67 - 600 mm) 1)		
return detect point 2	0x48	UINT16	R/W	> 3,638: window mode deactivated 320-65,512 (22 - 250 mm) 1)			0x48	UINT16	R/W	> 5,094: window mode deactivated 451-65,512 (31 - 349 mm) 1)			0x48	UINT16	R/W	> 8,733: window mode deactivated 961-65,512 (66 - 599 mm) 1)		
switching mode	0x42	UINT8	R/W	00: NCC, 02: NOC			0x42	UINT8	R/W	00: NCC, 02: NOC			0x42	UINT8	R/W	00: NCC, 02: NOC		
filter strength	0x43	UINT8	R/W	00-02: F00 - F02			0x43	UINT8	R/W	00-02: F00 - F02			0x43	UINT8	R/W	00-02: F00 - F02		
foreground suppression	0x44	UINT8	R/W	00-09: P00 - P09			0x44	UINT8	R/W	00-09: P00 - P09			0x44	UINT8	R/W	00-09: P00 - P09		
Teach-in via Pin 5 in SIO mode	0x49	UINT16	R/W	0-1,878 (0-129 mm) 1)			0x49	UINT16	R/W	0-3,246 (0-223 mm) 1)			0x49	UINT16	R/W	0-4,236 (0-291 mm) 1)		
	0x4A	UINT8	R/W	00: deactivated, 16: activated			0x4A	UINT8	R/W	00: deactivated, 16: activated			0x4A	UINT8	R/W	00: deactivated, 16: activated		
system commands	<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>		<b>index</b>	<b>access</b>	<b>value</b>			
Teach-in detect point – method A	0x02	W	161		0x02	W	161		0x02	W	161		0x02	W	161			
Teach-in detect point – method B	0x02	W	162		0x02	W	162		0x02	W	162		0x02	W	162			
Teach-in two way reflective barrier	0x02	W	164		0x02	W	164		0x02	W	164		0x02	W	164			
reset to factory settings	0x02	W	168		0x02	W	168		0x02	W	168		0x02	W	168			

<sup>1)</sup> Distance values, e.g. detect points, are given as multiple of the internal resolution of the measurement value = 0,069 mm (example: 320 ÷ 22 mm). The values in the table are decimal.