



### 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.

### IO-Link

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.

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

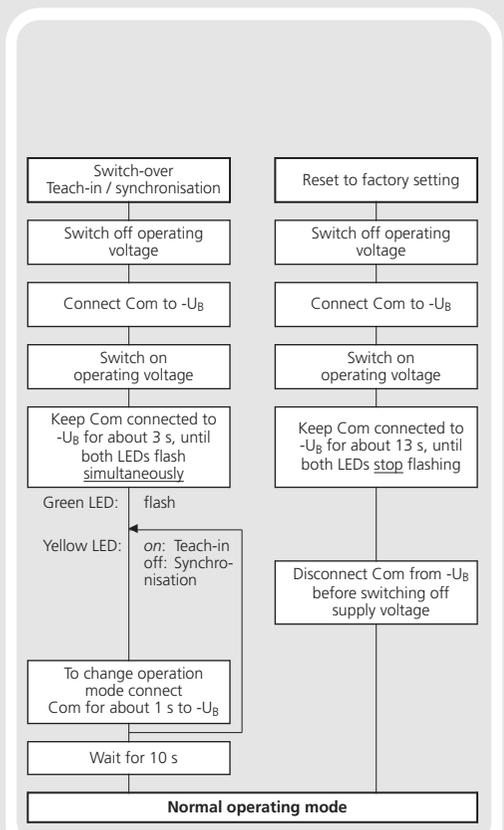
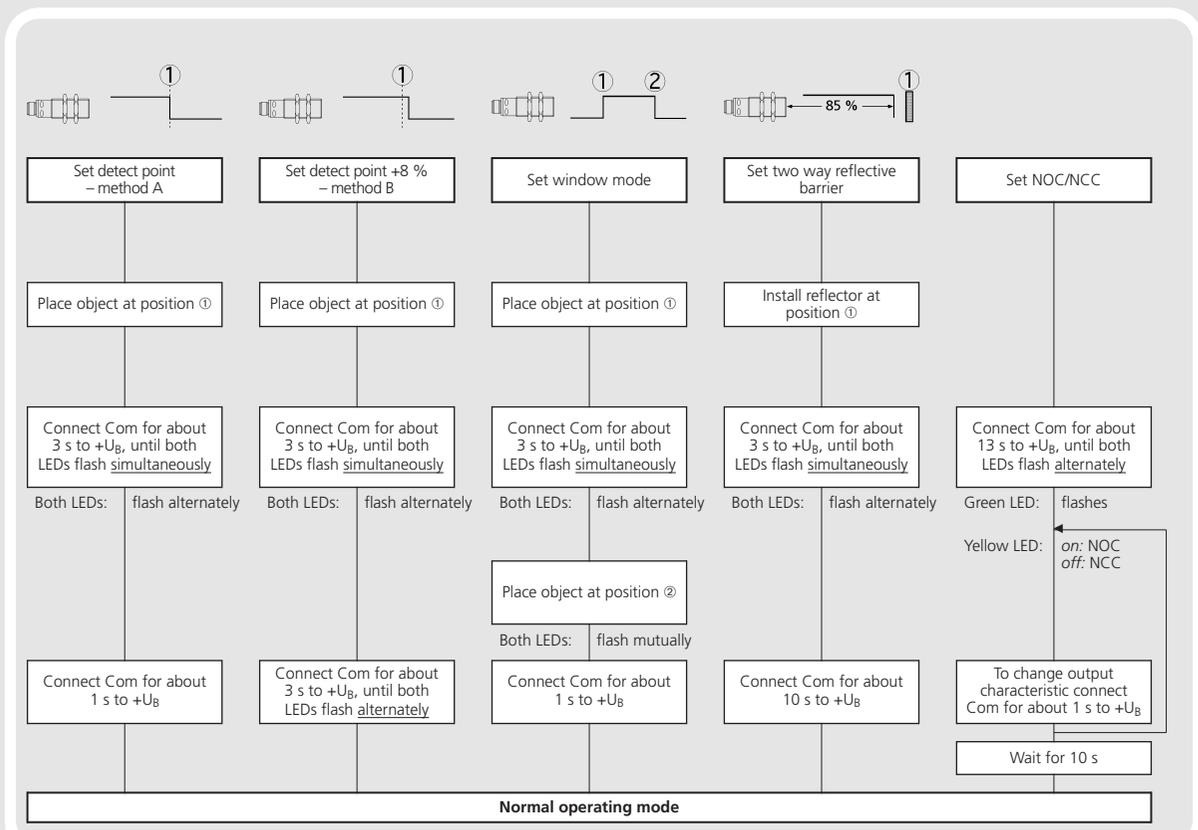
If under multiple sensor operation the assembly distance falls below the values shown in Fig. 2, the internal synchronisation should be used. For this purpose set the switched outputs of all sensors in accordance with the diagram »Sensor adjustment with the Teach-in procedure«. Then change the multi-function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

### 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 |

### Sensor adjustment with Teach-in procedure



	≥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

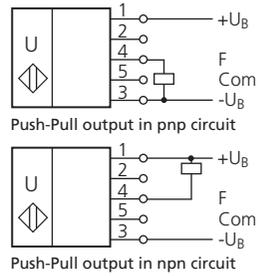
### Maintenance

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.
- Every time the power supply is switched on, the sensor detects its actual operating temperature and transmits it to the internal temperature compensation. The adjusted value is taken over after 120 seconds.
- 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**



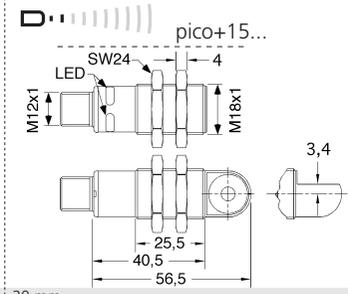
**blind zone**  
**operating range**  
**maximum range**  
**angle of beam spread**  
**transducer frequency**  
**resolution**  
**reproducibility**

**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.

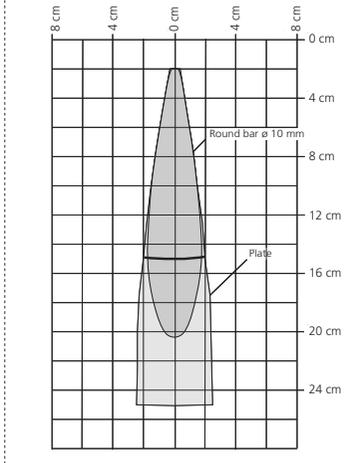


**accuracy**  
**operating voltage  $U_B$**   
**voltage ripple**  
**no-load current consumption**  
**housing**  
**max. tightening torque of nuts**  
**class of protection per EN 60 529**  
**type of connection**  
**controls**  
**indicators**  
**programmable**  
**synchronisation**  
**operating temperature**  
**storage temperature**  
**switched output**  
**switching hysteresis**<sup>1)</sup>  
**switching frequency**<sup>1)</sup>  
**response time**<sup>1)</sup>  
**time delay before availability**<sup>1)</sup>  
**norm conformity**

**order no. directly radiating weight**  
**order no. angular head weight**

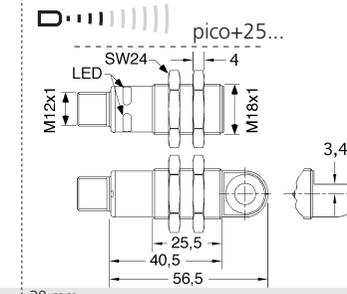


20 mm  
 150 mm  
 250 mm  
 see detection zone  
 380 kHz  
 0.069 mm  
 ± 0.15 %

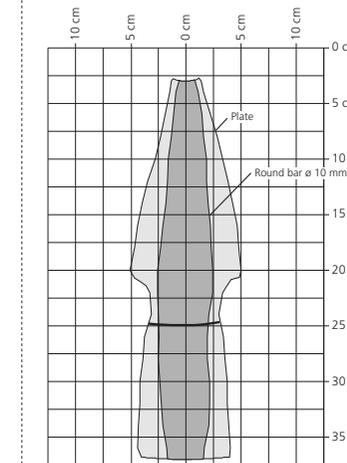


± 1 % (temperature drift internally compensated)  
 10 - 30 V DC, reverse polarity protection (Class 2)  
 ± 10 %  
 < 40 mA  
 brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
 15 Nm  
 IP 67  
 5-pin M12 circular plug  
 Teach-in via pin 5 (Com)  
 LED green (operation)  
 LED yellow (state of output)  
 Teach-in, LinkControl  
 internal synchronisation up to 10 sensors  
 -25°C to +70°C  
 -40°C to +85°C  
 Push-Pull,  $U_B$ -3 V,  $-U_B$ +3 V,  $I_{max}$  = 100 mA  
 switchable NOC/NCC, short-circuit-proof  
 2 mm  
 25 Hz  
 32 ms  
 < 300 ms  
 EN 60947-5-2

**pico+15/F**  
 30 g  
**pico+15/WK/F**  
 35 g

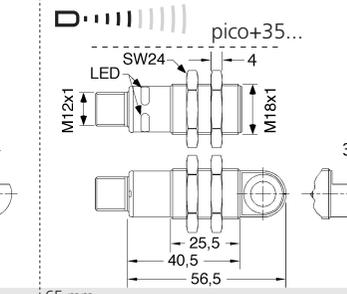


30 mm  
 250 mm  
 350 mm  
 see detection zone  
 320 kHz  
 0.069 mm  
 ± 0.15 %

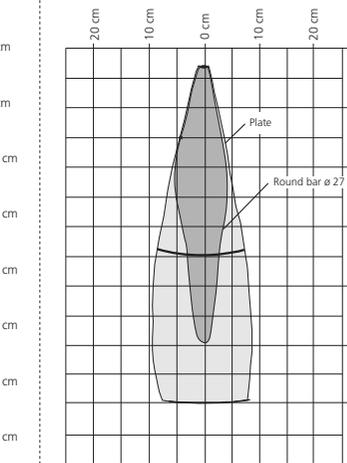


± 1 % (temperature drift internally compensated)  
 10 - 30 V DC, reverse polarity protection (Class 2)  
 ± 10 %  
 < 40 mA  
 brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
 15 Nm  
 IP 67  
 5-pin M12 circular plug  
 Teach-in via pin 5 (Com)  
 LED green (operation)  
 LED yellow (state of output)  
 Teach-in, LinkControl  
 internal synchronisation up to 10 sensors  
 -25°C to +70°C  
 -40°C to +85°C  
 Push-Pull,  $U_B$ -3 V,  $-U_B$ +3 V,  $I_{max}$  = 100 mA  
 switchable NOC/NCC, short-circuit-proof  
 3 mm  
 25 Hz  
 32 ms  
 < 300 ms  
 EN 60947-5-2

**pico+25/F**  
 30 g  
**pico+25/WK/F**  
 35 g

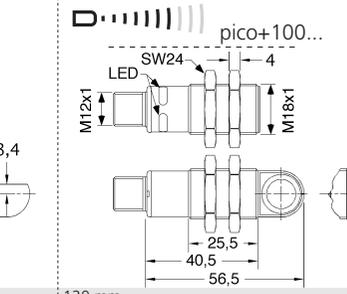


65 mm  
 350 mm  
 600 mm  
 see detection zone  
 400 kHz  
 0.069 mm  
 ± 0.15 %

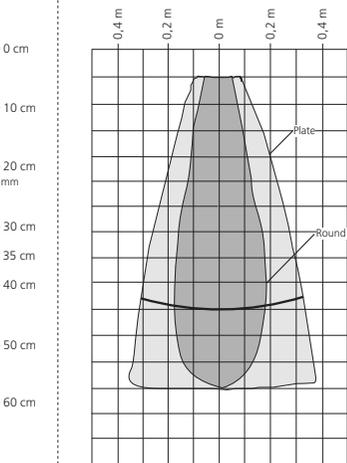


± 1 % (temperature drift internally compensated)  
 10 - 30 V DC, reverse polarity protection (Class 2)  
 ± 10 %  
 < 40 mA  
 brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
 15 Nm  
 IP 67  
 5-pin M12 circular plug  
 Teach-in via pin 5 (Com)  
 LED green (operation)  
 LED yellow (state of output)  
 Teach-in, LinkControl  
 internal synchronisation up to 10 sensors  
 -25°C to +70°C  
 -40°C to +85°C  
 Push-Pull,  $U_B$ -3 V,  $-U_B$ +3 V,  $I_{max}$  = 100 mA  
 switchable NOC/NCC, short-circuit-proof  
 5 mm  
 12 Hz  
 64 ms  
 < 300 ms  
 EN 60947-5-2

**pico+35/F**  
 30 g  
**pico+35/WK/F**  
 35 g



120 mm  
 1,000 mm  
 1,300 mm  
 see detection zone  
 200 kHz  
 0.069 mm  
 ± 0.15 %



± 1 % (temperature drift internally compensated)  
 10 - 30 V DC, reverse polarity protection (Class 2)  
 ± 10 %  
 < 40 mA  
 brass sleeve, nickel-plated, plastic parts: PBT; ultrasonic transducer: polyurethane foam, epoxy resin with glass content  
 15 Nm  
 IP 67  
 5-pin M12 circular plug  
 Teach-in via pin 5 (Com)  
 LED green (operation)  
 LED yellow (state of output)  
 Teach-in, LinkControl  
 internal synchronisation up to 10 sensors  
 -25°C to +70°C  
 -40°C to +85°C  
 Push-Pull,  $U_B$ -3 V,  $-U_B$ +3 V,  $I_{max}$  = 100 mA  
 switchable NOC/NCC, short-circuit-proof  
 20 mm  
 10 Hz  
 80 ms  
 < 300 ms  
 EN 60947-5-2

**pico+100/F**  
 30 g  
**pico+100/WK/F**  
 35 g

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.

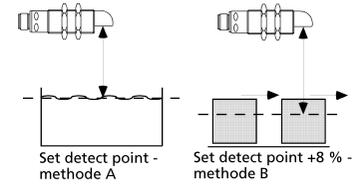


Fig. 4: Setting the detect point for different directions of movement of the object

- 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.

The proximity switches shall be used with a Listed (CYJ/V7) cable/connector assembly rated minimum 32 Vdc, minimum 290 mA, in the final installation.

1) Can be programmed with LinkControl

## 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

	D······) pico+15...				D······) pico+25...				D······) pico+35...				D······) pico+100...							
<b>physical layer</b>																				
<b>SIO mode support</b>	yes				yes				yes				yes							
<b>min cycle time</b>	8.4 ms				8.4 ms				16 ms				20.4 ms							
<b>baud rate</b>	COM 2 (38.400 Bd)				COM 2 (38.400 Bd)				COM 2 (38.400 Bd)				COM 2 (38.400 Bd)							
<b>format of process data</b>	16 Bit, R, UNI16				16 Bit, R, UNI16				16 Bit, R, UNI16				16 Bit, R, UNI16							
<b>content of process data</b>	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							
<b>service data IO-Link specific</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>		<b>index</b>	<b>access</b>	<b>value</b>					
<b>Vendor name</b>	0x10	R	microsonic GmbH		0x10	R	microsonic GmbH		0x10	R	microsonic GmbH		0x10	R	microsonic GmbH					
<b>Vendor text</b>	0x11	R	www.microsonic.de		0x11	R	www.microsonic.de		0x11	R	www.microsonic.de		0x11	R	www.microsonic.de					
<b>Product name</b>	0x12	R	pico+		0x12	R	pico+		0x12	R	pico+		0x12	R	pico+					
<b>Product ID</b>	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					
<b>Product text</b>	0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor		0x14	R	Ultraschall-Sensor					
<b>service data sensor specific</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>		<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>detect point 1</b>	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)		0x40	UINT16	R/W	1,747-18,892 (120 - 1,298 mm) 1)	
<b>return detect point 1</b>	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)		0x41	UINT16	R/W	1,761-18,907 (121 - 1,299 mm) 1)	
<b>detect point 2</b>	0x47	UINT16	R/W	335-65,512 (23 - 250 mm) 1) > 3,638: window mode deactivated		0x47	UINT16	R/W	466-65,512 (32 - 350 mm) 1) > 5,094: window mode deactivated		0x47	UINT16	R/W	975-65,512 (67 - 600 mm) 1) > 8,733: window mode deactivated		0x47	UINT16	R/W	1,776-65,512 (122 - 1,300 mm) 1) > 18,922: window mode deactivated	
<b>return detect point 2</b>	0x48	UINT16	R/W	320-65,512 (22 - 250 mm) 1) > 3,638: window mode deactivated		0x48	UINT16	R/W	451-65,512 (31 - 349 mm) 1) > 5,094: window mode deactivated		0x48	UINT16	R/W	961-65,512 (66 - 599 mm) 1) > 8,733: window mode deactivated		0x48	UINT16	R/W	1,761-65,512 (121 - 1,299 mm) 1) > 18,922: window mode deactivated	
<b>switching mode</b>	0x42	UINT8	R/W	00: NCC, 02: NOC		0x42	UINT8	R/W	00: NCC, 02: NOC		0x42	UINT8	R/W	00: NCC, 02: NOC		0x42	UINT8	R/W	00: NCC, 02: NOC	
<b>filter</b>	0x43	UINT8	R/W	00-02: F00 - F02		0x43	UINT8	R/W	00-02: F00 - F02		0x43	UINT8	R/W	00-02: F00 - F02		0x43	UINT8	R/W	00-02: F00 - F02	
<b>filter strength</b>	0x44	UINT8	R/W	00-09: P00 - P09		0x44	UINT8	R/W	00-09: P00 - P09		0x44	UINT8	R/W	00-09: P00 - P09		0x44	UINT8	R/W	00-09: P00 - P09	
<b>foreground suppression</b>	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)		0x49	UINT16	R/W	0-12,969 (0-891 mm) 1)	
<b>Teach-in via Pin 5 in SIO mode</b>	0x4A	UINT8	R/W	00: deactivated, 16: activated		0x4A	UINT8	R/W	00: deactivated, 16: activated		0x4A	UINT8	R/W	00: deactivated, 16: activated		0x4A	UINT8	R/W	00: deactivated, 16: activated	
<b>system commands</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>		<b>index</b>	<b>access</b>	<b>value</b>					
<b>Teach-in detect point – method A</b>	0x02	W	161		0x02	W	161		0x02	W	161		0x02	W	161					
<b>Teach-in detect point – method B</b>	0x02	W	162		0x02	W	162		0x02	W	162		0x02	W	162					
<b>Teach-in two way reflective barrier</b>	0x02	W	164		0x02	W	164		0x02	W	164		0x02	W	164					
<b>reset to factory settings</b>	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.

