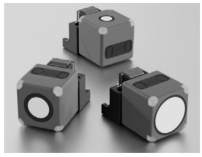

microsonic Ultrasonic Proximity Switch Instruction Manual

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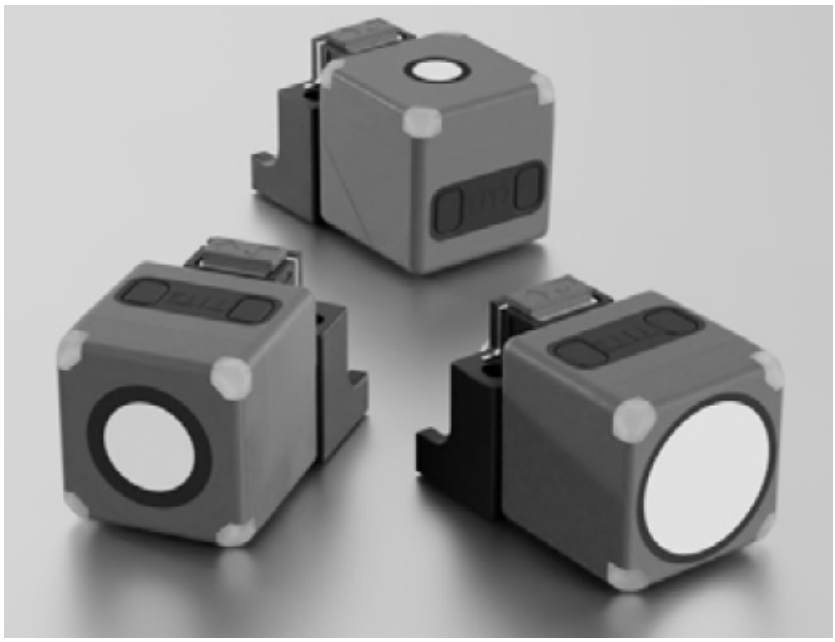
microsonic Ultrasonic Proximity Switch



Product Description

The cube sensor offers a non-contact measurement of the distance to an object which must be positioned within the sensor’s detection zone. The switching output is set conditional upon the adjusted switching distance and depending on the set window li-mits, a distance-proportional analogue signal is output.
The analogue output on pin 2 can op-tionally be deactivated and a second Push-Pull switching output activated instead.

Safety Notes

- Read the operating manual prior to start-up.
- Connection, installation and ad- justments may only be carried out by qualified staff.
- No safety component in accordance with the EU Machine Directive, use in the area of per-sonal and machine protection not permitted.

Proper Use
cube ultrasonic sensors are used for non-contact detection of objects.
IO-Link
The cube sensor is IO-Link-capable in accordance with IO-Link specification V1.1 and supports Smart Sensor Pro-file like Measuring and Switching Sen-sor. The sensor can be monitored and parameterised via IO-Link.

Installation

- Mount the sensor at the place of fitting, see »QuickLock mounting bracket«.
- Connect a connection cable to the M12 device plug, see Fig. 2.
- If necessary, use the alignment as-sistance (see »Using the Alignment Assistance«).

Start-up

- Connect the power supply.
- Set the parameters of the sensor, see Diagram 1 and Diagram 2.

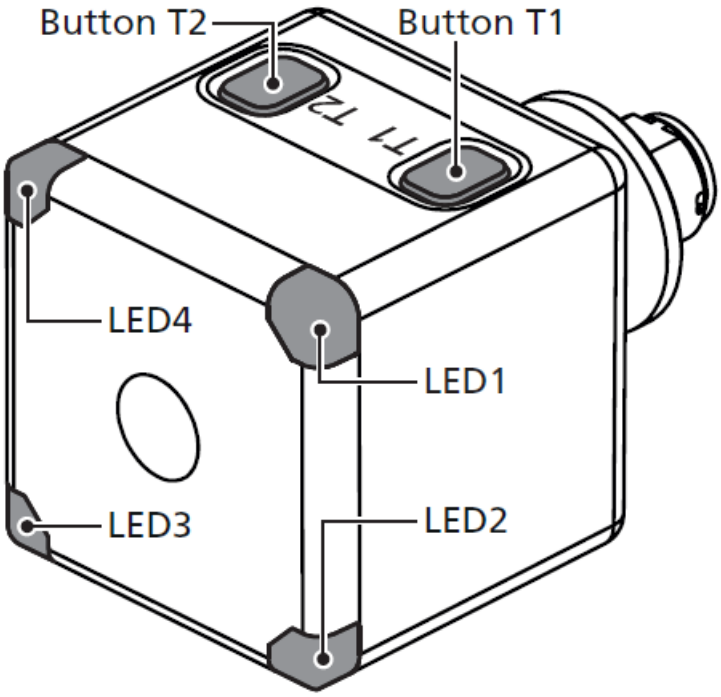


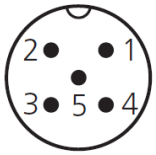
Fig. 1: Controls of the cube sensor

Controls of the cube sensor
The sensor can be operated using the push buttons T1 and T2. Four LEDs indicate the operation and the states of the outputs, see Fig. 1 and Fig. 3.
Output Level
The sensor has two output levels:

- Analogue output and one Push-Pull switching output
- Two Push-Pull switching outputs
    - If the sensor should operate with two Push-Pull switching outputs, follow the diagram »Switching the output on pin 2«, see Diagram 2.

Operating Modes
Three operating modes are available for the switching outputs:

- Operation with one switching point The switching output is set when the object falls below the set switching point.
- **Window mode:** The switching output is set when the object is within the window limits.
- **Two-way reflective barrier:** The switching output is set when the object is between sensor and fixed reflector.

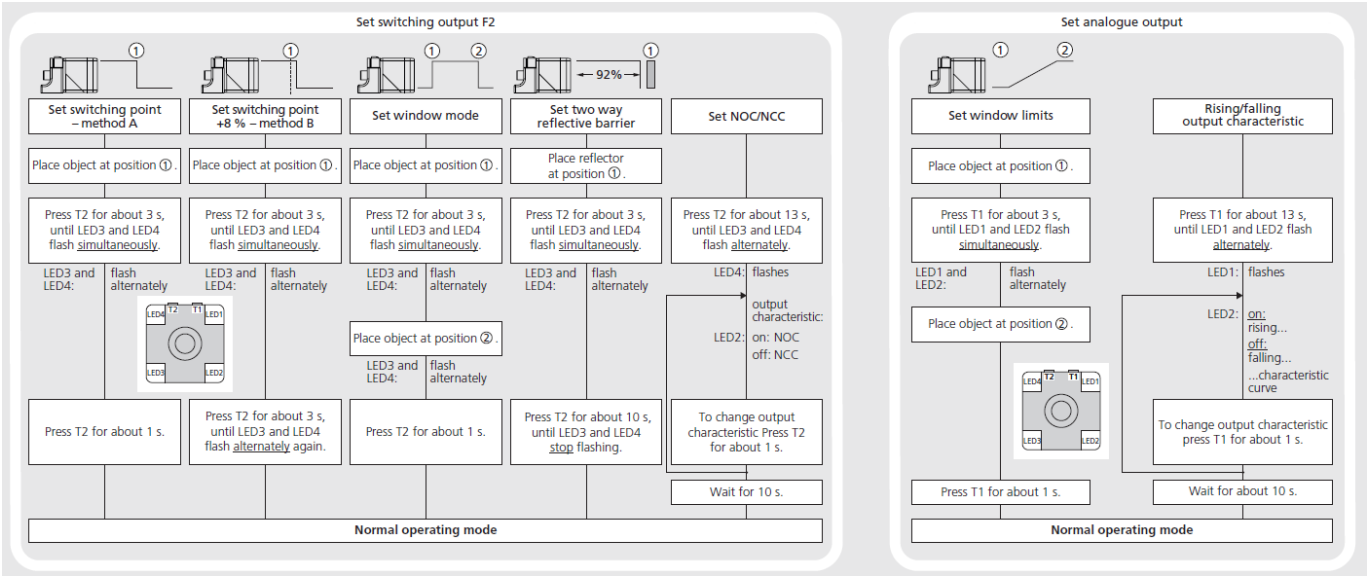
	**microsonic notation**	**IO-Link notation**	**IO-Link Smart Sensor Profile**	**colour**
1	$+U_B$	L+		brown
2	F1/IU	Q/IU	SSC2/ASC1	white
3	$–U_B$	L–		blue
4	F2	C/Q	SSC1	black
5	Com	NC		grey

LED	**Colour**	**Indicator**	**LED…**	**Meaning**
LED1	yellow	state of output pin 2		**analogue output on pin 2**
			on	object within window limits
			off	object outside window limits
				switching output on pin 2 (F1)
			on	output is set
			off	output is not set
LED2	green	output mode pin 2	on	analogue output on pin 2
			off	switching output on pin 2
L ED3	g reen	p ower indicator	on	normal operating mode
			flashing	IO-Link mode
LED4	yellow	state of output pin 4 (F2)	on	output is set
			off	output is not set

Synchronisation

If the assembly distance of multiple sensors falls below the values shown in Fig. 4, they can influence one another. To avoid this, the internal synchronisation should be used (»sync« must be switched on, see Diagram 2). Interconnect each pin 5 of the sensors to be synchronised.

Diagram 1: Set switching output F2 and analogue output via Teach-in procedure

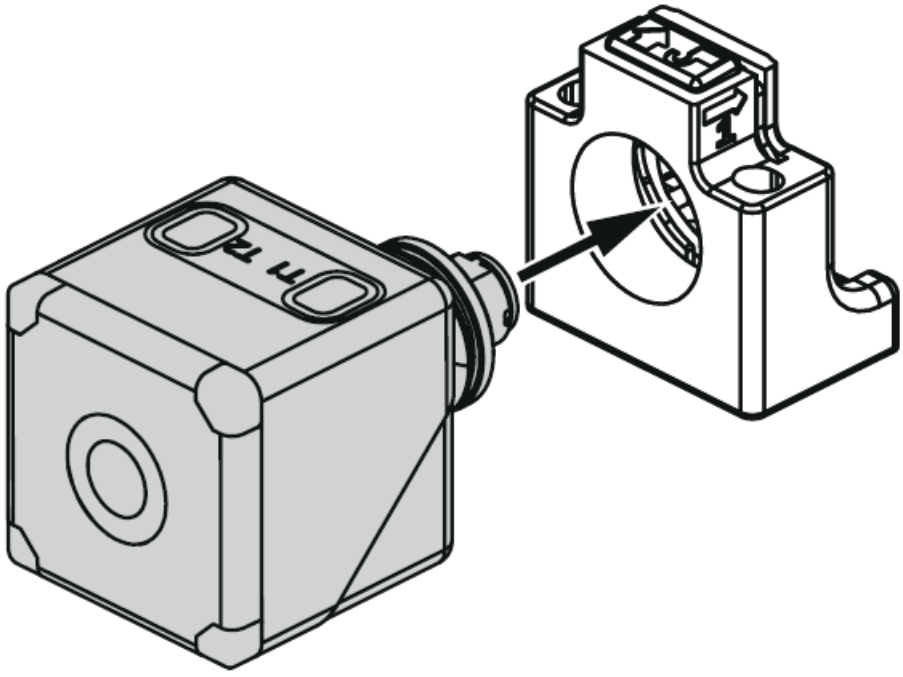


cube-35…	[3]0.40 m	[3]2.50 m
cube-130…	[3]1.10 m	[3]8.00 m
cube-340…	[3]2.00 m	[3]18.00 m

QuickLock mounting bracket

The cube sensor is attached using the QuickLock mounting bracket:

- Insert the sensor into the bracket according to Fig. 5 and press until the bracket audibly engages.



- The sensor can be rotated around its own axis when inserted into the bra-cket. Furthermore, the sensor head can be rotated so that measurements can be taken in four different direc-tions, see »Rotatable sensor head«. The bracket can be locked: Slide the latch (Fig. 6) in the direc-tion of the sensor.

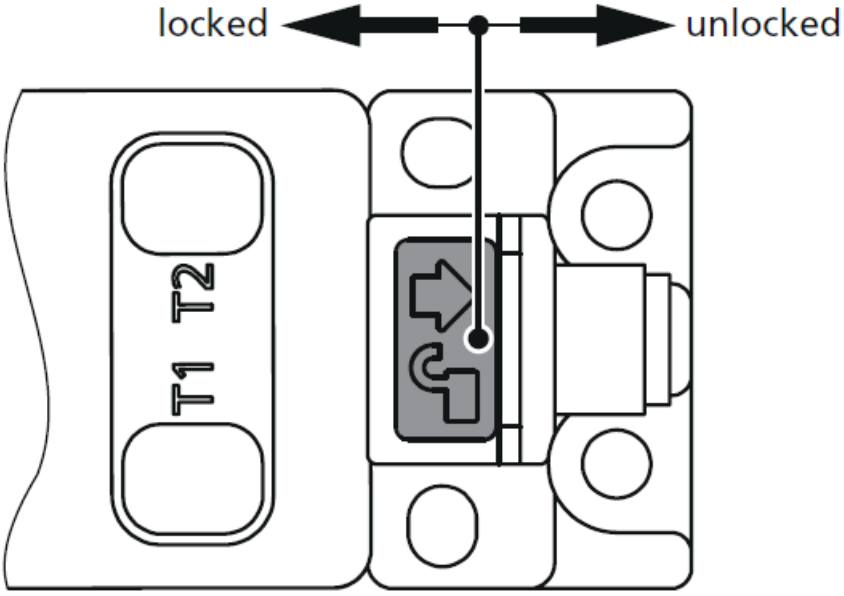


Fig. 6: QuickLock mounting bracket: lock/unlock Sensor

- Remove the sensor from the Quick-Lock mounting bracket: Unlock the latch according to Fig. 6 and press down (Fig. 7). The sensor detaches and can be removed.

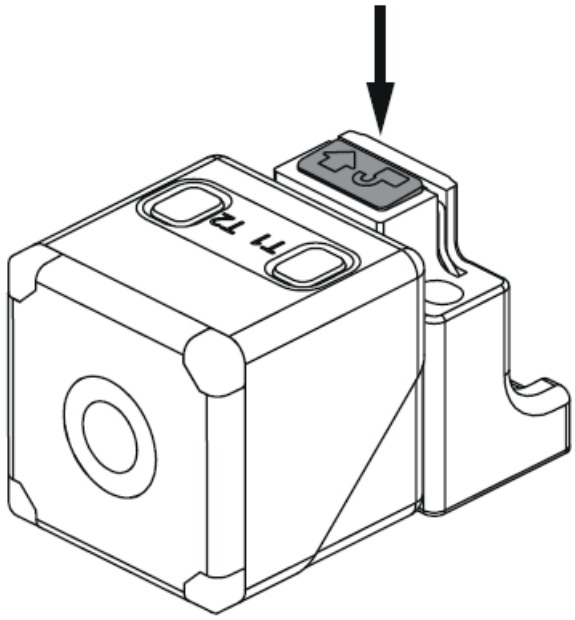


Fig. 7: Remove the sensor

- **Rotatable sensor head:** The cube sensor has a rotatable sensor head, with which the orientation of the sensor can be rotated by 180° (Fig. 8).

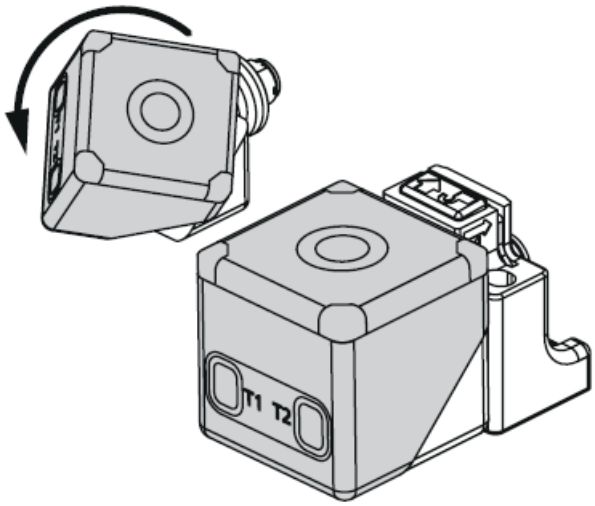


Fig. 8: Rotatable sensor head

Factory Setting

The cube sensor is delivered factory made with the following settings:

- Analogue output + Push-Pull switching output
- Analogue output on operating mode switching automatically
- Analogue window at maximum value of the blind zone and operating range, see »Technical data«
- Switching output on operating mode switching point
- Switching output on NOC
- Switching distance at operating range
- Input Com set to »sync«
- Filter at F01
- Filter strength at P00

Using the Alignment Assistance

With the internal alignment assistance the sensor can be optimally aligned to the object during installation. To do this, proceed as follows (see Fig. 9):

- Mount the sensor loosely at the place of mounting so that it can still be moved.
- Press T2 shortly. LED4 flashes. The faster the LED4 flashes, the stronger the received signal.
- Point the sensor at different angles to the object for about 10 seconds so that the sensor can determine the maximum signal level. Afterwards align the sensor until LED4 lights constantly.
- Screw the sensor in this position.
- Press T2 shortly (or wait approx. 120 s) to exit the Alignment Assis-tance. LED3 flashes 2x and the sen-sor returns to normal operating mode.

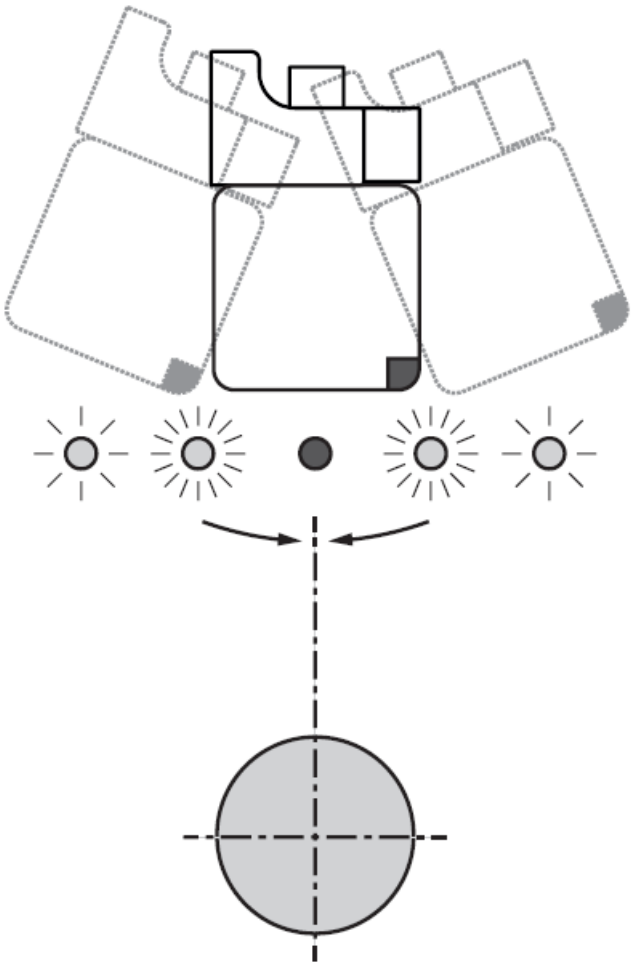
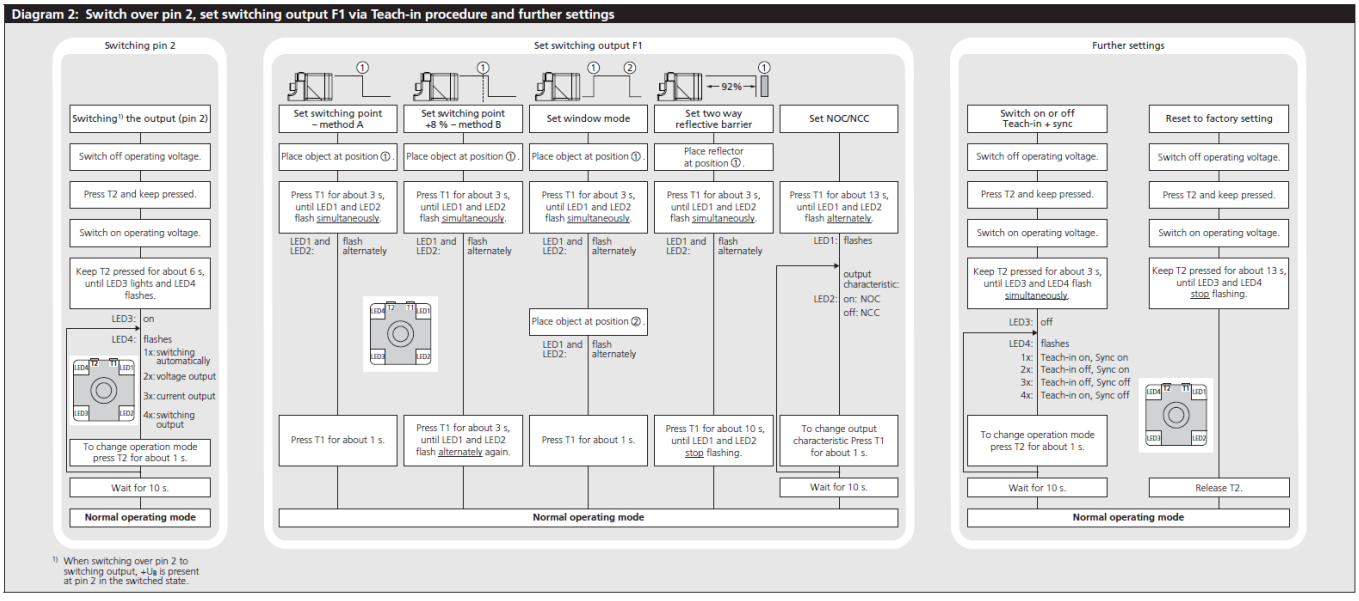
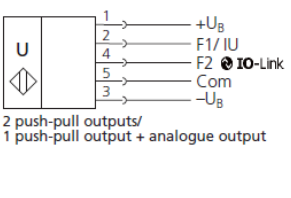
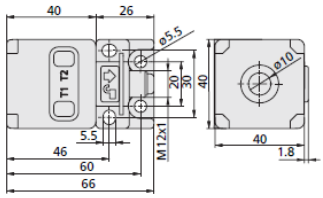
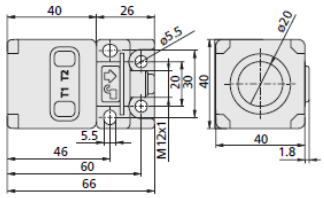
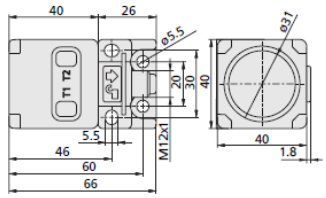
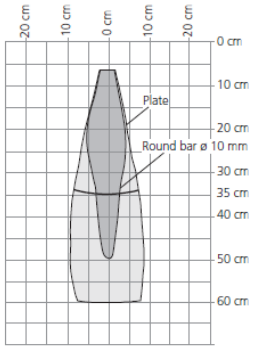
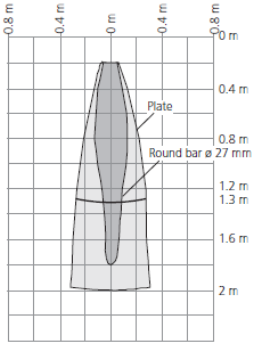
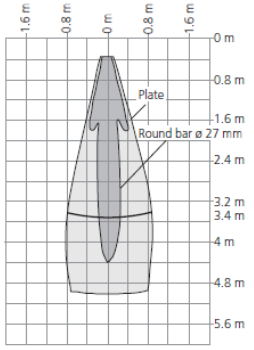


Fig. 9: Align the sensor optimally

Diagram 2: Switch over pin 2, set switching output F1 via Teach-in procedure and further settings



Technical data

	cube-35...	cube-130...	cube-340...
				
blind zone	0 to 65 mm	0 to 200 mm	0 to 350 mm
operating range	350 mm	1,300 mm	3,400 mm
maximum range	600 mm	2,000 mm	5,000 mm
angle of beam spread	see detection zone	see detection zone	see detection zone
transducer frequency	400 kHz	200 kHz	120 kHz
measurement resolution	0.056 mm	0.224 mm	0.224 mm
digital resolution	0.1 mm	1.0 mm	1.0 mm
analogue resolution [1]	≤0.17 mm	≤1.0 mm	≤1.45 mm
reproducibility	±0.15 %	±0.15 %	±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 in-stance a plate – can still be re-cognised. The requirement here is for an optimum align-ment to the sensor. It is not possible to evaluate ultrasonic reflections outside this area.			
accuracy	±1 % (Temperature drift internal compensated, may be deactivated [2], 0.17%/K without compensation)	±1 % (Temperature drift internal compensated, may be deactivated [2], 0.17%/K without compensation)	±1 % (Temperature drift internal compensated, may be deactivated [2], 0.17%/K without compensation)
operating voltage U_B	9 to 30 V DC, short-circuit-proof, Class 2	9 to 30 V DC, short-circuit-proof, Class 2	9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple	±10 %	±10 %	±10 %
no-load supply current	≤50 mA	≤50 mA	≤50 mA
housing	PA, Ultrasonic transducer: polyurethane foam, epoxy resin with glass content	PA, Ultrasonic transducer: polyurethane foam, epoxy resin with glass content	PA, Ultrasonic transducer: polyurethane foam, epoxy resin with glass content
class of protection to EN 60529	IP 67	IP 67	IP 67
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
type of connection	5-pin initiator plug, PBT	5-pin initiator plug, PBT	5-pin initiator plug, PBT
controls	2 push-buttons	2 push-buttons	2 push-buttons
indicators	2x LED green, 2x LED yellow	2x LED green, 2x LED yellow	2x LED green, 2x LED yellow
programmable	Teach-in via push button, LinkControl, IO-Link	Teach-in via push button, LinkControl, IO-Link	Teach-in via push button, LinkControl, IO-Link
IO-Link	V1.1	V1.1	V1.1
operating temperature	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C
storage temperature	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C
weight	120 g	120 g	130 g
switching hysteresis [2]	5 mm	20 mm	50 mm
switching frequency [3]	12 Hz	8 Hz	4 Hz
response time [3]	64 ms	96 ms	166 ms
time delay before availability	<300 ms	<300 ms	<300 ms
order No.	**cube-35/FFIU**	**cube-130/FFIU**	**cube-340/FFIU**
switching outputs	2 x push pull, U_B–3 V, –U_B+3 V, I_{max} = 2 x 100 mA switchable NOC/NCC, short-circuit-proof	2 x push pull, U_B–3 V, –U_B+3 V, I_{max} = 2 x 100 mA switchable NOC/NCC, short-circuit-proof	2 x push pull, U_B–3 V, –U_B+3 V, I_{max} = 2 x 100 mA switchable NOC/NCC, short-circuit-proof
current output 4 to 20 mA	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic
voltage output 0 to 10 V	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic

1. Depending on the window limits.
2. Can be programmed via LinkControl and IO-Link.
3. With LinkControl and IO-Link, the selected filter setting influences the switching frequency and response time.

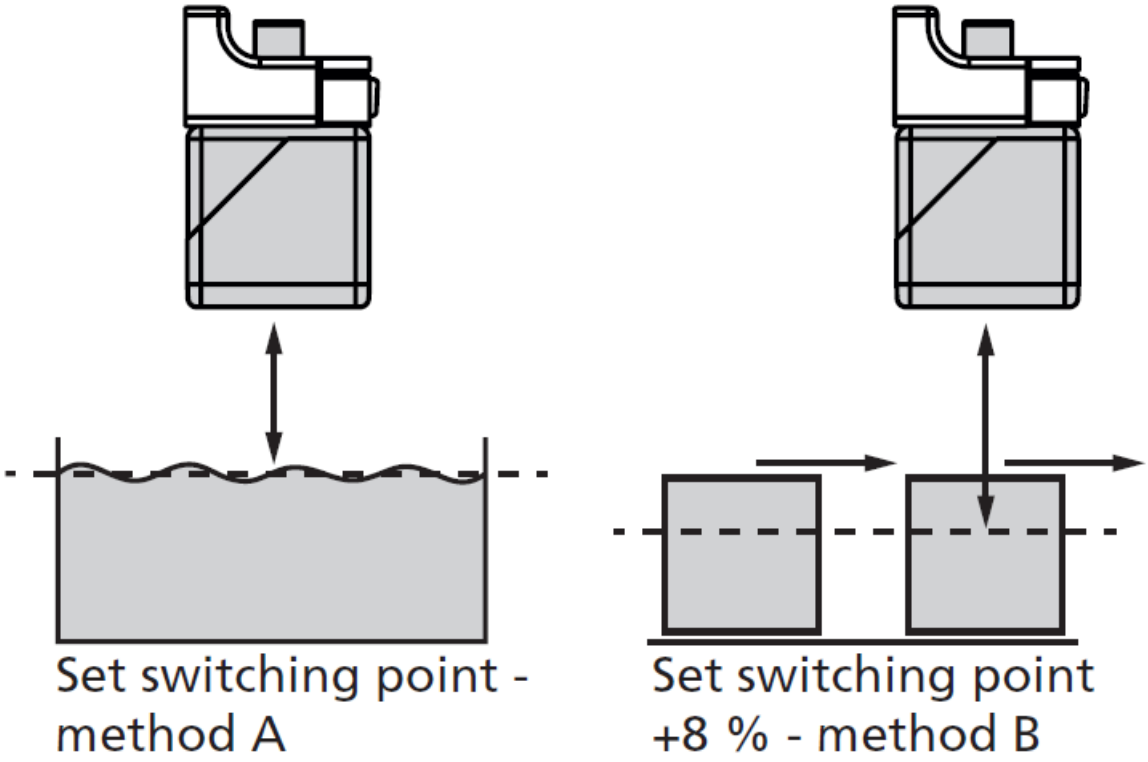
Maintenance

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

Notes

- The cube sensor has a blind zone within which a distance measure-ment is not possible.
- The cube sensor is equipped with an internal temperature compensa-tion. Due to the sensors self hea-ting, the temperature compensati-on reaches its optimal working point after approx. 3 minutes of operation.
- The cube sensor has a push-pull switching output and an analogue output. The analogue output can be switched to a second push-pull switching output.

- The sensor automatically detects the load during start-up put to the analogue output and switches to current output or voltage output respectively.
- Choosing between rising and falling output characteristic as well as out-put function NOC and NCC is possible.
- In the normal operating mode the illuminated yellow LED signals that the switching output is set.
- The flashing LED3 indicates that the sensor is in IO-Link mode.
- If a Teach-in procedure is not com- pleted, all changes are deleted after approx. 30 seconds.
- If two LEDs flash rapidly alternately for approx. 3 seconds during a teach-in procedure, the teach-in procedure was not successful and is discarded.
- In the »Two-way reflective barrier« operating mode, the object has to be within the range of 0 to 92 % of the set distance.
- In the »Set switching point – me-thod A« Teach-in procedure the actual distance to the object is taught to the sensor as the swit-ching 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 switching point +8 % – method B« Teach-in procedure should be used. In this way the swit-ching distance is set 8 % further than the actual measured distance to the object. This ensures a reliable switching behavior even if the height of the objects varies slightly, see Fig. 10.

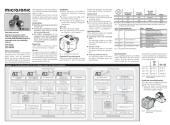


- The sensor can be reset to its factory setting (see »Further settings«, Diagram 2).
- The cube sensor can be locked against unwanted changes in the sensor via the function »Switch on or off Teach-in + sync«, see Diagram 2.
- Using the LinkControl adapter (optional accessory) and the LinkCon-control software for Windows®, all Teach-in and additional sensor pa-rameter settings can be optionally adjusted.
- The latest IODD file and information about the start-up and configuration of cube sensors via IO-Link, you will find online at: **www.microsonic.de/en/cube.**

Scope of delivery

- 1x QuickLock mounting bracket

Documents / Resources

	**microsonic Ultrasonic Proximity Switch** [pdf] Instruction Manual cube-35-FFIU, cube-130-FFIU, cube-340-FFIU, Ultrasonic Proximity Switch, Ultrasonic Switch, Proximity Switch, Switch

References

- **cuboidal | ultrasonic distance sensors | microsonic**

Manuals+,