microsonic

Operating manual
crm+ Ultrasonic Sensors with one switching output and IO-Link

crm+25/F/TC/E
crm+35/F/TC/E
crm+130/F/TC/E
crm+340/F/TC/E
crm+600/F/TC/E

IO-Link

Product description

- The crm+ sensor offers a non-contact measurement of the distance to an object which must be positioned within the sensor's detection zone.
- The ultrasonic transducer surface of the crm+ sensors is laminated with a PEEK film. The transducer itself is sealed against the housing by a PTFE joint ring. This composition ensures a high resitance against many aggressive substances.
- All settings are done with two push-buttons and a three-digit LED-display (TouchControl).
- Two LEDs indicate opration and the state of the switching output.
- The output functions are changeable from NOC to NCC.
- The sensors are adjustable manually using the numerical LED-display or may be trained via Teach-in procedure.
- Useful additional functions are set in the Add-on-menu.
- Using the LinkControl adapter (optional accessory) all TouchControl and additional sensor parameter settings may be made by a Windows software.
- The crm+ sensors are IO-Link capable according to specification V1.1 and support Smart Sensor Profile like Digital Measuring Sensor.

Safety Notes

- Read the operating manual prior to start-up.
- Connection, installation and adjustment works may only be carried out by qualified staff.
- No safety component in accordance with the EU Machine Directive.

Use for intended purpose only

crm+ ultrasonic sensors are used for non-contact detection of objects.

The crm+ sensors indicate a **blind zone**, in which the distance cannot be measured. The **operating range** indicates the distance of the sensor that can be applied with normal reflectors with sufficient function reserve. When using good reflectors, such as a calm water surface, the sensor can also be used up to its **maximum range**. Objects that strongly absorb (e.g. plastic foam) or diffusely reflect sound (e.g. pebble stones) can also reduce the defined operating range.

Synchronisation

If the assembly distances shown in Fig.1 for two or more sensors are exceeded the integrated synchronisation should be used. Connect Sync/Com-channels (pin 5 at the units receptable) of all sensors (10 maximum).

	≥0.35 m	≥2.50 m
	≥0.40 m	≥2.50 m
	≥1.10 m	≥8.00 m
	≥2.00 m	≥18.00 m
	≥4.00 m	≥30.00 m

Fig. 1: Assembly distances, indicating synchronisation/multiplex

Multiplex mode

The Add-on-menu allows to assign an individual address »01« to »10« to each sensor connected via the Sync/Com-channel (Pin5). The sensors perform the ultrasonic measurement sequentially from low to high address. Therefore any influence between the sensors is rejected.

The address »00« is reserved to synchronisation mode and deactivates the multiplex mode. (To use synchronised mode all sensors must be set to address »00«.)

Assembly instructions

- Mount the sensor at the installation location.
- Connect a connection cable to the M12 device plug, see fig. 2.

		colour
1	+U_B	brown
3	−U_B	blue
4	F	black
2	−	white
5	Sync/Com	grey
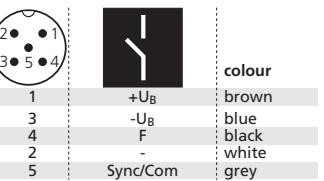
Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Factory setting

crm+ sensors are delivered factory made with the following settings:

- Switching output on NOC
- Switching point at operating range

- Measurement range set to maximum range

Set the parameters of the sensor manually or use the Teach-in procedure to adjust the detect points.

Fig. 3: TouchControl
- measuring range
- 3-digit LED-display
- LED D1 and D2
- Push-buttons T1 and T2
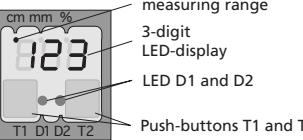
Maintenance

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

Note

- As a result of the design the assembly of PEEK film and PTFE joint ring is not gas-proof.
- The chemical resistance has to be tested experimentally if necessary.
- crm+ sensors have internal temperature compensation. Because the sensors heat up on their own, the temperature compensation reaches its optimum working point after approx. 30 minutes of operation.
- During normal operating mode, a yellow LED D2 signals that the switching output is set.
- During normal operating mode, the measured distance value is displayed on the LED-display in mm (up to 999 mm) or cm (from 100 cm). Scale switches automatically and is indicated by a point on top of the digits.
- During Teach-in mode, the hysteresis value is set back to factory settings.
- If no objects are placed within the detection zone the LED-display shows »- - -«.
- If no push-buttons are pressed for 20 seconds during parameter setting mode, the parameter changes are saved and the sensor returns to normal operating mode.
- You can reset the factory settings at any time, see »Key lock and factory setting«.
- The latest IODD file and informations about start-up and configuration of mic+ sensors with IO-Link, you will find online at: www.microsonic.de/crm+.

Show parameters

Tapping push-button T1 shortly during normal operating mode shows »PAr« on the LED-display. Each time you tap push-button T1 the actual settings of the switching output are displayed

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Set sensor parameters alternatively numerically using LED-display...

Start here

T1 + T2

HELLO **Pro** — Press T1 and T2 simultaneously for about 2 s until welcome message has passed

d
T1 — T2
T1 + T2

123 — Set detect distance in mm or cm
T1 + T2

- - - — For single detect point press T2 until »- - -« is displayed

456 — For window operating mode set far detect point in mm or cm

T1 + T2

Set switching output

Choose »□□□« for NCC or »□□□« for NOC

T1 + T2

End
T2 — T1
T1 + T2

Ready
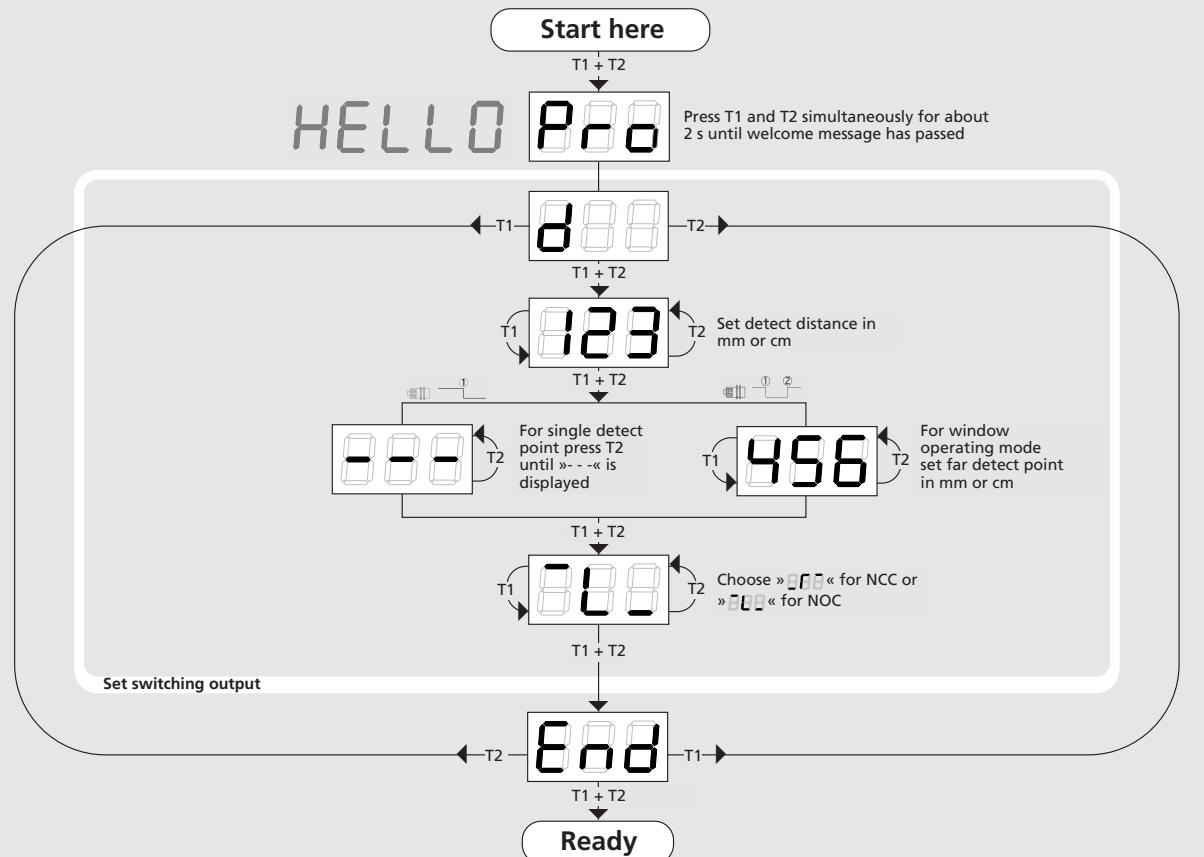
...or via the Teach-in procedure
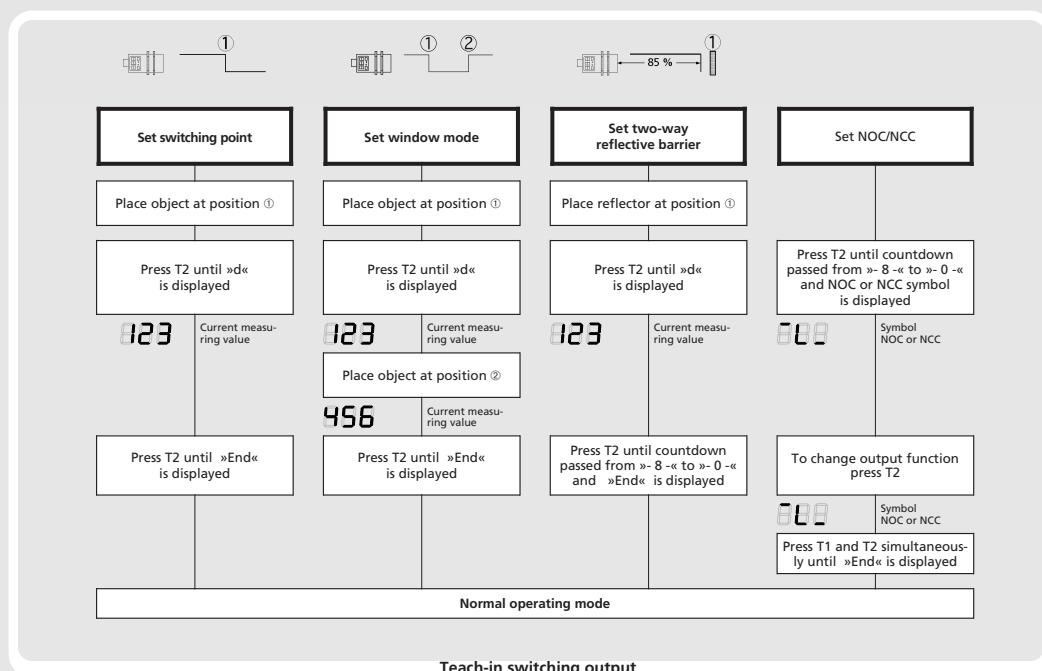
Teach-in switching output

Set switching point

Place object at position ①

Press T2 until »d« is displayed

`123` Current measuring value

Press T2 until »End« is displayed

Set window mode

Place object at position ①

Press T2 until »d« is displayed

`123` Current measuring value

Place object at position ②

`456` Current measuring value

Press T2 until »End« is displayed

Set two-way reflective barrier

85 %

Place reflector at position ①

Press T2 until »d« is displayed

`123` Current measuring value

Press T2 until countdown passed from »- 8 -« to »- 0 -« and »End« is displayed

Set NOC/NCC

Press T2 until countdown passed from »- 8 -« to »- 0 -« and NOC or NCC symbol is displayed

`C8` Symbol NOC or NCC

To change output function press T2

`C8` Symbol NOC or NCC

Press T1 and T2 simultaneously until »End« is displayed

Normal operating mode

Key lock and factory setting

Activate/deactivate TouchControl

Turn supply voltage OFF

While pressing T1 turn supply voltage ON until »on« or »off« is displayed

`On` »on« or »off«

To activate or deactivate press T1

`OFF` »off« or »on«

Wait for 20 s

Reset to factory setting

Turn supply voltage OFF

While pressing T1 turn supply voltage ON for ca. 13 s until «rESET» has passed through the display

Normal operating mode

Useful additional functions in Add-on menu (for experienced users only, settings not required for standard applications)

Start here

T1 + T2

HELLO Pro `Add`-on

Press T1 and T2 simultaneously for about 5 s until »Add« is shown in the LED-display

A1	A5	A6	A7	A9	A10	A11	A12	A13	A14
T1+T2	T1+T2	T1+T2	T1+T2	T1+T2	T1+T2	T1+T2	T1+T2	T1+T2	T1+T2
C01	030	F01	P01	123	01	10	123	123	E01

End

T1 + T2

Ready

Note
Changes in the Add-on menu may affect the sensor function. A6, A7, A10, A11, A12 have influence on the response time of the sensor.

Low power mode
»C01«: Display bright
»C02«: Display dimmed
»C03«: Display off

Hysteresis switching output
Minimum value: »001«
Maximum value: difference between maximum range and switching point - 1
During window operating mode hysteresis influences both switching points.

Measurement filter
»F00«: no filter
»F01«: standard filter
»F02«: averaging filter
»F03«: foreground filter
»F04«: background filter

Filter strength
Defines the strength of the chosen filter.
»P00«: weak filter up to
»P09«: strong filter

Foreground suppression
Minimum value: blind zone
Maximum value: nearwindow limit - 1

Multiplex mode device addressing
»00«: synchronisation
»01« to »10«: sensor address for multiplex mode
»oFF«: synchronisation deactivated

Multiplex mode highest address
To optimize multiplex speed the highest sensor address may be set.
Setting range »01« to »10«

Measurement range
Minimum value: sensor-distant window margin
Maximum value: 999 mm for crm+25/... and crm+35... and 999 cm for all other typs

Calibration display
Put plane reflector vertically disposed in front of sensor: in an exact distance of 250 mm for crm+ 25... and crm+35... and 900 mm for all other types. Adjust display to 250 mm or 900 mm. Confirm calibration with T1 + T2.

Detection zone sensitivity
Affects the size of the detection zone.
»E01«: high
»E02«: standard
»E03«: low

Push-Pull output in pnp circuit

Push-Pull output in npn circuit

	crm+25…	crm+35…	crm+130…	crm+340…	crm+600…
blind zone	0 to 30 mm	0 to 85 mm	0 to 200 mm	0 to 350 mm	0 to 600 mm
operating range	250 mm	350 mm	1,300 mm	3,400 mm	6,000 mm
maximum range	350 mm	600 mm	2,000 mm	5,000 mm	8,000 mm
angle of beam spread	see detection zone	see detection zone	see detection zone	see detection zone	see detection zone
transducer frequency	320 kHz	360 kHz	200 kHz	120 kHz	80 kHz
resolution, sampling rate	0.025 mm	0.025 mm	0.18 mm	0.18 mm	0.18 mm
reproducibility	± 0.15 %	± 0.15 %	± 0.15 %	± 0.15 %	± 0.15 %
accuracy	± 1 % (temperature drift internal compensated, may be deactivated[1], 0.17%/K without compensation)	± 1 % (temperature drift internal compensated, may be deactivated[1], 0.17%/K without compensation)	± 1 % (temperature drift internal compensated, may be deactivated[1], 0.17%/K without compensation)	± 1 % (temperature drift internal compensated, may be deactivated[1], 0.17%/K without compensation)	± 1 % (temperature drift internal compensated, may be deactivated[1], 0.17%/K without compensation)

detection zones
for different objects:
The dark grey areas are determind with a thin round bar (10 or 27 mm dia.) and indicate the typical operating range of a sensor. In order to obtain the light grey areas, a plate (500 x 500 mm) is introduced into the beam spread from the side. In doing so, the optimum angle between plate and sensor is always employed. This therefore indicates the maximum detection zone of the sensor. It is not possible to evaluate ultrasonic reflections outside this area.
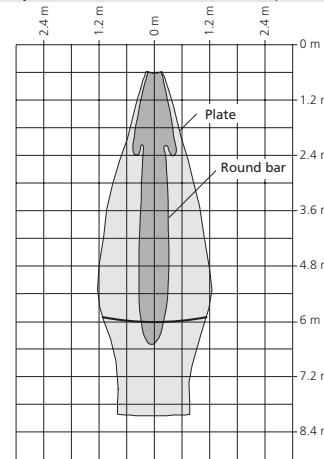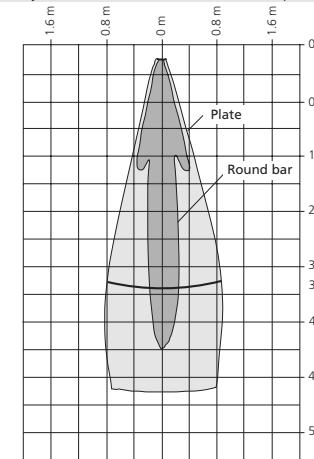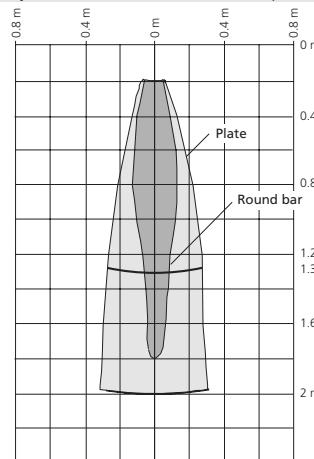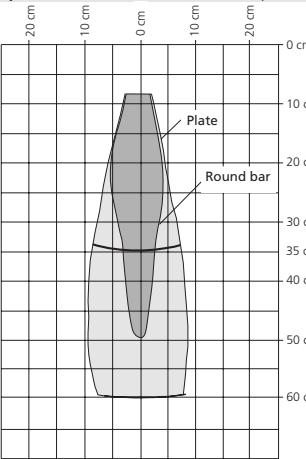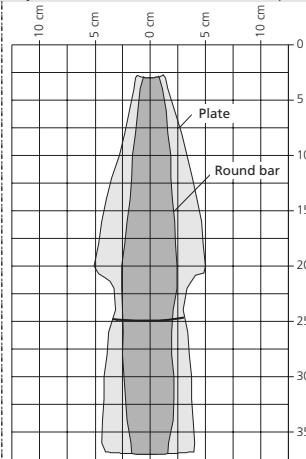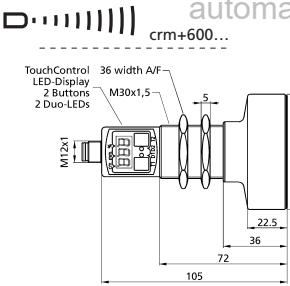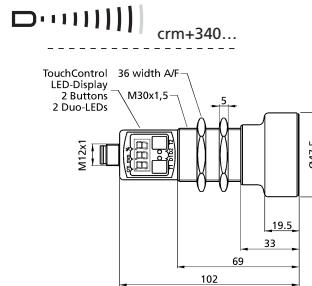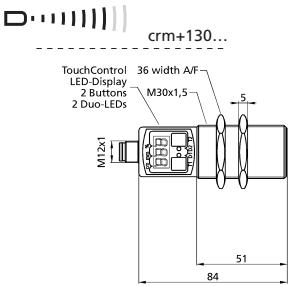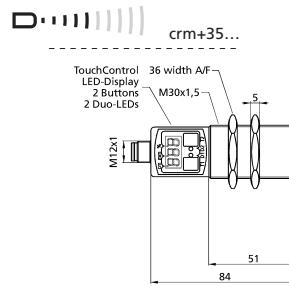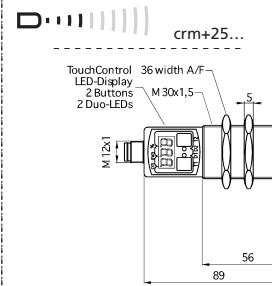
	crm+25…	crm+35…	crm+130…	crm+340…	crm+600…
operating voltage U_B	9 V to 30 V DC, reverse polarity protection	9 V to 30 V DC, reverse polarity protection	9 V to 30 V DC, reverse polarity protection	9 V to 30 V DC, reverse polarity protection	9 V to 30 V DC, reverse polarity protection
operating voltage ripple	±10 %	±10 %	±10 %	±10 %	±10 %
no-load current consumption	≤ 80 mA	≤ 80 mA	≤ 80 mA	≤ 80 mA	≤ 80 mA
housing	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE
class of protection to EN 60529	IP 67	IP 67	IP 67	IP 67	IP 67
norm conformity	EN 60947-5-2	EN 60947-5-2	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	5-pin initiator plug, PBT	5-pin initiator plug, PBT
controls	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)
indicators	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs
programmable	TouchControl, LinkControl and IO-Link	TouchControl, LinkControl and IO-Link	TouchControl, LinkControl and IO-Link	TouchControl, LinkControl and IO-Link	TouchControl, LinkControl and IO-Link
operating temperature	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C
storage temperature	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
weight	150 g	150 g	150 g	210 g	270 g
switching hysteresis[1]	3 mm	5 mm	20 mm	50 mm	100 mm
switching frequency[2]	25 Hz	12 Hz	8 Hz	4 Hz	3 Hz
response time[2]	32 ms	64 ms	92 ms	172 ms	240 ms
time delay before availability	< 300 ms	< 300 ms	< 300 ms	< 380 ms	< 450 ms
order No.	**crm+25/F/TC/E**	**crm+35/F/TC/E**	**crm+130/F/TC/E**	**crm+340/F/TC/E**	**crm+600/F/TC/E**
switching output	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA switchable NOC/NCC, short-circuit-proof	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA switchable NOC/NCC, short-circuit-proof	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA switchable NOC/NCC, short-circuit-proof	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA switchable NOC/NCC, short-circuit-proof	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA switchable NOC/NCC, short-circuit-proof

1) Can be programmed with TouchControl, LinkControl and IO-Link.
2) With TouchControl, LinkControl and IO-Link, the selected filter setting and the maximum range influence the switching frequency and response time.

The content of this document is subject to technical changes. Specifications in this document are presented in a descriptive way only. They do not warrant any product features.

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