Operating manual

**crm+ Ultrasonic Sensors with one analogue output and one switched output**

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

**Product description**

- The crm-sensor with one analogue output and one switched output measures the distance to an object within the detection zone contactless. A signal proportional to distance is created and the switched output is set according to the adjusted detect distance.
- 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 resistance against many aggressive substances.
- The sensor automatically detects the load put to the analogue output and switches to current output or voltage output respectively.
- All settings are done with two push-buttons and a three-digit LED-display (TouchControl).
- Light emitting diodes (three-colour LEDs) indicate all operation conditions.
- Choosing between rising and falling output characteristic as well as output function NOC and NCC is possible.
- The sensors are adjustable manually using the numerical LED-display or may be trained using Teach-in processes.

**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).

**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. Two or more sensors are exceeded the integrated synchronisation should be used. The sensors are assigned to blind zone and operating range automatically and is indicated by a point on the top of the digits. Alternatively a percentual compensation reaches its optimum working point after approx. 30 minutes of operation.

**Note**

- As a result of the assembly the design the assembly of PEEK film and PTFE joint ring is not gas-tight.
- 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.
- If an object is within the set window margins of the analogue output, then LED D1 lights up green, if the object is outside the window margins, then LED D1 lights up red.
- The load put to the analogue output is detected automatically when turning supply voltage on.
- During normal mode operation, a yellow LED D2 signals that the switched output has connected.
- During normal mode operation, the measured distance value is displayed on the LED-indicator 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. Alternatively a percentual scale may be set in the add-on menu. In this connection 0% and 100% correspond to the set window margins of the analogue output.
- In the «Two-way reflective barrier» operating mode, the object has to be within the range of 0-85% of the set distance.
- During Teach-in mode, the hysteresis loops are set back to factory settings.
- If no objects are placed within the detection zone the LED-indicator shows »- - -«.

**Show parameters**

Tapping push-button T1 shortly during normal mode operation shows «PAR» on the LED-display. Each time you tap push-button T1 the actual settings of the analogue output and the switched output are shown.

**Start-up**

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

- Rising analogue characteristic
- Window analogue output set to blind zone and operating range
- Switched output on NOC

**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).

**Assembly instructions**

- Assemble the sensor at the installation location.
- Plug in the connector cable to the M 12 connector.

**Fig. 1: Assembly distances, indicating synchronisation/multiplex**

**Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable**

**Fig. 3: TouchControl**

**Safety Notes**

- Read the operating instructions prior to start-up.
- Connection, installation and adjustment works may only be carried out by expert personnel.

**Operation**

crm+sensors work maintenance free. Small amounts of dirt on the surface do not influence function. Thick layers of dirt and caked-on dirt affect sensor function and therefore must be removed.

**Set sensor close window**

Press T1 and T2 simultaneously for about 3 s until welcome message has passed.

**Set switched output**

Press T1 and T2 simultaneously for about 3 s until welcome message has passed.

**End**

Press T1 and T2 simultaneously for about 3 s until welcome message has passed.

**Start here**

Press T1 and T2 simultaneously for about 3 s until welcome message has passed.

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

- 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.
...or with the Teach-in procedure

**Adjust point**

- Place object at position 0
- Press T2 until »d« is shown
- Place object at position 0
- Press T2 until »d« is shown
- Place object at position 0
- Press T2 until »d« is shown

**Calibration**

- Press T2 until countdown passed from 8 → 0 and symbol for rising/falling characteristic is displayed
- Press T2 until »End« is shown

**Filter strength**

- Choose current mode
- Display mode
- Filter strength
- Response time
- Multiplex mode
- Measurement range

**Set NDC/NCC**

- Normal mode operation
- Teach-in analogue output

**Normal mode operation**

- Teach-in switched output

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

- Press T1 and T2 simultaneously for about 13 s until »Add« is shown in the LED-display

**Key lock and factory setting**

- Activate/deactivate TouchControl
- Reset to factory setting
- Turn supply voltage ON while pressing T1
- Turn supply voltage OFF while pressing T1

**Notes**

- Changes in the Add-on menu may impact the sensor function.
- A6, A7, A8, A9, A11, A12 have influence on the response time of the sensor.
### Technical data

#### Class of protection to EN 60529

**U**

**R**

**P**

**F**

**W**

**IP 67**

#### Norm conformity

**EN 60947-5-2**

#### Type of connection

**5-pin initiator plug, PBT**

#### Controls

**2 push-buttons (TouchControl)**

#### Indicators

**3-digit LED-display, 2 three-colour LEDs**

**Yes, with TouchControl and LinkControl**

#### Programmable

Yes, with TouchControl and LinkControl

#### Storage temperature

**-40°C to +85°C**

#### Weight

**110 g**

#### Switching hysteresis

**3 mm**

#### Test frequency

**32 Hz**

#### Response time

**< 30 ms**

#### Time delay before availability

**< 300 ms**

### Blind zone

<table>
<thead>
<tr>
<th>Detection zone for different objects</th>
<th>Operating range</th>
<th>Maximum range</th>
<th>Angle of beam spread</th>
<th>Transducer frequency</th>
<th>Resolution, sampling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark grey areas</td>
<td>0 to 30 mm</td>
<td>250 mm</td>
<td>320 kHz</td>
<td>0.025 mm bis 0.17 mm, depending on the analogue window</td>
<td></td>
</tr>
<tr>
<td>Light grey areas</td>
<td>0 to 85 mm</td>
<td>250 mm</td>
<td>320 kHz</td>
<td>0.025 mm bis 0.17 mm, depending on the analogue window</td>
<td></td>
</tr>
<tr>
<td>Dark grey areas</td>
<td>0 to 200 mm</td>
<td>200 mm</td>
<td>320 kHz</td>
<td>0.025 mm bis 0.17 mm, depending on the analogue window</td>
<td></td>
</tr>
</tbody>
</table>

### Technical data

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Type</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td><strong>U</strong></td>
<td>Maximum range</td>
<td>mm</td>
</tr>
<tr>
<td>Operating range</td>
<td><strong>R</strong></td>
<td>Minimum range</td>
<td>mm</td>
</tr>
<tr>
<td>Switching hysteresis</td>
<td><strong>P</strong></td>
<td>2 push-buttons (TouchControl)</td>
<td></td>
</tr>
<tr>
<td>Voltage ripple</td>
<td><strong>F</strong></td>
<td>Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PEEK film, PTFE</td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td><strong>W</strong></td>
<td>9.5 V to 30 V DC, short-circuit-proof</td>
<td></td>
</tr>
<tr>
<td>No-load voltage</td>
<td><strong>IP 67</strong></td>
<td>± 0.15%</td>
<td></td>
</tr>
<tr>
<td>Class of protection</td>
<td><strong>EN 60947-5-2</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Type of connection</td>
<td><strong>5-pin initiator plug, PBT</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td><strong>2 push-buttons (TouchControl)</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td><strong>3-digit LED-display, 2 three-colour LEDs</strong></td>
<td>± 0.15%</td>
<td></td>
</tr>
<tr>
<td>Programmable</td>
<td><strong>Yes, with TouchControl and LinkControl</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td><strong>-40°C to +85°C</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td><strong>110 g</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Switching hysteresis</td>
<td><strong>3 mm</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Test frequency</td>
<td><strong>32 Hz</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td><strong>&lt; 30 ms</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
<tr>
<td>Time delay before availability</td>
<td><strong>&lt; 300 ms</strong></td>
<td>± 1% (Temperature drift internal compensated, may be deactivated, ±1.75% without compensation)</td>
<td></td>
</tr>
</tbody>
</table>

### Switching hysteresis

1. **Switched output**
2. **No load voltage**
3. **Class of protection to EN 60529**
4. **Type of connection**
5. **Switching hysteresis**
6. **Indicators**
7. **Programmable**
8. **Storage temperature**
9. **Weight**
10. **Switching hysteresis**
11. **Test frequency**
12. **Response time**
13. **Time delay before availability**
14. **Order No.**
15. **Current output**
16. **Voltage output**

1) Can be programmed with TouchControl and LinkControl

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**Disclaimer:** 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.