Operating Instructions
Radar sensor for continuous level measurement

CNCR-230
Two-wire 4–20 mA/HART

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1 About this document

Information, note, tip: This symbol indicates helpful additional information and tips.

Note: This symbol indicates notes to prevent failures, malfunctions, damage to devices or facility.

Caution: Non-observance may result in personal injury.

Warning: Non-observance may result in serious or fatal personal injury.

Danger: Non-observance of the information marked with this symbol results in serious or fatal personal injury.

Ex applications
This symbol indicates special instructions for Ex applications.

List
The dot set in front indicates a list with no implied sequence.

Sequence of actions
Numbers set in front indicate successive steps in a procedure.

Battery disposal
This symbol indicates special information about the disposal of batteries and accumulators.

2 For your safety

2.1 Authorized personnel
All operations described in this documentation must be carried out only by trained, qualified personnel authorized by the plant operator. Required personal protective equipment must always be worn when working on or with the device.

2.2 Appropriate use
CNCR-230 is a sensor for continuous level measurement.
Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions.
2.3 Warning about incorrect use
Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill by incorrect mounting or adjustment. Damage to property, persons or environmental contamination can result.

Safety instructions for Ex areas
Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each instrument with Ex approval and are part of the operating instructions.

3 Product Description
3.1 Configuration

![Diagram of CNCR-230 Components]

Fig. 1: Components of CNCR-230
1 Radar antenna
2 Process fitting
3 Process seal
4 Electronics housing
5 Ventilation/pressure compensation
3.2 Principle of operation

CNCR-230 is a radar sensor for continuous level measurement. It is suitable for liquids and solids in practically all industries.

The instrument emits a continuous, frequency-modulated radar signal from its antenna. The emitted signal is reflected by the material and received by the antenna as an echo with modified frequency. The frequency change is proportional to the distance to the material.

3.3 Adjustment

On-site adjustment of the device is carried out via the integrated display and adjustment unit.

Note:
The housing with display and adjustment unit can be rotated 330° for optimum readability and operability without tools.

Devices with integrated Bluetooth module can be adjusted wirelessly via standard adjustment tools:

• Smartphone/tablet (iOS or Android operating system)
• PC/notebook (Windows operating system)

Fig. 2: Wireless connection to standard operating devices with integrated Bluetooth LE

1 Sensor
2 Smartphone/Tablet
3 PC/Notebook
Fig. 3: Connecting the PC to the signal cable

1 Sensor
2 HART resistance 250 Ω (optional depending on evaluation)
3 Connection cable with 2 mm pins and terminals
4 Voltage supply
5 Interface adapter

4 Mounting

4.1 General instructions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1. It can be used indoors as well as outdoors.

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable
- Tighten the cable gland or plug connector firmly
- Face the connection cable or conduit entry downward, never upward

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.
4.2 Mounting instructions

The radar emits pulses of electromagnetic waves which are polarized. By adjusting the rotation of the instrument the polarization can be changed to reduce false echoes.

The narrow portion of the radar signal is in the middle of the conduit entry on the instrument. This should be pointed towards the center of the vessel or any obstacle that may cause any unwanted reflections to minimize false echoes, for example, the sidewall or vessel structure.

**Fig. 4: Polarization Position**
1. Cable conduit entry/vent

The lower side of the radar antenna is the beginning of the measuring range. It is at the same time the reference plane for the min./max. adjustment, see following diagram:

**Fig. 5: Reference plane**
1. Reference plane

When mounting the sensor, keep a distance of at least 200 mm (7.874 in) from the vessel wall. If the sensor is installed in the center of a round top vessel, multiple echoes can arise. However, these can be suppressed by a false signal suppression (see chapter “Set up”).
If you cannot maintain this distance, you should carry out a false signal suppression during initial setup. This applies particularly if buildup on the vessel wall is expected. If this is the case, we recommend repeating the false signal suppression later with the additional buildup.

![Fig. 6: Mounting the radar sensor on round vessel tops](image)

In vessels with cone bottoms, the sensor can be mounted in the center of the vessel to measure material down to the outlet.

![Fig. 7: Mounting the radar sensor with conical bottom](image)

Do not mount the instruments in or above the filling stream. Make sure that you detect the material surface, not the fill stream.
When using a threaded coupling, the antenna end should protrude at least 5 mm (0.2 in) out of the socket.

If the reflective properties of the medium are good, you can mount CNCR-230 on sockets or stand pipes longer than the antenna. The pipe end should be smooth, burr-free, and the end rounded.

Recommended values for socket or stand pipe lengths and heights are in the following table. The values come from typical applications.
<table>
<thead>
<tr>
<th>Socket diameter d</th>
<th>Socket length h</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mm</td>
<td>1½&quot;</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
</tr>
<tr>
<td>80 mm</td>
<td>3&quot;</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
</tr>
<tr>
<td>150 mm</td>
<td>6&quot;</td>
</tr>
<tr>
<td>≤ 150 mm</td>
<td>≤ 5.9 in</td>
</tr>
<tr>
<td>≤ 200 mm</td>
<td>≤ 7.9 in</td>
</tr>
<tr>
<td>≤ 300 mm</td>
<td>≤ 11.8 in</td>
</tr>
<tr>
<td>≤ 400 mm</td>
<td>≤ 15.8 in</td>
</tr>
<tr>
<td>≤ 600 mm</td>
<td>≤ 23.6 in</td>
</tr>
</tbody>
</table>

**Note:**
The sensor should be mounted in a location where the radar signal is not interfered with by structure, such as ladders, braces or fill stream.

Make sure when planning the installation there is a clear, unobstructed view to the material to be measured. After installation a false signal suppression should be carried out to minimize any reflections from the mount or nearby structure.

## 5 Connecting to power supply

### 5.1 Preparing the connection

- Carry out electrical connection by trained, qualified personnel authorized by the plant operator
- If overvoltage surges are expected, overvoltage arresters should be installed

**Warning:**
Only connect or disconnect in de-energized state.

**Note:**
Power the instrument via an energy-limited circuit (power max. 100 W) according to IEC 61010-1, e.g.

- Class 2 power supply unit (acc. to UL1310)
- SELV power supply unit (safety extra-low voltage) with suitable internal or external limitation of the output current

Use round cable to ensure effective sealing of the cable gland to the appropriate IP rating and check the cable diameter versus the cable gland before wiring for proper fit.

The instrument is connected with standard two-wire cable. If electromagnetic interference is expected which is above the test values of EN 61326-1 for industrial areas, shielded cable should be used.
**Note:**
Shielded cable generally necessary in HART multidrop mode.

**Note:**
If the temperatures are too high, the cable insulation can be damaged.

We recommend connecting the cable screening to ground potential at one end on the supply side when using shielded cable.

### 5.2 Connecting

*Fig. 11: Connection*

Connect the instrument as described in the following wiring plan.
5.3 Wiring plan

Fig. 12: Connection compartment CNCR-230
1. Voltage supply +24 VDC, signal output

6 Set up with the integrated display and adjustment unit

6.1 Adjustment system
The instrument is operated via the three keys of the integrated display and adjustment unit. The respective menu items are shown on the LCD display. You can find the function of the individual keys in the following overview.

Certain settings are only possible to a limited extent or not possible with the integrated display and adjustment unit. For these settings, we recommend using the adjustment app or PACTware with corresponding DTM.
Fig. 13: Integrated display and adjustment unit

1. LCD display
2. Adjustment keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[•]</td>
<td>Entry to the menu level</td>
</tr>
<tr>
<td></td>
<td>Jump to selected menu item</td>
</tr>
<tr>
<td></td>
<td>Edit parameter</td>
</tr>
<tr>
<td></td>
<td>Select editing position</td>
</tr>
<tr>
<td></td>
<td>Save value</td>
</tr>
<tr>
<td>[+</td>
<td>Switching between the individual measured value windows</td>
</tr>
<tr>
<td></td>
<td>Navigation in the menu items, forwards</td>
</tr>
<tr>
<td></td>
<td>Change parameter values upwards</td>
</tr>
<tr>
<td>[-</td>
<td>Switching between the individual measured value windows</td>
</tr>
<tr>
<td></td>
<td>Navigation in the menu items, backwards</td>
</tr>
<tr>
<td></td>
<td>Change parameter values downwards</td>
</tr>
<tr>
<td>[+ and - simultaneously</td>
<td>Jump to next higher menu</td>
</tr>
<tr>
<td></td>
<td>Interrupt input</td>
</tr>
</tbody>
</table>

When the [+ ] and [- ] keys are pressed quickly, the edited value, or the cursor, changes one value or position at a time. If the key is pressed longer than 1 s, the value or position changes continuously.

Simultaneous pressing of the [+ ] and [- ] keys causes a return to the measured value indication.

Approximately 60 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with [O] will not be saved.
6.2 Measured value and menu item display

The measured values are displayed according to the following presentation:

![Measured value display example](image)

*Fig. 14: Measured value display (example)*

1. Measured value as bargraph
2. Digital Value
3. Unit

The menu items are displayed according to the following presentation:

![Menu item display example](image)

*Fig. 15: Menu item display (example)*

1. Menu item
2. Actual parameter value
### 6.3 Menu overview

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Selection</th>
<th>Basic settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>Liquid, Bulk solid</td>
<td>Liquid</td>
</tr>
<tr>
<td>Application liquid</td>
<td>Storage tank, agitator tank, dosing tank, pumping station/pump shaft, rain overflow basin, tank/collection basin, plastic tank (measurement through tank top), mobile plastic tank (IBC), level measurement in waters, flow measurement flume/overflow, demonstration</td>
<td>Storage tank</td>
</tr>
<tr>
<td>Application bulk solid</td>
<td>Silo (slim and high), bunker (large volume), stockpile (point measurement/profile detection), crusher, demonstration</td>
<td>Silo (slender and high)</td>
</tr>
<tr>
<td>Units</td>
<td>Distance unit of the device, Temperature unit of the instrument</td>
<td>Distance in ft., Temperature in °F</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Max. adjustment (distance A) - 20mA (100%), Min. adjustment (distance B) - 4mA (0%)</td>
<td>Distance from sensor Max. adjustment 0.0 m Min. adjustment 15.0 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Selection</th>
<th>Basic settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displayed value</td>
<td>Distance</td>
<td></td>
</tr>
<tr>
<td>Scaling</td>
<td>Scaling size, Scaling unit, Scaling format</td>
<td>0% correspond to 0 L, 100% correspond to 100 L</td>
</tr>
<tr>
<td>Menu language</td>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Bluetooth access code</td>
<td>-</td>
<td>Activated</td>
</tr>
<tr>
<td>Parameter Protection</td>
<td>-</td>
<td>Deactivated</td>
</tr>
<tr>
<td>Reset</td>
<td>Delivery status, basic settings</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Selection</th>
<th>Basic settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Sensor status</td>
<td>-</td>
</tr>
<tr>
<td>Measurement reliability</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sensor information</td>
<td>Device name, serial number, hardware/software version, device revision, factory calibration date</td>
<td>-</td>
</tr>
</tbody>
</table>
6.4 Parameter adjustment

6.4.1 Main menu

This menu item enables you to adapt the sensor to the different measuring conditions of the material “Liquid” or “Bulk solid”. This selection adapts the signal processing to the expected reflections.

This menu item enables you to optimally adapt the sensor to the application, the place of use and the measuring conditions. The adjustment possibilities depend on the selection made under “Medium”, “Liquid” or “Bulk solid”.

With “Liquid”, the applications are based on the following features, to which the measuring characteristic of the sensor is adjusted in particular:

**Storage tank**
- Vessel:
  - Large volume
  - Upright cylindrical, horizontal round
- Process/measurement conditions:
  - Slow filling and emptying
  - Smooth medium surface
  - Multiple reflections from domed vessel ceiling
  - Condensation

**Stirrer vessel**
- Vessel:
  - Large agitator metal blades
  - Installations like flow breakers, heating spirals
  - Mounting socket or stand pipe
• Process/measurement conditions:
  — Frequent, fast to slow filling and emptying
  — Strongly agitated surface, foam and strong spout formation
  — Multiple reflections through dished vessel ceiling
  — Condensation, buildup on the sensor
• Further recommendations
  — False signal suppression with running agitator via adjustment app or PACTware/DTM

Dosing vessel
• Vessel:
  — Small vessels
• Process/measurement conditions:
  — Frequent and fast filling/emptying
  — Tight installation situation
  — Multiple reflections through dished vessel ceiling
  — Product buildup, condensate and foam generation

Pumping station/Pump shaft
• Process/measurement conditions:
  — Partly strongly agitated surface
  — Installations such as pumps and ladders
  — Multiple reflections through flat vessel ceiling
  — Dirt and grease deposits on shaft wall and sensor
  — Condensation on the sensor
• Further recommendations
  — False signal suppression via adjustment app or PACTware/DTM

Overflow basin
• Vessel
  — Large volume
  — Partly installed underground
• Process/measurement conditions:
  — Partly strongly agitated surface
  — Multiple reflections through flat vessel ceiling
  — Condensation, dirt deposits on the sensor
  — Flooding of the sensor antenna

Vessel/Collecting basin
• Vessel
  — Large volume
  — Upright cylindrical or rectangular
• Process/measurement conditions:
  — Slow filling and emptying
  — Smooth medium surface
  — Condensation
Plastic tank (measurement through the vessel top)
• Process/measurement conditions:
  — Measurement through the tank top, if appropriate to the application
  — Condensation on the plastic ceiling
  — In outdoor facilities, water and snow on vessel top possible
• Further recommendations
  — With measurement through the tank top false signal suppression via adjustment app or PACTware/DTM
  — When measuring through the tank top in outdoor areas protective roof for the measuring point

Transportable plastic tank (IBC)
• Process/measurement conditions:
  — Material and thickness different
  — Measurement through the vessel top, if appropriate to the application
  — Changed reflection conditions as well as jumps in measured values when changing vessels
• Further recommendations
  — With measurement through the tank top false signal suppression via adjustment app or PACTware/DTM
  — When measuring through the tank top in outdoor areas protective roof for the measuring point

Gauge measurement in water
• Process/measurement conditions:
  — Slow gauge change
  — Extreme damping of output signal in case of wave generation
  — Ice and condensation on the antenna possible
  — Floating debris sporadically on the water surface

Flow measurement flume/Overfall
• Process/measurement conditions:
  — Slow gauge change
  — Smooth to agitated water surface
  — Measurement often from a short distance with the demand for accurate measurement results
  — Ice and condensation on the antenna possible

Demonstration
• Applications that are not typical level measurements, e.g. device tests
  — Instrument demonstration
  — Object recognition/monitoring
  — Fast position changes of a measuring plate during functional test

With “Bulk solid”, the applications are based on the following features, to which the measuring characteristic of the sensor is adjusted in particular:

Silo (slender and high)
• Process/measurement conditions:
  — Interfering reflections due to weld seams on the vessel
  — Multiple echoes/diffuse reflections due to unfavorable pouring positions with fine grain
  — Varying pouring positions due to outlet funnel and filling cone
• Further recommendations
  — False signal suppression via adjustment app or PACTware/DTM
  — Alignment of the measurement to the silo outlet

Bunker (large-volume)
• Process/measurement conditions:
  — Large distance to the medium
  — Steep angles of repose, unfavorable pouring positions due to outlet funnel and filling cone
  — Diffuse reflections due to structured vessel walls or internals
  — Multiple echoes/diffuse reflections due to unfavorable pouring positions with fine grain
  — Changing signal conditions when large amounts of material slip off
• Further recommendations
  — False signal suppression via adjustment app or PACTware/DTM

Heap (point measurement/profile detection)
• Process/measurement conditions:
  — Measured value jumps, e.g. through heap profile and traverses
  — Large angles of repose, varying pouring positions
  — Measurement near the filling stream
  — Sensor mounting on movable conveyor belts

Crusher
• Process/measurement conditions:
  — Measured value jumps and varying pouring positions, e.g. due to truck filling
  — Fast reaction time
  — Large distance to the medium
  — Interfering reflections from fixtures or protective devices
• Further recommendations
  — False signal suppression via adjustment app or PACTware/DTM

Demonstration
• Applications that are not typical level measurements
  — Instrument demonstration
  — Object recognition/monitoring
  — Measured value verification with higher measuring accuracy with reflection without bulk solids,
    e.g. via a measuring plate

In this menu item you select the unit for measured distance in mm, m, in or ft.

Since the radar sensor is a distance measuring instrument, it is the distance from the sensor to the product surface
that is measured. To indicate the actual level, the measured distance must be assigned to a certain height percentage.
To perform the adjustment, enter the distance with full and empty vessel, see the following example:

![Diagram of a vessel with distances marked]

**Fig. 16: Parameter example, Min./max. adjustment**
1. Min. level = max. measuring distance
2. Max. level = min. measuring distance
3. Reference plane

The starting point for these distance specifications is always the reference plane, i.e. the lower edge of the sensor. Information on the reference plane can be found in the chapters “Mounting” and “Technical data”. The actual filling height is then calculated on the basis of these entries.

The actual product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

### 6.4.2 Extended Functions

In the menu item “Display value” you define the indication of the measured values on the indication as filling height, distance, percent, lin. percent or scaled.

In the menu item “Scaling” you define how the level value is shown on the indication. This includes the scaling size, unit and format as well as the assignment to 0% and 100% of the measured value. Scaling makes it possible, for example, to display the volume in m³.
This menu item enables the setting of the requested national language for the display.

The following languages are available:
German, English, French, Spanish, Portuguese, Italian, Dutch, Russian, Chinese, Turkish

In this menu item, you can change the factory-preset Bluetooth access code to your personal Bluetooth access code.

**Note:**
The individual preset Bluetooth access code of the device can be found on the supplied information sheet “*PINs and Codes*”. If this is changed by the user and is no longer available, access is only possible via the emergency Bluetooth unlock code on the information sheet “*Emergency unlock codes*” also supplied.

For instruments without Bluetooth function, this menu item displays “*Instrument without Bluetooth*”.

In the menu item “*Protection of the parameter adjustment*” you protect the sensor parameters against unwanted or unintentional changes by entering a device code.

With activated protection of the parameter adjustment, the individual menu items can be selected and displayed, however the parameters can no longer be modified.

Releasing the sensor adjustment is also possible in any menu item by entering the device code.

**Note:**
The factory set device code is “000000”. If this is changed by the user and is no longer available, access is only possible via the emergency device unlock code on the information sheet “*Emergency unlock codes*” also supplied.

**Caution:**
With protected parameter adjustment, adjustment via the adjustment app as well as PACTware/DTM and other systems is also blocked.
During a reset, parameter settings made by the user are reset to the values of the basic setting or the delivery status (see chapter “Menu overview”).

**Caution:**
For the duration of the reset, the set trouble signal is output via the current output. Within the context of the asset management function, the message “Maintenance” is output.

The following reset functions are available:

**Basic settings:** Resets the parameter settings to the default values of the respective device. The order-related settings are not transferred to the current parameters after this reset.

**Delivery status:** Resets the parameter settings to the delivery status.

### 6.4.3 Diagnostics

In this menu item, the device status is displayed.

The measurement reliability represents the signal strength of the level echo above the detection threshold in dB. This makes it possible to assess the quality of the measurement. The measurement reliability should be at least 20 dB.

The menu item “Sensor information” provides the device name and serial number as well as the hardware and software version.
7 Setup with smartphone/tablet (Bluetooth)

7.1 Preparations

Make sure that your smartphone/tablet meets the following system requirements:
- Operating system: iOS 8 or newer
- Operating system: Android 5.1 or newer
- Bluetooth 4.0 LE or newer

Download the Wireless Device Configurator app from the “Apple App Store” or “Google Play Store” to your smartphone or tablet. To enable the Bluetooth software enter the BinMaster company ID code BMYQXZ.

7.2 Connecting

Start the adjustment app and select the function “Setup”. The smartphone/tablet searches automatically for Bluetooth-capable instruments in the area.

The message “Connecting …” is displayed.

The devices found are listed and the search is automatically continued.

Select the requested instrument in the device list.

When establishing the connection for the first time, the operating tool and the sensor must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

For authentication, enter the 6-digit Bluetooth access code in the next menu window. You can find the code on the outside of the device housing.

![Fig. 17: Enter Bluetooth access code](image)

**Note:**

If an incorrect code is entered, the code can only be entered again after a delay time and the delay time gets longer after each incorrect entry.

The message “Waiting for authentication” is displayed on the smartphone/tablet.

After connection, the sensor adjustment menu is displayed on the smartphone/tablet.
If the Bluetooth connection is interrupted, e.g. due to a too large distance between the two devices, this is displayed on the smartphone/tablet. The message disappears when the connection is restored.

Parameter adjustment of the device is only possible if the parameter protection is deactivated, which is default. Parameter protection can be activated later if desired.

### 7.3 Parameter adjustment

The sensor adjustment menu is divided into two areas, which are arranged next to each other or one below the other, depending on the adjustment tool.

- Navigation section
- Menu item display

The selected menu item can be recognized by the color change.

![Example of an app view - Setup sensor adjustment](image)

**Fig. 18: Example of an app view - Setup sensor adjustment**

Enter the requested parameters and confirm via the keyboard or the editing field. The settings are then active in the sensor.

Close the app to terminate connection.

**Note:**

If the CNCR fails to connect to the Wireless Device Configuration App (WDCA) via Bluetooth, close the (WDCA), power cycle the Bluetooth on your device, and repeat the steps above.

If further action is required, power cycle the Bluetooth on your device, and repeat the steps above.
8 Diagnostics and servicing

8.1 Maintenance

If the device is used properly, no special maintenance is required in normal operation.

In some applications, buildup on the antenna system can influence the measurement. Depending on the sensor and application, be careful to avoid heavy soiling of the antenna system. If necessary, clean the antenna system periodically.

8.2 Status messages

The status messages are divided into the following categories:

- Failure
- Function check
- Out of specification
- Maintenance required

### Failure

<table>
<thead>
<tr>
<th>Code</th>
<th>Text message</th>
</tr>
</thead>
<tbody>
<tr>
<td>F013</td>
<td>No measured value available</td>
</tr>
<tr>
<td>F017</td>
<td>Adjustment span too small</td>
</tr>
<tr>
<td>F025</td>
<td>Error in the linearization table</td>
</tr>
<tr>
<td>F036</td>
<td>Checksum error if software update failed or aborted</td>
</tr>
<tr>
<td>F040</td>
<td>Error in the electronics</td>
</tr>
<tr>
<td>F080</td>
<td>General software error</td>
</tr>
<tr>
<td>F105</td>
<td>Determine measured value</td>
</tr>
<tr>
<td>F260</td>
<td>Error in the calibration</td>
</tr>
<tr>
<td>F261</td>
<td>Error in the instrument settings</td>
</tr>
<tr>
<td>F265</td>
<td>Measurement function disturbed</td>
</tr>
</tbody>
</table>

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<tr>
<th>Code</th>
<th>Text message</th>
</tr>
</thead>
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<td>No measured value available</td>
</tr>
<tr>
<td>F017</td>
<td>Adjustment span too small</td>
</tr>
<tr>
<td>F025</td>
<td>Error in the linearization table</td>
</tr>
<tr>
<td>F036</td>
<td>Checksum error if software update failed or aborted</td>
</tr>
<tr>
<td>F040</td>
<td>Error in the electronics</td>
</tr>
<tr>
<td>F080</td>
<td>General software error</td>
</tr>
<tr>
<td>F105</td>
<td>Determine measured value</td>
</tr>
<tr>
<td>F260</td>
<td>Error in the calibration</td>
</tr>
<tr>
<td>F261</td>
<td>Error in the instrument settings</td>
</tr>
<tr>
<td>F265</td>
<td>Measurement function disturbed</td>
</tr>
</tbody>
</table>

### Cause

- No measured value in the boot up phase or during operation
- Adjustment not within specification
- Linearization values are not continuously rising, for example illogical value pairs
- Checksum error in software update failed or aborted
- Limit value exceeded in signal processing
- General software error
- The instrument is still in the boot up phase, the measured value could not yet be determined
- Checksum error in the calibration values
- Error during setup
- Error in the instrument settings
- Program sequence of the measuring function disturbed

### Rectification

- Check or correct installation and/or parameter settings
- Clean the antenna system
- Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)
- Check linearization table
- Delete table/Create new
- Repeat software update
- Send instrument for repair
- Restart instrument
- Send instrument for repair
- Restart instrument
- Wait for the end of the boot up phase
- Device restarts automatically
- Repeat setup
- Resent instrument
- Send instrument for repair
- Send instrument for repair

### DevSpec State in CMD 48

- Byte 5, Bit 0 of Byte 0-5
- Byte 5, Bit 1 of Byte 0-5
- Byte 5, Bit 2 of Byte 0-5
- Byte 5, Bit 3 of Byte 0-5
- Byte 5, Byte 5, Bit 4 of Byte 0-5
- Byte 5, Byte 5, Bit 5 of Byte 0-5
- Byte 5, Byte 5, Bit 6 of Byte 0-5
- Byte 4, Bit 0 of Byte 0-5
- Byte 4, Bit 1 of Byte 0-5
- Byte 4, Bit 3 of Byte 0-5
## Function check

<table>
<thead>
<tr>
<th>Code</th>
<th>Text message</th>
<th>Cause</th>
<th>Rectification</th>
<th>DevSpec State in CMD 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>C700</td>
<td>Simulation active</td>
<td>A simulation is active</td>
<td>Finish simulation</td>
<td>“Simulation Active” in “Standardized Status 0”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wait for the automatic end after 60 mins.</td>
<td></td>
</tr>
</tbody>
</table>

## Out of specification

<table>
<thead>
<tr>
<th>Code</th>
<th>Text message</th>
<th>Cause</th>
<th>Rectification</th>
<th>DevSpec State in CMD 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>S600</td>
<td>Impermissible electronics temperature</td>
<td>Temperature of the electronics in the non-specified range</td>
<td>Check ambient temperature</td>
<td>Byte 23, Bit 4 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Insulate electronics</td>
<td></td>
</tr>
<tr>
<td>S601</td>
<td>Overfilling</td>
<td>Danger of vessel overfilling</td>
<td>Make sure that there is no further filling</td>
<td>Byte 23, Bit 5 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check level in the vessel</td>
<td></td>
</tr>
<tr>
<td>S603</td>
<td>Impermissible operating voltage</td>
<td>Terminal voltage too small</td>
<td>Check terminal voltage, increase operating voltage</td>
<td>Byte 23, Bit 6 of Byte 14-24</td>
</tr>
</tbody>
</table>

## Maintenance

<table>
<thead>
<tr>
<th>Code</th>
<th>Text message</th>
<th>Cause</th>
<th>Rectification</th>
<th>DevSpec State in CMD 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>M500</td>
<td>Error in the delivery status</td>
<td></td>
<td></td>
<td>Bit 0 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M501</td>
<td>Error in the delivery status</td>
<td></td>
<td></td>
<td>Bit 1 of Byte 14 -24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M504</td>
<td>Error at a device interface</td>
<td>Hardware defect</td>
<td>Check connections</td>
<td>Bit 4 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exchanging the electronics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Send instrument for repair</td>
<td></td>
</tr>
<tr>
<td>M505</td>
<td>No echo available</td>
<td>Sensor does not detect an echo during operation</td>
<td>Clean the antenna</td>
<td>Bit 5 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antenna dirty or defective</td>
<td>Use a more suitable antenna/sensor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remove possible false echoes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Optimize sensor position and orientation</td>
<td></td>
</tr>
<tr>
<td>M507</td>
<td>Error in the instrument settings</td>
<td>Error during setup</td>
<td>Carry out reset and repeat setup</td>
<td>Bit 7 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Error when carrying out a reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>False signal suppression faulty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M508</td>
<td>Data error in program memory</td>
<td></td>
<td></td>
<td>Bit 8 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td>Bluetooth controller</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M509</td>
<td>Software update</td>
<td></td>
<td></td>
<td>Bit 9 of Byte 14-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M510</td>
<td>No communication with the sensor</td>
<td></td>
<td></td>
<td>Bit 10 of Byte 14-24</td>
</tr>
</tbody>
</table>
9 Removal

9.1 Disposal

The device is made of recyclable materials. For this reason, it should be disposed of by a specialist recycling company. Observe the applicable national regulations.

10 Certificates and approvals

10.1 Radio licenses

Radar
The device has been tested and approved in accordance with the current edition of the applicable country-specific norms or standards.

Bluetooth
The Bluetooth radio module in the device has been tested and approved according to the current edition of the applicable country-specific norms or standards.

11 Supplement

11.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

Materials and weights

<table>
<thead>
<tr>
<th>Materials, wetted parts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>– Antenna, process fitting</td>
<td>PVDF</td>
</tr>
<tr>
<td>– Process seal</td>
<td>FKM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials, non-wetted parts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>– Housing</td>
<td>Plastic PBT (Polyester)</td>
</tr>
<tr>
<td>– Housing seals</td>
<td>O-rings (silicone)</td>
</tr>
<tr>
<td>– Cable gland</td>
<td>PA</td>
</tr>
<tr>
<td>– Sealing, cable gland</td>
<td>NBR</td>
</tr>
<tr>
<td>– Blind plug, cable gland</td>
<td>PA</td>
</tr>
<tr>
<td>– Weight</td>
<td>0.7 kg (1.543 lbs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torques</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. torque mounting boss</td>
<td>7 Nm (5.163 lbf ft)</td>
</tr>
<tr>
<td>Max. torque for NPT cable glands and conduit tubes</td>
<td>10 Nm (7.376 lbf ft)</td>
</tr>
</tbody>
</table>
Measurement Range

The measurement range is the distance between the antenna edge of the sensor and the product surface. The antenna edge is also the reference plane for the measurement.

Max. measuring range 15 m (49.21 ft)
Recommended measuring range up to 10 m (32.81 ft)

Output

Output signal 4 to 20 mA
Range of the output signal 3.8 to 20.5 mA (default setting)
Signal resolution 0.3 μA
Resolution, digital 1 mm (0.039 in)
Fault signal, current output (adjustable) ≤ 3.6 mA, >= 21 mA, last valid measured value
Max. output current 22 mA
Load See load resistance under Power supply
Starting current ≤ 3.6 mA; ≤ 10 mA for 5 ms after switching on
Damping (63 % of the input variable), adjustable 0 to 999 s

Ambient conditions

Ambient temperature device -40 to +70 °C (-40 to +158 °F)
Ambient temperature display -25 to +80 °C (-13 to +176 °F)
Storage and transport temperature -40 to +80 °C (-40 to +176 °F)
Process conditions
For the process conditions, please also note the specifications on the printed label. The lowest value (amount) always applies.

- **Process temperature**: -40 to +80 °C (-40 to +176 °F)
- **Process pressure**: -1 to 3 bar (-100 to 200 kPa/-14.5 to 43.51 psig)

Voltage supply

- **Operating voltage UB**
  - at 4 mA: 12 to 35 V DC
  - at 20 mA: 9 to 35 V DC
- **Operating voltage UB**: 15 to 35 V DC
  - illuminated display and adjustment unit

Electrical protective measures

- **Potential separation**: Electronics potential free up to 500 V AC
- **Protection rating**: IP66/IP67 acc. to IEC 60529
- **Altitude above sea level**: 5000 m (16404 ft)
- **Protection class**: III
- **Pollution degree**: 4

11.2 Dimensions

**CNCR-230**

*Fig. 20: Dimensions CNCR-230*

1. Thread G1½
2. Thread 1½ NPT
3. Thread R1½
All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

Subject to change without prior notice.

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