Guided Radar (TDR) Level Transmitter for the nuclear industry
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Warnings and symbols used

DANGER!
This information refers to the immediate danger when working with electricity.

DANGER!
These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator’s plant.

WARNING!
Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator’s plant.

CAUTION!
Disregarding these instructions can result in damage to the device or to parts of the operator’s plant.

INFORMATION!
These instructions contain important information for the handling of the device.

HANDLING
• This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

RESULT
This symbol refers to all important consequences of the previous actions.

Safety instructions for the operator

CAUTION!
Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.

LEGAL NOTICE!
The responsibility as to the suitability and intended use of this device rests solely with the user. The supplier assumes no responsibility in the event of improper use by the customer. Improper installation and operation may lead to loss of warranty. In addition, the “Terms and Conditions of Sale” apply which form the basis of the purchase contract.

INFORMATION!
• Further information can be found in the handbook and on the data sheet. These documents can be downloaded from the website [Download Center].
• If you need to return the device to the manufacturer or supplier, please fill out the device return form and send it with the device. Unfortunately, the manufacturer cannot repair or inspect the device without the completed form. The form can be found in the handbook or downloaded from the website. Click on the “Service” tab on one of the web pages and read the instructions.
2.1 Intended use

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

This TDR level transmitter measures distance, level, mass and volume of liquids.

It is for use in the nuclear industry and can be installed in spent fuel pools.
2.2 Scope of delivery

**INFORMATION!**
Do a check of the packing list to make sure that you have all the elements given in the order.

**POWERFLEX 2200 C – Compact version**

![Diagram of Scope of delivery](image_url)

- **Device** (compact version: signal converter and probe)
- **Quick Start**
- **DVD-ROM.** This contains the handbook, the quick start, the technical data sheet and related software.
- **Strap wrench**

**Figure 2-1: Scope of delivery (POWERFLEX 2200 C – Compact version)**
POWERFLEX 2200 S – Compact version with sensor extension

Figure 2-2: Scope of delivery (POWERFLEX 2200 S – Compact version with sensor extension)

1. Signal converter
2. Sensor extension: Coaxial cable and support with one attached length of flexible stainless steel jacket
3. Sensor extension: Wall bracket and lock nut
4. Sensor extension: One length of flexible stainless steel jacket
5. Process connection and probe
6. Quick Start
7. DVD-ROM. This contains the handbook, the quick start, the technical data sheet and related software.
8. Strap wrench
Figure 2-3: Scope of delivery [POWERFLEX 2200 F – Remote version]

1. Signal converter
2. Quick Start
3. DVD-ROM. This contains the handbook, the quick start, the technical data sheet and related software.
4. Strap wrench
5. RS-485 cable. A signal cable connects the signal converter to the probe housing. This signal cable is supplied on request. For more data about the signal cable, refer to “Electrical connections” in the handbook.
6. Probe housing, process connection and probe
Figure 2-4: Scope of delivery (POWERFLEX 2200 D – Remote version with sensor extension)

1. Signal converter
2. Quick Start
3. DVD-ROM. This contains the handbook, the quick start, the technical data sheet and related software.
4. Strap wrench
5. RS-485 cable. A signal cable connects the signal converter to the probe housing. This signal cable is supplied on request. For more data about the signal cable, refer to “Electrical connections” in the handbook.
6. Sensor extension: One length of flexible stainless steel jacket
7. Process connection and probe
8. Sensor extension: Coaxial cable and support with one attached length of flexible stainless steel jacket
9. Probe housing
10. Sensor extension: Wall bracket and lock nut
2.3 Visual Check

**INFORMATION!**
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Figure 2-5: Visual check
1. Device nameplate (for more data, refer to the handbook)
2. Process connection data (size and pressure rating, material reference and heat number)
3. Gasket material data – refer to the illustration that follows

Figure 2-6: Symbol for the supplied gasket material (on the side of the process connection)
1. EPDM

**INFORMATION!**
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

2.4 Storage

**WARNING!**
Store the device in its original packing.

**WARNING!**
Do not keep the device in a vertical position. This will damage the probe and the device will not measure correctly.

- Store the device in a dry and dust-free location.
- Storage temperature range: -50...+85°C / -60...+185°F (min. -40°C / -40°F for devices with the integrated LCD display option)
2.5 Transport

Figure 2-7: How to hold the device: general data

Figure 2-8: How to hold the device: cable data

1. Do not wind the cable probes less than 400 mm / 16” in diameter.
2. Do not hold the probe when you lift the device.
3. Remote versions (F or D): Do not wind the RS-485 electrical cable less than 330 mm / 13” in diameter.
4. Do not bend the flexible jacket less than 500 mm / 20” in diameter.

WARNING!
If you do not lift the device carefully, you can cause damage to the probe.

2.6 Pre-installation requirements

INFORMATION!
Obey the precautions that follow to make sure that the device is correctly installed.

- Make sure that there is sufficient space on all sides.
- Protect the signal converter from direct sunlight. If necessary, install the weather protection accessory.
- Do not subject the signal converter to heavy vibrations.
2.7 How to prepare the tank before you install the device

**CAUTION!**
To avoid measuring errors and device malfunction, obey these precautions.

2.7.1 Pressure and temperature ranges

![Diagram of pressure and temperature ranges](image)

**Figure 2-9: Pressure and temperature ranges**

1. **Temperature at the process connection**
   The temperature at the process connection must stay in the temperature range of the gasket material unless the device is a High-Temperature version. Refer to the table “Permitted temperature ranges for gaskets” that follows and to “Technical data” in the handbook.

2. **Ambient temperature for operation of the display**
   -20...+60°C / -4...+140°F
   If the ambient temperature is not between these limits, the display screen switches off automatically.

3. **Process connection and probe of devices with the sensor extension option (versions S and D):**
   -40...+85°C / -40...+185°F

4. **Process pressure**
   -1...40 barg / -14.5...580 psig

**WARNING!**
The process connection temperature range must agree with the temperature limits of the gasket material.

<table>
<thead>
<tr>
<th>Gasket material</th>
<th>Permitted temperature ranges for gaskets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[°C]</td>
</tr>
<tr>
<td>EPDM</td>
<td>-50...+150</td>
</tr>
</tbody>
</table>
Ambient temperature / flange temperature, flange and threaded connection, in °C

Figure 2-10: Ambient temperature / flange temperature, flange and threaded connection, in °C

Ambient temperature / flange temperature, flange and threaded connection, in °F

Figure 2-11: Ambient temperature / flange temperature, flange and threaded connection, in °F

1. Maximum ambient temperature, °C
2. Maximum flange temperature, °C
3. Maximum ambient temperature, °F
4. Maximum flange temperature, °F
5. All probes

**INFORMATION!**

Min. ambient temperature: -40°C / -40°F
2.7.2 General information for nozzles

**CAUTION!**
Follow these recommendations to make sure that the device measures correctly. They have an effect on the performance of the device.

**CAUTION!**
Do not put the process connection near to the product inlet. If the product that enters the tank touches the probe, the device will measure incorrectly.

![Figure 2-12: Do not put the device near to a product inlet](image)

1. The device is in the correct position.
2. The device is too near to the product inlet.
3. If it is not possible to put the device in the recommended position, install a deflector pipe.

![Figure 2-13: How to prevent build-up of product around the process connection](image)

1. If product particles are likely to collect in holes, a nozzle is not recommended.
2. Attach the flange directly to the tank.
3. Use a threaded connection to attach the device directly to the tank.
For single cable and single rod probes:

![Diagram](image)

Figure 2-14: Recommended nozzle dimensions for single rod and single cable probes

1. Recommended conditions: \( h \leq d \), where \( h \) is the height of the tank nozzle and \( d \) is the diameter of the tank nozzle.
2. The end of the nozzle must not have an extension into the tank. Do not install the device on a high nozzle.

**CAUTION!**

*If the device is installed on a high nozzle, make sure that the probe does not touch the side of the nozzle (attach the probe end etc.).*

![Diagram](image)

Figure 2-15: Sockets for threaded process connections

1. Recommended installation
2. The end of the socket must not have an extension into the tank

For double cable and double rod probes:

![Diagram](image)

Figure 2-16: Recommended nozzle dimensions for double rod and double cable probes

\[ d \geq 50 \text{ mm} / 2", \text{ where } d \text{ is the diameter of the tank nozzle} \]

For coaxial probes:

If your device has a coaxial probe, you can ignore these installation recommendations.
2 INSTALLATION

2.7.3 Installation requirements for concrete roofs

CAUTION!
Install coaxial probes in clean liquids that are not too viscous.

2.8 Installation recommendations for liquids

2.8.1 General requirements

Figure 2-17: Installation on a concrete roof

1. The diameter, d, of the hole must be greater than the thickness, t, of the concrete.
2. If the thickness, t, of the concrete is greater than the diameter, d, of the hole, install the device in a recess.

Figure 2-18: Installation recommendations for liquids

1. The electromagnetic (EM) field generated by the device. It has a radius of $R_{\text{min}}$. Make sure that the EM field is clear of objects and product flow. Refer to the table that follows.
2. If there are too many objects in the pool, install a stilling well.
3. Keep the probe straight. If the probe is too long, shorten the probe length. Make sure that the device is configured with the new probe length. For more data on the procedure, refer to the handbook.
4. Empty space. Refer to the table that follows.
**Clearance between the probe and other objects in the tank**

<table>
<thead>
<tr>
<th>Probe type</th>
<th>Empty space (radius, (R_{\text{min}})), around the probe</th>
<th>[mm]</th>
<th>[inches]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaxial</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Double rod / cable</td>
<td></td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>Single rod / cable</td>
<td></td>
<td>300</td>
<td>12</td>
</tr>
</tbody>
</table>

2.8.2 Installation in standpipes (stilling wells and bypass chambers)

**Use a standpipe if:**

- The liquid is very turbulent or agitated.
- There are too many other objects in the tank.
- The device is measuring a liquid in a tank with a floating roof.

For more data, refer to the Handbook.

**Figure 2-19: Installation recommendations for standpipes (stilling wells and bypass chambers)**

- Stilling well
- Bypass chamber
- Vent
- Level of the liquid

**INFORMATION!**

*Stilling wells are not necessary for devices with coaxial probes. But if there is a sudden change in diameter in the stilling well, we recommend that you install a device with a coaxial probe.*
2.9 How to install the device on the tank

2.9.1 How to install a device with a flange connection

Equipment needed:

- Device
- Gasket (not supplied)
- Wrench (not supplied)

![Flange connection](image)

- Make sure that the flange on the nozzle is level.
- Make sure that you use the applicable gasket for the flange and the process.
- Align the gasket correctly on the flange facing of the nozzle.
- Lower the probe carefully into the tank.

⚠️ For more data on cable probes, refer to How to install a cable probe in the tank on page 20.

- Tighten the flange bolts.

⚠️ Refer to local rules and regulations for the correct torque to apply to the bolts.
2.9.2 How to install a device with a threaded connection

Equipment needed:
- Device
- Gasket (not supplied)
- 50 mm / 2” wrench (not supplied)

![Figure 2-21: Threaded connection](image)

- Make sure the tank connection is level.
- Make sure that you use the applicable gasket for the connection and the process.
- Align the gasket correctly.
- If the device is installed on a tank made of plastic or other non-conductive material, refer to Recommendations for pits and tanks made of non-conductive materials on page 22.
- Lower the probe carefully into the tank.
- For more data on cable probes, refer to How to install a cable probe in the tank on page 20.
- Use 50 mm / 2” wrench to attach the process connection to the tank.
- Tighten the nut.
- Refer to local rules and regulations for the correct torque to apply to the connection.

**INFORMATION!**

*If there is not sufficient clearance to install the device, remove the housing. Install the probe and then put the housing back on the process connection. For more data, refer to How to turn or remove the signal converter on page 21.*
2.9.3 How to install a cable probe in the tank

- Use two persons to lift the housing and the probe above the process connection.
- Hold the device 1 m / 3½ ft above the tank.
- Unwind the probe carefully into the tank.

**WARNING!**
If you bend the probe too much, you will damage the device and it will not measure accurately.
2.9.4 How to turn or remove the signal converter

The converter turns 360°. The converter can be removed from the process connection assembly under process conditions.

Figure 2-24: How to turn or remove the signal converter

1. Tool: 5 mm Allen wrench (not supplied) for the lock screw on the signal converter
2. Cover for the coaxial hole on top of the process connection assembly (not supplied)

CAUTION!
If you remove the housing, put a cover on the coaxial hole on top of the process connection assembly.
When the housing is attached to the process connection assembly, tighten the lock screw with the 5 mm Allen wrench (1).
2.9.5 Recommendations for pits and tanks made of non-conductive materials

If you have a device with a single rod or a single cable probe and a thread connection, obey these instructions:

- Put a metal sheet between the device and the process connection.
- It must have a diameter greater than 200 mm / 8".
- Make sure that the metal sheet is in contact with the thread stop on the device.

We recommend that you use DN≥200 / ≥8" for flange connections.

If you have a device with a double rod, double cable or coaxial probe, you can ignore these instructions.

Figure 2-25: Installation in a non-metallic tank or pit with a thread connection

1. Non-metallic (plastic etc.) tank or pit
2. Metal sheet, Ø ≥200 mm / 8"

CAUTION!
When the device is installed, make sure that the tank roof has no deformation.
2.9.6 How to attach the weather protection to the device

The device and the weather protection option are supplied disassembled in the same box. The weather protection can also be supplied as an accessory. You must attach the weather protection when you install the device.

Figure 2-26: Equipment needed

1. Weather protection cover (with an R-clip to hold the cover on the clamp)
2. Device
3. Weather protection clamp (2 parts)
4. 10 mm socket wrench (not supplied)
5. 2 locking nuts
1. Put the weather protection clamp around the top of the device.
2. Attach the two locking nuts to the threads on the weather protection clamp. Tighten the locking nuts with a 10 mm socket wrench.
3. Lower the weather protection cover onto weather protection clamp until the hole for the lock is in the slot at the front of the cover.
4. Put the R-clip into the hole at the front of the weather protection cover.

End of the procedure.
Put the weather protection clamp around the front of the device (the end of the device that is nearest to the cable entry).

Attach the two locking nuts to the threads on the weather protection clamp. Tighten the locking nuts with a 10 mm socket wrench.

Lower the weather protection cover onto weather protection clamp until the hole for the lock is in the slot at the front of the cover.

Put the R-clip into the hole at the front of the weather protection cover.

End of the procedure.

The overall dimensions of the weather protection are in “Dimensions and weights” in the handbook.
2.9.7 How to open the weather protection

1. Remove the R-clip from the hole at the front of the weather protection cover.
2. Remove the weather protection cover.
3. End of the procedure.

Figure 2-29: How to open the weather protection
2.10 Electromagnetic compatibility

The device design agrees with European Standard EN 61326-1 [2013] when installed in metallic tanks.

The device design agrees with tests done according to performance criteria “A” of International Standards IEC 61000 (Parts 4-2, 4-4, 4-5, 4-6, 4-8, 4-9, 4-10, 4-12, and 4-16), and CISPR 11.

You can install the device on open-air tanks and tanks that are not made of metal. Refer also to the note that follows.

**CAUTION!**

If you install a device with a rod or cable probe in a non-metallic tank or open-air pit, a strong electromagnetic field near to the device can have an unwanted effect on the accuracy. Use a device with a coaxial probe for this type of installation.

**INFORMATION!**

Device operation agrees with residential-class (class B) and industrial-class (class A) emissions. The device fulfils immunity requirements when it is installed in industrial areas.

The device agrees with these conditions if:

- the device has a single or double probe (rod or cable probe) and is used in a closed tank made of metal or
- the device has a coaxial probe.
3.1 Electrical installation: 2-wire, loop-powered

3.1.1 Compact version

Terminals for electrical installation

Figure 3-1: Terminals for electrical installation

1. Grounding terminal in the housing (if the electrical cable is shielded)
2. Current output -
3. Current output +
4. Location of the external grounding terminal (at the bottom of the converter)

INFORMATION!

Electrical power to the output terminal energizes the device. The output terminal is also used for HART® communication.

CAUTION!

- Use the applicable electrical cables with the cable glands.
- Make sure that the current is not more than 5 A or that there is 5 A-rated fuse in the electrical circuit that energizes the device.

Open the terminal compartment cover

Figure 3-2: How to open the terminal compartment cover

1. Loosen the lock screw with a 2.5 mm Allen wrench.
2. Turn the cover counterclockwise with a strap wrench.
3. Remove the cover.
Equipment needed:
- Small slotted tip screwdriver (not supplied)

Procedure:
1. Do not disconnect the safety cord from the terminal compartment cover. Put the terminal compartment cover adjacent to the housing.
2. Remove the connector from the circuit board.
3. Connect the electrical wires to the connector. Attach the connector to the circuit board. Tighten the cable entry glands.

Close the terminal compartment cover
1. Put the cover on the housing and push it down.
2. Turn the cover clockwise until it is fully engaged.
3. Tighten the lock screw.
3.1.2 Remote version

Terminals for electrical installation

Figure 3-5: Terminals for electrical installation
1. Grounding terminal in the housing (if the electrical cable is shielded)
2. Current output -
3. Current output +
4. Location of the external grounding terminal (on the wall support)

**INFORMATION!**
Electrical power to the output terminal energizes the device. The output terminal is also used for HART® communication.

**CAUTION!**
- Use the applicable electrical cables with the cable glands.
- Make sure that the current is not more than 5 A or that there is a 5 A-rated fuse in the electrical circuit that energizes the device.

Connections between the remote converter and the probe housing

Figure 3-6: Connections between the remote converter and the probe housing
1. Remote converter
2. Probe housing
3. Power supply: voltage in -
4. Power supply: voltage in +
5. Signal cable B
6. Signal cable A
7. Shielding wire (attached to Faston connectors in the housings of the remote converter and the probe housing)

For more electrical installation data, refer to *Compact version* on page 28.
For more data about the signal cable between the remote converter and the probe housing, refer to the handbook.

### 3.2 Electrical connection for current output

![Electrical connections diagram](image)

**Figure 3-7:** Electrical connections

1. Power supply
2. Optional junction box [ref. SJB 200W] for on-site readings of loop current
3. Optional connection to the grounding terminal
4. Output: 11.5...30 VDC for an output of 22 mA at the terminal
5. Device

### 3.3 Minimum power supply voltage

Use this graph to find the minimum power supply voltage for a given current output load.

![Minimum power supply voltage graph](image)

**Figure 3-8:** Minimum power supply voltage for an output of 22 mA at the terminal

- X: Power supply U [VDC]
- Y: Current output load $R_L$ [$\Omega$]
3.4 Protection category

**INFORMATION!**
*The device fulfils all requirements per protection category IP66 / IP67. It also fulfils all requirements per NEMA type 4X (housing) and type 6P (probe).*

**DANGER!**
*Make sure that the cable gland is watertight.*

![Diagram of installation](image)

*Figure 3-9: How to make the installation agree with protection category IP67*

- Make sure that the gaskets are not damaged.
- Make sure that the electrical cables are not damaged.
- Make sure that the electrical cables agree with the national electrical code.
- The cables are in a loop in front of the device (1) so water does not go into the housing.
- Tighten the cable feedthroughs (2).
- Close unused cable feedthroughs with dummy plugs (3).

Refer to the table that follows for the diameter of the outer sheath of the electrical cable:

<table>
<thead>
<tr>
<th>Type of electrical cable</th>
<th>Min. / Max. diameter of the electrical cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[mm]</td>
</tr>
<tr>
<td>Power supply / output</td>
<td>6...7.5</td>
</tr>
<tr>
<td>Signal cable (for the remote version) (1)</td>
<td>6...10</td>
</tr>
</tbody>
</table>

(1) This electrical cable is connected between the remote converter and the probe housing
3.5 Networks

3.5.1 General information

The device uses the HART® communication protocol. This protocol agrees with the HART® Communication Foundation standard. The device can be connected point-to-point. It can also have a polling address of 1 to 63 in a multi-drop network.

The device output is factory-set to communicate point-to-point. To change the communication mode from point-to-point to multi-drop, refer to “Network configuration” in the handbook.

3.5.2 Point-to-point networks

![Diagram of Point-to-point connection]

Figure 3-10: Point-to-point connection

1. Address of the device (0 for a point-to-point connection)
2. 4...20 mA = HART®
3. Resistor for HART® communication
4. Power supply
5. HART® modem
6. HART® communication device
3.5.3 Multi-drop networks

Figure 3-11: Multi-drop network

1. Address of the device (n+1 for multidrop networks)
2. Address of the device (1 for multidrop networks)
3. 4 mA + HART®
4. Resistor for HART® communication
5. Power supply
6. HART® modem
7. HART® communication device
4.1 General notes

For more data about device configuration, refer to the handbook.

4.2 Digital display screen

4.2.1 Local display screen layout

Figure 4-1: Local display screen layout in Normal mode

1. Current output percentage (bar graph and text — only shown if the current output function is the same as the measurement on the screen in normal mode)
2. Measurement type (in this example, distance)
3. Device status (NE 107 symbols)
4. Device tag name
5. Updated measurement data symbol (the symbol flashes each time the measurement data is updated)
6. Measurement value and units
7. Device status [markers]
8. Keypad buttons (refer to the table in the section that follows)

4.2.2 Functions of keypad buttons

<table>
<thead>
<tr>
<th>Keypad button</th>
<th>Function</th>
</tr>
</thead>
</table>
| [Right]       | Normal mode: Enter menu (Enter Configuration mode)  
                Configuration mode: Move cursor to the right |
| [Return / Escape] | Normal mode: Change units [m, cm, mm, in, ft]  
                       Configuration mode: Exit |
| [Down]        | Normal mode: Change measurement type [distance, level, output (%), output [mA], conversion, ullage conversion]  
                       Configuration mode: Decrease value or change parameter |
| [Up]          | Normal mode: Change measurement type [distance, level, output (%), output [mA], conversion, ullage conversion]  
                       Configuration mode: Increase value or change parameter |

If you have made a strapping table in menu item 2.8.1 INPUT TABLE for volume or mass measurement, “Conversion” and “Ullage Conv.” will be shown in the list of measurement types.

For data on keypad functions, refer to the Operation section in the handbook.
### 4.3 Commissioning

Use this procedure to change the probe length and give the top and bottom measuring limits. Values and parameters that can be changed are shown between « ... » in the illustrations that follow. Push the keypad buttons in the correct sequence:

**CAUTION!**
Make sure that you do this procedure before you use the device. The settings in this procedure have an effect on the performance of the device.

#### Procedure

<table>
<thead>
<tr>
<th>Screen</th>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Default screen" /></td>
<td>• [&gt;] and [▲] and [■].</td>
<td>Default screen. Enter configuration mode (2.0.0 SUPERVISOR).</td>
</tr>
<tr>
<td><img src="image" alt="Enter configuration mode" /></td>
<td>• [&gt;] and [▲] and [■] and [■] and [■].</td>
<td>Enter the password (the default password is shown). If it is necessary to change the password, refer to the handbook.</td>
</tr>
<tr>
<td><img src="image" alt="Commission" /></td>
<td>• [▼] and [■].</td>
<td>Push this button 2 times to start the commissioning procedure.</td>
</tr>
<tr>
<td><img src="image" alt="Tank height" /></td>
<td>• [&gt;] to change the tank height (H). • [▼] to change the position of the cursor. • [■] to decrease the value or [▲] to increase the value. • [■] to confirm.</td>
<td>The manufacturer sets the output function to &quot;Level&quot; before delivery. If it is necessary to measure volume, ullage volume, mass or ullage mass (Conversion or Ullage Conv.), refer to the handbook.</td>
</tr>
<tr>
<td><img src="image" alt="Output function" /></td>
<td>• [ ■ ] or [ ▼ ] for the selection of the measurement name (Distance, Level, Conversion or Ullage Conv.). • [■] to confirm.</td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Range" /></td>
<td>• [■] or [▼] for the selection of the current output range (4-20 mA/3.6E, 4-20, 3.8-20.5/3.6E, etc.). • [■] to confirm.</td>
<td></td>
</tr>
</tbody>
</table>
### Screen | Steps | Description
--- | --- | ---
VMI 2 | • [>] to change Scale 4 mA. • [>] to change the position of the cursor. • [▼] to decrease the value or [▲] to increase the value. • [▼] to confirm. | Use this step to give the 4 mA output setting (0% limit) in the tank. Refer to the illustrations that follow. Illustration ① shows the settings for level. Illustration ② shows the settings for distance.

VMI 2 | • [>] to change Scale 20 mA. • [>] to change the position of the cursor. • [▼] to decrease the value or [▲] to increase the value. • [▼] to confirm. | Use this step to give the 20 mA output setting (100% limit) in the tank. Refer to the illustrations that follow. Illustration ① shows the settings for level. Illustration ② shows the settings for distance.

VMI 2 | • [▲] or [▼] for the selection of the error delay (0 s, 10 s, 20 s, 30 s, 1 mn, 2 mn, 5 mn or 15 mn). • [▼] to confirm. | The time after which the current output changes to an error value. The error value shows that there is a measurement error.

VMI 2 | • [>] to change the tag name. • [>] to change the position of the cursor. • [▼] to decrease the alphanumeric value (A, B, etc. / 1, 2, etc.) or [▲] to increase the alphanumeric value. • [▼] to confirm. | Set to STORE YES to save and use the data. Set to STORE NO to cancel the changes to the device settings.

VMI 2 | 3 × [▼] to confirm. • [▲] or [▼] for the selection of the save option [STORE NO or STORE YES]. • [▼] to confirm. | Set to STORE YES to save and use the data. Set to STORE NO to cancel the changes to the device settings.
4.4 Probe length calculation

**CAUTION!**
- Make sure that you do this procedure before you use the device.
- If you decrease the probe length, do the probe length calculation procedure before the snapshot procedure.
- The probe length cannot be less than 600 mm / 23.6" for coaxial probes and 1000 mm / 39.4" for other probe types. Shorter probe lengths can be delivered on request.
- Make sure that the tank is empty.
- Make sure that there are no objects adjacent to the probe. For more data about empty space, refer to General requirements on page 16.

Do this quick set-up procedure (menu item 2.1.3) if:

- it is the first time that the device is used,
- the probe length was changed or
- the signal converter was replaced.

When you do this procedure, the device automatically calculates and records the probe length.

**WARNING!**
If the probe material is pickled and passivated, do not decrease the probe length. Surfaces without protection can cause contamination.

Values and parameters that can be changed are shown between the « ... » marks in the illustrations that follow. Push the keypad buttons in the correct sequence:

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screen</strong></td>
</tr>
<tr>
<td><img src="image1" alt="Default screen" /></td>
</tr>
<tr>
<td><img src="image2" alt="Enter configuration mode" /></td>
</tr>
<tr>
<td><img src="image3" alt="Is your tank partially filled or empty?" /></td>
</tr>
<tr>
<td><img src="image4" alt="Calc. probe" /></td>
</tr>
</tbody>
</table>
Go to menu item 2.3.6 DETECT.DELAY in the supervisor menu.

- Record the initial value.
- Is the initial value the same as 2.3.2 BLOC. DIST.?
- If the initial value is different, change the value to the blocking distance in menu item 2.3.2 BLOC. DIST..
- Do the probe length calculation procedure again.
- After you complete the procedure, change the value back to its initial setting.

For more data about menu items, refer to the handbook.
4.5 Snapshot

The snapshot procedure is very important for the performance of the device. Make sure that the tank is empty or only filled to the minimum level before you do the procedure.

Use this procedure (menu item 2.1.2) if there are objects adjacent to the probe that can cause parasitic signals. The device does a scan for objects that do not change their vertical positions in the tank [heating tubes, agitators, fuel assemblies etc.] and records the data. The device can then use this data to put the measurement signal through a filter [Dynamic Parasite Rejection].

**INFORMATION!**

*Dynamic Parasite Rejection* (DPR) is a function that automatically puts parasitic signals through a signal filter. Parasitic signals are caused by internal vessel installations or build-up on the probe during normal operation. Use the DPR function to get the best possible performance during level measurement. To use the device with the DPR function, do the snapshot procedure (refer to menu item 2.1.2). During this procedure, the software finds, marks, and saves all parasitic signals.

When the device is in DPR mode [when menu item 2.5.11 SNAPSHOT MOD. is set to “static” or “static and dynamic”), it will automatically update this data to ignore old and new parasitic signals. Thus, it is not necessary to do the snapshot procedure again. Because the device records the data from the SNAPSHOT procedure (for “static” or “static and dynamic” modes), it is also not necessary to do the procedure again if you de-energize the device.

**CAUTION!**

- If you decrease the probe length, do the probe length calculation procedure before the snapshot procedure.
- Make sure that the tank is empty or only filled to the minimum level.
- Make sure that there are no objects adjacent to the probe. For more data about empty space, refer to General requirements on page 16.

Before you do the snapshot procedure, install the device on the tank. For more data about how to install the device, refer to the handbook.

Values and parameters that can be changed are shown between the «...» marks in the illustrations that follow. Push the keypad buttons in the correct sequence:

### Procedure

<table>
<thead>
<tr>
<th>Screen</th>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Screen 1" /></td>
<td>• [ ], [ ] and [ ].</td>
<td>Default screen. Enter configuration mode (2.0.0 SUPERVISOR).</td>
</tr>
<tr>
<td><img src="image2.png" alt="Screen 2" /></td>
<td>• [ ], [ ], [ ], [ ] and [ ].</td>
<td>Enter the password (the default password is shown). If it is necessary to change the password, refer to the handbook.</td>
</tr>
<tr>
<td>Screen</td>
<td>Steps</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>• [ ], [ ] and [ ]</td>
<td>Push these buttons to start the snapshot procedure.</td>
<td></td>
</tr>
<tr>
<td>• [ ] for the selection of “Partially filled” or [ ] for the selection of “Empty”.</td>
<td>Is your tank partially filled or empty? If the tank is partially filled, the device will scan for the first reflection in the tank. Continue to the subsequent step. NOTE: If you set this step to “Partially filled”, but the tank is empty, the device will show the error message “Failure! Pulse Lost”. Push one of the keypad buttons to go back to the start of the Snapshot procedure. If the tank is empty, the scan will start immediately. Ignore the 2 subsequent steps.</td>
<td></td>
</tr>
<tr>
<td>• [ ] for the selection of YES or [ ] for the selection of NO.</td>
<td>The device shows the distance to the surface of the tank contents. Set to YES if the distance is correct. The scan will start immediately. Set to NO if the distance is incorrect. The scan will start immediately, but the device will ignore the reflection found at this distance from the device.</td>
<td></td>
</tr>
<tr>
<td>• [ ] for the selection of YES or [ ] for the selection of NO.</td>
<td>The device does a scan for objects that do not change their vertical positions in the tank (heating tubes, agitators, fuel assemblies etc.) and records the data.</td>
<td></td>
</tr>
<tr>
<td>• [ ] for the selection of YES or [ ] for the selection of NO.</td>
<td>The device completes the scan. Set to YES to save the data. Set to NO to erase the data.</td>
<td></td>
</tr>
<tr>
<td>• 3 × [ ] to confirm. • [ ] or [ ] for the selection of the save option (STORE NO or STORE YES). • [ ] to confirm.</td>
<td>Set to STORE YES to use the data. Set to STORE NO to cancel the changes to the device settings.</td>
<td></td>
</tr>
</tbody>
</table>
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