



OPTIFLEX 1300 C Quick Start

Guided Radar (TDR) Level Meter

for distance, level, volume and mass measurement of liquids, liquid interface, pastes and solids

1	Safety instructions	4
<hr/>		
2	Installation	5
<hr/>		
2.1	Intended use	5
2.2	Scope of delivery.....	5
2.3	Visual Check	7
2.4	Storage	8
2.5	Transport	9
2.6	Pre-installation requirements	10
2.7	How to prepare the tank before you install the device	10
2.7.1	Pressure and temperature ranges.....	10
2.7.2	General information for nozzles.....	12
2.7.3	Installation requirements for concrete roofs.....	14
2.8	Installation recommendations for liquids.....	14
2.8.1	General requirements	14
2.8.2	How to attach probes to the bottom of the tank.....	15
2.8.3	Standpipes.....	15
2.9	Installation recommendations for solids	16
2.9.1	Nozzles on conical silos.....	16
2.9.2	Traction loads on the probe	18
2.10	How to install the device on the tank	18
2.10.1	How to assemble the single rod probe (single-piece probe)	18
2.10.2	How to assemble the single rod probe (segmented probe)	18
2.10.3	How to assemble the segmented coaxial probe	18
2.10.4	How to install a device with a flange connection.....	19
2.10.5	How to install a device with a threaded connection	20
2.10.6	How to install a cable probe in the tank	21
2.10.7	Installation recommendations for non-metallic tanks and pits	22
2.10.8	How to assemble the remote housing.....	23
2.10.9	How to turn or remove the signal converter	26
2.10.10	How to attach the weather protection to the device.....	27
2.10.11	How to open the weather protection	28
2.11	Electromagnetic compatibility	29
3	Electrical connections	30
<hr/>		
3.1	Safety instructions.....	30
3.2	Electrical installation: outputs 1 and 2	30
3.3	Electrical connection for current output	31
3.3.1	Non-Ex.....	31
3.3.2	Ex i.....	31
3.3.3	Ex d.....	31
3.3.4	PROFIBUS PA.....	32
3.3.5	FOUNDATION Fieldbus	32
3.4	Protection category	32

4 Start-up	33
4.1 Start-up checklist	33
4.2 Operating concept	33
4.3 Digital display screen	34
4.3.1 Local display screen layout	34
4.3.2 Keypad buttons	34
4.3.3 Help screens	34
4.3.4 How to start the device	35
4.4 Remote communication with PACTware™	35
4.5 Remote communication with the AMS™ Device Manager.....	36
5 Technical data	37
5.1 Technical data.....	37
5.2 Measurement limits	43

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. They appear on the back of the invoice and form the basis of the purchase contract.

**INFORMATION!**

- *Further information can be found on the supplied CD-ROM in the manual, on the data sheet, in special manuals, certificates and on the manufacturer's website.*
- *If you need to return the device to the manufacturer or supplier, please fill out the form contained on the CD-ROM and send it with the device. Unfortunately, the manufacturer cannot repair or inspect the device without the completed form.*

2.1 Intended use

This TDR level transmitter measures distance, level, mass and volume of liquids, pastes, slurries, granulates and powders. It can also measure level and interface of liquids at the same time.

It can be installed on tanks, silos and open pits.

2.2 Scope of delivery



INFORMATION!

Check the packing list to check if you received completely all that you ordered.

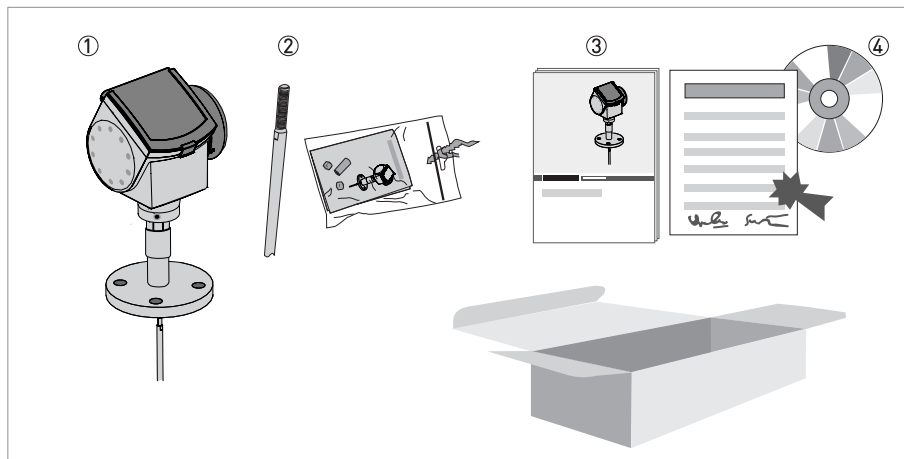


Figure 2-1: Scope of delivery for compact version

- ① Signal converter and probe - compact version.
- ② Probe segments. For the assembly procedure of the single rod probe, refer to the instructions that are supplied with the device. If a single rod or coaxial probe is attached and you ordered the "segmented probe" option, only part of the probe is attached to the device. For the assembly procedure of the segmented single rod probe, refer to *How to assemble the single rod probe (segmented probe)* on page 18, refer to the instructions that are supplied with the device. For the assembly procedure of the segmented coaxial probe, refer to the instructions that are supplied with the device. The assembly instructions and small parts are in a bag attached to the housing.
- ③ Quick Start
- ④ CD-ROM. This contains the Handbook, the Quick Start, the Technical Datasheet and related software.

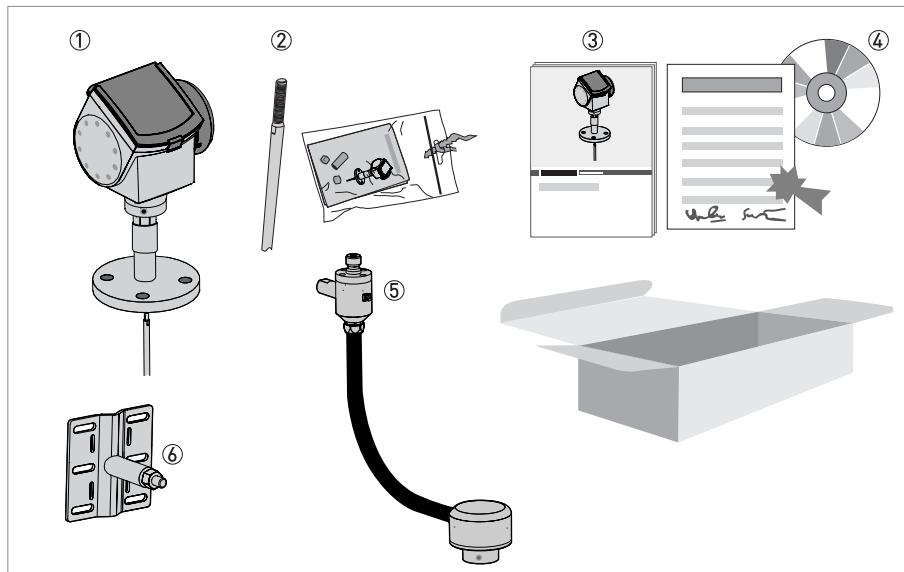


Figure 2-2: Scope of delivery for the remote housing version

- ① Signal converter and probe
- ② Probe segments. For the assembly procedure of the single rod probe, refer to the instructions that are supplied with the device. If a single rod or coaxial probe is attached and you ordered the "segmented probe" option, only part of the probe is attached to the device. For the assembly procedure of the segmented single rod probe, refer to *How to assemble the single rod probe (segmented probe)* on page 18, refer to the instructions that are supplied with the device. For the assembly procedure of the segmented coaxial probe, refer to the instructions that are supplied with the device. The assembly instructions and small parts are in a bag attached to the housing.
- ③ Quick Start
- ④ CD-ROM. This contains the Handbook, the Quick Start, the Technical Datasheet and related software.
- ⑤ Flexible conduit. For the assembly procedure, refer to *How to assemble the remote housing* on page 23.
- ⑥ Wall bracket (also for installation on pipes)



INFORMATION!

No special tools, no training required!

2.4 Storage



WARNING!

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

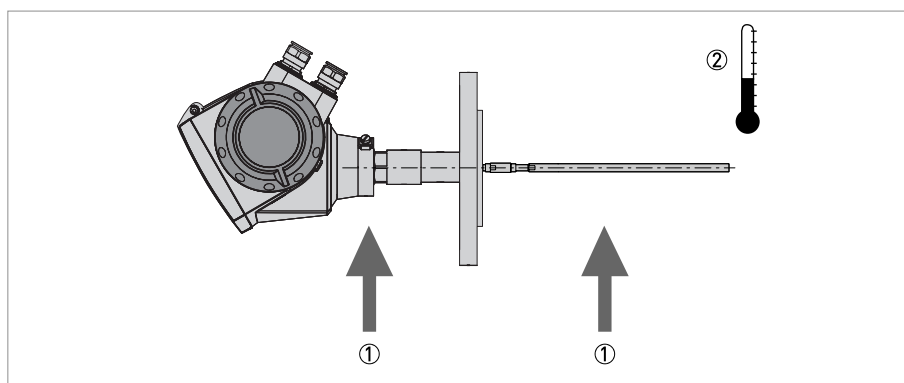


Figure 2-5: Storage conditions

- ① Do not bend rod and coaxial probes - support here
- ② Storage temperature range: -40...+85°C / -40...+185°F

- Store the device in a dry and dust-free location.
- Keep the housing out of the sunlight.
- Store the device in its original packing.

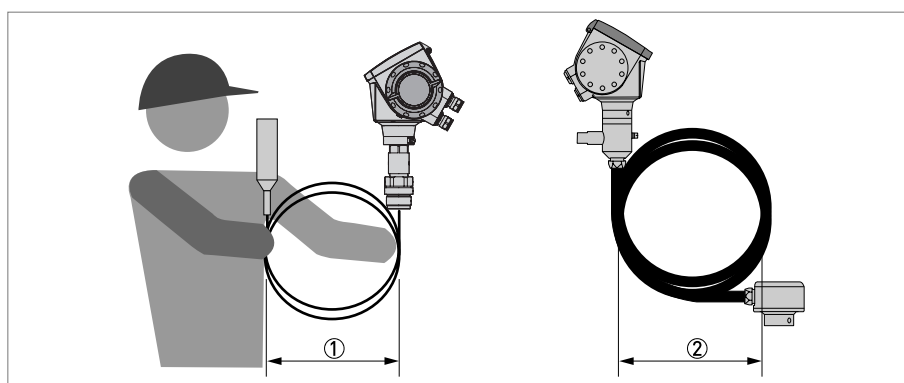


Figure 2-6: Wind cable probes and flexible conduits carefully

- ① Do not wind cable probes less than 400 mm / 16" in diameter.
- ② Do not wind the flexible conduit less than 330 mm / 13" in diameter.

2.5 Transport

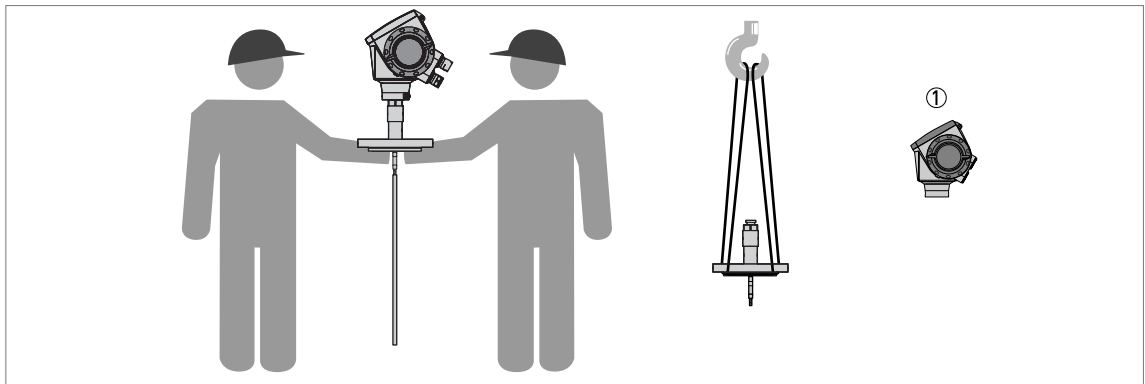


Figure 2-7: How to hold the device

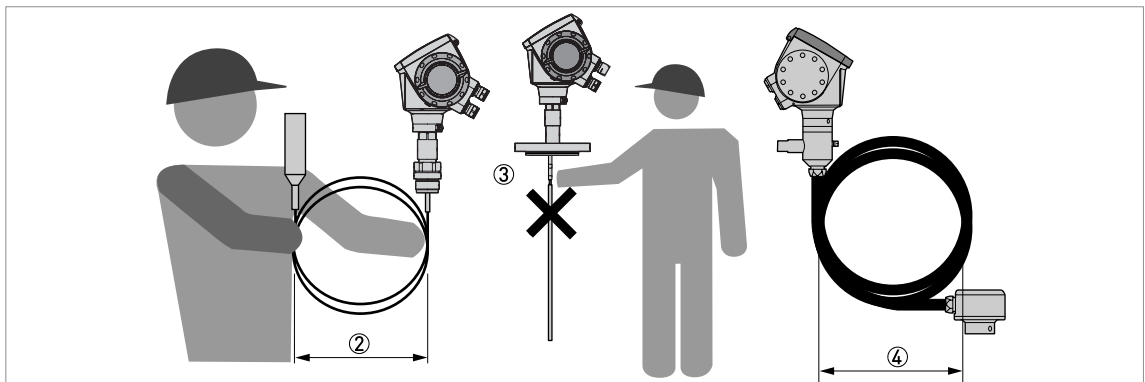


Figure 2-8: How to hold the device

- ① Remove the converter before you lift the device with a hoist.
- ② Wind cable probes greater than 400 mm / 16" in diameter.
- ③ Do not hold the probe when you lift the device.
- ④ Wind the flexible conduit greater than 330 mm / 13" 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. The devices are tested for vibration and agree with EN 50178 and IEC 60068-2-6.

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

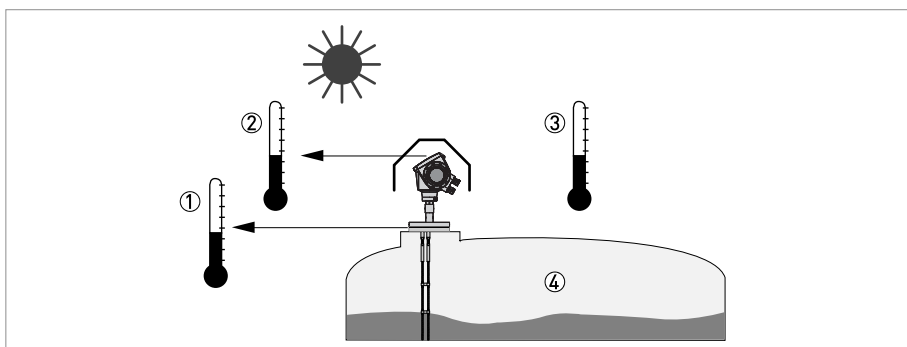


Figure 2-9: Pressure and temperature ranges

① Process connection temperature

The process connection temperature must stay in the temperature range of the gasket material unless the device is a High-Temperature version. Refer to the table "Temperature ranges for gaskets" that follows and to "Technical data" on page 37.

Ex devices: see supplementary operating instructions

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 Ambient temperature

Non-Ex devices: -40...+80°C / -40...+175°F

Ex devices: see supplementary operating instructions

④ Process pressure

Refer to the table "Process pressure limits" that follows and "Pressure/temperature table for probe selection" in the handbook.



WARNING!

The process connection temperature range must agree with the temperature limits of the gasket material. The operating pressure range is subject to the process connection used and the flange temperature.

Temperature ranges for gaskets

Gasket material	Process connection temperature					
	Standard version		High-Pressure version		High-Temperature and High-Temperature / High-Pressure versions	
	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]
FKM/FPM	-40...+200	-40...+390	-40...+150	-40...+300	-40...+300	-40...+570
Kalrez® 6375	-20...+200	-4...+390	-20...+150	-4...+300	-20...+300	-4...+570
EPDM	-50...+150	-58...+300	-50...+150	-58...+300	-50...+250	-58...+480



INFORMATION!

Ø4 mm / 0.15" single cable probe with FEP coating option only: The process connection temperature range is -20...+150°C / -4...+300°F



INFORMATION!

Single rod probes with protective sheath option only: The process connection temperature range depends on the protective sheath material selected.

PP: -40...+90°C / -40...+194°F; PVDF: -50...+150°C / -58...+302°F; PVC: -15...+80°C / +5...+176°F

Process pressure limits

Device version	Maximum process pressure	
	[barg]	[psig]
Ø8 mm / 0.3" single cable	40 ①	580 ①
High-Pressure (HP) version	300 ①	4350 ①
All other probe types and device versions	100 ①	1450 ①

① Refer also to "Pressure / temperature table for probe selection" in the handbook

2.7.2 General information for nozzles

**CAUTION!**

Follow these recommendations to make sure that the device measures correctly.

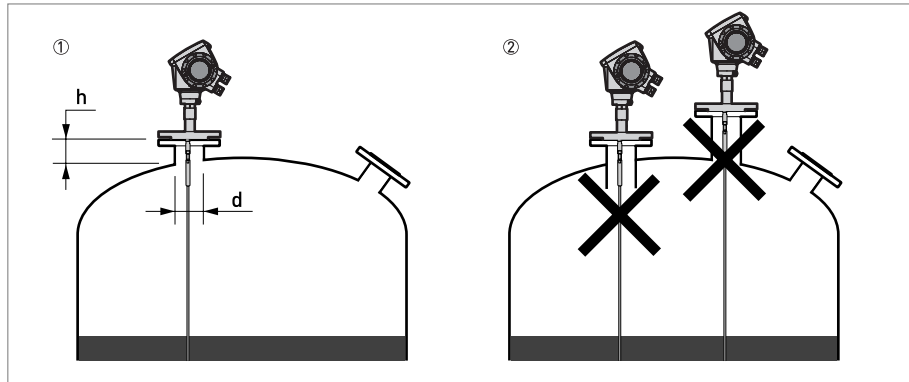


Figure 2-10: Recommended nozzle dimensions

- 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, ...).

**INFORMATION!**

It is possible to measure in these conditions with a minimum top dead zone. Use the snapshot function to filter the parasite signals from long nozzles. For more data, refer to the Handbook.

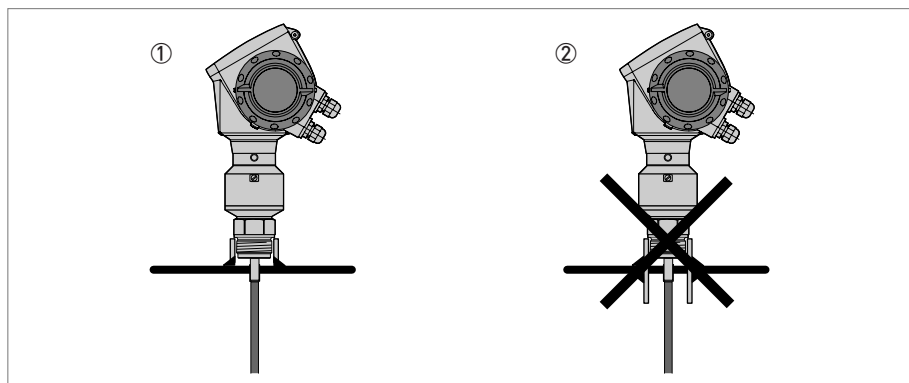


Figure 2-11: Sockets for threaded process connections

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

**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.

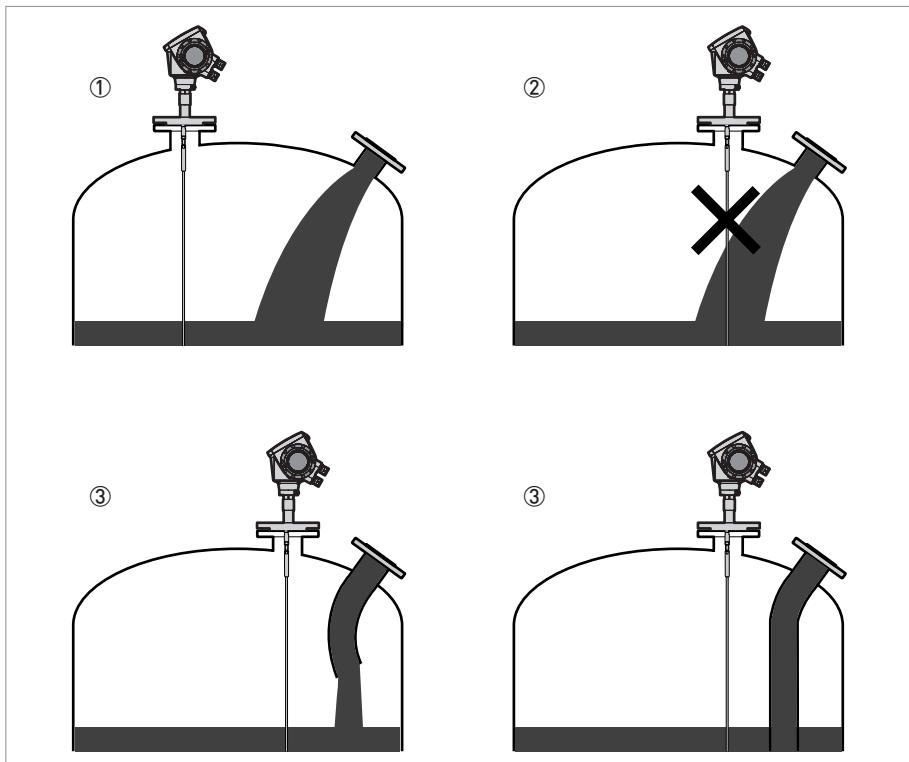


Figure 2-12: Do not put the device near to a product inlet

- 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.

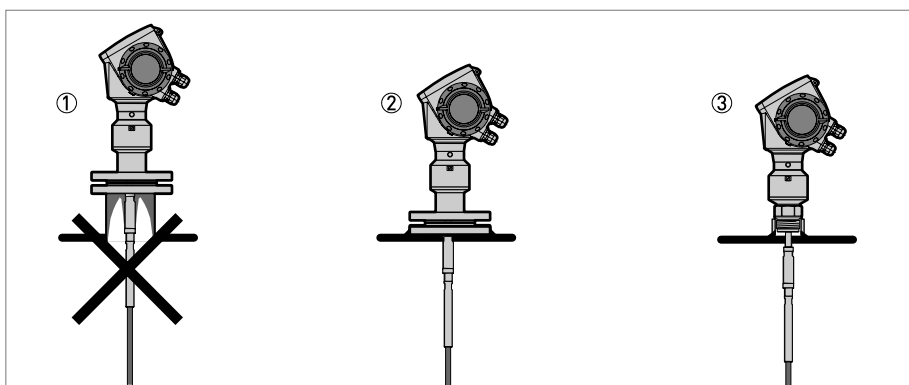


Figure 2-13: How to prevent build up of product around the process connection

- 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 thread connection to attach the device to the tank.

2.7.3 Installation requirements for concrete roofs

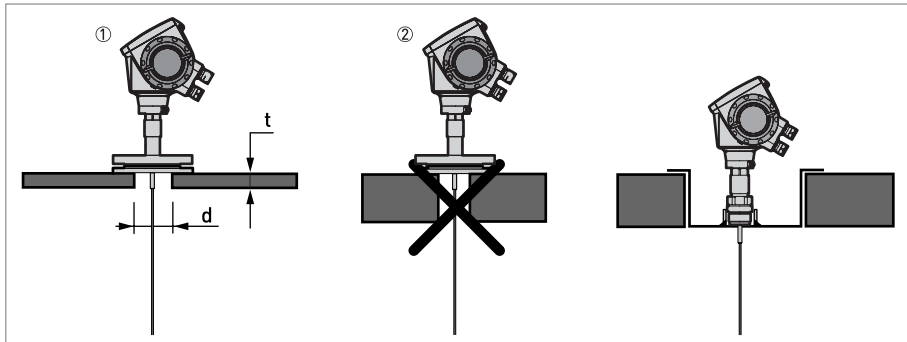


Figure 2-14: Installation on a concrete roof

- 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.

2.8 Installation recommendations for liquids

2.8.1 General requirements

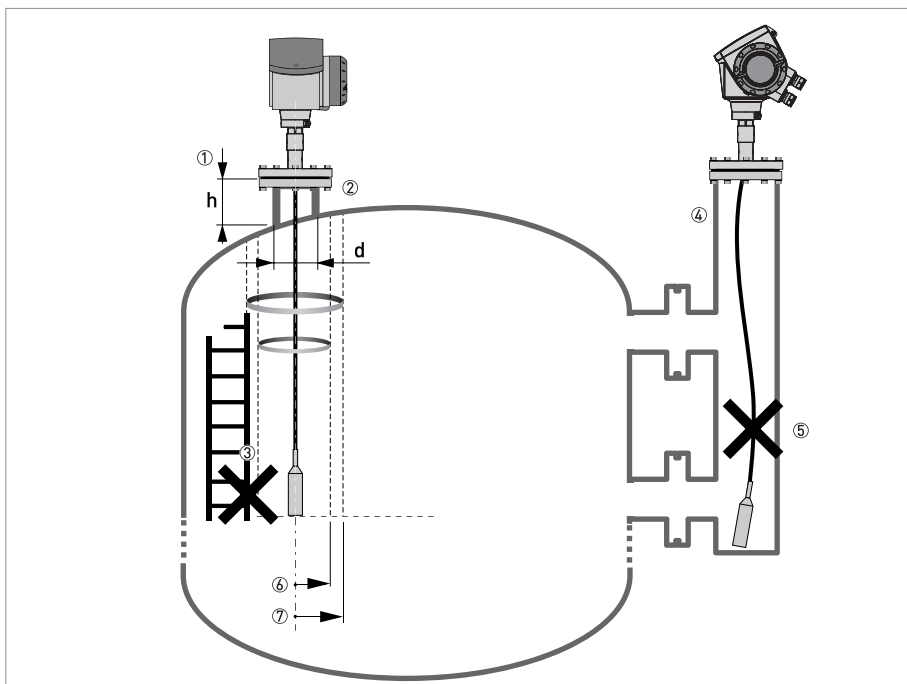


Figure 2-15: Installation recommendations for liquids

- ① $h \leq d$, where h is the height of the tank nozzle and d is its diameter.
- ② Make sure that the probe does not touch the nozzle. Attach the probe if the liquid is turbulent.
- ③ The electromagnetic (EM) field generated by the device. It has a radius of R_{min} . Make sure that the EM field is clear of objects and product flow. Refer to the table that follows.
- ④ If there are too many objects in the tank, install a bypass chamber or stilling well.
- ⑤ 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.
- ⑥ Empty space necessary for double probes. Refer to the table that follows.
- ⑦ Empty space necessary for single probes. Refer to the table that follows.

**INFORMATION!**

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

**CAUTION!**

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

**INFORMATION!**

If the device has to measure the level of dangerous products (ammonia etc.), we recommend that you use a device with the Metaglas[®] option.

Clearance between the probe and other objects in the tank

Probe type	Empty space (radius, R_{\min}), around the probe	
	[mm]	[inches]
Coaxial	0	0
Double rod ⑥ Double cable Ø4 mm / 0.15" ⑥	100	4
Single rod ⑦ Single cable Ø4 mm / 0.15" ⑦ Single cable Ø2 mm / 0.08" ⑦	300	12

2.8.2 How to attach probes to the bottom of the tank

If the liquid is agitated or turbulent, you can attach the probe to the bottom of the tank. The procedure to attach the probe depends on the type of probe used.

For more data, refer to the Handbook.

2.8.3 Standpipes

Use a standpipe if:

- There is highly conductive foam in the tank.
- The liquid is very turbulent or agitated.
- There are too many other objects in the tank.
- The device is measuring a liquid (petro-chemicals) in a tank with a floating roof.

For more data, refer to the Handbook.

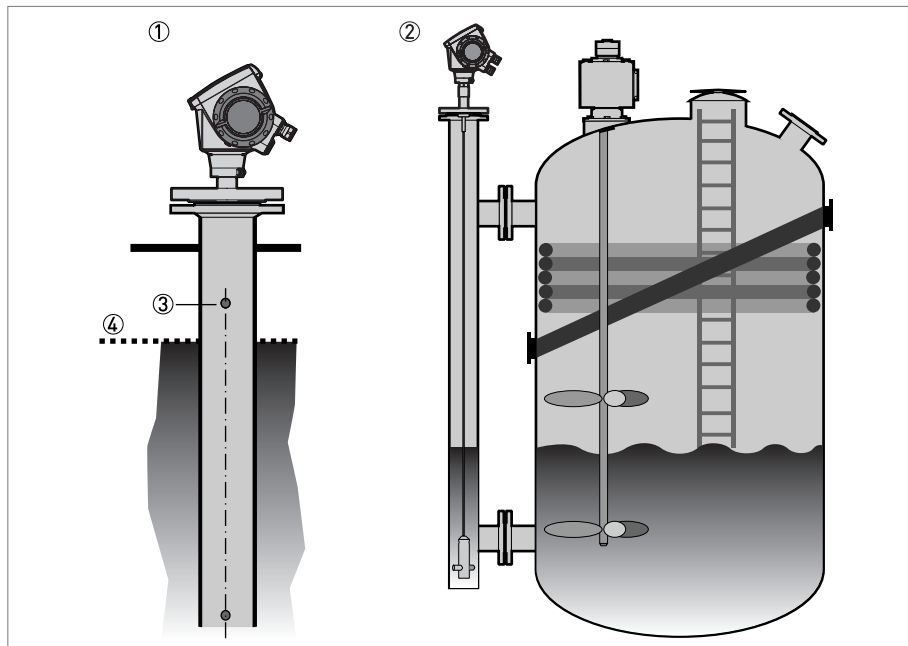


Figure 2-16: Basic installation recommendations for standpipes (stilling wells and bypass chambers)

- ① Stilling well
- ② Bypass chamber
- ③ Air circulation hole
- ④ Level of the liquid



INFORMATION!

Standpipes are not necessary for devices with coaxial probes. But if there is a sudden change in diameter in the standpipe, we recommend that you install a device with a coaxial probe.

2.9 Installation recommendations for solids

2.9.1 Nozzles on conical silos

We recommend that you prepare the installation when the silo is empty.



DANGER!

Risk of electrostatic discharge (ESD): *The device is resistant to electrostatic discharges of up to 15 kV (30 kV with the ESD protection option - recommended for solid applications), but it is the responsibility of the fitter and the user to prevent ESD.*



CAUTION!

Install the nozzle in the correct position to measure correctly and prevent too much bending and traction.

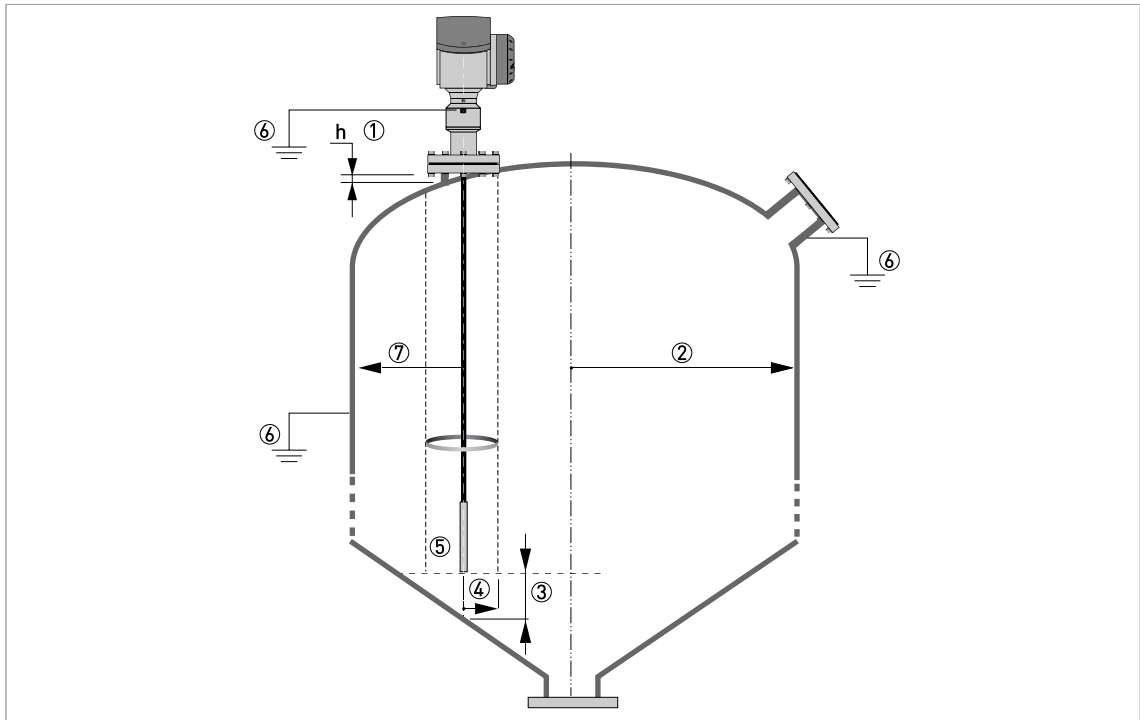


Figure 2-17: Installation recommendations for solids

- ① We recommend installation without a nozzle. If not, $h \leq 50 \text{ mm} / 2''$.
- ② Radius of the tank, r
- ③ The end of the probe must be more than $300 \text{ mm} / 12''$ above the tank bottom.
- ④ Empty space (radius, R_{\min}) around the probe.
- ⑤ The electromagnetic (EM) field generated by the device. It is also the measurement zone of the probe. Make sure that the EM field is clear of objects and product flow.
- ⑥ Ground the tank, the product and the probe (if attached).
- ⑦ If possible, put the process fitting $\geq 300 \text{ mm} / 12''$ from the tank wall

Clearance between the probe and other objects in the tank

Probe type	Empty space (radius, R_{\min}) around the probe	
	[mm]	[inches]
Single cable $\varnothing 4 \text{ mm} / 0.15''$ ④	300	12
Single cable $\varnothing 8 \text{ mm} / 0.3''$ ④	300	12



INFORMATION!

If the probe is longer than $10 \text{ m} / 33 \text{ ft}$, we recommend that you do not attach the end of the probe.

2.9.2 Traction loads on the probe

Traction load depends on:

- The height and shape of the tank.
- The particle size and density.
- The rate at which the tank is emptied.



CAUTION!

Risk of damage to the cable probe. High loads can break the cable.

If the load on the $\varnothing 8$ mm / 0.3" single cable probe is more than 3500 kg / 7700 lb, contact your supplier.



CAUTION!

Make sure that the tank roof is resistant to deformation at high loads.

Estimated traction load on the probe in kg

Material	Probe length, 10 m	Probe length, 20 m	Probe length, 30 m
	[kg]		
Cement	1000	2000	3000
Fly ash	500	1000	1500
Wheat	300	500	1200

Estimated traction load on the probe in lb

Material	Probe length, 33 ft	Probe length, 65 ft	Probe length, 98 ft
	[lb]		
Cement	2200	4410	6520
Fly ash	1100	2200	3300
Wheat	660	1100	2650

2.10 How to install the device on the tank

2.10.1 How to assemble the single rod probe (single-piece probe)

The assembly instructions and small parts are in a bag attached to the housing.

2.10.2 How to assemble the single rod probe (segmented probe)

The assembly instructions and small parts are in a bag attached to the housing.

2.10.3 How to assemble the segmented coaxial probe

The assembly instructions and small parts are in a bag attached to the housing.

2.10.4 How to install a device with a flange connection

Equipment needed:

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

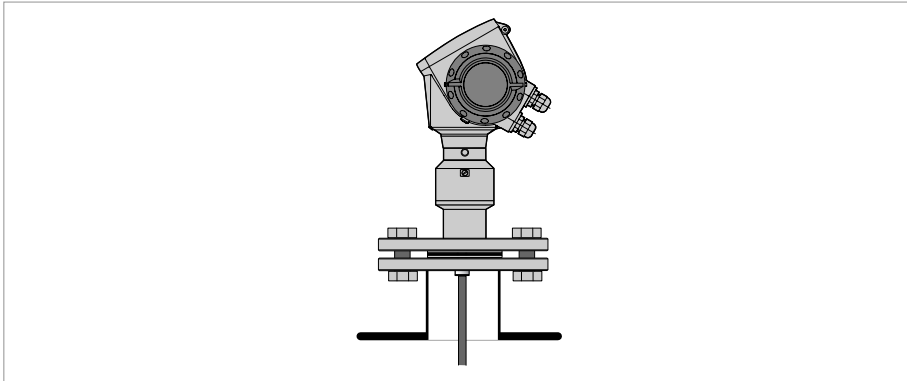


Figure 2-18: Flange connection



- Make sure 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 21.
- Tighten the flange bolts.
- ➡ Refer to local rules and regulations for the correct torque to apply to the bolts.

2.10.5 How to install a device with a threaded connection

Equipment needed:

- Device
- Gasket (not supplied with G (ISO 228) threaded connections)
- 50 mm / 2" wrench (not supplied)

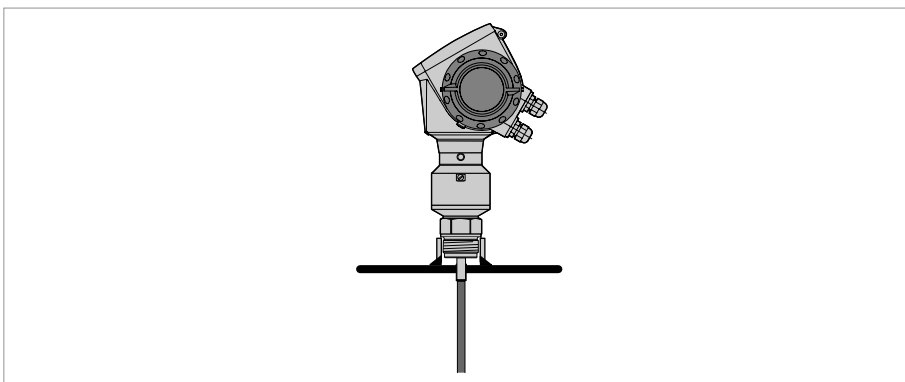


Figure 2-19: Threaded connection



- 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 installed on a tank made of plastic or other non-conductive material, refer to *Installation recommendations for non-metallic tanks and pits* 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 21.
- Turn the nut on the housing to attach the device to the process connection
- 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 process connection 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 26.*

2.10.6 How to install a cable probe in the tank

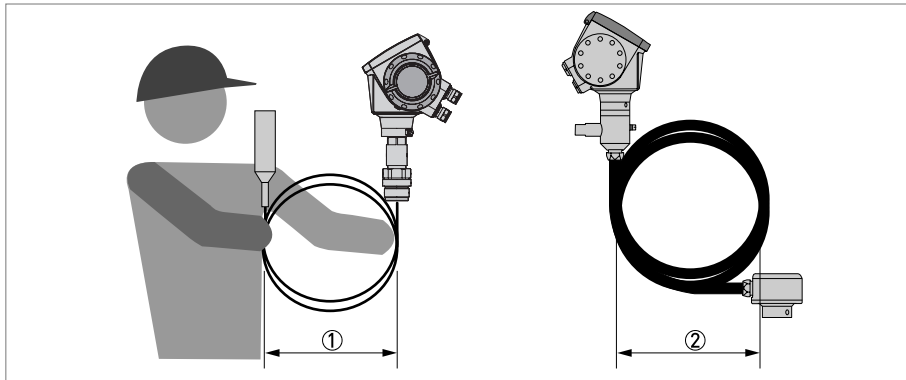


Figure 2-20: Wind cable probes and flexible conduits carefully

- ① Do not wind cable probes less than 400 mm / 16" in diameter.
- ② Do not wind the flexible conduit less than 330 mm / 13" in diameter.



WARNING!

If you bend the probe too much, you will damage the device and it will not measure accurately.

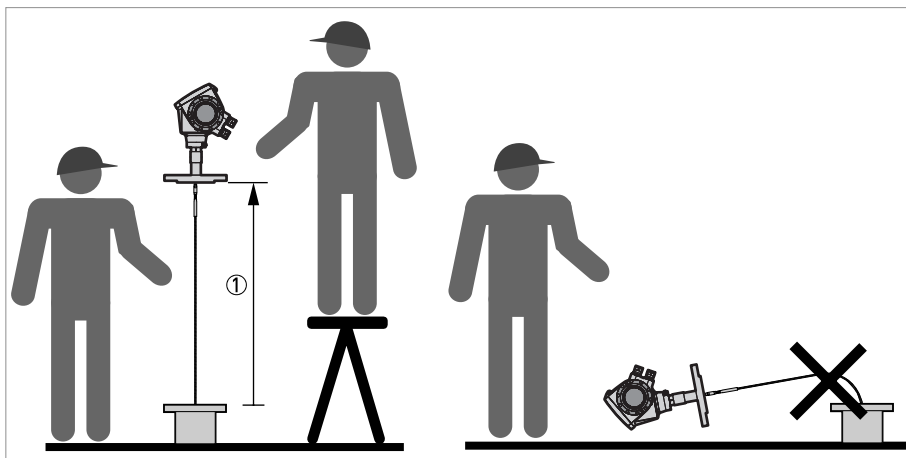


Figure 2-21: Installation of devices with cable probes

- ① >1 m / 3½ ft



- 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.

2.10.7 Installation recommendations for non-metallic tanks and pits



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 $DN \geq 200$ / $\geq 8''$ for flange connections.

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

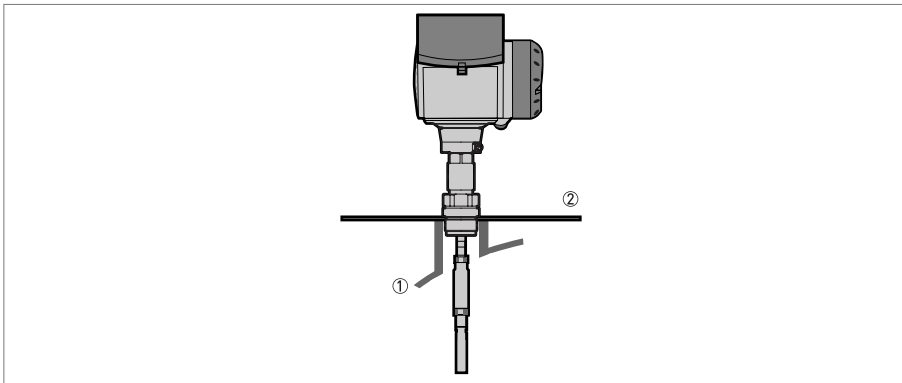


Figure 2-22: Installation in a non-metallic tank or pit with a thread connection

- ① Non-metallic (plastic...) tank or pit
- ② Metal sheet, $\varnothing \geq 200$ mm / 8"



CAUTION!

When the device is installed, make sure that the tank roof has no deformation.

2.10.8 How to assemble the remote housing

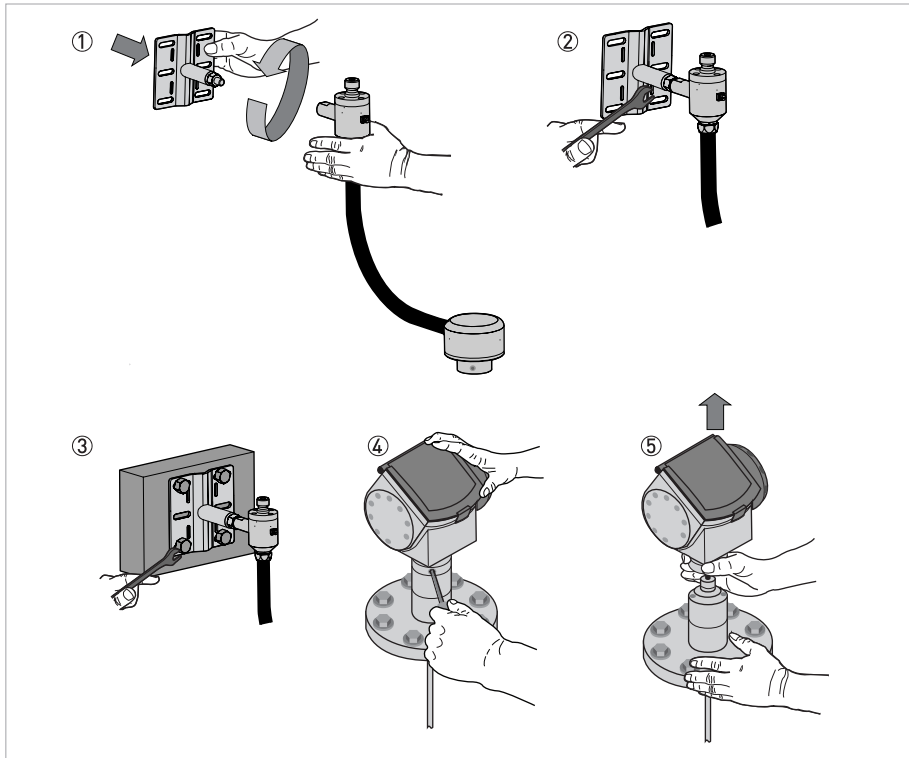


Figure 2-23: Part 1 of assembly procedure



- Attach the wall bracket ① to the flexible conduit.
- Tighten the locking nut ② with a 24 mm wrench.
- Attach the wall bracket to a wall or pipe (DN50...100 / 2"...4") ③.
- Loosen the housing locking screw ④ with a 5 mm Allen wrench.
- Remove the housing ⑤.

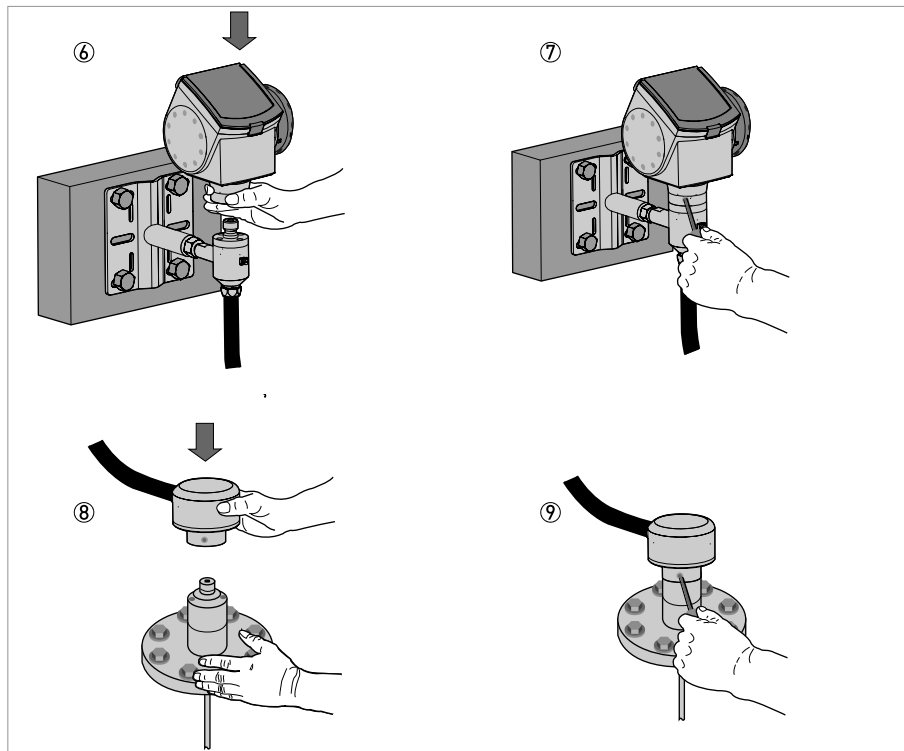


Figure 2-24: Part 2 of the assembly procedure



- Attach the housing to the flexible conduit ⑥.
- Tighten the housing locking screw ⑦.
- Attach the flexible conduit to the probe ⑧.
- Tighten the flexible conduit locking screw ⑨.

You can attach the wall bracket of the remote housing to a wall or pipe (DN50...100 / 2"...4"). These are the dimensions:

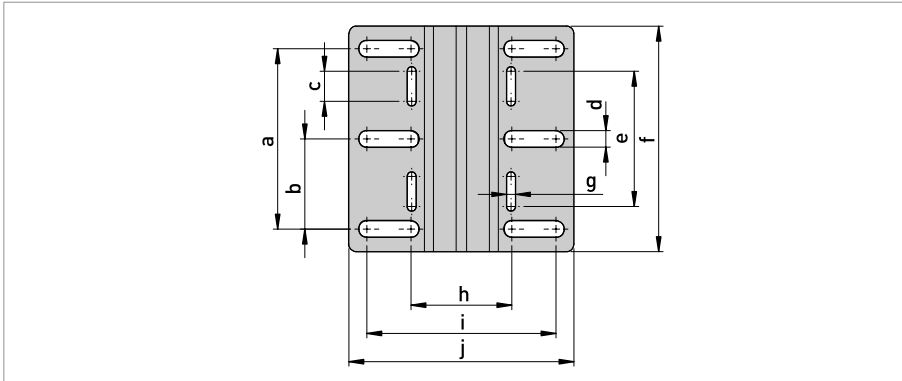


Figure 2-25: Dimensions of the wall bracket

Dimensions in mm

	Dimensions [mm]									
	a	b	c	d	e	f	g	h	i	j
Wall bracket	120	60	20	11	90	150	6	67.4	126.4	150.4

Dimensions in inches

	Dimensions [inches]									
	a	b	c	d	e	f	g	h	i	j
Wall bracket	4.7	2.4	0.8	0.4	3.5	5.9	0.2	2.65	4.98	5.92

2.10.9 How to turn or remove the signal converter



INFORMATION!
The converter turns 360°.

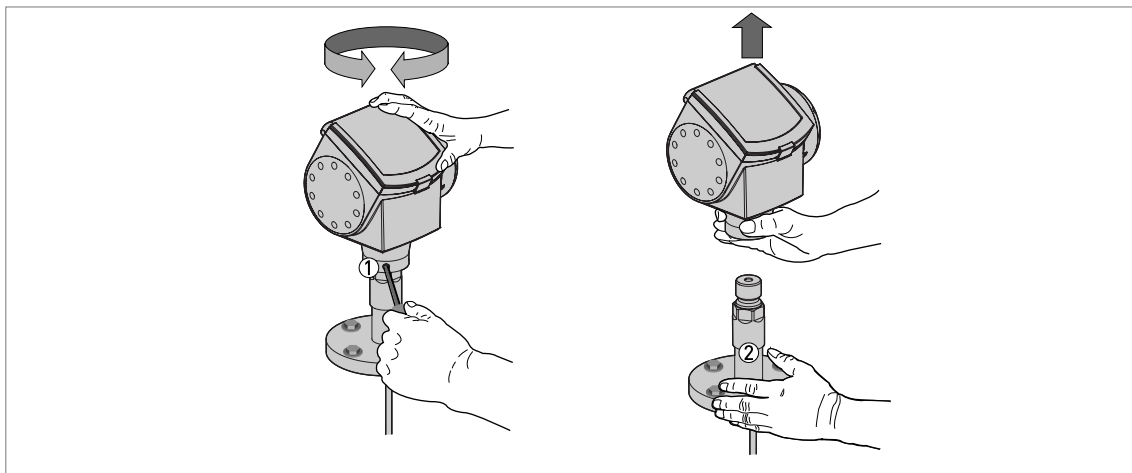


Figure 2-26: How to turn or remove the signal converter

Tool: 5 mm Allen wrench



How to turn the signal converter

- Loosen the housing locking screw ① with a 5 mm Allen wrench.
- Turn the housing to the correct position.
- Tighten the housing locking screw ①.



How to remove the signal converter

- Loosen the housing locking screw ① with a 5 mm Allen wrench.
- Remove the housing.
- Tighten the housing locking screw ①.



How to attach the signal converter

- Loosen the housing locking screw ① with a 5 mm Allen wrench.
- Attach the housing.
- Tighten the housing locking screw ①.



CAUTION!
If you remove the housing, put a cover on the coaxial hole on top of the flange assembly ②.

2.10.10 How to attach the weather protection to the device

Equipment needed:

- Device
- Weather protection (option)
- 10 mm wrench (not supplied)

Refer to "Technical data: Dimensions and weight", for the overall dimensions of the weather protection.

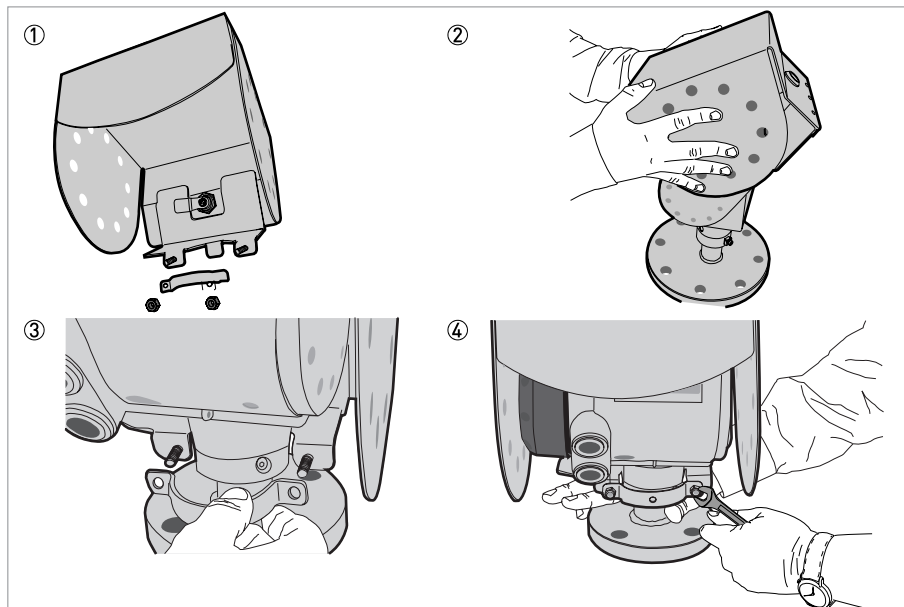


Figure 2-27: Installation of the weather protection



- Loosen the bracket nuts on the weather protection. Remove the bracket.
- Lower the weather protection onto the device. Turn the weather protection so that the keyhole points forward.
- Attach the bracket.
- Lift the weather protection to the top of the housing support pillar. Hold the weather protection in the correct position and tighten the bracket nuts.

2.10.11 How to open the weather protection

Equipment needed:

- Weather protection attached to the device.
- Large slotted tip screwdriver (not supplied).

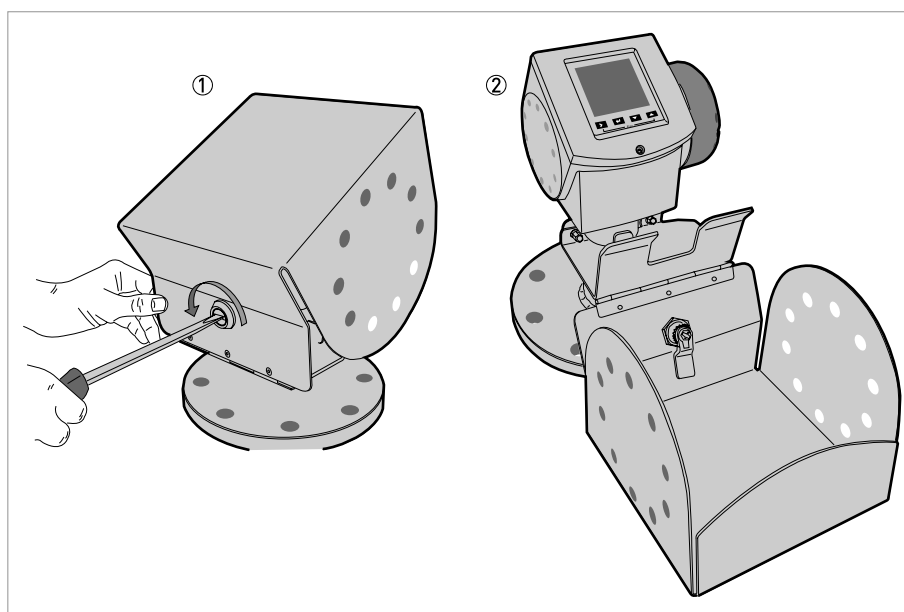


Figure 2-28: How to open the weather protection

- ① Weather protection in its closed position
- ② Weather protection in its open position. Minimum clearance in front of the device: 300 mm / 12".



- Put a large slotted tip screwdriver into the keyhole at the front of the weather protection. Turn the screwdriver counterclockwise.
- Pull the top of weather protection up and forward.
- ➡ This will open the weather protection.

2.11 Electromagnetic compatibility

The device design agrees with European Standard EN 61326-1 and EN 61326-2-3 when installed in metallic tanks.

You can install the device on open-air tanks and tanks that are not made of metal. This agrees with Emissions requirements for industrial environments (class A). For data on Immunity requirements, refer 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) emissions and industrial-class (class A) immunity requirements 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 Safety instructions

**DANGER!**

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**WARNING!**

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

**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.

3.2 Electrical installation: outputs 1 and 2

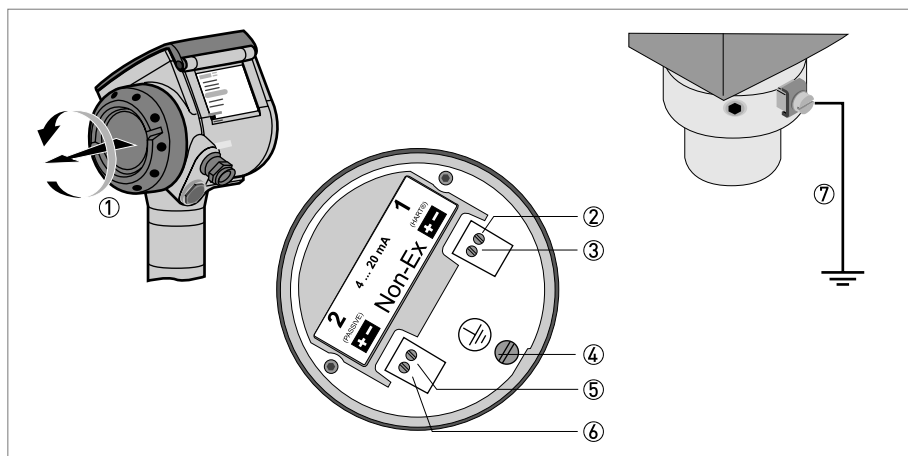


Figure 3-1: Electrical installation

- ① Terminal compartment cover
- ② Output 1: current output -
- ③ Output 1: current output +
- ④ Grounding terminal in the housing
- ⑤ Output 2: current output -
- ⑥ Output 2: current output +
- ⑦ Grounding terminal between the process connection and the converter

Output 1 energizes the device and is used for HART[®] communication. If the device has the second current output option, use a separate power supply to energize output 2.

**Procedure:**

- Remove the housing terminal compartment cover ①.
- Connect the wires to the device. Obey the national electrical codes.
- Make sure that the polarity of the wires is correct.
- Attach the ground to ④ or ⑦. Both terminals are technically equivalent.

**INFORMATION!**

If the polarity is not correct, this will not cause damage to the device. But the device will not operate and the output will be 0 mA.

3.3 Electrical connection for current output

3.3.1 Non-Ex

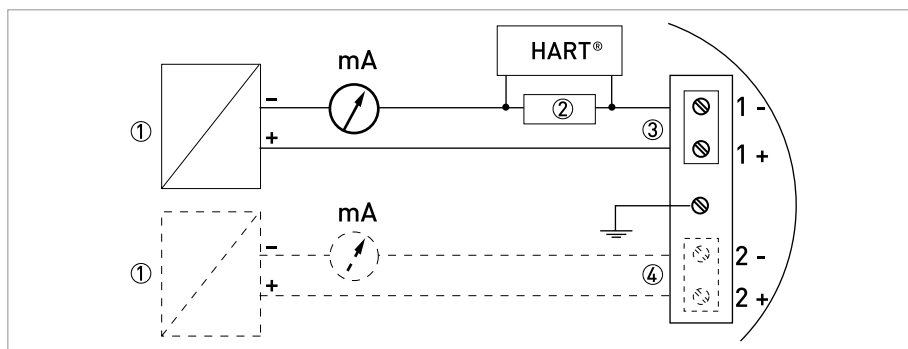


Figure 3-2: Electrical connections for non-Ex devices

- ① Power supply
- ② Resistor for HART® communication
- ③ Output 1: 14...30 VDC for an output of 22 mA at the terminal
- ④ Output 2: 10...30 VDC for an output of 22 mA at the terminal

3.3.2 Ex i

**DANGER!**

For electrical data for Ex i applications, refer to the Ex supplements. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

3.3.3 Ex d

**DANGER!**

For electrical data for Ex d applications, refer to the Ex supplements. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

3.3.4 PROFIBUS PA

For electrical data for PROFIBUS PA networks, refer to the PROFIBUS PA supplement. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

3.3.5 FOUNDATION Fieldbus

For electrical data for FOUNDATION Fieldbus networks, refer to the FOUNDATION Fieldbus supplement. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

3.4 Protection category



INFORMATION!

The device fulfills all requirements per protection class IP 66/67 (equivalent to NEMA type 4X (housing) and type 6P (probe)).



DANGER!

Make sure that the cable gland is watertight.

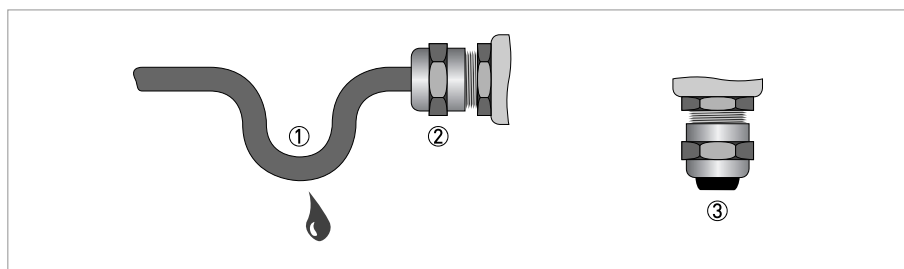


Figure 3-3: How to make the installation agree with protection category IP 67



- 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.

4.1 Start-up checklist

Check these points before you energize the device:

- Are all the wetted components (probe, flange and gaskets) resistant to the product in the tank?
- Does the information on the signal converter nameplate agree with the operating data?
- Did you correctly install the device on the tank?
- Do the electrical connections agree with the national electrical codes?



DANGER!

Before you energize the device, make sure that the polarity and the supply voltage are correct.



DANGER!

Make sure that the device and the installation agrees with the requirements of the Ex certificate of compliance.

4.2 Operating concept

You can read measurements and configure the device with:

- A digital display screen (optional).
- A connection to a system or PC with PACTware™. You can download the Device Type Manager (DTM) file from the internet site. It is also supplied on the CD-ROM delivered with the device.
- A connection to a system or PC with AMST™. You can download the Device Description (DD) file from the internet site. It is also supplied on the CD-ROM delivered with the device.
- A connection to a HART® Handheld Communicator.

4.3 Digital display screen

4.3.1 Local display screen layout



Figure 4-1: Local display screen layout

- ① Error icon
- ② Tag number or menu name
- ③ Selected menu item (gray text cannot be selected)
- ④ \triangle ∇ : scroll up/scroll down
- ⑤ Keypad buttons (refer to the table below)

4.3.2 Keypad buttons

Keypad button	Description
	Right
	Return
	Down
	Up
	Esc (Escape)

For data on keypad functions, refer to the **Operation** section in the Handbook.

4.3.3 Help screens

When you are in supervisor mode, the local display helps you to configure the device. If you do not touch any keys after 30 seconds, a help message is displayed. This will explain what the menu is and what the parameters do. Press > and \triangle (Esc) at the same time to go back to the menu. If you do not touch the display for another 30 seconds, the message is shown again.

4.3.4 How to start the device



- Connect the converter to the power supply.
- Energize the converter.
- ➡ After 30 seconds the screen will display "booting up", "starting up" and then the default screen will appear.
- The device will display readings.
- ➡ Measurements agree with specifications given in the customer order.



CAUTION!

If the manufacturer received information about the installation, the device will display readings correctly. If not, refer to the quick setup procedures in the handbook.

4.4 Remote communication with PACTware™

PACTware™ displays measurement information clearly and lets you configure the device from a remote location. It is an Open Source, open configuration software for all field devices. It uses Field Device Tool (FDT) technology. FDT is a communication standard for sending information between the system and the field device. This standard agrees with IEC PAS 62453. Field devices are easily integrated. Installation is supported by a user-friendly Wizard.

Install these software programs and equipment:

- Microsoft® .NET Framework version 1.1 or later.
- PACTware.
- HART® converter (USB, RS232...).
- The Device Type Manager for the device.

The software and installation instructions are given on the CD-ROM supplied with the device.

You can also download the latest version of PACTware™ and the DTM from our internet site.

Refer also to the PACTware™ consortium site at <http://www.pactware.de>.

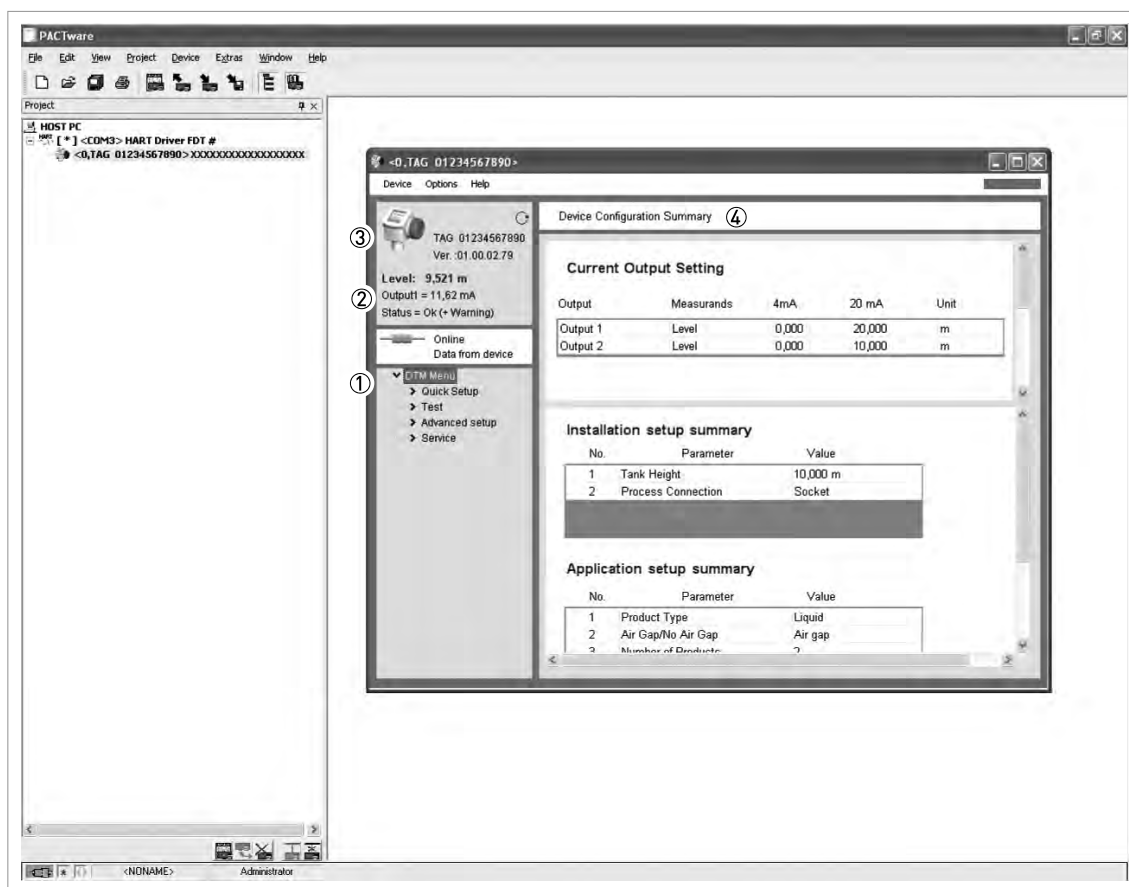


Figure 4-2: Screen from the PACTware™ user interface

- ① DTM menu
- ② Basic measurement information: level, current output and device status
- ③ Information for device identification
- ④ Configuration summary

4.5 Remote communication with the AMS™ Device Manager

The AMS™ Device Manager is an industrial Plant Asset Management (PAM) software tool. Its role is to:

- Store configuration information for each device.
- Support HART® and Fieldbus FOUNDATION™ devices.
- Store and read process data.
- Store and read diagnostic status information.
- Help plan preventive maintenance to reduce a plant's downtime to a minimum.

The DD file is given on the CD-ROM supplied with the device. You can also download it from our internet site.

5.1 Technical data



INFORMATION!

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).

Measuring system

Measuring principle	2-wire loop-powered level transmitter; Time Domain Reflectometry (TDR)
Application range	Level measurement of liquids, pastes, slurries, powders and granulates
Primary measured value	Time between the emitted and received signal
Secondary measured value	Distance, level, volume, mass and/or interface

Design

Construction	The measurement system consists of a measuring sensor (probe) and a signal converter which is available in a compact or remote version
Options	Integrated LCD display with sun cover (-20...+60°C / -4...+140°F); if the ambient temperature is not in these limits, the display switches off
	2nd current output
	ESD protection (max. 30 kV)
	Metaglas® (dual process sealing system for dangerous products (ammonia, chlorine, ...)) ①
	Remote housing connected to the probe via a flexible conduit Standard lengths: 2 m / 6.6 ft, 4.5 m / 14.8 ft, 9.5 m / 31.2 ft and 14.5 m / 47.6 ft
	Probe end types (not for rod and coaxial probes) Standard: Counterweights (refer to counterweight dimensions in "Technical data: Dimensions and weights" in the handbook.) Options: Turnbuckle, chuck, threaded end, crimped end, open end
Accessories	Weather protection
Max. measuring range	Double rod Ø8 mm / 0.3": 4 m / 13 ft
	Single rod Ø8 mm / 0.3": 4 m / 13 ft
	Single rod Ø8 mm / 0.3" (segmented): 6 m / 20 ft
	Coaxial Ø22 mm / 0.9": 6 m / 20 ft
	Coaxial Ø22 mm / 0.9" (segmented): 6 m / 20 ft
	Double cable Ø4 mm / 0.15": 8 m / 26 ft
	Single cable Ø2 mm / 0.08": 35 m / 115 ft (for liquids only)
	Single cable Ø4 mm / 0.15": 35 m / 115 ft (For liquids only. An angled probe is available on request for installations with very low ceilings or objects in the tank that prevent installation on top of the tank.)
	Single cable Ø8 mm / 0.3": 35 m / 115 ft (For solids only. Tolerance, probe length: -1%/+0%.)
Dead zone	This depends on the type of probe. For more data, refer to <i>Measurement limits</i> on page 43.
Display and User interface	
Display	LCD display
	9 lines, 160×160 pixels in 8-step grayscale with 4-button keypad
Interface languages	English, German, French, Italian, Spanish, Portuguese, Japanese, Chinese (Mandarin) and Russian

Accuracy

Resolution	1 mm / 0.04"
Repeatability	±1 mm / ±0.04"
Accuracy (in direct mode)	<p>Liquids: ±3 mm / ±0.12", when distance < 10 m / 33 ft; ±0.03% of measured distance, when distance > 10 m / 33 ft</p> <p>Powders: ±20 mm / ±0.8"</p> <p>Interface: ±10 mm / ±0.4" (ϵ_r constant)</p>
Accuracy (in TBF mode)	±20 mm / ±0.8" (ϵ_r constant)
Minimum layer (interface)	50 mm / 2"
Reference conditions acc. to EN 60770	
Temperature	+20°C ±5°C / +68°F ±10°F
Pressure	1013 mbara ±20 mbar / 14.69 psia ±0.29 psi
Relative air humidity	60% ±15%

Operating conditions

Temperature	
Ambient temperature	-40...+80°C / -40...+175°F (Ex: see supplementary operating instructions or approval certificates)
Storage temperature	-40...+85°C / -40...+185°F
Process connection temperature	<p>Standard -40...+200°C / -40...+390°F (according to the temperature limits of the gasket material. Refer to "Material" in this table.) (Ex: see supplementary operating instructions or approval certificates) ②</p> <p>High-Temperature (HT) and High-Temperature / High-Pressure (HT/HP) versions with FKM/FPM and Kalrez® 6375 gaskets +300°C / +570°F (single cable Ø2 mm / 0.08" probe only) (Ex: see supplementary operating instructions or approval certificates) ②</p> <p>HT and HT/HP versions with EPDM gaskets +250°C / +480°F (single cable Ø2 mm / 0.08" probe only) (Ex: see supplementary operating instructions or approval certificates) ②</p>
Thermal shock resistance	100°C/min
Pressure	
Operating pressure	<p>Single cable Ø8 mm / 0.3" probe -1...40 barg / -14.5...580 psig subject to process connection temperature and probe type used ②</p> <p>High-Pressure (HP) version max. 300 barg / 4350 psig (single cable Ø2 mm / 0.08" probe only) subject to process connection temperature and probe type used ②</p> <p>All other probe types -1...100 barg / -14.5...1450 psig subject to process connection temperature and probe type used ②</p>

Other conditions	
Dielectric constant (ϵ_r)	Level in direct mode: ≥ 1.4 for coaxial probe; ≥ 1.6 for single and double probes
	Interface in direct mode: $\epsilon_r(\text{interface}) \gg \epsilon_r(\text{level})^2$
	Level in TBF mode: ≥ 1.1
Vibration resistance	IEC 60068-2-6 and EN 50178 (10...57 Hz: 0.075 mm / 57...150 Hz:1g)
Protection category	IP 66/67 equivalent to NEMA 6-6X

Installation conditions

Process connection size	Refer to "Installation: How to prepare the tank before you install the device" and "Technical data: Measurement limits"
Process connection position	Make sure that there are not any obstructions directly below the process connection for the device.
Dimensions and weights	Refer to "Technical data: Dimensions and weights" in the Handbook

Material

Housing	Standard: Aluminium
	Option: Stainless steel (1.4404 / 316L)
Single rod (single-piece)	Standard: Stainless steel (1.4404 / 316L)
	Option: Hastelloy [®] C-22 (2.4602) ③
	On request: Stainless steel (1.4404 / 316L) in a PVC, PVDF or PP protective sheath
	On request: Monel; Tantalum; Titanium; Duplex
Single rod (segmented)	Standard: Stainless steel (1.4404 / 316L)
Double rod	Standard: Stainless steel (1.4404 / 316L)
	Option: Hastelloy [®] C-22 (2.4602)
	On request: Monel; Tantalum; Titanium; Duplex
Coaxial (single-piece)	Standard: Stainless steel (1.4404 / 316L)
	Option: Hastelloy [®] C-22 (2.4602)
Coaxial (segmented)	Standard: Stainless steel (1.4404 / 316L)
Single cable	Standard: Stainless steel (1.4401 / 316)
	Option: Hastelloy [®] C-22 (2.4602) - only for the $\varnothing 2$ mm / 0.08" or $\varnothing 4$ mm / 0.15" single cable probes
	On request: FEP-coated stainless steel (-20...+150°C / -4...+300°F) - only for the $\varnothing 4$ mm / 0.15" single cable probe
Double cable	Stainless steel (1.4401 / 316)
Process fitting	Standard: Stainless steel (1.4404 / 316 L)
	Option: Hastelloy [®] C-22 (2.4602)
	On request: Monel; Tantalum; Titanium; Duplex
Gaskets	FKM/FPM (-40...+200°C / -40...+390°F); Kalrez [®] 6375 (-20...+200°C / -4...+390°F); EPDM (-50...+150°C / -58...+300°F) - all probes except single cable $\varnothing 8$ mm / 0.3" ④
Weather protection (Option)	Stainless steel (1.4301 / 304)
Protective sheath (On request for single rod only)	PP (-40...+90°C / -40...+194°F); PVC (-15...+80°C / +5...+176°F); PVDF (-40...+150°C / -40...+300°F)
Conduit for remote housing (Option)	Zinc-coated steel in a PVC sheath (-40...+105°C / -40...+220°F)

Process connections

Thread	
Single cable Ø2 mm / 0.08"	G ½; ½ NPT; ½ NPTF (for the HT/HP version)
Single cable Ø8 mm / 0.3"	G 1½; 1½ NPT
All other probes	G ¾...1½; ¾...1½ NPT
Flange versions for single cable Ø8 mm / 0.3", double rod and double cable probes	
EN	DN40...150 in PN16, PN40, PN63 or PN100; others on request
ASME	1½"...8" in 150 lb, 1½"...6" in 300 lb, 1½"...4" in 600 lb or 900 lb; 1½"...2" in 1500 lb; others on request
JIS	40...100A in 10K; others on request
Flange versions for single cable Ø2 mm / 0.08" probe	
EN	DN25...150 in PN16, PN40, PN63 or PN100; others on request
ASME	1"...8" in 150 lb, 1½"...6" in 300 lb, 1"...4" in 600 lb or 900 lb, 1"...2" in 1500 lb, 1" in 2500 lb; others on request
JIS	40...100A in 10K; others on request
Flange versions for all other probes	
EN	DN25...150 in PN16, PN40, PN63 or PN100; others on request
ASME	1"...8" in 150 lb, 1½"...6" in 300 lb, 1"...4" in 600 lb or 900 lb, 1"...2" in 1500 lb; others on request
JIS	40...100A in 10K; others on request
Other options for single and double rod probes	
SMS	Available on request
Tri-clamp	Available on request
Others	Others on request

Electrical connections

Power supply	Terminals output 1 - Non-Ex / Ex i: 14...30 VDC; min./max. value for an output of 22 mA at the terminal
	Terminals output 1 - Ex d: 20...36 VDC; min./max. value for an output of 22 mA at the terminal
	Terminals output 2 - Non-Ex / Ex i / Ex d: 10...30 VDC; min./max. value for an output of 22 mA at the terminal (additional power supply needed - output only)
Cable entry	M20×1.5; ½ NPT
	G ½ (not for FM- and CSA-approved devices. Not for stainless steel housings.)
	M25×1.5 (for stainless steel housings only)
Cable gland	Standard: none
	Options: M20×1.5 (for non-Ex and Ex-approved devices with M20×1.5 and M25×1.5 cable entries); others are available on request
Cable entry capacity (terminal)	0.5...1.5 mm ²

Input and output

Current output	
Output signal (Output 1)	4...20 mA HART® or 3.8...20.5 mA acc. to NAMUR NE 43 ⑤
Output signal (Output 2 - optional)	4...20 mA (no HART® signal) or 3.8...20.5 mA acc. to NAMUR NE 43 (optional)

Resolution	±3 µA
Temperature drift	Typically 50 ppm/K
Error signal	High: 22 mA; Low: 3.6 mA acc. to NAMUR NE 43
PROFIBUS PA	
Type	4-wire (+ local HART) level transmitter; Time Domain Reflectometry (TDR)
Function blocks	11 (level, distance, interface level, interface distance, layer, interface conversion, ullage conversion, layer conversion, level conversion, level mass and distance mass)
Protocol / Communication standard	PROFIBUS PA protocol that agrees with IEC 61158-2, galvanically isolated
Physical layer types	Standard power signaling, bus powered, non I.S.
Other features	Bus interface with integrated reverse polarity protection
Device power supply (24 V input)	18...30 VDC
Current consumption on PROFIBUS network	20 mA
Output data	Level, distance, interface level, interface distance, layer, interface conversion, ullage conversion, layer conversion, level conversion, level mass and distance mass
Input data	None
Error current FDE	Typically 0 mA (FDE =Fault Disconnection Electronic)
Address range	0...125. Default address: 126.
FOUNDATION Fieldbus	
Type	4-wire (+ local HART) level transmitter; Time Domain Reflectometry (TDR)
Function blocks	1 × Resource Block (RB), 4 × Analog Input Blocks (AI), 1 × Transducer Block (TB) Analog Input Block: 50 ms
Protocol / Communication standard	Foundation Fieldbus protocol that agrees with IEC 61158-2, galvanically isolated
ITK version	5.1
Physical layer types	Standard power signaling, bus powered, non I.S.
Other features	Bus interface with integrated reverse polarity protection
Device power supply (24 V input)	18...30 VDC
Bus power supply	9...32 VDC (non-Ex); 9...17.5 VDC (intrinsically-safe)
Basic current	20 mA
Maximum error current	20 mA
Start current after 10 ms	20 mA
Polar sensitivity	Yes
Minimum cycle time	100 ms
Output data	Level, distance, level conversion, interface level, interface distance, layer, interface conversion, ullage conversion, layer conversion, level conversion, level mass or distance mass
Input data	None
Error current FDE	Typically 0 mA (FDE =Fault Disconnection Electronic)
Link Master function	Not supported

Approvals and certification

CE	This device fulfills the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Explosion protection	
ATEX (approval for fieldbus outputs pending)	ATEX II 1 G, 1/2 G, 2 G Ex ia IIC T6...T2;
	ATEX II 1 D, 1/2 D, 2 D Ex iaD 20 or Ex iaD 20/21 IP6X T70°C...T95°C;
	ATEX II 1/2 G, 2 G Ex d[ia] IIC T6...T2 ;
	ATEX II 1/2 D, 2 D Ex tD[iaD] A21/20 IP6X T70°C...T95°C;
ATEX II 3 G Ex nA IIC T6...T2	
IECEx (approval for fieldbus outputs options pending)	Ex ia IIC T6...T3 Ga; Ex iaD 20 IP6X T70°C...T95°C;
	Ex d[ia] IIC T6...T3 Ga/Gb; Ex tD[iaD] A21/20 IP6X T70°C...T95°C
FM - Dual Seal-approved (approval for fieldbus output options pending)	NEC 500
	XP-IS, Cl. I, Div. 1, Gr. ABCD T6...T2;
	DIP, Cl. II/III, Div. 1, Gr. EFG T6...T2;
	IS, Cl. I/II/III, Div. 1, Gr. ABCDEFG T6...T2;
	NI, Cl. I, Div. 2, Gr. ABCD T6...T2
	NEC 505
	Cl. I, Zone 0, AEx d[ia] IIC T6...T2;
	Cl. I, Zone 0, AEx ia IIC T6...T2;
	Cl. I, Zone 2, AEx nA[ia] IIC T6...T2
Hazardous (Classified) Locations, indoor/outdoor Type 4X and 6P, IP66, Dual Seal	
CSA - Dual Seal-approved (approval for Drop antenna, hygienic antenna and fieldbus output options pending)	CEC Section 18 (Zone ratings)
	Cl. I, Zone 1, Ex d, IIC (Probe: Zone 0) T6...T2;
	Cl. I, Zone 0, Ex ia, IIC T6...T2;
	Cl. I, Zone 2, Ex nA, IIC T6...T2
	CEC Section 18 and Annex J (Division ratings)
	XP-IS, Cl. I, Div. 2, Gr. ABCD; Cl. II, Div. 2, Gr. FG; Cl. III, Div. 2 T6...T2;
IS, Cl. I, Div. 1, Gr. ABCD; Cl. II, Gr. FG; Cl. III T6...T2	
NEPSI	Ex dia IIC T2~T6; Ex ia IIC T2~T6
CEPEL / INMETRO	BR-Ex ia IIC T2...T6; BR-Ex d[ia] IIC T2...T6
Other standards and approvals	
EMC	Electromagnetic Compatibility Directive 2004/108/EC in conjunction with EN 61326-1 (2006) and EN 61326-2-3 (2006). The device agrees with this standard if: - the device has a coaxial probe or - the device has a single / double probe that is installed in a metallic tank. For more data, refer to <i>Electromagnetic compatibility</i> on page 29.
NAMUR	NAMUR NE 21 Electromagnetic Compatibility (EMC) of Industrial Process and Laboratory Control Equipment
	NAMUR NE 43 Standardization of the Signal Level for the Failure Information of Digital Transmitters
WHG (pending)	In conformity with the German Federal Water Act, §9
Construction code	On request: NACE MR0175 / ISO 15156

① Metaglas® is a registered trademark of Herberts Industrieglas, GMBH & Co., KG

② Refer to the Pressure/Temperature table for probe selection

③ Hastelloy® is a registered trademark of Haynes International, Inc.

④ Kalrez® is a registered trademark of DuPont Performance Elastomers L.L.C.

⑤ HART® is a registered trademark of the HART Communication Foundation

5.2 Measurement limits

For more data, refer to the handbook.



KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
D-47058 Duisburg (Germany)
Tel.: +49 (0)203 301 0
Fax: +49 (0)203 301 10389
info@krohne.de

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

KROHNE