



OPTIFLEX 6200 C/F Technical Datasheet

Guided radar (TDR) level transmitter for solids from granulates to powders

- Designed to withstand high traction loads
- Aluminium and stainless steel housing, compact and remote up to 100 m / 328 ft
- Insensitive to dusty atmosphere and deposits on the probe

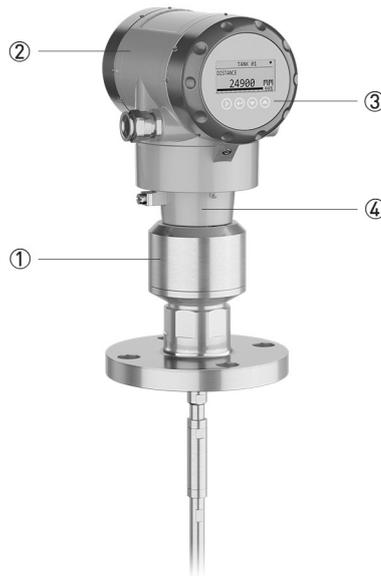
HART
COMMUNICATION PROTOCOL



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1.1 The modular TDR level transmitter for measuring granulates and powders

This device is a TDR level transmitter for measuring distance, level, volume and mass of solids. Designed specifically for solids, it is capable of withstanding high traction loads up to 3.5 tonnes, has a high level of protection against electrostatic discharge (ESD) and has an algorithm for measuring products that have low reflective properties.



- ① Designed to withstand high traction loads (<3500 kg / 7715 lb)
- ② Aluminium or stainless steel housing
- ③ Optional LCD screen with 4-button keypad
- ④ Quick coupling system: converter is rotatable and removable under process conditions

The display can be ordered with the device or as an accessory. It shows measurement data on a 128 × 64 pixel screen. The configuration menu permits the device to be set up in a small number of intuitive steps.

Highlights

- Process conditions up to +200°C / +392°F and 40 barg / 580 psig
- 2-wire 4...20 mA (HART® 7) with optional second output (current or switch/relay)
- ±2 mm / ±0.08" accuracy
- Measuring distance up to 40 m / 131.23 ft
- SIL 2/3-compliant: 1 current output, 2 current outputs, or 1 current output + 1 switch output (relay)
- Specific algorithm for low-reflective media
- 3-year warranty
- Real-time clock for event logging
- Various converter and electronic versions to facilitate access to the device:
 - Remote converter up to 100 m / 328.08 ft from the probe
 - Horizontal or vertical housing to suit every installation
- Quick setup assistant for easy commissioning

- Display keypad directly accessible without opening the cover
- Diagnosis functions supply data according to NAMUR NE 107
- PACTware™, HART® DD and DTM provided free of charge with full functionality

Industries

- Metals, Minerals & Mining
- Chemical
- Agri-food

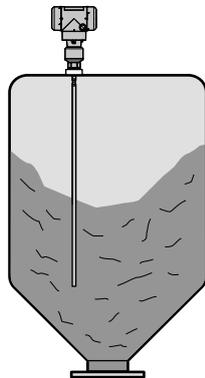
Applications

Solids from granulates to powders ≤ 40 m / 131.23 ft; $\leq +200^{\circ}\text{C}$ / $+392^{\circ}\text{F}$; ≤ 40 barg / 580 psig. This includes plastic granulates (PPC, PVC, PE, LDPE, PP), tobacco, lime, soap powder, milk powder, coffee powder, chocolate powder, silica, gypsum, starch, fly ash, fine powders and cement.

- Buffer silos
- Bulk storage containers
- Hoppers

1.2 Applications

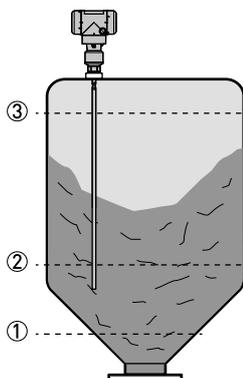
1. Level measurement of solids



The level transmitter has a $\varnothing 16$ mm / 0.63" single cable probe for measuring powders and granulates in silos up to 4 m / 13.12 ft high. It does not require any calibration: it is only necessary to adapt the probe length and do a short configuration procedure.

For silos up to 40 m / 131.2 ft high, the level transmitter also has a $\varnothing 8$ mm / 0.32" single cable probe.

2. Volume measurement



A conversion table (strapping table) function is available in the configuration menu for volume or mass measurement. Up to 30 volume values can be related to level values. For example:

Level ① = 2 m / Volume ① = e.g. 0.7 m³

Level ② = 10 m / Volume ② = e.g. 5 m³

Level ③ = 20 m / Volume ③ = e.g. 17 m³

This data permits the device to calculate volumes between strapping table entries.

1.3 Product family

OPTIFLEX 1100 C

for continuous measurement of liquids and solids up to 16 barg (232 psig) and +100°C (+212°F)



OPTIFLEX 1100 C is a 2-wire TDR level transmitter for measuring distance, level, volume and mass of liquids and solids. Its simple, compact design allows technicians to quickly assemble the probe and attach it to a threaded connection. It is an affordable solution for applications that do not require a high level of accuracy and is also an excellent alternative to traditional level controls such as RF Capacitance, conductive and DP transmitters.

It is ideal for level measurement in buffer tanks, collectors and simple process applications and silo level monitoring in quarrying and agriculture.

OPTIFLEX 3200 C/F

for liquids with hygienic requirements up to 40 barg (580 psig) and +150°C (+302°F)



This TDR level transmitter, with its hygienic design, is ideal for measuring measure level and interface in small vessels and tanks with CIP/SIP cycles. It can also be installed in tanks up to 4 m / 13.12 ft high.

This device has a single rod probe made of stainless steel with a surface roughness of $R_a < 0.76 \mu\text{m} / 30 \mu\text{in} - \text{AARRH}$, and large selection of process connections for hygienic applications.

OPTIFLEX 6200 C/F**for solids from granulates to powders up to 40 barg (580 psig) and +200°C (392°F)**

This level transmitter measures granulates and powders in deep pits or high containers. It has a maximum measuring distance of 40 m / 131.2 ft.

Its durable design can withstand traction loads up to 3500 kg (7700 lb) and electrostatic discharges up to 30 kV. A specially developed set of algorithms also permits the device to accurately measure the level of low-reflective media.

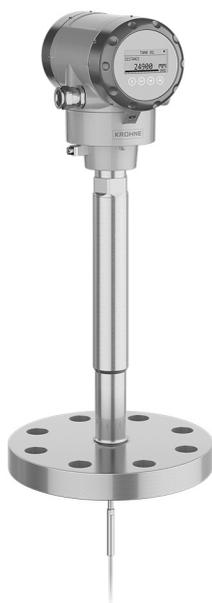
OPTIFLEX 7200 C/F/S/D**for liquids in storage and process applications up to 100 barg (1450 psig) and 250°C (482°F)**

The OPTIFLEX 7200 is designed specifically for measuring level and interface in the chemical, oil and gas industries. It can be used in high tanks (max. height 60 m / 197 ft) and pressure vessels.

It has many probe options, making it suitable for a wide range of process conditions. It can also measure volatile products such as carbon disulphide using the reversed interface probe.

OPTIFLEX 8200 C/F/S

for liquids at high temperature and pressure up to 320 barg (4641 psig) and 315°C (599°F)



This level transmitter is designed specifically for measuring level and interface in extreme conditions such as boilers in the power, oil and gas industries.

It can be used in very high tanks (max. height 60 m / 197 ft). It can be equipped with a stainless steel housing for corrosive environments.

1.4 Application table for probe selection

	Single rod	Single cable
Maximum probe length, L		
4 m / 13 ft		
40 m / 131 ft		
Solids		
Powders		
Granules, <5 mm / 0.2"		

Maximum probe length, L

	Single rod	Single cable
4 m / 13 ft		
40 m / 131 ft		

Solids

	Single rod	Single cable
Powders		
Granules, <5 mm / 0.2"		

■ standard ■ optional □ on request

1.5 Measuring principle

This Guided Radar (TDR) level meter has been developed from a proven technology called Time Domain Reflectometry (TDR).

The device transmits low-intensity electromagnetic pulses of approximately one nanosecond width along a rigid or flexible conductor. These pulses move at the speed of light. When the pulses reach the surface of the product to be measured, the pulses are reflected with an intensity that depends on the dielectric constant, ϵ_r , of the product.

The device measures the time from when the pulse is emitted to when it is received: half of this time is equivalent to the distance from the reference point of the device (the flange facing) to the surface of the product. The time value is converted into an output current of 4...20 mA and/or a digital signal.

Dust, changes in pressure, changes in temperature and changes in density do not have an effect on device performance.

The illustration that follows shows a snapshot of what a user would see on an oscilloscope, if the level of one product is measured.

Level measurement principle (direct mode)

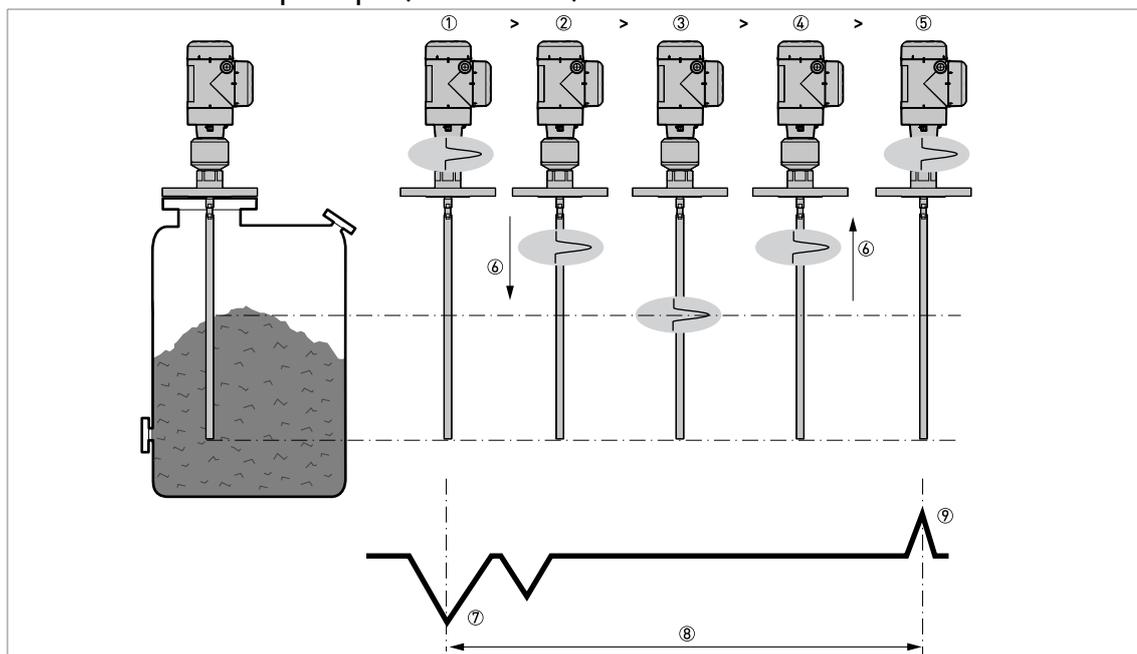


Figure 1-1: Level measurement principle

- ① Time 0: The electromagnetic (EM) pulse is transmitted by the converter
- ② Time 1: The pulse goes down the probe at the speed of light in air, V_1
- ③ Time 2: The pulse is reflected
- ④ Time 3: The pulse goes up the probe at speed, V_1
- ⑤ Time 4: The converter receives the pulse and records the signal
- ⑥ The EM pulse moves at speed, V_1
- ⑦ Transmitted EM pulse
- ⑧ Half of this time is equivalent to the distance from the reference point of the device (the flange facing) to the surface of the product
- ⑨ Received EM pulse

TBF mode (indirect measurement) compares:

- The time for the pulse to go to the probe end and go back to the converter when the tank is empty.
- The time for the pulse to go to the probe end and go back to the converter when the tank is full or partially filled.

The level of the product in the tank can be calculated from the time difference.

2.1 Technical data

- 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 sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

Converter

Measuring system

Application	Level measurement of powders and granulates
Measuring principle	TDR (time domain reflectometry) - guided radar
Primary measured value	Distance
Secondary values	Level, volume and mass
Construction	Compact (C) version: Measuring probe attached directly to a signal converter
	Remote (F) version: Measuring probe installed on a tank and connected by a signal cable (max. length 100 m / 328 ft) to a signal converter

Operating conditions

Ambient temperature	-40...+80°C / -40...+176°F Integrated LCD display: -20...+60°C / -5...+140°F; if the ambient temperature is not in these limits, the display switches off. The device continues to operate correctly.
Storage temperature	-50...+85°C / -58...+185°F (min. -40°C / -40°F for devices with the integrated LCD display option)
ESD protection	max. 30 kV
Ingress protection	IEC 60529: IP66 / IP68 (continuous immersion at a depth of 1.5 m for 2 weeks)
	NEMA 250: NEMA type 4X / 6 (housing) and type 6P (probe)

Materials

Housing	Polyester-coated aluminium or stainless steel (1.4404 / 316L)
Cable entry	Plastic; nickel-plated brass, stainless steel

Electrical connections

Power supply, output 1 (4...20 mA/HART output)	Non-Ex / Ex i: 11.5...30 V DC; min./max. value for an output of 22 mA at the terminals
	Ex d: 13.5...34 V DC; min./max. value for an output of 22 mA at the terminals
Power supply, optional output 2 (4...20 mA output)	Non-Ex / Ex i: 11.5...30 V DC; min./max. value for an output of 22 mA at the terminals (additional power supply needed – output only)
	Ex d: 11.5...34 V DC; min./max. value for an output of 22 mA at the terminals (additional power supply needed – output only)
Power supply, optional input 2 (switch output - relay)	Non-Ex / Ex i: 11.5...30 V DC / 30 mA
	Ex d: 11.5...34 V DC / 30 mA

Current output load	Non-Ex / Ex i: $R_L [\Omega] \leq ((U_{ext} - 11.5 \text{ V})/22 \text{ mA})$. For more data, refer to <i>Minimum power supply voltage</i> on page 17.
	Ex d, output 1: $R_L [\Omega] \leq ((U_{ext} - 13.5 \text{ V})/22 \text{ mA})$. For more data, refer to <i>Minimum power supply voltage</i> on page 17.
	Ex d, output 2: $R_L [\Omega] \leq ((U_{ext} - 11.5 \text{ V})/22 \text{ mA})$. For more data, refer to <i>Minimum power supply voltage</i> on page 17.
Cable entry	M20×1.5; ½ NPT
Cable gland	Standard: none
	Options: M20×1.5, others are available on request
	Cable diameter, output 1: non-Ex / Ex i: 6...7.5 mm / 0.24...0.30"; Ex d: 7...10 mm / 0.28...0.39"; Cable diameter, output 2: non-Ex / Ex i: 6...12 mm / 0.24...0.47"; Ex d: 7...12 mm / 0.28...0.47"
Signal cable – remote version	Relay (1 contact, normally open). SIS 2 Sensitive Series (ELESTA GmbH).
Cable entry capacity (terminal)	0.5...2.5 mm ²

Input and output

Measured variable	Time between the emitted and received signal
Current output / HART®	
Output 1 signal	4...20 mA HART® or 3.8...20.5 mA acc. to NAMUR NE 43
Output 2 signal	4...20 mA or 3.8...20.5 mA acc. to NAMUR NE 43
Resolution	±3 µA
Temperature drift (analog)	Typically 50 ppm/K
Temperature drift (digital)	Max. ±15 mm for the full temperature range
Error signal options	High: 22 mA; Low: 3.6 mA acc. to NAMUR NE 43; Hold (frozen value – not available if the output agrees with NAMUR NE 43 or the device is approved for safety-related systems [SIL])
Switch output - relay (option)	
Description	Relay (1 contact, normally open). SIS 2 Sensitive Series (ELESTA GmbH).
Maximum switching capacity	Non-Ex / Ex d: 48 V AC / 6 A; 24 V DC / 6 A (according to IEC 60947-5-1)
	Ex i / Ex nA: 24 V AC / 1.1 A; 24 V DC / 1.1 A (according to IEC 60947-5-1)
Voltage range	Non-Ex / Ex d: Category AC-1: 5...48 V AC / Category DC-1: 2...24 V DC
	Ex i / Ex nA: Category AC-1: 5...24 V AC / Category DC-1: 2...24 V DC
Current range	0.003...6 A
R _{on-state}	< 100 mΩ at 6 V / 100 mA
Switching capacity range	0.04...288 W (VA)

Display and user interface

User interface options	LCD display (128 × 64 pixels in 8-step greyscale with 4-button keypad)
Languages	English, German, French, Italian, Spanish, Portuguese, Japanese, Chinese (simplified), Russian, Czech, Polish and Turkish

Approvals and certification

CE / UKCA	<p>The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.</p> <p>For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download these documents free of charge from the website (Download Center).</p>
Vibration resistance	<p>Housing: EN 60721-3-4, Category 4M4 (5...8.51 Hz: ±3.5 mm / 8.51...200 Hz: 1g; 15g shock ½sinus: 6 ms) Refer to "Probe options" in this section for the vibration resistance of probes</p>
Explosion protection	
ATEX (Ex ia, Ex ia/db or Ex ia/tb) EU Type Approval UKEX (Ex ia, Ex ia/db or Ex ia/tb) UK Type Approval	Compact version
	II 1/2 G Ex ia IIC T6...T3 Ga/Gb;
	II 1/2 D Ex ia IIIC T85°C...T*°C Da/Db ①
	or...
	II 1/2 G Ex ia/db IIC T6...T3 Ga/Gb;
	II 1/2 D Ex ia/tb IIIC T85°C...T*°C Da/Db ①
	Remote version, converter
	II 2 (1) G Ex ia [ia Ga] IIC T6...T4 Gb;
	II 2 (1) D Ex ia [ia Da] IIIC T85°C...T135°C Db
	or...
	II 2 (1) G Ex db ia [ia Ga] IIC T6...T4 Gb;
	II 2 (1) D Ex ia tb [ia Da] IIIC T80°C...T150°C Db
	Remote version, sensor
	II 1/2 G Ex ia IIC T6...T3 Ga/Gb;
II 1/2 D Ex ia IIIC T85°C...T*°C Da/Db ①	
ATEX (Ex ic or Ex ic nA) Type Approval	Compact version
	II 3 G Ex ic IIC T6...T3 Gc;
	II 3 D Ex ic IIIC T85°C...T*°C Dc ①
	or...
	II 3 G Ex ic nA IIC T6...T3 Gc
	Remote version, converter
	II 3 G Ex ic [ic] IIC T6...T4 Gc;
	II 3 D Ex ic [ic] IIIC T85°C...T135°C Dc
	or...
	II 3 G Ex ic nA [ic] IIC T6...T4 Gc
	Remote version, sensor
	II 3 G Ex ic IIC T6...T3 Gc;
	II 3 D Ex ic IIIC T85°C...T*°C Dc ①

IECEX	Compact version
	Ex ia IIC T6...T3 Ga/Gb;
	Ex ia IIIC T85°C...T*°C Da/Db ①
	or...
	Ex ia/db IIC T6...T3 Ga/Gb;
	Ex ia/tb IIIC T85°C...T200°C Da/Db ①
	or...
	Ex ic IIC T6...T3 Gc;
	Ex ic IIIC T85°C...T*°C Dc ①
	or...
	Ex ic nA IIC T6...T3 Gc
	Remote version, converter
	Ex ia [ia Ga] IIC T6...T4 Gb;
	Ex ia [ia Da] IIIC T85°C...T135°C Db
	or...
	Ex db ia [ia Ga] IIC T6...T4 Gb
	Ex ia tb [ia Da] IIIC T85°C...T135°C Db
	or...
	Ex ic [ic] IIC T6...T4 Gc
	Ex ic [ic] IIIC T85°C...T135°C Dc
	or...
	Ex ic nA [ic] IIC T6...T4 Gc
	Remote version, sensor
	Ex ia IIC T6...T3 Ga/Gb;
	Ex ia IIIC T85°C...T*°C Da/Db ①
	or...
	Ex ic IIC T6...T3 Gc,
Ex ic IIIC T85°C...T*°C Dc ①	

cQPSus – Dual Seal-approved	NEC 500 and CEC Section 18 and Annex J (Division ratings)
	Compact version
	IS, Class I, Div 1, GPS ABCD, T6...T3;
	IS, Class II/III, Div 1, GPS EFG, T85°C...T*°C ①
	or...
	XP-IS, Class I, Div 1, GPS A (US only) BCD, T6...T3;
	DIP-IS, Class II/III, Div 1, GPS EFG, T85°C...T*°C ①
	or...
	NI, Class I, Div 2, GPS ABCD, T6...T3;
	NI, Class II/III, Div 2, GPS FG, T85°C...T*°C ①
	Remote version, converter
	IS, Class I, Div 1, GPS ABCD, T6...T4;
	IS, Class II/III, Div 1, GPS EFG, T85°C...T135°C
	or...
	XP-IS, Class I, Div 1, GPS A (US only) BCD, T6...T4;
	DIP-IS, Class II/III, Div 1, GPS EFG, T85°C...T135°C
	or...
	NI, Class I, Div 2, GPS ABCD, T6...T4;
	NI, Class II/III, Div 2, GPS FG, T85°C...T135°C
	Remote version, sensor
	IS, Class I, Div 1, GPS ABCD, T6...T3;
	IS, Class II/III, Div 1, GPS EFG, T85°C...T*°C ①
	or...
	NI, Class I, Div 2, GPS ABCD, T6...T3;
NI, Class II/III, Div 2, GPS FG, T85°C...T*°C ①	
NEC 505 and NEC 506 (Zone ratings)	
Compact version	
Class I, Zone 0 AEx ia IIC T6...T3 Ga;	
Zone 20, AEx ia IIIC T85°C...T*°C Da ①	
or...	
Class I, Zone 1 AEx db ia [ia Ga] IIC T6...T3 Gb;	
Zone 21, AEx ia tb [ia Da] IIIC T85°C...T*°C Db ①	
Remote version, converter	
Class I, Zone 1 AEx ia [ia Ga] IIC T6...T4 Gb;	
Zone 21, AEx ia [ia Da] IIIC T85°C...T135°C Db	
or...	
Class I, Zone 1 AEx db ia [ia Ga] IIC T6...T4 Gb;	
Zone 21, AEx ia tb [ia Da] IIIC T85°C...T135°C Db	
Remote version, sensor	
Class I, Zone 0 AEx ia IIC T6...T3 Ga;	
Zone 20, AEx ia IIIC T85°C...T*°C Da ①	

	CEC Section 18 (Zone ratings)
	Compact version
	Ex ia IIC T6...T3 Ga;
	Ex ia IIIC T85°C...T*°C Da ①
	or...
	Ex db ia [ia Ga] IIC T6...T3 Gb;
	Ex ia tb [ia Da] IIIC T85°C...T*°C Db ①
	Remote version, converter
	Ex ia [ia Ga] IIC T6...T4 Gb;
	Ex ia [ia Da] IIIC T85°C...T135°C Db
	or...
	Ex db ia [ia Ga] IIC T6...T4 Gb;
	Ex ia tb [ia Da] IIIC T85°C...T135°C Db
	Remote version, sensor
	Ex ia IIC T6...T3 Ga;
	Ex ia IIIC T85°C...T*°C Da ①
NEPSI	Compact version
	Ex ia IIC T3...T6 Ga/Gb;
	Ex ia IIIC T ₂₀₀ 85°C...T ₂₀₀ *°C Da / Ex ia IIIC T85°C...T*°C Db ①
	or...
	Ex ia db IIC T3...T6 Ga/Gb;
	Ex ia IIIC T ₂₀₀ 85°C...T ₂₀₀ *°C Da / Ex tb IIIC T85°C...T*°C Db ①
	Remote version, converter
	Ex ia [ia Ga] IIC T4...T6 Gb;
	Ex ia [ia Da] IIIC T85°C...T135°C Db
	or...
	Ex db ia [ia Ga] IIC T4...T6 Gb;
	Ex ia tb [ia Da] IIIC T85°C...T135°C Db
	Remote version, sensor
	Ex ia IIC T3...T6 Ga/Gb;
	Ex ia IIIC T ₂₀₀ 85°C...T ₂₀₀ *°C Da / Ex ia IIIC T85°C...T*°C Db ①

KCs	Compact version
	Ex ia IIC T6...T3 Ga/Gb;
	Ex ia IIIC T85°C...T*°C Da/Db ①
	or...
	Ex ia/db IIC T6...T3 Ga/Gb;
	Ex ia/tb IIIC T85°C...T200°C Da/Db ①
	Remote version, converter
	Ex ia [ia Ga] IIC T6...T4 Gb;
	Ex ia [ia Da] IIIC T85°C...T135°C Db
	or...
	Ex db ia [ia Ga] IIC T6...T4 Gb
	Ex ia tb [ia Da] IIIC T85°C...T135°C Db
	Remote version, sensor
	Ex ia IIC T6...T3 Ga/Gb;
	Ex ia IIIC T85°C...T*°C Da/Db ①
EAC-EX - pending	Compact version
	Ga/Gb Ex ia IIC T6...T3 X;
	Da/Db Ex ia IIIC T85°C...T*°C X ①
	or...
	Ga/Gb Ex ia/db IIC T6...T3 X;
	Da/Db Ex ia/tb IIIC T85°C...T*°C X ①
	Remote version, converter
	1Ex ia [ia Ga] IIC T6...T4 Gb X;
	Ex ia [ia Da] IIIC T85°C...T135°C Db X
	or...
	1Ex db ia [ia Ga] IIC T6...T4 Gb X;
	Ex ia tb [ia Da] IIIC T85°C...T135°C Db X
	Remote version, sensor
	Ga/Gb Ex ia IIC T6...T3 X;
	Da/Db Ex ia IIIC T85°C...T*°C X ①
Other standards and approvals	
SIL	C (Compact) version only: SIL 2/3 (SIL3: 1oo2 architecture is necessary for homogeneous redundancy) – certified according to all the requirements in EN 61508 (Full Assessment) and for high/low continuous demand mode operation. HFT=0, SFF=93% (for non-Ex / Ex i devices with one output), 94% (for non-Ex / Ex i devices with two outputs) or 95% (for Ex d devices), type B device
EMC	Electromagnetic Compatibility (EMC) directive. The device agrees with this directive and its related standard if the device has a single probe that is installed in a metallic tank. SIL 2/3-approved devices agree with EN 61326-3-1 and EN 61326-3-2.

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
	NAMUR NE 53 Software and Hardware of Field Devices and Signal Processing Devices with Digital Electronics
	NAMUR NE 107 Self-Monitoring and Diagnosis of Field Devices
Construction code	Option: NACE MR0175 (ISO 15156); NACE MR0103 (ISO 17945)

Table 2-1: Technical data: Converter

① If the device has a PTFE process seal system and an FPM/FKM or Kalrez® gasket, then T*°C = T200°C or *°C = 200°C. For all other versions, T*°C = T150°C or *°C = 150°C.

Probe options

	Single rod Ø16 mm / 0.63"	Single cable Ø8 mm / 0.32"
--	---------------------------	----------------------------

Measuring system

Application	Solids	
Measuring range	0.6...4 m / 1.97...13.12 ft	1...40 m / 3.28...131.23 ft
Dead zone	This depends on the type of probe. For more data, refer to <i>Measurement limits</i> on page 20.	

Measuring accuracy

Accuracy (in direct mode)	±2 mm / ±0.08", when distance ≤ 10 m / 33 ft; ±0.02% of measured distance, when distance > 10 m / 33 ft	
Accuracy (in TBF mode)	±20 mm / ±0.8"	
Resolution	0.1 mm / 0.004"	
Repeatability	±1 mm / ±0.04"	
Maximum rate of change at 4 mA	100 m/min / 328 ft/min	
Reference conditions acc. to EN 61298-1		
Temperature	+15...+25°C / +59...+77°F	
Pressure	1013 mbara ±50 mbar / 14.69 psia ±0.73 psi	
Relative air humidity	60% ±15%	
Target	Metal plate	

Operating conditions

Min./Max. temperature at the process connection (also depends on the temperature limits of the gasket material. Refer to "Materials" in this table.)	-50...+200°C / -58...+392°F	
Pressure	-1...40 barg / -14.5...580 psig	
Dielectric constant, ϵ_r	≥ 1.6 in direct mode; ≥ 1.1 in TBF mode	
Vibration resistance	EN 60721-3-4, Category 4M3 (5...8.22 Hz: ±0.75 mm / 8.22...200 Hz: 0.2g; 5g shock ½sinus: 6 ms)	EN 60721-3-4, Category 4M4 (5...8.51 Hz: ±3.5mm / 8.51...200 Hz: 1g; 15g shock ½sinus: 6 ms)

	Single rod Ø16 mm / 0.63"	Single cable Ø8 mm / 0.32"
--	---------------------------	----------------------------

Materials

Probe	Stainless steel (1.4404 / 316L)	Stainless steel (1.4401 / 316)
Gasket (process seal)	PTFE sealing system with process seal: FKM/FPM (-40...+200°C / -40...+392°F); Kalrez® 6375 (-20...+200°C / -4...+392°F); EPDM (-50...+150°C / -58...+302°F)	
Process connection	Stainless steel (1.4404 / 316L)	
Other wetted parts	PTFE	

Process connections

Thread	G 1 1/2 A (ISO 228); 1 1/2 NPT (ASME B1.20.1)
Flange version	
EN 1092-1	DN150 in PN10 (Type B1); DN40, 80, 100 or 150 in PN16 (Type B1); DN40 in PN25 (Type B1); DN40 or 50 in PN40 (Type B1); others on request Optional flange facings: Types E
ASME B16.5	1½...8" in 150 lb RF; 3" in 300 lb RF; others on request Optional flange facings: FF (Flat Face)
JIS B2220	50...100A in 10K RF; others on request
Other	Others on request

Table 2-2: Technical data: Probe options

Process connection options: flange facing finish

Type (flange facing)	Flange facing finish, R _a (min...max)	
	[µm Rz]	[µin - AARH]

EN 1092-1

B1	3.2...12.5	125...500
E	12.5...50	500...2000

ASME B16.5

RF or FF	3.2...6.3	125...250
RJ	≤ 1.6	≤ 63

JIS B2220

RF	3.2...6.3	125...250
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Table 2-3: Process connection options: flange facing finish

2.2 Minimum power supply voltage

Use these graphs to find the minimum power supply voltage for a given current output load.

Non-Ex and Hazardous Location approved (Ex i / IS / NI) devices



Figure 2-1: Non-Ex and Hazardous Location approval (Ex i / IS / NI): minimum power supply voltage for an output of 22 mA (switch output - relay option: 30 mA) at the terminals

X: Power supply U [V DC]

Y: Current output load R_L [Ω]

① Output 1: 4...20 mA/HART

Output 2: 4...20 mA (NOTE: use a separate power supply to energize output 2)

② Input 2: switch output - relay option

Hazardous Location (Ex d / XP/ DIP) approved devices

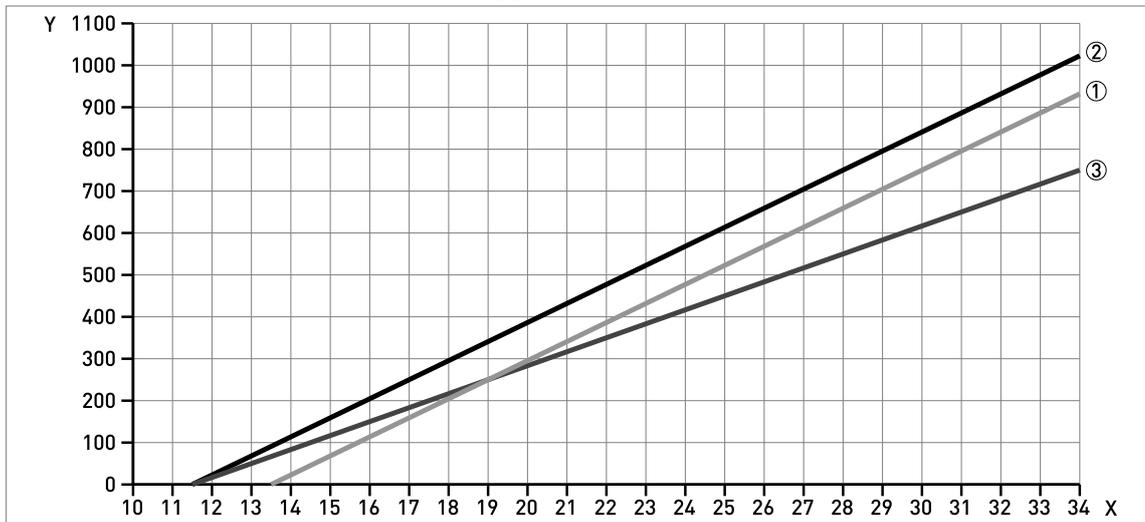


Figure 2-2: Non-Ex and Hazardous Location approval (Ex d / XP/ DIP): minimum power supply voltage for an output of 22 mA (switch output - relay option: 30 mA) at the terminals

X: Power supply U [V DC]

Y: Current output load R_L [Ω]

① Output 1: 4...20 mA/HART

② Output 2: 4...20 mA (NOTE: use a separate power supply to energize output 2)

③ Input 2: switch output - relay option

2.3 Process pressure and process connection temperature limits

Make sure that the transmitters are used within their operating limits. Obey the temperature limits of the process seal and the flange.

The process connection temperature range must agree with the temperature limits of the gasket material. Limits of the gasket material are shown below each graph. For more data about pressure and temperature limits of process connections, refer to the related standards (EN 1092-1, ASME B16.5 etc.).

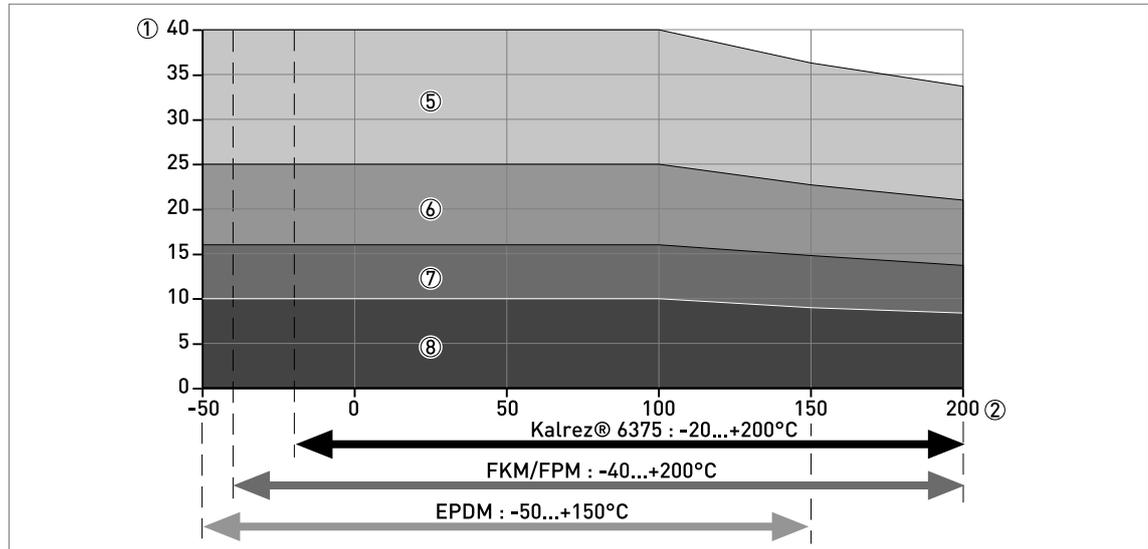


Figure 2-3: Operating limits: graph of process pressure (barg) against process connection temperature (°C)

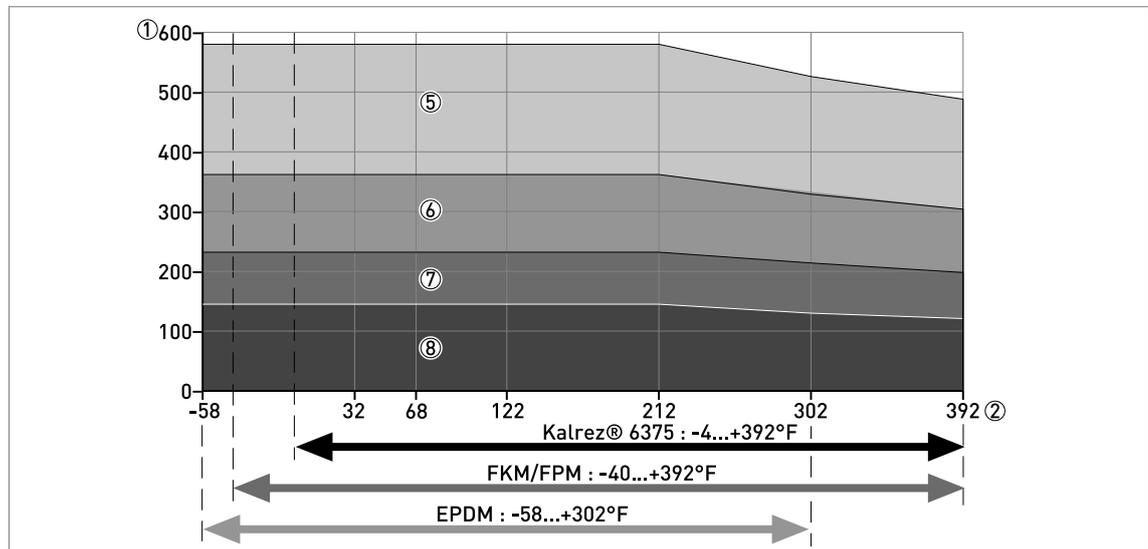


Figure 2-4: Operating limits: graph of process pressure (psig) against process connection temperature (°F)

- ① Process pressure, P_s [barg]
- ② Process connection temperature, T [°C]
- ③ Process pressure, P_s [psig]
- ④ Process connection temperature, T [°F]
- ⑤ Flange connection, PN40 (EN 1092-1) or Class 300 (ASME B16.5)
- ⑥ Flange connection, PN25 (EN 1092-1)
- ⑦ Flange connection, PN16 (EN 1092-1) or Class 150 (ASME B16.5)
- ⑧ Flange connection, PN10 (EN 1092-1)

2.4 Measurement limits

Single cable and single rod probes

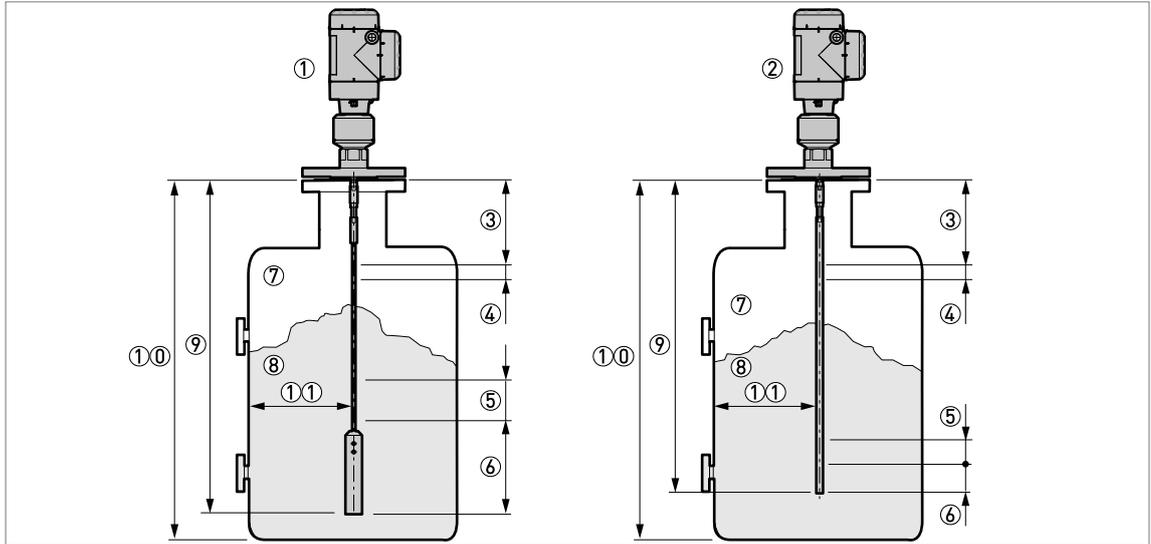


Figure 2-5: Measurement limits

- ① Device with a single cable probe
- ② Device with a single rod probe
- ③ **Top dead zone:** Top part of the probe where measurement is not possible
- ④ **Top non-linearity zone:** Top part of the probe with a lower accuracy of $\pm 30 \text{ mm} / \pm 1.18''$
- ⑤ **Bottom non-linearity zone:** Bottom part of the probe with a lower accuracy of $\pm 30 \text{ mm} / \pm 1.18''$
- ⑥ **Bottom dead zone:** Bottom part of the probe where measurement is not possible
- ⑦ Gas (Air)
- ⑧ Product
- ⑨ L, Probe length
- ⑩ Tank Height
- ⑪ **Minimum distance from the probe to a metallic tank wall:** Single cable or single rod probes = $300 \text{ mm} / 12''$

Measurement limits (dead zone) in mm and inches

Probe	$\epsilon_r = 80$				$\epsilon_r = 2.5$			
	Top ③		Bottom ⑥		Top ③		Bottom ⑥	
	[mm]	[inches]	[mm]	[inches]	[mm]	[inches]	[mm]	[inches]
$\varnothing 8 \text{ mm} / 0.32''$ single cable, type 1 ①	50	1.97	20	0.79	50	1.97	60	2.36
$\varnothing 8 \text{ mm} / 0.32''$ single cable, type 2 ②	50	1.97	270	10.63	50	1.97	370	14.57
Single rod	50	1.97	20	0.79	50	1.97	60	2.36

Table 2-4: Measurement limits (dead zone) in mm and inches

- ① When the probe has the $\varnothing 12 \times 100 \text{ mm} (\varnothing 0.5'' \times 3.9'')$ counterweight option. If the cable probe does not have a counterweight, speak or write to your local supplier for more data.
- ② When the probe has the $\varnothing 38 \times 245 \text{ mm} (\varnothing 1.5'' \times 9.6'')$ counterweight option. If the cable probe does not have a counterweight, speak or write to your local supplier for more data.

Measurement limits (non-linearity zone) in mm and inches

Probe	$\epsilon_r = 80$				$\epsilon_r = 2.5$			
	Top ④		Bottom ⑤		Top ④		Bottom ⑤	
	[mm]	[inches]	[mm]	[inches]	[mm]	[inches]	[mm]	[inches]
Ø8 mm / 0.32" single cable, type 1 ①	150	5.91	0	0	150	5.91	0	0
Ø8 mm / 0.32" single cable, type 2 ②	150	5.91	0	0	150	5.91	0	0
Single rod	150	5.91	0	0	150	5.91	0	0

Table 2-5: Measurement limits (non-linearity zone) in mm and inches

- ① When the probe has the Ø12×100 mm (Ø0.5"×3.9") counterweight option. If the cable probe does not have a counterweight, speak or write to your local supplier for more data.
- ② When the probe has the Ø38×245 mm (Ø1.5"×9.6") counterweight option. If the cable probe does not have a counterweight, speak or write to your local supplier for more data.

80 is ϵ_r of water; 2.5 is ϵ_r of oil

If you did the Auto Setup procedure after you installed the device, the values in the tables are correct. If you did not do the Auto Setup procedure, then the values for the dead zones and the non-linearity zones increase. If the cable probe does not have a counterweight, speak or write to your local supplier for more data.

The device software function "Blocking Distance" is set at the factory to 50 mm / 1.97", which is higher than or equal to the largest dead zone. This value agrees with the minimum dielectric constant at which the device can measure the level of a product. You can adjust "Blocking Distance" to agree with the dead zone (for this data, refer to the measurement limits table). For more data about the device software, refer to the handbook.

2.5 Dimensions and weights

2.5.1 General notes

All housing covers have bayonet connectors unless it is an explosion-proof (XP / Ex d-approved) device or has the second current output / switch output (relay) option. If the device has the second current output / switch output (relay) option or has an Ex d / XP (explosion-proof) approval, the terminal compartment cover has a thread with a flame path.

2.5.2 Primary components

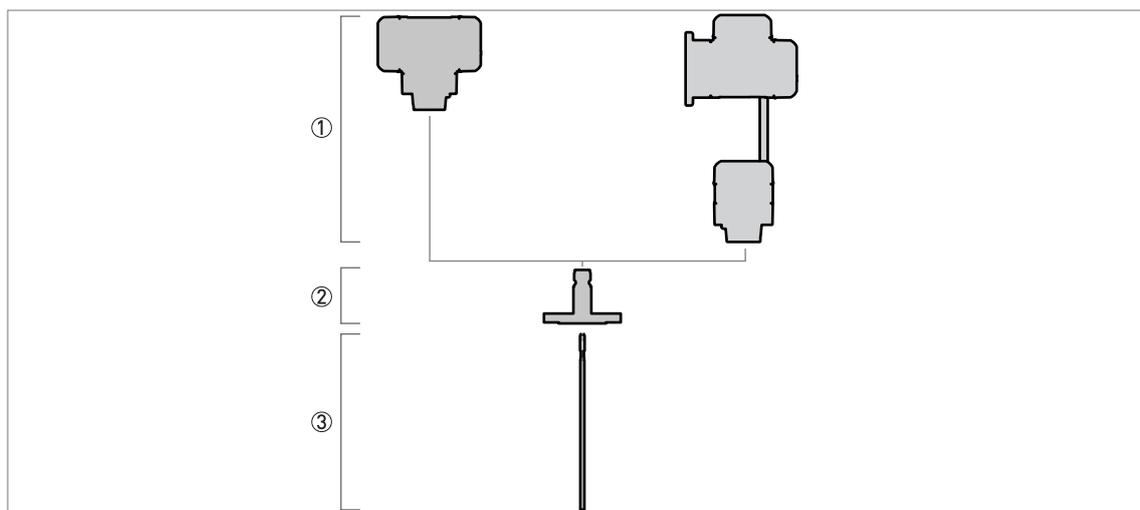


Figure 2-6: Primary components

- ① Signal converter. From left to right:
 - Compact version (C)
 - Remote version (F) – signal converter attached to the probe electronics in a different housing with an RS-485 cable
- ② Process connection: threaded or flange connection, including the process seal option. For more data, refer to *Technical data* on page 9.
- ③ Probe

2.5.3 Signal converter and probe electronics options

Compact version (C)

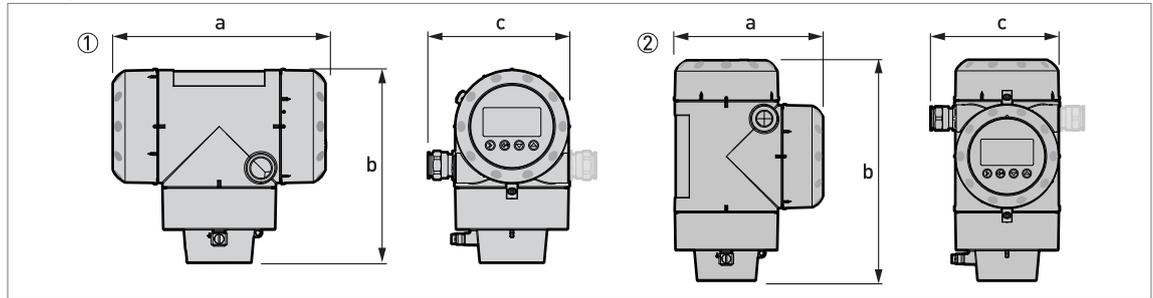


Figure 2-7: Compact version (C)

- ① Horizontal compact version
- ② Vertical compact version

If the device has the second current output / switch output (relay) option, use the dimensions given for Ex d / XP-approved devices.

Dimensions [mm]	Horizontal		Vertical	
	Non-Ex / Ex i / IS	Optional output / Ex d / XP	Non-Ex / Ex i / IS	Optional output / Ex d / XP
a	191	258	147	210
b	175	175	218	218
c	127	127 (153) ①	127	127 (153) ①

Table 2-6: Compact version (C): Dimensions in mm

- ① Use the dimension in round brackets if the device has 2 current outputs or a switch output (relay)

Dimensions [inches]	Horizontal		Vertical	
	Non-Ex / Ex i / IS	Optional output / Ex d / XP	Non-Ex / Ex i / IS	Optional output / Ex d / XP
a	7.52	10.16	5.79	8.27
b	6.89	6.89	8.23	8.23
c	5.00	5.00 (6.02) ①	5.00	5.00 (6.02) ①

Table 2-7: Compact version (C): Dimensions in inches

- ① Use the dimension in round brackets if the device has 2 current outputs or a switch output (relay)

Remote version (F) – remote converter housing

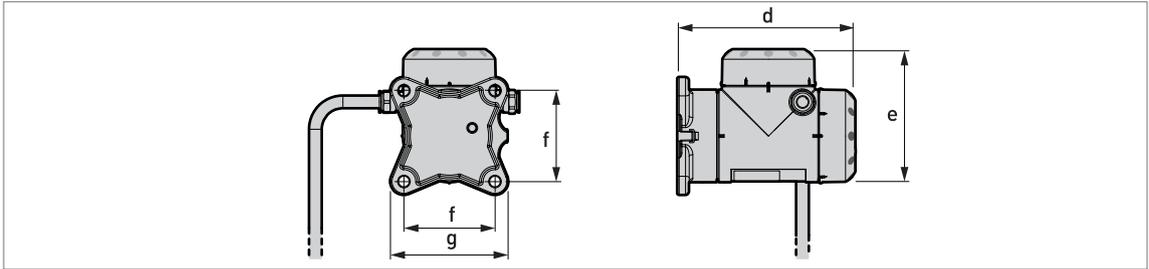


Figure 2-8: Remote version (F) – remote converter housing

If the device has the second current output / switch output (relay) option, use the dimensions given for Ex d / XP-approved devices.

Dimensions [mm]	Remote	
	Non-Ex / Ex i / IS	Optional output / Ex d / XP
d	195	195
e	146	209
f	100	100
g	130	130

Table 2-8: Remote converter housing (device version F"): Dimensions in mm

Dimensions [inches]	Remote	
	Non-Ex / Ex i / IS	Optional output / Ex d / XP
d	7.68	7.68
e	5.75	8.23
f	3.94	3.94
g	5.12	5.12

Table 2-9: Remote converter housing (device version F"): Dimensions in inches

Remote version (F) – probe electronics housing

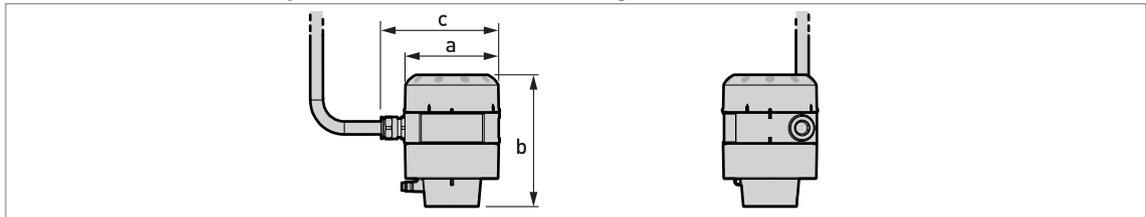


Figure 2-9: Remote version (F) – probe electronics housing

Dimensions [mm]	Remote	
	Non-Ex / Ex i / IS	Ex d / XP
a	104	104
b	142	142
c	129	129

Table 2-10: Probe electronics housing (device version "F"): Dimensions in mm

Dimensions [inches]	Remote	
	Non-Ex / Ex i / IS	Ex d / XP
a	4.09	4.09
b	5.59	5.59
c	5.08	5.08

Table 2-11: Probe electronics housing (device version "F"): Dimensions in inches

Converter and probe electronics housing weights

Type of housing	Weights			
	Aluminium housing		Stainless-steel housing	
	[kg]	[lb]	[kg]	[lb]
Compact converter	2.8	6.2	6.4	14.1
Remote converter ①	2.5	5.5	5.9	13.0
Probe electronics housing ①	1.8	4.0	3.9	8.6

One output / Non-Ex / intrinsically-safe (Ex i / IS)

Compact converter	2.8	6.2	6.4	14.1
Remote converter ①	2.5	5.5	5.9	13.0
Probe electronics housing ①	1.8	4.0	3.9	8.6

Optional output / Explosion proof (Ex d / XP)

Compact converter	3.2	7.1	7.5	16.5
Remote converter ①	2.9	6.40	7.1	15.65
Probe electronics housing ①	1.8	4.0	3.9	8.6

Table 2-12: Converter and probe electronics housing weights in kg and lb

① The remote version of the device has a "remote converter" and a "probe electronics housing". For more data, refer to "Housing dimensions" at the start of this section.

2.5.4 Process connection options

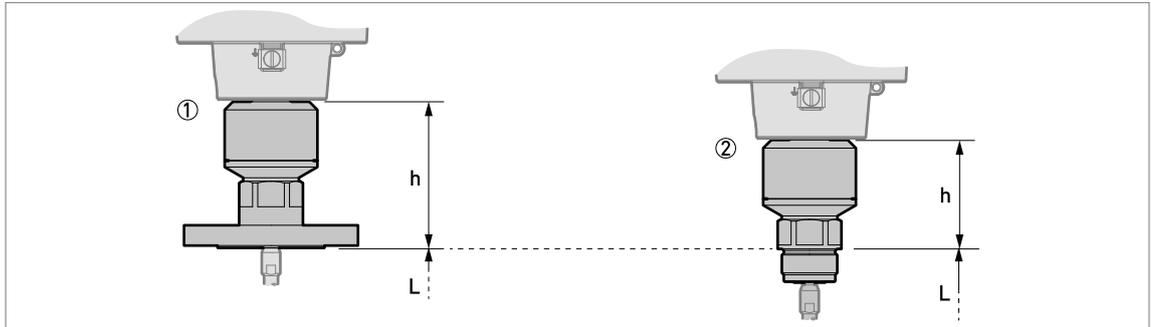


Figure 2-10: Process connection options

h = height of process connection

L = probe length

① Flange with single PTFE process seal system

② Threaded connection with single PTFE process seal system

Process connection	Process seal system	Dimensions [mm]	
		h	L
Flange	Single PTFE	126	①
Threaded connection	Single PTFE	94	①

Table 2-13: Process connection options: Dimensions in mm

① Refer to "Probe options" in this chapter

Process connection	Process seal system	Dimensions [inches]	
		h	L
Flange	Single PTFE	4.96	①
Threaded connection	Single PTFE	3.70	①

Table 2-14: Process connection options: Dimensions in inches

① Refer to "Probe options" in this chapter

2.5.5 Probe options

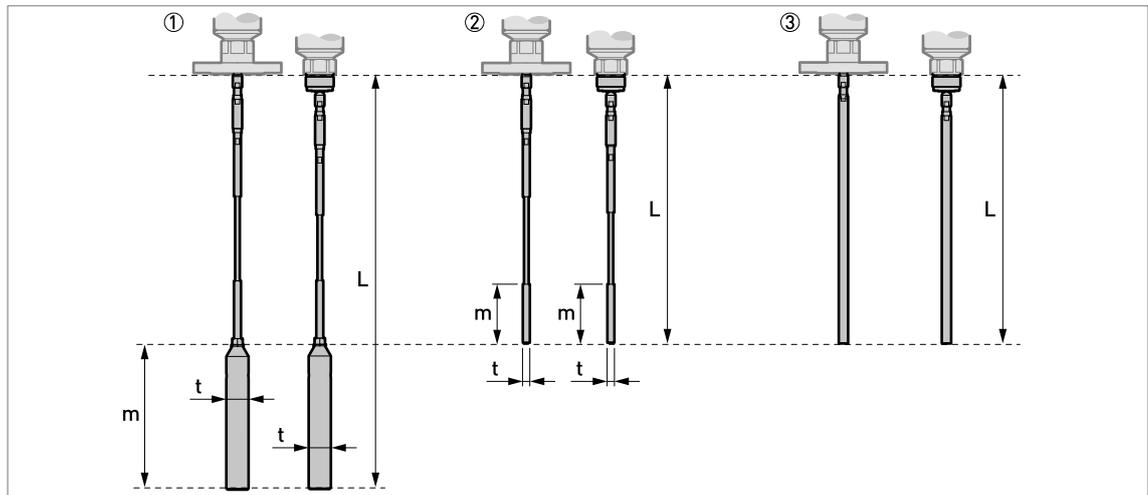


Figure 2-11: Probe options

- ① Single cable $\varnothing 8$ mm / $\varnothing 0.32$ " (thread and flange versions – standard counterweight 1)
- ② Single cable $\varnothing 8$ mm / $\varnothing 0.32$ " (thread and flange versions – standard counterweight 2)
- ③ Single rod $\varnothing 8$ mm / $\varnothing 0.32$ " (thread and flange versions)

Probe length, L , includes the length of the counterweight.

Other probe end options are available. For dimensional data, refer to the pages that follow.

Probes	Dimensions [mm]			
	L min.	L max.	m	t
Single cable $\varnothing 8$ mm, type 1	1000	40000	245	$\varnothing 38$
Single cable $\varnothing 8$ mm, type 2	1000	40000	100	$\varnothing 12$
Single rod $\varnothing 16$ mm ①	600	4000	—	—

Table 2-15: Probe options: Dimensions in mm

- ① A device with this probe option must be assembled on site. For the assembly procedure, refer to the handbook or the printed procedure supplied with the components.

Probes	Dimensions [inches]			
	L min.	L max.	m	t
Single cable $\varnothing 0.32$ ", type 1	39	1575	9.65	$\varnothing 1.5$
Single cable $\varnothing 0.32$ ", type 2	39	1575	3.94	$\varnothing 0.47$
Single rod $\varnothing 0.63$ " ①	24	157.5	—	—

Table 2-16: Probe options: Dimensions in inches

- ① A device with this probe option must be assembled on site. For the assembly procedure, refer to the handbook or the printed procedure supplied with the components.

Probe end options for the Ø8 mm / 0.32" single cable probe

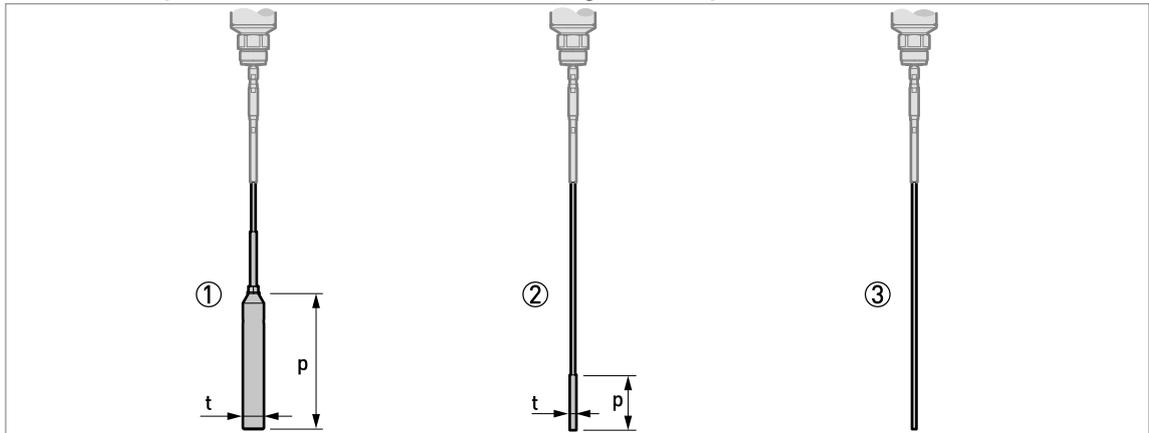


Figure 2-12: Probe end options for the Ø8 mm / 0.32" single cable probe

- ① Standard counterweight 1
- ② Standard counterweight 2
- ③ Open end

Probe end type	Dimensions [mm]	
	p	t
Counterweight 1	245	Ø38
Counterweight 2	100	Ø12
Open end	—	—

Table 2-17: Probe end options for the Ø8 mm / 0.32" single cable probe: Dimensions in mm

Probe end type	Dimensions [inches]	
	p	t
Counterweight 1	9.65	Ø1.5
Counterweight 2	3.94	Ø0.47
Open end	—	—

Table 2-18: Probe end options for the Ø8 mm / 0.32" single cable probe: Dimensions in inches

Probe weights

Probes	Process connection	Process connection weights		Probe Weights	
		[kg]	[lb]	[kg/m]	[lb/ft]
Single cable Ø8 mm / Ø0.32"	Threaded	2.5	5.1	0.4 ①	0.27 ①
	Flange	4.0...36.5	8.8...80.5		
Single rod Ø16 mm / Ø0.63"	Threaded	2.5	5.1	1.6 ②	1.07 ②
	Flange	4.0...36.5	8.8...80.5		

Table 2-19: Probe weights

- ① This value does not include the weights of the counterweight or the process connection
- ② This value does not include the weight of the process connection

2.5.6 Weather protection option

Vertical signal converters

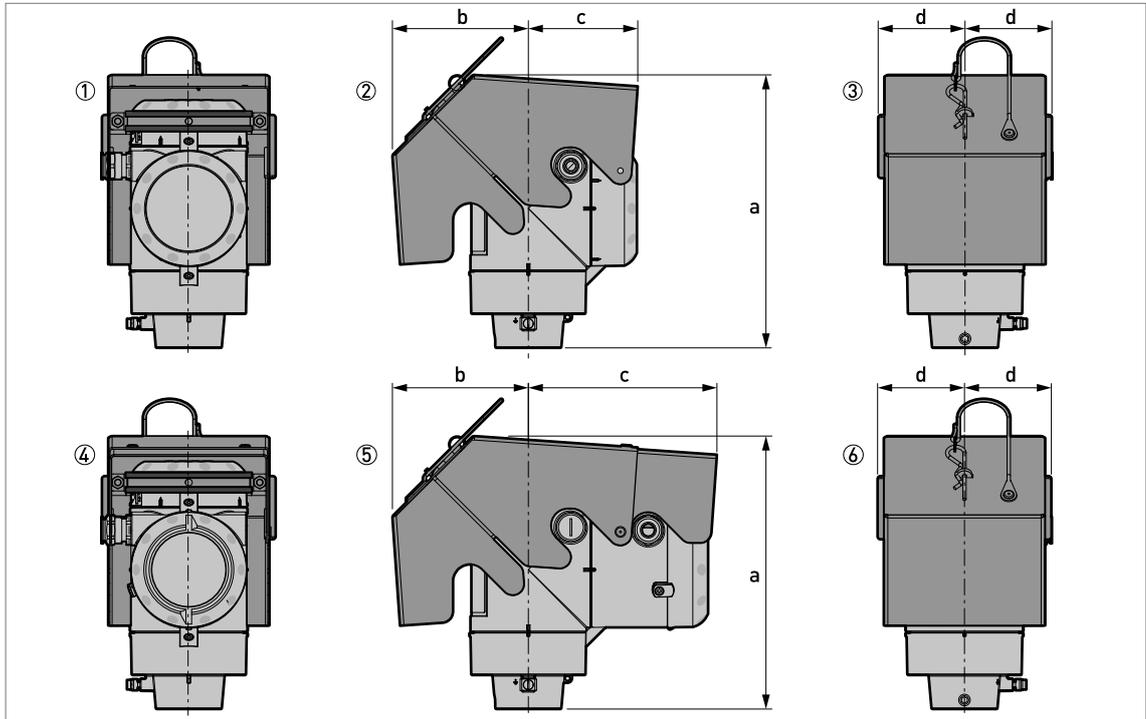


Figure 2-13: Vertical signal converters

- ① Non-Ex / Ex i / IS: Rear view (with weather protection closed)
- ② Non-Ex / Ex i / IS: Right side (with weather protection closed)
- ③ Non-Ex / Ex i / IS: Front view (with weather protection closed)
- ④ Optional output / Ex d / XP: Rear view (with weather protection closed)
- ⑤ Optional output / Ex d / XP: Right side (with weather protection closed)
- ⑥ Optional output / Ex d / XP: Front view (with weather protection closed)

Weather protection	Version	Dimensions [mm]				Weights [kg]
		a	b	c	d	
Vertical signal converter	Non-Ex / Ex i / IS	241	118	96	77	1.3
	Optional output / Ex d / XP	241	118	166	77	1.5

Table 2-20: Vertical signal converters: Dimensions and weights in mm and kg

Weather protection	Version	Dimensions [inches]				Weights [lb]
		a	b	c	d	
Vertical signal converter	Non-Ex / Ex i / IS	9.5	4.6	3.8	3.0	2.9
	Optional output / Ex d / XP	9.5	4.6	6.5	3.0	3.3

Table 2-21: Vertical signal converters: Dimensions and weights in inches and lb

Horizontal signal converters

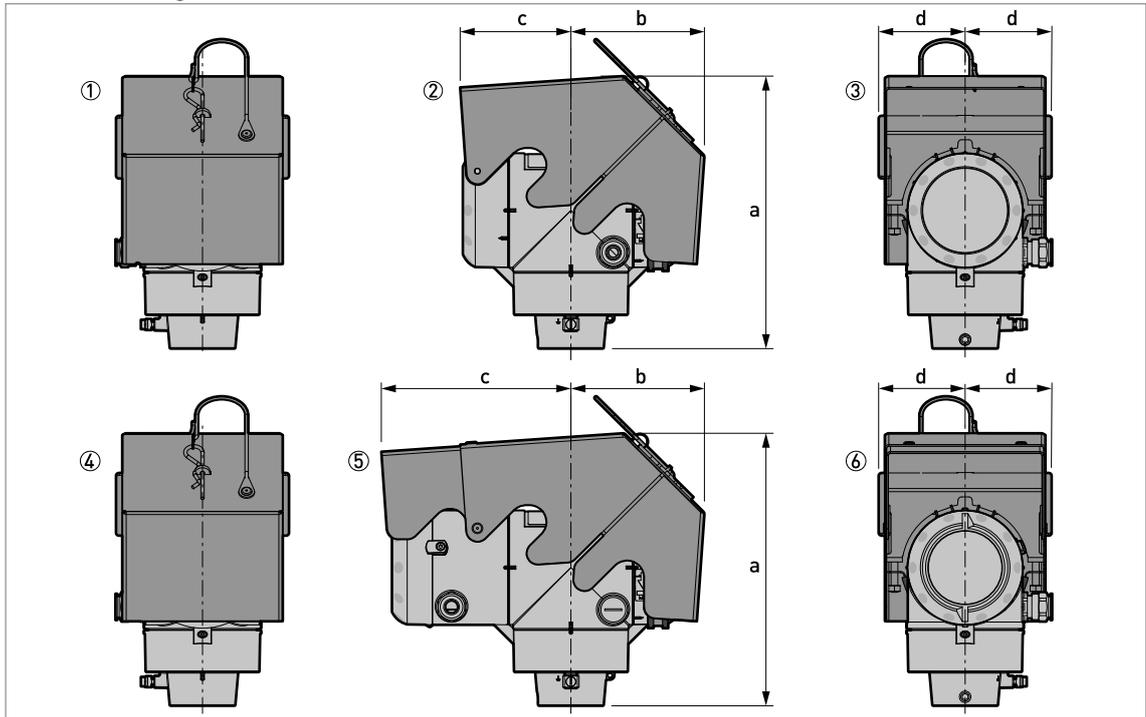


Figure 2-14: Horizontal signal converters

- ① Non-Ex / Ex i / IS: Front view (with weather protection closed)
- ② Non-Ex / Ex i / IS: Left side (with weather protection closed)
- ③ Non-Ex / Ex i / IS: Rear view (with weather protection closed)
- ④ Optional output / Ex d / XP: Front view (with weather protection closed)
- ⑤ Optional output / Ex d / XP: Left side (with weather protection closed)
- ⑥ Optional output / Ex d / XP: Rear view (with weather protection closed)

Weather protection	Version	Dimensions [mm]				Weights [kg]
		a	b	c	d	
Horizontal signal converter	Non-Ex / Ex i / IS	243	118	96	77	1.3
	Optional output / Ex d / XP	243	118	166	77	1.5

Table 2-22: Horizontal signal converters: Dimensions and weights in mm and kg

Weather protection	Version	Dimensions [inches]				Weights [lb]
		a	b	c	d	
Horizontal signal converter	Non-Ex / Ex i / IS	9.6	4.6	3.8	3.0	2.9
	Optional output / Ex d / XP	9.6	4.6	6.5	3.0	3.3

Table 2-23: Horizontal signal converters: Dimensions and weights in inches and lb

3.1 Intended use

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

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 granulates and powders.

It can be installed on silos, hoppers and bunkers.

3.2 How to prepare the silo before you install the device

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

3.2.1 General information for nozzles

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

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.

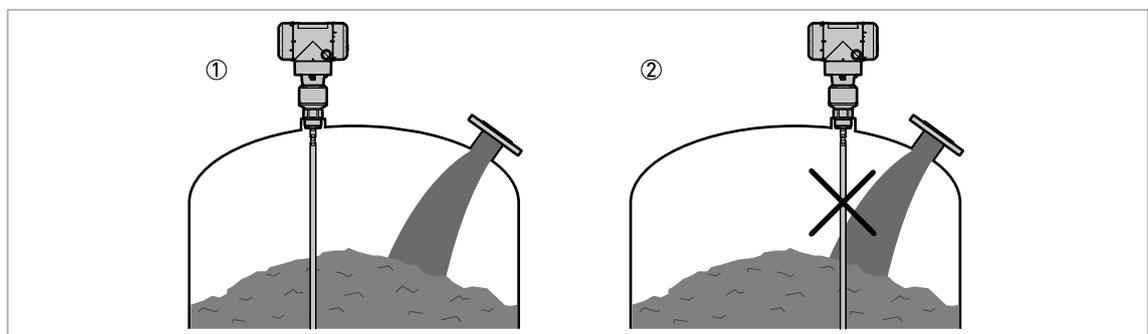


Figure 3-1: Do not put the device near to a product inlet

- 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.

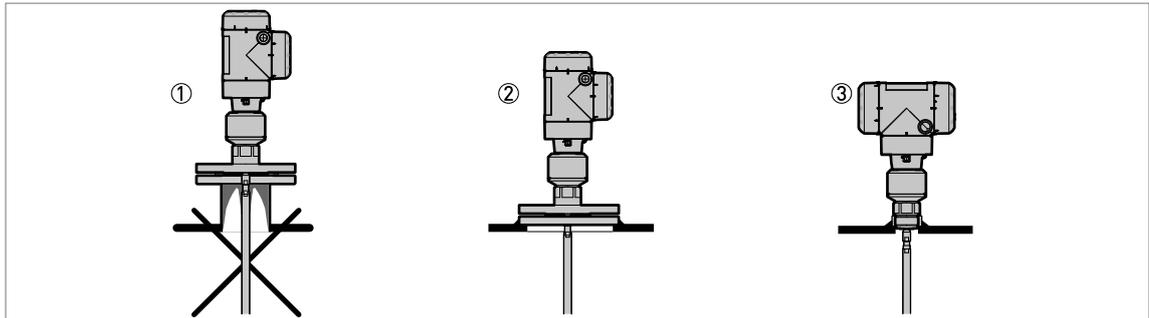


Figure 3-2: How to prevent build-up of product around the process connection

- ① If product particles are likely to collect in holes, a nozzle is not recommended.
- ② Attach the flange directly to the silo.
- ③ Use a threaded connection to attach the device directly to the silo.

For single cable and single rod probes:

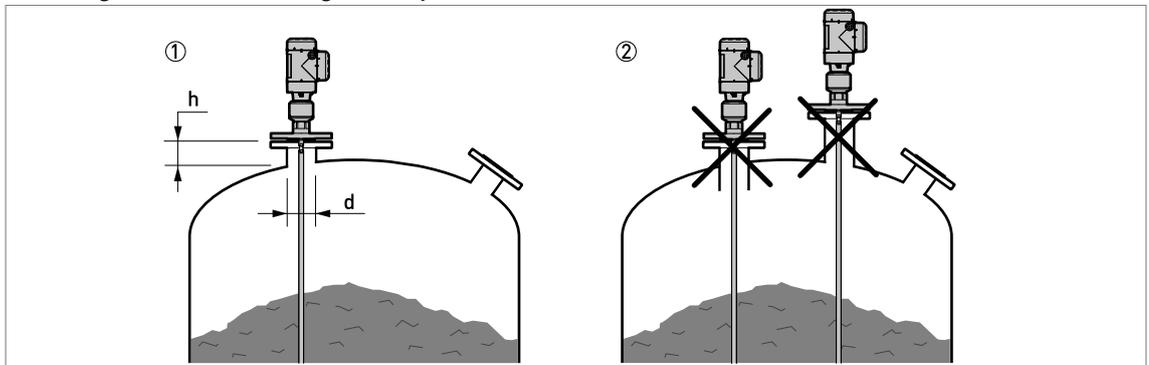


Figure 3-3: Recommended nozzle dimensions for single rod and single cable probes

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

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.).

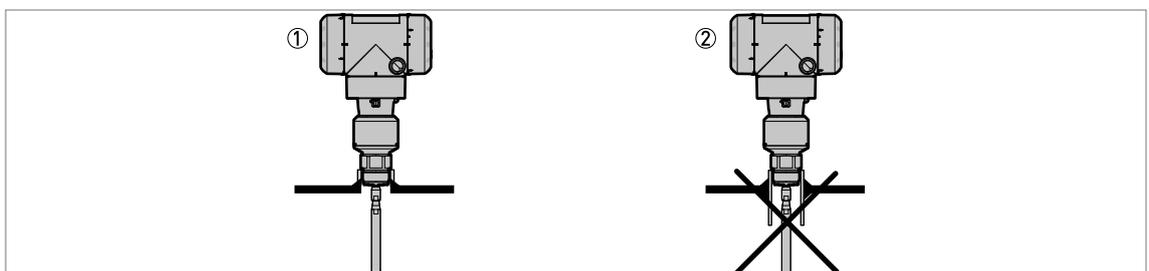


Figure 3-4: Sockets for threaded process connections

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

3.2.2 Installation requirements for concrete roofs

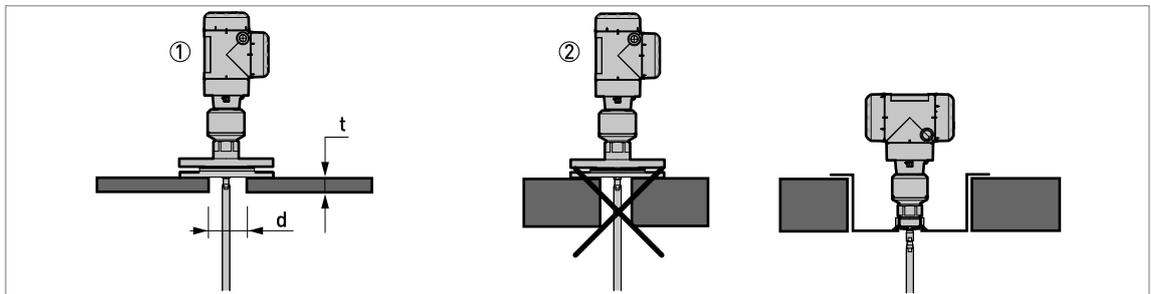


Figure 3-5: Installation on a concrete roof

- 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.

3.3 Installation recommendations for solids

3.3.1 Nozzles on conical silos

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

Risk of electrostatic discharge (ESD): The device is resistant to electrostatic discharges of up to 30 kV, but it is the responsibility of the fitter and the user to prevent ESD.

Install the device at the correct location to measure level correctly and prevent too much bending and traction. If necessary, attach the probe to the bottom of the silo.

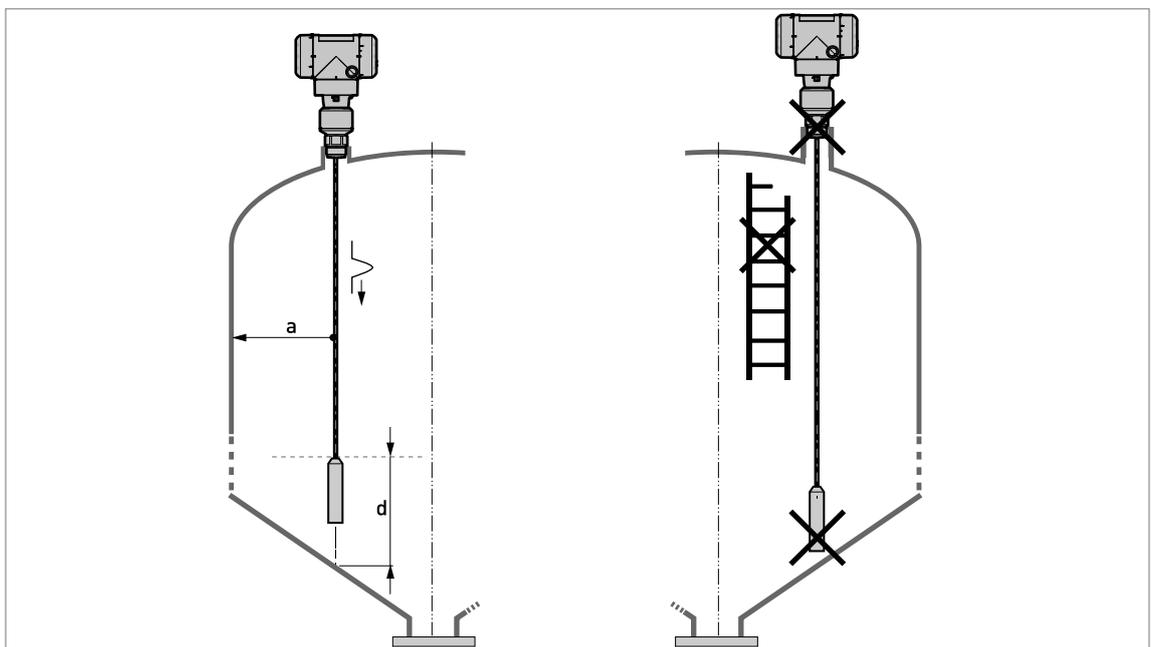


Figure 3-6: Installation recommendations for solids

$a \geq 300 \text{ mm} / 12''$

$d \geq 300 \text{ mm} / 12''$

3.3.2 Tensile load on the probe

Tensile load depends on:

- The height and diameter of the silo.
- The particle size and density of the product (medium) in the silo.

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

If the load on the $\varnothing 8 \text{ mm} / 0.32''$ single cable probe is more than $46.69 \text{ kN} / 10495 \text{ lb}_f$, speak or write to your supplier.

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

Cement

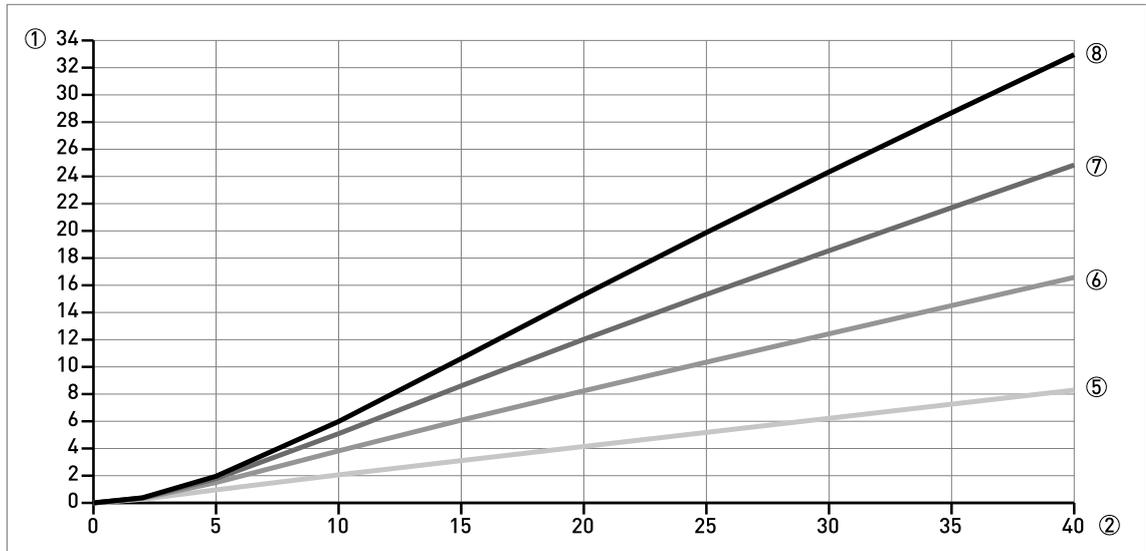


Figure 3-7: Estimated tensile load of cement on the Ø8 mm single cable probe, in kN

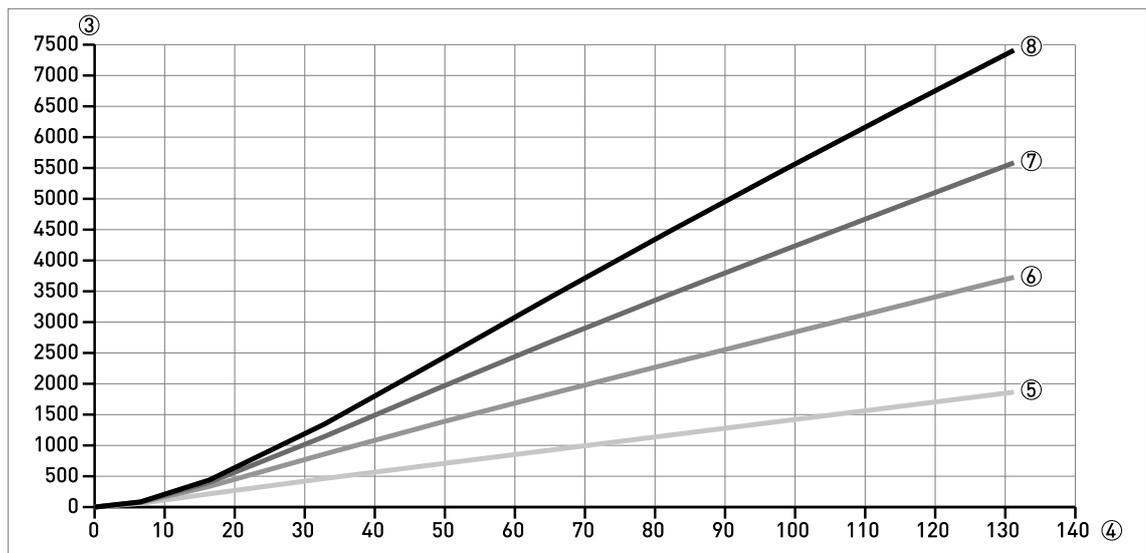


Figure 3-8: Estimated tensile load of cement on the Ø0.32" single cable probe, in lb_f

- ① Tensile load in kilonewtons (kN)
- ② Probe length in metres (m)
- ③ Tensile load in pounds-force (lb_f)
- ④ Probe length in feet (ft)
- ⑤ Tensile load for a metal silo with a diameter of 3 m / 9.8 ft
- ⑥ Tensile load for a metal silo with a diameter of 6 m / 19.7 ft
- ⑦ Tensile load for a metal silo with a diameter of 9 m / 29.5 ft
- ⑧ Tensile load for a metal silo with a diameter of 12 m / 39.4 ft

Wheat

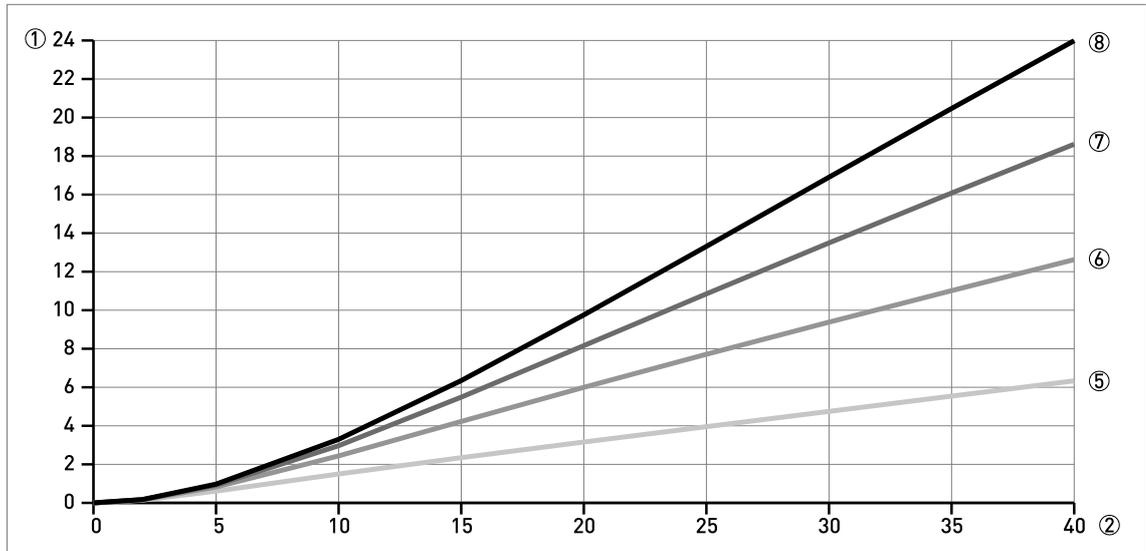


Figure 3-9: Estimated tensile load of wheat on the Ø8 mm single cable probe, in kN

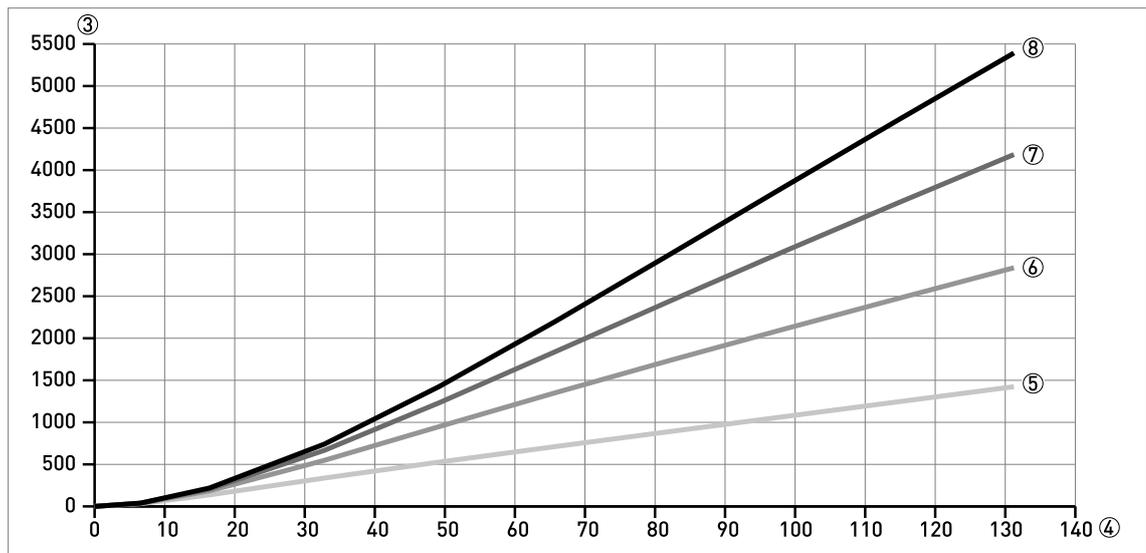


Figure 3-10: Estimated tensile load of wheat on the Ø0.32" single cable probe, in lb_f

- ① Tensile load in kilonewtons (kN)
- ② Probe length in metres (m)
- ③ Tensile load in pounds-force (lb_f)
- ④ Probe length in feet (ft)
- ⑤ Tensile load for a metal silo with a diameter of 3 m / 9.8 ft
- ⑥ Tensile load for a metal silo with a diameter of 6 m / 19.7 ft
- ⑦ Tensile load for a metal silo with a diameter of 9 m / 29.5 ft
- ⑧ Tensile load for a metal silo with a diameter of 12 m / 39.4 ft

Sand

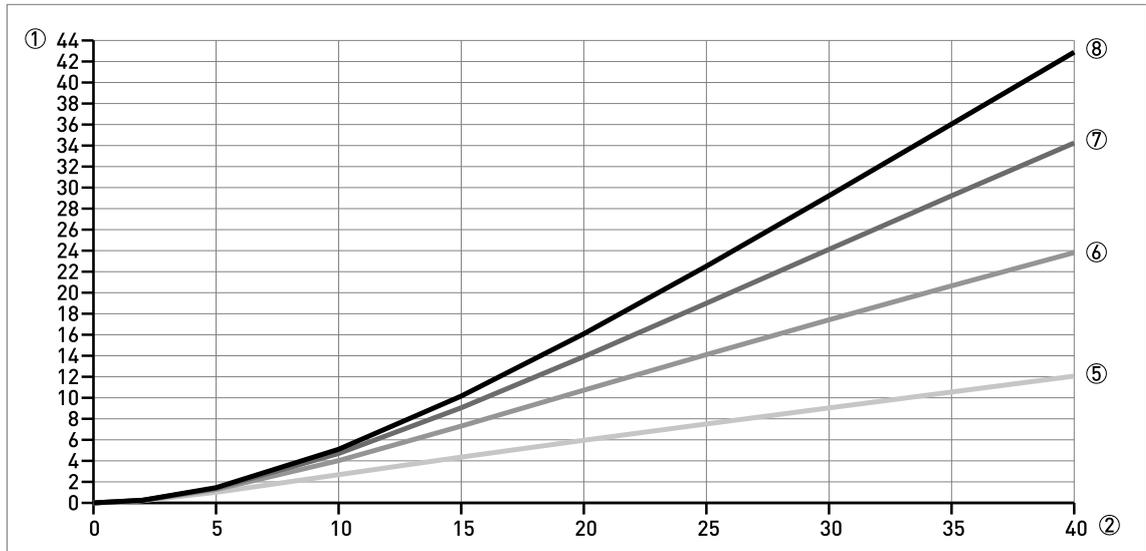
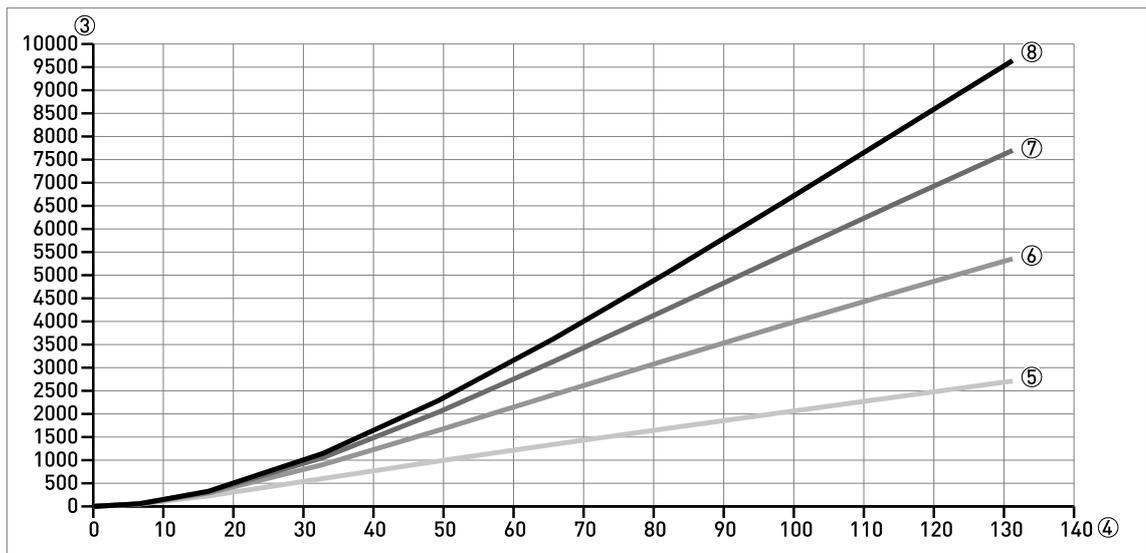


Figure 3-11: Estimated tensile load of sand on the Ø8 mm single cable probe, in kN

Figure 3-12: Estimated tensile load of sand on the Ø0.32" single cable probe, in lb_f

- ① Tensile load in kilonewtons (kN)
- ② Probe length in metres (m)
- ③ Tensile load in pounds-force (lb_f)
- ④ Probe length in feet (ft)
- ⑤ Tensile load for a metal silo with a diameter of 3 m / 9.8 ft
- ⑥ Tensile load for a metal silo with a diameter of 6 m / 19.7 ft
- ⑦ Tensile load for a metal silo with a diameter of 9 m / 29.5 ft
- ⑧ Tensile load for a metal silo with a diameter of 12 m / 39.4 ft

Polyethylene

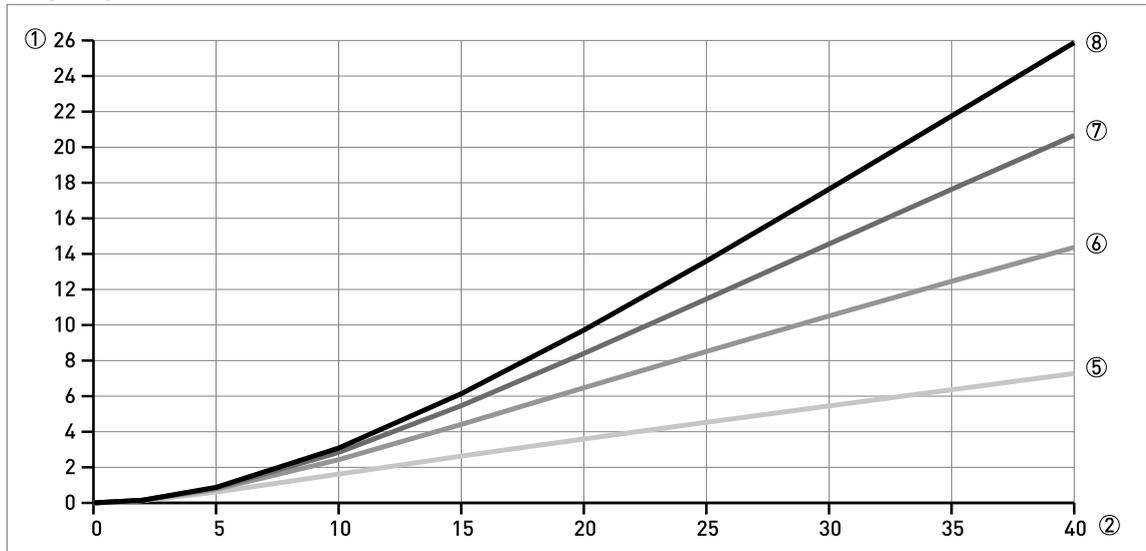


Figure 3-13: Estimated tensile load of polyethylene on the Ø8 mm single cable probe, in kN

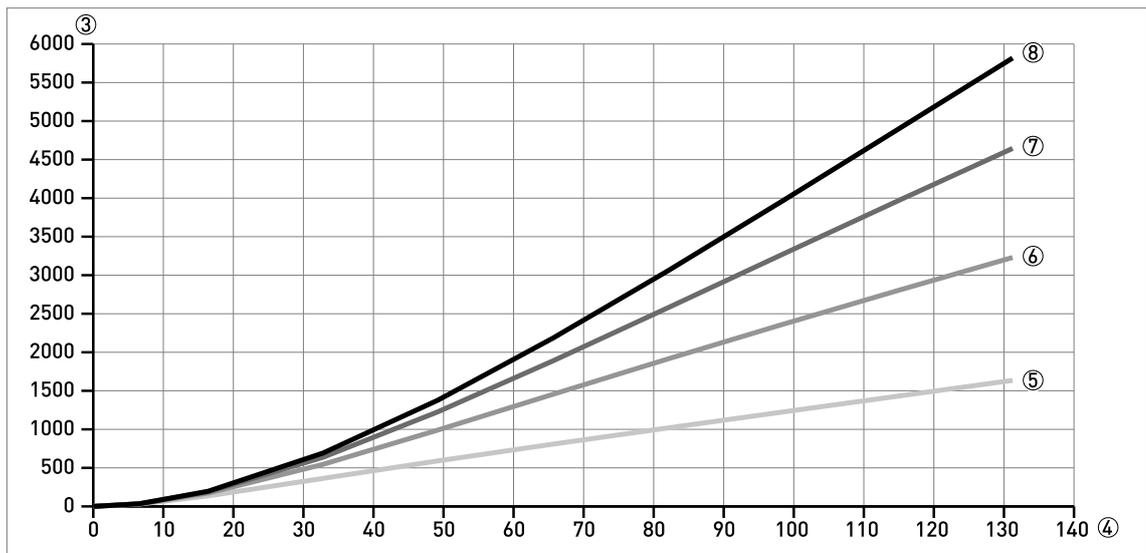


Figure 3-14: Estimated tensile load of polyethylene on the Ø0.32" single cable probe, in lb_f

- ① Tensile load in kilonewtons (kN)
- ② Probe length in metres (m)
- ③ Tensile load in pounds-force (lb_f)
- ④ Probe length in feet (ft)
- ⑤ Tensile load for a metal silo with a diameter of 3 m / 9.8 ft
- ⑥ Tensile load for a metal silo with a diameter of 6 m / 19.7 ft
- ⑦ Tensile load for a metal silo with a diameter of 9 m / 29.5 ft
- ⑧ Tensile load for a metal silo with a diameter of 12 m / 39.4 ft

4.1 Electrical installation: 2-wire, loop-powered

4.1.1 Compact version

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. If the device has a switch output - relay option, use a separate power supply (connect the power supply to the switch power supply terminals).

Terminals for electrical installation (one output)

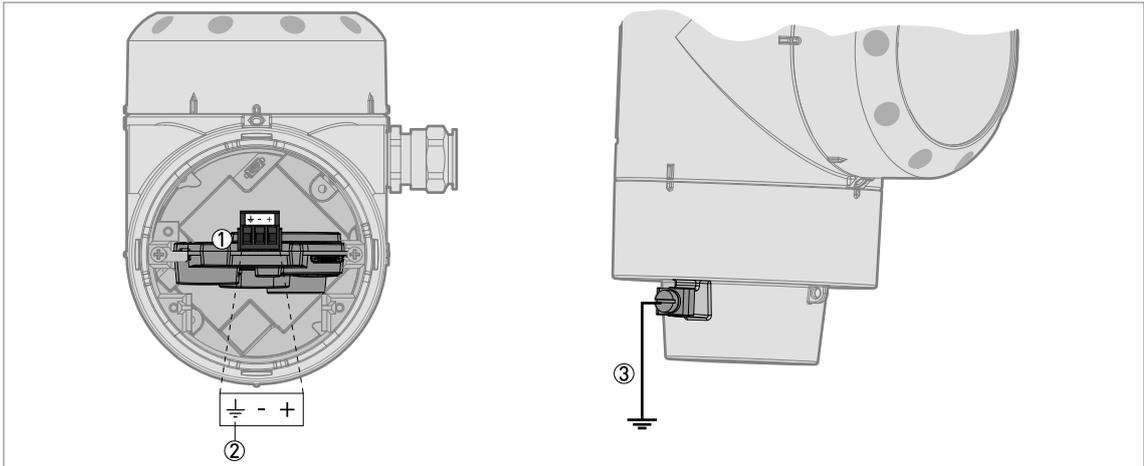


Figure 4-1: Terminals for electrical installation (one output)

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

Terminals for electrical installation (two current outputs)

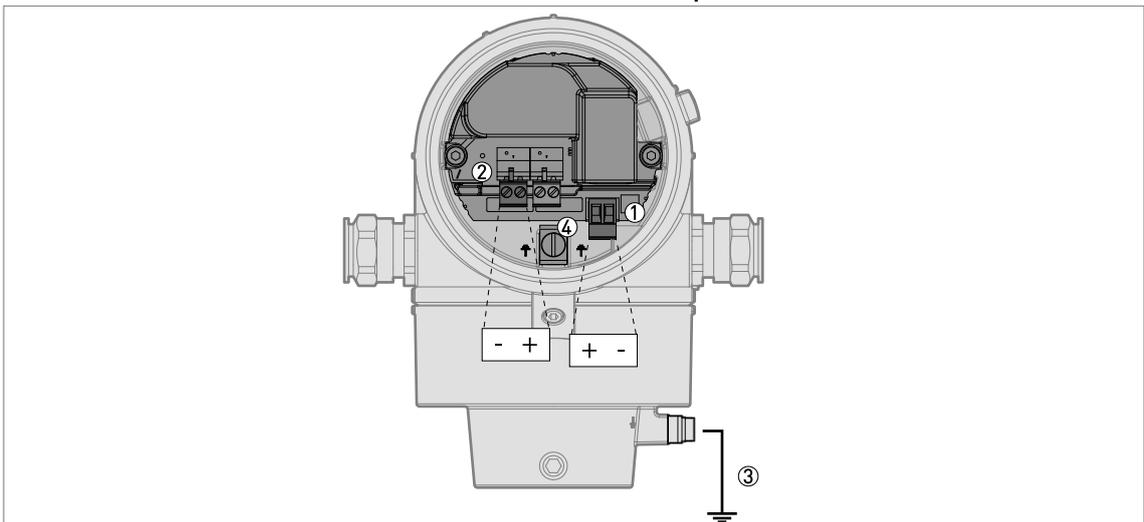


Figure 4-2: Terminals for electrical installation (two current outputs)

- ① Output 1: Terminals
- ② Output 2: Terminals
- ③ Location of the external grounding terminal (at the bottom of the converter)
- ④ Grounding terminal in the housing (if the electrical cable is shielded)

Terminals for electrical installation (one current output and one switch output - relay)

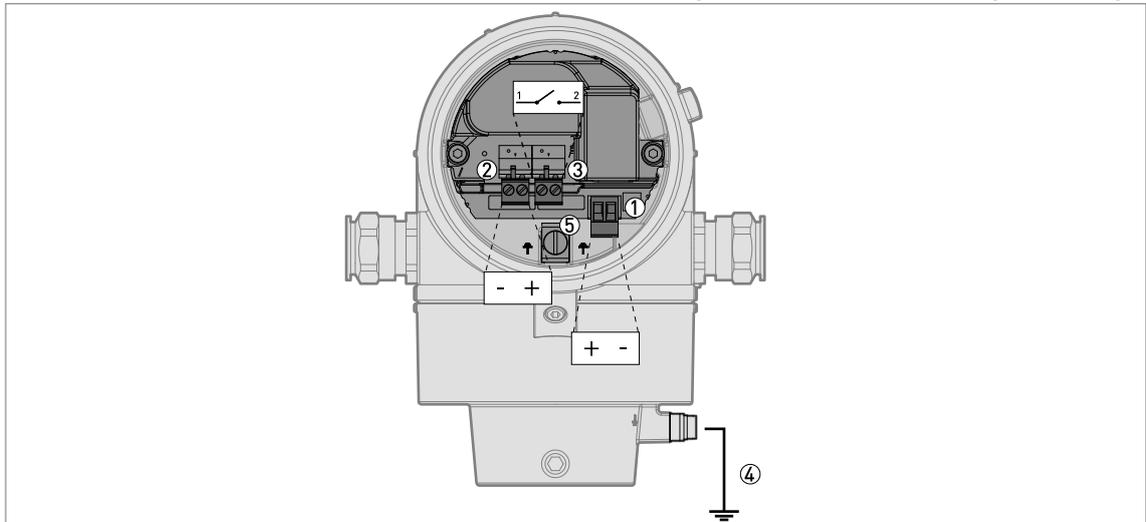


Figure 4-3: Terminals for electrical installation (one current output and one switch output - relay)

- ① Current output 1: Terminals
- ② Switch power supply: Terminals
- ③ Switch output - relay: Terminals
- ④ Location of the external grounding terminal (at the bottom of the converter)
- ⑤ Grounding terminal in the housing (if the electrical cable is shielded)

4.1.2 Remote version

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. If the device has a switch output - relay option, use a separate power supply (connect the power supply to the switch power supply terminals).

Terminals for electrical installation (one output)

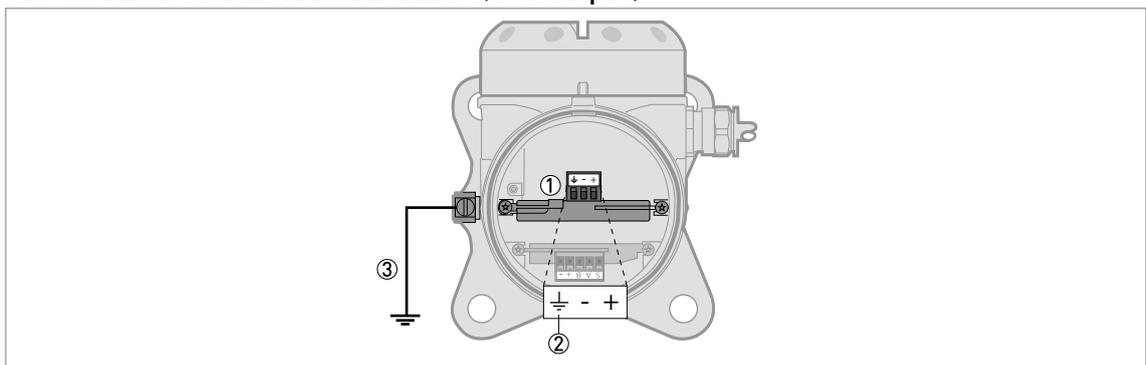


Figure 4-4: Terminals for electrical installation (one output)

- ① Current output 1: Terminals
- ② Grounding terminal in the housing (if the electrical cable is shielded)
- ③ Location of the external grounding terminal (on the wall support)

Terminals for electrical installation (two current outputs)

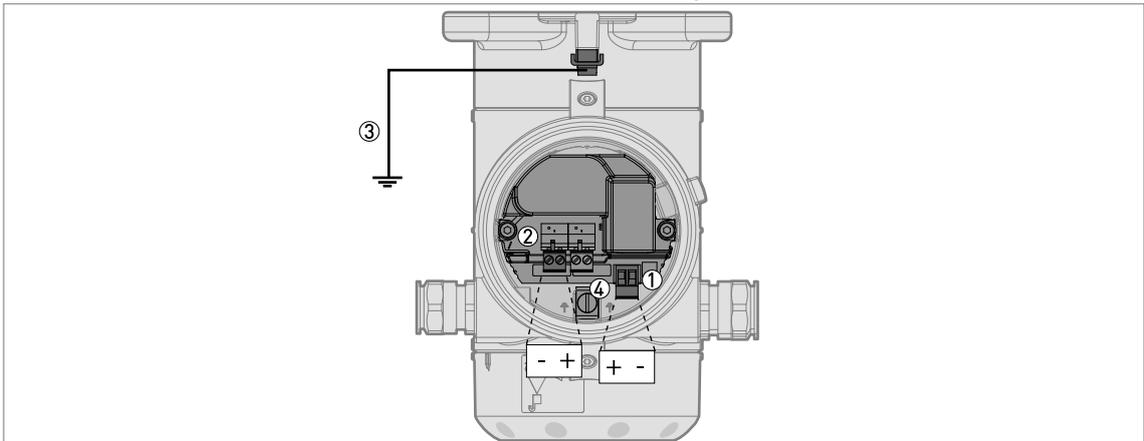


Figure 4-5: Terminals for electrical installation (two current outputs)

- ① Output 1: Terminals
- ② Output 2: Terminals
- ③ Location of the external grounding terminal (on the wall support)
- ④ Grounding terminal in the housing (if the electrical cable is shielded)

Terminals for electrical installation (one current output / one switch output - relay)

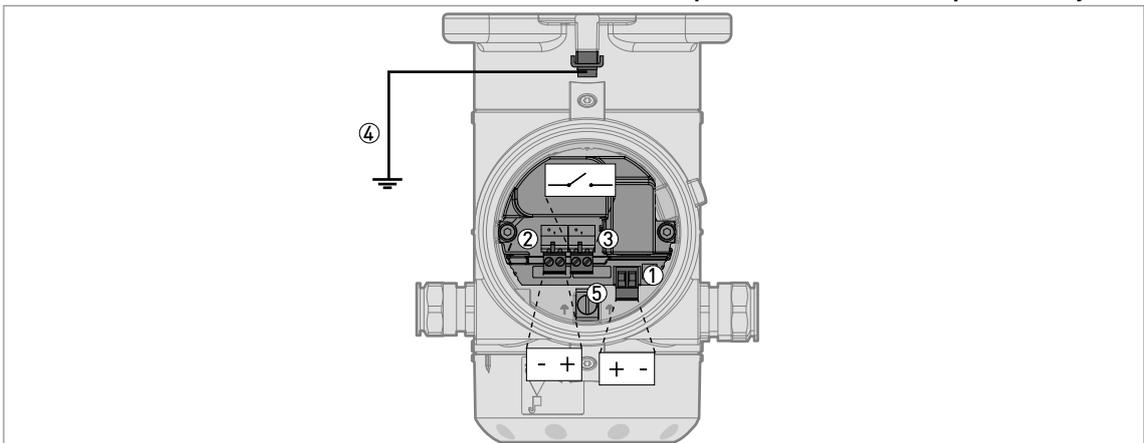


Figure 4-6: Terminals for electrical installation (one current output / one switch output - relay)

- ① Current output 1: Terminals
- ② Switch power supply: Terminals
- ③ Switch output - relay: Terminals
- ④ Location of the external grounding terminal (on the wall support)
- ⑤ Grounding terminal in the housing (if the electrical cable is shielded)

Connections between the remote converter and the probe housing (one output)

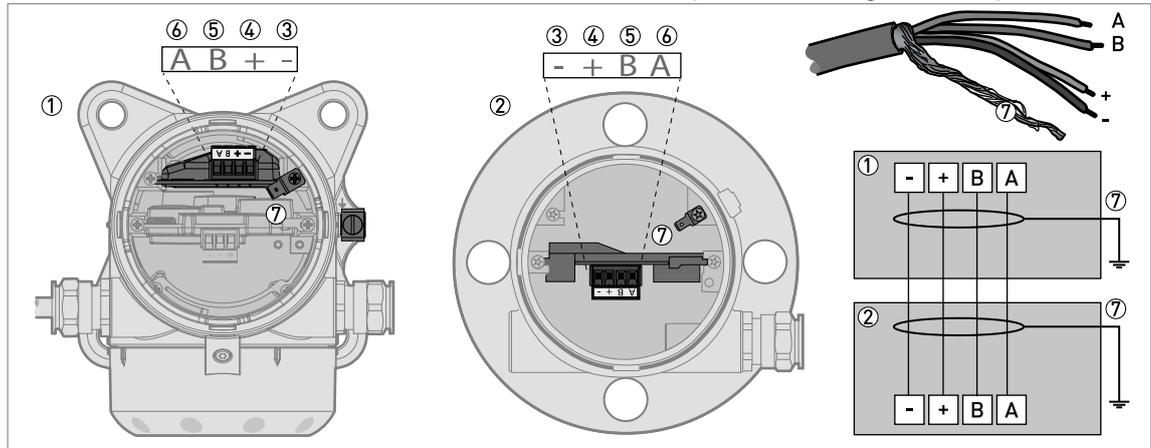


Figure 4-7: Connections between the remote converter and the probe housing (one output)

- 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 39.

4.2 Non-Ex devices

Two current outputs and the switch output - relay are supplied together as a device option. Two current outputs or the switch output - relay are only available if you send an order for a device with these options.

For more data about current output functions, the switch function and related settings, refer to the "Operation" chapter in the handbook.

One current output

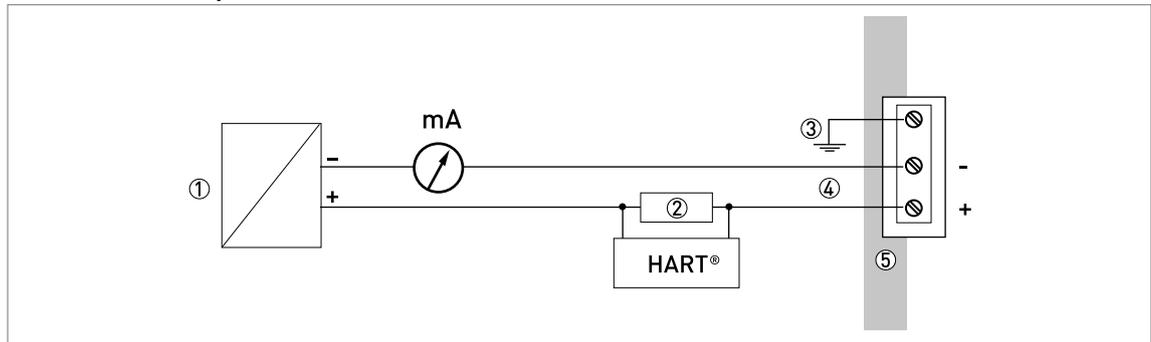


Figure 4-8: Electrical connections for non-Ex devices (one current output)

- ① Power supply
- ② Resistor for HART® communication
- ③ Optional connection to the grounding terminal
- ④ Output: 11.5...30 V DC for an output of 22 mA at the terminal
- ⑤ Device

Two current outputs

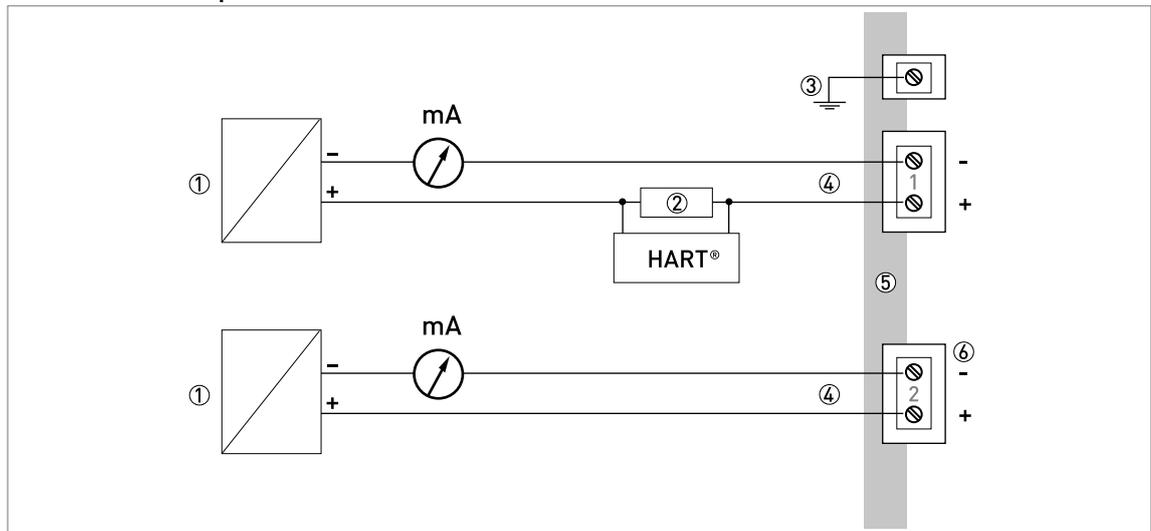


Figure 4-9: Electrical connections for non-Ex devices (two current outputs)

- ① Power supply
- ② Resistor for HART® communication
- ③ Optional connection to the grounding terminal
- ④ Output 1 and 2: 11.5...30 V DC for an output of 22 mA at the terminals

Note: Use a separate power supply to energize output 2. Make sure that the two outputs are energized.

- ⑤ Device
- ⑥ Connector for the optional second output

One current output and one switch output - relay

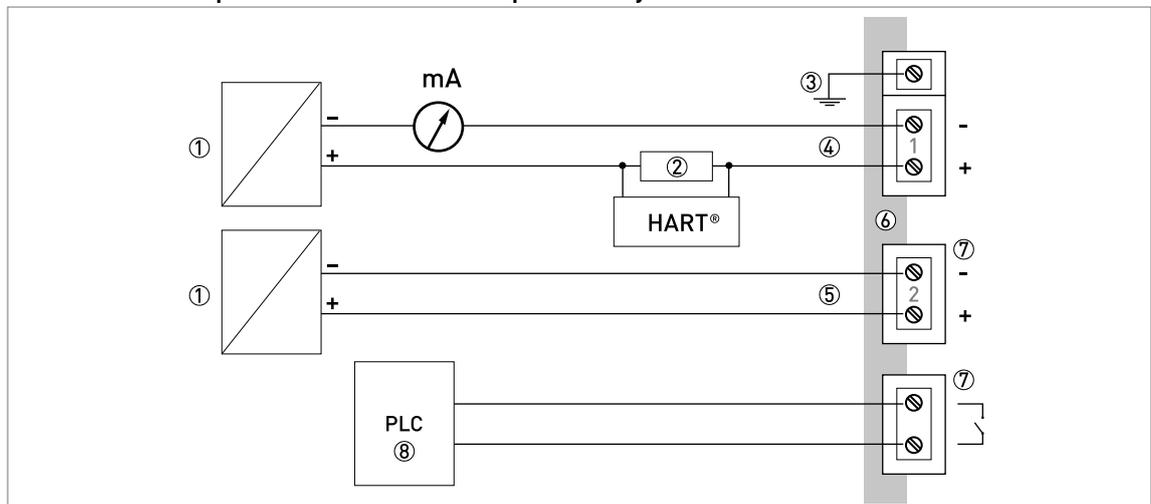


Figure 4-10: Electrical connections for non-Ex devices (one current output and one switch output - relay)

- ① Power supply
- ② Resistor for HART® communication
- ③ Optional connection to the grounding terminal
- ④ Output 1: 11.5...30 V DC for an output of 22 mA at the terminals
- ⑤ Switch power supply (2): 11.5...34 V DC / 30 mA

Note: Use a separate power supply to energize the switch output - relay option. Make sure that the current output and the switch power supply terminals are energized.

- ⑥ Device
- ⑦ Connector for the switch output - relay
- ⑧ PLC (for example)

4.3 Devices for hazardous locations

For electrical data for device operation in hazardous locations, refer to the related certificates of compliance and supplementary instructions (ATEX, IECEx etc.). This documentation can be downloaded from the website (Download Center).

4.4 Networks

4.4.1 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.

4.4.2 Point-to-point networks

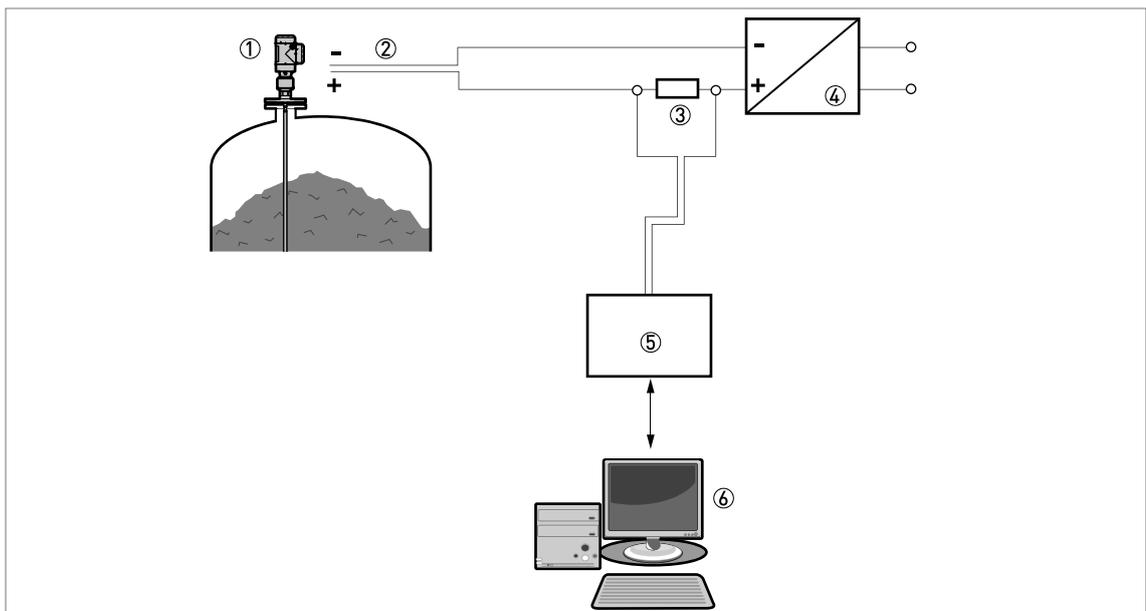


Figure 4-11: Point-to-point connection

- 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

4.4.3 Multi-drop networks

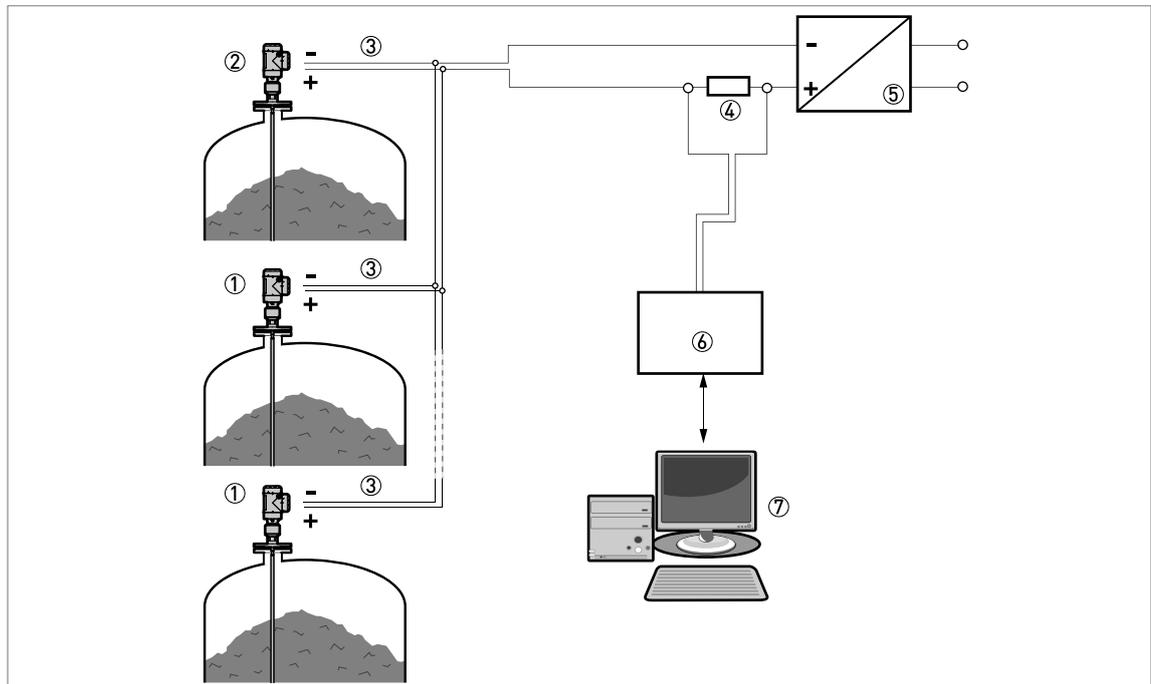
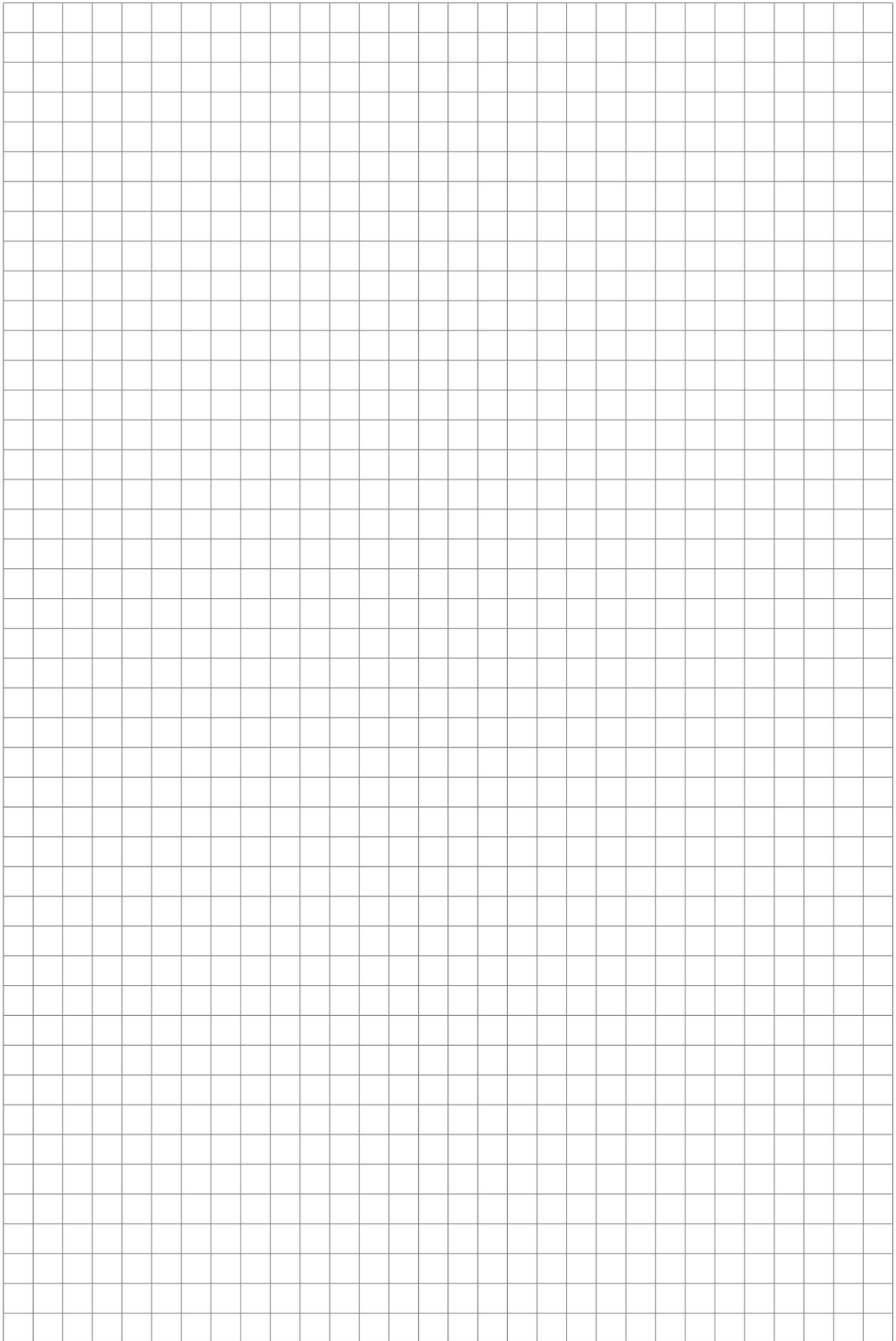
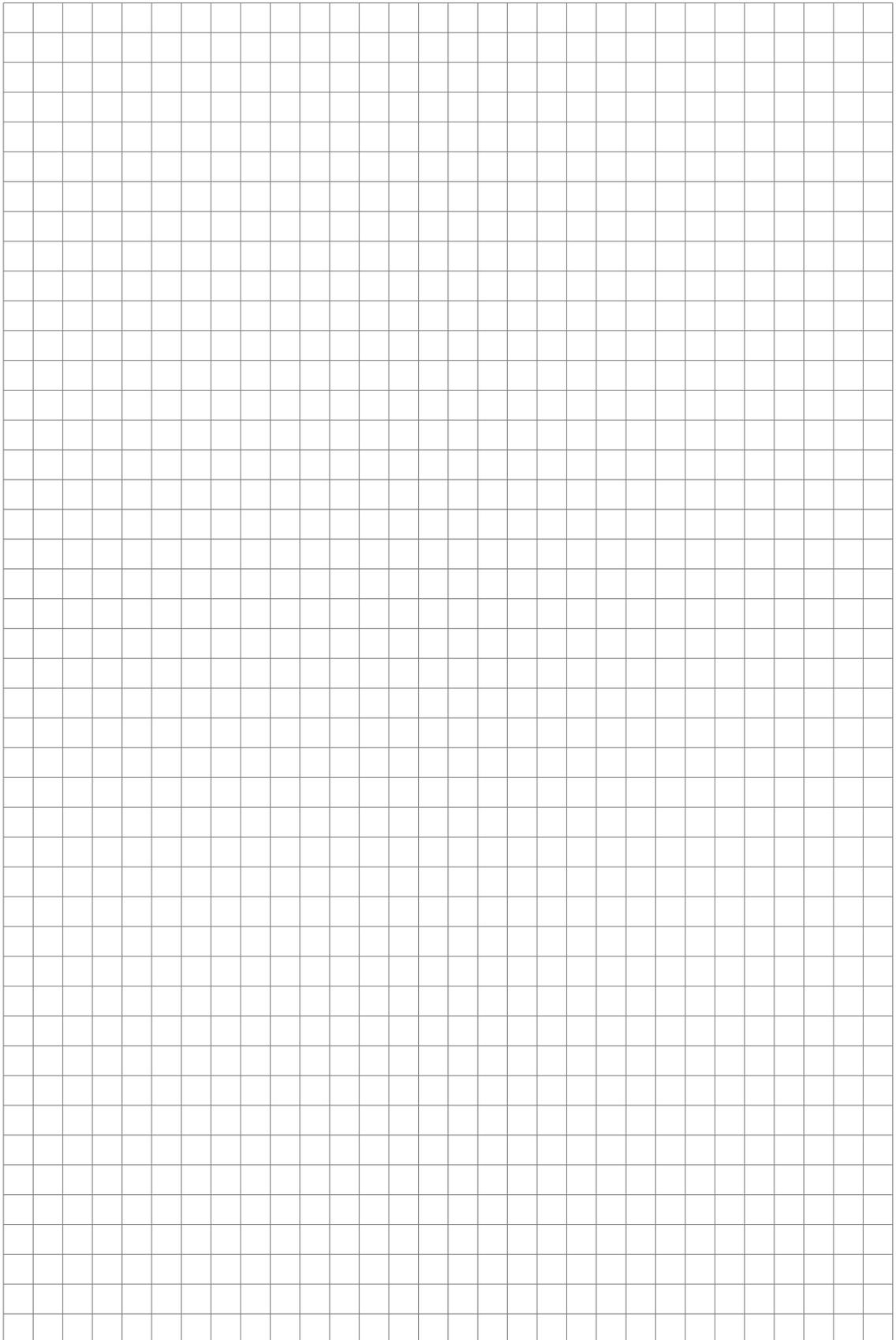


Figure 4-12: Multi-drop network (non-Ex)

- 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





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