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Subject to technical change.
 All dimensions in mm (inch).

We assume no liability for typing errors.
 Different variations than specified are possible.
 Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING






A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Introduction

Applications

Capacitive level limit switch for level monitoring in all types of containers and silos.

It can be used with powdery and granulated bulk materials with a dielectric constant of min. 1.6

A selection of fields of application:

- **Building materials industry**
lime, moulding sand, cement, etc.
- **Food industry**
milk powder, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Animal feed industry**
- **Chemical industry**
- **Mechanical engineering**

Function

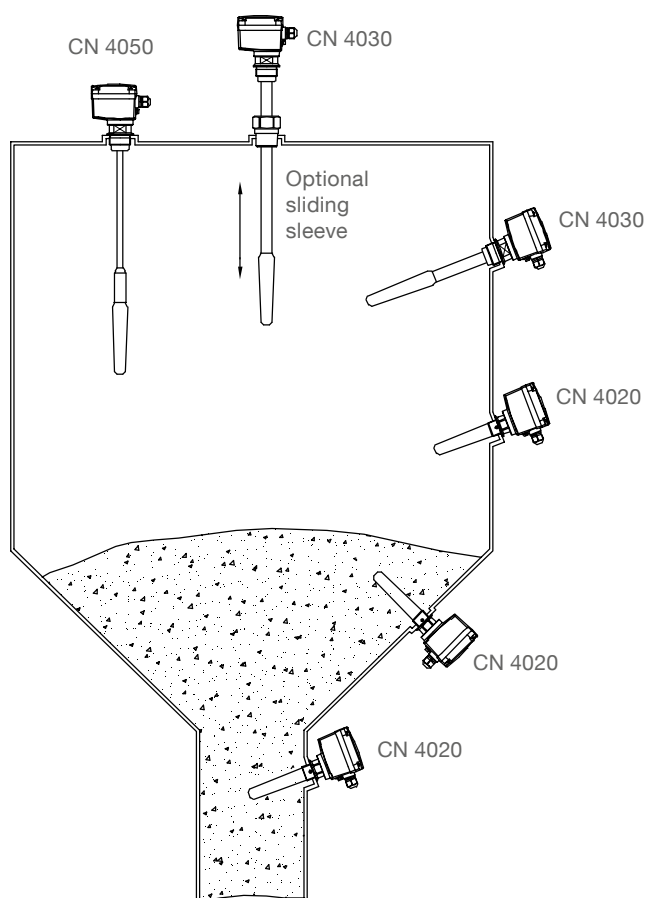
The Capanivo detects the capacitance around its probe. Due to the active shield technology it has an increased insensitivity to material buildup on the probe.

The measurement is nearly independent from the influence of the silo wall. Therefore factory provided precalibration allows measurement of most applications without calibration on site.

The unit is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The length of the probe can be up to 3 m (118") with an extension tube (CN 4030) or up to 6 m (236") with an extension rope (CN 4050).

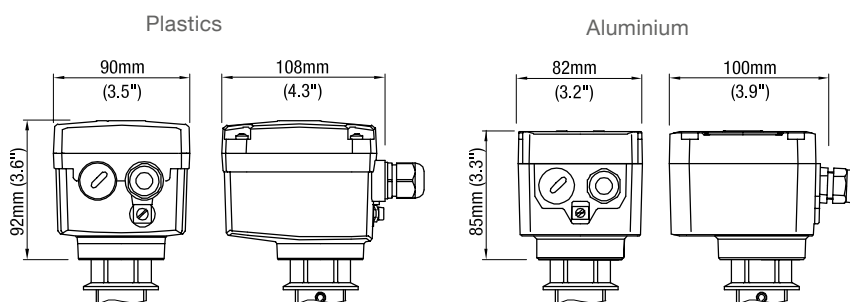
The use of a sliding sleeve is recommended so that the switch point can be changed easily during operation of the device.



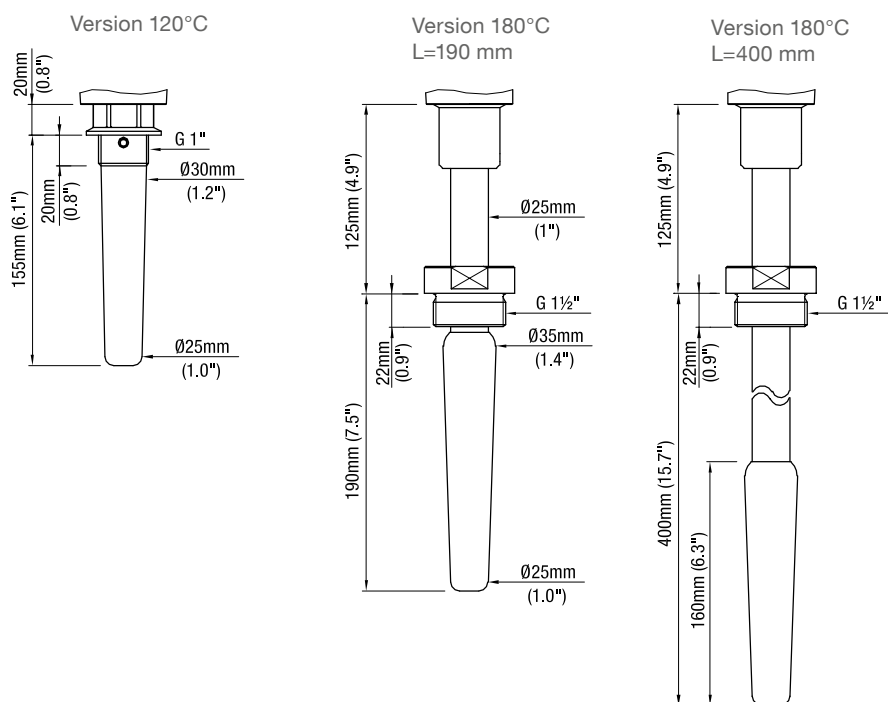
Technical data

Dimensions

Housing versions

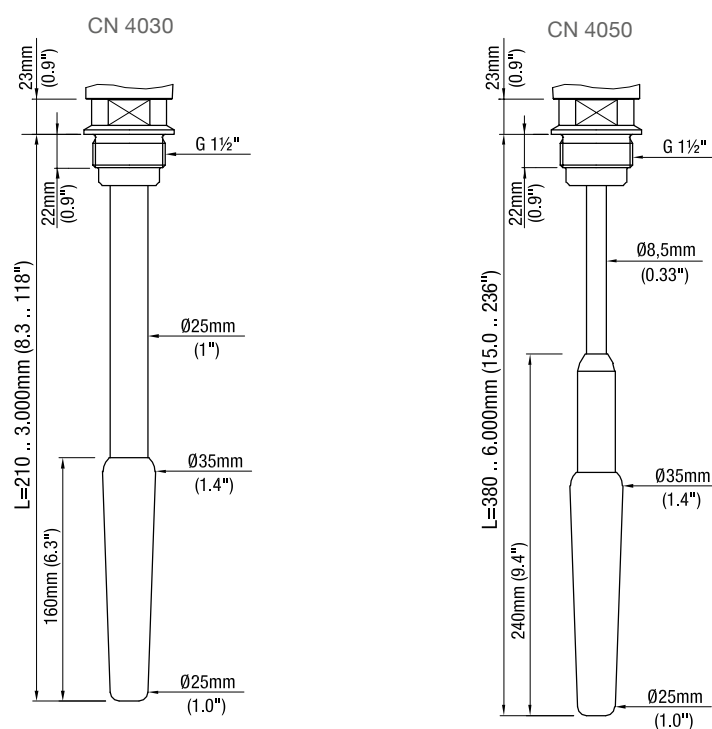


CN 4020



CN 4030

CN 4050



Technical data

Electrical data

Connection terminals	0.14 - 2.5 mm ² (AWG 26-14)
Cable entry	M20 x 1.5 screwed cable gland NPT ½" or NPT ¾" conduit connection Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")
Signal delay	Sensor free -> covered adjustable ca. 0.5 to 20 sec Sensor covered -> free adjustable ca. 0.5 to 20 sec
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety
Sensitivity	Adjustable in 4 ranges
Overvoltage category	II
Pollution degree	2 (inside housing)

Electronics	Relay SPDT	Relay DPDT Universal voltage	PNP 3-wire
Power supply	21 .. 27 V DC ±10% (incl. 10% of EN 61010)	21 .. 230 V AC 50 - 60 Hz 21 .. 45 V DC ±10% (incl. 10% of EN 61010)	20 .. 40 V DC ±10% (incl. 10% of EN 61010)
Max. ripple of power supply	7 V _{ss}	7 V _{ss} at DC	7 V _{ss}
Installed load	max. 1.5 W	max. 18 VA/ 2 W	max. 0.5 A
Signal output	Floating relay SPDT AC max. 250 V, 3 A non inductive DC max. 30 V, 5 A non inductive	Floating relay DPDT AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Open Collector: permanent load max. 0.4 A short-circuit and overload protected turn-on voltage: max. 44 V (reverse protection)
Indicating light	Status of signal output by built-in LED	Status of signal output by built-in LED	Status of signal output by built-in LED
Isolation	Power supply to signal output: 2,225 Vrms	Power supply to signal output: 2,225 Vrms Signal output to signal output (DPDT): 2,225 Vrms	-
Protection class	I	I	III

Technical data

Mechanical data

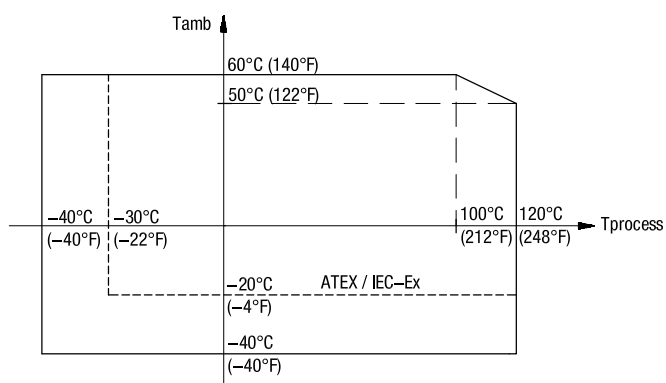
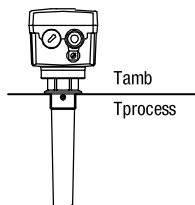
Housing	Plastics PA6 GF, RAL 5010 gentian blue or aluminium, powder coated, RAL 5010 gentian blue	
	Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film	
Degree of protection	IP66 (EN 60529)	
Process connection and extension	CN 4020 version 120°C:	
	Material process connection/ probe:	Plastics PPS (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾
	Thread:	G 1“
	Adapter (optional):	G 1" to G 1½“ in aluminium or 1.4305 (SS305) ⁽²⁾
	CN 4020 version 180°C:	
	Material process connection/ extension:	1.4305 (SS303) ⁽²⁾
	Material probe:	Plastics PPS (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾
	Thread:	G 1½“
	CN 4030:	
	Material process connection/ extension:	Aluminium or 1.4305 (SS303) ⁽²⁾
Material probe:	Plastics PBT (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾	
Thread:	G 1½“	
CN 4050:		
Material process connection:	Aluminium or 1.4305 (SS303)	
Material extension cable:	PE with black carbon	
Material probe:	Plastics PPS/PBT (glass fibre reinforced) ⁽¹⁾	
Thread:	G 1½“	
Flat gasket (included):	Material AFM30	
	⁽¹⁾ Discolouration is possible due to influence of UV and temperature. This has no negative effect to the material properties.	
	⁽²⁾ Food grade	
Sound level	max. 40 dBA	
Overall weight (ca.)	CN 4020 version 120°C:	0.5 kg (1.1 lbs)
	CN 4020 version 180°C:	1.8 kg (4.0 lbs)
	CN 4030 (aluminium extension):	0.8 kg (1.8 lbs) + 0.8 kg/m (1.8 lbs per 39.3“)
	CN 4030 (stainless steel extension):	1.5 kg (3.3 lbs) + 1.6 kg/m (3.5 lbs per 39.3“)
	CN 4050 (aluminium extension):	0.9 kg (2.0 lbs) + 0.25 kg/m (0.55 lbs per 39.3“)
	CN 4050 (stainless steel extension):	1.4 kg (3.1 lbs) + 0.25 kg/m (0.55 lbs per 39.3“)
Tolerance length "L“	CN 4020 version 120°C:	±5 mm (±0.2“)
	CN 4020 version 180°C :	±10 mm (±0.4“)
	CN 4030:	±10 mm (±0.4“)
	CN 4050:	±15 mm (±0.6“)

Technical data

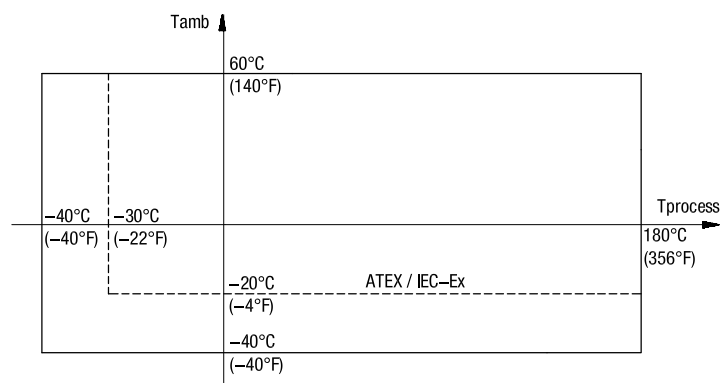
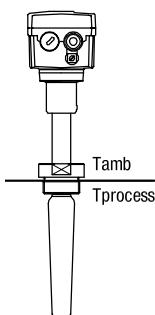
Operating conditions

Ambient and process temperature

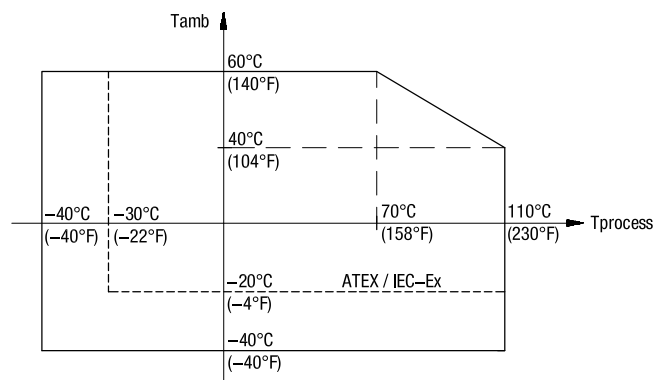
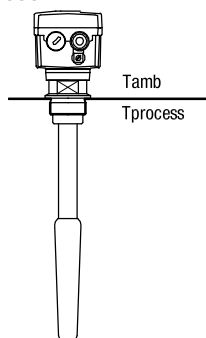
CN 4020
 version 120°C



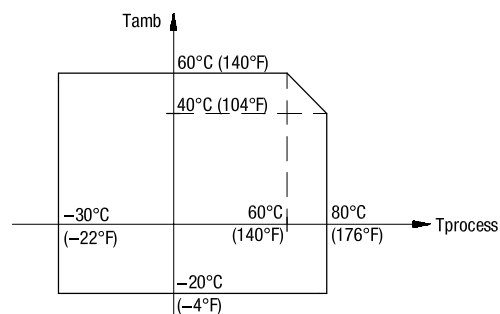
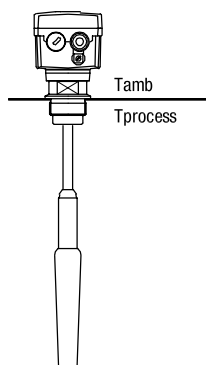
CN 4020
 version 180°C



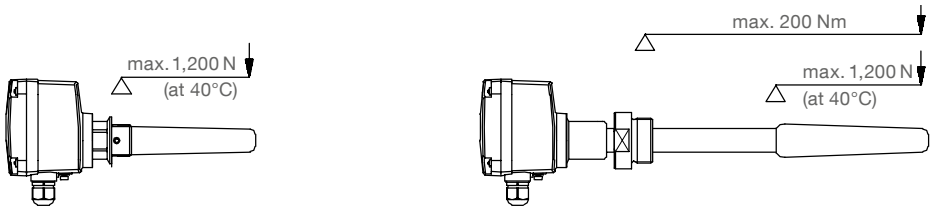
CN 4030



CN 4050



Technical data

Ventilation	Ventilation is not required	
Max. permitted mechanical torque	CN 4020 version 120°C	CN 4020 version 180°C CN 4030
	 <p>Recommended protection in case of high material load: mounting of a protective angle above the probe</p>	
Max. tractive force	CN 4050	4 kN
Max. process pressure	CN 4020 (Ausführung 120°C) CN 4020 (Ausführung 180°C)/ CN 4030 CN 4050	25 bar (363 psi) 16 bar (232 psi) 6 bar (87 psi)
Vibration	1.5 (m/s ²) ² /Hz according to EN 60068-2-64	
Features of bulk material	Min. DK: 1.6 (dielectric constant, see external DK tables) Max. grain size: ca. 30 mm	
Switching point	Material with high DK value -> the signal output switches when the probe is covered a few mm Material with low DK value -> the signal output switches, when the probe is covered a few cm	
Relative Humidity	0 - 100%, suitable for outdoor use	
Altitude	max. 2,000 m (6,562 ft)	
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.	

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals

General Purpose (Ordinary Locations)	CE TR-CU	EN 61010-1	
Hazardous Locations *	CN 4020/ CN 4030:	ATEX: IEC-Ex: TR-CU:	II 1/2D Ex ta/tb IIIC T! Da/Db Ex ta/tb IIIC T! Da/Db Ex ta/tb IIIC T! Da/Db X
	CN 4050:	ATEX: IEC-Ex: TR-CU:	II 1/2D Ex ia/tb IIIC T! Da/Db Ex ia/tb IIIC T! Da/Db Ex ia/tb IIIC T135°C Da/Db X
EMC	EN 61326 - A1		
RoHS conform	According to directive 2011/65/EU		
Food grade material	According to directive 1935/2004/EC		
Pressure Equipment Directive (2014/68/EU)	The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, Abs. 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive. The unit is NOT intended for use as an “equipment part with safety function (Art.1, Abs. 2.1.3). If the units should be used as „equipment part with safety function“ please contact the manufacturer.		

* Depending on selected version

Options / Accessories

Weather-protection-cover

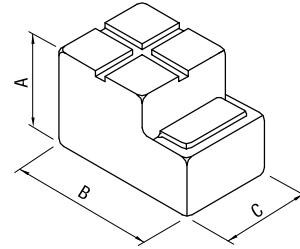
When the measuring device is used outdoor, the use of the weather-protection-cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation of water
- excessively high temperatures due to insulation
- excessively low temperatures in winter

Material: PE, weathering and temperature stable

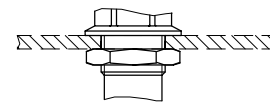


For use in Hazardous Locations: only permitted for Zone 22.



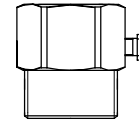
Hexagon nut

For mounting on a wall without a socket.
 Material: Aluminium or 1.4305 (303)



Sliding sleeve

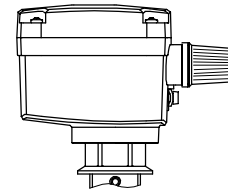
CN 4030 G 1½" ISO 228
 Material: 1.4305 (303)
 Sealing material to the extension tube: FKM



Bulb

Bright indicating light seen from outside.

Not available for use in Hazardous Locations.

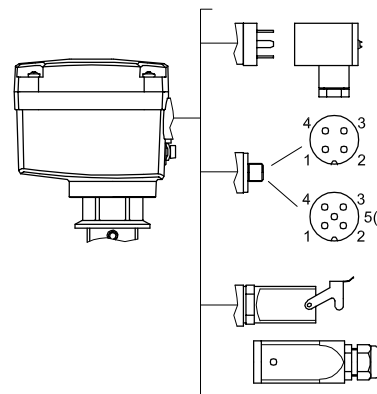


Plug

Used instead of cable gland.

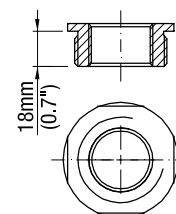
- Valve connector or
- M12 or
- Harting Han 4A

Not available for use in Hazardous Locations.



Adapter

G 1" to G 1½" / NPT 1¼" / NPT 1½"
 Material: Aluminium or 1.4305 (303)



Shortening kit

For CN 4050 cable

Mounting

! General Safety Instructions

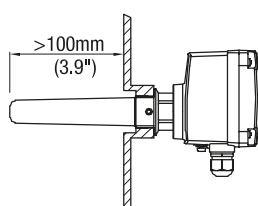
Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Fastening of the threaded process connection	Mounting torque for the thread may not exceed 40 Nm (metal thread)/ 20 Nm (plastic thread). Use a open-end wrench. Do not fasten by turning the housing, for this will destroy the unit.
Food grade material	The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.

Mounting instructions

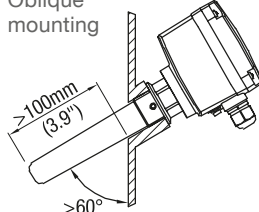
Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands face downwards and are closed to avoid water penetration into the housing. The housing can be rotated after installation.
Sealing	Ensure proper seal of the process thread in case of process pressure.

Distances of the probe

CORRECT
 Probe leads into the product

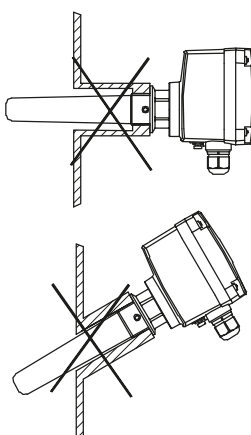


Oblique mounting

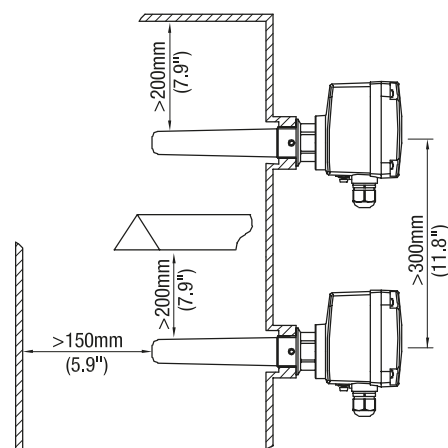


Observe mounting angle to ensure, that the active tip of the probe has enough distance to the metal silo wall

WRONG
 Socket too long

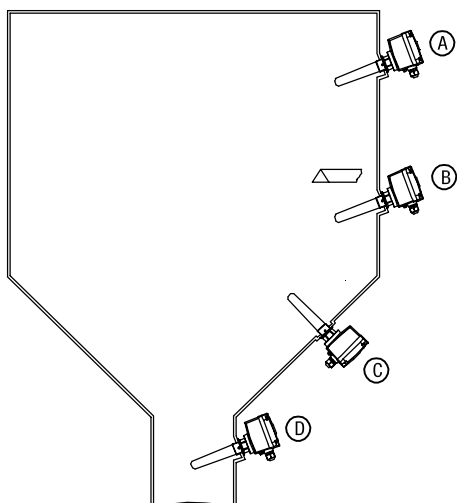


Observe min. distance between two sensors, to metal silo wall and to protective angle.



Mounting

CN 4020



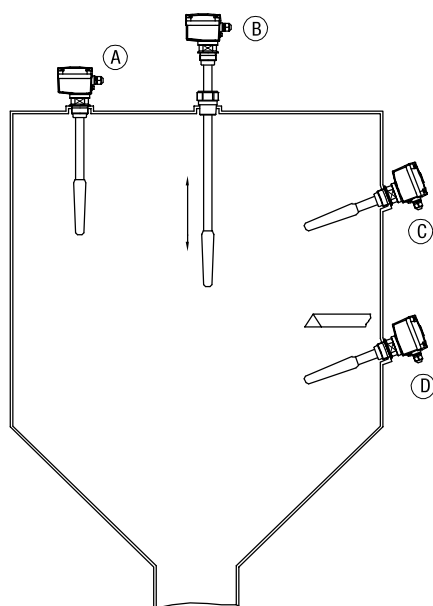
CAUTION

Observe:

- General distances of the probe (see page 11).
- Distance to material flow (filling).
- Max. permitted mechanical load (see page 8).
- Wearing due to abrasive bulk material.

- A** Full detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily.
- B** Demand or empty detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily. Protective angle recommended depending on load and abrasion of the material.
- C** Empty detector oblique from the bottom.
- D** Empty detector in the silo outlet.

CN 4030



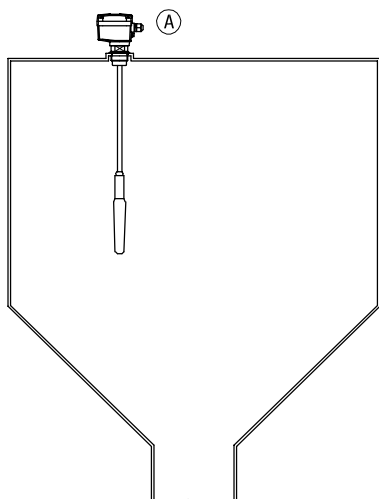
CAUTION

Observe:

- General distances of the probe (see page 11).
- Distance to material flow (filling).
- Max. permitted mechanical load (see page 8).
- Wearing due to abrasive bulk material.

- A** Full detector vertical.
- B** Full detector with sliding sleeve.
- C** Full detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily.
- D** Demand or empty detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily. Protective angle recommended depending on load and abrasion of the material.

CN 4050



CAUTION

Observe:

- Distance of the probe to the silo wall (see page 11). Consider that the hanging probe can move sideways with material.
- Distance to material flow (filling).
- Max. permitted mechanical traction (see page 8). Empty detector: Do not install in the center of the silo due to high traction with moving material.
- Wearing due to abrasive bulk material.

- A** Full, demand or empty detector vertical.

Electrical installation



General Safety Instructions

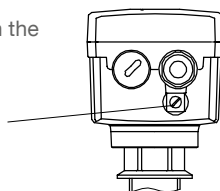
Handling	In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.
Protective earthing	Before any electrical installation, the device must be connected to the protective earthing terminal inside the housing.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed. With use of 24 V supply voltage, an approved power supply with reinforced isolation to mains is required
Fuse	Use a fuse as stated in the connection diagram.
RCCB protection	In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch so as to protect the user of the device from indirect contact with dangerous electric tensions.
Power supply switch	A power-supply-disconnecting switch must be provided and marked near the device.
Wiring diagram	The electrical connections have to be made according to the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic and name plate before switching the device on.
Cable gland/ closing element	The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be locked with a closing element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250 V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Connecting the terminals	Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Relay and transistor protection	Provide protection for relay contacts and output transistors to protect the device against spikes with inductive loads.
Protection against static charging	The unit must be grounded in any case to avoid static charging of the unit, especially on applications with pneumatic conveying.

Electrical installation

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal

Connect external terminal on the housing with equipotential bonding of the plant.



Cable glands and conduit system

- Installation according to the regulations of the country, where the product is installed.
- Not used entries have to be closed with blanking elements certified for this purpose.
- Where applicable the factory provided parts must be used.
- A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.
- The diameter of the field wiring cable must match to the clamping range of the cable clamp.
- If other than the factory provided parts are used, following must be ensured:
 The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection). The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 K.
 The parts must be mounted according to the instructions of the supplier.

Commissioning

Commissioning only with closed lid.

Opening the lid

Before opening the lid take care, that no dust deposits or whirlings are present.
 Do not remove the lid (cover) while circuits are alive.

Electrical installation

Relay SPDT

Power supply:

21 .. 27 V DC $\pm 10\%$ * 1.5W
 *incl. 10% of EN 61010

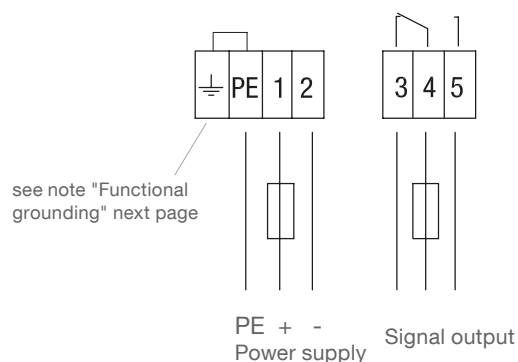
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay SPDT

AC max. 250 V, 3 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 5 A, fast or slow, HBC, 250 V



Relay DPDT Universal voltage

Power supply:

21 .. 230 V 50 - 60 Hz $\pm 10\%$ * 18 VA
 21 .. 45 V DC $\pm 10\%$ * 2 W
 *incl. 10% of EN 61010

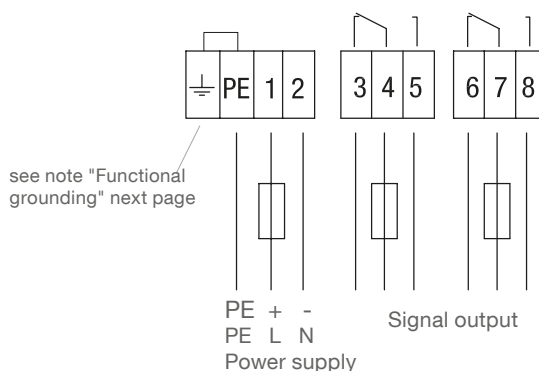
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



PNP 3-wire

Power supply:

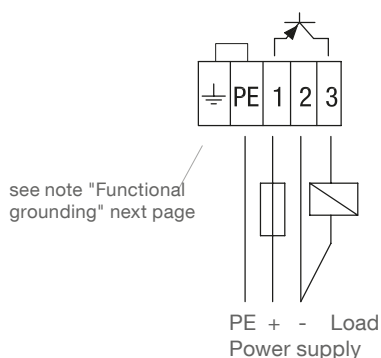
20 .. 40 V DC $\pm 10\%$ * 0.5 A
 *incl. 10% of EN 61010

Fuse:
 max. 4 A, fast or slow, 250V, HBC

Signal output:

max. 0.4 A

Load for example:
 PLC, relay, contactor, bulb



Approved power supply with reinforced insulation to mains is required

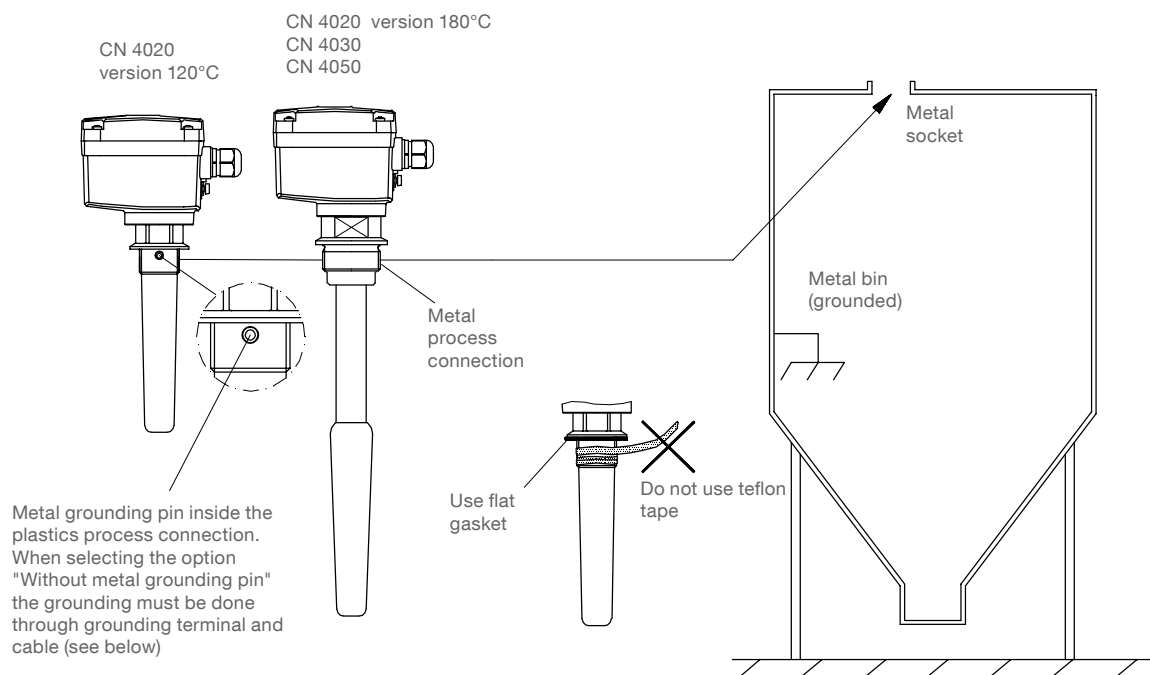
Electrical installation

Functional grounding

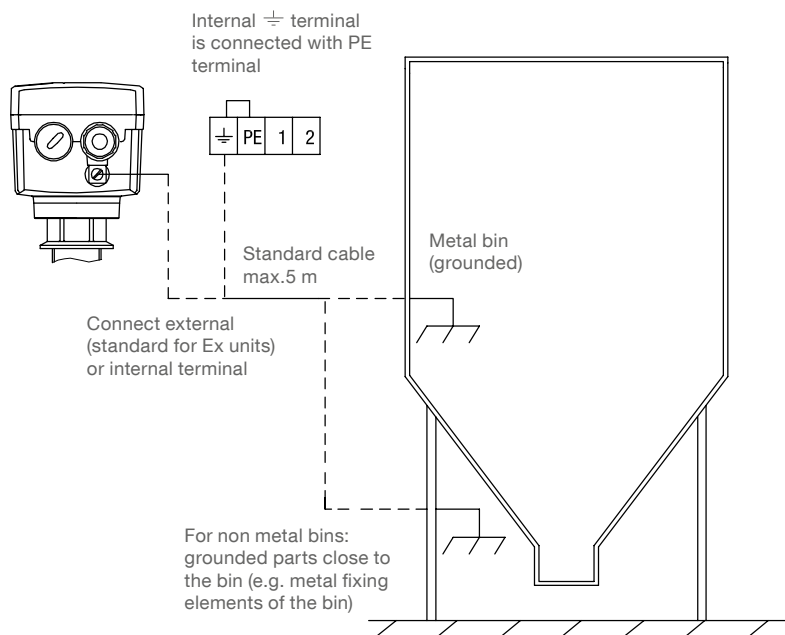
The unit must have connection to earth for proper functioning. This can be done by one of the following possibilities:

Grounding through process connection

CAUTION: This grounding alone is not enough for Ex applications.



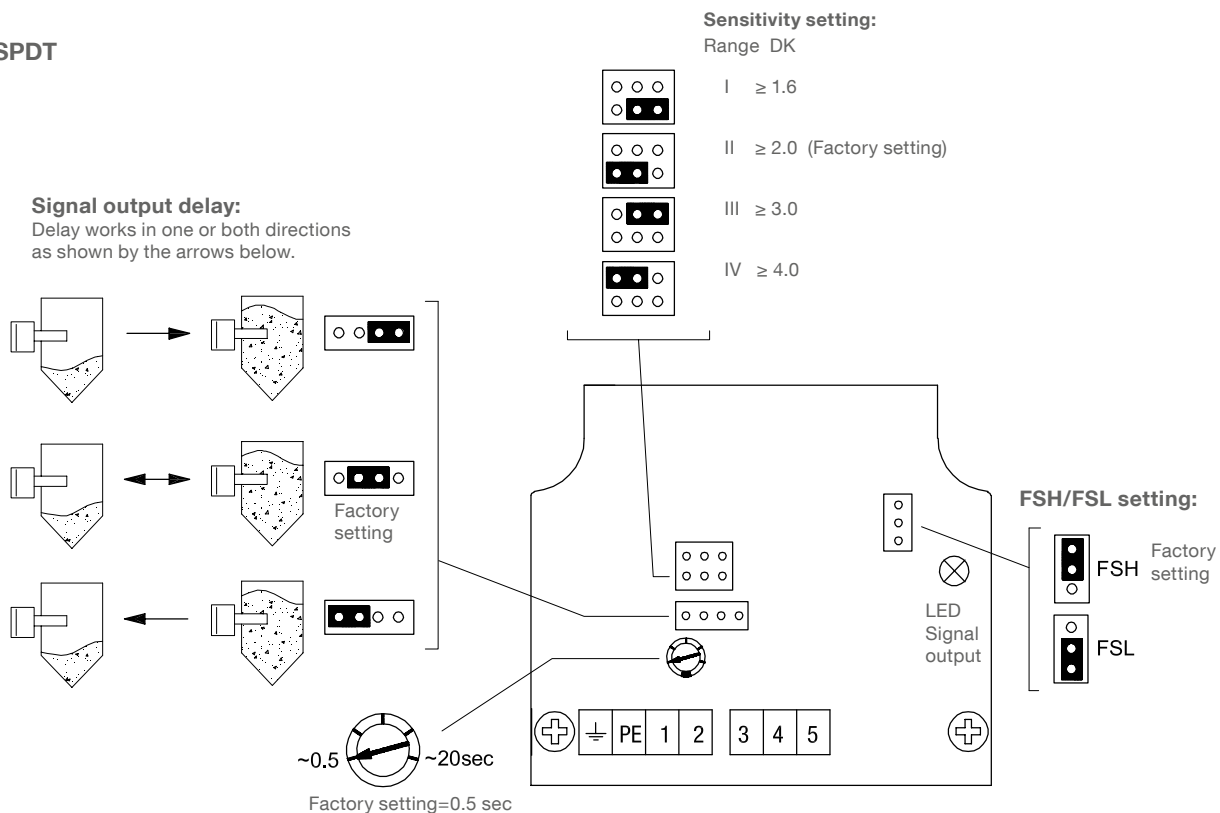
Grounding through grounding terminal and cable



Settings

Control elements

Relay SPDT

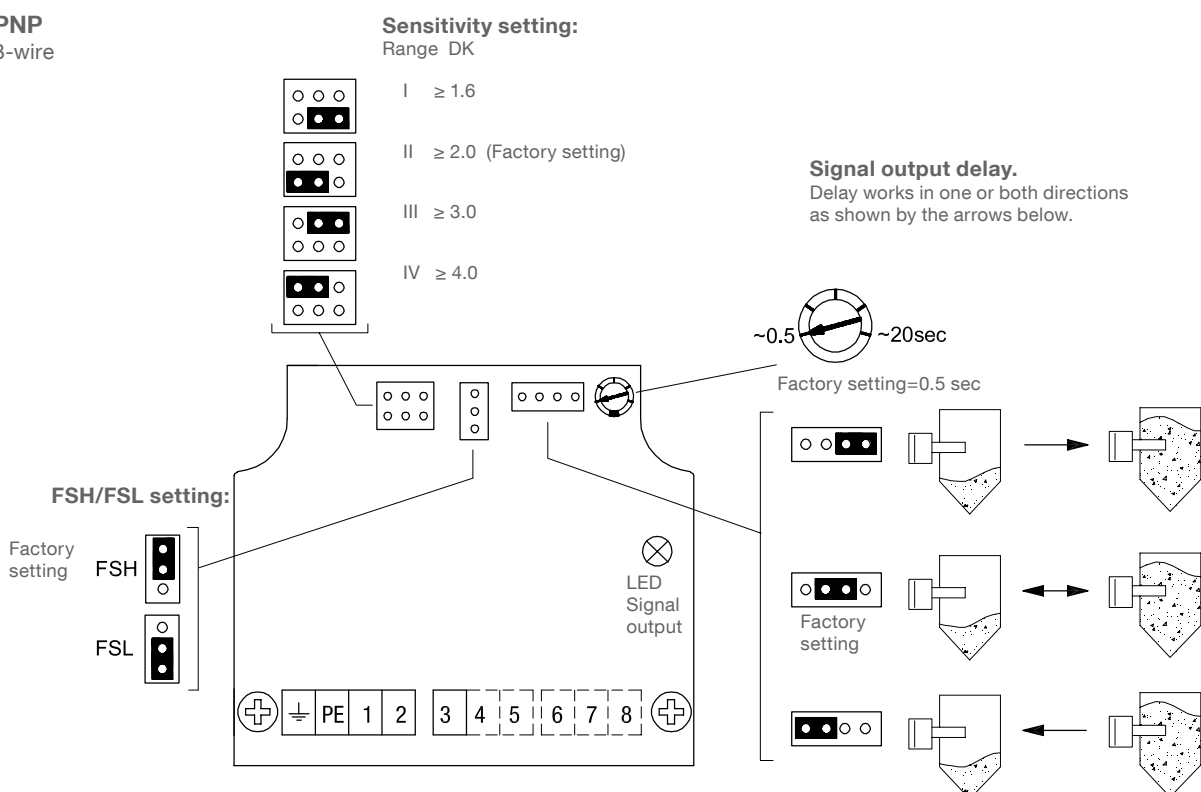


Relay DPDT

Universal voltage

PNP

3-wire



Settings / Signal output logic

Sensitivity setting

The units are factory set to Range II and do normally not need to be resetted on site.
 If required, the setting can be changed:

	Description	Required DK value	Possible material buildup
Range I	Max. sensitivity for low DK value	≥ 1.6	Low
Range II	Standard setting for most applications	≥ 2.0	Medium
Range III	Low sensitivity for high material buildup on the probe	≥ 3.0	High
Range IV	Min. sensitivity for very high material buildup on the probe	≥ 4.0	Very high

Signal output logic

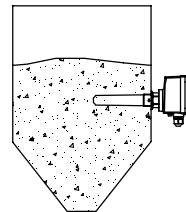
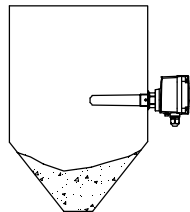
FSH: Set in case of using the sensor as a full detector: Power failure or line break is regarded as "full" signal (protection against overcharging).

FSL: Set in case of using the sensor as an empty detector: Power failure or line break is regarded as "empty" signal (protection against running dry).

Signal output

Signal output

Setting	FSL	FSH	FSL	FSH	
Relay SPDT					
Relay DPDT					
PNP					
LED „Signal output“					



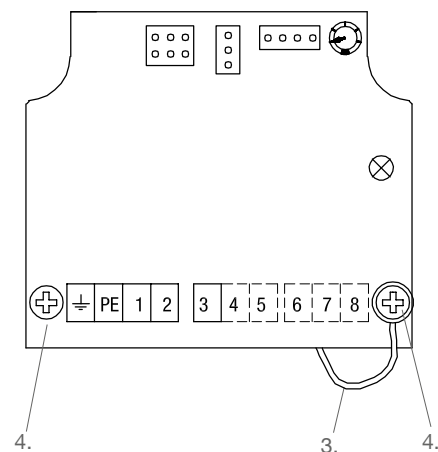
Maintenance

Opening the lid (cover)	<p>Before opening the lid for maintenance reasons observe following items:</p> <ul style="list-style-type: none"> • Do not remove the lid while circuits are alive. • No dust deposits or whirlings are present. • No rain can enter into the housing.
Frequent check of the unit	<p>To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:</p> <ul style="list-style-type: none"> • Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables. • Tight sealing of the process connection, cable glands and enclosure lid. • Properly connected external PE cable (if present).
Cleaning	<p>If cleaning is required by the application, following must be observed:</p> <ul style="list-style-type: none"> • Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered. <p>The cleaning process must be done in a way, that:</p> <ul style="list-style-type: none"> • The cleaning agent cannot enter into the unit through the lid sealing or cable gland. • No mechanical damage of the lid sealing, cable gland or other parts can happen. <p>A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.</p>
Function test	<p>A frequent function test may be required depending on the application.</p> <p>Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).</p> <p>This test does not proof if the sensor is sensitive enough to measure the material of the application.</p> <p>Function test is done by touching the sensor part with appropriate means (e.g. grounded metal plate or hand) and monitor if a correct change of the signal output from uncovered to covered happens.</p>
Production date	<p>The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.</p>
Spare parts	<p>All available spare parts are stated in the selection list</p>

Change of the electronic board:

- CN 4020** Deenergise device and secure against being switched on again.
 Before opening the lid take care, that the unit is clean and no water or dirt can enter into the housing.
1. Open the housing lid.
 2. Remove the field wiring cables.
 3. Remove the internal functional ground cable.
 4. Unscrew the two fastening screws of the electronic board.
 5. Take out the electronic board.
 6. Remove the plug to the probe.
 7. Connect the plug to a new electronic board.
 8. Insert the new electronic board and tighten fastening screws.
 9. Connect the functional ground cable and the field wire cables.
- Calibration is not required.

- CN 4030** For these types a non changeable electronic is located inside the probe. Please return defective units to the manufacturer.
- CN 4050**



Notes for use in Hazardous Locations

Zone classification

	Usable in zone	ATEX category	IEC-Ex Equipement Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D*	Dc

* in case of conductive dust additional demands for the installation are possible.

General Notes

Marking

Devices with Ex approval are marked on the name plate.

Process pressure

The device construction allows process over-pressure upto 6/ 16 bar (87/ 232 psi) (see name plate). These pressures are allowed for test purposes. The definition of the ATEX/ IEC-Ex is only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approval is not valid.

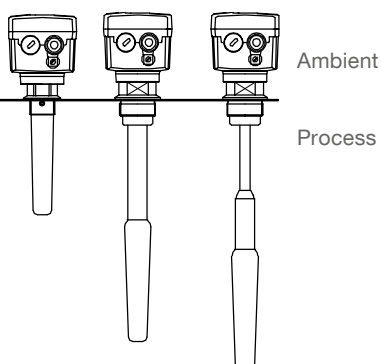
Process and ambient temperature

The permitted temperature ranges are marked on the name plate. Observe derating curves.


Permitted zones (categories) for mounting in partition wall

EPL (IEC-Ex)	Db
Category (ATEX)	2D
Zone	21

EPL (IEC-Ex)	Da
Category (ATEX)	1D
Zone	20



Max. Surface Temperature

The temperature marking on the name plate  refers to the instruction manual. On the following tables the relevant temperature ratings are shown. The maximum surface temperature is the hottest temperature of the unit which could occur during malfunction (according to Ex-definition).

Version CN 4020 120°C/ CN 4030/ CN 4050:

Max. ambient temperature*	Max. process temperature*	Max. surface temperature
60°C (140°F)	CN 4020: 120°C (248°F) CN 4030: 110°C (230°F)	120°C (248°F)
	CN 4050: 80°C (176°F)	135°C (275°F)

* Observe derating (see page 7)

Version CN 4020 180°C:

Max. ambient temperature	Max. process temperature	Max. surface temperature
60°C (140°F)	120°C (248°F)	120°C (248°F)
	130°C (266°F)	130°C (266°F)
	140°C (284°F)	140°C (284°F)
	150°C (302°F)	150°C (302°F)
	160°C (320°F)	160°C (320°F)
	170°C (338°F)	170°C (338°F)
	180°C (356°F)	180°C (356°F)

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.