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Subject to technical change.

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

## Safety notes / Technical support / Introduction

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

- 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.

WARNUNG
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.

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

WARNUNG
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)

CAUTION: refer to accompanying documents (manual) for details.

Earth (ground) Terminal

Protective Conductor Terminal

### Technical support

Please contact your local supplier (for address see www.uwtgroup.com). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau
Germany

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwtgroup.com
www.uwtgroup.com

## Introduction

### Measurement principle

The Capanivo series CN 7000 detects the capacitance around its probe. Due to the active shield technology it has an increased insensitivity to material buildup on the probe.

### Applications and suitability

The Capanivo series CN 7000 is a capacitance switch for:
- Level detection of liquids, solids (powder and granules), slurries and foam.
- Interface detection (for example, oil / water or foam / liquid)

It works in all types of vessels, pipes and silos within a wide range of appliations like:
- Food, brewery, dairy, beverage and pharmaceuticals
- Chemical and petrochemical
- Water and waste water
- Machine building industry

It can also be used for leckage detection in double walled vessels, tanks and silos or in moldings and collecting ponds.

## Introduction

| Media / Examples | | Suitability |
|---|---|---|
| **Low-viscosity media, conductive or non-conductive**<br>Remaining layer thickness on sensor typ. < 0,2mm (0.008") | | • |
| Water / Waste water | Tap water, salt water, dishwater | • |
| Brewery, dairy, beverage | Beer, Lemonade, Liquor, Wine, Orange Juice, Milk | • |
| Acids, alkalis | Acetic acid, hydrochloric acid, caustic soda | • |
| Cleaning agent | Alcohol, vinegar cleaner, chlorine cleaner, descaling agent | • |
| Gasoline, thinner (hydrocarbons) | Gasoline, diesel, nitro-cellulose thinner, acetone | • |
| **Viscous and sticky media, non-conductive (typically non-water based)**<br>Remaining layer thickness on sensor typ. > 0,2mm (0.008") | | • |
| Food | Sunflower oil, olive oil, honey, chocolate, molasses, syrup | • |
| Oil (hydrocarbons) | Mineral oil, oil paint | • |
| Diverse | Hand cream | • |
| **Viscous and sticky media, conductive (typically water based)**<br>Remaining layer thickness on sensor typ. > 0,2mm (0.008") | | — |
| Cleaning agent | Dishwashing gel, toilet cleaner, descaling gel, liquid detergent | — |
| Food | Mustard, ketchup, mayonnaise | — |
| Diverse | Toothpaste, emulsion paint | — |
| **Light solids (powder, granules)** | | • |

• Measurement with CN 7000 suitable — Measurement with CN 7000 not suitable

## Features

**Process**

- Measurement independent from influence of the vessel wall
- Factory provided precalibration allows measurement of most applications without sensitivity setting on site
- Active shield electrode for compensation of material buildup
- Potted construction protects from shock, vibration, humidity, condensation
- Dielectric constant of 1.5 or more
- Process temperature up to 125°C
- Intrinsically Safe (IS) design for Hazardous areas (requires external barrier)
- Approvals CE, UKCA, ATEX, UKEX, IEC-Ex, FM, CSA, INMETRO, TR-CU, KC, WHG

**Electronics**

- 4-wire DC with Relais signal output
- 2-wire 8/16 mA
- 4-20mA continuous mode
  (4mA = uncovered probe, 20mA = probe covered with high dielectric material)
- Terminal or M12 connection
- Sensitivity setting by potentiometer, including visual feedback via LED
- Remote Test with external signal conditioning instrument

**Mechanics**

- Corrosion resistant construction with enclosure made of thermoplastic polyester, wetted parts made of PPS, PVDF, PEEK and 316L stainless steel
- Compact probe lenght
- Pipe extension (max. 4m [157,5"]), optional sliding sleeve allows to change the switch point
  easily during operation of the device
- Cable extension (max. 20m [787,4"]), cuttable by user
- Various process connections: threaded (including G½“ hygienic), flanged (screwed) or Tri-clamp

# Technical data

## Electrical data

**Standard version (General Purpose)**
Power supply / signal output

**4-wire operation with DC supply and relay**
Supply:
9 - 33 V DC, 0.7W incl. 10% of EN 61010-1
Signal output:
Relay SPST
Max. switching voltage: 60 V DC or 30 V AC;
Limted to 35 V DC or 16 V AC in wet locations
Max. switching current / switching power: 1 A / 60 W

**2-wire operation with 8/16 mA loop**
9 - 33 V DC, 0.7W incl. 10% of EN 61010-1
8/16 mA
Tolerance: 8mA +/-0,5mA, 16mA -1mA/+2mA
If required, the unit can be set to 4-20mA continuous current output (direct output of the measured capacitance).
The stated voltage is the resulting voltage on the unit. Any voltage drop on an external series resistance must be considered.

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**Intrinsically safe version**
Power supply / signal output

**2-wire operation with 8/16 mA loop**
10.8 - 30 V DC, 0.7W incl. 10% of EN 61010-1
8/16 mA or 16/8 mA
Tolerance: 8mA +/-0,5mA, 16mA -1mA/+2mA

Intrinsically safe barrier or signal conditioning instrument required:
$U_i$=30 V $I_i$=160 mA $P_i$=0,8 W, $C_i$=7,6 nF $L_i$ =0,3 mH

If required, the unit can be set to 4-20mA continuous current output (direct output of the measured capacitance).
The stated voltage is the resulting voltage on the unit. Any voltage drop on an external series resistance must be considered.

**4-wire operation with DC supply and solid state relay**
This operation is only available for CN 7120/7121 with enclosure Ø65mm (2.56") and connection via terminal block (Solid state relay integrated).
Supply:
10.8 - 30 V DC, 0.7W incl. 10% von EN 61010-1
Intrinsically safe barrier required:
$U_i$=30 V $I_i$=160 mA $P_i$=0,8 W, $C_i$=7,6 nF $L_i$ =0,3 mH
Signal output::
Solid state relay
Max. switching voltage / current: 30 V DC / 82mA
For connection to an intrinsically safe "switch amplifier for contact input" or to an intrinsically safe PLC with integrated input card for contact input.
$U_i$=30 V $I_i$=200 mA $P_i$=350 mW, $C_i$=4,2 nF $L_i$=0

The power supply circuit is infallibly galvanically isolated from the transistor circuit.

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**Safety operation (FSL,FSH)**
Selectable for minimum or maximum safety by polarity of power supply voltage

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**Signal delay**
Probe uncovered -> covered ca. 0.5 sec
Probe covered -> uncovered ca. 0.5 sec

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**Indicating light**
Build in LEDs:
Power (green), Signal output (yellow), Sensor status / Diagnostics (white)

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**Sensitivity**
Adjustable by potentiometer

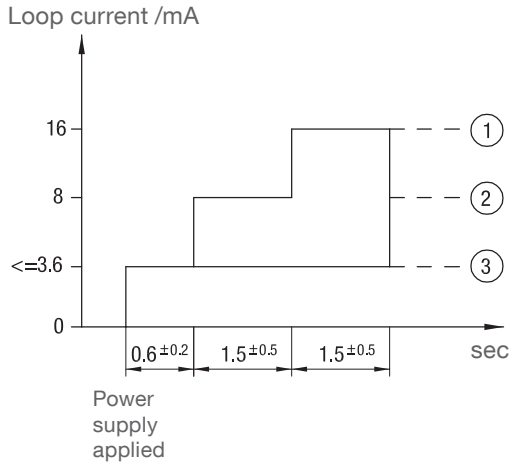
## Technical data

| | |
|---|---|
| **Electrical connection** | With enclosure Ø65mm (2.56"):<br>Terminal block, terminals 0.14 - 1.5 mm² (AWG 28-16)<br><br>With enclosure Ø65mm (2.56") and Ø35mm (1.38"):<br>M12x1 according to IEC 61076-2-101, male, 4-pole, coding A-standard |
| **Cable entry** | With enclosure Ø65mm (2.56"):<br>M20 x 1.5 screwed cable gland<br>Clamping range (diameter) of factory provided cable glands: 6..12 mm (0.24 .. 0.47")<br>or<br>NPT 1/2“ conduit |
| **Overvoltage category** | II |
| **Protection class** | III |

## Diagnostics / Remote funtion test

The units starts a self diagnostics routine when the power supply is applied or interrupted for >2 seconds.

The loop current shows following behavior, which can be evaluated by an external signal conditioning instrument (accessory) or by a PLC:




1 or 2:
Diagnostics test is o.k.
Measurement signal is present:
- Loop current = 8 or 16mA
- Relay = open or closed (depending on setted output logic, see page 26)

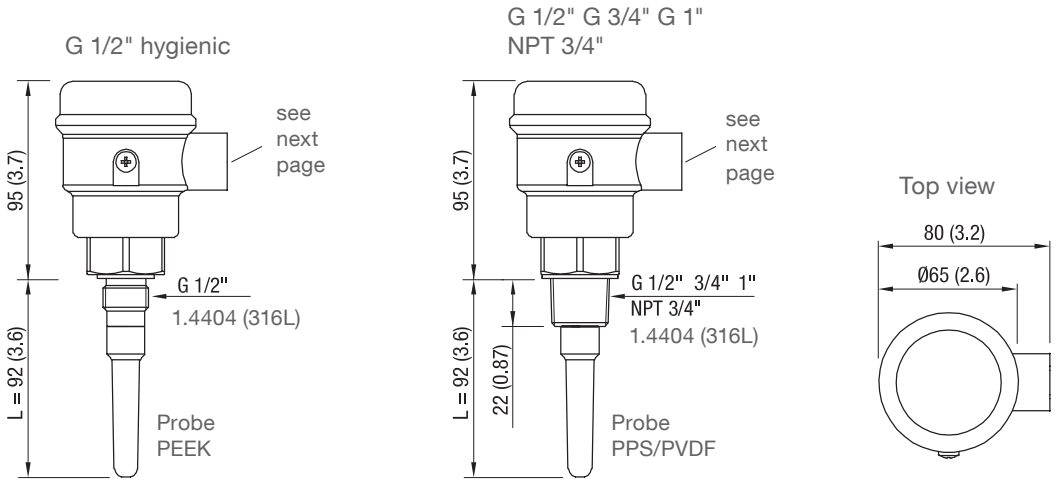
3:
Diagnostics test failed:
- Loop current <=3,6mA
- Relay = open

## Technical data

### Dimensions All dimensions in mm (inch)

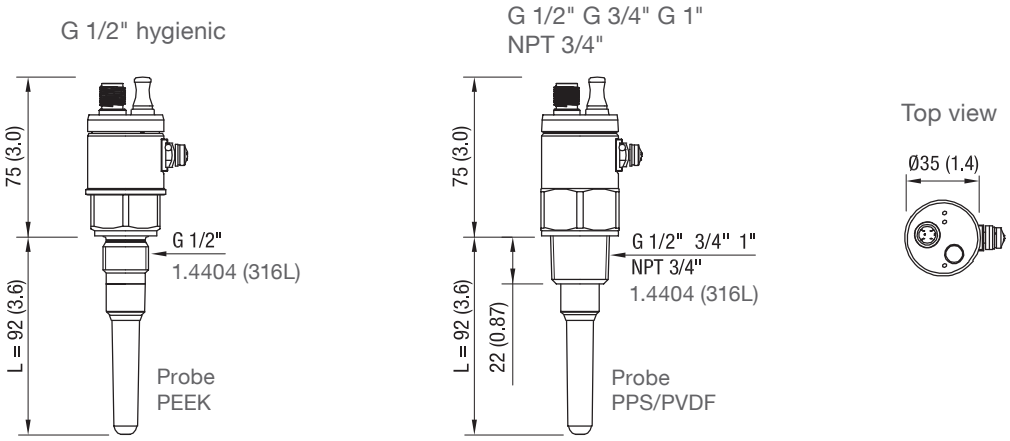
#### CN 7120 - Short extension length
Stainless steel process connection

**Enclosure Ø65mm (2.56")**




Versions CN 7120 are available with certificate EHEDG EL class I

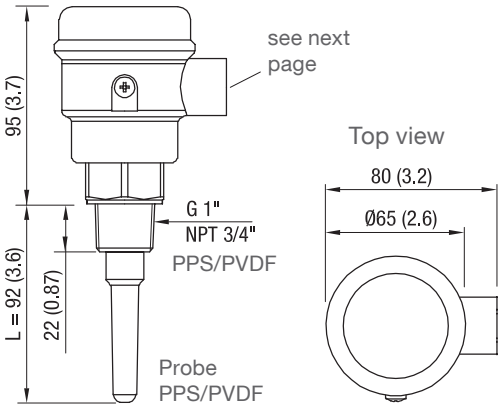
**Enclosure Ø35mm (1.38")**



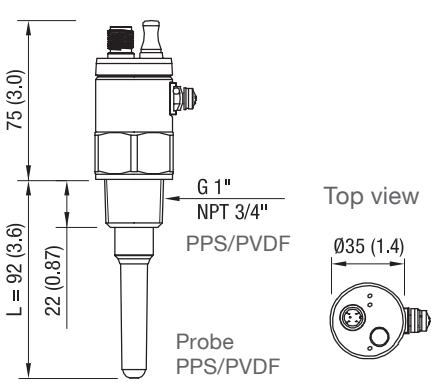

Versions CN 7120 are available with certificate EHEDG EL class I

#### CN 7121 - Short extension length
Plastic process connection

**Enclosure Ø65mm (2.56")**

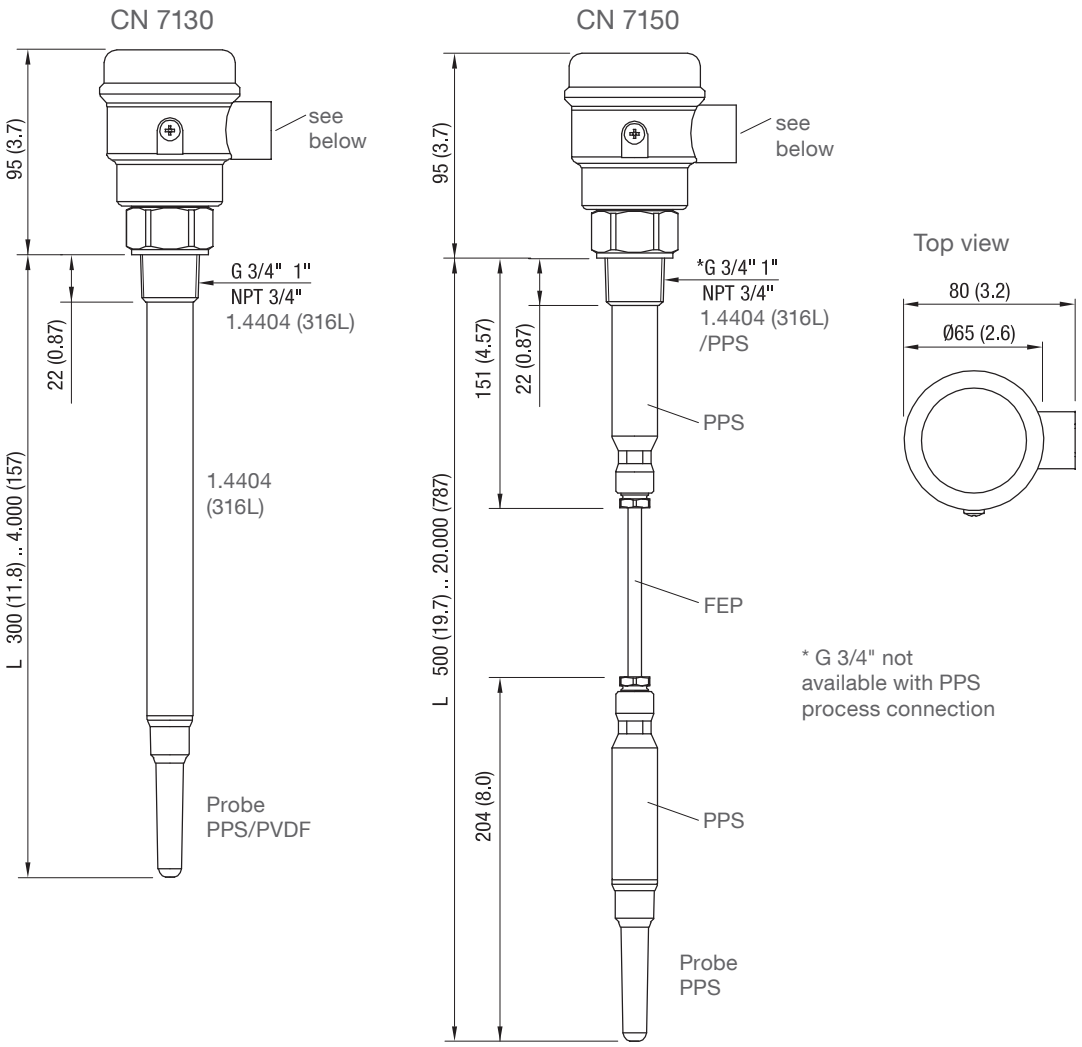



**Enclosure Ø35mm (1.38")**



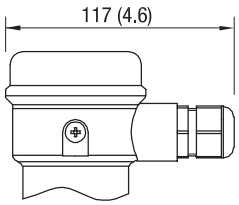
## Technical data

CN 7130 - Pipe extension
CN 7150 - Cable extension

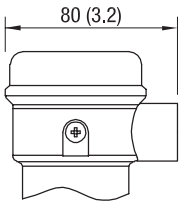



**Enclosure**
**Ø65mm (2.56")**
Possible wiring

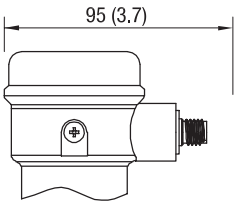
M20x1,5
cable gland




1/2" NPT
conduit

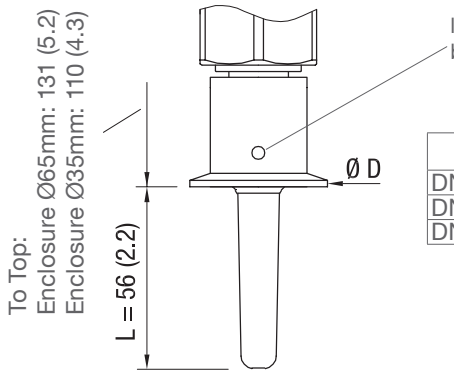



M12
plug



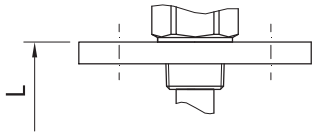
## Technical data

### Tri-clamp



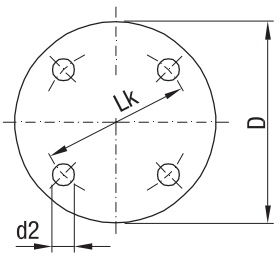

| Tri-clamp | ØD |
|---|---|
| DN 25 (1") | 50,5 (1.99") |
| DN 40 (1 1/2") | |
| DN 50 (2") | 64 (2.52") |

### Flange

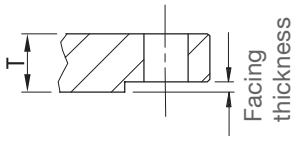



Flange is screwed to process connection

| | Code | Type | Number of holes | d2 mm (Inch) | Lk mm (Inch) | D mm (Inch) | T thickness mm (Inch) |
|---|---|---|---|---|---|---|---|
| ASME B16.5, raised face | R | 1" 150 lbs | 4 | 15,9 (0.63) | 79,3 (3.12) | 108,0 (4.25) | 14,3 (0.56) |
| | S | 1" 300 lbs | 4 | 19,1 (0.75) | 88,9 (3.5) | 123,8 (4.87) | 17,5 (0.69) |
| | T | 1½" 150 lbs | 4 | 15,9 (0.63) | 98,6 (3.88) | 127,0 (5.0) | 17,5 (0.69) |
| | U | 1½" 300 lbs | 4 | 22,2 (0.87) | 114,3 (4.5) | 155,6 (6.13) | 20,6 (0.81) |
| | V | 2" 150 lbs | 4 | 19,1 (0.75) | 120,7 (4.75) | 152,4 (6.01) | 19,1 (0.75) |
| | W | 2" 300 lbs | 8 | 19,1 (0.75) | 127,0 (5.0) | 165,1 (6.5) | 22,2 (0.87) |
| EN 1092-1 type A, flat faced | N | DN25 PN16/40 | 4 | 14,0 (0.55) | 85,0 (3.35) | 115,0 (4.53) | 18,0 (0.71) |
| | P | DN40 PN16/40 | 4 | 18,0 (0.71) | 110,0 (4.33) | 150,0 (5.91) | 18,0 (0.71) |
| | Q | DN50 PN16/25/40 | 4 | 18,0 (0.71) | 125,0 (4.92) | 165,0 (6.5) | 18,0 (0.71) |




**Raised face**




| Type | Facing thickness |
|---|---|
| ASME 150 lbs<br>ASME 300 lbs | 2 mm (0.08") |

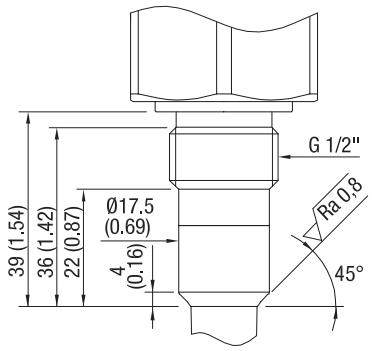
## Technical data

# CN 7120 - G 1/2" hygienic process connection / EHEDG approval

**EHEDG versions**

EHEDG (EL class I) approval is available with CN7120 with process connection G 1/2" hygienic.

**CN 7120 process connection**



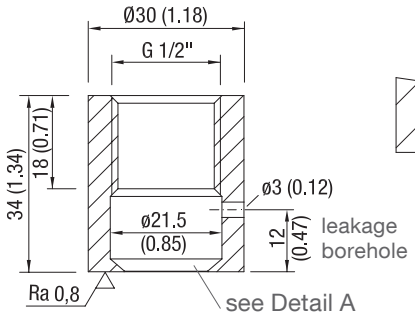

Metal
1.4404 (316L)

PEEK
FDA registration number:
21 CFR 177.2415

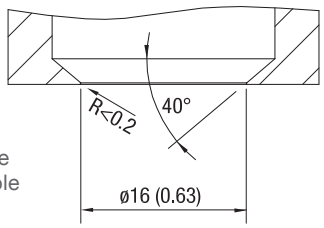
**Flush welding socket: Design**

The flush welding socket must meet the following design:

Metal type according to hygienic and further external requirements



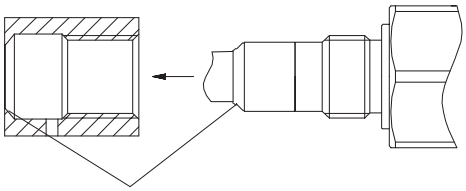

Detail A:
Sealing area between CN 7120 (PEEK) and the on site process connection (metal)



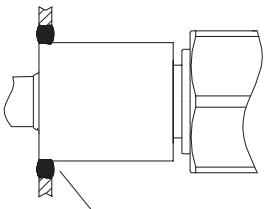

**Installation**

Install the sensor according to the requirements given in EHEDG Guidelines 8, 10 and 37. That is to mount the sensor in a self-draining orientation. In tanks, the cleaning device must be positioned in such a way that the sensor is directly assessed and wetted for cleaning.

**Flush welding socket: Installation**

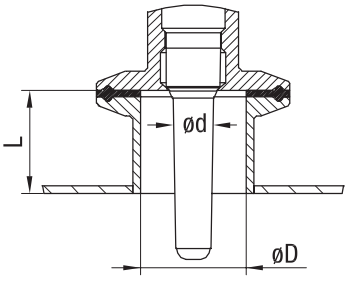


Metal-peek sealing
- The support must be without a gap. No teflon tape (or similar) is allowed to be in between.
- Fixing torque 15 Nm



The food contact surface must be smooth (polished to Ra < 0.8 µm) and the welding has to be done according to EHEDG Guidelines 9 and 35.

**T-piece: Installation**




The sensor should be installed flush with the process area.
The ratio between the depth of the upstand (L) and the diameter (D-d) of the upstand/Sensor shall be L / (D-d) < 1.

If welded adapters are used, the food contact surface must be smooth (polished to Ra < 0.8 µm). The welding has to be done according to EHEDG Guidelines 9 and 35. Suitable pipe couplings and process connections with the applicable gaskets must be applied according to the EHEDG Position Paper "Easy cleanable Pipe couplings and Process connections".

## Technical data

# Mechanical data

**Process connection and extension**

**CN 7120 - Stainless steel process connection, version G 1/2" Hygienic:**

| | |
|---|---|
| Material process connection: | 1.4404 (316L) |
| Material probe: | PEEK (1,2) |
| Seal process connection-probe: | FKM (optional FFKM) (2) |
| Thread (3),(5): | G 1/2" Hygienic |

**CN 7120 - Stainless steel process connection:**

| | |
|---|---|
| Material process connection: | 1.4404 (316L) |
| Material probe: | PPS (glass fibre reinforced) (1,2)<br>Optional PVDF (1,2)<br>Optional PEEK (for Triclamp) (1,2) |
| Seal process connection-probe: | FKM (optional FFKM) (2) |
| Thread (3): | G 1/2", G 3/4", G 1“, NPT 3/4"<br>Adapters for G 1 1/2", NPT 1 1/4", NPT 1 1/2" |
| Tri-clamp (5): | DN25 (1"), DN40 (1 1/2"), DN50 (2")<br>DIN 32676 Type A (DIN 11851) and<br>DIN 32676 Type C (ASME BPE 2009) |
| Flange (screwed) (4): | DN 25, 40, 50; ASME 1", 1 1/2”, 2" |

**CN 7121 -Plastic process connection:**

| | |
|---|---|
| Material process connection: | PPS (glass fibre reinforced) (1, 2)<br>Optional PVDF (1,2) |
| Material probe: | PPS (glass fibre reinforced) (1,2)<br>Optional PVDF (1,2) |
| Seal process connection-probe: | FKM (optional FFKM) (2) |
| Thread (3): | G 1“, NPT 3/4" |

**CN 7130 - Pipe extension:**

| | |
|---|---|
| Material process connection: | 1.4404 (316L) |
| Material pipe extension: | 1.4404 (316L) |
| Material probe: | PPS (glass fibre reinforced) (1,2)<br>Optional PVDF (1,2) |
| Seal pipe-probe: | FKM (optional FFKM) (2) |
| Thread (3): | G 3/4", G 1“, NPT 3/4"<br>Adapters for G 1 1/2", NPT 1 1/4", NPT 1 1/2" |
| Flange (screwed) (4) | DN 25, 40, 50; ASME 1", 1 1/2”, 2" |

**CN 7150 - Cable extension, with process connection 1.4404 (316L):**

| | |
|---|---|
| Material process connection: | 1.4404 (316L) |
| Material extension cable: | FEP jacketed |
| Material probe and extention cable fixing: | PPS (glass fibre reinforced) (1,2) |
| Seal process connection- extension cable: | FKM (optional FFKM) (2) |
| Seal extension cable- probe: | FKM (optional FFKM) (2) |
| Thread (3): | G 3/4", G 1“, NPT 3/4"<br>Adapters for G 1 1/2", NPT 1 1/4", NPT 1 1/2" |
| Flange (screwed) (4) | DN 25, 40, 50; ASME 1", 1 1/2”, 2" |

## Technical data

**CN 7150 - Cable extension, with process connection PPS:**

| | |
|---|---|
| Material process connection: | PPS (glass fibre reinforced) (1,2) |
| Material cable extension: | FEP jacketed |
| Material probe and extention cable fixing: | PPS (glass fibre reinforced) (1,2) |
| Seal process connection- extension cable: | FKM (optional FFKM) (2) |
| Seal cable- probe: | FKM (optional FFKM) (2) |
| Thread (3): | G 1“, NPT 3/4"<br>Adapters for G 1 1/2", NPT 1 1/4", NPT 1 1/2" |

(1) Discolouration is possible due to influence of UV and temperature. This has no negative effect to the material properties.

(2) Food grade, FDA registration number:

| | |
|---|---|
| Seals | 21 CFR 177.2600 |
| PVDF | 21 CFR 177.1550 |
| PPS | 21 CFR 175.300 |
| PEEK | 21 CFR 177.2415 |

(3) Thread types: G = DIN ISO 228-1 NPT = ASME B 1.20.1

(4) Flange pressure rating: DN25 PN16/40, DN40 PN16/40, DN50 PN16/25/40 ASME 150lbs, ASME 300lbs

(5) For Hygienic design (EHEDG/ 3A): Wetted sensor surface Ra ≤ 0.8 µm (31 µin)

| | | |
|---|---|---|
| **Extension length "L"** | CN 7120 Stainless steel process conn.: | 92 mm (3.6“) |
| | CN 7121 Plastic process connection: | 92 mm (3.6“) |
| | CN 7130 Pipe extension: | 300 .. 4000mm (11.8 .. 157") |
| | CN 7150 Cable extension: | 400 .. 20.000mm (15.7 .. 787") |
| **Tolerance length "L“** | CN 7120 Stainless steel process conn.: | ±5 mm (±0.2“) |
| | CN 7121 Plastic process connection: | ±5 mm (±0.2“) |
| | CN 7130 Pipe extension: | ±10 mm (±0.4“) |
| | CN 7150 Cable extension: | ±15 mm (±0.6“) |
| **Material Enclosure Ø65mm (2.56")** | Material Housing: Thermoplastic polyester (PBT/PC)<br>Material Lid: Transparent thermoplastic polycarbonate (PC)<br>Material Seal between housing and lid: VMQ (vinyl-methyl-silicone)<br>Material Nameplate: polyester film | |
| **Material Enclosure Ø35mm (1.38")** | Material Housing: 1.4404 (316L)<br>Material Lid with M12 plug: Transparent thermoplastic polycarbonate (PC)<br>Material Seal between housing and lid: VMQ (vinyl-methyl-silicone)<br>Material Nameplate: polyester film | |
| **Ingress protection** | Type 4X / IP68 | |
| **Sound level** | n.a. (no sound is produced) | |
| **Overall weight (ca.)** | CN 7120 Stainless steel process conn.: | 0.35 kg (0.77 lbs) |
| | CN 7121 Plastic process connection: | 0.25 kg (0.55 lbs) |
| | CN 7130 Pipe extension: | 0.6 kg (1.32 lbs) + 0.85 kg/m (1.87 lbs per 39.3“) |
| | CN 7150 Cable extension: | 0.6 kg (1.32 lbs) + 0.08 kg/m (0.18 lbs per 39.3“) |
| | All weights with threaded process connection. | |

# Options / Accessories

## Options

**Sliding sleeve**
CN 7130

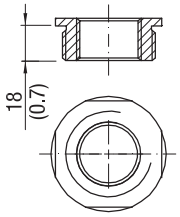
G 1 1/4" / G 1 1/2" / NPT 1 1/4" / NPT 1 1/2"
Material: 1.4404 (316L)
Sealing material to the extension pipe: FKM
Max. process pressure: –1 to 10 bar (146 psi)

## Accessories

**Adapter for process connection**

Adapter from G 1" thread to G 1 1/2"
Adapter from NPT 3/4" thread to NPT 1 1/4" / NPT 1 1/2"

Material: 1.4305 (303) or 1.4404 (316L)
Max. process pressure: –1 to 25 bar (363 psi)

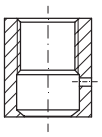



**Flush welding socket**

For version with EHEDG (EL class I) certificate
Fitting to CN 7120 with process connection G 1/2" hygienic

Flush welding socket ø30/ G 1/2", 1.4404 (316L).

Details see page 9

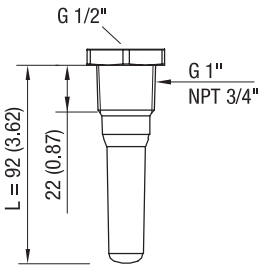


**Shortening kit**

For CN 7150 extension cable

**Sensguard**

Outer thread (process connection):
G1" DIN ISO 228-1 or NPT 3/4" ASME B 1.20.1
Internal thread:
G 1/2" (requires CN 7120 with process connection G 1/2" to fit in).
Material: PPS
Max. process pressure: –1 to 10 bar (146 psi)




## Complementary products (from outside companies)

**Remote instrument**

**Operation with 8/16 mA, 2-wire current loop:**
Input: 8/16 mA from CN 7000 unit
Output: Relay
Intrinsically safe and non-intrinsically safe operation:
Implements self diagnostics when power supply is applied or test button on remote instrument is pressed (remote test, see page 5 and page 42-43)

**M12 mating plug**

4 pole, for version with M12 plug

## Operating conditions

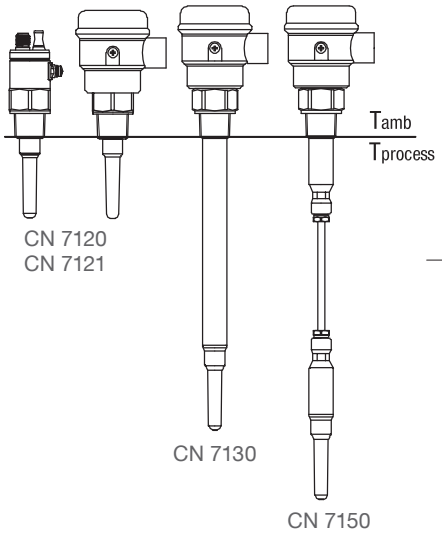
### Functional

| | |
|---|---|
| **Dielectric constant** | Min. 1.5<br>Factory setting = 2.0<br>For dielectric constant of applicable materials: see external dielectric constant tables |
| **Switching point** | Depending on setting of potentiometer and dielectric constant value of measured material.<br>See page 35 for details. |
| **Repeatability** | 2 mm (0.08"), for water based liquids |

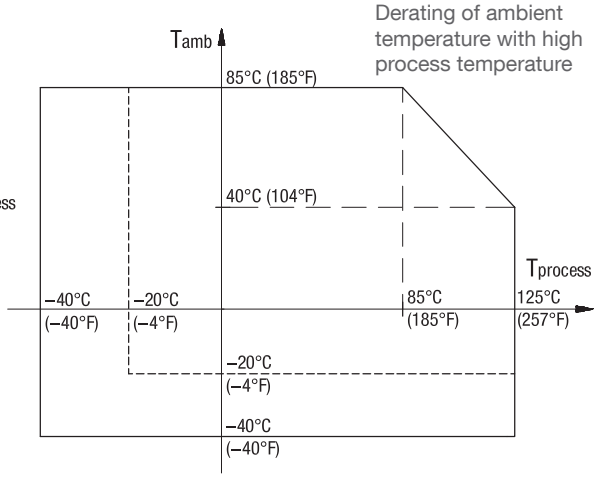
### Environment

**Ambient and process temperature**
(Non-Ex version)

**Mounting with short socket**

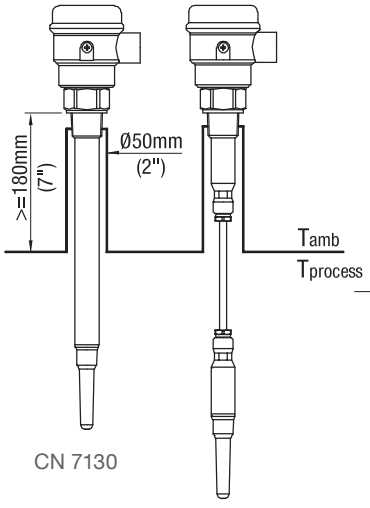


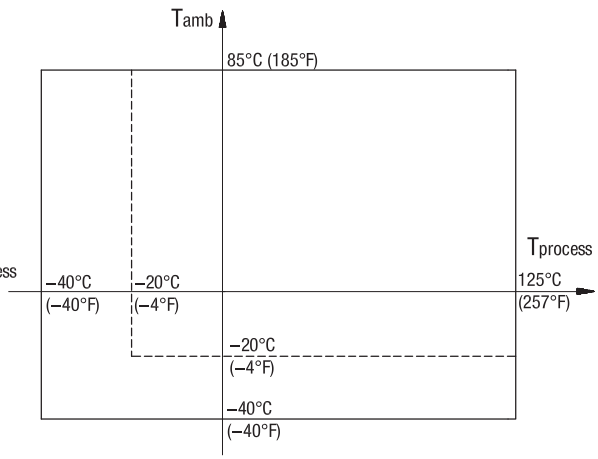

Derating of ambient temperature with high process temperature




Ambient- and process temperature limited to -20°C (-4°F) with option FFKM seal O-ring

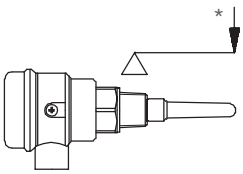
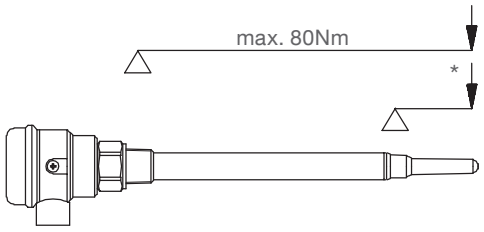
**Mounting with long socket**




Ambient- and process temperature limited to -20°C (-4°F) with option FFKM seal O-ring

## Operating conditions

| | |
|---|---|
| **Ambient and process temperature** (Ex versions) | Depending on Surface Temperature and Temperature Class, details see page 31. |
| **Max. temperature for CIP** | 135°C (275°F), duration 60min<br>150°C (302°F), duration 30min (only for CN 7120 with process connection G 1/2" hygienic)<br>Ambient temperature limited to 50°C (122°F), unit de-energized. |
| **Max. permitted mechanical torque** | CN 7120 / CN 7121<br>  <br><br>CN 7130<br>  <br><br>* PEEK/PPS: max. 400N (at 40°C)<br>PVDF: max. 200N (at 40°C) |
| **Max. tractive force** | CN 7150 1.5 kN (at 40°C) |
| **Max. process pressure** | CN 7120 Stainless steel process connection: –1 to 25 bar (363 psi)<br>CN 7121 Plastic process connection: –1 to 10 bar (146 psi)<br>CN 7130 Pipe extension: –1 to 25 bar (363 psi)<br>CN 7130 Pipe extension with sliding sleeve: –1 to 10 bar (146 psi)<br>CN 7150 Cable extension: –1 to 10 bar (146 psi)<br><br>Observe possible pressure limitation from the used flange type ! |
| **Pollution degree** | 4 |
| **Relative Humidity** | 0 - 100%, suitable for outdoor use |
| **Altitude** | max. 3.000 m (9.843 ft) |
| **Ventilation** | Ventilation is not required |
| **Expected product lifetime** | Following parameters have a negative influence on the expected product lifetime:<br>High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrassive bulk material passing the probe. |

## Approvals

| | |
|---|---|
| **General Purpose * (Ordinary Locations)** | CE<br>UKCA<br>FM / CSA<br>TR-CU |
| **Hazardous Locations *** | Intrinsically Safe:<br>ATEX II 1G, 1/2G Ex ia IIC<br>ATEX II 1/2D Ex ia IIIC<br>IEC Ex ia IIC<br>IEC Ex ia IIIC<br>FM / CSA IS Class I, II, III, Div. 1, Gr. A-G<br>TR-CU 0Ex ia IIC<br>TR-CU Ex ia IIIC<br>INMETRO Ex ia IIC<br>INMETRO Ex ia IIIC<br>KCs Ex ia IIC<br>KCs Ex ia IIIC<br>CCC Ex ia IIC<br>CCC Ex ia IIIC<br>UKEX II 1G, 1/2G Ex ia IIC<br>UKEX II 1/2D Ex ia IIIC |
| **Overfill and leackage protection *, **** | WHG<br>VLAREM |
| **EMC** | EN 61326 |
| **RoHS conform** | According to directive 2011/65/EU |
| **Hygiene *** | EHEDG EL class I<br>3A |
| **Food grade material** | Wetted parts with FDA registration. Details see "Mechanical data". |
| **Pressure Equipment Directive** (2014/68/EU) | As the equipment does not have pressure-bearing housings of its own, it is not subject to the PED:<br>- as “pressure accessory” (see 2014/68/EU Art. 2 (5) and PED Guidelines A-08, A-40)<br>- nor as “safety accessory” (see 2014/68/EU Art. 2 (4) and PED Guidelines A-20, A-25) |

* Not all approvals are available with all models, see selection list for more information
** Relevant information for use in applications with WHG/VLAREM: see external documentation "Technical Description" and notes to Proof Test on page 43

## Mechanical installation

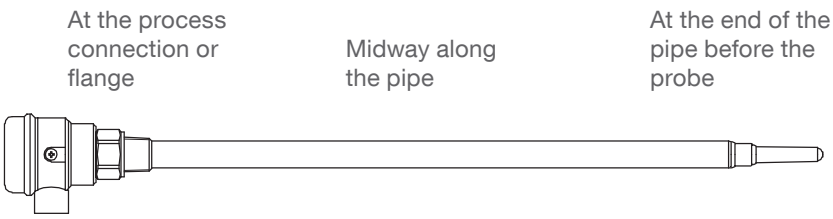
### General Safety Instructions

| | |
|---|---|
| **Process pressure** | Improper installation may result in loss of process pressure.<br>Observe possible pressure limitation from the used flange type or in case of use of the sliding sleeve (CN 7130). |
| **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. |
| **EHEDG approval/ 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. |

### General Mounting instructions

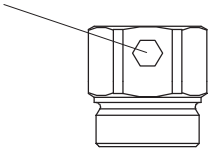
**Handling precautions**

To prevent damage of the pipe extension, all CN 7130 units with a pipe longer than 2 m (6.5 ft), must be suppported at these three points when lifting from a horizontal position




**Sliding sleeve**

Tighten both straining screws with 12 Nm to obtain resistance against pressure



**Direction of the cable glands** (enclosure Ø65mm [2.56"])

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 enclosure can be rotated against the process connection after mounting.

**Sealing**

Ensure proper seal of the process connection thread in case of process pressure.

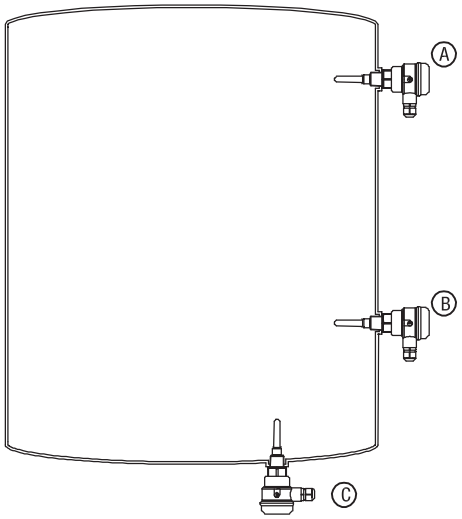
**Hygienic process connection**

Observe that the correct "On site process connection" is present, see page 9.

## Mechanical installation - Liquid applications

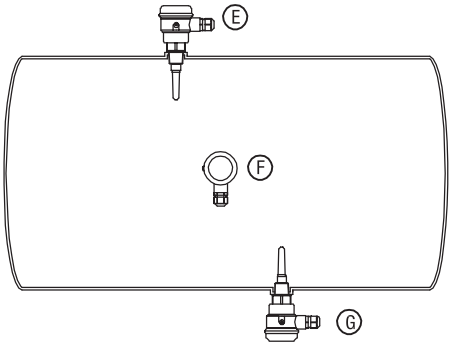
### Liquid applications - Mounting instructions

CN 7120 /
CN 7121

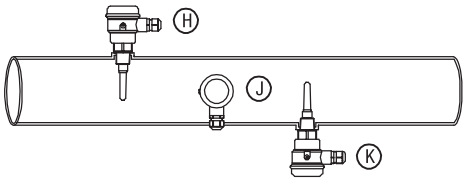



CAUTION
Observe:
- General distances of the probe (see page 19)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 14)

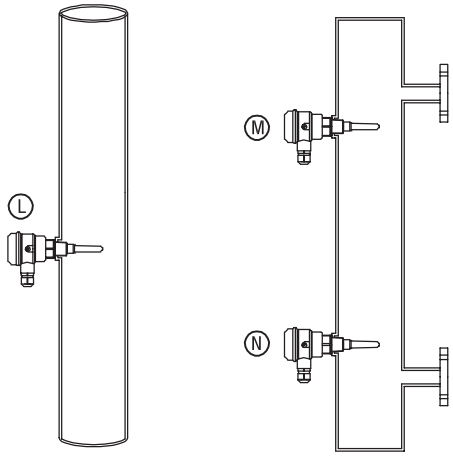
**Vertical vessel**
**A** Full detector horizontal
**B** Demand or empty detector horizontal
**C** Empty detector vertical from the bottom




**Horizontal vessel**
**E** Full detector vertical
**F** Demand or empty detector horizontal
**G** Empty detector vertical from the bottom




**Horizontal pipe**
**H** Full detector vertical
**J** Demand or empty detector horizontal
**K** Empty detector vertical from the bottom

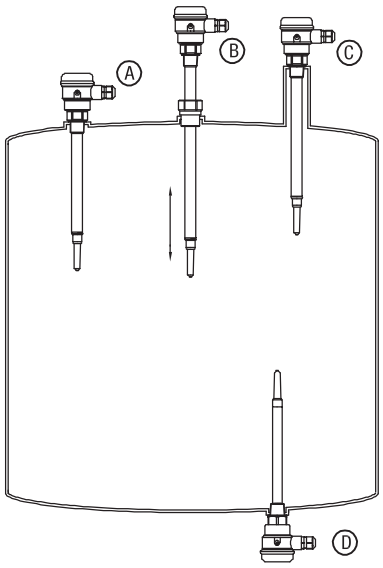



**Vertical pipe**
**L** Full, demand or empty detector horizontal

**Bypass**
**M** Full detector horizontal
**N** Demand or empty detector horizontal

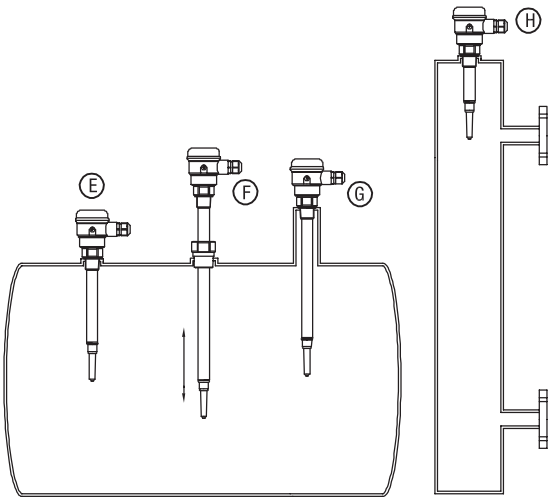
## Mechanical installation - Liquid applications

CN 7130




CAUTION
Observe:
- General distances of the probe (see page 19)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 14)

**Vertical vessel**
Full, demand or empty detector:
**A** Vertical
**B** Vertical with sliding sleeve
**C** Vertical with long mounting socket
**D** Vertical from bottom

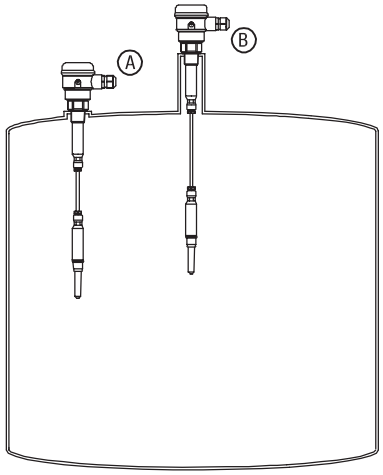



**Horizontal vessel**
**E** Full, demand or empty detector vertical
**F** Vertical with sliding sleeve
**G** Vertical with long mounting socket

**Bypass**
**H** Full, demand or empty detector vertical

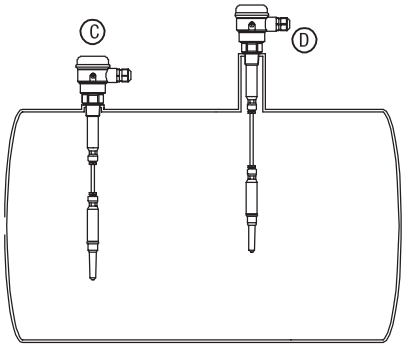
## Mechanical installation - Liquid applications

CN 7150




CAUTION
Observe:
- Distance of the probe to the vessel wall (see page 19).
  Consider that the hanging probe can move sidewards with material movement.
- Distance to material flow (filling).
- Max. permitted mechanical traction (see page 14).

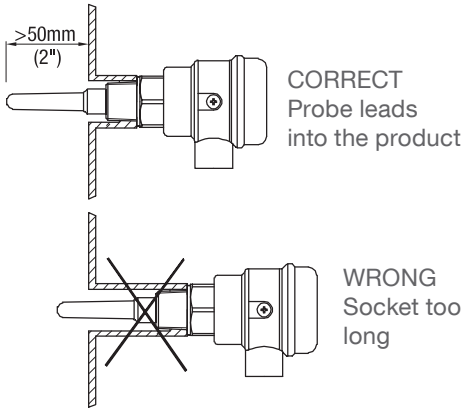
**Vertical vessel**
Full, demand or empty detector:
**A** Vertical
**B** Vertical with long mounting socket



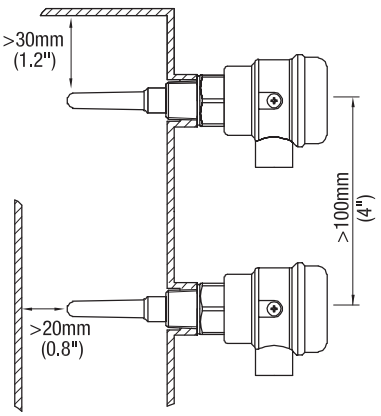

**Horizontal vessel**
Full, demand or empty detector:
**C** Vertical
**D** Vertical with long mounting socket

**Distances of the probe**

Observe socket length



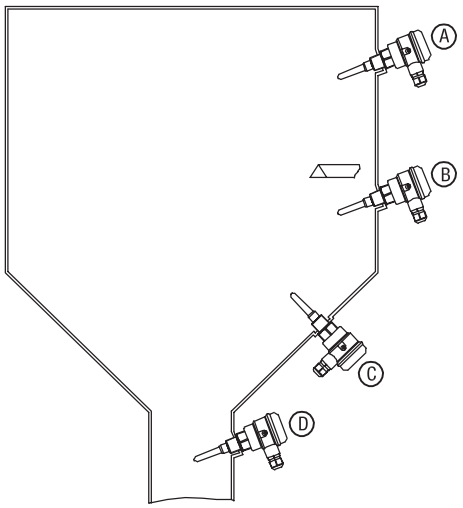

Observe min. distance
- between two probes
- to metal vessel wall



## Mechanical installation - Solid applications

### Solid applications - Mounting instructions

CN 7120 /
CN 7121




CAUTION
Observe:
- General distances of the probe (see page 21)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 14)
- Wearing due to abrasive bulk material

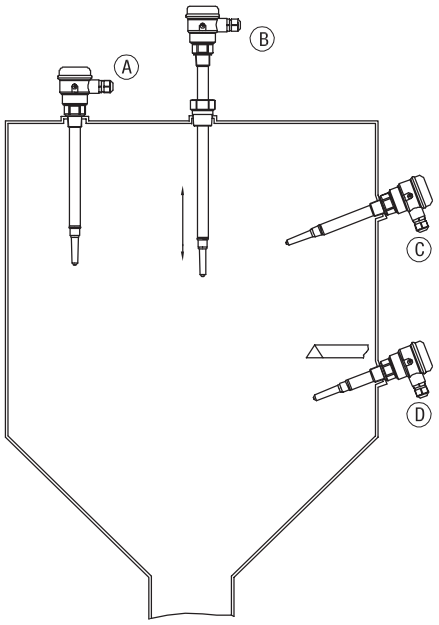
**A** Full detector horizontal or oblique.
Slight incline mounting helps remaining material to fall off more easily

**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 7130




CAUTION
Observe:
- General distances of the probe (see page 21)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 14)
- Wearing due to abrasive bulk material

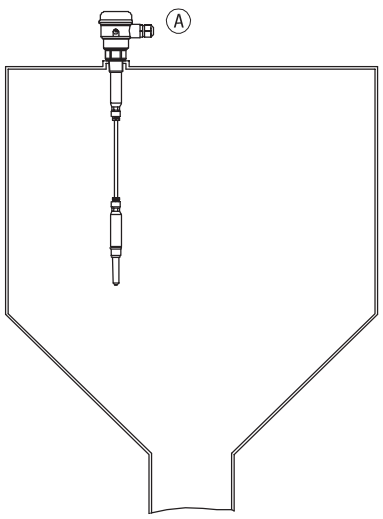
**A** Full detector vertical

**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 7150




CAUTION
Observe:
- Distance of the probe to the silo wall (see page 21)
  Consider that the hanging probe can move sidewards with material
- Distance to material flow (filling)
- Max. permitted mechanical traction (see page 14).
  Empty detector: Do not install in the center of the silo due to high traction with moving material
- Wearing due to abrasive bulk material

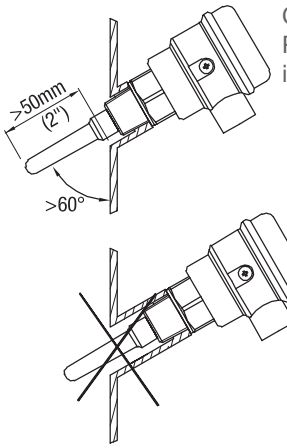
**A** Full, demand or empty detector vertical

## Mechanical installation - Solid applications

**Distances of the probe**

**Observe socket length**

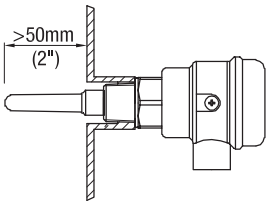
Oblique mounting



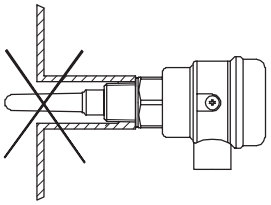

CORRECT
Probe leads into the product

WRONG
Socket too long

Horizontal mounting



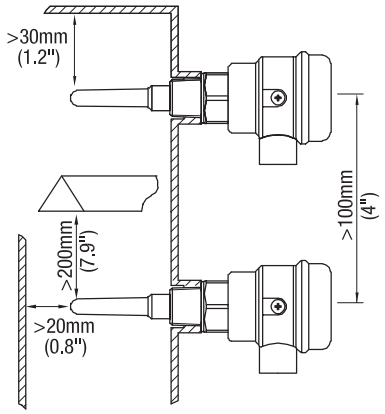

CORRECT
Probe leads into the product



WRONG
Socket too long

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

**Observe min. distance**
- between two probes
- to metal vessel wall
- to protective angle



## Electrical installation

### General Safety Instructions

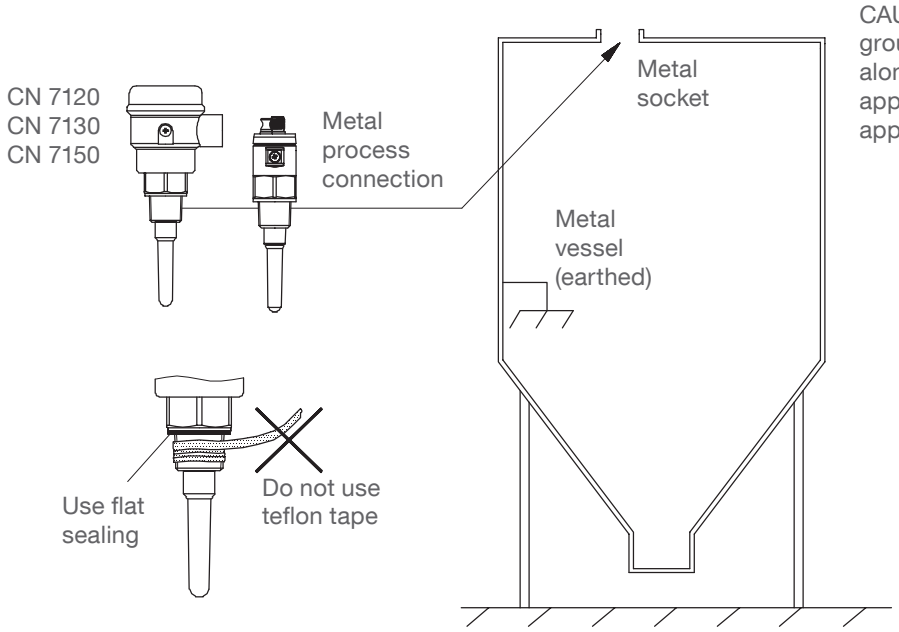
| | |
|---|---|
| **Handling** | In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed. |
| **Installation regulations** | The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed. |
| **Power supply 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 name plate before switching the device on.<br><br>The unit must be supplied from a SELV source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1.<br><br>Observe reduced supply voltage ratings in wet locations. A wet location is a location where water or other conductive liquid may be present and is likely to increase the risk of electric shock. |
| **Cable gland and Field wiring cables** | With use of terminal block and cable gland:<br>The screwed cable gland must have following specifications:<br>• Ingress protection IP68<br>• Temperature range from -40°C to 10 K above max. ambient temperature<br>• UL or VDE certified (depending on the country where the unit is installed)<br>• Pull relief<br>Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion).<br><br>The field wiring cables must have following specifications:<br>• The diameter has to match to the clamping range of the used cable gland.<br>• The cross section has to match with the clamping range of the connection terminals and consider the max. current.<br>• The temperature rating must be at least 10 K above max. ambient temperature.<br>Cut the field wiring cables to appropriate length to fit properly into the housing. |
| **M12 mating plug and Field wiring cables** | With use of M12 plug:<br>The mating plug must must have following specifications<br>• M12x1 according to IEC 61076-2-101, female, 4-pole, coding A-standard<br>• Ingress protection IP68<br>• Temperature range from -40°C to 10 K above max. ambient temperature<br><br>The field wiring cables must have following specifications:<br>• The diameter and cross section has to match to the specification of the mating plug.<br>• The temperature rating must be at least 10 K above max. ambient temperature.<br>• Install the field wiring cables according to the instructions of the mating plug |
| **Relay protection** | Provide protection for relay contacts / solid state relay against spikes with inductive loads |
| **Protection against static charging** | The unit must be earthed in any case to avoid static charging of the unit, especially on applications with pneumatic conveying.<br>For Non-Ex units: Functional earthing is satisfactory, see page 23.<br>For Ex-units: The external equipotential bonding terminal must be connected to ground, see page 25. |

## Electrical installation

### Functional earthing

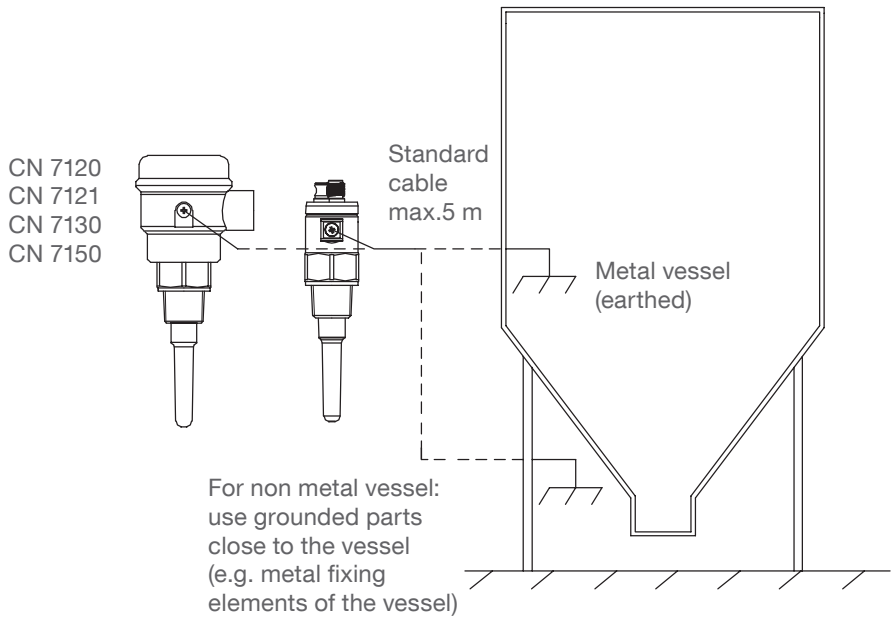
The unit must have connection to earth for proper functioning. This can be done by one of the following possibilities:

**Earthing through metal process connection**




CAUTION: This grounding method alone is not applicable for Ex applications.

**Earthing through external equi-potential bonding terminal**



## Electrical installation

### Standard version (General Purpose)

**4-wire operation with DC supply and relay (signal output)**

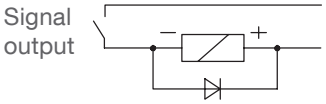
**Power supply:**
9 .. 33 V DC, 0,7W
incl. 10% of EN 61010-1

**Signal output:**
Floating relay SPST

Max. 60 V DC or 30 V AC;
Limited to 35 V DC or 16 V AC in wet locations
Max. 1 A, 60 W

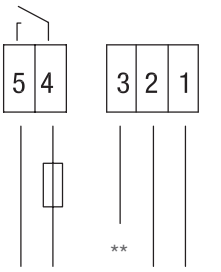
External fuse:
max.1A, fast or slow, HBC, 250V

Protection of Relay contact:
Observe a protection diode in case of connecting an inductance (e.g. external relay)



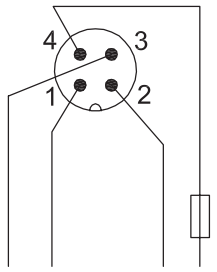
External relay with protection diode

**Terminal block**



Signal output
Power supply*

**M12 plug**



Power supply*
Signal output

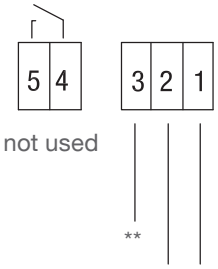
* Polarity determines output logic, see table page 26
** See "cable shield" below

**2-wire operation with 8/16 mA loop**

**8/16 mA loop:**
9 .. 33 V DC, 0,7W
incl. 10% of EN 61010-1

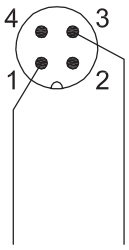
External resistor in loop:
The above stated voltage is the resulting voltage on the unit. Any voltage drop on an external series resistance must be considered.
$R_{max}$ = (Vsupply -9 V)/ 16 mA
Example: 24 V supply allows $R_{max}$ of 938 Ohms

**Terminal block**



8/16 mA loop*

**M12 plug**



8/16 mA loop*

Pin 2,4 not used

* Polarity determines output logic, see table page 26
** See "cable shield" below

**Cable shield**

It is recommended to use a shielded cable for stable measurement.

With Terminal block: The cable shield can be connected either to terminal 3 or on the other side to earth. Do not connect both sides of the shield to earth. Note: terminal 3 is internal connected to the external equipotential bonding terminal on the enclosure.

With M12 plug: With use of common M12 cables, the cable shield is connected with the M12 cap nut. Since the M12 thread on CN7 is made of plastics, the cable shield on the M12 cap nut is not connected with CN7 and must be connected on the other side to ground.

## Electrical installation

### Intrinsically safe version

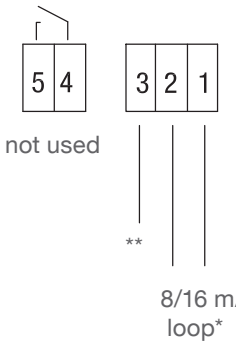
**2-wire operation with 8/16 mA loop**

**8/16 mA loop:**
10.8 .. 30 V DC, 0,7W
incl. 10% of EN 61010-1

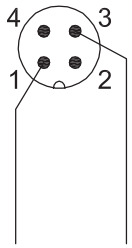
Intrinsically safe supply required (barrier or signal conditioning instruments):
$U_i$=30 V $I_i$=160 mA $P_i$=0,8 W,
$C_i$=7,6 nF $L_i$=0,3 mH

External resistor in loop:
The above stated voltage is the resulting voltage on the unit. Any voltage drop on an external series resistance must be considered.
$R_{max}$ = (Vsupply -10.8 V)/ 16 mA
Example: 24 V supply allows $R_{max}$ of 825 Ohms

**Terminal block**




**M12 plug**




* Polarity determines output logic, see table page 23
** See "cable shield" below

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**4-wire operation with DC supply and solid state relay (signal output)**

This operation is only available for CN 7120/7121 with enclosure Ø65mm (2.56") and connection via terminal block (Solid state relay integrated).

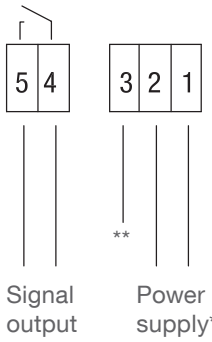
**Power supply:**
10.8 .. 30 V DC, 0,7W
incl. 10% of EN 61010-1

Intrinsically safe barrier required:
$U_i$=30 V $I_i$=160 mA $P_i$=0,8 W, $C_i$=7,6 nF $L_i$=0,3 mH

**Signal output:**
Solid state relay
Max. switching voltage / current: 30 V DC / 82mA

For connection to an intrinsically safe "switch amplifier for contact input" or to an intrinsically safe PLC with integrated input card for contact input.
$U_i$=30 V $I_i$=200 mA $P_i$=350 mW, $C_i$=4,2 nF, $L_i$=0

**Terminal block**




* Polarity determines output logic, see table page 23
** See "cable shield" below

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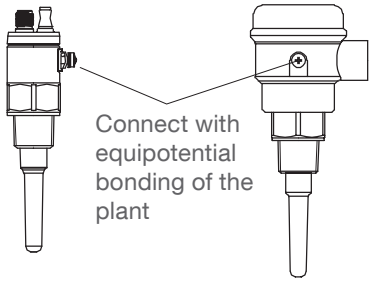
**External equipotential bonding terminal**

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**Cable shield**

It is recommended to use a shielded cable for stable measurement.

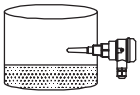
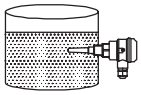
With Terminal block: The cable shield can be connected either to terminal 3 or on the other side to earth. Do not connect both sides of the shield to earth. Note: terminal 3 is internal connected to the external equipotential bonding terminal on the enclosure.

With M12 plug: With use of common M12 cables, the cable shield is connected with the M12 cap nut. Since the M12 thread on CN7 is made of plastics, the cable shield on the M12 cap nut is not connected with CN7 and must be connected on the other side to ground.

## Electrical installation

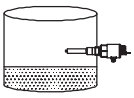
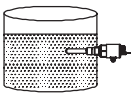
### Output logic

**Terminal block**

| |  | |  | | Fault |
|---|---|---|---|---|---|
| White LED | ● | | ☼ | | ◐ 2Hz |
| Setting | FSL | FSH | FSL | FSH | n.a. |
| Supply polarity<br>Terminal 1<br>Terminal 2 | L+<br>L- | L-<br>L+ | L+<br>L- | L-<br>L+ | n.a. |
| Yellow LED | ● | ☼ | ☼ | ● | ● |
| Relay<br>(Terminal 4+5) |  |  |  |  |  |
| 8/16 mA loop<br>(Terminal 1+2) | 8 mA | 16 mA | 16 mA | 8 mA | 3,6 mA |

FSL = Fail safe low  FSH = Fail safe high

**M12 plug**

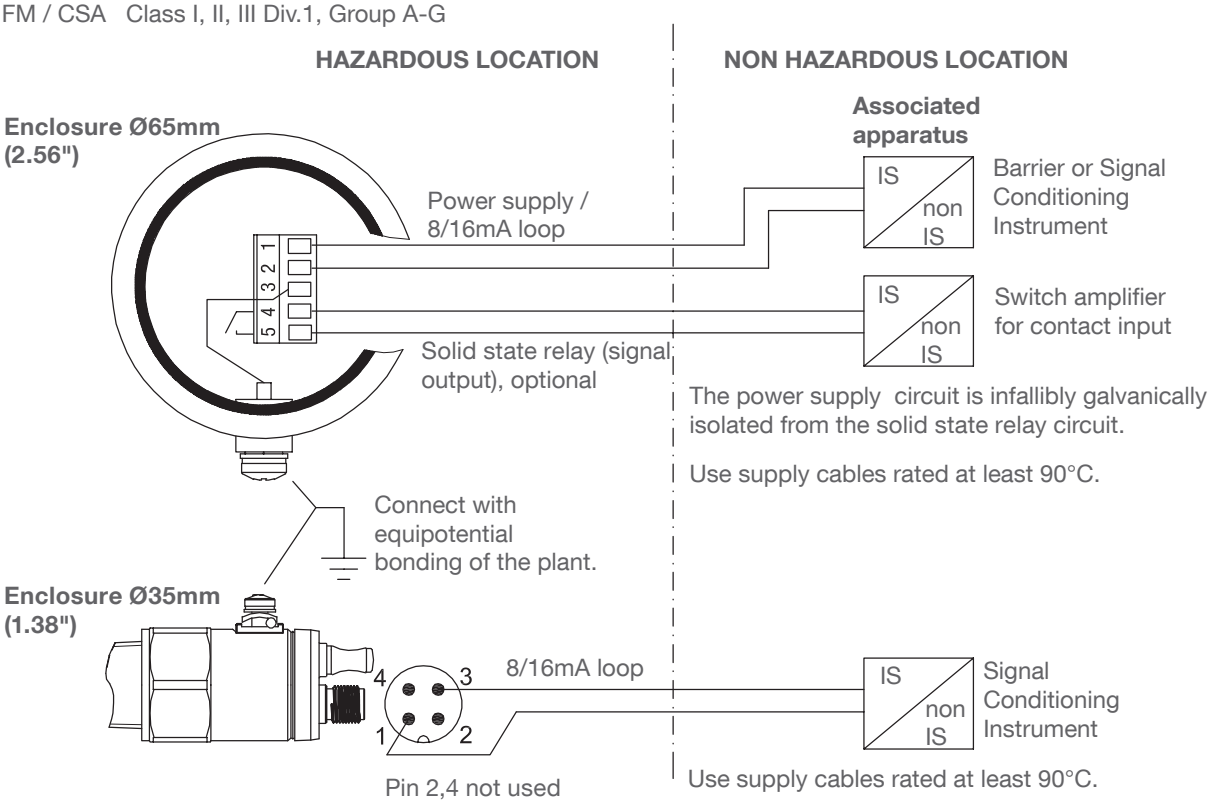
| |  | |  | | Fault |
|---|---|---|---|---|---|
| White LED | ● | | ☼ | | ◐ 2Hz |
| Setting | FSL | FSH | FSL | FSH | n.a. |
| Supply polarity<br>M12, Pin 1<br>M12, Pin 3 | L+<br>L- | L-<br>L+ | L+<br>L- | L-<br>L+ | n.a. |
| Yellow LED | ● | ☼ | ☼ | ● | ● |
| Relay<br>(M12, Pin 2+4) |  |  |  |  |  |
| 8/16 mA loop<br>(M12, Pin 1+3) | 8 mA | 16 mA | 16 mA | 8 mA | 3,6 mA |

FSL = Fail safe low  FSH = Fail safe high

## Electrical installation

### FM / CSA Approval - Control drawing

FM / CSA Class I, II, III Div.1, Group A-G




**For use at altitude ≤ 2000m (6.562ft):**

| Ambient temperature range | Process temperature range | Max. Surface temperature | Temperature class |
|---|---|---|---|
| -40 .. +50°C (-40 .. +122°F) (1) | -40 .. +50°C (-40 .. +122°F) (1) | 80°C | T6 |
| -40 .. +65°C (-40 .. +149°F) (1) | -40 .. +65°C (-40 .. +149°F) (1) | 95°C | T5 |
| -40 .. +85°C (-40 .. +185°F) (1) | -40 .. +100°C (-40 .. +212°F) (1) | 130°C | T4 |
| -40 .. +85°C (-40 .. +185°F) (1) | -40 .. +125°C (-40 .. +257°F) (1) | 155°C | T3 |

(1) With option FFKM O-ring seal: Lower ambient and process temperature limited to -20°C (-4°F)

**For use at altitude > 2000m ... ≤ 3000m: (>6.562 ... ≤ 9.843ft)**

| Ambient temperature range | Process temperature range | Max. Surface temperature | Temperature class |
|---|---|---|---|
| -40 .. +45°C (-40 .. +113°F) (1) | -40 .. +45°C (-40 .. +113°F) (1) | 80°C | T6 |
| -40 .. +58°C (-40 .. +136°F) (1) | -40 .. +58°C (-40 .. +136°F) (1) | 95°C | T5 |
| -40 .. +76°C (-40 .. +168°F) (1) | -40 .. +90°C (-40 .. +194°F) (1) | 130°C | T4 |
| -40 .. +76°C (-40 .. +168°F) (1) | -40 .. +112°C (-40 .. +233°F) (1) | 155°C | T3 |

(1) With option FFKM O-ring seal: Lower ambient and process temperature limited to -20°C (-4°F)

## Electrical installation

**Entity parameters:**

| | |
|---|---|
| Power supply / 8/16mA loop: | $U_i$=30 V $I_i$=160 mA $P_i$=0,8 W, $C_i$=7,6 nF $L_i$=0,3 mH |
| Solid state relay: | $U_i$=30 V $I_i$=200 mA $P_i$=350 mW, $C_i$=4,2 nF $L_i$=0 |

**Associated apparatus:**

The Associated apparatus must have ratings as follows:

| | |
|---|---|
| Max. output voltage | $U_o$ or $V_{oc}$ or $V_t$ < $U_i$ |
| Max. output current | $I_o$ or $I_{sc}$ or $I_t$ < $I_i$ |
| Max. output power | $P_o$ < $P_i$ |
| Max. allowed capacitance | $C_o$ or $C_a$ > $C_i$ + $C_{cable}$ |
| Max. allowed inductance | $L_o$ or $L_a$ > $L_i$ + $L_{cable}$ |

Observe installation manual of the manufacturer of the Associated apparatus.

**For FM:**

Use a FM certified intrinsic safe Associated Apparatus. Installation must be in accordance with the National Electrical Code (NPFA 70, articles 504 and 505) and ANSI/ISA RP 12.06.01.
Each intrinsically safe wiring must be installed as a separate intrinsically safe circuit per requirements of ANSI / NFPA 70 (National Electrical Code) for intrinsically safe installations.

**For CSA:**

WARNING – Substitution of components may impair Intrinsic Safety
AVERTISSEMENT – La Substitution de composants peut nuire à la Sécurité Intrinsèque”

WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES – VOIR INSTRUCTIONS

Use a CSA certified intrinsic safe Associated Apparatus. Installation must be in accordance with the Canadian Electrical Code.

# Notes for use in Hazardous Locations

## Use of this Manual

For use and assembly, refer to the instructions in this Manual. It does contain all instruction as required by ATEX Directive 2014_34_EU, Annex II, 1/0/6 and Ordinance INMETRO nº 115/2022.

## General notes

Refer to appropriate certificate for application in specific hazardous environment.

The equipment has not been assessed as a safety related device (as referred to by Directive 2014_34_EU Annex II, clause 1.5).

The certificate numbers have an 'X' suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.

## ! Qualification of personnel / Servicing / Repair

Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.

Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on).
In case of removing the unit from vessel, take care of process pressure and material passing the opening.

## Certificates / List of Standards

See www.uwtgroup.com for the latest certificates

See EU - Declaration of conformity for the list of standards valid for ATEX certificates

## Year of manufacturing

Marking on the name plate is done according to IEC 60062 as follows:

| Year of manufacturing | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|---|---|---|---|---|---|---|---|---|---|---|
| Marking code | M | N | P | R | S | T | U | V | W | X |

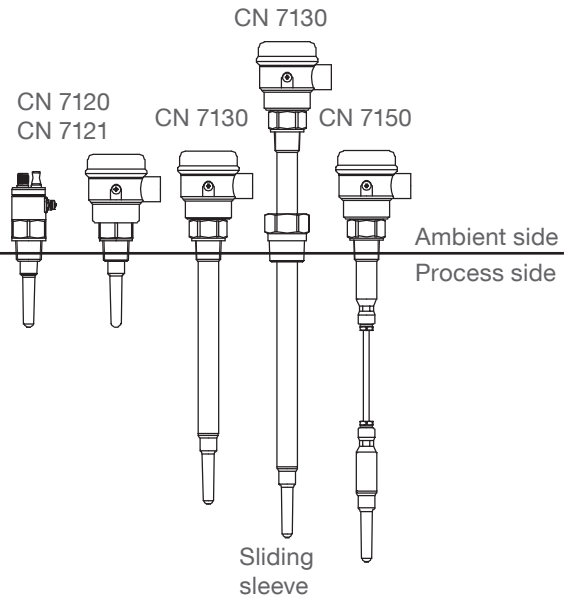
# Notes for use in Hazardous Locations

## Permitted zones for installation

Devices can be installed as follows:

| | Dust applications | Gas applications | |
|---|---|---|---|
| | Marking Da/Db | Marking Ga/Gb | Marking Ga |
| EPL | Db | Gb | Ga |
| Category | 2D | 2G | 1G |
| Zone | 21 | 1 | 0 |
| EPL | Da | Ga | Ga |
| Category | 1D | 1G | 1G |
| Zone | 20 | 0 | 0 |

Not all approvals are available with all models, see selection list for more information




## Warnings for installation

**Intrinsically safe supply**

For intrinsically safe models, power must be supplied from an Intrinsically Safe power source, otherwise protection is no longer guaranteed.

**Process pressure**

Devices with Ex Approval are approved for atmospheric pressure.
A detailed explanation is given below for ATEX and applies analogously for other Ex approvals:
The scope of the ATEX directive is generally limited to atmospheric pressure, see ATEX directive 2014_34_EU Chapter 1 Art.2 (4). Atmospheric pressure is defined as absolute pressure 0.8bar to 1.1bar, see ATEX guideline §50 and IEC 60079-0 chapter 1 Scope.
The technical background is that an explosive atmosphere which is compressed (overpressure) or released (underpressure) can exhibit different explosion behaviour than under atmospheric conditions.
The standards for the types of protection against explosion (IEC 60079 series), on which a type approval according to the ATEX directive is based, are designed for atmospheric conditions and do not automatically cover deviating pressure conditions.
Thus, an ATEX type approval issued in accordance with this directive only covers atmospheric pressure.
This applies to all manufacturers.
A deviating operating pressure can be assessed and approved by an expert for the respective application.
Regardless of this, the design of the level indicators is suitable for a vessel overpressure / underpressure in accordance with the specified technical data.

**Chemical resistance against the medium**

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.

## Notes for use in Hazardous Locations

**Versions with cable gland mounted by default**

Below-mentioned cable diameters and tightening torques of the nut shall be observed for the installation.

Cable gland: M20x1.5
Cable diameter: 6 mm to 12 mm (0.24 .. 0.47")
Tightening torque: Depending on the used cable and therefore to be determined by the user.

## ! Specific conditions of use

**Electrostatic charge**

For gas- and dust-explosive atmospheres:
The apparatus shall be installed in a way that electrostatic charging hazards on non-metallic parts outside the process can be excluded.

For gas-explosive atmospheres only:
The apparatus shall be installed in a way that electrostatic charging hazards on non-metallic parts inside the process can be excluded.

**Applications Ga/Gb or Da/Db**

The installation of the apparatus into the separation wall shall be in a way that technical tightness on the process connection is ensured.
The apparatus shall only be used in process media for which the chemical resistance of the materials, which are in contact with the process media, is ensured.
The materials which are in contact with the process media are defined by positions 6 and 7 of the type code.

**Intrinsic safety**

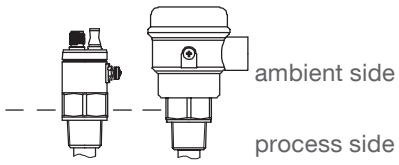
For dust-explosive atmospheres only:
The intrinsically safe circuits of the apparatus shall be regarded as grounded in the event of a fault. To avoid danger from circulating fault currents, appropriate measures , acc. to IEC / EN 60079-14 and depending on the installation shall be considered (e. g. equipotential bonding along the intrinsically safe circuits).

**Ambient and process temperature range**

The relation between ambient temperature range, process temperature range and temperature class (for gas) or maximum surface temperature (for dust) is shown in the thermal parameters table.
With option FFKM O-ring seal lower ambient temperature range and lower process temperature range are limited to -20°C (-4°F).
Details see next page.

**Max. permitted temperature close to the enclosure**

If the process temperature exceeds the permissible ambient temperature, the max. resulting temperature close to the enclosure (see dotted line) shall not exceed the related max. permissible ambient temperature (see next page), taking the worst case conditions into account.
This shall be verified by measurement when installed.



## Notes for use in Hazardous Locations

### ! Ambient and process temperature range, max. Surface Temperature and Temperature Class

The temperature marking on the type plate ⚠ refers to the instruction manual.
In the following tables the relevant temperature ratings are shown.

**For use at altitude ≤ 2000 m (6.562ft):**

| Ambient temperature range | Process temperature range | Max. Surface temperature (EPL Da or Db) | Temperature class (EPL Ga or Gb) |
|---|---|---|---|
| -40 .. +50°C (-40 .. +122°F) (1) | -40 .. +50°C (-40 .. +122°F) (1) | $T_{200}$ 80°C | T6 |
| -40 .. +65°C (-40 .. +149°F) (1) | -40 .. +65°C (-40 .. +149°F) (1) | $T_{200}$ 95°C | T5 |
| -40 .. +85°C (-40 .. +185°F) (1) | -40 .. +100°C (-40 .. +212°F) (1) | $T_{200}$ 130°C | T4 |
| -40 .. +85°C (-40 .. +185°F) (1) | -40 .. +125°C (-40 .. +257°F) (1) | $T_{200}$ 155°C | T3 |

(1) With option FFKM O-ring seal: Lower ambient and process temperature limited to -20°C (-4°F)

**For use at altitude > 2000 m ... ≤ 3000m (>6.562 ... ≤ 9.843ft):**

| Ambient temperature range | Process temperature range | Max. Surface temperature (EPL Da or Db) | Temperature class (EPL Ga or Gb) |
|---|---|---|---|
| -40 .. +45°C (-40 .. +113°F) (1) | -40 .. +45°C (-40 .. +113°F) (1) | $T_{200}$ 80°C | T6 |
| -40 .. +58°C (-40 .. +136°F) (1) | -40 .. +58°C (-40 .. +136°F) (1) | $T_{200}$ 95°C | T5 |
| -40 .. +76°C (-40 .. +168°F) (1) | -40 .. +90°C (-40 .. +194°F) (1) | $T_{200}$ 130°C | T4 |
| -40 .. +76°C (-40 .. +168°F) (1) | -40 .. +112°C (-40 .. +233°F) (1) | $T_{200}$ 155°C | T3 |

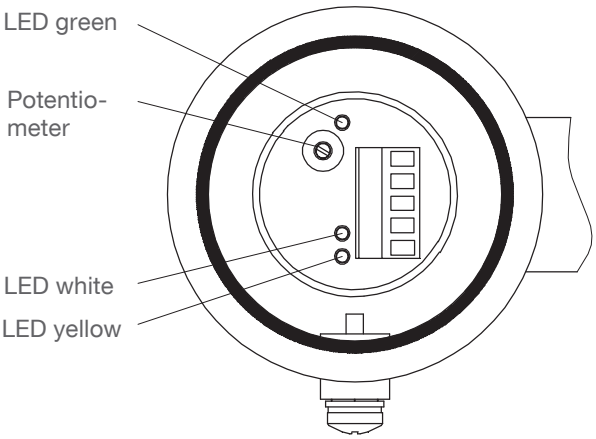
(1) With option FFKM O-ring seal: Lower ambient and process temperature limited to -20°C (-4°F)

# Operation

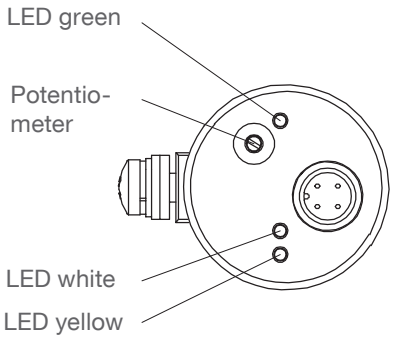
## Operation - Operating elements / LED's

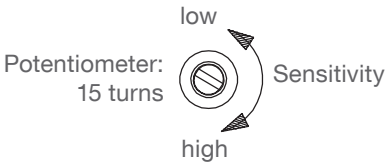
**Operating elements**

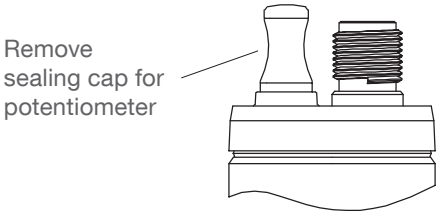
**Enclosure Ø65mm (2.56")**



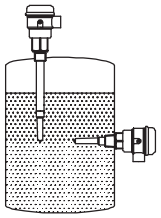
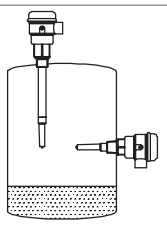

**Enclosure Ø35mm (1.38")**




**LEDs**

| | | |
|---|---|---|
| **Green** | ON | Power on |
| | OFF | Power off |
| **Yellow** | ON | Current loop: 16mA<br>Relay: activated |
| | OFF | Current loop: 8mA<br>Relay: idle |
| | Blinks for a few times, then stops blinking | The number of blinks indicates the position of the potentiometer after it was turned (see page 39) |
| **White** | ON | Unit indicates covered<br>  <br>Capacitance on probe<br>> setted switchpoint |
| | OFF | Unit indicates uncovered<br>  <br>Capacitance on probe<br>< setted switchpoint |
| | Blinks slowly (every 2 seconds) | Potentiometer is on the max. sensitive position (max. clockwise stop), the 4-20mA continuous mode is active (see page 42) |
| | Blinks fast (twice per second) | Diagnostics has indicated a failure |

# Operation - Factory calibration

## Switchpoint factory calibration - General applications

**Application**

Factory calibration is applicable for general applications.

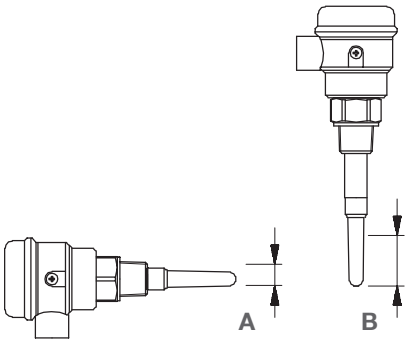
| Typical general application | On site calibration |
|---|---|
| • Low viscosity liquids<br>• Water based liquids<br>• High conductivity liquids without buildup<br>• Dry solids | Not required |

**Switchpoint with factory calibration**

The unit is factory calibrated to measure dielectric constant of material >= 2.0.
With factory calibration the probe must be covered with a certain hight of material in order to switch from uncovered to covered (switchpoint), as follows:

| Dielectric constant of measured material | Probe horizontal **A** | Probe vertical **B** |
|---|---|---|
| < 2.0 | not possible with factory calibration | |
| 2.0 | 5mm (0.2") | 20mm (0.8") |
| 2.0 ... 3.0 | 0mm (0.0") | 15mm (0.6") |
| 3.0 ... 5 | -5mm (-0.2")* | 8mm (0.3") |
| 5 ... 10 | -8mm (-0.3")* | 5mm (0.2") |
| >10 ... 40 | -10mm (-0.4")* | 3mm (0.1") |

* Switchpoint is below the probe (material not touching the probe).




Switchpoint
(coverage with material)

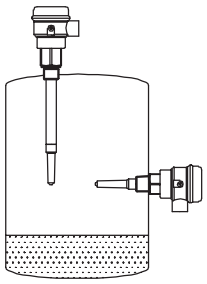
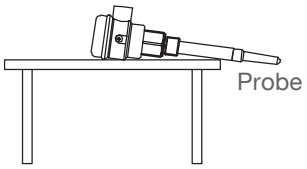
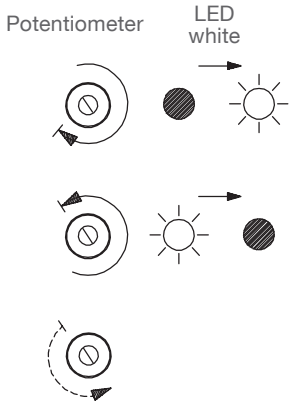
The stated values are valid under following conditions:
- The distance of the probe to a metal wall is not smaller than stated on page 19 and 21.
- The Sensguard (see page 12) is not used.
- Conductive material is not present.

**Note**

The active shield technology in combination with the length of the probe, resulting in adequate distance between internal measurement electrode and ground electrode, reduces the influence of various measured capacitiance due to the mounting situation and of moderate material buildup. As a result, no on site calibration is required for general applications.

## Operation - Recalibration

### Switchpoint setting - In case of recalibration or if factory calibration is not applicable

| | |
|---|---|
| **1. Ensure that the probe is uncovered** | The unit will calibrate to an uncovered probe.<br>  <br>**Setting with mounted sensor:**<br>Ensure material level is well below the probe<br>  <br><br>**Setting on the bench:**<br>Take care not to touch the probe and keep the probe at least 200mm (7.87") away from any material (for example table) |
| **2. Set switchpoint with potentiometer** | Note: 1 second after stopping to turn the potentiometer, the yellow LED blinks for a few times, then stops blinking. This allows to identify the position of the potentiometer which enables more easy service in case external technicians are contacted. Details see page 41.<br>  <br><br>If LED white is OFF, turn clockwise until LED white is ON.<br>Turn counter clockwise until LED white just stops glowing.<br>Turn further counter clockwise:<br>Dielectric constant of material / Number of turns<br>1.6 .. 2 / 1<br>2 .. 3 / 2<br>3 .. 4 / 3<br>>4 / 4<br>The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 19 and 21 and that the Sensguard (see page 12) is not used.<br>Depending on the application and the required switchpoint the number of turns can be varied. |
| **Switchpoint setting is finished** | |

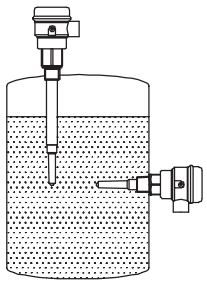
# Operation- Advanced calibration

## Operation - Advanced calibration

### Switchpoint setting - Demanding Applications

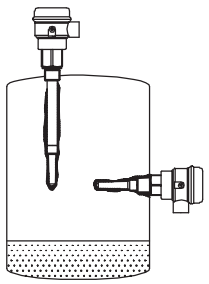
| Typical demanding application | On site calibration |
|---|---|
| • Material with heavy buildup (non conductive):<br>• High viscosity liquids<br>• Hygroscopic/ wet solids | Probe covered and then uncovered,<br>retaining max. possible material buildup |
| • Heavy buildup (conductive) | Consult manufacturer |

**1. Ensure material level is well above the probe**



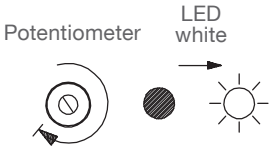
**2. Ensure material level is well below the probe**

It is important that as much material buildup as possible is retaining on the probe.



**3. Set switchpoint with potentiometer**

Note: 1 second after stopping to turn the potentiometer, the yellow LED blinks for a few times, then stops blinking. This allows to identify the position of the potentiometer which enables more easy service in case external technicians are contacted. Details see page 41.




If LED white is OFF,
turn clockwise until LED white is ON.

Turn counter clockwise until LED white just stops glowing.

Turn further counter clockwise:

| Dielectric constant of material | Number of turns |
|---|---|
| 1.6 .. 2 | 1 |
| 2 .. 3 | 2 |
| 3 .. 4 | 3 |
| >4 | 4 |

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 19 and 21 and that the Sensguard (see page 12) is not used.
Depending on the application and the required switchpoint the number of turns can be varied.

**Switchpoint setting is finished**

## Operation - Advanced calibration

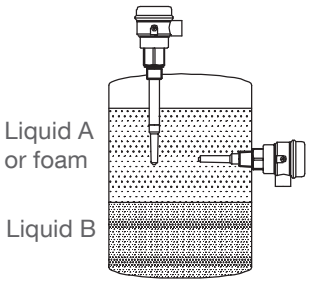
### Switchpoint setting - Interface detection

| Typical interface application | On site calibration |
|---|---|
| • Ignoring liquid A/ detecting liquid B<br>• Ignoring foam/ detecting liquid | Immerse probe in liquid A or foam |

**1. Immerse probe in liquid A or in foam which should NOT be detected**

Ensure that liquid A or foam (which should NOT be detected) is covering the probe.

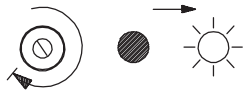
Liquid A or foam must have a **lower dielectric constant** than liquid B, which should be detected.



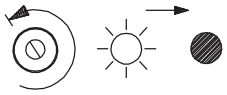

**2. Set switchpoint with potentiometer**

Note: 1 second after stopping to turn the potentiometer, the yellow LED blinks for a few times, then stops blinking. This allows to identify the position of the potentiometer which enables more easy service in case external technicians are contacted. Details see page 41.


If LED white is OFF,
turn clockwise until LED white is ON.



Turn counter clockwise until LED white just stops glowing.



Turn further counter clockwise:

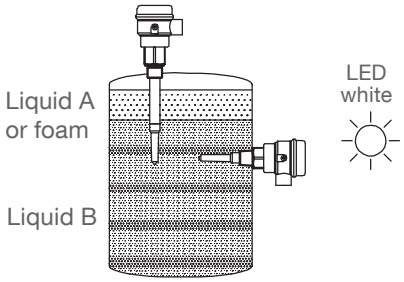
| Dielectric constant of liquid A or foam | Number of turns |
|---|---|
| <= 10 | 1 |
| > 10 | ½ |

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 19 and 21 and that the Sensguard (see page 12) is not used.
Depending on the application and the required switchpoint the number of turns can be varied.
The sensitivity is now setted thus that liquid A or foam is NOT detected.

**3. Immerse probe in liquid B which should be detected**

Ensure that liquid B (which should be detected) is covering the probe.

LED white should glow.




**Switchpoint setting is finished**

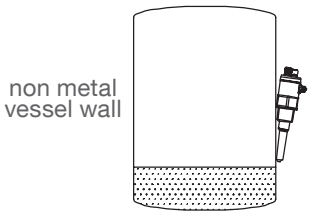
## Operation - Advanced calibration

### Switchpoint setting - Measurement through non metal vessel wall

| Typical application | On site calibration |
|---|---|
| • Measuring through non metal vessel wall | Material below probe |

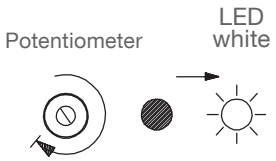
**1. Ensure material level is well below the probe**

The unit will calibrate to an uncovered probe.



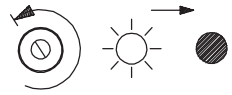

**2. Set switchpoint with potentiometer**

Note: 1 second after stopping to turn the potentiometer, the yellow LED blinks for a few times, then stops blinking. This allows to identify the position of the potentiometer which enables more easy service in case external technicians are contacted. Details see page 41.



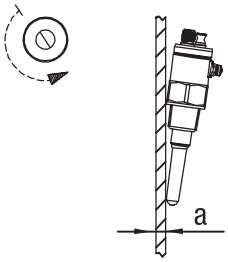

If LED white is OFF,
turn clockwise until LED white is ON.

Turn counter clockwise until LED white just stops glowing.



Turn further counter clockwise:

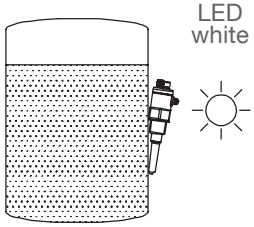
| Dielectric constant of material | Distance a (material to probe) | Number of turns |
|---|---|---|
| >= 3 | <= 10mm (0.4") | ¼ |
| > 40 | <= 20mm (0.8") | ½ |




Depending on the application and the required switchpoint the number of turns can be varied.

**3. Ensure material level is well above the probe**

LED white should glow.




**Switchpoint setting is finished**

## Operation - Advanced possibilities

### Advanced possibilities

The unit allows following usefull advanced possibilities, which are related to the position of the potentiometer

**Indicating the actual position of the potentiometer**

1 second after stopping to turn the potentiometer, the yellow LED blinks for a few times, then stops blinking. This allows to identify the actual position of the potentiometer which enables more easy service in case external technicians are contacted.
Note: The signal output (relay, transistor) does not follow the blinking.
See Table below.

**Relation of potentiometer position to sensitivity**

The position of the potentiometer is clearly related to the dielectric constant and therefore to the sensitivity of the unit.
See Table below.

| Selected mode | Required min. dielectric constant of material to be detected (1) | Position of the potentiometer = No. of potentiometer turns, see (2) below | Number of blinking of yellow LED, see (3) below |
|---|---|---|---|
| 4-20mA continuous mode | not applicable (see next page) | 0 ... 2 | 0 |
| switch mode | 1 (Probe in air) | 3 | 1 |
| | 1.5 | 4 | 2 |
| | 2 | 5 | 3 |
| | 3 | 6 | 4 |
| | 4 | 7 | 5 |
| | 6 | 8 | 6 |
| | 8 | 9 | 7 |
| | 11 | 10 | 7 |
| | 15 | 11 | 8 |
| | 25 | 12 | 8 |
| | 40 | 13 | 9 |
| | 60 | 14 | 9 |
| | 90 | 15 | 9 |

(1) The stated values are valid under following conditions:
- The distance of the probe to a metal wall is not smaller than stated on page 19 and 21.
- The probe is mounted inside the vessel (no measurement from outside through the vessel wall).
- The Sensguard (see page 12) is not used.
- Conductive material is not present.

(2) To set the position of the potentiometer to a certain sensitivity, do following steps:

a) Turn potentiometer clockwise for min. 15 turns, thus stop position is safely reached.

b) Turn potentiometer counter clockwise according to the number of turns stated in the table above.

(3) Yellow LED starts blinking 1 second after stopping to turn the potentiometer.

## Operation - Advanced possibilities

**4-20mA continuous mode**

The output can be set to 4-20 mA continuous mode.
In this mode the loop current is related to the measured dielectric constant.

This mode allows to improve the safety of measurement in critical or special applications, like:
- Detection of increasing material buildup .
- Detection of small changes of capacitance like material with low dielectric constant or measurement through non metallic walls.
- Understanding the capacitance change happening in certain applications.

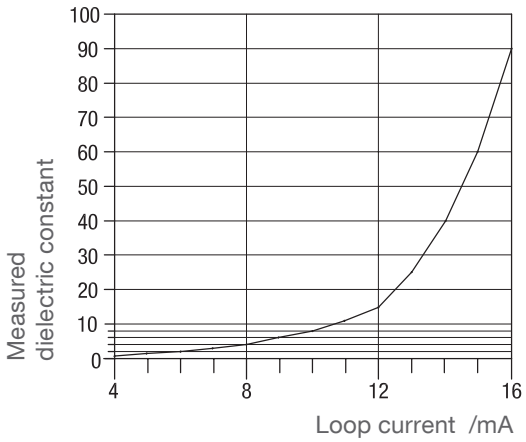
The loop current is related to the measured dielectric constant as follows:
- 4mA is related to an uncovered probe in air with dielectric constant = 1 (1)
- 16mA is related to a covered probe with dielectric constant = 90 (1, 2)

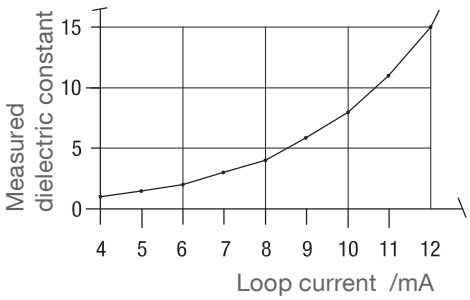
The stated values are valid under following conditions:
(1) The distance of the probe to a metal wall is not smaller than stated on page 19 and 21.
(2) Probe must be covered with enough height of material as stated on page 33.
The probe is mounted inside the vessel (no measurement from outside through the vessel wall)
Conductive material is not present

The measured dielectric constant versus loop current / mA is non-linear to ease the reading for high sensitivity applications in material with low dielectric constant.

The mode is selected by turning the potentiometer clockwise for min. 15 turns, until stop position is safely reached (= max. sensitive position). LED white must blink.

Note:
The relay output is not operable with this mode. It is idle.
The yellow LED is off.



## Operation - WHG Proof Test

The implemantation of the WHG proof test is done in accordance with the documentation "Technical Description" for WHG, Annex 8, Proof Test, by following possibilities:

**Filling the vessel**

- Filling the vessel until the switchoint is reached and monitoring the correct reaction of the system

**Simulation of the level**

- Suitable simulation of the level or of the physical measurement effect

This can be done for example by dismounting the sensor and immersion into the original medium.

**Interruption of the supply voltage**

- Interruption of the supply voltage of CN 7000 for > 2 sec and monitoring the correct reaction of the system

With connection of an additional signal conditioning instrument, which meets the requirements of clause 3 and 4 of the ZG-ÜS.

The CN 7000 starts a self diagnostics routine when the power supply is applied with a defined startup behaviour (see page 5). Possible functional failures can be monitored by the reaction of the system.

**Pushing the Test Key on a signal conditioning instrument**

- Pushing the Test Key on a signal conditioning instrument and monitoring the status indicator on the signal conditioning instrument

With connection of an additional signal conditioning instrument, which meets the requirements of clause 3 and 4 of the ZG-ÜS.

This possibility is descriped with use of the signal conditioning instrument Siemens Sitrans SCSC or TCSC as follows:

### Use of signal conditioning instrument with Test Key: Siemens Sitrans SCSC or TCSC

**Sitrans SCSC/ TCSC**

The signal conditioning instrument is available as single channel SCSC (connection of one CN 7000) or double channel TCSC (connection of two CN 7000).

The operation manual of Sitrans SCSC or Sitrans TCSC is mandantory.
Following notes give support for the connection with CN 7000.

**Function of the Test Key**

The Test Key on the Sitrans signal conditioning instrument interrupts the supply voltage of the CN 7000. When the supply voltage is applied, the CN 7000 starts a self diagnostics routine with a defined startup behaviour (see page 5). Possible functional failures will be evaluated by the signal conditioning instrument, which switches to the overflow state and indicates the failure by a LED .

**Interaction with CN 7000**

The Sitrans signal conditioning instrument is set to Mode "Max. Adjustment" (overflow protection).
For a correct interaction with CN 7000 the supply polarity for CN 7000 is set in a way, that the loop current with covered sensor is 16mA (see page 26):

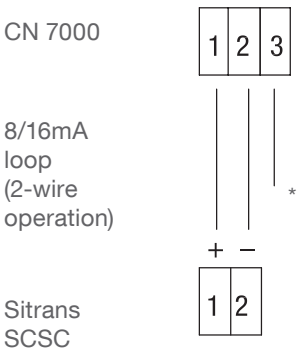
| **CN 7000** | **Connection to Sitrans** |
|---|---|
| Terminal 1 / M12 Pin 1 | + Polarity |
| Terminal 2 / M12 Pin 3 | - Polarity |

Wiring diagram see next page.

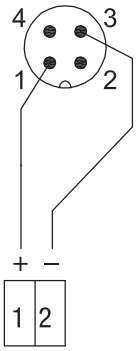
## Operation - WHG Proof Test

### Wiring 1-channel unit Sitrans SCSC

**CN 7000 with Terminal block**




**CN 7000 with M12 plug**

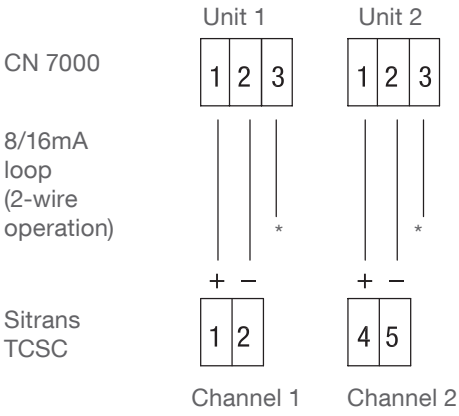



* Cable shield, see page 24

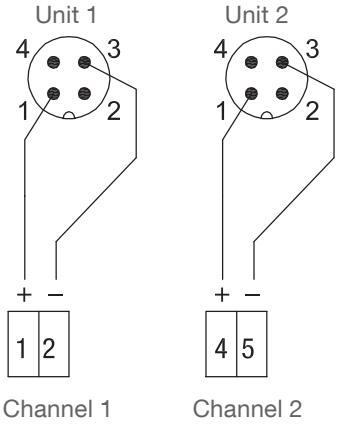
### Wiring 2-channel unit Sitrans TCSC

Two CN 7000 units can be connected to Sitrans TCSC:

**CN 7000 with Terminal block**



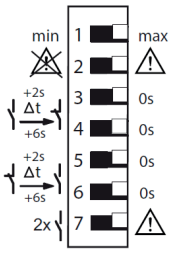

**CN 7000 with M12 plug**



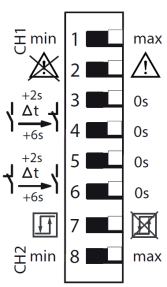

* Cable shield, see page 24

### Adjustment Sitrans SCSC/TCSC

The Sitrans SCSC/TCSC with connection of CN 7000 is adjusted as follows:




| **DIL-switch:** | **Setting:** |
|---|---|
| 1 Mode (min./max. adjustment) | Max. |
| 2 Switch-on pulse monitoring On/Off | On |
| 3 to 7 | * |




| **DIL-switch:** | **Setting:** |
|---|---|
| 1 Mode (min./max. adjustment), channel 1 | Max. |
| 2 Switch-on pulse monitoring On/Off | On |
| 3 to 6 | * |
| 7 Two-point control On/Off | Off |
| 8 Mode (min./max. adjustment), channel 2 | Max. |

* These settings are not defined for the interaction with CN 7000 and can be setted by the user under consideration of the WHG requirements.

## Troubleshooting

| LEDs | | | Behaviour | Cause | Action |
|---|---|---|---|---|---|
| **Green** Power supply | **Yellow** Signal output | **White** Probe covered/ uncovered | | | |
| OFF | OFF | OFF | | Proper power supply not applied to device<br><br>Connector came loose<br><br>Defective component in device | Check power supply<br><br>Refasten connector<br><br>Contact distributor |
| ON | ON or OFF | ON | Probe is uncovered but LED white states covered | Sensitivity is set too high. Either sensitivity setting not properly done or too much material buildup | Reduce sensitivity (see page 34 ff). If applicable clean probe from buildup |
| ON | ON or OFF | OFF | Probe is covered but LED white states uncovered | Sensitivity is set too low. Either sensitivity setting not properly done or too low dielectric constant from material. | Increase sensitivity (see page 34 ff). Dielectric constant of material must be 1.5 or more |
| ON | ON or OFF | ON or OFF | Yellow LED lights opposite to white LED when this is not meant to happen | Incorrect polarity on power supply | Reverse polarity on power supply. See Switching logic on page 26 |
| ON | OFF | Blinks slowly (every 2 seconds) | Relay = idle | Potentiometer is on the clockwise stop position and thus the 4-20mA continuous mode is active (see page 42) | If the swich mode is required, go to switchpoint setting (see page 34 ff) |
| ON | Blinks for a few times, then stops blinking | ON or OFF | Blinking happens after the potentiometer was turned | This is a normal operation. The blinking indicates the position of the potentiometer after it was turned (see page 41) | No action required |
| ON | OFF | Blinks fast (twice per second) | Current loop = 3.6mA, Relay = idle | Diagnostics has indicated a failure | Contact distributor |
| ON | ON or OFF | ON or OFF | No respond (change of white and yellow LED) when potentiometer is turned and probe is uncovered | Defective component in device | Contact distributor |
| ON | ON or OFF | ON or OFF | Unequal current in current loop | Loop circuitry is connected against earth | Remove earth connection from loop circuitry |

## 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 caried 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%

## Maintenance

**Opening the lid (cover)**

Before opening the lid for maintenance reasons observe following items:
- No dust deposits or whirlings are present.
- No rain can enter into the housing.

**Frequent check of the unit**

To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:
- Mechanical damage or corrosion of any components (housing side and process side) and of the field wiring cables.
- Thight sealing of the process connection, cable glands and enclosure lid.
- Properly connected external PE cable (if present).

**Cleaning**

If cleaning is required by the application, following must be observed:
- 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.

The cleaning process must be done in a way, that:
- 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.

Units with EHEDG (EL class I) certification, which are used in the respective EHEDG applications, must be cleaned according to the respective regulations.
The device has been developed for Cleaning in Place (CIP) applications and must not be dismantled for cleaning.

Units with explosion certification (not valid if units have as well EHEDG certification):
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.

**Max. temperature for CIP**

135°C (275°F), duration 60min
150°C (302°F), duration 30min (only for CN 7120 with process connection G 1/2" hygienic)
Ambient temperature limited to 50°C (122°F), unit de-energized.

**Function test**

A frequent function test may be required depending on the application.

Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous material, electric safety, process pressure).

This test does not proof if the unit is sensitive enough to measure the material of the application.

Function test is done by touching the probe 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.

**Production date**

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distrubutor. For ATEX/IEC-Ex versions see page 15.

**Spare parts**

All available spare parts are stated in the selection list

## Probe modifications - Shortening the extension cable (CN 7150)

The extension cable of CN 7150 can be shortend on site. See external manual dm140000.

## 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.