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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 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) 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) 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
- Approvals CE, UKCA, FM/CSA, TR-CU, WHG, VLAREM

Electronics

- IO-Link, IEC 61131-9 SDCI standard
- PNP, NPN or Push-Pull output (configurable)
- Terminal or M12 plug
- Sensitivity setting by IO-Link or by potentiometer (configurable)

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), optional sliding sleeve allows to change the switch point easily during operation of the device
- Various process connections: threaded (including G½“ hygienic), flanged (screwed) or Tri-clamp

Technical data

Electrical data

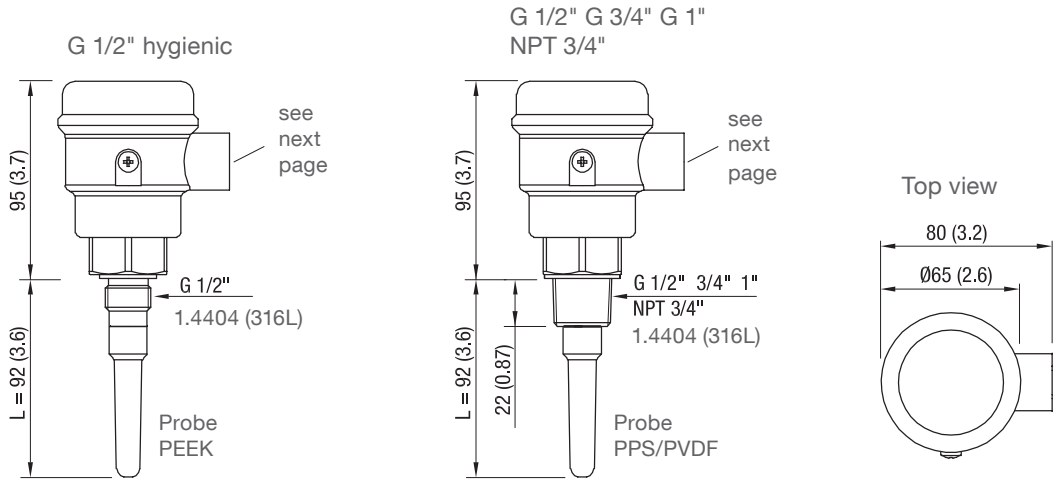
Power supply	10 - 30 V DC incl. 10% of EN 61010-1 Operation with IO-Link requires min. 18V Current consumption: <55mA
Signal outputs **Electrical ratings**	Out 1 and Out 2: Max. current: One output active: 200 mA Both outputs active: 100 mA each (short-circuit proof) Voltage drop: <2V
Out 1 **Configuration**	SIO mode*: Factory setting PNP (FSL) Other than factory setting can be configured via IO-Link as follows: PNP (FSH) or NPN (FSH or FSL) or Push/pull (FSH or FSL) COM-mode IO-Link communication *Note: If there is no IO-Link communication, the device operates in the SIO mode
Out 2 **Configuration**	Factory setting PNP (FSH) Note: Out 2 PNP is opposite to Out 1 PNP (antivalent) Other than factory setting can be configured via IO-Link as follows: PNP (FSL) or NPN (FSH or FSL) or Push/pull (FSH or FSL)
Diagnostics	Self diagnostics present
Safety operation (FSL,FSH)	Configurable via IO-Link
Signal delay	Configurable via IO-Link. Factory setting Probe uncovered -> covered ca. 0.5 sec Probe covered -> uncovered ca. 0.5 sec
Indicating light	Build in LEDs: Power (green), Signal output (yellow), Sensor status / Diagnostics (white)
Sensitivity	Factory setting Adjustable by potentiometer alternative Programmable by IO-Link
Electrical connection	With enclosure Ø65mm (2.56"): Terminal block, terminals (0.14 - 1.5 mm^2 (AWG 28-16) With enclosure Ø65mm (2.56") and Ø35mm: (1.38") M12x1 according to IEC 61076-2-101, male, 4-pole, coding A-standard
Cable entry	With enclosure Ø65mm (2.56"): M20 x 1.5 screwed cable gland Clamping range (diameter) of factory provided cable glands: 6..12 mm (0.24 .. 0.47") or NPT 1/2“ conduit
Overvoltage category	II
Protection class	III

Technical data

Dimensions All dimensions in mm (inch)

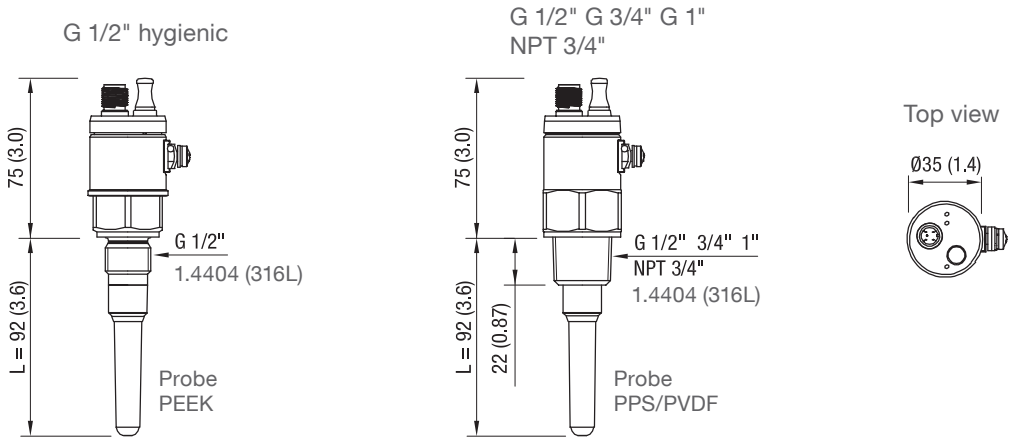
CN 7120 - Short extension length
Stainless steel process connection

Enclosure Ø65mm (2.56")



Versions CN 7120 are available with certificate EHEDG EL class I

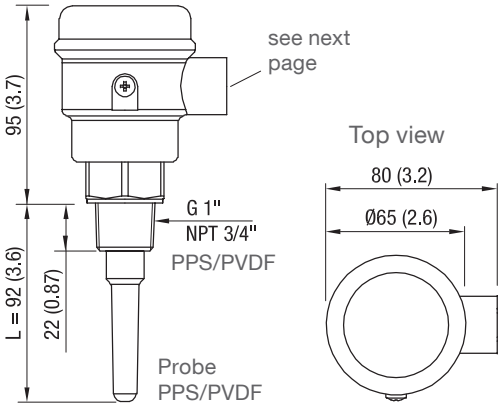
Enclosure Ø35mm (1.38")



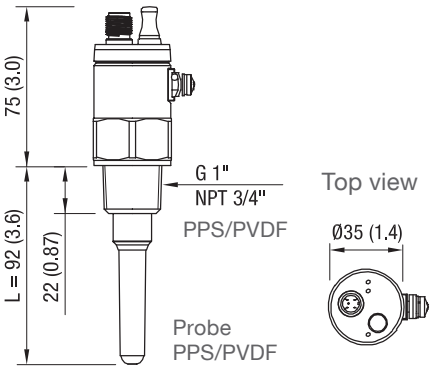
Versions CN 7120 are available with certificate EHEDG EL class I

CN 7121 - Short extension length
Plastic process connection

Enclosure Ø65mm (2.56")

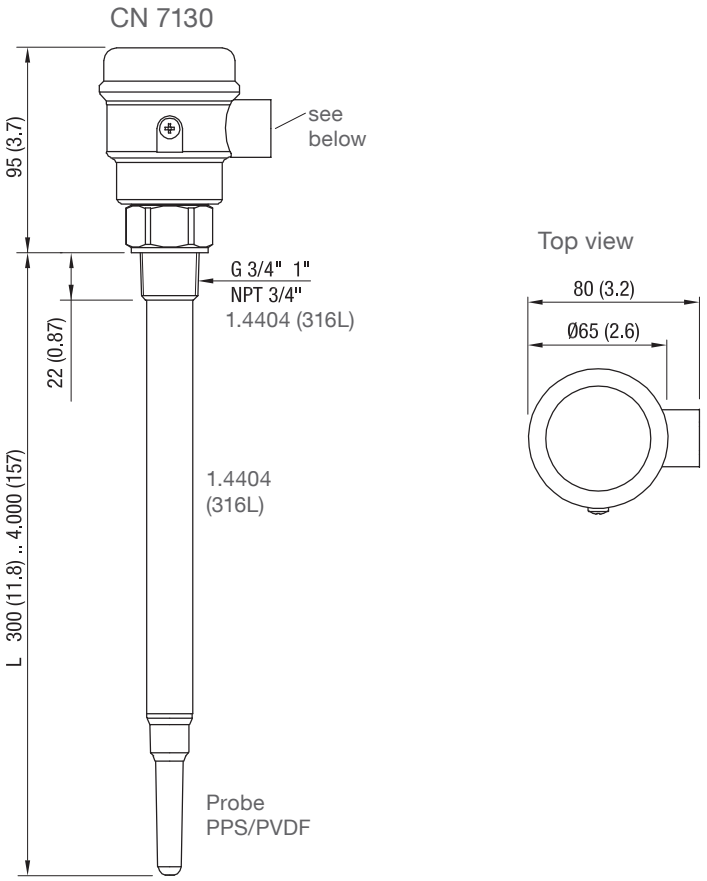


Enclosure Ø35mm (1.38")



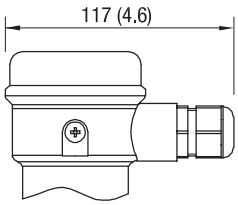
Technical data

CN 7130 - Pipe extension

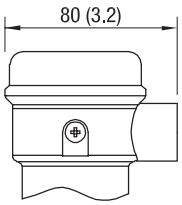


Enclosure
Ø65mm (2.56")
Possible wiring

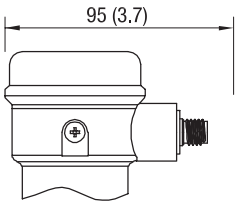
M20x1,5
cable gland



1/2" NPT
conduit

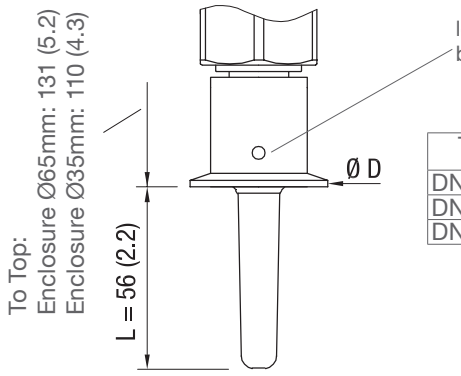


M12
plug



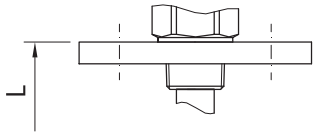
Technical data

Tri-clamp



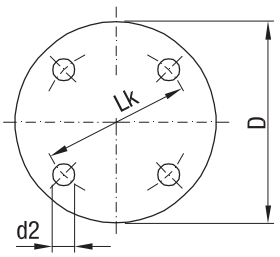
Tri-clamp	ØD
DN 25 (1")	50,5 (1.99")
DN 40 (1 1/2")	
DN 50 (2")	64 (2.52")

Flange

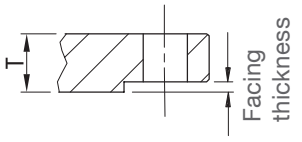


Flange is screwed to process connection

	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 ASME 300 lbs	2 mm (0.08")

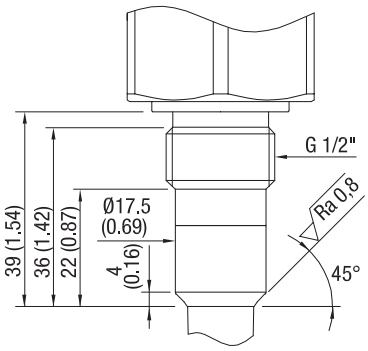
Technical data

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



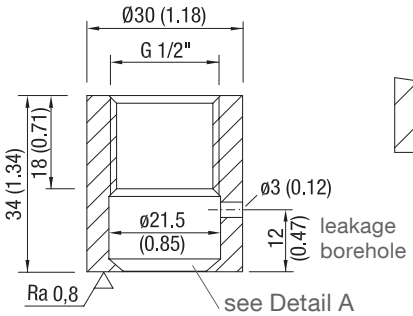
Metal
1.4404 (316L)

PEEK
FDA registration number:
21 CFR 177.2415

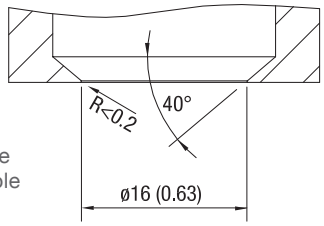
Flush welding socket: Design

The flush welding socket must meet the following design:

Metal type according to hygienic and further external requirements



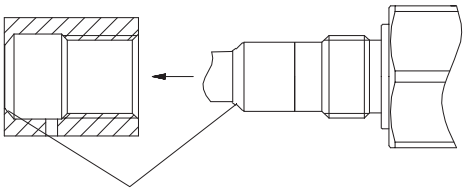
Detail A:
Sealing area between CN 7120 (PEEK) and the on site process connection (metal)



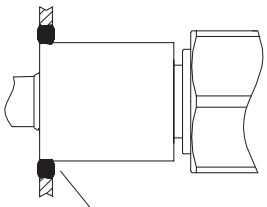
Installation

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

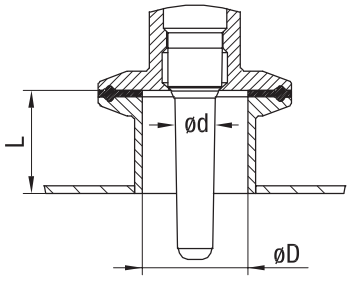


Metal-peek sealing
- The support must be without a gap. No teflon tape (or similar) is allowed to be in between.
- Fixing torque 15 Nm



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) Optional PVDF (1,2) 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" 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") DIN 32676 Type A (DIN 11851) and 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) Optional PVDF (1,2)
Material probe:	PPS (glass fibre reinforced) (1,2) 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) Optional PVDF (1,2)
Seal pipe-probe:	FKM (optional FFKM) (2)
Thread (3):	G 3/4", G 1“, NPT 3/4" 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"

(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)

Technical data

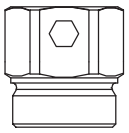
Extension length "L"	CN 7120 Stainless steel process conn.:	92 mm (3.6“)
	CN 7121 Plastic process connection:	92 mm (3.6“)
	CN 7130 Pipe extension:	300 .. 4000mm (11.8 .. 157")
Tolerance length "L“	CN 7120 Stainless steel process conn.:	±5 mm (±0.2“)
	CN 7121 Plastic process connection:	±5 mm (±0.2“)
	CN 7130 Pipe extension:	±10 mm (±0.4“)
Material Enclosure Ø65mm (2.56")	Material Housing: Thermoplastic polyester (PBT/PC) Material Lid: Transparent thermoplastic polycarbonate (PC) Material Seal between housing and lid: VMQ (vinyl-methyl-silicone) Material Nameplate: polyester film	
Material Enclosure Ø35mm (1.38)	Material Housing: 1.4404 (316L) Material Lid with M12 plug: Transparent thermoplastic polycarbonate (PC) Material Seal between housing and lid: VMQ (vinyl-methyl-silicone) 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“)
	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)

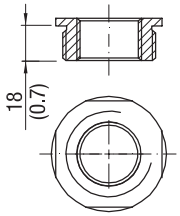


Accessories

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"

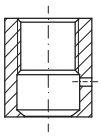
Material: 1.4305 (303) or 1.4404 (316L)
Max. process pressure: –1 to 25 bar (363 psi)



Flush welding socket

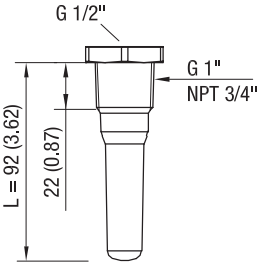
For version with EHEDG (EL class I) certificate
Fitting to CN 7120 with process connection G 1/2" hygienic

Details see page 8



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)

M12 mating plug

4 pole, for version with M12 plug

Operating conditions

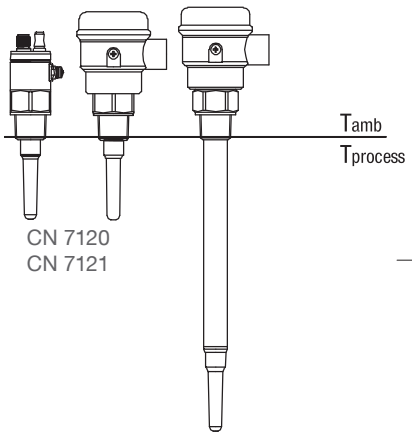
Functional

Dielectric constant	Min. 1.5 Factory setting = 2.0 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.
Repeatability	2 mm (0.08"), for water based liquids

Environment

Ambient and process temperature

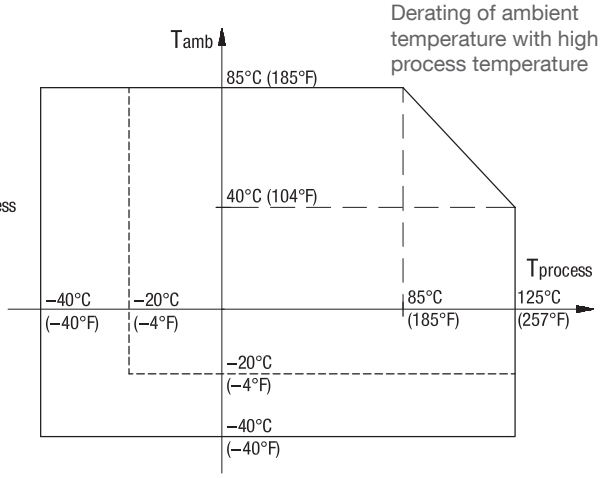
Mounting with short socket



CN 7120
CN 7121

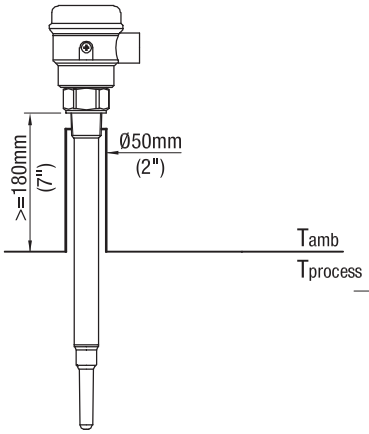
CN 7130

Derating of ambient temperature with high process temperature

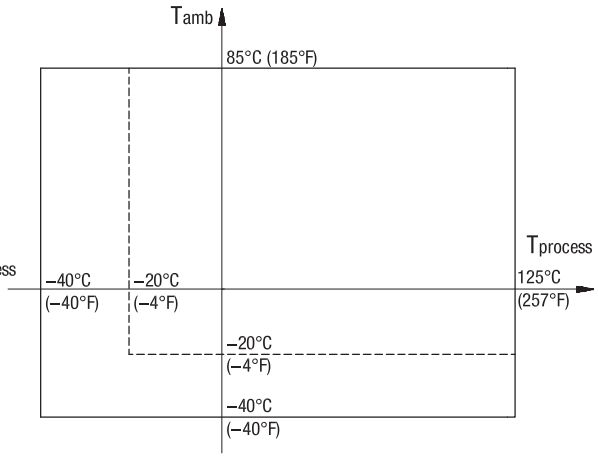


Ambient- and process temperature limited to -20°C (-4°F) with option FFKM seal O-ring

Mounting with long socket

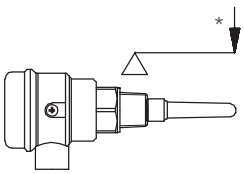
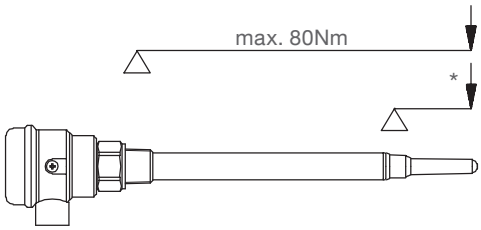


CN 7130



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

Operating conditions

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.
Max. permitted mechanical torque	CN 7120 / CN 7121  CN 7130  * PEEK/PPS: max. 400N (at 40°C) PVDF: max. 200N (at 40°C)
Max. process pressure	CN 7120 Stainless steel process connection: –1 to 25 bar (363 psi) CN 7121 Plastic process connection: –1 to 10 bar (146 psi) CN 7130 Pipe extension: –1 to 25 bar (363 psi) CN 7130 Pipe extension with sliding sleeve: –1 to 10 bar (146 psi) Observe possible pressure limitation from the used flange type !
Vibration	1.5 $(m/s^2)^2$/Hz according to EN 60068-2-64
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: 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 UKCA FM / CSA TR-CU
Overfill and leackage protection *, **	WHG VLAREM
EMC	EN 61326
RoHS conform	According to directive 2011/65/EU
Hygiene *	EHEDG EL class I 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: - as “pressure accessory” (see 2014/68/EU Art. 2 (5) and PED Guidelines A-08, A-40) - nor as “safety accessory” (see 2014/68/EU Art. 2 (4) and PED Guidelines A-20, A-25)

* Depending on selected version
** Relevant information for use in applications with WHG/VLAREM: see documentation "Technical Description"

Mechanical installation

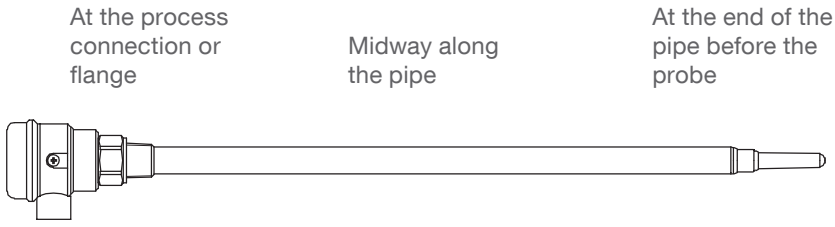
General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure. 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

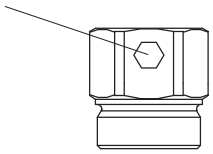
Handling precautions

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.

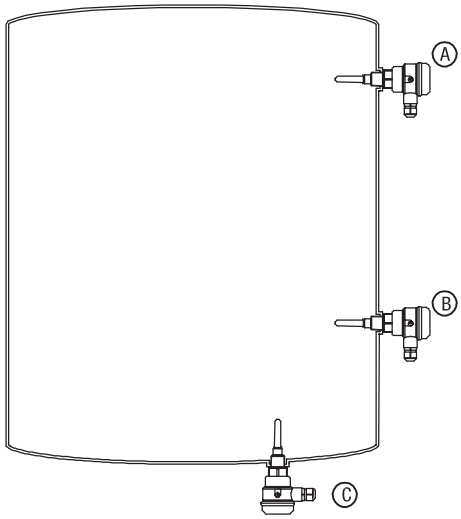
Hygienic process connection

Observe that the correct "On site process connection" is present, see page 8.

Mechanical installation - Liquid applications

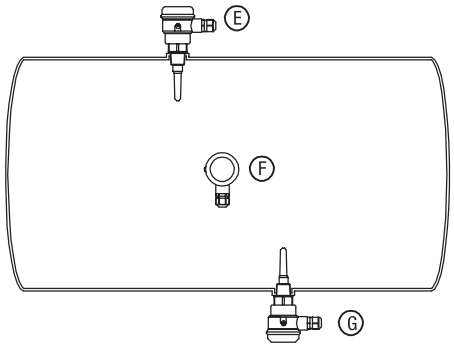
Liquid applications - Mounting instructions

CN 7120 /
CN 7121

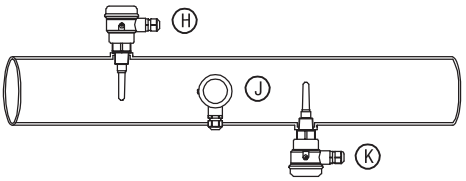


CAUTION
Observe:
- General distances of the probe (see page 17)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 13)

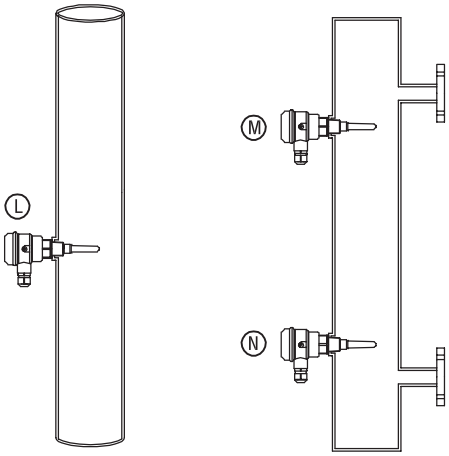
Vertical vessel
A Full detector horizontal
B Demand or empty detector horizontal
C Empty detector oblique from the bottom
D Empty detector in outlet pipe



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

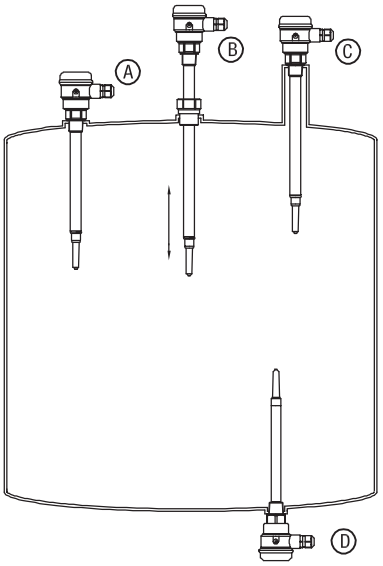


Vertical pipe
L Full, demand or empty detector horizontal

Bypass
M Full detector horizontal
N Demand or empty detector horizontal

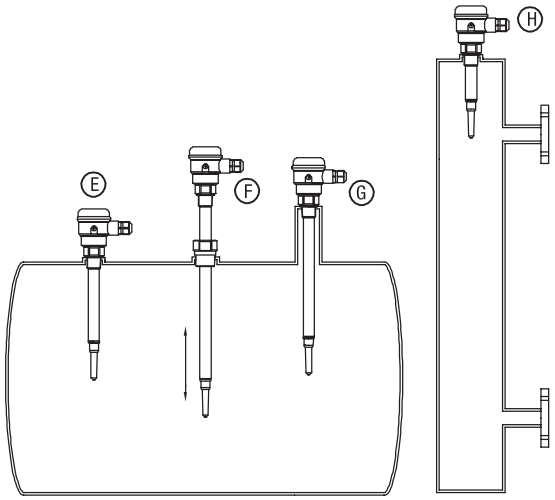
Mechanical installation - Liquid applications

CN 7130



CAUTION
Observe:
- General distances of the probe (see page 17)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 13)

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

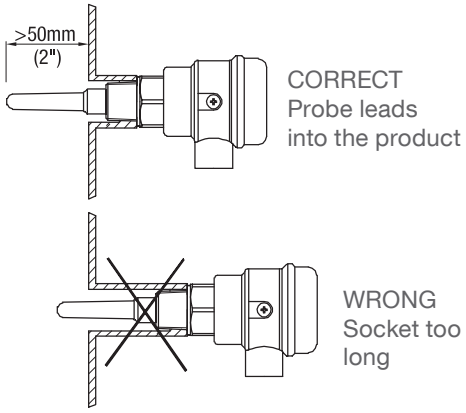


Horizontal vessel
E Full, demand or empty detector vertical
F Vertical with sliding sleeve
G Vertical with long mounting socket

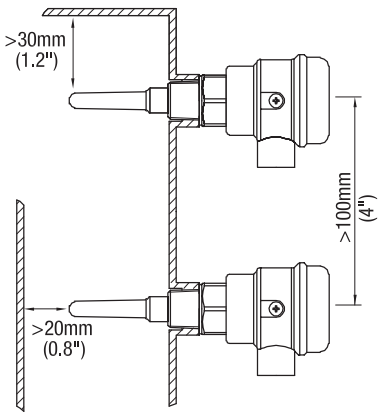
Bypass
H Full, demand or empty detector vertical

Distances of the probe

Observe socket length



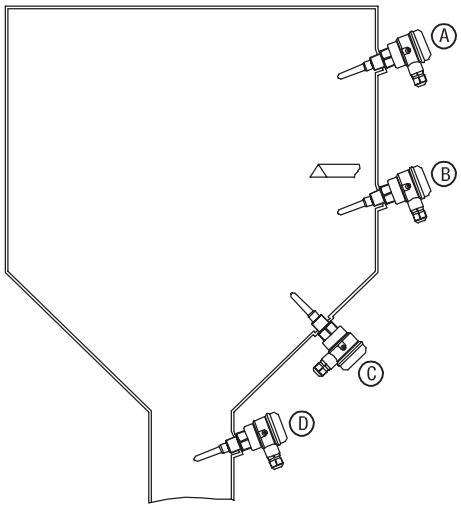
Observe min. distance
- between two probes
- to metal vessel wall



Mechanical installation - Solid applications

Solid applications - Mounting instructions

CN 7120 /
CN 7121



CAUTION
Observe:
- General distances of the probe (see page 19)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 13)
- Wearing due to abrasive bulk material

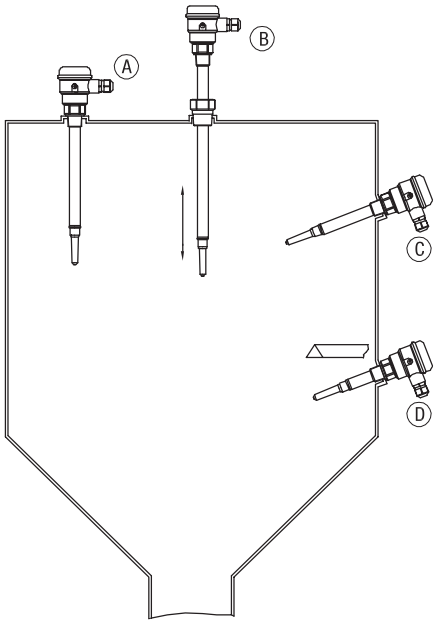
A Full detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily.

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 19)
- Distance to material flow (filling)
- Max. permitted mechanical load (see page 13)
- 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

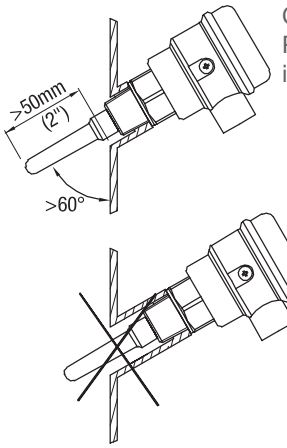
D Demand or empty detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily. Protective angle recommended depending on load and abrasion of the material

Mechanical installation - Solid applications

Distances of the probe

Observe socket length

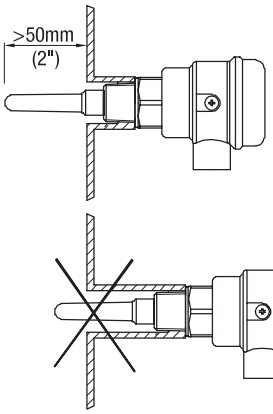
Oblique mounting



CORRECT
Probe leads into the product

WRONG
Socket too long

Perpendicular mounting

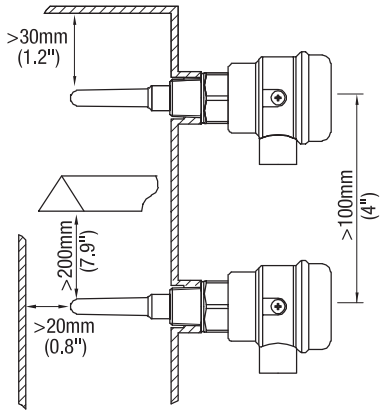


CORRECT
Probe leads into the product

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 probe
- to metal vessel wall
- to protective angle



Electrical installation

General Safety Instructions

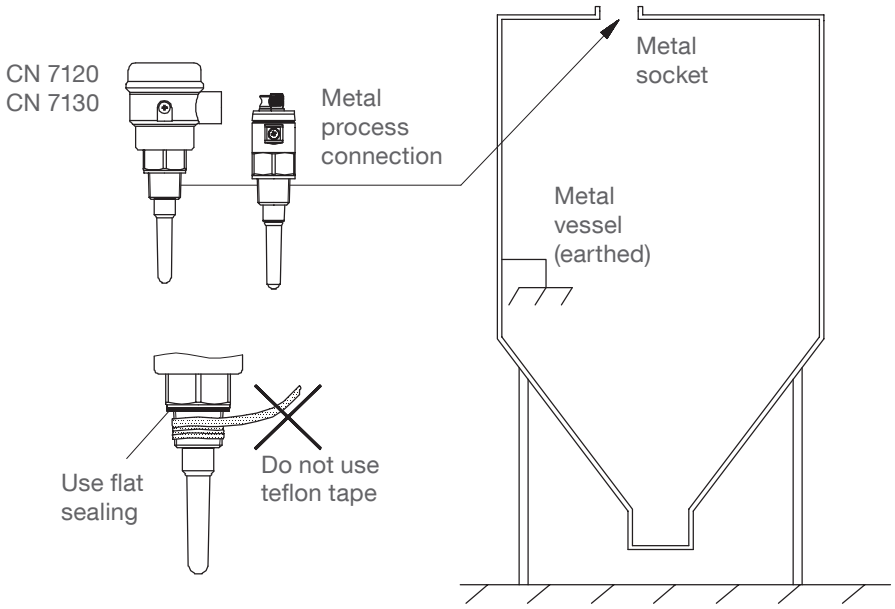
Handling	In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed.
Power supply switch	A power-supply-disconnecting switch 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. 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. 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: The screwed cable gland must have following specifications: • Ingress protection IP68 • Temperature range from -40°C to 10 K above max. ambient temperature • UL or VDE certified (depending on the country where the unit is installed) • Pull relief Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). The field wiring cables must have following specifications: • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • The temperature rating must be at least 10 K above max. ambient temperature. 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: The mating plug must must have following specifications • M12x1 according to IEC 61076-2-101, female, 4-pole, coding A-standard • Ingress protection IP68 • Temperature range from -40°C to 10 K above max. ambient temperature The field wiring cables must have following specifications: • The diameter and cross section has to match to the specification of the mating plug. • The temperature rating must be at least 10 K above max. ambient temperature. • Install the field wiring cables according to the instructions of the mating plug
Signal output contact protection	Provide protection for signal output to protect the device against spikes with inductive loads (e.g. when connecting external relays).
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. Functional earthing is satisfactory to protect against static charging, see page 21.

Electrical installation

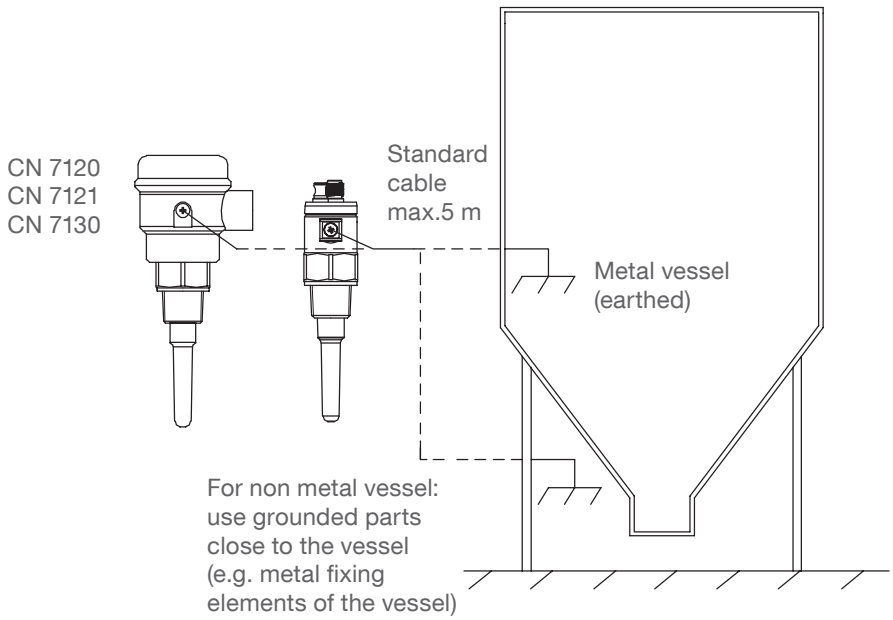
Functional earthing

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



Earthing through external equi-potential bonding terminal

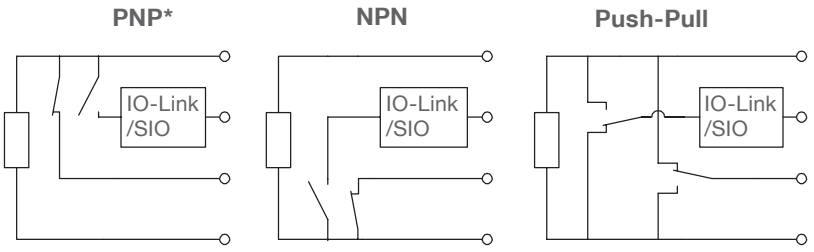


Electrical installation

Electrical ratings

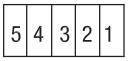
Power supply (L+, L-):	10 .. 30 V DC incl. 10% of EN 61010-1 Operation with IO-Link requires min. 18V <55mA
Signal outputs (Out1, Out2):	One output active: max. 200 mA Both outputs active: max. 100 mA each

Output type



*factory setting

Change to NPN or Push-Pull can be done in IO-Link registers.

	Pin assignement	
	M12 plug	Terminal block
		
L+	1	1
Out 1	4	4
Out 2	2	5
L-	3	2

External fuse in L+:
max. 0,5A, fast or slow, HBC, 250V

Terminal 3 see "Cable shield" below

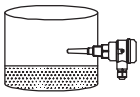
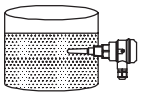
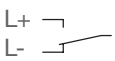
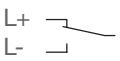
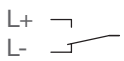
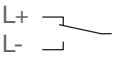
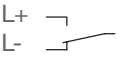
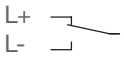
Cable shield

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

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.

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.

Output logic

Output logic (factory setting)						Fault	
White LED		●		☼		2Hz ◐	
Yellow LED		●		☼		●	
Output type		PNP/NPN	Push-Pull	PNP/NPN	Push-Pull	PNP/NPN	Push-Pull
Out 1	FSL						
Out 2	FSH						

FSL = Fail safe low
FSH = Fail safe high

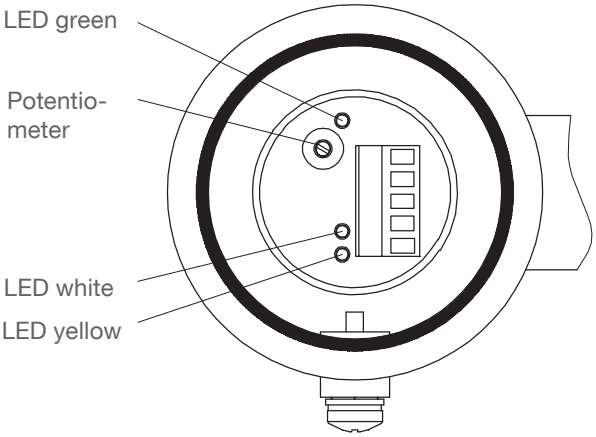
Factory setting of output logic: Out 1 is set to FSL, Out 2 is set to FSH.
Output logic can be changed in IO-Link registers

Operation

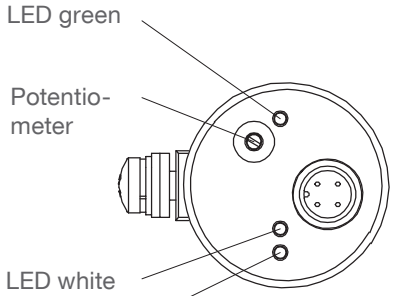
Operation - Operating elements / LED's

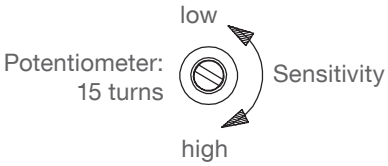
Operating elements

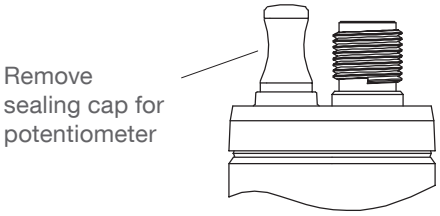
Enclosure Ø65mm (2.56")



Enclosure Ø35mm (1.38")







LEDs

Green	ON	Power on
	OFF	Power off
Yellow	ON	Out 1 activated
	OFF	Out 1 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 32)
White	ON	Unit indicates covered Capacitance on probe > setted switchpoint
	OFF	Unit indicates uncovered Capacitance on probe < setted switchpoint
	Blinks fast (twice per second)	Diagnostics has indicated a failure
Yellow+ White	Both LEDs blink 5 times, then stop blinking	Blinking happens when the potentiometer is turned. The potentiometer is not valid. Calibration by IO-Link is setted. See page 37.

Operation with potentiometer

Operation with potentiometer - Factory calibration

Switchpoint factory calibration - General applications

Application

Factory calibration is applicable for general applications.

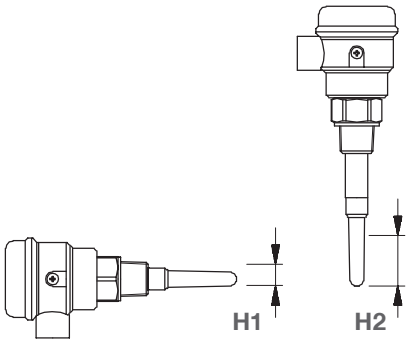
Typical general application	On site calibration
• Low viscosity liquids • Water based liquids • High conductivity liquids without buildup • Dry solids	Not required

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 **H1**	Probe vertical **H2**
< 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 17 and 19.
- The Sensguard (see page 11) is not used.
- Conductive material is not present.

Note

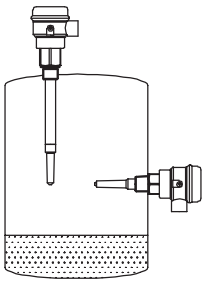
The active shield technology in combination with the length of the probe, resulting in adequate distance between internal measurement electrode and ground electrode, reduces the influence of various measured capacitiance due to the mounting situation and of moderate material buildup. As a result, no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

Operation with potentiometer - Recalibration

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

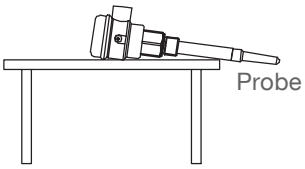
1. Ensure that the probe is uncovered

The unit will calibrate to an uncovered probe.



Setting with mounted sensor:

Ensure material level is well below the probe

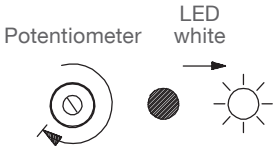


Setting on the bench:

Take care not to touch the probe and keep the probe at least 200mm (7.87") away from any material (for example table)

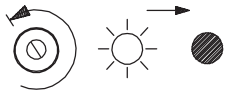
2. Set switchpoint with potentiometer

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 32.



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 17 and 19 and that the Sensguard (see page 11) is not used.
Depending on the application and the required switchpoint the number of turns can be varied.

Switchpoint setting is finished

Operation with potentiometer

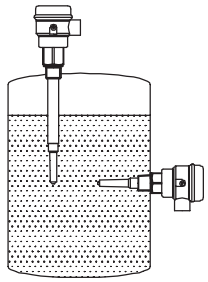
Advanced calibration

Operation with potentiometer - Advanced calibration

Switchpoint setting - Demanding Applications

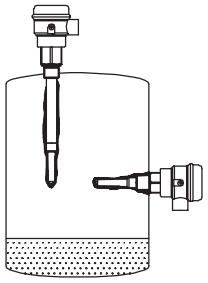
Typical demanding application	On site calibration
Material with heavy buildup (non conductive): • High viscosity liquids • Hygroscopic/ wet solids	Probe covered and then uncovered, retaining max. possible material buildup
• Heavy buildup (conductive)	Consult manufacturer

1. Ensure material level is well above the probe



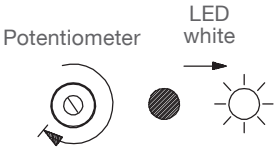
2. Ensure material level is well below the probe

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



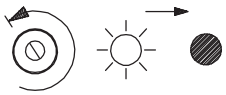
3. Set switchpoints with potentiometer

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 32.



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 17 and 19 and that the Sensguard (see page 11) is not used.
Depending on the application and the required switchpoint the number of turns can be varied.

Switchpoint setting is finished

Operation with potentiometer - Advanced calibration

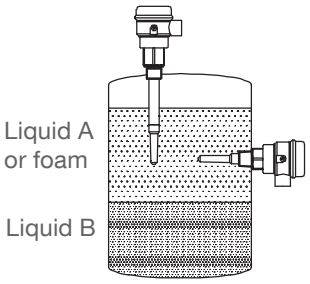
Switchpoint setting - Interface detection

Typical interface application	On site calibration
• Ignoring liquid A/ detecting liquid B • 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

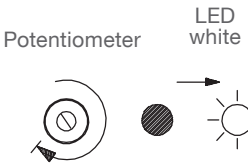
Ensure that liquid A or foam (which should NOT be detected) is covering the probe.

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



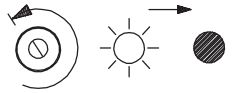
2. Set switchpoints with potentiometer

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 32.



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:

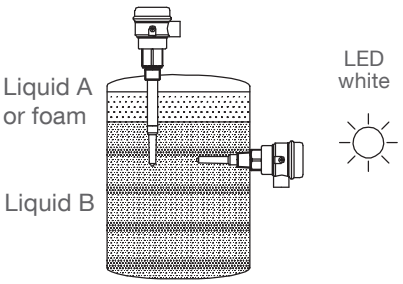
Dielectric constant of liquid A or foam	Number of turns
<= 10	1
> 10	½

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 17 and 19 and that the Sensguard (see page 11) 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

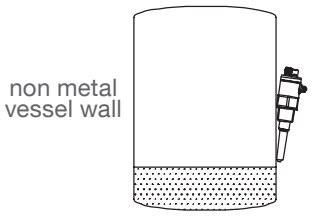
Operation with potentiometer - Advanced calibration

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

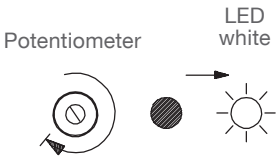
The unit will calibrate to an uncovered probe.



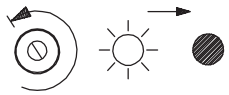
2. Set switchpoints with potentiometer

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 32.

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

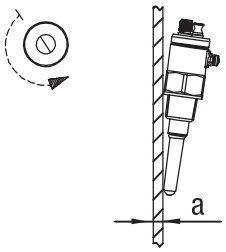


Turn counter clockwise until LED white just stops glowing.



Turn further counter clockwise:

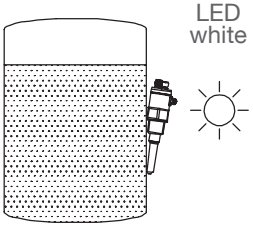
Dielectric constant of material	Distance a (material to probe)	Number of turns
>= 3	<= 10mm (0.4")	¼
> 40	<= 20mm (0.8")	½



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 with potentiometer - 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 (IO-Link /PNP / NPN / Push-Pull) 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.

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
not applicable	0 ... 2	0
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 17 and 19.
- The probe is mounted inside the vessel (no measurement from outside through the vessel wall).
- The Sensguard (see page 14) 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 (= max. sensitive 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 with IO-Link

Operation with IO-Link

IO-Link Data

Communication interface	IO-Link, IEC 61131-9, SDCI standard
IODD version	1.1
IO-Link Profiles	Smart Sensor
Required IO-Link master	as per DIN EN 61131-9
Speed	COM2 (38,4 kBaud)
Min. process cycle time	128 ms
Process data width	16 bit
IO-Link data storage	yes
Block parameter	no
SIO-Mode	yes

IO-Link Registers

Process Data (PDE - Process Data Exchange)

Bit 0 (LSB) to Bit 13 (MSB)	Bit 14	Bit 15
Actual measured value: 0 ... 10000 (equates to 0.00% - 100.00%)	Status Out 1	Status Out 2

Data Type: uInteger
Status Out 1 and Out 2:
1 = contact closed
0 = contact open

Pin assignement: see page 22

In application with overfill approval (WHG, VLAREM) the use of IO-Link is applicable for setting parameters only.
The "Process data Exchange" is not allowed, instead the signal output (PNP, NPN) must be used.

Item	ISDU (dec)	Acc-ess	Length (byte)	Data type	Value Range	Default value

System commands

System Command	2	W	1	UInt	129 = Application Reset 130 = Factory reset 131 = Back-to-box 160 = Reset switchpoints to default values 161 = Switchpoint setting by potentiometer	

System Command 130 sets all stated registers to "Default value", except register 127, which is set to "1 = IO-Link"
System Command 160 sets registers 96, 97, 112, 113 to "Default values". Register 127 is set to "1 = IO-Link"
System Command 161 sets register 127 to "0 = Potentiometer"

IO-Link specific device data

Vendor ID	7-8	R	2	UInt		1554
Device ID	9-11	R	4	UInt		101
Vendor Name	16	R	64	String		UWT GmbH
Product Name	18	R	64	String		CN 71*0
Product Text	20	R	64	String		Capacitive level sensor
Serial number	21	R	64	String		
Hardware Revision	22	R	2	String		
Firmware Revision	23	R	5	String		
Application-specific Tag	24	R/W	32	String		***
Function Tag	25	R/W	32	String		
Location Tag	26	R/W	32	String		
Device status	36	R	1	UInt	0 = Device is operating properly 3 = Functional-check 4 = Failure	0
Detailed Device Status	37	R	4 x 3	[String]		
Process Data Input	40	R	2	UInt	Values same as Process Data (PDE)	

Item	ISDU (dec)	Acc-ess	Length (byte)	Data type	Value Range	Default value

UWT specific device data

Setting of signal output:

Out 1 and Out 2: Output type	64	R/W	1	UInt	0 = Push-Pull 1 = NPN 2 = PNP	PNP
Out 1: Output logic	65	R/W	1	UInt	0 = FSH 1 = FSL	FSL
Out 1: Delay uncovered to covered	66	R/W	2	UInt	5 ... 600 (equates to 0.5 - 60 sec)	0.5 sec
Out 1: Delay covered to uncovered	67	R/W	2	UInt	5 ... 600 (equates to 0.5 - 60 sec)	0.5 sec
Out 2: Output logic	80	R/W	1	UInt	0 = FSH 1 = FSL With Push-Pull Out 2 will be set antivalent to Out 1	FSH
Out 2: Delay uncovered to covered	81	R/W	2	UInt	5 ... 600 (equates to 0.5 - 60 sec)	0.5 sec
Out 2: Delay covered to uncovered	82	R/W	2	UInt	5 ... 600 (equates to 0.5 - 60 sec)	0.5 sec

Switchpoint setting of sensor:

Out 1: Switchpoint: covered to uncovered *	96	R/W	2	UInt	0 ... 10000 (equates to 0.00% - 100.00%)	3.00% **
Out 1: Switchpoint: uncovered to covered *	97	R/W	2	UInt	0 ... 10000 (equates to 0.00% - 100.00%)	4.00% **
Out 2: Switchpoint: covered to uncovered *	112	R/W	2	UInt	0 ... 10000 (equates to 0.00% - 100.00%)	3.00% **
Out 2: Switchpoint: uncovered to covered *	113	R/W	2	UInt	0 ... 10000 (equates to 0.00% - 100.00%)	4.00% **
Actual switchpoint setting is done by:	127	R	1	UInt	0 = Potentiometer 1 = IO-Link	0

* If register is written, register 127 is set to "1 = IO-Link".
** Factory setted values for switchpoints can slightly deviate from the stated values, since factory calibration is done by use of potentiometer. This does not influence the proper funtion of the unit.

Diagnostics:

Operating hours	128	R	4	UInt	0 ... 2^32	0
Temperature electronic* actual	131	R	1	Int	-128 ... +127 °C	
Temperature electronic* min.	132	R	1	Int	-128 ... +127 °C	
Temperature electronic* max.	133	R	1	Int	-128 ... +127 °C	
Functional check	134	R/W	1	UInt	0 = No functional-check 1 = Simulate uncovered probe 2 = Simulate covered probe	0

* Ambient temperature of the electronic inside the enclosure (outside process)

Identification:

Ordercode	160	R	64	String		

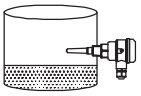
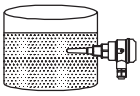
ISDU = Indexed Service Data Unit
R/W = read/write

FSL = Fail safe Low = output contact open with uncovered sensor
FSH = Fail safe High = output contact open with covered sensor

Operation with IO-Link - Setting of signal outputs

Setting of signal outputs (output logic)

Out 1 and Out 2 can be set individually by the related registers.

Output logic **Out 1 and Out 2**				
White LED*	●		☼	
Yellow LED*	●		☼	
Output type	PNP/NPN	Push-Pull	PNP/NPN	Push-Pull
FSL** Fail safe low				
FSH** Fail safe high				

*In case Out 1 and Out 2 are programmed to have different switchpoints and/or different output logic, the white and yellow LED follows Out 1.

** Factory setting: Out 1 = FSL, Out 2 = FSH

Pin assignement of Out 1 and Out 2: see page 22.

Operation with IO-Link - Calibration possibilities

Calibration possibilities (Switchpoint setting)

The switchpoint (sensitivity) is factory setted as stated on the next page.
If required, the switchpoint can be changed either with the potentiometer or with IO-Link.

Switchpoint setting by potentiometer (default)	Procedures see page 25ff. The switchpoint in IO-Link registers of Out 1 and Out 2 are automatically setted due to the position of the potentiometer. The switchpoints "covered to uncovered" and "uncovered to covered" of each Out 1 and Out 2 are the same. **In case the switchpoints were setted before with IO-Link:** • The potentiometer is not valid (register "Switchpoint setting by: 1=IO-Link"). If the potentiometer is turned, both yellow and white LEDs blink 5 times, then stop blinking to indicate that the potentiometer is not valid. • The setting can be set back to potentiometer: By System Command 161 =Switchpoint setting by potentiometer or By turning the potentiometer to CW (or CCW) stop position and then, within 30 seconds, to CCW (or CW) stop position • By setting back to potentiometer the switchpoint registers will be overwritten according to the actual position of the potentiometer. Usually a new calibration by potentiometer is required.
Switchpoint setting by IO-Link	Following sets the potentiometer to be not valid: • System Command 130, 160. • Write any number in one or more of the IO-Link registers "Switchpoint setting of sensor" for Out 1 and Out 2. Calibration procedures to find the Switchpoints with IO-Link: see following pages.
Situation when using a spare unit with transfer of the register values	In case that a preset unit will be replaced by a spare unit, and the register values of the present unit are readout and transfered to the spare unit, the switchpoint values will be transfered as well. It is not relevant whether the switchpoints were setted by potentiometer or by IO-Link. By writing the switchpoints values with IO-Link to the spare unit, the register "Switchpoint setting by: 1 = IO-Link" is set and the potentiometer is not valid.

Operation with IO-Link - Factory calibration

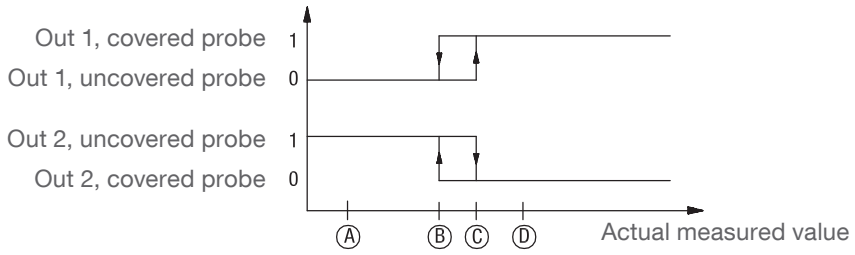
Switchpoint setting - Level detection of general applications

Application

Factory calibration is applicable for general applications.

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

Sensor behaviour:
Material covers the probe: Out1 and Out2 detect this material



A Uncovered probe
B Switchpoint covered to uncovered
C Switchpoint uncovered to covered
D Covered probe

The diagram shows:
Out 1 set to FSL
Out 2 set to FSH
1 = contact closed

0 = contact open

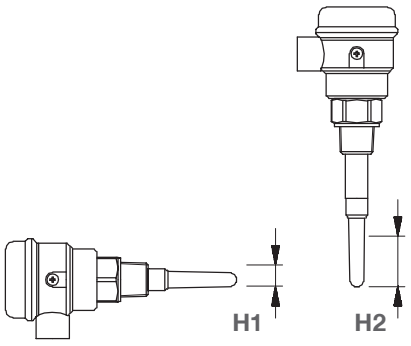
Pin assigmenent with PNP, NPN, Push-Pull:
see page 22

Switchpoint with factory calibration

The unit is factory calibrated to measure dielectric constant of material >= 2.0.
The switchpoints are settet in the IO-Link registers as stated on page 35, "Switchpoint setting of sensor". 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 **H1**	Probe vertical **H2**
< 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 17 and 19.
- The Sensguard (see page 11) 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 with IO-Link - Recalibration

Switchpoint setting - Level detection of general applications

Set switchpoints B, C

In case recalibration is required or factory calibration is not applicable, set the switchpoints (B, C) as stated in the table below.
See diagram on top of previous page for explanation of sensor behaviour and B,C.

Dielectric constant of material	B Switchpoint covered to uncovered	C Switchpoint uncovered to covered
<2	B=3.00%	C=4.00%
2 ... 4	B=5.20%	C=7.00%
>4	B=7.50%	C=10.00%

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 17 and 19 and that the Sensguard (see page 11) is not used.

Operation with IO-Link

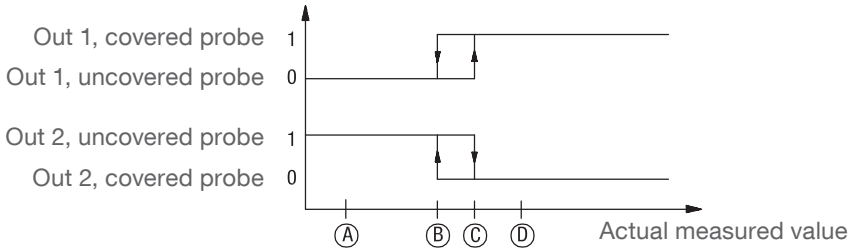
Advanced calibration

Operation with IO-Link - Advanced calibration

Switchpoint setting - Level detection of demanding applications

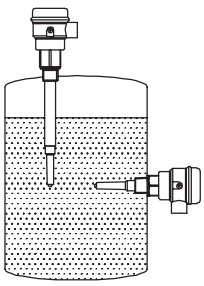
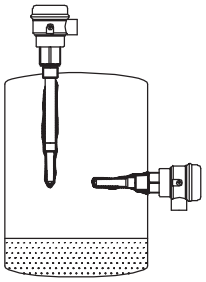
Typical demanding application	On site calibration
Material with heavy buildup (non conductive): • High viscosity liquids • Hygroscopic/ wet solids	Probe covered and then uncovered, retaining max. possible material buildup
• Heavy buildup (conductive)	Consult manufacturer

Sensor behaviour:
Material covers the probe: Out1 and Out2 detect this material



A Uncovered probe
B Switchpoint covered to uncovered
C Switchpoint uncovered to covered
D Covered probe

The diagram shows:
Out 1 set to FSL
Out 2 set to FSH
1 = contact closed
0 = contact open
Pin assigmenent with PNP, NPN, Push-Pull: see page 22

1. Ensure material level is well above the probe **2. Ensure material level is well below the probe**	**1.**  **2.**  It is important that as much material buildup as possible is retaining on the probe
3. Set switchpoints	• Read the "Actual measured value" (process data), which is "A Uncovered probe". • Set the switchpoints (B, C) by increasing "A Uncovered probe" as stated in the table below. See diagram on top of this page for explanation of A,B,C.
Switchpoint setting is finished	

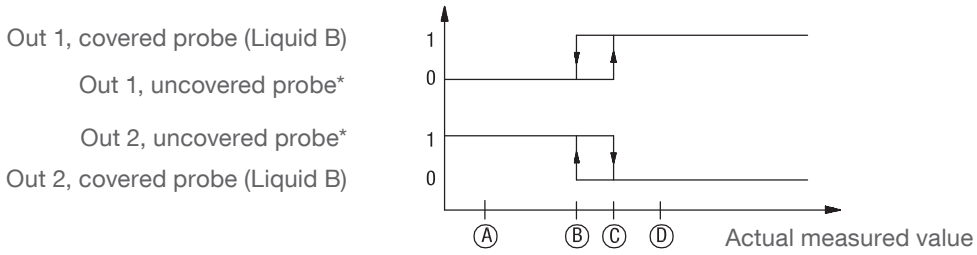
Dielectric constant of material A or foam	B Switchpoint covered to uncovered	C Switchpoint uncovered to covered
1,6 .. 2	B=0.75*C	C=A+1.80%
2 .. 3	B=0.75*C	C=A+5.00%
3 .. 4	B=0.75*C	C=A+7.60%
>4	B=0.75*C	C=A+9.00%

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 17 and 19 and that the Sensguard (see page 11) is not used.
Depending on the application and the required switchpoint the values B and C can be varied.

Operation with IO-Link - Advanced calibration

Switchpoint setting - Interface detection

Sensor behaviour:
Material 1 (Liquid A or foam) covers the probe: Out 1 and Out 2 do not detect this material.
Material 2 (Liquid B) with higher dielectric constant than material 1 covers the probe: Out 1 and Out 2 detect this material



The diagram shows:
Out 1 set to FSL
Out 2 set to FSH
1 = contact closed
0 = contact open
Pin assigmenent with PNP, NPN, Push-Pull: see page 22

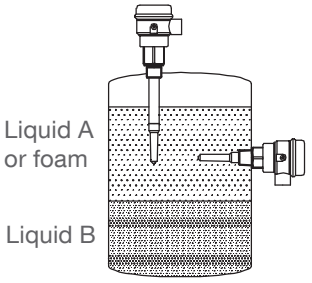
A Uncovered probe*
B Switchpoint covered to uncovered
C Switchpoint uncovered to covered
D Covered probe (Liquid B)

* For interface measurement "Uncovered probe" relates to a probe covered by 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 switchpoints

- Read the "Actual measured value" (process data), which is "A Uncovered probe".
- Set the switchpoints (B, C) by increasing "A Uncovered probe" as stated in the table below. See diagram on top of this page for explanation of A,B,C.

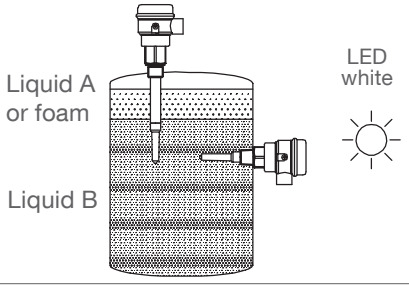
Dielectric constant of material A or foam	B Switchpoint covered to uncovered	C Switchpoint uncovered to covered
<= 10	B=0.75*C	C=A+2.00%
> 10	B=0.75*C	C=A+4.00%

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 17 and 19 and that the Sensguard (see page 11) is not used.
Depending on the application and the required switchpoint the values B and C 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.

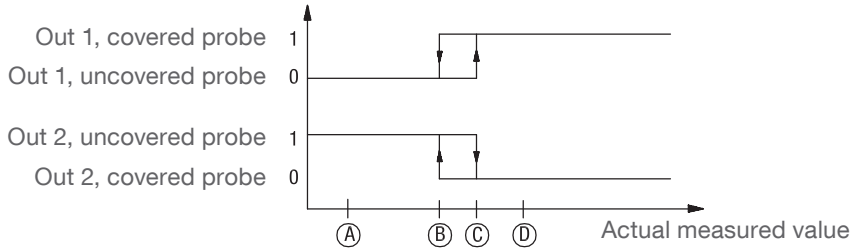


Switchpoint setting is finished

Operation with IO-Link - Advanced calibration

Switchpoint setting - Level detection through non metal vessel wall

Sensor behaviour:
Material covers the probe: Out1 and Out2 detect this material

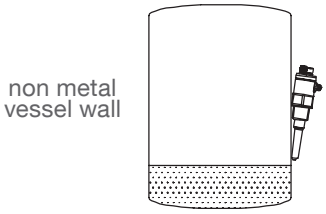
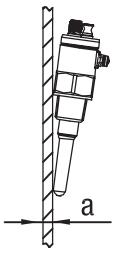
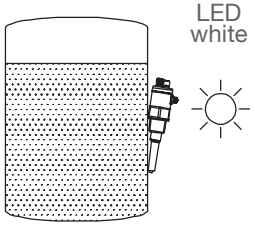


A Uncovered probe
B Switchpoint covered to uncovered
C Switchpoint uncovered to covered
D Covered probe

The diagram shows:
Out 1 set to FSL
Out 2 set to FSH
1 = contact closed

0 = contact open

Pin assigmenent with PNP, NPN, Push-Pull:
see page 22

1. Ensure that the probe is uncovered	The unit will calibrate to an uncovered probe. 
2. Set switchpoints	• Read the "Actual measured value" (process data), which is "A Uncovered probe". • Set the switchpoints (B, C) by increasing "A Uncovered probe" as stated in the table below. See diagram on top of this page for explanation of A,B,C. 
3. Ensure material level is well above the probe	LED white should glow. 
Switchpoint setting is finished	

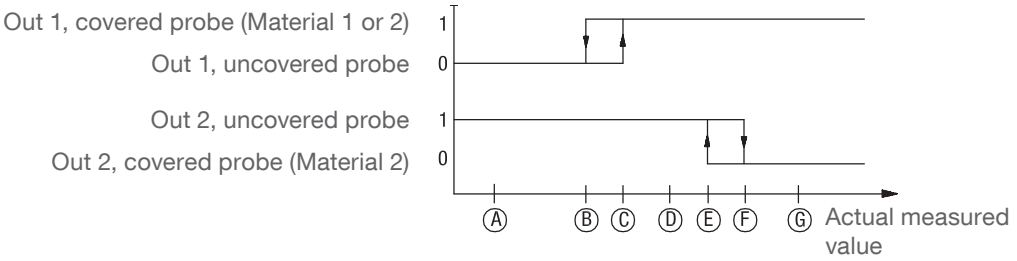
Dielectric constant of material	Distance "a" (material to probe)	B Switchpoint covered to uncovered	C Switchpoint uncovered to covered
>= 3	<= 10mm (0.4")	B=0.75*C	C=A+0.50%
> 40	<= 20mm (0.8")	B=0.75*C	C=A+1.00%

Depending on the application and the required switchpoint the values B and C can be varied.

Operation with IO-Link - Advanced calibration

Switchpoint setting - Level detection of two different materials

Sensor behaviour:
Material 1 covers the probe: Out 1 detects this material, Out 2 does not detect this material
Material 2 with higher dielectric constant than material 1 covers the probe: Out 1 and Out 2 detect this material



A Uncovered probe
B Out 1: Switchpoint covered to uncovered
C Out 1: Switchpoint uncovered to covered
D Covered probe (Material 1)
E Out 2: Switchpoint covered to uncovered
F Out 2: Switchpoint uncovered to covered
G Covered probe (Material 2)

The diagram shows:
Out 1 set to FSL
Out 2 set to FSH
1 = contact closed

0 = contact open

Pin assigmenent with PNP, NPN, Push-Pull:
see page 22

Note: the white and yellow LED follows Out1

Set switchpoints B, C, E, F

Set the switchpoints (B, C, E, F) as stated in the table below.
See diagram on top of this page for explanation of B, C, E, F.

Dielectric constant of material 1	B (Out 1) Switchpoint covered to uncovered	C (Out 1) Switchpoint uncovered to covered
<2	B=3.00%	C=4.00%
2 ... 4	B=5.20%	C=7.00%
>4	B=7.50%	C=10.00%

Dielectric constant of material 2	E (Out 2) Switchpoint covered to uncovered	F (Out 2) Switchpoint uncovered to covered
<2	E=3.00%	F=4.00%
2 ... 4	E=5.20%	F=7.00%
>4	E=7.50%	F=10.00%

The stated values assume, that the distance of the probe to a metal wall is not smaller than stated on page 17 and 19 and that the Sensguard (see page 11) is not used.
Depending on the application and the required switchpoint the values B,C,E,F can be varied.

Operation with IO-Link - Advanced possibilities

Advanced possibilities

Relation of "Actual measured value" to dielectric constant

The "Actual measure value" (process data) is clearly related to the dielectric constant and therefore to the sensitivity of the unit.
See Table below.

Required min. dielectric constant of material to be detected (1)	Actual measured value
1 (Probe in air)	0.0%
1.5	2.6%
2	4.2%
3	7.1%
4	10%
6	14%
8	18%
11	22%
15	27%
25	36%
40	45%
60	53%
90	61%

(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 17 and 19.
- The Sensguard (see page 11) is not used.
- The probe is mounted inside the vessel (no measurement from outside through the vessel wall).
- Conductive material is not present.

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.

Troubleshooting

LEDs			Behaviour	Cause	Action
Green Power supply	**Yellow** Signal output	**White** Probe covered/ uncovered			
OFF	OFF	OFF		Proper power not applied to device Connector came loose. Defective component in device.	Check supply voltage Refasten connector 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 25ff for potentiometer or 37ff for IO-Link). 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: By potentiometer (see page 25ff) or by IO-Link (see page 37ff). Dielectric constant of material must be 1.5 or more.
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 32).	No action required
ON	Both LEDs blink 5 times, then stop blinking		Blinking happens when the potentiometer is turned	Calibration by potentiometer is not valid. Calibration by IO-Link is setted.	The calibration can be set back to potentiometer: By turning the potentiometer to CW (or CCW) stop position and then within 30 seconds to CCW (or CW) stop position. or With IO-Link by System Command 161 (see page 34)
ON	OFF	Blinks fast (twice per second)	Signal output = idle	Diagnostics has indicated a failure	Contact distributor
ON	ON or OFF	ON or OFF	Signal output Out1 does not follow yellow LED	Defective component in device	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

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 dirt or rain can enter into the housing.
Frequent check of the unit	To ensure durable safety 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.
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. dangerous 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.
Spare parts	All available spare parts are stated in the selection list

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.