Capanivo®

Level limit switch
Series CN 7000
Product configuration - Technical notes

UWT
LEVEL. UP TO THE MAX.

Overview

- Level limit detection in liquids and solids
- Leackage detection
- Interface detection (water/oil or liquid/foam)
- Compact unit
- Wide range of applications
- Full-, demand-, empty detector
- Capacitive technology with active shield
- Sensitivity: dielectric constant ≥1.5
- Precalibration allows measurement of most applications without sensitivity setting on site
- No maintenance
- Plastic or stainless steel housing
- Corrosion resistant construction
- Various process connections: threaded (including G½“ hygienic), flanged (screwed) or Tri-clamp
- 4-wire DC with relay signal output
- 2-wire 8/16 mA or 4-20mA, including remote test
- IO-Link with PNP, NPN, Push Pull signal output
- Hazardous Locations approvals
- Hygiene approvals, food grade material
- 2011/65/EU RoHS conform

Approvals	CE, FM, CSA, TR-CU, UKCA	General purpose
	ATEX, IEC-Ex, TR-CU, INMETRO, KC, CCC, UKEX	Zone 0, 0/1, 20/21 Intrinsically safe
	FM, CSA	Class I, II, III, Div. 1, Gr. A-G Intrinsically safe
	EHEDG, 3A	Type EL class I, Hygiene
	WHG, VLAREM	Overfill and leackage protection

Electronics	4-wire 2-wire	DC with relay / solid state relay signal output 8/16 mA or 4-20mA, including remote test
	3/4-wire	IO-Link with PNP, NPN, Push Pull signal output

Enclosure	Ø65mm (2.56")	Thermoplastic polyester
	Ø35mm (1.38")	CN 7120: 1.4404 (316L) CN 7121: Thermoplastic polyester
	Ingress protection	Type 4X / IP68

CN 7120 Stainless steel process connection	Length of extension	92 mm (3.6“)
	Ambient temperature	-40 .. +85°C (-40 .. +185°F)
	Process temperature	-40 .. +125°C (-40 .. +257°F)
	Process pressure	-1 .. +25 bar (-14.5 .. +363 psi)
	Process connection	Thread: G 1/2" Hygienic, G 1/2", G 3/4", G 1“ NPT 3/4" Adapters for further threads available Tri-clamp: DN25 (1") - DN50 (2") Flanges (threaded): DN 25-50, ASME 1"- 2"
	Material of process connection	1.4404 (316L)
	Material of probe	PEEK, PPS or PVDF (FDA listed, food grade)

Enclosure
Ø35mm (1.38")
with M12v plug
and G 1/2" Hygienic

Enclosure
Ø65mm (2.56")
with cable gland
and NPT 3/4"

CN 7121 Plastic process connection	Length of extension	92 mm (3.6“)
	Ambient temperature	-40 .. +85°C (-40 .. +185°F)
	Process temperature	-40 .. +125°C (-40 .. +257°F)
	Process pressure	-1 .. +10 bar (-14.5 .. +146 psi)
	Process connection	Thread: G 1“, NPT 3/4" Adapters for further threads available
	Material of process connection and probe	PPS or PVDF (FDA listed, food grade)

Enclosure
Ø35mm (1.38")
with M12 plug
and G 1"

Enclosure
Ø65mm (2.56")
with cable gland
and NPT 3/4"

Overview

CN 7130 Pipe extension	Length of extension	300 .. 4000mm (11.8 .. 157")
	Ambient temperature	-40 .. +85°C (-40 .. +185°F)
	Process temperature	-40 .. +125°C (-40 .. +257°F)
	Process pressure	-1 .. +25 bar (-14.5 .. +363 psi) -1 .. +10 bar (-14.5 .. +146 psi) with sliding sleeve
	Process connection	Thread: G 3/4", G 1“, NPT 3/4" Adapters for further threads available Flanges (threaded): DN 25-50, ASME 1"- 2"
	Material of process connection/ extension	1.4404 (316L)
	Material of probe	PPS or PVDF (FDA listed, food grade)

Enclosure
Ø65mm (2.56")
with cabe gland
and G 3/4"

CN 7150 Cable extension	Length of extension	500 .. 20.000mm (19.7 .. 787")
	Ambient temperature	-40 .. +85°C (-40 .. +185°F)
	Process temperature	-40 .. +125°C (-40 .. +257°F)
	Process pressure	-1 .. +10 bar (-14.5 .. +146 psi)
	Process connection	Thread: G 3/4", G 1“, NPT 3/4" Adapters for further threads available Flanges (threaded): DN 25-50, ASME 1"- 2
	Material of process connection	1.4404 (316L) or PPS (FDA listed, food grade)
	Material of cable extension	FEP jacketed
	Material of probe	PPS (FDA listed, food grade)

Enclosure
Ø65mm (2.56")
with cabe gland
and NPT 3/4"

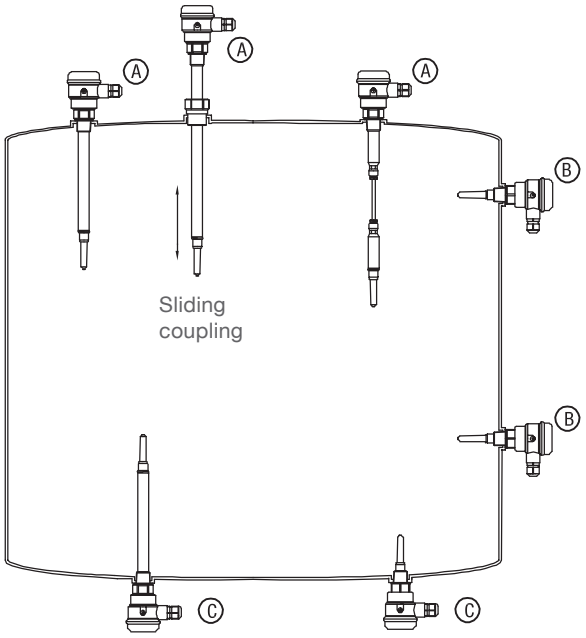
Applications and suitability

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)		•

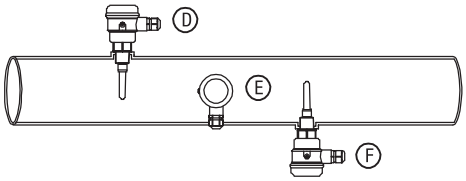
• Measurement with CN 7000 suitable — Measurement with CN 7000 not suitable

Liquid applications

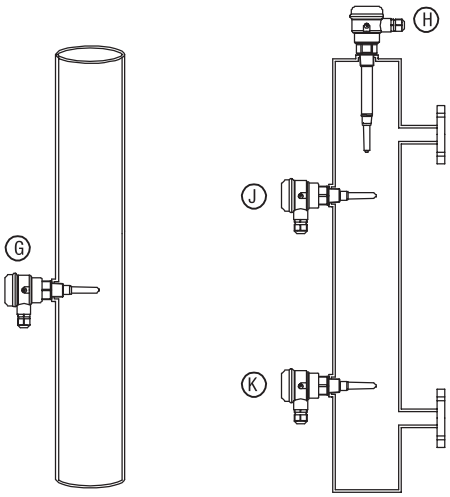
CN 7120
CN 7121
CN 7130
CN 7150



Vessel
A Full, demand or empty detector vertical
B Full, demand or empty detector horizontal
C Empty detector vertical from the bottom



Horizontal pipe
D Full detector vertical
E Demand or empty detector horizontal
F Empty detector vertical from the bottom

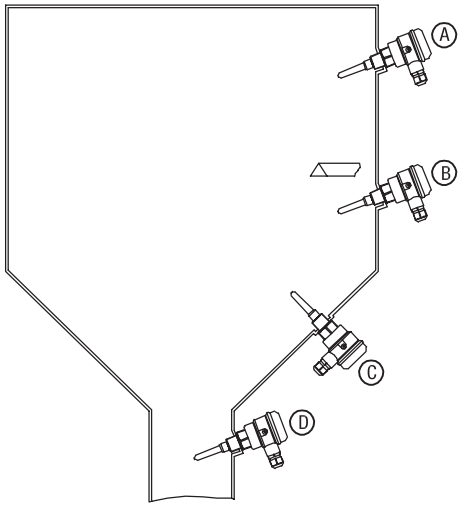


Vertical pipe
G Full, demand or empty detector horizontal

Bypass
H Full, demand or empty detector vertical
J Full detector horizontal
K Demand or empty detector horizontal

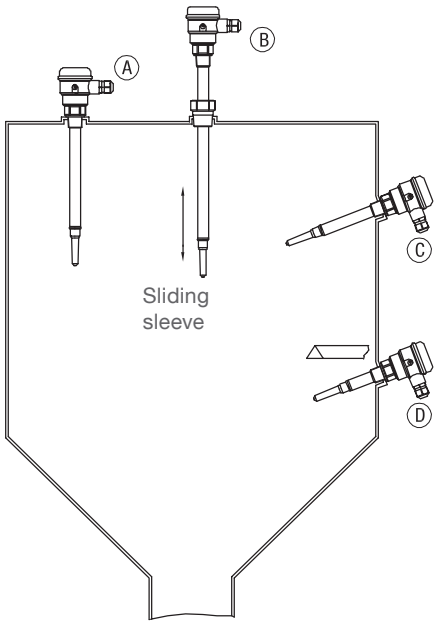
Solid applications

CN 7120 /
CN 7121



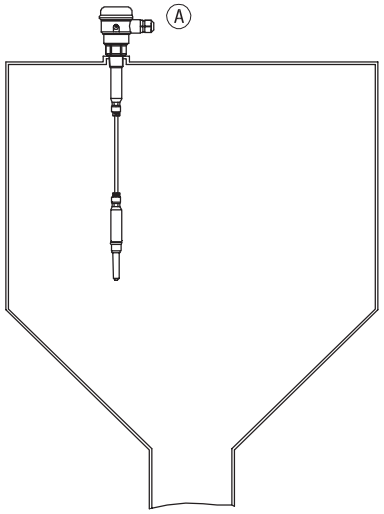
A Full detector horizontal or oblique
B Demand or empty detector horizontal or oblique
C Empty detector oblique from the bottom
D Empty detector in the silo outlet

CN 7130



A Full detector vertical
B Full detector with sliding sleeve
C Full detector horizontal or oblique
D Demand or empty detector horizontal or oblique

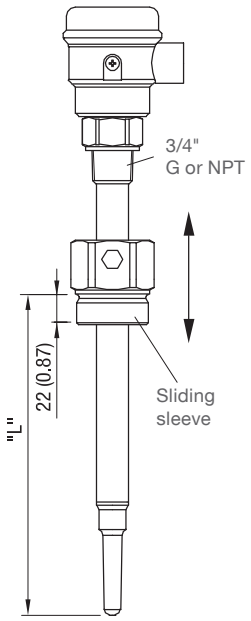
CN 7150



A Full, demand or empty detector vertical

Options / Detailed Ex markings

Pos.19
Sliding sleeve



Detailed Ex-markings

Certificate

		CN 7120 / 7121 / 7130	CN 7150
Pos.2	Y	ATEX II 1 G Ex ia IIC T ! Ga ATEX II 1/2 G Ex ia IIC T ! Ga/Gb ATEX II 1/2 D Ex ia IIIC T ! Da/Db IEC Ex ia IIC T ! Ga IEC Ex ia IIC T ! Ga/Gb IEC Ex ia IIIC T ! Da/Db	ATEX II 1 G Ex ia IIC T ! Ga ATEX II 1/2 G Ex ia IIC T ! Ga/Gb IEC Ex ia IIC T ! Ga IEC Ex ia IIC T ! Ga/Gb
	P	FM / CSA IS Cl. I, II, III Div.1 Gr. A-G	FM / CSA IS Cl. I Div.1 Gr. A-D
	V	TR-CU 0Ex ia IIC T6...T3 Ga X TR-CU Ga/Gb Ex ia IIC T6...T3 X TR-CU Ex ia IIIC T_{200}80°C...T_{200}155°C Da/Db X	TR-CU 0Ex ia IIC T6...T3 Ga X TR-CU Ga/Gb Ex ia IIC T6...T3 X
	B	INMETRO Ex ia IIC T6...T3 Ga INMETRO Ex ia IIC T6...T3 Ga/Gb INMETRO Ex ia IIIC T ! Da/Db	INMETRO Ex ia IIC T6...T3 Ga INMETRO Ex ia IIC T6...T3 Ga/Gb
	T	KCs Ex ia IIC T6...T3 Ga KCs Ex ia IIC T6...T3 Ga/Gb KCs Ex ia IIIC T_{200}80°C...T_{200}155°C Da/Db	KCs Ex ia IIC T6...T3 Ga KCs Ex ia IIC T6...T3 Ga/Gb
	G	CCC Ex ia IIC T ! Ga CCC Ex ia IIC T ! Ga/Gb CCC Ex ia IIIC T_{200} ! Da/Db	CCC Ex ia IIC T ! Ga CCC Ex ia IIC T ! Ga/Gb
	J	UKEX II 1 G Ex ia IIC T ! Ga UKEX II 1/2 G Ex ia IIC T ! Ga/Gb UKEX II 1/2 D Ex ia IIIC T ! Da/Db	UKEX II 1 G Ex ia IIC T ! Ga UKEX II 1/2 G Ex ia IIC T ! Ga/Gb

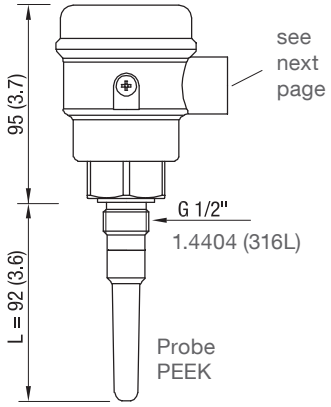
Dimensions

Dimensions All dimensions in mm (inch)

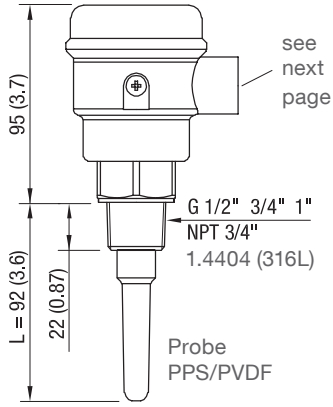
CN 7120 - Short extension length
Stainless steel process connection

Enclosure
Ø65mm (2.56")

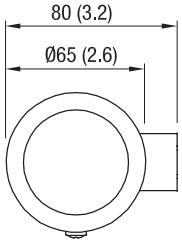
G 1/2" hygienic



G 1/2" G 3/4" G 1"
NPT 3/4"



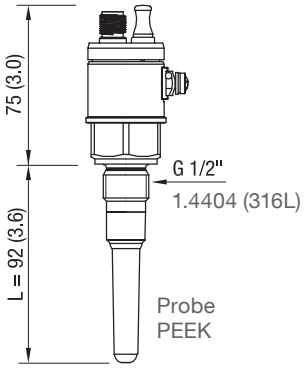
Top view



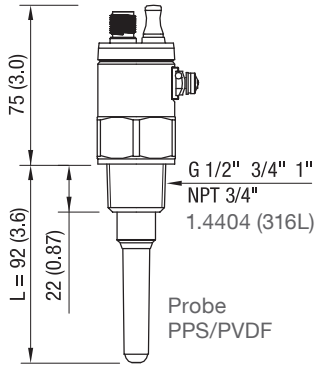
Versions CN 7120 are available with certificate EHEDG EL class I

Enclosure
Ø35mm (1.38")

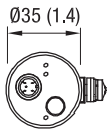
G 1/2" hygienic



G 1/2" G 3/4" G 1"
NPT 3/4"



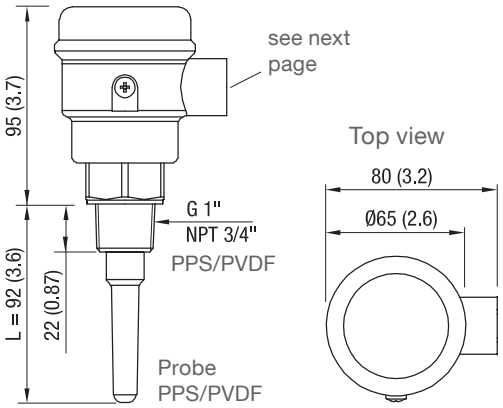
Top view



Versions CN 7120 are available with certificate EHEDG EL class I

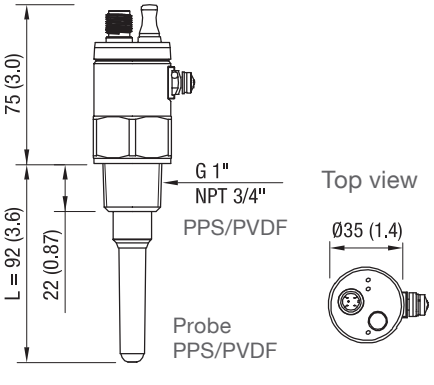
CN 7121 - Short extension length
Plastic process connection

Enclosure
Ø65mm (2.56")



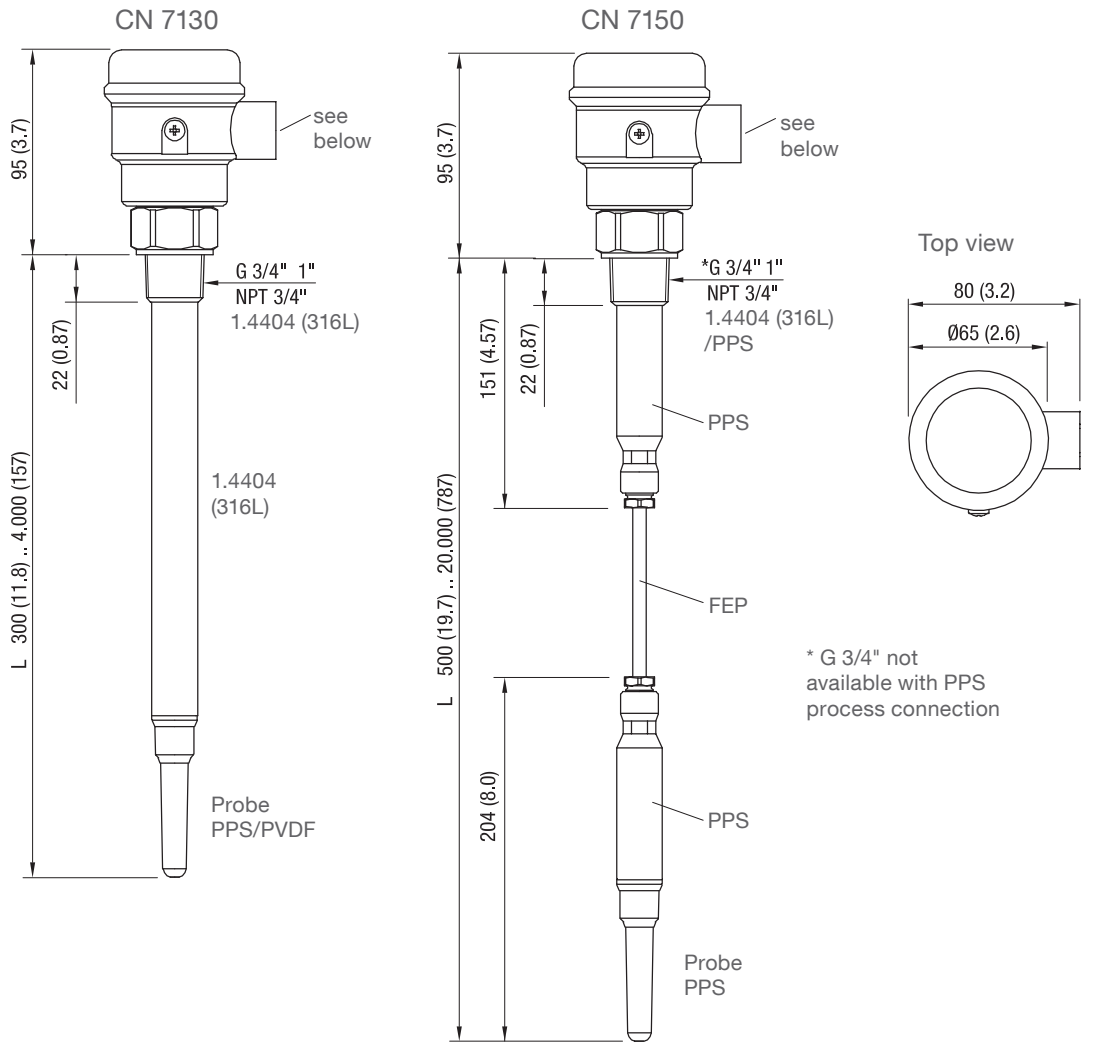
Top view

Enclosure
Ø35mm (1.38")



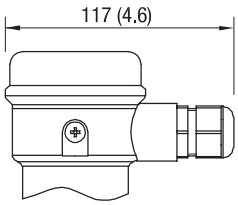
Dimensions

CN 7130 - Pipe extension
CN 7150 - Cable extension

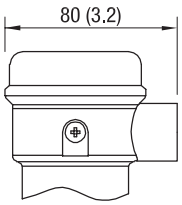


Enclosure
Ø65mm (2.56")
Possible wiring

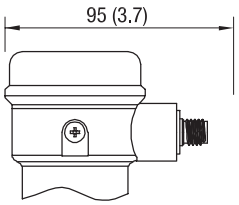
M20x1,5
cable gland



1/2" NPT
conduit

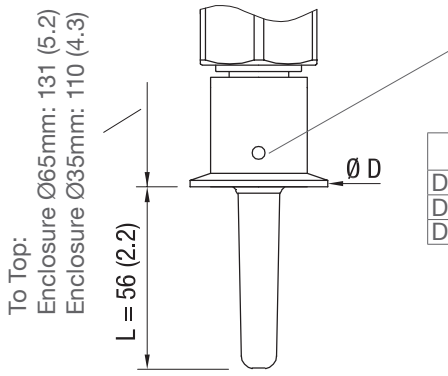


M12
plug



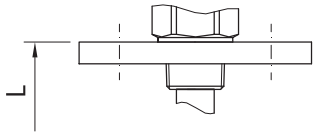
Dimensions

Tri-clamp



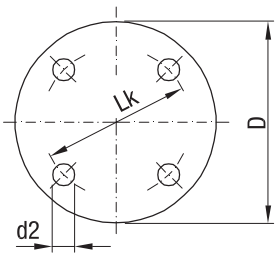
Tri-clamp	ØD
DN 25 (1")	50,5 (1.99")
DN 40 (1 1/2")	
DN 50 (2")	64 (2.52")

Flange

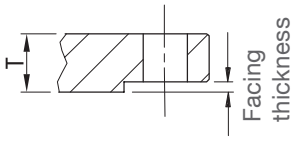


Flange is screwed to process connection

	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")

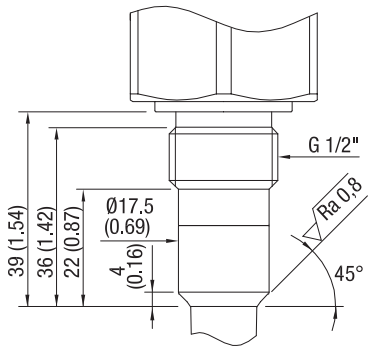
Dimensions

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



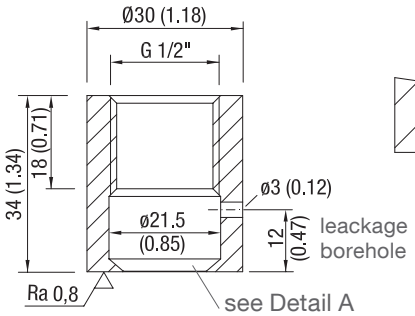
Metal
1.4404 (316L)

PEEK
FDA registration number:
21 CFR 177.2415

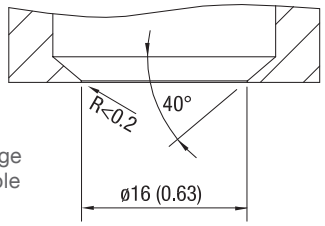
Flush welding socket: Design

The flush welding socket must meet the following design:

Metal type according to hygienic and further external requirements



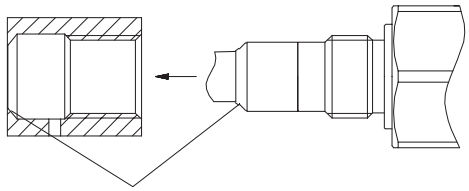
Detail A:
Sealing area between CN 7120 (PEEK) and the on site process connection (metal)



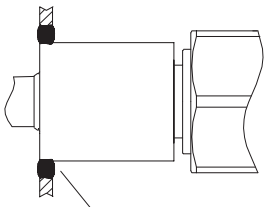
Installation

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

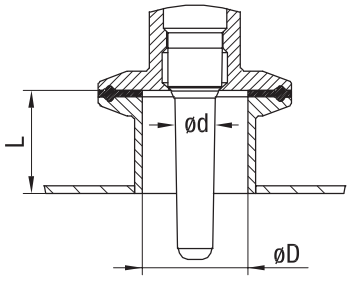


Metal-peek sealing
- The support must be without a gap. No teflon tape (or similar) is allowed to be in between.
- Fixing torque 15 Nm



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".

Electrical installation - Relay DC and 8/16mA electronic

Standard version (General Purpose)

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

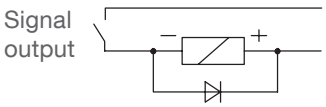
Power supply:
9 .. 33 V DC, 0,7W
incl. 10% of EN 61010-1

Signal output:
Floating relay SPST

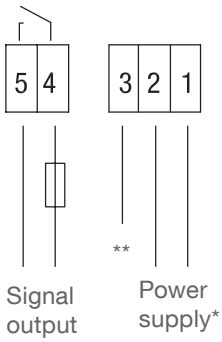
Max. 60 V DC or 30 V AC;
Limited to 35 V DC or 16 V AC in wet locations
Max. 1 A, 60 W

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

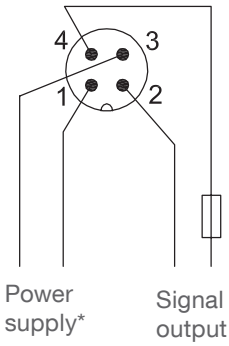
Protection of Relay contact:
Observe a protection diode in case of connecting an inductance (e.g. external relay)



Terminal block



M12 plug



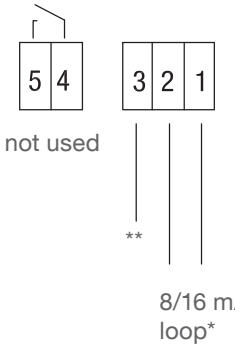
* Polarity determines output logic
** See "cable shield" below

2-wire operation with 8/16 mA loop

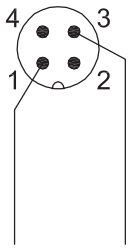
8/16 mA loop:
9 .. 33 V DC, 0,7W
incl. 10% of EN 61010-1

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



M12 plug



8/16 mA loop*

Pin 2,4 not used

* Polarity determines output logic
** 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 - Relay DC and 8/16mA electronic

Intrinsically safe version

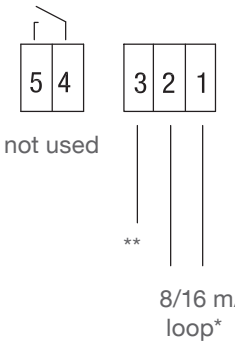
2-wire operation with 8/16 mA loop

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

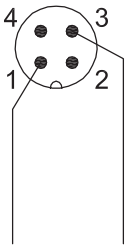
Intrinsically safe supply required (barrier or signal conditioning instruments):
U_i=30 V I_i=160 mA P_i=0,8 W,
C_i=7,6 nF L_i =0,3 mH

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



8/16 mA loop*

Pin 2,4 not used

* Polarity determines output logic
** See "cable shield" below

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).

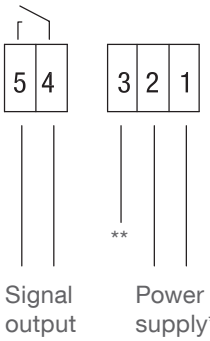
Power supply:
10.8 .. 30 V DC, 0,7W
incl. 10% of EN 61010-1

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

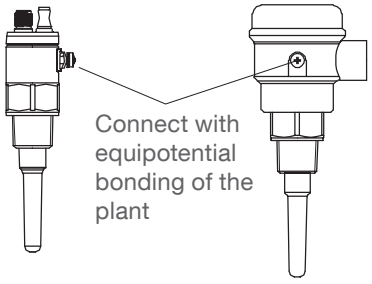
For connection to an intrinsically safe "switch amplifier for contact input" or to an intrinsically safe PLC with integrated input card for contact input.
U_i=30 V I_i=200 mA P_i=350 mW, C_i=4,2 n L_i=0

Terminal block



* Polarity determines output logic
** See "cable shield" below

External equipotential bonding terminal



Cable shield

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

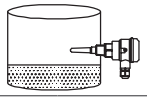
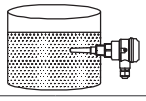
With Terminal block: The cable shield can be connected either to terminal 3 or on the other side to earth. Do not connect both sides of the shield to earth. Note: terminal 3 is internal connected to the external equipotential bonding terminal on the enclosure.

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 - Relay DC and 8/16mA electronic

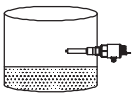
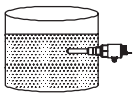
Output logic

Terminal block

					Fault
White LED	●		☼		◐☼ 2Hz
Setting	FSL	FSH	FSL	FSH	n.a.
Supply polarity Terminal 1 Terminal 2	L+ L-	L- L+	L+ L-	L- L+	n.a.
Yellow LED	●	☼	☼	●	●
Relay (Terminal 4+5)	_/_	_⌐_	_⌐_	_/_	_/_
8/16 mA loop (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 M12, Pin 1 M12, Pin 3	L+ L-	L- L+	L+ L-	L- L+	n.a.
Yellow LED	●	☼	☼	●	●
Relay (M12, Pin 2+4)	_/_	_⌐_	_⌐_	_/_	_/_
8/16 mA loop (M12, Pin 1+3)	8 mA	16 mA	16 mA	8 mA	3,6 mA

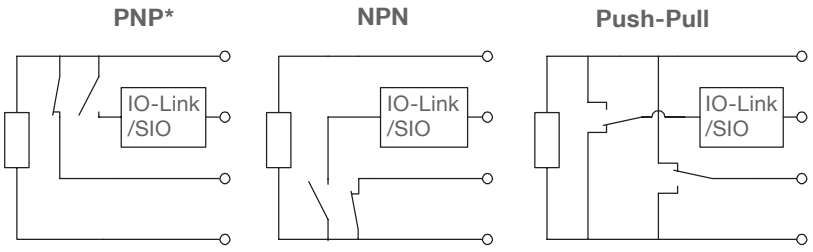
FSL = Fail safe low FSH = Fail safe high

Electrical installation - IO-Link electronic

Electrical ratings

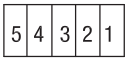
Power supply (L+, L-):	10 .. 30 V DC incl. 10% of EN 61010-1 Operation with IO-Link requires min. 18V <55mA
Signal outputs (Out1, Out2):	One output active: max. 200 mA Both outputs active: max. 100 mA each

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

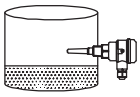
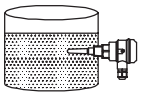
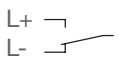
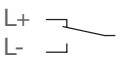
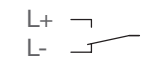
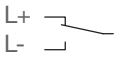
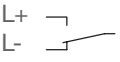
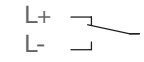
Cable shield

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