

DX-ECAP level transmitter is a capacitive level sensor for level measurement of conductive liquid, low conductive liquid, granulated materials with solid particles, adhesive and acid/basic liquids.

When a material comes between electrode rod and tank wall, a capacitance change occurs and when this change exceed adjustment threshold, contact output is delivered.

Full-empty calibration can be performed easily and safely.

Different designs and different solution related to industrial level measurement are offered especially for machinery manufacturers.

Application Areas

Liquid tanks, food machines, cooling liquid tanks, shipping, glycol tanks, brine, waste water tanks.

Oil tanks, CO₂ liquid tanks, high temperature tanks, non-conductive liquids.

Grain stores, cement, sand feed, flour, milk powder, organic and plastic granule.

Sticky hot and high viscosity liquid, acid and chemical liquids.



Certification



II 1/2G Ex db ia IIC T6...T2 Ga/Gb For Gas

II 1/2D Ex tb ia IIIC T85°C...T300°C Da/Db For Dust

* Have a look at the temperature class chart.

Technical Specifications:

Measurable Material	Conductive liquids Low conductive liquids Solids particulate materials Adhesive and acid/basic liquids
Supply	9-36 VDC
Signal Output	4-20mA two wire Std. 0-20 mA - 4-20 mA, 0-10 V Three wire Opt.
Accuracy	± % 0,5 , ± % 0,8 , ± % 1
Linearity	% 0,5
Capacity Range	1pF...3nF
Min. Di-Electric Constant	1,6 ε _r
Connection Material	304 St.St. Opt. 316 St.St.
Isolation Material	PFA Std. Opt. PEEK, PTFE , Rubber, FKM
Housing Material	Aluminum Injection Molding - AISi12Fe (Std) Black (RAL.9005)
Working Pressure	(-)1 bar...(+) 25 bar (Depending on the model)
Working Temperature	(-) 40 °C / (+) 150 °C (Depending on the model) 200 °C with cooling apparatus (-) 196 °C For Cryogenic Tank (-) 50 °C...(+) 80 °C For NBR FKM (-) 30 °C...(+) 200 °C
Ambient Temperature	(-)20 / (+) 60°C
Display	With LED-Power and Contact LED
Isolation	Max. 500 V
Power Consumption	Max. 50 mW
Electrical Connection	Terminal
Protection Class(EN60529)	IP 66 / 68
Test	EMC, Low Voltage
Max.Tensile Force	Max. 40 NM
Weight	295 g. for DX-ECAP 101 250 mm

DX-ECAP

CAPACITIVE LEVEL TRANSMITTER

DX-ECAP 101 / 102 / 103 / 107

DX-ECAP 202 / 203 / 204 / 205 / 20S

DX-ECAP 304 / 305

DX-ECAP 408A / 408B

Advantages :

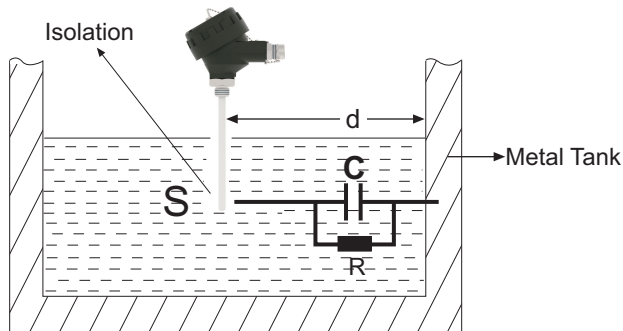
- * There are no moving parts.
- * High pressure and temperature resistant design.
- * Modular structure with easy assembly.
- * Not affected by foam, liquid splashes.
- * Not affected by vibration, has robust mechanical structure.
- * Zero span adjustment is easy.
- * Measurement along whole sensor.
- * Operability with reverse assembly.

CE 2284



Working Principle :

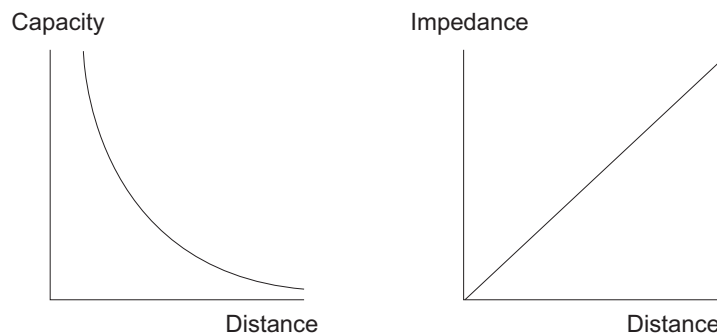
Capacitance definition, assuming two parallel conductive plates are used;



$$C = \frac{\epsilon_0 \cdot \epsilon_r \cdot S}{d}$$

C: Capacity , Farad
S: Surface Area , m²
d: Distance , m

However, there are scarcely any sensor type which this definition can be practically utilized. Above Formula can no longer be reliable especially when residual areas increase due to large distance (d) (which is usually the case). Thus, measuring impedance for distance measurements give more accurate results than capacitance measurement.



Impedance definition $Z = R + jL\omega + (jC\omega)^{-1}$ R is defined as real component and represent ambient conductivity.

$jL\omega$ second component is defined as inductive reactance. This component is present even if we perform capacitive measurement. However we neglect this. Since we evaluate results based on electrostatic properties of the environment, no error will occur. Resulting impedance definition is $Z = R + (jC\omega)^{-1}$.

Measurement is made by charge transfer in our capacitive sensors. Total impedance is defined as $Z = V / I$.

I (current) $I = Q/t$
Q (Coulomb)
T (sec)

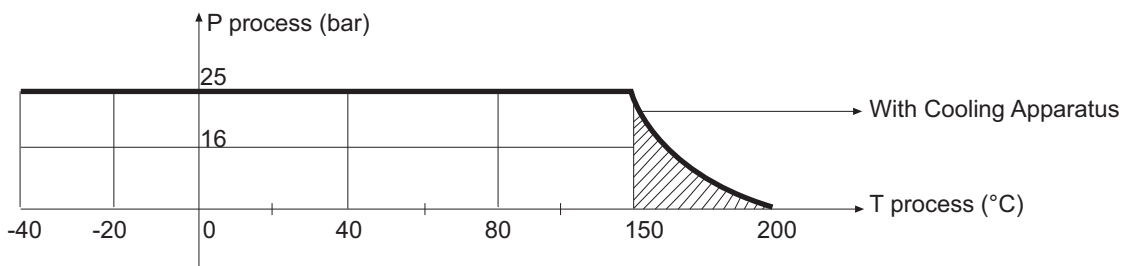
Capacitive reactance we desire to measure is $(jC\omega)^{-1}$. Meaning that charge and impedance have the same phase. To summarize, charge transferred to medium is directly proportional with capacitive reactance. For sensors manufactured as coaxial;

a: Central electrode radius
b: Outer screen radius
L: length

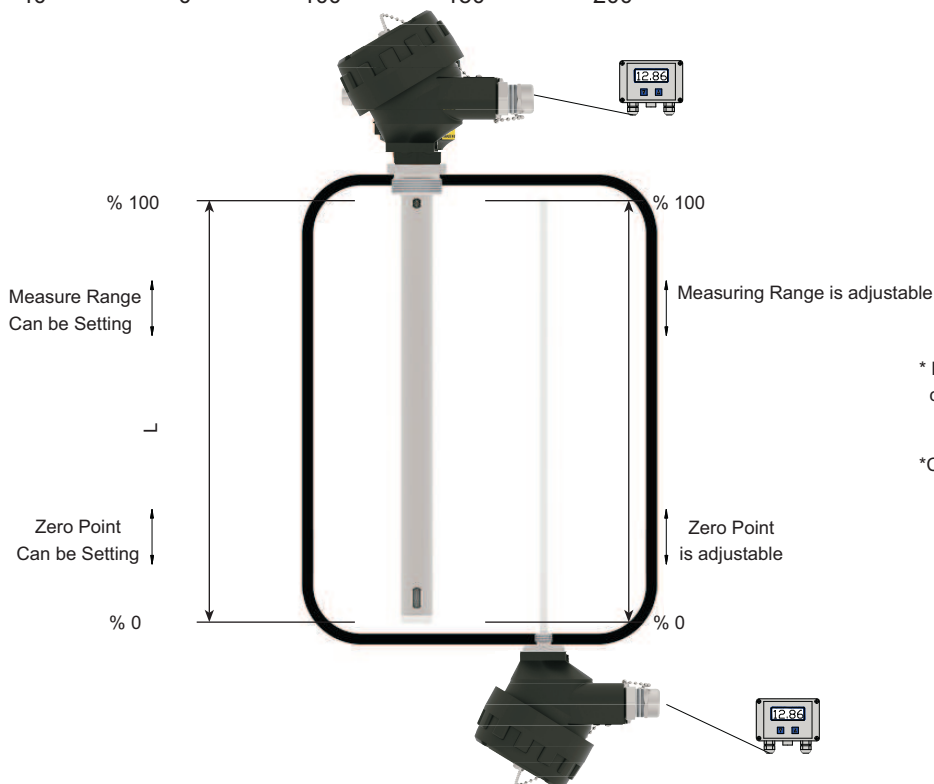
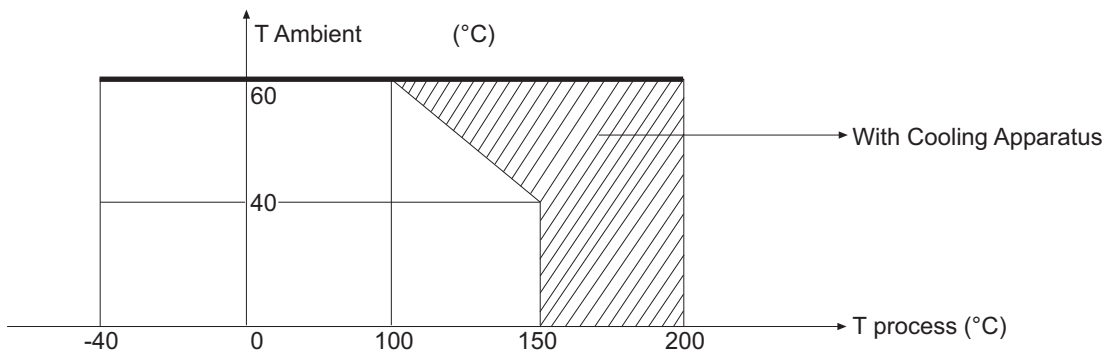
$$C = \frac{2 \cdot \pi \cdot \epsilon_0 \cdot \epsilon_r}{\ln(b/a)} \cdot L \quad \text{Impedance is calculated by this definition}$$

Excitation applied between 10 KHz...250 KHz based on length for all our models. ($\omega = 2\pi \times f$)
 Linearity error that may be caused by conductivity component (R) effect is prevented by electronic circuit design and mechanical design. Reduced to a level lower than 1ppm, acceptable as zero.

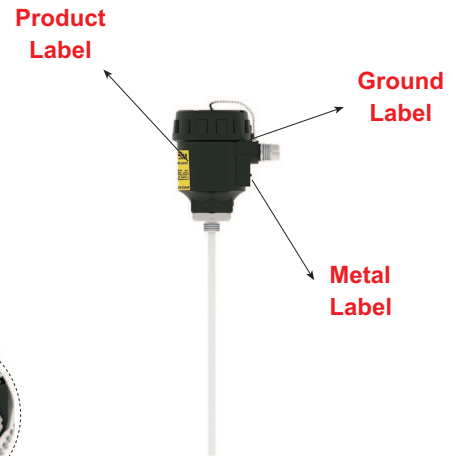
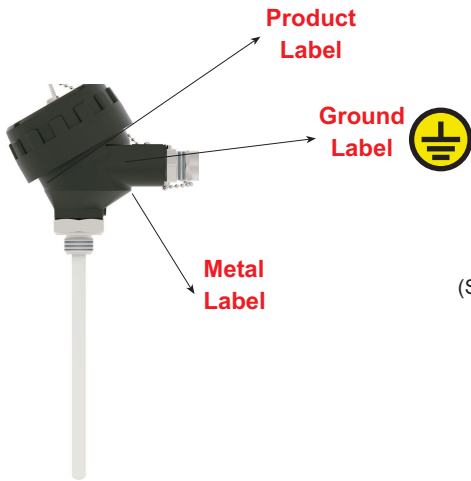
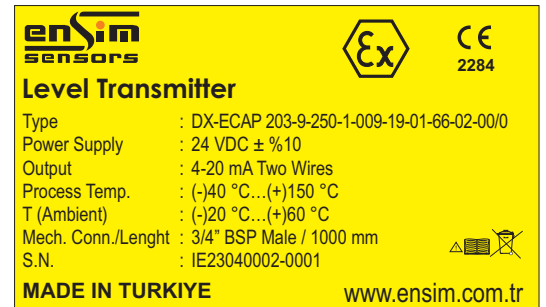
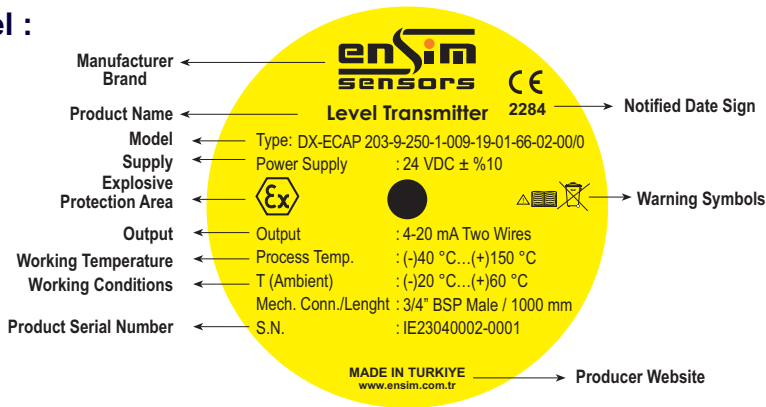
Process Pressure / Temperature Chart



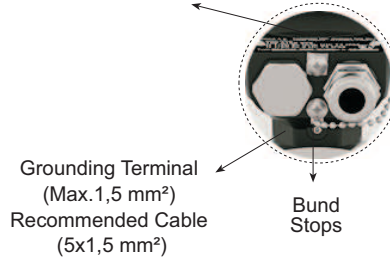
Environment Pressure / Temperature Chart



Label :

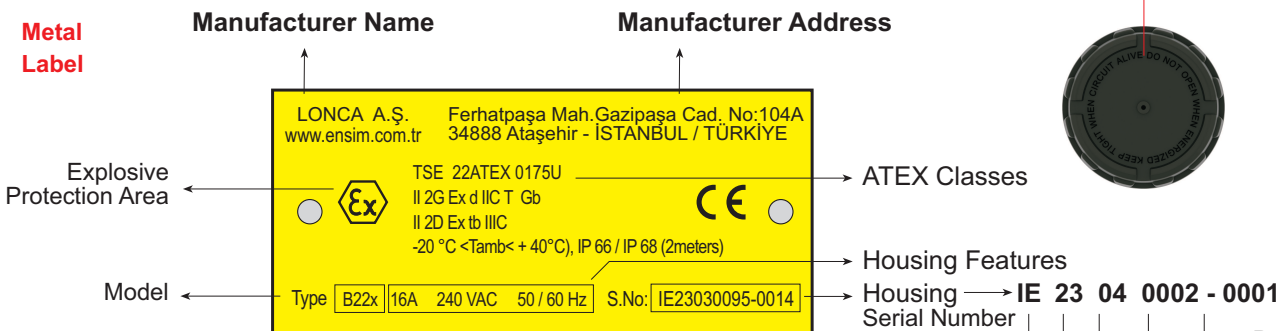


Aluminium Housing
 Cable Plug
 (Suitable Cable Diameter : Ø 6-12 mm)

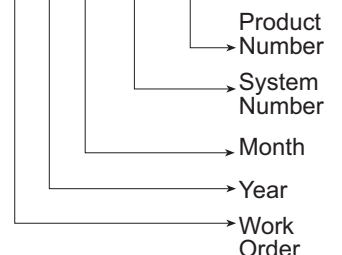


DO NOT OPEN WHEN ENERGIZED
 KEEP TIGHT WHEN CIRCUIT ALIVE

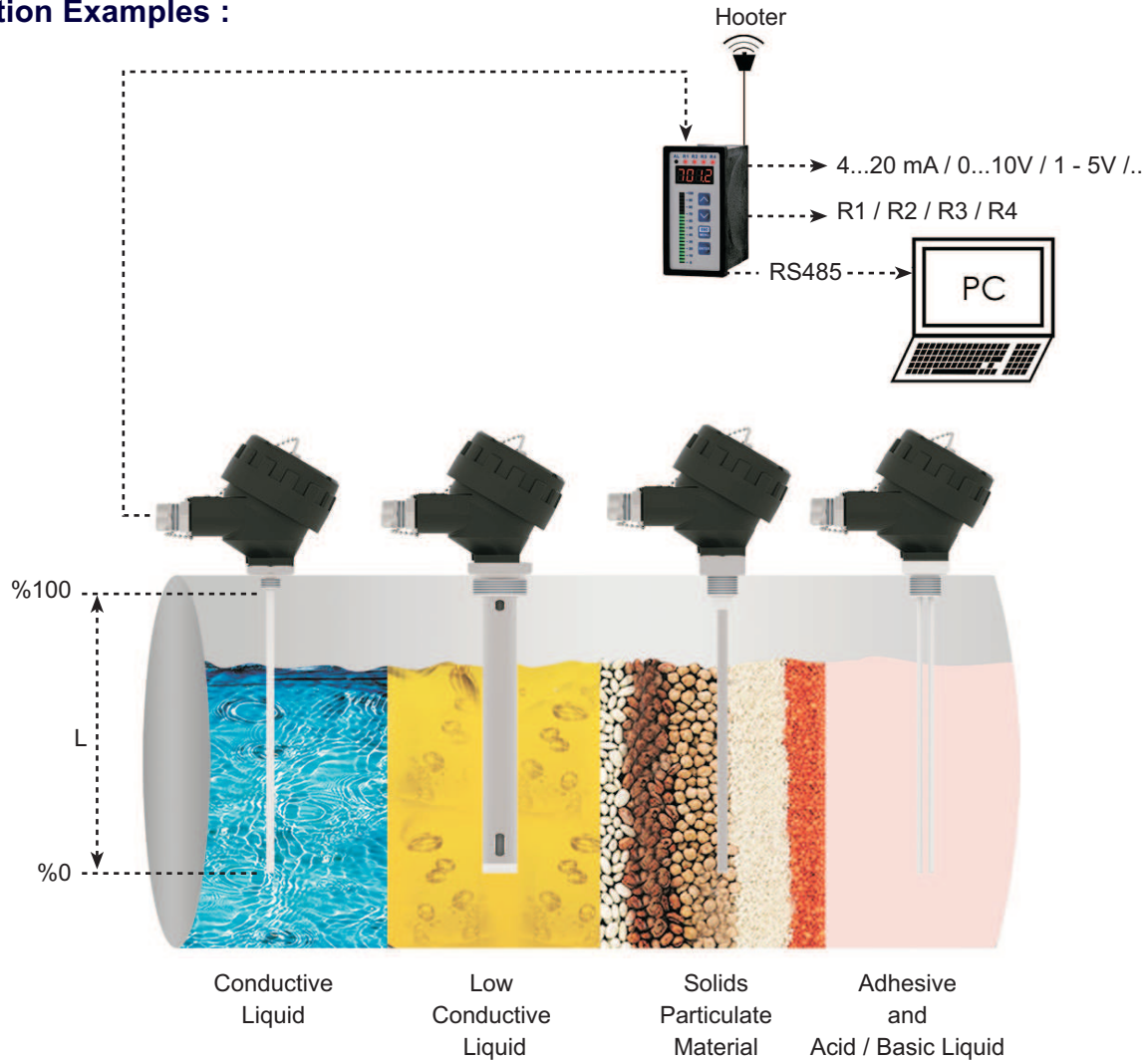
Metal Label



Note : If the ATEX certificate metal label is damaged, you can contact the manufacturer with the serial number.

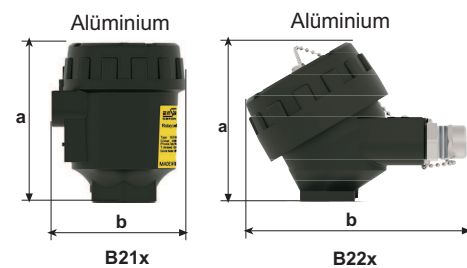


Application Examples :



Housing :

ORDER CODE	TYPE	MATERIAL	PROTECTION CLASS	TEMPERATURE (°C)	SIZE a x b (mm)
750	B22x	Aluminium	IP 66 /68	(-) 40...(+) 200	117 x 102
704	B21x	Aluminium	IP 66 /68	(-) 40...(+) 200	132 x 104



Cover Seal : NBR Nitrile Rubber 120 °C, Opt. FPM (Viton) 200 °C)

EU-Type Examination Certificate Number : TSE 22ATEX 0175U

The marking of the equipment :



Protection Case:

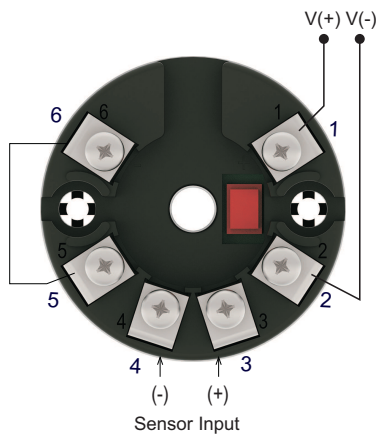


Material : 304 Stainless Steel
Welded manufacturing
Opens - Closes Hinged
To Protect Against external conditions.

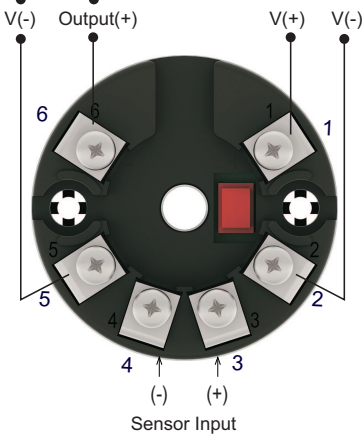
Electrical Connection :

For B22x

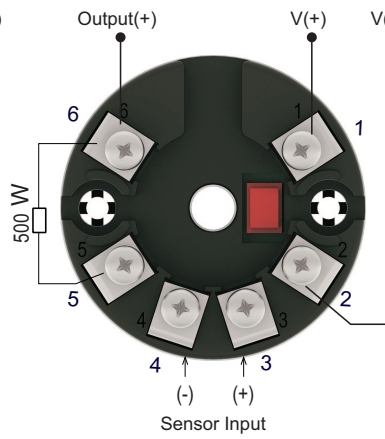
4-20mA Two Wire



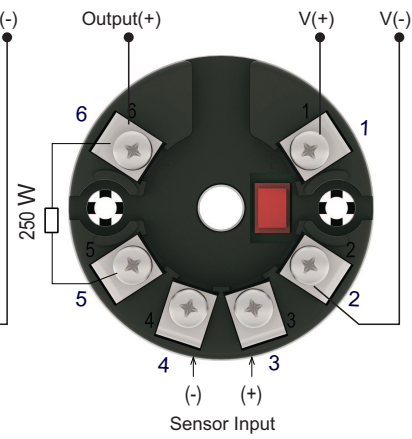
4-20mA Three Wire
0-20mA Three Wire



0-10V Three Wire

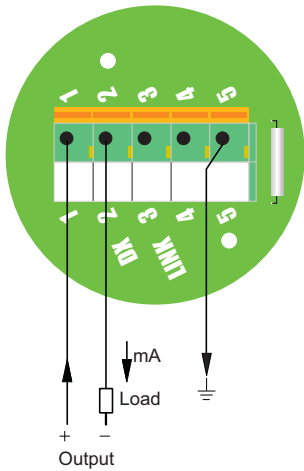


1-5V Three Wire

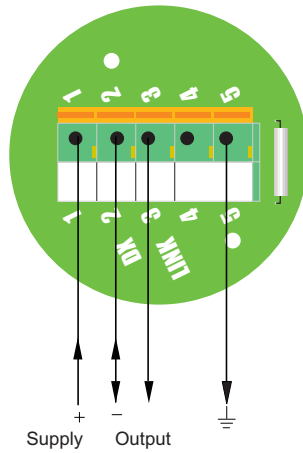


For B22x

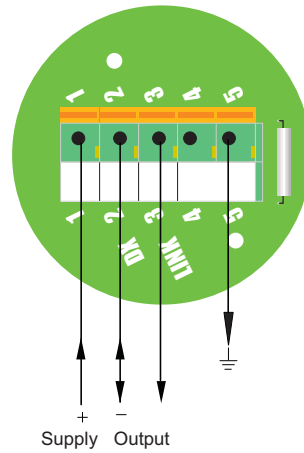
4-20mA Two Wire



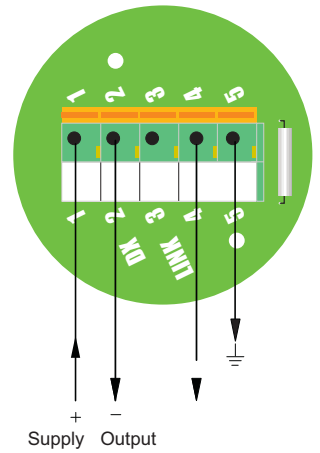
4-20mA Three Wire



0-20mA Three Wire

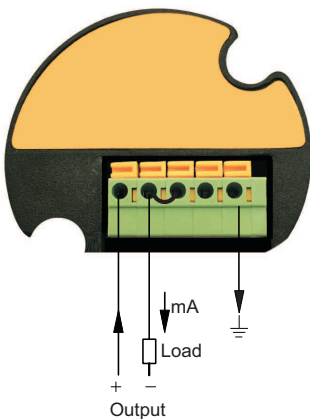


0-10V Three Wire

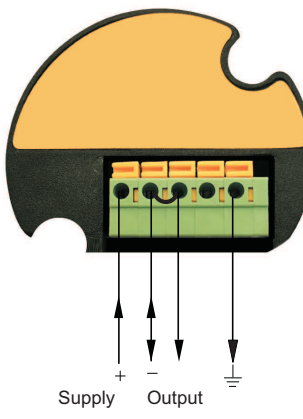


For B21x

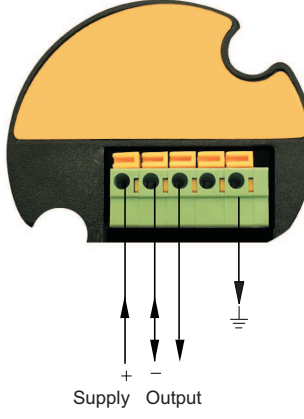
4-20mA Two Wire



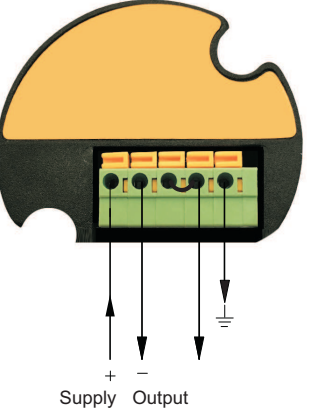
4-20mA Three Wire



0-20mA Three Wire



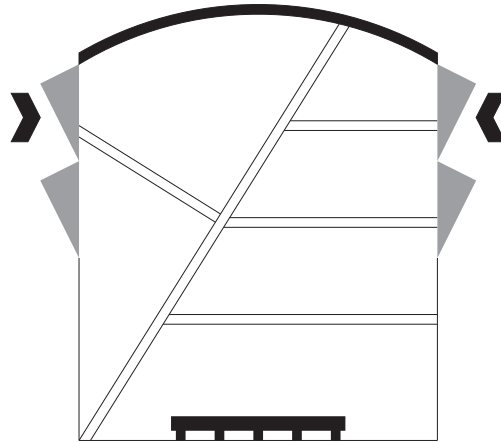
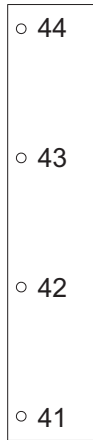
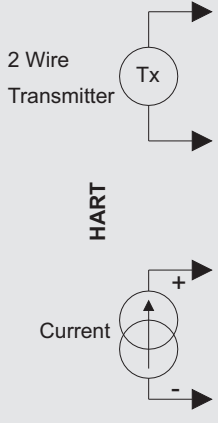
0-10V Three Wire



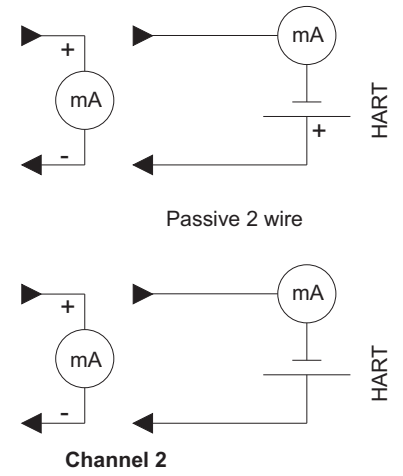
Note : It has been produced according to IPC A 600 class 2 conditions and tested with 100 % E-test. Moreover, HASL (non-lead) surface test has been applied.

Input Signals

Channel 1



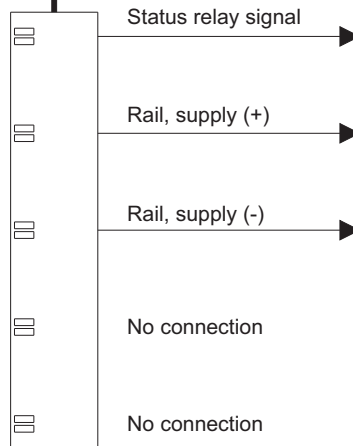
Output Signals



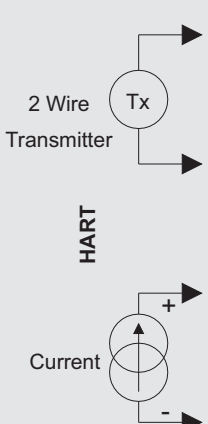
Power Rail

**Zone 0,1,2
20,21,22,M1 &
Cl. I/II/III, Div. 1
gr. A-G**

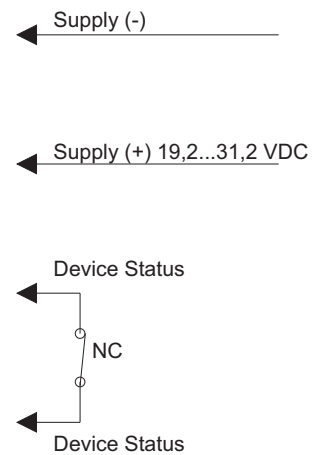
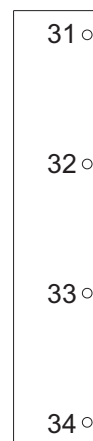
**Zone 2 & Cl. 1,
Div. 2, gr. A-D
or Safe Area**



Channel 2



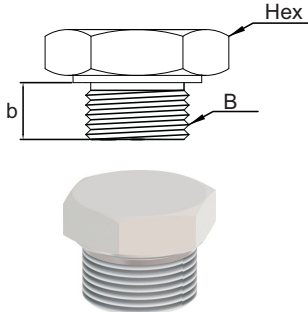
Power connection:



Same power rail as above

Mechanical Connection :

Thread

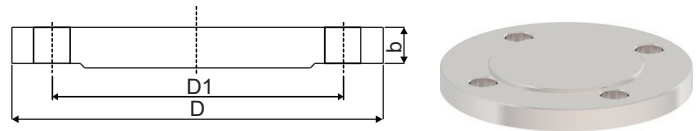


(ISO228-1)

Order Code	Dimension B	Hex [mm]	Stem Length b [mm]
0001	1/8" BSP	17	12
0002	1/4" BSP	17	12
0003	3/8" BSP	24	20
0004	1/2" BSP	27	14
0005	3/4" BSP	32	14
0006	1" BSP	41	23
0008	1 1/4" BSP	51	23
0009	1 1/2" BSP	60	23
0012	2" BSP	70	23

Flanged

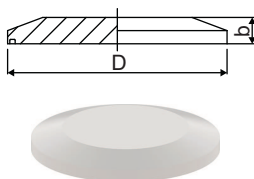
Order Code	(ISO1092-1) PN 16	D (mm)	D1 (mm)	b (mm)
0502	DN 25	165	85	16
0503	DN 32	140	100	16
0505	DN 50	165	125	18
0507	DN 80	200	160	20
0508	DN 100	220	180	20



Order Code	(ISO1092-1) PN 40	D (mm)	D1 (mm)	b (mm)
0702	DN 25	115	85	18
0703	DN 32	140	100	20
0705	DN 50	165	125	20
0707	DN 80	200	160	20
0708	DN 100	235	190	24

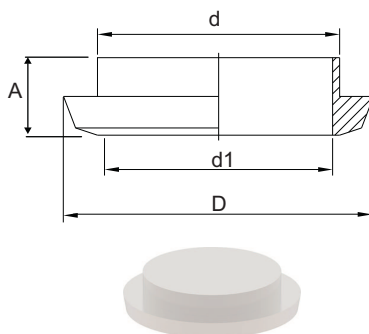
Order Code	(ANSI B16.5) 150 LBS	D (mm)	D1 (mm)	b (mm)
1005	DN 50	152,4	121	19
1006	DN 65	177,8	139,7	22,2
1007	DN 80	190,5	152,4	23,8
1008	DN 100	228,6	157,2	23,8

Clamp



Order Code	(ISO2852) Dimension	Diameter D (mm)	b (mm)
1501	DN 32	50,5	15
1502	DN 50	64	17
1503	DN 65	91	17

Dairy

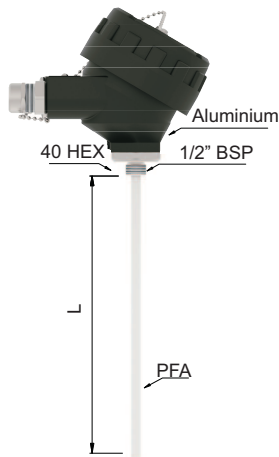


Order Code	Dimension	Dimension	D (mm)	d1 (mm)	A (mm)
1600	DN 40	DN 40	56	48	13
1601	DN 50	DN 50	68	61	14
1602	DN 100	DN 100	121	114	20

Sample Models:

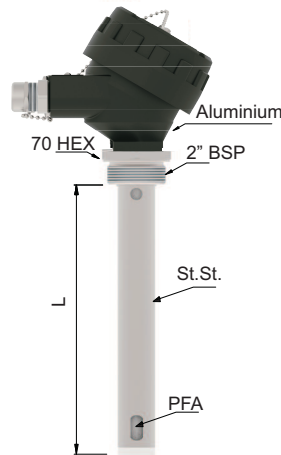
CONDUCTIVE LIQUIDS

DX-ECAP 101
Fully Insulated Probe
Conductive Tank



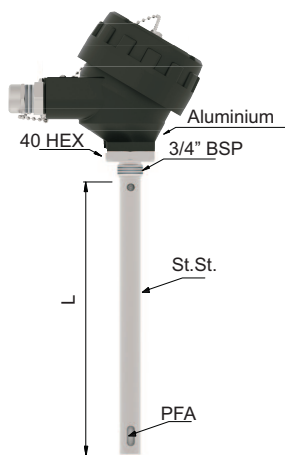
Max. 4 m.
(-) 1...(+) 25 bar
(-)40 °C...(+) 150 °C

DX-ECAP 102
Fully Insulated Coaxial Probe
Insulated Tank



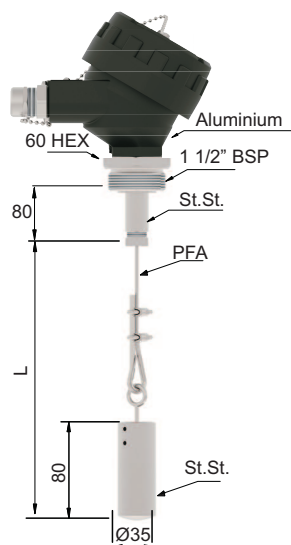
Max. 4 m.
(-) 1...(+) 25 bar
(-)40 °C...(+) 150 °C

DX-ECAP 103
Fully Insulated Coaxial Probe
Insulated Tank



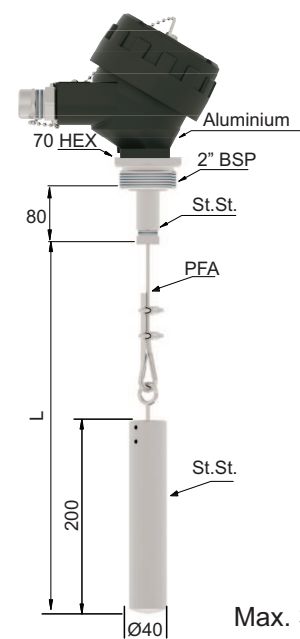
Max. 1 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 107
Fully Insulated Rope
Conductive Tank



L=1m.(Std) Max. 16 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 107
Fully Insulated Rope
Conductive Tank



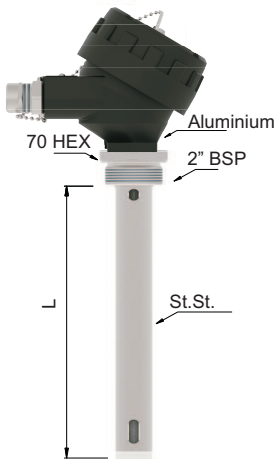
Max. 32 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

Sample Models:

LOW CONDUCTIVE LIQUIDS

DX-ECAP 202

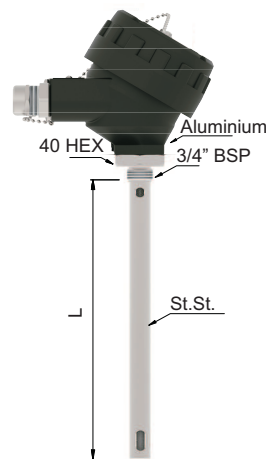
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



Max. 4 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 203

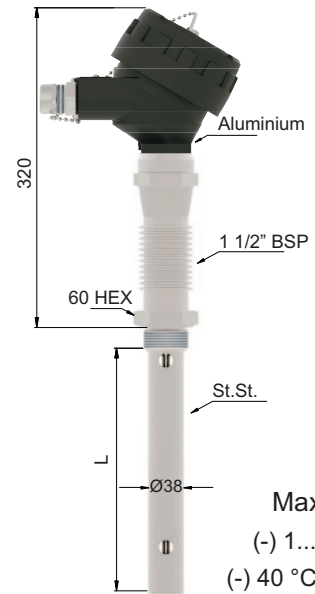
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



Max. 1 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 20S

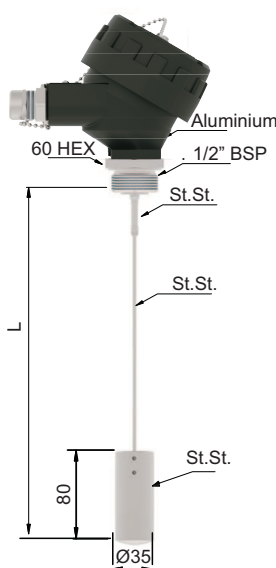
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



Max. 4 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 400 °C

DX-ECAP 204

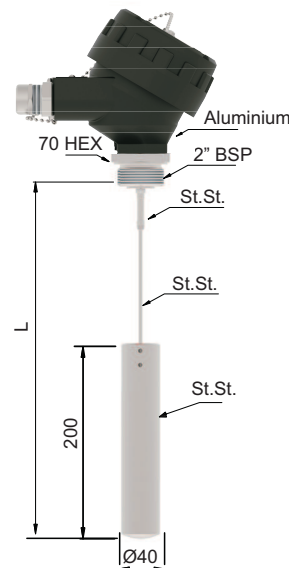
Partly Insulated Rope
Conductive Tank



Max. 16 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 204

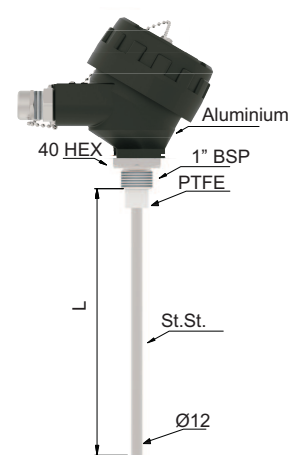
Partly Insulated Rope
Conductive Tank



Max. 32 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 205

Partly Insulated Probe
Conductive Tank

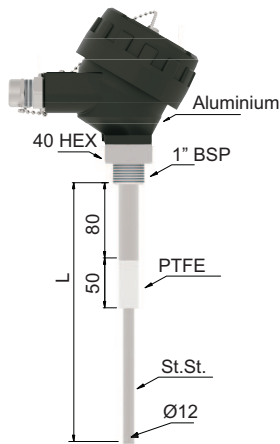


Max. 6 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

Sample Models:

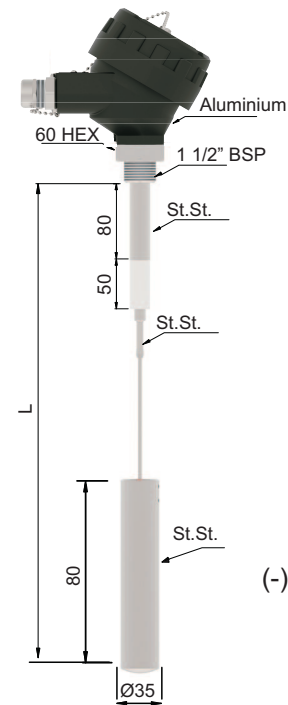
SOLID PARTICULATE MATERIALS

DX-ECAP 305
Partly Insulated Probe
Conductive Tank



Max. 6 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

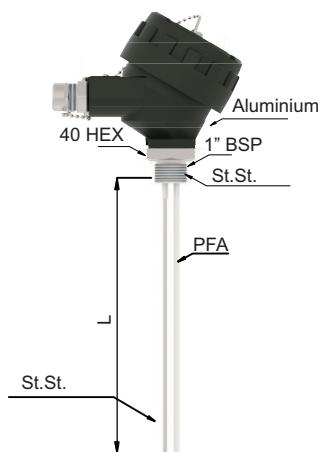
DX-ECAP 304
Partly Insulated Rope
Conductive Tank



Max. 16 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

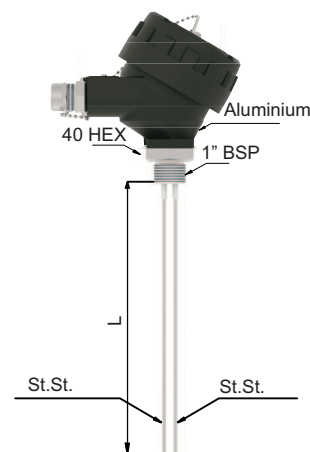
ADHESIVE AND ACID / BASIC LIQUIDS

DX-ECAP 408A
Double Probe (Single Fully Insulated)
Conductive / Insulating Tank



Max. 4 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 408B
Double Probe (Partly Insulated)
Conductive / Insulating Tank



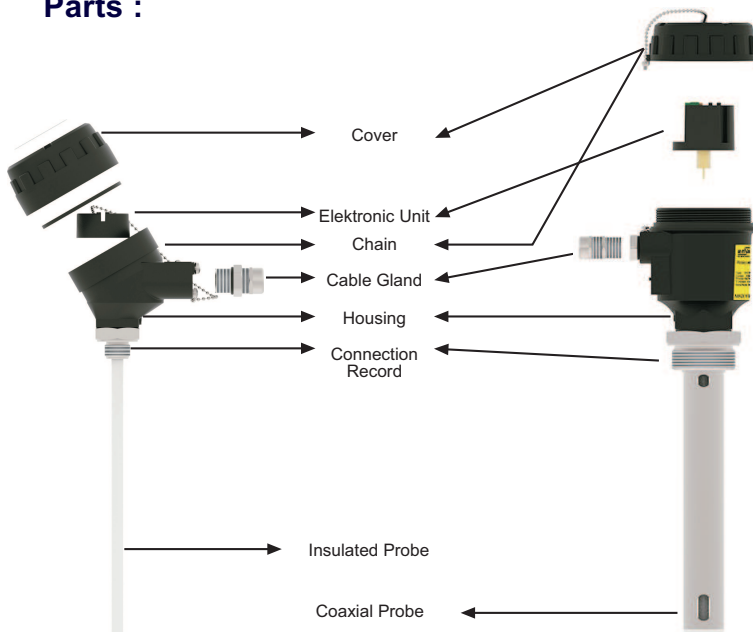
Max. 6 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

Temperature Class Table

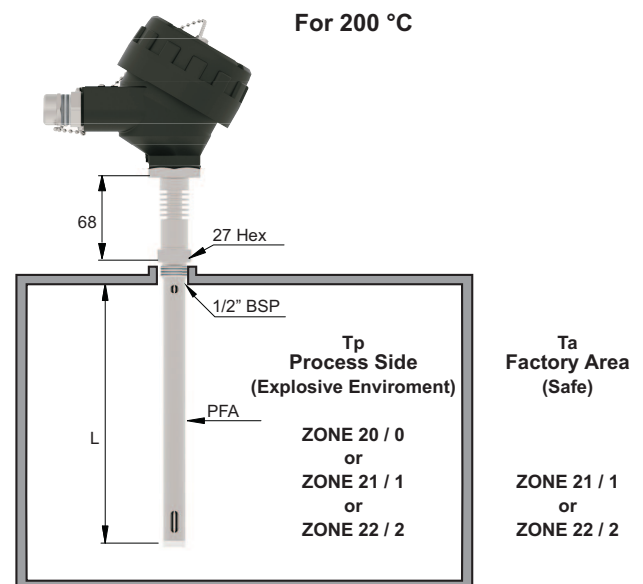
(-) 20° C ≤ Ta Ambient ≤ (+) 30° C...(+) 60° C		Working Temperature: (-) 20° C ... (+) 80° C / 90° C / 125° C / 190° C / 250° C		Group II
MODEL DX-ECAP101 - DX-ECAP102 - DX-ECAP103 - DX-ECAP107 DX-ECAP202 - DX-ECAP203 - DX-ECAP204 - DX-ECAP205 - DX-ECAP20S DX-ECAP304 - DX-ECAP305 DX-ECAP408A - DX-ECAP408B				
Without opening the cover standby time		30 min. (-)40...(+)150° C	40 min. (-)40...(+)200° C	
Ta AMBIENT TEMPERATURE	TP PROCESS TEMPERATURE	TEMPERATURE CLASS		
60° C	< 80° C	T6		
60° C	< 90° C	T5		
60° C	< 125° C	T4		
60° C	< 190° C	T3		
60° C	< 250° C	T2		

(-) 20° C ≤ Ta Ambient ≤ (+) 30° C...(+) 60° C		Working Temperature: (-) 20° C ... (+) 60° C		Group III
MODEL DX-ECAP101 - DX-ECAP102 - DX-ECAP103 - DX-ECAP107 DX-ECAP202 - DX-ECAP203 - DX-ECAP204 - DX-ECAP205 - DX-ECAP20S DX-ECAP304 - DX-ECAP305 DX-ECAP408A - DX-ECAP408B				
Without opening the cover standby time		10 min. (-)40...(+)60° C		
Ta AMBIENT TEMPERATURE	TP PROCESS TEMPERATURE	TEMPERATURE CLASS		
60° C	< 60° C	T6		

Parts :



Cooling:



1 MODEL DX-ECAP

Conductive Liquids.....1	Solids Particulate Materials.....3
Low Conductive Liquids2	Adhesive and Acid/Basic Liquids.....4

2 CERTIFICATE

No.....0	(EN10204-3-1) Material Certification.....1
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3 PROBE TYPE (MAX. LENGHT)

Single Probe - Insulated (Max 4 m)1	Double Probe - Single Fully Insulated (Max 4 m)8A
Single Probe - Coaxial (max 4 m) Ø 38 2	Double Probe - Partly Insulated (Max 6 m)8B
Single Probe - Thin Coaxial (max 1 m), Ø 21 3	Ceramic Partly Insulated Probe (Max 4 m) S
Rope - Partly Insulated (Max 32 m).....4	Special X
Single Probe - Partly Insulated (Max 6 m) 5	
Rope - Fully Insulated (0 ... 32 m) 7	

4 PROBE DIAMETER (Ø)

.....mm	Special x
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5 STEM LENGHT

.....mm

6 PROCESS TEMPERATURE

150°C Standard0	(-) 196 °C For Cryogenic Tank2
200°C with Cooling Apparatus1	230 °C with Peek Insulated3

7 CONNECTION

<u>Thread (ISO 228-1)</u>	<u>Clamp (ISO 2852)</u>	<u>ISO Flange(1092-1)</u>	<u>ISO Flange (1092-1)</u>	<u>ASA Flanged (B16.5)</u>
1/2" BSP.....0004	DN 25 - PN 16 ... 0502	DN 25 - PN 16...0502	DN 25 - PN 40...0702	DN 50 - 150lb ... 1005
3/4" BSP0005	DN 32 - PN 16 ... 0503	DN 32 - PN 16...0503	DN 32 - PN 40...0703	DN 65 - 150lb ... 1006
1" BSP.....0006	DN 50 - PN 16 ... 0504	DN 50 - PN 16...0505	DN 50 - PN 40...0705	DN 80 - 150lb ... 1007
1 1/2" BSP.....0010		DN 80 - PN 16...0507	DN 80 - PN 40...0707	DN 100 - 150lb ... 1008
2" BSP.....0012		DN 100 - PN 16...0508	DN 100 - PN 40...0708	
1/2" NPT.....0203				
3/4" NPT.....0204				

8 OUTPUT

4-20 mA Two Wire.....19	0-10 V Three Wire21
4-20 mA Three Wire20	0-20 mA Three Wire.....22
1-5 V Three Wire43	Special x

9 HOUSING

Aluminium Housing, B22x IP66 / 68.....750	Special.....x
Aluminium Housing, B21x IP66 / 68.....704	

10 INSULATION MATERIAL

PBT.....065	Polyamide.....069
PTFE.....066	Rubber.....081
PFA.....067	FKM.....084
PEEK.....068	Special.....x

11 CONNECTION MATERIAL

316 Stainless Steel.....002	Special.....x
Brass.....041	

12 ELECTRICAL CONNECTION

With Terminal.....00	Special.....x
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13 OPTIONAL

No...../ 0	Wall Apparatus...../ W
By - Pass Tube...../ T	Zener Baryer 9106B-B1B Single Channel.../B1B
Shetter (For the outside of the tank) 304 St. St.../ K2	Zener Barrier 9106B-B2B Double Channel.../B2B
	Special...../ x

SAMPLE

DX-ECAP 101 -10 - 300 - 0 - 0004 - 21 - 750 - 066 - 002 - 00 / 0
For Cond. Liquid, L= 300 mm, 1" BSP, 0-10V, Aluminium Housing B22x , Ø 10 Probe