

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 1/2 G Ex d IIC Tx*1 Ga/Gb For Gas

II 1/2 D Ex (ta/tb)*3 IIIC Tx*2 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

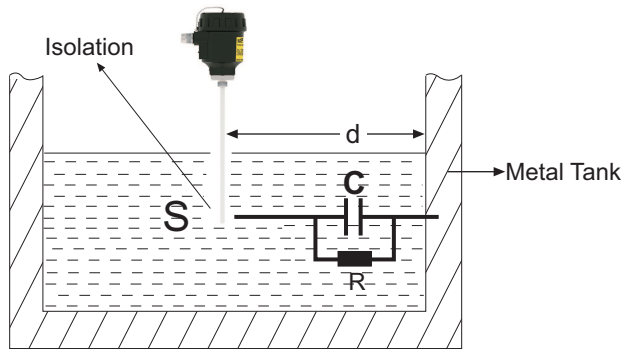
Advantages :

- * 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.



Working Principle :

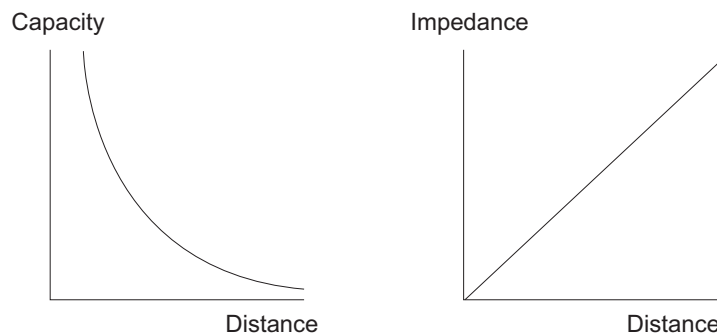
Capacitance definition, assuming two parallel conductive plates are used;



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

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

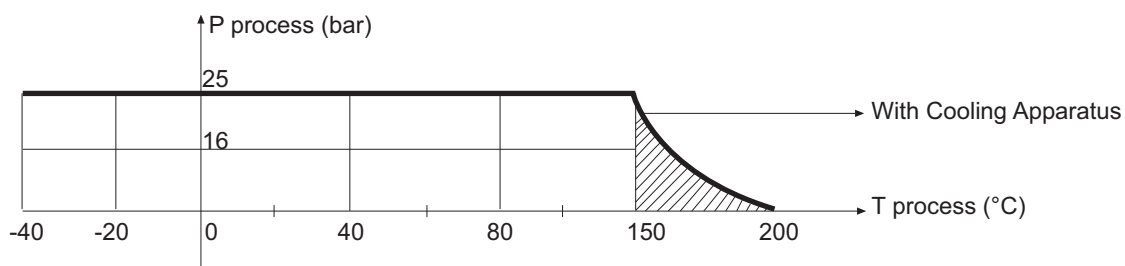
b: Outer screen radius

L: length

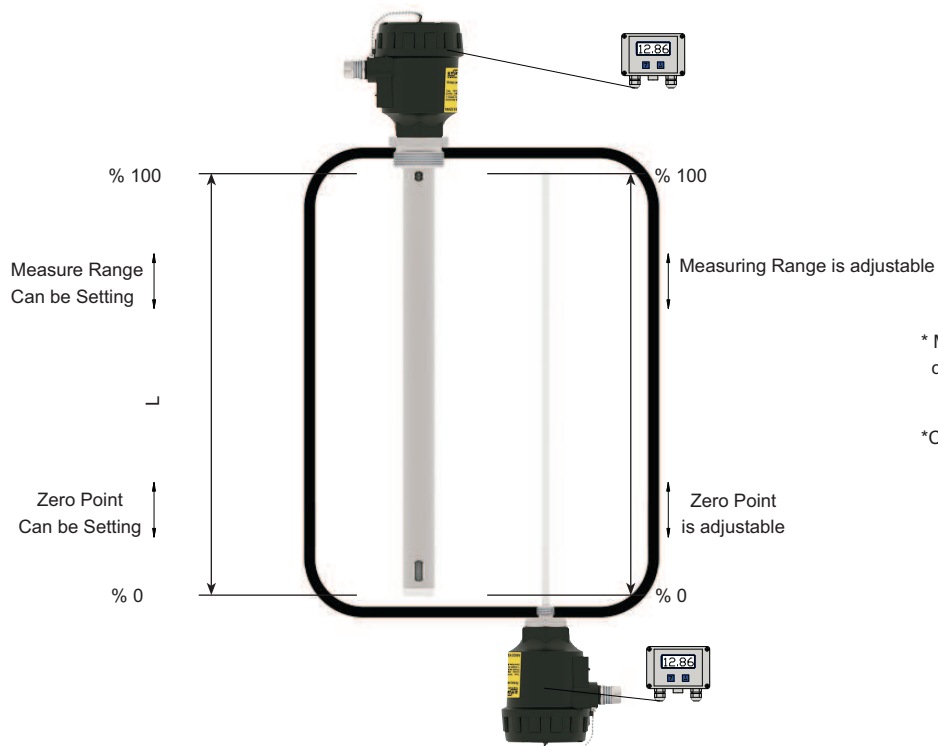
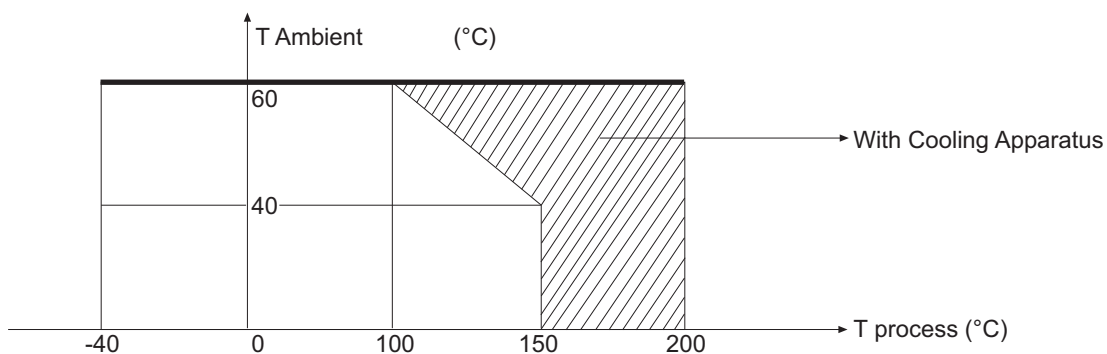
$$C = \frac{2 \cdot \pi \cdot \epsilon_0 \cdot \epsilon_r}{\ln(b/a)} \cdot L \quad \text{Impedance is calculated by this definition}$$

Excitation applied between 10 KHz...250 KHz based on length for all our models. ($\omega = 2\pi f$)
 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



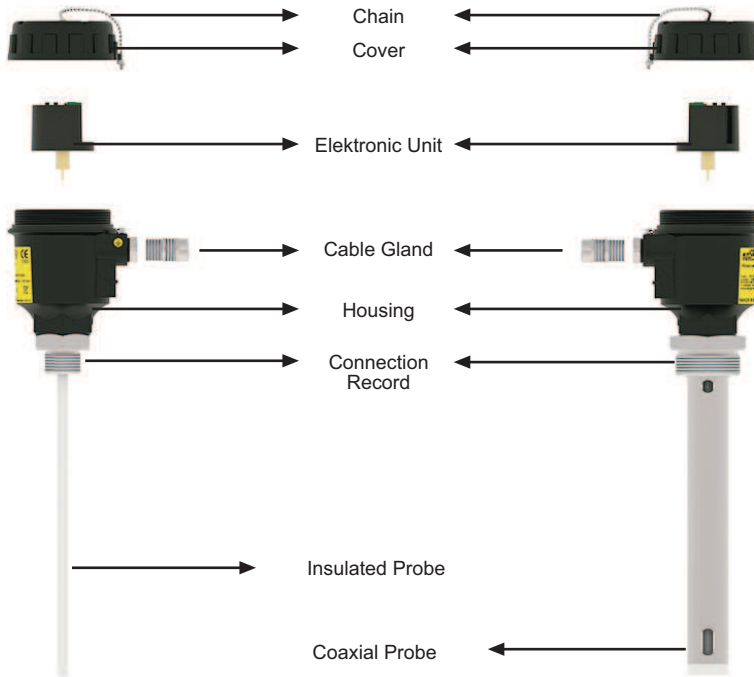
Environment Pressure / Temperature Chart



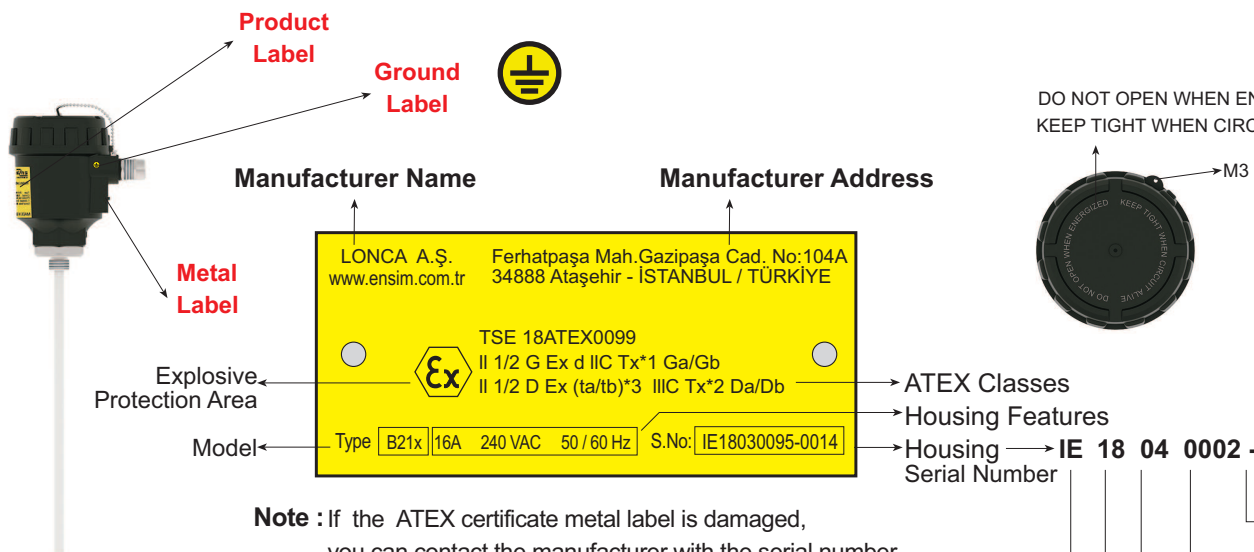
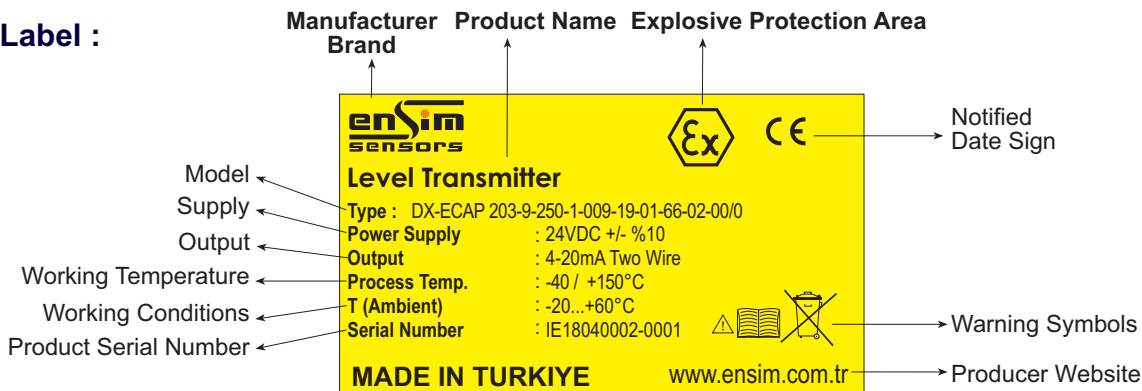
* Measuring range and zero point can be set 1/10 during probe.

*Can be mounted upside down

Parts :



Label :



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

Product Number

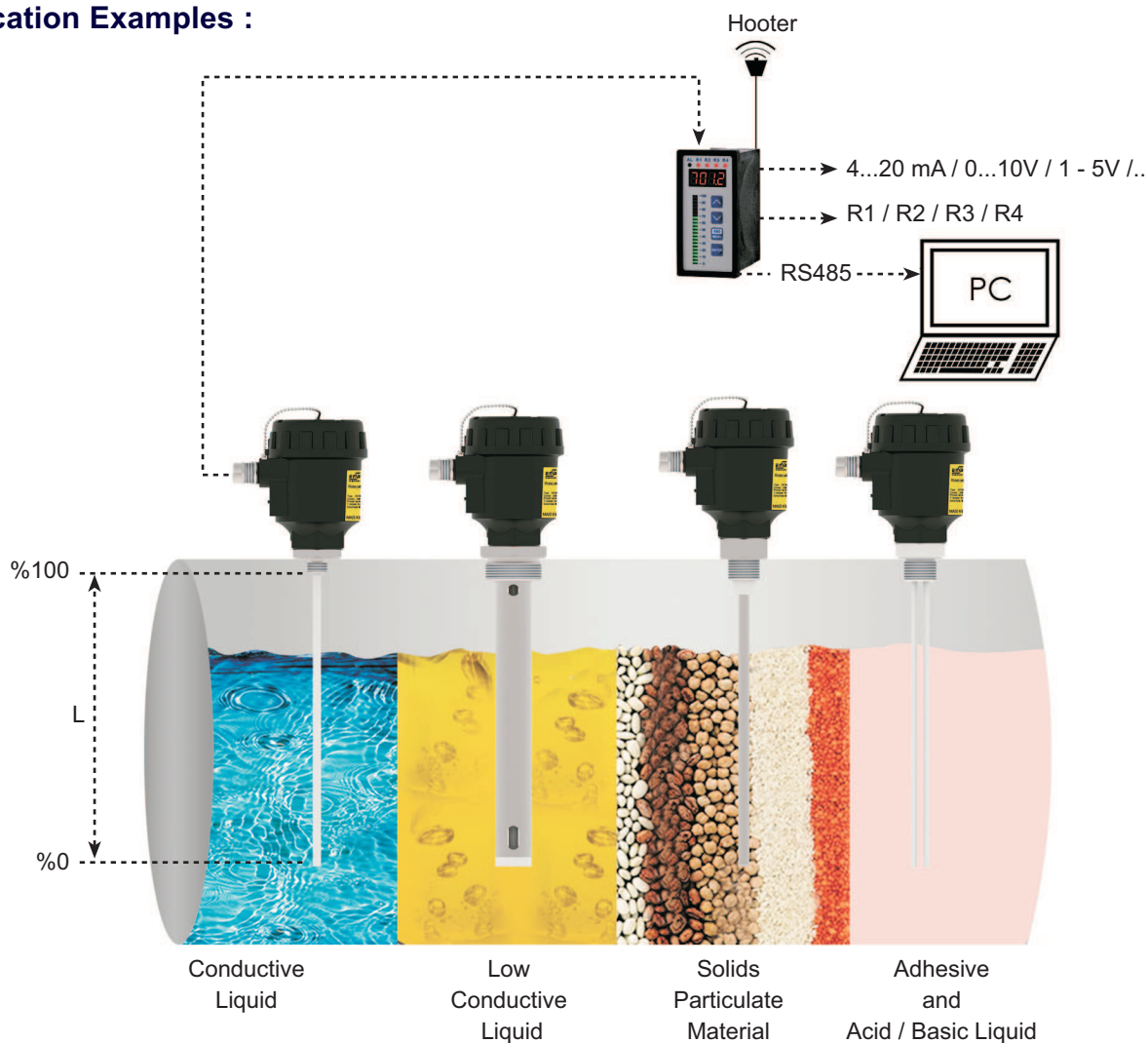
System Number

Month

Year

Work Order

Application Examples :



Housing :

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

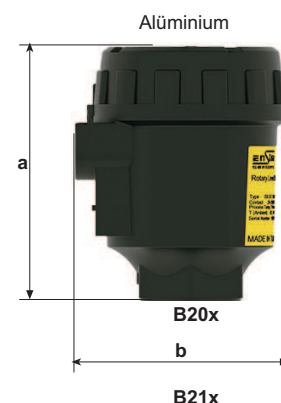
Cover Seal : NBR Nitrile Rubber 120 °C, Opt. FPM (Viton) 200 °C)

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

The marking of the equipment :



II 2G Ex d IIC Gb
II 2D Ex tb IIIC

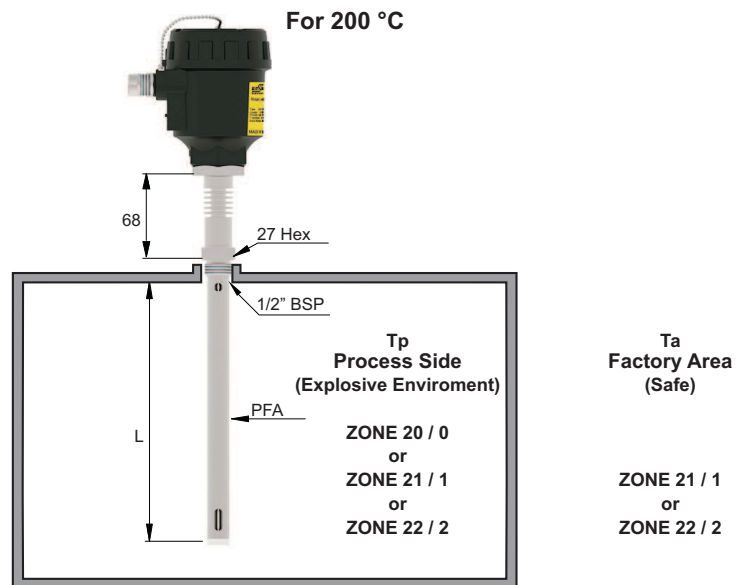


Protection Case:



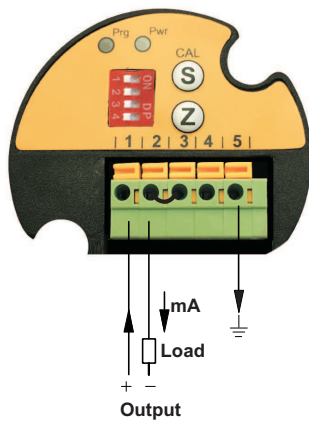
Material : 304 Stainless Steel
Welded manufacturing
Opens - Closes Hinged
To Protect Against external conditions.

Cooling:

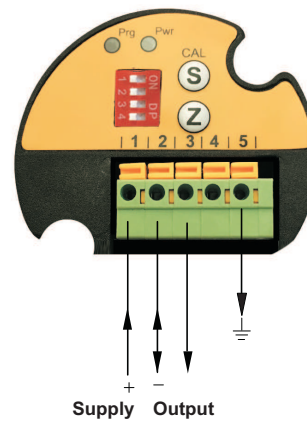


Electrical Connection :

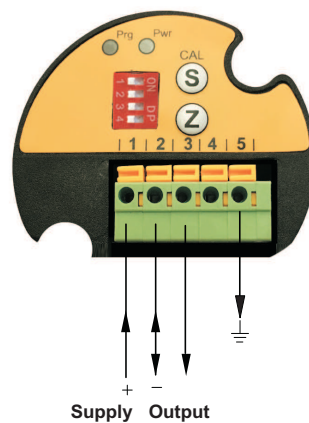
4-20mA Two Wire



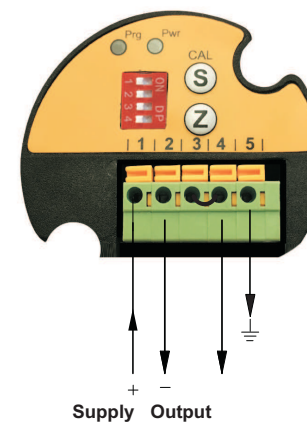
4-20mA Three Wire



0-20mA Three Wire



0-10V Three Wire



Identification of Calibration Buttons :

Z (Starting Range-Zero) : Measurement starting point - 4mA

Zero adjustment (zero): 4mA adjustment is performed at factory exit, assuming tank is completely empty. If adjustment is needed again, 4mA output adjustment can be performed by Z calibration after the tank is filled until initial level.

S (Measuring Range-Span): Measuring peak point - 20mA

Measurement field (span) adjustment: 20mA is adjusted at factory exit, assuming tank is filled up to length of electrode. If adjustment is needed again, 20mA output adjustment can be performed by S calibration after filling the tank up to a desired level.

Switch Settings of Output Signal :

When setting output signal, only the 3rd and 4th switches are active and configuration is defined only if the circuit energized.

Power Supply : 9-36VDC

Max. Load Resistance : $(R_L) = (V_{sup} - 3) / 0.02 [\Omega]$

Changes are not effective during normal operation.



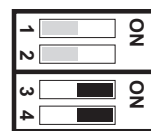
4-20mA Two Wire



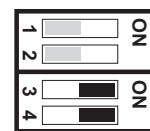
4-20mA Three Wire



or



0-20mA Three Wire



0-10V Three Wire

Calibration :

Only the switch 1 is active at first. When SW1 brought into "ON" position, red led light starts winking with 1 second interval.

Zero level adjust (SW1 is on position): Z button must be kept pressed until the green led is flashed.

Span level adjust (SW1 is on position): S button must be kept pressed until the green led is flashed.

After calibration, when SW1 brought into off position, it saves settings to memory and turn back into normal working condition.



 S → Span Level
 Z → Zero Level

Shifting Span Point :



Make SW2 ON

It becomes active when SW2 brought into ON position.



Make SW3 ON while SW2 ON.

If SW3 brought into ON position, while SW2 is in ON position.

The span point that's set before, shifts upper. When it came to the desired value, the switch should be taken to the off position.

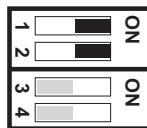


Make SW4 ON while SW2 ON.

If SW4 brought into ON position, while SW2 is in ON position.

The span point that's set before, shifts down, towards. When it came to the desired value, the switch should be taken to the off position.

Shifting Zero Point :



Make SW2 ON before SW1 ON.

It becomes active when SW2 brought into ON position and then SW1 brought into ON position.



Make SW3 ON while SW2+SW1 ON.

If SW3 brought into ON position, while SW2+SW1 are in ON position.

The span point that's set before, shifts upper. When it came to the desired value, the switch should be taken to the off position.



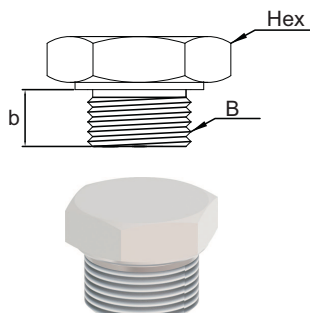
Make SW4 ON while SW2+SW1 ON.

If SW4 brought into ON position, while SW2+SW1 are in ON position.

The zero point that's set before, shifts down. When it came to the desired value, the switch should be taken to the off position.

Mechanical Connection :

Thread

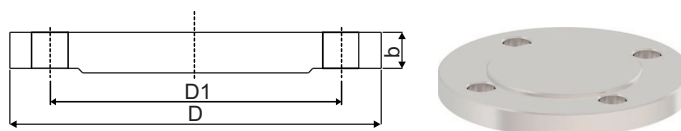


(ISO228-1)

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

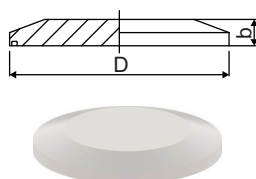
Order Code	(ISO1092-1) PN 16	D (mm)	D1 (mm)	b (mm)
0502	DN 25	165	85	16
0503	DN 32	140	100	16
0505	DN 50	165	125	18
0507	DN 80	200	160	20
0508	DN 100	220	180	20



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

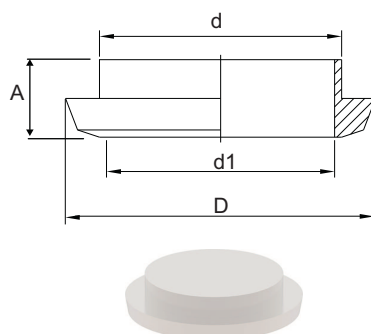
Order Code	(ANSI B16.5) 150 LBS	D (mm)	D1 (mm)	b (mm)
1005	DN 50	152,4	121	19
1006	DN 65	177,8	139,7	22,2
1007	DN 80	190,5	152,4	23,8
1008	DN 100	228,6	157,2	23,8

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

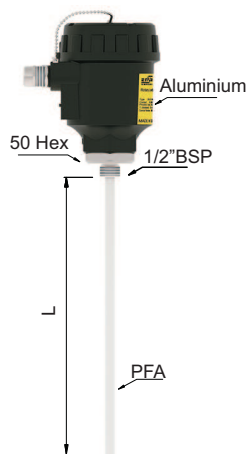


Order Code	Dimension	Dimension	D (mm)	d1 (mm)	A (mm)
1600	DN 40	DN 40	56	48	13
1601	DN 50	DN 50	68	61	14
1602	DN 100	DN 100	121	114	20

CONDUCTIVE LIQUIDS

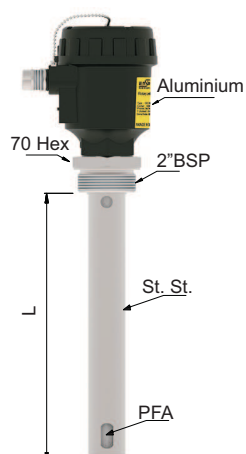
Sample Models:

DX-ECAP 101
Fully Insulated Probe
Conductive Tank



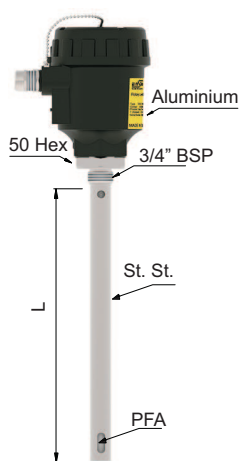
Max. 4 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 102
Fully Insulated Coaxial Probe
Insulated Tank



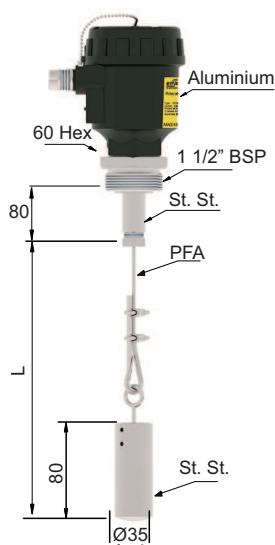
Max. 4 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

DX-ECAP 103
Fully Insulated Coaxial Probe
Insulated Tank



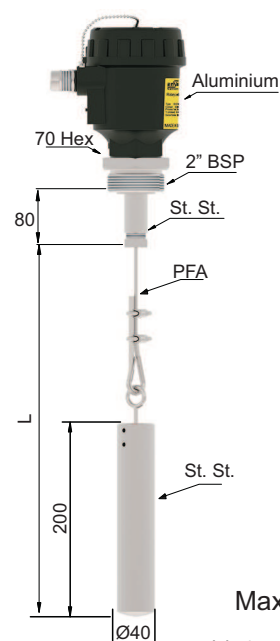
Max. 1 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

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



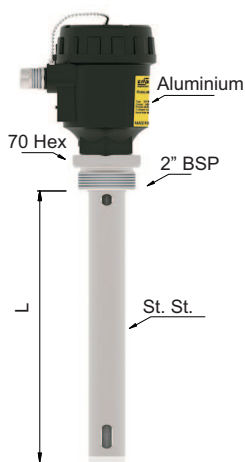
Max. 32 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

LOW CONDUCTIVE LIQUIDS

Sample Models:

DX-ECAP 202

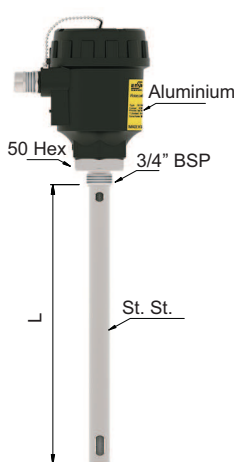
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



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

DX-ECAP 203

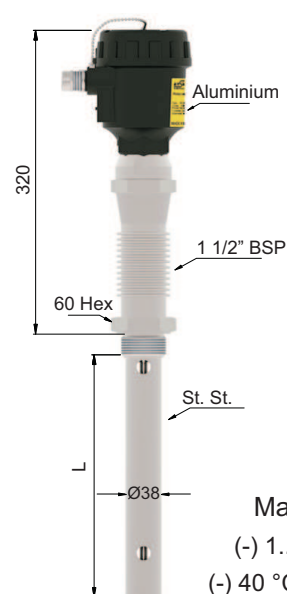
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



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

DX-ECAP 20S

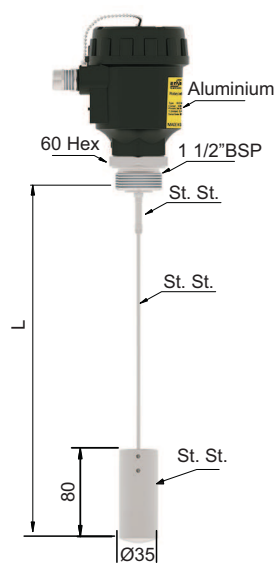
Partly Insulated Coaxial Probe
Conductive / Insulating Tank



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

DX-ECAP 204

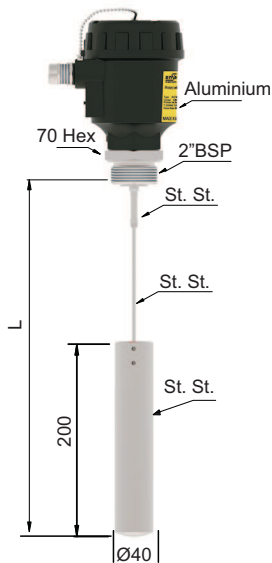
Partly Insulated Rope
Conductive Tank



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

DX-ECAP 204

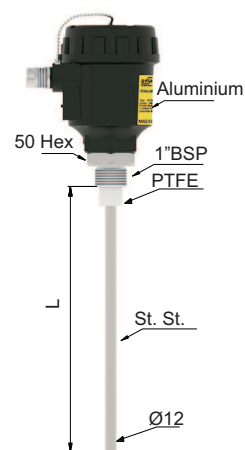
Partly Insulated Rope
Conductive Tank



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

DX-ECAP 205

Partly Insulated Probe
Conductive Tank

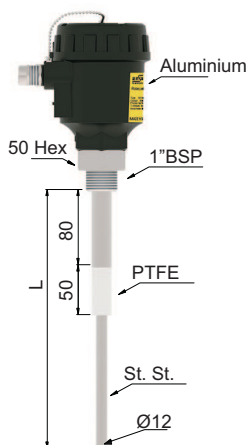


Max. 6 m.
(-) 1...(+) 25 bar
(-) 40 °C...(+) 150 °C

Sample Models:

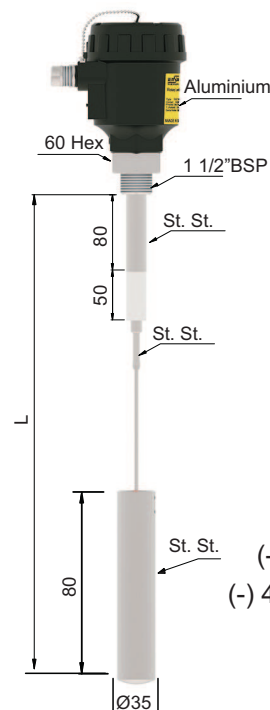
SOLID PARTICULATE MATERIALS

DX-ECAP 305
Partly Insulated Probe
Conductive Tank



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

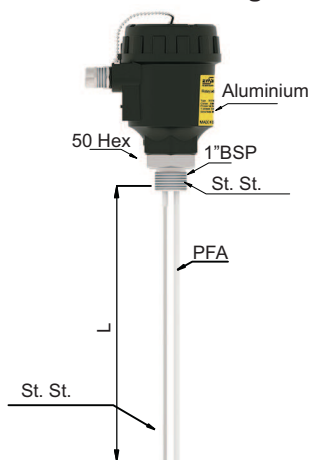
DX-ECAP 304
Partly Insulated Rope
Conductive Tank



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

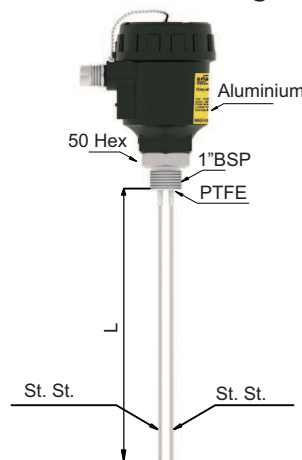
ADHESIVE AND ACID / BASIC LIQUIDS

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

STD. MODEL	DX-ECAP	
Working Temperature	(-) 40 °C...(+) 150 °C	(-) 40 °C...(+) 200 °C (With cooling)
Without opening the cover standby time	30 min.	40 min.

Thermal Protection Insurance is 105 °C

Important Note : Wall thickness of the product is manufactured as 3 mm from stainless steel for the temperature class tests.
Where the isolation is thinner, authorized technical personnel must take precautions.

(-) 20 °C ≤ T Ambient ≤ (+) 30 ° C...(+) 60 °C		Working Temperature : (-) 40 °C...(+) 150 °C	
DX-ECAP			
T Ambient MAX. AMBIENT TEMPERATURE ZONE 21 / 1	T Process MAX. PROCESS TEMPERATURE ZONE 20 / 0	T Surface MAX. SURFACE TEMPERATURE	TEMPERATURE CLASS
30 °C	150 °C	60 °C	T6
40 °C	150 °C	67 °C	T6
50 °C	150 °C	75 °C	T6
60 °C	150 °C	88 °C	T5

(-) 20 °C ≤ T Ambient ≤ (+) 30 °C...(+) 60 °C		Working Temperature :(-) 20 °C...(+) 200 °C	
DX-ECAP (Metal)			
T Ambient MAX. AMBIENT TEMPERATURE ZONE 21 / 1	T Process MAX. PROCESS TEMPERATURE ZONE 20 / 0	T Surface MAX. SURFACE TEMPERATURE	TEMPERATURE CLASS
30 °C	200 °C	43 °C	T6
40 °C	200 °C	46 °C	T6
50 °C	200 °C	58 °C	T6
60 °C	200 °C	70 °C	T6

1 MODEL DX-ECAPConductive Liquids.....1
Low Conductive Liquids 2Solids Particulate Materials.....3
Adhesive and Acid/Basic Liquids.....4**2 CERTIFICATE**

No.....0

(EN10204-3-1) Material Certification.....1

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

.....mm

Special x

5 STEM LENGHT

.....mm

6 PROCESS TEMPERATURE150°C Standard 0
200°C with Cooling Apparatus 1(-) 196 °C For Cryogenic Tank 2
230 °C with Peek Insulated 3**7 CONNECTION****Thread (ISO 228-1)**1/2" BSP.....0004
3/4" BSP 0005
1" BSP.....0006
1 1/2" BSP.....0010
2" BSP.....0012
1/2" NPT.....0203
3/4" NPT.....0204**Clamp (ISO 2852)**DN 25 - PN 16 ... 0502
DN 32 - PN 16 ... 0503
DN 50 - PN 16 ... 0504**ISO Flange(1092-1)**DN 25 - PN 16...0502
DN 32 - PN 16...0503
DN 50 - PN 16...0505
DN 80 - PN 16...0507
DN 100 - PN 16...0508**ISO Flange (1092-1)**DN 25 - PN 40...0702
DN 32 - PN 40...0703
DN 50 - PN 40...0705
DN 80 - PN 40...0707
DN 100 - PN 40...0708**ASA Flanged (B16.5)**DN 50 - 150lb ... 1005
DN 65 - 150lb ... 1006
DN 80 - 150lb ... 1007
DN 100 - 150lb ... 1008**8 OUTPUT**4-20 mA Two Wire.....19
4-20 mA Three Wire 20
0-10 V Three Wire 21
0-20 mA Three Wire.....223 -180 ohm 23
10-180 ohm 24
240-33 ohm 25
4-20mA Two Wire+Relay.....26
Special x**9 HOUSING**

Aluminium Housing, B21x IP66 / 68.....704

Special.....x

10 INSULATION MATERIALPBT.....065
PTFE.....066
PFA.....067
PEEK.....068Polyamide.....069
Rubber.....081
FKM.....084
Special.....x**11 CONNECTION MATERIAL**316 Stainless Steel.....002
Brass.....041

Special.....x

12 ELECTRICAL CONNECTION

With Terminal.....00

Special.....x

13 OPTIONALNo...../ 0
By - Pass Tube...../ T
Shetter (For the outside of the tank) 304 St. St.../ K2Wall Apparatus...../ W
Special...../ x**SAMPLE**

DX-ECAP 101 -10 - 300 - 0 - 0004 - 21 - 703 - 066 - 002 - 00 / 0

For Cond. Liquid, L= 300 mm, 1" BSP, 0-10V, Aluminium Housing , Ø 10 Probe