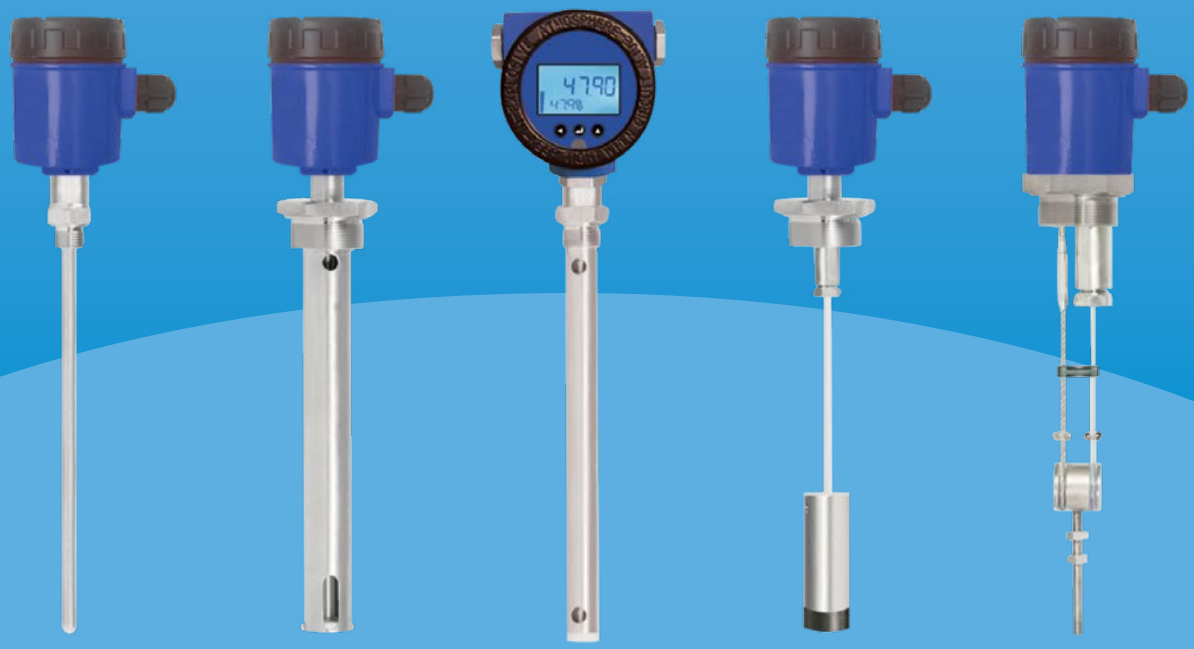


AECAP

CAPACITIVE LEVEL TRANSMITTER

09.2018

AYVAZ®

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.

AECAP - CAPACITIVE LEVEL TRANSMITTER

AECAP 101/ 102 / 103 / 107 / 109
AECAP 202 / 203 / 204 / 205 / 209
AECAP 304 / 305 / 306 / 309 / 30S
AECAP 408A / 408B / 408P / 408T

Advantaages:

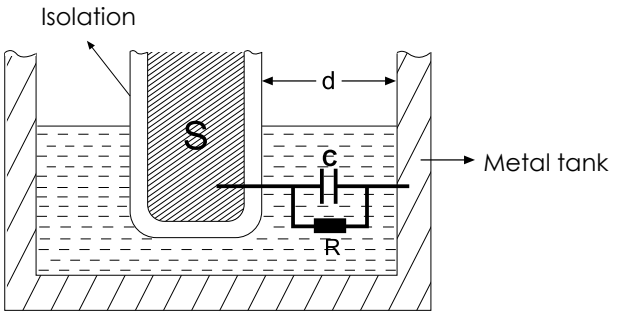
- There are no moving parts.
- High pressure and temperature resistant design.
- Modular structure with easy assembly.
- Not affected by foam, liquid splashes.
- Not affected by vibration, has robust mechanical structure.
- Zero Span adjustment is easy.
- Measurement along whole sensor.
- Operability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

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. 0-20mA - 4-20mA, 0-10 V three wire Opt.
Accuracy	∓ % 0,5, ∓ % 0,8, ∓ % 1
Linearity	% 0,5
Capacity Range	1pF...3nF
Min. Di-Elektric Constant	1,6 ε_r
Connection Material	304 Stainless Steel Opt.316 Stainless Steel
Isolation Material	PFA Std. Opt. PEEK, PTFE, Rubber, FKM
Housing Material	PBT Std., Opt. Aluminium, Stainless Steel
Working Pressure	(-)1...100 bar (Depending on the model)
Working Temperature	(-) 40 / (+) 150°C (Depending on the model) 200°C with cooling apparatus. (-) 196° for Cryogenic Tank (-) 50...+80 °C for NBR FKM (-) 30...+ 200 °C 400 °C with ceramic isolation
Ambient Temperature	(-)20 / (+) 60 °C
Display	with LED-Power and Contact LED
Isolation	Max. 500 W
Power Consumption	Max. 50mW
Electrical Connection	Clemens
Protection Class(EN60529)	PBT – IP 66, Aluminium, Stainless Steel IP 65
Test	EMC, Low voltage
Max. Tensile Force	Max. 40 NM
Weight	295gr. for AECAP 101 250 mm.

Working Principle:

Capacitance definition, assuming two parallel conductive plates are used;

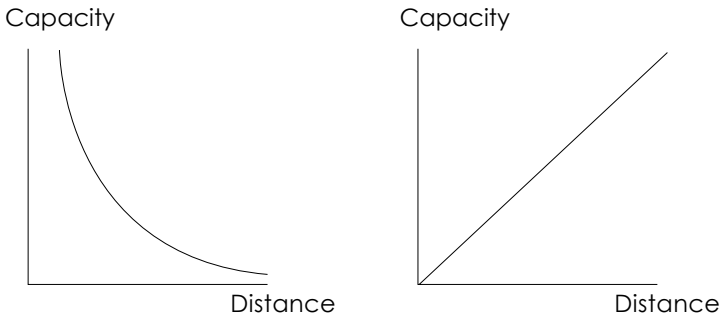


C(Farad)

S,d (mt)

$$C = \frac{\varepsilon_o.\varepsilon_r.S}{d}$$

However, there are scarcely any sensor type which this definition can be pratically utilized. Above Formula can no longer bi 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.

jLw 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 + (jCω)e -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)

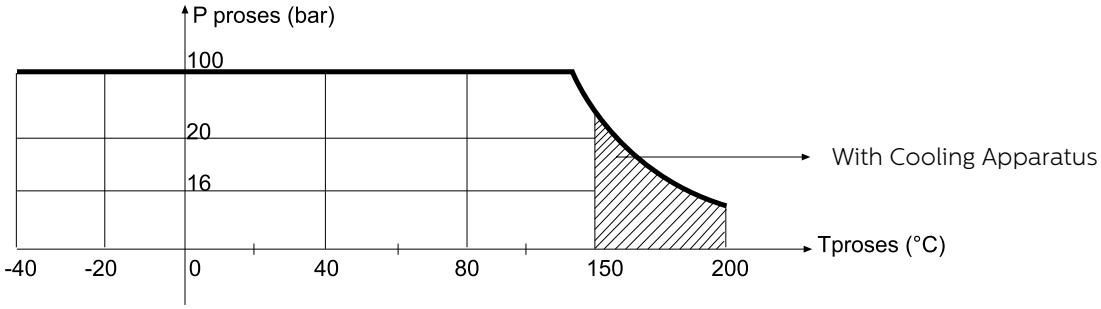
Capacitive reactance we desire to measure is $(jC\omega)^{-1}$. Meaning that charge and impedance have the same phase.
To summarize, charge transferred to medium is directly proportional with capacitive reactance. For sensors manufactured as coaxial;

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

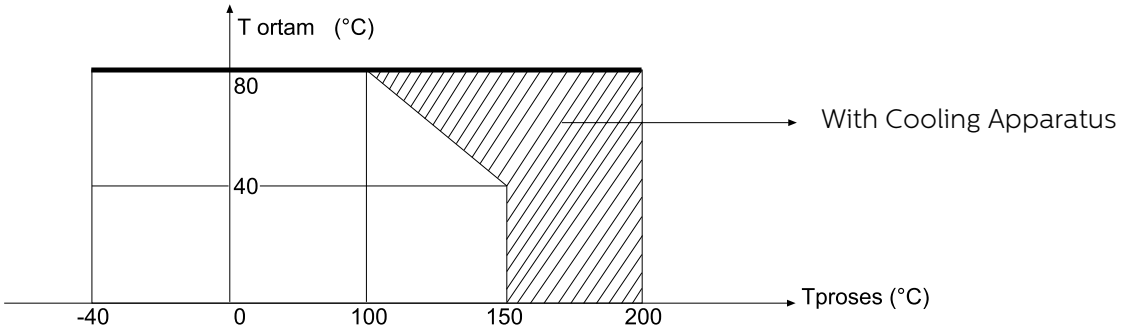
$$C = \frac{2.\pi.\varepsilon_o.\varepsilon_r}{\ln(b/a)}.L$$ Impedance is calculated by this definition

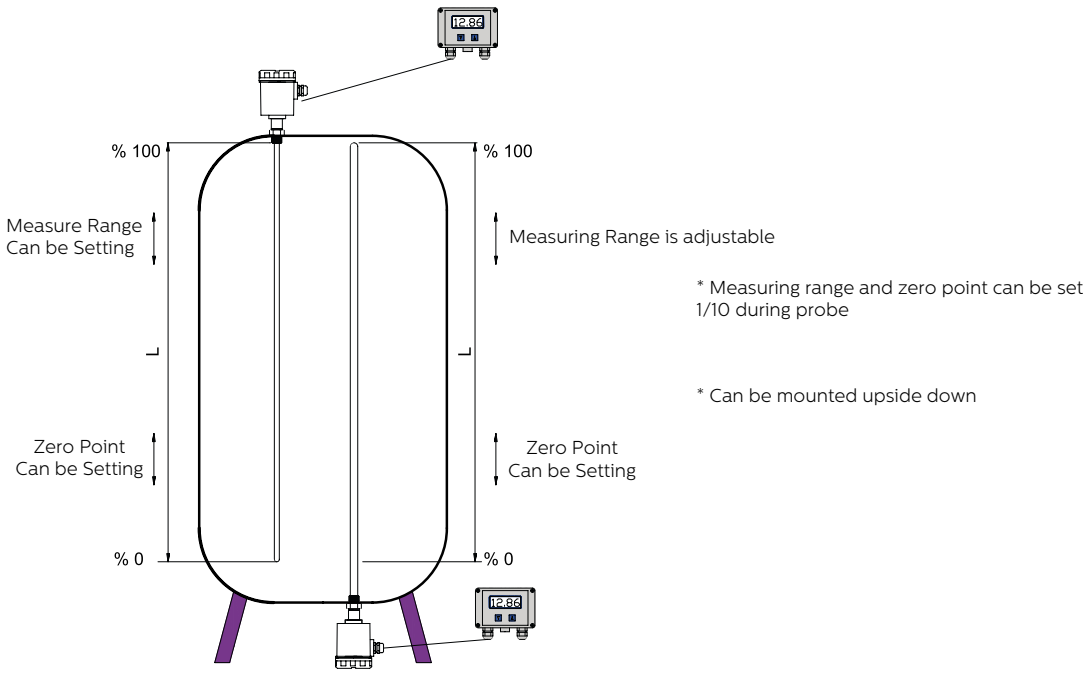
Excitation applied between 10KHz–250KHz based on length for all our models. (ω =2xpxf) Linearity error that may be caused by conductivity component (R) effect is prevented by electronic circuit design and mechanical design. Reduced to a level lower than 1ppm, acceptable as zero.

Process Pressure / Temperature Chart



Environment Pressure / Temperature Chart

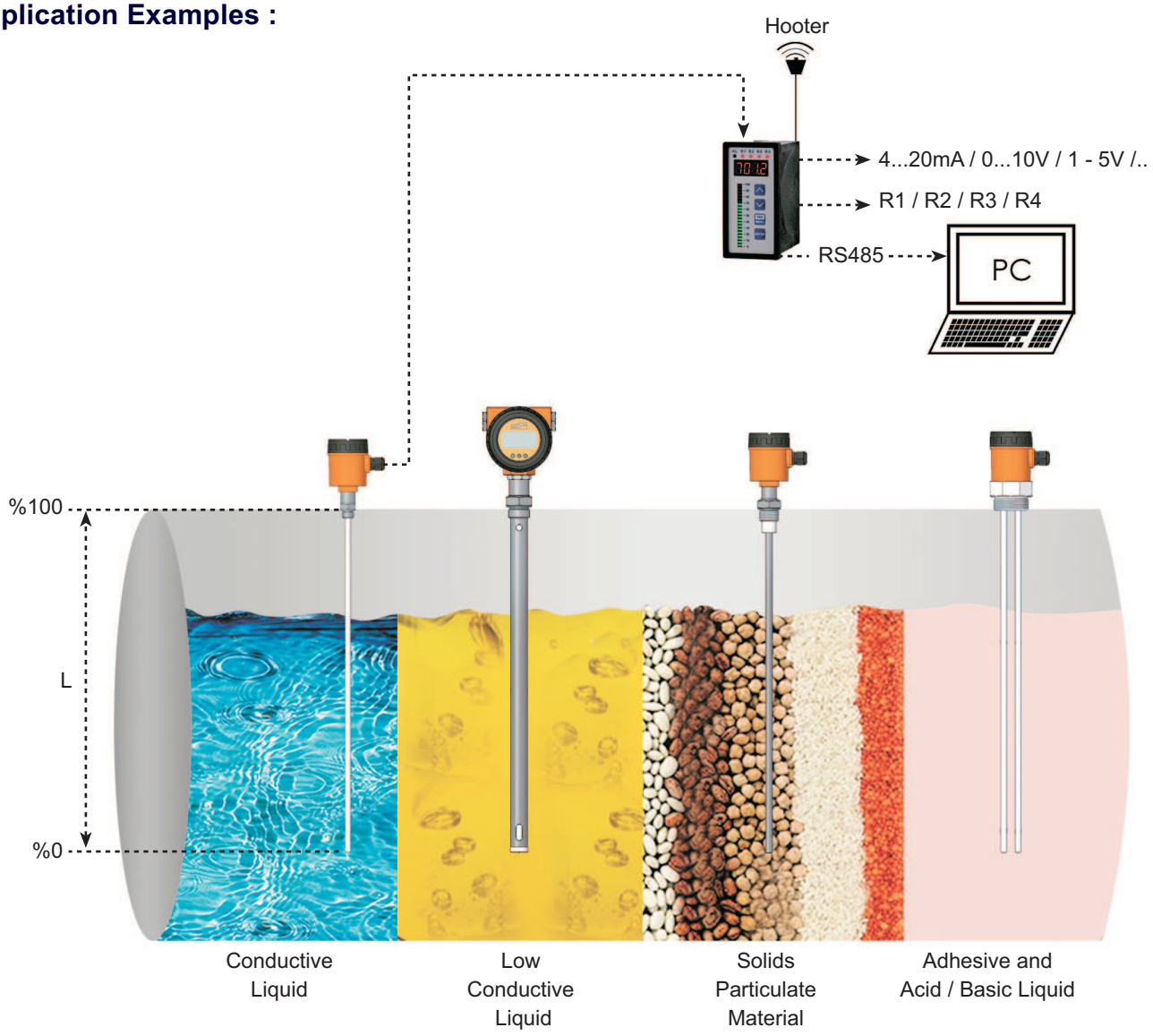




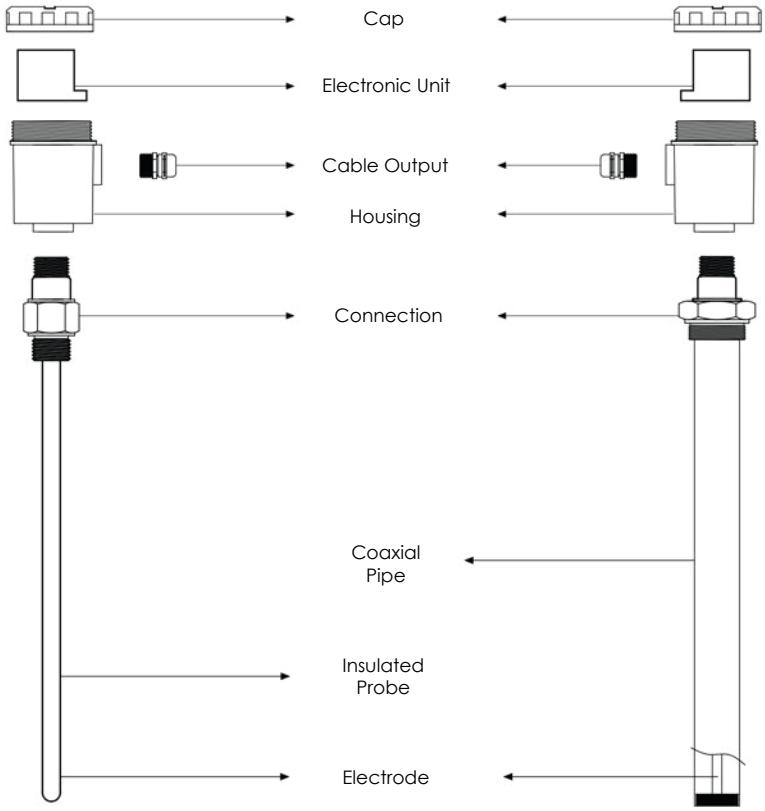
* Measuring range and zero point can be set 1/10 during probe

* Can be mounted upside down

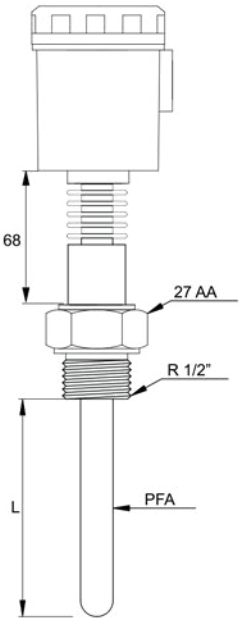
Application Examples :



Parts:

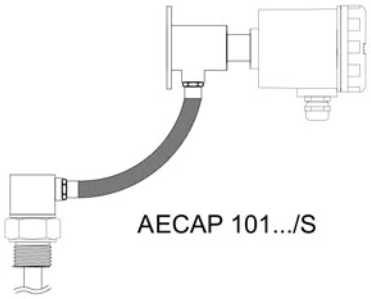


Cooling:

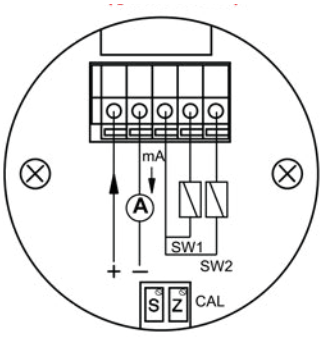


Electronic Unit with Cable:

Electronic unit and sensor component can be separated by a cable that protected against exterior conditions for easy calibration on site. Thanks to the properties of cable, easy assembly for user is possible without affecting capacitive measurement.



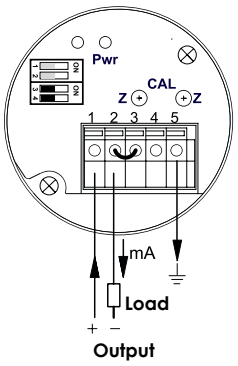
B010 Aluminium Housing (For Double Cell)



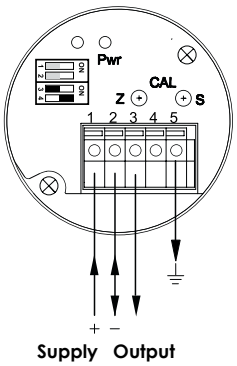
4-20 mA Two Wire + 2 PNP NO

Electrical Connection:

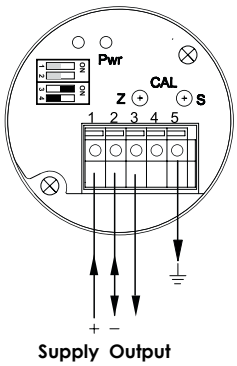
4-20 mA two Wire



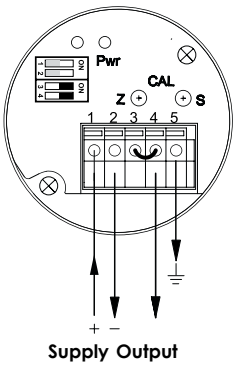
4-20 mA three Wire



0-20 mA 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.

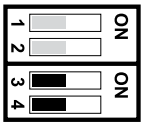
S (Measuring Range-Span): Measuring peak point - 20mA
Measurement field (span) adjustment: 20mA is adjusted at factory exit, assuming tank is filled up to length of electrode. If adjustment is needed again, 20mA output adjustment can be performed by S calibration after filling the tank up to a desired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

Switch Settings of Output Signal:

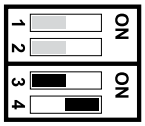
When setting output signal, only the 3rd and 4th switches are active and configuration is defined only if the circuit energized.

Power Supply : 9-36VDC Max. Load Resistance : (RL) = (Vsup Œ 3) / 0.02 [Ω]

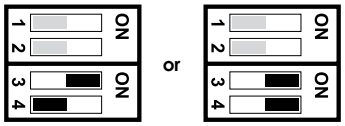
Changes are not effective during normal operation.



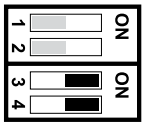
4-20mA Two Wire



4-20mA Three Wire



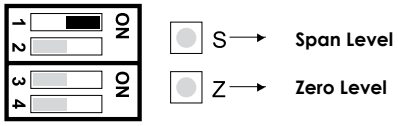
0-20 mA Three Wire



0-10 V Three Wire

Calibration:

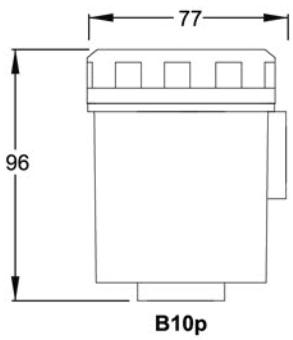
Only the switch 1 is active at first. When SW1 brought into "ON" position, red led light starts winking with 1 second interval. Zero level adjust SW1 is on position): Z button must be kept presoed until the green led is flashed.
Span level adjust (SW1 is on position): S button must be kept presoed until 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.



SW3 and SW4 positions have no effect on calibration.

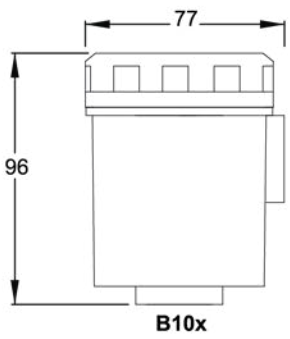
Housing:

Plastic



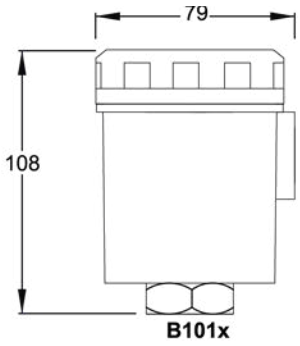
B10p

Aluminium



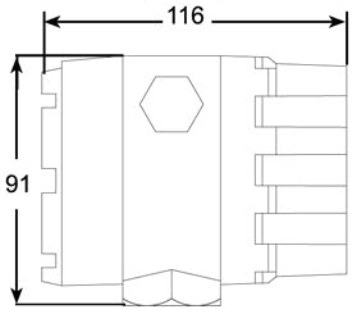
B10x

Stainless Steel



B101x

Aluminium(Double CELL)

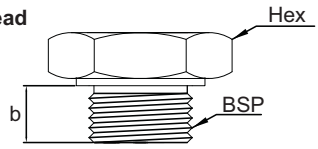


B010

TYPE	MATERIAL	PROTECTION CLASS	TEMPERATURE (°C)	SIZE a x b x c (mm)
B10p	Plastic (PBT)	IP 65 / IP 67	-40...+150	96 x 77
B10x	Aluminum	IP 65	-40...+150	96 x 77
B101x	Stainless Stell	IP 65	-40...+150	108 x 79
B010	Aluminum (Double Cell)	IP 68	(-)40...+ 100	91 x 116

Mechanical Connection :

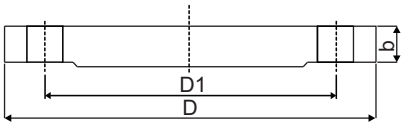
Thread



(ISO228-1)

Dimension BSP	Hex [mm]	Thread b [mm]
1/2”	27	14
3/4”	32	14
1”	41	23
1 1/4”	51	23
1 1/2”	60	23
2”	70	23

Flanged



(ISO1092-1)

PN 16	D (mm)	D1 (mm)	b (mm)
DN25	165	85	16
DN50	165	115	18

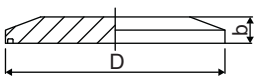
(ISO1092-1)

PN 40	D (mm)	D1 (mm)	b (mm)
DN25	115	85	18
DN32	140	100	20
DN50	165	125	20
DN80	200	160	20
DN100	235	190	24

(ANSI B16.5)

PN 40	D (mm)	D1 (mm)	b (mm)
DN50	152,4	121	19
DN80	190,5	152,4	23,8
DN100	228,6	157,2	23,8

Clamp



(ISO2852)

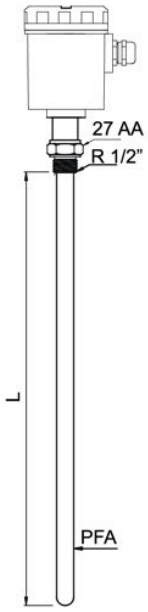
Dimension	Dia. D (mm)	b (mm)
DN32	50,5	32
DN50	64	50
DN65	91	65

Sample Models:

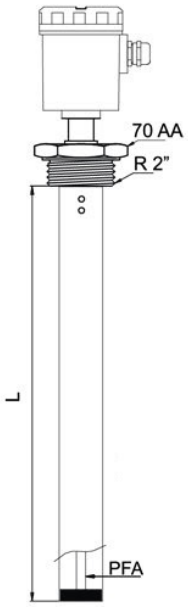
	Measuring Range		Probe	Process Pressure / Temp.
CONDUCTIVE LIQUIDS	AECAP 101 0...4mt.		Fully Insulated Conductive Tank	-1...+100 bar -40...+150°C
	AECAP 102 0...4mt.		Fully Insulated Coaxial Probe Insulated Tank	-1...+100 bar -40...+150°C
	AECAP 103 0...1mt.		Fully Insulated Coaxial Probe Insulated Tank	-1...+100 bar -40...+150°C
	AECAP 107 0...32mt.		Fully Insulated Rope Conductive Tank	-1...+60 bar -40...+150°C
	AECAP 109 0...32mt.		Fully Insulated Double Rope Insulated Tank	-1...+60 bar -40...+150°C

Sample Models:

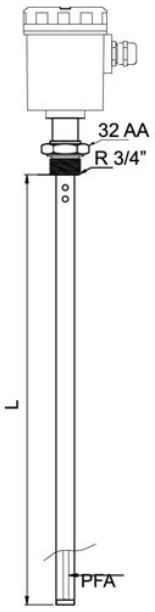
AECAP 101



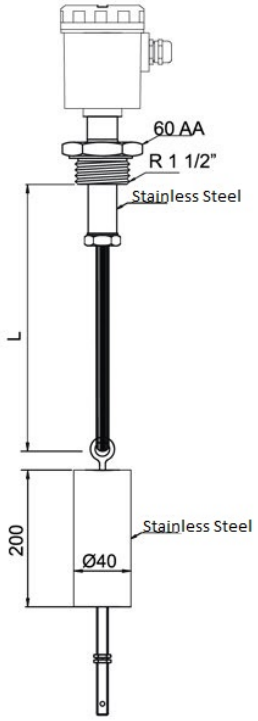
AECAP 102



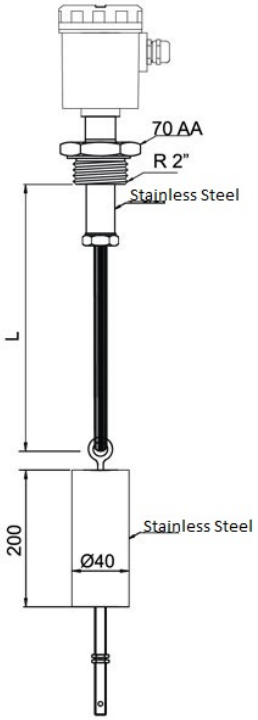
AECAP 103



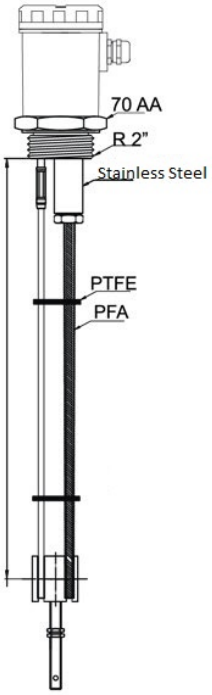
AECAP 107



AECAP 107



AECAP 109

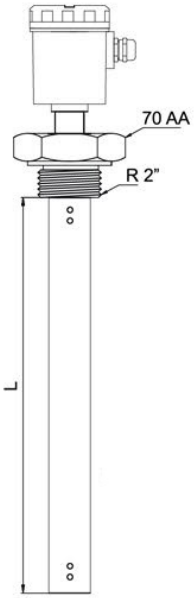


Sample Models:

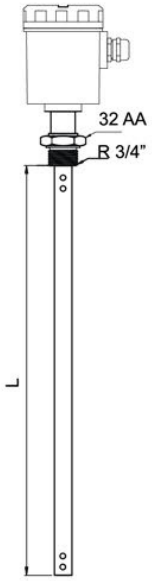
	Measuring Range		Probe	Process Pressure / Temp.
NONCONDUCTIVE LIQUIDS	AECAP 202 0...4mt.		Partly Insulated Coaxial Probe Conductive/Insulating Tank	-1...+100 bar -40...+150°C
	AECAP 203 0...1mt.		Partly Insulated Coaxial Probe Conductive/Insulating Tank	-1...+100 bar -40...+150°C
	AECAP 204 0...32mt.		Partly Insulated Rope Conductive Tank	-1...+60 bar -40...+150°C
	AECAP 205 0...6mt.		Partly Insulated Probe Conductive Tank	-1...+100 bar -40...+150°C
	AECAP 209 0...32mt.		Partly Insulated Double Rope Conductive/Insulating Tank	-1...+60 bar -40...+150°C

Sample Models:

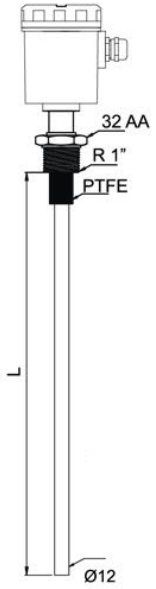
AECAP 202



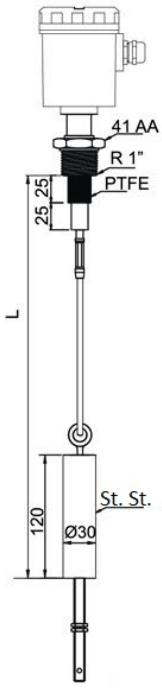
AECAP 203



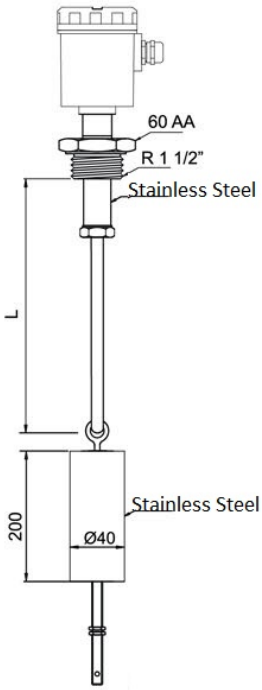
AECAP 205



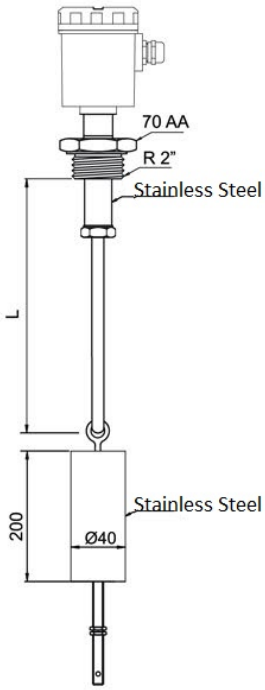
AECAP 204



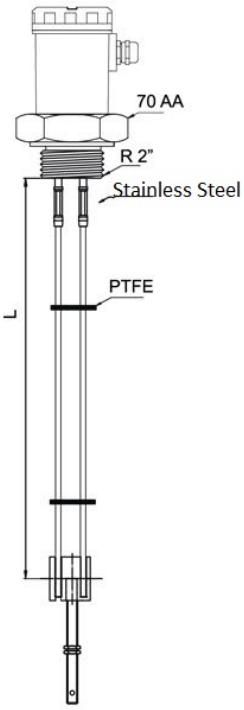
AECAP 204



AECAP 204



AECAP 209

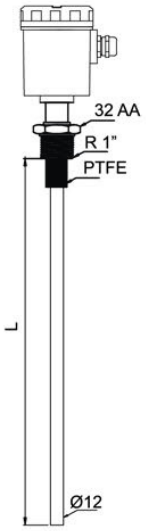


Sample Models:

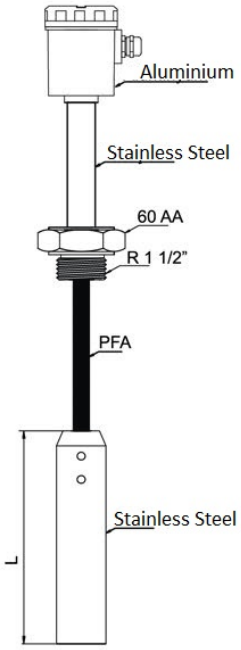
	Measuring Range		Probe	Process Pressure/Temp.
SOLIDS PARTICULATE MATERIALS	AECAP 304 0...32mt.		Partly Insulated Rope Conductive Tank	-1...+60 bar -40...+150°C
	AECAP 305 0...6mt.		Partly Insulated Probe Conductive Tank	-1...+60 bar -40...+150°C
	AECAP 306 0...1mt.	 High Temp.	Partly Insulated Probe Conductive Tank	-1...+25 bar -40...+200°C
	AECAP 309 0...32mt.		Fully Insulated Double Rope Insulated Tank	-1...+60 bar -40...+150°C
	AECAP 30S 0...4mt.	 High Temp.	Partly Insulated Probe Conductive Tank	-1...+25 bar -40...+400°C

Sample Models:

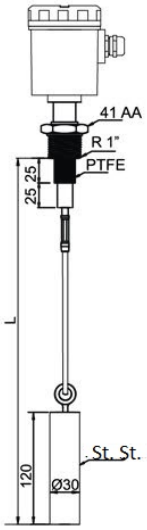
AECAP 305



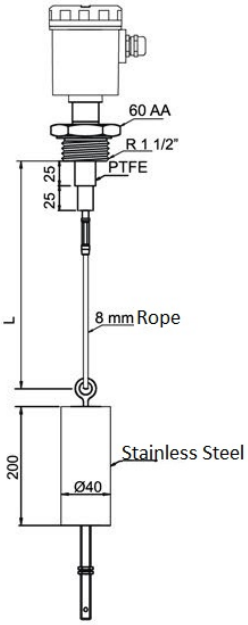
AECAP 306



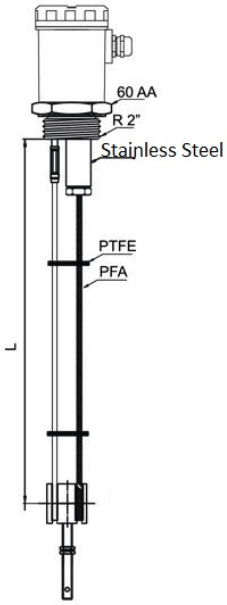
AECAP 304



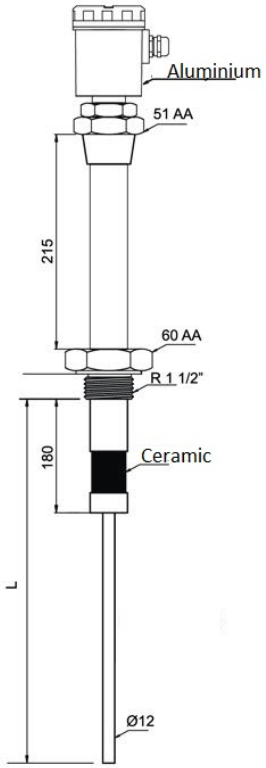
AECAP 304



AECAP 309



AECAP 30S

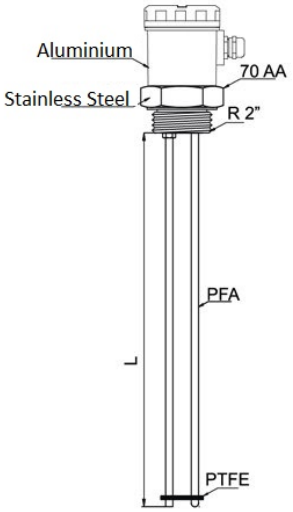


Sample Models:

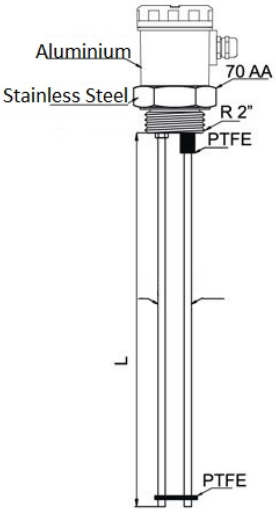
	Measuring Range		Probe	Process Pressure/Temp.
ADHESIVE AND ACID / BASIC LIQUIDS	AECAP 408A 0...4mt. Agressive Liquids		Double Probe Conductive/Insulating Tank	-1...+100 bar -40...+150°C
	AECAP 408B 0...6mt.		Partly Insulated Double Probe Conductive/Insulating Tank	-1...+60 bar -40...+150°C
	AECAP 408P 0...6mt.		Insulated from Body Double Probe Conductive/Insulating Tank	-1...+25 bar -20...+80°C
	AECAP 408T 0...4mt.		Fully Insulated Double Probe Conductive/Insulating Tank	-1...+25 bar -40...+150°C

Sample Models:

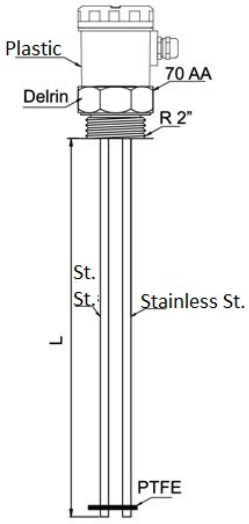
AECAP 408A



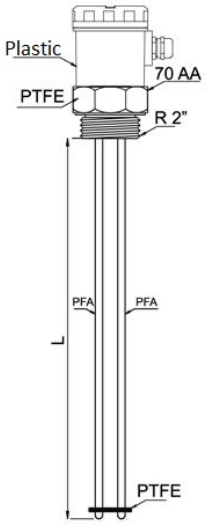
AECAP 408B



AECAP 408P



AECAP 408T



Order Form:

Please consider sample models when coding.

1 MODEL ECAP

Conductive Liquids.....1
Non-Conductive Liquids 2
Solids Particulate Materials.....3
Adhesive and Acid/Basic Materials.....4

2 CERTIFICATE

No 0

3 PROBE TYPE (MAX. LENGHT)

Fully Insulated Probe (Max. 4 m.).....1
Coaxial Probe, (Max. 4 m.) Ø38.....2
Coaxial Probe, (Max. 4 m.) , Ø21.....3
Partly Insulated Rope Probe (Max. 32 m.)..4
High Temperature (Max. 4 m.).....6
Complete Insulated Rope Probe (0...32m)....7
Double Electrode Probo (Max. 4 m.)....8
Double Insulated Probe..... (Max. 4 m.).....8A
Partly Insulated Double Probe (Max. 4 m.).....8B
Double Probe - Double Insulated (Max. 4 m.) 8T
Double Probe - Double Insulated, PVC Coaxial (Max. 4 m.).....8Tp
Double Thin Probe - Double Insulated (Max. 1 m.) 8Tm
Double Insulated Probe.....S
Special Insulated Probe.....x

4 STEM LENGHT

...mm.....0

5 PROCESS TEMPERATURE

150°C (Standard).....0
200°C with Cooling Apparatus 1
(-) 196°C For Cyrogenic Tank 2
230°C with Peek Insulated 3
400°C with Seramic Insulated 4

6 CONNECTION

Thread (ISO 228-1)
1/2flBSP.....04
3/4fl BSP.....05
1fl BSP 06
1 1/2fl BSP 08
2flBSP 09
1/2fl NPT.....12
3/4fl NPT.....13

Clamp (ISO 2852)
DN25 - PN16 ... 21
DN50 - PN16 ... 23

ISO Flange(1092-1)
DN25 - PN40 ... 26
DN32 - PN40 ... 27
DN50 - PN40 ... 28
DN80 - PN40 ... 29
DN100 - PN16 ... 30

ASA Flange (B16.5)
DN50 - 150lb ... 41
DN80 - 150lb ... 43
DN100 - 150lb ... 44

Special
Flange Ø70
Special x
Flanged..71

7 OUTPUT

4-20mA two wire 19
4-20mA three wire 20
0-10V three wire 21
0-20mA three wire 22
3 -180 ohm 23
10-180 ohm 24
240-33 ohm 25
4-20mA two wire+relay 26
Special.....x

8 HOUSING MATERIAL

PlastiC (PBT).....B10p
Aluminum.....B10x
Stainless Steel B101x
Aluminum, Double Cell (B010).....3
Special.....x

9 INSULATION MATERIAL

PTFE.....10
PEEK.....11
Ceramic.....12
Polyamide.....13
PBT.....14
PFA.....17
Rubber.....18
FKM.....19
Special.....x

10 CONNECTION MATERIAL

316 Stainless Steel 02
Brass.....03
Delrin.....09
PTFE.....10
PBT.....14
PVDF.....15
Polypropylene.....16
PVC.....17
Special.....x

11 OPTIONAL

No.....0
With By - Pass Tube..... T
Seperable Electronic Unit..... S
Double Cell Digital Display..... EDS02
Wall Apparatus..... W

SAMPLE

AECAP - 101 - 300mm - 0- 06 - 21 - B10x - 10 - 02 / 0 For Cond. Liquid, L=300mm, 1flBSP, 0-10V, Aluminium Housing

AECAP

CAPACITIVE LEVEL TRANSMITTER

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