AECAS
CAPACITIVE LEVEL SWITCH
AECAS level switch is a capacitive level sensor for level measurement of conductive liquid, nonconductive 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.

Designed for difficult process conditions. Refrigerated models can be manufactured for high temperature and pressure conditions. Calibrations of triggering point and relay operation range can be performed by the user under workplace conditions. It can be connected horizontally or vertically.

**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.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Measurable Material</th>
<th>Conductive liquids, refrigerant non-conductive liquids Solid particulate materials Adhesive and acid / basic liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Output</td>
<td>1 NANK x5 A/250VAC Relay</td>
</tr>
<tr>
<td>Min.Di-Electric Constant</td>
<td>1,6 fF</td>
</tr>
<tr>
<td>Connection Material</td>
<td>304 Stainless Steel Opt. 316 Stainless Steel</td>
</tr>
<tr>
<td>Isolation Material</td>
<td>PTFE, PFA Opt. Peek, Ceramik</td>
</tr>
<tr>
<td>Housing Material</td>
<td>PBT (Std.) Opt. Aluminium Injection, Stainless Steel</td>
</tr>
<tr>
<td>Working Pressure</td>
<td>-1...100 bar (Depending on the model,)</td>
</tr>
<tr>
<td>Working Temperature</td>
<td>(-) 40 / (+150 ºC Depending on the model) 200ºC with cooling apparatus, (Peek Isolator 230ºC Ceramic Isolator 400ºC)</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>(-) 20...(+ 60ºC</td>
</tr>
<tr>
<td>Display</td>
<td>Power LED ve Contact LED</td>
</tr>
<tr>
<td>Isolation</td>
<td>Max. 500V</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Max. 1 W</td>
</tr>
<tr>
<td>Electrical Connection</td>
<td>Connector</td>
</tr>
<tr>
<td>Protection Class (EN60529)</td>
<td>PBT - IP 66, Aluminium, Stainless Steel IP 65</td>
</tr>
<tr>
<td>Test</td>
<td>EMC, Low Voltage</td>
</tr>
<tr>
<td>Max. Tensile Force</td>
<td>Max. 40 NM</td>
</tr>
<tr>
<td>Weight</td>
<td>285 gr. for AECAS 101</td>
</tr>
</tbody>
</table>

**AECAS-CAPACITIVE LEVEL SWITCH**
AECAS 101 / 102 / 103 / 107-AECAS 202 / 203 / 204 / 205-AECAS 301 / 304 / 305 / 30D / 30S-AECAS 408A / 408B / 408P / 408T

**Advantages**
- Optionally high temperature resistant design.
- Easy to assemble and adjust sensitivity.
- No cleaning required.
- Foam, splashes and not affected by coating the probe.
- Can be connected in reverse.
**Working Principle:**

Capacitance definition, assuming two parallel conductive plates are used:

![Capacitance Diagram]

\[ C = \frac{\varepsilon_0 \varepsilon r S}{d} \]

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.

Measurement is made by charge transfer in our capacitive sensors. Total impedance is defined as:

\[ Z = \frac{V}{I} \]

\[ I = \frac{Q}{T} \]  
\[ Q \text{ (Coulomb)} \]
\[ T \text{ (sec)} \]

Capacitive reactance we desire to measure is \((j\omega)^{-1}\). 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

\[ C = \frac{2 \pi \varepsilon_0 \varepsilon r}{\ln \left( \frac{b}{a} \right)} \]

Impedance is calculated by this definition

Excitation applied between 10KHz–250KHz 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

Trigger Point
Sensing Area

Relay operating range adjustable %50
Application Sample

Max. 200°C
With Cooling
Apparatus

1 x NA / NK

Metal Tank

Conductive Liquid

AECAS

AECAS

PLC
AC/DC Delay
Light
Hooter

Max. 200°C
With Cooling
Apparatus

1 x NA / NK

Metal Tank

Non-Conductive
Liquid

AECAS

AECAS

PLC
AC/DC Delay
Light
Hooter
Application Examples:

Max. 200°C With Cooling Apparatus

Metal Tank

Solids Particulate Material

Max. 200°C With Cooling Apparatus

Metal Tank

Adhesive and Acid/Basic Liquid
Parts:

- Cap
- Electronic Unit
- Cable Gland
- Housing
- Connection
- Insulated Probe
- Coaxial Probe
- Extension Pipe
- Isolation
- Electrodes
**Housing:**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MATERIALS</th>
<th>PROTECTION CLASS</th>
<th>TEMPERATURE (°C)</th>
<th>SIZE a x b x c (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B10p</td>
<td>Plastic (PBT)</td>
<td>IP 65 / IP 67</td>
<td>-40...+150</td>
<td>96 x 77</td>
</tr>
<tr>
<td>B10x</td>
<td>Aluminium</td>
<td>IP 65</td>
<td>-40...+150</td>
<td>96 x 77</td>
</tr>
<tr>
<td>B101x</td>
<td>Stainless Steel</td>
<td>IP 65</td>
<td>-40...+150</td>
<td>108 x 79</td>
</tr>
</tbody>
</table>

**Mechanical Connection:**

**Thread**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Hex [mm]</th>
<th>Screw Length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2” BSP</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>3/4” BSP</td>
<td>32</td>
<td>14</td>
</tr>
<tr>
<td>1” BSP</td>
<td>41</td>
<td>23</td>
</tr>
<tr>
<td>1 1/4” BSP</td>
<td>51</td>
<td>23</td>
</tr>
<tr>
<td>1 1/2” BSP</td>
<td>60</td>
<td>23</td>
</tr>
<tr>
<td>2” BSP</td>
<td>70</td>
<td>23</td>
</tr>
</tbody>
</table>

**Flanged**

<table>
<thead>
<tr>
<th>PN</th>
<th>D (mm)</th>
<th>D1 (mm)</th>
<th>b (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN25</td>
<td>165</td>
<td>85</td>
<td>16</td>
</tr>
<tr>
<td>DN50</td>
<td>165</td>
<td>115</td>
<td>18</td>
</tr>
</tbody>
</table>

**Clamp**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Çap [mm]</th>
<th>b (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN32</td>
<td>50,5</td>
<td>32</td>
</tr>
<tr>
<td>DN50</td>
<td>64</td>
<td>50</td>
</tr>
<tr>
<td>DN65</td>
<td>91</td>
<td>65</td>
</tr>
</tbody>
</table>
Electrical Connection:

Indification and Calibration:

* **RlyLED:** “Relay active” during normal operation; means operation continues during calibration. Flashes continuously in normal operation mode – if relay is active– and blinks in calibration mode. It is red colored.

* **PwrLED:** Means there is no sensor failure during normal operation, and means “desired measurement values are saved in memory” during calibration. Operates by flashing. If light is continuous, it indicates failure. It is green colored.

* **CAL - S Button:** Used to acquire “High Level-span-” value during calibration.

* **CAL - Z Button:** Used to acquire “Low Level-zero-” value during calibration.

* **TST Button:** During normal operation, functions as “Relay Test”; during calibration, performs “saving to nonvolatile memory” of Zero-Span, the values previously acquired by S and Z button, function.

* **LVL - C Pot:** Adjusts relay triggering point between Zero-Span values.

* **LVL - F Pot:** Performs as “fine tuning” for triggering point. Adjustment field is equal to +/-5% of the point adjusted by “C Pot” (total 10%).

* **DIF Pot:** Adjusts “Release” level of the relay activated by “C/F Pot”. Highest adjustable value is equal to half (50%) of the operation region specified by “Z and S”. Meaning that, when DIF Pot is at 100% and relay is pulled, the level to release shall be reduced as half of the total scale.

Electronic Unit with Cable:

Electronic unit and sensor component can be separated by a cable protected against exterior conditions for easy calibration on site. Cable provides easy assembly for user by its property not affecting capacitive measurement.

Sample Model:

Cooling Equipment:
Sample Models:

<table>
<thead>
<tr>
<th>Model Measuring Range</th>
<th>Probe</th>
<th>Process Pressure/ Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECAS 101 L=250mm.(Std) Max. 4 m.</td>
<td></td>
<td>-1...+100 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 102 L=250mm.(Std) Max. 4 m.</td>
<td>Fully Insulated Coaxial Probe Insulated Tank</td>
<td>-1...+100 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 103 L=250mm.(Std) Max. 1 m.</td>
<td>Fully Insulated Coaxial Probe Insulated Tank</td>
<td>-1...+100 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 107 L=1mt.(Std) Max. 32 m.</td>
<td>Fully Insulated Probe Metal Tank</td>
<td>-1...+60 bar -40...+150°C</td>
</tr>
</tbody>
</table>
Sample Models:

AECAS 101

AECAS 102

AECAS 103

AECAS 107

AECAS 107

L=250 mm (Std.), Max 4 m.

L=250 mm (Std.), Max 4 m.

L=250 mm (Std.), Max 4 m.

L=1000 mm (Std.), Max. 16 m.

L=1000 mm (Std.), Max. 32 m.
### Sample Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Measuring Range</th>
<th>Probe</th>
<th>Process Pressure/Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AECAS 202</strong></td>
<td>L=250mm.(Std)</td>
<td>Partly Insulated</td>
<td>-1...+100 bar</td>
</tr>
<tr>
<td></td>
<td>Max. 4 m.</td>
<td>Coaxial Probe</td>
<td>-40...+150°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metal / Insulated Tank</td>
<td></td>
</tr>
<tr>
<td><strong>AECAS 203</strong></td>
<td>L=250mm.(Std)</td>
<td>Partly Insulated</td>
<td>-1...+100 bar</td>
</tr>
<tr>
<td></td>
<td>Max. 1 m.</td>
<td>Coaxial Probe</td>
<td>-40...+150°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metal / Insulated Tank</td>
<td></td>
</tr>
<tr>
<td><strong>AECAS 204</strong></td>
<td>L=1mt.(Std)</td>
<td>Partly Insulated Rope</td>
<td>-1...+60 bar</td>
</tr>
<tr>
<td></td>
<td>Max. 32 m.</td>
<td>Metal Tank</td>
<td>-40...+150°C</td>
</tr>
<tr>
<td><strong>AECAS 205</strong></td>
<td>L=250mm.(Std)</td>
<td>Partly Insulated Rope</td>
<td>-1...+60 bar</td>
</tr>
<tr>
<td></td>
<td>Max. 6 m.</td>
<td>Metal Tank</td>
<td>-40...+150°C</td>
</tr>
</tbody>
</table>
Sample Models:

**ECAS 202**

- 70 Hex
- 2" BSP
- L = 250 mm (Std.), Max. 4 m.

**ECAS 203**

- 32 Hex
- 1/4" BSP
- L = 250 mm (Std.), Max. 1 m.

**ECAS 205**

- 41 Hex
- 1" BSP
- PTFE
- L = 250 mm (Std.), Max. 1 m.

**ECAS 204**

- 41 Hex
- 1" BSP
- PTFE
- L = 1000 mm (Std.), Max. 10 m.

**ECAS 204**

- 60 Hex
- 1 1/2" BSP
- L = 1000 mm (Std.), Max. 16 m.

**ECAS 204**

- 70 Hex
- 2" BSP
- L = 1000 mm (Std.), Max. 32 m.
Sample Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Measuring Range</th>
<th>Probe</th>
<th>Process Pressure/ Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECAS 301</td>
<td>L=250mm.(Std) Max. 1 m.</td>
<td>Insulated Probe Metal Tank</td>
<td>-1...+25 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 304</td>
<td>L=1mt.(Std) Max. 32 m.</td>
<td>Partly Insulated Rope Metal Tank</td>
<td>-1...+25 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 305</td>
<td>L=250mm.(Std) Max. 6 m.</td>
<td>Partly Insulated Probe Metal Tank</td>
<td>-1...+25 bar -40...+150°C</td>
</tr>
<tr>
<td>ECAS 305m</td>
<td>L=250mm.(Std) Max. 1 m.</td>
<td>Partly Insulated Probe Metal Tank</td>
<td>-1...+25 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 30D</td>
<td>L=380 mm.(Std) Max. 4 m.</td>
<td>Partly Double Insulated Probe Metal / Insulated Tank</td>
<td>-1...+25 bar -40...+200°C</td>
</tr>
<tr>
<td>AECAS 30S</td>
<td>L=380 mm.(Std) Max. 4 m.</td>
<td>Partly Insulated Probe Metal Tank</td>
<td>-1...+25 bar -40...+400°C</td>
</tr>
</tbody>
</table>
Sample Models:

**AECAS 301**

- L = 250 mm (Std.), Max. 1 m.
- For antistatic material

**AECAS 305**

- L = 250 mm (Std.), Max. 6 m.

**AECAS 304**

- L = 1000 mm (Std.), Max. 32 m.

**AECAS 30D**

- L = 380 mm (Std.), Max. 4 m.

**AECAS 30S**

- L = 380 mm (Std.), Max. 4 m.
### Sample Models:

<table>
<thead>
<tr>
<th>Model Measuring Range</th>
<th>Probe</th>
<th>Process Pressure/Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECAS 408A L=250mm.(Std)</td>
<td>Aggressive Liquids Double Insulated Probe Metal / Insulated Tank</td>
<td>-1...+100 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 408B L=250mm.(Std)</td>
<td>Aggressive Liquids Partly Insulated Double Probe Metal / Insulated Tank</td>
<td>-1...+60 bar -40...+150°C</td>
</tr>
<tr>
<td>AECAS 408P L=250mm.(Std)</td>
<td>Solid Particulate Double Probe Metal / Insulated Tank</td>
<td>-1...+25 bar -20...+80°C</td>
</tr>
<tr>
<td>AECAS 408T L=250mm.(Std)</td>
<td>Acid/Basic Liquids Fully Insulated Double Probe Metal / Insulated Tank</td>
<td>-1...+60 bar -40...+150°C</td>
</tr>
</tbody>
</table>
Sample Models:

- **AECAS 301**
  - L=250 mm (Std.), Max. 1 m.
  - For antistatic material

- **AECAS 305m**
  - L=250 mm (Std.), Max. 1 m.

- **AECAS 305**
  - L=250 mm (Std.), Max. 6 m.

- **AECAS 304**
  - L=1000 mm (Std.), Max. 32 m.

- **AECAS 30D**
  - L=380 mm (Std.), Max. 4 m.

- **AECAS 30S**
  - L=380 mm (Std.), Max. 4 m.
Order Form: Please consider sample models when coding.

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

2. CERTIFICATE
   No..............................................0

3. PROBE TYPE (MAX. LENGHT)
   Fully Insulated Probe (Max. 4 m.).......1
   Coaxial Probe, (Max. 4 m.) Ø38 ........2
   Partly Insulated Probe (Max. 32 m.)....3
   Partly Insulated Probe, (Max. 6 m.)....4
   High Temperature (Max. 4 m.)............5
   Complete Insulated Rope Probe (0...32 m.)7
   Double Insulated Probe, (Max. 4 m.)....8
   Non Insulated Double Probe (Max. 6 m.)..8B
   Insulated Double Probe (Max. 4 m.)....8T
   Double Rope Probe (Max. 32 m.)..........9
   Single Insulated Probe (Max. 4 m.)......S
   Special Insulated Probe..................x

4. STEM LENGHT
   ................................................0

5. PROCESS TEMPERATURE
   150°C Standard ................................0
   200°C with Cooling Apparatus ............1
   (-)196°C For Cryogenic Tank .............2
   230°C with Peek Insulated ...............3
   400°C with Ceramic Insulated ...........4

6. CONNECTION
   Thread (ISO 228-1)  Clamp (ISO 2852)  ISO Flange (1092-1)  ASA Flange (B16.5)  Special Flange
   1/2" BSP ...........04  DN25 - PN16 .. 21  DN25 - PN40 .. 26  DN50 - 150lb .. 41  Ø70 Flanged..71
   3/4" BSP ...........05  DN50 - PN16 .. 23  DN32 - PN40 .. 27  DN80 - 150lb .. 43  Special........x
   1" BSP ............06  DN50 - PN40 .. 28  DN50 - PN40 .. 28  DN100 - 150lb .. 44
   1 1/2" BSP ...........08  DN80 - PN40 .. 29
   2" BSP ...............09  DN100 - PN16 .. 30
   1/2" NPT ...........12
   3/4" NPT ...........13

7. OUTPUT
   Relay Output................................11
   Special....................................x

8. HOUSING MATERIAL
   Plastic (PBT)..........................B10p
   Aluminium..........................B10x
   Stainless Steel ......................B101x

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
    Special ................................x

11. OPTIONAL
    No.........................................../ 0
    Seperable Electronic Unit ............./ S
    Wall Apparatus ........................../ W

SAMPLE
   ECAS - 101 - 300mm- 0 - 3 - 06 - 11 - B10x - 11 - 02 / 0 For Cond. Liquid, L=300mm, 1" BSP, Relay Output, Aluminium Housing