The AX-UL-Sxx-xx-x are a range of Ultrasonic level sensors designed for level measurement in tanks or sumps. They provide a 4-20mA output to the BMS system or alarm. The units use non-intrusive ultrasonic pulse technology such that any liquid can be measured. The units are housed in an IP68 housing and are fixed to the top of the tank. Set-up is by means of push buttons to set the full/empty levels. Two standard ranges of 6m and 8m are available. Additional options available include relay and HART outputs, and an LCD display/programming module.

**Product overview**

- Mounted on the top of a tank
- Built in temperature compensation

**Features**

- Non-intrusive design
- Easy to set-up

**Product specifications**

**Power Supply:**
12 to 36Vdc  720mW 2-wire loop powered

**Output signal:**
4-20mA loop (maximum 600 Ohm load)

**Measuring Range:**
-370 to 8.0m (20mA to 4mA - can be reversed)
-380 to 6.0m (20mA to 4mA - can be reversed)

**Accuracy:**
± (0.2% measured distance plus 0.05% of the range)

**Resolution:**
- 1mm
- 2mm
- 5mm

**Beam Angle:**
-7° (this area to be kept clear of obstacles in the tank)

**Process Temperature:**
- -370 to +90°C
- -380 to +70°C

**Operating Pressure:**
0.3 to 3 bar

**IP Rating:**
- Housing: IP67
- Sensor: IP68

**Materials:**
- SxP Polypropylene
- SxV PVDF (recommended for diesel)

**Mounting:**
2” BSP

**Electromagnetic Compatibility:**
EN61326

**Digital Communications:**
- Option -4 and -8 versions Hart

**Integral Relay:**
- Option Add R to part no.

**Display:**
- Option - SGx 6 digit LCD Display - full programming configuration & optimisation for 11 tank shapes

Note, display can be ordered separately as part AX-UL-SAP200

**Country of Origin:**
EU

**Order code break down:**
See page 2 for common codes

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Email: sales@annicom.com  Website: www.annicom.com

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**Order codes** for 2-Wire, 4-20mA output Ultrasonic Level Sensors

<table>
<thead>
<tr>
<th>Polypropylene housing</th>
<th>PVDF housing (recommended for diesel tanks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX-UL-SEP380-2</td>
<td>AX-UL-SEV380-2</td>
</tr>
<tr>
<td>AX-UL-SEP370-2</td>
<td>AX-UL-SEV370-2</td>
</tr>
<tr>
<td>AX-UL-SEP380-4</td>
<td>AX-UL-SEV380-4</td>
</tr>
<tr>
<td>AX-UL-SEP370-4</td>
<td>AX-UL-SEV370-4</td>
</tr>
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<td>AX-UL-SGP380-2</td>
<td>AX-UL-SGV380-2</td>
</tr>
<tr>
<td>AX-UL-SGP370-2</td>
<td>AX-UL-SGV370-2</td>
</tr>
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<td>AX-UL-SGP380-4</td>
<td>AX-UL-SGV380-4</td>
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<tr>
<td>AX-UL-SGP370-4</td>
<td>AX-UL-SGV370-4</td>
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<tr>
<td>AX-UL-SEP380-6</td>
<td>AX-UL-SEV380-6</td>
</tr>
<tr>
<td>AX-UL-SEP370-6</td>
<td>AX-UL-SEV370-6</td>
</tr>
<tr>
<td>AX-UL-SEP380-8</td>
<td>AX-UL-SEV380-8</td>
</tr>
<tr>
<td>AX-UL-SEP370-8</td>
<td>AX-UL-SEV370-8</td>
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<tr>
<td>AX-UL-SGP380-6</td>
<td>AX-UL-SGV380-6</td>
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<td>AX-UL-SGV370-6</td>
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<td>AX-UL-SGV380-6</td>
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<td>AX-UL-SGV370-6</td>
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<td>AX-UL-SGP380-8</td>
<td>AX-UL-SGV380-8</td>
</tr>
<tr>
<td>AX-UL-SGP370-8</td>
<td>AX-UL-SGV370-8</td>
</tr>
</tbody>
</table>

Add suffix ‘R’ to any code

- Relay Output
- LCD Display/programming module

**Default measurement outputs:**

<table>
<thead>
<tr>
<th>Measured current mA</th>
<th>Indicated distance m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit type (range)</td>
</tr>
<tr>
<td>4.0</td>
<td>-380</td>
</tr>
<tr>
<td>6.0</td>
<td>-370</td>
</tr>
<tr>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

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**Dimensions and connections**

**Installation of the BSP threaded models:**

- Screw the unit in to its place. Use open wrench for tightening; max torque is 20Nm.

- After tightening, the enclosure can be rotated to the proper position. (Safety bolt prevents more than 350°)

- The unit may be damaged by electrostatic discharge (EDS) via its terminal, thus apply the precautions commonly used to avoid electrostatic discharge e.g. by touching a properly grounded point before removing the cover of the enclosure.

- Ensure that the power supply is turned off at the source.

- With the cover of the housing removed and taking out the display module (if any), the screw terminals can be accessed. Suggested cable core cross section: 0.5 to 1.5mm².

- These sensors **must** be connected from the ground screw to an external ground point.

- Switch on the unit and make necessary programming adjustments.

- After programming ensure proper sealing and closing of the cover.

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**NOTE:** If mounting the unit directly to the tank (without our mounting flange) ensure that the mounting is non-metallic. (A metallic mounting is likely to resonate and affect the performance of the ultrasonic units.)
Programming without AX-UL-SAP display module

Programming is only possible if the EchoTREK is in level measuring mode and receives valid echo i.e. “VALID” LED is lit!

The following can be programmed without display module.
- Assignment of the 4mA to a required e.g. min. Level/max. distance
- Assignment of the 20mA to a required e.g. max. Level/min. distance
- Error indication by the current output (Hold, 3.6mA or 22mA)

NOTE: Current output can also be assigned in inverted mode:
4mA = 100% (Full), 20mA = 0% (Empty)

Programming procedure: press buttons in the relevant sequence and check the state of the LEDs as below.

Symbols for the states of the LEDs are:
○ = LED is off, ● = LED is blinking, ●● = LED is on, ●●○ = LEDs are blinking alternately, ❌ = Do not care

Minimum level (0%, empty tank) assignment to 4mA

<table>
<thead>
<tr>
<th>Action</th>
<th>LED state following the action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Check for a valid Echo</td>
<td>❌●● = Valid Echo, transmitter is programmable</td>
</tr>
<tr>
<td>2) Press NEXT button steadily</td>
<td>○○○ = Unit in programming mode</td>
</tr>
<tr>
<td>3) Press UP button steadily</td>
<td>●●● = 4mA assigned to the distance (see picture)</td>
</tr>
<tr>
<td>4) Release buttons</td>
<td>○○○ = Programming completed</td>
</tr>
</tbody>
</table>

Maximum level (100%, full tank) assignment to 20mA

<table>
<thead>
<tr>
<th>Action</th>
<th>LED state following the action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Check for a valid Echo</td>
<td>❌●● = Valid Echo, transmitter is programmable</td>
</tr>
<tr>
<td>2) Press NEXT button steadily</td>
<td>○○○ = Unit in programming mode</td>
</tr>
<tr>
<td>3) Press DOWN button steadily</td>
<td>●●● = 20mA assigned to the distance (see picture)</td>
</tr>
<tr>
<td>4) Release buttons</td>
<td>○○○ = Programming completed</td>
</tr>
</tbody>
</table>

‘Error state’ indication

<table>
<thead>
<tr>
<th>Action</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1) Check for a valid Echo</td>
<td>❌●● = Valid Echo, transmitter is programmable</td>
</tr>
<tr>
<td>2) Press NEXT button steadily</td>
<td>○○○ = Unit in programming mode</td>
</tr>
<tr>
<td>3) Press DOWN button steadily</td>
<td>●●● = for hold last value</td>
</tr>
<tr>
<td>or ENTER button steadily</td>
<td>●●● = for 3.6mA</td>
</tr>
<tr>
<td>or NEXT button steadily</td>
<td>●●● = for 22mA</td>
</tr>
<tr>
<td>4) Release buttons</td>
<td>○○○ = Programming completed</td>
</tr>
</tbody>
</table>

LED indication of errors during programming

<table>
<thead>
<tr>
<th>Action</th>
<th>LED state following the action</th>
<th>Possible correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempted programming</td>
<td>○○○ = blinking twice - no Echo</td>
<td>Find a valid echo</td>
</tr>
<tr>
<td>Attempted programming</td>
<td>○○○ = blinking three times = no access possible</td>
<td>With Display module only</td>
</tr>
<tr>
<td>Attempted programming</td>
<td>○○○ = blinking four times = not in Level Measurement mode</td>
<td>With Display module only</td>
</tr>
</tbody>
</table>

Damping (10, 30 or 60 sec) and ‘Reset to factory default’ can also be completed without the display module. Please ask the factory for details of these settings.
Programming with AX-UL-SAP200 display module

The SAP 200 supports 2 separately accessible programming modes representing 2 layers of programming complexity, dependant on the user choice.

QUICKSET
Recommended as a simple and fast way to set up the EchoTREK by 6 basic parameters for the following basic settings, marked by abbreviations easy to remember:

- Engineering unit for the display (Metric or US)
- Maximum measuring distance (H)
- Assignment of min level to 4mA
- Assignment of max level to 20mA
- Error indication by the current output
- Damping time

Full Parameter Access
All features of the EchoTREK such as:

- Measurement configuration
- Outputs
- Measurement optimisation
- 11 pre-programmed tank shapes for volume calculation
- 21 pre-programmed formula for flow metering
- 32-point linearisation

SAP200 Display Module
Symbols used on the LCD:

- DIST - Distance (measuring) mode
- LEV - Level (measuring) mode
- VOL - Volume (measuring) mode
- FLOW - Open channel (flow metering) mode
- PROG. - Programming mode (device under programming)
- RELAY - ‘C2’ circuit of the relay is closed
- TOT1 volume flow totaliser (resettable aggregate)
- T2 - TOT2 volume flow totaliser (aggregate)
- FAIL - Measurement / device error
- - Level changing direction
- Bargraph assigned to the current output or echo strength
Symbols used on the frame:

- M - Metric system
- US - US calculation

LEDs lit

- COM - digital (Hart) communication
- VALID - presence of valid echo

IrDA - Infrared communication port for logger readout, diagnostics and software upgrade.

**Steps of the SAP200 Display Module**

Programming will be performed by the pressing and releasing the relevant one or two keys (simultaneously).

**Single key pressing**

- **ENTER**
  - To select parameter address and go to parameter value
  - To save parameter value and return to parameter address

- **NEXT**
  - To move the blinking (sign of change) of the digit to the left
- **UP**
  - To increase value of the blinking digit
- **DOWN**
  - To decrease value of the blinking digit

**Double key pressing**

Press the two keys simultaneously for desired programming step.

**SAP200 indications:**

Depending on the measurement, one of the below symbols will light and the process value display. Engineering units will be indicated directly (˚C, ˚F and mA) and by the lit arrow showing towards them on the frame.

- DIST distance
- LEV level
- VOL volume
- FLOW flow
- T1/T2 totalised values
- FAIL (blinking) Error code displayed

The following process values can be displayed:

- Volume / Flow - if programmed
- Level - if programmed
- Distance - if programmed
- Warning indications - FAIL blinking

Display screens can be scrolled by pressing key NEXT.

To return to the screen of the selected measurement mode key ENTER should be pressed.

Temperature can be displayed by pressing UP.

Current output value can be displayed by pressing DOWN.

For paging readouts NEXT key should be pressed.

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