

# Ultrasonic Diffuse, Digital Output Types UA18CAD.....TI

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- Cylindrical M18 PBT housing
- Sensing distance: 50-2200 mm
- Power supply: 15 to 30 VDC
- Outputs: Two multi function switching outputs. PNP or NPN
- Setup: Normal switching or adjustable hysteresis
- Repeatability 0.5%
- Beam angle.  $\pm 7^\circ$  or  $\pm 8^\circ$
- Protection: Short-circuit, reverse polarity and overvoltage
- Protection degree IP 67
- 2 m cable or M12 plug

## Product Description

A self-contained multi function diffuse ultrasonic sensor with a sensing range of 50 to 2200 mm in three ranges. 2 switching outputs - easily set up for two different output modes and adjusted by teach-in - makes it ideal for level control tasks in a wide variety of vessels. A sturdy

one-piece polyester housing provides the perfect packaging for the sophisticated microprocessor controlled and digitally filtered sensor electronics. Excellent EMC performance and precision are typical features of this sensor on true distance measurement.

## Ordering Key

UA18CAD04NPM1TI

|                      |       |
|----------------------|-------|
| Ultrasonic sensor    | _____ |
| Housing style        | _____ |
| Housing size         | _____ |
| Housing material     | _____ |
| Housing length       | _____ |
| Detection principle  | _____ |
| Sensing distance     | _____ |
| Output type          | _____ |
| Output configuration | _____ |
| Connection           | _____ |
| Teach-in             | _____ |

## Type Selection

| Housing diameter | Connection | Rated operating dist. (S <sub>n</sub> ) | Digital output NPN/PNP | Ordering no.          |
|------------------|------------|-----------------------------------------|------------------------|-----------------------|
| M18              | Plug M12   | 50-400 mm                               | 2 x NPN                | UA 18 CAD 04 NP M1 TI |
| M18              | Cable      | 50-400 mm                               | 2 x NPN                | UA 18 CAD 04 NP TI    |
| M18              | Plug M12   | 50-400 mm                               | 2 x PNP                | UA 18 CAD 04 PP M1 TI |
| M18              | Cable      | 50-400 mm                               | 2 x PNP                | UA 18 CAD 04 PP TI    |
| M18              | Plug M12   | 100-900 mm                              | 2 x NPN                | UA 18 CAD 09 NP M1 TI |
| M18              | Cable      | 100-900 mm                              | 2 x NPN                | UA 18 CAD 09 NP TI    |
| M18              | Plug M12   | 100-900 mm                              | 2 x PNP                | UA 18 CAD 09 PP M1 TI |
| M18              | Cable      | 100-900 mm                              | 2 x PNP                | UA 18 CAD 09 PP TI    |
| M18              | Plug M12   | 200-2200 mm                             | 2 x NPN                | UA 18 CAD 22 NP M1 TI |
| M18              | Cable      | 200-2200 mm                             | 2 x NPN                | UA 18 CAD 22 NP TI    |
| M18              | Plug M12   | 200-2200 mm                             | 2 x PNP                | UA 18 CAD 22 PP M1 TI |
| M18              | Cable      | 200-2200 mm                             | 2 x PNP                | UA 18 CAD 22 PP TI    |

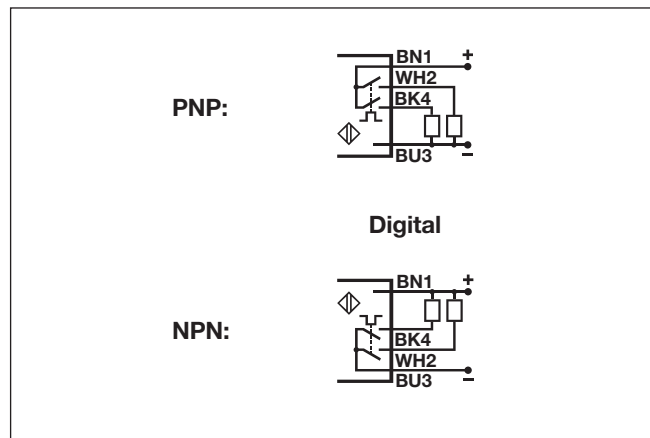
## Specifications

|                                                            |                                                                                                                                                     |                                                            |                                                                  |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------|
| Rated operating distance (S <sub>n</sub> )                 | Reference target: 1 mm metal rolled finish.<br>CAD04: 100 x 100 mm<br>CAD09 and CAD22: 200 x 200 mm<br>50 - 400 mm<br>100 - 900 mm<br>200 - 2200 mm | Repeatability                                              | 0.5%                                                             |
| UA18CAD04<br>UA18CAD09<br>UA18CAD22                        |                                                                                                                                                     | Beam angle<br>UA18CAD04...<br>UA18CAD09...<br>UA18CAD22... | $\pm 8^\circ$<br>$\pm 7^\circ$<br>$\pm 7^\circ$                  |
| Blind zone<br>UA18CAD04...<br>UA18CAD09...<br>UA18CAD22... | $\leq 50$ mm<br>$\leq 100$ mm<br>$\leq 200$ mm                                                                                                      | Adjustment<br>Push-button                                  | P1 (farthest setpoint)<br>P2 (nearest setpoint)                  |
|                                                            |                                                                                                                                                     | Temperature drift                                          | $\leq 0.1\%/^\circ\text{C}$ @ $-20^\circ$ to $+60^\circ\text{C}$ |
|                                                            |                                                                                                                                                     | Temperature compensation                                   | Yes                                                              |

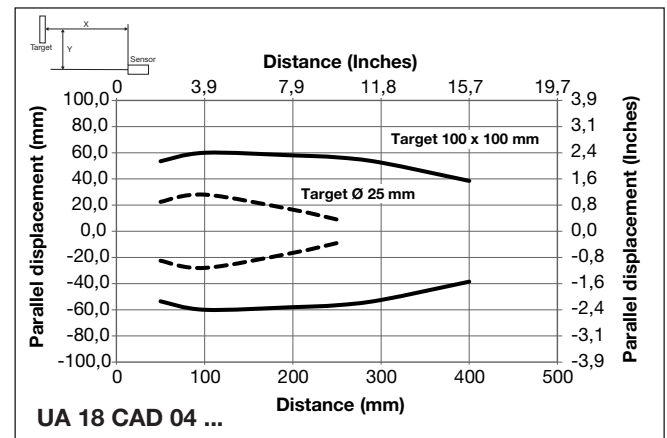
## Specifications (cont.)

|                                                       |                                                                      |                                 |                                                                                                        |
|-------------------------------------------------------|----------------------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Hysteresis (H)</b>                                 | Min. 1 %                                                             |                                 |                                                                                                        |
| <b>Rated operational voltage (<math>U_B</math>)</b>   | 15 to 30 VDC<br>(ripple included)                                    |                                 | Normal Switching function<br>with N.O. output.<br>Adjustable hysteresis<br>Filling or emptying control |
| <b>Ripple (<math>U_{rip}</math>)</b>                  | ≤ 5 %                                                                |                                 |                                                                                                        |
| <b>No-load supply current (<math>I_o</math>)</b>      |                                                                      |                                 |                                                                                                        |
| UA18CAD04...                                          | ≤ 45 mA @ $U_B$ max                                                  |                                 |                                                                                                        |
| UA18CAD09...                                          | ≤ 45 mA @ $U_B$ max                                                  |                                 |                                                                                                        |
| UA18CAD22...                                          | ≤ 50 mA @ $U_B$ max                                                  |                                 |                                                                                                        |
| <b>Output current continuous (<math>I_o</math>)</b>   |                                                                      |                                 |                                                                                                        |
| Max. load capacity 100 nF                             | ≤ 500 mA                                                             |                                 |                                                                                                        |
| UL508 specification                                   | ≤ 100 mA                                                             |                                 |                                                                                                        |
| <b>Output current short-time (I)</b>                  |                                                                      |                                 |                                                                                                        |
| Max. load capacity 100 nF                             | ≤ 500 mA                                                             |                                 |                                                                                                        |
| UL508 specification                                   | ≤ 100 mA                                                             |                                 |                                                                                                        |
| <b>Minimum operational current (<math>I_m</math>)</b> | ≤ 0.5 mA                                                             |                                 |                                                                                                        |
| <b>OFF-state current (<math>I_r</math>)</b>           | ≤ 10 $\mu$ A                                                         |                                 |                                                                                                        |
| <b>Voltage drop (<math>U_d</math>)</b>                | ≤ 2.2 VDC @ $I_o$ max.                                               |                                 |                                                                                                        |
| <b>Protection</b>                                     | Short-circuit, overvoltage<br>and reverse polarity                   |                                 |                                                                                                        |
| <b>Carrier frequency</b>                              |                                                                      |                                 |                                                                                                        |
| UA18CAD04...                                          | 400 kHz                                                              |                                 |                                                                                                        |
| UA18CAD09...                                          | 300 kHz                                                              |                                 |                                                                                                        |
| UA18CAD22...                                          | 200 kHz                                                              |                                 |                                                                                                        |
| <b>Operating frequency (f)</b>                        |                                                                      |                                 |                                                                                                        |
| UA18CAD04...                                          | ≤ 10 Hz                                                              |                                 |                                                                                                        |
| UA18CAD09...                                          | ≤ 4 Hz                                                               |                                 |                                                                                                        |
| UA18CAD22...                                          | ≤ 1 Hz                                                               |                                 |                                                                                                        |
| <b>Response time OFF-ON (<math>t_{ON}</math>)</b>     |                                                                      |                                 |                                                                                                        |
| UA18CAD04...                                          | ≤ 50 mS                                                              |                                 |                                                                                                        |
| UA18CAD09...                                          | ≤ 125 mS                                                             |                                 |                                                                                                        |
| UA18CAD22...                                          | ≤ 500 mS                                                             |                                 |                                                                                                        |
| <b>Response time ON-OFF (<math>t_{OFF}</math>)</b>    |                                                                      |                                 |                                                                                                        |
| UA18CAD04...                                          | ≤ 50 mS                                                              |                                 |                                                                                                        |
| UA18CAD09...                                          | ≤ 125 mS                                                             |                                 |                                                                                                        |
| UA18CAD22...                                          | ≤ 500 mS                                                             |                                 |                                                                                                        |
| <b>Power ON delay</b>                                 | ≤ 900 mS                                                             |                                 |                                                                                                        |
| <b>Output function, open collector</b>                |                                                                      |                                 |                                                                                                        |
| By sensor type                                        | NPN or PNP                                                           |                                 |                                                                                                        |
| <b>Output switching function</b>                      | Two open collector transis-<br>tor outputs to be config-<br>ured as: |                                 |                                                                                                        |
|                                                       |                                                                      | <b>Indication Output ON</b>     | Yellow LED                                                                                             |
|                                                       |                                                                      | <b>Environment</b>              |                                                                                                        |
|                                                       |                                                                      | Installation category           | III (IEC 60664/60664A;<br>60947-1)                                                                     |
|                                                       |                                                                      | Pollution degree                | 3 (IEC 60664/60664A;<br>60947-1)                                                                       |
|                                                       |                                                                      | Degree of protection            | IP67 (IEC 60529; 60947-1)                                                                              |
|                                                       |                                                                      | <b>Ambient temperature</b>      |                                                                                                        |
|                                                       |                                                                      | Operating                       | -20° to +60°C (-4° to +140°F)                                                                          |
|                                                       |                                                                      | Storage                         | -35° to +70°C (-31° to +158°F)                                                                         |
|                                                       |                                                                      | <b>Vibration</b>                | 10 to 55 Hz, 1.0 mm/6g<br>(IEC/EN 60068-2-6)                                                           |
|                                                       |                                                                      | <b>Shock</b>                    | 30 g / 11 mS, 3 directions<br>(IEC/EN 60068-2-27)                                                      |
|                                                       |                                                                      | <b>Rated insulation voltage</b> | < 500 VAC (rms)                                                                                        |
|                                                       |                                                                      | <b>Housing</b>                  |                                                                                                        |
|                                                       |                                                                      | Material body                   | PBT                                                                                                    |
|                                                       |                                                                      | Material front                  | Epoxy-glass resin                                                                                      |
|                                                       |                                                                      | Material back, plug             | Grilamid                                                                                               |
|                                                       |                                                                      | Material back, cable            | Grilamid                                                                                               |
|                                                       |                                                                      | Material push-button            | POM                                                                                                    |
|                                                       |                                                                      | Sealing around push-button      | TPE                                                                                                    |
|                                                       |                                                                      | Material sealing front          |                                                                                                        |
|                                                       |                                                                      | UA18CAD04...                    | TPE                                                                                                    |
|                                                       |                                                                      | UA18CAD09...                    | TPE                                                                                                    |
|                                                       |                                                                      | UA18CAD22...                    | PBT                                                                                                    |
|                                                       |                                                                      | <b>Connection</b>               |                                                                                                        |
|                                                       |                                                                      | Cable                           | PVC, grey, 2 m,<br>4 x 0.32 mm <sup>2</sup> , Ø = 4.7                                                  |
|                                                       |                                                                      | mm                              |                                                                                                        |
|                                                       |                                                                      | Plug                            | M12, 4-pin (CON. 14-series)                                                                            |
|                                                       |                                                                      | <b>Tightening torque</b>        | ≤ 1 Nm                                                                                                 |
|                                                       |                                                                      | <b>Weight</b>                   |                                                                                                        |
|                                                       |                                                                      | Cable version                   | 98 g                                                                                                   |
|                                                       |                                                                      | Plug version                    | 35 g                                                                                                   |
|                                                       |                                                                      | <b>CE-marking</b>               | Yes                                                                                                    |
|                                                       |                                                                      | <b>Approvals</b>                | cULus (UL508)                                                                                          |

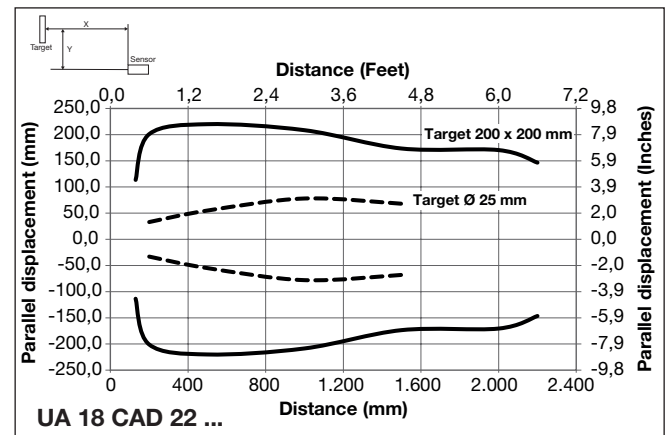
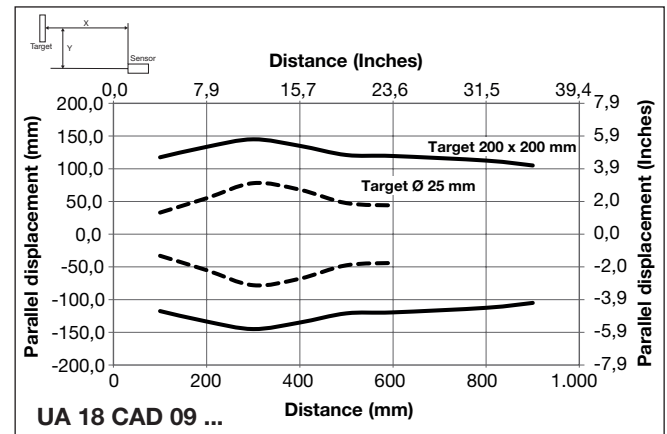
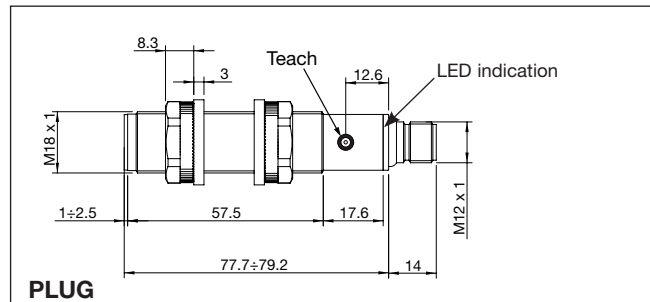
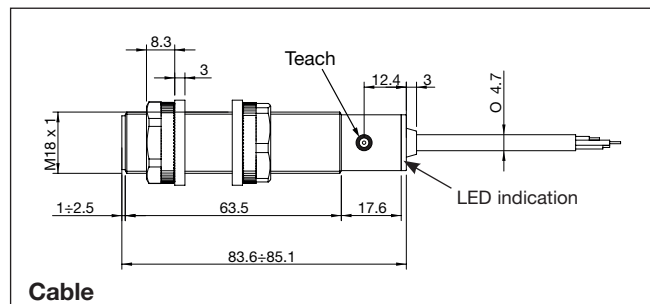
## Wiring Diagram



## Detection Range



## Dimensions



## Programming setup

**General set up of sensing point P1 (longest distance) and P2 (shortest distance) independently of the sensor type or function.**

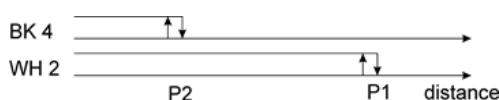
- 1) Mount the sensor in the selected application.
- 2) Place a target in front of the sensor at the maximum required distance (P1), then press shortly on the teach-button. The yellow LED switches Off and then On again after a maximum of 2 seconds. Now, the distance (P1) is saved in the sensor, and the target can be moved. I)
- 3) Place the target at the minimum distance requested (P2), then press shortly on the teach-button. The yellow LED turns Off and then flashes 5 times. Now, the distance (P2) is saved in the sensor and the target can be moved. II)

I) P1 can be set to maximum exceeding the family specification for the sensor by removing the target in front of the sensor. Push and hold the teach-button for more than one second and the sensing distance is set at a unique distance for this sensor only.

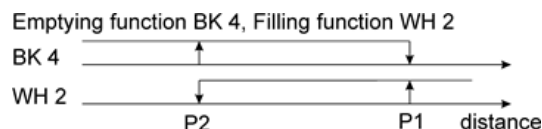
II) The second switch point can be set to minimum by setting the target within the blind zone close to the sensor head or by covering the sensor head with your hand while teaching P2.

**Sensors with 2 digital outputs: UA..CAD..PP/NP types, Normal sensing function or Adjustable Hysteresis**

- 1) The factory settings are normal sensing function.

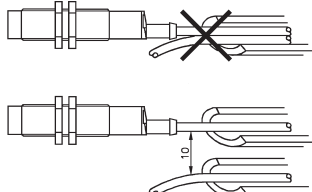
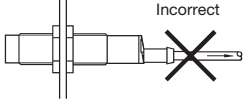
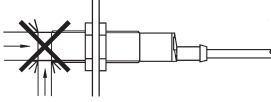
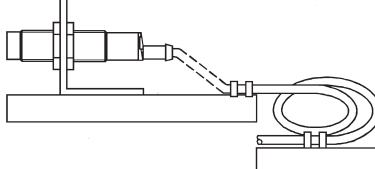


- 2) Push and hold the teach-button for 8 seconds (12 for UC18CAD22..) until the yellow LED flashes fast, then release the teach-button and the LED will flash 5 times to acknowledge the change in function. Now, the sensor is in adjustable hysteresis mode.



- 3) To switch back to normal function, repeat step 2.

## Installation Hints

|                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                             |                                                                                                                                                                                         |                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>To avoid interference from inductive voltage/current peaks, separate the prox. switch power cables from any other power cables, e.g. motor, contactor or solenoid cables</p>  | <p>Relief of cable strain</p> <p>Incorrect</p>  <p>Correct</p>  <p>The cable should not be pulled</p> | <p>Protection of the sensing face</p>  <p>A proximity switch should not serve as mechanical stop</p> | <p>Switch mounted on mobile carrier</p>  <p>Any repetitive flexing of the cable should be avoided</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Delivery Contents

- Ultrasonic sensor: UA18CAD....
- Installation instruction
- Mounting:
  - 2 x M18 Nuts
  - 2 x rubber washers
- **Packaging:** Carton box 35 x 107 x 173 mm