# Ultrasonic
# Diffuse, Analogue and 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: 0-10 VDC or 4-20 mA and one switching output NPN or PNP, NO or NC.
- Linearity error 1%
- Repeatability 0.5%
- Beam angle. ±7° or ±8°
- Protection: Short-circuit, reverse polarity and overvoltage
- Protection degree IP 67
- 2 m cable or M12 plug

## Product Description

A family of diffuse ultrasonic sensors with sensing range from 50-400 mm, 100-900 mm and 200-2200 with a resolution as low as 1.0 mm.
The sensor contains both an analogue and a digital output. The output is either 0-10V or 4-20 mA and the digital output NPN or PNP, NO or NC which forms a window detection. The sensor is the ideal choice for distance measurement, level measurement, diameter measurement or loop control.
Due to use of microprocessor control the digital filtering makes the sensor immune to most electromagnetic interferences.

## Ordering Key

**UA18CAD04NGM1TI**

- **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. ($S_n$) | Analog Output | Digital output NPN/PNP | Ordering no. |
|---|---|---|---|---|---|
| M18 | Plug M12 | 50-400 mm | 4-20 mA | NPN | **UA 18 CAD 04 NG M1 TI** |
| M18 | Cable | 50-400 mm | 4-20 mA | NPN | **UA 18 CAD 04 NG TI** |
| M18 | Plug M12 | 50-400 mm | 0-10 V | NPN | **UA 18 CAD 04 NK M1 TI** |
| M18 | Cable | 50-400 mm | 0-10 V | NPN | **UA 18 CAD 04 NK TI** |
| M18 | Plug M12 | 50-400 mm | 4-20 mA | PNP | **UA 18 CAD 04 PG M1 TI** |
| M18 | Cable | 50-400 mm | 4-20 mA | PNP | **UA 18 CAD 04 PG TI** |
| M18 | Plug M12 | 50-400 mm | 0-10 V | PNP | **UA 18 CAD 04 PK M1 TI** |
| M18 | Cable | 50-400 mm | 0-10 V | PNP | **UA 18 CAD 04 PK TI** |
| M18 | Plug M12 | 100-900 mm | 4-20 mA | NPN | **UA 18 CAD 09 NG M1 TI** |
| M18 | Cable | 100-900 mm | 4-20 mA | NPN | **UA 18 CAD 09 NG TI** |
| M18 | Plug M12 | 100-900 mm | 0-10 V | NPN | **UA 18 CAD 09 NK M1 TI** |
| M18 | Cable | 100-900 mm | 0-10 V | NPN | **UA 18 CAD 09 NK TI** |
| M18 | Plug M12 | 100-900 mm | 4-20 mA | PNP | **UA 18 CAD 09 PG M1 TI** |
| M18 | Cable | 100-900 mm | 4-20 mA | PNP | **UA 18 CAD 09 PG TI** |
| M18 | Plug M12 | 100-900 mm | 0-10 V | PNP | **UA 18 CAD 09 PK M1 TI** |
| M18 | Cable | 100-900 mm | 0-10 V | PNP | **UA 18 CAD 09 PK TI** |
| M18 | Plug M12 | 200-2200 mm | 4-20 mA | NPN | **UA 18 CAD 22 NG M1 TI** |
| M18 | Cable | 200-2200 mm | 4-20 mA | NPN | **UA 18 CAD 22 NG TI** |
| M18 | Plug M12 | 200-2200 mm | 0-10 V | NPN | **UA 18 CAD 22 NK M1 TI** |
| M18 | Cable | 200-2200 mm | 0-10 V | NPN | **UA 18 CAD 22 NK TI** |
| M18 | Plug M12 | 200-2200 mm | 4-20 mA | PNP | **UA 18 CAD 22 PG M1 TI** |
| M18 | Cable | 200-2200 mm | 4-20 mA | PNP | **UA 18 CAD 22 PG TI** |
| M18 | Plug M12 | 200-2200 mm | 0-10 V | PNP | **UA 18 CAD 22 PK M1 TI** |
| M18 | Cable | 200-2200 mm | 0-10 V | PNP | **UA 18 CAD 22 PK TI** |



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## Specifications

| | |
|---|---|
| **Rated operating distance** ($S_n$) | Reference target: 1 mm metal rolled finish. CAD04: 100 x 100 mm CAD09 and CAD22: 200 x 200 mm |
| UA18CAD04 | 50 - 400 mm |
| UA18CAD09 | 100 - 900 mm |
| UA18CAD22 | 200 - 2200 mm |
| **Blind zone** | |
| UA18CAD04... | ≤ 50 mm |
| UA18CAD09... | ≤ 100 mm |
| UA18CAD22... | ≤ 200 mm |
| **Repeatability** | 0.5% |
| **Linear Accuracy** | 1% |
| **Beam angle** | |
| UA18CAD04... | ±8° |
| UA18CAD09... | ±7° |
| UA18CAD22... | ±7° |
| **Sensitivity** | |
| Push-button | P1 (farthest setpoint) P2 (nearest setpoint) |
| Resolution | 1 mm |
| **Temperature drift** | 0.1%/°C @ -20° to +60° C |
| **Temperature compensation** | Yes |
| **Hysteresis** (H) | Min. 1% |
| **Rated operational voltage** ($U_B$) | 15 to 30 VDC (ripple included) |
| **Ripple** ($U_{rpp}$) | ≤ 5% |
| **No-load supply current** ($I_o$) | |
| UA18CAD04... | 45 mA @ $U_B$ max |
| UA18CAD09... | 45 mA @ $U_B$ max |
| UA18CAD22... | 50 mA @ $U_B$ max |
| **Output current continuous digital output** ($I_e$) | |
| Max. load capacity 100 nF | 500 mA |
| UL508 specification | 100 mA |
| **Output current short-time digital output** (I) | |
| Max. load capacity 100 nF | 500 mA |
| UL508 specification | 100 mA |
| **Minimum operational current digital output** ($I_m$) | 0.5 mA |
| **OFF-state current digital output** ($I_r$) | 10 µA |
| **Voltage drop digital output** ($U_d$) | ≤ 2.2 VDC @ $I_e$ max. |
| **Protection digital output** | Short-circuit, overvoltage and reverse polarity |
| **Output analog output** | |
| NG.. or PG.. types | 4 to 20 mA |
| NK.. or PK.. types | 0 to 10 VDC |
| **Load** | |
| 4 to 20 mA | max. 500 Ω |
| 0 to 10 VDC | min. 3 kΩ |
| **Carrier frequency** | |
| UA18CAD04... | 400 kHz |
| UA18CAD09... | 300 kHz |
| UA18CAD22... | 200 kHz |

| | |
|---|---|
| **Operating frequency digital output** (f) | |
| UA18CAD04... | ≤ 10 Hz |
| UA18CAD09... | ≤ 4 Hz |
| UA18CAD22... | ≤ 1 Hz |
| **Response time OFF-ON digital output** ($t_{ON}$) | |
| UA18CAD04... | ≤ 50 mS |
| UA18CAD09... | ≤ 125 mS |
| UA18CAD22... | ≤ 500 mS |
| **Response time ON-OFF digital output** ($t_{OFF}$) | |
| UA18CAD04... | ≤ 50 mS |
| UA18CAD09... | ≤ 125 mS |
| UA18CAD22... | ≤ 500 mS |
| **Response time analog output** | ≤ 500 mS |
| **Power ON delay** | ≤ 500 mS |
| **Output function, open collector** | |
| By sensor type | NPN or PNP |
| **Output switching function** | One open collector transistor and one analogue output to be configured as: Window function with N.O or N.C. output. Analogue output with positive or negative slope. |
| **Indication Output ON** | Yellow LED |
| **Environment** | |
| Installation category | III (IEC 60664/60664A; 60947-1) |
| Pollution degree | 3 (IEC 60664/60664A; 60947-1) |
| Degree of protection | IP67 (IEC 60529; 60947-1) |
| **Ambient temperature** | |
| Operating | -20° to +60°C (-4° to +140°F) |
| Storage | -35° to +70°C (-31° to +158°F) |
| **Vibration** | 10 to 55 Hz, 1.0 mm/6g (IEC/EN 60068-2-6) |
| **Shock** | 30 g / 11 mS, 3 directions (IEC/EN 60068-2-27) |
| **Rated insulation voltage** | < 500 VAC (rms) |
| **Housing** | |
| Material body | PBT |
| Material front | Epoxy-glass resin |
| Material back, plug | Grilamid |
| Material back, cable | Grilamid |
| Material trimmer | POM |
| Sealing around trimmer | TPE |
| Material sealing front | |
| UA18CAD04... | TPE |
| UA18CAD09... | TPE |
| UA18CAD22... | PBT |
| **Connection** | |
| Cable | PVC, grey, 2 m, 4 x 0.32 mm², Ø = 4.7 mm |
| Plug | M12, 4-pin (CON. 14-series) |
| **Tightening torque** | ≤ 1 Nm |



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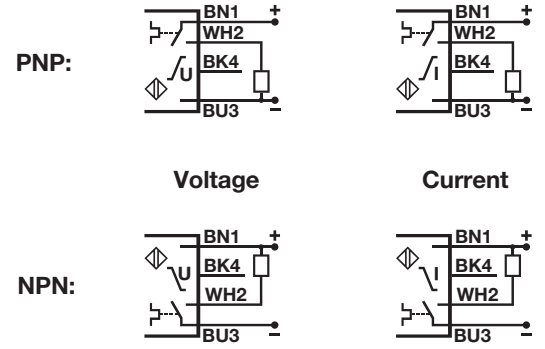
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## Specifications (cont.)

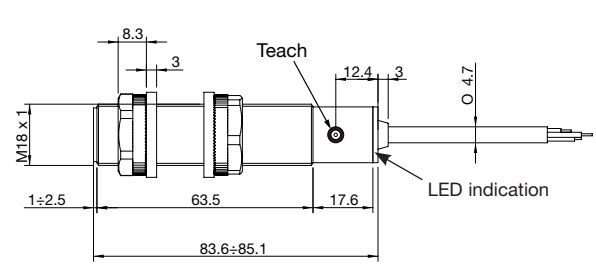
| | |
|---|---|
| **Weight** | |
| Cable version | 98 g |
| Plug version | 35 g |

| | |
|---|---|
| **CE-marking** | Yes |
| **Approvals** | cULus (UL508) |

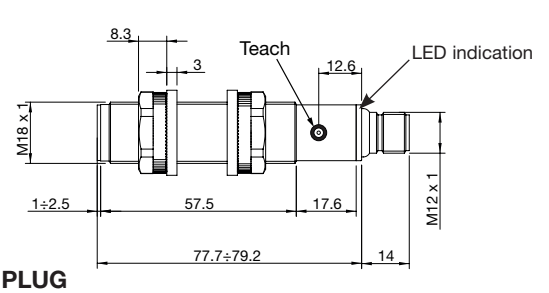
## Wiring Diagram




## Dimensions

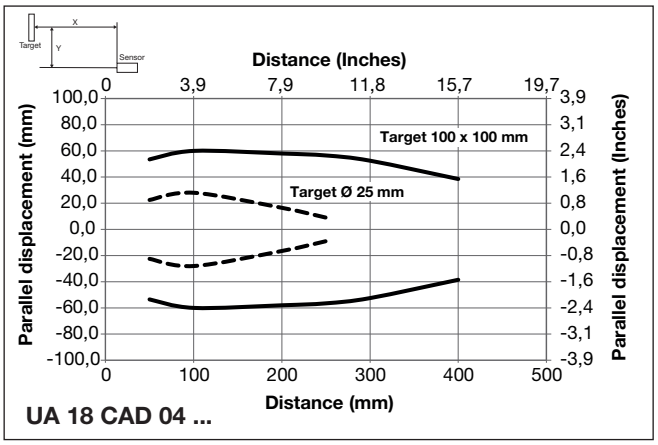



Cable

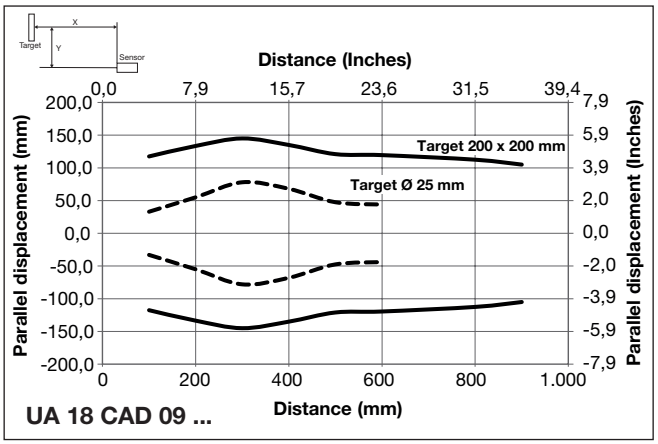



PLUG

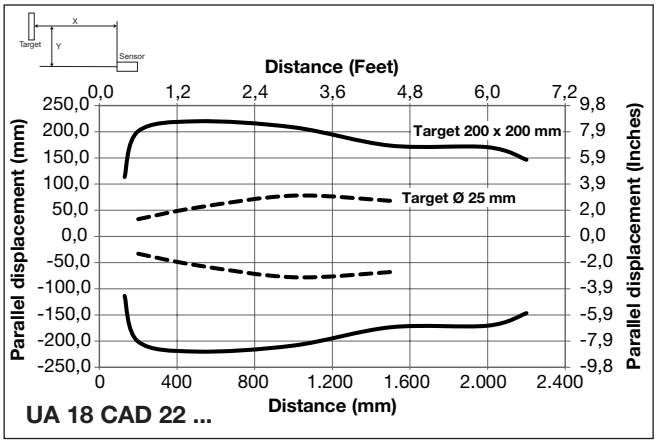
## Detection Range




UA 18 CAD 04 ...




UA 18 CAD 09 ...




UA 18 CAD 22 ...



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## Programming setup

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

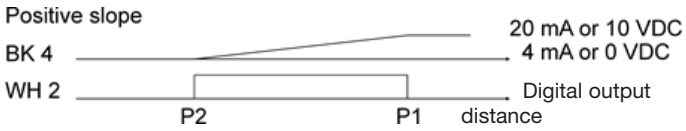
1) Mount the sensor in the selected application.
2) Place a target in front of the sensor at the maximum required distance (P1), then press shortly on the teach-button, the Yellow LED switch Off and then On and start flashing. The distance (P1) is now saved in the sensor, and the target can be moved. 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 more than one second and the sensing distance is set at a unique distance for this sensor only. Do not use this function for an analogue output.

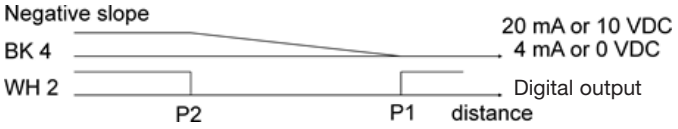
   II) The second switch point can be set to minimum by setting the target within the blind zone close to the sensor head or by covering the sensor head with your hand while teaching P2.

**Sensors with 1 digital output and one analogue output UA..CAD..PG/PK/NG or NK types**

1) The factory settings are Normally Open (N.O.) for the digital output and positive slope for the analogue output.

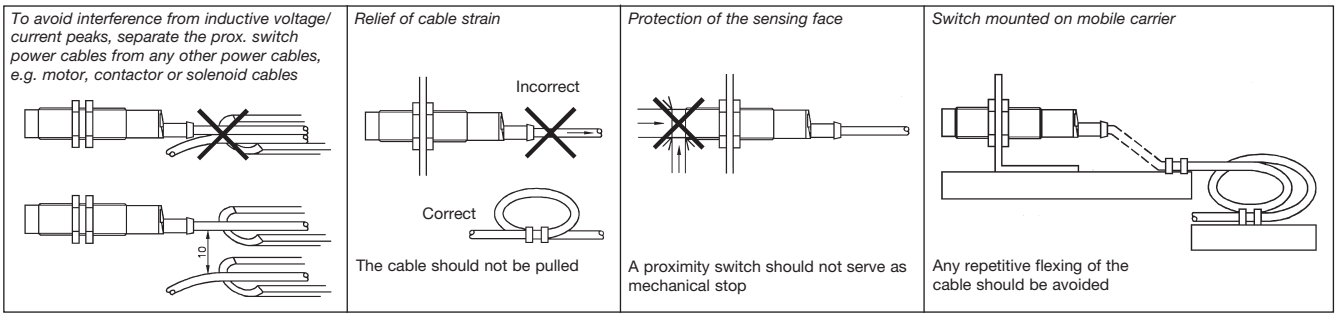



2) To reverse the slope to negative and reverse the N.O. output to N.C., push the teach-button for 8 seconds (12 seconds for UA18CAD22..) until the yellow LED flashes fast. Release the teach-button and the LED will flash 5 times to acknowledge the change in function.




3) To switch back to positive slope or N.O. output, repeat step 2.

## Installation Hints




## 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



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