

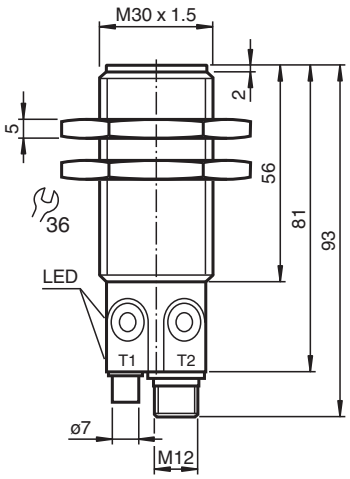
# Ultrasonic sensor

## UC500-30GM-2EP-IO-V15

- IO-Link interface for service and process data
- Programmable via DTM with PACTWARE
- 2 programmable switch outputs
- Selectable sound lobe width
- Synchronization options
- Temperature compensation

Single head system

## Dimensions




## Technical Data

| | | |
|---|---|---|
| **General specifications** | | |
| Sensing range | | 30 ... 500 mm |
| Adjustment range | | 50 ... 500 mm |
| Dead band | | 0 ... 30 mm |
| Standard target plate | | 100 mm x 100 mm |
| Transducer frequency | | approx. 380 kHz |
| Response delay | | minimum : 25 ms<br>factory setting: 45 ms |
| **Memory** | | |
| Non-volatile memory | | EEPROM |
| Write cycles | | 100000 |
| **Indicators/operating means** | | |
| LED green | | solid: Power on<br>flashing: Standby mode or IO link communication |
| LED yellow 1 | | solid: Object in evaluation range<br>flashing: Learning function, object detected |
| LED yellow 2 | | solid: Object in evaluation range<br>flashing: Learning function, object detected |

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## Technical Data

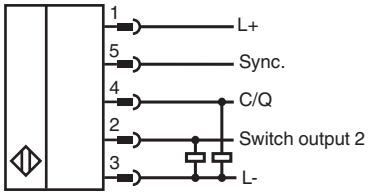
| | | |
|---|---|---|
| LED red | | solid red: Error<br>red, flashing: program function, object not detected |
| **Electrical specifications** | | |
| Operating voltage | $U_B$ | 10 ... 30 V DC , ripple 10 $\%_{SS}$ |
| No-load supply current | $I_0$ | ≤ 60 mA |
| Power consumption | $P_0$ | ≤ 1 W |
| Time delay before availability | $t_v$ | ≤ 100 ms |
| **Interface** | | |
| Interface type | | IO-Link |
| Protocol | | IO-Link V1.0 |
| Transfer rate | | Acyclical: typical 240 Bit/s |
| Cycle time | | min. 13.2 ms |
| Mode | | COM2 (38.4 kBit/s) |
| Process data width | | 16 bit |
| SIO mode support | | yes |
| **Input/Output** | | |
| Input/output type | | 1 synchronization connection, bidirectional |
| 0 Level | | 0 ... 1 V |
| 1 Level | | 4 V ... $U_B$ |
| Input impedance | | > 12 kΩ |
| Output current | | < 12 mA |
| Pulse length | | 0.5 ... 300 ms (level 1) |
| Pulse interval | | ≥ 14 ms (level 0) |
| Synchronization frequency | | |
| Common mode operation | | ≤ 70 Hz |
| Multiplex operation | | ≤ 90 Hz / n , n = number of sensors , n ≤ 10<br>(factory setting: n = 5 ) |
| **Output** | | |
| Output type | | 2 push-pull (4 in 1) outputs, short-circuit protected, reverse polarity protected |
| Rated operating current | $I_e$ | 200 mA , short-circuit/overload protected |
| Voltage drop | $U_d$ | ≤ 2.5 V |
| Repeat accuracy | | ≤ 0.1 % of full-scale value |
| Switching frequency | f | ≤ 11 Hz |
| Range hysteresis | H | 1 % of the adjusted operating range (default settings), programmable |
| Temperature influence | | ≤ 1.5 % from full-scale value (with temperature compensation)<br>≤ 0.2 %/K (without temperature compensation) |
| **Compliance with standards and directives** | | |
| Standard conformity | | |
| Standards | | EN IEC 60947-5-2:2020<br>IEC 60947-5-2:2019 |
| **Approvals and certificates** | | |
| UL approval | | cULus Listed, Class 2 Power Source |
| CCC approval | | CCC approval / marking not required for products rated ≤36 V |
| **Ambient conditions** | | |
| Ambient temperature | | -25 ... 70 °C (-13 ... 158 °F) |
| Storage temperature | | -40 ... 85 °C (-40 ... 185 °F) |
| **Mechanical specifications** | | |
| Connection type | | Connector plug M12 x 1 , 5-pin |
| Degree of protection | | IP67 |
| Material | | |
| Housing | | Stainless steel 1.4305 / AISI 303<br>TPU<br>Polyamides |
| Transducer | | epoxy resin/hollow glass sphere mixture; polyurethane foam |
| Mass | | 66 g |

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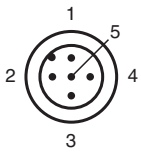
## Technical Data

| | | |
|---|---|---|
| Dimensions | | |
| Length | | 93 mm |
| Diameter | | 30 mm |
| **Factory settings** | | |
| Output 1 | | near switch point: 50 mm<br>far switch point: 500 mm<br>output function: Window mode<br>output behavior: NO contact |
| Output 2 | | near switch point: 100 mm<br>far switch point: 250 mm<br>output function: Window mode<br>output behavior: NO contact |
| Beam width | | wide |

## Connection Assignment




## Connection Assignment



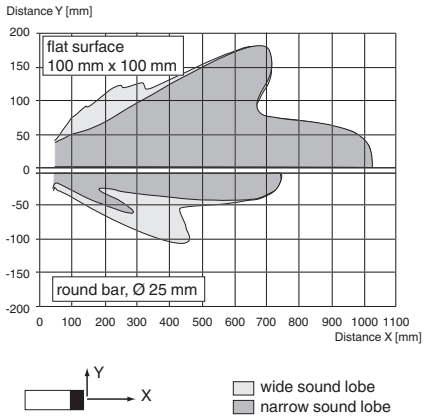

Wire colors in accordance with EN 60947-5-2

| | | |
|---|---|---|
| 1 | BN | (brown) |
| 2 | WH | (white) |
| 3 | BU | (blue) |
| 4 | BK | (black) |
| 5 | GY | (gray) |

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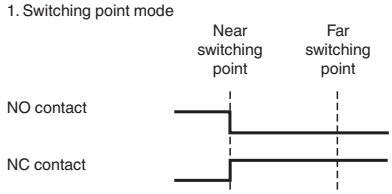
## Characteristic Curve

### Characteristic response curve

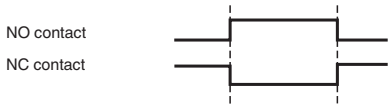



### Switching output operating modes

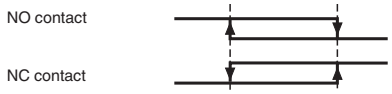
1. Switching point mode



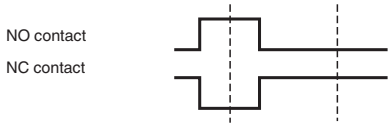

2. Window mode




3. Hysteresis mode




4. Retroreflective sensor mode




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# Programming

## Programming

The sensor is equipped with two outputs. Two switching points or trip values as well as the output mode, can be programmed for each output. The shape of the sensor sound cone can also be programmed. These parameters can be configured using two different methods:

- Using the sensor push buttons
- Using the IO-link interface of the sensor. This method requires an IO-link master (e.g. IO-link master01 USB) and the associated software. The download link is available on the product page for the sensor with the IO link at www.pepperl-fuchs.de

Configuration using the push buttons is described below. To configure the parameters using the sensor IO-link interface, please read the software description. The processes for configuring the switching points and the sensor operating modes run completely independently and do not influence one another.

**Note:**

- The sensor can only be programmed during the first 5 minutes after switching on. This time is extended during the actual programming process. The option of programming the sensor is revoked if no programming activities take place for 5 minutes. After this, programming is no longer possible until the sensor is switched off and on again.
- The programming activities can be canceled at any time without changing the sensor settings. To do so, press and hold the push button for 10 seconds.

## Programming the switch points

**Note:**

Each push button is assigned to a physical output. Switching output 1 (C/Q) is programmed via push button T1. Switching output 2 is programmed via push button T2. The status of switching output 1 is indicated by the yellow LED L1. The status of switching output 2 is indicated by the yellow LED L2.

### Programming the near switch point

1. Position the object at the site of the required near switch point.
2. Press and hold the push button for 2 seconds (yellow LED flashes).
3. Briefly press the push button (green LED flashes 3 times as confirmation). The sensor returns to normal mode.

### Programming the distant switch point

1. Position the object at the site of the required distant switch point
2. Press and hold the push button for 2 seconds (yellow LED flashes)
3. Press and hold the push button for 2 seconds (green LED flashes 3 times as confirmation). The sensor returns to normal mode.

## Programming the operating mode

The sensor features a 3-stage process for programming the sensor operating modes. You can program the following with this process:

1. Output function
2. Output behavior of the switching output
3. The beam width

These 3 stages of the process are programmed in succession. To switch from one programming function to the next, press and hold the push button for 2 seconds.

### Accessing the programming routine

The operating mode can be programmed separately for each of the two switching outputs. The switching output 1 (C/Q) operating mode is programmed via push button T1. The switching output 2 operating mode is programmed via push button T2.
To access the programming routine for the sensor operating mode, press the push button for 5 seconds.

### Programming the output function of the switching output

The green LED is now flashing. The number of flashes indicates the output function currently programmed:

1x: Switching point mode
2x: Window mode
3x: Hysteresis mode
4x: Reflective mode

1. Briefly press the push button to navigate through the output functions in succession. Use this method to choose the required output function.
2. Press and hold the push button for 2 seconds to save the selection and switch to the programming routine for the output behavior.

### Programming the output behavior for the switching output

The yellow LED is now flashing. The number of flashes indicates the output behavior currently programmed:

1x: NO contact
2x: NC contact

1. Briefly press the push button to switch between the possible output behaviors in succession. Use this method to choose the output behavior.
2. Press and hold the push button for 2 seconds to save the selection and switch to the programming routine for the sound cone.

### Programming the beam width

The red LED is now flashing. The number of flashes indicates the beam witdht currently programmed:

1x: narrow
2x: medium
3x: wide

1. Briefly press the push button to navigate through the different beam widths in succession. Use this method to choose the required beam width.
2. Press and hold the push button for 2 seconds to return to normal operation mode.

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**Note**
The last beam width programmed applies for both outputs in equal measure.

## Factory Setting

### Resetting the sensor to the factory settings

The sensor can be reset to the original factory settings.
1. Disconnect the sensor from the power supply
2. Press and hold one of the push buttons
3. Connect the power supply (yellow and red LEDs flash simultaneously for 5 seconds, followed by the yellow and green LEDs flashing simultaneously)
4. Release the push button

The sensor will now function with the original factory settings.

### Factory settings

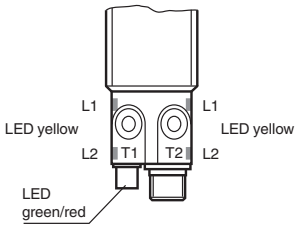
See technical data.

## Indication

### Indicators

The sensor has four LEDs for indicating the status and two buttons for setting parameters.

| | LED, green | LED L1, yellow | LED L2, yellow | LED, red |
|---|---|---|---|---|
| **In normal mode**<br>Error-free operation<br>Fault (e.g. compressed air) | <br>On<br>Off | The output status retains the last status | The output status retains the last status | <br>Off<br>On |
| **When programming the switching points or trip values**<br>Object detected<br>No object detected<br>Confirmation, programming successful<br>Warning, programming invalid | <br>Off<br>Off<br>Flashes 3x<br>Off | <br>Flashes<br>Off<br>Off<br>Off | <br>Flashes<br>Off<br>Off<br>Off | <br>Off<br>Flashes<br>Off<br>Flashes 3x |
| **When programming the operating mode**<br>Programming the output mode<br>Programming the output behavior<br>Programming the sound cone | <br>Flashes<br>Off<br>Off | <br>Off<br>Flashes<br>Off | <br>Off<br>Flashes<br>Off | <br>Off<br>Off<br>Flashes |




## Commissioning

### Synchronization

The sensor is fitted with a synchronization input that suppresses mutual interference from external ultrasonic signals. If this input is not connected, the sensor operates with internally generated cycle pulses. The sensor can be synchronized by creating external rectangular pulses and by setting the appropriate parameters via the IO-link interface. Each falling pulse edge sends an individual ultrasonic pulse. If the signal at the synchronization input is low for ≥1 second, the sensor reverts to the normal, unsynchronized operating mode. This also occurs if the synchronization input is disconnected from external signals (see note below).
If a high signal is applied to the synchronization input for > 1 second, the sensor switches to standby. This is indicated by the green LED. In this operating mode, the last recorded output statuses are retained. Please observe the software description in the event of external synchronization.

**Note:**
- If the option of synchronizing is not used, the synchronization input must be connected to ground (L-) or the sensor must be operated with a V1-connection cable (4-pin).
- During an active IO-Link communication the synchronization option is not available.

**The following synchronization modes are available:**
1. Multiple sensors (see Technical data for the maximum number) can be synchronized by connecting the synchronization inputs on the sensors. In this case, the sensors synchronize themselves in succession in multiplex mode. Only one sensor sends signals at any one time. (See note below)
2. Multiple sensors (see Technical data for the maximum number) can be synchronized by connecting the synchronization inputs on the sensors. The sensor interface can be used to parameterize the sensors so that one functions as a master and the others function as slaves. (See interface description) In this case, the sensors in master/slave mode work simultaneously, i.e. in synchronization where the master sensor plays the role of an intelligent external impulse generator.

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3. Multiple sensors can be controlled collectively by an external signal. In this case, the sensors are triggered in parallel and operate synchronously, i.e. at the same time. All sensors must be parameterized via the sensor interface so that they are set to external. See the software description.
4. Several sensors are controlled with a time delay by an external signal. In this case, only one sensor is externally synchronized at any one time (see note below). All sensors must be parameterized via the sensor interface so that they are set to external. See the software description.
5. A high signal (L+) or a low signal (L-) at the synchronization input switches the sensor to standby in the case of external parameterization.

**Note:**

The response time of the sensors increases in proportion to the number of sensors in the synchronization chain. In multiplex mode, the measuring cycles of the individual sensors run in succession in a chronological sequence.

**Note:**

The synchronization connection of the sensors supplies an output current in the case of a low signal, and generates an input impedance in the case of a high signal. Please note that the synchronizing device must have the following driver properties:

Driver current according to L+ $\geq$ n * high level signal/input impedance (n = number of sensors to be synchronized)
Driver current according to L- $\geq$ n * output current (n = number of sensors to be synchronized).

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