# Ultrasonic Sensors
## Single Head System with one Switch Output

- **Switch output**
- **5 different output functions available**
- **Teaching input**
- **Can be synchronised**
- **Can be deactivated**
- **Watchdog**

CE



**Figure 1**
Housing material:
Nickel plated brass
Transducer material:
Epoxy resin/hollow glass sphere mixture
Polyurethane foam
Cover: PBT (Polybutylenterephthalate)

**Synchronisation:**

In order to suppress mutual interference, the sensor operates via one sychronised input. If the input is unswitched, the senor operates at an internally generated pulse rate. The sensor can be synchronised by the super position of the square - shaped voltage. One synchronising pulse at the synchronisation input enables one measuring cycle to be completed. The pulse width must be greater than 100 µs. The measuring cycle commences with the descending flank. The state of the switching output changes after the switching threshold has been exceeded five times, as determined internally by five measurements. A low level $\geq 1$ s, or an open synchronisation input results in normal operation of the sensor. Synchronisation cannot take place during teaching and vice versa.
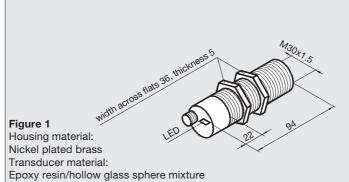
Two operating modes are possible:

1. Multiple sensors are controlled with the same synchronising signal. The sensors operate on the same pulse.
2. The synchronising pulses are fed cyclically to only one sensor at a time. The sensors operate in multiplex mode. A high level at the sychronisation input deactivates the sensor.

**To set the Switch Points:**

The ultrasonic sensor is provided with a switching output with two teachable switch points. These are set up by applying the supply voltage $-U_B$ bzw. $+U_B$ to the teaching input. The supply voltage should be applied to the teaching input for at least 1 s. During the teaching process the LED's indicate whether the sensor has recognised the target. The switch points A1 and A2 are taught by voltage $-U_B$ and $+U_B$, respectively.

Five functions can be set:

1. Window mode, normally open function
2. Window mode, normally closed function
3. One switch point, normally open function
4. One switch point, normaly closed function
5. Detection of presence of object

| Detection range: | 60 mm ... 500 mm |
| --- | --- |
| | Figure 1 |
| Version: | Transceiver with one switch output |

| Order code: | pnp | **UB 500-30GM-E2-V15** |
| --- | --- | --- |
| | npn | **UB 500-30GM-E0-V15** |

| **Operating data:** | |
| --- | --- |
| Detecting range | 60 mm ... 500 mm |
| Standart test plate (min. flat surface) | 100 mm x 100 mm |
| Close range (unsuitable for switching) | 0 mm ... 60 mm |
| Aperture angle of sonic lobe | approx. 5° at -3 dB |
| Transducer frequency | approx. 375 kHz |
| Response time | approx. 38 ms |
| Switching hysteresis | $\leq 1$ % of the set operating distance |
| Reproducibility | $\leq 1$ % |
| Temperature drift | 0.2 % / K |
| Operating cycle frequency | max. 13 Hz |
| Measuring cycle time $t_m$ | approx. 6.5 ms |
| Synchron. frequency equi-pulsed | $\leq 1 / t_{m1}$ |
| Synchron. frequency multiplex | $\leq 1 / t_{m1} + 1 / t_{m2} + ...$ |

| **Electrical Data:** | |
| --- | --- |
| Operating voltage $U_B$ | 20 V DC ... 30 V DC |
| Ripple | $\pm 10$ %$_{ss}$, $U_B$ = 33 V |
| Rated operating current | $\leq 60$ mA |
| Switch output | 200 mA (k) , $U_B$ -3 V short circuit/overload resistent |
| pnp | E2 |
| npn | E0 |
| Teaching input | $-U_B$ ... $(-U_B+2$ V$)$ near switch point |
| | $(+U_B-2$ V$)$ ... $+U_B$ far switch point |
| Synchronising input | $-U_B$ ... $(-U_B+1$ V$)$ Low level |
| | $(-U_B+5$ V$)$ ... $+U_B$ High level |
| | Input impedance 27 k$\Omega$ |
| Synchronisation pulse width | $\geq$ 100 µs |
| Synchronisation pause width | $\geq$ 100 µs |
| Indicators: | |
| LED green | "Power on", teaching function object detected |
| LED red | "Fault", object uncertain |
| LED yellow | Switching condition indicator, teaching function, no object detected |

| **Mechanical Data:** | |
| --- | --- |
| Operating temperature range | 248 Kelvin ... 343 Kelvin (-25 °C ... +70 °C) |
| Storage temperature range | 233 Kelvin ... 358 Kelvin (-40 °C ... +85 °C) |
| Protection class to DIN 40 050 | IP 65 |
| Permissible shock and vibration loading[5] | b $\leq$ 30 g, T $\leq$ 11 ms |
| | f $\leq$ 55 Hz, a $\leq$ 1 mm |
| Connection type | Equipment connector - V15 |

| in compliance with | EN 60974-5-2 |
| --- | --- |

5) to IEC 68-2-6 and IEC 68-2-27

Teach window operation, normally open function:

- Set target at near switch point
- Teach switch point A1 with - $U_B$
- Set target at far switch point
- Teach switch point A2 with + $U_B$

Teach window operation, normally closed function:

- Set target at near switch point
- Teach switch point A2 with + $U_B$
- Set target at far switch point
- Teach switch point A1 with - $U_B$

Teach one switch point, normally open function:

- Set target at near switch point
- Teach switch point A2 with + $U_B$
- Cover sensor with the palm of the hand, or remove all objects from the detection range of the sensor
- Teach switch point A1 with - $U_B$

Teach one switch point, normally closed function:

- Set target at near switch point
- Teach switch point A1 with - $U_B$
- Cover sensor with the palm of the hand, or remove all objects from the detection range of the sensor
- Teach switch point A2 with + $U_B$

Teach detection of presence of object:

- Cover sensor witch the palm of the hand, or remove all objects from the detection range of the sensor
- Teach switch point A1 - $U_B$
- Teach switch point A2 + $U_B$

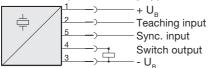Pre-setting of the switch points:

A1: Near range
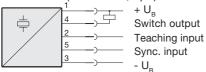A2: Nominal range

**Note:**
A programming Unit UB-PROG1 is  o b - tainable for  the basic setting of the switch points and output functions.

**Standard symbol / Connections:**
Transceiver ( version E2, pnp)

| | |
|---|---|
| 1 | + $U_B$ |
| 2 | Teaching input |
| 5 | Sync. input |
| 4 | Switch output |
| 3 | - $U_B$ |

Transceiver (version E0, npn)

| | |
|---|---|
| 1 | + $U_B$ |
| 4 | Switch output |
| 2 | Teaching input |
| 5 | Sync. input |
| 3 | - $U_B$ |

**V15 Connector arrangement**

**Accessories:**
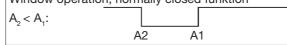Cable connectors, see catalogue of inductive, capacitive and magnetic sensors and section Accessories.

| Operating condition - Indications | Green LED | Red LED | Yellow LED |
|---|---|---|---|
| Switch point teaching | | | |
| Object detected | flashing | off | off |
| No object detected | flashing | off | on |
| Object uncertain (teaching invalid) | off | flashing | off |
| Normal operation | on | off | switch condition |
| Interference  (e.g. comp. air) | off | flashing | last condition |

**Programmed switching output function**

Window operation, normally open function

$A_1 < A_2$:
A1    A2    object range

Window operation, normally closed funktion

$A_2 < A_1$:
A2    A1

One switch point, normally open function

$A_1 -> \infty$ :
A2

One switch point, normally closed function

$A_2 -> \infty$ :
A1

$A_1 -> \infty$ , $A_2 -> \infty$ :   Detection of presence of object

Object detected: Switch output closed
No object detected: Switch output open