

Ultrasonic sensor without blind range, with deflection head UPS-W Series



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- Measuring range up to 180mm
- 90° angled sensing direction
- No blind range
- Narrow detection beam
- Small size
- Teach-In
- Binary or analogue outputs
- Measurement independent of material, surface, colour and size of target
- Work despite dust, dirt, fog, light
- Detect transparent and bright objects



no blind range!

Technical specifications UPS 180 ...

UPS 180 TVPA 24 CW UPS 180 TOR 24 CWA UPS 180 TOR 24 CWI

| | | | | |
|---|-----|------------------------|------------------------------------|---------|
| Detection and adjustment range | mm | | 0...180 | |
| Hysteresis | % | ≤1 | - | - |
| Linearity of analogue output | %FS | - | <1 | <1 |
| Reproducibility | %FS | <0.5 | <0.5 | <0.5 |
| Temperature error | %FS | ≤1.5 | ≤1.5 | ≤1.5 |
| Operating frequency | kHz | | ~400 | |
| Status indicator | - | | LED yellow/red | |
| Binary output, reversal polarity protection | - | PNP NO/NC max. 0.1A | - | - |
| Switching speed max. | Hz | 13 | - | - |
| t _{on} binary output | ms | ~30 | - | - |
| Analogue output in detection range | | | | |
| R _L min. 1kΩ with V output | V | | 0...10 | |
| R _L max. 300Ω with mA output | mA | | | 4...20 |
| Power supply (reversal polarity protection) | VDC | 10...30 | 15...30 | 10...30 |
| Power supply ripple | % | | 10 | |
| Mean consumption, switched without load | mA | | ~30 | |
| Ambient temperature during operation | °C | | 0...+70 | |
| Mass | g | | 27 | |
| Protection class | - | | IP67 | |
| Housing material | - | | nickel plated brass, head Polamide | |
| Electrical connection | - | | connector M12, 4-pin | |

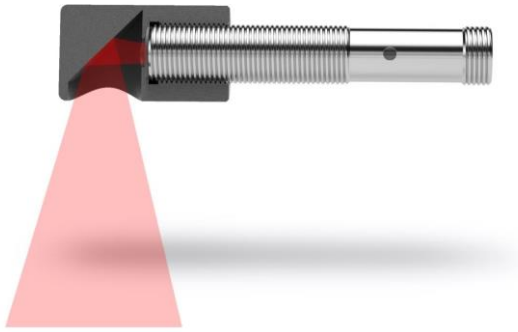
Description

The ultrasonic sensors of the UPS series are particularly small, and they have a narrow detection beam. Thus, they are well suited to detect objects in the near range up to 180mm and under confined conditions.

The "W" version described here has a head made by 3D printing, which reverses the beam by 90°. This eliminates the so-called blind range and the sensors measure distances directly from the sensor head. Likewise, the installation depth of the sensor is reduced to only 20 mm, which corresponds to the diameter of the deflecting head.

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The sensors are available as pure proximity switches as well as distance sensors with analogue mA or V output. The switching or measuring distances can be learned by a teach-in procedure. An optional Teach-In box is available. Typical applications are detection of objects and distance and level measurement.



Radial sensing direction

Model selection

The UPS versions have different outputs.

UPS 180 TVPA 24 C

Ultrasonic sensor with a binary output with 2 teachable switching points (NO, NC or window function).

UPS 180 TOR 24 CA

Ultrasonic sensor for distance measurement with an analogue output 0...10V. The lower and upper limits are teachable.

UPS 180 TOR 24 CI

Ultrasonic sensor for distance measurement with an analogue output 4...20mA. The lower and upper limits are teachable.

Setting of the switching points (UPS 180 TVPA 24 C)

The switching points are set by connecting the teach wire with either the power supply $-U_B$ (0V) or $+U_B$ (+24VDC). The voltage must be active for min. 1s on the teach wire. The LED shows during teaching if the sensor has detected the object.

Window operation NO

- Place the object to the closer switching point
- Teach switching point with $-U_B$
- Place the object to the switching point further away
- Teach switching point with $+U_B$

Window operation NC

- Place the object to the closer switching point
- Teach switching point with $+U_B$
- Place the object to the switching point further away
- Teach switching point with $-U_B$

Switching point NO

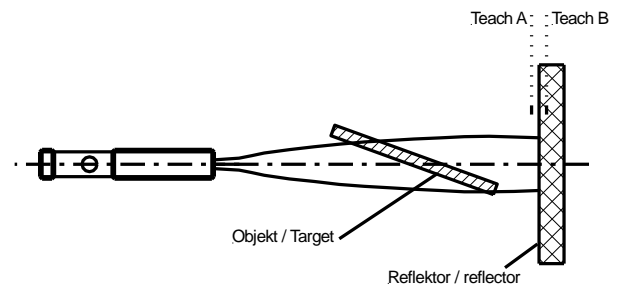
- Place the object on the switching point
- Teach switching point with $+U_B$
- Cover the sensor diaphragm by hand or let the sensor look into the void
- Teach with $-U_B$

Switching point NC

- Place the object on the switching point
- Teach switching point with $-U_B$
- Cover the sensor diaphragm by hand or let the sensor look into the void
- Teach with $+U_B$

Application hint window operation (UPS 180 TVPA 24 C)

In window operation the sensor detects only targets which are within the window limits. The same function can also be used to simulate a kind of retro-reflective sensor. The reflector is mounted in the small window between Teach A and Teach B (see drawing below). In such a setup, the sensor also detects targets which pass the sensor beam in a very flat angle. The sensor would not be able to detect such targets in normal scan operation mode.



Setting the measuring limits (UPS 180 TOR 24 CA/I)

The two measuring limits are set by connecting the teach wire with either the power supply $-U_B$ (0V) or $+U_B$ (+24VDC). The voltage must be active for min. 1s on the teach wire. The LED shows during teaching if the sensor has detected the object. With $-U_B$ the lower measuring limit (0V or 4mA) and with $+U_B$ the upper measuring limit (10V or 20mA) is taught. Thus it is possible to teach a rising or a falling ramp.

- Place the object on the lower measuring limit (i.e. where 0V or 4mA is expected)
- Teach lower measuring limit with $-U_B$
- Place the object on the upper measuring limit (i.e. where 10V or 20mA is expected)
- Teach upper measuring limit with $+U_B$

Lower and upper measuring limits can also be programmed individually at a later time. The teach wire must not be connected during normal operation. The sensor can e.g. be operated after teaching with a 3 wire cable.

LED indicator

| | LED red | LED yellow |
|--------------------------------|----------|------------------|
| During teach-in: | | |
| - object detected | off | blinking |
| - no object detected | blinking | off |
| - object not reliably detected | on | off |
| Normal operation PNP | off | switching status |
| Normal operation analogue | off | on |
| Error | on | last status |

Mounting

The sensor can be mounted with the two M12 nuts (HEX 17) which are included.

Inclination angle of object

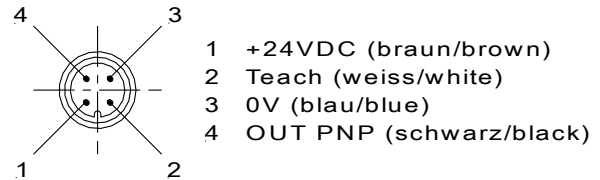
Smooth surfaces can be detected up to an inclination angle of approx. 10°. However rough and structured (granular) surfaces can be detected up to much higher angles.

Cable

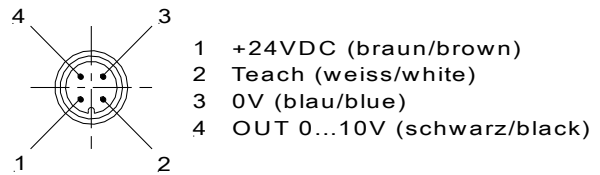
The sensors have an M12 4-pin connector for screw mounting. The cable should not be mounted parallel or close to high current cables. Cables have to be ordered separately.

Electrical connections (view to the sensor)

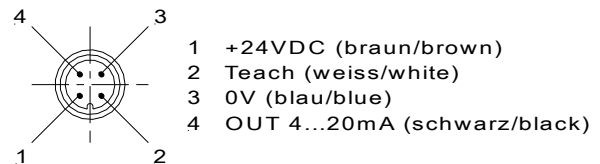
UPS 180 TVPA 24 CW



UPS 180 TOR 24 CWA



UPS 180 TOR 24 CWI



Scope of delivery

- Sensor
- 2 M12 nuts

Accessories (see data sheet ,ACC')

PUR cable 3-wire (pin 1, 3, 4) with M12 connector:
l=2m Type KAB 2L3VGPUR

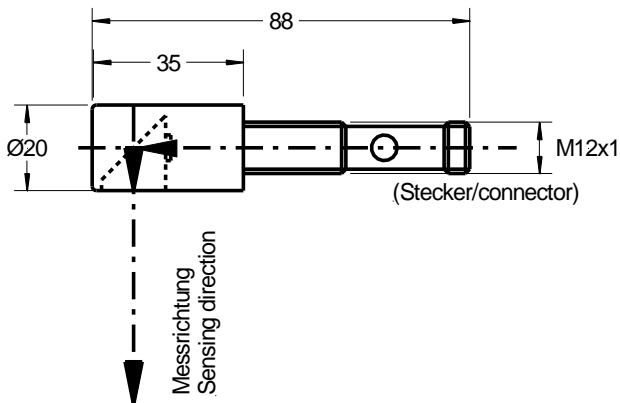
PUR cable 4-wire with M12 connector:
l=2m Type KAB 2L4VGPUR

PUR cable 4-wire with M12 connector:
l=5m Type KAB 5L4VGPUR

PUR cable 4-wire with M12 connector:
l=10m Type KAB 10L4VGPUR

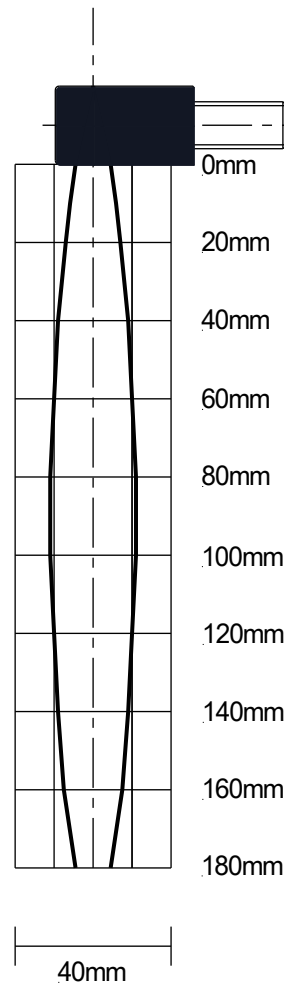
Teach-In box: see separate data sheet

Dimensions



Detection beam

The detection beam of an ultrasonic sensor has the shape of a cone. The size depends on the target and its sound reflecting characteristics. Small and worse reflecting objects result in a smaller cone (narrower and shorter). Bigger objects and those with surfaces which are not perpendicular to the central axis can expand the cone. The exact cone shape and size can be determined only at the object itself. No disturbing objects must be between the sensor and the target within the cone. Otherwise the sensor would detect the disturbing object instead of the desired target. Alongside the typical cone shape for the UPS-W sensors is shown. Furthermore, the size of the detection beam is influenced by air temperature and humidity. The colder and dryer the air, the larger is the beam.



All UPS versions

| | | |
|---|-----------------------------|----------------------|
| Standard, 20...200mm, PNP | see separate data sheet UPS | UPS 200 TVPA 24 C |
| Standard, 20...200mm, 0...10V | see separate data sheet UPS | UPS 200 TOR 24 CA |
| Standard, 20...200mm, 4...20mA | see separate data sheet UPS | UPS 200 TOR 24 CI |
| FocusBEAM, 0...150mm, PNP | see separate data sheet UPS | UPS 150 FB TVPA 24 C |
| FocusBEAM, 0...150mm, 0...10V | see separate data sheet UPS | UPS 150 FB TOR 24 CA |
| FocusBEAM, 0...150mm, 4...20mA | see separate data sheet UPS | UPS 150 FB TOR 24 CI |
| Chemical protection, 20...150mm, PNP | see separate data sheet UPS | UPS 150 CP TVPA 24 C |
| Chemical protection, 20...150mm, 0...10V | see separate data sheet UPS | UPS 150 CP TOR 24 CA |
| Chemical protection, 20...150mm, 4...20mA | see separate data sheet UPS | UPS 150 CP TOR 24 CI |
| with 90° angled head, 0...180mm, PNP | | UPS 180 TVPA 24 CW |
| with 90° angled head, 0...180mm, 0...10V | | UPS 180 TOR 24 CWA |
| with 90° angled head, 0...180mm, 4...20mA | | UPS 180 TOR 24 CWI |