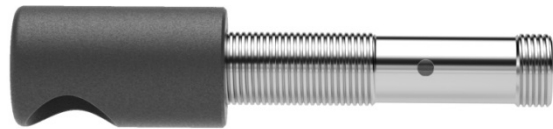# Ultrasonic sensor without blind range, with deflection head
DUPS-W Series

- 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 DUPS 180 …		DUPS 180 TVPA 24 CW	DUPS 180 TOR 24 CWA	DUPS 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		-		
$\quad R_L$ min. 1kΩ with V output	V		0...10	
$\quad R_L$ 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 DUPS 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.

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.
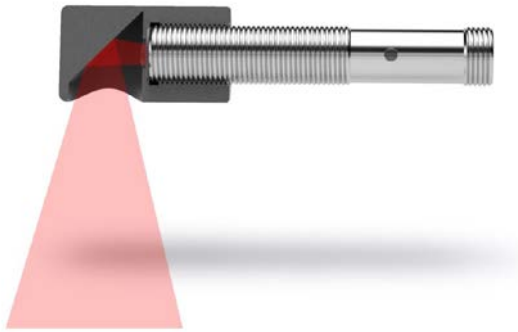
Radial sensing direction

Model selection

The DUPS versions have different outputs.

DUPS 180 TVPA 24 C
Ultrasonic sensor with a binary output with 2 teachable switching points (NO, NC or window function).

DUPS 180 TOR 24 CA
Ultrasonic sensor for distance measurement with an analogue output 0...10V. The lower and upper limits are teachable.

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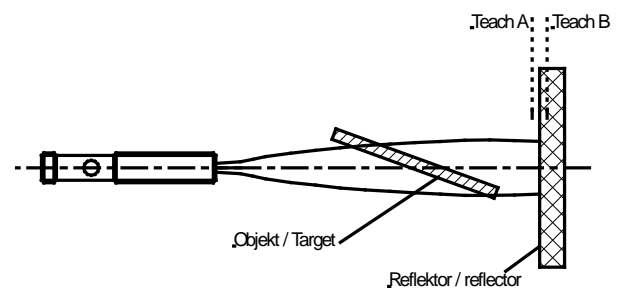
Setting the measuring limits (DUPS 180 TOR 24 CA/I)

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.
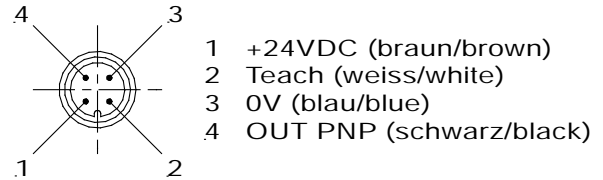
Inclination angle of object

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.
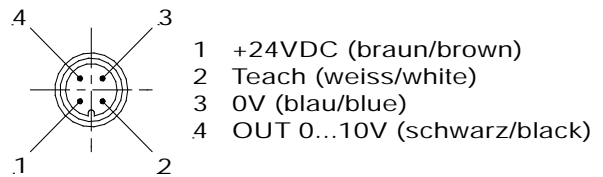
Cable

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.
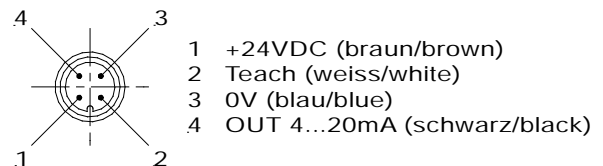
Electrical connections (view to the sensor)

DUPS 180 TVPA 24 CW

1 +24VDC (braun/brown)
2 Teach (weiss/white)
3 0V (blau/blue)
4 OUT PNP (schwarz/black)

DUPS 180 TOR 24 CWA

1 +24VDC (braun/brown)
2 Teach (weiss/white)
3 0V (blau/blue)
4 OUT 0...10V (schwarz/black)

DUPS 180 TOR 24 CWI

1 +24VDC (braun/brown)
2 Teach (weiss/white)
3 0V (blau/blue)
4 OUT 4...20mA (schwarz/black)

Scope of delivery

- Sensor
- 2 M12 nuts

Dimensions

Messrichtung
Sensing direction

Ø20

35

88

M12x1

(Stecker/connector)
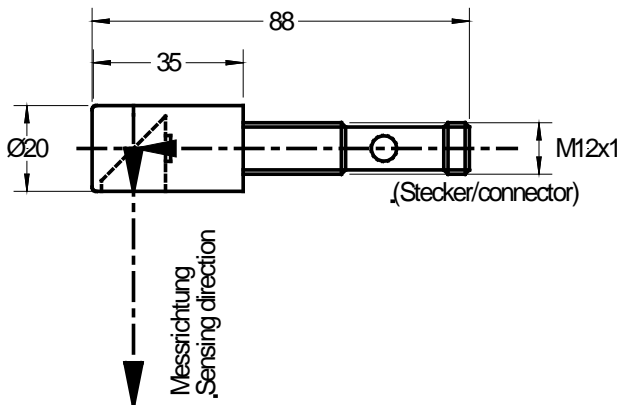
Detection beam

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 DUPS-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.

0mm
20mm
40mm
60mm
80mm
100mm
120mm
140mm
160mm
180mm

40mm
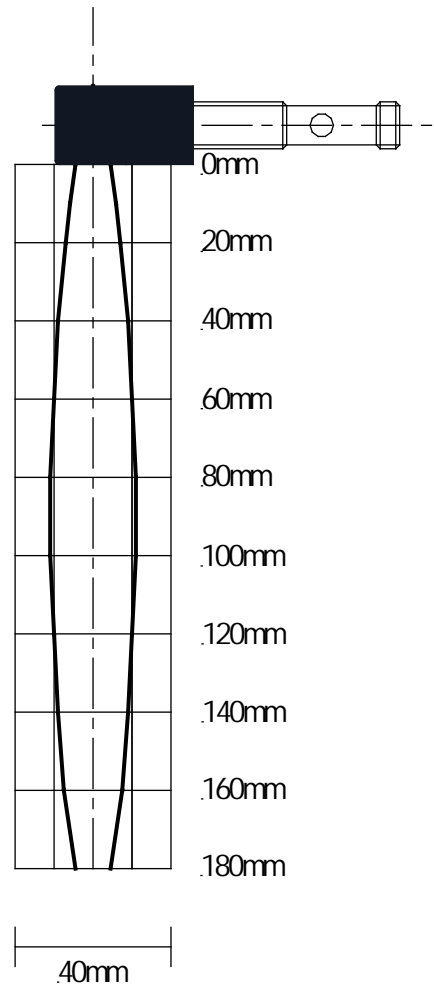
All DUPS versions

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