

### Miniature ultrasonic distance and proximity sensors DUPS series

- Measuring range up to 200mm
- Very small blind range
- Narrow detection beam
- Small size M12x1
- Teach-In
- Binary or analogue outputs
- Special versions with particularly narrow beam or chemically resistant
- Measurement independent of material, surface, colour and size of target
- Work under dust, dirt, fog, light
- Detect transparent and bright objects



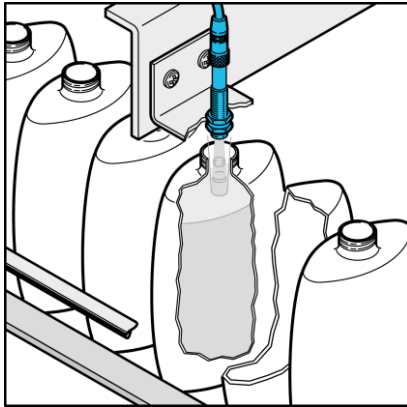
#### Technical specifications DUPS 200 ...

		DUPS 200 TVPA 24 C	DUPS 200 TOR 24 CA	DUPS 200 TOR 24 CI
Detection and adjustment range	mm		20...200	
Blind range (no reasonable analogue output signal)	mm		20	
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 <sub>on</sub> binary output	ms	~30	-	-
Analogue output in detection range				
R <sub>L</sub> min. 1kΩ with V output	V		0...10	
R <sub>L</sub> 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		25	
Protection class	-		IP67	
Housing material	-		nickel plated brass	
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 150 or 200mm and under confined conditions. The sensors are

available as well as pure proximity switches as also as distance sensors with analogue mA or V output. The switch 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.



### Model selection

The DUPS versions have different outputs.

#### DUPS ... TVPA 24 C

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

#### DUPS ... TOR 24 CA

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

#### DUPS ... TOR 24 CI

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

### Blind range

The lower detection range is called blind range. It is typical for ultrasonic sensors. In the blind range no distance measurement is possible! However the pure function as proximity switch (binary output) is possible in the blind range with certain restrictions (only bigger objects).

### Setting of the switching points (DUPS ... 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 near switching point
- Teach switching point with  $-U_B$
- Place the object to the far switching point
- Teach switching point with  $+U_B$

#### Window operation NC

- Place the object to the near switching point
- Teach switching point with  $+U_B$
- Place the object to the far switching point
- Teach switching point with  $-U_B$

#### Switching point NO

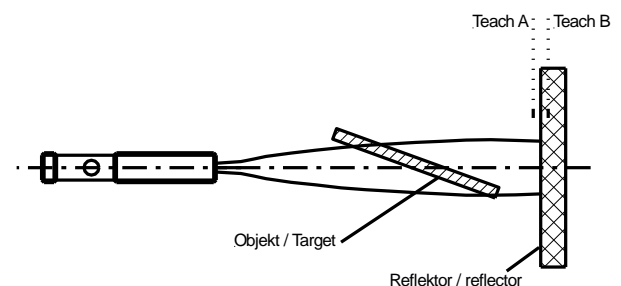
- Place the object to the switching point
- Teach switching point with  $+U_B$
- Cover the sensor diaphragm by hand or let the sensor look into the void
- Teach with  $-U_B$

#### Switching point NC

- Place the object to 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 ... 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 setup the sensor detects also targets which pass the sensor beam in a very flat angle. The sensor would not detect such targets in normal scan operation mode.



### Setting the measuring limits (DUPS ... 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 to the lower measuring limit (i.e. where 0V or 4mA is expected)
- Teach lower measuring limit with  $-U_B$
- Place the object to 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 later be programmed individually. 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 scope of delivery.

### Inclination angle of object

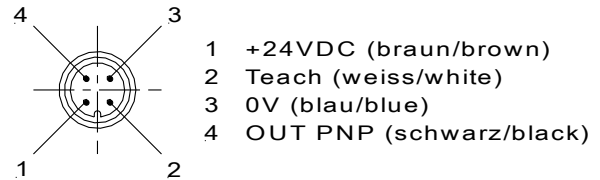
Smooth surfaces can be detected up to an inclination angle of approx.  $10^\circ$ . However rough and structured (granular) surfaces can be detected up to much higher angles.

### Cable

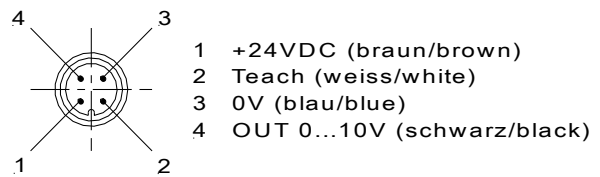
The sensors have an M12 4-pin connector for screw mounting. The cable should not be mounted parallel or close to high current cables. Cables have to be ordered separately.

### Electrical connections (view to the sensor)

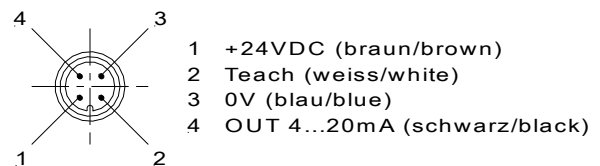
#### DUPS ... TVPA 24 C



#### DUPS ... TOR 24 CA



#### DUPS ... TOR 24 CI



## Special miniature ultrasonic distance and proximity sensors

### DUPS FB and DUPS CP series

#### DUPS 150 FB ...

- Very narrow detection beam (FocusBEAM)
- Particularly for level measurement in narrow cavities
- No blind range
- Measuring range up to 150mm
- Teach-In
- Binary or analogue outputs

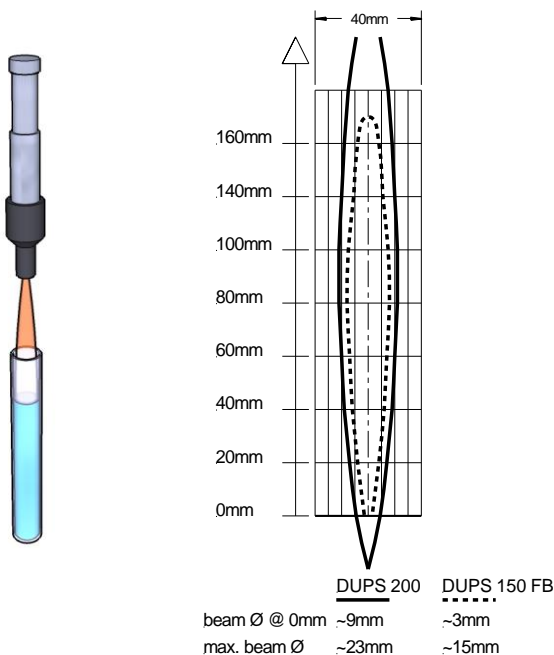
#### DUPS 150 CP ...

- Chemically resistant version (PVDF)
- Diaphragm PTFE coated
- Front resistant to most chemicals
- Measuring range up to 150mm
- Teach-In
- Binary or analogue outputs

#### Technical data (rest same as DUPS 200...)

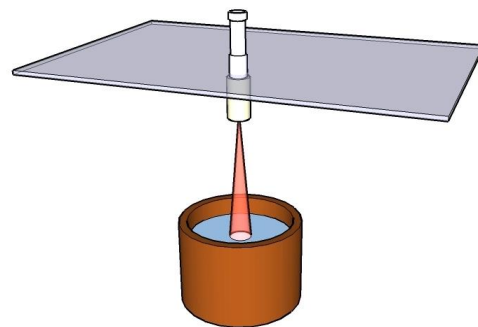
Detection and adjustment range	mm	DUPS 150 FB ...	DUPS 150 CP ...
		0...150	20...150

#### Description DUPS 150 FB..



#### DUPS 150 CP ...

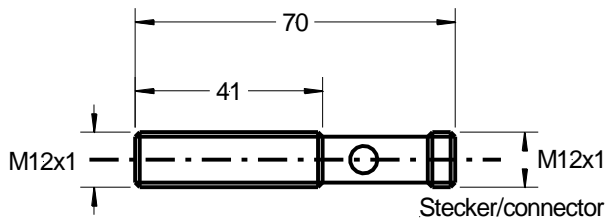
The diaphragm of the series DUPS 150 CP (Chemical Protection) is coated with a thin PTFE foil. The head made of chemically resistant PVDF serves as mechanical fixation for the foil and protection of the sensor front part. Thus the front part of the ultrasonic sensor becomes resistant to most chemicals.



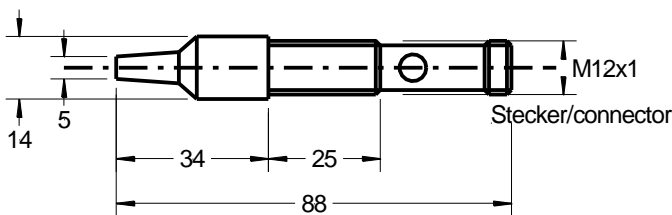
The ultrasonic sensors series DUPS FB (FocusBEAM) are equipped with a focusing device made of glass-fibre reinforced polypropylene, which makes the sound beam particularly narrow. Therefore they are suitable in the near range from 0mm up to 150mm to watch into narrow cavities. A typical application is measuring of liquid level in small tubes or containers.

With little distance between sensor and tube and, depending on the measuring height, levels can be measured in tubes which have only a few mm diameter. In very narrow setups, only a test can verify the feasibility of measurement.

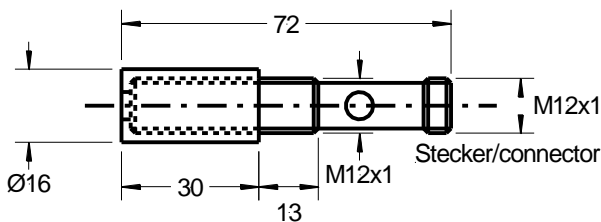
## Dimensions



## DUPS 200 ...



## DUPS 150 FB ...

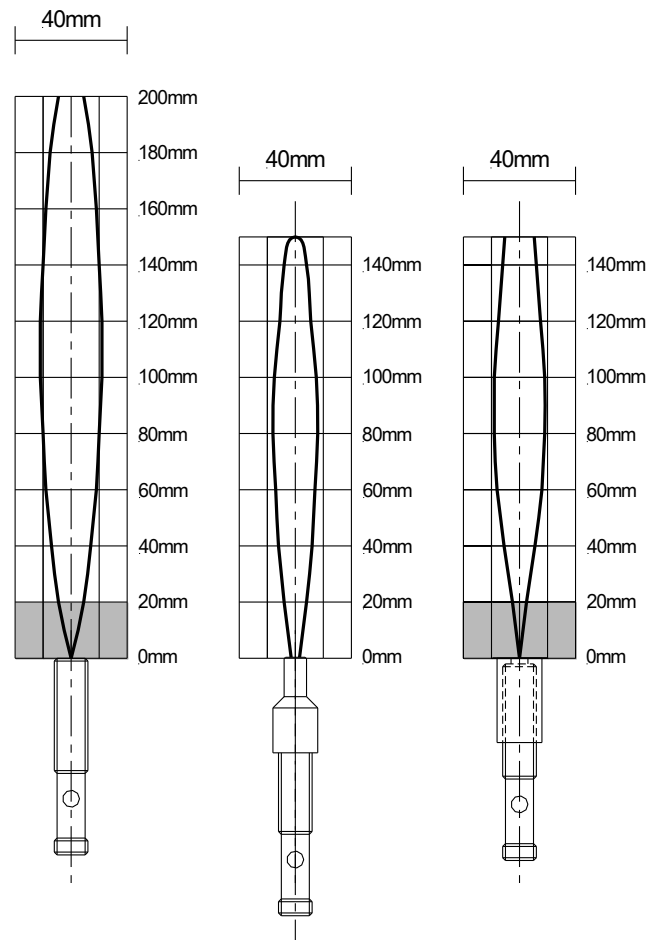


## DUPS 150 CP ...

### 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 more badly 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. Below the typical cone shapes for the DUPS sensors are 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.



DUPS 200    DUPS 150 FB    DUPS 150 CP

### The DUPS versions

Standard, 20...200mm, PNP	DUPS 200 TVPA 24 C
Standard, 20...200mm, 0...10V	DUPS 200 TOR 24 CA
Standard, 20...200mm, 4...20mA	DUPS 200 TOR 24 CI
FocusBEAM, 0...150mm, PNP	DUPS 150 FB TVPA 24 C
FocusBEAM, 0...150mm, 0...10V	DUPS 150 FB TOR 24 CA
FocusBEAM, 0...150mm, 4...20mA	DUPS 150 FB TOR 24 CI
Chemical protection, 20...150mm, PNP	DUPS 150 CP TVPA 24 C
Chemical protection, 20...150mm, 0...10V	DUPS 150 CP TOR 24 CA
Chemical protection, 20...150mm, 4...20mA	DUPS 150 CP TOR 24 CI

### Safety instruction:

Only properly qualified personnel is authorized to install these devices and connect them to the power supply. Applications where personal safety depends on the function of the devices are not authorized by the manufacturer!