

SONARANGE

UPR 09.11 e

Ultrasonic distance and proximity sensors UPR Series

- Measuring ranges up to 1500mm
- Version with 90° (radial) transducer
- Versions with synchronisation input
- Small size M18 x 1
- Measurement independent of material, surface, colour and size of target
- Work under dust, dirt, fog, light
- Detect transparent and bright objects
- Waterproof, IP 67, oil resistant, robust
- Plastic or stainless steel housing
- Customized versions available!
- Swiss made



New!
oil resistant thanks to Viton®

Technical specifications

		UPR 1003	UPR 1503
Detection range	mm	0...1000	0...1500
Blind range (no reasonable analogue output signal)	mm	0...180	0...180
Adjustment range of binary output (with potentiometer)	mm	180...1000	-
Adjustable full scale analogue out (with Potentiometer)	mm	-	500...1500
Hysteresis of binary output, axial	mm	45...15	-
Linearity of analogue output	%FS	<1%	<0.5%
Over all accuracy in whole temperature range	%FS		~±1
Operating frequency	kHz		~180
Status indicator	-		LED red
Binary output, short circuit proof, max. 0.1A	-	by choice PNP, NPN, NO, NC	-
Switching speed max.	Hz	~7	-
t _{on} / t _{off} binary output (depending on potentiometer setting)	ms	<100	-
Analogue output in detection range (versions)	V		(0)...10
R _L min. 10kΩ with V output	V		(10)...0V
R _L max. 500Ω with mA output	mA		(4)...20mA
Ripple of analogue output	mV		~±100
Tracking speed of analogue output	s/95%FS		<0.4
Power supply voltage (reversal polarity protection)	VDC		18...33
Ripple of supply voltage	%		<10
Mean consumption, switched without load	mA		~35
		version with mA output +20mA	
Peak current, switched without load	mA		300mA/0.1ms
Temperature coefficient of sensor	mV/°K		typ. +4
Temperature coefficient of air path	%/°K		-0.17 (increasing temperature → output decreases)
Ambient temperature during operation	°C		-20...+50
Sensor temperature during operation	°C		-20...+70
Pressure range	mbar _{abs}		~900...1100
Mass without cable	g		~45
Protection class	-		IP67
Housing material	-		Polyamide or V2A stainless steel
Electrical connection	-		M8 connector or integrated cable

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UPR 09.11 e

Description

Outstanding features of the UPR series are the compact M18 size and the 'W' version with 90° (radial) **SONARANGE** transducer for confine mounting conditions. The sensors are available as pure proximity switches and as distance sensors with V or mA analogue output as well. Typical applications are detection of objects and distance and level measurement.

Thanks to the new transducer sealing made of Viton® the UPR sensors are very robust against many environmental influences. In particular they are oil resistant, unlike many other ultrasonic sensors.

UPR 1003:

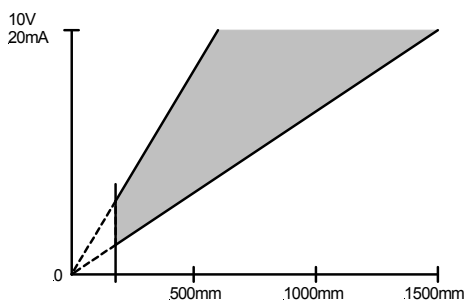
Distance up to 1000mm, versions with binary and/or analogue output, versions with cable or connector, versions in plastic or stainless steel housing.

UPR 1503:

These sensors have an extended measuring range of 1500mm with analogue output in V or mA. Ideal applications are distance and level measurement. The full scale (10V or 20mA) can be set with a multi turn potentiometer.

Setting of full scale (UPR 1503 only):

The full scale (FS), i.e. the distance where analogue output shall be 10V or 20mA, can be adjusted between 500...1500m. In order to set the FS, an object with reasonable size is placed at the desired distance. First the potentiometer is turned min. 4x counter clockwise to zero (no stop). Then the potentiometer is slowly turned clockwise until the desired reading is measured with a multimeter in V or mA. The analogue output always goes through (theoretical) zero, although it can never reach zero due to the blind range.



Inclination angle of object

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

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).

Binary output

The binary output becomes active, i.e. it switches on or off, when a scanned object falls below the set distance or if it exceeds it. Each switch point has a hysteresis (see technical specifications). This is the difference between switch on and switch off point during approach or departure. Hysteresis is necessary for an appropriate switching behaviour.

The switching distance is set with a 3-turn potentiometer. An object with reasonable size and perpendicularly to the sensor axis is placed at the desired distance from the sensor. First the potentiometer is turned min. 3x counter clockwise to zero (no stop). Then the potentiometer is slowly turned clockwise until the LED illuminates (NO) or expires (NC). Thus the switching distance for the binary output is set.

Synchronisation input (Y versions)

The ultrasonic signals can disturb each other when several sensors are focused on the same target or when sensors are mounted close together. This can be avoided by synchronizing the sending pulses. The synchronisation leads to all sensors are connected to each other by shielded cables as short as possible. Since all sensors send then simultaneously, the current consumption increases heavily. Not used synchronisation leads shall be isolated.

Cable

The sensors have a 3- or 4-pin M8 connector for screw or snap-on connection or an integrated cable. The cable should be kept as short as possible. Maximum cable length is approx. 100m, if cross section area is appropriate (peak current of 300mA!, use 470µF/35V backup capacitor close to sensor). The cable should not be mounted parallel or close to high current cables.

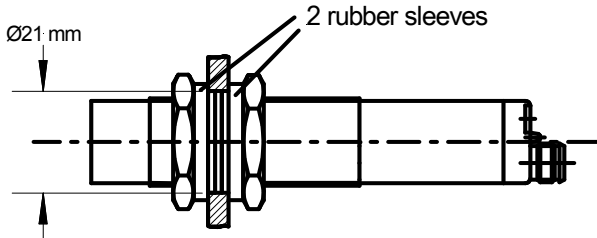
Cables for connection to the M8 connector have to be ordered separately.

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UPR 09.11 e

Mounting

Ultrasonic sensors shall be mounted as soft as possible in order keep acoustic disturbances away from the mounting spot. Thus two M18 nuts, washers and rubber sleeves for mounting are included. The rubber sleeves for a hole of $\varnothing 21\text{mm}$ shall be used.

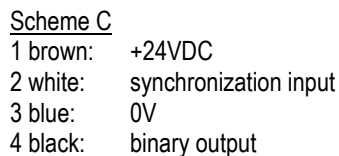
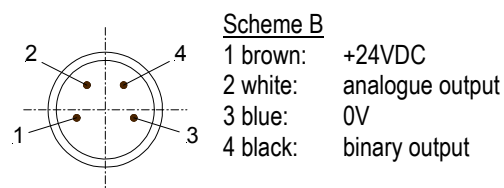
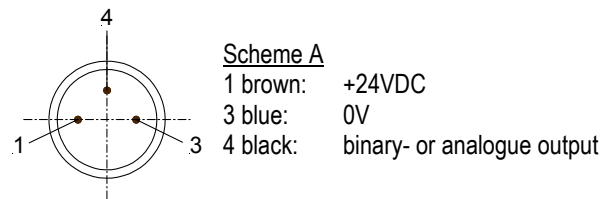


Power supply

Ideally a power supply is used exclusively for the sensor. The power supply must be able supply the short peak current of approx. 300mA for each sensor. In order to avoid disturbances the part where the sensor is mounted must be correctly earthed.

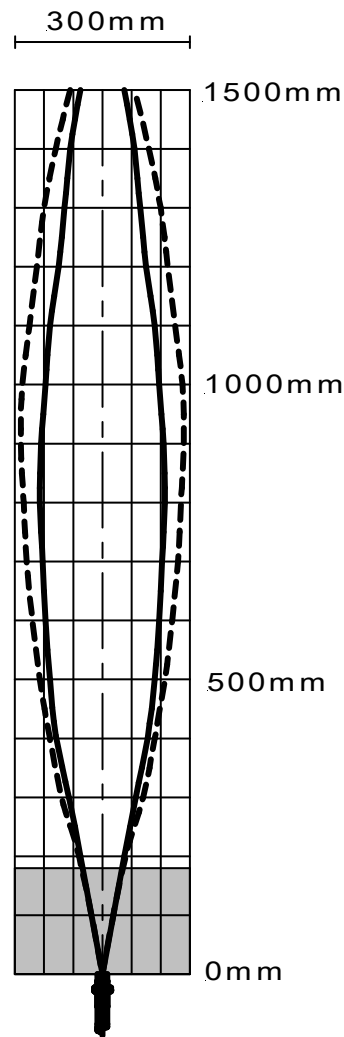
Electrical connection

(view on the sensor):



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. On the left the typical cone shapes for the UPR sensors are shown. The bold line shows the range, where the sensor detects objects which are perpendicular to the sensor axis. In the dotted range the sensor detects round objects ($\varnothing 10\text{mm}$). 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.

Max. range:
 UPR 1003: 1000mm
 UPR 1503: 1500mm

No other ultrasonic sensor working at the same frequency shall be within the cone or close to it or opposite to it. This is only allowed when using the synchronisation option (Y-version).

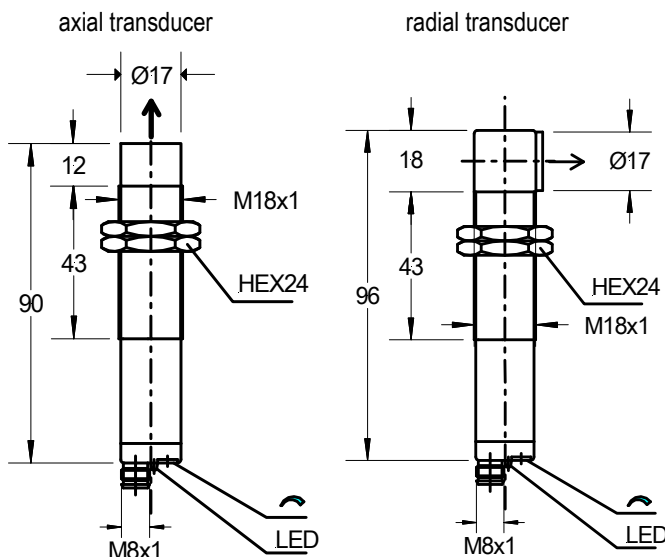
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Standard versions

Type	Description	Scheme
UPR 1003 PS 24	Plastic housing, axial transducer, PNP NO, 2m integrated cable	A
UPR 1003 PS 24 W	Plastic housing, radial transducer, PNP NO, 2m integrated cable	A
UPR 1003 PS 24 A	Plastic housing, axial transducer, PNP NO, analogue output 0...10V, 4-Pin connector	B
UPR 1003 PS 24 WA	Plastic housing, radial transducer, PNP NO, analogue output 0...10V, 4-Pin connector	B
UPR 1003 PS 24 VA	Plastic housing, axial transducer, PNP NO, inverted analogue output 10...0V, 4-Pin connector	B
UPR 1003 PS 24 VWA	Plastic housing, radial transducer, PNP NO, inverted analogue output 10...0V, 4-Pin connector	B
UPR 1003 PS 24 I	Plastic housing, axial transducer, PNP NO, analogue output 4...20mA, 4-Pin connector	B
UPR 1003 PS 24 WI	Plastic housing, radial transducer, PNP NO, analogue output 4...20mA, 4-Pin connector	B
UPR 1003 PS 24 Y	Plastic housing, axial transducer, PNP NO, Synchronisation input, 4-Pin connector	C
UPR 1003 PS 24 WY	Plastic housing, radial transducer, PNP NO, Synchronisation input, 4-Pin connector	C
UPR 1003 PS 24 C	Plastic housing, axial transducer, PNP NO, 3-Pin connector	A
UPR 1003 PS 24 CW	Plastic housing, radial transducer, PNP NO, 3-Pin connector	A
UPR 1003 PS 24 SA	stainless steel housing, axial transducer, PNP NO, analogue output 0...10V, 4-Pin connector	B
UPR 1003 PS 24 SVA	stainless steel housing, axial transducer, PNP NO, analogue output 10...0V, 4-Pin connector	B
UPR 1003 PS 24 SI	stainless steel housing, axial transducer, PNP NO, analogue output 4...20mA, 4-Pin connector	B
UPR 1003 PS 24 SC	stainless steel housing, axial transducer, PNP NO, 3-Pin connector	A
UPR 1503 R 24 CA	Plastic housing, axial transducer, analogue output 0...10V, 3-pin connector	A
UPR 1503 R 24 CI	Plastic housing, axial transducer, analogue output 4...20mA, 3-pin connector	A
UPR 1503 R 24 CWA	Plastic housing, radial transducer, analogue output 0...10V, 3-pin connector	A
UPR 1503 R 24 CWI	Plastic housing, radial transducer, analogue output 4...20mA, 3-pin connector	A

Dimensions



Parts included

- Sensor
- 2 of each M18 nuts, washers and rubber sleeves for mounting

Accessories (see also data sheet ,ACC')

Cables 4-pin with M8 screw connector, PUR:

- with straight connector: l=3m Type KAB 2K4VGPUR
- l=5m Type KAB 5K4VGPUR
- with 90° connector: l=2m Type KAB 2K4VWPUR
- l=5m Type KAB 5K4VWPUR

Cables 3-pin with M8 screw connector, PUR:

- with straight connector: l=2m Type KAB 2K3VGPUR
- l=5m Type KAB 5K3VGPUR
- with 90° connector: l=2m Type KAB 2K3VWPUR
- l=5m Type KAB 5K3VWPUR

Use an appropriate miniature screw driver max. Size 2.5mm for adjustment of the potentiometer for switching distance.