

INSTALLATION GUIDE

Ultrasonic Distance Sensor UPR-A ATEX

For further information please see the data sheet at www.waycon.biz/products/ultrasonic-sensors/

FIRST STEPS

WayCon Positionsmesstechnik GmbH would like to thank you for the trust you have placed in us and our products. This manual will make you familiar with the installation and operation of our ultrasonic sensors. Please read this manual carefully before initial operation!

Unpacking and checking:

Carefully lift the device out of the box by grabbing the housing. After unpacking the device, check it for any visible damage as a result of rough handling during the shipment. Check the delivery for completeness. If necessary, consult the transportation company, or contact WayCon directly.

EXPLOSION PROTECTION

Equipment for use in potentially explosive atmospheres must comply with the directive 2014/34/EU. When working with hazardous substances, the plant operator must carry out a safety analysis and the resulting zoning. Among others are the zones 2 and 22: Areas in which an explosive atmosphere does not occur or occurs only briefly during normal operation. These are for example areas in the vicinity of dust-containing systems, if dust can escape from leaks and can form deposits in dangerous quantities. In Zone 2 (gas) devices must be used, which correspond to the device group II, equipment protection level (EPL) Gc. In Zone 22 (dust) those of the device group III, EPL Dc. The protective measures are based on the tightness and impact resistance of the sensor housing, the maximum achievable housing temperature and the avoiding of sparks.

SAFETY INSTRUCTIONS

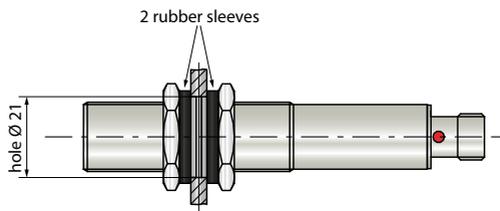
These devices are not designed for critical safety or emergency shut-down purposes. Therefore, they should never be used in an application, where a malfunction of the device could cause personal injury.

- The above-mentioned devices may be used only in zones compliant with the marking.
- Temperature range 0...+60 °C.
- Pressure range 0.9...1.1 bar absolute.
- Use only special cable sockets with self-locking!
- Tightening torque for M12 cable socket max. 25 Nm.
- Do not disconnect cable under tension!
- The sensor housing as well as the DC power ground must be earthed by an appropriate cable. A soldering eyelet is scope of delivery.
- The following statement has to be placed close to the device: „Do not disconnect cable under voltage!“



INSTALLATION

- Ultrasonic sensors may be installed in any position, if depositions like dust, spray mist or condensing humidity are avoided on the sound active membrane.
- It is important to avoid structure-borne sound bridges between the sensor and its holder. Please use the rubber rings for the installation, that are included in the delivery.
- In case several ultrasonic sensors are used in one application, it is important to leave sufficient distance between them. Otherwise the sensors may interact which leads to false measurement values.
- By using a sound deflection angle the sound beam can be redirected, at the expense of the sensor's maximum measurement range. A plain and hard surface should be used for the deflection of the sound beam. Redirecting the sound beam with multiple sound deflection angles should be avoided.



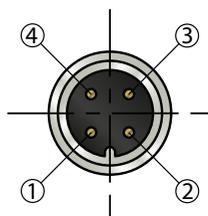
ELECTRICAL CONNECTION

Pin	Analog output version	Switching output version
1	+24 VDC	+24 VDC
2	Teach/Sync. ¹⁾	Teach/Sync. ¹⁾
3	GND	GND
4	OUT Analog ²⁾	OUT PNP

¹⁾ Sync. input with option Y only

²⁾ The analog sensor automatically recognises the load connected and emits the corresponding signal 4...20 mA or 0...10 V.

M12 connector, male



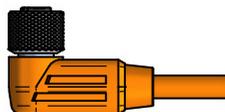
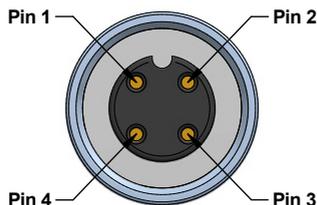
ACCESSORIES CABLES

Cable with connector (female) M12, 4 poles, shielded, IP67

K4PXM-S-M12 X m, straight connector

K4PXM-SW-M12 X m, angular connector

Pin	Cable colour
1	BN
2	WH
3	BU
4	BK



OVERVIEW TEACH FUNCTION

The accuracy can be improved beyond by teaching the sensor only after it has reached its thermally stable state (e.g. after 30 minutes).

Time	Connect Teach wire to	LED flashes	Analog output version	Switching output version
1...5 s	+U _B (typ. +24 VDC)	slowly yellow	NO: far window point or switching point NC: near window point	10 V or 20 mA
1...5 s	-U _B (typ. 0 VDC)	slowly yellow	NO: near window point NC: far window point or switching point	0 V or 4 mA
5...10 s	+U _B (typ. +24 VDC)	fast yellow	retroreflective barrier NO	-
10...15 s	+U _B (typ. +24 VDC)	fast red	retroreflective barrier NC	-
5...10 s	-U _B (typ. 0 VDC)	yellow	small detection cone	
10...15 s	-U _B (typ. 0 VDC)	yellow / red	medium detection cone	
15...20 s	-U _B (typ. 0 VDC)	red	large detection cone	
>20 s	-U _B (typ. 0 VDC)	-	factory reset	

TEACHING ANALOG OUTPUT

The two measuring limits are set by attaching the voltage supply -U_B (0 V) or +U_B (+24 VDC) to the Teach input for 1...5 s. During the teaching process the flashing LED indicates if the sensor detected the target.

- Yellow flashing LED: detected
- Red flashing LED: not detected

The lower evaluation limit (0 V or 4 mA) can be taught with -U_B and the upper evaluation limit (10 V or 20 mA) with +U_B. It can be used to program a rising or falling ramp:

- Position the target at the lower measuring limit (i.e. where 0 V or 4 mA is desired)
- Teach lower limit 1...5 s with -U_B
- Position the target at the upper measuring limit (i.e. where 10 V or 20 mA is desired)
- Teach upper limit 1...5 s with +U_B

Upper and lower measuring limits can be reprogrammed at any time.

Attention: The Teach wire/input (PIN 2) must be disconnected after the teaching process is completed. The sensor can therefore also be operated with a 3-wire cable after teaching.

TEACHING THE SWITCHING POINTS IN SCANNING MODE

In scanning mode, the target reflects a portion of the ultrasound, which in turn is detected by the sensor. The switching points are set by attaching the voltage supply $-U_B$ (0 V) or $+U_B$ (+24 VDC) during 1...5 s to the Teach input.

Window operation NO:

- Set target to near switching point
- Teach switching point 1...5 s with $-U_B$
- Set target to far switching point
- Teach switching point 1...5 s with $+U_B$

Window operation NC:

- Set target to near switching point
- Teach switching target at 1...5 s with $+U_B$
- Set target to far switching point
- Teach switching point 1...5 s with $-U_B$

Switching point NO:

- Set target to switching point
- Teach switching point 1...5 s with $+U_B$
- Point sensor at space (>1.5 m)
- Teach 1...5 s with $-U_B$

Switching point NC:

- Set target to switching point
- Teach switching point 1...5 s with $-U_B$
- Point sensor at space (>1.5 m)
- Teach 1...5 s with $+U_B$

During the learn-in process a flashing LED indicates whether the sensor detects the target.

- Yellow flashing LED: detected
- Red flashing LED: not detected

TEACHING THE SWITCHING POINTS IN RETROFLECTIVE MODE

Retroflective mode uses a reflector in the background (max. 1.5 m from the sensor). Unlike optical sensors the reflector can be any material which is somewhat sound reflecting. Retroflective mode is used in place of scanning mode if the target is at a very sharp angle to the sensor beam (see drawing) or is extremely sound absorbing (no evaluable signal would be reflected from the target to the sensor). In this mode the sensor permanently checks whether it sees the reflector or if it is covered by the target. Likewise, the sensor has no blind range in this operating mode.

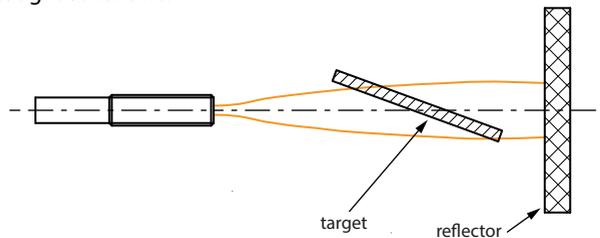
In reflection barrier mode the reflector is taught as follows:

NO:

Teach 5...10 s with $+U_B$
(Rapid flashing yellow LED)

NC:

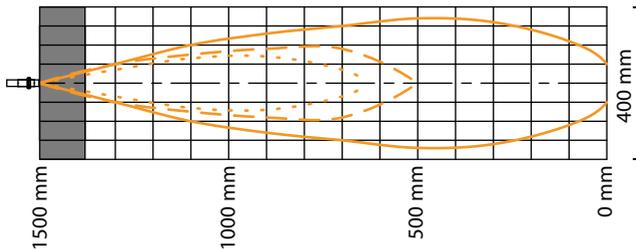
Teach 10...15 s with $+U_B$
(Rapid flashing red LED)



TEACHING THE SOUND BEAM

The diagram shows the 3 typical sound cone sizes, that can be programmed. The cone size is set by connecting the teach input for >5 s with the power supply $-U_B$ (0 V):

- Small cone: Teach 5...10 s with $-U_B$ (yellow LED blinks fast)
- Medium cone: Teach 10...15 s with $-U_B$ (yellow/red LED blinks fast)
- Large cone: Teach 15...20 s with $-U_B$ (red LED blinks fast)



The exact geometry of the sound cone depends on the air-pressure, temperature, humidity and the size of the target.

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. In the retroreflective mode the angle does not matter at all.

SYNCHRONISATION AND SUPPRESSION MODE

Ultrasonic sensor of the UPR-A ATEX series with option Y have the following two additional functions:

Synchronisation:

If several sensors are placed close together and scan the same object or if a common background is present, the sensors must be synchronized. For this, the Teach/Sync. wires of all sensors (max. 6 sensors) are interconnected. Important is the order:

1. teach each sensor individually (!)
2. turn off the power
3. interconnect all Teach/Sync. wires
4. power on again only when everything is wired!

Suppression mode:

This additional function is interesting, for example, in level measurement with troublesome agitators. The sensor can be stopped by an external signal. For this purpose, the Teach/Sync. wire is powered externally with a signal of 1...3 VDC. As long as this voltage is present, the sensor no longer transmits and keeps the last measured distance. To reactivate the sensor, the external power source has to be removed (not on mass but separated at high impedance!).



DECLARATION OF EU-CONFORMITY

WayCon Positionsmesstechnik GmbH

Based on: EN 60947-5-2 + amendments (proximity switches)
EN 60947-5-7 + amendments (proximity sensors with analogue output)

This is to certify that the following products correspond to the mentioned specifications.

Classification Ultrasonic Sensors
Series UPR-A-ATEX

Test on immunity IEC 61000-6-2 (Industry)

Type of test applied harmonized standards:
EN 61000-4-2, EN 61000-4-3, EN 61000-4-4

The declaration of conformity loses its validity if the product is misused or modified without proper authorisation.

Taufkirchen, 13.03.2013


Andreas Täger
CEO

ATEX DECLARATION

The manufacturer certifies conformity to the basic safety requirements of the following devices for the intended use in hazardous areas with dust (ATEX zone 22) and Gas (ATEX zone 2). The basic safety requirements are met by compliance with EN 60079:2012. The results are recorded in the test report.

Devices: Ultrasonic sensor UPR-A 1500 TOR 24 CAI Ex
Ultrasonic sensor UPR-A 1500 TVPA 24 C Ex
Ultrasonic sensor UPR-A 1500 TVNA 24 C Ex

Marking of the devices has to be as follows:

Dust: Ex tc IIIC T60°C Dc 0°C ≤ Ta ≤ +60°C
Gas: Ex nA IIC T6 Gc 0°C ≤ Ta ≤ +60°C