INSTALLATION GUIDE

Ultrasonic Sensors Series UPA

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.

MOUNTING THE SENSOR

Ultrasonic sensors may be installed in any position, as long as 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 it's holder.

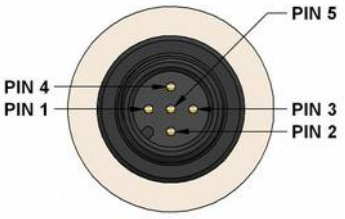
In case several ultrasonic sensors are used in one application, it is important to leave sufficient distance between them. Otherwise the sensors may interact which leads to false measurement values.

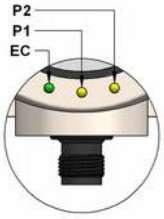
By using a sound deflection angle the sound beam can be redirected, at the expense of the sensor's maximum measurement range. A plain and hard surface should be used for the defection of the sound beam. Redirecting the sound beam with multiple sound deflection angles should be avoided.

ELECTRICAL CONNECTION

UPA-6000, Analog Output	
Pin 1	+24 V
Pin 3	0 V
Pin 4	Analog Output
Pin 5	Teach-In

UPA-6000, Switching Output	
Pin 1	+24 V
Pin 2	Switching Point P2
Pin 3	0 V
Pin 4	Switching Point P1
Pin 5	Teach-In





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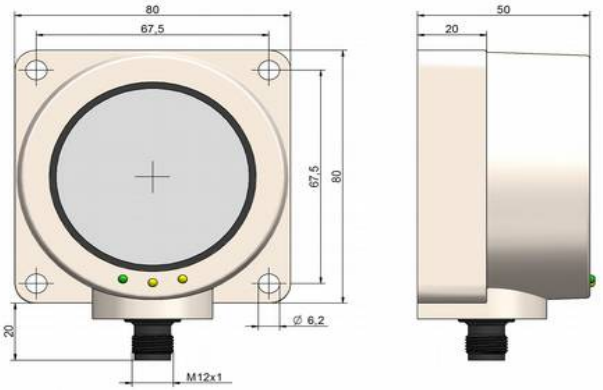
TECHNICAL DRAWING

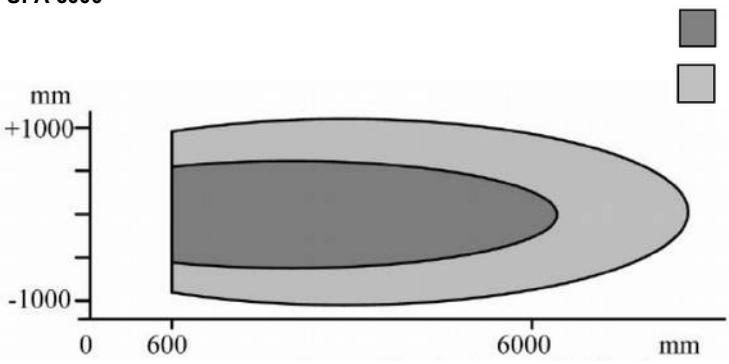
UPA-6000
Range: 6000 mm
output: 2 x switching points or 0...10 V or 4...20 mA



SOUND CONE GEOMETRY

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

UPA-6000



Guaranteed detection of a target 100 x 100 mm²
Possible detection of a large target

TEACHING THE SENSOR

Sensor with analog output:

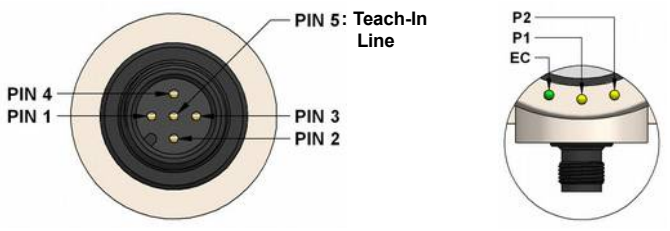
Every sensor is delivered with the factory set-up (max. measuring range). The teach-in feature was designed to choose a smaller range within the nominal measuring range for optimizing the resolution and linearity. Output current, resp. output voltage adapt to the new range and get new characteristic curves. Two positions must be taught.

Sensor with switching output:

The teaching procedure is used to set the operation mode of the switching output and the 2 switching points.

TEACH-IN ELEMENTS

UPA



EC (Echo LED) green: is on, when an echo is received (alignment LED).

P1, P2 LED yellow: LEDs P1 and P2 indicate the status of the switching outputs.

TEACH-IN GUIDE

Ultrasonic Sensors Series UPA

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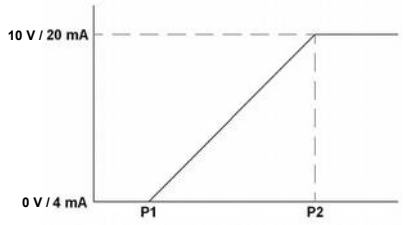
TEACHING THE ANALOG OUTPUT

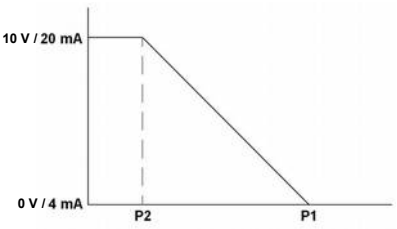
Characteristics

P1 and P2 define the analoge output slope.
P1 determines the 0 V / 4 mA position and P2 the 10V / 20 mA position.

Positive Slope: P1 < P2



Negative Slope: P2 < P1



Teach-In of P1 (SP1 position)

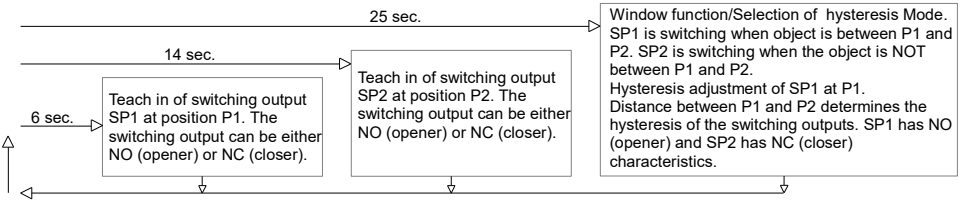
Connect Teach In line with GND until P1 and Echo LEDs start blinking with a 2 Hz frequency and then release the contact. The sensor is now in the Teach In mode for P1: P1 LED will now blink with 1 Hz frequency and the Echo LED will go back to normal function (alignment LED). There is a time window of 30 sec. to do the programming of P1.
Place the target at the new position P1. Contact and release Teach In line with GND: P1 is now programmed. Sensor returns to normal function with the new value for P1.

Teach-In of P2 (SP2 position)

Connect the Teach In line with GND until the P2 and Echo LEDs start blinking with a 2 Hz frequency. First P1 and Echo LEDs will be blinking, but it is important to wait to reach P2. The sensor is now in the Teach In mode for P2: P2 LED blinks with 1 Hz frequency now. The Echo LED returns to normal function (alignment LED). There is a time window of 30 sec. to do the programming of P2. Place target at the new position P2. Contact and release the Teach In line with GND: P2 is now programmed. Sensor returns to normal function with the new value for P2.

TEACHING THE SWITCHING OUTPUT

Three different modes of switching outputs can be selected:
normal switching function / window function / adjustable hysteresis
All these functions will be taught with the programming input (PIN 5) present in the connector. Each mode has a different sequence using the Echo, P1 and P2 LEDs. The diagram displays the timing.

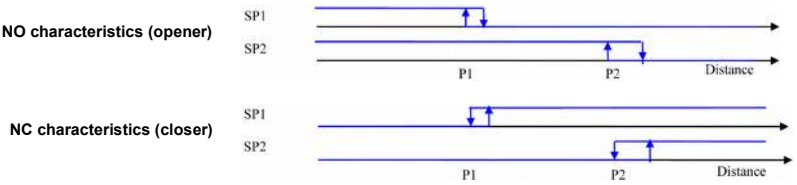


Normal Switching Function

Teach In of P1 (SP1 position)
Connect Teach In line with GND until P1 and Echo LEDs start blinking with a 2 Hz frequency and then release the contact. The sensor is now in Teach In mode for P1: P1 LED will now blink with 1 Hz frequency and the Echo LED will go back to normal function (alignment LED). There is a time window of 30 sec. to do the programming of P1. Place the target at the new position P1. Contact and release Teach In line with GND: P1 is now programmed. Sensor returns into normal function with new value for P1.

Teach In of P2 (SP2 position)
Connect the Teach In line with GND until the P2 and Echo LEDs start blinking with a 2 Hz frequency. First P1 and Echo LEDs will be blinking but it is important to wait to reach P2. The sensor is now in Teach In mode for P2: P1 LED blinks with 1 Hz frequency now. The Echo LED returns to normal function (alignment LED). There is a time window of 30 sec. to do the programming of P2. Place target to the new position P2. Contact and release the Teach In line with GND: P2 is now programmed. Sensor returns into normal function with new value for P2.

Switching output characteristics
can be selected during teach in of the set points P1 and P2. For each set point and during the teaching procedure, when the LED is ON when contacting and releasing the teach in line to ground, the switching output will have NO characteristics, when doing this when the LED is it OFF, the switching output will have NC characteristics.



TEACH-IN GUIDE

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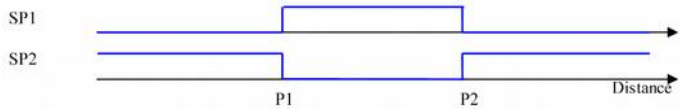
TEACHING THE SWITCHING OUTPUT

Window function / Hysteresis adjustment

Connect the teach In line with GND until P1, P2 and Echo LEDs start blinking with a 2 Hz frequency. Before reaching the hysteresis teach in mode, the sensor will go through the P1 and P2 teaching sequence. Keep the teach in line connected to the ground until reaching the point when all LEDs are blinking with a 2 Hz frequency. Release the teach in line contact. The sensor is now in Teach In mode for window function/ hysteresis adjustment: P1+P2 LEDs are blinking with a 1 Hz frequency. The Echo LED returns to its normal function (alignment LED). There is a time window of 30 sec. to complete the programming. Contact and release the teach In line with GND. Pay attention to P1 and P2:

If P1+P2 LEDs are OFF during the contact with the teach in line, the sensor will operate the in window function. If there is an object between P1 and P2, SP1 will switch ON and SP2 will switch OFF. If there is no object between P1 and P2, SP1 will switch OFF and SP2 will switch ON.

Window Function



If P1+P2 LEDs are ON during contact, the sensor will operate in the hysteresis mode. The switching output SP1 will be (NO) at P1 with hysteresis P1-P2 and switching output SP2 will be (NC) also at P1 with hysteresis P1-P2.

Hysteresis Adjustment

NOTES

Warning
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.

Environmental Influences
Ultrasonic sensors are made for the use in atmospheric air. Environmental Influences like rain, snow, dust or smoke have no influence on the accuracy of the measurement. However, measurements under pressure (higher that the atmospheric pressure) are not possible with ultrasound sensors.
Strong wind or air turbulences may lead to instability in measurement values. A flow speed up to a few m/s is unproblematic and will have no influence on the sensor's accuracy.

Target Influences

Liquids
are excellently detectable with ultra sound. A classic application for ultrasonic sensors is level measurement. The sound beam axis however must have a maximum deviation of 3° vertically to the liquid level (no strong waves), otherwise the reflected sound will miss the sensor.

Hot Targets
with high temperatures cause a thermal convection in the surrounding air. For this reason the sound beam may be strongly diverted vertically to it's axis, so that the echo is weakened, or can no longer be received at all.

For convex (cylindrical and spherical) surfaces,
every area element has a different angle to the sound cone’s axis. The reflected cone thus diverges and the portion of the sound energy reflected to the receiver is reduced correspondingly. The maximum range decreases with the decreasing size of the cylinder (ball).

The roughness and surface structures of the object
to be detected also determine the scanning capacities of the ultrasonic sensors. Surface structures that are larger than the ultrasound wavelength, as well as coarse-grained bulk materials, reflect ultrasound in a scattered manner, and are not detected optimally by the sensor under these conditions.

Hard material
reflects almost all of the impulse energy from ultrasound applications in a way that makes them very easy to detect with ultrasound.

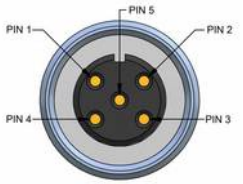
Soft material,
on the other hand, absorbs almost all of the impulse energy. It is thus harder to detect with ultrasound. These materials include felt, cotton, coarse meshes, foam, etc.

Thin-walled foils
behave like soft materials. To be able to use ultrasound, the foil thickness should be at least 0.01 mm.

ACCESSORIES

Cable with M12 connector, 5-pole, shielded, IP67	
K5P2M-S-M12	2 m, straight connector
K5P5M-S-M12	5 m, straight connector
K5P10M-S-M12	10 m, straight connector
K5P2M-SW-M12	2 m, angular connector
K5P5M-SW-M12	5 m, angular connector
K5P10M-SW-M12	10 m, angular connector

PIN	Cable colour
1	brow n
2	w hite
3	blue
4	black
5	grey



DECLARATION OF EC-CONFORMITY

WayCon Positionsmesstechnik GmbH
Mehlbeerenstrasse 4
82024 Taufkirchen / Germany

This is to certify that the products

Classification: Ultrasonic Sensors
Series: UPA

fulfill the current request of the following EC-directives:
EMV-directive 2004/108/CE
applied harmonized standards:
EN 61000-6-2:2005, EN 61000-6-4:2007, EN 61326-1:2006

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

Taufkirchen, 13.03.2013

Andreas Täger
CEO