INSTALLATION GUIDE

Ultrasonic Sensors Series UFP and 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 its 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

UFP-200

Pin	Function	Connection cable K4P
1	+V	BN
2	Teach-In	WH
3	GND	BU
4	Analog / Switching output	BK

connector output M12 (male)

ELECTRICAL CONNECTION

UFP-400...3500, UPA-6000

Pin	Analog output	Switching output	Connection cable K5P
1	+V	+V	BN
2	-	Switching point P2	WH
3	GND	GND	BU
4	Analog	Switching point P1	BK
5	Teach-In	Teach-In	GY

connector output M12 (male)

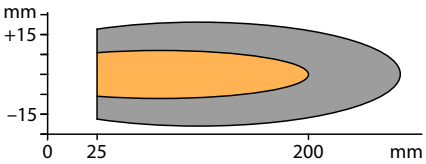
DETECTION BEAMS

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

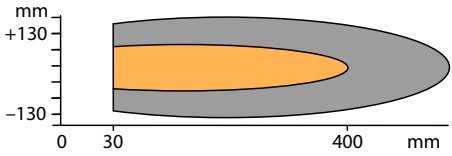
Guaranteed detection of target 100x100 mm²

Possible detection of a large target

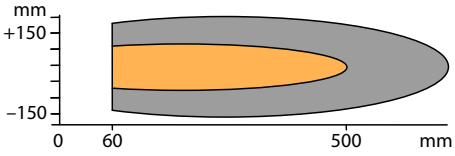
UFP-200



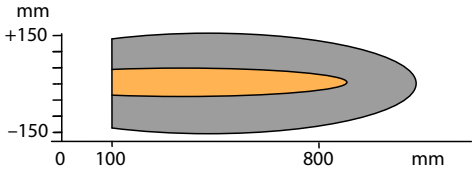
UFP-400



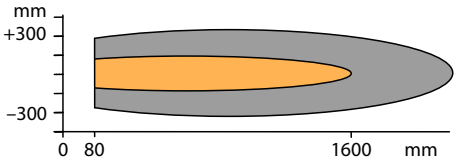
UFP-500



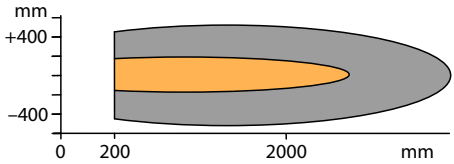
UFP-800



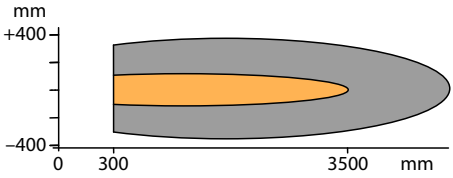
UFP-1600



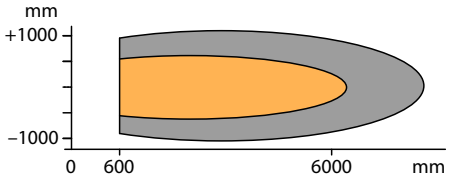
UFP-2000



UFP-3500

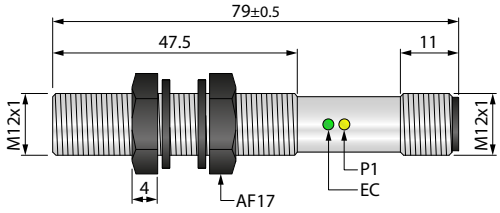


UPA-6000

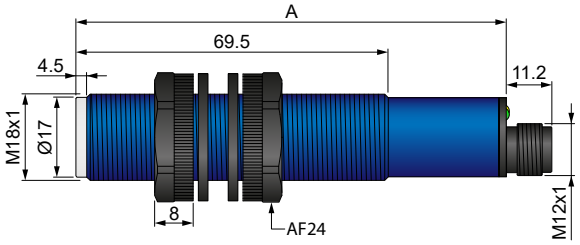


TECHNICAL DRAWING

UFP-200

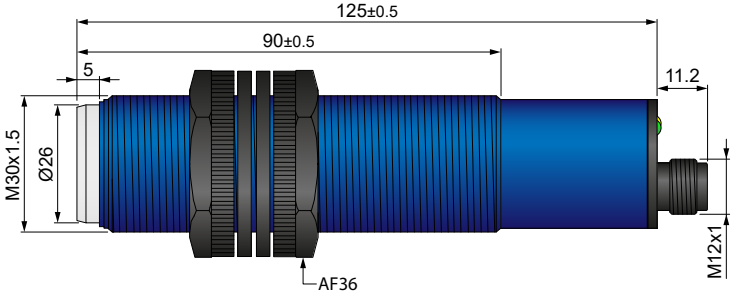


UFP-400/500/800/1600/2000

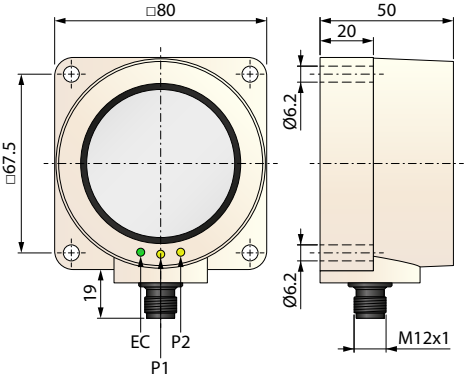


Model	A
UFP-400	89
UFP-500/800/1600/2000	96

UFP-3500

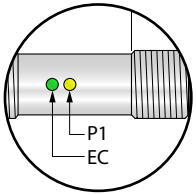


UPA-6000

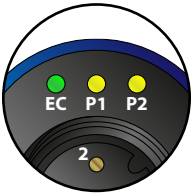


LEDS

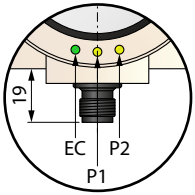
UFP-200



UFP-400/500/800/ 1600/2000/3500



UPA-6000

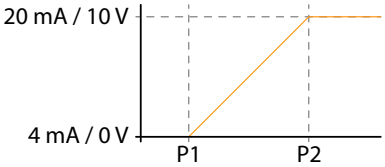


EC (Echo LED) green: is on, when an echo is received (alignment LED).
P1, P2 LED yellow: LEDs P1 and P2 indicate the status of the switching outputs (UFP-200: just P1).

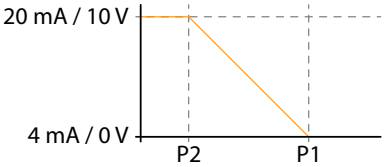
TEACHING THE ANALOG OUTPUT

Every sensor is delivered with the factory set-up (max. measurement range). The teach-in feature is designed to choose a smaller range within the nominal measuring range for optimizing the resolution and linearity. Output current, or output voltage adapt to the new range and get new characteristic curves. The two positions P1 and P2 must be taught.

Characteristics
P1 and P2 define the analog output slope.
P1 determines the 0 V / 4 mA position and P2 the 10 V / 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 (UFP-200 just yellow). Release the contact. The sensor is now in the Teach-In mode for P1: P1 LED will now blink with 1 Hz frequency (UFP-200 with ½ Hz) and the Echo LED will go back to normal function (alignment LED). There is a time window of 30 seconds to do the programming of P1. Place the target at the new position P1. Connect and release Teach-In line with GND: P1 is now programmed. Sensor returns to normal function with the new value for P1.

TEACHING THE ANALOG OUTPUT

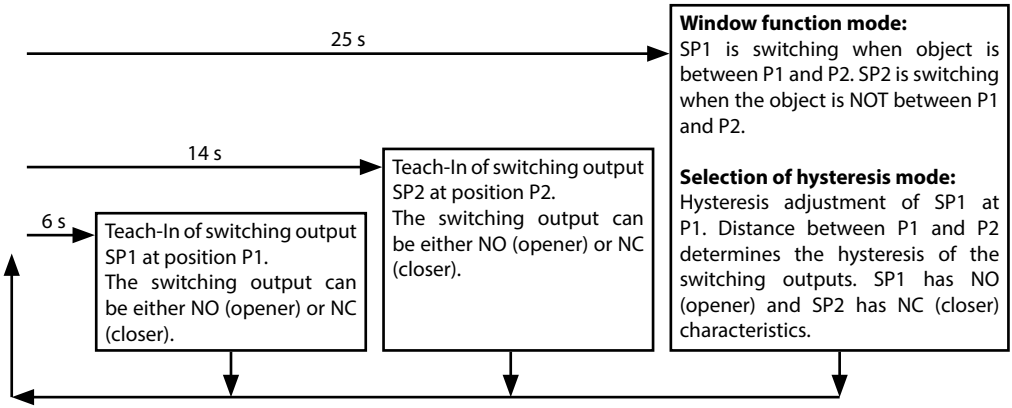
Teach-In of P2 (SP2 position)
Connect the Teach-In line with GND until the P2 and Echo LEDs start blinking with a 2 Hz frequency (UFP-200 just yellow, 1 Hz). First P1 and Echo LEDs will be blinking, but it is important to wait to reach P2. The sensor is now in the Teach-In mode for P2: P2 LED blinks with 1 Hz frequency now (UFP-200 just yellow, ½ Hz). The Echo LED returns to normal function (alignment LED). There is a time window of 30 seconds 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

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

Three different modes of switching outputs can be selected:
- Normal switching function
- Window function
- Adjustable hysteresis

All these functions will be taught with the Teach-In line present in the connector. Each mode has a different sequence using the Echo, P1 and P2 LEDs. The diagram displays the timing.

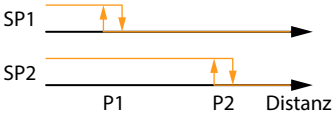


Normal Switching Function
Teach-In of P1 (SP1 position):
Connect Teach-In line with GND until P1 and Echo LEDs start blinking with a 2 Hz frequency and then release the contact. The sensor is now in Teach-In mode for P1: P1 LED will now blink with 1 Hz frequency and the Echo LED will go back to normal function (alignment LED). There is a time window of 30 s 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.

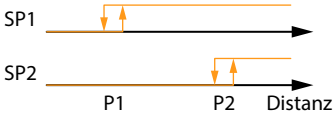
TEACHING THE SWITCHING OUTPUT

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 s 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:
The 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 GND, the switching output will have NO characteristics, when doing this when the LED is it OFF, the switching output will have NC characteristics.



NO characteristic (opener)

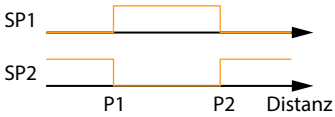


NC characteristic (closer)

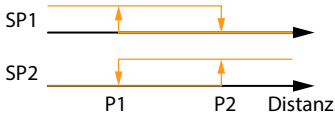
Window function / Hysteresis adjustment
Connect the Teach-In line with GND until P1, P2 and Echo LEDs start blinking with a 2 Hz frequency. Before reaching the hysteresis Teach-In mode, the sensor will go through the P1 and P2 teaching sequence. Keep the Teach-In line connected to the GND until reaching 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 s 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.



If P1+P2 LEDs are ON during contact, the sensor will operate in 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.



INFLUENCES ON THE MEASUREMENT

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 ultrasound. 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 its 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.

DECLARATION OF EU-CONFORMITY

WayCon Positionsmesstechnik GmbH
Mehlbeerenstraße 4
82024 Taufkirchen / Germany

This is to certify that the products

Classification	Ultrasonic Sensors
Series	UFP, UPA

fulfil the current request of the following EC-directives:
EMC-directive 2014/30/EU
applied harmonized standards:
EN 60947-5-2: 2007 + A1:2012, EN 60947-5-7:9/2003

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

Taufkirchen, 24.02.2016

Andreas Täger
CEO