

INSTALLATION GUIDE

Ultrasonic Sensors Series UN

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 deflection of the sound beam. Redirecting the sound beam with multiple sound deflection angles should be avoided.

The UN sensors have 4 threaded holes on their rear side of the housing. They can be mounted with M4 screws. Four M4x20 screws are provided with each sensor. The UN 5000 versions shall be mounted with the damping rubber bush (included) in order to avoid acoustic cross talk. An optional mounting bracket made of glass fibre reinforced plastic can be ordered (see accessories).

ELECTRICAL CONNECTION

All standard versions have a 4-pin M8 connector for screw or snap-on connection. The Y-versions with synchronisation input have a shielded integrated cable (l=2m). Special cable lengths and integrated cables instead of connectors are available on demand. The cable should be kept as short as possible. Maximum cable length is approx. 100m, if cross section area is appropriate (peak current <100mA, 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.

Power supply

Ideally a power supply is used exclusively for the sensor. The power supply must be able to supply a short peak current of 80...100 mA for each sensor. In order to avoid disturbances the component, the sensor is mounted to should be correctly earthed.

WayCon

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INSTALLATION GUIDE

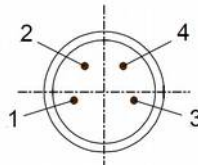
Ultrasonic Sensors Series UN

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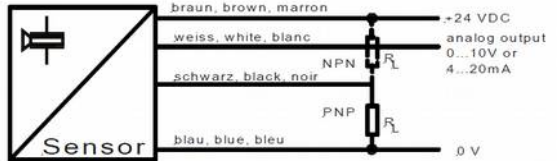
ELECTRICAL CONNECTION

Connector M8

PIN 1	brown
PIN 2	white
PIN 3	blue
PIN 4	black



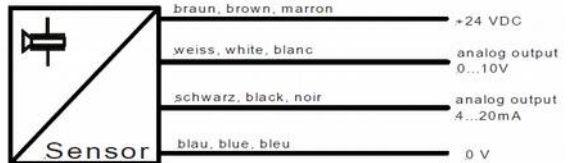
UN-...-PVPS-24-CU	PNP NO, 0...10 V
UN-...-PVPS-24-CI	PNP NO, 4...20 mA
UN-...-PVPS-24-CVU	PNP NO, 10...0 V
UN-...-PVPS-24-CVI	PNP NO, 20...4 mA



UN-...-PDPS-24-C	2 x PNP NO
UN-...-PDPA-24-C	1 x PNP NO, 1x PNP NC

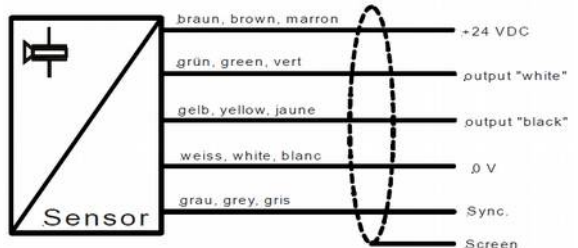


UN-...-POR-24-CUI	0...10 V, 4...20 mA
UN-...-POR-24-CVUI	10...0 V, 20...4 mA



Versions with synchronisation input

UN-...-Y	cable output, 2 m length
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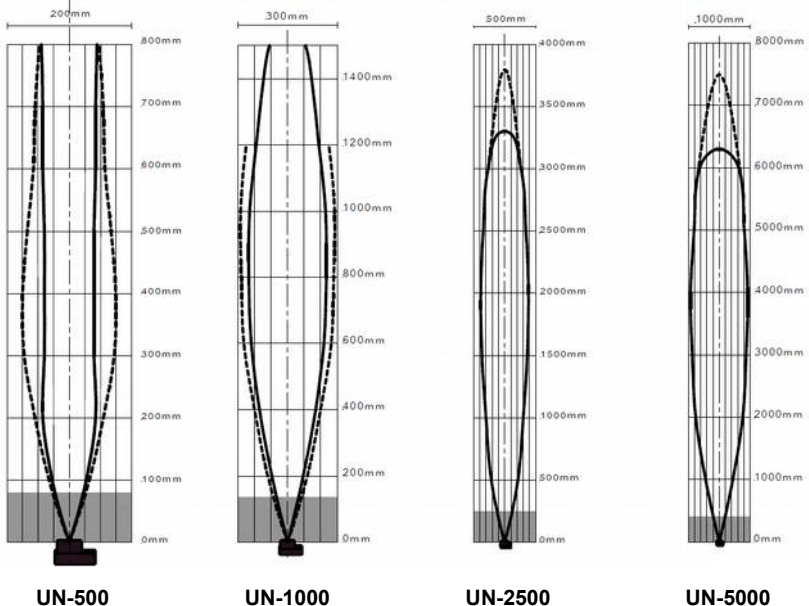
SOUND CONE GEOMETRY

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

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

Below are some typical cone shapes for each UN sensor type. The solid line shows the range, where the sensor detects flat objects of size A4 (UN 500/1000) or A3 (UN 2500/5000) which are perpendicular to the sensor axis. In the dotted range the UN 500/1000 sensors detect round objects ($\varnothing 10\text{ mm}$). For UN 2500/5000 the dotted range is the area where the sensor detects only large and very well reflecting objects. Furthermore the size of the detection cone is influenced by air temperature and humidity. The colder and dryer the air, the larger is the cone. The extended measuring range (above nominal range) is only available with the POR versions.

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



■ : blind range

TEACH-IN GUIDE

Ultrasonic Sensors Series UN

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ANALOG OUTPUT

Zero and full scale (FS) of the analog outputs can be set on the POR versions with two 4-turn potentiometers. The analog output has to be monitored with a multi-meter.

Zero (= limit close to the sensor):

Zero (e.g. 0 V) is at the position of the sensor diaphragm when potentiometer No. 1 is turned at least 4 x counter clockwise (no stop). If zero shall be in some distance away from the sensor, one has to place there an object with reasonable size. The potentiometer is turned min. 4 x clockwise (no stop). The reading must then be e.g. 0 V or a very small residual value (approx. 0.04 V). Then slowly turn counter clockwise until the reading starts to increase. This position is the correct setting for the zero.

Full scale (FS = far limit):

An object with reasonable size is placed at the desired distance. With potentiometer No. 2 the desired reading (e.g. 10 V) is then set. The zero and the gain can be varied within certain limits (see table below). However in the range >100 % the sensor will detect only large objects and above a certain distance no objects at all. FS must always be above zero. If the analog output shall be inverted, i.e. zero above FS, then the inverted version 'V' must be used.

Type	Zero normal: 0 V / 4 mA inverted: 10 V / 20 mA		Gain [mm per 10 V or 20 mA]	
	Min. [mm]	Max. [mm]	Min.	Max.
UN 500	0	300	100	800
UN 1000	0	500	200	1500
UN 2500	0	1500	500	3800
UN 5000	0	3000	1000	8000

SWITCHING OUTPUT

The switching distance is set with a 4-turn potentiometer. An object with reasonable size and perpendicular to the sensor axis is placed at the desired distance from the sensor. First the potentiometer is turned min. 4 x 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. Red corresponds to the output 1 and green to the output 2. The versions with two binary outputs have a bi-coloured LED (red/green).

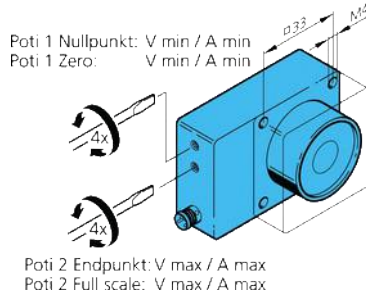


SETTINGS

Analog output

UN-...-POR-24-CUI
UN-...-POR-24-CVUI

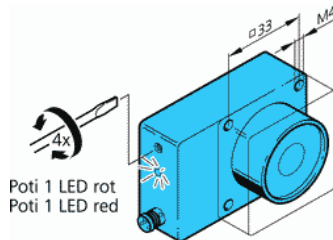
Setting elements:
1 Potentiometer
no LED



1 Analog + 1 switching output

UN-...-PVPS-24-CU
UN-...-PVPS-24-CI
UN-...-PVPS-24-CVU
UN-...-PVPS-24-CVI

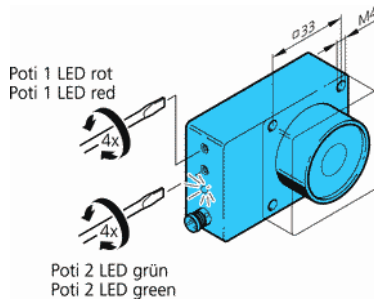
Setting elements:
1 Potentiometer
1 LED



2 switching outputs

UN-...-PDPS-24-C
UN-...-PDPA-24-C

Setting elements:
1 Potentiometer
1 bicolor LED



TEACH-IN GUIDE

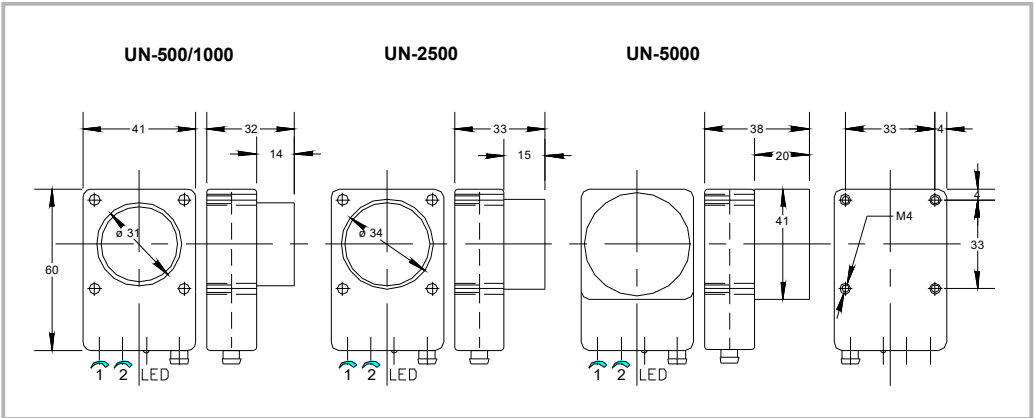
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SYNCHRONISATION Y VERSIONS

The ultrasonic signals can disturb each other when several sensors are focused on the same target or when sensors are mounted too close together. This can be avoided by synchronizing the sending pulses. The synchronisation lines of all sensors are connected to each other with shielded cables, that should be as short as possible. Since all sensors now send simultaneously, the current consumption increases heavily. Unused synchronisation lines shall be isolated.

TECHNICAL DRAWING





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 than the atmospheric pressure) are not possible with ultrasonic 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

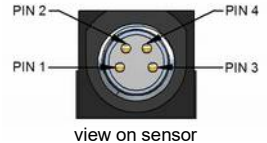
Cable with mating M8 connector

4 poles, shielded, IP67

K4P2M-S-M8	2 m, straight connector
K4P5M-S-M8	5 m, straight connector
K4P10M-S-M8	10 m, straight connector
K4P2M-SW-M8	2 m, angular connector
K4P5M-SW-M8	5 m, angular connector

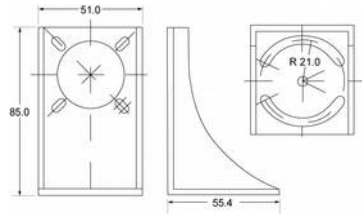
PIN Cable colour

1	brown
2	white
3	blue
4	black



Mounting bracket

UN-Winkel



DECLARATION OF EC-CONFORMITY

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 UN

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 Träger
CEO