



Ultrasonic detection

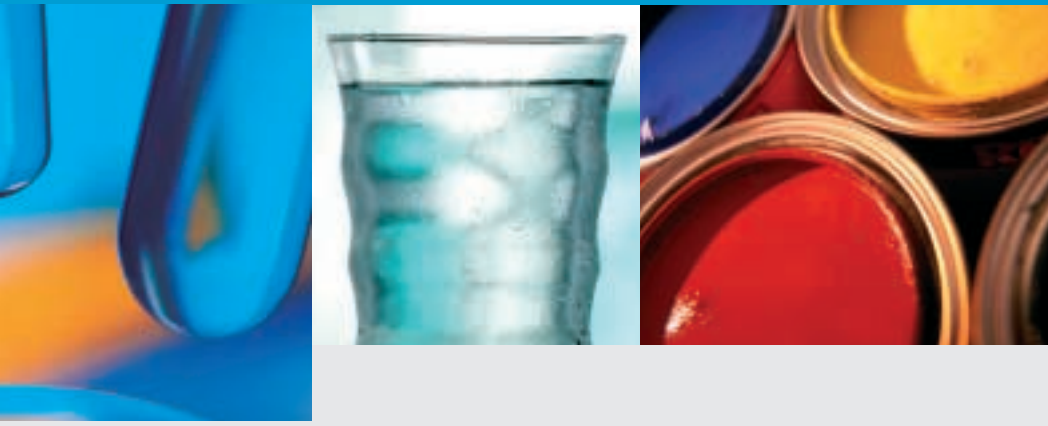


Ultrasonic detection

Light and sound are two natural phenomena which let every living being recognise their environment without physical contact and over widely varying distances. Likewise, industrial processes require reliable information. SICK's ultrasonic sensors UM 30 and UM 18 detect objects and measure distances with high accuracy.

The realm of sound is a world of its own, and for this reason ultrasonic sensors are simply the better choice in many industrial applications requiring sensor technology.





Detection and measurement, regardless of material

Transparent objects such as glass and film are often a difficult task for sensors, as are clear and coloured fluids. But it is hard to deceive ultrasonic. Almost all materials affect and reflect sound waves.



Sound has an advantage – even on superficial inspection

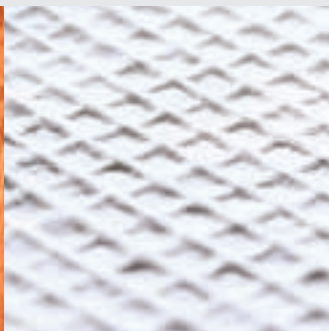
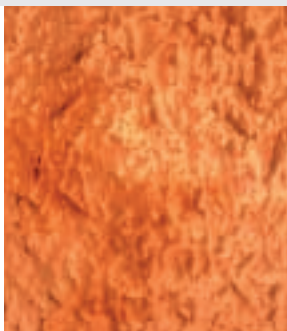
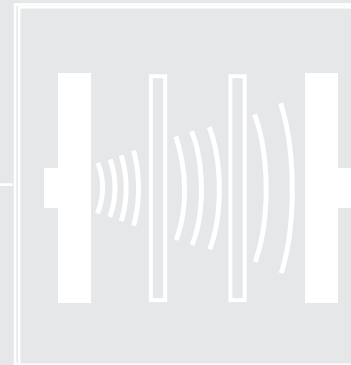
Whether the surface is rough or smooth, reflecting or retro-reflecting, regular or irregular in shape, ultrasonic sensors are generally unaffected. They detect objects reliably and almost independently of their appearance.

Highly available, even under difficult conditions

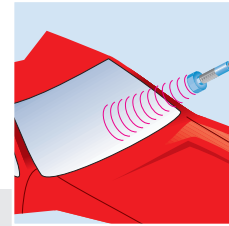
Dust and dirt, steam and spray are no problem for ultrasonic sensors. Unfavourable environments have little effect on them. Interferences are simply “blanked out”. And they do not even mind strong light and adverse temperatures.

Never confused by loud colours

Not even the oddest colours can bias Ultrasonic sensors. Reflecting objects do not irritate them at all. When objects change colour, there is no need to readjust the sensors. They just go on working as before – can anyone think of a more convenient way?



Detect, measure and switch with SENSICK UM 30



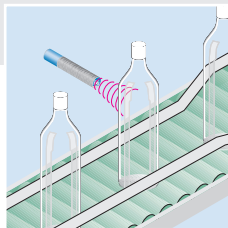
◀ Positioning: object-detection and distance-measurement independent of material

Sensors with a profile – defining the detection area

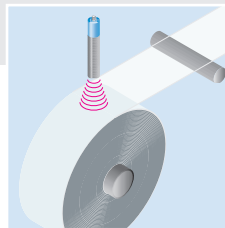
SICK Ultrasonic Sensors generate an ultrasonic wave by means of a piezo element in the front part of the housing. The wave spreads in the atmosphere in accordance with the laws of physics. The same piezo element can detect and measure the sound reflected by an object. Therefore it functions alternately as sender and receiver (transceiver).

The measurement principle of ultrasonic sensors is based on the time taken for ultrasonic to travel through the medium air. The signals are transmitted in defined “packages”. With the help of its processing electronics, the transceiver evaluates the time taken between the transmission

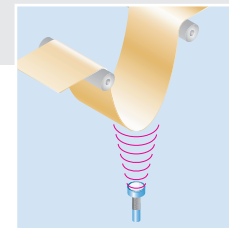
of a sound “package” and the arrival of the reflection from an object. As a result, either a signal proportionate to the distance is sent via an analogue interface, or a switching signal depending on a previously set distance parameter is sent through a binary output. The accuracy of the measurement and the maximum scanning range lie within a tolerance range which depends mainly on the state of the carrier medium air and the roughness of the object in question.



◀ Detection: recognise transparent objects



◀ Unwind: distance-measurement for diameter check



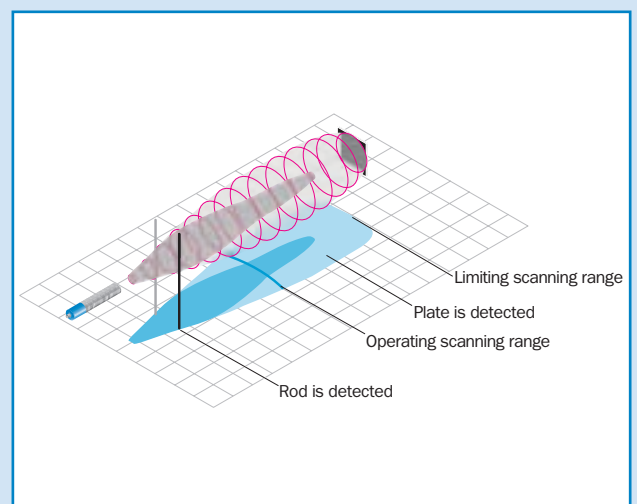
◀ Adjust: Control material looping

Detection range

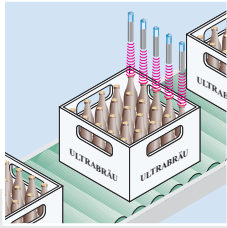
To determine the area of detection of the sensors, a series of measurements are carried out with two standardised objects, a thin round rod and a plate. The three-dimensional area within which the sensor responds to the rod has the form of a thin club. It marks the typical operating scanning range of the sensor.

The sensor responds to the plate within the area of a larger beam. This area defines the maximum or limit detection range of the sensor.

When projected onto a two-dimensional grid, typical profiles are created. These are the operating diagrams of the ultrasonic sensors, from which the operating scanning range, the limiting scanning range, the specific shape and the blind zone of the detection range can be read off. Objects which are smaller than the round rod may only be detected within an area smaller than the operating scanning range.



Every ultrasonic sensor has its characteristic club-shaped detection range. It is narrow for smaller objects and wide for larger ones. The typical detection areas are depicted by sound-beam diagrams.



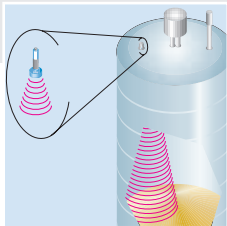
◀ Package:
“engaged” check
on package content

Sensors in action – scanning and measuring reflections

Ultrasonic sensors UM 30 are used as non-contact proximity switches which process reflected signals, e.g. from objects on a conveyor belt. An essential benefit of the working principle of ultrasonic sensors is the almost complete blanking of the background, a prerequisite for accurate detection.

Scanning round corners – thanks to the right accessories

Ultrasonic sensors UM 30 are small and easily installed even in confined spaces. And if things get really tight, the right accessories can help out. Suitable reflectors allow sound to be deflected almost without loss.



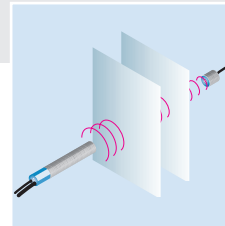
◀ Monitoring:
level control in
silos and con-
tainers

Double-sheet detection with SENSICK UM 18

This sound goes right through ...

When ultrasonic is used to detect two thin sheets, one of which is immediately behind the other, e.g. paper, film or thin sheet material, separate sender and receiver units are required. The continuously transmitted sonic waves packages cause vibrations in the first sheet which it then transmits via the intervening air to the second sheet, which also begins to vibrate. The receiver unit is able to detect these weakened signals via the air.

The sender and receiver units of the UM 18 are only 40 mm apart and work effectively without having to be parametered. They adjust automatically to a wide spectrum of different materials.

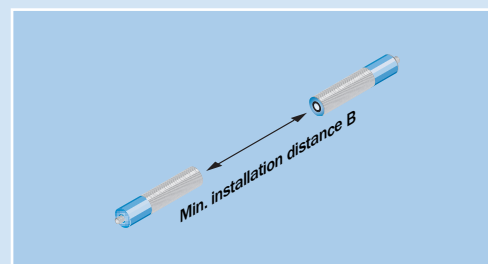
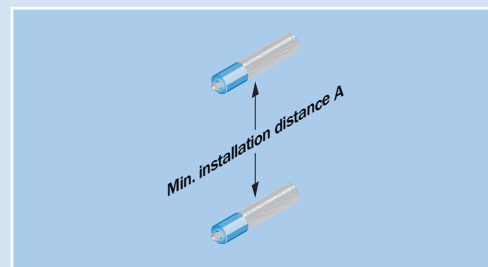


◀ Recognise:
detection of
double-sheet and
mis-fed-sheet

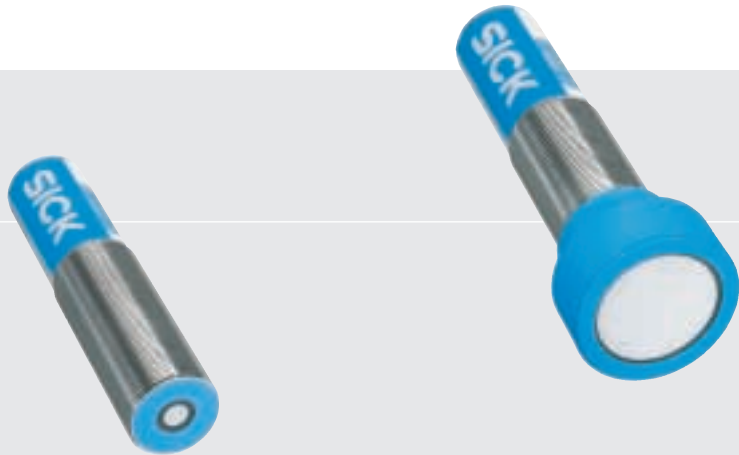
Installation

Ultrasonic sensors installed close together or opposite one another may affect each other mutually. For this reason, different axial and lateral distances have to be maintained depending on the detection range. The sensor with the largest detection range determines the minimum distance.

Operating scanning range	Min. installation distance A	Min. installation distance B
0.25 m	10 cm	≥ 100 cm
0.35 m	≥ 30 cm	≥ 170 cm
1.3 m	≥ 60 cm	≥ 540 cm
3.4 m	≥ 160 cm	≥ 1,600 cm
6 m	≥ 260 cm	≥ 3,000 cm



UM 30 – striking types for almost any application



Far and near – different scanning ranges

Short, medium or long-distance? The UM 30 has three different scanning ranges. The minimum operating distance begins at a minute 30 mm, and for really long-distance applications, to the limit of the scanning range is astonishing 6000 mm.

Deception impossible

The UM 30 remains unimpressed by even the most dust-laden air, and that applies to steam, vapour and spray as well. The background can be blanked almost completely – that's what can really be called focus to the essentials!

Detection or measurement as required

The UM 30 can be fitted with a binary output or analogue interface. Depending on the task on hand, objects can simply be detected or their distance measured.

UM 30 point by point



Highly perceptive

Setting a sensor's parameters can sometimes be time consuming – unless you just show it what to do. We call that "Teach-in". This makes the UM 30 quick and easy to handle. And when changes have to be made, it can be re-taught in a jiffy to cope with the new situation.

Well balanced and reliable – temperature compensation

Ultrasonic time measurements depend on the state of the medium transmitting the sound, i.e. the air. UM 30 sensors balance temperature fluctuations out automatically, thereby ensuring precision and reliability.

UM 18, a specialist for double layers – the smart sensor that looks beyond



Current or voltage – the appropriate signal automatically

The analogue output of the UM 30 sensor switches automatically between current and voltage. With its 4 to 20 A or 0 to 10 V, it fits perfectly into any measuring environment.

Q or \bar{Q} , no problem here

What signal does the application require, Q or \bar{Q} ? The UM 30 has an invertible switching output and can cope with both.

A sensor that does not stop at the surface

Detection of two superimposed sheets of material is no easy matter. The UM 18 can find out whether one or two sheets of film, paper, metal or cardboard lie between its sender and receiver. Which other sensor is able to look beyond the surface?



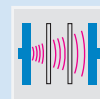
No need to tell it what to do

The UM 18 adjusts to its task itself. Fully automatically. Film down to 0.4 mm in thickness, paper of 1200 g/m² or metal sheet of 0.3 mm thickness – almost anything is detected.

Small and versatile

The sender and receiver of the UM 18 are located in an 18 mm threaded tube, and, because they are mounted only 40 mm apart, can be accommodated in the most confined spaces. With regard to alignment to the sheets, the UM 18 is undemanding. It puts up with as much as 45 degrees deviation from the vertical.

UM 18 point by point



- Double-sheet check for film, paper, corrugated cardboard and fine metal sheet
- Automatic adjustment
Alignment and Teach-in unnecessary
- Compact design
- Plug and play
- 2 PNP outputs for double- and mis-fed-sheets