# Ultrasonic Sensors

**Detection Irrespective of Material, Colour and Illumination**

**SICK**
Sensor Intelligence.

# Straightforward and with many benefits:
## Detection by ultrasonic.

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.

**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.

**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?

SICK's ultrasonic sensors 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.
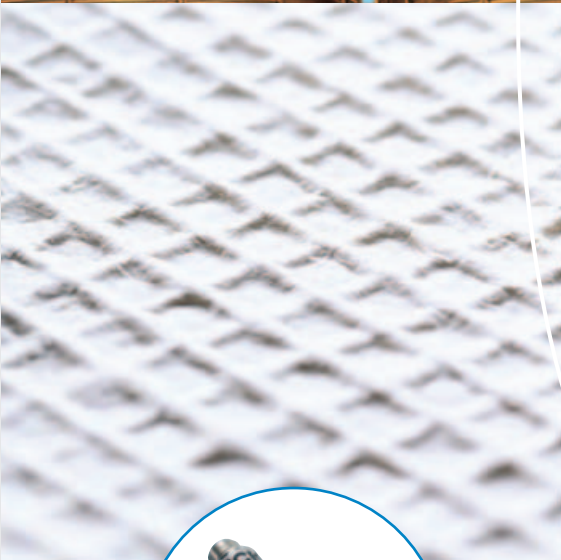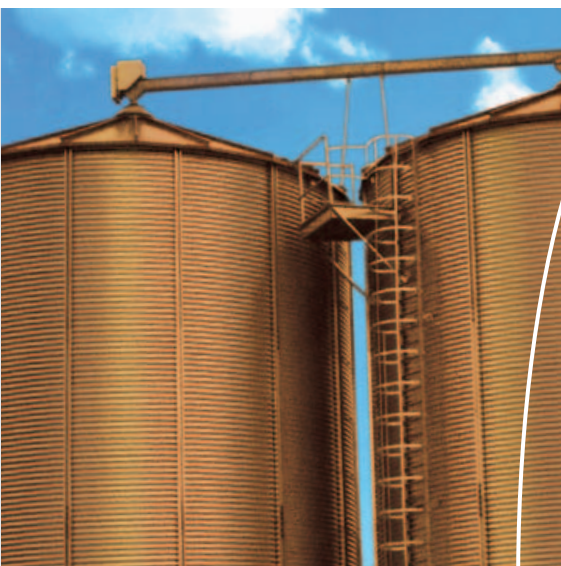
## Highly available,
## even under difficult conditions

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.

## Sound has an advantage –
## even on superficial inspection

Whether the surface is rough or smooth, reflecting or retroreflecting, regular or irregular in shape, ultrasonic sensors are generally unaffected. They detect objects reliably and almost independently of their appearance.
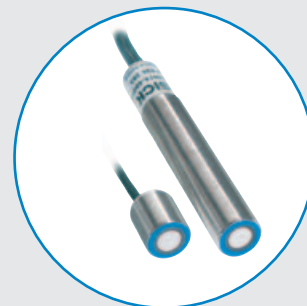
# Ultrasonic proximity sensors UM30, UM18 and UC12 – powerful devices for almost any application.

Even when it's extremely dusty: The ultrasonic proximity sensors are not impaired by foreign bodies in the air, mist, vapour and dirt. Even the background suppression is near perfect. We call this concentrating on the essentials.

| UM30 | UM18 |



### Far and near – different scanning ranges

Short, medium or long-distance? The UM30 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.

### Detection or measurement as required

The UM30 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.

### Smaller diameter with the same functionality

The UM18 has 1 or 2 switching outputs and extended features (for instance, ObSB mode): The sensor is taught a fixed background and reliably switches when an object is detected between sensor and background: Perfect for detecting round or tilted surfaces!

### Typical applications

- Level control of solids and liquids
- Checking presence of outer packaging
- Assignment control during packaging
- Checking presence of PET bottles
- Diameter control
- Loop control

### Typical applications

- Positioning of small objects in tight environments
- Checking for the presence of small, transparent or opaque outer packaging

## UC12



**After 2 seconds/shortest time to operation**

Position object, press Teach-in button, ready.
There is no faster way to commission an ultrasonic sensor.
This flexibility is further enhanced by the ObSB and window modes.

### Typical applications

– Checking presence of very dark objects
– Level control in the food and drinks industry
– Detecting transparent packaging
– Detecting printed/coloured paper during the printing process



# Ultrasonic proximity sensors point by point

**Easy to learn – Teach-in**

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 UM30 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. UM30 sensors balance temperature fluctuations out automatically, thereby ensuring precision and reliability.

**Current or voltage – the appropriate signal automatically**

The analogue output of the UM30 sensor switches automatically between current and voltage. With its 4 to 20 mA or 0 to 10 V DC, it fits perfectly into any measuring environment.

**Q or $\overline{Q}$ , no problem here**

What signal does the application require, Q or $\overline{Q}$?
The UM30 has an invertible switching output and can cope with both.

**ObSB mode – Object between sensor and background**

Perfect for detecting round and tilted surfaces, UM18 and UC12.
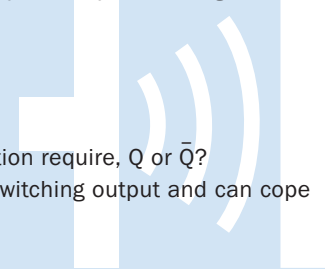
# Mode of operation: detecting, measuring and switching with ultrasonic proximity sensors.

The detection of objects with ultrasonic sensors opens up a new dimension. Objects are positioned, detected and controlled virtually irrespective of material and environment.

**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.
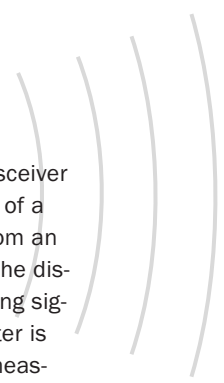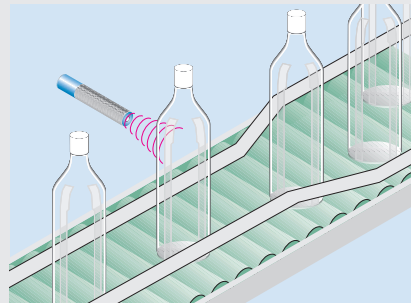
**Positioning**

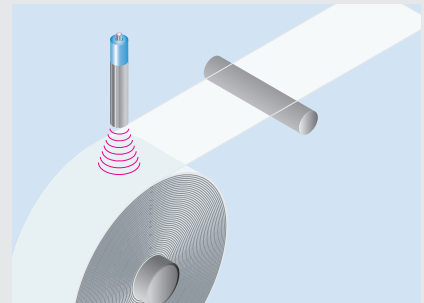Object detection and distance measurement independent of material
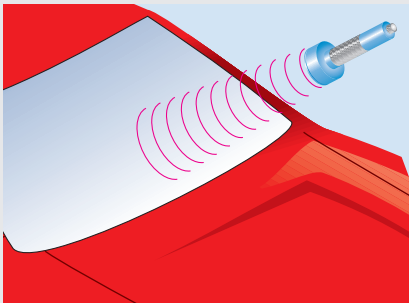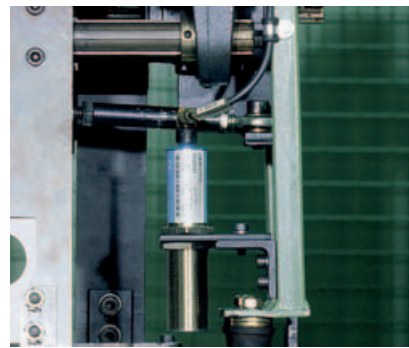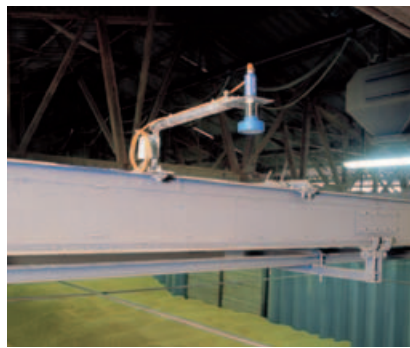
**Detection**

Recognise transparent objects

**Unwind**

Distance measurement for diameter check

**Sensors in action –
scanning and measuring reflections**

Ultrasonic sensors UM30 are used as non-contact pro-
ximity 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 com-
plete blanking of the background, a prerequisite for accu-
rate detection.

**Scanning round corners –
thanks to the right accessories**

Ultrasonic sensors UM30 are small and easily installed
even in confined spaces. And if things get really tight, the
right accessories can help out. Suitable reflectors allow
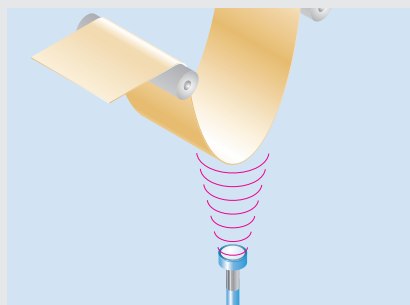sound to be deflected almost without loss.

**Package**

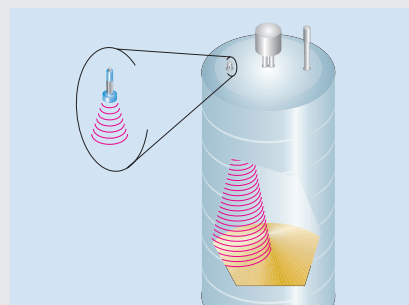"Engaged" check on package content
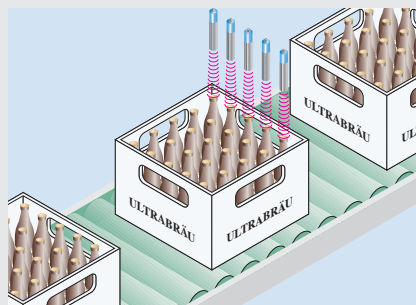
**Adjust**

Control material looping

**Monitoring**

Level control in silos and containers

# Ultrasonic double-sheet control UM18, the specialist for double layers – with smart vision.
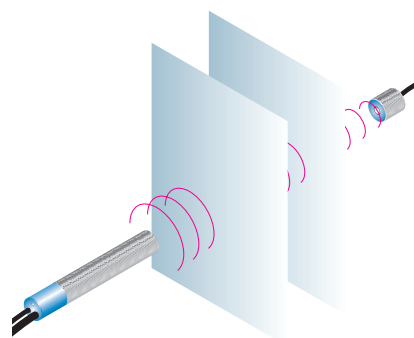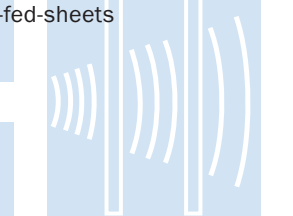
## UM18 FOR DOUBLE-SHEET CONTROL

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 UM18 are only 40 mm apart and work effectively without having to be parametered. They adjust automatically to a wide spectrum of different materials.
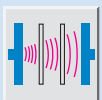
### UM18 sheet for sheet

– 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

### No need to tell it what to do

The UM18 adjusts to its task itself. Fully automatically. Film down to 0.4 mm in thickness, paper of 1200 g/m$^2$ or metal sheet of 0.3 mm thickness – almost anything is detected.

### A sensor that does not stop at the surface

Detection of two superimposed sheets of material is no easy matter.

The UM18 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?

### Small and versatile

The sender and receiver of the UM18 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 UM18 is undemanding. It puts up with as much as 45 degrees deviation from the vertical.

  8010312/12-01-06

# Detection range and assembly of ultrasonic sensors.

## 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.



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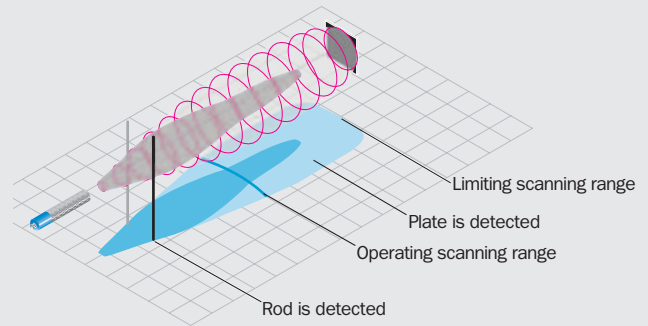
Every ultrasonic sensor has its characteristic club-shaped detection range. It is narrow for smaller objects and wide for larger ones. The typical detection areas are depicted by sound-beam diagrams.

## 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 | > 1600 cm |
| 6 m | > 260 cm | > 3000 cm |
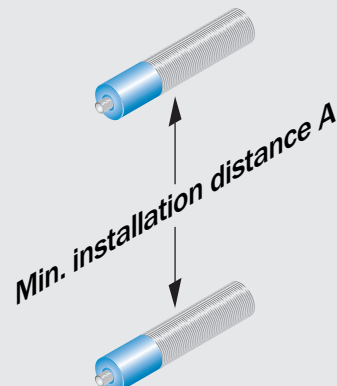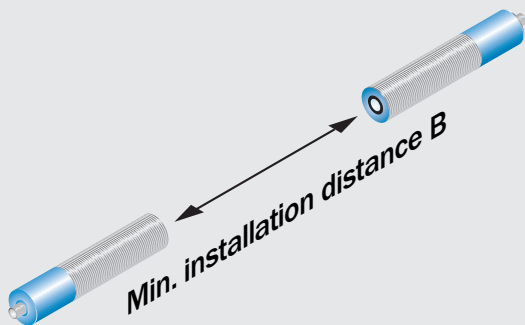


Min. installation distance B



Min. installation distance A

**Operating scanning range 30 … 1300 mm**

**Ultrasonic sensor**

- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
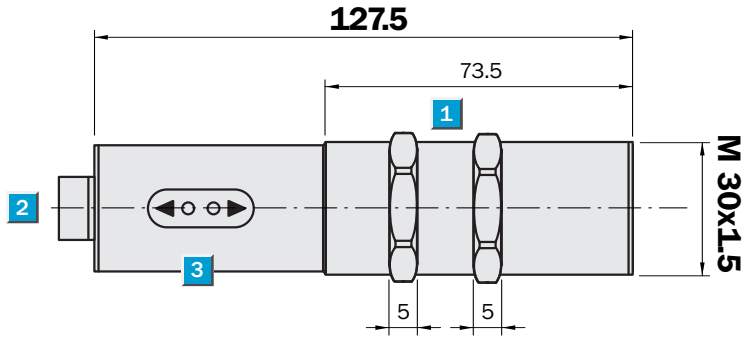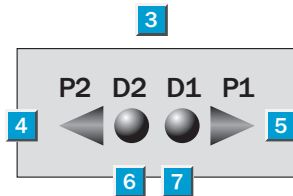- Operating scanning range up to 1300 mm
- Binary outputs or analogue output

CE

**Dimensional drawing**

127.5

73.5

**1**

**2**

**3**

5   5

M 30x1.5

| Adjustments possible |
|---|
| All types |

**3**

P2   D2   D1   P1

**4**   **5**

**6** **7**

| | |
|---|---|
| **1** | Fastening nuts, width across 36 mm |
| **2** | Connection plug M12 |
| **3** | Control and display panel |
| **4** | Setting key 2 |
| **5** | Setting key 1 |
| **6** | LED 2 |
| **7** | LED 1 |

**Connection types**

| UM30-11111 | UM30-11112 | UM30-11113 |
|---|---|---|
| UM30-12111 | UM30-12112 | UM30-12113 |
| UM30-13111 | UM30-13112 | UM30-13113 |

| Accessories |
|---|
| Mounting systems |

5-pin, M12

| | | |
|---|---|---|
| brn | 1 | L+ |
| blk | 4 | $Q, \overline{Q}$ |
| blu | 3 | M |
| wht | 2 | NC |
| gra | 5 | NC |

5-pin, M12

| | | |
|---|---|---|
| brn | 1 | L+ |
| blk | 4 | $Q_2, \overline{Q}_2$ |
| blu | 3 | M |
| wht | 2 | $Q_1, \overline{Q}_1$ |
| gra | 5 | NC |

5-pin, M12

| | | |
|---|---|---|
| brn | 1 | L+ |
| blk | 4 | NC |
| blu | 3 | M |
| wht | 2 | $Q_A$ |
| gra | 5 | NC |
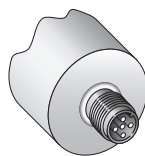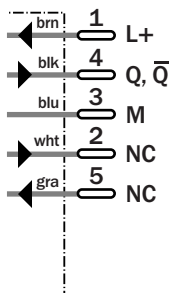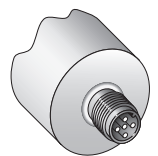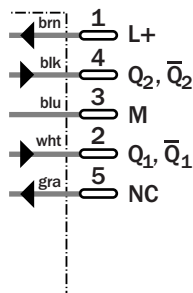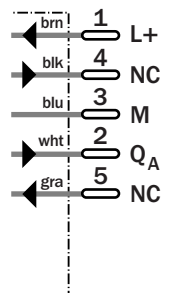
## Technical data — UM30-

| | UM30- | 11111 | 11112 | 11113 | 12111 | 12112 | 12113 | 13111 | 13112 | 13113 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operating scanning range** | 30 ... 250 mm (350) | ■ | ■ | ■ | | | | | | | |
| **(limiting scanning range)** | 60 ... 350 mm (600) | | | | ■ | ■ | ■ | | | | |
| | 200 ... 1300 mm (2000) | | | | | | | ■ | ■ | ■ | |
| Ultrasonic frequency | 320 kHz | ■ | ■ | ■ | | | | | | | |
| | 400 kHz | | | | ■ | ■ | ■ | | | | |
| | 200 kHz | | | | | | | ■ | ■ | ■ | |
| Resolution | 0.36 mm | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Reproducibility | ± 0.15 % of final value | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Accuracy | ≤ 2 % of final value | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Supply voltage $V_S$** | 9 ... 30 V DC [1] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Residual ripple | ± 10 % | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Current consumption [2] | ≤ 60 mA | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Switching outputs, reversible [3]** | Q: PNP | ■ | | | ■ | | | ■ | | | |
| | $Q_1$, $Q_2$: 2 x PNP | | ■ | | | ■ | | | ■ | | |
| Analogue output, reversible [3] [4] | $Q_A$: 4 ... 20 mA/0 ... 10 V | | | ■ | | | ■ | | | ■ | |
| Response time | 50 ms | ■ | ■ | ■ | | | | | | | |
| | 70 ms | | | | ■ | ■ | ■ | | | | |
| | 110 ms | | | | | | | ■ | ■ | ■ | |
| Switching frequency | 11/s | ■ | ■ | ■ | | | | | | | |
| | 8/s | | | | ■ | ■ | ■ | | | | |
| | 6/s | | | | | | | ■ | ■ | ■ | |
| Switching hysteresis | 20 mm | | | | | | | ■ | ■ | ■ | |
| | 5 mm | | | | ■ | ■ | ■ | | | | |
| | 2.5 mm | ■ | ■ | ■ | | | | | | | |
| Standby delay | 2 s | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Connection type** | Plug M12, 5-pin | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Enclosure rating** | IP 65 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Ambient temperature** | Operation –20 °C ... +70 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | Storage –40 °C ... +85 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Weight** | 260 g | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| **Housing material** | Nickel-plated brass | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |

[1] Limit values
[2] Without load
[3] Outputs short-circuit protected
$I_{max}$ = 200 mA
PNP: High = $V_S$ –( < 2 V)/LOW = 0 V

[4] Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
$R_L$ ≤ 500 Ω, $V_S$ ≥ 20 V;
$R_L$ ≤ 100 Ω, $V_S$ ≥ 12 V
Voltage output 0 ... 10 V:
$R_L$ ≥ 100 kΩ; $V_S$ > 15 V

[5] Temperature compensation at –20 ... +65 °C
[6] Plastic parts: PBT
Ultrasonic transducer: Polyurethane-foam, glass epoxy resin

## Detection ranges



UM30-1111_ 250 mm



UM30-1211_ 350 mm
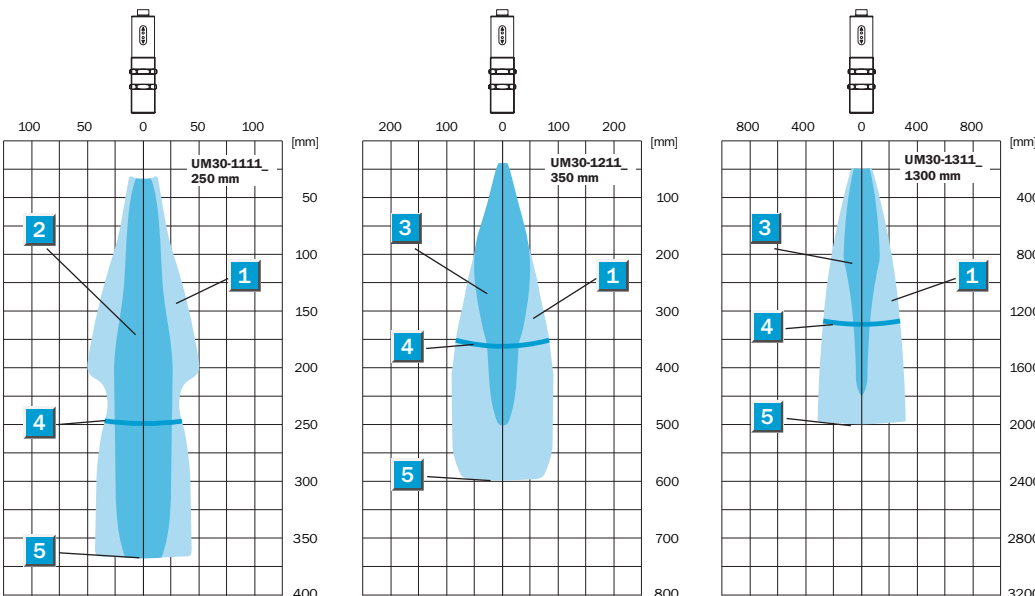


UM30-1311_ 1300 mm

### Order information

| Type | Order no. |
|---|---|
| UM30-11111 | 6025655 |
| UM30-12111 | 6025656 |
| UM30-13111 | 6025657 |
| UM30-11112 | 6025660 |
| UM30-12112 | 6025661 |
| UM30-13112 | 6025662 |
| UM30-11113 | 6025665 |
| UM30-12113 | 6025666 |
| UM30-13113 | 6025667 |

1 Aligned plate 500 x 500 mm
2 Pipe diameter 10 mm
3 Pipe diameter 27 mm
4 Operating scanning range
5 Limiting scanning range

## Operating scanning range 30 … 1300 mm
**Ultrasonic sensor**

- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 1300 mm
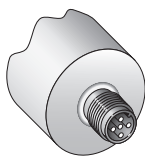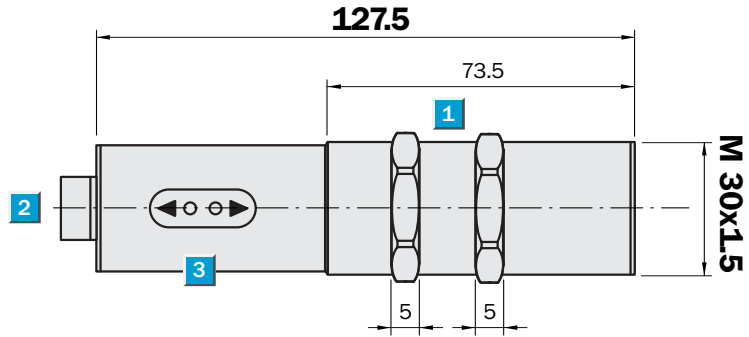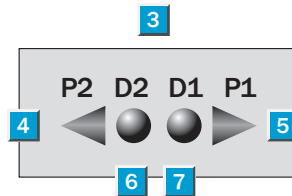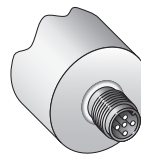- Binary outputs or analogue output

CE

### Dimensional drawing

**127.5**
73.5
M 30x1.5
5   5

### Adjustments possible
All types

P2  D2  D1  P1

| 1 | Fastening nuts, width across 36 mm |
|---|---|
| 2 | Connection plug M12 |
| 3 | Control and display panel |
| 4 | Setting key 2 |
| 5 | Setting key 1 |
| 6 | LED 2 |
| 7 | LED 1 |

### Connection types

| UM30-12115 | UM30-11114 |
|---|---|
| UM30-11115 | UM30-13114 |
| UM30-13115 | UM30-12114 |

5-pin, M12

| brn | 1 | L+ |
| blk | 4 | Q, $\overline{Q}$ |
| blu | 3 | M |
| wht | 2 | NC |
| gra | 5 | NC |

5-pin, M12

| brn | 1 | L+ |
| blk | 4 | $Q_2, \overline{Q}_2$ |
| blu | 3 | M |
| wht | 2 | $Q_1, \overline{Q}_1$ |
| gra | 5 | NC |
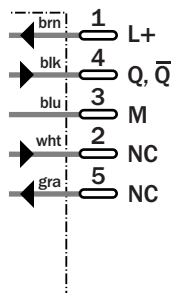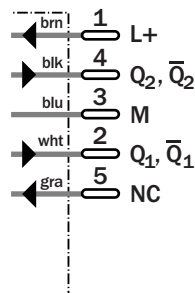
### Accessories
Mounting systems

## Technical data

| UM30- | 11115 | 11114 | 12115 | 12114 | 13115 | 13114 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Operating scanning range** — 30 … 250 mm (350) | ■ | ■ | | | | | | | | |
| **(limiting scanning range)** — 60 … 350 mm (600) | | | ■ | ■ | | | | | | |
| 200 … 1300 mm (2000) | | | | | ■ | ■ | | | | |
| Ultrasonic frequency — 320 kHz | ■ | ■ | | | | | | | | |
| 400 kHz | | | ■ | ■ | | | | | | |
| 200 kHz | | | | | ■ | ■ | | | | |
| Resolution — 0,36 mm | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Reproducibility — ± 0.15 % of final value | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Accuracy — ≤ 2 % of final value | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Supply voltage $V_S$** — 9 … 30 V DC [1] | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Residual ripple — ± 10 % | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Current consumption [2] — ≤ 60 mA | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Switching outputs, reversible** [3] — Q: NPN | | ■ | | ■ | | ■ | | | | |
| $Q_1$, $Q_2$: 2 x NPN | ■ | | ■ | | ■ | | | | | |
| Response time — 50 ms | ■ | ■ | | | | | | | | |
| 70 ms | | | ■ | ■ | | | | | | |
| 110 ms | | | | | ■ | ■ | | | | |
| Switching frequency — 11/s | ■ | ■ | | | | | | | | |
| 8/s | | | ■ | ■ | | | | | | |
| 6/s | | | | | ■ | ■ | | | | |
| Switching hysteresis — 20 mm | | | | | ■ | ■ | | | | |
| 5 mm | | | ■ | ■ | | | | | | |
| 2.5 mm | ■ | ■ | | | | | | | | |
| Standby delay — 2 s | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Connection type** — Plug M12, 5-pin | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Enclosure rating** — IP 65 | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Ambient temperature** — Operation –20 °C … +70 °C [4] | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Storage –40 °C … +85 °C | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Weight** — 260 g | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| **Housing material** [5] — Nickel-plated brass | ■ | ■ | ■ | ■ | ■ | ■ | | | | |

[1] Limit values
[2] Without load
[3] Outputs short-circuit protected
   $I_{max}$ = 200 mA
   NPN: High = $V_S$ /LOW ≤ 2 V
[4] Temperature compensation
   at –20 °C … +65 °C
[5] Plastic parts: PBT
   Ultrasonic transducer: Polyurethane-foam, glass epoxy resin

## Detection ranges



UM30-1111_ 250 mm

UM30-1211_ 350 mm

UM30-1311_ 1300 mm
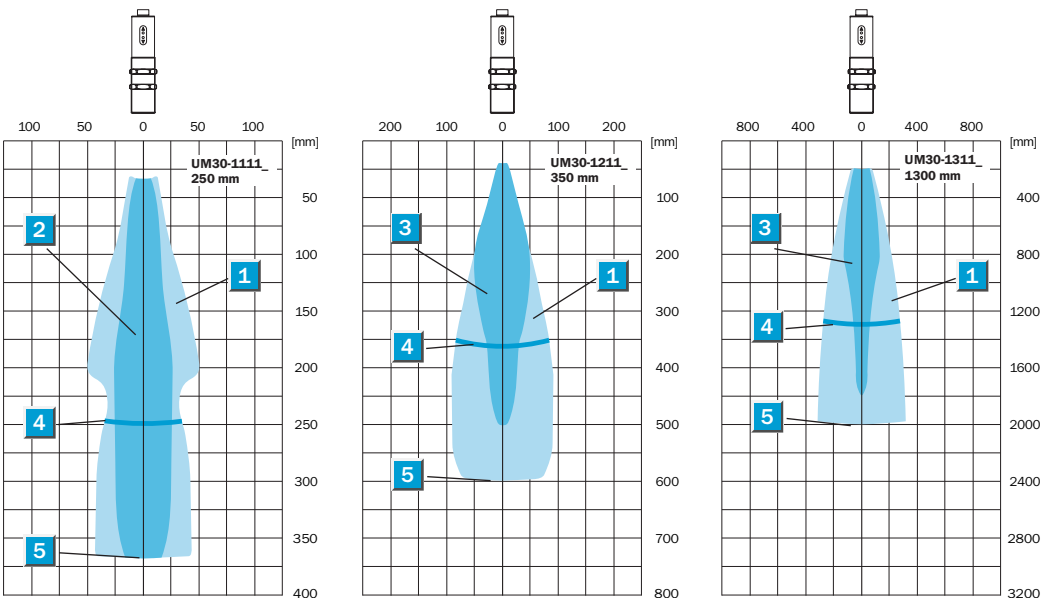
| 1 | Aligned plate 500 x 500 mm |
| 2 | Pipe diameter 10 mm |
| 3 | Pipe diameter 27 mm |
| 4 | Operating scanning range |
| 5 | Limiting scanning range |

### Order information

| Type | Order no. |
|---|---|
| UM30-11114 | 6030551 |
| UM30-11115 | 6030542 |
| UM30-12114 | 6030552 |
| UM30-12115 | 6030543 |
| UM30-13114 | 6030553 |
| UM30-13115 | 6030544 |

**Operating scanning range 350 ... 3400 mm**

Ultrasonic sensor

- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 3400 mm
- Binary outputs or analogue output

CE

## Dimensional drawing

135.5

48.5

1

2

3

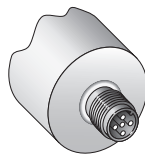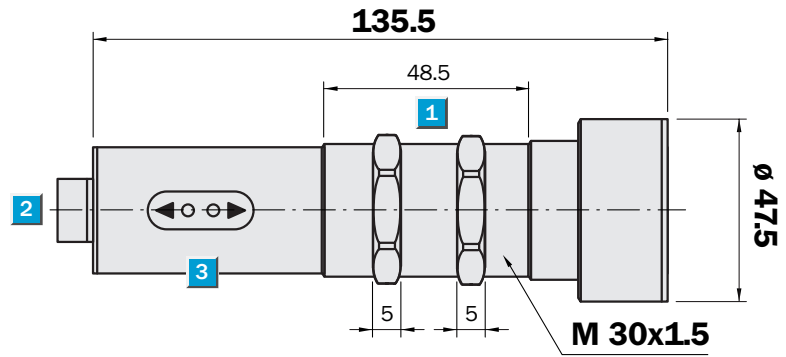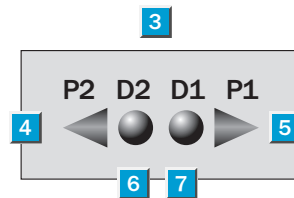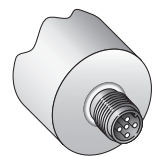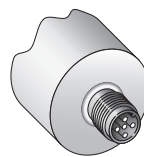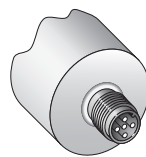5    5

M 30x1.5

⌀ 47.5

| Adjustments possible |
| --- |
| All types |

3

P2   D2   D1   P1

4 ◀   ● ●   ▶ 5

6   7

| | |
| --- | --- |
| 1 | Fastening nuts, width across 36 mm |
| 2 | Connection plug M12 |
| 3 | Control and display panel |
| 4 | Setting key 2 |
| 5 | Setting key 1 |
| 6 | LED 2 |
| 7 | LED 1 |

## Connection types

| UM30-14111 | UM30-14112 | UM30-14113 |
| --- | --- | --- |
| UM30-14115 | UM30-14114 | |

| Accessories |
| --- |
| Mounting systems |

5-pin, M12

| brn | 1 | L+ |
| --- | --- | --- |
| blk | 4 | $Q, \overline{Q}$ |
| blu | 3 | M |
| wht | 2 | NC |
| gra | 5 | NC |

5-pin, M12

| brn | 1 | L+ |
| --- | --- | --- |
| blk | 4 | $Q_2, \overline{Q}_2$ |
| blu | 3 | M |
| wht | 2 | $Q_1, \overline{Q}_1$ |
| gra | 5 | NC |

5-pin, M12

| brn | 1 | L+ |
| --- | --- | --- |
| blk | 4 | NC |
| blu | 3 | M |
| wht | 2 | $Q_A$ |
| gra | 5 | NC |

     8010312/12-01-06
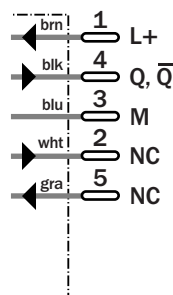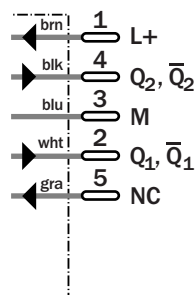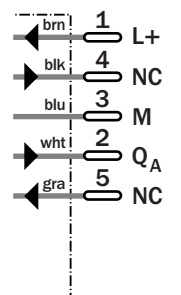
## Technical data UM30-

| | | 14111 | 14112 | 14113 | 14114 | 14115 |
|---|---|:---:|:---:|:---:|:---:|:---:|
| **Operating scanning range** (limiting scanning range) | 350 ... 3400 mm (5000) | ■ | ■ | ■ | ■ | ■ |
| Ultrasonic frequency | 120 kHz | ■ | ■ | ■ | ■ | ■ |
| Resolution | 1 mm | ■ | ■ | ■ | ■ | ■ |
| Reproducibility | ± 0.15 % of final value | ■ | ■ | ■ | ■ | ■ |
| Accuracy | ≤ 2 % of final value | ■ | ■ | ■ | ■ | ■ |
| **Supply voltage $V_S$** | DC 9 ... 30 V [1] | ■ | ■ | ■ | ■ | ■ |
| Residual ripple | ± 10 % | ■ | ■ | ■ | ■ | ■ |
| Current consumption [2] | ≤ 60 mA | ■ | ■ | ■ | ■ | ■ |
| **Switching outputs, reversible** [3] | Q: PNP | ■ | | | | |
| | Q: NPN | | | | ■ | |
| | $Q_1, Q_2$: 2 x PNP | | ■ | | | |
| | $Q_1, Q_2$: 2 x NPN | | | | | ■ |
| Analogue output, reversible [3] [4] | $Q_A$: 4 ... 20 mA/0 ... 10 V | | | ■ | | |
| Response time | 180 ms | ■ | ■ | ■ | ■ | ■ |
| Switching frequency | 3/s | ■ | | | | |
| Switching hysteresis | 50 mm | ■ | | | | |
| Standby delay | 2 s | ■ | ■ | ■ | ■ | ■ |
| **Connection type** | Plug M12, 5-pin | ■ | ■ | ■ | ■ | ■ |
| **Enclosure rating** | IP 65 | ■ | ■ | ■ | ■ | ■ |
| **Ambient temperature** [5] | Operation –20 °C ... +70 °C | ■ | ■ | ■ | ■ | ■ |
| | Storage –40 °C ... +85 °C | ■ | ■ | ■ | ■ | ■ |
| **Weight** | 310 g | ■ | ■ | ■ | ■ | ■ |
| **Housing material** | Nickel-plated brass | ■ | ■ | ■ | ■ | ■ |

[1] Limit values
[2] Without load
[3] Outputs short-circuit protected
$I_{max}$ = 200 mA
PNP: High = $V_S$ –( < 2 V)/LOW = 0 V

NPN: High = $V_S$ /LOW ≤ 2 V
[4] Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
$R_L$ ≤ 500 Ω, $V_S$ ≥ 20 V;
$R_L$ ≤ 100 Ω, $V_S$ ≥ 12 V
Voltage output 0 ... 10 V:
$R_L$ ≥ 100 kΩ; $V_S$ > 15 V

[5] Temperature compensation at –20 ... +65 °C

## Detection ranges



| | |
|---|---|
| 1 | Aligned plate 500 x 500 mm |
| 2 | Pipe diameter 27 mm |
| 3 | Operating scanning range |
| 4 | Limiting scanning range |

## Order information

| Type | Order no. |
|---|---|
| UM30-14111 | 6025658 |
| UM30-14112 | 6025663 |
| UM30-14113 | 6025668 |
| UM30-14114 | 6030555 |
| UM30-14115 | 6030546 |

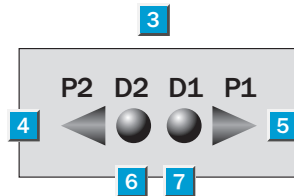**Operating scanning range 800 ... 6000 mm**

Ultrasonic sensor

- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 6000 mm
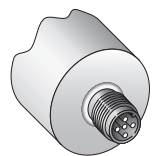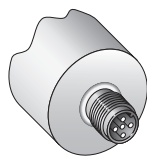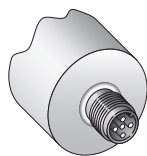- Binary outputs or analogue output
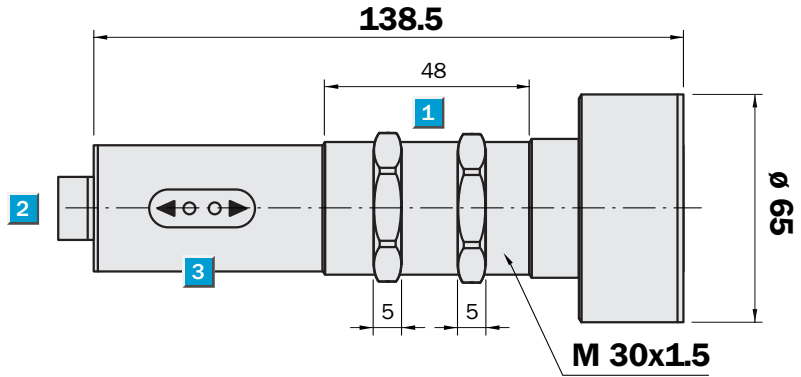
CE

**Accessories**

Mounting systems

---

**Dimensional drawing**

138.5

48

⌀ 65

M 30x1.5

**Adjustments possible**

All types

| 3 | | | |
|---|---|---|---|
| P2 | D2 | D1 | P1 |

| 1 | Fastening nuts, width across 36 mm |
|---|---|
| 2 | Connection plug M12 |
| 3 | Control and display panel |
| 4 | Setting key 2 |
| 5 | Setting key 1 |
| 6 | LED 2 |
| 7 | LED 1 |

**Connection types**

| UM30-15111 | UM30-15112 | UM30-15113 |
|---|---|---|
| UM30-15115 | UM30-15114 | |

5-pin, M12

| brn | 1 | L+ |
|---|---|---|
| blk | 4 | Q, $\overline{Q}$ |
| blu | 3 | M |
| wht | 2 | NC |
| gra | 5 | NC |

5-pin, M12

| brn | 1 | L+ |
|---|---|---|
| blk | 4 | $Q_2$, $\overline{Q}_2$ |
| blu | 3 | M |
| wht | 2 | $Q_1$, $\overline{Q}_1$ |
| gra | 5 | NC |
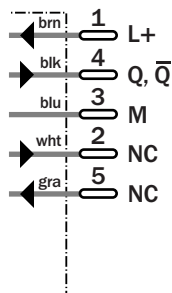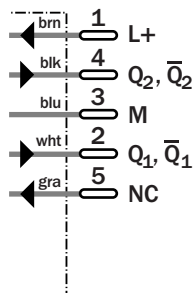
5-pin, M12
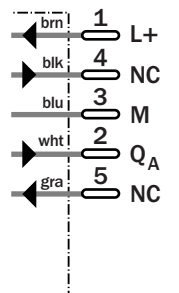
| brn | 1 | L+ |
|---|---|---|
| blk | 4 | NC |
| blu | 3 | M |
| wht | 2 | $Q_A$ |
| gra | 5 | NC |

| Technical data | UM30- | 15111 | 15112 | 15113 | 15114 | 15115 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operating scanning range** (limiting scanning range) | 800 ... 6000 mm (8000) | ■ | ■ | ■ | ■ | ■ | | | | | |
| Ultrasonic frequency | 80 kHz | ■ | ■ | ■ | ■ | ■ | | | | | |
| Resolution | 1 mm | ■ | ■ | ■ | ■ | ■ | | | | | |
| Reproducibility | ± 0.15 % of final value | ■ | ■ | ■ | ■ | ■ | | | | | |
| Accuracy | ≤ 2 % of final value | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Supply voltage $V_S$** | DC 9 ... 30 V [1] | ■ | ■ | ■ | ■ | ■ | | | | | |
| Residual ripple | ± 10 % | ■ | ■ | ■ | ■ | ■ | | | | | |
| Current consumption [2] | ≤ 60 mA | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Switching outputs, reversible** [3] | Q: PNP | ■ | | | | | | | | | |
| | Q: NPN | | | | ■ | | | | | | |
| | $Q_1, Q_2$: 2 x PNP | | ■ | | | | | | | | |
| | $Q_1, Q_2$: 2 x NPN | | | | | ■ | | | | | |
| Analogue output, reversible [3] [4] | $Q_A$: 4 ... 20 mA/0 ... 10 V | | | ■ | | | | | | | |
| Response time | 240 ms | ■ | ■ | ■ | ■ | ■ | | | | | |
| Switching frequency | 2/s | ■ | ■ | ■ | ■ | ■ | | | | | |
| Switching hysteresis | 100 mm | ■ | ■ | ■ | ■ | ■ | | | | | |
| Standby delay | 2 s | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Connection type** | Plug M12, 5-pin | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Enclosure rating** | IP 65 | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Ambient temperature** [5] | Operation −20 °C ... +70 °C | ■ | ■ | ■ | ■ | ■ | | | | | |
| | Storage −40 °C ... +85 °C | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Weight** | 360 g | ■ | ■ | ■ | ■ | ■ | | | | | |
| **Housing material** | Nickel-plated brass | ■ | ■ | ■ | ■ | ■ | | | | | |

[1] Limit values
[2] Without load
[3] Outputs short-circuit protected
   $I_{max}$ = 200 mA
   PNP: High = $V_S$ −( < 2 V)/LOW = 0 V

NPN: High = $V_S$/LOW ≤ 2 V
[4] Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
$R_L$ ≤ 500 Ω, $V_S$ ≥ 20 V;
$R_L$ ≤ 100 Ω, $V_S$ ≥ 12 V
Voltage output 0 ... 10 V:
$R_L$ ≥ 100 kΩ; $V_S$ > 15 V

[5] Temperature compensation at −20 ... +65 °C

---

**Detection ranges**



| | Type | Order no. |
|---|---|---|
| **Order-information** | | |
| | UM30-15111 | 6025659 |
| | UM30-15112 | 6025664 |
| | UM30-15113 | 6025669 |
| | UM30-15114 | 6030556 |
| | UM30-15115 | 6030547 |

| | |
|---|---|
| 1 | Aligned plate 500 x 500 mm |
| 2 | Pipe diameter 27 mm |
| 3 | Operating scanning range |
| 4 | Limiting scanning range |

**Operating distance 30 … 250 mm**

Ultrasonic sensor

- Independent of material shape (also foils, glass, bottles)
- Insensitive to dirt, dust and fog
- 1 switching output or 2 switching outputs (PNP or NPN) or analogue output
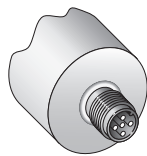- Teach-in via control input MF

CE

**Dimensional drawing**

73.3

5    47

M18x1

5    5
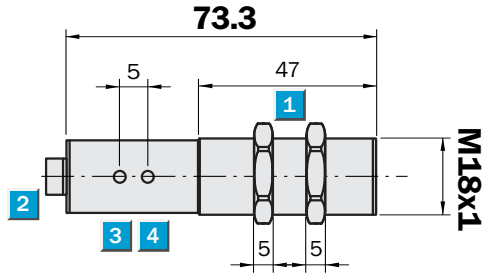
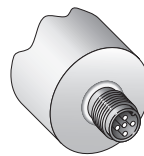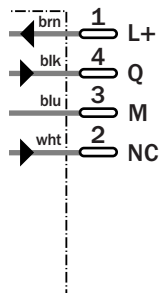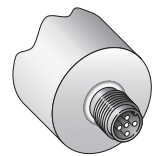| 1 | Locking nuts, 24 mm A/F |
| 2 | Connection plug M12 |
| 3 | LED 1 (UM18-51112, UM18-51114, UM18-11116 and UM18-11117) |
| 4 | LED 2 (UM18-51112, UM18-51114, UM18-11116 and UM18-11117) |

**Connection types**

| UM18-51111 | UM18-51112 | UM18-11116 |
| UM18-51115 | UM18-51114 | UM18-11117 |

| 5-pin, M12 | 5-pin, M12 | 5-pin, M12 |

| brn | 1 | L+ | | brn | 1 | L+ | | brn | 1 | L+ |
| blk | 4 | Q | | blk | 4 | $Q_2, \overline{Q}_2$ | | blk | 4 | NC |
| blu | 3 | M | | blu | 3 | M | | blu | 3 | M |
| wht | 2 | NC | | wht | 2 | $Q_1, \overline{Q}_1$ | | wht | 2 | $Q_A$ |
| | | | | gra | 5 | MF | | gra | 5 | MF |
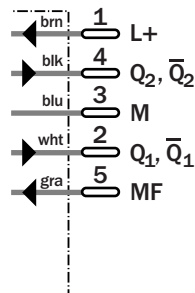
## Technical data — UM18-
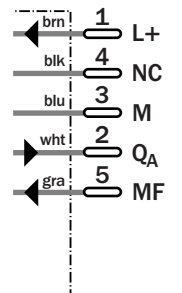
| Technical data | UM18- | 51111 | 51112 | 51114 | 51115 | 51116 | 51117 |
|---|---|---|---|---|---|---|---|
| **Operating distance** (maximum scanning distance) | 30 mm … 250 mm (< 350 mm) | ■ | ■ | ■ | ■ | ■ | ■ |
| Ultrasonic frequency | 320 kHz | ■ | ■ | ■ | ■ | ■ | ■ |
| Resolution | 0.36 mm | ■ | ■ | ■ | ■ | ■ | ■ |
| Reproducibility | typ. ±0.15 % of final value | ■ | ■ | ■ | ■ | ■ | ■ |
| Accuracy | ≤ 2 % of final value | | ■ | ■ | | ■ | |
| **Supply voltage $V_s$** | $V_s$ = 10 … 30 V DC [1] | ■ | ■ | ■ | ■ | ■ | ■ |
| Residual ripple | ± 10 % | ■ | ■ | ■ | ■ | ■ | ■ |
| Current consumption [2] | ≤ 40 mA | ■ | ■ | ■ | ■ | ■ | ■ |
| Display elements | 2 yellow LEDs | | ■ | ■ | | ■ | ■ |
| Control input MF | Teach-in; Reset | | ■ | ■ | | ■ | ■ |
| **Switching outputs** | Q: PNP | ■ | | | | | |
| | Q: NPN | | | | ■ | | |
| invertable [3] | $Q_1$, $Q_2$: 2 x PNP | | ■ | | | | |
| invertable [3] | $Q_1$, $Q_2$: 2 x NPN | | | ■ | | | |
| Analogue output, invertable [3] | $Q_A$: 4 … 20 mA | | | | | ■ | |
| | $Q_A$: 0 … 10 V | | | | | | ■ |
| Response time | 32 ms | ■ | ■ | ■ | ■ | ■ | ■ |
| Switching frequency | 15/s | ■ | ■ | ■ | ■ | ■ | ■ |
| Switching hysteresis | 2.0 mm ± 10 % | ■ | ■ | ■ | ■ | ■ | ■ |
| Temperature compensation | | | ■ | ■ | | ■ | ■ |
| Synchronisation option | | | ■ | ■ | | ■ | ■ |
| Functional display | | | ■ | ■ | | ■ | ■ |
| ObSB-mode [4] | | | ■ | | | | |
| Standby delay | < 300 ms | ■ | ■ | ■ | ■ | ■ | ■ |
| **Connection type** | Plug M12, 5-pin | ■ | ■ | ■ | ■ | ■ | ■ |
| **Enclosure rating** | IP 67 | ■ | ■ | ■ | ■ | ■ | ■ |
| **Ambient temperature** | Operating −25 °C … +70 °C | ■ | ■ | ■ | ■ | ■ | ■ |
| | Storage −40 °C … +85 °C | ■ | ■ | ■ | ■ | ■ | ■ |
| **Weight** | 65 g approx. | ■ | ■ | ■ | ■ | ■ | ■ |
| **Housing material [5]** | Nickel-plated brass | ■ | ■ | ■ | ■ | ■ | ■ |

[1] Limit values
[2] Without load
[3] Outputs short-circuit protected
  $I_{max}$ = 200 mA
  PNP: High = $V_s$ −(< 2 V)/LOW = 0 V
  NPN: High = $V_s$ /LOW ≤ 2 V
[4] Object between sensor and background
[5] Plastic parts: PBT
  Ultrasonic transducer: Polyurethane-foam, glass epoxy resin

### Detection ranges



UM18-_111 _ 250 mm
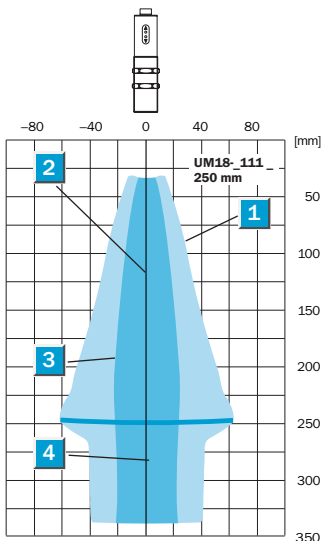
| | |
|---|---|
| 1 | Aligned plate 500 x 500 mm² |
| 2 | Tube diameter 10 mm |
| 3 | Operating distance |
| 4 | Maximum scanning distance |

### Order information

| Type | Order no.. |
|---|---|
| UM18-51111 | 6028965 |
| UM18-51112 | 6028964 |
| UM18-51114 | 6028973 |
| UM18-51115 | 6028974 |
| UM18-11116 | 6029507 |
| UM18-11117 | 6029508 |

**Operating scanning distance**
**20 … 150 mm**
**55 … 250 mm**
Ultrasonic sensor

- **Independent of material shape (including films, glass and bottles)**
- **Teach-in**
- **Insensitive to dirt, dust and fog**
- **1 switching output PNP/NPN**
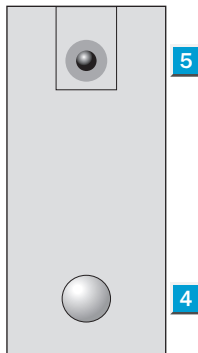- **Very good background suppression (BGS)**

CE

**Accessories**
Mounting systems

## Dimensional drawing

24   10
2
**43.5**

1
21.4

22.5
7.5
5.5
5
50.5
2
3

4   5
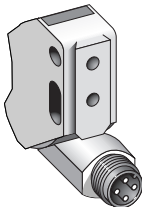15
9.24
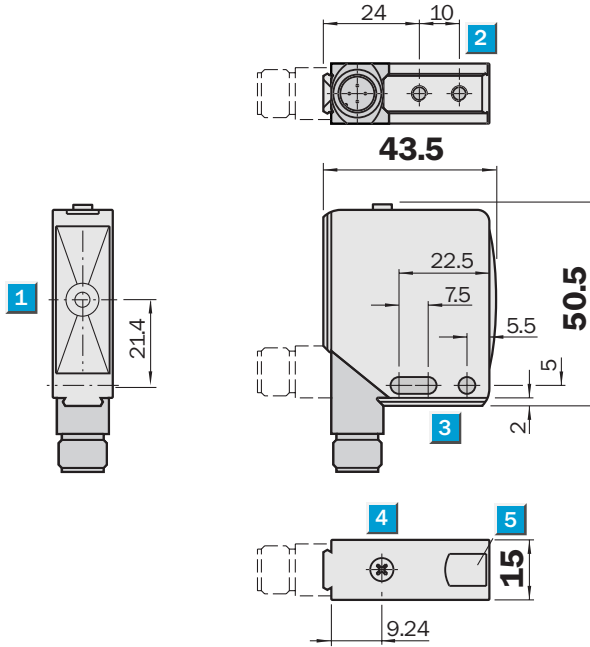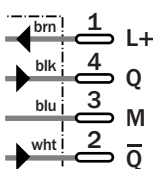
| **Adjustments possible** | | |
| All types | | |

| 1 | Centre of sender and receiver axis |
| 2 | M4 threated mounting hole – 4 mm deep |
| 3 | Mounting hole Ø 4,2 mm |
| 4 | Control element(s) |
| 5 | Signal strength indicator |

5

4

## Connection type
All types

4-pin, M12

| | | | |
| brn | 1 | L+ |
| blk | 4 | Q |
| blu | 3 | M |
| wht | 2 | Q̄ |

**Technical data**  UC12-

| Technical data | UC12- | 11231 | 12231 | 12235 | 12235 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operating scanning distance | 20 … 150 mm (250 mm) | ■ | | ■ | | | | | | | | |
| (limiting scanning distance) | 55 … 250 mm (350 mm) | | ■ | | ■ | | | | | | | |
| Ultrasonic frequency | Approx. 380 kHz | ■ | | ■ | | | | | | | | |
| | Approx. 500 kHz | | ■ | | ■ | | | | | | | | |
| Resolution | 0.18 mm | ■ | ■ | ■ | ■ | | | | | | | |
| Reproducibility | typ. ±0.15 % of final value | ■ | ■ | ■ | ■ | | | | | | | |
| Accuracy | ≤ 2 % of final value | ■ | ■ | ■ | ■ | | | | | | | |
| Supply voltage $V_s$ | 10 … 30 V DC | ■ | ■ | ■ | ■ | | | | | | | |
| Residual ripple | 10 % | ■ | ■ | ■ | ■ | | | | | | | |
| Current consumption | ≤ 40 mA | ■ | ■ | ■ | ■ | | | | | | | |
| Switching output [2] | Q: PNP | ■ | ■ | | | | | | | | | |
| | Q: NPN | | | ■ | ■ | | | | | | | | |
| Response time | 27 ms | ■ | ■ | ■ | ■ | | | | | | | |
| Switching frequency | < 25/s | ■ | ■ | ■ | ■ | | | | | | | |
| Switching hysteresis | 2.0 mm | ■ | ■ | ■ | ■ | | | | | | | |
| Standby delay | < 300 ms | ■ | ■ | ■ | ■ | | | | | | | |
| Indicator | Double-LED green/yellow | ■ | ■ | ■ | ■ | | | | | | | |
| Control element(s) | Teach-in button | ■ | ■ | ■ | ■ | | | | | | | |
| Connection type | Plug M12, 4-pin | ■ | ■ | ■ | ■ | | | | | | | |
| VDE protection class | ⬦ | ■ | ■ | ■ | ■ | | | | | | | |
| Temperature compensation | Yes | ■ | ■ | ■ | ■ | | | | | | | |
| Enclosure rating | IP 67 | ■ | ■ | ■ | ■ | | | | | | | |
| Ambient temperature | Operation     –20 °C … +70 °C | ■ | ■ | ■ | ■ | | | | | | | |
| | Storage        –40 °C … +85 °C | ■ | ■ | ■ | ■ | | | | | | | |
| Weight | Approx. 75 g | ■ | ■ | ■ | ■ | | | | | | | |
| Housing material [3] | Nickel-plated brass | ■ | ■ | ■ | ■ | | | | | | | |

[1] Outputs short-circuit protected
$I_{max}$ = 200 mA
PNP: High = $V_S$ –( < 2 V)/LOW = 0 V
NPN: High = $V_S$ /LOW ≤ 2 V

[2] Temperature compensation
at –20 … +65 °C

[3] Ultrasonic transducer: Polyurethane-
foam, glass epoxy resin

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**Measurement ranges**



**Order information**
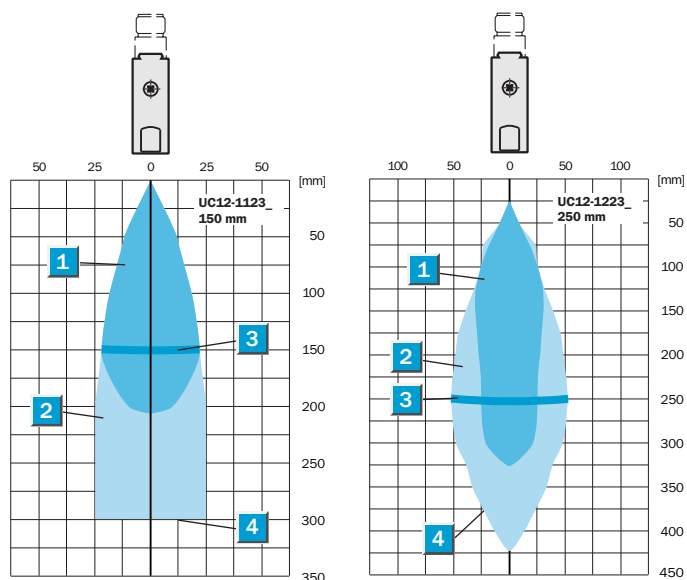
| Type | Order no. |
|---|---|
| UC12-11231 | 6029831 |
| UC12-12231 | 6029832 |
| UC12-11235 | 6029833 |
| UC12-12235 | 6029834 |

| | |
|---|---|
| 1 | Aligned plate 10 x 10 mm$^2$ |
| 2 | Pipe diameter 10 mm |
| 3 | Operating scanning distance |
| 4 | Limiting scanning distance |

# UM18 Ultrasonic double-sheet detector

- Double-sheet detection of foils, metal sheets and ultra-fine corrugated cardboards
- Automatic adjustment, no Teach-in necessary
- Colour-independent
- Plug & Play
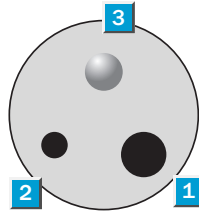- 2 PNP outputs for double- and mis-fed-sheets

CE

## Dimensional drawing

111.5

26

M 18

21

M 18

2 m   1.2 m   □ 7.5 x 15   1 m
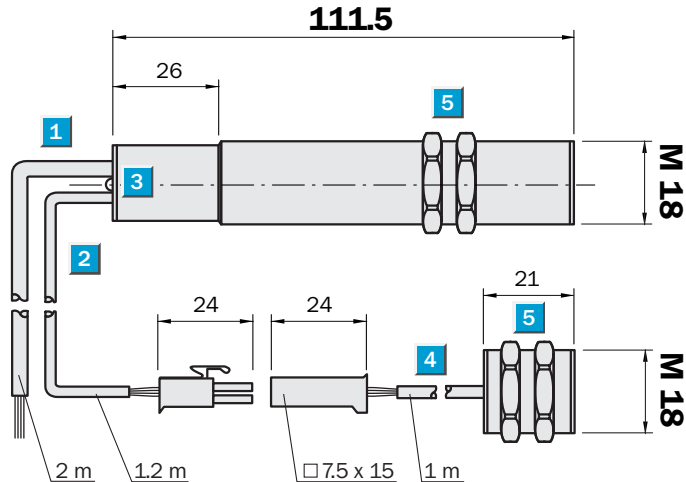
### Adjustments possible

UM18-20012

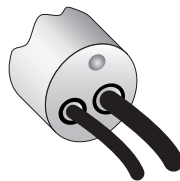| | |
|---|---|
| 1 | Connection cable 2 m (receiver) |
| 2 | Connection cable 1.2 m, 2-pin sender and receiver |
| 3 | 2-color LED indicator, receiver |
| 4 | Connection cable 1 m, 2-pin sender and receiver |
| 5 | Fastening nuts, width across 24 mm |

### Accessories

Mounting systems

### Connection types

UM18-20012*)

| Receiver | Sender |
|---|---|

| 5 x 0.25 mm² | 2-pin | 2-pin |
|---|---|---|

brn — L+
blk — $\overline{Q}_1$
blu — M
wht — $\overline{Q}_2$
gra — E
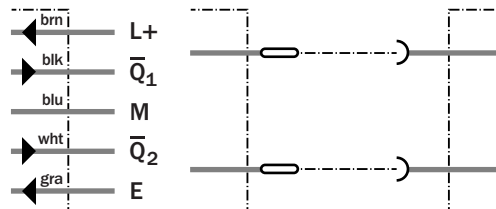
*) Sender/receiver pair:
Individual components on request

8010312/12-01-06

| Technical data | UM18- | 20012 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Installation distance**

| | | |
|---|---|---|
| **sender − receiver** | 40 mm ± 3 mm | |
| Blind zone | 7 mm, each time before sender | |
| | and receiver | |
| Permissible angle deviation | ± 45° perpendicular to sheet | |
| Ultrasonic frequency | 400 kHz | |
| Resolution | Double-sheets not completely | |
| | glued together | |

**Operational area**

| | | |
|---|---|---|
| Paper grams per square meter | 20 ... 1200 $g/m^2$ | |
| Metal-laminated sheets and films | ≤ 0.4 mm thickness | |
| Self-adhesive films, metal sheets | ≤ 0.3 mm | |
| Ultra-fine corrugated cardboard | | |
| **Supply voltage $V_S$** | 20 ... 30 V DC [1] | |
| Ripple | ± 10 % | |
| Current consumption [2] | ≤ 45 mA | |
| **Double-sheet switching/$Q_1$ [3]** | $Q_1$: PNP, $V_S$ −2 V, $I_{max}$ = 500 mA | |
| **Mis-fed-sheet switching output/$Q_2$ [3]** | $Q_2$:PNP, $V_S$ −2 V, $I_{max}$ = 500 mA | |
| Response time [4] | 2.5 ms or 6.5 ms | |
| Off delay | 10 ms | |
| $V_S$ at control unit [4] | Response time 6.5 ms: $V_S$ > 9 V DC | |
| | Response time 2.5 ms: $V_S$ < 5 V DC | |
| Standby delay | 300 ms | |
| **Connection type** | Cable PVC, 2 m; 5 x 0.25 $mm^2$ | |
| Sender cable [5] | PVC, 1.2 m with 2-pin plug | |
| Receiver cable [5] | PVC, 1 m with 2-pin plug | |
| **Enclosure rating** | IP 65 | |
| **Ambient temperature** | Operation +5 °C ... +60 °C | |
| | Storage −40 °C ... +85 °C | |
| **Weight** | 280 g | |
| **Housing material** | Nickel-plated brass | |

[1] Limit values
[2] Without load
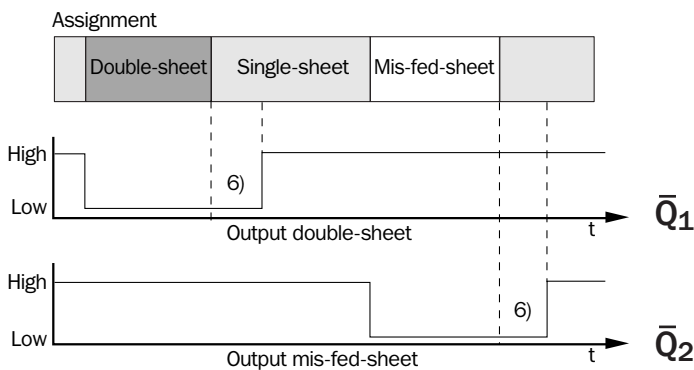[3] Outputs short-circuit protected, Opener; no switching hysteresis

[4] If the control line is laid against a ground, the response time is 2.5 ms. If the control line is laid against L+, the response time is 6.5 ms.

[5] Not reverse-polarity protected

**Measurement ranges**



Assignment

| Double-sheet | Single-sheet | Mis-fed-sheet | |

Output double-sheet  $\overline{Q}_1$

Output mis-fed-sheet  $\overline{Q}_2$

6) Off delay

**Order information**

| Type | Order no. |
|---|---|
| UM18-20012 | 6025670 |

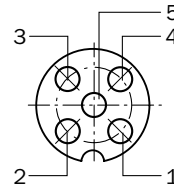**Dimensional drawings and order informations**

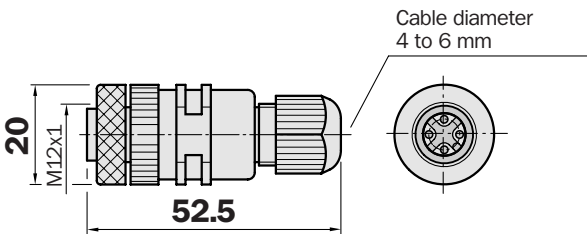**SENSICK screw-in system M12, 5-pin, enclosure rating IP 67**

## ■ Contact assignment according to EN 50 044
## ■ DC coding

Pin assignment
Pin 1 = brown
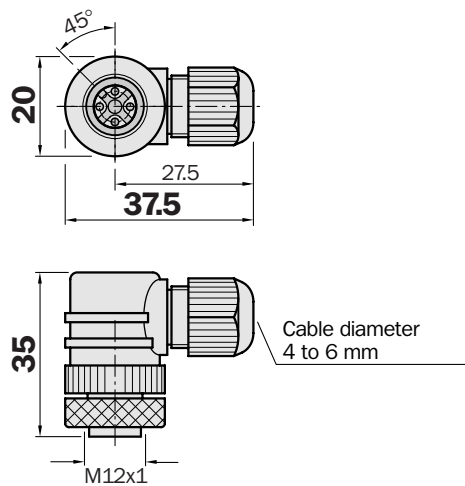Pin 2 = white
Pin 3 = blue
Pin 4 = black
Pin 5 = grey

**Female connector M12, 5-pin, straight**

| Type | Order no. | Contacts |
|---|---|---|
| DOS-1205-G | 6009719 | 5 |

Cable diameter 4 to 6 mm

**Female connector M12, 5-pin, right angle**

| Type | Order no. | Contacts |
|---|---|---|
| DOS-1205-W | 6009720 | 5 |

Cable diameter 4 to 6 mm

**Female connector M12, 5-pin, straight**
**Cable diameter 6 mm, 5 x 0.25 mm², sheath PVC**

| Type | Order no. | Contacts | Cable length |
|---|---|---|---|
| DOL-1205-G02M | 6008899 | 5 | 2 m |
| DOL-1205-G05M | 6009868 | 5 | 5 m |
| DOL-1205-G10M | 6010544 | 5 | 10 m |
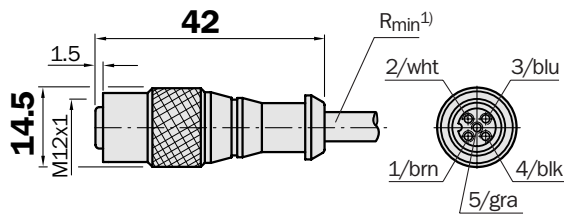
**Female connector M12, 5-pin, right angle**
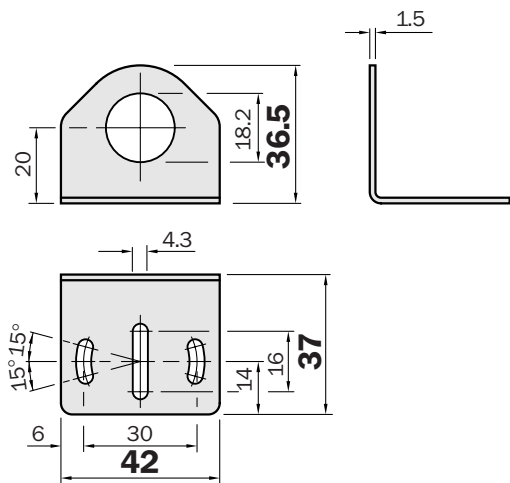**Cable diameter 6 mm, 5 x 0.25 mm², sheath PVC**

| Type | Order no. | Contacts | Cable length |
|---|---|---|---|
| DOL-1205-W02M | 6008900 | 5 | 2 m |
| DOL-1205-W05M | 6009869 | 5 | 5 m |
| DOL-1205-W10M | 6010542 | 5 | 10 m |
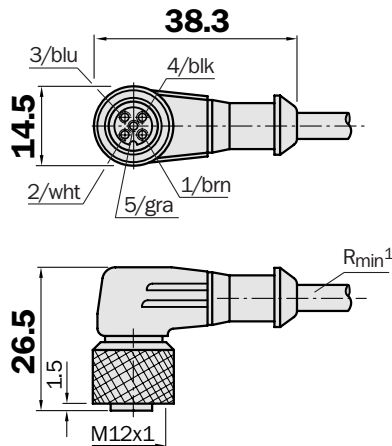
**Dimensional drawings and order informations**

**Mounting bracket for UM18**

| Type | Order no. |
|---|---|
| BEF-WN-M18 | 5308446 |

**Mounting bracket for UM30**

| Type | Order no. |
|---|---|
| BEF-WN-M30 | 5308445 |
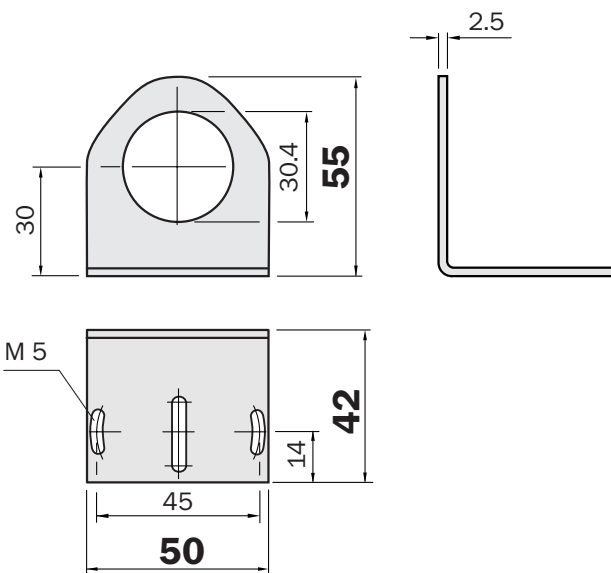
**Diverter plate for UM30 to 1300 mm operating scanning range**

| Type | Order no. |
|---|---|
| USP-UM30 | 5312916 |
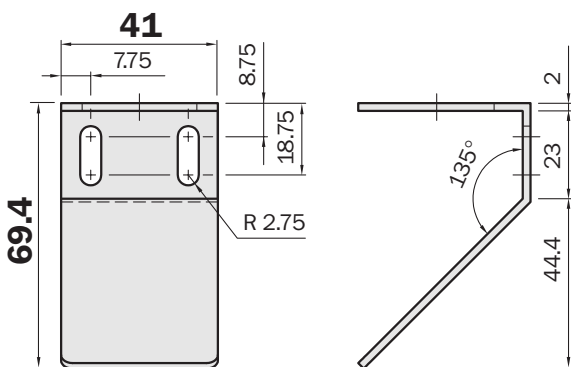
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