



ULTRASONIC SENSORS



Ultrasonic sensors

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Type code (without series LUC...)*

U	Ultrasonic sensor										
	Design										
	B	Basic series									
	BE	Basic series through-beam sensors									
	C	Advanced series									
	CC	Advanced series, chemical-resistant sensors									
	J	Initiator									
	DB	Double sheet control (DBL: for label detection, DBK: splice detection)									
		Upper limit of sensing range									
		300	300 mm (example)								
		6000	6000 mm (example)								
			Type of housing								
		12	cylindrical housing, diameter 12 mm								
		18	cylindrical housing, diameter 18 mm								
		30	cylindrical housing, diameter 30 mm								
		U	square housing <i>VariKont</i> (U1, U9)								
		FP	square housing FP (FP1, FP...P1, FP...P5)								
		F42	square housing F42								
		F43	square housing F43								
		F54	square housing F54								
		F64	square housing F64								
			Threaded bushing (cylindrical type only)								
			with specification of length in mm (example: GM75, length = 75 mm)								
			GM	Metal							
			GK	Plastic							
				Electrical output							
			E0	1 x 3-wire, npn switching output, normally open							
			E2	1 x 3-wire, pnp switching output, normally open							
			E4	1 x 3-wire, npn switching output, normally open/normally closed							
			E5	1 x 3-wire, pnp switching output, normally open/normally closed							
			E6	2 x 3-wire, pnp switching output, normally open/normally closed							
			E7	2 x 3-wire, npn switching output, normally open/normally closed							
			E01	2 x 3-wire, npn switching output, normally open/normally closed							
			E23	2 x 3-wire, pnp switching output, normally open/normally closed							
			A2	2 x 3-wire, pnp switching output, antivalent							
			H1	for external evaluation, transmitter							
			H2	for external evaluation, receiver							
			H3	for external evaluation, transmitter/receiver							
			I	Analogue output, 4 mA ... 20 mA							
			U	Analogue output, 0/2 V ... 10 V							
			IU	Analogue output 4 mA ... 20 mA + 0/ V2 ... 10 V or load-controlled							
			IUE2	Analogue output, load-controlled I/U and 1 switching output E2							
			IUE0	Analogue output, load-controlled I/U and 1 switching output E0							
			8B	8 bit data output, parallel							
			K	Relay output (2K = 2 relay outputs)							
			R2 (RS)	RS 232 interface (old designation)							
				Design (optional)							
			K	Transducer separate from evaluation unit							
				for use in restricted spaces							
				Connections							
			-	cable version							
			V1	plug connector, 4-pin, M12 x 1							
			V3	plug connector, 3-pin, M8 x 1							
			V7	plug connector, 7-pin, PG13,5							
			V15	plug connector, 5-pin, M12 x 1							
			V17	plug connector, 8-pin, M12 x 1							
			V95	plug connector, 5 pin, M18 x 1,5							

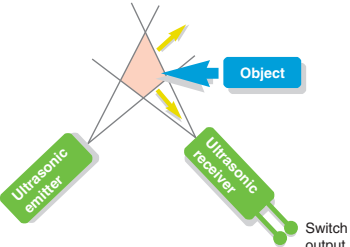
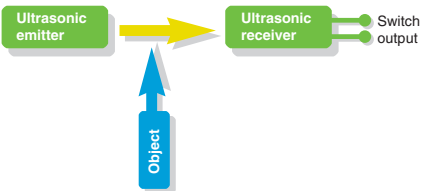
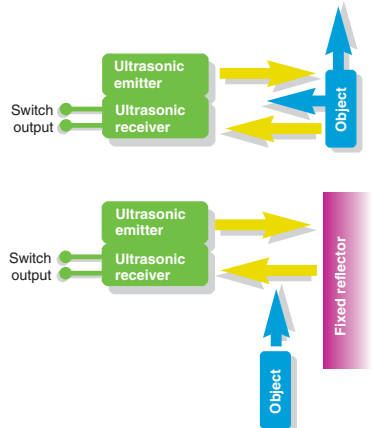
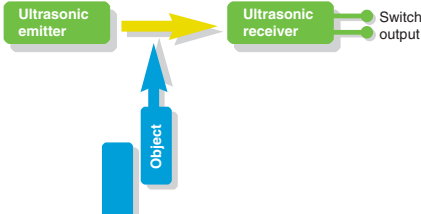
U			-			-		-	-	
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Date of issue 13.09.2005

* The type codes for the LUC series can be found on page 181.

Overview

Selection table

		Detection range (max.)	Output					Connection		
			PNP	NPN	Push-pull	Relais	Analog	Kabel	Stecker	Klemmen
 <p>Sensors for separate evaluation units</p> <p>Series -30GM 6000 mm</p> <p>Series <i>VariKont</i>® 3000 mm</p> <p>Series -FP 6000 mm</p> <p>Series -F54 2000 mm</p>										
 <p>Through beam sensors</p> <p>Series -18GK 500 mm</p> <p>Series -18GM40 1000 mm</p> <p>Series -30GM 4000 mm</p> <p>Series <i>VariKont</i> 6000 mm</p> <p>Series -F64 1500 mm</p>										
 <p>Detection and reflection sensors</p> <p>Series -12GM 400 mm</p> <p>Series -18GM40 300 mm</p> <p>Series -18GM75 1000 mm</p> <p>Series -30GM 6000 mm</p> <p>Series <i>VariKont</i>® 3000 mm</p> <p>Series -FP 6000 mm</p> <p>Series -F12 800 mm</p> <p>Series -F42 4000 mm</p> <p>Series -F43 2000 mm</p> <p>Series -F54 2000 mm</p> <p>Series -D1 550 mm</p> <p>Series -LUC 4000 mm</p>										
 <p>Double sheet monitoring</p> <p>Series UDC-18GM 60 mm</p> <p>Series UDB-18GM 80 mm</p>										
<p>Control / evaluation units</p> <p>UH3-KHD2-4E5</p> <p>UH3-KHD2-4I</p> <p>UH3-T1-KT</p> <p>DA5-IU...</p>										

- 1) on request
- 2) 10 ... 30 V DC without function of the current output
- 3) 10 ... 252 V DC / 20 ... 252 V AC
- 4) DC-Types: 10 ... 30 V DC,
DC/AC-Types: 20 ... 253 V DC
15 ... 253 V AC
- 5) only DC-Types

	Supply voltage range	angled head	Error indicator	Timer-function/ Pulse prolongation	N.C./N.O./ Window selectable mode	Synchronisation input	TEACH-IN/ Parameterisation	adjustable sound lobe width	Serial interface	Parallel interface (8 Bit)	Page
	10 ... 30 V DC					●					65
	10 ... 30 V DC					●					99
	10 ... 60 V DC					●					115
	10 ... 30 V DC					●					161
	18 ... 30 V DC										33
	10 ... 30 V DC	● ¹⁾	●					●			33
	18 ... 30 V DC		●	●							65
	20 ... 30 V DC		●								99
	7,5 ... 30 V DC										171
	10 ... 30 V DC		●		●		●				27
	10 ... 30 V DC	●	●		●		●				33
	18 ... 30 V DC	● ¹⁾	●		●	●	●	●			33
	10 ... 30 V DC		●		●	●	●		●		65
	15 ... 30 V DC		●		●	●	●		●	●	99
	15 ... 30 V DC		●		●	●	●		●	●	115
	10 ... 30 V DC		●		●	●	●	●			129
	DC/AC ⁴⁾		●		●	● ⁵⁾	●	●			133
	15 ... 30 V DC ²⁾		●	●	●				●		155
	10 ... 30 V DC		●		●	●					161
	DC/AC ³⁾		●				●				175
	10 ... 30 V DC		●				●				181
	20 ... 30 V DC	●		●			●				185
	24 V DC		●				●				185
	20 ... 30 V DC				●		●				201
	20 ... 30 V DC				●		●				201
	20 ... 30 V DC			●							201
	10 ... 30 V DC										201
	90 ... 260 V AC										

1) on request

2) 10 ... 30 V DC without function of the current output

3) 10 ... 252 V DC / 20 ... 252 V AC

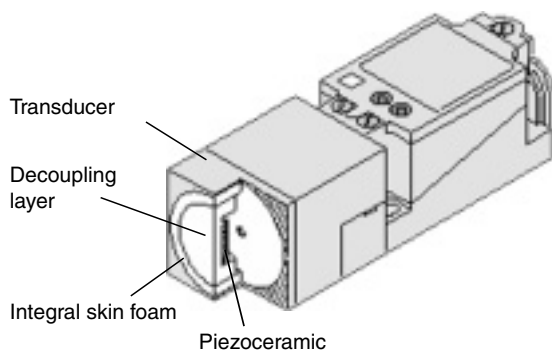
4) DC-Types: 10 ... 30 V DC,
DC/AC-Types: 20 ... 253 V DC
15 ... 253 V AC

5) only DC-Types

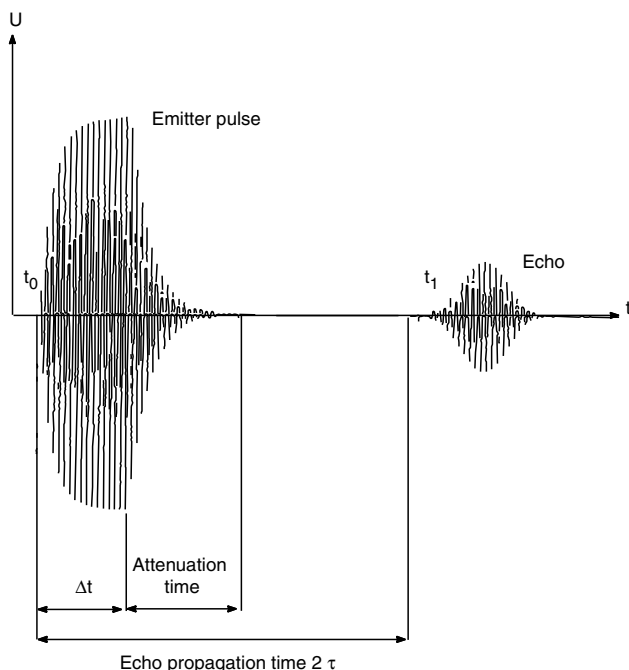
Operating principles and technology of ultrasonic sensors

Pepperl+Fuchs ultrasonic sensors operate with a piezoelectric transducer as the sound emitter and receiver. A patented decoupling layer in special material is used to decouple the ultrasonics to the air - an acoustically thin medium.

This ultrasonic transducer is embedded, watertight, into the sensor housing, in polyurethane foam.



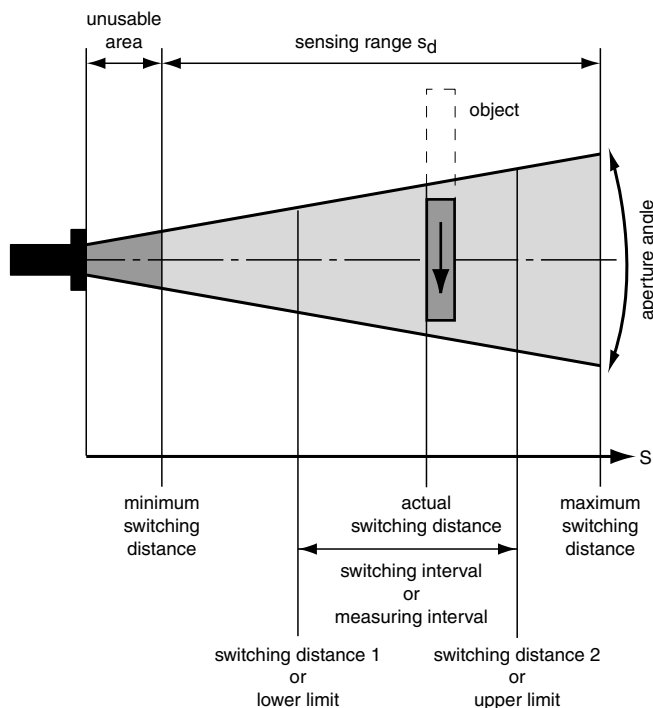
The transducer transmits a packet of sonic pulses and converts the echo pulse into a voltage. The integrated controller computes the distance from the echo time and the velocity of sound. The transmitted pulse duration Δt and the decay time of the sonic transducer result in an unusable area in which the ultrasonic sensor cannot detect an object. The ultrasonic frequency lies between 65 kHz and 400 kHz, depending on the sensor type; the pulse repetition frequency is between 14 Hz and 140 Hz.



The active range of the ultrasonic sensor is referred to as the sensing range s_d . This range is bounded by the lowest and highest sensing distances, whose values depend on the characteristics of the transducer. The highest sensing distance is given in the type code.

The ultrasonic sensor detects objects within its sensing range, regardless of whether these objects approach the sensor axially or move through the sound cone laterally.

Ultrasonic sensors are available with switching outputs and/or analogue outputs, various output functions are available according to type.



The ultrasonic beam has an opening angle of around $\pm 5^\circ$. The sound pressure level outside of this cone is less than half (-6 dB) that of the value on the sensor axis.

The opening angle defines the spatially dimension of the sound cone. The diameter of the sound cone D for a certain distance from the sensor S can be calculated by

$$D = 2 \cdot \tan \alpha \cdot S$$

in a good approach.

In the formula above, only the angle between the curve and the centre-line (0°) has to be inserted (half opening angle).

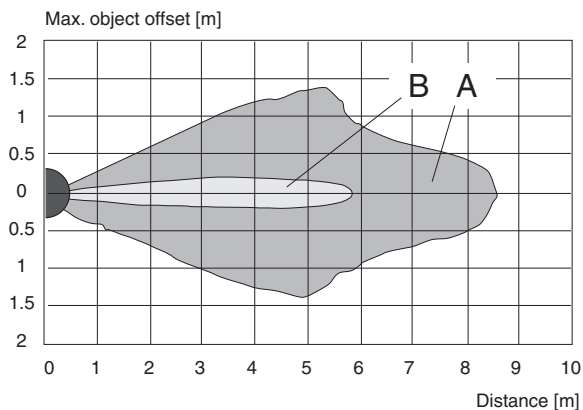
For a simple evaluation of the sound cone diameter D , you can use the list below, which shows the \tan -values for angles between $\alpha = 2^\circ$ and $\alpha = 20^\circ$ in 2° intervals.

angle α	$\tan \alpha$	angle α	$\tan \alpha$
2°	0.035	12°	0.213
4°	0.07	14°	0.249
6°	0.105	16°	0.287
8°	0.141	18°	0.325
10°	0.176	20°	0.364

Operating principles and technology of ultrasonic sensors

The figure shows the response ranges of typical objects, rather than the intensity distribution of the ultrasonic beam. Within these ranges, the sensor detects the specified object A or B.

Example: UC6000-FP...



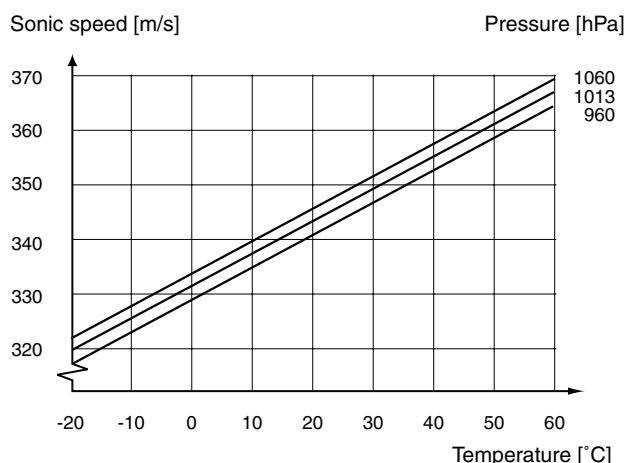
Where A = flat plate, 100mm x 100 mm
B = round rod, diameter 25 mm

The details given in the type code relate to a flat standard plate, 100 mm x 100 mm. This plate must be placed at right angles to the axis of the beam. The packet of sound pulses is reflected away if the object is inclined to this axis and consequently the echo does not reach the sensor.

Due to the physical properties of sound propagation, the decay (range) and velocity of the ultrasonic beam is dependent on the:

- Air temperature
- Relative humidity
- Barometric pressure

The following chart shows the theoretical relationship between the air temperature and pressure and the velocity of sound.



As the signal echo time is evaluated in our ultrasonic sensors, most sensors are temperature-compensated. This eliminates most temperature effects on the sensor output.

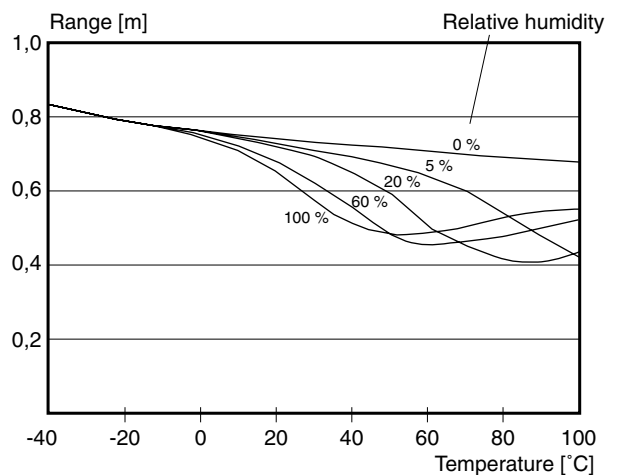
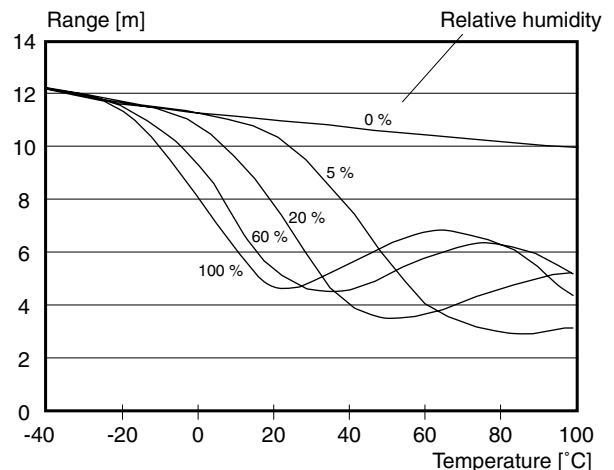
This temperature compensation is performed by an electrical temperature sensor that is integrated into the sensor.

The sensor gives off a certain intrinsic heat that depends on the operating mode and the design. The result of this intrinsic

heat is that the sensor has an additional temperature error of 2 % in the heating phase from 0.5 h ... 1 h.

As a result of the lag of the internal temperature sensor in reflecting the true current temperature, greater short-term fluctuations may occur than are specified on the data sheet due to a sudden change in the ambient temperature.

The relationships between the range of ultrasonic sensors and the air temperature, as well as that between the range and the relative humidity are shown in the following charts. The relationships shown here apply to sensors of the UC4000-30GM... and UC500-30GM... series, but with regard to the specific sensing range, apply in principle to all ultrasonic sensors.



The substantially increased sensor range at low temperatures is apparent, virtually independent of the relative humidity. The reduction in range at high temperatures, however, is subject to a strong influence by the relative humidity.

The sensing ranges stated in the data sheets for our ultrasonic sensors are based on an ambient temperature of +20 °C and a relative humidity of 50 %.

Selecting the correct sensor

The range of ultrasonic sensor products is a large one due to their wide range of deployment. Important selection criteria are described in detail on the next five pages to assist you in selecting the correct sensor type for your specific applications:

1. Sensor principle
2. Output functions
3. Series
4. Electrical connections
5. Parameterisation

1. Sensor principle

The principle by which ultrasonic sensors yield measurements is that of evaluating the time taken for the sound to travel between transmission and reception (direct detection), or a process of checking whether the transmitted signal has been received (detection by beam interruption). The following distinctions are made between types of sensor function:

Detection by beam interruption

Through-beam sensor

The emitter and receiver are mounted facing each other. If the ultrasonic beam is broken by an object, then the switch output becomes active.



Properties:

- High range, as the ultrasonic beam only travels the signal distance once.
- Less susceptible to interference, thus suitable for difficult operating conditions.
- Greater installation complexity, as two separate units must be wired.

Double-sheet monitoring

Double-sheet monitoring is a special application involving through-beam sensors designed especially for this purpose. This application originated in the printing industry and uses an ultrasonic beam to monitor the thickness of paper or foils.



Ultrasonic sensors for double-sheet monitoring are suitable for distinguishing between:

- no sheet, a single sheet, a double sheet.
- Base material
- Base material with labels

Ultrasonic double-sheet monitoring is deployed in all situations in which the automatic, high-speed distinction between base material, labels, single and double sheets is required in order to protect machines or avoid waste production.

A complete system consists of an ultrasonic emitter, an ultrasonic receiver and an evaluation unit. These units have been optimally tuned to one another at the factory and may not be used separately.

Properties:

- The sensing range covers 10 g/m² paperto 2000 g/m² carton.
- Thin plastic or metal foils can also be detected.
- TEACH-IN of various materials
- Suitable for use with glossy or transparent materials
- Automatic adaptation of the operation point to slow changes in ambient conditions
- Very high processing speed
- Insensitive to dust and dirt

Reflex sensor mode

The emitter and receiver are mounted in the same housing. The ultrasonic beam is reflected back to the receiver by a fixed reflector plate. Objects entering the sensing range are detected by:

- changes to the measured distances
- lack of signal from the reflector due to absorption or diffuse reflection



Properties:

- Only one measuring head
- High detection reliability of problematic objects (sound-absorbent objects or objects with angled surfaces)
- Less susceptible to interference, thus suitable for difficult operating conditions.

Direct detection

Reflection sensor

The emitter and receiver are mounted in the same housing (reflection sensor).

The object acts as a sound reflector.

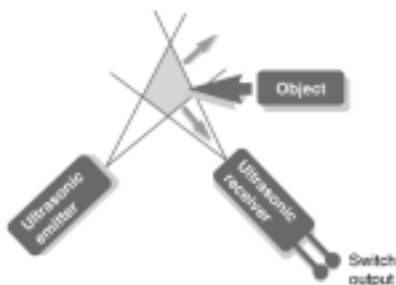


Properties:

- The sensing range depends on the reflectance of the object, i.e. the surface properties and the angle of incidence. Within limits, these influences can be compensated by adjusting the sensitivity.
- Simple installation, as the sensor consists of a single unit.
- Sensitive with regard to changes in the reflection properties of objects

Reflection sensor with twin-head

Emitter and receiver are separate, the axes of the emitter and receiver transducers intersect each other (reflex/direct detection). The use of separate units for the emitter and receiver reduces the unusable area considerably, as this arrangement is not subject to delays while waiting for oscillations of the emitter to die out.



Properties:

- It is possible to detect very small objects.
- Three-dimensional sensing range
- Insensitive with regard to unwanted reflections from objects outside the sensing range (background suppression)

Analogue distance measurement

The time of travel of the sound pulse is the means of measuring the distance of the object. The sensors operate in direct detection mode and have various analogue outputs, depending on the type:

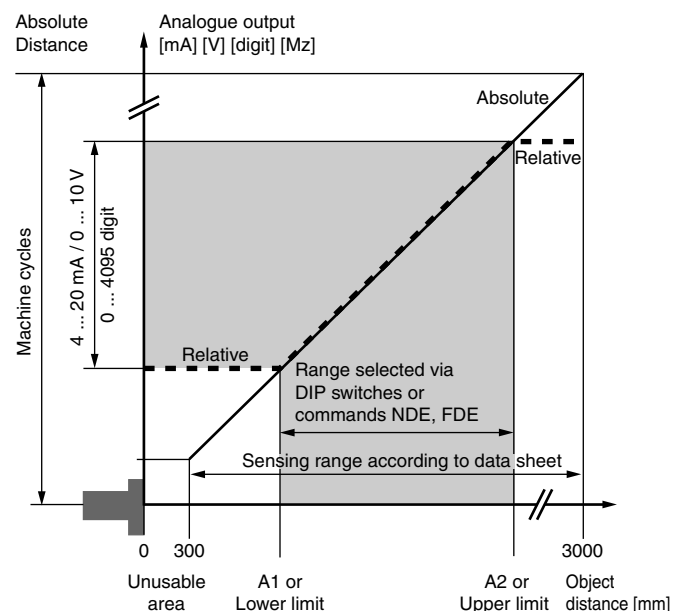
- Analogue voltage output: 0 V ... 10 V
- Analogue current output: 4 mA ... 20 mA
- 8-bit parallel output
- Serial output, RS 232

Absolute: distance as a series of digits in [mm]

Relative: type ...RS: three-digit sequence (0 ... 254)

type ...R2: four-digit sequence (0 ... 4095)

An arbitrary measuring window can be set within the near and far evaluation limits (lower/upper limit) of the sensor. The relative data determines the position of the object in the measuring window.



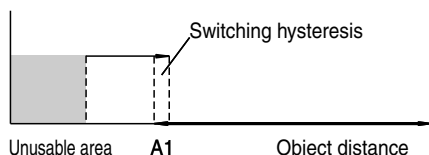
2. Output functions

Switching output

Switching distance mode

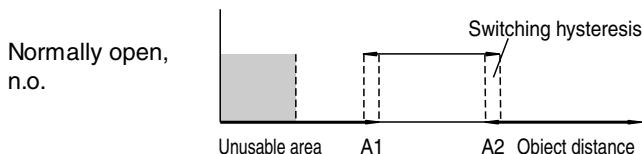
On sensors with two independent switch points, each output becomes active when the object passes the related switch point A1, A2. These switch points can be arbitrarily taught-in to the sensing range.

Normally open,
n.o.
and
Normally closed,
n. c.



Window mode

In window mode the ultrasonic sensor changes its output state when the first detected echo, and thus the object, is within the switching window. The window limits A1 and A2 can be taught-in as required. If multiple echoes arrive at different times and one of these is before A1, the output will not switch, even if a later echo is within the switching window. The sensor only evaluates the first echo detected. Multiple echoes thus cannot be evaluated.



With our ultrasonic sensors, which support the window mode, the reflex sensor mode can be realised in an easy way (see reflex sensor mode).

Reflex sensor mode

The output of the ultrasonic sensor switches in the following cases:

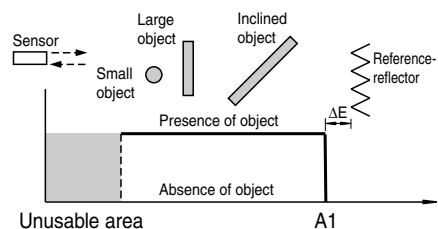
- The sensor receives an echo from a small object in the sound cone and from the reference reflector.
- The sensor detects a large object and no longer receives the echo from the reference reflector.
- The sensor does not receive an echo, for example in the event that an object is positioned at an angle that reflects the sound away.

The position of the reference reflector may not be changed. The set or taught-in switching distance A1 must be shorter than the distance to the reflector by the distance ΔE .

Example:

UC3000... $\Delta E > 2\%$ of 3000 mm = 60 mm
UC6000... $\Delta E > 2\%$ of 6000 mm = 120 mm

Normally open,
n.o.



Note

Reflex sensor mode is possible with each of our ultrasonic sensors, which support the window mode. Therefore by means of the switch points A1 and A2 a small window area is defined. Inside this area, the fixed reference reflector must be placed. An object outside of this defined window will cause reliably an output status change, independent of its reflection properties. The wished output function (normally open/normally closed) can be set, when adjusting a window operation in the opposite output function.

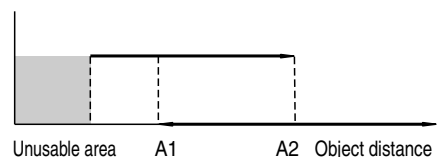
Example: to detect an object with normally open output function, a window mode with normally closed output function has to be set.

Double switching point mode (hysteresis mode)

The ultrasonic sensor maintains its previous switching state in the selected area of the evaluation window. The output switches when the object approaches the near switching point A1. It then does not switch back until the object passes the far switching point A2. The two switching points form a large range hysteresis.

Double switching point mode can be used in many applications (such as monitoring filling levels to perform tasks with a single output that would otherwise require two outputs in normal switching-distance mode).

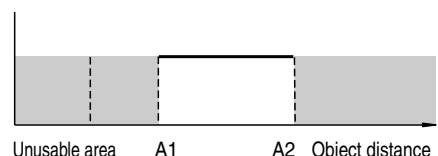
Normally open,
n.o.



Area monitoring

The ultrasonic sensor monitors the evaluation window. The output switches only if an object is detected in the window. Echoes other than those from the evaluation window are ignored by the sensor software. Thanks to this active masking of the foreground in the area monitoring mode, echoes from areas outside of the switching window (foreground) do not cause interference.

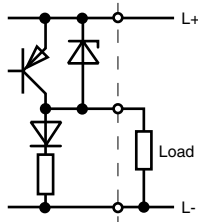
Normally open,
n.o.



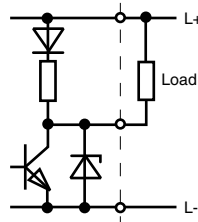
The area monitoring mode is supported by our UC... sensors.

nnp/pnp output

The outputs of the ultrasonic sensors can be realised in npn or in pnp technology. The sensors in this catalogue are mainly pnp types. In this case the load is connected to -L, at the switching output of the sensor +L is connected to the load.



pnp



nnp

Relay output

A number of ultrasonic sensors feature relay outputs. Please refer to the individual data sheets for the maximum switching loads and electrical design of the sensors. Information related to the mechanical service life refers to the number of switching actions of the relay contacts in a no-load condition. This value can also be reached with low electrical contact loads. At the rated load for the electrical contacts, the service life is reduced to the value indicated for the electrical service life. The life time data stated are MTBF values.

Analogue output: 4 mA ... 20 mA/0 V ... 10 V

This issues a current/voltage signal proportional to the distance. The limits of the analogue measuring window can be parameterised as required within the sensing range. Depending on the type, this can be realised by:

- TEACH-IN with programming wire or programming plug
- DIP switch
- RS 232 interface
- Two potentiometers

External evaluation

On these sensors an external synchronising pulse triggers the measuring cycle. The sensor transmits the ultrasonic pulse and, on receipt of the time-delayed echo, outputs a voltage pulse. The echo time evaluation is performed by the evaluation unit.

The following evaluation units are available:

- UH3-KHD2-4I (4 analogue outputs)
- UH3-KHD2-4E5 (4 switching outputs)
- UH3-T1-KT (1 relay output)

With the types UH3-KHD2..., 4 sensors can be used in synchronous or multiplex mode, thus permitting special applications such as the spatial detection of objects, increased sound-cone coverage, and multiple measuring ranges.

The type UH3-T1-KT features a clock-pulse output and 3 signal inputs. It has a relay output with adjustable pick-up and release delay.

Power is also supplied to the connected sensors by the evaluation unit.

Digital, parallel

The distance is issued in the form of an 8-bit data word in parallel on three lines.

Digital, serial

These ultrasonic sensors can be parameterised via a bi-directional RS 232 interface, or issue the measured distance in serial form.

Outputs:

- Absolute/relative distance in 8- or 12-bit resolution
- Switching states
- Object in measuring window (A1, A2 or NDE*, FDE*)
- Object in sensing range
- etc.

* NDE = Near Distance of Evaluation
FDE = Far Distance of Evaluation

Parameterisation

- Switching distances A1, A2
- Measuring window (NDE, FDE)
- Rising/falling ramp of analogue output
- Normally open/normally closed function
- Filter (for adaptation to application)
- etc.

The parameterisation can be performed with the Ultra 2001 service program or a terminal program and individual commands. A list of valid commands is contained in the individual sensor data sheets.

Digital, serial/parallel

These ultrasonic sensor function in the same way as those with the serial interface, but also feature an 8-bit parallel output for the measured distance. The parallel interface is parameterisable via RS 232 using the Ultra 2001 application.

3. Types/housing shapes

Cylindrical form

Design: 12GM...
18GK...
18GM40... / 18GM40A...
18GM75...
30GM...



Properties:

- Material: Plastic, nickel-plated brass or stainless steel.
- Thread: M12 x 1, M18 x 1 or M30 x 1.5
- Active area on the axial face
- (18GM40 and 18GM75 also available with angled head)
- Installation: In an existing threaded hole or using Pepperl+Fuchs mounting aids (see Accessories section)

Design: UC...-30GM... -T-...



Properties:

- Material: Plastic, stainless steel.
- Thread: M30 x 1,5
- Active area on the axial face
- Best suitable for low-temperature applications
- Installation: In an existing threaded hole or using Pepperl+Fuchs mounting aids (see Accessories section)

Design: 30GM... -K-...



Properties:

- Sensor head and evaluation unit are separate. The unit can therefore be installed in tight spaces.
- Material: Stainless steel.
- Thread: M30 x 1.5 (amplifier electronics)
M18 x 1 or M30 x 1,5 (transducer head).
- Active area on the axial face
- Installation: In an existing threaded hole or using Pepperl+Fuchs mounting aids (see Accessories section)

Design: LUC...



Properties:

- Material: PBT.
- Thread: G1½A and 1½" NPT in stainless steel or polypropylene
- Active area on the axial face
- Installation: In existing threaded flange
- Teflon-coated ultrasonic sensor for deployment in chemically aggressive environments

Design: D1

The D1 type was designed specifically for single-hole mounting in container lids to monitor fill levels. The display and operating elements are located under the transparent, permanently attached screw cap.



Properties:

- Material (housing): Plastic
- Material (flange): Stainless steel
- Single-hole mounting
- Simple parameterisation via DIP switch
- Large operating voltage range

Cuboid shaped types

VariKont® (Designation: U1 and U9)

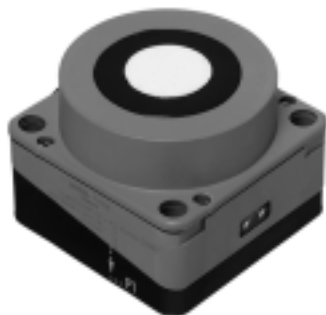
The *VariKont®* housing was developed by Pepperl+Fuchs and has been proven in millions of applications. It is extremely flexible due to the adjustability of the head (i.e. the active section) in five directions without changes to the mounting of the sensor. The electronics section can be replaced independently of the base of the sensor. Changing the wiring or adjustment is therefore not required.



Properties:

- Material: PBT
- Active section is adjustable in 5 directions without affecting the mounting of the sensor.
- The electronic section can be replaced without changes to the base of the sensor. The wiring and adjustment remain unaffected.
- Connection through terminal compartment
- Standardised mounting hole pattern as in mechanical roller-lever limit switches (compliant with EN 60947)

Design: FP



Properties:

- Material: PBT
- Active area at right angle to mounting surface
- The electronic section can be replaced without changes to the base of the sensor. The wiring and adjustment remain unaffected.
- Connection through terminal compartment

Design: F12

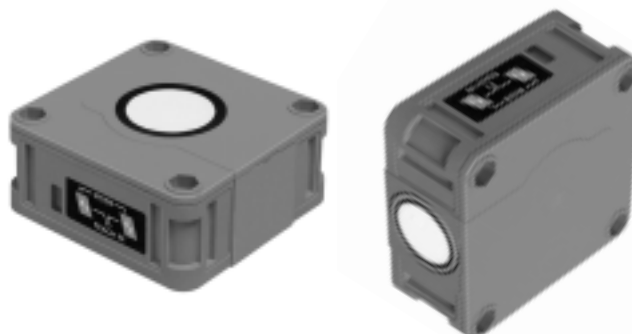


Properties:

- Robust housing, waterproof and nonbreakable
- Material: dy cast zinc, nickel plated, PC, PBT
- Active area on the front face
- Multiple installation possibilities by means of slotted hole and dove tail mount
- Best visible indicator LEDs at the front and at the rear side

Connection via 90° turnable connector, M12 x 1

Design: F42



Properties:

- Material: PBT
- Direct surface-installation without additional mounting bracket
- Easy programming via built in keypad. No external programming tool required
- LEDs for status indication and for user support through numerous programming routines
- Top-looker und side-looker designs available for ideal matching to the local conditions
- DC-versions with semiconductor switching outputs or analogue outputs
- AC/DC-versions with wide voltage supply range and relay output

Electrical connections

Design: F43



Properties:

- Material: PBT
- Direct surface mounting without additional mounting angles
- LEDs on the plug side
- No unusable area in the twin-head version

Design: F54



Properties:

- Cubical housing, material: PBT
- Direct surface mounting without additional mounting angles

Design: F64



Properties:

- Through-beam ultrasonic barrier
- Cubical housing, material: PA
- Direct surface mounting without additional mounting angles

Double-sheet monitoring

The ultrasonic double-sheet monitor is a measuring system consisting of a cylindrical ultrasonic emitter unit and a receiver unit with built in evaluation electronics in M18 threaded bushes or cylindrical ultrasonic emitter and receiver units (M18) with a separate cubical evaluation unit.



Properties:

- Material (evaluation unit, only UDB... devices): Makrolon (UDC... devices do't have a separate evaluation unit)
- Material (sensor heads): Nickel-plated brass
- Non-contact distinction between single and double sheets
- Short response times to 1 ms
- Insensitive to dust and dirt
- Paper weights between 10 g and ca. 2000 g detectable
- Installation: In existing threaded holes or using the special fork-mounting aid MH-UDB01 (see Accessories section)

Applications:

The ultrasonic double-sheet monitor is deployed in all situations in which the automatic distinction between single and double sheets is required in order to protect machines or avoid waste production.

Typical applications include:

- deployment in printing machines
- monitoring of bonding sheets in labeling machines
- deployment in letter-opening machines
- deployment in document counters
- deployment in packaging machines
- the detection of air, single and double sheets in paper processing machines.

4. Electrical connections

Direct voltage sensors, 3-wire (Type E)

3-wire sensors have separate connections for the power supply and load. The load can be switched to positive (pnp) or negative (nnp).

They are protected against overload, short circuit and reversal of polarity. The residual current is negligible.

Sensors with analogue output

are direct-voltage sensors that provide an output signal proportional to the measured value. They also have separate connections for the power supply and load.

The output signal is in the 0/4 mA ... 20 mA (current output) or 0/2 V ... 10V (voltage output) range.

Additionally, they can feature switching or control outputs and are protected against overload, short circuit and reversal of polarity.

Sensors with external evaluation

are direct voltage sensors with a clock pulse input that issue a pulse for the echo time at a separate output connection. The time at which the echo pulse is output is proportional to the echo time. A separate back-end unit is required for these sensors (see data section).

Sensors with serial interface

are direct voltage sensors that feature connections for an RS 232 interface in addition to the supply connections. This interface can be used for parameterisation, as well as to read out the sensor. Additional analogue or switching outputs may also be present.

Sensors with parallel interface

are direct voltage sensors that feature connections for the parallel output of the measured distance in addition to the supply connections. They can also feature control inputs, outputs, or a serial interface. Due to the large number of connections, these sensors are available with cable connections only.

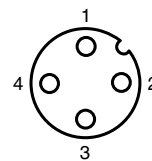
Three different connection types are used on Pepperl+Fuchs ultrasonic sensors:

Cable connection - The lengths, wire diameters and cable materials are stated in the individual data sheets. Sensors with cable connections do not have a supplementary designation in the type code.

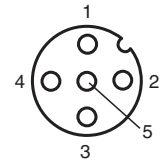
Terminal compartment - The *VariKont*® (U1 or U9) and *FP* types are equipped with a terminal compartment. The maximum diameter of the cable or cross section of the wires is stated in the data sheet.

Plug - The type of plug is stated under V... in the type code (see illustration).

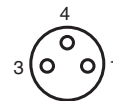
Plug connector -V1
(Circular connection M12)



Plug connector -V15
(Circular connection M12)



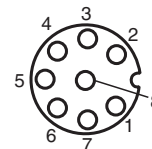
Plug connector -V3
(Circular connection M8)



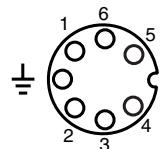
Colour assignments of ready-to-use mating connectors, V1, V15, V3:

Pin	Colour	Abbrev.
1	Brown	BN
2	White	WH
3	Blue	BU
4	Black	BK
5	Grey	GY

Plug connector -V17
(circular connector M12x1)



Plug connector -V7
(circular connector PG 13,5)



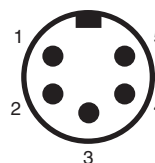
Colour assignments of ready-to-use mating connectors, V17:

Pin	Colour	Abbrev.
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YW
5	Grey	GY
6	Pink	PK
7	Blue	BU
8	None (shielding)	

Recommended colour assignments mating connectors V7:

Pin	Colour	Abbrev.
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YW
5	Grey	GY
6	Pink	PK
7	Blue	BU

Connector V95
(7/8"-16 UN 2A)

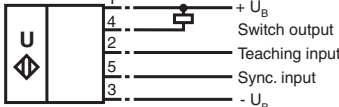
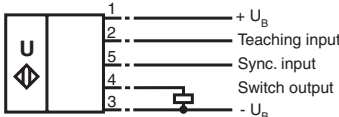
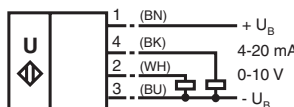
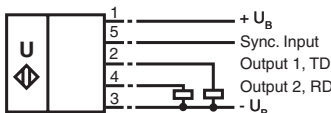
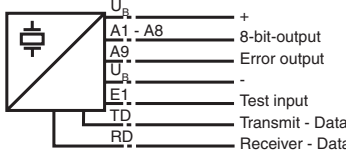
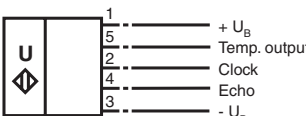


Recommended colour assignments mating connectors V95:

Pin	Colour	Abbrev.
1	Black	BK
2	Blue	BU
3	Green/ Yellow	GN/YE
4	Brown	BN
5	White	WH

Parameterisation

Overview of electrical connections

Typical electrical data	Type	Switching output/Remarks	Standard symbol (selection)	
<u>3-wire</u> Rated operating voltage 10 V ... 30 V DC Output 100 mA/200 mA	E0 E1 E01 E4 E7 E2 E3 E23 E5 E6	NPN NPN NPN NPN NPN PNP PNP PNP PNP PNP	Normally open NO Normally closed NC* E0 + E1* Normally closed NC/ Normally open NO (switchable)* 2 x E4* Normally open NO Normally closed NC* E2 + E3 Normally closed NC/ Normally open NO (switchable)* 2 x E5*	Standard symbol/Connections: (version E0, npn)  Standard symbol/Connections: (version E2, pnp) 
<u>Analogue</u> Rated operating voltage 10 V ... 30 V DC Output 4 mA ... 20 mA Output 0 V ... 10 V	IU	Sensor for distance measurement with analogue output	Standard symbol/Connection: (version IU)  Core colours in accordance with EN 60947-5-2.	
<u>Serial</u> Rated operating voltage 10 V ... 30 V DC	R2 (RS)	Communication-enabled, parameterisable sensor with RS 232 interface Old designation	Standard symbol/Connection: (Version E6, pnp) 	
<u>Parallel</u> Rated operating voltage 20 V ... 30 V DC	8B	Communication-enabled, parameterisable sensor with 8-bit parallel output	Standard symbol/Connection: Transceiver (parallel interface) 	
<u>External evaluation</u> Rated operating voltage 10 V ... 30 V DC	H1 H2 H3	Emitter* Receiver* Emitter/receiver	Standard symbol/Connection: 	

Note: The standard symbols shown here are examples. The types marked with * are not shown.

Note: The standard symbols shown here are examples. The types marked with * are not shown.

5. Parameterisation

Switching distances A1 and A2 or the lower and upper limits of the measuring window of ultrasonic sensors in direct-detection mode can be parameterised in a variety of ways depending on their type.

Coding switch in terminal compartment

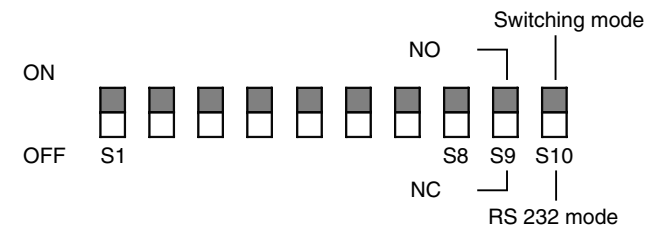
The near and far switching distances (A1 or A2) are set in steps using 4 DIP switches each. The step size of the adjustable switching distances is determined by the sensor software. For the sensor in the following example, the switch combinations 0000 ... 1000 correspond to 150 mm and for 1001 ... 1111 to 200 mm.

Different steps may apply to other sensors with coding switches (see the technical data for the relevant sensor type).

The following types are equipped with coding switches in terminal compartment:

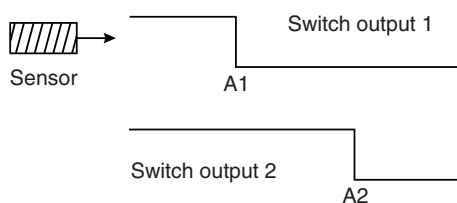
- UC500+U9+E6/E7+R2, UC500+U9+IUE2/IUE0+R2
- UC3000+U9+E6/E7+R2, UC3000+U9+IUE2/IUE0+R2
- UB1000+FP1+E6
- UC6000-FP-E6/E7-R2-P5, UC6000-FP-IUE2/IUE0-R2-P5

Example 1: UC3000+U9+E6+R2
(sensor with 2 switching outputs or RS 232 interface)



Near				Far					
S1	S2	S3	S4	S5	S6	S7	S8	A1/mm	A2/mm
0	0	0	0	0	0	0	0	300	400
0	0	0	1	0	0	0	1	450	550
0	0	1	0	0	0	1	0	600	700
...	...								
0	1	0	1	1	1	0	0	1050	2400
...	...								
1	1	1	1	1	1	1	1	2900	3000

(1 = ON, 0 = OFF)



(S9 = ON, normally open)

Example 2: UB1000+FP1+E6
(sensor with 2 switching outputs or 1 switching output and switching window)

S10	Operating behaviour	
0		Output 1 Output 2
1		Output 1 (window) Output 2

Switch S1 ... S8: adjustment of the switching range (200 mm ... 1000 mm)

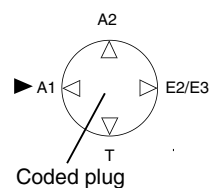
Switch S9: (0) normally closed/(1) normally open

Switch S10: (0) two independent switching points (1) measuring window

Programming plug

The following ultrasonic sensors are equipped with a programming plug with an integrated temperature probe. The plug can be connected in four different positions:

UC300 UC500 UC1000 UCC1000 UC2000 UC4000 UC6000	30GM	E6 E6R2 E7R2 IU IUR2	(K)	V1 V15
LUC4T	G5P G5S N5P N5S	IU		V15



The switching distances A1 and A2 of the evaluation (E2/E3), or the lower and upper limits of the measuring window are set using TEACH-IN.

Position	Function
A1	Distance A1 is taught (switching distance or measuring window limit)
A2	Distance A2 is taught (switching distance or measuring window limit)
E2/E3	E2: individual switching distances/falling analogue ramp E3: window/rising analogue ramp
T	Temperature compensation is activated

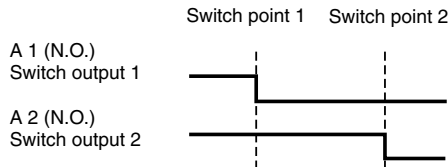
The state is stored when the plug is removed. The taught-in switching distances and functions are retained when power is switched off.

General information

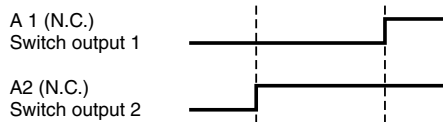
Switching outputs: types ...-E6R2/E7R2

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

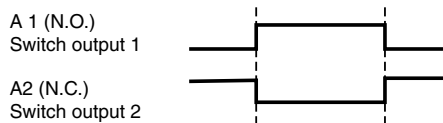


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



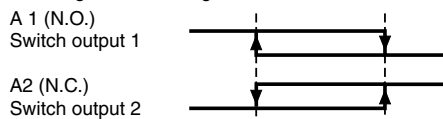
2. Window mode

To exchange the switching distances is of no effect.

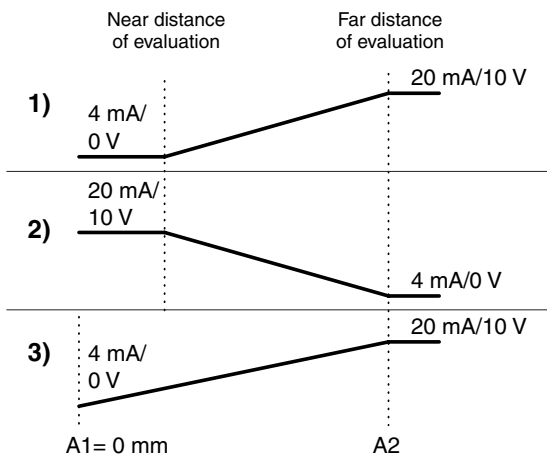


3. Hysteresis mode

To exchange the switching distances is of no effect.



Analogue output: types ...-IU and ...-IUR2



Programming units UB-PROG 2/UB-PROG 3

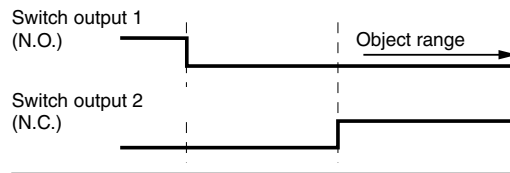
Ultrasonic sensor of the types:

UB500	18GM75	E01	V15
UB2000	30GM	E23	
UB4000	F54	E4	
UB6000		E5	
		E6	
		E7	
		I U	

permit the UB-PROG 2/UB-PROG 3 programming units to be inserted into the supply circuit. This permits the switching distances A1 and A2 or the evaluation limits to be programmed in an elegant manner (TEACH-IN). Each switching point/each evaluation limit has its own button.

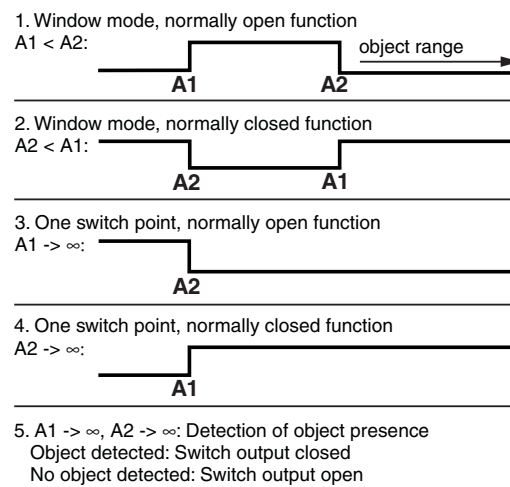
A window function or a normally closed/normally open function can be set for sensors with switching outputs depending on the order in which buttons A1 and A2 are pressed. The evaluation range and the mode of operation of the analogue output can be set for sensors with analogue output.

Switching output: types ...E01/E02

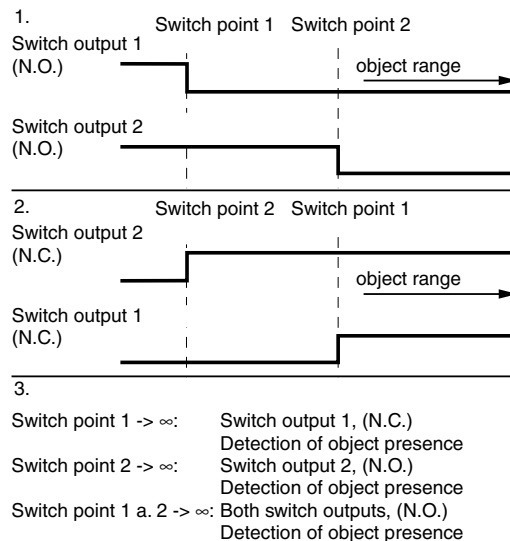


Switch point 1 $\rightarrow \infty$: Switch output 1, (N.O.)
Detection of object presence
Switch point 2 $\rightarrow \infty$: Switch output 2, (N.C.)
Detection of object presence

Switching output: types ...E4/E5



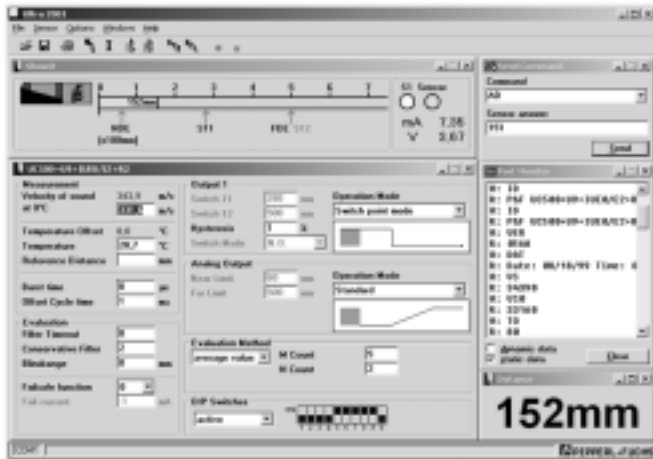
Switching output: types ...E6/E7



Ultra 2001 PC service program (RS 232, bi-directional interface)

The Ultra 2001 application can be used to parameterise, and read out the parameters and measured values, of ultrasonic sensors with the designation ...R2 (RS) in their type code. The sensors must be connected to a PC/notebook using the supplied interface cable.

Ultra 2001 is running with WINDOWS™ 32-Bit systems (WINDOWS 95™ and higher) and features a modern user interface. The operation of the program is mouse-based.



UC-F43-R2 programming adapter

The UC-F43-R2 programming adapter is designed to be inserted between sensors of the -F43- series and the supply lead. A 9-pin cable socket with 1 m of cable permit the sensor to be connected to the RS 232 interface of a PC with ease. The usual wiring requirements become superfluous with the use of the programming adapter. The PC service program Ultra 2001 can be used for the actual programming of ultrasonic sensors of the -F43- series.

UC-30GM-R2 programming adapter

The interface cable UC-30GM-R2 permits the parameterisation of ultrasonic sensors series UC...-30GM...R2-V15 using the PC service program ULTRA 2001. This cable connects the PC-internal RS 232-interface to the program/temperature socket of the sensor. During the parameterisation procedure, the program/temperature plug is unplugged.

UC-FP/U9-R2 programming adapter

The interface cable UC-FP/U9-R2 permits the parameterisation of ultrasonic sensors series VariKont (U9) and FP, which are equipped with a serial interface, (marked with R2 or RS in model number). This cable connects the PC-internal RS 232-interface to the according terminal screws in the sensor base.

6. General information

Resolution

Pepperl+Fuchs ultrasonic sensors of the UC... series are equipped with an integrated 12-bit DA converter. A resolution of 12 bits corresponds to 4096 steps. The echo time of an ultrasonic packet is determined with a resolution of 1 µs (sensors without an RS 232 interface) or 1.085 µs (sensors with an RS 232 interface) due to the clocking of the microcontroller. This corresponds to a physical resolution of 0.172 mm or 0.186 mm. This maximum sensor resolution is available if the measuring window (the range between A1 and A2 or between the lower and upper limits) is less than or equal to

$$4096 \times 0.172 \text{ mm} = 705 \text{ mm}$$

or

$$4096 \times 0.186 \text{ mm} = 762 \text{ mm}$$

Up to this window size, the resolution is solely dependent on the clock rate of the microcontroller. The DA converter controls the sensor resolution if a larger measuring window is selected. It can then be calculated using the following formula:

$$(A2 - A1) / 4096$$

or

$$(\text{upper limit} - \text{lower limit}) / 4096$$

Example:

A UC4000-30GM-IUR2-V1 sensor has been set up with the following parameters:

Upper limit:	3500 mm
Lower limit:	800 mm

In this application, the physical resolution of the sensor amounts to

$$(3500 \text{ mm} - 800 \text{ mm}) / 4096 = 0.66 \text{ mm.}$$

Ultrasonic sensors with 8-bit parallel output resolve the measuring window in 256 steps. Their resolution can be calculated as follows:

$$(\text{upper limit} - \text{lower limit}) / 256$$

if the measuring window has been set to a size greater than 44 mm. For smaller measuring windows, the resolution is 0.172 mm. The resolution given in the data sheet is based on the largest possible measuring window.

Accuracy (conformity error)

To determine the absolute accuracy of the measured value of an ultrasonic sensor, factors such as

- temperature
- atmospheric pressure
- relative humidity
- turbulence
- hot spots in the air surrounding the sensor
- Sensor in hot operating mode status

must be taken into consideration.

Notes for installation and operation

In addition, tolerances of the electronic components and differences in the response characteristic of the ultrasonic sensor due to varying signal strengths of the sound reflected by the object also have an effect.

Under consideration of all of these influences, an accuracy of better than 2 % generally can be achieved, along with a reproducibility and linearity of better than 0.2 %.

Resistance to shock and vibration

Pepperl+Fuchs ultrasonic sensors fulfill the DIN EN 60947-5-2 standards for low-voltage switching equipment, Part 5, Section 2: Proximity Switches. A reference is made to the applicable environmental testing procedures within the framework of this standard.

Resistance to shock

Our ultrasonic sensors were tested for their resistance to mechanical shocks in accordance with IEC 60068-2-27 under the following conditions:

6 impacts in each direction along 3 axes at right angles to one another (6 individual tests).

Pulse form:	half sine
Peak acceleration:	30 g (300 m/s ²)
Pulse duration:	11 ms

Resistance to vibration

Our ultrasonic sensors were tested for their resistance to vibration in accordance with IEC 60068-2-6 under the following conditions:

Vibration along 3 axes at right angles to one another.

Frequency range:	10 Hz ... 55 Hz
Amplitude:	1 mm
Duration:	30 min each (55 Hz)

Electromagnetic compatibility

The DIN EN 60947-5-2 "proximity switch standard" also refers to the applicable standards for the documentation of electromagnetic compatibility. Pepperl+Fuchs ultrasonic sensors fulfill the requirements of

- Interference immunity in accordance with DIN EN 61000-4-2 (immunity to electrostatic discharge)
- Interference immunity in accordance with DIN EN 61000-4-3 (immunity to high-frequency interference)
- Interference immunity in accordance with DIN EN 61000-4-4 (immunity to fast transients)
- Emitted interference in accordance with EN 55011 and DIN EN 50081-2.

7. Notes for installation and operation

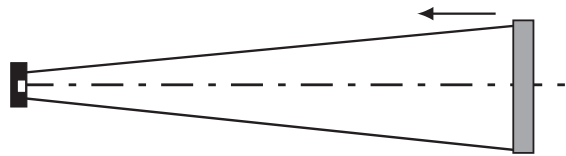
Ultrasonic sensors can be installed and operated in any position. Avoid installation positions that may lead to impaired functioning due to deposits of dust or dirt.

When cleaning ultrasonic sensors, take care not to damage the sensor surface (decoupling layer) or the integral foam in which the transducer is embedded.

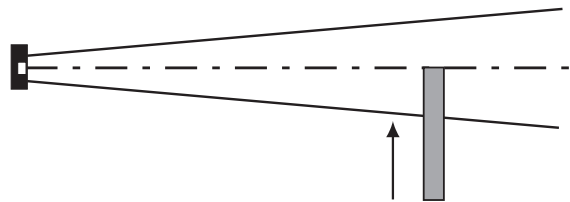
Water drops or the formation of crusts on the decoupling layer will lead to an impairment of the ultrasonic sensor's function. Light dust deposits are uncritical.

Actuation direction

The objects to be detected can enter the sound beam from any arbitrary direction. The sensor ranges and response curves in the data sheets represent the maximum object sensing ranges.

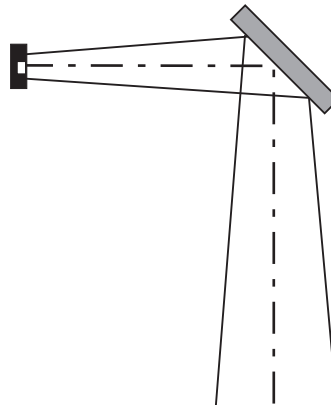


For objects moving radially, i.e. at right angles or any other angle lateral to the sound cone axis, refer to the response curve of the data sheet to determine the switching distance.



Deflection of the sound cone

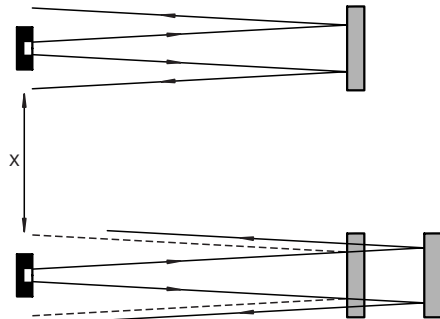
The sound cone can be deflected with smooth, even reflectors. Do not deflect the signal more than twice, however, as the signal damping that occurs with each deflection will result in reduced range.



An exact alignment of the reflector surfaces is required. Pepperl+Fuchs offers 45° reflectors for some sensor types to achieve a deflection of 90°.

Mutual interference

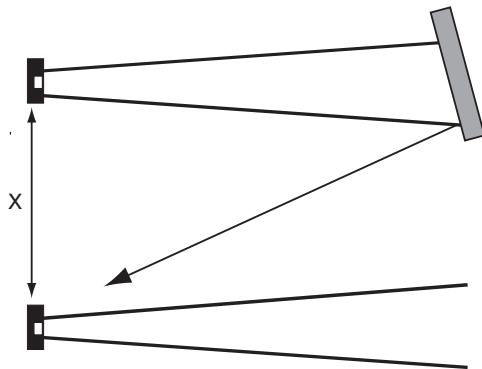
To prevent mutual interference, observe the minimum distances between sensors of the same type shown in the following drawings.



Detection range mm	X m	Detection range mm	X m
to 500 to 2000	> 0.3 > 1.0	to 4000 to 6000	> 2.0 > 2.5

The indicated values should be regarded as guidelines. They apply if the sound cones are aligned parallel to one another and the surfaces of the objects are at right angles to the axes of the sound cones. The actually required spacing "X" is dependent on alignment, the nature of the target objects to be detected, and local conditions related to other objects located in the sound cone.

In the event that objects with an unfavourable alignment are to be detected, a greater spacing "X" must be used.



The indicated spacing can be reduced significantly by synchronising the ultrasonic sensors. Pepperl+Fuchs offers a series of sensors equipped with synchronisation inputs for this purpose. These can be used in synchronised or multiplex mode. The synchronisation can be realised with an external synchronisation signal or with self-synchronisation in some sensor types.

The opposed installation on non-synchronised sensors of the same type should be avoided.

Synchronisation

Mutual interference of sensors with synchronisation inputs can be prevented effectively by synchronising the sensors. A distinction is made between synchronised and multiplex mode.

Multiplex mode

In this operating mode, the sensors are activated for a brief period, consecutively and in a cyclic manner. Please note that in this operating mode the cycle time T is extended by a factor of N, in which N stands for the number of sensors in the multiplex mode.

$$T_{\text{multiplex}} = N \times T_{\text{sensor}} \quad \text{and} \quad f_{\text{Sync}} = 1 / T_{\text{multiplex}}$$

If sensors of different types are used, the total cycle time is equal to the sum of the cycle times of the individual sensors.

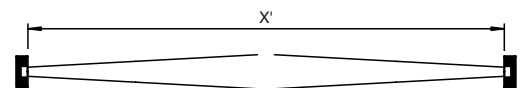
$$T_{\text{multiplex}} = T_{\text{sensor 1}} + T_{\text{sensor 2}} + \dots + T_{\text{sensor N}}$$

If the self-synchronisation option is used, the sensors work in multiplex mode.

Synchronised mode

In this mode, the synchronisation inputs of all sensors are connected to one another and controlled together. Unlike multiplex mode, the cycle time does not increase. In addition to the monitoring of large areas, the synchronised mode is above all suitable for the reduction of the required minimum lateral spacing of sensors of the same type, and for the operation of opposed sensors of the same type.

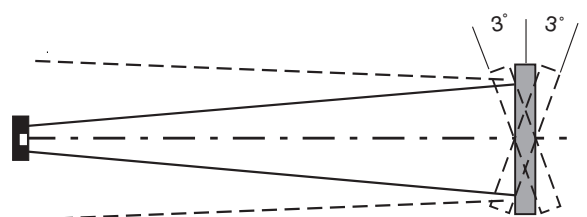
In the case of opposed sensor installation, observe the distances specified below.



Detection range mm	X' m	Detection range mm	X' m
to 500 to 2000	> 2.0 > 8.0	to 4000 to 6000	> 16.0 > 25.0

Measuring plate/objects

Objects to be detected by ultrasonic sensors can be solid, liquid or in powder form. The properties of the object's surface are important for the echo to be evaluated by the sensor. All level and smooth surfaces arranged at a right angle to the sound cone, provide an ideal reflection. An angular deviation of the measuring plate by a maximum of 3° is permissible for reliable detection.



Material properties such as transparency, colour, or surface finish (polished or matte) have no effect on detection reliability. The roughness of the object's surface, together with the sensor-specific transducer frequency, determines whether the echo is reflected or diffused. The following table contains a listing of the transducer frequencies used in Pepperl+Fuchs ultrasonic sensors and the associated degrees of surface roughness for the reflection or diffusion of the sensor signal. The following rule applies:

If the sound wavelength is longer than the peak-to-valley height of the surface roughness, the directional share of the reflection will predominate. If it is shorter than the peak-to-valley height, the diffuse share will predominate.

Transducer frequency	Degree of object surface roughness for a predominately directional reflection	Degree of object surface roughness for a predominately diffuse reflection
65 kHz	< 1 mm	> 25 mm
85 (90) kHz	< 0.8 mm	> 20 mm
120 (130) kHz	< 0.5 mm	> 13 mm
175 kHz	< 0.4 mm	> 10 mm
375 (400) kHz	< 0.2 mm	> 5 mm

The transition from directional to diffuse reflection is continuous. Depths of roughness between the indicated values will result in reflections with diffuse and directional shares. Objects with great surface roughness will result in a reduction of the ultrasonic sensor's sensing range.

Greater degrees of surface roughness permit greater deviations of the angle of incidence from the ideal position. The reason for this is the predominately diffuse reflection of the ultrasonic signal. As a result, filling levels or pouring cones of coarse-grained materials can be detected at an angular deviation of up to 45° (at a reduced sensing range).

The following objects are well-suited for detection:

- All smooth and solid objects that are aligned at a right angle to the sound cone.
- All solid objects with degrees of surface roughness that cause a diffuse reflection and which are to a large extent independent of their alignment.
- The surfaces of liquids, insofar as these are not angled more than 3° from the axis of the sound cone.

The following materials are poorly suited:

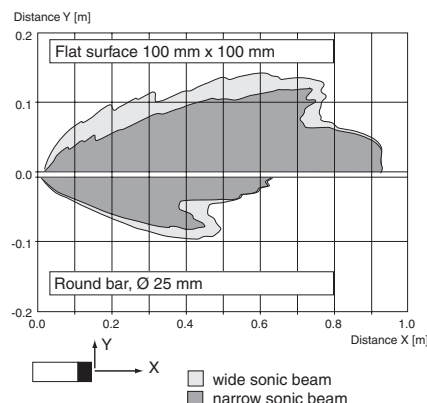
- Materials that absorb ultrasonic signals such as felt, cotton wool, coarse textiles, or plastic foam.
- Materials at temperatures greater than 100 °C.

It may be necessary to resort to through-beam operation for such materials.

Sensors with adjustable sound cone width

Some series offer a sound cone width adjustment in the close range. This enables the operation of such sensors even at narrow places, where objects can extend sideways into the sound cone. Such circumstances would cause erratic switching or erratic measurement under the use of sensors without this feature. An adjustment of the sound cone can solve this problem.

The adjustment of the shape of the sound cone has no influence to the maximum sensing range.




In the figure above, the characteristic response curve of the sensor UB500-F42... is shown for 2 different objects (round bar with $d = 25$ mm (upper part) and flat surface 100 mm x 100 mm (lower part)).

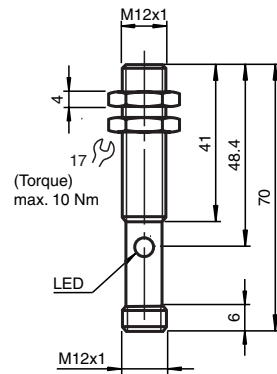
If you have any questions pertaining to difficult applications, simply give us a call. Take advantage of our help and experience. Our service team will be pleased to be of assistance.

Our contact addresses, you can find at the rear catalogue cover or in the chapter "Pepperl+Fuchs GmbH worldwide" beginning at page 246



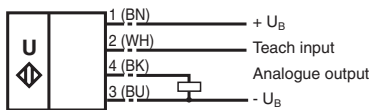
Model number	Detection range	Page
UB400-12GM-E5-V1	400 mm	28
UB400-12GM-I-V1		
UB400-12GM-U-V1		

Series -12GM	Ultrasonic sensor		UB400-12GM-...-V1		
Series -18GK/-18GM		<ul style="list-style-type: none">• TEACH-IN input• Temperature compensation• Analogue output 0 V ... 10 V• Analogue output 4 mA ... 20 mA• Switch output• 5 different output functions can be set• Measuring window adjustable			
Series -30GM					
Series VarKont					
Series -FP			<div>CE</div> <div>Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"</div>		
Technical Data					
Series -F12			Model number		
Series -F42	Sensing range	30 ... 400 mm	UB400-12GM-E5-V1	UB400-12GM-I-V1	UB400-12GM-U-V1
	Adjustment range	50 ... 400 mm	●	●	●
	Unusable area	0 ... 30 mm	●	●	●
	Standard target plate	100 mm x 100 mm	●	●	●
	Transducer frequency	approx. 310 kHz	●	●	●
	Response delay	approx. 50 ms	●	●	●
	LED yellow	permanently yellow: object in the evaluation range yellow, flashing: TEACH-IN function, object detected indication of the switching state flashing: TEACH-IN function object detected		●	●
	LED red	permanently red: Error red, flashing: TEACH-IN function, object not detected	●	●	●
	Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	
		15 ... 30 V DC, ripple 10 % _{SS}			●
	No-load supply current	≤ 30 mA	●	●	●
	Output type	1 analogue output 0 ... 10 V			●
		1 analogue output 4 ... 20 mA, short-circuit/overload protected		●	
		1 switch output E5, prp NO/NC, parameterisable	●		
	Resolution	0,17 mm		●	●
	Deviation of the characteristic curve	± 1 % of full-scale value		●	●
	Repeat accuracy	≤ 1 %	●		
		± 0,5 % of full-scale value		●	●
	Rated operational current	100 mA, short-circuit/overload protected	●		
	Voltage drop	≤ 3 V	●		
	Switching frequency	≤ 8 Hz	●		
	Range hysteresis	1 % of the set operating distance	●		
	Load impedance	> 1 kOhm			●
		0 ... 300 Ohm		●	
	Temperature influence	± 1,5 % of full-scale value	●	●	●
	Input type	1 TEACH-IN input operating distance 1: -U _B ... +1 V, operating distance 2: +6 V ... +U _B input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	●		
		1 TEACH-IN input lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s		●	●
	Standards	EN 60947-5-2	●	●	●
	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●
	Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●
	Protection degree	IP65	●	●	●
	Connection	V1 connector (M12 x 1), 4-pin	●	●	●
	Housing	brass, nickel-plated	●	●	●
	Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●	●
	Mass	25 g	●	●	●
Accessories					



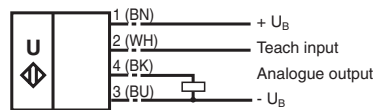
Electrical connection

Standard symbol/Connections:
(version I)



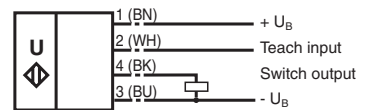
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

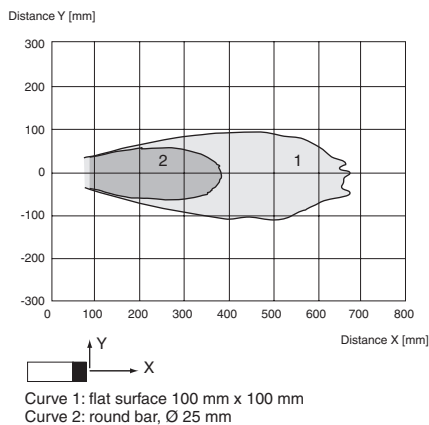
Standard symbol/Connections:
(version E5, pnp)



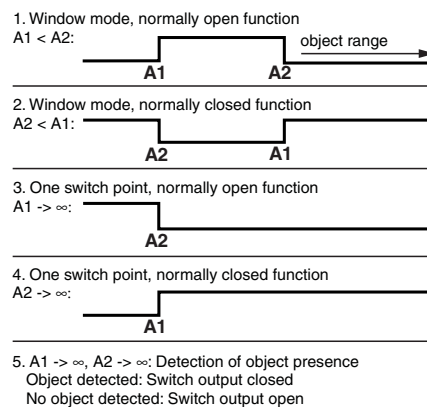
Core colours in accordance with EN 60947-5-2.

Diagrams

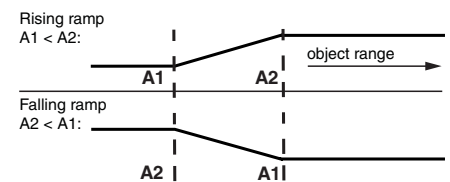
Characteristic response curve



Programmed switching output function



Programmed analogue output function



Output version E5:

Adjusting the switching points

The ultrasonic sensor features a switch output with two teachable switching points. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with $-U_B$, A2 with $+U_B$.

Five different output functions can be set

1. Window mode, normally-open function
2. Window mode, normally-closed function
3. one switching point, normally-open function
4. one switching point, normally-closed function
5. Detection of object presence

TEACH-IN window mode, normally-open function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Set target to far switching point
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN window mode, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Set target to far switching point
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-open function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN detection of objects presence

- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

Default setting of switching points

A1 = blind range, A2 = nominal distance

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN switching point:		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	On	off
Normal operation	off	Switching state
Fault	on	Previous state

Output versions -I and -U:

Adjusting the evaluation limits

The ultrasonic sensor features an analogue output with two teachable evaluation limits. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. The lower evaluation limit A1 is taught with $-U_B$, A2 with $+U_B$.

Two different output functions can be set:

1. Analogue value increases with rising distance to object (rising ramp)
2. Analogue value falls with rising distance to object (falling ramp)

TEACH-IN rising ramp (A2 > A1)

- Position object at lower evaluation limit
- TEACH-IN lower limit A1 with $-U_B$
- Position object at upper evaluation limit
- TEACH-IN upper limit A2 with $+U_B$

TEACH-IN falling ramp (A1 > A2):

- Position object at lower evaluation limit
- TEACH-IN lower limit A2 with $+U_B$
- Position object at upper evaluation limit
- TEACH-IN upper limit A1 with $-U_B$

Default setting

A1: unusable area
 A2: nominal sensing range
 Mode of operation: rising ramp

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN evaluation limit		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	on	off
Normal mode (evaluation range)	off	on
Fault	on	previous state

Series -18GK/-18GM



UBE500-18GK...



UB...-18GM40A...



UB...-18GM40...



UB...-18GM75...

Model number	Detection range	Page
UBE500-18GK-SE0-V1 UBE500-18GK-SE2-V1	500 mm	34
UBE1000-18GM40-SE2-V1	1000 mm	36
UB300-18GM40-E5-V1 UB300-18GM40-I-V1 UB300-18GM40-U-V1 UB800-18GM40-E5-V1 UB800-18GM40-I-V1 UB800-18GM40-U-V1	300 mm 800 mm	38
UB300-18GM40A-E5-V1 UB300-18GM40A-I-V1 UB300-18GM40A-U-V1 UB800-18GM40A-E5-V1 UB800-18GM40A-I-V1 UB800-18GM40A-U-V1	300 mm 800 mm	40
UB500-18GM75-E4-V15 UB500-18GM75-E5-V15 UB500-18GM75-I-V15 UB500-18GM75-U-V15	500 mm	42
UB500-18GM75-E01-V15 UB500-18GM75-E23-V15 UB500-18GM75-E6-V15 UB500-18GM75-E7-V15	500 mm	44
UB500-18GM75-F-V15 UB500-18GM75-BIT-V15 UB500-18GM75-PWM-V15	500 mm	46
UB1000-18GM75-E4-V15 UB1000-18GM75-E5-V15 UB1000-18GM75-I-V15 UB1000-18GM75-U-V15	1000 mm	48
UB1000-18GM75-E01-V15 UB1000-18GM75-E23-V15 UB1000-18GM75-E6-V15 UB1000-18GM75-E7-V15	1000 mm	50
UB1000-18GM75-F-V15 UB1000-18GM75-BIT-V15 UB1000-18GM75-PWM-V15	1000 mm	52

For detailed function description, see page 54

Subject to reasonable modifications due to technical advances.

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Through-beam ultrasonic barrier

UBE500-18GK...-V1

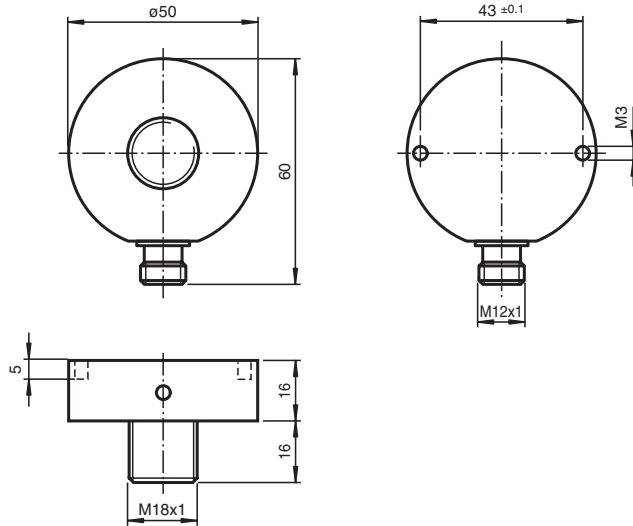


- High switching frequency
- Small, compact design
- Plastic housing
- Suited for applications for detection and counting of transparent objects (e.g. bottles and plastic-wrapping)
- Emitter and receiver included in the delivery package

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

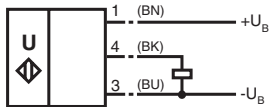
Model number		UBE500-18GK-SEB-V1	UBE500-18GK-SE2-V1
Sensing range	0 ... 500 mm , distance emitter-receiver 15 mm ... 500 mm	●	●
Transducer frequency	400 kHz	●	●
LED yellow	indication of the switching state (receiver)	●	●
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	●	●
No-load supply current	20 mA receiver 25 mA emitter	●	●
Output type	1 switch output E0, npn NO 1 switch output E2, pnp NO	●	●
Rated operational current	200 mA	●	●
Voltage drop	≤ 1,5 V	●	●
Switching frequency	100 Hz	●	●
Standards	EN 60947-5-2	●	●
Ambient temperature	0 ... 60 °C (273 ... 333 K)	●	●
Storage temperature	-40 ... 85 °C (233 ... 368 K)	●	●
Protection degree	IP65	●	●
Connection	V1 connector (M12 x 1), 4-pin	●	●
Housing	Polyamide (PA)	●	●
Mass	50 g	●	●



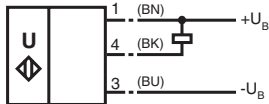
Electrical connection

Standard symbol / Connection:

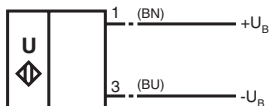
Receiver E2:



Receiver E0:



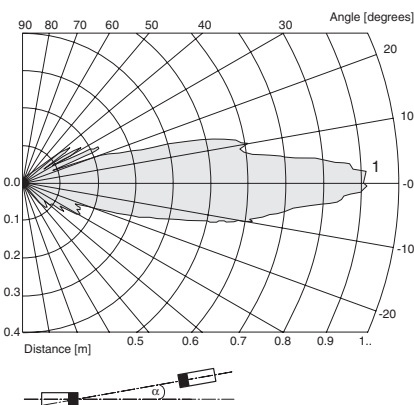
Emitter:



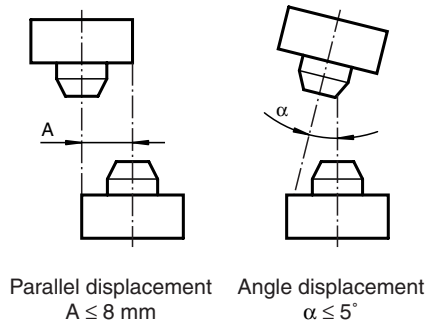
Core colours in accordance with EN 60947-5-2.

Diagrams

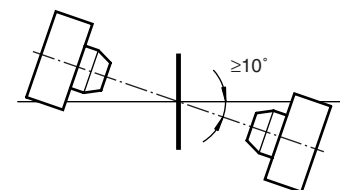
Characteristic response curves





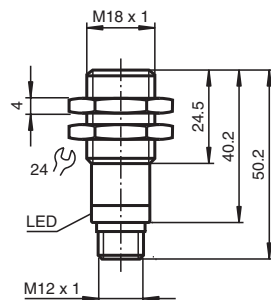
Mounting/Adjustment



Thin foil detection



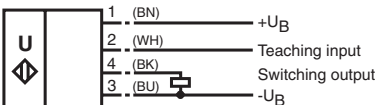
Ultrasonic sensor		UBE1000-18GM40-SE2-V1	
Series -12GM		<ul style="list-style-type: none">• Short design, 40 mm• Function indicators visible from all directions• Switch output• TEACH-IN input• Integrated alignment aid	
Series -18GM/-18GM			
Series -30GM			
Series VarKont			
Series -FP			
		Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"	
Technical Data			
Series -F12	Model number		UBE1000-18GM40-SE2-V1
Series -F42			
Series -F43	Sensing range	50 ... 1000 mm	●
	Standard target plate	100 mm x 100 mm	●
	Transducer frequency	approx. 205 kHz	●
	LED yellow	switching state	●
	LED red	error, object uncertain	●
Series -F54	LED green	Power on	●
	Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●
	No-load supply current	≤ 20 mA	●
	Output type	NO prp	●
	Rated operational current	200 mA, short-circuit/overload protected	●
Series -F64	Voltage drop	≤ 3 V	●
	Switching frequency	≤ 100 Hz	●
	Switch-on delay	< 5 ms	●
	Input type	1 TEACH-IN input operating distance 1: -U _B ... +1 V, operating distance 2: +6 V ... +U _B input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	●
	Standards	EN 60947-5-2	●
Series -D1	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●
	Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
	Protection degree	IP65	●
	Connection	V1 connector (M12 x 1), 4-pin	●
	Housing	brass, nickel-plated	●
Series LUC	Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●
	Mass	25 g	●
Double sheet monitoring			
Control units/ Power supplies			
Accessories			



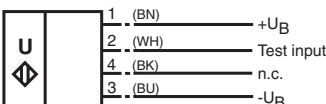
Electrical connection

Standard symbol/Connection:
(version E2, pnp)

Receiver:



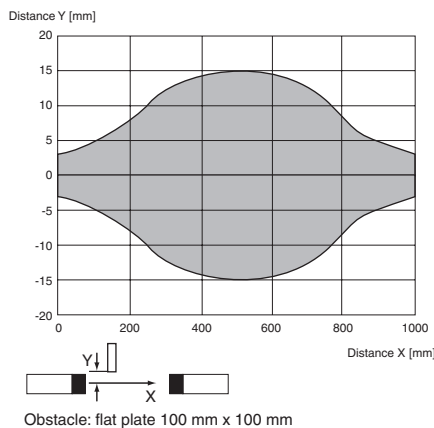
Emitter:



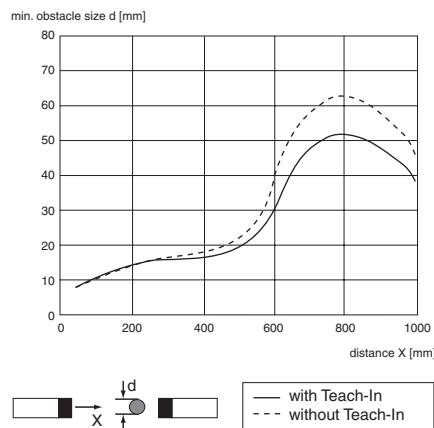
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve



Obstacle size



Date of edition: 08/18/2005

Series -123M
Series -18GM/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Ultrasonic sensor

UB...-18GM40-...-V1



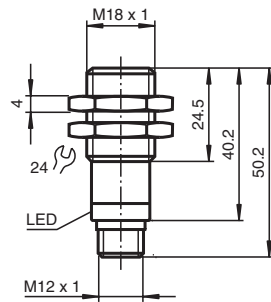
- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation
- Measuring window adjustable
UB...-18GM40-I-V1
UB...-18GM40-U-V1
- Analogue output 0 V ... 10 V
UB...-18GM40-U-V1
- Analogue output 4 mA ... 20 mA
UB...-18GM40-I-V1
- Switch output
UB...-18GM40-E5-V1
- 5 different output functions can be set
UB...-18GM40-E5-V1

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

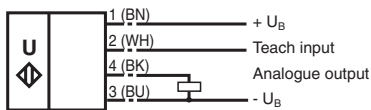
		Model number	UB300-18GM 40-E5-V1	UB300-18GM 40-I-V1	UB300-18GM 40-U-V1	UB800-18GM 40-E5-V1	UB800-18GM 40-I-V1	UB800-18GM 40-U-V1
Sensing range	30 ... 300 mm		●	●	●			
	50 ... 800 mm					●	●	●
Adjustment range	50 ... 300 mm		●	●	●			
	70 ... 800 mm					●	●	●
Unusable area	0 ... 30 mm		●	●	●			
	0 ... 50 mm					●	●	●
Standard target plate	100 mm x 100 mm		●	●	●	●	●	●
Transducer frequency	approx. 205 kHz					●	●	●
	approx. 390 kHz		●	●	●			
Response delay	approx. 100 ms					●	●	●
	approx. 30 ms		●	●	●			
LED yellow	permanently yellow: object in the evaluation range, yellow, flashing: TEACH-IN function, object detected		●	●	●			
	indication of the switching state, flashing: TEACH-IN function object detected		●	●	●	●	●	●
LED red	permanently red: Error, red, flashing: TEACH-IN function, object not detected		●	●	●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●	●	●
	15 ... 30 V DC, ripple 10 % _{SS}					●		●
No-load supply current	≤ 20 mA		●	●	●	●	●	●
Output type	1 analogue output 0 ... 10 V				●			●
	1 analogue output 4 ... 20 mA, short-circuit/overload protected			●			●	
Default setting	1 switch output E5, prp NO/NC, parameterisable		●			●		
	evaluation limit 1: 50 mm evaluation limit 2: 300 mm			●	●			
	evaluation limit 1: 70 mm evaluation limit 2: 800 mm						●	●
	Switch point A1: 50 mm Switch point A2: 300 mm		●					
	Switch point A1: 70 mm Switch point A2: 800 mm							
Resolution	0,4 mm at max. sensing range			●	●		●	●
Deviation of the characteristic curve	± 1 % of full-scale value			●	●		●	●
Repeat accuracy	≤ 1 %		●			●		
	± 0,5 % of full-scale value			●	●		●	●
Rated operational current	200 mA, short-circuit/overload protected		●			●		
Voltage drop	≤ 3 V		●			●		
Switching frequency	≤ 13 Hz		●					
	≤ 4 Hz					●		
Range hysteresis	1 % of the set operating distance		●			●		
Load impedance	> 1 kOhm				●			●
	0 ... 300 Ohm			●			●	
Temperature influence	± 1,5 % of full-scale value		●	●	●	●	●	●
Input type	1 TEACH-IN input		●			●		
	operating distance 1: -U _B ... +1 V, operating distance 2: +6 V ... +U _B							
	input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s							
	1 TEACH-IN input			●	●		●	●
	lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B							
	input impedance: > 4,7 kΩ pulse duration: ≥ 1 s							
Standards	EN 60947-5-2		●	●	●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●	●	●	●
Protection degree	IP65		●	●	●	●	●	●
Connection	V1 connector (M12 x 1), 4-pin		●	●	●	●	●	●
Housing	brass, nickel-plated		●	●	●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT		●	●	●	●	●	●
Mass	25 g		●	●	●	●	●	●

Date of edition: 08/18/2005



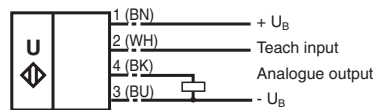
Electrical connection

Standard symbol/Connections:
(version I)



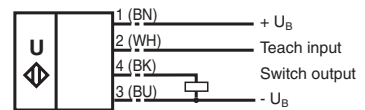
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

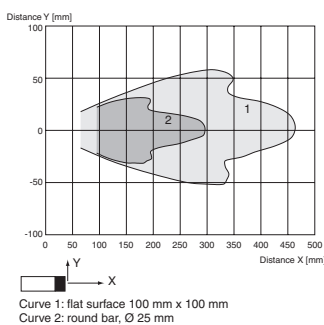
Standard symbol/Connections:
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

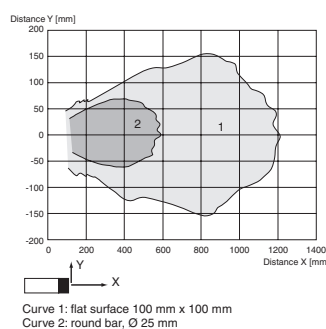
Diagrams

Characteristic response curve



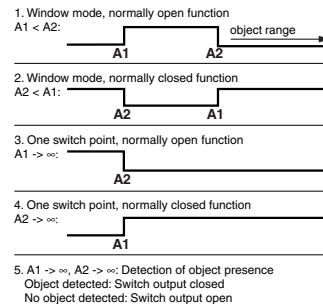
UB300-18GM40-V1

Characteristic response curve



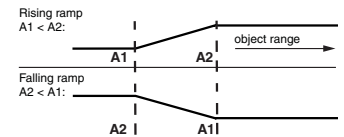
UB800-18GM40...-V1

Programmed switching output function



output version -E5

Programmed analogue output function



output versions -I and -U

Ultrasonic sensor

UB...-18GM40A-...-V1

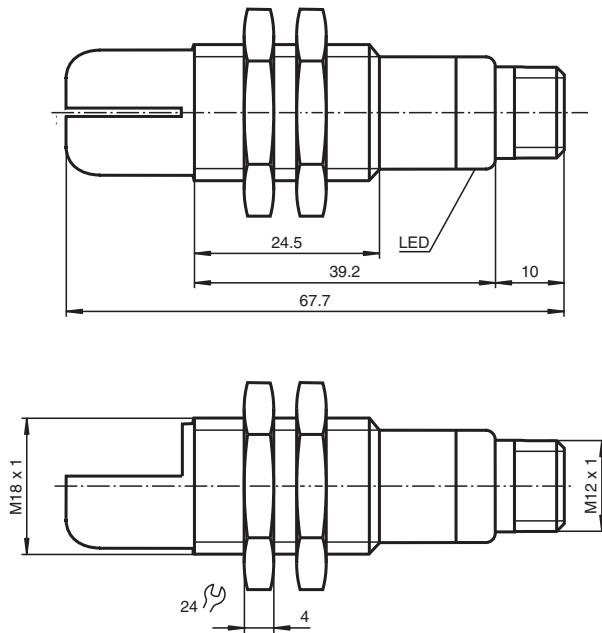


- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation
- Measuring window adjustable
UB...-18GM40A-I-V1
UB...-18GM40A-U-V1
- Analogue output 0 V ... 10 V
UB...-18GM40A-U-V1
- Analogue output 4 mA ... 20 mA
UB...-18GM40A-I-V1
- Switch output
UB...-18GM40A-E5-V1
- 5 different output functions can be set
UB...-18GM40A-E5-V1

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

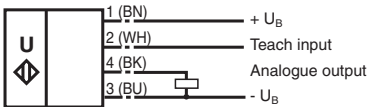
Technical Data

		Model number	UB300-18G M40A-E5-V1	UB300-18G M40A-I-V1	UB300-18G M40A-U-V1	UB800-18G M40A-E5-V1	UB800-18G M40A-I-V1	UB800-18G M40A-U-V1
Sensing range	30 ... 300 mm		●	●	●			
	50 ... 800 mm					●	●	●
Adjustment range	50 ... 300 mm		●	●	●			
	70 ... 800 mm					●	●	●
Unusable area	0 ... 30 mm		●	●	●			
	0 ... 50 mm					●	●	●
Standard target plate	100 mm x 100 mm		●	●	●	●	●	●
Transducer frequency	approx. 205 kHz		●	●	●			
	approx. 390 kHz					●	●	●
Response delay	approx. 100 ms					●	●	●
	approx. 30 ms		●	●	●			
LED yellow	permanently yellow: object in the evaluation range, yellow, flashing: TEACH-IN function, object detected		●	●	●			
	indication of the switching state, flashing: TEACH-IN function object detected		●			●		
LED red	permanently red: Error, red, flashing: TEACH-IN function, object not detected		●	●	●	●	●	●
			●	●	●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●	●	●
	15 ... 30 V DC, ripple 10 % _{SS}					●		●
No-load supply current	≤ 20 mA		●	●	●	●	●	●
Output type	1 analogue output 0 ... 10 V				●			●
	1 analogue output 4 ... 20 mA, short-circuit/overload protected			●			●	
Default setting	1 switch output E5, prp NO/NC, parameterisable		●			●		
	evaluation limit 1: 50 mm evaluation limit 2: 300 mm			●	●			
	evaluation limit 1: 70 mm evaluation limit 2: 800 mm						●	●
	Switch point A1: 50 mm Switch point A2: 300 mm		●					
	Switch point A1: 70 mm Switch point A2: 800 mm					●		
Resolution	0,4 mm at max. sensing range			●	●		●	●
Deviation of the characteristic curve	± 1 % of full-scale value			●	●		●	●
Repeat accuracy	≤ 1 %		●			●		
	± 0,5 % of full-scale value			●	●		●	●
Rated operational current	200 mA, short-circuit/overload protected		●			●		
Voltage drop	≤ 3 V		●			●		
Switching frequency	≤ 13 Hz		●					
	≤ 4 Hz					●		
Range hysteresis	1 % of the set operating distance		●			●		
Load impedance	> 1 kOhm				●			●
	0 ... 300 Ohm			●			●	
Temperature influence	± 1,5 % of full-scale value		●	●	●	●	●	●
Input type	1 TEACH-IN input		●			●		
	operating distance 1: -U _B ... +1 V, operating distance 2: +6 V ... +U _B							
	input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s							
	1 TEACH-IN input			●	●		●	●
	lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B							
	input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s							
Standards	EN 60947-5-2		●	●	●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●	●	●	●
Protection degree	IP65		●	●	●	●	●	●
Connection	V1 connector (M12 x 1), 4-pin		●	●	●	●	●	●
Housing	brass, nickel-plated		●	●	●	●	●	●
Transducer	epoxy resin/hollow glass/sphere mixture; foam polyurethane, cover PBT		●	●	●	●	●	●
Mass	25 g		●	●	●	●	●	●



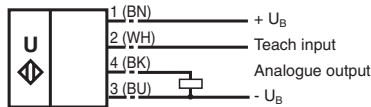
Electrical connection

Standard symbol/Connections:
(version I)



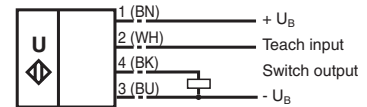
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

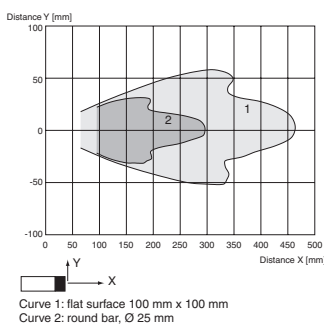
Standard symbol/Connections:
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

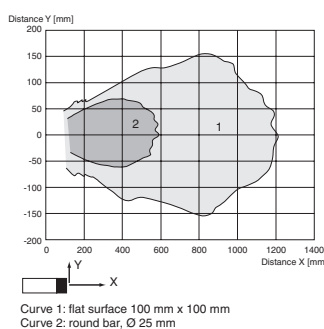
Diagrams

Characteristic response curve



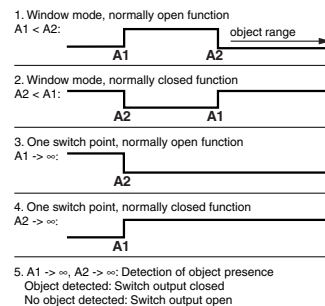
UB300-18GM40A-V1

Characteristic response curve



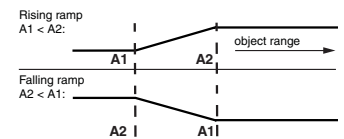
UB800-18GM40A...-V1

Programmed switching output function



output version -E5

Programmed analogue output function



output versions -I and -U

Ultrasonic sensor

UB500-18GM75-...-V15

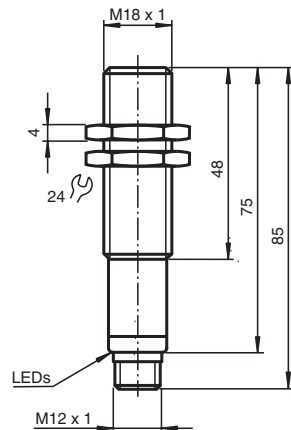


- Selectable sound lobe width
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Very small unusable area
- Switch output
5 different output functions can be set
- Analogue output 0 V ... 10 V
Analogue output 4 mA ... 20 mA
Measuring window adjustable

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

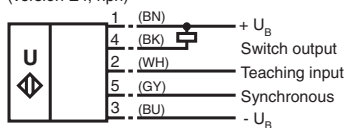
Technical Data

		Model number	UB500-18GM75-E4-V15	UB500-18GM75-E5-V15	UB500-18GM75-L-V15	UB500-18GM75-U-V15
Sensing range	30 ... 500 mm		●	●	●	●
Adjustment range	50 ... 500 mm		●	●	●	●
Unusable area	0 ... 30 mm		●	●	●	●
Standard target plate	100 mm x 100 mm		●	●	●	●
Transducer frequency	approx. 380 kHz		●	●	●	●
Response delay	approx. 50 ms		●	●	●	●
LED yellow	permanently yellow: object in the evaluation range, yellow, flashing: TEACH-IN function, object detected indication of the switching state, flashing: TEACH-IN function object detected		●	●	●	●
LED red	permanently red: Error, red, flashing: TEACH-IN function, object not detected "Error", object uncertain, in TEACH-IN function: No object detected		●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS} 15 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●
No-load supply current	≤ 45 mA ≤ 50 mA		●	●	●	●
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, prp NO/NC, parameterisable		●	●	●	●
Resolution	0,11 mm at max. sensing range 0,13 mm for max. detection range				●	●
Deviation of the characteristic curve	± 1 % of full-scale value		●	●	●	●
Repeat accuracy	≤ 1 %		●	●	●	●
Rated operational current	± 0,1 % of full-scale value		●	●	●	●
Voltage drop	200 mA, short-circuit/overload protected		●	●		
Switching frequency	≤ 3 V		●	●		
Range hysteresis	max. 8 Hz		●	●		
Load impedance	1 % of the set operating distance		●	●		
Temperature influence	> 1 kOhm				●	●
Input type	0 ... 300 Ohm		●	●	●	●
Synchronisation	± 1,5 % of full-scale value		●	●	●	●
Common mode operation	1 TEACH-IN input, operating range 1: -U _B ... +1 V, operating range 2: +4 V ... +U _B input impedance: > 4,7 kΩ; TEACH-IN pulse: ≥ 1 s		●	●		
Multiplex operation	1 TEACH-IN input lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s				●	●
Standards	1 synchronous connection, bi-directional 0-level: -U _B ... +1 V, 1-level: +4 V ... +U _B , input impedance: > 12 kΩ synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms		●	●	●	●
Ambient temperature	≤ 95 Hz		●	●	●	●
Storage temperature	≤ 95/n Hz, n = number of sensors		●	●	●	●
Protection degree	EN 60947-5-2		●	●	●	●
Connection	-25 ... 70 °C (248 ... 343 K)		●	●	●	●
Housing	-40 ... 85 °C (233 ... 358 K)		●	●	●	●
Transducer	IP65		●	●	●	●
Mass	connector V15 (M12 x 1), 5 pin		●	●	●	●
	brass, nickel-plated		●	●	●	●
	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT		●	●	●	●
	60 g		●	●	●	●



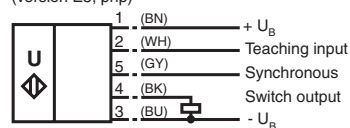
Electrical connection

Standard symbol/Connections:
(version E4, npn)



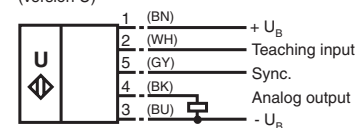
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E5, pnp)



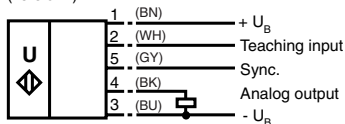
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

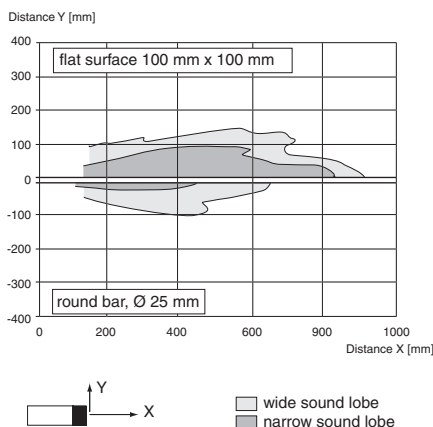
Standard symbol/Connections:
(version I)



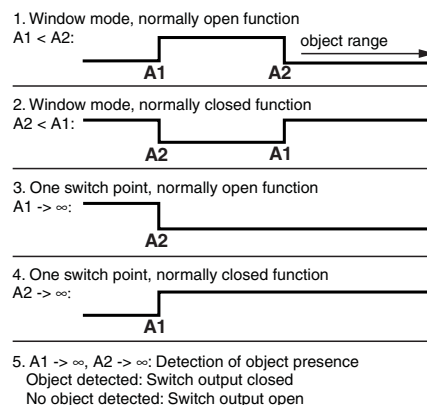
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve

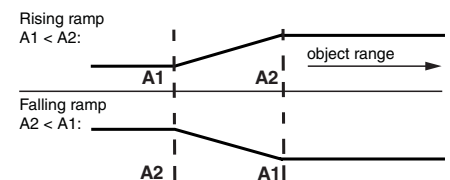


Programmed switching output function



output versions -E4 and -E5

Programmed analogue output function



output versions -I and -U

Ultrasonic sensor

UB500-18GM75-...-V15



- 2 switch outputs
- Selectable sound lobe width
- TEACH-IN input
- Temperature compensation
- Very small unusable area
- 3 different output functions can be set
UB500-18GM75-E7-V15
UB500-18GM75-E6-V15



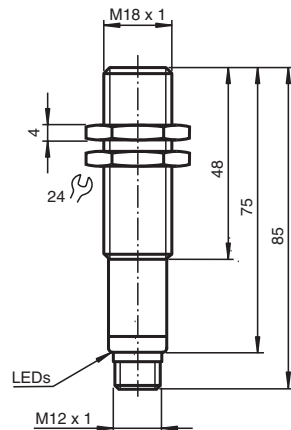
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

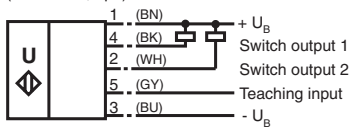
UB500-18GM75-E01-V15
UB500-18GM75-E23-V15
UB500-18GM75-E7-V15
UB500-18GM75-E6-V15

Sensing range	30 ... 500 mm
Adjustment range	50 ... 500 mm
Unusable area	0 ... 30 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Response delay	approx. 50 ms
LED yellow	indication of the switching state flashing: TEACH-IN function object detected
LED red	"Error", object uncertain in TEACH-IN function: No object detected
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 50 mA
Output type	2 switch outputs npn, NO/NC, parameterisable 2 switch outputs prp, NO/NC, parameterisable
Repeat accuracy	≤ 1 %
Rated operational current	2 x 100 mA, short-circuit/overload protected
Voltage drop	≤ 3 V
Switching frequency	max. 8 Hz
Range hysteresis	1 % of the set operating distance
Temperature influence	± 1,5 % of full-scale value
Input type	1 TEACH-IN input, operating range 1: -U _B ... +1 V, operating range 2: +4 V ... +U _B input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Protection degree	IP65
Connection	connector V15 (M12 x 1), 5 pin
Housing	brass, nickelplated
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT
Mass	60 g



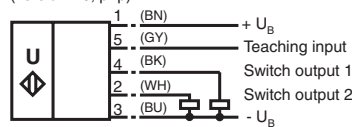
Electrical connection

Standard symbol/Connections:
(version E7, npn)



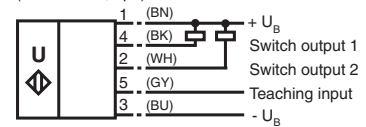
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E6, npn)



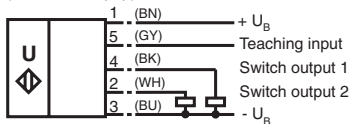
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E01, npn)



Core colours in accordance with EN 60947-5-2.

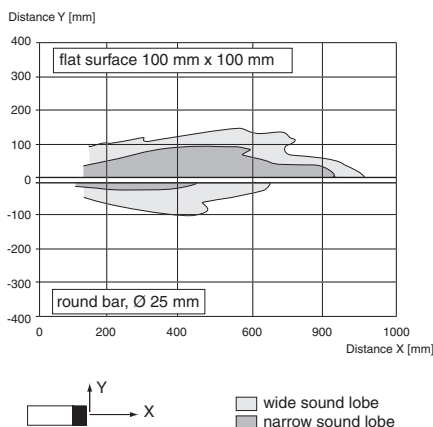
Standard symbol/Connections:
(version E23, npn)



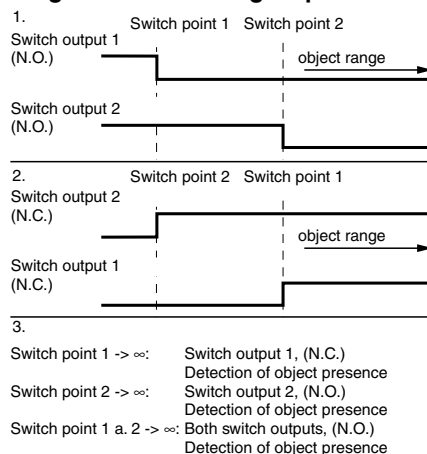
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve

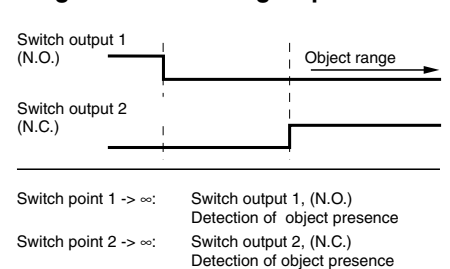


Programmed switching output function

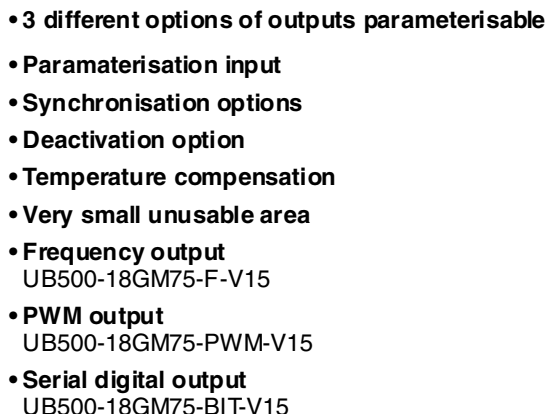


output versions -E6 and -E7

Programmed switching output function



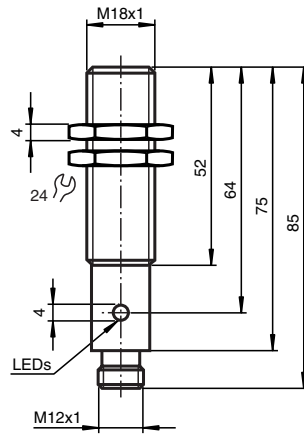
output versions -E01 and -E23



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

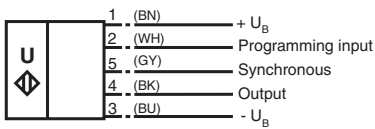
Model number

Date of edition: 08/18/2005



Electrical connection

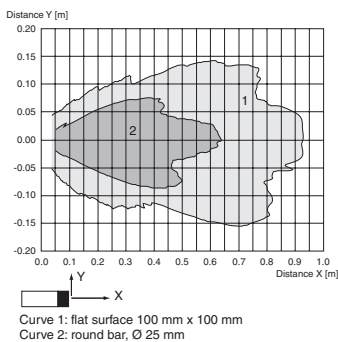
Standard symbol/Connections:



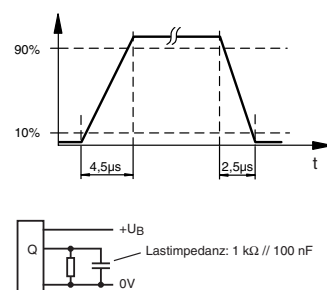
Core colours in accordance with EN 60947-5-2.

Diagrams

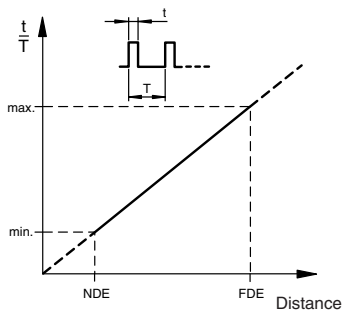
Characteristic response curve



Anstiegs-/Abfallzeit des Ausgangssignals

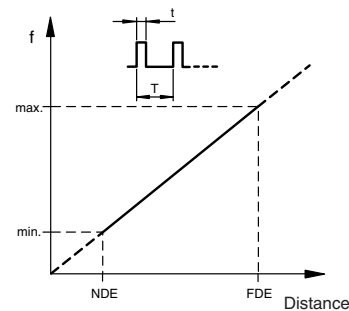


Output characteristic



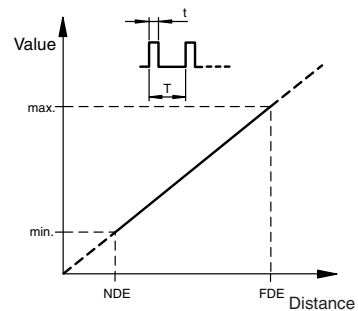
output version -PWM

Output characteristic



output version -F

Output characteristic



output version -BIT

Ultrasonic sensor

UB1000-18GM75-...-V15



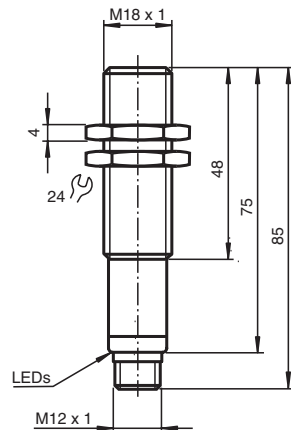
- Selectable sound lobe width
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Very small unusable area
- Switch output
5 different output functions can be set
- Analogue output 0 V ... 10 V
Analogue output 4 mA ... 20 mA
Measuring window adjustable



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

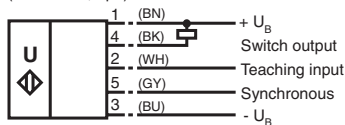
Technical Data

		Model number	UB100 0-1 8GM7 5-E4-V15	UB100 0-1 8GM7 5-E5-V15	UB100 0-1 8GM7 5-I-V1 5	UB100 0-1 8GM7 5-U-V15
Sensing range	70 ... 1000 mm		●	●	●	●
	Adjustment range	90 ... 1000 mm	●	●	●	●
	Unusable area	0 ... 70 mm	●	●	●	●
Standard target plate	0 ... 90 mm				●	
	100 mm x 100 mm		●	●	●	●
	Transducer frequency	approx. 205 kHz	●	●	●	●
Response delay	approx. 125 ms		●	●	●	●
	LED yellow	permanently yellow: object in the evaluation range, yellow, flashing: TEACH-IN function, object detected			●	●
	indication of the switching state, flashing: TEACH-IN function object detected		●	●		
LED red	permanently red: Error, red, flashing: TEACH-IN function, object not detected		●	●	●	●
	Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●	
	15 ... 30 V DC, ripple 10 % _{SS}					●
No-load supply current	≤ 45 mA				●	
	≤ 50 mA		●	●		
	Output type	1 analogue output 0 ... 10 V			●	●
	1 analogue output 4 ... 20 mA				●	
	1 switch output E4, npn NO/NC, parameterisable		●			
	1 switch output E5, pnp NO/NC, parameterisable			●		
Resolution	0,35 mm				●	●
	Deviation of the characteristic curve	± 1 % of full-scale value			●	●
	Repeat accuracy	≤ 1 %	●	●		
Rated operational current	± 0,1 % of full-scale value				●	●
	200 mA, short-circuit/overload protected		●	●		
	Voltage drop	≤ 3 V	●	●		
Switching frequency	max. 3 Hz		●	●		
	Range hysteresis	1 % of the set operating distance	●	●		
	Load impedance	> 1 kOhm				●
Temperature influence	0 ... 300 Ohm				●	
	± 1,5 % of full-scale value		●	●	●	●
	Input type	1 TEACH-IN input, operating range 1: -U _B ... +1 V, operating range 2: +4 V ... +U _B	●	●		
input impedance: > 4,7 kΩ; TEACH-IN pulse: ≥ 1 s						
	1 TEACH-IN input				●	●
lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B						
	input impedance: > 4,7 kΩ; pulse duration: ≥ 1 s					
	Synchronisation	bi-directional	●	●	●	●
0 level -U _B ... +1 V, 1 level: +4 V ... +U _B , input impedance: > 12 kOhm						
	synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms					
	Common mode operation	≤ 40 Hz	●	●	●	●
Multiplex operation	≤ 40/n		●	●	●	●
	Standards	EN 60947-5-2	●	●	●	●
	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●	●
	Protection degree	IP65	●	●	●	●
	Connection	connector V15 (M12 x 1), 5 pin	●	●	●	●
Material						
	Housing	brass, nickel-plated	●	●	●	●
	Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●	●	●
Mass			●	●	●	●
	60 g					



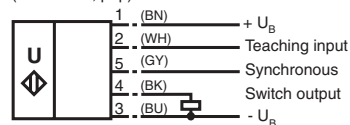
Electrical connection

Standard symbol/Connections:
(version E4, npn)



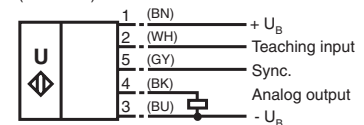
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E5, pnp)



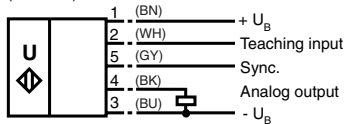
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

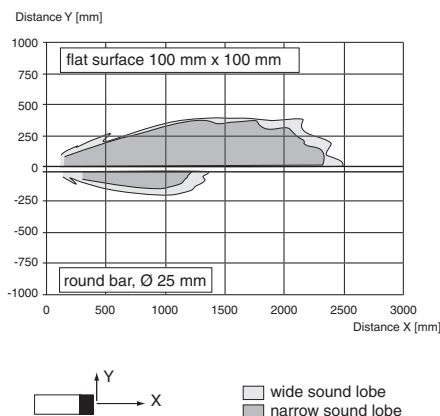
Standard symbol/Connections:
(version I)



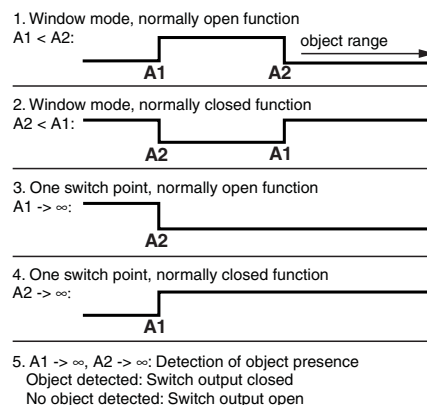
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve

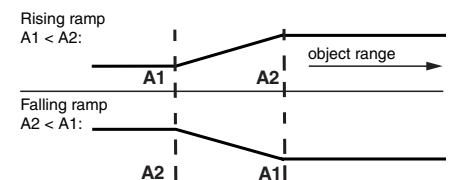


Programmed switching output function



output versions -E4 and -E5

Programmed analogue output function



output versions -I and -U

Series
-123M

Series
-18GM/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F44

Series
-F54

Series
-F64

Series
-D1

Series
LUC

Series
LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Ultrasonic sensor

UB1000-18GM75-...-V15



- 2 switch outputs
 - Selectable sound lobe width
 - TEACH-IN input
 - Temperature compensation
 - Very small unusable area
 - 3 different output functions can be set
- UB1000-18GM75-E6-V15
UB1000-18GM75-E7-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

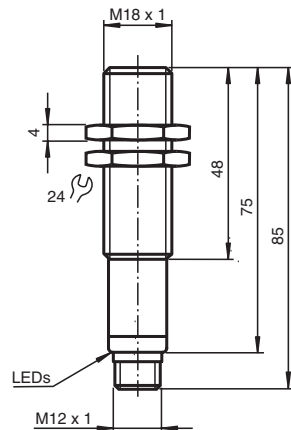
UB100 0-1 8GM7 5-E01-V15

UB100 0-1 8GM7 5-E23-V15

UB100 0-1 8GM7 5-E6-V15

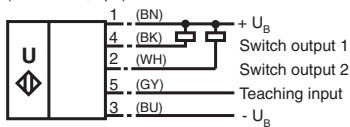
UB100 0-1 8GM7 5-E7-V15

Sensing range	70 ... 1000 mm	●	●	●	●
Adjustment range	90 ... 1000 mm	●	●	●	●
Unusable area	0 ... 70 mm	●	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●	●
Transducer frequency	approx. 205 kHz	●	●	●	●
Response delay	approx. 125 ms	●	●	●	●
LED yellow	indication of the switching state flashing: TEACH-IN function object detected	●	●	●	●
LED red	"Error", object uncertain in TEACH-IN function: No object detected	●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●	●
No-load supply current	≤ 50 mA	●	●	●	●
Output type	2 switch outputs npn, normally open/closed	●			
	2 switch outputs npn, normally open/dose selectable				●
	2 switch outputs prp, NO/NC		●		
	2 switch outputs prp, normally open/dose selectable			●	
Repeat accuracy	≤ 1 %	●	●	●	●
Rated operational current	2 x 100 mA, short-circuit/overload protected	●	●	●	●
Voltage drop	≤ 3 V	●	●	●	●
Switching frequency	max. 3 Hz	●	●	●	●
Range hysteresis	1 % of the set operating distance	●	●	●	●
Temperature influence	± 1,5 % of full-scale value	●	●	●	●
Input type	1 TEACH-IN input, operating range 1: - U _B ... +1 V, operating range 2: +4 V ... +U _B input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	●	●	●	●
Standards	EN 60947-5-2	●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●
Protection degree	IP65	●	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●	●
Material		●	●	●	●
Housing	brass, nickel-plated	●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●	●	●
Mass	60 g	●	●	●	●



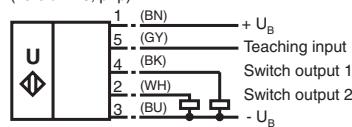
Electrical connection

Standard symbol/Connections:
(version E7, npn)



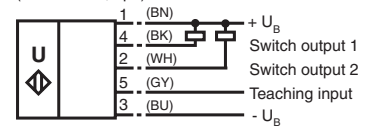
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E6, npn)



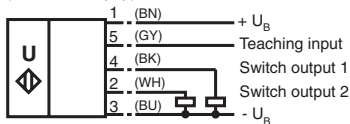
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E01, npn)



Core colours in accordance with EN 60947-5-2.

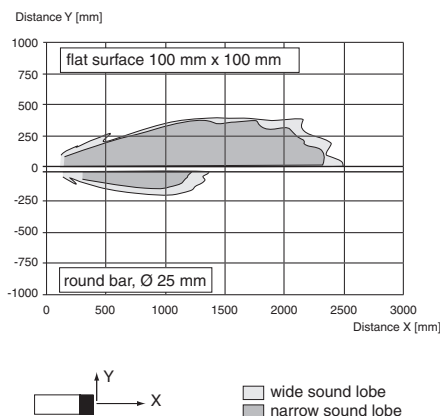
Standard symbol/Connections:
(version E23, npn)



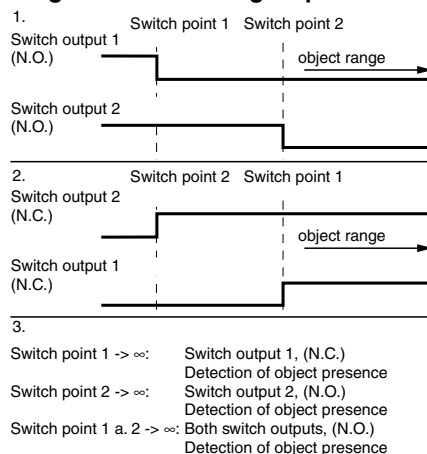
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve

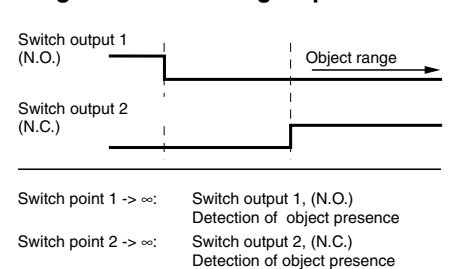


Programmed switching output function



output versions -E6 and -E7

Programmed switching output function



output versions -E01 and -E23

Series
-123M

Series
-18GM/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F54

Series
-F64

Series
-D1

Series
-LUC

Series
-D1

Series
-LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Ultrasonic sensor

UB1000-18GM75-...-V15

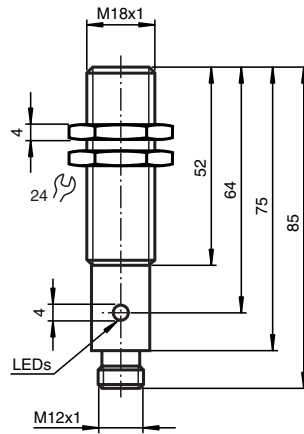


- 3 different options of outputs parameterisable
- Paramaterisation input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Frequency output
UB1000-18GM75-F-V15
- PWM output
UB1000-18GM75-PWM-V15
- Serial digital output
UB1000-18GM75-BIT-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

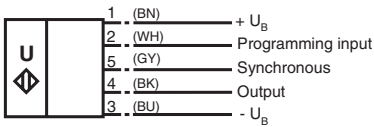
Technical Data

	Model number	UB1000-18GM75-F-V15	UB1000-18GM75-BIT-V15	UB1000-18GM75-PWM-V15
Sensing range	80 ... 1000 mm	●	●	●
Unusable area	0 ... 80 mm	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●
Transducer frequency	approx. 205 kHz	●	●	●
Response delay	approx. 150 ms	●	●	●
LED red	flashing: error(permanent: no object detected)	●	●	●
LED green	Power on	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●
No-load supply current	≤ 50 mA	●	●	●
Output type	1 frequency output, push/pull, parameterisable	●		
	1 PWM output, push/pull, parameterisable			●
	1 serial output, push/pull, parameterisable		●	
Resolution	1 mm	●	●	●
Deviation of the characteristic curve	± 1 % of full-scale value	●	●	●
Repeat accuracy	± 0,5 % of full-scale value	●	●	●
Load impedance	> 1000 Ohm < 100 nF	●	●	●
Temperature influence	± 1,5 % of full-scale value	●	●	●
Input type	1 Parameterisation input Input impedance: > 4,7 kΩ	●	●	●
Synchronisation	bi-directional 0 level: -U _B ...+1 V 1 level: +4 V...+U _B input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	●	●	●
Common mode operation	≤ 30 Hz	●	●	●
Multiplex operation	≤ 30/n Hz, n = number of sensors	●	●	●
Standards	EN 60947-5-2	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 368 K)	●	●	●
Protection degree	IP65	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●
Material				
Housing	brass, nickel-plated	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●	●
Mass	60 g	●	●	●



Electrical connection

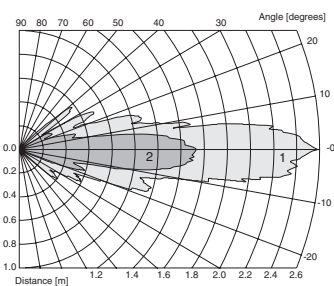
Standard symbol/Connections:



Core colours in accordance with EN 60947-5-2.

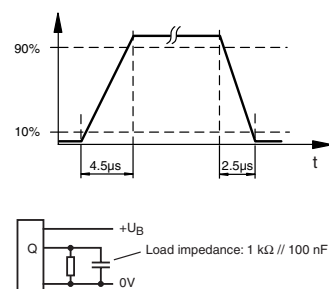
Diagrams

Characteristic response curves

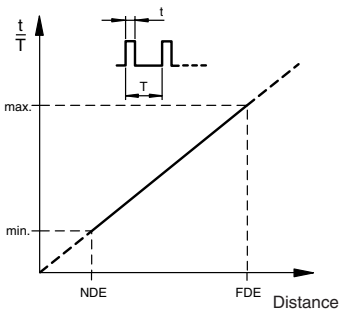


Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Rise-/fall time of output signal

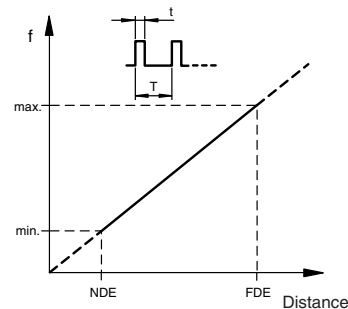


Output characteristic



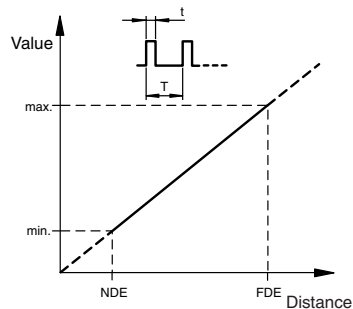
output version -PWM

Output characteristic



output version -F

Output characteristic



output version BIT

UBE500-18GK-SE0-V1 and UBE500-18GK-SE0-V1**Function**

A through-beam ultrasonic barrier always consists of a single emitter and a single receiver. The function of a through-beam ultrasonic barrier is based in the interruption of the sound transmission to the receiver by the object to be detected.

The emitter sends an ultrasonic signal that is evaluated by the receiver. If the signal is interrupted or muted by the object to be detected, the receiver switches.

No electrical connections are required between the emitter and receiver.

The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the emitter below in the case of vertical installations to prevent the accumulation of dust particles.

Installation tolerances

The installation tolerances of the central axes of the emitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

For the detection of thin foils (< 0.1 mm), install the through-beam ultrasonic barrier at an angle of $\geq 10^\circ$ from perpendicular to the foil.

Caution

Mount or replace emitter and receiver only in pairs. Both devices are optimally matched to each other by the manufacturer.

UBE1000-18GM40-SE2-V1**Function**

A through-beam ultrasonic barrier always consists of a single emitter and a single receiver. The function of a through-beam ultrasonic barrier is based in the interruption of the sound transmission to the receiver by the object to be detected.

The emitter sends an ultrasonic signal that is evaluated by the receiver. If the signal is interrupted or muted by the object to be detected, the receiver switches.

No electrical connections are required between the emitter and receiver.

The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the emitter below in the case of vertical installations to prevent the accumulation of dust particles.

Startup and parameterising

For easy alignment of emitter and receiver towards each other, the receiver is equipped with an alignment aid. To activate the alignment aid, the TEACH-Input of the receiver (pin 2) has to be connected to ground ($-U_B$). The flashing frequency of the yellow LED indicates the strength of the received ultrasonic signal. The better the alignment, the stronger the signal.

LED yellow, flashing frequency	Description
slowly (appr. 1.5 Hz)	no signal
medium (appr. 3 Hz)	weak signal
fast (appr. 9 Hz)	strong signal

Simultaneously the ultrasonic barrier evaluates the signal strength of the unobstructed signal path and generates the optimal switching threshold. When disconnecting the TEACH-input from $-U_B$, this threshold is stored non-volatile in the receivers memory. In case of clear ultrasonic path (no object), all LEDs are off.

TEACH-In of very small objects/obstacles

Like shown in the curve "obstacle size", the ultrasonic barrier offers the possibility to detect very small objects at a distance of more than 300 mm.

- place the object to be detected in the desired distance inside the ultrasonic path
- connect TEACH-input of the receiver to $+U_B$ (yellow LED flashes slowly)
- disconnect TEACH-input

In case of successful TEACH-IN (object is detected reliable), the yellow LED is on and the taught detection threshold is stored non-volatile to the receivers memory.

In case of unsuccessful TEACH-IN (object too small or too porous for ultrasonic sound), the red LED flashes 5 times and the ultrasonic barrier continues normal operation with unmodified detection threshold value.

Test function

For test purpose, the ultrasonic emitter is equipped with a test input. In normal operation mode (test input not connected or connected to $-U_B$), the green LED of the emitter is on. If the test input is connected to $+U_B$, the ultrasonic emitter gets deactivated and its LED changes into red. Simultaneously the receiver switches and its yellow LED goes on.

UB...-18GM40(A)-... , output type -E5 (1 switch output)**Adjusting the switching points**

The ultrasonic sensor features a switch output with two teachable switching points. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with $-U_B$, A2 with $+U_B$.

Five different output functions can be set

1. Window mode, normally-open function
2. Window mode, normally-closed function
3. one switching point, normally-open function
4. one switching point, normally-closed function
5. Detection of object presence

TEACH-IN window mode, normally-open function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Set target to far switching point
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN window mode, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Set target to far switching point
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-open function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN detection of objects presence

- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

Default setting of switching points

A1 = blind range, A2 = nominal distance

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN switching point:		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	On	off
Normal operation	off	Switching state
Fault	on	Previous state

UB...-18GM40(A)-... , output types -I and -U (analogue output)**Adjusting the evaluation limits**

The ultrasonic sensor features an analogue output with two teachable evaluation limits. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. The lower evaluation limit A1 is taught with $-U_B$, A2 with $+U_B$.

Two different output functions can be set:

1. Analogue value increases with rising distance to object (rising ramp)
2. Analogue value falls with rising distance to object (falling ramp)

TEACH-IN rising ramp (A2 > A1)

- Position object at lower evaluation limit

Series -18GK/-18GM

Sensor function description

- TEACH-IN lower limit A1 with - U_B
- Position object at upper evaluation limit
- TEACH-IN upper limit A2 with + U_B

TEACH-IN falling ramp (A1 > A2):

- Position object at lower evaluation limit
- TEACH-IN lower limit A2 with + U_B
- Position object at upper evaluation limit
- TEACH-IN upper limit A1 with - U_B

Default setting

A1: unusable area
A2: nominal sensing range
Mode of operation: rising ramp

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN evaluation limit		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	on	off
Normal mode (evaluation range)	off	on
Fault	on	previous state

All UB...-18GM75-... types

Installation conditions

If the sensor is installed at places, where the environment temperature can fall below 0 °C, for the sensors fixation, one of the mounting flanges BF18, BF18-F or BF 5-30 must be used.
In case of direct mounting of the sensor in a through hole using the steel nuts, it has to be fixed at the middle of the housing thread. If a fixation at the front end of the threaded housing is required, plastic nuts with centering ring (accessories) must be used.

UB...-18GM75-..., output types -E4 and -E5 (1 switch output)

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be realised as follows:
External synchronisation

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available

1. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
2. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

Internal synchronisation

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors will operate in multiplex mode. The response delay increases according to the number of sensors to be synchronised. Synchronisation cannot be performed during TEACH-IN and vice versa. The sensors must be operated in an unsynchronised manner to teach the switching point.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

Adjusting the switching points

The ultrasonic sensor features a switch output with two teachable switching points. These are set by applying the supply voltage -U_B or +U_B to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with -U_B, A2 with +U_B.

Five different output functions can be set

1. Window mode, normally-open function
2. Window mode, normally-closed function
3. One switch point, normally-open function
4. One switch point, normally-closed function
5. Detection of object presence

TEACH-IN window mode, normally-open function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Set target to far switching point
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN window mode, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Set target to far switching point
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-open function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN switching point, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN detection of object presence

- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

Default setting of switching points

A1 = unusable area

A2 = nominal sensing range

LED Displays

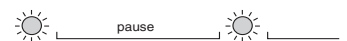
Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN switching point:		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	on	off
Normal operation	off	switching state
Fault	on	previous state

Adjusting the sound cone characteristics:

The ultrasonic sensor enables two different shapes of the sound cone, a wide angle sound cone and a small angle sound cone.

1. Small angle sound cone

- switch off the power supply
- connect the Teach-input wire to $-U_B$
- switch on the power supply
- the red LED flashes once with a pause before the next.
- yellow LED: permanently on: indicates the presence of an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $-U_B$ and the changing is saved

**2. Wide angle sound cone**

- switch off the power supply
- connect the Teach-input wire with $+U_B$
- switch on the power supply
- the red LED double-flashes with a long pause before the next.
- yellow LED: permanently on: indicates an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $+U_B$ and the changing is saved

**UB...-18GM75-..., output types -E01 and -E23 (2 switch outputs)**

Adjusting the switching points

The ultrasonic sensor features two switch outputs with one teachable switching point. The switching points are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with $-U_B$, A2 with $+U_B$.

TEACH-IN switching point for switch output 1

- Set target of desired switching point for switch output 1
- TEACH-IN switching point for switch output 1 with $-U_B$

TEACH-IN switching point for switch output 2

- Set target of desired switching point for switch output 2
- TEACH-IN switching point for switch output 2 with $+U_B$

TEACH-IN detection of object presence

- Cover the sensor with your hand, or remove all objects from the sensing range
- TEACH-IN switching point for switch output 1 with $-U_B$
- TEACH-IN switching point for switch output 2 with $+U_B$

Comments

Only one switch output can be configured for detection of presence of objects. If the sensor detects an objects within the maximum detection range, the switch output switches.

Default setting of switching points

Switch output 1: unusable area

Switch output 2: nominal sensing range

LED Displays

Displays in dependence on operating mode	Red LED	LED 1 yellow	LED 2 yellow
TEACH-IN switching point 1			
Object detected	off	flashes	off
No object detected	flashes	off	off
Object uncertain (TEACH-IN invalid)	on	off	off
TEACH-IN switching point 2:			
Object detected	off	off	flashes
No object detected	flashes	off	off
Object uncertain (TEACH-IN invalid)	on	off	off
Normal operation	off	switch state 1	switch state 2
Fault	on	previous state	previous state

Adjusting the sound cone characteristics:

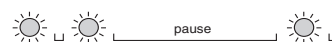
The ultrasonic sensor enables two different shapes of the sound cone, a wide angle sound cone and a small angle sound cone.

1. Small angle sound cone

- switch off the power supply
- connect the Teach-input wire to $-U_B$
- switch on the power supply
- the red LED flashes once with a pause before the next.
- yellow LED: permanently on: indicates the presence of an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $-U_B$ and the changing is saved

**2. Wide angle sound cone**

- switch off the power supply
- connect the Teach-input wire with $+U_B$
- switch on the power supply
- the red LED double-flashes with a long pause before the next.
- yellow LED: permanently on: indicates an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $+U_B$ and the changing is saved



UB...-18GM75-..., output types -E6 and -E7 (2 switch outputs)**Adjusting the switching points**

The ultrasonic sensor features two switch outputs with one teachable switching point. The switching points are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input.

The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with $-U_B$, A2 with $+U_B$.

Three different output functions can be set:

1. normally-open function
2. normally-closed function
3. Detection of object presence

TEACH-IN normally-open function

Switching point for switch output 1 < switching point for switch output 2

- Set target of desired switching point for switch output 1
- TEACH-IN switching point for switch output 1 with $-U_B$
- Set target of desired switching point for switch output 2
- TEACH-IN switching point for switch output 2 with $+U_B$

Comments: The order doesn't make any difference. If you want, you can set only one switching point.

TEACH-IN normally-closed function

Switching point for switch output 2 < switching point for switch output 1

- Set target of desired switching point for switch output 1
- TEACH-IN switching point for switch output 1 with $-U_B$
- Set target of desired switching point for switch output 2
- TEACH-IN switching point for switch output 2 with $+U_B$

Comments: The order doesn't make any difference. If you want, you can set only one switching point. If both switching points are equal, the sensor works in close function.

TEACH-IN detection of object presence

- Cover the sensor with the palm, or remove all objects from the detection range of the sensor
- TEACH-IN switching point for switch output 1 with $-U_B$
- TEACH-IN switching point for switch output 2 with $+U_B$

Comments

Only one switch output can be configured for detection of presence of objects. If the sensor detects an object within the maximum detection range, the switch output switches.

Default setting of switching points

Switch output 1: unusable area

Switch output 2: nominal sensing range

LED Displays



Displays in dependence on operating mode	Red LED	LED 1 yellow	LED 2 yellow
TEACH-IN switching point 1			
Object detected	off	flashes	off
No object detected	flashes	off	off
Object uncertain (TEACH-IN invalid)	on	off	off
TEACH-IN switching point 2:			
Object detected	off	off	flashes
No object detected	flashes	off	off
Object uncertain (TEACH-IN invalid)	on	off	off
Normal operation	off	switch state 1	switch state 2
Fault	on	previous state	previous state

Adjusting the sound cone characteristics:

The ultrasonic sensor enables two different shapes of the sound cone, a wide angle sound cone and a small angle sound cone.

1. Small angle sound cone

- switch off the power supply
- connect the Teach-input wire to $-U_B$
- switch on the power supply

Series -12GM	Series -18GK/-18GM	Sensor function description
Series -18GK/-18GM	<ul style="list-style-type: none"> - the red LED flashes once with a pause before the next. - yellow LED: permanently on: indicates the presence of an object or disturbing object within the sensing range - disconnect the Teach-input wire from $-U_B$ and the changing is saved 	
Series -30GM	2. Wide angle sound cone <ul style="list-style-type: none"> • switch off the power supply • connect the Teach-input wire with $+U_B$ • switch on the power supply 	
Series VarKont	<ul style="list-style-type: none"> • the red LED double-flashes with a long pause before the next. • yellow LED: permanently on: indicates an object or disturbing object within the sensing range • disconnect the Teach-input wire from $+U_B$ and the changing is saved 	
Series -FP	UB...-18GM75-..., output types -I and -U (analogue output)	
Series -F12	Synchronisation The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be realised as follows:	
Series -F42	External synchronisation The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level at the synchronisation input disables the sensor. Two operating modes are available: <ol style="list-style-type: none"> 1. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised. 2. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode. 	
Series -F43	Internal synchronisation The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors will operate in multiplex mode.	
Series -F54	The response delay increases according to the number of sensors to be synchronised. Synchronisation cannot be performed during TEACH-IN and vice versa. The sensors must be operated in an unsynchronised manner to teach the evaluation limits.	
Series -F64	Note: If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).	
Series -D1	Adjusting the evaluation limits The ultrasonic sensor features an analogue output with two teachable evaluation limits. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. The lower evaluation limit A1 is taught with $-U_B$, A2 with $+U_B$. Two different output functions can be set: <ol style="list-style-type: none"> 1. Analogue value increases with rising distance to object (rising ramp) 2. Analogue value falls with rising distance to object (falling ramp) 	
Series LUC	TEACH-IN rising ramp (A2 > A1) <ul style="list-style-type: none"> • Position object at lower evaluation limit • TEACH-IN lower limit A1 with $-U_B$ • Position object at upper evaluation limit • TEACH-IN upper limit A2 with $+U_B$ 	
Double sheet monitoring	TEACH-IN falling ramp (A1 > A2): <ul style="list-style-type: none"> • Position object at lower evaluation limit • TEACH-IN lower limit A2 with $+U_B$ • Position object at upper evaluation limit • TEACH-IN upper limit A1 with $-U_B$ 	
Control units/ Power supplies	Default setting A1: unusable area A2: nominal sensing range Mode of operation: rising ramp	
Accessories	LED Displays	

Displays in dependence on operating mode	Red LED	Yellow LED
TEACH-IN evaluation limit		
Object detected	off	flashes
No object detected	flashes	off
Object uncertain (TEACH-IN invalid)	on	off
Normal mode (evaluation range)	off	on
Fault	on	previous state

Adjusting the sound cone characteristics:

The ultrasonic sensor enables two different shapes of the sound cone, a wide angle sound cone and a small angle sound cone.

1. Small angle sound cone

- switch off the power supply
- connect the Teach-input wire to $-U_B$
- switch on the power supply
- the red LED flashes once with a pause before the next.
- yellow LED: permanently on: indicates the presence of an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $-U_B$ and the changing is saved



2. Wide angle sound cone

- switch off the power supply
- connect the Teach-input wire with $+U_B$
- switch on the power supply
- the red LED double-flashes with a long pause before the next.
- yellow LED: permanently on: indicates an object or disturbing object within the sensing range
- disconnect the Teach-input wire from $+U_B$ and the changing is saved



UB...-18GM75-..., output type -F (frequency output)

Parameter assignment of the signal output

The ultrasonic sensor is equipped with a signal output that represents the distance determined to the object in the form of a frequency proportional to the distance of the object. The current path characteristic of this output signal follows a zero-point straight line, i.e. The extrapolated output frequency for the object distance 0 (which is not usable in practical terms) also corresponds to 0. As the object distance increases, the output frequency also increases.

The object distance can be calculated according to:

$$\text{Object distance [mm]} = \text{output frequency [Hz]} / \text{gain [Hz/mm]}$$

If no object is detected, the level 1 is permanently present on the output.

The frequency of the output channel is adjusted by the gain of the output characteristic line.

Wiring arrangement of the parameterisation input	Gain of the output characteristic line
$-U_B$	2 Hz/mm
Not used	1 Hz/mm
$+U_B$	4 Hz/mm

The sensor checks the parameterisation input when the operating voltage is switched on. A change in the wiring of the parameterisation input during ongoing operation has no effect on the signal output.

LED display

The sensor is equipped with 2 LEDs. Their meaning is as follows:

LED green: Operating voltage applied

LED red: No object detected

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be implemented as follows:

External synchronisation

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 μ s. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input results in normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available

Series -18GK/-18GM

Sensor function description

1) Multiple sensors can be controlled by the same synchronisation signal. The sensors work on the same clock rate.
2) The synchronisation pulses are sent cyclically to only one sensor at a time. The sensors operate in multiplex mode.

Internal synchronisation

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors operate in multiplex mode. The response delay increases according to the number of sensors to be synchronised.

Note

If the option for synchronisation is not used, the synchronisation input should be connected with ground (0 V) or the sensor should be operated with a V1 cable connector (4-pin).

UB...-18GM75-..., output type -PWM (pulse width modulation)

Parameter assignment of the signal output

The ultrasonic sensor is equipped with a signal output that represents the distance determined to the object in the form of a pulse-duty factor proportional to the distance of the object. The current path characteristic of this output signal follows a zero-point straight line, i.e. the extrapolated pulse-duty factor for the object distance 0 (not usable in practice) also corresponds to 0. As the distance to the object increases, the pulse-duty factor also increases. It is 50 % when the nominal sensing range is reached.

The object distance can be calculated according to:

$$Object\ distance\ [mm] = 2 \cdot sensing\ range\ [mm] \cdot pulse\ length\ [s] \cdot frequency\ [Hz]$$

If the object distance reaches or exceeds twice the nominal detection range, or if no object is detected, a level 1 is permanently present on the output.

The frequency of the output channel is adjusted by the wiring arrangement of the parameterisation input.

Wiring arrangement of the parameterisation input	Output frequency
-U _B	30 Hz
Not used	245 Hz
+U _B	1900 Hz

The sensor checks the parameterisation input when the operating voltage is switched on. A change in the wiring of the parameterisation input during ongoing operation has no effect on the signal output.

LED display

The sensor is equipped with 2 LEDs. Their meaning is as follows:

LED green: Operating voltage applied

LED red: No object detected

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be implemented as follows:

External synchronisation

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input results in normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available

1) Multiple sensors can be controlled by the same synchronisation signal. The sensors work on the same clock rate.
2) The synchronisation pulses are sent cyclically to only one sensor at a time. The sensors operate in multiplex mode.

Internal synchronisation

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors operate in multiplex mode. The response delay increases according to the number of sensors to be synchronised.

Note

If the option for synchronisation is not used, the synchronisation input should be connected with ground (0 V) or the sensor should be operated with a V1 cable connector (4-pin).

UB...-18GM75-..., output type -BIT (digital value)

Parameter assignment of the signal output

The ultrasonic sensor is equipped with a signal output that represents the distance determined to the object in the form of a digital value proportional to the distance of the object. The current path characteristic of this output signal follows a zero-point straight line, i.e. The extrapolated digital value for the object distance 0 (which is not usable in practical terms) also corresponds to 0. As the object distance increases, the digital value also increases. The digital value is generated serially. A word consists of 1 start bit (level 1), 12 data bits (value), and 1 stop bit (level 0). The object distance can be calculated according to:

$$\text{Object distance [mm]} = \text{Value} / 2$$

If no object is detected, a level 1 is permanently present on the output.

The bit width is adjusted by the wiring arrangement of the parameterisation input.

Wiring arrangement of the parameterisation input	Bit width
-U _B	50 µs
Not used	100 µs
+U _B	200 µs

The sensor checks the parameterisation input when the operating voltage is switched on. A change in the wiring of the parameterisation input during ongoing operation has no effect on the signal output.

LED display

The sensor is equipped with 2 LEDs. Their meaning is as follows:

LED green: Operating voltage applied

LED red: No object detected

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be implemented as follows:

External synchronisation

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input results in normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available

- 1) Multiple sensors can be controlled by the same synchronisation signal. The sensors work on the same clock rate.
- 2) The synchronisation pulses are sent cyclically to only one sensor at a time. The sensors operate in multiplex mode.

Internal synchronisation

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors operate in multiplex mode. The response delay increases according to the number of sensors to be synchronised.

Note

If the option for synchronisation is not used, the synchronisation input should be connected with ground (0 V) or the sensor should be operated with a V1 cable connector (4-pin).

Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series VarKont	Series -30GM	Series -18GK/-18GM	Series -12GM
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Series -30GM

Series -30GM



Model number	Description	Detection range	Page
Comfort design (with RS 232 serial interface)			
UC300-30GM-IUR2-V15		300 mm	66
UC300-30GM-E6R2-K-V15 UC300-30GM-E7R2-K-V15 UC300-30GM-IUR2-K-V15	for installation in confined spaces	300 mm	68
UC500-30GM-E6R2-V15 UC500-30GM-E7R2-V15 UC500-30GM-IUR2-V15		500 mm	70
UC1000-30GM-E6R2-K-V15 UC1000-30GM-IUR2-K-V15	for installation in confined spaces	1000 mm	72
UCC1000-30GM-E6R2-V15 UCC1000-30GM-IUR2-V15	with chemical resistant transducer coating	1000 mm	74
UC2000-30GM-E6R2-V15 UC2000-30GM-E7R2-V15 UC2000-30GM-IUR2-V15		2000 mm	76
UC2000-30GM-E6R2-T-V15 UC2000-30GM-E7R2-T-V15 UC2000-30GM-IUR2-T-V15	extended temperature range	2000 mm	78
UC4000-30GM-E6R2-V15 UC4000-30GM-E7R2-V15 UC4000-30GM-IUR2-V15		4000 mm	80
UC6000-30GM-E6R2-V15 UC6000-30GM-E7R2-V15 UC6000-30GM-IUR2-V15		6000 mm	82
Basic design			
UBE4000-30GM-SA2-V15	Ultrasonic through beam barrier	4000 mm	84
UB500-30GM-E4-V15 UB500-30GM-E5-V15 UB2000-30GM-E4-V15 UB2000-30GM-E5-V15		500 mm 500 mm 2000 mm 2000 mm	86
UB4000-30GM-E4-V15 UB4000-30GM-E5-V15 UB6000-30GM-E4-V15 UB6000-30GM-E5-V15		4000 mm 4000 mm 6000 mm 6000 mm	88
Ultrasonic sensors for external control units			
UB500-30GM-H3-V1 UB2000-30GM-H3-V1 UB4000-30GM-H3-V1 UB6000-30GM-H3-V1	Emitter/receiver	500 mm 2000 mm 4000 mm 6000 mm	90

For detailed function description, see page 92

Ultrasonic sensor

UC300-30GM-IUR2-V15



- Very small unusable area
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- Current and voltage output
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

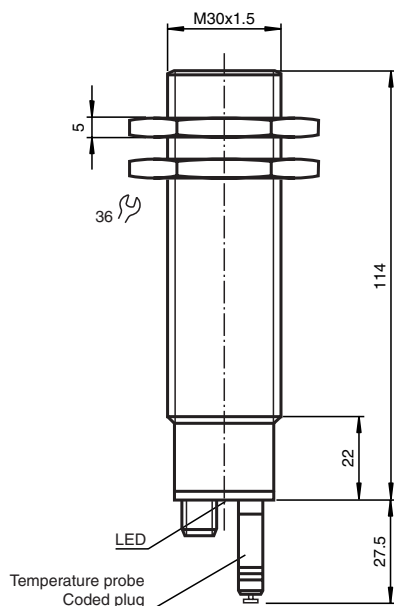


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

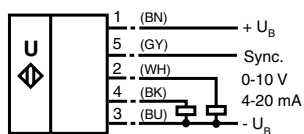
Model number		UC300-30GM-IUR2-V15
Sensing range	15 ... 300 mm	●
Adjustment range	15 ... 300 mm	●
Unusable area	0 ... 15 mm	●
Standard target plate	100 mm x 100 mm	●
Transducer frequency	approx. 380 kHz	●
Response delay	21 ms minimum 63 ms factory setting	●
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected	●
LED yellow 1	permanent: object in evaluation range flashing: TEACH-IN function	●
LED yellow 2	permanent: object in detection range flashing: TEACH-IN function	●
LED red	permanent: temperature/TEACH-IN plug not connected flashing: fault or TEACH-IN function object not detected	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN for evaluation range, output function setting	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●
Power consumption	≤ 900 mW	●
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V	●
Repeat accuracy	≤ 0,1 % of full-scale value	●
Deviation of the characteristic curve	≤ 0,2 % of full-scale value	●
Resolution	evaluation range [mm]/4000, but ≥ 0,05 mm	●
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm	●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0,2 %/K (without temperature compensation)	●
Synchronisation	bi-directional 0 level: -U _B ...+1 V 1 level: +4 V...+U _B input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	●
Common mode operation	≤ 95 Hz	●
Multiplex operation	≤ 95/n Hz, n = number of sensors	●
Interface type	RS 232, 9600 Baud/s, no parity, 8 data bits, 1 stop bit	●
Standards	EN 60947-5-2	●
Ambient temperature	0 ... 70 °C (273 ... 343 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP65	●
Connection	connector V15 (M12 x 1), 5 pin	●
Material		
Housing	stainless steel 1.4303 plastic parts PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	170 g	●

Date of edition: 08/18/2005



Electrical connection

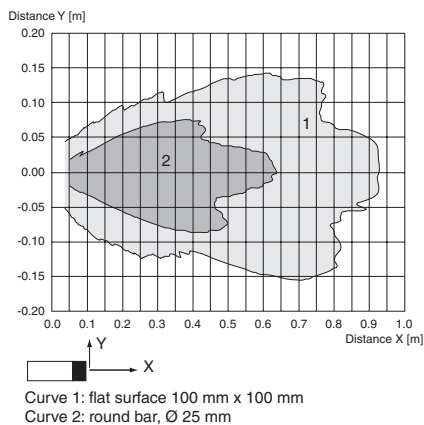
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

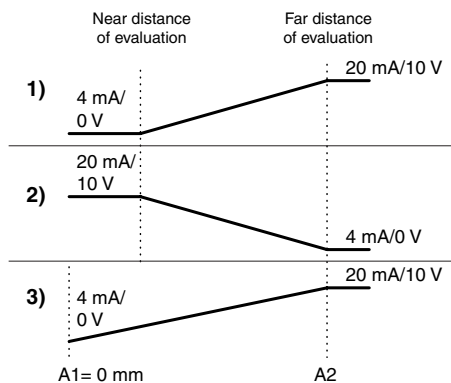
Diagrams

Characteristic response curve



Programmed analogue output function

Analogue function





CE

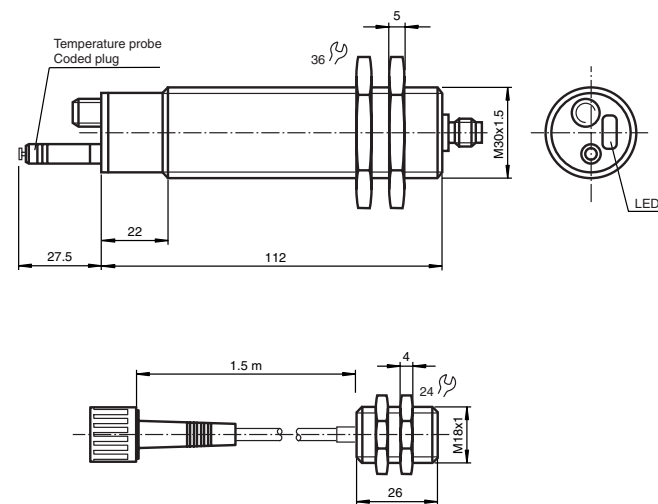
- **Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001**
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC300-30GM-E6R2-K-V15, UC300-30GM-E7R2-K-V15
- **Hysteresis mode selectable**
UC300-30GM-E6R2-K-V15, UC300-30GM-E7R2-K-V15
- **Window function can be selected**
UC300-30GM-E6R2-K-V15, UC300-30GM-E7R2-K-V15
- **Current and voltage output**
UC300-30GM-IUR2-K-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

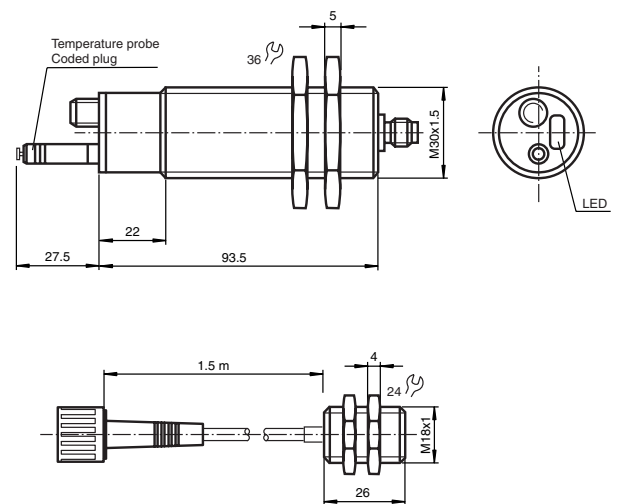
Technical Data

		Model number	UC300-30GM-E6R2-K-V15	UC300-30GM-E7R2-K-V15	UC300-30GM-IUR2-K-V15
Sensing range	30 ... 300 mm		●	●	●
Adjustment range	50 ... 300 mm		●	●	●
Unusable area	0 ... 30 mm		●	●	●
Standard target plate	100 mm x 100 mm		●	●	●
Transducer frequency	approx. 380 kHz		●	●	●
Response delay	21 ms minimum, 63 ms factory setting		●	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected		●	●	●
LED yellow1	permanent: object in evaluation range, flashing: TEACH-IN function				●
LED yellow2	permanent: switching state switch output 1, flashing: TEACH-IN function		●	●	
	permanent: object in detection range, flashing: TEACH-IN function				●
LED red	permanent: switching state switch output 2, flashing: TEACH-IN function		●	●	
	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected		●	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting		●	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting				●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●
No-load supply current	≤ 50 mA		●	●	
Power consumption	≤ 900 mW				●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V				●
	2 switch outputs npn, NO/NC, parameterisable			●	
	2 switch outputs pnp, NONC, parameterisable		●		
Rated operational current	200 mA, short-circuit/overload protected		●	●	
Voltage drop	≤ 2,5 V		●	●	
Repeat accuracy	≤ 0,1 % of full-scale value		●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable		●	●	
Switching frequency	≤ 7 Hz		●	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value				●
Resolution	evaluation range [mm]/4000, but ≥ 0,05 mm				●
Load impedance	current output: ≤ 500 Ohm, voltage output: ≥ 1000 Ohm				●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0,2 %/K (without temperature compensation)		●	●	●
Synchronisation	bi-directional 0 level: -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms		●	●	●
Common mode operation	≤ 95 Hz		●	●	●
Multiplex operation	≤ 95/n Hz, n = number of sensors		●	●	●
Interface type	RS 232, 9600 Baud, no parity, 8 data bits, 1 stop bit		●	●	●
Standards	EN 60947-5-2		●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●
Protection degree	sensor head: IP67 connector sensor head/controller unit: IP52		●	●	●
Connection	connector V15 (M12 x 1), 5 pin		●	●	●
Material					
Housing	stainless steel 1.4303, plastic parts PBT		●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●	●
Mass	210 g		●	●	
	260 g				

Date of edition: 08/18/2005



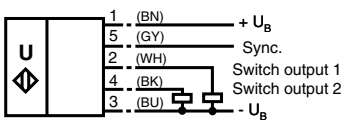
output version -IUE2



output version -E6R2 and -E7R2

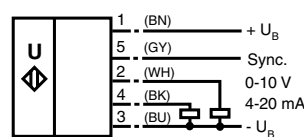
Electrical connection

Standard symbol/Connection:
(version E6, npn)



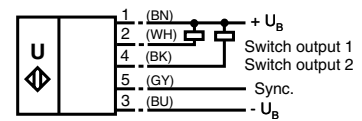
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

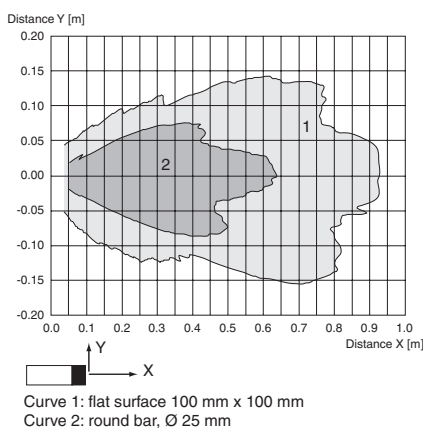
Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

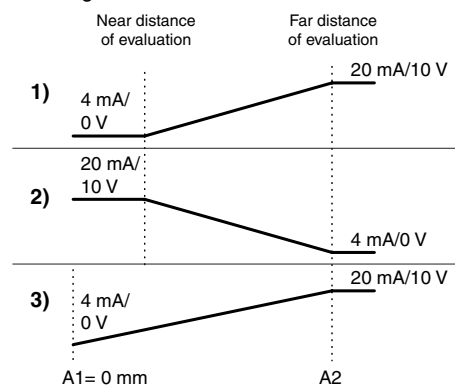
Diagrams

Characteristic response curve



Programmed analogue output function

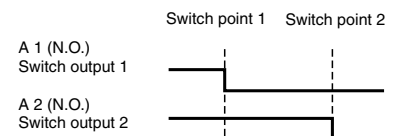
Analogue function



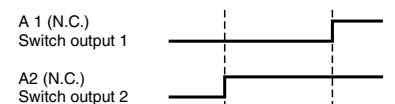
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

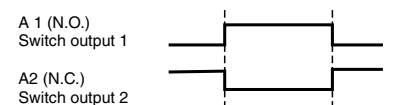


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



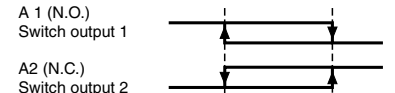
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output version -IUE2

output version -E6R2 and -E7R2

Ultrasonic sensor

UC500-30GM-...-V15



- **Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001**
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC500-30GM-E6R2-V15, UC500-30GM-E7R2-V15
- **Hysteresis mode selectable**
UC500-30GM-E6R2-V15, UC500-30GM-E7R2-V15
- **Window function can be selected**
UC500-30GM-E6R2-V15, UC500-30GM-E7R2-V15
- **Current and voltage output**
UC500-30GM-IUR2-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

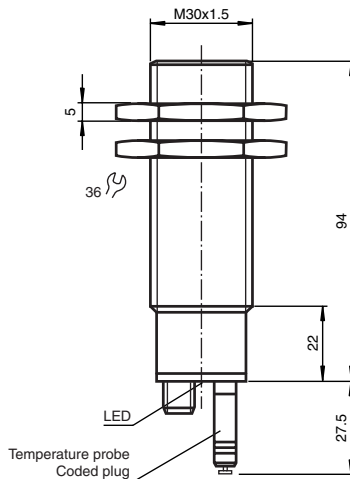
Model number

UC500-30GM-E6R2-V15

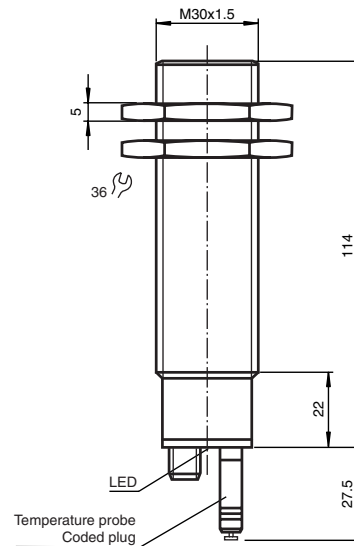
UC500-30GM-E7R2-V15

UC500-30GM-IUR2-V15

Sensing range	30 ... 500 mm	●	●	●
Adjustment range	50 ... 500 mm	●	●	●
Unusable area	0 ... 30 mm	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●
Transducer frequency	approx. 380 kHz	●	●	●
Response delay	21 ms minimum, 63 ms factory setting	●	●	●
Focke Ident-Nr.	8 763 161	●		
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected	●	●	●
LED yellow 1	permanent: object in evaluation range, flashing: TEACH-IN function			●
	permanent: switching state switch output 1, flashing: TEACH-IN function	●	●	
LED yellow 2	permanent: object in detection range, flashing: TEACH-IN function			●
	permanent: switching state switch output 2, flashing: TEACH-IN function	●	●	
LED red	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected	●	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting	●	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting			●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●
No-load supply current	≤ 50 mA	●	●	
Power consumption	≤ 900 mW			●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V			●
	2 switch outputs npn, NO/NC, parameterisable		●	
	2 switch outputs prp, NO/NC, parameterisable	●		
Rated operational current	200 mA, short-circuit/overload protected	●	●	
Voltage drop	≤ 2,5 V	●	●	
Repeat accuracy	≤ 0,1 % of full-scale value	●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	●	●	
Switching frequency	≤ 7 Hz	●	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value			●
Resolution	evaluation range [mm]/4000, but ≥ 0,05 mm			●
Load impedance	current output: ≤ 500 Ohm, voltage output: ≥ 1000 Ohm			●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)	●	●	●
	≤ 0,2 %/K (without temperature compensation)			
Synchronisation	bi-directional	●	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm			
	synchronisation pulse ≥ 100 µs, synchronisation interpulse period ≥ 2 ms			
Common mode operation	≤ 95 Hz	●	●	●
Multiplex operation	≤ 95/n Hz, n = number of sensors	●	●	●
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	●	●	●
Standards	EN 60947-5-2	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●
Protection degree	IP65	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●
Material				
Housing	stainless steel 1.4303, plastic parts PBT	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●
Mass	140 g	●	●	
	170 g			●



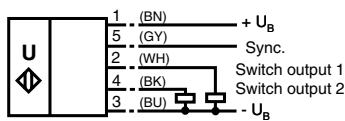
output versions -E6R2 and -E7R2



output version -IUR2

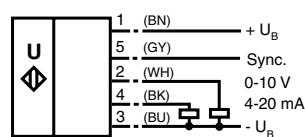
Electrical connection

Standard symbol/Connection:
(version E6, npn)



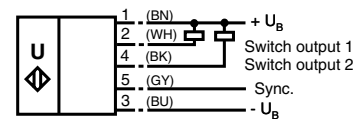
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

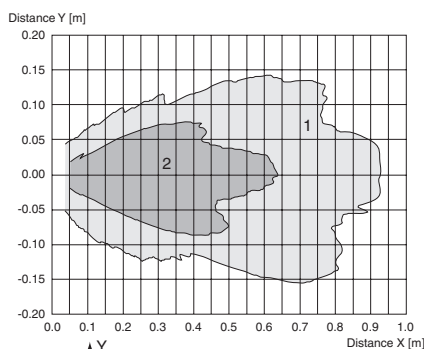
Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

Diagrams

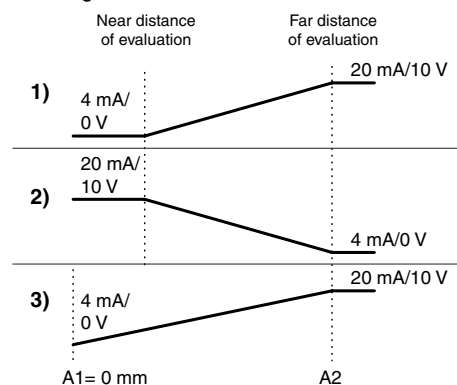
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

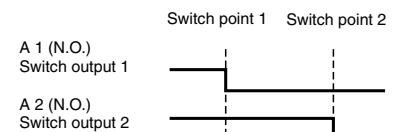
Analogue function



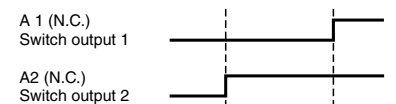
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

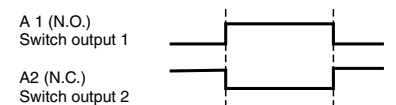


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



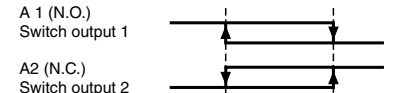
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output version -IUR2

output versions -E6R2 and -E7R2

Ultrasonic sensor

UC1000-30GM-..F2-K-V15



- **Parameterisation interface** for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **Current and voltage output**
UC1000-30GM-IUR2-K-V15
- **2 switch outputs freely adjustable**
UC1000-30GM-E6R2-K-V15
- **Hysteresis mode selectable**
UC1000-30GM-E6R2-K-V15
- **Window function can be selected**
UC1000-30GM-E6R2-K-V15



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

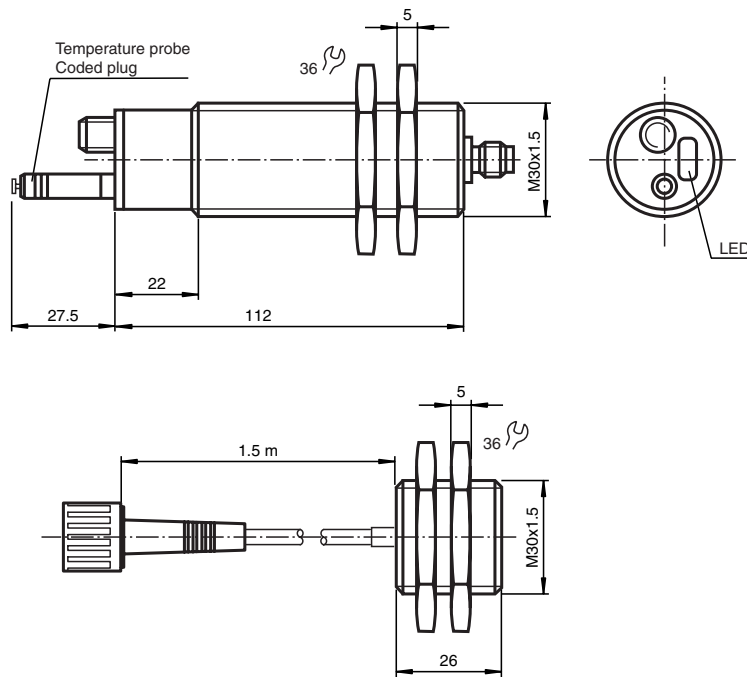
Model number

UC1000-30GM-E6R2-K-V15

UC1000-30GM-IUR2-K-V15

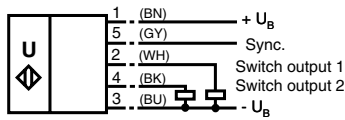
Sensing range	80 ... 1000 mm	●	●
Adjustment range	120 ... 1000 mm	●	●
Unusable area	0 ... 80 mm	●	●
Standard target plate	100 mm x 100 mm	●	●
Transducer frequency	approx. 180 kHz	●	●
Response delay	65 ms minimum, 195 ms factory setting	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected	●	●
LED yellow 1	permanent: object in evaluation range, flashing: TEACH-IN function	●	●
	permanent: switching state switch output 1, flashing: TEACH-IN function	●	
LED yellow 2	permanent: object in detection range, flashing: TEACH-IN function		●
	permanent: switching state switch output 2, flashing: TEACH-IN function	●	
LED red	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting		●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●
No-load supply current	≤ 50 mA	●	
Power consumption	≤ 900 mW		●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V		●
	2 switch outputs prp, NONC, parameterisable	●	
Rated operational current	200 mA, short-circuit/overload protected	●	
Voltage drop	≤ 2,5 V	●	
Repeat accuracy	≤ 0,1 % of full-scale value	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	●	
Switching frequency	≤ 2,5 Hz	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value		●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm		●
Load impedance	current output: ≤ 500 Ohm, voltage output: ≥ 1000 Ohm		●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)	●	●
	≤ 0,2 %/K (without temperature compensation)		
Synchronisation	bi-directional	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm		
	synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms		
Common mode operation	≤ 30 Hz	●	●
Multiplex operation	≤ 30/n Hz, n = number of sensors	●	●
Interface type	RS 232, 9600 B/s, no parity, 8 data bits, 1 stop bit	●	●
Standards	EN 60947-5-2	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●
Protection degree	sensor head: IP67	●	●
	connector sensor head/controller unit: IP52		
Connection	connector V15 (M12 x 1), 5 pin	●	●
Material			
Housing	stainless steel 1.4303, plastic parts PBT	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●
Mass	210 g	●	
	260 g		●

Date of edition: 03/18/2005



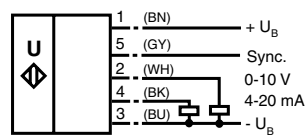
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



Core colours in accordance with EN 60947-5-2.

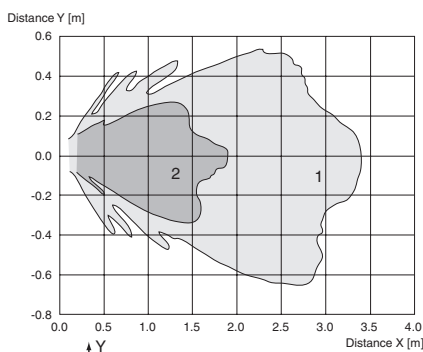
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

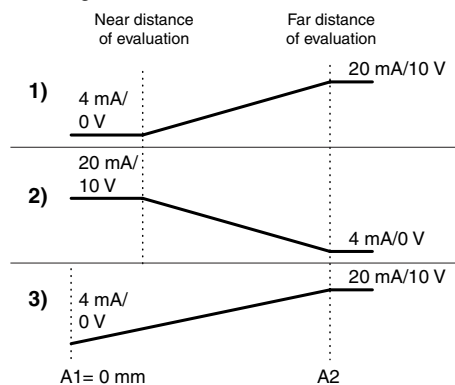
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

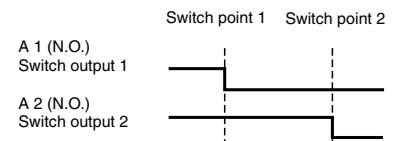
Analogue function



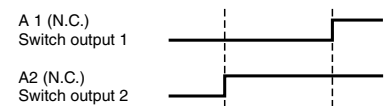
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

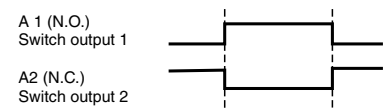


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



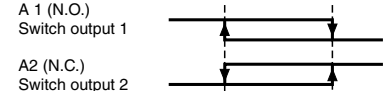
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output version -IUR2

output version -E6R2

Series
-123M

Series
-18GK/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F54

Series
-F64

Series
-D1

Series
LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Ultrasonic sensor

UCC1000-30GM-..R2-V15

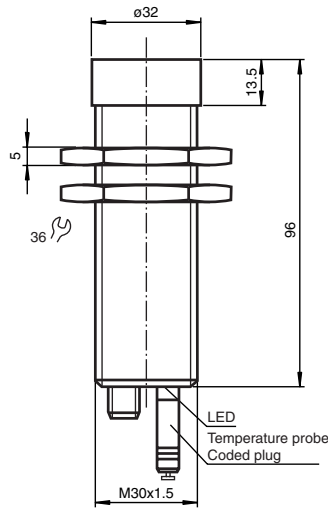


- High chemical resistance through teflon-coated transducer surface
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation
- Current and voltage output
UCC1000-30GM-IUR2-V15
- 2 switch outputs freely adjustable
UCC1000-30GM-E6R2-V15
- Hysteresis mode selectable
UCC1000-30GM-E6R2-V15
- Window function can be selected
UCC1000-30GM-E6R2-V15

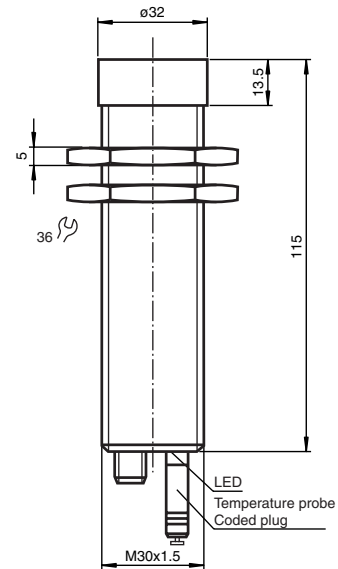
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

	Model number	UCC1000-30GM-E6R2-V15	UCC1000-30GM-IUR2-V15
Sensing range	80 ... 1000 mm	●	●
Adjustment range	100 ... 1000 mm		●
	120 ... 1000 mm	●	
Unusable area	0 ... 80 mm	●	●
Standard target plate	100 mm x 100 mm	●	●
Transducer frequency	approx. 175 kHz	●	●
Response delay	65 ms minimum, 195 ms factory setting	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected	●	●
LED yellow 1	permanent: object in evaluation range, flashing: TEACH-IN function		●
	permanent: switching state switch output 1, flashing: TEACH-IN function	●	
LED yellow 2	permanent: object in detection range, flashing: TEACH-IN function		●
	permanent: switching state switch output 2, flashing: TEACH-IN function	●	
LED red	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting		●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●
No-load supply current	≤ 50 mA	●	
Power consumption	≤ 900 mW		●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V		●
	2 switch outputs prp, NO/NC, parameterisable	●	
Rated operational current	200 mA, short-circuit/overload protected	●	
Voltage drop	≤ 2,5 V	●	
Repeat accuracy	≤ 0,1 % of full-scale value	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	●	
Switching frequency	≤ 2,5 Hz	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value		●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm		●
Load impedance	current output: ≤ 500 Ohm, voltage output ≥ 1000 Ohm		●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0,2 %/K (without temperature compensation)	●	●
Synchronisation	bi-directional 0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm synchronisation pulse ≥ 100 µs, synchronisation interpulse period ≥ 2 ms	●	●
Common mode operation	≤ 30 Hz	●	●
Multiplex operation	≤ 30/n Hz, n = number of sensors	●	●
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	●	●
Standards	EN 60947-5-2	●	●
Ambient temperature	0 ... 70 °C (273 ... 343 K)	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●
Protection degree	IP65	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●
Housing	stainless steel 1.4303, plastic parts PBT	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●
Mass	140 g	●	
	170 g		●



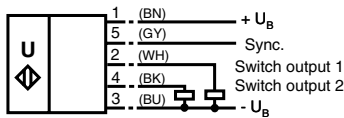
output version -E6R2



output version -IUR2

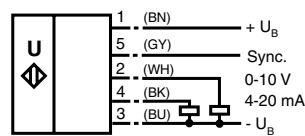
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



Core colours in accordance with EN 60947-5-2.

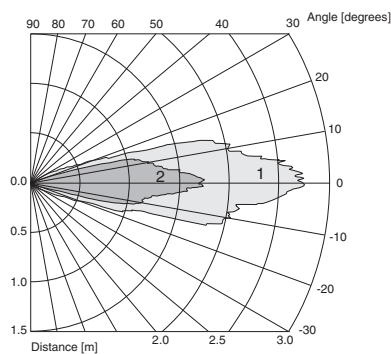
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

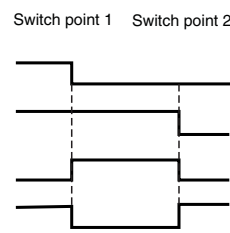
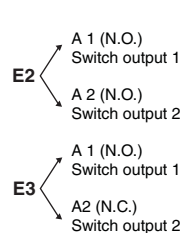
Characteristic response curves



Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed switching output function

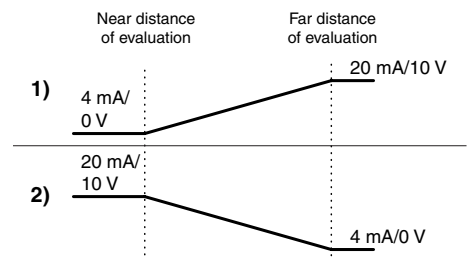
Position of insert
Switch output functions



output version -E6R2

Programmed analogue output function

Analogue function



output version -IUR2

Ultrasonic sensor

UC2000-30GM-...-V15



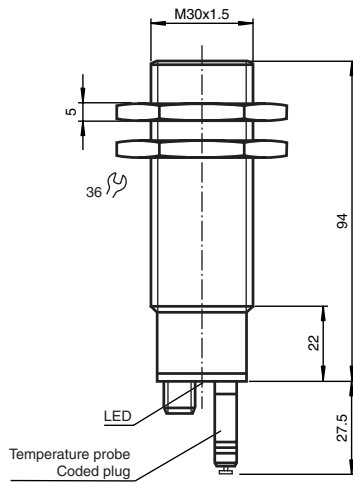
- **Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001**
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC2000-30GM-E6R2-V15, UC2000-30GM-E7R2-V15
- **Hysteresis mode selectable**
UC2000-30GM-E6R2-V15, UC2000-30GM-E7R2-V15
- **Window function can be selected**
UC2000-30GM-E6R2-V15, UC2000-30GM-E7R2-V15
- **Current and voltage output**
UC2000-30GM-IUR2-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

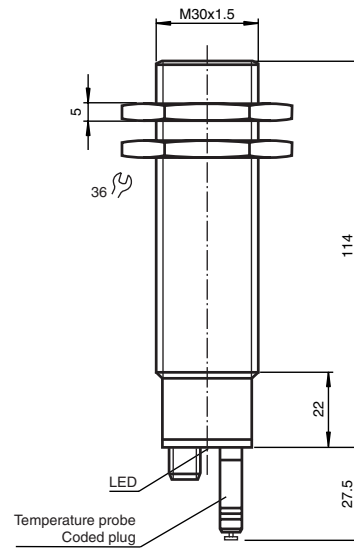
Technical Data

		Model number	UC2000-30GM-E6R2-V15	UC2000-30GM-E7R2-V15	UC2000-30GM-IUR2-V15
Sensing range	80 ... 2000 mm		●	●	●
Adjustment range	120 ... 2000 mm		●	●	●
Unusable area	0 ... 80 mm		●	●	●
Standard target plate	100 mm x 100 mm		●	●	●
Transducer frequency	approx. 180 kHz		●	●	●
Response delay	65 ms minimum, 195 ms factory setting		●	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected		●	●	●
LED yellow1	permanent: object in evaluation range, flashing: TEACH-IN function				●
LED yellow2	permanent: switching state switch output 1, flashing: TEACH-IN function		●	●	
	permanent: object in detection range, flashing: TEACH-IN function				●
LED red	permanent: switching state switch output 2, flashing: TEACH-IN function		●	●	
	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected		●	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting		●	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting				●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●
No-load supply current	≤ 50 mA		●	●	
Power consumption	≤ 900 mW				●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V				●
	2 switch outputs npn, NO/NC, parameterisable			●	
	2 switch outputs prnp, NONC, parameterisable		●		
Rated operational current	200 mA, short-circuit/overload protected		●	●	
Voltage drop	≤ 2,5 V		●	●	
Repeat accuracy	≤ 0,1 % of full-scale value		●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable		●	●	
Switching frequency	≤ 2,5 Hz		●	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value				●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm				●
Load impedance	current output: ≤ 500 Ohm, voltage output: ≥ 1000 Ohm				●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)		●	●	●
	≤ 0,2 %/K (without temperature compensation)				
Synchronisation	bi-directional		●	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm				
	synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms				
Common mode operation	≤ 30 Hz		●	●	●
Multiplex operation	≤ 30/n Hz, n = number of sensors		●	●	●
Interface type	RS 232, 9600 B/s, no parity, 8 data bits, 1 stop bit		●	●	●
Standards	EN 60947-5-2		●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●
Protection degree	IP65		●	●	●
Connection	connector V15 (M12 x 1), 5 pin		●	●	●
Material					
Housing	stainless steel 1.4303, plastic parts PBT		●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam				●
Mass	140 g		●	●	
	170 g				●

Date of edition: 08/18/2005



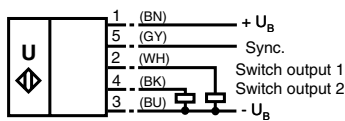
output versions -E6R2 and -E7R2



output version -IUR2

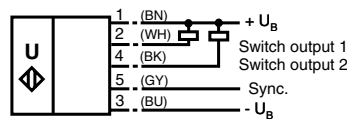
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



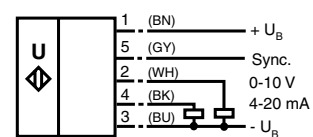
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

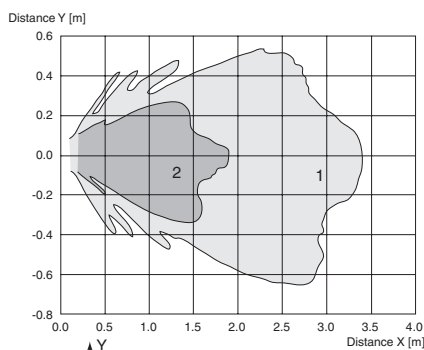
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

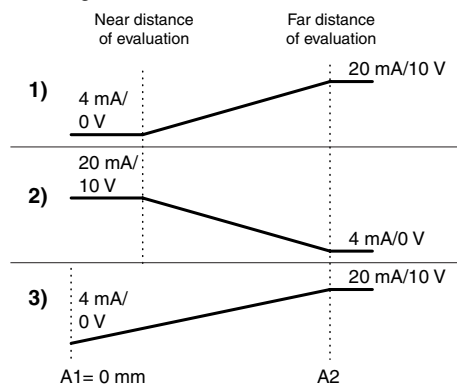
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

Analogue function

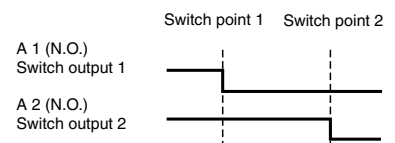


output version -IUR2

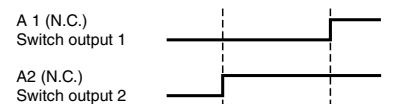
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

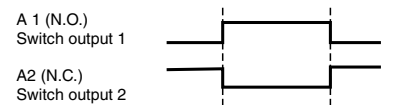


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



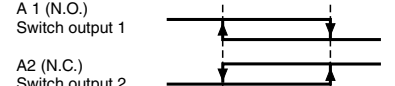
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output versions -E6R2 and -E7R2

Series
-123GM

Series
-18GK/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F54

Series
-F64

Series
-D1

Series
LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Ultrasonic sensor

UC2000-30GM-...-T-V15

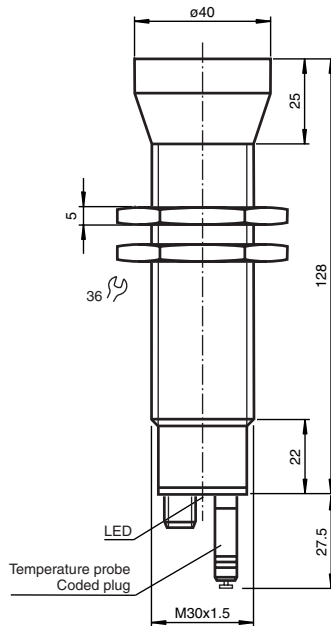


- **Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001**
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC2000-30GM-E6R2-T-V15, UC2000-30GM-E7R2-T-V15
- **Hysteresis mode selectable**
UC2000-30GM-E6R2-T-V15, UC2000-30GM-E7R2-T-V15
- **Window function can be selected**
UC2000-30GM-E6R2-T-V15, UC2000-30GM-E7R2-T-V15
- **Current and voltage output**
UC2000-30GM-IUR2-T-V15

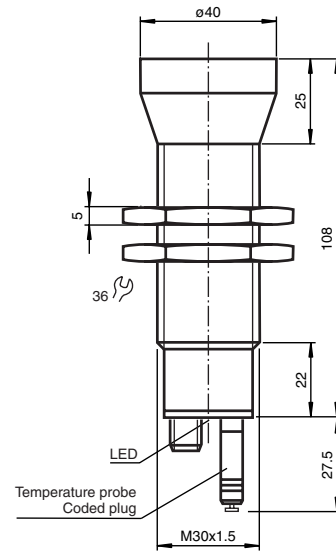
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number		UC2000-30GM-E6R2-FV15	UC2000-30GM-E7R2-FV15	UC2000-30GM-IUR2-T-V15
Sensing range	80 ... 2000 mm	●	●	●
Adjustment range	120 ... 2000 mm	●	●	●
Unusable area	0 ... 80 mm	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●
Transducer frequency	approx. 175 kHz	●	●	●
Response delay	65 ms minimum, 195 ms factory setting	●	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected	●	●	●
LED yellow1	permanent: object in evaluation range, flashing: TEACH-IN function	●	●	●
LED yellow2	permanent: switching state switch output 1, flashing: TEACH-IN function	●	●	●
LED red	permanent: object in detection range, flashing: TEACH-IN function	●	●	●
Temperature/TEACH-IN connector	permanent: switching state switch output 2, flashing: TEACH-IN function	●	●	●
	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected	●	●	●
	temperature compensation, TEACH-IN of the switch points, output function setting	●	●	●
	temperature compensation, TEACH-IN for evaluation range, output function setting	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●
No-load supply current	≤ 50 mA	●	●	●
Power consumption	≤ 900 mW	●	●	●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V	●	●	●
	2 switch outputs npr, NO/NC, parameterisable	●	●	●
	2 switch outputs prp, NONC, parameterisable	●	●	●
Rated operational current	200 mA, short-circuit/overload protected	●	●	●
Voltage drop	≤ 2,5 V	●	●	●
Repeat accuracy	≤ 0,1 % of full-scale value	●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	●	●	●
Switching frequency	≤ 2,5 Hz	●	●	●
Deviation of the characteristic curve	≤ 0,2 % of full-scale value	●	●	●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm	●	●	●
Load impedance	current output: ≤ 500 Ohm, voltage output ≥ 1000 Ohm	●	●	●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)	●	●	●
	≤ 0,2 %/K (without temperature compensation)	●	●	●
Synchronisation	bi-directional	●	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm	●	●	●
	synchronisation pulse ≥ 100 µs, synchronisation interpulse period ≥ 2 ms	●	●	●
Common mode operation	≤ 30 Hz	●	●	●
Multiplex operation	≤ 30/n Hz, n = number of sensors	●	●	●
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	●	●	●
Standards	EN 60947-5-2	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●
Protection degree	IP65	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●
Material		●	●	●
Housing	stainless steel 1.4303, plastic parts PBT	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●
Mass	180 g	●	●	●
	210 g	●	●	●



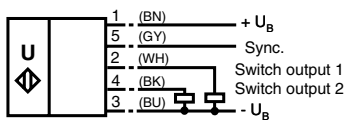
output version -IUR2



output versions -E6R2 and -E7R2

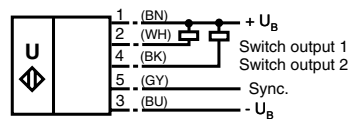
Electrical connection

Standard symbol/Connection:
(version E6, npn)



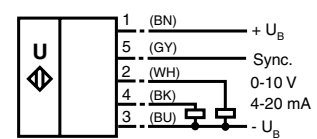
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

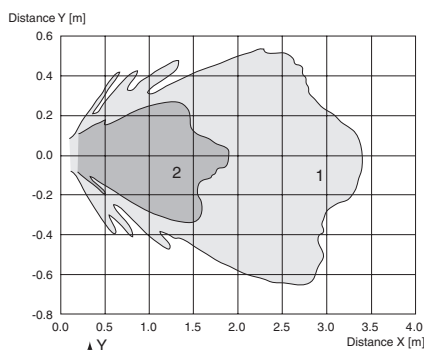
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

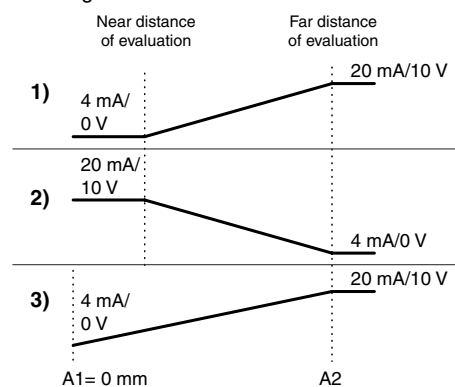
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

Analogue function

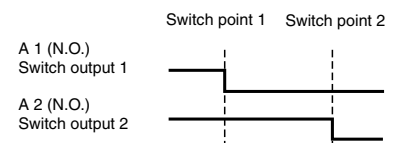


output version -IUR2

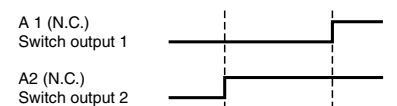
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

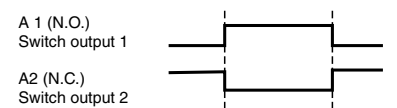


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



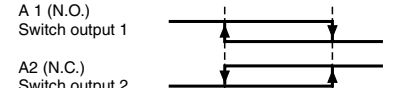
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output versions -E6R2 and -E7R2

Ultrasonic sensor

UC4000-30GM-...-V15



- **Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001**
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC4000-30GM-E6R2-V15, UC4000-30GM-E7R2-V15
- **Hysteresis mode selectable**
UC4000-30GM-E6R2-V15, UC4000-30GM-E7R2-V15
- **Window function can be selected**
UC4000-30GM-E6R2-V15, UC4000-30GM-E7R2-V15
- **Current and voltage output**
UC4000-30GM-IUR2-V15

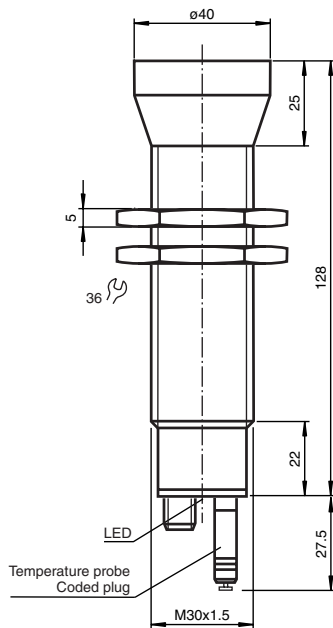


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

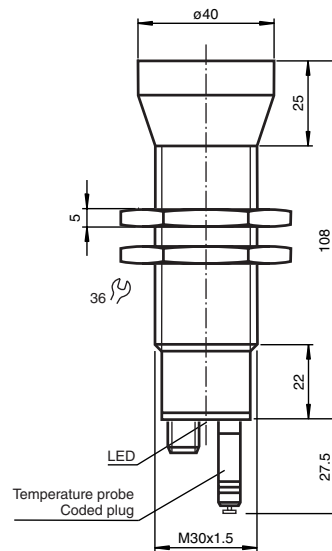
Technical Data

		Model number	UC4000-30GM-E6R2-V15	UC4000-30GM-E7R2-V15	UC4000-30GM-IUR2-V15
Sensing range	200 ... 4000 mm		●	●	●
Adjustment range	240 ... 4000 mm		●	●	●
Unusable area	0 ... 200 mm		●	●	●
Standard target plate	100 mm x 100 mm		●	●	●
Transducer frequency	approx. 85 kHz		●	●	●
Response delay	145 ms minimum, 440 ms factory setting		●	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected		●	●	●
LED yellow1	permanent: object in evaluation range, flashing: TEACH-IN function				●
LED yellow2	permanent: switching state switch output 1, flashing: TEACH-IN function		●	●	
	permanent: object in detection range, flashing: TEACH-IN function				●
LED red	permanent: switching state switch output 2, flashing: TEACH-IN function		●	●	
	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected		●	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting		●	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting				●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●
No-load supply current	≤ 50 mA		●	●	
Power consumption	≤ 900 mW				●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V				●
Rated operational current	2 switch outputs npn, NO/NC, parameterisable			●	
	2 switch outputs prp, NO/NC, parameterisable		●		
Voltage drop	200 mA, short-circuit/overload protected		●	●	
	≤ 2,5 V		●	●	
Repeat accuracy	≤ 0,1 % of full-scale value		●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable		●	●	
Switching frequency	≤ 1 Hz		●	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value				●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm				●
Load impedance	current output: ≤ 500 Ohm, voltage output ≥ 1000 Ohm				●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)		●	●	●
	≤ 0,2 %/K (without temperature compensation)				
Synchronisation	bi-directional		●	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm				
	synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms				
Common mode operation	≤ 13 Hz		●	●	●
Multiplex operation	≤ 13/n Hz, n = number of sensors		●	●	●
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit		●	●	●
Standards	EN 60947-5-2		●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●
Protection degree	IP65		●	●	●
Connection	connector V15 (M12 x 1), 5 pin		●	●	●
Material					
Housing	stainless steel 1.4303, plastic parts PBT		●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●	●
Mass	180 g		●	●	
	210 g				●

Date of edition: 08/18/2005



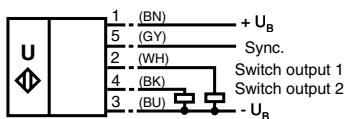
output version -IUR2



output versions -E6R2 and -E7R2

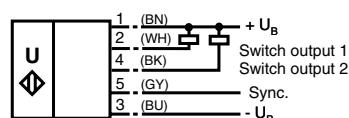
Electrical connection

Standard symbol/Connection:
(version E6, npn)



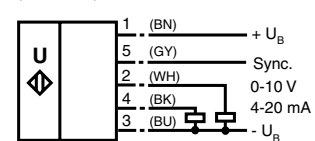
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

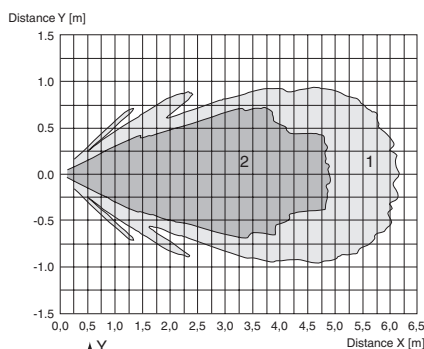
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

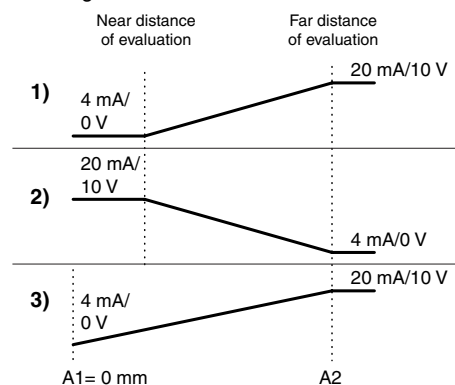
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

Analogue function

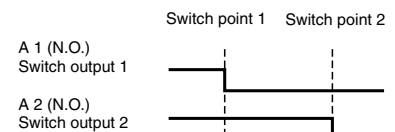


output version -IUR2

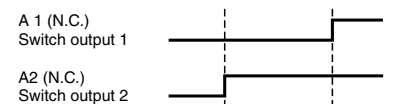
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

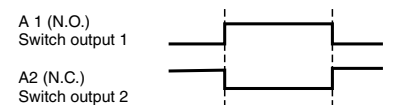


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



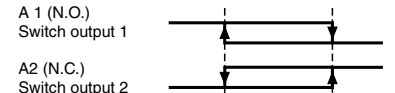
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output versions -E6R2 and -E7R2

Ultrasonic sensor

UC6000-30GM-...-V15



- **Parameterisation interface** for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- **Synchronisation options**
- **Adjustable acoustic power and sensitivity**
- **Temperature compensation**
- **2 switch outputs freely adjustable**
UC6000-30GM-E6R2-V15, UC6000-30GM-E7R2-V15
- **Hysteresis mode selectable**
UC6000-30GM-E6R2-V15, UC6000-30GM-E7R2-V15
- **Window function can be selected**
UC6000-30GM-E6R2-V15, UC6000-30GM-E7R2-V15
- **Current and voltage output**
UC6000-30GM-IUR2-V15

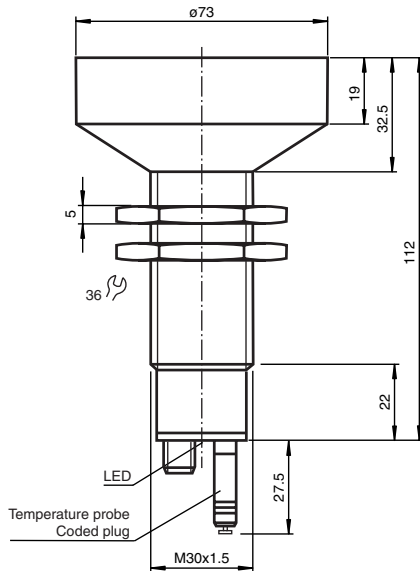
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

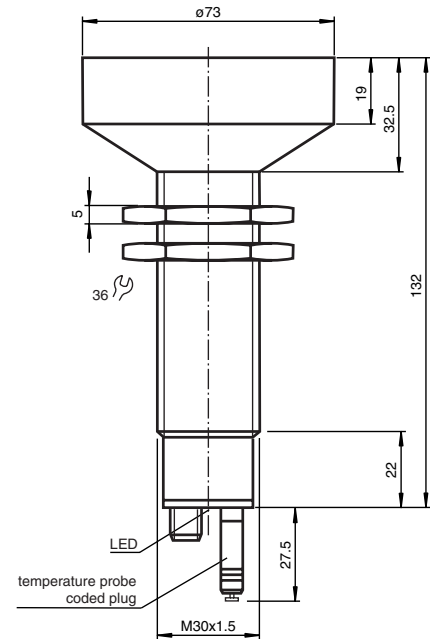
Model number

UC6000-30GM-E6R2-V15
UC6000-30GM-E7R2-V15
UC6000-30GM-IUR2-V15

Sensing range	350 ... 6000 mm	●	●	●
Adjustment range	400 ... 6000 mm	●	●	●
Unusable area	0 ... 350 mm	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●
Transducer frequency	approx. 65 kHz	●	●	●
Response delay	285 ms minimum, 850 ms factory setting	●	●	●
LED green	permanent: Power-on, flashing: Standby mode or TEACH-IN function object detected	●	●	●
LED yellow 1	permanent: object in evaluation range, flashing: TEACH-IN function			●
	permanent: switching state switch output 1, flashing: TEACH-IN function	●	●	
LED yellow 2	permanent: object in detection range, flashing: TEACH-IN function			●
	permanent: switching state switch output 2, flashing: TEACH-IN function	●	●	
LED red	permanent: temperature/TEACH-IN plug not connected, flashing: fault or TEACH-IN function object not detected	●	●	●
Temperature/TEACH-IN connector	temperature compensation, TEACH-IN of the switch points, output function setting	●	●	
	temperature compensation, TEACH-IN for evaluation range, output function setting			●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	●	●	●
No-load supply current	≤ 50 mA	●	●	
Power consumption	≤ 900 mW			●
Output type	1 current output 4 ... 20 mA, 1 voltage output 0 ... 10 V			●
	2 switch outputs npn, NO/NC, parameterisable		●	
	2 switch outputs prp, NO/NC, parameterisable	●		
Rated operational current	200 mA, short-circuit/overload protected	●	●	
Voltage drop	≤ 2,5 V	●	●	
Repeat accuracy	≤ 0,1 % of full-scale value	●	●	●
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	●	●	
Switching frequency	≤ 0,5 Hz	●	●	
Deviation of the characteristic curve	≤ 0,2 % of full-scale value			●
Resolution	evaluation range [mm]/4000, but ≥ 0,35 mm			●
Load impedance	current output: ≤ 500 Ohm, voltage output: ≥ 1000 Ohm			●
Temperature influence	≤ 2 % from full-scale value (with temperature compensation)	●	●	●
	≤ 0,2 %/K (without temperature compensation)			
Synchronisation	bi-directional	●	●	●
	0 level -U _B ...+1 V, 1 level: +4 V...+U _B , input impedance: > 12 KOhm			
	synchronisation pulse ≥ 100 µs, synchronisation interpulse period ≥ 2 ms			
Common mode operation	≤ 7 Hz	●	●	●
Multiplex operation	≤ 7/n Hz, n = number of sensors	●	●	●
Interface type	RS 232, 9600 B/s, no parity, 8 data bits, 1 stop bit	●	●	●
Standards	EN 60947-5-2	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●
Protection degree	IP65	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●
Material				
Housing	stainless steel 1.4303, plastic parts PBT	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●
Mass	270 g	●	●	
	280 g			●



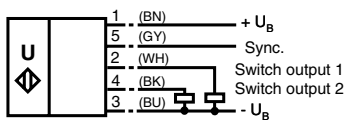
output versions -E6R2 and -E7R2



output version -IUR2

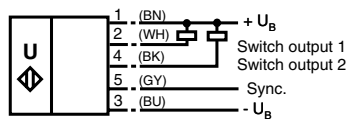
Electrical connection

Standard symbol/Connection:
(version E6, npn)



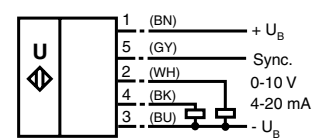
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

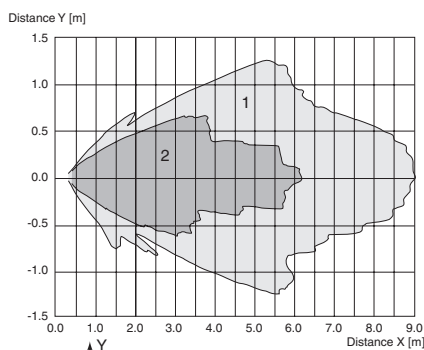
Standard symbol/Connection:
(version IU)



Core colours in accordance with EN 60947-5-2.

Diagrams

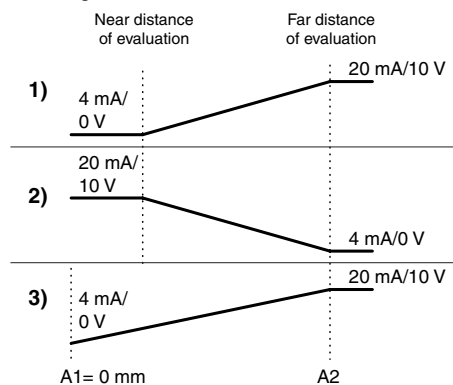
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Programmed analogue output function

Analogue function

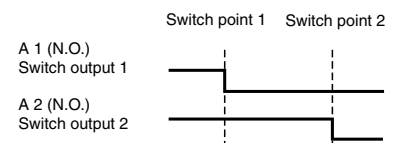


output version -IUR2

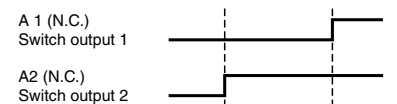
Possible operating modes

1. Switch point mode

When $A1 < A2$, both switch outputs are activated as N.O. contacts.

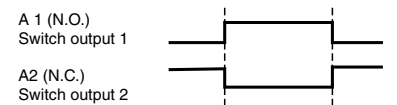


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



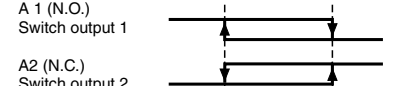
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.



output versions -E6R2 and -E7R2

Through-beam ultrasonic barrier

UBE4000-30GM-SA2-V15



- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Protective functions
- Emitter and receiver included in the delivery package
- Adjustable acoustic power
- Adjustable switch-on delay

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

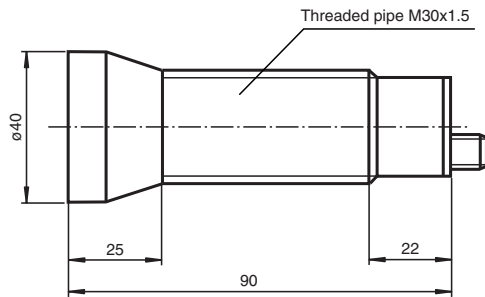
Technical Data

Model number

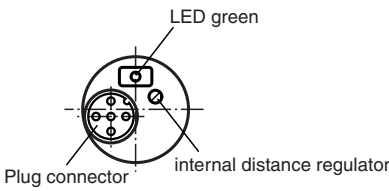
UBE4000-30GM-SA2-V15

Sensing range	0 ... 4000 mm , distance emitter-receiver 500 mm ... 4000 mm	●
Through-beam mode	Single path ultrasonic switch	●
Transducer frequency	85 kHz	●
Reference target	receiver	●
LED green	alignment aid OFF: no ultrasonic signal flashing: uncertain area ON: positive reception	●
LED yellow	switching state	●
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	●
No-load supply current	35 mA emitter 25 mA receiver	●
Output type	2 switch outputs prp, normally open/closed (complementary)	●
Rated operational current	200 mA	●
Voltage drop	≤ 2,5 V	●
Switching frequency	≤ 15 Hz	●
Switch-on delay	100 ... 3000 ms	●
Standards	EN 60947-5-2 C-UL listed: 57M3, IND CONT. EQ., "Powered by Class 2 Power Source"	●
Ambient temperature	0 ... 60 °C (273 ... 333 K)	●
Storage temperature	-40 ... 85 °C (233 ... 368 K)	●
Protection degree	IP65	●
Connection	connector V15 (M12 x 1), 5 pin	●
Material		
Housing	brass, nickel-plated, plastic components PBT	●
Mass	160 g each sensor	●

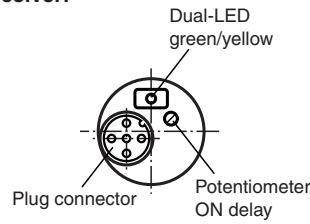
Dimensions:



Emitter:



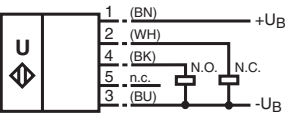
Receiver:



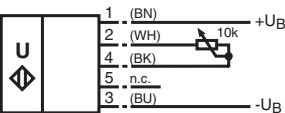
Electrical connection

Standard symbol/Connection:
(version A2, pnp)

Receiver:



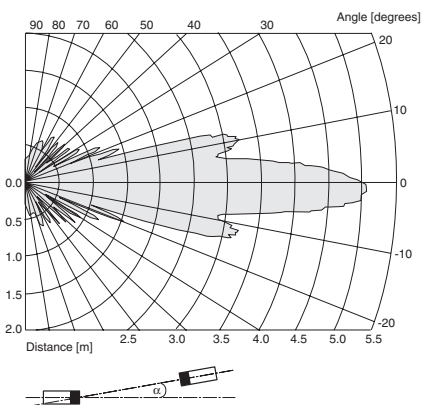
Emitter:



Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curves



Date of edition: 08/18/2005

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Ultrasonic sensor

UB...30GM...V15



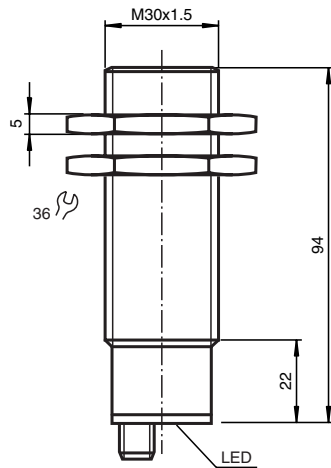
- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Insensitive to compressed air



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

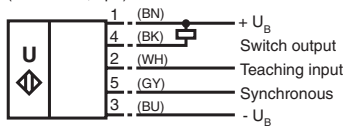
Technical Data

		Model number	UB500-30GM-E4-V15	UB500-30GM-E5-V15	UB2000-30GM-E4-V15	UB2000-30GM-E5-V15
Sensing range	30 ... 500 mm		●	●		
	80 ... 2000 mm				●	●
Adjustment range	120 ... 2000 mm				●	●
	50 ... 500 mm		●	●		
Unusable area	0 ... 30 mm		●	●		
	0 ... 80 mm				●	●
Standard target plate	100 mm x 100 mm		●	●		
Transducer frequency	approx. 180 kHz				●	●
	approx. 380 kHz		●	●		
Response delay	approx. 150 ms				●	●
	approx. 50 ms		●	●		
LED green	permanent: Power-on		●	●	●	●
	flashing: TEACH-IN function object detected		●	●	●	●
LED yellow	permanent: switching state switch output		●	●	●	●
	flashing: TEACH-IN function				●	●
LED red	normal operation: "fault"		●	●	●	●
	TEACH-IN function: no object detected				●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●
No-load supply current	≤ 50 mA		●	●	●	●
Output type	1 switch output E4, npn NO/NC, parameterisable		●		●	
	1 switch output E5, pnp NO/NC, parameterisable			●		●
Rated operational current	200 mA, short-circuit/overload protected		●	●	●	●
Voltage drop	≤ 2,5 V		●	●	●	●
Repeat accuracy	≤ 0,5 % of switching point		●	●	●	●
Range hysteresis	1 % of the set operating distance		●	●	●	●
Switching frequency	≤ 10 Hz		●	●		
	≤ 3,3 Hz				●	●
Temperature influence	< 2 % of full-scale value		●	●	●	●
	Input type		●	●	●	●
Synchronisation	bi-directional		●	●	●	●
	0 level: -U _B ... +1 V					
	1 level: +4 V ... +U _B					
	input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s					
Common mode operation	≤ 30 Hz				●	●
	≤ 95 Hz		●	●		
Multiplex operation	≤ 30/n Hz, n = number of sensors		●	●	●	●
	≤ 95/n Hz, n = number of sensors		●	●		
Standards	EN 60947-5-2		●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 368 K)		●	●	●	●
Protection degree	IP65		●	●	●	●
Connection	connector V15 (M12 x 1), 5 pin		●	●	●	●
Material						
Housing	brass, nickel-plated, plastic components PBT		●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●	●	●
Mass	135 g		●	●		
	140 g				●	●



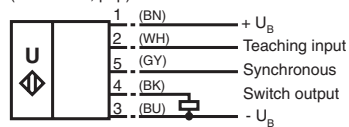
Electrical connection

Standard symbol/Connections:
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

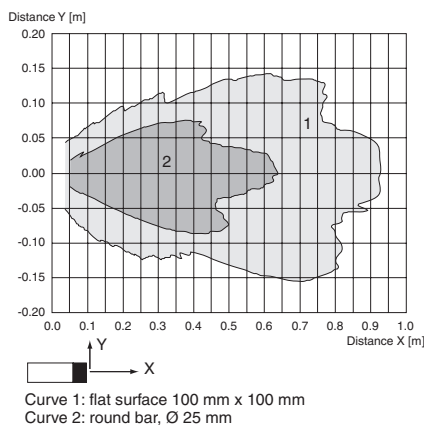
Standard symbol/Connections:
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

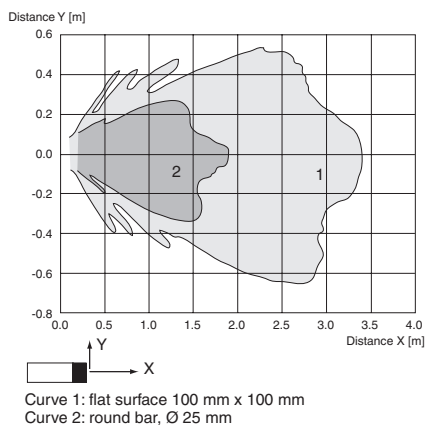
Diagrams

Characteristic response curve



UB500-30GM...

Characteristic response curve



UB2000-30GM...

Programmed switching output function

- Window mode, normally open function
A1 < A2:
- Window mode, normally closed function
A2 < A1:
- One switch point, normally open function
A1 -> ∞:
- One switch point, normally closed function
A2 -> ∞:
- A1 -> ∞, A2 -> ∞: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Ultrasonic sensor

UB...30GM-...V15



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Insensitive to compressed air

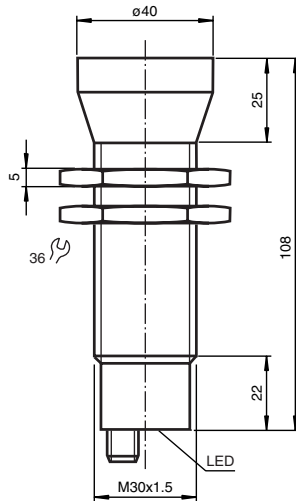


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

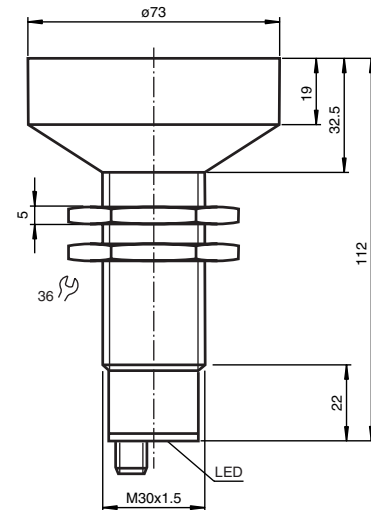
Technical Data

		Model number	UB4000-30GM-E4-V15	UB4000-30GM-E5-V15	UB6000-30GM-E4-V15	UB6000-30GM-E5-V15
Sensing range	200 ... 4000 mm		●	●		
	350 ... 6000 mm				●	●
Adjustment range	240 ... 4000 mm		●	●		
	400 ... 6000 mm				●	●
Unusable area	0 ... 200 mm		●	●		
	0 ... 350 mm				●	●
Standard target plate	100 mm x 100 mm		●	●		
Transducer frequency	approx. 65 kHz				●	●
	approx. 85 kHz		●	●		
Response delay	approx. 325 ms		●	●		
	approx. 650 ms				●	●
	permanent: Power-on		●	●	●	●
LED green	flashing: TEACH-IN function object detected				●	●
	permanent: switching state switch output		●	●	●	●
LED yellow	flashing: TEACH-IN function				●	●
	normal operation: "fault"		●	●	●	●
LED red	TEACH-IN function: no object detected				●	●
			●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●
No-load supply current	≤ 50 mA		●	●	●	●
Output type	1 switch output E4, npn NO/NC, parameterisable		●		●	
	1 switch output E5, pnp NO/NC, parameterisable			●		●
Rated operational current	200 mA, short-circuit/overload protected		●	●	●	●
Voltage drop	≤ 2,5 V		●	●	●	●
Repeat accuracy	≤ 0,5 % of switching point		●	●	●	●
Range hysteresis	1 % of the set operating distance		●	●	●	●
Switching frequency	≤ 0,8 Hz				●	●
	≤ 1,5 Hz		●	●		
Temperature influence	< 2 % of full-scale value		●	●	●	●
Input type	1 TEACH-IN input,		●	●	●	●
	operating range 1: -U _B ... +1 V, operating range 2: +4 V ... +U _B					
Synchronisation	input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s					
	bi-directional		●	●	●	●
	0 level: -U _B ... +1 V					
	1 level: +4 V ... +U _B					
Common mode operation	input impedance: > 12 kΩ					
	synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms					
Multiplex operation	≤ 13 Hz		●	●		
	≤ 7 Hz				●	●
Standards	≤ 13/n Hz, n = number of sensors		●	●		
	≤ 7/n Hz, n = number of sensors				●	●
Ambient temperature	EN 60947-5-2		●	●	●	●
Storage temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●	●
Protection degree	-40 ... 85 °C (233 ... 358 K)		●	●	●	●
Connection	IP65		●	●	●	●
Material	connector V15 (M12 x 1), 5 pin		●	●	●	●
Housing			●	●	●	●
Transducer	brass, nickel-plated, plastic components PBT		●	●	●	●
Mass	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●	●	●
	180 g		●	●		
	250 g				●	●

Date of edition: 03/18/2005



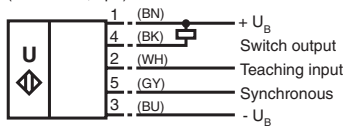
UB4000-30GM-...



UB6000-30GM-...

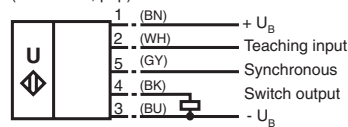
Electrical connection

Standard symbol/Connections:
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

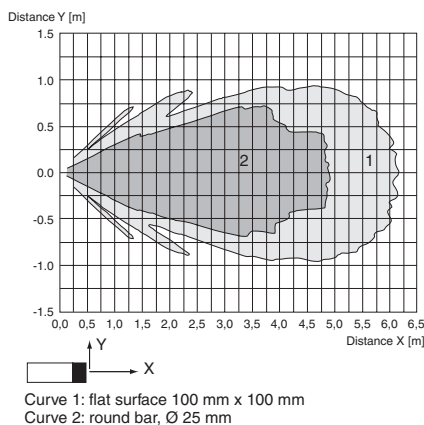
Standard symbol/Connections:
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

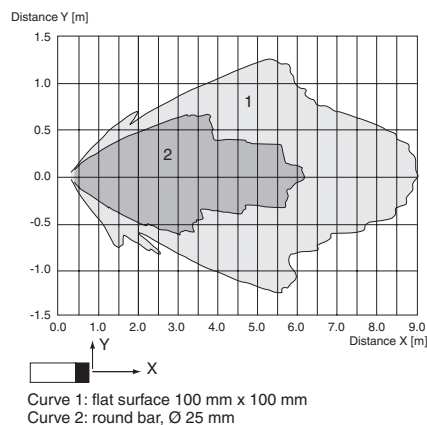
Diagrams

Characteristic response curve



UB4000-30GM-...

Characteristic response curve



UB6000-30GM-...

Programmed switching output function

- Window mode, normally open function
A1 < A2:
- Window mode, normally closed function
A2 < A1:
- One switch point, normally open function
A1 -> ∞:
- One switch point, normally closed function
A2 -> ∞:
- A1 -> ∞, A2 -> ∞: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Ultrasonic sensor

UB...-30GM-H3-V1



- Separate evaluation
- Direct detection mode

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

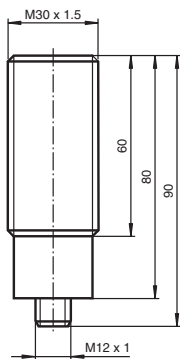
Model number		UB500-30GM-H3-V1	UB2000-30GM-H3-V1	UB4000-30GM-H3-V1	UB6000-30GM-H3-V1
Sensing range	200 ... 4000 mm				
	30 ... 500 mm				
	350 ... 6000 mm				
	80 ... 2000 mm				
Adjustment range	120 ... 2000 mm				
	240 ... 4000 mm				
	400 ... 6000 mm				
	50 ... 500 mm				
Unusable area	0 ... 200 mm ¹⁾				
	0 ... 30 mm ¹⁾				
	0 ... 350 mm ¹⁾				
	0 ... 80 mm ¹⁾				
Standard target plate	100 mm x 100 mm				
Transducer frequency	approx. [kHz]	380	180	85	65
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}				
No-load supply current	≤ 30 mA				
Output type	1 pulse output for echo run time, short-circuit proof open collector pnp with pull down resistor = 22 kOhm level 0 (no echo): -U _B , level 1 (echo detected): ≥ (+U _B -2 V)				
Rated operational current	15 mA, short-circuit/overload protected				
Temperature influence	the echo propagation time: 0,17 %/ K				
Input type	1 pulse input for transmitter pulse (clock) 0-level (active): < 5 V (U _B > 15 V), 1-level (inactive): > 10 V ... +U _B (U _B > 15 V) 0-level (active): < 1/3 U _B (10 V < U _B < 15 V), 1-level (inactive): > 2/3 U _B ... +U _B (10 V < U _B < 15 V)				
Pulse length	20 ... 300 μs (typ. 200 μs) ²⁾				
	40 ... 600 μs (typ. 500 μs) ²⁾				
	5 ... 100 μs (typ. 50 μs) ²⁾				
	50 ... 700 μs (typ. 500 μs) ²⁾				
Pause length	≥ 50 x pulse length				
Impedance	10 kOhm internal connected to +U _B				
Standards	EN 60947-5-2				
Ambient temperature	-25 ... 85 °C (248 ... 368 K)				
Storage temperature	-40 ... 85 °C (233 ... 368 K)				
Protection degree	IP67				
Connection	V1 connector (M12 x 1), 4-pin				
Housing	brass, nickel-plated, plastic components PBT				
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam				
Mass	140 g				
	180 g				
	250 g				

Function

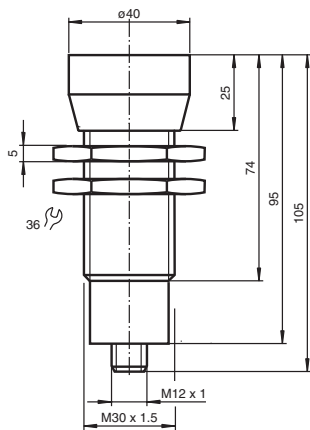
The sensing range is determined in the downstream evaluation electronics (e. g. the units UH3-KHD2-4E5, UH3-KHD2-4I or UH3-T1-KT). PLC modules or other existing evaluation units can also be substituted for these units offered by Pepperl+Fuchs.

The object distance in pulse-echo mode is obtained from the echo time.

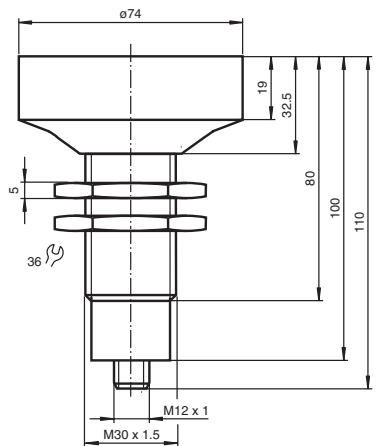
- ¹⁾ The unusable area (blind range) BR depends on the pulse duration T_i .
The unusable area reaches a minimum with the shortest pulse duration.
- ²⁾ The sensors detection range depends on the pulse duration T_p.
With pulse duration < typical pulse duration, the sensors detection range may be reduced.



UB500-... and UB2000-...



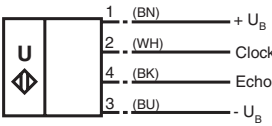
UB4000-...



UB6000-...

Electrical connection

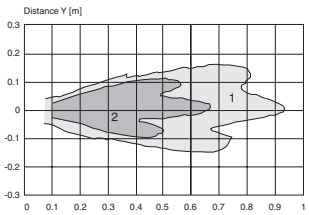
Standard symbol/Connection:



2 = Emitter pulse input
4 = Echo propagation time output
Core colours in accordance with EN 60947-5-2.

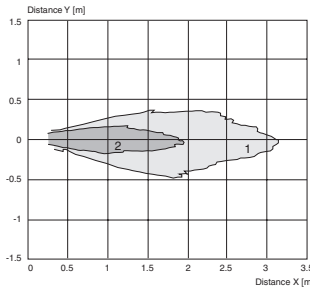
Diagrams

Characteristic response curves



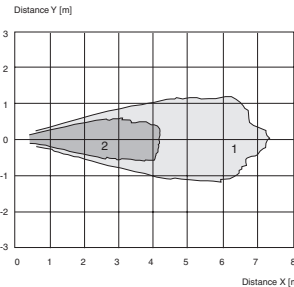
UB500-30GM-H3-V1

Characteristic response curves



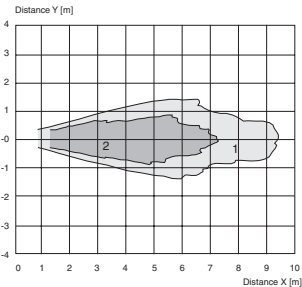
UB2000-30GM-H3-V1

Characteristic response curves



UB4000-30GM-H3-V1

Characteristic response curves



UB6000-30GM-H3-V1

Date of edition: 08/18/2005

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

UC...-30GM-IUR2...-V15 (with 2 analogue outputs)

Description of the sensor functions

This ultrasonic sensor features a four-pole temperature/TEACH-IN plug, that can be connected in four different positions. These have the following significance.

Plug position	Meaning
A1	TEACH-IN evaluation limit A1
A2	TEACH-IN evaluation limit A2
E2/E3	Rising/falling ramp/output characteristic of the voltage output by zero point
T	Temperature compensation

Description of the TEACH-IN procedure

TEACH-IN the evaluation limits 1 or 2

- Cut supply voltage
- Remove TEACH-IN plug
- Restore supply voltage (Reset)
- Set object to desired switching point
- Plug and remove the TEACH-IN plug in pos. A1 or A2. This teaches the evaluation limits A1 or A2.
Caution: Removing the temperature/TEACH-IN plug, the values of the object position will be adopted.
- The TEACH-IN procedure is controlled with the LED. The green LED flashes, when object is detected, the red LED flashes when no object is detected.
- Connect TEACH-IN plug in pos. T. This completes the TEACH-IN procedure and saves the distance.
- The sensor works in normal mode

TEACH-IN the analogue function

- Cut supply voltage
- Remove TEACH-IN plug
- Restore supply voltage (Reset)
- Connect TEACH-IN plug in pos. E2/E3. By multiple plugging, three different modes of operation can be set in cyclical sequence:
 - 1) rising ramp, LED A2 flashes,
 - 2) falling ramp, LED A1 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. This completes the TEACH-IN procedure and saves the mode of operation.
- The sensor works in normal mode

Note: If the temperature/TEACH-IN plug has not been plugged in within 5 minutes in position T, the sensor will return to normal mode (with the latest permanent stored values) without temperature compensation.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level ≥ 1 s or an open synchronisation input will result in the normal operation of the sensor.

A high level > 1 s will result in the standby mode of the sensor (indicator green LED). The outputs pause in the latest status.

Synchronisation cannot be performed during TEACH-IN and vice versa.

Multiple operating modes are possible:

1. Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
2. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
3. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.
4. A high level at the synchronisation input disables the sensor.

The response time increases when the sensor is synchronised, because the synchronisation increases the measurement cycle time.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

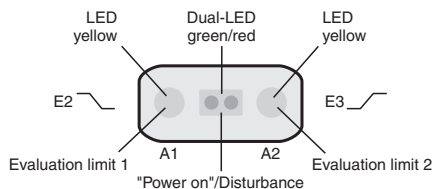
Default setting

- A1: unusable area
 A2: nominal sensing range
 Mode of operation: rising ramp

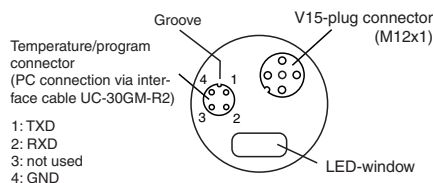
LED Displays/Analogue output

Displays in dependence on operating mode	Dual LED green	Dual-LED red	LED yellow A1	LED yellow A2	analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flashing off	off flashing	flashing flashing	off off	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flashing off	off flashing	off off	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	on on on	off off off	off flashing flashing (synchronised)	flashing off flashing (synchronised)	unchanged
Normal mode temperature compensated plug pulled/shorted	on off	off on	on, if target in evaluation range	on, if target in detection range	analogue value
Standby	flashing	off	previous state	previous state	unchanged
Interference (e.g. compressed air)	off	flashing	previous state	previous state	unchanged or error value

LED-Window



RS 232-connection



Note on communication with the UC-30GM-R2 interface cable

The UC-30GM-R2 interface cable allows for communication with the ultrasonic sensor using the ULTRA 2001 service program. The cable creates a connection between the PC-internal RS 232 interface and the plug-in connection for the temperature/program plug on the sensor. When setting up the connection on the sensor, make certain the plug is lined up correctly; otherwise no communication will be possible. The protrusion of the round plug must be inserted into the groove of the plug connection on the sensor side and **not** into the arrow symbol on the sensor.

Adjustable parameter with service program ULTRA 2001

- Evaluation limits A1 and A2
- Rising/falling ramp/zero line
- Mode of operation
- Sonic speed
- Temperature offset (The inherent temperature-rise of the sensor can be considered in the temperature compensation)
- Expansion of the unusable area (for suppression of unusable area echoes)
- Reduction of the detection range (for suppression of remote range echoes)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behaviour of the sensor in case of echo loss
- Behaviour of the sensor in case of a fault
- Average formation via an allowed number of measuring cycles
- Selection of the parameter set, RS 232 or manually.

UC...-30GM-... , output versions -E6R2 and -E7R2 (with 2 switch outputs)

Description of the sensor functions

This ultrasonic sensor features a four-pole temperature/TEACH-IN plug, that can be connected in four different positions. These have the following significance.

Plug position	Meaning
A1	TEACH-IN switching point A1
A2	TEACH-IN switching point A2
E2/E3	Switching: 2 independent switching points/window mode/hysteresis mode
T	Temperature compensation

Description of the TEACH-IN procedure

TEACH-IN of switching points 1 or 2

- Cut supply voltage
- Remove TEACH-IN plug
- Restore supply voltage (Reset)
- Set object to desired switching point
- Plug and remove the TEACH-IN plug in pos. A1 or A2. Switching point A1 or A2 is taught.
Caution: Removing the temperature/TEACH-IN plug, the values of the object position will be adopted.
- The TEACH-IN procedure is controlled with the LED. The green LED flashes, when object is detected, the red LED flashes when no object is detected.
- Connect TEACH-IN plug in pos. T. The TEACH-IN procedure is completed, the sensor is working in normal mode.

TEACH-IN of switching function

- Cut supply voltage
- Remove TEACH-IN plug
- Restore supply voltage (Reset)
- Connect TEACH-IN plug in pos. E2/E3. By multiple plugging, three different modes of operation can be set in cyclical sequence:
 - switching point mode, LED A1 is flashing,
 - window mode, LED A2 is flashing
 - hysteresis mode, LED A1 and A2 are flashing
- Connect TEACH-IN plug in pos. T. The TEACH-IN procedure is completed, the sensor is working in normal mode.

Note: If the temperature/TEACH-IN plug has not been plugged in within 5 minutes in position T, the sensor will return to normal mode (with the latest permanent stored values) without temperature compensation.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level ≥ 1 s or an open synchronisation input will result in the normal operation of the sensor.

A high level > 1 s will result in the standby mode of the sensor (indicator green LED). The outputs pause in the latest status.

Synchronisation cannot be performed during TEACH-IN and vice versa.

Multiple operating modes are possible

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.
- A high level at the synchronisation input disables the sensor.

The response time increases when the sensor is synchronised, because the synchronisation increases the measurement cycle time.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

Default setting

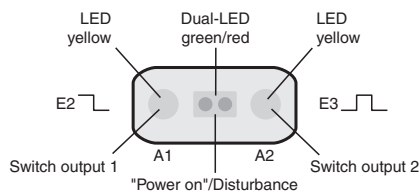
- A1: unusable area
 A2: nominal sensing range

LED Displays

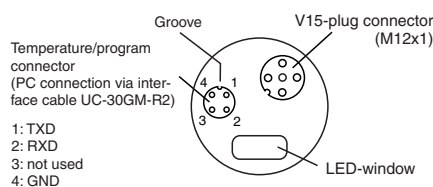
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected	flashing	off	flashing	off
no object detected	off	flashing	flashing	off
TEACH-IN switching point A2 object detected	flashing	off	off	flashing
no object detected	off	flashing	off	flashing
TEACH-IN mode of operation (E2/E3) two independent switching points	on	off	flashing	off
window mode	on	off	off	flashing
Hysteresis mode	on	off	flashing	flashing
Normal mode temperature compensated plug pulled or shorted	on off	off on	switching state A1 switching state A1	switching state A2 switching state A2
Interference (e.g. compressed air)	off	flashing	last or defined condition	last or defined condition
Standby	flashes	off	previous state	previous state

LED ON indicates closed switch output.

LED-Window



RS 232-connection



Note on communication with the UC-30GM-R2 interface cable

The UC-30GM-R2 interface cable allows for communication with the ultrasonic sensor using the ULTRA 2001 service program. The cable creates a connection between the PC-internal RS 232 interface and the plug-in connection for the temperature/program plug on the sensor. When setting up the connection on the sensor, make certain the plug is lined up correctly; otherwise no communication will be possible. The protrusion of the round plug must be inserted into the groove of the plug connection on the sensor side and **not** into the arrow symbol on the sensor.

Adjustable parameter with service program ULTRA 2001

- Switching point 1 and 2
- NO/NC function
- Mode of operation
- Sonic speed
- Temperature offset (The inherent temperature-rise of the sensor can be considered in the temperature compensation)
- Expansion of the unusable area (for suppression of unusable area echoes)
- Reduction of the detection range (for suppression of remote range echoes)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behaviour of the sensor in case of echo loss
- Behaviour of the sensor in case of a fault
- Average formation via an allowed number of measuring cycles
- On/off-delay
- Switching hysteresis
- Selection of the parameter set, RS 232 or manually.

UBE4000-30GM-SA2-V15 (through beam type)

Description of the sensor functions

Remote potentiometer

The distance range of the through-beam ultrasonic barrier can be adjusted with the potentiometer integrated in the emitter, or via a remote potentiometer connected to the emitter.

The remote potentiometer simplifies the adjustment of the distance range if the sensors are installed in an inaccessible location. A 10 k Ω /0.3 W potentiometer serves as the remote potentiometer. The connection is realised using the plug connector pins 2 and 4 of the emitter (see: Electrical Connection).

The following distance ranges can be set using the remote potentiometer:

Adjustment of the internal distance regulator	Distance range adjustable via remote potentiometer
Minimum switching point	0 m ... 2 m
Maximum switching point	2 m ... 4 m

When operating without a remote potentiometer, the plug connector pins 2 and 4 must be bridged.

Alignment

When adjusting the emitter and receiver, take care to align them as precisely as possible.

Angular tolerance: $\alpha < \pm 2^\circ$

maximum offset: $s < \pm 5 \text{ mm}$

A through-beam ultrasonic barrier consists of a single emitter and a single receiver.

Caution

Mount or replace emitter and receiver only in pairs. Both devices are optimally matched to each other by the manufacturer.

UB...-30GM-... , output types -E4 and -E5 (with 1 switch output)

Description of the sensor functions

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be realised as follows:

External synchronisation:

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 μs . The measuring cycle starts with the falling edge of a synchronisation pulse. Two operating modes are available:

1. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
2. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

Internal synchronisation:

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors will operate in multiplex mode.

The state of the switch output will not change until the switching threshold has been exceeded five times as an average of the five measurements is determined internally. A low level $> 1 \text{ s}$ or an open synchronisation input will result in the normal operation of the sensor.

Synchronisation cannot be performed during TEACH-IN and vice versa. The sensors must be operated in an unsynchronised manner to teach the switching point.

A high level at the synchronisation input disables the sensor.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

Adjusting the switching points

The ultrasonic sensor features an analogue output with two teachable evaluation limits. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Evaluation limit A1 is taught with $-U_B$, A2 with $+U_B$. For simple setting the switching point and the output functions the programming unit UB-PROG2 can be used.

Five different output functions can be set:

1. Window mode, normally-open function
2. Window mode, normally-closed function
3. One switching point, normally-open function
4. One switching point, normally-closed function
5. Detection of object presence

TEACH-IN window mode, normally-open function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Set target to far switching point
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN window mode, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Set target to far switching point
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN one switching point, normally-open function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN one switching point, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN detection of object presence

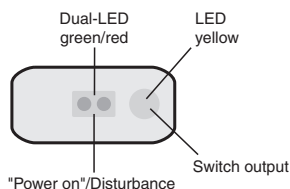
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

Default setting

A1: unusable area
A2: nominal sensing range

LED Displays

Displays in dependence on operating mode	Green LED	Red LED	Yellow LED
TEACH-IN switching point			
Object detected	flashes	off	flashes
No object detected	off	flashes	flashes
Object uncertain (TEACH-IN invalid)	off	flashes	off
Normal operation	on	off	switching state
Interference	off	flashes	previous state

LED-Window

Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM	Series -18GK/-18GM	Series -12GM	Notes



Model number	Description	Detection range	Page
UC500+U9+E6+R2	Switching output + RS 232-interface	500 mm	100
UC500+U9+IUE2+R2	Analogue output + RS 232-interface		
UC3000+U9+E6+R2	Switching output + RS 232-interface	3000 mm	102
UC3000+U9+E7+R2			
UC3000+U9+IUE0+R2	Analogue output + 1 Switching output + RS 232-interface		
UC3000+U9+IUE2+R2			
UJ3000+U1+8B+RS	8 Bit parallel-interface	3000 mm	104
UBE6000+U1+SA2	Through beam ultrasonic barrier	6000 mm	106
UB500+U9+H3	for external control/evaluation units	500 mm	108
UB3000+U9+H3		3000 mm	

For detailed function description, see page 110

UC500+U9+...+R2

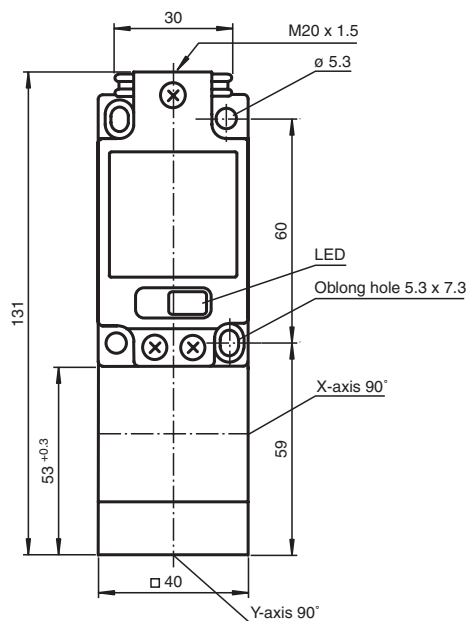
CE

- **Serial interface**
- **Synchronisation options**
- **Temperature compensation**
- **Absolute polarity reversal protection**
- **Parameterisable with ULTRA 2001**
- **1 Analogue output, load-dependent voltage or current + 1 switch output**
UC500+U9+IUE2+R2
- **2 independent switch outputs**
UC500+U9+E6+R2

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

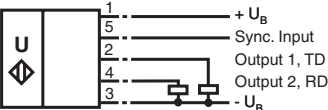
		Model number	UC500+U9+ E5+ R2	UC500+U9+ IUE2+R2
Sensing range	60 ... 500 mm		●	●
Unusable area	0 ... 60 mm		●	●
Standard target plate	100 mm x 100 mm		●	●
Transducer frequency	approx. 380 kHz		●	●
Response delay	for factory setting minimal (EM, NONE): ≤20 ms (2 measuring cycles) default (EM, MXN 5, 2): ≤40 ms (4 measuring cycles) dynamic (EM, DYN): ≤30 ms (3 measuring cycles)		●	●
LED yellow	switching state switch output		●	●
	switching state switch output 1		●	
	switching state switch output 2			
LED red/green	permanently green: "Power on", flashes during standby operation red flashing: "Error", (e.g. background noise level too high)		●	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}		●	●
No-load supply current	≤ 60 mA		●	●
Output type	1 switch output E5: prp NO/NC switchable 1 analogue output, load-dependent $R_L \leq 500 \text{ Ohm}$: current output 4 ... 20 mA $R_L \geq 1 \text{ kOhm}$: voltage output 2 ... 10 V 2 switch outputs prp, NONC		●	●
Rated operational current	200 mA, short-circuit/overload protected		●	●
Voltage drop	≤ 3 V DC		●	●
Deviation of the characteristic curve	≤ 0,2 % of full-scale value			●
Resolution	< 1 mm ≥ 0,172 mm		●	
Repeat accuracy	≤ 0,1 % of full-scale value		●	●
Range hysteresis	≤ 1 % of the set operating distance		●	●
Temperature influence	≤ 2 %		●	●
Synchronisation	1 synchronous connection, bidirectional 0-level: $-U_B \dots (-U_B + 1 \text{ V})$, 1-level: $(-U_B + 5 \text{ V}) \dots +U_B$		●	●
Pulse length	≥ 100 µs		●	●
Pause length	≥ 2 ms		●	●
Synchronisation frequency	≤ 80 Hz, with external synchronisation		●	●
Interface type	RS 232, 9600 bits/s, no parity, 8 data bits, 1 stop bit RS 232, 9600 bits/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)		●	●
Standards	EN 60947-5-2		●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●
Protection degree	IP65		●	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa		●	●
Material				
Housing	PBT		●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●
Mass	180 g		●	●

Date of edition: 08/18/2005

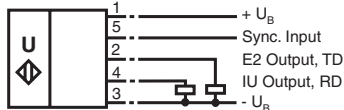


Electrical connection

Standard symbol/Connection:
(Version E6, pnp)

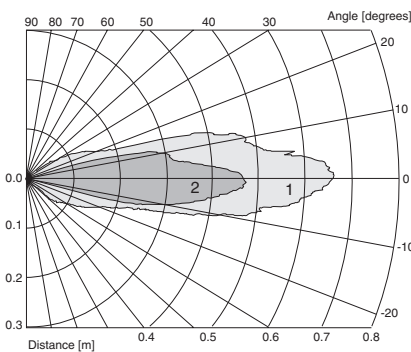


Standard symbol/Connection:
(Version IUE2, pnp)



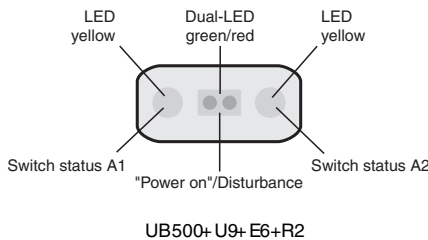
Diagrams

Characteristic response curves

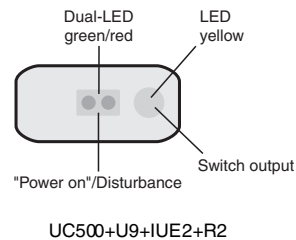


Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, ϕ 25 mm

LED-Window



LED-Window



Series -123M
Series -18GK/-18GM
Series -30GM
Series Varkont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/Power supplies
Accessories

Ultrasonic sensor

UC3000+U9+...+R2



- Serial interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001
- 1 Analogue output, load-dependent voltage or current + switch output
UC3000+U9+IUE0+R2
UC3000+U9+IUE2+R2
- 2 independent switch outputs
UC3000+U9+E6+R2
UC3000+U9+E7+R2

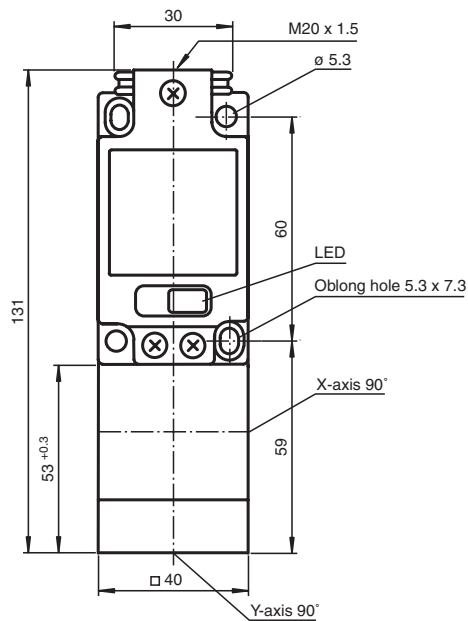


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

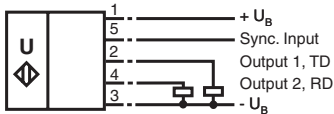
	Model number	UC3000+U9+ E6+ R2	UC3000+U9+ E7+ R2	UC3000+U9+ IUE0+R2	UC3000+U9+ IUE2+R2
Sensing range	300 ... 3000 mm	●	●	●	●
Unusable area	0 ... 300 mm	●	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●	●
Transducer frequency	approx. 130 kHz	●	●	●	●
Response delay	for factory setting minimum (EM; NONE): ≤80 ms (2 measuring cycles) default (EM, MXN, 5, 2): ≤160 ms (4 measuring cycles) dynamic (EM, DYN): ≤120 ms (3 measuring cycles)	●	●	●	●
LED yellow	switching state switch output			●	●
	switching state switch output 1	●	●		
	switching state switch output 2				
LED red/green	permanently green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)	●	●	●	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●	●	●	●
No-load supply current	≤60 mA	●	●	●	●
Output type	1 switch output E0, npn, normally open/closed switchable 1 analogue output, load dependent: R _L ≤ 500 Ohm: current output 4 ... 20 mA R _L ≥ 1 kOhm: voltage output 2 ... 10 V			●	
	1 switch output E5: prp NO/NC switchable 1 analogue output, load-dependent R _L ≤ 500 Ohm: current output 4 ... 20 mA R _L ≥ 1 kOhm: voltage output 2 ... 10 V				●
	2 switch outputs npn, normally open/closed		●		
	2 switch outputs prp, NONC	●			
Rated operational current	200 mA, short-circuit/overload protected	●	●	●	●
Voltage drop	≤3 V DC	●	●	●	●
Deviation of the characteristic curve	≤0,2 % of full-scale value			●	●
Resolution	<1 mm	●	●		
	≥0,172 mm			●	●
Repeat accuracy	≤0,1 % of full-scale value	●	●	●	●
Range hysteresis	≤1 % of the set operating distance	●	●	●	●
Temperature influence	≤2 %	●	●	●	●
Synchronisation	1 synchronous connection, bidirectional 0-level: -U _B ... (-U _B + 1 V), 1-level: (-U _B + 5 V) ... +U _B	●	●	●	●
Pulse length	≥100 µs	●	●	●	●
Pause length	≥2 ms	●	●	●	●
Synchronisation frequency	≤20 Hz, with external synchronisation ≤80 Hz, with external synchronisation	●	●		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	●	●		
Standards	EN 60947-5-2	●		●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●
Protection degree	IP65	●	●	●	●
Connection	terminal compartment, ≤2,5 mm ² conductor csa	●	●	●	●
Material					
Housing	PBT	●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●	●
Mass	180 g	●	●	●	●

Date of edition: 03/18/2005

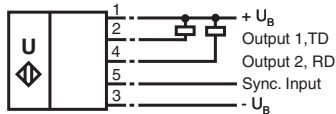


Electrical connection

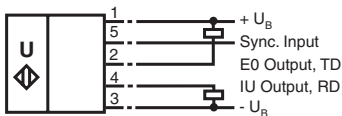
Standard symbol/Connection:
(Version E6, npn)



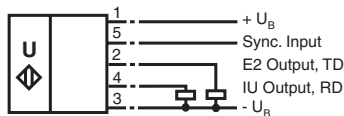
Standard symbol/Connection:
(Version E7, npn)



Standard symbol/Connection:
(Version IUE0, npn)

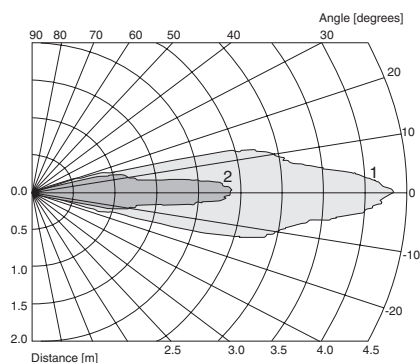


Standard symbol/Connection:
(Version IUE2, npn)



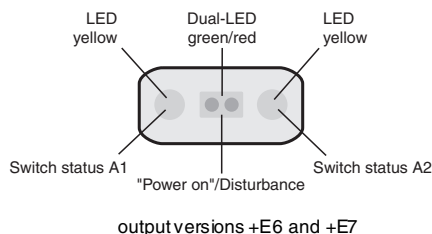
Diagrams

Characteristic response curves

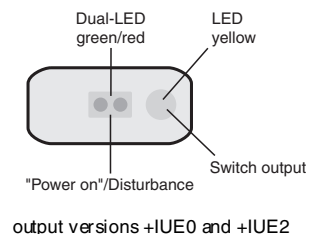


Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, $\phi 25$ mm

LED-Window



LED-Window



Ultrasonic sensor

UJ3000+U1+8B+RS

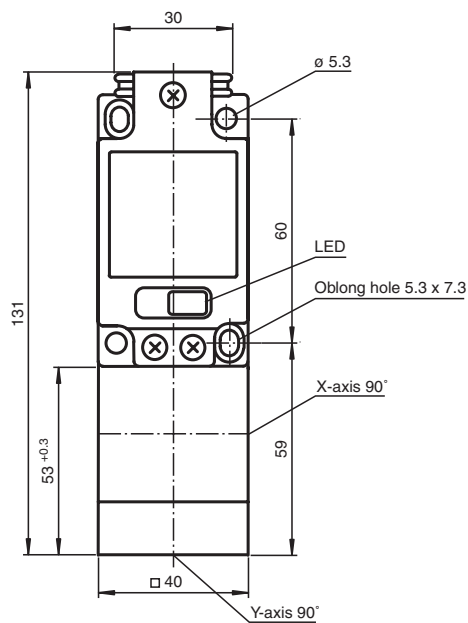


- 8 bit output
- Absolute polarity reversal protection
- Test input
- Fault output
- Serial interface
- Parameterisable with ULTRA 2001

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

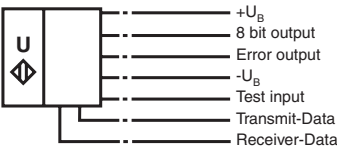
Technical Data

		Model number	UJ3000+U1+8B+RS
Sensing range	300 ... 3000 mm		●
Unusable area	0 ... 300 mm		●
Standard target plate	100 mm x 100 mm		●
Transducer frequency	approx. 130 kHz		●
Response delay	static 4: ≤ 280 ms (factory setting) static 1: ≤ 70 ms dynamic: ≤ 100 ms		●
LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (high level of external noise)		●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}		●
No-load supply current	≤ 90 mA		●
Output type	8 bit output for outputting object distance, prp 1 fault output, prp NC		●
Rated operational current	20 mA, short-circuit/overload protected		●
Voltage drop	U _e - 4 V		●
Resolution	11 mm, (corresponding to 1 LSB)		●
Repeat accuracy	11 mm, (corresponding to 1 LSB)		●
Range hysteresis	11 mm, (corresponding to 1 LSB)		●
Temperature influence	0,17 %/K		●
Input type	1 test input, (-U _B + 5 V) up to +U _B , ≤ 100 kOhm		●
Interface type	RS 232, 9600 bits, no parity, 8 data bits, 1 stop bit		●
Standards	EN 60947-5-2		●
Ambient temperature	-10 ... 50 °C (263 ... 323 K)		●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●
Protection degree	IP65		●
Connection	2 m, cable, 14 x 0.14 mm ² , cast terminal compartment		●
Material			
Housing	PBT		●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●
Mass	290 g		●



Electrical connection

Standard symbol/Connection:



Legend:

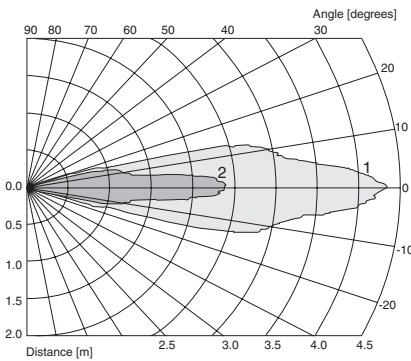
+U_B = Brown Test input = Grey/Pink
-U_B = Blue Error output = Red/Blue

Interface:
Receiver-Data RD = White/Green
Transmit-Data TD = Brown/Green

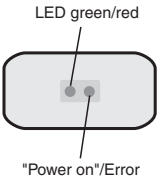
8 bit output:
A1 = White A2 = Yellow
A3 = Pink A4 = Red
A5 = Green A6 = Grey
A7 = Black A8 = Violet

Diagrams

Characteristic response curves



LED-Window



Through-beam ultrasonic barrier

UBE6000+U1+SA2



- High switching frequency
- Complementary outputs
- Absolute polarity reversal protection
- Adjustable sensitivity



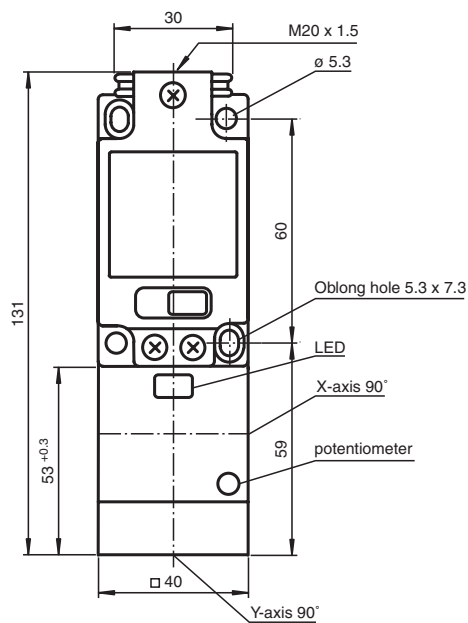
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

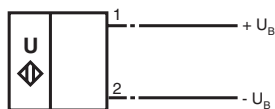
UBE6000+U1+SA2

Sensing range	0 ... 6000 mm	●
Transducer frequency	approx. 130 kHz	●
Operating range	0 ... 6000 mm	●
Reference target	receiver	●
LED yellow	switching state (receiver only)	●
LED green	Emitter: "Power on" mains ON Receiver: "Power on" mains ON	●
LED red	LED on continuously: strong signal LED 2 Hz flashing: multiple reflections	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
Power consumption	Emitter: ≤ 1,5 W Receiver: ≤ 1 W	●
Output type	Receiver: Complementary output stage 200 mA, Short-circuit/overload protected	●
Voltage drop	Receiver: U _B - 3 V	●
Switching frequency	≤ 30 Hz	●
Standards	EN 60947-5-2	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP65	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa	●
Housing	PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	180 g each sensor	●

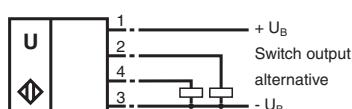


Electrical connection

Standard symbol / Connection:
Emitter

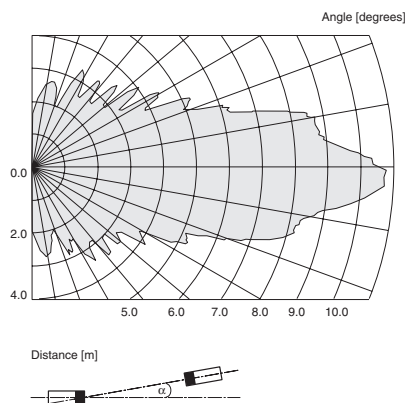


Standard symbol / Connection:
Transceiver

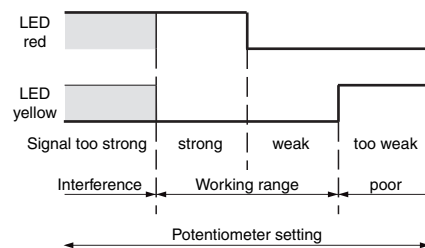


Diagrams

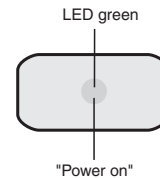
Characteristic response curves



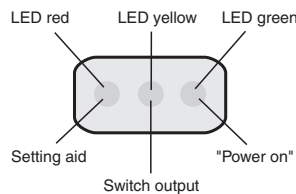
Indicating/operating means



LED-Window



LED-Window-Receiver



Ultrasonic sensor

UB...+U9+H3



- Separate evaluation
- With temperature sensor
- Direct detection mode



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number		UB500+U9+ H3	UB3000+U9+ H3
Sensing range	300 ... 3000 mm		
	60 ... 500 mm	●	
Unusable area	0 ... 300 mm ¹⁾		●
	0 ... 60 mm ¹⁾	●	
Standard target plate	100 mm x 100 mm	●	●
Transducer frequency	approx. 130 kHz		●
	approx. 380 kHz	●	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●	●
No-load supply current	≤ 30 mA	●	●
Output type	1 pulse output for temperature 1-level: > 4 V (100 µA), 0-level: < 0.5 V (100 µA) 1 pulse output for echo propagation time 1-level: ≥ U _B -3 V (< 10 mA), 0-level: ≤ 1 V (100 µA)	●	●
Temperature influence	the echo propagation time: ≤ 0,17 % / K the echo propagation time: 0,17 % / K		●
Pulse length	10 µs/K + timer pulse, synchronisation with the timer pulse	●	●
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive	●	●
Pulse length	10 ... 100 µs (typ. 50 µs) ²⁾	●	
	20 ... 500 µs (typ. 300 µs) ²⁾		●
Pause length	≥ 50 x pulse length	●	●
Standards	EN 60947-5-2	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●
Protection degree	IP65	●	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa	●	●
Material			
Housing	PBT	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●
Mass	180 g	●	●

Description of the sensor functions

The sensing range is determined in the downstream evaluation electronics (e. g. the units UH3-KHD2-4E5, or UH3-KHD2-4I).
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

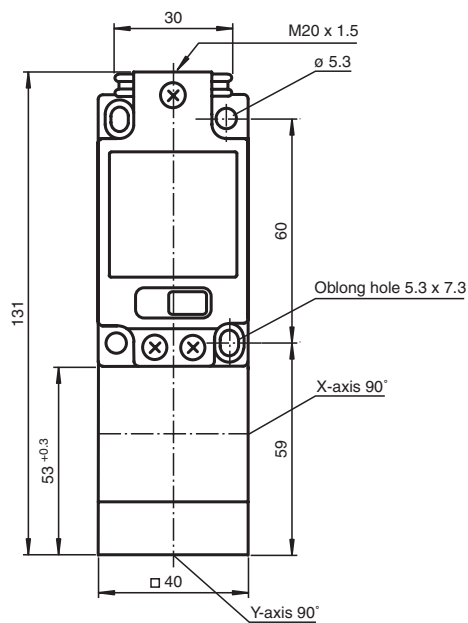
Temperature compensation

A temperature pulse is available at the temperature output for external temperature compensation. It is synchronous to the externally applied clock pulse and has the length T_{Temp}, calculated as follows:

$$T_{Temp} [\mu s] = T_{Akt} [\mu s] + T[K] \times 10 \mu s / K$$

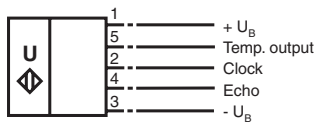
Put into the formula the temperature in Kelvin and the clock time in the unit µs.

1) The unusable area (blind range) BR depends on the pulse duration.
The unusable area reaches a minimum with the shortest pulse duration.
2) The sensors detection range depends on the pulse duration.
With pulse duration < typical pulse duration, the sensors detection range may be reduced.



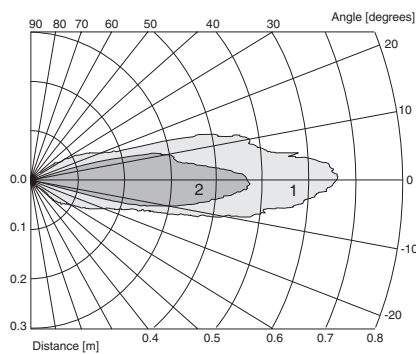
Electrical connection

Standard symbol/Connection:



Diagrams

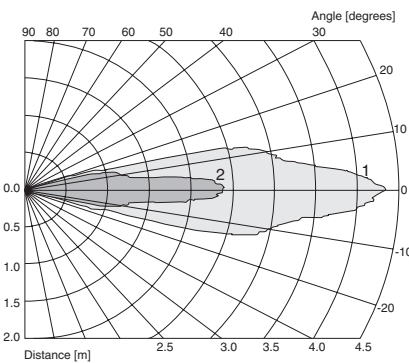
Characteristic response curves



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

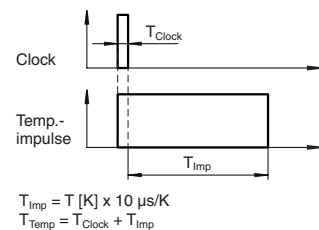
UB500+...

Characteristic response curves



Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

UB3000+...



UC500+U9+E6+R2**Description of the sensor functions**

The outputs of the sensor can be used in two different operating modes: Switching mode with 2 adjustable switching points, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The switching points are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch outputs.

For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

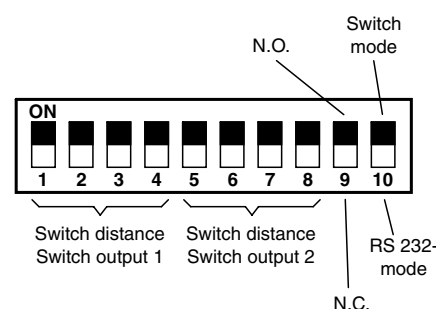
- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	60	0 0 0 0	70
0 0 0 1	80	0 0 0 1	90
0 0 1 0	100	0 0 1 0	110
0 0 1 1	125	0 0 1 1	135
0 1 0 0	150	0 1 0 0	160
0 1 0 1	175	0 1 0 1	185
0 1 1 0	200	0 1 1 0	210
0 1 1 1	230	0 1 1 1	240
1 0 0 0	260	1 0 0 0	270
1 0 0 1	290	1 0 0 1	300
1 0 1 0	320	1 0 1 0	330
1 0 1 1	350	1 0 1 1	360
1 1 0 0	385	1 1 0 0	395
1 1 0 1	420	1 1 0 1	430
1 1 1 0	455	1 1 1 0	465
1 1 1 1	490	1 1 1 1	500

1 = ON, 0 = OFF

DIP Switches in Terminal Compartment**UC500+U9+IUE2+R2****Description of the sensor functions**

The outputs of the sensor can be used in two different operating modes: Switching/analogue mode, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The limits of the IU ramp are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch output.

For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

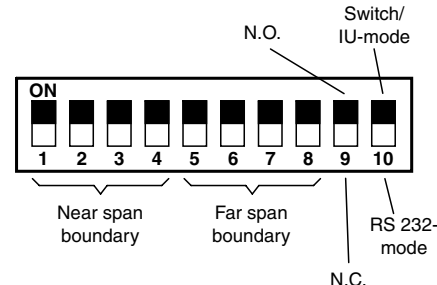
Several functions are available:

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	60	0 0 0 0	60
0 0 0 1	80	0 0 0 1	80
0 0 1 0	100	0 0 1 0	100
0 0 1 1	125	0 0 1 1	125
0 1 0 0	150	0 1 0 0	150
0 1 0 1	175	0 1 0 1	175
0 1 1 0	200	0 1 1 0	200
0 1 1 1	230	0 1 1 1	230
1 0 0 0	260	1 0 0 0	260
1 0 0 1	290	1 0 0 1	290
1 0 1 0	325	1 0 1 0	325
1 0 1 1	360	1 0 1 1	360
1 1 0 0	395	1 1 0 0	395
1 1 0 1	430	1 1 0 1	430
1 1 1 0	465	1 1 1 0	465
1 1 1 1	500	1 1 1 1	500

1 \triangle ON, 0 \triangle OFFDIP Switches in Terminal Compartment:
Adjustment of the Target Window

near span boundary < distant limit \Rightarrow IU-rising slope
 near span boundary > distant limit \Rightarrow IU-declining slope
 near span boundary = distant limit \Rightarrow IU-switch point

Switch point switch output:
 (NDE + FDE)/2 (Preconfiguration)

UC3000+U9+... output versions +E6+R2 and +E7+R2

Description of the sensor functions

The outputs of the sensor can be used in two different operating modes: Switching mode with 2 adjustable switching points, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The switching points are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch outputs.

For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

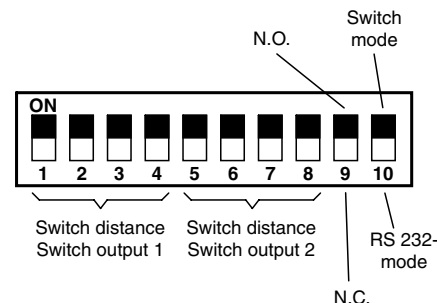
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	300	0 0 0 0	400
0 0 0 1	450	0 0 0 1	550
0 0 1 0	600	0 0 1 0	700
0 0 1 1	750	0 0 1 1	850
0 1 0 0	900	0 1 0 0	100
0 1 0 1	1050	0 1 0 1	1150
0 1 1 0	1200	0 1 1 0	1300
0 1 1 1	1350	0 1 1 1	1450
1 0 0 0	1500	1 0 0 0	1600
1 0 0 1	1700	1 0 0 1	1800
1 0 1 0	1900	1 0 1 0	2000
1 0 1 1	2100	1 0 1 1	2200
1 1 0 0	2300	1 1 0 0	2400
1 1 0 1	2500	1 1 0 1	2600
1 1 1 0	2700	1 1 1 0	2800
1 1 1 1	2900	1 1 1 1	3000

1 \triangle ON, 0 \triangle OFF

DIP Switches in Terminal Compartment



UC3000+U9+... , output versions +IUE0+R2 and +IUE2+R2**Description of the sensor functions**

The outputs of the sensor can be used in two different operating modes: Switching/analogue mode, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The limits of the IU ramp are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch output.

For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

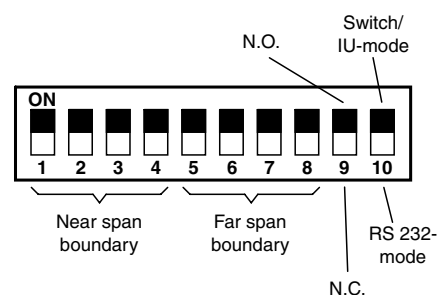
- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	300	0 0 0 0	300
0 0 0 1	450	0 0 0 1	450
0 0 1 0	600	0 0 1 0	600
0 0 1 1	750	0 0 1 1	750
0 1 0 0	900	0 1 0 0	900
0 1 0 1	1050	0 1 0 1	1050
0 1 1 0	1200	0 1 1 0	1200
0 1 1 1	1400	0 1 1 1	1400
1 0 0 0	1600	1 0 0 0	1600
1 0 0 1	1800	1 0 0 1	1800
1 0 1 0	2000	1 0 1 0	2000
1 0 1 1	2200	1 0 1 1	2200
1 1 0 0	2400	1 1 0 0	2400
1 1 0 1	2600	1 1 0 1	2600
1 1 1 0	2800	1 1 1 0	2800
1 1 1 1	3000	1 1 1 1	3000

1 \triangle ON, 0 \triangle OFF

**DIP Switches in Terminal Compartment:
Adjustment of the Target Window**

near span boundary < distant limit \Rightarrow IU-rising slope
 near span boundary > distant limit \Rightarrow IU-declining slope
 near span boundary = distant limit \Rightarrow IU-switch point

Switch point switch output:
 (NDE + FDE)/2 (Preconfiguration)

UJ3000+U1+8B+RS**Description of the sensor functions**

The measurement of the distance is realised using the echo time of the ultrasonic pulse. The μ processor calculates the distance on the basis of the echo time and the speed of sound. The distance is directly issued in parallel in the form of an 8-bit data word.

A serial interface (RS 232, 9 600, n, 8, 1) is also available.

The output functions can be set up flexibly. For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 interface".

In the event of interference that the sensor cannot handle, the sensor goes into failure mode in that the failure output opens and the 8-bit output retains the most recent measuring value. The dual LED goes into the red flashing state.

A 1 level at the test input causes the 8-bit output to switch from 00000000 to 11111111 and back every 200 ms.

UBE6000+U1+SA2**Description of the sensor function**

This system consists of one emitter and one receiver, which are operating independent of each other.

For the handling of the wide dynamic range the sensitivity of the receiver can be adjusted by means of a built in potentiometer.

The red LED can be used as adjustment aid.

System adjustment

Mount emitter and receiver in the desired distance. The detection area has to be unobstructed. Switch on supply voltage and turn potentiometer counter-clockwise until the red LED lights up permanently (strong signal). In case of short distance application, it may happen, that the red LED flashes at a frequency of approx. 2 Hz caused by multi sound reflections between the sensors transducers. In that case, turn the potentiometer clockwise, until the red LED goes off.

Make sure, that the receivers output is not activated (yellow LED off) when the detection area is unobstructed.

In the strong working range, the system is highly resistant against any interference. Only large objects can be detected.

In the weak working range the systems resistance against interference is decreased, but the system is highly sensitive even to detect small objects.

UB...+U9+H3**Description of the sensor functions**

The sensing range is determined in the downstream evaluation electronics (e. g. the units UH3-KHD2-4E5, or UH3-KHD2-4I). The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

Temperature compensation

A temperature pulse is available at the temperature output for external temperature compensation. It is synchronous to the externally applied clock pulse and has the length T_{Temp} calculated as follows:

$$T_{Temp}[\mu s] = T_{akt}[\mu s] + T[K] \times 10 \mu s / K$$

Put into the formula the temperature in Kelvin and the clock time in the unit μs .

- 1) The unusable area (blind range) BR depends on the pulse duration.
The unusable area reaches a minimum with the shortest pulse duration.
- 2) The sensors detection range depends on the pulse duration.
With pulse duration < typical pulse duration, the sensors detection range may be reduced.

Series -FP											Notes
Series -12GM											
Series -18GK/-18GM											
Series -30GM											
Series <i>VarKont</i>											
Series -FP											
Series -F12											
Series -F42											
Series -F43											
Series -F54											
Series -F64											
Series -D1											
Series LUC											
Double sheet monitoring											
Control units/ Power supplies											
Accessories											

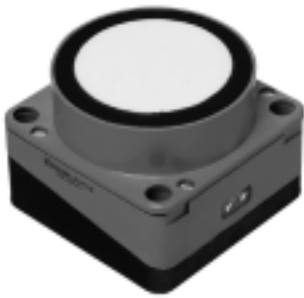


Model number	Description	Detection range	Page
UC6000-FP-E6-R2-P5 UC6000-FP-E7-R2-P5	2 switching outputs + RS 232 interface	6000 mm	116
UC6000-FP-IUE0-R2-P5 UC6000-FP-IUE2-R2-P5	1 analogue output + 1 switching output + RS 232 interface	6000 mm	116
UJ4000-FP-E2-P1	1 switching output	4000 mm	118
UJ6000-FP-8B-RS	8 bit parallel interface + RS 232 interface	4000 mm	120
UB1000+FP1+E6	Reflex sensor with switching output	1000 mm	122
UB6000-FP-H3	For external control/evaluation unit	6000 mm	124

For detailed function description, see page 126

Ultrasonic sensor

UC6000-FP-...-R2-P5



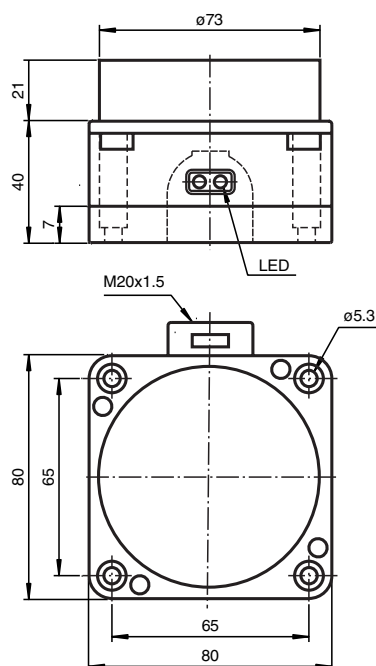
- Serial interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001
- 1 analogue output, load-dependent voltage or current + 1 witch output
UC6000-FP-IUE0-R2-P5
UC6000-FP-IUE2-R2-P5
- 2 independent switch outputs
UC6000-FP-E6-R2-P5
UC6000-FP-E7-R2-P5
- UC6000-FP-E7-R2-P5

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

	Model number	UC6000-FP-E6-R2-P5	UC6000-FP-E7-R2-P5	UC6000-FP-IUE0-R2-P5	UC6000-FP-IUE2-R2-P5
Sensing range	800 ... 6000 mm				
Unusable area	0 ... 800 mm	●	●	●	●
Standard target plate	100 mm x 100 mm	●	●	●	●
Transducer frequency	approx. 65 kHz	●	●	●	●
Response delay	for factory setting minimal (EM, NONE): ≤180 ms (2 measuring cycles) default (EM, MXN, 5, 2): ≤360 ms (4 measuring cycles) dynamic (EM, DYN): ≤270 ms (3 measuring cycles)	●	●	●	●
LED yellow	switching state switch output				●
	switching state switch output 1	●	●		
	switching state switch output 2				
LED red/green	permanently green: "Power on", flashes during standby operation red flashing: "Error", (e.g. background noise level too high)	●	●	●	●
Operating voltage	15 ... 30 V DC, ripple 10 % _{SS} 20 ... 30 V DC, ripple 10 % _{SS}	●	●		
No-load supply current	≤ 60 mA	●	●		●
Output type	1 switch output E0, npn, normally open/closed switchable 1 analogue output, load dependent: R _L ≤ 500 Ohm; current output 4 ... 20 mA, R _L ≥ 1 kOhm; voltage output 2 ... 10 V				●
	1 switch output E5: prp NO/NC switchable 1 analogue output, load-dependent: R _L ≤ 500 Ohm; current output 4 ... 20 mA, R _L ≥ 1 kOhm; voltage output 2 ... 10 V				
	2 switch outputs npn, normally open/closed		●		
	2 switch outputs prp, NO/NC	●			
Rated operational current	200 mA, short-circuit/overload protected	●	●	●	●
Voltage drop	≤ 3 V DC	●	●	●	●
Range hysteresis	≤ 1 % of the set operating distance	●	●	●	●
Deviation of the characteristic curve	≤ 0,2 %			●	●
Repeat accuracy	≤ 0,1 % of full-scale value	●	●	●	●
Resolution	< 1 mm	●	●		
	depending on the set evaluation range: 0,172 mm, if evaluation range < 705 mm, evaluation range [mm]/ 3296, when evaluation range > 705 mm			●	●
Temperature influence	≤ 2 %	●	●	●	●
Synchronisation	1 synchronous connection, bidirectional 0-level: -U _B ... (-U _B + 1 V), 1-level: (-U _B + 5 V) ... +U _B	●	●	●	●
Pulse length	≥ 100 µs	●	●	●	●
Pause length	≥ 2 ms	●	●	●	●
Synchronisation frequency	≤ 10 Hz, with external synchronisation	●	●	●	●
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	●	●		
Standards	EN 60947-5-2	●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●
Protection degree	IP65	●	●	●	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa	●	●	●	●
Material					
Housing	PBT	●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●	●
Mass	320 g	●	●	●	●

Date of edition: 08/18/2005

Series
-12GM

**Series
-18GK/-18GM**

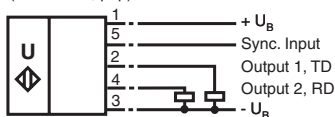
Series
-30GMSeries
VarKont

Series-FP

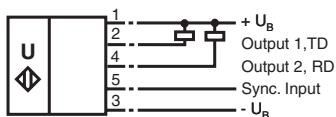
Series
-F12

Electrical connection

Standard symbol/Connection:
(Version E6, pnp)



Standard symbol/Connection:
(Version E7, npn)

Series
-F42Series
-F43Series
-F54Series
-F64Series
-D1

Series LUC

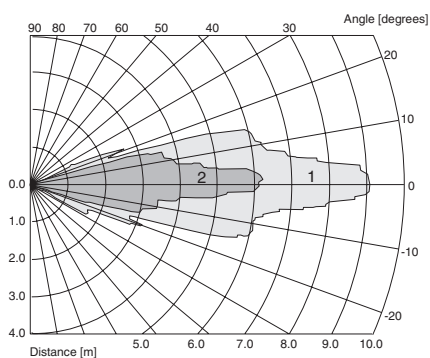
Double sheet monitoring

Control units/
Power supplies

Accessories

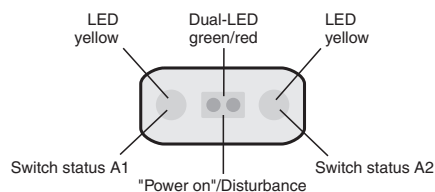
Diagrams

Characteristic response curves



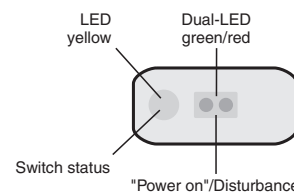
Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

LED-Window



output versions -E6 and -E7

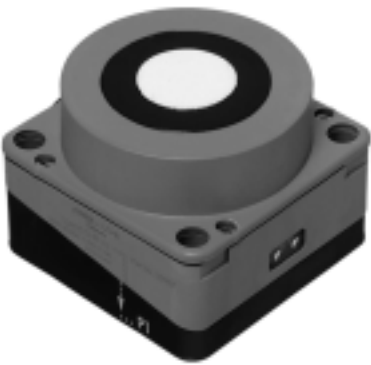
LED-Window



output versions -IUE0 and -IUE2

Ultrasonic sensor

UJ4000-FP-E2-P1



- Absolute polarity reversal protection
- 1 switch output
- TEACH-IN input
- Reflex sensor function



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

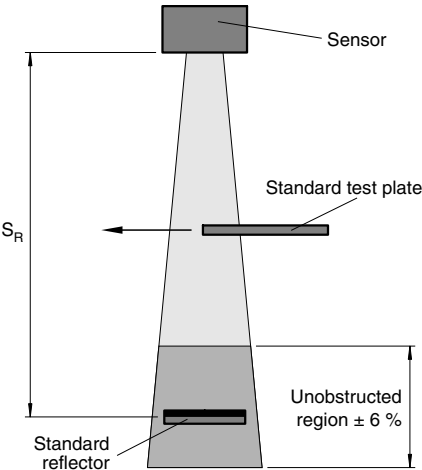
UJ4000-FP-E2-P1

Sensing range	1000 ... 4000 mm	●
Operating range	0 ... reflector distance S_R - 6 %	●
Standard target plate	100 mm x 100 mm	●
Transducer frequency	approx. 85 kHz	●
Response delay	≤ 900 ms, for TEACH-IN with +U _e ≤ 150 ms for TEACH-IN with -U _e	●
LED yellow	switching state switch output	●
LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (reflector incorrectly positioned)	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
No-load supply current	≤ 90 mA	●
Output type	1 switch output, NO prp	●
Rated operational current	200 mA, short-circuit/overload protected	●
Voltage drop	≤ 3 V	●
Input type	1 TEACH-IN input, operating distance 1: -U _B ... (-U _B + 2 V), operating distance 2: (+U _B - 2 V) ... +U _B	●
Standards	EN 60947-5-2	●
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP65	●
Connection	terminal compartment, ≤ 2.5 mm ² conductor csa	●
Material		
Housing	PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	320 g	●

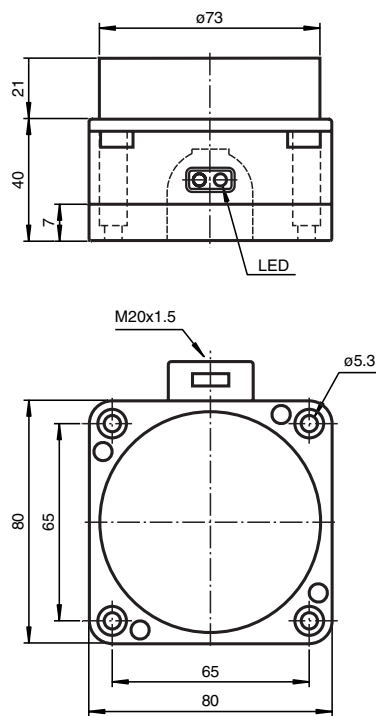
Description of the sensor functions

The measurement of the distance is realised using the echo time of ultrasonic pulses. After installation, the transmitter is taught with the distance to a stationary reflector and stores this value by shorting the TEACH-IN input with -U_B or +U_B (see Electrical Connection). The distance determined in this manner is retained for as long as required when the power supply is shut off. If an interruption of the barrier by an object is determined during operation, switch output is closed.

If objects smaller than the standard measuring plate are to be detected, the reflector must also be reduced in size accordingly. This may result in a reduction of range.

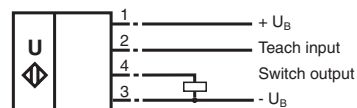


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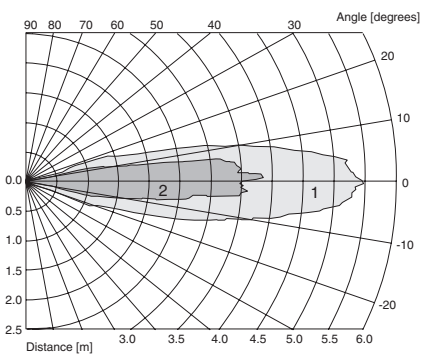
Electrical connection

Standard symbol/Connection:



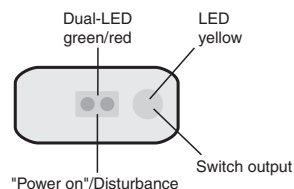
Diagrams

Characteristic response curves



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

LED-Window

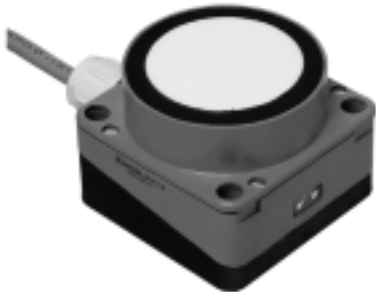


"Power on"/Disturbance

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Ultrasonic sensor

UJ6000-FP-8B+RS



• 8 bit output

• Absolute polarity reversal protection

• Test input

• Fault output

• Serial interface

• Parameterisable with ULTRA 2001

CE

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data			
	Model number		UJ6000-FP-8B+RS
Sensing range	800 ... 6000 mm		●
Unusable area	0 ... 800 mm		●
Standard target plate	100 mm x 100 mm		●
Transducer frequency	approx. 65 kHz		●
Response delay	static 4: ≤ 720 ms (factory setting) static 1: ≤ 180 ms dynamic: ≤ 270 ms		●
LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (high level of external noise)		●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}		●
No-load supply current	≤ 90 mA		●
Output type	8 bit output for outputting object distance, prp 1 fault output, prp NC		●
Rated operational current	20 mA, short-circuit/overload protected		●
Voltage drop	≤ 4 V		●
Range hysteresis	21 mm, (corresponding to 1 LSB)		●
Repeat accuracy	21 mm, (corresponding to 1 LSB)		●
Resolution	21 mm, (corresponding to 1 LSB)		●
Temperature influence	0,17 %/K		●
Input type	1 test input, (-U _B + 5 V) up to +U _B , ≤ 100 kOhm		●
Interface type	RS 232, 9600 bits, no parity, 8 data bits, 1 stop bit		●
Standards	EN 60947-5-2		●
Ambient temperature	-10 ... 50 °C (263 ... 323 K)		●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●
Protection degree	IP65		●
Connection	2 m, cable, 14 x 0.14 mm ² , cast terminal compartment		●
Material			
Housing	PBT		●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●
Mass	430 g		●

Description of the sensor functions

The measurement of the distance is realised using the echo time of the ultrasonic pulse. The μ processor calculates the distance on the basis of the echo time and the speed of sound. The distance is directly issued in parallel in the form of an 8-bit data word. A serial interface (RS 232, 9 600, n, 8, 1) is also available.

The output functions can be set up flexibly. For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 interface".

In the event of interference that the sensor cannot handle, the sensor goes into failure mode in that the failure output opens and the 8-bit output retains the most recent measuring value. The dual LED goes into the red flashing state.

A 1 level at the test input causes the 8-bit output to switch from 00000000 to 11111111 and back every 200 ms.

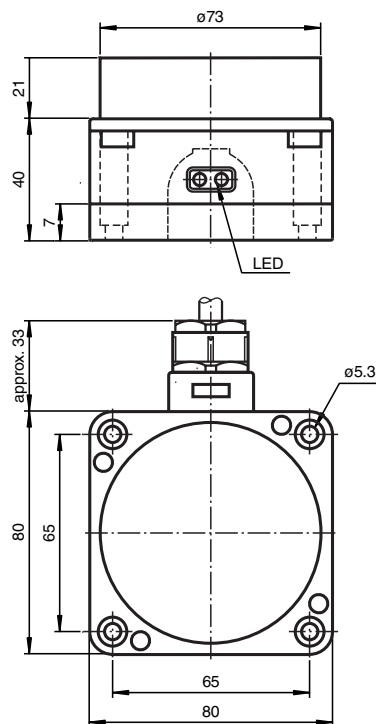
Subject to reasonable modifications due to technical advances.

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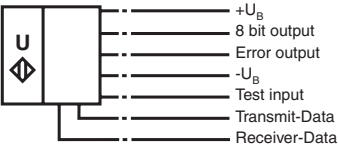
Date of edition: 03/18/2005

120



Electrical connection

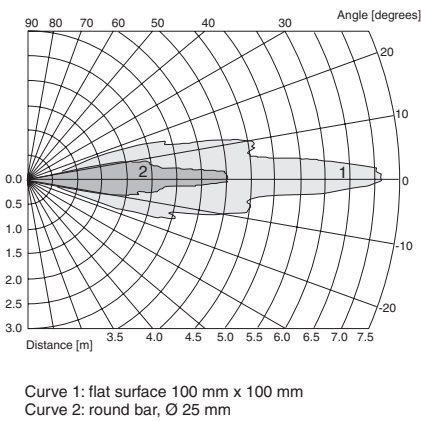
Standard symbol/Connection:



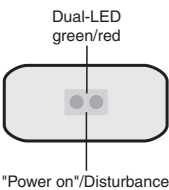
Legend:
+U_B = Brown Test input = Grey/Pink
-U_B = Blue Error output = Red/Blue
Interface:
Receiver-Data RD = White/Green
Transmit-Data TD = Brown/Green
8 bit output:
A1 = White A2 = Yellow
A3 = Pink A4 = Red
A5 = Green A6 = Grey
A7 = Black A8 = Violet

Diagrams

Characteristic response curves



LED-Window

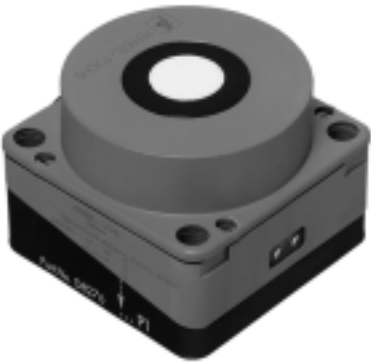


Date of edition: 08/18/2005

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/Power supplies
Accessories

Reflex sensor

UB1000+FP1+E6



- Through-beam and direct detection modes
- 2 independent switch outputs
- 4 operating modes can be set



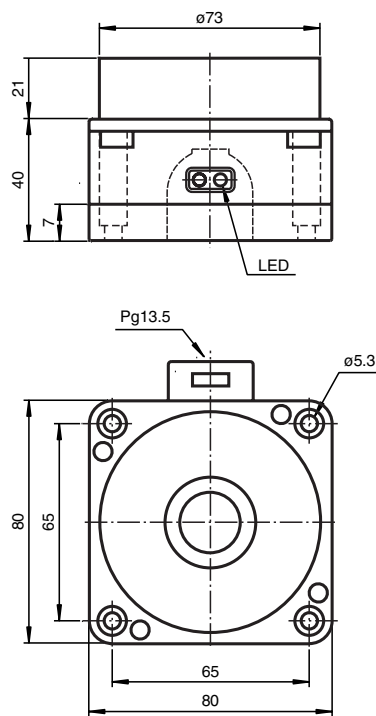
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

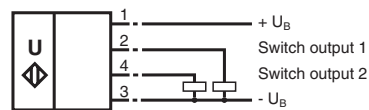
UB1000+FP1+E6

Sensing range	200 ... 1000 mm	●
Unusable area	0 ... 200 mm	●
Standard target plate	100 mm x 100 mm	●
Transducer frequency	approx. 175 kHz	●
Response delay	≤ 100 ms	●
LED green	Power on	●
LED yellow	switch output 1 switch output 2	●
LED red	fault (due to external noise or incorrect adjustment)	●
DIP-switch	S9= ON/NO S9= OFF/ NC S10= ON/Window operation (barrier mode) S10= OFF/independent switch points	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
No-load supply current	≤ 90 mA	●
Output type	2 switch outputs prp, NO/NC	●
Rated operational current	200 mA, short-circuit/overload protected	●
Voltage drop	≤ 3 V DC	●
Range hysteresis	≤ 5 % of the set operating distance	●
Switching frequency	≤ 5 Hz	●
Repeat accuracy	≤ 1 %	●
Temperature influence	≤ 0,17 %/ K	●
Standards	EN 60947-5-2	●
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP65	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa	●
Material		
Housing	PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	338 g	●



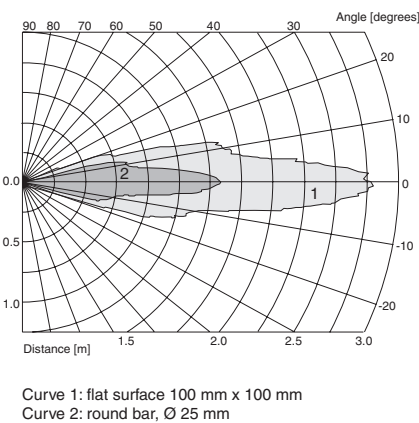
Electrical connection

Standard symbol/Connection:

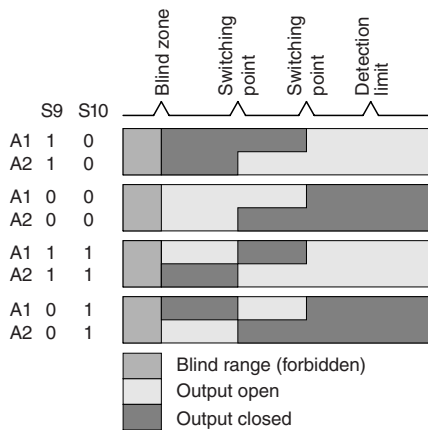


Diagrams

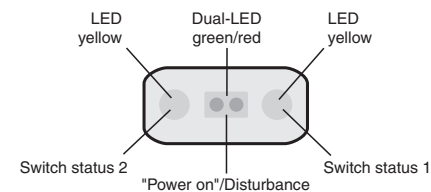
Characteristic response curves



Output functions

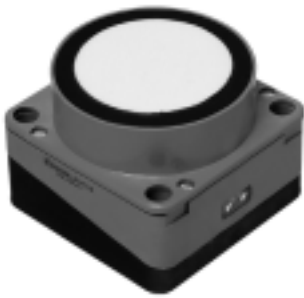


LED-Window



Ultrasonic sensor

UB6000-FP-H3



- Separate evaluation
- With temperature sensor
- Direct detection mode



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

UB6000-FP-H3

Sensing range	800 ... 6000 mm	●
Unusable area	0 ... 800 mm ¹⁾	●
Standard target plate	100 mm x 100 mm	●
Transducer frequency	approx. 65 kHz	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
No-load supply current	≤ 30 mA	●
Output type	1 pulse output for temperature 1-level: > 4 V (100 µA), 0-level: < 0.5 V (100µA) 1 pulse output for echo propagation time 1-level: ≥ U _B -3 V (< 10 mA), 0-level: ≤ 1 V (100 µA)	●
Temperature influence	the echo propagation time: ≤ 0,17 % / K	●
Pulse length	10 µs/K + timer pulse, synchronisation with the timer pulse	●
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive	●
Pulse length	50 ... 700 µs (typ. 500 µs) ²⁾	●
Pause length	≥ 50 x pulse length	●
Standards	EN 60947-5-2	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP65	●
Connection	terminal compartment, ≤ 2,5 mm ² conductor csa	●
Material		
Housing	PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	320 g	●

Description of the sensor functions

The sensing range is determined in the downstream evaluation electronics (e. g. the units UH3-KHD2-4E5, or UH3-KHD2-4I).
 The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

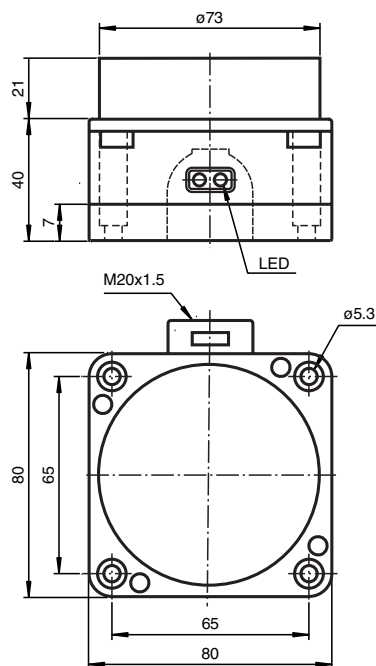
Temperature compensation

A temperature pulse is available at the temperature output for external temperature compensation. It is synchronous to the externally applied clock pulse and has the length T_{Temp}, calculated as follows:

$$T_{Temp}[\mu s] = T_{akt}[\mu s] + T[K] \times 10 \mu s / K$$

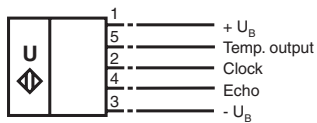
Put into the formula the temperature in Kelvin and the clock time in the unit µs.

- 1) The unusable area (blind range) BR depends on the pulse duration.
The unusable area reaches a minimum with the shortest pulse duration.
- 2) The sensors detection range depends on the pulse duration.
With pulse duration < typical pulse duration, the sensors detection range may be reduced.



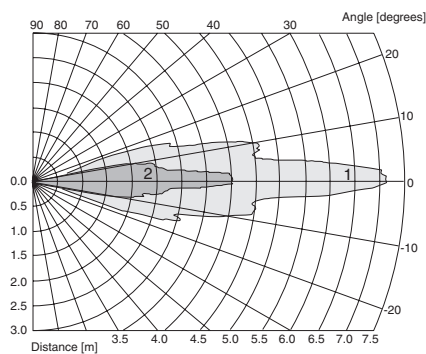
Electrical connection

Standard symbol/Connection:

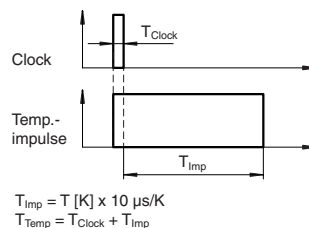


Diagrams

Characteristic response curves



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, \varnothing 25 mm



UC6000-FP-...-R2-P5 , output versions -E6 and -E7

Description of the sensor functions

The outputs of the sensor can be used in two different operating modes: Switching mode with 2 adjustable switching points, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The switching points are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch outputs. For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

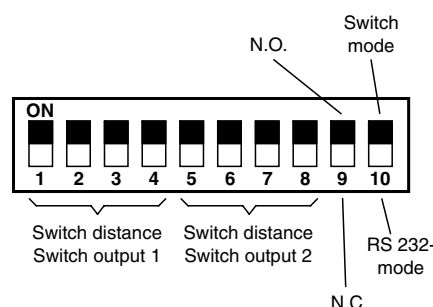
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	800	0 0 0 0	950
0 0 0 1	1100	0 0 0 1	1250
0 0 1 0	1400	0 0 1 0	1550
0 0 1 1	1700	0 0 1 1	1850
0 1 0 0	2000	0 1 0 0	2150
0 1 0 1	2300	0 1 0 1	2450
0 1 1 0	2600	0 1 1 0	2750
0 1 1 1	2900	0 1 1 1	3050
1 0 0 0	3200	1 0 0 0	3350
1 0 0 1	3500	1 0 0 1	3650
1 0 1 0	3800	1 0 1 0	4000
1 0 1 1	4200	1 0 1 1	4400
1 1 0 0	4600	1 1 0 0	4800
1 1 0 1	5000	1 1 0 1	5200
1 1 1 0	5400	1 1 1 0	5600
1 1 1 1	5800	1 1 1 1	6000

1 \uparrow ON, 0 \uparrow OFF

DIP Switches in Terminal Compartment



UC6000-FP-...-R2-P5 , output versions -IUE0 and -IUE2

Description of the sensor functions

The outputs of the sensor can be used in two different operating modes: Switching/analogue mode, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The limits of the IU ramp are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch output.

For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".

Caution: Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

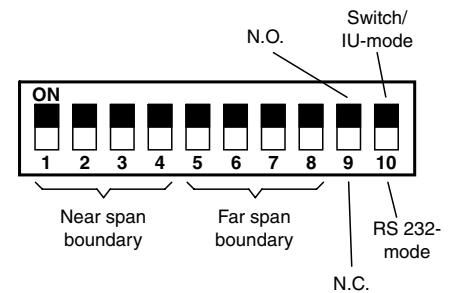
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

Adjustment of the evaluation window via coding switch in terminal compartment

Switch 1 2 3 4	NDE [mm]	Switch 5 6 7 8	FDE [mm]
0 0 0 0	800	0 0 0 0	800
0 0 0 1	1100	0 0 0 1	1100
0 0 1 0	1400	0 0 1 0	1400
0 0 1 1	1700	0 0 1 1	1700
0 1 0 0	2000	0 1 0 0	2000
0 1 0 1	2300	0 1 0 1	2300
0 1 1 0	2650	0 1 1 0	2650
0 1 1 1	3000	0 1 1 1	3000
1 0 0 0	3350	1 0 0 0	3350
1 0 0 1	3700	1 0 0 1	3700
1 0 1 0	4050	1 0 1 0	4050
1 0 1 1	4400	1 0 1 1	4400
1 1 0 0	4800	1 1 0 0	4800
1 1 0 1	5200	1 1 0 1	5200
1 1 1 0	5600	1 1 1 0	5600
1 1 1 1	6000	1 1 1 1	6000

1 \triangle ON, 0 \triangle OFF

DIP Switches in Terminal Compartment: Adjustment of the Target Window



near span boundary < distant limit \Rightarrow IU-rising slope
 near span boundary > distant limit \Rightarrow IU-declining slope
 near span boundary = distant limit \Rightarrow IU-switch point

Switch point switch output:
 (NDE + FDE)/2 (Preconfiguration)

UB1000+FP1+E6

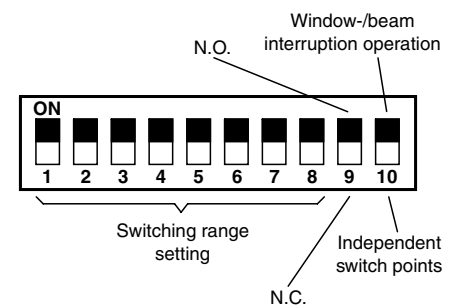
Description of the sensor functions

The sensor is suitable for direct-detection mode as well as beam-interruption mode. The functions of the outputs can be set with switches S9 and S10 in accordance with the following table.

Switch	Switching range
S1	200 ... 300 mm
S2	300 ... 400 mm
S3	400 ... 500 mm
S4	500 ... 600 mm
S5	600 ... 700 mm
S6	700 ... 800 mm
S7	800 ... 900 mm
S8	900 ... 1000 mm

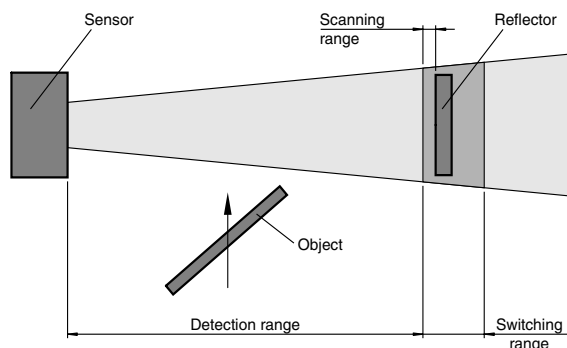
A continuous switching range must be selected. When operating with independent switching points, A1 switches the upper limit and A2 the lower limit of the switching range.

DIP Switches in Terminal Compartment



Barrier mode

In barrier mode, primarily the range up to objects used as reflector will be evaluated (e. g. machine part). Objects entering the range between the sensor and reflector are detected. This includes objects of a strongly sound-absorbent nature and objects positioned at an angle to the sensor's active axis. In this case, no echo reaches the receiver. If the sound is reflected by an object, the reflection will have a different echo time from the regular reflector echo. The sensor detects the object on the basis of the shorter echo time or lack of an echo while in barrier mode.



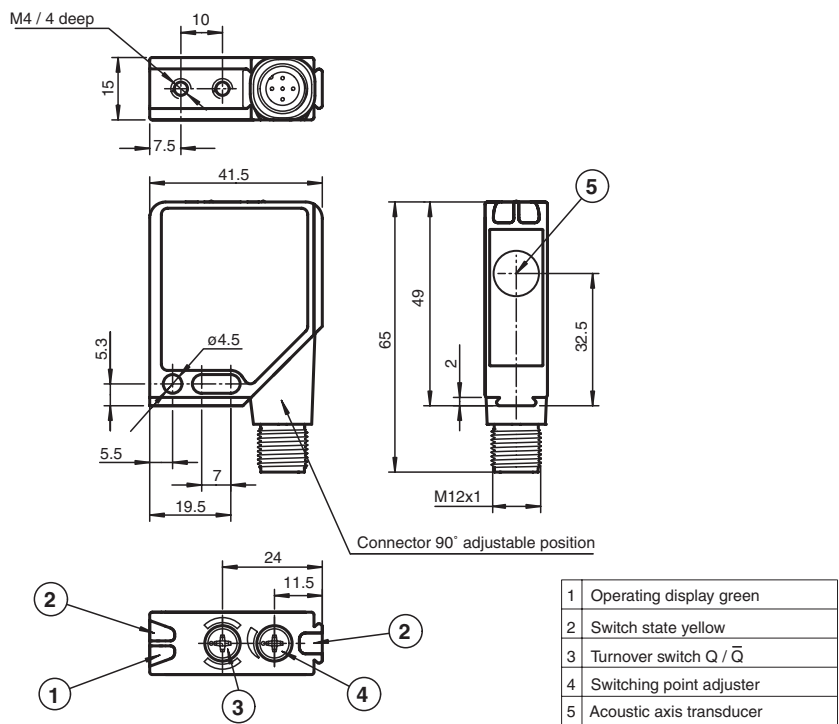
For use as a barrier, set the close function (S9 = 1) and window mode (barrier mode) (S10 = 1). The distance between the sensor and the reflector determines the switching range which must be set using a switch between S1 and S8. Only one switch may be set to "ON", resulting in a switching range of 100 mm.

The sensor and/or reflector should be adjusted in such a manner that output A1 is closed. The reflector should be positioned as closely as possible to the sensor's near switching range limit. The sensor works in direct-detection mode in the area between the reflector and the sensor's near limit. A reliable evaluation is therefore not possible.

If an interruption of the barrier by an object is determined during operation, switch output A1 is opened. Output A2 is not taken into consideration as a rule, as it also works in direct-detection mode rather than beam-interruption mode.

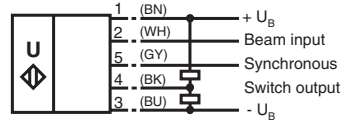


Model number	Detection range	Page
UB800-F12P-EP-V15	800 mm	130



Electrical connection

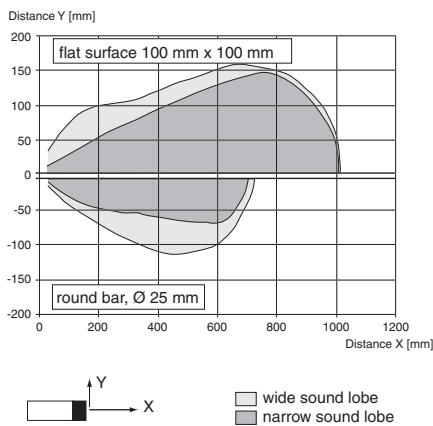
Standard symbol/Connections:
(version EP, pnp/npn)



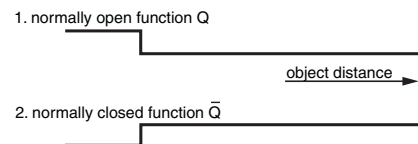
Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve



Switching output function



UB800-F12P-EP-V15

Synchronisation

To suppress mutual influence, the sensor is equipped with a synchronisation connection. If this is not activated, the sensor works with an internally generated clock. Synchronisation of multiple sensors can be achieved in the following ways.

External synchronisation

The sensor can be synchronized by external application of a square wave voltage. A synchronisation impulse on the synchronisation input leads to the execution of one measurement cycle. The impulse width must be larger than 100 µs. The measurement cycle starts with the falling flank. A low level > 1 sec or an open synchronisation input puts the sensor in normal mode. A high level on the synchronisation input deactivates the sensor.

Two operational modes are possible

- 1. Multiple sensors are controlled using the same synchronisation signal. The sensors work in synch.
- 2. The synchronisation impulses are cyclically fed to only one sensor at a time. The sensors work in multiplex mode.

Autosynchronisation

The synchronisation connections of up to 10 sensors are connected together with the option of autosynchronisation. These sensors work in multiplex mode after power is switched on. The activation delay is increased corresponding to the number of synchronised sensors.

Note:

If the synchronisation option is not used, the synchronisation input should be connected to ground (0V), or the sensor connected using a V1 connector cable (4-pin).

Selection of beam characteristics

By switching the beam input, the activation characteristics of the ultrasound sensor can be selected. If the beam input is open or connected to +U_B, the sensor works with a wide ultrasonic cone. A beam input connected to -U_B causes the sensor to work with a narrower ultrasonic cone. This setting is preferred when an object in the vicinity of the sensor is close to the ultrasonic beam, and should be suppressed. The characteristic of the ultrasonic cone can be changed during sensor operation. Switching the sound cone characteristics becomes active one second after the change to the signal level at the beam input.

Setting the switch point

The ultrasonic sensor possesses a switch output, of which the switching point can be set simply and precisely using the built-in 12-position potentiometer. Using the switch Q / \overline{Q} which is also easy to find on the upper side of the sensor, the effective direction of the switching output can be selected.

There are two different output functions which can be selected

- 1. one switching point, normally open
- 2. one switching point, normally closed

LED display

	Opening function (Q)	Closing function (Q)
LED green:	Power On	
LED yellow:	Switch state Object outside switching area, or no object	Switch state Object detected in switching area
LED red	Potentiometer for setting of switch point at "lim it"	
LED red flashing	Ultrasonic error	



UB...-F42-...V15
(top looker)



UB...-F42S-...V15
(side looker)

Model number	AC-version/ relay output	side looker	top looker	Detection range	Page
UB400-F42-UK-V95	●		●	400 mm	134
UB400-F42S-UK-V95	●	●			
UB500-F42-E4-V15			●	500 mm	136
UB500-F42S-E4-V15		●			
UB500-F42-E5-V15			●		
UB500-F42S-E5-V15		●			
UB500-F42-I-V15			●		
UB500-F42S-I-V15		●			
UB500-F42-U-V15			●		
UB500-F42S-U-V15		●			
UB500-F42-E6-V15			●		
UB500-F42S-E6-V15		●			
UB500-F42-E7-V15			●		
UB500-F42S-E7-V15		●			
UB1500-F42-UK-V95	●		●	1500 mm	138
UB1500-F42S-UK-V95	●	●			
UB2000-F42-E4-V15			●	2000 mm	140
UB2000-F42S-E4-V15		●			
UB2000-F42-E5-V15			●		
UB2000-F42S-E5-V15		●			
UB2000-F42-I-V15			●		
UB2000-F42S-I-V15		●			
UB2000-F42-U-V15			●		
UB2000-F42S-U-V15		●			
UB2000-F42-E6-V15			●		
UB2000-F42S-E6-V15		●			
UB2000-F42-E7-V15			●		
UB2000-F42S-E7-V15		●			
UB3000-F42-UK-V95	●		●	3000 mm	142
UB4000-F42-E4-V15			●	4000 mm	144
UB4000-F42-E5-V15			●		
UB4000-F42-I-V15			●		
UB4000-F42-U-V15			●		
UB4000-F42-E6-V15			●		
UB4000-F42-E7-V15			●		

For detailed function description, see page 146

Ultrasonic sensor

UB400-F42(S)-UK-V95

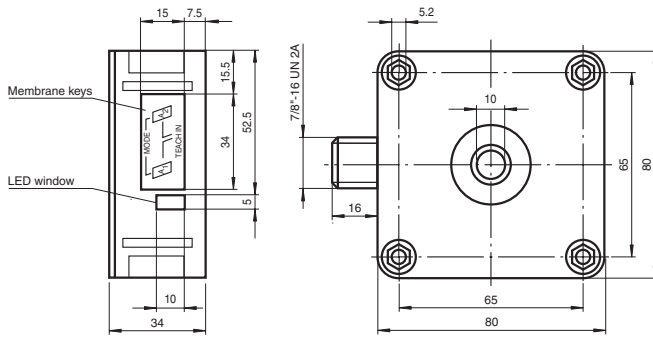


- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- NO/NC selectable

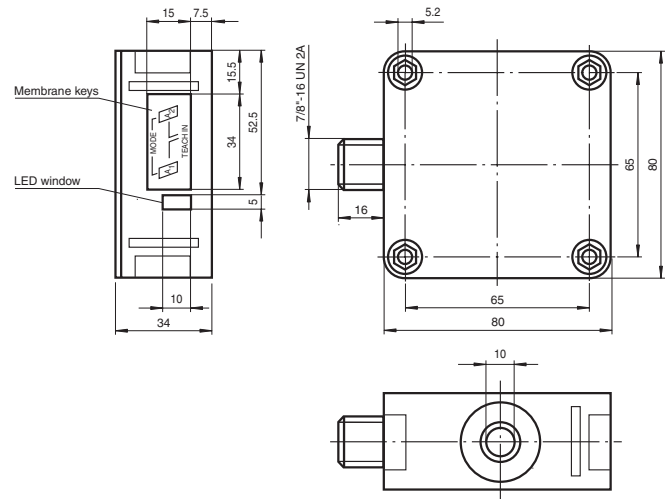
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

		Model number	UB400-F42-UK-V95	UB400-F42S-UK-V95
Series -F42	Sensing range	40 ... 400 mm	●	●
	Adjustment range	50 ... 400 mm	●	●
	Unusable area	0 ... 40 mm	●	●
Series -F43	Standard target plate	100 mm x 100 mm	●	●
	Transducer frequency	approx. 390 kHz	●	●
	Response delay	approx. 50 ms	●	●
Series -F54	LED green	permanently green: Power on	●	●
	LED yellow	permanent: switching state switch output flashing: TEACH-IN function	●	●
	LED red	normal operation: "fault" TEACH-IN function: no object detected	●	●
Series -F64	Operating voltage	20 ... V DC ... 253 V AC	●	●
	No-load supply current	≤ 60 mA	●	●
	Output type	1 relay output	●	●
Series -D1	Rated operational current	3 A	●	●
	Switching frequency	≤ 8 Hz	●	●
	Range hysteresis	1 % of the set operating distance	●	●
Series LUC	Repeat accuracy	≤ 0,5 % of switching point	●	●
	Temperature influence	± 1 % of full-scale value	●	●
	Standards	EN 60947-5-2	●	●
Series -FP	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●
	Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●
	Protection degree	IP65	●	●
Series -F12	Connection	Connector V95 (7/8"-16 UN 2A), 5-pin	●	●
	Housing	PBT	●	●
	Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●
Series -F42	Mass	260 g	●	●



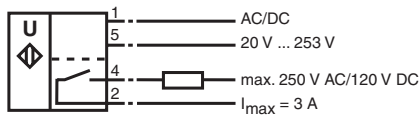
Housing version -F42



Housing version -F42S

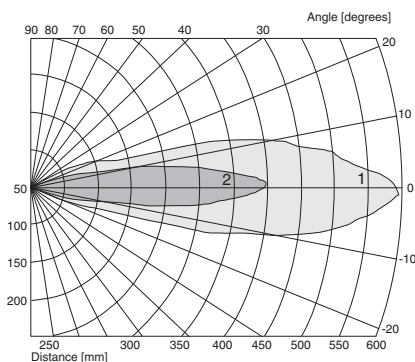
Electrical connection

Standard symbol/Connections:



Diagrams

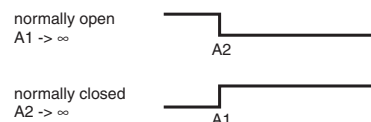
Characteristic response curves



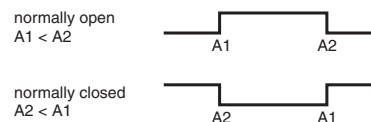
Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Possible operating modes

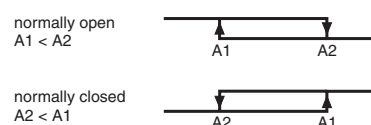
1. Switch point operation



2. Window operation



3. Hysteresis operation



4. Object presence detection mode

A1 -> ∞, A2 -> ∞: Sensor detects object presence within sensing range
Note A1 -> ∞, A2 -> ∞ means: cover sensor with hand or remove all objects from sensing range

Ultrasonic sensor

UB500-F42(S)-...-V15

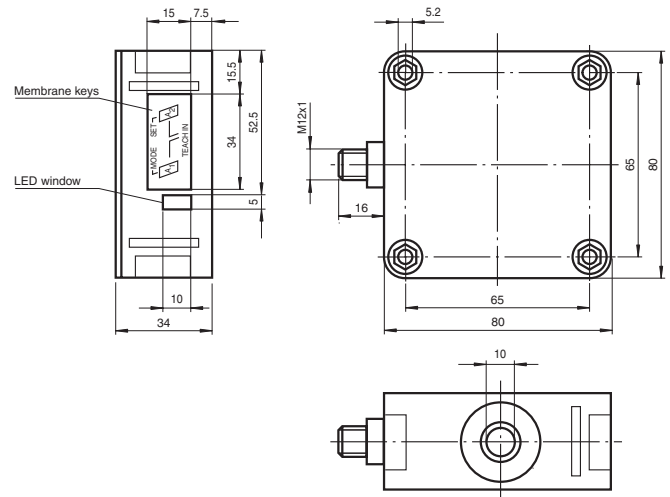
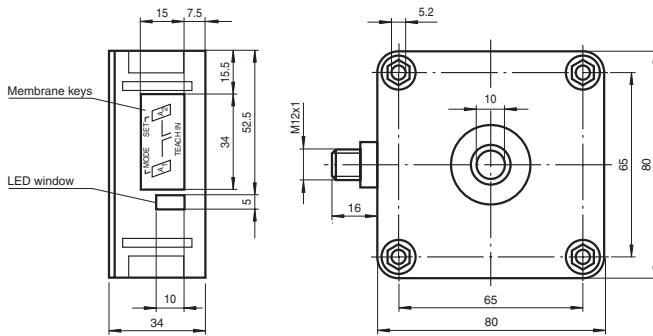


- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- Synchronisation options
- 1 Switch output
UB500-F42(S)-E4-V15
UB500-F42(S)-E5-V15
- 2 independent switch outputs
UB500-F42(S)-E6-V15
UB500-F42(S)-E7-V15
- Analogue output 0 V ... 10 V
UB500-F42(S)-U-V15
- Analogue output 4 mA ... 20 mA
UB500-F42(S)-I-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

		Model number	UB500-F42-E4-V15	UB500-F42S-E4-V15	UB500-F42-E5-V15	UB500-F42S-E5-V15	UB500-F42-I-V15	UB500-F42S-I-V15	UB500-F42-U-V15	UB500-F42S-U-V15	UB500-F42-E6-V15	UB500-F42S-E6-V15	UB500-F42-E7-V15	UB500-F42S-E7-V15
Series -F42	Sensing range	30 ... 500 mm	●	●	●	●	●	●	●	●	●	●	●	●
	Adjustment range	50 ... 500 mm	●	●	●	●	●	●	●	●	●	●	●	●
	Unusable area	0 ... 30 mm	●	●	●	●	●	●	●	●	●	●	●	●
	Standard target plate	100 mm x 100 mm	●	●	●	●	●	●	●	●	●	●	●	●
Series -F43	Transducer frequency	approx. 390 kHz	●	●	●	●	●	●	●	●	●	●	●	●
	Response delay	approx. 50 ms	●	●	●	●	●	●	●	●	●	●	●	●
	LED green	permanently green: Power on	●	●	●	●	●	●	●	●	●	●	●	●
	LED yellow	permanent: object in evaluation range, flashing: TEACH-IN function	●	●	●	●	●	●	●	●	●	●	●	●
Series -F54		permanent: switching state switch output, flashing: TEACH-IN function	●	●	●	●	●	●	●	●	●	●	●	●
	LED yellow1	permanent: switching state switch output 1, flashing: TEACH-IN function									●	●	●	●
	LED yellow2	permanent: switching state switch output 2, flashing: TEACH-IN function									●	●	●	●
	LED red	normal operation: "fault", TEACH-IN function: no object detected	●	●	●	●	●	●	●	●	●	●	●	●
Series -F64	Operating voltage	10 ... 30 V DC, ripple 10 % _{ess}	●	●	●	●	●	●	●	●	●	●	●	●
		17 ... 30 V DC, ripple 10 % _{ess}									●	●		
	No-load supply current	≤ 50 mA	●	●	●	●	●	●	●	●	●	●	●	●
	Output type	1 analogue output 0 ... 10 V									●	●		
Series -D1		1 analogue output 4 ... 20 mA												
		1 switch output E4, npn NONC, parameterisable	●	●										
		1 switch output E5, npn NONC, parameterisable			●	●								
		2 switch outputs npn, normally open/close selectable											●	●
Series -LUC		2 switch outputs prp, normally open/close selectable											●	●
	Rated operational current	200 mA, short-circuit/overload protected	●	●	●	●					●	●	●	●
	Voltage drop	≤ 2,5 V	●	●	●	●					●	●	●	●
	Switching frequency	≤ 8 Hz	●	●	●	●					●	●	●	●
Series -D1	Range hysteresis	1 % of the set operating distance	●	●	●	●					●	●	●	●
	Deviation of the characteristic curve	± 1 % of full-scale value					●	●	●	●				
	Repeat accuracy	≤ 0,5 % of switching point	●	●	●	●					●	●	●	●
		± 0,1 % of full-scale value					●	●	●	●				
Series -D1	Resolution	0,2 mm at max. sensing range									●	●		
		0,2 mm for max. detection range												
	Load impedance	> 1 kOhm									●	●		
		0 ... 300 Ohm									●	●		
Series -D1	Temperature influence	± 1 % of full-scale value	●	●	●	●	●	●	●	●	●	●	●	●
	Synchronisation	bi-directional	●	●	●	●	●	●	●	●	●	●	●	●
		0 level: -U _B ... +1 V												
		1 level: +4 V ... +U _B												
Series -D1		input impedance: > 12 kOhm												
		synchronisation pulse: ≥ 100 µs, synchronisation inter-pulse period: ≥ 2 ms												
	Common mode operation	≤ 95 Hz	●	●	●	●	●	●	●	●	●	●	●	●
	Multiplex operation	≤ 95/n Hz, n = number of sensors	●	●	●	●	●	●	●	●	●	●	●	●
Series -D1	Standards	EN 60947-5-2	●	●	●	●	●	●	●	●	●	●	●	●
	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●	●	●	●	●	●	●	●	●
	Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●	●	●	●	●	●	●	●	●
	Protection degree	IP54	●	●	●	●	●	●	●	●	●	●	●	●
Series -D1	Connection	connector V15 (M12 x 1), 5 pin	●	●	●	●	●	●	●	●	●	●	●	●
	Housing	ABS	●	●	●	●	●	●	●	●	●	●	●	●
	Transducer	epoxy resin/hd low glass sphere mixture; foam polyurethane, cover PBT	●	●	●	●	●	●	●	●	●	●	●	●
	Mass	140 g	●	●	●	●	●	●	●	●	●	●	●	●

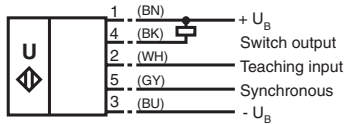


Housing version -F42

Housing version -F42S

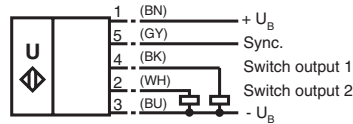
Electrical connection

Standard symbol/Connections: (version E4, npn)



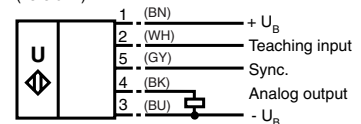
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, npn)



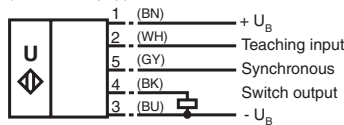
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



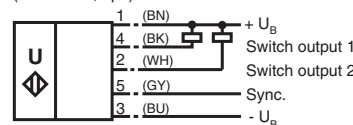
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, npn)



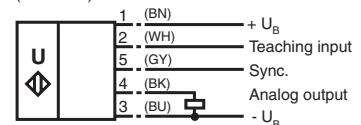
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)



Core colours in accordance with EN 60947-5-2.

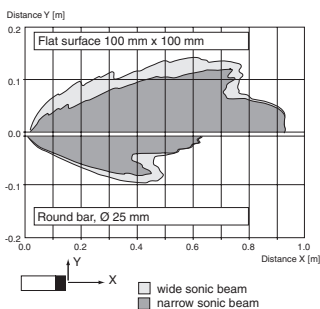
Diagrams

output versions -I and -U

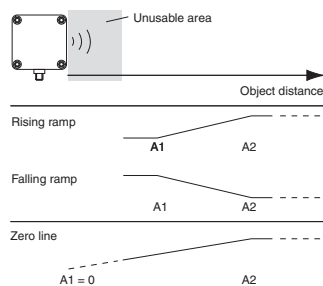
output versions -E6 and E7

output versions -E4 and -E5

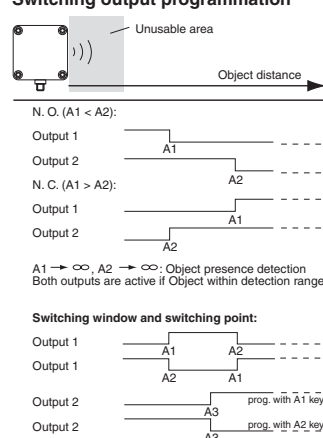
Characteristic response curve



Analogue output programming

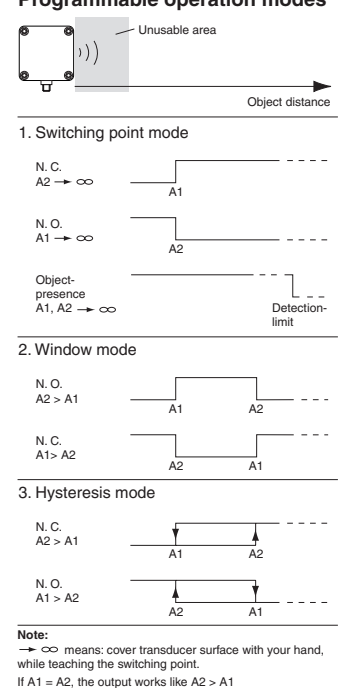


Switching output programming



Note:
→ ∞ means: cover transducer surface with your hand, while programming the output.
If A1 = A2, the output works like A1 < A2

Programmable operation modes



Note:
→ ∞ means: cover transducer surface with your hand, while teaching the switching point.
If A1 = A2, the output works like A2 > A1



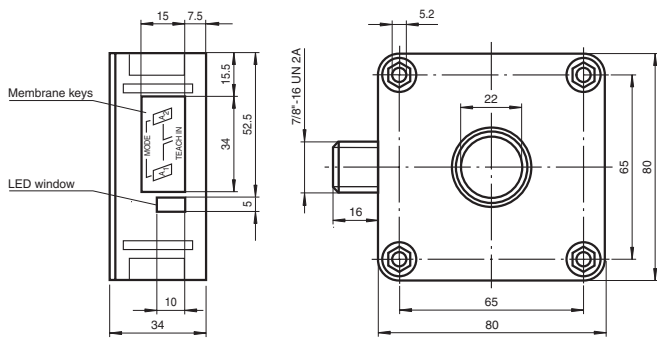
- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- NO/NC selectable



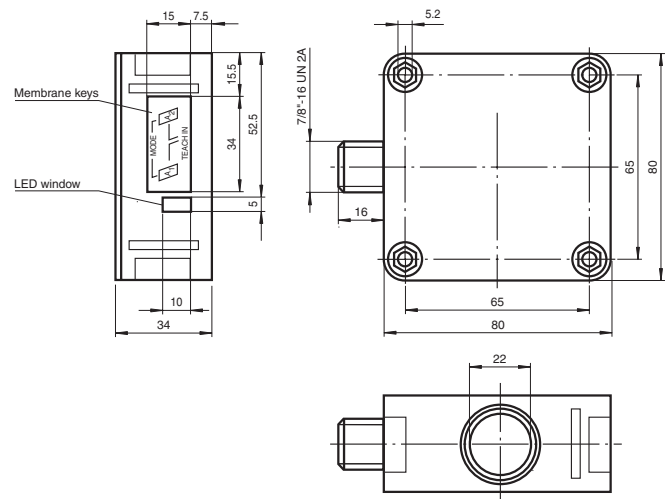
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

		Model number	UB1500-F42-UK-V95	UB1500-F42-S-UK-V95
Series -F42	Sensing range	70 ... 1500 mm	●	●
	Adjustment range	90 ... 1500 mm	●	●
	Unusable area	0 ... 70 mm	●	●
	Standard target plate	100 mm x 100 mm	●	●
Series -F43	Transducer frequency	approx. 175 kHz	●	●
	Response delay	approx. 150 ms	●	●
	LED green	permanently green: Power on	●	●
	LED yellow	permanent: switching state switch output flashing: TEACH-IN function	●	●
Series -F54	LED red	normal operation: "fault" TEACH-IN function: no object detected	●	●
	Operating voltage	20 ... V DC ... 253 V AC	●	●
	No-load supply current	≤ 60 mA	●	●
	Output type	1 relay output	●	●
Series -F64	Rated operational current	3 A	●	●
	Switching frequency	≤ 3 Hz	●	●
	Range hysteresis	1 % of the set operating distance	●	●
	Repeat accuracy	≤ 0,5 % of switching point	●	●
Series -D1	Temperature influence	± 1 % of full-scale value	●	●
	Standards	EN 60947-5-2	●	●
	Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●
	Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●
Series LUC	Protection degree	IP65	●	●
	Connection	Connector V95 (7/8"-16 UN2A), 5-pin	●	●
	Housing	PBT	●	●
	Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	●	●
	Mass	260 g	●	●



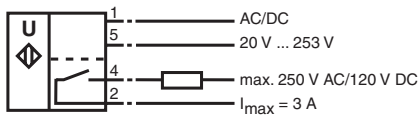
Housing version -F42



Housing version -F42S

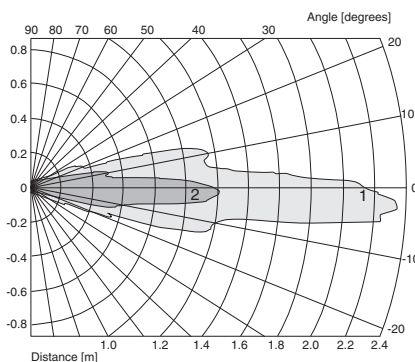
Electrical connection

Standard symbol/Connections:



Diagrams

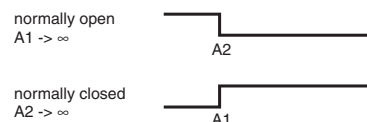
Characteristic response curves



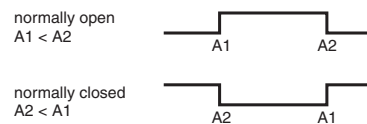
Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Possible operating modes

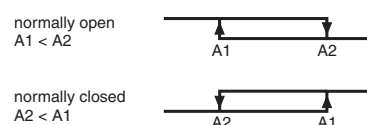
1. Switch point operation



2. Window operation



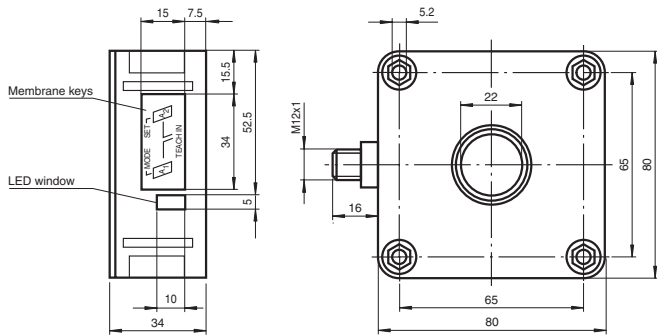
3. Hysteresis operation



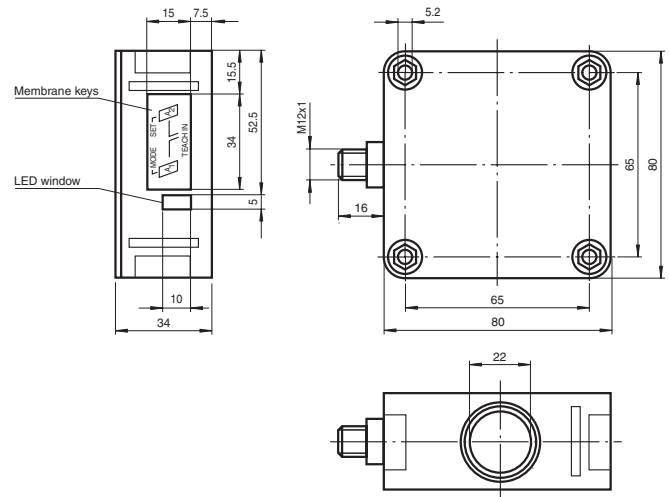
4. Object presence detection mode

A1 -> ∞, A2 -> ∞: Sensor detects object presence within sensing range
Note A1 -> ∞, A2 -> ∞ means: cover sensor with hand or remove all objects from sensing range

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories



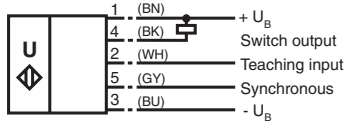
Housing version -F42



Housing version -F42S

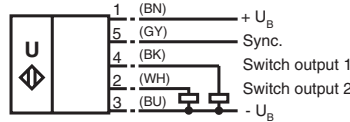
Electrical connection

Standard symbol/Connections:
(version E4, npn)



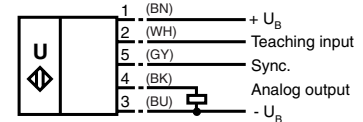
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E6, npn)



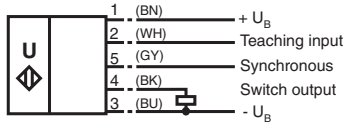
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version I)



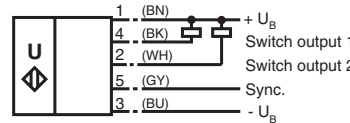
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E5, npn)



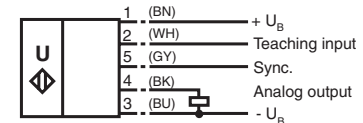
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E7, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

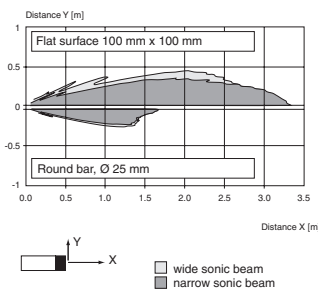
Diagrams

output versions -I and -U

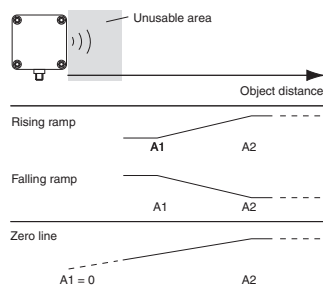
output versions -E6 and E7

output versions -E4 and -E5

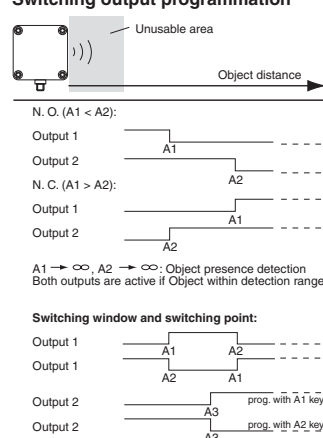
Characteristic response curve



Analogue output programming

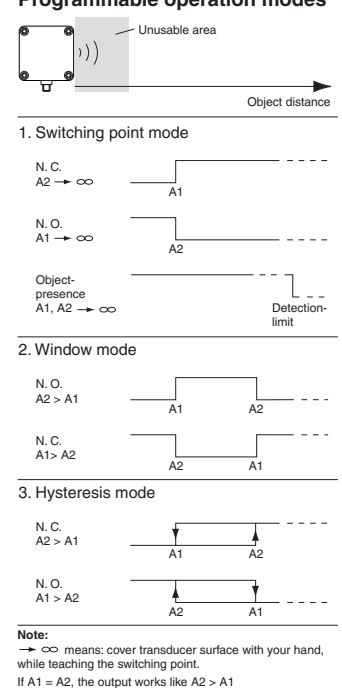


Switching output programming



Note:
→ ∞ means: cover transducer surface with your hand, while programming the output.
If A1 = A2, the output work like A1 < A2

Programmable operation modes



Note:
→ ∞ means: cover transducer surface with your hand, while teaching the switching point.
If A1 = A2, the output works like A2 > A1

Ultrasonic sensor

UB3000-F42-UK-V95



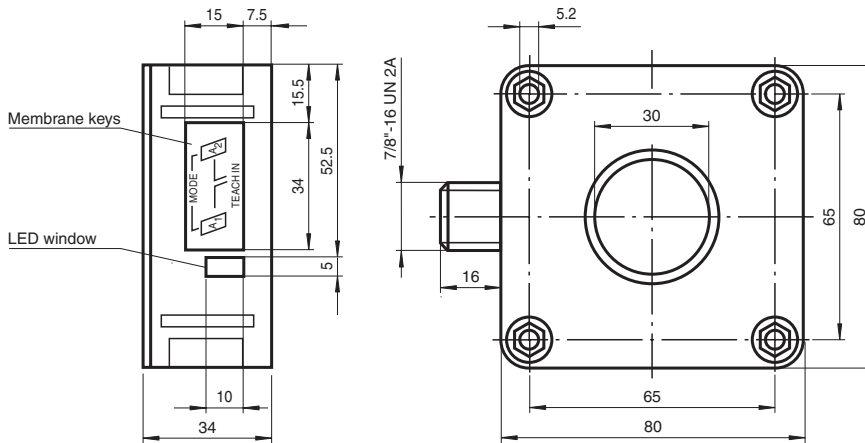
- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- NO/NC selectable



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

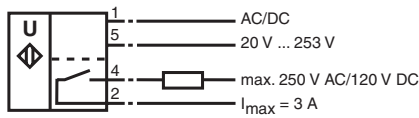
Technical Data

		Model number	UB3000-F42-UK-V95
Sensing range	200 ... 3000 mm		●
Adjustment range	240 ... 3000 mm		●
Unusable area	0 ... 200 mm		●
Standard target plate	100 mm x 100 mm		●
Transducer frequency	approx. 85 kHz		●
Response delay	approx. 325 ms		●
LED green	permanently green: Power on		●
LED yellow	permanent: switching state switch output flashing: TEACH-IN function		●
LED red	normal operation: "fault" TEACH-IN function: no object detected		●
Operating voltage	20 ... V DC ... 253 V AC		●
No-load supply current	≤ 60 mA		●
Output type	1 relay output		●
Rated operational current	3 A		●
Switching frequency	≤ 1,5 Hz		●
Range hysteresis	1 % of the set operating distance		●
Repeat accuracy	≤ 0,5 % of switching point		●
Temperature influence	± 1 % of full-scale value		●
Standards	EN 60947-5-2		●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●
Protection degree	IP65		●
Connection	Connector V95 (7/8" -16 UN2A), 5-pin		●
Housing	PBT		●
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT		●
Mass	260 g		●



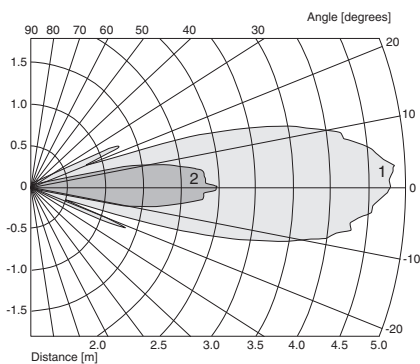
Electrical connection

Standard symbol/Connections:



Diagrams

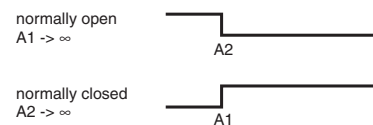
Characteristic response curves



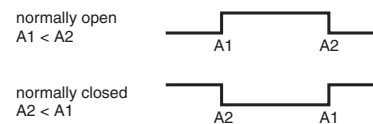
Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Possible operating modes

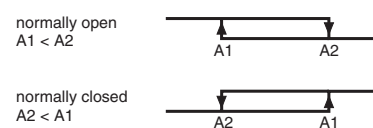
1. Switch point operation



2. Window operation



3. Hysteresis operation



4. Object presence detection mode

A1 -> ∞, A2 -> ∞: Sensor detects object presence within sensing range
Note A1 -> ∞, A2 -> ∞ means: cover sensor with hand or remove all objects from sensing range

Ultrasonic sensor

UB4000-F42-...-V15



- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- Synchronisation options
- 1 Switch output
UB4000-F42-E4-V15
UB4000-F42-E5-V15
- 2 independent switch outputs
UB4000-F42-E6-V15
UB4000-F42-E7-V15
- Analogue output 0 V ... 10 V
UB4000-F42-U-V15
- Analogue output 4 mA ... 20 mA
UB4000-F42-I-V15

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

UB4000-F42-E4-V15

UB4000-F42-E5-V15

UB4000-F42-E6-V15

UB4000-F42-E7-V15

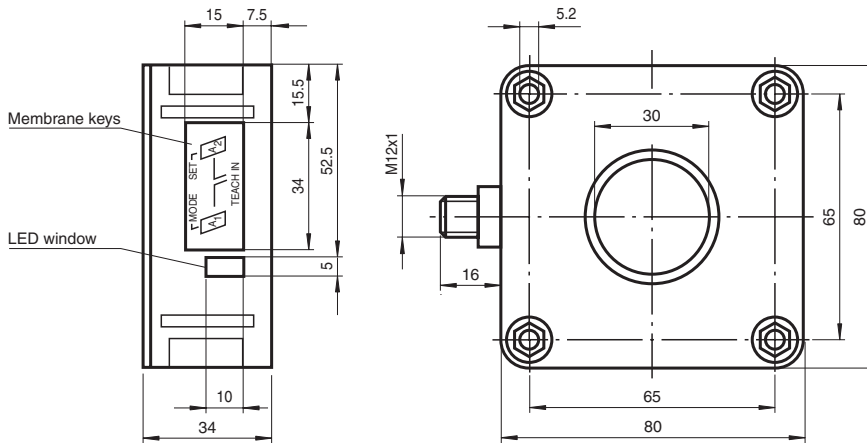
UB4000-F42-I-V15

UB4000-F42-U-V15

Sensing range	200 ... 4000 mm
Adjustment range	240 ... 4000 mm
Unusable area	0 ... 200 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 85 kHz
Response delay	approx. 325 ms
LED green	permanently green: Power on
LED yellow	permanent: object in evaluation range flashing: TEACH-IN function
	permanent: switching state switch output flashing: TEACH-IN function
LED yellow1	permanent: switching state switch output 1 flashing: TEACH-IN function
LED yellow2	permanent: switching state switch output 2 flashing: TEACH-IN function
LED red	normal operation: "fault" TEACH-IN function: no object detected
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS} 17 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 60 mA
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, prp NO/NC, parameterisable 2 switch outputs npn, normally open/close selectable 2 switch outputs prp, normally open/close selectable
Rated operational current	200 mA, short-circuit/overload protected
Voltage drop	≤ 2,5 V
Switching frequency	≤ 1,2 Hz
Range hysteresis	1 % of the set operating distance
Deviation of the characteristic curve	± 1 % of full-scale value
Repeat accuracy	≤ 0,5 % of switching point ± 0,1 % of full-scale value
Resolution	0,7 mm
Load impedance	> 1 kOhm 0 ... 300 Ohm
Temperature influence	± 1 % of full-scale value
Synchronisation	bi-directional 0 level: -U _B ... +1 V 1 level: +4 V ... +U _B input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms
Common mode operation	≤ 13 Hz
Multiplex operation	≤ 13/n Hz, n = number of sensors
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Protection degree	IP54
Connection	connector V15 (M12 x 1), 5 pin
Housing	ABS
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT
Mass	150 g

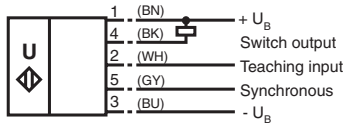
Subject to reasonable modifications due to technical advances.

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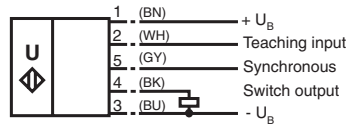
Electrical connection

Standard symbol/Connections: (version E4, npn)



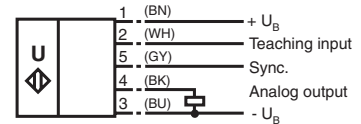
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, npn)



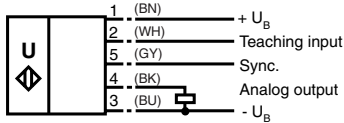
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)



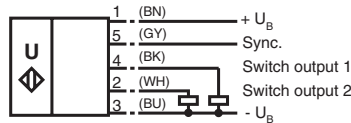
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



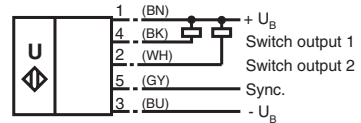
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



Core colours in accordance with EN 60947-5-2.

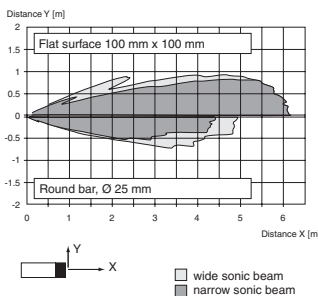
Diagrams

output versions -I and -U

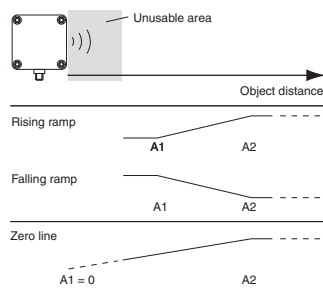
output versions -E6 and E7

output versions -E4 and -E5

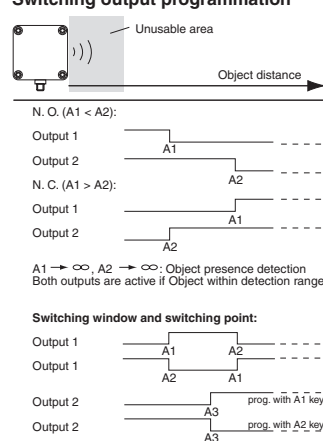
Characteristic response curve



Analogue output programming

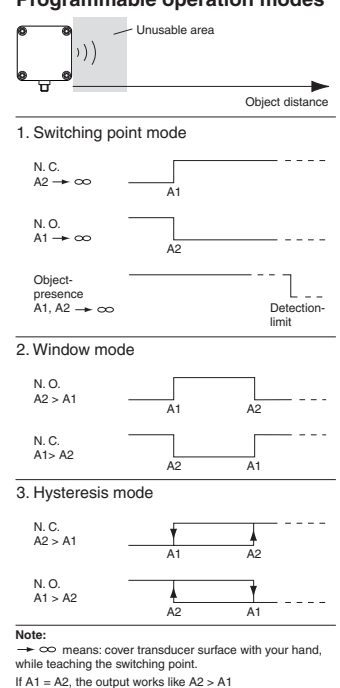


Switching output programming



Note:
→ ∞ means: cover transducer surface with your hand, while programming the output.
If A1 = A2, the output work like A1 < A2

Programmable operation modes



Note:
→ ∞ means: cover transducer surface with your hand, while teaching the switching point.
If A1 = A2, the output works like A2 > A1

UB...-F42(S)-... , output versions -UK

Safety notes:
 The supply circuit is separated from the relay circuit by basic insulation.
 Safety class II is only guaranteed when using the accessorial connector cable. The connector cable may only be separated from the unit when the power is off.

CAUTION:

The UB...-F42(S)-UK-V95 ultrasonic sensor is not suitable for use in environments subject to explosion hazards.



Conformity:	EN 60947-5-2
Housing insulation:	Safety class II
Degree of contamination:	3
Overvoltage category:	III

Parameterisation:
 You can use 2 keys to parameterise the sensor. In order to start the switch point 1 learning mode, press the A1 key; in order to start the switch point 2 learning mode, press the A1 key.
 If you keep both keys pressed as you switch on the power supply, the sensor will switch over to the sensitivity adjustment mode of operation.
 In case the parameterisation procedure is not completed within 5 minutes, the sensor will discontinue the process and retain all previous settings.

Teaching in switch points:

Teaching in A1 switch point by pressing A1 key.

Keep A1 key pressed for > 2 s	The sensor enters the switch point 1 learning mode
Position target object in the desired distance	The sensor indicates via LED lights whether the target object has been detected. In case the object has been detected, the yellow LED will flash; if the object has not been detected, the red LED flashes.
Briefly press the A1 key	The sensor completes the switch point 1 TEACH-IN process and saves this value in non-volatile memory. In the event of an uncertain object (flashing red LED), the value learned is invalid. The system exits the TEACH-IN mode.

Analogously, the A2 switch point is learned in the same fashion as described above using the A2 key.

Switching hysteresis operation mode <--> switch point/window operation mode:

Keep both A1 and A2 keys pressed	The sensor indicates the current operation mode through the green LED. permanent green: Switch point/window operation mode flashing green: Hysteresis operation mode
after 2 seconds:	The sensor changes the operation mode which can be identified through the green LED. permanent green: Switch point/window operation mode flashing green: Hysteresis operation mode
Release keys	The green LED of the sensor keeps indicating the operation mode selected for additional 5 seconds

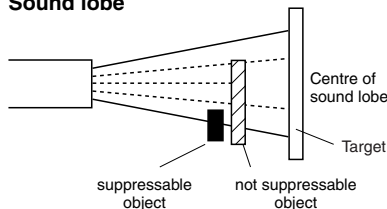
Suppression of disturbing targets

Some types of installation or particular conditions during operation of an ultrasonic sensor may admit that undesired objects (such as shelf brow posts, edges of machines) are closer than the actual target as they enter the recording range. In this case, the sensor would normally detect these objects rather than the desired target. So in order to ensure an error-free operation, it may be necessary to suppress those objects.

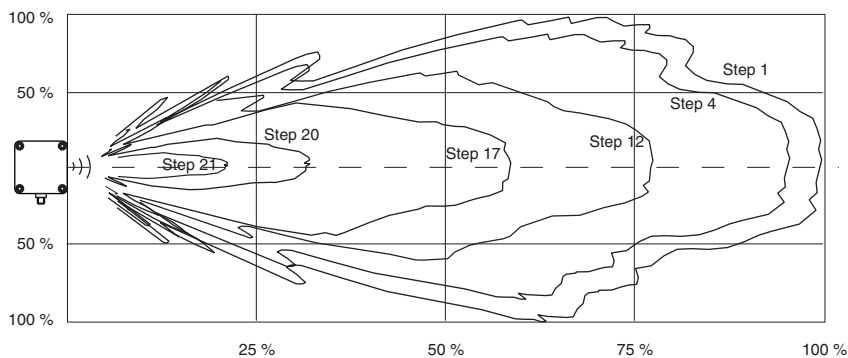
Objects can be suppressed if they meet the following conditions:

- The disturbing target must not hide the actual target completely.
- The amplitude of the disturbing signal must be smaller than the amplitude of the desired signal.
- The disturbing target must remain in the edge region of the sound lobe and must not enter its center.

Sound lobe



The suppression of the disturbing target is effected through reduction of the response sensitivity. This figure shows its effect on the response characteristics of the sensor. The sensor is preset on step 1 by the manufacturer.



Sensitivity adjustment for suppression of disturbing targets

Remove the actual target object from the detection range.

Keep A1 and A2 keys pressed as you switch on power supply

The sensor enters the sensitivity adjustment mode of operation.

The sensor sensitivity can be adjusted in 24 steps.

Step 1 = high response

Step 24 = low response

Briefly press the A1 key

Response is increased. The LED lights indicate the actual state of the sensor.

- flashing red: no disturbing target detected
- flashing yellow: disturbing target detected
- permanent red: upper setting limit is reached.

Briefly press the A2 key

Response is decreased. The LED lights indicate the actual state of the sensor.

- flashing red: no disturbing target detected
- flashing yellow: disturbing target detected
- permanent red: lower setting limit is reached.

Press both A1 and A2 keys at once

Exiting sensitivity adjustment. The sensor response is saved in non-volatile memory.

In the event the sensitivity adjustment is not exited through this procedure, the sensor will exit this operation mode automatically after 5 minutes, and the previous sensitivity value remains valid.

UB...-F42(S)-... , output versions -E4 and -E5

Functional Description

The sensor may be completely parameterised via two keys on the side panel of the housing. As a special feature provided by this sensor, the ultrasound beam width may be adapted to the environmental conditions at the place of operation of the sensor.

Default settings

A1: Minimum sensing range
A2: Nominal distance
window function
wide ultrasound beam

Specifying the switching points:

When specifying the switching points, the user determines at which points the switching output changes its state. The order of the switching points A1 > A2, or A1 < A2 also determines the direction of action (i.e. normally-closed/normally-open contact function).

Specifying the A1 switching point by pressing the A1 key	
Holding down the A1key > 2 seconds	The sensor switches to learn mode and the user may specify the A1 switching point
Positioning the target object at the desired distance	The yellow LED of the sensor flashes fast to indicate that the target object has been recognised. The red LED flashes if the object has not been recognised.
Briefly pressing the A1 key	The sensor terminates the specification of the A1 switching point and saves it as a non-volatile value. The specified value is invalid if the object is uncertain (i.e. the red LED lights up at irregular intervals). The learn mode is exited.

The A2 switching point is specified via the A2 key, analogous to the description above.

Alternatively, the switching points may also be specified electrically via the learn input. To specify the A1 switching point, the learn input must be connected to -U_B; to specify the A2 switching point, it must be connected to +U_B. Specified values are saved upon the disconnection from the learn input.














Switching points may only be specified directly after Power on. A time lock secures the adjusted switching points against unintended modification 5 minutes after the last keypress. To modify the switching points later, the user may specify the desired values only after a new Power On.

Proceed as follows to parameterise the output function and the ultrasound beam width:

Press the A1 key during Power on and hold down the key for another second to ensure that the sensor starts the two-step parameterisation of the operating modes.

Step 1, parameterisation of the output function










The output function parameterised last is displayed. All output functions available may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via short flashes of the green LED.

Operating mode	Flash sequence of the green LED	A2 key
1 switching point/ object detection	  pause  	
Window function (default)	   pause 	
Hysteresis mode	    pause	

Hold down the A1 key for 2 seconds to save the selected output mode, complete the parameterisation and ensure that the sensor returns to normal mode. Step 2 may be initiated by briefly pressing the A1 key (parameterisation of the ultrasound beam width).

Step 2, parameterisation of the ultrasound beam width

In the near range, via Step 2, the ultrasound beam width may be adapted to the requirements of the corresponding application. The beam width parameterised last is displayed first. Available beam width settings may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via the flash sequence of the red LED.

Beam width	Flash sequence of the red LED	A2 key
Small beam	 — pause —  —	
Medium beam	  — pause —  —	
Large beam	   — pause —	

Hold down the A1 key for 2 seconds to save the selected beam shape, complete the parameterisation and ensure that the sensor returns to normal mode. Briefly press the A1 key to return to Step 1 (parameterisation of the output function).

If the parameterisation mode is not terminated within 5 minutes after last keypress (by holding down the A1 key for 2 seconds), the sensor aborts this mode without modifying the settings.

Synchronisation

The sensor has a synchronisation port to suppress mutual influencing. If this port has not been connected, the sensor works at an internally generated cycle rate. Several sensors may be synchronised via the following options.

External synchronisation:

The sensor may be synchronised via the external application of a square wave voltage. A synchronisation pulse on the synchronisation input initiates a measuring cycle. The pulse width must be greater than 100 µs. The measuring cycle is started with the falling edge. A low level > 1 s or an open synchronisation input initiate the transition to normal sensor mode. A high level on the synchronisation input deactivates the sensor.

Two modes are possible:

- Several sensors are controlled via the same synchronisation signal. The sensors work in common mode.
- The synchronisation pulses are forwarded at cyclic intervals to respectively one single sensor. The sensors work in multiplex mode.

Self-synchronisation:

The synchronisation ports of up to 5 sensors suitable for self-synchronisation are connected to each other. These sensors work in multiplex mode after Power on. The On delay increases depending on the number of sensors to be synchronised. While the learn mode is active, no synchronisation is possible (and vice-versa). To specify the switching points, the sensors must be operated in non-synchronised mode.

Note:

If the synchronisation option is not used, the synchronisation input must be connected to ground (0V) or the sensor must be operated with a (4-pole) V1 connecting cable.

UB...-F42(S)-... , output versions -E6 and -E7

Functional description
The sensor can be completely parameterised using 2 keys on the side of the housing. One special feature of this sensor is the option of adapting the ultrasonic beam width to the ambient conditions at the place where the sensor is used.

Default settings
A1: blind range
A2: nominal distance
2 x normally open function
Wide ultrasonic beam width

Teach-in of switching points:
Teach-in of switching points is used to determine the points at which the switching outputs will change their state. In addition, the order of switching points A1 < A2, or A1 > A2 also determines the effective direction (normally closed/open function) of the window in the output function (operating mode) "Window + Switching point" (see below).

Teach-in of switching point A1 with key A1	
Press key A1 > 2 seconds	The sensor goes into learning mode for switching point A1
Position the target object at the desired distance	The sensor indicates by rapid flashing of the yellow LED that the target object has been detected. If no object is detected, the red LED flashes.
Press key A1 briefly	The sensor completes the Teach-in process for switching point A1 and stores the value in permanent memory. If the object is uncertain (red LED lit irregularly) the Teach-in value is not valid. Teach-in mode closes.

The process for Teach-in of switching point A2 is similar to what was described above, using key A2.
Special feature for output function "Window + switching point"
In the case of the output function (operating mode) "Window + switching point" (see below), switching points A1 and A2 define the window limits of switch output 1.
A third switching point A3 can also be defined here at which switch output 2 switches.

Teach-in of switching point A3 with keys A1 and A2 (only for operating mode window + switching point, see below)	
Press key A1 + A2 > 2 seconds	The sensor goes into learning mode for switching point A3
Position the target object at the desired distance	The sensor indicates by rapid flashing of the yellow LEDs that the target object has been detected. If no object is detected, the red LED flashes.
Press key A1 briefly (output 2: normally closed) or Press key A2 briefly (output 2: normally open)	The sensor completes the Teach-in process for switching point A3 and stores the value in permanent memory. If the object is uncertain (red LED lit irregularly) the Teach-in value is not valid. Teach-in mode closes.

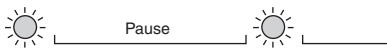
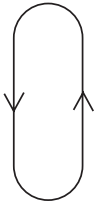



Teach-in for switching points can only be performed within the first 5 minutes after turning on the power supply. If the switching points need to be changed at a later time, this cannot be done until there is a new Power On.

Parameter assignment of the output function and ultrasound beam width

If you press the A1 key while the power supply is being turned on and then hold it down for 1 second, the sensor goes into the two-level parameterisation of operating modes.

Level 1, parametrisation of the output function

Pressing the A2 key briefly will cause the possible output functions to be selected one after the other (depending on the last output function to be parameterised). The functions are indicated by a flashing sequence of the green LED.

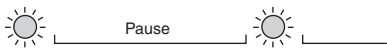
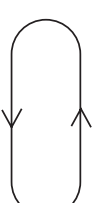


Operating mode	Flashing sequence of green LED	A2 key
2 x normally open function (default)		
2 x normally closed function		
2 switching points n.o. (output 1) + n.c. (output 2)		
Window (output 1) + switching point (output 2)		

Pressing the A1 key for 2 seconds saves the selected output operating mode. The parameter assignment process is then complete and the sensor returns to normal mode. If you press the A1 key briefly instead, you go to Level 2 (parameter assignment of ultrasonic beam range).

Level 2, parameter assignment of ultrasonic beam width

The ultrasonic beam width can be adjusted to match the requirements of the application in Level 2.

Pressing the A2 key briefly will cause the possible beam widths to be selected one after the other (depending on the last beam width to be parameterised). The functions are indicated by a flashing sequence of the red LED.

Beam width	Flashing sequence of red LED	A2 key
Narrow beam width		
Average beam width		
Wide beam (default)		

Pressing the A1 key for 2 seconds saves the selected type of beam width. The parameter assignment process is then complete and the sensor returns to normal mode. If you press the A1 briefly instead, you go back to Level 1 (parameter assignment of output function).

If parameterisation is not complete within 5 minutes (pressing the A1 key for 2 seconds), the sensor interrupts parameterisation mode without changing the settings.

Synchronisation

The sensor is equipped with a synchronisation connection to suppress mutual interaction. If it is not turned on, the sensor works at an internally generated cycle rate. Synchronisation of more than one sensor is possible in a number of different ways.

External synchronisation:

The sensor can be synchronised by the application of a square wave voltage externally. A synchronisation pulse on the synchronisation input results in the execution of a measurement cycle. The pulse width must be greater than 100 µs. The measurement cycle must be started with the falling signal edge. A Low level > 1 s or an open synchronisation input results in normal operation of the sensor. A High level on the synchronisation input deactivates the sensor.

Two different operating modes are possible

- Multiple sensors can be controlled by the same synchronisation signal. The sensors work on synonymous cycle.
- Synchronisation pulses are sent cyclically to only one sensor each time. The sensors work in Multiplex mode.

Self synchronisation:

The synchronisation connections of up to 5 sensors with option for self-synchronisation are connected with each other. These sensors work after turning on the operating voltage in Multiplex mode. The On delay increases depending on the number of sensors to be synchronised. Synchronisation is possible during Teach-in and vice-versa. Sensors must be operated unsynchronised to perform Teach-in of switching points.

Note:

If the option for synchronisation is not used, the synchronisation input can be connected with ground (0 V) or the sensor can be operated with a V1 connection cable (4-pin).

UB...-F42(S)-... , output versions -I and -U

Functional description

The sensor can be completely parameterised using 2 keys on the side of the housing. One special feature of this sensor is the option of adapting the ultrasonic beam width to the ambient conditions at the place where the sensor is used.

Default settings

- A1: blind range
- A2: nominal distance
- 2 x normally open function
- Wide ultrasonic beam width

Teach-in of switching points:

Teach-in of switching points is used to determine the points at which the switching outputs will change their state. In addition, the order of switching points A1 < A2, or A1 > A2 also determines the effective direction (normally closed/open function) of the window in the output function (operating mode) "Window + Switching point" (see below).

Teach-in of switching point A1 with key A1	
Press key A1 > 2 seconds	The sensor goes into learning mode for switching point A1
Position the target object at the desired distance	The sensor indicates by rapid flashing of the yellow LED that the target object has been detected. If no object is detected, the red LED flashes.
Press key A1 briefly	The sensor completes the Teach-in process for switching point A1 and stores the value in permanent memory. If the object is uncertain (red LED lit irregularly) the Teach-in value is not valid. Teach-in mode closes.

The process for Teach-in of switching point A2 is similar to what was described above, using key A2.

Special feature for output function "Window + switching point"

In the case of the output function (operating mode) "Window + switching point" (see below), switching points A1 and A2 define the window limits of switch output 1.

A third switching point A3 can also be defined here at which switch output 2 switches.

Teach-in of switching point A3 with keys A1 and A2 (only for operating mode window + switching point, see below)	
Press key A1 + A2 > 2 seconds	The sensor goes into learning mode for switching point A3
Position the target object at the desired distance	The sensor indicates by rapid flashing of the yellow LEDs that the target object has been detected. If no object is detected, the red LED flashes.
Press key A1 briefly (output 2: normally closed) or Press key A2 briefly (output 2: normally open)	The sensor completes the Teach-in process for switching point A3 and stores the value in permanent memory. If the object is uncertain (red LED lit irregularly) the Teach-in value is not valid. Teach-in mode closes.

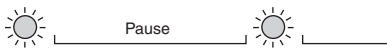
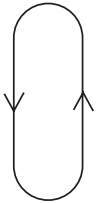



Teach-in for switching points can only be performed within the first 5 minutes after turning on the power supply. If the switching points need to be changed at a later time, this cannot be done until there is a new Power On.

Parameter assignment of the output function and ultrasound beam width

If you press the A1 key while the power supply is being turned on and then hold it down for 1 second, the sensor goes into the two-level parameterisation of operating modes.

Level 1, parametrisation of the output function

Pressing the A2 key briefly will cause the possible output functions to be selected one after the other (depending on the last output function to be parameterised). The functions are indicated by a flashing sequence of the green LED.

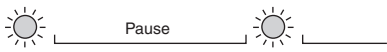
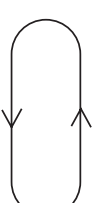


Operating mode	Flashing sequence of green LED	A2 key
2 x normally open function (default)		
2 x normally closed function		
2 switching points n.o. (output 1) + n.c. (output 2)		
Window (output 1) + switching point (output 2)		

Pressing the A1 key for 2 seconds saves the selected output operating mode. The parameter assignment process is then complete and the sensor returns to normal mode. If you press the A1 key briefly instead, you go to Level 2 (parameter assignment of ultrasonic beam range).

Level 2, parameter assignment of ultrasonic beam width

The ultrasonic beam width can be adjusted to match the requirements of the application in Level 2.

Pressing the A2 key briefly will cause the possible beam widths to be selected one after the other (depending on the last beam width to be parameterised). The functions are indicated by a flashing sequence of the red LED.

Beam width	Flashing sequence of red LED	A2 key
Narrow beam width		
Average beam width		
Wide beam (default)		

Pressing the A1 key for 2 seconds saves the selected type of beam width. The parameter assignment process is then complete and the sensor returns to normal mode. If you press the A1 briefly instead, you go back to Level 1 (parameter assignment of output function).

If parameterisation is not complete within 5 minutes (pressing the A1 key for 2 seconds), the sensor interrupts parameterisation mode without changing the settings.

Synchronisation

The sensor is equipped with a synchronisation connection to suppress mutual interaction. If it is not turned on, the sensor works at an internally generated cycle rate. Synchronisation of more than one sensor is possible in a number of different ways.

External synchronisation:

The sensor can be synchronised by the application of a square wave voltage externally. A synchronisation pulse on the synchronisation input results in the execution of a measurement cycle. The pulse width must be greater than 100 µs. The measurement cycle must be started with the falling signal edge. A Low level > 1 s or an open synchronisation input results in normal operation of the sensor. A High level on the synchronisation input deactivates the sensor.

Two different operating modes are possible

- Multiple sensors can be controlled by the same synchronisation signal. The sensors work on synonymous cycle.
- Synchronisation pulses are sent cyclically to only one sensor each time. The sensors work in Multiplex mode.

Self synchronisation:

The synchronisation connections of up to 5 sensors with option for self-synchronisation are connected with each other. These sensors work after turning on the operating voltage in Multiplex mode. The On delay increases depending on the number of sensors to be synchronised. Synchronisation is possible during Teach-in and vice-versa. Sensors must be operated unsynchronised to perform Teach-in of switching points.

Note:

If the option for synchronisation is not used, the synchronisation input can be connected with ground (0 V) or the sensor can be operated with a V1 connection cable (4-pin).

Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM	Series -18GK/-18GM	Series -12GM	Notes



UC2000-F43-2KIR2-V17

UC300-F43-2KIR2-V17

Model number	Detection range	Page
UC300-F43-2KIR2-V17	300 mm	156
UC2000-F43-2KIR2-V17	2000 mm	

Ultrasonic sensor

UC...-F43-2KIR2-V17



- Current output 4 mA ... 20 mA
- 2 relay outputs
- Serial interface
- Temperature compensation
- Reverse polarity protection
- Parameterisable with ULTRA 2001

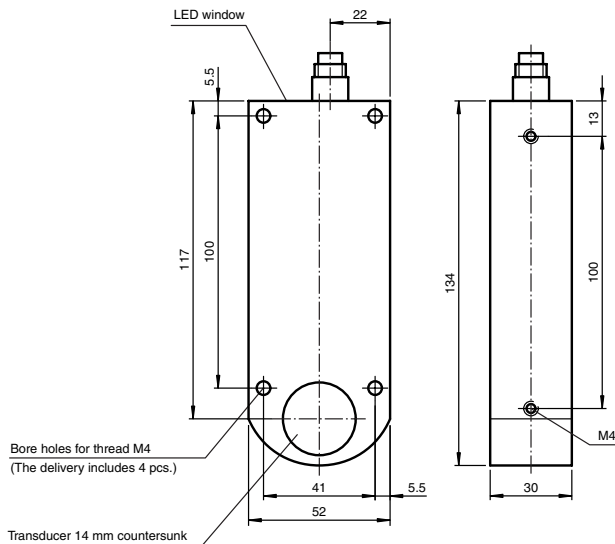


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

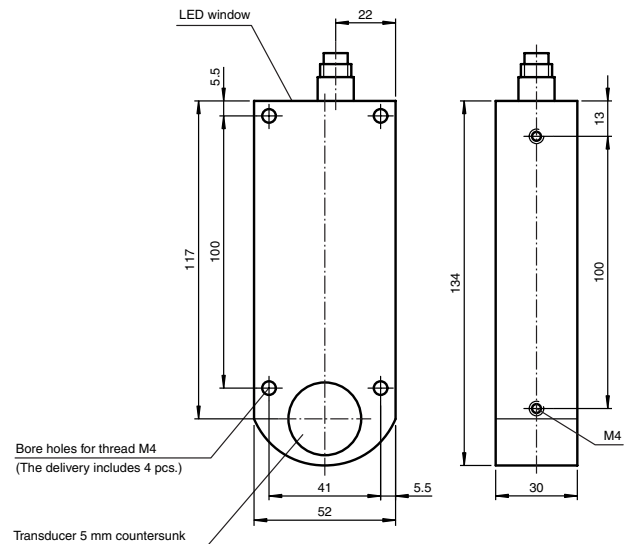
Technical Data

		Model number	UC300-F43-2KIR2-V17	UC2000-F43-2KIR2-V17
Sensing range	0 ... 300 mm		●	
	80 ... 2000 mm			●
Adjustment range	100 ... 2000 mm			●
Unusable area	0 ... 80 mm			●
Standard target plate	0 mm		●	
	100 mm x 100 mm		●	●
Transducer frequency	approx. 175 kHz		●	●
	approx. 390 kHz			
Response delay	minimum (EM; NONE): ≤20 ms (2 measuring cycles)		●	
	factory setting (EM; MXN, 5, 2): ≤60 ms (6 measuring cycles)			
	dynamic (EM; DYN): ≤30 ms (3 measuring cycles)			
	minimum (EM; NONE): ≤50 ms (2 measuring cycles)			●
	factory setting (EM; MXN, 5, 2): ≤150 ms (6 measuring cycles)			
	dynamic (EM; DYN): ≤75 ms (3 measuring cycles)			
LED green	continuous: object in the measuring window		●	●
	flashing: object outside the measuring window		●	●
LED red	error (e. g. interference level too high)		●	●
Operating voltage	10 ... 30 V DC		●	●
	ripple ± 10 % _{SS}			
Power consumption	≤ 2 W (all relays pulled-in, current output 20 mA)		●	●
	no-load power consumption ≤ 0.7 W			
Output type	2 relay outputs, 1 analogue output 4 ... 20 mA		●	●
	Deviation of the characteristic curve	< 0.2 % of full-scale value	●	●
Repeat accuracy	≤ 0.1 % of full-scale value		●	●
Resolution	0.2 mm		●	
	0.6 mm			●
Load impedance	current output:		●	●
	≤ 500 Ω at U _B ≥ 17V			
	≤ 200 Ω at U _B < 17V			
Range hysteresis	0 ... 15 % parameterisable with ULTRA2001		●	●
Contact loading	60 V DC / 1 A (max. 24 W DC), ohmic			●
	60 V DC / 1 A (max. 24 W DC), ohmic		●	
Lifetime	electrical: 3 x 10 ⁵ switching cycles at resistive load (1 A / 24 V DC)		●	●
	mechanical: 10 ⁷ switching cycles			
Temperature influence	≤ 2 % of full-scale value		●	●
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit		●	●
Standards	EN 60947-5-2		●	●
Ambient temperature	0 ... 70 °C (273 ... 343 K)		●	
	-25 ... 70 °C (248 ... 343 K)			●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●
Protection degree	IP65		●	●
Connection	8-pin round connector, Lumberg type RSF 8		●	●
Material				
Housing	PBT		●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●
Mass	290 g		●	●

Date of edition: 08/18/2005



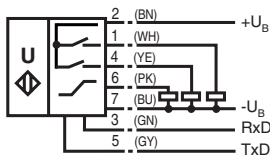
UC300-F43-2KIR2-V17



UC2000-F43-2KIR2-V17

Electrical connection

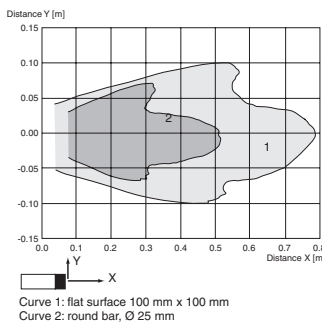
Standard symbol/Connection:



Core colours in accordance with EN 60947-5-2.

Diagrams

Characteristic response curve



Basic setting

OM:
Relay 1: NO
Relay 2: NO

SD1/SD2:
Switch point relay 1 = 25 mm
Switch point relay 2 = 50 mm

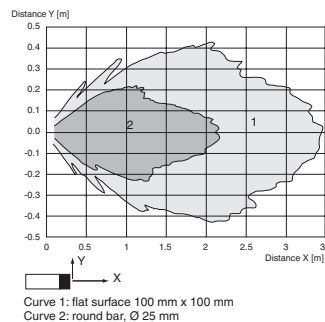
NDE/FDE:
Analogue output: 4 mA \Rightarrow 25 mm
20 mA \Rightarrow 300 mm

FSF:
Error \Rightarrow Relay 1 and 2: latest state
 \Rightarrow Analogue output: IOUT = 3,9 mA

NEF:
No echo \Rightarrow error message

MA,S:
Switching mode

Characteristic response curve



Basic setting

OM:
Relay 1: NO
Relay 2: NO

SD1/SD2:
Switch point relay 1 = 100 mm
Switch point relay 2 = 2000 mm

NDE/FDE:
Analogue output: 4 mA \Rightarrow 100 mm
20 mA \Rightarrow 2000 mm

FSF:
Error \Rightarrow Relay 1 and 2: latest state
 \Rightarrow Analogue output: IOUT = 3,9 mA

NEF:
No echo \Rightarrow error message

MA,S:
Switching mode

UC300-F43-2KIR2-V17

UC2000-F43-2KIR2-V17

Series -F43

Sensor function description

UC300-F43-2KIR2-V17

Thanks to its extensive command set, the sensor can be configured to suit the application via the RS 232 interface.

RS 232 command set (overview)

Command	Meaning	Parameter	Access
VS0	Velocity of Sound at 0 °C	Velocity of sound at 0 °centigrade VS0 in [cm/s] {10000 ... 60000}	read and set
VS	Velocity of Sound	Velocity of sound VS in [cm/s]	read
TO	Temperature Offset	TO in [0.1 K] {-200 ... 200}	read and set
TEM	TEMperature	TEM in [0.1 K]	read and adapt to TO
REF	REFerence measurement	REF distance in [mm]	adaptation of VS0
SD1	Switching Distance 1	Switching point, relay 1 SD1 in [mm] {1 ... 800}	read and set
SD2	Switching Distance 2	Switching point, relay 2 SD2 in [mm] {1 ... 800}	read and set
SH1	Switching Hysteresis 1	Hysteresis, relay 1 in [%] {0 ... 15}	read and set
SH2	Switching Hysteresis 2	Hysteresis, relay 2 in [%] {0 ... 15}	read and set
NDE	Near Distance of Evaluation	Near measuring window limit in [mm] {1 ... 800}	read and set
FDE	Far Distance of Evaluation	Far measuring window limit in [mm] {1 ... 800}	read and set
BR	Unusable area (Blind Range)	Unusable area in [mm] {0 ... 800}	read and set
RR	Range Reduction	reduces sensing range [mm] {0 ... 800}	read and set
CBT	Constant BurstTime	Burst length {0,1, 2, 3}	read and set
CCT	Constant Cycle Time	Time in [ms] {0 ... 1000}	read and set
FTO	Filter TimeOut	Number of measurements without echo to be filtered {0 ... 255}	read and set
EM	Evaluation Method	Evaluation method { 0 = NONE; PT1[.f,p,c]; MXN[.m,n]; DYN[p] }	read and set
CON	CONservative filter	Counter threshold as number {0 ... 255}	read and set
OM	Output Mode	OM coded [normally-open = 0, normally-closed = 1, inactive =]	read and set
FSF	Fail SafeFunction	Failure function type e.g. FSF,11,35 {0,1,2}, [fault current in 0.1 mA], -1 = current output indifferently	read and set
MD	Master Device	Function as master {0 = NONE},AD,RD,RT,SS,ADB,RDB,RTB }	read and set
MA	Main Application	Determines whether the green LED orients on analogue output or switching outputs {A,S}	read and set
NEF	No Echo Failure	Sensor behaviour when no echo is present {0,1}	read and set
AD	Absolute Distance	Distance in [mm]	read
RD	Relative Distance	Relative distance as number {0 ... 4095}	read
RT	RunTime	Echo run time in machine cycles [1 machine cycle = 1.085 µs]	read
SS1	Switching State 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	Switching State 2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ADB	Absolute Distance Binary	Distance in [mm] not as ASCII	read
RDB	Relative Distance Binary	Relative distance as number {0 ... 4095} not as ASCII	read
RTB	RunTime Binary	Echo run time in machine cycles [1 machine cycle = 1.085 µs] not as ASCII	read
ER	Echo Received	Echo detected: no, yes [0/1]	read
VER	VERsion	Version string: xxxx	read
ID	IDentification	ID string: P&F UC300-F43-2KIR2-V17...	read
DAT	DATe	Date string: e.g. Date: 04/12/02 Time: 11:14:35	read
ST	STatus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEFault settings	Restores defaults	Command
SUC	Store User Configuration	Stores all settings	Command
RUC	Recall User Configuration	Restores stored settings	Command

UC2000-F43-2KIR2-V17

Thanks to its extensive command set, the sensor can be configured to suit the application via the RS 232 interface.

RS 232 command set (overview)

Command	Meaning	Parameter	Access
VS0	Velocity of Sound at 0 °C	Velocity of sound at 0 °centigrade VS0 in [cm/s] {12000 .. 60000}	read and set
VS	Velocity of Sound	Velocity of sound VS in [cm/s]	read
TO	Temperature Offset	TO in [0..1K]	read and set
TEM	TEMperature	TEM in [0..1K]	read and adapt to TO
REF	REFerence measurement	REF distance in [mm] {100 ... 4000}	adaptation of VS0
SD1	Switching Distance 1	Switching point, relay 1 SD1 in [mm] {100 ... 4000}	read and set
SD2	Switching Distance 2	Switching point, relay 2 SD1 in [mm] {100 ... 4000}	read and set
SH1	Switching Hysteresis 1	Hysteresis, relay 1 in [%] {0 ... 15}	read and set
SH2	Switching Hysteresis 2	Hysteresis, relay 2 in [%] {0 ... 15}	read and set
NDE	Near Distance of Evaluation	Near measuring window limit in [mm] {100 ... 4000}	read and set
FDE	Far Distance of Evaluation	Far measuring window limit in [mm] {100 ... 4000}	read and set
BR	Unusable area (Blind Range)	Unusable area in [mm] {0 ... 4000}	read and set
RR	Range Reduction	reduces sensing range in [mm] {100 ... 4000}	read and set
CBT	Constant Burst Time	Burst length {0,1, 2, 3}	read and set
CCT	Constant Cycle Time	Time in [ms] {0 ... 1000}	read and set
FTO	Filter TimeOut	Number of measurements without echo to be filtered {0 ... 255}	read and set
EM	Evaluation Method	Evaluation method {0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p]}	read and set
CON	CONservative filter	Counter threshold as number {0 ... 255}	read and set
OM	Output Mode	OM coded [normally-open = 0, normally-closed = 1, inactive = I]	read and set
FSF	Fail Safe Function	Failure function type e.g. FSF,11,35 {0,1,2}, [fault current in 0.1 mA], -1 = current output indifferently	read and set
MD	Master Device	Function as master {0 = NONE},AD,RD,RT,SS,ADB,RDB,RTB}	read and set
MA	Main Application	Determines whether the green LED orients on analogue output or switching outputs {A,S}	read and set
NEF	No Echo Failure	Sensor behaviour when no echo is present {0,1}	read and set
AD	Absolute Distance	Distance in [mm]	read
RD	Relative Distance	Relative distance as number {0 ... 4095}	read
RT	RunTime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	Switching State1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	Switching State2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ADB	Absolute Distance Binary	Distance in [mm] not as ASCII	read
RDB	Relative Distance Binary	Relative distance as number {0 ... 4095} not as ASCII	read
RTB	RunTime Binary	Echo run time in machine cycles [1 machine cycle = 1.085µs] not as ASCII	read
ER	Echo Received	Echo detected: no, yes [0/1]	read
VER	VERsion	Version string: xxxx	read
ID	IDentification	ID string: P&F UC2000-F43-2KIR2-V17...	read
DAT	DATE	Date string: e.g. Date: 04/12/02 Time: 11:14:35	read
ST	STatus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEFault settings	Restores defaults	Command
SUC	Sbore User Configuration	Stores all settings	Command
RUC	Recall User Configuration	Restores stored settings	Command

Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM	Series -18GK/-18GM	Series -12GM	Notes

Series -F54



Model number	Description	Detection range	Page
UB500-F54-E4-V15	Switching output	500 mm	162
UB500-F54-E5-V15		500 mm	
UB2000-F54-E4-V15		2000 mm	
UB2000-F54-E5-V15		2000 mm	
UB500-F54-I-V15	Analogue output	500 mm	164
UB500-F54-U-V15		500 mm	
UB2000-F54-I-V15		2000 mm	
UB2000-F54-U-V15		2000 mm	
UB500-F54-H3-V1	For external control/evaluation unit	500 mm	166
UB2000-F54-H3-V1		2000 mm	

For detailed function description, see page 168

Ultrasonic sensor

UB...F54...-V15



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation

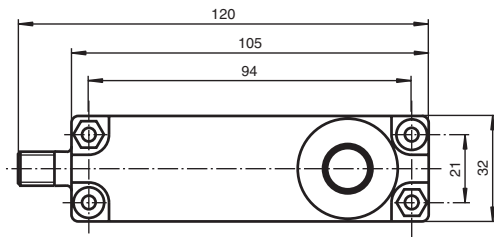


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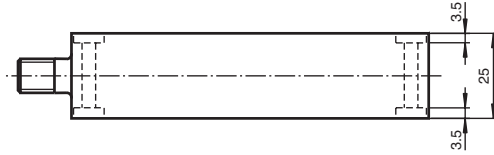
Technical Data

		Model number	UB500-F54-E4-V15	UB500-F54-E5-V15	UB2000-F54-E4-V15	UB2000-F54-E5-V15
Sensing range	30 ... 500 mm		●	●		
	80 ... 2000 mm				●	●
Adjustment range	100 ... 2000 mm				●	●
	50 ... 500 mm		●	●		
Unusable area	0 ... 30 mm		●	●		
	0 ... 80 mm				●	●
Standard target plate	100 mm x 100 mm		●	●	●	●
Transducer frequency	approx. 175 kHz		●	●		●
	approx. 380 kHz				●	●
Response delay	≤ 150 ms				●	●
	≤ 50 ms		●	●		
LED green	permanently green: monitoring system green flashing: TEACH-IN function		●	●	●	●
LED yellow	indication of the switching state flashing: TEACH-IN function object detected		●	●	●	●
LED red	flashing: normal mode: error, TEACH-IN function: no object detected permanently: TEACH-IN mode, object uncertain		●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●	●	●
	No-load supply current	≤ 55 mA	●	●	●	●
	Output type	1 switch output E4, npn NO/NC 1 switch output E5, prp NO/NC	●	●	●	●
Rated operational current	200 mA, short-circuit/overload protected		●	●	●	●
	Voltage drop	≤ 3 V	●	●	●	●
	Switching frequency	max. 10 Hz max. 3 Hz	●	●		
Range hysteresis	≤ 1 % of the set operating distance		●	●	●	●
	Repeat accuracy	≤ 1 % of full-scale value	●	●	●	●
	Temperature influence	± 1,5 % of full-scale value	●	●	●	●
	Input type	1 TEACH-IN input, switching point A1: -U _B ... +1 V, switching point A2: +4 V ... +U _B input impedance: > 4.7 kΩ, TEACH-IN pulse: ≥ 1 s	●	●	●	●
Synchronisation	1 synchronisation input 0 level: -U _B ... +1 V, 1 level: +4 V ... +U _B input impedance: > 12 kΩ, synchronisation pulse: 0.1 ... 28 ms				●	●
	1 synchronisation input 0 level: -U _B ... +1 V, 1 level: +4 V ... +U _B input impedance: > 12 kΩ, synchronisation pulse: 0.1 ... 8 ms		●	●		
Common mode operation	≤ 100 Hz		●	●		
	≤ 33 Hz				●	●
Multiplex operation	≤ 100 / n Hz, n = number of sensors		●	●		
	≤ 33 / n Hz, n = number of sensors				●	●
Standards	EN 60947-5-2		●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)		●	●	●	●
Protection degree	IP65		●	●	●	●
Connection	connector V15 (M12 x 1), 5 pin		●	●	●	●
Material						
Housing	ABS		●	●	●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●	●	●
Mass	100 g		●	●	●	●

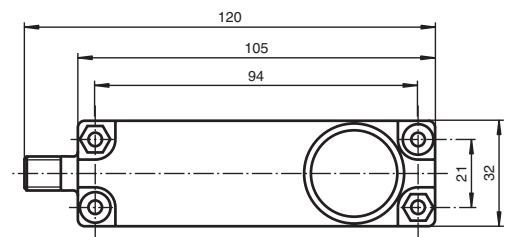
Date of edition: 08/18/2005



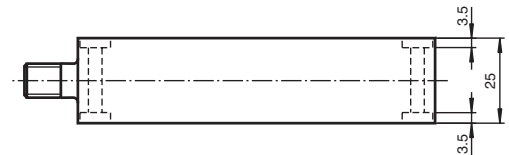
Bore hole and countersinking for screws/hexagon M4



UB500-F54...



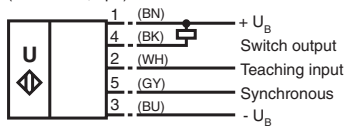
Bore hole and countersinking for screws/hexagon M4



UB2000-F54...

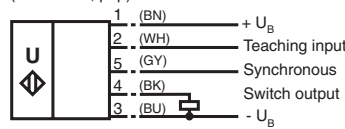
Electrical connection

Standard symbol/Connections:
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

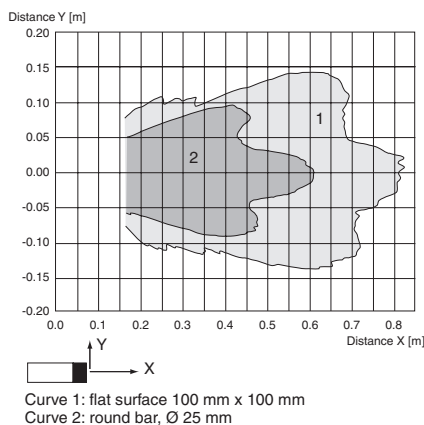
Standard symbol/Connections:
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

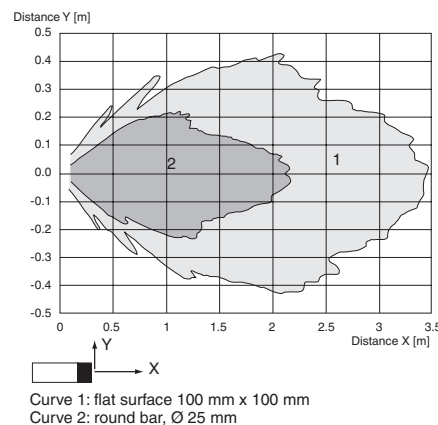
Diagrams

Characteristic response curve



UB500-F54...

Characteristic response curve



UB2000-F54...

Programmed switching output function

- Window mode, normally open function
A1 < A2:
- Window mode, normally closed function
A2 < A1:
- One switch point, normally open function
A1 -> ∞:
- One switch point, normally closed function
A2 -> ∞:
- A1 -> ∞, A2 -> ∞: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Ultrasonic sensor

UB...F54...-V15



- Measuring window adjustable
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Analogue output 0 V ... 10 V
UB500-F54-U-V15
UB2000-F54-U-V15
- Analogue output 4 mA ... 20 mA
UB500-F54-I-V15
UB2000-F54-I-V15

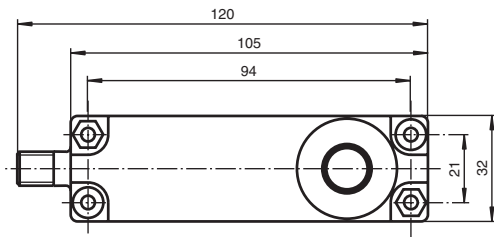


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

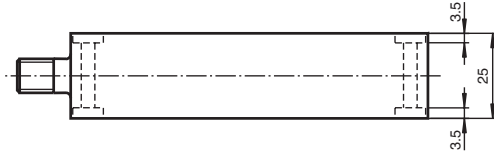
Technical Data

		Model number	UB500-F54-I-V15	UB500-F54-U-V15	UB2000-F54-I-V15	UB2000-F54-U-V15
Sensing range	30 ... 500 mm		●	●		
	80 ... 2000 mm				●	●
Adjustment range	100 ... 2000 mm				●	●
	50 ... 500 mm		●	●		
Unusable area	0 ... 30 mm		●	●		
	0 ... 80 mm				●	●
Standard target plate	100 mm x 100 mm		●	●	●	●
Transducer frequency	approx. 175 kHz				●	●
	approx. 380 kHz		●	●		
Response delay	≤ 150 ms				●	●
	≤ 50 ms		●	●		
LED green	permanently green: monitoring system		●	●	●	●
	green flashing: TEACH-IN function		●	●	●	●
LED yellow	permanently yellow: object in the evaluation range		●	●	●	●
	yellow, flashing: TEACH-IN function, object detected		●	●	●	●
LED red	flashing: normal mode: error, TEACH-IN function: no object detected		●	●	●	●
	permanently: TEACH-IN mode, object uncertain		●	●	●	●
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●		●	
	15 ... 30 V DC, ripple 10 % _{SS}			●		●
No-load supply current	≤ 55 mA		●	●	●	●
Output type	1 analogue output 0 ... 10 V			●		●
	1 analogue output 4 ... 20 mA		●		●	
Deviation of the characteristic curve	± 1 % of full-scale value		●	●	●	●
Resolution		0.13 mm	0.11 mm	0.5 mm	0.47 mm	
Repeat accuracy	± 0.1 % of full-scale value	●	●	●	●	
Load impedance	≥ 1 kOhm	●	●		●	
	0 ... 300 Ohm	●		●		
Temperature influence	± 1.5 % of full-scale value	●	●		●	
Default setting	evaluation limit 1: 100 mm evaluation limit 2: 2000 mm				●	●
	evaluation limit 1: 50 mm evaluation limit 2: 500 mm		●	●		
Input type	1 TEACH-IN input		●	●	●	●
	lower evaluation limit A1: -U _B ... +1 V, upper evaluation limit A2: +4 V ... +U _B					
Synchronisation	input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s					
	1 synchronous input, 0 level: -U _B ... +1 V, 1 level: +4 V ... +U _B				●	●
	input impedance: > 12 kOhm, synchronisation pulse: 0.1 ... 28 ms					
	1 synchronous input, 0 level: -U _B ... +1 V, 1 level: +4 V ... +U _B		●	●		
	input impedance: > 12 kOhm, synchronisation pulse: 0.1 ... 8 ms					
Common mode operation	≤ 100 Hz	●	●			
	≤ 33 Hz			●	●	
Multiplex operation	≤ 100 / n Hz, n = number of sensors	●	●			
	≤ 33 / n Hz, n = number of sensors			●	●	
Standards	EN 60947-5-2	●	●	●	●	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●	
Protection degree	IP65	●	●	●	●	
Connection	connector V15 (M12 x 1), 5 pin	●	●	●	●	
Material						
Housing	ABS	●	●	●	●	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●	●	●	●	
Mass	100 g	●	●	●	●	

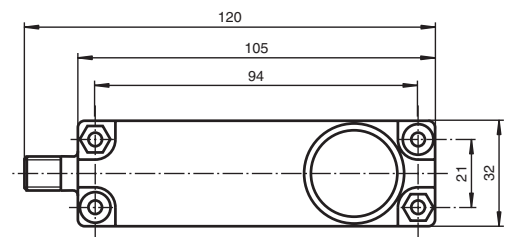
Date of edition: 08/18/2005



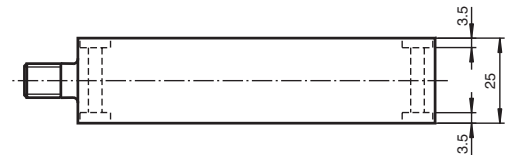
Bore hole and countersinking for screws/hexagon M4



UB500-F54-...



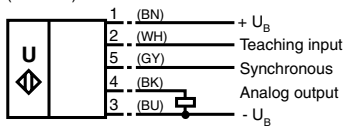
Bore hole and countersinking for screws/hexagon M4



UB2000-F54-...

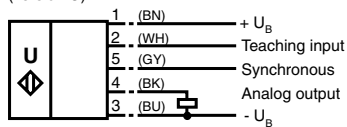
Electrical connection

Standard symbol/Connections:
(version I)



Core colours in accordance with EN 60947-5-2.

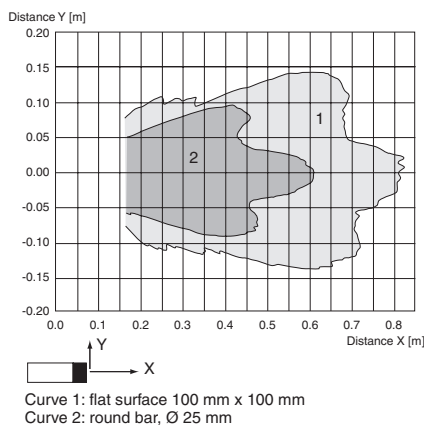
Standard symbol/Connections:
(version U)



Core colours in accordance with EN 60947-5-2.

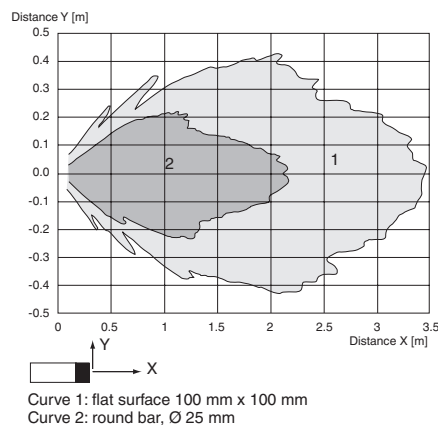
Diagrams

Characteristic response curve



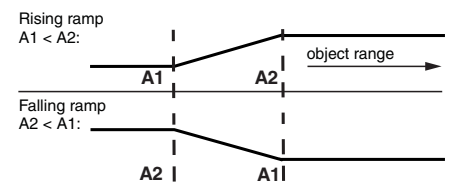
UB500-F54-...

Characteristic response curve



UB2000-F54-...

Programmed analogue output function



Series
-123GM

Series
-18GM/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F54

Series
-F64

Series
-D1

Series
LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Ultrasonic sensor

UB...-F54-H3-V1



- Separate evaluation
- Direct detection mode

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

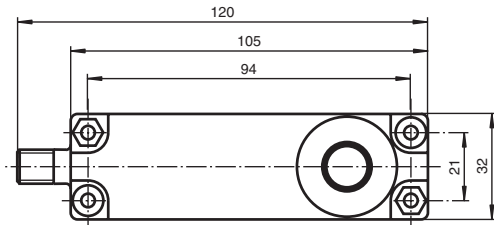
		Model number	UB500-F54-H3-V1	UB2000-F54-H3-V1
Sensing range	30 ... 500 mm		●	
	80 ... 2000 mm			●
Adjustment range	100 ... 2000 mm			●
	50 ... 500 mm		●	
Unusable area	0 ... 30 mm ¹⁾		●	
	0 ... 80 mm ¹⁾			●
Standard target plate	100 mm x 100 mm		●	●
Transducer frequency	approx. 175 kHz			●
	approx. 380 kHz		●	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}		●	●
No-load supply current	≤ 30 mA		●	●
Output type	1 pulse output for echo run time, short-circuit proof		●	●
	open collector pnp with pull down resistor = 22 kOhm			
	level 0 (no echo): - U _B		●	●
	level 1 (echo detected): ≥ (+U _B -2 V)		●	●
Rated operational current	15 mA, short-circuit/overload protected		●	●
Temperature influence	the echo propagation time: 0,17 %/ K		●	●
Input type	1 pulse input for transmitter pulse (clock)		●	●
	0-level (active): < 5 V (U _B > 15 V)			
	1-level (inactive): > 10 V ... +U _B (U _B > 15 V)			
	0-level (active): < 1/3 U _B (10 V < U _B < 15 V)			
Pulse length	1-level (inactive): > 2/3 U _B ... +U _B (10 V < U _B < 15 V)			
	20 ... 300 μs (typ. 200 μs) ²⁾			●
	5 ... 100 μs (typ. 50 μs) ²⁾		●	
Pause length	≥ 50 x pulse length		●	●
Impedance	10 kOhm internal connected to +U _B		●	●
Standards	EN 60947-5-2		●	●
Ambient temperature	-25 ... 85 °C (248 ... 368 K)		●	●
Storage temperature	-40 ... 85 °C (233 ... 368 K)		●	●
Protection degree	IP67		●	●
Connection	V1 connector (M12 x 1), 4-pin		●	●
Material				
Housing	ABS		●	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●	●
Mass	110 g		●	●

Function

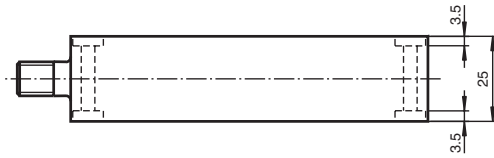
The sensing range is determined in the downstream evaluation electronics (e. g. the units UH3-KHD2-4E5, UH3-KHD2-4I or UH3-T1-KT). PLC modules or other existing evaluation units can also be substituted for these units offered by Pepperl+Fuchs.

The object distance in pulse-echo mode is obtained from the echo time.

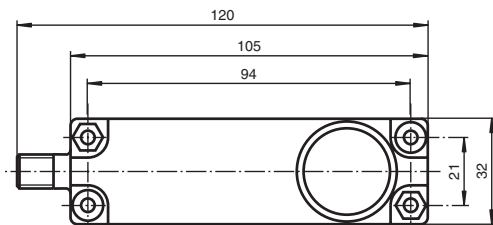
- 1) The unusable area (blind range) BR depends on the pulse duration T_i .
The unusable area reaches a minimum with the shortest pulse duration.
- 2) The sensors detection range depends on the pulse duration T_i .
With pulse duration < typical pulse duration, the sensors detection range may be reduced.



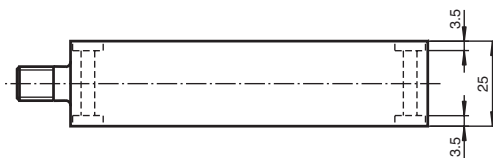
Bore hole and countersinking for screws/hexagon M4



UB500-F54-...



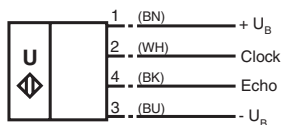
Bore hole and countersinking for screws/hexagon M4



UB2000-F54-...

Electrical connection

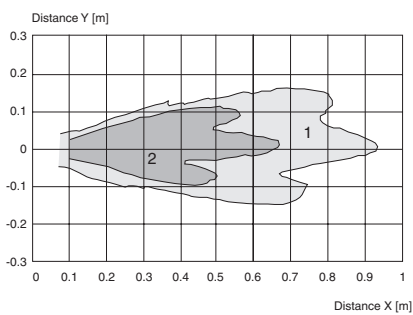
Standard symbol/Connection:



2 = Emitter pulse input
4 = Echo propagation time output
Core colours in accordance with EN 60947-5-2.

Diagrams

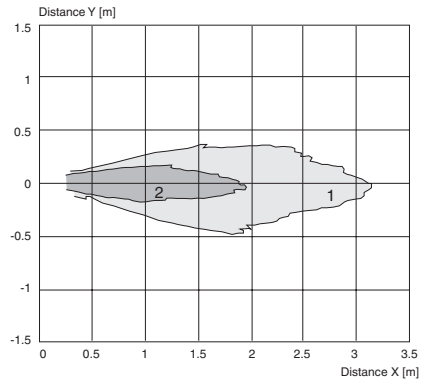
Characteristic response curves



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

UB500-F54-...

Characteristic response curves



Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

UB2000-F54-...

Date of edition: 08/18/2005

Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/Power supplies
Accessories

UB...-F54-... , output versions -E4 and -E5

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be realised as follows:

External synchronisation

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available

1. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
2. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

Internal synchronisation

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors will operate in multiplex mode. The response delay increases according to the number of sensors to be synchronised. Synchronisation cannot be performed during TEACH-IN and vice versa. The sensors must be operated in an unsynchronised manner to teach the switching point.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

Adjusting of switching points

The ultrasonic sensor features a switch output with two teachable switching points. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. Switching point A1 is taught with $-U_B$, A2 with $+U_B$.

Five different output functions can be set

1. Window mode, normally-open function
2. Window mode, normally-closed function
3. One switching point, normally-open function
4. One switching point, normally-closed function
5. Detection of object presence

TEACH-IN window mode, normally-open function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Set target to far switching point
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN window mode, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Set target to far switching point
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN one switching point, normally-open function

- Set target to near switching point
- TEACH-IN switching point A2 with $+U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$

TEACH-IN one switching point, normally-closed function

- Set target to near switching point
- TEACH-IN switching point A1 with $-U_B$
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A2 with $+U_B$

TEACH-IN detection of object presence

- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

Default setting of switching points

A1 = unusable area

A2 = nominal sensing range

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED	Green LED
TEACH-IN switching point:			
Object detected	off	flashes	flashes
No object detected	flashes	off	flashes
Object uncertain (TEACH-IN invalid)	on	off	flashes
Normal operation	off	switching state	on
Fault	flashes	previous state	off

UB...-F54-... , output versions -I and -U

Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. The synchronisation of multiple sensors can be realised as follows:

External synchronisation:

The sensor can be synchronised by the external application of a square wave voltage. A synchronisation pulse at the synchronisation input starts a measuring cycle. The pulse must have a duration greater than 100 µs. The measuring cycle starts with the falling edge of a synchronisation pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level at the synchronisation input disables the sensor.

Two operating modes are available:

1. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
2. The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

Internal synchronisation:

The synchronisation connections of up to 5 sensors capable of internal synchronisation are connected to one another. When power is applied, these sensors will operate in multiplex mode.

The response delay increases according to the number of sensors to be synchronised.

Synchronisation cannot be performed during TEACH-IN and vice versa. The sensors must be operated in an unsynchronised manner to teach the evaluation limits.

Note:

If the option for synchronisation is not used, the synchronisation input has to be connected to ground (0V) or the sensor has to be operated via a V1 cable connector (4-pin).

Adjusting the evaluation range (analogue output)

The ultrasonic sensor has an analogue output with programmable evaluation limits. These are set by applying the supply voltage $-U_B$ or $+U_B$ to the TEACH-IN input. The supply voltage must be applied to the TEACH-IN input for at least 1 s. LEDs indicate whether the sensor has recognised the target during the TEACH-IN procedure. The lower evaluation limit A1 is taught with $-U_B$, A2 with $+U_B$.

Two different output functions can be set:

1. Analogue value increases with rising distance to object (rising ramp)
2. Analogue value falls with rising distance to object (falling ramp)

TEACH-IN rising ramp (A1 > A2)

- Position object at lower evaluation limit
- TEACH-IN lower limit A1 with $-U_B$
- Position object at upper evaluation limit
- TEACH-IN upper limit A2 with $+U_B$

TEACH-IN falling ramp (A1 > A2):

- Position object at lower evaluation limit
- TEACH-IN lower limit A2 with $+U_B$
- Position object at upper evaluation limit
- TEACH-IN upper limit A1 with $-U_B$

LED Displays

Displays in dependence on operating mode	Red LED	Yellow LED	Green LED
TEACH-IN evaluation limit			
Object detected	off	flashes	flashes
No object detected	flashes	off	flashes
Object uncertain (TEACH-IN invalid)	on	off	flashes
Normal mode (evaluation range)	off	on	on
Fault	flashes	previous state	off


Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM	Series -18GK/-18GM	Series -12GM	Notes




Model number	Connection type	Detection range	Page
UBE500-F64-SE0	cable	500 mm	172
UBE500-F64-SE0-V3	M8 connector, 3-pin	500 mm	
UBE500-F64-SE2	cable	500 mm	
UBE500-F64-SE2-V3	M8 connector, 3-pin	500 mm	
UBE1500-F64-SE0	cable	1500 mm	
UBE1500-F64-SE0-V3	M8 connector, 3-pin	1500 mm	
UBE1500-F64-SE2	cable	1500 mm	
UBE1500-F64-SE2-V3	M8 connector, 3-pin	1500 mm	

Through-beam ultrasonic barrier

UBE...-F64-...



- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Small, compact design
- Plastic housing
- Emitter and receiver included in the delivery package



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data		Model number							
Sensing range	0 ... 1500 mm, distance emitter-receiver 20 mm ... 1500 mm								
	0 ... 500 mm, distance emitter-receiver 15 mm ... 500 mm								
	Reference target	receiver							
	Transducer frequency	200 kHz							
	LED yellow	indication of the switching state (receiver)							
Operating voltage	18 ... 30 V DC, ripple 10 % _{SS}								
	No-load supply current	20 mA receiver 12 mA emitter							
	Output type	1 switch output E0, npn NO 1 switch output E2, pnp NO							
Rated operational current	200 mA								
	50 mA								
	Voltage drop	≤ 0,5 V ≤ 2 V							
Switching frequency	100 Hz								
	120 Hz								
	Switch-on delay	< 5 ms							
Standards	EN 60947-5-2								
	Ambient temperature	0 ... 60 °C (273 ... 333 K)							
	Storage temperature	-40 ... 85 °C (233 ... 358 K)							
Protection degree	IP54								
	Connection	V3 connector (M8 x 1), 3 pin							
	2 m PVC cable								
emitter: 2 x 0.34 mm ²									
	receiver: 3 x 0.34 mm ²								
Material									
	Housing	PA 6.6							
	Mass	80 g per device							

Function

A through-beam ultrasonic barrier always consists of a single emitter and a single receiver. The function of a through-beam ultrasonic barrier is based in the interruption of the sound transmission to the receiver by the object to be detected.

The emitter sends an ultrasonic signal that is evaluated by the receiver. If the signal is interrupted or muted by the object to be detected, the receiver switches.

No electrical connections are required between the emitter and receiver.

The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the emitter below in the case of vertical installations to prevent the accumulation of dust particles.

Installation tolerances

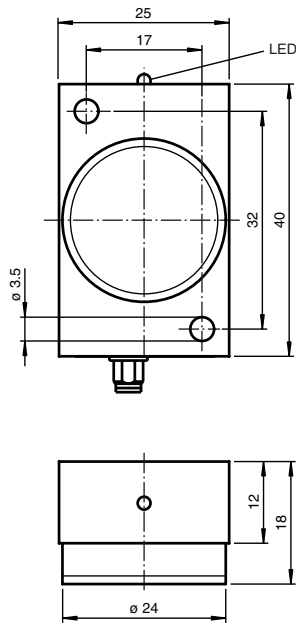
The installation tolerances of the central axes of the emitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

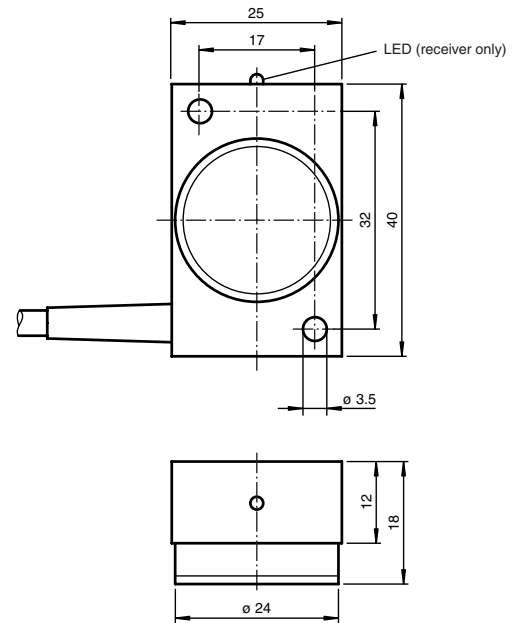
For the detection of thin foils (< 0.1 mm), install the through-beam ultrasonic barrier at an angle of ≥ 10° from perpendicular to the foil.

Caution

Mount or replace emitter and receiver only in pairs. Both devices are optimally matched to each other by the manufacturer.



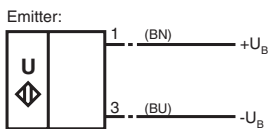
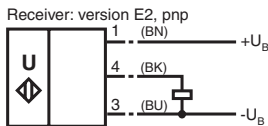
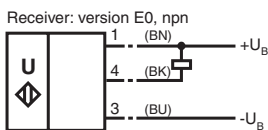
UBE...-F64-SE.-V3 (connector version)



UBE...-F64-SE. (cable version)

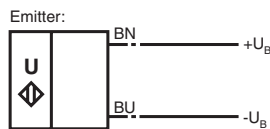
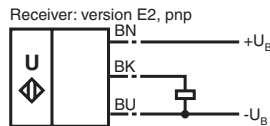
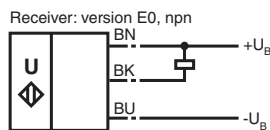
Electrical connection

Standard symbol/Connection:



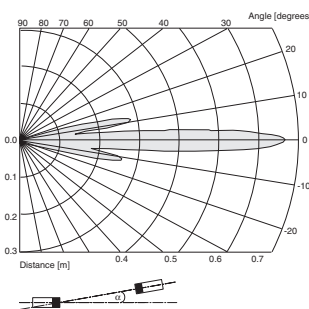
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:



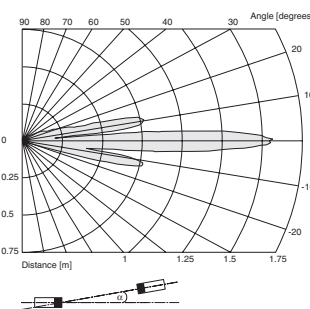
Diagrams

Characteristic response curves



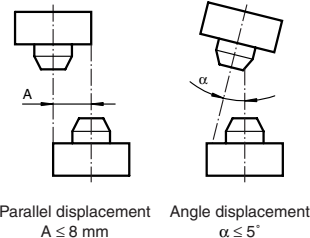
UBE500-F64...

Characteristic response curves

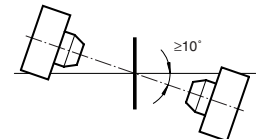


UBE1500-F64...

Mounting/Adjustment



Thin foil detection



Accessories	Control units/ Power supplies	D1 LUC	Series Double sheet monitoring	F64	Series F54	Series F43	Series F42	Series F12	Series FPP	-18GM -12GM	Series -30GM <i>Varkant</i>	Series -18GK/-18GM
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Notes



Model number	Detection range	Page
UC500-D1-3K-V7	500 mm	176

Ultrasonic sensor

UC500-D1-3K-V7



- Specially for level monitoring in vessels
- Large operating voltage range
10 V DC ... 252 V DC
20 V AC ... 252 V AC
- 3 relay outputs
- Parameter assignment via DIP-switches
- Temperature compensation

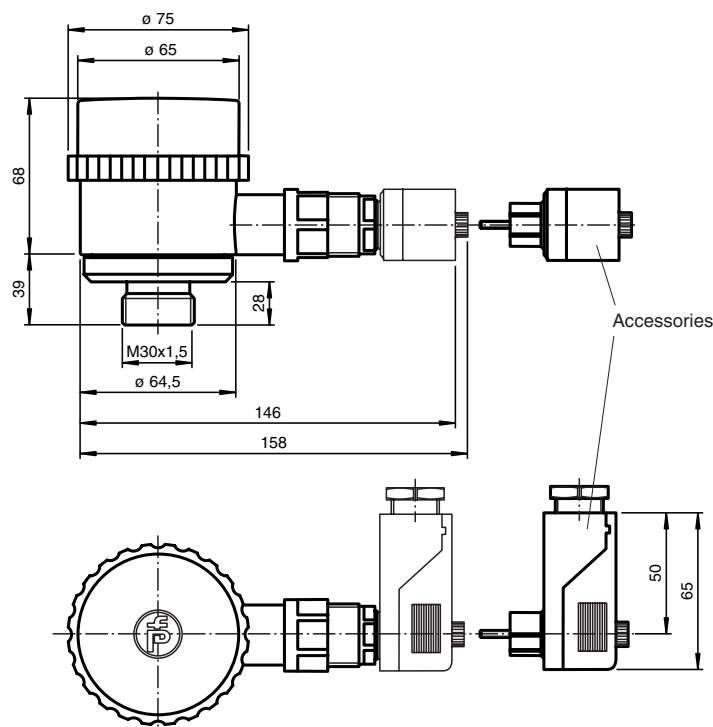
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

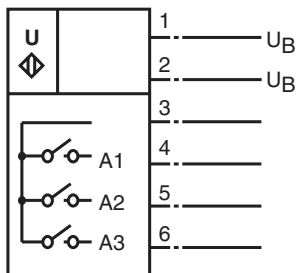
UC500-D1-3K-V7

Output type	3 relay outputs, normally open/closed, selectable
Contact loading	252 V AC/150V DC, 3 A (ohm. load)
Lifetime	Electrical: 10 ⁵ switching cycles at resistive load (3 A / 252 V AC or 3 A / 30 V DC) min. contact load: 100 µA / 100 mV DC mechanical: 20 x 10 ⁶ switching cycles
Range hysteresis	20 mm
Temperature influence	<4 %
Sensing range	60 ... 550 mm
Unusable area	0 ... 60 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Response delay	> 10 s, relay < 1 s, LEDs
Standards	EN 60947-5-2
LED green/yellow	LED 2: overfill warning and normal operation LED 3: normal operation and underfill warning
LED red	LED 1: overfill indication LED 4: underfill indication
DIP-switch	setting of the switch points/operating modes
Operating voltage	10 ... 252 V DC 20 ... 252 V AC, 47 ... 63 Hz
No-load supply current	< 30 mA with U _B = 30 V DC < 110 mA at U _B = 10 V DC < 25 mA at U _B = 220 V AC
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Protection degree	IP65
Connection	Cable connector 90° V7, (7-pin)
Material	
Housing	cover: PC housing: PBT threaded flange: stainless steel installation connector/cable socket: PETP
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	700 g



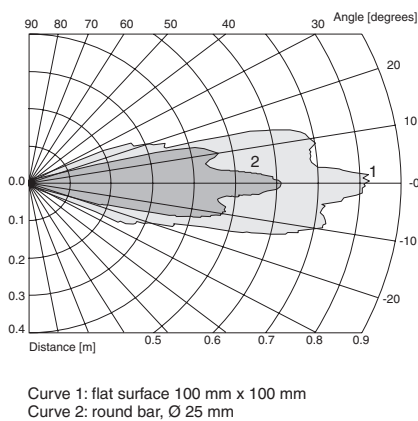
Electrical connection

Standard symbol/Connection:



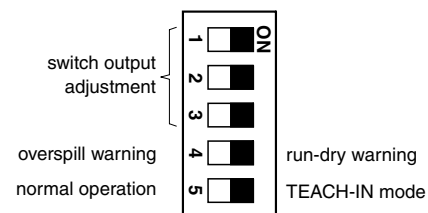
Diagrams

Characteristic response curves



Indicators/operating means

LED	S4 = OFF	S4 = ON
1 (red)	full	full
2 (green/yellow)	high	normal
3 (green/yellow)	normal	low
4 (red)	empty	empty



Date of edition: 08/18/2005

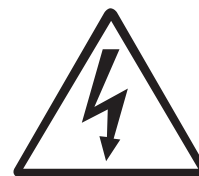
Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/Power supplies
Accessories

Safety notes:

The supply circuit is separated from the relay circuit by basic insulation.

The cover may only be opened by specially trained personnel. Degree of contamination 2 is permissible when the cover is open. Ensure that the sealing ring of the cover is in good condition.

Safety class II is only guaranteed when using the accessorial cable box and the associated mounting screw with plastic head. When operating this device with operating voltage exceeding 42 V, you must replace the metal mounting screw by the supplied plastic head mounting screw to avoid electric treatment. The cable box may only be separated from the unit when the power is off.

**CAUTION:**

The UC500-D1-K3-V7 ultrasonic sensor is not suitable for use in environments subject to explosion hazards.

Conformity: EN 60947-5-2
Housing insulation: Safety class II
Degree of contamination: 4
Overvoltage category: III

TEACH-IN of switching points:

One switching point can be taught for each of the 3 switch outputs. Set DIP switch 5 to ON to put the sensor in TEACH-IN mode. The sensor indicates TEACH-IN mode with two lit red LEDs. The green-yellow LEDs are off.

Next, position a suitable target object at the desired switching point in front of the sensor and switch the DIP switch associated with the relevant switch output (switches 1-3). The sensor will now be flashing yellow or green in addition to the lit red LEDs. Flashing green indicates that the target object was detected; flashing yellow signals that it was not detected. The measured switching point will be transferred to RAM when the associated DIP switch is switched back while the LED is flashing green. Only the red LEDs should now be lit. This signals the user that the DIP switches 1-3 have been restored to their original positions. The other switching points are set in the same manner. The TEACH-IN procedure is completed by setting DIP switch 5 back to the OFF position. The measured switching points will then be transferred to the nonvolatile EEPROM.

Under normal circumstances, switching point A1 should be less than A2, and A2 less than A3. If this is not observed, the sensor will automatically exchange the switching points after the TEACH-IN procedure is complete so that $A1 < A2 < A3$. This ensures that the LEDs respond correctly and that the shortest switching point is assigned to relay 1, the middle distance to relay 2 and the longest distance to relay 3.

If DIP switch 4 is switched during TEACH-IN, the default value for the switching point will be set rather than a target object. The default values for the switching points are 60 mm for A1, 220 mm for A2 and 270 mm for A3.

Display during TEACH-IN:

DIP1-3	one or more DIP switches changed TEACH-IN active			in normal state TEACH-IN complete	
DIP4	normal state TEACH-IN of object distance		changed default parameter	normal state	changed
State	object detected	object not detected	default active		
LED 1, red	lit	lit	lit	lit	lit
LED 2, green/yellow	flashes green	off	lit green	off	lit green
LED 3, green/yellow	off	flashes yellow	lit yellow	off	lit yellow
LED 4, red	lit	lit	lit	lit	lit

The relays switch to the "safe state" (all relays open, regardless of close/open function) during TEACH-IN.

Setting the switching behaviour:

In normal mode (DIP switch 5 OFF), the DIP switches 1 to 3 can be used to set the switching behaviour of the switch outputs 1 to 3. If the associated DIP switch is ON, the associated switch output has a close function; if the switch is set to OFF the output has an open function. Close function means that the relay trips when the object distance is less than the associated switching point; in the case of open function, the relay trips when the object distance is greater than the switching point.

The relays switch to the "safe state" (all relays open, regardless of close/open function) in the event of a failure

Setting the display modes:

Two display modes can be selected with DIP switch 4:

Display mode 1: DIP switch 4 ON, underfill warning:

Object distance x	$x < A1$	$A1 < x < A2$	$A2 < x < A3$	$x > A3$
LED 1, red (full)	flashes	off	off	off
LED 2, green/yellow (normal)	off	lit green	off	off
LED 3, green/yellow (low)	off	off	flashes yellow	off
LED 4, red (empty)	off	off	off	flashes

In this mode LED 1 (red) serves as the overfilling indicator, LED 2 (green) indicates the normal state, LED 3 (yellow) serves as the preliminary warning that the container is nearly empty and LED 4 (red) signals the "container empty" state.

Display mode 2: DIP switch 4 OFF, overfill warning

Object distance x	$x < A1$	$A1 < x < A2$	$A2 < x < A3$	$x > A3$
LED 1, red (full)	flashes	off	off	off
LED 2, green/yellow (high)	off	flashes yellow	off	off
LED 3, green/yellow (normal)	off	off	lit green	off
LED 4, red (empty)	off	off	off	flashes

In this mode LED 1 (red) serves as the overfilling indicator, LED 2 (yellow) serves as the preliminary warning that the container is nearly full, LED 3 (green) indicates the normal state, and LED 4 (red) signals the "container empty" state.

The relays switch to the "safe state" (all relays open, regardless of close/open function) in the event of a failure.

Date of edition 08/18/2005



Model number	Detection range	Page
LUC4T-G5P-IU-V15 LUC4T-G5S-IU-V15 LUC4T-N5P-IU-V15 LUC4T-N5S-IU-V15	4000 mm	182

Type code/ordering information

L	U	C	4	T	-				-	I	U	-	V15
---	---	---	---	---	---	--	--	--	---	---	---	---	-----

Connection type (electrical)
V15 V15-connector (M12 x 1) 5-pin

Electrical output
IU 4 mA ... 20 mA und 0 V ... 10 V

Material of process connection
S Stainless steel 1.4571
P Polypropylene

Process connection
G5 screwed connection G 1½ A
N5 screwed connection 1½" NPT

Membrane surface material
T PTFE

Measuring range
4 0,3 m ... 4 m

Ultrasonic level sensor

LUC4TG5.-IU-V15



- Fixed target suppression
- Simple calibration
- Function monitoring
- Fail-safe behaviour in the event of no echo
- Output signal 4 mA ... 20 mA/0 V ... 10 V
- Temperature compensation

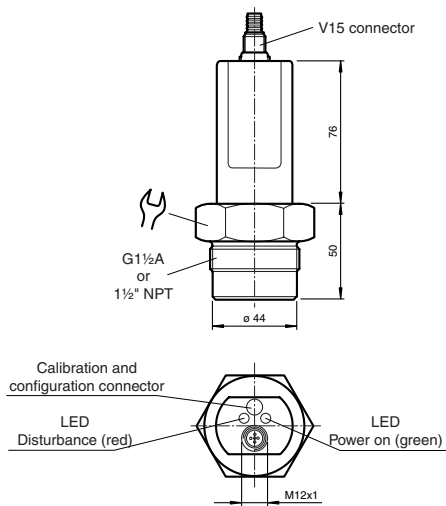


Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

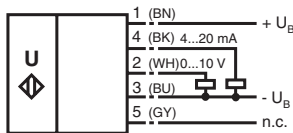
Technical Data

Model number		LUC4TG 5P-IU-V15	LUC4TG 5S-IU-V15	LUC4TNGP-IU-V15	LUC4TNS-IU-V15
Output type	1 analogue output 4 ... 20 mA, $R_L \leq 500 \text{ Ohm}$, error $\geq 21 \text{ mA}$ 1 voltage output 0 ... 10 V, $R_L \geq 1000 \text{ Ohm}$, error $\geq 10.5 \text{ V}$	●	●	●	●
Resolution	2 mm	●	●	●	●
Deviation of the characteristic curve	0.5 % of upper limit of measuring range	●	●	●	●
Sensing range	0.3 ... 4 m, with fluids	●	●	●	●
Transducer frequency	approx. 85 kHz	●	●	●	●
Standards	EN 60947-5-2	●	●	●	●
LED green	power on	●	●	●	●
LED red	2 Hz flashing: error	●	●	●	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●	●	●	●
Power consumption	$\leq 1200 \text{ mW}$	●	●	●	●
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	●	●	●	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●	●	●	●
Protection degree	IP65	●	●	●	●
Connection	connector V15 (M12 x 1), 5 pin	●	●	●	●
Mounting	screwed connection G1½A screwed connection 1½" NPT	●	●		●
Material					
Housing	PBT, stainless steel 1.4571 PBT, polypropylene		●		●
Transducer	PTFE (diaphragm surface)	●	●	●	●
Mass	220 g	●	●	●	●

Dimensions

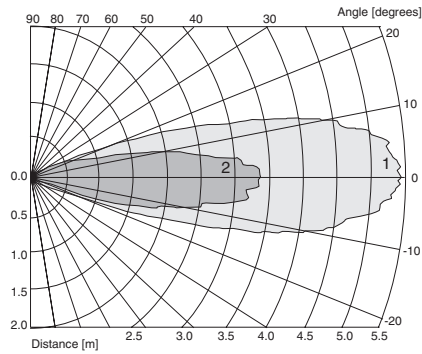


Standard symbol/Connection:



Core colours in accordance with EN 60947-5-2.

Characteristic response curves



Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Additional information

Product description:

The LUC4T-... ultrasonic sensor is especially designed to measure the fill level of liquids. With its Teflon-coated surface, the sensor is outstandingly suited for use with corrosive liquids. The masking of fixed objects permits the sensor to be deployed in locations in which struts or other internal structures extend into the measuring field.

Sensors of the LUC4T-... series feature a 4 mA ... 20 mA current and 0 V ... 10 V voltage output as standard. The outputs have fail-safe behaviour in the event of a fault.

Function

The ultrasonic converter sends out an acoustic pulse. This pulse is reflected by the contents of the container and registered by the converter after traveling the measurement distance.

A microprocessor evaluates the echo signals and determines the fill level.

Sources of interference such as weld seams, fixed installations, etc. are suppressed reliably via the masking of fixed objects. Temperature-related changes of the velocity of sound are compensated.

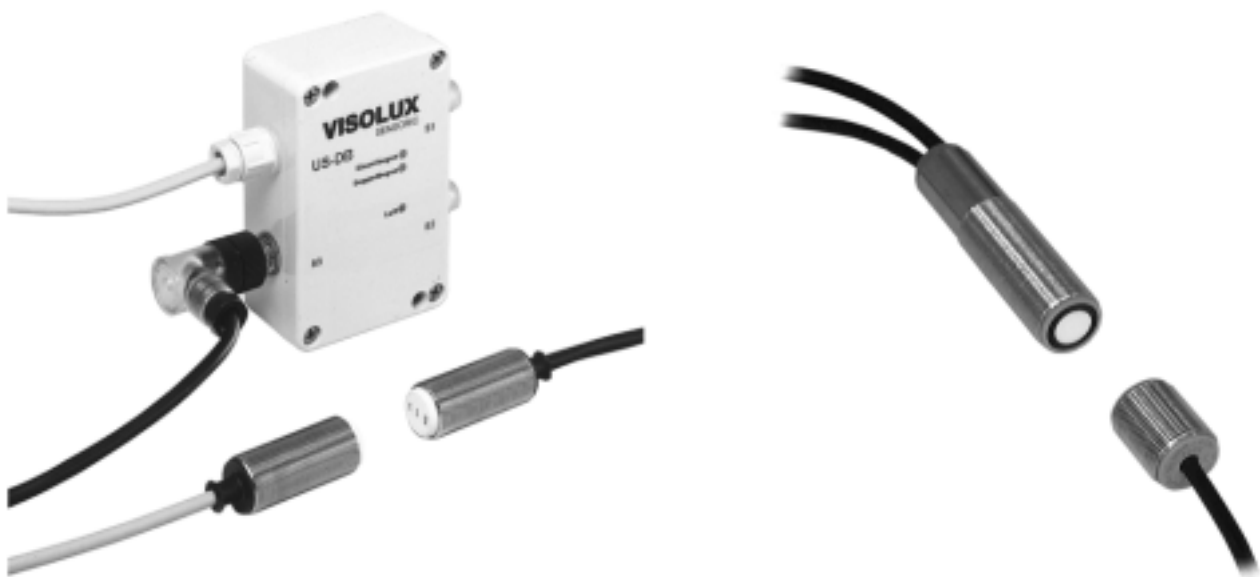
Measuring system:

A measuring system consists of a LUC4T-...-IU-V15 ultrasonic level sensor and a DA5... display unit or power supply. The LUC4T-...-IU-V15 ultrasonic level sensor can also be connected directly to a PLC.

Compensation:

Compensation (not installed)	Compensation (installed)	Plug position
1. Empty TEACH-IN simulation of 0 % level (wait 15 s)	1. Empty TEACH-IN approach 0 % level in container (wait 15 s)	T
Accept empty value Empty value accepted (red LED flashing) Empty TEACH-IN complete	Accept empty value Empty value accepted (red LED flashing) Empty TEACH-IN complete	A1 A1 T
2. Full TEACH-IN simulation of 100 % level (wait 15 s)	2. Full TEACH-IN approach 100 % level in container (wait 15 s)	T
Accept full value Full value accepted (red LED flashing) Full TEACH-IN complete	Accept full value Full value accepted (red LED flashing) Full TEACH-IN complete	A2 A2 T
TEACH-IN complete	TEACH-IN complete	T

Notes												
Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM
												Series -18GM/-18GM
												Series -12GM



Model number	Description	Page
UDC-18GM-400-3E3	Optimised for double sheet detection with integrated evaluation unit	186
UDC-18GMA-400-3E3	Optimised for double sheet detection with integrated evaluation unit Angled sensor head version	190
UDB-18GM35-3E2	Optimised for double sheet detection	194
UDBL-18GM35-3E2	Optimised for label detection	196
UDBK-18GM35-3E2	Optimised for jointing/splice detection	198

Applications:

The ultrasonic double-sheet monitor is deployed in all situations in which the automatic distinction between single and double sheets is required in order to protect machines or avoid waste production.

For example:

- Deployment in printing machines, in which the ultrasonic double-sheet monitor prevents damage to the complex mechanics by the inadvertent feed of two sheets or ensures that the second sheet does not remain in the machine.
- The monitoring of bonding sheets in labeling machines, in which the application of the sheets to a base material is detected and counted.

- Deployment in letter-opening machines to verify the complete emptying of the opened envelopes.
- Deployment in document counters, in which the ultrasonic double-sheet monitor ensures that bank deposit slips, for example, are properly counted.
- Deployment in packaging machines for the detection of splices in aluminium packaging foil and proper regulation of the machine speed.
- Detection of air, single and double sheet in paper processing machinery.



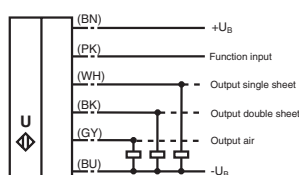
- **Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers**
- **No TEACH-IN required**
- **Function indicators visible from all directions**
- **Insensitive to printing, colours and shining surfaces**
- **Material weight from 10 g/m² up to over 2000 g/m²**
- **Very wide material spectrum, finest papers up to thin sheet metals as well as plastic- and metal foils**
- **Perpendicular or inclined sensor mounting relative to the sheet plane possible**

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

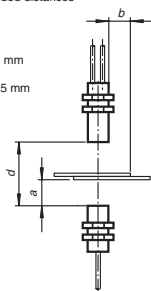
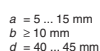
Model number

		Model number	UDC-18G M-400-3E3
Sensing range	20 ... 60 mm, optimal distance: 45 mm		●
Transducer frequency	395 kHz		●
Focke Ident-Nr.	9362245		●
LED green	indication: single sheet detected		●
LED yellow	Display: No sheet detected (Air)		●
LED red	indication: double sheet detected		●
Operating voltage	18 ... 30 V DC, ripple 10 %ss		●
No-load supply current	< 80 mA		●
Time delay before availability	< 500 ms		●
Output type	3 Switch outputs pnp, normally-closed		●
Rated operational current	3 x 100 mA, short-circuit/overload protected		●
Voltage drop	≤ 2 V		●
Switch-on delay	approx. 25 ms		●
Switch-off delay	approx. 25 ms		●
Pulse extension	min. 120 ms parameterisable		●
Input type	Function input 0-level: -U _B ... -U _B + 1 V 1-level: +U _B - 1 V ... +U _B		●
Pulse length	≥ 100 ms		●
Impedance	≥ 230 kΩ		●
Standards	EN 60947-5-2 C-UL listed: 57M3, IND CONT. EQ., "Powered by Class 2 Power Source"		●
Ambient temperature	0 ... 60 °C (273 ... 333 K)		●
Storage temperature	-40 ... 70 °C (233 ... 343 K)		●
Protection degree	IP67		●
Connection	2 m, PVC cable 0.14 mm²		●
Housing	brass, nickel-plated, plastic components PBT		●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam		●
Mass	150 g		●

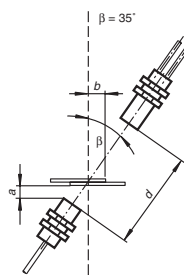
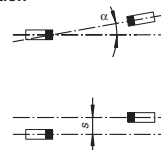
Standard symbol/Connection:
Double sheet control

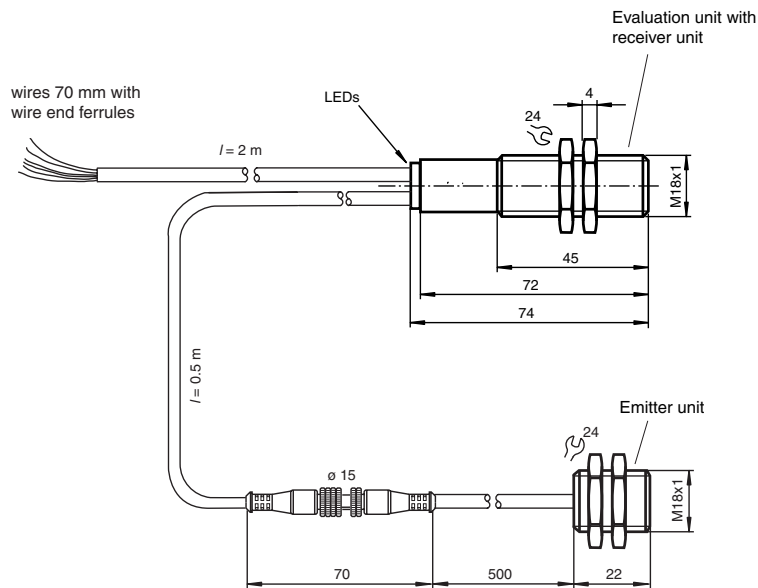


Recommended distances



(for very thick papers)

 $\alpha \leq \pm 1^\circ$ 



Additional information

Description of sensor functions

The ultrasonic double sheet monitor is used for double sheet detection in all situations in which the automatic distinction between double and single sheets is required in order to protect machines or avoid waste production. The double-sheet monitor is based on the ultrasonic through-beam principle. The following can be detected:

- No sheet, i.e. air,
- Individual sheet
- Double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. Changes in ambient conditions such as temperature and humidity are compensated for automatically. The interface electronics is integrated into a compact M18 metal housing together with a sensor head.

Switching on

The sensor is equipped with 6 connections. The functionality of the connections is described in the following table. The function input (PK) is used to assign parameters to the sensor. (See Output pulse extension, Alignment aid and Program selection). During normal operation, the function input must always be securely connected with +U_B or -U_B, to avoid possible interference or improper functionality.

Colour	Switching on	Comments
BN	+U _B	
WH	Switch output for single sheets	Pulse width corresponds to the event
BK	Switch output for double sheets	Pulse width corresponds to the event
GY	Switch output for air	Pulse width corresponds to the event
PK	-U _B / +U _B	Function input for parameter assignment/pulse prolongation
BU	-UB	

Normal mode

The sensor is working in normal mode if the function input (PK) is applied to -U_B or +U_B when the power source (Power-On) is supplied, as shown in the output pulse extension table (see below).

Displays:

- LED yellow: Detection of air
- LED green: Detection of single sheets
- LED red: Detection of double sheets

Switch outputs:

The switch outputs are only active in normal operation!

- White: WH Single sheet output
- Black: BK Double sheet output
- Gray: GY Air output

Output pulse extension

Switching the function input (PK) on to $-U_B$ or $+U_B$ makes it possible to select a minimum pulse width of 120 ms for all output pulses of the three switch outputs.

Switching on (PK)	Operating behaviour (after Power-On)
$-U_B$	No output pulse extension for switch outputs
$+U_B$	Output pulse extension of all switch outputs to at least 120 ms

Please note:

This can result in a condition in which more than one switch output is switched through!

Display Mode

The selected parameter assignment of the sensor can be displayed by switching the function input (PK) to voltage-free during normal operation. The green LED displays the program number (the number of flashing pulses (1 ... 4) = the program number). The outputs are inactive during this time.

If the function input (PK) is switched to voltage-free when power is supplied (Power-On), the sensor will also work in display mode.

If the unit is switched to voltage-free while the function input (PK) is in operation due to an error (broken cable, coming loose because of vibration), display mode acts as a fault display.

Parameter assignment

The sensor is equipped with 4 programs for different ranges of application. This makes it possible to work with a wide range of material. The user can select the program best suited for a specific application.

The default setting, Program 1, is designed so that no change in the setting is required for most applications.

Programs

Program number	Notes:	Range of materials
1	Default setting, standard paper	20 - 1200 g/m ²
2	Thick paper, cardboard, fine corrugated boards (DIN 55 468-1) and thin sheet metal**	> 100 g/m ²
3	Thin paper	20 - 250 g/m ²
4	Extremely fine paper	< 40 g/m ²

*) The measurements were made under the following conditions: $d = 45$ mm, $a = 10$ mm, $\beta = 0^\circ$

*) The measurements were made under the following conditions: $d = 45$ mm, $a = 10$ mm, $\beta = 35^\circ$

Procedure for assigning parameters

It is possible to switch to additional parameter assignment modes from the display mode:

Alignment mode -->

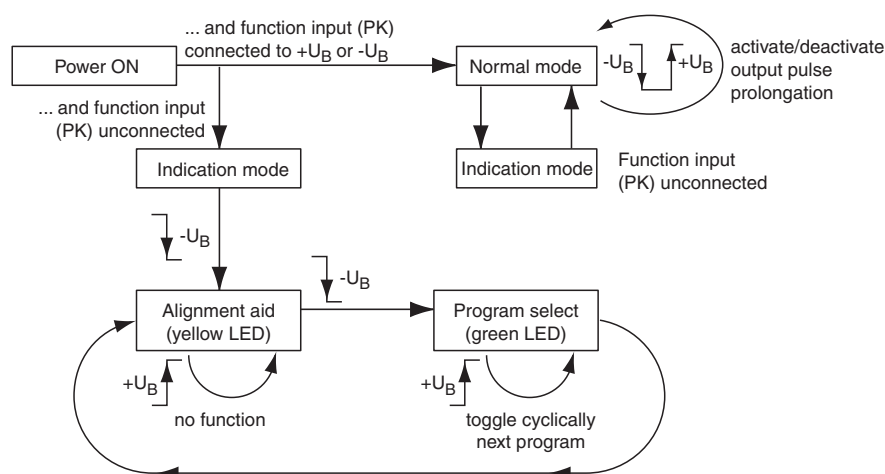
Program selection mode -->

Alignment aid mode --> (for checking)

When the function input (PK) is applied to $-U_B$ (for > 500 ms), the mode changes. When the "Program selection" mode is active, switching on function input (PK) on to $+U_B$ (for > 500 ms) selects the next program level.

Disconnecting the power supply causes the system to exit the current mode with the selected program change.

The switch outputs are not active while parameters are being assigned to the sensor!



Modes

Alignment aid

During installation, the DSM can provide an adjustment aid for optimal alignment of the emitter to the receiver.

If the sensor detects an area of air (yellow LED is lit) the DSM will begin to display the intensity of the measured amplitude signal:

- If the signal is weak, the yellow LED will flash at a slow rate
- As the intensity of the signal increases, the rate at which the LED flashes becomes faster
- At optimal alignment (maximum signal intensity), the yellow LED is continuously lit.

The single sheet function (green LED) and double sheet function (red LED) continues to be active. This makes it possible to check for correct functionality of the double sheet control.

Program selection

In the program selection mode, the current program is displayed by the green LED (number of flashing pulses = program number). Applying the adjustment input (PK) to +U_B (for > 500 ms) causes the next program to be selected in cyclic sequence (program 1 follows through to program 4).

Notes:

A complete device consists of an ultrasonic emitter and an evaluation unit with an ultrasonic emitter. The sensor heads are optimally adjusted to each other when they leave the factory. Therefore, they must not be used separately or exchanged with other devices of the same type. The plug connector on the emitter/receiver connection cable is only intended to be used for easier mounting, not to replace units.

Very light papers (for example handkerchiefs) or perforated papers are not always suitable for double sheet detection because of their physical characteristics.

If two or more double sheet controls are used in the immediate vicinity of each other, there may be mutual interference between them, which can result in improper functionality of the devices. Mutual interference can be prevented by introducing suitable countermeasures when planning systems.

Ultrasonic double sheet monitor

UDC-18GMA-400-3E3



- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- No TEACH-IN required
- Function indicators visible from all directions
- Insensitive to printing, colours and shining surfaces
- Material weight from 10 g/m² up to over 2000 g/m²
- Very wide material spectrum, finest papers up to thin sheet metals as well as plastic- and metal foils
- Perpendicular or inclined sensor mounting relative to the sheet plane possible
- Automatic compensation of the single-sheet value in the case of slowly changing ambient conditions

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

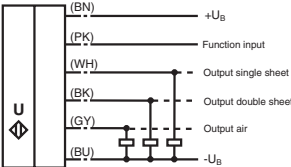
Model number

UDC-18G MA-400-3E3

Sensing range	20 ... 60 mm , optimal distance: 45 mm	●
Transducer frequency	395 kHz	●
LED green	indication: single sheet detected	●
LED yellow	Display: No sheet detected (Air)	●
LED red	indication: double sheet detected	●
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	●
No-load supply current	<80 mA	●
Time delay before availability	<500 ms	●
Output type	3 Switch outputs pnp, normally-closed	●
Rated operational current	3 x 100 mA , short-circuit/overload protected	●
Voltage drop	≤ 2 V	●
Switch-on delay	approx. 25 ms	●
Switch-off delay	approx. 25 ms	●
Pulse extension	min. 120 ms parameterisable	●
Input type	Function input 0-level: -U _B ... -U _B + 1V 1-level: +U _B - 1 V ... +U _B	●
Pulse length	≥ 100 ms	●
Impedance	≥ 230 kΩ	●
Standards	EN 60947-5-2 C-UL listed: 57M3, IND CONT. EQ., "Powered by Class 2 Power Source"	●
Ambient temperature	0 ... 60 °C (273 ... 333 K)	●
Storage temperature	-40 ... 70 °C (233 ... 343 K)	●
Protection degree	IP67	●
Connection	2 m, PVC cable 0.14 mm ²	●
Housing	brass, nickel-plated, plastic components PBT	●
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	●
Mass	150 g	●

Electrical connection, diagrams, additional information

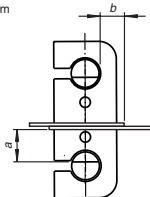
Standard symbol/Connection:
Double sheet control



Mounting/Adjustment

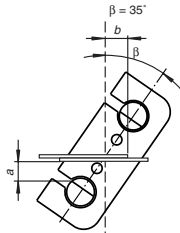
Recommended distances

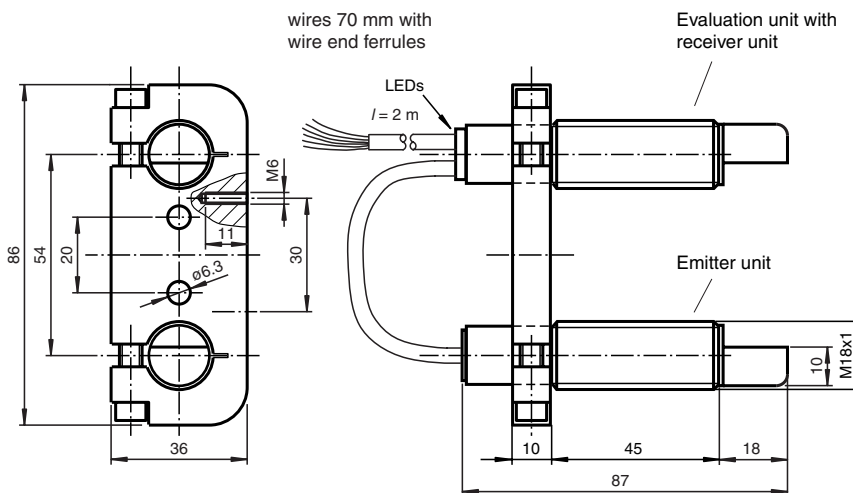
a = 5 ... 15 mm
b ≥ 10 mm



Mounting/Adjustment

(for very thick Papers)





Additional information

Description of sensor functions

The ultrasonic double sheet monitor is used for double sheet detection in all situations in which the automatic distinction between double and single sheets is required in order to protect machines or avoid waste production. The double-sheet monitor is based on the ultrasonic through-beam principle. The following can be detected:

- No sheet, i.e. air,
- Individual sheet
- Double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. Changes in ambient conditions such as temperature and humidity are compensated for automatically. The interface electronics is integrated into a compact M18 metal housing together with a sensor head. To ensure a reliable operation of the double sheet monitor, the detection threshold is adapted dynamically to the detected paper thickness.

Switching on

The sensor is equipped with 6 connections. The functionality of the connections is described in the following table. The function input (PK) is used to assign parameters to the sensor. (See Output pulse extension, Alignment aid and Program selection). During normal operation, the function input must always be securely connected with +U_B or -U_B, to avoid possible interference or improper functionality.

Colour	Switching on	Comments
BN	+U _B	
WH	Switch output for single sheets	Pulse width corresponds to the event
BK	Switch output for double sheets	Pulse width corresponds to the event
GY	Switch output for air	Pulse width corresponds to the event
PK	-U _B /+U _B	Function input for parameter assignment/pulse prolongation
BU	-U _B	

Normal mode

The sensor is working in normal mode if the function input (PK) is applied to -U_B or +U_B when the power source (Power-On) is supplied, as shown in the output pulse extension table (see below).

Displays:

- LED yellow: Detection of air
- LED green: Detection of single sheets
- LED red: Detection of double sheets

Switch outputs:

The switch outputs are only active in normal operation!

- White: WH Single sheet output
- Black: BK Double sheet output
- Gray: GY Air output

Output pulse extension

Switching the function input (PK) on to $-U_B$ or $+U_B$ makes it possible to select a minimum pulse width of 120 ms for all output pulses of the three switch outputs.

Switching on (PK)	Operating behaviour (after Power-On)
$-U_B$	No output pulse extension for switch outputs
$+U_B$	Output pulse extension of all switch outputs to at least 120 ms

Please note:

This can result in a condition in which more than one switch output is switched through!

Display Mode

The selected parameter assignment of the sensor can be displayed by switching the function input (PK) to voltage-free during normal operation. The green and the red LED display alternately the program number and the operation mode.

LED green: Number of blinking pulses = program number

LED red: single flashing = continuous operation mode

double flashing = pulsed operation mode

The outputs are inactive during this time.

If the function input (PK) is switched to voltage-free when power is supplied (Power-On), the sensor will also work in display mode.

If the unit is switched to voltage-free while the function input (PK) is in operation due to an error (broken cable, coming loose because of vibration), display mode acts as a fault display.

Parameter assignment

The sensor is equipped with 4 programs for different ranges of application. This makes it possible to work with a wide range of material. The user can select the program best suited for a specific application.

The default setting, Program 1, is designed so that no change in the setting is required for most applications.

Programs

Program number	Notes:	Range of materials
1	Default setting, standard paper	20 - 1200 g/m ²
2	Thick paper, cardboard, fine corrugated boards and thin sheet metal	> 100 g/m ²
3	Thin paper	20 - 250 g/m ²
4	Extremely fine paper	< 40 g/m ²

Operation modes

The double sheet monitor offers the possibility to select between continuous operation mode and pulsed operation mode. Due to the pulsed operation mode is pre-selected as the standard mode, most applications need no modification.

Procedure for assigning parameters

It is possible to switch to additional parameter assignment modes from the display mode:

Alignment mode -->

Program selection mode -->

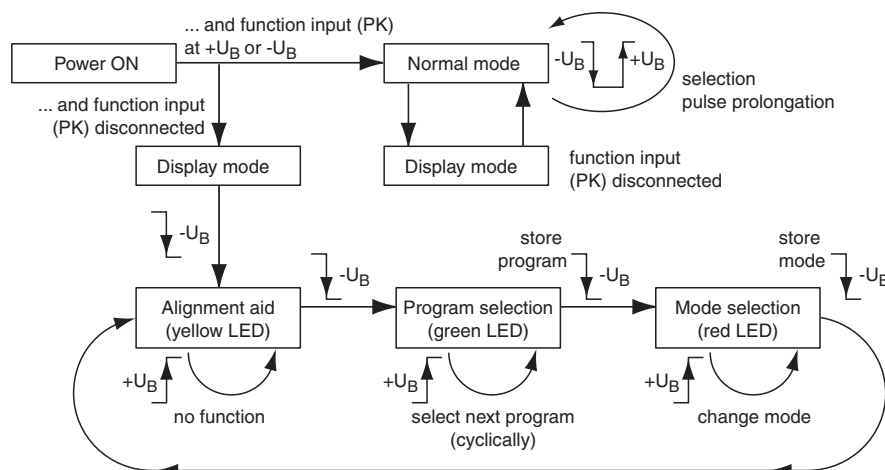
Operation mode selection mode -->

Alignment aid mode --> (for checking)

When the function input (PK) is applied to $-U_B$ (for > 500 ms), the mode changes and the storage of the current parameter. Within the Modes "program selection" and "operation mode selection" you can scroll through the programs or modes by applying $+U_B$ (for > 500 ms) to the function input (PK).

Disconnecting the power supply causes the system to exit the current mode with the selected program change.

The switch outputs are not active while parameters are being assigned to the sensor!



Modes

Alignment aid

During installation, the DSM can provide an adjustment aid for optimal alignment of the emitter to the receiver.

If the sensor detects an area of air (yellow LED is lit) after 3 seconds, the DSM will begin to display the intensity of the measured amplitude signal:

- If the signal is weak, the yellow LED will flash at a slow rate
- As the intensity of the signal increases, the rate at which the LED flashes becomes faster
- At optimal alignment (maximum signal intensity), the yellow LED is continuously lit.

The single sheet function (green LED) and double sheet function (red LED) continues to be active. This makes it possible to check for correct functionality of the double sheet control.

Program selection

In the program selection mode, the current program is displayed by the green LED (number of flashing pulses = program number). Applying the adjustment input (PK) to $+U_B$ (for > 500 ms) causes the next program to be selected in cyclic sequence (program 1 follows through to program 4).

Operation mode selection

In the operation mode selection mode, the current program is displayed by the red LED.

single flashing: continuous operation mode

double flashing: pulsed operation mode

Applying the adjustment input (PK) to $+U_B$ (for > 500 ms) causes an alteration of the operation mode.

Notes:

A complete device consists of an ultrasonic emitter and an evaluation unit with an ultrasonic emitter. The sensor heads are optimally adjusted to each other when they leave the factory. Therefore, they must not be used separately or exchanged with other devices of the same type. The plug connector on the emitter/receiver connection cable is only intended to be used for easier mounting, not to replace units.

Very light papers (for example handkerchiefs) or perforated papers are not always suitable for double sheet detection because of their physical characteristics.

If two or more double sheet controls are used in the immediate vicinity of each other, there may be mutual interference between them, which can result in improper functionality of the devices. Mutual interference can be prevented by introducing suitable countermeasures when planning systems.

Series
-123MSeries
-18GK/-18GMSeries
-30GMSeries
VarKontSeries
-FPSeries
-F12Series
-F42Series
-F43Series
-F54Series
-F64Series
-D1Series
LUCDouble sheet
monitoringControl units/
Power supplies

Accessories

Ultrasonic double sheet monitor

UDB-18GM35-3E2



- Ultrasonic system for detection of single sheet, no sheet and double sheet. Also detection of pasted double sheets.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are programmed in via a TEACH-IN signal.
- Automatic compensation of the operating point in the case of slowly changing ambient conditions.
- Signal output via short-circuit proof PNP switch outputs.
- Very high processing speeds are possible.

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

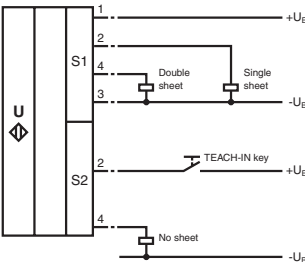
Model number

UDB-18GM35-3E2

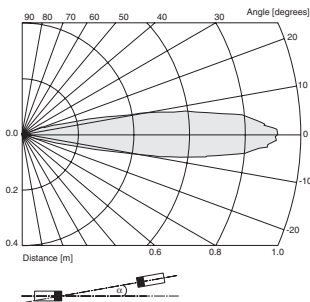
Transducer frequency	180 kHz
LED green	indication: single sheet detected
LED yellow	indication: no sheet detected
LED red	indication: double sheet or pasted double sheets detected
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	<80 mA
Output type	3 switch outputs prp, NO
Rated operational current	3 x 200 mA
Voltage drop	≤ 2 V
Switch-on delay	≤ 5 ms
Switch-off delay	≤ 5 ms
Input type	1 pulse input for TEACH-IN
Pulse length	≥ 100 ms
Impedance	≥ 10 kOhm
Voltage	12 ... 30 V
Standards	EN 60947-5-2
Ambient temperature	0 ... 60 °C (273 ... 333 K)
Storage temperature	-40 ... 70 °C (233 ... 343 K)
Protection degree	IP65
Connection	emitter: V1-W connector with 2.5 m cable receiver: 2.5 m fixed cable (not disconnectable) S1,S2: 2 connectors V1-W, M12x1 (included with delivery)
Housing	Makdon/nickel-plated brass
Mass	370 g

Electrical connection, diagrams, additional information

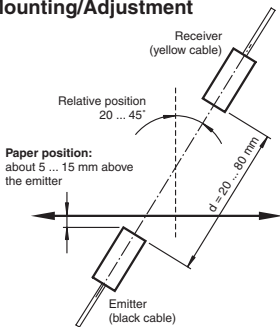
Standard symbol/Connection:
Double-sheet-control

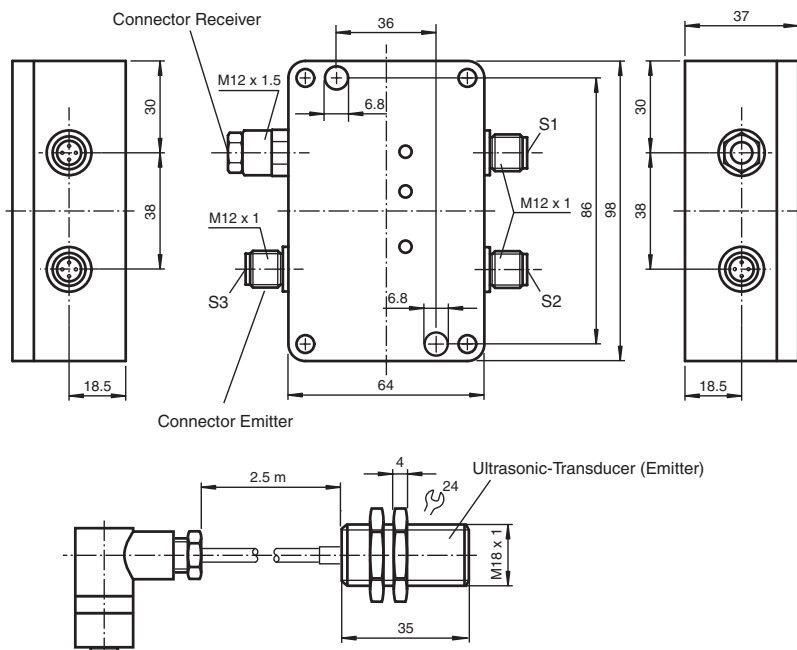


Characteristic response curves



Mounting/Adjustment





Additional information

Description of the sensor functions

In addition to the printing industry, the ultrasonic double-sheet monitor is deployed in all situations in which the automatic distinction between single and double sheets is required in order to protect machines or avoid waste production. The double-sheet monitor is based on the ultrasonic through-beam principle. The following can be detected:

- No sheet
- Individual sheet
- Double sheet or pasted double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. Changes in ambient conditions such as temperature and humidity are automatically compensated. The evaluation electronics are installed in a cuboid plastic housing separate from the sensor heads.

Measuring system

A complete system consists of an ultrasonic emitter, an ultrasonic receiver and an evaluation unit. These units have been optimally tuned to one another at the factory and may not be used separately.

Alignment

When adjusting the emitter and receiver, take care to align them as precisely as possible.

Distance of the sensor heads: $d = 20 \text{ mm} \dots 80 \text{ mm}$

Angular tolerance: $\alpha < \pm 2^\circ$

Maximum offset: $s < \pm 2 \text{ mm}$

To ensure their correct function, the sensor heads must be aligned at an angle of $20^\circ \dots 45^\circ$ from vertical on to the paper surface. The paper is guided over the emitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The emitter is installed below in order to prevent dust deposits. Install the sensor heads using the included plastic nuts. The sound cone must be completely covered by the paper. This means that the sensor heads must be installed above the sheet of paper and at least 10 mm away from the side edge of the paper.

Maximum feed speed of the sheet (approximate value)

$$v_{\max} [\text{m/s}] = \text{overlapping of sheets} [\text{mm}] / 5 \text{ ms} \quad (\text{overlapping} > 20 \text{ mm})$$

TEACH-IN

1. After the operating voltage has been applied, a single sheet can be fed in as the first sheet. It will automatically be programmed as a reference value by the system.
2. If a single sheet of paper is located between the ultrasonic emitter and receiver when the operating voltage is turned on, it will automatically be programmed as a reference value by the system.

Automatic learning for thinner types of sheets

If you are inserting a thinner type of sheet, you can dispense with the use of the TEACH-IN signal to program the system. In order to do this, a single sheet of paper must be between the emitter and receiver for at least 10 s .

Automatic learning for thicker types of sheets

If you are inserting a thicker type of sheet but still not one that will result in double-sheet output, you can dispense with learning by means of the TEACH-IN signal. In order to do this, a single sheet of paper must be between the emitter and receiver for at least 10 s .

TEACH-IN for new type of sheet

If you are inserting a new type of sheet that will result in double-sheet output, the system must be reprogrammed. To do this, a single sheet must be placed between the emitter and receiver. After the TEACH-IN signal has been applied, the corresponding reference value will be accepted.

Caution!

The paper sheets may not touch the sensor heads during operation. Depending on physical conditions, reflections on the edge of a single sheet may result in double-sheet output. This is not an error, and can be masked out in the higher-level control system.

Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.

Ultrasonic label control

UDBL-18GM35-3E2



- Ultrasonic system for detection of labels, carrier materials and double sheets.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are programmed in via a TEACH-IN signal.
- No automatic switching treshold tracking in the case of slowly changing ambient conditions.
- Signal output via short-circuit proof PNP switch outputs.
- Very high processing speeds are possible.

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

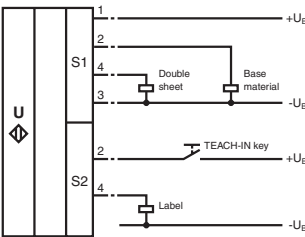
Model number

UDBL-18GM35-3E2

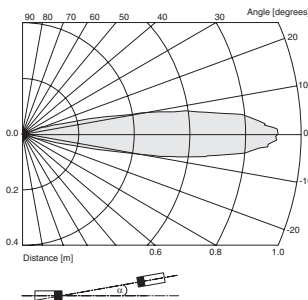
Transducer frequency	180 kHz	
LED green	indication: carrier material detected	
LED yellow	indication: label detected	
LED red	indication: double sheet detected	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	<80 mA	
Time delay before availability	≥5 minutes	
Output type	3 switch outputs prp, NO	
Rated operational current	3 x 200 mA	
Voltage drop	≤2 V	
Switch-on delay	≤1 ms	
Switch-off delay	≤1 ms	
Input type	1 pulse input for TEACH-IN	
Pulse length	≥100 ms	
Impedance	≥10 kOhm	
Voltage	12 ... 30 V	
Standards	EN 60947-5-2	
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 70 °C (233 ... 343 K)	
Protection degree	IP65	
Connection	emitter: V1-W connector with 2.5 m cable receiver: 2.5 m fixed cable (not disconnectable) S1,S2: 2 connectors V1-W, M12x1 (included with delivery)	
Housing	Makrolon/nickel-plated brass	
Mass	370 g	

Electrical connection, diagrams, additional information

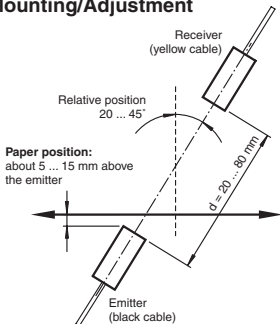
Standard symbol/Connection:
Double sheet control



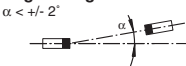
Characteristic response curves



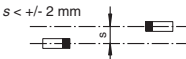
Mounting/Adjustment

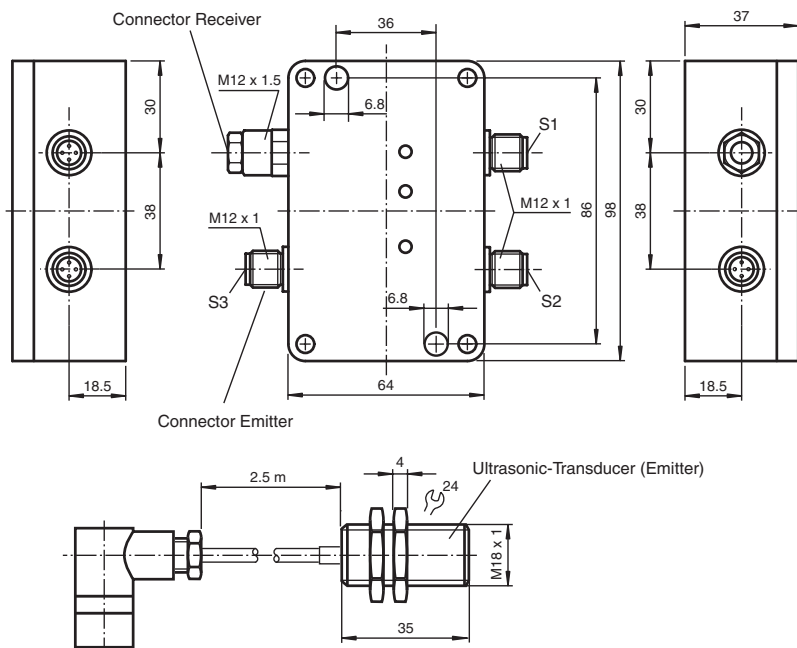


Angular alignment



Sensor offset





Additional information

Description of the sensor functions

Ultrasonic double-sheet monitoring to detect labels is used in all situations in which an automatic distinction must be made between labels and carrier material as well as double sheets in order to protect machines or avoid waste production. The double-sheet monitor is based on the ultrasonic through-beam principle. The following can be detected:

- Base material
- Label
- Double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. The evaluation electronics are installed in a cuboid plastic housing separate from the sensor heads.

Measuring system

A complete system consists of an ultrasonic emitter, an ultrasonic receiver and an evaluation unit. These units have been optimally tuned to one another at the factory and may not be used separately.

Alignment

When adjusting the emitter and receiver, take care to align them as precisely as possible.

Distance of the sensor heads: $d = 20 \text{ mm} \dots 80 \text{ mm}$

Angular tolerance: $\alpha < \pm 2^\circ$

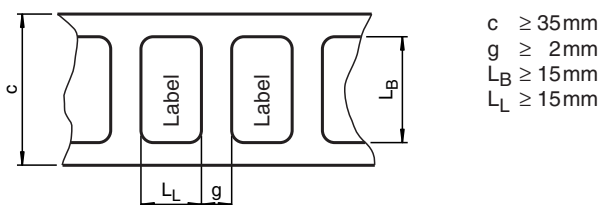
Maximum offset: $s < \pm 2 \text{ mm}$

To ensure their correct function, the sensor heads must be aligned at an angle of $20^\circ \dots 45^\circ$ from vertical on to the paper surface. The paper is guided over the emitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The emitter is installed below in order to prevent dust deposits. Install the sensor heads using the included plastic nuts. The sound cone must be completely covered by the paper. This means that the sensor heads must be installed above the sheet of paper and at least 10 mm away from the side edge of the paper.

Maximum feed speed of the sheet (approximate value)

Depends on the label and gap width as well as the materials in question.

Approximate value 10 m/s while maintaining the required minimum sizes.



- $c \geq 35 \text{ mm}$
- $g \geq 2 \text{ mm}$
- $L_B \geq 15 \text{ mm}$
- $L_L \geq 15 \text{ mm}$

TEACH-IN

Before starting a valid TEACH-IN a warm up period of approx. 5 min must be maintained. After the warm up period and a short-time reset of the operating voltage a valid value is automatically taught in, provided that a carrier material and label is between emitter and receiver.

TEACH-IN for new type of sheet

If a new type of labels is used, the TEACH-IN procedure must be carried out. To do this, a label with carrier material is put between emitter and receiver and the teach-in is performed with reference to the label. After having applied the TEACH-IN-signal the value is adopted automatically.

Caution!

The paper sheets may not touch the sensor heads during operation. Depending on physical conditions, reflections on the edge of a single sheet may result in double-sheet output. This is not an error, and can be masked out in the higher-level control system.

Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.

Ultrasonic splice control

UDBK-18GM35-3E2



- Ultrasonic system for detection of single and pasted double sheet.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are programmed in via a TEACH-IN signal.
- Automatic compensation of the operating point in the case of slowly changing ambient conditions.
- Signal output via short-circuit proof PNP switch outputs.
- Very high processing speeds are possible.

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

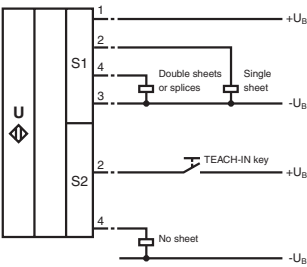
Model number

UDBK-18GM35-3E2

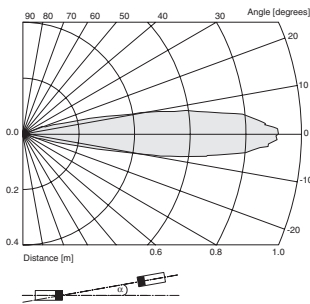
Transducer frequency	180 kHz
Focke Ident-Nr.	7 020 464
LED green	indication: single sheet detected
LED yellow	indication: no sheet detected
LED red	indication: double sheet or contact spot detected
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	<80 mA
Output type	3 switch outputs prp, NO
Rated operational current	3 x 200 mA
Voltage drop	≤ 2 V
Switch-on delay	≤ 1 ms
Switch-off delay	≤ 100 ms
Input type	1 pulse input for TEACH-IN
Pulse length	≥ 100 ms
Impedance	≥ 10 kOhm
Voltage	12 ... 30 V
Standards	EN 60947-5-2
Ambient temperature	0 ... 60 °C (273 ... 333 K)
Storage temperature	-40 ... 70 °C (233 ... 343 K)
Protection degree	IP65
Connection	emitter: V1-W connector with 2.5 m cable receiver: 2.5 m fixed cable (not disconnectable) S1,S2: 2 connectors V1-W, M12x1 (included with delivery)
Housing	Makrolon/nickel-plated brass
Mass	370 g

Electrical connection, diagrams, additional information

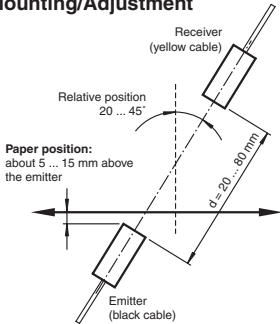
Standard symbol/Connection:
Double-sheet-control



Characteristic response curves



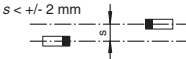
Mounting/Adjustment

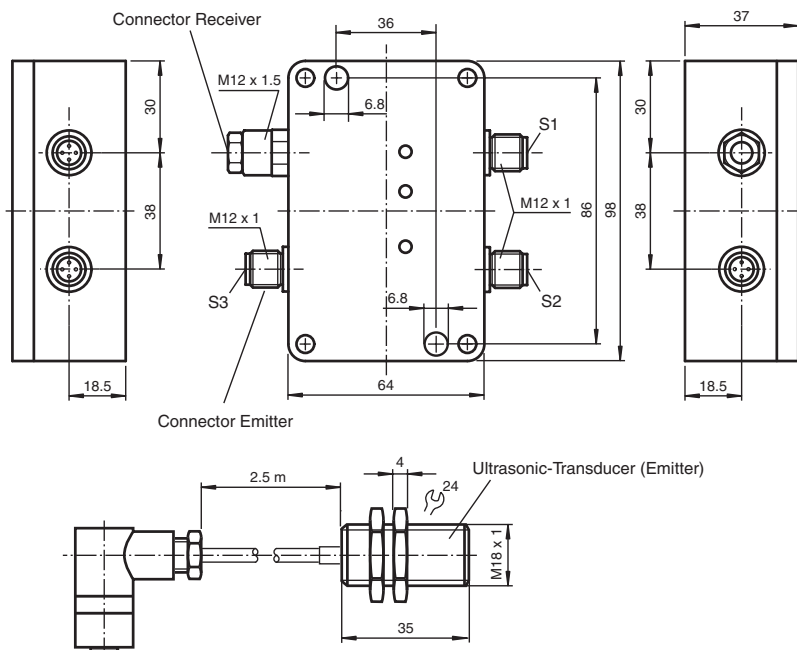


Angular alignment



Sensor offset





Additional information

Description of the sensor functions

Ultrasonic double-sheet monitoring to detect splice points is used in all situations in which an automatic distinction must be made between splice points and double sheets in order to protect machines or avoid waste production. Double-sheet monitoring for splice point detection is based on the ultrasonic through-beam principle. The following can be detected:

- No sheet
- Individual sheet
- Splice point or double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. Changes in ambient conditions such as temperature and humidity are automatically compensated. The evaluation electronics are installed in a cuboid plastic housing separate from the sensor heads.

Measuring system

A complete system consists of an ultrasonic emitter, an ultrasonic receiver and an evaluation unit. These units have been optimally tuned to one another at the factory and may not be used separately.

Alignment

When adjusting the emitter and receiver, take care to align them as precisely as possible.

Distance of the sensor heads: $d = 20 \text{ mm} \dots 80 \text{ mm}$

Angular tolerance: $\alpha < \pm 2^\circ$

Maximum offset: $s < \pm 2 \text{ mm}$

To ensure their correct function, the sensor heads must be aligned at an angle of $20^\circ \dots 45^\circ$ from vertical on to the paper surface. The paper is guided over the emitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The emitter is installed below in order to prevent dust deposits. Install the sensor heads using the included plastic nuts. The sound cone must be completely covered by the paper. This means that the sensor heads must be installed above the sheet of paper and at least 10 mm away from the side edge of the paper.

Feed speed of the sheet (approximate value)

$v_{\min} = 0.035 \text{ m/s}$

$v_{\max} [\text{m/s}] = \text{overlapping of sheets} [\text{mm}] / 1 \text{ ms}$ (approx. value, overlapping $> 20 \text{ mm}$)

TEACH-IN

1. After the operating voltage has been applied, a single sheet can be fed in as the first sheet. It will automatically be programmed as a reference value by the system.
2. If a single sheet of paper is located between the ultrasonic emitter and receiver when the operating voltage is turned on, it will automatically be programmed as a reference value by the system.

Automatic learning for thinner types of sheets

If you are inserting a thinner type of sheet, you can dispense with the use of the TEACH-IN signal to program the system. In order to do this, a single sheet of paper must be between the emitter and receiver for at least 2 s .

Automatic learning for thicker types of sheets

If you are inserting a thicker type of sheet but still not one that will result in double-sheet output, you can dispense with learning by means of the TEACH-IN signal. In order to do this, a single sheet of paper must be between the emitter and receiver for at least 2 s .

TEACH-IN for new type of sheet

If you are inserting a new type of sheet that will result in double-sheet output, the system must be reprogrammed. To do this, a single sheet must be placed between the emitter and receiver. After the TEACH-IN signal has been applied, the corresponding reference value will be accepted.

Caution!

The paper sheets may not touch the sensor heads during operation. Depending on physical conditions, reflections on the edge of a single sheet may result in double-sheet output. This is not an error, and can be masked out in the higher-level control system.

Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.



Model number	Description	Page
UH3-KHD2-4E5	Control/evaluation unit with 4 switching outputs	202
UH3-KHD2-4I	Control/evaluation unit with 4 analogue current outputs (4 mA ... 20 mA)	204
UH3-T1-KT	Control/evaluation unit with relay output for high power loads	206
DA5-IU-C	Process indication device	208
DA5-IU-2K-C DA5-IU-2K-V	Process indication device	210
WE77-RE2	Isolated switch amplifier with power supply und 2 relay outputs	212
KFA6-STR-1.24.500	Power supply	214



- **External evaluation for ultrasonic sensors UB...-H1, -H2 and -H3**
- **Modular concept: Installation of sensor on-site and evaluation in the control cabinet**
- **Simultaneous operation of 1 to 4 ultrasonic sensors with ranges from 60 mm to 6 m**
- **Freely selectable evaluation range**
- **Multiplex operation - no mutual interaction, operation is possible in a very confined space**
- **Synchronous operation**
- **Temperature compensation**
- **Reference measurement for highest accuracy**
- **4 switch outputs**

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

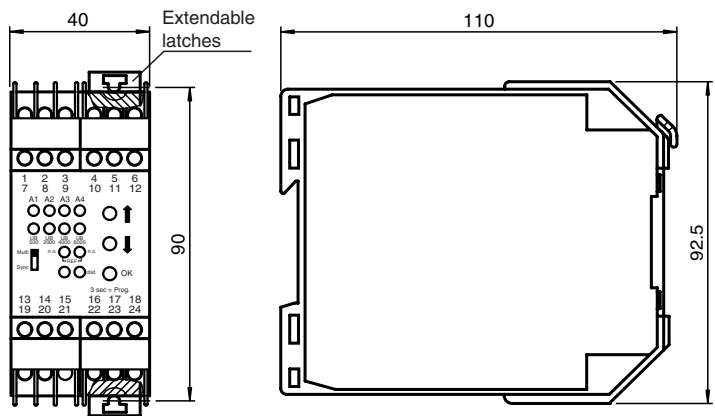
	Model number	UH3-KHD2-4E5
Operating modes	with switch-over: multiplex operation - consecutive activation of the channels synchronous operation - activation of the channels simultaneously	●
Measuring frequency	dependent on the operating mode, number and longest range of the active sensors (see page multiplex/synchronous operation)	●
Standards	EN 60947-5-2	●
LED green	sensortype / channel active (4 items) NO/NC/REF (2 items) switch point (1 item)	●
LED yellow	channel number A1 ... A4 / object in operating range (4 items)	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
No-load supply current	≤ 50 mA (without sensors)	●
Output type	4 switch outputs A1 ... A4 I _{max} = 500 mA, pnp, reverse-polarity protected, NO/NC operation	●
Repeat accuracy	multiplex operation: ± 1 mm synchronous operation: ± 3 mm	●
Input type	for 4 sensors for each of 4 connections +U _E /-U _E /clock (T)/echo (E) short-circuit proof with reverse-polarity protection attachable sensors: UB500/2000/4000/6000...-H3 or -H1/-H2	●
Ambient temperature	-20 ... 70 °C (253 ... 343 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP20	●
Connection	terminal housing, suitable for 35 mm standard rail plug-in screw terminal 1.5 mm ²	●
Mass	230 g	●

The UH3-KHD2-4E5 is an evaluation device for ultrasonic sensors with external interface electronics. Up to four sensors of type UB...-H3 or sensor pairs UB...-H1/-H2 can be connected to the device.

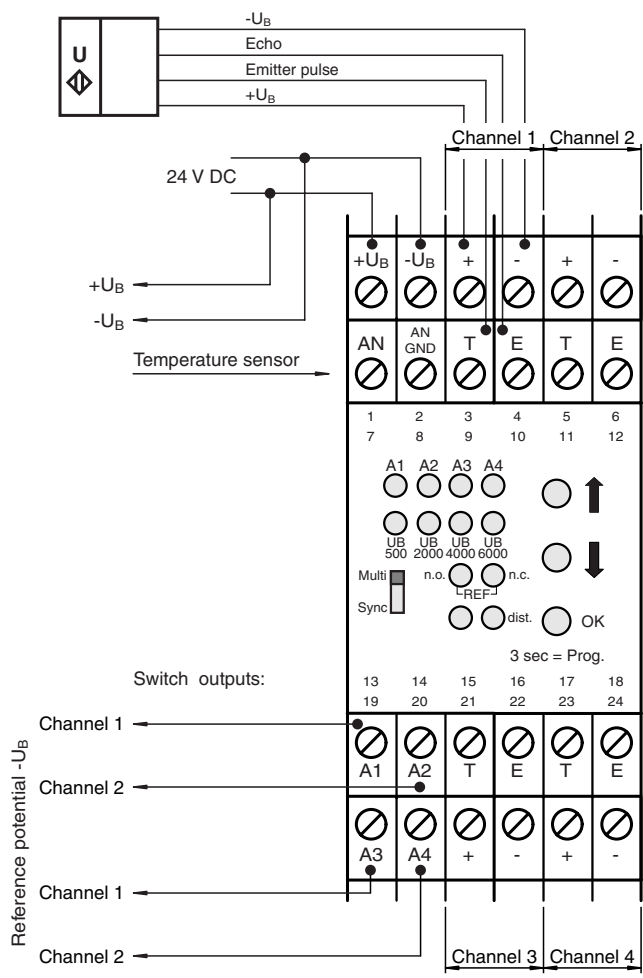
The evaluation unit issues the transmission pulses (cycle) for each sensor channel, then records the echo signal and forms the sensing range according to the echo time. A switch output is associated with each channel.
If the detected distance is less than the set switching point, the output of the associated channel is actuated according to the selected open/close action. This is indicated by the yellow LED assigned to the channel.
Sensors with a variety of detection ranges can be deployed on the four evaluation channels. One of the channels can be programmed as a reference measurement for a temperature compensation.

Note:

The maximum cable-length between evaluation unit and sensor must not exceed 20 m!



Electrical connection



Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Evaluation unit

UH3-KHD2-4I



- External evaluation for ultrasonic sensors UB...-H1, -H2 and -H3
- Modular concept: Installation of sensor on-site and evaluation in the control cabinet
- Simultaneous operation of 1 to 4 ultrasonic sensors with ranges from 60 mm to 6 m (up to 15 m when operated as a through beam barrier)
- Freely selectable measuring window
- Multiplex operation - no mutual interaction, operation is possible in a very confined space
- Synchronous operation
- Temperature compensation
- Reference measurement for highest accuracy
- 4 analogue outputs 4 mA ... 20 mA (rising/falling slope can be set)

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

UH3-KHD2-4I

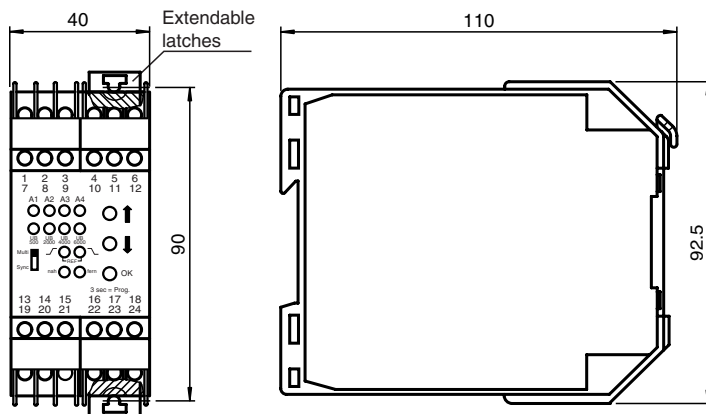
Operating modes	with switch-over: multiplex operation - consecutive activation of the channels synchronous operation - activation of the channels simultaneously	●
Measuring frequency	dependent on the operating mode, number and longest range of the active sensors (see page multiplex/synchronous operation)	●
Standards	EN 60947-5-2	●
LED green	sensortype / channel active (4 items) current slope: increasing / decreasing / REF (2 items) measuring window limits near / far (2 items)	●
LED yellow	channel number A1 ... A4 / object in operating range (4 items)	●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	●
No-load supply current	≤ 50 mA (without sensors)	●
Output type	4 analogue outputs A1 ... A4, 4 ... 20 mA rising/falling ramp	●
Repeat accuracy	multiplex operation: ± 1 mm synchronous operation: ± 3 mm	●
Input type	for 4 sensors for each of 4 connections +U _E / -U _E / clock (T) / echo (E) short-circuit proof with reverse-polarity protection attachable sensors: UB500/2000/4000/6000...-H3 or -H1/-H2	●
Ambient temperature	-20 ... 70 °C (253 ... 343 K)	●
Storage temperature	-40 ... 85 °C (233 ... 358 K)	●
Protection degree	IP20	●
Connection	terminal housing, suitable for 35 mm standard rail plug-in screw terminal 1.5 mm ²	●
Mass	230 g	●

The UH3-KHD2-4I is an evaluation device for ultrasonic sensors with external interface electronics. Up to four sensors of type UB...-H3 or sensor pairs UB...-H1/-H2 can be connected to the device.

The evaluation unit issues the transmission pulses (cycle) for each sensor channel, then records the echo signal and forms a current value proportional to the echo time (4 mA ... 20 mA). An analogue output is associated with each channel. An evaluation window and a rising or falling current ramp can be selected in the detection section for each output. If the distance determined is within the programmed measuring window, the output of the associated channel will deliver a value between 4 mA and 20 mA. The yellow LED associated with the channel will be lit. Sensors with a variety of detection ranges can be deployed on the four evaluation channels. One of the channels can be programmed as a reference measurement for a temperature compensation.

Note:

The maximum cable-length between evaluation unit and sensor must not exceed 20 m!



Series
-123M

Series
-18GK/-18GM

Series
-30GM

Series
VarKont

Series
-FP

Series
-F12

Series
-F42

Series
-F43

Series
-F54

Series
-F64

Series
-D1

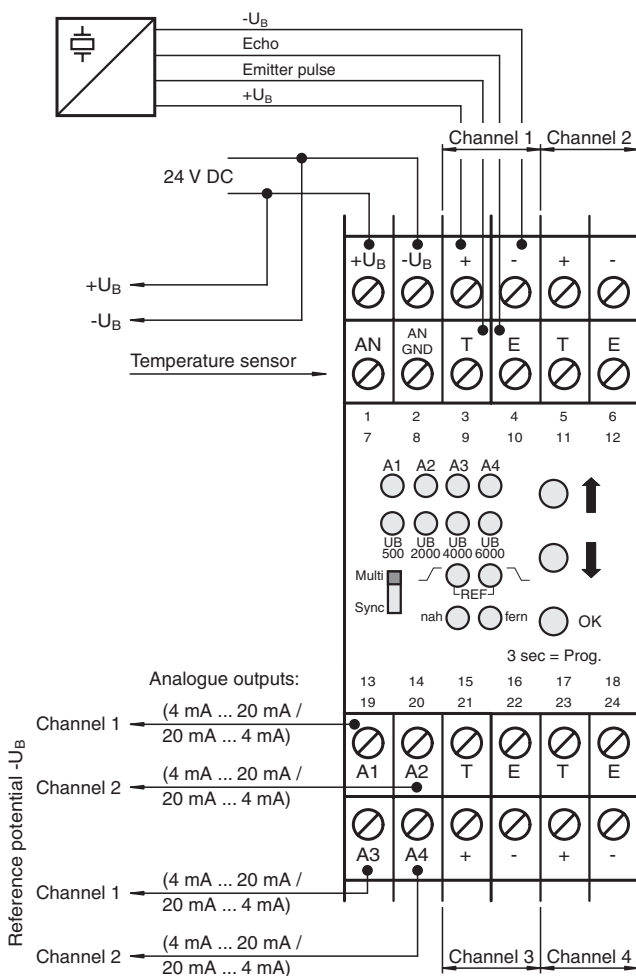
Series
LUC

Double sheet
monitoring

Control units/
Power supplies

Accessories

Electrical connection



Evaluation unit

UH3-T1-KT



- External evaluation for ultrasonic sensors UB...-H1, -H2 and -H3
- Relay output for high power
- Pull-in/Drop-out delay can be set
- Normally open/closed
- Switch point can be selected in steps in the sensing range

Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

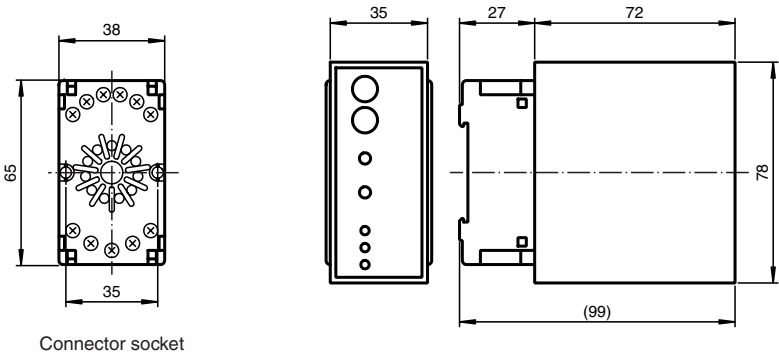
Technical Data

			Model number	UH3-T1-KT
Measuring frequency	approx. 16 Hz			●
Standards	EN 60947-5-2			●
Rotary switch	sensor select: setting the switch-point behaviour distance select: setting the operating distance			●
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}			●
No-load supply current	≤ 120 mA (without sensors)			●
Output type	changeover contact terminals 6 to 1 (NO) and 11 (NC)			●
Contact loading	AC: 8 A/250 V			●
Energised/De-energised delay	270°-potentiometer: ON delay, between 0.2 s ... 8 s (± 10%) 270°-potentiometer: OFF delay, between 0.2 s ... 8 s (± 10%)			●
Input type	for max. 3 ultrasonic sensors in direct detection mode: UB 500/2000/4000/6000, UJ 3000/6000 or for a through beam barrier: UB 2000 (e.g.)			●
Ambient temperature	-20 ... 60 °C (253 ... 333 K)			●
Storage temperature				
Connection	plug socket 11-pin, attached using 2 x M3 screws or snapped-on to 35 mm standard rail according to EN 50022 Base is included with delivery			●
Housing	modular housing			●
Mass	110 g			●

The UH3-T1-KT is a back-end unit for ultrasonic sensors with external evaluation logic. It features direct-detection and through-beam operating modes. All sensors of the types H3, H1 and H2 can be connected to the unit.

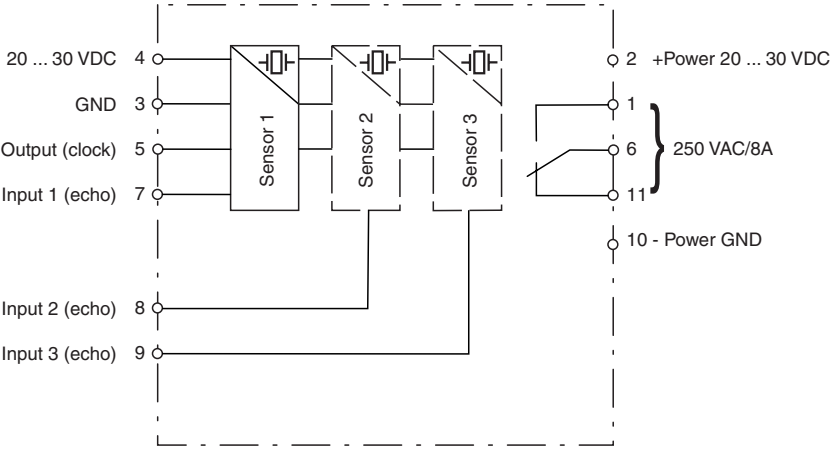
When an object is detected, a relay trips a change-over contact. The action and release delays can be adjusted independently of one another. In direct-detection mode the unit generates a clock signal for the sensors and determines the object distance on the basis of the echo time. A switching point can be set in steps in the detection range.

In barrier mode the clock signal starts the ultrasonic pulse from the device in the transmitter/sender. The receiver generates an echo signal when it picks up the ultrasonic signal. If this echo signal is not received, the evaluation unit trips the output relay.



Connector socket

Electrical connection



Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Digital display unit

DA5-IU-C



- Bright, high contrast 5-digit LED indicator
- Leading zero suppression
- Adjustable decimal point
- Maximum- and minimum-value display



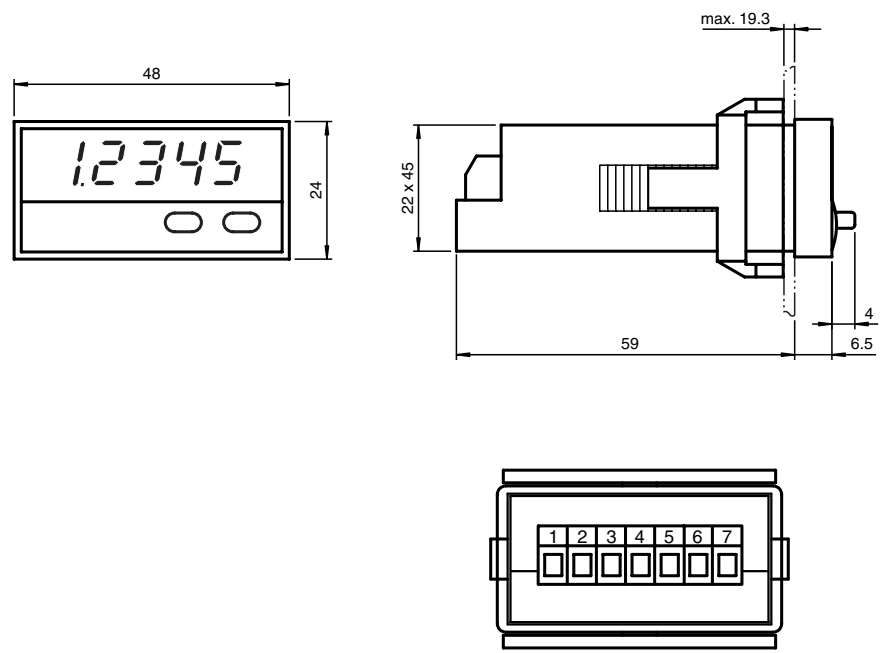
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

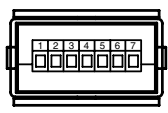
		Model number	DA5-IU-C
Pre-selection	none		●
	10 ⁶ storage cycles or 10 years, EEPROM		●
Data storage	keypad-driven menu		●
	7-segment LED display, red		●
Programming	Type		●
	Number of decades	5	●
Type	Display value	digit height 8 mm	●
	Display interval	-19999 ... 99999	●
Number of decades	Decimal point	freely adjustable	●
	Resolution	14 Bit	●
Display value	Scale factor	via linear characteristic curve	●
	Reset	maximum value, manually	●
Display interval	Key interlock	-	●
	Operating voltage	10 ... 30 V DC	●
Decimal point	Power consumption	1,5 VA	●
	Impedance	1 MOhm	●
freely adjustable	Voltage	max. 30 DC	●
	Analogue voltage input	0 ... 10 V / 2 ... 10 V DC	●
Resolution	Analogue current input	0 ... 20 mA / 4 ... 20 mA	●
	Ambient temperature	-10 ... 50 °C (263 ... 323 K)	●
Scale factor	Storage temperature	-25 ... 70 °C (248 ... 343 K)	●
	Relative humidity	≤ 80 % (non-condensing)	●
via linear characteristic curve	Mounting	latch fastener/mounting frame	●
	Connection	7-pin screw terminal	●
maximum value, manually		max. core cross-section 0.34 ... 1.5 mm ²	●
	Dimensions	48 mm x 24 mm x 65 mm	●
Key interlock	Mass	approx. 50 g	●

The DA5-IU-C permits a simple visual inspection by operating and maintenance personnel. It converts the analogue sensor output signal into a readable form for this purpose. Depending on the task or setting, 4 ... 20 mA or 0 ... 100 % values can be displayed.

- Scope of delivery:**
- Process control unit DA5-IU-C
 - Screw terminal, 7-pin
 - Clamp clip
 - Seal
 - 1 sheet of adhesive symbols



Electrical connection



Terminal No.	
1	10 ... 30 V DC
2	0 V (GND)
3	0 V LATCH
4	LATCH
5	Current input
6	0 V input signal
7	Voltage input

Process control and indication equipment

DA5-IU-2K-



- 2 adjustable limit values
- 2 relay outputs
- Operation via keypad
- Programmable characteristics
- Resetting the outputs, automatic, manual or with external signal
- Connection via plug-in screw terminals
- Auxiliary power output for sensors (Only DA5-IU-2K-V)
- Protection degree IP65 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6
- System hum suppression



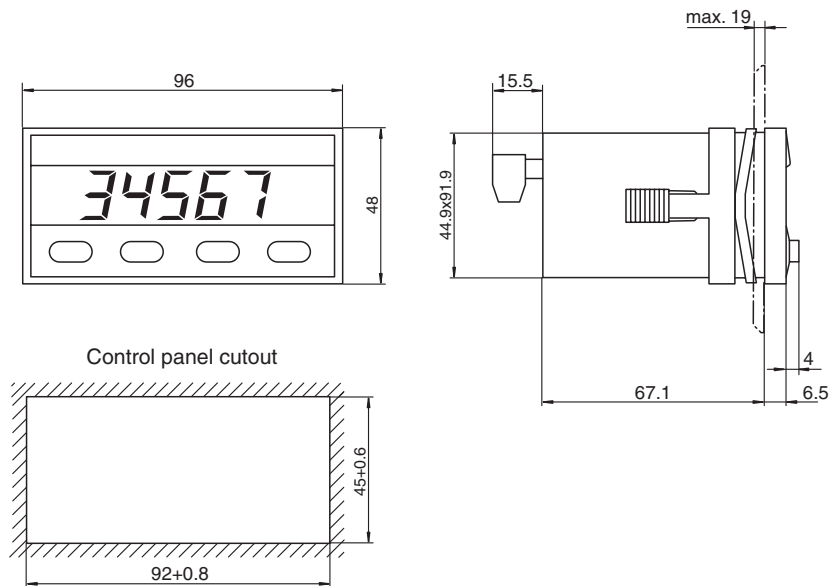
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

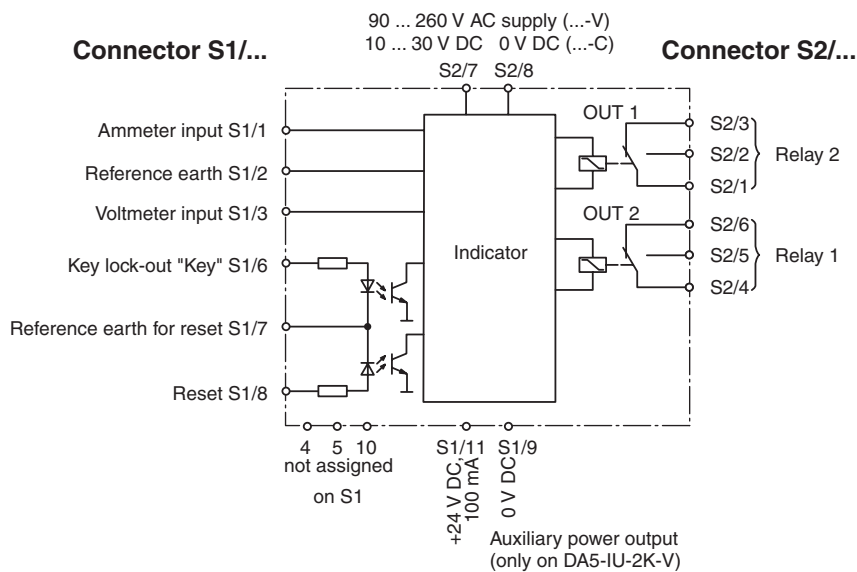
		Model number	DA5-IU-2K-C	DA5-IU-2K-V
	Pre-selection	2-fdd	●	●
	Data storage	10 ⁶ storage cycles or 10 years, EEPROM	●	●
	Programming	keypad-driven menu	●	●
	Type	7-segment LED display, red	●	●
	Number of decades	5	●	●
	Display value	digit height 14,2 mm	●	●
	Display interval	-19999 ... 99999	●	●
	Decimal point	freely adjustable	●	●
	Resolution	14 Bit	●	●
	Scale factor	via characteristic curve with up to 24 value pairs	●	●
	Reset	manually or external	●	●
	Key interlock	with "high"-level at terminal "KEY"	●	●
	Operating voltage	10 ... 30 V DC	●	
		90 ... 260 V AC		●
	Power consumption	2 W	●	
		7 VA		●
	Sensor supply	24 V DC, 100 mA		●
	Relay	2 x 250 V AC/300 V DC, 3 A, changeover contact	●	●
	Impedance	> 1 MΩ for voltage measurement < 50 Ω for current measurement	●	●
	Analogue voltage input	0 ... 10 V / 2 ... 10 V DC, -10 ... 10 V DC	●	●
	Analogue current input	0 ... 20 mA / 4 ... 20 mA	●	●
	Ambient temperature	-10 ... 50 °C (263 ... 323 K)	●	●
	Storage temperature	-25 ... 70 °C (248 ... 343 K)	●	●
	Relative humidity	≤ 80 % (non-condensing)	●	●
	Mounting	mounting frame with latch fastener	●	●
	Connection	8-pin and 11 pin connectors with plug-in screw terminals	●	●
	Dimensions	96 mm x 48 mm x 90 mm	●	●
	Mass	220 g	●	●

The DA5-IU-2K-... permits a simple visual inspection by operating and maintenance personnel. It converts the analogue sensor output signal into a readable form for this purpose. Depending on the task or setting, 4 mA ... 20 mA or 0 % ... 100 % values can be displayed.

- Scope of delivery:**
- Process control unit DA5-IU-2K-...
 - Screw terminals
 - 1 RM 5.08 8-pole terminal for power supply and outputs
 - 1 RM 3.81 11-pole terminal for measuring and control inputs
 - Clamp clip
 - Seal
 - 1 sheet of adhesive symbols

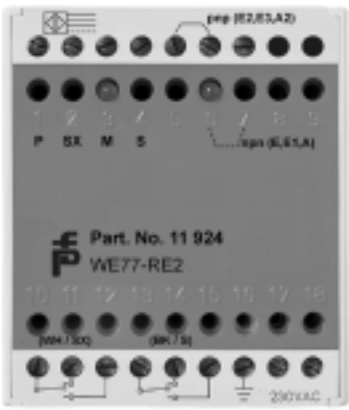


Electrical connection



Isolated switch amplifier

WE77-RE2



- 2-channel isolated switch amplifier
- Control circuit designed for the direct current versions of ultrasonic sensors and proximity switches
- 230 V AC/115 V AC mains nominal voltage
- Switching frequency 10 kHz
- Each with 1 relay output with 1 changeover contact
- One LED status display for each output relay
- Modular housing
- For PNP-sensors the terminals 5 and 6, for NPN-sensors the terminals 6 and 7 are to short out
- Mode of operation: input closed - energising the relay/input open - relay de-energised



Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

Model number

WE77-RE2

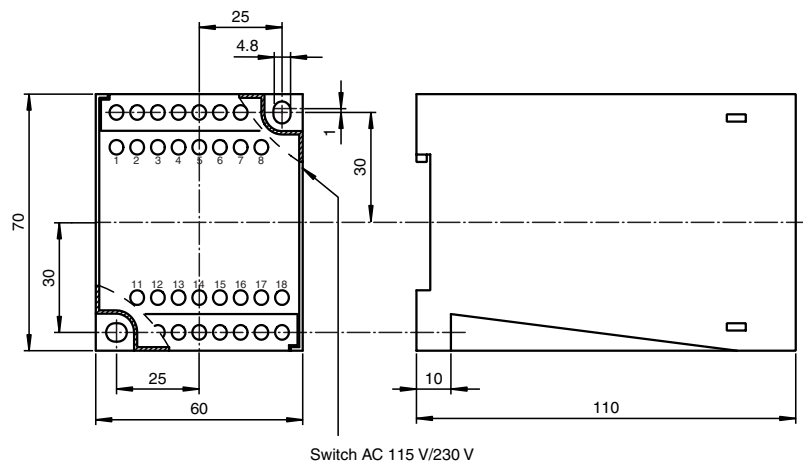
Connection	terminals 17, 18	●
Rated voltage	98 ... 126 V AC / 198 ... 253 V AC, 45 ... 63 Hz, switchable	●
Power consumption	approx. 7 VA	●
Voltage	24 V DC \pm 20 %	●
Current	160 mA at 60 °C, short-circuit proof	●
Contact loading	AC: 250 V / 4 A / 500 VA / $\cos \phi \geq 0.7$ DC: 220 V / 0.1 A; 60 V / 0.6 A; 24 V / 4 A	●
Energised/De-energised delay	approx. 20 ms / approx. 10 ms	●
Connection	terminals 10, 11, 12, 13, 14, 15 terminals 1+, 3-	●
Mechanical life	10 ⁷ switching cycles	●
Connection	terminals 2; 4	●
Input signal	high: 24 V DC \pm 20 % 37 mA low: < 1 V DC, \leq 0.5 mA	●
Switching frequency	\leq 10 Hz	●
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	●
Storage temperature	-25 ... 85 °C (248 ... 358 K)	●
Construction type	modular housing	●
Protection degree	IP20	●
Mounting	snap-on to 35 mm standard rail or screw fixing	●
Connection	self-opening apparatus connection terminals, max. conductor cross section 1 x 2.5 mm ²	●
Dimensions	60 mm x 70 mm x 110 mm	●
Mass	approx. 650 g	●

When using proximity switches (sensors) in pnp-technique (switched high), the connections 5 and 6 have to be bridged

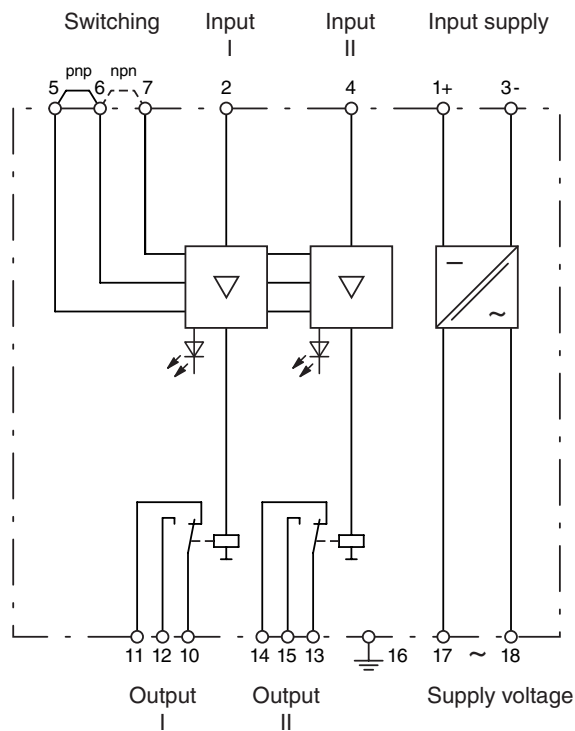
When using proximity switches (sensors) in npn-technique (switched low), the connections 6 and 7 have to be bridged.

Mode of operation

Input	Output
	 energised
	 de-energised



Electrical connection



Series -123M
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/ Power supplies
Accessories

Power supply

KFA6-STR-1.24.500



- Switched power supply
- 230/115 V AC supply voltage
- 24 V DC output voltage
- Max. output current 500 mA
- No ground connection required
- Removable terminals and Power Rail



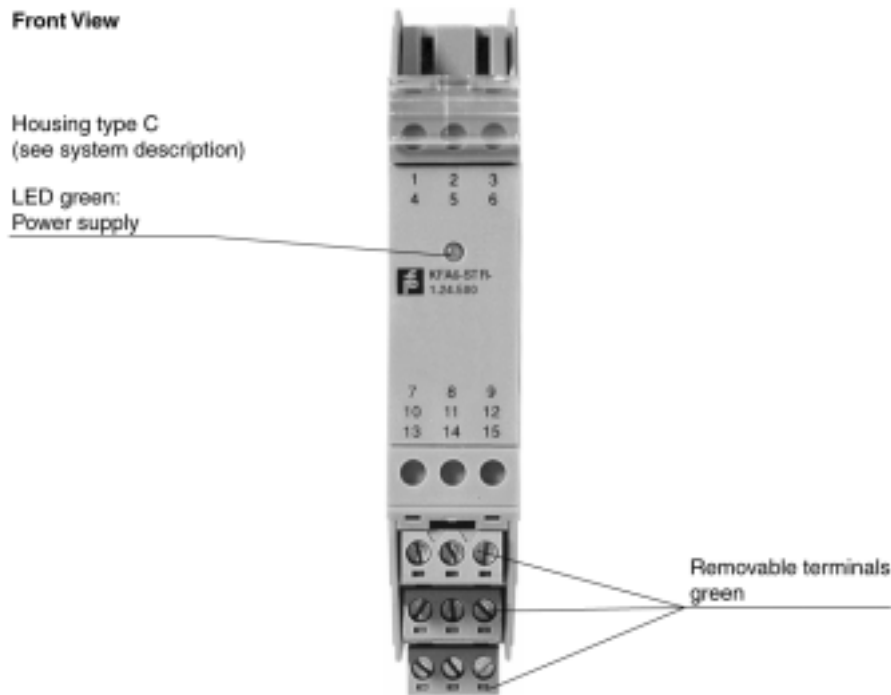
Suitable connector cables, mounting aids and more, you can find in chapter "Accessories"

Technical Data

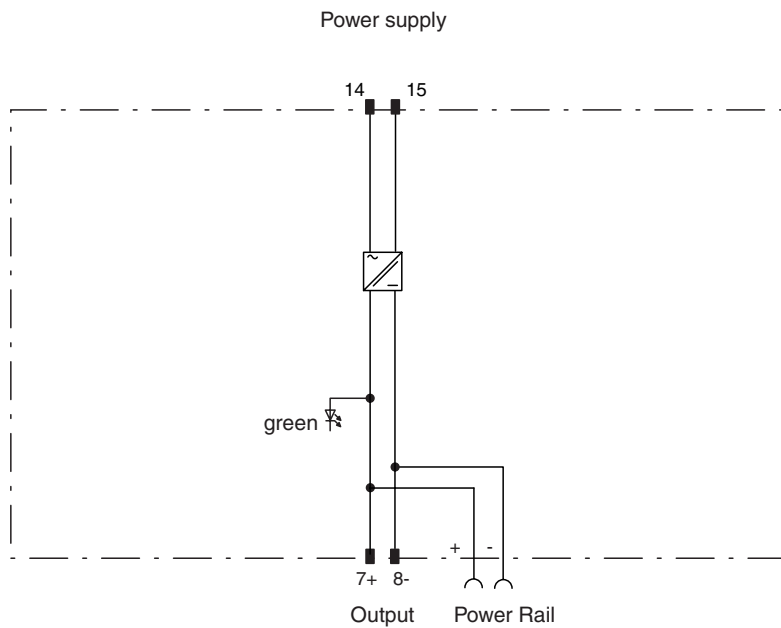
Model number			KFA6-STR-1.24.500
SIL/IEC 61508	no		●
Fault message output	no		●
Explosion protection	No Ex-protection		●
Connection	terminals 14, 15		●
Rated voltage	90 ... 253 V AC, 48 ... 63 Hz		●
Power loss	2,5 W		●
Number of channels	1		●
Connection	Power Rail or terminals 7+, 8-		●
Current	500 mA at 60 °C, permanent short-circuit protection (electronically)		●
Voltage	24 V ± 0,5 V		●
Power supply/Output	safe isolation acc. to DIN VDE 0106, rated insulation voltage 253 V _{eff}		●
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		●
Protection degree	IP20		●
Mass	approx. 140 g		●

Function

The output voltage of the power supply is regulated and remains stable regardless of the size of the power supply and the load current.

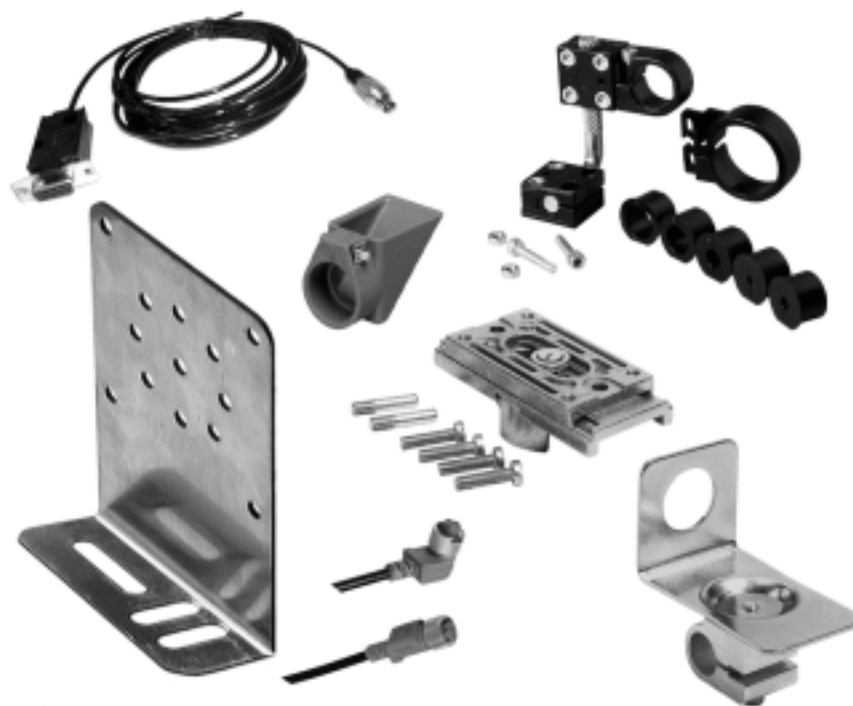


Electrical connection



Accessories	Control units/ Power supplies	Double sheet monitoring	Series LUC	Series -D1	Series -F64	Series -F54	Series -F43	Series -F42	Series -F12	Series -FP	Series <i>VarKont</i>	Series -30GM	Series -18GK/-18GM	Series -12GM	Notes

Accessories



Type	Description	Page
Kabel Dosen	Ready-to-use and customisable	218
MH 04-3505	Mounting aid for series -FP sensors	223
MH 04-2681F	Mounting aid for series <i>VariKont</i> (+U1+ und +U9*) sensors	223
OMH 04	Mounting bracket for series -18GM sensors	224
MHW 11	Mounting bracket for series -FP und -F42 sensors	224
MH-USB01	Rotatable mounting bracket for ultrasonic double sheet monitors	224
BF12, BF18, BF30	Mounting flanges for series -12GM, -18GM and -30GM sensors	225
M105	Mounting flanges for series -30GM sensors	226
BF18-F/BF30-F	Mounting flanges for series -18GM and -30GM sensors	226
PA02	Mounting flanges for series -FP sensors	227
BF 5-30	Universal mount for ø5 mm ... ø30 mm sensors	228
UVW90-K18 UVW90-K30	Redirection mirror for series -18GM and -30GM sensors	229
UVW90-M30	Focussing redirection mirror for series -30GM sensors	229
UC-30GM-TEMP	External temperature probe	230
LUC4-Z30-G2V LUC4-Z30-N2V	External temperature probe	230
FP100	Remote potentiometer for through beam barrier UBE4000-30GM-SA2-V1	230
USB-0,8M-PVC ABG SUBD9	Interface adapter USB/RS 232	231
UC-F43-R2	RS 232 interface for series -F43 sensors	231
UC-30GM-R2	Interface cable for series -30GM sensors	232
UC-FP/U9-R2	Interface cable for series <i>VariKont</i> und -FP sensors	232
UC-30GM-PROG	Extension cable for the programming of UC...-30GM-... and LUC4T-... series sensors	232
UB-PROG2/UB-PROG3	Programming units for all UB...-sensors with -V15 connector, where the TEACH-input is at connector-pin 2 (UB-PROG2) or at connector-pin 5 (UB-PROG3).	233
ULTRA 2001	Service program for easy programming of ultrasonic sensors with RS 232 interfaces	234

Non pre-wired connectors in M8, M12, M18 and Rd24 x 1/8:

Design	Order designation	Design	Connecting technique	Number of pins	Wire cross-section (mm ²)	Fig.
M8	V3-GM	Socket, straight	Insulation piercing	3-pin	0.25 ... 0.34	1
	V3-WM	Socket, angled	Insulation piercing	3-pin	0.25 ... 0.34	2
	V3S-GM	Connector, straight	Insulation piercing	3-pin	0.25 ... 0.34	1
M12	V1-G ¹⁾	Socket, straight	Screw terminal, PG7 cable gland	4-pin	max. 2.5	3
	V1-W ¹⁾	Socket, angled		4-pin	max. 2.5	4
	V1S-G	Connector, straight		4-pin	max. 2.5	-
	V1S-W	Connector, angled		4-pin	max. 2.5	-
	V1-E-LED	LED board (npn)	suitable for mounting in V1-G and V1-W	-	-	-
	V1-E2-LED	LED board (pnp)		-	-	-
	V1-G-Q2	Socket, straight	Insulation piercing	4-pin	0.34 ... 0.75	5
	V1S-G-Q2	Connector, straight	Insulation piercing	4-pin	0.34 ... 0.75	-
	V1-WV2A-PG9-Y42685 ²⁾	Socket, angled	Screw terminal	4-pin	max. 2.5	7
	V15-G-PG9 ¹⁾	Socket, straight	Screw terminal	5-pin	max. 0.75	-
	V15-W-PG9 ¹⁾	Socket, straight	Screw terminal	5-pin	max. 0.75	-
	V15-WV2A-PG9-Y117132 ²⁾	Socket, angled	Screw terminal	5-pin	max. 2.5	7
with central screw	V-W	Socket with central screw, angled	Screw terminal	5-pin	max. 2.5	-
	V-W-E2	Socket with central screw, angled	Screw terminal, with integrated LED	5-pin	max. 2.5	-
	V-W-N	Socket with central screw, angled	Screw terminal	5-pin	max. 2.5	-
	V7-W	Socket with central screw, angled	Screw terminal	7-pin	max. 2.5	6



Fig. 1



Fig. 2



Fig. 3¹⁾



Fig. 4¹⁾



Fig. 5



Fig. 6



Fig. 7²⁾

¹⁾ not suitable for UC...-30GM...

²⁾ suitable for UC...-30GM...

Technical data for connector with integrated cable

Connector and sockets

Number of pins	2-, 3-, 4- or 5-pin
Locking	Screw locking
Self-locking	via O-ring in cap nut
Colour of handle	green
Material of handle	PUR
Material of contacts	CuSn/Au
Material of contact surface	Au
Material of cap nut	CuSn/Ni
Material of sealing ring	NBR
protection class in accordance with DIN 40050	IP68 in screwed state
Max. operating voltage	60 V DC or 250 V AC (for V13-...-types)
Max. operational current	4 A
Volume resistance	< 5 mΩ
Insulation resistance	in acc. with VDE 0295
Test voltage	1500 V _{eff.} AC, 50 Hz

Cable

Cable structure	finely stranded, flexible
Wire cross-section	Cables for M12 connection: 0.34 mm ² but NAMUR mating connectors: 0.50 mm ² Cables for M8 connections: 0.25 mm ²
Colour of sheath	grey
Temperature range for PVC conductors	moving: -5 °C bis +70 °C non-moving: -30 °C bis +80 °C
Temperature range for PUR conductors ¹⁾	moving: -5 °C bis +70 °C non-moving: -30 °C bis +105 °C
Minimum permissible bending radius	> 10 x conductor diameter, appropriate for conveyor chains
Sheath diameter	Ø4.6 mm for M8 and Ø4.8 mm for M12, but Ø5.2 mm in 5-pin variant
Material of core insulation	PVC or in the case of halogen free cable synthetic material on polyester base
Core colours in acc. with VDE 293	2-pin: BN, BU 3-pin: BN, BU, BK 4-pin: BN, BU, BK, WH 5-pin: BN, BU, BK, WH, GY (GN/YE bei PE)

¹⁾ Please note reduced mechanical values for PUR cables at temperatures over +80 °C.

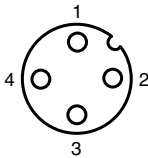
Accessories - cables, plugs, mating connectors

Core colours and connection assignment (EN 60947-5-2)

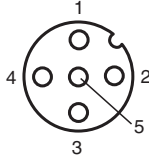
Colour assignment of ready-to-use cable sockets V1, V15, V3:

Pin	Colour	Abbrev.
1	Brown	BN
2	White	WH
3	Blue	BU
4	Black	BK
5	Grey	GR

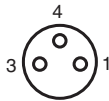
Plug connector -V1
(Circular connection M12)



Plug connector -V15
(Circular connection M12)



Plug connector -V3
(Circular connection M8)

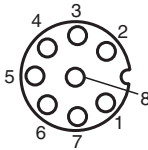


Top view of plug side

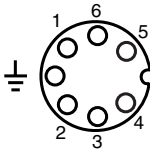
Colour assignment ready-to-use Mating connectors V17, V7 and :

Pin	Colour	Abbrev.
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YW
5	Grey	GR
6	Pink	PK
7	Blue	BU
8	None	(screening)

Plug connector -V17
(circular connector M12x1)

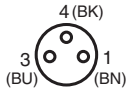
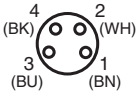





Plug connector -V7
(circular connector PG 13,5)



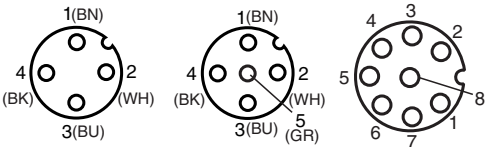



Top view of plug side

Mating connectors M8 type with metal cap nut ¹⁾





Suitable for sensors with 2, 3 or 4 wires <div>   </div>						
Cable-sheath	Length	No. of wires	Ø (mm ²)	Design straight	Design angled	Design angled with 2 LEDs
PUR, grey	2 m	3	0,25			V3-WM-E2-2M-PUR
	5 m	3	0,25	V3-GM-5M-PUR	V3-WM-5M-PUR	V3-WM-E2-5M-PUR
	10 m	3	0,25			V3-WM-E2-10M-PUR
PVC, grey	2 m	3	0,25	V3-GM-2M-PVC	V3-WM-2M-PVC	
	5 m	3	0,25	V3-GM-5M-PVC	V3-WM-5M-PVC	
	10 m	3	0,25	V3-GM-10M-PVC	V3-WM-10M-PVC	
PUR, grey	2 m	4	0,25	V3-... mating connectors		
	5 m	4	0,25	V31-GM-5M-PUR	V31-WM-5M-PUR	
	10 m	4	0,25	V31-... mating connectors		
PVC, grey	2 m	4	0,25	V31-GM-2M-PVC	V31-WM-2M-PVC	
	5 m	4	0,25	V31-GM-5M-PVC	V31-WM-5M-PVC	
	10 m	4	0,25	V31-GM-10M-PVC	V31-WM-10M-PVC	

¹⁾ M8 mating connectors with twist connect on demand.

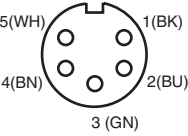


Cable connectors in M12 design for DC sensors

Suitable for DC sensors with 2, 3 or 4 wires 						
Cable-sheath	Length	No. of wires	Ø (mm ²)	Design straight	Design angled	Design angled with 2 LEDs
PVC, grey	2 m	4	0,34	V1-G-2M-PVC	V1-W-2M-PVC	
	5 m	4	0,34	V1-G-5M-PVC	V1-W-5M-PVC	
	10 m	4	0,34	V1-G-10M-PVC	V1-W-10M-PVC	
PUR, grey	2 m	4	0,34	V1-G-2M-PUR	V1-W-2M-PUR	V1-W-A2-2M-PUR
	5 m	4	0,34	V1-G-5M-PUR	V1-W-5M-PUR	V1-W-A2-5M-PUR V1-A0-5M-PUR V1-W-E2/E3-5M-PUR
	10 m	4	0,34	V1-G-10M-PUR	V1-W-10M-PUR	V1-W-A2-10M-PUR
PUR, grey	2 m	3	0,34	V15-... mating connectors		V1-W-E2-2M-PUR
	5 m	3	0,34			V1-W-E2-5M-PUR V1-W-E-5M-PUR
	10 m	3	0,34			V1-W-E2-10M-PUR
PVC, grey	2 m	5	0,34	V15-G-2M-PVC	V15-W-2M-PVC	
	5 m	5	0,34	V15-G-5M-PVC	V15-W-5M-PVC	
	10 m	5	0,34	V15-G-10M-PVC	V15-W-10M-PVC	
PUR, grey	2 m	5	0,25		V15-W-2M-PUR	
	5 m	5	0,25		V15-W-5M-PUR	
PUR, grey screened	2 m	7	0,25	V17-G-2M-PUR		
	5 m	7	0,25	V17-G-5M-PUR		
	10 m	7	0,25	V17-G-10M-PUR		

Mating connectors in M12 design with cross-braided lead

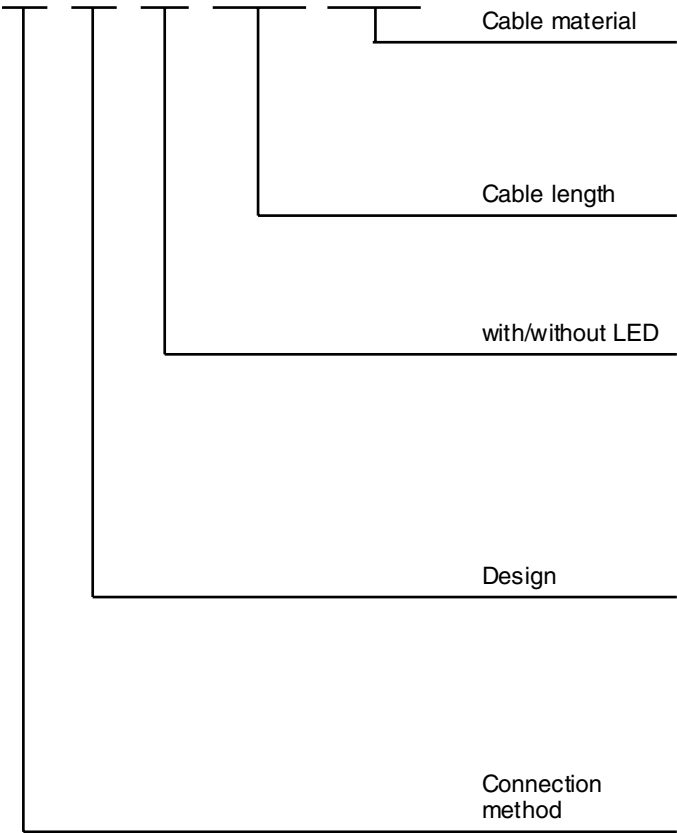
Suitable for DC sensors with 2, 3 or 4 wires technique, cross-braided halogen free lead or with PE 						
Cable-sheath	Length	No. of wires	Ø (mm ²)	Design straight	Design angled	Design angled with 2 LEDs
PUR, halogen free, cross-braided, orange	2 m	4	0,34	V1-G-2M-PUR H/S	V1-W-2M-PUR H/S	V1-W-A2-2M-PUR H/S
	5 m	4	0,34	V1-G-5M-PUR H/S	V1-W-5M-PUR H/S	V1-W-A2-2M-PUR H/S
PUR, cross-braided with PE, orange	2 m	4+1	0,34	V15-G-2M-PUR S/PE	V15-W-2M-PUR S/PE	V15-W-A2-2M-PUR S/PE
	5 m	4+1	0,34	V15-G-5M-PUR S/PE	V15-W-5M-PUR S/PE	V15-W-A2-5M-PUR S/PE

Mating connectors 7/8''-16 UN 2A for AC sensors in series F42 (UB...F42(S)-UK-V95)

Pin out/wire colours <div></div>					
Cable sheath	Length	Number of wires	Ø (mm²)	Design straight	Design angled
PVC	2 m	5	0,75	upon request	V95-W-2M-PVC

Type code mating connectors

V1 - W - E2 - 2M - PVC



- PVC
 - PUR
 - PUR H/S, halogen free cross-braided
 - PUR S/PE cross-braided, with PE
- 2 2 m
- 5 m
 - additional length on demand
- E2 (for 3-wire pnp), 2 LEDs
 - E0 (for 3-wire npn), 2 LEDs
 - E2/E3 (contact 2 + 4 link), 2 LEDs
 - A0 (for 4-wire npn), 2 LEDs
 - A2 (for 4-wire pnp), 2 LEDs
 - no designation = without LED
- W angled
 - G straight
 - WM angled with cap nut
 - WR angled with twist connect
 - GR straight with twist connect
- V1 M12 x 1, 4-pin, DC
 - V1S M12 x 1, 4-pin, DC, connector
 - V13 M12 x 1, 3-pin, AC
 - V15 M12 x 1, 5-pin, DC
 - V15S M12 x 1, 5-pin, DC, connector
 - V16 Rd24 x 1/8, 7-pin, AC/DC
 - V16S Rd24 x 1/8, 7-pin, AC/DC, connector
 - V17 M12 x 1 7-pin, DC
 - V18 M18 x 1, 4-pin, AC/DC
 - V3 M8 x 1, 3-pin, DC
 - V3S M8 x 1, 3-pin, DC, connector
 - V31 M8 x 1, 4-pin, DC
 - V31S M8 x 1, 4-pin, DC, connector
 - V7 Amphenol-Tuchel C164 639F 7S22
 - V95 7/8''-16 UN 2A, 4-pin, AC
 - V with central screwed connection, 4-pin

MH 04-3505

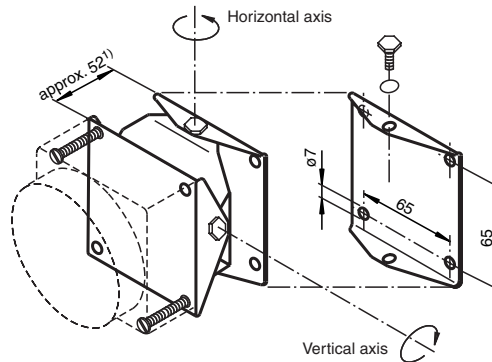


Mounting accessory for the simple adjustment of -FP and -F42 series sensors

MH 04-2681F



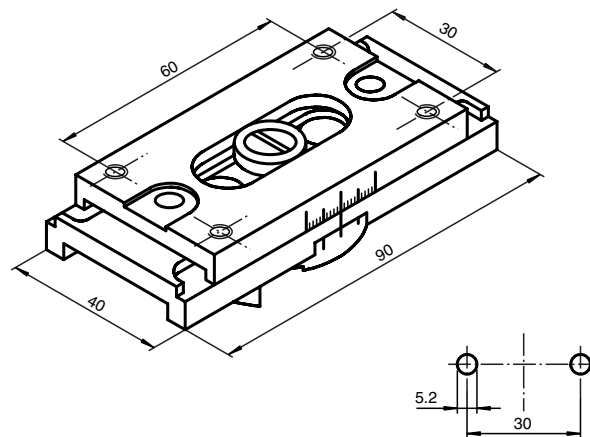
Mounting accessory for the simple adjustment of *VariKont*® series sensors



The type 04-3505 mounting accessory simplifies the adjustment of ultrasonic sensors of the -FP and -F42 series.

It permits the completely installed and wired sensor to be swiveled by up to $\pm 30^\circ$ in 2 orthogonal axes.

The sensor is locked in the desired position by tightening the mounting screws.



Height in two-point installation approx. 28 mm

For ultrasound sensors (*VariKont*®, +U9+ series) compliant with DIN 43694, EN 50025 oder EN 50037.

The simple mounting is performed with traditional C-profile rails¹⁾ as in EN 50024 (15 x 30 x 1.5). For existing systems, the mounting accessories will also fit on C-rails¹⁾ that comply with the obsolete DIN 43662 standard (15 x 30 x 2). Generous scope for adjustment in the x and y directions and 360° rotation simplify and speed up installation and adjustment work. The adjustment of the sensor in the selected position is performed using the switch mounting screws (included). Provision has also been made for two-point mounting as an alternative to the C-rail. The required holes can be accessed through the central guide slot. M5 x 16 mm screws may be used for mounting.

Technical data:

Material

Injection molded zinc, chromated

Permissible shock and

b < 30 g, T < 11 ms

Vibration loads

f < 55 Hz, a < 1 mm

as per IEC 68-2-6 and IEC 68-2-27

Mass

approx. 270 g

Accessories - mounting aids

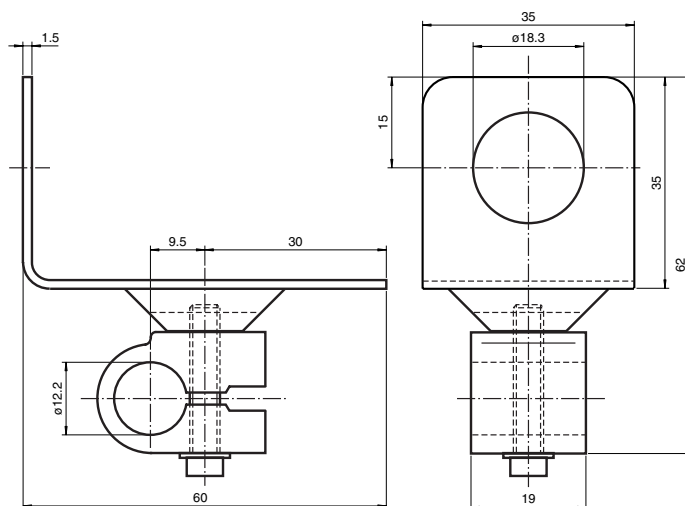
OMH 04



Universal mounting for all cylindrical $\varnothing 18$ mm sensors

Material

Angle: sheet steel, galvanised
 Locking disc: sheet steel, galvanised
 Locking profile: aluminium, diecast



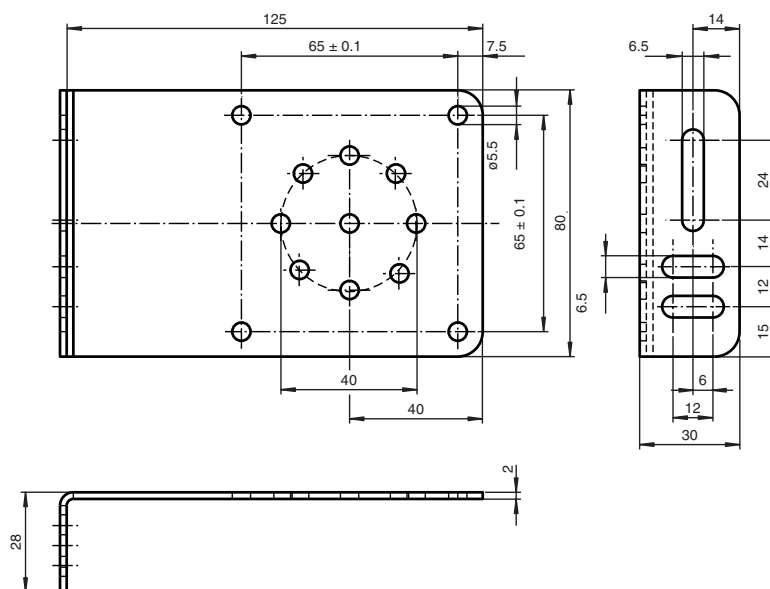
For installation on $\varnothing 12$ mm round rod or sheet material (thickness 1.5 mm ... 3 mm). Suitable for -18GM series sensors.

MHW 11



Mounting angle for -FP and -F42 series sensors

Material: Stainless steel

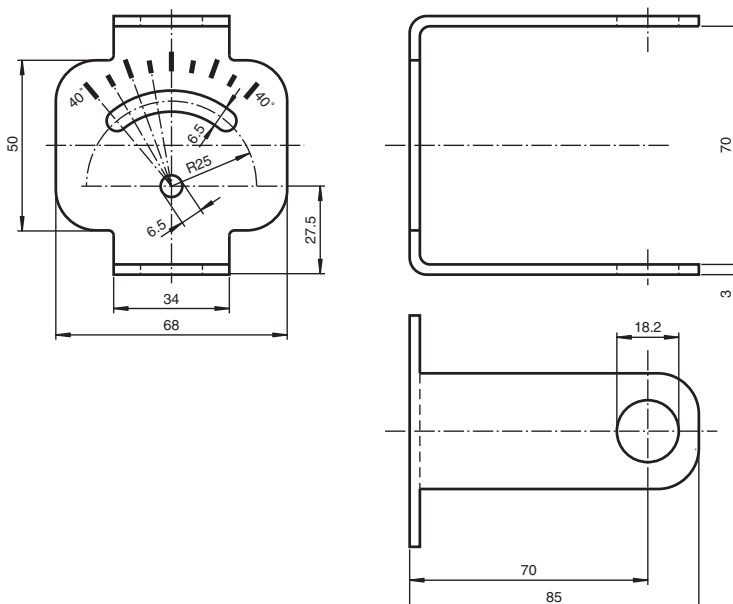


MH-UDB01



Rotatable mounting angle with angle scale for ultrasonic double-sheet monitors.

Material: Stainless steel



CPZ18B03



Mounting flange with tumble mechanism.
For sensors with an M18 threaded housing

Rotation range: 360°
Swing range: 10°

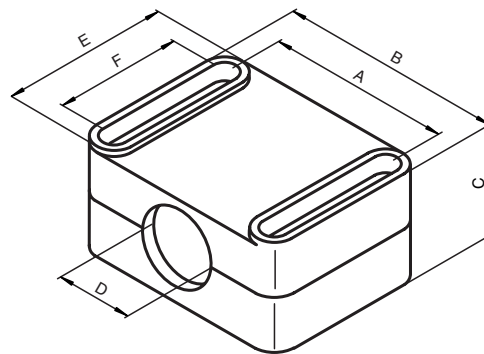
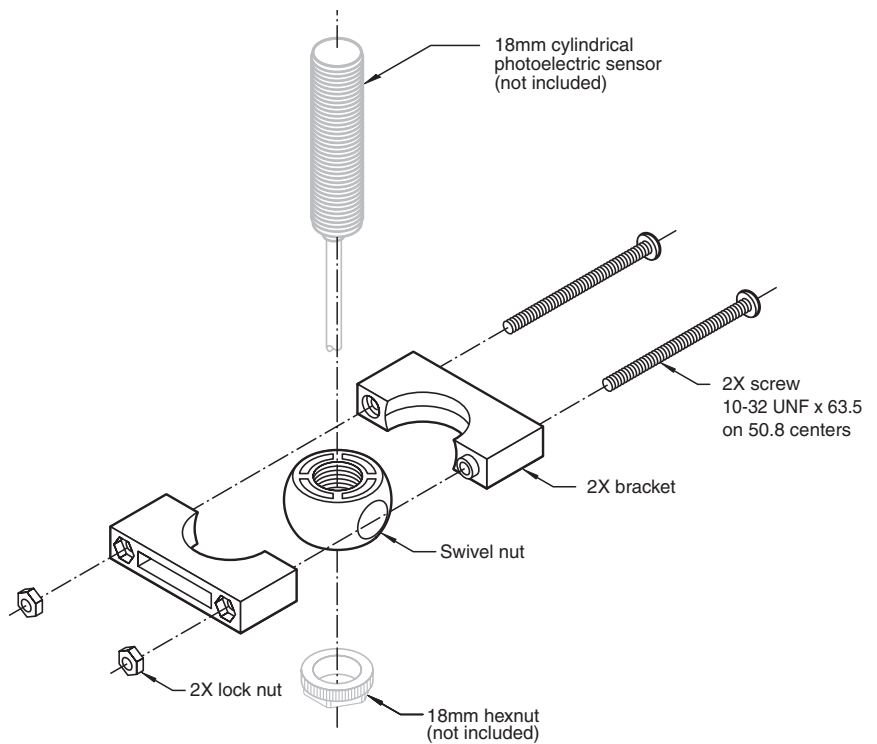
(Delivery of mounting flange does not include sensor)

BF12 BF18 BF30



Universal mounting brackets with transparent upper part for all cylindrical sensors with $\varnothing 12$ mm, $\varnothing 18$ mm, or $\varnothing 30$ mm.

Material: PBT



	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	suitable cylinder head screws
BF12	24	36	19	12	30	16	M4 x 20
BF18	30	44	23	18	40	26	M5 x 25
BF30	40	56	34	30	40	24	M5 x 40

Accessories - mounting aids

M105

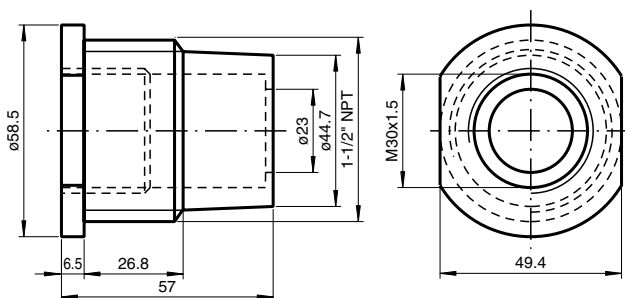


Universal mounting for cylindrical sensors with $\varnothing 30$ mm for sensors with front-end thread (UB/UC300, -500 and -2000).

- **Secure mounting**
- **Easy installation**
- **Robust design**
- **Chemical-resistant**

Material: PTFE

(Delivery of mounting accessories does not include sensor)



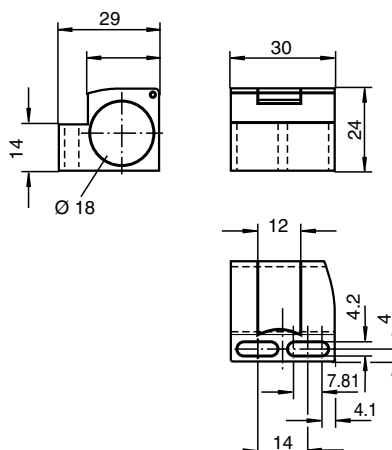
BF18-F BF30-F



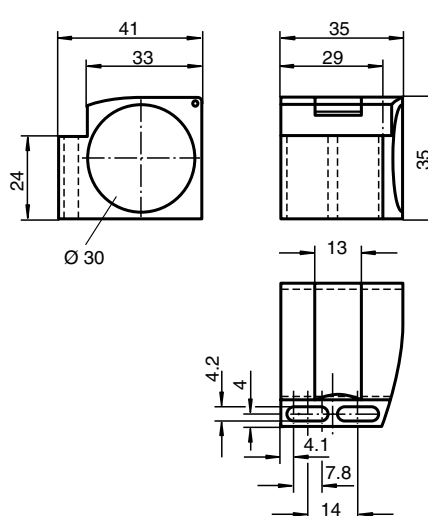
Universal mounting for all cylindrical sensors with $\varnothing 18/\varnothing 30$ mm

- **The flange is mounted using the oblong holes, the adjustment range is 8 mm at maximum.**
- **Suitable screws for installation of the mounting flange: M4**

BF18-F



BF30-F



PA02

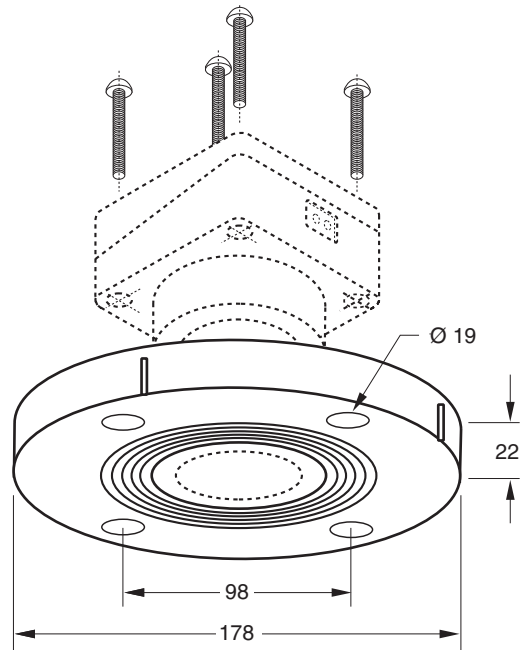


Mounting flange for all block type -FP series sensors

- **Secure mounting**
- **Easy installation**
- **Robust design**

(Delivery of mounting flange does not include sensor)

Material: PVC



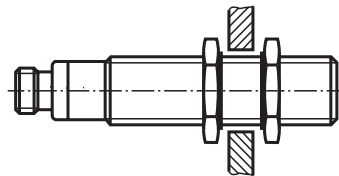
Nut M12K-VE Nut M18K-VE Nut M30K-VE



Plastic nuts with centering ring for vibration decoupled installation of cylindrical sensors with diameters of 12 mm, 18 mm and 30 mm.

These nuts should be used in applications, where the sensor is fixed at the front third of the housing, when ambient temperatures of $< 0^{\circ}\text{C}$ can occur.

Material: PA
Packaging unit: 1 pair



Series -123GM
Series -18GK/-18GM
Series -30GM
Series VarKont
Series -FP
Series -F12
Series -F42
Series -F43
Series -F54
Series -F64
Series -D1
Series LUC
Double sheet monitoring
Control units/Power supplies
Accessories

Accessories - mounting aids

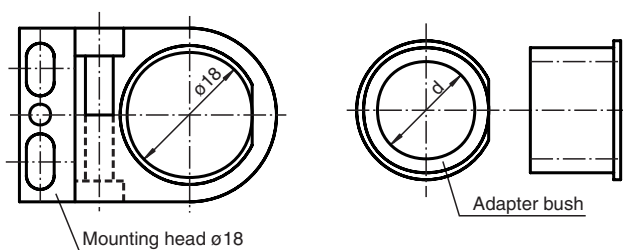
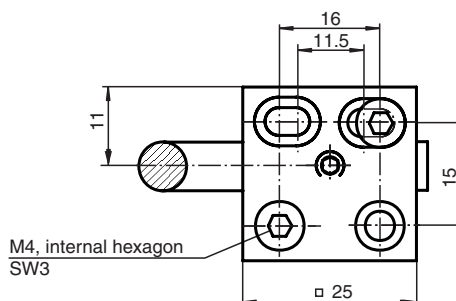
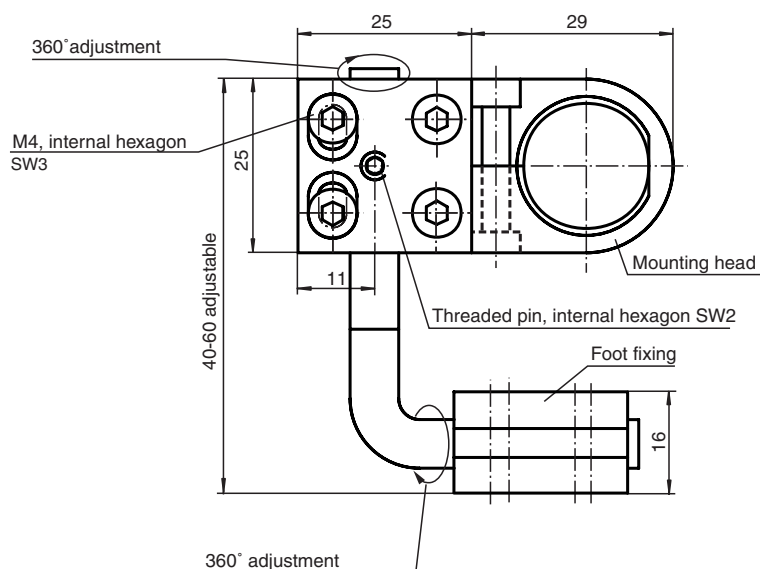
BF 5-30



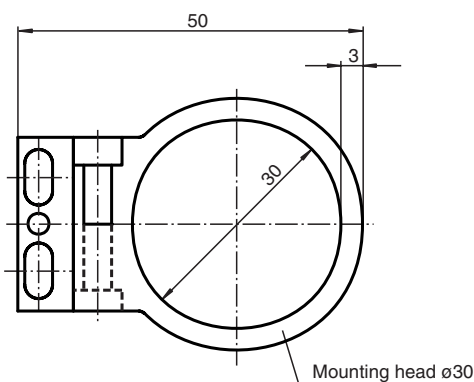
Universal mounting for all cylindrical sensors with $\varnothing 5 \text{ mm} \dots \varnothing 30 \text{ mm}$

- **Secure mounting**
- **Easy installation**
- **Flexible 360° adjustment of measuring head and base**
- **Robust design**

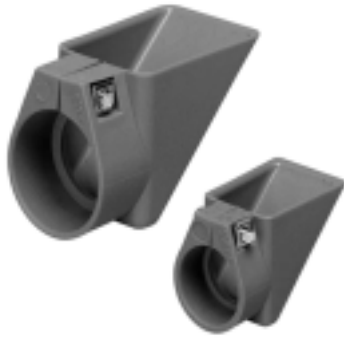
The BF 5-30 mounting flange is supplied with two mounting heads ($\varnothing 18 \text{ mm}$, $\varnothing 30 \text{ mm}$) and 4 sleeves ($\varnothing 5 \text{ mm}$, $\varnothing 8 \text{ mm}$, $\varnothing 12 \text{ mm}$, $\varnothing 14 \text{ mm}$).



d= 5 mm, 8 mm, 12 mm, 14 mm



UVW90-K18 UVW90-K30



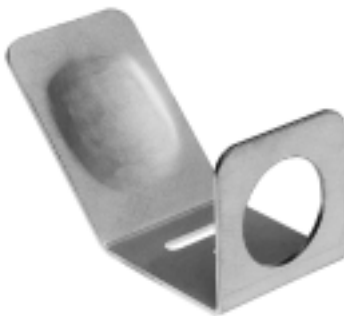
Sound deflector for cylindrical -18GM and -30GM series ultrasonic sensors.

- **Clamp mounting**
- **90° sound deflection for difficult installation circumstances**
- **Universal installation position**

On the underside of the slope the sound deflector has a hole over the complete width. Falling particle of dust can not congregate in the focusing attachment. The function is also guaranteed in dusty environment.

Material: PMMA

UVW90-M30

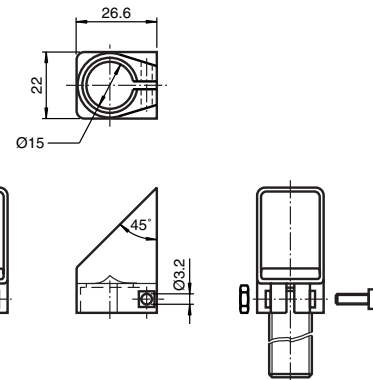


Focusing attachment for cylindrical -30GM series ultrasonic sensors.

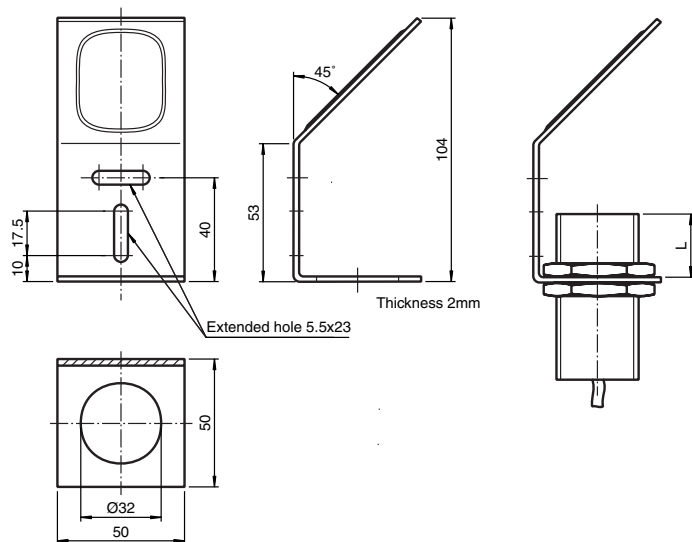
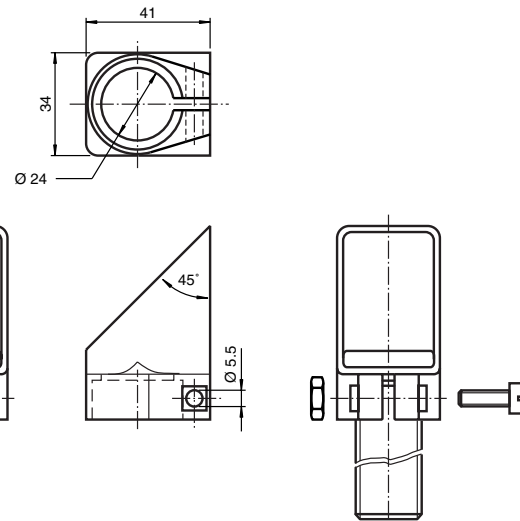
- **Universal installation options**
- **90° sound deflection for difficult installation circumstances**
- **Universal installation position**
- **Focusing effect**
- **Detection range increase (through focussing)**
 - approx. 40% with UB/UC500 (with dimension L = 10 mm)
 - approx. 20% with UB/UC2000 (with dimension L = 35 mm +/- 5 mm)

Material: Stainless steel

UVW90-K18



UVW90-K30



Accessories - external temperature probes, remote potentiometers

UC-30GM-TEMP



External temperature probe

- For ultrasonic sensors of the UC...-30GM-... and LUC4T-... series
- 8 mm plug connector
- Single-hole mounting with position locking

LUC4-Z30-G2V LUC4-Z30-N2V



External temperature probe

- For ultrasonic level sensors of the LUC4T-... and UC...-30GM-... series
- 8 mm plug connector
- Single-hole mounting in thread: G $\frac{1}{2}$ A (LUC4-Z30-G2V) $\frac{1}{2}$ NPT (LUC4-Z30-N2V).

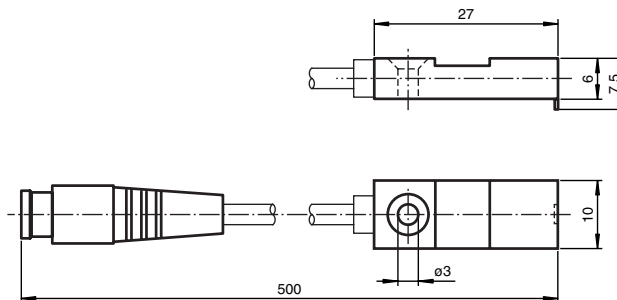
FP100



Remote potentiometer

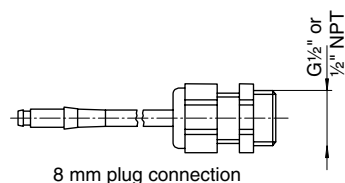
Potentiometer for the adjustment of the sensing range of ultrasonic through-beam sensor UBE4000-30GM-SA2-V15.

The potentiometer connection occurs on the transmitter



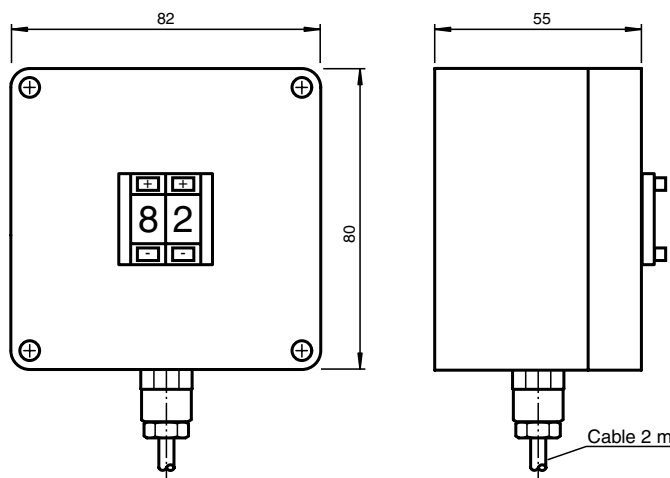
The external UC-30GM-TEMP temperature probe may be connected to ultrasonic sensors of the UC...-30GM-... and LUC4T-... series as an alternative to the supplied temperature plug.

The use of the UC-30GM-TEMP permits the ambient temperature of the measuring area to be monitored independently of the installation conditions of the sensor in order to minimise temperature influences as effectively as possible.



cable length: 300 mm

The external LUC4-Z30-G2V (with G $\frac{1}{2}$ A thread) or LUC4-Z30-N2V (with $\frac{1}{2}$ NPT thread) temperature probes may be connected to ultrasonic sensors of the LUC4T-... and UC...-30GM-... series as an alternative to the supplied temperature plug. The use of the LUC4-Z30-... permits the ambient temperature of the measuring area to be monitored independently of the installation conditions of the sensor in order to minimise temperature influences as effectively as possible.



USB-0,8M-PVC ABG-SUBD9



Interface adapter USB/RS_232

Modern notebooks and PCs are often not equipped with a standard RS 232 serial interface.

Anyhow, to allow the use of the multiple functions of the service program ULTRA 2001, the interface adapter USB-0,8M-PVC ABG-SUBD9 offers a simple solution.

The interface adapter USB-0,8M-PVC ABG-SUBD9 provides a RS 232 serial interface at a free USB port.

It can be connected to the USB port either directly or via the 800 mm USB cord, which is included in scope of delivery.

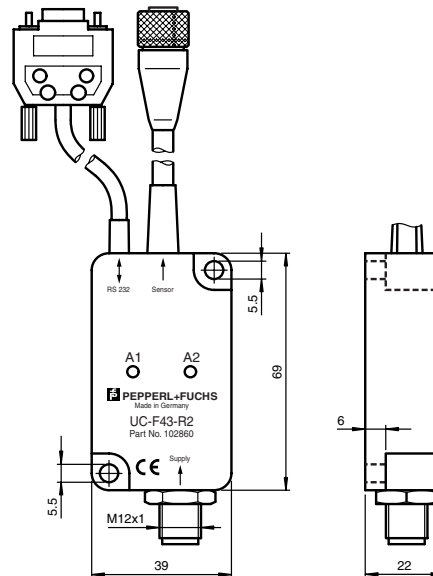
Our interface cables can be connected to the 9 pin SUB-D connector in the accustomed way.

UC-F43-R2



RS 232 interface

- For the sensors UC300-F43-2KIR2-V17 and UC2000-F43-2KIR2-V17.
- Simple insertion in the sensor connection lead.



The unit can be switched from the V17 cable connection socket and the V17 plug connection on the sensor for the TEACH-IN procedure.

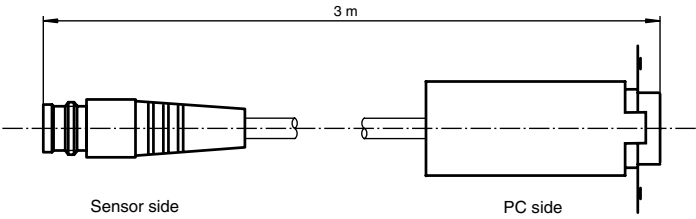
The parameterised functions are retained when the programming unit is removed and/or the power is switched off.

Accessories - programming aids

UC-30GM-R2



Interface cable

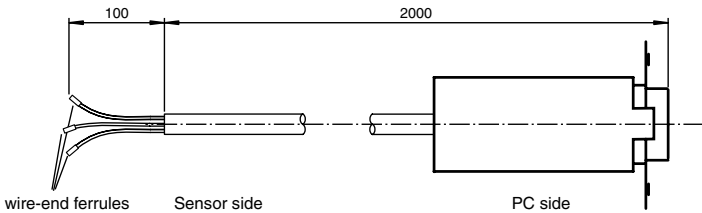


The UC-30GM-R2 interface cable enables the parameterisation of ultrasonic sensors of types UC...-30GM-..R2-V15 using the ULTRA 2001 service software. The cable creates a connection between the PC-internal RS 232 interface and the connector of the temperature/programming plug on the sensor.

UC-FP/U9-R2



Interface cable

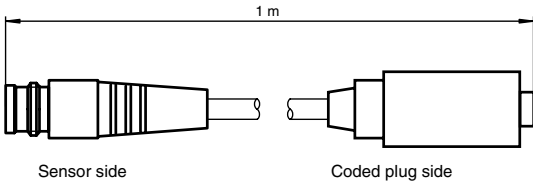


The UC-FP/U9-R2 interface cable enables the parameterisation of *VariKont*[®] and FP series ultrasound sensors using the ULTRA 2001 service software. The cable creates a connection between the PC-internal RS 232 interface and the interface connections in the terminal space of the sensor.

UC-30GM-PROG



Extension cable



The UC-30GM-PROG extension cable permits sensors of the UC...-30GM-... and LUC... series to be taught-in at inaccessible installation locations. The sensor-side end of the extension cable is connected to the sensor's temperature plug socket. The sensor can be programmed with the temperature plug at the other end of the cable.

UB-PROG2



Programming device

- For ultrasonic sensors series

UB300			
UB400	-12GM		
UB500	-18GM40	-E4	
UB800	-18GM75	-E5	
UB1000	-30GM	-I	
UB2000	F42(S)	-U	
UB4000	-F54		
UB6000			

... whose teach-in input is on pin 2.

- Simple TEACH-IN of the switching distances A1/A2 or the measuring window.
- Simple selection of the output function:
Window mode, normally open/normally closed function.
One switching distance, normally open/normally closed function.
Monitoring of the detection range.

UB-PROG3



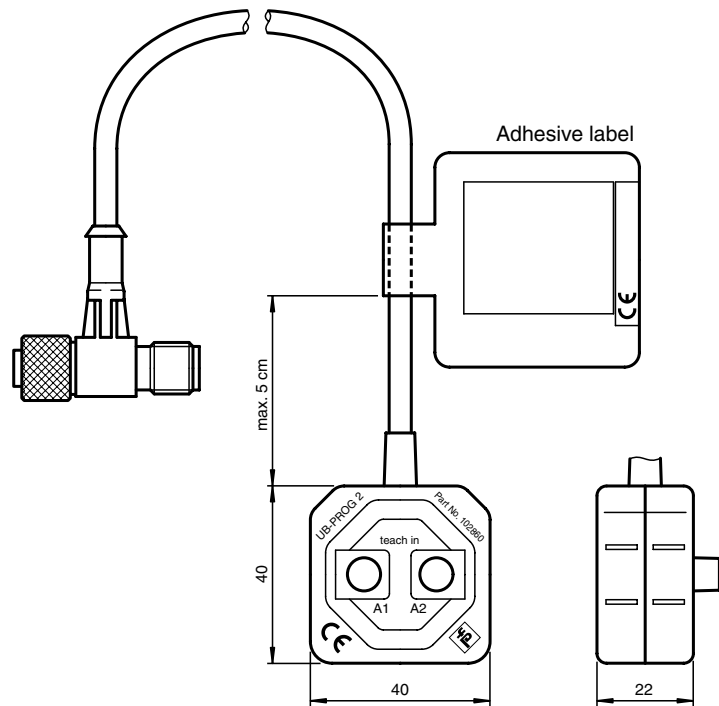
Programming device

- For ultrasonic sensors series

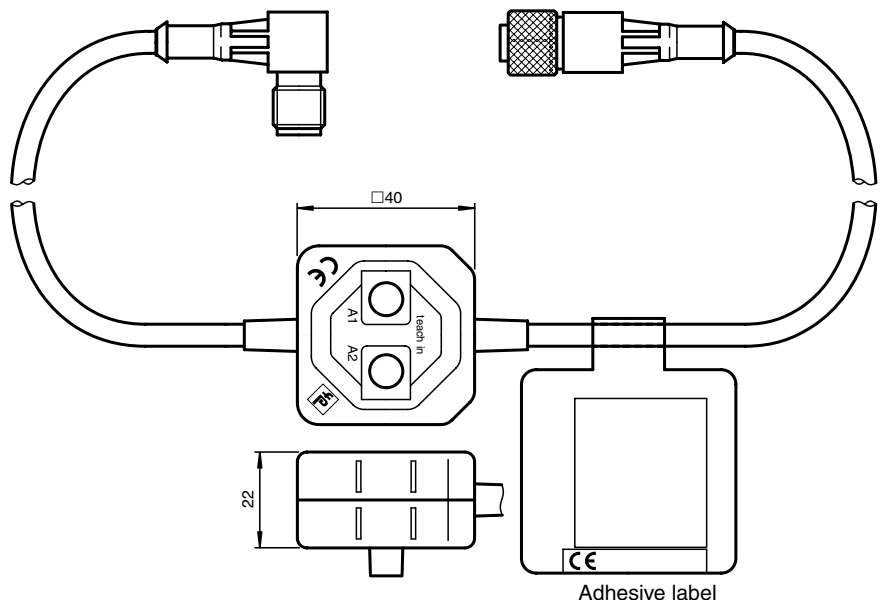
UB500		-E01	
UB1000	-18GM75	-E23	
		-E6	
		-E7	

... whose teach-in input is on pin 5.

- Simple TEACH-IN of the switching distances A1/A2 or the measuring window.
- Simple selection of the output function:
Window mode, normally open/normally closed function.
One switching distance, normally open/normally closed function.
Monitoring of the detection range.



The unit can be switched from the V15 cable connection socket and the V15 plug connection on the sensor for the TEACH-IN procedure.
The switching distances/measuring window and output function can be taught in using the A1 and A2 buttons.
The taught-in switching distances and functions are retained when the programming unit is removed and/or the power is switched off.



The unit can be switched from the V15 cable connection socket and the V15 plug connection on the sensor for the TEACH-IN procedure.
The switching distances/measuring window and output function can be taught in using the A1 and A2 buttons.
The taught-in switching distances and functions are retained when the programming unit is removed and/or the power is switched off.

ULTRA 2001

Service software

- WINDOWS™ user interface with up to 5 independent windows.
- For all ultrasonic sensors with RS 232 interfaces.
- Convenient parameterisation of all relevant sensor functions such as:
 - Evaluation process
 - Switching behaviour
 - Switching distances
 - Analogue output
 - Measuring window
 - Filter functions
 - Fault management
 - etc.
- to adapt the sensor optimally to its specific application.
- Logging functions for sensor parameter settings and recorded series of measurements.

Software and manual as free download:

<http://www.pepperl-fuchs.com>

Procedure:

- Select your product, which can be parameterised by ULTRA 2001 at our „Products“ page.
- Click on "1830288.zip" in the „Further documents“ section.
- Save and unpack the file on your local drive.

Use the appropriate interface or interface cable for communication between PC and sensor (see page 231)

Why use PC software for parameterisation?

Commands and parameters can be transferred to sensors via an RS 232 interface, if present. These commands can be used to output measured values, configure the evaluation process, switching outputs and/or analogue output, set and query parameters and control the general unit functions. This provides the user with an aid in adapting the sensor optimally to its specific application and visualising parameters or measured results.

Parameterisable sensors

<u>Series:</u>	<u>sensor types:</u>
-30GM	UC...-30GM-..R2-V15
Varikont®	UC...+U9+E6/E7+R2 and UC...+U9+IUE0/E2+R2
	UJ3000+U1+...+RS
-FP	UC6000-FP-...-R2-P5 and UJ6000-FP-...+RS
-F43	UC...-F43-2KIR2-V17

Brief description

The program features a multilingual, menu-based user interface with comprehensive help. It supports up to 5 independent windows. The windows can be displayed or hidden, and their size and position on the screen can be adjusted as required. The size and position of the windows is retained by the program.

Show It: Graphical display of the measured distance. The set switching distances are marked. Simulated LEDs display the switching states of the outputs.

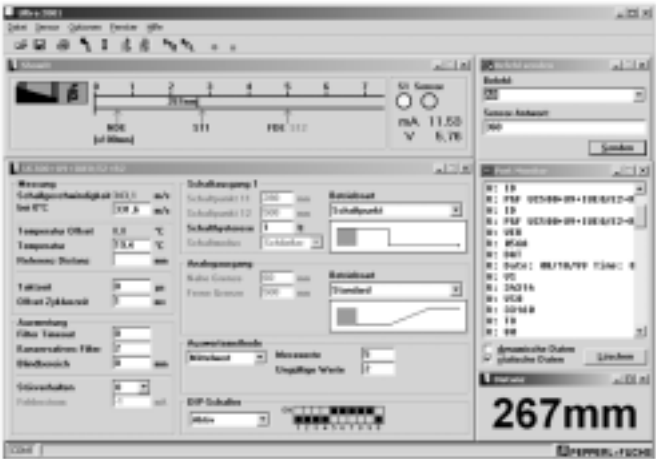
Parameters: All parameters are editable here. Display and input fields permit commands or parameters to be changed at the click of the mouse without detailed knowledge of the relevant commands or their syntax.

Send command: Sensor parameters are set and queried here in the same manner as with a terminal program (alternative to the parameterisation window).

Port Monitor: Display of commands sent to the sensor and received by it.

Distance: Display of the currently measured distance in mm.

The program and sensor parameters read out by the program can be saved to the hard drive or a diskette. Measurement series can be started, the measurement data queried periodically and output to a printer or saved to the hard drive/diskette.



System requirements

The Ultra 2001 application will run on any PC or laptop. Windows 95/98/ME/NT4/2000 or XP, an EGA or VGA graphic boards and a free RS 232 interface are required.

Standards

The proximity switches of Pepperl+Fuchs GmbH are developed and manufactured consistently according to applicable standards. Moreover, draft standards are taken into account during new development, redesign, and changes to existing products

German standards

DIN VDE 0660	Part 208 Low-voltage switching devices, auxiliary power switches, supplement on inductive proximity switches
DIN VDE 0660	Part 209 Switching devices, low-voltage switching devices, supplement on contact-free position switches for safety applications
DIN VDE 0660	Part 212 (replaces DIN 19234) Measurement, regulation, control - Electrical path sensors - DC interface for path sensors and switching amplifiers

European standards

EN 60947-5-2	Low-voltage switching devices Part 5: Control devices and switching elements, main section 2: Proximity switches
EN 60947-5-6	Control devices and switching elements, proximity sensors - DC interface for proximity sensors and switching amplifiers (NAMUR)

International standards

IEC 60947-5-2	Low-voltage switching devices and control devices, Part 5 Control circuit devices and switching elements - Section 2, proximity switches
Draft IEC 61934	Control circuit devices and switching elements DC interface for proximity sensors and switching amplifiers (NAMUR)

Standards for electromagnetic compatibility

EN 50081	Basic technical standard for radiation interference Part 1, Residential areas Part 2, Industrial areas
EN 50082	Basic technical standard for interference resistance Part 1, Residential areas Part 2, Industrial areas
EN 61000-4	EMC, testing and measurement procedures Parts 2, 3, 4, 5, and 6

Standards for explosion protection

DIN EN 50014	Electrical equipment for hazardous areas General requirements
DIN EN 50020	Electrical equipment for explosion hazardous areas Intrinsic safety "i"
EN 60079-10	Electrical equipment for gas explosion hazardous areas Classification of hazardous areas
EN 60079-14	Electrical equipment for gas explosion hazardous areas Electrical systems in explosion hazardous areas (excluding excavations)

Quality assurance standards

DIN ISO 9000-9004	EN 29000-29 004) Quality assurance (QA) for products and services
DIN ISO 9001	QA from development to production, installation, and customer service

Pepperl+Fuchs GmbH is DIN ISO 9001-certified.

The CE logo

The CE logo is a declaration by the manufacturer that the so designated product conforms to the European standards and directives that are applicable to the product. The following directives are applicable to Pepperl+Fuchs products:

89/336/EEC	EMC directive (EN 60 947-5-2)
73/23/EEC	Low-voltage directive (cf. VDE 0160, product standard EN 60947-5-2)
Directive 94/9/EC	Equipment and protective systems intended for use in potentially explosive atmospheres

Pepperl+Fuchs GmbH certifies the conformance of their products with applicable directives in a manufacturer declaration.

ALPHA

Pepperl+Fuchs GmbH is a member of ALPHA, an association for the testing and certification of low-voltage devices, e. V. This association promotes individual responsibility on the part of manufacturers of such devices through unified testing guidelines compliant with applicable standards, and thus supports high product quality. Through ALPHA's membership in LOVAG (Low Voltage Agreement Group), government-recognised product certifications issued by ALPHA under certain conditions are also recognised in other European countries.

Resistance of our housing materials to chemical substances

The following tabular listing of the chemical resistances of our housing materials gives some indications for the application of our sensors in aggressive environmental conditions (next page).

Chemical resistance

Chemically resistant to	V2A	ABS	Epoxy	PBT	PC	POM	PP	PPS	PS	PVC
Acetone	+	-	-	+	-	+	+	+	-	-
Formic acid	20 °C	40%	+	10%	-	-	85%	O	40%	50%
Ammonia	+	25%	O	10%	-	+	+	+	+	O
Petrol	+	25%	+	+	O	+	-	+	-	+
Benzene	+	-	+	+	-	+	-	+	-	-
Brake fluid	-	O	-	-	-	+	+	-	-	-
Butane	-	+	+	-	+	+	+	+	-	+
Butanol	-	-	-	-	-	+	+	-	-	40 °C
Calcium chloride	-	+	-	10%	+	+	+	+	+	60 °C
Chlorobenzene	20 °C	-	+	-	-	+	-	-	-	-
Diesel oil	-	+	+	+	O	+	60 °C	+	-	-
Acetic acid	20 °C	25%	O	+	10%	10%	70%	+	50%	40 °C
Formaldehyde	+	30%	50%	30%	-	+	40%	37%	40%	+
Frigen 113	-	-	-	-	+	-	-	+	-	+
Fruit juice	+	-	+	-	+	+	+	-	-	+
Glycerine	+	+	+	+	O	+	+	+	+	60 °C
Heating oil	-	O	+	+	O	+	60 °C	+	-	-
Hydraulic oil	-	-	-	-	+	+	60 °C	-	-	+
Caustic potash	-	50%	O	3%	-	+	50%	-	50%	60 °C
Potassium chloride	+	-	-	-	+	+	+	-	+	60 °C
Potassium hydroxide	+	-	-	-	-	-	+	-	-	-
Linseed oil	+	+	-	-	+	+	+	-	+	+
Methanol	+	-	+	+	-	+	+	+	-	+
Methylene chloride	+	-	-	-	-	O	O	+	-	-
Lactic acid	20 °C	80%	+	-	+	+	+	-	80%	O
Mineral oils	+	-	+	+	-	+	+	+	-	+
Motor oils	+	+	-	+	-	+	+	+	O	-
Sodium carbonate	+	+	-	-	+	+	+	-	+	-
Sodium chloride	+	+	-	-	+	+	+	-	+	+
Sodium hydroxide	20 °C	+	-	-	-	-	+	-	-	-
Caustic soda	20 °C	50%	-	3%	-	+	+	-	50%	+
Nitric acid	66%	-	-	-	10%	-	25%	-	10%	+
Hydrochloric acid	-	O	-	10%	20%	-	+	-	10%	O
Lubricating oil	+	-	+	-	+	O/+	+	-	-	-
Carbon disulphide	+	-	-	-	-	+	+	-	-	O
Sulphuric acid	-	50%	-	28%	50%	-	80%	50%	50%	70%
Sea water (cold)	+	-	+	+	-	+	+	+	-	+
Seifenlauge	+	-	+	-	O	+	+	-	-	+
Detergent	+	-	-	-	-	-	+	-	-	-
Turpentine	+	-	+	-	O	-	+	-	-	+
Carbon tetrachloride	+	-	-	-	O	-	-	-	-	O
Toluene	+	-	+	+	-	+	-	+	-	-
Trichlorethylene	+	-	-	+	-	-	-	O	-	-
Water	+	+	68 °C	68 °C	+	+	+	+	+	60 °C
Tartaric acid	20 °C	+	+	-	+	10%	+	-	+	60 °C
Xylene	+	-	-	+	-	+	-	+	-	-
Zinc sulphate	-	+	-	-	+	-	+	-	-	-
Citric acid	20 °C	+	+	-	10%	+	+	-	+	-

Legend:

+: resistant / O: resistant under some conditions / -: not resistant / □: unknown
 .. °C: resistant up to ... °C / ..%: resistant up to a ...% solution

Additional information

Protective enclosures

(DIN VDE 0470 Part 1, EN 60529)

IP 6 7

Degree of protection against contact and foreign bodies	Degree of protection against water
0 - Not protected	0 - Not protected
1 - Protected against contact with hazardous components with the backs of the hand - Protected against solid foreign bodies with a size and diameter of 50 mm and above	1 - Protected against dripping water
2 - Protected against contact with hazardous components with fingers - Protected against solid foreign bodies with a size and diameter of 12.5 mm and above	2 - Protected against dripping water when housing is tilted up to 15°
3 - Protected against contact with hazardous components with a tool - Protected against solid foreign bodies with a size and diameter of 2.5 mm and above	3 - Protected against sprayed water
4 - Protected against contact with hazardous components with a wire - Protected against solid foreign bodies with a size and diameter of 1.0 mm and above	4 - Protected against splash water
5 - Protected against contact with hazardous components with a wire - Dustproof	5 - Protected against water jets
6 - Protected against contact with hazardous components with a wire - Protected against dust	6 - Protected against strong water jets
	7 - Protected against temporary submersion in water
	8 - Protected against continuous submersion in water
	9 - Protected against water in high-pressure/steam-jet cleaning operations

Notes:

Wherever a code number is not required, the letter "X" must be used in its place.

Devices identified with a second digit 7 or 8 do not have to fulfil the requirements of the second digits 5 or 6 unless they have a double identification (e.g. IPX6/IPX7).

Glossary

ABS

Acrylonitrile butadiene styrol

Accuracy of measurement

Maximum value of the deviation from the ideal characteristic. This is given for sensors used for distance measurement and is based on the maximum measuring range.

Actuation direction

The objects can enter the sound beam from any arbitrary direction. All catalogue data on switching points relates to objects approaching the sensor along its axis.

Adjustment accessories

⇒ Mounting accessories

Adjustment range

The range within which the switching point of a sensor can be set.

Air pressure

During normal atmospheric variation, ($\pm 5\%$) the speed of sound varies by about $\pm 0,6\%$ in a fixed location. The resulting changes in switching distances can normally be ignored.

Air temperature

The velocity of sound is strongly dependent on the air temperature. This may lead to a strong dependence of the base values of an ultrasonic sensor if the sensor is not temperature-compensated.

⇒ Temperature compensation

Alarm

⇒ Fault indicator

Ambient conditions

Pepperl+Fuchs ultrasonic sensor operate unaffected by dust, mist, rain, snow and audible sound. Deposits on the faces of the sensors are normally prevented by the self-cleaning effect of the oscillating decoupling layer.

Ambient temperature

According to the applicable standards, ultrasonic sensors must be operational at temperatures from $-25\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$.

This corresponds to the standard temperature range of Pepperl+Fuchs sensors. The values appropriate to specific equipment are given on the relevant data sheet.

Blind range

⇒ "Unusable area" section

Cable length

Cables of up to 300 m length can be used for sensors with internal evaluation. A maximum length of 100 m can be used if the cable is used for communication via the RS 232 interface.

The cable should be shielded in the event of high interference levels.

In the case of sensors without evaluation (H1/2/3 sensors), the cable length should not exceed 50 m.

CE symbol

The CE symbol is a declaration by the manufacturer, that the so designated product conforms to the European and international standards and directives that are applicable to the product. The following standards and directives are applicable to Pepperl+Fuchs products:

89/336/EEC EMC-directive
(see also IEC 801)
73/23/EEC Low
voltage directive
(see VDE 0160,
EN 60 947-5-2)

94/9/EC Devices and protec-
tion systems
for hazardous areas

Concentration

The sound cone has an opening angle of approx. 5° at a sound pressure level of -6 dB. Further concentration of the ultrasonics, e.g. by placing a tube in front of the transducer, is not possible.

Detectable object

⇒ Standard measuring plate

Detection width hysteresis

This denotes the separation of the switching points between lateral approach and removal of the measuring plate, i.e. between approach and removal at right angles to the reference axis.

Deviation of characteristic curve

⇒ Accuracy of measurement

Diffuse reflection

⇒ Reflection

EMC classification

Electromagnetic compatibility is the ability of an electrical device to function satisfactorily in an electromagnetic environment, without interfering with other devices and without receiving interference itself. The EMC classification is obtained from tests for emission and resistance to interference in various test gradings. Grade 3, for example, corresponds to a normal industrial environment.

(see EN 60947-5-2 Annex X).

Fault indicator (alarm)

Many ultrasonic sensors from Pepperl+Fuchs are equipped with a red LED to indicate faults. Faults are generally due to the incorrect adjustment of the sensor or excessive levels of interference.

These are then indicated by the flashing red LED.

In case of a fault, the last valid output state is "frozen". Output states remain in effect until the fault is corrected and the sensor is returned to normal operation.

Humidity

The velocity of sound increases by 2% from dry to saturated air. As a result, switching distances decrease by a maximum of 2%. This can be disregarded under normal circumstances.

Hysteresis

⇒ Range hysteresis
⇒ Detection width hysteresis

Impulse relay function

Time function for switching outputs in which an output pulse of a specified length is generated which is not affected by the length of the switching event.

⇒ Timer function

Interference, mutual

Ultrasonic sensors operating simultaneously with overlapping detection areas may interfere with one another. For this reason, minimum distances between the sensors must be maintained.

- If the sensors are transmitting in the same direction, the lateral safety distance corresponds to around half the sensing range.
- In the case of opposed sensors, the distance should amount to slightly more than the sum of the sensors' sensing ranges.

The use of synchronisable sensors is recommended if these safety distances cannot be maintained.

Light emitting diodes

Pepperl+Fuchs ultrasonic sensors are equipped with LEDs to signal a variety of states.

Please refer to the appropriate data sheets for the significance of the individual LEDs.

Linearity

- ⇒ Accuracy of measurement

Measuring output

Absolute: The measuring output indicates the distance of the object from the face of the sensor in millimeters. The output is either analogue (4 mA ... 20 mA, or 0 V ... 10 V) or digital (parallel 8-bit or serial RS232). **Relative:** The measuring output gives the position of the object within the window area (A1/A2 or lower limit/upper limit).

Measuring range

Evaluation range of measuring sensors. The starting value of the measuring range is determined by the "lower limit" the end value by the "far limit" of the sensor.

Mounting accessories

The catalogue lists mounting brackets and angles for use with sensors, which can be adjusted relative to each other. These items simplify adjustment and alignment of the sensors.

No load current

This represents the self current requirement of the sensor and is measured under conditions of zero load.

No load power consumption

This is the power consumption of the sensor itself under no-load conditions.

Normally closed

If the sensor does not detect an object, then the output is energised. When an object is detected it is de-energised (normally closed, n.c.).

Normally open

If the sensor does not detect an object, then the output is de-energised. When an object is detected it is energised (normally open, n.o.).

Objects

The specification of a sensing range is normally based on a flat standard measuring plate measuring 100 x 100 mm which is positioned at right angles to the sensor axis. The sensing ranges for sensors for very small distances are sometimes based on smaller plates (see data sheets).

Solid materials, powders and liquids can be detected.

When working with poorly reflecting materials (felt, cotton wool, foam rubber, coarse textiles), we recommend deploying ultrasonic sensors as reflex sensors.

Hot materials (>100 °C) are poor reflectors.

- ⇒ Section "Notes for installation and operation"

PBT

Polybutyleneterephthalate

PC

Polycarbonate

PMMA

Polymethylmethacrylate

Probe

- ⇒ Reflection sensor

Protection class

EN 40050 classifies the protection of electrical apparatus against touch, penetration of objects or water through the housing, uncovering, and so on. The IP code consists of the letters "IP" (International Protection) and two digits:

1st digit:

Degree of protection against contact and foreign objects

2nd digit:

Degree of protection against entry of water

- ⇒ Table "Protective enclosures"

Pulse extension

Time function by means of which the switching time can be extended, provided it is shorter than the value of the pulse extension.

- ⇒ Timer function

Quality assurance

The standards DIN ISO 9000-9004

(EN 29000-29004) regulate the quality assurance (QA) of products and services.

Pepperl+Fuchs is certified in accordance with

DIN ISO 9001.

Range hysteresis

This is the separation of the switch points between the condition when the measuring plate approaches the sensor and the condition when it is moving away from the sensor. The hysteresis is given as a percentage of the operating distance (range).

Range

Usable distance between the ultrasonic transmitter and receiver (through-beam), sensor and reflector (interrupted beam), or sensor and object (reflection sensor).

- ⇒ Sensing range

Rated operating current

This value represents the maximum operating current for continuous operation.

Rated operating voltage

The rated operating voltage is given in terms of a maximum and minimum value of the supply voltage. Satisfactory operation of the sensor is assured in this range.

Rated operating voltage

The rated operational voltage is given in terms of a maximum and minimum value of the supply voltage, e.g. $V_e = 10 \text{ V DC} \dots 30 \text{ V DC}$. Correct operation of the sensors is assured within this range.

Readiness delay

The readiness delay is the time that passes from switch-on of the operating voltage to the point when a proximity switch is ready to operate.

Reference axis

Ideal line upon which the transmitter and receiver (through-beam) or sensor and object/reflector (reflection sensor or reflection barrier) are positioned. In the case of single-head systems the reference axis refers to the line of symmetry of the ultrasonic beam; in twin-head systems it is the central line between the ultrasonic beam axes of the transmitter and receiver.

Reflection barrier (Type R)

Ultrasonic sensor in interrupted beam mode.

An object with good reflective properties within the sensing range serves as a reference. Poorly reflecting objects that enter the sensing range can be detected reliably in this operating mode.

⇒ Section "Sensor principle"

Reflection sensors (Type D)

consist of an active unit with integrated ultrasonic transmitter and receiver. The sound waves are reflected diffusely by the material to be detected.

⇒ Section "Sensor principle"

Reflection

The term generally refers to the reversal of the direction of waves at the border between two media.

A distinction is made between three types of reflection:

- Specular reflection: A reflection in which virtually the entire incoming radiation is reflected with the angle of incidence equaling the angle of reflection, as in a mirror.
- Predominately specular reflection: A mirror reflection with a diffuse share, e.g. from roughened surfaces.
- Diffuse reflection: A reflection in which the incoming radiation is reflected evenly in all directions.

The manner in which an ultrasonic beam is reflected depends on the ratio of the wavelength to the roughness of the surface.

⇒ Section "Notes for installation and operation"

Reflective capability

The property of objects, depending on surface nature and structure, to reflect ultrasonic waves to a greater or lesser extent, directionally or diffusely. The non-reflected is absorbed or transmitted. In the case of reflection sensors, the attainable sensor range can be estimated using reflection tables for common materials.

Reflector range

Range within which the reflector of an ultrasonic sensor in beam-interruption mode must be positioned in order to be detected reliably. The reflector range extends from the end of the blind range to the end of the sensing range.

Reflector

A reflector is a flat plate with good reflective properties which is positioned within the sensing range at right angles to the ultrasonic beam. The reflector acts as the reference object for ultrasonic reflection sensors used in interrupted-beam mode.

⇒ Sensor principle

Repeat accuracy

(also: repeatability)

Repeatability is determined in an 8 hour test at $23 \pm 5^\circ \text{C}$ and at the rated operating voltage. The difference between two operating distances must not exceed 10% of the nominal operating distance.

Repeatability

⇒ Repeat accuracy

Residual current

Current in the load circuit of the sensor when in blocked state.

Resolution

The smallest change in the measurement variable that can be detected and represented by a measuring sensor.

Response time

The shortest possible time between two switching processes. The response time corresponds to half the switching frequency.

Reverse polarity protection

All Pepperl+Fuchs ultrasonic sensors are protected against incorrect connection of the operating voltage.

Ripple

The alternating voltage which is superimposed on the direct operating voltage (peak to peak) is expressed as a percentage of the arithmetic mean values. Pepperl+Fuchs sensors conform to the standard EN 50008 in having a maximum ripple of 10%.

Sensing range

Maximum usable distance between reflection sensor and object. The sensor range depends on the intensity of the transmitted ultrasonic packets, the conditions along the measuring distance, and above all the reflectance of the object.

⇒ Sensing range

Sensing range

Range, within its object or reflector is detected with certainty. In EN 60947-5-2, the terms range and sensor range have been replaced by the term sensing range.

This range is determined while applying rated operational voltage V_e at an ambient temperature of 20°C and a relative humidity of 50 %. In through-beam sensors, the receiver is moved axially against the sensor; in reflection sensors, the measurement plate is moved. The control element must switch reliably in the sensing range s_d .

Sensor principle

Physical principle upon which the function of a sensor is based.

Setting

The sensitivity of a number of ultrasonic sensor types can be adjusted using a potentiometer to ensure that they are optimally suited to their deployment.

Short circuit protection

Many ultrasonic sensors in the Pepperl+Fuchs range are provided with pulsing short circuit protection. If the limiting current value is exceeded, the output is periodically blocked and then switched free again, until the short circuit has been eliminated.

Standard measuring plate

Standard measuring plates permit comparative measurements of the switching distances and sensing ranges of a variety of proximity switches. The following has been established for ultrasonic sensors:

Through-beam and double-sheet monitor:

- Receiver specified by manufacturer (corresponds to the receiver of the two-part sensor set)

Reflection sensor:

- Flat plate, 100 mm x 100 mm.

Switching difference

Differences in sensor range due to variations in the reflectance of the objects to be detected. This specification relates especially to ultrasonic sensors in direct detection mode.

Switching frequency f

The switching frequency is the maximum number of relevant events in a given interval that can be detected by the sensor. It applies for a sensing ratio of 50% and is indicated in Hertz (Hz).

Switching hysteresis

The hysteresis is the difference in the path between the switch-on and switch-off point, when an object moves toward or away from the sensor in the axial direction about a switching distance. This prevents a continual changeover at the boundary of the region.

Switch-off delay

(previously: switch-off time)

Period of time required by the sensor from the point at which the object is removed from the detection area, to the point at which switching occurs. (Switch-on delay is analogous to this)

Switch-on delay

(previously: response time)

Period of time required by the sensor from the point at which the object enters the detection area, to the point at which switching occurs. (Switch-off delay is analogous to this).

Switch-on pulse suppression

This device, with which all sensors are equipped, suppresses an output error signal when operating voltage is applied, during the readiness delay interval.

Synchronisation

In order to avoid mutual interaction between neighbouring sensors, many types use a synchronisation input. If this is unused or on zero potential, then the sensor operates asynchronously or with its internal clock-pulse generator.

A positive synchronisation pulse initiates a measuring cycle. It is started with the falling pulse edge. Pepperl+Fuchs can supply sensors with synchronisation inputs or outputs which can be linked together for the purpose of self-synchronisation with each other.

Temperature compensation

Many ultrasonic sensors from Pepperl+Fuchs are provided with automatic temperature compensation to reduce the effect of air temperature fluctuations.

⇒ Air temperature

Temperature effect

The effect of temperature on the output parameters and switching points of a sensor.

The data is given in mm/K.

Through-beam sensor (Type T)

Through-beam sensors consist of two separate, active devices, the ultrasonic transmitter and the receiver.

⇒ see section "Sensor principle"

Tightening torque

On fixed cylindrical sensors with threaded housings, the recommended tightening torque of 15 Nm should not be exceeded.

Timer function

Parameterisable time function for the switch output of a sensor.

⇒ Pulse extension

⇒ Impulse relay function

Type D

According to EN 60947-5-2, the designation for a **Diffuse mode sensor**.

Type R

According to EN 60947-5-2, the designation for a **Reflective mode sensor**.

Type T

According to EN 60947-5-2, the designation for a **Through-beam sensor**.

Unusable area

Range in which a reflection sensor, for example, cannot detect an object.

⇒ "Sensing range" section

Unusable area

Zone immediately in front of an ultrasonic sensor in which an object or reflector will not be detected.

⇒ Section "Sensing range"

⇒ Adjustment range

Voltage drop

The voltage drop is measured across the active output of the sensor.

Watchdog function

In event of interruptions to the operating voltage or EMC effects, the watchdog function resets the internal microcontroller of the sensor to a defined initialisation status, i.e. a reset of the sensor's internal program is performed.

Window range

The switching output becomes active when an object is located in the area defined by the switching distances A1 and A2.

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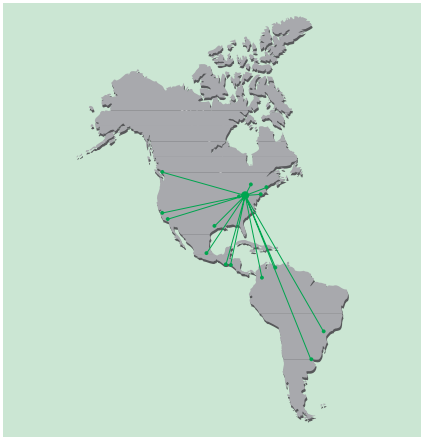
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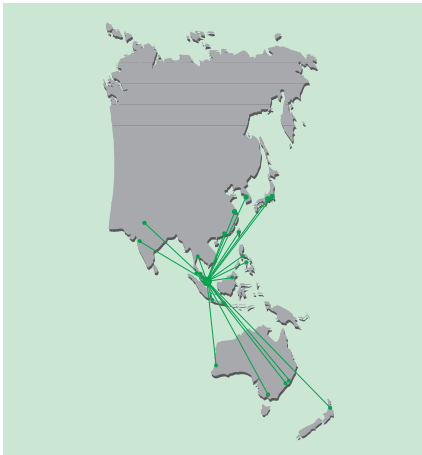
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