

2000 Purchase of Visolux

1998 Intelligent
opto-sensors

1995 Rotary encoders

1994 AS-Interface

1993 Microwave ID
system

2000 Purchase of Elcon
Italy

1998 IS Remote Process
Interface Zone 1

1996 Remote Process
Interface Zone 2

1995 HART Multiplexer

1993 Level control



1991 Division into business areas
Factory Automation and
Process Automation



1990 K-system

1990 Inductive ID system

1986 Opto-sensors

1984 Ultrasonic sensors

1968 Ex isolating switch
amplifier

1958 First inductive
proximity switch worldwide

1945 Founding year

EXISTENCE

Signals in the world of automation

During the more than 50 successful years of company history, it has always been possible to blaze new trails with innovative products.

Our central challenge is to intensify the necessary growth through future innovations as well and, whenever it makes sense, to support them through acquisitions.

ONE COMPANY, TWO DIVISIONS

FACTORY AUTOMATION

Factory Automation Division

Product areas

- Binary and analogue sensors
- in various technologies
 - Inductive and capacitive sensors
 - Magnetic sensors
 - Ultrasonic sensors
 - Photoelectric sensors
- Incremental and absolute value rotary encoders
- Counters and secondary switching devices
- Identification systems
- AS-Interface

Branches and partners

- Mechanical engineering
- Printing and paper
- Conveyor and transport systems
- Packaging and beverage machines
- Automobile Industry



PROCESS AUTOMATION



Process Automation Division

Product areas

- Signal conditioners
- Intrinsically safe interface components
- Remote process interface
- Intrinsically safe field bus solutions
- Level control sensors
- Process measuring and control systems engineering at the interface level
- Ex-protection training

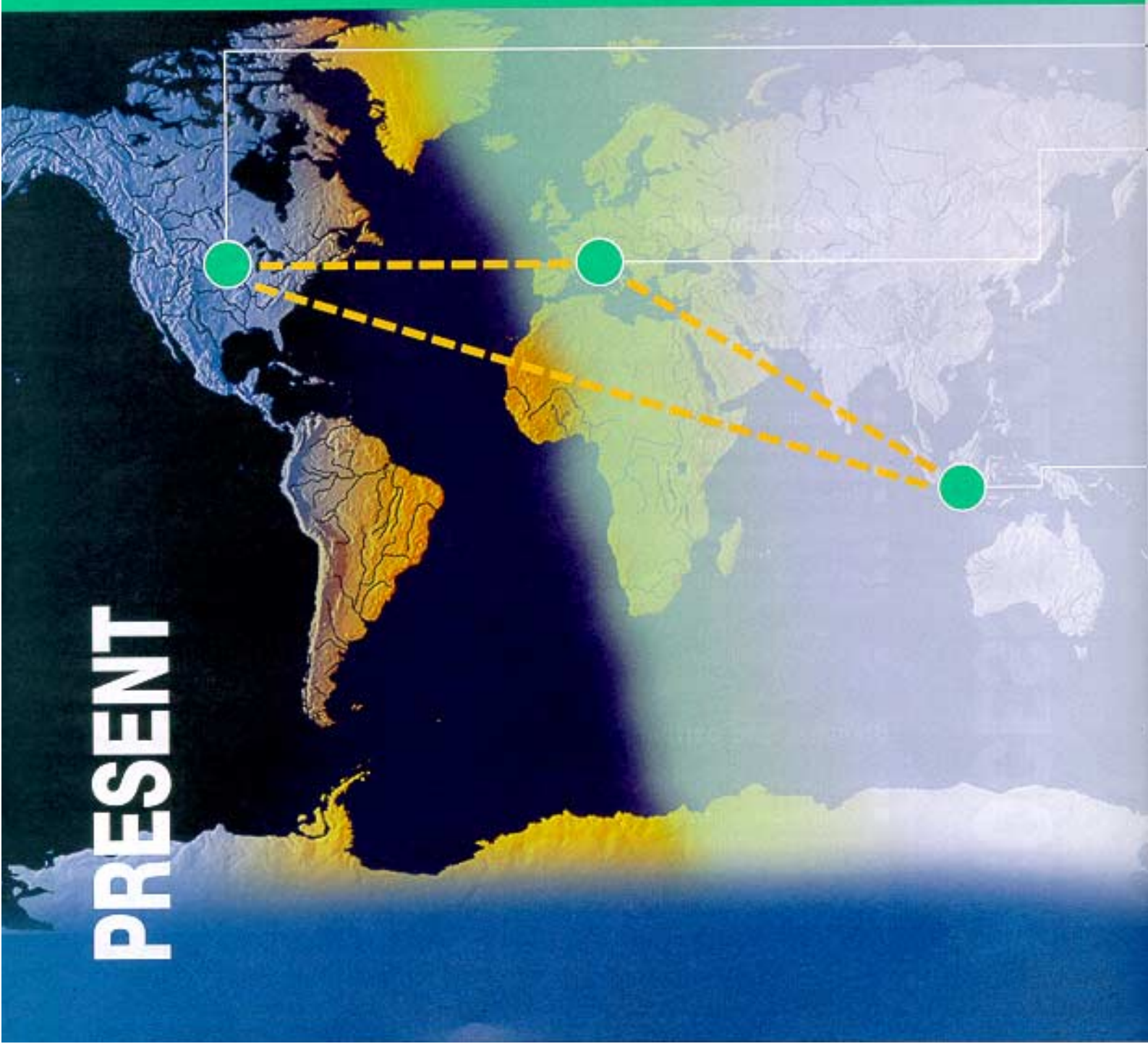
Branches and partners

- Chemistry
- Industrial and community wastewater systems
- Oil, gas and petro-chemicals
- PLC and process control systems
- Engineering companies for process systems

A worldwide presence

A worldwide sales and service organisation that provides consultation through competent and reliable employees, making it possible for you to reach us whenever and wherever you need us. There are more than 30 Pepperl+Fuchs companies throughout the world. You can find the current worldwide address information on our Web pages or in the Pepperl+Fuchs brochure, which you can request by e-mail.

PRESENT



IN HARMONY - THE PEPPERL+FUCHS TRIANGLE



Central office for America

- Founding year 1983
- More than 220 employees
- R&D, production, sales



Main headquarters of the company group

- Founding year 1945
- More than 1000 employees
- R&D, production, sales



Central office for Asia and Australia

- Founding year 1979
- More than 600 employees
- R&D, production, sales

Concentration and distribution - distributed unity

Know-how, professional expertise and highly motivated employees can be found everywhere in the world. It would be inefficient not to use this potential. As an integral part of making economical use of all available resources, we have concentrated precisely defined

assignment areas in Centers of Expertise. These are responsible not only for worldwide control and ongoing development, but also for ensuring that all relevant information is equally available at all locations.



Ultrasonic sensors

<u>Contents</u>	<u>Page</u>
Type code	7
Selection table	8
Operating principles and technology of ultrasonic sensors	10
Selecting the correct sensor	12
Sensor principle	12
Output functions	14
Types/housing shapes	16
Electrical connections	18
Parameterisation	20
General information	22
Notes for installation and operation	23
Cylindrical form	27
Series -18GK and -18GM	27
Series -30GM	41
Cubical form	127
Series <i>VariKont</i> ®	127
Series -FP	153
Series -F43	173
Series -F54	179
Series -F64	197
Series -D1	207
Series -LUC	211
Sensors for double sheet monitoring	217
Evaluation and secondary switch devices	225
UH3	226
DA5	242
WE77	246
KFA6	248
Accessories	251
Mating connectors	252
Mounting aids	257
Programming units UB-PROG 2/UB PROG 3	264
ULTRA 2001 service program	265
Additional information (protective enclosures)	267
Glossary	268
Pepperl + Fuchs worldwide	272
Type index	276
Notes	277

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)

Housing shape

18

Cylindrical, dia. in mm

30

Cylindrical, dia. in mm

U

Block type *VariKont* (U1, U9)

FP

Block type FP (FP1, FP...P1, FP...P5)

F43

Block type F43

F54

Block type F54

F64

Block type F64

Threaded bush

(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

E22

2 x 3-wire, pnp switching output, normally open

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

Connector, 4-pin, M12 x 1

V3

Connector, 3-pin, M8 x 1

V7

Connector, 7-pin, PG13.5

V15

Connector, 5-pin, M12 x 1

V17

Connector, 8-pin, M12 x 1

U

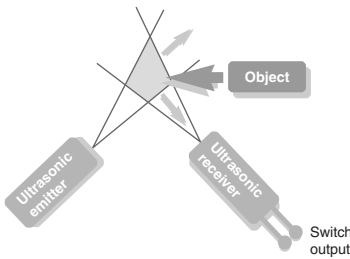
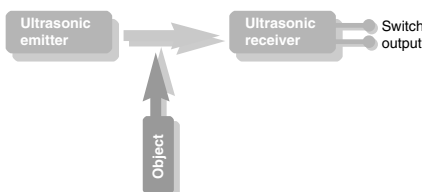
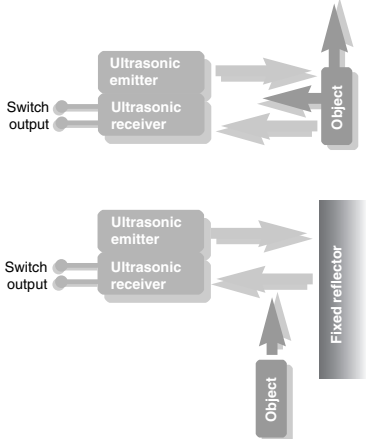
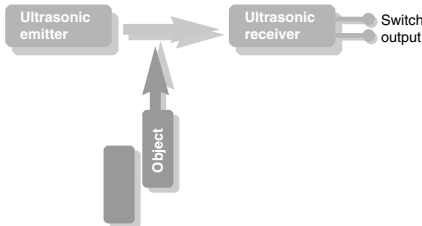
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Selection table

	Detection range (max.)	Output				Connection		
		PNP	NPN	Relay	Analogue	Cable	Plug	Terminals
 Sensors for separate evaluation Series -30GM 6000 mm Series <i>VariKont</i>® 3000 mm Series -FP 6000 mm Series -F54 2000 mm								
 Through-beam principle Series -18GK 500 mm Series -30GM 4000 mm Series -F64 1500 mm								
 Direct-detection and reflection principle Series -18GM 500 mm Series -30GM 6000 mm Series <i>VariKont</i>® 3000 mm Series -FP 6000 mm Series -F43 2000 mm Series -D1 550 mm Series -LUC 4000 mm								
 Double-sheet monitoring Series UDB-18GM 80 mm								
Evaluation units UH3-KHD2-4E5 UH3-KHD2-4I UH3-T1-KT DA5-IU-C DA5-IU-2K-C DA5-IU-2K-V								

- 1) on request
- 2) 10 ... 30 V DC without function of current output
- 3) 10 ... 252 V DC / 20 ... 252 V AC

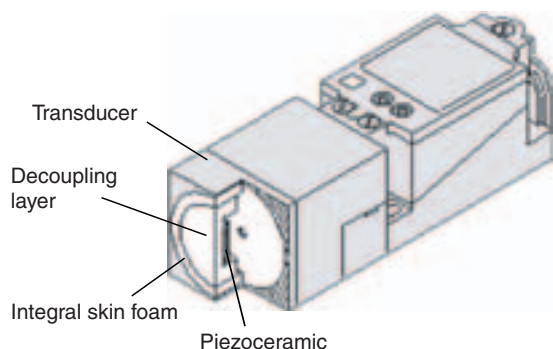
	Rated operating voltage	Fault indicator	Timer function/ pulse extension	Normally closed/ normally open/ Window switchable	Synchronisation input	TEACH-IN	Serial interface	Parallel interface (8 Bit)	Page
	10 ... 30 V DC				•				41
	10 ... 30 V DC				•				127
	10 ... 60 V DC				•				153
	10 ... 30 V DC				•				179
	18 ... 30 V DC								27
	18 ... 30 V DC		•						41
	18 ... 30 V DC								197
	18 ... 30 V DC	•		•	•	•			27
	10 ... 30 V DC	•		•	•	•	•		41
	15 ... 30 V DC	•		•	•		•	•	127
	15 ... 30 V DC	•		•	•	•	•	•	153
	15 ... 30 V DC ²⁾	•	•	•			•		173
	DC/AC ³⁾	•				•			207
	10 ... 30 V DC	•				•			211
	24 V DC	•				•			217
	20 ... 30 V DC			•		•			226
	20 ... 30 V DC			•		•			232
	20 ... 30 V DC		•						238
	10 ... 30 V DC								242
	10 ... 30 V DC								244
	90 ... 260 V AC								244

Operating principles and technology of ultrasonic sensors

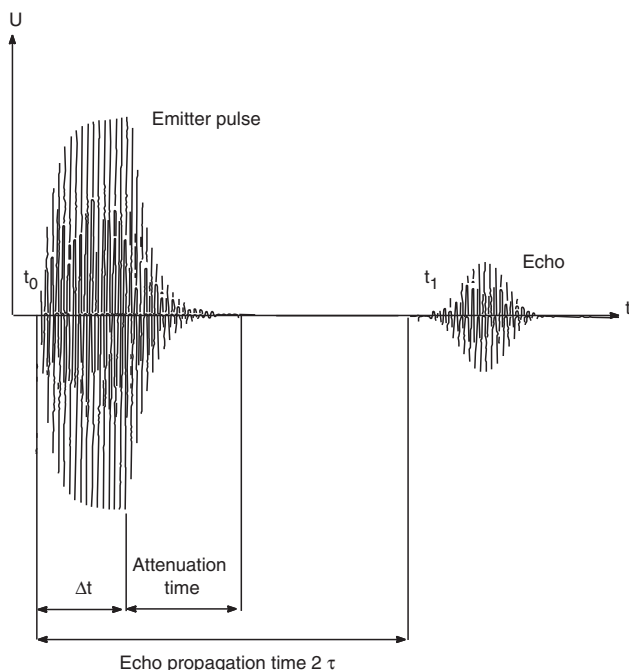
Operating principles and technology of ultrasonic sensors

Pepperl+Fuchs ultrasonic sensors operate with a piezoelectric transducer as the sound transmitter 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.



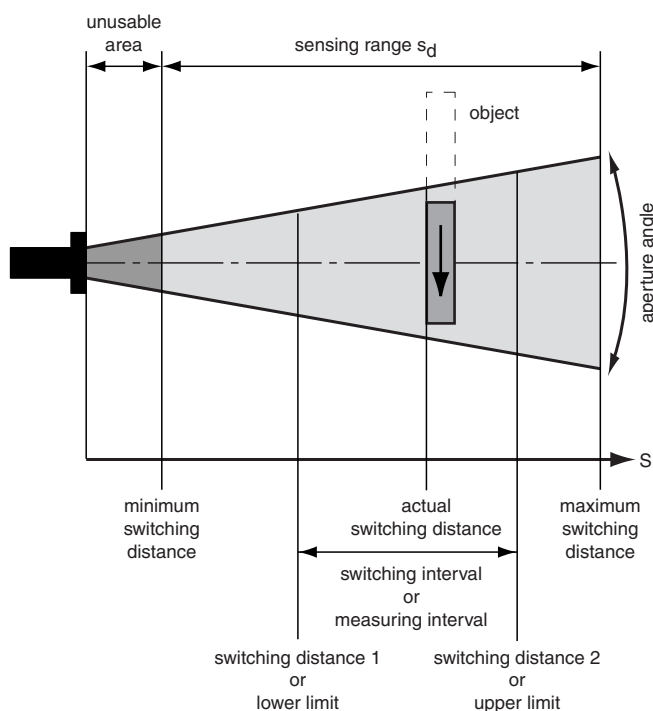
The transducer transmits a packet of sonic pulses and converts the echo pulse into a voltage. The integrated controller computes the distance from the echo time and the velocity of sound. The transmitted pulse duration Δt and the decay time of the sonic transducer result in an unusable area in which 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.

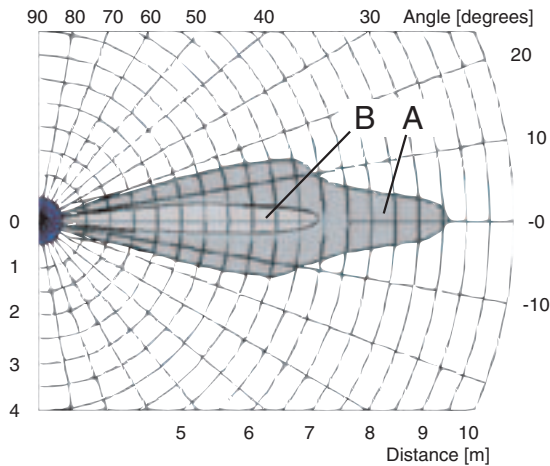


The ultrasonic beam has an opening angle of around $\pm 5^\circ$. The sound pressure level outside of this cone is less than half (-6 dB) that of the value on the sensor axis.

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

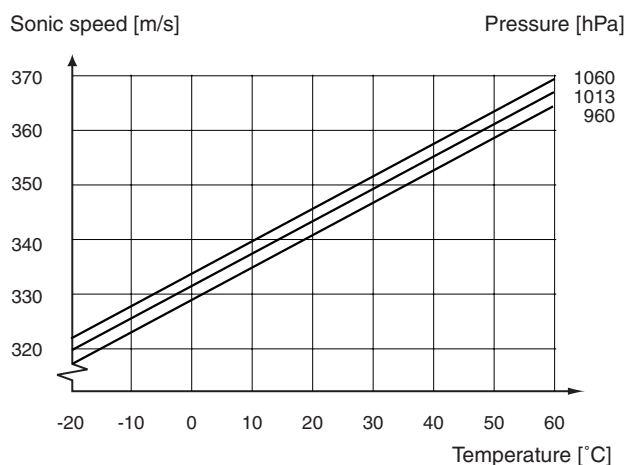
A = flat plate, 100mm x 100 mm
B = round rod, diameter 25 mm

The details given in the type code relate to a flat standard plate, 100mm x 100mm. 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:

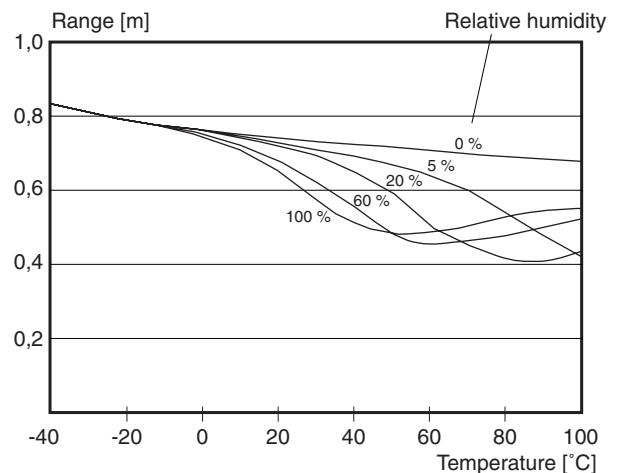
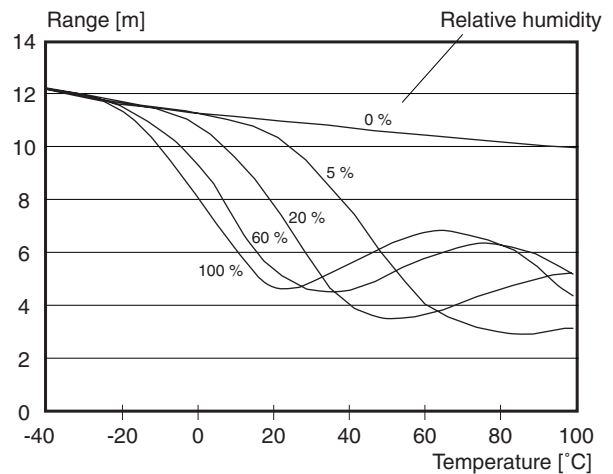
- Air temperature
- Relative humidity
- Barometric pressure

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.

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 for 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

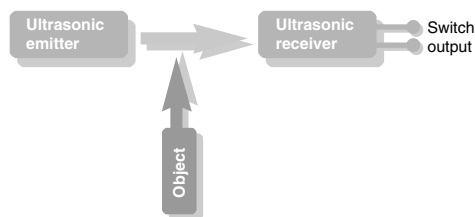
1. Sensor principle

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

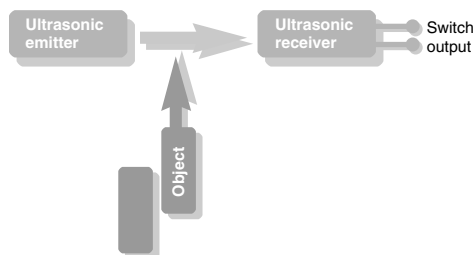


Properties:

- 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 transmitter, 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.

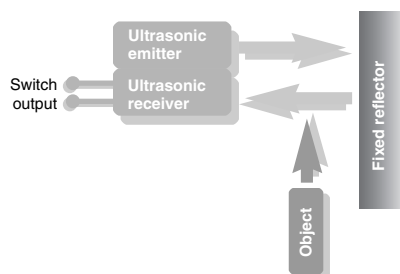
Properties:

- The sensing range covers 30 g/m² paper to 1200 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 transmitter 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:

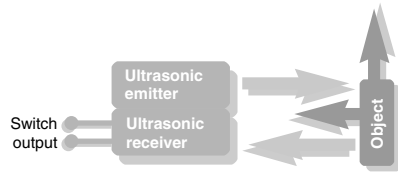
- Only one measuring head
- High detection reliability of problematic objects (sound-absorbent objects or objects with angled surfaces)
- Less susceptible to interference, thus suitable for difficult operating conditions.

Direct detection

Reflection sensor

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

The object acts as a sound reflector.

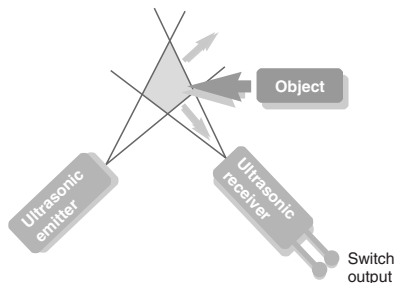


Properties:

- 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

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

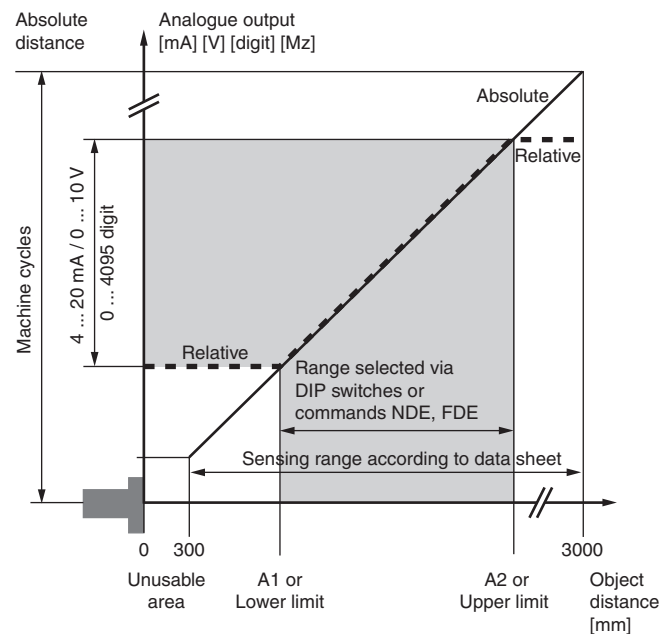
- Analogue voltage output: 0 V ... 10 V
- Analogue current output: 4 mA ... 20 mA
- 8-bit parallel output
- Serial output, RS 232

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.



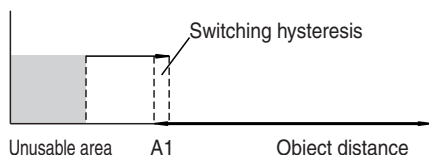
2. Output functions

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.

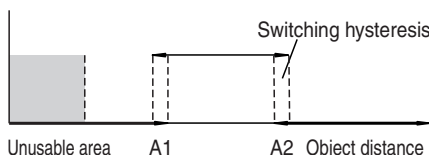
Normally open, n.o.



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.

Normally open, n.o.



Reflex sensor mode

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

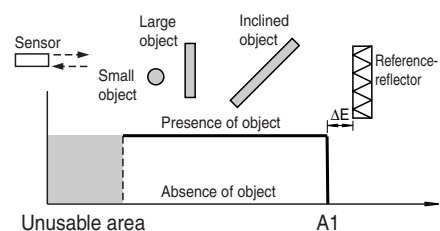
- The sensor receives an echo from a small object in the sound cone and from the reference reflector.
- The sensor detects a large object and no longer receives the echo from the reference reflector.
- The sensor does not receive an echo, for example in the event that an object is positioned at an angle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

Example:

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

Normally open, n.o.

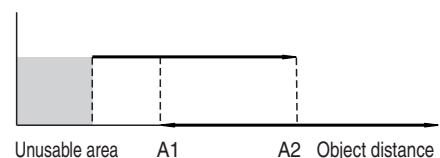


Double switching point mode (hysteresis mode)

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).

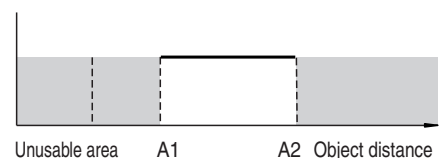
Normally open, n.o.



Area monitoring

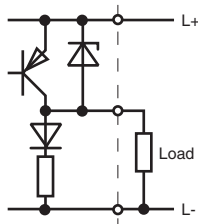
The ultrasonic sensor monitors the evaluation window. The output switches only if an object is detected in the window. Echoes other than those from the evaluation window are ignored by the sensor software. Thanks to this active masking of the foreground in the area monitoring mode, echoes from areas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

Normally open, n.o.

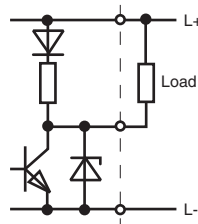


npn/pnp output

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: 18GK...
18GM...
30GM...



Properties:

- Material: Plastic, nickel-plated brass or stainless steel.
- Thread: M18 x 1 or M30 x 1.5
- Active area on the axial face
- 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: Nickel-plated brass or stainless steel.
- Thread: M30 x 1.5.
- 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

Cuboid shaped types

VariKont® (Designation: U1 and U9)

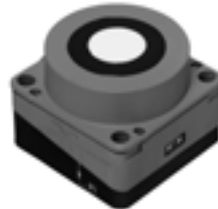
The *VariKont®* housing was developed by Pepperl+Fuchs and has been proven in millions of applications. It is extremely flexible due to the adjustability of the head (i.e. the active section) in five directions without changes to the mounting of the sensor. The electronics section can be replaced independently 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: 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

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

Double-sheet monitoring

The ultrasonic double-sheet monitor is a measuring system consisting of a cubical evaluation unit and cylindrical ultrasonic transmitter and receiver units in M18 threaded bushes.

**Properties:**

- Material (evaluation unit): Makrolon
- 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 30 g and ca. 1200 g detectable
- Simple calibration for a variety of materials and material weights using the TEACH-IN button
- Automatic switching threshold tracking makes readjustment superfluous

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 (npn).

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.

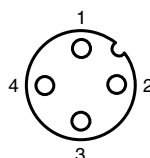
Three different connection types are used on Pepperl+Fuchs ultrasonic sensors:

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.

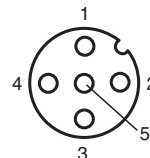
Terminal compartment - The *VariKont*® (U1 or U9) and *FP* types are equipped with a terminal compartment. The maximum diameter of the cable or cross section of the wires is stated in the data sheet.

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

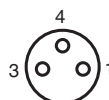
Plug connector -V1
(Circular connection M12)



Plug connector -V15
(Circular connection M12)



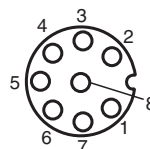
Plug connector -V3
(Circular connection M8)



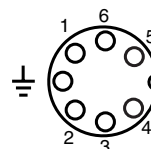
Colour assignments of ready-to-use mating connectors, V1, V15, V3:

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

Plug connector -V17
(circular connector M12x1)



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



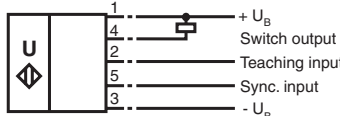
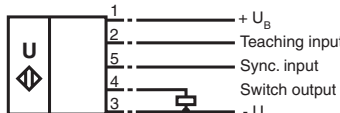
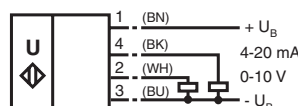
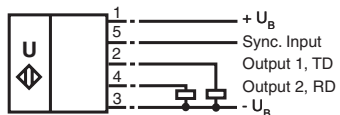
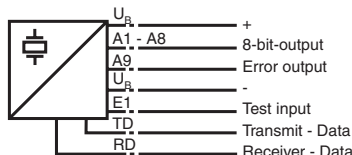
Colour assignments of ready-to-use mating connectors, V17:

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

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	Transmitter* Receiver* Transmitter/receiver	Standard symbol/Connection: 	

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

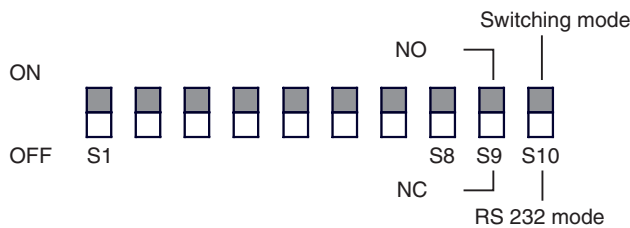
The near and far switching distances (A1 or A2) are set in steps using 4 DIP switches each. The step size of the adjustable switching distances is determined by the sensor software. For the sensor in the following example, the switch combinations 0000 ... 1000 correspond to 150 mm and for 1001 ... 1111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

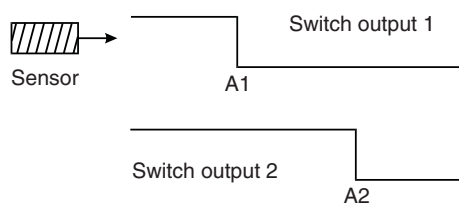
- UC500+U9+E6/E7+R2, UC500+U9+IUE2/IUE0+R2
- UC3000+U9+E6/E7+R2, UC3000+U9+IUE2/IUE0+R2
- UB1000+FP1+E6
- UC6000-FP-E6/E7-R2-P5, UC6000-FP-IUE2/IUE0-R2-P5

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)

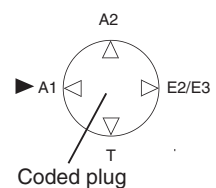
S10	Operating behaviour	
0		Output 1 Output 2
1		Output 1 (window) Output 2

- 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.

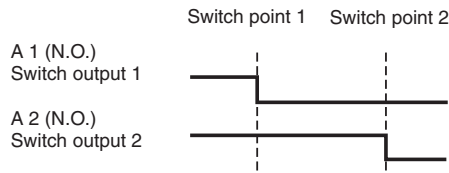
Position	Function
A1	Distance A1 is taught (switching distance or measuring window limit)
A2	Distance A2 is taught (switching distance or measuring window limit)
E2/E3	E2: individual switching distances/falling analogue ramp E3: window/rising analogue ramp
T	Temperature compensation is activated

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

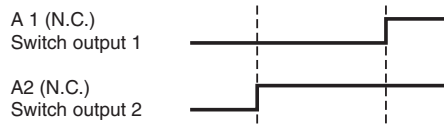
Switching outputs: types ...-E6R2/E7R2

1. Switch point mode

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

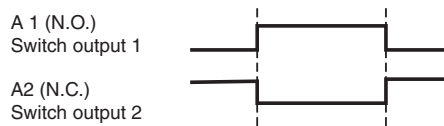


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



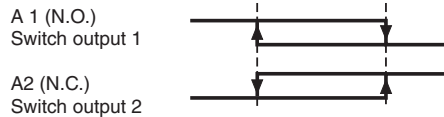
2. Window mode

To exchange the switching distances is of no effect.

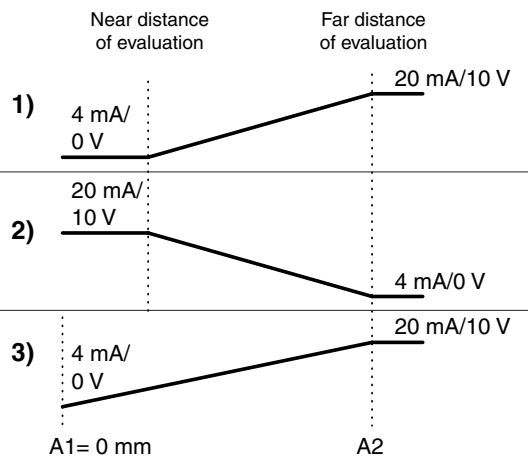


3. Hysteresis mode

To exchange the switching distances is of no effect.



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



Programming units UB-PROG 2/UB-PROG 3

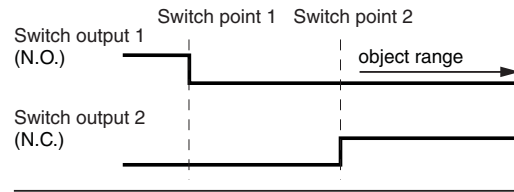
Ultrasonic sensor of the types:

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

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.

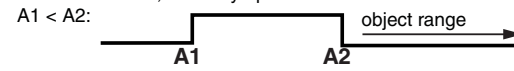
Switching output: types ...E01/E02



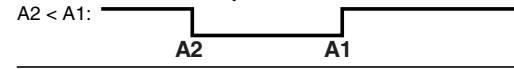
Switch point 1 $\rightarrow \infty$: Switch output 1, (N.O.)
Detection of object presence
Switch point 2 $\rightarrow \infty$: Switch output 2, (N.C.)
Detection of object presence

Switching output: types ...E4/E5

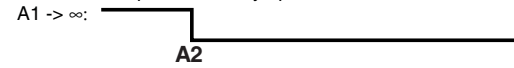
1. Window mode, normally open function



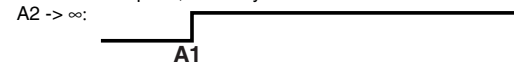
2. Window mode, normally closed function



3. One switch point, normally open function



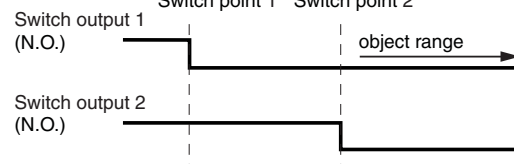
4. One switch point, normally closed function



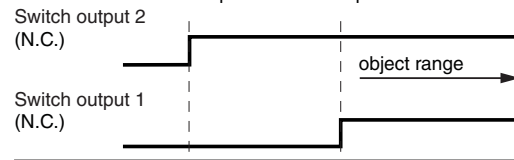
5. $A1 \rightarrow \infty$, $A2 \rightarrow \infty$: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Switching output: types ...E6/E7

1. N.O. function



2. N. C. function



3. Object presence

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

General information

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.

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

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

ist.

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

must be taken into consideration.

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

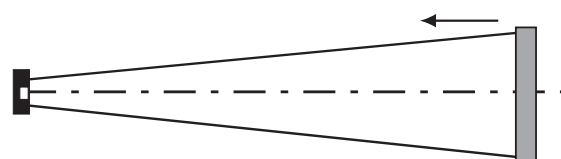
Ultrasonic sensors can be installed and operated in any position. Avoid installation positions that may lead to impaired functioning due to deposits of dust or dirt.

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

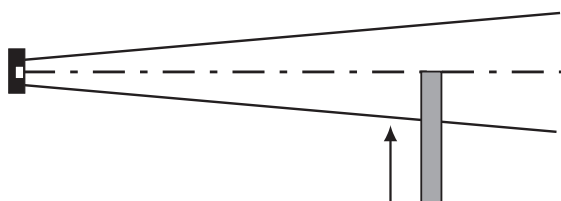
Water drops or the formation of crusts on the decoupling layer will lead to an impairment of the ultrasonic sensor's function. Light dust deposits are uncritical.

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.

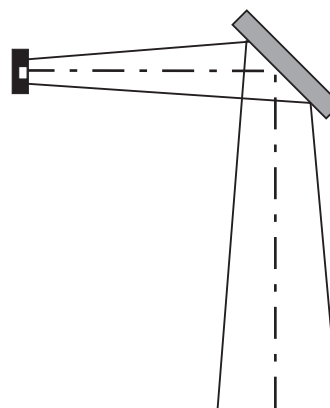


For objects moving radially, i.e. at right angles or any other angle lateral to the sound cone axis, refer to the response curve of the data sheet to determine the switching distance.



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.

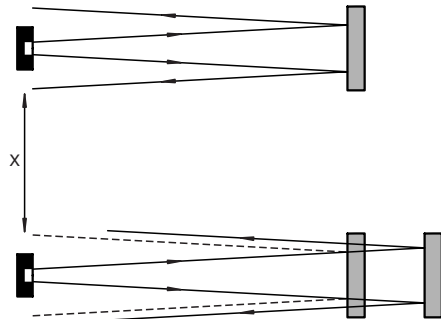


Notes for installation and operation

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

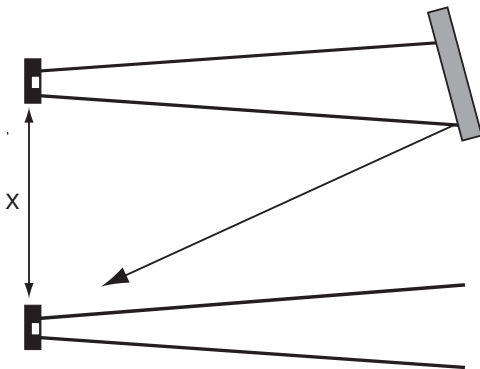
To prevent mutual interference, observe the minimum distances between sensors of the same type shown in the following drawings.



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.

$$T_{\text{multiplex}} = N \times T_{\text{sensor}}$$

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

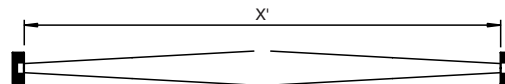
$$T_{\text{multiplex}} = T_{\text{sensor 1}} + T_{\text{sensor 2}} + \dots + T_{\text{sensor N}}$$

Sensors with a self-synchronisation option 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 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.

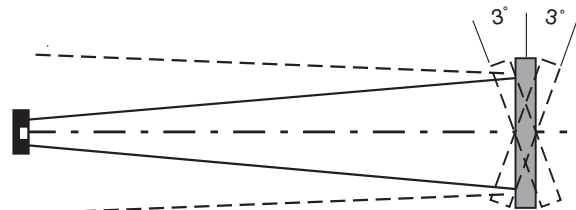
In the case of opposed sensor installation, observe the distances specified below.



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 and that have the minimum area indicated in the sensor data sheet provide an ideal reflection. An angular deviation of the measuring plate by a maximum of 3° is permissible for reliable detection.



The objects may have any shape as long as the minimum area specified in the technical data of the specific ultrasonic sensor is available and is present within the sensing range of the sound cone.

Material properties such as transparency, color, 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 predominantly directional reflection	Degree of object surface roughness for a predominantly 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:

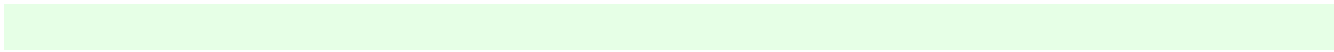
- All smooth and solid objects that are aligned at a right angle to the sound cone.
- All solid objects with degrees of surface roughness that cause a diffuse reflection and which are to a large extent independent of their alignment.
- The surfaces of liquids, insofar as these are not angled more than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

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.

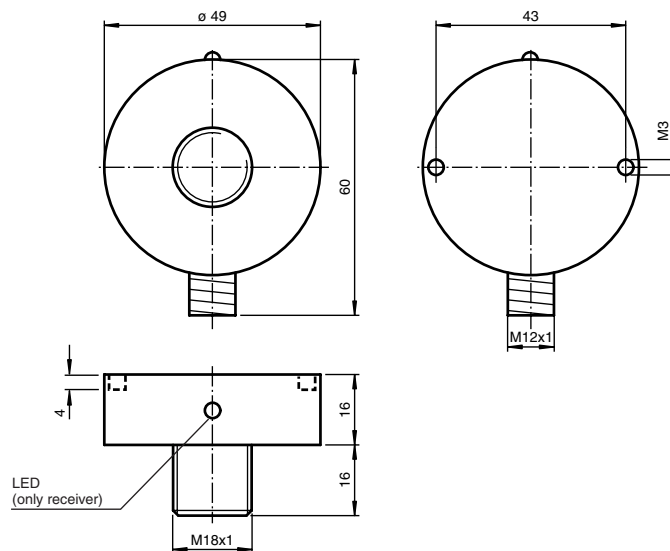




Type	Sensing range	Page
UBE500-18GK-SE0-V1	500 mm	28
UBE500-18GK-SE2-V1	500 mm	28
UB500-18GM75-E01-V15	500 mm	30
UB500-18GM75-E23-V15	500 mm	30
UB500-18GM75-E4-V15	500 mm	32
UB500-18GM75-E5-V15	500 mm	32
UB500-18GM75-E6-V15	500 mm	36
UB500-18GM75-E7-V15	500 mm	36
UB500-18GM75-U-V15	500 mm	38
UB500-18GM75-I-V15	500 mm	38

Ultrasonic single path barrier

Dimensions



UBE500-18GK-SE0-V1 UBE500-18GK-SE2-V1



Features

- 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

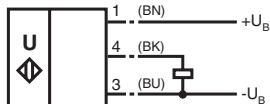
Technical data

	UBE500-18GK-SE0-V1	UBE500-18GK-SE2-V1
General specifications		
Sensing range	0 ... 500 mm , distance emitter-receiver 15 mm ... 500 mm	
Transducer frequency	400 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	Indication of the switching state (receiver)	
Electrical specifications		
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	20 mA receiver 25 mA emitter	
Output		
Output type	1 switch output E0, npn NO	1 switch output E2, pnp NO
Rated operational current	200 mA	200 mA
Voltage drop	≤ 1.5 V	≤ 1.5 V
Switching frequency	100 Hz	100 Hz
Ambient conditions		
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	V1 connector (M12 x 1), 4-pin	
Material		
Housing	Delrin	
Mass	45 g	

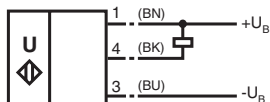
Electrical connection

Standard symbol / Connection:

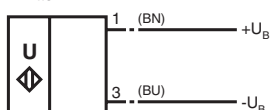
Receiver E2:



Receiver E0:



Emitter:



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

Connector V1



Notes

Function

A through-beam ultrasonic barrier always consists of a single transmitter 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 transmitter 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 transmitter and receiver. The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the transmitter 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 transmitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

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

Caution

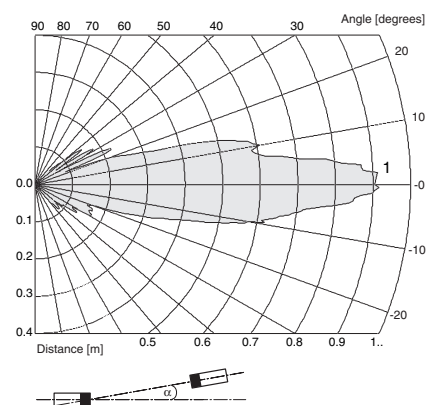
Mount or replace emitter and receiver only in pairs. Both devices are optimal matched to each other by the manufacturer.

Model number

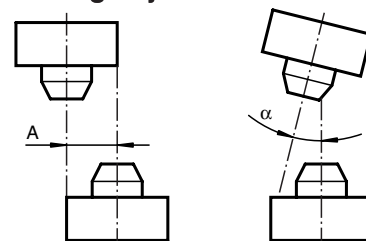
UBE500-18GK-SE0-V1
UBE500-18GK-SE2-V1

Characteristic curves/ Additional information

Characteristic response curves



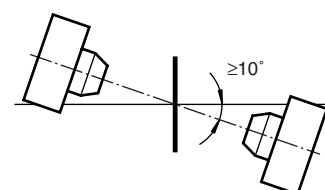
Mounting/Adjustment



Parallel displacement
 $A \leq 8 \text{ mm}$

Angle displacement
 $\alpha \leq 5^\circ$

Thin foil detection



Accessories

Cable sockets ^{*)}

V1-G-2M-PVC
V1-W-2M-PVC

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UB500-18GM75-E01-V15

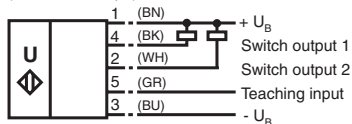
UB500-18GM75-E23-V15

Features

- 2 switch outputs
- TEACH-IN input
- Temperature compensation
- Very small unusable area

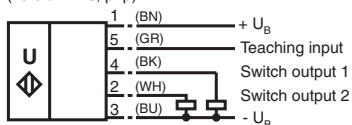
Electrical connection

Standard symbol/Connections:
(version E01, npn)



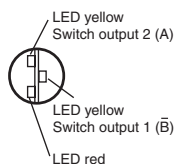
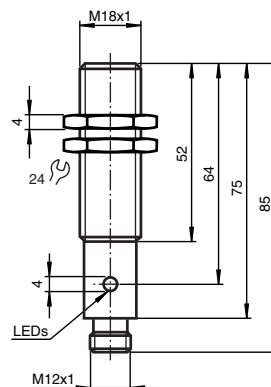
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:
(version E23, pnp)



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

Connector V15



Technical data

	UB500-18GM75-E01-V15	UB500-18GM75-E23-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs npn, NO/NC, parameterisable	2 switch outputs pnp, NO/NC, parameterisable
Rated operational current	2 x 100 mA , short circuit/overload protected	2 x 100 mA , short circuit/overload protected
Voltage drop	≤ 3 V	≤ 3 V
Switching frequency	max. 10 Hz	max. 10 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Repeat accuracy	≤ 1 %	≤ 1 %
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
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	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

Notes

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

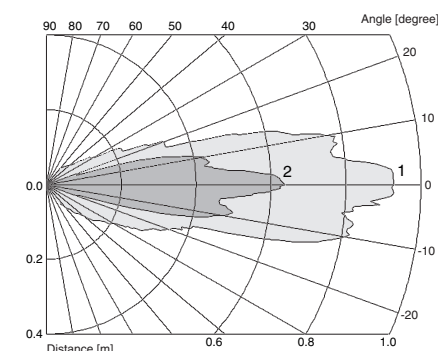
Model number

UB500-18GM75-E01-V15

UB500-18GM75-E23-V15

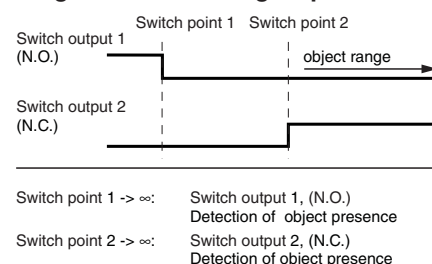
Characteristic curves/ Additional information

Characteristic response curve



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

Programmed switching output function



Accessories

Programming device

UB-PROG3

Mounting aids/fixing flanges

OMH-04

BF 18

BF 18F

BF 5-30

Sound deflector

UVW90-K18

Cable sockets^{*)}

V15-G-2M-PVC

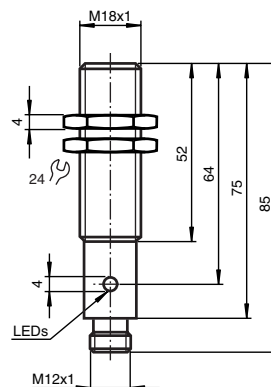
V15-W-2M-PUR

^{*)} additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions

-18GM/-18GM series



UB500-18GM75-E4-V15

UB500-18GM75-E5-V15



Features

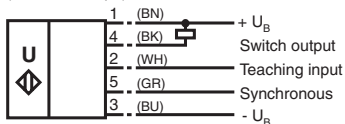
- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Very small unusable area

Technical data

	UB500-18GM75-E4-V15	UB500-18GM75-E5-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
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	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V	≤ 3 V
Switching frequency	max. 10 Hz	max. 10 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Repeat accuracy	≤ 1 %	≤ 1 %
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
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	
Input/Output		
Synchronisation	1 synchronous input, 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	
Common mode operation	≤ 95 Hz	
Multiplex operation	≤ 95/n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

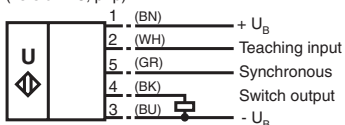
Electrical connection

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.

Connector V15



Subject to reasonable modifications due to technical advances.

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Notes

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.

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 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

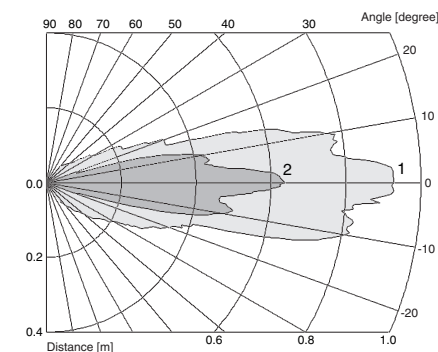
Model number

UB500-18GM75-E4-V15

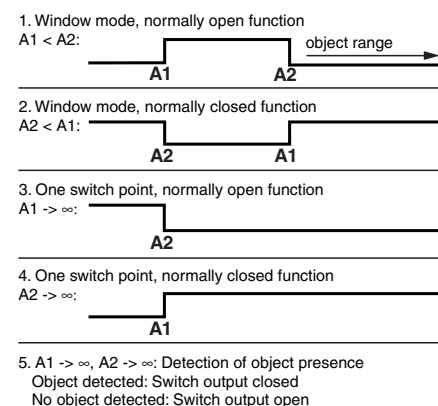
UB500-18GM75-E5-V15

Characteristic curves/ Additional information

Characteristic response curve



Programmed switching output function



Accessories

Programming device

UB-PROG2

Mounting aids/fixing flanges

OMH-04

BF 18

BF 18F

BF 5-30

Sound deflector

UVW90-K18

Cable sockets^{*)}

V15-G-2M-PVC

V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

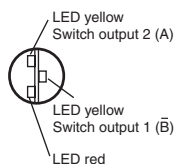
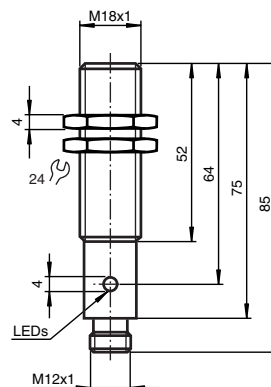
A1 = unusable area
A2 = nominal distance

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

Ultrasonic sensor

Dimensions



UB500-18GM75-E6-V15

UB500-18GM75-E7-V15



Features

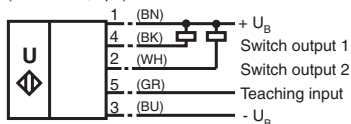
- 2 switch outputs
- 3 different output functions can be set
- TEACH-IN input
- Temperature compensation
- Very small unusable area

Technical data

	UB500-18GM75-E6-V15	UB500-18GM75-E7-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs pnp, NO/NC, parameterisable	2 switch outputs npn, NO/NC, parameterisable
Rated operational current	2 x 100 mA , short circuit/overload protected	2 x 100 mA , short circuit/overload protected
Voltage drop	≤ 3 V	≤ 3 V
Switching frequency	max. 10 Hz	max. 10 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Repeat accuracy	≤ 1 %	≤ 1 %
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
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	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

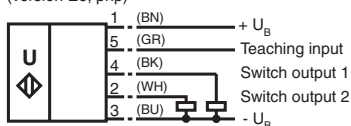
Electrical connection

Standard symbol/Connections:
(version E7, npn)



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

Standard symbol/Connections:
(version E6, pnp)



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

Connector V15



Notes

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 objects 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 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

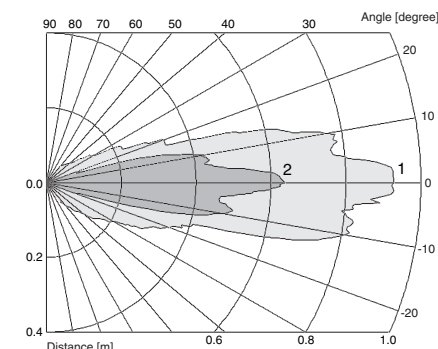
Model number

UB500-18GM75-E6-V15

UB500-18GM75-E7-V15

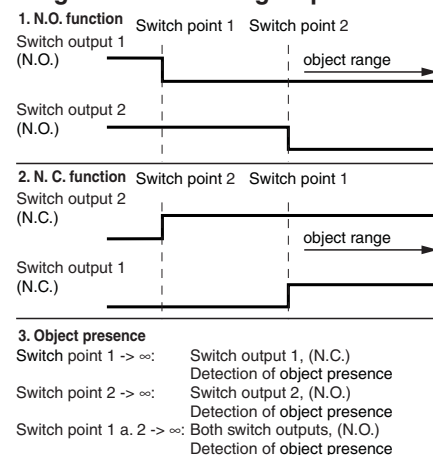
Characteristic curves/ Additional information

Characteristic response curve



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

Programmed switching output function



Accessories

Programming device

UB-PROG3

Mounting aids/fixing flanges

OMH-04

BF 18

BF 18F

BF 5-30

Sound deflector

UVW90-K18

Cable sockets^{*)}

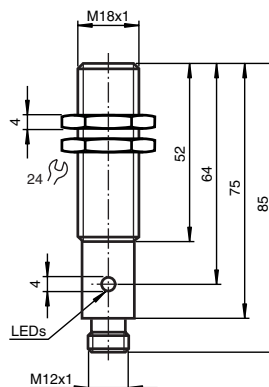
V15-G-2M-PVC

V15-W-2M-PUR

^{*)} additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UB500-18GM75-I-V15

UB500-18GM75-U-V15



Features

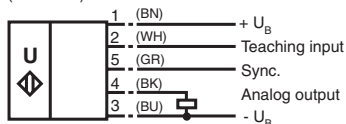
- Measuring window adjustable
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Very small unusable area
- Analogue output 0 ... 10 V
UB500-18GM75-U-V15
- Analogue output 4 mA ... 20 mA
UB500-18GM75-I-V15

Technical data

	UB500-18GM75-I-V15	UB500-18GM75-U-V15
General specifications		
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	≤ 50 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	permanently yellow: object in the evaluation range yellow, flashing: TEACH-IN function, object detected	
LED red	permanently red: Error red, flashing: TEACH-IN function, object not detected	
Electrical specifications		
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		
Output type	1 analogue output 4 ... 20 mA	1 analogue output 0 ... 10 V
Repeat accuracy	± 0.1 % of final value	± 0.1 % of final value
Resolution	0.13 mm for max. detection range	0.11 mm at max. sensing range
Deviation of the characteristic curve	± 1 % of final value	± 1 % of final value
Load impedance	0 ... 300 Ohm	> 1 kOhm
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
Input type	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	
Input/Output		
Synchronisation	1 synchronous input, 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	
Synchronisation frequency	≤ 95 Hz	
Common mode operation	≤ 95/n Hz, n = number of sensors	
Multiplex operation	≤ 95/n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	connector V15 (M12 x 1), 5 pin	
Material		
Housing	brass, nickel plated	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	60 g	

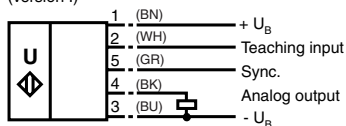
Electrical connection

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.

Connector V15



Notes

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.

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 (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 $-U_B$

Default setting

A1: unusable area
A2: nominal sensing range
Direction of effect: 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

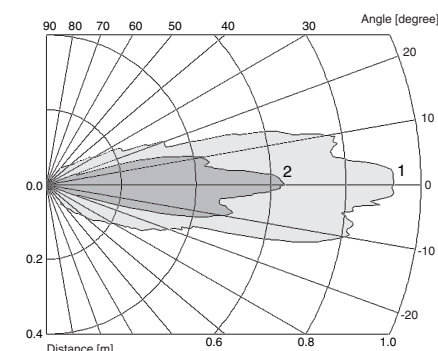
Model number

UB500-18GM75-I-V15

UB500-18GM75-U-V15

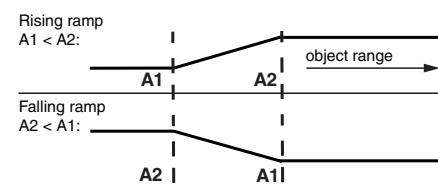
Characteristic curves/ Additional information

Characteristic response curve



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

Programmed switching output function



Accessories

Programming device

UB-PROG2

Mounting aids/fixing flanges

OMH-04

BF 18

BF 18F

BF 5-30

Sound deflector

UVW90-K18

Cable sockets^{*)}

V15-G-2M-PVC

V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.



Type	Description	Sensing range	Page
Advanced series			
UC300-30GM-E6R2-K-V15	with remote transducer	300 mm	42
UC300-30GM-IUR2-K-V15	with remote transducer	300 mm	46
UC300-30GM-IU-V1		300 mm	50
UC500-30GM-E6R2-V15 UC500-30GM-E7R2-V15		500 mm	52
UC500-30GM-IUR2-V15		500 mm	56
UCC1000-30GM-E6-V1	with chemical-resistant transducer coating	1000 mm	60
UC1000-30GM-E6R2-K-V15	with remote transducer	1000 mm	62
UCC1000-30GM-IU-V1	with chemical-resistant transducer coating	1000 mm	66
UC1000-30GM-IUR2-K-V15	with remote transducer	1000 mm	68
UC2000-30GM-E6R2-V15 UC2000-30GM-E7R2-V15		2000 mm	72
UC2000-30GM-IUR2-V15		2000 mm	76
UC4000-30GM-E6R2-V15 UC4000-30GM-E7R2-V15		4000 mm	80
UC4000-30GM-IUR2-V15		4000 mm	84
UC6000-30GM-E6R2-V15 UC6000-30GM-E7R2-V15		6000 mm	88
UC6000-30GM-IUR2-V15		6000 mm	92
Basic series			
UB500-30GM-E4-V15 UB500-30GM-E5-V15		500 mm	96
UB2000-30GM-E4-V15 UB2000-30GM-E5-V15		2000 mm	100
UB4000-30GM-E4-V15 UB4000-30GM-E5-V15		4000 mm	104
UB6000-30GM-E4-V15 UB6000-30GM-E5-V15		6000 mm	108
UBE4000-30GM-SA2-V1	Through-beam sensor	4000 mm	112
Ultrasonic sensors for external evaluation units			
UB500-30GM-H3	Transmitter/receiver	500 mm	114
UB2000-30GM-H1	Transmitter	2000 mm	116
UB2000-30GM-H2	Receiver	2000 mm	118
UB2000-30GM-H3	Transmitter/receiver	2000 mm	120
UB4000-30GM-H3	Transmitter/receiver	4000 mm	122
UB6000-30GM-H3	Transmitter/receiver	6000 mm	124

Ultrasonic sensor



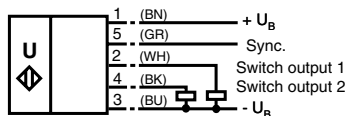
UC300-30GM-E6R2-K-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

Electrical connection

Standard symbol/Connection:
(version E6, pnp)

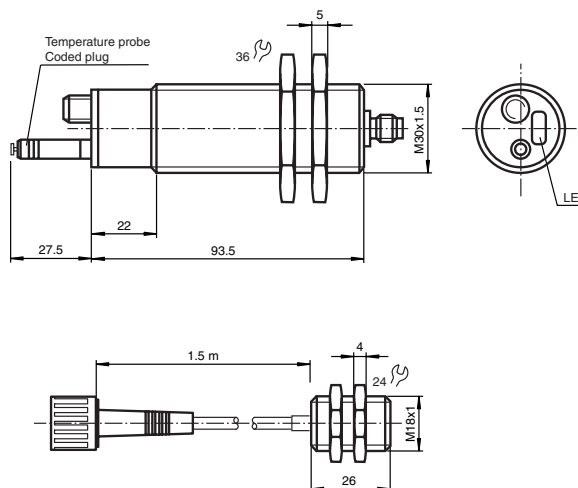


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications

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

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function
LED yellow 2	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

Electrical specifications

Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 50 mA
Output	
Output type	2 switch outputs pnp, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V
Switching frequency	≤ 7 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)

Input/Output

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

Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
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Ambient conditions

Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	sensor head: IP67 connector sensor head/controller unit: IP52
Connection type	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

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 1 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.

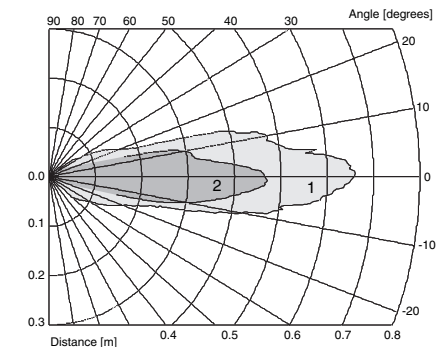
Multiple operating mode are possible

- 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.

Default setting

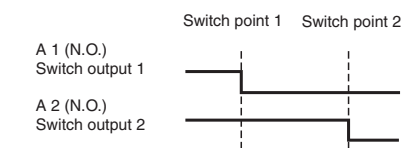
A1: unusable area
A2: nominal range

UC300-30GM-E6R2-K-V15**Characteristic curves/
Additional information****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 mode**

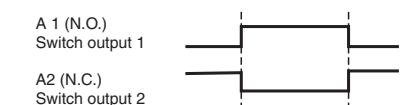
When $A1 < A2$, both switch outputs are activated as N.O. contacts.



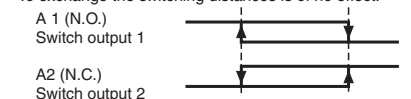
When $A1 > A2$, both switch outputs are activated as N.C. contacts.

**2. Window mode**

To exchange the switching distances is of no effect.

**3. Hysteresis mode**

To exchange the switching distances is of no effect.

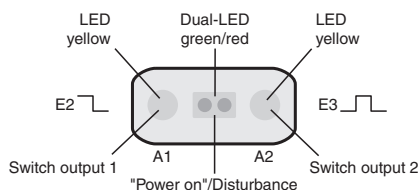


LED Displays

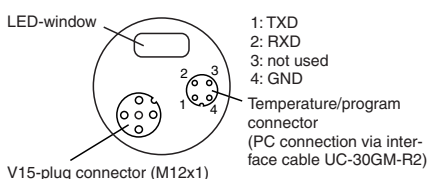
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories**Mounting aids**

BF30
BF30F
BF18
BF18F
BF5-30
OMH04

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



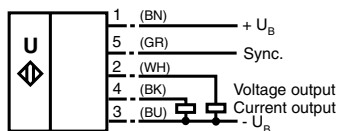
UC300-30GM-IUR2-K-V15

Features

- 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

Electrical connection

Standard symbol/Connection:
(version IU)

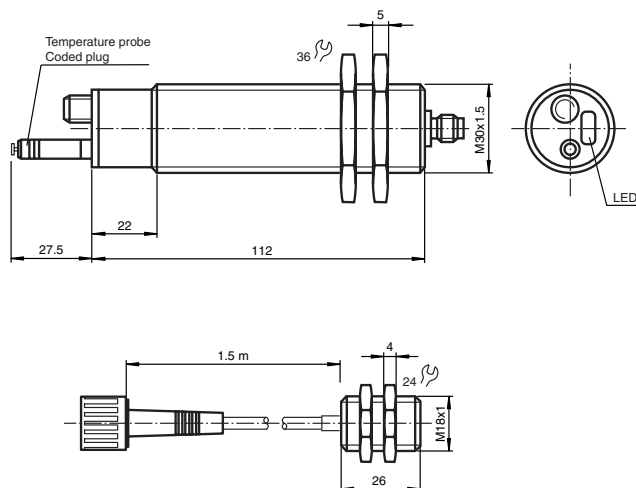


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications	
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
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
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
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.05 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output	
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	
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	sensor head: IP67 connector sensor head/controller unit: IP52
Connection type	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	260 g

Notes

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
- Connect TEACH-IN plug in pos. A1 or A2. Thus teaches the evaluation limits A1 or A2.
- 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus completes the TEACH-IN procedure and saves the mode of operation.
- The sensor works in normal mode

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

Multiple operating mode 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.

Default setting

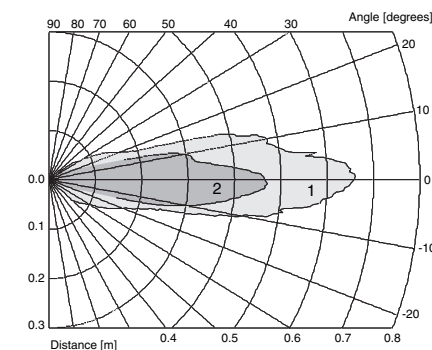
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

Model number

UC300-30GM-IUR2-K-V15

Characteristic curves/ Additional information

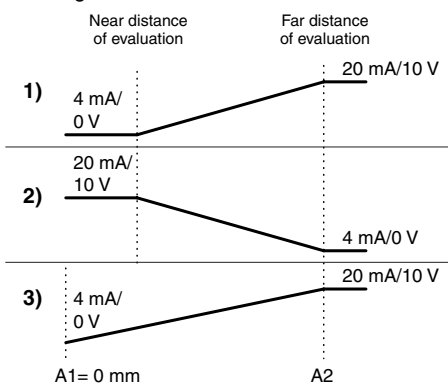
Characteristic response curves



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

Programmed analogue output function

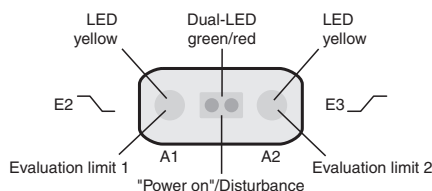
Analogue function



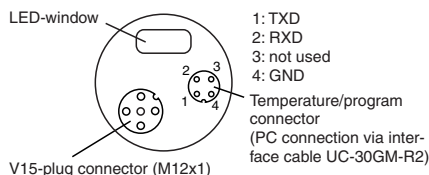
LED Displays / Analogue output

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

LED-Window



RS 232-connection



Adjustable parameter with the 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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF18
BF18-F
BF30
BF30F
BF5-30
OMH04

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

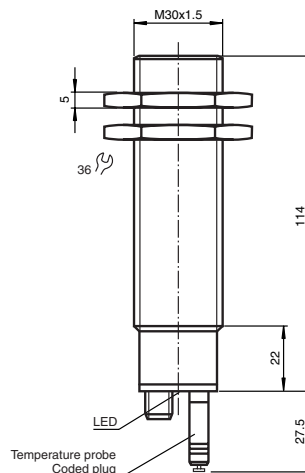
Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UC300-30GM-IU-V1

Features

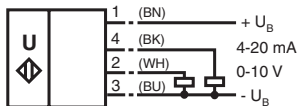
- Extremely small unusable area - only 15 mm
- Current and voltage output
- 12 bit D/A transducer
- Evaluation limits can be taught-in
- Temperature compensation
- Compact design
- Plug connection

Technical data

General specifications	
Sensing range	15 ... 300 mm
Unusable area	0 ... 15 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Response delay	≤ 35 ms
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED yellow	permanently yellow: object in the evaluation range yellow, flashing: TEACH-IN function evaluation limits, slope
LED red/green	permanent green: Power on green, flashing: TEACH-IN function, object detected permanently red: Connector removed red, flashing: Error, TEACH-IN function object not detected
Temperature/TEACH-IN connector	Temperature compensation, TEACH-IN for evaluation range, output function setting
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 800 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	0.172 mm
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm
Temperature influence	< 2 % of full-scale value (≤ 0.2 % / K without temperature compensation)
Ambient conditions	
Ambient temperature	0 ... 50 °C (273 ... 323 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	
Housing	high grade steel (stainless)
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT
Mass	175 g

Electrical connection

Standard symbol/Connection:
(version IU)



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

Connector V1



Notes

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	Switching: falling/rising ramp
T	Temperature compensation

Description of the TEACH-IN procedure

- Remove temperature plug
- Cut and restore supply voltage (e.g. by removing and replacing unit plug)

TEACH-IN of evaluation limits A1 or A2

- Set object to desired evaluation limit
- Connect TEACH-IN plug in pos. A1 or A2
- Green LED flashes when object detected, red LED flashes when no object detected
- Pull the plug (the current object position is taught and stored when the plug is removed!!)

TEACH-IN of output function

- Connect TEACH-IN plug in pos. E2/E3
- The yellow LED indicates the output function
 - E2: falling ramp
 - E3: rising ramp
- Pull the plug when the desired function is activated, otherwise reconnect the TEACH-IN plug in pos. E2/E3
- Pull plug

Completing the TEACH-IN procedure

- Connect TEACH-IN plug in pos. T Temperature compensation is now activated.

If the temperature plug has not been plugged in within 5 minutes, the sensor will return to normal mode without temperature compensation.

Default setting

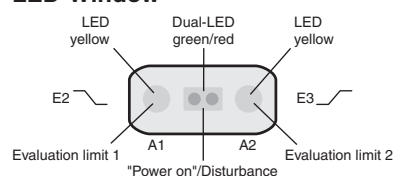
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

LED Displays

Displays depending on position of temperature/TEACH-IN plug position	Green dual LED	Red dual LED	Yellow LED A1/↖	Yellow LED A2/↗
TEACH-IN evaluation limit A1				
Object detected	flashes	off	flashes	off
No object detected	off	flashes	flashes	off
TEACH-IN evaluation limit A2				
Object detected	flashes	off	off	flashes
No object detected	off	flashes	off	flashes
TEACH-IN mode of operation				
rising ramp	On	off	flashes	off
falling ramp	On	off	off	flashes
Normal operation				
temperature compensated	On	off	on/off ¹⁾	on/off ²⁾
Plug pulled or shorted	off	On		
Interference (e.g. compressed air)	off	flashes	previous state	previous state

- 1) on, when object in evaluation range
 2) on, when object in detection range

LED-Window

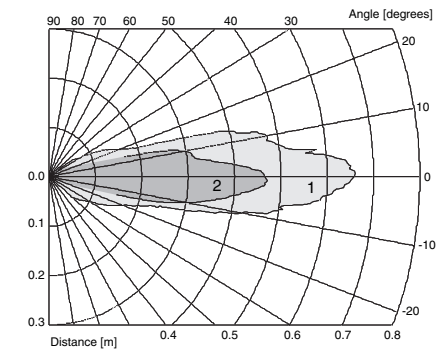


Model number

UC300-30GM-IU-V1

Characteristic curves/ Additional information

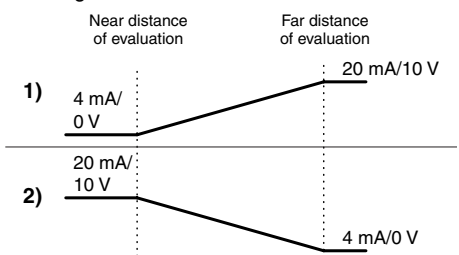
Characteristic response curves



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

Programmed analogue output function

Analogue function



Accessories

Mounting aids

BF30
 BF30F
 BF5-30
 M-105

Focusing attachment

UVW90-M30
 UVW90-K30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Process indication- and control unit

DA5-IU-2K-V

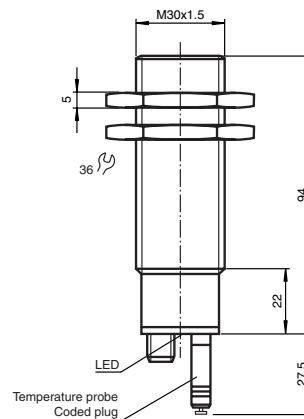
Cable sockets *)

V1-G-2M-PVC
 V1-W-2M-PVC

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UC500-30GM-E6R2-V15

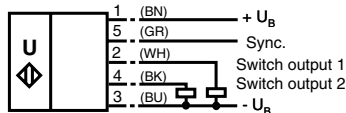
UC500-30GM-E7R2-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

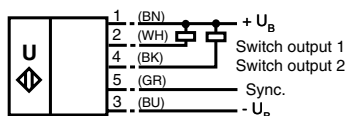
Electrical connection

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.

Connector V15



Technical data

	UC500-30GM-E6R2-V15	UC500-30GM-E7R2-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected	
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function	
LED yellow 2	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	
Electrical specifications		
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs npn, NO/NC, parameterisable	2 switch outputs npn, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 7 Hz	≤ 7 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output		
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		
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	



Notes

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 1 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 mode 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.

Default setting

A1: unusable area
A2: nominal range

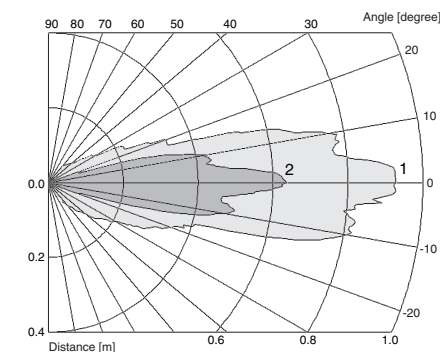
Model number

UC500-30GM-E6R2-V15

UC500-30GM-E7R2-V15

Characteristic curves/ Additional information

Characteristic response curve

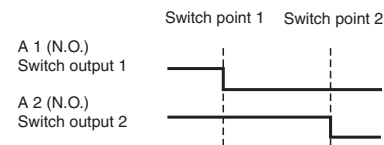


Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Possible operating modes

1. Switch point mode

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

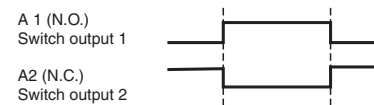


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



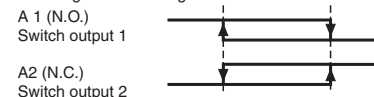
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.

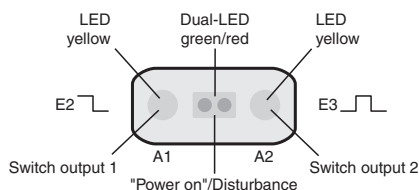


LED Displays

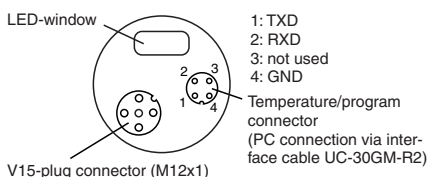
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

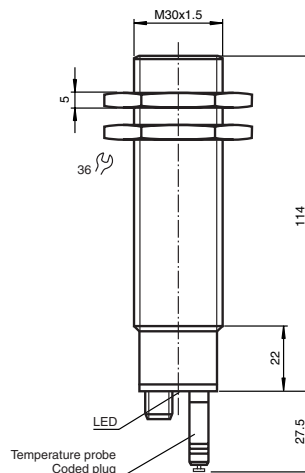
Cable sockets ^{*)}

V15-G-2M-PVC
V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UC500-30GM-IUR2-V15

Features

- 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

Technical data

General specifications

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

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

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

Electrical specifications

Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW

Output

Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
-------------	---

Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.05 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm

Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
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Input/Output

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

Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
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Ambient conditions

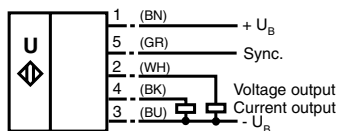
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP65
Connection type	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

Electrical connection

Standard symbol/Connection:
(version IU)



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

Connector V15



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. Thus 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus 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 mode are possible:

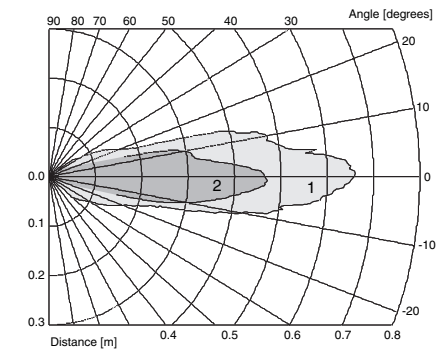
1. Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
2. Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
3. The synchronisation pulses are sent 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.

UC500-30GM-IUR2-V15

Characteristic curves/ Additional information

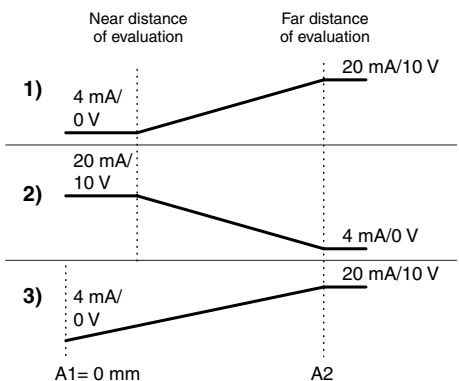
Characteristic response curves



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

Programmed analogue output function

Analogue function



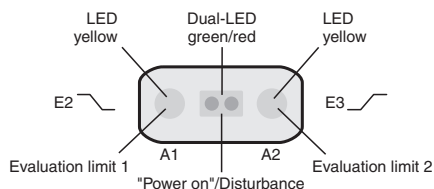
Default setting

A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

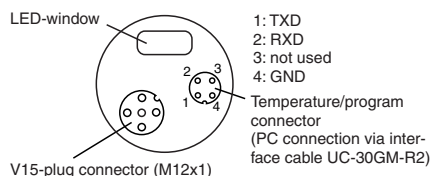
LED Displays / Analogue output

Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2	Analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flash- ing OFF	OFF flash- ing	flashing flashing	OFF OFF	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flash- ing OFF	OFF flash- ing	OFF OFF	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	ON ON ON	OFF OFF OFF	flashing OFF flashing (synchro- nised)	OFF flashes flashes (synchro- nised)	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	flash- es	off	Previous state	Previous state	unchanged
Interference (e.g. compressed air)	off	flash- es	Previous state	Previous state	unchanged or error val- ue

LED-Window



RS 232-connection



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

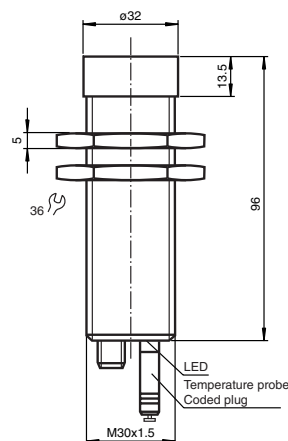
Cable sockets^{*)}

V15-G-2M-PVC
V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UCC1000-30GM-E6-V1

Features

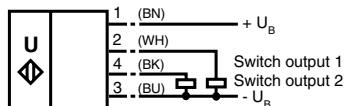
- 2 independent switch outputs
- High chemical resistance through teflon-coated transducer surface
- Switch point can be taught-in
- Window function can be selected
- Temperature compensation
- Compact design
- Plug connection

Technical data

General specifications	
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
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED yellow	switching state output 1, TEACH-IN function output 1 switching state output 2, TEACH-IN function output 2
LED red/green	permanent green: Power on green, flashing: TEACH-IN function, object detected permanently red: Connector removed red, flashing: Error, TEACH-IN function object not detected
Temperature/TEACH-IN connector	Temperature compensation, TEACH-IN of the switch points, output function setting
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 600 mW
Output	
Output type	2 switch outputs pnp, NO/NC
Repeat accuracy	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected
Voltage drop	≤ 3 V DC
Switching frequency	≥ 5 Hz
Range hysteresis	≤ 3.2 % of the set operating distance
Temperature influence	< 2 % of full-scale value (≤ 0.2 % / K without temperature compensation)
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	
Housing	high grade steel (stainless), PTB
Transducer	epoxy resin/hollow glass bead mixture; Polyurethane foam, PTFE coated
Mass	153 g

Electrical connection

Standard symbol/Connection:
(version E6, pnp)



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

Connector V1



Notes

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 positions/window function
T	Temperature compensation

Description of the TEACH-IN procedure

- Remove temperature plug
- Cut and restore supply voltage (e.g. by removing and replacing unit plug)

TEACH-IN of switching points 1 or 2

- Set object to desired switching point
- Connect TEACH-IN plug in pos. A1 or A2
- Green LED flashes when object detected, red LED flashes when no object detected
- Pull the plug (the current object position is taught and stored when the plug is removed!!)

TEACH-IN of switching function

- Connect TEACH-IN plug in pos. E2/E3
- The yellow LED indicates the switching function
 - E2: 2 independent switching points (NO)
 - E3: window function: switch output 1 NO, switch output 2 NC
- Pull the plug when the desired function is activated, otherwise reconnect the TEACH-IN plug in pos. E2/E3
- Pull plug

Completing the TEACH-IN procedure

- Connect TEACH-IN plug in pos. T Temperature compensation is now activated.

If the temperature plug has not been plugged in within 5 minutes, the sensor will return to normal mode without temperature compensation.

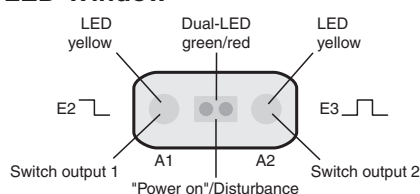
Default setting

A1: unusable area
A2: nominal range

LED Displays

Displays depending on position of temperature/TEACH-IN plug position	Green dual LED	Red dual LED	Yellow LED A1/E2	Yellow LED A2/E3
TEACH-IN switching point output A1				
Object detected	flashes	off	flashes	off
No object detected	off	flashes	flashes	off
TEACH-IN switching point output A2				
Object detected	flashes	off	off	flashes
No object detected	off	flashes	off	flashes
TEACH-IN of switch output functions:				
E2: 2 independent switching positions	On	off	flashes	off
E3: window function	On	off	off	flashes
Normal mode				
temperature compensated	ON	OFF	Switching state A1	Switching state A2
plug pulled/shorted	OFF	ON		
Interference (e.g. compressed air)	off	flashes	previous state	previous state

LED-Window

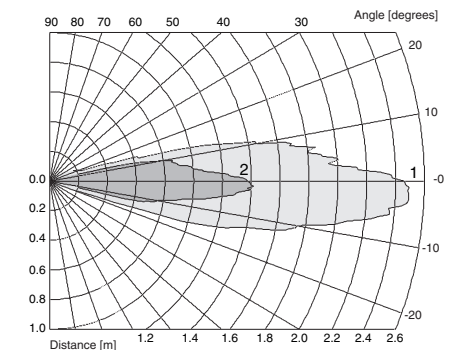


Model number

UCC1000-30GM-E6-V1

Characteristic curves/ Additional information

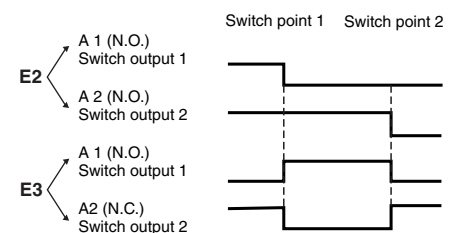
Characteristic response curves



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



Accessories

Mounting aids

BF30
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Cable sockets *)

V1-G-2M-PVC
V1-W-2M-PVC

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



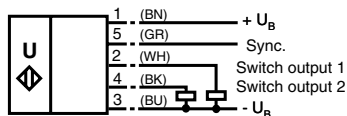
UC1000-30GM-E6R2-K-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

Electrical connection

Standard symbol/Connection:
(version E6, pnp)

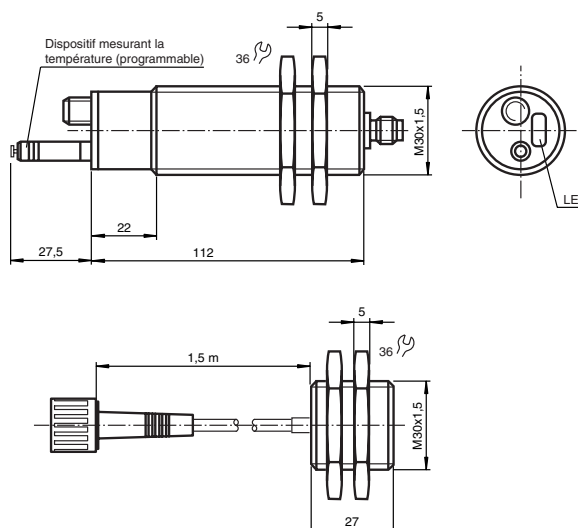


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications	
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
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function
LED yellow 2	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
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 50 mA
Output	
Output type	2 switch outputs pnp, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V
Switching frequency	≤ 2.5 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output	
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	
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	sensor head: IP67 connector sensor head/controller unit: IP52
Connection type	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

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 1 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.

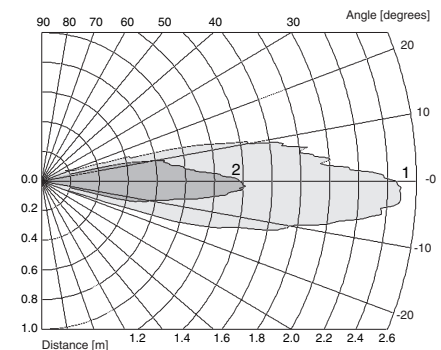
A high level > 1 s will result in the standby mode of the sensor (indicator green LED). The outputs pause in the latest status.

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

Multiple operating mode 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.

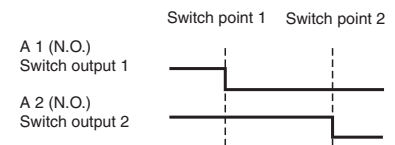
The response time increases when the sensor is synchronised, because the synchronisation increases the measurement cycle time.

UC1000-30GM-E6R2-K-V15**Characteristic curves/
Additional information****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 mode**

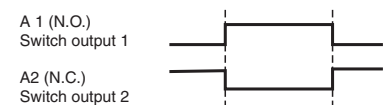
When $A1 < A2$, both switch outputs are activated as N.O. contacts.



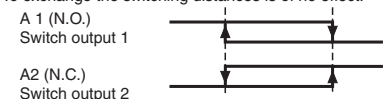
When $A1 > A2$, both switch outputs are activated as N.C. contacts.

**2. Window mode**

To exchange the switching distances is of no effect.

**3. Hysteresis mode**

To exchange the switching distances is of no effect.



Default setting

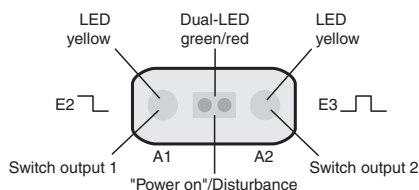
A1: unusable area
A2: nominal range

LED Displays

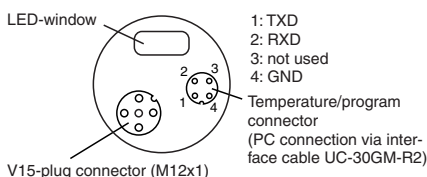
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

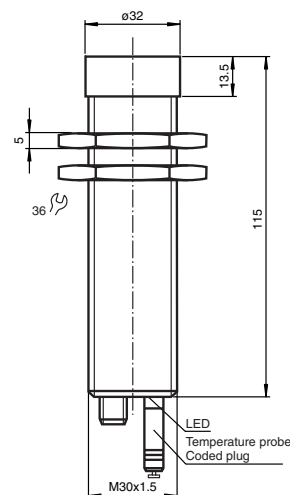
Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UCC1000-30GM-IU-V1

Features

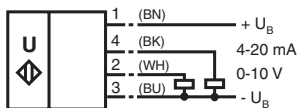
- Current and voltage output
- High chemical resistance through teflon-coated transducer surface
- 12 bit D/A transducer
- Evaluation limits can be taught-in
- Temperature compensation
- Compact design
- Plug connection

Technical data

General specifications	
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
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED yellow	permanently yellow: object in the evaluation range yellow, flashing: TEACH-IN function evaluation limits, slope
LED red/green	permanent green: Power on green, flashing: TEACH-IN function, object detected permanently red: Connector removed red, flashing: Error, TEACH-IN function object not detected
Temperature/TEACH-IN connector	Temperature compensation, TEACH-IN for evaluation range, output function setting
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 800 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	depending on the set evaluation range: 0.172 mm, if evaluation range < 705 mm, Evaluation range [mm] / 4096, if evaluation range > 705 mm
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm
Temperature influence	< 2 % of full-scale value (≤ 0.2 % / K without temperature compensation)
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	
Housing	high grade steel (stainless), PTB
Transducer	epoxy resin/hollow glass bead mixture; Polyurethane foam, PTFE coated
Mass	188 g

Electrical connection

Standard symbol/Connection:
(version IU)



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

Connector V1



Notes

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	Switching: falling/rising ramp
T	Temperature compensation

Description of the TEACH-IN procedure

- Remove temperature plug
- Cut and restore supply voltage (e.g. by removing and replacing unit plug)

TEACH-IN of evaluation limits A1 and A2

- Set object to desired evaluation limit
- Connect TEACH-IN plug in pos. A1 or A2
- Green LED flashes when object detected, red LED flashes when no object detected
- Pull the plug (the current object position is taught and stored when the plug is removed!!)

TEACH-IN of output function

- Connect TEACH-IN plug in pos. E2/E3
- The yellow LED indicates the output function
 - E2: falling ramp
 - E3: rising ramp
- Pull the plug when the desired function is activated, otherwise reconnect the TEACH-IN plug in pos. E2/E3
- Pull plug

Completing the TEACH-IN procedure

- Connect TEACH-IN plug in pos. T. Temperature compensation is now activated.

If the temperature plug has not been plugged in within 5 minutes, the sensor will return to normal mode without temperature compensation.

Default setting

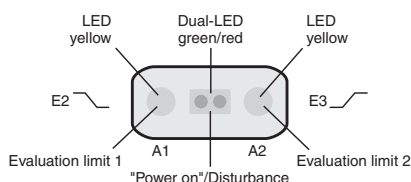
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

LED Displays

Displays depending on position of temperature/TEACH-IN plug position	Green dual LED	Red dual LED	Yellow LED A1/↖	Yellow LED A2/↗
TEACH-IN evaluation limit A1				
Object detected	flashes	off	flashes	off
No object detected	off	flashes	flashes	off
TEACH-IN evaluation limit A2				
Object detected	flashes	off	off	flashes
No object detected	off	flashes	off	flashes
TEACH-IN mode of operation				
rising ramp	On	off	flashes	off
falling ramp	On	off	off	flashes
Normal operation				
temperature compensated	On	off	on/off ¹⁾	on/off ²⁾
Plug pulled or shorted	off	On		
Interference (e.g. compressed air)	off	flashes	previous state	previous state

- 1) ON, when object in evaluation range
 2) ON, when object in detection range

LED-Window

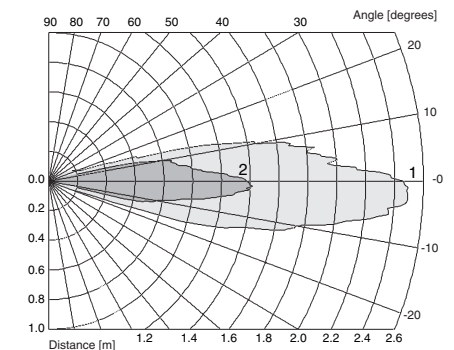


Model number

UCC1000-30GM-IU-V1

Characteristic curves/ Additional information

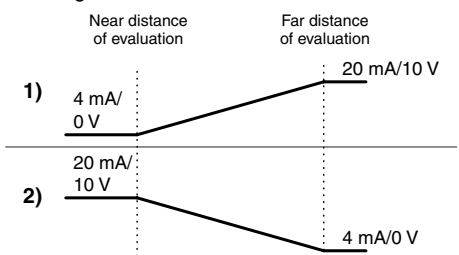
Characteristic response curves



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

Programmed analogue output function

Analogue function



Accessories

Mounting aids

BF30
 BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Process indication- and control unit

DA5-IU-2K-V

Cable sockets *)

V1-G-2M-PVC
 V1-W-2M-PVC

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



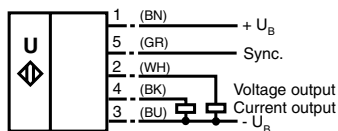
UC1000-30GM-IUR2-K-V15

Features

- 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

Electrical connection

Standard symbol/Connection:
(version IU)

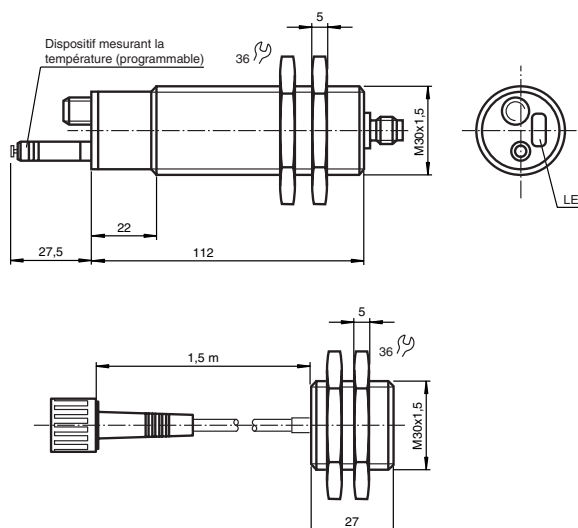


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications

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

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

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

Electrical specifications

Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.35 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)

Input/Output

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

Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
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Ambient conditions

Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	sensor head: IP67 connector sensor head/controller unit: IP52
Connection type	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	260 g

Notes

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. Thus 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus 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 mode 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.

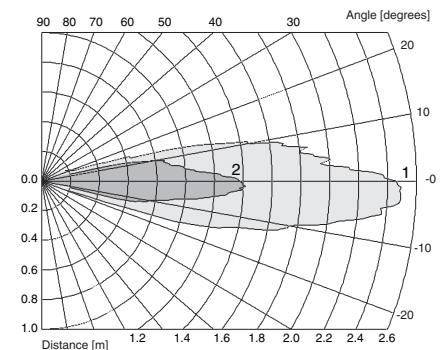
The response time increases when the sensor is synchronised, because the synchronisation increases the measurement cycle time.

Model number

UC1000-30GM-IUR2-K-V15

Characteristic curves/ Additional information

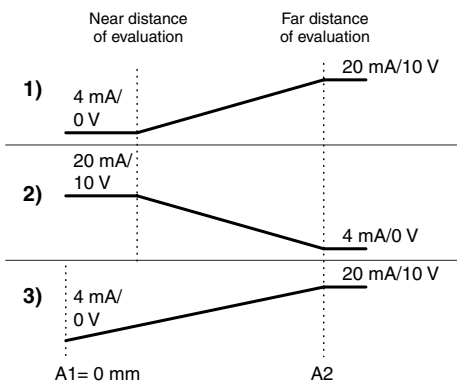
Characteristic response curves



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

Programmed analogue output function

Analogue function



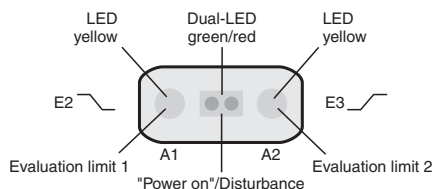
Default setting

A1: unusable area
A2: nominal direction
Direction of effect: rising ramp

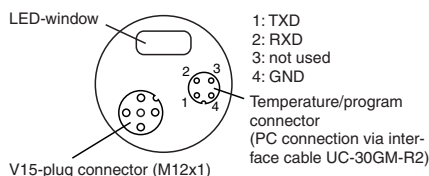
LED Displays / Analogue output

Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2	Analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flash- ing OFF	OFF flash- ing	flashing flashing	OFF OFF	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flash- ing OFF	OFF flash- ing	OFF OFF	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	ON ON ON	OFF OFF OFF	flashing OFF flashing (synchro- nised)	OFF flashes flashes (synchro- nised)	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	flash- es	off	Previous state	Previous state	unchanged
Interference (e.g. compressed air)	off	flash- es	Previous state	Previous state	unchanged or error val- ue

LED-Window



RS 232-connection



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



UC2000-30GM-E6R2-V15

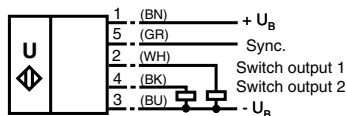
UC2000-30GM-E7R2-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

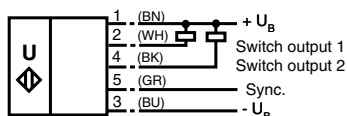
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



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

Standard symbol/Connection:
(version E7, npn)

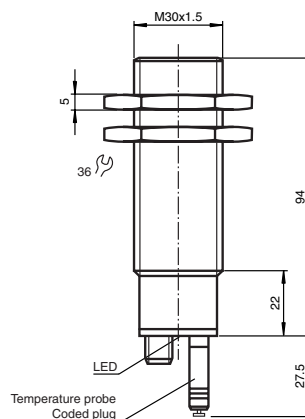


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	UC2000-30GM-E6R2-V15	UC2000-30GM-E7R2-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected	
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function	
LED yellow 2	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	
Electrical specifications		
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs pnp, NO/NC, parameterisable	2 switch outputs npn, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 2.5 Hz	≤ 2.5 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output		
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		
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

Notes

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 1 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 mode 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.

Default setting

A1: unusable area
A2: nominal range

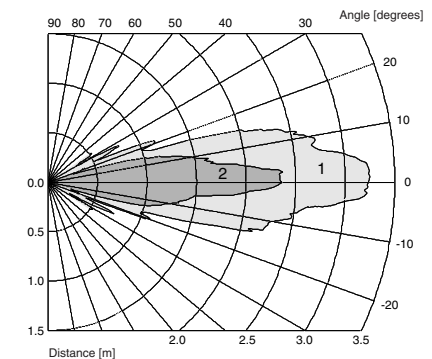
Model number

UC2000-30GM-E6R2-V15

UC2000-30GM-E7R2-V15

Characteristic curves/ Additional information

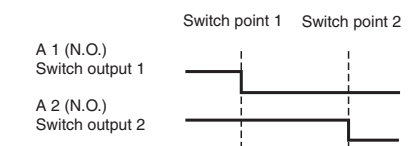
Characteristic response curves



Possible operating modes

1. Switch point mode

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

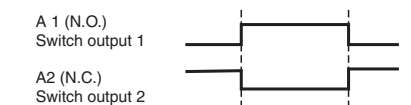


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



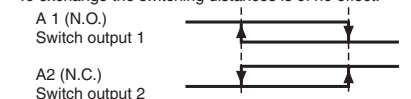
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.

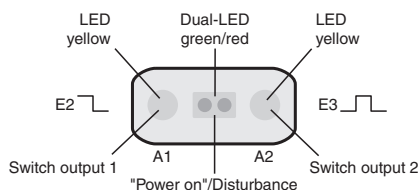


LED Displays

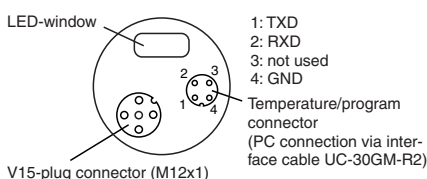
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

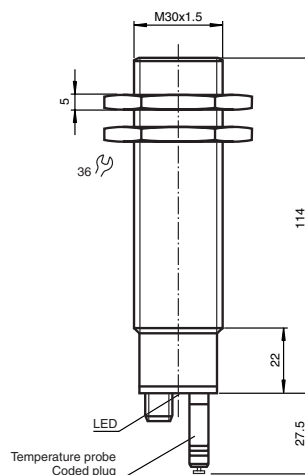
Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



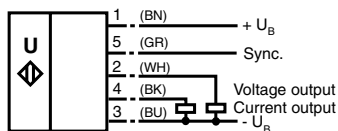
UC2000-30GM-IUR2-V15

Features

- 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

Electrical connection

Standard symbol/Connection:
(version IU)



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

Technical data

General specifications

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

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

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

Electrical specifications

Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.35 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)

Input/Output

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

Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
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Ambient conditions

Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP65
Connection type	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

Connector V15



Notes

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. Thus 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus 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 mode 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.

Default setting

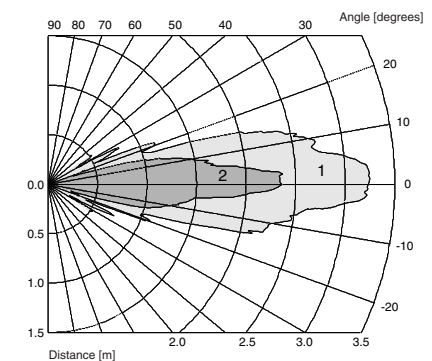
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

Model number

UC2000-30GM-IUR2-V15

Characteristic curves/ Additional information

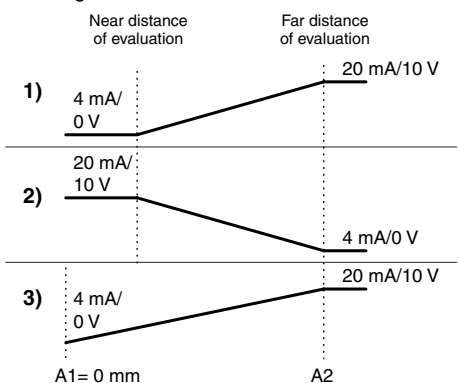
Characteristic response curves



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

Programmed analogue output function

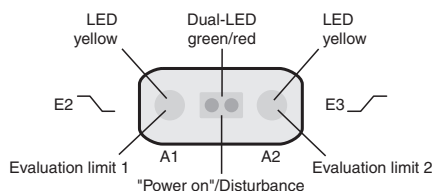
Analogue function



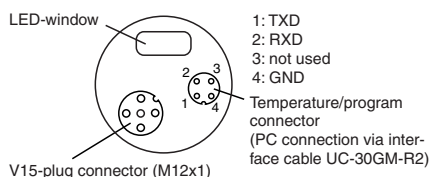
LED Displays / Analogue output

Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2	Analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flash- ing OFF	OFF flash- ing	flashing flashing	OFF OFF	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flash- ing OFF	OFF flash- ing	OFF OFF	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	ON ON ON	OFF OFF OFF	flashing OFF flashing (synchro- nised)	OFF flashes flashes (synchro- nised)	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	flash- es	off	Previous state	Previous state	unchanged
Interference (e.g. compressed air)	off	flash- es	Previous state	Previous state	unchanged or error val- ue

LED-Window



RS 232-connection



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

Cable sockets^{*)}

V15-G-2M-PVC
V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



UC4000-30GM-E6R2-V15

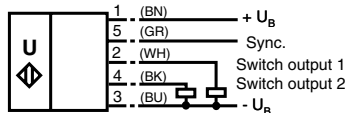
UC4000-30GM-E7R2-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

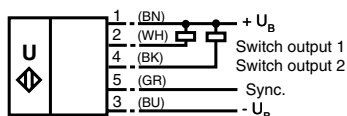
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



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

Standard symbol/Connection:
(version E7, npn)

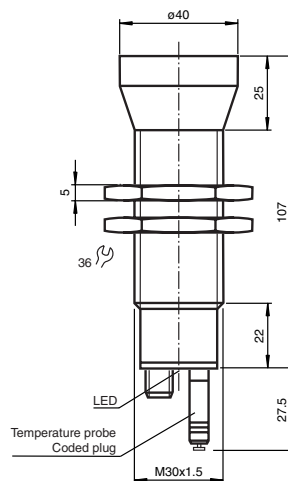


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	UC4000-30GM-E6R2-V15	UC4000-30GM-E7R2-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected	
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function	
LED yellow 2	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	
Electrical specifications		
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs pnp, NO/NC, parameterisable	2 switch outputs npn, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 1 Hz	≤ 1 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output		
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		
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

Notes

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 1 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 mode 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.

Default setting

A1: unusable area
A2: nominal range

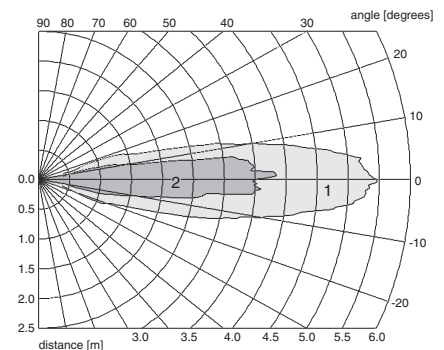
Model number

UC4000-30GM-E6R2-V15

UC4000-30GM-E7R2-V15

Characteristic curves/ Additional information

Characteristic response curves

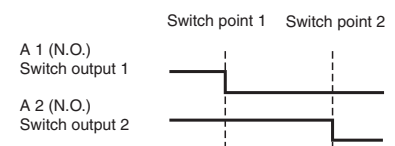


Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

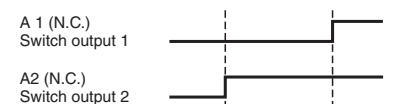
Possible operating modes

1. Switch point mode

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

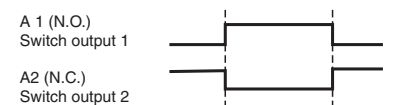


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



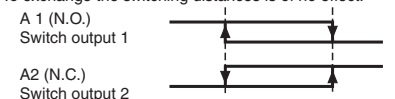
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.

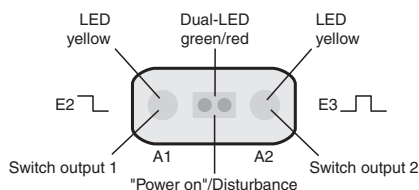


LED Displays

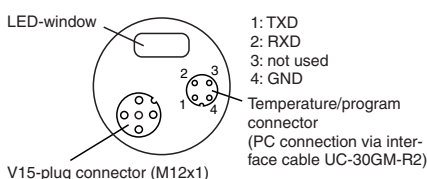
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



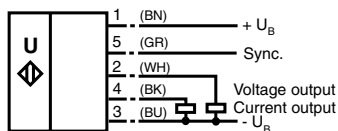
UC4000-30GM-IUR2-V15

Features

- 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

Electrical connection

Standard symbol/Connection:
(version IU)

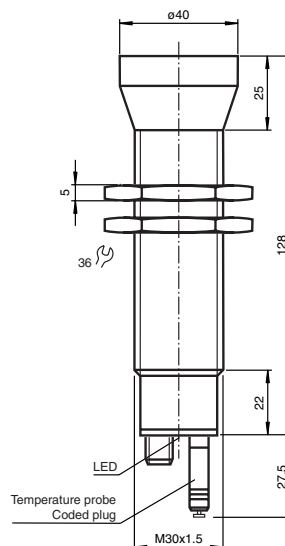


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications	
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
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
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
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.35 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output	
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	
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	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

Notes

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. Thus 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus 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 mode 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.

Default setting

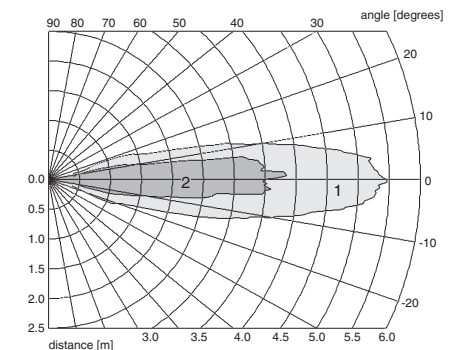
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

Model number

UC4000-30GM-IUR2-V15

Characteristic curves/ Additional information

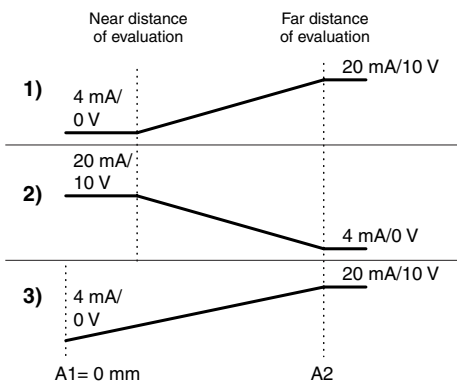
Characteristic response curves



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

Programmed analogue output function

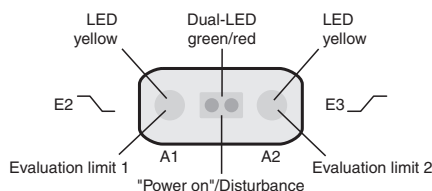
Analogue function



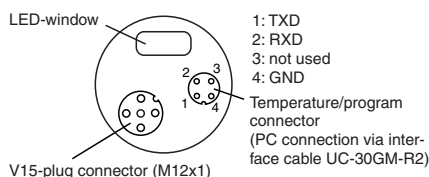
LED Displays / Analogue output

Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2	Analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flash- ing OFF	OFF flash- ing	flashing flashing	OFF OFF	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flash- ing OFF	OFF flash- ing	OFF OFF	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	ON ON ON	OFF OFF OFF	flashing OFF flashing (synchro- nised)	OFF flashes flashes (synchro- nised)	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	flash- es	off	Previous state	Previous state	unchanged
Interference (e.g. compressed air)	off	flash- es	Previous state	Previous state	unchanged or error val- ue

LED-Window



RS 232-connection



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

Cable sockets ^{*)}

V15-G-2M-PVC
V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



UC6000-30GM-E6R2-V15

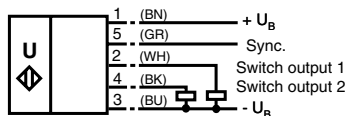
UC6000-30GM-E7R2-V15

Features

- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 2001
- 2 switch outputs freely adjustable
- Hysteresis mode selectable
- Window function can be selected
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

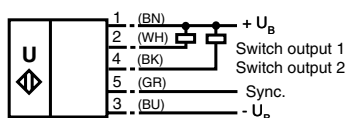
Electrical connection

Standard symbol/Connection:
(version E6, pnp)



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

Standard symbol/Connection:
(version E7, npn)

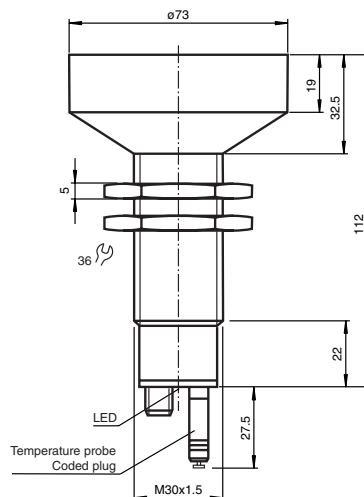


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	UC6000-30GM-E6R2-V15	UC6000-30GM-E7R2-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	permanent: Power-on flashing: Standby mode or TEACH-IN function object detected	
LED yellow 1	permanent: switching state switch output 1 flashing: TEACH-IN function	
LED yellow 2	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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	2 switch outputs pnp, NO/NC, parameterisable	2 switch outputs npn, NO/NC, parameterisable
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 0.5 Hz	≤ 0.5 Hz
Range hysteresis	1 % of the adjusted operating range (default settings), programmable	1 % of the adjusted operating range (default settings), programmable
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)
Input/Output		
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		
Interface type	RS 232, 9600 Bit/s , no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	

Notes

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 1 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 mode 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.

Default setting

A1: unusable area
A2: nominal range

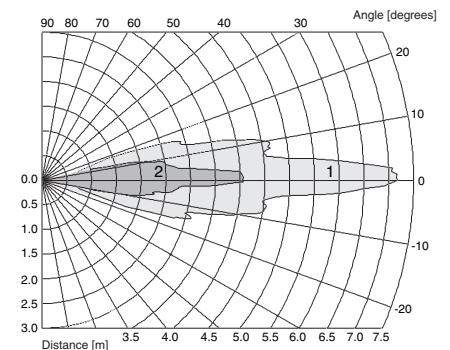
Model number

UC6000-30GM-E6R2-V15

UC6000-30GM-E7R2-V15

Characteristic curves/ Additional information

Characteristic response curves

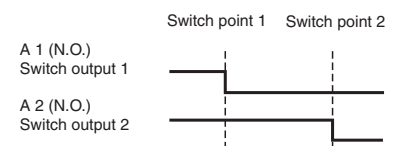


Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

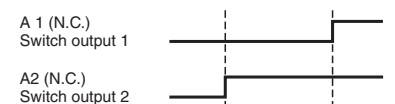
Possible operating modes

1. Switch point mode

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

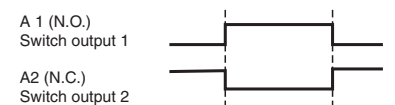


When $A1 > A2$, both switch outputs are activated as N.C. contacts.



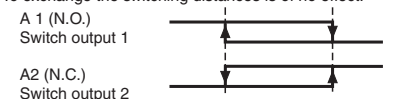
2. Window mode

To exchange the switching distances is of no effect.



3. Hysteresis mode

To exchange the switching distances is of no effect.

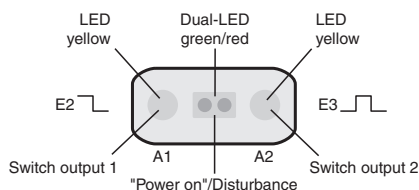


LED Displays

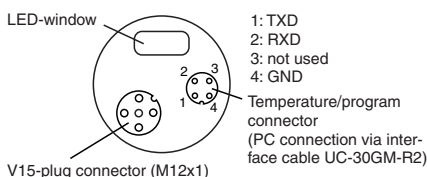
Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2
TEACH-IN of switching point A1 object detected no object detected	flashing OFF	OFF flashing	flashing flashing	OFF OFF
TEACH-IN switching point A2 object detected no object detected	flashing OFF	OFF flashing	OFF OFF	flashing flashing
TEACH-IN mode of operation (E2/E3) two independent switching points window mode Hysteresis mode	ON ON ON	OFF OFF OFF	flashing OFF flashing	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	flashes	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



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



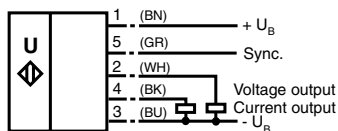
UC6000-30GM-IUR2-V15

Features

- 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

Electrical connection

Standard symbol/Connection:
(version IU)

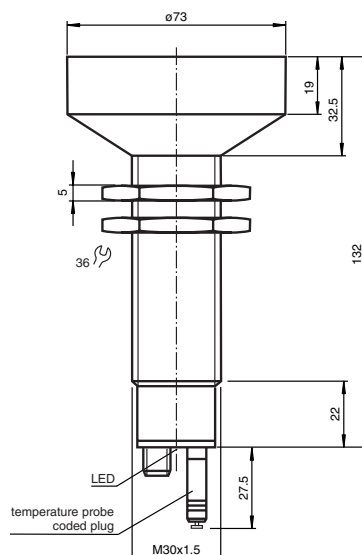


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

General specifications

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

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

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

Electrical specifications

Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
Power consumption	≤ 900 mW
Output	
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V
Deviation of the characteristic curve	≤ 0.2 % of final value
Repeat accuracy	≤ 0.1 % of final value
Resolution	Evaluation range [mm]/4000, but ≥ 0.35 mm
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm
Temperature influence	≤ 2 % from final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)

Input/Output

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

Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit
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Ambient conditions

Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP65
Connection type	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	280 g

Notes

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. Thus 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. Thus 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 A1 flashes,
 - 2) falling ramp, LED A2 flashes,
 - 3) zero line, LED A1 and A2 flash
- Connect TEACH-IN plug in pos. T. Thus 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 mode 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.

Default setting

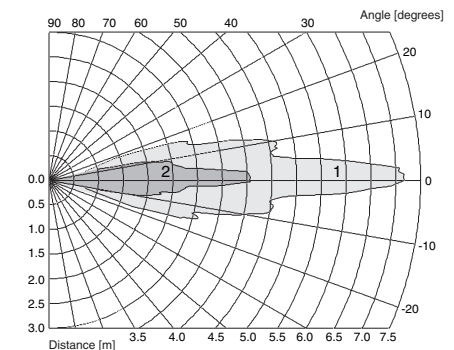
A1: unusable area
 A2: nominal direction
 Direction of effect: rising ramp

Model number

UC6000-30GM-IUR2-V15

Characteristic curves/ Additional information

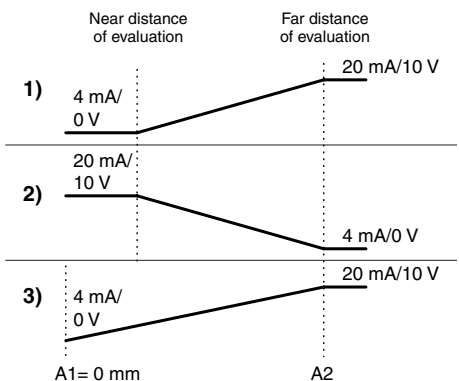
Characteristic response curves



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

Programmed analogue output function

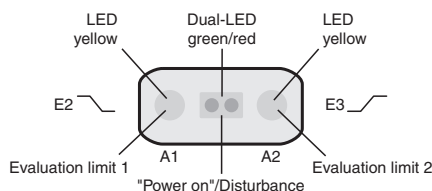
Analogue function



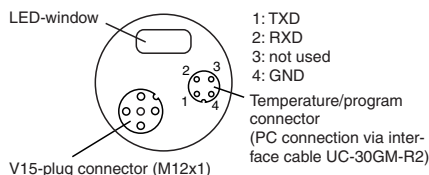
LED Displays / Analogue output

Displays in dependence on operating mode	Dual LED green	LED red	LED yellow A1	LED yellow A2	Analogue output
TEACH-IN evaluation limit A1 object detected object not detected	flash- ing OFF	OFF flash- ing	flashing flashing	OFF OFF	unchanged
TEACH-IN evaluation limit A2 object detected object not detected	flash- ing OFF	OFF flash- ing	OFF OFF	flashing flashing	unchanged
TEACH-IN mode of operation (E2/E3) rising ramp falling ramp zero line	ON ON ON	OFF OFF OFF	flashing OFF flashing (synchro- nised)	OFF flashes flashes (synchro- nised)	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	flash- es	off	Previous state	Previous state	unchanged
Interference (e.g. compressed air)	off	flash- es	Previous state	Previous state	unchanged or error val- ue

LED-Window



RS 232-connection



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 echos)
- Reduction of the detection range (for suppression of remote range echos)
- Time of measuring cycle
- Acoustic power (interference of the burst duration)
- Sensitivity
- Behavior of the sensor in case of echo loss
- Behavior 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.

Accessories

Mounting aids

BF30
BF5-30

External temperature probe

UC-30GM-TEMP

Extension cable

UC-30GM-PROG

Programming tools

Service program ULTRA 2001
Interface cable UC-30GM-R2

Process indication- and control unit

DA5-IU-2K-V

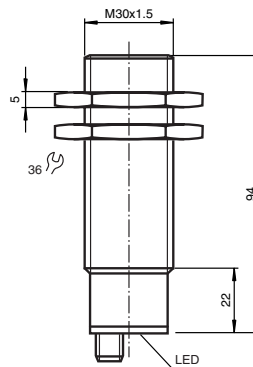
Cable sockets ^{*)}

V15-G-2M-PVC
V15-W-2M-PUR

^{*)} Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UB500-30GM-E4-V15

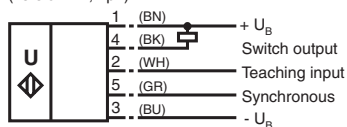
UB500-30GM-E5-V15

Features

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

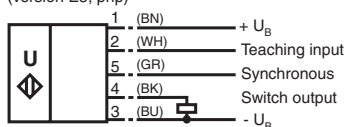
Electrical connection

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.

Connector V15



Technical data

	UB500-30GM-E4-V15	UB500-30GM-E5-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	1 switch output E4, npn NO/NC, parameterisable	1 switch output E5, pnp NO/NC, parameterisable
Repeat accuracy	≤ 0.5 % of switching point	≤ 0.5 % of switching point
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 10 Hz	≤ 10 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Temperature influence	< 2 % of full-scale value	< 2 % of full-scale value
Input		
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	
Input/Output		
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	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	



Notes

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 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.

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 $-U_B$

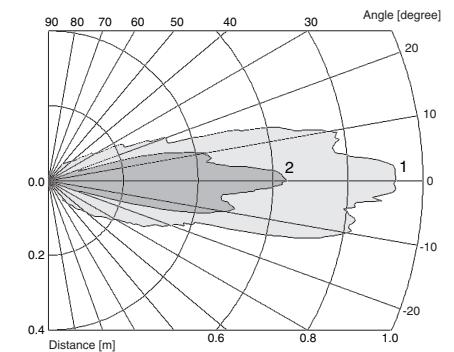
Model number

UB500-30GM-E4-V15

UB500-30GM-E5-V15

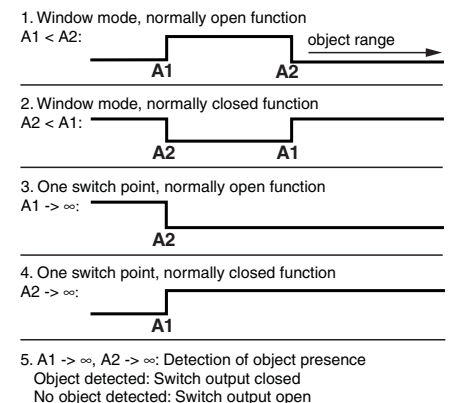
Characteristic curves/ Additional information

Characteristic response curve



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

Programmed switching output function



Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

Programming Unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

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 $+U_B$

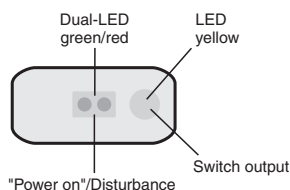
Default setting

A1: unusable area
A2: nominal range

LED Displays

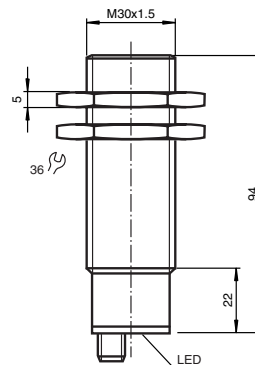
Displays in dependence on operating mode	Green LED	Red LED	Yellow LED
TEACH-IN switching point			
Object detected	flashes	off	flashes
No object detected	off	flashes	flashes
Object uncertain (TEACH-IN invalid)	off	flashes	off
Normal operation	On	off	Switching state
Interference (e.g. compressed air)	off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

LED-Window



Ultrasonic sensor

Dimensions



UB2000-30GM-E4-V15

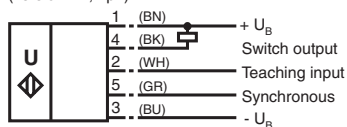
UB2000-30GM-E5-V15

Features

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

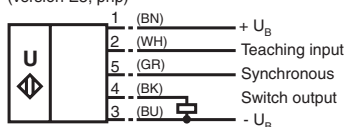
Electrical connection

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.

Connector V15



Technical data

	UB2000-30GM-E4-V15	UB2000-30GM-E5-V15
General specifications		
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	approx. 150 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	1 switch output E4, npn NO/NC, parameterisable	1 switch output E5, pnp NO/NC, parameterisable
Repeat accuracy	≤ 0.5 % of switching point	≤ 0.5 % of switching point
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 3.3 Hz	≤ 3.3 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Temperature influence	< 2 % of full-scale value	< 2 % of full-scale value
Input		
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	
Input/Output		
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	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	140 g	



Notes

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 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.

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 $-U_B$

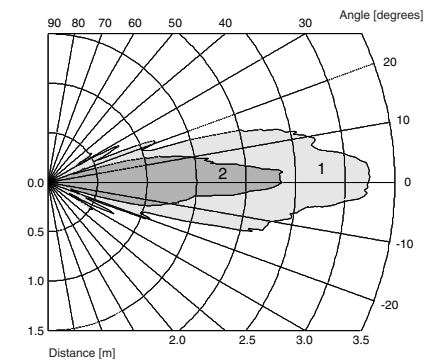
Model number

UB2000-30GM-E4-V15

UB2000-30GM-E5-V15

Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function

1. Window mode, normally open function
 $A1 < A2$:

object range
2. Window mode, normally closed function
 $A2 < A1$:

A2 A1
3. One switch point, normally open function
 $A1 \rightarrow \infty$:

A2
4. One switch point, normally closed function
 $A2 \rightarrow \infty$:

A1
5. $A1 \rightarrow \infty$, $A2 \rightarrow \infty$: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Focusing attachment

UVW90-M30
UVW90-K30

Programming Unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

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 $+U_B$

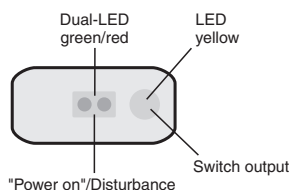
Default setting

A1: unusable area
A2: nominal range

LED Displays

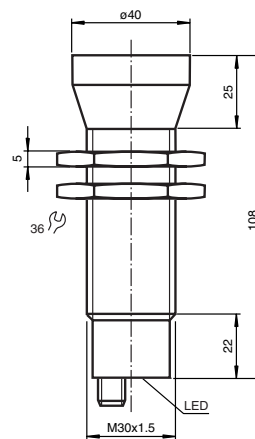
Displays in dependence on operating mode	Green LED	Red LED	Yellow LED
TEACH-IN switching point			
Object detected	flashes	off	flashes
No object detected	off	flashes	flashes
Object uncertain (TEACH-IN invalid)	off	flashes	off
Normal operation	On	off	Switching state
Interference (e.g. compressed air)	off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

LED-Window



Ultrasonic sensor

Dimensions



UB4000-30GM-E4-V15

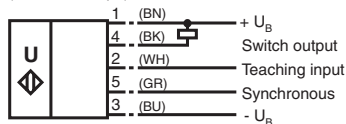
UB4000-30GM-E5-V15

Features

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

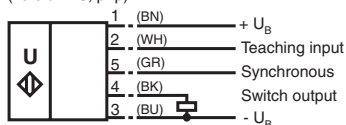
Electrical connection

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.

Connector V15



Technical data

	UB4000-30GM-E4-V15	UB4000-30GM-E5-V15
General specifications		
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	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	1 switch output E4, npn NO/NC, parameterisable	1 switch output E5, pnp NO/NC, parameterisable
Repeat accuracy	≤ 0.5 % of switching point	≤ 0.5 % of switching point
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 1.5 Hz	≤ 1.5 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Temperature influence	< 2 % of full-scale value	< 2 % of full-scale value
Input		
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	
Input/Output		
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	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	180 g	



Notes

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 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.

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 $-U_B$

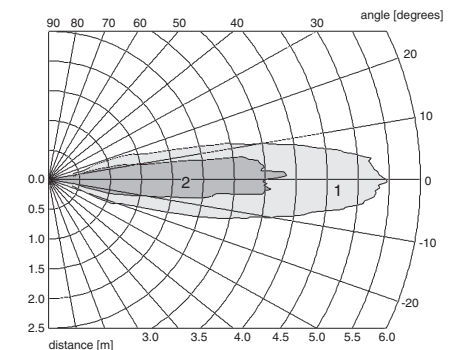
Model number

UB4000-30GM-E4-V15

UB4000-30GM-E5-V15

Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function

1. Window mode, normally open function

A1 < A2:

2. Window mode, normally closed function

A2 < A1:

3. One switch point, normally open function

A1 -> ∞:

4. One switch point, normally closed function

A2 -> ∞:

5. A1 -> ∞, A2 -> ∞: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Accessories

Mounting aid

BF30
BF5-30

Programming Unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

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 $+U_B$

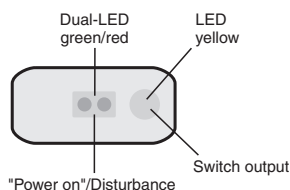
Default setting

A1: unusable area
A2: nominal range

LED Displays

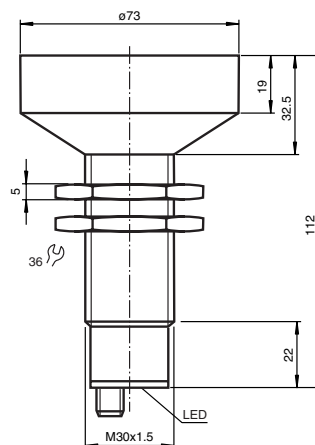
Displays in dependence on operating mode	Green LED	Red LED	Yellow LED
TEACH-IN switching point			
Object detected	flashes	off	flashes
No object detected	off	flashes	flashes
Object uncertain (TEACH-IN invalid)	off	flashes	off
Normal operation	On	off	Switching state
Interference (e.g. compressed air)	off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

LED-Window



Ultrasonic sensor

Dimensions



UB6000-30GM-E4-V15

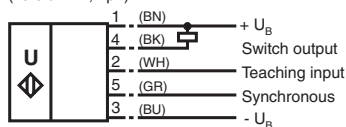
UB6000-30GM-E5-V15

Features

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

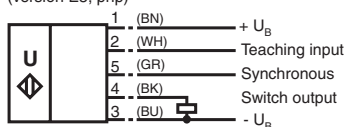
Electrical connection

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.

Connector V15



Technical data

	UB6000-30GM-E4-V15	UB6000-30GM-E5-V15
General specifications		
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	approx. 650 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	
Electrical specifications		
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 50 mA	
Output		
Output type	1 switch output E4, npn NO/NC, parameterisable	1 switch output E5, pnp NO/NC, parameterisable
Repeat accuracy	≤ 0.5 % of switching point	≤ 0.5 % of switching point
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 2.5 V	≤ 2.5 V
Switching frequency	≤ 0.8 Hz	≤ 0.8 Hz
Range hysteresis	1 % of the set operating distance	1 % of the set operating distance
Temperature influence	< 2 % of full-scale value	< 2 % of full-scale value
Input		
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	
Input/Output		
Synchronisation	bi-directional 0 level: -U _B ...+1 V 1 level: +4 V...+U _B input impedance: > 12 kΩhm synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	
Common mode operation	≤ 7 Hz	
Multiplex operation	≤ 7/n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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	250 g	



Notes

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 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.

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 $-U_B$

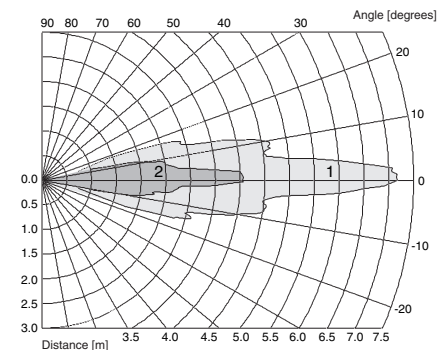
Model number

UB6000-30GM-E4-V15

UB6000-30GM-E5-V15

Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function

1. Window mode, normally open function
 $A1 < A2$:
object range
2. Window mode, normally closed function
 $A2 < A1$:
3. One switch point, normally open function
 $A1 \rightarrow \infty$:
4. One switch point, normally closed function
 $A2 \rightarrow \infty$:
5. $A1 \rightarrow \infty$, $A2 \rightarrow \infty$: Detection of object presence
Object detected: Switch output closed
No object detected: Switch output open

Accessories

Mounting aid

BF30
BF5-30

Programming Unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

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 $+U_B$

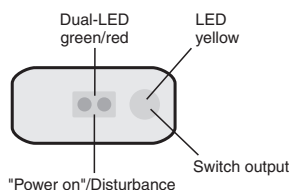
Default setting

A1: unusable area
A2: nominal 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 (e.g. compressed air)	off	flashes	previous state

LED-Window



Ultrasonic single path barrier

Dimensions



UBE4000-30GM-SA2-V1

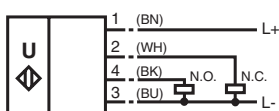
Features

- 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

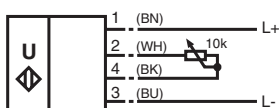
Electrical connection

Standard symbol/Connection:
(version A2, pnp)

Receiver:



Emitter:

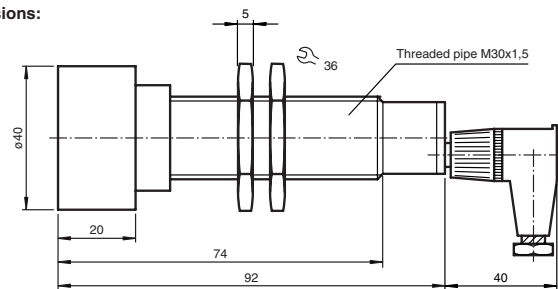


Core colours in accordance with EN 60947-5-2.

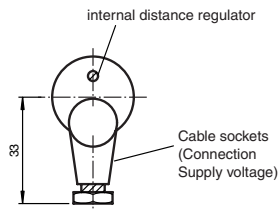
Connector V1



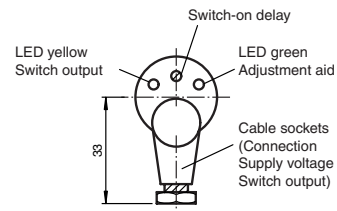
Dimensions:



Emitter:



Receiver:



Technical data

General specifications

Sensing range	0 ... 4000 mm , distance emitter-receiver 500 mm ... 4000 mm
Reference target	receiver
Transducer frequency	120 kHz

Standard conformity

Standards	EN 60947-5-2
-----------	--------------

Indicators/operating means

LED green	Alignment aid OFF: no ultrasonic signal Flashing: uncertain area ON: positive reception
LED yellow	switching state

Electrical specifications

Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	35 mA emitter 25 mA receiver

Output

Output type	2 switch outputs pnp, normally open/closed (complementary)
Rated operational current	200 mA
Voltage drop	≤ 2.5 V
Switching frequency	≤ 15 Hz
Switch-on delay	30 ... 3000 ms

Ambient conditions

Ambient temperature	0 ... 60 °C (273 ... 333 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	Housing: brass, nickel plated, plastic components: Delrin
Mass	190 g each sensor

Notes

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 transmitter, or via a remote potentiometer connected to the transmitter.

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 transmitter (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 ... 2 m
Maximum switching point	2 ... 4 m

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

Alignment

When adjusting the transmitter 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 transmitter and a single receiver.

Caution

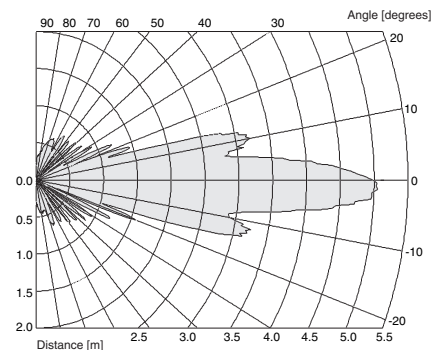
Mount or replace emitter and receiver only in pairs. Both devices are optimal matched to each other by the manufacturer.

Model number

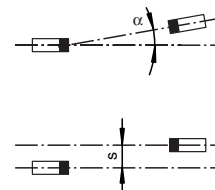
UBE4000-30GM-SA2-V1

Characteristic curves/ Additional information

Characteristic response curves



Alignment



Accessories

Mounting aid

BF30
BF5-30

Remote potentiometer

FP100

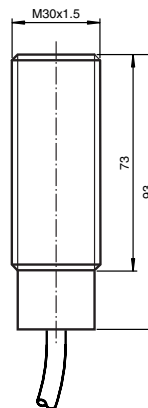
Cable sockets *)

V1-G-2M-PVC
V1-W-2M-PVC

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor

Dimensions



UB500-30GM-H3

Features

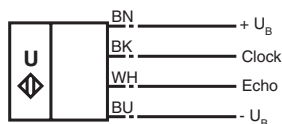
- Separate evaluation
- Direct detection mode

Technical data

General specifications	
Sensing range	60 ... 500 mm
Unusable area	0 ... 60 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
Output type	1 pulse output for echo propagation time, high-active, short-circuit proof
Signal level	level 1: ≥ U _B - 3 V ; ≤ 10 mA level 0: ≤ 1 V ; ≤ 0.1 mA
Temperature influence	the echo propagation time: 0.17 % / K
Input	
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
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	300 g

Electrical connection

Standard symbol/Connection:
(Transceiver)



BK = Emitter pulse input
WH = Echo propagation time output



Notes

Description

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.

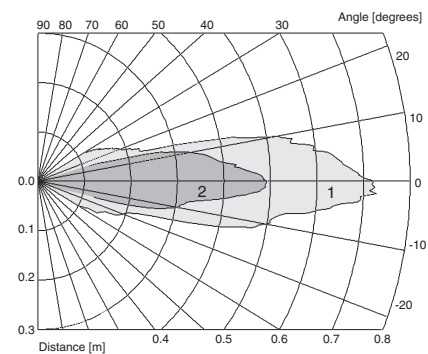
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

Model number

UB500-30GM-H3

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Redirection bracket

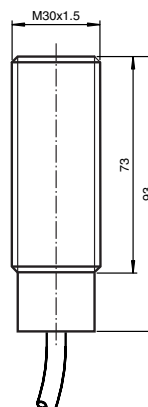
UVW90-M30
UVW90-K30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT

Ultrasonic emitter

Dimensions



UB2000-30GM-H1

Features

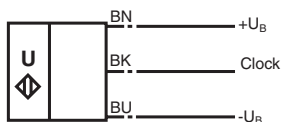
- Very small unusable area in direct detection mode with UB2000-30GM-H2
- Separate evaluation
- Emitter for direct detection or through-beam mode

Technical data

General specifications	
Sensing range	
Direct detection mode	50 ... 2000 mm
Single path mode	10 ... 5000 mm
Unusable area	
Direct detection mode	0 ... 50 mm
Single path mode	0 ... 10 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 175 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 10 mA
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	20 ... 200 µs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	290 g

Electrical connection

Standard symbol/Connection:
Emitter



BK = Emitter pulse input



Notes

Description of the sensor functions

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 sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

In addition to the evaluation electronics, a measuring system always consists of at least one transmitter (UB...-H1) and one receiver (UB...-H2).

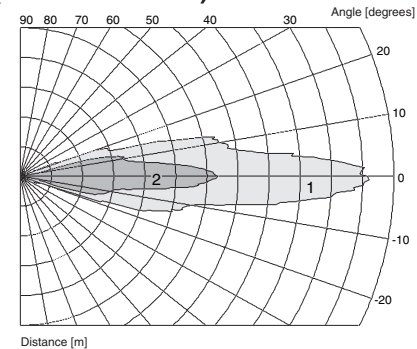
The pulse input on ultrasonic receivers (types UB...-H2) can be used to reduce the system amplification during transmission. This reduces crosstalk between the transmitter and receiver in direct-detection mode.

Model number

UB2000-30GM-H1

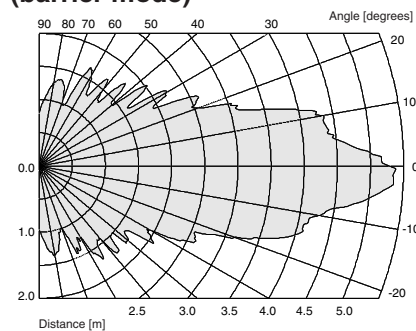
Characteristic curves/ Additional information

Characteristic response curves (direct detection)



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

Characteristic response curve (barrier mode)



Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Redirection bracket

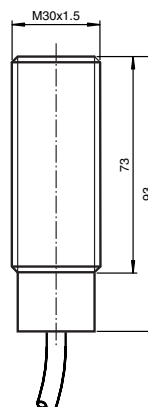
UVW90-M30
UVW90-K30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT

Ultrasonic receiver

Dimensions



UB2000-30GM-H2

Features

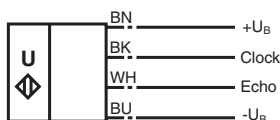
- Very small unusable area in direct detection mode with UB2000-30GM-H1
- Separate evaluation
- Receiver for direct detection or through-beam mode

Technical data

General specifications	
Sensing range	
Direct detection mode	50 ... 2000 mm
Single path mode	10 ... 5000 mm
Unusable area	
Direct detection mode	0 ... 50 mm
Single path mode	0 ... 10 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 175 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 12 mA
Output	
Output type	1 pulse output for echo propagation time, high-active, short-circuit proof
Signal level	level 1: ≥ U _B - 3 V ; ≤ 10 mA level 0: ≤ 1 V ; ≤ 0.1 mA
Temperature influence	the echo propagation time: ≤ 0.2 % / K
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: receiver active, > 4 V: receiver inactive
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	290 g

Electrical connection

Standard symbol/Connection:
Receiver



BK = Emitter pulse input
WH = Echo propagation time output



Notes

Description of the sensor functions

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 sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

In addition to the evaluation electronics, a measuring system always consists of at least one transmitter (UB...-H1) and one receiver (UB...-H2).

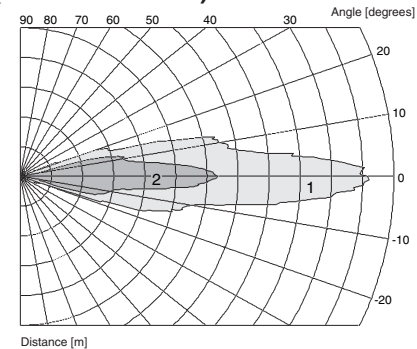
The pulse input on ultrasonic receivers (types UB...-H2) can be used to reduce the system amplification during transmission. This reduces crosstalk between the transmitter and receiver in direct-detection mode.

Model number

UB2000-30GM-H2

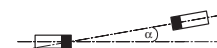
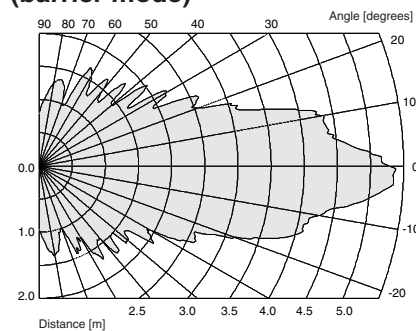
Characteristic curves/ Additional information

Characteristic response curves (direct detection)



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

Characteristic response curve (barrier mode)



Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Redirection bracket

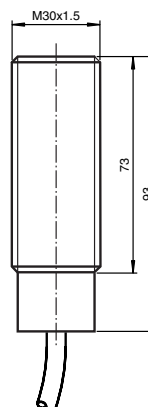
UVW90-M30
UVW90-K30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT

Ultrasonic sensor

Dimensions



UB2000-30GM-H3

Features

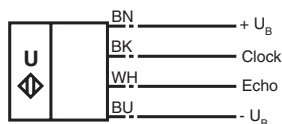
- Separate evaluation
- Direct detection mode

Technical data

General specifications	
Sensing range	200 ... 2000 mm
Unusable area	0 ... 200 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 175 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
Output type	1 pulse output for echo propagation time, high-active, short-circuit proof
Signal level	level 1: ≥ U _B - 3 V ; ≤ 10 mA level 0: ≤ 1 V ; ≤ 0.1 mA
Temperature influence	the echo propagation time: 0.17 % / K
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	20 ... 200 μs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	300 g

Electrical connection

Standard symbol/Connection:
(Transceiver)



BK = Emitter pulse input
WH = Echo propagation time output



Notes

Description

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.

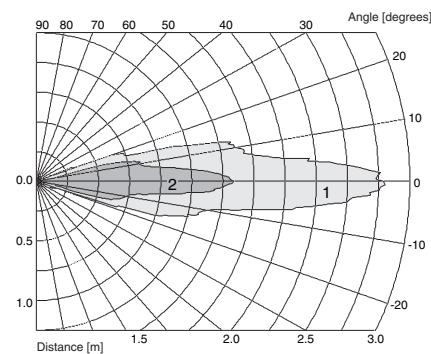
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

Model number

UB2000-30GM-H3

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Mounting aid

BF30
BF30F
BF5-30
M-105

Redirection bracket

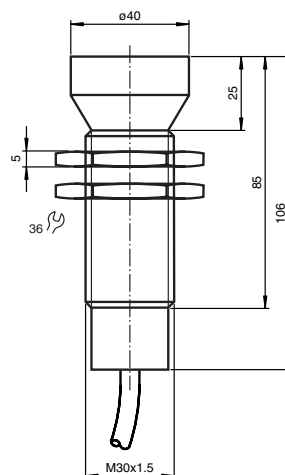
UVW90-M30
UVW90-K30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT

Ultrasonic sensor

Dimensions



UB4000-30GM-H3

Features

- Separate evaluation
- Direct detection mode

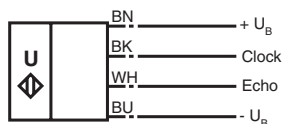
Technical data

General specifications	
Sensing range	500 ... 4000 mm
Unusable area	0 ... 500 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 85 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
Output type	1 pulse output for echo propagation time, high-active, short-circuit proof
Signal level	level 1: ≥ U _B - 3 V; ≤ 10 mA level 0: ≤ 1 V; ≤ 0.1 mA
Temperature influence	the echo propagation time: 0.17 % / K
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	40 ... 500 μs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	327 g



Electrical connection

Standard symbol/Connection:
(Transceiver)



BK = Emitter pulse input
WH = Echo propagation time output

Notes

Description

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.

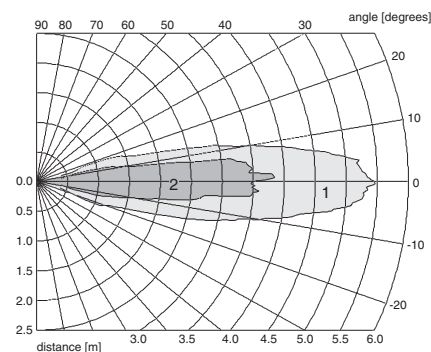
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

Model number

UB4000-30GM-H3

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Mounting aid

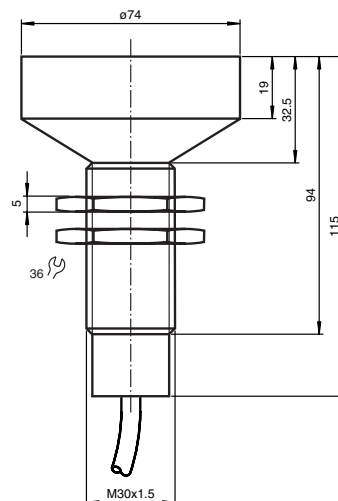
BF30
BF5-30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT

Ultrasonic sensor

Dimensions



UB6000-30GM-H3

Features

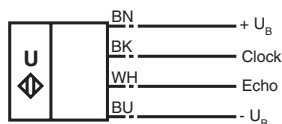
- Separate evaluation
- Direct detection mode

Technical data

General specifications	
Sensing range	800 ... 6000 mm
Unusable area	0 ... 800 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 65 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
Output type	1 pulse output for echo propagation time, high-active, short-circuit proof
Signal level	level 1: ≥ U _B - 3 V; ≤ 10 mA level 0: ≤ 1 V; ≤ 0.1 mA
Temperature influence	the echo propagation time: 0.17 % / K
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	50 ... 500 μs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	2 m, PVC-cable 0.75 mm ²
Material	
Housing	brass, nickel plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	446 g

Electrical connection

Standard symbol/Connection:
(Transceiver)



BK = Emitter pulse input
WH = Echo propagation time output



Notes

Description

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.

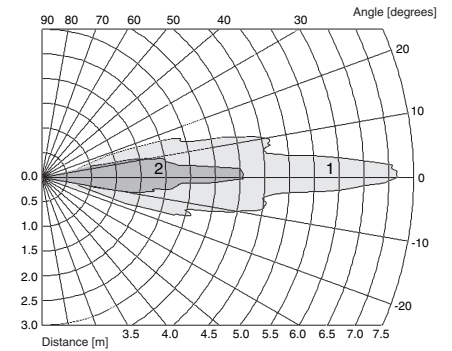
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

Model number

UB6000-30GM-H3

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Mounting aid

BF30
BF5-30

Analyser Units

UH3-KHD2-4E5
UH3-KHD2-4I
UH3-T1-KT



Type	Sensing range	Page
UC500+U9+E6+R2	500 mm	128
UC500+U9+IUE2+R2	500 mm	132
UB500+U9+H3	500 mm	136
UC3000+U9+E6+R2	3000 mm	138
UC3000+U9+E7+R2	3000 mm	138
UC3000+U9+IUE0+R2	3000 mm	142
UC3000+U9+IUE2+R2	3000 mm	142
UJ3000+U1+8B+RS	3000 mm	146
UB3000+U9+H3	3000 mm	150

Ultrasonic sensor

Dimensions



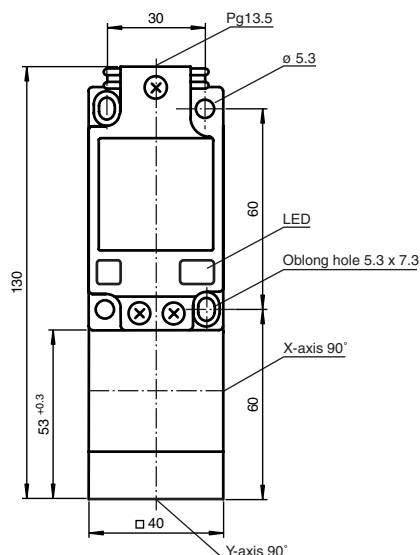
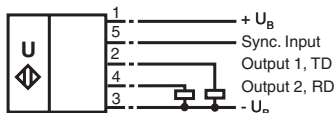
UC500+U9+E6+R2

Features

- 2 independent switch outputs
- Serial Interfaces
- Switch point setting via DIP-switches or RS 232 interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:
(Version E6, pnp)



Technical data

General specifications	
Sensing range	60 ... 500 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 60 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)
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED yellow	switching state switch output 1 switching state switch output 2
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)
Electrical specifications	
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 60 mA
Output	
Output type	2 switch outputs pnp, NO/NC
Rated operational current	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value
Resolution	< 1 mm
Temperature influence	≤ 2 %
Input/Output	
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	≤ 80 Hz , with external synchronisation
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	180 g

Notes

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.

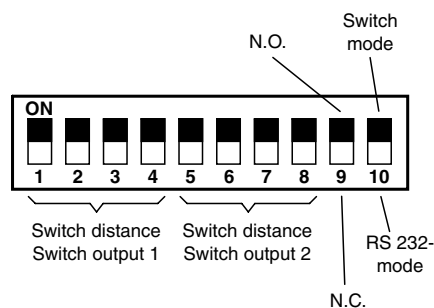
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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 $\triangle$ ON, 0 $\triangle$ OFF

DIP Switches in Terminal Compartment

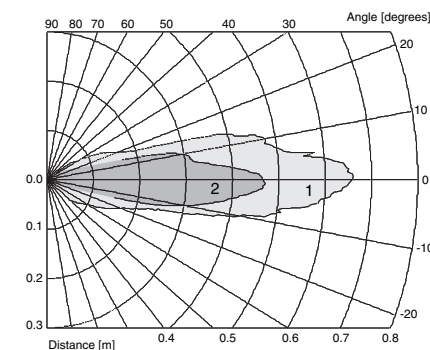


Model number

UC500+U9+E6+R2

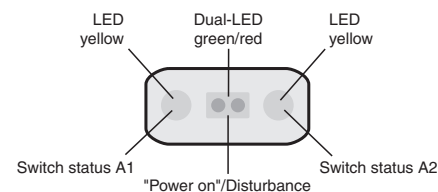
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-2681F

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
VS	Velocity of S ound	VS in [cm/s]	read
UDS	U se DIP S witches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SD2[1]	S witching D istance 2 1	SD21 distance in [mm]	read and set
SD22	S witching D istance 2 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
SH2	S witching H ysteresis 2	Hysteresis in [%]	read and set
BR	Unusable area (B lind R ange)	Unusable area to [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [close NO = 0, open NC = 1]	read and set
MD	M aster D evice	Function as master {0 = NONE},AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	S witching S tate 2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-E6/E7-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	Store User Configuration	Stores all settings	Command
RUC	Recall User Configuration	Restores stored settings	Command

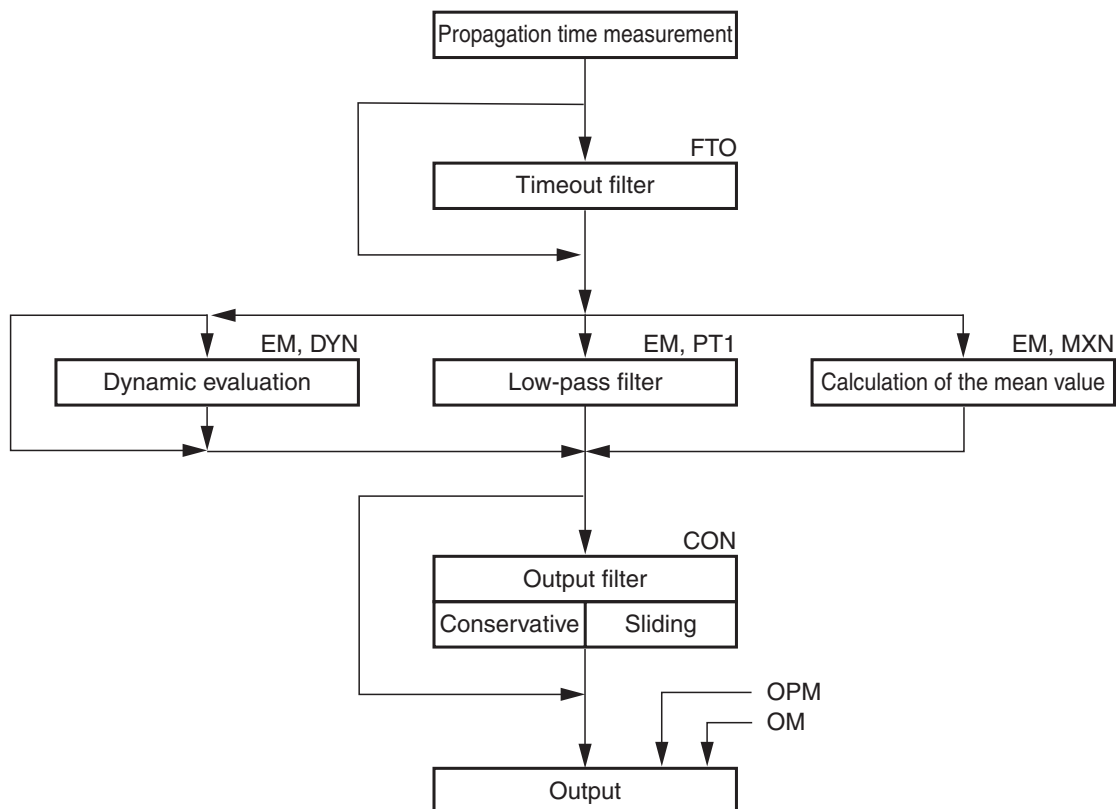
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor

Dimensions



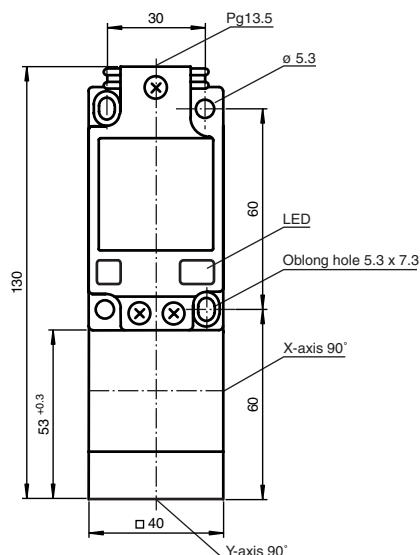
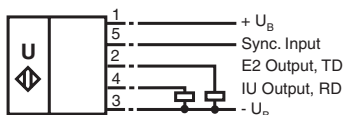
UC500+U9+IUE2+R2

Features

- Analogue output, load-dependent voltage or current
- Switch output
- Serial Interfaces
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:
(Version IUE2, pnp)



Technical data

General specifications	
Sensing range	60 ... 500 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 60 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)
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED yellow	switching state switch output
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)
Electrical specifications	
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 60 mA
Output	
Output type	1 switch output E5: pnp 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
Rated operational current	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value
Resolution	≥ 0.172 mm
Deviation of the characteristic curve	≤ 0.2 % of final value
Temperature influence	≤ 2 %
Input/Output	
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	≤ 80 Hz , with external synchronisation
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	180 g

Notes

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.

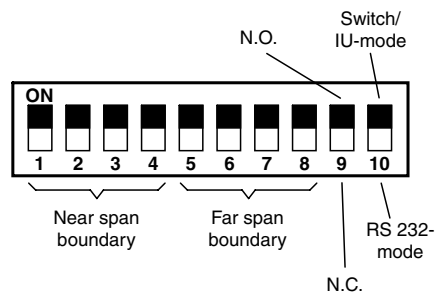
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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 $\triangle$ 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

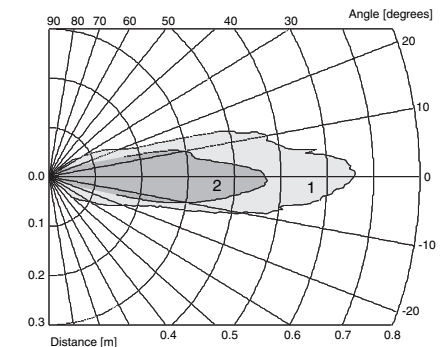
Switch point switch output:
(NDE + FDE)/2 (Preconfiguration)

Model number

UC500+U9+IUE2+R2

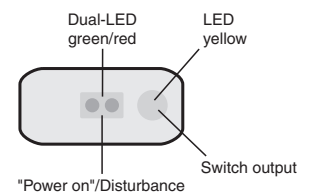
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-2681F

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
VS	Velocity of S ound	VS in [cm/s]	read
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
UDS	U se DIP S witches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
NDE	N ear D istance of E valuation	Near measuring window limit in [mm]	read and set
FDE	F ar D istance of E valuation	Far measuring window limit in [mm]	read and set
BR	Unusable area (B lind R ange)	Unusable area in [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [normally-open NO = 0, normally-closed NC = 1]	read and set
FSF	F ail S afe F unction	Failure function type {0,1,2},[fault current in 0.1 mA]	read and set
MD	M aster D evice	Function as master { 0 = NONE },AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RD	R elative D istance	Relative distance as number {0 ... 4095}	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RDB	R elative D istance B inary	Relative distance as number {0 ... 4095} binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-IUE0/E2-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	S tore U ser C onfiguration	Stores all settings	Command
RUC	R ecall U ser C onfiguration	Restores stored settings	Command

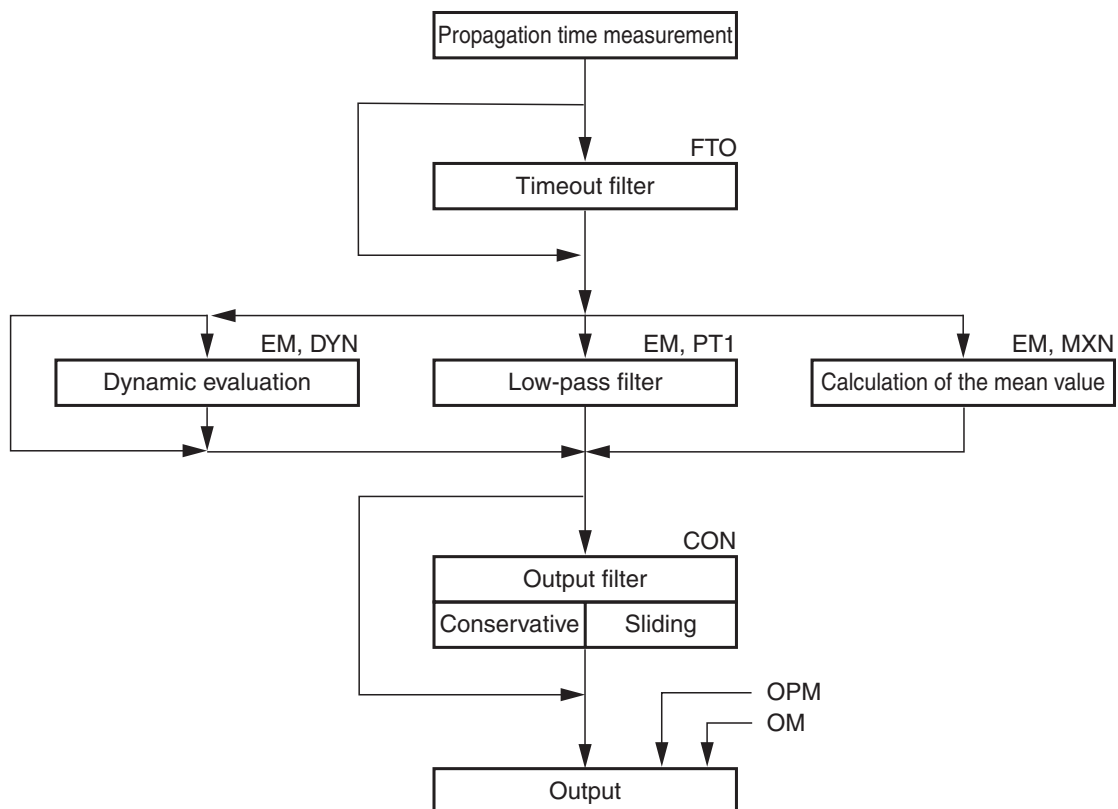
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor

Dimensions



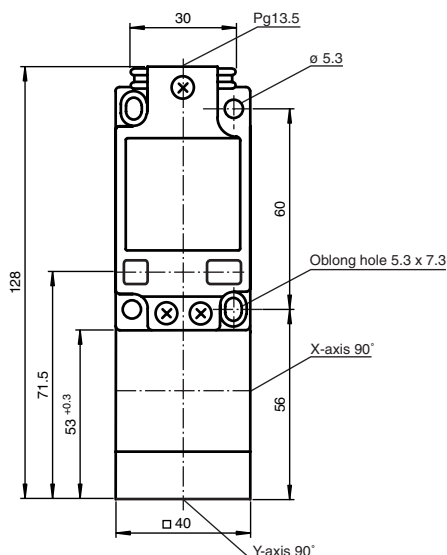
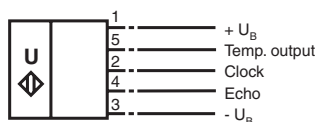
UB500+U9+H3

Features

- Separate evaluation
- With temperature sensor
- Direct detection mode

Electrical connection

Standard symbol/Connection:



Technical data

General specifications	
Sensing range	60 ... 500 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 60 mm
Transducer frequency	approx. 380 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
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
Pulse length	10 µs/K + timer pulse, synchronisation with the timer pulse
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	20 ... 300 µs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	180 g

Notes

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:

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

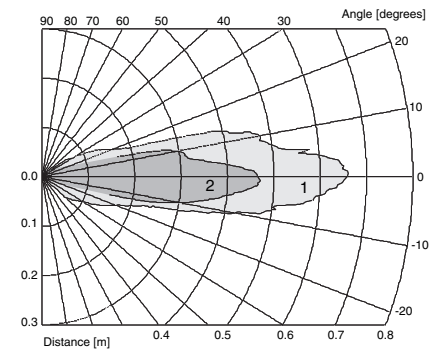
Put into the formula the temperature in Kelvin and the clock time in the unit μs .

Model number

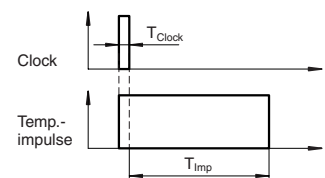
UB500+U9+H3

Characteristic curves/ Additional information

Characteristic response curves



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



$$T_{Imp} = T [K] \times 10 \mu s / K$$

$$T_{Temp} = T_{Clock} + T_{Imp}$$

Accessories

Mounting aid

MH 04-2681F

Ultrasonic sensor

Dimensions



UC3000+U9+E6+R2

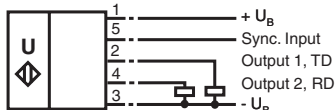
UC3000+U9+E7+R2

Features

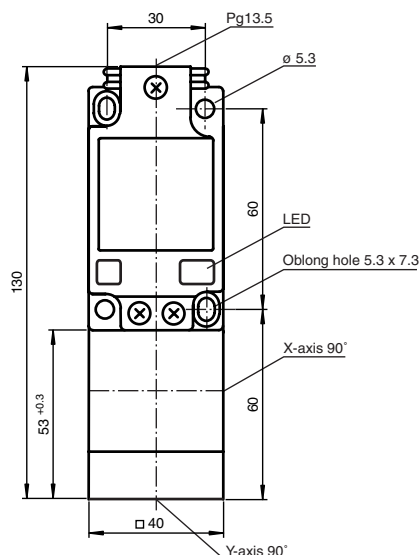
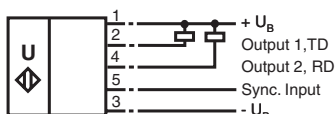
- 2 independent switch outputs
- Serial Interfaces
- Switch point setting via DIP-switches or RS 232 interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:
(Version E6, npn)



Standard symbol/Connection:
(Version E7, npn)



Technical data

	UC3000+U9+E6+R2	UC3000+U9+E7+R2
General specifications		
Sensing range	300 ... 3000 mm	
Standard target plate	100 mm x 100 mm	
Unusable area	0 ... 300 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)	
Standard conformity	EN 60947-5-2	
Indicators/operating means		
LED yellow	switching state switch output 1 switching state switch output 2	
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)	
Electrical specifications		
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	≤ 60 mA	
Output		
Output type	2 switch outputs npn, NO/NC	2 Switch outputs npn, normally open/closed
Rated operational current	200 mA, short circuit/overload protected	200 mA, short circuit/overload protected
Voltage drop	≤ 3 V DC	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Resolution	< 1 mm	< 1 mm
Temperature influence	≤ 2 %	≤ 2 %
Input/Output		
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	
Interface		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	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 issue 07/19/2002

Notes

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.

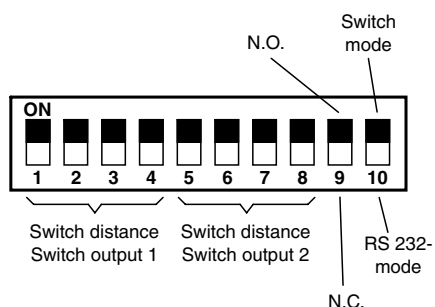
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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



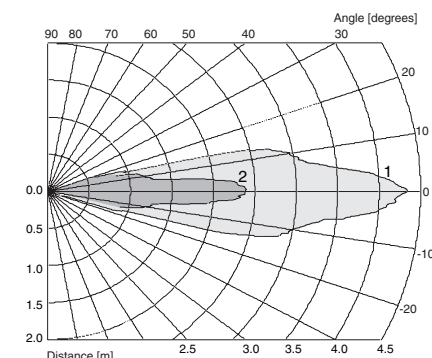
Model number

UC3000+U9+E6+R2

UC3000+U9+E7+R2

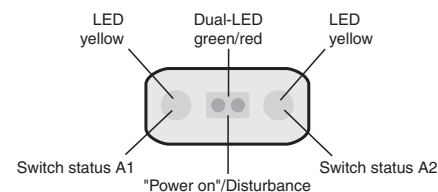
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-2681F

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
VS	Velocity of S ound	VS in [cm/s]	read
UDS	U se DIP Switches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SD2[1]	S witching D istance 2 1	SD21 distance in [mm]	read and set
SD22	S witching D istance 2 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
SH2	S witching H ysteresis 2	Hysteresis in [%]	read and set
BR	Unusable area (B lind R ange)	Unusable area to [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [close NO = 0, open NC = 1]	read and set
MD	M aster D evice	Function as master {0 = NONE},AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	S witching S tate 2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-E6/E7-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	Store User Configuration	Stores all settings	Command
RUC	Recall User Configuration	Restores stored settings	Command

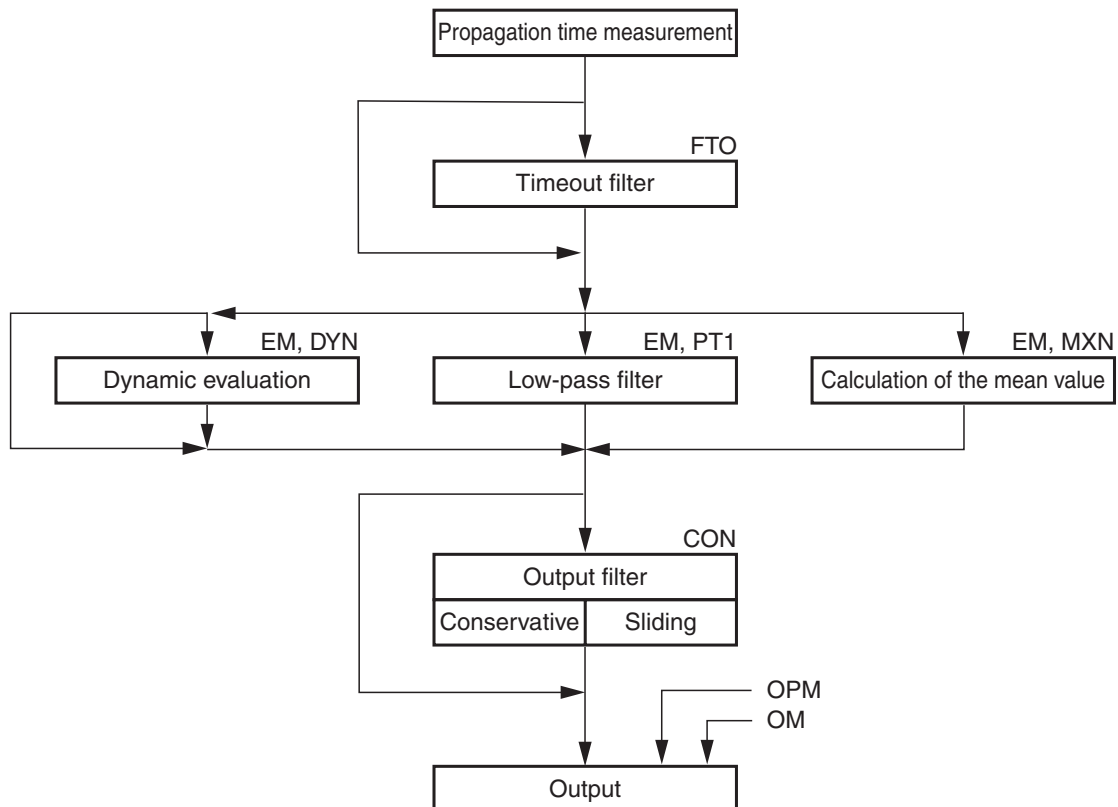
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor

Dimensions



UC3000+U9+IUE0+R2

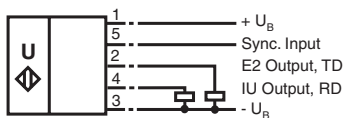
UC3000+U9+IUE2+R2

Features

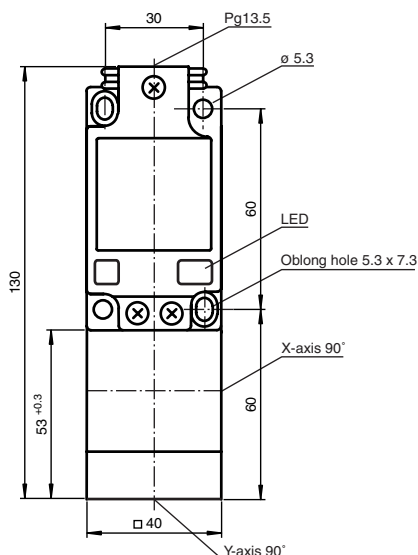
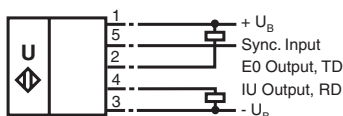
- Analogue output, load-dependent voltage or current
- Switch output
- Serial Interfaces
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:
(Version IUE2, pnp)



Standard symbol/Connection:
(Version IUE0, npn)



Technical data

	UC3000+U9+IUE0+R2	UC3000+U9+IUE2+R2
General specifications		
Sensing range	300 ... 3000 mm	
Standard target plate	100 mm x 100 mm	
Unusable area	0 ... 300 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)	
Standard conformity	EN 60947-5-2	
Indicators/operating means		
LED yellow	switching state switch output	
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)	
Electrical specifications		
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 60 mA	
Output		
Output type	1 switch output E0, npn, normally open/closed 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	1 switch output E5: pnp 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
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Resolution	≥ 0.172 mm	≥ 0.172 mm
Deviation of the characteristic curve	≤ 0.2 % of final value	≤ 0.2 % of final value
Temperature influence	≤ 2 %	≤ 2 %
Input/Output		
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		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa	
Material		
Housing	PBT	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	180 g	

Notes

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.

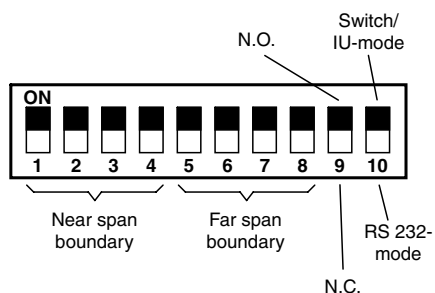
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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)

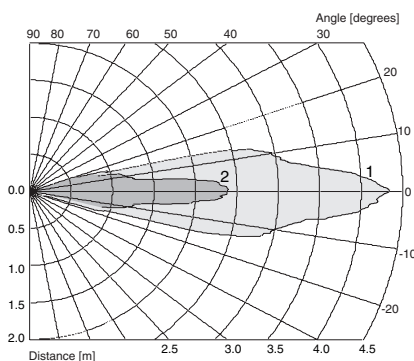
Model number

UC3000+U9+IUE0+R2

UC3000+U9+IUE2+R2

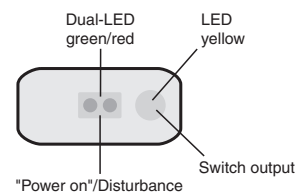
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-2681F

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
VS	Velocity of S ound	VS in [cm/s]	read
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
UDS	U se DIP S witches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
NDE	N ear D istance of E valuation	Near measuring window limit in [mm]	read and set
FDE	F ar D istance of E valuation	Far measuring window limit in [mm]	read and set
BR	Unusable area (B lind R ange)	Unusable area in [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [normally-open NO = 0, normally-closed NC = 1]	read and set
FSF	F ail S afe F unction	Failure function type {0,1,2},[fault current in 0.1 mA]	read and set
MD	M aster D evice	Function as master { 0 = NONE },AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RD	R elative D istance	Relative distance as number {0 ... 4095}	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RDB	R elative D istance B inary	Relative distance as number {0 ... 4095} binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-IUE0/E2-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	S tore U ser C onfiguration	Stores all settings	Command
RUC	R ecall U ser C onfiguration	Restores stored settings	Command

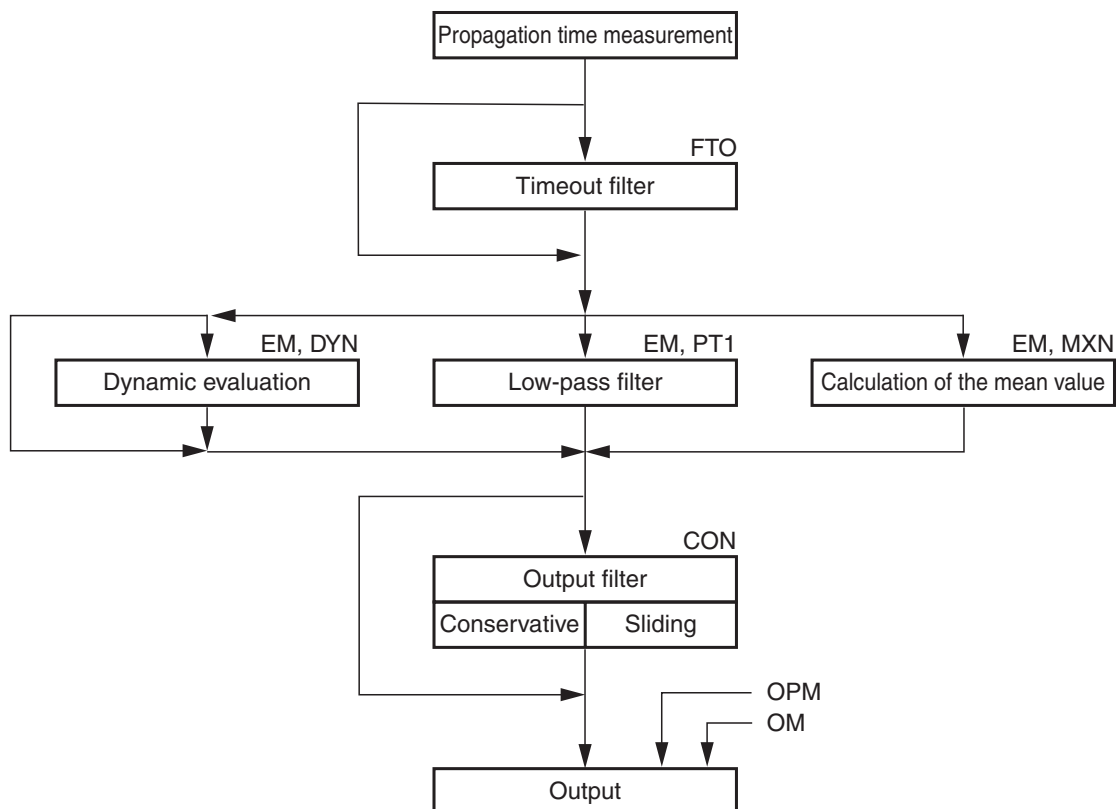
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor

Dimensions



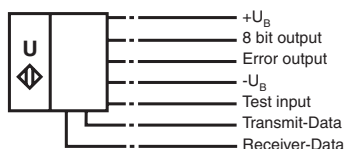
UJ3000+U1+8B+RS

Features

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

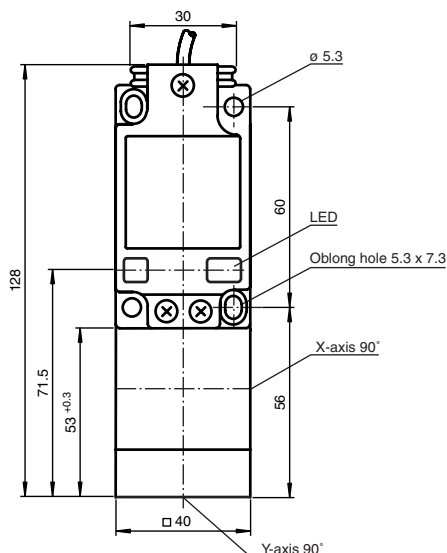
Electrical connection

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



Technical data

General specifications	
Sensing range	300 ... 3000 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 300 mm
Transducer frequency	approx. 130 kHz
Response delay	static 4: ≤ 280 ms (factory setting) static 1: ≤ 70 ms dynamic; ≤ 100 ms
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (high level of external noise)
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 90 mA
Output	
Output type	8 bit output for outputting object distance, pnp 1 fault output, pnp NC
Rated operational current	20 mA, short circuit/overload protected
Voltage drop	U _B - 4 V
Range hysteresis	11 mm, (corresponding to 1 LSB)
Repeat accuracy	11 mm, (corresponding to 1 LSB)
Resolution	11 mm, (corresponding to 1 LSB)
Temperature influence	0.17 % / K
Input	
Input type	1 test input, (-U _B + 5 V) up to +U _B , ≤100 kOhm
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-10 ... 50 °C (263 ... 323 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	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

Notes

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.

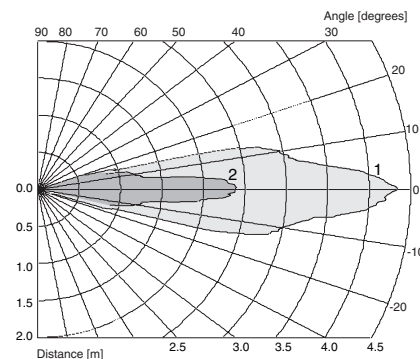
A 1 level at the test input causes the 8-bit output to switch from 00000000 to 11111111 and back every 200 ms.

Model number

UJ3000+U1+8B+RS

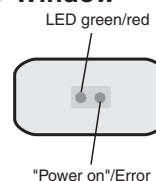
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-2681F

Service program

ULTRA 2001

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)

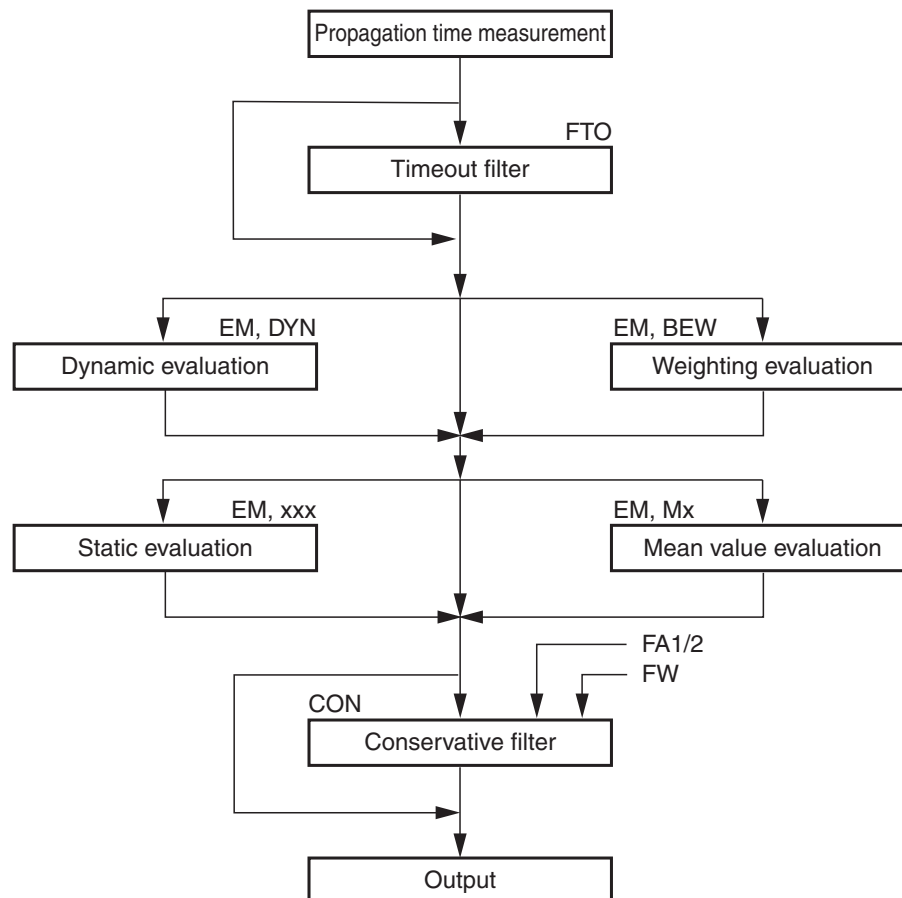
Com- mand	Meaning	Parameter	Access
VS	V elocity of S ound	VS in [cm/s]	read
NDE	N ear D istance of E valua- t ion	Near measuring window limit in [mm]	read and set
FDE	F ar D istance of E valuation	Far measuring window limit in [mm]	read and set
BDE	B oth D istances of E valua- t ion	Both evaluation distances at once [mm]	read and set
REF	REF erence measurement	REF distance in [mm]	read and set
UDS	U se DIP S witches	UDS binary [0/1]	read and set
FTO	F ilter T ime OUT	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0=NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
FA1	F ilter A ctive 1	Activate [1] or disable [0] filter	read and set
FW	F ilter W indow	Tolerance for current measurement value {5 ... 25} in [%]	read and set
OM	O utput M ode	OM coded [close NO = 0, open NC = 1]	read and set
ODF	O utput D ata F ormat	Data format of the 8-bit output [8-bit = 8B, BCD format = BCD]	read and set
MD	M aster D evice	Function as master {0 = NONE}, AD, RD, RT, SS, ATB, RDB, RTB	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
RT	R andom T ime	Random length pause after each measurement [0 = no pause, 1 = pause]	read and set
DIP	Read DIP switches	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RD	R elative D istance	Relative distance as number {0 ... 4095}	read
OER	O bject in E valuation R ange	Object within evaluation range (0 = no, 1 = yes)	read
ODR	O bject in D etection R ange	Object within detection range (0 = no, 1 = yes)	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	Sensor VER sion	Version string: xxxx	read
ID	Sensor ID entification	ID string: P&F UC...-...-IUE0/E2-R2 Eprom: xxxx Version yyyy	read
DAT	Software DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
FT	F unction T est	Self test, sensor returns fault code	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command

Programming notes

The following table specifies how the interface cable included with the ULTRA 3.0 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal com- partment Terminal no.
Brown (TD)	4 (RD)
Black (RD)	2 (TD)
Blue (GND)	3 (-U _B)

Filter function structure:



Ultrasonic sensor

Dimensions



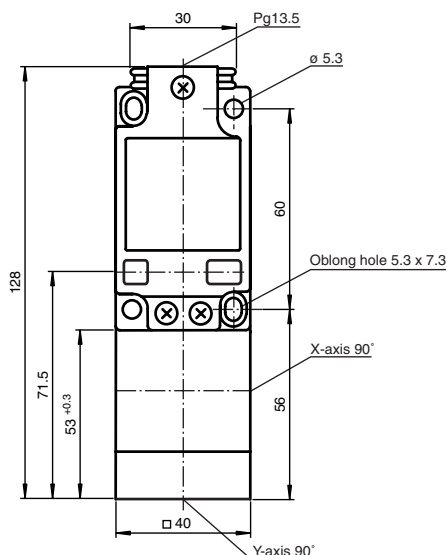
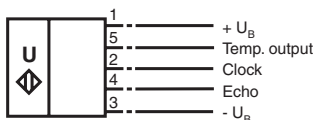
UB3000+U9+H3

Features

- Separate evaluation
- With temperature sensor
- Direct detection mode

Electrical connection

Standard symbol/Connection:



Technical data

General specifications	
Sensing range	300 ... 3000 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 300 mm
Transducer frequency	approx. 130 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
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
Pulse length	10 µs/K + timer pulse, synchronisation with the timer pulse
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pulse length	20 ... 300 µs
Pause length	≥ 50 x Pulse length
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	180 g

Notes

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:

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

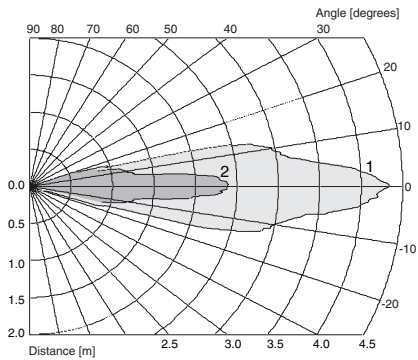
Put into the formula the temperature in Kelvin and the clock time in the unit μs .

Model number

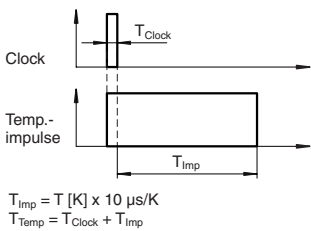
UB3000+U9+H3

Characteristic curves/
Additional information

Characteristic response curves



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



Accessories

Mounting aid

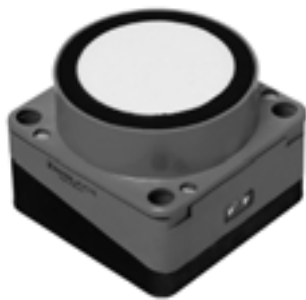
MH 04-2681F



Type	Sensing range	Page
UC6000-FP-E6-R2-P5 UC6000-FP-E7-R2-P5	6000 mm	154
UC6000-FP-IUE0-R2-P5 UC6000-FP-IUE2-R2-P5	6000 mm	158
UJ4000-FP-E2-P1	4000 mm	162
UJ6000-FP-8B+RS	6000 mm	164
UB1000+FP1+E6	1000 mm	168
UB6000-FP-H3	6000 mm	170

Ultrasonic sensor

Dimensions

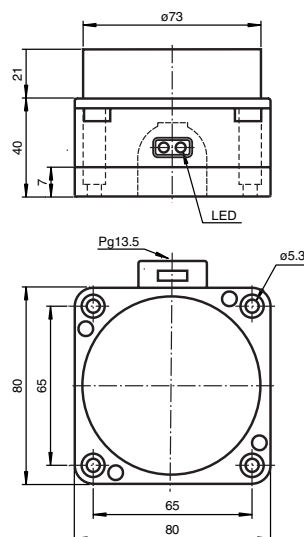


UC6000-FP-E6-R2-P5

UC6000-FP-E7-R2-P5

Features

- 2 independent switch outputs
- Serial Interfaces
- Switch point setting via DIP-switches or RS 232 interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001



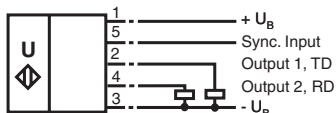
CE

Technical data

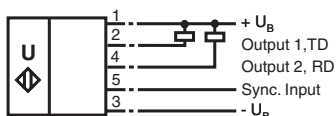
	UC6000-FP-E6-R2-P5	UC6000-FP-E7-R2-P5
General specifications		
Sensing range	800 ... 6000 mm	
Standard target plate	100 mm x 100 mm	
Unusable area	0 ... 800 mm	
Transducer frequency	approx. 65 kHz	
Response delay	for factory setting minimal (EM; NONE): ≤180 ms (2 measuring cycles) default (EM, MXN, 5, 2): ≤360 ms (4 measuring cycles) dynamic (EM, DYN): ≤270 ms (3 measuring cycles)	
Standard conformity	EN 60947-5-2	
Indicators/operating means		
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)	
LED yellow	switching state switch output 1 switching state switch output 2	
Electrical specifications		
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 60 mA	
Output		
Output type	2 switch outputs pnp, NO/NC	2 Switch outputs npn, normally open/closed
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Resolution	< 1 mm	< 1 mm
Temperature influence	≤ 2 %	≤ 2 %
Input/Output		
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		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa	
Material		
Housing	PBT	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	320 g	

Electrical connection

Standard symbol/Connection:
(Version E6, pnp)



Standard symbol/Connection:
(Version E7, npn)



Date of issue 07/19/2002

Notes

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.

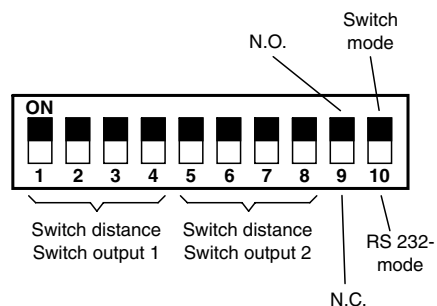
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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 $\triangle$ ON, 0 $\triangle$ OFF

DIP Switches in Terminal Compartment



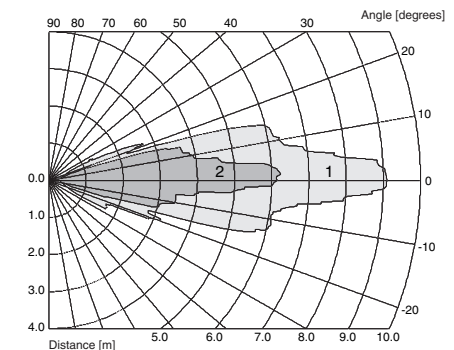
Model number

UC6000-FP-E6-R2-P5

UC6000-FP-E7-R2-P5

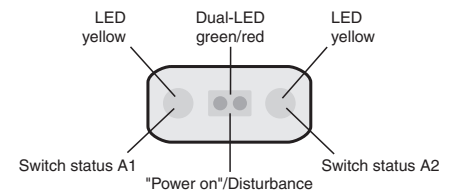
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-3505

Mounting flange

PA02

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
VS	Velocity of S ound	VS in [cm/s]	read
UDS	U se DIP S witches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SD2[1]	S witching D istance 2 1	SD21 distance in [mm]	read and set
SD22	S witching D istance 2 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
SH2	S witching H ysteresis 2	Hysteresis in [%]	read and set
BR	Unusable area (B lind R ange)	Unusable area to [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [close NO = 0, open NC = 1]	read and set
MD	M aster D evice	Function as master {0 = NONE},AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	S witching S tate 2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-E6/E7-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	Store User Configuration	Stores all settings	Command
RUC	Recall User Configuration	Restores stored settings	Command

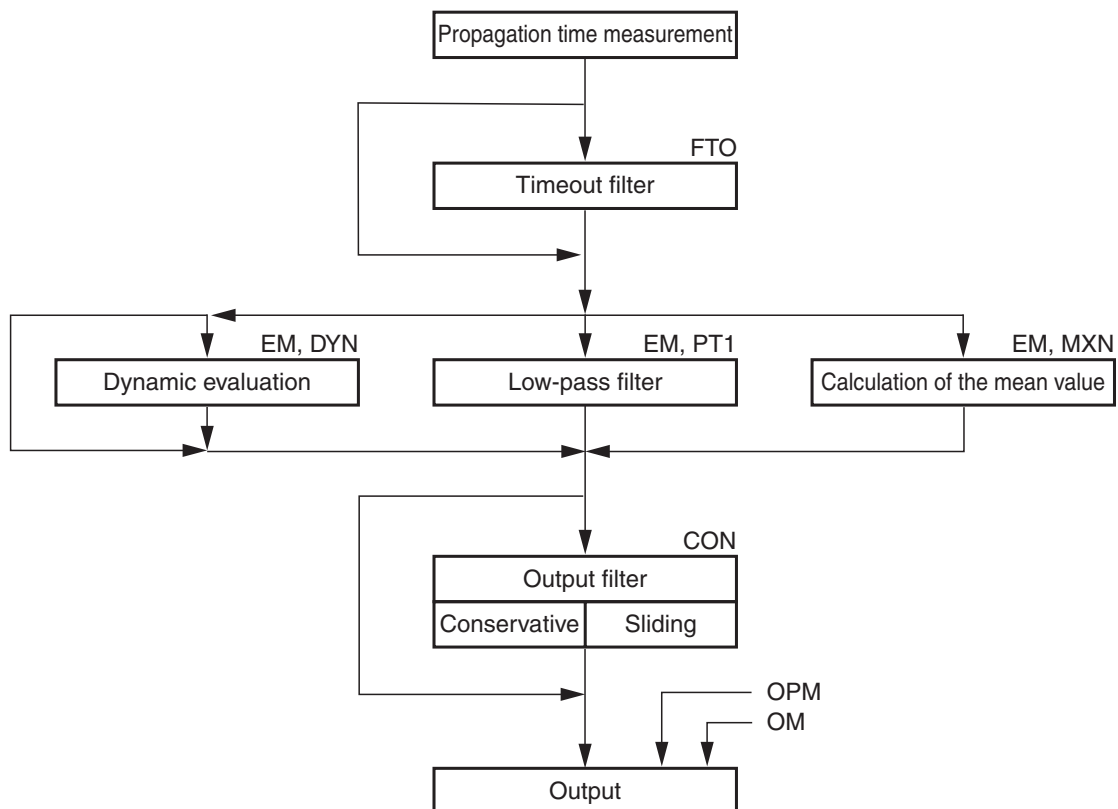
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

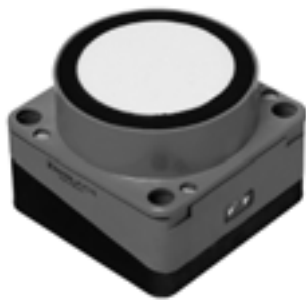
Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor

Dimensions

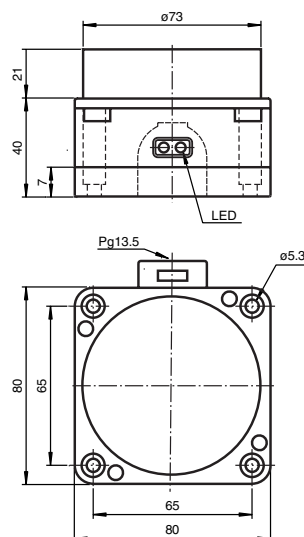


UC6000-FP-IUE0-R2-P5

UC6000-FP-IUE2-R2-P5

Features

- Analogue output, load-dependent voltage or current
- Switch output
- Serial Interfaces
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001



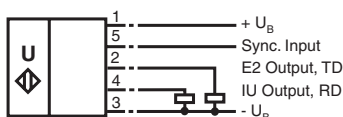
CE

Technical data

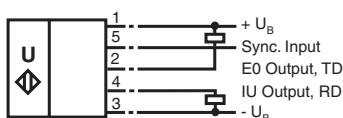
	UC6000-FP-IUE0-R2-P5	UC6000-FP-IUE2-R2-P5
General specifications		
Sensing range	800 ... 6000 mm	
Standard target plate	100 mm x 100 mm	
Unusable area	0 ... 800 mm	
Transducer frequency	approx. 65 kHz	
Response delay	for factory setting minimal (EM, NONE): ≤180 ms (2 measuring cycles) default (EM, MXN, 5, 2): ≤360 ms (4 measuring cycles) dynamic (EM, DYN): ≤270 ms (3 measuring cycles)	
Standard conformity	EN 60947-5-2	
Indicators/operating means		
LED red/green	permanent green : "Power on", flashes during standby operation red flashing : "Error", (e.g. background noise level too high)	
LED yellow	switching state switch output	
Electrical specifications		
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 60 mA	
Output		
Output type	1 switch output E0, npn, normally open/closed 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	1 switch output E5: pnp 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
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC	≤ 3 V DC
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 0.1 % of final value	≤ 0.1 % of final value
Resolution	depending on the set evaluation range: 0.172 mm , if evaluation range < 705 mm , Evaluation range [mm] / 3296, when evaluation range > 705 mm	depending on the set evaluation range: 0.172 mm , if evaluation range < 705 mm , Evaluation range [mm] / 3296, when evaluation range > 705 mm
Deviation of the characteristic curve	≤ 0.2 %	≤ 0.2 %
Temperature influence	≤ 2 %	≤ 2 %
Input/Output		
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	≤ 10 Hz , with external synchronisation	
Interface		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa	
Material		
Housing	PBT	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	320 g	

Electrical connection

Standard symbol/Connection:
(Version IUE2, pnp)



Standard symbol/Connection:
(Version IUE0, npn)



Date of issue 07/19/2002

Notes

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.

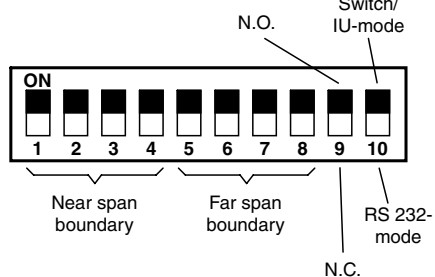
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

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)

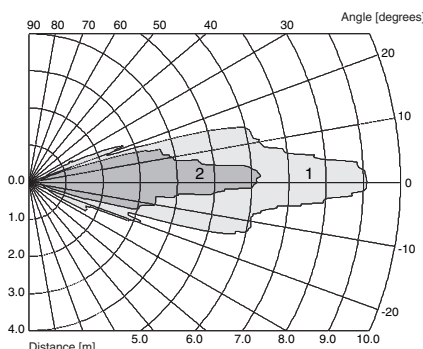
Model number

UC6000-FP-IUE0-R2-P5

UC6000-FP-IUE2-R2-P5

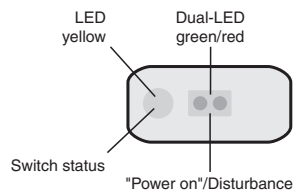
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window



Accessories

Mounting aid

MH 04-3505

Mounting flange

PA02

Service program

ULTRA 2001

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 S ound at 0 °C	VS0 in [cm/s]	read and set
VS	Velocity of S ound	VS in [cm/s]	read
TO	T emperature O ffset	TO in [0.1K]	read and set
TEM	TEM perature	TEM in [0.1K]	read and adapt to TO
REF	REF erence measurement	REF distance in [mm]	adaptation of VS0
UDS	U se DIP S witches	UDS binary [0/1]	read and set
SD1[1]	S witching D istance 1 1	SD11 distance in [mm]	read and set
SD12	S witching D istance 1 2	SD12 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
NDE	N ear D istance of E valuation	Near measuring window limit in [mm]	read and set
FDE	F ar D istance of E valuation	Far measuring window limit in [mm]	read and set
BR	Unusable area (B lind R ange)	Unusable area in [mm]	read and set
RR	R ange R eduction	Unusable area from [mm]	read and set
NEF	N o E cho is F ailure	1: "no echo" is failure; 0: "no echo" is not failure	read and set
FSF	F ail S afe F unction	Shutdown function in event of failure	read and set
CBT	C onstant B urst T ime	Burst time in [µs]	read and set
CCT	C onstant C ycle T ime	Time in [ms]	read and set
SSY	S tartup S YNchronised	SSY binary [0/1]	read and set
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0 = NONE; PT1[f,p,c]; MXN[m,n]; DYN[p] }	read and set
CON	CON servative filter	Counter threshold as number	read and set
OPM	O peration M ethod	switch output operating mode { S,R,W,L,H } analogue output { S,L }	read and set
OM	O utput M ode	OM coded [normally-open NO = 0, normally-closed NC = 1]	read and set
FSF	F ail S afe F unction	Failure function type {0,1,2},[fault current in 0.1 mA]	read and set
MD	M aster D evice	Function as master { 0 = NONE },AD,RD,RT,SS,ATB,RDB,RTB }	read and set
DIP	DIP switch settings	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RD	R elative D istance	Relative distance as number {0 ... 4095}	read
RT	R un T ime	Echo run time in machine cycles [1 machine cycle = 1.085µs]	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
ADB	A bsolute D istance B inary	Distance in [mm], binary	read
RDB	R elative D istance B inary	Relative distance as number {0 ... 4095} binary	read
RTB	R un T ime B inary	Echo run time in machine cycles [1 machine cycle = 1.085µs], binary	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	VER sion	Version string: xxxx	read
ID	ID entification	ID string: P&F UC...-IUE0/E2-R2 Eprom: xxxx Version yyyy	read
DAT	DAT e	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
ST	ST atus	Status as hexadecimal string	read
RST	ReSeT	Performs a reset	Command
DEF	DEF ault settings	Restores defaults	Command
SUC	S tore U ser C onfiguration	Stores all settings	Command
RUC	R ecall U ser C onfiguration	Restores stored settings	Command

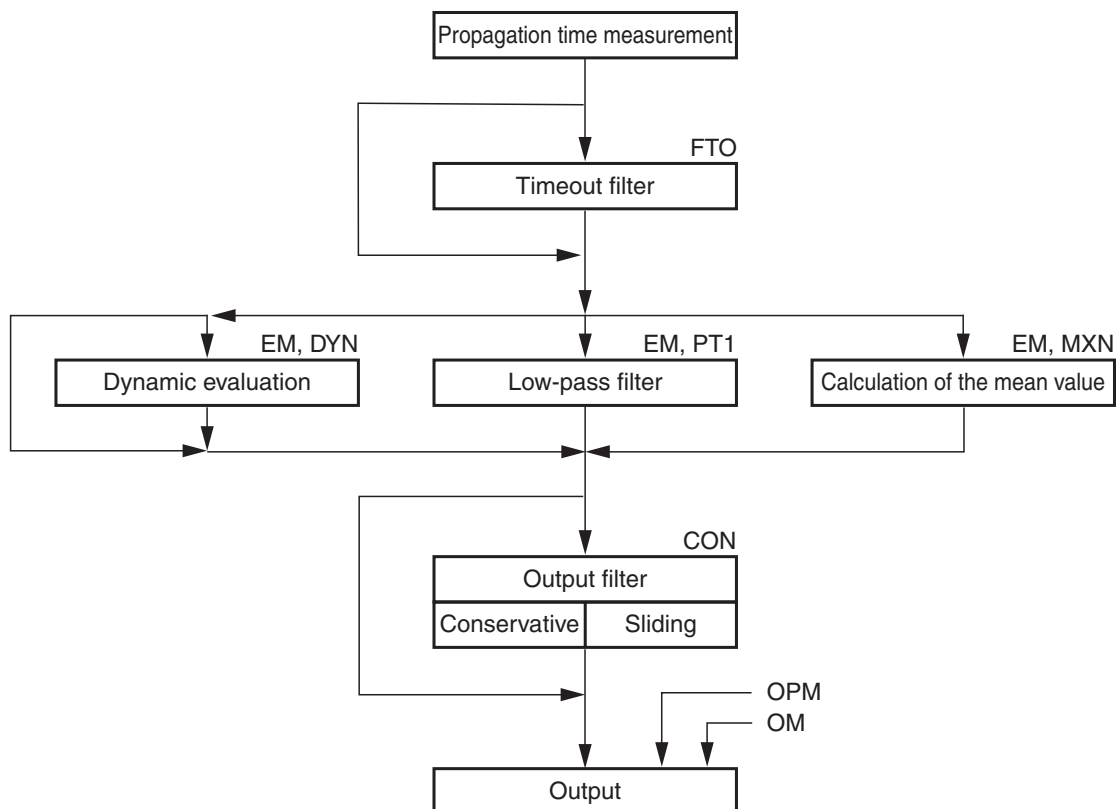
Programming instructions

Caution: When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

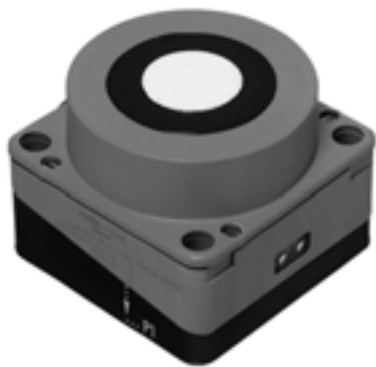
The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Ultrasonic sensor



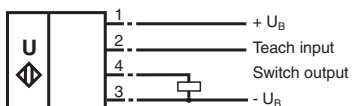
UJ4000-FP-E2-P1

Features

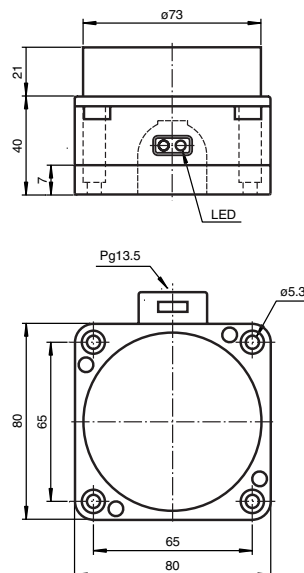
- Absolute polarity reversal protection
- 1 switch output
- TEACH-IN input
- Reflex sensor function

Electrical connection

Standard symbol/Connection:



Dimensions



CE

Technical data

General specifications

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 $+U_B$ ≤ 150 ms for TEACH-IN with $-U_B$

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (reflector incorrectly positioned)
LED yellow	switching state switch output

Electrical specifications

Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 90 mA

Output

Output type	1 switch output, NO pnp
Rated operational current	200 mA, short circuit/overload protected
Voltage drop	≤ 3 V

Input

Input type	1 TEACH-IN input, operating distance 1: $-U_B$... $(-U_B + 2 V)$, operating distance 2: $(+U_B - 2 V)$... $+U_B$
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Ambient conditions

Ambient temperature	-10 ... 50 °C (263 ... 323 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

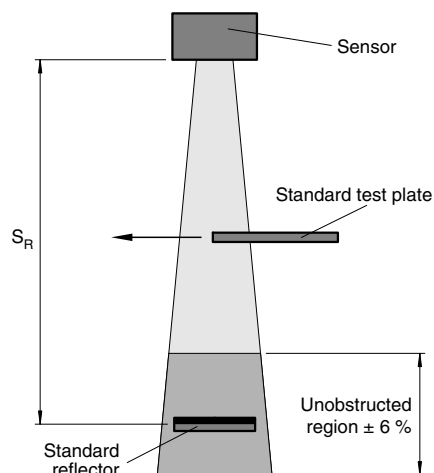
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	320 g

Notes

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 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.

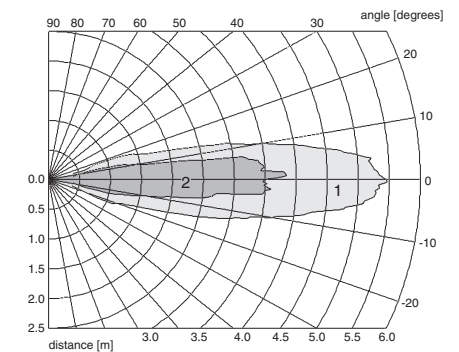


Model number

UJ4000-FP-E2-P1

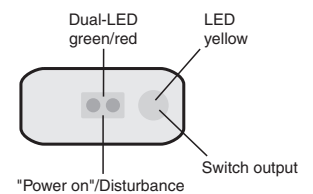
Characteristic curves/ Additional information

Characteristic response curves



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

LED-Window

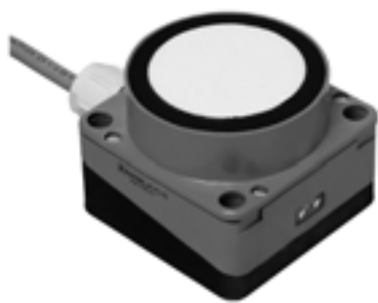


Accessories

Mounting aid

MH 04-3505

Ultrasonic sensor



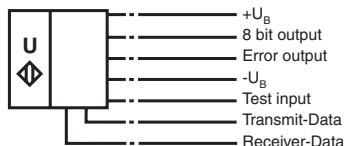
UJ6000-FP-8B+RS

Features

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

Electrical connection

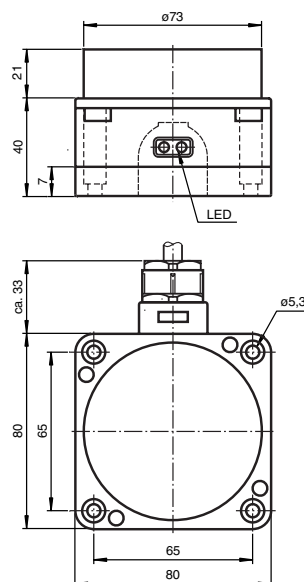
Standard symbol/Connection:



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

Dimensions



Technical data

General specifications	
Sensing range	800 ... 6000 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 800 mm
Transducer frequency	approx. 65 kHz
Response delay	static 4: ≤ 720 ms (factory setting) static 1: ≤ 180 ms dynamic: ≤ 270 ms
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED red/green	green LED: Power on red LED, flashing at 2 Hz: error (high level of external noise)
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 90 mA
Output	
Output type	8 bit output for outputting object distance, pnp 1 fault output, pnp 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	
Input type	1 test input, (-U _B + 5 V) up to +U _B , ≤ 100 kOhm
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-10 ... 50 °C (263 ... 323 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	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

Notes

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.

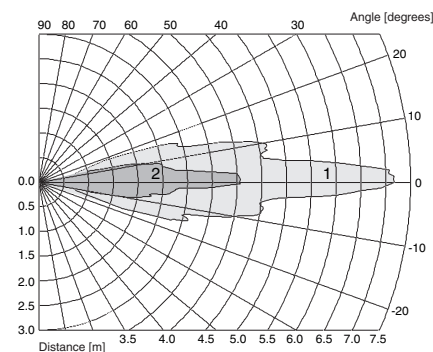
A 1 level at the test input causes the 8-bit output to switch from 00000000 to 11111111 and back every 200 ms.

Model number

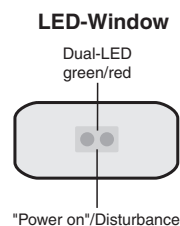
UJ6000-FP-8B+RS

Characteristic curves/ Additional information

Characteristic response curves



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



Accessories

Mounting aid

MH 04-3505

Mounting flange

PA02

Service program

ULTRA 2001

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)

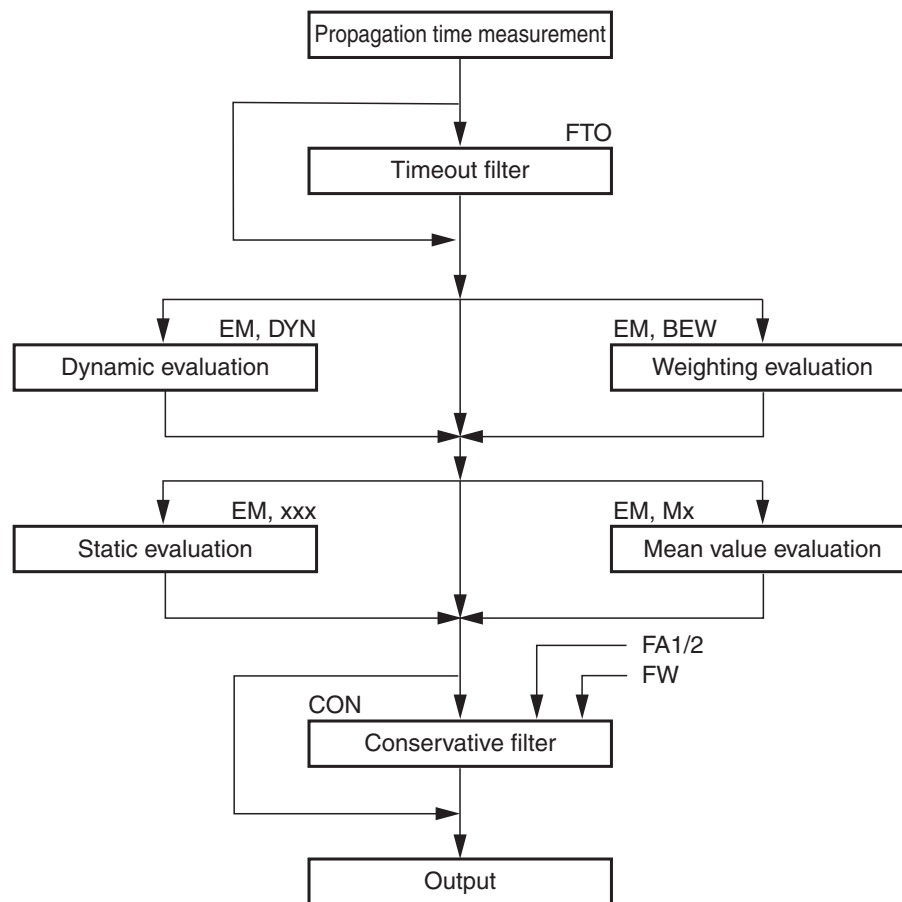
Command	Meaning	Parameter	Access
VS	V elocity of S ound	VS in [cm/s]	read
SD1	S witching D istance 1	SD1 distance in [mm]	read and set
SD2	S witching D istance 2	SD2 distance in [mm]	read and set
SH1	S witching H ysteresis 1	Hysteresis in [%]	read and set
SH2	S witching H ysteresis 2	Hysteresis in [%]	read and set
NDE	N ear D istance of E valuation	Near measuring window limit in [mm]	read and set
FDE	F ar D istance of E valuation	Far measuring window limit in [mm]	read and set
BDE	B oth D istances of E valuation	Measuring window limits in [mm]	read and set
REF	R eference measurement	Reference measurement	
FTO	F ilter T ime O ut	Number of measurements without echo to be filtered	read and set
EM	E valuation M ethod	Evaluation method { 0=NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] }	read and set
CON	C ONservative filter	Counter threshold as number	read and set
FA1	F ilter A ctivate for Output 1	conservative or integrating filter (0 = inactive, 1 = active)	read and set
FA2	F ilter A ctivate for Output 2	conservative or integrating filter (0 = inactive, 1 = active)	read and set
FW	F ilter W indow	Filter width in % around measured value (5 ... 25)	read and set
OM	O utput M ode	OM coded [close NO = 0, open NC = 1]	read and set
ODF	O utput D ata F ormat	Data format of the 8-bit output (8B = relative, BCD = absolute)	read and set
MD	M aster D evice	Function as master {0 = NONE},AD,RD,RT,SS,ATB,RDB,RTB }	read and set
CCT	C onstant C ycle T ime	Cycle time (0 = variable, 1 = constant)	read and set
CBT	C onstant B urst T ime	Length of the ultrasonic burst in µs: 0 = variable, x = fixed (UJ3000: x = 20 ... 500; UJ6000: x = 50 ... 1000)	read and set
RT	R andom T ime	Random length pause between 2 measurements (= active, 0 = inactive)	read and set
DIP	Read D IP switches	DIP switch setting as hexadecimal string	read
AD	A bsolute D istance	Distance in [mm]	read
RD	R elative D istance	Relative distance as number {0 ... 4095}	read
SS1	S witching S tate 1	SS1 binary [0: inactive, 1 active] (independent of OM)	read
SS2	S witching S tate 2	SS2 binary [0: inactive, 1 active] (independent of OM)	read
ODR	O bject in D etection R ange	Object in detection range (0 = no, 1 = yes)	read
OER	O bject in E valuation R ange	Object in evaluation range (0 = no, 1 = yes)	read
ER	E cho R eceived	Echo detected: no, yes [0/1]	read
VER	V ERsion	Version string: xxxx	read
ID	I Dentification	ID string: P&F UJ....-8B-RS Eprom: xxxx Version yyyy	read
DAT	D ATe	Date string: e.g. Date: 06/11/96 Time: 16:14:26	read
FT	F unction T est	Performs self-test	Command
RST	R e S e T	Performs a reset	Command
DEF	D E F ault settings	Restores defaults	Command

Programming instructions

The following table specifies how the interface cable included with the ULTRA 2001 service program (see accessories) is to be connected.

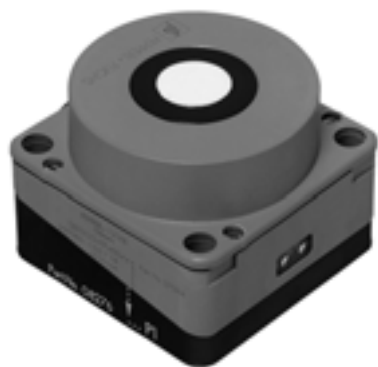
Interface cable Conductor colour	Sensor terminal compartment Terminal no.
brown (TD)	4 (RD)
black (RD)	2 (TD)
blue (GND)	3 (-U _B)

Structure of the filter functions



Retro-reflective photoelectric

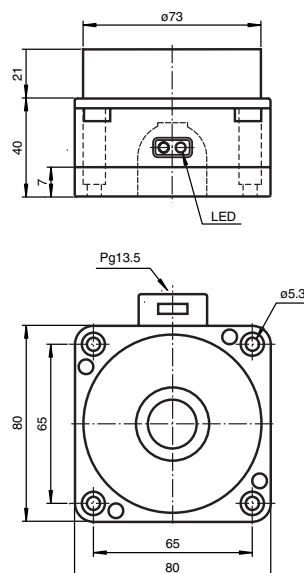
Dimensions



UB1000+FP1+E6

Features

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



CE

Technical data

General specifications

Sensing range	200 ... 1000 mm
Standard target plate	20 mm x 20 mm
Unusable area	0 ... 200 mm
Transducer frequency	approx. 175 kHz
Response delay	≤ 100 ms

Standard conformity

Standards	EN 60947-5-2
-----------	--------------

Indicators/operating means

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 = OF/independent switch points

Electrical specifications

Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 90 mA

Output

Output type	2 switch outputs pnp, NO/NC
Rated operational current	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V DC
Switching frequency	≤ 5 Hz
Range hysteresis	≤ 5 % of the set operating distance
Repeat accuracy	≤ 1 %
Temperature influence	≤ 0.17 % / K

Ambient conditions

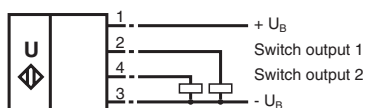
Ambient temperature	-10 ... 50 °C (263 ... 323 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP65
Connection type	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:



Notes

Description of the sensor functions

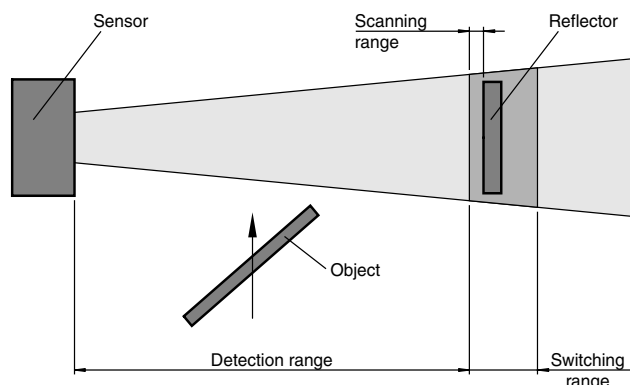
The sensor is suitable for direct-detection mode as well as beam-interruption mode. The functions of the outputs can be set with switches S9 and S10 in accordance with the following table.

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.

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.

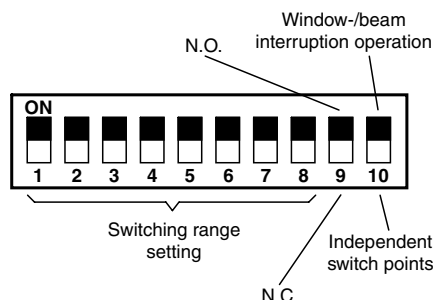


For use as a barrier, set the close function (S9 = 1) and window mode (barrier mode) (S10 = 1). The distance between the sensor and the reflector determines the switching range which must be set using a switch between S1 and S8. Only one switch may be set to "ON", resulting in a switching range of 100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

DIP Switches in Terminal Compartment

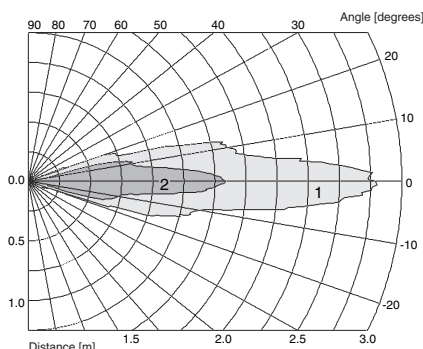


Model number

UB1000+FP1+E6

Characteristic curves/ Additional information

Characteristic response curves



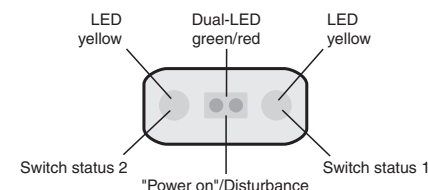
Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Output functions

	S9	S10	Unusable area	Switching point	Switching point	Detection limit
A1	1	0				
A2	1	0				
A1	0	0				
A2	0	0				
A1	1	1				
A2	1	1				
A1	0	1				
A2	0	1				

Unusable area
 Output open
 Output closed

LED-Window



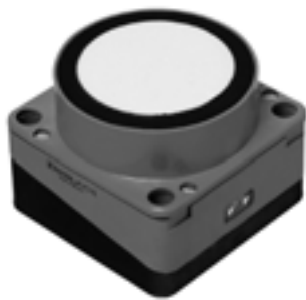
Accessories

Mounting aid

MH 04-3505

Ultrasonic sensor

Dimensions



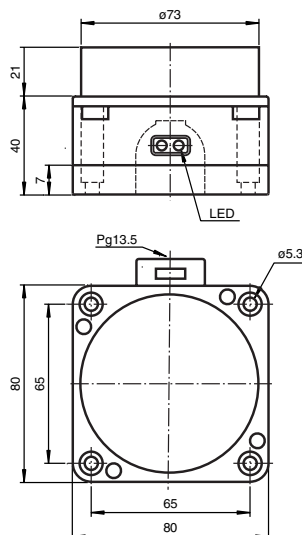
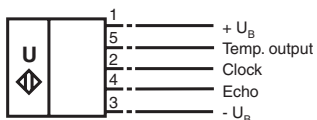
UB6000-FP-H3

Features

- Separate evaluation
- With temperature sensor
- Direct detection mode

Electrical connection

Standard symbol/Connection:



Technical data

General specifications	
Sensing range	800 ... 6000 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 800 mm
Transducer frequency	approx. 65 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 30 mA
Output	
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
Pulse length	10 µs/K + timer pulse, synchronisation with the timer pulse
Input	
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive
Pause length	≥ 50 x Pulse length
Pulse length	50 ... 500 µs
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	terminal compartment, ≤ 2.5 mm ² conductor csa
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	320 g

Notes

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:

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

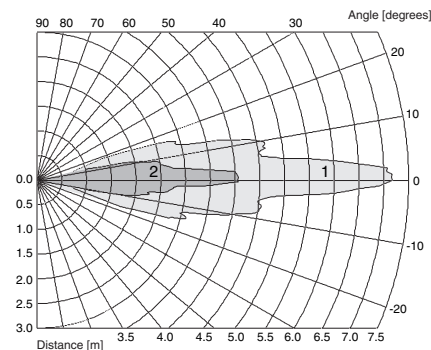
Put into the formula the temperature in Kelvin and the clock time in the unit μs .

Model number

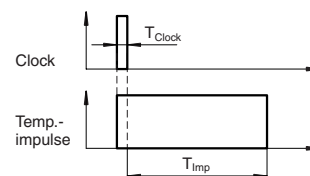
UB6000-FP-H3

Characteristic curves/ Additional information

Characteristic response curves



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



$$T_{Imp} = T [K] \times 10 \mu s / K$$

$$T_{Temp} = T_{Clock} + T_{Imp}$$

Accessories

Mounting aid

MH 04-3505



Type	Sensing range	Page
UC300-F43-2KIR2-V17	300 mm	174
UC2000-F43-2KIR2-V17	2000 mm	176

Ultrasonic sensor



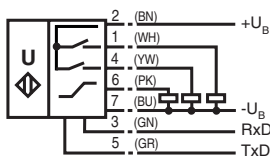
UC300-F43-2KIR2-V17

Features

- Current output 4 mA ... 20 mA
- 2 relay outputs
- Serial Interfaces
- Temperature compensation
- Reverse polarity protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:

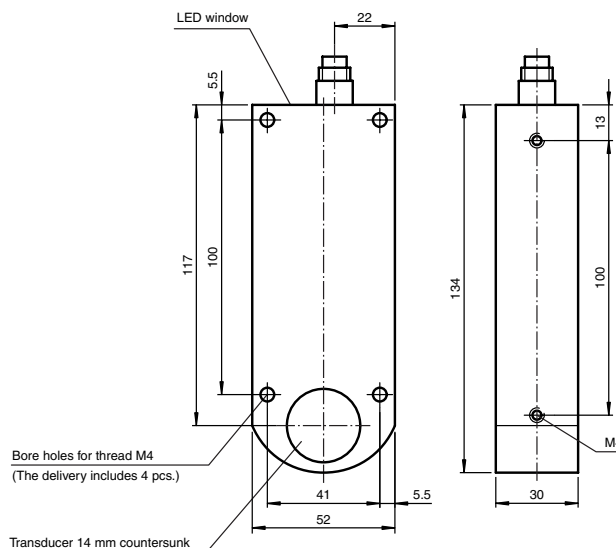


Core colours in accordance with EN 60947-5-2.

Connector V17



Dimensions



Technical data

General specifications	
Sensing range	0 ... 300 mm
Standard target plate	100 mm x 100 mm
Unusable area	0
Transducer frequency	approx. 380 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)
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green	continuous: object in the measuring window flashing: object outside the measuring window
LED red	error (e. g. interference level too high)
Electrical specifications	
Operating voltage	10 ... 30 V DC without current output function 15 ... 30 V DC with current output function Ripple ± 10 % _{SS}
Power consumption	≤ 2 W (all relays pulled-in, current output 20 mA) no-load power consumption ≤ 0.7 W
Output	
Output type	2 relay outputs, 1 analogue output 4 ... 20 mA
Contact loading	60 V DC/1 A (max. 24 W DC), ohmic
Lifetime	electrical: 3 x 10 ⁵ operating cycles at ohm. Load (1 A / 24 V DC) mechanical: 10 ⁷ operating cycles
Range hysteresis	0 ... 15 % parameterisable with ULTRA 2001
Repeat accuracy	≤ 0.1 % of final value
Resolution	0.17 mm
Load impedance	current output: ≤ 500 Ohm
Deviation of the characteristic curve	< 0.2 % of final value
Temperature influence	≤ 2 % , internal temperature compensation
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	0 ... 70 °C (273 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	8-pin round connector, Lumberg type RSF 8
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	290 g

Notes

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)

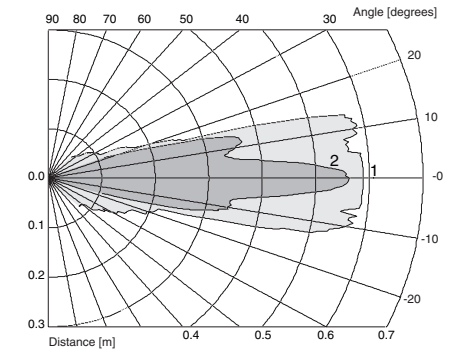
Command	Meaning	Parameter	Access
VS0	Velocity of Sound at 0 °C	Velocity of sound at 0 °centigrade VS0 in [cm/s] {10000 ... 60000}	read and set
VS	Velocity of Sound	Velocity of sound VS in [cm/s]	read
TO	Temperature Offset	TO in [0.1 K]	read and set
TEM	TEMperature	TEM in [0.1 K]	read and adapt to TO
REF	REFerence measurement	REF distance in [mm] {0 ... 600}	adaptation of VS0
SD1	Switching Distance 1	switching point, relay 1 SD1 in [mm] {0 ... 600}	read and set
SD2	Switching Distance 2	switching point, relay 2 SD2 in [mm] {0 ... 600}	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] {0 ... 600}	read and set
FDE	Far Distance of Evaluation	Far measuring window limit in [mm]{0 ... 600}	read and set
BR	Unusable area (Blind Range)	Unusable area in [mm] {0 ... 600}	read and set
CBT	Constant Burst Time	Burst length in [µs] {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 NO = 0, normally-closed NC = 1]	read and set
FSF	Fail Safe Function	Failure function type e.g. FSF,11,35 {0,1,2}, [fault current in 0.1 mA]	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 itself according to NDE, FDE or SD1 and SD2	read and set
NEF	No Echo Failure	Sensor behavior 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: e.g. 04/12/99 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

Model number

UC300-F43-2KIR2-V17

Characteristic curves/ Additional information

Characteristic response curves



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

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 ⇒ 25 mm
20 mA ⇒ 300 mm

FSF:

Error ⇒ Relay 1 and 2: latest state
⇒ Analogue output: Iout = 3,9 mA

NEF:

No echo ⇒ error message

MA,S:

Switching mode

Accessories

RS 232 interface

UC-F43-R2

Service program

ULTRA 2001

Cable sockets *)

V17-G-2M-PUR

V17-G-5M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



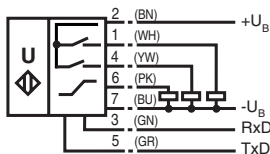
UC2000-F43-2KIR2-V17

Features

- Current output 4 mA ... 20 mA
- 2 relay outputs
- Serial Interfaces
- Temperature compensation
- Reverse polarity protection
- Parameterisable with ULTRA 2001

Electrical connection

Standard symbol/Connection:

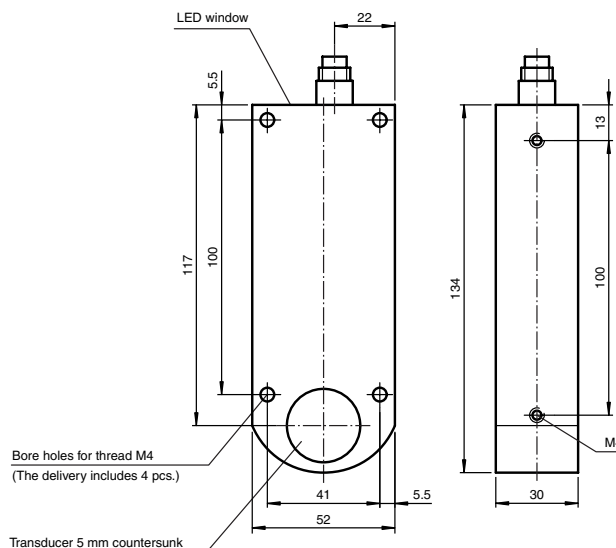


Core colours in accordance with EN 60947-5-2.

Connector V17



Dimensions



Technical data

General specifications	
Sensing range	100 ... 2000 mm
Standard target plate	100 mm x 100 mm
Unusable area	0 ... 100 mm
Transducer frequency	approx. 175 kHz
Response delay	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)
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green	continuous: object in the measuring window flashing: object outside the measuring window
LED red	error (e. g. interference level too high)
Electrical specifications	
Operating voltage	10 ... 30 V DC without current output function 15 ... 30 V DC with current output function Ripple ± 10 % _{SS}
Power consumption	≤ 2 W (all relays pulled-in, current output 20 mA) no-load power consumption ≤ 0.7 W
Output	
Output type	2 relay outputs, 1 analogue output 4 ... 20 mA
Contact loading	60 V DC / 1 A (max. 24 W DC), ohmic
Lifetime	electrical: 3 x 10 ⁵ operating cycles at ohm. Load (1 A / 24 V DC) mechanical: 10 ⁷ operating cycles
Range hysteresis	0 ... 15 % parameterisable with ULTRA 2001
Repeat accuracy	≤ 0.1 % of final value
Resolution	0.5 mm
Load impedance	current output: ≤ 500 Ohm
Deviation of the characteristic curve	< 0.2 % of final value
Temperature influence	≤ 2 % , internal temperature compensation
Interface	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	8-pin round connector, Lumberg type RSF 8
Material	
Housing	PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	290 g

Notes

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)

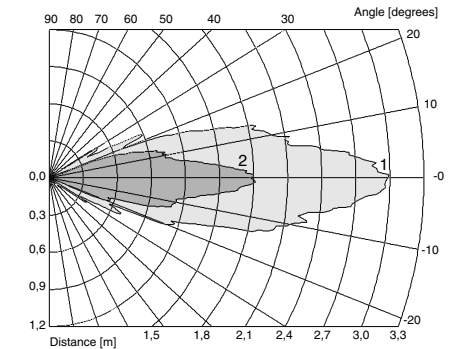
Command	Meaning	Parameter	Access
VS0	Velocity of Sound at 0 °C	Velocity of sound at 0 °centigrade VS0 in [cm/s] {10000 ... 60000}	read and set
VS	Velocity of Sound	Velocity of sound VS in [cm/s]	read
TO	Temperature Offset	TO in [0.1K]	read and set
TEM	TEMperature	TEM in [0.1K]	read and adapt to TO
REF	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 SD2 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] {100 ... 4000}	read and set
CBT	Constant Burst Time	Burst length in [µs] {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 NO = 0, normally-closed NC = 1]	read and set
FSF	Fail Safe Function	Failure function type e.g. FSF,11,35 {0,1,2}, [fault current in 0.1 mA]	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 itself according to NDE, FDE or SD1 and SD2	read and set
NEF	No Echo Failure	Sensor behavior 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 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 = 1.085µs] 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: e.g. 04/12/99 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

Model number

UC2000-F43-2KIR2-V17

Characteristic curves/ Additional information

Characteristic response curves



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

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 ⇒ 100 mm

20 mA ⇒ 2000 mm

FSF:

Error ⇒ Relay 1 and 2: latest state

⇒ Analogue output: I_{OUT} = 3,9 mA

NEF:

No echo ⇒ error message

MA,S:

Switching mode

Accessories

RS 232 interface

UC-F43-R2

Service program

ULTRA 2001

Cable sockets *)

V17-G-2M-PUR

V17-G-5M-PUR

*) Additional cable sockets find in section „Accessories“.

Series -F54



Type	Sensing range	Page
UB500-F54-E4-V15 UB500-F54-E5-V15	500 mm	180
UB500-F54-I-V15 UB500-F54-U-V15	500 mm	184
UB500-F54-H3-V1	500 mm	186
UB2000-F54-E4-V15 UB2000-F54-E5-V15	2000 mm	188
UB2000-F54-I-V15 UB2000-F54-U-V15	2000 mm	192
UB2000-F54-H3-V1	2000 mm	194

Ultrasonic sensor



UB500-F54-E4-V15

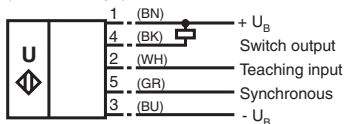
UB500-F54-E5-V15

Features

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

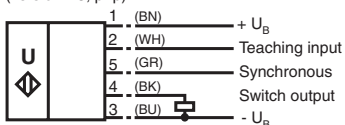
Electrical connection

Standard symbol/Connections:
(version E4, npn)



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

Standard symbol/Connections:
(version E5, pnp)

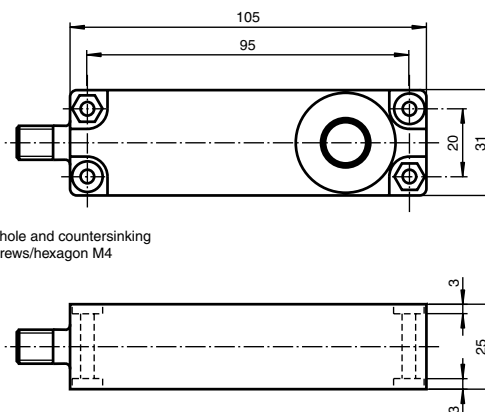


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	UB500-F54-E4-V15	UB500-F54-E5-V15
General specifications		
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	≤ 50 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	permanently red: Error red, flashing: TEACH-IN function, object not detected	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 55 mA	
Output		
Output type	1 switch output E4, npn NO/NC	1 switch output E5, pnp NO/NC
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V	≤ 3 V
Switching frequency	max. 10 Hz	max. 10 Hz
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 1 % of final value	≤ 1 % of final value
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
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	
Input/Output		
Synchronisation	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	
Multiplex operation	≤ 100 / n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	connector V15 (M12 x 1), 5 pin	
Material	ABS	
Housing	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	100 g	

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.

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

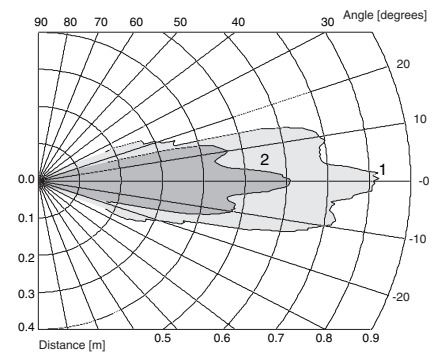
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

UB500-F54-E4-V15

UB500-F54-E5-V15

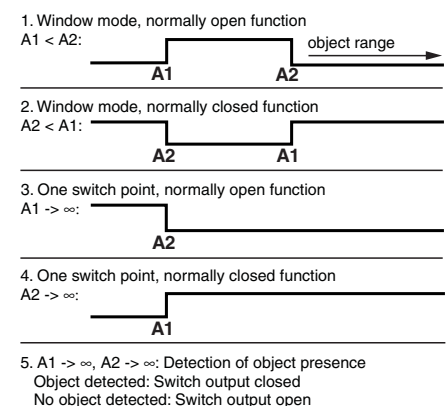
Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function



Accessories

Programming unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC

V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Default setting of switching points

A1 = unusable area

A2 = nominal distance

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	on	Previous state	off

Ultrasonic sensor



UB500-F54-I-V15

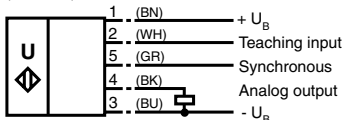
UB500-F54-U-V15

Features

- Measuring window adjustable
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Analogue output 0 ... 10 V
UB500-F54-U-V15
- Analogue output 4 mA ... 20 mA
UB500-F54-I-V15

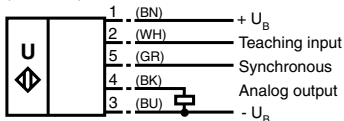
Electrical connection

Standard symbol/Connections: (version I)



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

Standard symbol/Connections: (version U)

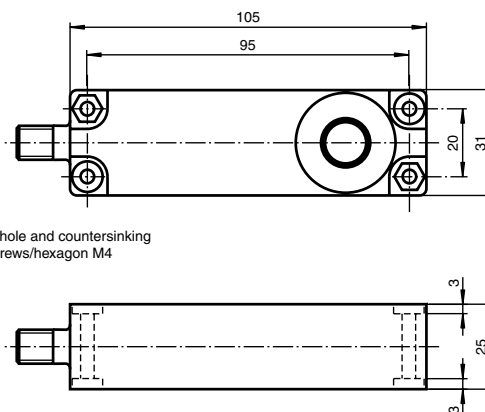


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	UB500-F54-I-V15	UB500-F54-U-V15
General specifications		
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	≤ 50 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	permanently red: Error red, flashing: TEACH-IN function, object not detected	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	15 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 55 mA	≤ 55 mA
Output		
Output type	1 analogue output 4 ... 20 mA	1 analogue output 0 ... 10 V
Load impedance	0 ... 300 Ohm	≥ 1 kOhm
Deviation of the characteristic curve	± 1 % of final value	± 1 % of final value
Repeat accuracy	± 0.1 % of final value	± 0.1 % of final value
Resolution	0.13 mm	0.11 mm
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
Input type	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	
Input/Output		
Synchronisation	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	
Multiplex operation	≤ 100 / n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	connector V15 (M12 x 1), 5 pin	
Material		
Housing	ABS	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	100 g	

Notes

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.

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 $-U_B$

Default setting

A1: unusable area
A2: nominal distance
Direction of effect: rising ramp

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	On	Previous state	off

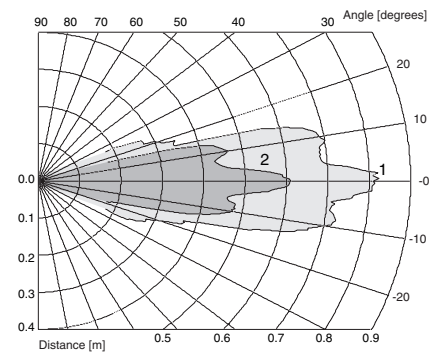
Model number

UB500-F54-I-V15

UB500-F54-U-V15

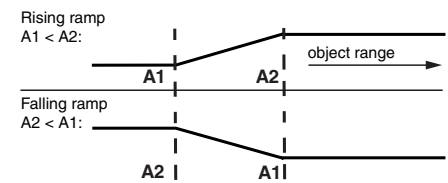
Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function



Accessories

Programming unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC

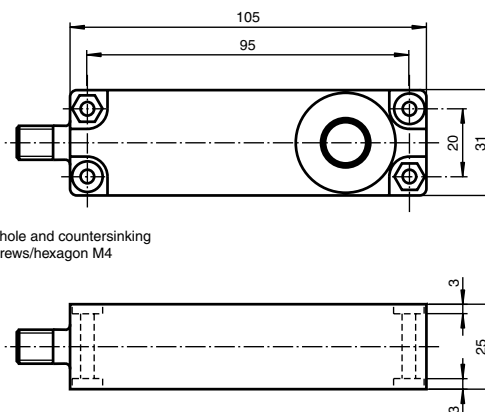
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



Dimensions



Bore hole and countersinking
for screws/hexagon M4

UB500-F54-H3-V1



Features

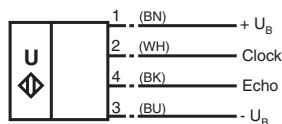
- Separate evaluation
- Direct detection mode

Technical data

General specifications	
Sensing range	60 ... 500 mm
Unusable area	0 ... 60 mm ¹⁾
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 30 mA (typ. 20 mA)
Output	
Output type	1 pulse output for echo run time, short-circuit-proof Open collector pnp with pulldown resistance = 22 kOhm level 0 (no echo): -U _B level 1 (Echo detected): ≥ (+U _B -2 V)
Output rated operating current	15 mA
Input	
Input type	1 pulse input for transmission pulse (clock) level 0 (active): < 1.5 V level 1 (inactive): 3.5 V ... +U _B
Pulse length	5 ... 100 μs (typ. 50 μs) ²⁾
Pause length	≥ 100 x Pulse length
Impedance	5 kOhm
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	
Housing	ABS
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	110 g

Electrical connection

Standard symbol/Connection:



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

Connector V1



Notes

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 transmitter pulse duration T_i and is calculated to:

$$BR [mm] = 0.2 \times (T_i [\mu s] + 250)$$

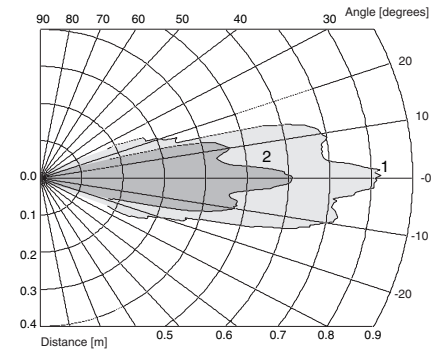
- 2) For $T_i < 50 \mu s$ calculate with reduced detection range.

Model number

UB500-F54-H3-V1

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Cable sockets ^{*)}

V1-G-2M-PVC

V1-W-2M-PVC

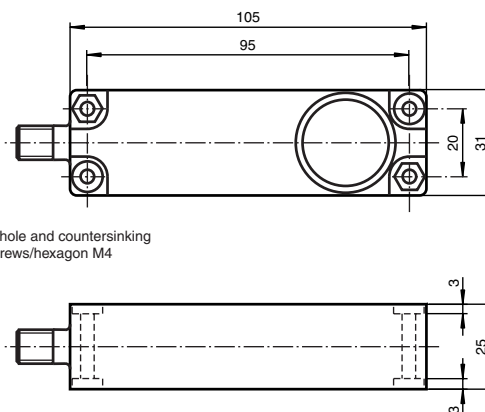
^{*)} Additional cable sockets find in section „Accessories“.

-F54 series

Ultrasonic sensor



Dimensions



UB2000-F54-E4-V15

UB2000-F54-E5-V15



Features

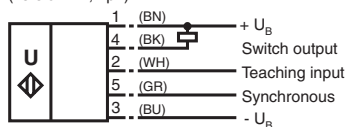
- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation

Technical data

	UB2000-F54-E4-V15	UB2000-F54-E5-V15
General specifications		
Sensing range	80 ... 2000 mm	
Adjustment range	100 ... 2000 mm	
Unusable area	0 ... 80 mm	
Standard target plate	100 mm x 100 mm	
Transducer frequency	approx. 175 kHz	
Response delay	≤ 150 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	permanently red: Error red, flashing: TEACH-IN function, object not detected	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	≤ 55 mA	
Output		
Output type	1 switch output E4, npn NO/NC	1 switch output E5, pnp NO/NC
Rated operational current	200 mA , short circuit/overload protected	200 mA , short circuit/overload protected
Voltage drop	≤ 3 V	≤ 3 V
Switching frequency	max. 3 Hz	max. 3 Hz
Range hysteresis	≤ 1 % of the set operating distance	≤ 1 % of the set operating distance
Repeat accuracy	≤ 1 % of final value	≤ 1 % of final value
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
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	
Input/Output		
Synchronisation	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	
Synchronisation frequency	Common mode operation ≤ 33 Hz Multiplex operation ≤ 33 / n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	connector V15 (M12 x 1), 5 pin	
Material		
Housing	ABS	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	100 g	

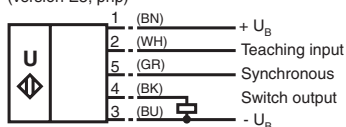
Electrical connection

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.

Connector V15



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.

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

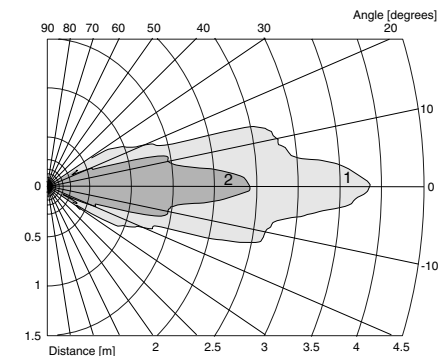
- Cover sensor with hand or remove all objects from sensing range
- TEACH-IN switching point A1 with $-U_B$
- TEACH-IN switching point A2 with $+U_B$

UB2000-F54-E4-V15

UB2000-F54-E5-V15

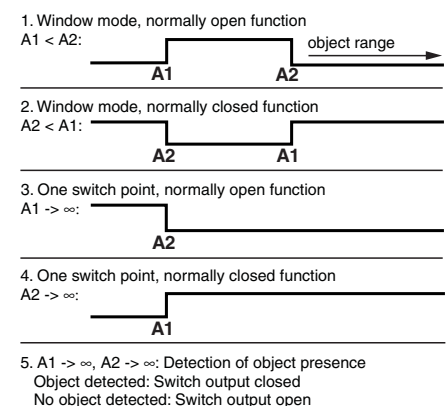
Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function



Accessories

Programming unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC

V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Default setting of switching points

A1 = unusable area

A2 = nominal distance

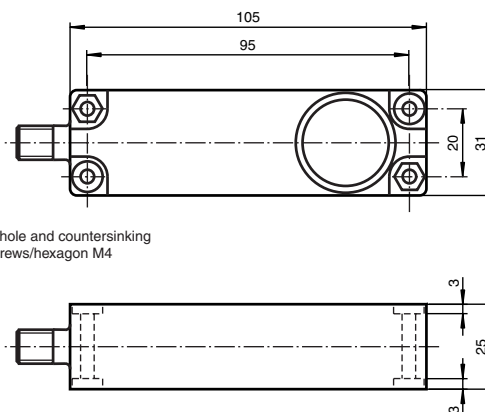
LED Displays

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	on	Previous state	off

Ultrasonic sensor



Dimensions



UB2000-F54-I-V15

UB2000-F54-U-V15



Features

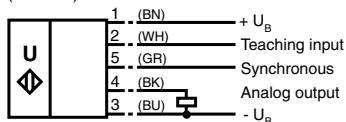
- Measuring window adjustable
- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation
- Analogue output 0 ... 10 V
UB2000-F54-U-V15
- Analogue output 4 mA ... 20 mA
UB2000-F54-I-V15

Technical data

	UB2000-F54-I-V15	UB2000-F54-U-V15
General specifications		
Sensing range	80 ... 2000 mm	
Adjustment range	100 ... 2000 mm	
Unusable area	0 ... 80 mm	
Standard target plate	100 mm x 100 mm	
Transducer frequency	approx. 175 kHz	
Response delay	≤ 150 ms	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
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	permanently red: Error red, flashing: TEACH-IN function, object not detected	
Electrical specifications		
Operating voltage	10 ... 30 V DC , ripple 10 % _{SS}	15 ... 30 V DC , ripple 10 % _{SS}
No-load supply current	≤ 55 mA	≤ 55 mA
Output		
Output type	1 analogue output 4 ... 20 mA	1 analogue output 0 ... 10 V
Load impedance	0 ... 300 Ohm	≥ 1 kOhm
Deviation of the characteristic curve	± 1 % of final value	± 1 % of final value
Repeat accuracy	± 0.1 % of final value	± 0.1 % of final value
Resolution	0.5 mm	0.47 mm
Temperature influence	± 1.5 % of final value	± 1.5 % of final value
Input		
Input type	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	
Input/Output		
Synchronisation	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	
Synchronisation frequency		
Common mode operation	≤ 33 Hz	
Multiplex operation	≤ 33 / n Hz, n = number of sensors	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	
Connection type	connector V15 (M12 x 1), 5 pin	
Material		
Housing	ABS	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	
Mass	100 g	

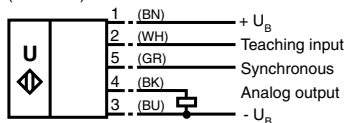
Electrical connection

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.

Connector V15



Notes

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.

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 $-U_B$

Default setting

A1: unusable area
A2: nominal distance
Direction of effect: rising ramp

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	On	Previous state	off

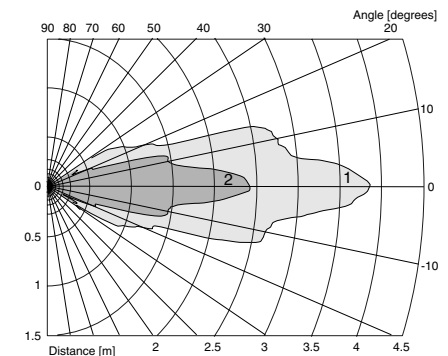
Model number

UB2000-F54-I-V15

UB2000-F54-U-V15

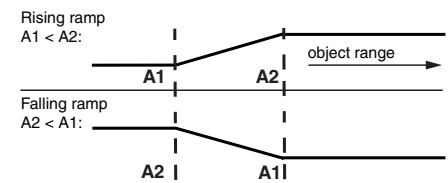
Characteristic curves/ Additional information

Characteristic response curves



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

Programmed switching output function



Accessories

Programming unit

UB-PROG2

Cable sockets *)

V15-G-2M-PVC

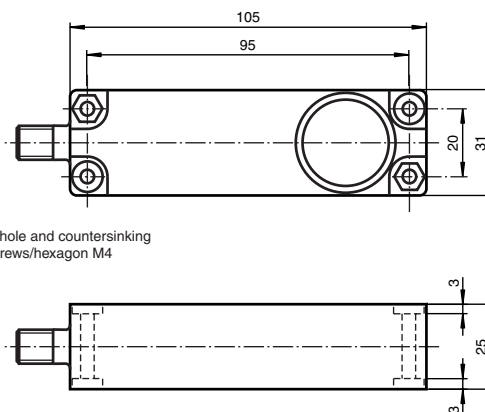
V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic sensor



Dimensions



Bore hole and countersinking
for screws/hexagon M4

UB2000-F54-H3-V1



Features

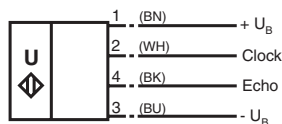
- Separate evaluation
- Direct detection mode

Technical data

General specifications	
Sensing range	150 ... 2000 mm
Unusable area	0 ... 150 mm ¹⁾
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 175 kHz
Standard conformity	
Standards	EN 60947-5-2
Electrical specifications	
Operating voltage	10 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 35 mA (typ. 20 mA)
Output	
Output type	1 pulse output for echo run time, short-circuit-proof Open collector pnp with pulldown resistance = 22 kOhm level 0 (no echo): -U _B level 1 (Echo detected): ≥ (+U _B -2 V)
Output rated operating current	15 mA
Input	
Input type	1 pulse input for transmission pulse (clock) level 0 (active): < 1.5 V level 1 (inactive): 3.5 V ... +U _B
Pulse length	20 ... 300 μs (typ. 200 μs) ²⁾
Pause length	≥ 50 x Pulse length
Impedance	5 kOhm
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	V1 connector (M12 x 1), 4-pin
Material	
Housing	ABS
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	110 g

Electrical connection

Standard symbol/Connection:



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

Connector V1



Notes

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 transmitter pulse duration T_i and is calculated to:

$$BR [mm] = 0.19 \times (T_i [\mu s] + 500)$$

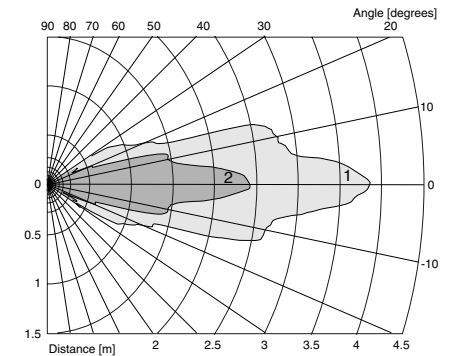
- 2) For $T_i < 150 \mu s$ calculate with reduced detection range.

Model number

UB2000-F54-H3-V1

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Cable sockets ^{*)}

V1-G-2M-PVC
V1-W-2M-PVC

^{*)} Additional cable sockets find in section „Accessories“.



Type	Sensing range	Page
UBE500-F64-SE0 UBE500-F64-SE2	500 mm	198
UBE500-F64-SE0-V3 UBE500-F64-SE2-V3	500 mm	200
UBE1500-F64-SE0 UBE1500-F64-SE2	1500 mm	202
UBE1500-F64-SE0-V3 UBE1500-F64-SE2-V3	1500 mm	204

Ultrasonic single path barrier



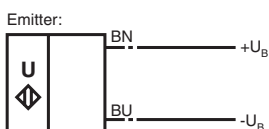
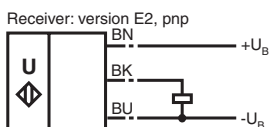
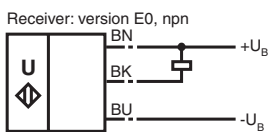
UBE500-F64-SE0 UBE500-F64-SE2

Features

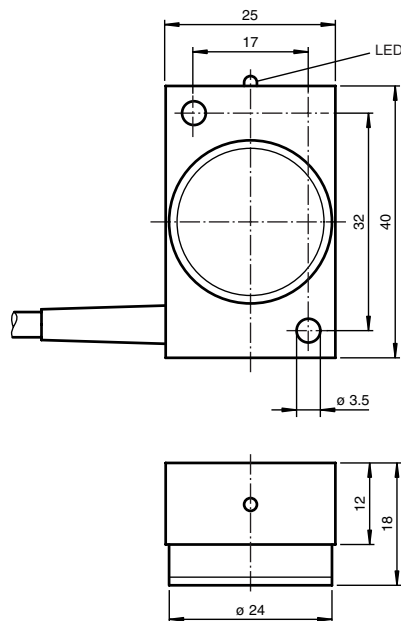
- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Small, compact design
- Plastic housing
- Emitter and receiver included in the delivery package

Electrical connection

Standard symbol/Connection:



Dimensions



Technical data

	UBE500-F64-SE0	UBE500-F64-SE2
General specifications		
Sensing range	0 ... 500 mm , distance emitter-receiver 15 mm ... 500 mm	
Reference target	receiver	
Transducer frequency	200 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	Indication of the switching state (receiver)	
Electrical specifications		
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	20 mA receiver 12 mA emitter	
Output		
Output type	1 switch output E0, npn NO	1 switch output E2, pnp NO
Rated operational current	50 mA	200 mA
Voltage drop	≤ 0.5 V	≤ 2 V
Switching frequency	100 Hz	100 Hz
Switch-on delay	< 5 ms	< 5 ms
Ambient conditions		
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP54	
Connection type	2 m, LiYY - 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	

Notes

Function

A through-beam ultrasonic barrier always consists of a single transmitter 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 transmitter 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 transmitter and receiver. The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the transmitter 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 transmitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

For the detection of thin foils ($< 0.1 \text{ mm}$), 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 optimal matched to each other by the manufacturer.

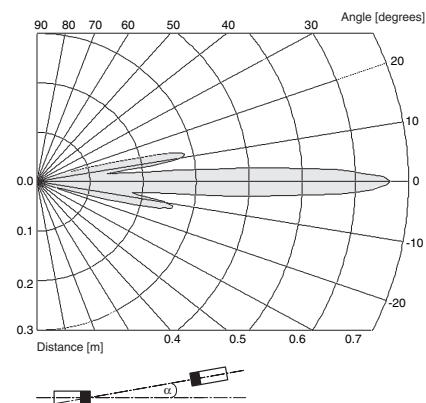
Model number

UBE500-F64-SE0

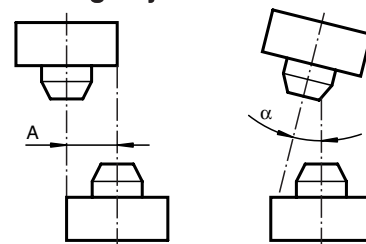
UBE500-F64-SE2

Characteristic curves/ Additional information

Characteristic response curves

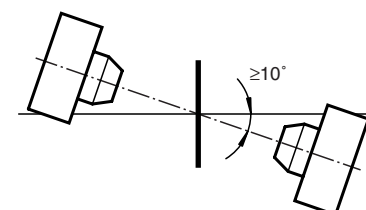


Mounting/Adjustment



Parallel displacement
 $A \leq 8 \text{ mm}$

Angle displacement
 $\alpha \leq 5^\circ$



Ultrasonic single path barrier



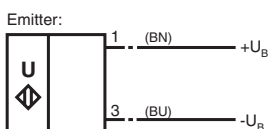
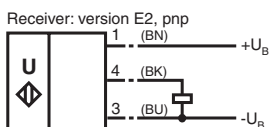
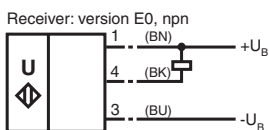
UBE500-F64-SE0-V3 UBE500-F64-SE2-V3

Features

- 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

Electrical connection

Standard symbol/Connection:

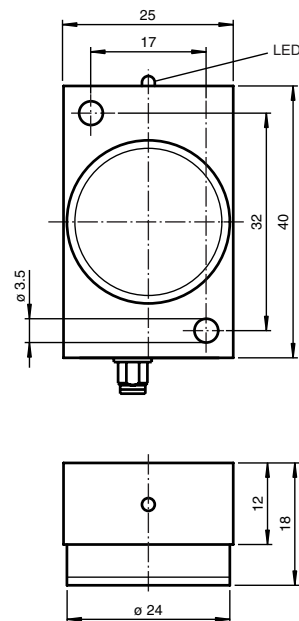


Core colours in accordance with EN 60947-5-2.

Connector V3



Dimensions



Technical data

	UBE500-F64-SE0-V3	UBE500-F64-SE2-V3
General specifications		
Sensing range	0 ... 500 mm , distance emitter-receiver 15 mm ... 500 mm	
Reference target	receiver	
Transducer frequency	200 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	Indication of the switching state (receiver)	
Electrical specifications		
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	20 mA receiver 12 mA emitter	
Output		
Output type	1 switch output E0, npn NO	1 switch output E2, pnp NO
Rated operational current	50 mA	200 mA
Voltage drop	≤ 0.5 V	≤ 2 V
Switching frequency	100 Hz	100 Hz
Switch-on delay	< 5 ms	< 5 ms
Ambient conditions		
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP54	
Connection type	V3 connector (M8 x 1), 3 pin	
Material		
Housing	PA 6.6	
Mass	80 g per device	

Notes

Function

A through-beam ultrasonic barrier always consists of a single transmitter 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 transmitter 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 transmitter and receiver. The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the transmitter 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 transmitter 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 optimal matched to each other by the manufacturer.

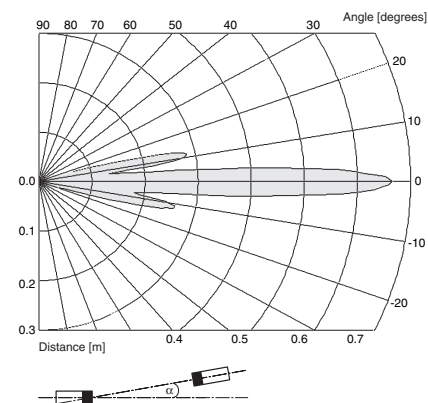
Model number

UBE500-F64-SE0-V3

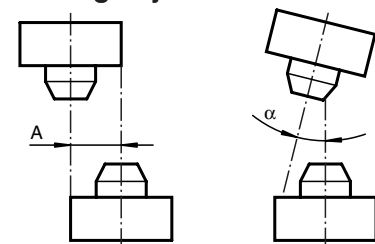
UBE500-F64-SE2-V3

Characteristic curves/ Additional information

Characteristic response curves

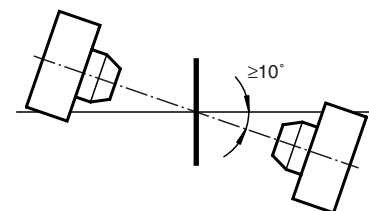


Mounting/Adjustment



Parallel displacement
 $A \leq 8 \text{ mm}$

Angle displacement
 $\alpha \leq 5^\circ$



Accessories

Mating connectors

V3-GM-5M-PUR

V3-WM-2M-PUR

For further informations refer to chapter „Accessories“.

Ultrasonic single path barrier



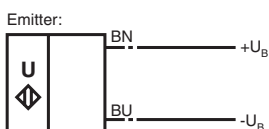
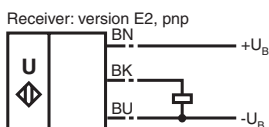
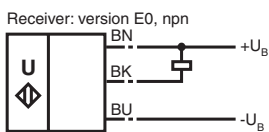
UBE1500-F64-SE0 UBE1500-F64-SE2

Features

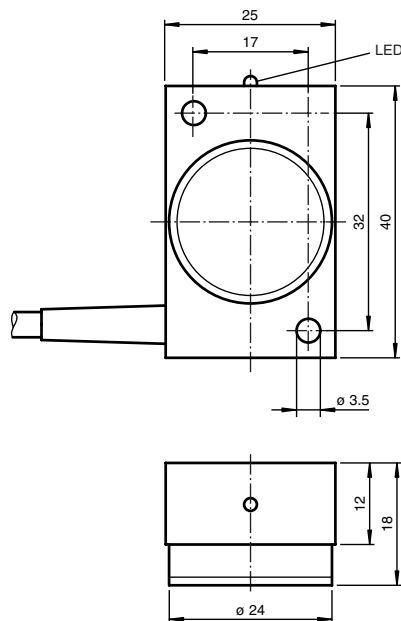
- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Small, compact design
- Plastic housing
- Emitter and receiver included in the delivery package

Electrical connection

Standard symbol/Connection:



Dimensions



Technical data

	UBE1500-F64-SE0	UBE1500-F64-SE2
General specifications		
Sensing range	0 ... 1500 mm , distance emitter-receiver 20 mm ... 1500 mm	
Reference target	receiver	
Transducer frequency	200 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	Indication of the switching state (receiver)	
Electrical specifications		
Operating voltage	18 ... 30 V DC , ripple 10 % _{SS}	
No-load supply current	20 mA receiver 12 mA emitter	
Output		
Output type	1 switch output E0, npn NO	1 switch output E2, pnp NO
Rated operational current	50 mA	200 mA
Voltage drop	≤ 0.5 V	≤ 2 V
Switching frequency	120 Hz	120 Hz
Switch-on delay	< 5 ms	< 5 ms
Ambient conditions		
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP54	
Connection type	2 m, LiYY - 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	

Notes

Function

A through-beam ultrasonic barrier always consists of a single transmitter 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 transmitter 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 transmitter and receiver. The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the transmitter 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 transmitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

For the detection of thin foils ($< 0.1 \text{ mm}$), 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 optimal matched to each other by the manufacturer.

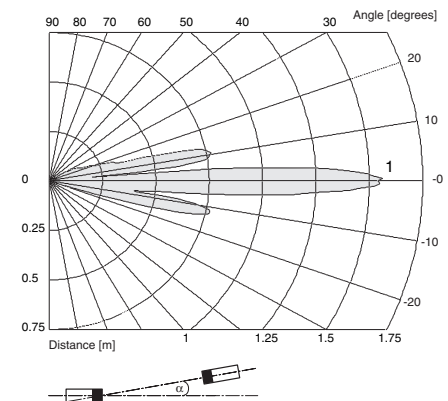
Model number

UBE1500-F64-SE0

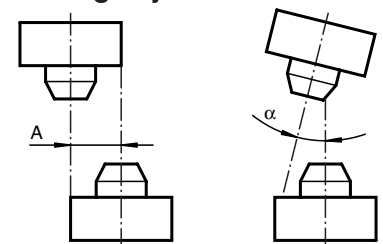
UBE1500-F64-SE2

Characteristic curves/ Additional information

Characteristic response curves



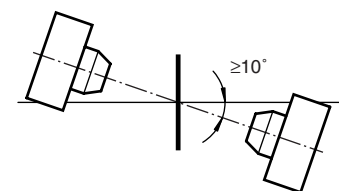
Mounting/Adjustment



Parallel displacement
 $A \leq 8 \text{ mm}$

Angle displacement
 $\alpha \leq 5^\circ$

Thin foil detection



Ultrasonic single path barrier



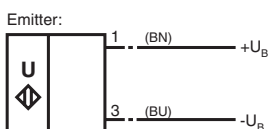
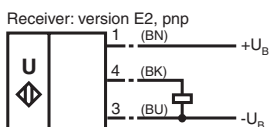
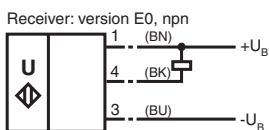
UBE1500-F64-SE0-V3 UBE1500-F64-SE2-V3

Features

- 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

Electrical connection

Standard symbol/Connection:

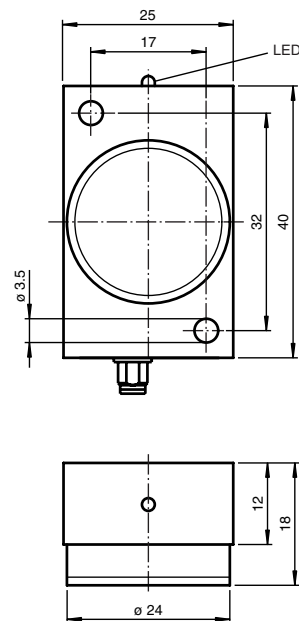


Core colours in accordance with EN 60947-5-2.

Connector V3



Dimensions



Technical data

	UBE1500-F64-SE0-V3	UBE1500-F64-SE2-V3
General specifications		
Sensing range	0 ... 1500 mm, distance emitter-receiver 20 mm ... 1500 mm	
Reference target	receiver	
Transducer frequency	200 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED yellow	Indication of the switching state (receiver)	
Electrical specifications		
Operating voltage	18 ... 30 V DC, ripple 10 % _{SS}	
No-load supply current	20 mA receiver 12 mA emitter	
Output		
Output type	1 switch output E0, npn NO	1 switch output E2, pnp NO
Rated operational current	50 mA	200 mA
Voltage drop	≤ 0.5 V	≤ 2 V
Switching frequency	120 Hz	120 Hz
Switch-on delay	< 5 ms	< 5 ms
Ambient conditions		
Ambient temperature	0 ... 60 °C (273 ... 333 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP54	
Connection type	V3 connector (M8 x 1), 3 pin	
Material		
Housing	PA 6.6	
Mass	80 g per device	

Notes

Function

A through-beam ultrasonic barrier always consists of a single transmitter 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 transmitter 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 transmitter and receiver. The function of through-beam ultrasonic barriers is not dependent on the position of their installation. We recommend, however, to install the transmitter 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 transmitter and receiver may not exceed the values specified in the illustration.

Detection of thin foils

For the detection of thin foils ($< 0.1 \text{ mm}$), 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 optimal matched to each other by the manufacturer.

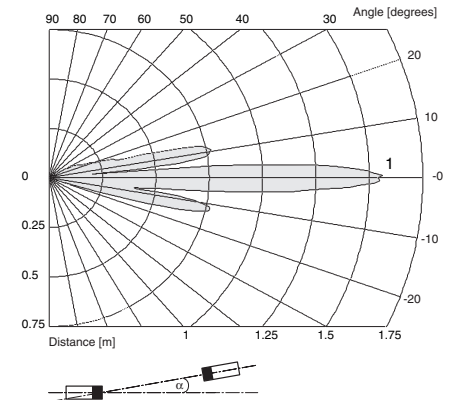
Model number

UBE1500-F64-SE0-V3

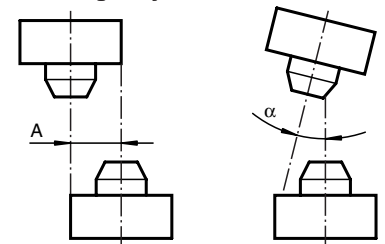
UBE1500-F64-SE2-V3

Characteristic curves/ Additional information

Characteristic response curves



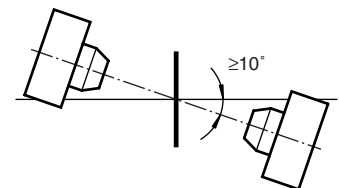
Mounting/Adjustment



Parallel displacement
 $A \leq 8 \text{ mm}$

Angle displacement
 $\alpha \leq 5^\circ$

Thin foil detection



Accessories

Mating connectors

V3-GM-5M-PUR

V3-WM-2M-PUR

For further informations refer to chapter „Accessories“.



Type	Sensing range	Page
UC500-D1-3K-V7	500 mm	208

Ultrasonic sensor



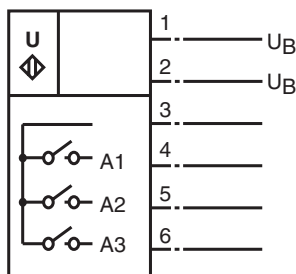
UC500-D1-3K-V7

Features

- 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
- Cable socket included in delivery

Electrical connection

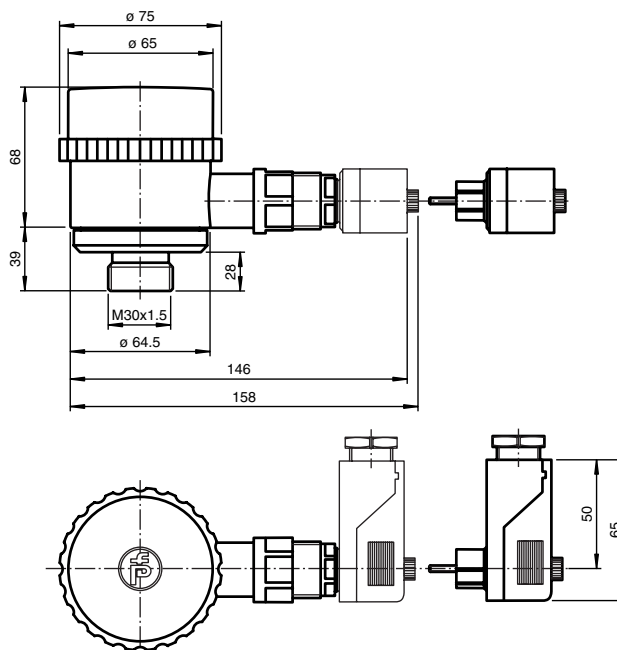
Standard symbol/Connection:



Connector V7



Dimensions



Technical data

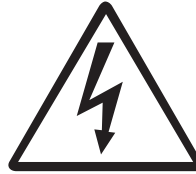
General specifications	
Sensing range	60 ... 550 mm
Unusable area	0 ... 60 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 380 kHz
Response delay	> 10 s, relay < 1 s, LEDs
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green/yellow	LED 2: overfill warning and normal operation LED 3: normal operation and underfill warning
LED red	LED 1: over fill indication LED 4: under fill indication
DIP-switch	setting of the switch points/operating modes
Electrical specifications	
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
Output	
Output type	3 relay outputs, normally open/closed, selectable
Contact loading	252 V AC/150V DC, 3 A (ohm. load)
Lifetime	Electrical: 10^5 operating cycles under ohmic load (3 A / 252 V AC bzw. 3 A / 30 V DC) min. contact load: 100 μ A / 100 mV DC mechanical: 20×10^6 operating cycles
Range hysteresis	20 mm
Temperature influence	< 4 %
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Mechanical specifications	
Protection degree	IP65
Connection type	90° cable socket 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

Notes

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 supplied cable box and the associated mounting screws with plastic heads. 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: 3

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. flashes 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.

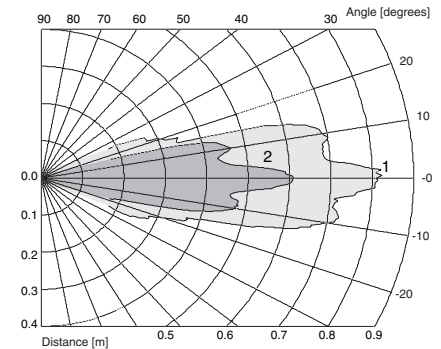
If DIP switch 4 is switched during TEACH-IN, the default value for the switching point will be set rather than a target object. The default values for the switching points are 60 mm for A1, 220 mm for A2 and 270 mm for A3.

Model number

UC500-D1-3K-V7

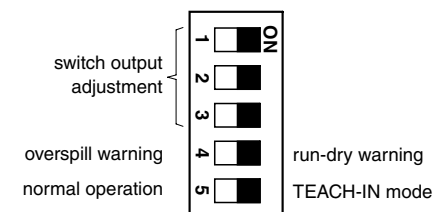
Characteristic curves/ Additional information

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



Accessories

Connector (for replacement)

V7-W

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 behavior:

In normal mode (DIP switch 5 OFF), the DIP switches 1 to 3 can be used to set the switching behavior 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) signalizes 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

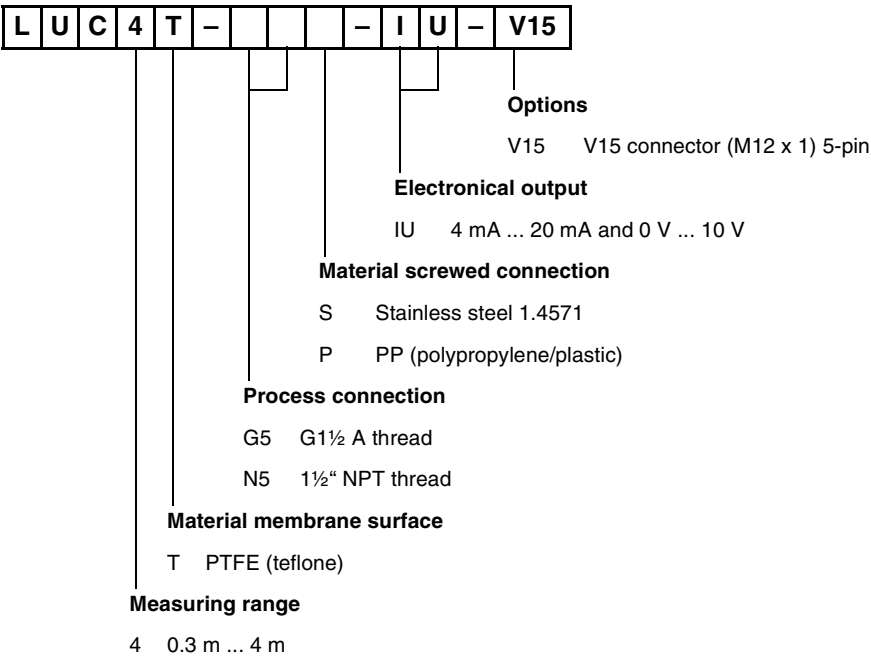
In this mode LED 1 (red) serves as the overfilling indicator, LED 2 (yellow) serves as the preliminary warning that the container is nearly full, LED 3 (green) indicates the normal state, and LED 4 (red) signalizes the "container empty" state.

The relays switch to the "safe state" (all relays open, regardless of close/open function) in the event of a failure.



Type	Sensing range	Page
LUC4T-G5P-IU-V15	4000 mm	212
LUC4T-G5S-IU-V15	4000 mm	212
LUC4T-N5P-IU-V15	4000 mm	214
LUC4T-N5S-IU-V15	4000 mm	214

Type code/model number



Date of issue 07/19/2002

Ultrasonic filling level sensor



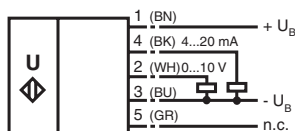
LUC4T-G5P-IU-V15 LUC4T-G5S-IU-V15

Features

- 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

Electrical connection

Standard symbol/Connection:

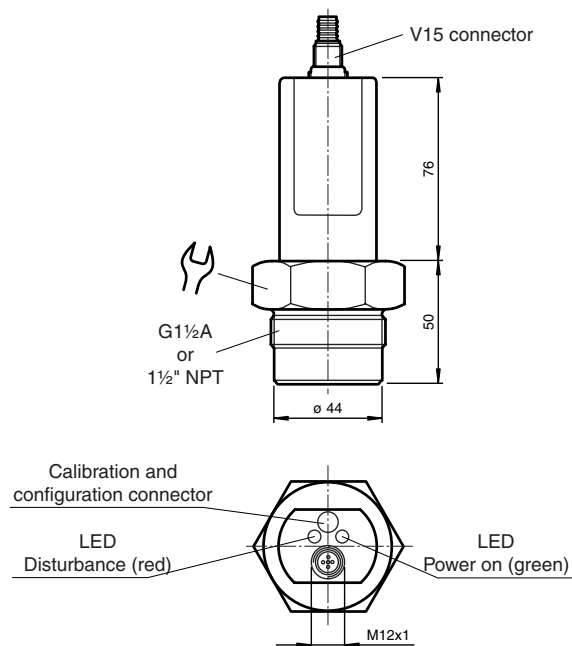


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	LUC4T-G5P-IU-V15	LUC4T-G5S-IU-V15
General specifications		
Sensing range	0.3 ... 4 m , with fluids	
Transducer frequency	approx. 85 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	power on	
LED red	2 Hz flashing: error	
Electrical specifications		
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	
Power consumption	≤ 1200 mW	
Output		
Output type	1 analogue output 4 ... 20 mA, R _L ≤ 500 Ohm, error ≥ 21 mA 1 voltage output 0 ... 10 V, R _L ≥ 1000 Ohm, error ≥ 10.5 V	
Resolution	2 mm	
Deviation of the characteristic curve	0.5 % from upper limit of measuring range	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	IP65
Connection type	connector V15 (M12 x 1), 5 pin	connector V15 (M12 x 1), 5 pin
Mounting	Screwed connection G1½A	Screwed connection G1½A
Material		
Housing	PBT, polypropylene	PBT, stainless steel 1.4571
Transducer	PTFE (diaphragm surface)	PTFE (diaphragm surface)
Mass	220 g	220 g

Notes

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 behavior 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

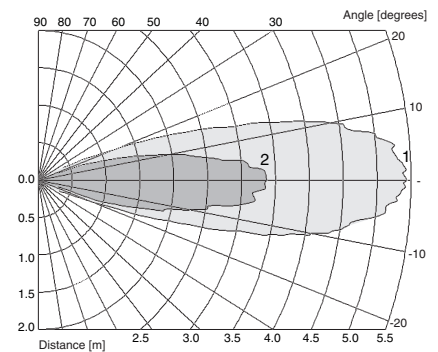
Model number

LUC4T-G5P-IU-V15

LUC4T-G5S-IU-V15

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Extension cable for TEACH-IN

UC-30GM-PROG

External temperature probe

LUC-Z30-G2V (G1/2A)

LUC-Z30-N2V (1/2" NPT)

Cable sockets *)

V15-G-2M-PVC

V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.

Ultrasonic filling level sensor



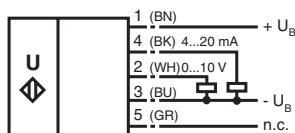
LUC4T-N5P-IU-V15 LUC4T-N5S-IU-V15

Features

- 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

Electrical connection

Standard symbol/Connection:

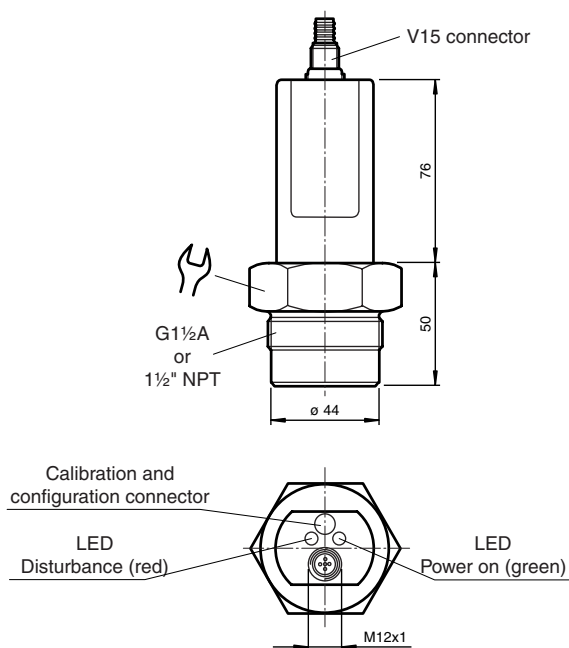


Core colours in accordance with EN 60947-5-2.

Connector V15



Dimensions



Technical data

	LUC4T-N5P-IU-V15	LUC4T-N5S-IU-V15
General specifications		
Sensing range	0.3 ... 4 m , with fluids	
Transducer frequency	approx. 85 kHz	
Standard conformity		
Standards	EN 60947-5-2	
Indicators/operating means		
LED green	power on	
LED red	2 Hz flashing: error	
Electrical specifications		
Operating voltage	20 ... 30 V DC , ripple 10 % _{SS}	
Power consumption	≤ 1200 mW	
Output		
Output type	1 analogue output 4 ... 20 mA, R _L ≤ 500 Ohm, error ≥ 21 mA 1 voltage output 0 ... 10 V, R _L ≥ 1000 Ohm, error ≥ 10.5 V	
Resolution	2 mm	
Deviation of the characteristic curve	0.5 % from upper limit of measuring range	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical specifications		
Protection degree	IP65	IP65
Connection type	connector V15 (M12 x 1), 5 pin	connector V15 (M12 x 1), 5 pin
Mounting	Screwed connection 1½" NPT	Screwed connection 1½" NPT
Material		
Housing	PBT, polypropylene	PBT, stainless steel 1.4571
Transducer	PTFE (diaphragm surface)	PTFE (diaphragm surface)
Mass	220 g	220 g

Notes

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 behavior 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

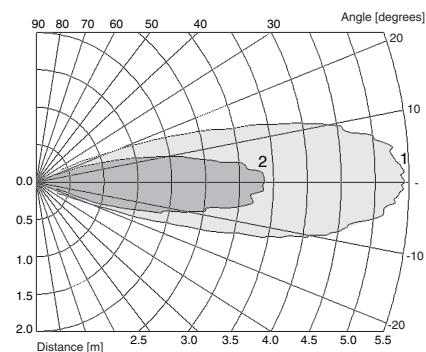
Model number

LUC4T-N5P-IU-V15

LUC4T-N5S-IU-V15

Characteristic curves/ Additional information

Characteristic response curves



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

Accessories

Extension cable for TEACH-IN

UC-30GM-PROG

External temperature probe

LUC-Z30-G2V (G1/2A)

LUC-Z30-N2V (1/2" NPT)

Cable sockets *)

V15-G-2M-PVC

V15-W-2M-PUR

*) Additional cable sockets find in section „Accessories“.



Type	Property	Page
UDB-18GM35-3E2	optimised for double sheet detection	218
UDBL-18GM35-3E2	optimised for label detection	220
UDBK-18GM35-3E2	Optimised for splice detection	222

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 de-

tected 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 double sheet control



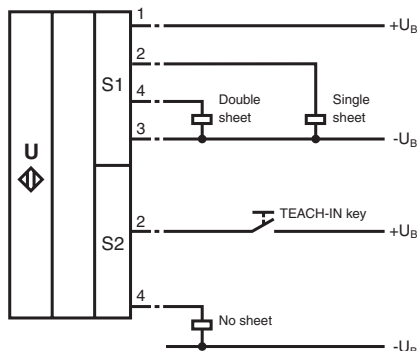
UDB-18GM35-3E2

Features

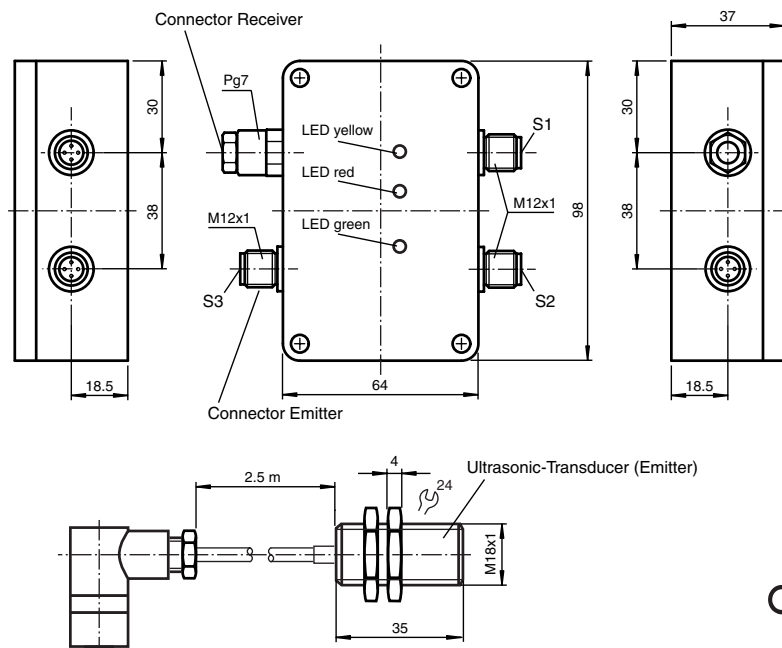
- Ultrasonic system for detection of single sheet, no sheet and double sheet. Also detection of pasted double sheets.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are 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.

Electrical connection

Standard symbol/Connection:
Double-sheet-control



Dimensions



Technical data

General specifications	
Transducer frequency	180 kHz
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green	Indication: single sheet detected
LED yellow	Indication: no sheet detected
LED red	Indication: double sheet or pasted double sheets detected
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	< 80 mA
Output	
Output type	3 switch outputs pnp, NO
Rated operational current	3 x 200 mA
Voltage drop	≤ 2 V
Switch-on delay	≤ 5 ms
Switch-off delay	≤ 5 ms
Input	
Input type	1 pulse input for TEACH-IN
Voltage	12 ... 30 V
Impedance	≥ 10 kOhm
Pulse length	≥ 100 ms
Ambient conditions	
Ambient temperature	0 ... 60 °C (273 ... 333 K)
Storage temperature	-40 ... 70 °C (233 ... 343 K)
Mechanical specifications	
Protection degree	IP65
Connection type	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)
Material	
Housing	Makrolon/nickel plated brass
Mass	370 g

Connector V1



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 transmitter, 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 transmitter 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 onto the paper surface. The paper is guided over the transmitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The transmitter 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 transmitter 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 transmitter 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 transmitter 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 transmitter and receiver. After the TEACH-IN signal has been applied, the corresponding reference value will be accepted.

Caution!

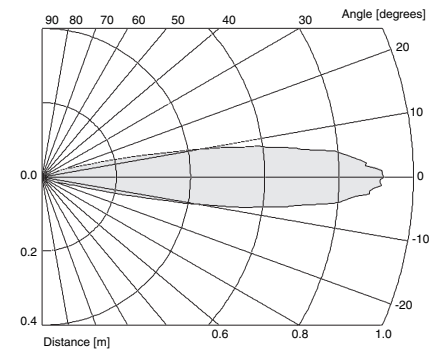
The paper sheets may not touch the sensor heads during operation. Depending on physical conditions, reflections on the edge of a single sheet may result in double-sheet output. This is not an error, and can be masked out in the higher-level control system.

Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.

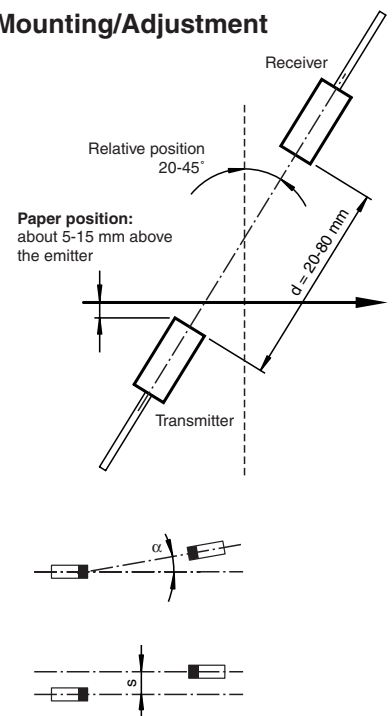
UDB-18GM35-3E2

Characteristic curves/ Additional information

Characteristic response curves



Mounting/Adjustment



Ultrasonic label control



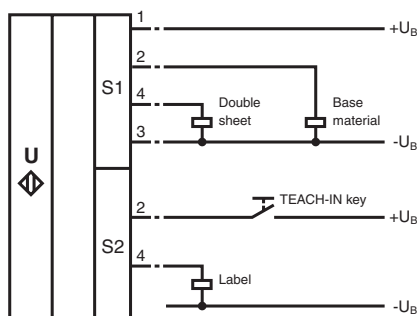
UDBL-18GM35-3E2

Features

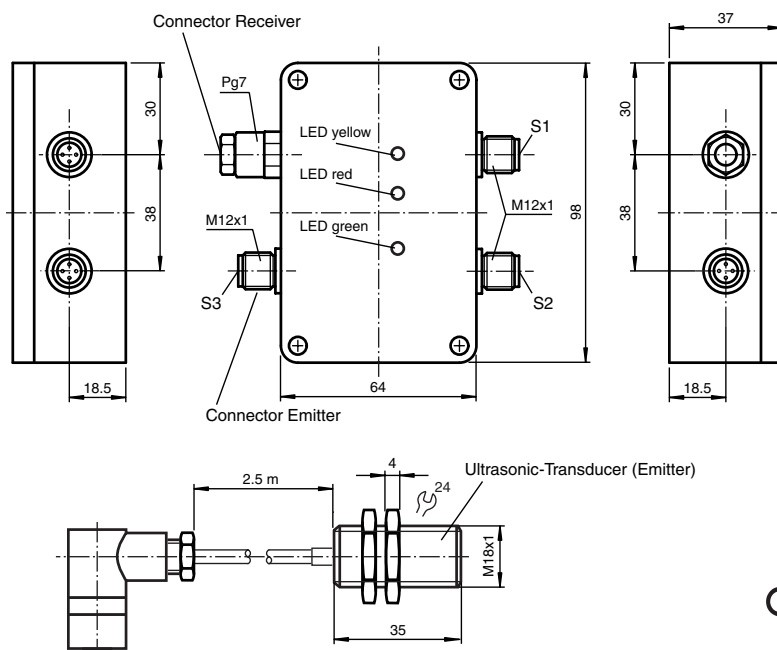
- Ultrasonic system for detection of labels, carrier materials and double sheets.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are programmed in via a TEACH-IN signal.
- No automatic switching threshold tracking in the case of slowly changing ambient conditions.
- Signal output via short-circuit proof PNP switch outputs.
- Very high processing speeds are possible.

Electrical connection

Standard symbol/Connection:
Double sheet control



Dimensions



Technical data

General specifications	
Transducer frequency	180 kHz
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
LED green	Indication: carrier material detected
LED yellow	Indication: label detected
LED red	Indication: double sheet detected
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	< 80 mA
Time delay before availability	≥ 5 Minutes
Output	
Output type	3 switch outputs pnp, NO
Rated operational current	3 x 200 mA
Voltage drop	≤ 2 V
Switch-on delay	≤ 1 ms
Switch-off delay	≤ 1 ms
Input	
Input type	1 pulse input for TEACH-IN
Voltage	12 ... 30 V
Impedance	≥ 10 kOhm
Pulse length	≥ 100 ms
Ambient conditions	
Ambient temperature	0 ... 60 °C (273 ... 333 K)
Storage temperature	-40 ... 70 °C (233 ... 343 K)
Mechanical specifications	
Protection degree	IP65
Connection type	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)
Material	
Housing	Makrolon/nickel plated brass
Mass	370 g

Connector V1



Notes

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 transmitter, 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 transmitter and receiver, take care to align them as precisely as possible.

Distance of the sensor heads: $d = 20 \text{ mm} \dots 80 \text{ mm}$

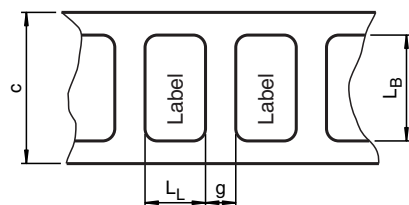
Angular tolerance: $\alpha < \pm 2^\circ$

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 onto the paper surface. The paper is guided over the transmitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The transmitter 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 transmitter 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 transmitter 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.

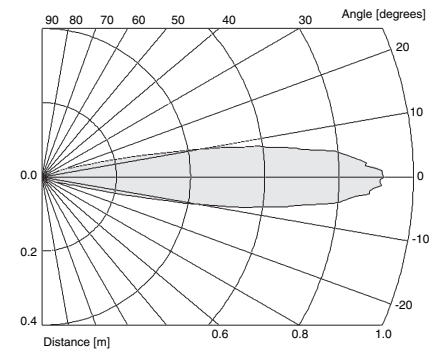
Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.

Model number

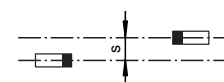
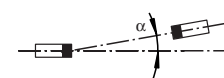
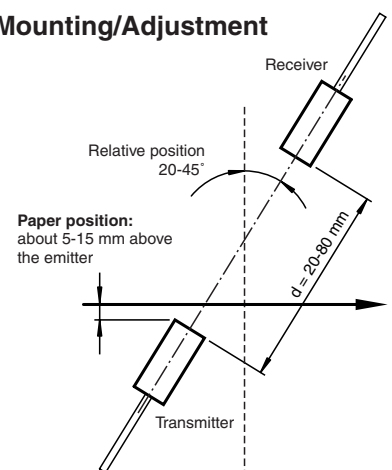
UDBL-18GM35-3E2

Characteristic curves/ Additional information

Characteristic response curves



Mounting/Adjustment



Ultrasonic adhesive spot control



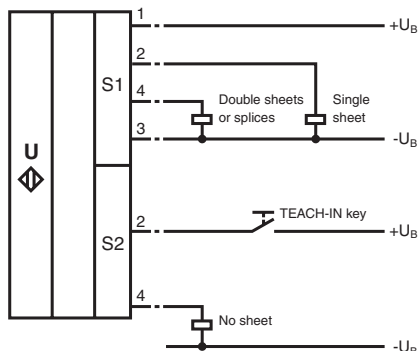
UDBK-18GM35-3E2

Features

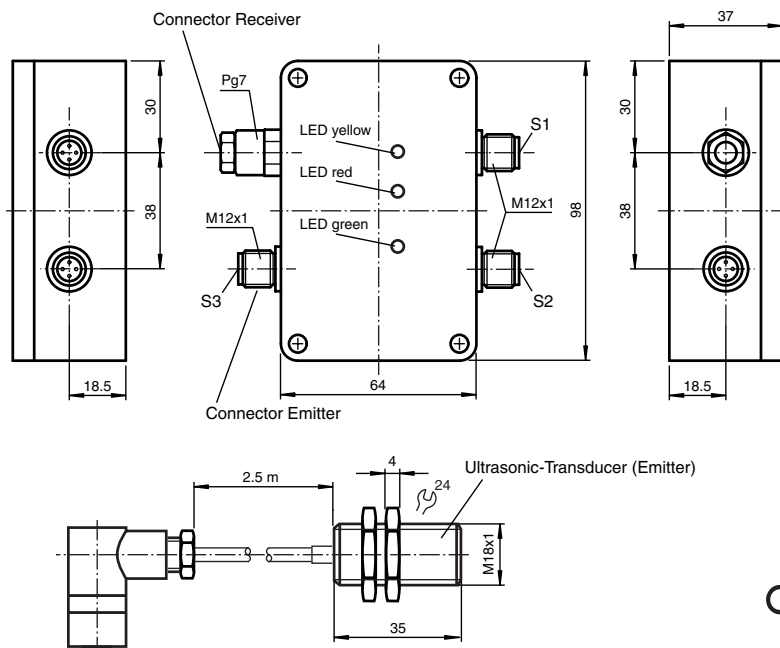
- Ultrasonic system for detection of single and pasted double sheet.
- Weights of paper from 30 g up to cartons weighing over 1200 g can be detected.
- It is also possible to detect thin metal and plastic films.
- Various materials and thicknesses are programmed in via a TEACH-IN signal.
- Automatic 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.

Electrical connection

Standard symbol/Connection:
Double-sheet-control



Dimensions



Technical data

General specifications

Transducer frequency 180 kHz

Standard conformity

Standards EN 60947-5-2

Indicators/operating means

LED green Indication: single sheet detected

LED yellow Indication: no sheet detected

LED red Indication: double sheet or contact spot detected

Electrical specifications

Operating voltage 20 ... 30 V DC, ripple 10 %_{SS}

No-load supply current < 80 mA

Output

Output type 3 switch outputs pnp, NO

Rated operational current 3 x 200 mA

Voltage drop ≤ 2 V

Switch-on delay ≤ 1 ms

Switch-off delay ≤ 100 ms

Input

Input type 1 pulse input for TEACH-IN

Voltage 12 ... 30 V

Impedance ≥ 10 kOhm

Pulse length ≥ 100 ms

Ambient conditions

Ambient temperature 0 ... 60 °C (273 ... 333 K)

Storage temperature -40 ... 70 °C (233 ... 343 K)

Mechanical specifications

Protection degree IP65

Connection type 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)

Material

Housing Makrolon/nickel plated brass

Mass 370 g

Connector V1



Notes

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 transmitter, 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 transmitter 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 onto the paper surface. The paper is guided over the transmitter at a distance of $5 \text{ mm} \dots 15 \text{ mm}$. The transmitter 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)

$v_{\min} = 0035 \text{ m/s}$

$v_{\max} [\text{m/s}] = \text{overlapping of sheets} [\text{mm}] / 1 \text{ ms}$ (approximate 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 transmitter 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 transmitter 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 transmitter 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 transmitter 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.

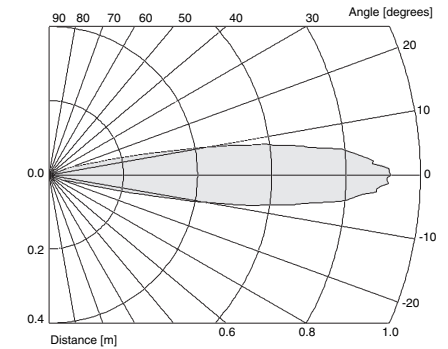
Sensor systems for ultrasonic double-sheet monitoring can also be delivered with a customised time response for optimal adaptation to specific applications.

Model number

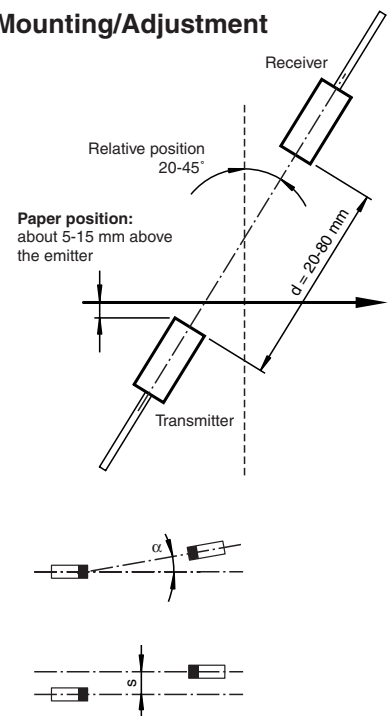
UDBK-18GM35-3E2

Characteristic curves/ Additional information

Characteristic response curves



Mounting/Adjustment





Type	Function	Page
UH3-KHD2-4E5	Evaluation unit with 4 switching outputs	226
UH3-KHD2-4I	Evaluation unit with 4 current outputs (4 mA ... 20 mA)	232
UH3-T1-KT	Evaluation unit with relay output for high switching performance	238
DA5-IU-C	Process display unit	242
DA5-IU-2K-C DA5-IU-2K-V	Process display unit	242
WE77-RE2	Isolation amplifier with power supply and two relay outputs	246
KFA6-STR-1.24.500	Power supply	248

Control unit

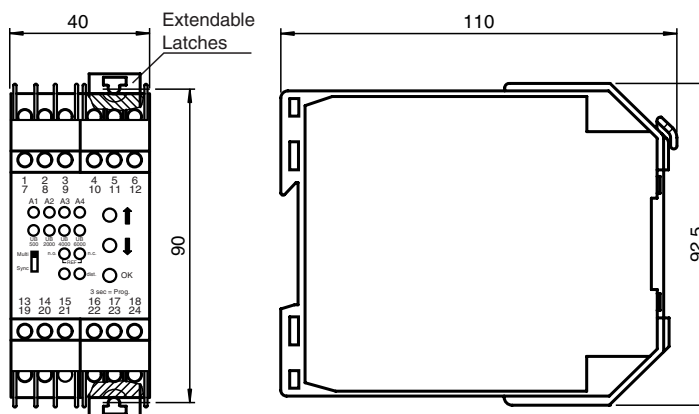


UH3-KHD2-4E5

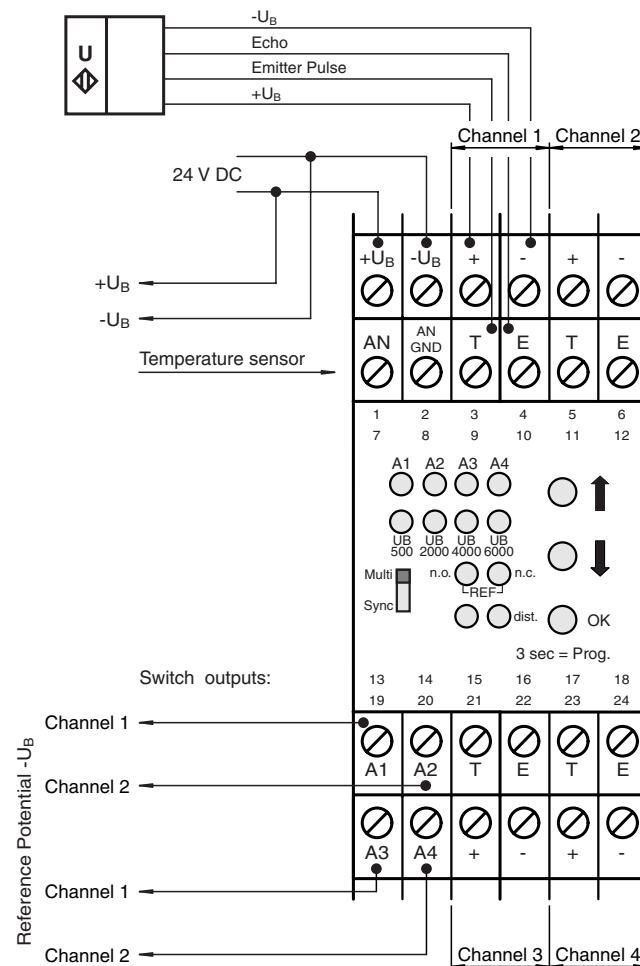
Features

- Sensors UB500/2000/4000/6000-30GM-H3, UB2000-30GM-H1/H2 and UB500/3000+U9+H3 can be connected
- Modular concept: Installation of sensor on-site and evaluation in the control cabinet
- Simultaneous operation of from 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

Dimensions



Electrical connection



Technical data

General specifications

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)

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

LED green	sensor type / 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)

Electrical specifications

Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 50 mA (without sensors)

Output

Output type	4 switch outputs A1 ... A4 I _{max} = 500 mA, pnp, reverse-polarity protected, NO/NC operation
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Repeat accuracy	Multiplex operation: ± 1 mm Synchronous operation: ± 3 mm
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Input

Input type	For 4 sensors for each of 4 connections +U _B /-U _B /clock (T)/echo (E) short-circuit-proof with reverse-polarity protection attachable sensors: UB500/2000/4000/6000...-H3 or -H1/-H2
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Ambient conditions

Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP20
Connection type	terminal housing, suitable for 35 mm standard rail plug-in screw terminal 1.5 mm ²
Mass	230 g

Model number

UH3-KHD2-4E5

Description

The UH3-KHD2-4E5 is an evaluation device for ultrasonic sensors with external interface electronics. Up to four sensors of type
UB500/2000/3000/4000/6000...-H3
or sensor pairs
UB2000...-H1/-H2
can be connected to the device:

- UB500-30GM-H3
- UB500+U9+H3
- UB500-F54-H3
- UB2000-30GM-H1/-H2
- UB2000-30GM-H3
- UB2000-F54-H3
- UB3000+U9+H3
- UB4000-30GM-H3
- UB6000-30GM-H3
- UB6000-FP-H3

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.

Notes

Initial operation/connection of the sensors

The sensors are connected to the channels in accordance with the terminal diagram (electrical connections). Connect the lower connections (operating power U_B) first, then the upper ones.

The number of connected sensors is limited by the performance of the external 24V DC power supply of the evaluation unit.

Channels equipped with sensors may also be disabled via programming (program step 2)

Selecting the operating mode

The slide switch Multi/Sync toggles the multiplex and synchronous operating modes.

Multiplex mode: The connected sensors are controlled consecutively, briefly and in a cyclic manner. The evaluation unit always processes the signals of a single sensor.

This operating mode should be selected if the sensors are installed in a restricted space or are arranged opposite each other. Multiplex mode prevents mutual interference.

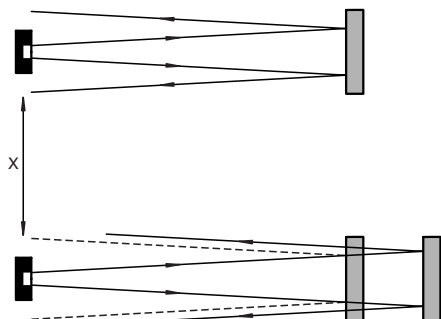
The measuring repeat rate is based on the number of activated sensors multiplied by the repeat time of the sensor with the longest range. The repeat times are:

- UB 500: approx. 30 ms
- UB 2000: approx. 40 ms
- UB 4000: approx. 50 ms
- UB 6000: approx. 65 ms

Synchronous mode: This operating mode guarantees a shorter response time than multiplex mode. All activated channels receive transmit pulses simultaneously. Each channel evaluates the time between the transmit pulse and the first echo. Later echoes could be signals from a neighboring sensor in the case of sensors with similar switching points (longer distance). They are not evaluated.

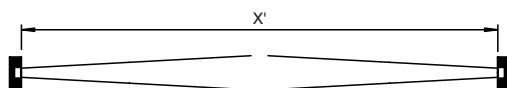
The lateral safety distance required to avoid mutual interference in neighboring sensors can be determined with the following table, provided smooth objects at a right angle to the axis of the ultrasonic bursts are to be detected. The indicated values are intended as a guideline. The values increase in the event of unfavorable alignment of the objects and should then be determined experimentally.

The repeat time of the sensor with the greatest range determines the measuring repeat rate of the evaluation unit.



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 distance "X" must be observed if two sensors of the same range are installed opposite one another.



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

Programming mode

Programming is performed with three keys: **▲** (up), **▼** (down) and OK. Starting the programming mode: Press OK key for 3 seconds.

Step 1: Select channel

One of the yellow LEDs in the upper row will be flashing to indicate the channel to be programmed, A1 to A4. Use **▲** (up) or **▼** (down) to select a different channel if required and confirm your choice with OK (yellow LED lit).

Step 2: Select UB range/(disable channel)

After the first OK, one of the green LEDs in the second row will be flashing. It indicates the range. Use **▲** (up) or **▼** (down) to make a selection (500/2000/4000/6000) so that the display corresponds to the range of the connected sensor. Confirm this setting with OK.

Disable channel: In step 2, **▲** (up) or **▼** (down) can also be used to start the "disable" function (all four green LEDs flashing). If this is confirmed with OK, the selected channel will be removed from the measuring cycle. The programming mode will be aborted and normal operation started.

Step 3: Select switching behavior/(REF)

After confirming the range, the program switches to the third LED row. The switching behavior is checked and programmed here. Use **▲** (up) or **▼** (down) to choose between the normally-open (n.o.) and normally-closed (n.c.) function. Confirm your choice with the OK key.

REF: The third option is REF (both LEDs). If this is confirmed with the OK key, the sensor on the selected channel must be aligned with a reference object. Normal operation will start immediately.

If the start does not take place, the sensor will not detect a reference object.

Step 4: Set/teach switching point

The switching point is adjustable within the detection range of the UB sensor if the lower LED "dist" is flashing (the left LED has no function). Use **▲** (up) to adjust toward the maximum, and **▼** (down) to adjust toward the minimum switching point. The minimum switching point begins above the unusable area which is indicated on the data sheets of the sensors that can be connected:

UB 500:	60 mm
UB 2000:	200 mm
UB 4000:	500 mm
UB 6000:	800 mm

Press OK for the evaluation to accept the selected switching point and start normal operation.

TEACH-IN: Press **▲** (up) and **▼** (down) simultaneously to store a distance determined by a target positioned in the sound cone. If no reflector is present, the largest switching point will apply. The evaluation unit will then change over to normal operation.

General information on programming mode

The channels must be programmed individually and consecutively.

The selected options will not be permanently stored for the given channel until the fourth programming step has been completed.

Correction option: In the event of an incorrectly chosen option, the programming mode can be aborted by not pressing any keys for 20 s. The previous settings for the selected channel (range, switching function, switching point) will be restored.

Display mode

To check the selected settings, use **▲** (up) or **▼** (down) during normal operation to start the display. The settings will remain unchanged.

Yellow LEDs:	Channel number A1 to A4: Object in switching range
Upper row green LEDs:	Type of connected sensor
Green LEDs n.o./n.c./REF:	Normally-open/normally-closed behavior of the switch output/refe- rence measurement

Back to normal operation: Press **▲** (up) and **▼** (down) keys simultaneously or do not press any key for 20 seconds.

Temperature compensation/reference measurement (REF)

The properties of the air as a transmission medium affect the velocity of sound. Especially fluctuations of the air temperature have a noticeable effect on the evaluation. Two types of compensation are possible to ensure the highest measuring accuracy:

Connection of an external temperature probe: The evaluation unit calculates using the following basic data: 4 mA = -20 °C and 20 mA = +70 °C. The Pepperl+Fuchs KFD2-UT-Ex1 universal temperature measuring transducer fulfills these requirements. It is simple to parameterize via an RS 232 interface, or can be supplied preconfigured if desired. As Pt 100 is preferable as a temperature probe; a thermocouple (Type B, E, J, K, L, N, R, S, T) can also be connected. The transformer must be externally supplied with 24 V DC and connected to contacts 7 and 8 (GND).

Reference measurement (REF) In program section 3, the option REF can be specified for the selected channel. The connected UB sensor must be working against a fixed target. All deviations of the echo time resulting from changes in the ambient conditions of the reference measurement distance will be applied to the other channels and their measured values adjusted accordingly.

The reference channel does not provide switch output. If another channel has already been selected as the reference channel, the REF function will be disabled for that channel and the normal mode activated.

The start of the reference function of a channel must take place at the same temperature at which the switching points were programmed for the other channels. If this was done at other temperatures, they should be readjusted.

Interesting deployment options

Increased coverage: Multiple UB sensors of the same range can work together if a larger area is to be monitored. Connect the transmission pulse inputs (BK/2) of all sensors to one another externally and connect them to the transmission pulse output (T) of a channel. The echo outputs (WH/4) of all sensors must also be connected to one another externally and then connected to the same evaluation channel of the echo input (E, see terminal diagram A).

All interconnected sensors thus simultaneously transmit ultrasonic pulses. Due to the inclusive OR circuit, the evaluation unit does not distinguish which sensor delivered the first echo. The time between the transmission pulse for all sensors on a channel and this first echo is used by the electronics to determine the distance to the detected object.

The number of connected sensors is limited by the performance of the external 24V DC power supply of the evaluation unit.

The current consumption of an evaluation system is the sum of the following values:

1. The no-load current consumption of the unit (max. 50 mA) and current consumption of the temperature probe (if connected: max. 20 mA)
2. The total no-load current consumption of all connected US sensors; (for the sake of simplicity, calculate 30 mA max. for each sensor),
3. The maximum output current of the evaluation unit: 2 A (4 channels x 500 mA)

Example: In terminal diagram A, three UB sensors are connected to a single evaluation channel. If one sensor is working on each of the three other channels, the total no-load current (for 6 sensors) is 180 mA. The power supply must have a capacity of around 2.3 A (50 mA + 6 x 30 mA + 2 A), not including a temperature probe.

Through-beam: Through-beam ultrasonic barriers can be realised with two Type H3 sensors or a combination of an H1 transmitter and H2 receiver.

Type H3: The resulting usable barrier width amounts to about 2.5 times the detection range of the deployed sensors. The sensors used as receivers may not transmit sound.

The transmission pulse output (T) of an evaluation channel should be applied only to the transmitter sensor (BK/2); apply only the echo signal of the receiver sensor (WH/4) to the input (E) of the channel (see terminal diagram B).

Program the detection range appropriate to the sensor at the evaluation channel in programming step 2. In step 4, teach the maximum switching point.

To perform the TEACH-IN, press the $\uparrow$ (up) and $\downarrow$ (down) keys simultaneously. The sound cone must not pick up any objects during TEACH-IN.

H1/H2 combination: Refer to the data sheet for the usable barrier width.

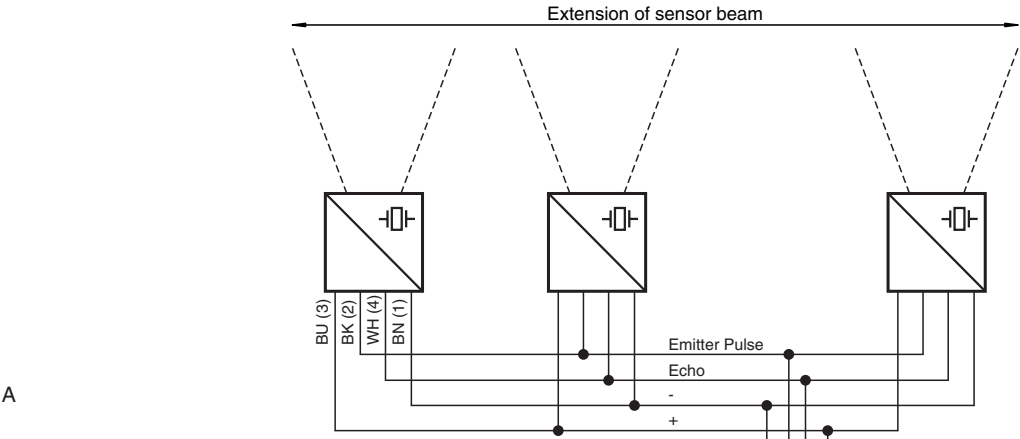
The transmission pulse output (T) of an evaluation channel should be applied to the transmitter H1 (BK) and receiver H2 (BK); the echo signal is provided by the receiver sensor (WH) to the input (E) of the channel (see terminal diagram C).

Program the detection range listed in the data sheet at the evaluation channel in programming step 2. In step 4, teach the maximum switching point (see Type H3).

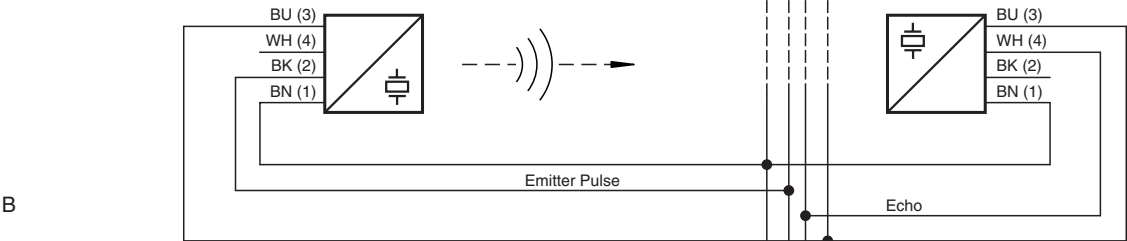
If the barriers set the output of the evaluation channel to the signal state active (high) in the event of a signal interruption, program the output to "n.c." in programming step 3.

The number of connected sensors is limited by the performance of the external 24V DC power supply of the evaluation unit. The calculation of the required power corresponds to the example above.

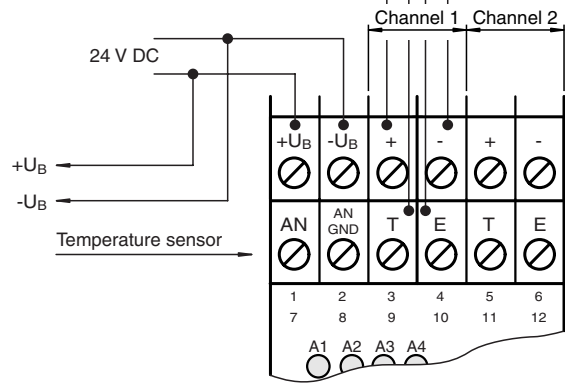
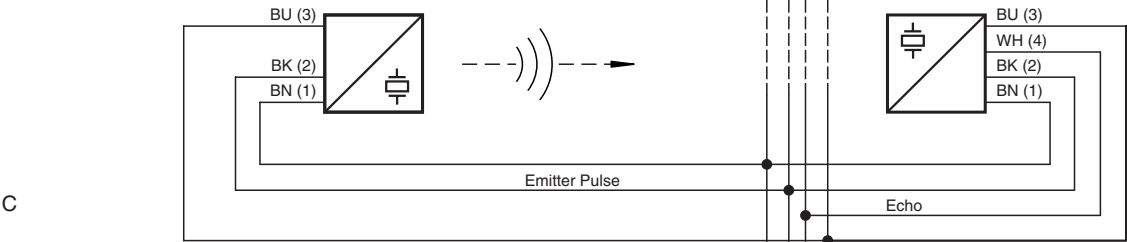
Extension of sensor beam



Through Beam Barrier using Type H3 Sensors



Through Beam Barrier with H1/H2 Combination

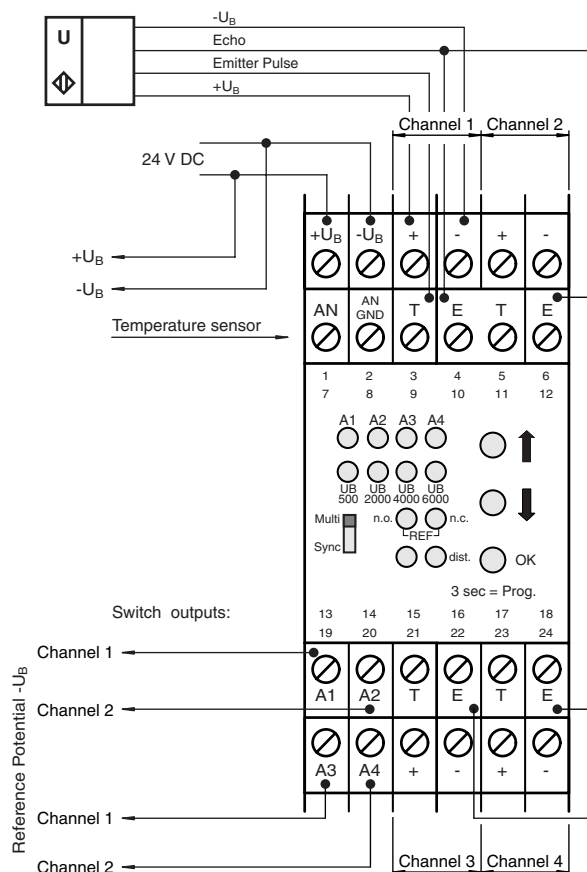


UB sensor with multiple switching points:

A UB sensor connected to any evaluation channel can work with up to 4 switching points by making use of the three other channels. Select synchronous mode and connect the echo output (WH/4) of the sensor to the echo signal inputs (E) of the other channels. For four switching points, use the entire evaluation unit.

Program each used channel to the same range (that of the connected sensor) in programming step 2. The switching points can then be set or taught consecutively for the channels.

Perform the TEACH-IN in programming step 4 by placing an object in the sound cone at the desired distance and pressing the $\uparrow$ (up) and $\downarrow$ (down) keys simultaneously.



Control unit

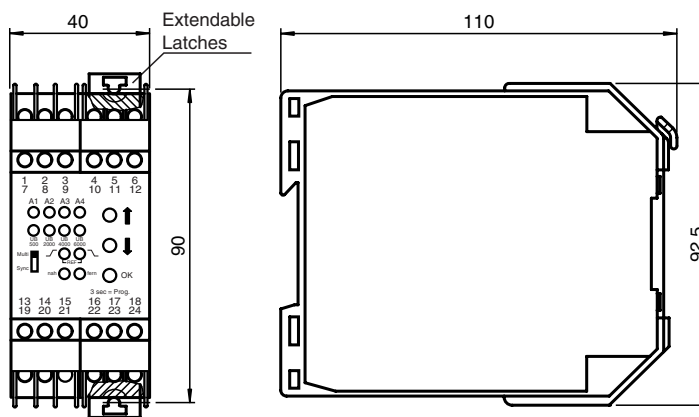


UH3-KHD2-4I

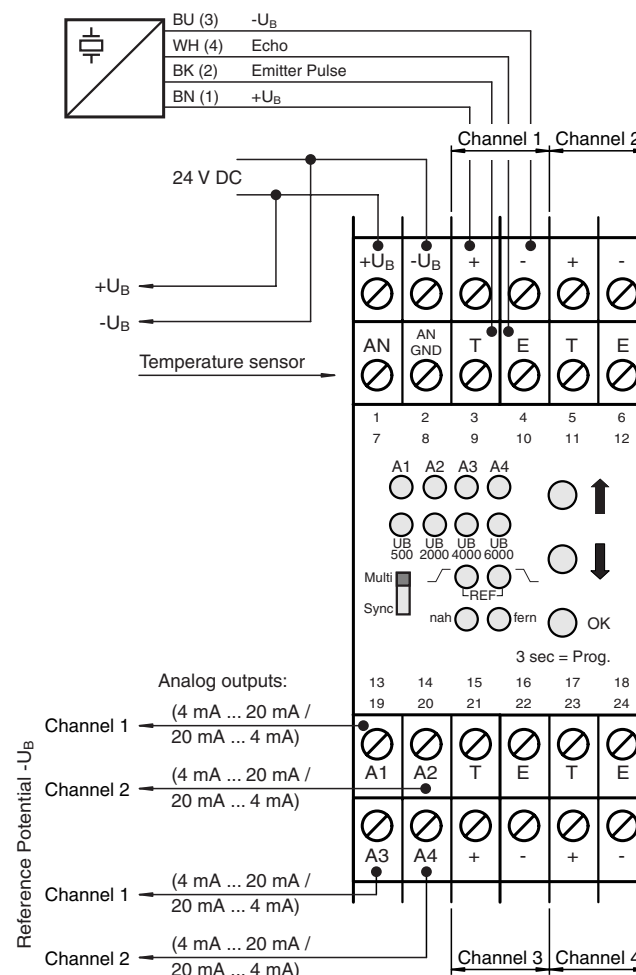
Features

- Sensors UB500/2000/4000/6000-30GM-H3, UB2000-30GM-H1/H2 and UB500/3000+U9+H3 can be connected
- 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)

Dimensions



Electrical connection



Technical data

General specifications

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)

Standard conformity

Standards	EN 60947-5-2
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Indicators/operating means

LED green	sensor type / 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)

Electrical specifications

Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 50 mA (without sensors)

Output

Output type	4 switch outputs A1 ... A4 I _{max} = 500 mA, pnp, reverse-polarity protected, NO/NC operation
-------------	---

Range hysteresis	1 % of range
Repeat accuracy	Multiplex operation: ± 1 mm Synchronous operation: ± 3 mm

Input

Input type	For 4 sensors for each of 4 connections +U _B /-U _B /clock (T)/echo (E) short-circuit-proof with reverse-polarity protection attachable sensors: UB500/2000/4000/6000...-H3 or -H1/-H2
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Ambient conditions

Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree	IP20
Connection type	terminal housing, suitable for 35 mm standard rail plug-in screw terminal 1.5 mm ²
Mass	230 g

Model number

UH3-KHD2-4I

Description

The UH3-KHD2-4I is an evaluation device for ultrasonic sensors with external interface electronics. Up to four sensors of type
UB500/2000/3000/4000/6000...-H3
or sensor pairs
UB2000...-H1/-H2
can be connected to the device:

- UB500-30GM-H3
- UB500-U9-H3
- UB500-F54-H3
- UB2000-30GM-H1/-H2
- UB2000-30GM-H3
- UB2000-F54-H3
- UB3000-U9-H3
- UB4000-30GM-H3
- UB6000-30GM-H3
- UB6000-FP-H3

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.

Notes

Initial operation/connection of the sensors

The sensors are connected to the channels in accordance with the terminal diagram. It is recommended to connect the operating power U_B first. The sensor cable must not exceed a length of 50 m. The number of connected sensors is limited by the performance of the external 24V DC power supply of the evaluation unit. Channels equipped with sensors may also be disabled via programming (program step 2)

Selecting the operating mode

The slide switch Multi/Sync toggles the multiplex and synchronous operating modes.

Multiplex mode: The connected sensors are controlled consecutively, briefly and in a cyclic manner. The evaluation unit always processes the signals of a single sensor.

This operating mode should be selected if the sensors are installed in a restricted space or are arranged opposite each other. Multiplex mode prevents mutual interference.

The measuring repeat rate is based on the number of activated sensors multiplied by the repeat time of the sensor with the longest range.

The repeat times are:

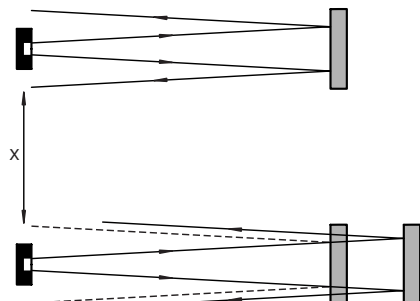
- UB 500: approx. 30 ms
- UB 2000: approx. 40 ms
- UB 4000: approx. 50 ms
- UB 6000: approx. 65 ms

Synchronous mode: This operating mode guarantees a shorter response time than multiplex mode.

All activated channels receive transmit pulses simultaneously. Each channel evaluates the time between the transmit pulse and the first echo. Later echoes could be signals from a neighboring sensor in the case of sensors with similar ranges (longer distance). They are not evaluated.

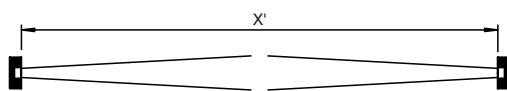
The lateral safety distance required to avoid mutual interference in neighboring sensors can be determined with the following table, provided smooth objects at a right angle to the axis of the ultrasonic bursts are to be detected. The indicated values are intended as a guideline. The values increase in the event of unfavorable alignment of the objects and should then be determined experimentally.

The repeat time of the sensor with the greatest range determines the measuring repeat rate of the evaluation unit.



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 distance "X" must be observed if two sensors of the same range are installed opposite one another.



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

Programming mode

Programming is performed with three keys: **▲** (up), **▼** (down) and OK. Starting the programming mode: Press OK key for 3 seconds.

Step 1: Select channel

One of the yellow LEDs in the upper row will be flashing to indicate the channel to be programmed, A1 to A4. Use **▲** (up) or **▼** (down) to select a different channel if required and confirm your choice with OK (yellow LED lit).

Step 2: Select UB range/(disable channel)

After the first OK, one of the green LEDs in the second row will be flashing. It indicates the range. Use **▲** (up) or **▼** (down) to make a selection (500/2000/4000/6000) so that the display corresponds to the range of the connected sensor. Confirm this setting with OK.

Disable channel: In step 2, **▲** (up) or **▼** (down) can also be used to start the "disable" function (all four green LEDs flashing). If this is confirmed with OK, the selected channel will be removed from the measuring cycle. The programming mode will be aborted and normal operation started.

Step 3: Select output characteristic/(REF)

After confirming the range, the program switches to the third LED row. The output behavior is checked or set here. Use the **▲** (up) or **▼** (down) keys to select either the rising analogue ramp (**↗**: 4 mA ... 20 mA) or falling ramp (**↘**: 20 mA ... 4 mA). Confirm your choice with the OK key.

REF: The third option is REF (both LEDs). If this is confirmed with the OK key, the sensor on the selected channel must be aligned with a reference object. Normal operation will start immediately.

If the start does not take place, the sensor will not detect a reference object.

Steps 4 and 5: Setting the measuring window

These steps set a measuring window (minimum width: 5 cm) within the detection range of the selected sensor. The analogue value changes in a linear manner from 4 mA ... 20 mA (or 20 mA ... 4 mA) in dependence upon the measured distance.

First, set the near window limit.

Step 4: Setting/teaching the near window limit

The near window limit must be outside the sensor's unusable area. The unusable areas for the usable UB sensors are indicated on the data sheets:

UB 500:	60 mm
UB 2000:	200 mm
UB 4000:	500 mm
UB 6000:	800 mm

After pressing OK in step 3, the lower left LED "near" will be flashing initially. The near limit can now be set to a greater distance with **▲** (up) or to a shorter distance with **▼** (down).

If the near limit comes within 5 cm (minimum window width) of the far limit, the far limit will be changed accordingly. The far limit will be moved outward 5 cm ahead of the near limit until the maximum range has been reached.

Use the OK key to confirm the lower limit. The display and program will move to the right LED "far" and the appropriate program section.

TEACH-IN: Press **▲** (up) and **▼** (down) simultaneously to store a distance determined by a target positioned in the sound cone as a near limit. If the sensor does not detect a reflector, the window will be set to the 5 cm within the maximum range. The program will then switch to the "far limit" (LED "far") option.

Step 5: Setting/teaching the far window limit

(LED "far"): The distance is changed with the **▲** (up) key toward the maximum range and the **▼** (down) key toward the sensor or near limit as when previously setting the near window limit.

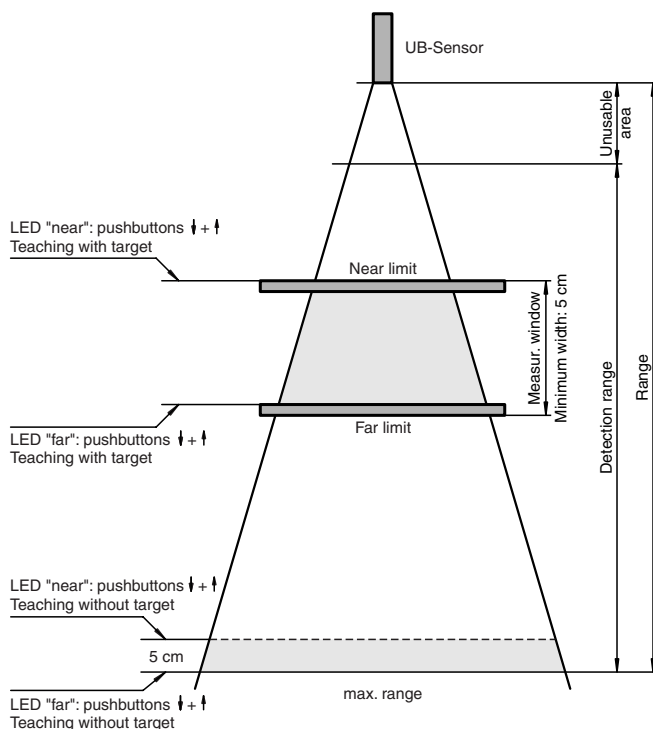
Exception: The far limit cannot affect the near limit.

TEACH-IN: Pressing $\uparrow$ (up) and $\downarrow$ (down) simultaneously will also store the distance to a target as a measuring window limit in this case. If the sensor does not detect an echo (no reflector), the window will be extended to the maximum range.

If the object is closer than the near limit, the measuring window will be set to a width of 5 cm from the near limit. The near limit will remain unchanged.

Confirm the setting with OK.

After the TEACH-IN, the programming mode will end automatically and normal operation will be started.



General information on programming mode

The channels must be programmed individually and consecutively.

The selected options will not be permanently stored for the given channel until the fifth programming step has been completed.

Correction option: In the event of an incorrectly chosen option, the programming mode can be aborted by not pressing any keys for 20 s. The previous settings for the selected channel (output ramp, measuring window limits) will be restored.

Display mode

To check the selected settings, use $\uparrow$ (up) or $\downarrow$ (down) during normal operation to start the display. The settings will remain unchanged.

Yellow LEDs:	Channel number A1 to A4: Object in measuring window
Upper row green LEDs:	Type of connected sensor/channel active
Green LEDs $\int$ / $\backslash$ / REF:	Rising/falling ramp of output current/reference measurement

Back to normal operation: Press $\uparrow$ (up) and $\downarrow$ (down) keys simultaneously or do not press any key for 20 seconds.

Temperature compensation/reference measurement (REF)

The properties of the air as a transmission medium affect the velocity of sound. Especially fluctuations of the air temperature have a noticeable effect on the evaluation. Two types of compensation are possible to ensure the highest measuring accuracy:

Connection of an external temperature probe: The evaluation unit calculates using the following basic data: 4 mA = -20 °C and 20 mA = +70 °C. The Pepperl+Fuchs KFD2-UT-Ex1 universal temperature measuring transducer fulfills these requirements. It is simple to parameterize via an RS 232 interface, or can be supplied preconfigured if desired. As Pt 100 is preferable as a temperature probe; a thermocouple (Type B, E, J, K, L, N, R, S, T) can also be connected. The transformer must be externally supplied with 24 V DC and connected to contacts 7 and 8 (GND).

Reference measurement (REF) In program section 3, the option REF can be specified for the selected channel. The connected UB sensor must be working against a fixed target. All deviations of the echo time resulting from changes in the ambient conditions of the reference measurement distance will be applied to the other channels and their measured values adjusted accordingly. The reference channel does not provide analogue output. If another channel has already been selected as the reference channel, the REF function will be disabled for that channel and the normal measuring function activated. The start of the reference function of a channel must take place at the same temperature at which the measuring window limits were programmed for the other channels. If this was done at other temperatures, they should be readjusted.

Interesting deployment options

Increased coverage: Multiple UB sensors of the same range can work together if a larger area is to be monitored. Connect the transmission pulse inputs (BK/2) of all sensors to one another externally and connect them to the transmission pulse output (T) of a channel. The echo outputs (WH/4) of all sensors must also be connected to one another externally and then connected to the same evaluation channel of the echo input (E, see terminal diagram A).

All interconnected sensors thus simultaneously transmit ultrasonic pulses. Due to the inclusive OR circuit, the evaluation unit does not distinguish which sensor delivered the first echo. The time between the transmission pulse for all sensors on a channel and this first echo is used by the electronics to determine the distance to the detected object.

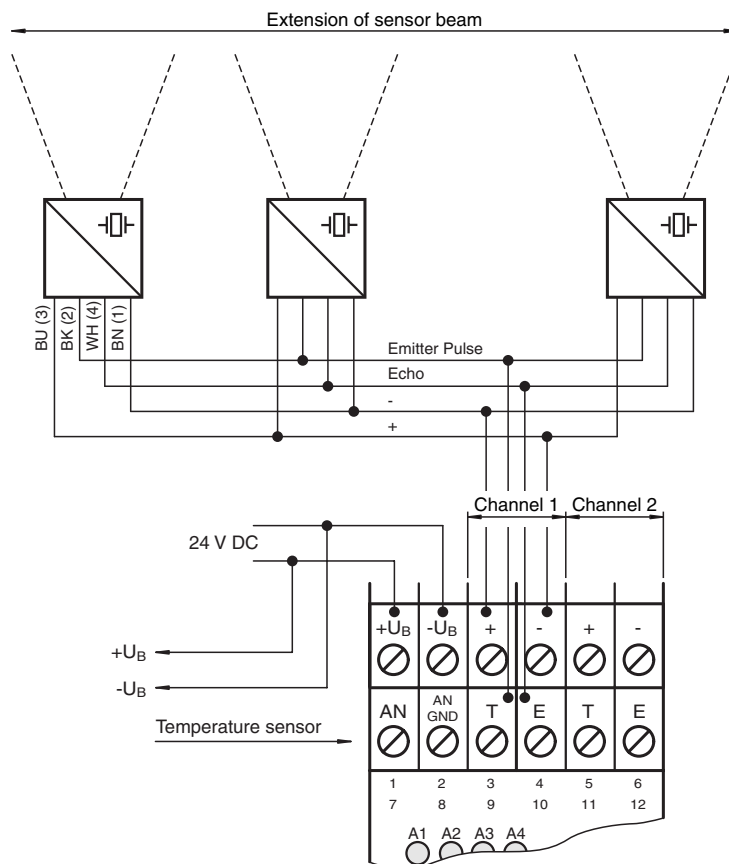
The number of connected sensors is limited by the performance of the external 24V DC power supply of the evaluation unit.

The current consumption of an evaluation system is the sum of the following values:

1. The no-load current consumption of the unit (max. 50 mA) and current consumption of the temperature probe (if connected: max. 20 mA)
2. The total no-load current consumption of all connected US sensors; (for the sake of simplicity, calculate 30 mA max. for each sensor),

3. The maximum output current of the evaluation unit: 80 A (4 channels x 20 mA)

Example: In the terminal diagram, three UB sensors are connected to a single evaluation channel. If one sensor is working on each of the three other channels, the total no-load current (for 6 sensors) is 180 mA. The power supply must have a capacity of around 310 mA ($50 \text{ mA} + 6 \times 30 \text{ mA} + 80 \text{ mA}$), not including a temperature probe.



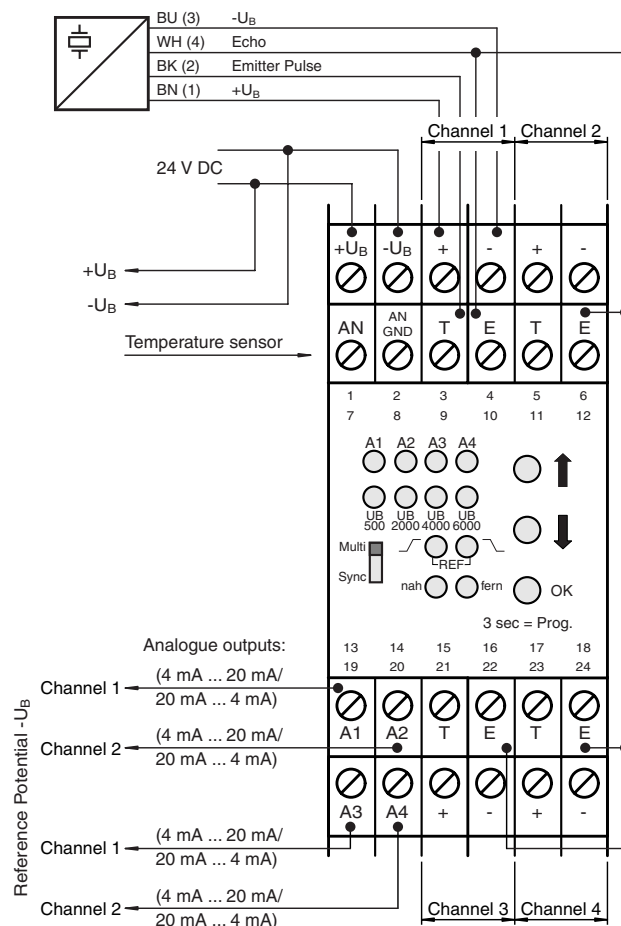
UB sensor with multiple measuring ranges:

A UB sensor connected to any evaluation channel can work with up to four independent measuring ranges by making use of the three other channels. Select synchronous mode and connect the echo output (WH/4) of the sensor to the echo signal inputs (E) of the other channels. For four measuring ranges, use the entire evaluation unit.

Program each used channel to the same range (that of the connected sensor) in programming step 2. The measuring ranges can then be set or taught consecutively for the channels.

Perform the TEACH-IN in programming steps 4 and 5 by placing a target in the sound cone at the desired distances and pressing the $\uparrow$ (up) and $\downarrow$ (down) keys simultaneously. Program the near measuring range limit (step 4) and the far measuring range limit for each channel.

The sequence and spatial relationship of the measuring ranges to one another can be freely selected.



Control unit

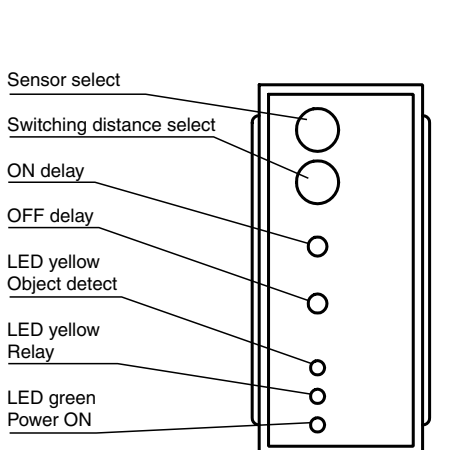


UH3-T1-KT

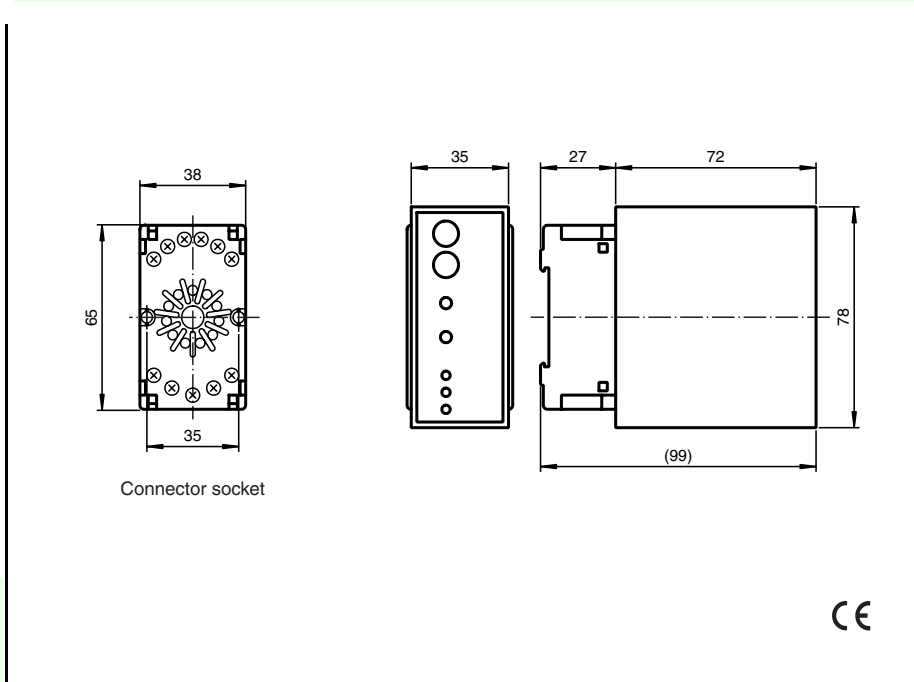
Features

- External evaluation for ultrasonic sensors UB 500/2000/4000/6000-30GM-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

Indicator/Operating means

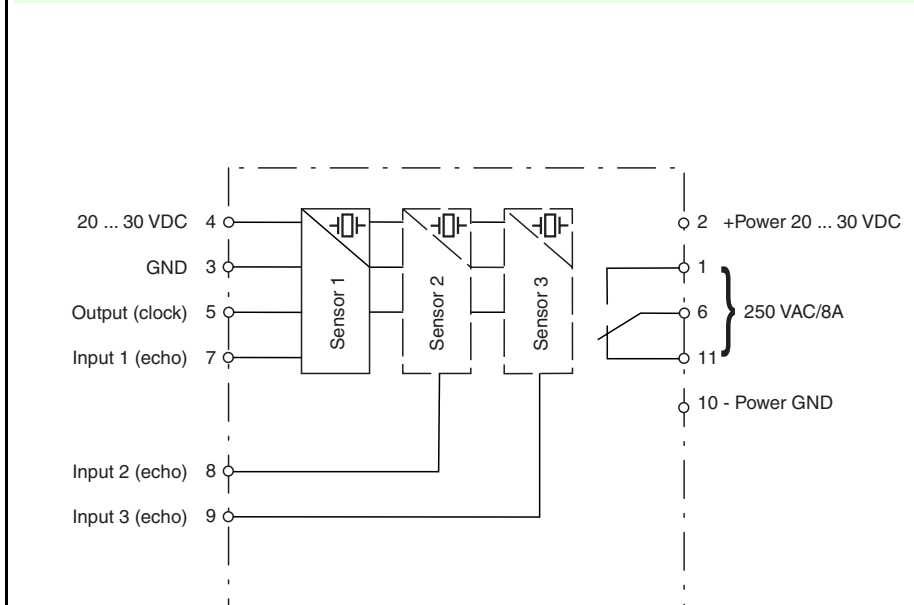


Dimensions



CE

Electrical connection



Technical data

General specifications	
Measuring frequency	approx. 16 Hz
Standard conformity	
Standards	EN 60947-5-2
Indicators/operating means	
Rotary switch	sensor select: setting the switch-point behaviour distance select: setting the operating distance
Electrical specifications	
Operating voltage	20 ... 30 V DC, ripple 10 % _{SS}
No-load supply current	≤ 120 mA (without sensors)
Output	
Output type	changeover contact terminals 6 to 1 (NO) and 11 (NC)
Contact loading	AC: 8 A/250 V
Energized/De-energized delay	270°-potentiometer: ON delay between 0.2 s ... 8 s (± 10%) 270°-potentiometer: OFF delay between 0.2 s ... 8 s (± 10%)
Input	
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 conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Storage temperature	
Mechanical specifications	
Connection type	plug socket 11-pin, attached using 2 x M3 screws or snapped-on to 35 mm standard rail in accordance with EN 50 022 base is included with delivery
Housing	Modular housing
Mass	110 g

Notes

1 Initial operation

A maximum of three sensors can be connected in direct-detection mode. The sensors are clocked synchronously and their outputs are connected in an inclusive OR circuit. They receive their operating power from the evaluation unit. The back-end unit is protected against polarity reversal. The ultrasonic sensors must be connected to the pin base in accordance with the terminal assignment before plugging in the evaluation unit.

Terminal assignment of pin base:

Terminal	Function
1	Output - normally-open change-over contact
2	Operating voltage +20 VDC ... 30 VDC
3	Voltage supply for sensors GND
4	Voltage supply for sensors +20 VDC ... 30 VDC
5	bk/Output - clock signal for sensors
6	Output - middle change-over contact
7	wh/Input 1 - echo input from sensor 1
8	wh/Input 2 - echo input from sensor 2
9	wh/Input 3 - echo input from sensor 3
10	Operating voltage GND
11	Output - normally-closed change-over contact
12	not used
13	not used

Model number

UH3-T1-KT

Description

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. Sensors of the types H3, H12 and H1/H2 can be connected to the unit:

- UB 500-30GM-H3
- UB 500+U9+H3
- UB 2000-30GM-H1 / -H2
- UB 2000-30GM-H3
- UB 3000+U9+H3
- UB 4000-30GM-H3
- UB 6000-30GM-H3
- UB 6000-FP-H3

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.

Accessories

Control unit base (for replacement)

UH3-ST

2 Operating controls

16-position rotary switch (sensor select) (0 ... F):
Setting according to the connected sensor type and desired output relay switching behavior

10-position rotary switch (distance select) (0 ... 9):
Selection of switching point in direct-detection mode
Selection of sensitivity in through-beam mode

270° potentiometer (ON delay):
Pick-up delay of relay (0.2 s ... 8 s)

270° potentiometer (OFF delay):
off delay of relay (0.2 s ... 8 s)

2.1 Sensor select rotary switch

Set the switch according to the connected sensor(s), the detection range and operating mode (direct-detection or through-beam mode) as per the printed table. In addition the switch position determines whether the output relay should pick up (NO) or release (NC) when an object is detected. The following settings are possible depending on the sensor type (see table):

Sensor select	Operating mode	Sensor type	Detection range [mm]	Output relay pick up/release
0/1	Probe	UB 500-30GM-H3 / UB500+U9+H3	60 ... 500	p.u.(NO)/rel.(NC)
2/3	Probe	UB 2000-30GM-H1/H2	100 ... 1000	p.u.(NO)/rel.(NC)
4/5	Probe	UB 2000-30GM-H3	200 ... 2000	p.u.(NO)/rel.(NC)
6/7	Probe	UJ 3000+U9+H3	300 ... 3000	p.u.(NO)/rel.(NC)
8/9	Probe	UB 4000-30GM-H3	500 ... 4000	p.u.(NO)/rel.(NC)
A/B	Probe	UB 6000-30GM-H3 / UB6000-FP-H3	800 ... 6000	p.u.(NO)/rel.(NC)
C/D	Through-beam	UB 2000-30GM-H1/H2	10 ... 5000 barrier	pick up/release
E/F	not used			

2.2 Switching point select rotary switch

When in direct-detection mode, the switch can set a custom switching point within the fixed detection range. Ten steps are possible. The switching point can be calculated on the basis of $(\text{max. switching point}/10) \times (\text{switch position} + 1)$.

Example: An object is to be detected with the 4-m sensor UB 4000-30GM-H3 when it reaches a distance of approx. 2400 mm from the sensor. The evaluation unit is to provide a control signal for a positioning device upon detecting the object.

The Sensor Select rotary switch is in position 8 in accordance with the sensor type and desired switching behavior. The position for the switching point rotary switch can be determined as follows for the desired switching point: Detection range (max. switching point) at position 8/9 divide by 10 = 400. 400×6 results in the required switching point of 2400 mm. According to the formula above, the distance selector switch should be turned to position 5.

Please note: The shortest switching point in position 0 cannot be less than the sensor's unusable area according to the data sheet (see table)!

In through-beam mode, the switching point switch affects the sensitivity of the barrier. In positions with high numbers, small signal differences are distinguished better than in the 0 position (see application 2).

2.3 ON/OFF Delay potentiometers

The switching action of the output relay can be delayed. The potentiometers permit the independent adjustment of the pick-up and release delays of the relay over a range of 0.2 s ... 8.0 s.

Please note: The pick-up delay must be shorter than the time spent in the switching range by the object!

2.4 Displays

Yellow LED (Object detect)	Object within selected switching range
Yellow LED (Relay)	Switching state of the relay (release/pick up)
Green LED (Power ON)	Ready, power on

3 Deployment

The UH3-T1-KT evaluation unit is optimally suited for situations in which areas, entrances or doors are to be monitored using ultrasonic sensors. The advantages of this unit are:

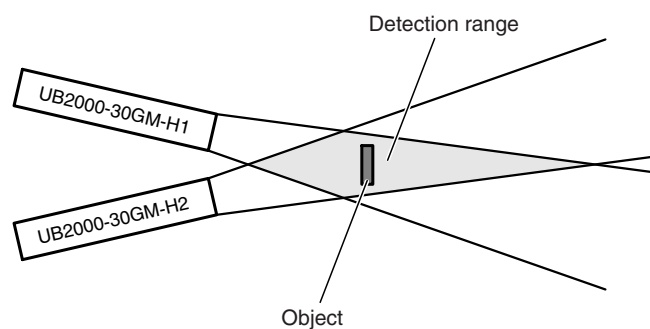
- The connected ultrasonic sensors do not need evaluation logic of their own.
- Certain events call for a delayed evaluation; the immediate response of sensors with integrated evaluation logic would result in evaluation errors (see application 2)
- Simple parallel switching of up to three sensors results in greater coverage, permitting larger areas to be monitored.
- Higher power levels for actuators can be switched directly via relays.

Detection of very small objects

In beam-interruption mode, the transmitter and receiver are mounted on a shared reference line so that the transmitted ultrasonic signal reaches the receiver when there is no object interrupting the signal path.

An arrangement in which the axes of the transmitter and receiver intersect, rather than being positioned on the same line, is particularly useful. The intersection of the axes forms a detection area in which very small objects can also be detected.

For example, the reflection of a wire of >1 mm dia. is sufficient to generate an output signal at the receiver. The switching point Select rotary switch affects the evaluation sensitivity of this arrangement. Small objects are detected more reliably in position 8 or 9 than at 0 or 1.



Digital display unit

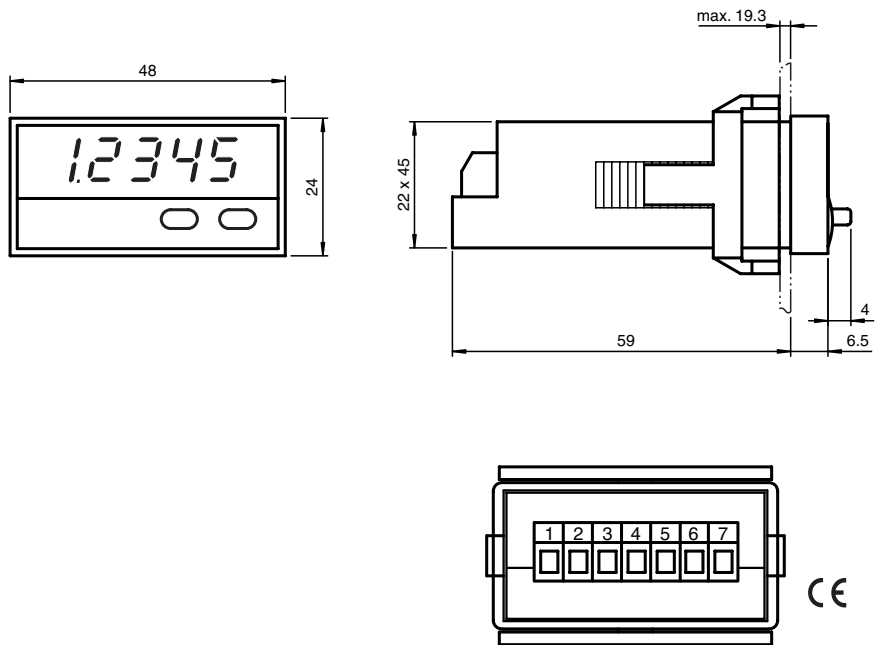


DA5-IU-C

Features

- Bright, high contrast 5-decade LED display
- Leading zero suppression
- Adjustable decimal dot
- Maximum- and minimum-value display

Dimensions



Electrical connection



Terminal Nr.	
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

Technical data

General specifications

Pre-selection	none
Data storage	10 ⁶ storage cycles or 10 years, EEPROM
Programming	menu guided via keypad

Indicators/operating means

Type	7-Segment LED display, red
Number of decades	5
Display value	digit height 8 mm
Display interval	-19999 ... 99999
Decimal dot	free adjustable
Resolution	14 Bit
Scale factor	via linear characteristic curve
Reset	maximum value, manually
Key interlock	-

Electrical specifications

Operating voltage	10 ... 30 V DC
Power consumption	1.5 VA

Input

Impedance	1 MOhm
Voltage	max. 30 DC
Analogue voltage input	0 ... 10 V / 2 ... 10 V DC
Analogue current input	0 ... 20 mA / 4 ... 20 mA

Ambient conditions

Ambient temperature	-10 ... 50 °C (263 ... 323 K)
Storage temperature	-25 ... 70 °C (248 ... 343 K)
Relative humidity	≤ 80 % (non condensing)

Mechanical specifications

Mounting	latch fastener/mounting frame
Connection type	7-pin screw terminal max. core cross-section 0.34 ... 1.5 mm ²
Dimensions	48 mm x 24 mm x 65 mm
Mass	approx. 50 g

Model number

DA5-IU-C

Description

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

Process control and indication equipment

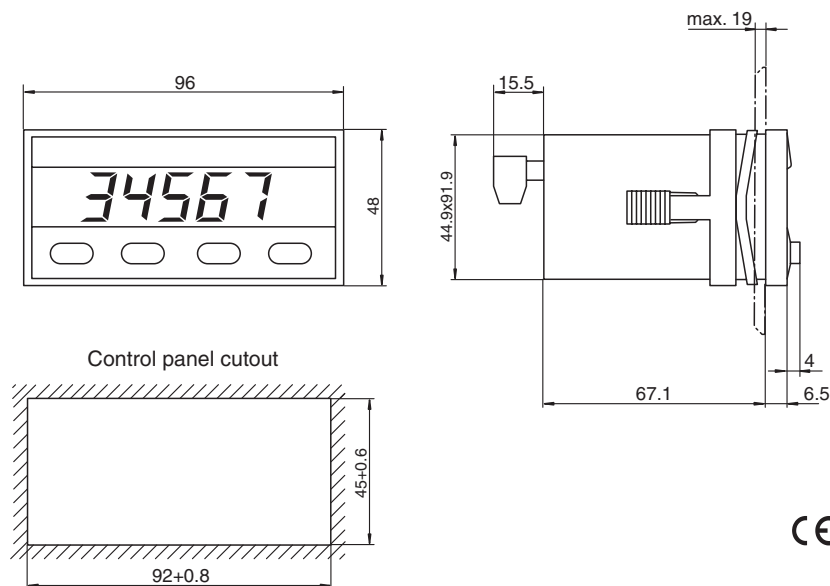


DA5-IU-2K-C DA5-IU-2K-V

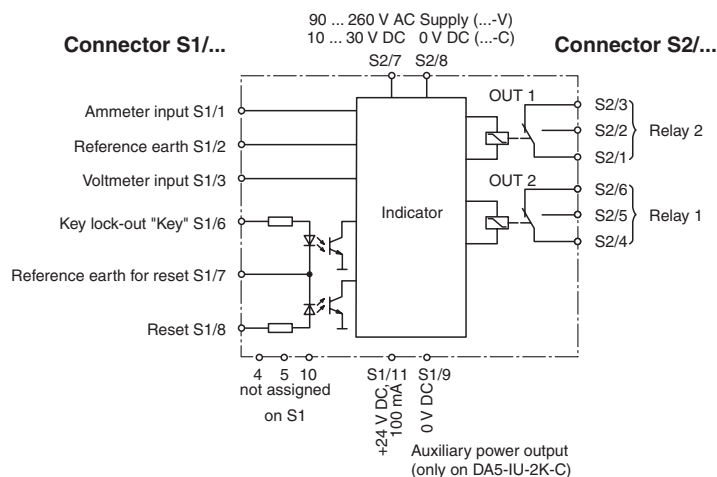
Features

- 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
- Protection degree IP65 in accordance with DIN EN 60 529 (front only)
- Shock resistance in accordance with DIN EN 60 068-2-27
- Vibration resistance in accordance with DIN EN 60 068-2-6

Dimensions



Electrical connection



Technical data

	DA5-IU-2K-C	DA5-IU-2K-V
General specifications		
Pre-selection	2-fold	
Data storage	10 ⁶ storage cycles or 10 years, EEPROM	
Programming	menu guided via keypad	
Indicators/operating means		
Type	7-Segment LED display, red	
Number of decades	5	
Display value	digit height 14.2 mm	
Display interval	-19999 ... 99999	
Decimal dot	free 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"	
Electrical specifications		
Operating voltage	10 ... 30 V DC	90 ... 260 V AC
Power consumption	2 W	7 VA
Output		
Sensor supply		24 V DC , 100 mA
Relay	2 x 250 V AC/ 300 V DC, 3 A, change-over contact	2 x 250 V AC/ 300 V DC, 3 A, change-over contact
Input		
Impedance	> 1MOhm for voltage measurement < 50 Ohm 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 conditions		
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	
Storage temperature	-25 ... 70 °C (248 ... 343 K)	
Relative humidity	≤ 80 % (non condensing)	
Mechanical specifications		
Mounting	Mounting frame with latch fastener	
Connection type	8-pin and 11 pin connectors with plug-in screw terminals	
Dimensions		
Mass	220 g	

Model number

DA5-IU-2K-C
DA5-IU-2K-V

Description

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 ... 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

Transformer Isolated Barriers

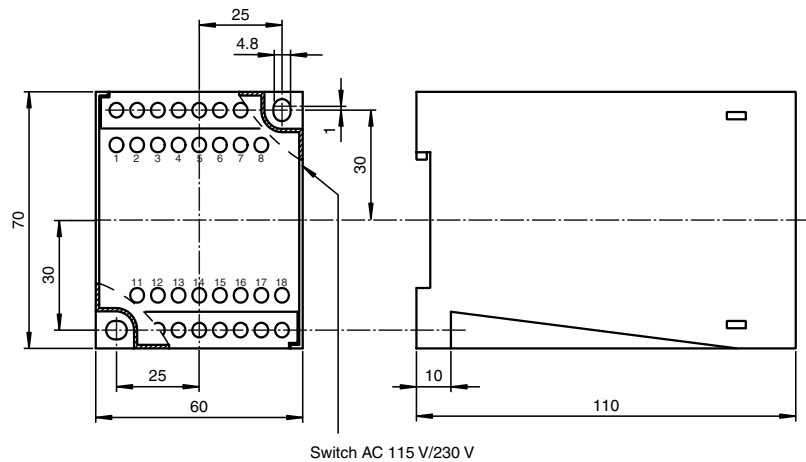


WE77-RE2

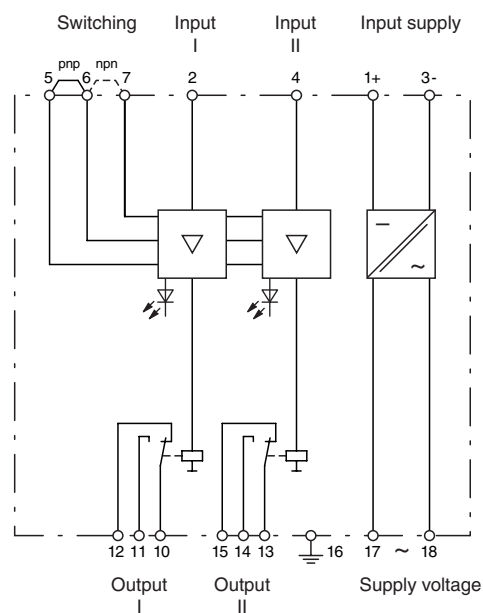
Features

- 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 - energizing the relay / input open - relay de-energized

Dimensions



Electrical connection



Technical data

Supply	
Connection type	terminals 17, 18
Rated operational voltage	98 ... 126 V AC / 198 ... 253 V AC ,45 ... 63 Hz , switchable
Power consumption	approx. 7 VA
Output	
Connection type	terminals 1+, 3-
Voltage	24 V $\pm$ 20 %
Current	160 mA at 60 °C , short-circuit proof
Contact loading	AC: 250 V / 4 A / 500 VA / $\cos \varphi \geq 0.7$ DC: 220 V / 0.1 A; 60 V / 0.6 A; 24 V / 4 A
Mechanical life	10 ⁷ switchings
Energized/De-energized delay	20 ms / 10 ms
Input	
Input signal	high: 24 V DC $\pm$ 20 %, 37 mA low: < 1 V DC, $\leq$ 0.5 mA
Transfer characteristics	
Switching frequency	10 Hz
Ambient conditions	
Ambient temperature	-25 ... 60 °C (248 ... 333 K)
Storage temperature	-25 ... 85 °C (248 ... 358 K)
Mechanical specifications	
Construction type	Modular housing
Mounting	snap-on to 35 mm standard rail or screw fixing
Connection possibilities	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

Model number

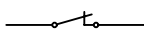
WE77-RE2

Description

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.

Wirkungsrichtung

Eingang	Ausgang
	 angezogen
	 abgefallen

Power supply

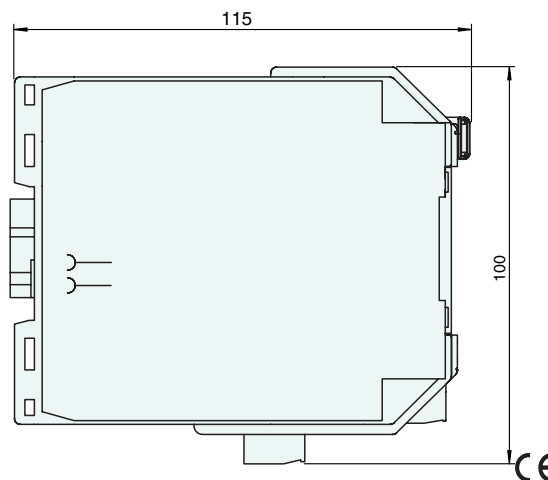
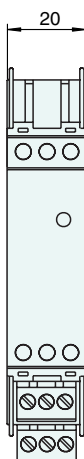


KFA6-STR-1.24.500

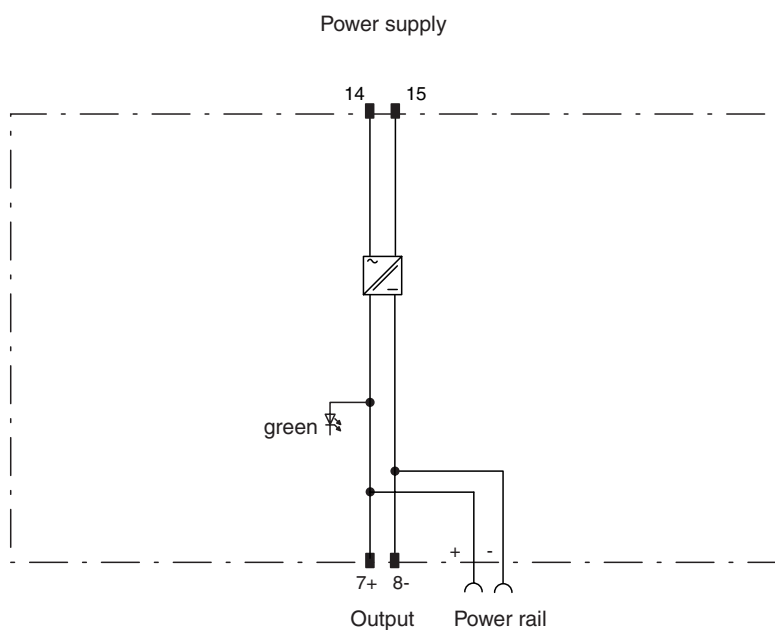
Features

- Switched power supply
- 230 V AC/115 V AC mains nominal voltage
- 24 V DC output voltage
- Max. output current 500 mA
- No ground connection required
- Removable terminals and Power Rail

Dimensions



Electrical connection



Technical data

Supply

Connection type	terminals 14, 15
Rated operational voltage	90 ... 253 V AC , 48 ... 63 Hz
Power loss	2.5 W

Galvanic isolation

Power supply/Output	safe isolation acc. to DIN VDE 0106, design isolation voltage 253 V _{eff}
---------------------	--

Standard conformity

Coordination of insulation	accord. to DIN EN 50178
Galvanic isolation	accord. to DIN EN 50178
Electromagnetic compatibility	accord. to EN 50081-2 / EN 50082-2
Climatic conditions	accord. to DIN IEC 721

Output

Voltage	24 V ± 0.5 V
Current	500 mA at 60 °C , permanent short-circuit protection (electronically)
Connection type	Power Rail or terminals 7+, 8-

Ambient conditions

Ambient temperature	-20 ... 60 °C (253 ... 333 K)
---------------------	-------------------------------

Mechanical specifications

Mass	approx. 140 g
------	---------------

Model number

KFA6-STR-1.24.500

Description

The output voltage of the power supply KFA6-STR-1.24.500 is controlled and permanent, independent of the size of the supply voltage and the load current.

Accessories



Type	Designation	Page
Cable sockets	Ready-to-use and customisable	252
MH 04-3505	Mounting accessory for -FP series sensors	257
MH 04-2681F	Mounting accessory for <i>VariKont (+U1+ and +U9*) series sensors</i>	257
OMH 04	Mounting angle for -18GM series sensors	258
BF18	Mounting flange for -18GM series sensors	258
BF30	Mounting flange for -30GM series sensors	258
M105	Installation flange for -30GM series sensors	258
UVW90-K18 UVW90-K30	Redirection attachment for series -18GM and -30GM	261
UVW90-M30	Focusing attachment bracket for -30GM series sensors	261
BF18-F/BF30-F	Mounting flange for series -18GM/-30GM	259
PA02	Installation flange for -FP series sensors	259
BF 5-30	Universal mounting for ø5 ... ø30 mm sensors	260
UC-30GM-TEMP	External temperature probe	262
LUC4-Z30-G2V	External temperature probe	262
LUC4-Z30-N2V	External temperature probe	262
FP100	Remote potentiometer for through-beam sensor UBE4000-30GM-SA2-V1	262
UC-F43-R2	RS 232 interface for -F43 series sensors	263
UC-30GM-PROG	Extension cable for the programming of UC...-30GM-... and LUC4T-...series sensors	263
UB-PROG2/UB-PROG3	Programming devices for sensor types UB500-18GM75-...-V15, UB...-30GM-...-V15 und UB...-F54-...-V15	264
ULTRA 2001	Service program for easy programming of ultrasonic sensors with RS 232 interfaces	265

Accessories - cables, plugs, mating connectors

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	Socket, straight	Screw terminal, PG7 cable gland	4-pin	max. 2.5	3
	V1-W	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	-
	V15-W-PG9	Socket, straight	Screw terminal	5-pin	max. 0.75	-
Rd24 x 1/8	V16-G	Socket Rd24 x 1/8, straight	Screw terminal	6-pin + PE	max. 0.75	6
	V16S-G	Connector Rd24 x 1/8, straight	Screw terminal	6-pin + PE	max. 0.75	-
M18	V18-G	Socket, straight	Screw terminal	4-pin	max. 1.5	7
	V18-W	Socket, angled	Screw terminal	4-pin	max. 1.5	8
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	9



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9

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 for 5-pin version
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.

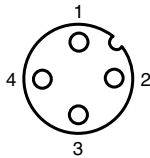
Accessories - cables, plugs, mating connectors

Core colours and connection assignment (EN 60947-5-2)

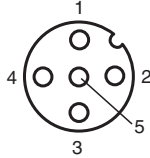
Colour assignment of ready-to-use cable sockets V1, V15, V3:

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

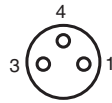
Plug connector -V1
(Circular connection M12)



Plug connector -V15
(Circular connection M12)



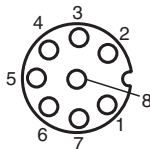
Plug connector -V3
(Circular connection M8)



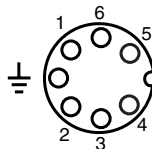
Colour assignment ready-to-use mating connectors V17:

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)



Mating connectors M8 type with metal cap nut ¹⁾

Suitable for sensors with 2, 3 or 4 wires 						
Cable-sheath	Length	No. of cores	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

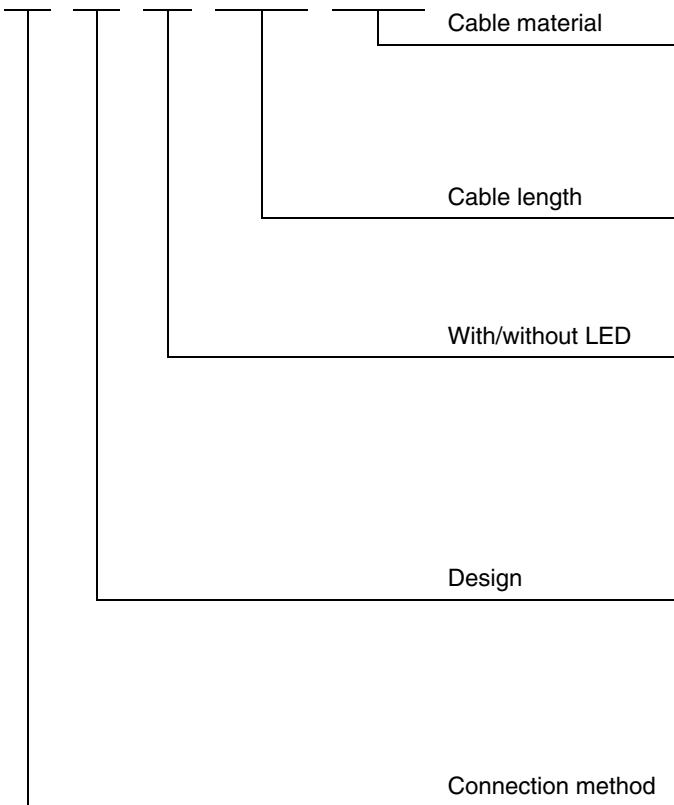
Suitable for DC sensors with 2, 3 or 4 wires 						
Cable-sheath	Length	No. of cores	Ø (mm ²)	Design straight	Design angled	Design angled with 2 LEDs
PVC, grey	2 m	4	0.34	V1-G-2M-PVC	V1-W-2M-PVC	
	5 m	4	0.34	V1-G-5M-PVC	V1-W-5M-PVC	
	10 m	4	0.34	V1-G-10M-PVC	V1-W-10M-PVC	
PUR, grey	2 m	4	0.34	V1-G-2M-PUR	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 cores	Ø (mm ²)	Design straight	Design angled	Design angled with 2 LEDs
PUR, halo-gen 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

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 npn), 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 npn), 2 LEDs
- no designation = without LED

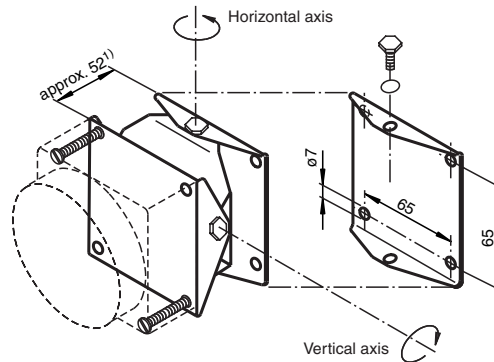
- W angled
- G straight
- WM angled with cap nut
- WR angled with twist connect
- GR straight with twist connect

- 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
- V with central screwed connection, 4-pin

Mounting accessory MH 04-3505



Mounting accessory for the simple adjustment of -FP series sensors



The type 04-3505 mounting accessory simplifies the adjustment of ultrasonic sensors of the FP series.

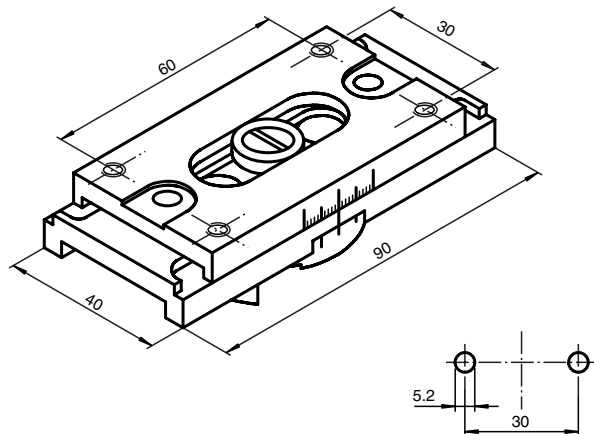
It permits the completely installed and wired sensor to be swiveled by up to $\pm 30^\circ$ in 2 orthogonal axes.

The sensor is locked in the desired position by tightening the mounting screws.

Mounting accessory MH 04-2681F



Mounting accessory for the simple adjustment of *VariKont* series sensors



Height in two-point installation approx. 28 mm

For ultrasonic sensors (VariKont, +U1+ series) as per DIN 43694, EN 50025 or EN 50037.

The simple installation is realised on a proven C-rail¹ in accordance with 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 vibration loads

b < 30 g, T < 11 ms

f < 55 Hz, a < 1 mm

as per IEC 68-2-6 and IEC 68-2-27

Weight

approx. 270 g

Accessories - Mounting aids

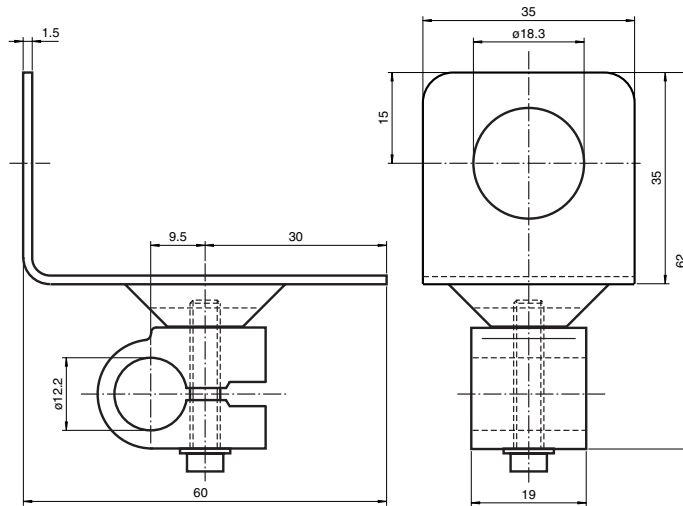
Mounting accessory OMH 04



Universal mounting for all cylindrical
ø18 mm sensors

Material

Angle: sheet steel,
galvanised
Locking disc: sheet steel,
galvanised
Locking profile: aluminium, diecast



For installation on ø12 mm round rod or sheet material
(thickness 1.5 mm ... 3 mm). Suitable for -18GM series sensors.

Mounting flange BF18

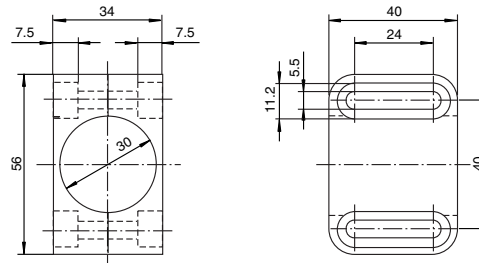
Mounting flange BF30



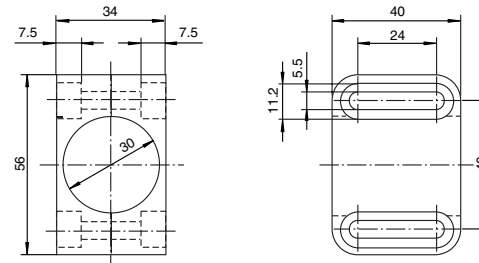
Universal mounting for all cylindrical
sensors with ø18/ø30 mm.

Material: PBT

BF18



BF30



Mounting accessory M-105

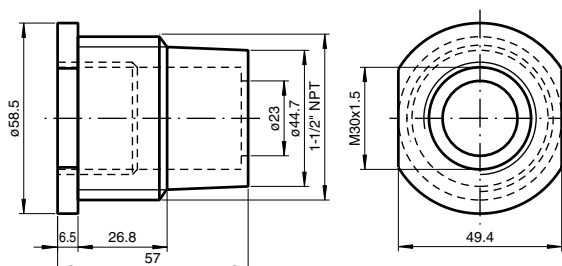


Universal mounting for cylindrical sen-
sors with ø30 mm for sensors with front-
end thread (UB/UC300, -500 and -2000.

- **Secure mounting**
- **Easy installation**
- **Robust design**
- **Chemical-resistant**

Material: PTFE

(Delivery of mounting assecories does
not include sensor))



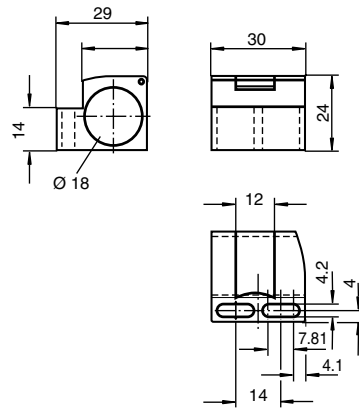
Mounting flanges BF18-F/BF30-F



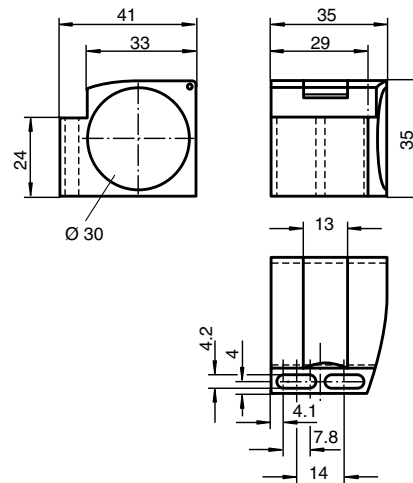
Universal mounting for all cylindrical sensors with $\varnothing 18/\varnothing 30$ mm

- 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



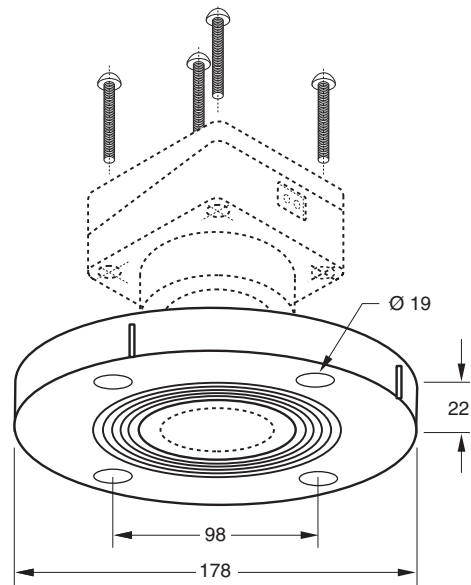
Mounting flange PA-02



Mounting flange for all cubical type -FP series sensors

- **Secure mounting**
- **Easy installation**
- **Robust design**

(Delivery of mounting flange does not include sensor)



Material: PVC

Accessories - Mounting aids

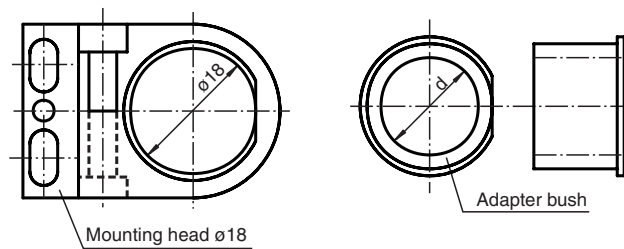
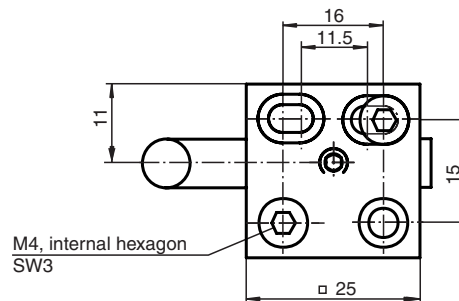
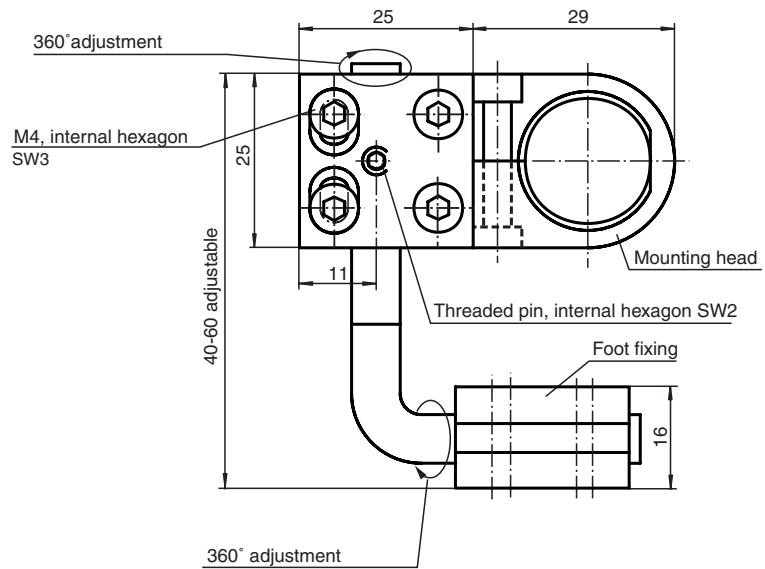
Mounting flange BF 5-30



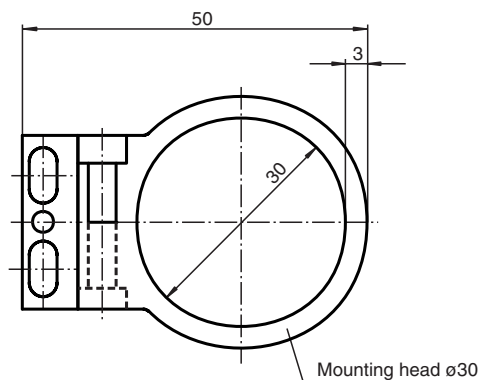
Universal mounting for all cylindrical sensors with $\varnothing 5$ mm ... $\varnothing 30$ mm

- **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 ($\varnothing 18$ mm, $\varnothing 30$ mm) and 4 sleeves ($\varnothing 5$ mm, $\varnothing 8$ mm, $\varnothing 12$ mm, $\varnothing 14$ mm).



d = 5 mm, 8 mm, 12 mm, 14 mm



Sound deflector UVW90-K18 Sound deflector UVW90-K30



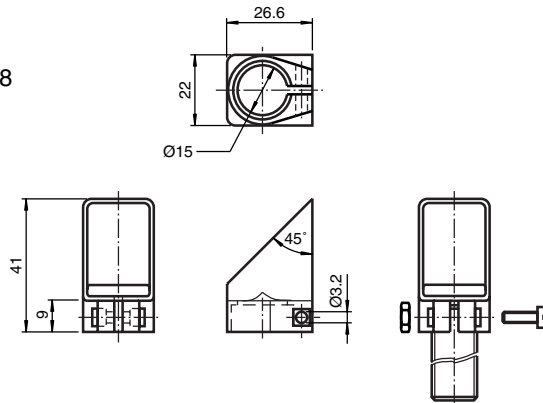
Sound deflector for cylindrical -18GM and -30GM series ultrasonic sensors.

- **Clamp mounting**
- **90° sound deflection for difficult installation circumstances**
- **Universal installation position**

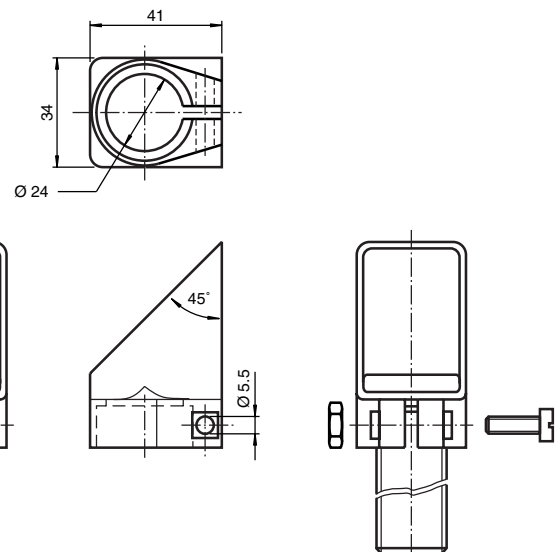
On the underside of the slope the focusing attachment has a hole over the complete width. Falling particle of dust can not congregate in the deflector. The function is also guaranteed in dusty environment.

Material: PMMA

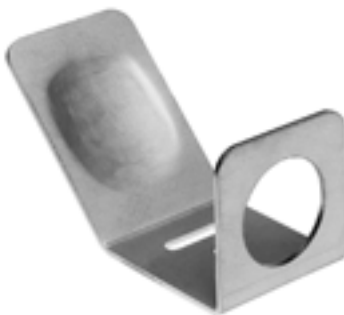
UVW90-K18



UVW90-K30



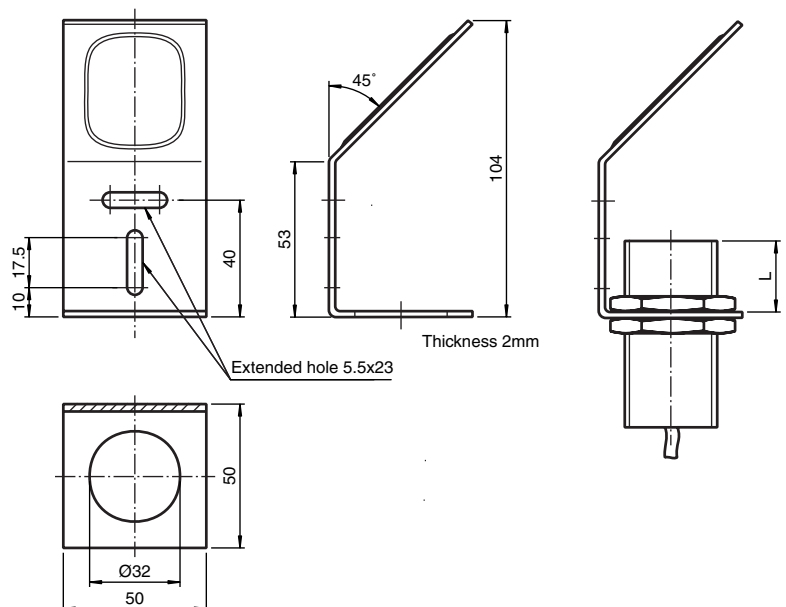
Focusing sound deflector UVW90-M30



Focusing sound deflector for cylindrical -30GM series ultrasonic sensors.

- **Universal installation options**
- **90° sound deflection for difficult installation circumstances**
- **Universal installation position**
- **Focusing effect**
- **Increasing of sensing range (due to focusing)**
 - approx. 40 % at UB/UC500 (with L = 10 mm)
 - approx. 20 % at UB/UC2000 (with L = 20 mm)

Material: Stainless steel



Accessories - externe temperature probe, remote potentiometer

External temperature probe UC-30GM-TEMP



- For ultrasonic sensors of the UC...-30GM-... and LUC4T-... series
- 8 mm plug connector
- Single-hole mounting with position locking

External temperature probe LUC4-Z30-G2V LUC4-Z30-N2V



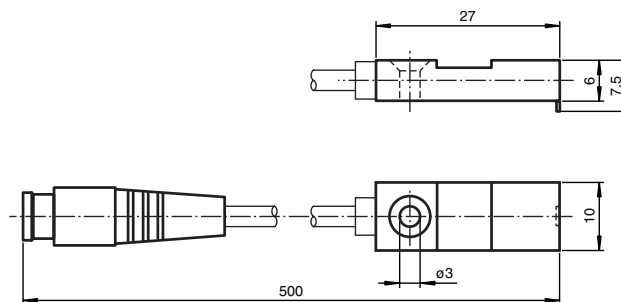
- For ultrasonic level sensors of the LUC4T-... and UC...-30GM-... series
- 8 mm plug connector
- Single-hole mounting in thread:
G $\frac{1}{2}$ A (LUC4-Z30-G2V)
 $\frac{1}{2}$ NPT (LUC4-Z30-N2V).

Remote potentiometer FP100



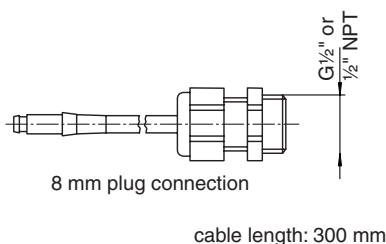
Potentiometer for the adjustment of the sensing range of ultrasonic through-beam sensor UBE4000-30GM-SA2-V1.

The potentiometer connection occurs on the transmitter

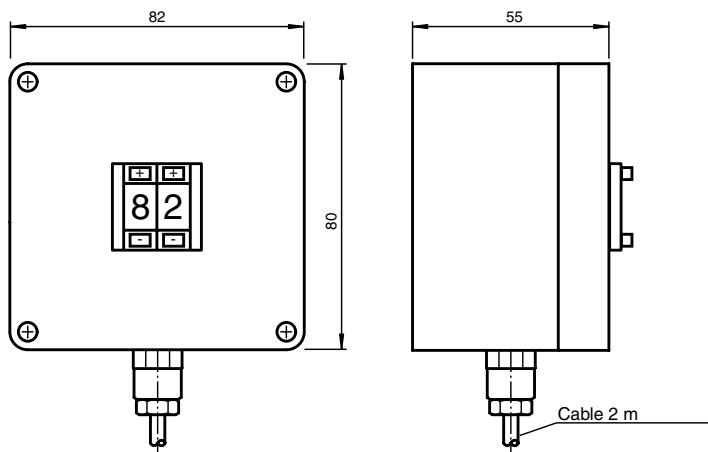


The external UC-30GM-TEMP temperature probe may be connected to ultrasonic sensors of the UC...-30GM-... and LUC4T-... series as an alternative to the supplied temperature plug.

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.



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.

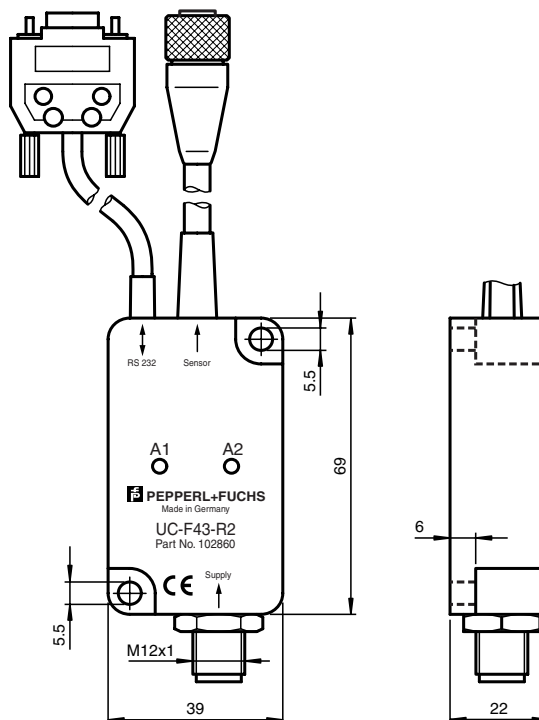


RS 232 interface UC-F43-R2

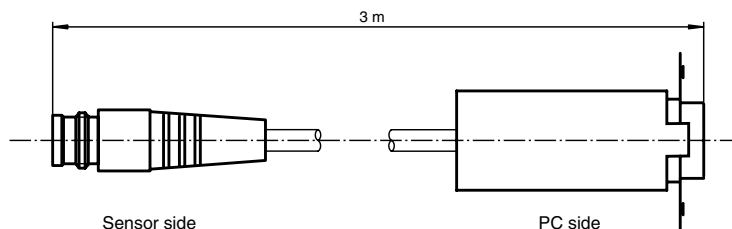


- For the sensors UC300-F43-2KIR2-V17 and UC2000-F43-2KIR2-V17.
- Simple insertion in the sensor connection lead.

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.

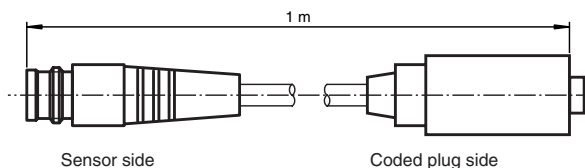


Interface cable UC-30GM-R2



The interface cable UC-30GM-R2 permits to program the UC...-30GM-...R2-V15 ultrasonic sensor series using the service program ULTRA 2001. The cable connects the PC internal RS 232 interface and the plug connector of the temperature-/TEACH-IN plug.

Extension cable UC-30GM-PROG



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.

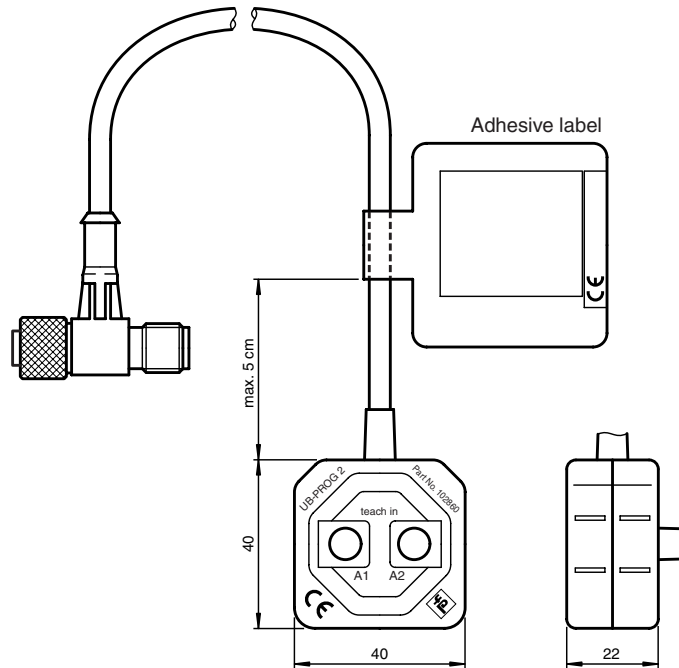
Programming unit UB-PROG2



- For ultrasonic sensors series

UB500	-18GM75	-E4	-V15
UB2000	-30GM	-E5	
UB4000	-F54	-I	
UB6000		-U	

- 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.

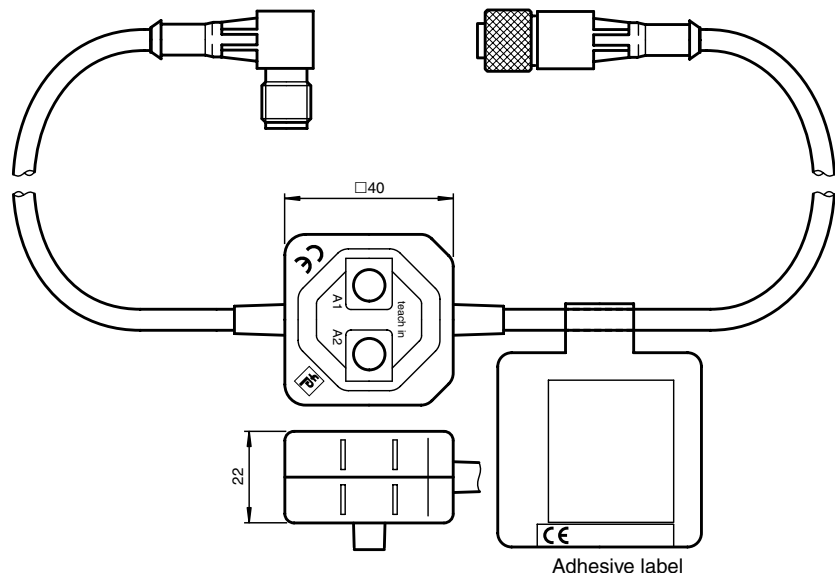
Programming unit UB-PROG3



- For ultrasonic sensors series

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

- 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.

ULTRA 2001 service program

Service program ULTRA 2001



- 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 behavior
 - 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.

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

Series:	sensor types:
-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.

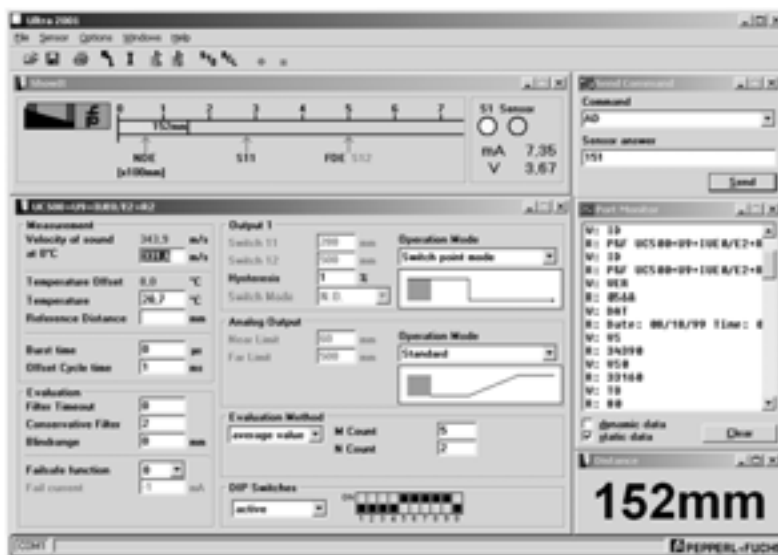
Parameters: All parameters are editable here. Display and input fields permit commands or parameters to be changed at the click of the mouse without detailed knowledge of the relevant commands or their syntax.

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.

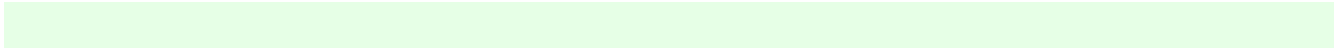


Scope of delivery:

- 1 CD ROM with the service program ULTRA 2001
- 1 RS 232 interface cable
- 1 Ultra 2001 manual, German/English.

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.



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

The usual atmospheric fluctuations ($\pm 5\%$) at a given location causes fluctuations in the velocity of sound amounting to around $\pm 0.6\%$.

Under normal circumstances, the effect on switching distances is negligible.

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

Range in which an ultrasonic sensor cannot detect an object or reflector.

⇒ "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/EWG EMC-directive
(see also IEC 801)
73/23/EWG Low
voltage directive
(see VDE 0160,
EN 60 947-5-2)

94/9/EG Devices and protection 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 the event of a fault, the last valid output states are "frozen". The output states are retained until the fault is cleared and the sensor returns 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

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 RS 232).

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"

One shot output 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

PBT

Polybutyleneterephthalate

PC

Polycarbonate

PMMA

Polymethylmethacrylate

Probe

⇒ Reflection sensor

Protection class

EN 40050 classifies the degree of protection of electrical equipment against contact, the entry of objects or water into enclosures or covers, etc. The IP code consists of the letters IP (International Protection) and two numbers:

First number:

Degree of protection against contact and foreign objects

Second number:

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. $U_e = 10 \text{ V DC} \dots 30 \text{ V DC}$.

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.

⇒ "Sensor principle" section

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.

⇒ "Sensor principle" section

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:

Reflection (continuation)

- 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 $23 \pm 5 \text{ °C}$ 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 with the operating voltage U_e applied at an ambient temperature of 20 °C and a relative humidity of 50 %. In the case of through-beam sensors the receiver is moved toward the transmitter, and with reflection sensors the measuring plate is moved axially toward the sensor. 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 **aReflective mode sensor**.

Type T

According to EN 60947-5-2, the designation for a **Through-beam sensor**.

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

(previously:

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.

Type index

Ordering code Page

DA5-IU-2K-C	244
DA5-IU-2K-V	244
DA5-IU-C	242
KFA6-STR-1.24.500	248
LUC4T-G5P-IU-V15	212
LUC4T-G5S-IU-V15	212
LUC4T-N5P-IU-V15	214
LUC4T-N5S-IU-V15	214
UB1000+FP1+E6	168
UB2000-30GM-E4-V15	100
UB2000-30GM-E5-V15	100
UB2000-30GM-H1	116
UB2000-30GM-H2	118
UB2000-30GM-H3	120
UB2000-F54-E4-V15	188
UB2000-F54-E5-V15	188
UB2000-F54-H3-V1	194
UB2000-F54-I-V15	192
UB2000-F54-U-V15	192
UB3000+U9+H3	150
UB4000-30GM-E4-V15	104
UB4000-30GM-E5-V15	104
UB4000-30GM-H3	122
UB500+U9+H3	136
UB500-18GM75-E01-V15	30
UB500-18GM75-E23-V15	30
UB500-18GM75-E4-V15	32
UB500-18GM75-E5-V15	32
UB500-18GM75-E6-V15	36
UB500-18GM75-E7-V15	36
UB500-18GM75-I-V15	38
UB500-18GM75-U-V15	38
UB500-30GM-E4-V15	96
UB500-30GM-E5-V15	96
UB500-30GM-H3	114
UB500-F54-E4-V15	180
UB500-F54-E5-V15	180
UB500-F54-H3-V1	186
UB500-F54-I-V15	184
UB500-F54-U-V15	184
UB6000-30GM-E4-V15	108
UB6000-30GM-E5-V15	108
UB6000-30GM-H3	124
UB6000-FP-H3	170
UBE1500-F64-SE0	202
UBE1500-F64-SE0-V3	204
UBE1500-F64-SE2	202
UBE1500-F64-SE2-V3	204
UBE4000-30GM-SA2-V1	112

Ordering code Page

UBE500-18GK-SE0-V1	28
UBE500-18GK-SE2-V1	28
UBE500-F64-SE0	198
UBE500-F64-SE0-V3	200
UBE500-F64-SE2	198
UBE500-F64-SE2-V3	200
UC1000-30GM-E6R2-K-V15	62
UC1000-30GM-IUR2-K-V15	68
UC2000-30GM-E6R2-V15	72
UC2000-30GM-E7R2-V15	72
UC2000-30GM-IUR2-V15	76
UC2000-F43-2KIR2-V17	176
UC3000+U9+E6+R2	138
UC3000+U9+E7+R2	138
UC3000+U9+IUE0+R2	142
UC3000+U9+IUE2+R2	142
UC300-30GM-E6R2-K-V15	42
UC300-30GM-IUR2-K-V15	46
UC300-30GM-IU-V1	50
UC300-F43-2KIR2-V17	174
UC4000-30GM-E6R2-V15	80
UC4000-30GM-E7R2-V15	80
UC4000-30GM-IUR2-V15	84
UC500+U9+E6+R2	128
UC500+U9+IUE2+R2	132
UC500-30GM-E6R2-V15	52
UC500-30GM-E7R2-V15	52
UC500-30GM-IUR2-V15	56
UC500-D1-3K-V7	208
UC6000-30GM-E6R2-V15	88
UC6000-30GM-E7R2-V15	88
UC6000-30GM-IUR2-V15	92
UC6000-FP-E6-R2-P5	154
UC6000-FP-E7-R2-P5	154
UC6000-FP-IUE0-R2-P5	158
UC6000-FP-IUE2-R2-P5	158
UCC1000-30GM-E6-V1	60
UCC1000-30GM-IU-V1	66
UDB-18GM35-3E2	218
UDBK-18GM35-3E2	222
UDBL-18GM35-3E2	220
UH3-KHD2-4E5	226
UH3-KHD2-4I	232
UH3-T1-KT	238
UJ3000+U1+8B+RS	146
UJ4000-FP-E2-P1	162
UJ6000-FP-8B+RS	164
WE77-RE2	246

