

Ultrasonic sensor

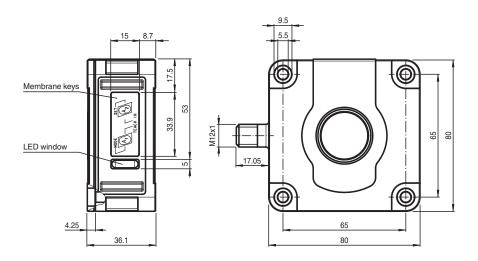
UB2000-F42-I-V15

- Analog output 4 mA ... 20 mA
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable divergence of sound cone in close range)
- Temperature compensation
- Synchronization options
- Mode of operation adjustable

Single head system



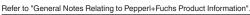
Dimensions



Technical Data

General specifications	
Sensing range	60 2000 mm
Adjustment range	90 2000 mm
Dead band	0 60 mm
Standard target plate	100 mm x 100 mm
Transducer frequency	approx. 175 kHz
Response delay	approx. 150 ms
Indicators/operating means	
LED green	solid green: Power on

Technical Data LED yellow solid: object in evaluation range flashing: program function LED red normal operation: "fault" program function: no object detected **Electrical specifications** Operating voltage U_B 10 ... 30 V DC , ripple 10 $\%_{\text{SS}}$ No-load supply current ≤ 50 mA Input/Output Synchronization bi-directional 0 level -U_B...+1 V 1 level: +4 V...+U_B input impedance: > 12 KOhm synchronization pulse: \geq 100 μ s, synchronization interpulse period: \geq 2 ms Synchronization frequency Common mode operation max. 30 Hz ≤ 30/n Hz. n = number of sensors Multiplex operation Output 1 analog output 4 ... 20 mA Output type Default setting evaluation limit A1: 90 mm, evaluation limit A2: 2000 mm, wide sound lobe Resolution 0.7 mm Deviation of the characteristic curve ± 1 % of full-scale value Repeat accuracy ± 0.1 % of full-scale value Load impedance 0 ... 300 Ohm ± 1 % of full-scale value Temperature influence Compliance with standards and directives Standard conformity EN IEC 60947-5-2:2020 IEC 60947-5-2:2019 Standards EN 60947-5-7:2003 IEC 60947-5-7:2003 Approvals and certificates **UL** approval cULus Listed, Class 2 Power Source CCC approval CCC approval / marking not required for products rated ≤36 V **Ambient conditions** Ambient temperature -25 ... 70 °C (-13 ... 158 °F) Storage temperature -40 ... 85 °C (-40 ... 185 °F) Mechanical specifications Connection type Connector plug M12 x 1, 5-pin IP54 Degree of protection Material ABS Housing epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT Transducer Mass 140 g **Dimensions** Height 80 mm Width 80 mm Length 34 mm



Ultrasonic sensor UB2000-F42-I-V15

Connection Assignment

Standard symbol/Connections:

(version I)

1 (BN) + U_B

5 (GY) Teaching input

4 (BK) Sync.

Analog output

- II.

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

Connection Assignment

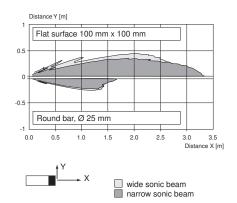


Wire colors in accordance with EN 60947-5-2

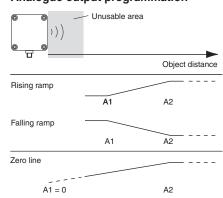
1 BN (brown)
2 WH (white)
3 BU (blue)
4 BK (black)
5 GY (gray)

Characteristic Curve

Characteristic response curve



Analogue output programmation



Functional Description

The sensor may be completely parameterised via two keys on the side panel of the housing. As a special feature provided by this sensor, the ultrasound beam width may be adapted to the environmental conditions at the place of operation of the sensor.

Specifying the evaluation limits:

The evaluation limits determine the characteristic line and the working range of the analog output.

Specifying the A1 evaluation limit by pressing the A1 key		
Holding down the A1key > 2 seconds	The sensor switches to learn mode and the user may specify the A1 evaluation limit	
Position the target object at the desired distance	The yellow LED of the sensor flashes fast to indicate that the target object is recognised. The red LED flashes if the object is not recognised.	
Briefly pressing the A1 key	The sensor terminates the specification of the A1 evaluation limit and saves it as a non-volatile value. The specified value is invalid if the object is uncertain (i.e. the red LED lights up at irregular intervals). The learn mode is exited.	

The A2 evaluation limit is specified via the A2 key, analogous to the description above.

Alternatively, the evaluation limits may also be specified electrically via the learn input. To specify the A1 evaluation limit, the learn input must be connected to

-U_B; to specify the A2 evaluation limit, it must be connected to +U_B. Specified values are saved upon the disconnection from the learn input.

Evaluation limits may only be specified within the first 5 minutes after Power on. To modify the evaluation limits later, the user may specify the desired values only after a new Power On.

Proceed as follows to parameterise the output function and the ultrasound beam width:

Press the A1 key during Power on and hold down the key for another second to ensure that the sensor starts the two-step parameterisation of the operating modes.

Step 1, parameterisation of the output function

The output function parameterised last is displayed. All output functions available may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via short flashes of the green LED.

Operating mode	Flash sequence of the green LED	A2 key
Rising edge		
Falling edge	-\\(\frac{1}{2}\)-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
Zero point straight line	pause	

The "Zero point straight line" setting fixedly specifies the A1 evaluation limit to 0 (see specification of the evaluation limits). The A2 evaluation limit determines the steepness of the output characteristic line.

Hold down the A1 key for 2 seconds to save the selected output mode, complete the parameterisation and ensure that the sensor returns to normal mode. If you briefly press the A1 key, Step 2 is entered (parameterisation of the ultrasound beam width).

Step 2, parameterisation of the ultrasound beam width

Via Step 2, the ultrasound beam width may be adapted to the requirements of the corresponding application.

The beam width parameterised last is displayed first. Available beam width settings may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via the flash sequence of the red LED.

Beam width	Flash sequence of the red LED	A2 key
Small beam		
Medium beam		
Large beam	pause pause	

Hold down the A1 key for 2 seconds to save the selected beam shape, terminate the parameterisation and ensure that the sensor returns to normal mode. Briefly press the A1 key to return to Step 1 (parameterisation of the output function).

If the parameterisation mode is not terminated within 5 minutes (hold down the A1 key for 2 seconds), the sensor aborts this mode without modifying the settings.

The sensor provides a synchronisation port to suppress mutual influencing. If this port has not been connected, the sensor works at an internally generated cycle rate. Several sensors may be synchronised via the following options.

External synchronisation:

The sensor may be synchronised via the external application of a square wave voltage. A synchronisation pulse on the synchronisation input initiates a measuring cycle. The pulse width must be greater than $100 \, \mu s$. The measuring cycle is started with the falling edge. A low level $> 1 \, s$ or an open synchronisation input initiate the transition to normal sensor mode. A high level on the synchronisation input deactivates the sensor.

Two modes are possible:

- Several sensors are controlled via the same synchronisation signal. The sensors work in common mode.
- The synchronisation pulses are forwarded at cyclic intervals to respectively one single sensor. The sensors work in multiplex mode.

Self-synchronisation:

The synchronisation ports of up to 5 sensors suitable for self-synchronisation are connected to each other. These sensors work in multiplex mode after Power on. The On delay increases depending on the number of sensors to be synchronised. While the learn mode is active, no synchronisation is possible (and vice-versa). To specify the switching points, the sensors must be operated in non-synchronised mode.

Note:

If the synchronisation option is not used, the synchronisation input must be connected to ground (0V) or the sensor must be operated with a (4-pole) V1 connecting cable.