**Ultrasonic sensor**
UB500-F42S-E5-V15

Features

- Switch output
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation
- Synchronisation options
- NO/NC selectable

Electrical connection

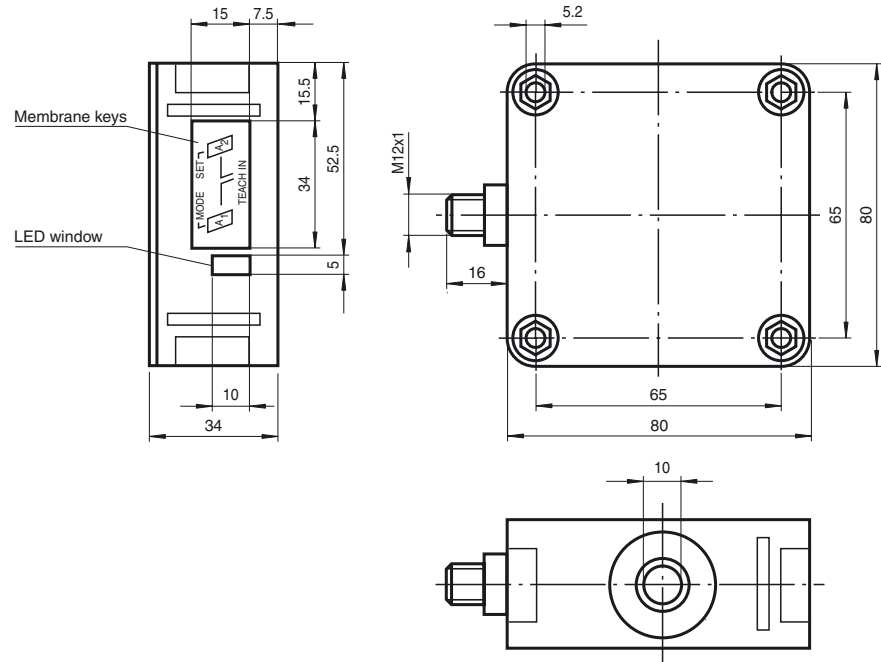**Standard symbol/Connections:**
(version E5, pnp)

Pin	Colour	Signal
1	(BN)	+ U_B
2	(WH)	Teaching input
5	(GY)	Synchronous
4	(BK)	Switch output
3	(BU)	- U_B
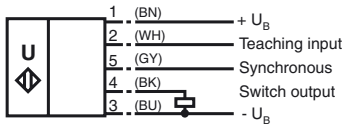
Core colours in accordance with EN 60947-5-2.

Connector V15

Dimensions

Membrane keys

LED window

Technical data

$C \epsilon$

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. 390 kHz
Response delay	approx. 50 ms

Indicators/operating means

LED green	permanently green: Power on
LED yellow	permanent: switching state switch output
	flashing: TEACH-IN function
LED red	normal operation: "fault"
	TEACH-IN function: no object detected

Electrical specifications

Operating voltage	10 ... 30 V DC , ripple 10 %$_{SS}$
No-load supply current I_0	$\leq$ 50 mA

Input/Output

Synchronisation	bi-directional
	0 level $-U_B$...+1 V
	1 level: +4 V...+U_B
	input impedance: > 12 KOhm
	synchronisation pulse: $\geq$ 100 μs, synchronisation interpulse period: $\geq$ 2 ms

Synchronisation frequency
Common mode operation	$\leq$ 95 Hz
Multiplex operation	$\leq$ 95/n Hz, n = number of sensors

Output

Output type	1 switch output E5, pnp NO/NC, parameterisable
Repeat accuracy	$\leq$ 0.5 % of switching point
Rated operational current I_e	200 mA , short-circuit/overload protected
Voltage drop U_d	$\leq$ 2.5 V
Switching frequency f	$\leq$ 8 Hz
Range hysteresis H	1 % of the set operating distance
Temperature influence	$\pm$ 1 % of full-scale value

Standard conformity

Standards	EN 60947-5-2

Ambient conditions

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

Mechanical specifications

Protection degree	IP54
Connection	connector V15 (M12 x 1), 5 pin
Material	
Housing	ABS
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT
Mass	140 g

Functional Description

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

Default settings

A1: Minimum sensing range
A2: Nominal distance
window function
wide ultrasound beam

Specifying the switching points:

When specifying the switching points, the user determines at which points the switching output changes its state. The order of the switching points A1 > A2, or A1 < A2 also determines the direction of action (i.e. normally-closed/normally-open contact function).

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

The A2 switching point is specified via the A2 key, analogous to the description above.

Alternatively, the switching points may also be specified electrically via the learn input. To specify the A1 switching point, the learn input must be connected to -U_B; to specify the A2 switching point, it must be connected to +U_B. Specified values are saved upon the disconnection from the learn input.

Switching points may only be specified directly after Power on. A time lock secures the adjusted switching points against unintended modification 5 minutes after the last keypress. To modify the switching points later, the user may specify the desired values only after a new Power On.

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

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

Step 1, parameterisation of the output function

The output function parameterised last is displayed. All output functions available may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via short flashes of the green LED.
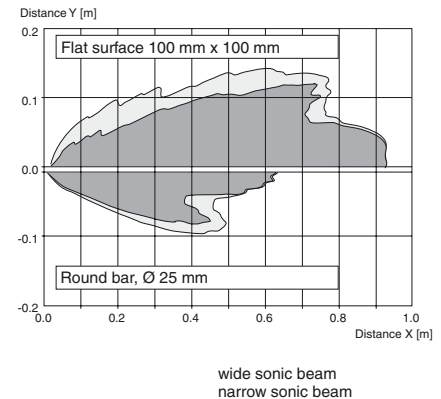
Operating mode	Flash sequence of the green LED	A2 key
1 switching point/ object detection	☼ ——— pause ——— ☼	
Window function (default)	☼ ☼ ——— pause ——— ☼	
Hysteresis mode	☼ ☼ ☼ ——— pause ———	

Hold down the A1 key for 2 seconds to save the selected output mode, complete the parameterisation and ensure that the sensor returns to normal mode. Step 2 may be initiated by briefly pressing the A1 key (parameterisation of the ultrasound beam width).
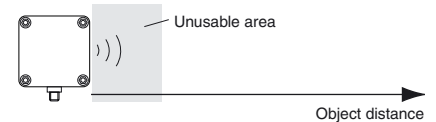
UB500-F42S-E5-V15

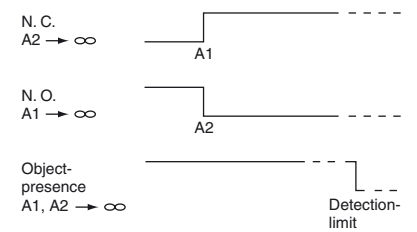### Characteristic curves/additional information
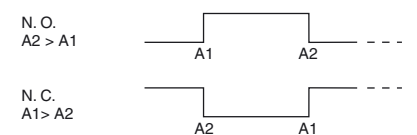
Characteristic response curve

Distance Y [m]
Flat surface 100 mm x 100 mm
Round bar, Ø 25 mm
Distance X [m]

wide sonic beam
narrow sonic beam

Programmable operation modes

Unusable area
Object distance

1. Switching point mode

N. C.
A2 → ∞
A1

N. O.
A1 → ∞
A2

Object-presence
A1, A2 → ∞
Detection-limit

2. Window mode

N. O.
A2 > A1
A1   A2

N. C.
A1 > A2
A2   A1

3. Hysteresis mode

N. C.
A2 > A1
A1   A2

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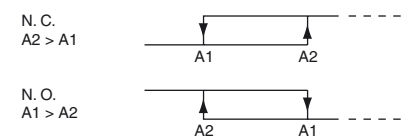
Note:
→ ∞ means: cover transducer surface with your hand, while teaching the switching point.
If A1 = A2, the output works like A2 > A1

Subject to reasonable modifications due to technical advances.   Printed in Germany

Sensotronik AB • Tel.: +46 44 200 800 • Fax +46 44 200 899 • E-mail info@sensotronik.se • Internet http://www.sensotronik.se   **2**

Step 2, parameterisation of the ultrasound beam width

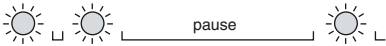In the near range, via Step 2, the ultrasound beam width may be adapted to the requirements of the corresponding application. The beam width parameterised last is displayed first. Available beam width settings may be selected via consecutive, brief strokes of the A2 key. These strokes are visualised via the flash sequence of the red LED.

Beam width	Flash sequence of the red LED	A2 key
Small beam	☼ └── pause ──┘ ☼ └	
Medium beam	☼ ☼ └── pause ──┘ ☼ └	
Large beam	☼ ☼ ☼ └── pause ──┘	

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

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

Synchronisation

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

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

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

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

Note:

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

Accessories

Mounting aids
MH 04-3505
MHW 11

Cable sockets [*)]
V15-G-2M-PVC
V15-W-2M-PUR

[*)] For additional cable sockets see section „Accessories".

Subject to reasonable modifications due to technical advances.   Printed in Germany

3   Sensotronik AB • Tel.: +46 44 200 800 • Fax +46 44 200 899 • E-mail info@sensotronik.se • Internet http://www.sensotronik.se