

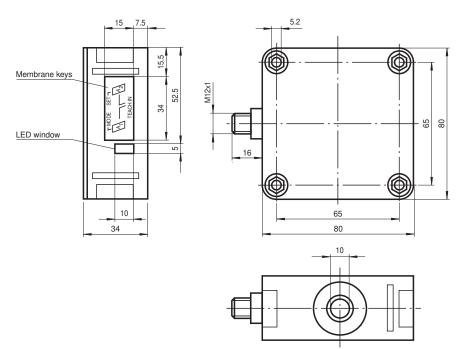
# Ultrasonic sensor UB500-F42S-E5-V15

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

Single head system



## **Dimensions**



## **Technical Data**

General specifications	
Sensing range	30 500 mm
Adjustment range	50 500 mm
Dead band	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	solid green: Power on

Refer to "General Notes Relating to Pepperl+Fuchs Product Information"

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## **Technical Data**

## UB500-F42S-E5-V15

Operating voltageUB1030 V DC, ripple 10 %BBNo-load supply currentI0 $\leq 50 \text{ mA}$ Input/OutputSynchronizationSiddirectional I olevel - UB, at YU Input impediance:> 12 KOhm input impediance:> 11 % of the set operating distance ince input impediance:Standa			
Piogram function: no object detectedElectrical specificationsUp1030 V DC, ripple 10 %38No-load supply currentlp≤ 50 mAInput/OutputSo mASynchronizationlpI-directional 0 level -Up+1 V 1 level + 4 V+Up niput impedance: > 12 KOhm synchronization frequencymax. 95 HzMultiplex operationmax. 95 HzMultiplex operationsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutputsynchronization frequencymax. 95 HzMultiplex operationsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization interpulse period: > 2 msOutput typsynchronization publies > 100 µs, synchronization publies > 2 msOutput typsynchronization publies > 100 µs, synchronization publies > 2 msSynchronization public > 200 mA, short-circuit/verload protectedOutput typsynchronization publies > 100 µsSynchronization public > 100 µssynchronization publics > 100	LED yellow		
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synchronization         bi-directional olievel - Ua+1 V 1 level: +4 V+Ua synchronization interpulse period: ± 2 ms           Synchronization frequency         synchronization interpulse period: ± 2 ms           Common mode operation         max. 95 Hz           Multiplex operation         synchronization pulse: ± 100 µs, synchronization interpulse period: ± 2 ms           Output tiplex operation         max. 95 Hz           Output type         1 switching output E5, PNP NO/NC, programmable           Rated operating current         In           Paleat doperating current         In           Paleat doperating furger         5 witch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobe           Voltage drop         U_u         < 2.5 V	Operating voltage	UB	10 30 V DC , ripple 10 $\%_{\rm SS}$
Synchronization     bi-directional 0 Norm + Viewei + Viewe	No-load supply current	I <sub>0</sub>	≤ 50 mA
Olevel - Ug., +1 Vg. input impedance: > 12 K Ohm synchronization interpulse period: > 2 ms         Synchronization frequency       max. 95 Hz         Common mode operation       max. 95 Hz         Multiplex operation       vs/rhonization pulse: > 100 µs, synchronization interpulse period: > 2 ms         Output       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Output type       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Output type       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Output type       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Output type       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Notage drop       vs/rhonization pulse: > 000 µs, synchronization interpulse period: > 2 ms         Pepeat accuracy       vs/rhonization pulse: > 000 µs, synchronization pulse: > 000 µs, synchindid: 0 µs, synchronization pulse: > 000 µs,	Input/Output		
Common mode operationmax. 95 HzMultiplex operation≤ 95/n Hz, n = number of sensorsOutputIOutput typeINated operating currentIDefault estingC00 mA, short-circui/voerload protectedDefault estingC0Switch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeVoltage dropUdVoltage dropUdSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeVoltage dropUdSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch ing frequencyfSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch ing frequencyfSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch ing frequencyfSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch ing frequencyfSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeSwitch point A1: 50 mm, Switch point A1: 50 mm, Switch point A2: 500 mm, switch point A1: 50 mm, Switc	Synchronization		0 level -U <sub>B</sub> +1 V 1 level: +4 V+U <sub>B</sub> input impedance: > 12 KOhm
Multiplex operationIc\$ 95/n Hz, n = number of sensorsDutput typeIs witching output ES, PNP NO/NC, programmableRated operating currentIe200 mA , short-circuit/overload protectedDefault settingIeSwitch point 150 mm , Switch point A2: 500 mm , wide sound lobeVoltage dropJudy2.5.5 VRepeat accuracyImage SystemsisImage SystemsisSwitching frequencyImage SystemsisImage SystemsisTemperature influenceImage SystemsisImage SystemsisStandard conformityImage SystemsisImage SystemsisStandard conformityImage SystemsisImage SystemsisStandardsImage SystemsisImage SystemsisApprovals and certificatesImage SystemsisUL approvalImage SystemsisCompetitioneImage SystemsisApprovals and certificatesImage SystemsisUL approvalImage SystemsisApproval conditionsImage SystemsisAmbient conditionsImage SystemsisMultiplex output SystemsisImage SystemsisOperatureImage SystemsisOperatureImage SystemsisAmbient conditionsImage SystemsisMultiplex output SystemsisImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperatureImage SystemsisOperature<	Synchronization frequency		
Dutput         Iswitching output E5, PNP NO/NC, programmable           Rated operating current         Is         200 mA, short-circuit/overload protected           Default setting         Switch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobe           Voltage drop         Ug         ≤ 2.5 V           Repeat accuracy         6         5 % of switching point           Switching frequency         f         ≤ 8 Hz           Range hysteresis         H         1 % of the set operating distance           Temperature influence         ± 1 % of full-scale value           Compliance with standards and directives         EN IEC 60947-5-2:2020           Standard conformity         EN IEC 60947-5-2:2020           Standards         CC capproval / marking not required for products rated ≤36 V           Ambient conditions         CC capproval / marking not required for products rated ≤36 V           Ambient temperature         -25 70 °C (-13 158 °F)           Storage temperature         -25 70 °C (-13 158 °F)           Storage temperature         -25 70 °C (-13 158 °F)           Moterial         Gonnector plug M12 x 1, 5-pin           Degree of protection         IP54           Material         Gonnector plug M32 x 1, 5-pin           Degree of protection         IP54	Common mode operation		max. 95 Hz
Output typeImage: Image: I	Multiplex operation		$\leq$ 95/n Hz, n = number of sensors
Rated operating currentI.e.200 mA , short-circuit/overload protectedDefault settingSwitch point A1: 50 mm , Switch point A2: 500 mm , wide sound lobeVoltage dropU.d.<2.5 V	Output		
Default settingImage: Switch point A1: 50 mm, Switch point A2: 500 mm, wide sound lobeVoltage dropUd< 2.5 V	Output type		1 switching output E5, PNP NO/NC, programmable
Voltage dropUd $\leq 2.5$ VRepeat accuracy $\leq 0.5$ % of switching pointSwitching frequencyf $\leq 8$ HzRange hysteresisH1 % of the set operating distanceTemperature influence $\pm 1$ % of full-scale valueCompliance with standards and directivesStandard conformityEN IEC 60947-5-2:2020 co947-5-2:2019StandardsEN IEC 60947-5-2:2020 co947-5-2:2019Approvals and certificatesCCC approval / marking not required for products rated $\leq 36$ VAmbient conditionsCCC approval / marking not required for products rated $\leq 36$ VAmbient temperature $< 2570$ °C (-13 158 °F)Storage temperature $< 4085$ °C (-40 185 °F)Storage temperatureIP54MeterialIP54MaterialIP54HousingABSTransducerIP50xy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Rated operating current	l <sub>e</sub>	200 mA , short-circuit/overload protected
Repeat accuracy         Image of the set operating distance           Switching frequency         f         ≤ 8 Hz           Range hysteresis         H         1 % of the set operating distance           Temperature influence         ± 1 % of full-scale value           Compliance with standards and directives         ± 1 % of full-scale value           Standard conformity         EN IEC 60947-5-2:2020           Standards         CC 60947-5-2:2020           Approvals and certificates         CCC approval           VL approval         CC 2 approval / marking not required for products rated ≤36 V           Ambient conditions         CCC approval / marking not required for products rated ≤36 V           Ambient temperature         -25 70 °C (-13 158 °F)           Storage temperature         -40 85 °C (-40 185 °F)           Storage temperature         -25 70 °C (-13 158 °F)           Onnection type         Connector plug M12 x 1 , 5-pin           Degree of protection         IP54           Material         IP54           Housing         ABS           Transducer         Gpoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Default setting		Switch point A1: 50 mm , Switch point A2: 500 mm , wide sound lobe
Switching frequencyf≤ 8 HzRange hysteresisH1% of the set operating distanceTemperature influence± 1 % of full-scale valueCompliance with standards and directivesStandard conformityStandardsEN IEC 60947-5-2:2020 IEC 60947-5-2:2019Approvals and certificatesCCC approvalUL approvalCCC approval / marking not required for products rated ≤36 VAmbient conditions-25 70 °C (-13 158 °F)Ambient temperature-25 70 °C (-13 158 °F)Storage temperatureConnector plug M12 x 1, 5-pinDegree of protectionIP54MaterialIEHousingABSTransducerepoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Voltage drop	$U_d$	≤ 2.5 V
Aange hysteresis       H       1 % of the set operating distance         Temperature influence       ± 1 % of full-scale value         Compliance with standards and directives       ± 1 % of full-scale value         Standard conformity       Standards         Standards       EN IEC 60947-5-2:2020 IEC 60947-5-2:2019         Approvals and certificates       EN IEC 60947-5-2:2020         UL approval       CCC approval / marking not required for products rated ≤36 V         Ambient conditions       CCC approval / marking not required for products rated ≤36 V         Ambient temperature       -25 70 °C (-13 158 °F)         Storage temperature       -25 70 °C (-13 158 °F)         Storage temperature       -25 70 °C (-40 185 °F)         Degree of protection       IP54         Material       IP54         Housing       ABS         Transducer       Epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Repeat accuracy		$\leq$ 0.5 % of switching point
Temperature influence       ± 1 % of full-scale value         Compliance with standards and directives       EN leC 60947-5-2:2020         Standard conformity       EN IEC 60947-5-2:2020         Standards       cULus Coop47-5-2:2020         Approvals and certificates       cULus Listed, Class 2 Power Source         UL approval       CCC approval / marking not required for products rated ≤36 V         Ambient conditions       -25 70 °C (-13 158 °F)         Storage temperature       -25 70 °C (-40 185 °F)         Storage temperature       -25 70 °C (-40 185 °F)         Connection type       Connector plug M12 x 1, 5-pin         Degree of protection       IP54         Material       64         Housing       ABS         Transducer       epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Switching frequency	f	≤ 8 Hz
Standard conformity         Standards       EN IEC 60947-5-2:2000 IEC 60947-5-2:2019         Approvals and certificates       EN IEC 60947-5-2:2019         LL approval       CULus Listed, Class 2 Power Source         CCC approval       CCC approval / marking not required for products rated ≤36 V         Ambient conditions       CCC approval / So °C (-13 158 °F)         Ambient temperature       -25 70 °C (-13 158 °F)         Storage temperature       -40 85 °C (-40 185 °F)         Connection type       Connector plug M12 x 1 , 5-pin         Degree of protection       IP54         Material       Housing         Housing       ABS         Transducer       epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Range hysteresis	Н	1 % of the set operating distance
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IEC 60947-5-2:2019         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       -25 70 °C (-13 158 °F)         Ambient temperature       -25 70 °C (-40 185 °F)         Storage temperature       -40 85 °C (-40 185 °F)         Mechanical specifications       Connector plug M12 x 1 , 5-pin         Degree of protection       IP54         Material       ABS         Housing       ABS         Transducer       epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Standard conformity		
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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     -40 85 °C (-40 185 °F)       Connection type     Connector plug M12 x 1 , 5-pin       Degree of protection     IP54       Material     ABS       Housing     ABS       Transducer     Epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Approvals and certificates		
Ambient conditionsAmbient temperature-25 70 °C (-13 158 °F)Storage temperature-40 85 °C (-40 185 °F)Mechanical specificationsConnection typeConnector plug M12 x 1 , 5-pinDegree of protectionIP54MaterialHousingABSTransducerepoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	UL approval		cULus Listed, Class 2 Power Source
Ambient temperature-25 70 °C (-13 158 °F)Storage temperature-40 85 °C (-40 185 °F)Mechanical specificationsConnection typeConnection typeConnector plug M12 x 1 , 5-pinDegree of protectionIP54MaterialHousingABSTransducerepoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	CCC approval		CCC approval / marking not required for products rated $\leq$ 36 V
Storage temperature-40 85 °C (-40 185 °F)Mechanical specificationsConnection typeConnection typeConnector plug M12 x 1 , 5-pinDegree of protectionIP54MaterialIP54HousingABSTransducerepoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Ambient conditions		
Mechanical specifications         Connection type         Connector plug M12 x 1 , 5-pin           Degree of protection         IP54           Material         Housing         ABS           Transducer         epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Ambient temperature		-25 70 °C (-13 158 °F)
Connection type     Connector plug M12 x 1, 5-pin       Degree of protection     IP54       Material     IP54       Housing     ABS       Transducer     epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Storage temperature		-40 85 °C (-40 185 °F)
Degree of protection     IP54       Material     IP54       Housing     ABS       Transducer     epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Mechanical specifications		
Material     ABS       Transducer     epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Connection type		Connector plug M12 x 1 , 5-pin
Housing     ABS       Transducer     epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Degree of protection		IP54
Transducer epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	Material		
	Housing		ABS
Mass 140 g	Transducer		epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT
•	Mass		140 g

## Connection

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

`	1 (BN)	-+ U <sub>B</sub>
	2 (WH)	Program input
U	5 (GY)	- Sync. input
	4 (BK)	Switch output
	3 (BU) 中	U_

Wire colors in accordance with EN 60947-5-2.

 Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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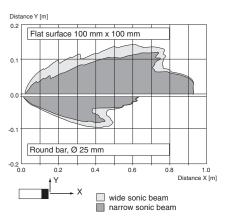
## **Connection Assignment**

### **Connector V15**

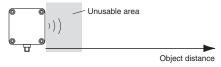


## **Characteristic Curve**

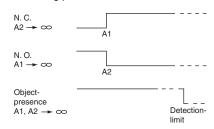
## Characteristic response curve



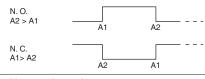
#### Programmable operation modes



1. Switching point mode



2. Window mode



3. Hysteresis mode

N. C. A2 > A1	 A1	A2	
N. O. A1 > A2	A2	A1	

Release date: 2023-02-15 Date of issue: 2023-02-15 Filename: 133981\_eng.pdf

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

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3

## Ultrasonic sensor

## UB500-F42S-E5-V15

Accessories			
	MH 04-3505	Mounting aid for FP and F42 sensors	
	MHW 11	Mounting brackets for sensors	
ø /	V15-G-2M-PVC	Female cordset single-ended M12 straight A-coded, 5-pin, PVC cable grey	
6/	V15-W-2M-PUR	Female cordset single-ended M12 angled A-coded, 5-pin, PUR cable grey	

 Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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## Programming

#### **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 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<sub>B</sub>; to specify the A2 switching point, it must be connected to +U<sub>B</sub>. 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	-;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	$\bigcirc$
Window function (default)		
Hysteresis mode		

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

#### Step 2, parameterisation of the ultrasound beam width

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

Beam width	Flash sequence of the red LED	A2 key
Small beam	-Ò,	$\bigcirc$
Medium beam		
Large beam		

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).



## Ultrasonic sensor

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  $\mu$ 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.

#### 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".

