

## MANUAL

# TopScan-S / TopScan-S-T0V1

**EN** Translation of the original instructions

**DE** Originalbetriebsanleitung

**FR** Traduction des instructions originales

**IT** Traduzione delle istruzioni originali



**EN**

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

**DE**

Es gelten die Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie, herausgegeben vom Zentralverband Elektroindustrie (ZVEI) e.V. in ihrer neusten Fassung sowie die Ergänzungsklausel: "Erweiterter Eigentumsvorbehalt".

**FR**

Les conditions de vente générales pour les produits et les services de l'industrie des équipements électriques publiées par la Fédération de l'industrie électronique (ZVEI) s'appliquent dans leur toute dernière version, tout comme la clause complémentaire "Réserve de propriété élargie".

**IT**

Valgono le condizioni generali di fornitura dei prodotti e delle prestazioni dell'industria elettronica ed elettrotecnica, pubblicate nella versione più attuale dall'associazione centrale dell'industria elettronica ed elettrotecnica tedesca (ZVEI - Zentralverband Elektroindustrie e.V.), nonché la clausola integrativa: "Riserva di proprietà omnibus".

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>Introduction.....</b>                           | <b>2</b>  |
| <b>2</b> | <b>Safety .....</b>                                | <b>3</b>  |
| 2.1      | Safety-Relevant Symbols .....                      | 3         |
| 2.2      | Intended Use .....                                 | 3         |
| 2.3      | Operation, Maintenance, Repair .....               | 3         |
| 2.4      | Delivery, Transport and Storage .....              | 4         |
| <b>3</b> | <b>Product Description .....</b>                   | <b>5</b>  |
| 3.1      | Active Infrared Scanner.....                       | 5         |
| 3.2      | Indicators and Operating Controls .....            | 5         |
| 3.3      | Connections.....                                   | 5         |
| 3.4      | Included in Delivery.....                          | 6         |
| <b>4</b> | <b>Installation.....</b>                           | <b>7</b>  |
| 4.1      | Unpacking.....                                     | 7         |
| 4.2      | Mounting the Aluminum Profile .....                | 7         |
| 4.3      | Mounting the Module .....                          | 7         |
| <b>5</b> | <b>Commissioning.....</b>                          | <b>10</b> |
| 5.1      | Setting the Leading Edge Monitoring Beam.....      | 10        |
| 5.2      | Master/Slave Extension of the Detection Area ..... | 10        |
| 5.3      | Test—Pulse Diagram of the Time Sequence.....       | 12        |
| 5.4      | Connection to the Door Controller.....             | 14        |
| <b>6</b> | <b>Settings .....</b>                              | <b>15</b> |
| 6.1      | Optical Adjustment of the Sensor.....              | 15        |
| <b>7</b> | <b>Troubleshooting.....</b>                        | <b>19</b> |
| 7.1      | Troubleshooting .....                              | 19        |
| <b>8</b> | <b>Appendix .....</b>                              | <b>20</b> |
| 8.1      | Technical Data .....                               | 20        |

1

## Introduction

### Informative Symbols



#### **Note!**

This symbol brings important information to your attention.



#### Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

#### Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH  
Lilienthalstraße 200  
68307 Mannheim, Germany  
Telephone: +49 (0)621 776-1111  
Fax: +49 (0)621 776-271111  
Email: fa-info@de.pepperl-fuchs.com

#### Device Version

This manual applies to device version V.01

## 2 Safety

### 2.1 Safety-Relevant Symbols



**Danger!**

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



**Warning!**

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



**Caution!**

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

#### Standards



This symbol draws the user's attention to DIN 18650/EN 16005. All points described there are required to comply with DIN 18650/EN 16005.

### 2.2 Intended Use

The TopScan-S is an active infrared triangulation sensor. The TopScan-S is designed for mounting on a swinging door panel.



The TopScan-S is intended for providing protection for automatic revolving doors according to DIN 18650/EN 16005. When used as intended, the sensor should only be able to influence the movement of the door via the door controller rather than directly, as the combination of a safe door controller and a sensor is a prerequisite for the system to be considered a protective device according to EN ISO 13849-1, Performance Level "c" Category 2.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is only guaranteed if the device is operated in accordance with its intended use.

### 2.3 Operation, Maintenance, Repair

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismantling of the device. The trained and qualified personnel must have read and understood the instruction manual.

## 2.4

Only use accessories specified by the manufacturer.

Do not repair, modify, or manipulate the device.

If there is a defect, always send back the device to Pepperl+Fuchs.

### Delivery, Transport and Storage

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Always store the device in a clean and dry environment. The permitted storage temperature (see data sheet) must be considered.

### 3 Product Description

#### 3.1 Active Infrared Scanner

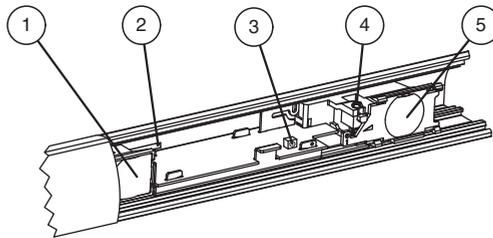
##### Functional Principle

Objects that enter the sensor's protection area are detected by infrared beams and cause the relay contact output to become disabled. The light spot created on the floor by the infrared beam measures approx. 1.1 cm x 8.3 cm (at an installation height of approx. 2 m). The two lens systems can be adjusted to change the angle. This allows a detection range (detection height of objects) of up to 2.5 m to be set.

The sensor is set to the maximum detection range by default and is equipped with an optical adjustment accessory. The sensor generally reacts to objects in the detection range irrespective of their surface color and structure. Even reflective and extremely dark objects are detected.

Multiple sensors can be operated in a master/slave combination to adapt the protection field to the appropriate requirements. See chapter 5.2. A 6-pin screw terminal is used to connect the master module with the door controller. The slave modules are connected to the master module by ribbon cables, and are powered via the master module. The master module and slave module are located in the same aluminum profile.

#### 3.2 Indicators and Operating Controls



| No. | Designation                | Color         | Description  |
|-----|----------------------------|---------------|--|
| 1   | Emitter                    |               | Emitter beam exit opening  |
| 2   | Left/right adjuster switch |               | Setting the monitoring beam on the leading edge  |
| 3   | Function indicator         | Red/<br>green | LED red: Object detected<br>LED green: Clear protection field and sensor sees the ground |
| 4   | Detection range adjustment |               | Setting the detection range  |
| 5   | Receiver                   |               | Receiver beam entry opening  |

Table 3.1 Indicators and Operating Controls

#### 3.3 Connections

The following device connections are found on all sensors:

### Power Supply, Test Input, and Relay Output

Inside the housing, there is a 6-pin terminal for connecting the power supply, a test input, and the relay output. The following diagram shows the pinning:

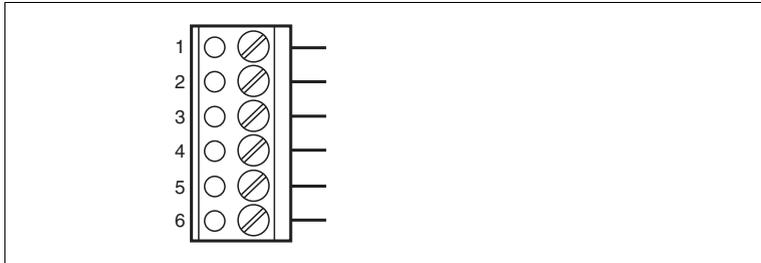


Figure 3.1 Power supply, test input, and relay output connection layout

- 1 Ground (GND)
- 2 24 V power supply
- 3 Center contact relay
- 4 NC contact relay
- 5 NO contact relay
- 6 Test input

Information about the test input and relay circuitry can be found in the technical data. See chapter 8.1.

## 3.4

### Included in Delivery

The delivery package contains:

- TopScan-S
- Operating instructions
- Declaration of Conformity

## 4 Installation

### 4.1 Unpacking

Check the product for damage while unpacking. In the event of damage to the product, inform the post office or parcel service and notify the supplier.

Retain the original packaging in case the device must be stored or shipped again at a later date.

Should you have any questions, please contact Pepperl+Fuchs.

### 4.2 Mounting the Aluminum Profile

1. Place the module brackets in the aluminum profile and position the module brackets at the points where the modules will be fitted later.
2. Drill the mounting holes centrally between the module brackets (the gray areas in the illustration). Make sure that no chips remain in the aluminum profile. Seal the boreholes when mounting so that dripping water cannot penetrate. Mechanical details to make screw positioning easier:

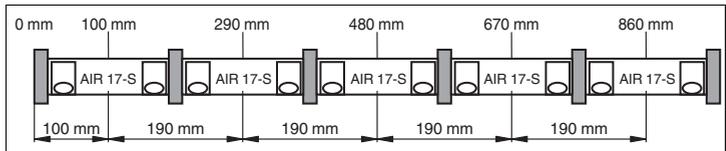


Figure 4.1 Mounting the aluminum section

3. To mount the aluminum profile, use flat head screws only and mount the aluminum profile at the intended mounting height (maximum 2.5 m).



#### **Note!**

#### **Saw Recommendation for Aluminum and Plastic Profiles**

For both profiles, use a miter box saw with a hacksaw blade. Make sure that the plastic profile rests with the convex side facing outward. Saw carefully at a low feed rate (risk of breakage). The aluminum profile is noncritical during processing.

### 4.3 Mounting the Module

1. Set the emitters of the modules identically on all modules to be used. -> Always push the emitter adjustment toward the door hinge side (the door hinge side is opposite the leading edge) → see Figure 5.1 on page 10.

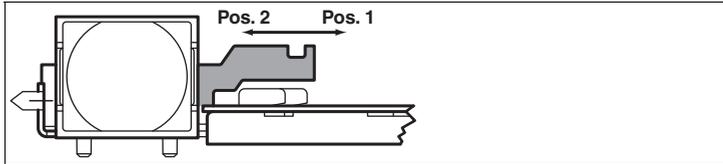


Figure 4.2 Setting the monitoring beam to the leading edge

2. Connect all required ribbon cables to the modules before mounting the modules. -> For the master module, use the long ribbon cable (24 cm), and for the slave module, use the short ribbon cable (20 cm).
3. Make sure that the master module is always on the door hinge side.
4. Connect the screw terminal on the master module to the adapter cable of the door controller.
5. Click the module bracket into the aluminum profile from the front.
6. Place the modules between the module brackets. Then tighten the M2.5

**1**  
screw to the module bracket.

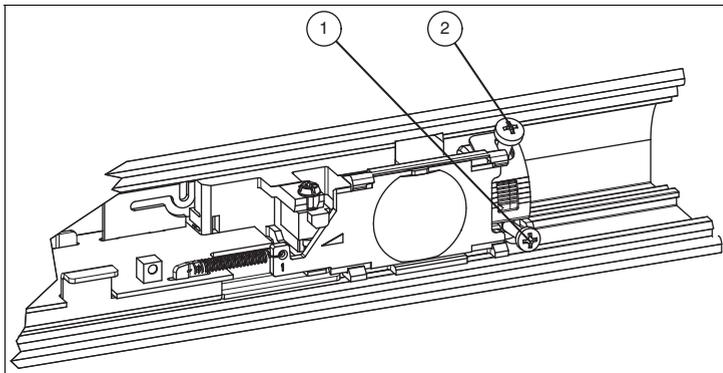


Figure 4.3 Module holder

7. On the last module (last slave module or master module if individual device), use pliers to cut the configuration bridge out of the PCB see chapter 5.2.
8. Set the inclination angle and the detection range see chapter 6.1, and then

**2**  
tighten the upper M3 fastening screw to the module bracket

9. Position the housing cover on top.
10. Screw the end covers onto both sides of the aluminum profile.
11. Check the detection range for each beam.

↳ The module is now mounted.



**Note!**

**Adapter Cable and IP54 Protection Class**

The adapter cable to the door controller can be introduced through the side of the end cover using a cable bushing. The TopScan-S profile can be sealed to IP54 standard using the optional profile seal.

5

Commissioning

5.1

Setting the Leading Edge Monitoring Beam

EN



1. Set the emitter beam or receiver beam vertically to ensure optimal coverage of the leading edge.

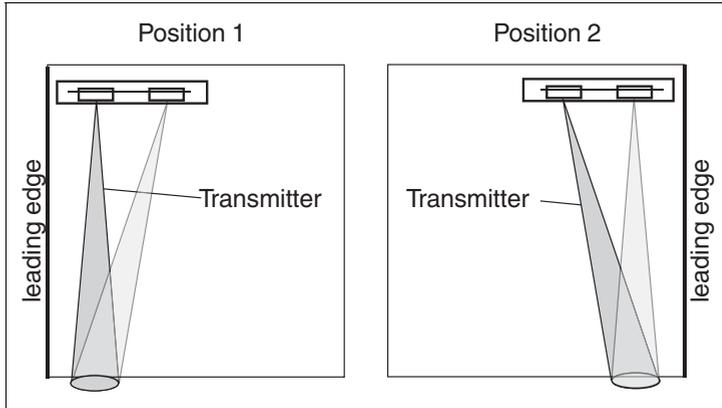


Figure 5.1 Explanation of the monitoring beam setting on the leading edge

2. Use the two grid positions on the emitter to set a monitoring edge flush with the left or right.

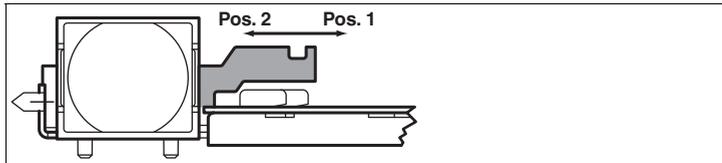


Figure 5.2 Setting the monitoring beam to the leading edge

↳ The monitoring edge is now set.

In the default settings, all the emitter modules are preset to position 1 and the detection range is set to the maximum. Position 1 means that the emitter sits straight and the leading edge is on the left. If using several slave modules, ensure that the emitters are all set the same (same emitter grid position)! The master module must have the same emitter settings.

## 5.2 Master/Slave Extension of the Detection Area

### Difference between Master and Slave Modules

In addition to one master module, it is possible to install up to seven more slave modules. The difference between the master module and the slave module is the number of connectors and the presence of a relay.

|               |   |
|---------------|---|
| Master module | with relay; 6-pin connector; one red socket   |
| Slave module  | no relay; no 6-pin connector; two red sockets |

### Mounting the Modules

When mounting the master module and the slave modules, make sure the chassis plate locks neatly into the module bracket. The chassis plate must lock into the module bracket as follows

- Make sure that the module bracket's stem locks neatly into the borehole of the chassis
- The chassis clip must be visible in the middle of the module bracket
- Connect only the master module to the door controller using the 6-pin screw terminal
- Connect the slave modules with the 20 cm ribbon cables provided
- The master module is connected to the next slave module via the longer 24 cm ribbon cable

### Removing the Configuration Bridge

Make sure you disconnect the configuration bridge <sup>②</sup> on the PCB on the last sensor module (slave). The bridge must still be disconnected if you are using a master as an individual device only, otherwise the device will not work. Disconnect the bridge only when the module is de-energized. Before carrying out

this step, ground yourself on the chassis lever <sup>①</sup>.

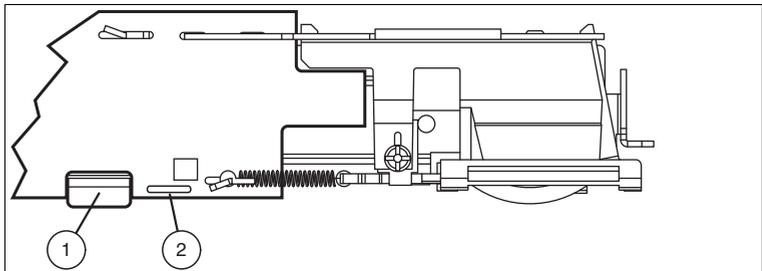


Figure 5.3 Configuration bridge

### 5.3 Test—Pulse Diagram of the Time Sequence

EN

|   |   |
|---|---|
|  | <p>The following test must be carried out via the door controller only when operating as a safety sensor according to DIN 18650/EN 16005.</p> |
|---|---|

If you use the TopScan-S as a protective device, the device must be tested at regular intervals by the door controller. Perform the test only if no object is detected. We recommend performing the test while the door is fully open. Connect the door controller test signal to the master module via the 6-pin screw terminal (pin 6).

#### Test Sequence

- |            |  |
|------------|--|
| Time $t_0$ | The door controller activates the test request.  |
| Time $t_1$ | After the response time of max. 70 ms, the sensor must move to detection mode.   |
| Time $t_2$ | After 200 ms, the sensor must still be in detection mode. After this point, the test request from the door controller can be canceled. |

This action ends the test and the sensor is available again after about 70 ms.

On TopScan-S-T0V1-MS sensors, the test input is active at  $U = 0$  VDC.

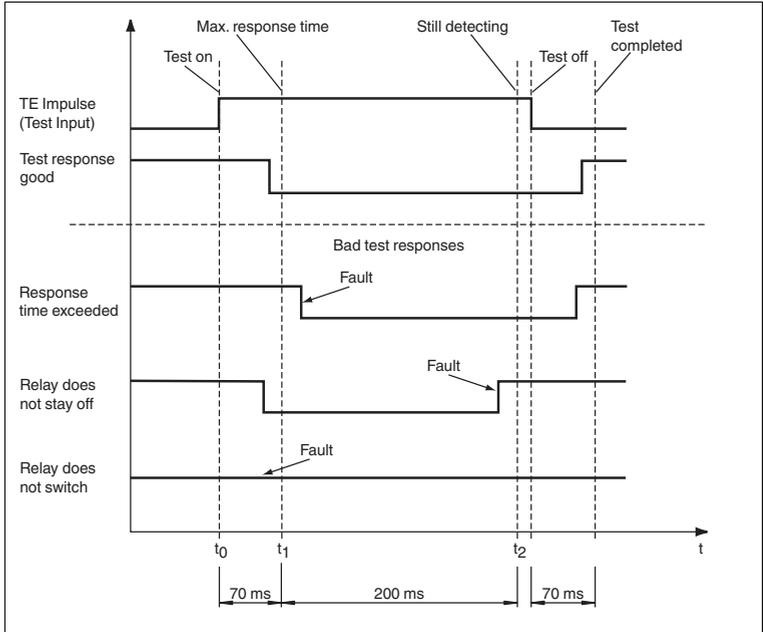


Figure 5.4 Pulse diagram of the time sequence

The door controller must query the sensor at times  $t_1$  and  $t_2$ . The interior and exterior sides of the door must be switched on and off alternately (muting) -> and/or removed from the evaluation by the door controller.

### TopScan-S-M

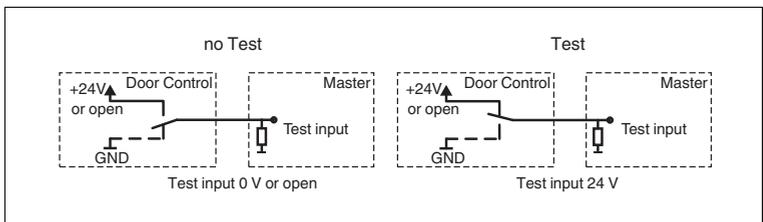


Figure 5.5 Electrical Test Input Circuitry

**TopScan-S-T0V1-M**

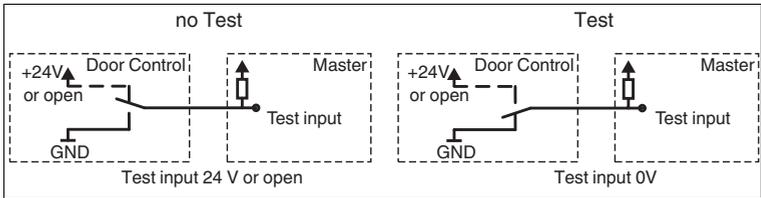


Figure 5.6 Electrical Test Input Circuitry

If the device is not used as a safety sensor in accordance with DIN 18650/EN 16005, there is no need to connect the test input.

**5.4 Connection to the Door Controller**

The interior and exterior sides of the door must be switched on and off alternately (muting) -> and/or removed from the evaluation by the door controller. If the device is not used as a safety sensor in accordance with DIN 18650/EN 16005, there is no need to connect the test input.



**Note!**

**Special Cable Connectors**

If the modules on the interior and exterior sides of the door are supplied simultaneously via a door adapter cable, special connectors (e.g., 3M Scotchlok UB2 single-strand connector) are recommended which allow another cable to be crimped onto the supply cable.

## 6 Settings

### 6.1 Optical Adjustment of the Sensor

#### Setting the Inclination Angle

The adjustment of the inclination angle according to DIN 18650/EN 16005 can be found below in the table.

You can adjust the inclination angle to swivel the detection area away from or toward the door. The inclination angle can be varied to any position from 0° to

+25°. Use the handle on the chassis plate to adjust the inclination angle  
Use the M3 screw on the top of the module bracket to fix the inclination angle

**2** → see Figure 6.1 on page 15.

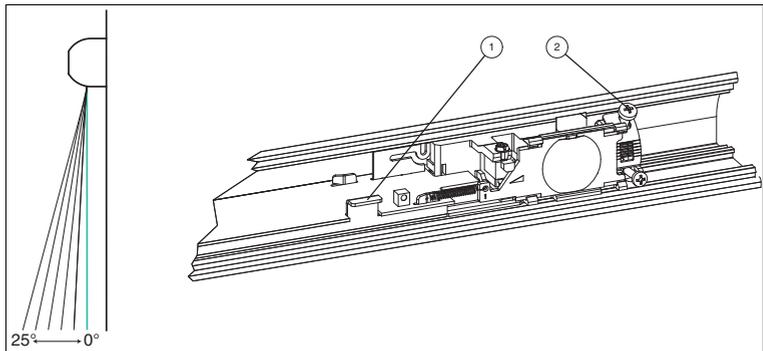


Figure 6.1 Setting the detection angle

#### Setting the Detection Range

The adjustment of the detection range according to DIN 18650/EN 16005 can be found below in the table.

Adjust the detection range using the detection range screw **2**. The detection

range can be adjusted by turning the detection range screw **2** using a screwdriver, thereby moving the receiver lens. An optical adjustment accessory

(green/red LED **1**) aids precise adjustment of the detection range above the ground → see Figure 6.2 on page 16.

If the sensor is not used for protection according to DIN 18650, a higher setting (but not above 80 cm) is possible.

**LED Display**

| LED Color | Description                                       |
|-----------|---|
| Red       | Object detected                                   |
| Green     | Clear protection field and sensor sees the ground |

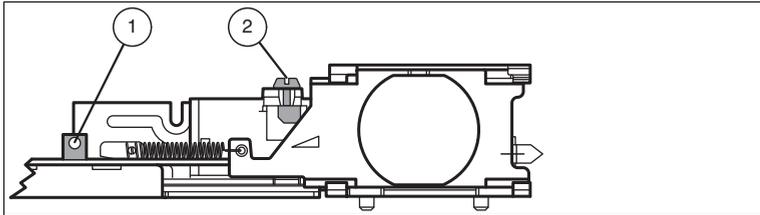


Figure 6.2 Adjustment of the sensing range

**Setting the Inclination Angle According to DIN 18650/EN 16005**

|  |   |
|--|---|
| <div style="border: 1px solid black; padding: 5px; font-size: 2em; font-weight: bold; letter-spacing: 5px;">EN</div> | <p>Use the optional adjustment accessory (test card + test body) to aid adjustment.</p>   |
|  | <p><b>Sensor Inclination Angle</b></p> <ol style="list-style-type: none"> <li>1. Place the test card on the ground with the mark parallel to the door</li> <li>2. Place the door side of the test body on the mark</li> <li>3. The sensor looks down vertically</li> <li>4. Swivel the sensor forward using the chassis lever until it detects the 20 cm high test body (LED = red)</li> <li>5. Slowly continue to swivel the sensor forward until it just sees the ground again (LED changes from red to green)</li> <li>6. Now fasten the module to the module bracket using the M3 screw. The inclination angle is now set</li> <li>7. The adjustment is complete</li> <li>8. Check the detection range setting again using the test card</li> </ol> |

Table 6.1 Setting the inclination angle according to DIN 18650/EN 16005

## Setting the Detection Range According to DIN 18650/EN 16005

|   |   |
|---|---|
|  | <p>Use the optional adjustment accessory (test card + test body) to aid adjustment.</p> <p><b>Sensor Detection Range Setting</b></p> <ol style="list-style-type: none"> <li>1. Using the chassis lever, set the module on the first line of the mark on the module bracket, and fasten it with the M3 screw</li> <li>2. Turn the detection range screw counter-clockwise until the overwind protection is heard (slight "click"). You have now set the maximum detection range</li> <li>3. Take the test card and position it on the test body so that it is 12.5 cm above the ground</li> <li>4. Turn the detection range screw clockwise until the LED indicator changes from red to green (if necessary, turn back to red and then turn clockwise until it just turns green)</li> <li>5. The detection range adjustment is complete</li> </ol> |
|---|---|

Table 6.2 Setting the detection range according to DIN 18650/EN 16005

### Increasing/Reducing the Detection Area



**Note!**

The following sensor characteristics do not comply with the safety regulations outlined in the EC Declaration of Conformity:

- The distance from the modules to the leading edge is more than 10 cm
- Gaps are left between the modules
- The right/left adjustment of the modules is not aligned to the leading edge
- The modules are set to a detection height of more than 20 cm above the ground

Depending on requirements and the door width, a master module can be extended with up to seven slave modules. We recommend that the straight emitter/receiver beam of the relevant sensor module be mounted no more than 10 cm from the leading edge. Mounting information for different door widths can be found in the following illustration → see Figure 6.3 on page 18.

EN

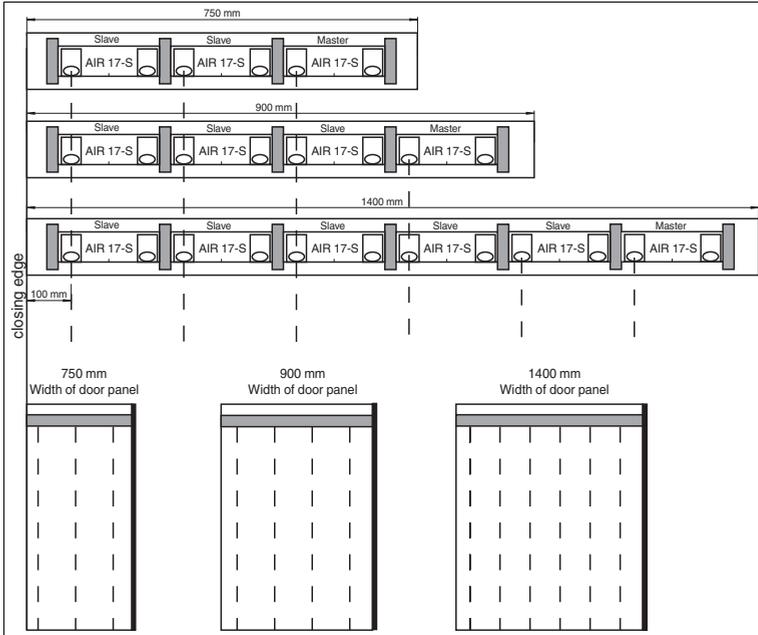


Figure 6.3 Detection area

The wider the door, the more slave modules are required.

## 7 Troubleshooting

### 7.1 Troubleshooting

**Before requesting a service call, please check that the following actions have been taken:**

- Equipment has been tested according to the following checklists,
- Telephone assistance has been obtained from the Service Center in order to isolate the problem.

#### Interference

- The sensor must be firmly mounted. It must not vibrate.
- The sensor must not be installed behind a cover.
- The sensor should be installed so it is protected from rain.

#### Fault Analysis

| Source of Fault                                    | Cause  | Action  |
|--|--|---|
| The sensor does not initialize or does not respond | Incorrect power supply   | Check the power supply  |
| Door opens and closes at regular intervals         | The sensor is disturbed by the movement of the door<br>The doors are detected by the sensor<br>The door movement causes vibrations | Adjust the detection field angle<br>Check the sensor mounting           |
| Door opens and closes sporadically                 | There are objects in the detection area moving in the air flow   | Remove the objects  |
| Test body is not detected                          | Detection range is set incorrectly<br>Inclination angle is set incorrectly   | Check detection range with test body<br>Set the inclination angle again |

- If none of the above corrects the problem, please contact the Service Center.

8

Appendix

8.1

Technical Data

**General specifications**

|                                 |   |
|---------------------------------|---|
| Detection range min.            | 0 ... 1500 mm   |
| Detection range max.            | 0 ... 2500 mm   |
| Reference target                | Minimum degree of reflection of the floor: 6 %<br>Minimum degree of reflection to objects being detected: 0 % |
| Light source                    | IRED  |
| Light type                      | modulated infrared light 875 nm   |
| Black/White difference (6%/90%) | < 2 % at 2000 mm sensor range   |
| Number of beams                 | 1 (number of built-in sensor modules AIR)   |
| Operating mode                  | Background evaluation   |
| Diameter of the light spot      | 1.1 cm x 8.3 cm at 2000 mm sensor range   |
| Resolution                      | Reference object CA DIN 186850-1/EN 16005 in all applicable locations   |

**Indicators/operating means**

|                                |                  |
|--------------------------------|------------------|
| Safety Integrity Level (SIL)   | SIL 1            |
| Performance level (PL)         | PL c             |
| Category                       | Cat. 2           |
| MTTF <sub>d</sub>              | 880 a per module |
| Mission Time (T <sub>M</sub> ) | 20 a             |
| Diagnostic Coverage (DC)       | 90 %             |

**Indicators/operating means**

|                    |  |
|--------------------|--|
| Function indicator | LED red/green  |
| Control elements   | Sensing range adjuster ; Adjuster for edge monitoring left/right |

**Electrical specifications**

|                        |                  |
|------------------------|------------------|
| Operating voltage      | 24 V DC +/- 20 % |
| No-load supply current | 75 mA            |

EN

### Input

|                             |  |
|-----------------------------|--|
| Test input (TopScan-S-M)    | active at U = 11 V DC at 30 V DC inactive at U = -3 V DC at 5 V DC |
| Test input (TopScan-S-T0V1) | active at U = -3 VDC to +1 VDC inactive at U = +4 VDC to 30 VDC    |

### Output

|                   |  |
|-------------------|--|
| Switching type    | Relay de-energized at object inside the scanning range |
| Signal output     | Relay, 1 alternator                                    |
| Switching voltage | 5 V ... 30 V AC/DC                                     |
| Switching current | max. 300 mA  |
| Response time     | ≤ 70 ms  |

### Conformity

|                   |                                 |
|-------------------|---------------------------------|
| Functional safety | ISO 13849-1                     |
| Product standard  | EN 12978 ; EN 16005 ; DIN 18650 |

### Approvals and certificates

|              |  |
|--------------|--|
| CCC approval | CCC approval / marking not required for products rated ≤36 V |
| TÜV approval | TÜV NORD   |

### Ambient conditions

|                     |   |
|---------------------|---|
| Ambient temperature | -10 ... 50 °C (14 ... 122 °F)                             |
| Relative humidity   | Humidity at 20 °C: < 90 % <br />Humidity at 60 °C: < 50 % |

### Mechanical specifications

|                      |  |
|----------------------|--|
| Housing length L     | Min. 310 mm  |
| Mounting height      | max. 2500 mm   |
| Degree of protection | IP52 , IP54 Optional (with special seal)   |
| Connection           | screw terminals ; Cable cross-section 0.3 mm <sup>2</sup> ... 1.3 mm <sup>2</sup> (AWG26-16), single-stranded/multistranded CU                           |
| Material             |  |
| Housing              | aluminum / ABS   |
| Optical face         | PMMA   |
| Cable length         | max. 30 m  |
| Note                 | Safety fuse ≤ 1 A (slow-blow) according to IEC 60127-2 Sheet 1<br>Recommendation: after a short circuit, check that the device is functioning correctly. |



EN

# FACTORY AUTOMATION – SENSING YOUR NEEDS



## Worldwide Headquarters

Pepperl+Fuchs GmbH  
68307 Mannheim · Germany  
Tel. +49 621 776-0  
E-mail: [info@de.pepperl-fuchs.com](mailto:info@de.pepperl-fuchs.com)

## USA Headquarters

Pepperl+Fuchs Inc.  
Twinsburg, Ohio 44087 · USA  
Tel. +1 330 4253555  
E-mail: [sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)

## Asia Pacific Headquarters

Pepperl+Fuchs Pte Ltd.  
Company Registration No. 199003130E  
Singapore 139942  
Tel. +65 67799091  
E-mail: [sales@sg.pepperl-fuchs.com](mailto:sales@sg.pepperl-fuchs.com)

[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to modifications  
Copyright PEPPERL+FUCHS • Printed in Germany

 **PEPPERL+FUCHS**  
SENSING YOUR NEEDS

820228

DOCT-3871A  
06/2018