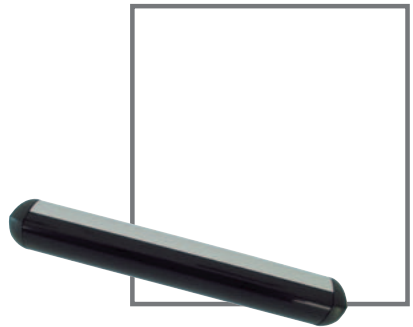


HANDBUCH / MANUAL / MANUEL / MANUALE

# TopScan-S





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Part No. 194564

Ausgabedatum: 30.01.2007

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"

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	<i>This symbol points out German standard DIN 18650 to the user. All points described there are required to fulfill German standard DIN 18650.</i>
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	<i>This symbol points out important notes to the user.</i>
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### Declaration of Conformity

We, Pepperl+Fuchs GmbH, herewith declare our sole responsibility for the fact that

#### **Active Infrared Scanner TopScan-S**

and all models of the product have been developed and manufactured under observation of the applicable European standards and directives.

	<i>The Active Infrared Scanner TopScan-S has been certified in keeping with German standard DIN 18650.</i>
---	--

## 1 Design of the Device

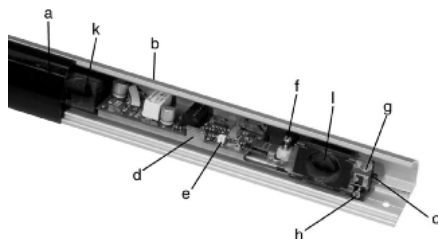


Figure 1.1 Internal design of the device

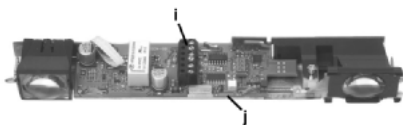


Figure 1.2 Design of the master module

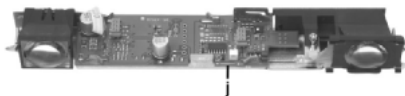


Figure 1.3 Design of the slave module

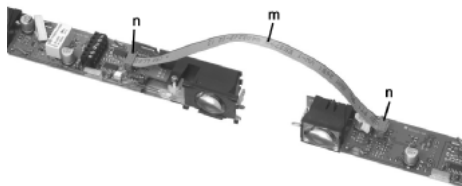


Figure 1.4 Connection of two modules

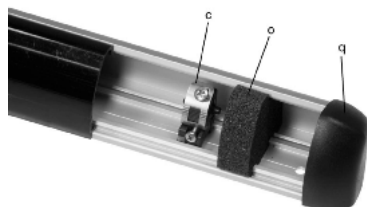


Figure 1.5 Installation of the module holder and of the profile seal

- a** Removable housing cover
- b** Aluminum profile
- c** Module holder
- d** Handle to set the detection angle (chassis lever)
- e** LED for status indication
- f** Screw for sensing range adjustment
- g** Screw to secure the detection angle
- h** Screw M2.5 to secure the module holder
- i** Terminal block for supply voltage, output and test input
- j** Configuration bridge
- k** Infrared transmitter
- l** Infrared receiver
- m** Flat cable
- n** Module connector
- o** Profile seal
- q** End caps

## 2 Functional Description

The TopScan-S is an active infrared triangulation scanner.  
The TopScan-S has been designed for sensing while mounted on a swinging door panel.

**DIN** *The intended use of TopScan-S is to make safe automatic swinging doors in complying with German standard DIN 18650. If used as intended, the sensor shall influence the door movement through the safe door control only and not by direct intervention, as only using the safe door controller and the sensor together constitutes a protective device of Category 2 EN 954/1.*



*The modification of the construction/ arrangement of the installation without consultation with the manufacturer could lead to dangerous situations.*

### 2.1 Principle of Operation

Any objects entering the protected area will be detected by the infrared beams and will cause the relay output to be switched off.

The beam spot produced by the infrared beam on the ground is approx. 3 cm x 8 cm in size (at a mounting height of approx. 2 m).

The angle of the two lens systems can be modified by an adjustment mechanism. A sensor mounting height of up to a maximum of 2.50 m can be set. The sensing range of the device is set to maximum at the factory. The device includes an optical adjusting tool.

The sensor detects objects in its sensing field with little to no influence by the targets' color and surface finish. Reflective and very dark objects are detected as well.

Several sensors can be operated in a master and slave combination in order to adapt the protected area to the application's required sensing area (cf. Chapter 7).

By means of a six-position screw terminal, the master module is connected to the door controller. The slave modules are connected to the master module by means of flat cables. The master module and the slave modules are located in an aluminum profile together.

## 3 Installation and Initial Operation

### 3.1 Installation Check List

#### 3.1.1 Installation of Aluminum Profile

1. Push the module holder (c) into the aluminum profile (b) and position the module holder at the points where the modules (model numbers AIR 16-S) will be mounted later.
2. Drill the mounting holes in the aluminum profile between the module holders (in Fig. 3.1 gray surface).

Make sure that no chips remain in the aluminum profile.

Seal the borehole when mounting so that dripping water cannot penetrate the housing.

Mechanical information which may facilitate positioning the screws:

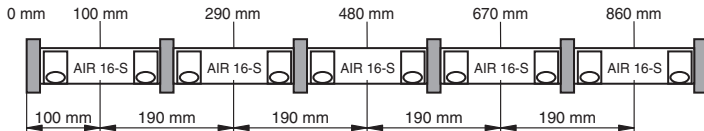


Figure 3.1 Mounting the aluminum section

3. Only use flat-head screws to mount the aluminum profile (b) at the intended mounting height (maximum 2.50 m).



**Sawing recommendation for aluminum and plastic profiles:**

*Use a miter-box saw with a hack saw blade for both profiles.*

*Make sure that the plastic profile rests with the convex side facing outwards.*

*Saw carefully (risk of breakage).*

*The aluminum profile is non-critical during machining.*

### 3.1.2 Installation of the Module

1. Set the transmitters of the modules identically on all modules to be used (see Figure 3.3). -> For example, move all of the transmitter adjustments towards the hinge (the hinge side is opposite the leading edge).
2. Connect all required flat cables to the modules prior to the installation of the modules. -> Use the long flat conductor cable (24 cm) for the master module and the short flat conductor cable (20 cm) for the slave module.
3. Please make sure that the master module is always located on the door's hinged side.
4. Connect the screw terminals (i) of the master module to the connection cable of the door controller.
5. Place the module holders into the Aluminum profile.
6. Place the modules between the module holders (c). Then use the headless screw (h) to screw the modules down to the module holder (see Figure 1.1).
7. Use cutters to cut the configuration bridge (j) out of the PCB of the last module (last slave module or individual master module) (see Chapter 5).
8. Set the detection angle and the sensing range as indicated in Chapter 3.2.
9. Replace the housing cover (a).
10. Screw down the end caps.
11. Finally, check the sensing range for each beam.



The connection cable to the door controller can be passed through the end cap by means of a cable bushing. The optional section seal (o) can be used to seal the TopScan-S section to conform with IP54.

### 3.2 Setting the Monitoring Beam - Leading Edge

Designate either the transmitting light beam or receiving light beam as vertical to optimize coverage of the door's leading edge.

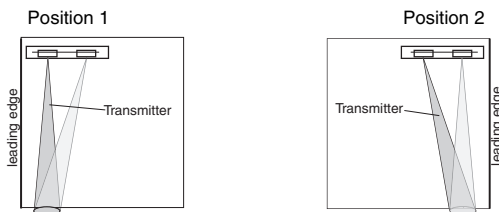


Figure 3.2 Explanation of the monitoring beam setting at the leading edge

Adjust the transmitter for left-justified or right-justified monitoring of the main leading edge. (see Figure 3.3).

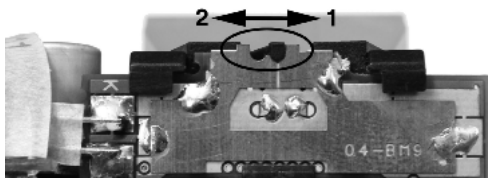


Figure 3.3 Setting the monitoring beam to the leading edge

In the factory default setting, all transmitter modules are preset to position 1 and to a sensing range to maximum. Position 1 means that the transmitter beam is straight and the main leading edge is on the left (see Figure 3.2 left).

Make sure that all modules (including the master) have identical transmitter settings on their lock positions.

### 3.3 Optical Setting of the Sensor

You can swivel the sensing field away from the door or towards the door by setting the detection angle. The detection angle can be adjusted from 0° to +25°.

Use the handle on the chassis (d) to set the detection angle.

To adjust the detection angle, use the M3 screw (g) at the top of the module holder.

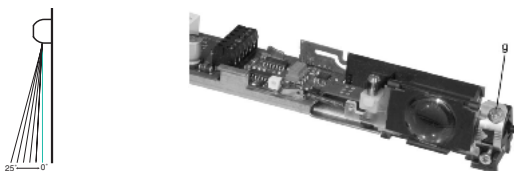


Figure 3.4 Setting the detection angle

Use the sensing range screw (f) to adjust the sensing range.

By turning the sensing range screw (f) with a screwdriver, the receiver lens is shifted and the sensing range is set.

A bi-color status LED (p) assists in setting the exact sensing range over the ground.

**If the sensor is not used for protection in complying with German standard DIN 18650, a higher adjustment (no more than 80 cm) is possible.**

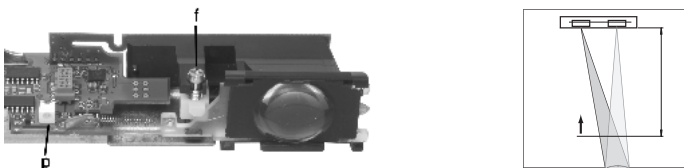


Figure 3.5 Adjustment of the sensing range

LED display:

LED red: Object has been detected.

LED green: Sensing area is unobstructed, and the sensor sees the ground.

**DIN**

*If used as a means of protection in complying with German standard DIN 18650, the detection angle and the sensing range have to be adjusted as follows:*

Use the optional calibration tools (test card and square) for adjustment.

#### Sensing range adjustment of the Sensor:

1. Use the chassis lever to move the module to the first marked line on the module holder (see Figure 5.2), and use the M3 screw to fasten (g).
2. Turn the sensing range adjustment screw (f) counterclockwise until its overturn protection is activated (slight "clicking" noise). Now the maximum sensing range has been set.
3. Now place the test card on the test specimen so that the card lays 12.5 cm above the ground.
4. Turn the sensing range adjustment screw clockwise just until the LED display switches from red to green (if necessary turn back to red and then clockwise to just to green). The sensing range adjustment is thus completed.



Figure 3.6 Sensing range adjustment (left) and detection angle (right)

**Detection Angle of the Sensor:**

5. Lay the test card on the ground with its mark parallel to the door.
6. Place the test specimen on the door-side of the test card mark. (see Figure 3.7).
7. Aim the sensor down vertically.
8. Use the chassis lever to swivel the sensor forward until it detects the test specimen (20 cm height) and the red LED illuminates.
9. Swivel the sensor's light beam slowly further away from the door sees the ground again (LED switches from red to green).
10. Now use the M3 screw (g) to attach the module to the module holder. The detection angle has now been set.

This setting has been completed now.



**Checking the Sensing range adjustment**

11. Use the test card to check the sensing range adjustment once again.

Figure 3.7 Positioning the test specimen

For operation as a safety sensor in complying with German standard DIN 18650, the sensing range has to be set to approx. 12.5 cm ± 1 cm over the ground.



**4 Sensing Field**

Depending on the application and the door width, a master module can be supplemented with up to seven slave modules.

We recommend to adjusting the straight (vertical) transmitting / receiving beam of the corresponding sensor module no further than 10 cm away from the main leading edge.

.Figure 4.1 illustrates the installation for different door panel widths.

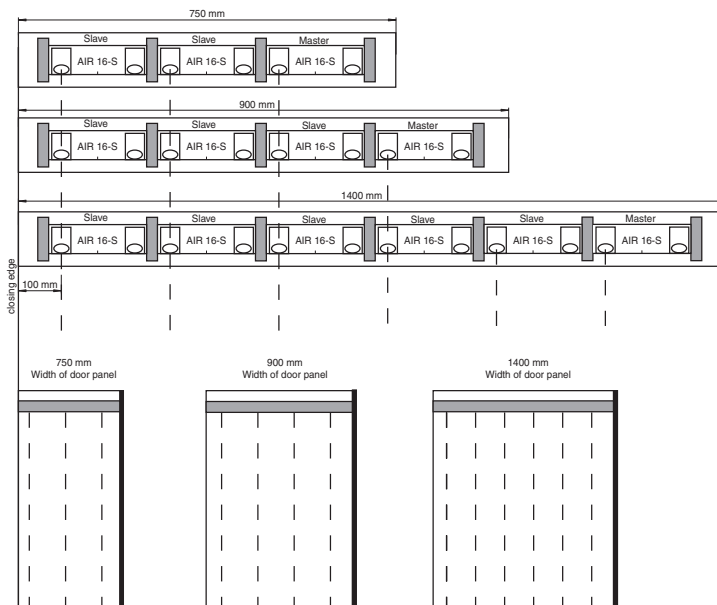


Figure 4.1 Sensing field

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

Part No. 194564  
Date of issue 02/07/2008

## 5 Master / Slave Operation

### 5.1 Difference between Master and Slave Modules

It is possible to add up to seven additional slave modules together with one master module. The differences between the master module and the slave module are as follows:

**Master module:** with relay; 6-pole connector; one red socket

**Slave module:** no relay; no 6-pole connector; two red sockets

### 5.2 Installing Master / Slave Modules

Make sure that the chassis neatly locks into the module holder during the installation of the master module and the slave module.



Figure 5.1 Master / slave modules

The chassis has to lock into the module holder as follows:

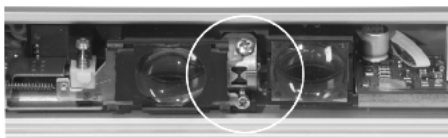


Figure 5.2 Installing master / slave modules

- Please make sure that the module holder's stem locks into the borehole of the chassis safely. The chassis clip has to be visible in the middle of the module holder (See inside circle of Figure 5.2).
- Connect only the master module to the door controller via the 6 position screw terminal (i).
- Connect the slave modules with the 20 cm flat cables.  
The connection from the master module to its adjacent slave module is made by the longer flat cable (24 cm).

### 5.3 Removing the Configuration Bridge

Disconnect the configuration bridge (j) at the last slave module or on the last slave module's PCB or on the master module's PCB.

Disconnect the bridge when the sensor is not powered.

Before carrying out this step, touch the chassis lever.



Figure 5.3 Configuration bridge

## 6 Test



The following test should be conducted only when used as a safety sensor of the door controller in complying with German standard DIN 18650.

### 6.1 Pulse Diagram of Time Sequence

If the TopScan-S is used as a safety device, the device has to be tested cyclically by the door controller. This test should be conducted only if no object is detected, and the recommended door position for the test is completely open.

The door controller's test signal should be connected to the master module's 6-position screw terminal only.

Test Description:

**Time  $t_0$ :** The door controller sends the test request input.

**Time  $t_1$ :** After a response time of no more than 70 ms, the sensor output must go into detection mode.

**Time  $t_2$ :** After 200 ms, the sensor output must remain in detection mode.

The test input signal can now be turned off by the door controller.

The test is now completed. After another 70 ms, the sensor will be available again.

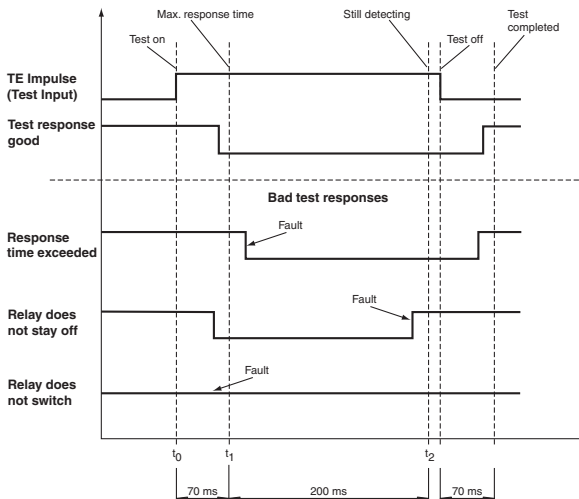


Figure 6.1 Pulse diagram of time sequence

The door controller sends signals to the sensor at the times  $t_1$  and  $t_2$ .

## 7 Connection to the Door Controller

The inside and outside of the door has to be switched on and off alternately (muting) -> or has to be excluded from the evaluation of the door control.

If the device is not used as a safety sensor in complying with German standard DIN 18650, the test input can be left unconnected.



If the modules on the inside and outside of the door are connected to a door transition cable, special cable ties (e.g.: 3M Scotchlok single core tie UB2) are recommended where another cable can be added to the supply cable.

## 8 Troubleshooting

Error	Cause	Remedy
The sensor does not initialize or react.	Supply voltage is not correct.	Check the voltage supply.
Door stops cyclically.	<ul style="list-style-type: none"> <li>The sensor is disturbed by the movement of the door.</li> <li>The door panels are detected by the sensor.</li> <li>The door movement causes vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>Change the sensor's detection angle.</li> <li>Check the sensor's mounting.</li> </ul>
Door stops sporadically.	<ul style="list-style-type: none"> <li>There are objects in the detection field which move in the wind.</li> </ul>	<ul style="list-style-type: none"> <li>Remove the objects (flags, plants, etc.)</li> </ul>
Test specimen is not detected.	<ul style="list-style-type: none"> <li>The sensing range is incorrectly set.</li> <li>The detection angle is incorrectly set.</li> </ul>	<ul style="list-style-type: none"> <li>Check the sensing range with the test card.</li> <li>Readjust the detection angle (see Chapter 3.3).</li> </ul>

Table 8.1 Troubleshooting

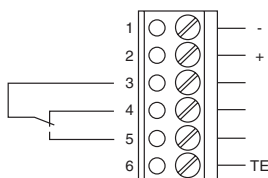
## 9 Specifications / Wiring Diagram

General data	
Sensing range min.	0 ... 1,500 mm ...
Sensing range max.	0 ... 2,500 mm ...
Light transmitter	IRED
Black/white differential (6 % / 90 %)	< 1 % at a sensing range of 2,000 mm
Approvals	CE, TÜV
Number of beams	Number of mounted sensor modules (AIR 16-S)
Mode of operation	Background evaluation
Diameter of the light spot	3 cm x 8 cm at a range of 2,000 mm for each module
Displays/operating elements	
LED	LED red / green (see chapter "Optical Setting of the Sensor")
Operating components	Sensing range adjustment
Electrical data	
Supply voltage	24 VDC ± 20 %
Current Consumption I <sub>0</sub>	60 mA / module
Input	
Test input	-3 V ... +5 VDC or disconnected: Test off +11 V...+30 VDC Test on
Output	
Output type	Relay switched off when objects are inside the sensing range.
Signal output	1 Form C Relay
Switching voltage	5 V ... 30 VAC / VDC
Switching current	0.001 mA ... 0.3 A
Response time	70 ms
Maximum length of the interconnecting cables	30 m
Wire diameter	0.3 mm ... 1.3 mm (16AWG - 26AWG) Cu single/multicore
Optical data	
Light wavelength	870 nm ± 15 nm
Laser class	1
Minimum reflection of the floor	6 %
Minimum reflection of the target	0 %

Standards of Conformity	
Standards	EN 60947-5-2 / EN 61000-6-3 / EN 12650-1 / EN 12978
Standards	EN 61000-6-2 without EN 61000-4-5 / EN 61000-4 / EN -11
Standards	DIN EN 18650-1 / EN 954-1 / EN 60825-1 / EN 61508
Ambient conditions	
Ambient temperature	-10° Celsius ... 50° Celsius (263 K ... 323 K)
Humidity at 20° Celsius	< 90 %
Humidity at 60° Celsius	< 50 %
Mechanical data	
Housing length L	min. 310 mm
Mounting height	max. 2,500 mm
Protection type	IP52, with optional rubber seal IP54
Connection	Screw terminal
Material	
Housing	Aluminum / ABS
Light exit	PMMA

Table 9.1 Technical data

## 9.1 Wiring Diagram



Pin	Assignment
1	GND (0 V)
2	V+ (+24VDC +/- 20%)
3	Relay output - common
4	Relay output - Normally closed
5	Relay output - Normally open
6	Test input

### Explanation:

#### Relay:

- Relay is inactive for target presence
- Relay is active in for target absence

#### Test input:

- Test input is inactive when signal is -3 V DC to +5 V DC or disconnected
- Test input is active when signal is +11 V DC to +30 V DC

## 10 Components of TopScan-S

Part Numbers	Description
187683	AIR 16-S MASTER
188945	AIR 16-S SLAVE

Table 10.1 Components of TopScan-S

Part No. 194654

02/07/2008

Date of issue

## 11 Disposal, Repair, Maintenance

### 11.1 Disposal

Dispose of the device according to the applicable national laws and regulations.  
For example, take the sensor to an electronic waste collection center.

### 11.2 Repair

Device may be repaired by the manufacturer only.

### 11.3 Servicing

Observe the applicable national regulations for servicing.

The sensor requires little to no maintenance.

Nonetheless, check the technical safety of the sensor system in regularly intervals, looking out for damage to the housing in particular.

If safe operation is no longer possible, the sensor system should be shut down and secured against unintentional operation.

Check the sensor for soiling occasionally. To clean the sensor, use a dry or moist soft cloth to wipe across the sensor regularly. This will ensure optimal function.

The housing is made of plastic. For this reason avoid contact with acetone and detergents containing solvents.





Part No. 194584

Ausgabedatum 07.02.2008

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"

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