Installation and operation manual

CEDES

TPS

Triangulation Proximity Switch

English

CE

IMPORTANT NOTE

FOLLOW THE INSTRUCTIONS GIVEN IN THIS MANUAL CAREFULLY. FAILURE TO DO SO MAY CAUSE CUSTOMER COMPLAINTS AND SERIOUS CALLBACKS. KEEP INSTRUCTION MANUAL ON SITE.

Part No. 106 687 en

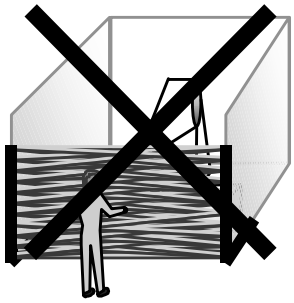
IMPORTANT INFORMATION

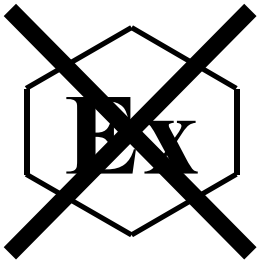
THE TPS SHOULD ONLY BE INSTALLED BY AUTHORIZED AND FULLY TRAINED PERSONNEL! IN ADDITION, THE INSTALLER IS REQUIRED TO COMPLY WITH ALL LOCAL LAWS AND STANDARDS. FOLLOW THE INSTRUCTIONS GIVEN IN THIS MANUAL CAREFULLY. THE INSTALLER OR SYSTEM INTEGRATER IS FULLY RESPONSIBLE FOR THE SAFE INTEGRATION OF THE SENSOR. IT IS THE SOLE RESPONSIBILITY OF THE PLANNER AND/OR INSTALLER AND/OR BUYER TO ENSURE THAT THIS PRODUCT IS USED ACCORDING TO ALL APPLICABLE CODES, STANDARDS AND REGULATIONS THAT PERTAIN TO INFRARED AND PHOTO-ELECTRIC DOOR PROTECTION DEVICES!

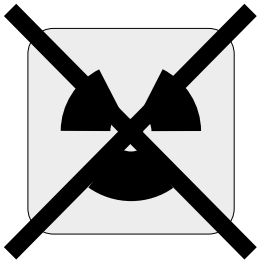
ANY ALTERATIONS TO THE DEVICE BY THE BUYER, INSTALLER OR USER MAY RESULT IN UNSAFE OPERATING CONDITIONS.

CEDES IS NOT RESPONSIBLE FOR ANY LIABILITY OR WARRANTY CLAIM WHICH RESULT FROM SUCH MANIPULATION.

DO NOT USE THIS PRODUCT IN EXPLOSIVE ATMOSPHERES, RADIOACTIVE ENVIRONMENTS OR FOR MEDICAL APPLICATIONS! USE ONLY SPECIFIC AND APPROVED DEVICES FOR SUCH APPLICATIONS, OTHERWISE SERIOUS INJURY OR DEATH OR DAMAGE TO PROPERTY MAY OCCUR!







Content

1. Introduction

The sensors of the TPS product family are a class of very precise active infrared proximity sensors with background suppression. Due to their very high sensitivity, they are able to operate over distances of up to 2 m for independent targets. The two sensor beams are in the same housing. This unique concept allows various applications, such as reliable object detection, direction recognition of moving objects, height discrimination, etc. These applications would not easily be possible with two individual sensors.

The sensing range can be adjusted very precisely by multiturn potentiometers between 0.3 m and 2 m. The two integrated status LEDs allow simple trigger level adjustment.

The detection principle is based on triangulation technology. This technology is optimized for excellent background suppression and low sensitivity variation between black and white objects. Therefore, the TPS sensor is independent to variable ambient light conditions.

The application of multiple (adjacent) TPS sensors requires only a gap of 0.2 m between the devices and 0.1 m to the wall. (see Figure 6)

The infrared beams are not visible to the human eye and are completely safe.

2. Features of TPS

- Infrared sensor based on triangulation proximity technology
- Built-in signal processing
- Insensitive to variable light conditions
- Plug-and-play system
- Easy to install
- Integrated status LEDs
- Test input (TPS 100 only)

3. Applications

The TPS sensor uses the two light beams in different ways.

3.1. TPS 100: Presence detection

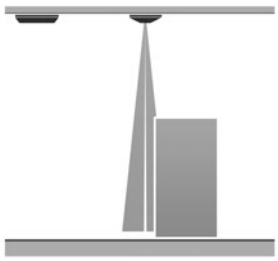


Figure 1: Function of TPS 100

If an object interrupts either beam, one shared output is switched. The trigger level can be adjusted according to the application requirements. The sensor can be tested with a simple pulse using the test input.

3.2. TPS 200: Level detection

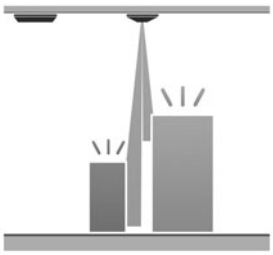


Figure 2: Function of TPS 200

With individually adjusted trigger levels on each beam, the unit detects objects of different height. Each of the two outputs represents the status of one beam with its related trigger level.

3.3. TPS 210: Direction recognition

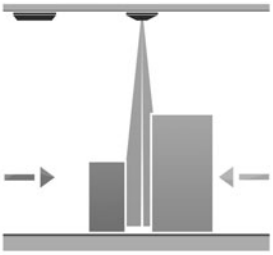


Figure 3: Function of TPS 210

The unit recognizes the direction of passing objects and sends a pulse to the corresponding output.

4. Main functions

Adjusting the trigger level and gap between different sensors is highly important. Following these simple guidelines will enable perfect detection with the TPS family.
With separately adjustable trigger levels on each beam, the TPS can be used for different detection heights. The operation range is between 0.1 m to 2 m from the device. The trigger level can be adjusted manually from 0.3 m up to 2 m in order to determine the preferred detection range.

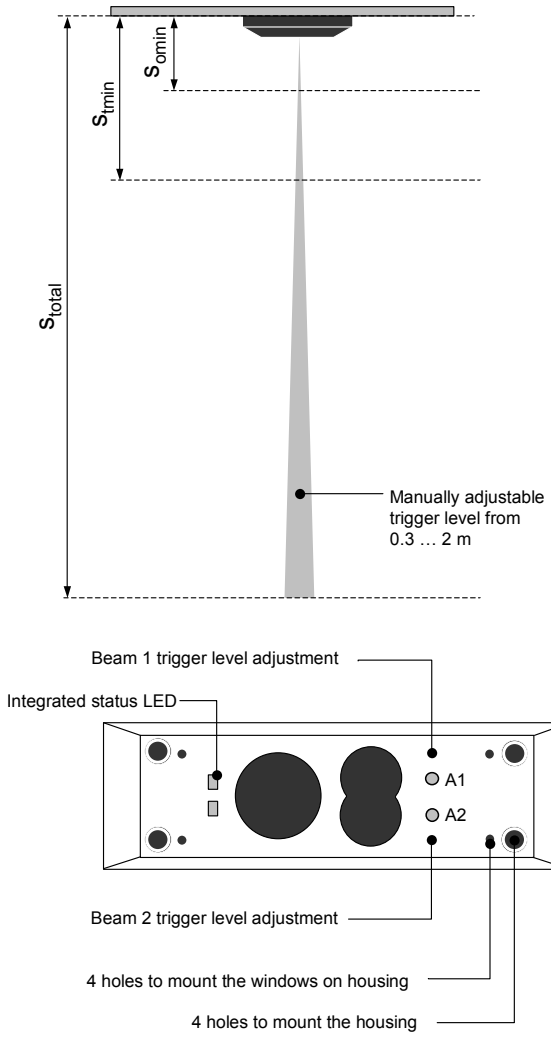


Figure 4: Operating range and trigger levels of the device

s_{total}	Maximum operation / trigger level	2.0 m
s_{omin}	Minimal operation level	0.1 m
$s_{factory}$	Trigger level set by factory	1.0 m
s_{tmin}	Minimal trigger level	0.3 m
A1/A2	Trigger level increase	
A1/A2	Trigger level decrease	

Example for trigger adjustment:
The TPS device is mounted at the top to detect objects from above. To detect the higher object, the trigger level has to be set between the height of two objects.

The trigger level can be calculated according to
$s_{trigger} = s_{mount} - s_{height}$

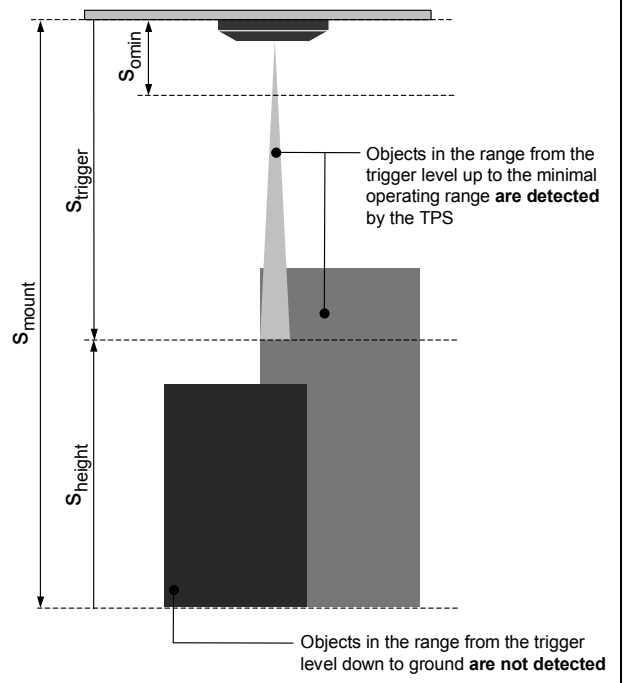


Figure 5: Example for triggering the TPS device

5. Installation

- Be sure to turn off power supply when carrying out electrical work.
- Clearly mark that this device is out of service.

There are one flush and two surface mounting solutions. Distances from wall, doors and/or other obstacles must be considered. The application of multiple (adjacent) TPS sensors requires a minimum gap between the devices. This gap is needed to avoid any interference between neighboring sensors.

Important information:
Every device needs to be separately connected to the corresponding control device. For electrical connection, see Figure 10.

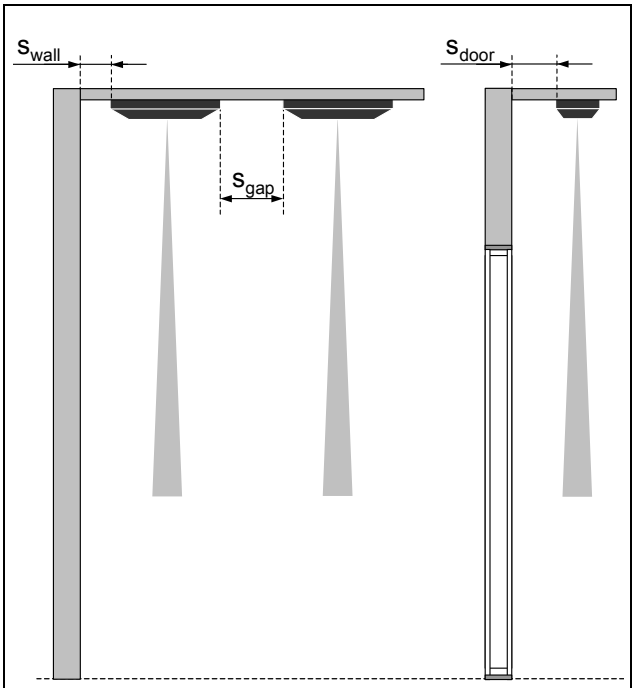
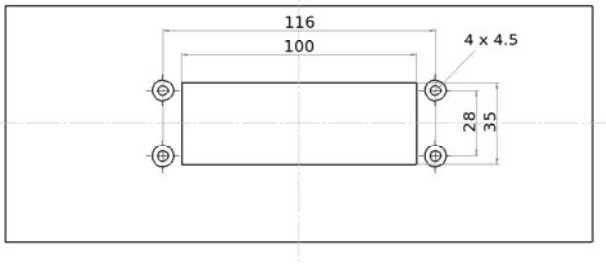


Figure 6: Spacing for TPS front view (left) side view (right)

s_{wall}	Spacing to wall	> 0.1 m
s_{gap}	Spacing to next TPS	> 0.2 m
s_{door}	Spacing to door	> 0.1 m

5.1. Flush mounting

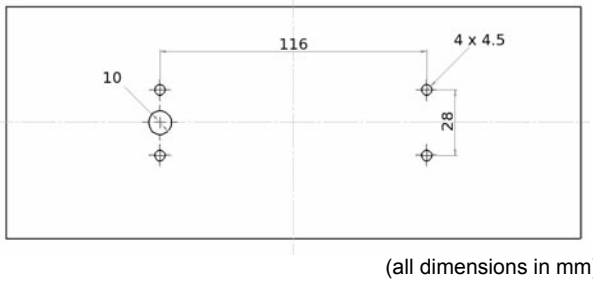


(all dimensions in mm)

Figure 7: Backside view of a flush-mounted TPS

1. Mill square (the sheet has to be thinner than 2 mm)
2. Drill holes
3. Mount sensor with countersink
4. Connect wires (see Figure 10)
5. Set trigger level (see Figure 4)
6. Clip window to sensor

5.2. Surface mounting - cable invisible

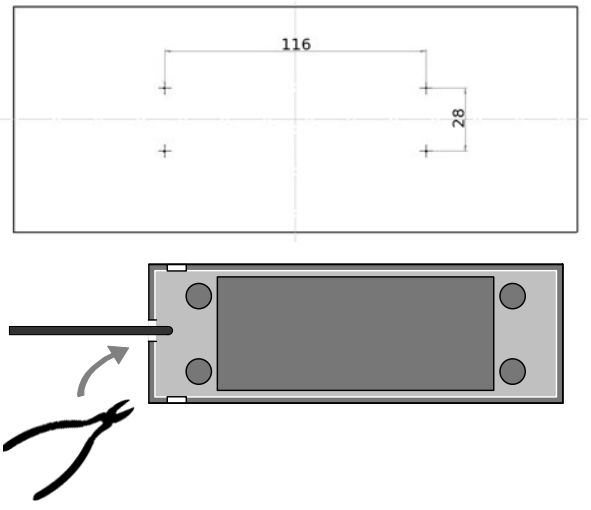


(all dimensions in mm)

Figure 8: Backside view of a surface-mounted TPS

1. Drill holes
2. Lead connector through the hole
3. Mount sensor with screws (recommended screws are flat headed torx)
4. Connect wires (see Figure 10)
5. Set trigger level (see Figure 4)
6. Clip window to sensor

5.3. Surface mounting - cable visible



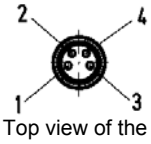
(all dimensions in mm)

Figure 9: Backside view of a surface-mounted TPS

1. Drill holes
2. Cut slots from sensor on the back side.
3. Lead connector through the slots
4. Mount sensor with screws (recommended screws are flat headed torx)
5. Connect wires (see Figure 10)
6. Set trigger level (see Figure 4)
7. Clip window to sensor

5.4. Electrical installation

Standard M8 male connector
Pin allocation based on industry standard:



Pin 1: $+U_{sp}$ (brown)
Pin 2: PNP-output B (black)
Pin 3: GND (blue)
Pin 4: PNP-output A or test input (white)

Top view of the connector (view to the pins)

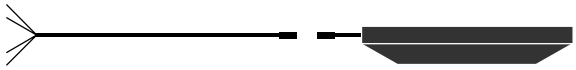
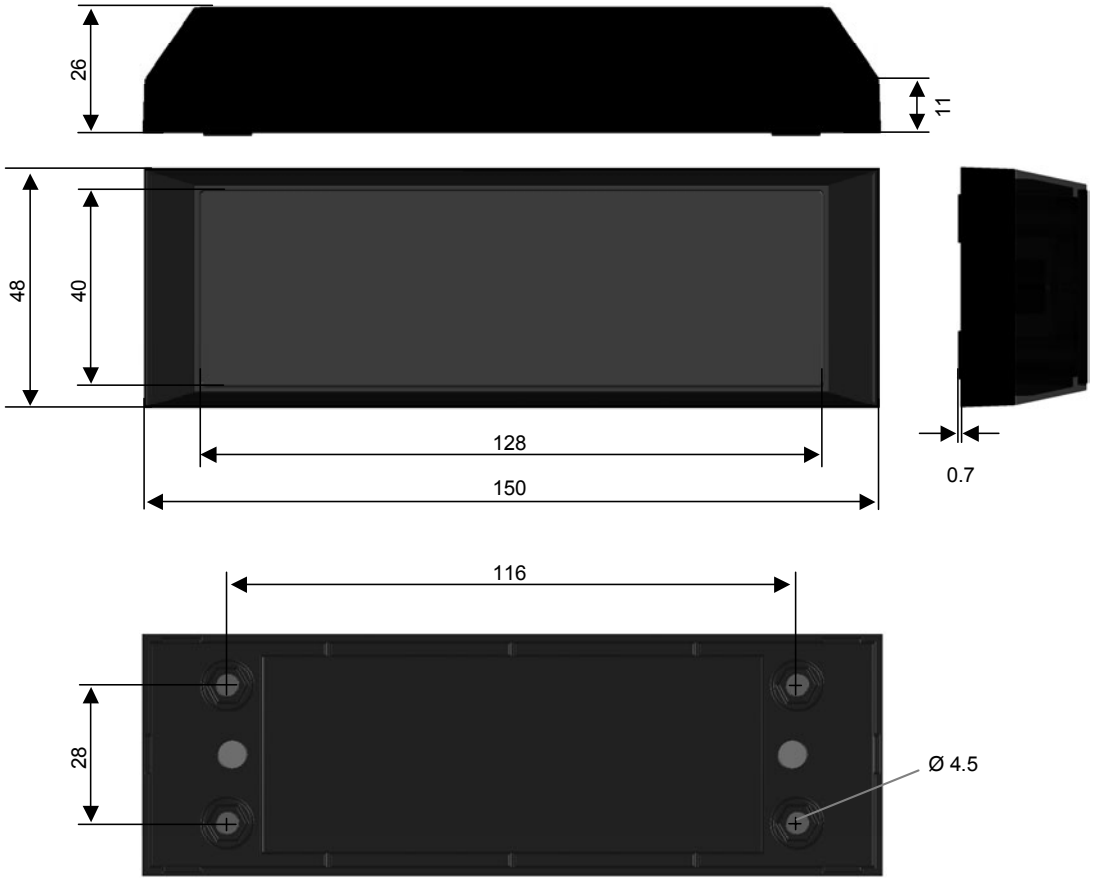


Figure 10: Connecting diagram of the connector

1. Connect the sensor to connecting cable
2. Connect the wires in the control device according to pin allocation

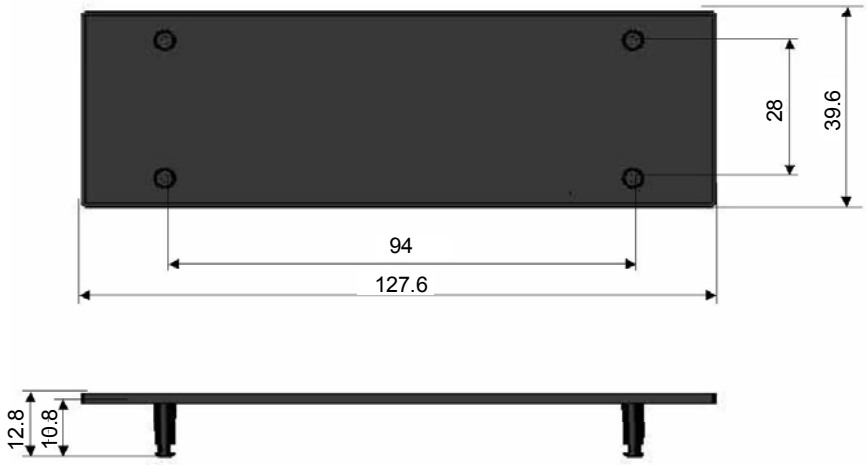
6. Dimensions

6.1. Dimensions of the housing



(all dimensions in mm)

6.2. Dimensions of the front cover



(all dimensions in mm)

7. Timing diagram

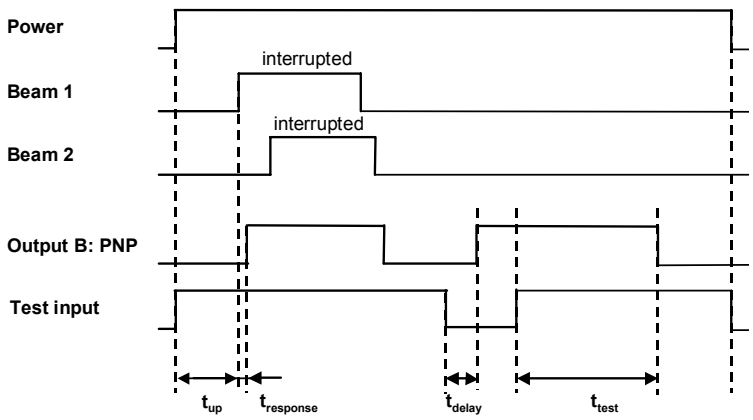


Figure 11: Timing diagram of TPS 100

t_{up}	Max. 200 ms
$t_{response}$	Max. 10 ms
t_{delay}	20 ms
t_{test}	80 ms

The test input can be used to verify that the device operates correctly. To ensure the system functions failure-free, the test input has to be connected to the power supply. A GND or open wire on the test input switches Output B to high without checking beam 1 or beam 2.

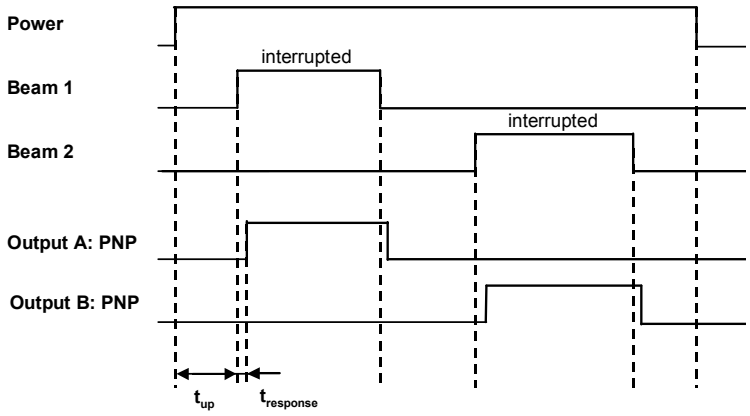


Figure 12: Timing diagram of TPS 200

t_{up}	Max. 200 ms
$t_{response}$	Max. 10 ms

Upon interruption of either light beam, the corresponding PNP output is switched to HIGH.

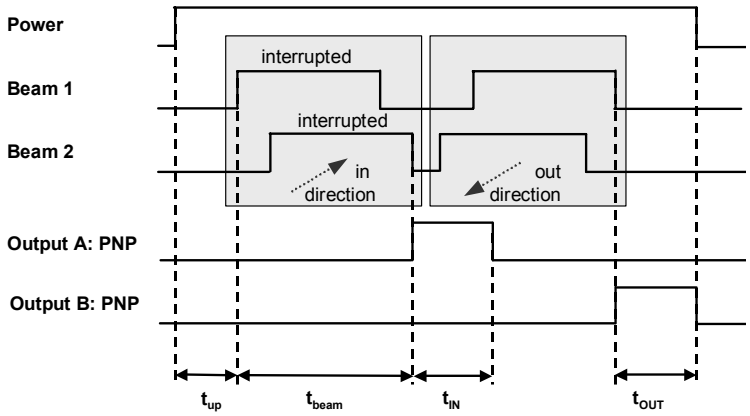


Figure 13: Timing diagram of TPS 210

t_{up}	Max. 200 ms
t_{beam}	Object with max 5m/s
$t_{IN} = t_{OUT}$	200 ms
$t_{response}$	Max. 100ms after object

If an object passes through both light beams in IN or OUT direction, an output pulse is sent to the corresponding PNP output.

8. Maintenance

Although TPS does not need periodical maintenance, a functional check with every facility maintenance check is strongly recommended.

8.1. Periodic functional test

The periodic functional test should consist of the following:

- Test the reopening function over the whole object area.
- Confirm sensor is fastened securely
- Ensure the front window / lenses of TPS are clean and without scratches

8.2. Cleaning

Clean the front surface from dust or dirt with a soft towel. To clean the surface with a towel, it must be either dry or slightly moist, but should not be wet.

Do not use plastics cleaner, acetone, gasoline or other solvents!

9. Troubleshooting

Trouble	Cause	Solution
Does not operate as expected The red LEDs remain unlit	Irregular supply voltage	Adjust to the specified voltage range
	Wire / cable cut or improperly connected	Check the wires / cable: reconnect or replace as appropriate
	Inappropriate installation	Check the installation section of this manual
	Trigger level too low	Increase the trigger level
	TPS installed too high	Check the installation section of this manual
Irregular operation	Dirty lens	Clean the front surface from dust or dirt with a soft towel
	Something swaying between the sensors interrupts the light beam	Remove the obstruction
The red LEDs blink continuously	Trigger level set get too long	Decrease the trigger level
	TPS installed too low	Check the installation section of this manual
The red LEDs flicker continuously	Minimum gap between devices too short	Increase gap between devices
	The device is interrupted by other infrared emitters	If possible, change the alignment angle of the sensors
Adjusting trigger level (screws) has no effect	Beams are interrupted by a hand (LEDs always on)	Take care that while manually adjusting the trigger level with a screwdriver, the light beams are not interrupted by your hand
	Trigger level too long (LEDs always off)	Try to pull the screw a bit while tightening
Direction recognition functions poorly in both directions	Wrong TPS device	Check the label for right TPS device
	Sensor incorrectly set	Adjust the trigger to the same level
Direction recognition functions poorly in one direction	The two triggers do not have the same level	Adjust the trigger to the same level
Other trouble	Root cause not known	Contact your CEDES representative

10. Technical data

Type	TPS 100	TPS 200	TPS 210
Light beams	2	2	2
Detection levels	2	2	1
PNP output	1	2	2
Direction recognition	no	no	yes (max: 5 m/s with 0.2 m wide object)
Test input	yes	no	No
Sensor type	Two beam infrared triangulation sensor		
Operating range	0.1 m ... 2 m		
Trigger level	0.3 m ... 2 m		
Distance detection accuracy	± 5 mm @ 0.5 m with Kodak white and gray test card ± 10 mm @ 1 m with Kodak white and gray test card ± 20 mm @ 2 m with Kodak white and gray test card		
Distance detection hysteresis	< 2% with Kodak white test card		
Light beam diameter	< 70 mm @ 1.1 m		
Space between light beams	22 mm		
Max. ambient light	100,000 Lux		
Supply voltage U_{sp}	10 … 30 VDC		
Ripple at U_{sp}	Max. 10%		
Current consumption	Max. 40 mA		
Connector type	Standard: 4-pin M8 connector, male		
Cable	0.15 m, pig-tail, incl. connecting cable 5 m		
Beam indicator	Two red LEDs, one red LED for each light beam		
PNP-Output (all TPS)	Output A / Output B	Current max. 50 mA short circuit protected load max. 100 nF	
Output pulse duration (TPS 210 only)	Output A / Output B	200 ms	
Test input threshold (TPS 100 only)	Test input	$U_{th}(L) = 1/3\ U_{sp}$	$U_{th}(H) = 2/3\ U_{sp}$
Enclosure rate	IP65		
Temperature range	- 20 … + 65°C		
Dimensions (L x W x H)	150 x 48 x 26 mm		
Material	PC visually black		
Mounting	Four screws		
Certificates	CE		
According to	Vibration Shock EMC-Immunity EMS-Emission Eye safety	EN 60068-2-6 EN 60068-2-27, EN 50155 EN 61000-6-1 (Residential), EN 61000-6-2 (Industrial) EN 61000-6-3 (Residential), EN 61000-6-4 (Industrial) EU Directive 2006/25/EG, Annex I	

11. Ordering information

Systems

Part No.	Device type	Description
106 676	TPS 100	Presence detection, with 5 m connecting cable
106 677	TPS 200	Level detection, with 5 m connecting cable
106 678	TPS 210	Direction recognition, with 5 m connecting cable

Accessories

Part No.	Device type	Description
102 790	Extension cable, 3 m	M8 connector, male, female
106 169	Extension cable, 10 m	M8 connector, male, female
103 371	Connecting cable, 5 m	M8 connector, female
105 973	Front cover	-

12. Certificate

12.1. CE Certificate

Konformitätserklärung
Declaration of Conformity
Déclaration de Conformité
Dichiarazione di Conformità
Deklaracja zgodności

CE

Wir / We / Nous / Noi / My	
erklären in alleiniger Verantwortung, dass declare in sole responsibility that déclarons sous notre propre responsabilité que dichiariamo sotto propria responsabilità che deklarujemy z pełną odpowiedzialnością, że	**CEDES AG** **Science Park** **CH-7302 Landquart / Switzerland**
die Produktfamilie the product range la famille de produit la gamma di prodotti rodzina wyrobów	**TPS**
den Anforderungen der folgenden Richtlinien entspricht meets all the provisions of the following directives remplit toutes les exigences de la directives suivantes adempie a tutte le esigenze della direttive seguenti odpowiada wszystkim wymaganiom następujących dyrektyw	EMC 2004/108/EC
Angewandte normative Dokumente Applied standards Normes appliquées Norme applicati Zastosowane dokumenty normatywne	EMC – Immunity (Industrial) EN 61000 – 6 – 2 (08.2005) EMC – Emission (Residential) EN 61000 – 6 – 3 (01.2007)
Andere normative Dokumente Other standards D'autre normes Altre norme Inne dokumenty normatywne	EN 50155 (08.2001)
Prüfberichte Test reports Rapports de test Relazioni sull'esperimento Nr raportu technicznego	EMV Zentrum Graubünden Hochschule für Technik und Wirtschaft Ringstrasse, CH – 7000 Chur PB-08-DG-025 TPS_ EMC.doc
Ort und Datum Place and date Lieu et date Luogo e data Miejsce i data	**CH-7302 Landquart, 2008-10-15** **Daniel Lippuner**
Name und Funktion Name and function Nome et fonction Nome e funzione Nazwisko i stanowisko	Leiter Qualitätsmanagement Head of Quality Management Directeur de Qualité Direttore di Qualità Dyrektor ds. Jakości

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