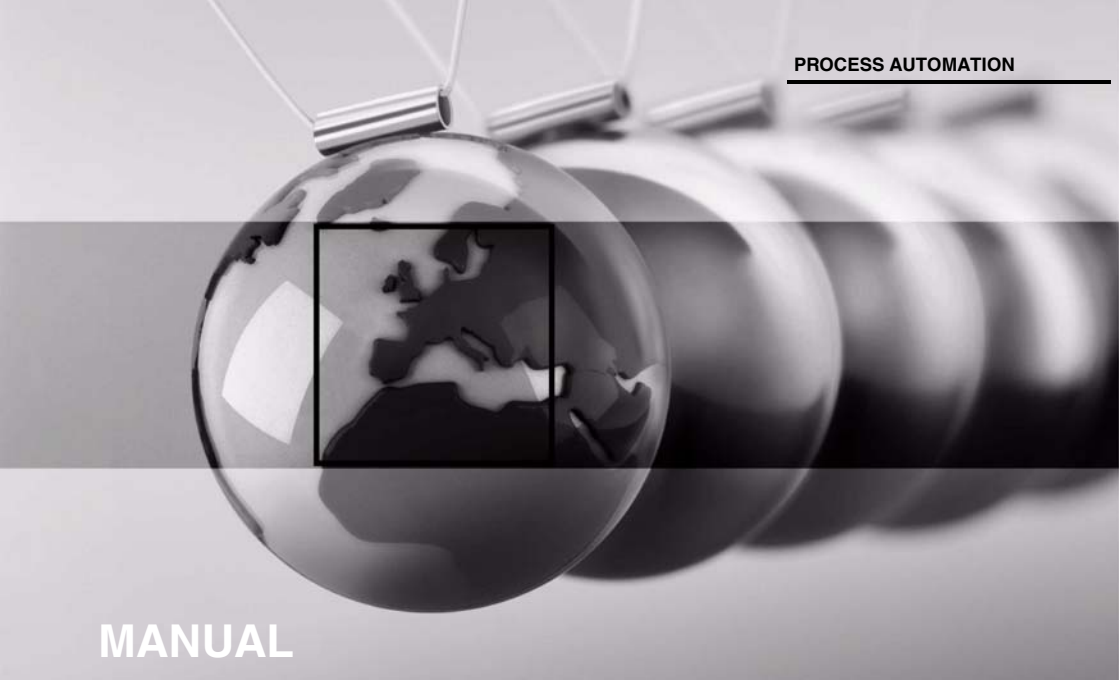

MANUAL

R2-SP-N*

Segment Protectors

PEPPERL+FUCHS

PROTECTING YOUR PROCESS

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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1 Safety

1.1 Validity

Specific process and instructions in this document require special precautions to guarantee the safety of personnel.

1.2 Symbols used

This document contains information that you must read for your own personal safety and to avoid property damage. The warning signs are displayed in descending order depending on the hazard category, as follows:

Safety-relevant symbols

Danger!
This symbol indicates a warning about a possible danger.

In case of ignoring the consequences may range from personal injury to death.

Warning!
This symbol indicates a warning about a possible fault or danger.

In case of ignoring the consequences may cause personal injury or heaviest property damage.

Caution!
This symbol warns of a possible fault.

In case of ignoring the devices and any connected facilities or systems may be interrupted or fail completely.

Informative symbols

Note!
This symbol brings important information to your attention.

Action

This symbol marks an acting paragraph.

1.3 System Operator and Personnel

The plant owner is responsible for its planning, installation, commissioning, operation, maintenance and disassembly.

Mounting, commissioning, operation, maintenance and dismounting of any devices may only be carried out by trained, qualified personnel. The instruction manual must be read and understood.

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1.4 Pertinent Laws, Standards, Directives, and further Documentation

Laws, standards, or directives applicable to the intended use must be observed. In relation to hazardous areas, Directive 1999/92/EC must be observed.

The corresponding data sheets, declarations of conformity, EC Type-examination certificates, certificates and Control Drawings if applicable (see data sheet) are an integral part of this document. You can find this information under www.pepperl-fuchs.com.

1.5 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.

1.6 Marking

R2-SP-N*

Pepperl+Fuchs GmbH

68307 Mannheim / Germany

Segment Protector

TÜV 11 ATEX 081151 X

 II 3 G Ex nA[nL] [ic] IIC T4

The stars replace a combination of characters, depending on the product.

1.7 Intended Use

The R2-SP-N* Segment Protectors are couplers for fieldbus according to IEC 61158-2 to connect field devices through spurs to the trunk of a fieldbus segment. Each spur individually limits the current in case of a failure ensuring that the remaining segment is not affected.

The Segment Protectors may be installed in Zone 2 or Class 1 Division 2 hazardous area. Types of protection are Ex nA [nL] [ic] for Zone 2 Gas Groups IIC, IIB, IIA and non-incendive for use in Class I Division 2 Gas Groups A, B, C and D.

In combination with dedicated fieldbus power supply modules which limit the output voltage safely acc. to IEC60079-11, the spurs are specified Ex nL or Ex ic.

The devices are only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

The device must only be operated in the ambient temperature range and at the relative humidity (non-condensing) specified.

1.8 Mounting and Installation

Prior to mounting, installation, and commissioning of the device you should make yourself familiar with the device and carefully read the instruction manual.

The devices may be installed in a corrosive location acc. to ISA-S71.04-1985, severity level G3.

1.8.1 Segment Protectors Special Mounting Requirements

The device is designed for installation on a 35 mm DIN mounting rail in accordance with DIN EN 60715.

Take the cable parameters to be used from the installation instructions of the corresponding Fieldbus system and from the Statement of Conformity.

During installation of Segment Protectors, the following parameters must be strictly followed:

- The permissible core cross-section is 0.2 mm² to 2.5 mm².
- The insulation stripping length of strands is 7 mm.
- Whenever finely stranded conductors must be used, the strand ends must be protected from fraying, for example by using end splices.

The following identifying values must be observed when connecting Fieldbus transmission lines:

- Tightening torque for the screw terminals should be 0.5 ... 0.6 Nm.

The connectors are qualified for pulling and plugging at temperatures higher than -40 °C.

Within a segment, the physically last Segment Protector has to be equipped with a fieldbus terminator type M-FT.

1.8.2 Requirements Zone 2

Connection or disconnection of energized non-intrinsically-safe circuits is only permitted in the absence of a hazardous atmosphere.

The devices may only be installed and operated in zone 2 if they have been mounted in an enclosure with degree of protection IP 54 according to IEC/EN 60529. The enclosure must have a declaration of conformity according to 94/9/EC for at least category 3G.

Segment Protectors Zone 2 Special Requirements

It is necessary to pay particular attention to the type of Fieldbus Power Supply selected for use with the R2-SP* Segment Protector. This determines the type of Zone 2/Div. 2 installations and certified field instruments that can be connected in Zone 2 or Div. 2 area to the spurs of the Segment Protector.

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Special care must be taken if power supply modules are to be used in conjunction with Pepperl+Fuchs segment protectors for energy limited Ex nL, intrinsically safe Ex ic and non-incendive field wiring.
A check must be made to ensure that the correct type of power supply module is used in relation to its output values. For example, the output voltage must be equal or less than the maximum voltage of the connected field devices.

Requirements for all used fieldbus products in Zone 2 installations are summarized in the manual: "Using Pepperl+Fuchs fieldbus equipment in Zone 2 hazardous area environment". This document is available separately.

1.8.3 Ex ic

The intrinsically safe circuits of the associated apparatus may lead into hazardous areas. Make sure to observe all relevant distances (creepage distances, clearances) to all non-intrinsically safe circuits (e.g. clearance) in accordance with IEC/EN 60079-14.

Circuits in type of protection "Ex ic" which have been operated with circuits of other type of protections may not be used as "Ex ic" circuits afterwards.

The respective peak values of the field device and the associated apparatus with regard to explosion protection should be considered when connecting intrinsically safe field devices with intrinsically safe circuits of associated appartus (verification of intrinsic safety). Make sure to observe IEC/EN 60079-14 and IEC/EN 60079-25.

When using Pepperl+Fuchs Segment Protectors in combination with Fieldbus Power Supplies to generate Ex ic rated spur outputs, the delivered separation wall has to be plugged on the Segment Protector. This is to to guarantee the clearance distance of 50 mm between the trunk terminals and the spur terminals.

The device must be mounted with at least a degree of protection of IP 54 according to IEC/EN 60529.

1.8.4 Ex nL

Circuits of type of protection " Ex nL" (limited energy) that are operated with circuits of other type of protections must not be used as "Ex nL" circuits afterwards.

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1.9 Housing

If additional housings are needed for installation in hazardous areas, the following points must be considered / evaluated:

- Degree of protection as per IEC/EN 60529
- Light resistance as per IEC/EN 60079-0
- Impact strength as per IEC/EN 60079-0
- Chemical resistance as per IEC/EN 60079-0
- Heat resistance as per IEC/EN 60079-0
- Electrostatics as per IEC/EN 60079-0

To ensure the IP degree of protection:

- all seals must be undamaged and correctly fitted
- all screws of the housing / housing cover must be tightened with the appropriate torque
- only cable of the appropriate size must be used in the cable glands
- all cable glands must be tightened with the appropriate torque
- all empty cable glands must be sealed with sealing plugs

1.10 Repair and Maintenance

The devices must not be repaired, changed or manipulated. If there is a defect, the product must always be replaced with an original device.

1.11 Disposal

Disposing of devices, packaging material, and possibly contained batteries must be in compliance with the applicable laws and guidelines of the respective country.

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2 Product Specifications

2.1 Overview

The R2-SP-N* Segment Protectors are a family of fieldbus device couplers for connection of field instruments to fieldbus segments. They are designed for fieldbus systems according to IEC 61158-2 such as FOUNDATION Fieldbus H1 or PROFIBUS PA and in accordance with the fieldbus device coupler test specification FF-846.

Communication and power distribution share the same two-wire cable using Manchester Bus Powered (MBP) coding. The R2-SP-N* series Segment Protector is designed for DIN-Rail installation with simple snap hooks included. It can be installed in a field junction box or a control cabinet. Various choices of tailored solutions are offered by the Pepperl+Fuchs Group.

Field instruments are connected one per output, also named spur. The main fieldbus segment is often named trunk. R2-SP-N* offer the choice from four to twelve spur connections.

The Segment Protector is certified for installation in Zone 2. Using Pepperl+Fuchs Segment Protectors in conjunction with Pepperl+Fuchs Fieldbus Power Supplies allows you to do live maintenances at the field device level in Zone 2 as outputs are either classified for Ex nL, Ex ic Entity or FISCO ic.

Each spur is equipped with short-circuit current limitation. If a spur has a short circuit or failure, the fieldbus trunk and all other field devices remain in operation. When the fault is repaired, the Segment Protector automatically resumes operation of the spur. This feature and the overvoltage protection at 39 V make fieldbus segments extremely reliable.

The Segment Protector is connected to the trunk via a T-connector. Exchange and modification of one Segment Protector is possible while the fieldbus segment is still in operation without effect on other parts of the same fieldbus segment. This connection design loads the Segment Protector only with the actual device load compared to designs where the fieldbus distribute has to handle the entire load current of the fieldbus trunk.

All connectors feature plugs with retaining screws giving fieldbus in Process Automation the necessary durability and availability. Receptacles for measuring tools such as the Mobile Advanced Diagnostic Module are also standard. Maintenance and commissioning personnel can conduct measurements in the field without the need for wiring tools. Thus the wiring is not disturbed.

A fieldbus terminator with high-availability design is included. One terminator each is mounted at the very end of the segment. The last Segment Protector on the segment has open terminals at the T-connector where the terminator is installed. This design further increases fieldbus availability in two ways: The connection is secured by screws; and over termination resulting in reduced signal levels can be avoided as the termination is clearly visible to installation personnel and possible only at the end of the trunk line.

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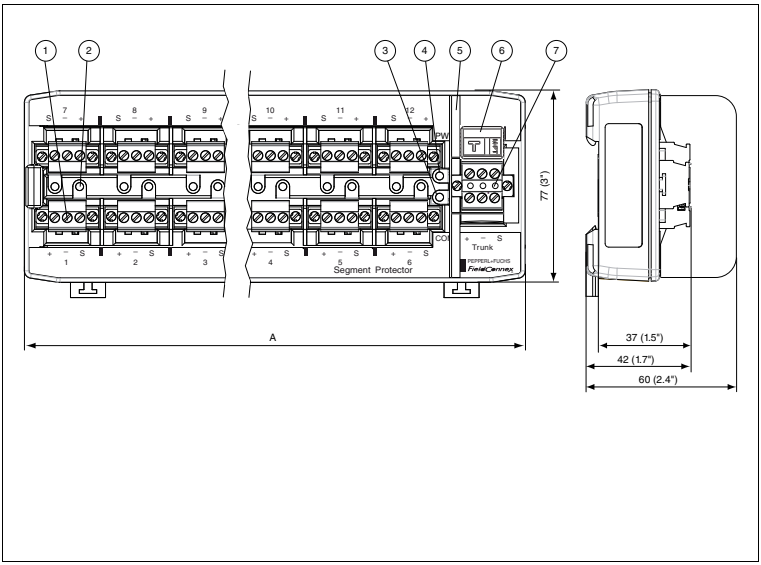
One LED each indicates bus communication activity and power on the trunk. Each output is equipped with an LED for indication of a short-circuit condition or fault at the spur.

2.2 Device Component Overview



A Height see table Technical data depending on model

1 Spur Connection Segment 1

2 LED ERR Spur 1 (red, short-circuit)

3 LED COM (Communication)

4 LED PWR (Power)

5 Separation wall ACC-R2-SW.3

6 Terminator M-FT, removable

7 T-connector T-CON.3

All dimensions in millimeters (mm) and inch (") without tolerance indication

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2.2.1 Status and error messages

LED ERR	Red, short-circuit
LED COM	Yellow flashing, bus activity
LED PWR	Green, Fieldbus Power present

2.3 Technical Data

Fieldbus Segment Protector R2-SP-N*

Fieldbus interface	
Main cable (Trunk)	
Rated voltage	9 ... 31 V DC
Rated current	max. 4.5 A
Outputs	
Rated voltage	max. 31 V
Rated current	max. 43 mA
Short-circuit current	max. 58 mA
Voltage drop main cable/outputs	max. 1.3 V
Voltage drop trunk In/Out	0 V
Terminating resistor	external type M-FT 100 Ω +/- 10 %
Surge protection	Trunk overvoltage protection if voltage exceeds typ. 39 V, max. 41 V
Ambient conditions	
Ambient temperature	-50 ... 70 °C
Storage temperature	-50 ... 85 °C
Relative humidity	< 95 % non-condensing
Shock resistance	15 g 11 ms
Vibration resistance	1 g , 10 ... 150 Hz
Mechanical specifications	
Connection type	screw terminals, removable, with retaining screws
Core cross-section	max. 2.5 mm^2 /AWG 12-24

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Technical Data Depending on Model

	*-N4	*-N6	*-N8	*-N10	*-N12
Number of outputs	4	6	8	10	12
Housing height (A)	93 mm (3.7")	121 mm (4.7")	148 mm (5.8")	177 mm (7")	205 mm (8")
Mass	130 g	180 g	230 g	280 g	330 g
Quiescent current	max. 8 mA	max. 8 mA	max. 8 mA	10	10
Power loss at 31 V input	248 mW**	248 mW**	248 mW**	248 mW**	248 mW**

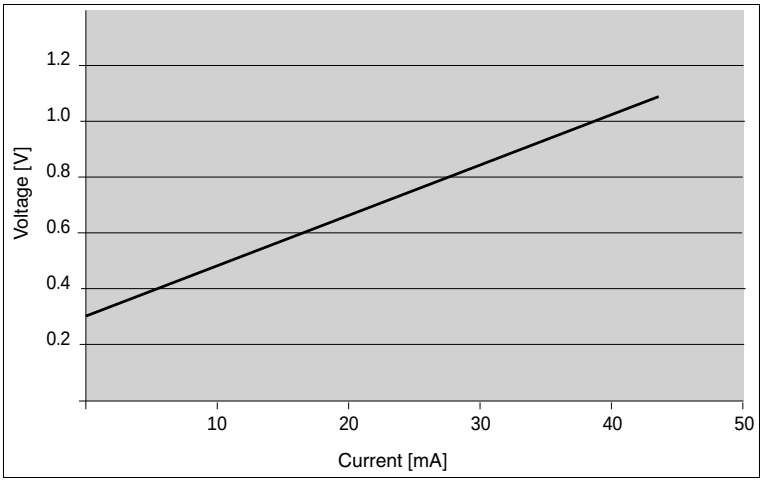
** + 8 mW per spur at 20 mA load

Note!

For characteristic values in conjunction with hazardous areas, please refer to the Statement of Conformity

2.4 Voltage Drop

The graph below illustrates typical voltage drop for each spur.



Test Conditions

Device	R2-SP-N12
Temperature	T_0 = 25ºC
Measured spur	1 of 12
Load conditions	all other spurs loaded with constant 40 mA

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3 Installation and Commisioning

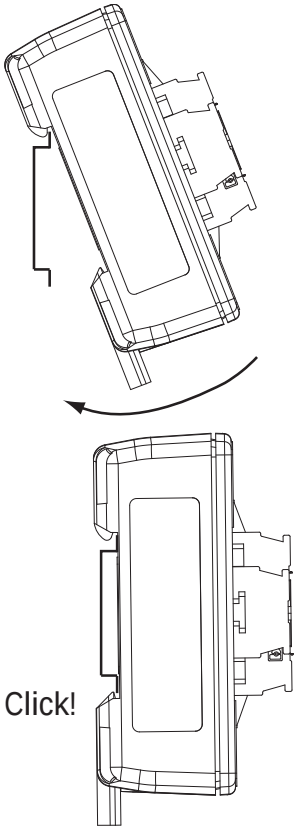
Note!

Read chapter Safety see chapter 1, especially all relevant sections for your kind of use before performing any work.

3.1 Mounting and Dismounting

Mounting the Segment Protector on a DIN rail

1. Place the Segment Protector on the DIN rail.
2. Gently press the Segment Protector to the DIN rail till it is locked in place.



The DIN rail mounting of the Segment Protectors must mesh securely with the rail.

The Segment Protectors must be fixed firmly on the rail.

Dismounting is performed in the reverse order.

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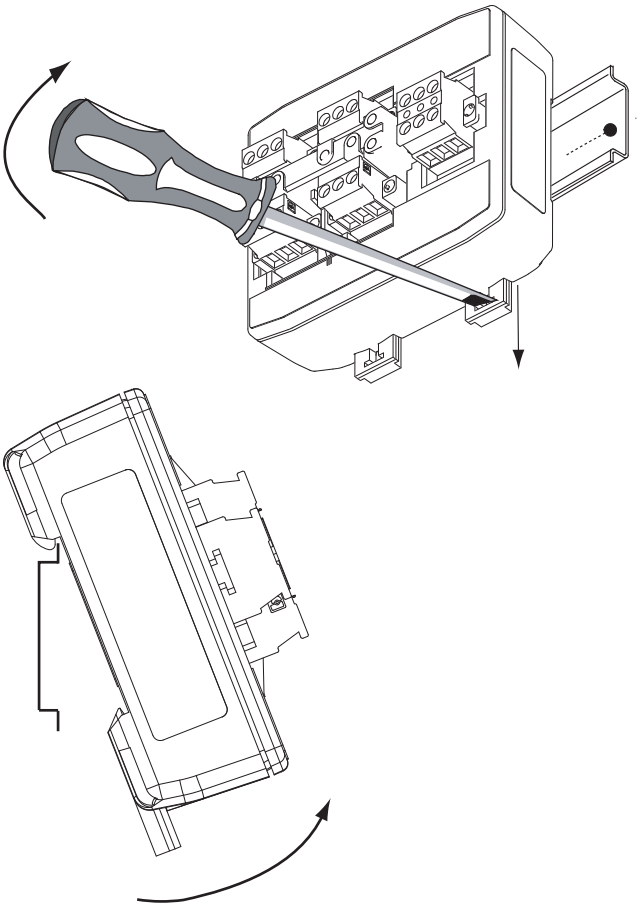
Dismounting the Segment Protector

1. Use a slotted screwdriver to open both latches.
2. Then lift up the device in a semicircular motion.



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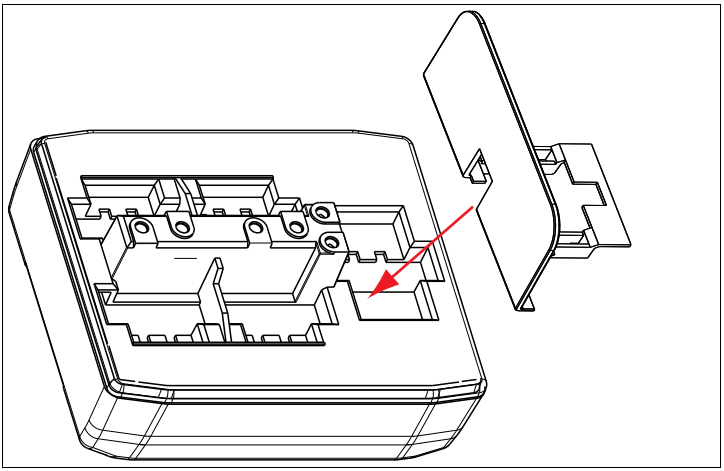
3.1.1 Mounting the Separation Wall

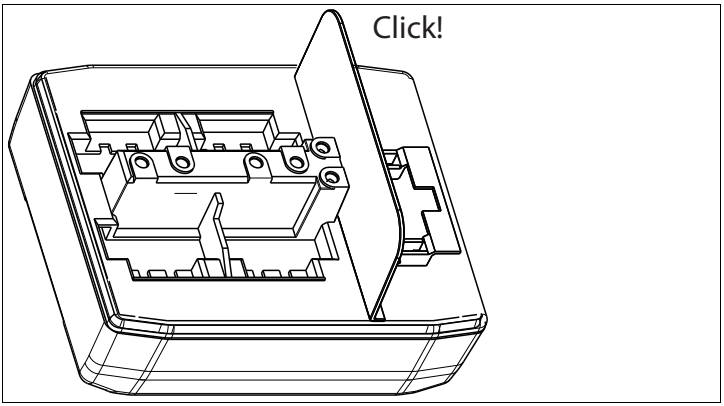
When using Pepperl+Fuchs Segment Protectors in combination with Fieldbus Power Supplies to generate Ex ic rated spur outputs, the delivered separation wall has to be plugged on the Segment Protector. This is to to guarantee the clearance distance of 50 mm between the trunk terminals and the spur terminals.

Mounting the Separation Wall

1. Remove the T-connector
2. Press the separation wall into the T-Connctor gap



3. Make sure that it is locked in place



4. Remount the T-connector and fasten the retaining screws

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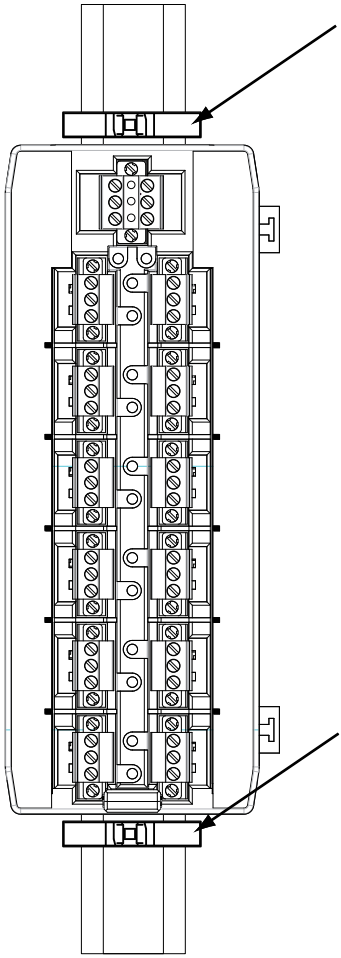
3.1.2 Additional Information Vertical Mounting

If a Segment Protector is mounted vertically, use end brackets / end clamps on both sides of the Segment Protector to prevent shifting of the device.



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Pepperl+Fuchs recommends using the following Phoenix Contact parts:

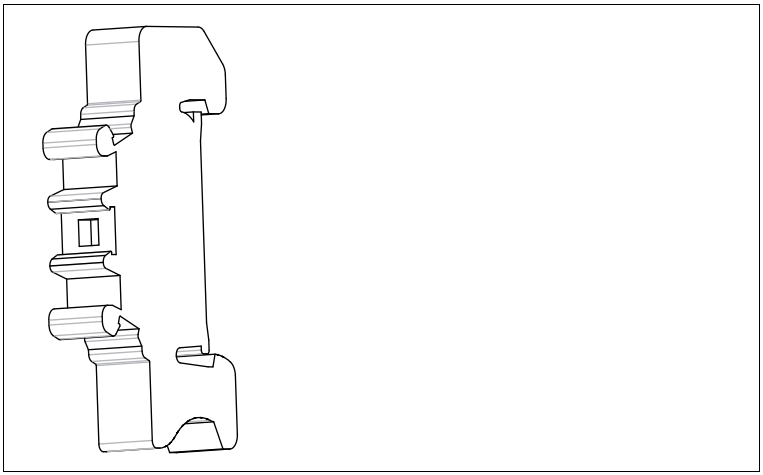


Figure 3.1: Clipfix 35, snap-on end bracket, PHOENIX CONTACT part no: 3022218

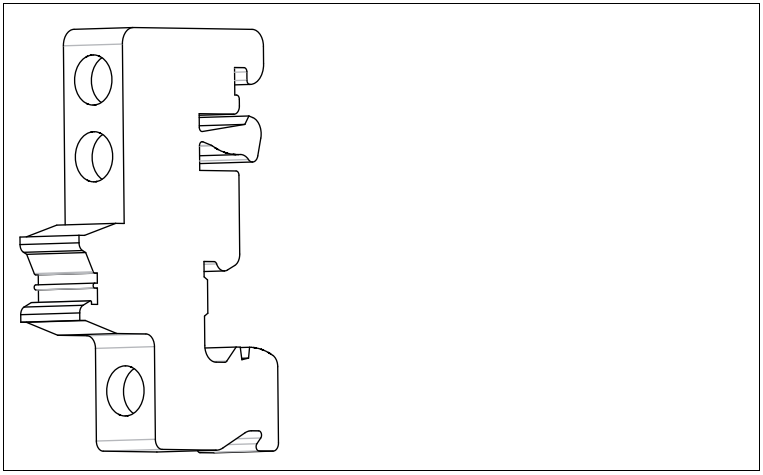
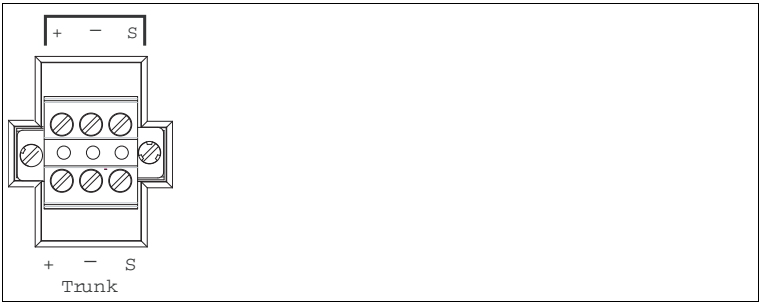


Figure 3.2: E/UK, screw-fastening end bracket, PHOENIX CONTACT part no: 1201442

For further information please refer to www.phoenixcontact.com.

3.2 Connection Layout of the Trunk



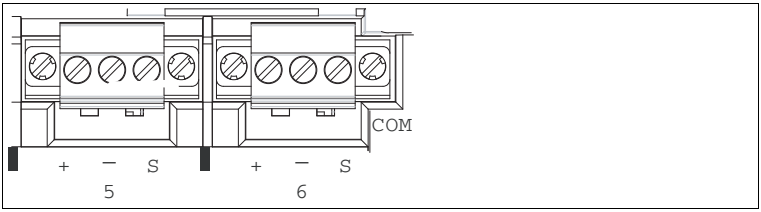
+ Segment +

- Segment -

S Shield connection

The trunk terminals must be fixed with screws to protect against loosening.

3.3 Connection Layout of the Spurs



5 Spur segment 5

+ Segment +

- Segment -

S Shield connection

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3.4 Grounding / Shielding of Fieldbus transmission lines

All shields of the Fieldbus transmission lines (trunks and spurs) are connected together inside the Segment Protector, they have no connection to ground/DIN rail.

Warning!

Wrong Wiring Practice

Connection of signal poles of the spur lines to the earth potential or the cable shield may cause major damage.

Do not connect any signal poles of spur lines to earth potential or cable shield.

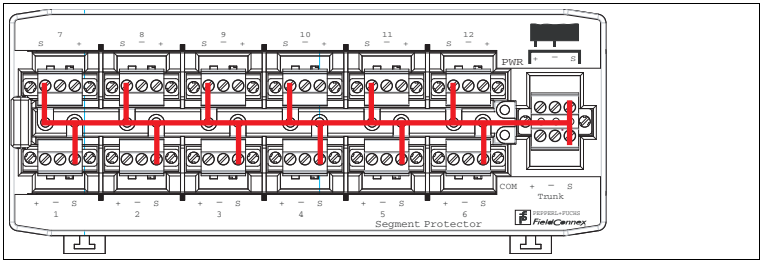

Figure 3.3: Stylized composition of the shield lines within the Segment Protector

If the shield of the trunk or of the spurs of a Fieldbus transmission line is grounded due to EMC considerations, the EN 60079-14 and the corresponding sections of the PROFIBUS PA User and Installation Guideline, or of the FOUNDATION Fieldbus Application Guides, should be closely observed.

3.5 Series Connection and Termination

To realize a series connection of several Segment Protectors loop the Trunk line through the T-connector.

For exchange or maintenance of a Segment Protector within a series connection, pull off the respective T-connector without loosening the Trunk lines, therewith supply to the remaining Segment Protectors persists.

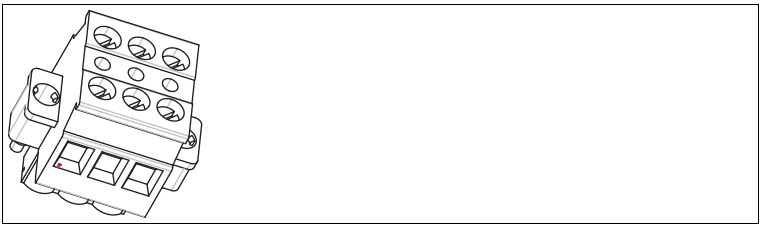

Figure 3.4: T-connector for Trunk and Terminator connection

Mount the delivered Terminator at the last T-connector of the segment to provide segment termination.

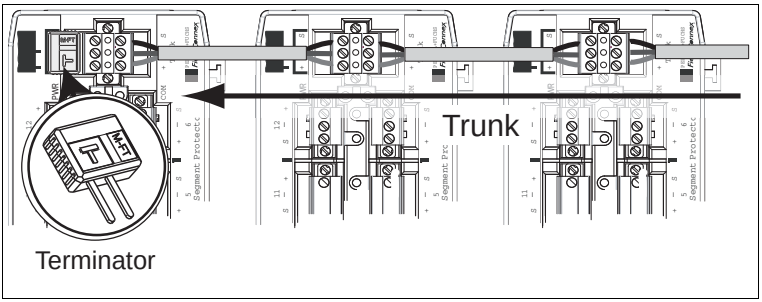

Figure 3.5: Stylized series connection and termination

Note!

As wrong termination may cause communication problems make sure that each trunk is terminated with exactly two Terminators.

4 Appendix

4.1 Ordering Information

Designation	Description
R2-SP-N4	Segment Protector with four outputs (spurs)
R2-SP-N6	Segment Protector with six outputs (spurs)
R2-SP-N8	Segment Protector with eight outputs (spurs)
R2-SP-N10	Segment Protector with ten outputs (spurs)
R2-SP-N12	Segment Protector with twelve outputs (spurs)
M-FT	Fieldbus Terminator M-FT, (packaging unit = 3 pieces) One Terminator comes with each Segment Protector R2-SP*
T-CON.3	T-Connector T-CON.3, (packaging unit = 4 pieces) One T-Connector comes with each Segment Protector R2-SP*
TP-CON.3	Fieldbus plug sockets with test points TP-CON.3, (packaging unit = 4 pieces)
ACC-R2-SW.3	Separation wall ACC-R2-SW.3, (packaging unit = 3 pieces) One separation wall comes with each Segment Protector R2-SP*

4.2 Electromagnetic Compatibility Verification in Accordance with EC Council Legislation Directive 2004/108/EC

Compatibility in accordance with EN61326-1:2006 and Namur NE21:2006 recommendation.

The electromagnetic compatibility – EMC – requirements applicable for electrical equipment for measurement, control and laboratory use in general are anchored in the European Standard EN 61326. Three different performance criteria are distinguished in this standard:

A category **A** device operates as intended during the test. This device can withstand the immunity tests without any noticeable performance degradations within the specification limits of the manufacturer.

A category **B** device operates as intended after the test. The device shows temporary degradation or loss of function of performance during the test but self-recovers from that state when the exposures are ceased.

A category **C** device has loss of function, may need manual restoration. During the test a temporary loss of function is allowed as long as an operator can restore the device back to operation.

The requirements of the association for standard and control and regulations of the German chemical industries, defined in the NE21 recommendation, are partly higher compared to the test levels and failure criteria defined in EN61326-1. For the product qualification, failure criteria and test levels have been selected, representing always the worst case conditions.

EN61000-4, as a generic standard, defines the test setups for the specific required test for EN61326-1 and NE21.

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Applied standards:

CE-Conformity 2004/108/EC
EN61000-4, July 2007
EN61326-1, October 2006
EN55011, March 2007
NE21, Mai 2006

Conducted EMC tests:

Immunity

Standard	Type	Test Level	Category
EN 61000-4-2	Electrostatic discharge, direct contact	6 kV	A
	Electrostatic discharge, indirect, air	8 kV	A
EN 61000-4-3	Electromagnetic field radiated, radio frequency	10 V/m	A
EN 61000-4-4	Fast transients burst on signal lines	1 kV	A
	Fast transients burst on power lines	2 kV	A
EN 61000-4-5	Slow transient surge on signal lines	1 kV	B
	Slow transient surge on shielded lines	2 kV	B
EN 61000-4-6	Conducted immunity, radio frequency	10 V	A
EN 55011	RF conducted emission	Class A	_
	RF radiated emission	Class A	_

4.3 Referenced Documents

Manual: "Using Pepperl+Fuchs fieldbus equipment in Zone 2 hazardous area environment"

Selection table: Conformity of FieldConnex® Power Hub power modules and motherboards to Ex ic

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