PROZESSAUTOMATION

MANUAL

SEGMENT PROTECTOR
R-SP-□12

FieldConnex™ Segment Protectors with overloaod protection and short-circuit current limitation for the connection of 12 field devices

Zone 1
Zone 2 / Div 2
FNICO

ISO9001

PEPPERL+FUCHS
FieldConnex™

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1 Explanation of symbols

Warning

This symbol indicates a warning about a possible danger. In the event the warning is ignored, the consequences may range from personal injury to death or from damage to equipment to destruction.

Attention

This symbol warns of a possible fault. Failure to observe the instructions given in this warning may result in the device and any connected facilities or systems to it develop a fault or fail completely.

Note

This symbol brings important information to your attention.

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2 Introduction

This user manual describes 2 types of Fieldbus distributors with short-circuit current limitation at each spur, so-called Segment Protectors (SP):

- **R-SP-N12**, a Segment Protector in Type of protection EEx nA[L] for use in category 3G (Zone 2).
- **R-SP-E12**, a Segment Protector in Type of protection EEx mb for use in category 2G (Zone 1).

All products are developed and manufactured compliant with applicable European standards and guidelines.

Note

A corresponding Declaration of Conformity may be requested from the manufacturer.

ISO9001

The manufacturer of the product, Pepperl+Fuchs GmbH in D-68301 Mannheim, has a certified quality assurance program in accordane with ISO 9001.

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3 Details

The following chapter concerns the R-SP-N12 and R-SP-E12 Segment Protectors and is valid only in combination with the corresponding data sheets. You can access the data sheets at www.pepperl-fuchs.com.

The operator of the system is responsible in terms of planning, mounting, commissioning, operating and maintenance.

3.1 Intended use

Fieldbus devices are often connected over spurs to the trunk of the Fieldbus system. The Segment Protector serves to connect Fieldbus devices to the trunk. Each output has a short-circuit current limitation with a square characteristic curve.

Supply current and short-circuit limitation of the Segment Protectors:

	Supply current	Short-circuit limitation
R-SP-N12	max. 40 mA per output	45 mA
R-SP-E12	max. 40 mA per output	50 mA

The R-SP-N12 and R-SP-E12 Segment Protectors can be used for all Fieldbus systems using the "Manchester Bus Powered" physics as in IEC 61158-2, e.g.: FOUNDATION Fieldbus and PROFIBUS PA.

Laws and/or regulations governing the use or intended usage goal must be observed.

The Segment Protectors are only approved for proper professional usage in accordance with the intended purposes. Improper handling will void any claim made under the warrantee and any manufacturer's liability.

Protection of operating personnel and the system is not ensured if the module is not used in accordance with its intended purpose.

The device can only be operated by trained professionals in accordance with the available instruction manual.

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3.2 Marking

The Segment Protector for installation in hazardous areas in category 3G (Zone 2) is labelled with:

R-SP-N12
Pepperl + Fuchs
D-68307 Mannheim
R-SP-N12
TÜV 04 ATEX 2465X
⟨Ex⟩ II 3 G EEx nA[L] IIC T4

The Segment Protector for installation in hazardous areas in category 2G (Zone 1) is labelled with

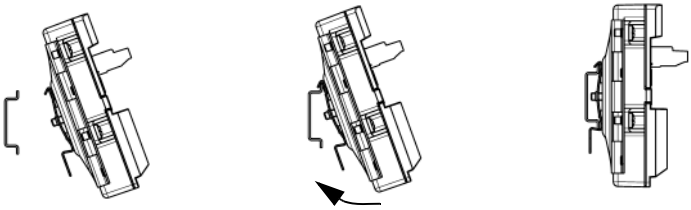
R-SP-E12
Pepperl + Fuchs
D-68307 Mannheim
R-SP-E12
PTB 04 ATEX 2100X
⟨Ex⟩ II 2 G EEx mb e II T4

3.3 Mounting and dismounting

Mounting and dismounting work is only to be performed by specially trained professionals.

Segment Protectors are to be mounted as follows on a 35 mm DIN rail compliant with EN 50022.

Step 1 Step 2 Step 3



- The DIN rail mounting of the Segment Protectors must mesh securely with the rail.
- The Segment Protector must be fixed firmly on the rail.

Dismounting of Segment Protectors is performed in the reverse order.

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Warning

The Segment Protectors must be mounted for installation in the safe area in a housing which corresponds at least to protection class IP 20 per EN 60529.

Warning

The R-SP-N12 Segment Protector must be mounted in a housing which is conform to:

- the requirements of resistence to light and resistence to impact corresponding to EN 50 014/ IEC 60079-0
- the requirements of thermal endurance corresponding to EN 50 014/ IEC 60079-15.

Warning

The R-SP-N12 Segment Protector must be mounted for installation in the hazardous area in category 3G (Zone 2) in a housing which corresponds at least to protection class 54 per EN 60529 and which is suitable for this type of installation.

Warning

The R-SP-E12 Segment Protector must be mounted for installation in the hazardous area in category 2G (Zone 1) in a certified housing which is suitable for this type of installation.
The EC-Type-Examination certificate and any included "particular conditions“ must be observed.

Warning

If metal housings are used in the hazardous area, they must be installed in such a way that even in the event of occasional service ignition sources resulting from sparks due to striking or abrading metal are avoided.

Warning

If plastic enclosures are used in the hazardous area, then they must be constructed in such a way that if used as intended, ignition dangers from electrostatic charge during maintenance and cleaning are avoided.

Warning

Segment Protectors must be protected from electrostatic charge.

Warning

The opening of the housing in which the Segment Protectors are installed, may only be done in a de-energized state.

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Recognised rules of the technology and setup requirements must be observed during mounting and dismounting. Especially for tasks on electrical systems, special safety requirements must be observed.

Special attention must be paid to the following points:

- Has the Segment Protector been installed in accordance with specifications?
- Is the Segment Protector free of damage?
- Is IP protection ensured?

3.4 Service and maintenance

The transmission properties of Segment Protectors are stable over long periods of time. For this reason, regular adjustment or service or the like is unnecessary.

Warning

Segment Protectors being operated in connection with hazardous areas may not be changed or manipulated.

Details for the service and maintenance of the housing used can be found in the corresponding user's manuals.

3.5 Fault elimination

Warning

In case of defect, the Segment Protector must be removed and replaced with a new one.

3.6 Disposal

Note

Disposal of Segment Protectors and their packaging material must be performed in compliance with the applicable laws and guidelines of the corresponding country.
The Segment Protectors contain no batteries which must be disposed of separately from the Segment Protectors.

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4 Product specifications

4.1 Functional description

The R-SP-N12 and R-SP-E12 Segment Protectors are Fieldbus distributors for Manchester-coded two-wired Fieldbusses compliant with IEC 61158-2, like FOUNDATION Fieldbus H1 or PROFIBUS PA.

The Segment Protectors are designed for the connection of up to 12 field devices (see chapter 5.4). Each output has a separate short-circuit current limitation. These increase the availability of the Fieldbus segment as a whole. If an output has a short circuit or failure, the connected Fieldbus Power Supply is only loaded with the short-circuit current of the faulty output; the Fieldbus segment remains intact otherwise.

The integrated Fieldbus terminator can be activated using an external bridge (see chapter 5.6). Two groups of LEDs grouped by function support commissioning and fault searches (see chapter 5.8). There are LEDs for the existence of supply power, the activation of the Fieldbus terminator, and for bus communications activity. Each channel also possesses a separate LED for the display of short circuits or faults on the output.

4.2 Device component overview

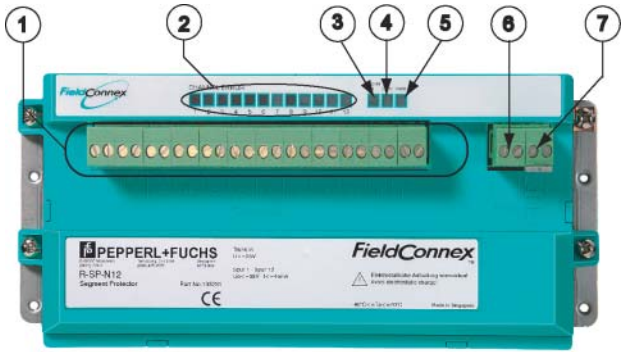

Figure 4.1: Device component overview

1	Spur terminals R-SP-N12 ==> screw terminals, removable R-SP-E12 ==> screw terminals, fixed
2	LED CHANNEL ERROR
3	LED TERM ON
4	LED COM
5	LED PWR
6	Connection to trunk
7	Fieldbus terminator

Table 4.1: Device component overview

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4.3 Technical data

Fieldbus Segment Protector R-SP-E12

Fieldbus interface:

Power loss: ..... 250 mW

Trunk:
Rated voltage:..... 9 ... 32 V DC
Rated current:..... ≤ 4.5 A

Outputs:
Rated voltage:..... ≤ 32 V DC
Rated current:..... ≤ 40 mA
Short-circuit current: ..... ≤ 50 mA
Current consumption: ..... max. 9 mA
Voltage drop main cable/outputs:.. ≤ 1.3 V DC
Terminating impedance:..... 100 Ω
Overvoltage protection:..... typ. 39 V, max. 41 V

Ambient conditions

Ambient temperature: ..... -40...70 °C (233...343 K)
Storage temperature ..... -40...85 °C (233...358 K)

Mechanical data

Connection type:..... Screw terminals, fixed
Core cross-section:..... ≤ 2.5 mm²

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Fieldbus Segment Protector R-SP-N12

Fieldbus interface:

Power loss: ..... 250 mW

Trunk:
- Rated voltage: ..... 9 ... 31 V DC
- Rated current: ..... ≤ 4.5 A

Outputs
- Rated voltage: ..... ≤ 31 V DC
- Rated current: ..... ≤ 40 mA
- Short-circuit current ..... ≤ 45 mA
- Current consumption ..... max. 9 mA
- Voltage drop main line/outputs ... ≤ 1.3 V
- Terminating impedance..... 100 Ω
- Overvoltage protection..... typ. 39 V, max. 41 V

Ambient conditions

Ambient temperature ..... -40...70 °C (233...343 K)
Storage temperature ..... -40...85 °C (233...358 K)

Mechanical data

Connection type: ..... Screw terminals, removable
Core cross-section: ..... ≤ 2.5 mm²

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4.4 Mechanical dimensions

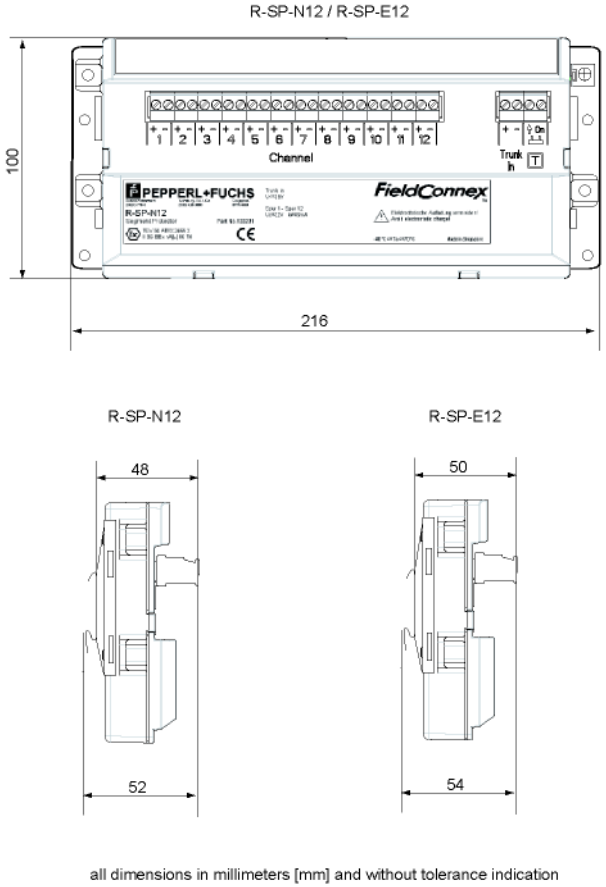

Figure 4.2: Mechanical dimensions

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5 Installation and commissioning

This chapter of the manual applies to the R-SP-N12 and R-SP-E12 Segment Protectors.

5.1 General

Segment Protectors may only be operated by trained professionals in accordance with these operating instructions.

For installation in hazardous areas, IEC 60079-14 must be observed.

Warning

If devices are operated in general electrical systems, they must not thereafter be operated in electrical systems that are connected with hazardous areas.

Warning

Circuits in type of protection "i" that where operated with circuits of other types of protection may not be used as circuits in type of protection "i" afterwards.

Warning

Circuits in type of protection "nL" that where operated with circuits of other types of protection (except circuits in type of protection "i") may not be used as circuits in type of protection "nL" afterwards.

Please take the cable parameters to be used from the installation instructions of the corresponding Fieldbus system.

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 8 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.

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5.2 R-SP-N12 Segment Protector for category 3G (Zone 2) / Class I. Div.2

The Segment Protector may be used corresponding to its labeling in hazardous areas of category 3G (Zone 2) / Class I, Div. 2.

By using R-SP-N12 Segment Protectors in combination with different Fieldbus Power Supplies, many different field topologies can be achieved. Examples for possible use and topologies are shown in the following sections.

The trunk is classified EEx nA in all topologies, and the outputs of the Segment Protectors are classified as "energy limited",EEx nL. The short-circuit current (I_o) is always 45 mA.

When using a Fieldbus Power Supply which is voltage limited certified according to EN 50021, this determines the safety-oriented maximum voltage (U_o). In all other cases, U_o is limited by the Segment Protector itself to 31 V (U_o = 31 V).

For particular questions and for further information, please contact Pepperl+Fuchs (www.pepperl-fuchs.com).

Warning

The Declaration of Conformity and any included "particular conditions“ must be observed.

Warning

The connection and disconnection of non-power-limited circuits carrying current is permitted only during installation or maintenance, or for purposes of repair.

Note

The temporary coexistence of potentionally explosive atmosphere and installation, maintenance, and repair work is considered improbable in Zone 2.

Devices may only be connected to non-power-limited circuits in category 3G (Zone 2) which are suitable for operation in this zone and for the conditions pertaining at the installation location. A manufacturer declaration or certificate from a testing authority must be available.

The connection or disconnection of field devices under voltage is only allowed if the field device is certified as EEx nL or EEx i and the electrical safety requirements are fulfilled (simplified proof of intrinsic safety).

If installation is performed in compliance with FNICO acc. to. IEC 60079-27, the maximum length of each spur is limited to 60 m. Further information in this regard can be found in the "Wiring + Installation Guide" from Pepperl+Fuchs.

The diameter of individual wires in hazardous areas may not be less than 0.2 mm. This also applies to the individual strands of stranded wires.

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5.2.1 Supply from Fieldbus Power Supply not certified according to EN 50021

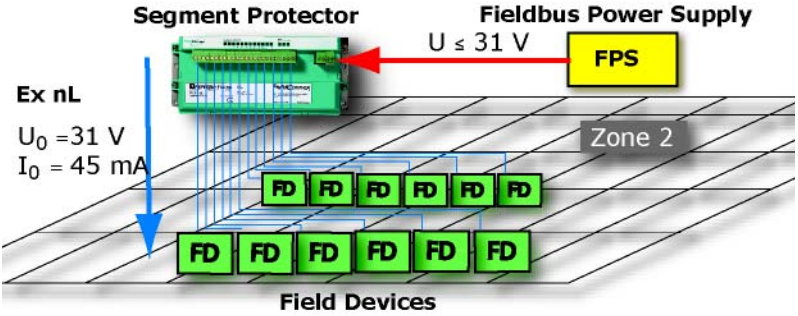

Figure 5.1: Installation in category 3G (Zone 2) / Class I, Div. 2

When supplying power to a segment using a Standard Fieldbus Power Supply not certified according to EN 50021 (see figure 5.1), the output voltage on the Segment Protector for each spur is limited to 31 V and the short-circuit current to 45 mA.

The functional output voltage is determined by the Fieldbus Power Supply. The output current available for field devices is 40 mA per spur.

The proof of connection is performed according to the Entity concept; the following safety parameters must be observed:

31 V ≤ Ui field devices

Li field devices + L cable ≤ 0.25 mH

Ci field devices + C cable ≤ 100 nF

Note

When installing with a standard Fieldbus Power Supply, the calculation of all parameters must be performed according to the Entity concept.

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5.2.2 Supply from Fieldbus Power Supply certified according to EN 50021

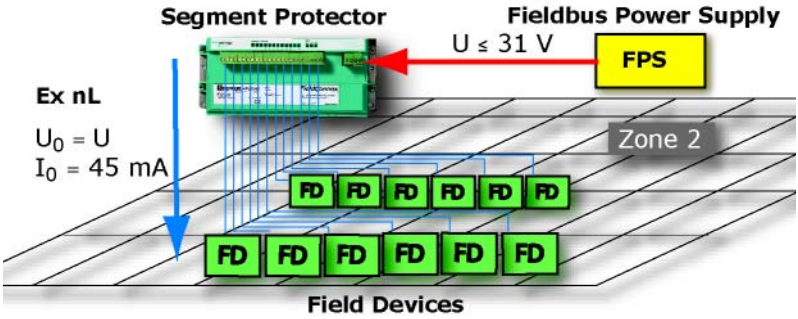

Figure 5.2: Installation with EN 50021 certified Fieldbus Power Supply

If the Segment Protector is operated with a voltage-limited Fieldbus Power Supply certified according to EN 50021 (see figure 5.2), then from a safety standpoint the maximum output voltage on the spurs is determined by the Fieldbus Power Supply. The short-circuit current on the output is limited to 45 mA.

The functional voltage available on the spurs of the Segment Protector is determined by the output voltage of the Fieldbus Power Supply.

The proof of connection is performed according to the Entity concept; the following safety parameters must be observed:

$U_0 \leq$ Ui field devices

Li field devices + L cable ≤ 0.25 mH

Ci field devices + C cable ≤ 100 nF

Note: The calculation of all parameters must be performed according to the Entity concept. The Fieldbus Power Supply must demonstrably have a EN 50021 / IEC 60079-15 compliant certified voltage limitation.

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5.2.3 Installation according to FNICO

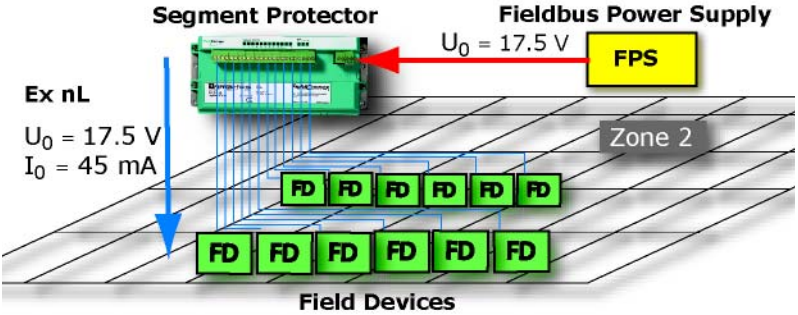

Figure 5.3: Installation according to FNICO

A special case of the installation described in chapter 5.2.2 is the FNICO "Fieldbus Non-Incendive COncept" (see figure 5.3).

FNICO provides a limitation of power supply voltage to a maximum of 17.5 Volts.

From a safety standpoint, the maximum output voltage on the spur is determined by the Fieldbus Power Supply. The functional voltage available on the spur of the Segment Protector is determined by the output voltage of the Fieldbus Power Supply. The short-circuit current on the output of the Segment Protector is limited to 45 mA.

With compliance of the boundary conditions specified by FNICO according to IEC 60079-17, the computer proof of connection is not necessary.

Note

The voltage limitation of the Fieldbus Power Supply must be certified compliant with EN 50021 / IEC 60079-15.

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5.3 R-SP-E12 Segment Protector for category 2G (Zone 1)

Warning

If the R-SP-E12 Segment Protector is mounted in a category 2G (Zone 1) environment, the following instructions must absolutely be followed.

Warning

The EC-Type-Examination certificate and any included "particular conditions“ must be observed.

If the R-SP-E12 Segment Protector is installed in a category 2G (Zone 1) environment, the housing in which the Segment Protector is mounted must be suitable for this use. The housing must have an EC-Type-Examination certificate.

Warning

When using the Segment Protector in catetory 2G (Zone 1) the installation guidelines of EN 60079-14 / IEC 60079-14 must be observed.

Warning

The manual and the notes for installation and maintenance of the housing manufacturer must absolutely be followed.

Warning

The connection and disconnection of circuits and the opening of the housing in which the Segment Protector is installed, may only be done during operation

- in a de-energized state
- or when it is ensured that **no** explosive atmosphere is present.

Warning

If, in the housing in which the Segment Protector is installed, also intrinsically safe circuits are to be operated, the terminals of the Segment Protector must be protected with an additional covering. This covering must achieve protection class IP 30 according to EN 60529.

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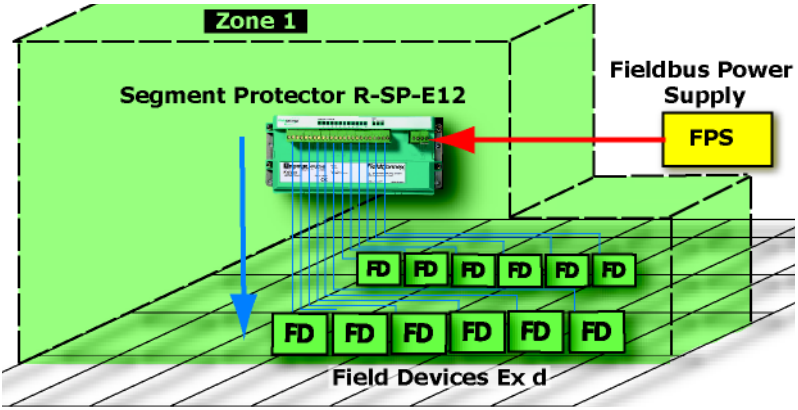

Figure 5.4: Installation in categorie 2G (Zone 1)

The maximum output voltage for each spur on the Segment Protector is limited to 32 V and the output current to 40 mA. When using a Segment Protector, the short-circuit current on the output is limited to 50 mA.

Characteristics of field devices

STOP
Warning

When installing in category 2G (Zone 1), all field devices must be certified for this use (EC-Type-Examination certificate), e.g: ignition protection class "EEx d".

Characteristics of the trunk and spurs in Zone 1

STOP
Warning

Both the trunk and all spurs to the field devices must satisfy the requirements of ignition protection class "increased safety (EEx e)".

STOP
Warning

When using the Segment Protector in catetory 2G (Zone 1) the installation guidelines of EN 60079-14 / IEC 60079-14 must be observed.

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5.4 Connection layout of spurs

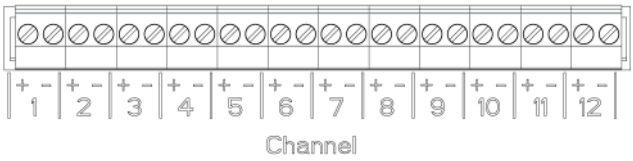


Figure 5.5:Connection layout of spurs

Terminal	Function
Channel 1+ / -	Spur 1 + / spur 1 -
Channel 2+ / -	Spur 2 + / spur 2 -
.....	
Channel 12 + / -	Spur 12 + / spur 12 -

Table 5.1: Connection layout of spurs

5.5 Connection layout of the trunk

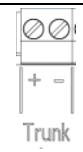
	Terminal	Function
 Figure 5.6: Trunk	Trunk + / -	Trunk + Trunk -

Table 5.2: Connection layout of the trunk

5.6 Fieldbus terminator

The R-SP-N12 and R-SP-E12 Segment Protectors have an integrated Fieldbus terminator.

The Fieldbus terminator is activated when the bridge (see figure 5.9) is screwed onto both "Fieldbus terminator" terminals (see figure 5.7).

Figure 5.7:Fieldbus terminator activated

Figure 5.8:Fieldbus terminator deactivated

Figure 5.9:Bridge

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5.7 Grounding / shielding of Fieldbus transmission lines

The shields of Fieldbus transmission lines must be connected together outside the Segment Protector using a separate ground rail (see figure 5.10).

If the shield of the trunk or the spurs of a Fieldbus transmission line is grounded due to EMC considerations, Section 12.2.2.3 of EN 60079-14 and Section 3.3.3 of the PROFIBUS PA User and Installation Guideline, or Sections 4.1 and 4.4 of the FOUNDATION Fieldbus Application Guides, should be closely observed.

Further information about grounding can be found in the "Wiring + Installation Guide" or in the "FOUNDATION Fieldbus Pre-Engineering Document" from Pepperl+Fuchs.

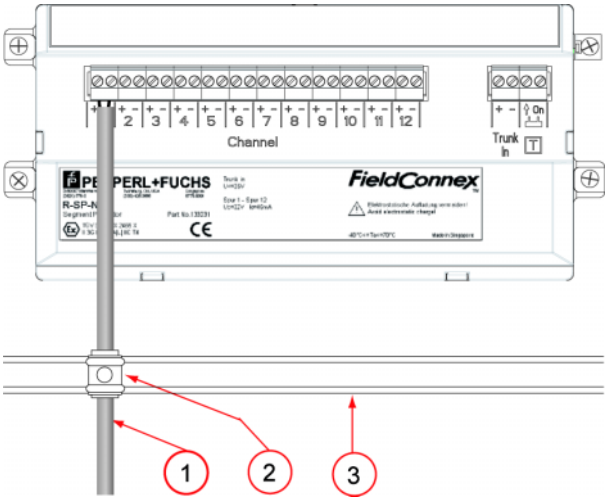

Figure 5.10: Grounding / shielding of Fieldbus transmission lines

1 Spur
2 Shielding connection terminal
3 Grouding rail

Table 5.3: Grounding / shielding components

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5.8 Status and error messages

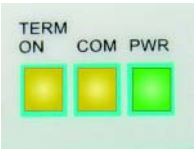

Figure 5.11:LED ON, COM, PWR

Figure 5.12:LED CHANNEL ERRORS

LED	Meaning
CHANNEL ERROR	red, blinking ==> short-circuit
TERM ON	yellow ==> Fieldbus terminator activated
COM	yellow, blinking ==> bus activity
PWR	green ==> Fieldbus power present

Table 5.4: Meaning of LEDs

Note

There is a separate LED CHANNEL ERROR for each channel. In case of an error, only the LED of the channel affected blinks.

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6 List of referenced dokuments

6.1 Norms

- [IEC 61158-2] Digital data communication for measurement and control –Field-bus for use in industrial control systems –IEC 61158 Ed.3 2002,
- [IEC 60079-0] Electrical apparatus for explosive gas atmospheres –IEC 60079-0 Ed.4 2004-1
- [IEC 60079-14] Electrical installations in hazardous areas; third edition 2002-10
- [IEC 60079-15] Type of protection "n"; second edition 2001-02; German version EN 60079-15:2003 [DIN EN 50021]
- [IEC 60079-17] Inspection and maintenance of electrical installations in hazardous areas; second edition 1996-12
- [IEC 60079-27] Fieldbus intrinsically safe concept (FISCO); first edition 2002-11
- [IEC 60529] Degrees of protection provided by enclosures (IP Code):1989 + A1:1999; German version EN 60529:1991 + A1:2000

6.2 Guidelines

- FOUNDATION Fieldbus Application Guide, AG-163 Revision 2.0
- PROFIBUS PA User and Installation Guideline; Version 2.2, February 2003
- Wiring and Installation Guide for FOUNDATION Fieldbus; Pepperl+Fuchs December 2003
- Pre-engineering document for Fieldconnex; Pepperl+Fuchs

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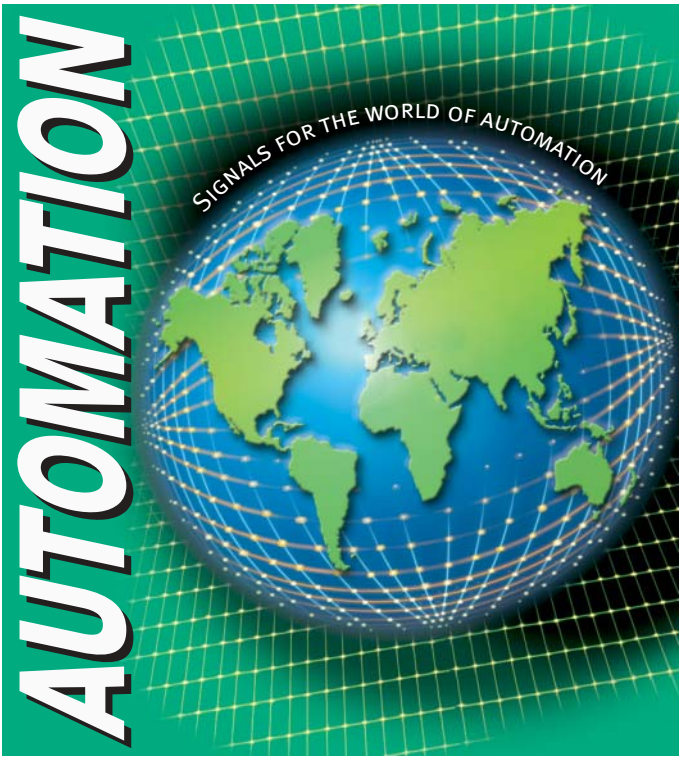

www.pepperl-fuchs.com

Worldwide Headquarters
Pepperl+Fuchs GmbH · Königsberger Allee 87
68307 Mannheim · Germany
Tel. +49 621 776-0 · Fax +49 621 776-1000
e-mail: info@de.pepperl-fuchs.com

Asia Pacific Headquarters
Pepperl+Fuchs Pte Ltd. · P+F Building
18 Ayer Rajah Crescent · Singapore 139942
Tel. +65 67799091 · Fax +65 68731637
e-mail: sales@sg.pepperl-fuchs.com

USA Headquarters
Pepperl+Fuchs Inc. · 1600 Enterprise Parkway
Twinsburg, Ohio 44087 · Cleveland-USA
Tel. +1 330 4253555 · Fax +1 330 4 25 93 85
e-mail: sales@us.pepperl-fuchs.com

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