

# Manual

## IS1 - Remote I/O System

> Earthing and shielding



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## 2 General Information

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### 2.1 Manufacturer

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We reserve the right to make technical changes without notice.

## 2.2 Symbols used

	Action request: Describes actions to be carried out by the user.
	Reaction sign: Describes the results or the reactions to the actions taken.
	Bullet
	This symbol marks important additional information, tips and recommendations.
	This symbol marks notes whose non-observance will endanger your health or the functioning of the device or component.

## 3 General Safety Instructions

### 3.1 Safety instructions for the engineering personnel

The most important safety instructions are summarised in this section. They supplement the corresponding regulations which the personnel in charge must study.

When engineering in areas subject to explosion hazards, the safety of personnel and plant depends on complying with all relevant safety regulations. The engineering personnel has a particular responsibility.

Precise knowledge of the applicable standards and regulations is required for engineering.

- x the national safety, accident prevention, assembly and installation regulations (e.g. IEC/EN 60079-14)
- x generally recognised technical regulations
- x safety instructions and information in this document

### 3.2 Applicable standards

- x DIN EN 60079-14 and VDE 0165-1 (IEC 60079-14):  
Explosive atmospheres - Part 14: Electrical installations design, selection and erection  
This standard contains the minimum data for equipotential bonding and earthing.
- x DIN VDE 0100-410 (IEC 60364-4-41, revision):  
Low-voltage electrical installations - Part 4-41: Protection for safety -  
Protection against electric shock
- x DIN VDE 0100-433 (IEC 60364-4-44 + A1, revision):  
Low-voltage electrical installations - Part 4-44: Protection for safety - Protection  
against voltage disturbances and electromagnetic disturbances - Section 443:  
Protection against overvoltages of atmospheric origin or due to switching
- x DIN VDE 0100-444 (IEC 60364-4-444:1996, revision):  
Electrical installations of buildings - Part 4: Protection for safety - Chapter 44:  
Protection against overvoltages, Main section 444: Protection against electromagnetic  
interferences (EMI) in installations of buildings
- x DIN VDE 0100-540 (IEC 60364-5-54, revision):  
Low-voltage electrical installations - Part 5-54: Selection and erection  
of electrical equipment - Earthing arrangements, protective conductors and protective  
bonding conductors



### Earthing bar (1)

The earthing bar must

- X be mounted into the enclosure as close as possible to the supply cable entry,
- X be mounted to the mounting plate such that conductance is achieved and
- X be connected directly to the earth stud.

Connect the following components to the earthing bar:

- X Enclosure
- X Mounting plate
- X PE conductor of the power supply
- X Shield bus
- X Earth stud

### Shield bus (2)

 The shield bus is not required if EMC cable entries are used.

The shield bus must

- X be mounted into the enclosure as close as possible to the field and field bus cable entry,
- X be mounted to the mounting plate such that conductance is achieved and
- X be connected directly to the earthing bar.

Connect the following components to the shield bus:

- X Fieldbus and field cable shields
- X Earth terminal of the DIN rail

### Earthing of the system (3)

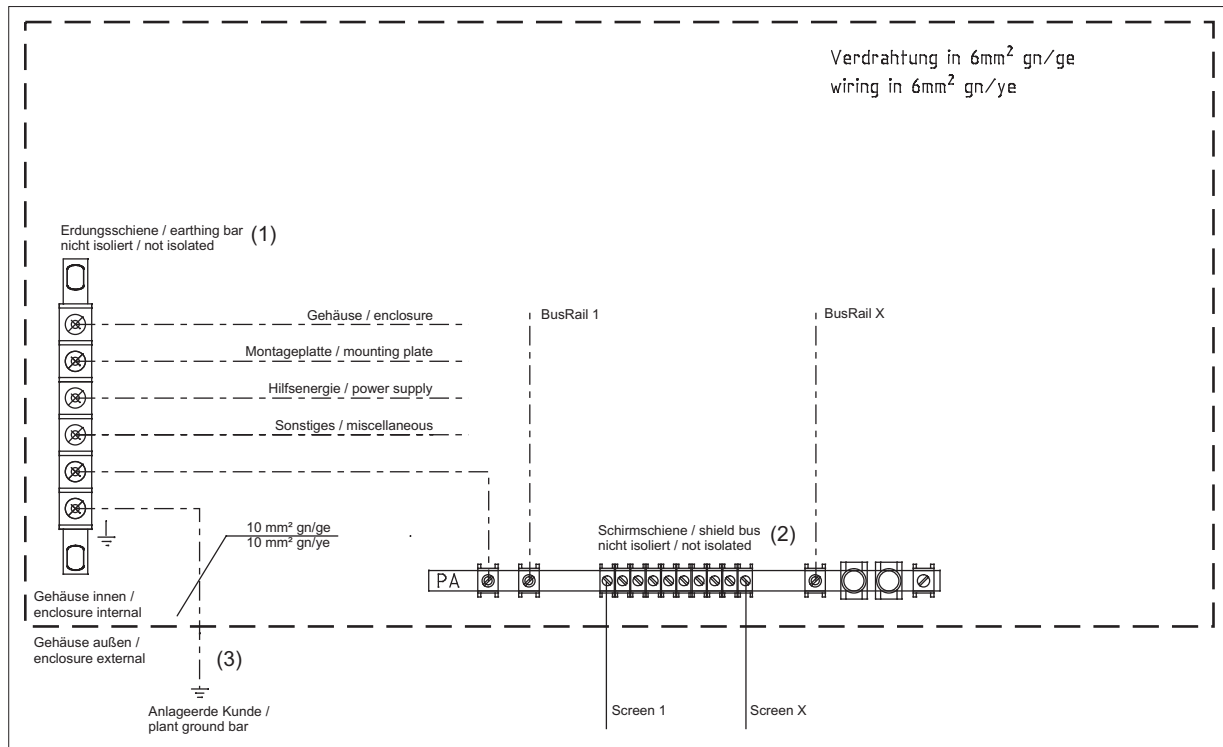
In case of a metal enclosures, the field station is connected to the equipotential bonding of the hazardous area (earthing of the system) by means of an earth stud.

The equipotential bonding conductor must be connected to the earth stud such that a conductance is achieved and it must be secured against loosening.

### Enclosure covers or doors (4)

The enclosure covers or doors must be connected to the enclosure such that a conductance over a large area is achieved.

## 5.2 Installation in the plastic enclosure - Overview



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### Earthing bar (1)

The earthing bar must

- X be mounted into the enclosure as close as possible to the supply cable entry,
- X be mounted to the mounting plate such that conductance is achieved and
- X be connected directly to the earth stud.

Connect the following components to the earthing bar:

- X Enclosure
- X Mounting plate
- X PE conductor of the power supply
- X Shield bus
- X Earth stud

### Shield bus (2)



The shield bus is not required if EMC cable entries are used.

In case of plastic enclosures, the EMC cable entries must be connected to the earthing bar by means of a brass plate.

The shield bus must

- X be mounted into the enclosure as close as possible to the field and field bus cable entry,
- X be mounted to the mounting plate such that conductance is achieved and
- X be connected directly to the earthing bar.

Connect the following components to the shield bus:

- ✗ Fieldbus and field cable shields
- ✗ Earth terminal of the DIN rail

### Earthing of the system (3)

In case of a plastic enclosure, the field station is connected to the equipotential bonding of the hazardous area (earthing of the system) by means of an earthing bar.

The equipotential bonding conductor is conducted through a cable entry into the enclosure and connected directly to the earthing bar.

### 5.3 Arranging the equipment with power supply connection

- ▶ The equipment with power supply connection must be mounted into the enclosure as close as possible to the power supply entry in order to have a very short power supply cable inside the enclosure.

### 5.4 Arranging the external products

- ▶ It is recommended to install external products with potential interference emission (e.g. power supply unit, solenoid valves or frequency converters) in a separate housing.
- ▶ Contact your R. STAHL contact person before installing external products into an IS1 field enclosure.

## 6 Internal earth connection

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- ▶ Connect the following components directly to the earthing bar:
  - ✗ Enclosure
  - ✗ Mounting plate
  - ✗ PE conductor of the power supply
  - ✗ Shield bus
  - ✗ Earth stud



The DIN rails of the BusRails must be connected to the shield bus by means of terminals.

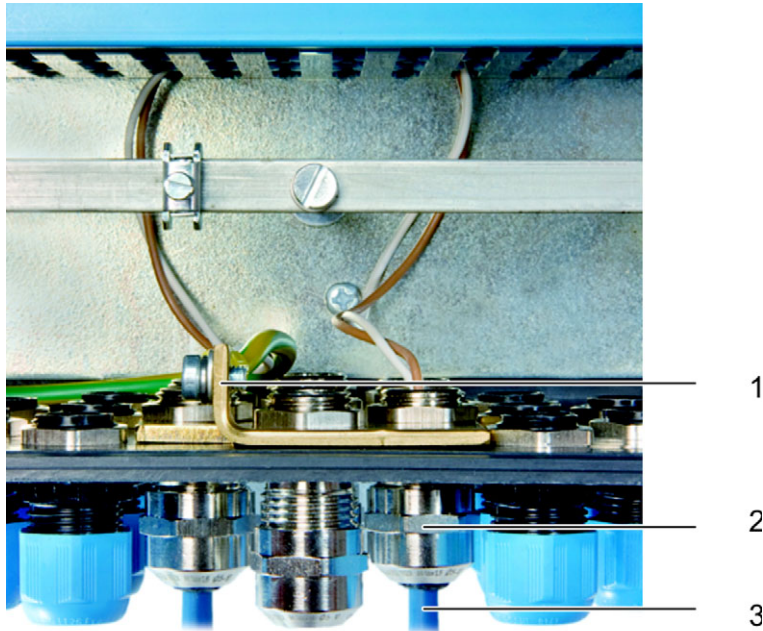
All IS1 modules are connected to the earthing bar thanks to the connection between the shield bus and the earthing bar.

## 7 Connecting the field and fieldbus cables to the shield

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### 7.1 Recommended shield

- ☞ With regard to EMC, the use of EMC cable entries is recommended because this ensures that the EMC interferences are eliminated outside the enclosure.



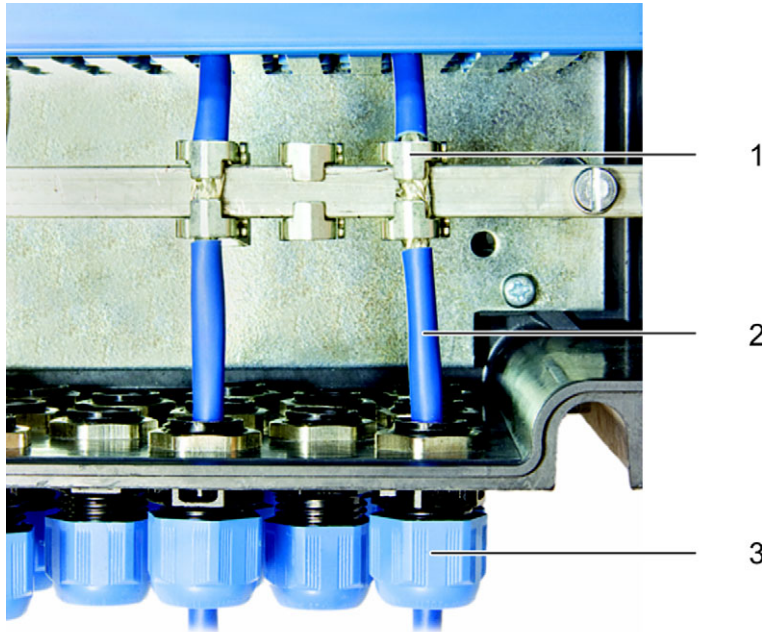
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- ▶ Position the fieldbus cable shield (3) onto the EMC cable entry (2) according to the mounting instructions.
- ▶ Connect the EMC cable entry to the earthing bar by means of the brass plate (1) in case of plastic enclosures and by means of the enclosure in case of metal enclosures.

## 7.2 Alternative shield

☞ If no EMC cable glands are used, it is recommended to apply the shields to the shield bus.

The shield of the field cable is applied safely and over a large area by using spring-loaded shield clamps.

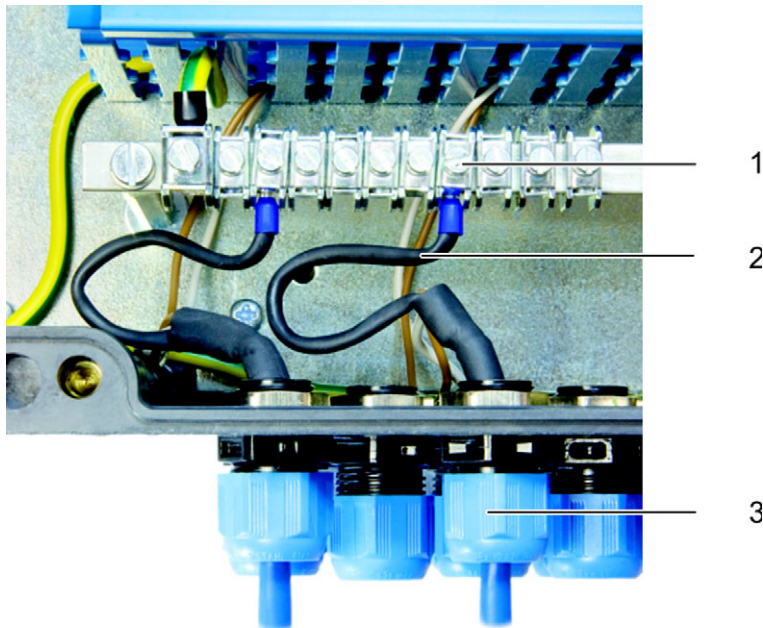


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- ▶ Strip the fieldbus cable shield (2) as described in the mounting instructions of the shield clamp (1) and apply it to the shield bus.
- ▶ Close the cable entry (3) in order to prevent the field cable from loosening.

### 7.3 Alternative shield - not recommended

- ☞ It is allowed to twist the shield in order to get so-called pigtails but it is not recommended because thus the interferences enter the enclosure and are not eliminated over a large area/in a high quality. The pigtails work as antennas. The pigtails must be as short as possible (max. 2 to 3 cm) and protected by shrink tubings in order to prevent the interferences from entering the enclosure. An end covering sleeve must be applied to the end of the pigtail in order to achieve a safe contact between the pigtail and the shield clamp.

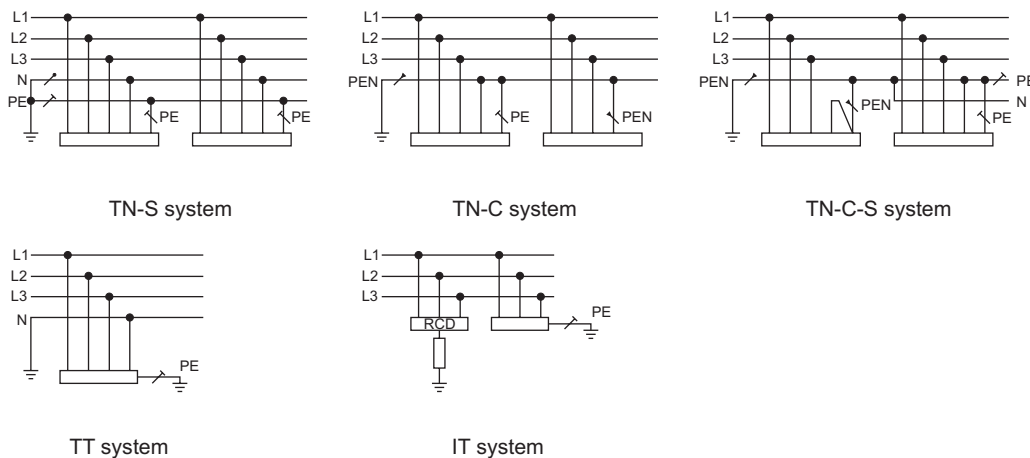


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- ▶ Strip and twist the field cable shield.
- ▶ Use a shrink tubing to protect the pigtail (2) and apply an end covering sleeve.
- ▶ Connect the pigtail to the shield clamp (1).
- ▶ Close the cable entry (3) in order to prevent the field cable from loosening.

## 8 Present equipotential bonding

### 8.1 System type



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In hazardous areas it is not allowed to use a TN-C system as earthing system!



In order to achieve an optimum electromagnetic compatibility, the system on the supply side must be a TN-S system.

TT and IT systems are allowed although they are not as good as TN-S system in terms of EMC protection.

### 8.2 Earthing system requirements of the hazardous area

- ✗ The earthing system should be a permanent earthing grid inside the system.
- ✗ The fail-safety of the earthing system must be guaranteed by selecting suitable conducting materials (e.g. galvanised strip steel, permanently embedded in concrete, copper or stainless steel V4A).
- ✗ The connecting points of the earthing system must form an equipotential surface inside the system.
- ✗ All system components (e.g. containers, pipes, machines and electrical equipment) must be connected to the earthing system.
- ✗ The electrical equipment must be connected to the main equipotential bonding of the low voltage supply according to the system type.

### 8.3 Connecting the field station to the equipotential bonding of the system



The field station must be connected to the equipotential bonding as close as possible since long line sections are inductive and prevent the efficient elimination of EMC interferences.

For this reason, the central connection of the earth lead to a central earthing point is inefficient in case of high-frequency interferences or inductive coupling.

#### Connection requirements

- X The earth lead must have a minimum diameter of 4 mm<sup>2</sup> in order to comply with the explosion protection requirements.
- X The earth lead must have a minimum diameter of 10 mm<sup>2</sup> or better 16 mm<sup>2</sup> in order to safely eliminate EMC interferences.
- X The earth lead must be as short as possible.
- X It must be connected from the outside to a metal enclosure.
- X In case of plastic enclosures, the earth lead must be connected to the earthing bar as close as possible to the enclosure entry.
- X The connection between field station and earth lead must be protected against loosening.

## 9 Laying the field, field bus and power cables in the field

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Observe the relevant standards and directives when laying the field, field bus and power cables.



For detailed information about the installation of field bus cable, see "Project planing, installation and commissioning of the RS 485 field bus system of R. STAHL for the safe and hazardous area" and "Project planing, installation and commissioning of a fibre optic cable system of R. STAHL for the safe and hazardous area".

### 9.1 General laying requirements

- X Earthing of the conductive shield of an intrinsically safe field bus  
The field bus recommended by R. STAHL is earthed according to EN 60079-14:2003, 12.2.2.3, section b). This basically concerns the possibility of earthing the field bus shield in different points if there is a high-quality equipotential bonding between the hazardous and non-hazardous areas.
- X Cabling  
The field bus cables must not be laid directly next to energy cables (especially energy converters). In hazardous areas the field bus cable must be laid according to the current installation instructions (e.g. EN 60079-14).
- X R. STAHL recommends the use of fibre optic cables. In addition to the suitability for higher cable lengths, the advantages of fibre optic cables are in particular the higher interference resistance with respect to copper conductors and the independence from the present earthing system quality.