

MANUAL

# FIELD BUS POWER HUB INVENSYS

Advanced high performance  
power supplies and  
conditioner



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 dismantling of any devices may only be carried out by trained, qualified personnel. The instruction manual must be read and understood.

## 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](http://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

### Motherboards

FBTA-228-BPFB-\*

Pepperl+Fuchs GmbH

Fieldbus Power Hub

TÜV 05 ATEX 2890 X



II 3 G EEx nA II T4

### Power Supply Modules

HD2-FBPS-\*.500

Pepperl+Fuchs GmbH

Fieldbus Power Hub

TÜV 04 ATEX 2500 X



II 3 G Ex nA II T4

HD2-FBPS-1.25.360

Pepperl+Fuchs GmbH

Fieldbus Power Hub

HD2-FBPS-1.25.360

TÜV 06 ATEX 553229 X



II 3 G Ex nA II T4

## 1.7 Intended use

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.

Protection of the operating personnel and the overall system is not ensured if the product is not being used according to its intended purpose.

### Fieldbus Power Hub INVENSYS

The Fieldbus Power Hub product range is intended to power fieldbus segments either in simplex or redundant mode according to IEC 61158-2.

The solution is intended for use with FOXBORO I/A Series FBM 228 host. The motherboards provide a base for mounting redundant or dual FBM 228 FOUNDATION Fieldbus modules.

The FBM modules have to fulfil the requirements for category 3 apparatus and have to be suitable for the conditions at the place of operation (Declaration of the Manufacturer or Certificate of a Testing Department).

## 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.

### 1.8.1 Mounting instructions for motherboards

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

### 1.8.2 Mounting instructions for HD2\* modules

The modules are intended for mounting on an appropriate Fieldbus Power Hub motherboard.

### Instruction for redundant systems

Each segment on a redundant motherboard must only be fitted with two power modules of the same type.

### 1.8.3 Zone 2

If devices have already been operated in general electrical systems, they may subsequently no longer be installed in electrical systems used in combination with hazardous areas.

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

### 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.

## 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.

## 2 Specification

### 2.1 Overview

The FieldConnex Power Hub is a high performance power supply for FOUNDATION Fieldbus. It consists of a motherboard with sockets for plug-in modules and one or two power modules (redundant configuration) per segment. The Power Hub is designed for use with fieldbus systems in accordance with IEC 61158-2. This standard specifies how power and communication are transmitted sharing one shielded twisted-pair cable. Communication between field devices and host system is established by modulating the data signal onto the power stream utilizing Manchester Bus Powered (MBP) transmission.

All active electronic components are located in the plug-in modules. Each module holds the electronic components for only one segment and two modules build a redundant configuration. If required, only the smallest amount of electronic components needs to be exchanged. Modules can be exchanged while the system is energized without the use of tools, thus ensuring very high system availability.

The Power Hub feeds fieldbus segments following the High-Power Trunk concept for explosion protection. High energy level on the trunk line is fed to the field instrument via couplers as FieldBarriers or Segment Protectors.

Using Segment Protectors allows you to do live maintenance at the field device in Zone 2 as outputs are classified Ex nL. Using FieldBarriers allows to do live maintenance in Zone 1 as outputs are classified Ex ia. Thus, limitations for explosion protection are overcome enabling maximum cable lengths and highest number of devices in any explosive area.

### 2.2 System Components

#### 2.2.1 Motherboards

Motherboards are available in redundant or single configuration, for a different number of fieldbus segments. Motherboards are typically mounted on DIN rails inside a wiring or marshalling cabinet. Wiring connectors exist on board for two independent bulk power supplies, fieldbus segments, fault and diagnostics signalling.

All motherboards contain the unique, patented CREST technology thereby creating high impedance for common mode noise and network resonance effects.

#### **FBTA-228-BPFB-R-4R**

The motherboard is designed for use with INVENSYS FBM 228 FOUNDATION Fieldbus modules and allows the redundant supply of four fieldbus segments. Eight sockets will hold the power supply modules, two each are in redundancy per segment.

#### **FBTA-228-BPFB-8**

The motherboard is designed for use with INVENSYS FBM 228 FOUNDATION Fieldbus modules and allows the supply of eight fieldbus segments. Eight sockets will hold the power supply modules.

## 2.2.2

### Modules

Power Modules are connected to the motherboards via sockets. Replacement under live conditions (hot-swap) and load sharing capability in redundant configuration enable uninterrupted communication. The modules are available in different explosion protection configurations and with various isolation levels.

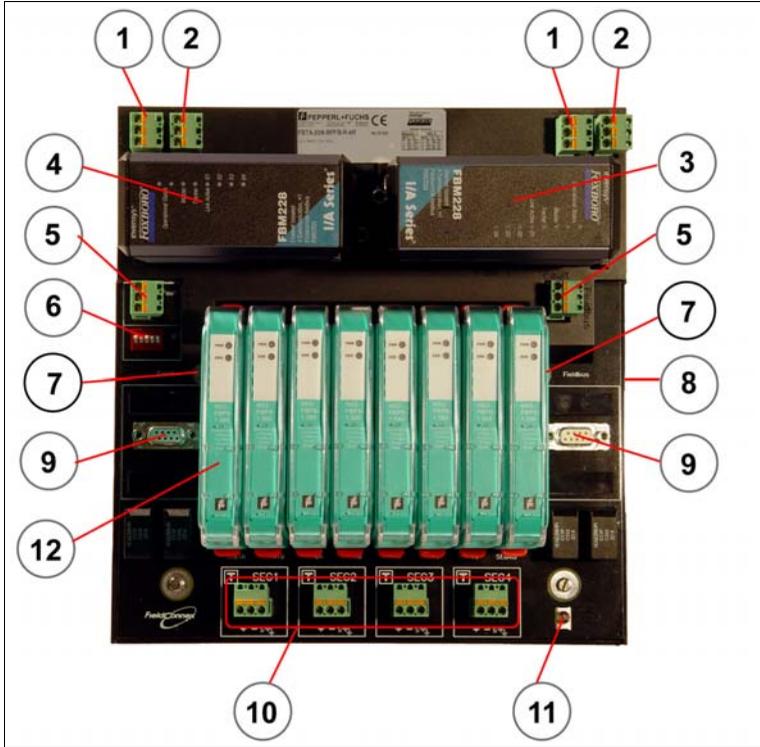
- **Power Supply Modules**

Modules providing full galvanic isolation between bulk power supply and fieldbus segments are called "Power Supply Modules". They provide optimal system reliability for applications where cabling and wiring are routed through critical or harsh electrical environments, i.e. where superior protection from electromagnetic interference (EMI) is mandatory. Different Power Supply Modules exist with voltage regulated and limited energy levels according to the specifications of FNICO, Entity and FISCO standards. A maximum output current of 500 mA is available to power field devices.

- **Power Conditioner Modules**

Modules with current limiting circuits between bulk power supply and fieldbus segment and without galvanic isolation are called "Power Conditioner Modules". Power Conditioner Modules carry passive components only and can be used if good wiring practice is followed and reduced safety requirements exist, such as protection type n or increased safety. Power Conditioner Modules utilize CREST technology creating high impedance for common mode noise reduction and network resonance suppression.

## 2.3 Component Identity FBTA-228-BPFB\*



- 1 Primary power connection
- 2 Secondary power connection
- 3 FBM 1
- 4 FBM 2
- 5 Fault output
- 6 Screen/ground connection clamp
- 7 ID DIP switch array
- 8 DIN rail slot
- 9 Ethernet trunk Fieldbus connection
- 10 Segment trunk connections
- 11 Shield/ground connection clamp
- 12 Power Module

## 2.4

## Technical Data

### System Specification

#### Ambient conditions

Ambient temperature	-40 ... 60 °C
Storage temperature	-40 ... 85 °C
Shock resistance	15 g , 11 ms
Vibration resistance	1 g , 10 ... 150 Hz
Relative humidity	< 95 % non-condensing

#### Mechanical specifications

Connection type	screw terminals
Core cross-section	2.5 mm <sup>2</sup>
Protection degree	IP20

#### Standard conformity

Electromagnetic compatibility	NE 21:2006
Protection degree	IEC 60529
Fieldbus standard	IEC 61158-2
Shock resistance	EN 60068-2-27
Vibration resistance	EN 60068-2-6

### Motherboard Types MFBTA-BPFB-R\*

#### Supply

Rated voltage	21.6 ... 25.2 V
Rated current	16 A
Terminating resistor	fixed build in

### Isolated Power Supply Module Type HD2-FBPS-1.25.360

#### Supply

Rated voltage	19.2 ... 35 V DC
Power loss	typ. 2 W

#### Fieldbus interface

Rated voltage	25 ... 28 V
Rated current	360 ... 10 mA
Short-circuit current	typ. 400 mA

#### Indicators/operating means

LED ERR	red flashing: short-circuit or undervoltage at output
LED PWR	Power LED: green, if $U_{out} > 25 V$

Isolated Power Supply Module Type HD2-FBPS-1.500

**Supply**

Rated voltage	19.2 ... 35 V DC
Power loss	typ. 1.8 W

**Fieldbus interface**

Rated voltage	28 ... 30 V
Rated current	500 ... 10 mA
Short-circuit current	550 mA

**Indicators/operating means**

LED ERR	red flashing: short-circuit or undervoltage at output
LED PWR	green if $U_{out} > 28$ V

Isolated Power Supply Module Type HD2-FBPS-1.23.500

**Supply**

Rated voltage	19.2 ... 35 V DC
Power loss	typ. 1.5 W

**Fieldbus interface**

Rated voltage	21 ... 23 V
Rated current	500 ... 10 mA
Short-circuit current	550 mA

**Indicators/operating means**

LED ERR	red flashing: short-circuit or undervoltage at output
LED PWR	green if $U_{out} > 21$ V

Isolated Power Supply Module Type HD2-FBPS-1.17.500

**Supply**

Rated voltage	19.2 ... 35 V DC
Power loss	typ. 1.3 W

**Fieldbus interface**

Rated voltage	15 ... 17 V
Rated current	500 ... 10 mA
Short-circuit current	550 mA

**Indicators/operating means**

LED ERR	red flashing: short-circuit or undervoltage at output
LED PWR	green if $U_{out} > 15$ V

**Power Conditioner Non-Isolated Type HD2-FBCL-1.500**

**Supply**

Rated voltage 19.2 ... 35 V DC

Power loss typ. 1.3 W

**Fieldbus interface**

Rated voltage supply voltage minus max. 2.5 V at full load

Rated current 500 ... 10 mA

Short-circuit current 600 mA

Host-rated current 0 ... 40 mA

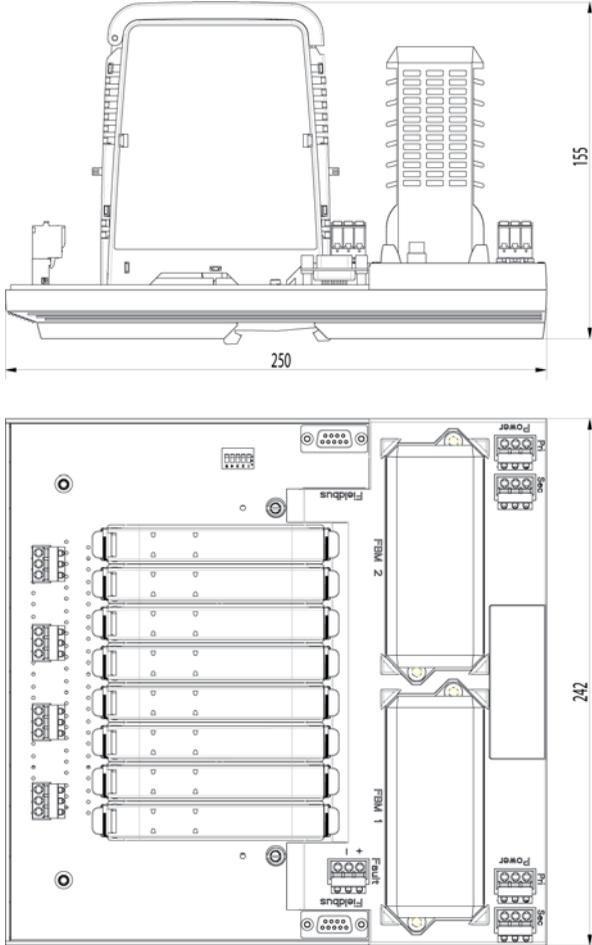
Host short-circuit current 0 ... 55 mA

**Indicators/operating means**

LED ERR red flashing: short-circuit or undervoltage at output

LED PWR green if  $U_{out} > 16$  V

## 2.5 Dimensional Drawings



### 3 Installation and Commissioning

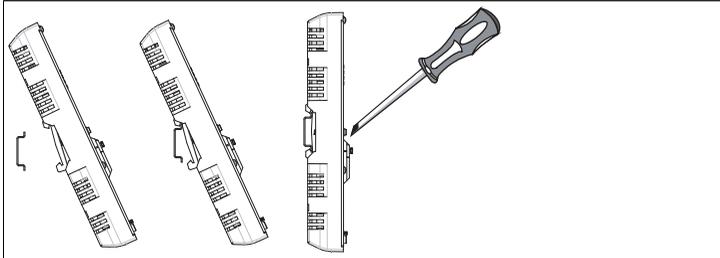
#### 3.1 Mounting and Dismounting



##### Mounting of Fieldbus Motherboards on DIN mounting rail

To mount a motherboard on a DIN mounting rail, proceed as follows:

1. Place the motherboard on the mounting rail.
2. Tighten the two fastening screws to attach the motherboard on the DIN rail.



↳ The motherboard has been mounted.



##### Mounting of Modules on the motherboard



##### **Caution!**

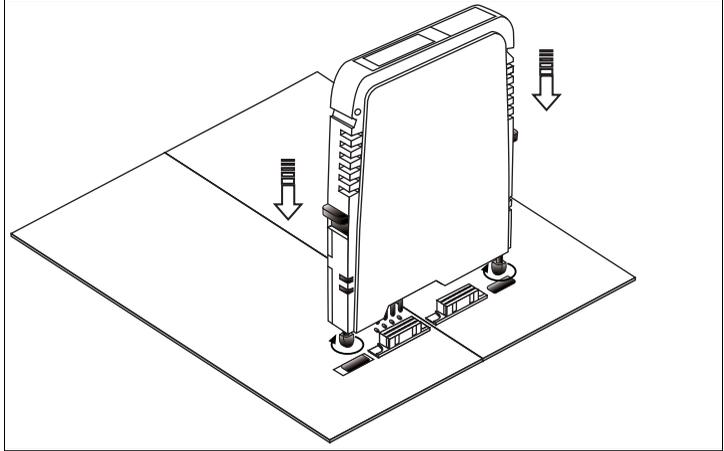
##### Hardware Damage

There is a special connection slot for the diagnostic modules HD2-DM\* on the Power Hub motherboard, which is labeled "Diagnostic Module only".

Do not try to plug other modules into this connection slot. Other modules may be damaged.

To install a new module on the motherboard, proceed as follows:

1. Carefully center the polarisation holes and mate the two connectors, then gently press down the module.
2. Push down the red Quick Lok Bars on each side of the module to fix it to the panel (no tools required).



↳ The new module has been installed.



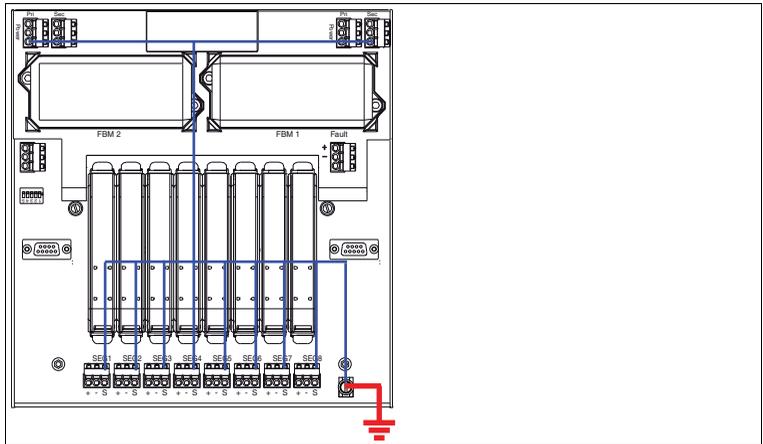
### Dismounting of Modules from the Motherboard

To dismount a module from the motherboard, proceed as follows:

Pull up the red Quick Lok Bars on each side of the module and lift off the entire module carefully.

↳ The module has been removed from the motherboard.

## 3.2 Shield and Ground Connection



### Prevent Grounding Loops

You can leave the shield earthing at the host connecton open, depending on the selected grounding method. If the grounding points of the host and the field devices do not have the same potential, the shield of the motherboard must be left open to prevent a grounding loop.



#### Caution!

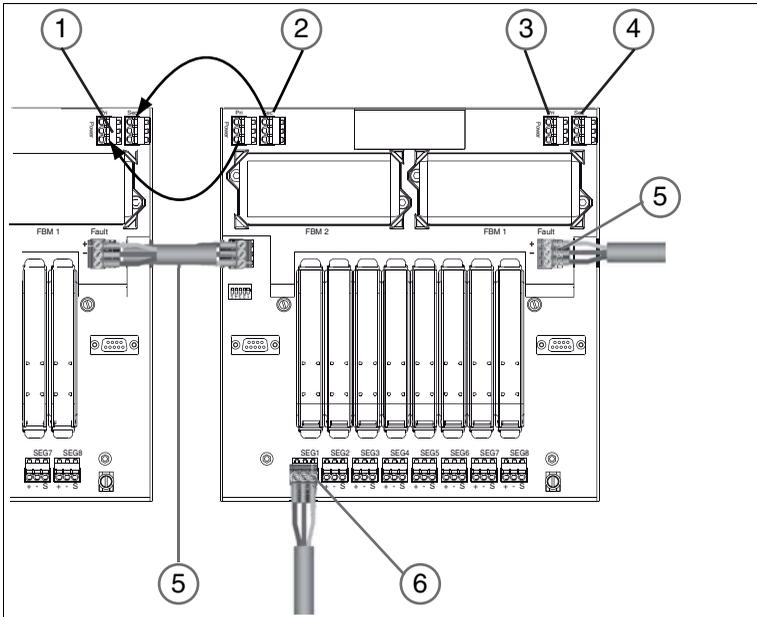
This is not a safety earth.

Under certain conditions, it may be necessary to ground any exposed metal parts to ground.

Note that a correct grounding must be guaranteed at all times.

### 3.3

### Connections



- 1 Primary bulk power series connection
- 2 Secondary bulk power series connection
- 3 Primary bulk power connection
- 4 Secondary bulk power connection
- 5 Fault output series connection
- 6 Fieldbus trunk connection



**Warning!**

**Motherboard Damage**

For series connection of motherboards the current must not exceed a maximum of 16 A.

### 3.4 Segment Termination

Motherboards got integrated terminators for each fieldbus segment.



**Caution!**

**Communication Problems**

Wrong termination may cause communication problems or a total communication loss.

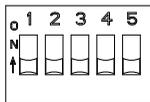
- Make sure that there are two terminators activated on each trunk line.
- One terminator should be located on each end of the trunk line.

### 3.5 Addressing and ID Switch Settings

The addressing of the Fieldbus Power Hub motherboards and the FBM is based on the principle of FOXBORO's baseplates. For further information, please refer to the corresponding INVENSYS/FOXBORO User Guide: "I/A Series – DIN Rail Mounted FBM Subsystem (B0400FA)".

For connecting to the Ethernet bus or for traversing relatively large distances, the Fieldbus Power Hub motherboards must be divided into a maximum of four groups, each with a maximum of eight stations. This corresponds to four non-modular baseplates from FOXBORO, each with eight modules of type FBM.

Each motherboard has an ID DIP switch array with five switches. You can adjust the number of the group with the first two switches.

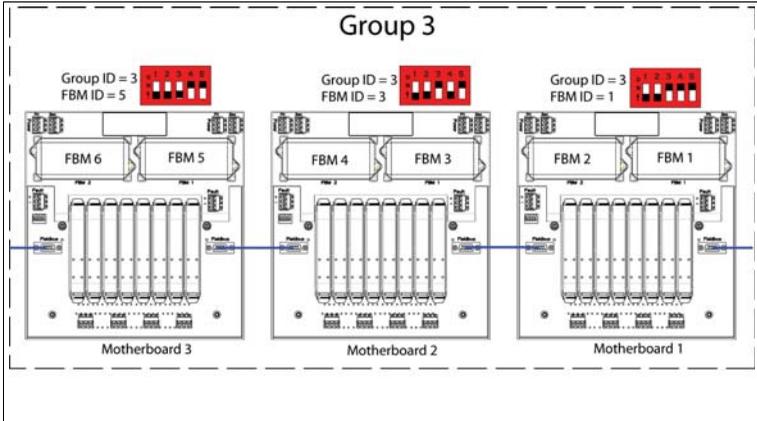


The switches 3 to 5 control the addressing of the motherboard within the group. The motherboards can be numbered according to their physical placement in the enclosure, or according to their position in the cable connection schema.

Each ID number must be used once only. The Fieldbus segments must be subdivided into groups of no more than eight stations each.

### 3.5.1 Addressing of Motherboards

The addresses 1, 3, 5 and 7 of the motherboard is assigned to the first FBM module, the second FBM automatically contains the next address.



#### Motherboard ID settings

Group ID	Switch 1	Switch 2
0	ON	ON
1	ON	OFF
2	OFF	ON
3	OFF	OFF

#### FBM ID settings

FBM ID	Switch 3	Switch 4	Switch 5
1	ON	ON	ON
3	ON	OFF	ON
5	OFF	ON	ON
7	OFF	OFF	ON

## 4 Fieldbus Power Hub Basic Diagnostics

The Fieldbus Power Hub System provides integrated self-supervision functionality located within the Power Modules and the Motherboards. The following conditions are monitored:

- Availability of the bulk power supply
- Output voltage per segment
- Overload or short circuit per segment
- Power Module failure

The status of the Power Hub is indicated via LEDs and a voltage-free contact. Under normal operating conditions the LEDs are green and the voltage-free contact is closed. See the table below for detailed diagnostic information.

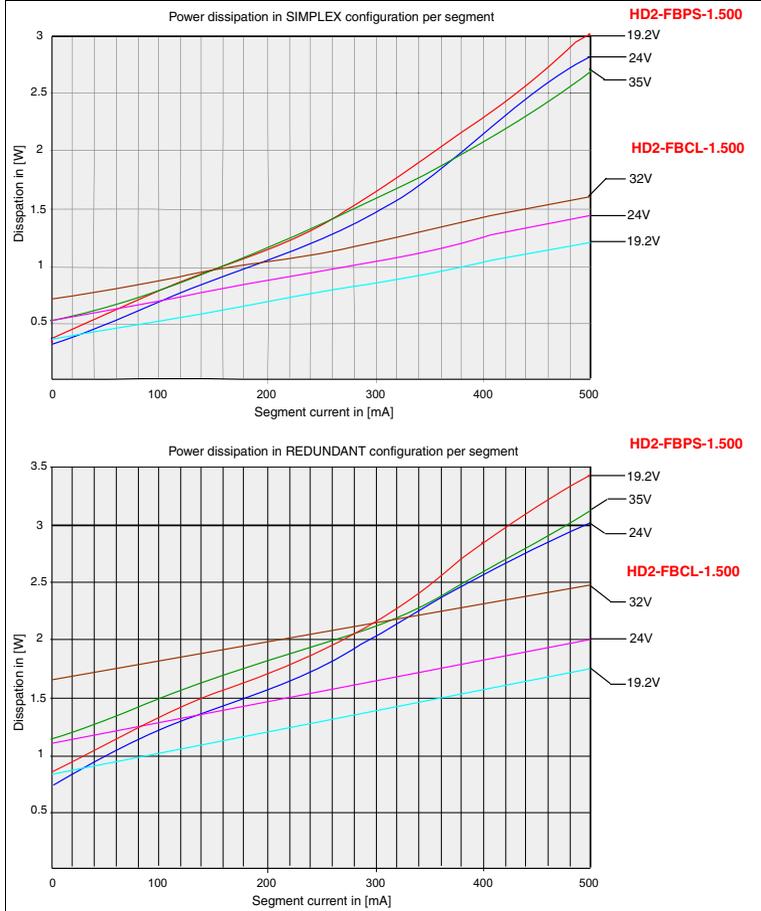
Fault	Relay Contact	Power Module
<b>A: Supply Under/Over Voltage Detection</b>		
> 18.5 V DC +/- 4 % < 35.8 V DC +/- 4 %		● PWR ○ ERR
< 17.5 V DC +/- 4 % > 36.8 V DC +/- 4 %*		○ PWR ● ERR
<b>B: Power Module compatibility</b> redundant system only		
All modules have intact redundancy partner		● PWR ○ ERR
Only one Power Module is fitted to a segment		● PWR ○ ERR
<b>C: Power Module or load status</b>		
Power Module failure		○ PWR ● ERR

Fault	Relay Contact	Power Module
Output overload or trunk short circuit		<p>○ PWR                  ● ERR</p>
All Power Modules fixed and healthy		<p>● PWR                  ○ ERR</p>

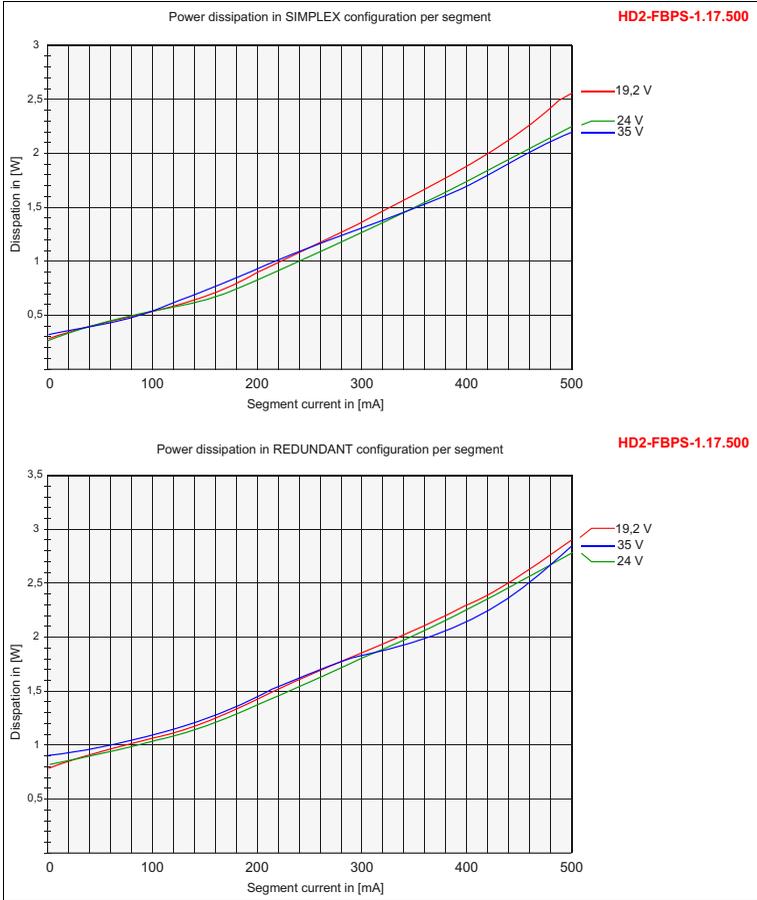
## 5 Thermal Dissipation

Each Fieldbus Power Supply will dissipate, i. e. lose energy in form of heat. The graphs below illustrate typical power dissipation values in Watts for one segment including motherboard power losses, for given output currents and supply voltages.

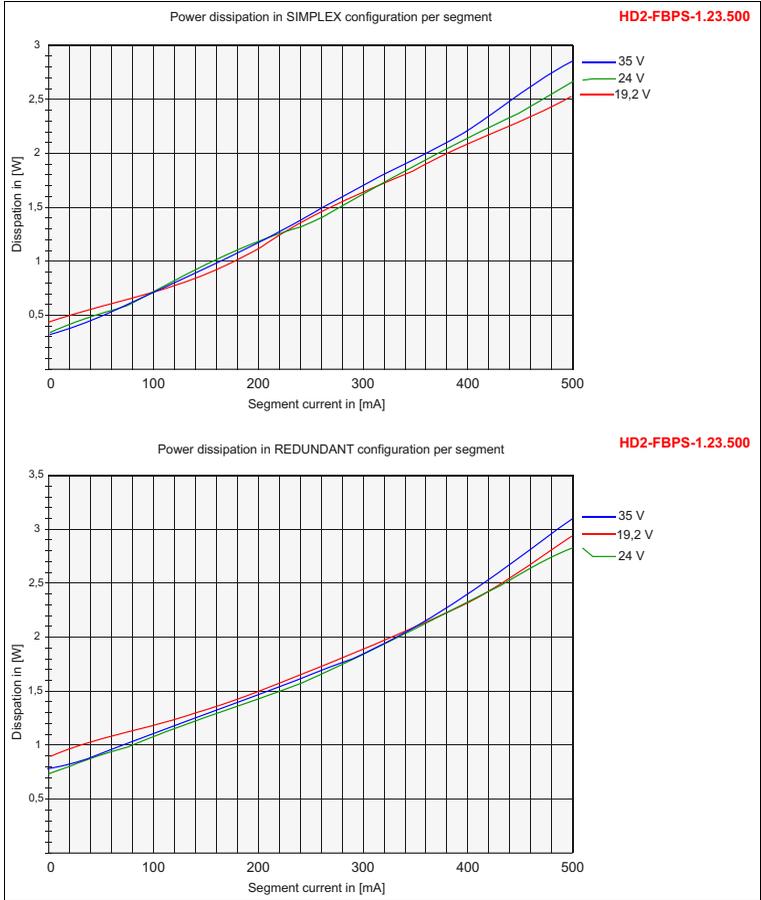
### Thermal Dissipation of HD2-FBPS-1.500 and HD2-FBCL-1.500



### Thermal Dissipation of HD2-FBPS-1.17.500



### Thermal Dissipation of HD2-FBPS-1.23.500



## 6 Appendix

### 6.1 Ordering Information

#### Power Hub System Ordering Summary

HD2-FBPS-1.25.360	Isolated Fieldbus Power Supply Module with 25 ... 28 V DC and 360 mA output.
HD2-FBPS-1.500	Isolated Fieldbus Power Supply Module with 28 ... 30 V DC and 500 mA output.
HD2-FBPS-1.23.500	Isolated Fieldbus Power Supply Module with 21 ... 23 V DC and 500 mA output.
HD2-FBPS-1.17.500	Isolated FNICO Power Supply Module with 15 ... 17 V DC and 500 mA output.
HD2-FBCL-1.500	Fieldbus Power Conditioner (non-isolated) Module with load share and host fault isolation (short circuit protection) 500 mA.
FBTA-228-BPFB-8	Motherboard for eight fieldbus segments and two FOXBORO FGM 228 modules in simplex, dual configuration. Redundant bulk power feed.
FBTA-228-BPFB-R-4R	Motherboard for four fieldbus segments and two FOXBORO FGM 228 modules redundant configuration. Redundant bulk power feed.

### 6.2 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.

**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	–

**6.3 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

# PROCESS AUTOMATION – PROTECTING YOUR PROCESS



## Worldwide Headquarters

Pepperl+Fuchs GmbH  
68307 Mannheim · Germany  
Tel. +49 621 776-0  
E-mail: [info@de.pepperl-fuchs.com](mailto:info@de.pepperl-fuchs.com)

For the Pepperl+Fuchs representative  
closest to you check [www.pepperl-fuchs.com/pfcontact](http://www.pepperl-fuchs.com/pfcontact)

[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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