

MANUAL

# FIELD BUS GENERIC POWER HUB HIGH DENSITY





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 the event the warning is ignored, the consequences may range from personal injury to death.



#### ***Warning!***

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

In the event the warning is ignored, the consequences may course personal injury or heaviest property damage.



#### ***Caution!***

This symbol warns of a possible fault.

Failure to observe the instructions given in this warning may result in the devices and any connected facilities or systems develop a fault 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 operator of the system is responsible in terms of planning, mounting, commissioning, operating and maintenance.

Assembly, commissioning, operation, maintenance and dismantling of any devices may only be carried out by trained, qualified personnel who have read and understood the instruction manual.

### 1.4 Pertinent Laws, Standards, Directives, and further Documentation

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

The corresponding data sheets, the declaration of conformity, the EC-type-examination certificate and applicable certificates (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, dry environment. Note the permitted storage temperature (see data sheet).

### 1.6 Marking

#### Motherboards

MBHD-FB1-4R

Pepperl+Fuchs GmbH

Fieldbus Power Hub

TÜV 06 ATEX 553229 X



II 3 G Ex nA II T4

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

TÜV 06 ATEX 553229 X



II 3 G Ex nA II T4

### Diagnostic Modules

## HD2-DM-A

Pepperl+Fuchs GmbH

Fieldbus Power Hub

TÜV 04 ATEX 2500 X



II 3 G Ex nA II T4

## HD2-DM-B

Pepperl+Fuchs GmbH

Fieldbus Power Hub

TÜV 04 ATEX 2500 X



II 3 G Ex nA C IIC T4

## 1.7

### Intended Use

The Fieldbus Power Hub HD product range is intended to power up to four FOUNDATION Fieldbus H1 segments in redundant mode according to IEC 61158-2.

The Fieldbus Power Hub HD product range may be installed in Zone 2 or Class I Division 2 hazardous areas. Types of protection are Ex nA (non-arcing) 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.

Dedicated power supply modules limit the output voltage safely acc. to IEC 60079-11. In combination with Pepperl+Fuchs Segment Protectors the outputs are specified Ex nI or Ex ic (except HD2-FBPS-1.23.500 modules with part number 180995). Thus live maintenance at the field device level is permitted.

For further information about hazardous area installation refer to referenced documents see chapter 6.2.

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 (noncondensing) 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, serverity level G3.

### 1.8.1 Mounting instructions for HD2\* modules

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

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.

#### Instruction for redundant systems

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

### 1.8.2 Zone 2 and Div. 2

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

It is necessary to pay particular attention to the type of Fieldbus Power Supply selected for use on the Power Hub. 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.

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 ignition protection class "Ex ic" which have been operated with circuits of other ignition protection classes may not be used as "Ex ic" circuits afterwards.

When connecting intrinsically safe field devices to intrinsically safe circuits on the associated apparatus, observe the relevant maximum values of the field devices and associated apparatus specified in the explosion protection documentation (certificate of intrinsic safety). Make sure to observe IEC/EN 60079-14 and IEC/EN 60079-25.



Using the Fieldbus Power Hub in conjunction with Pepperl+Fuchs' Segment Protectors to generate Ex ic rated outputs, connector covers (ACC-MB-CC) have to be plugged on the bulk power supply connectors. This is to guarantee the clearance distance of 50 mm between host terminal and power supply connectors.

The devices should be installed at least in an environment according pollution degree 2.

No more than 30 mm of the single leads of the trunk and diagnostic bus cables may stick out of the cable jacket. Respectively the single leads of the trunk and diagnostic bus cable have to be band together with a tie-wrap or a shrink hose after 30 mm see chapter 3.

### 1.8.4 Ex nL

Current circuits with ignition protection class " Ex nL " (limited energy) that are operated with current circuits with different ignition protection classes (except intrinsic safety ignition protection class "Ex i") may subsequently no longer be operated as current circuits with ignition protection class "Ex nL".

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

### 1.10 Repair and Maintenance

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

### 1.11 Disposal

Devices, packaging material, and possibly contained batteries must be disposed of in compliance with the applicable laws and guidelines of the corresponding country.

## 2 Specification

### 2.1 Overview

The FieldConnex® High-density Power Hub is a high-performance power supply for FOUNDATION Fieldbus with redundant configuration as standard for four segments. It consists of a motherboard with sockets for plug-in modules: Two power supply modules per segment and a diagnostic module. 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 a host system is established by modulating the data signal onto the power stream utilizing Manchester Bus Powered (MBP) transmission.

All FieldConnex® Power Hubs feature superior design elements. The main design points are redundancy, passive impedance generation, well balanced circuitry and low heat dissipation.

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. When an exchange becomes necessary only the smallest amount of electronic components is exchanged compared to block configurations for power supplies. Modules can be exchanged while the system is energized without the use of tools, thus ensuring very high system availability.

Impedance generation prevents the data signal from being short circuited by the power supply's low internal resistance. This impedance generation is designed with passive components such as inductances and resistors with very long durability.

A fully balanced circuit and segment design is important for undisturbed fieldbus operation. An external disturbance through EMI impacts both leads of the shielded twisted-pair cable symmetrically. The data signal is thus undisturbed. Low heat dissipation allows highest packing density inside the cabinet and a very long service life.

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 level in Zone 2 as outputs are either classified for Ex nL, Ex ic, Entity, FNICO or FISCO ic. 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.

A plug-in Advanced Diagnostic Module for fieldbus is available. This module monitors the physical layer online and in real time enabling detection of degradation and faults during operation. Measurement data and alarms are transmitted to the control room thus bringing visibility to the fieldbus physical layer, which can now be treated as active component in Plant Asset Management systems. Operators are enabled to decide on proactive measures to avoid unwanted situations and while the plant is running smoothly.

The following table summarizes the main features and benefits of the Power Hub:

| Features                                                                                   | User benefit                                                                                                                                                          |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low heat dissipation of less than 2 W per segment under full load condition.               | Long service life. Very high packing density and reduced cooling requirements.                                                                                        |
| Exchange of modules while the system is energized and load share between power modules.    | Increased segment availability                                                                                                                                        |
| Full balance of electric circuitry with high isolation against RF and in-band interference | High resistance to external disturbance such as EMI.                                                                                                                  |
| High-integrity passive power conditioners                                                  | Long service life.                                                                                                                                                    |
| Local and remote alarm annunciation                                                        | Easy maintenance and troubleshooting                                                                                                                                  |
| Tolerance against inrush currents during segment start                                     | Long-term, robust operation with tolerance towards field device misbehavior                                                                                           |
| Full current span operation from 10...500 mA                                               | Flexible segment design and tolerance against live working on field devices                                                                                           |
| Advanced Diagnostic Module for physical layer fieldbus diagnostics                         | Improved and known quality of fieldbus installation. Live supervision for preventive and pro-active maintenance. Professional Tools for easy fieldbus troubleshooting |

## 2.2 System components

### 2.2.1 Motherboard

#### MBHD-FB1-4R

The motherboard MBHD-FB1-4R allows the redundant supply of four fieldbus segments and the connection of the FOUNDATION Fieldbus H1 Host system. The eight sockets will hold the power supply modules, two each supply one of the four segments redundantly. The extra socket will hold a diagnostic module.



#### Note!

If the motherboard is intended to be used with dedicated Power Supply Modules and Segment Protectors to generate Ex ic rated outputs, connector cover have to be mounted on each power supply terminal. Two connector cover and special connectors comes with each motherboard.



**2.2.2 Power Supply Modules HD2-FBPS-\***

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.

Power Modules are connected to the motherboards via sockets. They can be exchanged while the system is in operation. In redundant configuration load is shared between two power modules.

For different application requirements special Power Supply Modules are available:

| Designation       | Application     |
|-------------------|-----------------|
| HD2-FBPS-1.500    | general purpose |
| HD2-FBPS-1.23.500 | Ex ic, Ex nL    |
| HD2-FBPS-1.17.500 | FISCO ic, FNICO |
| HD2-FBPS-1.25.360 | general purpose |

**2.2.3 Diagnostic Modules**

**Basic Diagnostic Module**

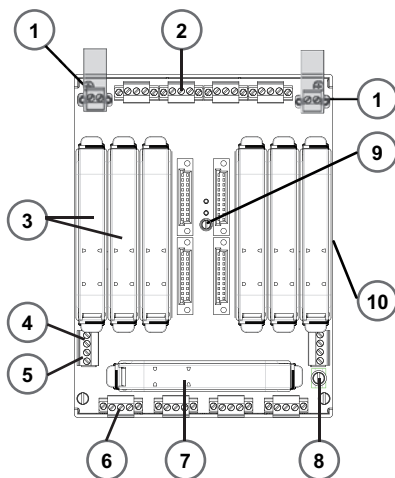
The Basic Diagnostic Module provides basic system diagnostics. It monitors the input voltage of the bulk power supply and each segment for overload and short-circuit conditions. Each Power Supply Module is checked for proper function. Power Modules operating in redundant configuration are checked for compatibility. Status and faults are indicated by LEDs and can be transmitted via dry contact.

**Advanced Diagnostic Module**

The Advanced Diagnostic Module is a comprehensive measurement tool for the fieldbus physical layer. It is well suited for commissioning, online monitoring and maintenance. The module provides the exact segment and individual device data needed for detection of changes in the fieldbus physical layer. Segment measurements include fieldbus voltage and load current; device specific measurements are: signal level, noise and jitter. All data is transmitted to the control room via Ethernet. The Diagnostic Manager – Basic Edition shows all data on easy to use displays.

The Diagnostic Manager - Professional Edition offers additional functionality: the Commissioning Wizard generates automated reports; the software displays clear-text messages for troubleshooting of out-of spec behavior. The OPC server transmits user-selectable summary alarms to the DCS.

## 2.3 Component Identity



- 1 Bulk power connections with mounted connector cover for Ex ic installations
- 2 Host connection (segment 1)
- 3 Power modules (segment 1)
- 4 Common alarm voltage-free contact
- 5 Diagnostic bus connection
- 6 Trunk connection (segment 1)
- 7 Diagnostic module
- 8 Screen/ground connection clamp
- 9 Motherboard fastening screw
- 10 DIN rail slot

## 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 |
|-----------------|-----------------|

### System Specification

|                               |                     |
|-------------------------------|---------------------|
| Core cross-section            | 2.5 mm <sup>2</sup> |
| Protection degree             | IP20                |
| <b>Standard conformity</b>    |                     |
| 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 MBHD-FB1-4R

#### Supply

|                      |                        |
|----------------------|------------------------|
| Rated voltage        | 19.2 ... 35 V          |
| Rated current        | 16 A                   |
| Power loss           | typ. 0.2 W per segment |
| Terminating resistor | 100 Ω integrated       |

### 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 <sub>out</sub> > 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 |
|---------------|-------------|

## Isolated Power Supply Module Type HD2-FBPS-1.23.500

|                                   |                                                       |
|-----------------------------------|-------------------------------------------------------|
| Rated current                     | 500 ... 10 mA                                         |
| Short-circuit current             | 550 mA                                                |
| <b>Indicators/operating means</b> |                                                       |
| LED ERR                           | red flashing: short-circuit or undervoltage at output |
| LED PWR                           | green if $U_{out} > 21\text{ V}$                      |

## Isolated Power Supply Module Type HD2-FBPS-1.17.500

|                                   |                                                       |
|-----------------------------------|-------------------------------------------------------|
| <b>Supply</b>                     |                                                       |
| Rated voltage                     | 19.2 ... 35 V DC                                      |
| Power loss                        | typ. 1.3 W                                            |
| <b>Fieldbus interface</b>         |                                                       |
| Rated voltage                     | 15 ... 17 V                                           |
| Rated current                     | 500 ... 10 mA                                         |
| Short-circuit current             | 550 mA                                                |
| <b>Indicators/operating means</b> |                                                       |
| LED ERR                           | red flashing: short-circuit or undervoltage at output |
| LED PWR                           | green if $U_{out} > 15\text{ V}$                      |

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

|                                   |                                                       |
|-----------------------------------|-------------------------------------------------------|
| <b>Supply</b>                     |                                                       |
| Rated voltage                     | 19.2 ... 35 V DC                                      |
| Power loss                        | typ. 2 W                                              |
| <b>Fieldbus interface</b>         |                                                       |
| Rated voltage                     | 25 ... 28 V                                           |
| Rated current                     | 360 ... 10 mA                                         |
| Short-circuit current             | typ. 400 mA                                           |
| <b>Indicators/operating means</b> |                                                       |
| LED ERR                           | red flashing: short-circuit or undervoltage at output |
| LED PWR                           | Power LED: green, if $U_{out} > 25\text{ V}$          |

## Basic Diagnostic Module Type HD2-DM-B

### Supply

|               |               |               |
|---------------|---------------|---------------|
| Rated voltage | Rated current | 19.2 ... 35 V |
| Rated current |               | 20 mA         |
| Power loss    |               | Max. 0.5 W    |

### Indicators/operating means

|              |                                                                                        |
|--------------|----------------------------------------------------------------------------------------|
| LED PRI PWR  | green: on, primary bulk power supply connected                                         |
| LED SEC PWR  | green: on, secondary bulk power supply connected                                       |
| LED ERR      | red: 2 Hz flashing, power supply fault (short-circuit, undervoltage), redundancy fault |
| Fault signal | VFC alarm 1 A, 50 V DC, normally closed                                                |

## Advanced Diagnostic Module Type HD2-DM-A

### Supply

|               |               |
|---------------|---------------|
| Rated voltage | 19.2 ... 35 V |
| Rated current | 110 ... 30 mA |
| Power loss    | max. 2 W      |

### Fieldbus interface

|                    |            |
|--------------------|------------|
| Number of segments | 4          |
| Rated voltage      | 9 ... 32 V |

### Indicators/operating means

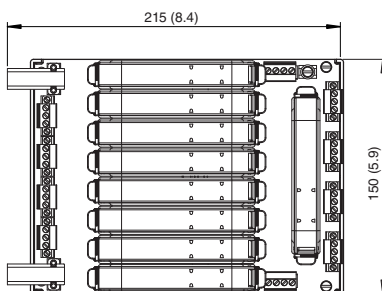
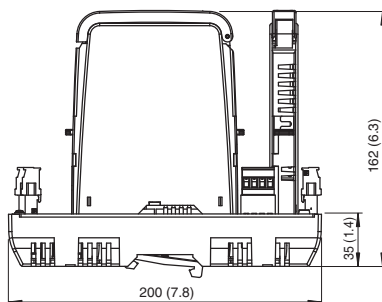
|               |                                                                     |
|---------------|---------------------------------------------------------------------|
| LED PRI PWR   | green: on, primary bulk power supply connected                      |
| LED SEC PWR   | green: on, secondary bulk power supply connected                    |
| LED Seg 1...4 | yellow: bus activity; red 2 Hz flashing: alarm; red: hardware error |
| Fault signal  | VFC alarm 1 A, 50 V DC, normally closed                             |
| DIP-switch    | diagnostic address 1...247, binary coded                            |

## Accessories

|            |                                                                                                                           |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| ACC-MB-HDC | Diagnostic link cable<br>Coupling of diagnostic bus between two motherboards, length 6 cm                                 |
| ACC-MB-CC  | Connector cover<br>Set of two covers with special connectors to keep clearance distance between power and host terminals. |



## 2.5 Dimensional Drawings



All dimensions in millimeters and inches (values in brackets) and without tolerance indication.

### 3 Installation and Commissioning

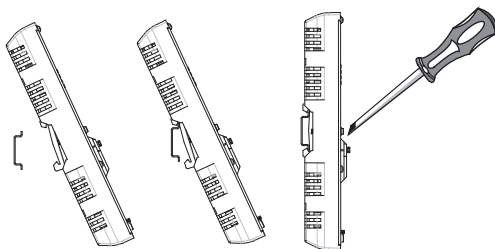
#### 3.1 Mounting and Dismounting



##### 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!**

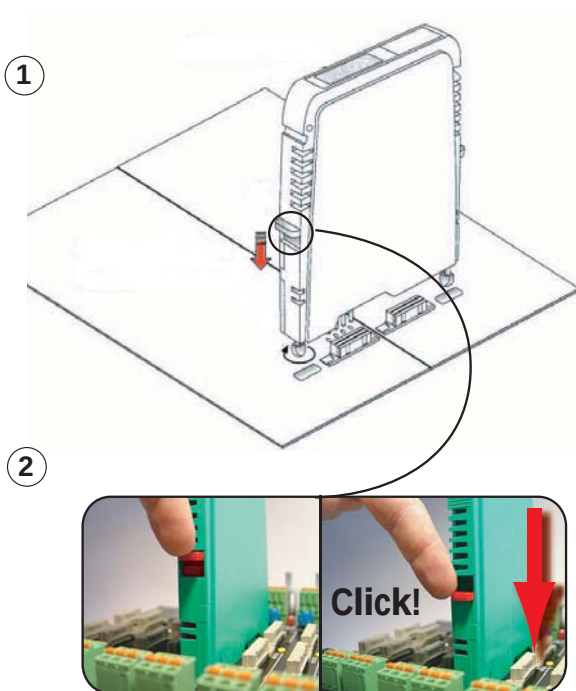
##### Hardware Damage

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.



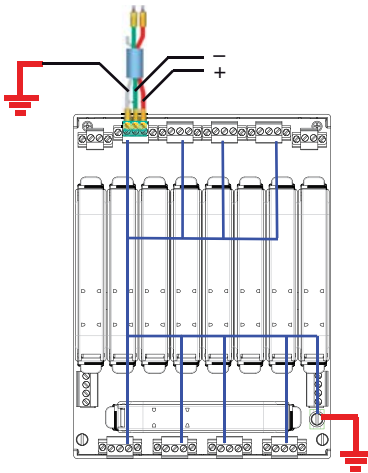
### Dismounting of Modules from the Motherboard

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

Push the red Quick LOK bars upwards and lift off the entire module gently.

The module has been removed from the motherboard.

### 3.2 Shielding and Grounding



#### To Prevent earth loops

The shield at the host connection can be left open, but not loose.

If host shield is connected and the shields of the field devices are locally connected to earth the shields of the motherboard must be left open if the earthpoints (host/field devices) do not have the same potential.

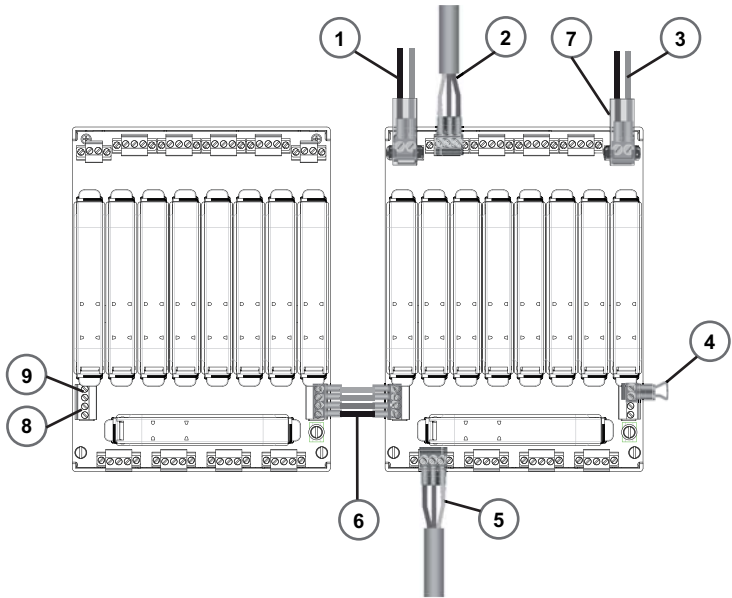


#### **Caution!**

This is not a safety earth, although there may be a requirement to earth all exposed metal parts as a matter of course.

Care must be taken to ensure a clean earth at all times.

## 3.3 Connections



- 1 Primary connection to bulk power supply
- 2 Host connection
- 3 Secondary connection to bulk power supply
- 4 Final motherboard link (The alarm contact has to be looped at the last motherboard)
- 5 Connections for fieldbus trunk
- 6 Diagnostic link cable ACC-MB-HDC for series connection of motherboards
- 7 Connector cover ACC-MB-CC needed for Ex ic installations
- 8 Diagnostic bus connection
- 9 Common alarm voltage-free contact

## 3.3.1 Installation requirements for Ex ic installations

If the Fieldbus Power Hub should be used within an intrinsically safe installation (Ex ic) the following installation requirements have to be executed:

- Mount connector cover on each power terminal.
- Prepare trunk, alarm voltage-free contact and diagnostic bus cable as described as following.



Monting of the connector cover ACC-MB-CC for Ex ic installations



### Warning!

Wrong wiring

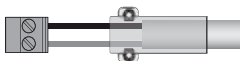
Use the delivered connector without fastening screws only:

- in combination with the connector cover
- on primary and secondary bulk power terminals

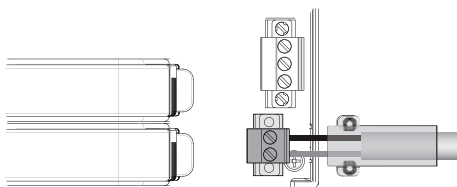
1. Slide the connector cover over the stripped power supply cable.



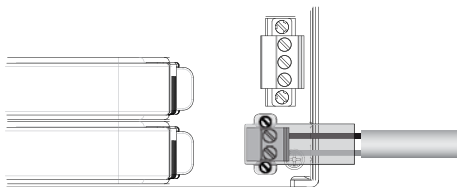
2. Screw the leads into the delivered connector.



3. Mount the connector onto the power terminal.



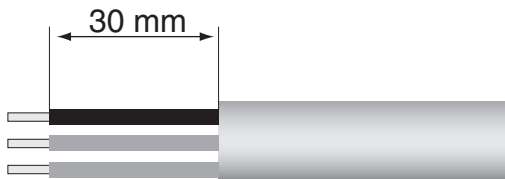
4. Put the connector cover over the power supply connector and tighten the fastening screws



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### Preparing trunk, alarm and diagnostic bus cable for Ex ic installations

To guarantee the prescribed clearance distance the trunk cables, the alarm voltage-free contact and diagnostic bus cable have to be prepared as following (unnecessary if ACC-MB-HDC diagnostic cable is been used).



No more than 30 mm of the single leads of the trunk and diagnostic bus cables may stick out of the cable jacket. Respectively the single leads of the trunk and diagnostic bus cable have to be banded together with a tie-wrap or a shrink hose after 30 mm see chapter 3.

### 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.

### 4 Fieldbus Power Hub Basic Diagnostics

The Fieldbus Power Hub System provides integrated self-supervision functionality located within the Power Modules and the Motherboards. Additionally, a Basic Diagnostic Module is available to monitor bulk power supply status and compatibility of the mounted Power Modules in redundant systems. 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 shown by LED indication and by a normally closed, voltage-free contact. Normal operating conditions are shown by green LEDs, the voltage-free contact is closed. See table below for detail diagnostic information.

| Fault                                                      | Relay Contact | Diagnostic Module                                          | Power Module                      |
|------------------------------------------------------------|---------------|------------------------------------------------------------|-----------------------------------|
| <b>A: Supply Under/Over Voltage Detection</b>              |               |                                                            |                                   |
| > 18.5 V DC +/- 4 %<br>< 35.8 V DC +/- 4 %                 |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>○ ERR</div> | <div>● PWR</div> <div>○ ERR</div> |
| < 17.5 V DC +/- 4 %<br>> 36.8 V DC +/- 4 %*                |               | <div>○ PRI PWR</div> <div>○ SEC PWR</div> <div>● ERR</div> | <div>○ PWR</div> <div>● ERR</div> |
| <b>B: Power Module compatibility redundant system only</b> |               |                                                            |                                   |
| All modules have intact redundancy partner                 |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>○ ERR</div> | <div>● PWR</div> <div>○ ERR</div> |
| Only one Power Module is fitted to a segment               |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>● ERR</div> | <div>● PWR</div> <div>○ ERR</div> |
| <b>C: Power Module or load status</b>                      |               |                                                            |                                   |
| Power Module failure                                       |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>● ERR</div> | <div>○ PWR</div> <div>● ERR</div> |
| Output overload or trunk short circuit                     |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>● ERR</div> | <div>○ PWR</div> <div>● ERR</div> |
| All Power Modules fixed and healthy                        |               | <div>● PRI PWR</div> <div>● SEC PWR</div> <div>○ ERR</div> | <div>● PWR</div> <div>○ ERR</div> |

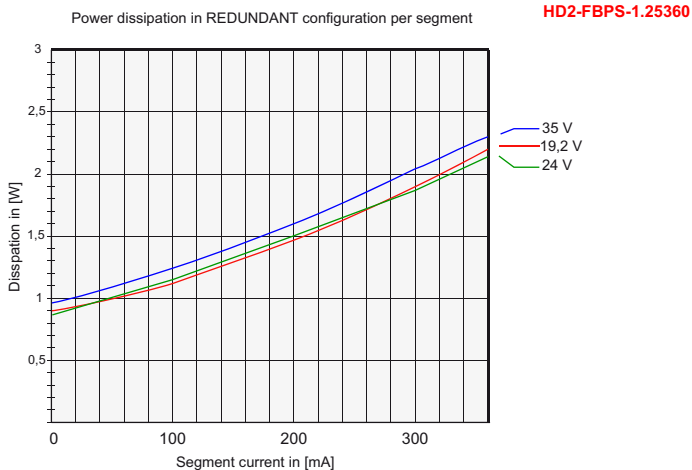
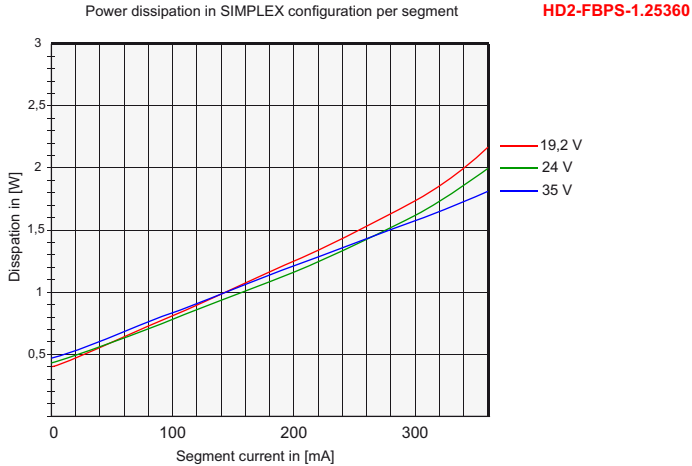
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## 5 Thermal Dissipation

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.

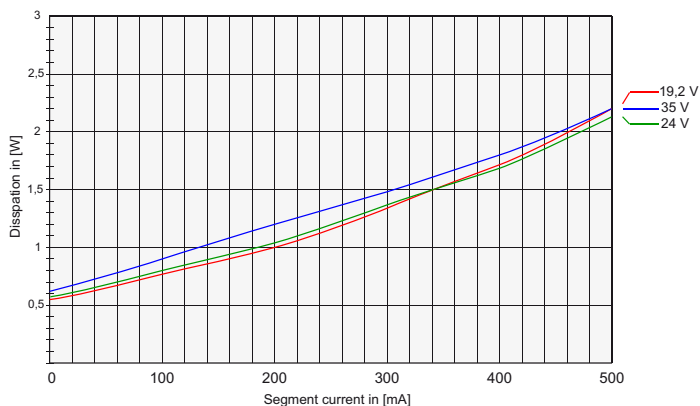
### Thermal Dissipation of HD2-FBPS-1.25.360, including motherboard



### Thermal Dissipation of HD2-FBPS-1.500, including motherboard

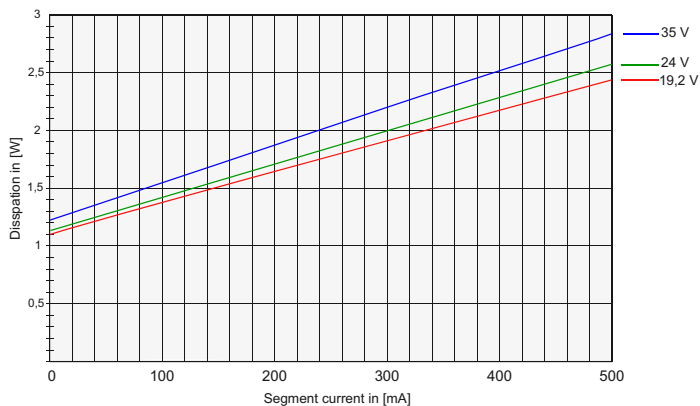
Power dissipation in SIMPLEX configuration per segment

HD2-FBPS-1.500



Power dissipation in REDUNDANT configuration per segment

HD2-FBPS-1.500

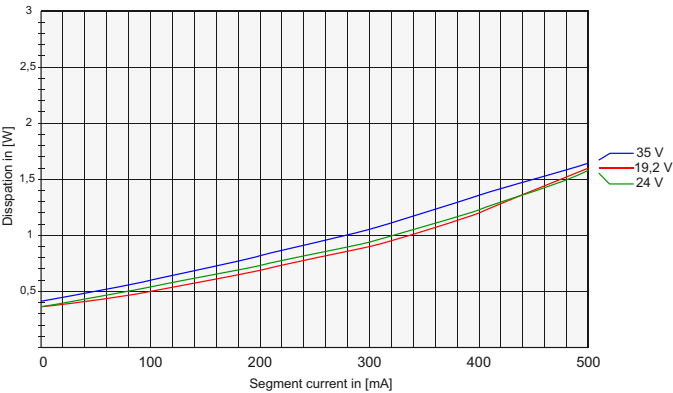




### Thermal Dissipation of HD2-FBPS-1.17.500, including motherboard

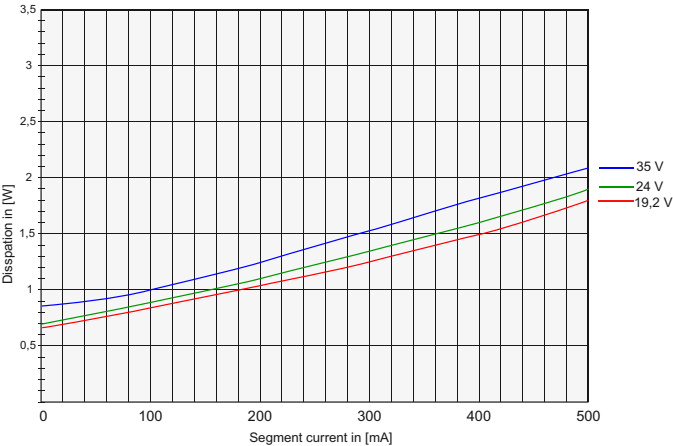
Power dissipation in SIMPLEX configuration per segment

HD2-FBPS-1.17.500



Power dissipation in REDUNDANT configuration per segment

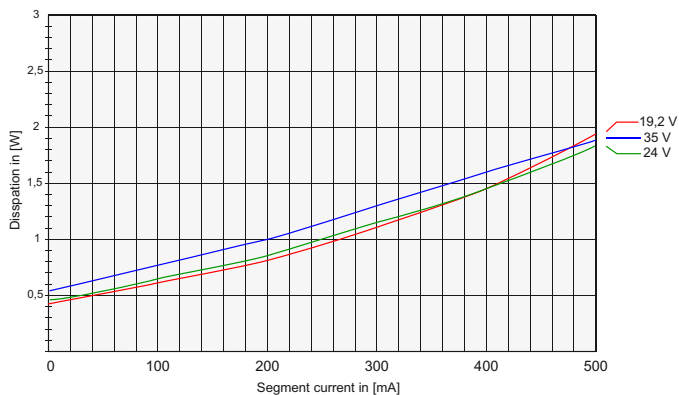
HD2-FBPS-1.17.500



### Thermal Dissipation of HD2-FBPS-1.23.500, including motherboard

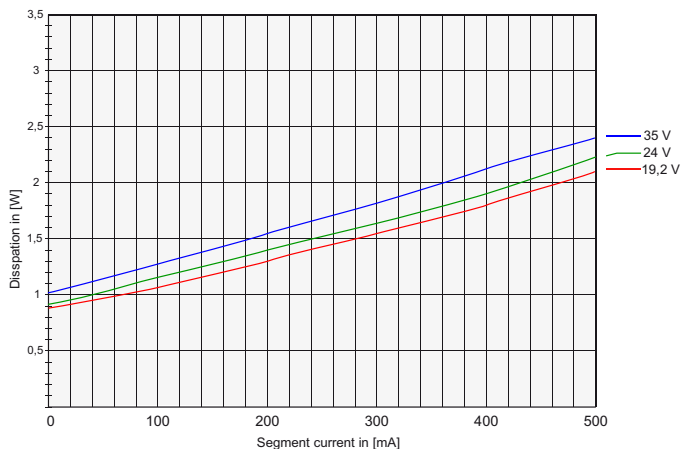
Power dissipation in SIMPLEX configuration per segment

HD2-FBPS-1.23.500



Power dissipation in REDUNDANT configuration per segment

HD2-FBPS-1.23.500



## 6 Appendix

### 6.1 Ordering Information

| Designation       | Description                                                                                                                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HD2-FBPS-1.500    | General purpose isolated Fieldbus Power Supply Module with 28 ... 28 V DC and 500 mA output.                                                                                                                        |
| HD2-FBPS-1.23.500 | Ex ic, Ex nL isolated Fieldbus Power Supply Module with 21 ... 23 V DC and 500 mA output.                                                                                                                           |
| HD2-FBPS-1.17.500 | FNICO, FISCO ic isolated Fieldbus Power Supply Module with 15 ... 17 V DC and 500 mA output.                                                                                                                        |
| HD2-FBPS-1.25.360 | General purpose isolated Fieldbus Power Supply Module with 25 ... 28 V DC and 360 mA output.                                                                                                                        |
| HD2-DM-B          | Basic Diagnostic Module with LED indication and common relay fault output.                                                                                                                                          |
| HD2-DM-A          | The Advanced Diagnostic Module allows, in conjunction with the FDT/DTM based Diagnostic Manager, to analyze signal and segment parameters as well as measurement of specific system and node physical layer values. |
| MBHD-FB1-4R       | General purpose 4x redundant segment Fieldbus motherboard with redundant bulk power feed and diagnostic interface, all connectors screw terminal type.                                                              |
| Accessories       |                                                                                                                                                                                                                     |
| ACC-MB-HDC        | Diagnostic link cable<br>Coupling of diagnostic bus between two motherboards, length 6 cm                                                                                                                           |
| ACC-MB-CC         | Connector cover<br>Set of two covers with special connectors to keep clearance distance between power and host terminals.                                                                                           |

### 6.2 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



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