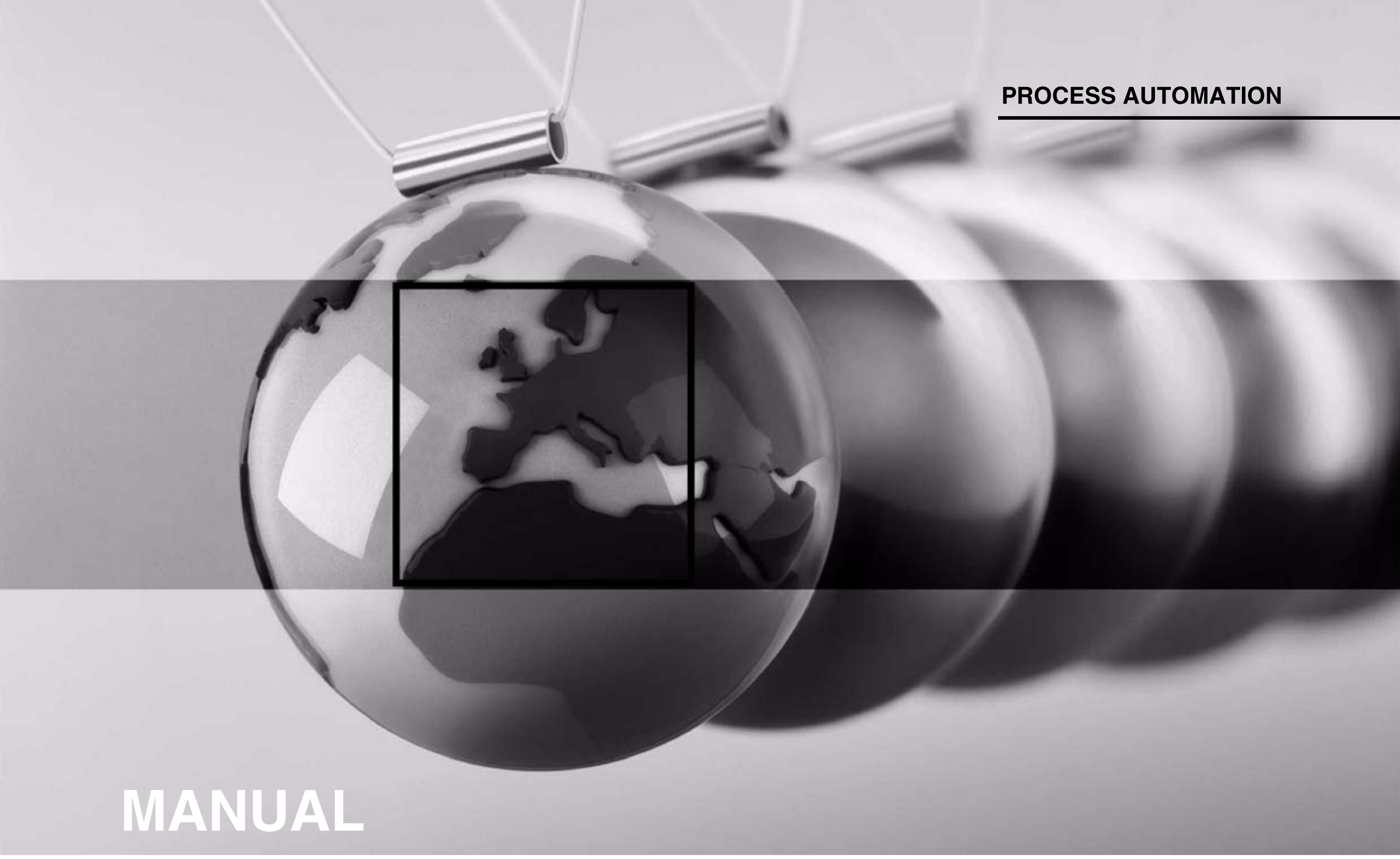

PROCESS AUTOMATION

MANUAL

DART PROFIBUS POWER HUB COMPACT

FieldConnex®

DART FIELDBUS

PEPPERL+FUCHS

PROTECTING YOUR PROCESS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

1 Safety

1.1 Validity

The chapter “Safety” is valid as instruction manual.

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

1.2 Symbols used

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

Safety-relevant symbols

Danger!
This symbol indicates a warning about an immediate 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 indicates a warning about 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 indicates a paragraph with instructions.

1.3 System Operator and Personnel

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

Mounting, installation, commissioning, operation, maintenance and disassembly 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.

Due to constant revisions, documentation is subject to permanent change. Please refer only to the most up-to-date version, which can be found under www.pepperl-fuchs.com.

1.5 Delivery, Transport and Storage

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Always store the device in a clean and dry environment. The permitted storage temperature (see data sheet) must be considered.

1.6 Marking

DART Motherboard

MBCB-FB-GT-D-2
Pepperl+Fuchs GmbH
Profibus Power Hub
EC-type examination certificate:
PTB 11 ATEX 2010 X
Ex II 2 G Ex ib IIC T4
Ex II (2) D [Ex ib] IIIC
Ex II 3(2) G Ex nAc [ib] IIC T4

DP/PA Gateway

HD2-GTB-2PA
Pepperl+Fuchs GmbH
DP/PA Gateway
Declaration of conformity:
TÜV 04 ATEX 2500 X
Ex II 3G EEx nA II T4

DART Power Supply

HD2-FBPS-IBD-1.24.360
Pepperl+Fuchs GmbH
Fieldbus Power Supply Module
EC-type examination certificate:
PTB 10 ATEX 2020 X
Ex II 2 G Ex ib IIC T4
Ex II (2) D [Ex ib] IIIC
Statement of conformity
Ex II 3(2) G Ex nAc [ib] IIC T4

DART Segment Protector

R3-SP-IBD12
Pepperl+Fuchs GmbH
Fieldbus Power Supply Module
EC-type examination certificate:
PTB 10 ATEX 2018X
Ex II 2 G Ex ib IIC T4
Ex II (2) G [Ex ib] IIIC

DART Surge Protector

-LBF-I1.36
Pepperl+Fuchs GmbH
Fieldbus Power Supply Module
EC-type examination certificate:
KEMA 09 ATEX 0191 X
Ex II 2(1)G Ex ia IIC T4/T5/T6

-LBF-I1.36

Declaration of conformity:
KEMA 09 ATEX 0190 X
II 3G Ex ic IIC T4/T5/T6 ,
II 3G Ex nA II T4/T5/T6

1.7 Intended Use

The PROFIBUS DART Power Hub Compact is intended to power two PROFIBUS PA intrinsically safe, Ex ib IIC, segments in simplex mode according to IEC 61158-2. It also serves as a Segment Coupler for connecting PROFIBUS PA segments to PROFIBUS DP. The Segment Coupler ensures communication and galvanic isolation between PROFIBUS PA and PROFIBUS DP.

The PROFIBUS DART Power Hub Compact may be installed in Zone 2 hazardous areas. Types of protection are Ex nA (non-arcing) for Zone 2 Gas Groups IIC, IIB, IIA.

Dedicated Pepperl+Fuchs DART Segment Protectors will allow to connect fieldbus devices certified according to Entity model with safety values of $U_i \geq 24$ V, $I_i \geq 47$ mA, $P_i \geq 1.08$ W, $C_i \leq 5$ nF, Li ≤ 20 µH. Thus live maintenance at field device level in Zone 1 is permitted at any time.

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

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

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

1.8 Mounting and Installation

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

1.8.1 Mounting Instructions for Power Hub

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

Instructions for Zone 2

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

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

Instructions for Zone 22

The devices may only be installed and operated in zone 22 if mounted in an enclosure for which an EC-type-examination certificate acc. 94/9/EG for at least category 3D exists.

1.8.2 Mounting instructions for HD2* modules

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

1.8.3 Ambient Conditions

Power Hub

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

Power Hub Motherboard: Pay attention to avoid electrostatic discharges while operating the installed device. Avoid electrostatic charge.

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

The permitted ambient temperature range of the device depends on the monting orientation:

- Horizontal -40...40 °C
- Vertical -40...60 °C

see chapter 3.1.2

Segment Protector

The permitted temperature range is -40...70 °C.

Cable

The temperature range of the cable must be chosen according to the application.

The cable must be suitable for the specified ambient temperature range at the intended location. The allowed temperature range is -40 to 70 °C, even if the specified ambient temperature range for the cable is higher.

Other Equipment

All used devices and components must be suitable for the specified ambient temperature range at the intended location.

1.8.4 Mounting Instructions for Segment Protector

Instructions for Zone 1

The devices may only be installed and operated in zone 1 if mounted in an enclosure for which an EC-type-examination certificate according to 94/9/EC for at least category 2G exists.

Instructions for Zone 2

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

Instructions for Zone 21

The devices may only be installed and operated in zone 21 if mounted in an enclosure for which an EC-type-examination certificate acc. 94/9/EG for at least category 2D exists.

Instructions for Zone 22

The devices may only be installed and operated in zone 22 if mounted in an enclosure for which an EC-type-examination certificate acc. 94/9/EG for at least category 3D exists.

1.8.5 Ex i

The following instructions are valid for both the DART Power Hub and the DART Segment Protector:

Circuits of type of protection "Ex i" (intrinsically safe) which have been operated with circuits of other type of protections must not be used as "Ex i" circuits afterwards.

Intrinsically safe circuits of associated apparatus (installed in safe areas) can be led into hazardous areas, whereby special attention must be paid to maintain separation distances to all non-intrinsically safe circuits according to the requirements in IEC/EN 60079-14.

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

All separation distances between two adjacent intrinsically safe circuits need to be observed in accordance with IEC/EN 60079-14.

1.9 Housing

The following instructions are valid for both the DART Power Hub and the DART Segment Protector:

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

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

- Degree of protection according to per IEC/EN 60529
- Light resistance according to IEC/EN 60079-0
- Impact strength according to IEC/EN 60079-0
- Chemical resistance according to IEC/EN 60079-0
- Heat resistance according to IEC/EN 60079-0
- Electrostatics according to 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® DART PROFIBUS Power Hub Compact consists of high-performance power supplies in simplex configuration for two PROFIBUS PA segments and a Segment Coupler for coupling PROFIBUS PA to PROFIBUS DP. DART Fieldbus enables completely intrinsically safe fieldbus segments for all existing field instrumentation that complies with the Entity standard.

Compared to conventional intrinsically safe fieldbus concepts such as FISCO or Fieldbus Entity, DART Fieldbus offers more than five times more intrinsically safe power and true load-sharing redundancy of power supplies. The high intrinsically safe power supports fieldbus topologies with long cable lengths and a high number of field devices, similar to non-intrinsically safe fieldbus solutions. Live maintenance without gas clearance is permitted at any point of the DART Fieldbus system.

The simplicity of use, particularly the validation of DART Fieldbus Systems, reduces the safety documentation to a minimum.

The motherboard of the FieldConnex® DART PROFIBUS Power Hub Compact provides connections for two fieldbus segments. Sockets for plug-in modules carry one power supply module per segment and one Segment Coupler.

The Power Hub features superior design elements. The main design points are passive impedance generation, well balanced circuitry, and low heat dissipation. They are characteristic for FieldConnex® and enable superior availability of the fieldbus infrastructure and make FieldConnex® Power Hubs easy to install and maintain. All active electronic components are located in the plug-in modules, thus making the motherboard extremely reliable.

Impedance generation prevents the data signal on PROFIBUS PA 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 thus remains undisturbed. Low heat dissipation allows highest packing density inside the cabinet and a very long service life.

Dedicated DART Segment Protectors, which are connected to the intrinsically safe segment, allow feeding of standard Entity certified field devices. Devices are installed in hazardous area Zone 1 gas groups IIC. Limiting electric fault conditions at the spur, Segment Protectors ensure proper operation of the fieldbus segment during faults or hot work at the spur.

2.2 System components

2.2.1 Architecture

The DART PROFIBUS Power Hub Compact consists of two powered fieldbus segments including backplane, DART Fieldbus power supplies and one Segment Coupler.

Segment Couplers offer dedicated interfaces to connect general purpose hosts to a DART fieldbus segment. A maximum of four DART Segment Protectors with up to 12 spur outputs are allowed to be connected to a DART trunk. The Power Hub comprises one fixed built in fieldbus terminator for each segment. A DART Segment Protector contains a selectable DART fieldbus terminator.

Dedicated DART Surge Protectors are allowed to be connected to the DART trunk to protect Power Hub and Segment Protectors from over-voltages. The cable used for the trunk is required to be a 100 Ω fieldbus cable. Trunk cable length is supported up to 1000 m, spur cable length up to 120 m. Auxiliary devices as handhelds are allowed to be connected to trunk and spur.

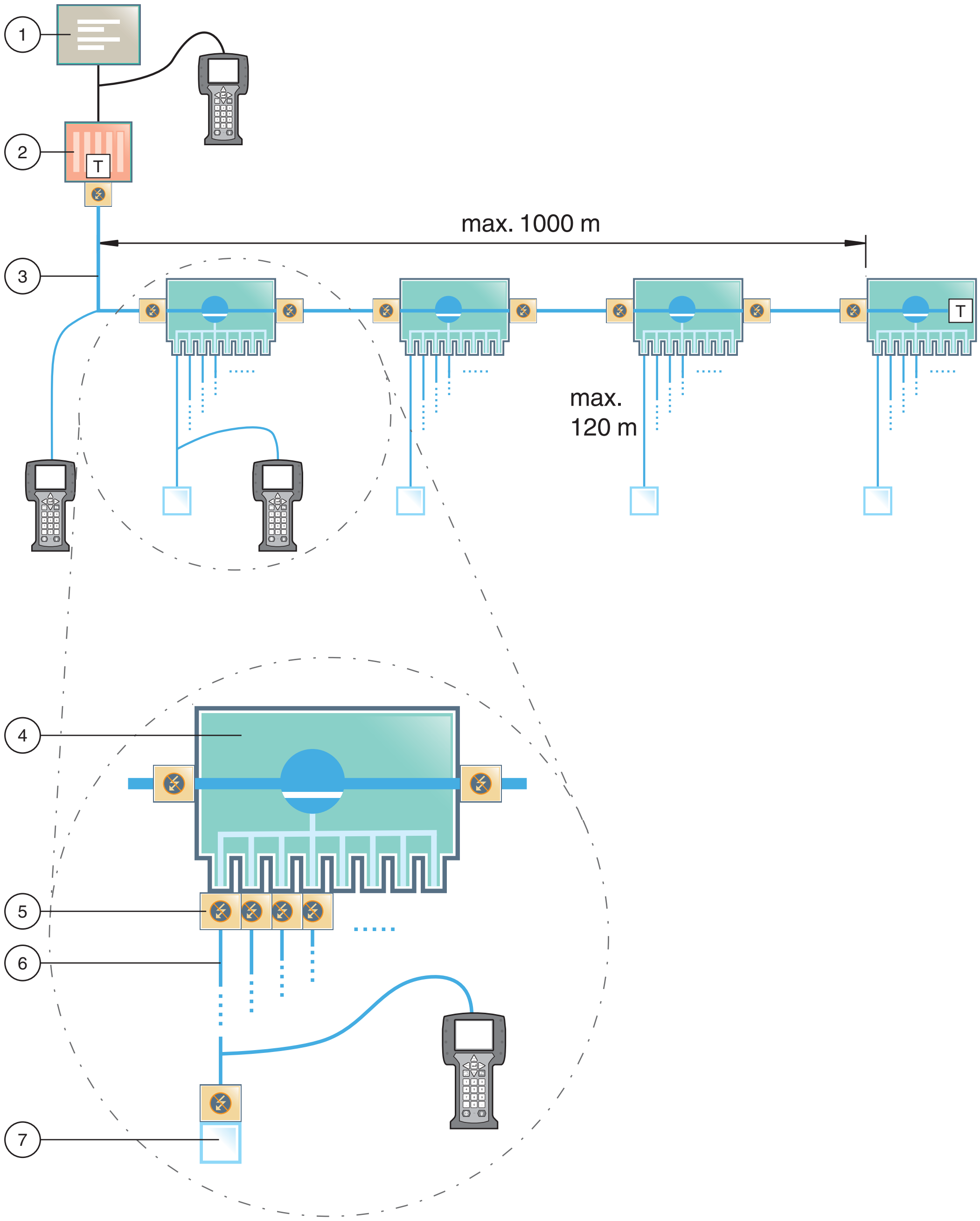

Figure 2.1DART system architecture

1 PROFIBUS DP master
2 DART PROFIBUS Power Hub Compact with DP/PA Gateway
3 DART trunk
4 DART Segment Protector
5 Surge Protector
6 Spur
7 PROFIBUS PA field device

2.2.2 DART Motherboard Compact

MBCB-FB-GT-D-2

The motherboard MBCB-FB-GT-D-2 allows for coupling of two simplex PROFIBUS PA segments to PROFIBUS DP. The motherboard provides a connection for 24 V input power. For each PROFIBUS PA segment a non-selectable fieldbus terminator is built in.

The motherboard is designed to be mounted on a horizontal 35 mm DIN rail. The defined temperature rating is valid for mounting on a horizontal 35 mm DIN rail only.
For vertical mounting see derating specification ().

2.2.3 DP/PA Gateway Module

HD2-GTB-2PA

The PROFIBUS Power Hub DP/PA Gateway Module is responsible for transparent coupling between DP master and PA field devices. It is mounted onto the PROFIBUS Power Hub Motherboard.

2.2.4 DART Power Supply Modules

HD2-FBPS-IBD-1.24.360

DART Power Supply Modules provide full galvanic isolation between bulk power supply, fieldbus segments and H1 Host System connection. Designed for fieldbus systems according to IEC 61158-2 such as PROFIBUS PA and FOUNDATION Fieldbus H1, the power supply modules fulfil the power supply test specification FF-831. 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. LED indicators provide information about the health of the fieldbus segment and the power supply itself.

2.2.5 DART Segment Protector

R3-SP-IBD12

The DART Segment Protector is a fieldbus device coupler for connection of up to twelve intrinsically safe Entity certified field instruments to a DART segment. The R3-SP-IBD12 Segment Protector is designed for DIN-Rail installation with simple snap hooks included. It can be installed in a field junction box or in a control cabinet. Various choices of tailored solutions are offered by the Pepperl+Fuchs Group.

Field instruments are connected one per output, also named spur. The Segment Protector is certified for installation in Zone 1. Maintenance at the field device level in Zone 1 is permitted at any time without the need of a hot work permit. Each spur is equipped with short-circuit current limitation. If a spur has a short circuit or failure, the fieldbus trunk and all other field devices remain in operation. As soon as the fault is repaired, the Segment Protector automatically resumes operation of the spur.

The Segment Protector is connected to the trunk via a T-connector. Exchanging and modifying one Segment Protector is possible while the fieldbus segment is still in operation, without effect on other parts of the same fieldbus segment. All connectors feature plugs with retaining screws, providing the necessary durability and availability for process automation.

A DART Fieldbus Terminator with high-availability design is included in the Segment Protector, located at the end of the trunk. LEDs indicate bus communication activity and power on the trunk. Each output is equipped with an LED for indication of a short-circuit condition or fault at the spur.

2.2.6 Surge Protectors

The FieldConnex® Surge Protector will protect fieldbus components and control units from damage caused by voltage surges and secondary lightning strikes. Surge Voltages between the fieldbus wire (plus and minus) and between either wire and ground will be safely limited in an overvoltage event.

The Surge Protectors are designed for use in fieldbus communication topologies according to IEC 61158-2. They conform to IEC 60079-11: FISCO and Entity concepts and are also ‘DART Intrinsically Safe Compatible’ (models without diagnostic). The Surge Protectors allow the coordinated use in an ‘EMC-orientated Lightning Protection Zones Concept’, in accordance with IEC 61312-1. The protective effect is adapted to the EMC interference immunity (conducted high-energy interference impulses) for fieldbus measuring, control and equipment.

Versions with different mounting options are available:

-LBF-I1.36

The *-LBF-I1.36* Surge Protector is designed for DIN rail installation with simple snap hooks included. For further information see data sheet and manual.

*-LBF-IA1.36.IE.0

The TSC-LBF* and SCP-LBF* series Surge Protectors consist of pluggable units, designed to fit directly into 3-pin terminals sockets of Pepperl+Fuchs fieldbus components as Power Hubs and Segment Protectors, to protect trunk and spur connections of a fieldbus installation. This leads to a significant reduction in design and installation time/cost and significantly reduces the overall equipment footprint. For further information please consult the data sheet and the manual.

2.2.7 Auxiliary Components

For testing or configuration purposes, auxiliary devices such as handhelds may be connected to a DART installation temporarily.

- **Connection of auxiliary devices to the DART trunk**
  Auxiliary devices such as handhelds may be connected to the DART trunk if they are passive, non-feeding and if no hazardous atmosphere is present in the installation (hot work permit).
- **Connection of auxiliary devices to the outputs of a Segment Protector**
  Entity certified auxiliary devices are allowed to be connected to the Segment Protector (see chapter 4.4).

2.3 Component Identity

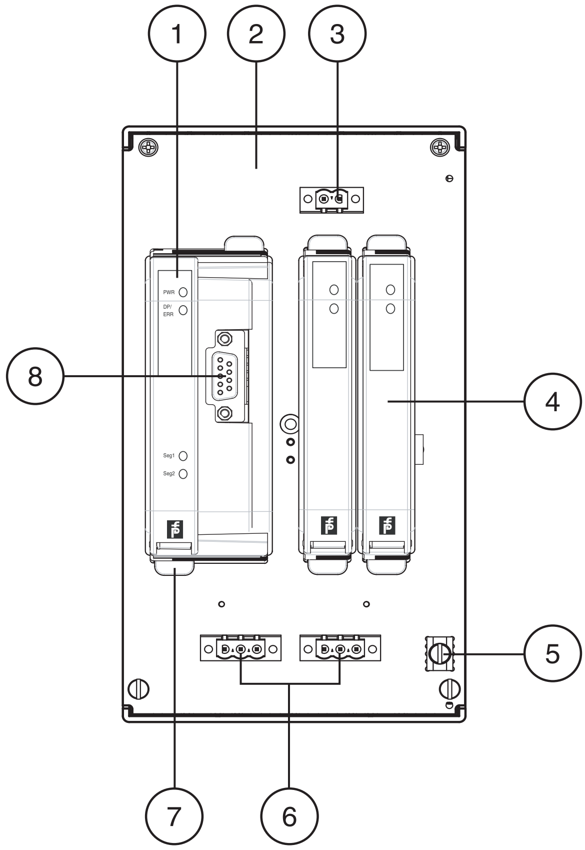

Figure 2.2_DART Profibus Power Hub Compact

1 PROFIBUS DP/PA Gateway HD2-GT-2PA
2 Motherboard MBCB-FB-GT-D-2
3 Power supply connection
4 Power Supply Module HD2-FBPS-IBD-1.24.360
5 Screen/ground connection clamp
6 PA trunk connections
7 Quick Lok bar
8 PROFIBUS DP connection

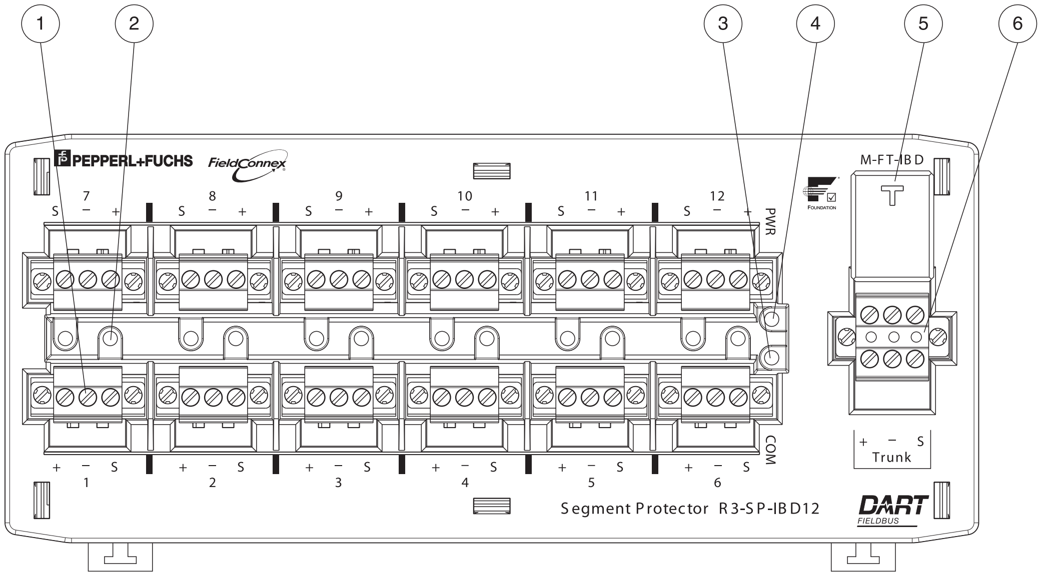

Figure 2.3 DART Segment Protector

1 Spur 1 connection
2 LED ERR Spur 1 (red, short-circuit)
3 LED COM (Communication)
4 LED PWR (Power)
5 Terminator M-FT-IBD, removable
6 T-connector T-CON.3

2.4 Technical Data

The table "System Specifications" below applies to all components listed in this section unless otherwise specified in the table of a certain component.

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^2
Protection degree	IP20
Standard conformity	
Electromagnetic compatibility	NE 21:2006
Protection degree	IEC 60529
Fieldbus standard	IEC 61158-2

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System Specification	
Shock resistance	EN 60068-2-27
Vibration resistance	EN 60068-2-6

Motherboard KT-MB-GTB-D-2PS	
Supply	
Rated voltage	19.2 ... 35 V SELV/PELV
Rated current	1330 ... 745 mA
Fieldbus interface	
Number of segments Simplex	2
Rated voltage	20.8 ... 22.3 V
Rated current	360 ... 10 mA
Short-circuit current	413 mA
PROFIBUS DP	
Connection	9-pin Sub-D socket
Protocol	PROFIBUS DP/DP V1
Terminating resistor	100 Ω , integrated

Isolated Power Supply Module Type HD2-FBPS-IBD-1.24.360	
Supply	
Rated voltage	19.2 ... 35 V SELV/PELV
Power loss	Error: 'attrid' nicht vorhanden
Fieldbus interface	
Rated voltage	20.8 ... 22.3 V
Rated current	360 ... 10 mA
Short-circuit current	413 mA
Host-rated voltage	10.1 ... 11 V
Host-rated current	... 40 mA
Host short-circuit current	... 50 mA
Maximum safe voltage	35 V
Indicators/operating means	
LED ERR	red flashing: short-circuit or undervoltage at output
LED PWR	green if U_{out} > 21 V

DART Segment Protector R3-SP-IBD12	
Fieldbus interface	
Main cable (Trunk)	
Rated voltage	14.5 ... 24 V DC
Rated current	max. 4.5 A
Outputs	
Number of outputs	12

DART Segment Protector R3-SP-IBD12	
Number of devices per output	1
Rated voltage	min 10.5 V, max. 24 V
Rated current	max. 34 mA
Short-circuit current	max. 47 mA
Voltage drop main cable/outputs	max. 4 V
Voltage drop trunk In/Out	0 V
Terminating resistor	external type M-FT-IBD 100 Ω +/- 10 %
Ambient conditions	
Ambient temperature	-40 ... 70 °C
Storage temperature	-50 ... 85 °C
Relative humidity	< 95 % non-condensing
Shock resistance	15 g 11 ms
Vibration resistance	1 g , 10 ... 150 Hz
Mechanical specifications	
Connection type	screw terminals, removable, with retaining screws
Core cross-section	max. 2.5 mm^2 /AWG 12-24

2.5 Dimensional Drawings

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

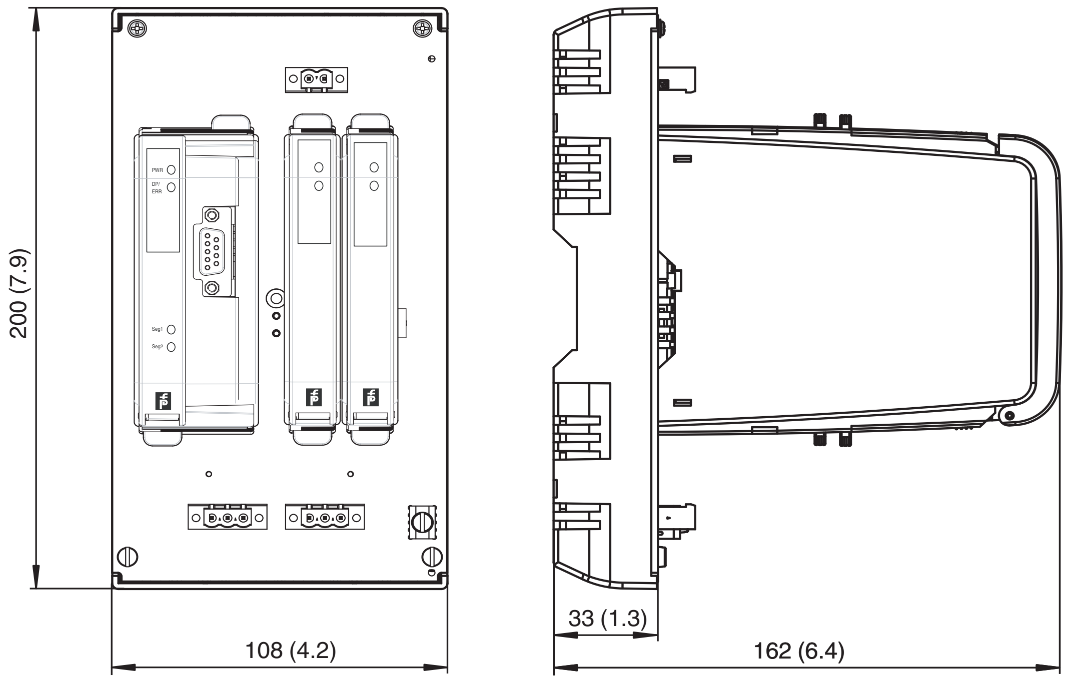


Figure 2.4_Dimensions Motherboard MBCB-FB-GT-D-2

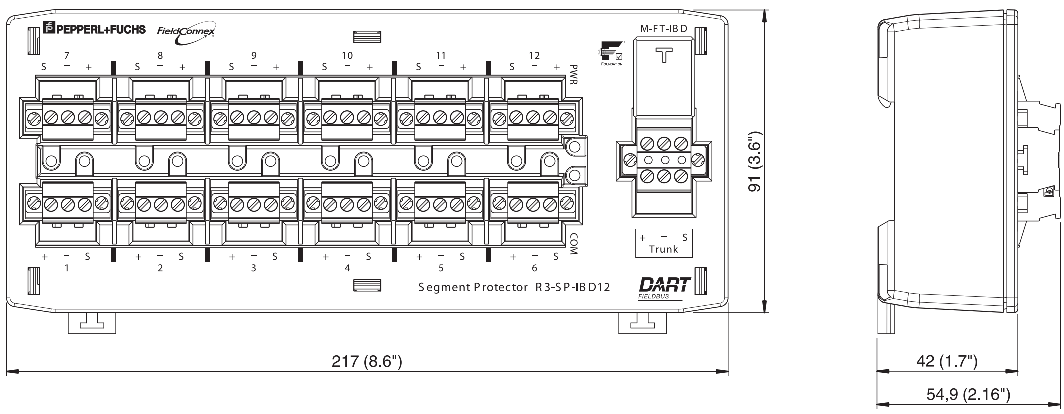


Figure 2.5_Dimensions Segment Protector R3-SP-IBD12

3 Installation and Commissioning

3.1 Motherboard and Modules

Observe the recognized rules of technology and setup requirements during mounting, installation and dismounting. For tasks on electrical systems observe the respective safety requirements.

Pay special attention to the following points:

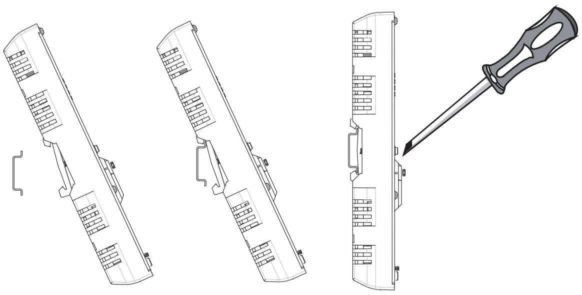
- The Fieldbus Power Supply is installed in accordance with the specification.
- All devices, equipment and cables are free of damage.
- The IP protection is ensured.
- All mounted modules are mechanically locked.

3.1.1 Mounting and Dismounting

Mounting Fieldbus Motherboards on a 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 fastening screw in the middle of the motherboard to attach the motherboard to the DIN rail.

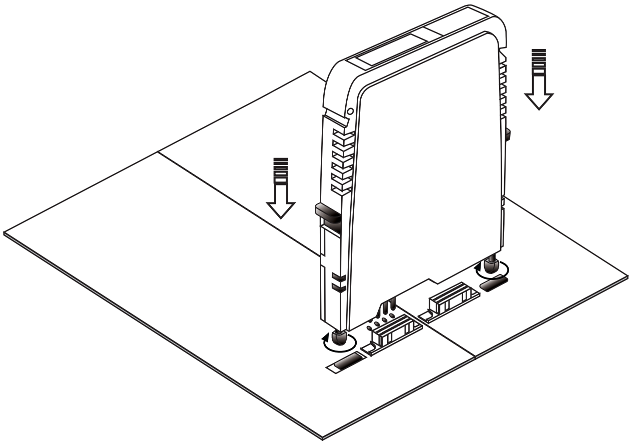


The motherboard has been mounted.

Mounting of HD2*-Modules on the motherboard

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

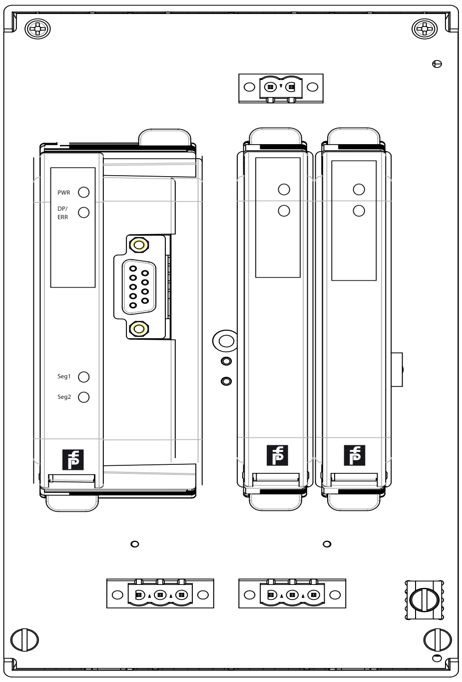
To dismount a module from the motherboard, proceed as follows:

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.

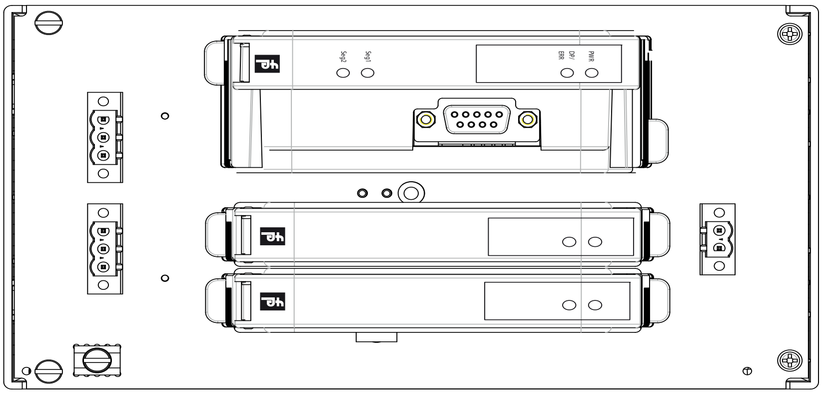
3.1.2 Motherboard Mounting Positions

Vertical Mounting



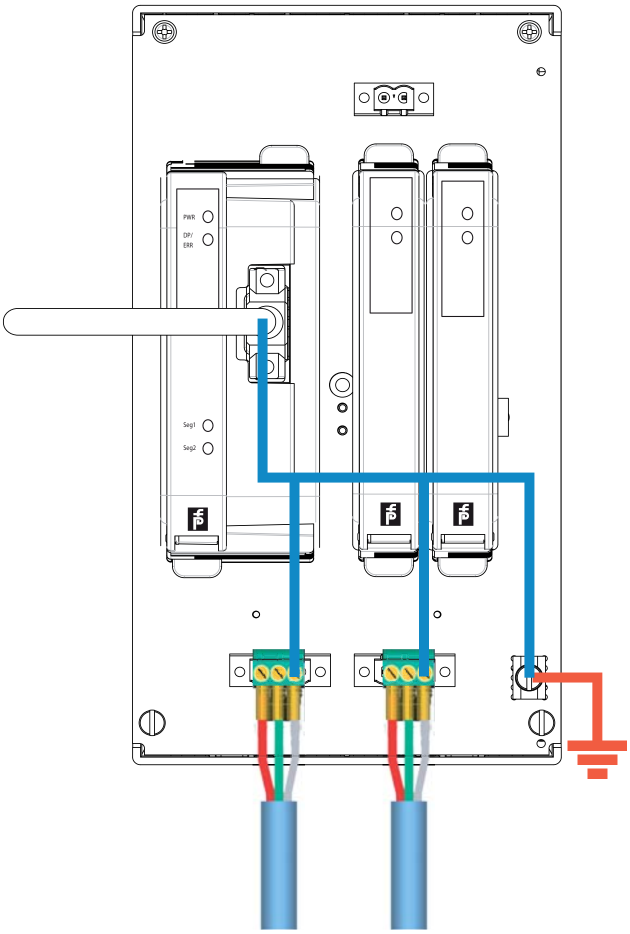
Permitted temperature range for vertical alignment -40°C to +60°C

Horizontal Mounting



Permitted temperature range for horizontal alignment -40°C to +40°C

3.1.3 Shielding and Grounding



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.

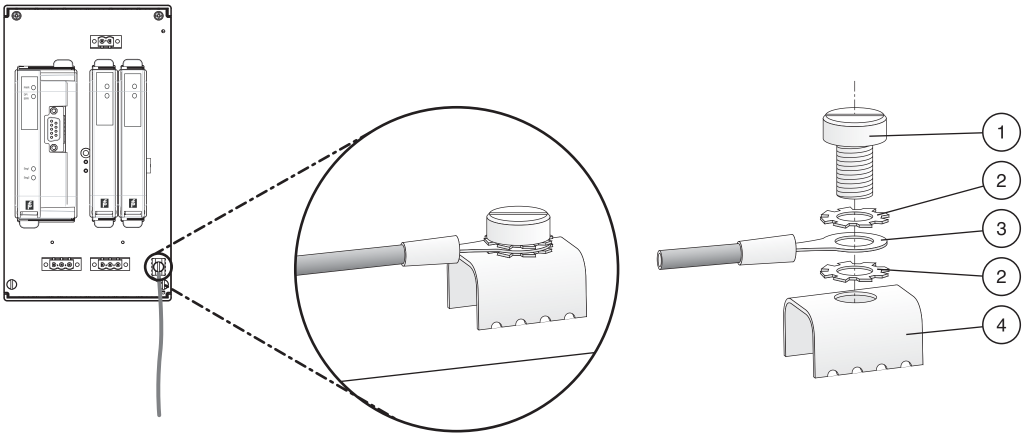
Caution!
This is not a safety earth.

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.

Connecting the ground connection cable

1. Connect the ground cable to a cable lug.
2. Position the cable lug over the ground connection clamp so that the cable points downwards.
3. Screw the cable lug to the ground connection clamp using two toothed lock washers.
4. Tighten the screw so that the cable lug can not move.



Connecting the ground connection cable

1 Screw

2 Toothed lock washer

3 Cable lug

4 Ground connection clamp on motherboard

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3.1.4 Connections

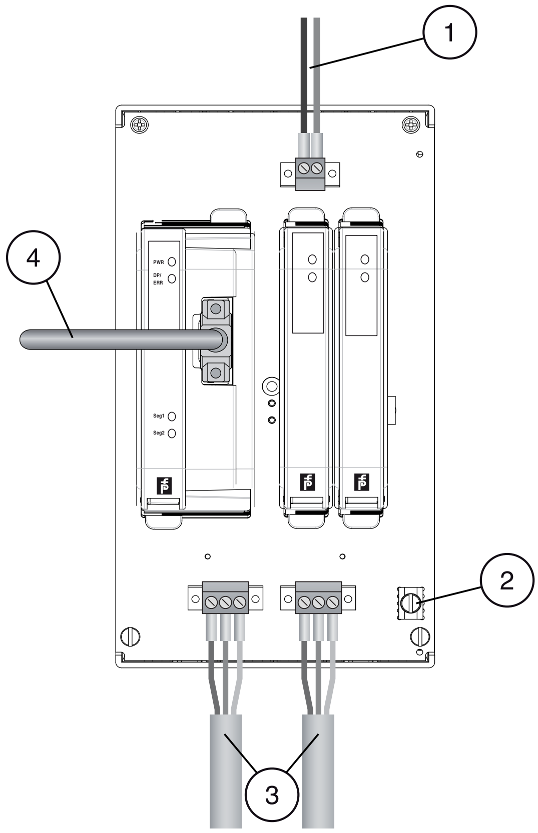


Figure 3.1_Connections of the motherboard

1 Power supply connection
2 Ground connection clamp
3 PROFIBUS PA trunk connections
4 PROFIBUS DP connection

3.1.5 Trunk Connections

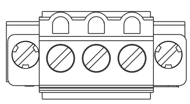


Figure 3.2 Trunk connection layout

Cable and Connection Information

- Permissible cross core section is 0,2 to 0,5 mm²
- Insulation stripping length is 7 mm
- Use end splices to protect strand ends, if stranded conductors are used
- Connectors must be mechanically locked
- Tight the screws with a torque of 0,4 to 0,5 Nm

3.1.6 Segment Termination

Motherboards got integrated terminators for each fieldbus segment.

Caution!
Communication Problems

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

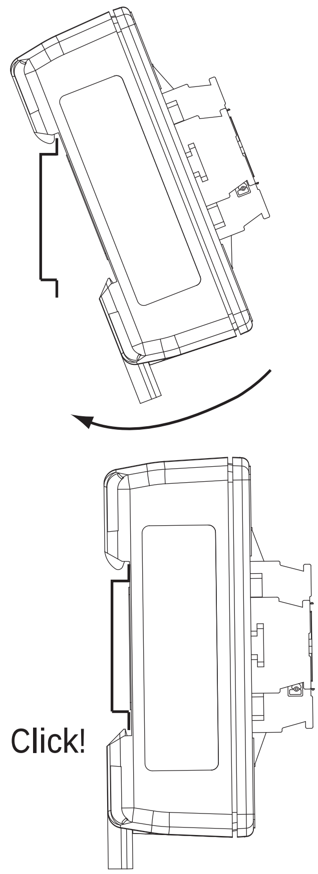
- Make sure that there are two terminators activated on each trunk line.
- One terminator should be located on each end of the trunk line.

3.2 Segment Protector

3.2.1 Mounting and Dismounting

Mounting the Segment Protector on a DIN rail

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



The DIN rail mounting of the Segment Protectors must mesh securely with the rail. The Segment Protectors must be fixed firmly on the rail. Dismounting is performed in the reverse order.

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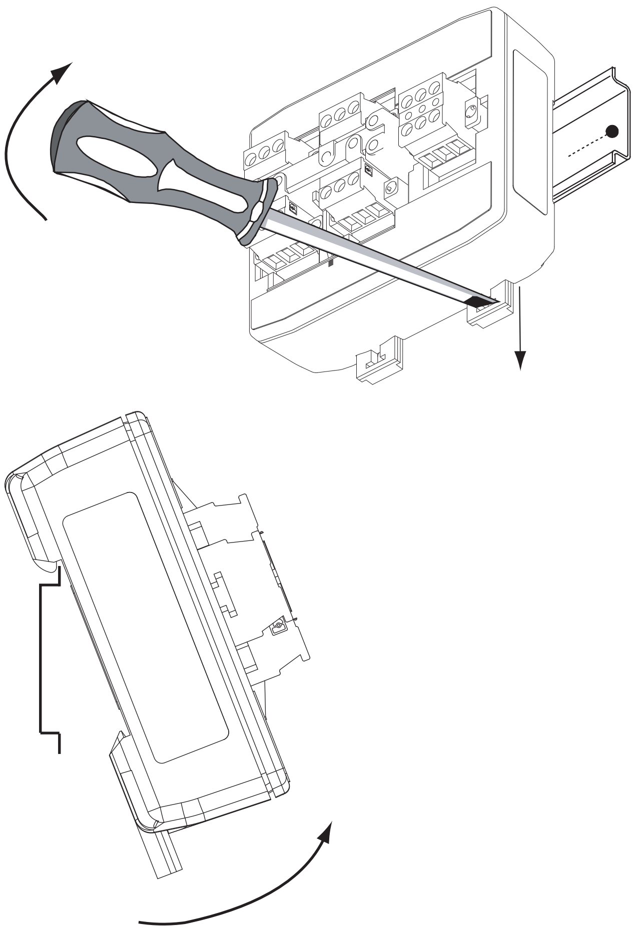
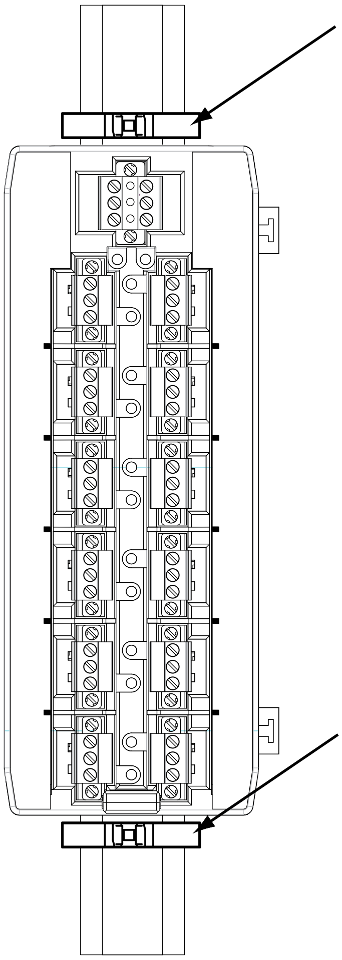
Dismounting the Segment Protector

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



3.2.2 Additional Information Vertical Mounting

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



Pepperl+Fuchs recommends using the following Phoenix Contact parts:

- Clipfix 35, snap-on end bracket, PHOENIX CONTACT part no: 3022218
- E/UK, screw-fastening end bracket, PHOENIX CONTACT part no: 1201442

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

3.2.3 Grounding / Shielding of Fieldbus transmission lines

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

> ***Warning!***
> Wrong Wiring Practice
>
> Connection of signal poles of the spur lines to the earth potential or the cable shield may cause major damage.
>
> Do not connect any signal poles of spur lines to earth potential or cable shield.

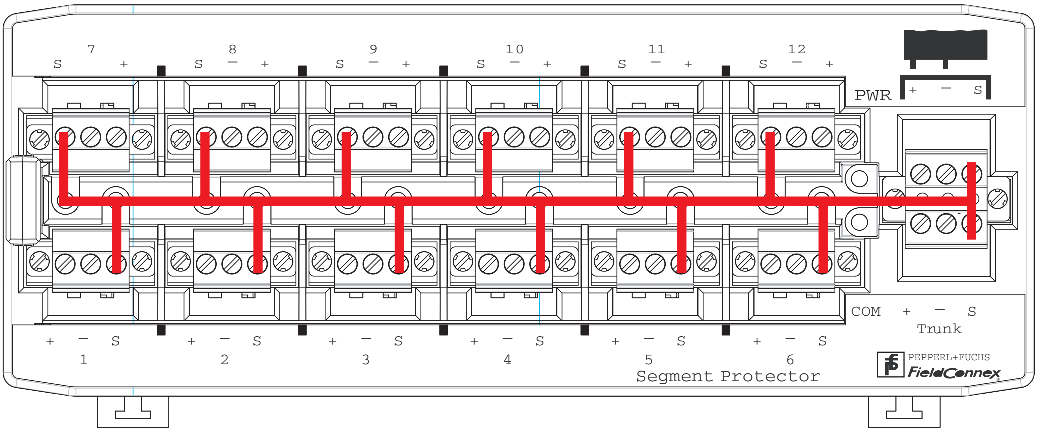
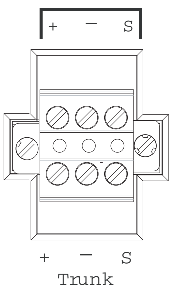


Figure 3.3 _Stylized composition of the shield lines within the Segment Protector

If the shield of the trunk or of the spurs of a Fieldbus transmission line is grounded due to EMC considerations, the EN 60079-14 should be closely observed.

3.2.4 Segment Protector Connection Layout of the Trunk



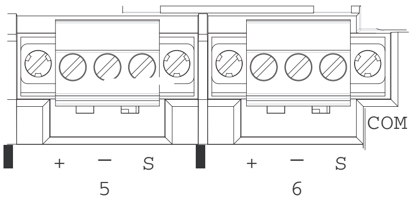
- **+** Segment +
- **-** Segment -
- **S** Shield connection

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

Cable and Connection Information

- Permissible cross core section is 0,2 to 0,5 mm²
- Insulation stripping length is 7 mm
- Use end splices to protect strand ends, if stranded conductors are used
- Connectors must be mechanically locked
- Tight the screws with a torque of 0,4 to 0,5 Nm

3.2.5 Segment Protector Connection Layout of the Spurs



5 Spur 5 connector
+ Spur +
- Spur -
S Shield connection

Cable and Connection Information

- Permissible cross core section is 0,2 to 0,5 mm²
- Insulation stripping length is 7 mm
- Use end splices to protect strand ends, if stranded conductors are used
- Connectors must be mechanically locked
- Tight the screws with a torque of 0,4 to 0,5 Nm

3.2.6 Series Connection and Termination

To realize a series connection of several Segment Protectors, loop the Trunk line using T-connectors.

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

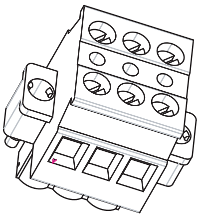


Figure 3.4 T-connector for Trunk and Terminator connection

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

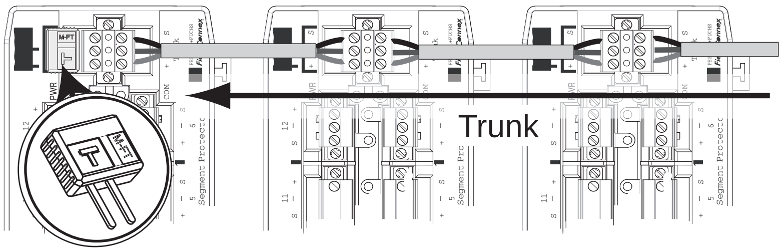


Figure 3.5 Stylized series connection and termination

Note!

As wrong termination may cause communication problems make sure that each trunk is terminated with exactly two Terminators. Only use terminators of the type M-FT-IBD.

4 Hazardous Area Usage

4.1 Installation of the DART Power Hub in Zone 2

The DART Power Hub may be installed in Zone 2. Connection or disconnection of energized non-intrinsically safe circuits is only permitted in the absence of a hazardous atmosphere.

4.2 Intrinsically Safe Circuits

The intrinsically safe circuits of the associated apparatus (DART Power Hub) may lead into hazardous areas Zone 2 Gas Groups IIC, IIB, IIA. Make sure to observe all relevant distances (creepage distances, clearances) to all non-intrinsically safe circuits in accordance with IEC/EN 60079-14.

Up to four DART Segment Protectors R3-SP-IBD* and up to five Surge Protectors *-LBF-I1.36* may be connected to the intrinsically safe outputs of the DART Power Hub.

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

When connecting intrinsically safe field devices to intrinsically safe circuit spurs of the DART Segment Protector, observe the relevant maximum values of the field devices and DART Segment Protector specified in the explosion protection documentation (certificate of intrinsic safety). Make sure to observe IEC/EN 60079-14 and IEC/EN 60079-25.

The DART Power Hub must be installed at least in an environment according to pollution degree 2.

4.3 Safety Assessment of DART Trunk Connections

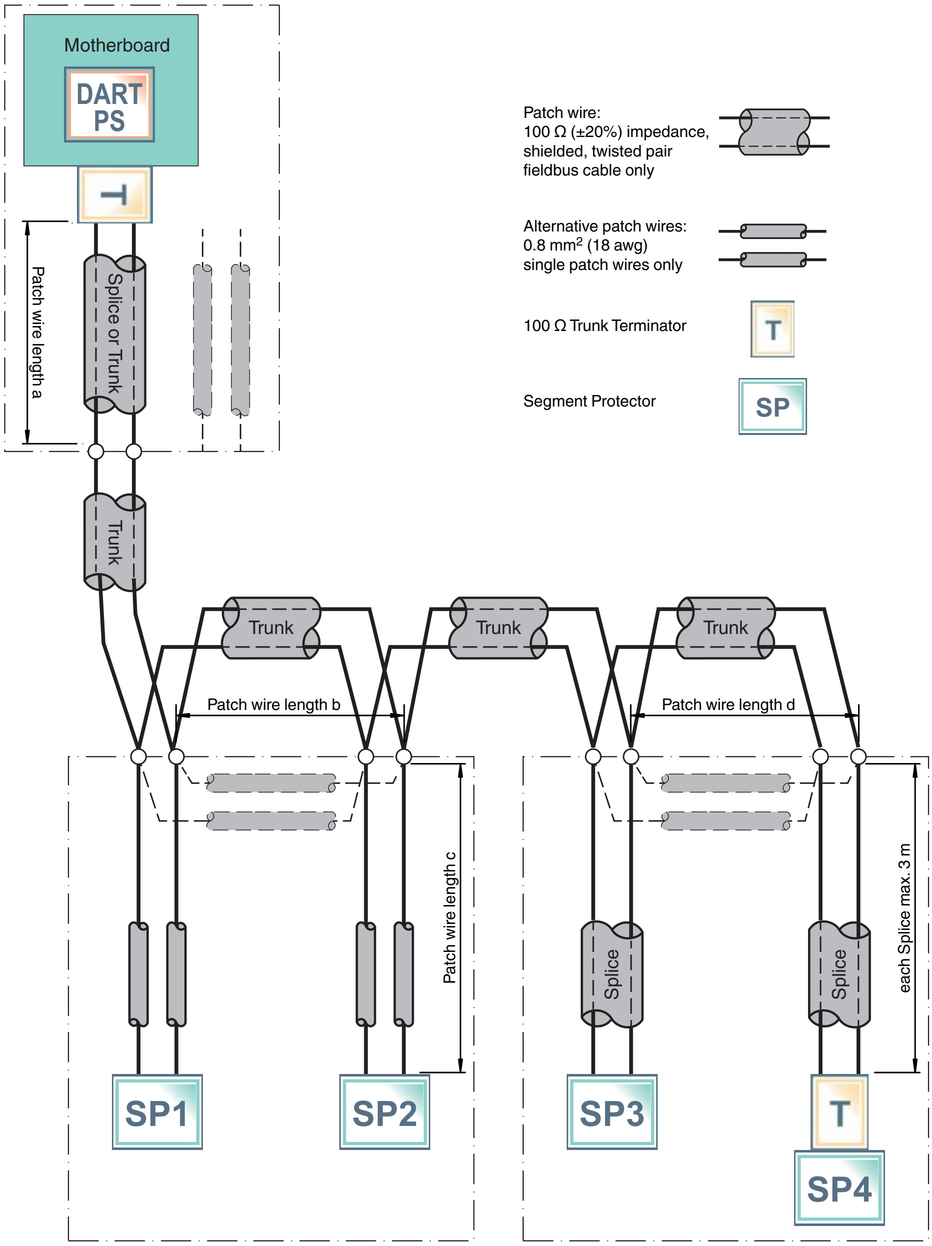
Only DART certified equipment may be connected to the trunk of a DART segment. This includes the DART Power Hub populated with DART Power Supplies HD2-FBPS-IBD*, DART Segment Protectors R3-SP-IBD*, DART fieldbus terminator M-FT-IBD and DART Surge Protectors *-LBF-I1*.

The type of fieldbus cable must be a 100 Ω ±20% shielded fieldbus cable. Depending on the cable resistance, the maximum trunk cable length and the maximum number of DART Segment Protectors connected to a DART trunk are limited.

Cross core section	≥ 0.823 mm^2 (AWG18)	≥ 1.309 mm^2 (AWG16)	≥ 2.081 mm^2 (AWG14)
Max. number of Segment Protectors	Max. trunk cable length Segment Protectors connected in line topology		
1	1000 m	1000 m	1000 m
2	800 m	1000 m	1000 m
3	700 m	1000 m	1000 m
4	600 m	900 m	1000 m

Up to a maximum length of 1000 m, the DART trunk is intrinsically safe. The trunk must be build up in a line topology with a terminator on each end.

The assessment of the DART trunk is limited to a list of DART products, the type of fieldbus cable, and the verification of the cable.



If the Power Supply, Segment Protectors or Surge Protectors are connected via splice cables through a wiring interface to the trunk cable (used to connect the DART components to the trunk), the splice cable may differ from the type of cable used for the trunk, as long the characteristic impedance of 100Ω ±20% is maintained and it is shielded.

The length of the intermediate splice cable is limited to 3 m per connection. If short cable connections are required, to interconnect wiring interface terminals for example, individual 0,8 mm^2 (18 AWG) patch wires may be used, of up to a total length of 1 m per DART segment. The minimum required core cross sectional area of the patch wires must be 0,8 mm^2 (18 AWG).

The number of Surge Protectors which are allowed to be connected to a DART trunk is limited to 5. A maximum of two DART Fieldbus Terminators may be connected to a DART trunk whilst one terminator is built into the DART Power Hub backplane.

Other type of equipment may only be connected to the trunk if the equipment is certified as a passive device, not able to feed energy into a DART trunk, and if no hazardous atmosphere is present (hot work permit).

Number of DART Segment Protectors	≤ 4
Number of DART Surge Protectors per trunk	≤ 5
Number of DART Fieldbus Terminators	max. 2
Max. trunk cable length (100 Ω ±20%)	≤ 1000 m

For further information please refer to the installation drawing on the last page of this manual.

4.4 Safety Assessment DART Segment Protector Spur Connection

Entity certified Fieldbus devices are allowed to be connected to the outputs of DART Segment Protectors. All devices that are connected to the outputs must work as a passive current sink (non-feeding).

The maximum safety values of the outputs are:
U_0 = 23 V
I_0 = 47 mA
P_0 = 1.08 W
C_i negligible
L_i negligible

Two different types of safety assessment may be used (see following sub-sections).

4.4.1 Safety Assessment according to the Simplified Entity Model

According to the simplified safety assessment, any type of fieldbus cable may be used for the spurs under following conditions:

Spur cable length	≤ 120 m
Number of fieldbus devices per spur	= 1
Number of Surge Protectors per spur	≤ 2
Number of auxiliary Entity equipment per spur	≤ 1
U_i (field device, surge protector, auxiliary equipment)	≥ 23 V
I_i (field device, surge protector, auxiliary equipment)	≥ 47 mA
P_i (field device, surge protector, auxiliary equipment)	≥ 1.08 W
C_i (field device, surge protector, auxiliary equipment)	≤ 5 nF
L_i (field device, surge protector, auxiliary equipment)	≤ 20 µH

All devices connected to a spur of a DART Segment Protector must be passive (non-feeding).

4.4.2 Safety Assessment according to the Entity Model

Using the standard method to asses an Entity loop, the entity parameters of the devices (field devices, Surge Protectors, auxiliary equipment) and fieldbus cable connected to the spur output have to be less than the entity output parameter of the intrinsically safe source.

U_i	≥ 23 V
I_i	≥ 47 mA
P_i	≥ 1.08 W
$\sum L_i$	≤ 170 µH (gas group IIC) or 1.0 mH (gas group IIB)
$\sum C_i$	≤ 60 nF (gas group IIC) or 470 nF (gas group IIB)

All devices connected to a spur of a DART Segment Protector must be passive (non-feeding).

4.5 Installation Drawing

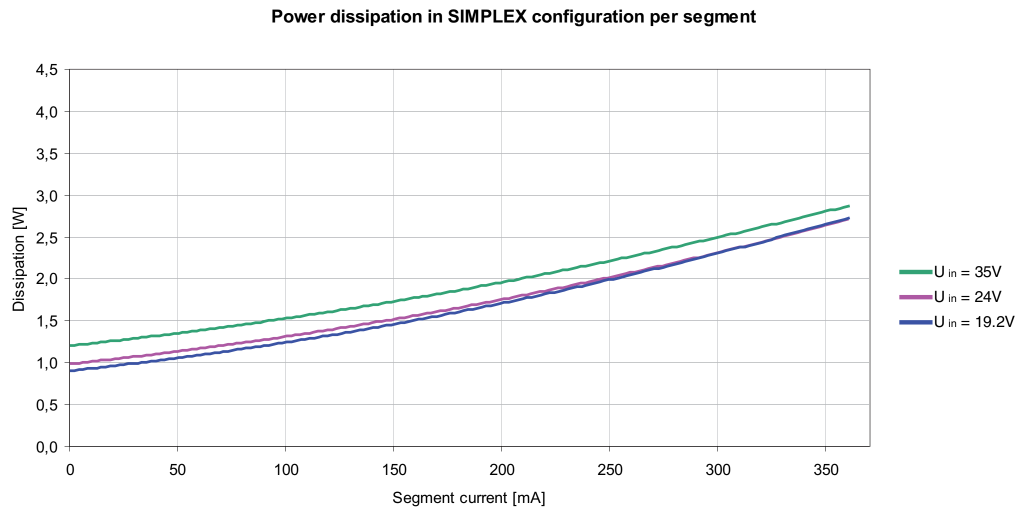
Note!

Please see chapter 8.3 of this manual for the installation drawing.

5 Thermal Dissipation

Thermal Dissipation of HD2-FBPS-IBD-1.24.360

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



6 PROFIBUS Commissioning

6.1 Cyclic Data Exchange

An appropriate configuration tool is required to configure the cyclic data exchange (define the slaves, user data, etc.) via a PROFIBUS-DP master, class 1.

Preparing the Cyclic Data Exchange

1. If necessary, convert existing GSD files for the PA slaves using the P+F GSD converter, then integrate them into the configuration tool.
2. Adapt the response monitor (watchdog) to the master. Guide value: 5 seconds.

6.1.1 Information on GSD conversion

Because coupling is transparent, PROFIBUS PA nodes are treated like PROFIBUS DP slaves by the PROFIBUS DP Master. This also applies to start-up and configuration.

The GSD file must be integrated in a configuration tool before it can be used to configure and operate a PROFIBUS PA slave.

The following distinctions must always be made between GSD files for PROFIBUS PA slaves:

- is the GSD a profile GSD or a GSD specific to a particular manufacturer?
- is the GSD designed to communicate via the RS 485 interface (DP-GSD) or the interface as per IEC 61158-2 (PA-GSD)?

If a profile GSD is being used, the filename indicates whether it is a DP-GSD or a PA-GSD. For example, file PA039733.gsd is the profile GSD for 4 binary outputs. The "PA“ in the filename means it is a PROFIBUS PA slave. The following "0“ indicates it is a DP-GSD. The filename of the PA-GSD for the same profile is PA139733. The "1“ after the PA abbreviation identifies it as a PA-GSD.

If manufacturer-specific GSDs are used, for example to make use of functionality that falls outside the profile, the following convention identifies whether it is a DP-GSD or PA-GSD:

- If not already done, integrate the GSD into your configuration tool.
- Check which baud rates your configuration tool supports.

If a baud rate of 31.25 kBd is supported, this indicates a PA-GSD. The PA-GSD usually only supports the baud rates 31.25 kBd, 45.45 kBd and 93.75 kBd.

If the data transfer rates are supported as per PROFIBUS specification IEC 61158, i.e. baud rates of 9.6 kBd to 1.5 MBd or 12 MBd, this indicates a DP-GSD. Some PROFIBUS PA field device manufacturers do not offer PROFIBUS DP-GSDs. Existing PROFIBUS PA-GSDs must be converted in this case. Suitable conversion software (GSD converter) is available free of charge at www.pepperl-fuchs.com. The sole function of this conversion software is to enter the missing data transfer rates and set certain bus parameters to values that enable the PROFIBUS DP to operate correctly.

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When the GSD file is converted, the following functions are restricted if previously supported by the original GSD file:

- the FREEZE and SYNC functions are disabled. These functions are used with PROFIBUS DPs to synchronize sensors/actuators. and may not work correctly because operations at the PROFIBUS DP end (host end) run at data transfer rates of up to 12 MBd and operations at the PROFIBUS PA end (field end) run at a data transfer rate of 31.25 kBd.

Many PROFIBUS functions are not supported at present. If the field device does not support one or more of the following functions, a warning will appear. This indicates that these will no longer be available after the conversion. The following functions are affected:

- Master class 1 acyclic access

The following PROFIBUS DP V2 functions:

- Data Exchange Broadcast (Publisher/Subscriber)
- Isochronous mode, i.e. synchronous cyclic transmission

Using the Pepperl+Fuchs GSD converter

Note!

The advisory board of the PROFIBUS user organization has agreed not to rescind the certification of GSD files that are modified using Pepperl+Fuchs GSD converter software.

You can select one or more files for conversion by pressing the CTRL or SHIFT keys. Files preceded by a "+" symbol are the result of a previous conversion. These files cannot be converted again and an error message appears if an attempt is made to do so. Files beginning with a "-" symbol have not been converted and can be if required. Double-click to open and view or edit a file.

To convert GSD files, proceed as follows:

1. Start the program PFGSDCX.EXE

   The following dialog window appears:

2. Select the directory that contains the GSD files you wish to convert
3. Select the GSD files you wish to convert
4. Select the directory where you would like to store the converted GSD files
5. Convert the GSD files by clicking the "Process GSD -->" button

   Another window opens displaying information on the finished conversion process.

Note!

Visit www.pepperl-fuchs.com to download the Pepperl and Fuchs GSD converter.

6.1.2 Additional Information about Watchdog Time

PROFIBUS devices can activate a mechanism that monitors each time interval in the cyclic data exchange process (also referred to as user data exchange) to ensure that the PROFIBUS master is still active. The time is measured in the PROFIBUS slave.

If the response monitor is active and the time (T_{WD}) since the last cyclic polling process has expired, the device stops the cyclic data exchange, reverts to its original status (Wait_prm) and secures the status of the outputs.

The time value T_{WD} and the signal for activating the response monitor are transmitted from the PROFIBUS master to the PROFIBUS slave in the parameter telegram at start-up (transmitted during the cyclic data exchange). The time T_{WD} is generally defined specific to the user (not device-specific, not in the GSD). Lesser values are limited by the cycle times.

The time T_{WD} is usually entered via the configuration tool. The watchdog setting in the DP/PA gateway is transparent. On some configuration tools, the response monitor is preset once for the PROFIBUS master. While on other tools, the response monitor is preset individually for each PROFIBUS PA participant. The response monitor value does not change in any way.

Many tools calculate the time T_{WD} automatically with a corresponding baud rate based on the cycle time of the master.

If the baud rates at the PROFIBUS DP end are high (e.g. 12 MBd), the cycle times of the PA end may be 300 times longer. If a PROFIBUS PA device has been programmed directly with a time T_{WD} calculated at a higher master baud rate (DP), this is usually shorter than the PA cycle and the device does not exchange data.

The following bus parameters should be used to ensure the DP/PA gateway operates reliably:

- only one watchdog time T_{WD} is programmed for the entire PROFIBUS system. The longest delay period must be determined in order to define T_{WD}
- one watchdog time T_{WD} is programmed for each individual slave.

The preset (programmed) time T_{WD} must be greater than the maximum occurring delay period T_{V_max}. This is determined as follows:

$T_{V\_max} = T_{cycle\_DP} + T_{cycle\_PA\_channel}$

with $T_{cycle\_PA\_channel}$ = cycle time of the PROFIBUS PA channel

T_{cycle_DP} = cycle time of the PROFIBUS DP

Pepperl+Fuchs recommends a value three times the PROFIBUS PA cycle time.

The PA cycle time $T_{cycle\_PA\_channel}$ depends on:

- the number n of devices attached to the bus on one channel
- the user data length L

The user data length L is a unitless variable calculated as an average quantity of user data input and output (in bytes) for all devices.

The following is an approximate calculation for the cycle time: $T_{cycle\_PA\_channel}$ = n * (0.256 ms * L + 12 ms) + 40 ms

7 Operation

7.1 LED Displays at the DP/PA Gateway

LED display	Possible cause	Remedy
	DP/PA Gateway in operation.	
	No power supply	Check the power supply
	Gateway defective	Restart the Gateway, send Gateway back if the problem persists
	No data exchange at the DP end	Check the cable Check the termination
	Master problem	Check the master
	Gateway defective	Restart the Gateway, send Gateway back if the problem persists
	Hardware fault	Restart the gateway, send gateway back if the problem persists
	Address collision, the same address is assigned to two field devices on two segments	Modify the address of one PA slave
	Hardware fault (LED SEG1 or SEG2)	Restart the Gateway, send Gateway back if the problem persists

7.2 LED Displays on the Power Supply Module

LED display	Possible cause	Remedy
PWR ERR	Power Supply Module in operation.	
PWR ERR	Defective power supply: < 17.5 VDC ± 4% > 36.8 VDC ± 4%	Check the power supply
	Module defective	Send in the module for inspection

8 Appendix

8.1 Ordering Information

Designation	Description
KT-MB-GTB-D-2PS	PROFIBUS Power Hub Compact Kit consisting of: • MBCB-FB-GT-D-2 Motherboard (1 piece) • HD2-GTB-2PA Gateway Module (1 piece) • HD2-FBPS-IBD-1.24.360 DART Fieldbus Power Supply Module (2 pieces)
MBCB-FB-GT-D-2	DART PROFIBUS Power Hub motherboard for two PROFIBUS PA Segments and one PROFIBUS DP to PROFIBUS PA Gateway Module.
HD2-GTB-2PA	PROFIBUS Power Hub Gateway Module for coupling of two PROFIBUS PA Segments to PROFIBUS DP.
HD2-FBPS-IBD-1.24.360	DART Fieldbus Power Supply Module with 20.8 ... 22.3 V DC and 360 mA output.
R3-SP-IBD12	The DART Segment Protector is a fieldbus device coupler for connection of up to twelve intrinsically safe Entity certified field instruments to a DART segment. Certified for installation in Zone 1.
DP-LBF-I1.36.*	The Surge Protector protects fieldbus equipment safely from damages caused by surge voltages or lightning strikes. For use on a DART fieldbus trunk or on the outputs of a DART Segment Protector.

Accessories	
Power Hub	
TP-CON.3.BU	Plug with test probe, 3 pole with screw flange, colour blue, packing unit 4 pcs
Segment Protector	
M-FT-IBD	Fieldbus Terminator for Segment Protector
T-CON.3.BU	Plug with double screw connection for T-connection, 3 pole with screw flange, colour blue, packing unit 4 pcs
TP-CON.3.BU	Plug with test probe, 3 pole with screw flange, colour blue, packing unit 4 pcs
Surge Protection	
DP-LBF-I1.36*	Surge Protector DIN-rail installation for DART trunk and spur connection
TCP-LBF-IA1.36.IE.0	Surge Protector for trunk connections of Segment Protectors R3-SP-IBD*
TPH-LBF-IA1.36.DE.0	Surge Protector for trunk connections of DART Power Hubs
SCP-LBF-IA1.36.IE.0	Surge Protector for spur connections of Segment Protectors R3-SP-IBD*

8.2 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	_

8.3 Installation Drawing

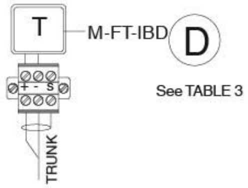
Please see next page to view the installation drawing.

1 INTRINSICALLY SAFE DART CIRCUIT:
THE DASHED LINES ENVELOPE THE DART CIRCUIT. ONLY MATCHED DART CERTIFIED COMPONENTS ARE PERMITTED FOR CONNECTION TO THIS CIRCUIT. FOR PERMITTED DART COMPONENTS, SEE TABLE 3 AND NOTE 7.
STANDARDS: IEC 60079-14 AND IEC 60079-25 APPLY.

2 INTRINSICALLY SAFE CABLE SHIELD/SCREEN EARTH TO IEC 60079-14 AND 25.
THIS MUST BE CONNECTED TO A CLEAN EQUIPOTENTIAL BONDING SYSTEM TO EARTH.
ALL IS and NON-IS SHIELDS/SCREENS MUST BE CONNECTED TO THE SCREEN (S)TERMINALS OR SOCKET/PLUG PINS.

3 INSTALLATION POSITION OPTIONS FOR SURGE PROTECTOR PART No. *-LBF-I1.36-*
WARNING: A MAXIMUM OF 5 SURGE PROTECTORS CAN BE CONNECTED TO EACH TRUNK AND 2 SURGE PROTECTORS CAN BE CONNECTED TO EACH SPUR. SEE TABLE 2.

4 A MAXIMUM OF FOUR R3-SP-IBD* SEGMENT PROTECTORS CAN BE CONNECTED.
SEE TABLE 1 FOR TRUNK LENGTH & CABLE SPECIFICATION.
TEMINATOR M-FT-IBD MUST BE FITTED TO THE FINAL SEGMENT PROTECTOR AS ILLUSTRATED RIGHT.
WARNING:
USE ONLY DART APPROVED TERMINATORS PART No. M-FT-IBD.
A MAXIMUM OF ONE TERMINATOR MAY BE INSTALLED IN THE FIELD.



5 DEVICE ENTITY PARAMETERS:
SEE TABLE 2
ALL DEVICES REMAIN PASSIVE; NON FEEDING I < 50µA

6 TO BE MOUNTED IN A SUITABLE ENCLOSURE, WHICH IS CERTIFIED FOR THE PROVIDED USE.

7 AUXILIARY TEST EQUIPMENT (HAND HELD) CONNECTION:
AUXILIARY TEST EQUIPMENT MAY BE CONNECTED TO THE TRUNK OR SPUR CONNECTION UNDER THE FOLLOWING CONDITIONS:
AUXILIARY TEST EQUIPMENT MUST BE NON-FEEDING, PASSIVE AND CERTIFIED INTRINSICALLY SAFE FOR USE IN ZONE 1 OR ZONE 2.
GAS CLEARANCE (WORKING PERMIT) MUST BE GIVEN WHEN USING NON-DART COMPONENTS ON THE TRUNK.
AUXILIARY TEST EQUIPMENT MAY BE CONNECTED TO THE SPUR OR HOST CIRCUIT WITHOUT GAS CLEARANCE OR WORKING PERMIT.
WHERE THE DART POWER HUB IS INSTALLED IN THE SAFE AREA, HOST CONNECTED AUXILIARY TEST EQUIPMENT MAY NOT NEED TO BE CERTIFIED.

TABLE 1 - TRUNK CABLE AND DEVICES [Ex ib IIC, IIB]

Cable Cross Sectional Area	>= 0.823 mm² or 18 AWG	>= 1.309 mm² or 16 AWG	>= 2.081 mm² or 14 AWG
No. of Segment Protectors	MAXIMUM TRUNK CABLE LENGTH		
1	1000 m	1000 m	1000 m
2	800 m	1000 m	1000 m
3	700 m	1000 m	1000 m
4	600 m	900 m	1000 m
CABLE IMPEDANCE	100 Ohms +/-20%		
NUMBER OF SURGE PROTECTORS	5 MAXIMUM PER TRUNK - SEE TABLE 3		
NUMBER OF DEVICE COUPLERS	A MAXIMUM OF 4 (FOUR) SEGMENT PROTECTORS ONLY - SEE TABLE 3 & NOTE 4		
AUXILIARY TEST EQUIPMENT:	MAX 1 - SEE NOTE 7, Ui ≥ 24 V, Ii ≥ 413 mA		

TABLE 2 - SPUR CABLE & DEVICES [Ex ib] FOR GAS GROUP IIC (IIB in brackets)

	SIMPLIFIED ENTITY MODEL			STANDARD ENTITY MODEL
1 PARAMETER	2 DEVICE PARAMETERS	3 SURGE PROTECTOR PARAMETERS	4 NON-FEEDING AUX TEST EQUIPMENT	5 TOTAL SPUR PARAMETERS (The summation of all components including the cable). See note below.
INPUT VOLTAGE Ui	≥ 23 V	≥ 23 V	≥ 23 V	≥ 23 V
INPUT CURRENT Ii	≥ 47 mA	≥ 47 mA	≥ 47 mA	≥ 47 mA
INPUT CAPACITANCE Ci	≤ 5 nF	≤ 5 nF	≤ 5 nF	IIC: ≤ 60 nF, IIB: ≤ 470 nF
INPUT INDUCTANCE Li	≤ 20 uH	≤ 20 uH	≤ 20 uH	IIC: ≤ 150 uH, IIB: ≤ 1 mH
INPUT POWER Pi	≥ 1.08 W	≥ 1.08 W	≥ 1.08 W	≥ 1.08 W
NUMBER OF DEVICES PER SPUR	1 MAXIMUM	2 MAXIMUM	1 MAXIMUM	See left, column 2,3 and 4
SPUR CABLE LENGTH	≤ 120 m			
CABLE IMPEDANCE	100 Ohms +/-20%			
AUX. TEST EQUIPMENT	MAX 1, SEE NOTE 7, SAFETY VALUES AS FOR DEVICES			

NOTE: The entity parameters can be established by meeting the individual parameters in column 2, 3 and 4. Alternatively, the entity parameters can be established by adding up each component's parameters to ensure that the total spur parameters in column 5 are met, which include the cable parameters Li and Ci.

NON INTRINSICALLY SAFE CIRCUITS MAXIMUM SAFETY INPUT VOLTAGE: Um = 35V PELV/SELV.

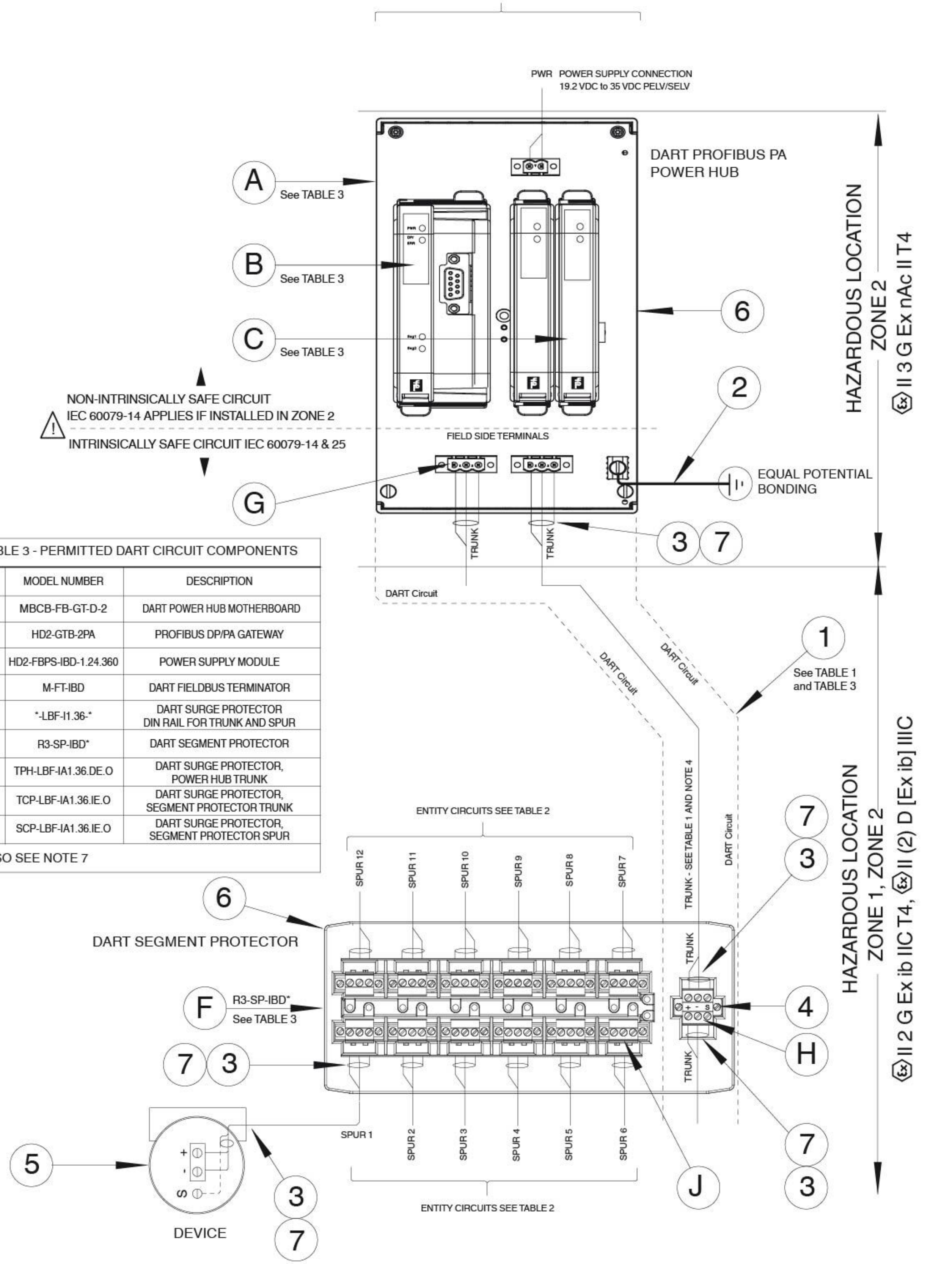


TABLE 3 - PERMITTED DART CIRCUIT COMPONENTS

No.	MODEL NUMBER	DESCRIPTION
A	MBCB-FB-GT-D-2	DART POWER HUB MOTHERBOARD
B	HD2-GTB-2PA	PROFIBUS DP/PA GATEWAY
C	HD2-FBPS-IBD-1.24.360	POWER SUPPLY MODULE
D	M-FT-IBD	DART FIELDBUS TERMINATOR
E	*-LBF-I1.36-*	DART SURGE PROTECTOR DIN RAIL FOR TRUNK AND SPUR
F	R3-SP-IBD*	DART SEGMENT PROTECTOR
G	TPH-LBF-IA1.36.DE.O	DART SURGE PROTECTOR, POWER HUB TRUNK
H	TCP-LBF-IA1.36.IE.O	DART SURGE PROTECTOR, SEGMENT PROTECTOR TRUNK
J	SCP-LBF-IA1.36.IE.O	DART SURGE PROTECTOR, SEGMENT PROTECTOR SPUR
ALSO SEE NOTE 7		

FOR FURTHER INFORMATION, PLEASE REFER TO THE DART SYSTEM MANUAL ON WWW.PEPPERL-FUCHS.COM

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