MANUAL

PROFIBUS Power Hub
Segment Coupler 3
(SK3)
With HD2-GTR-4PA Gateway

FieldConnex ®

PEPPERL+FUCHS

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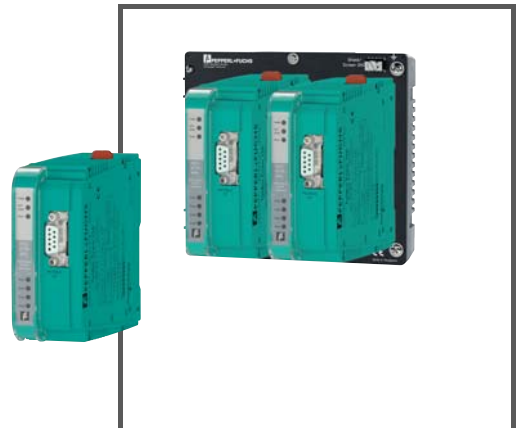
With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI)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

PEPPERL+FUCHS

PEPPERL+FUCHS

PEPPERL+FUCHS

1 Introduction

1.1 Contents

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note!

This document does not substitute the instruction manual.

Note!

For full information on the product, refer to the instruction manual and further documentation on the Internet at www.pepperl-fuchs.com.

The documentation consists of the following parts:

- Present document
- Instruction manual
- Datasheet

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Additional documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

2016-10

PEPPERL+FUCHS

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols

Note!

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2016-10

PEPPERL+FUCHS

2   Product Specifications

2.1   Overview and Application

Various simplex or redundant Power Hub solutions provide power to PROFIBUS PA segments. Power Hubs are available for high–power trunk, FISCO, and DART. As part of the Power Hub system, the PROFIBUS Power Hub Segment Coupler SK3 connects and supplies 4 PROFIBUS PA segments per gateway to PROFIBUS DP in accordance with IEC 61158–2. The Segment Coupler ensures communication and galvanic isolation between PROFIBUS PA and PROFIBUS DP.

The Segment Coupler SK3 may be installed in Zone 2 equipment category 3G hazardous areas. Types of protection are Ex nA (non-sparking) for Zone 2, gas groups IIC, IIB, and IIA.

The SK3 can be used in all system environments that are compliant to industry standard PROFIBUS DP masters.

The FieldConnex® PROFIBUS Power Hub system has a modular design. A number of possible combinations is available in order to meet the specific requirements of different explosion protection concepts or the need for increased segment availability. Functionally, the system can be divided into 2 types of component categories:

- Coupling components (described in this document)
- Segment supply components (described in the Power Hub manuals)

The following table lists the modules and motherboards and shows in which category they belong:

Coupling Components	Segment Supply Components
Modules	
Gateway module HD2-GTR-4.PA	Power supply modules HCD2-FB* Diagnostic modules HD2-DM*
Motherboards	
Gateway motherboard simplex, MBHC-FB-4.GT Gateway motherboard redundant, MB-FB-GTR1	Power Hub motherboards simplex or redundant: MBHC-FB-4.HSC, MBHC-FB-4R.HSC*
	DART Power Hub motherboard redundant: KT-MB-FB-D-4R.GEN

PEPPERL+FUCHS

4 x PA Fieldbus Trunk
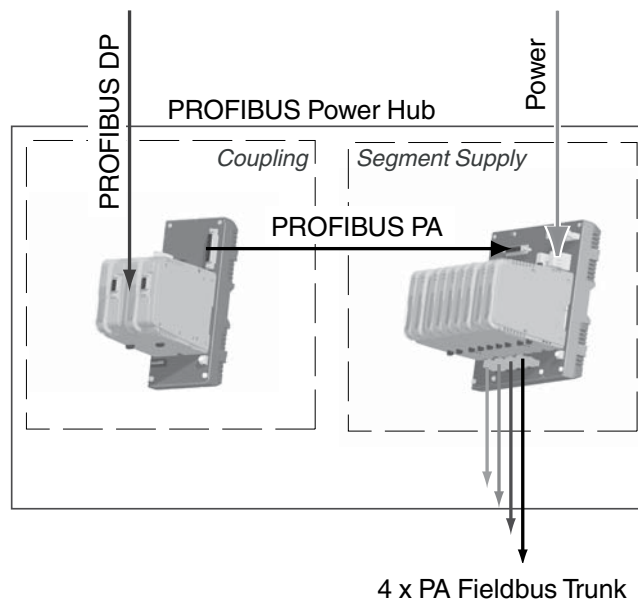
Various Power Hub power supply solutions offer simplex or redundant power to PROFIBUS PA segments. The Power Hub consists of a motherboard with sockets for plug-in modules.

- 1 power supply module per segment in simplex mode or 2 power supply modules per segment in redundant mode

- 1 physical layer diagnostic module HD2-DM*

The Power Hub feeds segments following the high–power trunk concept for explosion protection. High energy on the trunk line is fed to the field devices via couplers such as FieldBarriers or Segment Protectors. A dedicated version of the DART Power Hub supports the intrinsically safe concept for fieldbus.

Also, 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. This way, they make the fieldbus physical layer visible which can now be treated as an active component in plant asset management systems. Operating personnel are enabled to decide on proactive measures to avoid unwanted situations while the plant is running smoothly.

Note!

The segment supply is part of the PROFIBUS Power Hub system. For detailed information go to www.pepperl-fuchs.com and look up to the corresponding documentation of the fieldbus power supply you installed.

2.2 Coupling

Coupling involves a gateway motherboard and 1 or, in the case of redundant coupling, 2 gateway modules. The purpose of coupling is to adjust the physical data transfer properties on the PROFIBUS DP side (RS–485) to those of PROFIBUS PA (in conformity with IEC 61158–2). The coupling provides a baud rate of 31.25 kbit/s on the PROFIBUS PA side. In addition, the coupling generates galvanic isolation between PROFIBUS DP and

2016-10

PEPPERL+FUCHS

PROFIBUS PA. The DP/PA coupling of the PROFIBUS Power Hub system is functionally compatible with the Pepperl+Fuchs Segment Coupler 2. The coupling of the PROFIBUS PA slave to the PROFIBUS DP is transparent. This means that all PA slaves appear on the PROFIBUS DP bus and are interpreted by the host as PROFIBUS DP slaves. A PROFIBUS DP address is also assigned to the gateway itself for diagnostic and parameterization purposes.

Cyclic data exchange can be connected redundantly to the PROFIBUS DP line by using the redundant gateway motherboard MB–FB–GTR1 and 2 HD2-GTR-4PA gateways.

The gateway module HD2-GTR-4PA supports the PROFIBUS flying redundancy (see chapter 8), as well as all non-redundant DP masters. The gateway fulfills the following tasks:

- Conversion of the PROFIBUS DP physical layout to that of PA
- Adjustment of the PROFIBUS DP transfer rate to the PA transfer rate
- Galvanic isolation between PROFIBUS DP and PA
- Elementary functional diagnostics via LEDs
- Ensuring increased availability through redundant coupling of cyclic data exchange (with redundant layout)
- Acyclic parameterization of gateway parameters by FDT/DTM
- Redundancy diagnostics (with redundant layout)

2.3 Segment Supply

The field devices are supplied with power via power supply modules on a Power Hub motherboard and via fieldbus lines to the individual segments. The simplex Power Hub version features 4 power supply slots, the redundant Power Hub version 8 power supply slots. PROFIBUS PA segments can receive redundant power supplies if a redundant Power Hub motherboard is used with 2 power supply modules for each segment.

In summary, the segment supply fulfills the following tasks:

- Power supply of field devices: power and communication signal
- Redundant supply for high system availability
- Elementary diagnostic information via LEDs
- Advanced physical layer diagnostics via the HD2-DM* diagnostic module and the FDT/DTM software package (see corresponding documentation)

2.4 System Components

Motherboards

The following types of motherboards are available:

The gateway motherboard MB-FB-GTR1 has 2 slots for up to 2 HD2-GTR-4PA Segment Coupler 3 gateway modules. The gateway motherboard is designed for the use with Power Hub motherboards holding power supply modules supplying PROFIBUS PA segments. The motherboards are connected with a customized cable that is included in the delivery of the gateway motherboard. The MB-FB-GTR1 motherboard can also be used with one gateway in simplex operation. In this case special handling of slave address setting is required. For more information, see chapter 5.1.

The following versions of power supply motherboards are available:

- MBHC-FB-4.HSC* supports 4 simplex segments, redundant bulk power supply
- MBHC-FB-4R.HSC* supports 4 redundant segments, redundant bulk power supply
- MBHD-FB-D-4R.GEN supports 4 redundant DART intrinsically safe segments, redundant bulk power supply

For further information refer to the specific product documentation.

PEPPERL+FUCHS

The MBHC-FB-4.GT compact motherboard features slots for HD2-GTR-4PA 1 gateway, 4 simplex power supply modules, and 1 diagnostic module.

Gateway Module

The Segment Coupler 3 gateway module HD2-GTR-4PA connects 4 PROFIBUS PA segments to PROFIBUS DP. Together with fieldbus power modules, PROFIBUS PA segments are supplied directly via fieldbus lines.

Coupling is transparent, so each PA device is addressed and configured as a PROFIBUS DP device.

The HD2-GTR-4PA module includes 4 PROFIBUS PA masters for time-independent data transfer.

An FDT/DTM-based PC software is available for the parameterization of the gateway and for performing several status and diagnostic functionalities.

When used with the respective motherboard, 2 gateways provide redundant coupling. HD2-GTR-4PA supports the PROFIBUS "flying redundancy" as well as all non-redundant masters.

Fieldbus Power Supply Modules

The fieldbus power supplies supply the PROFIBUS PA segments with power. For different application requirements, dedicated power supply modules are available:

- HCD2-FBPS-1.500. Output: 30 V at 500 mA with an intrinsically safe limited voltage for Zone 2 of $U_o = 30$ V

- HCD2-FBPS-1.23.500. Output: 23 V at 500 mA with an intrinsically safe limited voltage for Zone 2 of $U_o = 24$ V

- HD2-FBPS-IBD-1.24.360. Output: 24 V at 360 mA for intrinsically safe (DART) segments installed in Zone 1

The power supply modules provide full galvanic isolation between the bulk power supply and the PA segments. The modules offer system reliability for applications where cabling and wiring are routed through critical or harsh electrical environments, with full protection from electromagnetic interference (EMI).

Power supply modules are plugged into the motherboard slots and can be exchanged during system operation. In redundant configuration, load is shared between 2 power supply modules.

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 supply modules operating in redundant configuration are checked for compatibility. LEDs indicate both status and fault information. This information can be transmitted via volt-free contact.

For further information refer to the manual "Basic Diagnostic Module " at www.pepperl-fuchs.com.

Advanced Diagnostic Module

The advanced diagnostic module is a comprehensive measurement tool for the PROFIBUS PA physical layer, and supports commissioning, online monitoring, and maintenance tasks. 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 basic edition of the diagnostic manager

2016-10

PEPPERL+FUCHS

displays all data in an easy-to-use user interface. The professional edition of the diagnostic manager offers extended software functions: the commissioning wizard generates automated reports; the software displays clear-text messages for troubleshooting of out-of-specification behavior. The OPC server transmits user-selectable common alarms to the process control system.

For further information refer to the manual "Advanced Diagnostic Module " at www.pepperl-fuchs.com.

2.5 Recommended System Combinations

Simplex Power Feed for 4 Segments with Gateway Redundancy

Figure 2.1   MBHC-FB-4.HSC motherboard for the simplex supply of 4 segments combined with the MB-FB-GTR1 motherboard and 2 gateway modules HD2-GTR-4PA for redundant gateway coupling.

The simplex system with a redundant gateway coupling consists of the following components:

- Combined Power Hub gateway motherboard MBHC–FB–4.HSC
- HD2-GTR-4PA* (x 2)
- Power supply modules (x 4)
- Sub-D cable, 9 pins

Optional components:

- Diagnostic module
- Surge protectors TPH-LBF-IA1.36.DE* (x 4)
- Earth bar for surge protectors ACC–LBF–EB.4

PEPPERL+FUCHS

Simplex Power Feed for 4 Segments with Single Gateway
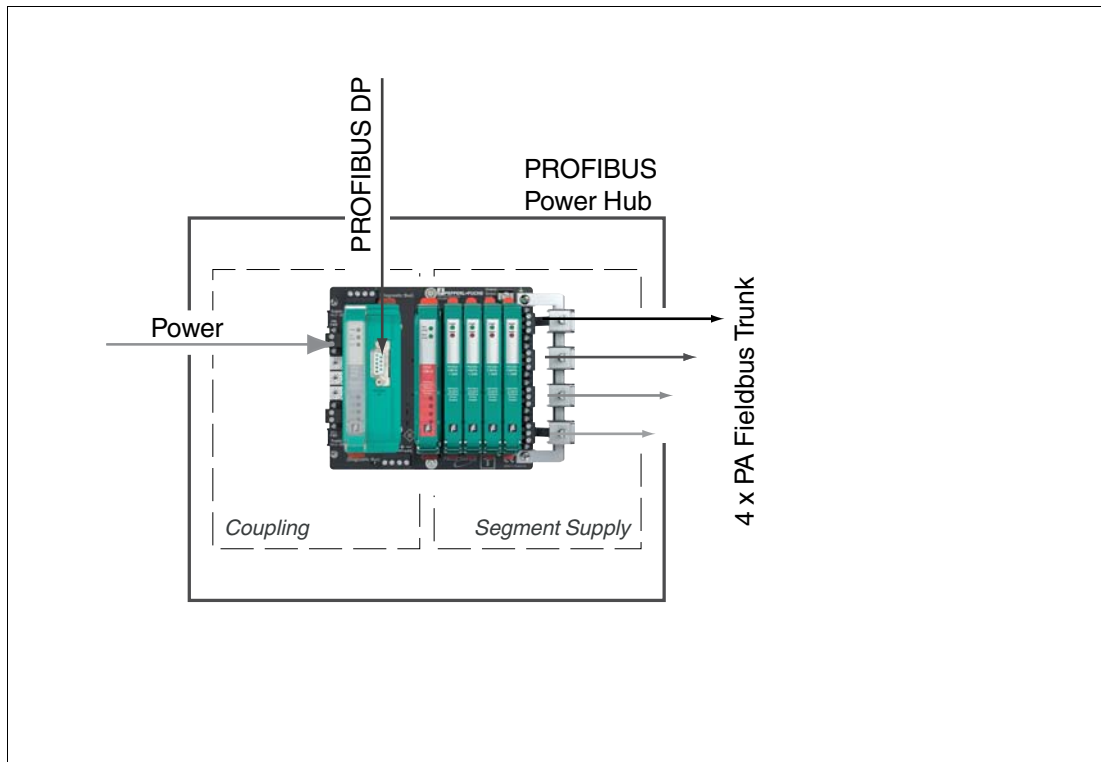
Figure 2.2   MBHC-FB-4.GT* motherboard for the simplex supply of 4 segments amd 1 gateway
                    module HD2-GTR-4PA for simplex gateway coupling.

The one-board simplex system with single gateway coupling consists of the following
components:

- Combined Power Hub gateway motherboard MBHC–FB–4.GT

- HD2-GTR-4PA* (x 1)

- Power supply modules (x 4)

Optional components:

- Diagnostic module

- Surge protectors TPH-LBF-IA1.36.DE* (x 4)

- Earth bar for surge protectors ACC–LBF–EB.4

PEPPERL+FUCHS

Redundant Power Feed for 4 Segments with Gateway Redundancy
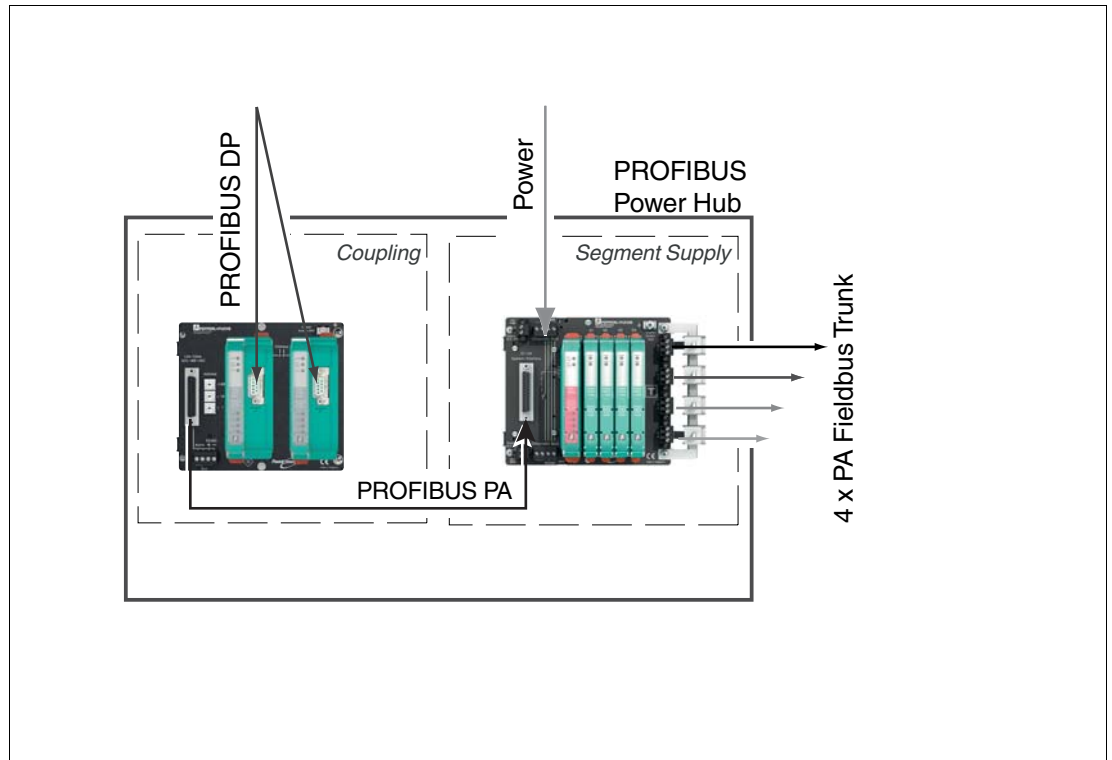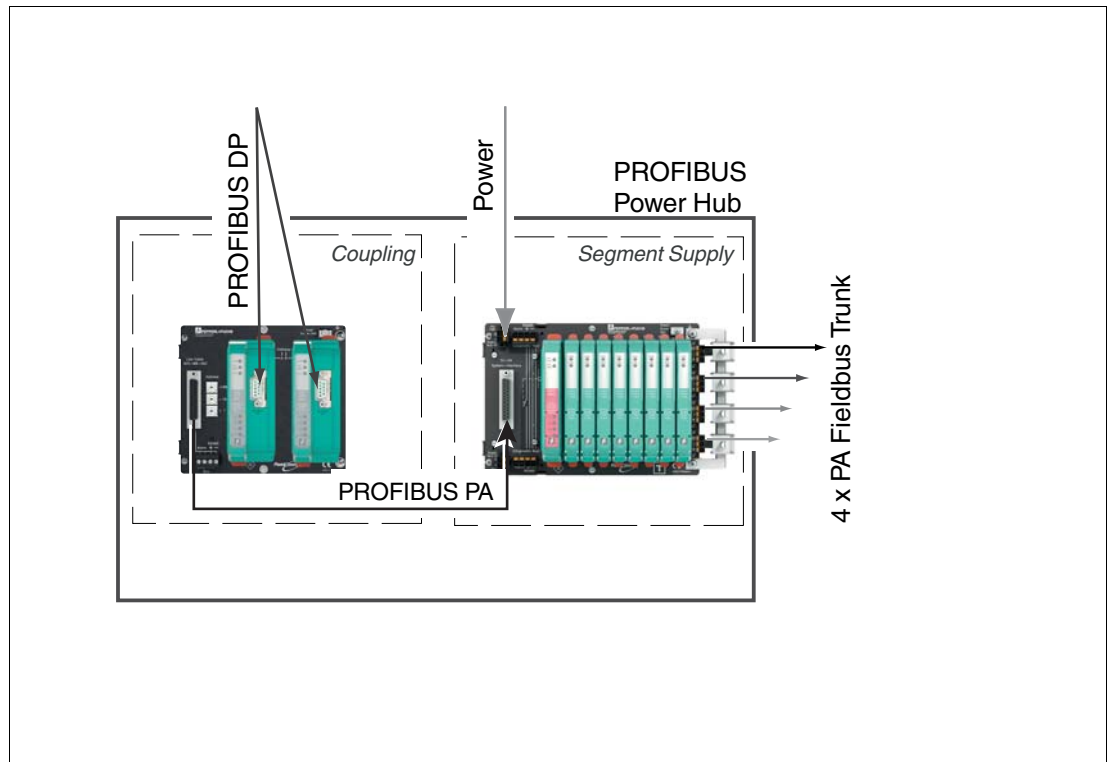

Figure 2.3   MBHC-FB-4R.HSC motherboard for the redundant supply of 4 segments combined with the MB-FB-GTR1 motherboard and 2 gateway modules HD2-GTR-4PA for redundant gateway coupling.

The redundant system with a redundant gateway coupling consists of the following components:

- Combined Power Hub gateway motherboard MBHC–FB–4R.HSC
- HD2-GTR-4PA* (x 2)
- Power supply modules (x 8)
- Sub-D cable, 9 pins

Optional components:

- Diagnostic module
- Surge protectors TPH-LBF-IA1.36.DE* (x 4)
- Earth bar for surge protectors ACC–LBF–EB.4

Note!

Combining a simplex gateway motherboard with a redundant Power Hub motherboard is not recommended. Since a fault in the coupling of DP to PA results in failure of all 4 segments at once, but the failure of a single segment does not have any effect on the remaining segments, increased segment availability can be achieved most easily with redundant coupling.

PEPPERL+FUCHS

2.6   Component Overview

MB-FB-GTR1* Component Overview
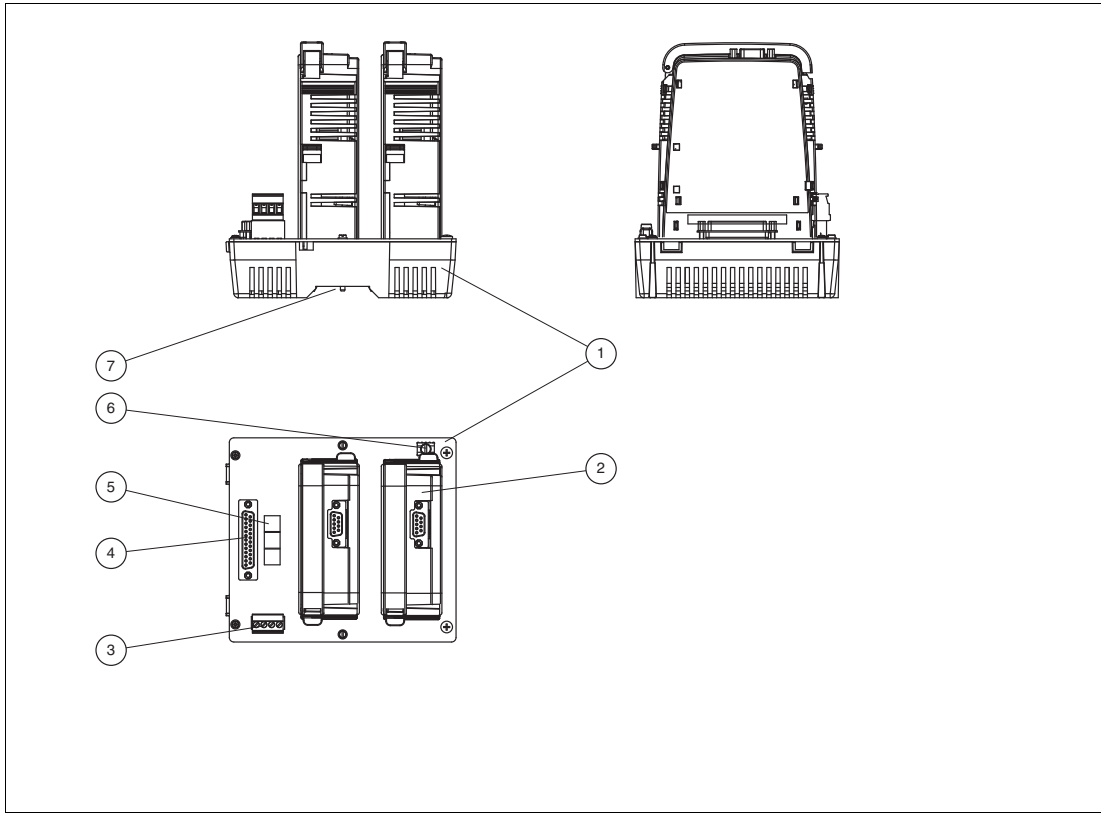
Figure 2.4   MB-FB-GTR1* component identity

1   Motherboard MB-FB-GTR1*

2   Gateway HD2-GTR-4PA

3   Connections: Volt-free contact alarm and diagnostic bus.
          Diagnostic link cable ACC-MB-HDC, optional accessory

4   Sub-D interface for the connection of Power Hub motherboards

5   Rotary switches for gateway addressing, x1, x10, x100

6   Earth connection

7   Mounting slot for DIN mounting rail

2016-10

PEPPERL+FUCHS

HD2-GTR-4PA Component Overview
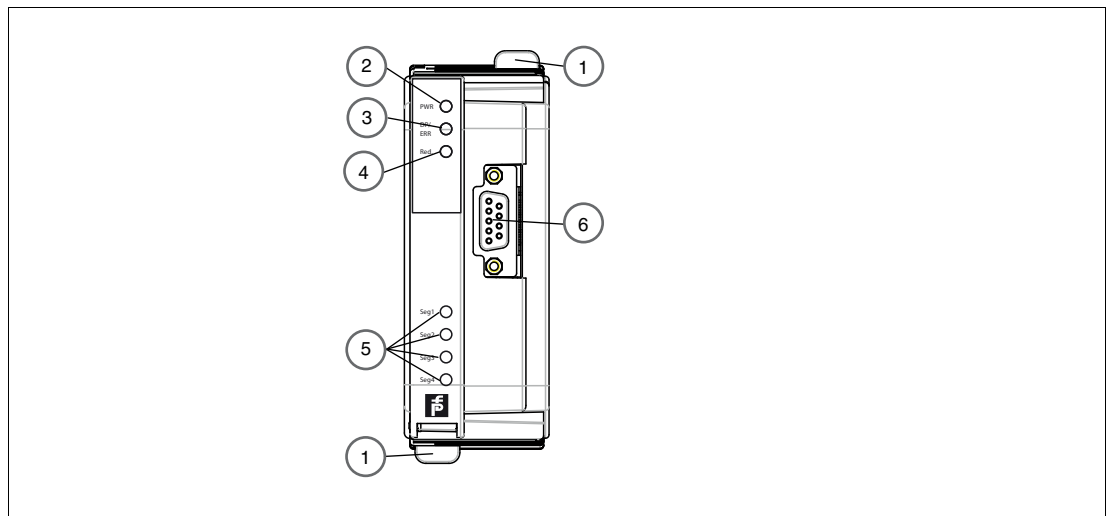
Figure 2.5   HD2-GTR-4PA component identity

1   Quick Lok bar

2   LED "PWR":
- Green: Power on

3   LED "DP/ERR":
- Red flashing at 2 Hz: DP error
- Red constant: Hardware error

4   LED "Redundancy":
- Yellow constant: Redundancy operation (this gateway module is the primary device)
- Yellow flashing at 2 Hz: Synchronization or redundancy are not available (this gateway module is the primary device)
- LED off: Single operation (simplex). In redundant mode, this gateway module is the secondary device

5   LED Seg 1 ... Seg 4:
- Red, flashing at 2 Hz: PA error
- Any segment LED in combination with LED "DP/ERR" on: MAU hardware error

6   PROFIBUS DP interface

2.7   Technical Data

System Overview	
Ambient conditions	
Ambient temperature	-40 ... 60 °C (-40 ... 140 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	< 95 % non-condensing
Shock resistance	15 g 11 ms
Vibration resistance	1 g , 10 ... 150 Hz
Pollution degree	max. 2, according to IEC 60664
Corrosion resistance	acc. to ISA-S71.04-1985, severity level G3
Mechanical specifications	
Degree of protection	IP20
Mounting	motherboard mounting

PEPPERL+FUCHS

System Overview	
Standard conformity	
Electrical isolation	IEC 62103
Electromagnetic compatibility	NE 21:2011
Degree of protection	IEC 60529
Fieldbus standard	IEC 61158-2
Shock resistance	EN 60068-2-27
Vibration resistance	EN 60068-2-6

HD2-GTR-4PA

System Overview	
Supply	
Rated voltage	19.2 ... 35 V DC
Rated current	160 ... 90 mA
Power dissipation	3 W
Fieldbus interface	
PROFIBUS DP	
Connection	9-pin Sub-D socket
Protocol	PROFIBUS DP V1
Electrical isolation	
CH/PROFIBUS DP	functional insulation acc. to IEC 62103, rated insulation voltage 50 V_{eff}
PROFIBUS DP/Supply	
CH/CH	
All circuits/FE	
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 04 ATEX 2500 X
Group, category, type of protection, temperature class	⟨Ex⟩ II 3 G Ex nA IIC T4 Gc
Directive conformity	
Directive 94/9/EC	EN 60079-0:2012 , EN 60079-11:2012 , EN 60079-15:2010
International approvals	
FM approval	CoC 3024816, CoC 3024816C
Approved for	Class I, Division 2, Groups A, B, C, D, T4 / Class I, Zone 2, AEx/Ex nA IIC T4
IECEx approval	IECEx TUN 13.0038X
Approved for	Ex nA IIC T4 Gc

MB-FB-GTR1*

Supply	
Rated voltage	19.2 ... 35 V SELV/PELV
Rated current	2 ... 3 A
Indicators/operating means	

2016-10

PEPPERL+FUCHS

Fault signal	VFC alarm output via connectors
Rotary switch	bus addressing, gateway-specific
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 15 ATEX 7735 X
Group, category, type of protection, temperature class	⟨Ex⟩ II 3 G Ex ec IIC T4 Gc
Directive conformity	
Directive 94/9/EC	EN 60079-0:2012 , EN 60079-7:2015 , EN 60079-11:2012
International approvals	
IECEx approval	IECEx TUR 16.0007X
Approved for	Ex ec IIC T4 Gc

Accessories	
ACC-MB-HDC	Diagnostic link cable, length 6 cm
ACC–MB–HGC	Sub-D cable, 9 pins for connecting the gateway motherboard and Power Hub motherboard. Included in the delivery of gateway motherboards.

Overview of Ordering Information	
HD2–GTR–4PA	Gateway module for 4 PROFIBUS PA segments
MB-FB-GTR1	Motherboard for gateway redundancy, slots for 2 gateway modules with removable screw terminals
MB-FB-GTR1.1	Motherboard for gateway redundancy, slots for 2 gateway modules with removable spring terminals

PEPPERL+FUCHS

2.8 Dimensions

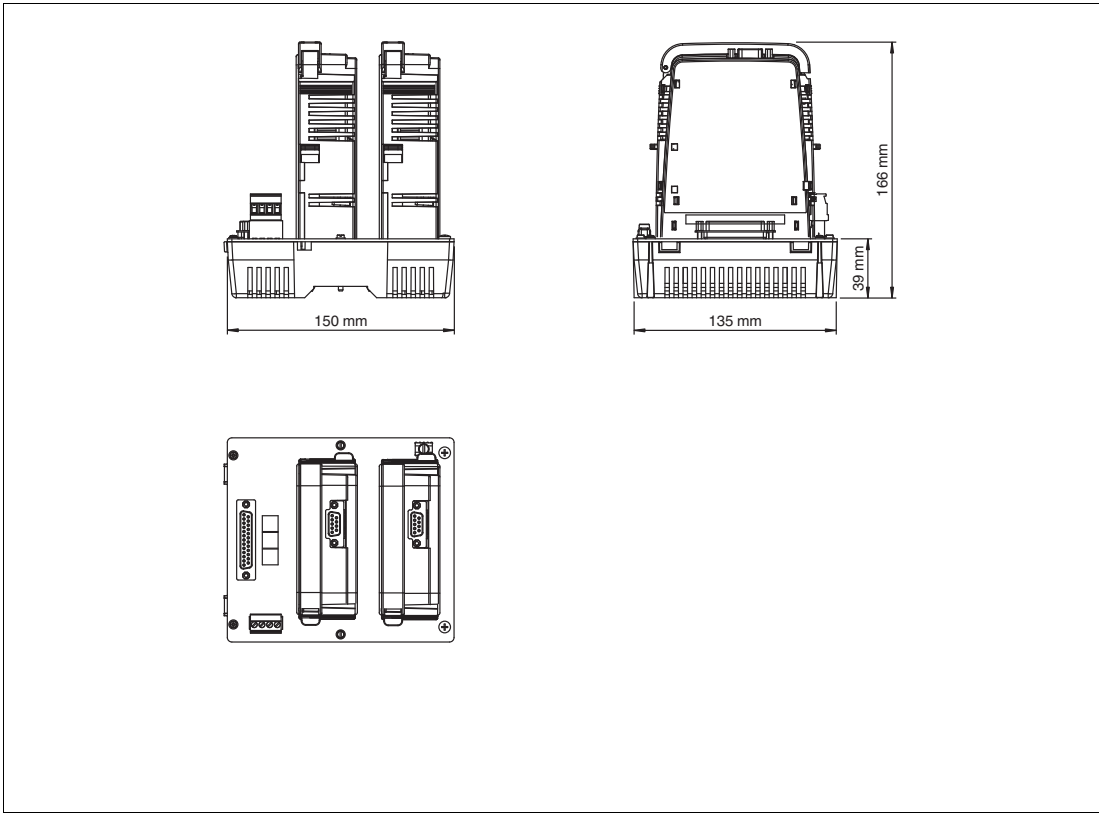**Component Dimensions**

Figure 2.6   All dimensions in millimeters and without tolerance indication.

PEPPERL+FUCHS

3 Installation and Commissioning

In the following section you find information on how to install and commission the device in your fieldbus topology.

STOP

Danger!

Explosion hazard from exposure to potentially explosive gas atmosphere

If the device is installed in Zone 2 without mounting it in a sufficiently suitable enclosure, gas, dust, water or other external interferences can cause the live device to spark. The sparks can ignite the surrounding potentially explosive atmosphere.

Only mount the device in an enclosure with degree of protection IP54 according to IEC/EN 60529. The enclosure must have an EU declaration of conformity according to the ATEX Directive for at least equipment category 3G.

STOP

Danger!

Explosion hazard from exposure to potentially explosive dust atmosphere

If the device is installed in Zone 22 without mounting it in a sufficiently suitable enclosure, dust, water or other external interferences can cause the live device to spark. The sparks can ignite the surrounding potentially explosive atmosphere.

Only mount the device in a suitable enclosure. The enclosure must have an EU declaration of conformity according to the ATEX Directive for at least equipment category 3D.

STOP

Danger!

Explosion hazard from live wiring

If you connect or disconnect energized non-intrinsically safe circuits in a potentially explosive atmosphere, sparks can ignite the surrounding atmosphere.

Only connect or disconnect energized non-intrinsically safe circuits in the absence of a potentially explosive atmosphere.

Note!

Read the instruction manual first!

Before you install and commission this product: Read the instruction manual for this product carefully. Make sure you have understood all information that is relevant for your application.

3.1 Mounting and Dismounting

STOP

Danger!

Danger to life from wrong mounting and installation

Incorrect mounting and installation of the device can compromise its function and its electrical safety.

- Observe the safety instruction in the instruction manual.
- Observe the information in the manual.

PEPPERL+FUCHS

STOP

Danger!

Explosion hazard from damaged electronic components

Premature wear of electronic components in a device that was previously used in a general electrical installation can cause sparks that can ignite the surrounding potentially explosive atmosphere.

Never install devices that have already been operated in general electrical installations in electrical installations used in combination with hazardous areas!

▶ Mounting of Fieldbus Motherboards on DIN Mounting Rail

In order to mount a motherboard on a DIN mounting rail, proceed as follows:

1. Place the motherboard on the DIN mounting rail.
2. Tighten the two fastening screws to attach the motherboard on the DIN mounting rail.
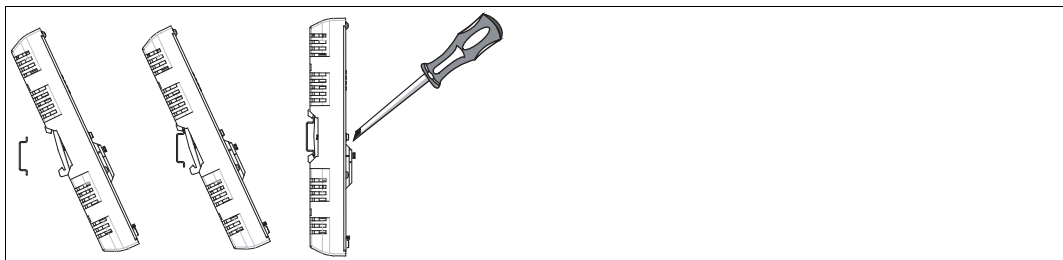
↳ The motherboard has been mounted.

▶ Mounting Plug-In Modules on the Motherboard

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

1. Carefully center the polarization holes and mate the 2 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.
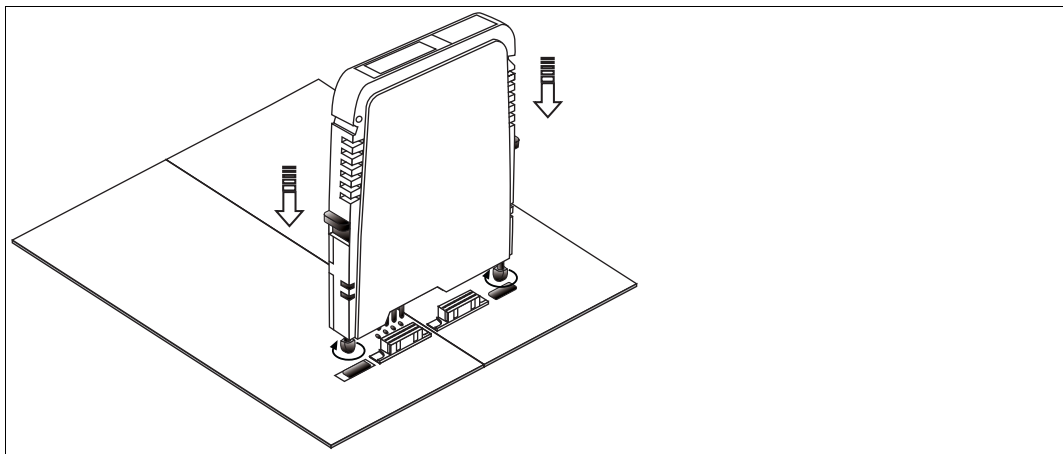
↳ The new module has been installed.

▶ Dismounting 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 carefully lift off the entire module.

↳ The module has been removed from the motherboard.

2016-10

PEPPERL+FUCHS
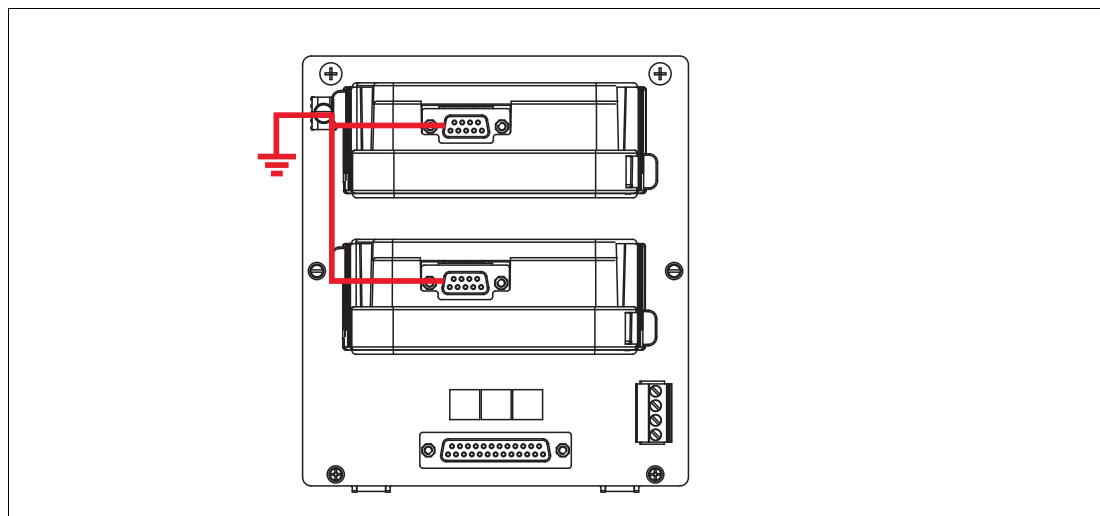
3.2 Shielding/Grounding

Figure 3.1   Stylized composition of the shield lines inside the gateways

The shield (screen) of the PROFIBUS cable on the gateway is directly connected to the grounding terminal of the motherboard.

Tip

Earth Connection

Ensure that the grounding practice applied is well-planned and consistent. Ensure a clean earth always.

We recommend connecting the grounding terminal to earth in order to achieve the highest protection against electromagnetic interference (EMI).

It may be necessary to ground all exposed metal parts as a matter of course.

3.2.1 Connection to Equipotential Bonding System

Caution!

Risk of electric shock or property damage from inadequate grounding

If you fail to connect all metal parts of the device to protective local earth correctly, this could result in potential equalization currents. These currents could hurt operating personnel or cause property damage.

The grounding terminal is not a safety earth: Do not use the grounding terminal to ground exposed metal parts.
Ground exposed metal parts of the device separately. Ensure that a correct grounding is guaranteed at all times.

All shield connections are internally connected to the "Shield/Screen GND" grounding terminal.

Connecting the Ground Connection Cable

Note!

Use a cable with a minimum cross core section of 4 mm².

1. Connect the ground cable to a cable lug.
2. Position the cable lug over the ground connection clamp with the cable pointing downwards.

PEPPERL+FUCHS

3. Screw the cable lug to the ground connection clamp with 2 toothed lock washers inserted between screw, lug, and clamp as illustrated:
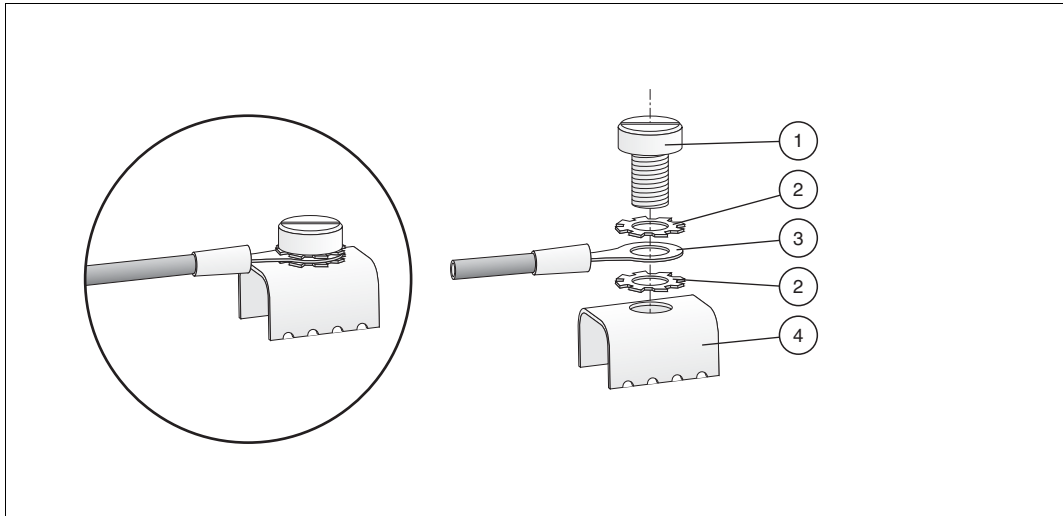
Figure 3.2   Connecting the ground connection cable

1   Screw

2   Toothed lock washer

3   Cable lug

4   Ground connection clamp on motherboard

4. Tighten the screw with a torque of 1.5 Nm.

↳ The cable lug is properly attached and cannot come loose.

Connect the "Shield/Screen GND" grounding terminal to an equipotential bonding system.

PEPPERL+FUCHS

3.3 Connections

Connections
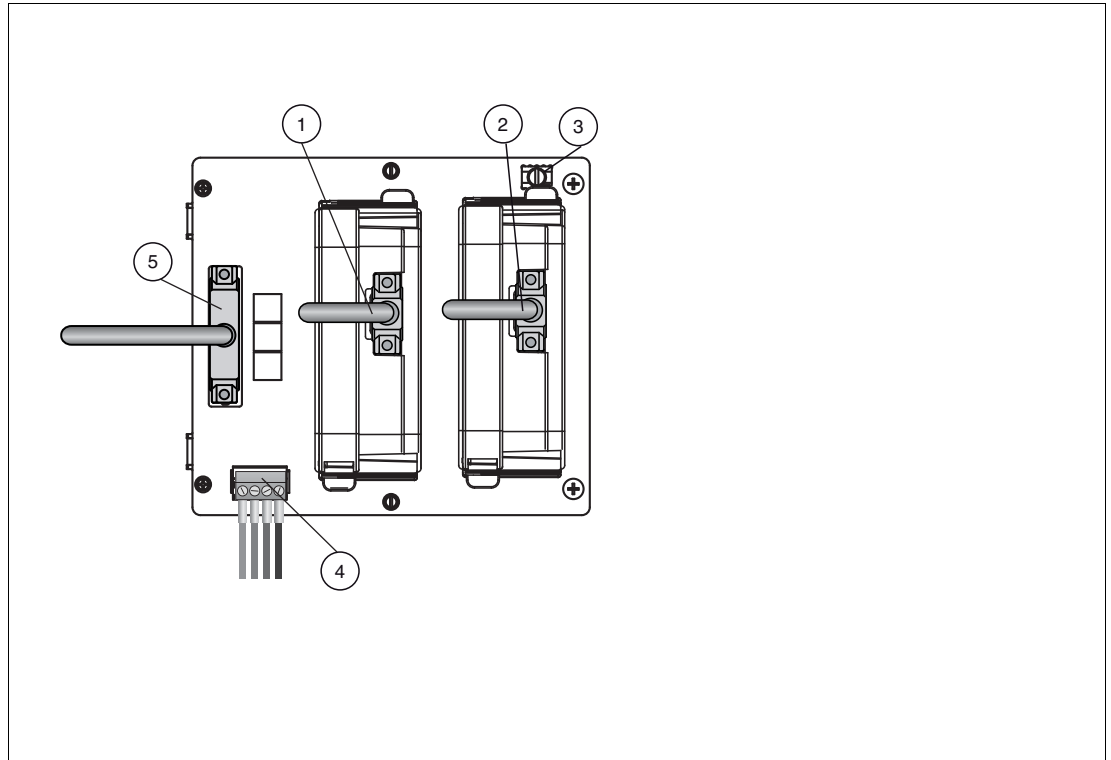
1   PROFIBUS DP connection

2   PROFIBUS DP connection

3   Grounding terminal

4   Connections: Volt-free contact alarm and diagnostic bus. Diagnostic link cable ACC-MB-HDC, optional accessory

5   Sub-D connection to Power Hub motherboard MBHC-FB-4*.HSC* using ACC-MB-HDC link cable

PEPPERL+FUCHS

Connections of the PROFIBUS Power Hub System
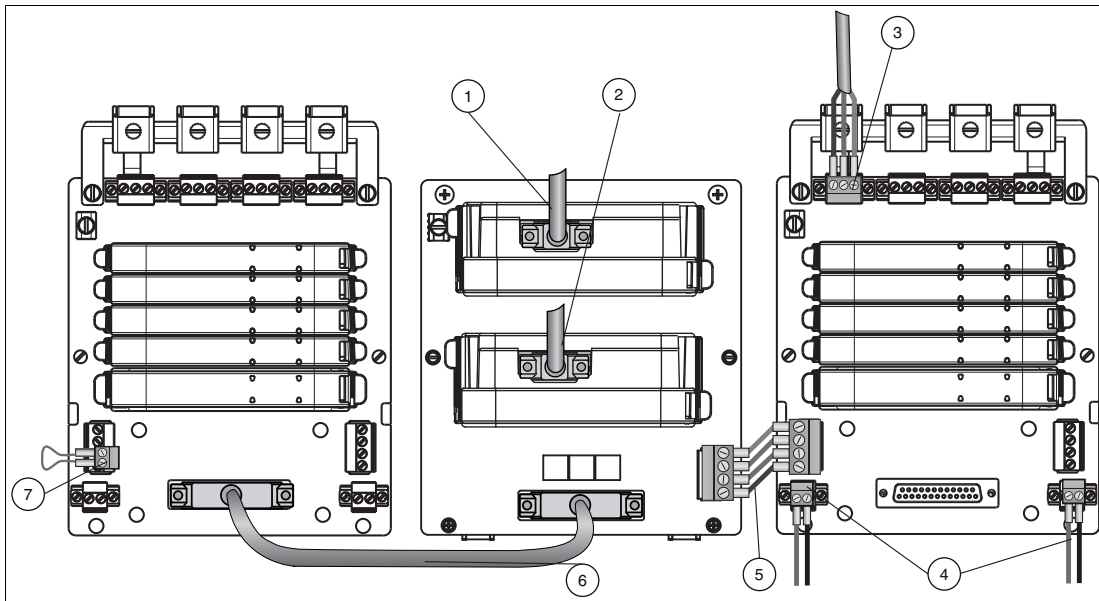
1	PROFIBUS DP connection
2	PROFIBUS DP connection
3	Trunk connections (4 x)
4	Primary and secondary bulk power supply connection
5	ACC-MB-HDC diagnostic link cable connecting neighboring Power Hubs (optional)
6	Diagnostic link cable ACC-MB-HDC, optional accessory
7	Final motherboard link (optional)

Note!

Different Ways to Transmit Diagnostic Information

By default, diagnostic information from the diagnostic module HD2-DM* is transmitted via the gateway. It is not necessary to connect neighboring Power Hubs.

Alternatively, the gateway can be bypassed and the diagnostic information can be transmitted via a separate bus. In this case, neighboring Power Hubs need to be connected using the ACC-MB-HDC diagnostic link cable. The last Power Hub in a row has to be fitted with a final motherboard link (see picture below).

2016-10

PEPPERL+FUCHS

4 Hazardous Area Installation and Use

4.1 Installation in Zone 2, Category 3G

> **STOP**
>
> ***Danger!***
>
> Explosion hazard from exposure to potentially explosive gas atmosphere
>
> If the device is installed in Zone 2 without mounting it in a sufficiently suitable enclosure, gas, dust, water or other external interferences can cause the live device to spark. The sparks can ignite the surrounding potentially explosive atmosphere.
>
> Only mount the device in an enclosure with degree of protection IP54 according to IEC/EN 60529. The enclosure must have an EU declaration of conformity according to the ATEX Directive for at least equipment category 3G.

> **STOP**
>
> ***Danger!***
>
> Explosion hazard from damaged electronic components
>
> Premature wear of electronic components in a device that was previously used in a general electrical installation can cause sparks that can ignite the surrounding potentially explosive atmosphere.
>
> Never install devices that have already been operated in general electrical installations in electrical installations used in combination with hazardous areas!

> **STOP**
>
> ***Danger!***
>
> Explosion hazard from exposed conductors
>
> Exposed conductors of inadequately attached cables can cause sparks that can ignite the surrounding potentially explosive atmosphere.
>
> When installing the device ensure that the cables are adequately attached.

> **STOP**
>
> ***Danger!***
>
> Explosion hazard from connection damage
>
> Manipulating connections outside of the specified ambient temperature range can lead to material damage, resulting in an unwanted failure of the connection. This could result in an increased explosion hazard in potentially explosive atmospheres.
>
> Only manipulate connections in the specified ambient temperature range.
> Temperature range: -5 C° ... +70 C°

The PROFIBUS Power Hub Segment Coupler may be installed in Zone 2, equipment category 3G. The motherboard MB-FB-GTR1 has the type of protection Ex ec (increased safety), and the gateway module HD2-GTR-4PA has the type of protection is Ex nA (non-sparking) for Zone 2, gas groups IIC, IIB, or IIA.

Depending on the type of power supply modules used, different topologies and Zone 2 installations can be implemented. The fieldbus trunk is always categorized as Ex nA for Zone 2 applications. Connecting the PROFIBUS Power Hub with the Pepperl+Fuchs Segment Protectors allows for hot swapping of field devices.

2016-10

PEPPERL+FUCHS

5 PROFIBUS Commissioning

5.1 Device Address Assignment

Before mounting the HD2-GTR-4PA gateway module, assign a slave address to the built-in slave of the gateway.

In order to assign the slave address use the 3 control switches on the motherboard. They can be used to assign 3–digit addresses.

Permitted Address Ranges

In non-redundant configuration using the motherboard MBHC-FB-4.HSC: 0 … 125

In redundant configuration using the motherboard MB-FB-GTR1: 500 ... 625
Address setting corresponds to slave address 0, 625 corresponds to slave address 125.

In redundant configuration using the motherboard MB-FB-GTR1: 0 … 61

Assigning an invalid address for the type of operation required causes the built-in slave to be deactivated.

In redundant operation, an address must be assigned to the built-in slave.

Assigning the Built-In-Slave (BIS) Address

To assign an address to the built-in slave of the gateway HD2-GTR-4PA, proceed as follows:

1. In order to assign the required 3-digit address of the built-in slaves: Set the control switches to the correct positions.

2. In order to restart the gateway: Disconnect it from the power supply or unplug the gateway module and reconnect it. The built-in slave address is assigned.

In the case of redundant coupling, both gateways need to be restarted at the same time.

5.2 Cyclic Data Exchange

A suitable configuration tool is required to configure the cyclic data exchange and to define the slaves, user data, etc. via a PROFIBUS DP master, class 1.

Commissioning the Simplex and the Redundant System

Note!

No Conversion of the GSD File of the Gateway Module

Because the DP/PA gateway already is a PROFIBUS DP slave, its GSD file does not need to be converted. The GSD file of the HD2-GTR-4PA is available for download at www.pepperl-fuchs.com.

In order to start the communication of the HD2-GTR-4PA, proceed as follows:

1. If necessary, convert existing GSD files of PA slaves with the Pepperl+Fuchs GSD converter. Integrate the converted files into the configuration tool.

2. Integrate the GSD file of the HD2-GTR-4PA in the configuration tool.

2016-10

PEPPERL+FUCHS

3. Add the built-in slave (BIS) of the HD2-GTR-4PA to the PROFIBUS DP bus configuration.

4. Assign the BIS address set on the motherboard DIP switch to the HD2-GTR-4PA on the DP bus.

5. Adjust the watchdog. Rough value: 5 seconds (see chapter 6.3.4).

▶ **Additional Steps for Redundant Coupling**

Note!
PROFIBUS PA Slaves

PROFIBUS PA slaves do not take part in cyclic data exchange The built-in slave (BIS) of the first DP/PA gateway must take part in cyclic data exchange. If it does not the connected, PA slaves will also not enter into cyclic data exchange.

Add the BIS of the gateway to the PROFIBUS DP bus configuration!

To enable redundant coupling, proceed as follows:

1. Add the built-in slave (BIS) of the second DP/PA gateway to the PROFIBUS DP bus configuration.

2. Assign the BIS address set on the DP bus (the address of the first BIS + 64) to the second DP/PA gateway on the DP bus.

▶ **Additional Steps for Using Fiberoptical Communication**

If coupling is designed redundantly and the DP bus uses optical fiber as a communication medium, additionally perform the following steps:

Adjust the retry limit according to the baud rate (see chapter 6.3.5).

5.2.1 Information on GSD File Conversion

Because coupling is transparent, the PROFIBUS DP master treats PROFIBUS PA slaves like PROFIBUS DP slaves. 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.

Before converting GSD files, always consider the following distinctions between GSD files for PROFIBUS PA slaves:

- Is the GSD file a profile GSD file or a manufacturer–specific GSD file?

- Is the GSD file designed to communicate via an RS–485 interface (DP GSD file) or an interface according to IEC 61158–2 (PA GSD file)?

If a profile GSD file is being used, the file name indicates whether it is a DP GSD file or a PA GSD file.

Example 1

"PA039733.gsd" is a profile GSD file for 4 binary outputs.
The name resolves as follows:
PA = PROFIBUS PA slave
0 = DP GSD file
39733.gsd = name of the file

Example 2

"PA139733.gsd" is a profile GSD file for 4 binary outputs.
The name resolves as follows:
PA = PROFIBUS PA slave
1 = PA GSD file
39733.gsd = name of the file

PEPPERL+FUCHS

27

If manufacturer-specific GSD files are used, e.g., to define functionalities outside the profile, proceed as follwos to identify whether it is a DP or PA GSD file:

■ If not already done, load the GSD file in 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 file. The PA GSD file usually only supports the baud rates 31.25 kBd, 45.45 kBd and 93.75 kBd.

If the data transfer rates are supported according to the PROFIBUS specification IEC 61158, i.e., the baud rates 9.6 kBd to 1.5 MBd or 12 MBd, this indicates a DP GSD file.

Some PROFIBUS PA field device manufacturers do not offer PROFIBUS DP GSD files. In this case, existing PROFIBUS PA GSD files must be converted. A suitable conversion software (a GSD file converter) is available free-of-charge at www.pepperl-fuchs.com. The conversion software enters the missing data transfer rates and sets necessary bus parameters to values that enable the PROFIBUS DP to operate correctly.

When the GSD file is converted, several functions that were previously supported by the original GSD file are restricted. The following functions can be affected:

■ FREEZE function is disabled.

■ SYNC function is disabled.

These functions are used with PROFIBUS DP to synchronize sensors/actuators. It is possible that these functions do no longer work correctly because operations at the PROFIBUS DP end (host end) run at data transfer rates of up to 12 MB/s and operations at the PROFIBUS PA end (field end) run at a data transfer rate of 31.25 KB/s.

At present, many PROFIBUS functions are not supported yet. In case a field device does not support a function, a message appears to inform you that these functions are no longer available after conversion. The following functions are affected:

■ Master class 1 acyclic access

■ PROFIBUS DP V2 function: Data Exchange Broadcast (publisher/subscriber)

■ PROFIBUS DP V2 function: Isochronous mode, i.e., synchronous cyclic transmission

5.2.2 GSD Converter

If you need a conversion tool in order to convert PA GSD files into DP GSD files, you can use the Pepperl+Fuchs GSD converter free of charge.

Tip

Download Free Software Tool

If needed, download the Pepperl+Fuchs GSD converter from the product information page of the device you obtained at www.pepperl-fuchs.com.
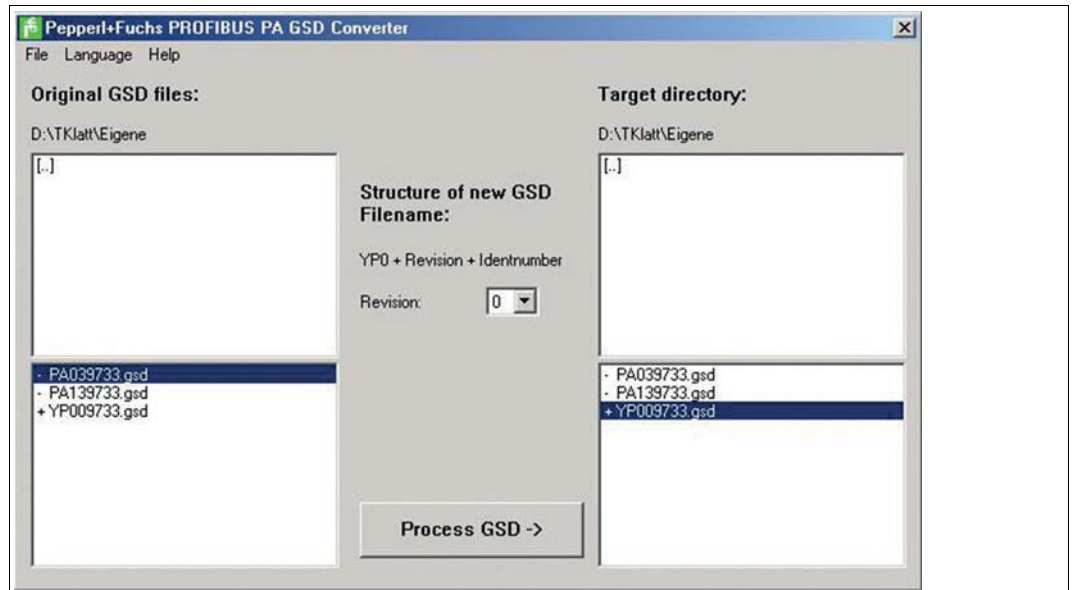
Using the Pepperl+Fuchs GSD Converter

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.

In order to convert GSD files, proceed as follows:

1. Start the program PFGSDCX.EXE

   ↳ The following dialog window appears:

PEPPERL+FUCHS

2. Select the directory that contains the GSD files intend to convert.

3. Select the GSD files you intend to convert.
   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 yet and can be converted if required. Doubleclick to open and view or edit a file.
   You can select one or more files for conversion by pressing the [CTRL] or [SHIFT] keys.

4. Select the directory where you intend to store the converted GSD files.

5. Convert the GSD files by clicking the **Process GSD ->** button.

   ↳ A window opens with information on the finished conversion process.

5.2.3 Information on Watchdog Time (T_{WD})

PROFIBUS devices can activate a mechanism that monitors each time interval in the cyclic data exchange process (or "user data exchange") to ensure that the PROFIBUS master is still active. This socalled watchdog time (T_{WD}) is measured in the PROFIBUS slave.

Note!

Watchdog Reprogramming during Cyclic Communication!

DPV1 slaves leave cyclic communication because the DPV1 standard does not permit any watchdog change during operation.

Note!

The built-in slave of the DP/PA gateway performs diagnostics in the DTM and cyclically to determine whether the watchdog time (T_{WD}) is sufficient.

If the response monitor is active and the 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 T_{WD} time value 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 during the cyclic data exchange. The T_{WD} is generally defined as user-specific and not device-specific, i.e., it is not included in the GSD file. Lower values are limited by the cycle times.

PEPPERL+FUCHS

The T_{WD} is usually entered via the configuration tool. The watchdog setting in the DP/PA gateway is transparent. In some configuration tools, the response monitor is preset once for the PROFIBUS master. In 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 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., 1.5 MB/s), the cycle times of the PA end are up to 300 x longer. If a PROFIBUS PA device is directly programmed with a 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.

In order to ensure that the DP/PA gateway operates reliably, it is recommended that you set the following bus parameters:

- Program only one T_{WD} for the entire PROFIBUS system. Determine the longest delay period in order to define the T_{WD}.

- Program one T_{WD} 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:

The follwing 2 types of watchdogs can be configured on the HD2-GTR-4PA in cyclic or acyclic data exchange, (see chapter 6.3.4:

- Transparent watchdog: The watchdog time on the DP side is the same as on the PA side (= default setting).

- Fixed watchdog: A watchdog time is set on the HD2-GTR-4PA for the PA side that is different from the DP side.

Note!

The HD2-GTR-4PA measures the current cycle time of each PA segment and generates a diagnostic message if the watchdog time is too short. Then the watchdog time must be increased.

The gateway diagnostics are based on the following formula: $2 \times T_{Cycle\_PA\_Channel} + 500$ ms

Information on I/O Cycle Time

The overall I/O data cycle time from a DP master via HD2-GTR-4PA to a PA slave can be approximated as follows:

$T_{Cycle\_IO\_Data} = T_{Cycle\_DP} + T_{Cycle\_PA\_Channel}$
where:

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

T_{cycle_DP} = cycle time of PROFIBUS DP

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

- Number of devices attached to the bus on 1 channel n

- User data length L

The effective data length L is a unitless variable calculated as the sum of input and output effective data quantity (in bytes) of all devices.

The following is an approximate calculation for the cycle time.
For a nonredundant system: $T_{Cycle\_PA\_channel} = (0.256$ ms $* L) + (n * 12$ ms$) + 40$ ms
For a redundant system: $T_{Cycle\_PA\_channel} = (0.256$ ms $* L) + (n * 12$ ms$) + 100$ ms

2016-10

PEPPERL+FUCHS

Note!

Cycle Time Discrepancy in Realworld Applications

This is the basic cycle time under ideal conditions. In reality, acyclic communication, retries, and diagnostic data can increase the cycle time, requiring an additional safety margin to be added.

For the calculation of an overall cycle time (change of a measured signal until reaction of an actuator), additional parameters like the measurement cycle time of the PROFIBUS PA devices and IO processing cycle of the controller must be considered.

5.2.4 Retry Limits

Adjusting the Retry Limit for Fiberoptical Communication

If the coupling from PROFIBUS DP to PA is designed redundantly and the DP bus uses optical fiber as a communication medium, Pepperl+Fuchs recommends increasing the retry limit of the DP master.

Recommended retry limits corresponding to various baud rates:

Baud Rate	Retry Limit
45.45 kBd	2
93.75 kBd	2
187.5 kBd	2
1.5 kBd	2
3 kBd	4
6 kBd	6
12 kBd	7

5.2.5 Device Type Manager (DTM): Installation and Commissioning

System requirements for installation, commissioning, and operation of the DP/PA gateway device type manager (DTM):

- Hardware requirements based on your FDT frame application
- FDT frame application (FDT specification 1.2)
- Latest version of the HD2-GTR-4PA DTM
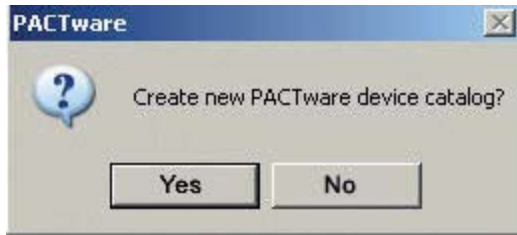- 40 MB free hard drive storage

Installing the DTM Package with PACTware[TM] **(Example)**

In order to install the DTM package on your system, proceed as follows:

1. Install the P+F-FieldConnex[®] DTM package.

2. Start the PACTware[TM] program.

3. Update the device catalog.

PEPPERL+FUCHS
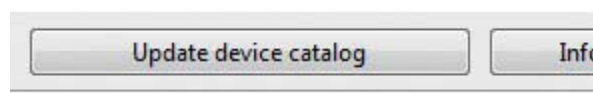
↪ The **Create new device** catalog window appears:

4. Confirm with **Yes**.

   ↪ The DTM is installed and ready for operation.

Creating the Project Tree

In order to create the project tree, proceed as follows:

1. Start PACTware^{TM}.
   Note: Make sure the latest DTM version is installed and that the device catalog is updated.

2. Open the appropriate project or create a new one.

3. Open the Device catalog: **View > Device Catalog**. Alternatively, press <F3>.

4. Open the menu entry **Softing AG**.
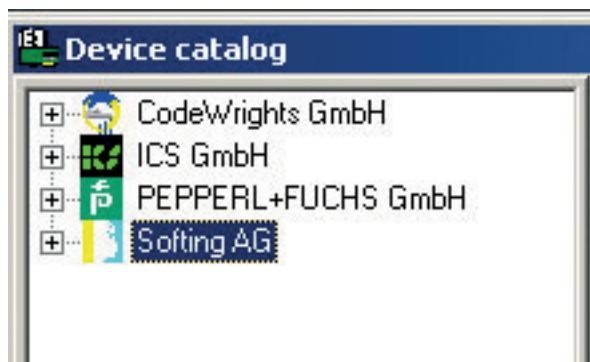
5. Select the entry **Drivers > PROFIBUS Driver**.
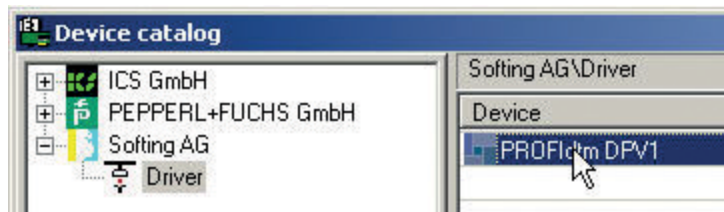
6. Drag and drop the **PROFIBUS Driver** to your project window below **Host PC**.
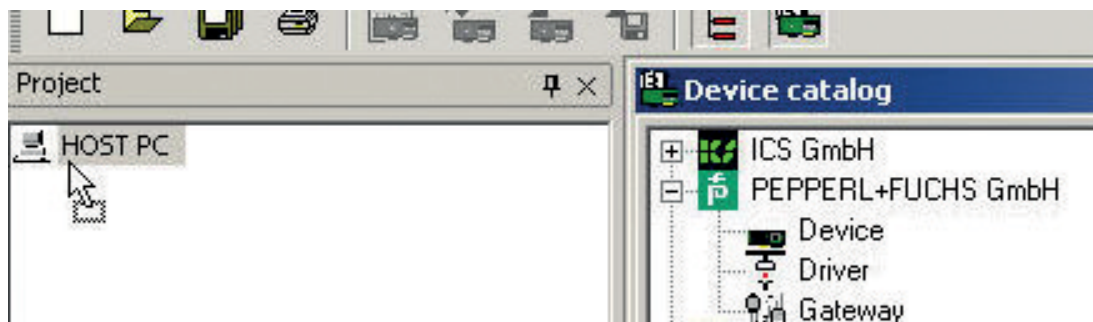
7. In the Device catalog, open menu item **Pepperl+Fuchs GmbH > Device > HD2-GTR-4PA**.

2016-10

PEPPERL+FUCHS

8. Drag the **HD2-GTR-4PA** into the project window into the **PROFIdtm DPV1** node. The window **Add station address** appears.
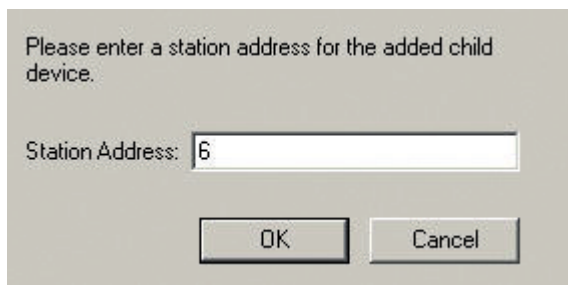
9. Enter the station address (BIS address of the gateway) and confirm with **OK**.

↳ Your project tree now looks like this:
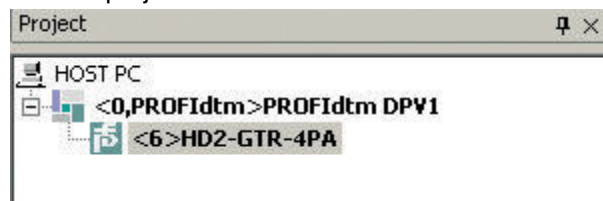
► **Entering the Assigned Built-In Slave Address in the DTM**

In order to enter the built-in slave address that was assigned on the gateway motherboard into the DTM, proceed as follows:

1. Right-click on **PROFIdtm DPV1** in the project tree and choose **Additional Functions > Edit DTM Station Addresses**.

2. Enter the BIS address set on the gateway motherboard and confirm with **Apply**.
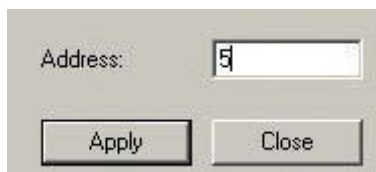
○
Ⅱ **Note!**

Sometimes, the FDT application does not immediately display the address change in the project window, even though the change has been made. If that happens, save the project once to refresh the display.

PEPPERL+FUCHS

Advanced Diagnostic Module (ADM) Engineering

The advanced diagnostic module (ADM) can be engineered both in the offline and the online dialog. After engineering is complete, ensure to load the data from the device or to the device, in order to avoid data loss.
In order to integrate a HD2-DM-A ADM via PROFIBUS PA, proceed as follows:

1. In the Device catalog, open **PEPPERL+FUCHS GmbH > Device > HD2-DM-A**.

2. Drag and drop **HD2-DM-A** into the HD2-GTR-4PA node of the the project window.
   Note: The ADM address is being detected automatically and is displayed symbolically by "999". There is no need to assign an address.

   ↪ Your project tree now looks like this:

   ```
   HOST PC
   <0,PROFIdtm>PROFIdtm DPV1 #
      <6>HD2-GTR-4PA
         [ * ] <999,DMA Tag>HD2-DM-A
   ```

3. In order to assign a tag to the ADM, open the offline dialog of HD2-GTR-4PA.

4. Enter a device description in the ADM tag field and confirm with **Enter**.

ADM Tag	DMA_SEG1	✏
Press Enter to confirm		

PEPPERL+FUCHS
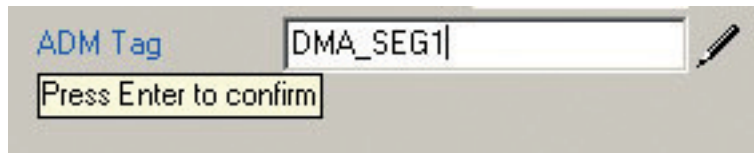
6 Operation

In PROFIBUS, the following 2 types of communication exist:

- Cyclic data exchange
- Acyclic data exchange

During cyclic data exchange, user data is exchanged between the master (process control system) and slave (field device) at regular intervals. User data includes measurement values, limit position feedback and output data, etc. The bus cycle time essentially depends on the number of nodes and the amount of data being transmitted.

In acyclic data exchange, "service" data, e.g., device parameterization or diagnostic information, is transmitted. A number of parameters of the HD2-GTR-4PA gateway module can be adjusted both through acyclic parameterization (using the DTM) and via the process control system. The advantage of parameterization via the process control system is the simplification of device replacement since no additional effort is required in addition to replacing the physical device.

6.1 Built-In Slave (BIS) Description

The gateway has an integrated slave, a socalles "built-in slave" (BIS) with a DP address that can be configured with the DIP switch on the motherboard. As a device participating in cyclic data exchange, the BIS returns function monitoring and diagnostic data to the master.

Cyclic Data Exchange

The BIS is a modular DPV1 slave with 1 slot. 2 modules are available, each with a 1–byte input and 1–byte output. The input provides a combined status message for the gateway. The status message is coded as a PA profile status byte:

- 0 x 00: Bad, unspecific
- 0 x A4: Good, maintenance required
- 0 x 80: Good

For the actual value of the byte under certain diagnostic conditions, see chapter 10.2, table on diagnostic parameters. If multiple diagnostic events are present, the priority is as follows:

1. Bad (highest priority)
2. Good, maintenance required
3. Good (lowest priority)

A dummy byte (0 x 00) must be sent as an output data item.

Parameterization Options (Channel Assignment)

The following 3 configuration modules exist:

- Default
- PA bus configuration
- PA bus configuration + diag.

These configuration modules enable the parameterization of the following values:

- **Default**:
  - None
- **PA Bus Configuration**:
  - Watchdog time
  - PA retry limits
  - Number of activated PA segments

PEPPERL+FUCHS

- **PA Bus Configuration + Diag.** :
  - Watchdog time
  - PA retry limits
  - Number of activated PA segments
  - Diagnostics (ADM alarm observer)

If the PA bus configuration module is set, values that are set with this module cannot be changed with acyclic access during cyclic communication.

Diagnostics (Slave Diagnostics)

The BIS returns the following of the diagnostic blocks described in the GSD file:

- Device diagnostics

- 0 … 4 x segment diagnostics (channel diagnostics)

- RedState data block

Device diagnostics provides specific diagnostic information on the gateway. This information is parsed directly by the process control system and displayed for the user. In redundant configuration, all diagnostic information is also available for the redundancy partner. Device diagnostics includes:

Device Diagnostic Parameters	EXT_DIAG	InputData
Gateway primary device	No	GOOD
Redundancy not operative	Yes	BAD
Redundancy is synchronizing	Yes	BAD
Redundancy gateway missing	Yes	BAD
Hardware error detected	Yes	BAD
Redundancy link error	Yes	BAD
No baud rate detected	Yes	BAD
Built-in slave not in data exchange	No	GOOD
Firmware version mismatch	Yes	BAD
Firmware updated, need reboot	Yes	BAD
A PA master not in token ring	Yes	BAD
PA bus parameters write locked	No	GOOD
Segment MAU error	Yes	BAD
ADM error or module missing	Yes	BAD
ADM system maintenance required	Yes	GOOD Maintenance required
ADM system out of specification	Yes	BAD
ADM segment maintenance required	Yes	GOOD Maintenance required
ADM segment out of specification	Yes	BAD

All device diagnostic parameters marked with "Yes" in the EXT_DIAG column cause the EXT_DIAG to be set in the slave diagnostics. The process control system then marks that slave as defective. Channel diagnostics returns specific diagnostic information on each individual segment. These error messages are prioritized and set to preferred by the BIS depending on their ranking. The following table represents diagnostic information according to its ranking.

2016-10

PEPPERL+FUCHS

■ **Channel Diagnostic Parameters**

- Hardware error
- No slave in live list
- DP watchdog time too short
- Duplicate slave address
- PA master not in token ring
- ADM: Segment out of specification
- ADM: Segment maintenance required

The **RedState data block** is a standardized diagnostic data block, it is inserted when the slave receives a PRM command.

6.2 Coupled Slaves

This section applies to coupled slaves on non-redundant masters and to flying redundancy masters.

All coupled PROFIBUS PA slaves behave as non-redundant PROFIBUS DP slaves after the GSD file conversion, so that every PA slave appears directly on the DP bus.

The PA slaves are**not**merged to one single slave.

Both cyclic and acyclic communication is coupled.

As many C2 connections are coupled to the slaves as they support, altogether a maximum of 500.

Seen from the master, redundancy switching of the gateway has no effect on PA slaves. PA slaves do not drop out of communication.

The FREEZE and SYNC modes are coupled, but because DP communication and PA communication are time-incompatible, they are not relevant for practical purposes.

Identification & Maintenance (I&M) functions are supported.

6.3 Acyclic Data Exchange with Built-In Slave via Device Type Manager

The built-in slave (BIS) supports 4 acyclic connections. In acyclic mode via the device type manager (DTM), the following 3 dialogs are available:

- **Offline**
- **Online**
- **Diagnostics**

In the **Offline** dialog, all parameters can be set locally without having any direct effect on communication or the device. Data can be written to the device after all settings are made. Current parameters can also be read in from the device, processed, and saved.

Note!

Data Loss

Settings made in the **Online** dialog are not automatically transferred to the **Offline** dialog.

In order to save online settings, load the data into the **Offline** dialog with the function "Read data from device".

In the **Online** dialog, you directly effect device parameters. Your entry is written to the device immediately, as soon as you press the <Return> key. The **Online** dialog additionally offers diagnostic information on the gateway and the PA segments connected to the Power Hub.

The **Diagnostics** dialog shows the current device parameters and diagnostic information. Changes to the data cannot be made in this dialog.
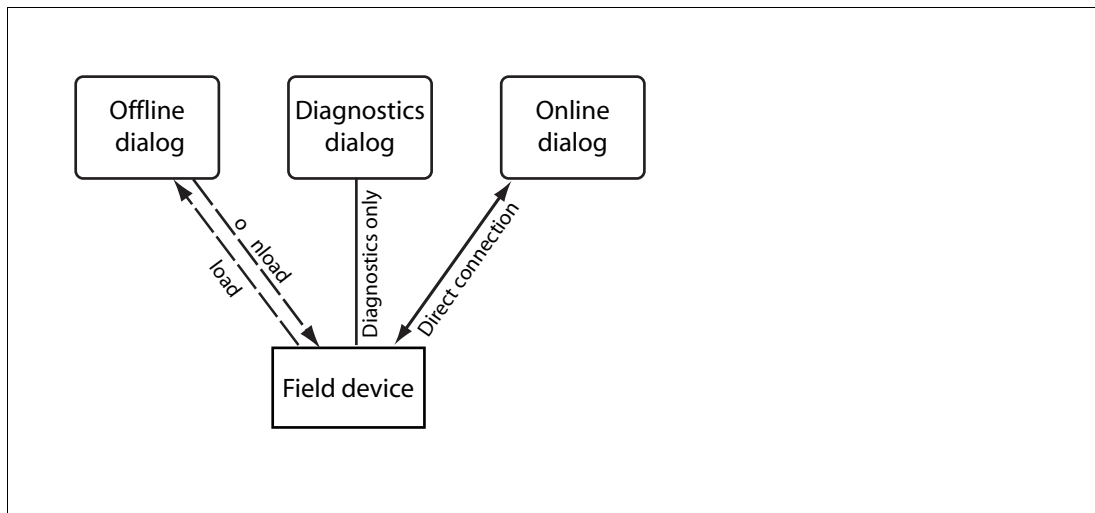
2016-10

PEPPERL+FUCHS

Figure 6.1   Functional overview of dialogs

6.3.1   Brief Introduction to DTM with PACTware^{TM} (Example)

The gateway has an integrated slave (built-in slave or "BIS") with a DP address that can be configured with the DIP switch on the motherboard. As a device participating in cyclic data exchange, the BIS returns function monitoring and diagnostic data to the master.

▶ Connecting the DTM to the HD2-GTR-4PA

Ensure that all settings are made correctly (device address, etc.)

1. Right-click in the project tree on **HD2-GTR-4PA**.
2. Select **Connect**.

   ↪ A hash (#) next to the device icon in the project tree indicates that the connection exists.

▶ Opening the Offline Dialog

In order to open the Offline dialog, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.
2. Select **Parameters > Offline Parameterization**.

▶ Opening the Online Dialog

Ensure that the HD2-GTR-4PA is connected.
In order to open the Online dialog, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.
2. Select **Parameters > Online Parameterization**.

▶ Opening the Diagnostics Dialog

Ensure that the HD2-GTR-4PA is connected.
In order to open the Diagnostics dialog, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.
2. Select **Diagnostics**.

PEPPERL+FUCHS

▶ **Printing Diagnostic Information**

In order to print diagnostic information, proceed as follows:

1. Open the **Diagnostics** or the **Online** dialog (see above).
2. In the DTM header press the **Print** button.

   ↳ The **Print preview** window of the diagnostic report appears.

3. In the footer of the **Print preview** window click **Print**.

   ↳ The **Printer driver selection** menu appears.

4. Select your printer and confirm the print job.

6.3.2 Overview of the Device Type Manager User Interface
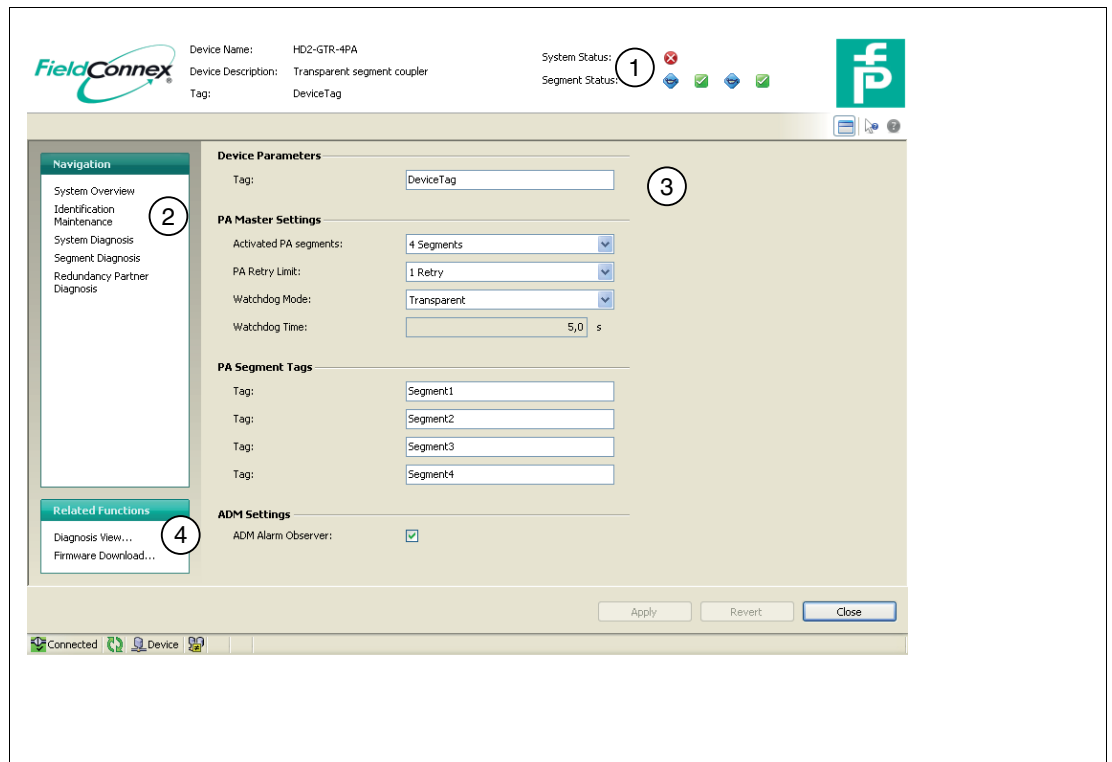
1   Identification section
2   Navigation section
3   Work section
4   Quick start section

PEPPERL+FUCHS

6.3.3 HD2-GTR-4PA Structure Diagrams
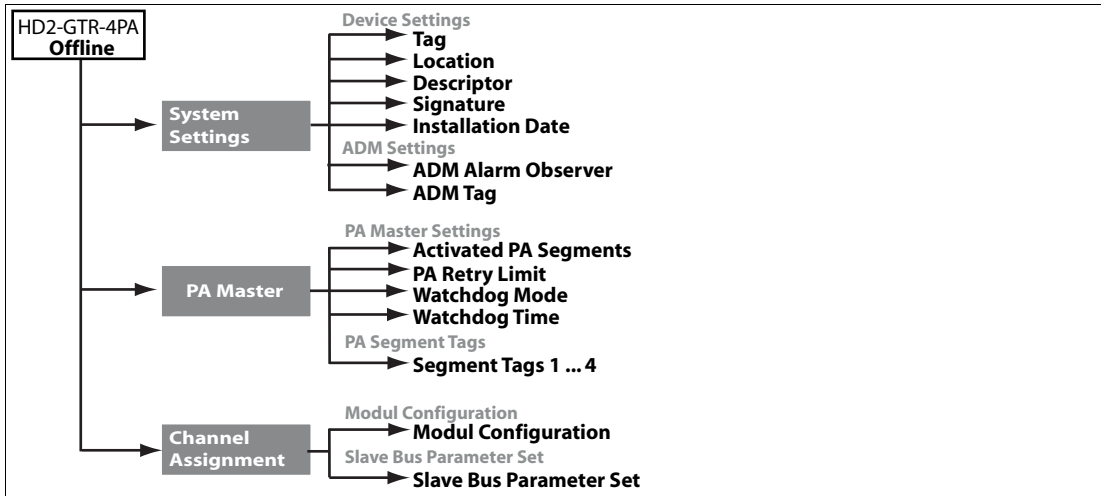
Figure 6.2   DTM structure, offline dialog
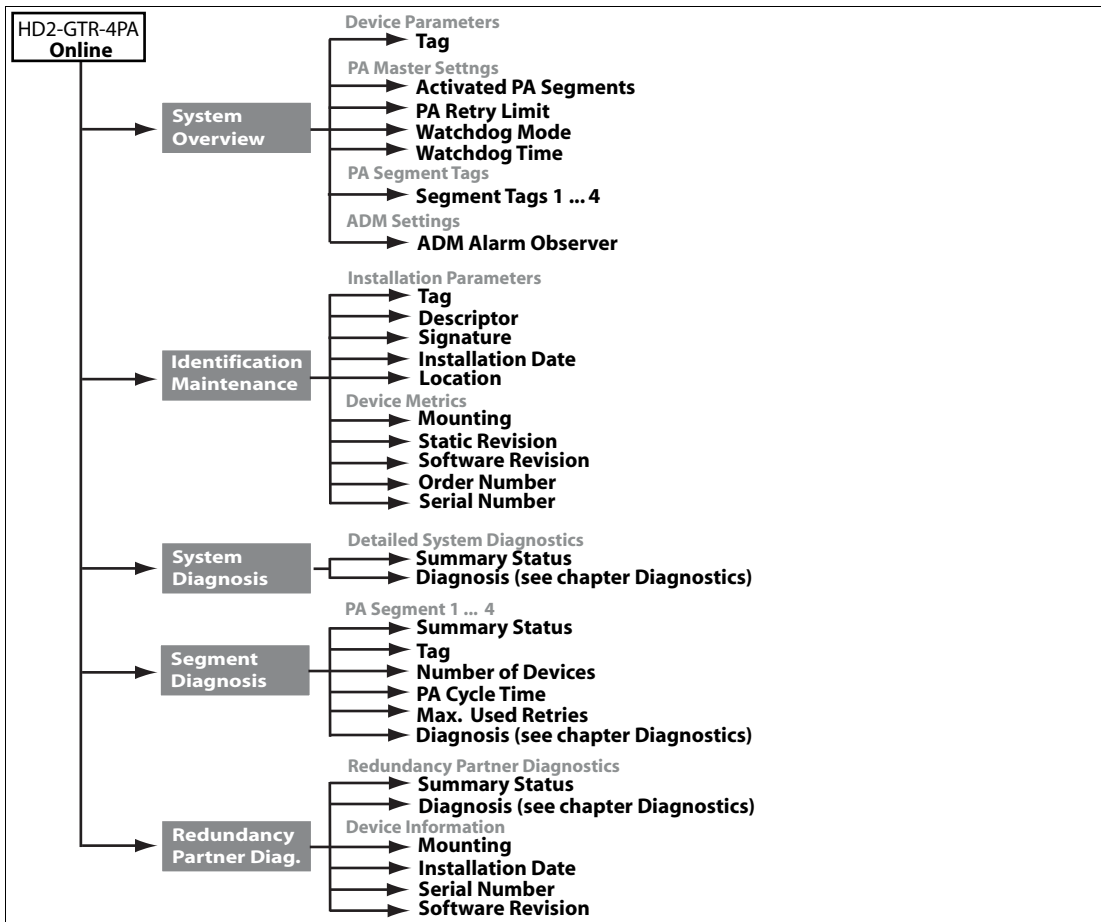
Figure 6.3   DTM structure, online dialog

6.3.4 Watchdog Time in the Device Type Manager

The HD2-GTR-4PA has the following 2 watchdog time settings:

- Transparent: The watchdog time on the DP side is the same as on the PA side.

2016-10

PEPPERL+FUCHS

■ Fixed value: A watchdog time is set on the HD2-GTR-4PA for the PA side that differs from the time of the DP side.

When the HD2-GTR-4PA is delivered, the watchdog setting by default is set to "transparent". For additional information, see chapter 5.2.3.

Setting the Watchdog Time to "Fixed" in the DTM

In oder to change the watchdog setting, proceed as follows:

1. Open the **Online** or **Offline** dialog.

2. Select "Fixed" from the drop-down list.

Watchdog Mode:	🖉 Transparent ▼	
Watchdog Time:	Transparent	**Watchdog Mode:**
	Fixed	Mode for the PA watchdog (Transparent / Fixed value)

3. Confirm the entry with <Return>.

4. Enter the watchdog time and confirm with <Return>.

Watchdog Time:	5,0	s

6.3.5   PROFIBUS PA Retry Limit in the Device Type Manager

You can also set parameters for the PA side retry limit in acyclic data exchange.

Setting the PA Retry Limit in the DTM

In order to set the PA retry limit in the DTM, proceed as follows:

1. Open the **Online** or **Offline** dialog.

2. Select the retry limit from the drop-down list.

PA Retry Limit:	1 Retry ▼	
	1 Retry	
Watchdog Mode:	2 Retries	**PA Retry Limit:**
	3 Retries	Retry limit for the PA masters
Watchdog Time:	4 Retries	
	5 Retries	
	6 Retries	
PA Segment Tags	7 Retries	

3. Confirm the entry with <Return>.

6.3.6   Restart Functions, Redundancy Switchover, and Firmware Update

The HD2-GTR-4PA DTM offers the following 4 additional functions:

■ Restart

■ Restart with default values

■ Redundancy switchover

■ Firmware update

Restart Functions

If the coupling is simplex or redundancy is not available, all coupled PA slaves drop out of the cycle and communication is lost. The restart functions in the DTM reboot the HD2-GTR-4PA.

When coupled redundantly, the freshly rebooted device takes over all configurations from the other device that is still active. In order to reset to default values in a redundant system, the rebooted gateway must be mounted alone on the motherboard.

PEPPERL+FUCHS

Performing a Restart

In order to reboot the gateway, proceed as follows:

1. Right-click on **HD2-GTR-4PA**.

2. Select **Additional Functions > Restart**.

↳ After you confirmed the restart, the gateway is rebooted.

Performing a Restart with Default Values

Restarting the gateway with the default values function reboots the HD2-GTR-4PA with its default values. All manually configured data such as device tags, watchdog times, and retry limits are lost!
In order to restart the gateway with default values, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.

2. Select **Additional Functions > Restart with Default Values**.

↳ After you confirmed the restart, the gateway is rebooted.

Redundancy Switchover

Loss of communication
If redundancy is not available, all coupled PA slaves drop out of data exchange, i.e. communication is lost. Before trying to switch over from one device to the next, ensure that redundancy is available. The primary and secondary device exchange roles. The active built-in slave drops out of communication. All coupled PA slaves remain in the data exchange.

Redundancy Behavior

When coupled redundantly, the freshly rebooted device takes over all configurations from the other device that is still active. In order to reset to default values in a redundant system, the rebooted gateway must be mounted alone on the motherboard.

Performing a Redundancy Switchover

In order to perform redundancy switching, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.

2. Select **Additional Functions > Force Redundancy Switchover**.

↳ After you confirmed the setting, the function is performed.

Firmware Update Behavior

During the process of a firmware update, In the case of simplex coupling or if redundancy is unavailable, all coupled PA slaves leave cyclic communication, i.e. communication is lost.

Updating the Firmware

In order to perform redundancy switching, proceed as follows:

1. Right-click in the project tree on **HD2-GTR-4PA**.

2. Select **Additional Functions > Firmware Download**.

3. Device identitfy appears, press **Next**.

PEPPERL+FUCHS

4. Choose the new firmware file

5. Confirm the installation windows which follow by clicking **Continue**.

6. Restart the gateway.

PEPPERL+FUCHS

43
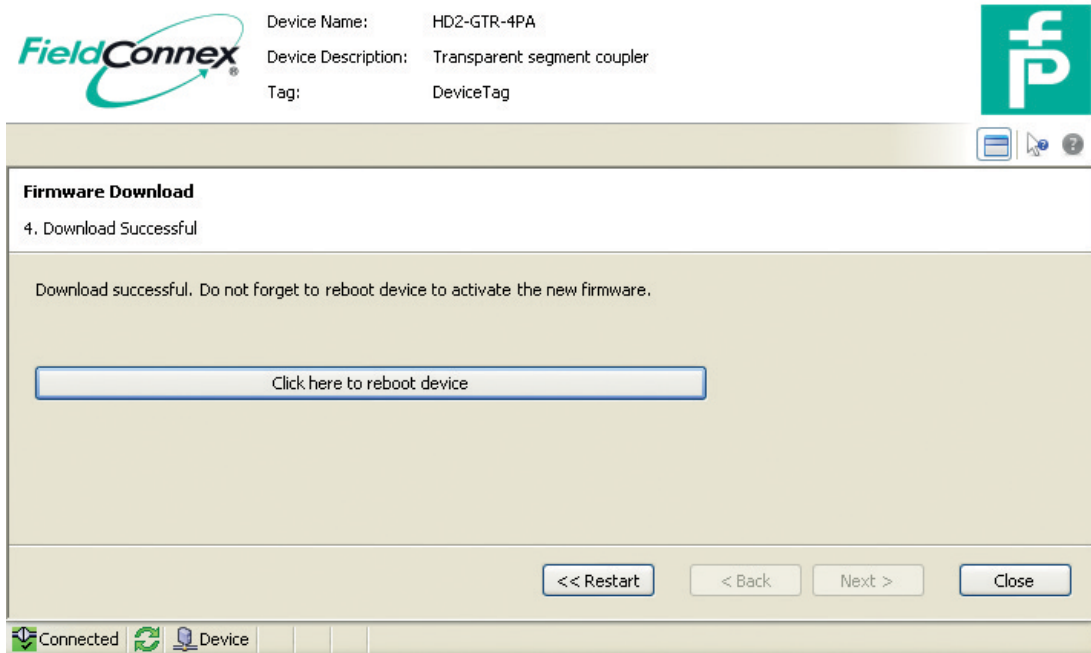
↳ In the case of redundant coupling, rebooting the gateway results in a redundancy switchover. After that, repeat these steps to update the firmware for the second gateway as well.

6.4 Redundant Operation

Redundancy Behavior

During redundant operation, the gateway simulates PA slaves for the DP bus. From the point of view of the DP bus, redundancy switchover has no visible effect on the master. All slaves remain in the cycle. This transparent redundancy (TR) differs from normal flying redundancy (FR) behavior, which allows slaves to drop out of the cycle for a defined time.

The HD2-GTR-4PA supports all masters that work on the flying redundancy principle, as well as all non-redundant masters.

The built-in slave automatically detects whether the DP master is using a redundancy concept. If the DP master is working according to the flying redundancy concept, the gateway automatically adjusts itself accordingly without any manual setting required.

With transparent redundancy, exchange of user data remains intact. In the worst case, only non-critical acyclic data exchange drops out.

System Environment for Redundant Operation

In redundant operation, both built-in slaves (primary and secondary gateway) should be in cyclic data exchange. Assigning bus addresses to both gateways makes it easy to monitor both built-in slaves with the master which detects the failure of 1 of the 2 built-in slaves and reports the relevant slave address.

The PROFIBUS Power Hub provides redundant coupling of PA segments in the following system environments:

- Combined with a non-redundant master
- In a flying redundancy system

PEPPERL+FUCHS

Non-redundant masters do not see any effect on PA slaves from redundancy switchover. The backup gateway takes over communication seamlessly. Both gateways participate in general token ring operation:

- Primary gateway = PA master address 1
- Secondary gateway = PA master address 2

Participation in token ring operation thus allows use of handhelds for diagnostic purposes.

Note!

Information: The built-in slave must participate in cyclic data exchange.

In the flying redundancy environment all PA slaves are configured as normal non-redundant slaves. The built-in slave can be configured as a flying redundancy slave. For additional information, see chapter 8.
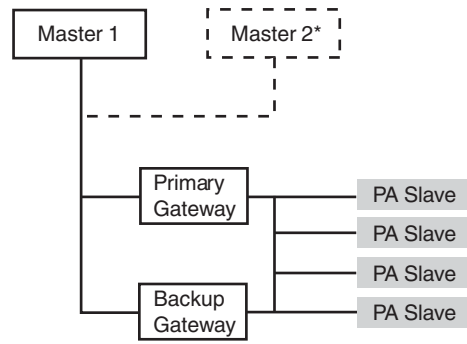
*Flying Redundancy

Applications with Redundant Operation

Redundancy is available in the following cases:

- Both gateways are in operation with no errors
- Both gateways detect DP baud rates
- No errors occurred in PA communication

If redundant operation is not available, this is reported back by the slave diagnostics.

Possible reasons for redundancy switchover are the following:

- Hardware error in the primary gateway
- Loss of baud rate (cable break, etc.)
- Built-in slave drops out of the cycle (because of an unlock from the master or the watchdog time has expired, etc.)

Redundancy switching in either of the following cases:

- Both built-in slaves dropped out of communication and the primary BIS immediately comes up on the bus again
- The built-in slaves on the DP bus have changed roles

The primary gateway can be identified by the following LED: "Red." (redundancy) is flashing or lights up.

PEPPERL+FUCHS

If a secondary gateway is plugged into the motherboard its built-in slave boots and takes over all configurations from the primary gateway.

Note: The reinstalled gateway normally takes all configurations from the primary gateway. Any previous configurations of the new gateway are overwritten!

The primary and secondary built-in slaves are synchronized with each other.

If a gateway is separated from the redundant motherboard, the primary device issues the following diagnostic message: "Redundancy not available, redundancy partner missing".

PEPPERL+FUCHS

7 Advanced Diagnostics with the PROFIBUS Power Hub

Together with the advanced diagnostic module HD2-DM-A, the PROFIBUS Power Hub offers extensive analytic and monitoring options for a PROFIBUS fieldbus installation. This special diagnostics called "advanced diagnostics", among other things includes the following features:

- Proactive plant monitoring
- Analysis of the fieldbus physical layer (jitter, noise, etc.)
- Assistance during the complete fieldbus life cycle
- Wizards for commissioning and fault detection
- Integrated oscilloscope function

Further information regarding advanced diagnostics can be found in the corresponding documentation of the "Advanced Diagnostic Module HD2-DM-A". You can download this manual from www.pepperl-fuchs.com.

7.1 Advanced Diagnostics Infrastructure

In general, the advanced diagnostics setup comprises a number of different hardware (PROFIBUS Power Hub, advanced diagnostic module) and software components (FDT, DTM). Depending on your requirements and your hardware and plant infrastructure, this setup can vary. See also the corresponding documentation of the "Advanced Diagnostic Module HD2-DM-A".

In order to integrate the advanced diagnostic module HD2-DM-A into a PROFIBUS Power Hub installation, one of the following 2 different kind of setups can be implemented:

- Direct connection via PROFIBUS DP (recommended)
- Via the diagnostic bus of the Power Hub motherboard

Advanced Diagnostics Connection via PROFIBUS DP

In the case of a direct connection of the diagnostic module, communication between the diagnostic manager (device type manager) and the diagnostic module takes place via PROFIBUS DP and the PROFIBUS gateway HD2-GTR-4PA. The gateway then acts as an interface and a data access coordinator for the diagnostic module.

No further components are necessary. The diagnostic module is being addressed in the device type manager using "Plug&Play". With this type of connection, one diagnostic module is statically assigned to one gateway each. Thus, this diagnostic module appears as a child node of its corresponding PROFIBUS gateway in the device type manager project.
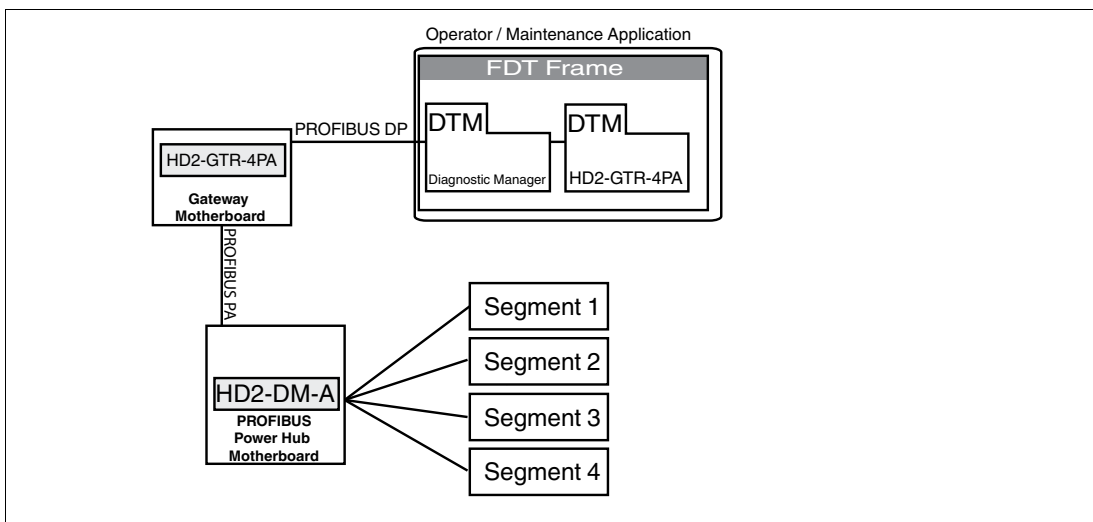
Figure 7.1   Schematic topology of direct connection of diagnostics

PEPPERL+FUCHS

Hardware	Description
Segment 1...4	PROFIBUS PA segments
HD2-DM-A	Advanced diagnostic module (ADM) on fieldbus Power Hub motherboard.
HD2-GTR-4PA	Gateway module on gateway motherboard.
Operator / Maintenance Application	Depending on setup and structure, FDT can either run on the maintenance application or the operator application.

Software	Description
Field device tool (FDT)	The FDT specification defines the interaction of DTMs with host computers or software. An FDT frame application is a PC–based software including many DTMs for configuration monitoring and programming of field devices. Both, the diagnostic manager DTM and the gateway DTM run in an FDT environment.
Device type manager (DTM)	A DTM is a device configuration and management software. It contains a graphic user interface and configures and diagnoses devices. DTMs are embedded in an FDT frame application, such as PACTware[TM] or in a DCS with an FDT interface. The DTM for the advanced diagnostic module is called diagnostic manager.

Advanced Diagnostics Connection via Diagnostic Bus

This type of diagnostics connection with a PROFIBUS installation is mainly used to forward diagnostic information to an OPC system. Communication of the diagnostic managers (DTM) with the diagnostic module takes place via a further software module, the FieldConnex Diagnostic Server (FDS), and a further hardware component, the COM port converter. In contrast to direct connection via PROFIBUS DP, the FDS here serves as an interface and a data access coordinator for the diagnostic module, as well as an OPC DA server, the converter provides the connection to the RS 485 diagnostic bus of the motherboards.

The diagnostic modules which are part of a device type manager project are not exclusively allocated to one gateway. Rather, all HD2-DM-A modules connected to the FDS appear at the FDS node. Alarms and warnings of all diagnostic modules are analyzed centrally in one single window, the so-called system "diagnostic window".

You can find further information regarding the FDS and the setup, configuration, and commissioning of the diagnostic module corresponding documentation of the "Advanced Diagnostic Module HD2-DM-A".
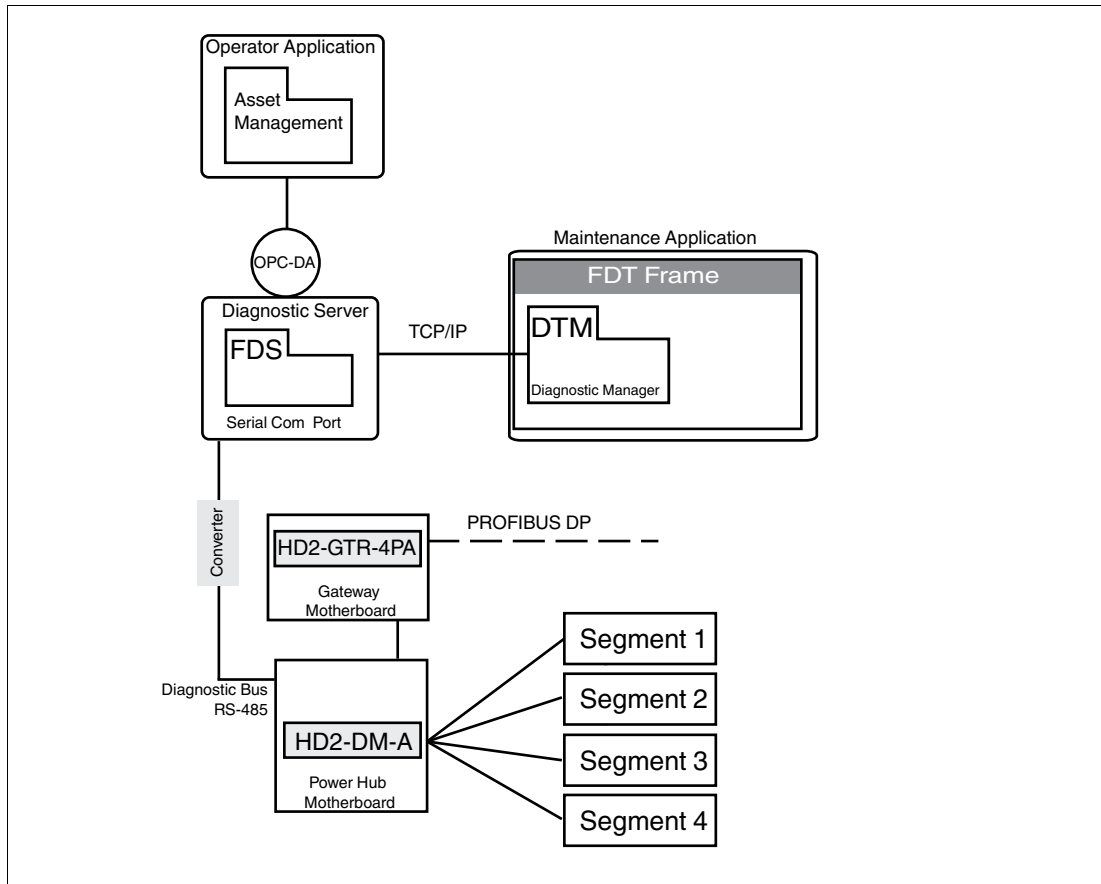
PEPPERL+FUCHS

Figure 7.2   Topology of diagnostic connection via diagnostic bus

Hardware	Description
Segment 1...4	PROFIBUS PA segments
HD2-DM-A	Advanced diagnostic module (ADM) on fieldbus Power Hub motherboard.
HD2-GTR-4PA	Gateway module on gateway motherboard.
Diagnostic Server	Server or Cabinet PC on which the FieldConnex® Diagnostic Server (FDS) is running. The Server is connected to the advanced diagnostic module via the RS-485 diagnostic bus.

Firmware / Hardware	Description
Operator application	Application on which the plant management or operator system is running. An OPC-DA client can also be running here.
Maintenance application	Host application for the FDT frame.
Converter	Device which provides the connection between serial Ethernet and RS–485. Since the FDS works on a serial COM port, a converter is needed to connect the FDS with the RS–485 diagnostic bus in the cabinet.

PEPPERL+FUCHS

Interface	Description
OPC-DA	Standardized interface allowing access to DCS data (OPC = OLE for Process Control). Integrated into the FDS.
TCP/IP	Communication protocols used on the Internet and on most commercial networks.

Software	Description
FieldConnex® Diagnostic Server (FDS)	The FDS works as an interface and a data access coordinator for the diagnostic module HD2-DM-A that includes the OPC-DA service.
Field device tool (FDT)	The FDT specification defines the interaction of DTMs with host computers or software. An FDT frame application is a PC–based software including many DTMs for configuration monitoring and programming of field devices. Both, the diagnostic manager DTM and the gateway DTM run in an FDT environment.
Device type manager (DTM)	A DTM is a device configuration and management software. It contains a graphic user interface and configures and diagnoses devices. DTMs are embedded in an FDT frame application, such as PACTware™ or in a DCS with an FDT interface. The DTM for the advanced diagnostic module is called diagnostic manager.

7.2   PROFIBUS Advanced Diagnostics Integration

If the advanced diagnostic module HD2-DM-A is connected via PROFIBUS DP with the PROFIBUS Power Hub and the HD2-GTR-4PA gateway, a special "alarm observer" function allows for intelligent advanced diagnostics integration.

The "alarm observer" function enables the gateway HD2 GTR 4PA to serve as the interface and the data access coordinator for diagnostic messages to the distribution control system (DCS) and the device type manager (DTM). With an activated alarm observer, basic warnings and alarms of the diagnostic module are integrated into the slave diagnostics and can be parsed by the DCS via cyclic data exchange. Additionally, these warnings and alarms also appear directly in the DTM diagnostics dialog (online parameterization) of the PROFIBUS gateways.

The alarm observer can be switched on both acyclically via the DTM and cyclically via DCS gateway configuration.

▶ Activating the Alarm Observer in the Device Type Manager

1. Open the window **Offline or online parameterization**.

2. Choose **Alarm Observer Enabled** from the drop-down list and confirm with <Return>.

PEPPERL+FUCHS
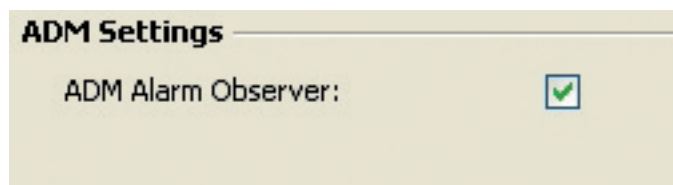
Advanced Diagnostic Messages in the Gateway DTM

Due to the integration of basic alarms and warnings into the slave diagnostics of the gateway, the DTM diagnostics dialog of the gateway includes the following additional entries:
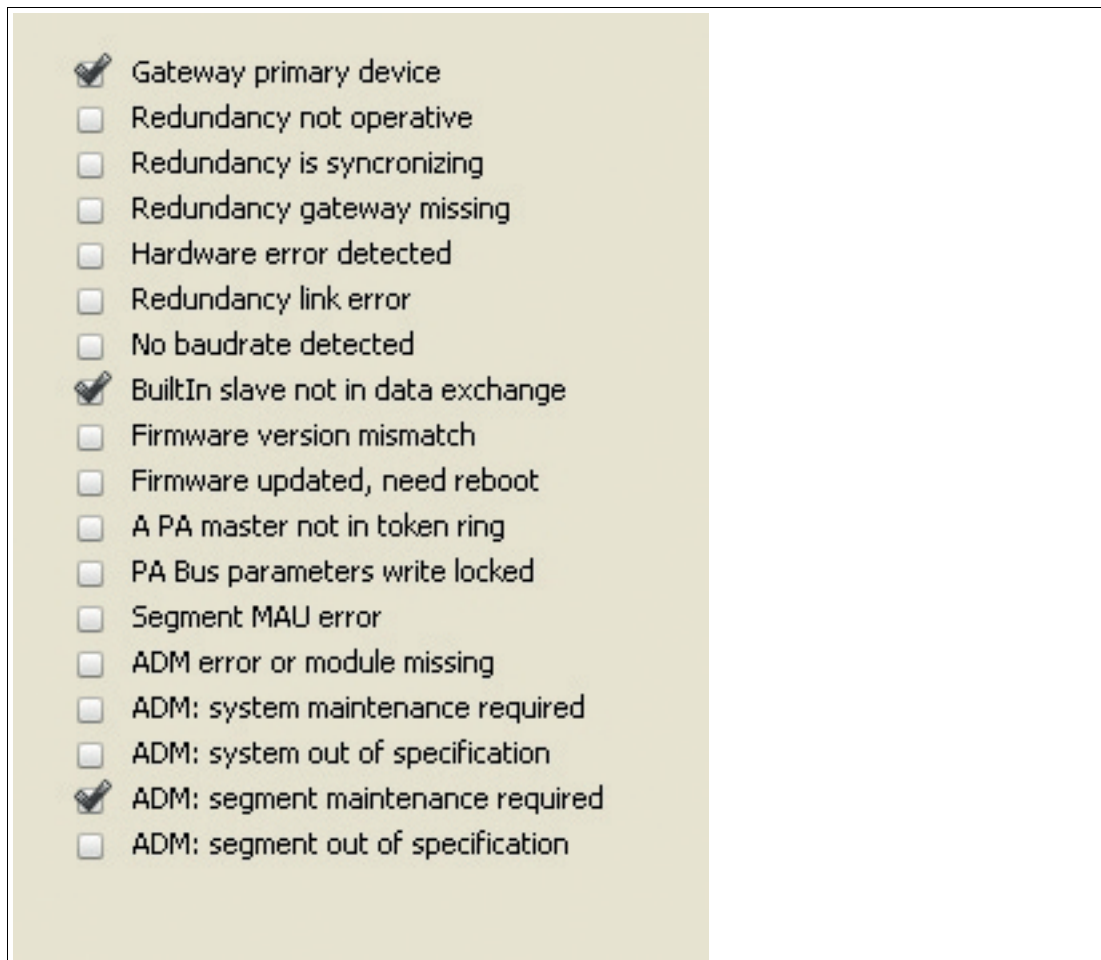

Figure 7.3   Device-specific messages
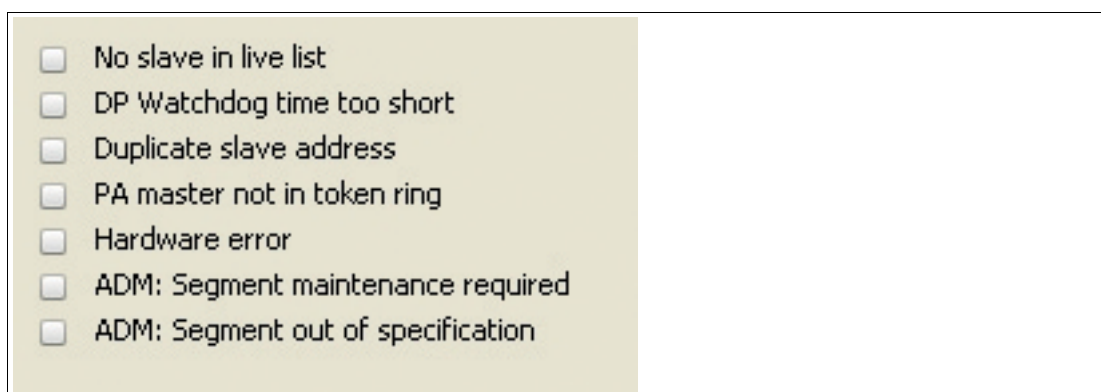
Figure 7.4   Segment-specific messages

PEPPERL+FUCHS

8 Basic Redundancy Concepts

The following redundancy concepts have become established on the market: Flying redundancy and system redundancy. These redundancy implementations are described in the following sections.

Flying Redundancy

This concept connects both slave and master instances to the same physical bus, so only 1 PROFIBUS DP cycle exists. The address of the primary slave incremented by 64 is assigned to the backup slave:
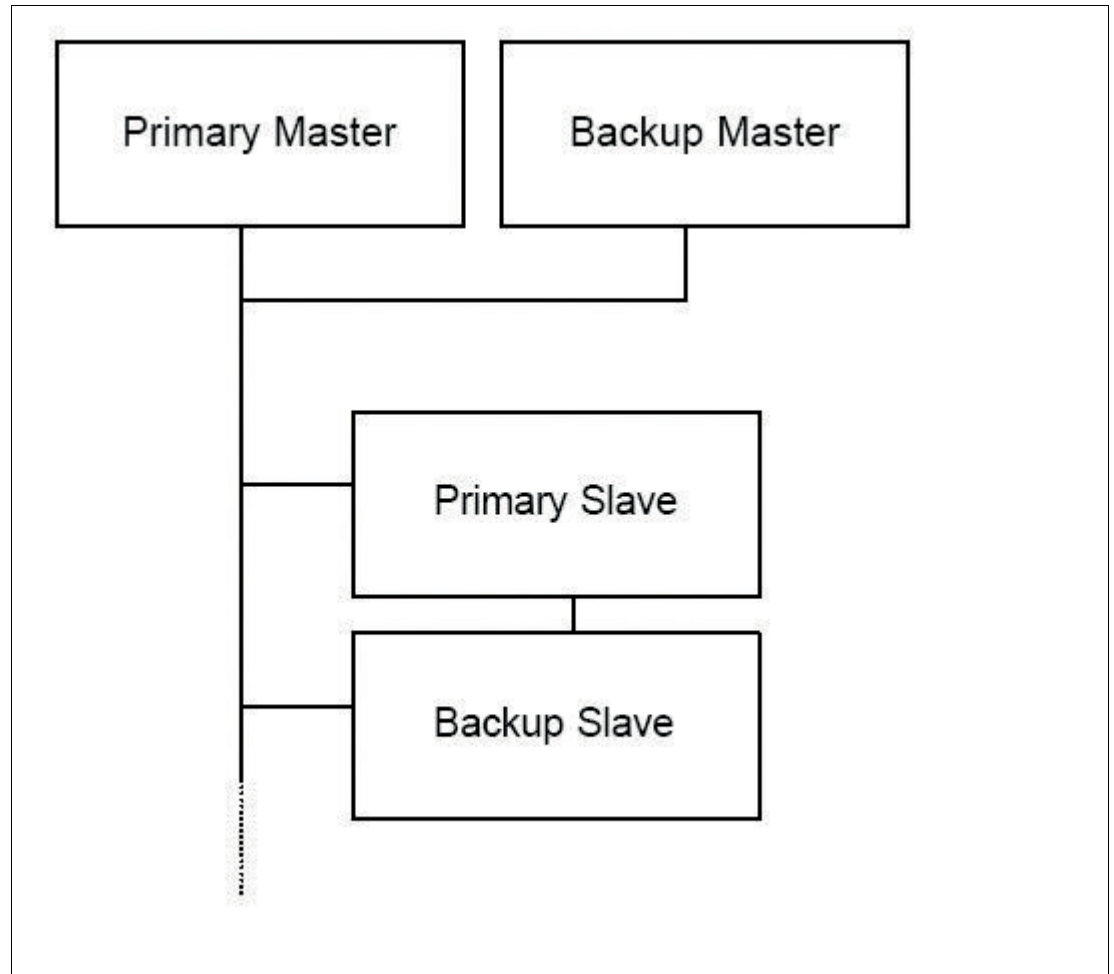
Figure 8.1　　　Flying redundancy

The concept has the disadvantage that in the event of a fault on the bus, all communication is interrupted. If redundancy link modules (RLM) are used, this can be avoided through socalled media redundancy. As the following topology illustrates, a fault is only relevant to the corresponding bus:

PEPPERL+FUCHS
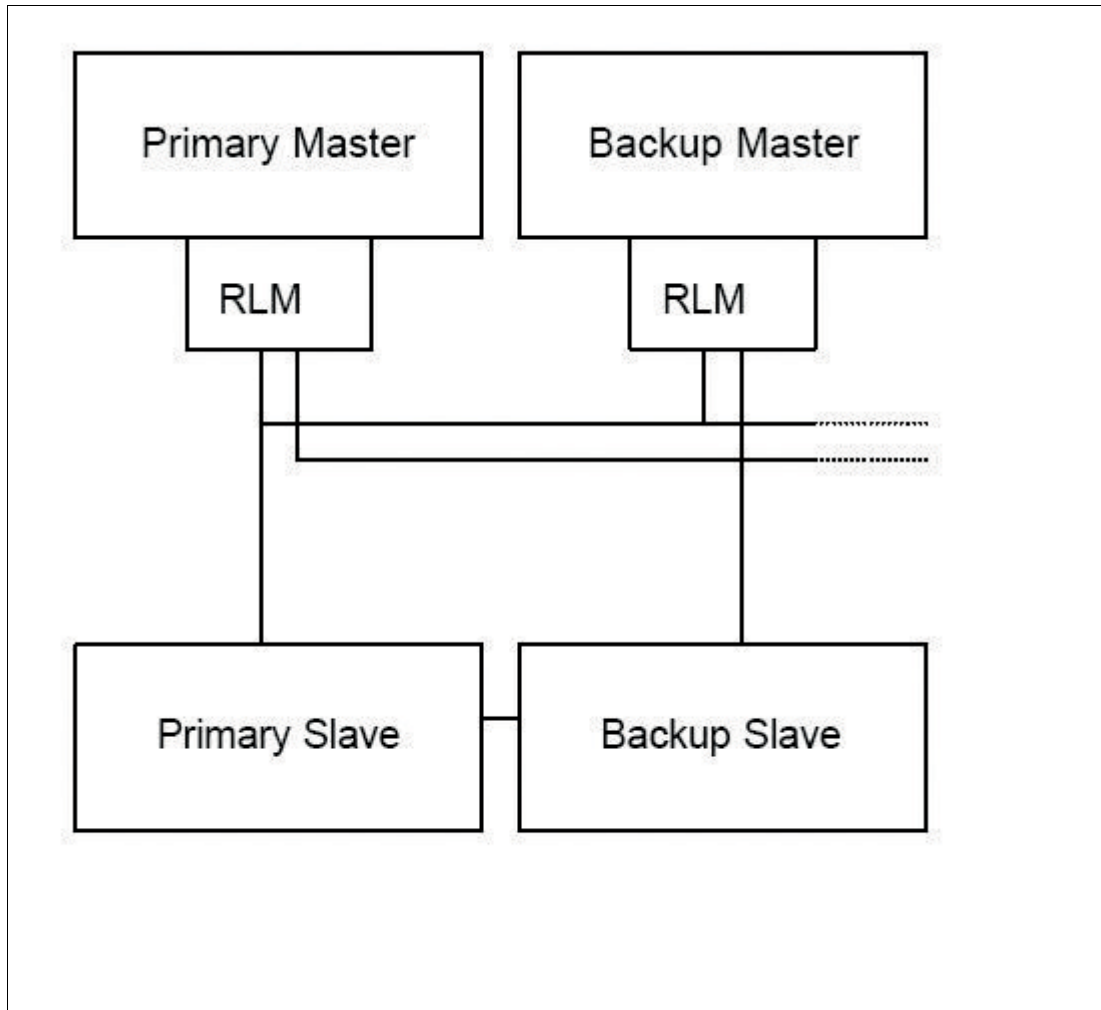
Figure 8.2   Flying redundancy with redundancy link modules (RLM) for combination with media redundancy

This structure represents a common flying redundancy concept with no need for the primary slave and backup slave to be connected to the same physical bus.

2016-10

PEPPERL+FUCHS

System Redundancy

In the system redundancy concept 2 masters exist, each one of which performs its own PROFIBUS cycle on 2 different lines. The redundant slave instances are connected to each other with the corresponding connection lines:
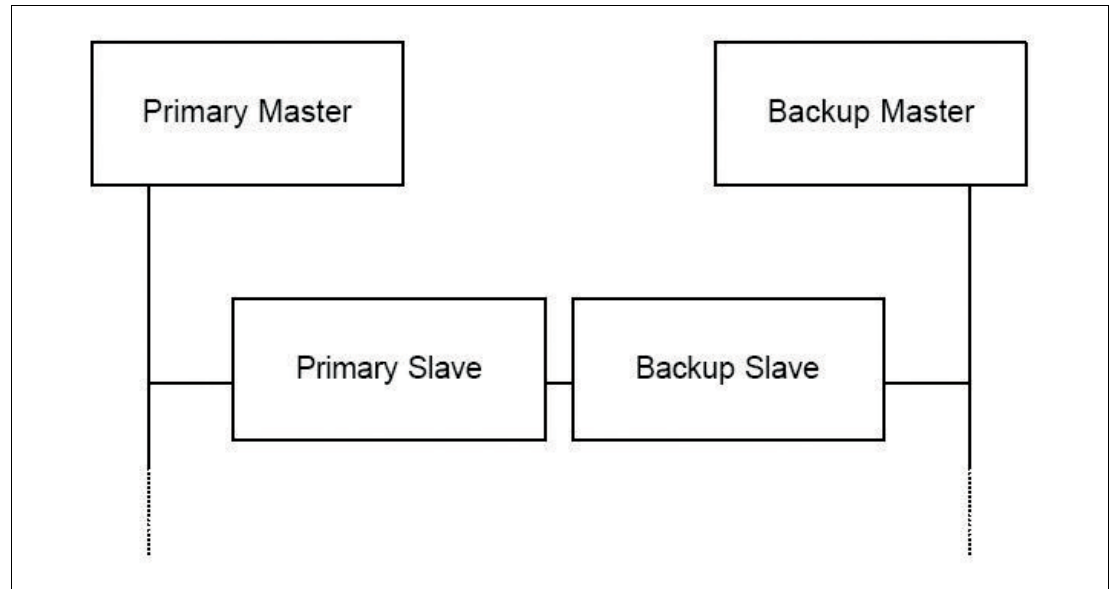
Figure 8.3   System redundancy

This concept has the disadvantage that using non-redundant slaves necessarily require Y–links. System redundancy is found with Siemens S7.

The Pepperl+Fuchs HD2-GTR-4PA gateway does not support system redundancy.

PEPPERL+FUCHS

9 Glossary

This appendix gives explanations concerning the explosion protection declarations used in this manual. It also contains a glossary of terms often used in connection with fieldbus applications.

| Term	Explanation
acyclic data exchange	Event-driven communication used to read or write parameters into or out of a field device.
advanced diagnostic module	Module of the FieldConnex® system which is plugged onto the Power Hub motherboard and which delivers diagnostic functions such as advanced physical layer diagnostics.
basic diagnostic module	Module of the FieldConnex® system which is plugged onto the Power Hub motherboard and delivers basic diagostic information such as redundant supply of segments, supply voltage failure of a module, etc.
CREST	Crosstalk and resonance suppression technology. Prevents signal overlay and resonance, increases the signal-to-noise-ratio and thus maintains a high signal quality level.
crosstalk	Signal overlay. Signals of one segemtn partly appear on another. Can be caused by capacitive coupling. Remedy: Drilled cable connections, CREST.
cyclic data exchange	Cyclic exchange of process data and setpoint values between master and sensors/actuators which are connected over the fieldbus.
daisy chaining	Series connection of devices.
DIP switch	Switch used to assign an address for configuration of a device.
DTM	Common abbreviation for device type manager. Software which allows parameterization and diagnostics of field devices via a GUI. Parameterization can be done online, i.e., with instant effect of changes, or offline.
earth leakage	Short circuit via earth. Causes signal deviations (asymmetry) in case of redundant supply.
galvanic isolation	Physical separation of circuits. Charge carriers cannot flow from one circuit into another.
GSD converter	Pepperl+Fuchs software which converts GSD files from PROFIBUS DP to PROFIBUS PA.
GSD file	Text file which describes communication behavior and supported functions of a PROFIBUS device.
intrinsic safety	Safety concept. Uses energy limitation to ensure that no temperatures or sparks are present which could lead to ignition of an explosive atmosphere. In an intrinsically safe circuit current, voltage, and power are so low that in case of short circuit, circuit breakage, or earth leakage ignition cannot take place. Intrinsically safe devices can be removed from or added to circuits during operation.
jitter	Deviation from ideal timing of an event. Here: Deviation from the ideal zero passage of the signal as compared to the last zero passage.
mobile advanced diagnostic module	Module which offers the functionality of the advanced diagnostic module but which is designed for mobile use in the field since it is USB–powered.
noise	Often caused by overlay of a number of disturbances. Leads to signal deterioration.
physical layer	Layer 1 of the OSI–7–layer model. This is where physical data exchange takes place.

2016-10

PEPPERL+FUCHS

Term	Explanation
power conditioner module	Not galvanically isolated Power Hub module for segment supply.
Power Hub module	Term under which power supply modules and power conditioner modules as well as diagnostic modules are subsumed.
power dissipation	Energy produced during device operation which is let off in form of heat into surroundings.
power supply module	Galvanically isolated Power Hub module which limits voltage to a given value and supplies the segment with this voltage.
PROFIBUS DP	Brief for "PROFIBUS decentralized periphery". Most often used PROFIBUS protocol using transmission rates between 9.6 kbit/s and 12 Mbit/s.
PROFIBUS MBP	Brief for "PROFIBUS Manchester-coded bus powered". Alternative term for PROFIBUS PA.
PROFIBUS PA	Brief for "PROFIBUS process automation". PROFIBUS protocol using a transmission rate of 31.25 kbit/s. Unlike PROFIBUS DP, PROFIBUS PA can be used in intrinsically safe circuits.
redundant coupling	Coupling which is implemented twice, thereby offering increased reliability. Coupling is performed by 2 gateway modules on the gateway motherboard.
redundant supply	Supply which is implemented twice, thereby offering increased reliability. Per segment, 2 power modules supply field devices.
retry limit	Number of retries that are undertaken before a field device is interpreted as non-existent by the host.
RS-485	Communication protocol on the PROFIBUS DP segment.
Segment Protector	Junction box by Pepperl+Fuchs with implemented short-circuit protection.
Segment Checker	Software for designing, calculating and checking for plausibility of entire fieldbus installations, using a GUI.
spur	A usually short cable which connects the field device to the trunk.
static revision counter	Counter which is increased by one every time a substantial change of state occurs. Can be used for status monitoring.
transparent coupling	Coupling in which all PA slaves appear on the DP bus as if they were DP slaves.
trunk	Main line of a segment. Leads from the supply to the junction box, where the spurs go off.
watchdog time	Time after which a device is taken out of the cyclic data exchange.
Zone 0	Zone in which a hazardous, potentially explosive atmosphere comprised of air and inflammable gases, fumes or fog is present permanently, over longer periods of time or frequently.
Zone 1	Zone in which during normal operation a hazardous, potentially explosive atmosphere comprised of air and inflammable gases, fumes or fog is occasionally present.
Zone 2	Zone in which a hazardous, potentially explosive atmosphere comprised of air and inflammable gases, fumes or fog is normally not or only present for short periods of time.

2016-10

PEPPERL+FUCHS

10 Parameter Reference List

10.1 General Parameters

Name	Description
TAG (device)	Device TAG; Default EMPTY
Reserved	-
Mounting location	Mounting location of the device; Default EMPTY
Software version	Software version of the device
Serial number	Serial number of the device
Static revision	"Static revision" counter is incremented when nonvolatile values are changed.
Information	Device information in a bit field: Bit 0 = board type ■ 0 = non-redundant motherboard ■ 1 = redundant motherboard Bit 1 = device position on motherboard* ■ 0 = left device ■ 1 = right device *0 for non-redundant motherboard
Total status	Combined device status message (good: 0 x 00; bad. 0 x 80)
Number of activated PA segments	Number of active PA segments (1 ... 4)

PA Master Parameters

Name	Description
PA retry limit	Retry limit of PA master (valid values: 1 ... 7) Default: 1 (firmware 2.6.0 or older) Default: 3 (firmware 2.6.1 or newer)
Watchdog mode	Value of / working with watchdog time (WDt): ■ 0 = Transparent WDt ■ 1= Fixed WDt* *Valid values 2 ... 25 s; Default: 50* 100 ms

Table 10.1   Work on the bus (e.g., connecting or disconnecting field devices) can cause malfunctions on the bus. This may cause other field devices to fail. To counteract this problem, the retry limit can be increased. Increasing the retry limit under certain circumstances increases the cycle time.

PA Segment Parameters

Name	Description
TAG	Segment TAG; Default EMPTY
Number of nodes	Number of devices on this segment (masters + slaves)
PA bus cycle time	Value of the last PA bus cycle time in ms

10.2 Diagnostic Parameters

Diagnostic parameters represent the current status of the device/segment as a bit field.

PEPPERL+FUCHS

Device Diagnostic Parameters

Bit	Description
0	0: Backup device 1: Gateway is primary redundant device (always with non-redundant layout)
1	Redundancy status (only with redundant layout): 0: OK 1: Redundancy not operative
2	Synchronization status (only with redundant layout): 0: OK 1: Redundancy is synchronizing
3	Redundancy device status (only with redundant layout): 0: OK 1: Redundancy gateway missing
4	Hardware error status: 0: OK 1:Hardware error detected
5	Redundancy communication status (only with redundant layout): 0: OK 1: Redundancy link error
6	DP baud rate status: 0: OK 1: No baud rate detected
7	Built-In slave status: 0: OK 1: Built-in slave not in data-exchange state
8	Firmware versions in both gateways differ: 0: False 1: True
9	Firmware was updated, reboot required: 0: False 1: True
10	A PA master is not participating the token ring: 0: False 1: True
11	Cyclic bus parameters write locked: 0: False 1: True (watchdog. retry limit, segment status)
12	A segment MAU error has been detected: 0: False 1: True
13	Advanced diagnostic module (ADM) state: 0: OK 1: Diagnostic module error or module missing
14	System maintenance required: 0: False 1: True
15	System out of specification: 0: False 1: True

PEPPERL+FUCHS

Bit	Description
16	Segment maintenance required: 0: False 1: True
17	Segment out of specification: 0: False 1: True

PA Segment Diagnostic Parameters

Bit	Description
0	Live list status: 0: OK 1: No PA slave detected in segment live list
1	Watchdog status: 0: OK 1: DP watchdog time too short
2	Device address status: 0: OK 1: Double slave address (other device or BIS)
3	Reserved
4	Master diagnostic status: 0: OK 1: PA master not in token ring
5	Hardware state: 0: OK 1: Segment MAU error
6	Segment maintenance required 0: False 1: True
7	Segment out of specification 0: False 1: True

Redundancy Partner Parameters

Name	Description
Software version (R)	Software version of the redundancy partner.
Serial number (R)	Serial number of the redundancy partner.
Static revision (R)	Static revision counter of the redundancy partner.
Redundancy diagnostics	Diagnostic status of the redundancy partner.
Redundancy information	Redundancy information of the redundancy partner.

2016-10

PEPPERL+FUCHS

11 Troubleshooting

This chapter helps you to solve problems that may occur in connections with commissioning or operating your Power Hub.

Note!

First Checks in Case of Problems

In case a fault occurs, first ensure that the field wiring is complete, properly terminated, and that all field spurs are properly attached. Also check if the gateway module(s) and the power modules are properly plugged into the connection slots of the respective motherboards.

11.1 Faults Indicated via LEDs

Symptom	Possible cause	Remedy
LED "PWR" is off	■ No power. ■ Gateway defective.	■ Check power supply. ■ Restart gateway. If problem persists, send gateway to Pepperl+Fuchs.
LED "DP/ERR" is flashing red	■ No data transmission on DP side. ■ Master problem. ■ Gateway defective.	■ Check cables. ■ Check termination. ■ Check master. ■ Restart gateway. If problem persists, send gateway to Pepperl+Fuchs.
LED "DP/ERR" lights up constantly red	Hardware error.	Restart gateway. If problem persists, send gateway to Pepperl+Fuchs.
LED "Red." (Redundancy) is flashing yellow	Redundancy not available. Reasons: ■ Synchronization in progress. ■ Second gateway module is missing on a redundant board. ■ Backup gateway is defective.	■ Not a fault. Wait a few seconds. ■ Plug in second gateway module. ■ Send gateway to Pepperl+Fuchs. If problem persists, send gateway to Pepperl+Fuchs.
LED "Red." is off	■ Gateway module is plugged into simplex motherboard. ■ Only 1 gateway module is plugged into redundant motherboard. ■ Redundant board is used and LED "Red." lights up constantly yellow at primary gateway.	■ Use redundant motherboard. ■ Not a fault. ■ Not a fault. Gateway is backup device.

PEPPERL+FUCHS

Symptom	Possible cause	Remedy
LED "Seg 1" ... "SEG 4" are flashing red	■ Address collision: The same address is assigned to field devices on 2 segments. ■ BIS address collision: The same address is assigned to a field device and 1 of the built-in slaves (in case of redundant board: address or address + 64).	■ Change address of PA slave. ■ Change address of PA slave.
LED "Seg 1" ... "SEG 4" lights up constantly red **and** LED "DP/ERR" lights up constantly red	Hardware error.	Send gateway to Pepperl+Fuchs.
Redundancy switchover occurs for no apparent reason	■ Built-in slave has left data exchange. ■ Inactivity/startup toggle.	■ Not a fault. See PROFIBUS specification . ■ Not a fault. While not used, redundant slaves constantly change their roles (see PROFIBUS specification).
No redundancy even though 2 gateway modules are used	Gateway module is defective.	Send gateway to Pepperl+Fuchs.

11.2 Fault Indicated via DTM

Symptom	Possible cause	Remedy
Redundancy switchover occurs for no apparent reason.	■ Built-in slave has left data exchange ■ Inactivity/startup toggle	■ Not a fault. See PROFIBUS specification ■ Not a fault. While not used, redundant slaves constantly change their roles (see PROFIBUS specification)
"Redundancy partner missing"	■ No second gateway module plugged into motherboard ■ Secondary gateway module has failed	■ Plug second gateway module into motherboard ■ Replace second gateway module
No redundancy even though 2 gateway modules are used	Gateway module is defective.	Send gateway to Pepperl+Fuchs.
"Firmware version mismatch"	Devices use different firmware versions.	Harmonize firmware versions.
"Firmware updated"	Device has not been rebooted.	Reboot device. Firmware is not active until device has been rebooted.
"Hardware error"	■ Poor signal quality ■ Hardware error	■ Perform physical layer diagnostics. ■ Send gateway to Pepperl+Fuchs.

2016-10

PEPPERL+FUCHS

Symptom	Possible cause	Remedy
PA bus master parameters (WD mode, WD time, no. of retries, segment no.) cannot be written.	PA bus master parameters are write-protected. Reason: Built-in slave is in cyclic data exchange using PA bus configuration module.	Use different module to configure cyclic data exchange.
Diagnostic module error or module missing.	Diagnostic module is defect or was removed (by active ADM alarm observer only).	■ Replace diagnostic module ■ Switch off ADM alarm observer
ADM reports system maintenance required.	At least one monitored system value has violated the preset limit.	Perform diagnostics with the DTM diagnostic manager for detailed information. For further information see the documentation on the "Advanced Diagnostic Module HD2-DM-A".
ADM reports system out of specification.		
ADM reports segment maintenance required.		
ADM reports segment out of specification.		

11.3 Fault Indicated via DCS

Note!

First Checks concerning the DCS

In case faults are indicated via the control system, make sure the built-in slaves of your PROFIBUS Power Hub system are correctly integrated into the engineering tool.

Symptom	Possible cause	Remedy
PA slaves keep leaving cyclic data exchange.	■ Termination problem on PA side ■ Fault on PA bus ■ Poor signal quality on PA side ■ Watchdog time too short	■ Check termination ■ Eliminate fault on PA bus ■ Perform physical layer diagnostics on PA side with advanced diagnostic module ■ Increase watchdog time
PA slaves and DP slaves keep leaving cyclic data exchange.	■ Fault on DP bus ■ Poor signal quality on DP side	■ Eliminate fault on DP bus ■ Check DP signal quality
Device diagnostics: No redundancy even though 2 gateway modules are used.	■ Poor signal quality ■ Gateway module is defective	■ Perform physical layer diagnostics on the PA side with the advanced diagnostic module. ■ Send gateway to Pepperl+Fuchs.
Device diagnostics: "Redundancy partner missing"	■ No second gateway module plugged into motherboard ■ Secondary gateway module has failed	■ Plug second gateway module into motherboard ■ Replace second gateway module

PEPPERL+FUCHS

Symptom	Possible cause	Remedy
Device diagnostics: "Hardware error"	■ Poor signal quality ■ Hardware error	■ Perform physical layer diagnostics. ■ Send gateway to Pepperl+ Fuchs.
Device diagnostics: "Firmware version mismatch"	Devices use different firmware versions.	Harmonize firmware versions.
Device diagnostics: "Firmware updated"	Device was not rebooted.	Reboot device. Firmware is not active until device was rebooted.
PA slaves do not take part in cyclic data exchange	Redundant system, but built-in slave was not added to cyclic data exchange.	Add built-in slave to cyclic data exchange
PA bus master parameters (WD mode, WD time, no. of retries, segment no.) cannot be written.	PA bus master parameters are write-protected. Reason: Built-in slave is in cyclic data exchange using PA bus configuration module.	Use different module to configure cyclic data exchange.
Slave not visible in DCS	■ Respective segment is deactivated ■ Poor signal quality on PA side	■ Harmonize number of PA segments at gateway and actual number of existing segments. ■ Perform physical layer diagnostics on PA side with advanced diagnostic module.
Diagnostic module error or module missing	Diagnostic module is defect or was removed (by active ADM alarm observer only).	■ Replace diagnostic module ■ Switch off ADM alarm observer
ADM: System maintenance required	At least one monitored system value has violated the preset limit.	Perform diagnostics with the DTM diagnostic manager for detailed information. For further information see the documentation on the "Advanced Diagnostic Module HD2-DM-A".
ADM: System out of specification.		
ADM: Segment maintentance required.		
ADM: Segment out of specification		

11.4 Problems with Gateway Operation

Symptom	Remedy/Background
Built-in slave does not accept the address assigned via the DIP switch on the motherboard.	Reboot gateway. In case of redundancy: Restart **both gateways at the same time**. Caution: No redundancy available while booting!
Default values are not taken over when restarting with default settings.	In case of redundancy: Restart **both gateways at the same time**. For detailed information, see chapter 6.3.6. Caution: No redundancy available while booting!

2016-10

PEPPERL+FUCHS

Symptom	Remedy/Background
PA bus master parameters are write-protected.	Built-in slave was addes to the cyclic data exchange, using the PA bus configuration module. Remedy: Use different module to configure cyclic data exchange.
PA slaves do not take part in cyclic data exchange.	Add built-in slave to cyclic data exchange.
Unusual gateway behavior and diagnostic messages recurring at irregular intervals.	Possible cause: Address collision with master of backup gateway (address 2). Remedy: Change address of the colliding slave.

PEPPERL+FUCHS

PROCESS AUTOMATION –
PROTECTING YOUR PROCESS

Worldwide Headquarters
Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

For the Pepperl+Fuchs representative
closest to you check www.pepperl-fuchs.com/contact

www.pepperl-fuchs.com

PEPPERL+FUCHS

PROTECTING YOUR PROCESS

/ DOCT-5093A
10/2016