PROFIBUS Design and Good Practices

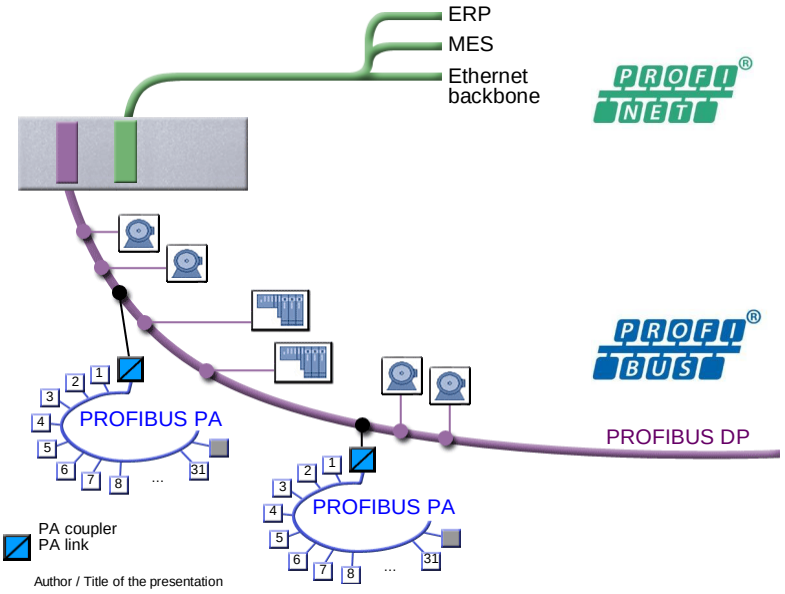
Presenter
Vidyut Gandhi
Link Vue Systems

- Introduction
- PROFIBUS-DP
- PROFIBUS-PA
- Installations and Best practise

PROFIBUS Family

Agenda

- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training



PROFIBUS-DP/PA

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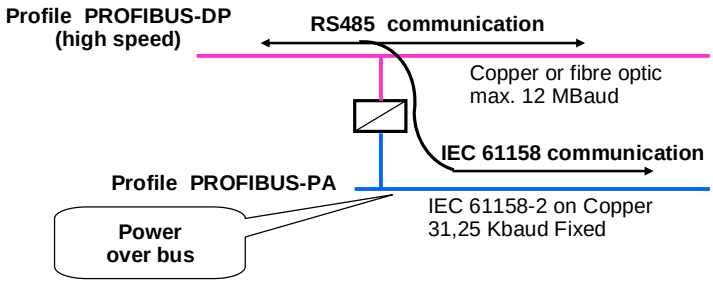
- Profibus DP and Profibus PA same Protocol
- Profibus DP for high speed communication
- Profibus PA for low speed long distance communication with power over the bus



PROFIBUS - Transmission Technologies

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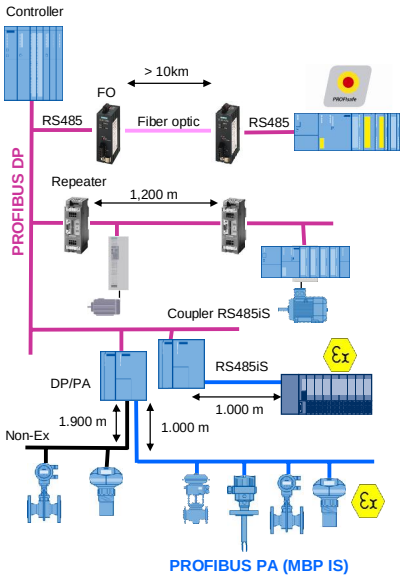

- **PROFIBUS is a Master/ Slave Protocol**
- **1 PROFIBUS Network can address max. 124 DP slaves per bus**
- **There can be more than 1 Profibus DP Master per bus**
- **max. 32 DP Devices per segment**
- **Repeaters extend DP length as well as allow additional segments**
- **DP Couplers connect different Profibus networks into a system.**
- **RS485iS couplers for PROFIBUS DP in EX areas**
- **OLM's (Optical Link Module) is a media converter for Profibus DP on Fiber optic cable**
- **PROFIBUS PA for direct connection of field devices with power supply via bus**

Device Rules - Network

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PROFIBUS Address Map

0	Service-, diagnosis- and programming tool
1..2	Masters (class 1)
3..125	Slaves (total 123 or 124)
126	Address for: "Set Slave Address"
127	Broadcast address

- Most configuration tools block address 0 and 126 for slaves.
- Address 126 is a default address for slaves with software address settings.
- Address 127 is a broadcast address (only visible with a bus monitor).
- Maximum 124 DP slaves per bus!!!!!!!

PROFIBUS - Functional levels

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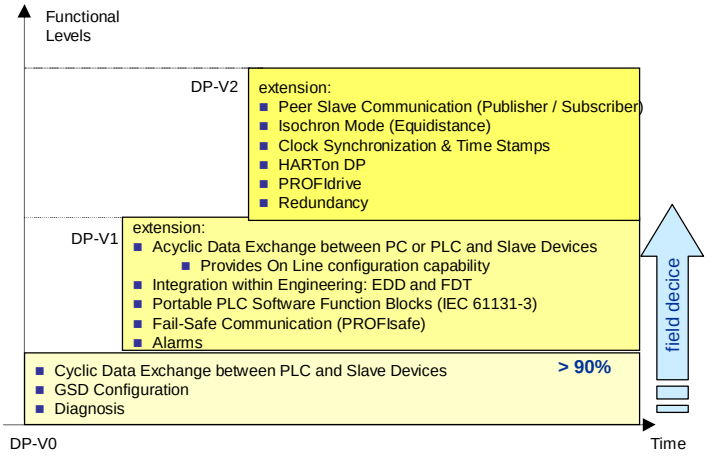

PROFIBUS - Master - Slave

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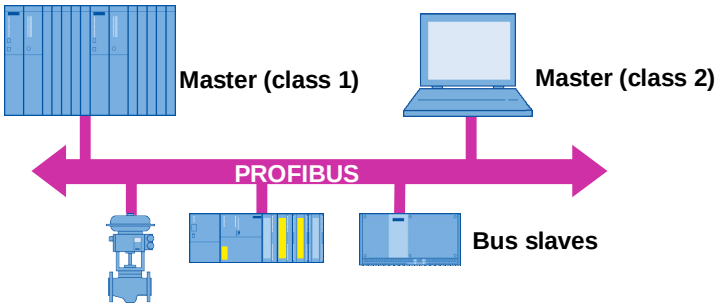
- Master (class 1)
  - Central control
  - Cyclical data exchange with the slaves
  - Active with a high priority
- Master (class 2)
  - Engineering tool for commis-sioning and parameter settings of the slaves
  - Acyclical data exchange with the slaves
  - Active with a low priority



PROFIBUS DP/PA - Deterministic communication

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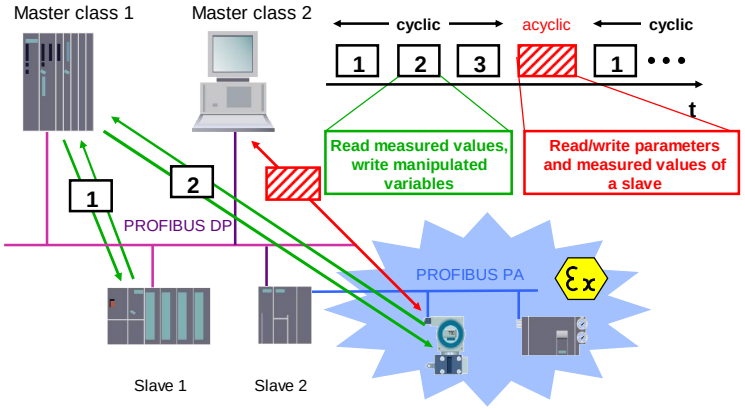
Deterministic communication according Master/Slave principle:

- **Parameterized time behaviour of the bus and defined reaction times of the slaves are permanently guaranteed!**



Configuration of the bus (GSD file)

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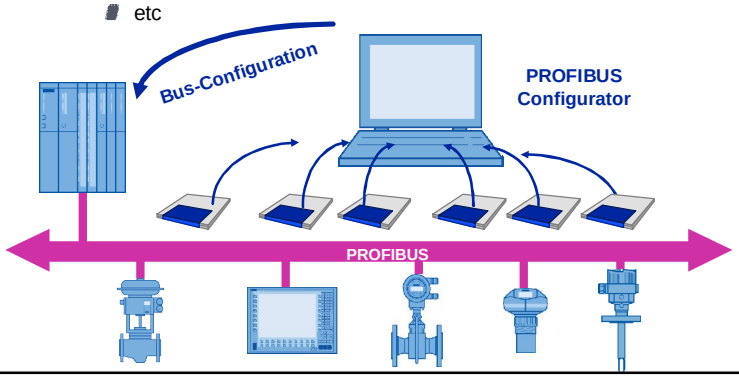
- Bus master (Class 1 Master) needs the technical data of the attached field device.
  - The GSD file describes the general and device specific communication characteristic of a PROFIBUS device:
    - Supported transmission rates
    - Length of the transferred I/O data
    - Type of the field device (compact slave, modular slave)
    - etc



Introduction

PROFIBUS-DP

PROFIBUS-PA

Installations and Best practise

Network Setup/Debug

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Training

- Set up your network
  - ✓ cable Installation
    - A-line green wire (RxD/TxD-N) , B-line red wire (RxD/TxD-P)
    - Termination “ON” only at the beginning and end of segments
    - Set station addresses
    - Ensure proper connection of the shield
    - do not exceed the max. segment length
  - ✓ check proper installation
  - ✓ Configure your system
    - Select devices and station address
    - Select specific functions (I/O configuration and device) parameters
    - Select baud rate
  - ✓ Load configuration file into master system
  - ✓ Start up the network
  - ✓ Trouble shoot and diagnose problems

Network Setup/Debug

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Training

- How to Wire?
  - PROFIBUS DP wiring can be done with:
    - Fiber optic components (OLM, OBT,..)
    - Twisted shielded pair copper cable (Repeater)
    - Infrared components (ILM)
  - Wiring/Cabling Guides
    - PI Installation Guides
    - PROFIBUS Manual

Useful Links

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- Siemens Customer Page, PROFIBUS Manual:
- http://support.automation.siemens.com/WW/view/en/35222591
- PI Southeast Asia:
- www.sea.profibus.com
- www.sea.profinet.com
- Here you find information's on Seminars, Certified Training and Documentation.

Network Setup/Debug

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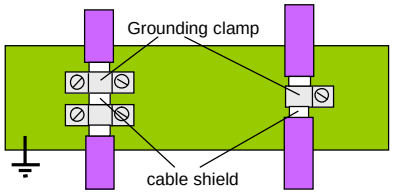
- Why grounding and shielding on both ends
  - Helps to improve the EMC behavior
  - Provides a low impedance (short) return path for noise and current
  - Reduces the emission from the bus

- Shield is not always connected to protective GND within the devices; therefore, make sure the cable shield will be connected to GND before it leaves the cabinet.



Network Setup/Debug

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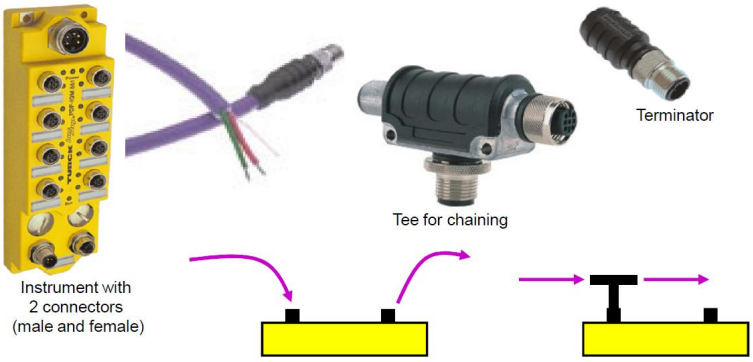
- Connectors
  - One preferred connector type - 9 pin Sub-D
    - the pins for the Sub D connector are defined in the Profibus Standard
    - Connectors with integrated terminator are available
    - For use at higher baud rates, inductance is built in
    - Easy plug and unplug without interrupting the communication to other devices
    - shield is connected with the Sub-D shell

It is highly recommended to use PROFIBUS Products (Connectors, Cables,..) to ensure a stable network

M12 connector - Structure

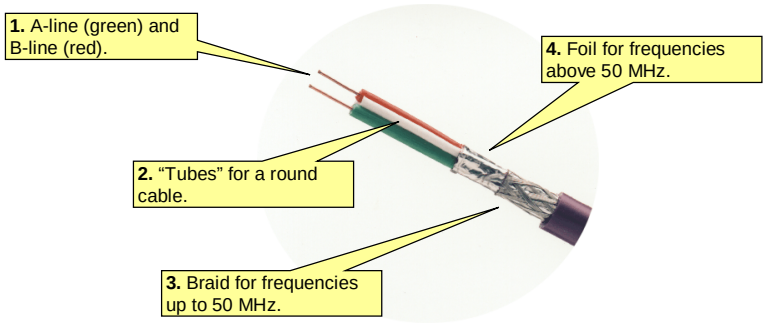
With IP65 applications, the M12 system is often used.



Cable construction and wire colors

The A and B line are **green** and **red**:

A-line	TXD-N	1	-	green
B-line	TXD-P	2	+	red



Cable types

All kinds of cables are available for areas in which the standard PROFIBUS cable cannot be used.

- Robust Cable
- Food Cable
- Underground Cable
- Trailing Cable
- Festoon Cable
- FRNC Cable
- Flexible Cable
- Shipboard Cable
- Hybrid Cable

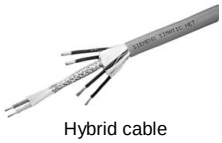

Flexible cable


Trailing cable


Festoon cable


Food cable


Shipboard cable


Hybrid cable


Robust cable


FRNC cable

2.0

PROFIBUS Family - Principle

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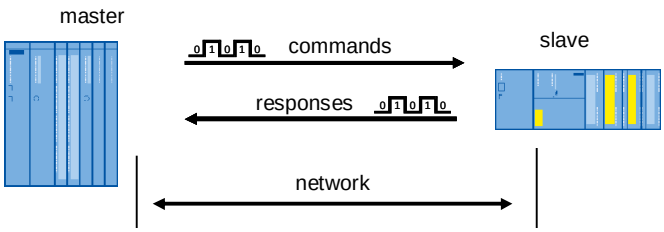
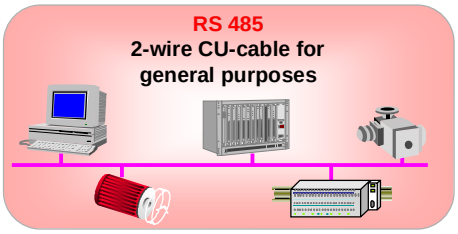
To create hierarchy in the network, PROFIBUS defines 2 types of stations: active (**masters**) and passive (**slaves**).

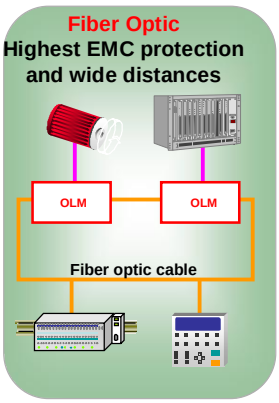


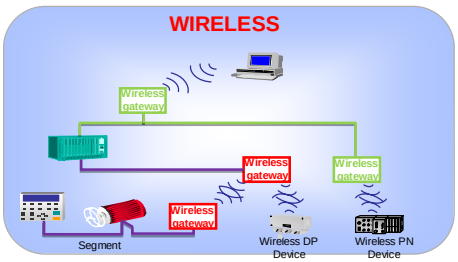
- At least **1 master** is mandatory.
- PROFIBUS networks allow **multiple masters**.
- In total **127 stations** can be addressed (masters + slaves).

Communication Medias

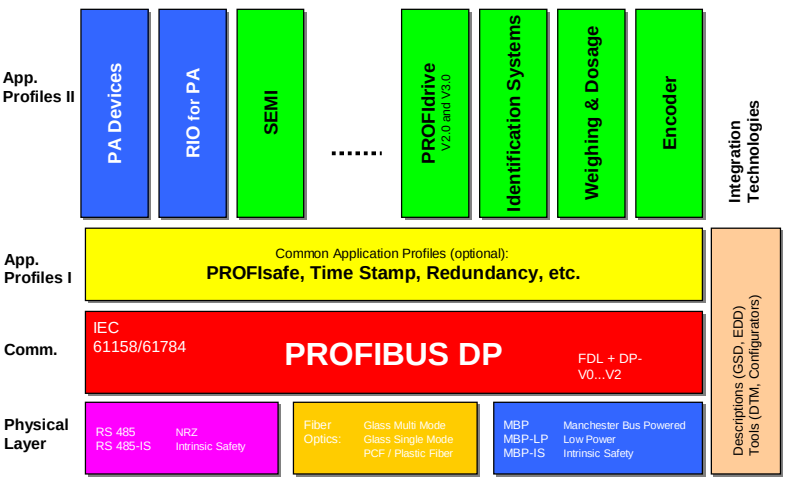
- PROFIBUS DP Supports 3 transmission media





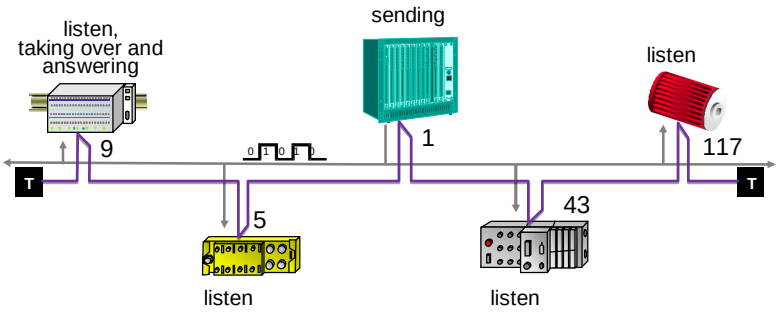


Total Overview of the Technology



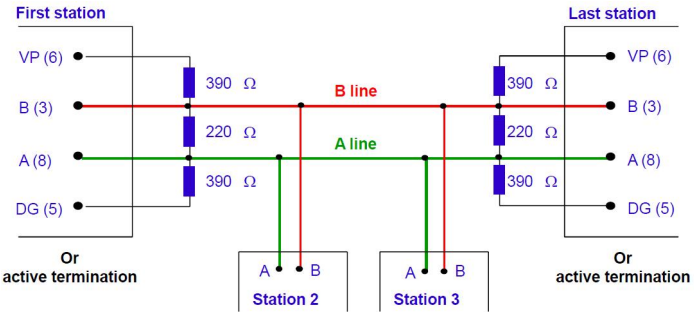
PROFIBUS DP Topologies - General

PROFIBUS communicates over a two wire bus structure.



- Devices are addressed through a network address (0..126).
- Devices are coupled in parallel to the bus.
- Devices can be hot swapped and position does not matter.
- Each segment is terminated at both end with an active termination
- Spurs should be avoided as length is very limited

Termination - Application



Termination must always be present and powered at all times.....
If the user wants more guarantee, then an active termination is the best solution.

TERMINATION

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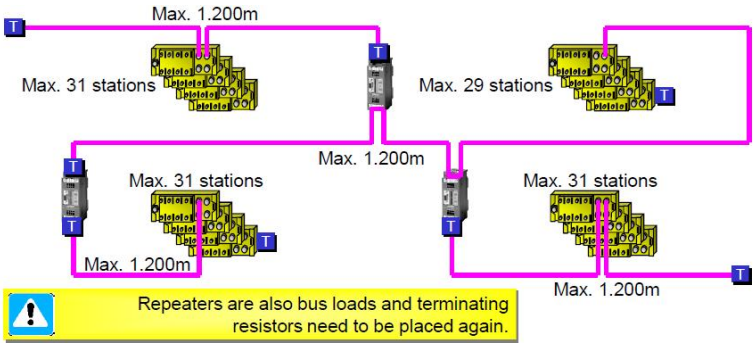

Repeaters are also bus loads and terminating resistors need to be placed again.

PROFIBUS DP Topologies - Repeaters

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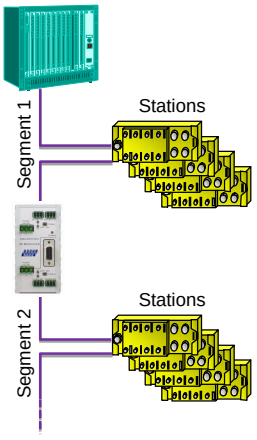
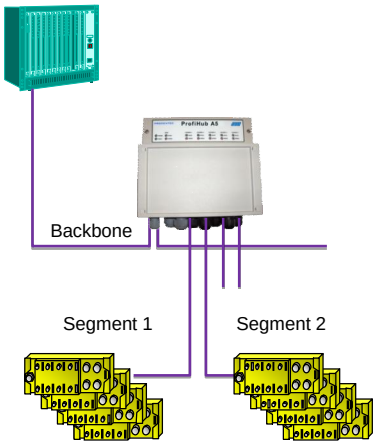
Single Repeaters



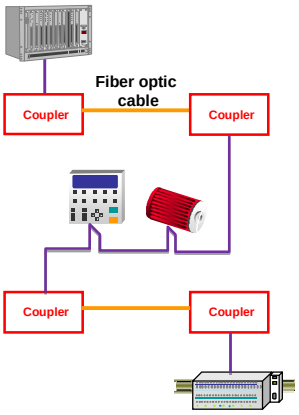
PROFIBUS Hubs



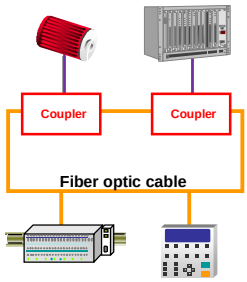
Benefit: Isolate part of your network from EMC/Noise

PROFIBUS DP Topologies – Fiber Optic

Classic Topology



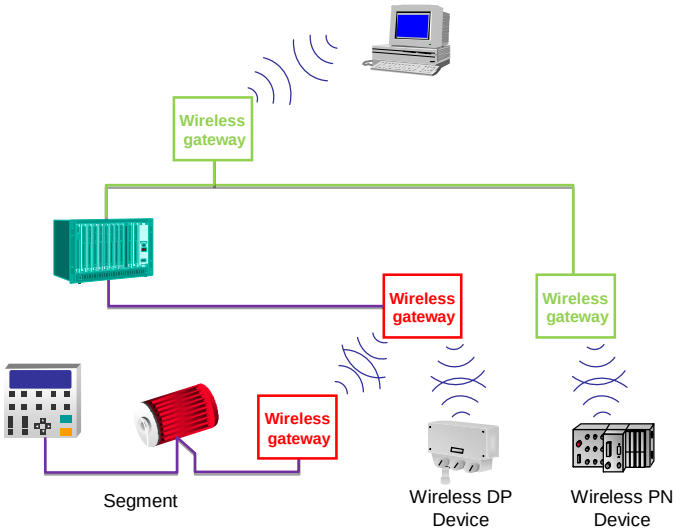
Ring Topology



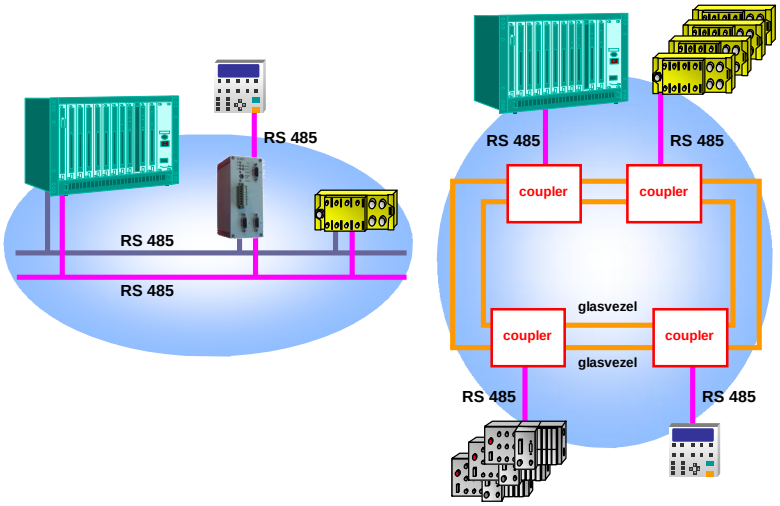
Benefits: Long distances and EMC/Noise isolation

PROFIBUS DP Topologies - Wireless

Connect your slaves through wireless couplers



PROFIBUS DP Topologies - Redundancy



Transmission speed (baudrate)

PROFIBUS offers the user the possibility to choose from 10 transmission speeds (RS 485).

9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000 kbps

Remarks:

- The transmission speed determines the maximum cable length and vice versa.
- The transmission speed has to be set identically at all the masters on the same bus.
- Most slaves detect the baudrate automatically.
- Because of economic and technical reasons some products do not support all transmission speeds.
- Some older products do not support 45,45 kbps.

PROFIBUS DP – Cable Length

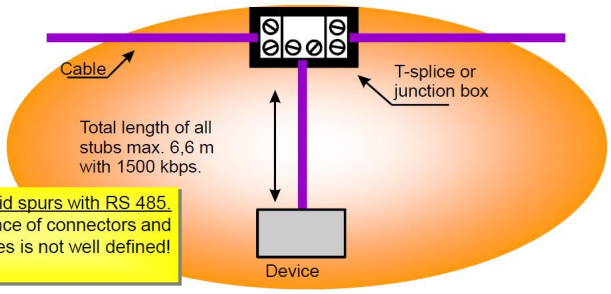
- Baudrate vs Cable Length

Baudrate (kbit/s)	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Segment length (m)	1200	1200	1200	1200	1000	400	200	100	100	100
Segment length (feet)	3940	3940	3940	3940	3280	1310	656	328	328	328

3 baudrate transitions in which the cable length reduces with more than 50 %.

- These lengths are defined for 1 segment with 32 bus loads!

Spurs



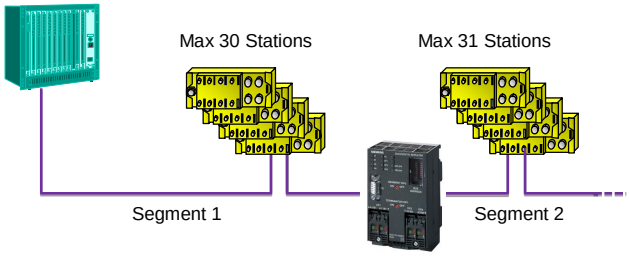
Try to avoid spurs with RS 485. Capacitance of connectors and junction boxes is not well defined!

- Total **6,6 m** with **1500 kbps** (capacity of spurs = 0,2 nF)
- Total **20 m** with **500 kbps** (capacity of spurs = 0,6 nF)
- Total **33 m** with **187,5 kbps** (capacity of spurs = 1,0 nF)
- Total **100 m** with **93,75 kbps** (capacity of spurs = 3,0 nF)
- Total **500 m** with **9,6 and 19,2 kbps** (capacity of spurs = 15 nF)

The length is a sum of all the spurs in the segment!

Device Rules - DP Segments

- Maximum 32 loads per RS485 segments



- Devices that generate new segments:
  - Repeaters
  - Optical Link Module (OLM)
  - Wireless gateways

-1 meter rule with 1,5 Mbps or higher baud rates

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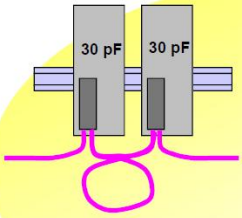
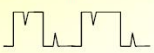


Each certified device has a small connection capacitance (typically 30 pF) and causes a minimal reflection because of the small short circuit that appears when bits change to another level. This is absolutely normal!

However when connected closely together the capacitances ADD and can produce a reflection that alters the bit level and corrupts messages.

'Scope trace:-



Separating devices with at least 1 m cable, introduces a small signal delay between the devices, so the reflections don't add!

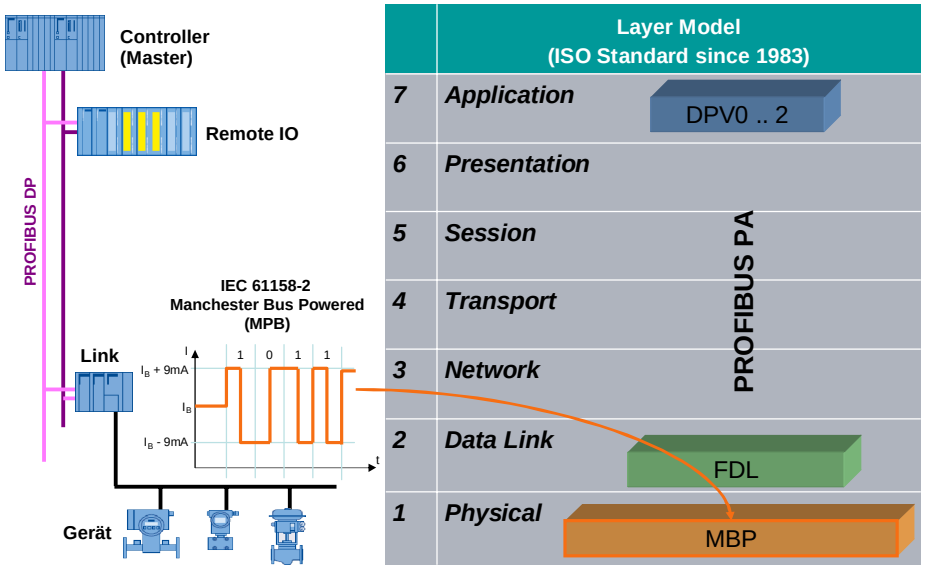
Introduction

PROFIBUS-DP

PROFIBUS-PA

Installations and Best practise

PROFIBUS-PA Network layout



Typical Zone Applications

Safe Area	Zone2	Zone1 / 0
Paper	**Chemical**	**LNG**
Water	**Fertilizer**	**Refineries**
Cement	**Food & Beverage**	**Offshore**
Power	**Oil & Gas**	**Oil & Gas**

Directive 99/92/EG

Zone 0 / Zone 20

- A place in which an explosive atmosphere consisting of a mixture with air of flammable substances
- Zone 0: in the form of gas, vapour or mist
- Zone 20: in the form of a cloud of combustable dust in air
- is present continuously or for long periods or frequently.

Zone 1 / Zone 21

- A place in which an explosive atmosphere consisting of a mixture with air of flammable substances
- Zone 1: in the form of gas, vapour or mist
- Zone 21: in the form of a cloud of combustable dust in air
- is likely to occur in normal operation occasionally.

Zone 2 / Zone 22

- A place in which an explosive atmosphere consisting of a mixture with air of flammable substances
- Zone 2: in the form of gas, vapour or mist
- Zone 22: in the form of a cloud of combustable dust in air
- is not likely to occur in normal operation but, if it does occur,will persist for a short period only.

Directive 99/92/EG

Classification of hazardous areas

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	continuous danger (> 1000h / year)	occasional danger (10 ... 1000 h / year)	danger only under abnormal operating conditions (< 10 h / year)
IEC / CENELEC / Europe	Zone 0 Gases Zone 20 Dusts	Zone 1 Gases Zone 21 Dusts	Zone 2 Gases Zone 22 Dusts
North America	Division 1		Division 2
	No separation Gases/Dusts (Classes)		

PROFIBUS PA Topologies - Overview

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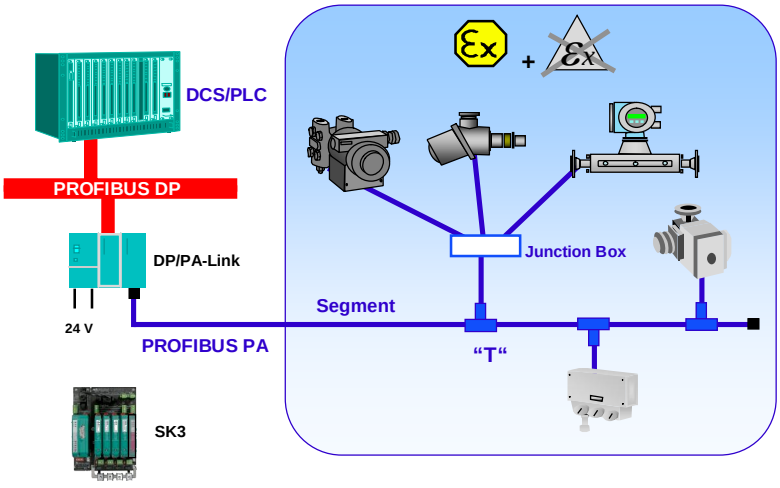

Typical Zone Certifications

Safe area, Zone2

Existing standards

-Ex nA (Non arcing) / Ex nL (energy Limiting)

-2007 onwards Ex nL renamed to Ex ic (similar to IS)

-Zone1

-Ex d (Explosion Proof)

-Ex ia, Ex ib (Intrinsically Safe -IS)

Zone 2 applications

Current practice (widely used now)

-Trunk Ex nA (Non arcing) / Spurs Ex nL (energy Limiting)

-(referred as High power trunk)

-Spurs could be disconnected live

-Trunk live disconnect not allowed (usually not required), but can be done via Ex-term disconnect switch

Application - Zone2 and Safe Area ExnA / ExnL

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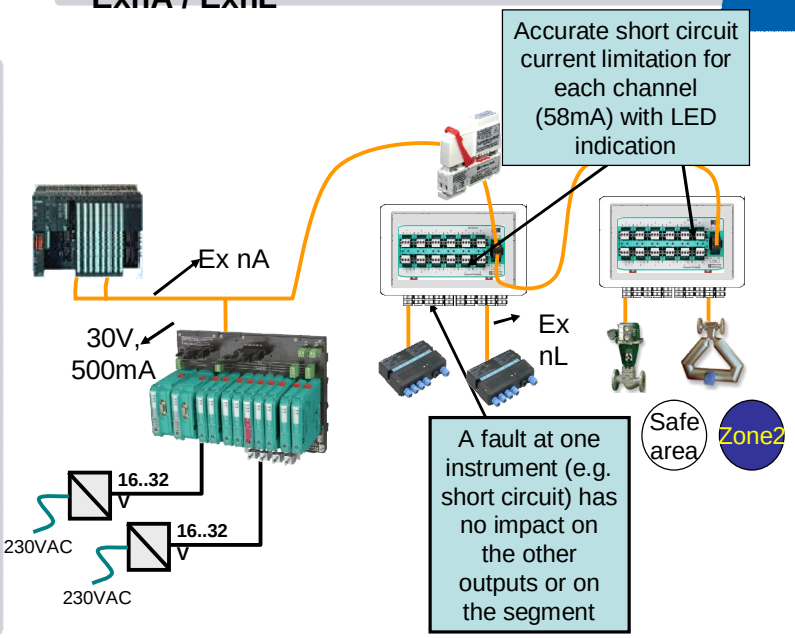
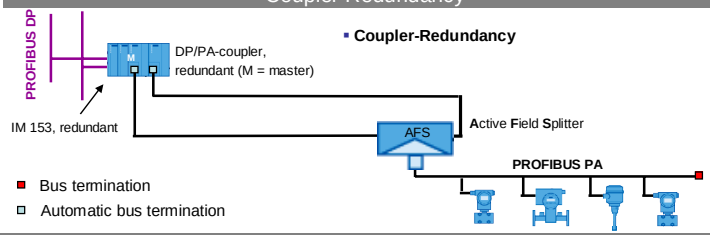


PROFIBUS PA Topologies - Redundancy

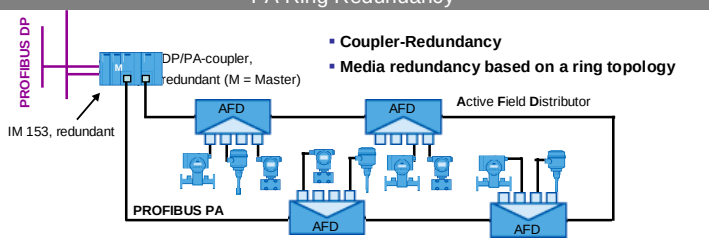
Agenda
- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training

Coupler Redundancy



- **Coupler-Redundancy**

PA Ring Redundancy



- **Coupler-Redundancy**
- **Media redundancy based on a ring topology**

Higher availability with Redundancy

Agenda

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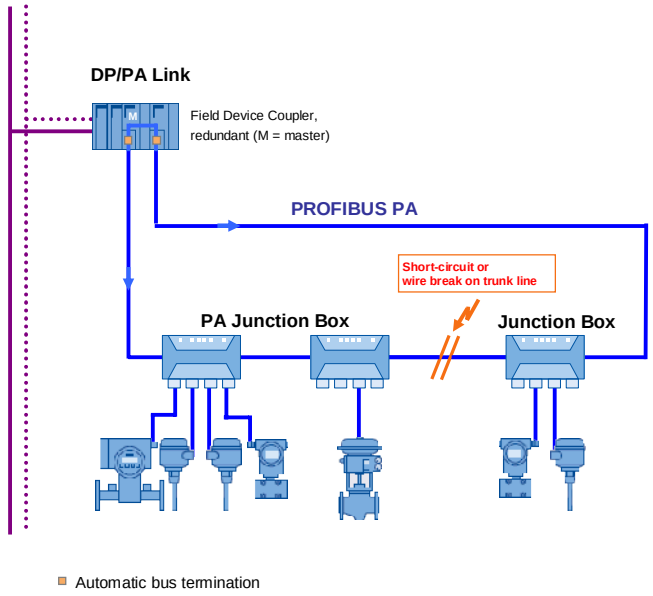
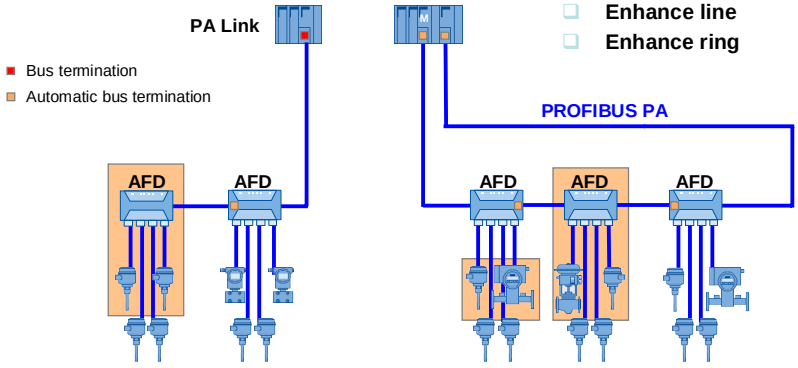


Automatic Termination

Automatic bus termination enables unique online changeability

- **Add new devices**
- **Enhance line**
- **Enhance ring**



There is no need to reserve spare ports of the AFDs !

Zone2 – Exic Solution

Agenda

PROFIBUS Family

Communication Medias

Topologies

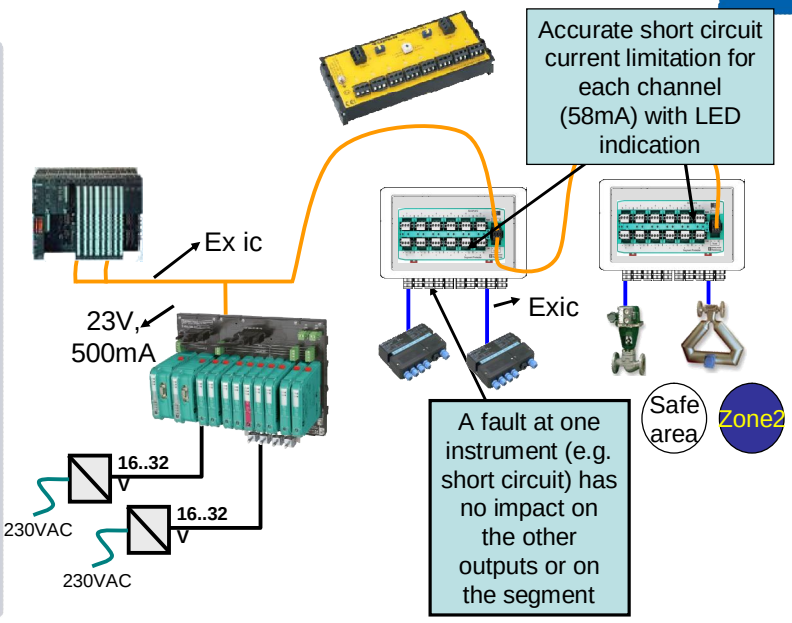
Cable length

Devices Rules

Installation Rules

Troubleshooting

Training



Zone2 – Exic Enclosure Solutions

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

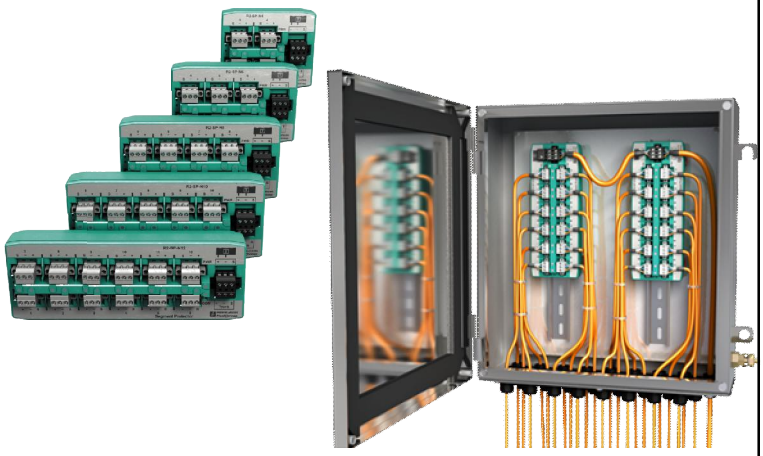
Devices Rules

Installation Rules

Troubleshooting

Training

P+F R2 Segment Protector
4, 6, 8, 10 & 12 Spurs



Application - Zone1 installations

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

- Non-IS(EEx d)
  - Trunk and spurs must be installed in increased safety EEx e
- IS
- - HPT (**H**igh **P**ower **T**runk)
  - A mixture of EEx e and EEx I
    - Trunk has to be installed in increased safety
    - Spurs are intrinsically safe
    - Allows the use of Non IS Power Supplies/Power Repeaters/Power Links
  - DART High Power IS concept

Application Area - Zone 1 (EEx d)

Agenda

PROFIBUS Family

Communication Medias

Topologies

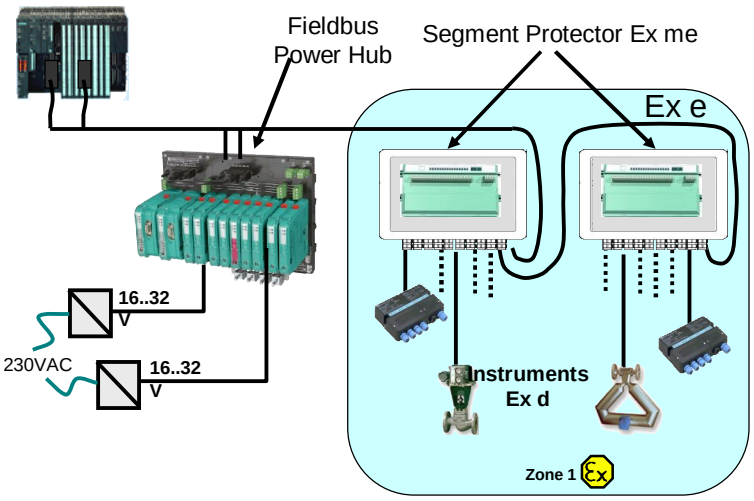
Cable length

Devices Rules

Installation Rules

Troubleshooting

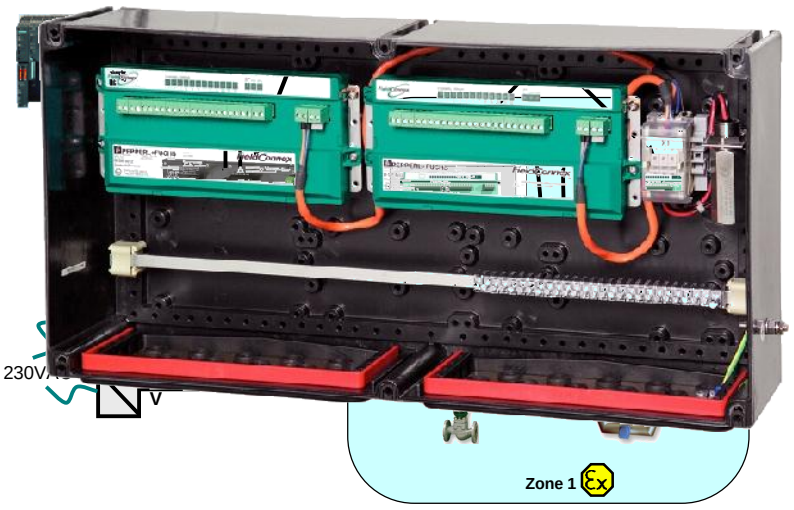
Training



Application Area - Zone 1 (EEx d)

Agenda

- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training



Application Area - Zone 1 (EEx d)

Agenda

- PROFIBUS Family
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- Topologies
- Cable length
- Devices Rules
- Installation Rules
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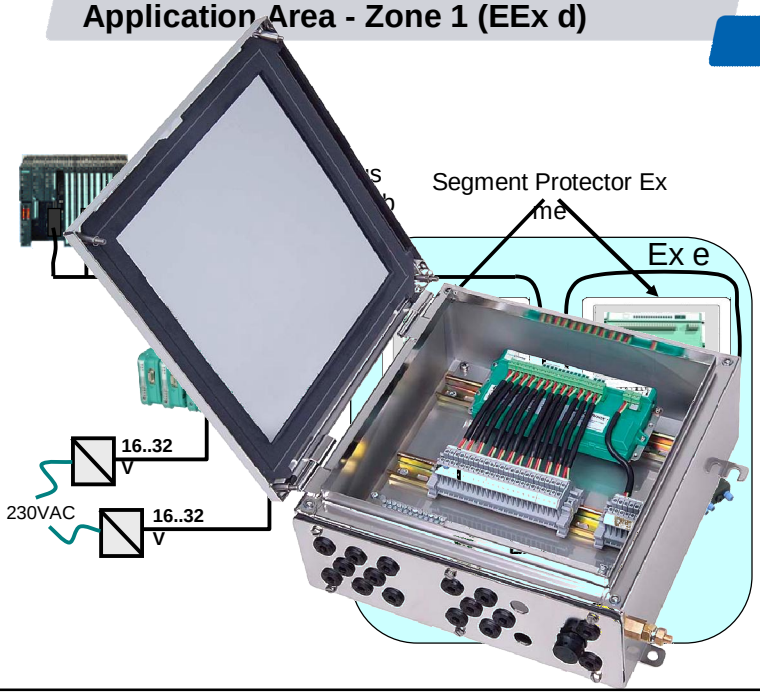
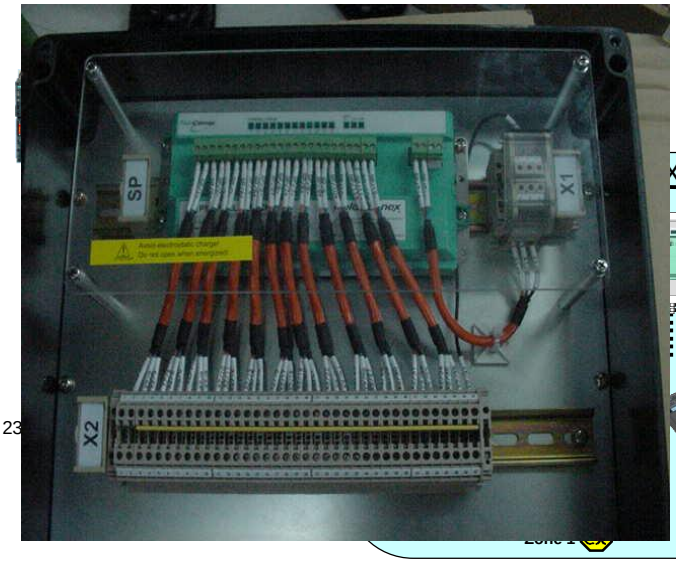


Application Area - Zone 1 (EEx d)

Agenda

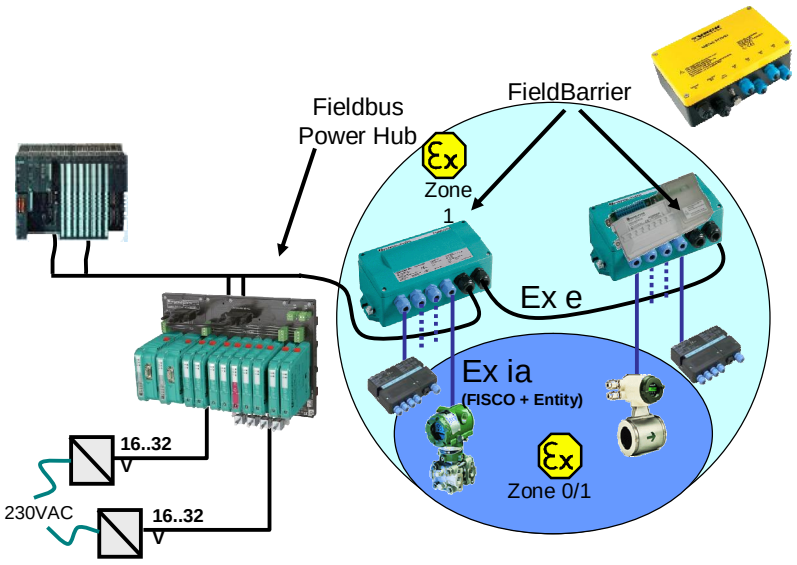
- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training



HPT - Zone 1

Agenda

- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training



Sample Enclosures for Profibus PA FieldBarrier

Agenda

- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
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Sample Enclosures for Profibus PA FieldBarrier

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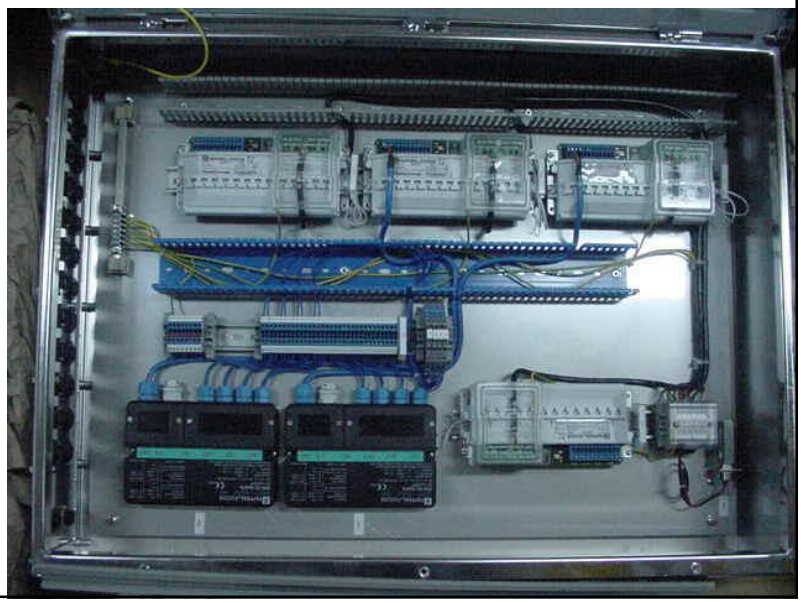

Sample Enclosures for Profibus PA FieldBarrier

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

Sample Enclosures for Profibus PA FieldBarrier

Agenda

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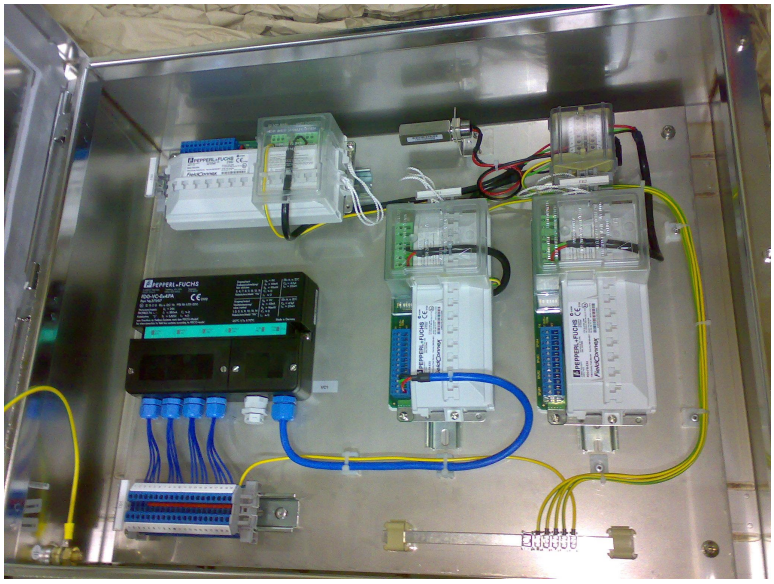

Sample Enclosures for Profibus PA FieldBarrier

Agenda

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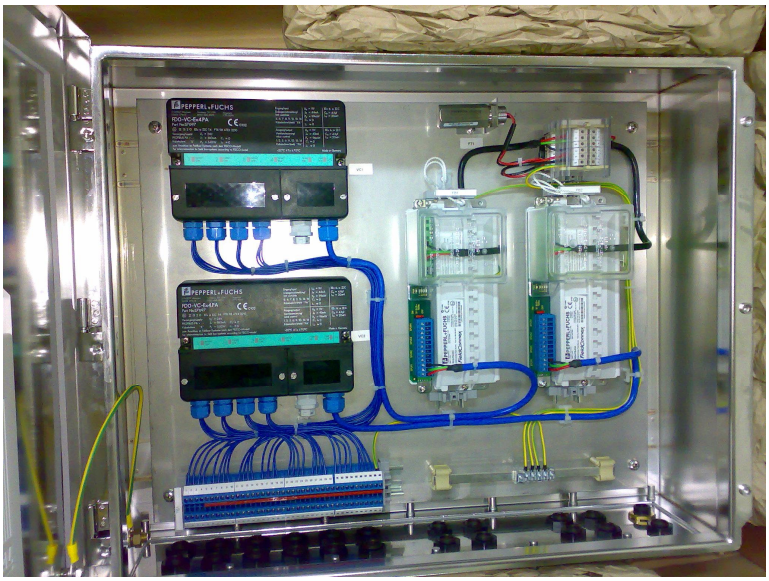
Installation Rules

Troubleshooting

Training



DART High Power IS - Zone 1

Agenda

PROFIBUS Family

Communication Medias

Topologies

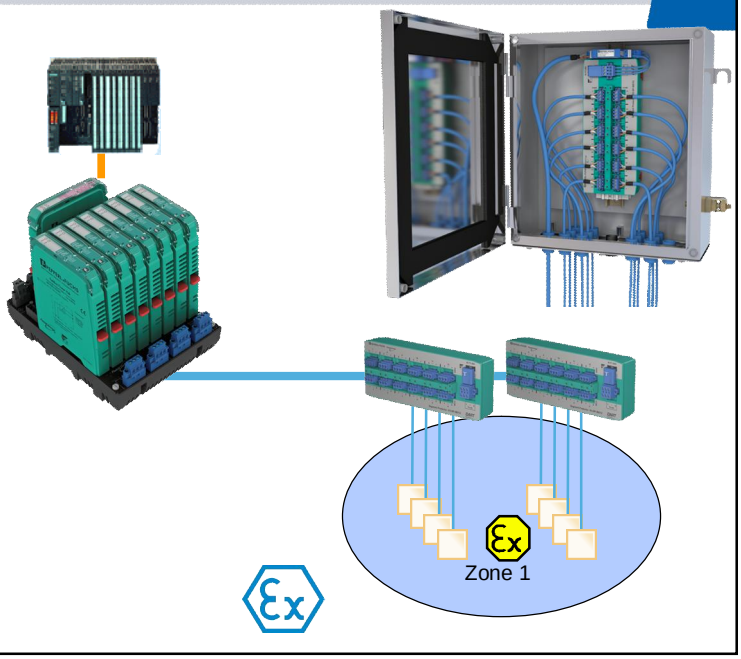
Cable length

Devices Rules

Installation Rules

Troubleshooting

Training



BASF Ludwigshafen

Agenda

PROFIBUS Family

Communication Medias

Topologies

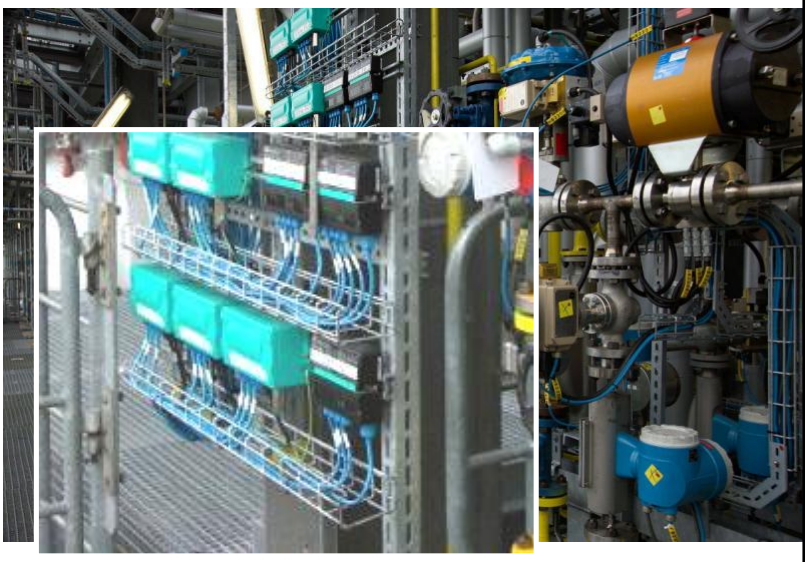
Cable length

Devices Rules

Installation Rules

Troubleshooting

Training



Rubin-Rot, Clariant IP Hoechst

Agenda

PROFIBUS Family

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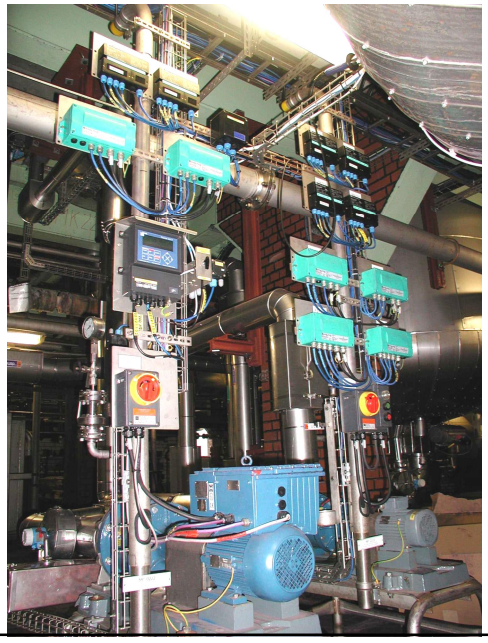
Installation Rules

Troubleshooting

Training



Introduction

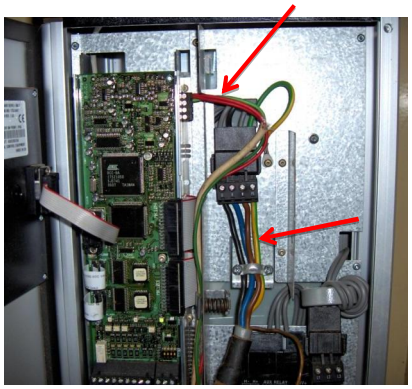
PROFIBUS-DP

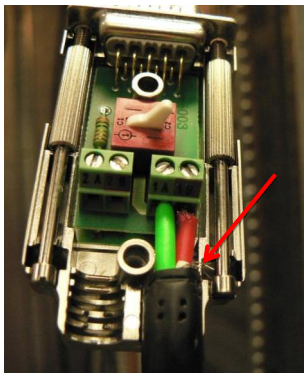
PROFIBUS-PA

Installations and Best practise

Installation rules

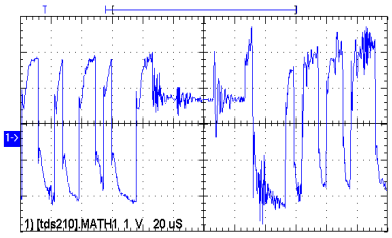
- Grounding & Shielding
  - PROFIBUS is digital communication, not 4-20mA
  - Ground at both end
  - Ungrounded shield has no effect



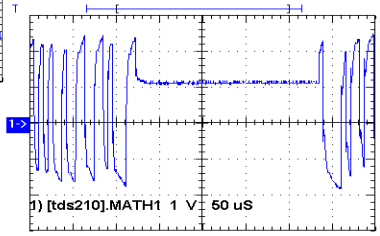


Installation rules

- Power Lines
  - Digital communication is sensitive to power lines
  - Watch out for cable runs in trays
  - Respect distances for air separation



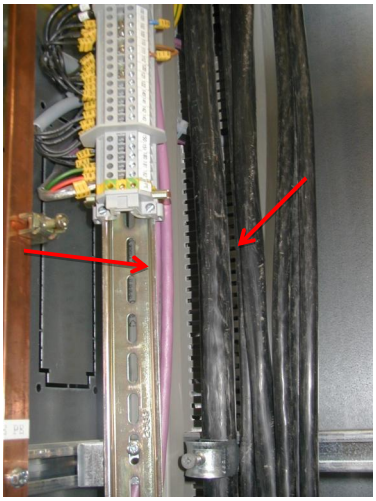
Power line too close

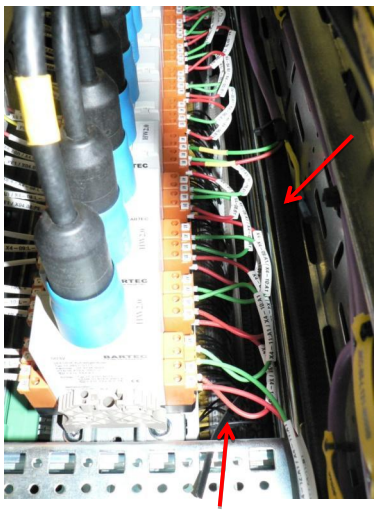


Power line are removed

Installation rules

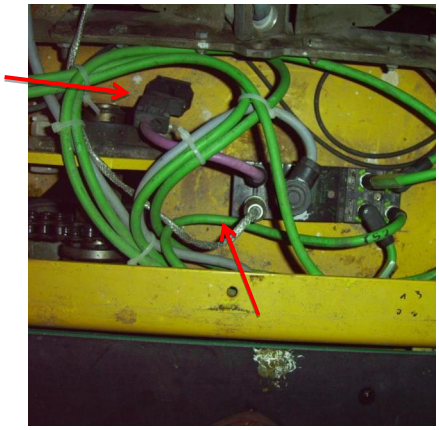
- Some examples with Power Lines





Installation rules

- Proper wiring and component selection
  - Wiring and cable termination is critical
  - Wrong component selection leads to bad installation
  - Take environment in account (humidity, sunlight…)

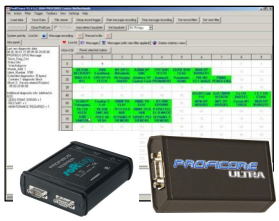


Troubleshooting

- Recognizing bad installations
  - You cannot use the multimeter, this is digital comm.
  - Specific tools are required

Cable Tester

Oscilloscope

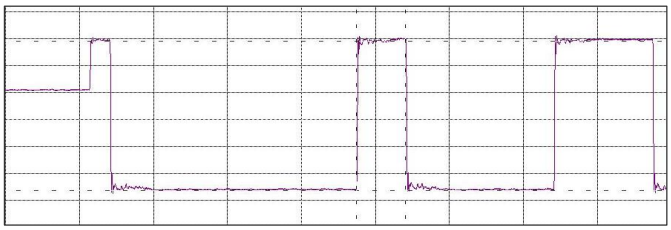


Analyzer

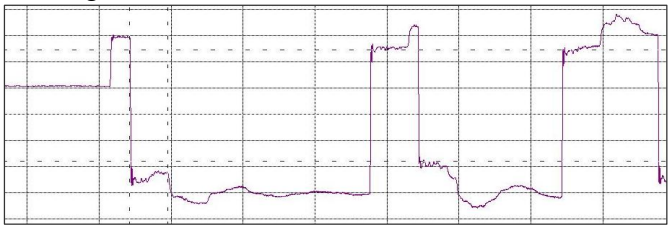
  - Find wiring errors such as short circuit
  - Identify missing termination and EMC
  - Capture error messages and find the source of your system shutdown
  - Cost and time saving by using the right tools!

Troubleshooting - Oscilloscope

- Good signal



- Missing termination



Troubleshooting - Analyzer

- Capture all PROFIBUS messages
  - Useful for random errors
  - Shows underlying conditions
  - Device diagnostic

FrameNr	Timestamp	Idle time	Attention	Frame	Addr	Service	Msg type	Req/Re
3664497	22-May-2...	43 Bit		SD4	0->2	Token pass	Pass token	
3664498	22-May-2...	40 Bit		SD2	2->10	SRD_HIGH	Data Exchange	Req
3664499	22-May-2...	16 Bit		SD2	2<-10	DL	Data Exchange	Res
3664500	22-May-2...	39 Bit		SD2	2->12	SRD_HIGH	Data Exchange	Req
3664501	22-May-2...	18 Bit		SD2	2<-12	DL	Data Exchange	Res
3664502	22-May-2...	39 Bit		SD2	2->14	SRD_HIGH	Data Exchange	Req
3664503	22-May-2...	17 Bit		SD2	2<-14	DL	Data Exchange	Res
3664504	22-May-2...	39 Bit		SD2	2->20	SRD_HIGH	Data Exchange	Req
3664505	22-May-2...	36 Bit	Parity error	Illegal				
3664506	22-May-2...	172 Bit		SD2	2->20	SRD_HIGH	Data Exchange	Req
3664507	22-May-2...	316 Bit		SD2	2->21	SRD_HIGH	Data Exchange	Req
3664508	22-May-2...	307 Bit	Repeat(lost)	SD2	2->21	SRD_HIGH	Data Exchange	Req
3664509	22-May-2...	316 Bit		SD2	2->22	SRD_HIGH	Data Exchange	Req
3664510	22-May-2...	307 Bit	Repeat(lost)	SD2	2->22	SRD_HIGH	Data Exchange	Req
3664511	22-May-2...	316 Bit		SD2	2->23	SRD_HIGH	Data Exchange	Req
3664512	22-May-2...	307 Bit	Repeat	SD2	2->23	SRD_HIGH	Data Exchange	Req
3664513	22-May-2...	36 Bit		SD2	2<-23	DL	Data Exchange	Res
3664514	22-May-2...	39 Bit		SD2	2->24	SRD_HIGH	Data Exchange	Req
3664515	22-May-2...	35 Bit		SD2	2<-24	DL	Data Exchange	Res
3664516	22-May-2...	40 Bit		SD2	2->25	SRD_HIGH	Data Exchange	Req
3664517	22-May-2...	49 Bit		SD2	2<-25	DL	Data Exchange	Res
3664518	22-May-2...	40 Bit		SD2	2->26	SRD_HIGH	Data Exchange	Req
3664519	22-May-2...	54 Bit		SD2	2<-26	DL	Data Exchange	Res
3664520	22-May-2...	40 Bit		SD2	2->27	SRD_HIGH	Data Exchange	Req
3664521	22-May-2...	62 Bit		SD2	2<-27	DL	Data Exchange	Res

Don‘ts

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

Bad Wiring

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

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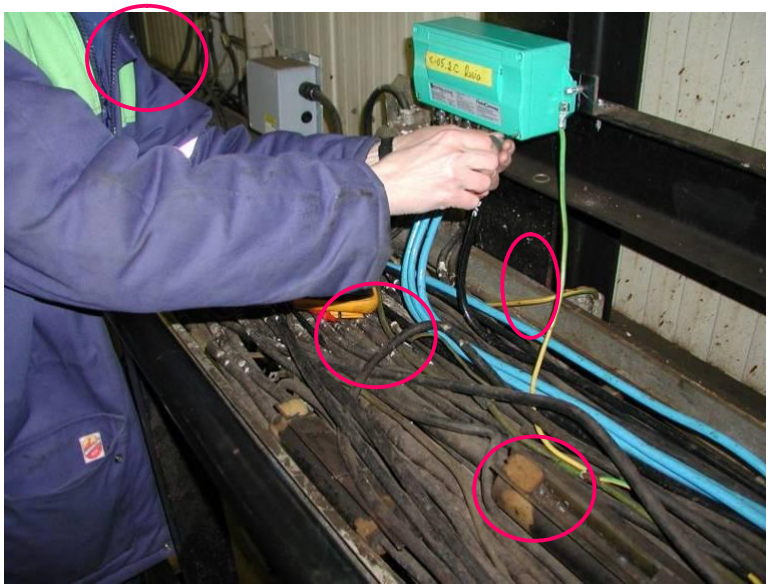
Troubleshooting

Training



Bad Wiring

Agenda

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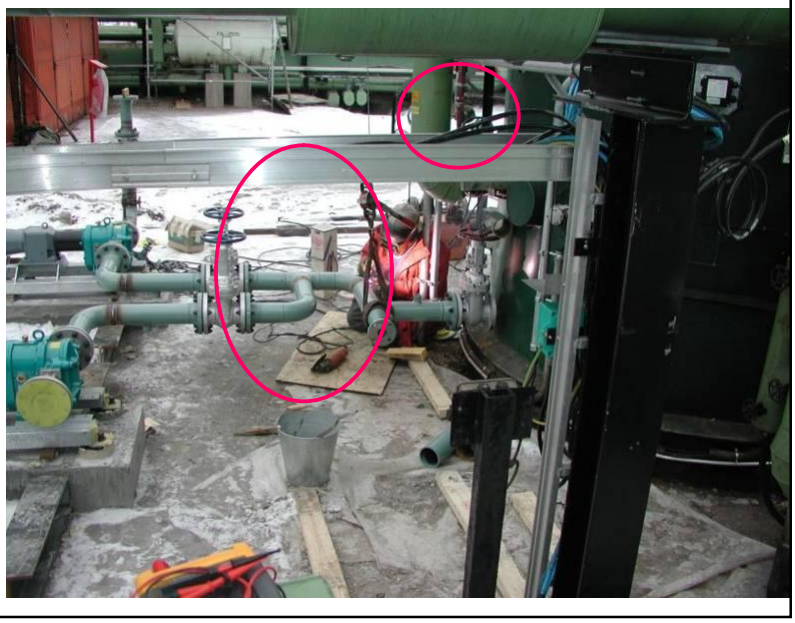


Installation - Cable Separation Distances

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

	Communication Cables (PROFIBUS)	Shielded/Unshielded Cables Carrying >60 VDC or >25 VAC but <= 400 V	Shielded/Unshielded Cables Carrying > 400 V	Any Cables at risk of Lighting
Communication Cables (PROFIBUS)		10 cm	20 cm	50 cm
Shielded/Unshielded Cables Carrying >60 VDC or >25 VAC but <= 400 V	10 cm		10 cm	50 cm
Shielded/Unshielded Cables Carrying > 400 V	20 cm	10 cm		50 cm
Any Cables at risk of Lighting	50 cm	50 cm	50 cm	

Physical Layer considerations

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

- Take care of Right cable
- Take care of EMC disturnaces
- Take care of Earthing and Grounding based on
- the plant situation
- Practice the recommended wiring guidelines
- Take care of Surge disturbance

- **USE the RIGHT TOOL to find the RIGHT disturbances**

Commissioning until now

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

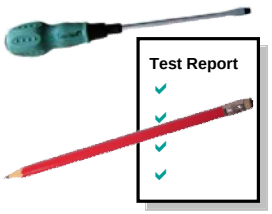
Devices Rules

Installation Rules

Troubleshooting

Training

- Always on the critical path
- Manual, step-by-step procedure
- Labor intensive
- Requires
  - Screw driver
  - Check sheet
  - Pencil
  - Multimeter
  - Oscilloscope
- Connect one device at a time
- Disconnect after testing



Simple Commissioning Steps with ADM

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

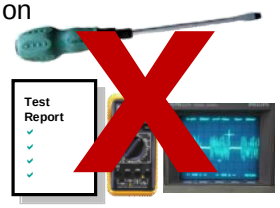
Devices Rules

Installation Rules

Troubleshooting

Training

- Verify address setting
- Wire up devices in the right location
- Check shielding
- Activate communication
- Use automated work procedures
  - Testing
  - Documentation
- All devices at once
- Wiring remains undisturbed!



Commissioning Wizard

ADM in PRM, Jump to Diagnostic Menu

Agenda

PROFIBUS Family

Communication Medias

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Cable length

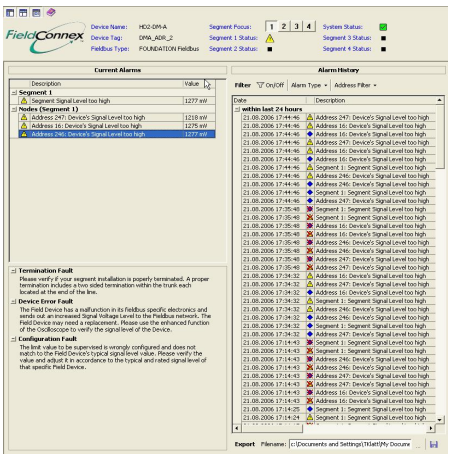
Devices Rules

Installation Rules

Troubleshooting

Training

- Diagnostic Manager is launched by a right click in the network view of a specific ADM representation



Diagnostic Menu

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

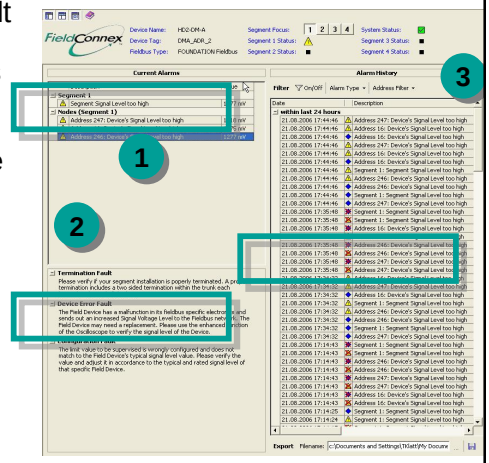
Devices Rules

Installation Rules

Troubleshooting

Training

- ADM delivers actionable information for fast fault finding
  - 1 Active messages
  - 2 Actionable information with solution guideance based on expert knowledge
  - 3 History with timestamps
    When the failure…
    - … occured
    - … disappeared
  - Export function for external analysis and storage



Commissioning Wizard

Agenda

PROFIBUS Family

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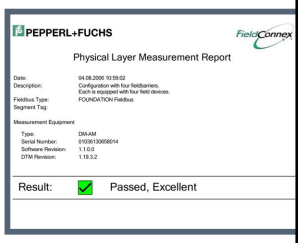
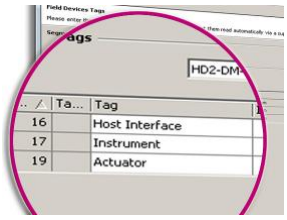
Installation Rules

Troubleshooting

Training

- With Expert System Support
  - Takes snapshot
  - Identifies wiring erros
  - Ensures compliance with IEC 61158-2
  - Recommends limits for ADM messages
  - Stores limits in non-volatile memory
- Automatic Tag Readout
- Creates baseline report:
  - Snapshot of all measurements
  - Complete documentation
- Saves 80% of pre-commissioning time





Built-in fieldbus oscilloscope

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

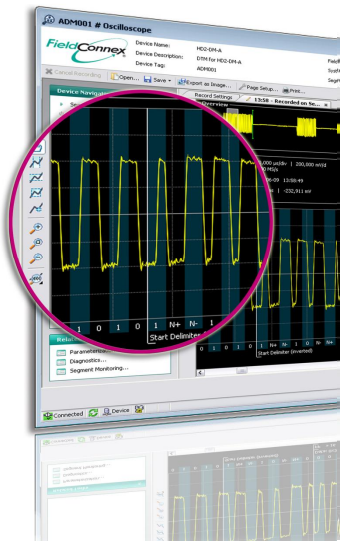
Devices Rules

Installation Rules

Troubleshooting

Training

- ADM provides expert tools for fast fault finding
  - For diagnosing complex scenarios
  - For the fieldbus expert
  - With fieldbus specific triggers
  - Captures up to 10 shots in a row



Full Integration – Simplifies your work

Agenda

PROFIBUS Family

Communication Medias

Topologies

Cable length

Devices Rules

Installation Rules

Troubleshooting

Training

- Simplify configuration processes
  - Select segments and configure entire plant automatically
  - Only a few mouse clicks
- Simplify operations processes
  - DCS-native op guide messages
  - Summary alarms alert without nuisance
- Simplify maintenance processes
  - Integrated into DCS platforms
  - Fieldbus physical layer is now a manageable asset
  - Detailed information for proactive planning of plant upkeep
- Another easy-to-manage asset: The fieldbus physical layer with the PA Advanced Diagnostic Module

Physical Layer considerations

Agenda
- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training

- Take care of Right cable
- Take care of EMC disturnaces
- Take care of Earthing and Grounding based on the plant situation
- Practice the recommended wiring guidelines
- Take care of Surge disturbance

- **USE the RIGHT TOOL to find the RIGHT disturbances**

Training

Agenda
- PROFIBUS Family
- Communication Medias
- Topologies
- Cable length
- Devices Rules
- Installation Rules
- Troubleshooting
- Training

- Certified Training by PROFIBUS International

Benefits
- Avoid basic errors that cost time and money
- Quality assurance for design and commissioning
- Faster project delivery
- Better installation, longer operation

Various courses available

- PROFIBUS Certified Engineer
- PROFIBUS Certified PA Module
- PROFIBUS Certified Installer

- PROFINET Certified Engineer

Certified by PI PROFIBUS • PROFINET

The end

Thank you for listening

Presenter
Teo Puay Yong
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