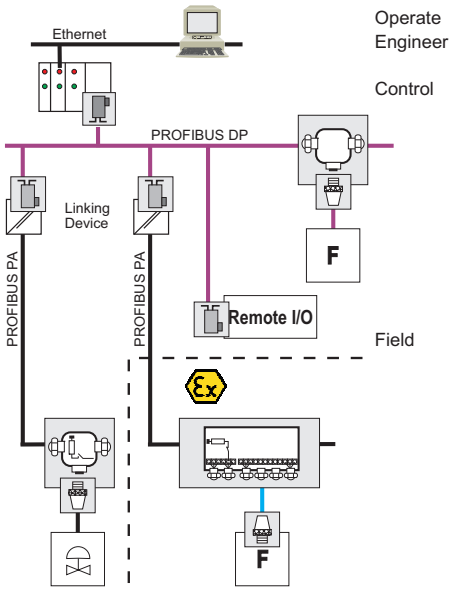
Data Sheet 10/63-0.40 EN Rev. G

PROFIBUS
Installation suggestion

Measurement made easy



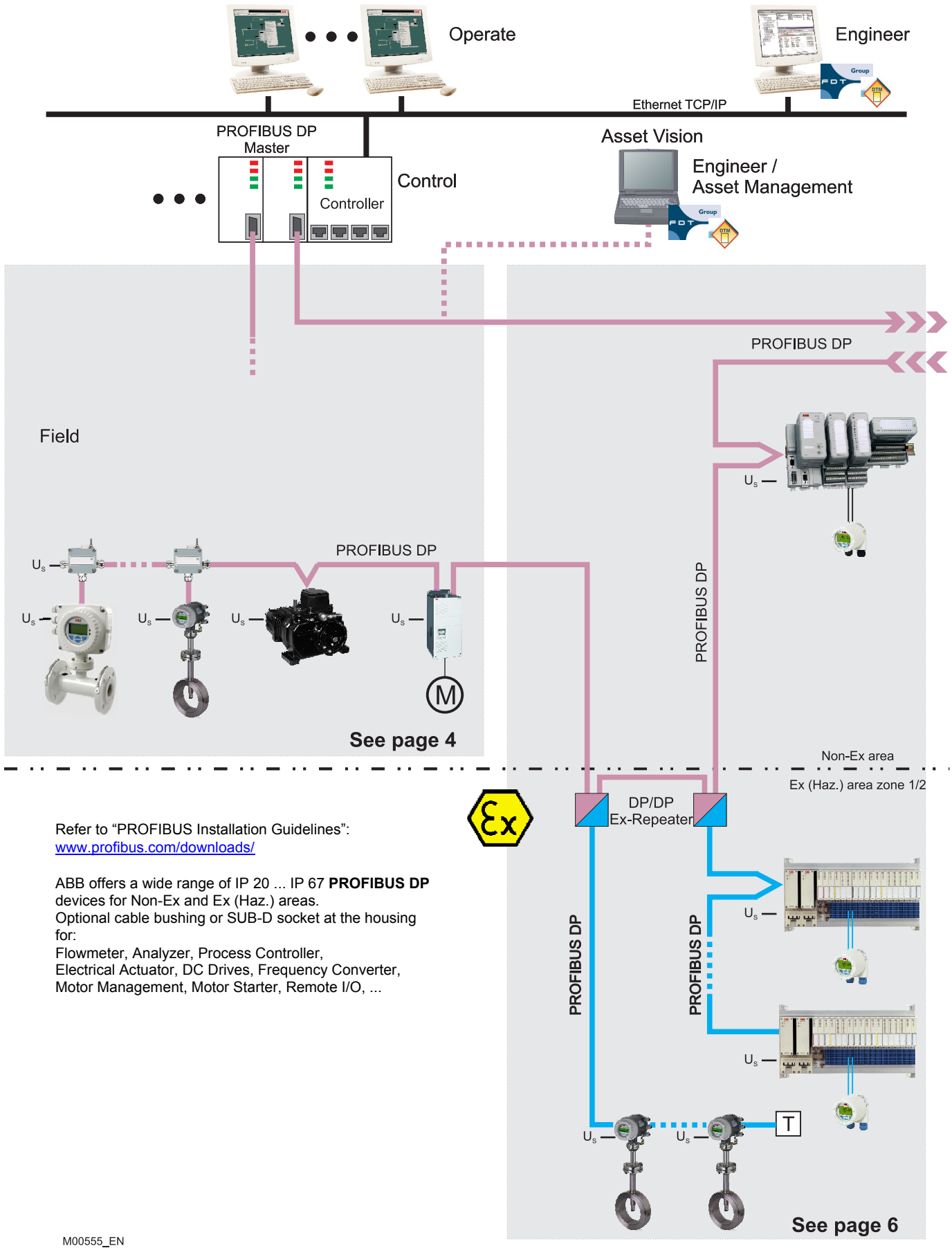
PROFIBUS DP
— Passive T-junction and active bus termination in the Non-Ex area
— Remote I/Os and field devices in Ex (Haz.) and Non-Ex area
— Redundancy concept with RLM01

PROFIBUS DP/PA
— Segment Coupler

PROFIBUS PA
— Fieldbus barrier in Ex (Haz.) area
— Passive T and 4-way junction in Non-Ex area

Shielding and grounding
— PROFIBUS DP
— PROFIBUS PA

PROFIBUS PA-layout example
— Fieldbus barrier in Ex (Haz.) area
— Passive 4-way junction in Non-Ex area



Refer to “PROFIBUS Installation Guidelines”:
www.profibus.com/downloads/

ABB offers a wide range of IP 20 ... IP 67 **PROFIBUS DP** devices for Non-Ex and Ex (Haz.) areas.
Optional cable bushing or SUB-D socket at the housing for:
Flowmeter, Analyzer, Process Controller,
Electrical Actuator, DC Drives, Frequency Converter,
Motor Management, Motor Starter, Remote I/O, ...

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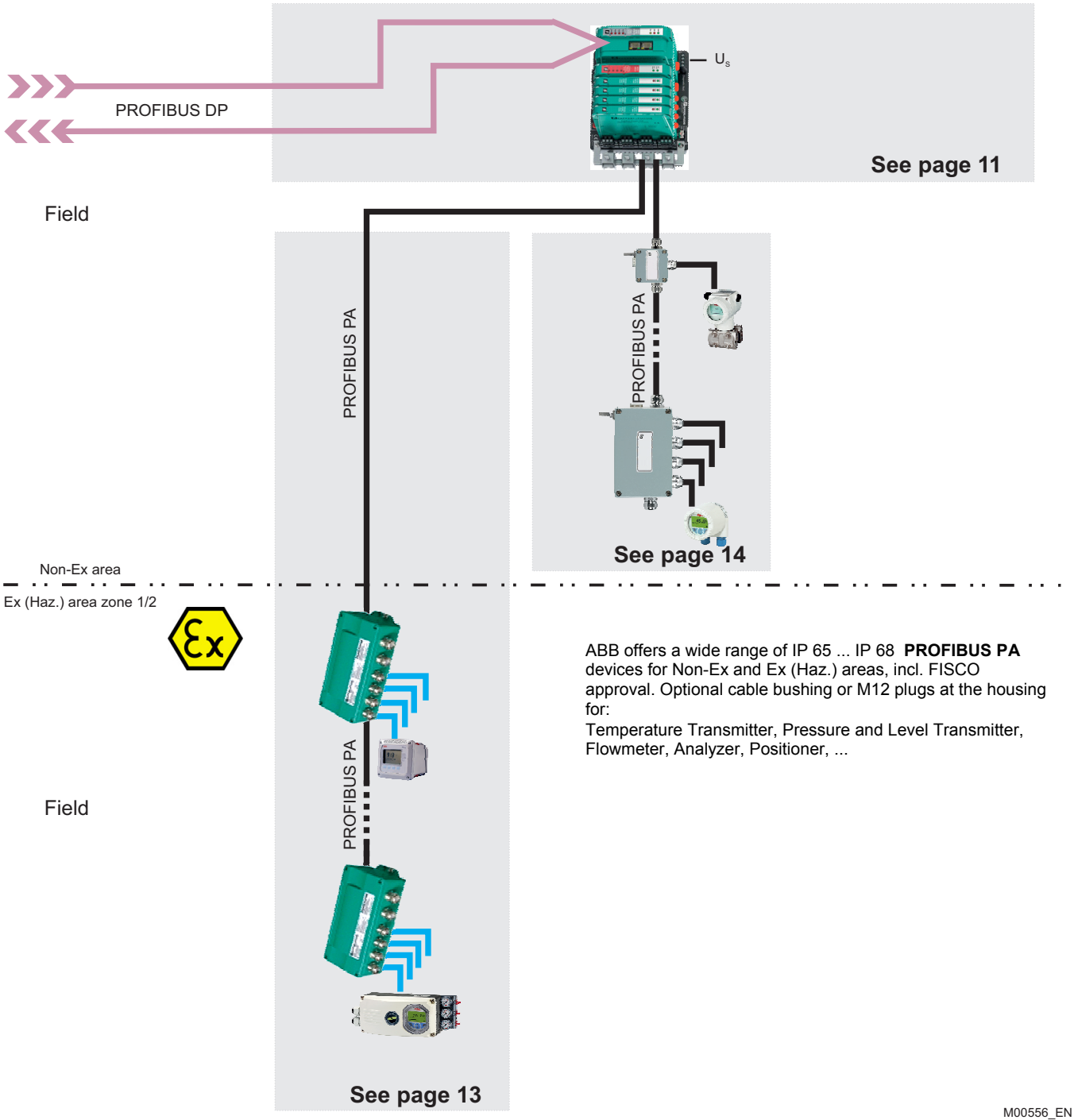

ABB offers a wide range of IP 65 ... IP 68 **PROFIBUS PA** devices for Non-Ex and Ex (Haz.) areas, incl. FISCO approval. Optional cable bushing or M12 plugs at the housing for:
Temperature Transmitter, Pressure and Level Transmitter, Flowmeter, Analyzer, Positioner, ...

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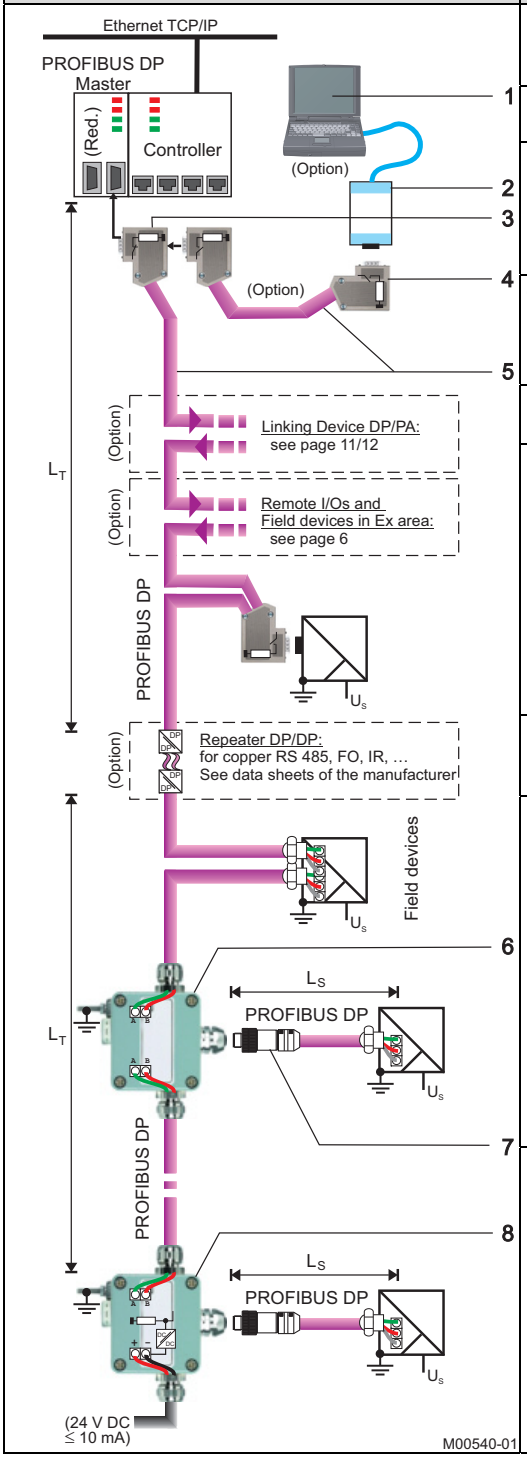
PROFIBUS DP - Passive T junction and active bus termination in the Non-Ex area



	Description	Catalog No.	Data sheet
1	**DTM Bundle & DATxxx (option)**	9820027	DS/DTM/DAT200
	- Asset Vision - Device Management Tools for configuration and parameterization of PROFIBUS DP/PA and HART field devices incl. open FDT interface.		
2	**NDA121-NO** (option)	9890002	10/63-6.31
	- PROFIBUS DP/PC Adapter for USB		
3	**NDE230-NO** - DP cable plug, 9-pos. SUB-D	9890119	10/63-6.40
	- incl. switchable bus termination and programming connection SUB-D, ≤12 MBit/s, IP 40, Ex (Haz.) Zone 2		
	♦ PINs: **IN:** 1A = RxD/TxD-N, 1B = RxD/TxD-P		
	OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P		
4	**NDE220-NO** - DP cable plug, 9-pos. SUB-D	9890118	10/63-6.40
	- incl. switchable bus termination, ≤ 12 MBit/s, IP 40, Ex (Haz.) Zone 2		
	♦ PINs: **IN:** 1A = RxD/TxD-N, 1B = RxD/TxD-P		
	OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P		
5	PROFIBUS DP cable, violet	989014x	10/63-6.47
	NDC110-NO - 2 x 0.33 mm^2 (AWG22/1), 65/330/1000 m		
6	**NDJ120-NO** - DP T-junction, ≤ 1.5 MBit/s	9890109	10/63-6.40
	- 2x EMC cable bushing, without bus termination, aluminum housing, IP 66 (Shielding braid on ground via cable bushing)		
	♦ PINs: trunk cable (L_T): **IN/OUT:** A = RxD/TxD-N, B = RxD/TxD-P		
	(Alternative, not shown)		
	NDJ130-NO - DP T-junction, ≤ 1.5 MBit/s	9890112	10/63-6.40
	- 3x EMC cable bushing, without bus termination, aluminum housing, IP 66		
	NDJ120-NOS - DP T-junction, ≤ 1.5 MBit/s	9890111	10/63-6.40
	- 2x cable bushing (plastic), without bus termination, stainless steel housing, IP 66		
	♦ PINs: trunk cable (L_T): **IN/OUT:** A = RxD/TxD-N, B = RxD/TxD-P, S = shielding		
7	**NDE100-NE** - DP cable plug	9890113	10/63-6.40
	- metal housing, M12, for Ex and Non-Ex areas, IP 67		
	♦ PINs: 2 = RxD/TxD-N, 4 = RxD/TxD-P, 5 = shielding		
8	**NDJ122-NO** - DP T-junction, ≤ 1.5 MBit/s	9890110	10/63-6.40
	- 2x EMC cable bushing, incl. active bus termination, aluminum housing, IP 66 (Shielding braid on ground via cable bushing)		
	♦ PINs: trunk cable (L_T): (L_T): **IN:** A = RxD/TxD-N, B = RxD/TxD-P		
	♦ Power-PINs: 24V = (+), 0V = (-)		
	(Alternative, not shown)		
	NDJ132-NO - DP T-junction, ≤ 1.5 MBit/s	9890123	10/63-6.40
	- 3x EMC cable bushing, incl. active bus termination, aluminum housing, IP 66		
	NDJ122-NOS - DP T-junction, ≤ 1.5 MBit/s	9890124	10/63-6.40
	- 2x cable bushing (plastic), incl. active bus termination, stainless steel housing, IP 66		
	♦ PINs: PINs: trunk cable (L_T): **IN:** A = RxD/TxD-N, B = RxD/TxD-P, S = shielding		
	♦ Power-PINs: 24V = (+), 0V = (-)		

Color coding:

PROFIBUS DP: RxD/TxD-P = red, RxD/TxD-N = green

PROFIBUS PA: PA+ = red, PA - = green

Attention (valid for all pages): For the PIN coding the respective product data sheet is relevant!

PROFIBUS – Installation suggestion

Limits and rules!

When using the ABB Fieldbus accessories:

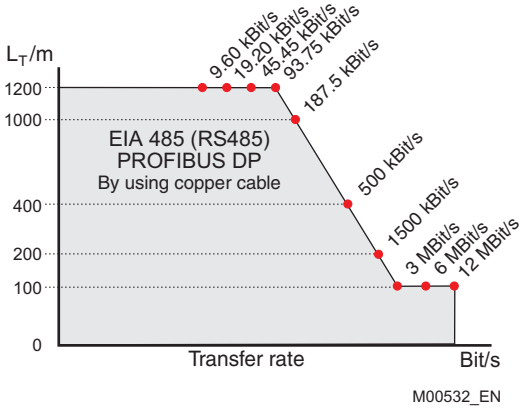
per PROFIBUS Line

(Line = Starting at the DP Master up to the last DP/PA Slave)

- approx. 4 up to 8 DP segments by Repeater (see data sheets of the Repeater)
- recommended DP transfer rate 500 … 1500 kBit/s
- the slowest DP subscriber sets the transfer rate of the DP line
- number of PROFIBUS DP and PA subscribers ≤ 126 (Addresses 0 …125)

per PROFIBUS DP segment:

- number of DP subscriber ≤ 32 (subscriber = device with / without PROFIBUS address)
- bus termination each at the beginning and the end of every DP segment necessary!
- trunk cable length (L_T) see diagram (length depending on transfer rate)
- min. 1 m cable length between two DP subscriber at ≥ 1500 kBit/s!
- spur cable length (L_S), at ≤ 1500 kBit/s: **L_S ≤ 0.25 m**, at > 1500 kBit/s: **L_S = 0.00 m!**
  - at **1500 kBit/s** and ABB DP cable type A:
    Total sum of all spur cable length (L_S) ≤ 6.60 m,
    trunk cable length (L_T) > 6.60 m, $L_{total} = L_T + (\Sigma L_S) \leq 200$ m,
    max. 22 DP subscribers (= 6.60 m / (0.25 m + 0.05 m reserve))



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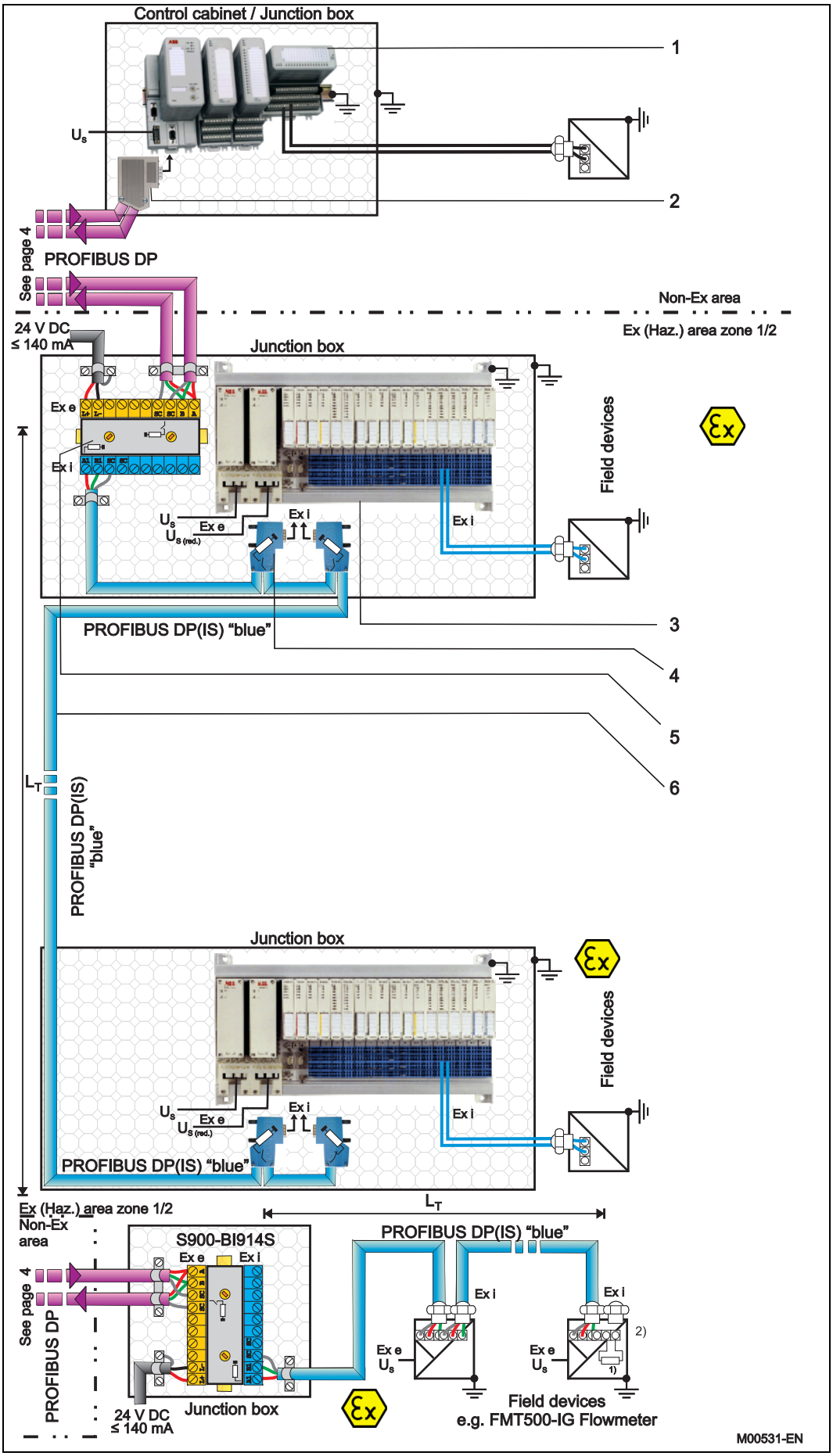
PROFIBUS DP - Remote I/Os and field devices in Ex (Haz.) and Non-Ex area



Color coding

PROFIBUS DP:
RxD/TxD-P = red
RxD/TxD-N = green

PROFIBUS PA:
PA+ = red
PA- = green

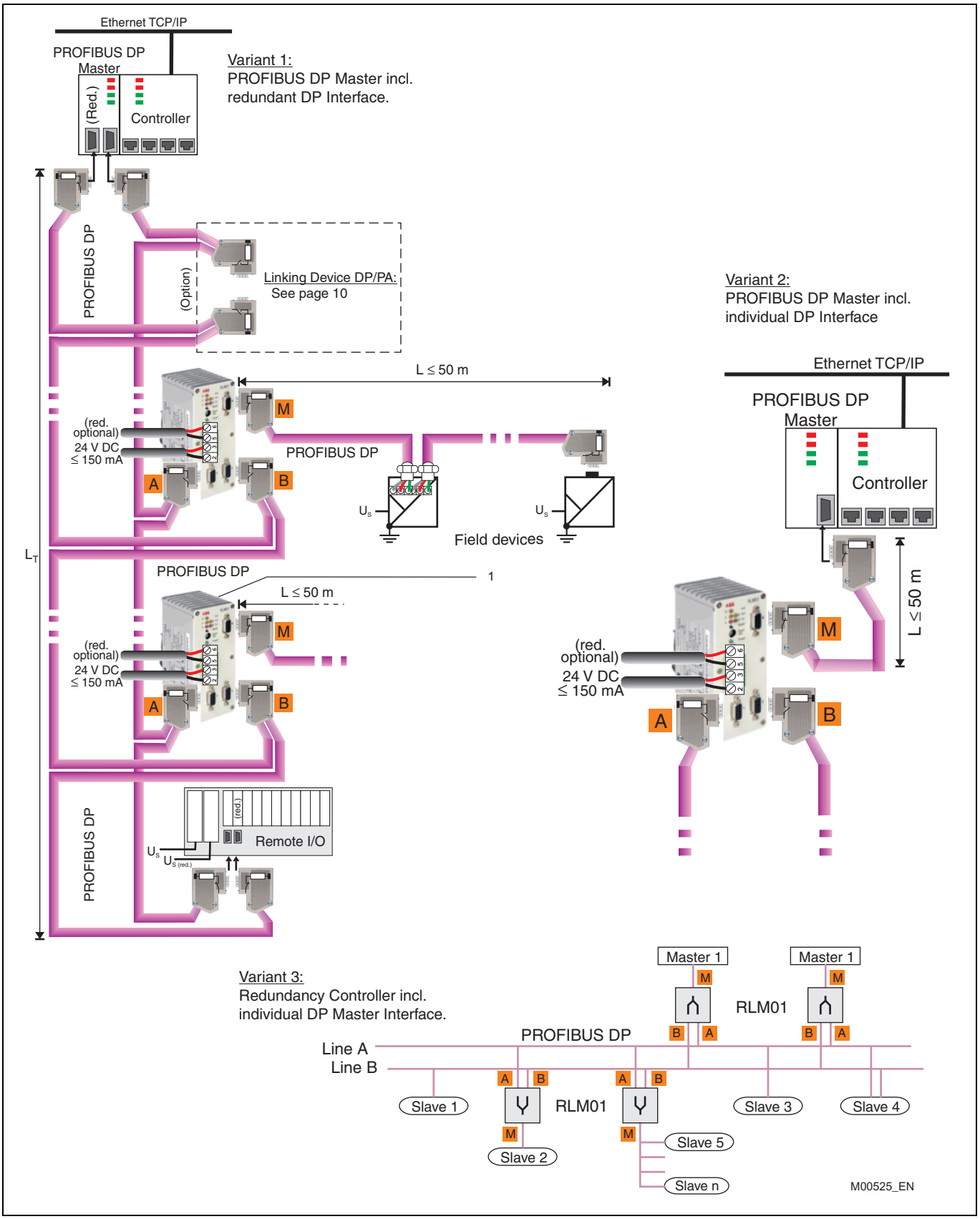
1) Alternative to increase the protocol stability:
External active bus termination with S900-BI914S at the end of the DP segment.

2) Number of field devices per DP Ex i segment are calculate explicitly and depend on the Repeater type, the DP cable, the Field devices and the bus termination.

You can find more information on the following page.

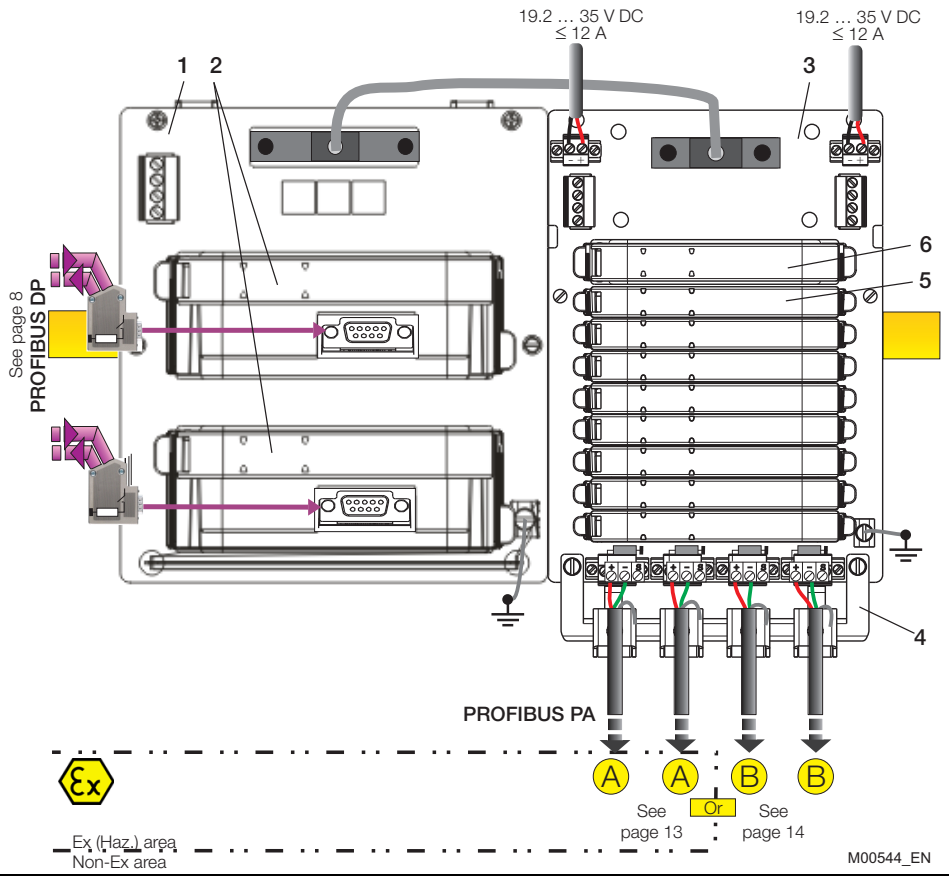
	Description (for page 6)	Catalog No.	Data sheets
1	**S800** - Remote I/O System - DP / DPV1 bus up to 12 MBit/s, [Ex ia] - more information see Product Guide	See S800 price book	On request
2	**NDE220-NO** - DP cable plug, 9-pos. SUB-D incl. switchable bus termination, Ex (Haz.) Zone 2 ♦ PINs: **IN:** 1A = RxD/TxD-N, 1B = RxD/TxD-P **OUT:** 2A = RxD/TxD-N, 2B = RxD/TxD-P	9890118	10/63-6.40
	NDE230-NO (Alternative, not shown) DP cable plug, 9-pos. SUB-D with programming connection SUB-D		10/63-6.40
3	**S900** - Remote I/O System - for Ex (Haz.) (Zone 1/2) and Non-Ex area, DP / DPV1 bus up to 1.5 MBit/s - More information how to build up the S900 System and limits see manual. (e.g.: number of S900/CB220, Non-Ex or Ex (Haz.) zone 2, FO, redundancy, power supply filter, ...)	See S900 price book	On request
4	**S900-PB914S** - DP cable plug - 9-pos SUB-D, “blue”, used for the Ex i DP cable, incl. switchable bus termination Attention: Check in advance if the tech. properties of the DP cable fits to the connector!	3BSE067082R1 See S900 price book	On request
5	**S900-BI914S** - DP Repeater - Build up in the Ex (Haz.) area, DIN rail mounted, RS485 Non-Ex and Ex i isolator, 1x DP/Ex i output, manual adjustment of the DP transfer rate up to 1.5 MBit/s, switchable DP bus termination (Ex e side). ♦ PINs (Ex e): **IN/OUT:** A = RxD/TxD-P, B = RxD/TxD-N, SC = DP shielding, not grounded! ♦ PINs (Ex i): **OUT:** A1 = RxD/TxD-P, B1 = RxD/TxD-N, SC = DP shielding, not grounded!	3BDH000649R1 See S900 price book	On request
6	**NDC110-EX** - PROFIBUS DP cable, blue! (Intrinsic safety) - 2 x 0.33 mm^2 (AWG22/1), 65/330/1000 m	989014x	10/63-6.47

PROFIBUS DP - Redundancy concept with RLM01 (Redundancy Link Module)



	Description	Catalog No.	Data sheet
1	**RLM01** - DP Redundancy Link Module	3BDZ000398R1	3BDD011641R0301
	- Converts a non-redundant DP line (M) to two redundant DP lines (A / B) and vice versa [redundant DP lines (A / B) to DP line (M)].		
	- Transfer rate 9.6 kBit/s ... 12 MBit/s, IP 20		
	♦ Power PINs: **individual:** 3 = (+), 2 = (-), 1 = PE **redundant:** 6 = (+), 5 = (-)		

PROFIBUS DP/PA - Segment Coupler (redundant)



Color coding

PROFIBUS DP:
RxD/TxD-P = red
RxD/TxD-N = green

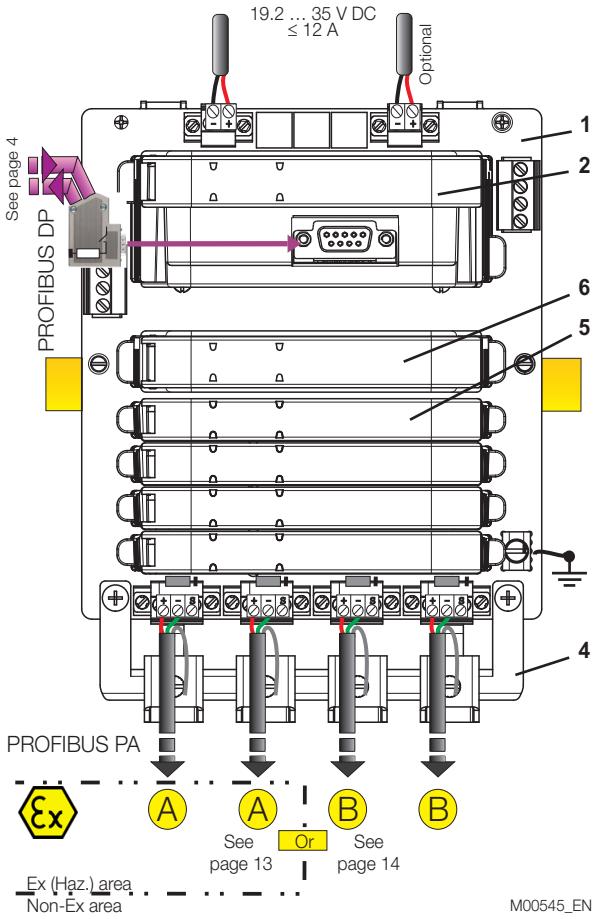
PROFIBUS PA:
PA+ = red
PA- = green

NOTICE

- With a redundant gateway configuration or use of the Gateway DTM.FC for diagnostic transmission, an address must be set by means of a rotary switch.
- The addresses **"1"** & **"2"** must not be assigned for PA field devices.
- Max. **30** PA field devices per power supply module (red.).
- All modules can be combined with all other modules.
- First check that the Gateway / diagnostic DTMs have been approved for your frame application
- **DTM.FC** Gateway and **DTM-FC.AD** Basic on request.

The 3 system combinations below are possible:
- Redundant Gateway & redundant Power supply
- Redundant Gateway & simple Power supply
- Simple Gateway (On red. GW motherboard) & redundant Power supply

	Description	Catalog No.	Data sheet
1	**NDL300** - Motherboard for Gateways (redundant) for 2x DP/PA gateway modules (redundant), DIN top-hat rail, IP 20, Zone 2/Class I, Div. 2. - Includes SUB-D cable, 25-pin, for connecting the motherboards - Includes rotary switches for address assignment	3KXN635300L0121	DS/NDL
2	**NDL300** - DP/PA Gateway DP bus up to 12 Mbit/s, transparent, for 4x power supply modules, IP 20, Zone 2/Class I, Div. 2. - **DTM.FC** (optional) for gateway parameterization or diagnostic transmission	3KXN635300L0150	DS/NDL
3	**NPP310** - Motherboard for Power Supply (redundant) for 2x4 power supply modules (redundant) and 1x diagnostic module, 4x fixed PA bus terminators, DIN top-hat rail, screw terminals, IP 20, Zone 2/Class I, Div. 2. ♦ Power PINs: **PRI:** + = (+), - = GND, **SEC**: + = (+), - = GND ♦ PA PINs: **OUT segment 1:** + = PA+, - = PA-, S (NGP310) = shield **and!** motherboard grounding firmly **OUT segment 2/3/4**: + = PA+, - = PA-, S (NGP310) = shield	3KXN636310L0121	DS/NDL
	(Alternative, not shown) **NPP310** - Motherboard for Power Supply (simplex) for 4 power supply modules and 1x diagnostic module	3KXN636310L0111	DS/NDL
4	**NGP310** (optional) Grounding connection set for large-surface connection of the trunk cable shields.	3KXN617310L0100	DS/NDL
5	**NGP310** - Power supply module PA bus fixed at 31.25 kbit/s, IP 20, Zone 2/Class I, Div. 2 - PA power feed: U_S = 28 ... 30 V DC, I_S ≤ 500 mA, elec. isolation.	3KXN617310L0154	DS/NDL
6	Diagnostic modules (optional) for supply & PA bus, IP 20, Zone 2/Class I, Div. 2. **NGP312** (Basic module)	3KXN617312L0160	DS/NDL
	- Check power sources, power supply modules, and PA for overload and short circuit, etc. - Messages only transmitted by means of relay contact. **NGP312** (Advanced module)	3KXN617312L0161	DS/NDL
	- Additional physical layer checks. - DTM Diagnostic Manager (Gateway DTM.FC is mandatory and one of the following three) - **DTM-FC.AD** DTM Basic		
	- **NGP312** DTM Professional, ≤ 100 segments	3KXN617312L0170	DS/NDL
	- **NGP312** DTM Professional, > 100 segments	3KXN617312L0171	DS/NDL



Color coding

PROFIBUS DP:
RxD/TxD-P = red
RxD/TxD-N = green

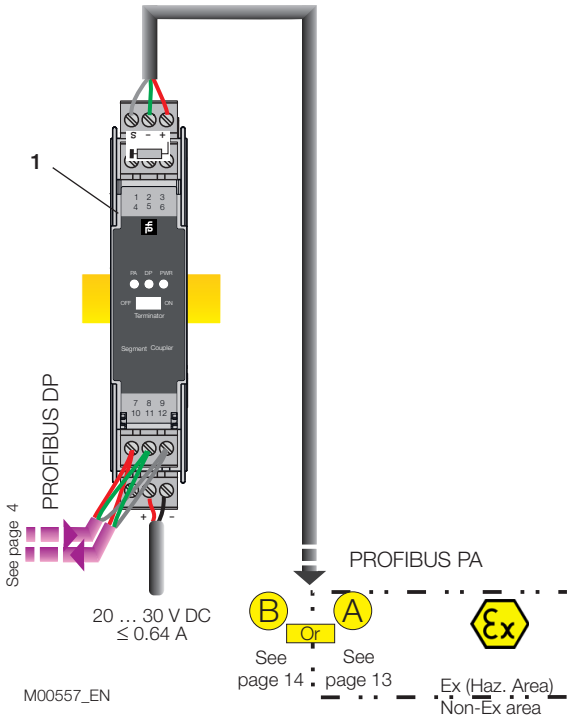
PROFIBUS PA:
PA+ = red
PA- = green

NOTICE

- With use of the Gateway DTM.FC for diagnostic transmission, an address must be set by means of a rotary switch.
- The address **"1"** must not be assigned for PA field devices
- Max. **31** PA field devices per power supply module.
- All modules can be combined with all other modules.
- First check that the Gateway / diagnostic DTMs have been approved for your frame application.
- **DTM.FC** Gateway and **DTM-FC.AD** Basic on request

	Description	Catalog No.	Data sheet
1	**NPP310** - Motherboard (simplex)	3KXN636310L0131	DS/NDL
	for 4x power supply modules, 1x DP/PA gateway module and 1x diagnostic module, 4x fixed PA bus terminators, DIN top-hat rail, screw terminals, IP 20, Zone 2/Class I, Div. 2. - Includes rotary switches for address assignment ♦ Power PINs: **PRI:** + = (+), - = GND, **SEC** (optional): + = (+), - = GND ♦ PA PINs: **OUT segment 1:** + = PA+, - = PA-, S (NGP310) = shield **and!** motherboard grounding firmly **OUT segment 2/3/4**: + = PA+, - = PA-, S (NGP310) = shield		
2	**NDL300** – DP/PA Gateway	3KXN635300L0150	DS/NDL
	DP bus up to 12 Mbit/s, transparent, for 4x power supply modules, IP 20, Zone 2/Class I, Div. 2. - **DTM.FC** (optional) for gateway parameterization or diagnostic transmission		
4	**NGP310** (optional)	3KXN617310L0100	DS/NDL
	Grounding connection set for large-surface connection of the trunk cable shields.		
5	**NGP310** - Power supply modules	3KXN617310L0154	DS/NDL
	PA bus fixed at 31.25 kbit/s, IP 20, Zone 2/Class I, Div. 2. - PA power feed: U_S = 28 ... 30 V DC, I_S ≤ 500 mA, elec. isolation.		
6	Diagnostic modules (optional)		
	For supply & PA bus, IP 20, Zone 2/Class I, Div. 2.		
	NGP312 (Basic module)	3KXN617312L0160	DS/NDL
	- Check power sources, power supply modules, and PA for overload and short circuit, etc. - Messages only transmitted by means of relay contact.		
	NGP312 (Advanced module)	3KXN617312L0161	DS/NDL
	- Additional physical layer checks. - DTM Diagnostic Manager (Gateway DTM.FC is mandatory and one of the following three)		
	- **DTM-FC.AD** DTM Basic		
	- **NGP312** DTM Professional, ≤ 100 segments	3KXN617312L0170	DS/NDL
	- **NGP312** DTM Professional, > 100 segments	3KXN617312L0171	DS/NDL

PROFIBUS DP/PA - Segment Coupler (compact)



Color coding

PROFIBUS DP:
RxD/TxD-P = red
RxD/TxD-N = green

PROFIBUS PA:
PA+ = red
PA- = green

NOTICE

- The address **"1"** must not be assigned for PA field devices.
- Max. **31** PA field devices per power supply module.

	Description	Catalog No.	Data sheet
1	**NDL300** Segment coupler (basic)	3KXN635300L0002	DS/NDL
	IP 20, Zone 2/Class I, Div. 2. Module, comprises the following functions: - PROFIBUS DP/PA gateway, DP bus up to 1.5 Mbit/s, transparent - Power supply, PA bus fixed at 31.25 kbit/s, PA power feed: U_S = 24 ... 26 V DC, I_S ≤ 400 mA, incl. fixed bus termination ♦ Power PINs: 11 = (+), 12 = (-) GND ♦ DP-PINs: **IN & OUT**: 7 = RxD/TxD-P, 8 = RxD/TxD-N, 9 = shield, 10 = FE ♦ PA PINs: **OUT segment:** 3 = PA+, 2 = PA-, 1 = shield		

Limits and rules for page 13 up to 14!

PROFIBUS PA segment – Calculation of the cable length L_T:

When using differential PA cable diameter the characteristics (max. length L_T) changed out of the charts page 13 up to 15.

- L_{Total} ≤ 1,900 m unchanged.
- For calculation please add the respective conductor resistance (loop) of the cable types into the formula.

ABB cable types:

- NPC080-xx 0.88 mm² **43.6 Ω/km** (loop)
- NPC150-xx 1.30 mm² **28.5 Ω/km** (loop)
- NPC250-xx 2.10 mm² **17.9 Ω/km** (loop)

$$L_T\ (m) = \frac{\left(\frac{28.0\ V - U_{s\ max.\ PA\ Device}}{\Sigma\ I_s\ (A)}\right) \times 1{,}000\ m}{\text{Conductor resistance (Loop) } \Omega/km}$$

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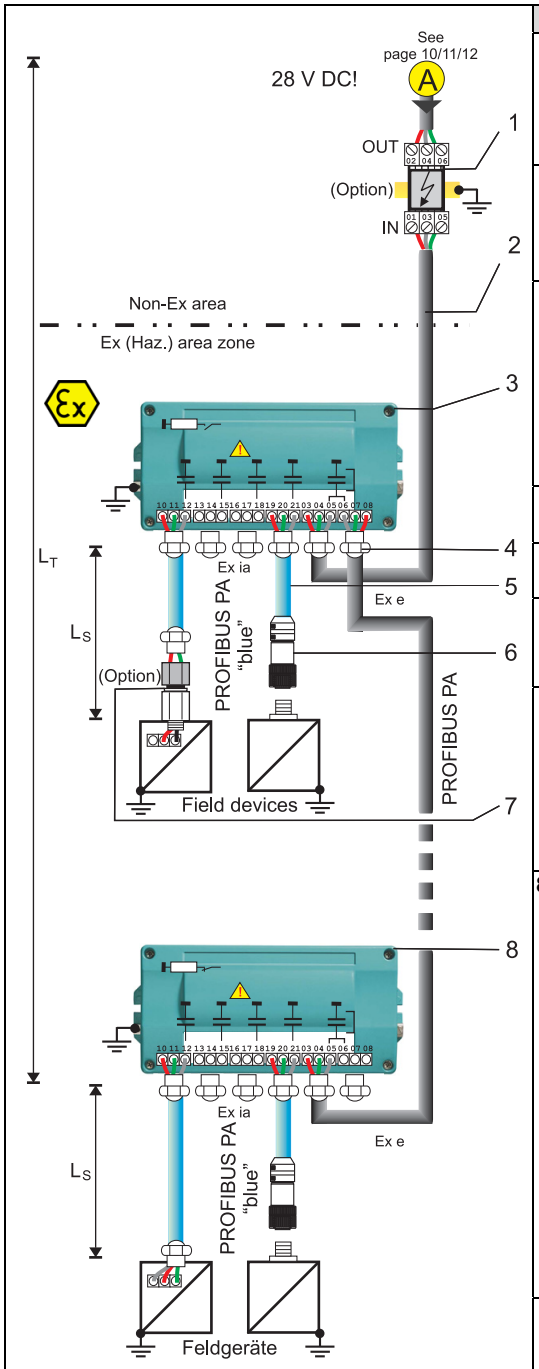
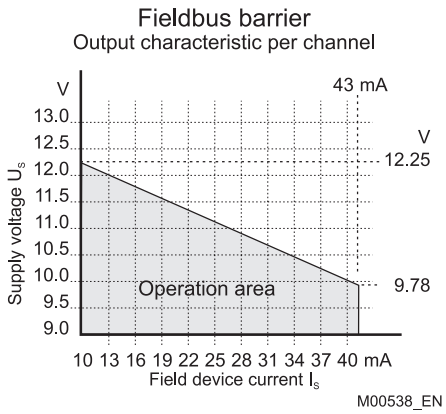
PROFIBUS – Installation suggestion

PROFIBUS PA – Fieldbus barrier in Ex (Haz.) area



	Description	Catalog No.	Data sheet
1	PA overvoltage protection, 2-channel, IN ≤ 450 mA (option)		
	NGV211-NO - Cartridge for NGV210-NO	9890181	10/63-6.15
	NGV210-NO - Basic element for top-hat rail	9890180	10/63-6.15
	♦ PINs: 1. channel: **IN**: 01 = PA+, 05 = PA-, 03 = shielding **OUT**: 02 = PA+, 06 = PA-, 04 = shielding 2. channel: **IN**: 07 = PA+, 11 = PA-, 09 = shielding **OUT**: 08 = PA+, 12 = PA-, 10 = shielding		
2	PROFIBUS PA cable, black (No intrinsic safety)		
	NPC080-NO - 0.88 mm², 43.6 Ω/km, 65/330/1000 m	989013x	10/63-6.47
	NPC150-NO[1] - 1.30 mm², 28.5 Ω/km, 1000 m	9890133	10/63-6.47
	NPC250-NO[1] - 2.10 mm², 17.9 Ω/km, 1000 m	9890138	10/63-6.47
3	**NGB900** – Fieldbus barrier	3KXN611900L0010	DS/NGB
	- aluminum housing, IP 67, switchable bus termination - 4x [Ex ia/Ex ib] and 2x (Ex e) cable bushing plastic (shielding capacitive!) ♦ PINs: trunk cable (L_T): **IN**: 03 = PA+, 04 = PA-, 05 = S **OUT**: 08 = PA+, 07 = PA-, 06 = S ♦ PINs: spur cable (L_S): **4 x OUT**: 10 = PA+, 11 = PA-, 12 = S / 13 = PA+, 14 = PA-, 15 = S 16 = PA+, 17 = PA-, 18 = S / 19 = PA+, 20 = PA-, 21 =S		
4	**6x EMC cable bushing**	Special order!	
	(Shielding braid on ground via cable bushing)		
5	PROFIBUS PA cable, blue (Intrinsic safety)		
	NPC080-EX – 0.88 mm², 43.6 Ω /km, 65/330/1000 m	989013x	10/63-6.47
6	**NPE300-NE** - PA cable socket, IP 67	9890116	10/63-6.40
	- metal case, M12, for Ex (Haz.) and Non-Ex area ♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding		
7	**NGV220-EX**[2] - PA overvoltage protection (optional)	7964115	10/63-6.15
	- IP 67 metal case, for M20 x 1.5 cable gland mounting, II 2(1)G Ex ia [ia Ga] IIC T4 .. T6 Gb ♦ PINs: **IN**: (+) = PA+, (-) = PA-, shielding on ground via EMC cable bushing ♦ PINs: **OUT**: red = PA+, black = PA-, shielding on ground via metal case - Possible use at the Fieldbus barrier of the IN/OUT-PINs of the trunk cable (L_T) by using EMC cable bushing (shielding capacity bridged).		
8	**NGB900** – Fieldbus barrier Input: - Supply voltage per Barrier: U_S min. 16.0 V DC - Basic current per Barrier: I_{basic} ≤ 49 mA Output: - Supply voltage per channel: U_S 12.25 V (at 10 mA) up to 9.78 V (at 43 mA) - Supply current per channel: I_S ≤ 43 mA		



Color coding

PROFIBUS DP: RxD/TxD-P = red; RxD/TxD-N = green

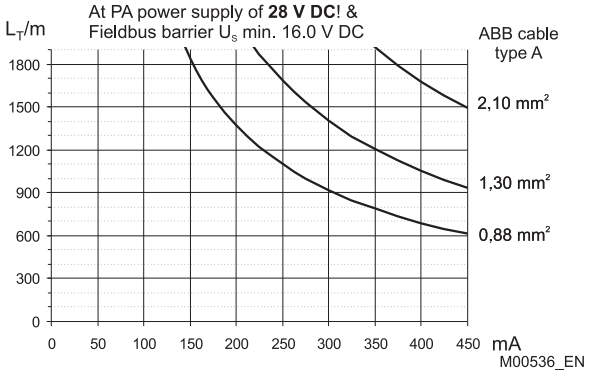
PROFIBUS PA: PA+ = red; PA- = green

1) By using the 1.3 / 2.1 mm² cable it is not possible to use plugs / sockets!
2) Not suitable for field device types with low lying M20 x 1.5 thread!
Note NGV220 outer dimensions! Option: Insert M20 x 1,5 / M20 x 1,5 intermediate support.

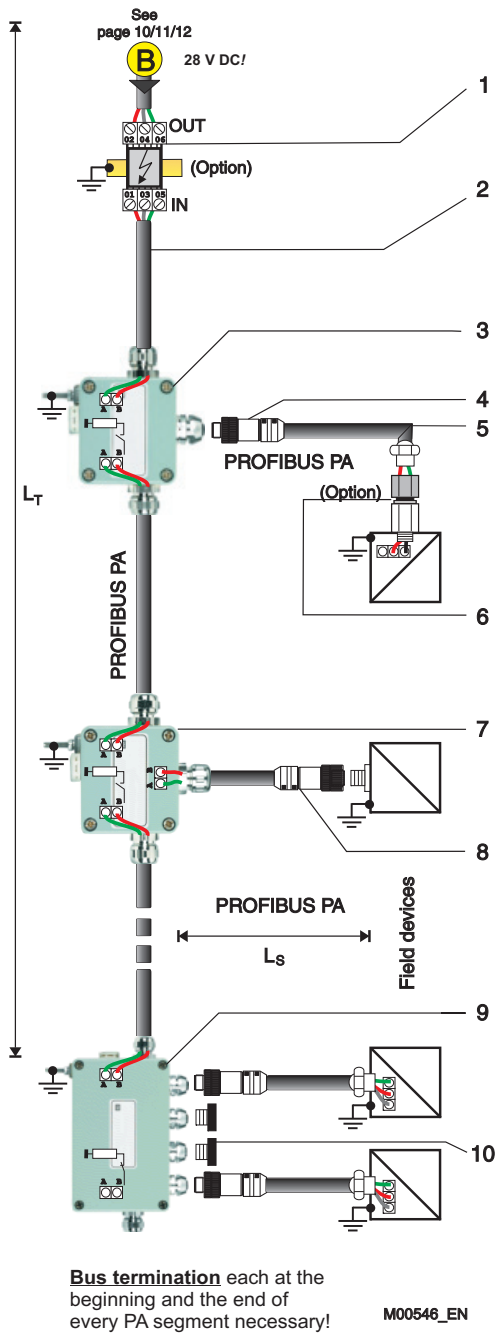
Limits and rules!

When using the ABB Segment coupler, Fieldbus barrier and cable.
(by other coupler / Barriers / cable the limits are calculated new)
per PROFIBUS PA segment:

- number of PA subscribers ≤ **16**
- number of Fieldbus barrier ≤ **4**
- Σ current (I) ≤ 450 mA (max. current via NGV21x-NO)
  Σ current (I) = Σ basic current of all Field devices and Fieldbus barrier + error current of one device
- trunk cable length (L_T) see diagram at U_S min. 16.0V DC of Fieldbus barrier (length depending on Σ current and cable diameter)
- spur cable length (L_S) (acc. to the FISCO/IEC 60079-27 model):
  At 1 ... 10 spur cable: L_S ≤ 120 m / at 11 ... 12 spur cable: L_S ≤ 90 m
  At 13 ... 16 spur cable: L_S ≤ 60 m
- cable length L_{total} = L_T+ (Σ L_S) ≤ 1900 m



PROFIBUS PA – Passive T and 4-way junction (IP 66) in Non-Ex area



	Description	Catalog No.	Data sheet
1	PA overvoltage protection, 2-channel, $I_N \leq 450$ mA (Optional)		
	NGV211-NO - Cartridge for NGV210-NO	9890181	10/63-6.15
	NGV210-NO - Basic element for top-hat rail	9890180	10/63-6.15
	♦ PINs: 1. channel : **IN**: 01 = PA+, 05 = PA-, 03 = shielding **OUT:** 02 = PA+, 06 = PA-, 04 = shielding; 2. channel: **IN**: 07 = PA+, 11 = PA-, 09 = shielding **OUT**: 08 = PA+, 12 = PA-, 10 = shielding		
2	PROFIBUS PA cable, black (No intrinsic safety)		
	NPC080-NO - 0.88 mm², 43.6 Ω/km, 65/330/1000 m	989013x	10/63-6.47
	NPC150-NO[1] - 1.30 mm², 28.5 Ω/km, 1000 m	9890133	10/63-6.47
3	**NPJ120-NO** - PA T-junction, IP 66	9890101	10/63-6.40
	- 2x EMC cable bushing, switchable bus termination (Shielding braid on ground via cable bushing)		
	♦ PINs: trunk cable (L_T): **IN/OUT**: A = PA-, B = PA+		
4	**NPE100-NE** - PA cable plug, IP 67	9890115	10/63-6.40
	- metal case, M12, for Ex (Haz.) and Non-Ex area		
	♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding		
5	PROFIBUS PA cable, black	989013x	10/63-6.47
	NPC080-NO - 0.88 mm², 43.6 Ω/km, 65/330/1000 m		
6	**NGV220-NO**[2] - PA overvoltage protection (Optional)	7964116	10/63-6.15
	- IP 67 metal case, for M20 x 1.5 cable gland mounting		
	♦ PINs: **IN**: (+) = PA+, (-) = PA-, shielding on ground via EMC cable bushing		
	♦ PINs: **OUT**: red = PA+, black = PA-, shielding on ground via metal case		
7	**NPJ130-NO** - PA T-junction, IP 66	9890102	10/63-6.40
	- 3x EMC cable bushing, switchable bus termination (Shielding braid on ground via cable bushing)		
	♦ PINs: trunk cable (L_T): **IN/OUT:** A = PA-, B = PA+		
	♦ PINs: spur cable (L_S): **OUT**: A = PA-, B = PA+		
8	**NPE300-NE** - PA cable socket, IP 67	9890116	10/63-6.40
	- metal case, M12, for Ex (Haz.) and Non-Ex area		
	♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding		
9	**NPJ420-NO -** PA 4-way junction, IP 66	9890103	10/63-6.40
	- 2x EMC cable bushing, switchable bus termination (Shielding braid on ground via cable bushing)		
	♦ PINs: trunk cable (L_T) **IN/OUT**: A = PA-, B = PA+		
	NPJ460-NO - PA 4-way junction, IP 66	9890104	10/63-6.40
	- 6x EMC cable bushing, switchable bus termination (Alternative, not shown)		
10	**NDZ413-NE** - protection cap for sockets M12	9890122	10/63-6.40

Color coding

PROFIBUS DP: RxD/TxD-P = red; RxD/TxD-N = green

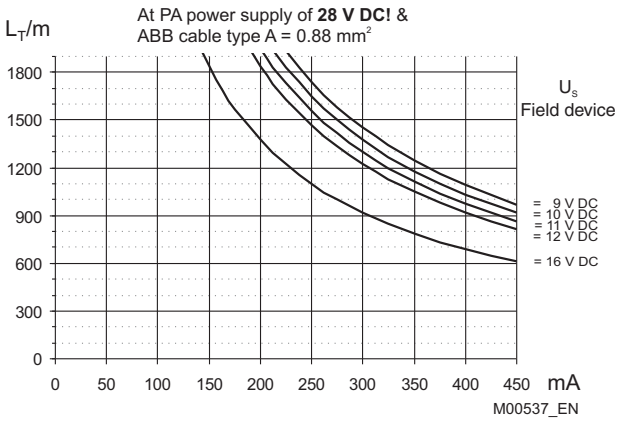
PROFIBUS PA: PA+ = red; PA- = green

1) By using the 1.3 mm² cable it is not possible to use plugs / sockets!
2) Not suitable for field device types with low lying M20 x 1.5 thread!
Note NGV220 outer dimensions! Option: Insert M20 x 1,5 / M20 x 1,5 intermediate support.

Limits and rules!

When using the ABB Segment coupler, junction and cable.
(by other coupler / junction / cable the limits are calculated new)
per PROFIBUS PA segment:

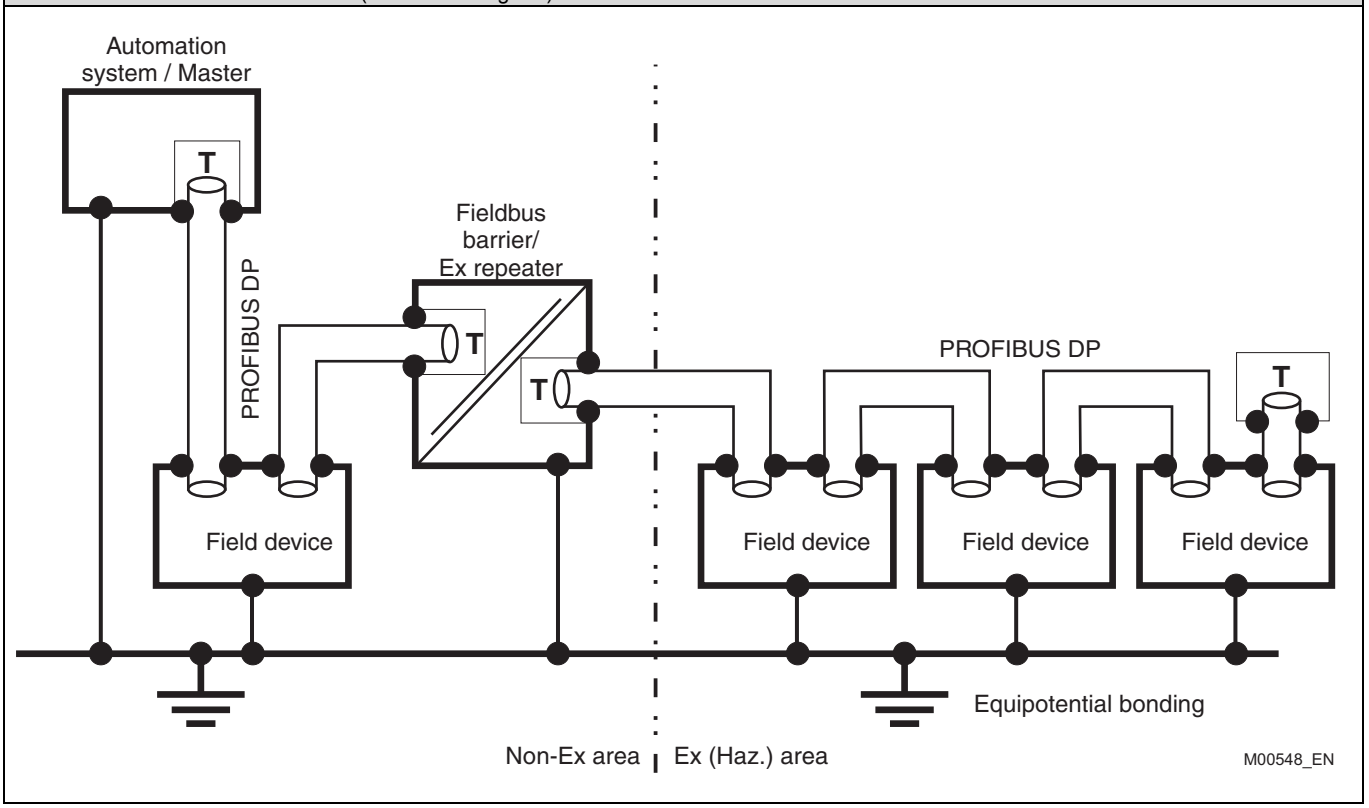
- number of PA subscribers ≤ **31** (**30** by using of red. Segment coupler)
- Σ current (I) ≤ 450 mA (max. current via NGV21x-NO)
  Σ current (I) = Σ basic current of all field devices
  + error current of one device
- trunk cable length (L_T) of 0.88 mm² cable see diagram (length (L_T) depending on Σ current, U_S field device and cable diameter)
- spur cable length (L_S):
  at 1 ... 10 spur cable: $L_S \leq 120$ m / at 11 ... 12 spur cable: $L_S \leq 90$ m
  at 13 ... 16 spur cable: $L_S \leq 60$ m / at 17 ... 22 spur cable: $L_S \leq 30$ m
  at 23 ... 31(30) spur cable: $L_S \leq 1$ m
- cable length $L_{total} = L_T + (\Sigma L_S) \leq 1900$ m



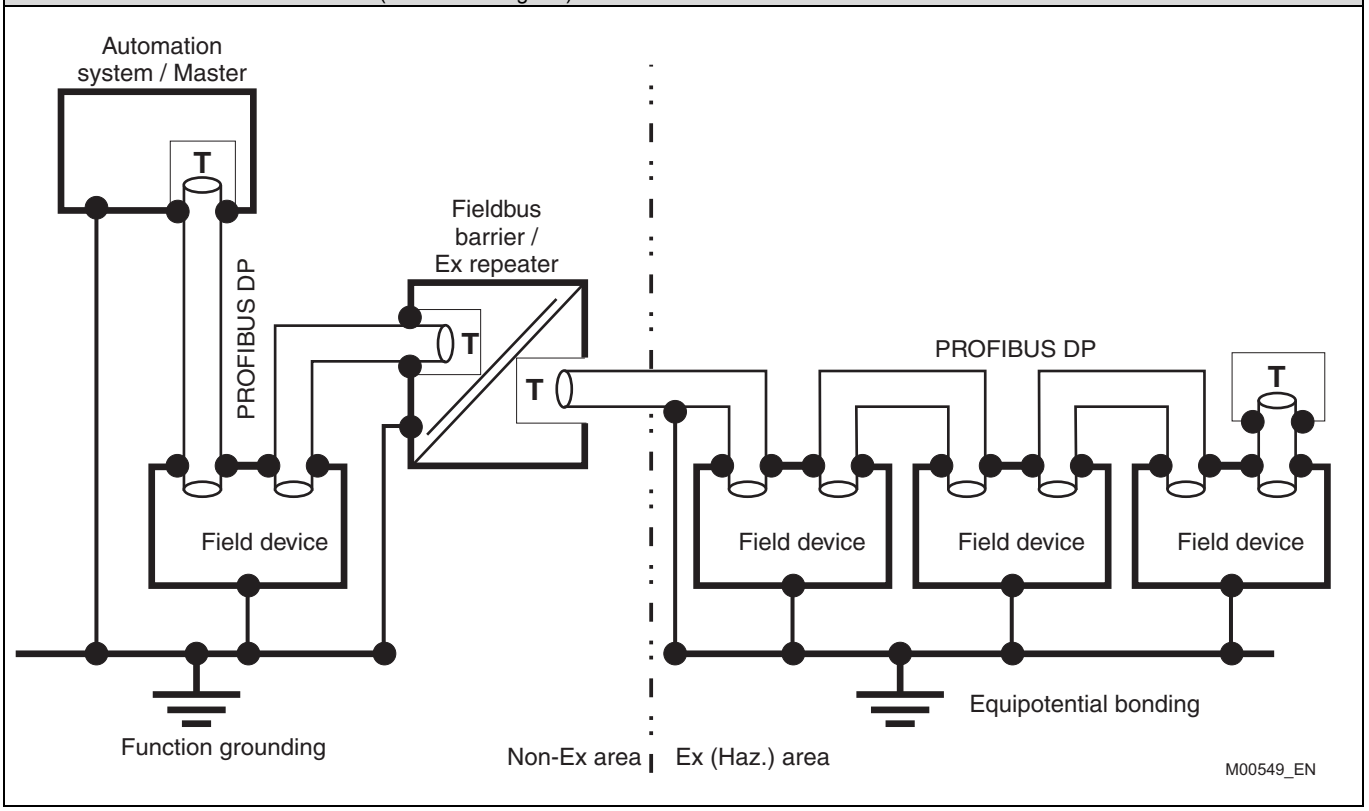
PROFIBUS DP – Shielding and grounding

For information of shielding and grounding refer to the PROFIBUS Technical Guidelines (www.profibus.com/downloads/):
PNO - Order No. 2.262, PROFIBUS RS 485-IS - User and Installation Guidelines, chapter 3.5

PROFIBUS DP: Ideal combination (schematic diagram)



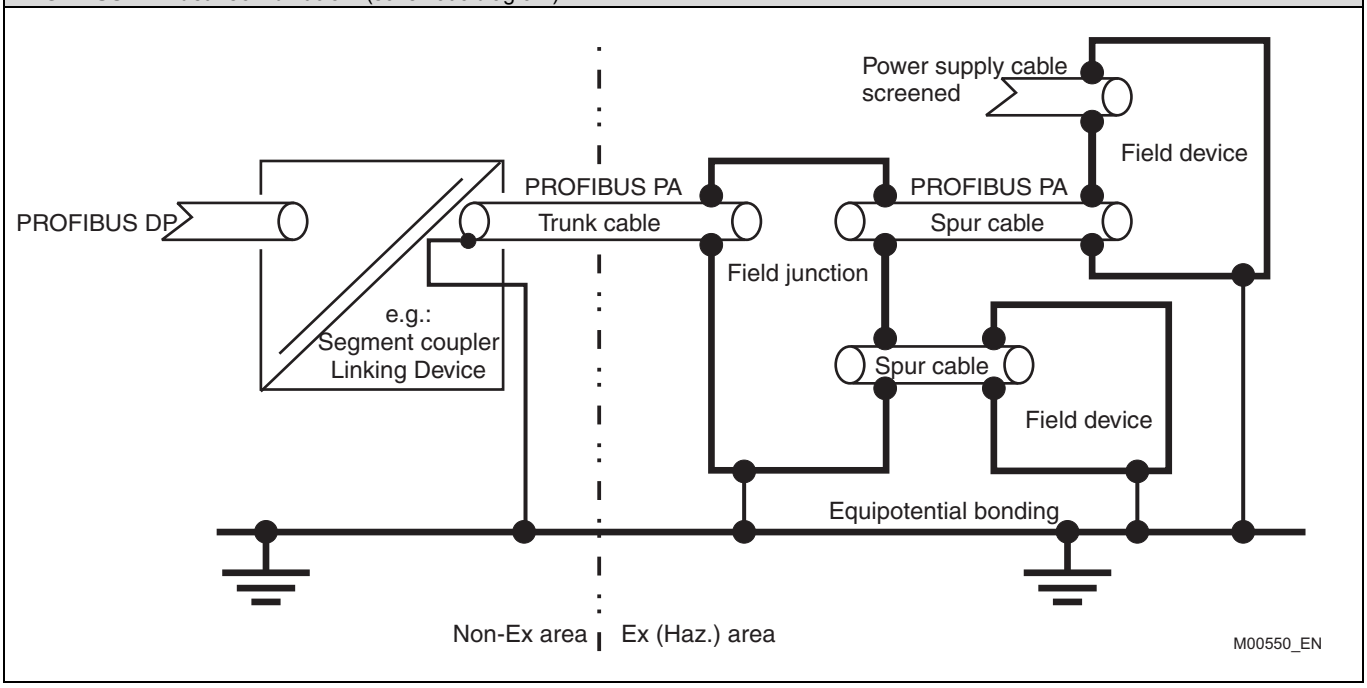
PROFIBUS DP: Possible alternative (schematic diagram)



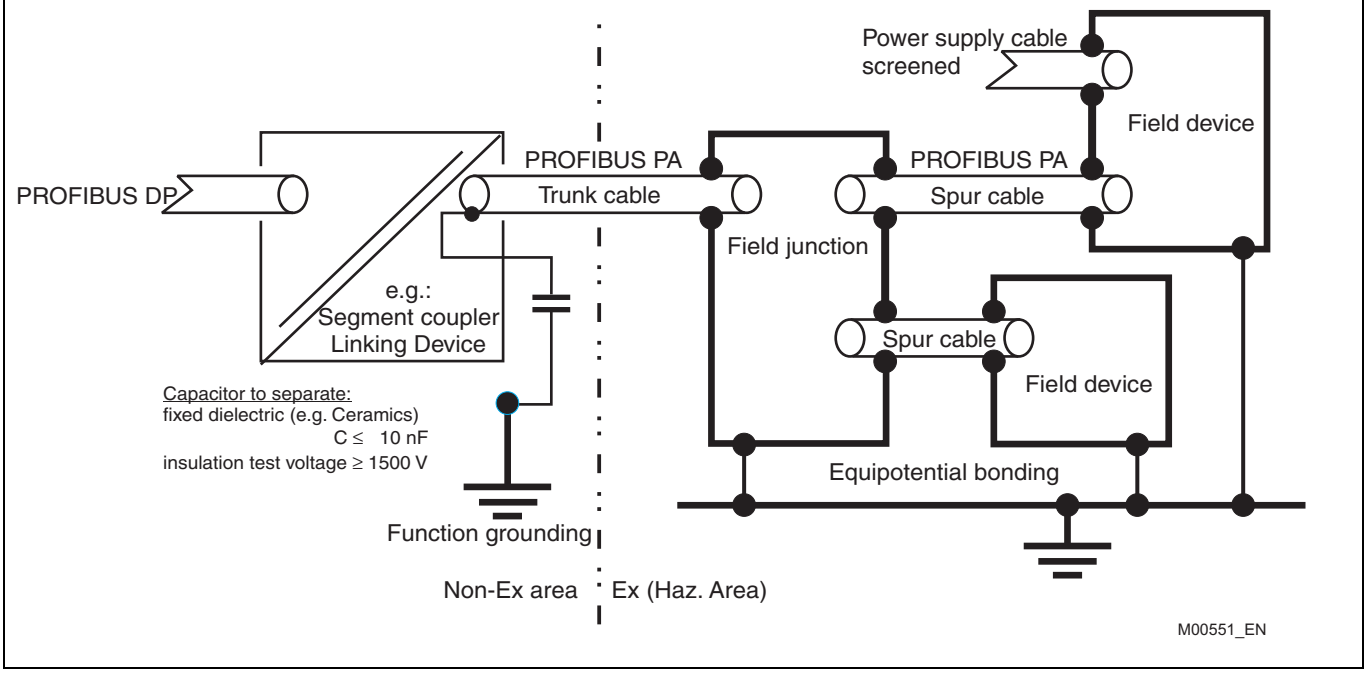
PROFIBUS PA – Shielding and grounding

For information of shielding and grounding refer to the PROFIBUS Technical Guidelines (www.profibus.com/downloads):
PNO - Order No. 8.022, PROFIBUS - Assembling Guideline, chapter 2.7.5

PROFIBUS PA: Ideal combination (schematic diagram)



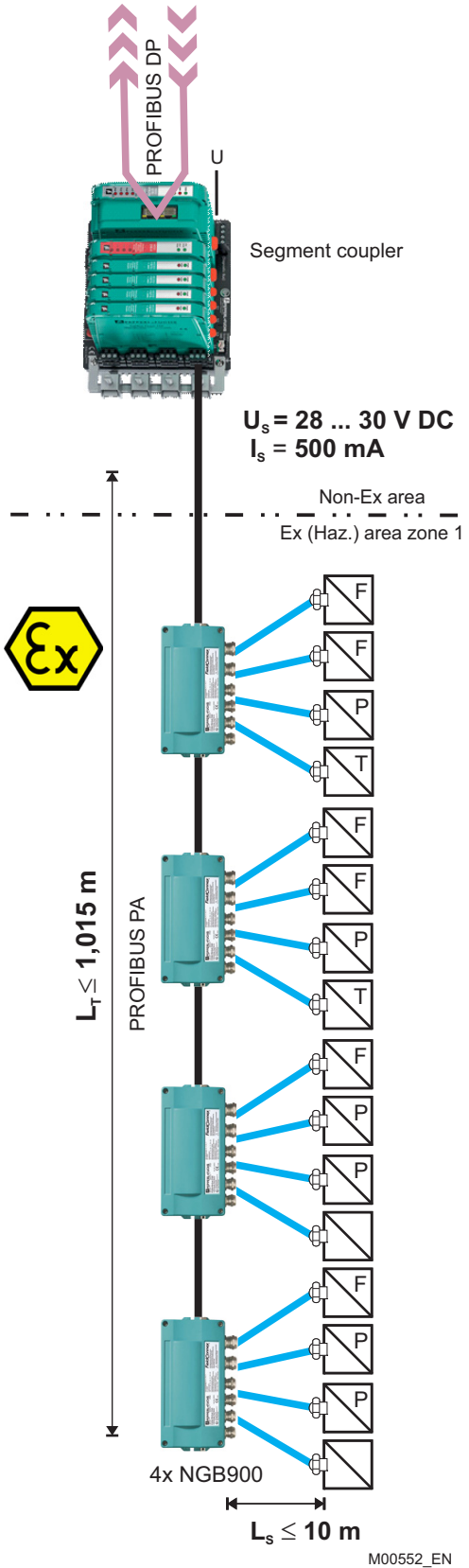
PROFIBUS PA: Possible alternative with capacitive grounding in the Non-Ex area (schematic diagram)



PROFIBUS PA-layout example – Fieldbus barrier in Ex (Haz.) area

Calculation example for <u>one</u> PROFIBUS PA segment: Number of PA subscriber and cable length

Structure referring to the variant on page 13



Guideline: (e. g. Tank with a mixer)

- □ A PA segment with 16 field devices in the **Ex (Haz.) area** for an application
- □ ABB field device types: For Flow 3x FEH300, 3x FCM2000
  For Pressure 6x 2600T(266xxx)
  For Temperature 2x TTH300
  For Positioning 2x TZIDC-110
- □ Power supply by the module NGP310 (U_S = 28 ... 30 V DC, $I_S \leq$ 500 mA)
- □ **Fieldbus barrier** NGB900
- □ Spur length per field device max. 10 m and L_T min. 750 m

Question:

1. **Is the structure possible?**
   Referring to the current and voltage supply.
2. If yes, **which max. PA segment cable length can be laid?**
   Referring to PA cable of **1.30 mm²** ,
   from the Power supply module up to the last PA field device

Calculation:

Create a table with the values $U_{s\ Min.}$, $I_{basic\ current}$ and $I_{error\ current}$ for the Fieldbus barrier and the five field device types. The values can be found in the respective field device data sheets.

PA devices	$U_{s\ Min.}$	$I_{basic\ current}$	$I_{error\ current}$
4x NGB900	**16.0 V**	49.0 mA	---
3x FEH300	9.0 V	10.0 mA	3.0 mA
3x FCM2000	9.0 V	14.0 mA	**12.0 mA**
6x 2600T(266xxx)	9.0 V	15.0 mA	5.0 mA
2x TTH300	9.0 V	12.0 mA	8.0 mA
2x TZIDC-110	9.0 V	10.5 mA	4.5 mA
		Σ 403.0 mA	

1. Appraise and calculate (U, I):
   - for the voltage supply: Highest $U_{s\ Min.}$ (16.0 V)
     is less than U_S = 28 ... 30 V DC of the Power supply module.
   - for the current supply:
     Sum $I_{basic\ current}$ (403.0 mA) plus 1x highest $I_{error\ current}$ (12.0 mA)
     is less than $I_S \leq$ 500 mA of the Power supply module.
2. Calculation of the PA segment length (L_T):
   - Max. L_T is approx. 1,015 m. Shown in the diagram page 13
     by means of the characteristic curve for the ABB PA cable **1.30 mm²** and
     of the sum current (0.415 A)
   - Max. total length of the PA segment cable is equal to
     L_{max} = 1,015 m + L_S (16 x 10 m) = 1,175 m
     is less than the max. allowed 1,900 m.

Result:

1. **The structure is possible in principle!**
2. **L_{max} = 1,175 m.**

Cycle time (approximate value) on the PA segment:

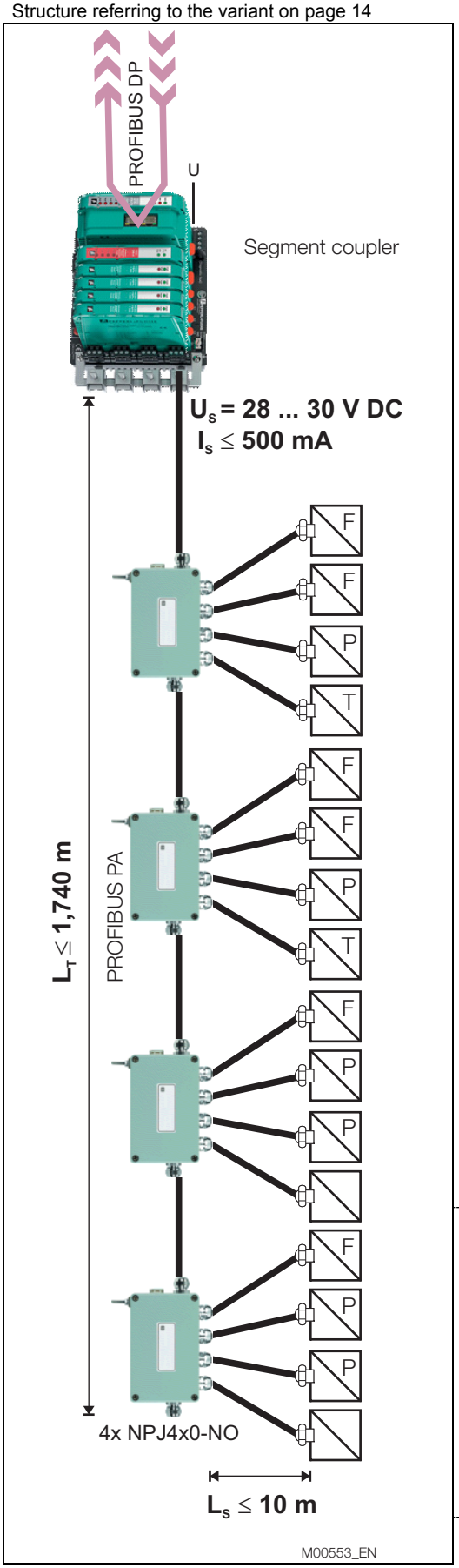
- Depending on the Segment coupler type, number of PA devices and FB's / PA device (Function Blocks). The cycle time could be affected additionally by acyclic communication, reties, diagnostic data and bus parameter.

PA devices	Overhead / PA device	FB min. / PA device	FB max. / PA device	Cycle time min.	Cycle time max.
1x Segment Coupler	- / -	- / -	- / -	40 ms (simplex)	
3x FEH300	≈ 317 Bit	5 Byte	33 Byte	34 ms	56 ms
3x FCM2000	≈ 317 Bit	5 Byte	34 Byte	34 ms	57 ms
6x 2600T(266xxx)	≈ 317 Bit	5 Byte	15 Byte	69 ms	84 ms
2x TTH300	≈ 317 Bit	5 Byte	29 Byte	23 ms	35 ms
2x TZIDC-110	≈ 317 Bit	8 Byte	25 Byte	24 ms	33 ms
Cycle time approx.:				**from 224 ms**	**up to 305 ms**

Speak to us for the calculation of complex PROFIBUS topologies.

Calculation example for <u>one</u> PROFIBUS PA segment: Number of PA subscriber and cable length

Structure referring to the variant on page 14



Guideline: (e.g. Tank with a mixer)

- ☐ A PA segment with 16 field devices in the **Non-Ex area** for an application
- ☐ ABB field device types: For Flow 3x FEH300, 3x FCM2000
  For Pressure 6x 2600T(266xxx)
  For Temperature 2x TTH300
  For Positioning 2x TZIDC-110
- ☐ Power supply by the module NGP310 (U_S = 28 ... 30 V DC, $I_S \leq$ 500 mA)
- ☐ **Passive 4-way junction** NPJ460-NO
- ☐ Spur length per field device max. 10 m and **L_T** min. 750 m

Question:

1. **Is the structure possible?**
   Referring to the current and voltage supply.

2. If yes, **which max. PA segment cable length can be laid?**
   Referring to PA cable of **0.88 mm²** ,
   from the Power supply module up to the last PA field device.

Calculation:

Create a table with the values **$U_{s\ Min.}$**, **$I_{basic\ current}$** and **$I_{error\ current}$** for the junction and the five field device types. The values can be found in the respective field device data sheets.

PA device	$U_{s\ Min.}$	$I_{basic\ current}$	$I_{error\ current}$
4x NPJ460-NO	---	---	---
3x FEH300	**9.0 V**	10.0 mA	3.0 mA
3x FCM2000	9.0 V	14.0 mA	**12.0 mA**
6x 2600T(266xxx)	9.0 V	15.0 mA	5.0 mA
2x TTH300	9.0 V	12.0 mA	8.0 mA
2x TZIDC-110	9.0 V	10.5 mA	4.5 mA
		Σ 207.0 mA	

1. Appraise and calculate (U, I):
   - for the voltage supply: Highest **$U_{s\ Min.}$** (9 V)
     is less than U_S = 28 ... 30 V DC of the Power supply module.
   - for the current supply:
     Sum **$I_{basic\ current}$** (207.0 mA) plus 1x highest **$I_{error\ current}$** (12.0 mA)
     is less than $I_S \leq$ 500 mA of the Power supply module.

2. Calculation of the PA segment length (L_T):
   - Max. **L_T** is > 1.900 m! Shown in the diagram page 14
     by means of the characteristic curve for the ABB PA cable **0.88 mm²**,
     the sum current (0.219 A) and highest $U_{s\ Min.}$ (9.0 V).
   - Max. total length of the PA segment cable is equal to
     L_{max} = 1.900 m + L_S (16x 10 m) > 1.900 m!
     Attention: Not exceed the max. allowed 1.900 m!
     Max. **L_T** = 1.900 m - L_S (16x 10 m) ≤ **1.740 m!**

Result:

1. **The structure is possible in principle!**
2. **L_{max} = 1.900 m.**

Cycle time (approximate value) on the PA segment:

- Depending on the Segment coupler type, number of PA devices and FB's / PA device (Function Blocks). The cycle time could be affected additionally by acyclic communication, reties, diagnostic data and bus parameter.

PA devices	Overhead / PA device	FB min. / PA device	FB max. / PA device	Cycle time min.	Cycle time max.
1x Segment Coupler	- / -	- / -	- / -	40 ms (simplex)	
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2x TZIDC-110	≈ 317 Bit	8 Byte	25 Byte	24 ms	33 ms
Cycle time approx.:				**from 224 ms**	**up to 305 ms**

Speak to us for the calculation of complex PROFIBUS topologies.

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