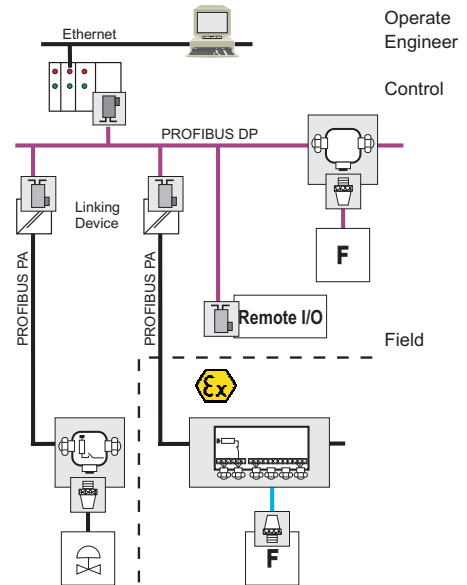


PROFIBUS Installation suggestion



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

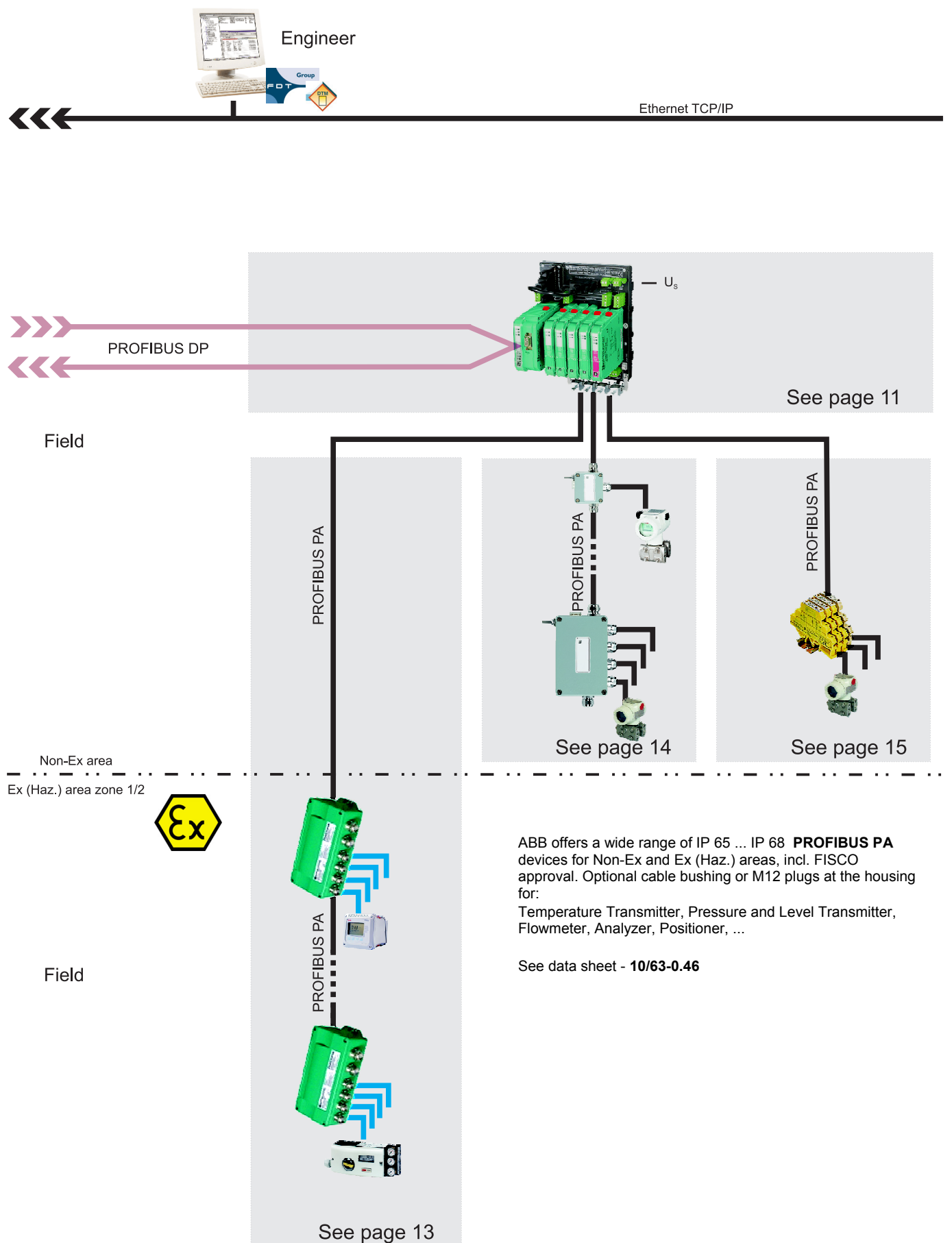
Shielding and grounding

- PROFIBUS DP
- PROFIBUS PA

PROFIBUS PA-layout example

- Fieldbus barrier in Ex (Haz.) area
- Passive 4-way junction in Non-Ex area

Overview



M00556_EN

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

| Description | Catalog No. | Data sheet |
|--|-------------|---------------|
| 1 DTM Bundle & DATxxx (option) - Asset Vision - Device Management Tools for configuration and parameterization of PROFIBUS DP/PA and HART field devices incl. open FDT interface. | 9820027 | DS/DTM/DAT200 |
| 2 NDA121-NO (option) - PROFIBUS DP/PC Adapter for USB | 9890002 | 10/63-6.31 |
| 3 NDE230-NO - DP cable plug, 9-pos. SUB-D - incl. switchable bus termination and programming connection SUB-D, ≤12 MBit/s, IP 40 ♦ PINs: IN: 1A = RxD/TxD-N, 1B = RxD/TxD-P OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P | 9890119 | 10/63-6.40 |
| 4 NDE220-NO - DP cable plug, 9-pos. SUB-D - incl. switchable bus termination, ≤ 12 MBit/s, IP 40 ♦ PINs: IN: 1A = RxD/TxD-N, 1B = RxD/TxD-P OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P | 9890118 | 10/63-6.40 |
| 5 PROFIBUS DP cable, violet NDJ110-NO - 2 x 0.32 mm² (AWG22/1), 65/330/1000 m | 989014x | 10/63-6.47 |
| 6 NDE210-NO - DP cable plug, 9-pos. SUB-D - without bus termination, ≤ 12 MBit/s, IP 40 ♦ PINs: IN: 1A = RxD/TxD-N, 1B = RxD/TxD-P OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P | 9890117 | 10/63-6.40 |
| 7 NDJ120-NO - DP T-junction, ≤ 1.5 MBit/s - 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 - 3x EMC cable bushing, without bus termination, aluminum housing, IP 66 NDJ120-NOS - DP T-junction, ≤ 1.5 MBit/s - 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 | 9890109 | 10/63-6.40 |
| 8 NDE100-NE - DP cable plug - metal housing, M12, for Ex and Non-Ex areas, IP 67 ♦ PINs: 2 = RxD/TxD-N, 4 = RxD/TxD-P, 5 = shielding | 9890113 | 10/63-6.40 |
| 9 NDJ122-NO - DP T-junction, ≤ 1.5 MBit/s - 2x EMC cable bushing, incl. active bus termination, aluminum housing, IP 66 (Shielding braid on ground via cable bushing) ♦ PINs: trunk cable (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 - 3x EMC cable bushing, incl. active bus termination, aluminum housing, IP 66 NDJ122-NOS - DP T-junction, ≤ 1.5 MBit/s - 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 = (-) | 9890110 | 10/63-6.40 |
| 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!

Limits and rules!

When using the ABB Fieldbus accessories:

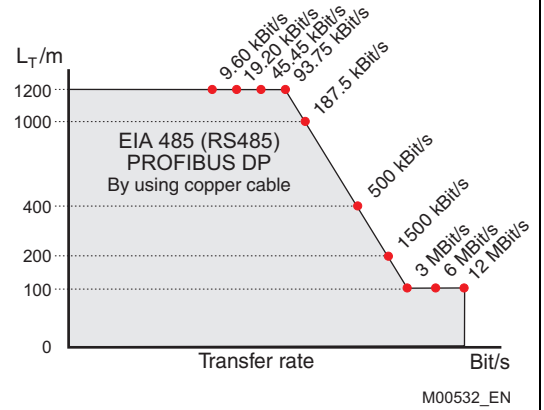
per PROFIBUS Line

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

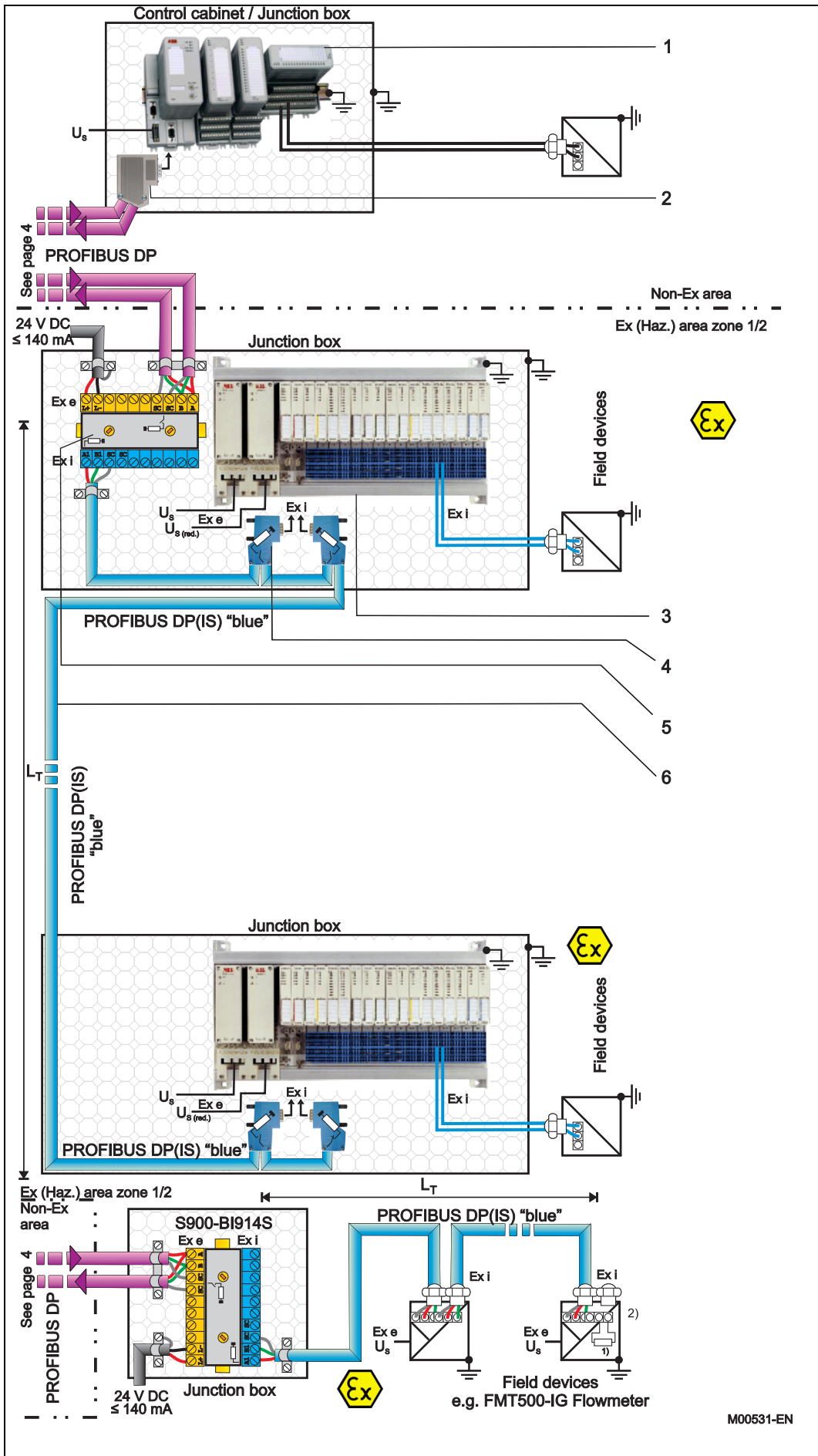
- approx. 4 up to 8 DP segments by Repeater (see data sheets of the Repeater)
- recommended DP transfer rate 500 ... 1500 kBit/s
- the slowest DP subscriber sets the transfer rate of the DP line
- number of PROFIBUS DP and PA subscribers ≤ 126 (Addresses 0 ... 125)

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)
- spur cable length (L_S), at ≤ 1500 kBit/s: $L_S \leq 0.25$ 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, $L_{total} = L_T + (\sum L_S) \leq 200$ m,
 max. 22 DP subscribers (= 6.60 m / (0.25 m + 0.05 m reserve))



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

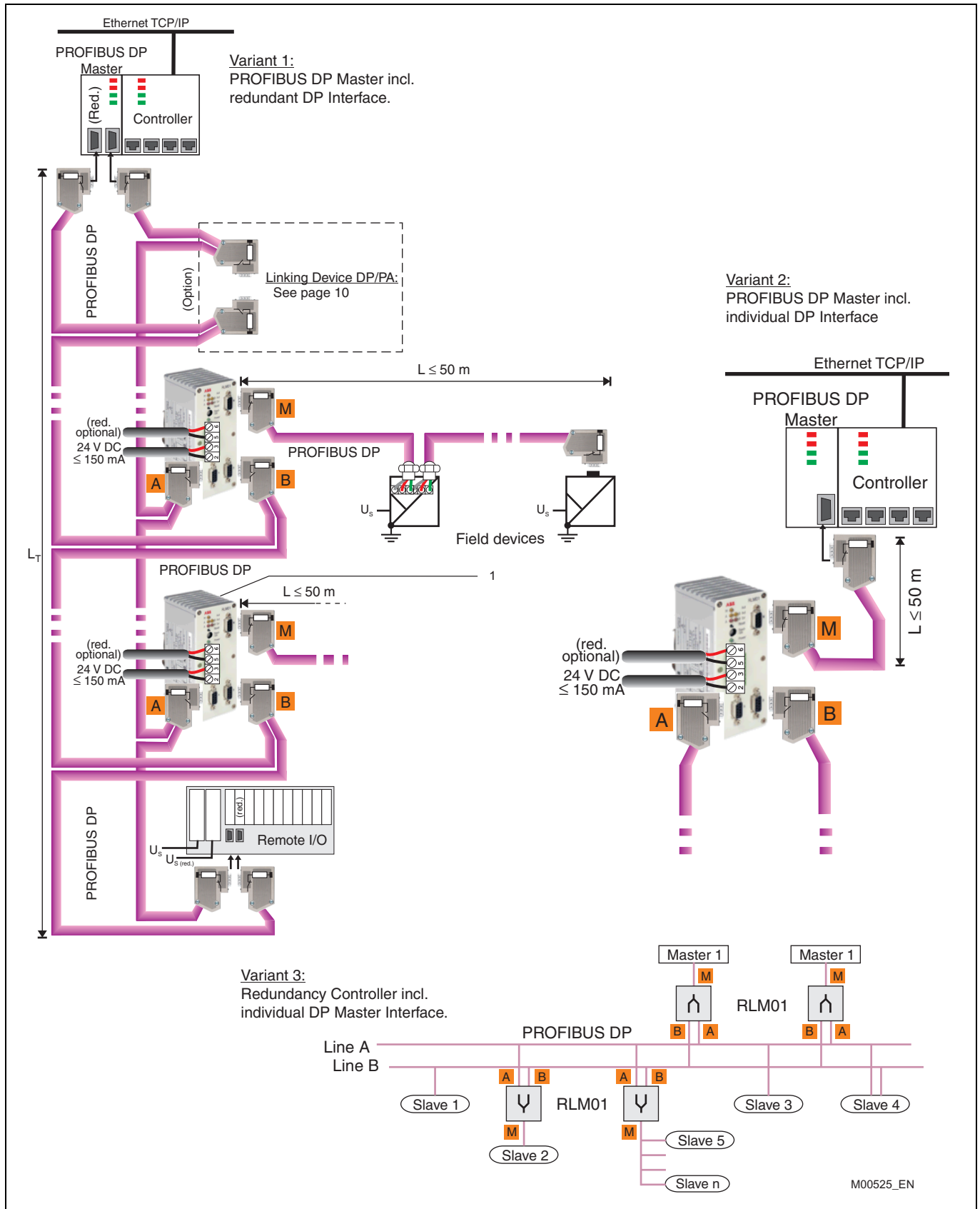
- 1) Alternative to increase the protocol stability:
External active bus termination with S900-BI914S at the end of the DP segment.
- 2) Number of field devices per DP Ex i segment are calculate explicitly and depend on the Repeater type, the DP cable, the Field devices and the bus termination.

You can find more information on the following page.

M00531-EN

| | 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 | On request | 3BSE020924-510 |
| 2 | NDE210-NO - DP cable plug, 9-pos. SUB-D ♦ PINs: IN: 1A = RxD/TxD-N, 1B = RxD/TxD-P OUT: 2A = RxD/TxD-N, 2B = RxD/TxD-P <hr/> NDE220-NO, NDE230-NO (Alternative, not shown) DP cable plug, 9-pos. SUB-D | 9890117 | 10/63-6.40 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, ..) | On request | 3BDD010421Rxx01 3BDD010437Rxx01 |
| 4 | S900-BP910S - DP cable plug - 9-pos SUB-D, "blue", used for the Ex i DP cable, incl. switchable bus termination ♦ PINs: IN/OUT: A = RxD/TxD-N, B = RxD/TxD-P | 3KDE175831L9100 | 3BDD010421Rxx01 |
| 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, <u>not</u> grounded! ♦ PINs (Ex i): OUT: A1 = RxD/TxD-P, B1 = RxD/TxD-N, SC = DP shielding, <u>not</u> grounded! | 3BDH000649R1 | On request |
| 6 | PROFIBUS DP cable, blue! (Intrinsic safety) NDC110-EX - 2 x 0.32 mm ² (AWG22/1), 65/330/1000 m | 989014x | 10/63-6.47 |

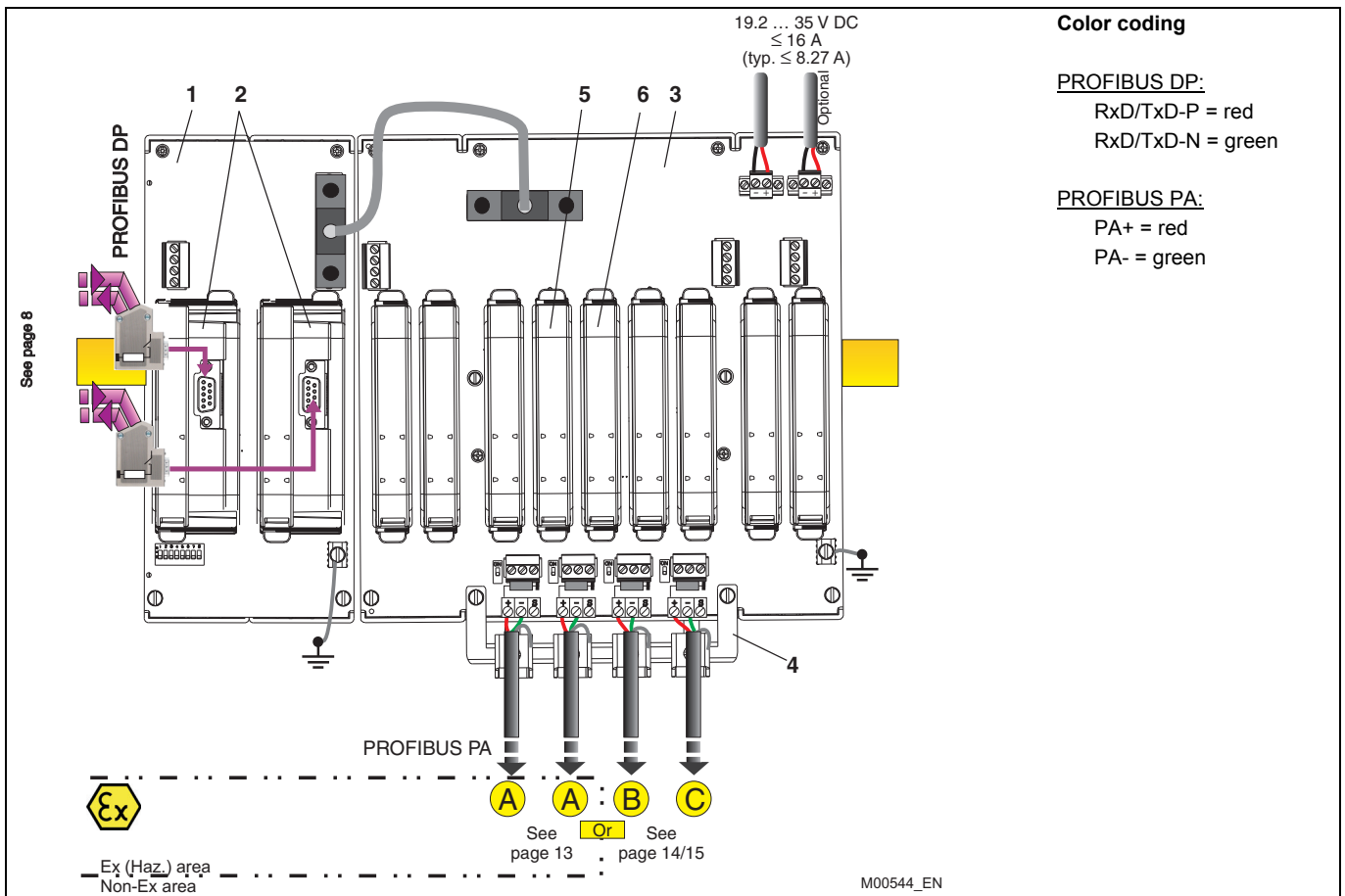
PROFIBUS DP - Redundancy concept with RLM01 (Redundancy Link Module)



M00525_EN

| Description | Catalog No. | Data sheet |
|---|--------------|-----------------|
| 1 RLM01 - DP Redundancy Link Module - 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 = (-) | 3BDZ000398R1 | 3BDD011641R0301 |

PROFIBUS DP/PA - Segment Coupler (redundant)



Color coding

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

PROFIBUS PA:
 PA+ = red
 PA- = green

i Important!

- With a redundant gateway configuration or use of the Gateway DTM.FC for diagnostic transmission, an address must be set by means of a DIP 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.
- Do not use NDE2x0-NO PROFIBUS DP cable connectors for applications in hazardous area Zone 2/Class I, Div. 2.
- First check that the Gateway / diagnostic DTMs have been approved for your frame application
- **DTM.FC** Gateway and **DTM-FC.AD** Basic will be found on: www.abb.com/instrumentation

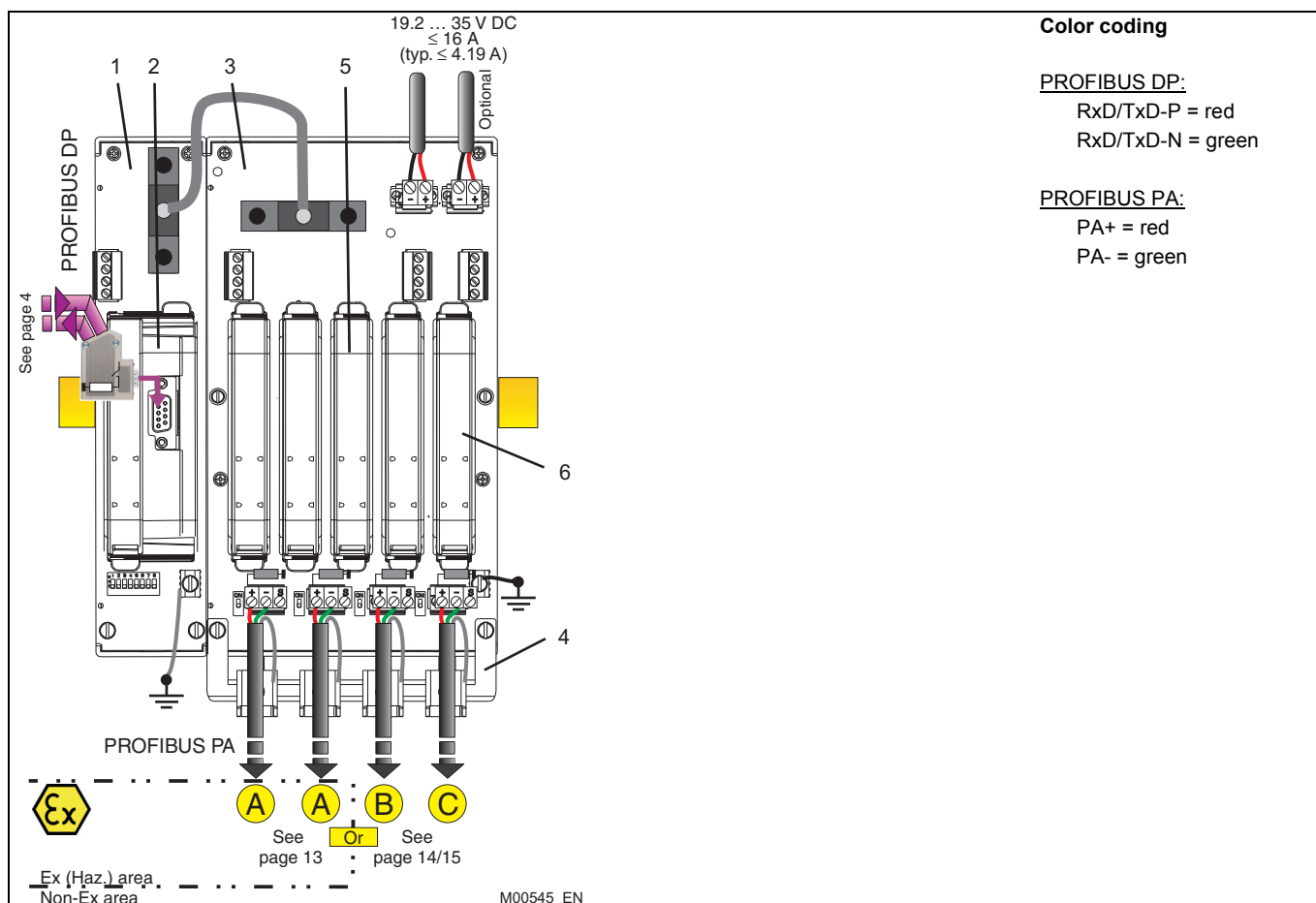
The four system combinations below are possible:

- Redundant connection & redundant supply
- Redundant connection & simple supply
- Simple connection & redundant supply
- Simple connection & simple supply

| Description | Catalog No. | Data sheet |
|---|--|--------------------------------------|
| 1 NDL300 - Motherboard for 2x DP/PA gateway modules (redundant), DIN top-hat rail, IP 20, II 3G Ex nA IIC T4, Zone 2/Class I, Div. 2. - Includes SUB-D cable, 25-pin, for connecting the motherboards - Includes DIP switch for address assignment | 3KXN635300L0120 | DS/NDL |
| 2 NDL300 - DP/PA Gateway DP bus up to 12 Mbit/s, transparent, for 4x power supply modules, IP 20, II 3G Ex nA IIC T4, Zone 2/Class I, Div. 2. - DTM.FC (optional) for gateway parameterization or diagnostic transmission | 3KXN635300L0150 | DS/NDL |
| 3 NPP310 - Motherboard for 2x4 power supply modules (redundant) and for 1x diagnostic module, 4x switchable PA bus terminators, DIN top-hat rail, IP 20, II 3G Ex nA IIC T4, Zone 2/Class I, Div. 2. ♦ 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 | 3KXN636310L0120 | DS/NDL |
| 4 NGP310 (optional) Grounding connection set for large-surface connection of the trunk cable shields. | 3KXN617310L0100 | DS/NDL |
| 5 Power supply modules PA bus fixed at 31.25 kbit/s, IP 20, II 3G Ex nA IIC T4, Zone 2/Class I, Div. 2. NGP310 (for "A", "B", or "C") - PA power feed: $U_S = 28...30$ V DC, $I_S \leq 500$ mA, elec. isolation. NGP310 (for "A", "B", or "C") - PA power feed: $U_S = 25...28$ V DC, $I_S \leq 360$ mA, elec. isolation. | 3KXN617310L0150 3KXN617310L0152 | DS/NDL DS/NDL |
| 6 Diagnostic modules (optional) For supply & PA bus, IP 20, Zone 2/Class I, Div. 2. NGP312 (Basic module), II 3G Ex nA IIC T4 - 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), II 3G Ex nA IIC T4 - 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 - NGP312 DTM Professional, > 100 segments | 3KXN617312L0160 3KXN617312L0161 3KXN617312L0170 3KXN617312L0171 | DS/NDL DS/NDL DS/NDL DS/NDL |

PROFIBUS – Installation suggestion

PROFIBUS DP/PA – Segment Coupler (simplex)



Color coding

PROFIBUS DP:

RxD/TxD-P = red
RxD/TxD-N = green

PROFIBUS PA:

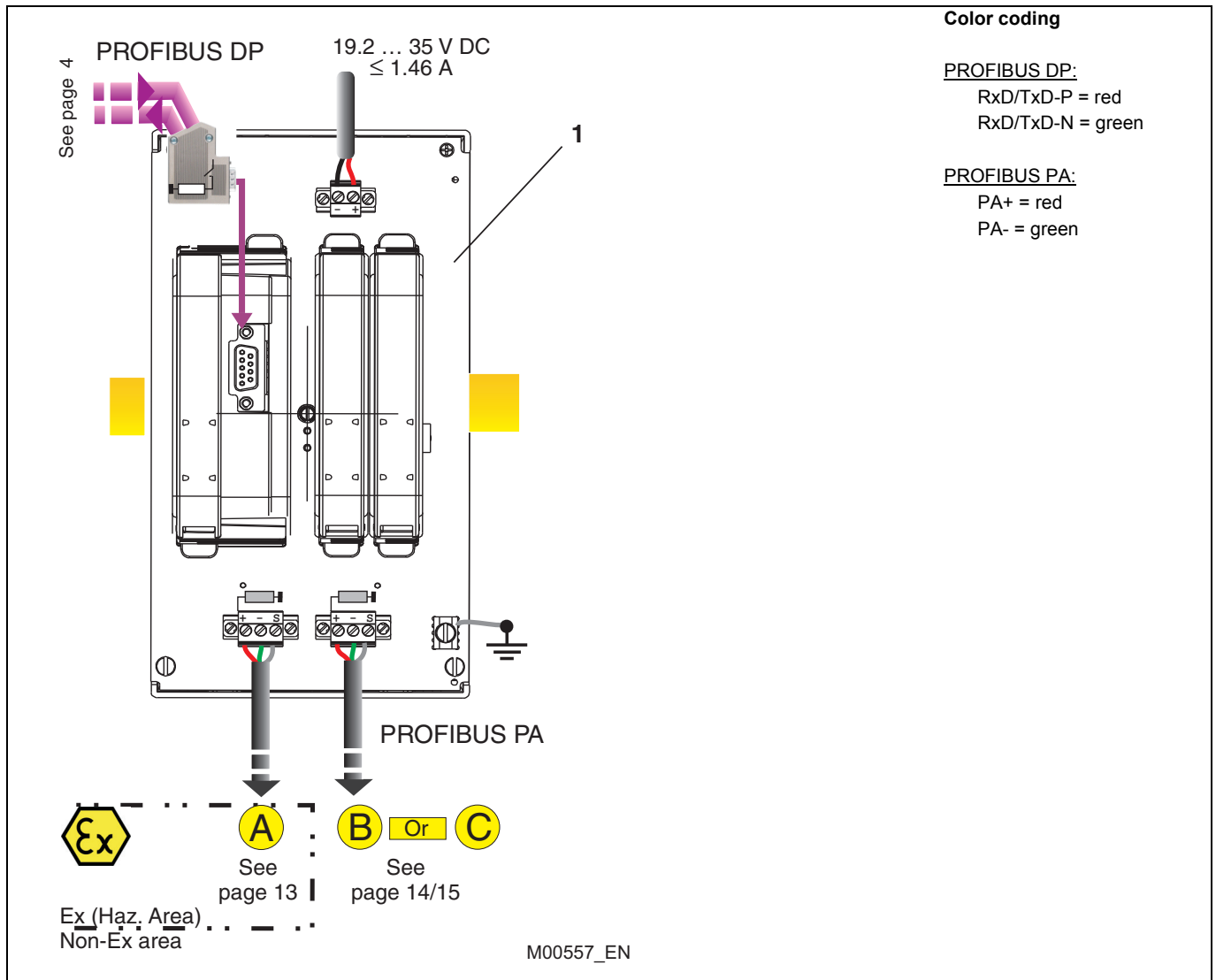
PA+ = red
PA- = green

i Important!

- With use of the Gateway DTM.FC for diagnostic transmission, an address must be set by means of a DIP 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.
- Do not use NDE2x0-NO PROFIBUS DP cable connectors for applications in hazardous area Zone 2/Class I, Div. 2.
- First check that the Gateway / diagnostic DTMs have been approved for your frame application.
- **DTM.FC** Gateway and **DTM-FC.AD** Basic will be found on: www.abb.com/Instrumentation

| Description | Catalog No. | Data sheet |
|--|--|--------------------------------------|
| 1 NDL300 - Motherboard for 1x DP/PA gateway modules, DIN top-hat rail, IP 20, II 3G Ex nA IIC T4, Zone 2/Class I, Div. 2. - Includes SUB-D cable, 25-pin, for connecting the motherboards - Includes DIP switch for address assignment | 3KXN635300L0110 | DS/NDL |
| 2 NDL300 – DP/PA Gateway DP bus up to 12 Mbit/s, transparent, for 4x power supply modules, IP 20, II 3G Ex nA II T4, Zone 2/Class I, Div. 2. - DTM.FC (optional) for gateway parameterization or diagnostic transmission | 3KXN635300L0150 | DS/NDL |
| 3 NPP310 - Motherboard for 4 power supply modules and for 1x diagnostic module, 4x switchable PA bus terminators, DIN top-hat rail, IP 20, II 3G Ex nAC IIC T4, Zone 2/Class I, Div. 2. ♦ 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 | 3KXN636310L0110 | DS/NDL |
| 4 NGP310 (optional) Grounding connection set for large-surface connection of the trunk cable shields. | 3KXN617310L0100 | DS/NDL |
| 5 Power supply modules PA bus fixed at 31.25 kbit/s, IP 20, II 3G Ex nA II T4, Zone 2/Class I, Div. 2. NGP310 (for "A", "B", or "C") - PA power feed: $U_S = 28 \dots 30$ V DC, $I_S \leq 500$ mA, elec. isolation. NGP310 (for "A", "B", or "C") - PA power feed: $U_S = 25 \dots 28$ V DC, $I_S \leq 360$ mA, elec. isolation. | 3KXN617310L0150 3KXN617310L0152 | DS/NDL DS/NDL |
| 6 Diagnostic modules (optional) For supply & PA bus, IP 20, Zone 2/Class I, Div. 2. NGP312 (Basic module), II 3G Ex nAC IIC T4 - 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), II 3G Ex nA IIC T4 - 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 - NGP312 DTM Professional, > 100 segments | 3KXN617312L0160 3KXN617312L0161 3KXN617312L0170 3KXN617312L0171 | DS/NDL DS/NDL DS/NDL DS/NDL |

PROFIBUS DP/PA - Segment Coupler (compact)



i

Important!

- The address "1" must not be assigned for PA field devices.
- Max. **31** PA field devices per power supply module.
- Not permitted for Ex (Haz.) areas.

| Description | Catalog No. | Data sheet |
|--|-----------------|------------|
| 1 NDL300 (compact) IP 20, comprises the following components: 1x Motherboard compact, DIN rail, system M36 1x PROFIBUS DP/PA gateway, DP bus up to 12 Mbit/s, transparent 2x Power supply modules, PA bus fixed at 31.25 kbit/s, PA power feed: $U_S = 25 \dots 28$ V DC, $I_S \leq 360$ mA, incl. fixed bus termination ♦ Power PINs: + = (+), - = GND ♦ PA PINs: OUT segment 1: + = PA+, - = PA-, S = shield and! motherboard grounding firmly OUT segment 2: + = PA+, - = PA-, S = shield | 3KXN635300L0001 | DS/NDL |

Limits and rules for page 13 up to 15!

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.

- $L_{Total} \leq 1,900$ 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 **27.4 Ω/km** (loop)
- NPC250-xx 2.10 mm² **17.2 Ω/km** (loop)

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

M00751_EN

PROFIBUS – Installation suggestion

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

Bus termination each at the beginning and the end of every PA segment necessary!

M00554_EN

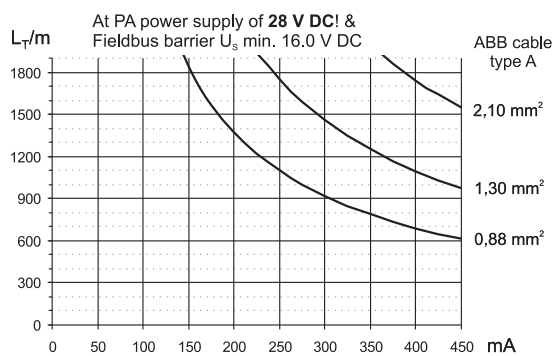
| Description | Catalog No. | Data sheet |
|---|--|--|
| 1 PA overvoltage protection, 2-channel, $I_N \leq 450$ mA (option) NGV211-NO - Cartridge for NGV210-NO NGV210-NO - Basic element for top-hat rail | 9890181 9890180 | 10/63-6.15 10/63-6.15 |
| <ul style="list-style-type: none"> ◆ PINs: 1. channel: 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 mm ² , 43.6 Ω/km, 65/330/1000 m NPC150-NO ¹⁾ - 1.30 mm ² , 27.4 Ω/km, 1000 m NPC250-NO ¹⁾ - 2.10 mm ² , 17.2 Ω/km, 1000 m | 989013x 9890133 9890138 | 10/63-6.47 10/63-6.47 10/63-6.47 |
| 3 NGB900 – Fieldbus barrier - IP 67, aluminum housing, II 2 (1G/D) G Ex me [ia] IIC T4 - 6x cable bushing plastic (shielding capacitive!), switchable bus termination ◆ 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 | 3KXN611900L0010 | DS/NGB |
| 4 6x EMC cable bushing (Shielding braid on ground via cable bushing) | Special order! | |
| 5 PROFIBUS PA cable, blue (Intrinsic safety) NPC080-EX – 0.88 mm ² , 43.6 Ω/km, 65/330/1000 m | 989013x | 10/63-6.47 |
| 6 NPE300-NE - PA cable socket, IP 67 - metal case, M12, for Ex (Haz.) and Non-Ex area ◆ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding | 9890116 | 10/63-6.40 |
| 7 NGV220-EX ²⁾ - PA overvoltage protection (optional) - IP 67 metal case, for M20 x 1.5 cable gland mounting, II2(1)G Ex ia IIC T4/T5/T6 ◆ 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). | 7964115 | 10/63-6.15 |
| 8 NGB900 – Fieldbus barrier - Supply voltage per channel: U_S 12.25 V (at 10 mA) up to 9.78 V (at 43 mA) - Supply current per channel: $I_S \leq 43$ mA - Supply voltage per Barrier: U_S min. 16.0 V DC - Basic current per Barrier: $I_{basic} \leq 49$ mA | <p style="text-align: center;">Fieldbus barrier Output characteristic per channel</p> <p style="text-align: right;">M00538_EN</p> | |
| Color coding PROFIBUS DP: RxD/TxD-P = red RxD/TxD-N = green PROFIBUS PA: PA+ = red PA- = green | | |
| <ul style="list-style-type: none"> 1) By using the 1.3 / 2.1 mm² cable it is not possible to use plugs / sockets! 2) By using the field device types FXE4000, FV4000, FS4000 it is not possible to use NGV220! | | |

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: $L_S \leq 120$ m / at 11 ... 12 spur cable: $L_S \leq 90$ m
At 13 ... 16 spur cable: $L_S \leq 60$ m
- cable length $L_{total} = L_T + (\Sigma L_S) \leq 1900$ m



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

Bus termination each at the beginning and the end of every PA segment necessary!

M00546_EN

| Description | Catalog No. | Data sheet |
|--|--------------------|--------------------------|
| 1 PA overvoltage protection, 2-channel, $I_N \leq 450$ mA (Optional) NGV211-NO - Cartridge for NGV210-NO NGV210-NO - Basic element for top-hat rail ♦ 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 | 9890181 9890180 | 10/63-6.15 10/63-6.15 |
| 2 PROFIBUS PA cable, black (No intrinsic safety) NPC080-NO - 0.88 mm ² , 43.6 Ω/km, 65/330/1000 m NPC150-NO ¹⁾ - 1.30 mm ² , 27.4 Ω/km, 1000 m | 989013x 9890133 | 10/63-6.47 10/63-6.47 |
| 3 NPJ120-NO - PA T-junction, IP 66 - 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+ | 9890101 | 10/63-6.40 |
| 4 NPE100-NE - PA cable plug, IP 67 - metal case, M12, for Ex (Haz.) and Non-Ex area ♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding | 9890115 | 10/63-6.40 |
| 5 PROFIBUS PA cable, black NPC080-NO - 0.88 mm ² , 43.6 Ω/km, 65/330/1000 m | 989013x | 10/63-6.47 |
| 6 NGV220-NO ²⁾ - PA overvoltage protection (Optional) - 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 | 7964116 | 10/63-6.15 |
| 7 NPJ130-NO - PA T-junction, IP 66 - 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+ | 9890102 | 10/63-6.40 |
| 8 NPE300-NE - PA cable socket, IP 67 - metal case, M12, for Ex (Haz.) and Non-Ex area ♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding | 9890116 | 10/63-6.40 |
| 9 NPJ420-NO - PA 4-way junction, IP 66 - 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 - 6x EMC cable bushing, switchable bus termination (Alternative, not shown) | 9890103 9890104 | 10/63-6.40 10/63-6.40 |
| 10 NDZ413-NE - protection cap for sockets M12 | 9890122 | 10/63-6.40 |

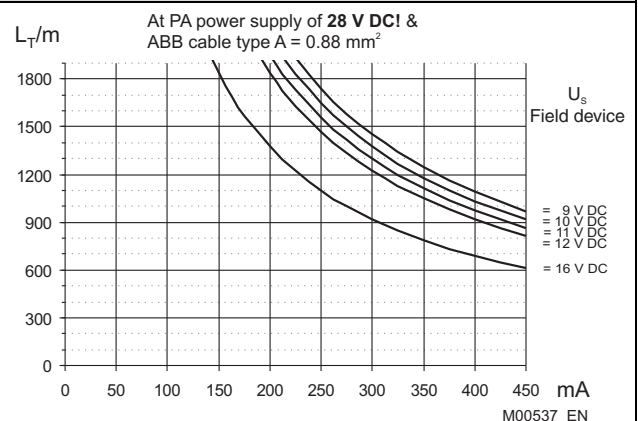
Color coding
PROFIBUS DP: RxD/TxD-P = red RxD/TxD-N = green
PROFIBUS PA: PA+ = red PA- = green

1) By using the 1.3 mm² cable it is not possible to use plugs / sockets!
 2) By using the field device types FXE4000, FV4000, FS4000 it is not possible to use NGV220!

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 – Installation suggestion

PROFIBUS PA – Passive T junction (IP 20) in Non-Ex area

| Description | Catalog No. | Data sheet |
|--|-------------------------------|--|
| 1 PA overvoltage protection, 2-channel, $I_N \leq 450$ mA NGV211-NO - Cartridge for NGV210-NO NGV210-NO - Basic element for top-hat rail ♦ 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 | 9890181 9890180 | 10/63-6.15 10/63-6.15 |
| 2 PROFIBUS PA cable, black (No intrinsic safety) NPC080-NO - 0.88 mm ² , 43.6 Ω/km, 65/330/1000 m NPC150-NO¹⁾ - 1.30 mm ² , 27.4 Ω/km, 1000 m NPC250-NO¹⁾ - 2.10 mm ² , 17.2 Ω/km, 1000 m | 989013x 9890133 9890138 | 10/63-6.47 10/63-6.47 10/63-6.47 |
| 3 PA shield module, for stabilizing the fieldbus shield ♦ PINs: Trunk cable (L _T): IN: S = shield (braided shield connected to ground via the module) | 3KXN623100L0050 | 10/63-6.40 |
| 4 PA line-in module For connecting the main line to the current-limiter modules, max. voltage 30 V DC, rated current 380 mA ♦ PINs: Trunk cable (L _T): IN: A = PA+, B = PA- | 3KXN623100L0010 | 10/63-6.40 |
| 5 PA current-limiter module(s), max. 20 modules per line-in module, supply voltage U _S = 17.5 V DC, supply current I _S = 62 mA ♦ PINs: Spur cable (L _S): OUT: A = PA+, B = PA- | 3KXN623100L0020 | 10/63-6.40 |
| 6 PA bus termination module at end of every main line for NGJ100-NE | 3KXN623100L0040 | 10/63-6.40 |
| 7 NGZ100-NE - Jumper 2 pol, 4 pol or 15 pol to wrap the modules easily. Terminal for segment expansion | 3KXN622100L000x | 10/63-6.40 |
| NGJ100-NE - Basic current per Line-In module: $I_{basic} \leq 5.0$ mA - Basic current per Current-Limiter module: $I_{basic} \leq 5.0$ mA | | |
| 8 NPE300-NE - PA cable socket, IP 67 - Metal case, M12, for Ex (Haz.) and Non-Ex area ♦ PINs: 1 = PA+, 3 = PA-, case (or 4) = shielding | 9890116 | 10/63-6.40 |
| 9 NGV220-NO ²⁾ (optional) - PA overvoltage protection - IP67 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 | 7964116 | 10/63-6.15 |
| 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!
 By using the 2.1 mm² cable it is not possible to use NGV220-NO!
 2) By using the field device types FXE4000, FV4000, FS4000 it is not possible to use NGV220!

Bus termination each at the beginning and the end of every PA segment necessary!

M00547_EN

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 ≤ 20
- Σ current (I) ≤ 450 mA (max. current via NGV21x-NO)
 Σ current (I) = Σ basic current (all field devices, Line-In, Current-Limiter modules) + 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 ... 20 spur cable: L_S \leq 30 m
- cable length L_{total} = L_T + (Σ L_S) \leq 1900 m

At PA power supply of 28 V DC! & ABB cable type A = 0.88 mm²

M00537_EN

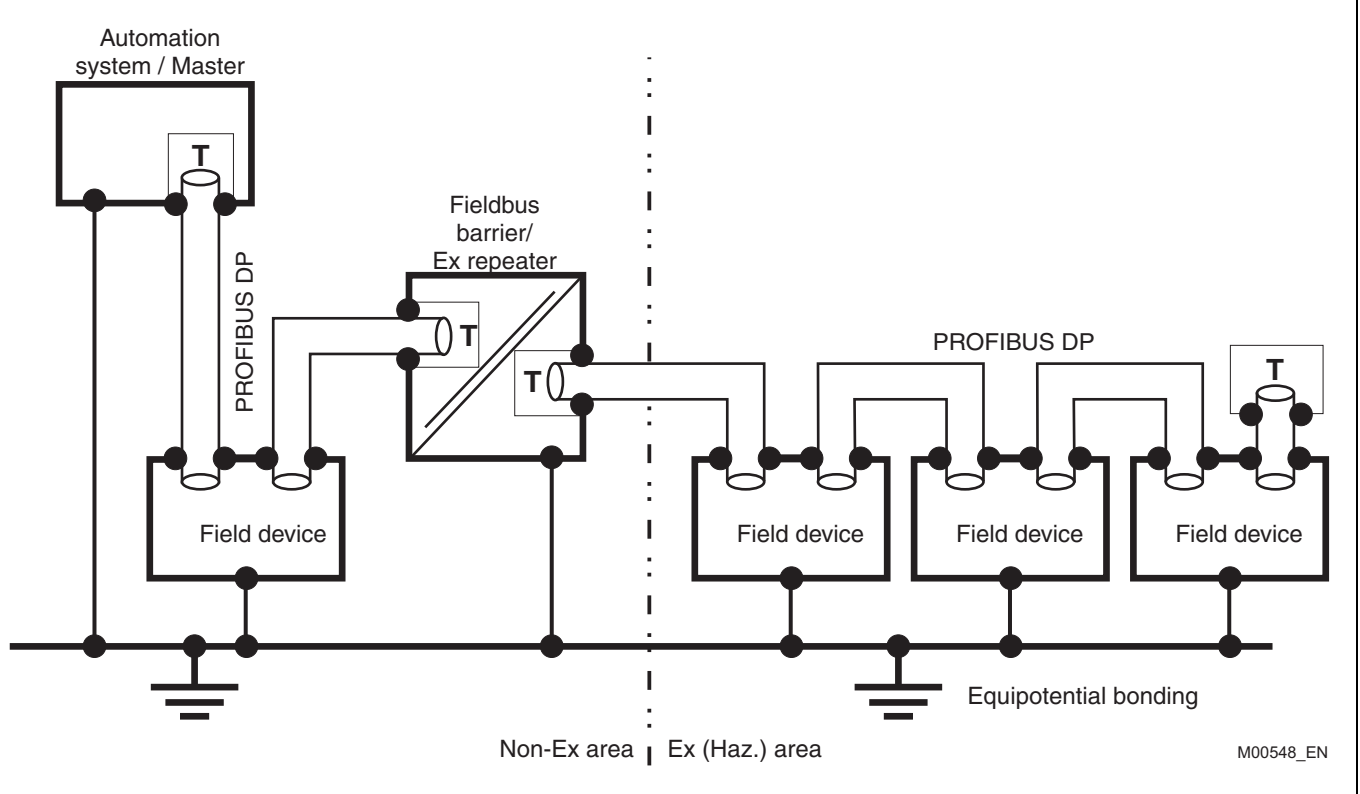
PROFIBUS DP – Shielding and grounding

For information of shielding and grounding refer to the PROFIBUS Technical Guidelines

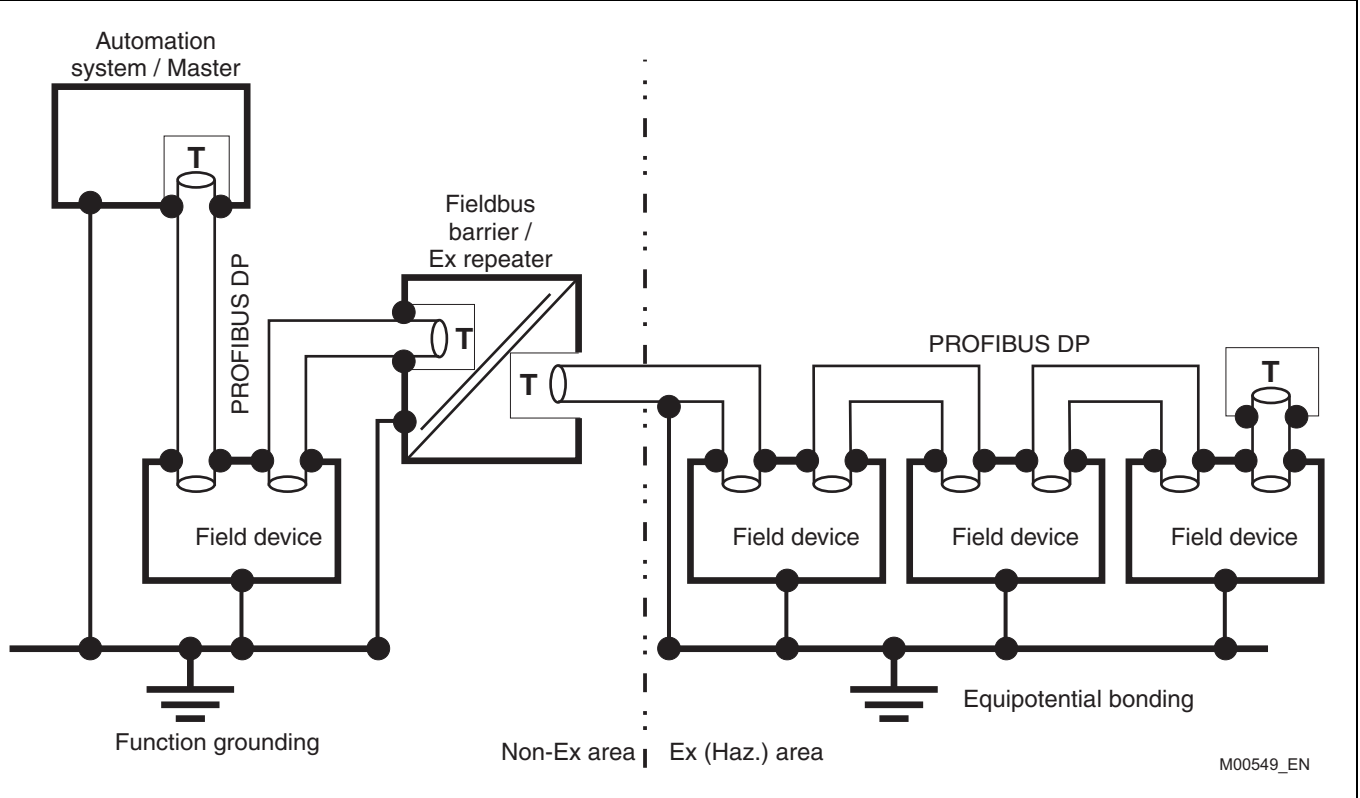
(www.profibus.com/downloads/):

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)



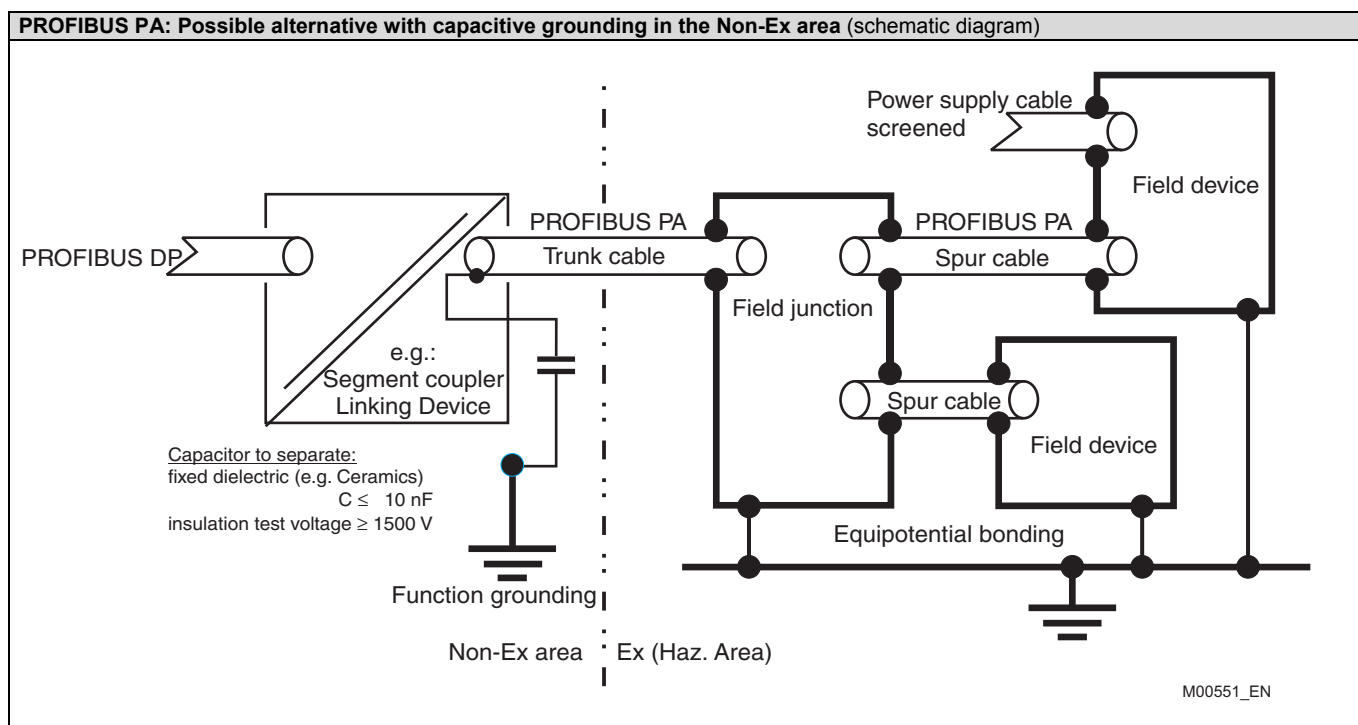
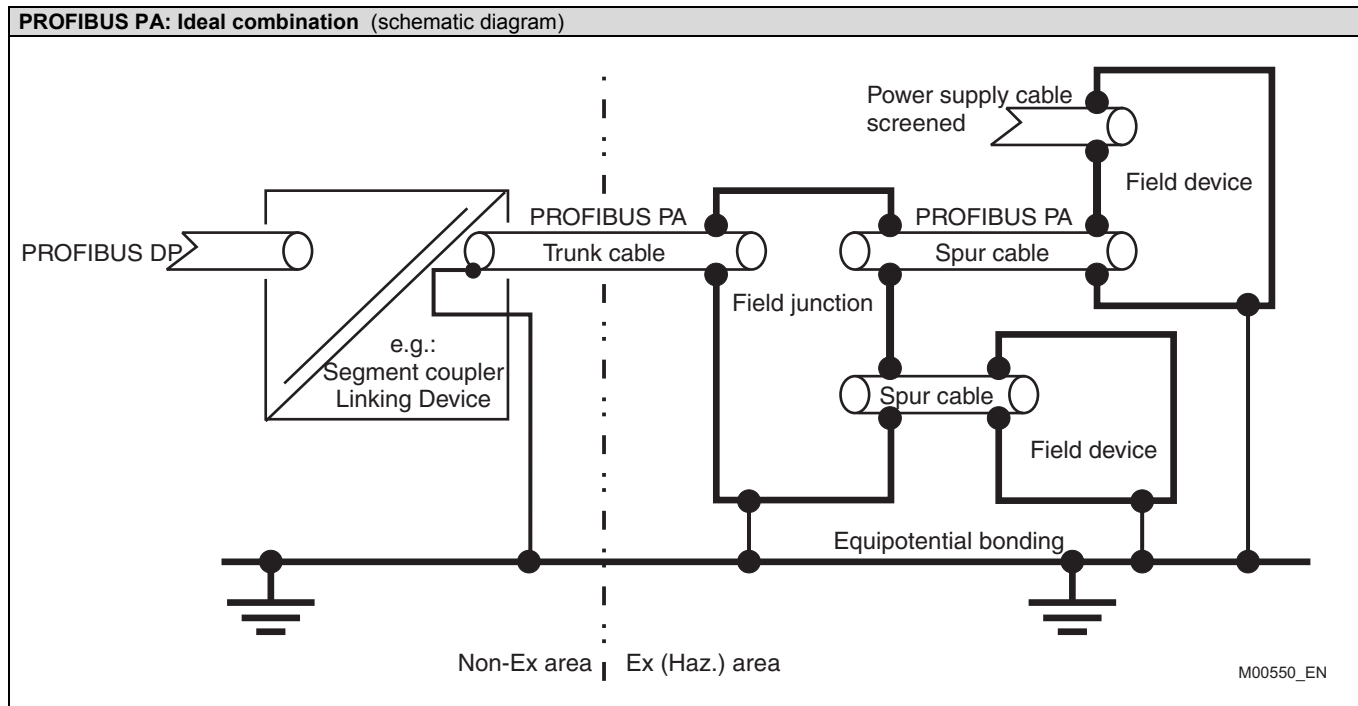
PROFIBUS – Installation suggestion

PROFIBUS PA – Shielding and grounding

For information of shielding and grounding refer to the PROFIBUS Technical Guidelines

(www.profibus.com/downloads):

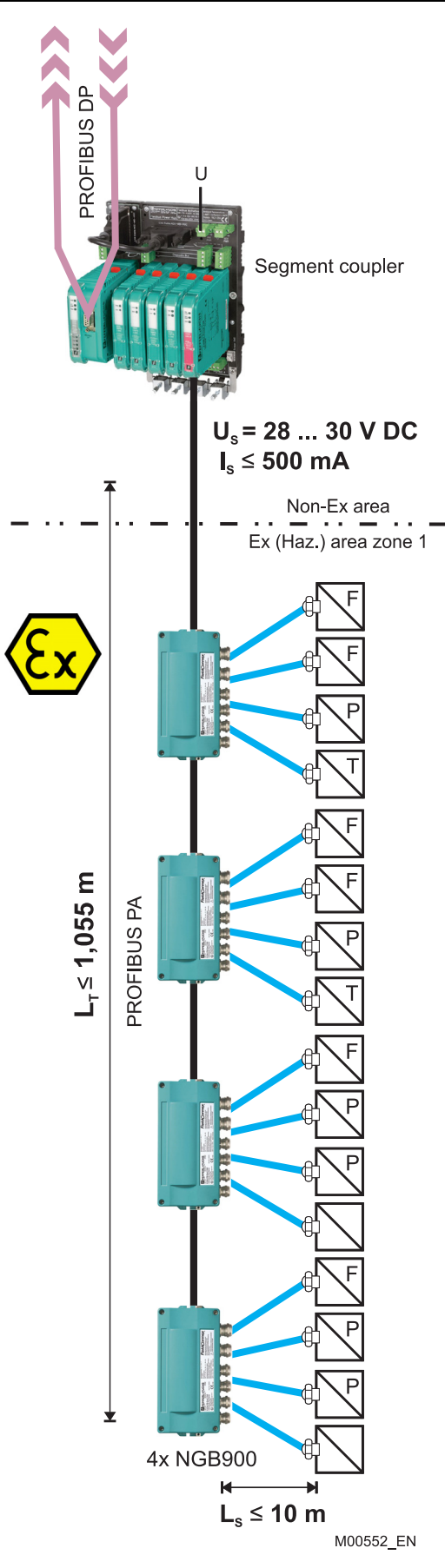
PNO - Order No. 2.092, PROFIBUS PA - User and Installation Guidelines, chapter 3.3.3



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

Calculation example for one 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 ($U_s = 28 \dots 30$ 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 $U_{s \text{ Min.}}$, $I_{\text{basic current}}$ and $I_{\text{error current}}$ for the Fieldbus barrier and the five field device types. The values are shown in the following data sheet: 10/63-0.46 - ABB Device overview for PROFIBUS PA

| PA devices | $U_s \text{ Min.}$ | $I_{\text{basic current}}$ | $I_{\text{error current}}$ |
|------------------|--------------------|----------------------------|----------------------------|
| 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 $U_{s \text{ Min.}}$ (16.0 V)
is less than $U_s = 28 \dots 30$ V DC of the Power supply module.
 - for the current supply:
Sum $I_{\text{basic current}}$ (403.0 mA) plus 1x highest $I_{\text{error current}}$ (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. 1,055 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
 $L_{\text{max}} = 1,055 \text{ m} + L_s (16 \times 10 \text{ m}) = 1,215 \text{ m}$
is less than the max. allowed 1,900 m.

Result:

1. **The structure is possible in principle!**
2. **$L_{\text{max}} = 1,215 \text{ m}$.**

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, retries, 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**

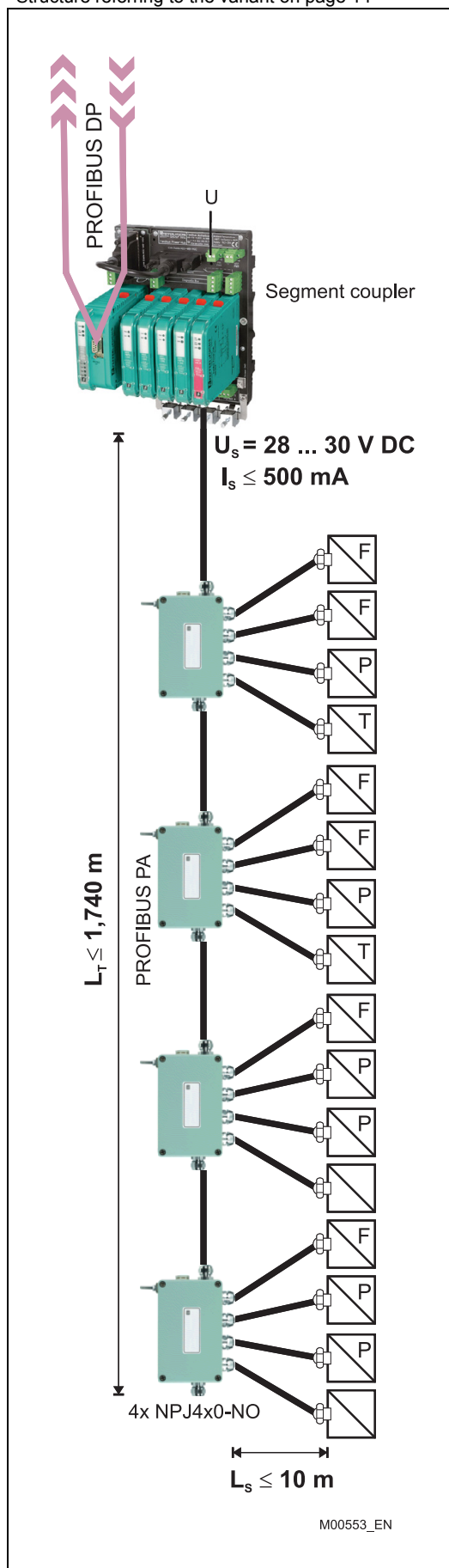
Speak to us for the calculation of complex PROFIBUS topologies.

PROFIBUS – Installation suggestion

PROFIBUS PA layout example - Passive 4-way junction in Non-Ex area

Calculation example for one 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 ($U_s = 28 \dots 30 \text{ V DC}$, $I_s \leq 500 \text{ mA}$)
- **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 mm^2 ,
from the Power supply module up to the last PA field device.

Calculation:

Create a table with the values $U_{s \text{ Min.}}$, $I_{\text{basic current}}$ and $I_{\text{error current}}$ for the junction and the five field device types. The values are shown in the following data sheet:
10/63-0.46 - ABB Device overview for PROFIBUS PA

| PA device | $U_{s \text{ Min.}}$ | $I_{\text{basic current}}$ | $I_{\text{error current}}$ |
|------------------|----------------------|---|----------------------------|
| 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 |
| | | $\Sigma 207.0 \text{ mA}$ | |

1. Appraise and calculate (U, I):
 - for the voltage supply: Highest $U_{s \text{ Min.}}$ (9 V)
is less than $U_s = 28 \dots 30 \text{ V DC}$ of the Power supply module.
 - for the current supply:
Sum $I_{\text{basic current}}$ (207.0 mA) plus 1x highest $I_{\text{error current}}$ (12.0 mA)
is less than $I_s \leq 500 \text{ mA}$ of the Power supply module.
2. Calculation of the PA segment length (L_T):
 - Max. L_T is $> 1.900 \text{ m}$! Shown in the diagram page 14
by means of the characteristic curve for the ABB PA cable 0.88 mm^2 ,
the sum current (0.219 A) and highest $U_{s \text{ Min.}}$ (9.0 V).
 - Max. total length of the PA segment cable is equal to
 $L_{\text{max}} = 1.900 \text{ m} + L_s (16 \times 10 \text{ m}) > 1.900 \text{ m}$!
Attention: Not exceed the max. allowed 1.900 m!
Max. $L_T = 1.900 \text{ m} - L_s (16 \times 10 \text{ m}) \leq 1.740 \text{ m}$!

Result:

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

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, retries, 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 | $\approx 317 \text{ Bit}$ | 5 Byte | 33 Byte | 34 ms | 56 ms |
| 3x FCM2000 | $\approx 317 \text{ Bit}$ | 5 Byte | 34 Byte | 34 ms | 57 ms |
| 6x 2600T(266xxx) | $\approx 317 \text{ Bit}$ | 5 Byte | 15 Byte | 69 ms | 84 ms |
| 2x TTH300 | $\approx 317 \text{ Bit}$ | 5 Byte | 29 Byte | 23 ms | 35 ms |
| 2x TZIDC-110 | $\approx 317 \text{ Bit}$ | 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.

Contact us

ABB Automation GmbH

Service Instrumentation

Kallstadter Str. 1

68309 Mannheim, Germany

Customer Service Center:

+49 180 5 222 580*

E-Mail: automation.service@de.abb.com

www.abb.com

* 4 cents/minute from German landlines,
max. 42 cents/minute from mobiles.

Note

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents - in whole or in parts - is forbidden without prior written consent of ABB.

Copyright© 2011 ABB

All rights reserved

3KXN040000R1001

10/63-0.40/EN Rev. D 06.2011