

Safety Instructions

Micropilot

FMR50/51/52/53/54/56/57

PROFIBUS PA, FOUNDATION Fieldbus

Ga/Gb Ex ia/db [ia Ga] IIC T6...T1 X
Ex ta/tb IIIC T85°C Da/Db X



Micropilot FMR50/51/52/53/54/56/57

PROFIBUS PA, FOUNDATION Fieldbus

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About this document

This document has been translated into several languages. Legally determined is solely the English source text.

Associated documentation

This document is an integral part of the following Operating Instructions:

PROFIBUS PA

- BA01124F/00 (FMR50)
- BA01125F/00 (FMR51, FMR52)
- BA01126F/00 (FMR53, FMR54)
- BA01127F/00 (FMR56, FMR57)

FOUNDATION Fieldbus

- BA01120F/00 (FMR50)
- BA01121F/00 (FMR51, FMR52)
- BA01122F/00 (FMR53, FMR54)
- BA01123F/00 (FMR56, FMR57)

Supplementary documentation

Explosion protection brochure: CP00021Z/11

The Explosion-protection brochure is available:

- In the download area of the Endress+Hauser website:
www.endress.com -> Downloads -> Brochures and Catalogs -> Text Search: CP00021Z
- On the CD for devices with CD-based documentation

Manufacturer's certificates**Certificate of Conformity TP TC 012/2011**

Inspection authority:

LLC NANIO CCVE (ООО «НАНИО ЦСВЭ»)

Certificate number:

EAЭС RU C-DE.AA87.B.00976/22

Affixing the certificate number certifies conformity with the following standards (depending on the device version):

- GOST 31610.0-2014 (IEC 60079-0:2011)
- GOST IEC 60079-1-2013
- GOST 31610.11-2014 (IEC 60079-11:2011)
- GOST 31610.26-2012/IEC 60079-26:2006
- GOST IEC 60079-31-2013

Manufacturer address Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany
Address of the manufacturing plant: See nameplate.

Extended order code The extended order code is indicated on the nameplate, which is affixed to the device in such a way that it is clearly visible. Additional information about the nameplate is provided in the associated Operating Instructions.

Structure of the extended order code

| | | | | |
|----------------------|---|-------------------------------|---|----------------------------------|
| FMR5x | – | ***** | + | A*B*C*D*E*F*G*.. |
| <i>(Device type)</i> | | <i>(Basic specifications)</i> | | <i>(Optional specifications)</i> |

* = Placeholder

At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.

Basic specifications

The features that are absolutely essential for the device (mandatory features) are specified in the basic specifications. The number of positions depends on the number of features available.

The selected option of a feature can consist of several positions.

Optional specifications

The optional specifications describe additional features for the device (optional features). The number of positions depends on the number of features available. The features have a 2-digit structure to aid identification (e.g. JA). The first digit (ID) stands for the feature group and consists of a number or a letter (e.g. J = Test, Certificate). The second digit constitutes the value that stands for the feature within the group (e.g. A = 3.1 material (wetted parts), inspection certificate).

More detailed information about the device is provided in the following tables. These tables describe the individual positions and IDs in the extended order code which are relevant to hazardous locations.

Extended order code: Micropilot



The following specifications reproduce an extract from the product structure and are used to assign:

- This documentation to the device (using the extended order code on the nameplate).
- The device options cited in the document.

Device type

FMR50, FMR51, FMR52, FMR53, FMR54, FMR56, FMR57

Basic specifications


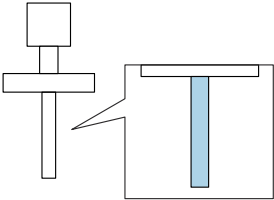
| Position 1, 2 (Approval) | | |
|--------------------------|------------------|---|
| Selected option | | Description |
| FMR5x | G3 ¹⁾ | EAC Ga/Gb Ex ia/db [ia Ga] IIC T6...T1 X EAC Ex ta/tb IIIC T85°C Da/Db X |

- 1) The designation changes in connection with Position 4 = L, M, N:
Ga/Gb Ex ia/db [ia Ga] IIC T6...T1 X, Ex ta/tb [ia Da] IIIC T85°C Da/Db X


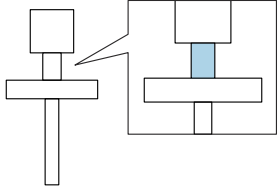
| Position 3 (Power Supply, Output) | | |
|-----------------------------------|---|--|
| Selected option | | Description |
| FMR5x | E | 2-wire, FOUNDATION Fieldbus, switch output (PFS) |
| | G | 2-wire, PROFIBUS PA, switch output (PFS) |

| Position 4 (Display, Operation) | | |
|---------------------------------|---|--|
| Selected option | | Description |
| FMR5x | A | Without, via communication |
| | C | SD02, 4-line, push buttons + data backup function |
| | E | SD03, 4-line, illum., touch control + data backup function |
| | M | Prepared for display FHX50 + custom connection |
| | N | Prepared for display FHX50 + NPT1/2" |

| Position 5 (Housing) | | |
|----------------------|---|-----------------------------------|
| Selected option | | Description |
| FMR51-54 FMR57 | B | GT18 dual compartment, 316L |
| FMR5x | C | GT20 dual compartment, Alu coated |


| Position 7, 8 (Antenna) | | |
|---|----|--|
| Selected option | | Description |
| FMR50 | BN | Horn 80 mm/3", PP cladde, -40...80°C |
| | BR | Horn 100 mm/4", PP cladde, -40...80°C |
| FMR51 | Bx | Horn (different sizes) |
| FMR52 | BO | Horn 50 mm/2", -196...200°C, flush mount |
| | BP | Horn 80 mm/3", -196...200°C, flush mount |
| FMR53 | Cx | Rod (different sizes) |
| FMR54 | Ax | Without Horn |
| | Bx | Horn (different sizes) |
| | Dx | Planar (different sizes) |
| FMR56 | BN | Horn 80 mm/3", PP cladde, -40...80°C |
| | BR | Horn 100 mm/4", PP cladde, -40...80°C |
| FMR57 | Bx | Horn (different sizes) |
| | Fx | Parabolic (different sizes) |
| <p> Shown in the temperature tables exemplary as follows:</p>  | | |

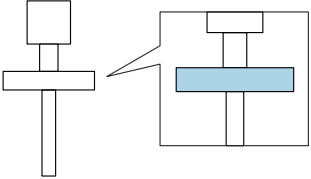
| Position 9, 10 (Seal) | | |
|-----------------------|----|--|
| Selected option | | Description |
| FMR51 | A5 | Viton GLT, -40...150°C |
| | C1 | Kalrez, -20...150°C |
| | D2 | Graphite, -196...450°C (HT) |
| | D3 | Graphite, -40...250°C (XT) |
| FMR54 | A7 | Viton, -20...150°C (Planar) |
| | A8 | Viton, -40...200°C |
| | B4 | EPDM, -40...150°C |
| | C2 | Kalrez, -20...200°C, conductive media max. 150°C |
| | D1 | Graphite, -196...280°C (XT) |
| | D2 | Graphite, -196...400°C (HT) |

| Position 9, 10 (Seal) | | |
|--|-------------|----------------------------|
| Selected option | Description | |
| FMR57 | A6 | Viton GLT, -40...200°C |
| | D4 | Graphite, -40...400°C (HT) |
| <p> Shown in the temperature tables exemplary as follows:</p>  | | |

| Position 11-13 (Process Connection) | | |
|-------------------------------------|-------------------|---|
| Selected option | Description | |
| FMR5 1-54 FMR57 | Axx Cxx Kxx | Flange (different sizes) |
| FMR50 | UAE | Mounting bracket |
| | XRO | Connection, without flange/mounting bracket |
| | XxG | Slip on flange (different sizes) |
| FMR5 1 | Pxx | Flange (different sizes) |
| | Rxx | Thread |
| | Txx | Tri-Clamp |
| FMR52 | Mxx | Slotted-nut |
| | Txx | Tri-Clamp |
| FMR53 | Rxj | Thread, 316L |
| | RxF | Thread, PVDF |
| FMR56 | UAE | Mounting bracket |
| | XRO | Connection, without flange/mounting bracket |
| | XxG | Slip on flange (different sizes) |

| Position 11-13 (Process Connection) | | |
|-------------------------------------|-----|---------------------------------|
| Selected option | | Description |
| FMR57 | RxJ | Thread, 316L |
| | XxJ | Align. device (different sizes) |

 Shown in the temperature tables exemplary as follows:



| Position 14 (Air Purge Connection) | | |
|------------------------------------|---|-------------|
| Selected option | | Description |
| FMR57 | 1 | G1/4 |
| | 2 | NPT1/4 |

Optional specifications

| ID Nx, Ox (Accessory Mounted) | | |
|-------------------------------|----------------|---|
| Selected option | | Description |
| FMR51 | OM OU OV | Antenna extension (different sizes) |
| | OW | Horn protection, PTFE, no airpurge possible |
| FMR54 | OM | Antenna extension (different sizes) |
| | ON | |
| | OR | |
| | OS | |
| FMR57 | OP OT | Antenna extension (different sizes) |
| | OW | Horn protection, PTFE, no airpurge possible |

Safety instructions:
General

- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
 - Be suitably qualified for their role and the tasks they perform
 - Be trained in explosion protection
 - Be familiar with national regulations
- Install the device according to the manufacturer's instructions and national regulations.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Avoid electrostatic charging:
 - Of plastic surfaces (e.g. enclosure, sensor element, special varnishing, attached additional plates, ..)
 - Of isolated capacities (e.g. isolated metallic plates)
- Alterations to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.
- Refer to the temperature tables for the relationship between the permitted ambient temperature for the sensor and/or transmitter, depending on the range of application and the temperature class.
- When using in hybrid mixtures (gas and dust occurring simultaneously), observe additional measures for explosion protection.

Safety instructions:
Special conditions

Permitted ambient temperature range at the electronics enclosure:
 $-40\text{ °C} \leq T_a \leq +80\text{ °C}$

- Observe the information in the temperature tables.
- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- To avoid electrostatic charging: Do not rub surfaces with a dry cloth.
- In the event of additional or alternative special varnishing on the enclosure or other metal parts or for adhesive plates:
 - Observe the danger of electrostatic charging and discharge.
 - Do not install in the vicinity of processes ($\leq 0.5\text{ m}$) generating strong electrostatic charges.

Device type FMR50, FMR52, FMR53, FMR54 (planar, enamel), FMR56
 An antenna coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).

Device type FMR51, FMR57 and Optional specification, ID Nx, Ox = OW
 An antenna coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).

Device type FMR57 and Basic specification, Position 11-13 = XxJ

- Changing the position of the alignment device must be impossible:
 - After the alignment of the antenna via the pivot bracket
 - After tightening of the clamping flange
 - After setting the damping ring (torque 15 Nm)
- Degree of protection IP67 must be fulfilled.

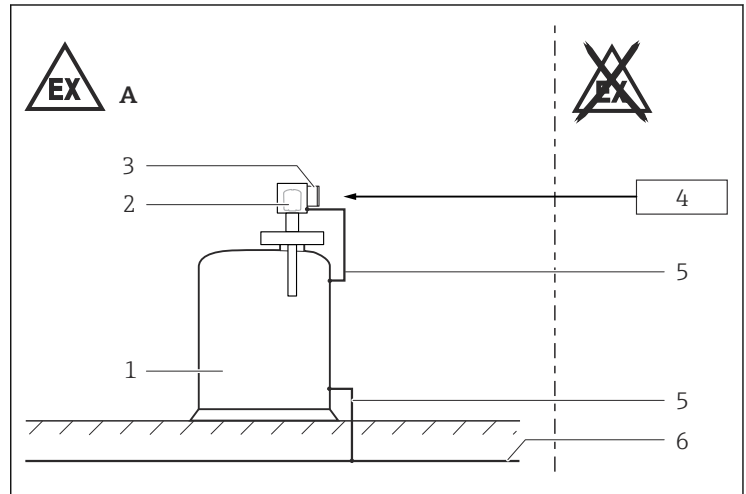
Device type FMR57 and Basic specification, Position 14 = 1, 2

- If equipment with Ga/Gb or Da/Db is required: In the closed state the minimum degree of protection of the installation must be IP67.
- After removing the air purge connection: Lock the opening with a suitable plug.
 - Torque: 6-7 Nm
 - For Da/Db: thread engagement > 5 turns
- Degree of protection IP67 must be fulfilled.

Device type FMR51, FMR54, FMR57 and Optional specification, ID Nx, Ox = OM, ON, OR, OS, OU, OV, OP, OT

Avoid contact between sensor and tank wall. Take into account tank fittings and flow conditions (avoid sparks caused by impact and friction).

Safety instructions: Installation



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- A Zone 1, Zone 21
- 1 Tank; Zone 0, Zone 1 or Zone 20, Zone 21
- 2 Electronics compartment Ex ia; Electronic insert
- 3 Connection compartment Ex db
- 4 Power supply
- 5 Potential equalization line
- 6 Potential equalization

- After aligning (rotating) the enclosure, retighten the fixing screw (see Operating Instructions).
- Install the device to exclude any mechanical damage or friction during the application. Pay particular attention to flow conditions and tank fittings.
- In potentially explosive atmospheres:
 - Do not disconnect the electrical connection of the power supply circuit when energized.
 - Do not open the connection compartment cover.
- Only use certified cable entries suitable for the application. Observe national regulations and standards. Accordingly, the connection terminal does not include any ignition sources.
- When operating the transmitter enclosure at an ambient temperature under $-20\text{ }^{\circ}\text{C}$, use appropriate cables and cable entries permitted for this application.
- When connecting through a conduit entry approved for this purpose, mount the associated sealing unit directly at the enclosure.
- Only use certified cable entries or sealing plugs. The metal sealing plugs supplied meet this requirement.
- Seal unused entry glands with approved sealing plugs that correspond to the type of protection. The plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.
- Before operation:
 - Screw in the cover all the way.
 - Tighten the securing clamp on the cover.
- After mounting and connecting the antenna, ingress protection of the enclosure must be at least IP65.
- Perform the following to achieve the degree of protection:
 - Screw the cover tight.
 - Mount the cable entry correctly.
- Continuous service temperature of the connecting cable:
 $-40\text{ }^{\circ}\text{C}$ to $\geq +85\text{ }^{\circ}\text{C}$; in accordance with the range of service temperature taking into account additional influences of the process conditions ($T_{a,\text{min}}$), ($T_{a,\text{max}} + 20\text{ K}$).

Basic specification, Position 4 = N

Observe the requirements according to IEC/EN 60079-14 for conduit systems and the wiring- and installation instructions of the suitable Safety Instructions (XA). In addition, observe national regulations and standards for conduit systems.

Explosion protection "Flameproof enclosure Ex db"

Flameproof equipment with G threaded entry holes is not intended for new installations but only for replacement of equipment in existing installations. Application of this equipment shall comply with the local installation requirements.

Intrinsic safety

The device can be connected to the Endress+Hauser FXA291 service tool: refer to the Operating Instructions.

Potential equalization

Integrate the device into the local potential equalization.

Safety instructions: Zone 0

- In the event of potentially explosive vapor/air mixtures, only operate the device under atmospheric conditions.
 - Temperature: -20 to +60 °C
 - Pressure: 80 to 110 kPa (0.8 to 1.1 bar)
 - Air with normal oxygen content, usually 21 % (V/V)
- If no potentially explosive mixtures are present, or if additional protective measures have been taken, the device may also be operated under non-atmospheric conditions in accordance with the manufacturer's specifications.

Temperature tables

→ Safety Instructions: XA02414F/00



The Safety Instructions for temperature tables are available: In the download area of the Endress+Hauser website: www.endress.com -> Downloads -> Manuals and Datasheets -> Type: Ex Safety Instructions (XA) -> Text Search: ...



Observe the permitted temperature range at the antenna.



Basic specification, Position 3 = E, G

Deratings are based on a power consumption of 1 W (PFS);
→ 16.

Explanation of how to use the temperature tables



Unless otherwise indicated, the positions always refer to the basic specification.

Zone 0, Zone 1 or Zone 1

1st column: Position 5 = A, B, ...

2nd column: Position 3 = A, B, ..

- (1): 1 channel used
- (2): 2 channels used

3rd column: Temperature classes T6 (85 °C) to T1 (450 °C)

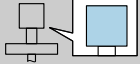
Column P1 to P6: Position (temperature value) on the axes of the derating

- T_a : Ambient temperature in °C
- T_p : Process temperature in °C



Column P6 is only relevant for version B of the derating.

Example table

|  = C | (1) | P1 | | P2 | | P3 | | P4 | | P5 | | P6 | | |
|--|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| | | T_p | T_a | T_p | T_a | T_p | T_a | T_p | T_a | T_p | T_a | T_p | T_a | |
| | E, G | T6 | -40 | 60 | 60 | 60 | 85 | 54 | 85 | -40 | -40 | -40 | - | - |
| | | T5 | -40 | 75 | 75 | 75 | 100 | 69 | 100 | -40 | -40 | -40 | - | - |
| | | T4 | -40 | 80 | 80 | 80 | 135 | 68 | 135 | -40 | -40 | -40 | - | - |

Zone 20, Zone 21

1st column: Position 5 = A, B, ...

2nd column: Position 3 = A, B, ..

- (1): 1 channel used
- (2): 2 channels used

3rd column: Process temperature

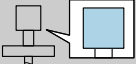
Column P1 to P6: Position (temperature value) on the axes of the derating

- T_a : Ambient temperature in °C
- T_p : Process temperature in °C

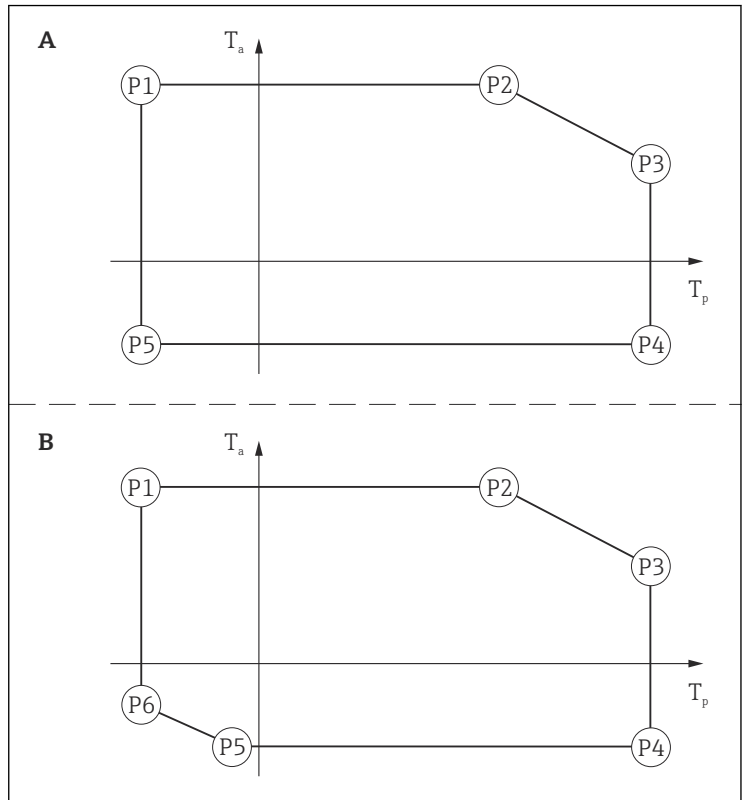


Column P6 is only relevant for version B of the derating.

Example table

|  = C | (1) | P1 | | P2 | | P3 | | P4 | | P5 | | P6 | | |
|---|------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| | | T _p | T _a | T _p | T _a | T _p | T _a | T _p | T _a | T _p | T _a | T _p | T _a | |
| | E, G | 135 | -40 | 80 | 80 | 80 | 135 | 67 | 135 | -40 | -40 | -40 | - | - |
| | | 200 | -40 | 80 | 80 | 80 | 200 | 51 | 200 | -40 | -40 | -40 | - | - |

Example diagrams of possible deratings



A0022717

Connection data

Cable entry: Connection compartment

Ex tb

Cable gland: No cable gland available.

Cable entry: Electronics compartment

Cable gland: *Basic specification, Position 4 = M*


Basic specification, Position 5 = B, C

preferably for Position 5 = B

| Thread | Clamping range | Material | Sealing insert | O-ring |
|---------|----------------|----------|----------------|--------------|
| M16x1,5 | ø 5 to 10 mm | 1.4404 | PA/NBR | NBR (ø 13x2) |

preferably for Position 5 = C

| Thread | Clamping range | Material | Sealing insert | O-ring |
|---------|----------------|-------------------|----------------|--------------|
| M16x1,5 | ø 5 to 10 mm | Ms, nickel-plated | PA/NBR | NBR (ø 13x2) |

- 
 - The tightening torque refers to cable glands installed by the manufacturer:
 - Recommended: 3.5 Nm
 - Maximum: 5 Nm
 - This value may be different depending on the type of cable. However, the maximum value must not be exceeded.
- Only suitable for fixed installation. The operator must pay attention to a suitable strain relief of the cable.
- The cable glands are suitable for a low risk of mechanical danger (4 Joule) and must be mounted in a protected position if larger impact energy levels are expected.
- To maintain the ingress protection of the enclosure: Install the enclosure cover, cable glands and blind plugs correctly.

Terminals: Connection compartment

Ex db or Ex tb

Basic specification, Position 3 = E, G

The power consumption of I/O modules with passive PFS output can be limited for certain applications.

- Recommended: Power consumption = 1 W. This is obtained for a supply voltage at the terminals of 27 V_{DC}.
- For higher supply voltages (U_{max}): Insert a serial resistance (R_V) in order to limit the power consumption, see table below.

Table for the PFS serial resistance (R_V):

| | |
|---------------------------|--------------|
| Power consumption | 1.0 W |
| Total power consumption | 1.88 W |
| Internal resistance R_i | 760 Ω |

| U_{max} [V] | R_V min |
|---------------|--------------|
| 35 | 205 Ω |
| 34 | 177 Ω |
| 33 | 150 Ω |
| 32 | 122 Ω |
| 31 | 95 Ω |
| 30 | 67 Ω |
| 29 | 39 Ω |
| 28 | 12 Ω |
| 27 | 0 Ω |



For values associated with a higher or lower internal power consumption please contact Endress+Hauser.

| Terminal 1 (+), 2 (-) | Terminal 3 (+), 4 (-) |
|--|---|
| Power supply $U_N = 32 V_{DC}$ $U_m = 250 V$ | Switch output (PFS) $U_N = 35 V_{DC}$ $U_m = 250 V$ |

Terminals: Electronics compartment

Ex ia

Service interface (CDI)

Taking the following values into consideration, the device can be connected to the certified Endress+Hauser FXA291 service tool or a similar interface:

| Service interface | | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| $U_i = 7.3 \text{ V}$ effective inner inductance $L_i = \text{negligible}$ effective inner capacitance $C_i = \text{negligible}$ | | | | | | | | | | | | | |
| $U_o = 7.3 \text{ V}$ $I_o = 100 \text{ mA}$ $P_o = 160 \text{ mW}$ | | | | | | | | | | | | | |
| $L_o \text{ (mH)} =$ | 5.00 | 2.00 | 1.00 | 0.50 | 0.20 | 0.15 | 0.10 | 0.05 | 0.02 | 0.01 | 0.005 | 0.002 | 0.001 |
| $C_o \text{ (}\mu\text{F)}^{1) =}$ | 0.73 | 1.20 | 1.60 | 2.00 | 2.60 | - | 3.20 | 4.00 | 5.50 | 7.30 | 10.00 | 12.70 | 12.70 |
| $C_o \text{ (}\mu\text{F)}^{2) =}$ | - | 0.49 | 0.90 | 1.40 | - | 2.00 | - | - | - | - | - | - | - |

1) Values according to PTB "ispark" program

2) Values according to IEC/EN 60079-25, Annex C or equivalent national standards



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