

# Safety Instructions

## Levelflex FMP50-FMP57

4-20 mA HART

Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb

Ex ta/tb IIIC T85 °C Da/Db





# Levelflex FMP50-FMP57

4-20 mA HART

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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:

- BA01000F/00 (FMP50)
- BA01001F/00 (FMP51, FMP52, FMP54)
- BA01002F/00 (FMP53)
- BA01003F/00 (FMP55)
- BA01004F/00 (FMP56, FMP57)

**Supplementary documentation**

Explosion protection brochure: CP00021Z

The Explosion-protection brochure is available:

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

**Manufacturer's certificates****KC Declaration of Conformity**

Certificate number:

- 23-KA4BO-0026X (Ex ia/db)
- 23-KA4BO-0027X (Ex ta/tb)

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

- IEC 60079-0 : 2017
- IEC 60079-1 : 2014
- IEC 60079-11 : 2011 + Corr. 1: 2012
- IEC 60079-26 : 2014
- 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

|                      |   |                               |   |                                  |
|----------------------|---|-------------------------------|---|----------------------------------|
| FMP5x                | - | *****                         | + | 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: Levelflex



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*

FMP50, FMP51, FMP52, FMP53, FMP54, FMP55, FMP56, FMP57

*Basic specifications*

| Position 1, 2 (Approval) |                  |  |
|--------------------------|------------------|--|
| Selected option          | Description      |  |
| FMP5x                    | K3 <sup>1)</sup> | KC Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb<br>KC Ex ta/tb IIIC T85 °C Da/Db |


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

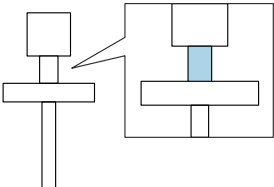
| Position 3 (Power Supply, Output) |             |   |
|-----------------------------------|-------------|---|
| Selected option                   | Description |   |
| FMP5x                             | A           | 2-wire, 4-20 mA HART                      |
|                                   | B           | 2-wire, 4-20 mA HART, switch output (PFS) |
|                                   | C           | 2-wire, 4-20 mA HART, 4...20 mA           |
|                                   | K           | 4-wire, 90-253 VAC; 4-20 mA HART          |
|                                   | L           | 4-wire, 10,4-48 VDC; 4-20 mA HART         |

| Position 4 (Display, Operation) |             |  |
|---------------------------------|-------------|--|
| Selected option                 | Description |  |
| FMP5x                           | 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 |                                   |
| FMP51<br>FMP52<br>FMP54-57 | B           | GT18 dual compartment, 316L       |
| FMP5x                      | C           | GT20 dual compartment, Alu coated |

| Position 9, 10 (Seal) |    |                                       |
|-----------------------|----|---------------------------------------|
| Selected option       |    | Description                           |
| FMP50                 | A1 | Viton, -20...80 °C                    |
| FMP51                 | A4 | Viton, -30...150 °C                   |
|                       | B3 | EPDM, -40...120 °C                    |
|                       | C3 | Kalrez, -20...200 °C                  |
|                       | E1 | FVMQ, -50...150 °C                    |
| FMP53                 | AD | FKM, FDA, USP Cl. VI, -10...150 °C    |
|                       | B5 | EPDM, FDA, USP Cl. VI, -20...130 °C   |
|                       | C4 | Kalrez, FDA, USP Cl. VI, -20...150 °C |
| FMP54                 | D1 | Graphite, -196...280 °C (XT)          |
|                       | D2 | Graphite, -196...450 °C (HT)          |
| FMP56                 | AB | Viton, -30...120 °C                   |
|                       | B3 | EPDM, -40...120 °C                    |
| FMP57                 | A4 | Viton, -30...150 °C                   |
|                       | B3 | EPDM, -40...120 °C                    |
|                       | C5 | Kalrez, -5...185 °C                   |

 Shown in the temperature tables exemplary as follows:



*Optional specifications*

| ID Mx (Probe Design) |    |   |
|----------------------|----|---|
| Selected option      |    | Description   |
| FMP5x                | MB | Sensor remote, 3 m/9 ft cable, detachable + mounting bracket  |
| FMP53                | MA | Sensor compact, detachable                                    |
| FMP50-54             | MC | Sensor remote, 6 m/18 ft cable, detachable + mounting bracket |
| FMP56                |    |   |
| FMP57                | MD | Sensor remote, 9 m/27 ft cable, detachable + mounting bracket |

| ID Nx, Ox (Accessory Mounted) |                  |                        |
|-------------------------------|------------------|------------------------|
| Selected option               |                  | Description            |
| FMP5x                         | NF <sup>1)</sup> | Bluetooth              |
| FMP51<br>FMP52<br>FMP55       | NC               | Gas-tight feed through |

1) Only in connection with Position 4 = C, E

**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 replacing the probe electronics or opening the connection between the remote cable and the probe, a jumper plug must be used or a short-circuit must be established between the probe contact and the potential equalization conductor to avoid electrostatically charging the probe.
- 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:  
 $-40\text{ °C} \leq T_a \leq +80\text{ °C}$

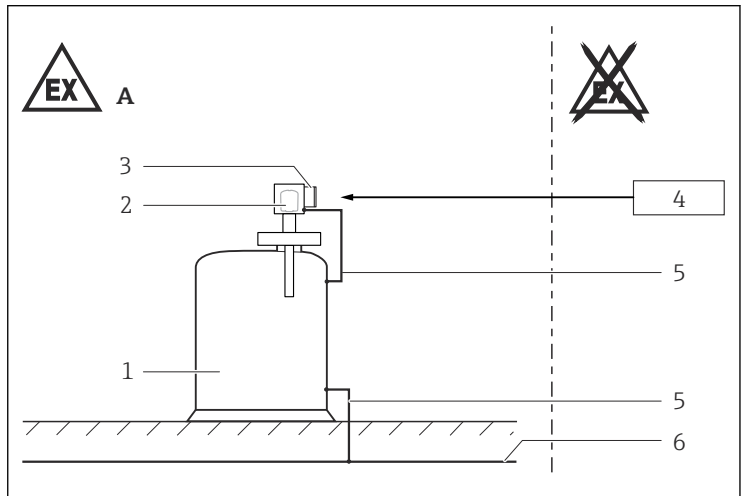


- Observe the information in the temperature tables.
- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- To avoid electrostatic charging: Do not rub surfaces with a dry cloth.
- In the event of additional 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 ( $\leq 0.5$  m) generating strong electrostatic charges.
- Secure probes against swinging: e.g. by fixing them to the wall or floor or by installing them in the ground tube.

*Device type FMP52, FMP55 and Device type FMP5x with non-conductive plastic coated probes*

A probe coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).

### Safety instructions: Installation



A0025537

- 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 probe, 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 3 = K*

Connect the protective ground to the device.

*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.
- The device can be equipped with the Bluetooth® module: refer to the Operating Instructions and specifications in the "Bluetooth® module" chapter.

### Potential equalization

Integrate the device into the local potential equalization.

### Bluetooth® module

*Optional specification, ID Nx, Ox = NF*


- With Bluetooth® module installed: Use of external hardware not allowed (e.g. external display, service interface).
- The intrinsically safe input power circuit of the Bluetooth® module is isolated from ground.


### 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: XA02252F/00

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

 Observe the permitted temperature range at the probe.

 *Basic specification, Position 3 = B*  
Deratings are based on a power consumption of 1 W (PFS);  
→  15.

## 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)

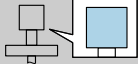
Column P1 to P6: Position (temperature value) on the axes of the derating

- $T_a$ : 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    |       |
|--|---------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|  |         |    | $T_p$ | $T_a$ | $T_p$ | $T_a$ | $T_p$ | $T_a$ | $T_p$ | $T_a$ | $T_p$ | $T_a$ | $T_p$ | $T_a$ |
|  | A, B, C | T6 | -20   | 60    | 60    | 60    | 80    | 56    | 80    | -20   | -20   | -20   | -     | -     |
|  | K, L    | T6 | -20   | 60    | 60    | 60    | 80    | 55    | 80    | -20   | -20   | -20   | -     | -     |

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

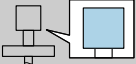
Column P1 to P6: Position (temperature value) on the axes of the derating

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

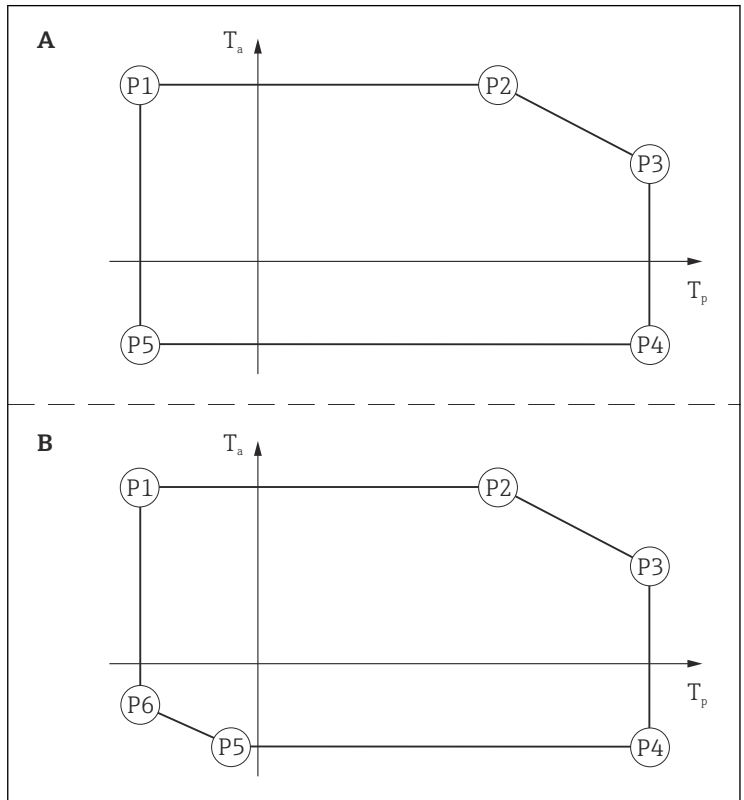


Column P6 is only relevant for version B of the derating.

Example table

|  = C | (1)     | P1             |                | P2             |                | P3             |                | P4             |                | P5             |                | P6             |                |   |
|---|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
|   |         | T <sub>p</sub> | T <sub>a</sub> | T <sub>p</sub> | T <sub>a</sub> | T <sub>p</sub> | T <sub>a</sub> | T <sub>p</sub> | T <sub>a</sub> | T <sub>p</sub> | T <sub>a</sub> | T <sub>p</sub> | T <sub>a</sub> |   |
|   | A, B, C | 135            | -20            | 80             | 80             | 80             | 135            | 69             | 135            | -20            | -20            | -20            | -              | - |
|   |         | 150            | -20            | 80             | 80             | 80             | 150            | 66             | 150            | -20            | -20            | -20            | -              | - |
|   | K, L    | 135            | -20            | 76             | 76             | 76             | 135            | 64             | 135            | -20            | -20            | -20            | -              | - |
|   |         | 150            | -20            | 76             | 76             | 76             | 150            | 61             | 150            | -20            | -20            | -20            | -              | - |

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**

*Optional specification, ID Nx, Ox = NF*

When using the Bluetooth® module: No changes to the connection values.

**Ex db or Ex tb***Basic specification, Position 3 = A***Terminal 1 (+), 2 (-)**

Power supply

$U_N = 35 \text{ V}_{\text{DC}}$

$U_m = 250 \text{ V}$

$I_{\text{max}} = 22 \text{ mA}$

*Basic specification, Position 3 = B*

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<sub>DC</sub>.
- For higher supply voltages (U<sub>max</sub>): Insert a serial resistance (R<sub>V</sub>) in order to limit the power consumption, see table below.

**Table for the PFS serial resistance (R<sub>V</sub>):**

|                                    |        |
|------------------------------------|--------|
| Power consumption                  | 1.0 W  |
| Total power consumption            | 1.88 W |
| Internal resistance R <sub>I</sub> | 760 Ω  |

| U <sub>max</sub> [V] | R <sub>V</sub> 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<br>$U_N = 35 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_{\text{max}} = 22 \text{ mA}$ | Switch output (PFS)<br>$U_N = 35 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$ |

*Basic specification, Position 3 = C*

| Terminal 1 (+), 2 (-)   | Terminal 3 (+), 4 (-)  |
|---|--|
| Power supply<br>$U_N = 30 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_{\text{max}} = 22 \text{ mA}$ | Output 4 to 20 mA<br>$U_N = 30 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_{\text{max}} = 22 \text{ mA}$ |

*Basic specification, Position 3 = K*

| Terminal 1 (+), 2 (-)  | Terminal 3 (+), 4 (-)  |
|--|--|
| Power supply<br>$U_N = 253 \text{ V}_{\text{AC}}; 50/60 \text{ Hz}$<br>$U_m = 250 \text{ V}$<br>$I_N = 25 \text{ mA}$<br>$I_{\text{max}} = 160 \text{ mA}$ | Output 4 to 20 mA<br>$U_N = 22 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_{\text{max}} = 22 \text{ mA}$ |

*Basic specification, Position 3 = L*

| Terminal 1 (+), 2 (-)  | Terminal 3 (+), 4 (-)  |
|--|--|
| Power supply<br>$U_N = 48 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_N = 112 \text{ mA}$<br>$I_{\text{max}} = 300 \text{ mA}$ | Output 4 to 20 mA<br>$U_N = 22 \text{ V}_{\text{DC}}$<br>$U_m = 250 \text{ V}$<br>$I_{\text{max}} = 22 \text{ mA}$ |



## 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  |      |      |      |      |      |      |      |      |      |      |       |       |       |
|--|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| $U_i = 7.3 \text{ V}$<br>effective inner inductance $L_i = \text{negligible}$<br>effective inner capacitance $C_i = \text{negligible}$ |      |      |      |      |      |      |      |      |      |      |       |       |       |
| $U_o = 7.3 \text{ V}$<br>$I_o = 100 \text{ mA}$<br>$P_o = 160 \text{ mW}$  |      |      |      |      |      |      |      |      |      |      |       |       |       |
| $L_o \text{ (mH)} =$   | 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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