

# Safety Instructions

## **Gammapilot M FMG60**


4-20 mA HART

JPN: Ex db [ia Ga] IIC T6 Gb

Document: XA01819F-A

Safety instructions for electrical apparatus for explosion-hazardous areas →  3

Document: XA01819F-A

Attachment: Cable gland →  11



# Gammapilot M FMG60

4-20 mA HART

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<b>Associated documentation</b>	<p>This document is an integral part of the following Operating Instructions: BA00236F/00</p> <p><b>Additional documentation</b></p> <p>Installation guideline: JNIO SH-TR-No.44: "User's guidelines for installations for explosive atmospheres in general industry"</p>										
<b>Supplementary documentation</b>	<p>Explosion-protection brochure: CP00021Z/11</p> <p>The Explosion-protection brochure is available:</p> <ul style="list-style-type: none"> <li>■ In the download area of the Endress+Hauser website: <a href="http://www.endress.com">www.endress.com</a> -&gt; Downloads -&gt; Media Type: Documentation -&gt; Documentation Type: Brochures and catalogs -&gt; Text Search: CP00021Z</li> <li>■ On the CD for devices with CD-based documentation</li> </ul>										
<b>Manufacturer's certificates</b>	<p><b>Certificate of Conformity</b></p> <p>Certificate number: DEK18.0103X</p> <p>Affixing the certificate number certifies conformity with the following standards (depending on the device version):</p> <ul style="list-style-type: none"> <li>■ JNIO SH-TR-46-1 : 2015</li> <li>■ JNIO SH-TR-46-2 : 2018</li> <li>■ JNIO SH-TR-46-6 : 2015</li> </ul>										
<b>Manufacturer address</b>	<p>Endress+Hauser SE+Co. KG Hauptstraße 1 79689 Maulburg, Germany Address of the manufacturing plant: See nameplate.</p>										
<b>Extended order code</b>	<p>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.</p> <p><b>Structure of the extended order code</b></p> <table border="0" style="margin-left: 40px;"> <tr> <td style="text-align: center;">FMG60</td> <td style="text-align: center;">–</td> <td style="text-align: center;">*****</td> <td style="text-align: center;">+</td> <td style="text-align: center;">A*B*C*D*E*F*G*..</td> </tr> <tr> <td style="text-align: center;"><i>(Device type)</i></td> <td></td> <td style="text-align: center;"><i>(Basic specifications)</i></td> <td></td> <td style="text-align: center;"><i>(Optional specifications)</i></td> </tr> </table> <p>* = Placeholder At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.</p> <p><i>Basic specifications</i></p> <p>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.</p> <p><i>Optional specifications</i></p> <p>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</p>	FMG60	–	*****	+	A*B*C*D*E*F*G*..	<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>
FMG60	–	*****	+	A*B*C*D*E*F*G*..							
<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>							

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: Gammapilot M



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

FMG60

#### Basic specifications

Position 1 (Approval)		
Selected option		Description
FMG60	K	JPN Ex db [ia Ga] IIC T6 Gb

Position 2 (Power Supply)		
Selected option		Description
FMG60	1	90-253 VAC
	2	18-35 VDC

Position 3 (Connect. Power Supply; Connect. Output)		
Selected option		Description
FMG60	D	Ex db (XP); Ex db (XP)

Position 4 (Output)		
Selected option		Description
FMG60	1	4-20 mA HART

Position 5 (Scintillator; Measuring Range)		
Selected option		Description
FMG60	A-D	NaI-Crystal
	G-T	PVT

#### Optional specifications

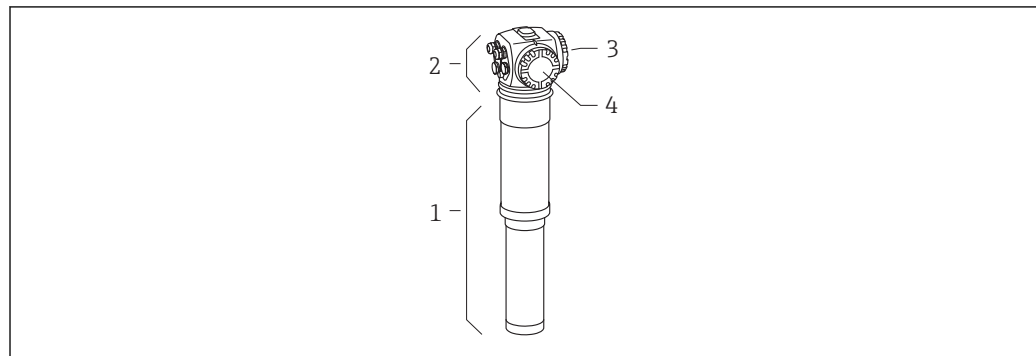
No options specific to hazardous locations are available.

**Safety instructions: General**

- Comply with the installation and safety instructions in the Operating Instructions.
- 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.
- Avoid electrostatic charging:
  - Of plastic surfaces (e.g. housing, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)

**Safety instructions:  
Special conditions**

- In the event of additional or alternative special varnishing on the housing or other metal parts:
- Observe the danger of electrostatic charging and discharge.
  - Do not rub surfaces with a dry cloth.
  - Do not install in the vicinity of processes generating strong electrostatic charges.

**Safety instructions:  
Installation**

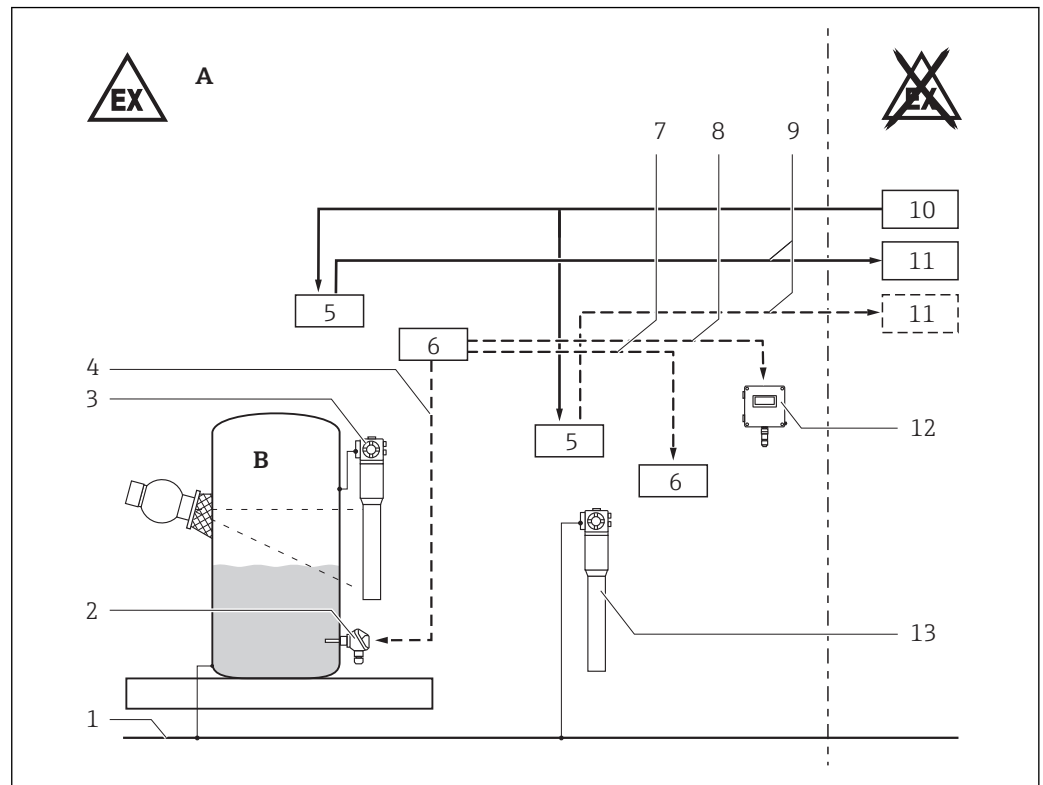
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 1

- 1 Pipe housing
- 2 Compartment housing
- 3 Terminal compartment A
- 4 Terminal compartment B

**Circuit 4...20 mA/HART (active) in type of protection Flameproof enclosure (Ex db)**

Basic specification, Position 3 (Connect. Power Supply; Connect. Output) = D



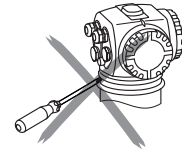
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2

- A Zone 1 or Zone 2  
 B Zone 0, Zone 1 or Zone 2  
 1 Local potential equalization line  
 2 PT100; approved Ex ia equipment  
 3 Gammapilot with NaI crystal scintillator, PVT plastic scintillator  
 4 [Ex ia] circuit  
 5 Terminal compartment A (Ex db)  
 6 Terminal compartment B (Ex i)  
 7 [Ex ia] circuit; Cascade in, out  
 8 [Ex ia] circuit  
 9 Communication: 4...20 mA/HART active  
 10 Power supply  
 11 E.g. transmitter  
 12 Remote display FHX40  
 13 Gammapilot with NaI crystal scintillator, PVT plastic scintillator

- To maintain the ingress protection of the housing IP66/67: Install the housing cover, cable glands and blind plugs correctly.
- Cable glands as well as sealing plugs of the terminal compartment A must not be exchanged with those of the terminal compartment B.
- Do not open the terminal compartment A when energized.
- In an explosive atmosphere: Minimum waiting time before opening the terminal compartment A after switching off the power supply: 3 minutes.
- Before operation:
  - Screw in the cover all the way.
  - Tighten the securing clamp on the cover.
- Continuous service temperature of the connecting cable:  $\geq T_a + 20 \text{ K}$ .

The safety screws at the pipe housing must not be loosened:



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*When using the water cooling*

To avoid damages at the detector or at the cooling jacket if the cooling water freezes: Empty cooling jacket or protect against freezing.

**Intrinsic safety**

- Observe the pertinent guidelines when interconnecting intrinsically safe circuits.
- The intrinsically-safe input circuits are galvanically isolated from other circuits up to a peak value of the nominal voltage of 375 V.
- The intrinsically safe circuits of the device are isolated from ground and have a dielectric strength of at least 500 V<sub>rms</sub>.
- When the device is connected to an intrinsically safe circuit Ex ib, the type of protection changes to Ex ib. Do not operate the temperature sensor in Zone 0 if the device is connected to an intrinsically safe circuit of Category Ex ib.
- When the device is connected to an intrinsically safe circuit Ex ic, the type of protection changes to Ex ic. Do not operate the temperature sensor in Zone 0 or Zone 1 if the device is connected to an intrinsically safe circuit of Category Ex ic.
- Do not interconnect the 4...20 mA/HART signal circuits of the devices of a cascade set.

**Flameproof enclosure (Ex db)**

- Connect the device:
  - Using suitable cable and wire entries of protection type "Flameproof Enclosure (Ex db)".
  - Using piping systems of protection type "Flameproof Enclosure (Ex db)".
- Seal unused entry glands with approved Ex db sealing plugs.

*Safety instructions: Ex db joints*

If required or if in doubt: ask manufacturer for specifications.

**Potential equalization**

Integrate the device into the local potential equalization.

**Temperature tables**

Temperature class
T6

*Basic specification, Position 5 (Scintillator; Measuring Range) = A-D, G-T*

Ambient temperature T <sub>a</sub> (ambient)	
Detector without water cooling or detector with water cooling out of operation: <ul style="list-style-type: none"> <li>■ Devices with NaI crystal scintillator:</li> <li>■ Devices with PVT plastic scintillator:</li> </ul>	Temperature class T6  -20 °C ≤ T <sub>a</sub> ≤ +60 °C -20 °C ≤ T <sub>a</sub> ≤ +60 °C
Detector with water cooling in operation: At the pipe housing (within the water cooling): <ul style="list-style-type: none"> <li>■ Devices with NaI crystal scintillator:</li> <li>■ Devices with PVT plastic scintillator:</li> </ul> At the compartment housing:	Temperature class T6  -20 °C ≤ T <sub>a</sub> ≤ +60 °C -20 °C ≤ T <sub>a</sub> ≤ +60 °C  -20 °C ≤ T <sub>a</sub> ≤ +60 °C



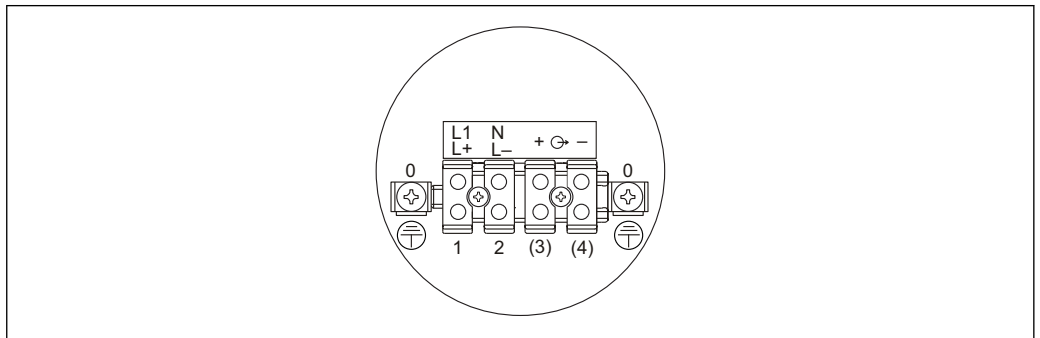
Type of protection	
Power supply circuit (Terminal compartment A)	Ex db
Signal circuits (Terminal compartment B)	Ex ia

**Connection data**

- Tightening torque of the terminal screws: max. 0.4 Nm.
- Strip the insulation of the connection wires with suitable length. Bare parts of the wires must not emerge from the terminal.
- Ensure that the wires are securely clamped.

**Terminal compartment A**


**Flameproof enclosure (Ex db)**



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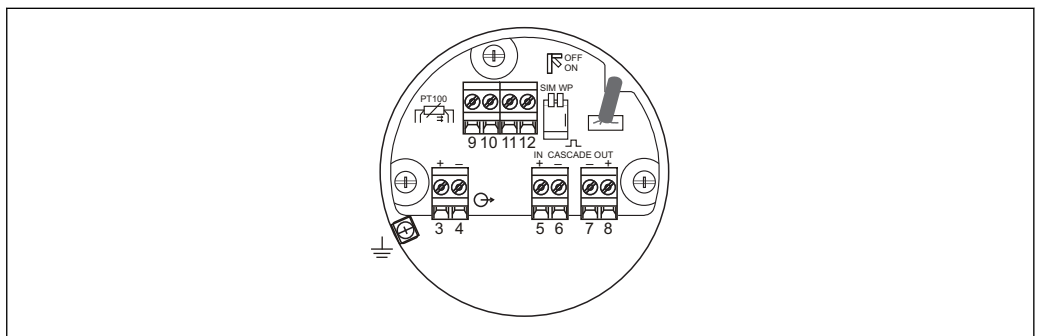
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Power supply circuit		
Basic specification, Position 2 (Power Supply) = 1	L1 N	$U_e = 90 \text{ to } 253 \text{ V}_{AC}, 50/60 \text{ Hz}, 8.5 \text{ VA}$
Basic specification, Position 2 (Power Supply) = 2	L+ L-	$U_e = 18 \text{ to } 35 \text{ V}_{DC}, 3.5 \text{ W}$ $U_m = 253 \text{ V}_{AC}$

Signal circuit		
Basic specification, Position 3 (Connect. Power Supply; Connect. Output) = D	 + -	$4 \dots 20 \text{ mA/HART (active)}$ $U_m = 253 \text{ V}_{AC}$ The detector ensures galvanic isolation up to a maximum of $253 \text{ V}_{AC}$ between the signal circuit and any other circuit.






**Terminal compartment B**

**Intrinsic safety (Ex ia)**



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Signal circuit			Ex ia IIC	Ex ia IIB	Ex ib IIC	Ex ib IIB
Terminals 3, 4 not connected	 + -					
PT100	 + -	$U_o = 8.4 \text{ V}$ $I_o = 8.3 \text{ mA}$ $P_o = 17.5 \text{ mW}$ $R_i = 1012 \text{ }\Omega$ $C_i = 0$ $L_i = 0$ Characteristic curve: linear	$C_o = 1200 \text{ nF}$ at $L_o = 1 \text{ mH}$ $C_o = 1800 \text{ nF}$ at $L_o = 0.15 \text{ mH}$	$C_o = 6 \text{ }\mu\text{F}$ at $L_o = 1 \text{ mH}$ $C_o = 5.2 \text{ }\mu\text{F}$ at $L_o = 2 \text{ mH}$	$C_o = 5.2 \text{ }\mu\text{F}$ $L_o = 400 \text{ mH}$	$C_o = 43 \text{ }\mu\text{F}$ $L_o = 400 \text{ mH}$
Cascade out <sup>1)</sup>	 - +	$U_o = 8.4 \text{ V}$ $I_o = 19.2 \text{ mA}$ $P_o = 40.3 \text{ mW}$ $R_i = 439 \text{ }\Omega$ $C_i = 5.3 \text{ nF}$ $L_i = 67 \text{ }\mu\text{H}$ Characteristic curve: linear	$C_o = 5.1 \text{ }\mu\text{F}$ $L_o = 69 \text{ mH}$	$C_o = 42 \text{ }\mu\text{F}$ $L_o = 199 \text{ mH}$	$C_o = 5.1 \text{ }\mu\text{F}$ $L_o = 69 \text{ mH}$	$C_o = 42 \text{ }\mu\text{F}$ $L_o = 199 \text{ mH}$
Cascade in <sup>2)</sup>	 + -	$U_i = 8.4 \text{ V}$ $I_i = 19.2 \text{ mA}$ $P_i = 40.3 \text{ mW}$ $C_i = 0$ $L_i = 67 \text{ }\mu\text{H}$				
Connection for FHX40		$U_o = 4.7 \text{ V}$ $I_o = 37.7 \text{ mA}$ $P_o = 44.3 \text{ mW}$ $R_i = 125 \text{ }\Omega$ $C_i = 12.7 \text{ nF}$ $L_i = 0$ Characteristic curve: linear	For connection to the approved display FHX40 with associated cable (IECEX TUN 04.0011) in type of protection intrinsic safety Ex ia IIC. Observe associated Safety Instructions! $C_o = 150 \text{ }\mu\text{F}$ $L_o = 25 \text{ mH}$			

- 1) Only for connection to FMG60 signal circuit Cascade in  
 2) Only for connection to FMG60 signal circuit Cascade out

# Gammapilot M FMG60

4-20 mA HART

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**Attachment: Cable gland**

**i** If the cable gland has to be replaced, use the following packing proof cable gland from the manufacturer Shimada Electric Co. Ltd.: EXTC-16MG (IECEX DEK 18.0029).

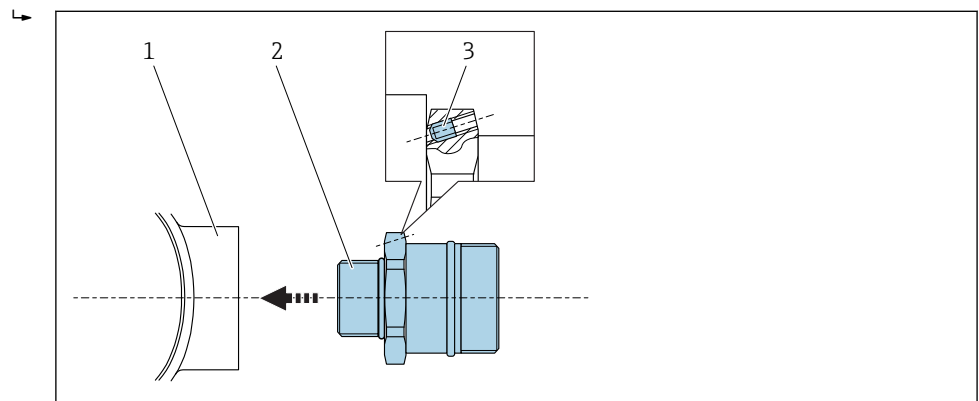


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- 1 Cable gland: EXTC-16MG  
2 Gammapilot M

**Mounting the cable gland**

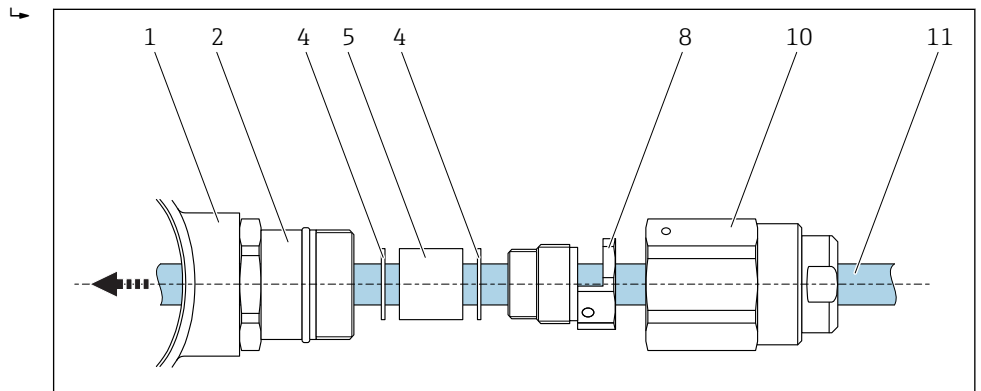
1. Tighten the cable gland (2) into thread hole of terminal box (1) using tightening tool with a torque of 4 Nm. Then tighten the lock screw (3) using a hexagon wrench (nominal 1.5).



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- 1 Terminal box  
2 Cable gland (M20x1.5)  
3 Lock screw

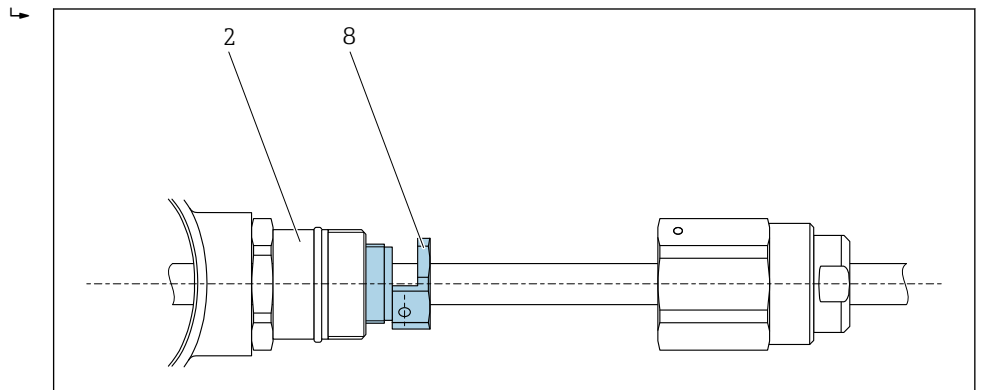
2. Pass the cable (11) through the individual parts.



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- 1 Terminal box
- 2 Cable gland
- 4 Washer
- 5 Sealing ring
- 8 Packing gland
- 10 Union nut/B. coupling
- 11 Cable

3. Screw the packing gland (8) into cable gland (2) using a wrench and tighten the sealing ring (5) with tightening torque 6 Nm.

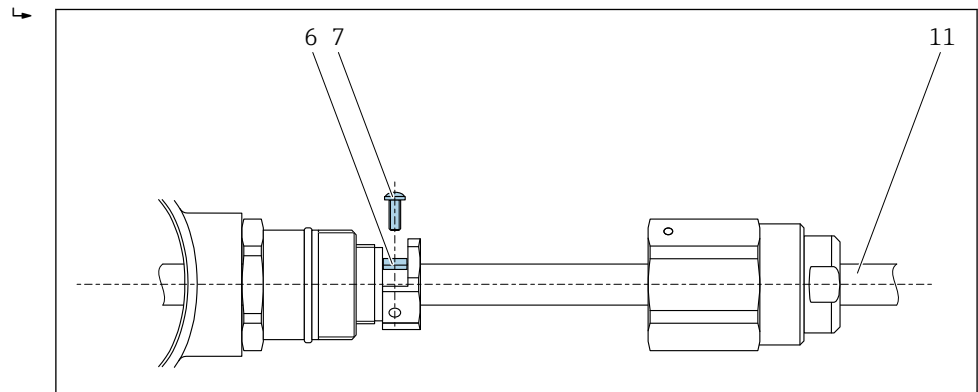


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- 2 Cable gland
- 8 Packing gland

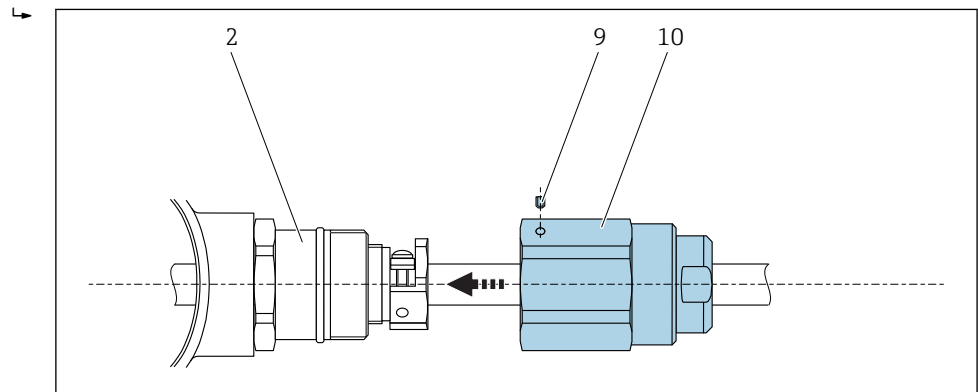
Cable diameter (in mm)		Inner diameter of the sealing ring (in mm)	Inner diameter of the washer (in mm)
Minimum	Maximum		
ø 6	ø 8	ø 8	ø 10.5
ø 8	ø 10.0	ø 10.0	
ø 10.0	ø 12.0	ø 12.0	ø 13.0

4. Secure the cable (11) firmly with clamp (6) and set screws (7). In this case the tightening torque is 1 Nm.



- 6 Clamp  
7 Set screw  
11 Cable

5. Screw the union nut/B. coupling (10) onto cable gland (2) and tighten the lock screw (9) using a hexagon wrench (nominal 1.5).



- 2 Cable gland  
9 Lock screw  
10 Union nut/B. coupling (G 1/2)

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