IOM-D22-D32-D41-C: AUGUST 2019

DELTA MOBREY

MANUFACTURE OF PRESSURE TRANSMITTERS
AND CONTROL INSTRUMENTS

USER'S MANUAL

PRESSURE TRANSMITTERS
D22
DIFFERENTIAL PRESSURE TRANSMITTERS
D32
HYDROSTATIC LEVEL PROBES
D41

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Symbols used

Symbol	Description
	Warning to proceed strictly in accordance with the information contained in the documentation in order to ensure the safety and full functionality of the device.
	Information particularly useful during installation and operation of the device.
	Information particularly useful during installation and operation of a type Ex device.
	Information on disposal of used equipment.

BASIC REQUIREMENTS AND SAFE USE

- **The manufacturer will not be liable for damage resulting from incorrect installation, failure to maintain the device in a suitable technical condition, or use of the device other than for its intended purpose.**
- Installation should be carried out by qualified personnel having the required authorizations to install electrical and pressure-measuring devices. The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.
- Installation should be carried out by qualified staff having the required authorizations to install electrical and pressure-measuring devices. The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.
- If a device is not functioning correctly, disconnect it and send it for repair to the manufacturer or to a firm authorized by the manufacturer.

In order to minimise the risk of malfunction and associated risks to personnel, the device is not to be installed or used in particularly unfavourable conditions, where the following dangers occur:

- Possibility of mechanical impacts, excessive shocks and vibration;
- Excessive temperature fluctuation;
- Condensation of water vapour, dust, icing.

Installation of intrinsic safety versions should be performed with particular care, in accordance with the regulations and standards applicable to that type of installation.

Changes to the products manufacturing documentation may forestall a paper user updating.
Current User Manual is available at www.delta-mobrey.com

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I. Appendix Ex.01

CE 0598 D22/XX/YY, D41/XX/YY PRESSURE TRANSMITTERS,
TYP D32/XX/YY DIFFERENTIAL PRESSURE TRANSMITTER
Ex VERSIONS according to ATEX

1. Introduction

1.1. The "Appendix Ex.01" to IOM-D22-D32-D41-C: AUGUST 2019 applies to D22/XX/YY, D41/XX/YY and D32/XX/YY transmitters in Ex version according to ATEX, marked on the rating plate as shown in p. 2 and 3 and signed "Ex" in the Product Certificate, only.
Extensions XX, YY after the marking product types apply to the types of pressure (XX) and electrical (YY) connections and will not occur later in the documentation.

1.2. The appendix contains supplementary information relating to the Ex version transmitters.
During installation and use of the Ex transmitters, reference should be made to **IOM-D22-D32-D41-C: AUGUST 2019 together with "Appendix Ex.01".**

2. Using of D22, D41, D32 transmitters in hazardous areas

2.1. The transmitters are produced in accordance with the requirements of the following standards: EN 60079-0:2012+A11:2013, EN 60079-11:2012, EN 50303:2000.

2.2. The transmitters with PD, PK, PKM, PZ, SG, SGM electrical connection may operate in areas where there is a risk of explosion, in accordance with the rating of the explosion protection design:

I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
II 1D Ex ia IIIC T110ºC Da
FTZÚ 19 ATEX 0112X

2.3. The transmitters with PKD and PM12 electrical connection are permitted only for potentially explosive gas atmospheres and are marked:

II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
FTZÚ 19 ATEX 0112X

2.4. The transmitters with ALW and ALM electrical connection are permitted for potentially explosive gas and dust atmospheres and are marked:

II 1/2G Ex ia IIC T4 Ga/Gb (with PD or PM12 connector)
II 1D Ex ia IIIC T110ºC Da (with PD connector)
FTZÚ 19 ATEX 0112X

3. Identifying marks

Intrinsically safe transmitters (Ex version) must have a rating plate containing the information specified in paragraph 4 of **IOM-D22-D32-D41-C: AUGUST 2019**, and also at least the following:

- CE mark and the notified body number: 1453;
- Mark "Ex", designation of explosion protection design, certificate number;
- Values of parameters such as: Ui, Ii, Ci, Li;
- The type of process and electrical connectors;
- Manufacture year;
- Inscription: "Version SA" - for transmitters with the protection against overvoltage (surge arrester).

4. Consignment contents

Together with the transmitter are delivered:

a) Product certificate, which is also as the warranty card;
b) Declaration of Conformity;
c) Certificate copy (on request);
d) User's Manual signed „IOM-D22-D32".

Items b), c), d) are available at www.delta-mobrey.com

5. Permissible input parameters

The transmitters should be powered via the associated power supplier and measurement devices provided with the relevant intrinsically safe certificates. The parameters of their outputs to the hazardous area should not exceed the limit power supply parameters specified below for the transmitters.
Transmitters in "Version SA" and transmitters working in dust zone should be powered with galvanically isolated power supply. If there is no power supply with galvanic isolation, transmitter or connected to it metal parts must be properly grounded by implementing equipotential bonding or equipotential connection between the transmitter and the negative terminal of intrinsic safety zener barrier.
Minimum supply voltage is 9V DC.

The pressure transmitter is an intrinsically safe apparatus with level of protection “ia”, when supply circuit have level of protection “ia”.

a) Permissible input parameters for power supply with a linear output characteristic:
Ui = 28V DC; Ii = 0.1A; Pi = 0.7W
b) Permissible input parameters for power supply with a trapezial and rectangular output characteristic:
Ui = 24V DC; Ii = 0.1A; Pi = 1.2W
c) Input inductance and capacity: Ci = 25nF*; Li = 0.4mH*

** One should take into account the capacity and inductance of the cable, which permanently connected cable are: C_K = 0.2nF/m and L_K = 1µH/m.*

Input capacitance C_W and input inductance L_W of the transmitters with PK, PKM, SG, or SGM electrical connections, taking into account the parameters of the permanently connected cable are accordingly:

$C_W = C_i + a \cdot C_K = 25nF + a \cdot 0.2nF/m$

$L_W = L_i + a \cdot L_K = 400\mu H + a \cdot 1\mu H/m$

a - length of the mounted permanently cable in meters;
Ta = -40ºC to ... - see table Z1

Table Z1

Pi[W]	Ta[ºC]	Temperature classification
0.7	45	T6
	80	T5, T4, Group I, Group III - 110ºC
1.2	75	T5
	80	T4, Group I, Group III - 110ºC

Special conditions for safe use:

- Ambient temperature range from Ta = -40ºC to…- see table Z1.
- Process temperature (medium) at the diaphragm of the transmitter must be in range of ambient temperature.
- In case of use the transmitter in dust atmosphere, supplying voltage could occur on transmitter enclosure. It should be taken into consideration during transmitter installation.
- In case of use titan parts in diaphragm seal, during installation and operation of the device the diaphragm seal should be protected against mechanical impact.
- Version of transmitter with surge arrester, marked on the plate “Version SA”, does not meet the requirements of Section 6.3.13 of the EN 60079-11:2012 (test of isolation 500VAC). This must be taken into consideration during the installation of transmitter.
- Transmitters with display (with electrical connections ALW, ALM) and with diaphragm seals covered by PTFE, for Group lll, should be installed in a place and in a way that prevents electrostatic charging.

At the customer's request, elements of diaphragm seal can be made of titanium. This version of the transmitter has information on the label that the titanium elements are used. Then user should secure the diaphragm seal against the possibility of an impact.

When medium temperature is higher than Ta, use of separating elements such a diaphragm seal, or looped siphon tube etc. is necessary. Process temperature, close to the transmitter diaphragm seal, must be in the Ta range (Ta = ambient temperature).

6. Supply examples

6.1. For power supply with a linear output characteristic

Power supply with a linear characteristic may be e.g. a typical barrier with parameters
Uo=28V Io=0,093A Rw=300Ω for Ta ≤ 80ºC and T5 or Ta ≤ 45ºC and T6

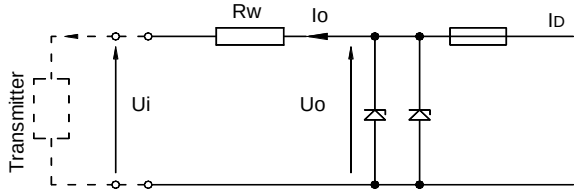


Fig.1. Power supply from a source with linear characteristic.

6.2. For power supply with a trapezial output characteristic

Example of power supply - Ta ≤ 80ºC and T4; or Ta ≤ 75ºC and T5
Uo=24V Io=0.05A Po = 1.2W

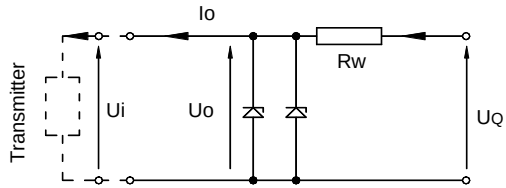
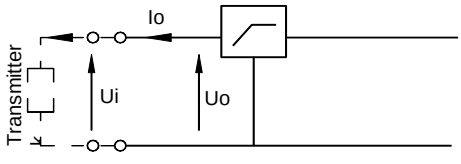


Fig.2. Power supply from a source with trapezial characteristic.

If $Uo \leq \frac{U_Q}{2}$ then parameters U_Q, Io, Po are interrelated as follows:

$$U_Q = \frac{4Po}{Io}, \qquad Rw = \frac{U_Q}{Io}, \qquad Po = \frac{Uo(U_Q - Uo)}{Rw}$$

6.3. For power supply with rectangular output characteristic



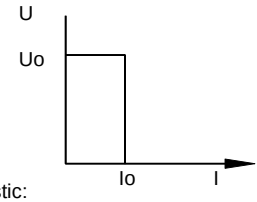


Fig.3. Power supply from a source with rectangular characteristic:

a) Uo = 24V Io = 0.05A Po = 1.2W for Ta ≤ 75ºC and T5 or Ta ≤ 80ºC and T4, group I
b) Uo = 24V Io = 0.025A Po = 0.6W for Ta ≤ 80ºC and T5 or Ta ≤ 45ºC and T6

The supply of power from a source with a rectangular characteristic means that the voltage of the Ex power supply remains constant until current limitation activates.
The protection level of power supplies with a rectangular characteristic is normally “ib”.
The transmitter powered from such supply is also the Ex device with “ib” level protection.
Example of practical provision of power supply with a rectangular characteristic:
use a stabilized power supply with Uo=24V, with the “ib” level protection and current limited to Io=50mA or Io = 25mA.

7. How to connect Ex transmitters Ex: D22, D41 and D32

The transmitter and other devices in the measuring loop should be connected in accordance with the intrinsic-safety and explosion-safety regulations and the conditions for use in dangerous areas.
Failure to observe the intrinsic-safety regulations can cause explosion and the resulting hazard to people.

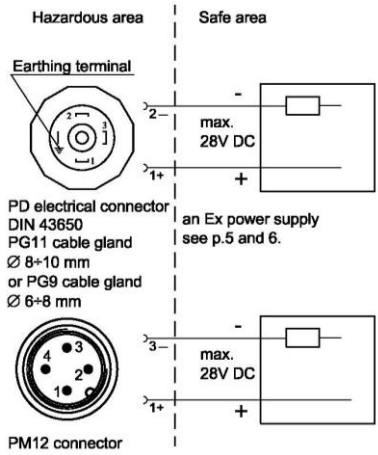


Fig.4a

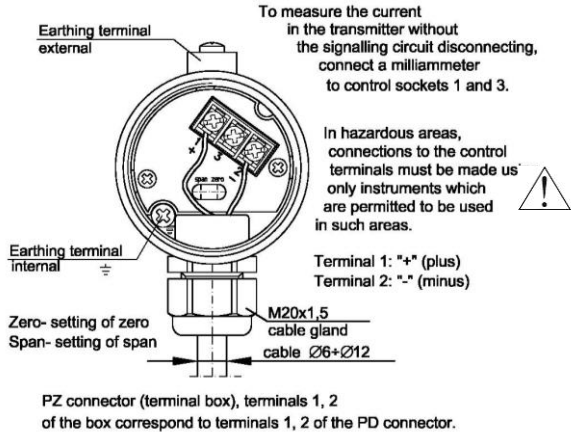


Fig.4b

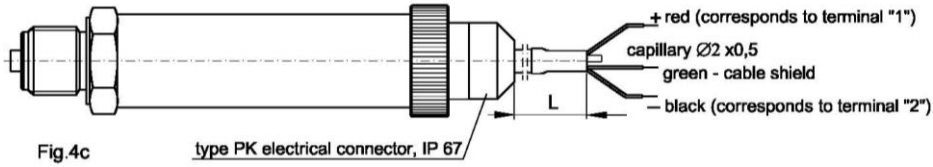


Fig.4c

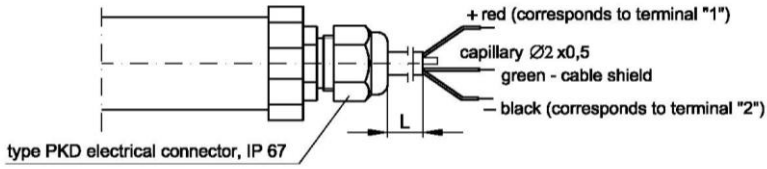


Fig.4d

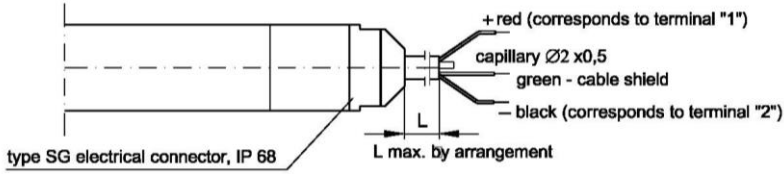


Fig.4e

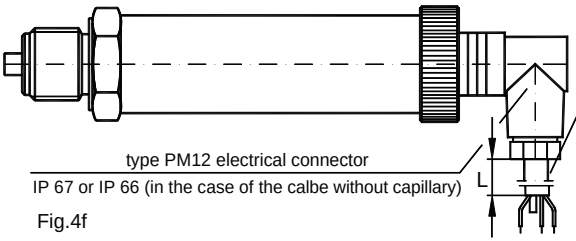


Fig.4f

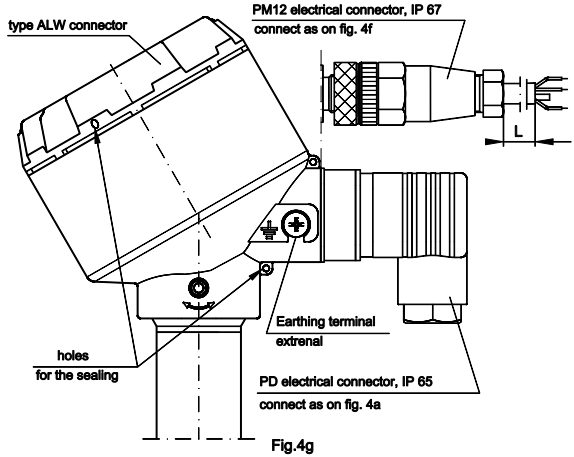


Fig.4g

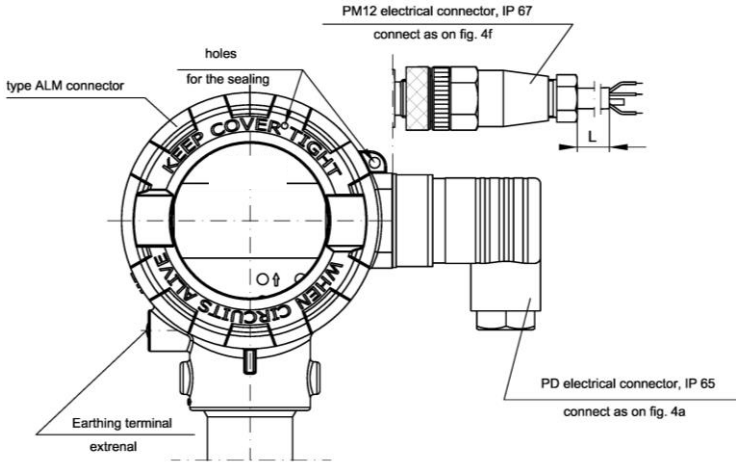


Fig.4h

It is not allowed to repair or otherwise interfere with the transmitter's electrical circuits in any way.
Damage and possible repair can be assessed and done by the manufactures or another authorised party only.

II. Appendix Ex.02

D22/XX/YY, D41/XX/YY PRESSURE TRANSMITTERS,
TYP D32/XX/YY DIFFERENTIAL PRESSURE TRANSMITTER
Ex VERSIONS according to IECEx

1. Introduction

1.1. The "Appendix Ex.02" to IOM-D22-D32-D41-C: AUGUST 2019 applies to D22/XX/YY, D41/XX/YY and D32/XX/YY transmitters in Ex version according to IECEx, marked on the rating plate as shown in p. 2 and 3 and signed "Ex" in the Product Certificate, only.
Extensions XX, YY after the marking product types apply to the types of pressure (XX) and electrical (YY) connections and will not occur later in the documentation.

1.2. The appendix contains supplementary information relating to the Ex version transmitters.
During installation and use of the Ex transmitters, reference should be made to **IOM-D22-D32-D41-C: AUGUST 2019** together with **Appendix Ex.02.**

2. Using D22, D32, D41 transmitters in hazardous areas

2.1. The transmitters are produced in accordance with the requirements of the following standards:
IEC 60079-0:2011 ed. 6.0, IEC 60079-11:2011 ed. 6.0.

2.2. The transmitters with PD, PK, PKM, PZ, SG, SGM electrical connection may operate in areas where there is a risk of explosion, in accordance with the rating of the explosion protection design:

Ex ia I Ma
Ex ia IIC T4/T5/T6, Ga/Gb
Ex ia IIIC T110°C Da
IECEx FTZÚ 18.0023X

2.3. The transmitters with PKD and PM12 electrical connection are permitted only for potentially explosive gas atmospheres and are marked:

Ex ia IIC T4/T5/T6 Ga/Gb
IECEx FTZÚ 18.0023X

2.4. The transmitters with ALW and ALM electrical connection are permitted for potentially explosive gas and dust atmospheres and are marked:

Ex ia IIC T4 Ga/Gb (with PD or PM12 connector)
Ex ia IIIC T110°C Da (with PD connector)
IECEx FTZÚ 18.0023X

3. Identifying marks

Intrinsically safe transmitters (Ex version) must have a rating plate containing the information specified in paragraph 4 of **IOM-D22-D32-D41-C: AUGUST 2019** and also at least the following:

- Values of parameters such as: Ui, Ii, Ci, Li;
- Manufacture year;
- Inscription: "Version SA" - for transmitters with the protection against overvoltage (surge arrester).

4. Consignment contents.

Together with the transmitter are delivered:

a) Product certificate, which is also as the warranty card;
b) Certificate copy (on request);
c) User's Manual signed „ **IOM-D22-D32-D41-C: AUGUST 2019**".

Items b), c) are available at www.delta-mobrey.com

5. Permissible input parameters (based on data from the IECEx FTZÚ 18.0023X certificates)

The transmitters should be powered via the associated power supplier and measurement devices provided with the relevant intrinsically safe certificates. The parameters of their outputs to the hazardous area should not exceed the limit power supply parameters specified below for the transmitters.

Transmitters in "Version SA" and transmitters working in dust zone should be powered with galvanically isolated power supply. If there is no power supply with galvanic isolation, transmitter or connected to it metal parts must be properly grounded by implementing equipotential bonding or equipotential connection between the transmitter and the negative terminal of intrinsic safety zener barrier.
Minimum supply voltage is 9 V DC.

The pressure transmitter is an intrinsically safe apparatus with level of protection “ia”, when supply circuit have level of protection “ia”.

a) Permissible input parameters for power supply with a linear output characteristic:
Ui = 28V DC; Ii = 0.1A; Pi = 0.7W

b) Permissible input parameters for power supply with a trapezial and rectangular output characteristic
Ui = 24V DC; Ii = 0.1A; Pi = 1.2W

c) Input inductance and capacity: Ci = 25nF*, Li = 0.4mH*

** One should take into account the capacity and inductance of the cable, which permanently connected cable are: C_K= 0.2nF/m and L_K=1µH/m.*

Input capacitance C_W and input inductance L_W of the transmitters with PK, PKM, SG or SGM electrical connections, taking into account the parameters of the permanently connected cable are accordingly:

$C_W = Ci + a \cdot C_K = 25nF + a \cdot 0.2nF/m$

$L_W = Li + a \cdot L_K = 400\mu H + a \cdot 1\mu H/m$

a - length of the mounted permanently cable in meters;

Ta = -40ºC to ... - see table Z2

Table Z2

Pi[W]	Ta[ºC]	Temperature classification
0.7	45	T6
	80	T5, T4, Group I, Group III - 110ºC
1.2	75	T5
	80	T4, Group, Group III - 110ºC

Special conditions for safe use:

- Ambient temperature range - see table Z2.
- Process temperature (medium) at the diaphragm of the transmitter must be in range of ambient temperature.
- In case of use the transmitter in dust atmosphere, supplying voltage could occur on transmitter enclosure. It should be taken into consideration during transmitter installation.
- In case of use titan parts in diaphragm seal, during installation and operation of the device the diaphragm seal should be protected against mechanical impact.
- Version of transmitter with surge arrester, marked on the plate “Version SA”, does not meet the requirements of Section 6.3.13 of the IEC 60079-11:2011 (test of isolation 500VAC).
  This must be taken into consideration during the installation of transmitter.
- Transmitters with display (with electrical connections ALW, ALM) and with diaphragm seals covered by PTFE, for Group lll, should be installed in a place and in a way that prevents electrostatic charging.

At the customer's request, elements of diaphragm seal can be made of titanium. This version of the transmitter has information on the label that the titanium elements are used. Then user should secure the diaphragm seal against the possibility of an impact.

When medium temperature is higher than Ta, use of separating elements such a diaphragm seal, or looped siphon tube etc. is necessary. Process temperature, close to the transmitter diaphragm seal, must be in the Ta range (Ta - ambient temperature).

6. Supply examples

Supply examples according to p.6. „Appendix Ex.01” – (ATEX).

7. How to connect Ex transmitters Ex: D22, D41 and D32

- according to p.7 IOM-D22-D32-D41-C: AUGUST 2019 Appendix Ex.01

1. INTRODUCTION, CERTIFICATES

1.1. This user's manual is intended for users of **D22** electronic pressure transmitters, **D32** differential pressure transmitters and **D41** level probes. It contains the data and guidelines necessary to understand the functioning of the transmitters.

1.2. The transmitters comply with the following requirements of EU directives and other requirements, according to the marking on their rating plates and their Declarations of Conformity:

ATEX

1.3. ATEX directive, **Exi** intrinsically safe versions, certificate no. **FTZÚ 19 ATEX 0112X**

*Additional data on the **D22, D32** transmitters and **D41** probes in Ex versions covered by the common EC-type test certificate, are contained in the appendix designated **IOM-D22-D32-D41-C: AUGUST 2019 Appendix Ex.01**.*

IECEx

1.4. The requirements of **IECEx** organization, certificate **IECEx FTZÚ 18.0023X**

*Additional data on **D22, D32** transmitters and **D41** probes in Ex versions covered by the common EC-type test certificate **IECEx FTZÚ 18.0023X**, are contained in the appendix designated **IOM-D22-D32-D41-C: AUGUST 2019 Appendix Ex.02**.*

EMC

1.5. EMC directive.

*The transmitters: **D22, D41, D32** in all versions met the requirements EMC Directive in accordance with standards: EN 61326-1:2013, EN 61000-6-2:2005.*

RoHS

1.6. RoHS directive.

*The transmitters: **D22, D32** and **D41** in all versions met the requirements RoHS Directive in accordance with standards PN-EN 50581 :2013-03.*

2. USER DOCUMENTS

Transmitters are delivered in single and/or multiple packs.
Together with the transmitter are delivered:

a) Product certificate, which is also as the warranty card;
b) Declaration of Conformity (on request);
c) Certificate copy (on request);
d) User's Manual signed "IOM-D22-D32".

These documents can also be found at www.delta-mobrey.com

3. APPLICATIONS AND MAIN FEATURES

3.1. The **D22** pressure transmitters are designed to measure gauge pressure, vacuum pressure and absolute pressure of gases, vapours and liquids (including corrosive).

3.2. The **D32** differential pressure transmitters are used to measure liquid levels in closed tanks, and to measure differential pressure at filters, orifices and others. The **D32** differential pressure transmitters with P-type connectors are designed to work with static pressure of up to 4MPa only (see fig.11). The **D32** differential pressure transmitters with C-type vented connectors to mount together with a valve manifold are designed to work with static pressure of up to 25MPa (see fig.12).

3.3. The **D41** level probes are designed to measure the depth of medium in a tank which is accessible from the top. They can also be used to measure levels in open tanks, watercourses, canals, measurement pipes in open channels, levels of liquid waste etc.

3.4. The **D22** with electrical connection **ALW and ALM** allows local display of the measured value for current loop 4 ÷ 20mA. Configurable using the buttons indicator LCD displays three process variables described in section 10.3.3. The ALW and ALM electrical connection is available in two versions with PD and PM12 connector.

i

3.5. The **D22** can be fitted with a range of additional process connectors, enabling them to be used in a conditions variety, such as dense media, reactive media, high and low temperature etc.
Data on these connectors can be found in the catalogue cards "**DIAPHRAGM SEALS**".
To measure a medium which contain suspensions or impurities, or are viscous, hot, corrosive etc., use the **D32** transmitter with a single diaphragm seal.

3.6. The **D22 or D32** transmitters and the **D41** probes generate a 4...20mA signal using two-wire transmission, other **D22** and **D32** solution can be produced with or 0...10V signal using three-wire transmission.

4. IDENTIFYING MARKS

4.1. Every transmitter and probe carries a rating plate containing at least the following information: manufacturer name or logo, type of transmitter, serial number, measurement range, permissible static pressure (for D32 only), output signal, power supply voltage.

4.2. The **D22, D32 and D41** transmitters in Ex version, in accordance with the **ATEX** directive, have additional marks as described in **IOM-D22-D32-D41-C: AUGUST 2019** Appendix Ex.01 paragraph 3.

4.3. The **D22, D32 and D41** transmitters in Ex version, in accordance with the **IECEx** requirements, have additional marks as described in **IOM-D22-D32-D41-C: AUGUST 2019** Appendix Ex.02 paragraph 3.

5. TECHNICAL DATA

5.1. D22 Technical Data

5.1.1. D22. Measurement Ranges

The **D22** transmitter can be produced with any desired range in the following spans:

- 0...25mbar ÷ 0...1000bar (over pressure, under pressure);
- 400mbar ÷ 80bar (absolute pressure).

Recommended ranges:

- over/under pressure (0÷ -1; -0.4; -0.1; 0.1; 0.4; 1; 2.5; 6; 10; 16; 25; 60; 160; 250; 400, 600, 1000) bar;
- absolute pressure (0 ÷ 0.4; 1; 2.5; 6; 10; 16; 25; 60) bar.

5.1.2. D22. Operating Parameters

Table 1	Measurement Range		
	100mbar (10kPa)	400mbar (40kPa)	0...1 ÷ 1000bar (0...100kPa ÷ 100MPa)
Overpressure limit (repeatable, no hysteresis)	1bar (100kPa)	2.5bar (250kPa)	4 x range max 1200bar (120MPa)
Damaging overpressure	2bar (200kPa)	2.5bar (250kPa)	8 x range; max 2000bar (200MPa)
Accuracy	0.3%	0.2%	(0.16% - special version)
Thermal error / 10ºC	typically 0.3% / 10ºC; max 0.4% /10ºC		typically 0.2% /10ºC; max 0.3% /10ºC
Long term stability	0.2 % / year	0.1 % / year	
Hysteresis and repeatability	0.05%		

5.2. D32 Technical Data

5.2.1. D32. Measurement Ranges

The **D32** differential pressure transmitters are manufactured with any desired range in the interval 1.6mbar to 25 bar.

Recommended ranges: 0.4; 1; 2.5; 6; 10; 16; 25bar, (-0.1...0.1); (-1...1) bar

5.2.2. D32. Operating Parameters

Table 2	Measurement Ranges			
	100mbar (10kPa)	1bar (100kPa)	2bar (200kPa)	25bar (2500kPa)
Overpressure limit Static pressure limit	250bar (25MPa) [40bar (4MPa) for P-type connector]			
Accuracy	0.4%	0.25%		
Thermal error / 10ºC	typical 0.3%, max 0.4%	typical 0.2%, max 0.3%		
Zero shift error for static pressure *	0.1% / 10 bar			
Long term stability	0.2%/year	0.1%/year		
Hysteresis and repeatability	0.05%			

** This error can be eliminated by zeroing the transmitter in static pressure conditions with zero differential pressure.*

5.3. D41 Technical Data

5.3.1. The **D41** probes are manufactured with measurement ranges in the interval 200÷3000mm H_2O

5.3.2. D41. Metrological Parameters

Table 3	Measurement range 0...200 ÷ 500mm H_2O	0...700 ÷ 3000mm H_2O
Accuracy	0.25%	0.16%
Thermal error of zero	typically0.3%/10ºC; max 0.5%/10ºC	typically 0.2%/10ºC; max 0.3%/10ºC
Thermal error of span	typically 0.2% / 10ºC max 0.3% / 10ºC	typically 0.2% / 10ºC max 0.3% / 10ºC
Long term stability	≤ (1.5 mm H_2O +0.16% range) / year	
Hysteresis, repeatability	0.05%	

5.4. D22, D32, D41. Common parameters

5.4.1. D22, D32, D41. Electrical Parameters

	Transmitter type	Output signal	Power supply	Note
Normal	D22/D32	4÷20mA	8÷36V DC	
		0÷10V	13÷30V DC	
	D41	4÷20mA	8÷36V DC	
	D22/ALW, D22/ALM		11*÷36V DC	
	D22/D32/TR; D41/TR		10,5÷36V DC	
Exi	D22/D32 (version Exi); D41 (version Exi)		9÷28V DC	Appendix Ex.01 and Ex.02
	D22/ALW (version Exi) D22/ALM (version Exi)		12*÷28V DC	

Load resistance
(for output signal 4÷20mA)

$$R[\Omega] = \frac{Usup.[V] - Umin[V]}{0{,}0235A}$$

Umin – the minimum supply voltage.

Load resistance
(for output signal 0 ÷ 10V) R ≥ 20kΩ
Error due to supply voltage changes 0.005% / 1 V
Voltage for insulation strength testing 75 V AC (110 V DC) or 500V AC (750V DC) see p.9.6
Excess voltage protection see p.9.6

**) Turn on the backlight indication of transmitters D22 with an ALW and ALM connection increases the minimum supply voltage for all versions of 3V (p. 10.3.3). The method of self-turn on or off the backlight is shown in Figure 6.*

5.4.2. D22, D32, D41. Permitted Environmental Conditions

Ambient temperature limit:

- D22 -40 ÷ 80ºC
- D32, D41 -25 ÷ 80ºC

Operating temperature range and medium temperature for intrinsically safe versions in accordance with Appendix Ex.01, Ex.02

Process temperature limit:

- D22 -40 ÷ 130ºC – direct measurement
- D32, D41 -40 ÷ 120ºC – direct measurement

For temperatures above 120°C / 130°C transmitter must be equipped in diaphragm seal, the other elements such as looped siphon tube, impulse line, connectors mounting S-type (figure 19), or should be used transmitters with radiators (RM process connection type).

Thermal compensation range

- D22 -10 ÷ 80ºC or by arrangement
- D32 0 ÷ 70ºC or by arrangement
- D41 0 ÷ 25ºC or -10 ÷ 70ºC for special version

Relative humidity 0 ÷ 98% with condensation
Vibration during operation max 4g; 10g for D22
g - acceleration of gravity.

5.4.3. D22, D32, D41. Construction Materials

Diaphragm	Stainless steel 1.4435 (316L) Hastelloy (for D22 only)
Sensing module	Stainless steel 1.4404 (316L)
Casing for electronic parts	Steel pipe, 1.4301 (304)
PZ-type terminal box	Thick steel pipe, 1.4301 (304)
Angular connector, DIN 43650, PD type	Itamide
Internal sensor liquids fill	Silicone oil, chemically inactive liquid for measurement of oxygen
Cable shield in PK connector	Polyurethane, special version – Teflon
Display housing in the ALW and ALM electrical connection	Aluminium alloy, lacquered with chemical-resistant epoxy enamel,

5.5. Pressure Connectors

5.5.1. D22. Pressure Connectors

- M-type connector with M20x1.5 thread – see figure 7a
- P-type connector with M20x1.5 thread – see figure 8a
- CM30x2 or CM20x1.5-type connector with flush diaphragm
- RM-type connector with M20x1.5 thread and radiator;
- G1/2-type connector with G1/2" thread – see figure 10a
- GP-type connector with G1/2" thread;
- G1/4" type connector with G1/4" thread;
- CG1/2-type connector with G1/2" thread and flush diaphragm – see figure 10c;
- CG1-type connector with G1" thread and flush diaphragm – see figure 10e;
- RG-type connector with G1/2" thread and radiator;
- 1/2"NPT-type connector with 1/2"NPT tread (male) and with internal G1/4" tread (female)
- Other connection types by arrangement.

5.5.2. D32. Pressure Connectors

P-type connectors with M20x1.5 thread – see fig. 11.
C-type connectors to mount together with a valve manifold see fig. 12.
Diaphragm seal connectors: see the Catalogue Cards for the diaphragm seals.

5.6. Protection Degree of Casing

according to - EN 60529:1991/A2:2013

IP65 rated	**D22, D32, D41** with PD-type connector, DIN 43650, PG-11 cable gland and **D22/ALW, D22/ALM** with PD-type electrical connector.
IP66 rated	**D22, D32** with PZ-type terminal box, M20x1.5 cable gland.
IP67 rated	**D22, D32, D41** with PK, PKM, PKD and PM12-type cable connector and **D22/ALW, D22/ALM** with PM12-type electrical connector.
IP68 rated	**D22** with SG, SGM-type connector.

6. CONSTRUCTION

6.1. Measurement Principles

The **D22,** pressure transmitters, **D32** differential pressure transmitters and the **D41** level probes operate by converting changes in the piezo-resistive bridge, which are proportional to the measured pressure, into a standard current (4÷20 mA) or voltage (0÷10 V) output signal.
The active sensing device is encapsulated piezo-resistive silicon sensor separated from the medium by a diaphragm and manometric liquid.
ALW-type, ALM-type transmitters have an integrated, configurable by the user, LCD display module (see p.10.3).

6.2. Casing, Electrical Connections, potentiometers adjusting zero and span

6.2.1. The casing of the transmitters, made from Ø27 pipe or Ø25 (for SG and SGM connections), is welded to the sensing module (figure 1b and 11). On the other side is mounted tight electrical connection.

6.2.2. The standard transmitters are equipped with **PD** type (see figure 1b).. The transmitters may be also fitted with an electrical connection type: **PK** (see figure 1d, 1f, 11), **PKD** (see figure 1g, 1h) or **PM12** (see figure 1c).
By unscrewing and removing the connector, can be gained access to the potentiometers used to the zero and range setting. The bodies of the **PK, PKD and PM12** connectors contain a permanently fixed and sealed cable with capillary of standard length 3m (other lengths can be produced to order).
In these electrical connections access to the potentiometers zero and span can be obtained by loosening the union nut connection to the transmitter housing and removal connections on cable length.
6.2.3. The **D22, D32** transmitters with a **PZ** type connector, has a terminal box welded the upper part of the casing (figure 2) with threaded covers. **PZ** type connector has an internal, and in Ex version also external earthing terminal.
Unscrewing the covers in the PZ connectors gives access to the potentiometers setting the zero and span (+/- 10%).

6.2.4. The transmitters can also be equipped with a **SG** type electrical connector (see figure 1i, 1j) or **SGM** type electrical connector (with G1/2" thread), which provide degree of protection IP68.
Cable with a capillary, as in the connector PK, is used for connection of the measuring diaphragm to the atmosphere. For transmitters with cable connections SG and SGM does not have access to the potentiometers zero and span.

6.2.5. The transmitters can also be fitted with connection type **ALW** (Figure 3) or ALM with built-in local indicator of the size of the measured and PD or PM12 electrical connection. The design of the display makes it possible to rotate ± 180°, in increments of 90° (Fig. 5), and the rotation of the housing relative to the axis of transmitter in the range of 0 ... 340º (see Figure 3).

In order to access to the potentiometers zero and span, the display must be removed without electrical disconnecting from aluminium housing (see figure 5).
Transmitters with connection type **ALW and ALM** have external earth terminals.

7. PLACE OF INSTALLATION OF TRANSMITTERS

7.1. General note

7.1.1. The **D22** transmitters can be installed both indoors and outdoors. It is recommended that transmitters intended for outdoor use place under cover.
7.1.2. The place of installation should be chosen in such a way as to allow access to the device and to protect from mechanical damage. In planning the installation of the transmitter and configuration of the impulse lines, attention should be paid to the following requirements:

- The impulse lines should be as short as possible, with a sufficiently large cross-section, and free of sharp bends, in order to prevent blockages.
- Where the medium is a gas, the transmitters should be installed above the measuring point, so that condensation flows down towards the tapping point. Where the medium is a liquid or where a diaphragm seal is used, the transmitters should be installed below the tapping point.
- The impulse lines should be inclined at a gradient of at least 10cm/m.
- The levels of filling liquid in the impulse lines should be equal or kept constant difference.
- The configuration of the impulse lines and the valve connection system should be chosen with regard to the measurement conditions and to requirements such as the need to reset the transmitters in position and the need for access to the impulse lines during water or gas removal and flushing.

7.1.3. Transmitters should be protected from physical damage. If the installation location can cause danger to the integrity of the process connection or the electrical connection, causing leaks or possibility of sparking a more appropriate location should be selected for the transmitter.

7.1.4. The level probes **D41** are installed in places where liquid levels are to be measured. The probe is immersed in the medium being measured, but the electronic assembly and connector should remain above the maximum level of the medium. When installing the probe, the zero position should be precisely determined. When the tube is particularly long, it should be fastened at two points. Roof or box should be used to shield electronic parts of the probe when it is installed in the open air. If there is a current or turbulence in the place where the probe will operate, a protective tube should be fitted.

The medium around the sensing module should not be allowed to freeze. This applies particularly to water when the probe is used in the open air. The sealing diaphragms should be checked regularly, and sediment deposits, blockages etc. should not be allowed to occur.
Dirt should be removed only by dissolving or washing off.

7.2. Low Ambient Temperature

When the solidification point of the liquid, whose pressure is being measured, is greater than the ambient temperature, steps should be taken to protect the measurement apparatus from freezing effects.

This is particularly important in the case open-air installations.
Protection by filling the impulse lines with an ethylene glycol and water mixture, or another liquid whose solidification point ensures the working temperature is not exceeded. The transmitter case and electrical connection protects the transmitter from short exposure to low temperatures only. Where the temperature is very low, the transmitter and impulse lines should be heated.

7.3. High Medium Temperature

To protect transmitter measuring head from temperature higher than permissible should be used suitably long impulse lines, causing heat dissipation. In the absence of the possibility of using long impulse lines, use transmitters with diaphragm seals (see catalogue cards "**DIAPHRAGM SEALS**").

Data as per Appendix Ex.01 or Ex.02 apply for the Ex version.

7.4 Electrostatic hazards

Varnish covering the casing of transmitter with display constitutes a non-conductive layer covering the conductive cover basis. Transmitters D22/ALW, D32/ALW, D22/ALM, D32/ALM should be installed in locations with no possibility of electrostatic charging. In particular through contact with electrified dust falling or exhaled from devices operating nearby.

7.5. Mechanical Vibration, Corrosive Media.

7.5.1. Transmitters should work correctly with vibrations with amplitudes to 1.6mm and accelerations to 10g. If strong vibrations are carried via the pressure line use should be made of flexible lines or transmitters with a remote diaphragm seal.

7.5.2. Transmitters should not be installed in places where the diaphragm, made of 1.4435 (316L) steel, would be subject to corrosion by the measured medium. If possible, use transmitters with diaphragms made of Hastelloy C276 or other protective measures (e.g. such as a liquid separation) or transmitters with diaphragm seals adapted to measure aggressive mediums according to catalogue cards "**DIAPHRAGM SEALS**".

8. INSTALLATION AND MECHANICAL CONNECTIONS

8.1. The **D22** transmitters can be mounted directly on rigid impulse lines.
Where connectors are used as in figures 7a, 8a, 9a, 10a, 10c, 10e it is recommended that connection sockets be used as shown in figure 7b, 8b, 9b, 10b or 9c, 10d, 10f.
Where the connectors are as in figures 8a, 9a and 10c, 10e rectangular gaskets are used with each transmitter.
The socket shown as in figure 9c, 10d and 10f can be obtained from the manufacturer.
The material of the seal is selected based on the pressure value and the type and temperature of the medium.
If the pressure is applied via a flexible plastic tube, the transmitter should be mounted on a support with Red Ø6-M reduction.
The types of the impulse tubes are to be selected depending on the measured value of the pressure and the medium temperature.

8.2. The **D32** transmitters can be mounted directly on rigid impulse lines.
To connect the basic versions of transmitters, with two M20x1.5 stubs (P-type connector), one can use (for example) straight connecting elements with nuts.
If the pressure is carried via a flexible plastic tube, use a reduction elements "Red Ø6-M" (M20x1.5 / Ø6).
The **D32** transmitters can be installed using the Assembly Kit, on an ø25 pipe or on a flat surface using an angle bracket (figure 15).
The **D32** with connecting cover (C-type connector) is designed for installation on 3-valve or 5-valve manifolds, to a 2" pipe or to a flat surface using a fastener C2 (figure 16) or "U" (figure 17).

8.3. The **D22 and D32** transmitters can operate in any position.
When installed on an object with a high-temperature medium, it is advantageous to mount the transmitter in a horizontal position with the packing gland pointing downwards or to the side, in such a way that the transmitter is kept away from the stream of rising hot air.
Examples of the use of Delta Mobrey assembly components to isolate the **D22** transmitters from high temperature media are shown in figure 18
When the measurement range is small, the reading can be affected by the position of the transmitter and by the configuration of the impulse lines and the way in which they are filled with liquid.
This error can be corrected using the zero-setting function.

8.4. In selecting assembly components, it may be helpful to consult information on connection elements, reduction elements, sockets, valves, reduction clamps and signal tubes manufactured by Delta Mobrey.
Information on this subject can be found in the catalogue cards "**FITTING ACCESSORIES**".

Pressure may be transmitted to the installed device only after checking that it has a measurement range which properly corresponds to the value of the measured pressure, that gaskets have been properly selected and fitted, and the connector has been properly screwed tight.
Attempts to undo the screws or fixing connector pipes on a transmitter under pressure may cause the medium to leak and create hazards for the personnel.
When disassembling the transmitter, it is necessary to disconnect it from the process pressure or bring the pressure to atmospheric level, and to take particular care and precautions in case of media which are highly reactive, caustic, explosive or otherwise hazardous to personnel.
If necessary, rinse out this part of the system.

Transmitters with flange diaphragm seals are to be installed on the corresponding counter flanges on the facility.
It is recommended that the user matches the screw joints material to the pressure, temperature, flange material and seal to ensure tightness of the flange joint in the expected operating conditions.
Coarse-threaded screws complying with ISO 261 are to be used for flanges used in the transmitters.

9. ELECTRICAL CONNECTION.

9.1. General recommendations

It is recommended that twisted pair cabling be used for the signal lines. If the transmitter and signal line are subject to a large amount of electromagnetic interference, then shield pair cable should be used. The signal wires should not run alongside network power supply cables or near to large electrically-powered devices.
The devices used together with the transmitters should be resistant to electromagnetic interference from the transmission line in accordance with EMC requirements. It is also beneficial to use anti-interference filters on the primary side of the transformers, the power supplies used for the transmitters and apparatus used in conjunction with them.

9.2. Connections for transmitters with PD-type connector

The electrical connections of transmitters equipped with connection type **PD** performed in accordance with the diagrams on Figure 1a. using a cable with a diameter of 6 ÷ 8mm (for PG9) or 8 ÷ 10mm (for PG11).
Cable outlet can be set in any direction by slightly loosening the union nut connection to the transmitter housing. The section of the signal cable leading to the cable gland should be formed as a protective loop which the lowest point will lower than input to the cable gland to prevent a condensed water of running down towards the gland. Type PD connectors correctly mounted should have a tightened: the gland nut, nut connections for steel housing and screw connection linking the two parts.

9.3. Connections for transmitters with PK, PKD, SG, SGM or PM12-type connectors

The electrical connections transmitters equipped with connector **PK, PKD, PM12, SG** or **SGM** shall be carried out via the junction box with cable gland, in which the transmitter's cable connects with rest of the signal line. The junction box should have an opening "breathable" equalizing pressure inside the can to atmospheric pressure.
Description of signal wires for transmitters with connector type **PK, PKD, PM12, SG** or **SGM** is shown on Fig. 1c - 1j.

9.4. Connections for transmitters with PZ-type connector

The electrical connection of transmitters with **PZ** type connector should be performed by connecting the signal wires to the terminals in accordance with Fig.2. Carefully screw the cover and cork the gland, making sure that the wire is tightly packed.
On request is possible special version - transmitter "breathes" through a capillary in the cable.

9.5. Connections for transmitters with ALW-type, ALM-type connector

Electrical connections transmitters equipped with **ALW**-type, **ALM**-type connector is the same as connecting transmitters with connectors PD or PM12.

9.6. Overvoltage protection

9.6.1. The transmitters and probes may be in danger from excess voltage caused by connection faults or atmospheric electrical discharge. Protection from excess voltage between the wires of the transmission line is provided by TVS diodes installed in all types of transmitter (see the table 4, column 2). Protection against excess voltage between the transmission line and the casing or earth (not prevented by the diodes connected between the transmission wires) is provided in the form of plasma surge arresters (see the table 4, column 3).

9.6.2. Additionally external protective devices may be used, e.g. the UZ-2 Delta Mobrey system, or others. When the transmission lines are long, it is advantageous to use one protective device near the transmitter (it's inside), and another near entry points to devices used in conjunction with it.

Table 4. Internal protection of transmitters

1	2	3
Type of transmitter (probe) and type of electrical connector	Protection between wires (TVS diodes) – nominal voltage	Protection between wires and earth and/or casing – type of protection, nominal voltage
D22, D32, D41 with PD, PK connector	39V DC	Plasma surge arresters - 230VDC The Ex versions used for the "Version SA"
D22 with PKM, PKD, SG, SGM, PM12, PZ, ALW, ALM connector		

9.6.3. The voltage in the protective elements must not exceed the maximum permitted values given in table 4.

i The insulation test voltage 500V AC or 750V DC applies only to transmitters without surge arresters.

9.7. Earthing

9.7.1. The transmitters, in each solution, have terminals or wires for earthing that should be used in accordance with the installation design documentation.
Transmitters with PD electrical connector have earth terminal in connectors. These terminals should not be used to protective earth or to the equipotential bonding cable; they should be used only as a functional earthing (see p.9.7.2). The transmitters with PZ connectors are equipped with internal (in Ex versions also in external) earth terminal, to which one can connect functional either equipotential wires. Shields of the connecting cables for transmitters with PK, PKD, SG, PM12 cable connectors are led out for the user's disposal. Transmitters with connection ALW and ALM have an external earthing terminal.
Do not use the connecting cable shields to the protective earthing system, but only to the functional. The cable shield should be connected from one end of the connecting cable to the earthed transmitter, or to the earthed measuring system. If transmitters have certain galvanic connections to the well-earthed metal pipelines or tanks, through their process connections, additional functional earthing is not necessary.

9.7.2. Internal earthing terminals or earthing terminals in connectors, within the manufacturer meaning, act as the functional terminals, i.e. those which should be used for the earthing in the absence of an earthing transmitter via process connection. In another situation, these terminals can be used to connect the cable shield to an earthed transmitter by process connection. In both cases, the functional earthing has to ensure the proper functioning of the transmitter, i.e. when the transmitter is earthed through the metal pipeline, and possible cable shield is connected to the measuring installation, functional earthing terminal should not be used.

10. SETTING AND REGULATION

The transmitters are factory calibrated to the range stated in the order or to the basic range.

10.1. Readjust the zero signal after installation

The zero signal regulation may be necessary after mounting the transmitter. It can be done using a precision screwdriver and milliammeter or millivoltmeter for the relative pressure transmitter (gauge) with zero adjustable for barometric pressure. Adjustment can be done after power the transmitter, partially removing the electrical connection and get access to the appropriate potentiometer (access to the knobs setting is given in p.6.2). Zero potentiometer is described as "zero". At atmospheric pressure in the installation using potentiometer set the zero signal to the initial value zero: 4mA or 0.05V, depending on the output signal. For other than zero initial pressure values setting zero can only be made by supplying pressure equal to the lower limit of the measurement range. The zero signal can be set within the limit of 10% of span (FSO).

10.2. Checking the calibration and adjustments on the position

In order to check the calibration or carry out adjustment, connect the transmitter to the calibrator and power it, according to technical data. Supply a pressure equal to the lower limit of the measurement range, and make the output signal equal to 4mA (0V) by turning the “zero” potentiometer. Turn the knob to the right to increase the output signal. After the zero position has been set, supply a pressure equal to the upper limit of the range, and use the “range” potentiometer to make the output current (voltage) equal to 20mA (10V). Recheck the zero position, and repeat the procedure if necessary.
Access to the setting knobs is given in p.6.2.
In the D22 transmitters with SG or SGM electrical connection does not have access to "zero" and "range" potentiometer. Correction of setting can be done by the manufacturer only.

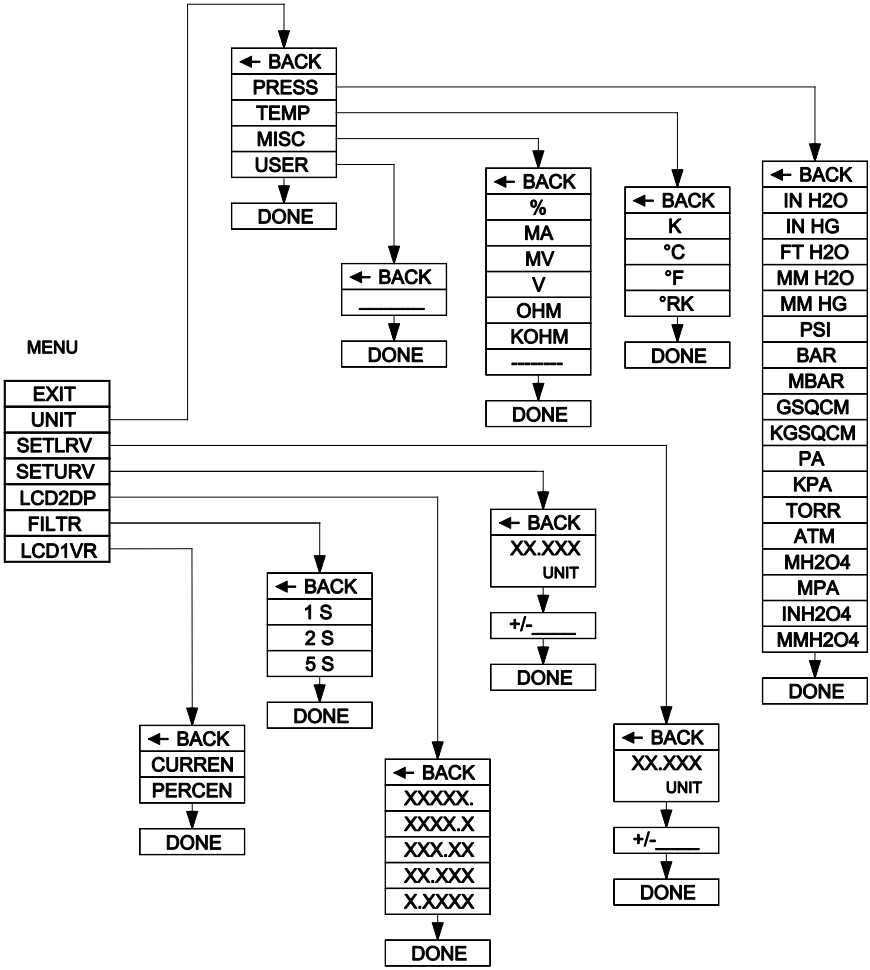
i

Potentiometers can be used to shift the zero position and the range by up to 10%, without altering the setting. For the **D22** and **D32** transmitters with output signal 0 ÷ 10V one should set “zero” to a value of 0.05 V (output 0 .. 10V) (transmitter not reach the value 0 V).

10.3. Configuration of the D22 with ALW-type, ALM-type connection

10.3.1. Display configuration

Changes to the display settings you can make using the buttons below the display. Access to buttons will get after unscrewing the cover of the display.
The buttons are marked with symbols: [↓], [↑] and [●].
The buttons [↓], [↑] allow you to move up and down the menu tree structure while the button [●] confirm and execute the selected option.
Pressing and holding any button for about 4s will cause enter to the local setting mode, and appears on the display in the field LCD3 (the display fields are describe in p. 10.3.3) message "EXIT".
No action in the area of MENU for longer than 2 minutes will automatically exit from the local setting and move to the display of the process variable.
After approval the selected parameter transmitter will confirm the party of command by the "DONE".
The "← BACK" button allows you to jump to the higher level in the menu structure.
Ways to navigate in the local menu tree of transmitter are shown in the diagram below.



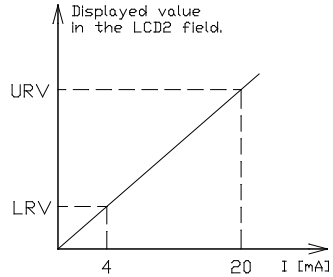
<table>
<tr><th colspan="3">Local Menu</th><th>Description</th></tr>
<tr><td>EXIT</td><td colspan="2"></td><td>Return from the Local menu to display the process variable.</td></tr>
<tr><td rowspan="5">UNIT</td><td colspan="2"></td><td>Setting units</td></tr>
<tr><td colspan="2">PRESS</td><td>Switching to pressure units selection.</td></tr>
<tr><td colspan="2">TEMP</td><td>Switching to temperature units selection.</td></tr>
<tr><td colspan="2">MISC</td><td>Switching to various units selection</td></tr>
<tr><td rowspan="2">USER</td><td></td><td>Switching to entering of user’s units.</td></tr>
<tr><td>_____</td><td>Entering values of user’s units (six alphanumeric characters).
Buttons “↑” or “↓” are used to select each alphanumeric character of the entered unit. Addition of successive character is made by confirmation of the previous character (pressing [●] button). The device will confirm acceptance of the command with “DONE” message or will notify error number after confirmation of the last (6th) character.</td></tr>
<tr><td rowspan="3">SET LRV / SET URV</td><td colspan="2"></td><td>Function allows assigning the given values corresponding to the output signals 4 and 20 [mA]. Value after linear scaling is displayed in the LCD2 field. User may set any value of start and the end of the range. Percentage value of measured range is displayed in the LCD2 field as a standard.
 

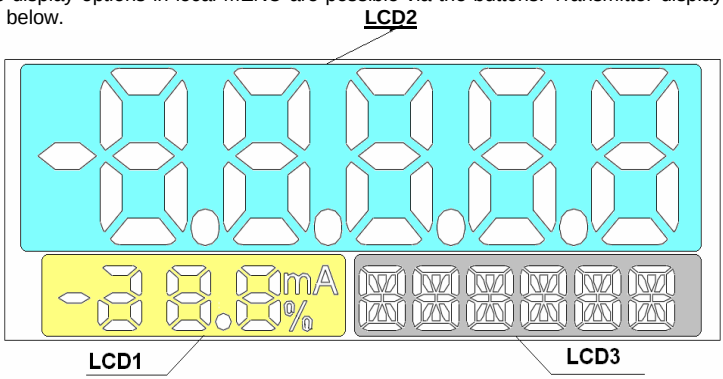
Table.
Exemplary settings LRV , URV.
<table>
<tr><th>Unit</th><th>LRV</th><th>URV</th><th>LCD2</th></tr>
<tr><td>mA</td><td>4</td><td>20</td><td>Current in current loop</td></tr>
<tr><td>%</td><td>0</td><td>100</td><td>Output setting percentage - set as a standard</td></tr>
<tr><td>Measurement range unit (e.g.kPa)</td><td>Range beginning (e.g.0)</td><td>Range end (e.g.100)</td><td>Physical value measured (e.g. pressure)</td></tr>
</table></td></tr>
<tr><td colspan="2">XX.XXX
UNIT</td><td>Actual value of start and end of the displayed range will be presented. Confirmation of this option allows assigning the given value to the start and end of the displayed range.</td></tr>
<tr><td colspan="2">+/-_____</td><td>Entering value of set range.
Buttons “↑” or “↓” are used to select entered character. Addition of successive figure is made by confirmation of the previous one (pressing [●] button). Change of the figure or setting a comma is made using button “↑” or “↓”. The device will confirm acceptance of the command with “DONE” message or will notify error number after confirmation of the last (6th) figure.
Parameter is entered in UNIT units.</td></tr>
<tr><td>LCD2DP</td><td colspan="2"></td><td>Change of position of the decimal point of variable presented in the LCD2 field of the display.</td></tr>
<tr><td>FILTR</td><td colspan="2"></td><td>Selection of averaging time of displayed process variable.</td></tr>
<tr><td>LCD1VR</td><td colspan="2"></td><td>Type of process variable presented in the LCD1 field of the display.</td></tr>
<tr><td></td><td colspan="2">CURREN</td><td>Value of current in current loop will be presented in the LCD1 field.</td></tr>
<tr><td></td><td colspan="2">PERCEN</td><td>Percentage value of output setting will be presented on the display.</td></tr>
</table>

10.3.2. Local Menu, error reports

During perform some functions in Local Menu may appear on LCD2 field an error message EXXXX (the letter E and 4 digits error code). The error message evidences about no realization of the command. The persistence of the error message for a long time indicates malfunction or improper operation of the display.

10.3.3. View local LCD display

Changes of the display options in local MENU are possible via the buttons. Transmitter display appearance is shown in figure below.



On the display can distinguish 3 main fields:

- **LCD1** – value of current or guidance percent preset range display. Depending on the display configuration will be displayed the current value of the current line 4 ÷ 20mA with a resolution of 0.1mA, or percent guidance the preset range with a resolution of indications 1%.
- **LCD2** – digital value of measured pressure by transmitter, value of pressure rescaled according to the user's units or the error code. Decimal point position can be set in local MENU.
- **LCD3** – information field. During normal operation is designed for continuous display of the base unit or the user units. In case of errors in the transmitter's work, it displays an error number. In manual mode, the local change settings menu displays options of selecting the setting. It also displays errors related to the implementation of commands in the local menu of the settings change.

Display backlighting - local display is equipped in backlight which can be switched on or off depending on needs. Turn on the backlight increases the minimum supply voltage for all version of 3V. Enable or disable the backlight is possible using the jumper after removing the back cover of the display. Enable or disable backlight is shown in Figure 6.

11. SERVICES AND SPARE PARTS

11.1. Periodic service

Periodic service should be made in accordance with the regulations to which the user is subject.
During inspection, the pressure connectors should be checked for loose connections and leaks, the electrical connectors should be checked with regard to tightness and the state of the gaskets, and the diaphragm seals should be checked for tarnishing and corrosion. Calibration and output should also be checked.

11.2. Unscheduled services

i

If the transmitters or probes are installed in a location where they may be exposed to mechanical damage, excess pressure, hydraulic impulses or excess voltage, or the diaphragm may be in danger from sedimentation, crystallization or erosion, inspections should be carried out as required.
The diaphragm should be inspected and cleaned, the protective diodes should be checked for shorting, and the calibration and output should be checked.
Where it is found that the signal in the transmission circuit is lost or its value is incorrect, a check should be made on the circuit and its terminal connections. Check whether the values of the supply voltage and load resistance are correct. If the circuit is in order, check the operation of the transmitter.
After checks have been made, take steps to eliminate the faults detected.

11.3. Cleaning the Diaphragm Seal, Overloading Damage

11.3.1. Sediment and dirt which have formed on the diaphragm in the course of operation must not be removed by mechanical means, as this may damage both the diaphragm and the transmitter itself. The only permitted method is the dissolving of sediment.

11.3.2. Sometimes transmitters malfunction due to damage caused by overloading, e.g. in case of:

- **Application of excessive pressure;**
- **Freezing or solidification of the medium;**
- **Action of a hard object, such as a screwdriver, on the diaphragm.**

Usually in such cases the symptoms are such that the output current falls below “zero” or rises above “range” (below: 4mA or 0V; above: 20mA or 10V - depending on the output signal), and the transmitter fails to respond to input pressure.

11.4. Spare parts.

The following transmitter parts may need replacing due to damage or normal wear:

- PD connector – terminal block with angular cover and seal, connector base with seal, rating plate, case;
- PK, PKD connector – the entire connector;
- PZ connector – cover seal and cable gland;
- PM12 connector – the entire connector;
- ALW, ALM connector – cover seal and connector PD or PM12.

In the Ex version, the user may replace only the terminal block with angular shield and the seal in the PD connector, or the seal and cable gland in the PZ connector.

Other parts, due to their special characteristics and anti-explosive requirements, may be replaced only by the manufacturer or an authorized firm.

12. PACKING, STORAGE AND TRANSPORT

12.1. The transmitters should be packed in such a way as to protect them from damage during transportation.
The transmitters should be stored in multiple packs under cover, in a place free of vapours and reactive substances, with temperature and humidity not exceed the permitted parameters.
Transmitters with uncovered diaphragm or seal connectors, stored without packaging, should have covers to prevent damage to the diaphragm.
During transportation, the transmitters should be packed and secured so as to prevent them from shifting.
Any means of transport may be used, provided direct atmospheric effects are eliminated.

12.2. The **D41** probes are individually packed. Individually packed probes are bound in packages containing several probes. Storage and transport as above.

13. GUARANTEE

Manufacturer warrants under the conditions specified in the Product Certificate which is also a guarantee card.

14. SCRAPPING, DISPOSAL

Waste or damaged transmitters should be dismantled and disposed of in accordance with Directive (2012/19/EC) on waste electrical and electronic equipment (WEEE) or returned to the manufacturer.

15. ADDITIONAL INFORMATION

The manufacturer reserves the right to make constructional and technological changes which do not lower the quality of the transmitters and probes.

15.1. Related documents

Catalogue Cards “Diaphragm seals”.
Catalogue Cards “Fitting accessories”.

15.2. Related standards

EN 60529:1991+A2:2013	Degrees of protection provided by enclosures (IP Code).
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements.
EN 1092-1:2007+A1:2013	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories. – Part 1: Steel flanges.

16. FIGURES

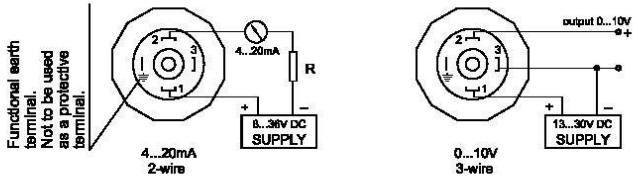


Fig. 1a. Wiring diagram for D22, D32 transmitters and D41 probe (Not applicable to Ex version)

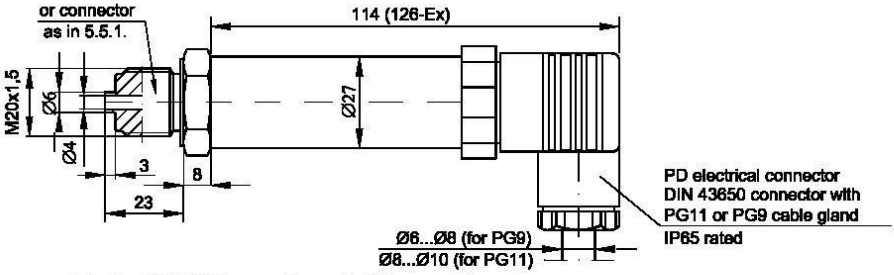


Fig. 1b. D22 transmitter with PD connector

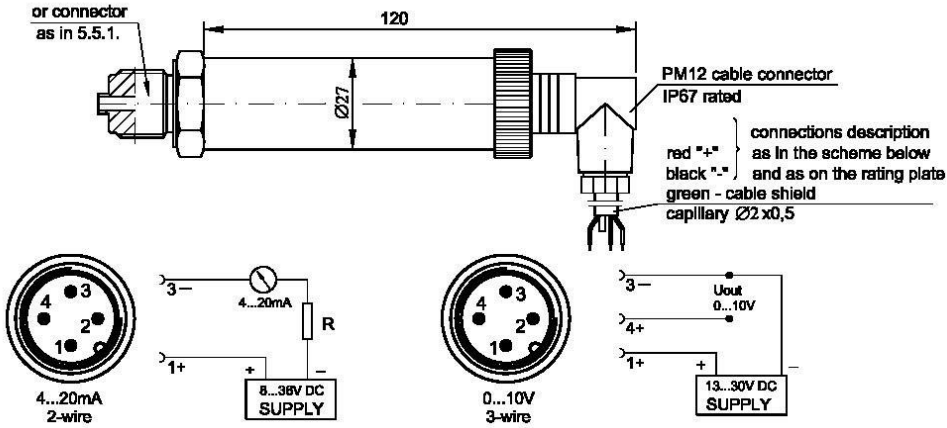


Fig. 1c. D22 transmitter with PM12 connector

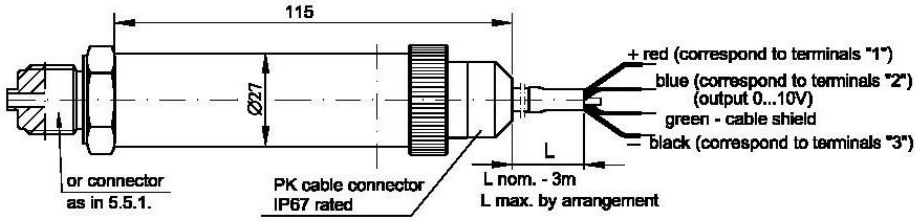


Fig. 1f. D22 transmitter with PK connector - (three-wire transmission 0…10V)

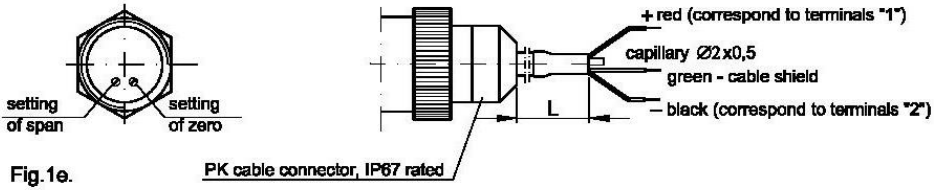


Fig.1e.
View of potentiometers
of zero and span
(PD, PK, PKD or PM12)

Fig. 1d. D22 transmitter with PK connector for output signal 4…20mA

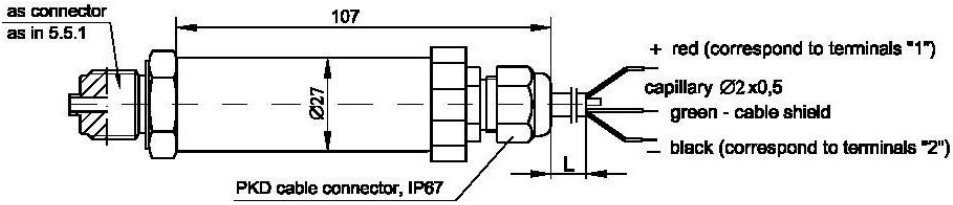


Fig. 1g. D22 transmitter with PKD connector for output signal 4…20mA

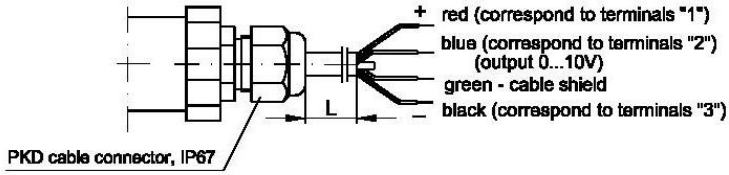


Fig. 1h. D22 transmitter with PKD connector for output signal 0…10V

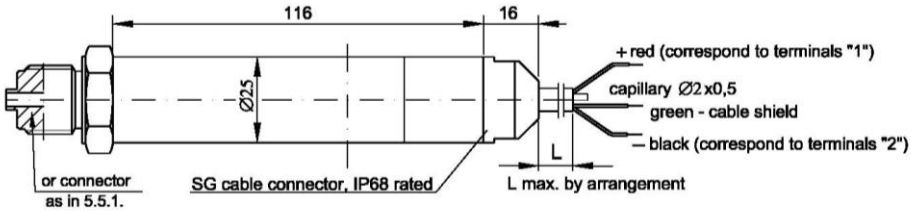


Fig. 1i. D22 transmitter with SG connector for output signal 4…20mA

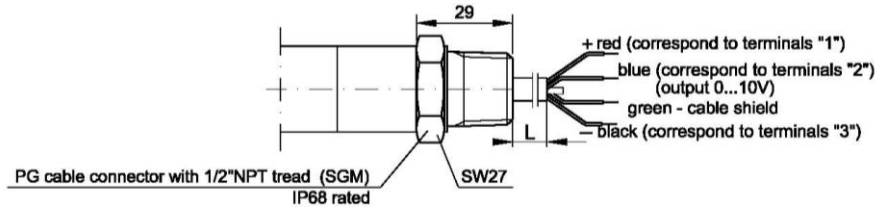
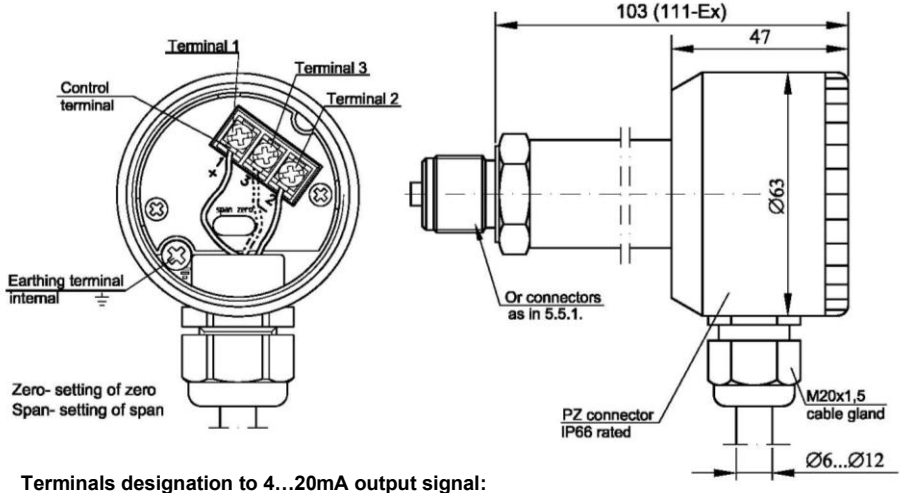


Fig. 1j. D22 transmitter with SG connector with ½ NPT tread (SGM) (three-wire transmission 0…10V)

Figure 1. D22 transmitter with PD, PK, PKD, PM12 connectors: dimensions and methods of connection



Terminals designation to 4…20mA output signal:

Terminal 1 - Supply "+" (plus)
Terminal 2 - Supply "-" (minus)
Terminal 3 - TEST_SIGNAL

To output current measure in the transmitter without the signalling circuit disconnecting, connect a multimeter to control terminals 2 and 3 (max. voltage fall on the milliammeter: 200mV).

Terminals designation to 0…10V output signal:

Terminal 1 - Supply "+" (plus)
Terminal 2 - Output signal
Terminal 3 - Supply "-" (minus)

Figure 2. D22 transmitter with PZ connector: dimensions and connection method

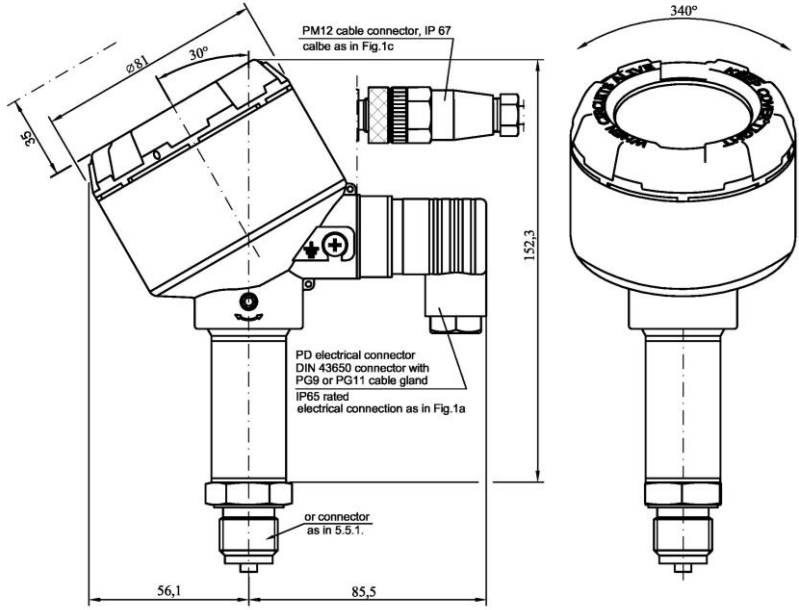


Figure 3. D22 transmitter with ALW-type connector:
dimensions and methods of connection

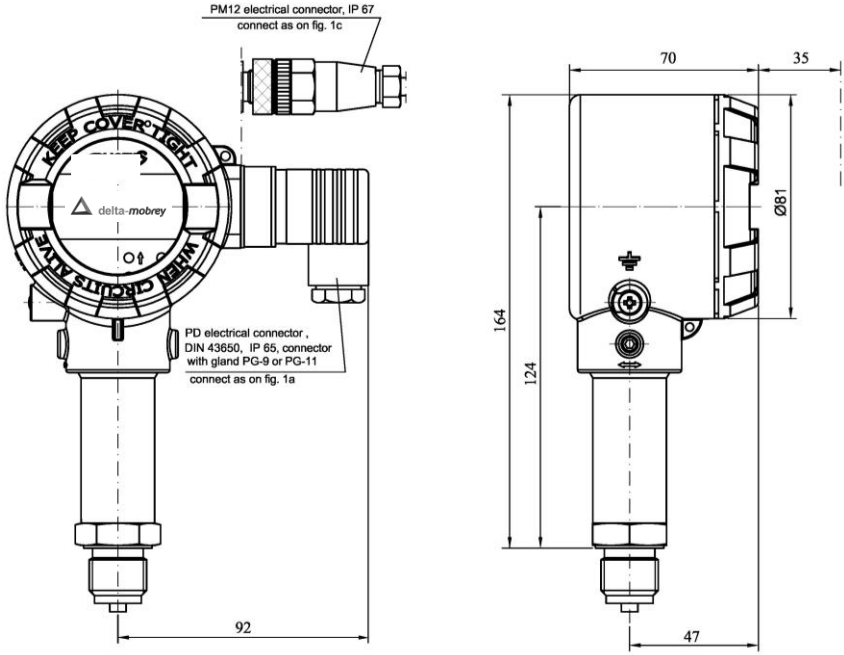


Figure 4. D22 transmitter with ALM-type connector:
dimensions and methods of

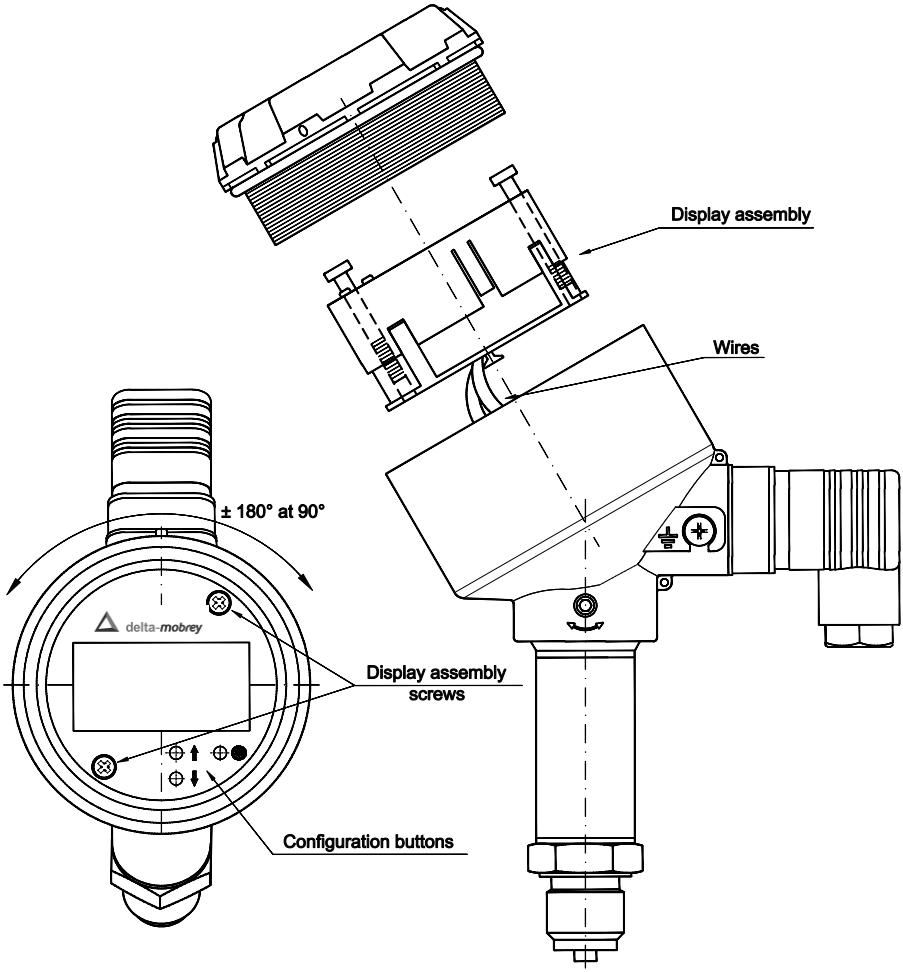


Figure 5. View of the D22 transmitter with ALW-type connector after removing the display cover

In order to change the display position or access to the potentiometers "ZERO", "SPAN" shall be:

1. Remove the display cover.
2. Remove the display assembly screws.
3. Carefully remove the LCD display assembly.
4. Set the LCD display to the desired position (possibility of rotation: ± 180 ° at 90 °) and / or set the "zero" and span according to p. 10.
5. Screw the display screws and the cover.

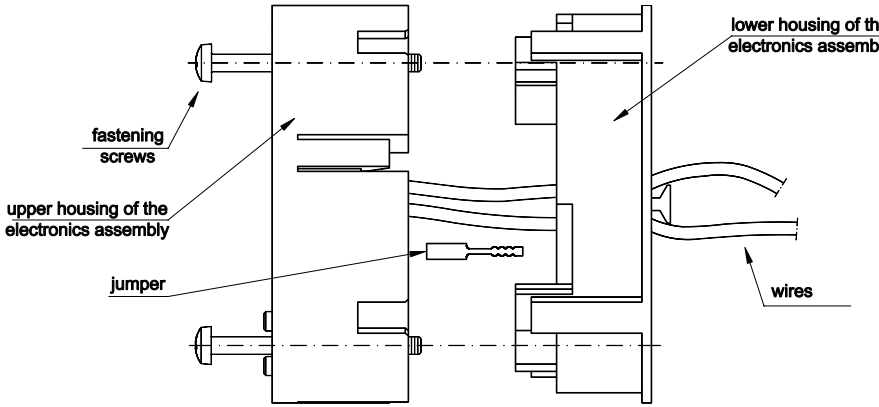


Figure 6a. View of disassembled display assembly

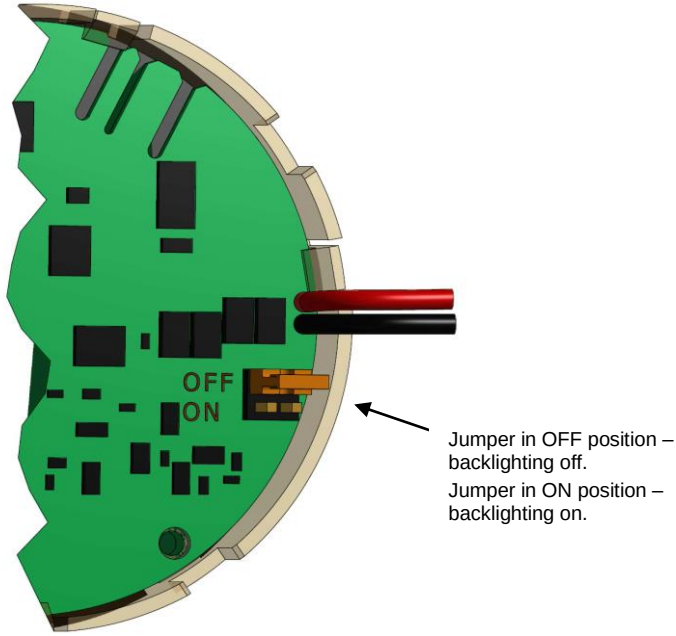


Figure 6b. Backlighting jumper view at transmitter electric board (unit display back side)

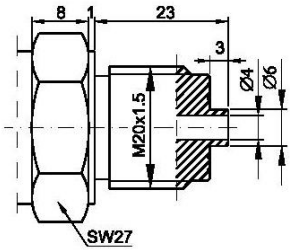


Fig.7a. M-type connector
with M20x1.5 thread

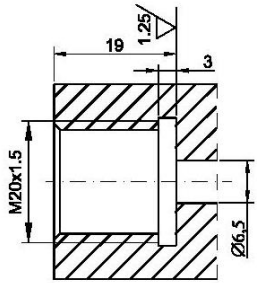


Fig.7b. Socket for M-type connector.

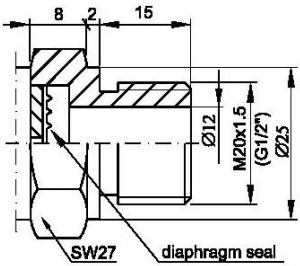


Fig.8a. P-type connector
with M20x1.5 thread
(GP-type connector
with G1/2" thread)

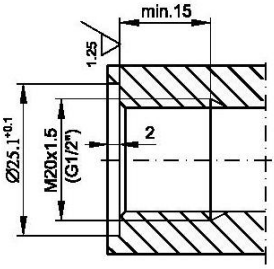


Fig.8b. Socket for P-type connector,
(GP-type connector)

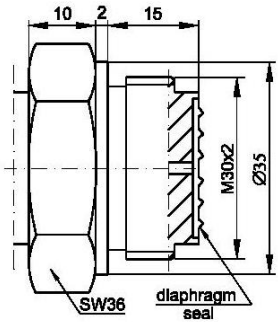


Fig.9a. CM30x2-type connector
with flush diaphragm
with M30x2 thread,

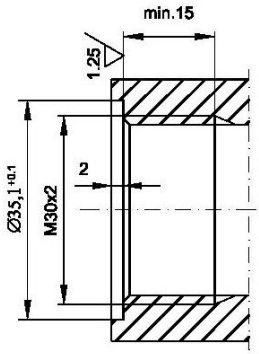


Fig.9b. Socket for
CM30x2-type connector

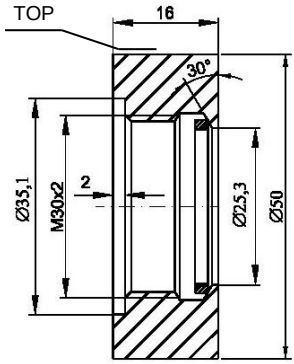


Fig.9c. Weldable fitting ring for
CM30x2-type connector
Sealing: teflon

Order code Socket CM30x2

i The ring in Fig.9c must be welded in place with the word TOP upwards

Figure 7. M-type connector with M20x1.5 thread
Figure 8. P-type (GP-type) connector with M20x1.5 (G1/2") thread
Figure 9. CM30x2-type connector with flush diaphragm with M30x2 thread

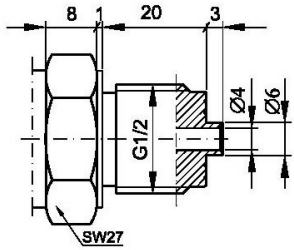


Fig.10a. G1/2-type connector
with G1/2" thread

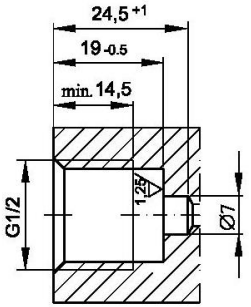


Fig.10b. Socket for use with transmitters
with G1/2-type connector

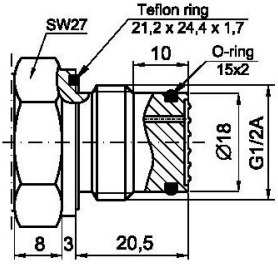


Fig.10c. CG1/2 -type connector
with flush diaphragm
with G1/2" thread

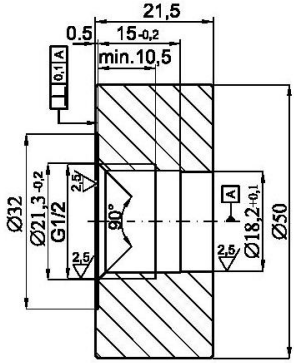


Fig.10d. Weldable fitting ring for use with
transmitters with CG1/2 - type connector
Material – 316Lss
Order code Socket CG1/2

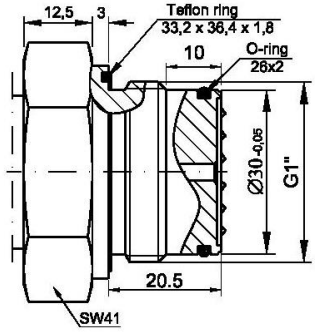


Fig.10e. CG1-type connector
with flush diaphragm
with G1" thread

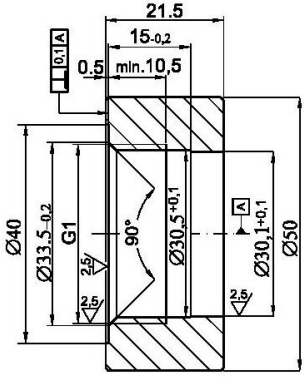


Fig.10f. Weldable fitting ring for use with
transmitters with CG1 - type connector
Material – 316Lss
Order code Socket CG1

Figure 10. G1/2” and G1” process connectors.

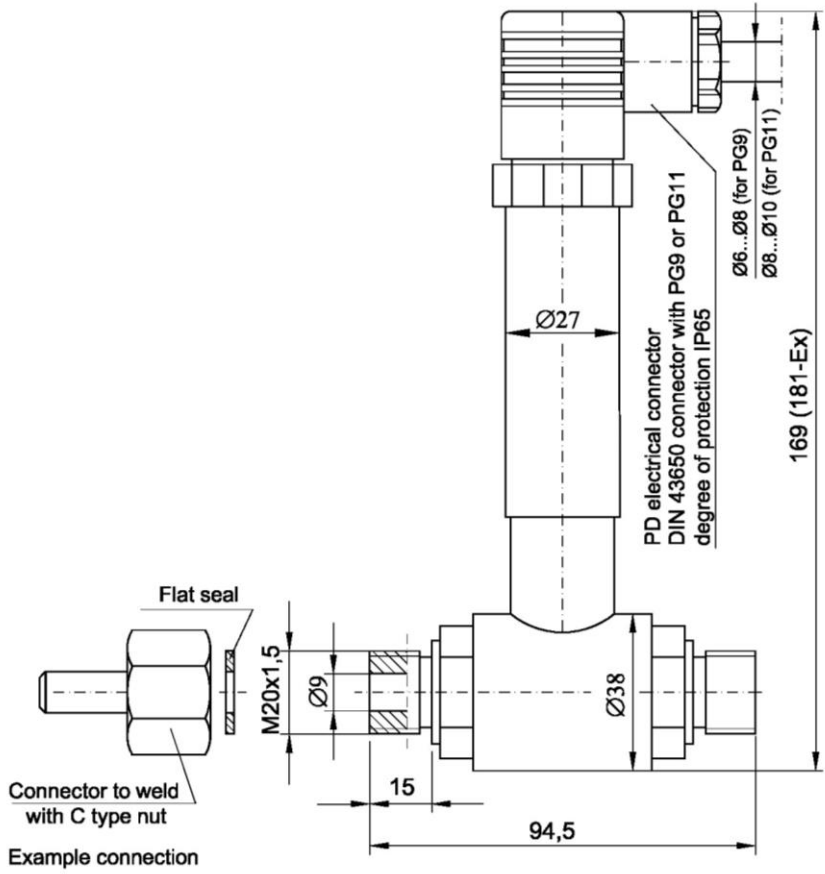


Figure 11. D32 differential pressure transmitter with PD, PK connectors

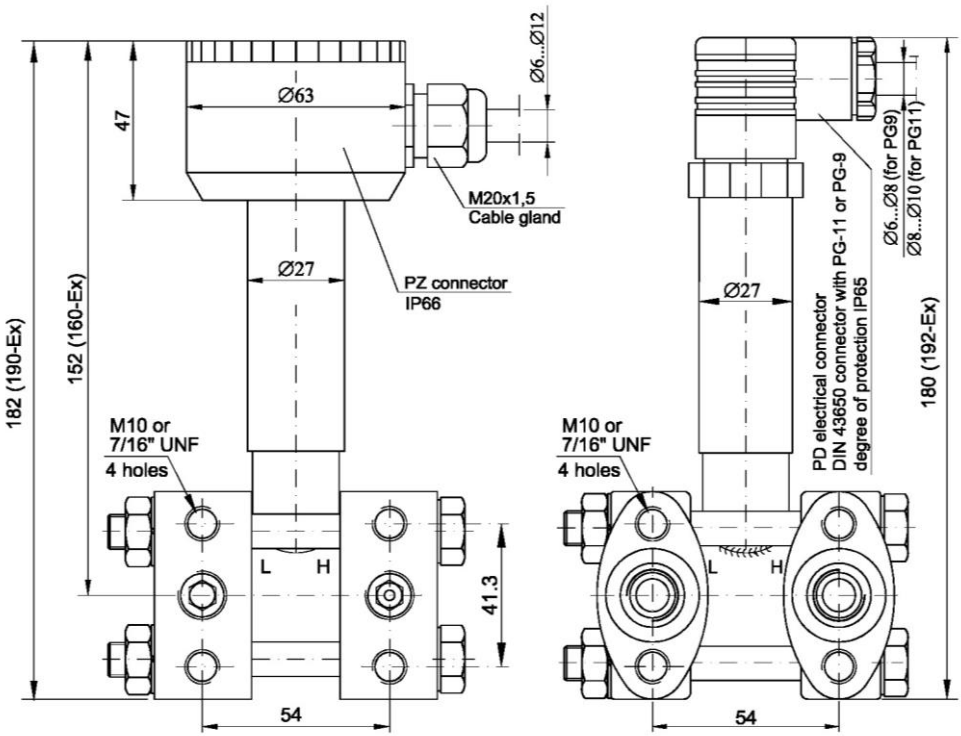


Figure 12. D32 differential pressure transmitter with C-type process connection to be mounted together with valve manifold

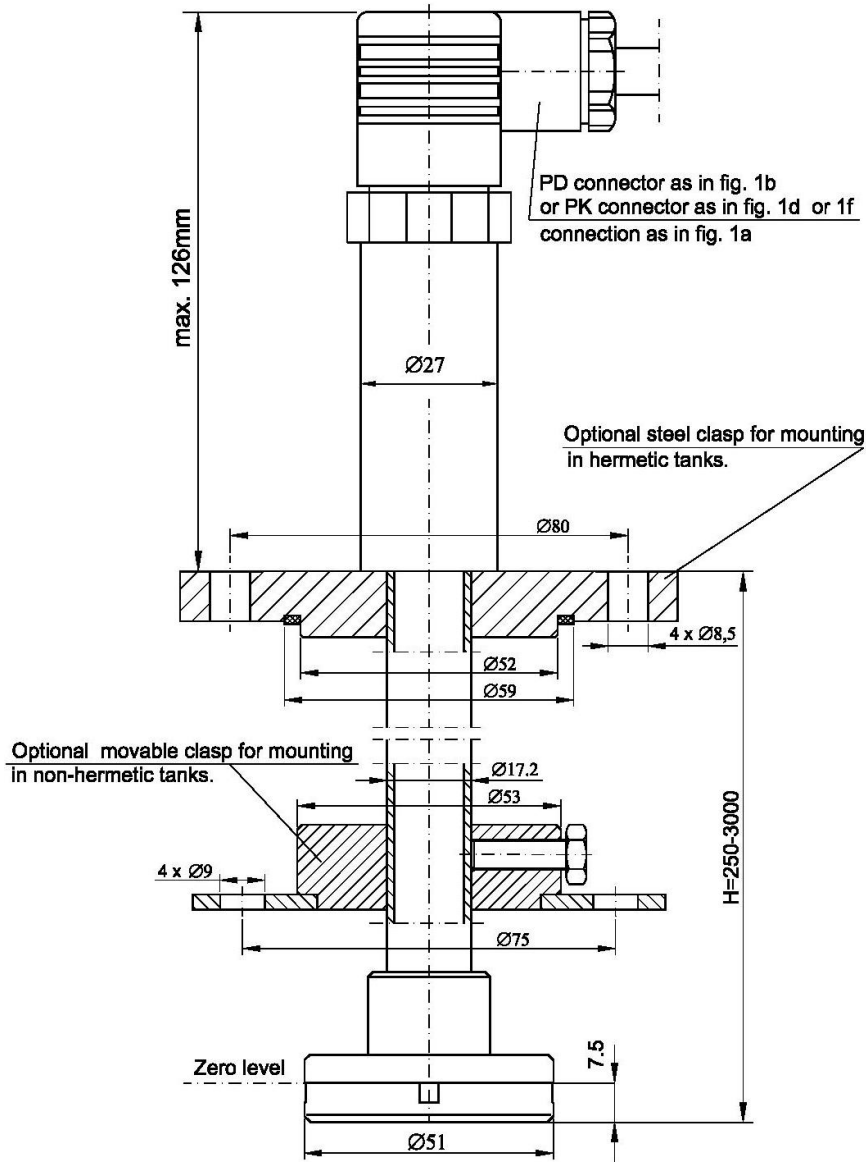


Figure 13. D41 level probes

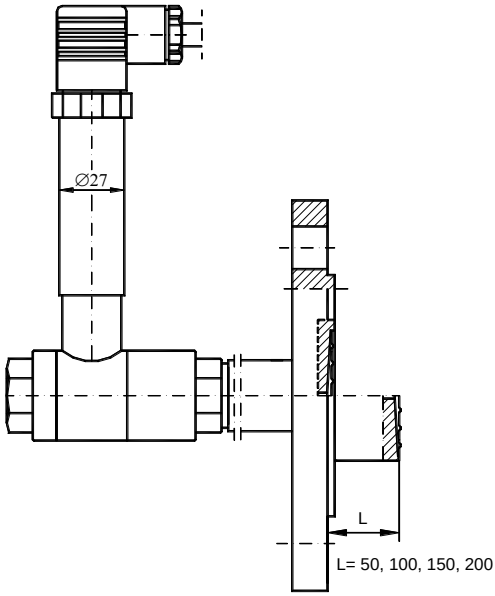


Figure 14. D32 differential pressure transmitter with a single direct diaphragm seal

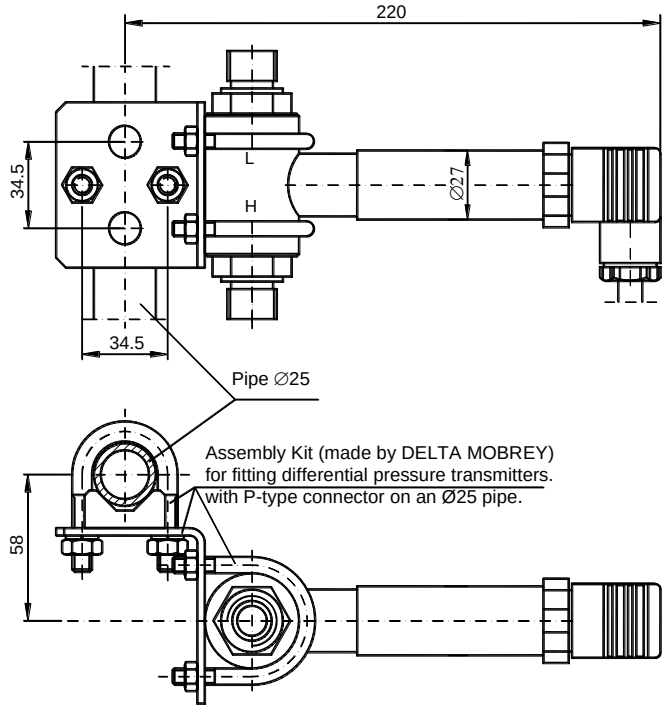


Figure 15. Example: how to install the D32

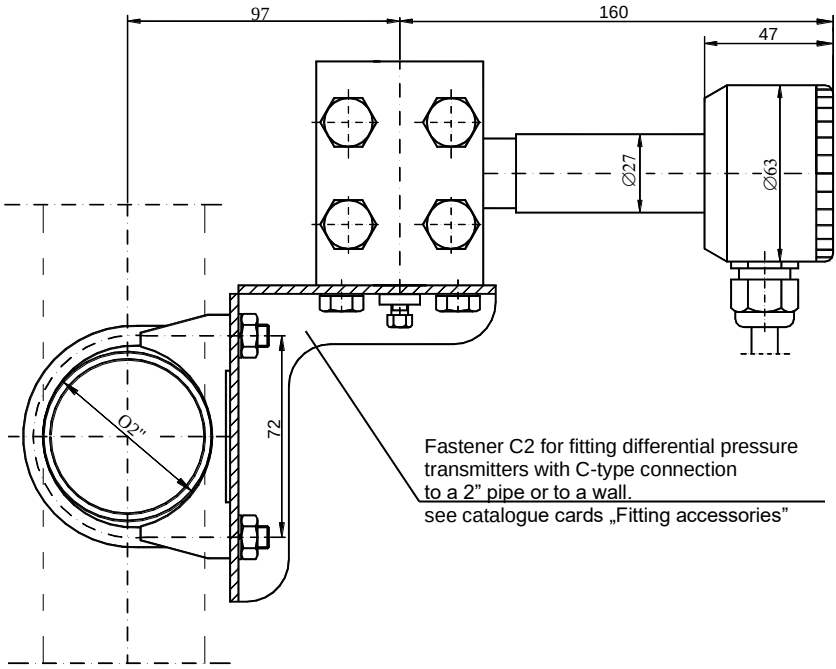


Figure 16. Example: how to install the D32 transmitter on a vertical or horizontal pipe

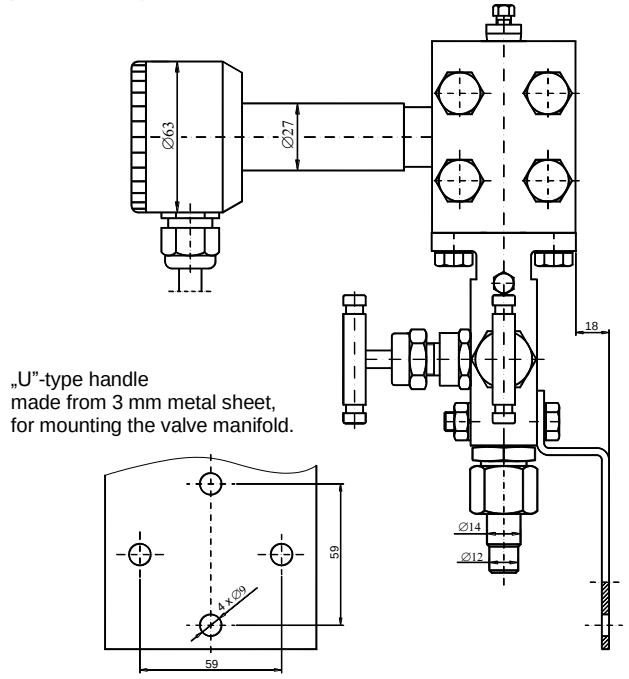


Figure 17. Example: how to install the D32 transmitter with a valve manifold to a wall

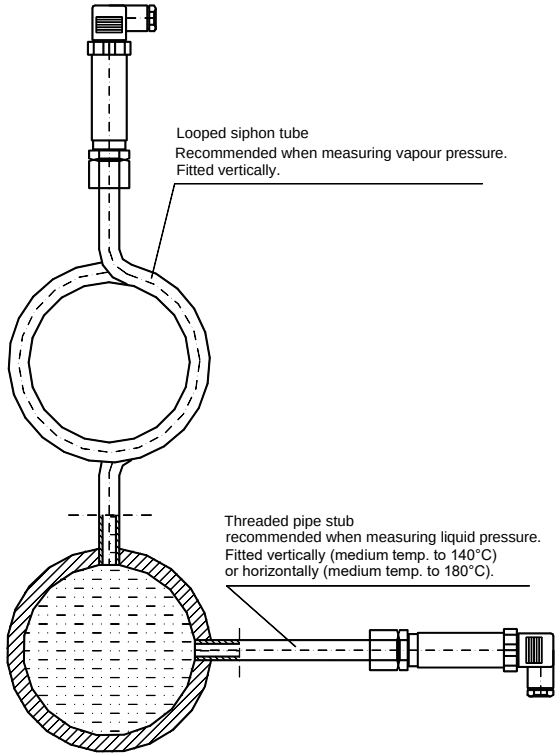


Figure 18. Example of possible method for isolating the transmitter from high temperatures.

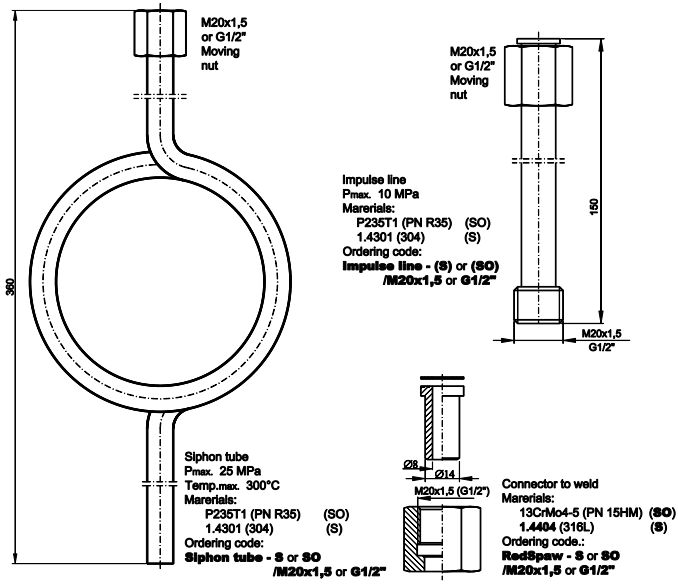


Figure 19. Additional equipment for mounting pressure transmitters.