

PYRP.PYRD.PYRL-28.



USER'S MANUAL





PRESSURE TRANSMITTERS
PYRP-28, PYRP-28IS
DIFFERENTIAL PRESSURE TRANSMITTERS
PYRD-28, PYRD-28IS
HYDROSTATIC LEVEL PROBES
PYRL-28, PYRL-28IS

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Rev.A

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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 authorisation 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 authorised 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.



The manufacturer reserves the right to make changes (not having a negative impact on the operational parameters of the products) without updating the contents of the technical manual.

I. APPENDIX EX.02.....	3
1. INTRODUCTION.....	6
2. USER MATERIALS	6
3. APPLICATIONS AND MAIN FEATURES	6
4. IDENTIFYING MARKS. ORDERING PROCEDURE.....	7
5. TECHNICAL DATA	7
<u>5.1. PYRP-28. TECHNICAL DATA</u>	7
5.1.1. PYRP-28. MEASUREMENT RANGES	7
5.1.2. PYRP-28. OPERATING PARAMETERS	7
<u>5.2. PYRD-28. TECHNICAL DATA</u>	8
5.2.1. PYRD-28. MEASUREMENT RANGES	8
5.2.2. PYRD-28. OPERATING PARAMETERS.....	8
<u>5.3. PYRP-28, PYRD-28.- COMMON PARAMETERS</u>	8
5.3.1. PYRP-28, PYRD-28 . ELECTRICAL PARAMETERS	8
5.3.2. PYRP-28, PYRD-28. PERMITTED ENVIRONMENTAL CONDITIONS	8
5.3.3. PYRP-28, PYRD-28. CONSTRUCTION MATERIALS	8
<u>5.4. PRESSURE CONNECTORS</u>	9
5.4.1. PYRP-28. PRESSURE CONNECTORS	9
5.4.2. PYRD-28. PRESSURE CONNECTORS.....	9
<u>5.5. PYRP-28, PYRD-28 ELECTRICAL CONNECTORS AND INGRESS PROTECTION RATING OF CASE</u>	9
6. CONSTRUCTION	9
<u>6.1. MEASUREMENT PRINCIPLES</u>	9
<u>6.2. CONSTRUCTION</u>	9
<u>6.3. CASING, ELECTRICAL CONNECTIONS</u>	9
7. INSTALLATION LOCATION OF TRANSMITTERS.....	11
<u>7.1. GENERAL NOTE</u>	11
<u>7.2. LOW AMBIENT TEMPERATURE</u>	11
<u>7.3. HIGH MEDIUM TEMPERATURE</u>	11
<u>7.4. MECHANICAL VIBRATION, CORROSIVE MEDIA</u>	11
8. INSTALLATION AND MECHANICAL CONNECTIONS	12
9. ELECTRICAL CONNECTION.....	12
<u>9.1. GENERAL RECOMMENDATIONS</u>	12
<u>9.2. CONNECTIONS FOR TRANSMITTERS WITH PD-TYPE CONNECTOR</u>	13
<u>9.3. CONNECTIONS FOR TRANSMITTERS WITH PK OR PM12-TYPE CONNECTOR</u>	13
<u>9.4. CONNECTIONS FOR TRANSMITTERS WITH TERMINAL BOX (PZ-TYPE CONNECTOR)</u>	13
<u>9.5. PROTECTION FROM EXCESS VOLTAGE</u>	13
<u>9.6. EARTHING</u>	14
10. SETTING OF ZERO POSITION AND MEASUREMENT RANGE	14
11. SERVICES AND SPARE PARTS.....	14
<u>11.1. PERIODIC SERVICE</u>	14
<u>11.2. UNSCHEDULED SERVICES</u>	14
<u>11.3. CLEANING THE DIAPHRAGM SEAL, OVERLOADING DAMAGE</u>	14
<u>11.4. SPARE PARTS</u>	14
12. PYRL-28 LEVEL PROBES	15
<u>12.1. APPLICATIONS</u>	15
<u>12.2. PYRL-28. TECHNICAL DATA</u>	15
<u>12.3. PRINCIPLES OF OPERATION, CONSTRUCTION</u>	15
<u>12.4. PLACE AND METHOD OF INSTALLATION, FITTING</u>	15
<u>12.5. ELECTRICAL CONNECTION. SETTINGS</u>	15
<u>12.6. EARTHING</u>	16
13. PACKING, STORAGE AND TRANSPORT	16
14. GUARANTEE	16
15. ADDITIONAL INFORMATION	16
<u>15.1. RELATED DOCUMENTS</u>	16
<u>15.2. RELATED STANDARDS</u>	16
16. FIGURES.....	17

I. APPENDIX Ex.02

DTR.PYRP.PYRD.PYRL-28(ENG),
Appendix Ex.02



PYRP-28IS/XX/YY, PYRL-28IS/XX/YY PRESSURE TRANSMITTERS,
TYP PYRD-28IS/XX/YY DIFFERENTIAL PRESSURE TRANSMITTER
Ex VERSIONS according to ATEX

1. Introduction

1.1. The "Appendix Ex.02" to DTR.PCE.PYRD-28(ENG) applies to PYRP-28IS/XX/YY, PYRL-28IS/XX/YY and and PYRD-28IS/XX/YY transmitters in Ex version according to ATEX, marked on the rating plate as shown in 2.2 and 3. and signed "Ex" in the Product Certificate, only.

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 DTR.PYRP.PYRD-28(ENG) in conjunction with "Appendix Ex.02".

2. Using of PYRP-28IS/XX/YY, PYRL-28IS/XX/YY and PYRD-28IS/XX/YY transmitters in danger zones.

2.1. The PYRP-28IS, PYRL-28IS and PYRD-28IS transmitters are produced in accordance with the requirements of the following standards: EN 60079-0:2009, EN 50303:2000, EN 60079-26:2007, EN 60079-11:2007 EN 61241-11:2006.


2.2. The transmitters may operate in areas where there is a risk of explosion, in accordance with the rating of the explosion protection design:



II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
I M1 Ex ia I Ma
II 1D Ex ia IIIC T105°C Da
KDB

3. Identifying marks

Intrinsically safe transmitters (Ex version) must have a rating plate containing the information specified in paragraph 4 of DTR.PYRP.PYRD-28(ENG) and also at least the following:

- CE mark and the notified unit number: 0359, mark 
- designation of explosion protection design, certificate number
- values of parameters such as: U_i , I_i , C_i , L_i
- type of electrical and process connectors
- manufacture year and serial number

4. User information.

Together with the transmitters, user will receive: User's Manual signed DTR.PYRP.PYRD-28 (ENG) with the Appendix Ex.02.

5. Permissible input parameters (based on data from the KDB..... certificates and certification documentation).



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:



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

- for power supply with a linear characteristic
 $U_i = 28V$ $I_i = 0,1A$
- for power supply with a "trapezoidal" and "rectangular" characteristic
 $U_i = 24V$ $I_i = 0,08A$

Input inductance and capacity: $C_i = 40nF$, $L_i = 0,9mH$

Pi for all type of power supply - see Table 1

Table 1

Pi [W]	Dt [°C]	Tp [°C]	Temperature classification	Pi [W]	Dt [°C]	Tp [°C]	Temperature classification
1.5	24.7	55	T6	0.9	14.8	65	T6
		70	T5			80	T5
		80	T4 and Group I			80	T4 and Group I
1.2	19.7	60	T6	0.6	9.9	70	T6
		75	T5			80	T5, T4 and Group I
		80	T4 and Group I			1.5	24.7

Tp – temperature of enclosure of transmitter mounted on installation without power supply, determined for maximum ambient temperature

Special conditions for safe use:

- electrical installation of pressure transmitters shall comply with installation requirements of valid standard.

6. Supply examples.

6.1.- for power supply with a linear characteristic

Power supply with a “linear” characteristic may be e.g. a typical barrier with parameters
Uo=28V Io=0.093A Rw=300Ω.

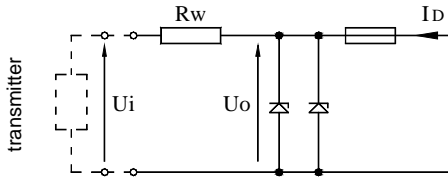


Fig.1. Power supply from a source with “linear” characteristic

6.2. –for power supply with a trapezoidal characteristic

Supply parameters according to the certificate:

a) Uo=24V Io=0,08A Po=1,2W

b) Uo=24V Io=0.05A Po=0,6W

Example of power supply from a source with trapezoidal characteristic (see Fig.2).

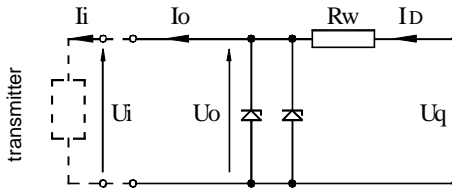


Fig.2. Power supply from a source with trapezoidal characteristic”

If $U_o \leq \frac{1}{2} U_q$ then parameters U_q, I_o, P_o are interrelated as follows:

$$U_q = \frac{4P_i}{I_o}, \quad R_w = \frac{U_q}{I_o}, \quad P_o = \frac{U_o(U_q - U_o)}{R_w}$$

6.3. -for power supply with rectangular characteristic

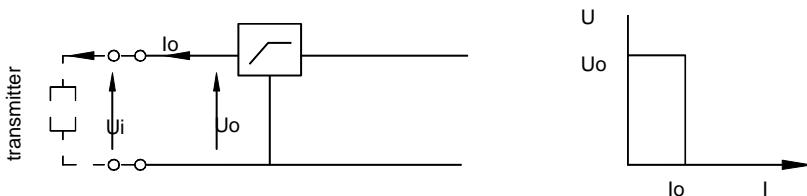


Fig.3. Power supply from a source with rectangular characteristic

$U_0=24V$ $I_0=0,05A$ $P_0=1.2W$

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 a 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 $U_0=24V$, with the "ib" level protection and current limited to $I_0=50mA$.

Such current limit ensures that the power P_i will not be exceeded ($0,05A \times 24V = 1,2W$)

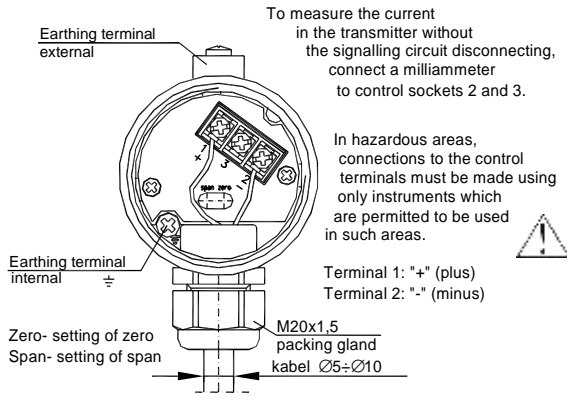
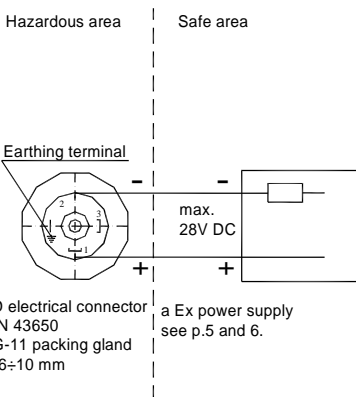
and the powering of two transmitters simultaneously is possible.

7. How to connect Ex transmitters: PYRP–28IS, PYRL–28IS and PYRD–28IS

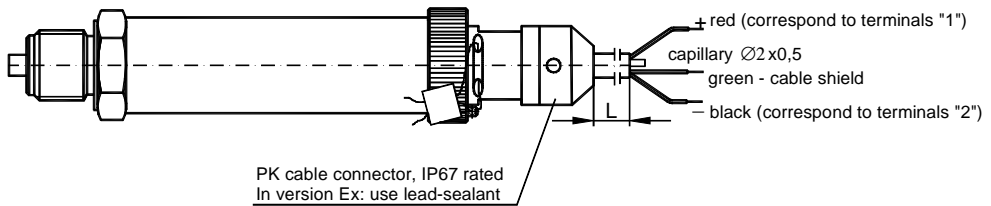


The transmitter and other devices in the measuring loop should be connected in accordance with the intrinsic-safety and explosion-safety regulations and the conditions for use in dangerous areas.

Failure to observe the intrinsic-safety regulations can cause explosion and the resulting hazard to people.



PZ connector (terminal box), terminals 1, 2 of the box correspond to terminals 1, 2 of the PD connector.



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 manufacturer or another authorised party only.



1. INTRODUCTION

1.1. This user's manual is intended for **PYRP-28** electronic pressure transmitters, **PYRD-28** differential pressure transmitters and **PYRL-28** level probes, containing the data and guidelines necessary to understand the functioning of the transmitters and how to operate them. It includes essential recommendations concerning installation and use, as well as emergency procedures.

1.2. Technical literature for the **PYRP-28** and **PYRD-28** transmitters with diaphragm seal connectors and technical data for seals are contained within a separate catalogue.

1.3. The transmitters comply with the requirements of EU directives as shown on the plate and with the relevant Declaration of Conformity.

1.4. Additional data on **PYRP-28IS**, **PYRD-28IS** transmitters and **PYRL-28IS** probes in Ex version: covered by the common EC-type test certificate **KDB** are contained in the appendix designated **DTR.PYRP.PYRD-28(ENG)**. **Appendix Ex.02**.



During installation and use of **PYRP-28IS**, **PYRD-28IS** transmitters and **PYRL-28IS** probes in Ex version, reference should be made to **DTR.PYRP.PYRD-28(ENG)** in conjunction with **Appendix Ex.02**

2. USER MATERIALS

Transmitters are delivered in single and/or multiple packs.

A batch of transmitters is supplied together with the User's Manual.

At the customer's request, a "Declaration of Compliance" and/or Certificate will be supplied.

(These documents can also be found at www.pyropress.com)

3. APPLICATIONS AND MAIN FEATURES

3.1. The **PYRP-28** pressure transmitters are designed to measure gauge pressure, vacuum pressure and absolute pressure of gases, vapours and liquids that are compatible with the wetted parts material.

3.2. **PYRD-28** differential pressure transmitters are used to measure liquid levels in closed tanks, and to measure differential pressure at filters, orifices etc. of gases and vapours that are compatible with the wetted parts material

PYRD-28 differential pressure transmitters with P-type connectors are designed to work with static pressure of up to 40 Bar (see fig.7).

PYRD-28 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 320 Bar (see fig.8).

3.3. The **PYRP-28** can be fitted with a range of additional process connectors, enabling them to be used in a variety of conditions, such as dense media, reactive media, high and low temperature etc.

Data on these connectors can be found within a separate catalogue.



To measure a medium which contains suspensions or impurities, or is viscous, hot, corrosive etc., use the **PYRD-28** transmitter with a single diaphragm seal.

3.4. For depth measurements in open tanks, the transmitters are fitted with sensing modules with an extensor tube, and are referred to as the **PYRL-28** level probes (for details see Section 12).

3.5. The **PYRP-28** or **PYRD-28** transmitters and the **PYRL-28** probes generate a 4...20mA signal using two-wire transmission, other **PYRP-28** and **PYRD-28** solution can be produced with 0...20mA or 0...10V signal using three wire transmission.

4. IDENTIFYING MARKS. ORDERING PROCEDURE

4.1. Every transmitter and probe carries a rating plate containing at least the following information: CE mark notified body numbers and certificates obtained designations, manufacturer name, type, serial number measurement range, output signal, power supply voltage.

4.2. **PYRP-28IS, PYRD-28IS and PYRL-28IS** transmitters in Ex version, in accordance with the ATE) directive, have additional marks as described in DTR.PYRP.PYRD-28(ENG) Appendix Ex.02 paragraph 3.

4.3. The designations to be used when ordering can be found in the Catalogue.

5. TECHNICAL DATA

5.1. PYRP-28. Technical Data

5.1.1. PYRP-28. Measurement Ranges

The **PYRP-28** transmitter can be produced with any desired range in the following spans:

0...10mbar÷0...1000bar (over pressure, under pressure)
400mbar ÷ 80bar (absolute pressure).

Recommended standard 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. PYRP-28. 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)
Burst pressure	2bar (200kPa)	5bar (500kPa)	8 x range, max 2000bar (200MPa)
Accuracy	0,3%	0,2%	(0,16 %- special version)
Thermal error	typically 0,3% / 10° C;	max 0,4% /10° C	typically 0,2% /10° C; max 0,3% /10° C
Long term stability	0,2 % / year	0,1 % / year	
Hysteresis and repeatability	0,05%		

5.2. PYRD–28. Technical Data

5.2.1. PYRD–28. Measurement Ranges

The PYRD–28 differential pressure transmitters are manufactured with any desired range in the span between 0 - 16mbar to 0 - 25 bar.

Recommended ranges: 0,4; 1; 2,5; 6; 10; 16; 25bar
(-0,1...0,1); (-1...1) bar

5.2.2. PYRD–28. 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%		
Long term stability	0.2%/year	0.1%/year		
Thermal error / 10°C	typical 0,3%/10°C max 0,4%/10°C	typical 0,2%/10°C, max 0,3%/°C		
Zero shift error for static pressure *	0,1% / 10 Bar			
Hysteresis and repeatability	0,05%			

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

5.3. PYRP-28, PYRD-28.- Common parameters

5.3.1. PYRP–28, PYRD–28 . Electrical Parameters

Power supply for non-intrinsically safe versions 10,5 - 36V DC, rated 24V DC (for output signal 4 - 20mA)
15 - 30V DC- (for output signal 0 - 10V, 0 - 20mA)

Power supply for intrinsically safe versions in accordance with Appendix Ex.02.

Output signal	4 - 20mA two-wire transmission 0 - 10 V three-wire transmission 0 - 20 mA three-wire transmission
Error due to supply voltage changes	0,005 % /V
Load resistance (for output signal 4 - 20mA)	$R[\Omega] = \frac{U_{sup}[V] - 10,5V}{0,02A}$
Load resistance (for output signal 0 - 10V)	$R \geq 5k\Omega$
Error due to supply voltage changes	0,005 %/V
Voltage for insulation strength testing	500 VAC or 750 VDC, see p.9.5.
Excess voltage protection	see p.9.5.

5.3.2. PYRP–28, PYRD–28. Permitted Environmental Conditions

Ambient temperature limit -40 to +80°C (for PYRP-28)
Ambient temperature limit -25°C to +80°C (for PYRD-28)

(Operating temperature range for intrinsically safe versions in accordance with Appendix Ex.02.)

Process temperature limit	-40 to +120°C – direct measurement, over 120°C, only with the use of a diaphragm seal, radiator, looped siphon tube or impulse line.
Thermal compensation range	-10 to +80°C (for PYRP-28) or by arrangement
Thermal compensation range	0 - 70°C (for PYRD-28) or by arrangement
Relative humidity	0 - 98%

Vibration during operation

max 4g

5.3.3. PYRP–28, PYRD–28. Construction Materials

Diaphragm	Stainless steel 316L
Sensing module	Stainless steel 316L
Casing for electronic parts	Stainless steel 304
PZ-type terminal box	Stainless steel 304
Angular connector, DIN 43650, PD type	Itamid
Internal sensor liquid fill	Silicone oil, chemically inactive liquid for measurement of oxygen.
Cable shield in PK connector	Polyurethane, special version – teflon

5.4. Pressure Connectors

5.4.1. PYRP–28. Pressure Connectors

M & MG-type connector with M20x1.5 thread – see figure 3a

P & PH -type connector with M20x1.5 thread – see figure 4a.

T, TH or MF-type connector with flush diaphragm – see figure 5a.

RM-type connector with M20x1.5 thread and radiator – see figure 3a

RG-type connector with G1/2" thread – see figure 6a

GC or GH -type connector with G1/2" thread – see figure 6a

GF-type connector with G1/2" thread and flush diaphragm – see figure 6c

GD-type connector with G1" thread and flush diaphragm – see figure 6e

N-type connector with 1/2"NPT thread (male) and with internal G1/4" thread (female).

X-type Diaphragm seal – refer to literature

Other connection types by arrangement

5.4.2. PYRD–28. Pressure Connectors

P-type connectors with M20x1.5 thread – see fig. 7.

C-type connector to mount together with a valve manifold see fig. 8.

X-type Diaphragm seal – refer to literature

5.5. PYRP–28, PYRD–28 Electrical Connectors and Ingress Protection Rating of Case

PYRP-28, PYRD-28 with PD-type connector, DIN 43650, PG-11 gland. IP65 rated (EN 60529:1991/A1:2000)

PYRP-28, PYRD-28 with PZ-type terminal box, M20x1,5 packing gland. IP66 rated (EN 60529:1991/A1:2000)

PYRP-28, PYRD-28, PYRL-28 with PK-type cable connector. IP67 rated (EN 60529:1991/A1:2000)

PYRP-28 with PM12-type connector. IP67 rated (EN 60529:1991/A1:2000)

6. CONSTRUCTION

6.1. Measurement Principles

The **PYRP-28**, pressure transmitters, **PYRD-28** differential pressure transmitters and the **PYRL-28** level probes operate by converting changes in the piezoresistive bridge, which are proportional to the measured pressure, into a standard current or voltage output signal.

The active sensing device is a silicon diaphragm with diffused piezoresistors, separated from the medium by an isolating diaphragm and oil.

6.2. Construction

The basic component of the transmitter and probe is the sensing module, in which the input pressure is converted into an electrical signal. The sensing modules are fitted with process connections (see para. 5.4). The second element of the transmitter is an electronic unit which amplifies and conditions the output signal. This is fitted with potentiometers which can be used to set the zero and the range positions.

For the measurement of dense, chemically reactive, or high-temperature media, the transmitters are fitted additionally with various types of diaphragm seal connectors, depending on the type of medium and environmental conditions (details can be found within a separate catalogue.)

6.3. Casing, Electrical Connections

6.3.1. The casing of the **PYRP-28** and **PYRD-28** transmitters, made from $\varnothing 27$ pipe, is permanently mounted on the sensing module as shown in figure 1b and 7. On the other side is a **PD** type electrical connector with PG-1" packing gland. By unscrewing and removing the connector, access can be gained to the potentiometers used to set the zero and range setting.

6.3.2. The **PYRP-28, PYRD-28** transmitters may be fitted with a **PK** cable connector (see figure 1c) or **PM12** (**PYRP-28 only**) (see figure 1f), mounted similarly to the **PD** connector. The body of the connector contains a permanently fixed and sealed cable of standard length 3m (other lengths can be produced to order). The cable contains a capillary which connects one side of the measuring diaphragm to the atmosphere.

6.3.3. The **PYRP-28, PYRD-28** transmitters with a **PZ** type connector has a terminal box permanently mounted on the upper part of the casing (figure 2). The box is sealed with a threaded lid. Mounted internally are terminals marked 1, 2 and 3.

PZ type connector has an internal, and in Ex version also external earthing terminal.

7. INSTALLATION LOCATION OF TRANSMITTERS

7.1. General note

7.1.1. The **PYRP-28** transmitters can be installed both indoors and outdoors. It is recommended that transmitter intended for outdoor use be placed under cover.

There is no need for a cover in the case of transmitters with **PZ** and **PK** type connectors.

7.1.2. The location of the installation should be chosen in such a way as to allow access to the device and to protect it 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 the 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. Should the installation location endanger the integrity of the process connection or the electrical connection causing leaking medium or the possibility of sparking a more appropriate location should be selected for the transmitter.



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.

The **PYRP-28** and **PYRD-28** transmitters may be used to measure media with temperatures of up to 120°C.

To protect the sensing module from temperatures in excess of 120°C, suitably long impulse lines are used to disperse the heat and to lower the temperature of the module.

Where it is not possible to use impulse lines of the required length, **PYRP-28** transmitters with remote diaphragm seals should be used please refer to separate catalogue.



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

7.4. Mechanical Vibration, Corrosive Media.

7.4.1. Transmitters should correctly work with vibrations with amplitudes to 1,6 mm and accelerations to 4g. If strong vibrations are carried via the pressure line use should be made of flexible lines or transmitters with a remote diaphragm seal.

7.4.2. Transmitters should not be installed in places where the diaphragm, made of 316L steel would be subject to corrosion by the medium being measured.



If possible, transmitters with diaphragms made of Hastelloy C276 should be used, or other means of protection applied (e.g. in the form of a separating liquid) or transmitters with diaphragm seals adapted for measuring aggressive mediums should be used. Please refer to separate catalogue.

8. INSTALLATION AND MECHANICAL CONNECTIONS

8.1. The **PYRP-28** transmitters can be mounted directly on rigid impulse lines.

Where connectors are used as in figures 3a, 4a, 5a, 6a, 6c, 6e it is recommended that connection sockets be used as shown in figure.3b, 4b, 5b, 6b or 5c, 6d, 6f.

Where the connectors are as in figures 4a, 5a and 6c, 6e flat gaskets are to be used with each transmitter.

The socket shown as in figure 5c, 6d and 6f 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.

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 **PYRD-28** transmitters can be mounted directly on rigid impulse lines.

To connect the basic versions of transmitters, with two M20 x 1.5 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 an reduction elements "Red Ø6-M" (M20x1,5 / Ø6).

The **PYRD-28** transmitters can be installed using mounting bracket (BF) for wall mounting or attachment to ø2" pipe (Figure 11).

The **PYRD-28** with manifold style (C-type connector) are designed for installation on 3-valve or 5-valve manifolds. When fitted with a manifold BU mounting bracket can be used for wall mounting (figure 13) or without manifold: mounting bracket BCZ (zinc plated steel) or BCS (stainless steel) can be used for wall mounting or 2" pipe mounting (figure 12).

8.3. The **PYRP-28** and **PYRD-28** 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 Pyropress assembly components to isolate the **PYRP-28** transmitters from high temperature media are shown in figure 14.

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 Pyropress connector elements, reduction elements, sockets, valves, reduction clamps and signal tubes.

Information on this subject can be found in the transmitter catalogue.

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.

i 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.

Additional data concerning the diaphragm seals are specified in a separate catalogue.

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 screened twisted 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 compatibility requirements.

It is also beneficial to use anti-interference filters on the primary side of the transformers, the power supplies user for the transmitters and apparatus used in conjunction with them.

9.2. Connections for transmitters with PD-type connector.

The PYRP-28 and PYRD-28 transmitter and PYRL-28 probe fitted with PD type connectors are to be connected as shown in diag.1a.

To make the connections, remove the terminal block from the contact pins together with its cover.

Then remove the block from its cover, levering it off with the end of a screwdriver inserted into the slot provided for this purpose. Connect the wires to the block.

i Where the isolation of the wires in the packing gland is ineffective (for example, when single wires are used) the opening of the gland should be carefully sealed with an elastic sealing compound to obtain IP6t ingress protection. It is useful to form the segment of the signal wire leading to the PG-11 packing gland into a protective loop to prevent condensation from running down in the direction of the gland.

9.3. Connections for transmitters with PK or PM12-type connector.

The PYRP-28 and PYRD-28 transmitter with PK connector or PYRP-28 transmitter with PM12 connector should be connected via a terminal box, in which the transmitter's cable is joined to the remainder of the signal line.

The terminal box must not be completely airtight, as the transmitter must be able to "breathe" through a capillary in the connector cable.

9.4. Connections for transmitters with terminal box (PZ-type connector).

The PYRP-28 and PYRD-28 transmitters with PZ-type connectors should be connected by linking the signal wires to a terminal block, as shown in figure 2. Carefully screw in the cover and cork of the packing gland, making sure the wire is tightly packed.

9.5. Protection from excess voltage

9.5.1. 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, column 2).

9.5.2. In order to protect against excess voltage between the transmission line and the casing or earth (not prevented by the diodes connected between the transmission wires), additional protection is provided in the form of plasma surge arresters (see the table, column 3).

Also external protective devices may be used. When the transmission lines are long, it is advantageous to use one protective device near the transmitter (or inside it), and another near entry points to devices used in conjunction with it.

Internal protection of transmitters and probes:

Table 3

	1	2	3
	Type of transmitter (probe) and type of electrical connector	Protection between wires (TVS diodes) – permitted voltage	Protection between wires and earth and/or casing – type of protection, permitted voltage
1	PYRP-28, PYRD-28 with PZ connector	39V DC	Plasma surge arresters - 100VDC
2	PYRP-28 with PD, PK or PM12 connector	39V DC	Installed by arrangement
3	PYRL-28 with PD, PK connector	39V DC	Installed by arrangement
4	PYRD-28 with PD connector	39V DC	Installed by arrangement

9.5.3. The voltage in the protective elements must not exceed the maximum permitted values given in columns 2 and 3 of the table.

i The insulation test voltages (500V AC or 750V DC) given in 5.1.1 refer to transmitters plasma surge arresters - such protection is not used in Ex versions of transmitters.

9.6. Earthing

The methods of earthing the transmitters are shown in figures 1a, 2.

If the transmitter has, via a connector, a reliable galvanic connection with a properly earthed metal pipe or tank, additional earthing is not necessary.

10. SETTING OF ZERO POSITION AND MEASUREMENT RANGE

The transmitter is factory regulated for the measurement range stated in the order.

After it has been installed, it may become necessary for the zero position to be changed

The way of gaining access to the control knob is described in 6.3.


To perform the regulation, connect and power the transmitter in accordance with its technical parameters.

Supply a pressure equal to the lower limit of the measurement range, and make the output signal equal to 4mA (0mA, 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.

 Potentiometers can be used to shift the zero position and the range by up to 10%, without altering the setting.

 The **PYRP-28** and **PYRD-28** transmitters with output signal $0 \div 10V$ not attain precisely 0V position.

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 seal should be checked for tarnishing and corrosion. Calibration and output should also be checked.

11.2. Unscheduled services

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. Transmitter malfunction can be due to damage caused by overloading, e.g. in cases 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 4mA or rises above 20mA, 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 connector – the entire connector.

PZ connector – cover seal and packing gland.

In the Ex version, the user may replace only the terminal block with angular shield and the seal in the PC connector, or the seal and packing 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 authorised firm

12. PYRL-28 LEVEL PROBES

12.1. Applications

The **PYRL-28** 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.

12.2. PYRL-28. Technical Data

12.2.1. The **PYRL-28** probes are manufactured with measurement ranges in the interval 200 - 3000mm H₂O.

12.2.2. **PYRL-28.** Operating Parameters

	Measurement range	
	0...200 - 500mm H ₂ O	0...700 - 3000mm H ₂ O
Accuracy	0,25%	0,16%
Thermal error of zero	typically 0,3%/10°C, max 0,5%/10°C	typically 0,2%/10°C, max 0,3%/10°C
Thermal error of span	typically 0,2%/10°C max 0,3%/10°C	typically 0,2%/10°C max 0,3%/10°C
Hysteresis, repeatability	0,05%	

12.2.3. **PYRL-28** electrical parameters see para. 5.5.

12.2.4. **PYRL-28** permitted environmental and operating conditions:

Thermal compensation range	0 - 25°C – standard -10 - +70 - special version
Medium temperature	-25 - +80°C
Other parameters	as given in paras 5.3. and 5.4.


12.3. Principles of Operation, Construction

The **PYRL-28** level probes work by converting the pressure of a column of liquid into a standard electrical signal. The **PYRL-28** generate 4 - 20mA output signals with two-wire transmission, although a special version can produce 0 - 20mA or 0 - 10V signals with three-wire transmission.

The probe consists of a sensing module and an electronic assembly, connected with an extension tube whose length depends on the depth being measured. The tube can be fitted with a flange for mounting on the cover of the tank (figure 8). The **PYRL-28** probe can be fitted with PD and PK type connectors, (the connectors are shown on figures 1b, 1c, 9).

12.4. Place and method of installation. Fitting

The level probes are installed in places where liquid levels are to be measured, as described in 12.1. 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. When the probe is installed in the open air, a roof or box should be used to cover the electronic parts. 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.

12.5. Electrical connection. Settings

12.5.1. The **PYRL-28** probe should be connected as shown in figure 1a.

The probes are factory set to the range specified in the order.

The user may adjust the setting within the range 10% using the zero and range potentiometers.

12.5.2. The probes are protected against excess voltage as described in 9.5.

12.6. Earthing.

PYRL-28 probes with PD, PK, PZ connectors, if excess voltage protection is fitted, the probe's extension tube should be earthed.

PYRL-28 probes with PZ connectors, in EX version, should be earthed via the external earth terminal.

13. PACKING, STORAGE AND TRANSPORT

13.1. 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 an air temperature between +5°C and +40°C, and relative humidity of not more than 85%.

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.

13.2. The **PYRL-28** probes are individually packed. Individually packed probes are bound in packages containing several probes. Storage and transport as above.

14. GUARANTEE

14.1 The manufacturer guarantees the proper operation of the **PYRP-28** transmitters for a period of 24 months from the date of purchase and servicing provided under the guarantee and following the guarantee period. In the case of special versions, the guarantee period shall be agreed by the manufacturer and the user, but shall not be less than 12 months.

14.2. The manufacturer guarantees the proper operation of the **PYRL-28** probes for a period of 12 months, as well as servicing provided under the guarantee and following the guarantee period.

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 "Diaphragm seals"

15.2. Related standards

EN 60529:1991/A1:2000	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	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories. – Part 1: Steel flanges.

16. FIGURES

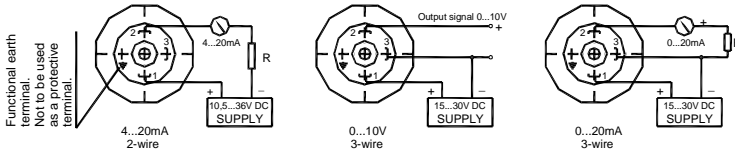


Fig.1a. Wiring diagram for PCE-28, PRE-28 transmitters and PCE-28P probe (Not applicable to Ex version)

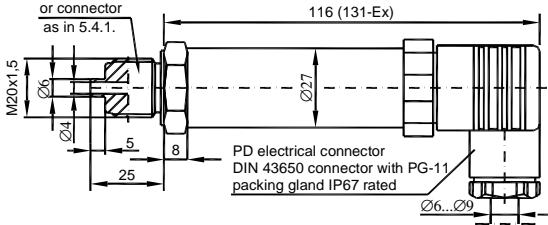


Fig.1b. PCE-28 transmitter with PD connector

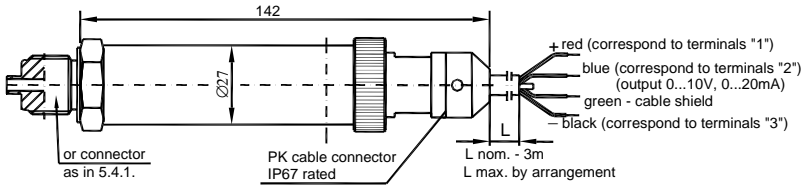


Fig.1c. PCE-28 transmitter with PK connector - (three-wire transmission 0...10V or 0...20mA).

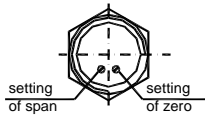


Fig.1e. View of potentiometers of zero and span (PD, PK or PM12)

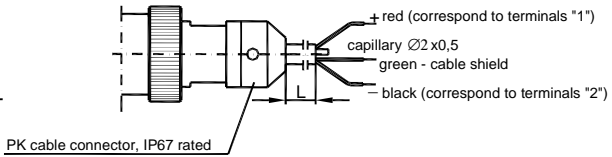


Fig.1d. PCE-28 transmitter with PK connector for output signal 4...20mA

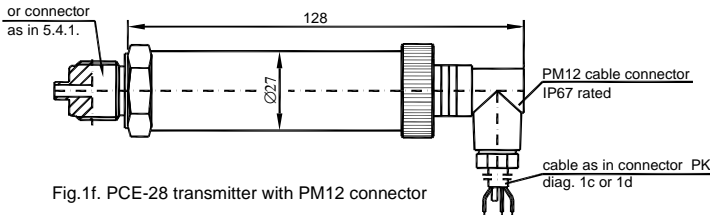
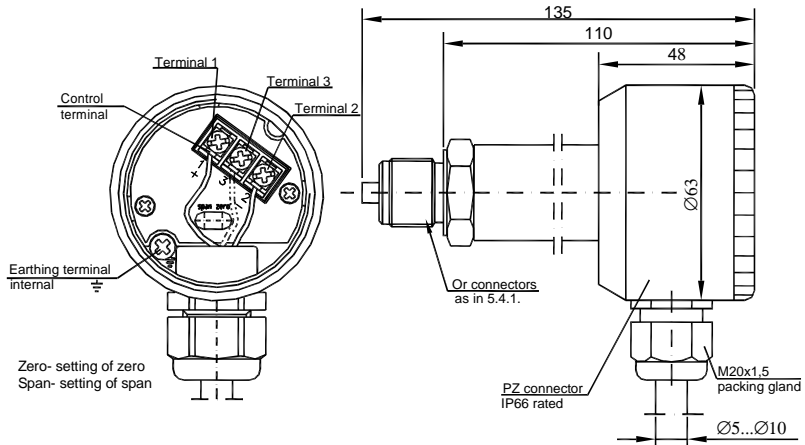


Fig.1f. PCE-28 transmitter with PM12 connector

Figure 1. PYRP-28 transmitter with PD, PK and 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 measure the output without disconnecting the signal circuit connect a multimeter to control terminals 2 and 3 (max. voltage fall on the millimeter: 200mV).

Terminals designation to: 0 ... 20mA and 0 ... 10V output signals:

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

Figure 2. PYRP-28 transmitter with PZ connector: dimensions and connection method.

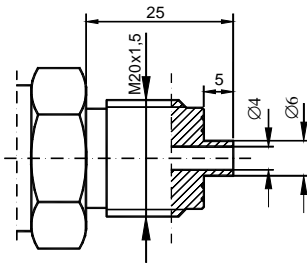


Fig.3a. M connection
with M20x1.5 thread

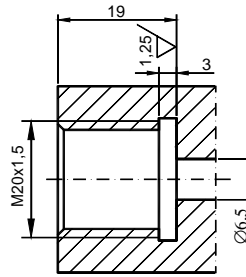


Fig.3b. Socket for M connection.

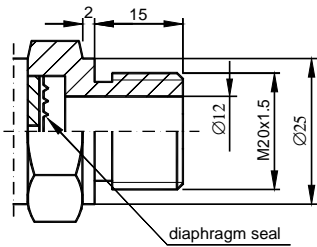


Fig.4a. P connection
with M20x1.5 thread

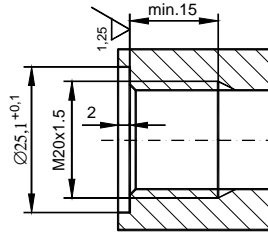


Fig.4b. Socket for P connection

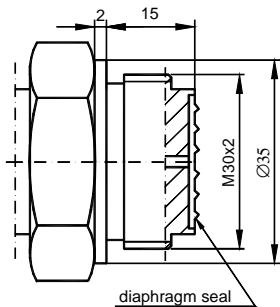


Fig.5a. T connection
with flush diaphragm
with M30x2 thread,

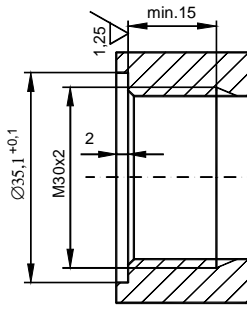


Fig.5b. Socket for
T connection

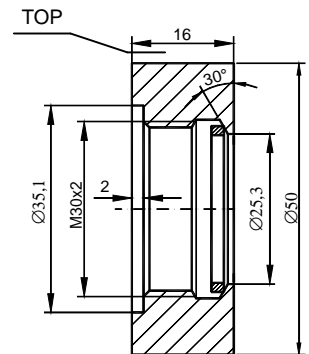


Fig.5c. Weldable fitting ring for
T connection
Sealing: teflon

Order code Socket T



The ring in Fig.5c must be welded in place with the word TOP upwards

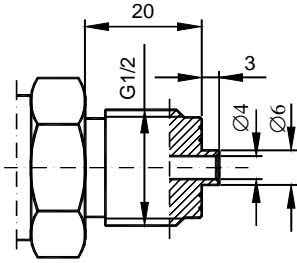


Fig.6a. GB connection with G1/2" thread

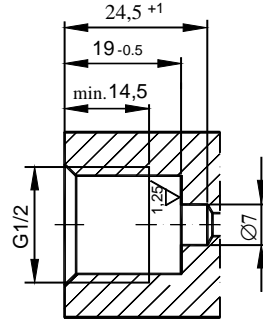


Fig.6b. Socket for GB connection.

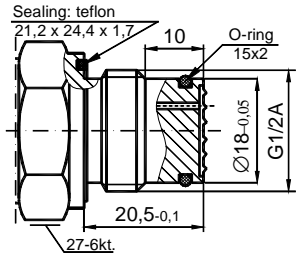


Fig.6c. GF connection with flush diaphragm with G1/2" thread,

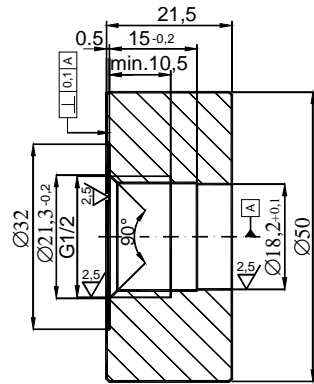


Fig.6d. Weldable fitting ring for GF connection
Order code **Socket CG1/2**

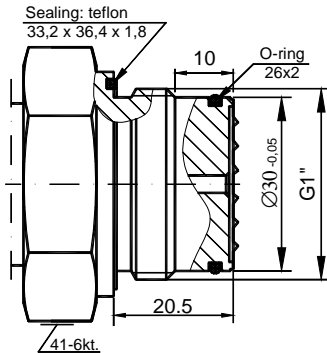


Fig.6e. GD connection with flush diaphragm with G1" thread,

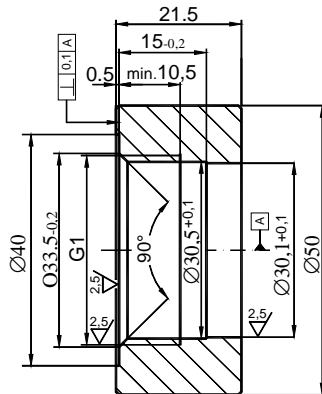
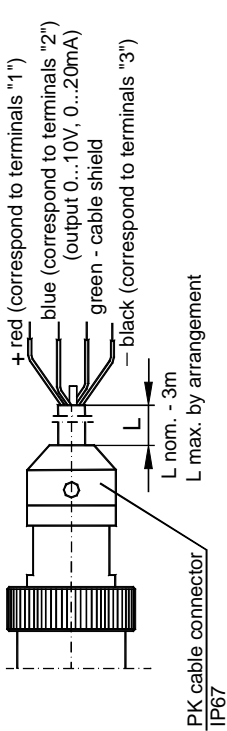
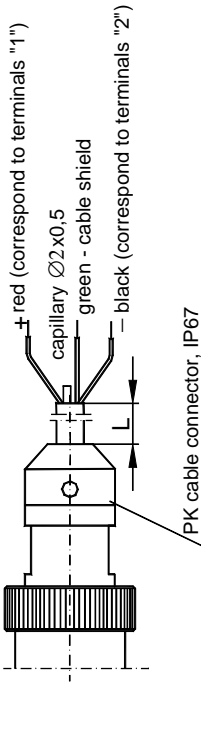


Fig.6f. Weldable fitting ring for GD connection
Order code **Socket CG1**

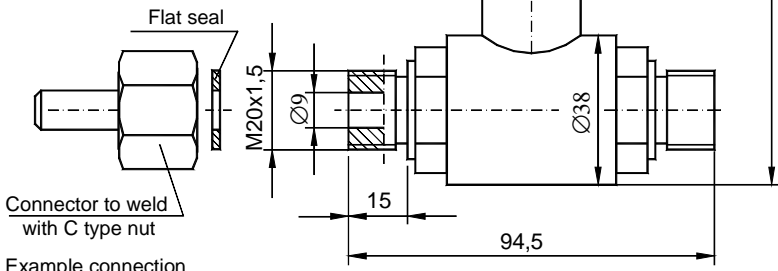
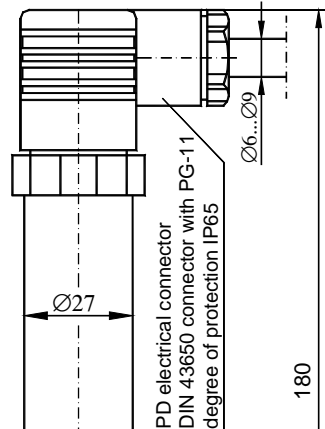
Figure 6. Process connections G1/2" and G1".



PYRD-28 transmitter with PK connector (three-wire transmission 0...10V or 0...20mA).



PYRD-28 transmitter with PK connector for output signal 4...20mA.



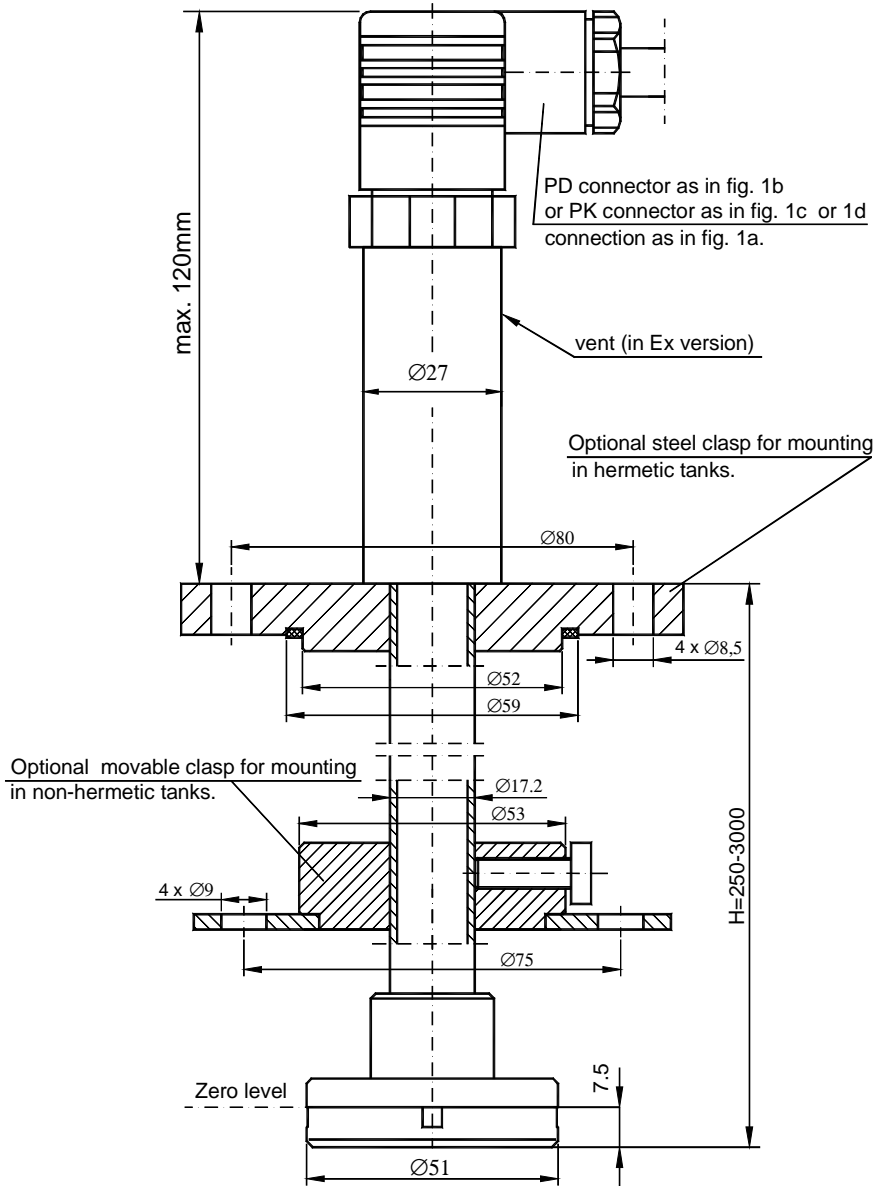


Figure 9. PYRL-28 level probes

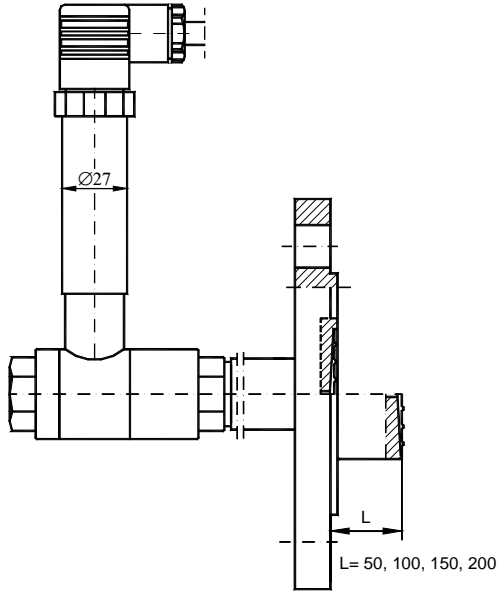


Figure 10. PYRD-28 differential pressure transmitter with a single direct diaphragm seal

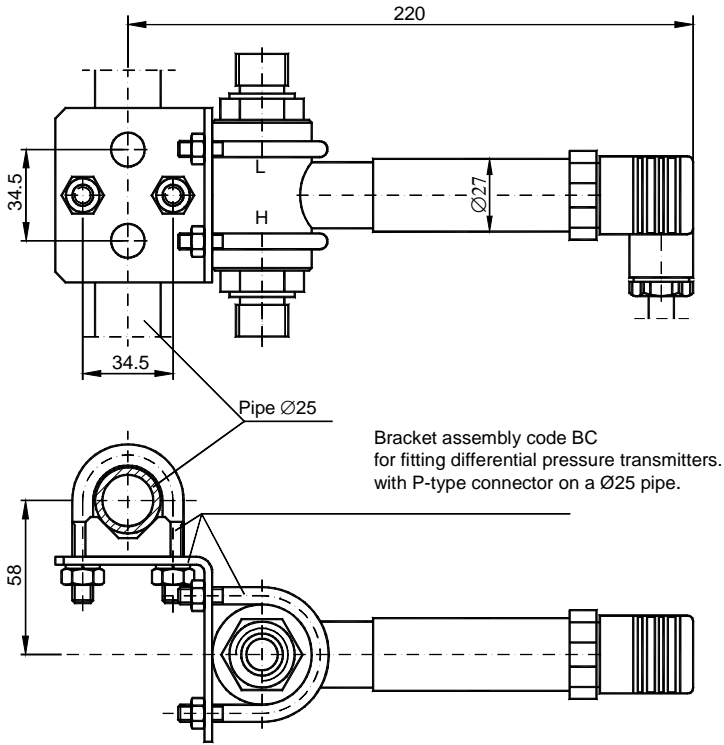


Figure 11. Example: how to install the PYRD-28.

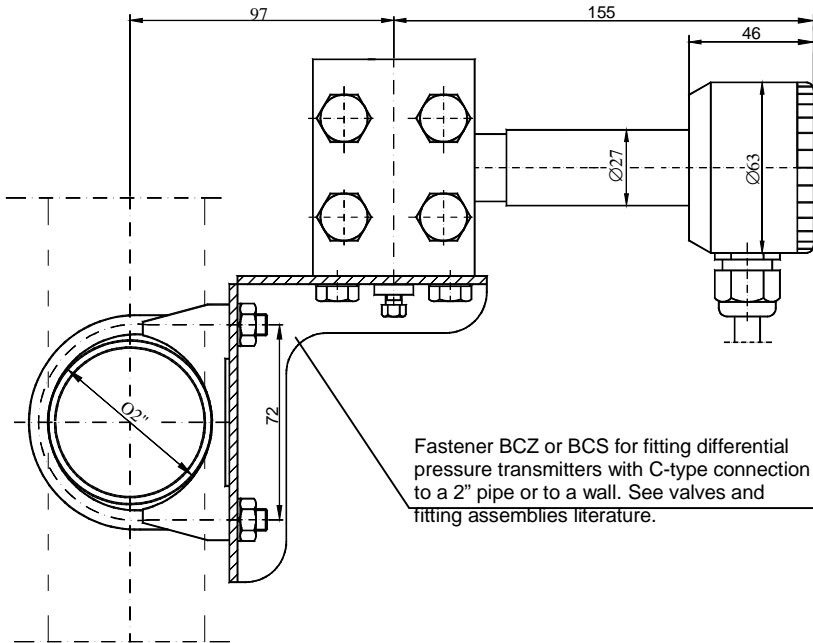


Figure 12. Example: how to install the PYRD-28 transmitter on a vertical or horizontal pipe.

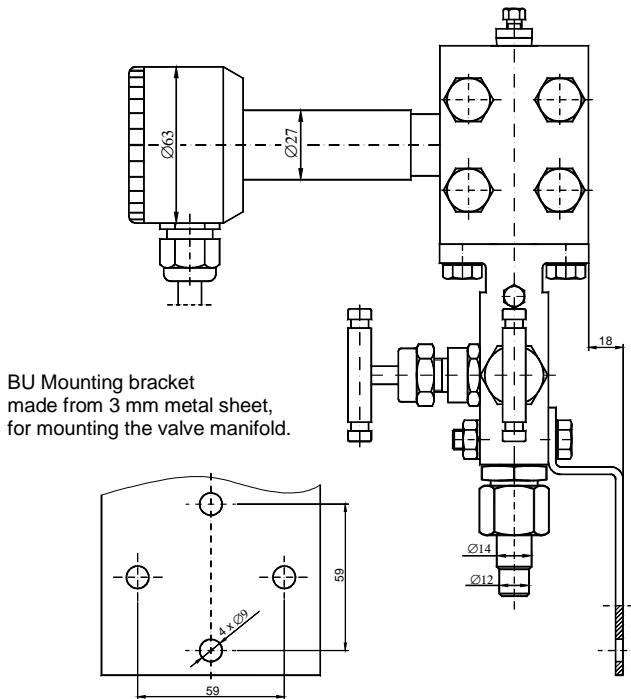


Figure 13. Example: how to install the PYRD-28 transmitter with a valve manifold to a wall

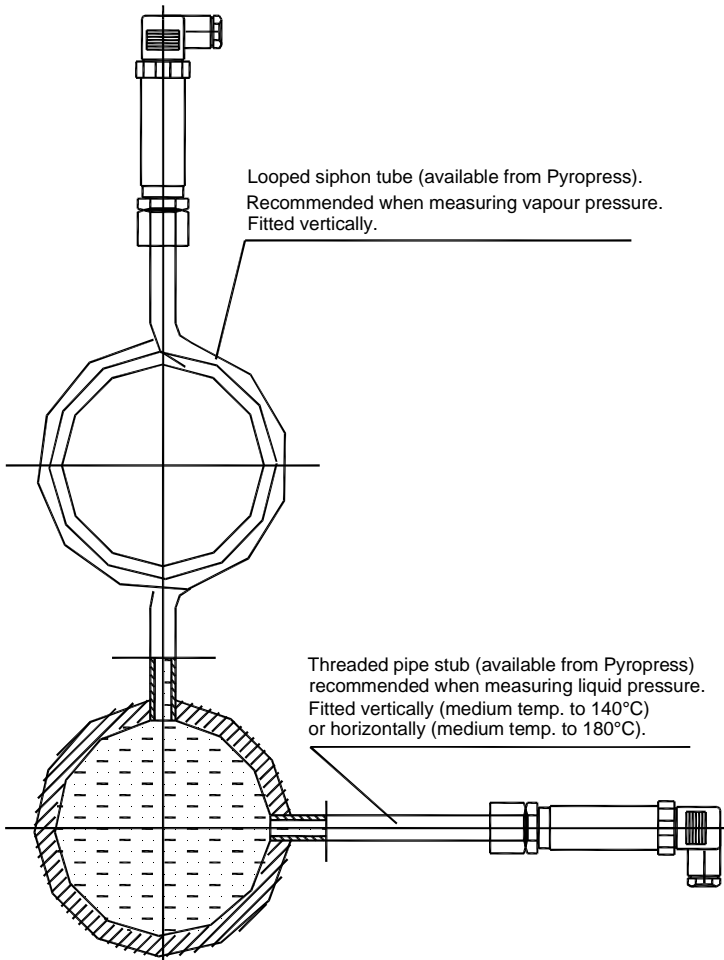


Figure 14. Possible methods of isolating the transmitter from high temperatures

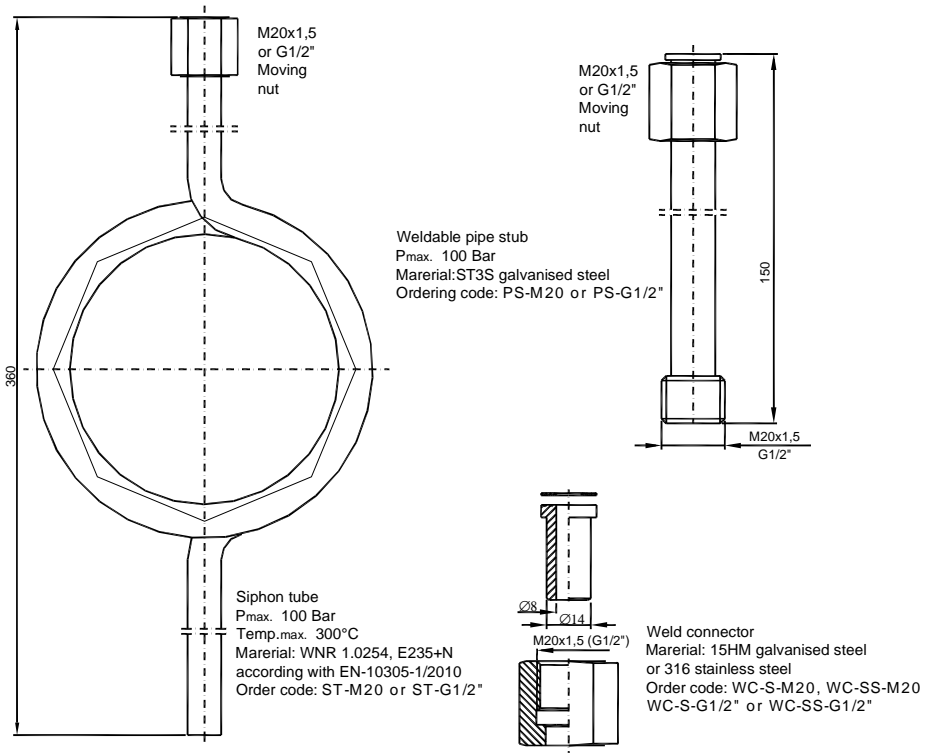


Figure 15. Additional equipment for fitting of pressure transmitters.

