

DTR.PYRP.PYRD.PYRL-28.



INSTALLATION, OPERATION AND MAINTENANCE MANUAL





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

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Rev. C

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Symbols used

Symbol	Description
	Warning – Installer to proceed strictly in accordance with the information contained within the manual in order to ensure the safety and full functionality of the product.
	Denotes information applicable during installation and operation of all listed products.
	Denotes information essential to Exia certified products.
	Denotes information on disposal of used equipment

BASIC REQUIREMENTS AND SAFE USE

- **The manufacturer is not responsible for any damage to property or personnel resulting from incorrect installation, failure to maintain the product in a suitable condition, or use of the product 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 product is deemed to be not functioning correctly, disconnect it and send it for repair to the manufacturer or to a firm authorised by the manufacturer.



- To minimise the risk of malfunction and associated risks to personnel, the product is not to be installed or used in particularly excessive arduous conditions, where the possibility of the following hazards may be present.
- Possibility of mechanical impacts, excessive shocks and vibration;
 - Excessive temperature fluctuation,
 - Condensation of water vapour, dust, icing.



The installation of intrinsically safe versions should be carried out in accordance with the latest hazardous area installation regulations and standards.

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

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1. INTRODUCTION

1.1. This manual covers the **PYRP-28** pressure transmitter, **PYRD-28** differential pressure transmitter and **PYRL-28** hydrostatic level probe, and contains all the necessary information and guidelines to understand their functioning and how to correctly put them to work. It includes instructions and recommendations concerning their installation and use.

1.2. The transmitters comply with the requirements of all the relevant EU directives and this is indicated on the transmitter labelling and the relevant Declaration of Conformity.



1.3. Additional data relating to the ATEX certified Intrinsically Safe versions **PYRP-28IS**, **PYRD-28IS** transmitters and **PYRL-28IS** level probes is provided under the appendix (see page 27).

This appendix must be referred to during the installation and putting to work of these transmitters.

2. CONSIGNMENT CONTENTS

Transmitters are delivered in single and/or multiple packs.

A single batch of transmitters will be supplied with a copy of this manual (more can be supplied on application)

If requested at the ordering stage Calibration Certificates for each transmitter or a common Certificate Of Conformity can be supplied and will accompany the goods.

Non order specific documentation/certificates such as ATEX, SIL 1, PED etc. would be provided when applicable (these can also be downloaded from us 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 designed to measure the difference between two separate inputted pressures on applications such across filters (blocked filter monitoring), orifices (liquid or gas flow monitoring) or liquid levels in closed tanks.

PYRD-28 differential pressure transmitters with N4,GA,GB or P connections are suitable for a maximum static pressure 40 Bar (see fig.7 – typical representation only).

PYRD-28 differential pressure transmitters with C type manifold connection blocks are suitable for a maximum static pressure of 250 Bar (320 Bar and 420 Bar options available) (see fig.8).

3.3. The **PYRP-28** and **PYRD-28** can be fitted with a range of additional process connectors and/or isolating seals enabling them to be used on various challenging media, such as high viscosity, reactive/corrosive to standard wetted parts, and temperature extremes (high and low) etc. Data on these options and ancillary items can be found in a separate technical literature.



3.4. For depth measurements in open tanks the **PYRL-28** hydrostatic level probe variant would be used, this is a pressure transmitter fitted with sensing modules with an extension tube to suit the depth of level required. (see Section 12).

3.5. The **PYRP-28** or **PYRD-28** transmitters and the **PYRL-28** probes provide a 2 wire, 4 - 20mA output signal. Alternatively, the **PYRP-28** and **PYRD-28** can as an supplied with either a 3 wire, 0 - 20mA or 0 - 10V output signal.

4. IDENTIFYING MARKS. ORDERING PROCEDURE

4.1. Every transmitter and probe supplied is fitted with an information label containing at least the following: CE mark, notified body certificate references/codings, Pyropress' name, transmitter model no., unique serial number, measurement range, output signal and power supply voltage. Additionally, Intrinsically Safe certified versions would have the full ATEX markings as detailed in the Appendix (see page 27).

5. TECHNICAL DATA

5.1. PYRP-28 Pressure Transmitter Technical Data

5.1.1. PYRP-28 Measurement Ranges

The PYRP-28 pressure transmitter can be supplied specifically calibrated with any desired range contained within the below spans:

Gauge pressure : 0 - 10 mbar to 0 - 1000 Bar

Absolute pressure : 400mbar to 80bar.

Recommended standard ranges:

Gauge pressure : 0 to -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 to 0,4; 1; 2,5 6; 10; 16; 25; 60 Bar

5.1.2. PYRP-28 Operating Parameters

Table 1	Measurement Range		
	100 mBar	400 mBar	0 - 1 to 1000 Bar
Overpressure limit (repeatable, no hysteresis)	1 Bar	2.5 Bar	4 x range Max 1200 Bar
Burst pressure	2 Bar	5 Bar	8 x range, Max 2000 Bar
Accuracy	0.3%	0.2%	(0.16 % - special version)
Thermal error	Typically 0.3% / 10 ^o C; Max 0.4% /10 ^o C		Typically 0.2% /10 ^o C; Max 0.3% /10 ^o C
Long term stability	0.2 % / year	0.1 % / year	
Hysteresis and repeatability	0.05%		

5.2. PYRD–28 Differential Pressure Technical Data

5.2.1. PYRD–28 Measurement Ranges

The PYRD–28 differential pressure transmitters can be supplied specifically calibrated with any desired range contained within the spans of 0 - 16mbar to 0 - 25 bar.

Recommended standard ranges: 0.4; 1; 2.5; 6; 10; 16; 25 Bar
(-0,1 to + 0,1); (-1.0 to +1.0) Bar

5.2.2. PYRD–28 Operating Parameters

Table 2

<u>Parameters</u>	Measurement Ranges			
	100 mBar	1 Bar	2 Bar	25 Bar
Overpressure limit Static pressure limit	C type connection: 250 Bar - (320 and 420 Bar option) N4, GA, GB and P Type connection : 40 Bar			
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 Pressure and PYRD-28 Differential Pressure Transmitters - Common Parameters

5.3.1. Electrical Parameters

Power supply 10.5 - 36V DC, nominally 24V DC (2 wire, 4 - 20mA version)
15 - 30V DC (3 wire, 0 - 10V or 0 - 20mA version)

Note: For power supply for Intrinsically Safe versions see Appendix 01 of this manual.

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 4 - 20mA version)	$R[\Omega] = \frac{U_{sup}[V] - 10.5V}{0.02A}$
Load resistance (for 0 - 10V and 0 – 20mA versions)	R ≥ 5kΩ
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 Point 9.5 (page 10)

5.3.2. PYRP–28, PYRD–28. Environmental Condition Limitations

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

(For ambient temperature limits for Intrinsically Safe versions see Appendix 01.

Process temperature limit -40 to +120°C – direct measurement of process.
For temperatures in excess of 120°C a diaphragm seal, radiator, looped siphon tube or impulse line must be used.
Thermal compensation range -10 to +80°C (for PYRP-28) or special by arrangement
Thermal compensation range 0 - 70°C (for PYRD-28) or special by arrangement

Relative humidity	0 - 98%
Vibration during operation	Max 4g

5.3.3. Construction Materials

Diaphragm	Stainless steel 316L (Hastelloy C-276 option on pressure transmitter only)
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
GB 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
N2-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

Type **N4** - 1/4" NPT F, Type **GA** – G1/4, Type **GB** – G1/2, Type **P** – M20 x 1.5 M type see typical representation fig.7.
C type connection for direct mounting with a 3 or 5 valve manifold see Fig. 8.

5.5. PYRP–28 and PYRD–28 Electrical Connectors and IP Ratings.

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 separate literature).

6.3. Casing and Electrical Connections

6.3.1. The casing of the **PYRP-28 and PYRD-28** transmitters is manufactured from $\varnothing 27$ tube (304 st steel or 316 st. steel), fixed to the the sensing module as shown in figure 1b and 7. At the electrical connection end is the **PD** type electrical connector with PG-11 packing gland. By loosening the fixing screw and removing the connector access can be gained to the potentiometers for zero and span adjustments.

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 supplied to order). The cable contains a capillary which references the non media side of the measuring diaphragm to 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 a lid. Mounted internally are terminals marked 1, 2 and 3.

PZ type terminal housing has an internal earth terminal, whilst the Intrinsically Safe certified version also has an 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 transmitters with DIN type electrical connectors (PD and PM12) intended for outdoor use be provided with an additional form of mechanical protection.

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 selected to both allow easy access to the transmitter but also to ensure it cannot be subjected to accidental mechanical damage. In planning the installation of the transmitter and configuration of the impulse lines, consideration should be given to the following requirements:

- The impulse lines should be as short as possible, with a sufficiently large cross-section, and be free of sharp bends, in order to prevent blockages;
- Where the medium is a gas, the transmitters should be installed above the measuring point ensuring any 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 a constant difference maintained.
- The impulse lines and the valve connection system configuration should be implemented taking into consideration the measurement conditions, the need to access the transmitters for maintenance and access the impulse lines for water or gas removal and flushing purposes.



7.1.3. Transmitters should be as much as possible be protected from any physical damage. Should the installation location compromise the integrity of the process connection or the electrical connection causing leaking of the medium or making the electrical connection unreliable or hazardous a more appropriate location should be selected.



7.2. Low Ambient Temperature

When the solidification point of a liquid process medium is greater than the ambient temperature, steps should be taken to protect the sensor from freezing effects such as fluid expansion.

This is particularly important in the case of open air installations.

Protection by filling the impulse lines with an ethylene glycol and water mixture, or another liquid whose solidification point ensures the minimum 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 (less than -25°C), the transmitter and impulse lines should be heated.

7.3. High Process Temperatures.

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 should be incorporated to disperse the heat and to reduce the process temperature at the transmitter inlet.

Where it is not possible to use impulse lines of necessary length, **PYRP-28** transmitters with alternative protection methods should be used i.e. cooling elements/radiators or diaphragm seals (see these options in separate literature)



For the Intrinsically Safe version also see the Appendix at page 27 onwards.

7.4. Mechanical Vibration, Corrosive Media.

7.4.1. The transmitters will operate satisfactorily without hindrance when subjected to vibration with amplitudes up to 1.6 mm and accelerations to 4g.

If high levels of vibration are transmitted to the equipment via the pressure line, a more flexible line with vibration dampening properties should be adopted, or alternatively the connection to the transmitter interrupted via a diaphragm seal and capillary.

7.4.2. On the **PYRP-28** pressure transmitters, where the process medium is incompatible with the standard 316L stainless steel diaphragm, the option of Hastelloy C276 should be considered. (The **PYRD-28** differential pressure transmitter is fitted with Hastelloy C276 diaphragm as standard).

If this material is also not compatible then other means of protection should be adopted such as chemical/diaphragm seals. Please refer to separate literature for these items.



8. INSTALLATION AND MECHANICAL CONNECTIONS

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

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

Where the connectors as figures 4a, 5a and 6c, 6e are used then flat gaskets are also to be fitted.

The socket shown as in figure 5c, 6d and 6f can be obtained from the Pyropress.

The seal material is to be selected based on the pressures involved, type of medium and the process temperature.

If the pressure is applied via flexible tubing the transmitter should be mounted on a fixed surface or support.

The material and characteristics of the impulse tubes are to be selected in the same way as the seal material above, i.e. based on pressure, medium and temperature.

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

To connect the basic versions of transmitters, with two threaded connections (N4,GA,GB or P), one can use standard stainless steel threaded tube connectors.

The **PYRD-28** transmitters can be installed using mounting bracket (BF) for wall mounting or attachment to a $\varnothing 25$ 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 manifolds 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 be installed and will operate satisfactorily in any orientation.

When directly mounted on equipment with a high process temperature (up to 120°C) or radiated heat it is recommended that the transmitter is mounted (if possible) to the side of the equipment and not directly in the flow of a continuous rising heat source.

The **PYRP-28** can be fitted to a Pyropress syphon loop to protect against high temperature vapour applications, see Fig. 14.

In the case of narrow pressure spans, the accuracy can be affected by the location of the transmitter, the configuration of the impulse lines and the way in which they are filled with the liquid process medium.

This error can be corrected using the zero setting function.

8.4. In selecting the correct assembly components, Pyropress would be pleased to provide information and recommendations for connection elements, adapters, sockets, valves and other ancillary items.

Further details of these items can be found in the transmitter catalogue.

Pressure may be applied to the transmitter only after checking that the item has a measurement range and maximum withstand rating that is equal to or greater than the value of the pressurised system. Additionally gaskets must have been properly selected and fitted, and the pressure connections have been correctly secured.



Attempts to undo fasteners or fixing connector pipes on a transmitter whilst pressurised may cause the medium to leak and create hazards for the personnel.

When removing the transmitter it must be isolated from the process pressure or the pressure reduced to atmospheric level. It is also important that due care is taken with regard to the characteristics of medium which may be highly reactive, caustic, explosive, high temperature or otherwise hazardous to personnel.

If necessary, rinse out this part of the system before removing the transmitter and wear suitable protective clothing based on the recommendations in the Material Safety Data Sheet (MSDS).

Transmitters with flanged diaphragm seals are to be fitted to identical mating 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 screened twisted pair cable should be used.

The signal wires should not run alongside network power supply cables or near to equipment that draws high levels of electrical current.

Any associated equipment used in conjunction with the transmitters should be equally resistant to electromagnetic interference from the transmission lines in accordance with compatibility requirements. It is also recommended to have EMC filters on the primary side of the transformers, power supplies used for the transmitters and apparatus used in conjunction with them.

9.2. Connections for transmitters with PD DIN 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 Fig.1a.

To connect, loosen the retaining screw and remove the connector from the contact pins together with its cover. Then remove the block from its cover, levering it off carefully with the end of a small screwdriver inserted into the slot provided for this purpose. Connect the wires to the block as shown in Fig 1a (page 14).

When cabling to the DIN connector through the PG11 gland, should the wire sizes be insufficient to provide a full seal when tightened then the gland should be sealed with an elastic sealing compound to maintain the IP65 seal. It is recommended that a loop is incorporated in the cable prior to the PG11 gland 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** connection or **PYRP-28** transmitter with **PM12** connector should be wired via a separate terminal box, in which the transmitter's cable is terminated.

The terminal box must not be fully airtight as the transmitter must be able to reference atmospheric pressure through the capillary in the connector cable.

9.4. Connections for transmitters incorporating terminal housing (PZ Type).

The **PYRP-28** and **PYRD-28** transmitters with **PZ** terminal housing should be wired to the terminal block as shown in figure 2 (page 15). Tighten the packing gland ensuring there is a water tight seal on the cable, and refit the screwed terminal cover and gasket.

9.5. Over-voltage Protection

9.5.1. If subjected to over-voltage through incorrect supply connections or atmospheric electrical discharges the transmitters can fail or be irreparably damaged, therefore all models are fitted with Transient Voltage Suppression (TVS) diodes (see Table 3, Column 2).

9.5.2. Over-voltage protection between the signal lines and the casing or earth (not prevented by the TVS diodes) is provided by plasma surge arresters (see the Table 3, Column 3).

When the signal lines have lengthy runs it is recommended that additional similar protection is installed near the transmitter, with another adjacent to electrical connection points of any equipment used in conjunction with the transmitter.

Details of fitted transmitter over-protection

Table 3

	1	2	3
	Type of transmitter and 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 PM 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 applied to Intrinsically Safe (Exia) models.

9.6. Earthing

The transmitter earthing methods are detailed in figures 1a and 2.

If the transmitter is directly mounted or connected to an fully earthed electrically conductive structure or pipework system via a metal bodied fitting then additional earthing would not be necessary.

10. ZERO AND RANGE (SPAN) ADJUSTMENT

The transmitter is factory calibrated in accordance to the requirements stated in the customer's purchase order.

After the transmitter has been installed it may be necessary to reset the zero point, see Point 6.3 and Fig's 1e or 2 (depending on the electrical connection version) for access to the zero adjusting potentiometer.

To carry out range adjustment, power the transmitter in accordance with its electrical requirements as specified in this document and as as stated on the transmitter label.

Apply a pressure equal to the lower limit of the measurement range, and adjust the "zero" potentiometer (clockwise to increase/anti-clockwise to decrease) to provide an output signal of 4mA (or 0mA or >*0V).

After carrying out this zero-ing procedure, apply supply a pressure equal to the upper limit of the range, and use the "range" potentiometer to provide an output signal of 20mA (or 10V on the voltage output version).

Once the top of the range has been set, re-check the zero out and repeat the procedure if necessary.



Potentiometers can be used to adjust the zero point and the range by up to 10%.



*Obviously on Transmitters with a 0 – 10 Vdc output it is not possible to achieve an output of 0 volts.

11. SERVICING AND SPARE PARTS.

11.1. Periodic servicing

Periodic servicing should be carried out at intervals to suit the installation but we recommend annual checks are made as follows:

1. Pressure connectors should be checked for loose connections and leaks.
2. The electrical connections should be checked for tightness, ensuring there has been no ingress of water or dust and the condition state of the gaskets inspected.
3. Diaphragm seals (if fitted) should be checked for tarnishing and corrosion.
4. The transmitter calibration and output should be checked.

11.2. Unscheduled services

If the transmitters are installed in a location or system where there is the possibility of accidental mechanical damage, excess pressure, hydraulic impulses or over-voltage, or if the diaphragm is at risk of sedimentation build up, crystallization or erosion, inspections should be carried out more regularly.



The sensing element (diaphragm) should be inspected and carefully cleaned (see 11.3 below), the protective diodes should be checked for shorting, and the calibration and output checked..

Where it is found that there is no value signal within the circuit or the value is incorrect, a check should be made on the integrity of the circuit and its electrical connections. Additionally the power supply and load resistance should be checked. If the electrical circuit is proven to be secure, check the operation of the transmitter.

After checks have been made, take steps to eliminate the faults detected.

11.3. Cleaning the Diaphragm and Overload 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 approved method to dissolve or flush out any sediment build up

11.3.2. Transmitter malfunction can be due to damage caused by overloading, e.g. in cases of:



- **over pressurisation.**
- **freezing or solidification of the process medium.**
- **action of a hard or sharp object, such as a screwdriver.**

In the above instances, typical symptoms are that the output current falls below 4mA or rises above 20mA, or 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 – DIN plug and gasket, connector base screwed clamping ring, information/rating label.

PK connector – the entire connector.

PZ/PS housing – cover seal/gasket and electrical packing gland.

In the Exia version, the user may replace only the terminal block with angled cover and the seal in the **PD** connector, or the seal and packing gland in the PZ/PS housing version



Replacement or repair of any other parts should not be carried out by anyone other than the manufacturer or their authorised servicing affiliates.

12. PYRL-28 TRANSMITTER LEVEL PROBES

12.1. Applications

These transmitter level probes are designed to measure the depth of a liquid medium from the top in the vertical plane and used in applications such as open tanks, sumps, watercourses, open channels etc.

12.2. Technical Data

12.2.1. The level transmitters are designed to measure levels from 200 to 3000mm H₂O.

12.2.2. Operating Parameters

	Measurement Range	
	0 - 200 to 500mm H ₂ O	0 - 700 to 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 to 25°C - standard -10 to 70 - special version on application.
Process/medium temperature	-25 to 80°C
Other parameters	as stated in paras 5.3 and 5.4

12.3. Principles of Operation, Construction

The **PYRL-28** level transmitter probe functions by converting the pressure of a column of liquid into a standard transmitter signal. The standard version provides a two wire 4 - 20mA output, however there are options for three wire 0 - 20mA or 0 - 10V output versions.

The transmitter comprises of a sensing module and an electronic assembly, connected with an extension tube whose length is determined by the required depth of the process to be measured. The tube can be fitted with a flange for mounting on the cover of the tank (figure 9). The electrical connection options are the **PD** or **PK** type connectors, (see figures 1b, 1c and 9).

12.4. Installation and Fitting

The probe is inserted into the liquid being measured vertically from the top with the electronic assembly and connector kept clear of the maximum level of the liquid. When installing the transmitter, the zero position should be precisely determined. When the tube is >2M it should also be additionally secured at or near the bottom. If there is a current or turbulence in the fluid process, a protective tube should be fitted. When fitted outdoors it is recommended that a cover be provided.

The process medium must not be allowed to freeze around the probe. The sealing diaphragms should be checked regularly, and sediment deposits, blockages etc. should be prevented. Any accumulations should be removed by dissolving or careful washing.



12.5. Electrical connection. Settings

12.5.1. The transmitter probe should be connected as detailed in figure 1a.

The user may adjust the span by 10% using the zero and range potentiometers as detailed in point 10.

12.5.2. The probes are protected against over voltage as stated in 9.5.

12.6. Earthing.

On level transmitter probes with PD, PK or PZ connectors, if overvoltage protection is fitted, the probe's extension tube should be earthed.

When supplied with the PZ connector on the Intrinsically Safe Exia version earthing should be made 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 damp and corrosive substances, with an air temperature between +5°C and +40°C, and relative humidity of not more than 85%.

Transmitters stored without packaging, should have protective covers fitted over the diaphragm.

During transportation, the transmitters should be packed and secured so as to prevent them from moving in transit. Any means of transport may be used, provided the items are isolated from atmospheric conditions.

13.2. The level transmitters are individually packed, thereafter bound together in packages containing several probes where multiples are ordered. Storage and transport as above.

14. GUARANTEE

14.1 The manufacturer guarantees the correction functioning of the **PYRP-28** pressure and **PYRD-28** differential pressure transmitters for a period of 24 months from the date of purchase and servicing, the specific details being as stated in the product warranty supplied with the goods. In the case of non standard models 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 correct functioning of the **PYRL-28** level transmitters for a period of 12 months from the date of purchase or servicing the specific details being as stated in the product warranty supplied with the goods.

15. ADDITIONAL INFORMATION

The manufacturer reserves the right to make design improvements and changes without notice which do not negatively effect the quality of the transmitters.

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

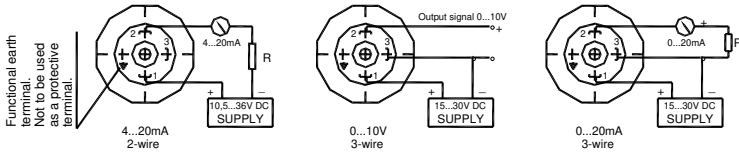


Fig. 1a. Wiring diagram for PCE-28, PRE-28P transmitters and PCE-28P probe (Not applicable to Ex version)

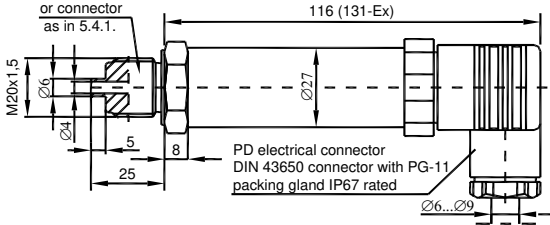


Fig. 1b. PCE-28 transmitter with PD connector

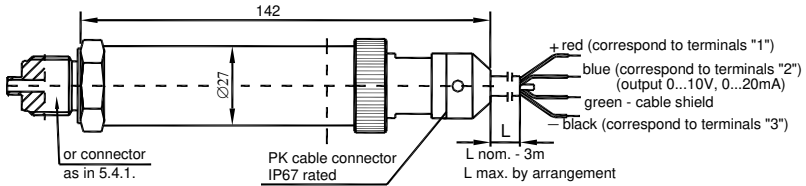


Fig. 1c. PCE-28 transmitter with PK connector - (three-wire transmission 0...10V or 0...20mA).

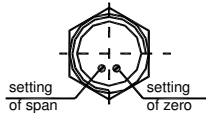


Fig. 1e. View of potentiometers of zero and span (PD, PK or PM12)

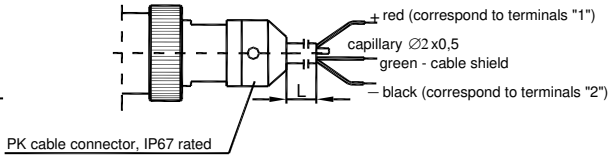


Fig. 1d. PCE-28 transmitter with PK connector for output signal 4...20mA

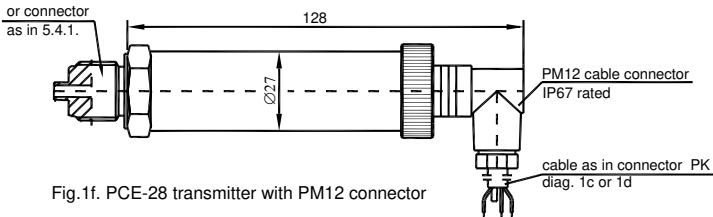
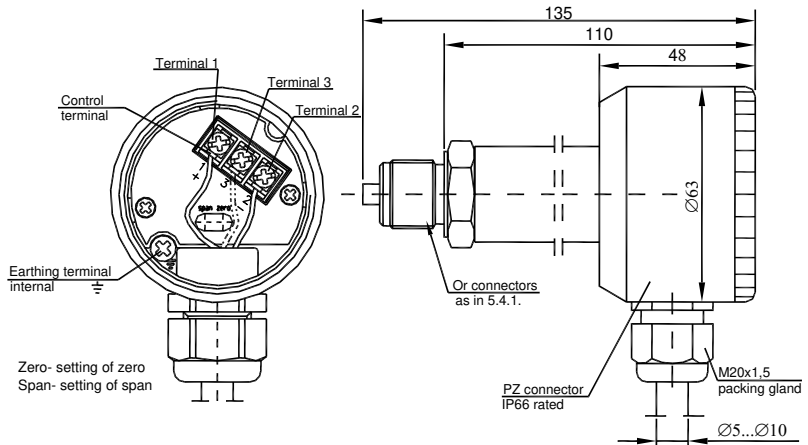


Fig. 1f. PCE-28 transmitter with PM12 connector

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.

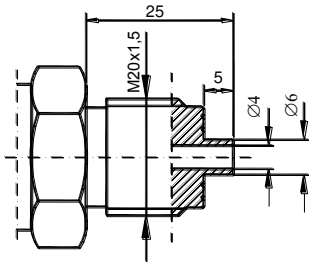


Fig.3a. M connection with M20x1.5 thread

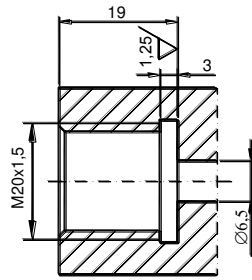


Fig.3b. Socket for M connection.

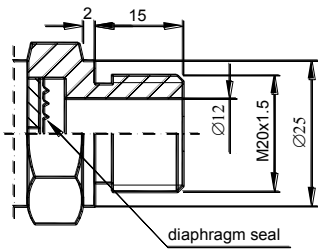


Fig.4a. P connection with M20x1.5 thread

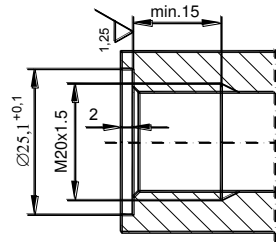


Fig.4b. Socket for P connection

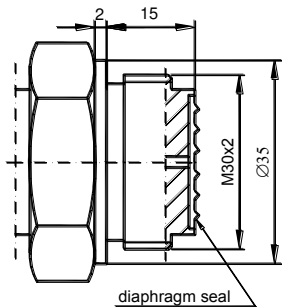


Fig.5a. T connection with flush diaphragm with M30x2 thread,

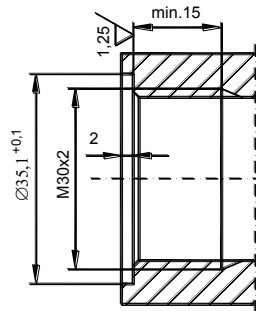


Fig.5b. Socket for T connection

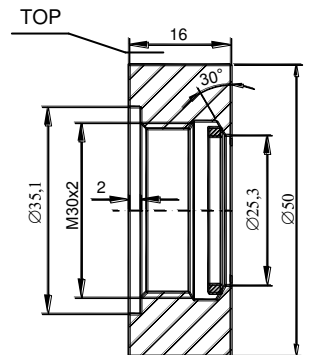


Fig.5c. Weldable fitting ring for T connection
Sealing: teflon

Order code Socket T



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

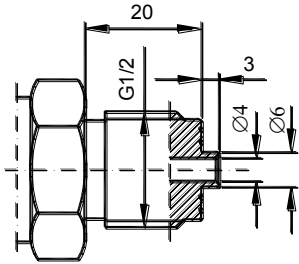


Fig.6a. GB connection with G1/2" thread

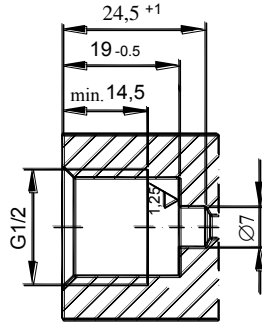


Fig.6b. Socket for GB connection.

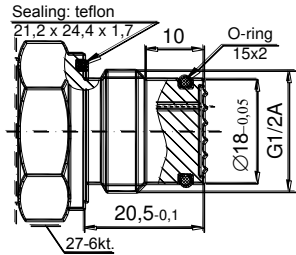


Fig.6c. GF connection with flush diaphragm with G1/2" thread,

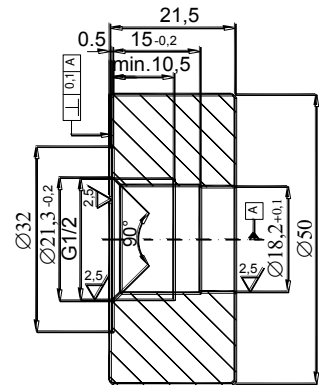


Fig.6d. Weldable fitting ring for GF connection
Order code Socket CG1/2

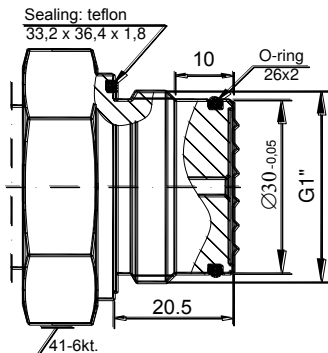


Fig.6e. GD connection with flush diaphragm with G1" thread,

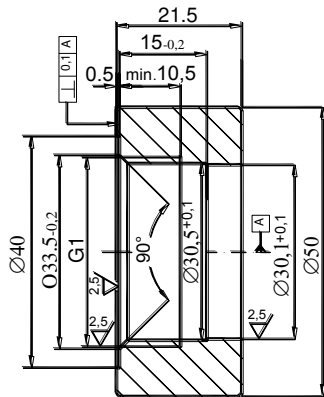
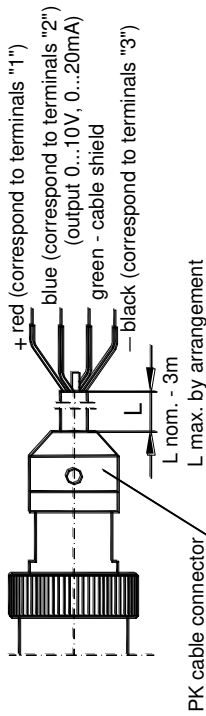
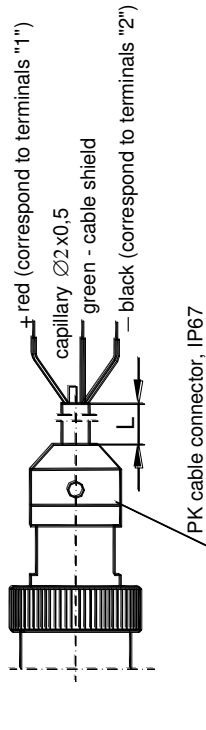


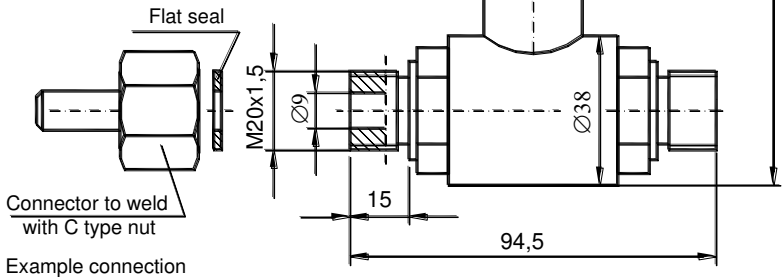
Fig.6f. Weldable fitting ring for GD connection
Order code Socket CG1



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.



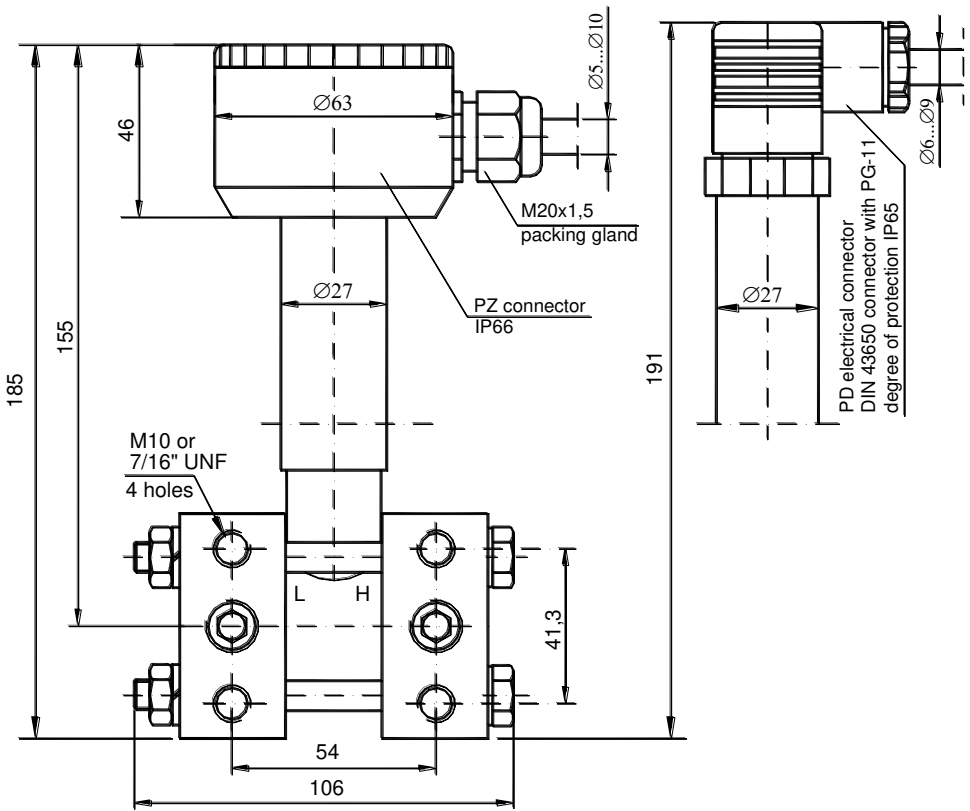


Figure 8. PYRD-28 differential pressure transmitter with C process connection to be mounted together with valve manifold.

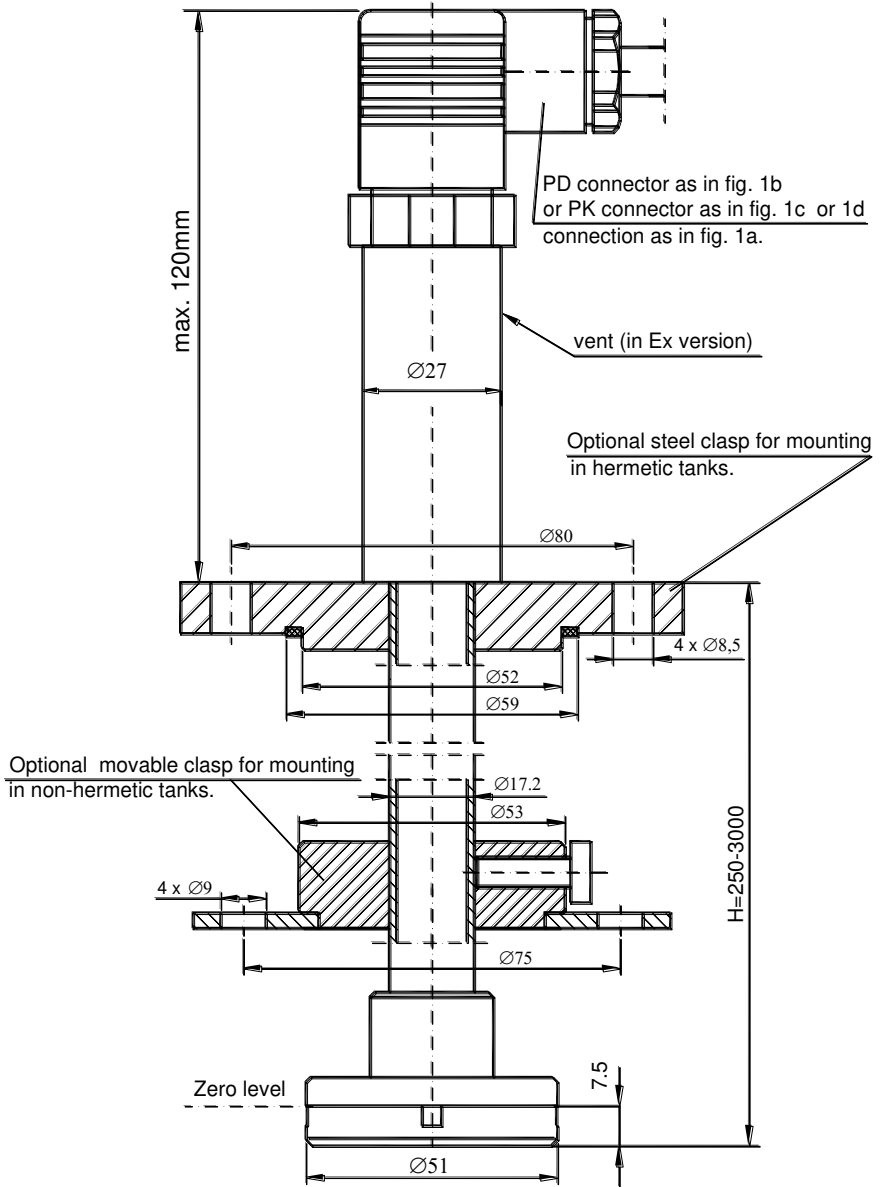


Figure 9. PYRL-28 level probes

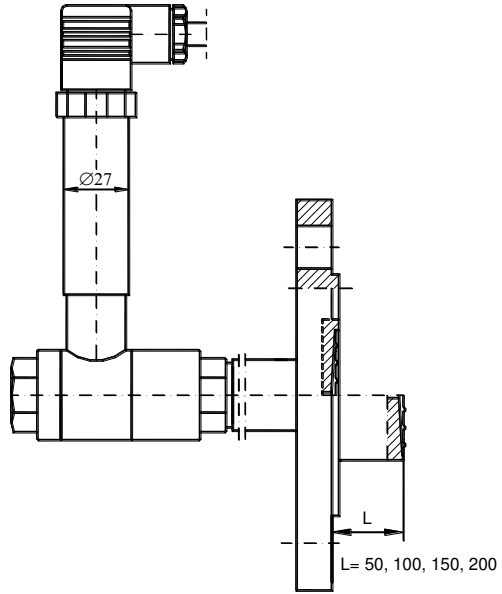


Figure 10. PYRD-28 differential pressure transmitter with a single direct diaphragm seal

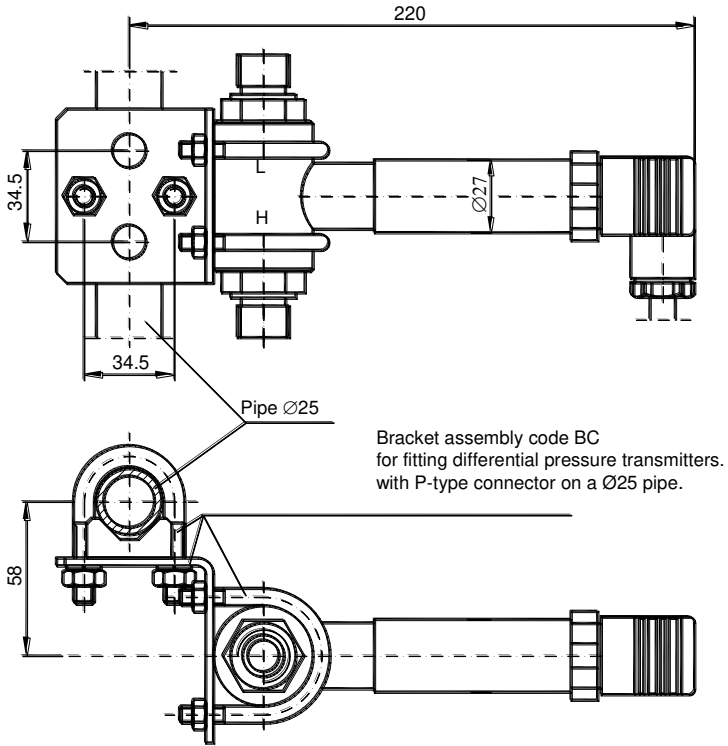


Figure 11. Example: how to install the PYRD-28.

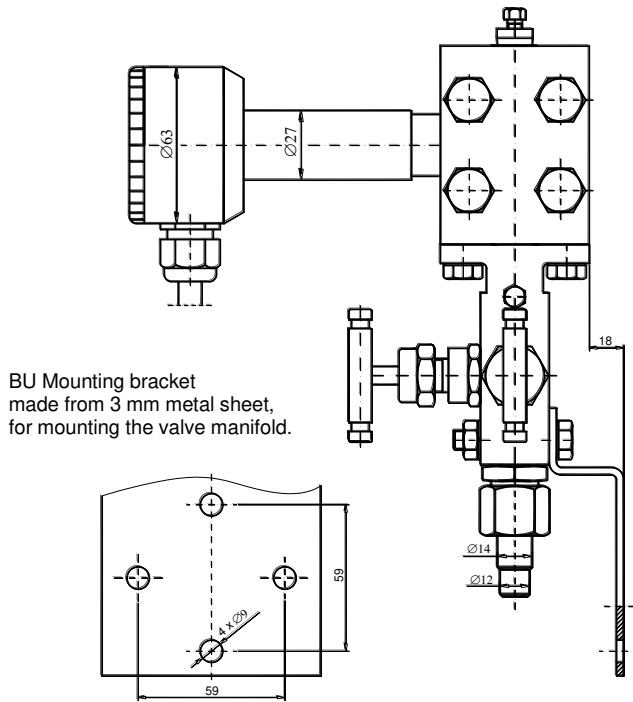


Figure 13. Example: how to install the PYRD-28 transmitter with a valve manifold to a wall

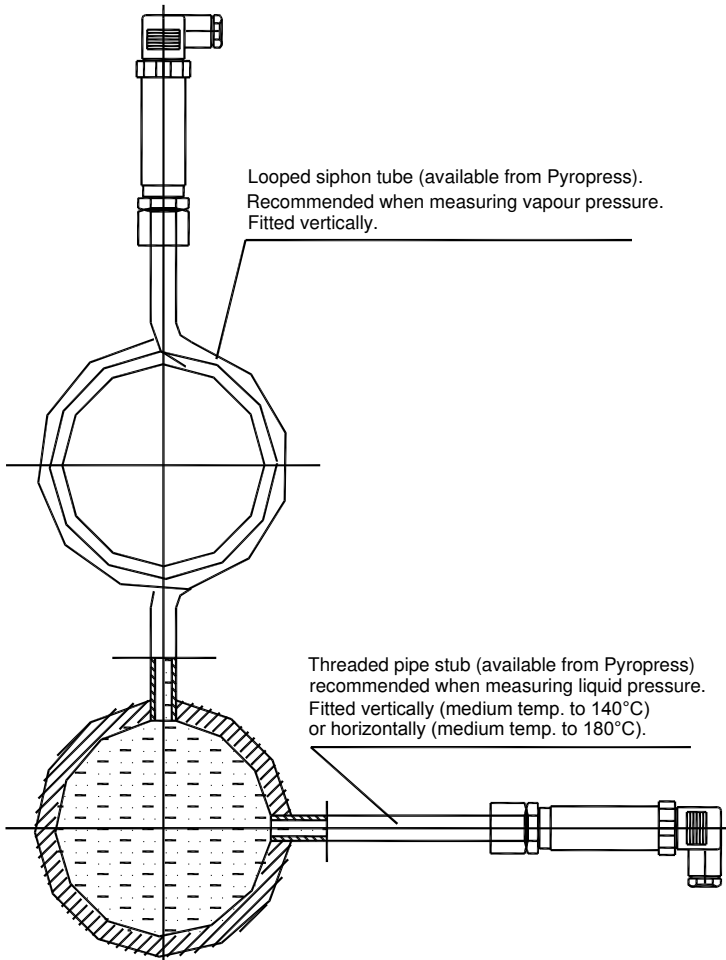


Figure 14. Possible methods of isolating the transmitter from high temperatures

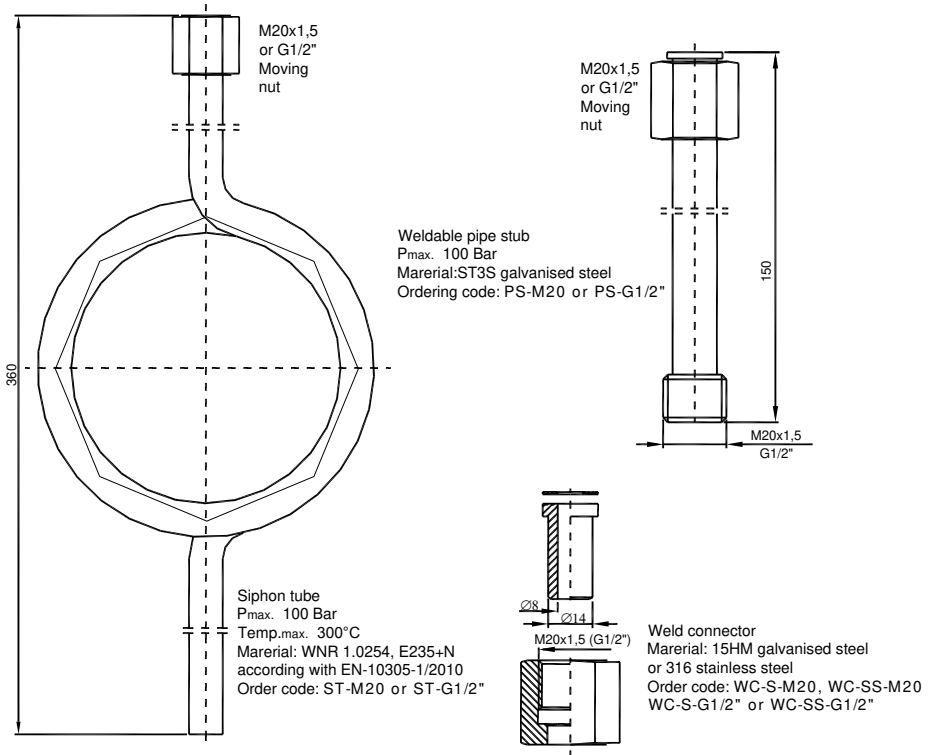


Figure 15. Additional equipment for fitting of pressure transmitters.

APPENDIX 01

DTR.PYRP.PYRD.PYRL-28



PYRP-28IS, PYRL-28IS AND PYRD-28IS
PRESSURE/LEVEL/DIFFERENTIAL PRESSURE TRANSMITTERS -
ATEX INTRINSICALLY SAFE CERTIFIED VERSIONS.

1. Introduction

1.1. This appendix applies to ATEX certified Intrinsically Safe Transmitters Type PYRP-28IS/XX/YY, PYRL-28IS/XX/YY and PYRD-28IS/XX/YY.

1.2. The appendix contains supplementary information relating to the Exia version transmitters. During installation and use of the Exia transmitters, reference should be made to **DTR.PYRP.PYRD.PYRL-28 in conjunction with "Appendix 01"**.

2. Operation of PYRP-28IS/XX/YY, PYRL-28IS/XX/YY and PYRD-28IS/XX/YY transmitters in hazardous areas.

2.1. The PYRP-28IS, PYRL-28IS and PYRD-28IS transmitters are manufactured to in accordance with the following standards: EN 60079-0:2009, EN 50303:2000, EN 60079-26:2007, EN 60079-11:2012, EN 61241-11:2006.

2.2. The transmitters can be installed in hazardous areas in accordance with the Exia rating as below:

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
FTZU



3. Identifying marks

Intrinsically safe transmitters (Exia version) will be fitted with a rating plate containing the information specified in paragraph 4 of DTR.PYRP.PYRD.PYRL-28 and also at least the following:

- CE mark and the notified unit number: 0359, mark
- Designation of Exia protection design, certificate number
- Values of parameters such as: Ui, li, Ci, Li
- Type of electrical and process connectors
- Manufacture year and serial number

4. User information.

With the transmitter you will be provided with a copy of the Installation, Operation and Maintenance Manual DTR.PYRP.PYRD.PYRL-28.

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



The transmitters should be powered in accordance with the specified power supply configurations in sections 6 and 7 hereafter and the current limiting device provided with valid intrinsically safe certificates. The outputs to the transmitters in the hazardous area should not exceed the limit power supply parameters specified below.

Transmitters with integral surge arresters (SA version) and transmitters installed in a "zone 22" (dust) hazardous area ideally should be powered via a galvanically isolated power supply. If this is not possible then the transmitter casing or connected metal parts must be earthed via high integrity equipotential bonding or a equipotential connection between the transmitter and the negative terminal of the intrinsic safety zener barrier.



The intrinsically safe transmitter is certified with an "ia" level of protection, the associated power supply circuit must also have the equivalent "ia" level of protection.

- for power supply with a linear characteristic
 $U_i = 28V$ DC; $I_i = 0,1A$; $P_i=0,7W$

- for power supply with a “trapezoidal” and “rectangular” characteristic
 $U_i = 24V$ DC; $I_i = 0,1A$; $P_i=1,2W$

Input inductance and capacity: $C_i = 25nF^*$, $L_i = 0,4mH^*$

$T_a = -40^\circ C$ to ...see Table Z1

*It should take into account the capacity and inductance of the cable which in permanently connected cables are: $C_k= 0.2nF/m$ i $L_k=1\mu H/m$.

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

$$C_w = C_i + a \times C_k = 25nF + a \times 0.2nF/m$$

$$L_w = L_i + a \times L_k = 400\mu H + a \times 1\mu H/m$$

a = length of the mounted permanently cable in metres.

Table Z1

$P_i[W]$	$T_{amb_{max}} [^\circ C]$	Temperature classification
0,7	+45	T6
	+80	T5, T4, Group I
1,2	+75	T5
	+80	T4 Group I

Special conditions for safe use:

- Ambient temperature range - see Table Z1 above.
- The process temperature at the transmitter diaphragm must be the same as the permitted ambient temperature range.
- When installed in a “Zone 22” (dust) hazardous area it is recommended that a fully galvanically isolated
- A transmitter fitted with an integral surge arrester, (marked with “version SA” on the transmitter), does not meet the requirements of Section 6.3.13 of the EN 60079-11:2012 (500Vac isolation test) and should be noted at the time of installation..



Should the transmitter be fitted with a Titanium diaphragm/chemical seal (indicated on the transmitter label), every care should be taken to protect against impact on the seal during installation and using of the transmitter.



When the process temperature is higher than the stated $T_{amb_{max}}$ value in Table Z1 above, an additional temperature barrier should be incorporated such as a suitable length of impulse piping, a cooling element/radiator or diaphragm seal. The process temperature at the transmitter diaphragm must be in within the $T_{amb_{max}}$ range. ($T_{amb_{max}}$ = maximum ambient temperature)

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 $U_0=28V$ $I_0=0.093A$ $R_w=300\Omega$.

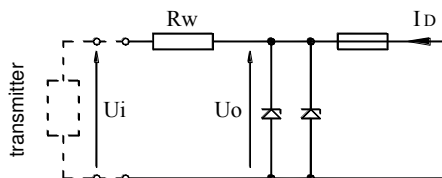


Fig.1. Power supply from a source with “linear” characteristic

6.2. - For power supply with a trapezoidal characteristic

Supply parameters in accordance with the Exia certification:

a) $U_0=24V$ $I_0=0,08A$ $P_0=1,2W$

b) $U_0=24V$ $I_0=0.05A$ $P_0=0,6W$

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

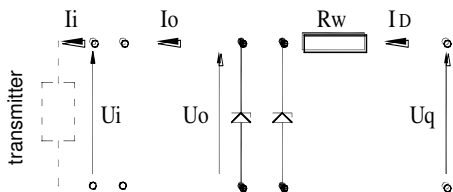


Fig.2. Power supply from a source with trapezoidal characteristic”

If $U_0 \leq \frac{1}{2} U_q$ then parameters U_q , I_0 , P_0 are interrelated as follows:

$$U_q = \frac{4P_i}{I_0}, \quad R_w = \frac{U_q}{I_0}, \quad P_0 = \frac{U_0(U_q - U_0)}{R_w}$$

6.3. - For power supply with rectangular characteristic

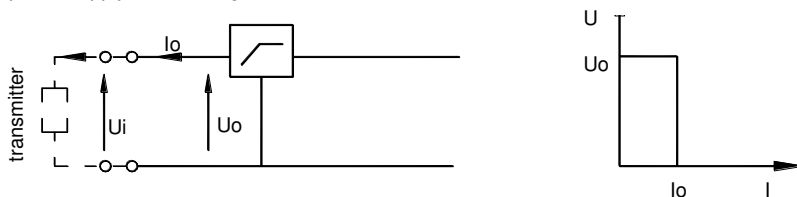


Fig.3. Power supply from a source with rectangular characteristic

a) $U_0=24V$ $I_0=0,05A$ $P_0=1.2W$ for $T_a \leq 75^\circ C$ and T5 or $T_a \leq 80^\circ C$ and T4, group I

b) $U_0=24V$ $I_0=0,025A$ $P_0=0,6W$ for $T_a \leq 80^\circ C$ and T5 or $T_a \leq 45^\circ C$ 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 a such supply is also the Ex device with “ib” level protection.

Example of practical provision of power supply with a rectangular characteristic:

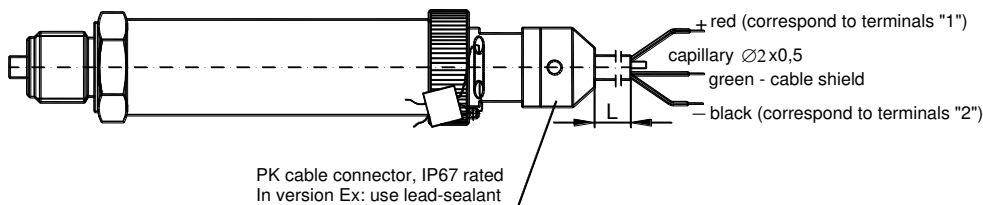
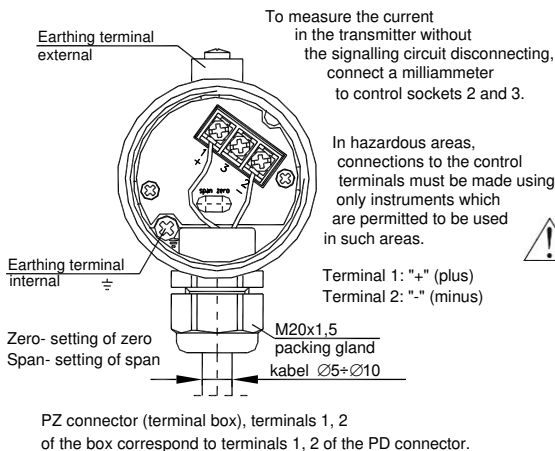
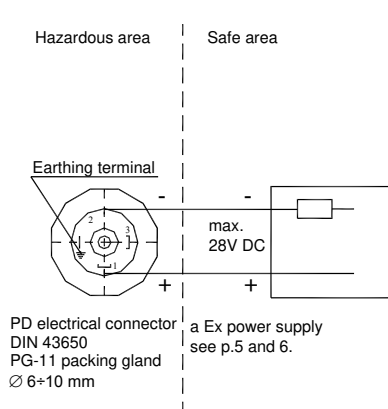
– use a stabilized power supply with $U_0=24V$, with the “ib” level protection and current limited to $I_0=50mA$ or $I_0=25mA$.

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. Connection of Exia transmitters: PYRP-28IS, PYRL-28IS and PYRD-28IS



The transmitter and other devices in the measuring loop must be installed and electrically connected in accordance with the relevant applicable hazardous area installation requirements and standards.



Repair or other tampering with the transmitter's internals will invalidate the hazardous area certification.
The unit should be returned to the manufacturer to carry out assessment and any repairs.

END