Pressure transmitter PT06RS

Special designed digital transmitter for pressure measurement in all types of Tunnel Boring Machines

INNOVATIVE, FLEXIBLE AND EXTREMELY DURABLE DESIGN. KEY FEATURES:

- Special design for pressure measurement on media that consist of stones, gravel, sandrock, slurry, water and air, or a mixture of these.
- Measure both "single point pressure" and distributed pressure (pressure over the whole diaphragm) with the same high accuracy
- Digital electronics. 4-20 mA signal.
- MODBUS Communication (RS485) as standard. Registry based for all needs (transfer of values, configuration and maintenance).
- Innovative Autozero function. Just remove a screw and press a button.
- Accuracy 0,5% (option 0,35 %).
- Fixed range (can be readjusted via MODBUS communication).
- Withstands media temperatures between -20 °C and +80 °C continuously.
- Stainless steel IP67 enclousure with a 316L stainless steel diaphragm with an extremely durable rubber cover.
- Completely potted electronics for highest possible reliability.
- Well tested and approved for CE (EMC and PED).
- Six different sizes for different machine design and can also be adopted to other machine designs.

PONDUS INSTRUMENTS

Types and order codes:

The transmitters order codes for different configurations can be found from the table below.

PT06 xx - x x x x

	Description	Suffix	Figure 1	Figure 2	Figure 3	Figure 4	
Electronics	**Digital, RS485**	**RS**					
Diaphragm	**Rubber protected 316L**		**3**				
Connection	**TBM 50 (see drawings)**			**M1**			
	TBM 68 (see drawings)			**M2**			
	TBM 70 (see drawings)			**M3**			
	TBM 85 (see drawings)			**M4**			
	TBM 86 (see drawings)			**M5**			
	TBM 86 (see drawings)			**M6**			
Pressure range	**2 bar**				**2**		
	10 bar				**6**		
	20 bar				**8**		
Design	**Atmospheric pressure**					**0**	
Filling oil	**Siliconoil**						**None**

Ordering example

Pressure transmitter for Tunnel Boring Machine mounting diameter 70 mm and calibrated range 0-6 bar will have the order code: **PT06RS-3M360 and specified range 0-6 bar.**

Description

PT06RS is a specially designed pressure transmitter for measuring of boring material from a Tunnel Boring Machine. The design is done to achieve the highest possible durability to media with stone, gravel, sandrock, slurry, water, air or a mixture of these.

The exposed diaphragm is covered with an extremely durable rubber protection. This method of protection has been tested for several years in different conditions and has showne extremely good results.

Due to the design the transmitter can measure both "single point pressure" and distributed pressure (pressure on the whole diaphragm) with the same high accuracy. "Sinle point pressure" can for example be a corner of a stone in contact with the diaphragm.

The mechanical design is for six types of TBM design , but can easily be adopted to other machine design.

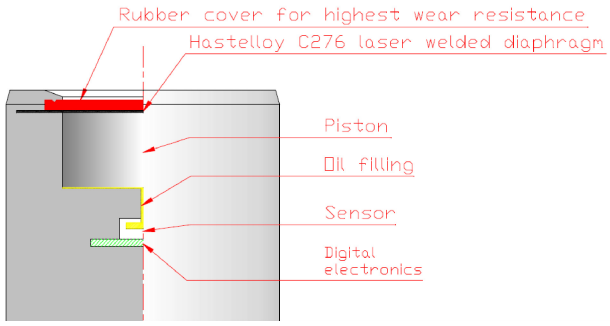
Function

PT06RS has a piezoresistive sensor connected to the media by means of a diaphragm. The media pressure acts on the diaphragm and is tranfered to the sensor through a pressure intermediate oil. Since this oil completely fills the volume between the diaphragm and the sensor the diaphragm movement is very small when the pressure changes. To obtain atmospheric pressure on the back side of the sensor (for reference pressure) it is connected to the surrounding through a capillary tube protected with a fluid filter. The vent hole is located in the edge of the flange.

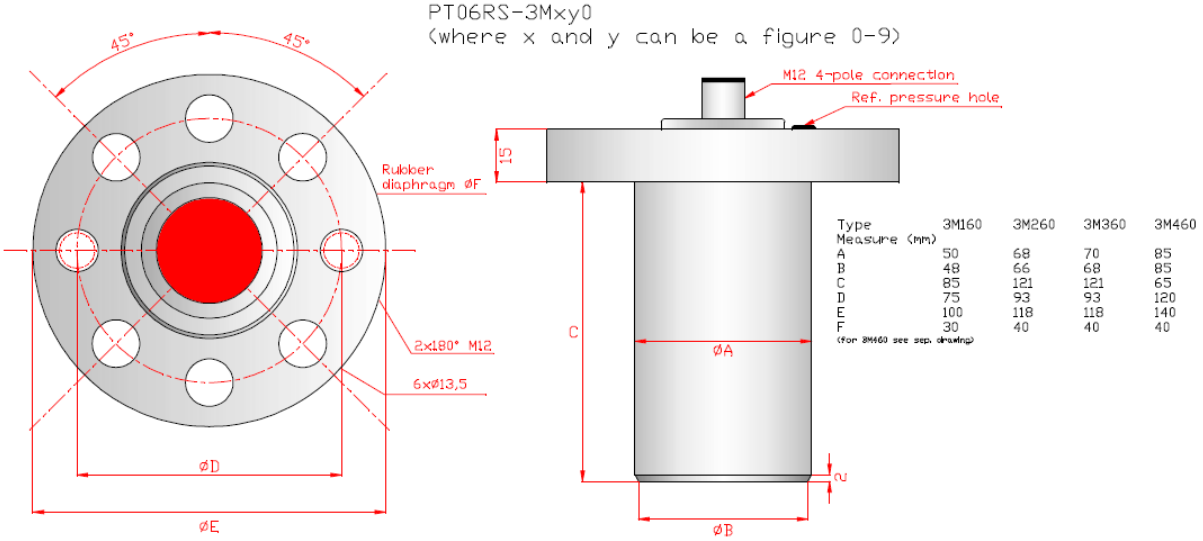
PT06RS has micro-computer-based electronics, which communicate with the outside world with 4 to 20 mA signal as well as MODBUS communication. The electronics measure and converts the output signal from the pressure dependent sensor bridge to digital values. The digital value is converted to analogue for the 4 to 20 mA current loop.

The digital value can also be read via MODBUS communication in optional engineering units, percentage or current.

PT06RS can be configured/ calibrated fully by means of a PC via MODBUS communication.



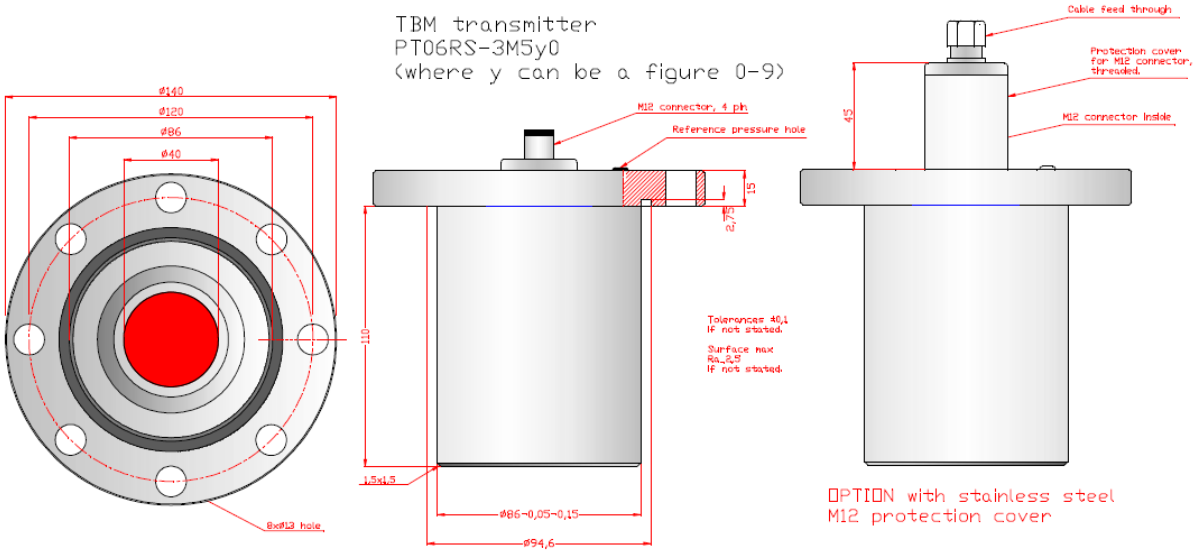
TBM transmitter
PT06RS-3Mxy0
(where x and y can be a figure 0-9)



Type	3M160	3M260	3M360	3M460
Measure (mm)				
A	50	68	70	85
B	48	66	68	85
C	85	121	121	65
D	75	93	93	120
E	100	118	118	140
F	30	40	40	40

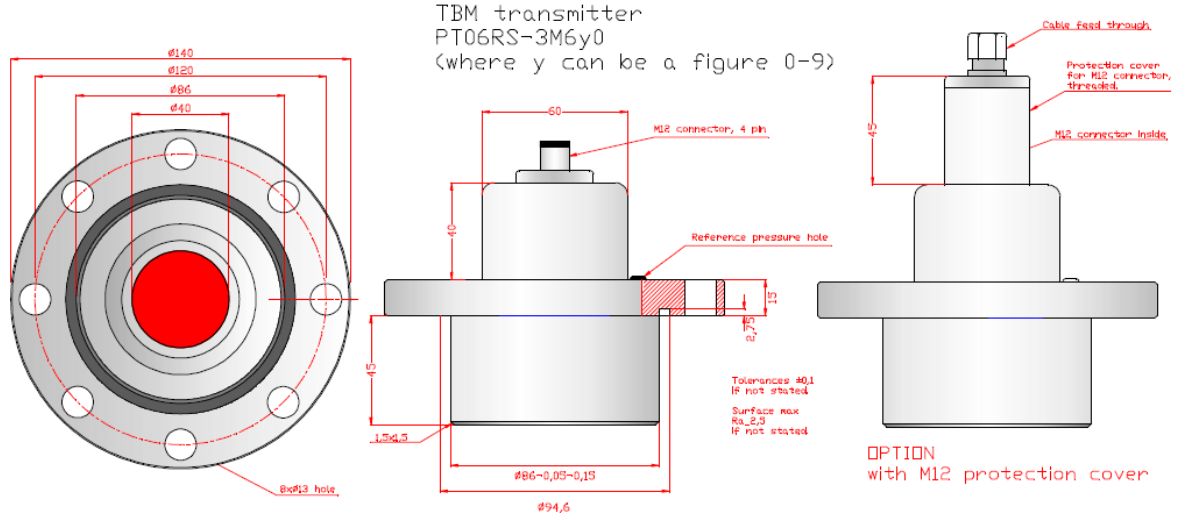
(for 3M460 see sep. drawing)

TBM transmitter
PT06RS-3M5y0
(where y can be a figure 0-9)



OPTION with stainless steel
M12 protection cover

TBM transmitter
PT06RS-3M6y0
(where y can be a figure 0-9)



OPTION
with M12 protection cover

MODBUS Communication
MODBUS communication can be used for transfer of measured values, for example the pressure and the temperature (etc.). The communication can also be used for configuration of all PT06RS parameters direct from a suited control system or from a PC (with appropriate software and hardware).
The MODBUS communication is fully registry based (see the Modbus specification for more information).
Physical interface for MODBUS is RS485, 4 lines. Supply voltage (8-36 VDC) use the 4-20 mA lines and the communication use two separate lines A and B.
A standard RS485 dongle can be used (but it is optimal to use an optoisolated RS485 dongle).

Autozero function
PT06RS has an innovative solution to eliminate the problem of zero shift (due to for example covering or mechanical wear of the diaphragm). Just place the PT06RS diaphragm in free air (zero pressure on the diaphragm) , remove the screw on the cover and press the button below. This action resets the 4 mA to zero pressure (and also makes the communication to send zero level in engineering units).

PI200PS and MEP7 Modbus Tool
PI200PS is a stand alone configuration box (with battery supplie and RS485 modem) for configuration in field. PI200PS are delivered with MEP7 Modbus Tool.
MEP7 Modbus Tool is a software tool on CD-ROM for Windows for configuration, calibration and documentation.
The program can configure transmitter specific values and perform maintenance, output signal and factory calibration.

Approvals
PT06RS is CE approved according to the EU directives for pressure equipment, PED, and EMC.
The pressure intermediate oil is a FDA approved silicon oil.

Electrical connection
For electrical connection a standard 4 pin M12 connector (male), mounted on the transmitters cover, is used. Use the corresponding female contact to connect supply/signal, either with premounted cable or contact with own cable. (Cabels and contacts can be bought from several sources, for example Hirschman or Binder.)

The connector is assigned as below (see also fig 3 below):

Pin 1	S+	Signal/Supply +
Pin 2	S-	Signal/Supply -
Pin 3	S-	Signal/Supply -
Pin 4	GND	Ground

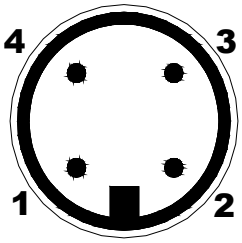


Fig. 3

Avoid polarity reversal when connecting the cable (the transmitter is fully protected against wrong polarity, if the transmitter is wrong polarised there will be no output signal).
The electronic system for measured value transmission is realized as a 2-wire system, i.e. the same wire pair is used for the supply voltage and the output signal. Starting from the power source, all other devices in the measuring loop must be series-connected.

To consider
To obtain longlife and faultless operation of PT06RS there are some important factors to consider.
Pressure transmitters with piezoresistive sensors are designed to withstand a specific overload. If the pressure on the diaphragm exceeds these limits, irrespective if it is for a long or short time, the sensor will be broken permanently.
The measuring diaphragm is the most exposed and easily affected part of the transmitter.
Even though this transmitters rugged rubber diaphragm is sufficient for the intended media it will be slightly affected. This means that the measurement will be slightly changed over time (especially the zero point). Use Autozero function to correct zero point.
The transmitters electronic- and electric connection housing is approved for IP67. Make sure that the electronic housing cover and contact is tight. If the transmitter is installed in a dirty environment, make sure that the reference pressure hole always is open for the atmospheric pressure.
In plants with high vibration levels it is important to secure that the transmitters performance is sufficient. The most certain is to measure the vibrations amplitude resp. acceleration.
The transmitters are designed and tested for (Standards: IEC770 and DNV Certification note 2.4 location B.):
3-25 Hz, amplitude 1,6 mm
25-60 Hz, amplitude 0,21 mm
60-100 Hz, accel. 19,6 m/s2

Technical specification PT06RS:

Type:	Electronic pressure transmitter with digital electronics	**Series resistance:**	R kohm = (Supply voltage - 8)/20.
Function:	Directly connected transmitter with piezoresistive sensor	**Series resistance dependence:**	Better than +/- 0,1%
Operating range:	From 0% to 100% of upper sensorlimit	**Supply voltage dependence:**	Better than +/- 0,1%
Span:	Ranges see page 2. Adjustable.to min 1/10 of range	**Temperature dependence:**	From 0 to 80 degrees C.
Zero:	Adjustable from 0-100% of range. (4 mA+/-0,8%)	Zero:	Max +/-0,01% per degree C
Overload:		Span:	Max +/-0,02% per degree C
2 bar:	Max 6 bar	**Long time stability:**	Better than 0,1 % per year.
10 bar:	Max 30 bar	**Vibration dependence:**	
20 bar:	Max 60 bar	Perpendicular to the diaphragm:	Max +0,3 kPa/G
Material: Diaphragm:	Rubber coated stainless steel 316L	Parallell to the diaphragm:	Max +0,02 kPa/G
Other media tuched parts:	Stainless steel SS2353	**Repeatability:**	Better than +/- 0,1% of max range.
Ambient temperature:	-20 to +80 degrees C	**Accuracy:**	Better than +/- 0,5% of max range (including nonliearity, hysteresis and repeatability).
Damping:	0,1 s at delivery. Adjustable	**Electrical connection:**	M12, male, 4 terminal
Media temperature:	Max 80 degrees C	**Encapsulation:**	Better than IP67
Output:	4-20 mA, two wire connection, signal proportional to the pressure. Max current at overload 22,5 mA. MODBUS communication.	**Electrical safety:**	According to EN 60204-1
Supply:	8-36 V DC	**EMC:**	According to EN 61326-1-2-3
Filling liquid:	Silicon oil	**PED:**	According to 97/23/EG
Orientation dependence:	Max 30 mbar (+/-90° change)	**Weight:**	1500-3500 g (depending on type)

www.pondus-instruments.se