I N S T R U C T I O N

for

EMCO PITOBAR Averaging Pitot Tube

type DK 261

Steam applications

Application

EMCO PITOBAR pitot tube type DK 261 is the primary element in steam flow measurement according to the fluid dynamic pressure principle.

The fluid must be in one phase.

Changes of flow shall be slowly i.e. without pulsations.

Storage

Before installation the PITOBAR must be kept clean and protected against corrosion and physical damage.

Pipe Run

The PITOBAR pitot tube shall be fitted in a straight cylindrical pipe of constant crosssectional area without any obstructions.

The inner pipe diameter D must not vary more than 0,3% of D used in the differential pressure calculation.

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The required minimum straight length of the pipe varies according to the nature of the obstruction - bends, reducers etc.

From the table below it can be seen how many times the inner pipe diameter D is required.

	Upstream PITOBAR	Downstream PITOBAR
single 90° bend	9	3
two or more 90° bends in same plane	14	3
two or more 90° bends in different planes	24	4
reducer 2D to D over a length of 1,5D to 3D	8	3
expander 0,5D to D over a length of 1D to 2D	8	3

Please note : The PITOBAR requires less straight pipe run upstream if the PITOBAR is mounted in the same plane as the disturbance.

Is above lengths of straight pipe not possible, the accuracy will decrease especially in the low flow ranges. The repeated accurracy will not be affected notably.

The inside surface of the measuring pipe shall be clean, free from pitting and deposit for at least a length of 5 times D upstream and 2 times D downstream of the PITOBAR.
The inner roughness "k" shall be below the following limits given below:

$$k < \frac{D}{1000}$$

Typical inner pipe wall roughnesses are stated below.

Material	**Condition**	k, mm
steel	new, seamless cold drawn	< 0,03
	new, seamless hot drawn	
	new, seamless rolled	0,05 to 0,10
	new, welded longitudinally	
	new, welded spirally	0,10
	slightly rusted	0,10 to 0,20
	rusty	0,20 to 0,30
	encrusted	0,50 to 2
	with heavy incrustations	> 2
	bituminized, new	0,03 to 0,05
	bituminized, normal	0,10 to 0,20
	galvanized	0,13

Installation

The PITOBAR is supplied in 3 parts, namely; the probe, the mounting nipple and the bottom support.

The probe is fixed in the pipe by welding to the nipple which is welded to the pipe. Please follow the points given below in order to achieve the best installation procedure.

1) Drill a Ø 10 mm hole in the side of the pipe where the top of the probe is placed and a Ø 36 mm hole on the opposite side of the pipe.

2) Tag weld the mounting nipple on the pipe at the Ø 10 mm hole. Make sure that the nipple is placed at the right angle to the pipe and diagonally across the opposite hole to the bottom support.

3) After final welding of the mounting nipple, a hole of Ø 31,90 mm is drilled through the nipple and finished with a reamer up to Ø 32 mm.

4) The bottom support is welded to the pipe opposite the mounting nipple. Make sure that the support is directly across the welding nipple.

It is adviseable for larger pipe sizes to use the probe to center the bottom support when tag welding is performed.

5) After final welding of the bottom support, the probe is placed in the pipe according to the flow direction. Make sure that the +side is pointing towards the flow direction. Weld the probe to the nipple.

Final welding into the pipe line is done with an approved method of welding and if necessary heat treatment must be used.

Please observe that the flow in the pipe line flows in same direction as indicated by the pointer on the PITOBAR.

Tap location

2 pressure tappings provide the pressure upstream and the pressure downstream. The upstream pressure tapping is the " + " tapping and the downstream pressure is the " - " tapping.

The PITOBAR shall be mounted horizontally (on the side of the pipe). Preferably with a slope of 5 degr. above center line allowing the condensate in the probe to flow back to the main pipe.

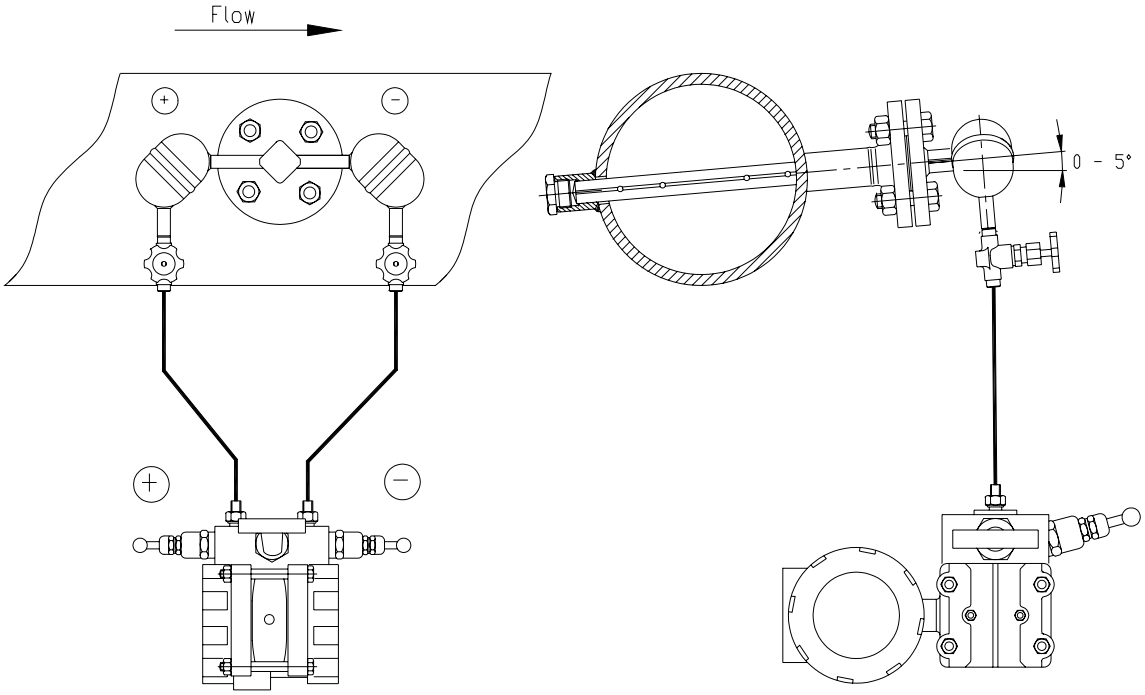

figure 1 : Steam flow measurement in a horizontal pipe with a slope of 5 degr.

The orientation of the pressure taps is matched to either a vertical or horizontal pipe run.

It is important that the 2 condensing chambers are in the same level to ensure equal water column above the differential pressure transmitter.

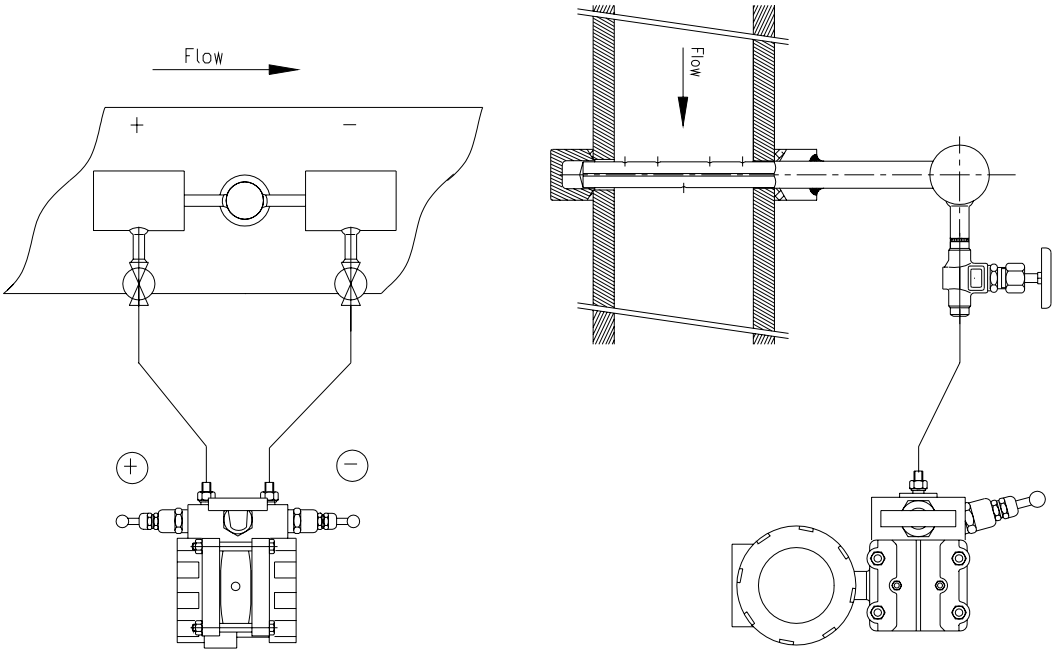

figure 2 : Steam flow measurement in a horizontal and a vertical pipe

Instrument Connection

It is recommended to install the differential pressure transmitter below the PITOBAR.

The " + " side of the PITOBAR is connected to the" + " side of the differential pressure transmitter and the two " - " sides are connected. The impulse lines must be installed with a slope to let captured air eccape.

The impulse lines should not be less than 10 x 1 mm in a material suitable to the service condition.

The PITOBAR is normally supplied with condensing pots and the primary isolating valves.

It is recommended to use a 5-way manifold valve in connection with the differential pressure transmitter in order to isolate, equalize and blow-down or depressurize the transmitter.

Maintenance

The EMCO PITOBAR pitot tube requires no special maintenance. If the PITOBAR is removed from the pipe line, the PITOBAR may be mechanically cleaned in- and outside or with air pressure only.