I N S T R U C T I O N

for

EMCO PITOBAR Averaging Pitot Tube

types DK 200/1/2/3 and DK 250/1/2/3

Liquid, gas, and steam

Application

EMCO PITOBAR pitot tube is the primary element in liquid, gas or steam flow measurement according to the fluid dynamic pressure principle.

The fluid must be in one phase and the pipe shall run full in the measuring section.

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

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 cross-sectional area without any obstructions.

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

EMCO Controls A/S · Høgevej 6, DK-3400 Hillerød · Phone: +45 4576 9400 · Fax: +45 4576 9401 · emco@emco.dk · www.emco.dk

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
globe valve fully open	24	4

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 accuracy will not be affected notably.

It is recommended to use full bore valves upstream the primary element. The valves shall be fully open.

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 roughness are stated below.

Material	Condition	k, mm
brass, copper, aluminium, plastics, glass	smooth, without sediments	< 0,03
steel	new, seamless cold drawn new, seamless hot drawn new, seamless rolled new, welded longitudinally new, welded spirally slightly rusted rusty encrusted with heavy incrustations bituminized, new bituminized, normal galvanised	< 0,03 0,05 to 0,10 0,10 0,10 to 0,20 0,20 to 0,30 0,50 to 2 > 2 0,03 to 0,05 0,10 to 0,20 0,13
cast iron	new rusty encrusted bituminized, new	0,25 1,0 to 1,5 > 1,5 0,03 to 0,05
asbestos cement	insulated and not insulated, new not insulated, normal	< 0,03 0,05

Installation

Disassemble the PITOBAR probe from the mounting kit.

Drill a hole Ø 31 mm (type DK 200/1/2/3) or Ø 36 mm (type DK 250/1/2/3) in the pipe.

Tag weld the mounting kit to the pipe observing that:

a. the distance from the outside of pipe to flange facing is 128 mm, or as specified in the order.

b. the centre line of the mounting kit is square to the pipe axis.

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

Assemble the PITOBAR unit with the gasket, bolts and nuts supplied with the unit.

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

Bottom support

For PITOBAR`s with bottom support or guiding, the support is welded to the pipe opposite the mounting kit in the same manner as the mounting kit.

It is advisable for bigger pipes to use the probe to centre the bottom support when tag welding is performed.

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.

Liquid

In a horizontal pipe the pressure taps shall be in the horizontal pipe axis or even better below.

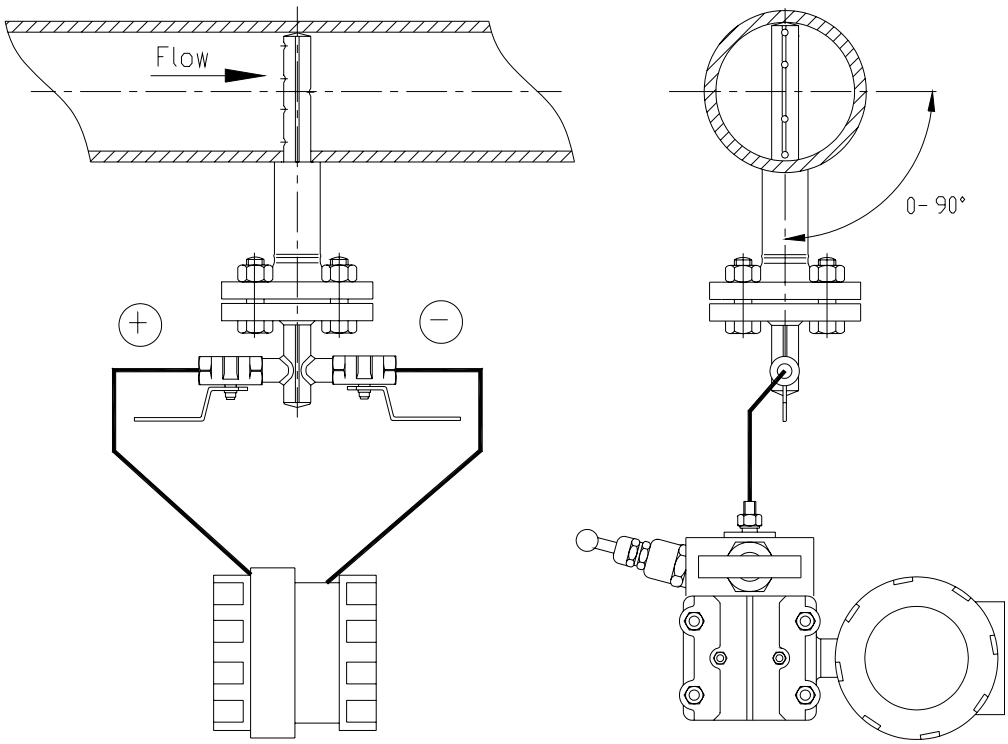

figure 1 : Liquid flow measurement in a horizontal pipe

Gas

In a horizontal pipe the pressure taps shall be in the horizontal pipe axis or even better above.

Steam

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

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 at the same level to ensure equal water column above the differential pressure transmitter.

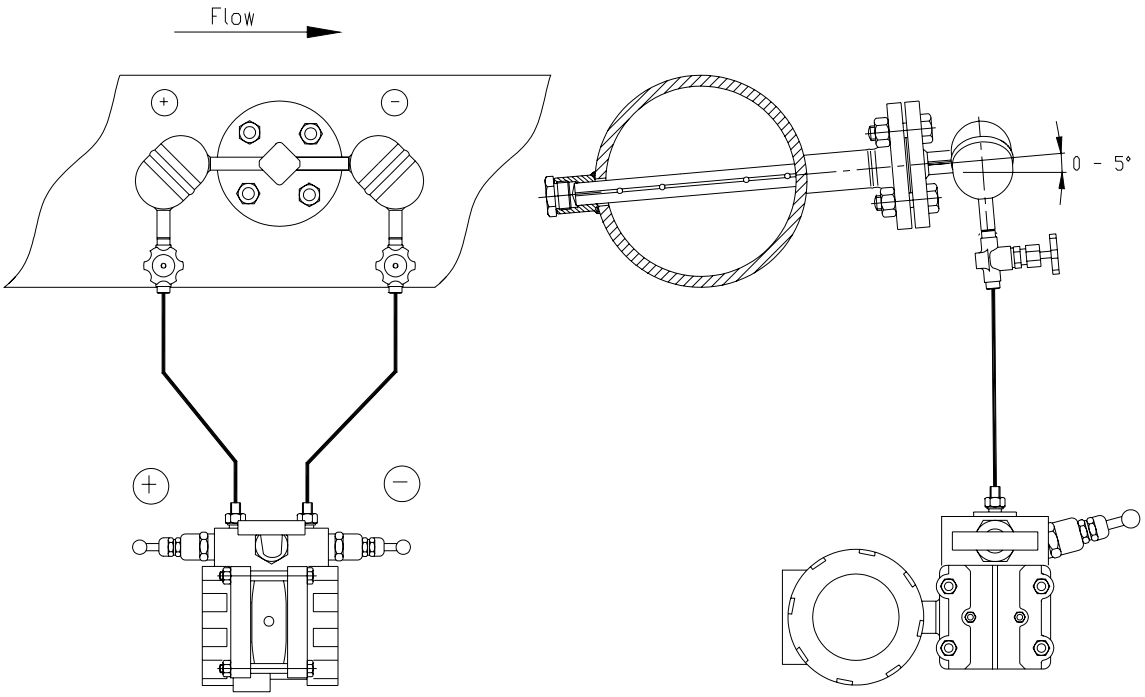

figure 2 : Steam flow measurement in a horizontal pipe

Purge

If the PITOBAR is used for a fluid with impurities the PITOBAR is foreseen with purge connections. The PITOBAR can be purged continuously or periodically with a gas or liquid compatible with the process fluid. Apart from purge fluids, it is possible to clean the inside of the PITOBAR probe mechanically.

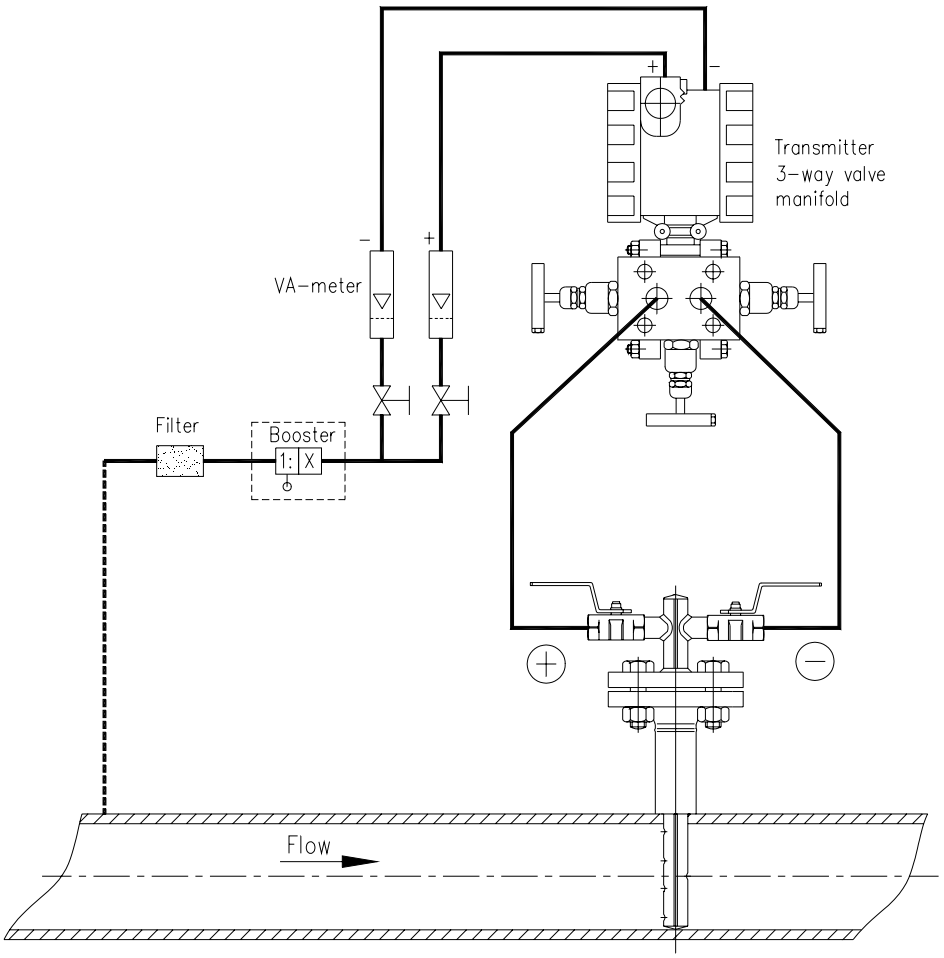

figure 3 : Continuously purging through transmitter and valve-manifold by the process-media

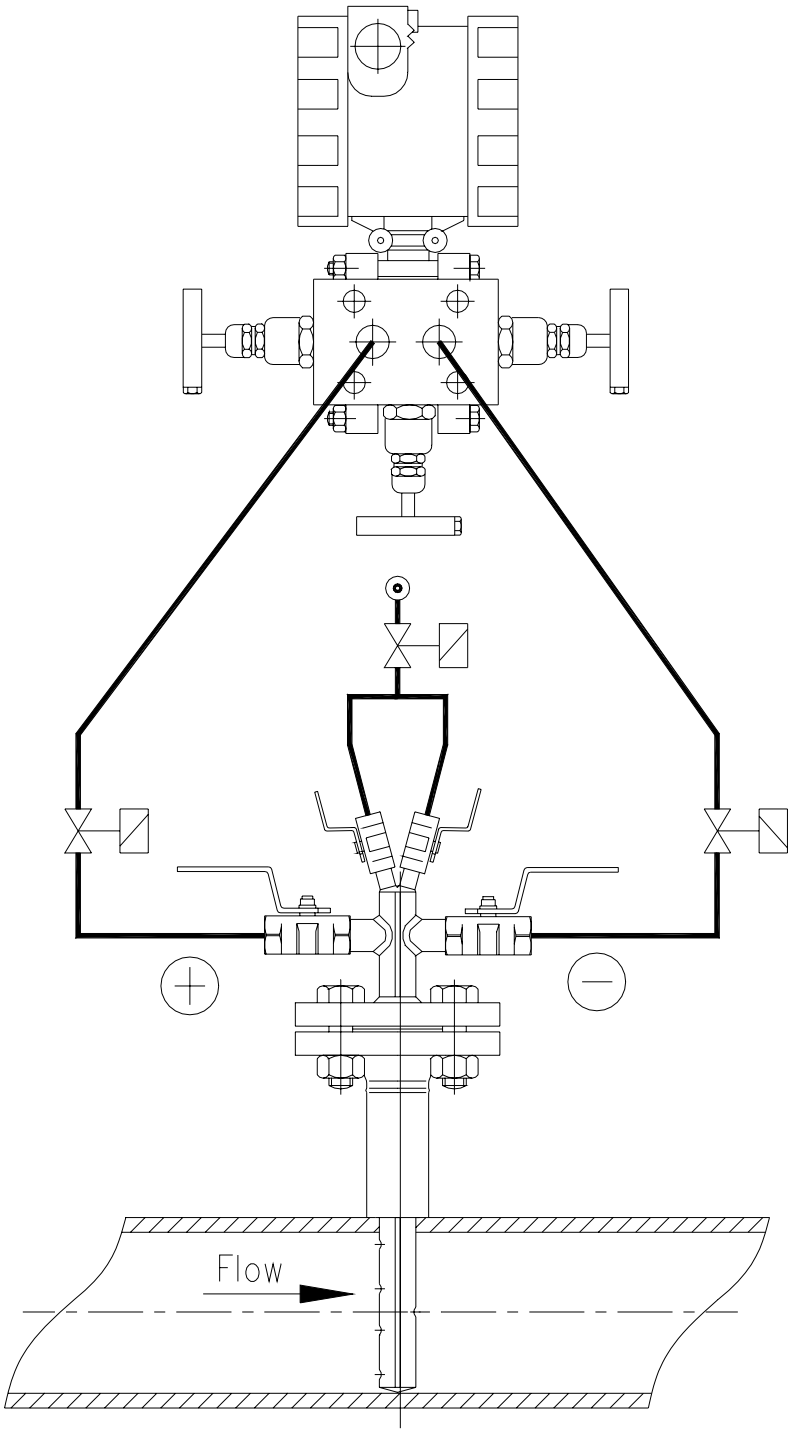

figure 4 : Momentarily purging with compressed air through purge connection, mounted on the PITOBAR, and process shut-off with solenoid valves.

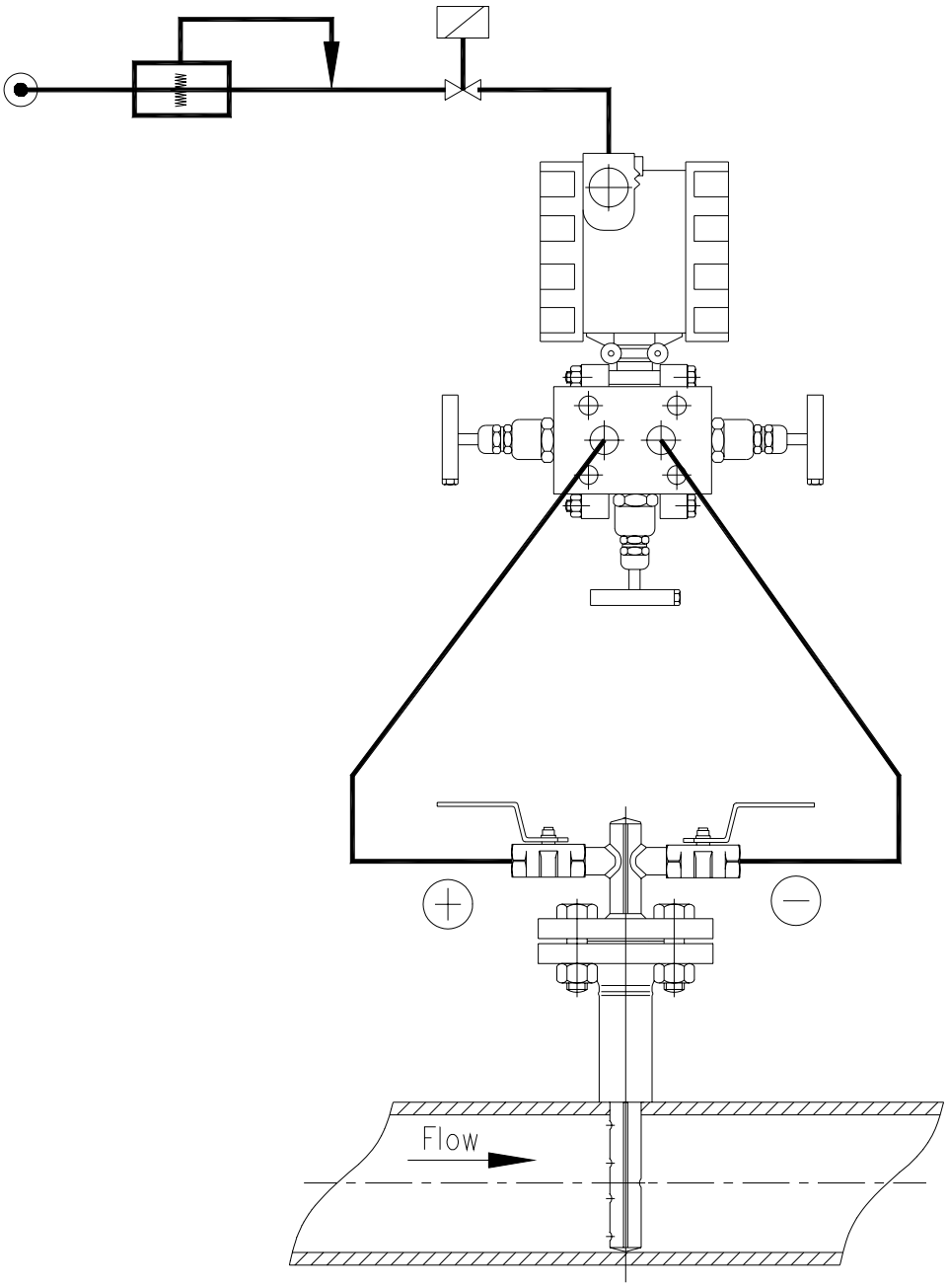

figure 5 : Momentarily purging with compressed air through transmitter and valve-manifold.

Caution ! Some low pressure transmitters can not withstand high one -way pressures

Instrument Connection

It is recommended to install the differential pressure transmitter below the PITOBAR for liquid and steam flow, and above the PITOBAR for gas flow. 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 escape.

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 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, equalise and blow-down or depressurise 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.

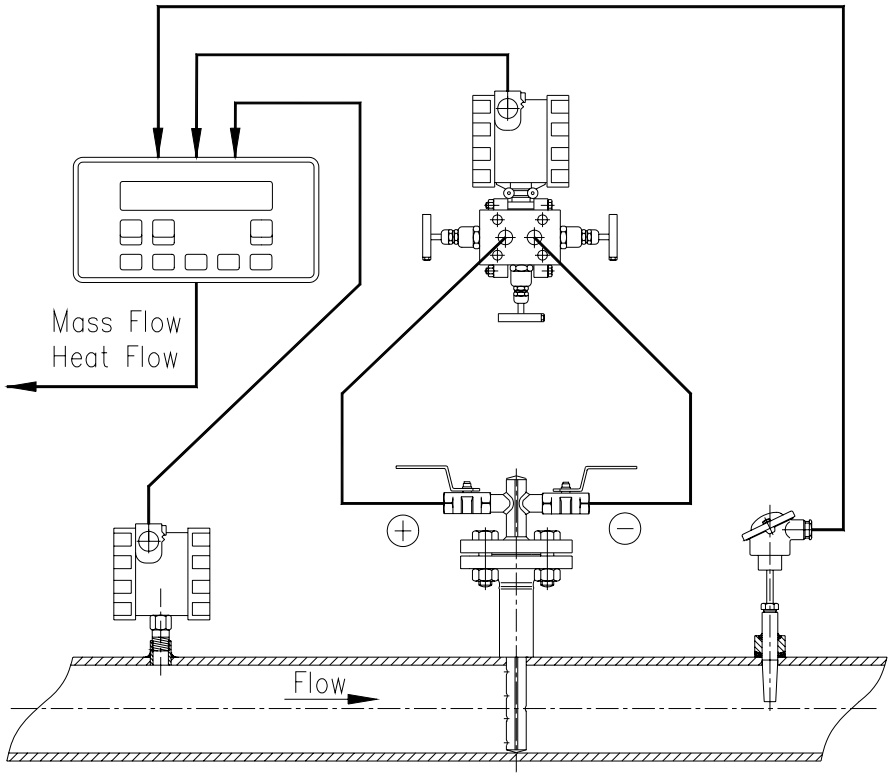

Figure 6 : Mass flow measurement with compensation of temperature and pressure, compensated in a flow computer.