LITREMETER
Specialist flow measurement engineering

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DIMENSIONS AND INSTALLATION

FLOWMETER MM SERIES TYPES PVC CE

Pipe or flanged series

This unit is a flowmeter with an integral electronics that transmits a pulse output linear to flow. The unit is rated to 2 bar at 60°C and 5 bar at 50°C subject to chemical compatibility.

The meter body is constructed in PVC with the orifice plate in 316 stainless steel or PVC. The rotor shaft is stainless steel with tungsten/sapphire bearings. The rotor is equipped with 6 ferrites which are sensed by a coil mounted in the electronics housing. The standard O-ring material is Viton for the electronics/body seal.

If it is necessary to remove the electronics then the line should be non-pressurised and drained down. The turbine ring assembly can then be simply pulled out. If it is held against the underside of the electronics and gently blown then the flowmeter action will be duplicated. (Ensure that any dangerous fluids that may be on the rotor assembly are removed before this test).

The transmitter electronics have top mounted push on terminals. The terminal's cover provided as standard is the LMH rubber protective hat. This is a push-on fit over the transmitter electronics and is a sliding fit on the cable. This protective hat or boot has no official designation for environmental protection standards. However, it has been found to be highly reliable in service both in industry and for agricultural spraying. An optional "Q" or “PM” ABS enclosure rated to IP65 is available as per optional extras.

In Intrinsically Safe versions the electronics are protected by an IP65 die cast aluminium epoxy coated or plastic enclosure. The sensor coil can be removed while the line is pressurised. The cap remains in situ and the box and sensor can be released using the 2 socket cap head screws on the inside of the electronics enclosure.

Optional Extras - Check with calibration certificate

a) The ferrites of the rotor may be sealed on all versions against highly corrosive fluids.

b) If titanium is superior to 316 stainless steel for certain fluid applications, then a titanium turbine ring assembly can be produced at a relatively small extra charge.

c) If tungsten is likely to be attacked by the fluid (as in demineralised water and highly acidic applications) then sapphire bearing balls instead of tungsten are used.

d) If a Viton O-seal is not suitable then EPDM or Nitrile can be substituted at no extra cost. A PTFE covered Viton or Silicon O-ring can be specified. Alternatively Kalrez can be supplied but this is an expensive option.

e) If an official IP65 protection is required then the PM or Q-cover should be used. It is a robust ABS material enclosure complete with IP65 gland entry for cable connection. The top lid has a sealing gasket and is removable for access to the terminations.

f) If metals such as 316 stainless steel and titanium are unsuitable for the fluid to be measured then the all PVC/PVC (also known as PVC2 or PVC3) version may be specified. This has a PVC orifice plate, bearing ring and bearing holders, sapphire/sapphire bearings and sealed ferrites. The rotor and wetted face of the electronics can be constructed in glass-filled nylon or polypropylene, PVC, Teflon PFA or PVDF depending on the application. The usual materials are PVC for the wetted face with a PFA rotor. The electronics, which is protected by the wetted face is in 316 stainless steel.

Connections

Between sizes MM12.5 and MM30 inclusive the meters have in-line male PVC pipe solvent weld connections corresponding to their body size. Larger sizes are designed to fit within the bolt circle diameter of the corresponding flange size. In certain circumstances meters may be provided with pipes or pipes and flanges welded into the body. Comments regarding installation must be noted.

Installation

The MM flowmeter is designed with an orifice having flow tappings on the upstream and downstream side which diverts flow through the pelton wheel turbine measurement chamber. As they include an orifice, the normal practice associated with orifice plate installation should be adopted.

Where possible the flowmeter should be fitted in a horizontal pipe run with ideally 25 x pipe diameter of straight pipe upstream and 5 x diameter downstream where the diameter is of the same nominal bore as the flowmeter. This is illustrated on the accompanying drawings C3678 and C3679. To duplicate the factory calibration method, the word "top" should appear in the position shown. If however the electronics is required to be installed at 180° from this position it will have no measurable effect on accuracy with the installation design as detailed above.

The meter installation should avoid the following undesirable situations. Some of these are shown on drawing number C3729.

It is **VERY IMPORTANT** that any couplings used at the meter (not MM12.5, MM20, MM25 and MM30 which have in built piperuns) do not restrict the flow. They should have the same internal diameter as the meter itself.

It should be noted that inside the body is an orifice with an access hole on each side leading to the bypass chamber which houses the rotor and ring assembly. If the direction of flow arrow is obscured, then the direction of flow can be determined since the smaller of the two access holes should be on the meter inlet side. If the holes are not visible as in the MM12.5, 20, 25 and 30 then the longest pipe will be the inlet.

Care should be taken with the following undesirable situations (see also C3729):

1. Two or more elbow bends or loops in different planes. This causes swirl in the pipe which could be corrected by separating the two bends by, if possible, 25 diameters of straight pipe and similarly installing the flowmeter 25 diameters after the second bend.

2. Partly closed valves should be avoided as these cause the flow across the pipe to travel at different velocities. This poor velocity profile can cause either high or low readings, depending on the relative orientation of the flowmeter. Filters and bends have similar effects and in virtually all cases 25 to 30 diameters of straight pipe would eradicate these disturbances.

3. If the flowmeter is installed after a valve that can be more than half closed, up to 50 diameters of pipe may be required for the highest accuracy of measurement.

4. An elbow bend or a tee piece upstream of the flowmeter will affect accuracy. A minimum of 10 x pipe diameters should be present as per C3678 or C3679.

If space is very restricted and the above conditions cannot be met, the loss in meter accuracy can be minimised by using a Zanker type (or similar) flow straightener.

The Zanker flow straightener has two elements: the first is a plate with many holes in it. This creates a pressure drop across the pipe which evens out the poor velocity profile. This cannot, however, remove swirl in the pipe: correction is made with the second element which consists of a honeycomb or tube bundle at least one diameter long. The use of the Zanker straightener allows the flowmeter to be installed within 10 diameters of the disturbance with little or no loss in flowmeter performance.

If the installation is poor then it may be possible to effect an in-situ flow calibration at various flow rates to establish the effect on the flowmeter. If the operating flow range is small, a new "meter factor" of pulses per litre could be used optimised for the smaller range as a result of in-situ testing. Non-linearity over a wide flow range can be minimised using a microprocessor instrument having a linearising signal processing facility. In this case the display or flow rate signal will have an enhanced accuracy over and above the flowmeter performance.

Viscosity effects

Viscosity affects all turbine type meters. If the viscosity is low this is minimal. Viscosity imposes drag on the rotor reducing the RPM even at high flows. Rangeability (turndown) is also reduced and it is desirable to operate in the higher end of the meter flow range as non-linearity appears particularly at low flows.

A relatively high viscosity fluid can be metered if the flow rate is stable or of a limited range and if the application temperature and resulting viscosity of the fluid is also stable. This applies to many batching systems where simple recalibration will provide system accuracy.

All viscous fluids create an increased pressure drop throughout the pipe line systems. Since it is desirable to operate flowmeters at the higher end of their flow range, most users operate pumped rather than gravity fed systems for viscous fluids.

Drawings included:

C3679 Installation diagram and dimensions for MM PVC solvent weld flowmeters

C3678 Installation diagram for MM PVC and SN type flange mounted flowmeters

C3729 MM Flowmeter Installation