



LITRE METER

Specialist flow measurement engineering

Tel: (01296) 670200

Fax: (01296) 670999

email: sales@litremeter.com

website: www.litremeter.com

DIMENSIONS AND INSTALLATION

IN-LINE FLOWMETER LMX & MMX SERIES + series

These units are flowmeters having an integral electronics transmitting a pulse output linear to flow. The meters are rated to 100 bar pressure and 100°C (optionally 230 bar). The main meter body and inlet and outlet pipes are made in 316 stainless steel. The connection size is either ½" BSP or ½" NPT – refer to transmitter calibration certificate to establish exact connection size. The rotor shaft is stainless steel with sapphire/sapphire bearings. The rotor is manufactured in Teflon PFA and is equipped with six ferrites which are sealed from the fluid. The ferrites are sensed by a coil mounted in the electronics. A PTFE gasket is used for the electronics/body seal. (An FPM O ring is used for the 230bar version) Viton is usually used for the removable electronics sensor seal although this is not a wetted part.

If it is necessary to remove the electronics then this can be done under pressure. Simply unscrew the electronics by hand. If a screwdriver is waved in front of the end of the electronics then the flowmeter action will be duplicated.

If it is necessary to remove the turbine ring for inspection or replacement then the line should be *non-pressurised and drained down*. First unscrew the electronics (see above). Then remove the aluminium disc and undo the eight socket cap screws that hold the cap to the body. The PTFE gasket/FPM O ring should be handled with care, as it needs to be re-used. Spare gaskets are available from the manufacturer. 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 has a 4-way M12 sensor connector [IEC-61076-2-101] rated to IP67 e.g. compatible with Brad Harrison, Hirschmann, ERNI and Turck Banner. The flowmeter is normally supplied with a separate 5m lead with the mating connector. The signal is an NPN open collector, 8 to 28Vdc input. *TTL and PNP are optional outputs*.

In higher temperature applications (above 40°C fluid temperature) **it is important that the electronics is not covered** and that there is a free flow of air around the electronics. In addition the electronics must be to the side of the meter and not above the flowmeter. This will avoid heat soak from the pipe. Lagging or insulation must not be used on the electronics. If this is unavoidable then Litre Meter produces a stalk

mounted version at extra cost. In some instances a finned electronics may be used (coloured red) which is rated to 120°C.

Installation

The LMX series of flowmeters are provided with inbuilt lengths of straight pipe both before and after the meter. This should limit the installation effects caused by various fittings before and after the flowmeter. For the 12.5 size an extra horizontal pipe run should be fitted prior to the flowmeter where the diameter is of the same nominal bore as the flowmeter. This should ideally be an extra 300mm. It is desirable that valves or T-pieces are not mounted directly on to the inlet pipe, as a change in calibration from the factory calibration certificate may result.

The transmitter should be installed in the horizontal plane as illustrated on the accompanying installation drawing C5576. If, however, the electronics are required to be installed at 180° from this position, this will have no measurable effect on accuracy with the installation design as detailed above. If PTFE tape is used to join the flowmeter to the rest of the piping system then care should be taken that small pieces of tape do not shred and enter the flowmeter.

The metering installation should avoid the following undesirable situations:

1. Two or more elbow bends or loops in different planes fitted prior to the flowmeter. This causes swirl in the pipe which can lead to errors. This can be corrected by separating the two bends by, if possible, 25 diameters and providing 25 diameters straight pipe after the second bend, which is immediately upstream of the flowmeter.
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 high or low readings.

For types 003, 005, 01, 05, 24, 45, 48 and 12.5 which have an internal jet, care should be taken to ensure that they are seated firmly down if they have been removed for any reason.

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 the 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.

Possible sources of error – specific to low flow:

1. That small particles may be affecting/blocking the jet. The size of the jet hole is just 0.38mm for the 005 and 0.3mm for the 003. We recommend a 40 micron filter for the 005 and 003.
2. The installation must have the flowmeters inlet and outlet pipes in the horizontal plane. In addition, the electronics must also be in the horizontal plane. This ensures that the rotor axis is vertical and that there is minimum friction on the bearings. With higher friction, then at lower flows errors will be observed. In the worst case, the minimum flow measurable will be higher as well.
3. Air pockets within the flowmeter. When we calibrate on our flow rig, we are able to remove the air pockets by manipulating a flexible hose. This is necessary on all flowmeters below LM01 in size. Above this size then the simple throughput of water removes the air, but below this size then some assistance is required. Removing the air pocket can also be effected just by twisting the flowmeter along the axis of the pipe.
4. Vibrations in the pipe and flowmeter may cause extra pulses to occur but we would find this unusual. Clamping the meter may assist.