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Installation and storage conditions
for cold water meters

Conditions d'installation et de stockage des compteurs d'eau froide



Foreword

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States.

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INSTALLATION and STORAGE CONDITIONS

for COLD WATER METERS

1. Scope.

This Document applies to water meters which are the subject of OIML Recommendation N° 49. It gives guidelines only for factors which might affect the error curve or might damage the water meter. It is suggested that the ISO Standard N° 4064, Part 2, on this subject be consulted on other aspects of water meter installation.

2. Criteria for the selection of water meters.

The type, flowrate range, maximum permissible error and size of a water meter are determined according to the operating conditions of the installation taking into account, particularly, the following:

- a) the available supply pressure,
- b) physical and chemical characteristics of the water,
- c) acceptable pressure loss across the water meter,
- d) the expected flowrates: the flowrates Q_{min} , Q_n , Q_{max} of the water meter (so defined in OIML Recommendation n° 49) must be compatible with the expected flowrate conditions of the installation, and
- e) the suitability of the water meter type for the installation conditions outlined below.

3. Water temperature.

The water meter shall be protected from the risk of damage by extreme temperatures of water and ambient air when installed.

4. Pressure fluctuations.

Means shall be incorporated into an installation to prevent pressure fluctuations which may damage the water meter or adversely affect its error curve.

5. Water quality.

5.1. Suspended particles

If the accuracy of the measurement of volume flow by the water meter is likely to be affected by the presence of suspended particles in the water (e.g. turbine and displacement water meters) then it shall be provided with a strainer or filter installed at the inlet or in the pipe upstream to remove the suspended particles.

The free area of the strainer or filter when it is an integral part of the water meter shall not cause the pressure loss of the combined strainer and water meter to exceed by 50 % the head loss of the meter without the strainer at the maximum flowrate of the water meter.

As the purpose of the strainer or filter is to remove suspended particles which might otherwise cause damage to the water meter or adversely affect the error curve of the water meter the size and pattern of holes is dependent on the condition of the water and the type of water meter.

5.2. Aeration of water

Aeration of water shall be prevented if this can damage the water meter or alter its accuracy but if unacceptable aeration does occur a means of eliminating air shall be incorporated at a suitable distance upstream of the water meter.

5.3. Substances in solution

Deposition of substances from solution within the water meter shall be prevented or deposits shall be removed if the accuracy of the measurement of volume flow by the water meter is likely to be affected.

6. Straight lengths of pipe and/or flow straighteners.

In points 6.1. and 6.2. diameter D is the nominal bore of the pipe connected to the water meter.

6.1. The need for straight lengths of pipe and/or flow straighteners

The accuracy of the water meter can be affected by upstream disturbances caused by the presence of bends, taper pieces, valves or pumps for instance. The water meter shall be installed in a straight length of pipe (as recommended in point 6.2.) to correct any such effect. This pipe shall have the same nominal bore as the meter connection. Additionally a flow straightener situated upstream of the straight length of pipe may also be necessary.

6.2. Recommended straight lengths of pipe

Displacement meters (e.g. rotary piston type) are accepted as being insensitive to upstream installation conditions and hence no special recommendations are required.

Velocity meters (single and multi-jet types) require in general a straight length of $3D$ upstream of the meter and $1D$ downstream unless it is shown that there is no need for this provision.

However, special requirements are required for the installation of helix type or Woltman meters. This type of meter is sensitive to flow disturbances which cause important errors.

A flow can be subject to two types of disturbances: velocity profile distortion and swirl, both of which affect the accuracy of the water meter. Velocity profile distortion is typically caused by an obstruction partially blocking the pipe, for instance the presence of a partly closed valve or a misaligned flanged joint. This effect can easily be minimised.

Swirl is caused mainly by two or more bends in different planes. This effect can be controlled either by ensuring an adequate length of straight pipe upstream of the water meter, or if this is not possible by installing a straightening device.

The following recommendations are therefore given for Woltman meters. Woltman meters shall be installed with a straight length of at least $5D$ upstream of the meter for vertical type meters and $3D$ for horizontal.

If a centrifugal pump or two or more bends in different planes is/are situated upstream of a Woltman meter the meter shall be installed with a suitable flow straightener upstream of 5D of straight pipe length.

Abrupt variations of the pipe cross section within ID of the outlet of Woltman meters shall be avoided.

6.3. Errors due to installation effects

International Recommendation N° 49, point 4.3. stipulates that when installed, the indications of the water meter shall satisfy the requirements of point 10.2. of that Recommendation, in relation to the maximum permissible errors.

The effect of installation conditions on the accuracy of a water meter has not been comprehensively investigated.

It is recommended meanwhile that bends, pumps and variations in pipe diameter upstream of the meter should be avoided so far as possible and the meter should be positioned to afford the maximum possible straight length of pipe upstream and downstream. Manufacturers installation recommendations, and those of the legal metrological services of the Member States for particular meter types should be taken into account.

When the recommendations of point 6.2. are observed the installation errors will not take more than 25 % of the maximum permissible errors.

7. Isolating, air bleed and drain valves.

Isolating valves, if used, shall be of the full bore type, e.g. gate, ball valves and be installed upstream of the recommended inlet straight length of pipe (and flow straightener if fitted), and downstream of the recommended outlet straight length of pipe.

Provided other types of isolating valves are known to have no effect on the accuracy of the water meter, for certain meter types, e.g. multi-jet, the use of diaphragm and butterfly valves for instance is acceptable.

All isolating valves shall be fully opened during operation.

The provision of air bleed and drain valves situated between the upstream and downstream isolating valves is recommended (see point 9) particularly for larger meters. Their presence must not affect the accuracy of the water meter and they must be fully closed during the operation of the water meter.

8. Installation.

8.1. Positioning

The water meter shall be easily accessible for reading, for maintenance and removal, and also for dismantling of mechanism if required.

8.2. Sealing

Where it is thought necessary to prevent fraud the water meter shall be provided with a sealing device on the water inlet pipe so that unauthorised removal and replacement of the water meter shall be obvious on inspection.

8.3. Orientation

The orientation of the water meter shall be appropriate to its type.

9. Preparation for installation and running of water meters.

Before installation the water main shall be flushed to remove debris.

After installation water shall be let into the main slowly and with any air bleeds opened so that entrained air does not cause the water meter to race thereby causing damage.

The water meter shall be installed so that it is completely filled with water under normal conditions.

10. Storage conditions.

During handling and storing the water meter shall be stored in a sanitary environment with protective end caps in place and shall not be subjected to ambient conditions which may damage the meter either physically or metrologically.

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