INTERNATIONAL STANDARD

ISO 4064-2

Third edition
2005-10-15

Measurement of water flow in fully charged closed conduits — Meters for cold potable water and hot water —

Part 2: Installation requirements

Mesurage de débit d'eau dans les conduites fermées en pleine charge — Compteurs d'eau potable froide et d'eau chaude —

Partie 2: Conditions d'installation

Reference number
ISO 4064-2:2005(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4064-2 was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 7, *Volume methods including water meters*.

This third edition cancels and replaces the second edition (ISO 4064-2:2001), which has been technically revised, as well as cancelling and replacing ISO 7858-2:2000.

ISO 4064 consists of the following parts, under the general title *Measurement of water flow in fully charged closed conduits — Meters for cold potable water and hot water*:

— *Part 1: Specifications*

— *Part 2: Installation requirements*

— *Part 3: Test methods and equipment*

Measurement of water flow in fully charged closed conduits — Meters for cold potable water and hot water —

Part 2: Installation requirements

1 Scope

This part of ISO 4064 specifies criteria for the selection of single, combination and concentric water meters, associated fittings, installation, special requirements for meters and the first operation of new or repaired meters to ensure accurate constant measurement and reliable reading of the meter.

This part of ISO 4064 also applies to water meters, based on electrical or electronic principles and to water meters based on mechanical principles incorporating electronic devices, used to meter the actual volume flow of cold potable water. It also applies to electronic ancillary devices.

NOTE 1 As a rule ancillary devices are optional.

The recommendations of this part of ISO 4064 apply to water meters, irrespective of technology, defined as integrating measuring instruments continuously determining the volume of water flowing through them.

NOTE 2 Attention is drawn to the fact that national legislation may apply in the country of use, which will take precedence over the provisions of this part of ISO 4064.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4064-1:2005, *Measurement of water flow in closed fully charged conduits — Meters for cold and hot potable water — Part 1: Specifications*

ISO 6817:1992, *Measurement of conductive liquid flow in closed conduits — Method using electromagnetic flowmeters*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4064-1 and the following apply.

3.1
parallel operation
operation of two or more meters grouped together and connected to a common source and a common delivery

3.2
multiple meter operation
operation of several meters grouped together where their inlets are connected to a common source, or their outlets to a common delivery, but not both at the same time

4 Criteria for the selection of water meters

4.1 General considerations

The type, metrological characteristics and sizes of water meters shall be determined according to the operating conditions of the installation and the environmental class(es) demanded, particularly taking into account the following:

— available supply pressure;

— physical and chemical characteristics of the water;

— acceptable pressure loss across the meter;

— expected flowrates: the flowrates, Q_1 and Q_3, of the meter (as defined in Clause 3 of ISO 4064-1:2005) shall be compatible with the expected flowrate conditions of the installations, including the water flow direction(s);

— suitability of the meter type for the intended installation conditions;

— available space and pipework to install the meter and fittings;

— possibility of deposition of substances from solution within the meter;

— sustainability of the power supply of the water meter (where applicable).

When using combination meters, care shall be taken to ensure that “cross-over” flowrates are different from (and less than) normal operating flowrates.

4.2 Information to be provided by the manufacturer

The manufacturer shall supply sufficient information to enable the correct choice and installation of a meter, such that influencing factors shall not lead to either failure or non-conformance with the specified metrological characteristics.

NOTE This is particularly important for hydraulic disturbances.

Specifically, the manufacturer shall determine the influence factors, which affect the indicating error and state of the individual meter design. For each influence factor, the manufacturer shall state the relevant rated operating conditions applicable to the meter.

4.3 Meters operating in parallel or in a group

4.3.1 For meters operating in parallel, means shall be provided so that the unserviceability of one or more meters within a group shall not cause the remaining meters to operate at a flowrate in excess of each individual meter’s limit of operation.

4.3.2 In order to ensure that water meters of different types will operate satisfactorily in parallel, the individual characteristics of meters operating in parallel shall be compatible, e.g. by grouping them according to pressure loss, flowrate range and maximum working pressure. However, the installation conditions for each type shall be respected.

4.3.3 For meters operating in parallel and multiple meter operation, the possibilities of interaction between one meter or meter type and another to the detriment of their life and accuracy, e.g. pressure surges and vibration, shall be considered.

NOTE Examples of the use of meters operating in parallel and multiple meter operation are the following:

— meters operating in parallel where the installation of one large meter to meet the maximum water demand or to cover the required flowrate range is impractical;

— meters installed in parallel where “stand by” meters are necessary to ensure continuity of delivery and flow measurement in the case of filter blockage or water meter breakdown;

— meters grouped in multiple operation for ease of access, service and reading, where it is necessary to split a water supply into a number of branches, as for instance in a block of flats, or where it is necessary to unite a number of metered tributary flows into a common main, as in a water treatment plant.

5 Associated fittings

5.1 General

The water meter installation may include the following accessories as applicable.

5.2 Upstream of the meter

5.2.1 A stopcock or valve, optionally with the direction of the valve operation indicated.

5.2.2 A flow straightening device and/or a length of straight pipe, fitted between the valve and the meter.

5.2.3 A strainer, fitted between the stop valve and the meter.

5.2.4 A means of sealing the connection of the water meter to the water supply line, in order to detect any unauthorized removal of the water meter.

5.3 Downstream of the meter

5.3.1 An adjustable length device, to allow for easy installation and removal of the water meter. This device is specially recommended for meters having $Q_3 \geqslant 16$ m^3/h.

5.3.2 A device including a drain valve, which may be used for pressure monitoring, sterilization and water sampling.

5.3.3 A stopcock or a valve, for meters having $Q_3 > 4{,}0$ m^3/h; this valve shall be operated in the same sense as the upstream valve.

5.3.4 A check valve, if required, except for bi-directional flow applications.

6 Installation

6.1 General requirements

6.1.1 Every water meter, single or in a group, shall be easily accessible for reading (without, e.g., the use of mirror or ladder), for installation, for maintenance, for removal and for *in situ* dismantling of the mechanism if required.

In addition, for water meters of mass in excess of 25 kg, clear access to the installation site to allow the water meter to be brought to, or removed from, its working position, and adequate space around the working position for the installation of lifting gear, shall be provided. The following points shall be taken into account:

— need for adequate illumination of the installation site;

— need for the floor to be even, rigid, non-slip and clear of obstacles.

6.1.2 Accessories such as those specified in 5.2 and 5.3, if fitted, shall also be readily accessible and the requirements of 6.1.1, relating to large meters shall also be applicable to the fittings.

6.1.3 In all cases, contamination shall be avoided, especially when the meter is installed in a pit, by mounting the water meter and the fittings at a sufficient height above the floor. If necessary, the pit shall be provided with a sump or drain for water removal.

6.2 Installation requirements

6.2.1 For correct operation and long service, a water meter shall always be entirely full of water.

6.2.2 The meter shall be protected from the risk of damage by shock or vibration induced by the surroundings.

6.2.3 The meter shall not be subjected to undue stresses caused by pipes and fittings. If necessary, it shall be mounted on a plinth or bracket.

The water pipe lines upstream and downstream shall be adequately anchored to ensure that no part of the installation can be displaced under water thrust when the meter is dismantled or disconnected on one side.

6.2.4 The meter shall be protected from the risk of damage from extremes of temperature of the water or ambient air.

6.2.5 If there is a risk of air entering the meter or a group of water meters, an upstream air release valve shall be incorporated and installed in accordance with the manufacturer's instructions.

6.2.6 The meter pit shall be protected from flooding and rainwater.

6.2.7 The orientation of the meter shall be appropriate to its type as marked (the manufacturer shall clearly identify any limits).

6.2.8 The meter shall be protected from the risk of damage due to external environmental corrosion.

6.2.9 In the case where the water meter is part of an electrical earthing, in order to minimize the risk to operational staff, there shall be a permanent shunt for the water meter and its associated fittings.

NOTE National or local legislation may apply concerning the use of water pipes for this purpose.

6.2.10 Precautions shall be taken to prevent damage to the meter due to unfavourable hydraulic conditions (cavitation, surging, water hammer).

6.2.11 Other conditions shall be taken into consideration when installing the water meter, such as:

a) water temperature;

b) ambient relative humidity;

c) water pressure;

d) transmission of vibrations;

e) water quality (suspended particles);

f) electrostatic discharge;

g) continuous magnetic field;

h) electromagnetic disturbances;

i) any other relevant mechanical, chemical, climatic, electrical, or hydraulic conditions.

The installation and environmental conditions shall be such that the water meter remains within its rated operating conditions for all influence quantities during the product lifetime specified by the manufacturer.

6.3 Water quality (suspended particles)

If, for the specific installation conditions, the accuracy of measurement of volume flow by the water meter is likely to be affected by the presence of suspended particles in the water, then it may be installed with a strainer or filter. The strainer or filter shall be placed either at the inlet of the water meter or in the pipework upstream.

6.4 Electromagnetic meters

To ensure accurate measurement and prevent galvanic corrosion at the electrodes, the meter and the measured fluid shall be electrically connected at the same potential. Whilst in general this means earthing the water, the manufacturer's individual installation instructions for a particular meter design shall be followed.

On a conducting but uninsulated fluid pipe, without a non-conducting internal coating, the connecting point(s) of the meter's primary element shall be electrically linked to the secondary element and both connected to earth.

On non-conducting pipes, or pipes isolated from the fluid, metal earthing rings shall be interposed between the pipe and the primary element of the meter. These shall be electrically linked to the secondary element and both to earth.

Where the fluid cannot be earthed for technical reasons, the meter may be connected without referencing the fluid potential, but only when the meter model and manufacturer's instructions permit.

For other requirements for electromagnetic meters, ISO 6817 shall apply.

6.5 Meters operating in parallel or in a group

6.5.1 Means shall be provided to permit installation, reading, servicing, *in situ* dismantling and removal of any meter, without interference from, or interfering with, the operation of any other meter in the group.

6.5.2 For multiple meter operation, with common outlet, check valves shall be installed, downstream of each meter, to prevent back flow through the meter.

6.5.3 For multiple meter operation, means shall be provided, affixed on or immediately adjacent to each water meter, to identify the source or delivery each water meter is registering.

6.6 Security of operation

Water meters shall have protective devices installed, which can be sealed in such a way that after sealing and when the water meter has been correctly installed, there is no possibility of dismantling, altering or removing the water meter or its adjustment device without visibly damaging the protective devices.

7 Hydraulic disturbances

7.1 General

Many types of meter are sensitive mainly to upstream flow disturbances, which cause large errors and premature wear. They are likewise, though to a lesser extent, sensitive to downstream flow disturbances.

It should be noted that proper functioning of different water meters is related not only to their construction but to their installation conditions as well.

7.2 Types of disturbance

A flow can be subject to two types of disturbance: velocity profile distortion and swirl.

Velocity profile distortion is caused typically by an obstruction partially blocking the pipe, e.g. the presence of a partly closed valve, a butterfly valve, a check valve, an orifice, a flow or pressure regulator, etc.

Swirl may be caused in many ways. For example, by two or more bends of the pipe in different planes, by centrifugal pumps, by tangential inlet of supply line into the main line in which the water meter is installed, etc.

Disturbance shall be eliminated as far as possible, by the application of the guidelines set out in 7.3.

7.3 Methods of eliminating disturbances

7.3.1 The circumstances leading to flow disturbances are by nature complex and too numerous to detail in this document. Potential causes should be eliminated prior to the implementation of remedial devices such as flow straightening devices.

The factors given in 7.3.2 to 7.3.7 may serve as a guideline, for new installations.

7.3.2 Velocity-profile distortion can easily be eliminated by careful application of installation procedures. This is particularly true in the case of “coning” down, abrupt section reduction and the malinstallation of joint washers/gaskets. In addition, when the water meter is in service, it is essential to ensure that the upstream and downstream valves remain in the fully open position. These valves shall be of a type that does not cause any disturbance to the water flow whilst in the open position.

7.3.3 It is a common accepted rule of thumb that straight sections of pipe of the same diameter, D, as the water meter, having lengths of 10 D and 5 D upstream and downstream of the water meter, respectively, are required and sufficient. It should be clarified that this is just a practical compromise. The longer the pipe, the better, particularly in the upstream side of the water meter.

7.3.4 Any device like a check-valve, orifice, flow or pressure regulator, etc. may create a flow profile disturbance that will exist well after a length of 10 D pipe. Whenever possible, such devices shall be installed downstream of the water meter, at the far end of the straight section.

7.3.5 Water feed line connection to a main line in which a water meter is installed shall not create a swirl (see Figure 1).

7.3.6 Two or more bends in different planes shall be:

— either installed downstream of the water meter or

— moved as far as possible from the water meter if located upstream and

— separated as far as possible from each other.

7.3.7 A compatible flow straightening device may be used upstream of the water meter to reduce the straight lengths of pipe (7.3.3), as long as this does not conflict with the meter manufacturer's instructions.

Special consideration shall be given to bi-directional flow applications.

a) Bad connection **b) Good connection**

Key

1 feed line

2 main line

Figure 1 — Water feed line connection to main line

8 First operation of new or repaired water meters

8.1 General

Before installation, the water main shall be flushed. All debris shall be removed from the supply pipe and the surrounding area shall be made clean and dry to prevent any possibility of debris ingress into the water meter.

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

8.2 Meters operating in parallel or in a group

8.2.1 When one or more water meters of a group commence operation, the possibility of reverse flow through other meters in the group exists. Steps shall be taken to avoid this, e.g. by the use of pressure gauges, control valves, check valves, etc. (See 4.3 and 6.5.)

8.2.2 Flow regulation shall be installed downstream of the water meter.

8.3 Protection of the meter

8.3.1 General considerations

The meter shall be protected from the risk of damage that may be caused by:

— frost (see 8.3.2);

— flooding or rain leaking in;

— shock or vibration either transmitted from or induced by the installation (see 8.3.3);

— reverse water flow (see 8.3.4);

— adverse hydraulic conditions (cavitation, overpressure, water hammer);

— excessive water or ambient air temperatures;

— damp heat and dry heat;

— installation-induced stress and unbalance (see 8.3.5);

— external electrolytic or environmental corrosion;

— intentional fraud (see 8.3.6);

— electromagnetic disturbances;

— electrostatic discharge;

— electrical bursts;

— short time power reduction;

— power voltage variation;

— sinusoidal vibration;

8.3.2 Frost

Special arrangements shall be made to avoid freezing of the water meter but without restricting access. Insulating materials, where applied, shall be rot-proof.

8.3.3 Shock or vibration either transmitted from or induced by the installation

Special arrangements shall be made to ensure that the meter is not affected by vibration, in accordance with the manufacturer's specifications.

Potential causes of vibration should be eliminated prior to the installation of the water meter. However, when necessary, flexible joints may be provided on the pipe work. For large meters (typically DN 150 and above), blocks and anchor stops shall be isolated from the groundwork by flexible footings.

8.3.4 Reverse water flow

NOTE In addition to manufacturer's instructions, national regulations may apply.

Protection against reverse water flow shall be provided when the type of meter installed is designed or specified to correctly meter in one direction only and where reverse flow could either cause failure to stay within the maximum permissible error or lead to the deterioration of the meter.

Where the meter design provides for correct metering of reverse flow without detriment, a reverse flow indicating device may be implemented as an alternative to protection; e.g. in the case of a bi-directional electromagnetic meter.

In the case of commercial transactions, whenever the flow of water through the meter is required to be unidirectional, protection should consist of an approved anti-pollution non-return device that may be incorporated into the meter drain valve or other associated fitting.

Protection against reverse flow may be incorporated into the design of the meter assembly.

8.3.5 Installation induced stress and unbalance

The water meter shall not be subjected to unbalanced or undue stresses, caused either by misalignment of pipes and fittings, or by lack of adequate support, or by being mounted on misaligned supports.

8.3.6 Intentional fraud

For all commercial transactions a protective device for sealing the meter on to the inlet pipe shall be installed. This shall prevent the removal of the water meter, without the protecting device being visibly damaged.

Use of such protective devices may be implemented for non-commercial transactions, as appropriate.

8.4 Safety of personnel and users

8.4.1 General

NOTE National regulations with regard to health and safety, including hazardous area zoning as applicable, may apply.

Meters shall not be installed in hazardous locations. Furthermore, it is essential to avoid all installation conditions that could constitute a risk to the health of personnel or users.

Reasonable provision in regard to lighting, ventilation, non-slip surfaces, floor level changes and avoidance of obstructions shall be made.

For water meters of mass greater than 25 kg, clear access shall be provided to the installation site, in order to allow the water meter to be brought to, or removed from, its working position. Additionally, adequate space shall be provided around the working position to allow for the installation of lifting gear.

8.4.2 Pipework anchoring

The pipework upstream and downstream shall be adequately anchored to ensure that no part of the installation can be displaced by water thrust, either during normal operation, during the period when the meter is dismantled, or when the meter is disconnected on one side or flange.

8.4.3 Manhole installation

The manhole lid shall resist the ingress of water, shall be easy to manipulate by a single person and shall be specified to resist the loads encountered in the particular location.

When so required by the depth of the manhole, rungs with a handrail, or stairs for large chambers, shall be installed.

NOTE Health and safety regulations may apply.

8.4.4 Installations requirements for pipes greater than DN 40

In all cases where the meter is not buried there shall be a minimum free space above the meter and its associated fittings equal to 700 mm.

8.4.5 Protection against hazard related to electrical installations

NOTE 1 Local and/or national regulations with regard to electrical health and safety, including hazardous area zoning and earthing, may apply.

In the case where the water meter is part of an electrical earth path, in order to minimize the risk to operational staff, there shall be a permanent shunt across the water meter and its associated fittings.

Water pipe connections shall not be used as the earthing system for electrical installations.

NOTE 2 Such use implicitly creates hazards for the user and the personnel in charge of installing and maintaining connections, meters and associated fittings.

Further to any applicable national regulations, it is recommended that consideration be given to electrically isolating the water system inside a private installation from the water connection itself. This may require the interposition of an insulating length of at least two meters between the origin of any internal piping and the metallic accessory furthest downstream of the connection.

NOTE 3 The installer should be aware that even when the electrical installation earthing is properly executed and independent from the water pipe connection, there may still be a danger to personnel working on the meter and its associated fittings. This is true in the following cases:

— when there are equipotential links between the internal water system and the independent earthing point;

— when the user, as part of the current regulations in terms of electrical work, utilizes drinking water conduits inside buildings, located after the meter, for connecting the various electrical equipment to the building's earth.

8.5 Comfort of personnel — Access to the water meter and fittings

8.5.1 General

It shall be possible to separate the meter system, comprising the meter and associated fittings, from the installation, including the pipe, in which it is installed. The installation, removal and replacement of the meter and its associated fittings shall be carried out without deterioration or removal of material from the construction and without having to displace any equipment or miscellaneous objects.

NOTE This requires the presence of one or more disassembly joints.

For water meters weighing more than 40 kg, a suitable gangway, path, access road or similar shall be provided for bringing the meter to its installation point.

Except in the case of in-line meters which fit into specific metering pits or metering assemblies, sufficient clearance shall be provided between any side wall or obstacle and not less than one side of the installed water meter/associated fittings. This clearance is recommended to be at least one pipe diameter plus 300 mm.

8.5.2 Installation in manholes

For installation in a manhole, the base of the manhole shall normally be above water.

The meter and its fittings shall be installed at a sufficient height above the base of the manhole to prevent any risk of contamination. If necessary, the manhole shall be equipped with a sump or drain to evacuate water.

NOTE The manhole should contain only the meter and its accessories.

The manhole shall be built of rot-proof materials offering sufficient mechanical strength.

ICS 91.140.60

Price based on 10 pages