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Water meters for cold potable water and hot water. Part 5: Installation requirements

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Water meters for cold potable water and hot water

Part 5: Installation requirements

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National foreword

This British Standard is the UK implementation of EN ISO 4064-5:2014. It supersedes BS EN 14154-2:2005+A2:2011, which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee CPI/30, Measurement of fluid flow in closed conduits, to Subcommittee CPI/30/7, Volume flow-rate methods.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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NORME EUROPÉENNE

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English Version

Water meters for cold potable water and hot water - Part 5: Installation requirements (ISO 4064-5:2014)

Compteurs d'eau potable froide et d'eau chaude - Partie 5: Exigences d'installation (ISO 4064-5:2014)

Wasserzähler zum Messen von kaltem Trinkwasser und heißem Wasser - Teil 5: Einbaubedingungen (ISO 4064-5:2014)

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Foreword

This document (EN ISO 4064-5:2014) has been prepared by Technical Committee ISO/TC 30 “Measurement of fluid flow in closed conduits” in collaboration with Technical Committee CEN/TC 92 “Water meters” the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2014, and conflicting national standards shall be withdrawn at the latest by June 2017.

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Endorsement notice

The text of ISO 4064-5:2014 has been approved by CEN as EN ISO 4064-5:2014 without any modification.

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2, www.iso.org/directives.

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The committee responsible for this document is ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 7, *Volume methods including water meters*. It supersedes ISO 4064-2:2005, which has been technically revised.

ISO 4064 consists of the following parts, under the general title *Water meters for cold potable water and hot water*:

— *Part 1: Metrological and technical requirements*

— *Part 2: Test methods*

— *Part 3: Test report format*

— *Part 4: Non-metrological requirements not covered in* ISO 4064-1

— *Part 5: Installation requirements*

INTERNATIONAL STANDARD **ISO 4064-5:2014(E)**

Water meters for cold potable water and hot water —

Part 5: Installation requirements

1 Scope

This part of ISO 4064 applies to water meters used to meter the volume of cold potable water and hot water flowing through a fully charged, closed conduit. These water meters incorporate devices which indicate the integrated volume.

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.

In addition to meters based on mechanical principles, 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 measure the volume of cold potable water and hot water. It also applies to electronic ancillary devices. Ancillary devices are optional. However, national or international regulations may make some ancillary devices mandatory in relation to the utilization of the water meter.

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 Any national regulations apply in the country of use.

2 Normative references

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

ISO 4064-1:2014|OIML R 49-1:2013, Water meters for cold potable water and hot water — Part 1: Metrological and technical requirements

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

3 Terms and definitions

For the purposes of this part of ISO 4064, the definitions given in ISO 4064-1|OIML R 49-1 and the following apply.

3.1
parallel operation
<water meters> 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

3.3
adaptor
<water meters> additional mechanical device fitted into a connection interface on location in order to combine an unmodified cartridge meter of one geometry with a connection interface of another geometry

3.4
converter
<water meters> connection interface consisting of several parts produced as a complete unit prior to installation into the supply system

Note 1 to entry: No assembly work is to be done on location other than the installation of the complete interface. Conversion is related to either change of flow pattern, change of flow direction or extension of seat depth.

4 Criteria for the selection of water meters

4.1 General considerations

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

— the available supply pressure;

— the physical and chemical characteristics of the water, including water temperature and water quality (suspended particles);

— the acceptable pressure loss across the meter;

— the expected flow rates: the flow rates Q_1 and Q_3 of the meter (as defined in ISO 4064-1:2014|OIML R 49-1:2013, Clause 3) shall be compatible with the expected flow rate conditions of the installations, including the water flow direction(s);

— the suitability of the meter type for the intended mechanical, climatic, electrical, and hydraulic conditions, including ambient relative humidity, vibrations, electrostatic discharges, continuous magnetic field, and electromagnetic disturbances;

— the available space and pipe work to install the meter and fittings;

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

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

When using combination meters, changeover flow rates shall be different from normal operating flow rates.

4.2 Information to be provided by the manufacturer

Sufficient information shall be provided to enable customers to choose and install a meter that conforms to particular metrological characteristics.

The influence factors that affect the indicating error of the individual design should be stated. For each influence factor, the relevant rated operating conditions applicable to the meter should be stated.

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 flow rate in excess of the limit of operation of each individual meter.

4.3.2 To ensure that water meters of different types operate satisfactorily in parallel, the individual characteristics of meters operating in parallel shall be compatible, e.g. by grouping them according to pressure loss, flow rate 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, should be considered.

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

— meters operating in parallel where the installation of one large meter to meet the maximum water demand or to cover the required flow rate 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 shall include the associated fittings listed in 5.2 and 5.3 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 $Q_3 \geq 16$ 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 the use of a mirror or ladder, for instance), for installation, for maintenance, for removal and for *in situ* dismantling of the mechanism if required.

In addition, for water meters of a mass in excess of 25 kg, there shall be 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. The following points should be taken into account:

a) the need for adequate illumination of the installation site;

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

6.1.2 Associated fittings such as those specified in Clause 5, if fitted, shall also be readily accessible, and the requirements of 6.1.1 relating to large meters are also applicable for the fittings.

6.1.3 Measures shall be employed to avoid contamination, 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, a water meter shall always be full of water. If there is a risk of air entering the meter, an upstream air release valve shall be installed.

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

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 and associated fittings 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 Where possible, the meter pit shall be protected from flooding and rainwater.

6.2.6 The instructions shall give limits on orientation dependent on the meter type.

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

6.2.8 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 Any national or local legislation concerning the use of water pipes for this purpose applies in the country of use.

6.2.9 Unfavourable hydraulic conditions, e.g. cavitation, surging and water hammer, should be avoided.

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 pipe work 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. While in general this means earthing the water, the 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 primary element of the meter 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 should have protective devices installed which can be sealed in such a way that after sealing has taken place and the water meter has been correctly installed, there is no possibility of removing the water meter or its adjustment device without visibly damaging the protective devices.

7 Hydraulic disturbances

7.1 General considerations

Many types of meter are sensitive to upstream flow disturbances, which may 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.

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.

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

Disturbance should be eliminated as far as possible, by the application of the provisions set out in 7.2.

7.2 Methods to eliminate disturbances

7.2.1 The circumstances leading to flow disturbances are by nature complex and too numerous to detail in this part of ISO 4064. Potential causes should be eliminated prior to the implementation of remedial devices such as flow straightening devices.

The factors given in 7.2.2 to 7.2.8 may serve as a guideline for new installations.

7.2.2 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 incorrect installation of joint washers or gaskets. Upstream or downstream valves shall be of a type which does not cause any disturbance to the water flow while in the open position.

7.2.3 Meters shall be installed in accordance with the upstream and downstream sensitivity classes, as given at type approval. The longer the pipe the better it is, particularly on the upstream side of the water meter.

7.2.4 Wherever possible, a device that creates a flow profile disturbance, such as a check valve, orifice or pressure regulator, should be installed downstream of the meter.

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

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

Key
1 feed line
2 main line

Figure 1 — Water feed line connection to main line

7.2.6 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.

7.2.7 A compatible flow straightening device may be used upstream of the water meter to reduce the straight lengths of pipe (7.2.3), as long as this does not conflict with the meter manufacturer's instructions.

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

7.2.8 Adaptors as defined in 3.3 shall not be used on cartridge meters and their related connection interfaces. Converters as defined in 3.4, which are not adaptors in the context of a cartridge meter system, can be used.

NOTE Examples of converters are shown in ISO 4064-4:2013, Annex C.

8 First operation of new or repaired water meters

8.1 General considerations

Before installation, the water mains shall be flushed. Care shall be taken to prevent the ingress of debris into the water meter or supply lines.

After installation, water shall be let into the mains slowly and with trapped air bled so that the trapped air does not cause the water meter to overspeed, 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. (See 4.3 and 6.5.3.)

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

8.3 Protection of the meter

8.3.1 Frost

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

8.3.2 Reverse water flow

NOTE In addition to manufacturer's instructions, national regulations apply in the country of use.

Protection against reverse water flow shall be provided when the type of meter installed is designed or specified to meter correctly in one direction only and where reverse flow could either cause an error outside 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, which 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.

8.3.3 Intentional fraud

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

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

8.3.4 Cartridge meters

8.3.4.1 Instructions for the installation of cartridge meters

The installation instructions shall be followed. Where they are not available, the following principles shall be adhered to:

a) use exclusively original sealing rings/gaskets as supplied by manufacturer together with the meters;

b) remove old gaskets immediately after old cartridge meters have been removed;

c) check the relevant sealing surfaces and clean them if necessary in order to make sure the sealing is functioning correctly and that there is no internal bypass leak leading to incorrect measurements;

d) check new seals before applying them, taking the positioning instructions of the manufacturer into account;

e) check that cartridge meters match the connection interfaces into which they are to be fitted;

f) using on installation other seals than the ones provided by the manufacturer, e.g. tape, as well as applying grease as lubrication for threaded connections shall be avoided;

g) if gaskets need to be lubricated, make sure at all times that only a lubricant approved for the material of the gasket as well as for its contact with potable water is used;

h) the interchange of cartridge meters should only be undertaken by trained people.

8.3.4.2 Unequivocal coding of cartridge meters and their related connection interfaces

Connection interfaces and related cartridge meters shall be marked with an identical code as defined in ISO 4064-4:2014, Annex B. The code shall be checked prior to installing cartridge meters into their related connection interfaces. So:

a) on cartridge meters, the code shall be marked on the surface;

b) on the connection interfaces, the code shall be visible after removal of the cartridge meter;

c) the code shall be indelibly marked;

d) the code for cartridge meters shall be maximum XXX alphanumerical.

8.3.5 Meters with exchangeable metrological modules

8.3.5.1 Instructions and preconditions for the installation of exchangeable metrological modules

An exchangeable metrological module should be delivered with an instruction and installation manual and a written declaration of conformity. The installation manual shall be followed and the following installation principles shall be taken into account:

a) use exclusively original sealing rings or gaskets as supplied by the manufacturer together with the metrological modules - the installation seal should be traceable;

b) remove old gaskets or sealing rings immediately after the metrological module has been removed, check the relevant sealing surfaces directly afterwards, and clean them if necessary;

c) if, for example, the water has a high calcium carbonate content, deposits in the upstream areas of connection interfaces of bulk meters can lead to altered flow profiles which may result in deviating measurements. To ensure correct measurement, the connection interface shall be clean before fitting a new exchangeable metrological module;

d) check the correct matching of the codes of the metrological module and the connection interface it is supposed to be installed into;

e) check new seals before applying them, taking the instructions of the manufacturer into account;

f) if gaskets need to be lubricated, make sure at all times that only a lubricant approved for the material of the gasket as well as for its contact with potable water is used;

g) the interchange of exchangeable metrological modules shall only be undertaken by trained people.

8.3.5.2 Unequivocal coding of meters with exchangeable metrological modules and their related connection interfaces

Connection interfaces and related exchangeable metrological modules shall be marked with an identical code as follows:

Manufacturer Type Identification and DNXXX

The identification chosen by the manufacturer can include also the type of meter if necessary. **DN** is the usual abbreviation for the nominal diameter of the meter and **XXX** the maximum 3 figure value of the nominal diameter.

That identification has to be checked prior to installing exchangeable metrological modules into their related connection interfaces:

a) on exchangeable metrological modules the identification shall be marked on the surface;

b) on the connection interface the identification shall either be visible inside after removal of the metrological module or, at the discretion of the manufacturer, on the outside of the connection interface;

c) the identification shall be indelibly marked.

8.4 Safety of personnel and users

8.4.1 General

NOTE Any national regulations with regard to health and safety, including hazardous area zoning and earthing as applicable, apply in the country of use.

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 a 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 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.

8.4.3 Installation 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.

8.4.4 Protection against hazard related to electrical installations

If 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 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 2 m between the origin of any internal piping and the metallic accessory furthest downstream of the connection.

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 earth 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 electrical equipment to the building earth.

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

8.5.1 General considerations

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 or 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 should 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.

The manhole should contain only the meter and its associated fittings.

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

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