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

Part 1: Specifications

Mesurage de débit d'eau dans les conduites fermées en pleine charge — Compteurs d'eau potable froide et d'eau chaude — Partie 1: Spécifications

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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 4064-1 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 4064-1:1993), which has been technically revised as well as cancelling and replacing ISO 7858-1:1998 and ISO 10385-1:2000.

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 1: Specifications

1 Scope

This part of ISO 4064 specifies terminology, technical characteristics, metrological characteristics and pressure loss requirements for cold potable water and hot water meters. It applies to water meters that can withstand maximum admissible working pressures (MAP) $\geqslant$ 1 MPa[1)] (0,6 MPa for meters for use with pipe nominal diameters, DN $\geqslant$ 500 mm) and a maximum admissible temperature, MAT, for cold potable water meters of 30 °C and for hot water meters up to 180 °C, depending on class.

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 and hot water. It also applies to electronic ancillary devices. Generally ancillary devices are optional.

The specifications 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 National regulations may apply in the country of use. These 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 3:1973, *Preferred numbers — Series of preferred numbers*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 4064-3:2005, *Measurement of water flow in fully charged closed conduits — Meters for cold potable water and hot water — Part 3: Test methods and equipment*

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

ISO 7005-2, *Metallic flanges — Part 2: Cast iron flanges*

1) 0,1 MPa = 1 bar

ISO 7005-3, *Metallic flanges — Part 3: Copper alloy and composite flanges*

OIML D 11:1994, *General requirements for electronic measuring instruments*

OIML V 1:2000, *International vocabulary of terms in legal metrology (VIML)*

OIML V 2: 1993, *International vocabulary of basic and general terms in metrology (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in OIML V 2 and OIML V 1 and the following apply.

NOTE The terms 3.27 to 3.43 are typically associated with electronic and electrical equipment.

3.1
flowrate
Q
quotient of the actual volume of water passing through the water meter and the time taken for this volume to pass through the water meter

3.2
actual volume
V_a
total volume of water passing through the water meter, disregarding the time taken

NOTE This is the measurand of the meter.

3.3
indicated volume
V_i
volume of water indicated by the meter, corresponding to the actual volume

3.4
maximum permissible error
MPE
extreme values of the relative error of indication of the water meter permitted by this part of ISO 4064

3.5
rated operating conditions
ROC
conditions of use giving the range of values of the influence factors, for which the errors of indication of the water meter are required to be within the MPE

3.6
limiting conditions
LC
extreme conditions, including flowrate, temperature, pressure, humidity and electromagnetic interference, EMI, that a water meter is required to withstand without damage, and without degradation of its error of indication, when it is subsequently operated within its ROC

NOTE 1 The above refers to both upper and lower LC.

NOTE 2 The LC for storage, transport and operation may be different.

3.7
relative error
error of indication divided by the actual volume, expressed as a percentage

3.8
error of indication
indicated volume minus the actual volume

3.9
permanent flowrate
Q_3
highest flowrate within ROC at which a water meter is required to operate in a satisfactory manner within the maximum permissible error

3.10
overload flowrate
Q_4
highest flowrate at which a water meter is required to operate for a short period of time within its MPE, whilst maintaining its metrological performance when it is subsequently operated within its ROC

3.11
minimum flowrate
Q_1
lowest flowrate at which the water meter is required to operate within the MPE

3.12
transitional flowrate
Q_2
flowrate which occurs between the permanent flowrate, Q_3, and minimum flowrate, Q_1, that divides the flowrate range into two zones, the "upper zone" and the "lower zone", each characterized by its own MPE

3.13
minimum admissible working temperature
mAT
minimum temperature that a water meter can withstand permanently at a given internal pressure, without deterioration of its metrological performance

3.14
maximum admissible working temperature
MAT
maximum temperature that a water meter can withstand permanently at a given internal pressure, without deterioration of its metrological performance

NOTE mAT and MAT are respectively the lower and upper limits of the ROC for working temperature.

3.15
minimum admissible working pressure
mAP
minimum pressure that a water meter can withstand permanently within ROC, without deterioration of its metrological performance

3.16
maximum admissible working pressure
MAP
maximum pressure that a water meter can withstand permanently within ROC, without deterioration of its metrological performance

NOTE mAP and MAP are respectively the lower and upper limits of the ROC for working pressure.

3.17
working temperature
T_w
average water temperature in the pipe, measured upstream and downstream of the water meter

3.18
working pressure
P_w
average water pressure in the pipe, measured upstream and downstream of the water meter

3.19
pressure loss
Δp
head loss, at a given flowrate caused by the presence of the meter in the pipeline

3.20
in-line meter
type of water meter, fitted directly into a closed conduit by means of the meter end connections (threaded or flanged) provided

3.21
combination meter
in-line type of water meter comprising one large flowrate meter, one small flowrate meter and a changeover device that, depending on the magnitude of the flowrate passing through the meter, automatically directs the flow through either the small or large meter or both

NOTE The meter reading is obtained from two independent totalizers or one totalizer, which adds up the values from both water meters.

3.22
concentric meter

type of water meter fitted into a closed conduit by means of an intermediate fitting called a manifold, whereby the inlet and outlet passages of the meter and manifold, at the interface between them, are coaxial

3.23
concentric meter manifold

pipefitting specific to the connection of a concentric meter

3.24
complete meter
meter that does not have separable measurement transducer (including flow sensor) and calculator (including indicating device)

3.25
combined meter
meter that has separable measurement transducer (including flow sensor) and calculator (including indicating device)

3.26
flow sensor
volume sensor
that part of the water meter (such as a disc, piston, wheel, turbine element or electromagnetic coil), which senses the flowrate or volume of water passing through the meter

3.27
measurement transducer
part of the meter that transforms the flow or the volume of the water to be measured into signals that are passed to the calculator

NOTE 1 It can be based on a mechanical, electrical or electronic principles. It can be autonomous or use an external power source.

NOTE 2 For the purposes of this part of ISO 4064, the measurement transducer includes the flow or volume sensor.

3.28
calculator
part of the meter that receives the output signals from the transducer(s) and, possibly, from associated measuring instruments, transforms them into a measurement result and, if appropriate, stores the results in memory until they are used.

NOTE In addition, the calculator can be capable of communicating both ways with ancillary devices

3.29
indicating device
part of the meter that displays the measurement results, either continuously or on demand

NOTE A printing device, which provides an indication at the end of the measurement, is not an indicating device.

3.30
primary indication
indication (displayed, printed or memorized) which is subject to legal metrological control

3.31
adjustment device
device incorporated in the meter, which only allows the error curve to be shifted generally parallel to itself, with a view to bringing relative errors of indication within the maximum permissible errors

3.32
correction device
device connected to or incorporated in the meter for automatically correcting the volume at metering conditions, by taking into account the flowrate and/or the characteristics of the water to be measured (e.g. temperature and pressure) and the pre-established calibration curves

NOTE The characteristics of the water to be measured can either be measured using associated measuring instruments, or be stored in a memory in the instrument.

3.33
ancillary device
device intended to perform a particular function, directly involved in elaborating, transmitting or displaying measurement results.

NOTE Main ancillary devices are:

— zero setting device;

— price indicating device;

— repeating indicating device;

— printing device;

— memory device;

— tariff control device;

— pre-setting device;

— self service device.

3.34
associated measuring instruments
instruments connected to the calculator, the correction device or the conversion device, for measuring certain quantities that are characteristic of water, with a view to making a correction and/or a conversion

3.35
electronic device
device employing electronic sub-assemblies and performing a specific function

NOTE 1 Electronic devices are usually manufactured as separate units and are capable of being tested independently

NOTE 2 Electronic devices, as defined above, can be complete meters or parts of meters.

3.36
electronic sub-assembly
part of an electronic device, employing electronic components and having a recognizable function of its own

3.37
electronic component
smallest physical entity, which uses electron or hole conduction in semi-conductors, gases, or in a vacuum

3.38
checking facility
facility which is incorporated in a water meter with electronic devices and which enables significant faults to be detected and acted upon

NOTE The checking of a transmission device aims at verifying that all the information that is transmitted (and only that information) is fully received by the receiving equipment.

3.39
automatic checking facility
checking facility operating without the intervention of an operator

3.40
type P permanent automatic checking facility
permanent automatic checking facility operating during the entire measurement operation

3.41
type I intermittent automatic checking facility
intermittent automatic checking facility operating at certain time intervals or per fixed number of measurement cycles

3.42
type N non-automatic checking facility
non-automatic checking facility that requires the intervention of an operator

3.43
power supply device
device, which provides the electronic devices with the required electrical energy, using one or several sources of a.c. or d.c.

3.44
fault
difference between the error of indication and the intrinsic error of a water meter

3.45
significant fault
fault, the magnitude of which is greater than one half of the maximum permissible error in the “upper zone”

NOTE The following are not considered to be significant faults:

— faults arising from simultaneous and mutually independent causes in the water meter itself or in its checking facilities;

— transitory faults being momentary variations in the indication, which cannot be interpreted, memorized, or transmitted as a measurement result.

3.46
influence quantity
quantity that is not the measurand but that affects the result of measurement

3.47
reference conditions
set of reference values, or reference ranges, of influence quantities, prescribed for testing the performance of a water meter, or for the inter-comparison of the results of measurements

3.48
intrinsic error
error of indication of a water meter determined under reference conditions

3.49
initial intrinsic error
intrinsic error of a water meter as determined prior to all performances tests

3.50
influence factor
influence quantity having a value within the ROC of the water meter, as specified in this part of ISO 4064

3.51
disturbance
influence quantity having a value within the limits specified in this part of ISO 4064, but outside the specified ROC of the water meter

NOTE An influence quantity is a disturbance if, for that influence quantity, the ROC are not specified.

3.52
first element of the indicating device
element that, in an indicating device comprising several elements, carries the graduated scale with the verification scale interval

3.53
verification scale interval
lowest value scale division of the first element of the indicating device

3.54
equipment under test
EUT
complete water meter, sub-assembly of a water meter or ancillary device

3.53
sub-assembly
measurement transducer, (including flow sensor) and the indicating device (including calculator) of a combined meter

3.55
test flowrate
mean flowrate during a test, calculated from the indications of a calibrated reference device, equal to the quotient of the actual volume passing through the water meter divided by the time for that volume to pass through the water meter

3.56
nominal diameter
alphanumeric designation of size for components of a pipework system, which is used for reference purposes

NOTE It comprises the letters DN followed by a dimensionless whole number that is indirectly related to the physical size in mm of the bore, or outside diameter of the end connections.

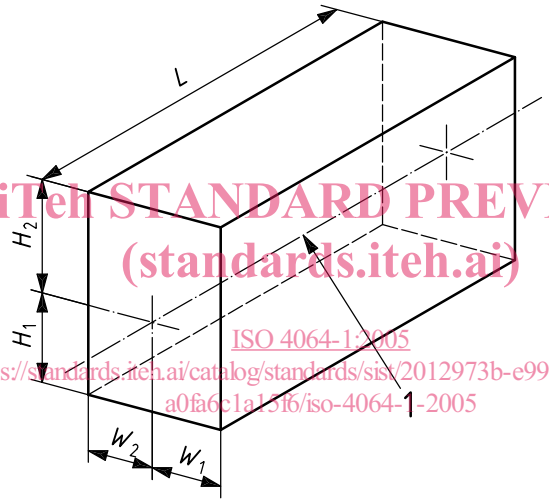
3.57
conversion device
device that automatically converts the volume measured at metering conditions into a volume at base conditions, or into a mass, by taking account of the characteristics of the liquid (temperature, pressure, density, relative density) measured using associated measuring instruments, or stored in a memory by an automatic checking facility operating at certain time intervals or per fixed number of measurement cycles

4 Technical characteristics

4.1 In-line meters

4.1.1 Meter size and overall dimensions

Meter size is characterized either by the thread size of the end connections or by the nominal size of the flange. For each meter size there is a corresponding fixed set of overall dimensions. The dimensions of the meter, as illustrated in Figure 1, shall be in accordance with those listed in Table 1.



Key

1 pipe axis

NOTE H_1, H_2, L, W_1 and W_2 define the height, length and width respectively of a cuboid within which the water meter can be contained (the cover being at right angles to its closed position). H_1, H_2, W_1 and W_2 are maximum dimensions. L is a fixed value with specified tolerances.

Figure 1 — Meter size and overall dimensions

Table 1 — Water meter dimensions

Dimensions in millimetres

Size DN[a]	a_{min}	b_{min}	L^b (preferred)	L^b (alternatives)	$W_1;W_2$	H_1	H_2
15	10	12	165	80, 85, 100, 105, 110, 114, 115, 130, 134, 135, 145, 170, 175, 180, 190, 200, 220	65	60	220
20	12	14	190	105, 110, 115, 130, 134, 135, 165, 175, 195, 200, 220, 229	65	60	240
25	12	16	260	110, 150, 175, 200, 210, 225, 273	100	65	260
32	13	18	260	110, 150, 175, 200, 230, 270, 300, 321	110	70	280
40	13	20	300	200, 220, 245, 260, 270, 387	120	75	300
50			200	170, 245, 250, 254, 270, 275, 300, 345, 350	135	216	390
65			200	170, 270, 300, 450	150	130	390
80			200	190, 225,300, 305,350, 425, 500	180	343	410
100			250	210, 280, 350, 356, 360, 375, 450, 650	225	356	440
125			250	220, 275, 300, 350, 375, 450	135	140	440
150			300	230, 325, 350, 450, 457,500, 560	267	394	500
200			350	260, 400, 500, 508, 550, 600, 620	349	406	500
250			450	330, 400, 600, 660, 800	368	521	500
300			500	380, 400, 800	394	533	533
350			500	420, 800	270	300	500
400			600	500, 550, 800	290	320	500
500			600	500, 625, 680, 770, 800, 900, 1 000	365	380	520
600			800	500, 750, 820, 920, 1 000, 1 200	390	450	600
800			1 200	600	510	550	700
> 800			1,25 × DN	DN	0,65 × DN	0,65×DN	0,75 × DN

[a] DN: nominal size of flanges and threaded connections

[b] Tolerance on length: DN 15 to DN 40 – 0/–2 mm;
DN 50 to DN 300 – 0/–3 mm;
DN 350 to DN 400 – 0/–5 mm.

Tolerances on lengths of meters greater than DN 400 shall be agreed upon between the user and manufacturer.

4.1.2 Threaded connection

Permissible values of dimensions a and b for threaded connections are given in Table 1. Threads shall comply with ISO 228-1. Figure 2 defines dimensions a and b.

4.1.3 Flanged connection

Flanged end connections shall comply with ISO 7005-2 and ISO 7005-3 for the maximum pressure corresponding to that of the water meter. Dimensions shall be as given in Table 1.

The manufacturer shall provide a reasonable clearance behind the rear face of the flange to allow access for installation and removal.