



Agenda Item 9.1.2.2:

Project proposal: Revision of OIML R 49:2013

Water meters for cold potable water and hot water



Proposal for a new project

Within:	TC	8	SC	5
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Date:	10/05/2021
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Proposer(s):

OIML TC 8/SC 5 Secretariat
CEN/TC 92/WG 2

Proposed convener(s):

Mr. Morayo Awosola (OPSS)
Mrs. Sarah Jones (NEL)

Type of proposed publication:

New	<input checked="" type="checkbox"/>	Revised	<input type="checkbox"/>
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<input checked="" type="checkbox"/>	Recommendation	<input type="checkbox"/>	Document	<input type="checkbox"/>	Vocabulary	<input type="checkbox"/>	Guide
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Title of proposed publication:

Water meters for cold potable water and hot water

Terms of reference of the project, including detailed time frame

This will be a joint project activity between OIML TC 8/SC 5 and ISO TC 30/SC 7.

Following CIML project approval, the joint working group will be set up soon after and meetings of this group will be held in 2022. By the end of 2022 a 1 working draft (1WD) of OIML R 49 should be circulated for comments. In 2023 it is expected that the joint working group will hold meetings and OIML committee drafts will be circulated.

Why should the OIML develop this publication?

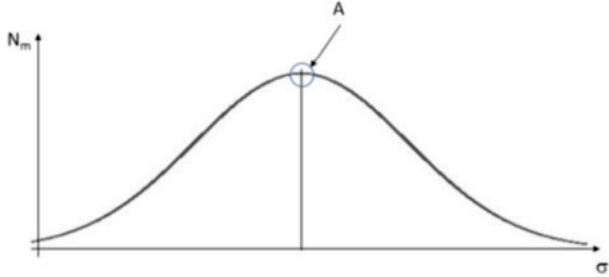
R 49 and ISO 4064 were developed jointly developed and approved in 2014. The “Non-exploitation of the maximum permissible errors” was an outstanding issue that was discussed during previous joint reviews of both standards, but no consensus was achieved on obtaining an acceptable method of addressing the potential issue. A compromise was to achieve a statement that a statement was to be included that meters should not be biased to favor either party, but with no objective method to achieve this. Following the establishment of a Task Group on “Non-exploitation of the maximum permissible errors” with membership from AFNOR, ANSI, BSI, DIN, OIML, GOST R, SNV, UNE, UNI, ASI and ISO, the Task Group meet three times to consider the clause on non-exploitation of maximum permissible errors (same-sign rule). The primary conclusion of the Task Group was that certain clauses in Parts 1 and 2 in both OIML R 49 and ISO 4064 could be improved in ways likely to find support among both OIML TC 8/SC 5 and ISO TC 30/SC 7 members. Key changes needed are outlined below.

It therefore seems likely that a revision of OIML R 49 is necessary to implement these proposals and to align with similar changes in ISO 4064. Particularly as efforts to progress the Preliminary Work Items for revision of ISO 4064 Parts 1 and 2 to the Approved Work items status is currently underway.

Task Group proposals:

Proposed changes to Part 1		
Gen	Add definitions for adjustable and non-adjustable meters	For some meters it is not clear if they are adjustable or non-adjustable.
6.2.1	A water meter may be fitted with an adjustment device and/or a correction device. Any adjustment and/or correction shall be performed in such a way as to adjust the errors (of indication) of the water meter to values as close as practical to zero so that the meter may not exploit the MPE or systematically favour any party.	Suggested addition in red.
7.2.3	Delete the following paragraph. If all the relative errors (of indication) of a water meter have the same sign, at least one of the errors shall not exceed one half of the MPE. In all cases this requirement shall be applied equitably with respect to the water supplier and the consumer (see also 4.3.3, paragraphs 3 and 8).	Wording on the principle to be added to 7.3.5 with detailed requirements to be moved to Part 2.
7.3.5	The errors (of indication) determined at each of the above flow rates shall not exceed the MPEs given in 4.2.2 or 4.2.3 and may not exploit the MPE or systematically favour any party.	Add wording in red to explain the principle.
7.3.6	Delete this clause. If all the errors (of indication) of a water meter have the same sign, at least one of the errors shall not exceed one half of the MPE. In all cases this requirement shall be applied equitably with respect to the water supplier and the consumer. If all the errors (of indication) of a water meter determined for initial verification have the same sign, but none of them is within half the MPE, additional errors at other flow rate(s) as specified in 7.2.3 shall be obtained: if one of these errors is within half the MPE or of the opposite sign, this criterion is deemed fulfilled.	The detailed requirements to be moved to Part 2.

Proposed changes to Part 2		
7.4.5 b)	Delete this sub-clause. If all the relative errors (of indication) of a water meter have the same sign, at least one of the errors shall not exceed one-half of the maximum permissible error. In all cases, this requirement shall be applied equitably with respect to the water supplier and the consumer (see also OIML R 49-1:2013, 4.3.3, paragraphs 3 and 8).	Preferably to be moved to another section
10.1.4 b)	If all the errors (of indication) of the water meter have the same sign, within the complete measuring range (Q1 to Q4), the water meter shall only pass initial verification if all errors did not exceed half of the MPE. Water meters which have no capability for adjustment (see 3.1.6) or correction (see 3.1.7) of the error (of indication) shall use statistical methods to demonstrate that a batch of water meters complies with this requirement when the error at the maximum of the error	The wording in red to replace the remainder of the original clause. It is noted that this revised wording refers to the range Q1 to Q4, while Part 1 clause 7.3.4 appears to refer to Q1, Q2 and

	<p>distribution does not exceed half of the MPE at flowrate Q2 or Q3.</p>  <p>Figure – Error distribution Key N_m Number of meters A Maximum of the error distribution σ Error</p>	<p>Q3 this will need clarification. the statistical method will only apply to non-adjustable meters where all the errors have the same sign.</p>
10.1.4 c)	<p>Where necessary to meet the requirements of b), and in accordance with OIML R 49-1:2013, 7.3.6 7.3.5, additional errors at flow rates specified in OIML R 49-1:2013, 7.2.3, but other than those specified in 10.1.3 g), shall be measured.</p>	<p>Reference to 7.3.6 changed to 7.3.5 following deletion of 7.3.6, see Table 1.</p>

<p>Countries known to regulate or to be intending to regulate this subject, if applicable:</p>
<p>AUSTRALIA, AUSTRIA, BELGIUM, BRAZIL, CUBA, CZECH REPUBLIC, DENMARK, FRANCE, GERMANY, INDIA, IRAN, JAPAN, KOREA (R.), NETHERLANDS, P.R. CHINA, POLAND, ROMANIA RUSSIAN FEDERATION, SERBIA, SLOVAKIA, SLOVENIA, SOUTH AFRICA, SWEDEN, SWITZERLAND, TURKEY, UNITED KINGDOM, UNITED STATES, BOTSWANA, BULGARIA, EGYPT FINLAND, HUNGARY, INDONESIA, IRELAND, ISRAEL, NORWAY, SPAIN</p>
<p>Relevant associated OIML publications:</p>
<p>OIML R 49 2013E</p>
<p>List of appropriate liaisons and their work related to this proposed project (include supporting documentation as necessary and reference it here):</p>
<p>See attached letter from CEN/TC 92. See attached report from the ISO /TC 30/SC 7 Secretariat</p>

Responses to the survey on the proposal for the Revision of R 49

Question 1: Would you support the secretariat's proposal for a revision of R 49?

Question 2: Would you be willing to be co-convenor for the project?

Country	Country Code	Membership in TC 8/SC 5	Question 1	Question 2	Date
Austria	AT	P	Yes	No	2021-07-09
Czech Republic	CZ	P	Yes	No	2021-07-09
Egypt	EG	O	Yes	Yes	2021-07-07
Iran (Islamic Republic of)	IR	P	Yes	No	2021-07-07
Turkey	TR	P	Yes	??	2021-07-05
Japan	JP	P	Yes	No	2021-07-05
Sweden	SE	P	Yes	No	2021-07-01
Korea	KR	P	Yes	No	2021-06-30
Netherlands (the)	NL	P	Yes	No	2021-06-23
Australia	AU	P	Yes	No	2021-06-18
Germany	DE	P	Yes	No	2021-06-16



Document: **ISO/TC 30/SC 7 N 452**

**Secretariat of ISO/TC 30/SC 7
Measurement of fluid flow in closed
conduits - Volume methods
including water meters**

Date: 28 April 2021

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To the Members of ISO/TC 30/SC 7

Dear Member,

Report from ISO/TC 30/SC7/TG 1 'Non-exploitation of Maximum Permissible Errors' (MPEs)

Following the establishment of TG 1 'Non-exploitation of Maximum Permissible Errors' approximately one year ago, this Task Group held three meetings to examine the clauses on non-exploitation of MPEs (same sign rule) in ISO 4064 Parts 1 and 2. Experts from France, Germany, Italy, Japan, Russian Federation, Spain, Switzerland, United Kingdom and United States attended these meetings. The meetings enabled a full discussion of the issues referred to in the position letter submitted by CEN/TC 92 and issued to ISO/TC 30/SC 7 as N 447.

The TG 1 report on its discussions is attached. In considering the non-exploitation of MPEs, numerous other technical issues arose, but the discussion was largely confined to the original remit, while noting that the additional issues would have to be addressed, if revision of ISO 4064 Parts 1 and 2 were to start.

The primary conclusion of the TG 1 discussions was that clauses in ISO 4064 Parts 1 and 2 on non-exploitation of MPEs could be improved in ways likely to find support across the membership of ISO/TC 30/SC 7. Key changes needed are outlined in the attached report.

It therefore seems likely that the current Preliminary Work Items for revision of ISO 4064-1:2014 and ISO 4064-2:2014 should advance to Approved Work Item status, and further communications concerning this will follow, pending the identification of a Project Leader(s).

Yours sincerely,

A handwritten signature in black ink that reads 'D. J. Michael'. The signature is written in a cursive style with a large initial 'D'.

D J Michael
for the Secretariat of ISO/TC 30/SC 7

Summary of discussions in ISO TC 30/SC 7/TG 1: Non-exploitation of maximum permissible errors

Version 3, 22 March 2021

1. Background

The standard requires that meters perform within a stated Maximum Permissible Error (MPE). Particularly for meters with electronic interfaces, it is theoretically possible for a meter output to be very close to either the positive or negative limit of the MPE over the full range thereby biasing the output in favour of either the supplier or the consumer.

The requirement for changing the standard to ensure non-exploitation of the MPE has come from WELMEC in order to meet the MID. None of the experts in the Task Group was aware of any cases of fraudulent behaviour that exploit the MPE.

The issue was discussed during previous reviews of the standard but no consensus was achieved on an acceptable method of addressing the potential issue. A compromise was to include a statement that meters should not be biased to favour either party, but with no objective method to assess this.

The issue has been discussed extensively in CEN TC 92/WG 2 over the last 5 years which has resulted in an outline procedure to address this issue. In the course of the 2019 Systematic Review of ISO 4064 Parts 1 to 5 (2014), the CEN/WELMEC position was communicated to ISO/TC 30/SC 7.

ISO/TC 30/SC 7/TG 1 was set up to discuss the issue in more detail, with no time limits, to establish a consensus on a practicable way forwards before a formal process to revise ISO 4064 is started.

TG 1 members were appointed by: AFNOR, ANSI, BSI, DIN, GOST R, JISC, SNV, UNE, UNI, OIML (Liaison representative), ASI (Document monitor) and ISO.

This document provides a summary of the discussions of the TG to date. The experts in the TG have

- reviewed the CEN TC 92/WG2 proposals
- concluded that these provide a sound basis for addressing the issue
- discussed the statistical method given to address bias in non-adjustable meters and agreed that this has the potential to address the issue
- discussed the definitions of adjustable and non-adjustable meters
- discussed possible changes to the wording of the standard
- achieved consensus that the proposed method and wording is feasible and can now be included in a forthcoming proposal for revision of ISO 4064.

2. Summary of discussions

2.1 General principles

The changes to the standard to ensure non-exploitation of maximum permissible errors will apply to both adjustable and non-adjustable meters where the errors at all the tested flow rates have the same sign. The methods used to address the bias are different for the two types of meter.

The procedures in the current standard for Type Approval and Initial Verification of adjustable and non-adjustable meters where the errors have different signs will not change.

The general principle for the proposed editorial changes is to rearrange some sections to avoid inconsistency and to ease future revision. In particular, the intention is to ensure that each stage of the procedure is detailed in only one place in the standard. The suggested changes in sections 2.4 and 2.5 below may not be a complete list of all the editorial changes that need to be made. This will need to be checked during the revision of ISO 4064 if undertaken.

- ISO 4064 Part 1 will contain a general description of the principles to be applied to ensure non-exploitation and will refer to the relevant clauses in Part 2.
- ISO 4064 Part 2 will detail the procedure(s) to be followed.

All experts agreed that it was essential that OIML R 49 is to be updated in parallel with ISO 4064 to ensure it remains harmonised with ISO 4064 and that the requirements for Type Approval and Initial Verification should be the same.

If revision of ISO 4064 is undertaken, parallel revision of corresponding CEN publications in the EN ISO 4064 series will be triggered automatically.

2.2 Current definitions

The following definitions are quoted from ISO 4064-1 Section 3:

Adjustment device	“Part of the meter that allows an adjustment of the meter such that the error curve of the meter is generally shifted parallel to itself to fit in the envelope of the maximum permissible” (section 3.1.6 in [1]).
Correction device	“Device connected to or incorporated in the meter for automatic correction of the volume of water at metering conditions, by taking into account the flow rate and/or the characteristics of the water to be measured and the pre-established calibration curves” (section 3.1.7 in [1]).

2.3 Additional definitions

Definitions for ‘adjustable’ and ‘non-adjustable’ meters may need to be added to ISO 4064-1 Section 3. Preliminary definitions are given below for discussion.

Non-adjustable Meters whose readings cannot be altered in any way without changing the internal dimensions and/or method of operation of the meter. They have no adjustment device or correction device.

This category should also include mechanical meters with an internal adjustment device where the adjustment cannot be altered at Initial Verification stage as the meter would need to be dismantled.

The meters should not have a correction device, i.e. the readout of the meter should either be purely mechanical or be electronic but with a constant factor applied to all readings and set to the same value for all meters (such as a device which counts the number of rotations of the shaft and multiplies by a fixed value to give total volume passed).

Adjustable Meters where there is an adjustment and/or correction device:

- Mechanical meters with an external adjustment device with a mechanical readout (which could be altered during Type Approval and Initial Verification)

- Meters (mechanical or electronic) with an electronic correction device where the software has the capability of altering some or all of an individual meter's output by either
 - A constant (but individually modifiable) calibration factor (and zero offset, if relevant) applying to all flow readings, or
 - Calibration factors which vary with the flow reading

2.4 ISO 4064-1

The clauses currently identified as requiring updating are shown in Table 1 below together with the suggested changes to the wording for consideration during the periodic review. The purpose of these changes is to describe the principles and refer to the relevant sections in Part 2.

Table 1: Proposed changes to ISO 4064 Part 1

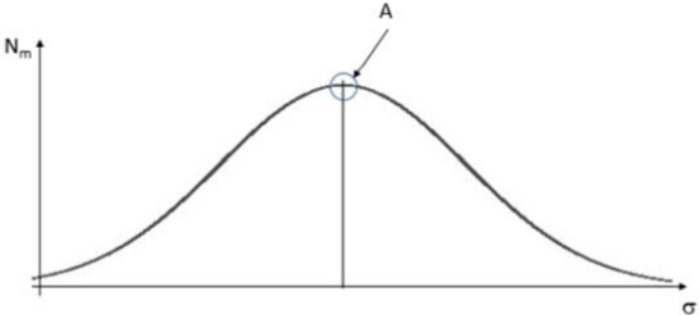
Section	Proposed change	Comments
3.x.x	Add definitions of adjustable and non-adjustable meters	For many meters it is clear if they are adjustable or non-adjustable There may be some meters for which it is not so clear
6.2.1	A water meter may be fitted with an adjustment device, and/or a correction device. Any adjustment and/or correction shall be performed in such a way as to adjust the errors (of indication) of the water meter to values as close as practical to zero so that the meter may not exploit the MPE or systematically favour any party.	Suggested addition in red
7.2.3	Delete the following paragraph: "If all the relative errors (of indication) of a water meter have the same sign, at least one of the errors shall not exceed one half of the MPE. In all cases this requirement shall be applied equitably with respect to the water supplier and the consumer (see also 4.3.3, paragraphs 3 and 8)."	Wording on the principle to be added to 7.3.5, with the detailed requirements to be moved to Part 2
7.3.5	The errors (of indication) determined at each of the above flow rates shall not exceed the MPEs given in 4.2.2 or 4.2.3 and may not exploit the MPE or systematically favour any party.	Added wording in red to explain the principle
7.3.6	Delete this section	The detailed requirements to be moved to Part 2

2.5 ISO 4064-2

The clauses currently identified as requiring updating are shown in Table 2 below together with the suggested changes to the wording for consideration during the periodic review.

Table 2: Proposed changes to ISO 4064 Part 2

Section	Proposed change	Comments
7.4.5 b)	Delete this sub-section	This is probably better moved to another section
10.1.4 b)	If all the errors (of indication) of a water meter have the same sign, within the complete measuring range (Q1 to Q4), the water meter shall only pass initial verification if all errors do not exceed half of the MPE. Water meters which	The wording in red to replace the remainder of the original clause It is noted that this revised wording refers to the range

Section	Proposed change	Comments
	<p>have no capability for adjustment (see 3.1.6) or correction (see 3.1.7) of the error (of indication) may use statistical means to demonstrate that a batch of water meters complies with this requirement when the error at the maximum of the error distribution does not exceed half of the MPE at flowrate Q2 or Q3.</p>  <p>Figure – Error distribution Key N_m Number of meters A Maximum of the error distribution σ Error</p>	<p>Q1 to Q4 while Part 1 section 7.3.4 appears to refer to Q1, Q2 and Q3. This will need clarification. The statistical method would only apply to non-adjustable meters where all the errors have the same sign</p> <p>For non-adjustable meters where all the errors DO NOT have the same sign, there will be no change to the existing procedure</p> <p>An example of how this might be implemented is described in Section 2.6 below</p> <p>A detailed description of the final method selected will be needed either here or in another section</p> <p>It was noted that the requirements for Type Approval and Initial Verification should always be the same</p>
10.1.4 c)	<p>Where necessary to meet the requirements of b), and in accordance with ISO 4064-1:2014 OIML R 49-1:2013, 7.3.5, additional errors at flow rates specified in ISO 4064-1:2014 OIML R 49-1:2013, 7.2.3, but other than those specified in 10.1.3 g), shall be measured.</p>	<p>Reference to 7.3.6 changed to 7.3.5 following deletion of 7.3.6 (see Table 1)</p>

2.6 Example of statistical method referred to in ISO 4064-2 10.1.4 b)

This method only applies to non-adjustable meters where all the errors have the same sign. The following is an illustration only of how a statistical method might be implemented. This is expected to need further discussion and refinement for inclusion in the standard.

Figure 1 shows the slide provided by one of the experts [6] to give an example of how this might be implemented for a single flow, in this case Q2. Figure 2 is an extract from the slide to show the graph more clearly.

The procedure for a batch of meters would be:

1. Reject all meters with errors greater than the MPE (as normal).
2. Divide the MPE range into a number of sections (16 in the example here, each with a width of 0.25%).
3. Place each meter in one of the sections based on the error of that meter at that flow rate.
4. Count the number of meters whose errors are in each section and convert into a percentage.
5. Locate the section with the maximum percentage of meters.
6. If this maximum is in the central $\pm \frac{1}{2}$ MPE zone, then that batch of meters passes.

If this procedure was carried out for all the flow rates specified in the Initial Verification tests then the batch of meters (excluding any failures with errors greater than the MPE) would pass, even if some of the meters had all their errors of the same sign.

It should be noted that the number of these meters with errors of the same sign that exceed $\pm \frac{1}{2}$ MPE is likely to be a small minority of meters assuming the distribution of the errors is the shape shown in this example.

ISO/TC 30/SC 7/TG 1 N 14 Annex B

Maximum of the error distribution: illustration @ Q2

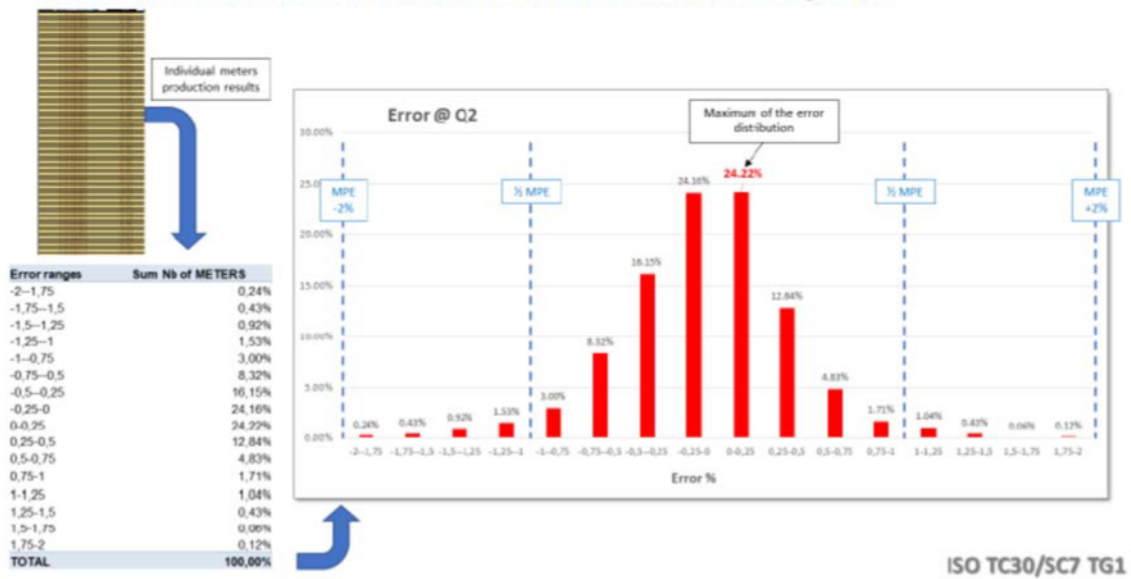


Figure 1: Illustration of a method for assessing the bias of non-adjustable meters [6]

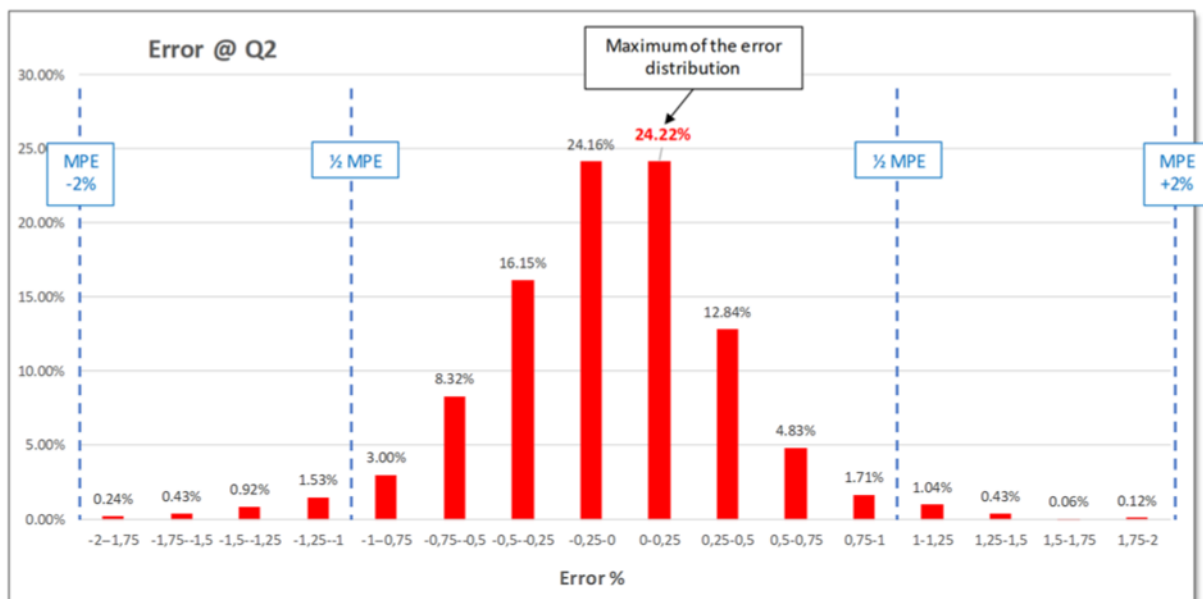


Figure 2: Extract from the slide in Figure 1 to show the graph in more detail

3. General issues also identified during the TG

3.1 General

Several topics were discussed during the life of the TG that were either not directly related to the TG 1 remit, or had implications beyond it, and merit further discussion during the forthcoming periodic review of ISO 4064 (and subsequently OIML R 49). These are summarised below.

3.2 Meters of increased accuracy (High R number)

In previous issues of the standard, the R number was limited to a few allowed values. Since then these restrictions have been lifted, allowing much larger R numbers. This results in widely spaced values of Q1, Q2, Q3 and Q4. A concern was expressed that testing at only these values might miss the maximum or minimum value of the calibration curve.

There is provision in the standard at Type Approval stage to require intermediate test points which will also be required at Initial Verification. However, it is recommended that the standard is checked to ensure that there are no unintended consequences of removing the limit on R values as well as considering whether any additional measures are required for R numbers over a certain value.

3.3 Meters that can correct individual flow readings

There are some adjustment and/or correction devices that have the capability of applying different correction factors at different flow rates. This high accuracy correction could adjust the error of a meter close to zero over the whole range of the meter and this should be a requirement for meters with these types of devices.

A suggestion was made to classify adjustment and/or correction devices into two types: those that can apply different correction factors across the flow range and those that cannot. These meters could be marked in some way to distinguish them from other meters without this capability. Alternatively an additional accuracy class with a lower MPE could be created.

4. References

- 1 ISO 4064-1:2014
- 2 ISO 4064-2: 2014
- 3 OIML R 49-1: 2013, R 49-2:2013, R 49-3:2013
- 4 Examples of adjustable and non-adjustable meters (ISO/TC 30/SC 7/TG 1 N21 and N23)
- 5 CEN TC 92/WG 2 recommendations (ISO/TC30/SC 7 N447)
- 6 Example of statistical method (ISO/TC 30/SC 7/TG 1 N14 Annex B)



CEN/TC 92
Water meters

Email of secretary: marcel.schulze@snv.ch
Secretariat: SNV (Switzerland)

Position letter to OIML ISO 4064-X-2014 and R49

Document type: Other committee document

Date of document: 2019-07-02

Expected action: INFO

Background:

Committee URL: <https://cen.iso.org/livelink/livelink/open/centc92>



To the Secretariat of OIML/TC 8/SC 5
OIML
11, rue Turgot
75009 Paris
France

CEN/TC 92/WG 2 and WELMEC/WG 13 Position letter regarding the Systematic Review of ISO 4064 Part X:2014 and OIML R 49

Dear Dr. Michael Reader-Harris,
Dear Mr. Morayo Awosola,

Regarding the Systematic Review of R 49:Part X:2013, which to our knowledge found in OIML internally a qualified majority for a revision CEN/TC 92 jointly with WELMEC/WG 13 approaches your technical committee and expresses its support for a revision of this standard, which is in line with the support of a revision of ISO 4064-X:2014 too.

CEN/TC 92 targeted the Standards EN ISO 4064 to be cited in the European Official Journal (OJ). CEN/TC 92 accepted as a matter of principle the Standardization Request M/541 in 2016 which requires the adaptation of the text of EN ISO 4064 regarding the EN ISO that this is in line with the new edition of the MID with respect to the "Non-exploitation of the MPEs (same sign rule)".

Various options were considered such as the development of an Amendment or approaching ISO with an NWIP and the creation of a solely European Annex for the EN ISO 4064-X: 2017 in addition to the Annex ZA. The last option was chosen by CEN/TC 92 as, at first sight a European affair could be addressed on a European level CEN/TC 92 developed Annex ZB, which was submitted for Enquiry subsequently put on hold by CCMC and finally withdrawn on 2019-01-24 because of various reasons.

CEN/TC 92 and WELMEC /WG 13 jointly concluded that the most appropriate way to address the same sign rule would be to harmonize the wording in the ISO 4064 and in OIML R-49 main text.

To harmonize the text of OIML R-49 and ISO 4064 which lays down the requirements for the same sign rule, as proposed by CEN/TC 92 and WELMEC / WG 13 would be beneficial for the international water meter industry to access the European Market.

A uniform understanding and interpretation of the sections in the harmonized ISO, EN ISO 4064, OIML R 49 and the Welmec Guide 11: 2017 would create legal security for consumer, manufacturers, public authorities, certification bodies, notified bodies for the trade and use of domestic water meters.





02/07/2019 11:11:00

CEN/TC 92 understands that OIML TC 8 SC 5 currently considers a revision of OIML R49 as well. CEN/TC 92 and WELMEC/WG 13 therefore suggest the creation of a Joint Working Group between ISO, EN and OIML in order to ensure that all three standards remain harmonized in future revisions as well. We kindly ask you to consider our proposal on the further development of ISO 4064-X:2014 and OIML R-49.

Kind regards

Marcel Schulze
CEN/TC 92 Secretary

Dr Wilhelm Staudt
CEN/TC 92 Chair

Ulrich Eff
CEN/TC 92/WG 2 Convenor

Dr Miroslawa Benková
WELMEC/WG13 Convenor

Appendix:
CEN/TC 92 Draft Annex ZB

Annex ZB (normative)

Non-exploitation of MPE or systematic favouring of any party

ZB 1 Adjustment of water meters in order to avoid an exploitation of MPE or systematic favouring of any party

Annex III of [Directive 2014/32/EU](#) includes a requirement which restricts the MPE additionally in order to avoid undue biasing of meters during production:

- The meter shall not exploit the MPEs or systematically favour any party

This requirement (further called: Adjustment rule AR) shall be applied during the production step, where the adjustment of a meter takes place or during the final tests of the meter. It is not to be applied during all other tests being conducted in order to meet the requirements listed in Annex I Essential requirements of [Directive 2014/32/EU](#).

The manufacturer is responsible for the correct adjustment and shall establish appropriate measures in its quality system or implement other means during production.

The adjustment shall lead to meter error curves which are as close as possible to zero, taking into account the technical capabilities of a meter or sub assembly design.

The quality system of the manufacturer (Annex II Module D, H1) shall refer to one of the following options and describe if and how an adjustment is implemented. If a manufacturer chooses Annex II Module F they shall inform the party executing the conformity assessment about the methods applied.

In order to allow checking of the correct application of the AR, the manufacturer shall file the results of the relevant tests over an appropriate period of time.

ZB 2 Criteria in respect to the instrument specific annex:

These requirements are based on the WELMEC Guide 11.1. All meters must be designed and adjusted as close as possible to zero error.

a) Water meters with abilities for adjustment of the error curves, where the errors are aligned into the same sign (+/-) within the complete measuring range (Q_1 to Q_4), shall only pass the assessment (verification) if all errors do not exceed half of the MPE.

b) For water meters where no adjustment is possible, special measures have to be included into the quality system.

Note: Measures mean e.g. to evaluate the statistics coming from test results of a batch of water meters which shall show at Q_3 or Q_2 that the error at the maximum of the error distribution does not exceed half of the MPE.

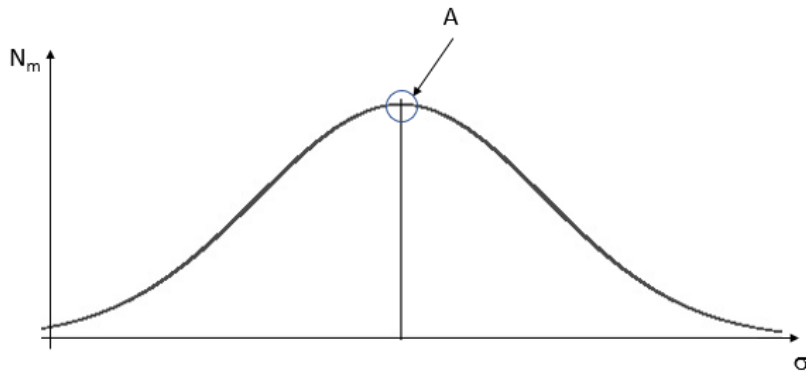


Figure – Error distribution

Key

N_m *Number of meters*

A *Maximum of the error distribution*

σ *Error*

Measures may also mean, at the choice of the manufacturer, to apply the same verification rule as the one for water meters with abilities for adjustment of the error curve; see paragraph a) above.

Statistical control

In case of applying statistical methods it is not permitted to create a non-representative subset of a proved batch for a customer. A batch is a deliverable of the same type and range. WELMEC guide 8.10 provides information about the acceptable size of a batch (lot size).