



Report of survey on the non-exploitation of MPE rule for utility meters

Prepared by OIML TC 8 Secretariat in National Metrology Institute of Japan (NMIJ)

Revision as of 8 July, 2016

1 Outline of the survey

In March 2014, the CIML Presidential Council requested Dr. Yukinobu Miki of NMIJ (National Metrology Institute of Japan), CIML second Vice President, to conduct a survey on ‘the non-exploitation of maximum permissible errors rule’ (hereafter referred to as “non-exploitation of MPE rule”) applied to utility meters under the legal metrological control in a number of OIML Member countries and some regions. This survey was conducted jointly with Secretariat of OIML TC 8 (*Measurement of Quantities of Fluid*).

A report of the survey was provided as Addendum 8.3.3 at the 50th CIML Meeting in October, 2015. In addition, a draft resolution on two new requirements regarding the non-exploitation of MPE rule, which were intended to be included in the OIML publications, was proposed by BIML. At the meeting, Netherlands requested that the descriptions of the survey on MID (Measuring Instrument Directive) should be corrected and that D 11 should be excluded from the target publications of the new requirements. In this meeting, (see CIML 50th Meeting Minutes, item 8.3.3, page 69) it was agreed that it was premature to decide on this resolution, and that TC 8 would update the survey and provide amended text of the resolution.

This is an updated version of the survey prepared by TC 8 Secretariat in consideration of above discussions.

2 Basic understanding of ‘non-exploitation of MPE rule’

2.1 Introduction

In some countries or regions, there has been a longtime discussion regarding measuring instruments including utility meters (gas, water, electricity and heat meters), which involves an opinion that the characteristic of instrumental errors should be controlled even if all of the errors are within the MPEs (maximum permissible errors). It is because there is a possibility in which some manufacturers or suppliers might add an intentional bias to the errors and set them close to the upper limit of MPE for the entire measurement range. As a result, an actual indication of a meter, which is accumulated for a wide range of flow rate, becomes larger than the true amount of consumption. Recent technical developments in precise control of instrumental errors also enable such an intentional control of bias for some categories of instrument, and it may cause a disadvantage or a risk to the consumers.

In order to protect consumers from such a risk, a national / regional authority usually sets up so-called ‘non-exploitation of MPE rule’. However, there has not been a unique and uniform rule for the non-exploitation of MPE rule. The rule is sometimes referred as ‘same-sign rule’, ‘horizontal rule’, ‘rule in respect of exploitation of MPEs’, or ‘rule to prevent undue biasing’. Based on the method, the non-exploitation of MPE rule is categorized into two types as described below.

2.2 Generic non-exploitation of MPE rule

The most common rule is a ‘generic-type’. In this type, only the basic policy is specified with a generic and moral expression such as ‘the meter shall not exploit the MPE’ or ‘the meter shall not systematically favor any party’. However, it is obvious that this rule does not have any practical power to prevent exploitation in a testing procedure for type evaluation or verification.

2.3 Quantitative non-exploitation of MPE rule

In order to compensate the ambiguous nature of the generic rule, a ‘quantitative-type’ rule may be employed. In verifications of utility meters, errors are usually measured at three or more measuring points of flow rate (or current). A typical example of the quantitative rule requires that “at least one of the three values of error shall be within a half of the MPE when all of them have the same sign.”

Figure 1 shows an example of instrumental errors of a water meter at the three testing points in a test for verification with the results of assessment based on the quantitative rule. Case 1 passed the test because all of the errors were within MPE and one of them had an opposite sign. Case 2 also passed the test because one of them was within a half of MPE although all of them had the same sign. Only case 3 failed the test because all of the errors had the same sign and exceeded a half of MPE.

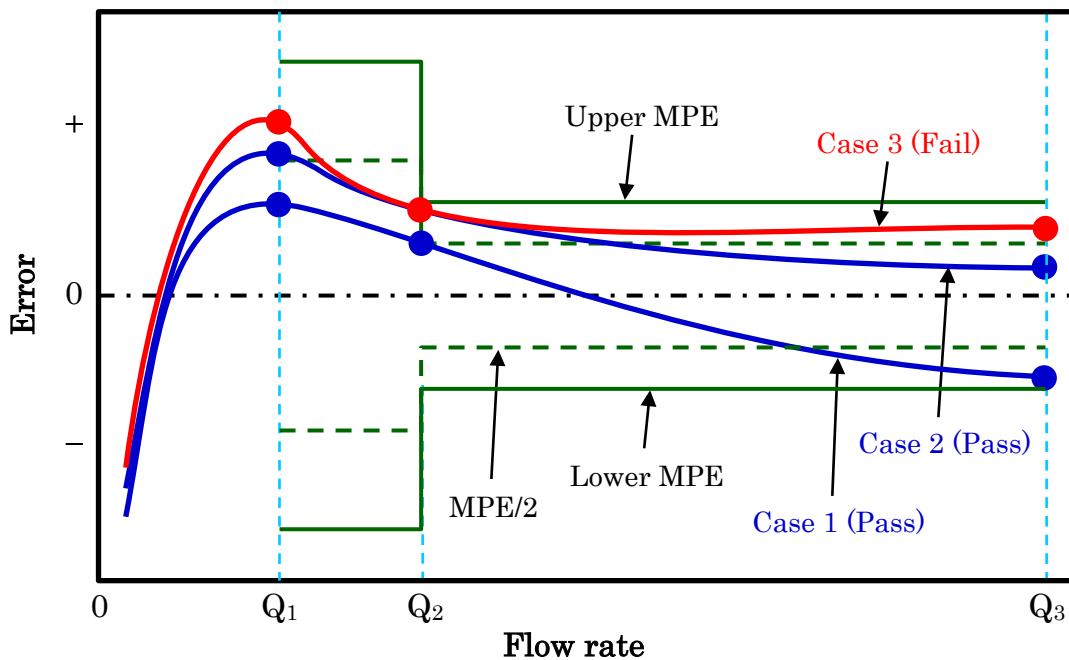


Figure 1: Typical example of instrumental errors of a water meter where, Q_1 , Q_2 and Q_3 represent testing points in verification.

3 Current situation of OIML Recommendations related the non-exploitation of MPE rule

OIML has provided several International Recommendations which include a kind of non-exploitation of MPE rule. A summary of the survey is given in Table 1.

Number (year)	Title	Clauses	Type of rules	Description
R49-1/2 (2013)	Water meters for cold potable water and hot water	4.3.3, 7.3.6 and 7.4.5.	Generic and quantitative	A rule explained in Clause 2.3 is applied to both type evaluation and verification. A generic rule is also found in 4.3.3 (correction device) of R49.
R137-1/2 (2012)	Gas meters	3.2.5, 5.3, 5.4, 12.6.1 and 13.1.6	Generic and quantitative	WME (weighted mean error) is evaluated for the entire measuring range. The absolute value of WME shall be smaller than that of MPE ($WME \leq 0.2$ or 0.4 MPE).

Table 1: Current situation of non-exploitation of MPE rules in OIML Recommendations

4 Current situation in some OIML member countries

A summary of the survey on non-exploitation of MPE rule implemented in some OIML member countries is given in Table 2. This summary table includes feedback comments from Australia, Canada and USA in reply to earlier versions of the present document.

Country / Region	Category of instrument	Type of rule	Description
Australia	Water and gas meters	Generic and quantitative	R49 and R137 are employed and implemented in the national metrological control system.
Canada	Electricity meters	Generic and quantitative	A national specification (S-E-02) specifies a generic rule which requires targeting the middle point of specification range (MPE) in the calibration procedure. It also specifies a quantitative rule including an evaluation of the mean of errors called MADT (mean absolute deviation from target).
European Union-Part 1 (EU 1)	Five categories in MID (water/gas/electricity/heat meters and fuel dispensers)	Generic	A new Measuring Instrument Directive (MID) 2009/137/EC ¹⁾ specifies a generic rule for the five categories (MI-001 to MI-005) under MID with the statement “ <i>the meter shall not exploit the MPE or systematically favor any party.</i> ” EU also provides a guide document ²⁾ to implement the rule in practice.
European Union-Part 1 (EU 2)	Gas meters	Generic and quantitative	Annex MI-002 of the first MID 2004/22/EC ³⁾ specifies a quantitative non-exploitation of MPE rule with the statement “ <i>When the errors between Q_t and Q_{max} all have the same sign, they shall all not exceed 1 % for class 1.5 and 0.5 % for class 1.0.</i> ” The generic rule (EU 1) also applies to gas meters.
Japan	Water meters	Quantitative	A cabinet order accompanied with a JIS (Japanese Industrial Standards) B 8570-2: 2013 specifies a rule similar to that explained in Clause 2.3.
USA	Fuel dispensers and scales (not for utility meters)	Generic	NIST Handbook 44 specifies a general policy in the clauses G-UR.4.1, G-UR.4.3 and A, 2.3. However, utility meters are not regulated by weights and measures authorities. Rather, they are regulated by public utility commissions individually.

Table 2: Current situations of non-exploitation of MPE rules implemented in some OIML member countries/regions

5 Summary and conclusions

As far as we investigated, Australia, Canada, EU, Japan and USA have introduced non-exploitation of MPE rules, including generic rules, and have implemented them in practice. Regarding other regions, no such examples were seen although we have not finished a complete survey.

It seems that such a rule is generally required in a country where quality control of utility meters is maintained in a high level because a precise control of instrument errors is required to exploit the MPEs intentionally. In the future, there could be a concern on purely electrical electricity meters which are sometimes referred as ‘smart meters’. For such instruments, it is very easy to control instrumental errors. We can easily produce instruments with a flat characteristic with any offset value of error.

We should also take a note to another opinion in which the original MPE should be set narrower rather than setting a non-exploitation of MPE rule without a scientific background. This opinion however implies another risk, i.e. to set a stricter MPE for some manufacturers or countries. Provision of two or more accuracy classes might be a solution to avoid such a risk.

Considering the current situation and trend, we would support OIML to develop a generic statement, such as “the instruments shall not exploit the maximum permissible errors or systematically favor any party”. The statement could be suggested for TC/SC or Project Groups to consider for inclusion in appropriate OIML publications including Recommendations. In addition, we would like to emphasize that creation of a new OIML document (D or G) dedicated only for the non-exploitation of MPE rule is not necessary. Such a generic statement would of course influence the present Recommendations like R 49 and R 137, in which a non-exploitation of MPE rule is already included. In such a case, we propose that the original rule should be superseded by the generic statement in the next revision.

6 References

- 1) *European Union Directive: 2009/137/EC of 10 November 2009 amending Directive 2004/22/EC of the European Parliament and of the Council on Measuring Instruments in respect of Exploitation of the Maximum Permissible Errors, as regards the Instrument-Specific Annexes MI-001 to MI-005, 11.11.2009 Official Journal of the European Union L 294/7*
- 2) *WELMEC 11.1 Issue 5, January 2014, European Cooperation in Legal Metrology, Measuring Instruments Directive 2004/22/EC, Common Application for Utility Meters*
- 3) *European Union Directive: 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on Measuring Instruments, 30.4.2004 EN Official Journal of the European Union L 135/1*



**Draft resolution on the non-exploitation of the MPE rule for utility meters
to be submitted to the 51st CIML meeting**

Provided by Dr. Yukinobu Miki and TC 8 Secretariat on 8 July, 2016

Draft Resolution no. 2016/..

The Committee,

Noting the discussion in the 50th CIML meeting and revised report from TC 8, on the existing rules concerning the non-exploitation of maximum permissible errors, contained in Addendum XXXX to the working document for its current meeting,

Noting the advice of the Presidential Council that relevant OIML Recommendations should include uniform requirements concerning the non-exploitation of maximum permissible errors,

Resolves to instruct the secretariats of technical committees and subcommittees and conveners of project groups, when OIML Recommendations for relevant categories of measuring instruments are being revised, to ensure that a requirement should be included, if necessary, stating that

the instruments shall not exploit the maximum permissible errors or systematically favor any party,

Instructs the Bureau to monitor the implementation of this Resolution.