WELMEC 10.1

Issue 1

WELMEC

European cooperation in legal metrology

Guide for Pattern Examination of a family of volumetric rotating meters for liquids other than water

September 2001

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1 INTRODUCTION

1.1 General considerations

OIML International Recommendations R117 contains the metrological and technical requirements applicable to measuring systems for liquids other than water and components thereof. R117 specifies that each measurement transducer is subject to a complete Pattern Examination. However in the case of a family of volumetric rotating meters for liquids other than water, there is no metrological and technical need for testing each individual diameter from this family.

This Guide describes a metrological and technical acceptable method of carrying out a Pattern Examination on a family of meters, which reduces the number of tests required for gathering sufficient information on the behaviour of the subjected family of meters.

1.2 Scope

WELMEC WG10 has agreed that there should be a harmonised approach to the testing of a family of meters and that this approach should be applicable only to volumetric meters, except piston meters. This guide describes the requirements for testing a family of such meters. This guide does not cover those meters intended to measure volumes less than 2 litres.

2 DEFINITION OF A FAMILY OF METERS

A family of meters is a group of meters, in which all the meters have:

- the same manufacturer,
- a similar design and build standard,
- the same materials for those components that are critical to the performance of the meter

but each meter has a different size and/or flow rate.

3 METER SELECTION

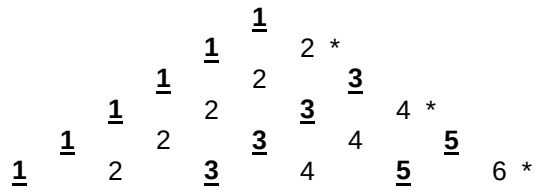
3.1 The smallest meter in any family of meters shall always be tested. In general, the largest member of the family shall also require testing.

3.2 Larger meters in the family may be accepted without further testing provided:

- The maximum flow rate of the untested meter(s) is not greater than twice the maximum flow rate of a tested meter and
- the ratio Qmax to Qmin of the untested meter(s) are smaller or the same as the tested one.

3.3 Any other meter, which provides more-extreme operating parameters, should be considered for testing, e.g. largest flowrate range, highest peripheral (tip) speed, etc.

3.4 As a consequence, the family members underlined in the scheme below may be considered for testing, where appropriate:



* Provided that 3.2 above is complied with

4 TESTS

4.1 Field of operation

The proposed field of operation of the meter shall be defined at least by the following parameters:

- minimum measured quantity,
- measuring range defined by the minimum flowrate, Qmin, and the maximum flowrate, Qmax,
- nature of the liquids to be measured and the limits of the kinematic or dynamic viscosity, when the indication of the nature of the liquid alone is not sufficient to characterise its viscosity,
- maximum temperature of the liquid,
- minimum temperature of the liquid.

The proposed field of operation may be amended by paragraph 4.5 below.

4.2 Flow Rates

Sets of three tests each shall be performed at different flowrates, which are distributed over the measuring range at regular intervals. The number of different flowrates are as in the following table.

Qmax/Qmin	Number of Flowrates
5 - 12	6
13 - 21	7
22 - 35	8
36 - 60	9

Using suitable liquid(s) the sets of tests shall be carried out at the limit(s) of the field of operation for viscosity and temperature. The tests shall be performed at normal working pressure. The maximum permissible error shall be respected for each test conducted.

4.3 Minimum Measured Quantity

One set of three tests shall be performed at Qmin. The tests shall be done at the lowest viscosity and normal working pressure. The maximum permissible errors shall not exceed twice line B of Table 2 in OIML R117.

4.4 Endurance Test

This test shall be carried out only on the member of the family with the highest peripheral (tip) speed at a flow rate between 0,8 Qmax and Qmax. This member might not be one of those underlined above. Endurance tests shall be carried out for an accumulated period of 100 hours using the liquid with the lowest viscosity specified for use with the meter. If a suitable substitute liquid is used, the accumulated period shall be up to 200 hours. The tests shall be performed at normal working pressure. The meter shall be tested before and after the endurance test at the flowrates as specified in 4.2. The magnitude of the difference between the initial intrinsic error and the error after the endurance test shall not exceed the value specified in line B of Table 2 of OIML R117.

4.5 Extrapolation of Test Results

For meters that have been tested in accordance with the tests outlined above, the field of operation may be extended without further testing to liquids having a greater viscosity than those already tested. Further testing may be considered applicable before extrapolating the fields of operation for temperature, flow rate, etc.

Note! When applying extrapolation care should be taken with utilising the results.

5 MAXIMUM PERMISSIBLE ERRORS

5.1 The above tests shall be performed using the intended liquids or suitable substitutes. The maximum permissible errors in the above tests are defined in line B of Table 2 of OIML R117.

The maximum permissible errors shall be doubled for delivery of the minimum measured quantity.

5.2 Repeatability

For quantities greater than five times the minimum measured quantity, the repeatability error of the meter shall not be greater than $^{2}/_{5}$ of the value of line A of table 2 of R117.