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RECOMMENDATION

OIML R 138

Edition 2007 (E)

Vessels for commercial transactions

Réipients pour transactions commerciales



Contents

Foreword	4
1 Scope and application	7
2 Terminology and symbols	7
2.1 General terms.....	7
2.2 Capacity serving measures.....	7
2.3 Measuring container bottles.....	7
2.4 Casks and barrels.....	7
2.5 Nominal capacity, V_n	7
2.6 Conventional true capacity.....	7
2.7 Brim capacity, V_r	7
2.8 Ullage (or headspace).....	7
2.9 Gauge mark.....	8
2.10 Filling orifice.....	8
3 Units of measurement	8
4 Technical requirements	8
4.1 Nominal capacities.....	8
4.2 Material.....	8
4.3 Construction.....	9
4.4 Resolution if gauge mark.....	9
4.5 Vertical position.....	9
4.6 Filling requirements.....	9
5 Metrological requirements	9
5.1 Maximum permissible errors.....	9
5.2 Markings.....	11
6 Metrological controls	11
6.1 Type approval.....	11
6.2 Initial verification.....	11
6.3 Subsequent verification or control.....	12
7 Measuring instruments used for official controls	12
Annex A Statistical test.....	13

Foreword

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This publication — reference OIML R 138, Edition 2007 (E) — was developed by the OIML Technical Subcommittee TC 8 *Measurement of quantities of fluids*. It was approved for final

publication by the International Committee of Legal Metrology in 2007 and will be submitted to the International Conference of Legal Metrology in 2008 for formal sanction. This Edition replaces the previous editions of OIML R 4 *Volumetric flasks (one mark) in glass* (Edition 1972), R 29 *Capacity serving measures* (Edition 1979), R 45 *Casks and barrels* (Edition 1980) and R 96 *Measuring container bottles* (Edition 1990).

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Part -

1 Scope and application

This Recommendation applies to volumetric containers or vessels used to measure, and when applicable to store and transport, liquids for commercial transactions.

2 Terminology and symbols

2.1 General terms

The general terms and definitions are those of the International Vocabulary of Basic and General Terms in Metrology (VIM, 1993).

2.2 Capacity serving measures

Measures which are filled as required and used for the retail sale of drinks sold by volume. They are divided into two categories: transfer measures used solely for decanting specific volumes of beverages and drinking measures used also for the consumption of specific volumes of beverages.

2.3 Measuring container bottles

Bottles intended to be filled either at constant level or at constant ullage with sufficient accuracy without the need to use an independent measuring instrument.

2.4 Casks and barrels

Containers used for commercial transactions of liquids when they are filled to their nominal volume. To simplify the text, casks and barrels are referred to hereafter by the name “casks” only.

2.5 Nominal capacity, V_n

Volume indicated on the vessel.

2.6 Conventional true capacity

For measuring container bottles and casks: contained volume of water at a reference temperature with an uncertainty appropriate for the given purpose.

For capacity serving measures: delivered volume of water at a reference temperature with an uncertainty appropriate for the given purpose. This volume is measured after prior wetting of the interior of the vessel and draining for 30 seconds.

2.7 Brim capacity, V_r

Volume that the vessel is meant to contain when filled to the brim.

2.8 Ullage (or headspace)

Empty volume remaining in a container after it is filled.

2.9 Gauge mark

Mark, generally a line that indicates the nominal capacity V_n .

2.10 Filling orifice

Opening in the cask wall defined by its section and the thickness of the cask walls.

3 Units of measurement

The units of measurement shall be the SI units.

4 Technical requirements

4.1 Nominal capacities

4.1.1 Capacity serving measures and measuring container bottles

Capacity serving measures and measuring container bottles shall have one of the nominal capacities given by the following formula:

$$V_n = x \cdot 10^n \text{L} \quad (1)$$

with n = positive or negative integer, or zero
 $x = 1, 1,5, 2, 2,5, 3, 4$ and 5

and comprised between the following values:

- capacity serving measures [20 ... 5000] mL
- measuring container bottles [50 ... 5000] mL

4.1.2 Casks

Casks shall have a nominal capacity equal to:

- a multiple of 5 L for $V_n \leq 100$ L
- a multiple of 50 L for $V_n > 100$ L

4.1.3 Exceptions

When justified by local traditions or by special requirements, national regulations may allow additional values for nominal capacities or units (e.g. 0,33 L).

4.2 Material

The vessels shall be sufficiently robust to withstand normal usage without distortions.

For capacity serving measures and measuring container bottles, the materials used in construction should be sufficiently tough, rigid, non porous and stable to maintain accuracy during use.

Casks may be manufactured in any material with strength, rigidity and toughness adequate for the intended use (e.g. solid wood, plywood, metal). National regulations may stipulate that the interior of

certain casks must be covered with a protective permanent coating, compatible with the material used for construction and the liquids to be contained.

Vessels used only once, such as thin plastic or cardboard drinking capacities, must remain accurate during nominal filling, transportation and discharge functions.

4.3 Construction

The total volume of vessels intended to contain liquids under pressure shall not increase more than 0.5 % when subjected to an internal pressure of 100 kPa maintained for 48 hours.

The position of the filling orifice shall allow for complete filling of the casks.

4.4 Resolution if gauge mark

Vessels with gauge marks shall be so designed that at the nominal capacity, a variation in the contents equal to the maximum permissible error causes a change in the liquid level of at least 2 mm.

4.5 Vertical position

Vessels with gauge marks and measuring container bottles shall have a base wide enough to allow a vertical, stable position when resting on a flat horizontal surface. If not, a holder must be provided with the vessel.

4.6 Filling requirements

4.6.1 Vessels with gauge marks

“Filled to the gauge mark” is when the lowest part of the meniscus formed by the liquid is tangential to the upper edge of the gauge mark.

4.6.2 Measuring container bottles

Depending on the specifications of the manufacturer, the surface of the liquid shall either be at the specified distance from the brim or have the specified ullage at the top.

4.6.3 Casks

Casks shall be filled to the lower edge of the filling orifice.

5 Metrological requirements

5.1 Maximum permissible errors

5.1.1 Capacity serving measures

Table 1 — Capacity serving measures

		Maximum permissible error (MPE)	
		Nominal capacity V_n	Brim capacity V_r
Transfer measures	< 100 mL	± 2 mL	0

Table 1 (continued)

		Maximum permissible error (MPE)	
		Nominal capacity V_n	Brim capacity V_r
	≥ 100 mL	$\pm 3\%$ of V_n	+ 4 mL
			0
			+ 6% of V_r
Drinking measures	< 200 mL	$\pm 5\%$ of V_n	0
			+ 10% of V_r
	≥ 200 mL	$\pm (5 \text{ mL} + 2,5\% \text{ of } V_n)$	0
			+ 10 mL + 5% of V_r

5.1.2 Measuring container bottles

Table 2 — Measuring container bottles

Nominal capacity V_n or Brim capacity V_r in mL	Maximum permissible error (MPE)	
	in % of V_n or V_r	in mL
from 50 to 100	-	± 3
from 100 to 200	± 3	-
from 200 to 300	-	± 6
from 300 to 500	± 2	-
from 500 to 1000	-	± 10
from 1000 to 5000	± 1	-

5.1.3 Casks

$\pm 0,5\%$ but not less than 0,10 L for casks made of metal which shall be designated by the letter “A” affixed to the vessel.

$\pm 1,0\%$ but not less than 0,15 L for casks made of other materials which shall be designated by the letter “B” affixed to the vessel.

5.1.4 General

Systematic exploitation of the maximum permissible errors is prohibited.

5.2 Markings

5.2.1 Nominal capacity

Every vessel for commercial transactions shall bear a clearly visible, easily readable and permanent indication of the nominal capacity V_n . Markings shall be in SI units.

5.2.2 Capacity serving measures

In addition to the requirements of 5.2.1, capacity serving measures shall bear at least one filling mark. All filling marks shall be clearly visible and permanently marked. They must be at least 10 mm long and in a horizontal plane when the measure stands on a horizontal flat surface.

On drinking measures with a capacity of more than 50 mL, the filling mark is at least 10 mm from the brim.

For foam building liquids the distance between the upper gauge mark and the brim shall be sufficient to allow for a complete filling to the mark but not less than 20 mm.

Exception: if the capacity of a serving or drinking measure is defined by its brim capacity, the requirement of 5.2.2 does not have to be fulfilled.

5.2.3 Measuring container bottles

In addition to the requirements of 5.2.1, measuring container bottles shall be marked with one of the following marks, either on the lower rim or the bottom:

- when filled to a constant level: the distance, expressed in mL followed by the symbol mm from the brim to the filling level corresponding to the nominal capacity; or
- when filled to a constant ullage: the number, expressed in mL followed by the symbol mL that is equal to the brim capacity.

5.2.4 Compliance with the metrological specifications

Every vessel for commercial transactions shall bear a mark identifying the company responsible for compliance with the metrological specifications applicable to the vessel.

5.2.5 Reference temperature

If the National Metrology Authority decides on a reference temperature other than 20 °C, this temperature must be indicated next to every volume indication affixed to the vessel.

6 Metrological controls

6.1 Type approval

The vessels for commercial transactions are not subject to type approval.

6.2 Initial verification

The conformity of vessels used for commercial transactions to the prescribed specifications shall be controlled by the competent authority using a suitable statistical test. The controls shall preferably take place at the manufacturer's plant or at the importer's warehouse.

The competent authority shall use a suitable test to perform the controls. An example is given in Annex A. In cases where a small number of vessels are concerned, the control may be replaced by individual initial verification.

Casks may be presented to the competent authority for legal metrology without an indication of the nominal capacity. In this case, the authority shall determine the conventional true capacity at a reference temperature when the container is filled according to the specifications and shall affix the value of the nominal capacity and the official mark of verification.

Capacity serving measures may be presented to the competent Legal Metrology Authority without marking. In this case, the authority shall affix the gauge mark, the value of the nominal capacity and the official verification mark.

6.3 Subsequent verification or control

Vessels made of glass are not subject to subsequent verification.

7 Measuring instruments used for official controls

Measuring instruments used for official controls of vessels for commercial transactions shall be traceable to internationally supported realizations of the SI Units and have an uncertainty not greater than one-third of the maximum permissible error.

Annex A

(Mandatory)

Statistical test

A.1 Sampling

The method of control set out in Annex A assumes that the distribution of actual capacities of the vessels in a batch submitted for inspection is near to a normal distribution.

The sampling procedure shall conform as much as possible to sampling theory and shall be adapted to the manufacturing procedures of the manufacturer or to the conditions in which batches are presented by the importer.

A.2 Computation example

A sample of 35 vessels of the same type and manufacture shall be taken at random in one or several batches so that the sample is as representative as possible of the production.

The following computational procedure is taken from the International Standard ISO 3951:1989, letter code J, AQL = 2.5, normal control, unknown standard deviation.

Compute the mean \bar{x} of the capacities x_i of the vessels in the sample:

$$\bar{x} = \sum_{i=1}^N \frac{x_i}{N} \quad (\text{A.1})$$

with $N = 35$.

Compute the standard deviation s of the capacities x_i of the vessels in the sample:

$$s = \sqrt{\sum_{i=1}^N \frac{(x_i - \bar{x})^2}{N - 1}} \quad (\text{A.2})$$

with $N = 35$.

Compute the specified upper limit T_s , the sum of the capacity to be verified and of the maximum permissible error for this capacity.

Compute the specified lower limit T_i , the difference between the capacity to be verified and the maximum permissible error for this capacity.

A.3 Acceptance criteria

The batch shall be accepted if the values of \bar{x} and s satisfy simultaneously the following three inequalities:

$$\bar{x} + k \cdot s \leq T_s \quad (\text{A.3})$$

$$\bar{x} - k \cdot s \geq T_i \quad (\text{A.4})$$

$$s \leq F \cdot (T_s - T_i) \tag{A.5}$$

where $k = 1,57$ and $F = 0,266$.