On the basis of article 27 paragraph 2 of the Law on Metrology (,,Official Gazette of Montenegro'', No. 79/08), the Ministry of Economy has adopted

RULEBOOK
ON MEASURING CONTAINER BOTTLES *

(The Rulebook has been published in the ,,Official Gazette of Montenegro'',
No. 56/2011, dated 25 November 2011)

Article 1

This Rulebook prescribes metrological requirements for the bottles used as measuring containers (hereinafter referred to as: the bottles), tolerable error of the capacity, labeling and marks on the bottles used as measuring containers, such as procedure of testing of bottles.

Article 2

This Rulebook shall apply to the bottles, made of glass or any other substance having such rigidity and stability that it offers the same metrological guarantees as glass.
 The bottles shall fulfill the following metrological requirements:
1) are closed or designed to be closed and are intended for the storage, transport or delivery of liquids,
2) have a nominal capacity of between 0,05 liter and 5,00 liter inclusive,
3) that they can be used as measuring containers, i.e. when they are filled up to a specified level or to a specified percentage of their brim capacity their contents can be measured with sufficient accuracy.

Article 3

The bottles shall be characterized by the following capacities which are always specified for a temperature of 20ºC:
1) the nominal capacity Vn is the capacity which is marked on the bottle, it is the capacity of liquid which the latter is deemed to contain when it is filled in the conditions of use for which it is intended;
2) the brim capacity of a bottle is the capacity of liquid it contains when filled to the brim;
3) the actual capacity of a bottle is the capacity of liquid it in fact contains when it is filled exactly under the conditions corresponding theoretically to the nominal capacity.

Article 4

The bottles which fulfill the requirements of this Rulebook, the manufacturer of bottles is marking with the opposite letter epsilon.
The form and sign of the mark from the paragraph 1 of this article is given at the Annex 1 which is integral part of this Rulebook.

Article 5

There are two methods of filling the bottles:
1) to a constant level;
2) to a constant vacuity.

The distance between the theoretical filling level for the nominal capacity and the brim level and the difference between the brim capacity and the nominal capacity (capacity of expansion or vacuity), shall be perceptibly constant for all bottles of the same type, that is, for all bottles made to the same design.

Article 6

The maximum permissible errors (positive or negative) in the capacity of a bottle, at a temperature of 20ºC after performed testing of bottles, between the actual capacity and the nominal capacity Vn shall be in accordance with the following table:

Nominal capacity Vn [ml]	Tolerable negative error % from Vn	Tolerable negative error [ml]
50 to 100	-	3
100 to 200	3	-
200 to 300	-	6
300 to 500	2	-
500 to 1000	-	10
1000 to 5000	1	-

The maximum permissible error in the brim capacity shall be the same as the maximum permissible error in the corresponding nominal capacity.

The procedure of testing is given at Annex 2 which s integral part of this Rulebook.

Article 7

The actual capacity of a measuring container bottle shall be checked by determining the quantity of water at 20ºC which the bottle actually contains when filled to the level theoretically corresponding to the nominal capacity.

Beside the method described at paragraph 1 of this article, it may also be checked indirectly by a method of equivalent accuracy (determine the mass and density).

Article 8

The bottle, on the bottom rim or on the bottom, shall bear the following indelible, easily legible and visible indications:

1) an indication of its nominal capacity in liters, centiliters or milliliters followed by the symbol for the unit of measurement used or, where appropriate, by the name of the unit;
2) the manufacturer's identifying mark;
3) the opposite letter epsilon from the article 4 of this Rulebook.

The height of the mark from the point 1 of paragraph 1 of this article shall be determinate, depending from nominal capacity, by the following kind:

Nominal capacity Vn [cl]	The height of mark [mm]
Vn <= 20	3
20 < Vn <= 100	4
Vn > 100	>= 6

Article 9

The application for approving the manufacturer's identifying mark shall be lodged with the Bureau of Metrology (hereinafter referred to as: the Bureau).
The application referred to in paragraph 1 of this article shall contain:
1) description and the image of the proposed manufacturer's identifying mark;
2) statement from the bottle manufacturer, conforming that the manufacturer's mark is an original and designed in a way which prevents other manufacturers from using it;
3) technical documentation on bottles (blueprints, type of the bottles, nominal capacity, substance from which the bottles have been made);
4) an evidence that bottles comply with the requirements laid down in this Rulebook.

Article 10

Should it be determined that there is a similarity of the proposed bottle manufacturer's mark with the already approved manufacturer's mark, the applicant for the bottle manufacturer's mark shall:
1) change the proposed mark of the bottle manufacturer, or
2) insert additional letters or numbers in the proposed mark of the bottle manufacturer.

Article 11

Checking as to whether the bottles comply with the requirements laid down in this Rulebook shall be undertaken in a manner prescribed in the Annex 2 of this Rulebook.
Checking of the bottles shall be carried by sampling at the place of manufacture or, if this is not practicable, on the premises of the importer or the agent of the foreign bottle manufacturer.

Checking of the bottles may also be carried by using other accepted statistical sampling methods if its effectiveness may be comparable to that of the reference method specified in the Annex 2 of this Rulebook.

Article 12

Checking the nominal capacity of the content of the measuring container bottles shall be carried by using the sampling method specified in the Annex 2 of this Rulebook.

The check referred to in paragraph 1 of this article shall be carried out by means of legal measuring instrument which comply with the prescribed metrological requirements.

The nominal capacity of the measuring container bottles shall be carried out by determining the quantity of water at the temperature of 20 °C which the measuring container bottle actually contains when filled to the level theoretically corresponding to the nominal capacity indicated on the measuring container bottle.

When the nominal capacity of the content of the bottle is measured based on the mass and density of its content, the value of the verification division "e" of the control balances, including the value of the verification division "e" of measuring vessels which are used to directly determine the nominal capacity of the content of the bottles, shall be as follows:

Nominal capacity Vn [ml]	The maximum permissible value of verification division "e" [g]
50 to 150	0,5
150 to 500	1,0
500 to 2500	2,0
2500 to 5000 included	5,0

The report on conducted testing along with its results shall be delivered to the Bureau.

The report referred to in paragraph 5 of this article shall contain the following:
1) the name and the seat of the bottles manufacturer;
2) the name of the bottle (type and nominal capacity);
3) bottle manufacturer's identification mark;
4) the average value of the nominal capacity of the content;
5) permissible capacity error in comparison to capacity determined by testing;
6) date and time of testing;
7) signature of a person who carried out the testing.

Article 13

The following indication shall be inserted on the bottom or on the bottom rim, in figures of the same minimum height as those expressing the corresponding nominal capacity, according to the method or methods of filling for which the bottle is intended:

1) an indication of the brim capacity expressed in centiliters and not followed by the symbol cl, and/or
2) an indication of the distance in millimeters from the brim level to the filling level corresponding to the nominal capacity, followed by the symbol mm.

Other indicators may appear on the bottle provided they do not give rise to confusion with the indicators set forth in this Rulebook.

Article 14

This Rulebook shall enter into force on the eight day following its publishing in the "Official Gazette of Montenegro".

Number: 0904 – 2156/5
Podgorica, 17 November 2011.

Minister, Vladimir Kavaric, PhD

* In this Rulebook the Council Directive 75/107/EEC of 19 December 1974 on the approximation of the laws of the Member States relating to bottles used as measuring containers, has been transposed.

**MARKING THE MEASURING CONTAINER BOTTLES
WHOSE TYPE HAS BEEN APPROVED**

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Minimum size of the indication shall be 3 mm.

THE PROCEDURE FOR CHECKING THE MEASURING CONTAINER BOTTLES

1. Sampling method

A sample of measuring container bottles of the same design and the same manufacturer shall be drawn down from a batch corresponding to an hour's production.

If the result of the check on a batch corresponding to an hour's production is not satisfactory, a second test can be carried out, based either on another sample from a batch corresponding to a longer period of production or, where production has been subject to a check recognized by the Bureau, on the results recorded in the manufacturer's checked reports.

The quantity of bottles constituting the sample shall be 35 or 40, depending on which method of applying and processing the results has been chosen.

2. Measuring the capacity of the bottles constituting the sample

The measuring container bottles shall be weighed empty.

They shall be filled with water at 20 °C of a know density, up to the filling level appropriate to the method of checking used and they shall then be weighed in full.

The check shall be carried out by means of a legal measuring instrument, having the appropriate metrological characteristics for effecting the necessary operations.

Error in measuring the capacity shall not be greater than 1/5 of the maximum permissible error corresponding to the nominal capacity of the measuring container bottle.

3. Application of the results

3.1 Use of the standard deviation method

The number of measuring container bottles in the sample is 35.

By means of applying the following equations and procedures, the following values shall been calculated:

1) Average value $\bar{x}$ of the actual capacity x_i of the bottles in the sample;
2) Estimated standard error s of actual capacity x_i of the bottles in the batch.

Than the following shall be calculated:
1) The upper limit Ts: the sum of the capacity indicated on a bottle and of the maximum permissible error corresponding to this capacity;
2) The lower limit Ti: the difference between the capacity indicated on a bottle and the maximum permissible error corresponding to this capacity.

The batch shall be deemed in compliance with the metrological requirements specified in this Rulebook when $\bar{x}$ and s values at the same time satisfy the following three equations which represent the acceptance criteria:

$$\bar{x} + k \cdot s \leq T_s$$

$$\overline{x} - k \cdot s \geq T_i$$
$$s \leq F\,(T_s - T_i)$$

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

Calculating the average values of the actual capacities $\overline{x}$ and estimated standard error s series shall be carried by using the following equation:

- the sum of 35 measured actual capacities, $x = \sum x_i$

- average value of 35 measures, symbol $\overline{x} = \dfrac{\sum x_i}{35}$

- the sum of quadrants of 35 measures, $\sum (x_i)^2$

- the quadrant of the sum of 35 measured values, $\left(\sum x_i\right)^2$, i.e. $\dfrac{\left(\sum x_i\right)^2}{35}$

- corrected sum $\quad SC = \sum x_i^{\,2} - \dfrac{1}{35}\left(\sum x_i\right)^2$

- estimated error, $v = \dfrac{SC}{34}$

The estimated average error v shall be calculated by using the equation $s = \sqrt{v}$

3.2 Use of the average range method

The number of bottles in the sample is 40.
The following values shall be calculated by using the following equations and procedures:
1) Average value $\overline{x}$ of the actual capacities xi of the bottles in the sample
2) Average range $\overline{R}$ of the actual capacities xi of the bottles in the sample

Than the following shall be calculated:
1) The upper limit Ts: the sum of the nominal capacity indicated on a bottle and the maximum permissible error corresponding to this capacity;
2) The lower limit Ti: difference between the nominal capacity indicated on a bottle and the maximum permissible error corresponding to this capacity.

The batch shall be deemed in compliance with the metrological requirements specified in this Rulebook when $\overline{x}$ and $\overline{R}$ values at the same time satisfy the following three equations which represent the acceptance criteria:

$$\overline{x} + k' \cdot \overline{R} \leq T_s$$
$$\overline{x} + k' \cdot \overline{R} \geq T_i$$
$$\overline{R} \leq F'\,(T_s - T_i)$$

where k' = 0,668 and F' = 0,628

Calculating the average values of the actual capacities $\overline{x}$ of 40 bottles in the sample shall be carried by using the following equations:

- the sum of 40 measures of the actual capacity, $x = \sum x_i$

- the average value of 40 measures, $\overline{x} = \dfrac{\sum x_i}{40}$

For calculating the average range of the actual capacities $\overline{R}$ the sample should be divided in chronological order of selection, into eight sub-samples of five measuring container bottles each.

Than the range of each of the sub-samples shall be calculated, i.e. the difference between the actual capacity of the largest and the smallest of the five bottles in the sub-sample, thereby obtaining eight ranges: R1, R2 …….. R8.

The sum of the ranges of the eight sub-samples shall be calculated by using the equation:

$$\sum R_i = R_1 + R_2 + \ldots\ldots + R_8$$

The average range of the actual capacities $\overline{R}$ shall be calculated by using the equation:

$$\overline{R} = \dfrac{\sum R_i}{8}$$