Council Directive of 19 December 1974 on the approximation of the laws of the Member States relating to bottles used as measuring containers (75/107/EEC)

ANNEX II

This Annex lays down the procedures for the statistical checking of measuring container bottles in order to meet the requirements of Article 2 of the Directive and of Section 6 of Annex I.

1. METHOD OF SAMPLING

A sample of measuring container bottles of the same design and the same manufacture shall be drawn from a batch corresponding, in principle, 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 competent departments of the Member State, on the results recorded on the manufacturers' check-cards.

The number of measuring container bottles constituting the sample shall be 35 or 40, depending on which of the two methods of applying the results, detailed in Section 3 below, has been chosen by each Member State.

2. MEASURING THE CAPACITY OF THE MEASURING CONTAINER BOTTLES CONSTITUTING THE SAMPLE

The measuring container bottles shall be weighed empty.

They shall be filled with water at $20^{o}C$ of a know density, up to the filling level appropriate to the method of checking used.

They shall then be weighed in full.

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

Error in measuring the capacity shall not be great er than one-fifth 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.

3.1.1. Calculate as follows (see 3.1.4.):

3.1.1.1. the average

$\bar{x}$

of the actual capacities x_i of the bottles in the sample,

3.1.1.2. estimated standard deviation s of the actual capacities x_i of the bottles in the batch.

3.1.2. Calculate as follows:

3.1.2.1. The upper limit T_s: the sum of the indicated capacity (see Annex I, Section 8) and of the maximum permissible error corresponding to this capacity.

3.1.2.2. The lower limit T_i: the difference between the indicated capacity (see Annex I, Section 8) and the maximum permissible error corresponding to this capacity.

3.1.3. Acceptance criteria:

The batch shall be declared to comply with the Directive if the numbers $\bar{x}$ and s verify simultaneously the following three inequations:

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

$$\bar{x} - k \cdot s \geq T_i$$

$$s \leq F(T_s - T_i)$$

where k = 1·57
and F = 0·266

3.1.4. Calculation of the mean value $\bar{x}$ and the estimated standard deviation s of the batch.

Calculate as follows:

— the sum of the 35 actual capacity measurements $x = \Sigma x_i$

— the mean value of the 35 measurements $\bar{x} = \frac{\Sigma x_i}{35}$

— the sum of the squares of the 35 measurements Σx_i^2

— the square of the sum of the 35 measurements $(\Sigma x_i)^2$, then $\frac{(\Sigma x_i)^2}{35}$

— the corrected sum: $SC = \Sigma x_i^2 - \frac{1}{35}(\Sigma x_i)^2$

— the estimated variance $v = \frac{SC}{34}$

Hence the estimated standard deviation:

$$s = \sqrt{v}$$

3.2. **Use of the average range method**

The number of measuring container bottles in the sample is 40.

3.2.1. Calculate as follows (see 3.2.4):

3.2.1.1. the average $\bar{x}$ of the actual capacities x of the bottles in the sample,

3.2.1.2. the average range $\bar{R}$ of the actual capacities x_i of the bottles in the sample.

3.2.2. Calculate as follows:

3.2.2.1. the upper limit T_s the sum of the indicated capacity (see Annex I, Section 8) and the maximum permissible error corresponding to this capacity,

3.2.2.2. the lower limit T_i:

difference between the indicated capacity (see Annex I, Section 8) and the maximum permissible error corresponding to this capacity.

3.2.3. Acceptance criterion:

The batch shall be declared to comply with the Directive if the numbers
$\bar{x}$
and
$\bar{R}$
verify simultaneously the following three inequations:

$\bar{x} + k' \cdot R \leq T_s$

$\bar{x} + k' \cdot R \geq T_i$

$\bar{R} \leq F'(T_s - T_i)$

where k' = 0·668,
and F' = 0·628.

3.2.4. Calculation of the mean value
$\bar{x}$
and of the average range of
$\bar{R}$
of the 40 measuring container bottles in the sample.

3.2.4.1. to obtain
$\bar{x}$
, calculate as follows:

— the sum of the 40 actual capacity measurements x_i: Σx_i

— the mean value of these 40 measurements:

$$\bar{x} = \frac{\Sigma x_i}{40}$$

3.2.4.2. To obtain
$\bar{R}$:

Divide the sample, in chronological order of selection, into eight sub-samples of five measuring container bottles each.

Calculate as follows:

— the range of each of the sub-samples, i.e. the difference between the actual capacity of the largest and the smallest of the five bottles in the sub-sample; eight ranges are thus obtained: R_1; R_2; ... R_8

— the sum of the ranges of the eight sub-samples:

$\Sigma R_i = R_1 +$
$\bar{R}_2$
$+ ... + R_8$

The average range
$\bar{R}$
is therefore:

$$\bar{R} = \frac{\Sigma R_i}{8}$$