

## SCHEDULE 2

Regulation 2

### The reference test

This Schedule lays down the procedures of the reference test for statistical checking of batches of packages in order to meet the requirements of regulation 4(1)(a) and (b).

#### **1. REQUIREMENTS FOR MEASURING THE ACTUAL CONTENTS OF PACKAGES**

- 1.1 The actual contents of packages may be measured directly by means of weighing instruments or volumetric instruments or, in the case of liquids, indirectly, by weighing the packed product and measuring its density.
- 1.2 In all operations for checking quantities of products expressed in units of volume, the value employed for the actual contents shall be measured at or corrected to a temperature of 20°C, whatever the temperature at which packaging or checking is carried out. However this rule shall not apply to deep frozen or frozen products the quantity of which is expressed in units of volume.
- 1.3 Irrespective of the method used, the error made in measuring the actual contents of a package shall not exceed one-fifth of the tolerable negative error for the nominal quantity in the package.

#### **2. REQUIREMENTS FOR CHECKING BATCHES OF PACKAGES**

- 2.1 The checking of packages shall be carried out by sampling and shall be in two parts:
  - 2.1.1 a check covering the actual contents of each package in the sample,
  - 2.1.1 another check on the average of the actual contents of the packages in the sample.
- 2.2 A batch of packages shall be considered acceptable if the results of both these checks satisfy the acceptance criteria.
- 2.3 For each of these checks, there are three sampling plans:
  - (a) a single sampling plan for non-destructive testing, i.e. testing which does not involve opening the package,
  - (b) a double sampling plan for non-destructive testing, and
  - (c) a single sampling plan for destructive testing, i.e., testing which involves opening or destroying the package.
- 2.4 For economic and practical reasons, the third test shall be limited to the absolutely essential minimum; it is less effective than the non-destructive tests. Destructive testing shall therefore be used only when non-destructive testing is impracticable. As a general rule it shall not be applied to batches of fewer than 100 units.

#### **Package batches**

- 2.5 The batch shall comprise all the packages of the same nominal quantity, the same type and the same production run, packed in the same place, which are to be inspected. The batch size shall be limited to the amounts laid down below.
- 2.6 When packages are checked at the end of the packing line, the number in each batch shall be equal to the maximum hourly output of the packing line, without any restriction as to batch size.
- 2.7 In other cases the batch size shall be limited to 10,000.
- 2.8 For batches of fewer than 100 packages, the non-destructive test, where carried out, shall be 100%.
- 2.9 Before the tests in paragraphs 3 and 4 are carried out, a sufficient number of packages shall be drawn at random from the batch so that the check requiring the larger sample

*Status: This is the original version (as it was originally made).*

can be carried out. For the other check, the necessary sample shall be drawn at random from the first sample and marked.

2.10 This marking operation shall be completed before the start of measuring operations.

**3. CHECKING OF THE ACTUAL CONTENTS OF A PACKAGE**

3.1 The minimum acceptable contents shall be calculated by subtracting the tolerable negative error for the contents concerned from the nominal quantity of the package.

3.2 Packages in the batch whose actual contents are less than the minimum acceptable contents shall be considered defective.

Single sampling plan for non-destructive testing.

3.3 The number of packages checked shall be equal to the number in the sample, as indicated in the table below.

3.4 If the number of defective packages found in the sample is less than or equal to the acceptance criterion indicated in that table, the group shall be considered as acceptable for the purpose of the check..

3.5 If the number of defective packages found in the sample is equal to or greater than the rejection criterion there indicated, the group shall be rejected.

<i>Number in group</i>	<i>Number in sample</i>	<i>Number of defective packages</i>	
		<i>Acceptance criterion</i>	<i>Rejection criterion</i>
100 to 500	50	3	4
501 to 3,200	80	5	6
3,201 and above	125	7	8

3.6 For a batch of fewer than 100 packages the batch shall be considered acceptable for the purposes of the check if the number of defective packages does not exceed 5%.

*Double sampling plan for non-destructive testing*

3.7 Non-destructive testing shall be carried out in accordance with a double sampling plan as shown in the table below.

3.8 The first number of packages checked shall be equal to the number of units in the first sample, as indicated in the plan.

3.9 If the number of defective units found in the first sample is less than or equal to the first acceptance criterion, the batch shall be considered acceptable for the purpose of this check.

3.10 If the number of defective units found in the first sample is equal to or greater than the first rejection criterion, the batch shall be rejected.

3.11 If the number of defective units found in the first sample lies between the first acceptance criterion and the first rejection criterion, a second sample shall be checked, the number of units in which is indicated in the plan. The defective units found in the first and second samples shall be added together and:

3.11.1 If the aggregate number of defective units is less than or equal to the second acceptance criterion, the batch shall be considered acceptable for the purpose of this check,

3.11.2 If the aggregate number of defective units is greater than or equal to the second rejection criterion, the batch shall be rejected.

Number in batch	Samples		Number of defective units		
	Order	Number	Aggregate number	Acceptance criterion	Rejection criterion
100 to 50	1st	30	30	1	3
	2nd	30	60	4	5
501 to 3,200	1st	50	50	2	5
	2nd	50	100	6	7
3,201 and over	1st	80	80	3	7
	2nd	80	160	8	9

Single sampling plan for destructive testing

- 3.12 Destructive testing shall be carried out in accordance with the single sampling plan below and shall be used only for batches of 100 or more.
- 3.13 The number of packages checked shall be equal to 20.
- 3.14 If the number of defective units found in the sample is less than or equal to the acceptance criterion, the batch of packages shall be considered as acceptable.
- 3.15 If the number of defective units found in the sample is equal to or greater than the rejection criterion, the batch of packages shall be rejected.

Number in batch	Number in sample	Number of defective packages	
		Acceptance criterion	Rejection criterion
Whatever the number ( ≥ 100)	20	1	2

**4. CHECKING OF AVERAGE ACTUAL VOLUME OF THE CONTENTS OF THE INDIVIDUAL PACKAGES MAKING UP A BATCH**

- 4.1 A batch of packages shall be considered acceptable for the purpose of this check if the

mean value  $\bar{x} = \frac{\sum x_i}{n}$  of the actual quantity of the contents of the packages in the sample is greater than the value:

$$Q_n - \frac{s}{\sqrt{n}} \cdot t_{(1-\alpha)}$$

- 4.2 In this formula:

- $Q_n$  = the nominal quantity of the package,
- $n$  = the number of packages in the sample for this check,
- $s$  = the estimated standard deviation of the actual contents of the batch,
- $t_{(1-\alpha)}$  = 0.995 confidence level of a Student distribution with  $\delta = n-1$  degree of freedom

- 4.3 If  $\chi_i$  is the measured value for the actual contents of the i-th item in a sample containing n items, then:

The mean of the measured values for the sample is obtained by the following calculation:

$$\bar{x} = \frac{\sum_{i=1}^{i=n} \chi_i}{n}$$

*Status: This is the original version (as it was originally made).*

4.4 and the estimated value of the standard deviation  $s$  is obtained by the following calculation:

— 
$$\sum_{i=1}^{i=n} (\chi_i)^2$$
  
 the sum of the squares of the measured values:

— 
$$\left( \sum_{i=1}^{i=n} \chi_i \right)^2$$
  
 the square of the sum of the measured values:

then 
$$\frac{1}{n} \left( \sum_{i=1}^{i=n} \chi_i \right)^2$$

— 
$$SC = \sum_{i=1}^{i=n} (\chi_i)^2 - \frac{1}{n} \left( \sum_{i=1}^{i=n} \chi_i \right)^2$$
  
 the corrected sum

— 
$$v = \frac{SC}{n - 1}$$
  
 the estimated variance:

the estimated value of the standard deviation is: 
$$s = \sqrt{v}$$

Criteria for acceptance or rejection of the batch of packages for checking the mean

4.5 Criteria for non-destructive testing:

Number in batch	Number in sample	Criteria	
		Acceptance	Rejection
100 to 500 (inclusive)	30	$\bar{x} \geq Q_n - 0.503s$	$\bar{x} < Q_n - 0.503s$
> 500	50	$\bar{x} \geq Q_n - 0.379s$	$\bar{x} < Q_n - 0.379s$

4.6 Criteria for destructive testing:

Number in batch	Number in sample	Criteria	
		Acceptance	Rejection
Whatever the number ( $\geq 100$ )	20	$\bar{x} \geq Q_n - 0.640s$	$\bar{x} < Q_n - 0.640s$

4.7 For batches of fewer than 100 packages, the average of the measured values of the actual contents shall be determined by application of the formula in paragraph 4.3 where  $n$  equals the number of packages in the batch. If the average is equal to or greater than the nominal quantity of the packages in the batch, the batch shall be considered as acceptable for the purposes of the check.