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**Cork — Cork stoppers for still wines —  
Mechanical and physical specifications**

*Liège — Bouchons de liège pour vins tranquilles —  
Spécifications  
mécaniques et physiques*



Reference number  
ISO 16420:2013(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16420 was prepared by Technical Committee ISO/TC 87, *Cork*.

# Cork — Cork stoppers for still wines — Mechanical and physical specifications

## 1 Scope

This International Standard defines, for each type of ready-to-use, cylindrical cork stopper for still wines (colmated or non-colmated natural cork stoppers, agglomerate cork stoppers, 1 + 1 stoppers), a set of specifications corresponding to different tested parameters, a list of which is given below:

- dimensions;
- mass (for 1+1 stoppers only);
- mass and apparent density (for agglomerate cork stoppers only);
- moisture content;
- dimensional recovery after compression;
- extraction force;
- liquid tightness;
- dust content.

For all parameters, this set of specifications comprises:

- a proposal for the number of stoppers to be tested (incremental sample);
- an acceptable quality level;

and, for certain parameters:

- nominal value or values;
- specification limits (or “tolerances”).

For cork stoppers for still wines, and for certain parameters, the concept of a range is introduced, with 3 decreasing levels of requirements:

- upper range;
- standard range;
- entry level.

It is, therefore, up to the consumer to specify, for each batch of cork stoppers ordered, what their needs are based on these three specification levels (or ranges).

It is also up to each supplier, besides a commercial reference for each batch of cork stoppers, to define which range applies in terms of the requirements in this International Standard.

The sampling method, as well as the possible repetitions of incremental samples are defined by the sampling standard (currently being drafted) or defined jointly by the consumer and the supplier.

The stoppers tested shall comply with the requirements of ISO 9727.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 633, *Cork — Vocabulary*

ISO 9727-1, *Cylindrical cork stoppers — Physical tests — Part 1: Determination of dimensions*

ISO 9727-2, *Cylindrical cork stoppers — Physical tests — Part 2: Determination of mass and apparent density for agglomerated cork stoppers*

ISO 9727-3, *Cylindrical cork stoppers — Physical tests — Part 3: Determination of humidity content*

ISO 9727-4, *Cylindrical cork stoppers — Physical tests — Part 4: Determination of dimensional recovery after compression*

ISO 9727-5, *Cylindrical cork stoppers — Physical tests — Part 5: Determination of extraction force*

ISO 9727-6, *Cylindrical cork stoppers — Physical tests — Part 6: Determination of liquid tightness*

ISO 9727-7, *Cylindrical cork stoppers — Physical tests — Part 7: Determination of dust content*

EN 12726, *Packaging — Cork mouth finish with a bore diameter of 18,5 mm for corks and tamper evident capsules*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 633 and the following apply.

### 3.1 still wine

wine is said to be still when the excess pressure of carbon dioxide it contains is less than or equal to 0,5 bar at 20 °C<sup>1)</sup>

## 4 Natural cork stoppers, colmated or non-colmated

### 4.1 Dimensions

4.1.1 Number of stoppers to be tested (incremental sample): 32

4.1.2 Nominal values and specification limits

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1) Definition from the International Code of Oenological Practices of the International Organisation of Vine and Wine.

Table 1

Stopper type	Parameter measured	Normal diameter (for cork mouth finish following EN 12726)	Ovality	Length (mm)
Natural	Nominal value	24 mm		38, 44, 45, 49, 53 or 54
	Specification limits	± 0,5 mm	≤0,7 mm	± 0,7
Colmated natural cork	Nominal value	24 mm		38, 44, 45, 49, 53 or 54
	Specification limits	± 0,5 mm	≤0,7 mm	± 0,7

NOTE The same specification limits apply for natural and colmated natural cork stoppers whose nominal dimensions are not listed in Table 1 (for special cork mouth finishes or for specific uses).

#### 4.1.3 Acceptable Quality Level (AQL)

Table 2

Stopper range	Parameter measured			
	Diameter	Ovality	Ovality > 1,2 mm	Length
Upper range	AQL: 2,5: A 2/R 3	AQL: 4 A 3/R 4	AQL: 0,65 A 0/R 1	AQL: 4 A 3/R 4
	AQL: 4 A 3/R 4	AQL: 6,5 A 5/R 6	AQL: 0,65 A 0/R 1	AQL: 4 A 3/R 4
Standard range	AQL: 6,5 A 5/R 6	AQL: 6,5 A 5/R 6	AQL: 0,65 A 0/R 1	AQL: 6,5 A 5/R 6

A 2/R 3 means that, of the 32 stoppers tested:

- the batch shall be **accepted** if 2 stoppers, at most, have a result below or above the specification limits;
- the batch shall be **rejected** if 3 stoppers or more have a result below or above the specification limits.

## 4.2 Moisture content

4.2.1 Number of stoppers to be tested (incremental sample): 20

4.2.2 Nominal value: 6 %

4.2.3 Specification limits: ± 2 % (or from 4 % to 8 %)

4.2.4 Acceptable Quality Level (AQL)

For all types of stopper **the AQL is 4**, which means that, for the sampling size stated in subclause 4.2.1:

- the batch shall be **accepted** if 2 stoppers, at most, have a result below or above the specification limits;
- the batch shall be **rejected** if 3 stoppers or more have a result below or above the specification limits.

## 4.3 Dimensional recovery after compression

4.3.1 Number of stoppers to be tested (incremental sample): 5

4.3.2 Lower specification limit: 90 %

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### 4.3.3 Acceptable Quality Level (AQL)

For the 5 stoppers tested:

- the batch shall be **accepted** if **no** stopper has a percentage of dimensional recovery below 90 %;
- the batch shall be **rejected** if **1** or more stoppers have a percentage of dimensional recovery below 90 %.

## 4.4 Extraction force

4.4.1 Number of stoppers to be tested (incremental sample): 5

4.4.2 Upper and lower specification limit values, expressed in daN

These values apply to tests carried out with glass cylindrical tubes.

NOTE For the same batch of stoppers, it is not possible to compare the extraction force test results obtained from cylindrical glass tubes with the results obtained from the necks of bottles.

**Table 3**

Length of stoppers	38 mm	44/45 mm	49 mm <b>and above</b>
Natural cork stoppers, colmated or non-colmated	12 daN to 35 daN	15 daN to 40 daN	15 daN to 45 daN

Table 3 shows, for each stopper length, the range of nominal values found according to the corresponding destination wine markets.

For the same batch of stoppers, the extraction force values measured at a speed of 30 cm/min shall be below those measured at a speed of 60 cm/min.

In all cases, the extraction forces for all stoppers tested from the same batch shall fall within a range between the mean and  $\pm 1/4$  of the mean.

EXAMPLE (20  $\pm$  5) daN.

## 4.5 Liquid tightness

4.5.1 Number of stoppers to be tested (incremental sample): 6

4.5.2 Liquid test pressures

- Upper range: 1,2 bar;
- Standard range: 0,9 bar;
- Entry level: 0,9 bar;

4.5.3 Acceptable Quality Level (AQL)

For the 6 stoppers tested, at the pressures indicated above:

- the batch shall be **accepted** if **no** stoppers leak;
- the batch shall be **rejected** if **1** or more stoppers leak.



## 4.6 Dust content

4.6.1 Number of stoppers to be tested (incremental sample): 4

4.6.2 Acceptable Quality Level (AQL)

- Upper range: average content per stopper < 1,5 mg;
- Standard range: average content per stopper < 2,0 mg;
- Entry level: average content per stopper < 2,0 mg.

The result shall be accompanied by a comment on the anomalies of the cork stoppers submitted for testing likely to have an influence on the dust content (earthy corkwood, excess colmatage).

## 5 Agglomerate cork stoppers

### 5.1 Dimensions

5.1.1 Number of stoppers to be tested (incremental sample): 32

5.1.2 Nominal values and specification limits

**Table 4**

Stopper type	Parameter measured	Diameter	Length
Agglomerate cork stoppers for still wines	Nominal value	(22,5 to 23,5) mm	(38 to 44) mm
	Specification limits	± 0,5 mm	± 0,5 mm

The same specification limits shall apply for agglomerate cork stoppers whose nominal dimensions are not listed in [Table 4](#) (for special cork mouth finishes or for specific uses).

5.1.3 Acceptable Quality Level (AQL)

**The AQL is 1,5**, which means that for the sampling size stated (32 stoppers):

- the batch shall be **accepted** if **1** stopper, at most, has a result below or above the specification limits;
- the batch shall be **rejected** if **2** or more stoppers have a result below or above the specification limits.

### 5.2 Mass and apparent density

5.2.1 Number of stoppers to be tested (incremental sample): 32

5.2.2 Specification limits:

Table 5

Stopper type	Length (mm)	Diameter (mm)	Parameter measured	Mass (g)	Density (kg/m <sup>3</sup> )
Agglomerate	38	22,5	Nominal value	4,4	290,00
	38	23,0		4,6	
	38	23,5		4,8	
	40	22,5		4,6	
	40	23,0		4,8	
	40	23,5		5,0	
	42	22,5		4,8	
	42	23,0		5,1	
	42	23,5		5,3	
	44	22,5		5,1	
	44	23,0		5,3	
	44	23,5		5,5	
				Specification limits	

### 5.2.3 Acceptable Quality Level (AQL)

The AQL is 1,5, which means that, for the sampling size stated (32 stoppers):

- the batch shall be **accepted** if 1 stopper, at most, has a result below or above the specification limits;
- the batch shall be **rejected** if 2 or more stoppers have a result below or above the specification limits.

## 5.3 Moisture content

5.3.1 Number of stoppers to be tested (incremental sample): 20

5.3.2 Nominal value: 6 %

5.3.3 Specification limits: ± 2 % (or from 4 % to 8 %)

5.3.4 Acceptable Quality Level (AQL)

For all types of stopper the AQL is 4, which means that, for the sampling size stated (20 stoppers):

- the batch shall be **accepted** if 2 stoppers, at most, have a result below or above the specification limits;
- the batch shall be **rejected** if 3 or more stoppers have a result below or above the specification limits.

## 5.4 Dimensional recovery after compression

5.4.1 Number of stoppers to be tested (incremental sample): 5

5.4.2 Lower specification limit: 90 %

5.4.3 Acceptable Quality Level (AQL)

5.4.4 For the 5 stoppers tested:

- the batch shall be **accepted** if **no** stoppers have a percentage of dimensional recovery below 90 %;
- the batch shall be **rejected** if **1** or more stoppers have a percentage of dimensional recovery below 90 %.

## 5.5 Extraction force

5.5.1 Number of stoppers to be tested (incremental sample): 5

5.5.2 Upper and lower specification limit values, expressed in daN

These values apply to tests carried out using glass cylindrical tubes.

NOTE For the same batch of stoppers, it is not possible to compare the extraction force test results obtained from cylindrical glass tubes with the results obtained from the necks of bottles.

**Table 6**

Length of stoppers	38 mm	44 mm
Agglomerate cork stoppers	(12 to 30) daN	(12 to 30) daN

Table 6 shows the range of nominal values for each stopper length found according to the corresponding destination wine markets.

For the same batch of stoppers, the extraction force values measured at a speed of 30 cm/min shall be below those measured at a speed of 60 cm/min.

In all cases, the extraction forces for all stoppers tested from the same batch shall fall within a range between the mean and  $\pm 1/4$  of the mean.

EXAMPLE (16  $\pm$  4) daN.

## 5.6 Liquid tightness

5.6.1 Number of stoppers to be tested (incremental sample): 6

5.6.2 Liquid test pressures: 0,9 bar

5.6.3 Acceptable Quality Level (AQL)

5.6.4 For the 6 stoppers tested, to the pressures indicated above:

- the batch shall be **accepted** if **no** stoppers leak;
- the batch shall be **rejected** if **1** or more stoppers leak.

## 5.7 Dust content

5.7.1 Number of stoppers to be tested (incremental sample): 4

5.7.2 Acceptable Quality Level (AQL)

5.7.3 Average content per stopper < 2 mg.

## 6 1 + 1 Stoppers (disk/agglomerate/disk)

### 6.1 Dimensions

6.1.1 Number of stoppers to be tested (incremental sample): 32

6.1.2 Nominal values and specification limits

Table 7

Stopper type	Parameter measured	Diameter (mm)	Length (mm)
"1 + 1" stoppers (disk/agglomerate/disk)	Nominal value	23 to 24	40 to 44
	Specification limits	± 0,5	± 0,5

NOTE For 1+1 stoppers whose nominal dimensions are not listed in [Table 7](#) (for special cork mouth finishes or for specific uses), the same specification limits apply.

6.1.3 Acceptable Quality Level (AQL)

The AQL is 1,5, which means that, for the sampling size stated (32 stoppers):

- the batch shall be **accepted** if 1 stopper, at most, has a result below or above the specification limits;
- the batch shall be **rejected** if 2 stoppers or more have a result below or above the specification limits.

### 6.2 Mass

6.2.1 Number of stoppers to be tested (incremental sample): 32

6.2.2 Specification limits:

Table 8

Stopper type	Length (mm)	Diameter (mm)	Parameter measured	Mass (g)
"1 + 1" stoppers (disk/agglomerate/disk)	40	23,0	Nominal value	4,5
	40	23,5		4,7
	40	24,0		4,9
	42	23,0		4,7
	42	23,5		4,9
	42	24,0		5,1
	44	23,0		4,9
	44	23,5		5,2
	44	24,0		5,4

**6.2.3** Acceptable Quality Level (AQL)

The **AQL is 1,5** which means that, for the sampling size stated (32 stoppers):

- the batch shall be **accepted** if **1** stopper, at most, presents a result below or above the specification limits;
- the batch shall be **rejected** if **2** or more stoppers have a result below or above the specification limits.

**6.3** Moisture content

**6.3.1** Number of stoppers to be tested (incremental sample): 20

**6.3.2** Nominal value: 6 %

**6.3.3** Specification limits:  $\pm 2$  % (or from 4 % to 8 %)

**6.3.4** Acceptable Quality Level (AQL)

For all types of stoppers **the AQL is 4**, which means that, for the sampling size stated in point 1 (20 stoppers):

- the batch shall be **accepted** if **2** stoppers, at most, have a result below or above the specification limits;
- the batch shall be **rejected** if **3** or more stoppers have a result below or above the specification limits.

**6.4** Dimensional recovery after compression

**6.4.1** Number of stoppers to be tested (incremental sample): 5

**6.4.2** Lower specification limit: 90 %

**6.4.3** Acceptable Quality Level (AQL)

**6.4.4** For the 5 stoppers tested:

- the batch shall be **accepted** if **no** stoppers have a percentage of dimensional recovery below 90 %;
- the batch shall be **rejected** if **1** or more stoppers have a percentage of dimensional recovery below 90 %.

**6.5** Extraction force

**6.5.1** Number of stoppers to be tested (incremental sample): 5

**6.5.2** Upper and lower specification limit values expressed in daN

These values apply to tests carried out using glass cylindrical tubes.

NOTE For the same batch of stoppers, it is not possible to compare the extraction force test results obtained from cylindrical glass tubes with the results obtained from the necks of bottles.

**Table 9**

<b>Length of stoppers</b>	<b>(38 to 44) mm</b>
1 + 1 Stoppers (disk/agglomerate/disk)	(12 to 30) daN

Table 9 gives, for the different stopper lengths, the range of nominal values found according to the corresponding destination wine markets.

For the same batch of stoppers, extraction force values measured at a speed of 30 cm/min shall be below those measured at a speed of 60 cm/min.

In all cases, the extraction forces for all stoppers tested from the same batch shall fall within a range between the mean and  $\pm 1/4$  of the mean.

EXAMPLE (18  $\pm$  5) daN.

## 6.6 Liquid tightness

6.6.1 Number of stoppers to be tested (incremental sample): 6

6.6.2 Liquid test pressures: 1,2 bar

6.6.3 Acceptable Quality Level (AQL)

For the 6 stoppers tested, to the pressures indicated above:

- the batch shall be **accepted** if **no** stoppers leak;
- the batch shall be **rejected** if **1** or more stoppers leak.

## 6.7 Dust content

6.7.1 Number of stoppers to be tested (incremental sample): 4

6.7.2 Acceptable Quality Level (AQL)

Average content per stopper < 2 mg.

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