

Specification for

# Glass bottles for light wine

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# Cooperating organizations

The Packaging and Freight Containers Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

- Association of Drum Manufacturers
- British Bag Federation
- British Fibreboard Packaging Association
- British Food Manufacturing Industries Research Association
- British Paper and Board Industry Federation (PIF)
- British Stationery and Office Products Federation
- Chemical Industries Association\*
- Collapsible Tube Manufacturers' Association
- Department of Trade, Paper, Printing, Publishing, Services and Distribution
- Department of Transport
- Food Manufacturers' Federation Incorporated\*
- General Council of British Shipping
- Glass Manufacturers' Federation\*
- Institute of Packaging
- Institute of Trading Standards Administration\*
- Institution of Production Engineers
- Metal Packaging Manufacturers' Association\*
- Ministry of Defence
- Oil Companies Materials Association
- Paintmakers' Association of Great Britain Ltd.
- Soap and Detergent Industry Association
- Timber Packaging and Pallet Confederation
- Timber Research and Development Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

- Association of the British Pharmaceutical Industry
- Brewers' Society
- British Soft Drinks Council
- Campden Food Preservation Research Association
- Consumer Standards Advisory Committee of BSI
- Dairy Trade Federation
- Department of Health and Social Security
- Department of Trade
- Honey Importers and Packers Association
- Milk Marketing Board
- National Association of Cider Makers
- National Association of Soft Drinks Manufacturers
- Pira (The Research Association for the Paper and Board, Printing and Packaging Industries)
- Process Plant Association
- Scotch Whisky Association
- Scottish Association of Soft Drinks Manufacturers
- Wine and Spirit Association of Great Britain
- Technical expert

This British Standard, having been prepared under the direction of the Packaging and Freight Containers Standards Committee, was published under the authority of the Executive Board and comes into effect on 31 August 1981

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# Foreword

This British Standard has been prepared under the direction of the Packaging and Freight Containers Standards Committee, at the request of the Glass Manufacturers' Federation and the Wine and Spirit Association of Great Britain. The control of capacity is a statutory requirement as stipulated in the Measuring Container Bottles (EEC Requirements) Regulations 1977 (UK Statutory Instrument 1977 No. 932) which implements EEC Directive 75/107. The method of assessing compliance is given in full in the EEC Directive 75/107 on the approximation of the laws of member states relating to bottles used as measuring containers.

NOTE The design and dimensions of the neck finishes shown in Figure 11 to Figure 13 are based on the following glass container finish references prepared by the Glass Manufacturers' Federation, 19 Portland Place, London W1N 4BH.

|                     |          |
|---------------------|----------|
| cork mouth finish   | GF 119   |
| aluminium finish    | GF 120/2 |
| pilfer-proof finish | GF 313   |

It is anticipated that the GMF reference GF 313 will be amended to GF 305.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves the user from statutory obligations relating to health and safety at any stage of manufacture or use. In particular, attention is drawn to the test for thermal shock resistance and to the use of monochlorobenzene in the test for light transmission of amber bottles.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This British Standard specifies the design and dimensions, capacity, neck finish, verticality, thermal shock resistance and markings for the following types of bottle for light wine, intended for multi-trip use as measuring containers.

| Nominal capacity | Style of bottle |
|------------------|-----------------|
| 350 ml           | Burgundy        |
| 350 ml           | Bordeaux        |
| 350 ml           | German          |
| 500 ml           |                 |
| 700 ml           | Burgundy        |
| 700 ml           | Bordeaux        |
| 700 ml           | German          |
| 1 litre          | Dumpy           |
| 1 litre          | Tall            |
| 2 litre          |                 |

Designs and dimensions for cork mouth, aluminium and pilfer-proof screw finishes are also specified. Gauges for measuring dimensions, together with methods of test for capacity, verticality, and thermal shock resistance, are also specified.

## 2 Reference

The title of the publication referred to in this standard is given on the inside back cover.

## 3 Definitions

For the purposes of this British Standard the following definitions apply.

### 3.1

#### filling level

the distance from the top of the neck finish to the centre of the meniscus measured on the centre line of the bottle

### 3.2

#### multi-trip bottle

a bottle having strength characteristics that enable it to perform a number of trips

### 3.3

#### vacuity

the free space left above the liquid in a sealed container. It is expressed as a percentage of the nominal volume of the liquid

### 3.4

#### verticality

the horizontal deviation of the centre of the bore entrance from a vertical line through the centre of the base when the bottle is standing upright on a horizontal surface (For the method of measurement, see 12.3.)

## 4 Material

The bottles shall be made from either white-flint or coloured soda-lime glass as specified by the purchaser.

Bottles made of amber glass shall allow transmission of between 30 % and 50 % of light at 550 nm wavelength measured in air through glass of 2 mm thickness, when tested in accordance with 12.1.

If glass of other colours is used, it shall be sufficiently transparent to allow effective use of filling level templates.

## 5 Bottle design

The bottle designs shall be as shown in Figure 1 to Figure 10. The glass distribution shall be as uniform as possible.

The approximate mass of glass shall be as specified in Table 1.

## 6 Dimensions

**6.1 General.** The bottle dimensions shall be as specified in Table 1, and as shown in Figure 1 to Figure 10. Bottles shown in Figure 1 to Figure 7 and Figure 9 are shown with a cork mouth finish for convenience.

Untoleranced dimensions given in Figure 1 to Figure 10 are for mould-making purposes only.

Sampling and acceptance levels shall be in accordance with 11.1.

**6.2 Measurement of body diameter.** The body diameter shall be measured by means of a GO — NO GO gauge, using a ring gauge for the maximum diameter, and a gap gauge with a 50 mm wide anvil for the minimum diameter.

**6.3 Measurement of neck finish diameter.** The diameter of the neck finish shall be measured using a Parnaby gauge as shown in Figure 15, in which each engaging surface subtends an angle of 36°.

## 7 Capacity

**7.1 Capacity at filling level.** The capacity at filling level, when tested in accordance with 12.2, shall be as detailed in Table 1.

Sampling shall be in accordance with 11.2.

**7.2 Filling level.** The filling level shall be as specified in Table 1, as appropriate.

## 8 Neck finish

**8.1 Type.** The neck finish of the bottles shall be either the cork mouth finish, the aluminium finish, or the pilfer-proof finish.

### 8.2 Design and dimensions

**8.2.1 General.** The design and dimensions of the neck finishes shall be as shown in Figure 11 to Figure 13. Sampling and acceptance levels shall be in accordance with 11.1.

**8.2.2 Bore dimensions.** Bore dimensions shall be measured using a gauge that enters the neck vertically.

**8.2.3 Closure integrity.** All sealing surfaces shall be essentially smooth and free from features that prevent adequate sealing.

**Table 1 — Capacity, dimensions and mass of glass**

| Nominal capacity and style of bottle | Capacity at filling level | Overall height of bottle with cork mouth or aluminium finish <sup>a</sup> but without closure | Body diameter | Filling level | Approximate mass of glass |
|--------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------|---------------|---------------------------|
|                                      | ml                        | mm                                                                                            | mm            | mm            | g                         |
| 350 ml Burgundy                      | 350 ± 7                   | 238.0 ± 1.6                                                                                   | 61.7 ± 1.2    | 55.0          | 310                       |
| 350 ml Bordeaux                      | 350 ± 7                   | 238.0 ± 1.6                                                                                   | 61.5 ± 1.2    | 55.0          | 330                       |
| 350 ml German                        | 350 ± 7                   | 264.8 ± 1.4                                                                                   | 60.1 ± 1.2    | 55.0          | 330                       |
| 500 ml                               | 500 ± 10                  | 255.0 ± 1.7                                                                                   | 69.4 ± 1.4    | 55.0          | 380                       |
| 700 ml Burgundy                      | 700 ± 10                  | 285.0 ± 1.8                                                                                   | 80.0 ± 1.5    | 55.0          | 480                       |
| 700 ml Bordeaux                      | 700 ± 10                  | 285.0 ± 1.8                                                                                   | 75.5 ± 1.5    | 55.0          | 480                       |
| 700 ml German                        | 700 ± 10                  | 317.6 ± 1.9                                                                                   | 76.5 ± 1.5    | 55.0          | 510                       |
| 1 litre dumpy                        | 1 000 ± 10                | 288.0 ± 1.8                                                                                   | 93.4 ± 1.7    | 60.0          | 600                       |
| 1 litre tall                         | 1 000 ± 10                | 314.0 ± 1.9                                                                                   | 86.9 ± 1.5    | 60.0          | 595                       |
| 2 litre                              | 2 000 ± 20                | 344.0 ± 2.0                                                                                   | 111.3 ± 1.8   | 70.0          | 950                       |

<sup>a</sup> If the pilfer-proof finish is used, the height of the bottle will be 6.0 mm greater than if either a cork mouth or aluminium finish is used. The filling level and vacuity will be unchanged, although a slight increase in the mass of glass will be required to maintain compliance with measuring container requirements.

## 9 Verticality

The maximum verticality (see 3.4) of the bottles, when tested in accordance with 12.3, shall not be greater than the values specified in Table 2.

Sampling and acceptance levels shall be in accordance with 11.1.

**Table 2 — Verticality limits**

| Bottle          | Maximum verticality |
|-----------------|---------------------|
|                 | mm                  |
| 350 ml Burgundy | 2.8                 |
| 350 ml Bordeaux | 2.8                 |
| 350 ml German   | 3.1                 |
| 500 ml          | 3.1                 |
| 700 ml Burgundy | 3.3                 |
| 700 ml Bordeaux | 3.3                 |
| 700 ml German   | 3.5                 |
| 1 litre dumpy   | 3.3                 |
| 1 litre tall    | 3.5                 |
| 2 litre         | 3.8                 |

## 10 Thermal shock resistance

The bottles shall resist, without breakage, the thermal shock imposed by a fall in temperature of 35 °C when tested in accordance with 12.4.

Sampling and acceptance levels shall be in accordance with 11.1.

## 11 Sampling and acceptance levels

**11.1 Dimensions, neck finish, verticality and thermal shock resistance.** The sampling and acceptance levels for dimensions, neck finish, verticality and thermal shock resistance shall be in accordance with Table 3.

**11.2 Sampling for capacity test.** The number of bottles in the sample for the capacity test shall be as follows, depending on the method to be used to determine compliance with UK Statutory Instrument No. 932 (see foreword).

a) *Standard deviation method:* the sample size shall be 35 bottles taken at random which are representative of one hour's production of the bottles.

b) *Mean range method:* the sample size shall be 40 bottles which are representative of one hour's production of the bottles. The sample of 40 bottles is subdivided into 8 subgroups of 5 bottles.

**NOTE** UK Statutory Instrument No. 932 (see foreword) refers primarily to determination of capacity by the manufacturer or inspector. For capacity testing by the bottle user or other interested party, consultation should be held with the bottle manufacturer in order to establish a scheme of sampling which complies with this subclause.

Table 3 — Sampling and acceptance levels for dimensions, neck finish, verticality and thermal shock resistance

| Test                                                                                                                                                                                                                                                                                                                                                                      | Initial sample size | Number of failures in initial sample |                    |                    | Second sample size | Cumulative number of failures |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|--------------------|--------------------|-------------------------------|--------------------|
|                                                                                                                                                                                                                                                                                                                                                                           |                     | Accept consignment                   | Take second sample | Reject consignment |                    | Accept consignment            | Reject consignment |
| Dimensions                                                                                                                                                                                                                                                                                                                                                                | 20                  | 0                                    | 1 or 2             | $\geq 3$           | 20                 | 3                             | $\geq 4$           |
| Neck finish                                                                                                                                                                                                                                                                                                                                                               | 20                  | 0                                    | 1 or 2             | $\geq 3$           | 20                 | 3                             | $\geq 4$           |
| Verticality                                                                                                                                                                                                                                                                                                                                                               | 20                  | 0                                    | 1 or 2             | $\geq 3$           | 20                 | 3                             | $\geq 4$           |
| Thermal shock resistance                                                                                                                                                                                                                                                                                                                                                  | 13                  | 0                                    | 1                  | $\geq 2$           | 13                 | 1                             | $\geq 2$           |
| NOTE The sampling plans and acceptance criteria correspond to an AQL of 2.5 % in accordance with BS 6001. Ensure that at least one bottle from each mould in use is included. If the samples selected for the thermal shock resistance test contain any bottles with visible defects or damage, they should be removed and replaced by sound bottles from the same mould. |                     |                                      |                    |                    |                    |                               |                    |

## 12 Test methods

### 12.1 Light transmission (for bottles made of amber glass)

#### 12.1.1 Apparatus

12.1.1.1 A means of producing a beam of light with a wavelength band centred on 550 nm.

NOTE A band width between 530 nm and 570 nm, as obtained by means of an optical filter, is acceptable.

12.1.1.2 Equipment capable of passing the beam of light through a glass specimen and measuring the transmitted light intensity ( $I$ ) in relation to the incident intensity ( $I_0$ ). The equipment may be calibrated in % transmission ( $= (I/I_0) \times 100$ ) or in optical density [ $= \log_{10}(I_0/I)$ ].

12.1.2 *Specimen preparation.* Use either an unpolished piece of glass cut from the wall of a bottle or grind and polish a glass specimen to give a glass plate of approximately 2 mm thickness. In either case, if the specimen is not exactly 2 mm thick, it will be necessary to measure the average thickness and correct the result as given in .

12.1.3 *Procedure.* Make the measurement of the light transmission of a parallel-sided specimen in either liquid or air, correcting for reflectance if measured in air. For glass cut from the wall, make the measurement with the specimen immersed in a parallel-sided glass cell filled with a liquid which has the same refractive index as glass e.g. monochlorobenzene; it will be necessary to measure the transmission in comparison with a control cell containing only the liquid medium.

For equipment measuring directly in % transmission, calculate the specimen % transmission ( $T$ ) from the following.

$$\left( \frac{\% \text{ transmission of the specimen cell}}{\% \text{ transmission of the control cell}} \right) \times 100$$

c) For equipment measuring optical density, calculate the specimen % transmission ( $T$ ) from the following.

$$(\text{optical density of the specimen cell}) - (\text{optical density of the control cell})$$

Then convert the optical density to % transmission using the following formula.

$$\log_{10} T = \log_{10} 100 - \log_{10} \left( \frac{I_0}{I} \right)$$

where

$I_0$  is the incident intensity

$I$  is the transmitted light intensity

*Correction of result.* Correct the transmission obtained to that of a specimen of 2 mm thickness using the equation below.

For measurement in air: For measurement in liquid:

$$\log_{10}\left(\frac{T}{92}\right) = \frac{t}{2} \log_{10}\left(\frac{T_o}{92}\right) \quad \log_{10}\left(\frac{T}{100}\right) = \frac{t}{2} \log_{10}\left(\frac{T_o}{92}\right)$$

where

$T_o$  is the percentage transmission of a specimen of 2 mm thickness

$t$  is the thickness of the specimen (in mm)

$T$  is the specimen percentage transmission

NOTE The difference is accounted for by 4 % loss of transmission due to reflectance from each surface of the specimen when measured in air.

**12.2 Capacity test.** The following test methods are essentially identical with the two official methods for determining compliance with UK Statutory Instrument No. 932 (see foreword):

a) the standard deviation method;

b) the mean range method.

Either method may be used to determine compliance with 7.1.

The gravimetric test method for determining the capacity at filling level shall be as follows for either method.

Sampling shall be in accordance with 11.2.

Weigh each bottle empty. Fill each bottle to the filling level with water and weigh again. Determine the mass of water by subtraction and express the capacity in millilitres, corrected to 20 °C, using the temperature conversion given in Appendix A.

In the standard deviation method the mean capacity ( $\bar{x}$ ) and estimated standard deviation ( $s$ ) are calculated from 35 bottles which are representative of one hour's production. The following inequalities shall be satisfied:

$$\bar{x} + 1.57s \leq T_s$$

$$\bar{x} - 1.57s \geq T_i$$

$$s \leq 0.266(T_s - T_i)$$

where

$T_s$  is the upper tolerance limit

$T_i$  is the lower tolerance limit

as specified in 7.1 for each of the bottles.

In the mean range method the capacities of the 8 subgroups from an hour's production are determined and the mean range ( $\bar{R}$ ) of the ranges of the 8 samples is calculated. The mean capacity of the 40 bottles is  $\bar{x}$ . The following inequalities shall be satisfied:

$$\bar{x} + 0.688\bar{R} \leq T_s$$

$$\bar{x} - 0.668\bar{R} \geq T_i$$

$$\bar{R} \leq 0.628(T_s - T_i)$$

**12.3 Verticality test.** Measure the verticality using apparatus incorporating a V-block and dial gauge. Care shall be taken while turning the bottle in the V-block to compensate for any pressure exerted by the dial gauge. Such pressure exerted to overcome the dial gauge pressure shall be directed downward towards the V-block. The verticality is expressed as half the difference between the maximum and minimum readings of the dial gauge obtained during rotation of the bottle through 360°.

NOTE The measurement obtained includes slight dimensional deviations that may occur in other parts of the bottle such as ring finish ovality, tilted finish, and rocky bottoms. No correction is made.