# Certificate of measurement

4005

## Brandy – 40 % ABV (Alcohol by Volume)

Certified Reference Material LGC5000

### Certified Values

| Parameter | Number of Determinations | Certified value at 20 °C | Uncertainty[4] |
|---|---|---|---|
| Apparent Density in air of the obscured spirit ($kg/m^3$)[1] | 10 | 950.376 | 0.056 |
| Apparent Alcoholic Strength (% Alcohol by Volume, ABV) [2,3] | 10 | 37.834 | +0.034/ -0.035 |
| Actual Alcoholic Strength (% Alcohol by Volume, ABV)[2,3] | 9 | 40.075 | +0.070/ -0.067 |



Notes:

1) The apparent density in air was determined by pycnometry, with all weighings, temperature, volume and other influence quantities traceable to the SI.

2) The certified value is for alcohol by volume at 20 °C, not ethanol.

3) The values of alcoholic strength were interpolated from the UK Official Laboratory Alcohol Table (H M Customs & Excise reference RDC80/267/04) using the values of density in air at 20 °C obtained by pycnometry. All weighings, temperature, volume and other influence quantities are traceable to the SI.

4) The uncertainty quoted is the half-width of the expanded uncertainty interval calculated using a coverage factor of two, which gives a level of confidence of approximately 95 %. The non-symmetrical uncertainties quoted for both apparent and actual alcoholic strength are the result of the non-linearity of the UK Official Laboratory Alcohol Table.

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Signed:_____
Gill Holcombe (Mrs)
for the Government Chemist



Queens Road, Teddington, Middlesex, TW11 0LY, UK
Tel: +44 (0)20 8943 7000 • Fax: +44 (0)20 8943 2767 • www.lgcgroup.com

## Material Preparation

Approximately 50 litres of commercial brandy was obtained, mixed in a 50 L capacity container and dispensed in 50 mL portions into amber glass vials fitted with 20 mm fluro-tec stoppers and crimp caps.

The material was tested for homogeneity by density meter measurements on 2 mL portions from units selected from across the fill run. The level of homogeneity proved to be satisfactory for a 2 mL portion of brandy.

For distillation purposes 50 mL should be used. For density measurements the minimum recommended sample size is 2 mL.

## Analytical Method Used for Certification

The material has been certified at LGC. The apparent alcoholic strength was determined from the density of the sample by reference to the laboratory alcohol tables issued by HM Customs and Excise [1]. The actual alcoholic strength was determined in a similar way by determining the density of the distillate obtained from 50 mL of material diluted to 100 mL [2] by the addition of water.

Distillation was carried out in accordance with The Spirits Regulations 1991 [2]. Pycnometry was used to determine the apparent density in air at 20 °C, with all weighings traceable to national standards.

The apparent density in air at 20 °C was measured by pycnometry at 20 °C using a density bottle (BS733), calibrated using pure water as a reference material. The value for the apparent density in air of pure water adopted for the purposes of the calibration is 997.15 kg/m$^3$ at 20 °C (not the more widely quoted value of 998.20 kg/m$^3$ for the buoyancy corrected, true density of pure water at 20 °C). The adopted value (997.15 kg/m$^3$) is defined in the Official Laboratory Alcohol Table [1].

The apparent density in air was measured on ten separate units selected at random from across the fill run.

The alcoholic strength of the reference material was determined according to the provisions of The Spirits Regulations 1991 [2]. The alcoholic strength was taken to be the percentage of alcohol by volume corresponding to the apparent density in air from the Official Laboratory Alcohol Table[1].

The Official Laboratory Alcohol Table[1] is based on data calculated using the general formula relating density, temperature and alcoholic strength by mass, contained in Recommendation No 22 of the International Organisation of Legal Metrology (OIML)[3].

## Safety Information

Refer to safety data sheet.

## Instructions for Use

Prior to use the solution should be allowed to equilibrate to ambient temperature (20 ± 5) °C and thoroughly mixed by inversion. De-crimp the bottle immediately prior to use and discard any excess material once the measurement has been made. Open bottles must not be stored for re-use.

This material will be monitored under LGC's 'reference material stability testing' programme and customers will be informed of any changes in the certified values.

## Intended Use

This material is intended to be used for calibration of density meters and the validation of methods for the determination of alcoholic strength in obscured spirits by the UK statutory method of distillation and density measurement.

## Storage Conditions

The material should be stored at (5 ± 4) °C

## Shelf Life

This certificate is valid for 12 months from the date of shipment provided the sample is stored with the cap intact under the recommended conditions.

## Metrological Traceability

The apparent density determined by pycnometry has all weighings, temperature, volume and other influence quantities traceable to the SI.

For apparent and actual alcoholic strength, the values of alcoholic strength were interpolated from the Official Laboratory Alcohol Table[1] using the values of density in air at 20 °C obtained by pycnometry. All weighings, temperature, volume and other influence quantities are traceable to the SI.

## Accreditation

The production of this material is within LGC's accreditation to ISO 17034.

## References

[1] Official Laboratory Alcohol Table, H. M. Customs and Excise reference RDC80/267/04, 1979.

[2] The Spirits Regulations 1991, H M Customs and Excise, 1991 No. 2564.

[3] Alcoométrie, Recommandation Internationale No 22, Bureau International de Métrologie Légale, Paris 1973.

## Certificate Revision

The certificate was revised in June 2022 to reflect an update to the UKAS symbol.

| Unit Number | Date of Shipment |
| --- | --- |
| | |

## Legal Notice

The values quoted in this certificate are the best estimate of the true values within the stated uncertainties and based on the techniques described herein. No warranty or representation, express or implied, is made that the use of the product or any information, material, apparatus, method or process which is the subject of or referred to in this certificate does not infringe any third party rights. Further, save to the extent: (a) prohibited by law; or (b) caused by a party's negligence; no party shall be liable for the use made of the product, any information, material, apparatus, method or process which is the subject of or referred to in this document. In no event shall the liability of any party exceed whichever is the lower of: (i) the value of the product; or (ii) £500,000; and any liability for loss of profit, loss of business or revenue, loss of anticipated savings, depletion of goodwill, any third-party claims or any indirect or consequential loss or damage in connection herewith is expressly excluded.

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