Certificate of measurement

UKAS REFERENCE MATERIALS
4005

Whisky – Congeners

Certified Reference Material LGC5100

Certified Values

Constituent	Number of laboratories	Certified value [1,2] (g/100 L of alcohol)	Uncertainty [3] (g/100 L of alcohol)	Coverage factor, *k*
Methanol	12	5.20	0.32	2.01
Propanol	13	57.0	2.4	2.10
2-Methyl propanol	12	58.8	3.1	2.13
2-Methyl butanol	11	21.38	0.70	2.08
3-Methyl butanol	11	58.2	2.1	2.09
Butanol	7	0.48	0.11	2.06

Notes:

1. The measurands were characterised using the results of an inter-laboratory comparison using different methods. Each data set was obtained in a different laboratory and/or using a different method of measurement.
2. The results are traceable to the SI through the physical and chemical standards used by the inter-laboratory study participant laboratories. The certified values are reported to the same number of decimal places as the uncertainties (reported to 2 significant figures).
3. The quoted uncertainty is the half-width of the expanded uncertainty interval calculated using a coverage factor (*k*), which gives a level of confidence of 95 %.

Date of issue: November 2011

G Holcombe

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

Material number: LGC5100
Batch number: 002

LGC Setting standards in analytical science

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The following figures have not been certified but are provided for information purposes and should be regarded as indicative values only.

Indicative Values

Constituent	Number of laboratories	Indicative value
Ethyl acetate[1]	12	23 g/100 L of alcohol
Furfural	4	0.82 g/100 L of alcohol
Apparent alcohol content[2]	13	40.06 % ABV

Notes:

1. The level of ethyl acetate was determined at the same time as the other analytes in February 2011. However, the concentration measured in the previous batch decreased by as much as 25 % over 10 years, so analysts can expect to measure a lower concentration than the indicative value quoted above.
2. The alcohol content of the sample is the median of medians of the alcohol content determined by the participant laboratories.

Material Preparation

Approximately 20 litres of whisky was obtained from a commercial source. The whisky was mixed by shaking and sub-divided into nominally 10 mL aliquots in amber glass vials with flurotec stoppers and crimp caps.

Homogeneity

The material was tested for homogeneity at LGC by analysing randomly selected samples; congener determinations were carried out by gas chromatography (GC) and apparent alcohol content was measured using a PAAR density meter. A contribution was calculated to allow for possible inhomogeneity and added to the combined uncertainty.

Characterisation

The material was characterised by means of an inter-laboratory exercise in which each participating laboratory was asked to carry out 5 replicate measurements on the material supplied using suitable methods with which they were familiar. The material was characterised using gas chromatography with flame ionisation detection, and one laboratory used high performance liquid chromatography for one analyte.

The data from the inter-laboratory study were processed using a robust statistical approach, after screening laboratories based on their performance in analysing a separate QC sample. The certified value for each analyte was assigned as the robust estimate of location of the accepted laboratory data. Uncertainties were based on the robust estimate of dispersion, (taking into account the number of laboratories and corrected for the efficiency of the estimator), and combined with the uncertainties related to homogeneity and stability.

Stability

Previous experience suggests that the certified measurands in this material are stable over the anticipated lifetime, however LGC5100 Batch 002 will be subjected to routine stability testing under LGC's 'reference material stability testing' program. Purchasers will be informed of any changes that affect the certified values.

Intended Use

This material is intended for use in the development, validation or quality control of analytical methods for the determination of congeners in spirit samples.
Information on how to compare an analytical result with the certified value can be found in ERM Application Note 1; www.erm-crm.org

Instructions for Use

Before use the material should be thoroughly mixed by inversion, and allowed to equilibrate to a temperature of (20 ± 5) °C. Use immediately on opening. Open vials must not be stored for re-use. Homogeneity was assessed using a sample of 2.5 mL, but since the material is a liquid thorough mixing should ensure homogeneity at lower sample sizes.

Storage Conditions and Shelf Life

The certified reference material should be stored in the original container at ambient temperature (20 ± 5) °C. If stored under the appropriate conditions, the certified values of the material will remain valid for 12 months from the date of shipment.

Participants in the Inter-laboratory Exercise

The following laboratories took part in the inter-laboratory study for this material.

AMEC	Canada
Angostura	Trinidad
Birmingham City Laboratories	UK
Canada Border Services Agency	Canada
Chivas Brothers	UK
City of Edinburgh Council	UK
Diageo	UK
Edrington Group	UK
E&J Gallo Winery	USA
Ginebra San Miguel	Philippines
Kent Scientific Services	UK
North British Distillery	UK
Pernod Ricard	France
Scotch Whisky Research Institute	UK
West Yorkshire Analytical Services	UK
Whyte & MacKay	UK

Unit Number	Date of Shipment
69.12	28 July 2014

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 certificate. 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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