

# CERTIFICATE OF CALIBRATION

ISSUED BY H & D FITZGERALD LTD.

DATE OF ISSUE **5 May 2011**

CERTIFICATE NUMBER **10123**



0291



Cefn Du, Tremeirchion,  
St. Asaph, LL17 0US, UK

☎ +44 (0)1352 720 774

☎ +44 (0)1352 720 249

✉ calibration@density.co.uk

www.density.co.uk

Page 1 of 1 pages

Approved signatory **H. Fitzgerald**

*[Signature]* **I. Edge**

Description	<b>Dodecane</b>	Batch	<b>10123</b>
Supplier	<b>Sigma - Aldrich</b>	Grade	<b>99+% purity</b>
Expiry date	<b>30 September 2015</b>		

The density of this liquid was determined by hydrostatic weighing, using instruments and weights, the calibrations of which are traceable to national standards. The liquid in the ampoule formed part of the bulk liquid tested in the hydrostatic weighing cell.

A total of **25** density measurements were made at ambient pressure, and the following densities then calculated:-

<b>10.0°C</b> and 1.013 bar	<b>756.141</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>15.0°C</b> and 1.013 bar	<b>752.519</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>20.0°C</b> and 1.013 bar	<b>748.895</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>25.0°C</b> and 1.013 bar	<b>745.269</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>30.0°C</b> and 1.013 bar	<b>741.638</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>40.0°C</b> and 1.013 bar	<b>734.359</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>
<b>50.0°C</b> and 1.013 bar	<b>727.049</b> kg/m <sup>3</sup> ± 0.01 kg/m <sup>3</sup>

The density of this liquid can be found to ± **0.01** kg/m<sup>3</sup> over the temperature range of **10** to **50°C** using the following equation:-

$$\text{density} = \alpha + \beta t + \gamma t^2 + \delta t^3$$

where

$$\alpha = \mathbf{763.3840}$$

$$\beta = \mathbf{-0.724577}$$

$$\gamma = \mathbf{+0.0000398}$$

$$\delta = \mathbf{-0.00000165}$$

$$t \quad \mathbf{\text{temperature in } ^\circ\text{C ITS-90}}$$

This standard is for the calibration of density measuring equipment.  
See guidance notes on the use of density CRMs, and the relevant MSDS.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of about 95%. The evaluation of the uncertainty has been carried out in accordance with UKAS requirements.

This certificate has been drawn up according to the guidelines given in ILAC-G12:2000.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.