Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-RM-19716-01-00 according to ISO Guide 34:2009


Holder of certificate:
Sigma-Aldrich Laborchemikalien GmbH
Technical Service HYDRANAL
Wunstorfer Straße 40, 30926 Seelze

Production of reference materials in the fields:
certified reference materials in the form of liquid and solid water standards for the Karl-Fischer-Titration

Abbreviations used: see last page

<table>
<thead>
<tr>
<th>Product</th>
<th>Measured quantity</th>
<th>Measuring range</th>
<th>Relative uncertainty 1)</th>
<th>Standard methods for the determination of the reference values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquid water standards</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>matrix: organic solvents or mixtures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mass fraction water</td>
<td></td>
<td>0,08 - 0,5 mg/g</td>
<td>1 %</td>
<td>coulometric Karl Fischer Titration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0,5 - 5,0 mg/g</td>
<td>0,1 %</td>
<td>coulometric Karl Fischer Titration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8,0  - 12,0 mg/g</td>
<td>0,4 %</td>
<td>volumetric Karl Fischer Titration</td>
</tr>
<tr>
<td><strong>Solid water standards</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>matrix: organic pure substances or mixtures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mass fraction water</td>
<td></td>
<td>10 - 200 mg/g</td>
<td>0,4 %</td>
<td>volumetric Karl Fischer Titration</td>
</tr>
</tbody>
</table>

1) Expanded combined uncertainties are given with a confidence interval of 95 % and the coverage factor $k = 2$. 

This document is a translation. The definitive version is the original German annex to the accreditation certificate.
The determination of the reference values based on the following test methods:

1  **Determination of the water content in organic and inorganic liquids, solids and Reagents by Karl-Fischer-Titration**

ISO 760  
1978-12  
Determination of water; Karl Fischer method (General method)

ASTM E 203  
2008  
Standard Test Method for Water Using Volumetric Karl Fischer Titration

DIN 51777-1  
1983-03  
Testing of mineral oil hydrocarbons and solvents; determination of water content according to Karl Fischer; direct method

DIN 51777-2  
1974-09  
Testing of Mineral Oil Hydrocarbons and Solvents; Determination of Water Content according to Karl Fischer; Indirect Method

Ph. Eur. chapter 2.5.32  
Semi-micro determination of water – volumetric titration

Ph. Eur. chapter 2.5.12  
micro determination of water – coulometric titration

Test method 01  
Technical Service HYDRANAL  
27.05.2014  
Determination of water content in liquids and solids using volumetric Karl-Fischer-Titration

Test method 02  
Technical Service HYDRANAL  
09.04.2014  
Determination of water content in liquids and solids using coulometric Karl-Fischer-Titration

Test method 03  
Technical Service HYDRANAL  
09.04.2014  
Determination of water content in liquids and solids using indirect Karl-Fischer-oven method

2  **Determination of physical characteristics using gravimetric methods**

Ph. Eur. chapter 2.2.32  
Loss on drying

Test method 04  
Technical Service HYDRANAL  
28.08.2009  
Determination of water content in organic and inorganic solids by Loss on drying
Abbreviations used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM</td>
<td>Standard Methods, American Society for Testing and materials</td>
</tr>
<tr>
<td>DIN EN</td>
<td>German takeover of European Standard</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsche Institut für Normung e. V.</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>KF</td>
<td>Karl Fischer</td>
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<tr>
<td>Ph. Eur.</td>
<td>European Pharmacopoeia</td>
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