

## Deutsche Akkreditierungsstelle GmbH

### Annex to the accreditation certificate D-PL-17999-01-00 in accordance with DIN EN ISO/IEC 17025:2005

Period of validity: 30.07.2014 to 29.07.2019

Issue date: 30.07.2014

Certificate holder :

**Institut für Kalk- und Mörtelforschung e.V.**

**Annastraße 67-71, 50968 Köln**

Tests in the areas of:

**Chemical-tests of lime and feed lime, limestone, aggregates, mortar with atomic spectrometry, titration, electro-chemical test method, gravimetry and photometry; selected tests to determinate sum parameter and physical characteristics;**

**Applications- /materials engineering – tests of lime, aggregates and mortar, and rheological tests, density- and surface area analysis, testing of grain size distribution and of grain shape, testing of permeation and diffusion of mortar and thermal insulation composite systems (WVDS), tensile- and pressure strength tests, tests of physical characteristics, tests of petrography and thermal properties, optical testing**

Abbreviations used: see last page

The laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standard test methods listed here with different issue dates or revision status updates

## 1 Chemical testing

### 1.1 Testing of lime and feed lime, limestone and aggregates using atomic spectroscopy

<p>DIN EN 12485 2010-08</p>	<p>Chemicals used for treatment of water intended for human consumption - Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate - Test methods, here:  <i>5.1 - Fusion with lithium tetraborate</i>  <i>5.2 - Extraction with hydrochloric acid</i>  <i>5.3 - Microwave digestion with nitric acid</i>  <i>7.2 Determination of major and minor constituents by ICP-OES)</i>  <i>8.1 - Determination of lead, cadmium, chromium and nickel by AAS graphite tube technique</i>  <i>8.3 - Determination of mercury, arsenic, antimony and selenium by AAS hydride technique</i>  <i>8.4 - Determination of mercury by cold-vapour technique)</i></p>
<p>BVK test method anthology, Part 3 2002-08</p>	<p>Lime, chemical analyses - atomic absorption spectrometric and atomic emission spectrometric methods, here:  <i>7.1 - Fusion with lithium tetraborate</i>  <i>7.2 - Microwave digestion for the determination of trace elements</i>  <i>7.3 - Pressure digestion for the determination of trace elements</i>  <i>8.1 - Determination of minor constituents by AAS flame technique</i>  <i>8.2 Determination of minor constituents by ICP-OES</i>  <i>9.1 - Determination of trace elements by AAS graphite furnace technique</i>  <i>9.2 - Determination of trace elements by ICP-OES</i>  <i>9.3 - Determination of arsenic, antimony and selenium by AAS hydride technique</i>  <i>9.4 - Determination of mercury by AAS cold-vapour technique</i></p>
<p>VDLUFA, Method book Volume II.1 1995</p>	<p>Testing of fertiliser, here:            9.7.2 – Thallium using Graphitrohr-AAS, amend 2004</p>
<p>DIN EN ISO 15587-1 2002-07</p>	<p>Water quality - Digestion for the determination of selected elements in water - Part 1: Aqua regia digestion</p>
<p>DIN EN 459-2 2010-12</p>	<p>Building lime - Part 2 Test methods, here;            5.1 - Extraction with hydrochloric acid</p>

## 1.2 Testing of lime, limestone, aggregates and mortar using titration

<p>DIN EN 12485 2010-08</p>	<p>Chemicals used for treatment of water intended for human consumption - Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate - Test methods, here:</p> <p>6.5 - Determination of content of water-soluble calcium oxide and calcium hydroxide (reference method)</p> <p>6.6 - Determination of sugar-soluble calcium oxide or calcium hydroxide (alternative method)</p> <p>6.8 - Determination of free CaO</p> <p>6.9 - Determination of calcium oxide and magnesium oxide</p>
<p>BVK test method anthology, Part 1 2002-08</p>	<p>Chemical, mortar technology and physical tests -</p> <p>C 01 - Rapid determination of calcium oxide content (total alkalinity)</p> <p>C 03 - Method for the determination of unbound lime content and for the determination of the water-soluble content of high-calcium limes with titration machines</p>
<p>BVK test method anthology, Part 2 2002-08</p>	<p>Lime, chemical analyses - titrimetric, gravimetric and gas volumetric methods, here:</p> <p>8.1 - Calcium oxide, magnesium oxide</p>
<p>DIN EN 459-2 2010-12</p>	<p>Building lime - Part 2 Test methods, here;</p> <p>5.2 Determination of calcium oxide (CaO) and magnesium oxide (MgO)</p> <p>5.8 Available lime</p>
<p>VDLUFA, Method book Volume I 1995</p>	<p>Testing of fertiliser, here:</p> <p>6.4 - Determination of reactivity of calcium carbonates</p>
<p>DIN EN 1015-17 2005-01</p>	<p>Methods of test for mortar for masonry - Part 17: Determination of water-soluble chloride content of fresh mortar</p>
<p>DIN EN 1744-1 2013-03</p>	<p>Tests for chemical properties of aggregates - Part 1: Chemical analysis, here;</p> <p>7 - Determination of water-soluble chloride using the Volhard method</p>
<p>QMAA-C2-03-042 2008-07</p>	<p>Determination of sulphite using titration</p>

### 1.3 Testing of lime, limestone, aggregates and mortar with electrochemical method

<p>BVK test method anthology, Part 1 2002-08</p>	<p>Chemical, mortar technology and physical tests - C 05 - Determination of reactivity of powdered limestone compared to acidic media C 06 - Determination of the dissolving rate of lime milk and hydrated lime using conductivity measurement</p>
<p>DIN EN 1744-1 2013-03</p>	<p>Tests for chemical properties of aggregates - Part 1: Chemical analysis, here; 8 - Determination of water-soluble chloride by potentiometry</p>
<p>DIN EN 12485 2010-08</p>	<p>Chemicals used for treatment of water intended for human consumption - Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate - Test methods, here: 6.11 - Determination of solubility index by conductivity</p>
<p>QMAA-C2-03-217 2012-09</p>	<p>Determination of carbon dioxide in limes (ELTRA CS 2000)</p>
<p>QMAA-C2-03-218 2008-08</p>	<p>Determination of sulphat in limes using IR-detection (ELTRAS CS 2000)</p>
<p>QMAA-C2-03-036 2012-08</p>	<p>Determination of fluoride in solids using steam distillation</p>

### 1.4 Testing of lime, limestone and aggregate using gravimetry

<p>DIN EN 459-2 2010-12</p>	<p>Building lime - Part 2 Test methods, here; 5.5 - Gravimetric determination of carbon dioxide 5.3 - Determination of sulphate (expressed as SO<sub>3</sub>) 5.4 - Free water 5.7 - Loss on ignition</p>
<p>DIN EN 1097-5 2008-06 Corrigendum 1 2008-09</p>	<p>Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven</p>

**Annex to the accreditation certificate D-PL-17999-01-00**

<p>DIN EN 12485 2010-08</p>	<p>Chemicals used for treatment of water intended for human consumption - Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate - Test methods, here:</p> <p>6.1 - Determination of free water 6.2 - Loss on ignition at 450 °C 6.3 - Determination of carbon dioxide 6.4 - Determination of residue insoluble in hydrochloric acid</p>
<p>BVK test method anthology, Part 2 2002-08</p>	<p>Lime, chemical analyses - titrimetric, gravimetric and gas volumetric methods, here:</p> <p>9.1 - Loss on ignition 9.2 - Free water 9.5 - Determination of HCl-insoluble and soluble silicic acid 9.6 - Determination of sulphur as <math>\text{SO}_3</math> (<math>\text{SO}_4^{2-}</math>, <math>\text{S}^{2-}</math>)</p>
<p>DIN EN 1744-1 2013-03</p>	<p>Tests for chemical properties of aggregates - Part 1: Chemical analysis, here;</p> <p>10 - Determination of water-soluble sulphates 11 - Determination of total sulphur content 12 - Determination of acid-soluble sulphates 16 - Determination of water solubility 17 - Determination of loss on ignition</p>
<p><b>1.5 Determination of physical characteristics for testing of lime, limestone and aggregates</b></p>	
<p>DIN EN 459-2 2010-12</p>	<p>Building lime - Part 2 Test methods, here;</p> <p>5.6 - Volumetric determination of carbon dioxide 6.4 - Soundness 6.4.2 - For hydrated lime and all types of lime with hydraulic properties 6.4.2.1 - Reference method (tablet method) 6.4.2.2 - Alternative method (LeChatelier method) 6.4.2.3 - For hydraulic limes with a <math>\text{SO}_3</math> content larger than 3 % and up to 7 % (testing based on the cold water test) 6.4.3 - For hydrated lime, high-calcium lime putty and dolomitic hydrated lime with particles larger than 0.2mm 6.4.4 - For unslaked lime, lime putty, dolomite lime and dolomitic hydrated lime (in heating cabinet) 6.6 - reactivity</p>
<p>DIN 53163 1988-07</p>	<p>Testing of pigments and extenders; determination of lightness of extenders and white pigments in powder form</p>

**Annex to the accreditation certificate D-PL-17999-01-00**

DIN EN 1744-4 2005-10	Tests for chemical properties of aggregates - Part 4: Determination of water susceptibility of fillers for bituminous mixtures
DIN EN 12176 1998-06	Characterization of sludge - Determination of pH-value
DIN EN 13639 2002-07 Corrigendum 1 2006-09	Determination of total organic carbon in limestone
BVK test method anthology, Part 2 2002-08	Lime, chemical analyses - titrimetric, gravimetric and gas volumetric methods, here: 9.4 Carbon dioxide (CO <sub>2</sub> )
QMAA-C2-03-219 2014-01	Determination of total organic carbon (TOC) using IR-detection

**1.6 Determination of sum parameters of aggregates**

DIN EN 1744-1 2013-03	Tests for chemical properties of aggregates - Part 1: Chemical analysis, here; 14 - Determination of components affecting the surface finish of concrete 14.1 - Examination for the presence of reactive iron sulphide particles 14.2 - Determination of lightweight contaminants 15 - Determination of organic components affecting the setting and the hardening of cement
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**1.7 Testing of lime, limestone, aggregates and mortar using photometry**

QMAA-C2-03-017a 2012-11	Determination of water-soluble chromium (VI) in lime products
QMAA-C2-03-017b 2012-11	Determination of water-soluble chromium (VI) in ready-mixed dry mortar
DIN EN 196-10 2006-10	Methods of testing cement - Part 10: Determination of the water-soluble chromium (VI) content of cement

## 2 Applications- /materials engineering

### 2.1 Rheological testing of lime, aggregates and mortar

DIN EN 459-2 2010-12	Building lime - Part 2 Test methods, here; 6.7 Yield 6.5 Setting times 6.8 Standard mortar by mass and water demand for values of flow and penetration
DIN EN 1015-3 2007-05	Methods of test for mortar for masonry - Part 3: Determination of consistence of fresh mortar (by flow table)
DIN EN 1015-4 1998-12	Methods of test for mortar for masonry - Part 4: Determination of consistence of fresh mortar (by plunger penetration)
DIN EN 1015-9 2007-05	Methods of test for mortar for masonry - Part 9: Determination of workable life and correction time of fresh mortar
DIN EN 1348 2007-11	Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesive
DIN EN 933-6 2002-02 Corrigendum 1 2004-09	Test for geometrical properties of aggregates - Determination of surface characteristics - Part 6: Flow coefficient of aggregates
DIN EN 13179-1 2000-11	Tests for filler aggregate used in bituminous mixtures - Part 1: Delta ring and ball test
DIN EN 13179-2 2000-11	Tests for filler aggregate used in bituminous mixtures - Part 2: Bitumen number
DIN EN 13279-2 2004-10	Gypsum binders and gypsum plasters - Part 2: Test methods: 4.4 – determination of begin to harden
DIN EN 1346 2007-11	Adhesives for tiles - Determination of open time
DAfStb Guidelines Part 2 (SCC guidelines) 2003-11	DAfStb - Self-compacting concrete; SCC guidelines, here: P.1 - Determination of the $\beta_p$ value according to Okamura P.2 - Determination of the water demand according to Puntke

## 2.2 Testing of the density- and surface analyses of lime, aggregates and mortar

DIN ISO 9277 2003-05	Determination of the specific surface area of solids by gas adsorption using the BET method
DIN EN 459-2 2010-12	Building lime - Part 2 Test methods, here; 6.3 - Bulk density
DIN EN 196-6 2010-05	Methods of testing cement - Part 6: Determination of fineness
DIN EN 1015-6 2005-07	Methods of test for mortar for masonry - Part 6: Determination of bulk density of fresh mortar
DIN EN 1015-7 1998-12	Methods of test for mortar for masonry - Part 7: Determination of air content of fresh mortar
DIN EN 1015-10 2007-05	Methods of test for mortar for masonry - Part 10: Determination of dry bulk density of hardened mortar
WTA Merkblatt 2-9-04/D 2005-12	Renovation mortar systems (here: 6.3.9 Porosity)
DIN EN 1097-4 2008-06	Tests for mechanical and physical properties of aggregates - Part 4: Determination of the voids of dry compacted filler
DIN EN 1097-6 2005-12 Corrigendum 2008-08	Tests for mechanical and physical properties of aggregates - Part 6: Determination of bulk density and water absorption
DIN EN 1097-7 2008-06 Corrigendum 2008-09	Tests for mechanical and physical properties of aggregates - Part 7: Determination of the density of filler - Pycnometer method
DIN 18124 2011-04	Soil, investigation and testing - Determination of density of solid particles - Capillary pycnometer, wide mouth pycnometer, gas pycnometer
DIN EN 13163 2013-03	Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products, (here: 4.3.14 Bulk density)



### 2.3 Testing of particle size distribution and particle shape of lime, aggregate and mortar

DIN EN 459-2 2010-12	Building lime - Part 2 Test methods, here; 6.1 - Particle size by dry sieving 6.2 - Particle size by air-jet sieving
DIN EN 12485 2010-08	Chemicals used for treatment of water intended for human consumption - Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate - Test methods, here: 4 - Determination of screen oversize of high-calcium lime 4.1 - Air-jet sieving method 4.2 - Wet sieving method
DIN EN 933-1 2012-03	Determination of particle size distribution - Sieving method
DIN EN 933-3 2012-04	Tests for geometrical properties of aggregates - Part 3: Determination of particle shape - Flakiness index
DIN EN 933-4 2008-06 Corrigendum 2008-09	Tests for geometrical properties of aggregates - Part 4: Determination of particle shape - Shape index
DIN EN 933-5 2005-02	Tests for geometrical properties of aggregates - Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles
DIN EN 933-9 2013-07	Tests for geometrical properties of aggregates - Part 9: Assessment of fines - Methylene blue test
DIN EN 933-10 2009-10	Tests for geometrical properties of aggregates - Part 10: Assessment of fines - Grading of filler aggregates (air jet sieving)
ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: C.1.2 - Dry extract C.1.3 - Ash content
DIN EN 1015-1 2007-05	Methods of test for mortar for masonry - Part 1: Determination of particle size distribution (by sieve analysis)

**Annex to the accreditation certificate D-PL-17999-01-00**

QMAA-C2-02-003 2009-04	Operation of Sympatec device He/Ne laser diffraction
QMAA-C2-03-064 2009-04	Particle size analyses of powdered limestone and determination of grading number (KVZ)
QMAA-C2-03-237 2011-02	Sedimentation analyses for the determination of SWeRF and SWeRFCS content in stone meal, fine lime and hydrated lime
QMAA-C2-03-238 2011-02	Laser diffraction for the determination of SWeRF value

**2.4 Testing of the permeation and diffusion of mortar and thermal insulation composite systems (WVDS)1**

DIN EN 1015-18 2003-03	Methods of test for mortar for masonry - Part 18: Determination of water absorption coefficient due to capillary action of hardened mortar
DIN EN 1015-19 2005-01	Methods of test for mortar for masonry - Part 19: Determination of water vapour permeability of hardened rendering and plastering mortars
ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: 5.1.3.1 - Water absorption (capillarity test) 5.1.3.4 - Water vapour permeability (resistance to water vapour diffusion)
WTA Merkblatt 2-9-04/D 2005-12	Renovation mortar systems, here: 6.3.7 - Water penetration
DIN EN ISO 12572 2001-09	Hygrothermal performance of building materials and products: Determination of water vapour transmission properties
DIN EN ISO 15148 2003-03	Hygrothermal performance of building materials and products: Determination of water absorption coefficient by partial immersion
DIN EN 12003 2009-01	Adhesive for tiles - Determination of shear adhesion strength of reaction resin adhesives

## 2.5 Tensile- and pressure strength tests of aggregates, mortar and thermal insulation composite systems (WDVS)

ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: 5.1.4.1.1 - Bond strength between base coat and insulation product 5.1.4.1.2 - Bond strength test between adhesive and substrate 5.1.4.1.3 - Bond strength test between adhesive and insulation product 5.1.3.3 - Impact resistance 5.1.7.1 - Bond strength after ageing 5.5.4.1 - Render Strip Tensile Test 5.6.7.1 - Glass fibre mesh – Tearing strength and elongation of the reinforcing fabric
DIN EN 1015-11 2007-05	Methods of test for mortar for masonry - Part 11: Determination of flexural and compressive strength of hardened mortar
DIN EN 1015-12 2006-06	Methods of test for mortar for masonry - Part 12: Determination of adhesive strength of hardened rendering and plastering mortars
DIN EN 1324 2007-11	Adhesives for tiles - Determination of shear adhesion strength of dispersion adhesives
DIN EN 13286-47 2012-07	Unbound and hydraulically bound mixtures - Part 47: Test method for the determination of California bearing ratio, immediate bearing index and linear swelling
DIN 18555-5 1986-03	Testing of mortars containing mineral binders; hardened mortars; determination of bond shear strength of masonry mortars
DIN 18555-9 1999-09	Testing of mortars containing mineral binders - Part 9: Hardened mortars; determination of the mortar compressive strength in the bed joint

## 2.6 Testing of physical characteristics of lime, aggregates, mortar and thermal insulation composite systems (WVDS)

ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: C.4.1.1 - Dynamic modulus of elastic (Resonance frequency method)
QMAA-C2-03-133 2009-02	Dynamic modulus of elastic with Grindo-Sonic method (ibac method)

**Annex to the accreditation certificate D-PL-17999-01-00**

WTA Merkblatt 2-9-04/D 2005-12	Renovation mortar systems, here: 6.3.10 - Salt resistance
DIN 52450 1985-08	Testing of inorganic non-metallic building materials; determination of shrinkage and expansion on small specimens
DIN EN 459-2 2010-12	Building lime - Part 2 Test methods, here; 6.9 - Water retention value
DIN 18555-7 1987-11	Testing of mortars containing mineral binders; determination of water retentivity of freshly mixed mortar by the filter plate method
DIN EN 413-2 2005-08	Masonry cement - Part 2: Test methods, here; 6 - Determination of the water retention value
DIN EN 1367-2 2010-02	Tests for thermal and weathering properties of aggregates - Part 2: Magnesium sulphate test
DIN EN 12697-11 2005-12	Bituminous mixtures - Test methods for hot mix asphalt - Part 11: Determination of the affinity between aggregate and bitumen
DIN EN 13286-2 2013-02	Unbound and hydraulically bound mixtures - Part 2: Test methods for laboratory reference density and water content - Proctor compaction
QMAA-C2-03-213 2008-06	Testing of the grammage of reinforcements
DIN EN 1308 2007-11	Adhesives for tiles - Determination of slip
DIN 52115-2 2014-02	Test methods for aggregates - Part 2: Impact test on crushed and broken aggregates larger than 32 mm
DIN EN 1097-2 2010-07	Tests for mechanical and physical properties of aggregates - Part 2: Methods for the determination of resistance to fragmentation

## **2.7 Testing of the petrography of lime, aggregates and mortar**

DIN EN 932-3 2003-12	Tests for general properties of aggregates - Part 3: Procedure and terminology for simplified petrographic description
QMAA-C2-03-203 2010-04	Determination of the mineral phase composition using X-ray diffraction analysis
QMAA-C2-03-236 2012-03	Determination of the quartz content using X-ray diffraction analysis

## **2.8 Testing of the thermal properties of aggregates and mortar**

ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: 5.1.3.2.2 Freeze-thaw behaviour
DIN EN 1367-1 2007-06	Tests for thermal and weathering properties of aggregates - Part 1: Determination of resistance to freezing and thawing
DIN EN 1367-5 2011-04	Tests for thermal and weathering properties of aggregates - Part 5: Determination of resistance to thermal shock
DIN EN 1367-6 2008-12	Tests for thermal and weathering properties of aggregates - Part 6: Determination of resistance to freezing and thawing in the presence of salt (NaCl)
TP Stone 6.3.2 2008	Resistance of construction material mixtures to freezing and thawing

## **2.9 Optical testing of thermal insulation composite systems (WVDS)**

ETAG 004 2000-03	Guideline for European technical approval of external thermal insulation composite systems with rendering, here: 5.1.3.2.1 Hygrothermal behaviour
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**Abbreviations used:**

BVK	Association of the German Lime Industry (Bundesverband der Deutschen Kalkindustrie e. V.)
DAfStb-Guidelines	Guidelines of the German Committee for Reinforced Concrete (Deutschen Ausschuss für Stahlbeton)
DIN	German Institute for Standardisation (Deutsches Institut für Normung)
EN	European Standardisation (Europäische Normung)
ETAG	European Technical Approval Guidelines
ibac	Institute for Building Materials Research of the RWTH Aachen University (Institut für Bauforschung der RWTH Aachen)
QMAA	In-house method of the Institute für Kalk- und Mörtelforschung e.V. (Quality management manufacturing procedure)
TP	Technical test regulations (Technische Prüfvorschriften)
VDLUFA	Association of German Agricultural Analytic and Research Institutes (Verband Deutscher landwirtschaftlicher Untersuchungs- und Forschungsanstalten)
WTA	Scientific & Technological study group for the restoration of buildings and preservation of monuments (Wissenschaftlich-Technische Arbeitsgemeinschaft für Bauwerkserhaltung und Denkmalpflege e. V.)