

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-11140-15-00
according to DIN EN ISO/IEC 17025:2005

Period of validity: 03.12.2014 to 02.12.2019

Date of issue: 24.03.2015

Holder of certificate:

Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e. V.
Hansastraße 27c, 80686 München

for the

Fraunhofer-Institut für Keramische Technologien und Systeme (IKTS)

with the

Labor für Thermische Analyse/Thermophysik und
Labor für Partikel- und Suspensionscharakterisierung
Winterbergstraße 28, 01277 Dresden

Tests in the fields:

Determination of thermal, dispersion and electrokinetic characteristics of gases, fluids and solids

Abbreviations used: see last page

Within the given testing field marked with * and ** respectively, the testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, the following:

*** the free choice of standard or equivalent testing methods.**

**** the modification, development and refinement of testing methods.**

Within the scope of accreditation marked with *, the calibration laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standard calibration procedures listed here with different issue dates.

1 Thermal properties of plastic materials, metals, ceramics, cermets, basic materials, organic auxiliaries and powder-metallurgical materials

1.1 Thermo-chemical and thermo-physical properties by Differential scanning calorimetry (DSC) / simultaneous thermal analysis (STA)*

DIN 51004 1994-06	Thermal analysis - Determination of melting temperatures of crystalline materials by differential thermal analysis
DIN EN 821-3 2005-04	Advanced technical ceramics - Monolithic ceramics - Thermo-physical properties - Part 3: Determination of specific heat capacity
DIN EN 1159-3 2008-06	Advanced technical ceramics - Ceramic composites, thermo-physical properties - Part 3: Determination of specific heat capacity
DIN EN ISO 11357-1 2010-03	Plastics - Differential scanning calorimetry (DSC) - Part 1: General principles
DIN EN ISO 11357-2 2014-07	Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature and glass transition step height
DIN EN ISO 11357-3 2013-04	Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization
DIN EN ISO 11357-4 2014-03	Plastics - Differential scanning calorimetry (DSC) - Part 4: Determination of specific heat capacity
E DIN EN ISO 11357-5 2014-07	Plastics - Differential scanning calorimetry (DSC) - Part 5: Determination of characteristic reaction-curve temperatures and times, enthalpy of reaction and degree of conversion
DIN EN ISO 11357-6 2013-04	Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)

each in connection with:

*DIN 66160
1992-09*

Analysis of disperse systems - concepts

*DIN 66161
2010-10*

*Particle size analysis - Formula symbols,
units*

*DIN ISO/TS 27687
2010-02*

*Nanotechnologies - Terminology and
definitions for nano-objects - Nano-
particle, nanofibre and nanoplate*

*ISO 13099
2012-06*

*Colloidal systems - Methods for zeta-
potential determination - Part 1: Electro-
acoustic and electrokinetic phenomena*

1.2 Thermo-physical properties by Thermo-mechanical analysis (TMA) / dilatometry (DiL)*

DIN 51045-2
2009-04

Determination of linear thermal expansion of solids - Part 2:
Testing of fired fine ceramic materials using the dilatometer
method

DIN 51045-3
2009-04

Determination of linear thermal expansion of solids - Part 3:
Testing of non-fired fine ceramic materials using the dilatometer
method

DIN 51045-4
2007-01

Determination of linear change of solids by thermal effect using
the dilatometer method - Part 4: Testing of fired heavy ceramic
materials

DIN 51045-5
2007-01

Determination of linear change of solids by thermal effect using
the dilatometer method - Part 5: Testing of non-fired heavy
ceramic materials

DIN EN 821-1
1995-04

Advanced technical ceramics - Monolithic ceramics - Thermo-
physical properties - Part 1: Determination of thermal expansion

DIN EN 1159-1
correction 1
2009-02

Advanced technical ceramics - Ceramic composites - Thermo-
physical properties - Part 1: Determination of thermal expansion

DIN ISO 7991
1998-02

Glass - Determination of coefficient of mean linear thermal
expansion

ISO 11359-1
2014-01

Plastics - Thermomechanical analysis (TMA) - Part 1: General
principles

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ISO 11359-2 1999-10	Plastics - Thermomechanical analysis (TMA) - Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature
ISO 11359-3 2002-10	Plastics - Thermomechanical analysis (TMA) - Part 3: Determination of penetration temperature
DIN 51909 2009-05	Testing of carbonaceous materials - Determination of coefficient of linear thermal expansion - Solid materials
DIN 51045-1 2005-08	Determination of the thermal expansion of solids - Part 1: Basic rules

each in connection with:

<i>DIN 66160</i> <i>1992-09</i>	<i>Analysis of disperse systems - concepts</i>
<i>DIN 66161</i> <i>2010-10</i>	<i>Particle size analysis - Formula symbols, units</i>
<i>DIN ISO/TS 27687</i> <i>2010-02</i>	<i>Nanotechnologies - Terminology and definitions for nano-objects - Nano-particle, nanofibre and nanoplate</i>
<i>ISO 13099</i> <i>2012-06</i>	<i>Colloidal systems - Methods for zeta-potential determination - Part 1: Electroacoustic and electrokinetic phenomena</i>

1.3 Thermo-physical properties by laser flash analysis (LFA)* and comparing

DIN EN 821-2 1997-08	Advanced technical ceramics - Monolithic ceramics, thermo-physical properties - Part 2: Determination of thermal diffusivity by the laser flash (or heat pulse) method
DIN EN 1159-2 2003-12	Advanced technical ceramics - Ceramic composites - Thermo-physical properties - Part 2: Determination of thermal diffusivity
DIN 51908 2006-05	Testing of carbon materials - Determination of thermal conductivity at room temperature by means of a comparative method - Solid material

DIN 51936
2008-01 Testing of carbonaceous materials - Determination of thermal diffusivity at high temperatures by the laser pulse method - Solid materials

each in connection with:

DIN 66160 *Analysis of disperse systems - concepts*
1992-09

DIN 66161 *Particle size analysis - Formula symbols, units*
2010-10

DIN ISO/TS 27687 *Nanotechnologies - Terminology and definitions for nano-objects - Nano-particle, nanofibre and nanoplate*
2010-02

ISO 13099 *Colloidal systems - Methods for zeta-potential determination - Part 1: Electro-acoustic and electrokinetic phenomena*
2012-06

1.4 Thermo-chemical properties by thermal gravimetric analysis (TGA) - Measurement of evaporation, decomposing, gas reaction, redox reaction, reaction by nitride, oxidation and burning

ISO 9924-1
2000-12 Rubber and rubber products - Determination of the composition of vulcanizates and uncured compounds by thermogravimetry - Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers

DIN EN ISO 11358-1
2014-10 Plastics - Thermogravimetry (TG) of polymers - Part 1: General principles

DIN 51006
2005-07 Thermal analysis (TA) - Thermogravimetry (TG) - Principles

each in connection with:

DIN 66160 *Analysis of disperse systems - concepts*
1992-09

DIN 66161 *Particle size analysis - Formula symbols, units*
2010-10

DIN ISO/TS 27687 *Nanotechnologies - Terminology and definitions for nano-objects - Nano-particle, nanofibre and nanoplate*
2010-02

ISO 13099
2012-06

Colloidal systems - Methods for zeta-potential determination - Part 1: Electroacoustic and electrokinetic phenomena

2 Thermal properties** (Kat. II)

2.1 Evolved gas analysis (EGA) by means of mass spectrometry (MS) und Fourier transform infrared spectroscopy (FTIR)**

StAA-EGA-MS
Rev01
2014

Evolved gas analysis (EGA) during the synthesis of powder metallurgica and ceramic materials as well as during the decomposition of polymers, wood and organic aids and during gas reactions of metals and glass by means of mass spectrometry (MS)

StAA-EGA-FTIR
Rev01
2014

Evolved gas analysis (EGA) during the synthesis of powder metallurgica and ceramic materials as well as during the decomposition of polymers, wood and organic aids and during gas reactions of metals and glass by means Fourier transform infrared spectroscopy (FTIR)

2.2 Fourier transform infrared spectroscopy with Transmission method and Attenuated total reflection (ATR)**

StAA-ATR-T-FTIR
Rev01
2014

FTIR- spectroscopy with Transmission method and Attenuated total reflection (ATR) of powders, fluids and solids

3 Characteristics of powder and suspension

3.1 Specimen preparation*

ISO 14488
2007-12

Particulate materials - Sampling and sample splitting for the determination of particulate properties

DIN ISO 14887
2010-03

Sample preparation - Dispersing procedures for powders in liquids

each in connection with:

DIN 66160
1992-09

Analysis of disperse systems - concepts

DIN 66161
2010-10

Particle size analysis - Formula symbols, units

DIN ISO/TS 27687
2010-02

Nanotechnologies - Terminology and definitions for nano-objects - Nano-particle, nanofibre and nanoplate

ISO 13099
2012-06

Colloidal systems - Methods for zeta-potential determination - Part 1: Electroacoustic and electrokinetic phenomena

3.2 Properties of dispersion*

ISO 13320
2009-10

Particle size analysis - Laser diffraction methods

ISO 22412
2008-05

Particle size analysis - Dynamic light scattering (DLS)

DIN EN 725-5
2007-04

Advanced technical ceramics - Methods of test for ceramic powders - Part 5: Determination of the particle size distribution

each in connection with:

DIN 66160
1992-09

Analysis of disperse systems - concepts

DIN 66161
2010-10

Particle size analysis - Formula symbols, units

DIN ISO/TS 27687
2010-02

Nanotechnologies - Terminology and definitions for nano-objects - Nano-particle, nanofibre and nanoplate

ISO 13099
2012-06

Colloidal systems - Methods for zeta-potential determination - Part 1: Electroacoustic and electrokinetic phenomena

3.3 Electrokinetics measurement*

ISO 13099-2
2012-06 Colloidal systems - Methods for zeta-potential determination -
Part 2: Optical methods

ISO 13099-3
2014-07 Colloidal systems - Methods for zeta-potential determination -
Part 3: Acoustic methods

each in connection with:

DIN 66160 *Analysis of disperse systems - concepts*
1992-09

DIN 66161 *Particle size analysis - Formula symbols,*
2010-10 *units*

DIN ISO/TS 27687 *Nanotechnologies - Terminology and*
2010-02 *definitions for nano-objects - Nano-*
particle, nanofibre and nanoplate

ISO 13099 *Colloidal systems - Methods for zeta-*
2012-06 *potential determination - Part 1: Electro-*
acoustic and electrokinetic phenomena

4 General physical properties*

DIN 19268
2007-05 pH-measurement - pH-measurement of aqueous solutions with pH
measuring chains with pH glass electrodes and evaluation of
measurement uncertainty

DIN EN 27888
1993-11 Water quality - determination of electrical conductivity

DIN 66137-2
2004-12 Determination of solid state density - Part 2: Gaspycnometry

DIN EN ISO 18753
2006-01 Fine ceramics (advanced ceramics, advanced technical ceramics) -
Determination of absolute density of ceramic powders by
pycnometer

DIN EN ISO 3369
2010-08 Impermeable sintered metal materials and hard metals - Deter-
mination of density

DIN 51918
2012-12 Testing of carbonaceous materials - Determination of bulk density
and the open porosity

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DIN 66137-1 2003-11	Determination of solid state density - Part 1: Principles
DIN EN 993-1 1995-04	Methods of test for dense shaped refractory products - Part 1: Determination of bulk density, apparent porosity and true porosity
DIN EN 993-2 1995-04	Methods of test for dense shaped refractory products - Part 2: Determination of true density
DIN EN 1389 2004-03	Advanced technical ceramics - Ceramic composites - Physical properties - Determination of density and apparent porosity

Abbreviations used:

DIN	German Institute for Standardization
E	Draft standard
EN	European Standard
ISO	International Organization for Standardization
StAA-XX	In house method of the Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e. V.