

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-11140-15-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 03.12.2019

Date of issue: 03.03.2020

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

Within the given testing field marked with *, the testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, the free choice of standard or equivalent testing methods.

The listed testing methods are exemplary. The testing laboratory maintains a current list of all testing methods within the flexible scope of accreditation.

This document is a translation. The definitive version is the original German annex to the accreditation certificate.

Abbreviations used: see last page

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

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

DIN EN 821-3 2005-04	Advanced technical ceramics - Monolithic ceramics - Thermophysical properties - Part 3: Determination of specific heat capacity
DIN EN 1159-3 2008-06	Advanced technical ceramics - Ceramic composites, thermophysical properties - Part 3: Determination of specific heat capacity
DIN EN ISO 11357-1 2017-02	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 2018-07	Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization
DIN EN ISO 11357-4 2014-10	Plastics - Differential scanning calorimetry (DSC) - Part 4: Determination of specific heat capacity
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 2018-07	Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)
DIN EN ISO 11357-7 2015-12	Plastics - Differential scanning calorimetry (DSC) - Part 7: Determination of crystallization kinetics
DIN 51007 2019-04	Thermal analysis - Differential thermal analysis (DTA) and differential scanning calorimetry (DSC) - General Principles
DIN EN 1159-3 2008-06	Advanced technical ceramics - Ceramic composites, thermophysical properties - Part 3: Determination of specific heat capacity
ISO 19628 2017-04	Fine ceramics (advanced ceramics, advanced technical ceramics) - Thermophysical properties of ceramic composites - Determination of specific heat capacity

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ASTM E 793 1995	Standard test method for enthalpies of fusion and crystallization by differential scanning calorimetry
ASTM E 967 2018	Standard practice for temperature calibration of differential scanning calorimeters and differential thermal analysis
ASTM E 968 1983	Standard practice for heat flow calibration of differential scanning calorimeters
ASTM E 1269 1995	Standard test method for determining specific heat capacity by differential scanning calorimetry
ASTM E 1356 1991	Standard test method for glass transition temperatures by differential scanning calorimetry or differential thermal analysis
ASTM E 2069 2000	Standard Test method for Temperature Calibration on Cooling of Differential Scanning Calorimeters
ASTM D 3417 1999	Standard Test Method for Enthalpies of Fusion Crystallization of Polymers by Differential Scanning Calorimetry (DSC)
ASTM D 3418 2003	Standard Test Method for Transition Temperatures of Polymers by Differential Scanning Calorimetry

1.2 Thermo-physical properties by Thermo-mechanical analysis (TMA) / Thermodilatometry (TDiL) *

DIN 51045-1 2005-08	Determination of the thermal expansion of solids - Part 1: Basic rules
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

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DIN EN 821-1 1995-04	Advanced technical ceramics - Monolithic ceramics - Thermophysical properties - Part 1: Determination of thermal expansion
DIN EN 1159-1 2007-11	Advanced technical ceramics - Ceramic composites - Thermophysical 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
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 2019-02	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
ISO 17139 2014-06	Fine ceramics (advanced ceramics, advanced technical ceramics) - Thermophysical properties of ceramic composites - Determination of thermal expansion
ASTM D 696 1998	Standard test method for coefficient of linear thermal expansion of plastics between -30 °C and 30 °C with a vitreous silica dilatometer
ASTM E 831 2006	Standard test method for linear thermal expansion of solid materials by thermomechanical analysis
ASTM E 1363 1997	Standard test method for temperature calibration of thermomechanical analyzers
ASTM E 2113 2002	Standard Test Method for Length Change Calibration of Thermomechanical Analyzer
ASTM D 3386 1994	Standard Test Method for Coefficient of Linear Thermal Expansion of Electrical Insulating Materials

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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 2016-08	Testing of carbonaceous materials - Determination of thermal diffusivity at high temperatures by the laser pulse method - Solid materials
ISO 18755 2005-03	Fine ceramics (advanced ceramics, advanced technical ceramics) - Determination of thermal diffusivity of monolithic ceramics by laser flash method
ASTM E 1461 1992	Standard test method for thermal diffusivity of solids by the flash method

1.4 Thermo-chemical properties by thermal gravimetric analysis (TGA) *

ISO 9924-1 2016-08	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
ASTM E 794 1995	Standard test method for melting and crystallization temperatures by thermal analysis
ASTM E 914 1983	Standard Practice for Evaluating Temperature Scale for Thermogravimetry

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ASTM E 1582 2004	Standard Practice for Calibration of Temperature Scale of Thermogravimetry
ASTM E 1641 1999	Standard Test Method for Decomposition Kinetics by Thermogravimetry
ASTM E 2040 2003	Standard Test Method for Mass Scale Calibration of Thermogravimetric Analyzer
ASTM D 2766 1995	Standard Test Method for Specific Heat of Liquid and Solid
ASTM D 3850 1994	Standard Test Method for Rapid Thermal Degradation of Solid Electrical Insulating Materials by Thermogravimetric Method

1.5 Emission Gas Thermal Analysis (EGA) using Mass Spectrometry (MS) und Fourier Transform Infrared Spectroscopy (FTIR)

StAA-EGA-MS Rev01 2014	Evolved gas analysis (EGA) during the synthesis of powder metallurgical and ceramic materials as well as during the decomposition of polymers, wood and organic acids 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 metallurgical and ceramic materials as well as during the decomposition of polymers, wood and organic acids and during gas reactions of metals and glass by means Fourier transform infrared spectroscopy (FTIR)

1.6 FTIR Spectroscopy with Transmission Method and Attenuated Total Reflection Method (ATR)

StAA-ATR-T-FTIR Rev01 2014	FTIR-spectroscopy with Transmission method and Attenuated total reflection (ATR) of powders, fluids and solids
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2 Characterization of powders and suspensions

2.1 Sample preparation / Testing of dispersion *

ISO 14488 2007-12	Particulate materials - Sampling and sample splitting for the determination of particulate properties
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DIN EN ISO 18753 2018-01	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 hardmetals - Determination of density
DIN 51918 2018-07	Testing of carbonaceous materials - Determination of bulk density and the open porosity
DIN EN 993-1 2019-03	Methods of test for dense shaped refractory products - Part 1: Deter- mination of bulk density, apparent porosity and true porosity
DIN EN 993-2 1995-04	Methods of test for dense shaped refractory products - Part 2: Deter- mination of true density
DIN EN 1389 2004-03	Advanced technical ceramics - Ceramic composites - Physical properties Determination of density and apparent porosity

abbreviations used:

ASTM	American Society for Testing and Materials
DIN	German Institute for Standardization
EN	European Standard
ISO	International Organization for Standardization
StAA-XX	In-house method of the Fraunhofer Gesellschaft zur Förderung der angewandten Forschung eingetragener Verein

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