DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory

Universität Stuttgart

with its testing laboratory

Materialprüfungsanstalt Universität Stuttgart
Bereich Maschinenbau
Pfaffenwaldring 32, 70569 Stuttgart

is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out tests in the following fields:

Mechanical-technological testing of metallic materials, fusion-welded joints and structural parts at high and low temperatures under static, rapid, sudden and cyclic, uniaxial and multiaxial loading; Material and fracture-mechanical testing of metallic materials at high and low temperatures, fatigue strength testing (LCF, HCF); Operational stability and proficiency testing, vibration tests (sine, shock, random); Experimental stress analysis of metallic and non-metallic materials of components used in the aviation and aerospace industries, plant, automotive and mechanical engineering and in semi-finished products using strain measurement with strain gauges and residual stress determination with the hole drilling, ring core and slitting methods; Metallographic analysis using hardness testing and microanalysis; Chemical analysis; Manual and (partially) mechanised non-destructive testing (ultrasonic testing, radiographic testing, magnetic particle testing, liquid-penetrant testing, visual testing) of metallic materials (forgings, castings, welds), of components used in plant, automotive and mechanical engineering, and of semi-finished products; Testing in the area of passive driver safety (seat belts, restraint systems, safety helmets)

The accreditation certificate shall only apply in connection with the notice of accreditation of 10.09.2020 with the accreditation number D-PL-11027-04. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 13 pages.

Registration number of the certificate: **D-PL-11027-04-01**

Berlin, 04.12.2020	Dr Heike Manke Head of Division	Translation issued: 01.02.2021	Head of Division

The certificate together with the annex reflects the status as indicated by the date of issue.
The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH https://www.dakks.de/en/content/accredited-bodies-dakks.

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

See notes overleaf.

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The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-11027-04-01 according to DIN EN ISO/IEC 17025:2018

Valid from: **10.09.2020**

Date of issue: 04.12.2020

Holder of certificate:

Universität Stuttgart

with its testing laboratory

Materialprüfungsanstalt Universität Stuttgart
Bereich Maschinenbau
Pfaffenwaldring 32, 70569 Stuttgart

Tests in the fields:

Mechanical-technological testing of metallic materials, fusion-welded joints and structural parts at high and low temperatures under static, rapid, sudden and cyclic, uniaxial and multiaxial loading;
Material and fracture-mechanical testing of metallic materials at high and low temperatures, fatigue strength testing (LCF, HCF);
Operational stability and proficiency testing, vibration tests (sine, shock, random);
Experimental stress analysis of metallic and non-metallic materials of components used in the aviation and aerospace industries, plant, automotive and mechanical engineering and in semi-finished products using strain measurement with strain gauges and residual stress determination with the hole drilling, ring core and slitting methods;
Metallographic analysis using hardness testing and microanalysis, chemical analysis;

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of testing laboratories. Laboratories that conform to the requirements of this standard, operate generally in accordance with the principles of DIN EN ISO 9001.

The certificate together with the annex reflects the status as indicated by the date of issue.
The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH https://www.dakks.de/en/content/accredited-bodies-dakks.

Manual and (partially) mechanised non-destructive testing (ultrasonic testing, radiographic testing, magnetic particle testing, liquid penetrant testing, visual testing) of metallic materials (forging, casting, welds), of components used in plant, automotive and mechanical engineering, and of semi-finished products;
Testing in the area of passive driver safety (seat belts, restraint systems, safety helmets)

Within the scope of accreditation marked with *, the testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standards or equivalent testing methods listed here with different issue dates.**

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.

Within the given testing field marked with **, the testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, the following:
1) **the free choice of standard or equivalent testing methods.**
2) **the modification, development and refinement of testing methods.**

The testing laboratory maintains a current list of all testing procedures within the flexible scope of accreditation.

1 Mechanical-technological testing of metallic materials, fusion-welded joints and structural parts, material and fracture-mechanical testing of metallic materials, fatigue strength testing, operational stability and proficiency testing, vibration tests

1.1 Determination of mechanical properties at different temperatures and ambient conditions

DIN EN ISO 148-1 *** 2017-05	Metallic materials – Charpy pendulum impact test – Part 1: Test method
DIN EN ISO 204 *** 2019-04	Metallic materials – Uniaxial creep testing in tension – Method of test
DIN EN ISO 6892-1 *** 2017-02	Metallic materials – Tensile testing – Part 1: Method of test at room temperature
DIN EN ISO 6892-2 *** 2018-09	Metallic materials – Tensile testing – Part 2: Method of test at elevated temperature
DIN EN ISO 6892-3 *** 2015-07	Metallic materials – Tensile testing – Part 3: Method of test at low temperature
DIN EN ISO 7438 *** 2016-07	Metallic materials – Bend test
DIN EN ISO 14556 *** 2017-05	Metallic materials – Charpy V-notch pendulum impact test – Instrumented test method
DIN EN ISO 26203-2 *** 2012-01	Metallic materials – Tensile testing at high strain rates – Part 2: Servo-hydraulic and other test systems
DIN EN 10319-1 *** 2003-09	Metallic materials – Tensile stress relaxation testing – Part 1: Procedure for testing machines
DIN EN 10319-2 *** 2007-01	Metallic materials – Tensile stress relaxation testing – Part 2: Procedure for bolted joint models
DIN 50100 *** 2016-12	Load controlled fatigue testing – Implementation and evaluation of cyclic tests at constant load amplitudes on metallic specimens and components
DIN 50106 *** 2016-11	Testing of metallic materials – Compression test at room temperature
DIN 50134 *** 2008-10	Testing of metallic materials – Compression test of metallic cellular materials

ASTM E 9 *** 2019	Standard Test Methods of Compression Testing of Metallic Materials at Room Temperature
ASTM E 208 *** 2019	Standard Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels
ASTM E 606 *** 2019	Standard Practice for Strain-Controlled Fatigue Testing
ASTM E 647 *** 2015	Standard Test Method for Measurement of Fatigue Crack Growth Rates
ASTM E 2714 *** 2013	Standard Test Method for Creep-Fatigue Testing
SEP 1230 *** 2007-02	Determination of Mechanical Properties of Sheet Metal at High Stain Rates in High Speed Tensile Tests
SEP 1231 *** 2013-08	Determination of Mechanical Properties on Joined Sheet Metals by High-Speed Tensile Testing
SEP 1240 *** 2006-07	Testing and Documentation Guideline for the Experimental Determination of Mechanical Properties of Steel Sheets for CAE-Calculations
SEP 1325 *** 1982-12	Falling weight test according to W. S. Pellini
MPAS-PA 52240-01 2020-03	Implementation of internal pressure and external pressure swell tests
MPAS-PA 52240-02 2020-03	Implementation of internal pressure tests on hollow bodies up to a specified internal pressure or until failure
MPAS-PA 55610-05 2020-04	Tensile test in hydrogen in the temperature range from -50 °C to 290 °C

1.2 Fracture-mechanical analysis

ISO 12135 *** 2016-11	Metallic materials – Unified method of test for the determination of quasistatic fracture toughness
DIN EN ISO 15653 *** 2018-06	Metallic materials – Method of test for the determination of quasistatic fracture toughness of welds

ASTM E 399 *** 2020	Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness of Metallic Materials
ASTM E 561 *** 2019	Standard Test Method for K-R Curve Determination
ASTM E 1221 *** 2012	Standard Test Method for Determining Plane-Strain Crack-Arrest Fracture Toughness, K_{Ia} , of Ferritic Steels
ASTM E 1457 *** 2019	Standard Test Method for Measurement of Creep Crack Growth Rates in Metals
ASTM E 1737 *** 1996	Standard Test Method for J-Integral Characterization of Fracture Toughness
ASTM E 1820 *** 2020	Standard Test Method for Measurement of Fracture Toughness
ASTM E 1921 *** 2019	Standard Test Method for Determination of Reference Temperature, To', for Ferritic Steels in the Transition Range
ESIS P1 *** 1992	ESIS Recommendations for Determining the Fracture Resistance of Ductile Materials
ESIS P2 *** 1992	ESIS Procedure for Determining the Fracture Behaviour of Materials
MPAS-AA 52220-01 2020-04	Identification of the stretched zone for the determination of Ji and CTODi values from crack growth resistance curves
MPAS-PA 55610-06 2020-04	Fracture-mechanical test in hydrogen in the temperature range from -50 °C to 290 °C
MPAS-PA 55610-07 2020-04	Cyclic crack growth tests in hydrogen in the temperature range from -50 °C to 290 °C
MPAS-PA 55610-08 2020-04	Low-cycle fatigue (LCF) tests in the temperature range from -50 °C to 290 °C

2 Experimental stress analysis of metallic and non-metallic materials of components used in the aviation and aerospace industries, plant, automotive and mechanical engineering and in semi-finished products using strain measurement with strain gauges and residual stress determination with the hole drilling, ring core and slitting methods **

2.1 Measurement of mechanical variables

MPAS-PA 53230-01 2014-05	Implementation of strain measurements with strain gauges

2.2 Determination of residual stress and implementation of strain measurements

MPAS-PA 53230-11 2014-05	Implementation of residual stress determination with destructive methods
MPAS-PA 53230-12 2015-06	Implementation of residual stress determination using the borehole method
MPAS-PA 53230-13 2015-06	Implementation of residual stress measurements using the toroidal core method
MPAS-PA 53230-14 2015-06	Implementation of residual stress measurements using the longitudinal groove method

3 Metallography ***

3.1 Hardness testing

DIN EN ISO 2639 2003-04	Steels – Determination and verification of the depth of carburized and hardened cases
DIN EN ISO 6506-1 2015-02	Metallic materials – Brinell hardness test – Part 1: Test method
DIN EN ISO 6507-1 2018-07	Metallic materials – Vickers hardness test – Part 1: Test method
DIN EN ISO 6508-1 2016-12	Metallic materials – Rockwell hardness test – Part 1: Test method
DIN EN ISO 9015-1 2011-05	Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints

DIN EN ISO 9015-2 2016-10	Destructive tests on welds in metallic materials – Hardness testing – Part 2: Microhardness testing of welded joints
DIN EN ISO 14271 2018-01	Resistance welding – Vickers hardness testing (low-force and microhardness) of resistance spot, projection, and seam welds
DIN EN 10328 2005-04	Iron and steel – Determination of the conventional depth of hardening after surface heating
DIN 50190-3 1979-03	Hardness depth of heat-treated parts – Determination of the effective depth of hardening after nitriding

3.2 Macroscopic and microscopic structural examination

ISO 4968 1979-11	Steel; Macrographic examination by sulfur print (Baumann method)
DIN EN ISO 643 2013-05	Steels – Micrographic determination of the apparent grain size
DIN EN ISO 945-1 2019-10	Microstructure of cast irons – Part 1: Graphite classification by visual analysis
DIN EN ISO 1463 2004-08	Metallic and oxide coatings – Measurement of coating thickness – Microscopical method
SEP 1520 1998-09	Microscopic examination of carbide structure in steels by means of diagram series
SEP 1572 2019-03	Microscopic testing of free-cutting steels for sulphide non-metallic inclusions using standard images
VGB S 517 2014-11	Guidelines for rating the microstructure and creep rupture damage of creep-resistant steel for high pressure pipelines and boiler components and their weld connections – Sections 6 & 7

4 Chemical analysis

MPAS-PA 55320-02 2017-09	Chemical analysis of low-alloy steels, chromium/chromium-nickel and free-cutting steels and of aluminium-silicon alloys by optical emission spectrometry (OES)

5 Manual non-destructive testing methods (NDT)

5.1 Radiographic testing for volume defects in metallic forged and cast components and in welds on film and digital detectors using X-rays *

DIN EN ISO 5579 2014-04	Non-destructive testing – Radiographic testing of metallic materials using film and X- or gamma rays – Basic rules
DIN EN ISO 17636-1 2013-05	Non-destructive testing of welds – Radiographic testing – Part 1: X- and gamma-ray techniques with film
DIN EN ISO 17636-2 2013-05	Non-destructive testing of welds – Radiographic testing – Part 2: X- and gamma-ray techniques with digital detectors
DIN EN 12681-1 2018-02	Founding – Radiographic testing – Part 1: Film techniques

5.2 Ultrasonic testing – Testing of metallic materials for volume and surface defects in forged parts, cast components and welded joints, adhesion tests of multilayer plain bearings and section thickness determination using ultrasound *

DIN ISO 4386-1 2015-12	Plain bearings – Metallic multilayer plain bearings – Part 1: Non-destructive ultrasonic testing of bond of thickness ≥ 0.5 mm
DIN EN ISO 10893-8 2011-07	Non-destructive testing of steel tubes – Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections
DIN EN ISO 10893-10 2011-07	Non-destructive testing of steel tubes – Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections
DIN EN ISO 16809 2020-02	Non-destructive testing – Ultrasonic thickness measurement

DIN EN ISO 16810 2014-07	Non-destructive testing – Ultrasonic testing – General principles
DIN EN ISO 16823 2014-07	Non-destructive testing – Ultrasonic testing – Transmission technique
DIN EN ISO 16826 2014-06	Non-destructive testing – Ultrasonic testing – Examination for discontinuities perpendicular to the surface
DIN EN ISO 16827 2014-06	Non-destructive testing – Ultrasonic testing – Characterisation and sizing of discontinuities
DIN EN ISO 17640 2019-02	Non-destructive testing of welds – Ultrasonic testing – Techniques, testing levels, and assessment
DIN EN 10160 1999-09	Ultrasonic testing of steel flat product of thickness equal to or greater than 6 mm (reflection method)
DIN EN 10228-3 2016-10	Non-destructive testing of steel forgings – Part 3: Ultrasonic testing of ferritic or martensitic steel forgings
DIN EN 10307 2002-03	Non-destructive testing – Ultrasonic testing of austenitic and austenitic-ferritic stainless steels flat products of thickness equal to or greater than 6 mm (reflection method)
DIN EN 10308 2002-03	Non-destructive testing – Ultrasonic testing of steel bars
DIN EN 12680-1 2003-06	Founding – Ultrasonic examination – Part 1: Steel castings for general purposes
DIN EN 12680-2 2003-06	Founding – Ultrasonic examination – Part 2: Steel castings for highly stressed components
DIN EN 12680-3 2012-02	Founding – Ultrasonic examination – Part 3: Spheroidal graphite cast iron castings
SEP 1913 1997-09	Ultrasonic surface testing of seamless and longitudinally welded steel pipes with surface waves
SEP 1920 1984-12	Ultrasonic testing of rolled semi-finished products on internal material discontinuities
SEP 1923 2009-02	Ultrasonic testing of steel forgings to stringent standards, in particular for components in turbine and generator systems

5.3 Magnetic particle testing for the detection of surface defects on magnetisable forged and cast components and weld seams *

DIN EN ISO 9934-1 2017-03	Non-destructive testing – Magnetic particle testing – Part 1: General principles
DIN EN ISO 17638 2017-03	Non-destructive testing of welds – Magnetic particle testing
DIN EN 1369 2013-01	Founding – Magnetic particle testing
DIN EN 10228-1 2016-10	Non-destructive testing of steel forgings – Part 1: Magnetic particle testing

5.4 Liquid penetrant testing for the detection of surface defects on magnetisable and non-magnetisable forged and cast components and weld seams *

DIN EN ISO 3452-1 2014-09	Non-destructive testing – Liquid penetrant testing – Part 1: General principles
DIN EN 1371-1 2012-02	Founding – Liquid penetrant testing – Part 1: Sand, gravity die and low pressure die castings
DIN EN 1371-2 2015-04	Founding – Liquid penetrant testing – Part 2: Investment castings
DIN EN 10228-2 2016-10	Non-destructive testing of steel forgings – Part 2: Penetrant testing

5.5 Visual testing of metallic parts and components and welds with and without the aid of video endoscopes

DIN EN ISO 17637 * 2017-04	Non-destructive testing of welds – Visual testing of fusion-welded joints
DIN EN 13018 * 2016-06	Non-destructive testing – Visual testing – General principles
MPAS-PA 55310-02 2017-12	Visual inspection of components with a video endoscope

5.6 Cross-process testing of cast components, forgings and weld seams *

DIN EN ISO 17635 2017-04	Non-destructive testing of welds – General rules for metallic materials
AD-2000 Information Sheet P 5/3 2015-04	Manufacture and testing of joints – Non-destructive testing of welded joints – Annex 1
DVGW GW 350 2015-06	Welding Joints of Steel Pipelines for Gas and Water Supply – Manufacturing, Testing and Evaluation
SEP 1914 1983-08	Non-destructive testing of fusion-welded seams in pipes of stainless steels
SEP 1916 1989-12	Non-destructive testing of fusion-welded pipes of ferritic steels
SEP 1917 1994-09	Non-destructive testing of resistance-welded pipes of ferritic steels

6 Testing in the area of passive driver safety

6.1 Testing of seat belts and restraint systems

DIN EN ISO 9227 *** 2017-07	Corrosion tests in artificial atmospheres – Salt spray tests
DIN EN ISO 11997-1 *** 2018-01	Paints and varnishes – Determination of resistance to cyclic corrosion conditions – Part 1: Wet (salt fog)/dry/humid
DIN EN ISO 11997-2 *** 2013-12	Paints and varnishes – Determination of resistance to cyclic corrosion conditions – Part 2: Wet (salt fog)/dry/humidity/UV light
77/541/EWG *** 2006	Directive on safety belts and restraint systems of motor vehicles (component, installation), 2006/96/EC
97/24/EG *** 2006	Directive on certain components and characteristics of two or three-wheel motor vehicles, *here:* Section 11 Annex VI (component)
ECE-R 16 *** 2019-05	Safety belts and restraint systems for adults in motor vehicles, *here:* Annexes 1-16

ECE-R 44 *** 2017-02	Uniform provisions concerning the approval of restraint systems for children in motor vehicles
MPAS-PA 53240-01 2015-03	General tests on the slide system
MPAS-PA 53240-03 2015-03	Test of energy consumption in accordance with ECE-R 44, *here:* Section 7.1.2

6.2 Installation of seat belts ***

77/541/EWG 2006	Directive on safety belts and restraint systems of motor vehicles (installation), 2006/96/EC
97/24/EG 2006	Directive on certain components and characteristics of two or three-wheel motor vehicles, *here:* Section 11 Annexes II and VI, 2006/120/EC
ECE-R 16 2019-05	Safety belts and restraint systems for adults in motor vehicles, *here:* Appendix 17

6.3 Testing of safety helmets and visors

DIN EN ISO 6270-2 *** 2018-04	Paints and varnishes – Determination of resistance to humidity – Part 2: Condensation (in-cabinet exposure with heated water reservoir)
ECE-R 22 *** 2012-07	Uniform provisions concerning the approval of safety helmets and their visors for riders and passengers of motorcycles and mopeds, Amendment 05 Supplement 2
MPAS-PA 53240-04 2015-03	Testing of a glare shield for motorcyclist helmets

Abbreviations used:

AD 2000	Technical rule of Arbeitsgemeinschaft Druckbehälter (pressure vessel working group)
AGW/AGH	Guidelines for analysis in the working groups
ASTM	American Society for Testing and Materials
DIN	Deutsches Institut für Normung e. V. (German Institute for Standardization)
DVGW GW	Work sheet of Deutscher Verein des Gas- und Wasserfaches e.V. (German Association of the Gas and Water Industry)
ECE-R	ECE Regulations: International technical regulations for motor vehicles
EN	European standard
ESIS P	European Standardised Information Sheet
ISO	International Organization for Standardization
MPAS-AA XXXXX-YY	In-house method of the Stuttgart Materials Testing Institute
MPAS-PA XXXXX-YY	In-house method of the Stuttgart Materials Testing Institute
SEP	Regulations of Stahl-Eisen-Prüfblatt (steel-iron test sheet)
VGB S	Guidelines/Information Sheet of VGB PowerTech e. V.
XX/XXX/EEC	Directive of the European Council
XX/XXX/EC	Directive of the European Parliament and of the Council