List of test methods
Accreditation Number D-PL-12001-02

Industrieanlagen Betriebsgesellschaft mbH (IABG)
Fatigue Strength Laboratory (IBL)

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Examinations in the following areas:

1) Hardness tests on metallic materials and plastics
   Metallographic tests on metallic materials
   Evaluation of the adhesion behaviour of coatings
   Surface tests on components
2) Mechanical-technological tests on metallic materials and plastics
   Fatigue tests on metallic material samples and components
3) Vibration testing and earthquake simulation
4) Climatic tests on components
5) Mechanical strength and functional tests on components of railway vehicles and construction machinery
6) Manual and mechanical non-destructive testing (penetrant, magnetic particle and visual testing) on metallic components, fibre-reinforced materials, plastics and composites

Within the accreditation scopes marked with *, the testing laboratory is permitted to freely select standardised or equivalent test methods without having to inform and obtain prior approval from DAkkS. The test methods listed are examples.

Within the accreditation scopes marked with ***, the testing laboratory is permitted to use the standardised or equivalent test methods listed here with different issue statuses without the need for prior information and approval by DAkkS.

1 Determination of the hardness of metallic materials and plastics using hardness testing methods [Flex B] (IBL-M, Ottobrunn)

Test type	Test parameters/ Measure	Test area	Characteristic test methods
Brinell	Force	153,28 up to 2452,5 N	DIN EN ISO 6506-1 ASTM E 10
Vickers	Force	9,81 up to 294,3 N	DIN EN ISO 6507-1 ASTM E 384
Rockwell	Force	Up to 1471,5 N	DIN EN ISO 6508-1 ASTM E 18
	Penetration depth	60 up to 120 µm	

1.1 Characteristic test methods belonging to the test types listed above

Standard	Description	Date of inventory
DIN EN ISO 6506-1 2015-02	Metallic materials - Brinell hardness test - Part 1: Test procedure	31.03.2015
ASTM E 10 2018	Testing of metallic materials - Brinell hardness test	30.10.2018
DIN EN ISO 6507-1 2018-07	Metallic materials - Vickers hardness test - Part 1: Test procedure	30.10.2018
DIN EN ISO 6507-1 2024-01	Metallic materials - Vickers hardness test - Part 1: Test procedure	02.05.2024
ASTM E 384 2017	Standard Test Method for Microindentation Hardness of Materials	11.10.2018
DIN EN ISO 6508-1 2006-03	Metallic materials - Rockwell hardness test - Part 1: Test procedure (here: scale C)	04.04.2014
DIN EN ISO 6508-1 2016-12	Metallic materials - Rockwell hardness test - Part 1: Test procedure (here: scale C)	09.12.2016
ASTM E 18 2020	Standard Test Methods for Rockwell Hardness of Metallic Materials	06.07.2021
DIN EN ISO 2639 2003-04	Steel - Determination and testing of case hardening depth	11.04.2023

DIN EN ISO 3887 2018-05	Steel - Determination of the decarburisation depth (here: *Chapter 5.3 - Method for measuring microhardness*)	30.10.2018
DIN EN 10328 2005-04	Iron and steel - Determination of the hardening depth after surface hardening	12.10.2005
DIN EN ISO 9015-1 2011-05	Destructive testing of welded joints on metallic materials - Hardness test - Part 1: Hardness test for arc welded joints	08.06.2011
DIN EN ISO 9015-2 2011-05	Destructive testing of welded joints in metallic materials - Hardness testing - Part 2: Microhardness testing of welded joints	04.04.2014
DIN EN ISO 9015-2 2016-10	Destructive testing of welded joints in metallic materials - Hardness testing - Part 2: Microhardness testing of welded joints	05.09.2017
DIN 50190-3 1979-03	Hardening depth of heat-treated parts - Determining the nitriding hardness depth	05.12.2002
DIN 50190-4 1999-09	Laser technology - Hardening depth of heat-treated parts - Part 4: Determination of the melt hardness depth and the melt depth	05.12.2002
DIN EN ISO 18203 2022-07	Steel - Determination of the thickness of surface-hardened layers; German version EN ISO 18203:2022	06.07.2022

2 Metallographic testing methods (IBL-M, Ottobrunn)

2.1 Determination of non-metallic inclusions (steel purity) in steels using optical microscopy [Flex B]

Standard	Description	Date of inventory
DIN 50602 1985-09	Metallographic testing methods; microscopic testing of stainless steels for non-metallic inclusions with image series	05.12.2002
DIN EN 10247 2017-09	Metallographic testing of the content of non-metallic inclusions in steels with image series	04.10.2017
ASTM E 45 2013	Guidelines for the quantitative determination of non-metallic inclusions in steel	04.04.2014

ASTM E 45 2018	Guidelines for the quantitative determination of non-metallic inclusions in steel	24.01.2023

2.2 Determination of the recognizable ferrite or austenite grain size of steels (determination of the average grain size) using microphotographic methods [Flex B]

Standard	Description	Date of inventory
DIN EN ISO 643 2013-05	Steel - Microphotographic determination of the apparent grain size	04.04.2014
DIN EN ISO 643 2020-06	Steel - Microphotographic determination of the apparent grain size	14.07.2020
ASTM E 112 2013	Determination of the average grain size	04.04.2014

2.3 Other metallographic test methods [Flex A]

Standard	Description	Date of inventory
DIN EN ISO 3887 2018-05	Steel - Determination of decarburisation depth (here: *Chapter 5.2 - Metallographic processes*)	30.10.2018
DIN EN ISO 945-1 2010-09	Microstructure of cast iron - Part 1: Graphite classification by visual evaluation	25.09.2010
DIN EN ISO 945-1 2019-10	Microstructure of cast iron - Part 1: Graphite classification by visual evaluation	30.01.2020
DIN EN ISO 1463 2004-08	Metal and oxide coatings - Coating thickness measurement - Microscopic procedure	10.11.2009
DIN EN ISO 1463 2021-08	Metal and oxide coatings - Coating thickness measurement - Microscopic procedure	21.08.2021

3 Adhesion behavior of coatings (IBL-M, Ottobrunn)

3.1 Evaluation of the degree of blistering of coatings on steel by comparison with images [Flex A]

Standard	Description	Date of inventory
DIN EN ISO 4628-2 2016-07	Coating materials - Assessment of coating damage - Evaluation of the amount and size of damage and the intensity of uniform changes in appearance Part 2: Assessment of the degree of bubbles	20.02.2018

3.2 Evaluation of the degree of rusting of coatings on steel by comparison with images [Flex B]

Standard	Description	Date of inventory
DIN EN ISO 4628-3 2016-07	Coating materials - Assessment of coating damage - Assessment of the amount and size of damage and the intensity of uniform changes in appearance Part 3: Assessment of the degree of rust	20.02.2018
ASTM D 610 2008	Testing coated steel surfaces for corrosiveness	22.09.2008

3.3 Further tests on the adhesion behaviour of coatings [Flex A]

Standard	Description	Date of inventory
DIN EN ISO 2409 2013-06	Coating materials - Cross-cut test	27.07.2013
DIN EN ISO 2409 2020-12	Coating materials - Cross-cut test	06.07.2021
ASTM D 3359 2017	Measurement of adhesion using the adhesive tape method	06.09.2017
ASTM D 3359 2023	Measurement of adhesion using the adhesive tape method	04.07.2023

4 Surface testing of components using the replica technique [Flex B] (IBL-M, Ottobrunn)

Standard	Description	Date of inventory
DIN 54150 1977-08	Non-destructive testing - impression method for surface testing (replica technique) *(withdrawn standard)*	17.07.2017
ISO 3057 1998-03	Non-destructive testing - Metallographic replica technology for surface testing	17.07.2017

5 Mechanisch-technologische Prüfungen [Flex B] (IBL-B, Ottobrunn)

Test type	Test parameters/ Measure	Test area	Characteristic test methods
Static testing (force-, displacement- and strain-controlled) with temperature exposure	Force Displacement Strain Moment Temperature	0,1 … 1.000 kN 0,01 … 5.000 mm 0,05 … 50 % 0,1 … 4.000 Nm -196 … +1.200 °C	DIN EN ISO 6892-1 DIN EN ISO 6892-2 DIN EN ISO 6892-3 ASTM D 3518 ASTM D 3039
Single and multi-stage fatigue strength tests (force-, displacement- and strain-controlled) with temperature exposure			DIN 50100 ASTM E466
Fatigue limit tests in the operating load with temperature exposure			DIN 50100 ASTM E466

5.1 Characteristic test methods belonging to the test types listed above

5.1.1 Determination of the quasi-static properties of metallic materials, plastics and plastic composites at different temperatures by means of tensile, compression and shear tests

Standard	Description	Date of inventory
DIN EN ISO 6892-1 2017-02	Metallic materials - Tensile test - Part 1: Test method at room temperature (here: *Method B*)	10.07.2017
DIN EN ISO 6892-1 2020-06	Metallic materials - Tensile test - Part 1: Test method at room temperature (here: Method B)	17.02.2021
DIN EN ISO 6892-2 2011-05	Metallic materials - Tensile test - Part 2: Test method at elevated temperature	25.05.2011
DIN EN ISO 6892-2 2018-09	Metallic materials - Tensile test - Part 2: Test method at elevated temperature	09.11.2018

DIN EN ISO 6892-3 2015-07	Metallic materials - Tensile test - Part 3: Test methods at low temperatures	22.09.2015
ASTM D 3518 2013	Testing the shear stress - slip in unidirectional reinforced plastics	04.04.2014
ASTM D 3518 2018	Testing the shear stress - slip in unidirectional reinforced plastics	09.07.2020
ASTM D 3039 2014	Standard test method for tensile properties of polymer matrix composite materials	04.04.2014
ASTM D 3039 2017	Standard test method for tensile properties of polymer matrix composite materials	29.11.2018
BS EN IEC 61462 2023	Composite hollow insulators. Pressurised and unpressurised insulators for use in electrical equipment with AC rated voltage greater than 1000 V AC and D.C. voltage greater than 1500V. Definitions, test methods, acceptance criteria and design recommendations (here: *Section 8 - Type Tests, Section 9 - Sample Tests, Section 10 - Routine Tests*)	25.04.2024

5.1.2 Determination of material characteristics under oscillating stress of metallic materials and components by means of fatigue tests

Standard	Description	Date of inventory
DIN 50100 2016-12	Fatigue strength test - Performance and evaluation of cyclic tests with constant load amplitude for metallic material samples and components	29.11.2018
DIN 50100 2022-12	Fatigue strength test - Performance and evaluation of cyclic tests with constant load amplitude for metallic material samples and components	26.01.2023
ASTM E 466 2015	Method for performing force-controlled, axial fatigue tests with constant amplitude on metallic materials	22.09.2015
ASTM E 466 2021	Method for performing force-controlled, axial fatigue tests with constant amplitude on metallic materials	26.01.2023
ISO 1143 2021	Metallic materials — Rotating bar bending fatigue testing	28.11.2024

6 Determination of the vibration and earthquake resistance of plants and systems in the fields of energy, automotive, aviation, rail and medical technology by means of vibration tests [Flex B] (IBL-B, Ottobrunn)

Test type	Test parameters/ Measure	Test area	Characteristic test methods
Sine: - Sine sweep - Sine dwell - Fixed sine - Air plane crash	Frequency Acceleration	0,5 up to 200 Hz 0 up to 350 m/s^2	DIN EN 60068-2-6 IEC 60068-2-6 KTA2201.4 KTA3504 IEEE Std 344™ RCC-E
Sine-Beat			DIN EN 60068-2-57 IEC 60068-2-57 KTA 3504 IEC / IEEE 60780-323
Shock			IEEE Std 693™ IEEE Std 344™ IEC / IEEE 60780-323
Broadband noise			DIN EN 60068-2-64 IEC 60068-2-64 DIN EN 61373 IEC 61373 DIN EN 60255-21-3 IEC 60255-21-3
Synthetic design and safety earthquakes; real-time earthquake histories (Time-history method)			DIN EN 60068-2-57 IEC 60068-2-57 IEC / IEEE 60980-344 IEEE Std. 693™ ICC-ES AC156 RCC-E GR-63-core
Operating load follow-up test (Load-time-history test)			DIN EN 60068-2-57 IEC 60068-2-57

6.1 Characteristic test methods belonging to the test types listed above

Standard	Description	Date of inventory
IEEE Std. 693™ 2005	IEEE Recommended Practice for Seismic Design of Substations	22.09.2008
IEEE Std. 693™ 2018	IEEE Recommended Practice for Seismic Design of Substations	25.10.2021
IEEE 344 2004	IEEE Recommended Practice for Seismic Qualification for Class 1E Equipment for Nuclear Power Generating Stations	22.09.2008
IEEE Std 344™ 2013	IEEE Recommended Practice for Seismic Qualification for Class 1E Equipment for Nuclear Power Generating Stations	25.10.2021
IEEE Std 382™ 2006	IEEE Standard for Qualification of Safety-Related Actuators for Nuclear Power Generating Stations *Chapter 14 "Vibration aging test"* *Chapter 15 "Seismic simulation test"* *Annex B "Rationale for vibration and seismic test methods"*	22.09.2008
IEEE Std 382™ 2019-11	IEEE Standard for Qualification of Safety-Related Actuators for Nuclear Power Generating Stations and Other Nuclear Facilities *Chapter 15 "Vibration aging test"* *Chapter 16 "Seismic simulation test"* *Annex B "Rationale for vibration and seismic test methods"*	19.10.2022
IEEE Std 535™ 2013	IEEE Standard for Qualification of Class 1E Vented Lead Acid Storage Batteries for Nuclear Power Generating Stations (in Verbindung mit Änderung: IEEE Std 535™-2013/Cor 1-2017) *Chapter 8.3 "Aging"* *Chapter 8.4 "Seismic qualification procedure"*	27.01.2020
KTA 2201.4 1990-06	Design of nuclear power plants against seismic events; Part 4: Requirements for methods to verify the seismic safety of mechanical and electronic plant components	22.09.2008
KTA 2201.4 2012-11	Design of nuclear power plants against seismic impacts -Part 4: System components	04.04.2014

KTA 3504 2006-11	Electrical drives of the safety system in nuclear power plants	04.04.2014
KTA 3504 2015-11	Electrical drives of the safety system in nuclear power plants	22.09.2008
KTA 3505 2015-11	Type testing of transducers and transmitters in safety instrumentation and control technology	17.02.2023
DIN EN 60068-2-6 2008-10	Environmental influences - Part 2-6: Test methods - Test Fc: Oscillation (sinusoidal) (IEC 60068-2-6:2007); German version EN 60068-2-6:2008	22.09.2008
IEC 60068-2-6 2007-12	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	19.10.2022
DIN EN 60068-2-27 2010-02	Environmental influences - Part 2-27: Test methods Exam Ea and guide: Shock (IEC 60068-2-27:2008); German Version EN 60068-2-27:2009	30.11.2022
IEC 60068-2-27 2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	14.12.2020
DIN EN 60068-2-57 2000-07	Environmental audits Part 2: Tests - Test Ff: Oscillation - Time history method (IEC 60068-2-57:1999) German version EN 60068-2-57:2000	22.09.2008
DIN EN 60068-2-57 2015-10	Environmental influences - Part 2-57: Tests - Test Ff: Oscillation - Time history method and sine pulses (IEC 60068-2-57:2013); German version EN 60068-2-57:2013	25.07.2017
IEC 60068-2-57 2013-04	Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method	19.10.2022
DIN EN 60068-2-64 2009-04	Environmental influences - Part 2-64: Test methods - Test Fh: Vibration, broadband noise (digitally controlled) and guide (IEC 60068-2-64:2008) German version EN 60068-264:2008	04.04.2014
DIN EN 60068-2-64 2020-09	Environmental influences - Part 2-64: Test methods - Test Fh: Vibration, broadband noise (digitally controlled) and guide (IEC 60068-2-64 + A1:2019) German version EN 60068-2-64:2008 + A1:2019	19.10.2022

IEC 60068-2-64 2008	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance (in Verbindung mit Änderung: IEC 60068-2-64-AMD 1 2019-10)	14.12.2020
DIN EN 60068-2-81 2004	Environmental testing - Part 2-81: Tests - Test Ei: Shock - Shock response spectrum synthesis	14.12.2020
IEC 60068-2-81 2003	Environmental testing - Part 2-81: Tests - Test Ei: Shock - Shock response spectrum synthesis	13.12.2022
IEC 60068-3-3 1991	Environmental testing - Part 3-3: Guidance - Seismic test methods for equipments	22.09.2008
IEC 60068-3-3 2019-08	Environmental testing – Part 3-3: Supporting documentation and guidance – Seismic test methods for Equipment; (in Verbindung mit Änderung: IEC 60068-3-3 2019-COR1-2021-09)	27.01.2020
DIN IEC 60068-3-3 1993	Environmental testing Seismic test methods for devices Guide; Identical with IEC 60068-3-3:1991	22.09.2008
DIN EN IEC 60068-3-3 2022-12	Environmental exposure - Part 3-3: Supporting documentation and guidance - Seismic test methods for equipment (IEC 60068-3-3:2019 + COR1:2021); German version EN IEC 60068-3-3:2019 + AC:2021	30.01.2023
IEC 60076-11 2018-08	Power transformers – Part 11: Dry-type transformers *Chapter 13 „Seismic“* *Chapter 14.4.7. „Seismic test”*	06.12.2018
DIN EN 60255-21-3 1995-11	Electrical relays - Part 21: Vibration, shock, continuous shock and earthquake tests on dimensioned relays and protective devices - Section 3: Earthquake tests; (IEC 60255-21-3:1993); German version EN 60255-21-3:1995	22.09.2008
IEC 60255-21-3 1993-09 2022-07	Electrical relays — Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment *Section 3: Seismic tests*	30.11.2022
IEC 60980 1989-06	Recommended practices for seismic qualification of electrical equipment of the safety system for nuclear generating stations	22.09.2008

IEC/IEEE 60980-344 2020-10	Nuclear facilities – Equipment important to safety – Seismic qualification; Edition 1.0	01.02.2021
DIN EN 61373 2011-04	Railway applications - Operating equipment of railway vehicles - Tests for vibrations and shocks (IEC 61373:2010); German version EN 61373:2010; (in conjunction with corrigendum: DIN EN 61373 corrigendum 2018-01)	22.09.2008
IEC 61373 2010-05	Railway applications - Rolling stock equipment - Shock and vibration tests; (Edition 2.0)	30.11.2022
DIN EN 61587-2 2001-09	Mechanical construction methods for electronic equipment - Tests for IEC 60917 and IEC 60297 Part 2: Seismic tests for cabinets and racks; (IEC 61587-2:2000) German version EN 61587-2:2001	22.09.2008
DIN EN 61587-2 2012-06	Mechanical construction methods for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 2: Seismic tests for cabinets and racks; (IEC 61587-2:2011) German version EN 61587-2:2011	19.10.2022
IEC 61587-2 2011-08	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 2: Seismic tests for cabinets and racks	30.11.2022
IEC 62271-2 2003-02	High-voltage switchgear and controlgear - Part2: Seismic qualification for rated voltages of 72.5 kV and above	26.01.2023
DIN EN 62271-207 2013-02	High-voltage switchgear and controlgear - Part 207: Earthquake qualification for gas-insulated switchgear and controlgear assemblies with rated voltages above 52 kV; (IEC 62271-207:2012) German version EN 62271-207:2012	04.04.2014
IEC 62271-207 2012	High-voltage switchgear and controlgear - Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV	14.12.2020
IEC 62271-207 2023	High-voltage switchgear and controlgear - Part 207: Seismic qualification for gas-insulated switchgear assemblies, metal enclosed and solid-insulation enclosed switchgear for rated voltages above 1 kV *Not included chapter 6 "Qualification by combined test and numeric analysis"*	22.12.2023

IEC TS 62271-210 2013	High-voltage switchgear and controlgear - Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV *Not included chapter 6 "Qualification by combined test and numeric analysis"*	25.10.2021
IEC/TR 62271-300 2006	High-voltage switchgear and controlgear - Part 300: Seismic qualification of alternating current circuit-breakers *Not included chapter 7 "Qualification by combined test and numeric analysis"*	12.12.2014
GR-63-CORE NEBS 2012-04	Network Equipment-Building System Requirements: Physical Protection *Chapter 5.4 "Earthquake, Office Vibration, and Transportation Vibration Test Methods"*	14.12.2020
GR-63-CORE NEBS 2017-12	Network Equipment-Building System Requirements: Physical Protection *Chapter 5.4 "Earthquake, Office Vibration, and Transportation Vibration Test Methods"*	03.11.2022
ICC-ES AC156 2010-10	Acceptance criteria for seismic certification by shake-table testing of nonstructural components	26.01.2023
ICC-ES AC156 2015-05	Acceptance criteria for seismic certification by shake-table testing of nonstructural components	12.12.2014
ICC-ES AC156 2020-12	Acceptance criteria for seismic certification by shake-table testing of nonstructural components	02.12.2022
RCC-E 2012	Design and construction rules for Electrical Equipment of Nuclear Islands *Chapter B 4200 "Seismic resistance test procedure"* *Chapter B 8400 "Seismic resistance – two-axis using accelerograms"*	12.12.2014
RCC-E 2016	Design and construction rules for electrical equipment of PWR nuclear islands *Chapter V.3320 "Seismic resistance test procedure"* *Chapter V.4300 "Seismic resistance – two-axis test with accelerograms*	14.12.2020

RCC-E 2019	Design and construction rules for Electrical and I&C Systems and Equipment *Chapter V.3320 "Seismic resistance test procedure"* *Chapter V.4300 "Seismic resistance – two-axis test with accelerograms*	30.11.2022
RCC-E 2022	Design and construction rules for Electrical and I&C Systems and Equipment *Chapter V.3320 "Seismic resistance test procedure"* *Chapter V.4300 "Seismic resistance – two-axis test with accelerograms*	30.01.2025
IEC TS 61463 2016	Technical specification; Bushings - Seismic qualification *Not included:* *Chapter 7 "Qualification by static calculation"* *Chapter 8 "Qualification by dynamic analysis"* *Annex C „Static calculation method – Additional considerations"* *Annex D "Qualification by static calculation - Example on transformer bushing"*	25.02.2021

7 Determination of the functionality and resistance to aging of plants and systems by means of environmental simulation tests [Flex A] (IBL-U, Ottobrunn)

Test type	Test parameters/ Measure	Test area	Characteristic test methods
Temperature Cold, dry heat	Temperature	-60 up to +100 °C	DIN EN 60068-2-1 DIN EN 60068-2-2 ISO 16750-4 *Section 5.1 & 5.2* RTCA DO-160 G *Section 4.5*
Temperature change	Temperature	-60 up to +180 °C	DIN EN 60068-2-14 *Prüfung Nb* ISO 16750-4 *Section 5.3* RTCA DO-160 G *Section 5*
	Temperature change at a fixed speed	≤ 10 K/min	
Climate	Temperature	+20 up to +70 °C	DIN EN 60068-2-78 DIN EN 60068-2-30 DIN EN 60068-2-38 ISO 16750-4 *Section 5.6 & 5.7* RTCA DO-160 G *Section 6*
	Relative Humidity	20 up to 95 % r.H.	
Temperature-Shock	Temperature	-60 up to +180 °C	DIN EN 60068-2-14 *Prüfung Na* ISO 16750-4 *Section 5.4*
Height, overpressure and pressure changes	Pressure	50 up to 2.000 mbar	RTCA DO-160 G *Section 4.6*

7.1 Characteristic test methods belonging to the test types listed above

Standard	Description	Date of inventory
DIN EN 60068-2-1 2008-01	Environmental influences - Part 2-1: Test methods Test A: Cold	27.06.2012

DIN EN 60068-2-2 2008-05	Environmental influences - Part 2-2: Test methods Test B: Dry heat	27.06.2012
DIN EN 60068-2-14 2010-04	Environmental influences - Part 2-14: Test methods Test N: Temperature change (here: Na and Nb test)	28.07.2021
DIN EN 60068-2-30 2006-06	Environmental influences - Part 2-30: Test methods Test Db: Moist heat, cyclical (12 + 12 hours)	27.06.2012
DIN EN 60068-2-38 2010-06	Environmental testing - Part 2-38: Test methods - Test Z/AD: Composite test, temperature/humidity, cyclic	27.06.2012
DIN EN 60068-2-38 2022-09	Environmental testing - Part 2-38: Test methods - Test Z/AD: Composite test, temperature/humidity, cyclic	23.12.2022
DIN EN 60068-2-78 2014-02	Environmental testing - Part 2-78: Testing - Test Cab: Moist heat, constant	27.06.2014
ISO 16750-4 2010-04	Electrical and electronic automotive equipment - Environmental conditions - Part 4: Climatic stresses *Section 5.1 – Tests at constant temperature* *Section 5.2 – Temperature step test* *Section 5.3 – Temperature cycling test* *Section 5.4 – Ice water shock test* *Section 5.6 – Humid heat, cyclic test* *Section 5.7 – Damp heat, steady-state test*	27.06.2012
RTCA DO-160 G 2010	Radio Technical Commission for Aeronautics Environmental Conditions and Test Procedure for Airborne Equipment *Section 4 - Temperature and Attitude* *Section 5 - Temperature Variation* *Section 6 - Humidity*	28.07.2021

8 Non-destructive testing [Flex A] (IBL-S, Dresden)

8.1 Penetration test

Standard	Description	Date of inventory
DIN EN ISO 3452-1 2014-09	Non-destructive testing - Penetrant testing - Part 1: General principles; (here: point 8 only)	03.05.2021
DIN EN ISO 3452-1 2022-02	Non-destructive testing - Penetrant testing - Part 1: General principles; (here: point 8 only)	02.12.2024
DIN EN ISO 3452-5 2009-04	Non-destructive testing - Penetrant testing - Part 5: Penetrant testing at temperatures above 50 °C	03.05.2021
DIN EN ISO 3452-6 2009-04	Non-destructive testing - Penetrant testing - Part 6: Penetrant testing at temperatures below 10 °C	03.05.2021
DIN EN 1371-1 2012-02	Founding - Penetrant testing - Part 1: Sand, gravity and low pressure die castings	03.05.2021
DIN EN 1371-2 2015-04	Founding - Indentation testing - Part 2: Investment castings	03.05.2021
DIN EN 10228-2 2016-10	Non-destructive testing of steel forgings - Part 2: Penetrant testing	03.05.2021

8.2 Magnetic particle testing

Standard	Description	Date of inventory
DIN EN ISO 9934-1 2017-03	Non-destructive testing - Magnetic particle testing - Part 1: General principles; (here: points 7 to 14 only)	26.01.2023
DIN EN 1369 2013-01	Foundry - Magnetic particle testing	26.01.2023
DIN EN 10228-1 2016-10	Non-destructive testing of steel forgings - Part 1: Magnetic particle testing	04.11.2024
DIN EN ISO 17638 2017-03	Non-destructive testing of welded joints - Magnetic particle testing	03.05.2021

8.3 Visual inspection

Standard	Description	Date of inventory
DIN EN 13018 2016-06	Non-destructive testing - Visual inspection - General principles; (here: points 5 and 6 only)	03.05.2021
DIN EN ISO 17637 2017-04	Non-destructive testing of welded joints - Visual inspection of fusion-welded joints	03.05.2021

9 Mechanical strength and functional tests on components of railway vehicles [Flex A] (IBL-S, Dresden)

Test type	Test parameters/ Measure	Test area	Characteristic test methods
Static testing (force- and displacement-controlled) with temperature	Force Displacement Torque Angle Strain Air Speed Revolutions Temperature	10 N up to 4000 kN 10 µm up to 2,4 m 5 Nm up to 50 kNm 0,1° up to 360° 10 µm/m up to 10000 µm/m 1 m/s up to 25 m/s 1 up to 4000 min^{-1} 0°C up to 150°C	DIN EN 16019 DIN EN 12663-1 DIN EN 13749 UIC 510-3 UIC 515-4 UIC 615-4 APTA-PR-CS-S-034-99 DIN EN 12082
Quasi-static testing (force- and displacement-controlled) with temperature			
Single and multi-stage fatigue strength tests (force- and displacement-controlled) with temperature			
Fatigue strength tests in the operating load follow-up test with temperature			

9.1 Characteristic test methods belonging to the test types listed above

Standard	Description	Date of inventory
DIN EN 16019 2014-06	Railway applications - Automatic couplers - Performance requirements, specific interface geometry and test methods	30.09.2023
DIN EN 12663-1 2015-03	Railway applications - Strength requirements for railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)	16.09.2021
DIN EN 12663-1 2024-02	Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons); German version EN 12663-1:2010+A2:2023	26.08.2024
DIN EN 13749 2011-06	Railway applications - Wheelsets and bogies - Specification method for strength requirements for bogie frames	16.09.2021

DIN EN 13749 2021-05	Railway applications - Wheelsets and bogies - Specification method for strength requirements for bogie frames	21.06.2021
DIN EN 13749 2024-02	Railway applications - Wheelsets and bogies - Method of specifying the structural requirements of bogie frames; German version EN 13749:2021+A1:2023	26.08.2024
UIC 510-3 1994-07	Freight wagons - Test bench tests on frames of bogie wagons with 2 and 3 wheelsets	16.09.2021
UIC 515-4 1993-01	Railway vehicles for the transport of passengers - bogies - running gear, Strength tests on the frame of bogies	16.09.2021
UIC 566 1990-01	Stress on passenger coach bodies and their attachments	16.09.2021
UIC 615-4 2003-02	Traction units - bogies and running gear, Strength tests on bogie frame structures	16.09.2021
APTA-PR-CS-S-034-99 2006-06	Standard for the Design and Construction of Passenger Railroad Rolling Stock	16.09.2021
DIN EN 12082 2017-12	Railway applications - Wheelset bearings - Performance testing	16.09.2021
DIN EN 12082 2021-09	Railway applications - Wheelset bearings - Performance testing	30.09.2021

List of test methods
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Abbreviations used:

AECTP	Allied Environmental Conditions and Test Publication
APTA	American Public Transportation Association
ANSI	American National Standards Institution
ASTM	American Society for Testing and Materials
DIN	German Institute for Standardisation e.V.
EN	European standard
GR	Generic Requirements
NEBS	Network Equipment Building Systems
ICC-ES AC	International Code Council Evaluation Service Acceptance Criteria
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
KTA	Nuclear Technology Committee
RCC-E	Règles de conception et de construction des matériels des chaudières électronucléaires
RTCA	Radio Technical Commission for Aeronautics
SEP	Steel-iron test sheets from the Verein Deutscher Eisenhüttenleute
STANAG	Standardization Agreement (Standardisation agreement of the NATO contracting states on the use of standardised procedures or similar equipment. The STANAG guidelines are issued by NATO Standardisation
UIC	Union internationale des chemins de fer