# Deutsche Akkreditierungsstelle GmbH

# Annex to the Accreditation Certificate D-PL-11335-01-00 according to DIN EN ISO/IEC 17025:2018

**Valid from:** **25.02.2021**

Date of issue: 25.02.2021

Holder of certificate:

**ALSTOM Transport Deutschland GmbH**
**Prüfstelle ALSTOM Transport Deutschland**
**Linke-Hofmann-Busch-Straße 1, 38239 Salzgitter**

Tests in the fields:

**Testing of running characteristics of railway vehicles; static and dynamic strength tests on railway-specific components; specific measurements in accordance with TSI PRM; acoustic and vibration testing in rail transport; testing of illumination level on railway vehicles; testing of electromagnetic compatibility of railway vehicles; braking tests on railway vehicles; destructive material testing and non-destructive material testing**

**For the test areas marked with *, the testing laboratory is permitted to freely select standard test methods or equivalent methods without obtaining prior notification and consent from DAkkS.**

**Within the test areas marked with **, the testing laboratory is permitted to use the standardised test methods listed here with different revision levels of the standard without prior disclosure to or agreement by DAkkS.**

**The test methods listed are given by way of example. The testing laboratory has an up-to-date list of all test methods within the flexible scope of accreditation.**

*The management system requirements in DIN EN ISO/IEC 17025 are written in language relevant to operations of testing laboratories and operate generally in accordance with the principles of DIN EN ISO 9001.*

*The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH. https://www.dakks.de/en/content/accredited-bodies-dakks*

## 1. Testing of running characteristics of railway vehicles: testing of running and vibration behaviour (wheel-rail contact force, running speed, acceleration, wheel and rail profile dimensions)*

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|---|---|
| DIN EN 14363<br>2005-10 | Railway applications – Testing for the acceptance of running characteristics of railway vehicles – Testing of running behaviour and stationary tests<br>Sections 1, 2, 3, 5 (not 4 – Stationary tests) |
| ERA/TD/2012-17/INT rev 3.0<br>2014-07 | European Railway Agency; Interoperability Unit; Running Dynamics; Application of EN14363:2005 - Modifications and clarifications (Technical Document) |
| DIN EN 14363<br>2016-10 | Railway applications – Testing and simulation for the acceptance of running characteristics of railway vehicles – Running behaviour and stationary tests<br>Sections 1, 2, 3, 4, 5, 7 (not 6 – Stationary tests) |
| UIC 518<br>2009 | Testing and acceptance of running characteristics of railway vehicles – Running safety, track fatigue and running behaviour |
| DIN EN 15302<br>2011-01 | Railway applications – Method for determining the equivalent conicity |
| DIN EN 12299<br>2009-08 | Railway applications – Ride comfort for passengers – Measurement and evaluation |
| ORE C116<br>1977-04 | Interaction entre les véhicules et la voie, Rapport No 8<br>Methodes d'appréciation du confort d'un vehicule<br>(Interaction between vehicles and the track, Report No 8 Methods for assessing the comfort of a railway vehicle) |
| ISO 2631-1<br>1997-05 + A1:2010-07 | Mechanical vibration and shock – evaluation of human exposure to whole – body vibration |
| UIC 513<br>1994-07 | Guidelines for evaluating passenger comfort in relation to vibration in railway |
| VDI 2057 Blatt 1<br>2015-12 | Human exposure to mechanical vibrations<br>Whole-body vibration |

## 2. Strength tests on railway-specific components*

### 2.1. Testing of the structural behaviour of railway vehicle bodies (elongation, structural deformation, longitudinal force, support load)

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|---|---|
| DIN EN 12663-1<br>2010-07 | Structural requirements of<br>railway vehicle bodies – Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)<br>(Sections 7 to 9) |
| EN 12663-1:<br>2010+A1:2014 | Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons) (Sections 7 to 9) |
| DIN EN 12663-1<br>2015-03 | Structural requirements of railway vehicle bodies<br>Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons) (Sections 7 to 9) |
| ERRI B12/RP 60<br>2001-06 | Tests for proof of strength on railway vehicles |

### 2.2. Load analysis on vehicle components (wheelset axles, bogie frames) by on-track testing (elongation, running speed)

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|---|---|
| DIN Paperback 491/1<br>2013-03 | Railway vehicles 1 *Wheelsets*<br>Annex 1<br>(Measurement and evaluation of wheelset torsional vibrations) |
| DIN Paperback 491/2<br>2013-10 | Railway vehicles 2 *Railway applications wheelsets and bogies*<br>Application guideline for on-track testing in accordance with DIN EN 13749<br>Sections 1-4, Annex A, D, E |
| DIN EN 13104<br>2013-03 | Railway applications – Wheelsets and bogies – Powered axles – Design method<br>Sections 1, 2, 3, 4, Annex D 4.2 Experimental validation of the assumptions from Sections 5 and 6, Annex B and C |
| DIN EN 13103<br>2012-10 | Railway applications – Wheelsets and bogies – Non powered axles – Design method<br>Sections 1, 2, 3, Annex A Experimental validation of the assumptions of the calculation from Section 6.2.2, Annex C and D |

| | |
|---|---|
| DIN EN 13749<br>2011-06 | Railway applications – Wheelsets and bogies – Method of specifying the structural requirements of bogie frames<br>Metrological determination of the stresses in the on-track test in accordance with Section 4.6.2.5 |

**2.3. Specific measurements in accordance with TSI PRM: measurement of force on control elements**

| | |
|---|---|
| EN16585-1<br>2017-01 | Railway Applications - Design for PRM Use Equipment and Components onboard Rolling Stock - Part 1: Toilets |
| EN16585-3<br>2017-01 | Railway Applications - Design for PRM Use - Equipment and Components onboarding Rolling Stock - Part 3: Passageways and Internal Doors (not Section 5.2.2) |

**3. Acoustic and vibration testing in rail transport:**
**- Airborne noise (sound pressure, also for determination of sound power levels), speech intelligibility (STIPA / RASTI) on railway vehicles and their components**
**- Vibrations (vibration acceleration), track decay rates (TDR), acoustically effective rail roughness on track systems***

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|---|---|
| EN ISO 3743-1<br>2010 | Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for small movable sources in reverberant<br>fields - Part 1: Comparison method for a hard-walled test room |
| DIN EN ISO 3743-1<br>2011-01 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for small, movable sources in reverberant fields – Part 1: Comparison method for a hard-walled test room |
| EN ISO 3744<br>2010 | Acoustics- Determination of sound power levels and sound energy levels of noise sources using sound pressure- Engineering methods for an essentially free field over a reflecting plane |
| DIN EN ISO 3744<br>2011-02 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane |
| EN ISO 3745<br>2012 | Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms |

| | |
|---|---|
| DIN EN ISO 3745<br>2012-07 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for anechoic rooms and hemi-anechoic rooms |
| DIN EN ISO 3745/A1<br>2015-04 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for anechoic rooms and hemi-anechoic rooms – Amendment 1 |
| EN ISO 3746<br>2010 | Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane |
| DIN EN ISO 3746<br>2011-03 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane |
| EN ISO 3747<br>2010 | Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering/survey methods for use in situ in a reverberant environment |
| DIN EN ISO 3747<br>2011-03 | Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering/survey methods for use in situ in a reverberant environment |
| EN ISO 9614-2<br>1996 | Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning |
| DIN EN ISO 9614-2<br>1996-12 | Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning |
| EN ISO 9614-1<br>2009 | Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points |
| DIN EN ISO 9614-1<br>2009-11 | Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points |
| DIN EN ISO 3095<br>2014-07 | Acoustics – Railway applications – Measurement of noise emitted by railbound vehicles |
| DIN EN ISO 3381<br>2011-05 | Railway applications – Acoustics – Measurement of noise inside railbound vehicles |
| DIN EN 15892<br>2011-05 | Railway applications – Noise Emission – Measurement of noise inside driver’s cabs |

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|---|---|
| DIN EN 15461<br>2011-01 | Railway applications – Noise emission – Characterisation of the dynamic properties of track sections for pass by noise measurements |
| DIN EN 15610<br>2009-08 | Railway applications – Noise emission – Rail roughness measurement related to rolling noise generation |
| EN 15610<br>2019-05 | Railway applications – Acoustics – Rail and wheel roughness measurement related to noise generation |
| DIN EN 14752<br>2014-07 | Railway applications – Bodyside entrance systems for rolling stock (only acoustic measurements) |
| Verordnung<br>(EU) 1300/2014<br>2014-11 | COMMISSION REGULATION (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility<br><br>Here exclusively the measuring method in accordance with Annex G (Measurement of acoustic warning signals for exterior passenger doors) |
| DIN 45672-1<br>2018-02 | Vibration measurement associated with railway traffic systems – Part 1: Measuring method |
| DIN 45672-2<br>1995-07 | Vibration measurement associated with railway traffic systems – Part 2: Evaluation method |
| DIN EN 15153-2<br>2007-08 | Railway applications – External visible and audible warning devices for high speed trains – Part 2: Warning horns |
| DIN EN 15153-2<br>2013-04 | Railway applications – External visible and audible warning devices for trains – Part 2: Warning horns |
| UIC 644<br>1980-07 | Acoustic signalling devices of powered units used on international services |
| IEC 60286-16<br>2011 | Sound System Equipment – Part 16: Objective rating of speech ineligibility by speech transmission index |
| ISO 7626-2<br>2015 | Mechanical vibration and shock -- Experimental determination of mechanical mobility -- Part 2: Measurements using single-point translation excitation with an attached vibration exciter |
| DIN EN 17285<br>2018 | Railway applications – Acoustics – Measuring of door audible warnings; German and English version prEN 17285:2018 |

## 4. Testing of illumination level on railway vehicles*

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|---|---|
| DIN EN 13272<br>2012-05 | Railway applications – Electrical lighting for rolling stock in public transport systems, German version |
| DIN EN 15153-1<br>2013-04 | Railway applications – External visible and audible warning devices for trains – Part 1: Head, marker and tail lamps<br>From this only testing of photometric quantities in accordance with Section 6 |

## 5. Testing of electromagnetic compatibility of railway vehicles

### 5.1 Radiated emission in the railway area

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | DIN EN 50121-2 (VDE 0115-121-2) 2007-07 ** | Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world | |
| EMC | EN 50121-2:2006-07 ** | Railway applications – Electromagnetic compatibility –Part 2: Emission of the whole railway system to the outside world | |
| EMC | DIN EN 50121-3-1 (VDE 0115-121-3-1) 2007-07 ** | Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle | |
| EMC | EN 50121-3-1: 2006-07 ** | Railway applications –Electromagnetic compatibility –Part 3-1: Rolling stock – Train and complete vehicle | |
| EMC | DIN EN 50121-2 (VDE 0115-121-2) 2016-01 ** | Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world | |
| EMC | EN 50121-2:2015 ** | Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world | |
| EMC | DIN EN 50121-3-1 (VDE 0115-121-3-1) 2016-01 ** | Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle | |

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | EN 50121-3-1:2015 ** | Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle | |
| EMC | FprEN 50121-2 2014-09 | Railway applications - Electromagnetic compatibility - Part 2: Emission of the whole railway system to the outside world | |
| EMC | FprEN 50121-3-1 2014-09 | Railway applications - Electromagnetic compatibility - Part 3-1: Rolling stock - Train and complete vehicle | |

### 5.2 Compatibility with radio systems in the railway sector

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | EMV 06 2014-07 ** | Regulation No. EMV 06: Technical rules for electromagnetic compatibility – Proof of radio compatibility of railway vehicles with railway radio services (without Section 6 – Radio compatibility testing of devices) | Not Section 6 (Radio compatibility testing of devices) |

### 5.3 Compatibility with track circuits (interference current measurement)

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | Ril 807.0201:2003-06 | Selected measures and requirements for the track/vehicle system – Electromagnetic compatibility – Interference current limits for powered units | |
| EMC | Notification 01 AK EMV 2009-11 | Interference current limits for powered units – Notes on Ril 807.0201 | |

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | Ril 807.0205:2003-06 | Selected requirements and measures for the system: Track / vehicle – Electromagnetic compatibility – Measuring method for interference currents of powered units | |
| EMC | Notification 02<br>AK EMV 2009-11 | Interference current limits for powered units – Measuring method – Notes on Ril 807.0205 | |
| EMC | EMV 01 2010-03 ** | Regulation No. EMV 01: Technical rules for electromagnetic compatibility – Interference current limits for electrical power supply systems on powered units | |
| EMC | EMV 02 2010-05 ** | Regulation No. EMV 02: Technical rules for electromagnetic compatibility – Interference current limits for electrical power supply systems on passenger coaches | |
| EMC | DIN CLC/TS 50238-2 :2015 **<br>(VDE V 0831-238-2) 2016-05 | Railway applications – Compatibility between rolling stock and train detection systems – Part 2: Compatibility with track circuits; German version CLC/TS 50238-2:2015 | |
| EMC | I-50097<br>Version: 1-0 | Compatibility between rolling stock and train detection systems – Track circuits<br>Compatibility with track circuits on the infrastructure network of the Swiss Federal Railways SBB | |
| EMC | TR-EMV Part 2<br>2015-10 ** | Technical regulations for the verification of electromagnetic compatibility between railway vehicles and the infrastructure within the scope of EBO (TR-EMV)<br>Part 2 – Verification of compliance with interference current limits | |

### 5.4 Verification of compatibility with track switching devices (axle counters and wheel sensors)

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | EMV 03:2010-05 ** | Regulation No. EMV 03: Technical rules for electromagnetic compatibility; proof of compatibility of railway vehicles with track switching devices – MK, DMK, WSSB pulse generator | Not Section 8 – Run-over tests MK |
| EMC | EMV 04:2010-05 ** | Regulation No. EMV 04: Technical rules for electromagnetic compatibility; proof of compatibility of railway vehicles with track switching devices. | Only Frauscher RSR122 |
| EMC | EMV 05:2012-05** | Regulation No. EMV 05: Technical rules for electromagnetic compatibility; proof of compatibility of railway vehicles with axle counters and wheel sensors on the basis of TS 50238-3 | |
| EMC | ERA/ERTMS/033281<br>Version: 3.0<br>2015-12 | Interfaces between control-command and signalling trackside and other subsystems | Only Section 3.2 Electromagnetic compatibility |
| EMC | FprEN 50592:2016<br>DIN EN 50592<br>(VDE 0115-592)<br>2015-01 – Draft | Railway applications – Testing of rolling stock for electromagnetic compatibility with axle counters | |
| EMC | EN 50592:2016 ** | Railway applications. Testing of rolling stock for electromagnetic compatibility with axle counters | |
| EMC | DIN CLC/TS 50238-3:2013 **<br>(VDE V 0831-238-3)<br>2014-09 | Railway applications – Compatibility between rolling stock and train detection systems – Part 3: Compatibility with axle counters; | |
| EMC | TR-EMV Part 3<br>2015-10 ** | Technical regulations for the verification of electromagnetic compatibility between railway vehicles and the infrastructure within the scope of EBO (TR-EMV)<br>Part 3 – Sensor technology | Only Frauscher RSR122 and Section 4 DC and AC fields up to 250 Hz |

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMC | I-50098<br>Version: 1-0 | Compatibility between rolling stock and train detection systems – Axle counters<br>Compatibility with axle counters on the infrastructure network of the Swiss Federal Railways SBB | |

### 5.5 Testing of electromagnetic fields (EMF) for personal protection

| Technical field | Standard or test method (revision level) | Title of standard or test method | Restrictions |
|---|---|---|---|
| EMV | DIN EN 50500<br>VDE 0115-500<br>2009-03** | Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure | |
| EMV | DIN EN 50500 /A1<br>(VDE 0115-500/ A1) :<br>2015-08** | Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure | |
| EMV | EN 50500:2008/ A1<br>2015-03** | Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure | |

## 6 Brake testing on railway vehicles: Determination of braking power based on stopping distance and instantaneous deceleration measurement (speed, deceleration, pressure, temperature, traction force) *

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|---|---|
| UIC 544-1<br>2014-10 | Bremse-Bremsleistung, 6th Edition, October 2014 |
| EN 16185-2<br>2014-12 | Railway applications – Braking systems of multiple unit trains – Part 2: Test methods |
| DIN EN 16185-2<br>2015-03 | Railway applications – Braking systems of multiple unit trains – Part 2: Test methods; German version EN 16185-2:2014 |
| EN 13452-2<br>2003 | Railway applications - Braking - Mass transit brake systems - Part 2: Methods of test |
| DIN EN 13452-2<br>2005-01 | Railway applications – Braking –Mass transit brake systems – Part 2: Test methods; German version EN 13452-2:2003 |
| prEN 16834<br>2015-03 | Railway applications - Braking - Brake performance |
| Regulation (EU) 1302/2014<br>2014-11 | Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock – locomotives and passenger rolling stock' subsystem of the rail system in the European Union (in particular Section 4.2.4) |
| EN 16207<br>2014 | Railway applications - Braking - Functional and performance criteria of Magnetic Track Brake systems for use in railway (ch. 9) rolling stock |
| DIN EN 16207<br>2014-11 | Railway applications – Braking – Functional and performance criteria of Magnetic Track Brake systems for use in railway rolling stock; German version EN 16207:2014 (Section 9) |
| EBA Test Module 1<br>Rev. 15.1, 08.06.2004 | Brake testing of powered units as part of the acceptance test in accordance with § 32 EBO (type testing for individual vehicles) |

## 7. Non-destructive material testing *

### 7.1 Ultrasonic testing

| | |
|---|---|
| DIN EN ISO 16810<br>2014-07 | Non-destructive testing – Ultrasonic testing – General principles |
| DIN EN ISO 17640<br>2019-02 | Non-destructive testing of welds – Ultrasonic testing – Techniques, testing levels, and assessment |
| DIN EN 10228-3<br>2016-10 | Non-destructive testing of steel forgings – Part 3: Ultrasonic testing of ferritic or martensitic steel forgings |
| DIN EN 12680-1<br>2003-06 | Founding – Ultrasonic examination – Part 1: Steel castings for general purposes |
| DIN EN 12680-3<br>2012-02 | Founding – Ultrasonic examination – Part 3: Spheroidal graphite cast iron castings |

### 7.2 Magnetic particle testing

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|---|---|
| DIN EN ISO 9934-1<br>2017-03 | Non-destructive testing – Magnetic particle testing – Part 1: Noise control strategies |
| DIN EN ISO 17638<br>2017-03 | Non-destructive testing of welds – Magnetic particle testing of welds |
| DIN EN 1369<br>2013-01 | Founding – Magnetic particle testing |
| DIN EN 10228-1<br>2016-06 | Non-destructive testing of steel forgings – Part 1: Magnetic particle testing |

### 7.3 Dye penetrant testing

| | |
|---|---|
| DIN EN ISO 3452-1<br>2013-08 | Non-destructive testing – Liquid penetrant testing – Part 1: General principles |
| DIN EN 1371-1<br>2012-02 | Founding – Liquid penetrant testing – Part 1: Sand, gravity die and low pressure die castings |
| DIN EN 1371-2<br>2015-04 | Founding – Liquid penetrant testing – Part 2: Investment castings |

| | |
|---|---|
| DIN EN 10228-2<br>2016-10 | Non-destructive testing of steel forgings – Part 2:<br>Penetrant testing |

### 7.4 Visual testing

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|---|---|
| DIN EN ISO 17637<br>2017-04 | Non-destructive testing of welds – Visual testing of fusion-welded joints (withdrawn) |
| DIN EN 1370<br>2012-03 | Founding – Surface roughness inspection by visual tactile comparators |
| DIN EN 12454<br>1998-07 | Founding – Visual examination of surface discontinuities – Steel sand castings |
| DIN EN 13018<br>2016-06 | Non-destructive testing – Visual testing – General principles<br>*(Here Sections 5 and 6)* |

### 7.5 Radiographic testing

| | |
|---|---|
| DIN EN ISO 5579<br>2014-04 | Non-destructive testing – Radiographic testing of metallic materials using film and X- or gamma rays – Basic rules<br>*(Here Section 6)* |
| DIN EN ISO 17636-1<br>2013-05 | Non-destructive testing of welds – Radiographic testing – Part 1:<br>X- and gamma-ray techniques with film |
| DIN EN 12681-1<br>2018-02 | Founding – Radiographic examination |

### 7.6 Phased array ultrasonic testing

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|---|---|
| DIN EN ISO 13588<br>2019-07 | Non-destructive testing of welds – Ultrasonic testing – Use of automated phased array technology |

### 7.7 Other test methods

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|---|---|
| VPI 09<br>2015-07 | Maintenance of freight wagons – Non-destructive testing<br>*(Only Sections: P-NDT; P-UT-01; I-UT-A-02; J-UT-W-01; J-UT-W-02; J-UT-S-01; P-MT-01; I-MT-A-02; I-MT-A-03; I-MT-W-01; I-MT-A-W-04; I-MT-M-01; I-MT-S-01; P-PT-01; P-VT-01; I-VT-W-01; I-VT-S-01; I-VT-S-02)* |

## 8. Destructive material testing **

### 8.1 Hardness testing

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|---|---|
| DIN EN ISO 868<br>2003-10 | Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) |
| DIN EN ISO 6506-1<br>2015-02 | Metallic materials – Brinell hardness test – Part 1: Test method |
| DIN EN ISO 6507-1<br>2018-07 | Metallic materials – Vickers hardness test – Part 1: Test method |
| DIN EN ISO 6508-1<br>2016-12 | Metallic materials – Rockwell hardness test – Part 1:<br>Test method |
| DIN EN ISO 9015-1<br>2011-05 | Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints |

### 8.2 Tensile testing

| | |
|---|---|
| DIN EN ISO 4136<br>2013-02 | Destructive tests on welds in metallic materials – Transverse tensile test |
| DIN EN ISO 5178<br>2019-05 | Destructive tests on welds in metallic materials – Longitudinal tensile test on weld metal in fusion welded joints |

### 8.3 Pendulum impact testing

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|---|---|
| DIN EN ISO 148-1<br>2017-05 | Metallic materials – Charpy pendulum impact test –<br>Part 1: Test method |
| DIN EN ISO 9016<br>2013-02 | Destructive tests on welds in metallic materials – Impact tests – Test specimen location, notch orientation and examination |

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|---|---|
| DIN EN 10045-1<br>1991-04 | Metallic materials – Charpy pendulum impact test –<br>Part 1: Test method (standard withdrawn) |

### 8.4 Bend testing

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|---|---|
| DIN EN ISO 5173<br>2012-02 | Destructive tests on welds in metallic materials<br>– Bend tests |
| DIN EN ISO 7438<br>2016-07 | Metallic materials – Bend test |

### 8.5 Selected metallographic structure analysis

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|---|---|
| DIN EN ISO 17639<br>2013-12 | Destructive tests on welds in metallic materials – Macroscopic and microscopic examination of welds |

**Abbreviations used:**

| | |
|---|---|
| AK EMV | Arbeitskreis Elektromagnetische Verträglichkeit (Working Group on Electromagnetic Compatibility) |
| DIN | Deutsches Institut für Normung e.V. (German Institute for Standardisation) |
| EN | European standard |
| ERA | European Union Agency for Railways |
| ERRI | European Rail Research Institute |
| ORE | Office de Recherches et d'Essais |
| PRM | Persons with Reduced Mobility |
| Ril | Directive of Deutsche Bahn AG |
| TSI | Technical Specification for Interoperability |
| UIC | International Union of Railways |
| VDI | Verein Deutscher Ingenieure (Association of German Engineers) |
| VPI | Guideline of VPI European Rail Service GmbH |