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

Salzgitter Mannesmann Forschung GmbH
Standort Duisburg
Ehinger Straße 200, 47259 Duisburg

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

mechanic-technological testing of metallic materials; technological testing of metallic components; metallographic tests of steels; corrosion tests on various steels;
optical spark emission spectrometry (OES) of steel-, iron- and nickel-based materials;
testing of effectiveness of plastic coatings

The accreditation certificate shall only apply in connection with the notice of accreditation of 12.05.2016 with the accreditation number D-PL-11278-01 and is valid until 11.05.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 11 pages.

Registration number of the certificate: D-PL-11278-01-00

Berlin,
12.05.2016
Ralf Egner
Head of Division

Translation issued:
30.05.2016
Head of Division

This document is a translation. The definitive version is the original German accreditation certificate.
See notes overleaf.
Deutsche Akkreditierungsstelle GmbH

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The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.

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-11278-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 12.05.2016 to 11.05.2021 Date of issue: 12.05.2016

Holder of certificate:

Salzgitter Mannesmann Forschung GmbH
Standort Duisburg
Ehinger Straße 200, 47259 Duisburg

Tests in the fields:

mechanic-technological testing of metallic materials; technological testing of metallic components; metallographic tests of steels; corrosion tests on various steels; optical spark emission spectrometry (OES) of steel-, iron- and nickel-based materials; testing of effectiveness of plastic coatings

abbreviations used: see last page

The testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standard testing methods listed here with different issue dates.
The testing laboratory maintains a current list of all testing methods within the flexible scope of accreditation.

Metallographic tests of steels

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN 50602 1985-09</td>
<td>Metallographic examination - Microscopic examination of special steels using standard diagrams to assess the content of non-metallic inclusions <em>(withdrawn standard)</em></td>
</tr>
<tr>
<td>ASTM E 45 2013</td>
<td>Standard Practice for Determining the Inclusion Content of Steel</td>
</tr>
<tr>
<td>DIN EN 10247 2007-07</td>
<td>Metallographic examination of the non-metallic inclusion content of steels using standard pictures</td>
</tr>
<tr>
<td>Standard</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>ISO 4967</td>
<td>Steel - Determination of content of non-metallic inclusions - Micrographic method using Standard Diagrams</td>
</tr>
<tr>
<td>ASTM E 1181</td>
<td>Standard Test Methods for Characterizing Duplex Grain Sizes</td>
</tr>
<tr>
<td>ASTM E 930</td>
<td>Standard Test Methods for Estimating the Largest Grain Observed in a Metallographic Section (ALA Grain Size)</td>
</tr>
<tr>
<td>ASTM E 112</td>
<td>Standard Test Methods for Determining Average Grain Size</td>
</tr>
<tr>
<td>DIN EN ISO 643</td>
<td>Steels - Micrographic determination of the apparent grain size</td>
</tr>
<tr>
<td>ISO 9042</td>
<td>Steels - Manual point counting for statistically estimating the Volume fraction of a constituent with a point grid</td>
</tr>
<tr>
<td>DIN EN ISO 3887</td>
<td>Steels - Determination of depth of decaburization</td>
</tr>
<tr>
<td>ASTM E 1268</td>
<td>Standard Practice for Assessing the Degree of Bending or Orientation of Microstructures (reapproved 2007)</td>
</tr>
<tr>
<td>ASTM E 407</td>
<td>Standard Practice for Microetching Metals and Alloys</td>
</tr>
<tr>
<td>ASTM A 923</td>
<td>Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels</td>
</tr>
<tr>
<td>DIN EN ISO 1463</td>
<td>Metallic and oxide coatings - Measurement of coating thickness - Microscopical method</td>
</tr>
<tr>
<td>ASTM E 1351</td>
<td>Standard Practice for Production and Evaluation of Field Metallographic Replicas</td>
</tr>
</tbody>
</table>
Annex to the accreditation certificate D-PL-11278-01-00

DIN 54150 1977-08
Non-destructive testing - Impression methods for surface examination (Replica-technique)
(withdrawn standard)

ISO 3057 1998
Non-destructive testing - Metallographic replica techniques of surface examination

Analytical surface and surface-imaging studies using electron microscopy

A-EDWW-011 2015-10
Qualitative spatially resolved surface analysis of chemical elements typical of steels and nickel-base alloys by means of wavelength dispersive (WDS) or energy dispersive (EDS) X-ray spectroscopy using the electron beam microprobe (EPMA)

A-EDWW-012 2015-10
Quantitative spatially resolved surface analysis of chemical elements typical of steels and nickel-base alloys by means of wavelength dispersive X-ray spectroscopy (WDS) using the electron beam microprobe (EPMA)

A-EDWW-007 2015-10
Qualitative point and area analyses of chemical elements typical of steels, nickel-base alloys and non-ferrous metals by means of energy dispersive X-ray spectroscopy (EDS) using the scanning electron microscope (SEM)

A-EDWW-010 2015-03
Point and area analysis of the crystal structure and crystallographic orientations by means of electron backscatter diffraction (EBSD) of steels, nickel-base alloys and non-ferrous metals using the scanning electron microscope (SEM)

Corrosion tests of unalloyed and low-alloyed steels

NACE Standard TM0284 2011
Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking

NACE Standard M0177 2005
Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Corrosion Cracking in H₂S Environments (Method A-D)

EFC Publ. No. 16 Annex A 2009
Guidelines on Materials Requirements for Carbon and Low Alloy Steels for H₂S-Containing Environments in Oil and Gas Production
Corrosion tests at high alloyed steels


Annex to the accreditation certificate D-PL-11278-01-00

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM G 48</td>
<td>Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution</td>
</tr>
<tr>
<td>ASTM A 262</td>
<td>Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels <em>(withdrawn standard)</em></td>
</tr>
<tr>
<td>ASTM A 763</td>
<td>Standard Practices for Detecting Susceptibility to Intergranular Attack in Ferritic Stainless Steels</td>
</tr>
<tr>
<td>DIN EN ISO 3651-1</td>
<td>Determination of resistance to intergranular corrosion of stainless steels - Part 1: Austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in nitric acid medium by measurement of loss in mass (Huey test)</td>
</tr>
<tr>
<td>DIN EN ISO 3651-2</td>
<td>Determination of resistance to intergranular corrosion of stainless steels - Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulfuric acid</td>
</tr>
</tbody>
</table>

**Oxidation test in hot gases**

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A14310/60</td>
<td>Determination of resistance to oxidation of metallic materials in water vapour atmosphere with elevated temperature</td>
</tr>
<tr>
<td>ISO 21608</td>
<td>Corrosion of metals and alloys - Test method for isothermal-exposure oxidation testing under high-temperature corrosion conditions for metallic materials</td>
</tr>
<tr>
<td>ISO 26146</td>
<td>Corrosion of metals and alloys - Method for metallographic examination of samples after exposure to high temperature corrosive environments</td>
</tr>
</tbody>
</table>
Annex to the accreditation certificate D-PL-11278-01-00

Testing of plastics and coatings

DIN EN ISO 6270-2
2005-09
DIN EN ISO 9227
2012-09
DIN 30670
2012-04 +
Corrigenda 1
2012-10
DIN 30678
2013-09
DIN EN ISO 4892-2
2013-06
DIN EN ISO 1133-1
2012-03
DIN EN ISO 21809-1
2011-10

Paints and varnishes - Determination of resistance to humidity - Part 2: Procedure for exposing test specimens in condensation water atmospheres

Corrosion tests in artificial atmospheres - Salt spray tests

Polyethylen coatings of steel pipes and fittings - Requirements and testing
(Annex A: Inspection of thickness; Annex C: Cathodic disbondment (CD test); Annex D: Peel strength; Annex E: Continuity (holiday detection); Annex G: Measuring the melt mass-flow rate (MFR);
Annex H: Impact resistance and low temperature impact resistance;
Annex I: Indentation resistance; Annex J: Specific electrical coating resistance; Annex K: UV resistance; Annex L: Thermal ageing resistance)

Polypropylene coatings on steel pipes and fittings - Requirements and testing
(Annex A: Inspection of thickness; Annex C: CD Test (cathodic disbondment); Annex D: Peel strength; Annex E: Continuity (holiday detection); Annex G: Measuring the melt mass-flow rate (MFR);
Annex H: Impact resistance and low temperature impact resistance;
Annex I: Indentation resistance; Annex J: Specific electrical coating resistance; Annex K: UV resistance; Annex L: Thermal ageing resistance)

Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps

Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method

Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 1: Polyolefin coatings (3-layer PE and 3-layer PP)
Annex to the accreditation certificate D-PL-11278-01-00


Physical tests

A-EDWW-005 2015-10 Determination of the chemical composition of steel and nickel-based materials using spark emission spectroscopy for the determination of up to 30 elements

A-EDWW-006 2015-03 Quantitative determination of the oxygen and nitrogen contents by the carrier gas method

DIN EN ISO 3690 2012-07 Welding and allied processes - Determination of hydrogen content in arc weld metal

AWS A4.4M 2001 Standard Procedures for determination of the Moisture content of Welding Fluxes and Welding Electrode Coverings

Mechanical tests, Fracture mechanics

ASTM A 370 2014 Standard Test Methods and Definitions for Mechanical Testing of Steel products

DIN EN ISO 642 2000-01 Steel - Hardenability test by end quenching (Jominy test)

Tensile test

DIN EN ISO 6892-1 2009-12 Metallic materials - Tensile testing - Part 1: Method of test at room temperature (here: Method B)

DIN EN ISO 6892-2 2011-05 Metallic materials - Tensile testing - Part 2: Method of test at elevated temperature (here: Method B)
Annex to the accreditation certificate D-PL-11278-01-00


**Compression test**

DIN 50106 1978-12  Testing of Metallic Materials - Compression Test

**Pendulum impact test**


**Drop weight tear test**

API RP 5L3 2014  Conducting Drop Weight Tear Test on Line Pipe

DIN EN 10274 1999-07  Metallic materials - Drop weight tear test

SEP 1325 1982-12  Falling weight test according to W. S. Pellini

ASTM E 436-03 2014  Standard Test Method for Drop-Weight Tear Tests of Ferritic Steels
Annex to the accreditation certificate D-PL-11278-01-00

**Hardness test**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 6506-1</td>
<td>Metallic materials - Brinell hardness test - Part 1: Test method (here: 5 mm and 10 mm ball)</td>
</tr>
</tbody>
</table>

**Technological tests**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 7438</td>
<td>Metallic materials - Bend test</td>
</tr>
<tr>
<td>DIN EN ISO 5173</td>
<td>Destructive tests on welds in metallic materials - Bend tests</td>
</tr>
<tr>
<td>DNV-OS-F101</td>
<td>Submarine pipeline systems (Appendix B, Pre-straining and aging of materials, B1102 to B1110, Appendix B, Pre-straining and aging of materials, A1202 to A1210)</td>
</tr>
<tr>
<td>ASTM E 190</td>
<td>Standard Test Method for Guided Bend Test for Ductility of Welds</td>
</tr>
</tbody>
</table>

**High-temperature strength test**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 204</td>
<td>Uniaxial creep testing in tension</td>
</tr>
</tbody>
</table>
Annex to the accreditation certificate D-PL-11278-01-00

Sphere of competence fracture mechanic

Within the test ranges specified in the table below 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.

Testing of metallic materials for determining the toughness under quasi-static, monotone increasing load

Type of tests

<table>
<thead>
<tr>
<th>Type of test</th>
<th>Measurement category/Test parameter</th>
<th>Measurement and test range</th>
<th>Maximum uncertainty according to</th>
<th>Characteristical test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasi-static and monotonically increasing load</td>
<td>Strength (Tensile, Pressure)</td>
<td>2.5 to 250 kN 6.0 to 600 kN 8.0 to 500 KN</td>
<td>Category 1 (DIN EN ISO 7500-2)</td>
<td>ASTM E 1820:2013 BS 7448 Part 1:1991</td>
</tr>
<tr>
<td>Displacement</td>
<td>0 mm to 5 mm ($L_0 = 2$ mm) 0 mm to 12 mm ($L_0 = 6$ mm)</td>
<td>Category 1 (DIN EN ISO 9513)</td>
<td>BS EN ISO 15653:2010 ISO 12135</td>
<td></td>
</tr>
</tbody>
</table>

Pressure vessel test

DIN EN 12245 2009-06 Transportable gas cylinders - Fully wrapped composite cylinders (withdrawn standard)

DIN EN ISO 9809-1 2010-10 Gas cylinders - Refillable seamless steel gas cylinders - Design, construction and testing - Part 1: Quenched and tempered steel cylinders with tensile strength less than 1.100 MPa

DIN EN ISO 9809-2 2010-10 Gas cylinders - Refillable seamless steel gas cylinders - Design, construction and testing - Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1.100 MPa

DIN EN ISO 11439 2013-09 Gas cylinders - High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles (withdrawn standard)
Annex to the accreditation certificate D-PL-11278-01-00

ECE 110 2002-02

Uniform provisions concerning the approval of
I. Specific components of motor vehicles using compressed natural Gas (CNG) in their propulsion system
II. Vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system
Annex 3, Attachment A
(here:
A.6 : Leak Before Break (LBB) performance test
A.11: Hydrostatic test / Option 2: Proof pressure test
A.12: Hydrostatic pressure burst test
A.13: Ambient temperature pressure cycle test
A.14: Acid environmental test
A.17: Composite flaw tolerance test)

abbreviations used:

A-EDXX -XXX House procedures, work instructions of the laboratories of the Salzgitter Mannesmann Forschung GmbH, Standort Duisburg
API American Petrol Industry
ASTM American Society of Testing and Materials
AVS Working instruction of the Kraftwerkunion (KWU)
AWS American Welding Society
BS British Standards
DNV Det Norske Veritas
ECE Economic Commission for Europe
EFC European Federation of Corrosion
IACS International Association of Classification Societies
JIS Japanese Industrial Standards
NACE National Association of Corrosion Engineers
OTI Offshore Technology Information
SEP Stahl-Eisen-Prüfblatt des Vereins Deutscher Eisenhüttenleute e. V.