

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-11278-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 09.12.2020

Date of issue: 01.02.2021

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

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

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

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.**

The testing laboratory maintains a current list of all testing 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>*

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1 Metallographic tests of steels ***

ASTM E 45-18a 2018	Standard Test Methods for Determining the Inclusion Content of Steel
ASTM E 112-13 2013	Standard Test Methods for Determining Average Grain Size
ASTM E 562-19 2019	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count
ASTM E 1351-01 (2012) 2012	Standard Practice for Production and Evaluation of Field Metallographic Replicas
DIN 50602 1985-09	Metallographic examination - Microscopic examination of special steels using standard diagrams to assess the content of non-metallic inclusions <i>(withdrawn standard)</i>
DIN 54150 1977-08	Non-destructive testing - Impression methods for surface examination (Replica-technique) <i>(withdrawn standard)</i>
DIN EN 10247 2017-09	Micrographic examination of the non-metallic inclusion content of steels using standard pictures
DIN EN ISO 643 2013-05	Steels - Micrographic determination of the apparent grain size
DIN EN ISO 3887 2018-05	Steels - Determination of the depth of decarburization
ISO 3057 1998-03	Non-destructive testing - Metallographic replica techniques of surface examination
ISO 4967 2013-07	Steel - Determination of content of non-metallic inclusions - Micrographic method using standard diagrams

2 Analytical surface and surface-imaging studies using electron microscopy

A-EDWW-007 2020-02	EDS analysis by means of the scanning electron microscope
A-EDWW-010 2020-02	EBSD analysis by means of the scanning electron microscope

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A-EDWW-011
2020-08 Quantitative and qualitative micro-analysis by means of the electron probe microanalysis technique (EPMA)

A-EDWW-012
2020-02 EDS analysis by means of the electron probe microanalysis technique

3 Corrosion tests of unalloyed and low-alloyed steels according standards ***

ASTM G 39-99 (2016)
2016 Standard Practice for Preparation and Use of Bent-Beam Stress-Corrosion Test Specimens

BS 8701
2016-06 Full ring ovalization test for determining the susceptibility to cracking of linepipe steels in sour service. Test method

DIN 50915
1993-09 Testing the resistance of unalloyed and low alloy steels to intergranular stress corrosion cracking by attack of nitrate medium - Welded and unwelded materials

DIN EN ISO 7539-1
2013-04 Corrosion of metals and alloys - Stress corrosion testing - Part 1: General guidance on testing procedures

DIN EN ISO 7539-2
1995-08 Corrosion of metals and alloys - Stress corrosion testing - Part 2: Preparation and use of bent-beam specimen

DIN EN ISO 7539-3
1995-08 Corrosion of metals and alloys - Stress corrosion testing - Part 3: Preparation and use of U-bend specimens

DIN EN ISO 7539-4
1995-08 Corrosion of metals and alloys - Stress corrosion testing - Part 4: Preparation and use of uniaxially loaded tension specimens

DIN EN ISO 7539-5
1995-08 Corrosion of metals and alloys - Stress corrosion testing - Part 5: Preparation and use of C-ring specimens

DIN EN ISO 7539-7
2018-05 Corrosion of metals and alloys - Stress corrosion testing - Part 7: Method for slow strain rate testing
(here: without force, length and measurands based upon)

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4 Corrosion tests of unalloyed and low-alloyed steels according other standards ***

EFC Publ. No. 16 Annex A 2009	Guidelines on Materials Requirements for Carbon and Low Alloy Steels for H ₂ S-Containing Environments in Oil and Gas Production
NACE Standard TM0177 2016	Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H ₂ S Environments
NACE Standard TM0284 2016	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking
NACE Standard TM0316 2016	Four-Point Bend Testing of Materials for Oil and Gas Applications

5 Corrosion test of high-alloyed steels ***

ASTM A 262-15 2015	Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A 763-15 2015	Standard Practices for Detecting Susceptibility to Intergranular Attack in Ferritic Stainless Steels
ASTM G28-02(2015) 2015	Standard test Methods for Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys
ASTM G 36-94(2018) 2018	Standard Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution
ASTM G 46-94(2018) 2018	Standard Guide for Examination and Evaluation of Pitting Corrosion
ASTM G 48-11(2015) 2015	Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution
ASTM G 78-15 2015	Standard Guide for Crevice Corrosion Testing of Iron-Base and Nickel-Base Stainless Alloys in Seawater and Other Chloride-Containing Aqueous Environments
DIN EN ISO 3651-1 1998-08	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)

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DIN EN ISO 3651-2
1998-08 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

6 Tests of plastics and coatings ***

DIN 30670
2012-04 +
Corrigendum 1
2012-10 Polyethylen coatings of steel pipes and fittings - Requirements and testings
(here:
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)

DIN 30678
2013-09 Polypropylene coatings on steel pipes and fittings - Requirements and testing
(here:
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)

DIN EN ISO 1133-1
2012-03 Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method

DIN EN ISO 4892-2
2013-06 Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps

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)

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DIN EN ISO 9227
2017-07

Corrosion tests in artificial atmospheres - Salt spray tests

DIN EN ISO 21809-1
2011-10

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) (*withdrawn standard*)

(here:

Annex A: Inspection of thickness

Annex B: Holiday detection test

Annex C: Peel strength test

Annex E: Impact test

Annex F: Indentation test

Annex G: UV ageing and thermal ageing test

Annex H: Cathodic disbondment test

Annex I: Flexibility test

Annex K: Total volatile/moisture content of the epoxy powder - Mass loss

Annex M: Hot water immersion test)

DIN EN ISO 21809-2
2015-03

Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 2: Single layer fusion-bonded epoxy coatings

(here:

Annex A.4: Dry adhesion test

Annex A.5: Total volatile/moisture content of the epoxy powder - Mass loss

Annex A.9: Cathodic disbondment of coatings for standard temperatures up to 95 °C

A.13: Flexibility of the coating

Annex A.14: Resistance to impact of the coating

Annex A.15: Cathodic disbondment of strained coating

Annex A.16 Hot-water adhesion of the coating)

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ISO 21809-1
2018-10

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)
(here:
Annex A: Inspection of thickness
Annex B: Holiday detection test
Annex C: Peel strength test
Annex E: Impact test
Annex F: Indentation test
Annex G: UV ageing and thermal ageing test
Annex H: Cathodic disbondment test
Annex I: Flexibility test
Annex K: Total volatile/moisture content of the epoxy powder - Mass loss
Annex M: Hot water immersion test)

ISO 21809-2
2014-11

Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 2: Single layer fusion-bonded epoxy coatings
(here:
Annex A.4: Dry adhesion test
Annex A.5: Total volatile/moisture content of the epoxy powder - Mass loss
Annex A.9: Cathodic disbondment of coatings for standard temperatures up to 95 °C
A.13: Flexibility of the coating
Annex A.14: Resistance to impact of the coating
Annex A.15: Cathodic disbondment of strained coating
Annex A.16 Hot-water adhesion of the coating)

7 Physical tests according standards ***

DIN EN ISO 3690
2018-12

Welding and allied processes - Determination of hydrogen content in arc weld metal

8 Physical tests according in-house and other procedures

A-EDWW-005
2020-08

Determination of the chemical composition of steel and nickel-based materials using spark emission spectroscopy for the determination of up to 30 elements
(Restriction: *no nickel-base alloys*)

AWS A4.4M
2001

Standard Procedures for determination of the Moisture content of Welding Fluxes and Welding Electrode Coverings

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9 Mechanical-technological testing, fracture mechanics ***

ASTM A 370-19e1 2019	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)

10 Tension test ***

ASTM E 8/E8M-16ae1 2016	Standard Test Methods for Tension Testing of Metallic Materials
ASTM E 21-17e1 2017	Standard Test Methods for Elevated Temperature Tension Tests of Metallic Materials
DIN EN ISO 6892-1 2020-06	Metallic materials - Tensile testing - Part 1: Method of test at room temperature (here: <i>Procedure B</i>)
DIN EN ISO 6892-2 2018-09	Metallic materials - Tensile testing - Part 2: Method of test at elevated temperature (here: <i>Procedure B</i>)

11 Compression test ***

DIN 50106 2016-11	Testing of metallic materials - Compression test at room temperature
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12 Pendulum impact test ***

ASTM E 23-18 2018	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
DIN EN ISO 148-1 2017-05	Metallic materials - Charpy pendulum impact test - Part 1: Test method

13 Drop weight tear test according standards ***

DIN EN 10274 1999-07	Metallic materials - Drop weight tear test
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14 Drop weight tear test according other procedures

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

15 Hardness test ***

DIN EN ISO 6506-1 Metallic materials - Brinell hardness test - Part 1: Test method
2015-02 (here: $\varnothing 2,5 \text{ mm ball}$)

DIN EN ISO 6507-1 Metallic materials - Vickers hardness test - Part 1: Test method
2018-07

DIN EN ISO 6508-1 Metallic materials - Rockwell hardness test - Part 1: Test method
2016-12 (here: *Scale C*)

16 Technological tests according standards ***

ASTM E 190-14 Standard Test Method for Guided Bend Test for Ductility of Welds
2014

DIN EN ISO 5173 Destructive tests on welds in metallic materials - Bend tests
2012-02

DIN EN ISO 7438 Metallic materials - Bend test
2016-07

17 Technological tests according other procedures

DNV-OS-F101 Submarine pipeline systems
2013-10 + (Appendix B, Pre-straining and aging of materials, B1102 to B1110,
2007-10 Appendix B, Pre-straining and aging of materials, A1202 to A1210)

18 High-temperature strength test ***

DIN EN ISO 204 Metallic materials - Uniaxial creep testing in tension - Method of test
2019-04

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19 Competence area fracture mechanics *

(Determination of fracture toughness K_{Ic} , of crack tip opening displacement CTOD and of experimental equivalent for J-integral at metallic materials by force and displacement measurements on the sample under quasistatic, monotonous increasing load)

BS 7448-1 1991-12	Fracture mechanics toughness tests. Method for determination of K_{Ic} , critical CTOD and critical J values of metallic materials
BS 8571 2018-11	Method of test for determination of fracture toughness in metallic materials using single edge notched tension (SENT) specimens
DIN EN ISO 15653 2018-06	Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds
ISO 12135 2016-11	Metallic materials - Unified method of test for the determination of quasistatic fracture toughness

20 Pressure vessel tests according standards ***

DIN EN 12245 2012-03	Transportable gas cylinders - Fully wrapped composite cylinders
DIN EN ISO 9809-1 2020-02	Gas cylinders - Design, construction and testing of refillable seamless steel gas cylinders and tubes - Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1100 MPa
DIN EN ISO 9809-2 2020-02	Gas cylinders and tubes - Design, construction and testing of refillable seamless steel gas cylinders and tubes - Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 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

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ISO 11119-2
2012-07

Gas cylinders - Design, construction and testing of refillable composite gas cylinders and tubes - Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners
(here:
8.5.1 Proof pressure test
8.5.2 Hydraulic volumetric expansion test
8.5.3 Liner burst test
8.5.4 Cylinder burst test
8.5.5 Ambient cycle test
8.5.7 Flaw test
8.5.8 Drop test)

21 Pressure vessel tests according other procedures

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	In-house procedures, work instructions of the laboratories of the Salzgitter Mannesmann Forschung GmbH, Standort Duisburg
API	American Petroleum Institute
ASTM	American Society of Testing and Materials
AWS	American Welding Society
BS	British Standards
DIN	German Institute for Standardization
DNV	Det Norske Veritas
ECE	Economic Commission for Europe
EFC	European Federation of Corrosion

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EN	European Standard
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
NACE	National Association of Corrosion Engineers
SEP	Steel-iron test sheet from the Association of German Ironworkers e. g.