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

Element Materials Technology Hamburg GmbH
Tempowerkring 11, 21079 Hamburg

at the locations

Tempowerkring 11, 21079 Hamburg
Lahnstraße 26, 45478 Mülheim/Ruhr
Siemensstraße 17, 73733 Esslingen
Südstraße 59, 44625 Herne

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

structural mechanical and metallographic testing;
selected corrosion tests and chemical tests using stationary and mobile vacuum emission spectrometer as well as manual non-destructive tests (ultrasonic test, magnetic particle test, penetrant test, visual test and digital radiographic) on metallic materials

The accreditation certificate shall only apply in connection with the notice of accreditation of 24.05.2017 with the accreditation number D-PL-11166-01 and is valid until 19.06.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 12 pages.

Registration number of the certificate: D-PL-11166-01-00

Berlin, 24.05.2017
Dipl.-Ing. (FH) Ralf Egner
Head of Division

Translation issued: 20.03.2018

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

Annex to the Accreditation Certificate D-PL-11166-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 24.05.2017 to 19.06.2021          Date of issue: 20.03.2018

Holder of certificate:

Element Materials Technology Hamburg GmbH
Tempowerkring 11, 21079 Hamburg

at the locations

Tempowerkring 11, 21079 Hamburg
Lahnstraße 26, 45478 Mülheim/Ruhr
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Tests in the fields:

structural mechanical and metallographic testing;
selected corrosion tests and chemical tests using stationary and mobile vacuum emission spectrometer as well as manual non-destructive tests (ultrasonic test, magnetic particle test, penetrant test, visual test and digital radiographic) on metallic materials

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 test methods are indicated with the symbols of locations in which they are carried out as follows:

HER = Herne, MH = Mülheim, ES = Esslingen, HH = Hamburg

This document is a translation. The definitive version is the original German annex to the accreditation certificate.
1 Structural mechanical tests

<table>
<thead>
<tr>
<th>Standard/Revision</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 642 2000-01</td>
<td>Steel - Hardenability test by end quenching (Jominy test)</td>
<td>HER, MH</td>
</tr>
<tr>
<td>DIN EN 1561 2012-01</td>
<td>Founding - Grey cast iron</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 1562 2012-05</td>
<td>Founding - Malleable cast iron</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 7438 2016-01</td>
<td>Metallic materials - Bend test</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>Standard Number</td>
<td>Standard Description</td>
<td>Analysts</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>DIN EN 10164 2005-03</td>
<td>Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 8495 2014-03</td>
<td>Metallic materials - Tube - Ring-expanding test</td>
<td>HER, ES</td>
</tr>
<tr>
<td>DIN EN ISO 2639 2003-04</td>
<td>Steels - Determination and verification of the depth of carburized and hardened cases</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10328 2005-04</td>
<td>Iron and steel - Determination of the conventional depth of hardening after surface heating</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN 50190-3 1979-03</td>
<td>Hardness depth of heat-treated parts - Determination of the effective depth of hardening after nitriding</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>SEP 1390 1996-07</td>
<td>Beadbend test</td>
<td>HER, MH, ES, HH</td>
</tr>
</tbody>
</table>
Annex to the accreditation certificate D-PL-11166-01-00

ASTM E 8/E 8M 2015
Standard Test Methods for Tension Testing of Metallic Materials
HER, MH, ES, HH

ASTM E 21 2009
Standard Test Methods for Elevated Temperature Tension Tests of Metallic Materials
HER, MH, ES, HH

ASTM A 770/ A 770M 2012
Standard Specification for Through-Thickness Tension Testing of Steel Plates for Special Applications
HER, MH, ES, HH

ASTM E 384 2011
Standard Test Method for Knoop and Vickers Hardness of Metallic Materials
HER, ES

ASTM E 23c 2012
Standard Test Methods for Notched Bar Impact Testing of Metallic Materials (Restriction: Performance according to Charpy)
HER, HH

DIN EN ISO 17660-1 2006-12 + Amendment 1 2007-08
Welding - Welding of reinforcing steel - Part 1: Load-bearing welded joints
Para 14: Examination and testing of samples
Para. 14.2: Tensile test
Para. 14.3: Shear test
Para. 14.3: Bend test
HER, MH, HH

DIN EN ISO 17660-2 2006-12 + Amendment 1 2007-08
Welding - Welding of reinforcing steel - Part 2: Non load-bearing welded joints
Para. 14: Examination and testing of samples - Tensile test
HER, MH

DIN EN 15045-2 2014-11
Non-preloaded structural bolting assemblies - Part 2: Suitability test
HER, MH, ES, HH

DIN EN ISO 5178 2011-05
Destructive tests on welds in metallic materials - Longitudinal tensile test on weld metal in fusion welded joints
HER, MH, ES, HH

ASTM E 436 2003 (reapproval 2014)
Standard Test Method for Drop-Weight Tear Tests of Ferritic Steels
HER
## Metallographic Examinations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 1463 2004-08</td>
<td>Metallic and oxide coatings - Measurement of coating thickness - Microscopical method</td>
</tr>
<tr>
<td>DIN EN ISO 17639 2013-12</td>
<td>Destructive test on welds in metallic materials – Macroscopic and microscopic examination of welds</td>
</tr>
<tr>
<td>ISO 4968 1979-11</td>
<td>Steel - Macrographic examination by sulphur print (Baumann method)</td>
</tr>
<tr>
<td>DIN EN ISO 3887 2003-10</td>
<td>Determination of depth of decarburization</td>
</tr>
<tr>
<td>DIN EN ISO 643 2015-06</td>
<td>Steel - Microphotographic determination of average Grain Size</td>
</tr>
<tr>
<td>DIN 54150 1977-08</td>
<td>Non-destructive testing - Impression methods for surface examination (Replica-technique) <em>(withdrawn standard)</em></td>
</tr>
<tr>
<td>ISO 3057 1998-03</td>
<td>Non-destructive testing - Metallographic replica techniques of surface examination</td>
</tr>
<tr>
<td>ASTM E 1351 2012</td>
<td>Standard Practice for Production and Evaluation of Field Metallographic Replicas</td>
</tr>
<tr>
<td>DIN EN 10247 2007-07</td>
<td>Micrographic examination of the non-metallic inclusion content of steels using standard pictures</td>
</tr>
<tr>
<td>ISO 4967 2013-07</td>
<td>Steel - Determination of content of nonmetallic inclusions - Micrographic method using standard diagrams</td>
</tr>
<tr>
<td>SEP 1520 1998-09</td>
<td>Microscopic examination of carbide formation with image series</td>
</tr>
<tr>
<td>ASTM E 112 2012</td>
<td>Standard Test Methods for Determining Average Grain Size</td>
</tr>
<tr>
<td>ASTM E 407 2015</td>
<td>Standard Practice for Microetching Metals and Alloys</td>
</tr>
</tbody>
</table>

Period of validity: 24.05.2017 to 19.06.2021
Annex to the accreditation certificate D-PL-11166-01-00

3 Chemical Examinations

MFA-3-2D
2015-11
Determination by the vacuum emission spectrometer of C, Si, Mn, P, S, Ni, Cr, Mo, V, Al, Cu, W, Co, Nb, Ti, B, As, Zr, Ca, Pb, Te, Sb, Fe, Zn, Mg, Sn, N in Ni-, Al-, Cu-alloys, in low- and high-alloy steels as well as in chilled cast iron (only ES) and in Co alloys (only ES), Ti- and Mg-alloys (only HH, without gas)

MFA-3-3D
2015-11
Determination by the vacuum emission spectrometer of C, Si, Mn, P, S, Ni, Cr, Mo, V, Al, Cu, W, Co, Nb, Ti, B, As, Zr, Ca, Pb, Te, Sb, Fe, Zn, Mg, Sn, in Ni-, Al-, Cu-alloys, in low- and high-alloy steels; performance of spectroscopic analyses by means of the portable Belec- Compactport A device

MFA-3-4D
2015-11
Determination by the emission spectrometer of C, Si, Mn, P, S, Ni, Cr, Mo, V, Al, Cu, W, Co, Nb, Ti, B, As, Zr, Ca, Pb, Te, Sb, Fe, Zn, Mg, Sn, in Ni-, Al-, Cu-alloys, in low- and high-alloy steels; Implementation of positive material identification and the determination of the chemical composition of iron and non-ferrous metals with the portable spectrum analyzer "WAS PMI-MASTER PLUS"
Annex to the accreditation certificate D-PL-11166-01-00

4 Corrosion Tests

MFA-3-5D 2015-11
Work Instruction Positive Material Identification (PMI)  HER, MH, ES, HH
Positive Alloy Material Identification (PAMI)

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 by measuring the mass loss (Huey test)  HER, ES, HH

DIN EN ISO 3651-2 1998-08
Determination of resistance to intergranular corrosion of stainless steels - Part 2: Austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulphuric acid  HER, ES, HH

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  HER, ES

SEP 1877 1994-07
Testing of the resistance of high-alloy, corrosion-proof materials against intercrystalline corrosion  HER, ES, HH

DIN EN 10229 1998-11
Evaluation of resistance of steel products to hydrogen induced cracking (HIC)  ES

ASTM A 262 2010

ASTM G 28 2015

ASTM G 48 2015
Standard Test Methods for Pitting and Crevice Corrosion Resistance of stainless Steels and Related Alloys by Use of Ferric Chloride Solution  HER, ES, HH

Resolution MSC. 215(82) 2006-12
Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-Side Spaces of Bulk Carriers  HH

DIN EN ISO 9400 1995-12
Nickel-based alloys - Determination of resistance to intergranular corrosion  HER, MH, ES, HH
5 Ultrasonic Examinations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Accreditation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN ISO 16826 2014-06</td>
<td>Non-destructive testing - Ultrasonic testing - Examination for discontinuities perpendicular to the surface</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 17640 2011-04</td>
<td>Non-destructive testing of welds - Ultrasonic testing - Techniques, testing levels, and assessment</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 22825 2012-08</td>
<td>Non-destructive testing of welds - Ultrasonic testing - Testing of welds in austenitic steels and nickel-based alloys</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10160 1999-09</td>
<td>Ultrasonic testing of steel flat products of thickness equal or greater than 6 mm (reflection method)</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10228-3 2012-12</td>
<td>Non-destructive testing of steel forgings - Part 3: Ultrasonic testing of ferritic or martensitic steel forgings</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10228-4 2012-12</td>
<td>Non-destructive testing of steel forgings - Part 4: Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10307 2002-03</td>
<td>Non-destructive testing - Ultrasonic testing of flat products of austenitic and austenitic-ferritic stainless steel greater than 6 mm (reflection method)</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10308 2002-03</td>
<td>Non-destructive testing - Ultrasonic testing of steel bars</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 10893-8 2011-07</td>
<td>Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>Standard/Method</td>
<td>Description</td>
<td>Approval</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>DIN EN ISO 10893-9 2011-07</td>
<td>Non-destructive testing of steel tubes - Part 9: Automated ultrasonic testing for the detection of laminar imperfections in strip/plate used for the manufacture of welded steel tubes</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 10893-10 2011-07</td>
<td>Non-destructive testing of steel tubes - Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 10893-11 2011-07</td>
<td>Non-destructive testing of steel tubes - Part 11: Automated ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN ISO 10893-12 2011-07</td>
<td>Non-destructive testing of steel tubes - Part 12: Automated full peripheral ultrasonic thickness testing of seamless and welded (except submerged arc-welded) steel tubes</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>SEP 1916 1989-12</td>
<td>Non-destructive examination of fusion-welded ferritic steel tubes</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>SEP 1917 1994-09</td>
<td>Non-destructive examination of electrically pressure welded ferritic steel tubes</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 12680-1 2003-06</td>
<td>Founding - Ultrasonic examination - Part 1: Steel castings for general purposes</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 12680-2 2003-06</td>
<td>Founding - Ultrasonic examination - Part 2: Steel castings for highly stressed components</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 12680-3 2012-02</td>
<td>Founding - Ultrasonic testing - Part 3: Spheroidal graphite cast iron castings</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>SEP 1923 2009-02</td>
<td>Ultrasonic testing of steel forgings to stringent standards, in particular for components in turbine and generator systems</td>
<td>HER, MH, ES, HH</td>
</tr>
<tr>
<td>DIN EN 10306 2002-04</td>
<td>Iron and steel - Ultrasonic testing of H beams with parallel flanges and IPE beams</td>
<td>HER, MH, ES, HH</td>
</tr>
</tbody>
</table>
Annex to the accreditation certificate D-PL-11166-01-00

AD 2000-Merkblatt HP 5/3 2015-04
Manufacture and testing of joints - Non-destructive testing of the welds
HER, MH, ES, HH

DIN ISO 4386-1 2015-12
Plain bearings - Metallic multilayer plain bearings - Non-destructive ultrasonic testing of bond
HER, MH, ES, HH

DIN EN 14127 2011-04
Non-destructive testing - Ultrasonic thickness measurement
HER, MH, ES, HH

ASME Section V, Article 4 & 5
Ultrasonic Examination
HER, MH, ES, HH

ASME Section V, Article 4 & 5 & 23
Straight-Beam Ultrasonic Examination of Steel Plates (UT)
HER, MH, ES, HH

ASME Section VIII
Ultrasonic Examination of Welds
HER, MH, ES, HH

SEP 1921 1984-12
Ultrasonic testing of forgings and forged steel bars with diameters or edge lengths of ~ 100 mm and above
HER, MH, ES, HH

6 Magnetic Particle Examinations

DIN EN ISO 9934-1 2015-12
Non-destructive testing - Magnetic particle testing - Part 1: General rules
HER, MH, ES, HH

DIN EN ISO 17638 2010-03
Non-destructive Testing of welded joints - Magnetic particle testing of welded joints
HER, MH, ES, HH

DIN EN 1369 2013-01
Founding - Magnetic particle testing
HER, MH, ES, HH

DIN EN 10228-1 1999-07
Non-destructive testing of steel forgings - Part 1: Magnetic particle testing
HER, MH, ES, HH

DIN EN ISO 10893-5 2011-07
Non-destructive testing of steel tubes - Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections
HER, MH, ES, HH

ASME Section V Article 7 & 25 2010
Magnetic particle testing
HER, MH, ES, HH

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Annex to the accreditation certificate D-PL-11166-01-00

7 Penetrant Examination

DIN EN ISO 3452-1 2014-09
Non-destructive testing - Penetrant testing - Part 1: General principles
HER, MH, ES, HH

DIN EN ISO 3452-5 2009-04
Non-destructive testing - Penetrant testing - Part 5: Penetrant testing at temperatures more than 50 °C
HER, MH, ES, HH

DIN EN ISO 3452-6 2009-04
Non-destructive testing - Penetrant testing - Part 6: Penetrant testing at temperatures less than 10 °C
HER, MH, ES, HH

DIN EN 10228-2 1998-06
Non-destructive testing of steel forgings - Part 2: Penetrant testing
HER, MH, ES, HH

DIN EN 1371-1 2012-02
Founding - Liquid penetrant testing - Part 1: Sand, gravity die and low pressure die castings
HER, MH, ES, HH

DIN EN 1371-2 2015-04
Founding - Liquid penetrant inspection - Part 2: Investment castings
HER, MH, ES, HH

ASME Section V Article 6 & 24 (2010)
ASME Section VIII Liquid Penetrant Examination
HER, MH, ES, HH

8 Visual Testing

DIN EN ISO 17637 2011-05
Non-destructive testing of welds - Visual testing of fusion-welded joints
HER, MH, ES, HH

DIN EN 13018 2001-07
Non-destructive testing - Visual testing - General principles
HER, MH, ES, HH

DIN EN 1370 2012-03
Founding - Examination of surface condition
HER, MH, ES, HH

DIN EN 10163-1 Amendment 2007-05
Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections - Part 1: General requirements
HER, MH, ES, HH

DIN EN 10163-2 2005-03
Delivery requirements for surface conditions of hot-rolled steel plates, wide flats and sections - Part 2: Plate and wide flats
HER, MH, ES, HH

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Annex to the accreditation certificate D-PL-11166-01-00

**DIN EN 10163-3**
2005-03

Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections - Part 3: Sections

HER, MH, ES, HH

**DIN EN ISO 8501-1**
2007-12

Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings

HER, MH, ES, HH

**DIN EN ISO 8501-2**
2002-03

Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings

HER, MH, ES, HH

**DIN EN ISO 8501-3**
2007-10

Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 3: Preparation grades of welds, edges and other areas with surface imperfections

HER, MH, ES, HH

9 **Digital Radiography**

**DIN EN ISO 17636-2**
2013-05

Non-destructive testing of welds - Radiographic testing Part 2: X- and gamma-ray techniques with digital detectors

HH

**abbreviation used:**

ASME
American Society of Mechanical Engineers

ASTM
American Society for Testing and Materials

GLP
Examination procedures belong to Germanischer Lloyd Prüflabor GmbH

SEP
Steel-Iron-test sheets from the German Iron and Steel Institute

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