CERTIFICATE OF ACCREDITATION

Hyundai Steel Company(Dangjin Laboratory)

Accreditation No. : KT533

Corporation Registration No. : 120111-0001743

Address of Laboratory : (Branch site)1480, Bukbusaneop-ro Songak-eup, Dangjin-si, Chungcheongnam-do, Republic of Korea

Date of Initial Accreditation : November 06, 2012

Validity of Accreditation : March 05, 2021 ~ March 04, 2025

Scope of Accreditation : Attached Annex

Date of issue : March 24, 2021

This testing laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025 : 2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to Joint ISO-ILAC-IAF Communiqué).

Sanghoon Lee

Head
Korea Laboratory Accreditation Scheme

No. KT533

01. Mechanical Testing

01.001 Metals and Related Products

Test method	Standard designation	Test range	Site	Field testing
API RP 5L3:2014	Drop-Weight Tear Tests on Line Pipe	(0 ~ 100) % Temperature : (-80 ~ room temperature) ℃	BS	N
AS 1391:2020	Metallic materials - Tensile testing at ambient temperature	Load : (10 ~ 1 600) kN Elongation : (0 ~ 60) % Reduction of area : (1 ~ 80) %	BS	N
AS 1544.2:2003	Methods for impact tests on metals charpy V-notch	Absorbed Energy : max. 640 J V-notch Liquid medium Temperature : -196 ℃, (-170 ~ room temperature) ℃	BS	N
ASTM E1382-97	Standard test methods for determining Average grain size using semiautomatic and automatic image analysis	Grain count method (single phase grain, planimetric procedure)	BS	N
ASTM E23-18	Standard test methods for notched bar impact testing of metallic materials	Absorbed Energy : max. 640 J V-notch Liquid medium Temperature : -196 ℃, (-170 ~ room temperature) ℃	BS	N
ASTM E290-14	Standard test methods for bend testing of material for ductility	R : (5 ~ 120) mm Flat wrought product	BS	N
ASTM E436-03	Standard test method for drop-weight tear tests of ferritic steels	(0 ~ 100) % Temperature : (-80 ~ room temperature) ℃	BS	N
ASTM E8/E8M-16a	Standard test methods for tension testing of metallic materials	Load : (10 ~ 1 600) kN Elongation : (0 ~ 60) % Reduction of area : (1 ~ 80) %	BS	N

No. KT533

Test method	Standard designation	Test range	Site	Field testing
ISO 148-1:2016	Metallic materials - Charpy pendulum impact test - Part 1 : Test method	Absorbed Energy : max. 640 J V-notch Liquid medium Temperature : -196 ℃, (-170 ~ room temperature) ℃	BS	N
ISO 4967:2013	Steel - Determination of content of nonmetallic inclusions - Micrographic method using standard diagrams	A method	BS	N
ISO 6506-1:2014	Metallic materials - Brinell hardness test - Part 1 : Test method	(100 ~ 400) HBW	BS	N
ISO 6507-1:2018	Metallic materials - Vickers hardness test - Part 1 : Test method	(100 ~ 300) HV	BS	N
ISO 6508-1:2016	Metallic materials - Rockwell hardness test - Part 1 : Test method	(40 ~ 90) HRB (20 ~ 60) HRC	BS	N
ISO 6892-1:2019	Metallic materials - Tensile testing - Part 1 : Method of test at room temperature	Load : (10 ~ 1 600) kN Elongation : (0 ~ 60) % Reduction of area : (1 ~ 80) %	BS	N
ISO 7438:2020	Metallic materials - Bend test	R : (5 ~ 120) mm Flat wrought product	BS	N
JIS G 0555:2020	Microscopic testing method for the non-metallic inclusions in steel	A method	BS	N
JIS Z 2241:2011	Metallic materials - Tensile testing - Method of test at room temperature	Load : (10 ~ 1 600) kN Elongation : (0 ~ 60) % Reduction of area : (1 ~ 80) %	BS	N
JIS Z 2242:2018	Method for charpy pendulum impact test of metallic materials	Absorbed Energy : max. 640 J V-notch Liquid medium Temperature : -196 ℃, (-170 ~ room temperature) ℃	BS	N

No. KT533

Test method	Standard designation	Test range	Site	Field testing
JIS Z 2243-1:2018	Brinell hardness test - Part 1 : Test method	(100 ~ 400) HBW	BS	N
JIS Z 2243-2:2018	Brinell hardness test - Part 2 : Table of hardness value	(100 ~ 400) HBW	BS	N
JIS Z 2244:2009	Vickers hardness test - Test method	(100 ~ 300) HV	BS	N
JIS Z 2245:2016	Rockwell hardness test - Test method	(40 ~ 90) HRB (20 ~ 60) HRC	BS	N
JIS Z 2248:2006/ AMENDMENT 1:2014	Metallic materials - Bend test	R : (5 ~ 120) mm Flat wrought product	BS	N
KS B 0802:2003	Method of tensile test for metallic materials	Load : (10 ~ 1 600) kN Elongation : (0 ~ 60) % Reduction of area : (1 ~ 80) %	BS	N
KS B 0804:2001	Metallic materials - Bend test	R : (5 ~ 120) mm Flat wrought product	BS	N
KS B 0805:2000	Metallic materials - Test method of brinell hardness	(100 ~ 400) HBW	BS	N
KS B 0806:2000	Metallic materials - Test method of rockwell hardness	(40 ~ 90) HRB (20 ~ 60) HRC	BS	N
KS B 0810:2003	Method of impact test for metallic materials	Absorbed Energy : max. 640 J V-notch Liquid medium Temperature : -196 ℃, (-170 ~ room temperature) ℃	BS	N
KS B 0811:2003	Metallic materials - Vickers hardness test - Part 1 : Test method	(100 ~ 300) HV	BS	N
KS D 0204:2007	Steel - Determination of content of nonmetallic inclusions - Micrographic method using standard diagrams	A method	BS	N
KS D 0205:2002	Steel - Micrographic determination of the ferritic or austenitic grain size	5.3.3 McQquaid Ehn Method by carburizing for 925℃	BS	N

No. KT533

Test method	Standard designation	Test range	Site	Field testing
KS D 0283:2005	Standard test method for drop-weight tear tests of ferritic steels	(0 ~ 100) % Temperature : (-80 ~ room temperature) ℃	BS	N
KS D 3504:2019	Steel bars for concrete reinforcement	Tensile test : (10 ~ 800) kN Elongation : (0 ~ 60) % Bend test : D8 ~ D51	BS	N
NACE TM0177:2016	Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H2S Environments	B method	BS	N
NACE TM0284:2016	Evaluation of pipeline and pressure vessel steels for resistance to hydrogen-induced cracking	Solution A, Pressure vessel plate	BS	N
NACE TM0316:2016	Four-Point Bend Testing of Materials for Oil and Gas Applications	Test Solution A, B	BS	N

No. KT533

02. Chemical Testing

02.001 Iron and Steel

Test method	Standard designation	Test range	Site	Field testing
AS/NZS 1050.16:1994	Methods for the analysis of iron and steel Part 16 : Determination of sulfur content - Infrared absorption method after combustion in an induction furnace	S(0.002 ~ 0.10) %	BS	N
AS/NZS 1050.32:1994	Methods for the analysis of iron and steel Part 32 : Determination of carbon content - Infrared method	C(0.002 ~ 0.45) %	BS	N
AS3641.1:1999	Recommended practice for atomic emission spectrometric analysis Principles and techniques	C(0.001 ~ 1.3) % Mn(0.003 ~ 2.2) % S(0.001 ~ 0.31) % Al(0.001 ~ 1.00) % Cr(0.002 ~ 5.0) % V(0.001 ~ 0.65) % Nb(0.001 ~ 0.2) % Si(0.004 ~ 3.1) % P(0.001 ~ 0.08) % Cu(0.001 ~ 1.4) % Ni(0.002 ~ 5.2) % Mo(0.001 ~ 1.5) % Ti(0.001 ~ 0.3) % Sn(0.001 ~ 0.10) % B(0.000 3 ~ 0.010) %	BS	N
ASTM E1019-18	Standard test methods for determination of carbon, sulfur, nitrogen and oxygen in steel, iron, nickel and cobalt alloys by various combustion and fusion techniques	C(0.001 ~ 4.50) % S(0.002 ~ 0.35) % N(0.00055 ~ 0.50) % O(0.000 5 ~ 0.03) %	BS	N

No. KT533

Test method	Standard designation	Test range	Site	Field testing
ASTM E415-17	Standard test method for Analysis of Carbon and Low-Alloy Steel by Spark Atomic Emission Spectrometry	C(0.001 ~ 1.1) % Mn(0.006 ~ 2.0) % S(0.001 ~ 0.055) % Al(0.006 ~ 0.093) % Cr(0.007 ~ 5.0) % V(0.003 ~ 0.3) % Nb(0.003 ~ 0.12) % Si(0.02 ~ 1.54) % P(0.006 ~ 0.085) % Cu(0.006 ~ 0.5) % Ni(0.006 ~ 5.0) % Mo(0.007 ~ 1.3) % Ti(0.001 ~ 0.2) % Sn(0.005 ~ 0.061) % B(0.000 4 ~ 0.007) %	BS	N
JIS G 1253:2002/ AMENDMENT 1:2013	Iron and steel - Method for spark discharge atomic emission spectrometric analysis	C(0.001 ~ 1.3) % Mn(0.003 ~ 2.2) % S(0.001 ~ 0.31) % Al(0.001 ~ 1.00) % Cr(0.002 ~ 5.0) % V(0.001 ~ 0.65) % Nb(0.001 ~ 0.2) % Si(0.004 ~ 3.1) % P(0.001 ~ 0.08) % Cu(0.001 ~ 1.4) % Ni(0.002 ~ 5.2) % Mo(0.001 ~ 1.5) % Ti(0.001 ~ 0.3) % Sn(0.001 ~ 0.10) % B(0.000 3 ~ 0.010) %	BS	N
KS D 1652:2007	Iron and steel - Method for spark discharge atomic emission spectrometric analysis	C(0.001 ~ 1.3) % Mn(0.003 ~ 2.2) % S(0.001 ~ 0.31) % Al(0.001 ~ 1.00) % Cr(0.002 ~ 5.0) % V(0.001 ~ 0.65) % Sn(0.001 ~ 0.15) % Si(0.004 ~ 3.1) % P(0.001 ~ 0.08) % Cu(0.001 ~ 1.4) % Ni(0.002 ~ 5.2) % Mo(0.001 ~ 1.5) % Ti(0.001 ~ 0.3) % Nb(0.001 ~ 0.2) % B(0.000 3 ~ 0.010) %	BS	N
KS D 1655:2008	Method for X-ray fluorescence spectrometric analysis of iron and steel	Si(0.03 ~ 4.69) % P(0.005 ~ 1.5) % Ti(0.001 ~ 0.28) % Mn(0.003 ~ 2.23) % S(0.001 ~ 0.16) % V(0.001 ~ 0.50) %	BS	N

No. KT533

Test method	Standard designation	Test range	Site	Field testing
KS D 1673:2007	Methods for inductively coupled plasma emission spectrochemical analysis of steel	Si(0.01 ~ 0.6) % P(0.003 ~ 0.1) % Cr(0.01 ~ 3.0) % V(0.002 ~ 0.5) % Ti(0.001 ~ 0.3) % Mn(0.01 ~ 2.0) % Ni(0.01 ~ 4.0) % Cu(0.01 ~ 0.5) % Co(0.003 ~ 0.2) % Al(0.004 ~ 0.1) %	BS	N

No. KT533

02. Chemical Testing

02.004 Mine and Ceramic Related Products

Test method	Standard designation	Test range	Site	Field testing
KS D 1901:1999	Method for chemical analysis of ferromanganese 6.2 Volumetric Analysis Method B	Mn (74.40 ~ 88.15) %	BS	N
KS D 2515:2011	Methods for chemical analysis of ferrovanadium (Annex A:Vanadium determination method- Potassium permanganate oxide, iron(II) ammonium sulfate titration method)	V (53.40 ~ 82.31) %	BS	N
KS E 3075:2017	Method for X - ray fluorescence spectrometric analysis of limestone and dolomite	Fe_2O_3 (0.05~2.0) % CaO (29.0~55.8) % MgO (0.1~22.0) % SiO2 (0.1~12.4) % Al2O3 (0.05~5.0) %	BS	N
KSEISO 2597-1:2007	Iron ores - Determination of total iron content - Part 1 : Titrimetric method after tin(II) chloride reduction	Fe (36.76 ~ 72.0) %	BS	N

End.