



National Accreditation Board for
Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

STAR WIRE (INDIA) LIMITED, TESTING DIVISION

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

**"General Requirements for the Competence of Testing &
Calibration Laboratories"**

for its facilities at

21/4, MATHURA ROAD, BALLABGARH, FARIDABAD, HARYANA, INDIA

in the field of

TESTING

Certificate Number: TC-5164

Issue Date: 10/03/2022

Valid Until: 09/03/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : Star Wire (India) Limited

Signed for and on behalf of NABL



N. Venkateswaran
Chief Executive Officer



National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 1 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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CHEMICAL TESTING

I.	ATMOSPHERIC POLLUTION			
1.	Stack Emission	Particulate Matter	IS : 11255 (Pt.-1) : 1985 (RA 2009), IS : 11255 (Pt.-3) : 2008, SWDC/WI/E/03: 2012	5 to 1000 mg/m ³
		Sulphur Dioxide	IS : 11255 (Pt.-2) : 1985 (RA 2009), SWDC/WI/E/03: 2012	2 to 1000 mg/m ³
		Nitrogen oxide	IS : 5182 (Pt- 6) :2012 & SWDC/WI/E/03: 2012	2 to 100 mg/m ³
2.	Ambient Air / Process Emissions	Particulate Matter (PM2.5)	USEPA-FRM/FEM-40-CFR part-50-53-appendix-L	5 to 1000 µg/m ³
		Particulate Matter (PM10)	IS : 5182 (Pt- 23) :2006 (RA 2012) SWDC/WI/E/04-2012	5 to 2000 µg/m ³
		Metals(Lead, Nickel) (particulate friction)	IS : 5182 (Pt- 22) :2001 (RA 2009) / AAS	0.1 to 50 µg/m ³
		Ammonia (gaseous)	IS:11255 (Pt-6):1999 (RA 2012)	2.0 to 500 µg/m ³
		Ozone	ASTM- D 5156- 02 (2008)	5 to 10000 µg/m ³
		Suspended Particulate Matter (SPM)	IS : 5182 (Pt.-4) : 1999 (RA 2010), SWDC/WI/E/04-2012	5 to 10000µg/m ³
		Sulphur-Di-Oxide as SO ₂	IS : 5182 (Pt.-2) : 2001 (RA 2012), SWDC/WI/E/04- 2012	4 to 1050 µg/m ³
		Nitrogen-Di- oxide as NO ₂	IS : 5182 (Pt.- 6) : 2006 (RA 2012), SWDC/WI/E/04-2012	6 to 750 µg/m ³

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Convenor

Jitendra B. Vispute
Program Manager



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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 2 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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II.	POLLUTION & ENVIRONMENT			
1.	Waste water / Effluents	Bio Chemical Oxygen Demand	IS : 3025 (Pt.- 44)-1993 (RA2009)	5 to 10000 mg/L
		Chemical Oxygen Demand	5220B of SM(APHA):2012 / IS : 3025 (Pt.-58)- 2006 (RA 2012)	5 to 10000 mg/L
		Chlorides	IS : 3025 (Pt.-32)- 1988 (RA 2009)	2 to 5000 mg/L
		Cadmium	IS : 3025 (Pt.- 41)-1992 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.02 to 1000 mg/L
		Chromium as Cr ⁺³	3111B of SM (APHA)-2012/AAS (Direct) / IS : 3025 (Pt.-52)- 2003 (RA 2009)	0.1 to 1000 mg/L
		Hexavalent Chromium as Cr ⁺⁶	SM (APHA)-2012 colorimetric	0.1 to 100 mg/L
		Copper	IS:3025 (Pt-42)-1992 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.06 to 1000 mg/L
		Iron	3111B of SM (APHA)-2012/AAS (Direct) / IS : 3025 (Pt.-53)- 2003 (RA 2009)	0.10 to 1000 mg/L
		Lead	IS : 3025 (Pt.- 47)-1994 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.15 to 1000 mg/L
		Manganese	IS : 3025 (Pt.- 59)-2006 / 3111B of SM (APHA)-2012/AAS (Direct)	0.1 to 1000 mg/L

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 3 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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		Phosphates (Dissolved)	IS : 3025 (Pt.- 31)- 1988 (RA 2009), Stannous Chloride Method	0.01 to 1000 mg/L
		Nickel	IS : 3025 (Pt.- 54)-2003 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.10 to 1000 mg/L
		Zinc	IS : 3025 (Pt.- 49)-1994 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.01 to 100 mg/L
		Aluminum	IS : 3025 (Pt.- 55)- 2006 (RA 2009) / 3111D of SM (APHA)-2012/AAS (Direct)	1.0 to 1000 mg/L
		Volatile (organic) solids	IS:3025(Pt.-18)- 1984 (RA 2012)	5 to 2000 mg/L
		Fixed (Inorganic) solids	IS:3025(Pt.-18)- 1984 (RA 2012)	5 to 10000 mg/L
		Ammonia- Nitrogen	IS:3025 (Pt.-34)- 1988 (RA 2009), Nesslerization & Titrimetric Method	5 to 1000 mg/L
		Phenols	IS:3025(Pt.-43)- 1992 (RA 2009)	0.01 to 1000 mg/L
		Oils & Grease	IS:3025(Pt.- 39) 1993 (RA 2009), Partition Gravimetric Method	5.0 to 250 mg/L
		pH Value	IS : 3025 (Pt.- 11) 1983 (RA 2012), Electrometric Method	2 to 12
		Temperature	IS:3025(Pt.- 9)- 1984 (RA 2012)	10 to 70°C
		Phosphates (Dissolved)	IS:3025 (Pt.- 31)- 1988 (RA 2009), Stannous Chloride Method	0.1 to 100 mg/L
		Total Dissolved solid	IS : 3025 (Pt.-16)- 1984 (RA 2012)	5 to 10000 mg/L

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 4 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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		Sulphates	IS :3025 (Pt.- 24)-2003 Rea IS:3025 (Pt-24)-1986 (RA 2009) Gravimetric/ turbidity Method	1.0 to 3000 mg/L
		Total Suspended Solids	IS : 3025 (Pt.- 17)- 1984 (RA 2012)	5 to 10000 mg/L
		Nitrates-Nitrogen	IS:3025(Pt.34)- 1988 (RA 2012) Chromo tropic acid method	0.1 to 100 mg/L
		Color	IS:3025(Pt.- 4)- 1983 (RA 2012)	Qualitative
III.	WATER			
1.	Water (Drinking / Construction / Surface/ Bore well/ As per customer's application)	Acidity	IS : 3025 (Pt.-22)- 1986 (RA 2009)	1 to 1000 mg/L
		Alkalinity	IS : 3025 (Pt.-23)- 1986 (RA 2009)	1 to 1000 mg/L
		Calcium	IS:3025(Pt.- 40)- 1991 (RA 2009), EDTA titremetric Method	2 to 1000 mg/L
		Chlorides	IS : 3025(Pt.- 32)- 1988 (RA 2009), Argentometric Method	2 to 3000 mg/L
		Residual free Chlorine	IS 3025(Pt.-26)- 1986 (RA 2009), Titrimetric / color Comparison Method	1.0 to 25 mg/L
		Colour	IS:3025(Pt.- 4)- 1983 (RA 2012) Visual Compression Method	5 to 500 Hazen
		Fluorides	SM (APHA)-2012, 4500 F, SPADNS Method, IS: 3025 (Pt.-60)- 2008	0.1 to 10 mg/L

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 5 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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		Total Hardness	IS : 3025 (Pt.- 21)-2009 EDTA Titrimetric Method	2 to 1000 mg/L
		Magnesium	IS : 3025 (Pt.- 46)-1993 (RA 2009) EDTA Titrimetric method	2 to 500 mg/L
		Cadmium	3111B of SM(APHA)-2012 / AAS Direct) / IS : 3025 (Pt.-41)- 1992 (RA 2009)	0.02 to 100 mg/L
		Chromium as Cr ⁺³	3111B of SM(APHA)-2012 / AAS Direct) / IS : 3025 (Pt.-52)- 2003 (RA 2009)	0.1 to 1000 mg/L
		Hexavalent Chromium as Cr ⁺⁶	SM (APHA)-2012, colorimetric	0.1 to 100 mg/L
		Copper	IS:3025 (Pt-42)-1992 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.06 to 100 mg/L
		Iron	3111B of SM (APHA)-2012/AAS (Direct) / IS : 3025 (Pt.-53)- 2003 (RA 2009)	0.1. to 100 mg/L
		Lead	IS : 3025 (Pt.- 47)-1994 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.15 to 100 mg/L
		Manganese	IS : 3025 (Pt.- 59)-2006 / 3111B of SM (APHA)-2012/AAS (Direct)	0.1 to 100 mg/L
		Silver	3111B of SM(APHA) 2012, AAS(Direct)	0.10 to 10 mg/L
		Aluminum	IS : 3025 (Pt.- 55)- 2006 (RA 2009) / 3111D of SM (APHA)-2012/AAS (Direct)	1.0 to 100 mg/L
		Nickel	IS : 3025 (Pt.- 54)-2003 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.10 to 100 mg/L

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 6 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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		Sodium & Potassium	IS : 3025 (Pt.- 45)-21993 (RA 009), Flame Photometric Method	1 to 3000 mg/L
		Zinc	IS : 3025 (Pt.- 49)-1994 (RA 2009) / 3111B of SM (APHA)-2012/AAS (Direct)	0.01 to 100 mg/L
		pH Value	IS : 3025 (Pt.- 11) 1983 (RA 2012), Electrometric Method	2 to 12
		Total Dissolved solid	IS : 3025 (Pt.-16)- 1984 (RA 2012)	5 to 10000 mg/L
		Volatile (organic) solids	IS:3025(Pt.-18)- 1984 (RA 2012)	5 to 2000 mg/L
		Fixed (Inorganic) solid	IS:3025(Pt.-18)- 1984 (RA 2012)	5 to 10000 mg/L
		Nitrates-Nitrogen	IS:3025(Pt.34)- 1988 (RA 2012) Chromo tropic acid method	0.1 to 100 mg/L
		Conductivity	IS:3025(Pt.- 14)-2013	5 to 20200 μ mhos/cm
		Sulphates	IS : 3025 (Pt.- 24)-2003 Rea IS:3025 (Pt-24)-1986 (RA 2009) Gravimetric/ turbidity Method	1 to 5000 mg/L
		Turbidity	IS :3025 (Pt.- 10)-1984 (RA 2012), Nephelometric Method	1 to 500 NTU
		Phenols	IS:3025(Pt.-43)- 1992 (RA 2009)	0.001 to 10 mg/L
		Silica (SiO ₂)	IS :3025 (Pt.- 35)-1988 (RA 2009), Ammonium Molybdate/ gravimetric method	0.5 to 100 mg/L

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 7 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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IV.	BUILDING MATERIALS			
1.	Refractory material, Fire Bricks & Clay	Loss on Ignition	IS:1527-1972 (RA 2006)	0.1 to 5.0%
		Oxide of Silica	IS:1527-1972 (RA 2006)	10 to 70%
		Alumina	IS:1527-1972 (RA 2006)	20.0 to 80.0%
		Iron Oxide	IS:1527-1972 (RA 2006)	0.5 to 8.0%
		Calcium Oxide	IS:1527-1972 (RA 2006)	0.1 to 5.0%
		Magnesium Oxide	IS:1527-1972 (RA 2006)	0.1 to 5.0%
		Titanium Oxide	IS:1527-1972 (RA 2006)	0.1 to 5.0%
2.	Fly Ash	Iron Oxide as Fe ₂ O ₃	IS:1727-1967 (RA 2013)	0.1 to 10.0%
		Alumina As Al ₂ O ₃	IS:1727-1967 (RA 2013)	15.0 to 40.0%
		Calcium Oxide as CaO	IS:1727-1967 (RA 2013)	0.1 to 5.0%
		Magnesia As MgO	IS:1727-1967 (RA 2013)	0.1 to 5.0%
		Oxide of Silica	IS:1727-1967 (RA 2013)	30.0 to 70.0%
		Sulphate As SO ₃	IS:1727-1967 (RA 2013)	0.05 to 5.0%
		Loss on Ignition	IS:1727-1967 (RA 2013)	0.1 to 10.0%
		Total Alkali as Na ₂ O	IS:3812- 2013	0.1 to 5.0%
3.	Cement OPC PPC PSC	Loss on ignition	IS:4032:1985 (RA 2014)	0.1 to 12%
		Insoluble residue	IS:4032:1985 (RA 2014)	0.1 to 35%
		Alumina	IS:4032:1985 (RA 2014)	3.0 to 8.0%
		Iron Oxide	IS:4032:1985 (RA 2014)	2.0 to 5.0%
		Silica	IS:4032:1985 (RA 2014)	15 to 25%
		Calcium Oxide	IS:4032:1985 (RA 2014)	50 to 70%
		Magnesium Oxide	IS:4032:1985 (RA 2014)	0.5 to 8.0%
		Sulphuric anhydride as SO ₃	IS:4032:1985 (RA 2014)	0.5 to 5.0%
		Sulphide Sulphur	IS:4032:1985 (RA 2014)	0.01 to 1.5%
		Chloride	IS:4032:1985 (RA 2014)	0.01 to 0.50%
4.	Admixture	Chloride	IS:6925-1973 (RA 2013)	0.01 to 1.0%
		pH Value	IS:9103-1999 (RA 2013)	2 to 12
		Ash content	IS:9103-1999 (RA 2013)	1.0 to 25%
		Dry material content	IS:9103-1999 (RA 2013)	1.0 to 60.0%
		Relative Density	IS:9103-1999 (RA 2013)	1.00 to 1.50

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 8 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
5.	Soil	pH Value	IS:2720-Pt-26-1987 (RA 2011)	2 to 12
		Total soluble sulphate	IS:2720-Pt-27-1977 (RA 2010)	0.01 to 2.0%
6.	Aggregate Testing	Alkali Aggregate Reactivity		
		i) Dissolved Silica	IS: 2386-Pt- 7- 1963 (RA 2016)	1 to 80 milimoles/l
		ii) Reduction In Alkalinity	IS: 2386-Pt- 7- 1963 (RA 2016)	5 to 700 milimoles/l
		Sulphate	BS EN 1744-1-2009+A1: 2012	0.01 to 2.0%
		Chloride	BS EN 1744-5-2006	0.01 to 2.0%
7.	Concrete	Sulphate	BS:1881(Pt-124)- 1988	0.01 to 2.0%
		Chloride	BS:1881(Pt- 124)-1988	0.01 to 2.0%
V.	PETROLEUM PRODUCTS			
1.	Furnace Oil	Kinematics Viscosity @ 50 °C	IS:1448 (Pt- 25)-1976 (RA 2007)	20 to 550 cst
		Density / Relative Density	IS:1448 (Pt-.32)-1992 (Ra 2008)	0.800 to 1.2 g/ml
		Water Content	IS:1448 (Pt- 40)-1987 (RA 2010)	0.1 to 15.0%
		Total Sulphur	IS:1448 (Pt- 33)-1991 (RA 2008)	0.02 to 5.0%
		Flash Point(PMCC)	IS:1448 (Pt- 21)-2012	30 to 390 °C
		Ash content	IS:1448 (Pt- 4)-1984 (RA 2008)	0.001 to 20.0%
		Carbon Residue(CCR)	IS:1448 (Pt- 122)-2013	1.0 to 20.0%
		Inorganic Acidity	IS:1448 (Pt- 2)-2007	0 to 50 mg KOH/g
		Sediment	IS:1448 (Pt- 30)- 2013	0.1 to 1.0%
		Gross Calorific value	IS:1448 (Pt- 6)-1984 (RA 2007)	10 to 15000 Cal/g

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 9 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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2.	HSD	Inorganic Acidity	IS:1448 (Pt- 2)-2007	0 to 10 mg KOH/g
		Total Acidity	IS:1448 (Pt- 2)-2007	0 to 50mg KOH/g
		Ash content	IS:1448 (Pt- 4)-1984 (RA 2008)	0.001 to 10%
		Carbon Residue (Rams bottom)	IS:1448 (Pt- 8)-2012	0.01 to 30%
		Pour Point	IS:1448 (Pt- 10) Sec I/II-2013	to 35 to 70 °C
		Distillation	IS:1448 (Pt- 18)- 1991 (RA 2010)	30 to 390 °C
		Flash Point (PMCC)	IS:1448 (Pt- 21)- 2012	30 to 350 °C
		Flash Point (Abel)	IS:1448 (Pt- 20)- 1998 (RA 2008)	25 to 100 °C
		Kinematics Viscosity @ 40 °C	IS:1448 (Pt- 25)-1976 (RA 2007)	2 to 16 cSt
		Density / Relative Density	IS:1448 (Pt- 16)-1990 (RA 2007)	0.700 to 1.000 g/ml
		Water Content	IS:1448 (Pt- 40)-1987 (RA 2010)	0.1 to 1.5%
		Gross Calorific value	IS:1448 (Pt- 6)-1984 (RA 2007)	100 to 15000 Cal/g
3.	Lubricating Oil	Kinematic Viscosity At 40 & 100 Deg.	IS:1448 (Pt- 25)-1976 (RA 2007)	20 to 400 cSt
		Viscosity Index	IS:1448 (Pt- 56)-2013	70 to 170
		Total Base Number	IS:1448 (Pt- 86)- 1977 (RA 2010)	0 to 35 mg KOH/g
		Total Acid Number	IS:1448 (Pt- 1)-2002 (RA 2007)	0 to 10 mg KOH/g
		Acidity (Organic & Inorganic)	IS:1448 (Pt- 2, A & C)- 2007	0 to 50 mg KOH/g
		Ash Content	IS:1448 (Pt- 4)-1984 (RA 2008)	0.001 to 10%
		Pour Point	IS:1448 (Pt- 10)-2012	- 50 to 50 °C

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Certificate Number TC-5164

Page 10 of 37

Validity 30.08.2018 to 14.01.2019

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		Water Content	IS:1448 (Pt- 40)-1987 (RA 2010)	0.1 to 10%
		Flash Point (COC)	IS:1448 (Pt- 69)-2013 RA	40 to 390 °C
4.	Bitumen	K. Viscosity @ 135 °C	IS:1206 (Pt-03)-1976 (RA 2007)	50 to 1500 cSt
		Flash Point (COC)	IS:1209-1973 (RA 2007)	40 to 390 °C
		Loss on Heating	IS:1212-1976 (RA 2007)	0.01 to 5.0%
		Solubility in TCE	IS:1216-1979 (RA 2007)	95.0 to 100%
VI. METALS & ALLOYS				
1.	Plain Carbon & Low Alloy Steels	Carbon	IS : 228(Pt.-1)- 1987 (RA 2008)	0.05 to 2.5%
		Manganese	IS : 228(Pt.-2)- 1987 (RA 2008) ASTM E350- 2012	0.01 to 2.5%
		Silicon	IS : 228(Pt.-8)-1989 (RA 2009)	0.05 to 4.0%
		Sulphur	IS : 228(Pt.- 9)-1989 (RA 2009)	0.01 to 0.25%
		Phosphorus	IS : 228(Pt. 3)- 1987 (RA2008)	0.005 to 0.25%
		Chromium	IS : 228(Pt.6)- 1987 (RA 2009) ASTM E350- 2012	0.006 to 5.0%
		Nickel	IS : 228(Pt.- 5)- 1987 (RA 2009) ASTM E 350- 2012	0.005 to 4.0%
		Molybdenum	IS : 228(Pt.- 7)- 1990 (RA 2012)	0.01 to 2.5%
		Vanadium	ASTM E350-2012/AAS	0.01 to 1.5%
		Copper	IS : 228 (Pt.-15)-1992 (RA 2009)/AAS	0.001 to 2.0%

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Certificate Number TC-5164

Page 11 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

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		Aluminum	ASTM E350- 2012/AAS	0.005 to 1.5%
		Lead	ASTM-E-350- 2012/AAS	0.002 to 0.50%
		Tin	ASTM-E-350- 2012/AAS	0.050 to 1.00%
		Cobalt	AAS	0.005 to 0.20%
		Bismuth	ASTM-E-350- 2012/AAS	0.02 to 0.25%
2.	Stainless Steel	Carbon	IS : 228(Pt.-1)- 1987 (RA 2008)	0.05 to 2.5%
		Manganese	ASTM E353- 2014	0.1 to 18.0%
		Silicon	ASTM E353- 2014	0.05 to 4.0%
		Sulphur	IS : 228(Pt.- 9)-1989 (RA 2009)	0.01 to 0.25%
		Phosphorus	ASTM E353- 2014	0.01 to 0.25%
		Chromium	ASTM E353- 2014	1.0 to 25.0%
		Nickel	ASTM E353- 2014	0.05 to 20.0%
		Molybdenum	IS : 228(Pt.- 7)- 1990 (RA 2012)	1.0 to 3.0
		Vanadium	ASTM E353- 2014/AAS	0.01 to 1.00%
		Copper	ASTM E353- 2014/AAS	0.001 to 5.0%
		Aluminum	ASTM E353- 2014/AAS	0.005 to 1.5%
		Titanium	ASTM E353- 2014/AAS	0.05 to 2.0%
		Lead	ASTM E353- 2014/AAS	0.002 to 0.50%
		Tin	ASTM E353- 2014/AAS	0.050 to 1.00%
		Cobalt	ASTM E353- 2014/AAS	0.005 to 0.50%
3.	HSS / Tool Steel	Carbon	IS : 228(Pt.-1)- 1987 (RA 2008)	0.05 to 2.5%
		Manganese	ASTM E-352- 2013	0.1 to 2.5%
		Silicon	ASTM E-352-2013	0.05 to 4.0%
		Sulphur	IS : 228(Pt.- 9)-1989 (RA 2009)	0.01 to 0.1%
		Phosphorus	ASTM E353- 2014	0.01 to 0.25%
		Chromium	ASTM E352- 2013	0.006 to 20.0%
		Nickel	ASTM-E-351- 2013/AAS	0.005 to 1.00%
		Molybdenum	ASTM E352- 2013	0.02 to 10.0%
		Vanadium	ASTM E352- 2013/AAS	0.01 to 4.0%

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National Accreditation Board for Testing and Calibration Laboratories

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 12 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
4.	HCHCR Steel	Tungsten	ASTM E352- 2013	0.1 to 24.0%
		Cobalt	ASTM-E-352- 2013/AAS	0.01 to 10.0%
		Carbon	IS : 228(Pt.-1)- 1987 (RA 2008)	0.05 to 2.5%
		Manganese	ASTM E-352- 2013	0.1 to 2.5%
		Silicon	ASTM E-352-2013	0.05 to 4.0%
		Sulphur	ASTM E-352- 2013	0.01 to 0.25%
		Phosphorus	ASTM E352- 2013	0.01 to 0.25%
		Chromium	ASTM E352- 2013	0.006 to 20.0%
5.	Cast Iron	Molybdenum	ASTM E352- 2013	0.01 to 2.0%
		Carbon	IS : 12308 (Pt.-11)- 1991 (RA 2006)	1.5 to 4.5%
		Manganese	IS : 12308 (Pt.-10)- 1991 (RA 2006)	0.1 to 1.0%
		Silicon	IS : 12308(Pt.- 6)-1991 (RA 2006)	1.0 to 4.0%
		Sulphur	SOP / WI / S / 02- 2012	0.005 to 0.3%
		Phosphorus	IS : 12308 (Pt.-5)- 1991 (RA 2006)	0.01 to 0.25%
		Chromium	IS : 12308 :(Pt.- 8)- 1989 (RA 2007) ASTM E351- 2013	0.006 to 1%
		Nickel	IS :12308 (Pt.- 7)- 1991 (RA 2006) /AAS/ ASTM E 351- 2013	0.005 to 4.0%
		Molybdenum	IS : 12308 :(Pt- 9)- 1993 (RA 2009) / AAS	0.10 to 1.0%
		Copper	IS : 12308 (Pt.12)-1992 (RA 2007)/ AAS	0.001 to 2.0%
		Titanium	AAS/ IS:12308 (Pt.-14)-1992 (RA 2009)	0.05 to 0.50%
		Magnesium	IS : 12308 (Pt.13)- 1992 (RA 2007) /AAS/ ASTM E 351- 2013	0.002 to 0.20%

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 13 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Lead	ASTM-E-351- 2013/AAS	0.002 to 0.50%
		Tin	ASTM-E-351- 2013/AAS	0.050 to 1.00%
		Cobalt	ASTM-E-351- 2013/AAS	0.005 to 5.0%
6.	SG Iron	Manganese	IS : 12308 (Pt.-10)- 1991 (RA 2006)	0.1 to 1.0%
		Silicon	IS : 12308(Pt.- 6)-1991 (RA 2006)	1.0 to 4.0%
		Phosphorus	IS : 12308 (Pt.-5)- 1991 (RA 2006)	0.01 to 0.25%
		Chromium	IS : 12308 :(Pt.- 8)- 1989 (RA 2007) ASTM E351- 2013	0.006 to 1%
		Nickel	IS :12308 (Pt.- 7)- 1991 (RA 2006) /AAS/ ASTM E 351- 2013	0.005 to 4.0%
		Molybdenum	IS : 12308 :(Pt.- 9)- 1993 (RA 2009) / AAS	0.10 to 1.0%
		Copper	IS : 12308 (Pt.12)-1992 (RA 2007)/ AAS	0.001 to 2.0%
		Titanium	AAS/ IS:12308 (Pt.-14)- 1992 (RA 2009)	0.05 to 0.50%
		Magnesium	IS : 12308 (Pt.13)- 1992 (RA 2007) /AAS/ ASTM E 351- 2013	0.002 to 0.20%
7.	Ferro Chromium	Chromium	IS : 13452(Pt.-5)- 2003 (RA 2009)	50 to 75%
		Silicon	IS : 13452(Pt.-1) 1988 (RA 2009) IS : 13452(Pt.-2) 1992 (RA 2007)	0.2 to 4.0%
		Phosphorus	IS : 13452(Pt.-7)- 2003 (RA 2009)	0.01 to 0.10%
8.	Ferro Manganese	Manganese	IS : 1559- 1961 (RA 2007)	50 to 85%

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National Accreditation Board for Testing and Calibration Laboratories

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 14 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
9.	Metallic Manganese	Manganese	IS : 2017- 1967 (RA 2007)	85 to 99.8%
10.	Ferro Molybdenum	Molybdenum	IS : 12614(Pt.-1)- 2009	50 to 70%
11.	Ferro Silicon	Silicon	IS : 1559(Pt-1)- 1988 (RA 2009)	50 to 80%
12.	Ferro Titanium	Titanium	IS : 13840(Pt.-3)- 1993 (RA 2009)	25 to 70%
13.	Metallic Silicon	Silicon	IS : 2277- 1964 (RA 2007)	90.0 to 99%
14.	Calcium Salicide	Silicon	IS : 2018- 1998 (RA 2007)	55 to 65%
		Calcium	IS : 2018- 1998 (RA 2007)	25 to 35%
15.	Ferro Vanadium	Vanadium	ASTM E365-1999	40 to 80%
16.	Foundry Nickel	Iron as Fe	IS : 2390- 1967 (RA 2010)	10 to 30%
		Nickel	IS : 2390- 1967 (RA 2010)	70 to 99.8%
17.	Sponge Iron	Iron- Metallic	IS : 10812- 19921(RA 997)	70 to 99.5%
		Iron- Total	IS:1493-1959 (RA 2006)	70 to 99.5%
18.	Steel / Metals	Hydrogen	IS:228-Pt.-22- 2003 (RA 2008)	0.3 to 10 ppm
		Oxygen	IS:228-Pt.-18-1998 (RA 2006)	5 to 500 ppm
		Nitrogen	IS:228-Pt.-17-1998 (RA 2010)	5 to 6000 ppm
19.	Steel	Carbon	IS:228-Pt.-20-2003 (RA 2008)	0.005 to 2.0%
		Sulphur	IS:228-Pt.-20-2003 (RA 2008)	0.005 to 0.350%
20.	Steel (OES analysis)	Aluminum	ASTM A751- 01	0.002 to 1.0%
		Boron	ASTM E415- 15	0.0001 to 0.01%
		Carbon		0.005 to 2.6%
		Cobalt		0.001 to 10%
		Chromium		0.002 to 27%
		Copper		0.001 to 4%
		Manganese		0.05 to 20%
		Magnesium		0.001 to 0.08%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 15 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Molybdenum		0.001 to 10%
		Nickel		0.001 to 40%
		Niobium		0.001 to 2.5%
		Phosphorus		0.003 to 1.2%
		Lead		0.001 to 0.35%
		Sulphur		0.001 to 0.15%
		Tin		0.001 to 0.20%
		Silicon		0.005 to 4%
		Titanium		0.001 to 1%
		Vanadium		0.001 to 2%
		Tungsten		0.001 to 25%
		Zirconium		0.001 to 0.1%
		Tantalum		0.001 to 0.2%
		Cerium		0.001 to 0.06%
		Antimony		0.001 to 0.10%
		Nitrogen		0.010 to 0.60%
		Calcium		0.0001 to 0.006%
		Arsenic		0.001 to 0.10%
21.	Zinc & Zinc Alloys (OES Analysis)	Aluminum	ASTM E634- 12	0.10 to 4.5%
		Copper		0.001 to 1.40%
		Cadmium		0.0001 to 0.006%
		Iron		0.001 to 0.10%
		Magnesium		0.001 to 0.10%
		Nickel		0.0002 to 0.03%
		Lead		0.0005 to 0.01%
		Tin		0.0003 to 0.005%
22.	Aluminum & Aluminum Alloys (OES Analysis)	Chromium	ASTM E1251-2011	0.001 to 0.5%
		Copper		0.002 to 13%
		Iron		0.001 to 1.5%
		Manganese		0.01 to 1.5%
		Magnesium		0.001 to 5%
		Nickel		0.001 to 3%
		Lead		0.001 to 0.5%
		Tin		0.001 to 0.30%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 16 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Silicon		0.001 to 16%
		Zinc		0.001 to 11%
		Titanium		0.001 to 0.35%
23.	Copper & Copper Alloys (OES Analysis)	Aluminum	BS EN- 15079-2015	0.001 to 11.5%
		Arsenic		0.001 to 0.40%
		Bismuth		0.001 to 0.04%
		Iron		0.001 to 6%
		Manganese		0.001 to 3.5%
		Nickel		0.001 to 7%
		Phosphorus		0.003 to 1%
		Lead		0.002 to 13%
		Sulphur		0.003 to 0.20%
		Tin		0.001 to 13%
		Antimony		0.001 to 0.50%
		Silicon		0.001 to 1%
		Zinc		0.001 to 50%
		Chromium		0.001 to 0.05%
24.	Tin & Lead Base Alloys	Tin	IS:1409-1959 (RA 2010) SWDC/SOP/NF/CHEM/02-2010 /AAS	0.005 to 99.99%
		Lead	IS:1409-1959 (RA 2010) SWDC/SOP/NF/CHEM/02-2010	0.005 to 99.99%
		Antimony	IS:403-1964 (RA 2010) / AAS	0.001 to 20%
		Bismuth	IS:1409-1959 (RA 2010) SWDC/SOP/NF/CHEM/02-2010 /AAS	0.001 to 25.0%
		Cadmium	IS: 1409-1959, RA-2010 /AAS	0.001 to 25.0%
		Copper	IS: 1409-1959, RA-2010 /AAS	0.001 to 8.0%
		Iron	IS: 1409-1959, RA-2010 /AAS	0.001 to 0.5%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 17 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Zinc	IS: 1409-1959, RA-2010 /AAS	0.001 to 1.0%
		Aluminum	IS: 1409-1959, RA-2010 /AAS	0.001 to 0.5%
		Nickel	IS: 1409-1959, RA-2010 /AAS	0.001 to 0.5%
		Cobalt	IS: 1409-1959, RA-2010 /AAS	0.001 to 0.10%
		Manganese	IS: 1409-1959, RA-2010 /AAS	0.001 to 0.10%
		Silver	IS: 1409-1959, RA-2010 /AAS	0.001 to 5.0%
25.	Copper & Copper Alloys	Aluminum	IS: 4027-(Pt.-9)- 1991 (RA 2007)	0.001 to 12%
		Copper	IS:4027(Pt.-1)- 1987 (RA 2006), IS:3685-1966 (RA 2006), IS: 440- 1964 (RA 2006)	10 to 99.99%
		Chromium	ASTM E118- 89 (2004)/AAS	0.001 to 2.0%
		Iron	IS : 4027(Pt.8)- 1991 (RA 2007) / AAS IS:440- 1964 (RA 2006)	0.001 to 6.0%
		Lead	IS : 4027(Pt.-1)- 2006 RA / AAS	0.001 to 25.0%
		Manganese	ASTM E54- 80 (1996) / AAS	0.001 to 5.0%
		Nickel	ASTM E-54-80 (1996), IS:440-1964 (RA 2006) / AAS	0.001 to 35.0%
		Phosphorus	IS : 4027(Pt.-3)-1987 (RA 2006)	0.01 to 8.0%
		Silicon	IS : 3685- 1966 (RA 2006)	0.1 to 5.0%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 18 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Tin	IS : 4027-Pt.-5-1987 (RA-2006) SWDC/SOP/NF/CHEM/01-2010 /AAS	0.01 to 15.0%
		Zinc	IS : 3685 : 1966 (RA 2006) / AAS	0.001 to 50.0%
		Silver	ASTM-E-56/ AAS	0.001 to 60%
		Cadmium	ASTM-E-56/ AAS	0.001 to 25.0%
		Graphite Carbon	IS : 12548- 1988 (RA 2009)	0.1% to 50%
		Antimony	IS:4027 (Pt.-7)- 1990 (RA 2007) /AAS	0.001 to 2%
		Bismuth	IS:4027 (Pt.-7)- 1990 (RA 2007) /AAS	0.001 to 2%
		Molybdenum	IS:4027 (Pt.-7)- 1990 (RA 2007) /AAS	0.1 to 8.0%
26.	Aluminum & Aluminum Alloys	Chromium	ASTM E-34- 11e1	0.001 to 1.0%
		Copper	ASTM E-34- 11e1	0.001 to 12.0%
		Iron	ASTM E-34- 11e1	0.001 to 5.0%
		Lead	ASTM E-34- 11e1	0.001 to 1.0%
		Manganese	ASTM E-34- 11e1	0.001 to 5.0%
		Nickel	ASTM E-34- 11e1	0.001 to 4.0%
		Silicon	ASTM E-34- 11e1	0.05 to 16.0%
		Tin	ASTM E-34- 11e1	0.01 to 1.0%
		Zinc	ASTM E-34- 11e1	0.001 to 10.0%
		Titanium	ASTM E-34- 11e1	0.01 to 1.0%
		Magnesium	ASTM E-34- 11e1	0.001 to 5.0%
27.	Zinc & Zinc Alloys	Aluminum	ASTM-E-47- 93 /AAS	0.001 to 12.0%
		Copper	IS : 2600 Pt.-II-1988 (RA 2008)	0.001 to 2.0%
		Iron	IS : 2600 Pt.-II-1988 (RA 2008)	0.001 to 2.0%
		Lead	IS : 2600 Pt.-II-1988 (RA 2008)	0.001 to 2.0%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 19 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Cadmium	IS : 2600 Pt.-II-1988 (RA 2008)	0.001 to 0.5%
		Nickel	IS : 2600 Pt.-I-1988 (RA 2008)	0.001 to 1.0%
		Magnesium	AAS/ASTM-E-536-2016/ AAS	0.001 to 0.5%
		Zinc	IS:9958-1981 (RA2012)	50 to 99.99%
VII.	ORES & MINERALS			
1.	Iron Ore	Iron- Total	IS:1493(Pt-1): 1981 (RA 2006)	40 to 70%
		Phosphorus	IS:1493(Pt-1): 1981 (RA 2006)	0.01 to 0.5%
		Silica	IS:1493(Pt-1): 1981 (RA 2006)	0.1 to 10%
VIII.	METALLIC COATINGS & TREATMENT SOLUTIONS			
1.	Electroplated material	Plating / coating thickness of Cd, Cr, Ni, Cu, Au, Pb, Ag, Sn, Zn	SWDC/SOP/NF/PT/01-2010 ASTM B 504-90 (2011) IS : 14126-1994 (RA 2010) ISO : 2177-1985 (RA 2003)	0.01 to 99.9 µm
		Mass of Zn, Al coating	IS : 6745-1972 (RA 2010) IS : 3821-1973 (RA 2010)	0.1 to 2000 g/m ²
2.	Coating Thickness	Anodizing Coating	IS:5523-1983 (RA 2010) ASTM B-137- 95 (2009)	0.5 to 50 µm
IX.	CORROSION TEST			
1.	Metals	Accelerated corrosion (CASS /AASS TEST)	IS:5528- 1983 (RA 2010), ASTM-B-368- 09 (2014), ASTM B-287- 74, ISO-9227- 2012 IS:6910- 1985 (RA 2010)	Qualitative

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National Accreditation Board for Testing and Calibration Laboratories

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 20 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Corrosion test (Salt Spray Test)	IS:9844-1981 (Ra 2010) ASTM-B117-11 / ISO-9227-2012	Qualitative

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 21 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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ELECTRONICS TESTING

I.	IT EQUIPMENT			
1.	IT Equipment (Computer, laptops, Notebooks, Tablets, VDU, mobiles, Tablets, printers, Plotters, Automatic Data Processing Machine, Set Top Box, Power Adapters, Cash Registers, Point of Sale terminal, Duplicators, Smart Card Reader, Passport Readers, Power banks, Mail Processing Machine, monitors, keyboards, scanners, Visual display units, Video monitors of screen size up to 32", CCTV Cameras/ CCTV Recorders,	a) Power Interface Marking and Instructions b) Protection from electric shock and energy hazards c) SELV circuits d) Limited current circuit e) Limited power sources f) Provisions for earthing and bonding g) Safety interlocks h) Electrical insulation i) Clearances, creepage distances and distances through insulation	Cl. 1.6 of IS 13252(Part 1): 2010+A1:2013+A2:2015. Cl.1.7 of IS 13252:Part1: 2010+A1:2013+A2:2015. Clause 2.1 of IS 13252: Part 1: 2010+A1:2013+A2:2015. Clause 2.2 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.4 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.5 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.6 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.8 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.9 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015 Clause 2.10 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	AC Current : 0 to 16A Power 0-500W Qualitative Test (Marking) Qualitative Test 1 mV to 70 V dc 10 mA 0 to 8A 0 to 300VA Qualitative Test Qualitative Test 100 mV to 1000Vdc 1mm to 1000mm

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 22 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	USB Driven Barcode readers, barcode scanners, Iris scanners, Optical fingerprint scanners)	j) Wiring Connection and Supply	Clause 3.0 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test
		k) Stability	Cl. 4.1 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	(Up to 25kg)
		l) Mechanical strength:	Cl. 4.2 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	0 to 250 N/L.C. 0.1N
			Cl. 4.2.2 Steady force test, 10 N:	(Steel ball 50 mm Mass 500 g. Distance 1.3 m)
			Cl. 4.2.3 Steady force test, 30 N:	Thickness of Hardwood plate: 19 to 20 mm
			Cl. 4.2.4 Steady force test, 250 N:	Height- 0 to 1000 mm L.C. 0.01 mm
			Cl. 4.2.5 Impact test:	Ambient to 200 °C/ L.C. 1 °C,
			Cl. 4.2.6 Drop test:	
			Cl. 4.2.7 Stress relief test	0 to 24 Hr. L.C. 0.01 s
		m) Design and construction	Cl. 4.3 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test
		n) Protection against hazardous moving parts	Cl. 4.4 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test
		o) Thermal Requirement	Cl. 4.5 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	1 to 200 °C L.C. 0.1 °C
		p) Resistance to abnormal Heat	Cl. 4.5.5 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	75 to 200 °C Mass- 20 N Ball dia.- 5mm
		q) Openings in enclosure	Cl. 4.6 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test
		r) Resistance to fire	Cl. 4.7 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test

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SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 23 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		s) Electric Strength	Cl. 5.2 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Up to 10kV
		T) Abnormal operating and fault condition	Cl. 5.3 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	Qualitative Test
		u) Connection to telecommunication networks	Cl. 6.0 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	2.5kV to 5Kv
		v) Connection to cable distribution systems	Cl. 7.0 of IS 13252 : Part 1 : 2010+A1:2013+A2:2015	2.5kV to 10Kv
2.	Audio, Video and similar electronics apparatus. (Electronics Games, LED/Plasma/LCD TVs, Optical Disc Player, Amplifier, Electronic Music Systems, Power Adopter, LED/Plasma/LCD TVs of screen size Upto 32")	A) Marking and instructions Durability test	Cl. 5.1 of IS 616: 2017	Qualitative Test
		B) Identification and Supply ratings (Power Consumption test)	Cl. 5.2 of IS 616: 2017	0.1 to 600V/0.1V; 0.001 to 20A/0.001A; 0.1 to 1500W/0.1W
		C) Heating under normal operating condition	Cl. 7.0 of IS 616: 2017	20°C to 200°C L.C. 1 °C
		D) Constructional Requirements with regard to protection against electric shock	Cl. 8.0 of IS 616:2017	0-30 N
		Electric shock hazard under normal operating condition:	Cl. 9.0 of IS 616:2017	0 to 100 V ac
		Determination of Hazardous live parts	Cl. 9.1.1.2 of IS 616:2017	0.1 to 60Volt 0.1-999.9µA/0.1µA; 1000-9999µA/1µA
		Withdrawal of Mains Plug	Cl. 9.1.6 of IS 616:2017	42.4Vpeak or 60VDC
		Insulation requirement	Cl. 10.0 of IS 616:2017	
		Surge test	Cl. 10.2 of IS 616:2017	0.1 to 10 kV /L.C. 0.1kV
		Humidity treatment	Cl. 10.3 of IS 616:2017	20 to 60°C; 20 to 96%RH
		Insulation Resistance	Cl. 10.4.1 of IS 616:2017	1 to 999MΩ/1MΩ

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(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164


Page 24 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Fault Condition	Cl. 11.0 of IS 616:2017	1 to 200 °C
		Mechanical Strength	Cl. 12.0 of IS 616:2017	0.1 – 100 N /LC 0.1N
		Bump Test	Cl. 12.1.2 of IS 616:2017	5cm height
		Vibration Test	Cl. 12.1.3 of IS 616:2017	Amplitude: 1.56mm Frequency: 1 to 1kHz
		Impact Test	Cl. 12.1.4 of IS 616:2017	(Steel ball 50 mm Mass 500 gm. Distance 1.3 m) 0.1J to 3.5J
		Drop Test	Cl. 12.1.5 of IS 616:2017	Thickness of Hardwood plate: 13 mm; Height – 0.01-1000 mm/L.C. 0.01 mm
		Stress Relief Test	Cl. 12.1.6 of IS 616:2017	Ambient to 100 °C/L.C.1°C, 0 to 24 Hr. L.C. 0.01 s
		Fixing of actuating elements	Cl. 12.2 of IS 616:2017	0.1Nm to 5Nm/0.1Nm 0.1 to 250.0N/1N
		Remote control devices held in hand	Cl. 12.3 of IS 616:2017	Tumbling barrel 50 times, 25 times
		Drawers	Cl. 12.4 of IS 616:2017	Qualitative
		Antenna coaxial sockets mounted on the apparatus	Cl. 12.5 of IS 616:2017	Qualitative
		Clearance and Creepage Distance	Cl. 13.0 of IS 616:2017	Up to 300 mm
		Determination of working voltage	Cl. 13.2 of IS 616:2017	0.1 to 600V/0.1V
		Clearances	Cl. 13.3 of IS 616:2017	0.0 1mm to 200.0 mm/ 0.01mm
		Measurement of Transient Voltages	Cl. 13.3.4 of IS 616:2017	2500Vdc
		Creepage Distances	Cl. 13.4 of IS 616:2017	0.01mm to 200.0mm/0.01mm CTI 600Volt


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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 25 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Terminals	Cl. 15.0 of IS 616:2017	1 $\mu\Omega$ to 1.999k Ω
		Devices forming parts of Mains Plug	Cl. 15.4.1 of IS 616:2017	0.01 Nm to 5 Nm
		K) External Flexible cable	Cl. 16.0 of IS 616:2017	Qualitative Test
		L) Electrical & Mechanical Connections	Cl. 17.0 of IS 616:2017	0.1 – 5.0 Nm/0.1Nm
		M) Stability & mechanical hazard	Cl. 19.0 of IS 616:2017 (Ex. 19.7.2)	Distance – 0.01mm 1000 mm Inclined Plane – 1 to 15 deg with 360 deg rotation
		N) Resistance to fire:	Cl. 20.0 of IS 616:2017	9.5 mm Burner dia 0.5 mm needle dia 0.01 s to 24 Hr. 650°C
II.	POWER SUPPLIES & STABILIZERS			
1.	Secondary Cells & Batteries containing Alkaline or other Non-Acid Electrolytes	a) Continuous Low Rate Charging test	Cl. 7.2.1 of IS 16046:2015	Voltage Range: 0 to 25V Current range- 1 Amp to 5 Amp
		b) Vibration Test	Cl. 7.2.2 of IS 16046:2015	10 Hz to 2 KHz , Amplitude : 0.52 mm
		c) Moulded Case stress at High ambient Temperature	Cl. 7.2.3 of IS 16046:2015	27 to 90 °C
		d) Temperature Cycling Test	Cl. 7.2.4 of IS 16046:2015	-20 °C to 75 °C
		e) External Short Circuit	Cl. 7.2.5 of IS 16046:2015	15 °C to 60 °C & Resistor 60 to 100 Milli ohm
		f) Free fall Test	Cl. 7.3.3 of IS 16046:2015	0.1m to 1.5 m
		g) Mechanical Shock Test (Crash Hazard)	Cl. 7.3.4 of IS 16046:2015	Time 3 milli second, Acceleration 75g, 125g, 175g

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 26 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		h) Thermal abuse test	Cl. 7.3.5 of IS 16046:2015	100°C to 150°C (Qualitative Test)
		i) Crushing of cells test	Cl. 7.3.6 of IS 16046:2015	5 to 13 kN (Qualitative Test)
		j) Low pressure test	Cl. 7.3.7 of IS 16046:2015	5 to 15 kPa (Qualitative Test)
		k) Overcharge for nickel system test	Cl. 7.3.8 of IS 16046:2015	voltage range- 0 to 25V Current range-0.1 Amp to 5 Amp
		l) Forced discharge test	Cl. 7.3.9 of IS 16046:2015	voltage range- 0 to 25 V Current range- 0.1 to 5 Amp
		m) Overcharge for lithium system test	Cl. 8.3.6 of IS 16046:2015	voltage range- 0 to 30 V Current range-0.1 Amp to 5 Amp
		n) Information for safety	Cl. 8.3.6 of IS 16046:2015 & IEC 61438	Qualitative Test
		o) Marking (Cell & Battery)	Cl. 10.0 of IS 16046:2015 & IEC 61438, IEC 61951-1 & -2, IEC 61960	Qualitative Test
III.	LAMPS, LUMINARIES AND ACCESSORIES			
1.	Self-ballasted LED lamps for general lighting services, Safety of lamp control gear	a) Marking	Cl. 5.0 of IS 16102 (P-1):2012, Cl. 7.1 of IS 15885 (P-1):2011	Qualitative
		b) Interchangeability	Cl. 6.0 of IS 16102 (P-1):2012	Gauges: B22d, E14, E27
		c) Protection against accidental contact with live parts	Cl. 7.0 of IS 16102 (P-1):2012, Cl. 10.1 & Cl. 10.2 of IS 15885 (P-1):2011	1) 1 to 20 N 2) 1 to 500 V 3) 1 to 60 S

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 27 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		d)Insulation Resistance and electric strength after humidity treatment	Cl. 8.1.1, Cl. 8.2 of IS 16102 (P-1): 2012, Cl. 11 of IS 15885 (P-1): 2011 and Cl. 12 of IS 15885 (P-1): 2011	1) 500V & 1000V, 100kΩ to 10 MΩ 2) 1 to 60 Min 3) 0 to 5kV 4) 15 to 60°C/ 30 to 99%RH
		e)Mechanical Strength	Cl. 9.0 of IS 16102 (P-1):2012	1) 0.1 to 4Nm 2) 1 to 20N
		f)Cap Temperature rise	Cl. 10 of IS 16102 (P-1):2012	0 to 100°C (Up to 300W)
		g)Resistance to heat	Cl. 11 of IS 16102 (P-1): 2012	50 to 1000°C
		h)Resistance to flame and ignition	Cl. 12 of IS 16102 (P-1): 2012	50 to 1000°C, 60Sec
		i)Clearance and Creepage distance	Cl. 14 of IS 16102 (P-1): 2012 Cl. 16 of IS 15885 (P-1):2011	1 to 150 mm
		j)Resistance to heat	Cl. 18.1 of IS 15885 (P-1):2011	1) 0.1 to 5mm 2) 1-20N 3)10-650°C 4) 01. to 0.5A
		k)Resistance to fire	Cl. 18.2 of IS 15885 (P-1):2011	1) 0.1 to 5mm 2) 1-20N 3)10-650°C 4) 01. to 0.5A
		l)Resistance to Tracking	Cl. 18.3, Cl. 18.4, Cl. 18.5 of IS 15885 (P-1):2011	1) 0.1 to 5mm 2) 1-20N 3)10-650°C 4) 01. to 0.5A

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 28 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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MECHANICAL TESTING

AT LABORATORY				
I.	BUILDING MATERIALS			
1.	Tile	Water Absorption	IS : 1237-2012 / IS:13801-2013	0.5 to 40%
		Dimensions	IS : 1237-2012 / IS:13801-2013	0.5 to 610 mm
		Abrasion value	IS : 1237-2012 / IS:13801-2013	0.10 to 5 mm
		Wet transverse strength	IS : 1237-2012 / IS:13801-2013	0 to 10 N/mm ²
		Modulus of Rupture	IS:13630 Pt.-6-2006 (RA2011)	1.0 to 50 N/mm ²
2.	Acid Resistance Tile / Bricks	Breaking Strength	IS:4457- 2007 (RA 2012)	100 to 2500 N
		Water Absorption	IS : 4860- 1968 (RA 2011)	0.5 to 40%
3.	Fire Clay Refractory	Bulk Density	IS :1528 Pt.12-2007	1 to 3 g/cm ³
		Cold Crushing Strength	IS :1528 Pt.4- 2012	10 to 100 N/mm ²
4.	Common Burnt Clay /Fly ash Bricks	Water Absorption	IS :3495(Pt-2) : 1992 (RA 2011)	0.1 to 40%
		Compressive Strength	IS :3495(Pt-1) : 1992 (RA 2011)	1.0 to 40 N/mm ²
		Efflorescence	IS: 3495(Pt-3): 1992 (RA 2011)	Qualitative
	Aggregate	Dimensions	IS : 1077 : 1992 (RA 2011)	1 to 5000 mm
5.		Flakiness Index	IS : 2386 (Pt.-1) :1963 (RA 2011)	0 to 50%
		Elongation Index	IS : 2386 (Pt.-1) :1963 (RA 2011)	0 to 50%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 29 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Sieve Analysis	IS : 2386 (Pt.-1) :1963 (RA 2011)	75 mic to 100 mm
		Water Absorption	IS : 2386 (Pt.-3) :1963 (RA 2011)	1 to 25%
		Specific Gravity	IS : 2386 (Pt.-3) :1963 (RA 2011)	2.3 to 3.5
		Bulk Density	IS : 2386 (Pt.-3) :1963 (RA 2011)	1 to 2 g/cc
		Material Finer than 75 micron	IS : 2386 (Pt.-1) :1963 (RA 2011)	1 to 20%
		Impact Value	IS : 2386 (Pt.-4) :1963 (RA 2011)	1 to 80%
		Crushing Value	IS : 2386 (Pt.-4) :1963 (RA 2011)	1 to 80%
		10% Fine value	IS : 2386 (Pt.-4) :1963 (RA 2011)	1 to 1000kN
		Deleterious Materials	IS : 2386 (Pt.-2) :1963 (RA 2011)	0.5 to 5%
		L.A. Abrasion value	IS : 2386 (Pt.-4) :1963 (RA 2011)	10% to 80%
		Organic Impurities	IS : 2386 (Pt.-2) :1963 (RA 2011)	Qualitative
		Soundness	IS : 2386 (Pt.-5) :1963 (RA 2011)	1 to 30%
		Stripping value	IS : 6241 :1971 (RA 2013)	Qualitative
6.	Concrete / Core	Flexural strength(using simple beam with third point loading)	IS :516-1959 (RA 2008), ASTM : C-78-10e1, IS: 2185 (Pt.-1)-2005 IS: 2185 (Pt.-2)-1983 IS: 2185 (Pt.-3)-1984 IS:15658-2006	1.0 to 20 N/mm ²
		Compressive Strength / Core test	IS:516-1959 (RA 2008)	5.0 to 80 N/mm ²

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 30 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
7.	Stone	Durability	IS:1126: 2013	Qualitative
		Water Absorption	IS:1124: 1974 (RA 2013)	0.1 to 40%
		Apparent Porosity	IS:1124: 1974 (RA 2013)	0.5 to 40%
		Apparent Specific Gravity	IS:1124: 1974 (RA 2013)	2.0 to 5.00
8.	Fly Ash	Lime reactivity	IS :1727: 1967 (RA 2008)	1.0 to 15 N/mm ²
		Specific gravity	IS :1727: 1967 (RA 2008)	1.5 to 3.6 g/cc
		Fineness by Blain's permeability method	IS :1727: 1967 (RA 2008)	5 to 800 m ² /kg
		Particle retained on 45 micron sieve	IS :1727: 1967 (RA 2008)	1 to 50%
		Compressive strength at 28 days	IS :1727: 1967 (RA 2008)	1 to 50 N/mm ²
		Soundness by autoclave	IS :1727: 1967 (RA 2008)	0.01 to 1%
9.	Timber	Moisture Content by oven dry method	IS:287: 1993 (RA 2008) IS:1708 (P-1): 1986 (RA 2005)	0.5% to 60%
10.	Bitumen	Bitumen Contents from DBM,BC,SDBC	MORTH Specification	1 to 10%
		Bitumen Penetration test	IS:1203-1978 (RA 2009)	5 to 100
		Softening Point (R & B)	IS:1205-1978 (RA 2009)	10 to 360 ⁰ C
		Ductility	IS:1208-1978 (RA 2009)	1 to 100 cm
		Elastic recovery	IS:15462-2004 (RA 2009) IRC SP-53- 2010	10 to 100%
11.	Cement (OPC, PPC, Slag Cement, White Cement)	Consistency	IS:4031 PT-4:1988 (RA 2009)	10 to 35%
		Initial Setting time	IS:4031 PT-5 : 1988 (RA 2009) EN-196 Pt. 3-2005	2.0 to 272 Minutes
		Final Setting time	IS:4031 PT-5 : 1988 (RA 2009) EN-196 Pt. 3-2005	2.0 to 272 Minutes

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 31 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Fineness (blains)	IS:4031 PT-2: 1999 (RA 2008)	100 to 700 m ² /kg
		Soundness Le-Chatlier	IS:4031 PT-3: 1988 (RA 2009) EN-196 Pt. 3-2005	0.5 to 20mm
		Soundness Autoclave	IS:4031 PT-3: 1988 (RA 2009) EN-196 Pt. 3-2005	0.01 to 4%
		Compressive strength	IS:4031 PT-6: 1988 (RA 2009) EN-196 Pt. 1-2005	10.0 to 75 MPa
12.	Admixture	Water content, % of control sample	IS:9103: 1999 (RA 2008)	0 to 80%
		Slump	IS:9103: 1999 (RA 2008)	10 to 250mm
		Time of setting, allowable deviation from control sample hours	IS:9103: 1999 (RA 2008)	1 to 5 hrs
		Compressive strength, % of control sample 1,3,7,28 days, 6 month, and 1 year	IS:9103: 1999 (RA 2008)	100 to 150%
		Flexural strength % of control sample 3,7,28 days	IS:9103: 1999 (RA 2008)	100 to 150%
		Length change % increase over control sample	IS:9103: 1999 (RA 2008)	0.001 to 0.02%
		Bleeding % increase over control sample	IS:9103: 1999 (RA 2008)	0 to 7%
		Loss of workability	IS:9103: 1999 (RA 2008)	Qualitative
		Air content (%)	IS:9103: 1999 (RA 2008)	0 to 10%

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 32 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
II.	SOIL AND ROCK			
1.	Soil (Site & Lab)	Liquid Limit	IS :2720 (Pt.-5)-1985 (RA 2010)	10 to 500%
		Plastic Limit	IS :2720 (Pt.-5)-1985 (RA 2010)	1 to 50%
		California Bearing Ratio	IS :2720 (Pt-16)-1987 (RA 2011)	1 to 100%
		Sieve Analysis	IS :2720 (Pt.-4)-1985 (RA 2010)	0.075 to 4.75 mm
		Determination. of water content	IS :2720 (Pt.-2)-1973 (RA 2010)	0.5 to 50%
		Proctor Density Test	IS :2720 (Pt.-7)-1985 (RA 2011) IS: 2720 (Pt-8)-1983 (RA 2010)	0.5 to 3.0 g/cm ³
		Direct Shearing Testing	IS: 2720 (Pt-13)-1986 (RA 2011)	Cohesion 0 to 0.5 kg/cm ² Angle 1 to 50°
		Field Density Test (sand replacement method & core cutter method)	IS: 2720 (Pt-28)-1974 (RA 2010) IS: 2720 (Pt-29)-1975 (RA 2010)	1.5 to 2.5 g/cc 0 to 50%
		One dimensional consolidation	IS: 2720 (Pt-15)-1986 (RA 2011)	0.005 to 1N/mm ²
		Tri axial (UU)	IS: 2720 (Pt-11)-1993 (RA 2011) IS: 2720 (Pt-12)-1981 (RA 2011)	0.005 to 1 N/mm ²
III.	PERFORMANCE TEST			
1.	PVC Water Stop	Tensile strength	IS:15058:2002 (RA 2013)	10 to 5000 MPa
		Elongation	IS: 8543(Pt-4/Sec1)-1984	10 to 600%
		Hardness(Shore A)	IS: 13360 (Pt-5/ Sec 11)-2013	2 to 98 shore A

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 33 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Water absorption	IS:15058:2002 (RA 2013)	0 to 10%
		Accelerated extraction test	IS:15058:2002 (RA 2013)	
		a) Tensile strength		10 to 5000 N
		b) Elongation		10 to 500%
		Stability in effects of alkalis test	IS:15058:2002 (RA 2013)	
		a) weight increase at 7 days		0 to 10%
		b) weight decrease at 7days		0 to 10%
		c) change in hardness at 7 days		±25 shore A
		d) weight increase at 28 days		0 to 10%
		e) weight decrease at 28 days		0 to 10%
		f) dimension change		0 to 10%
IV.	MECHANICAL PROPERTIES OF METALS			
1.	Metallic Materials (Ferrous & Non Ferrous)	Tensile Test	IS:1608- 2005, (RA 2011)	
		Tensile Strength	ISO : 6892 (Pt-1)-2016	2 to 100 kN
		Yield Stress	ASTM:A-370.-2016	10 to 1000 kN
		0.2% Proof Stress	IS:1786- 2008, (RA 2013)	0.40 to 80.0%
		% Elongation		20.0 to 80.0%
		% Reduction Area		
		Breaking Load		
		Weight per meter	IS:1786- 2008, (RA 2013)	0.001 kg to 10 kg
		Bend & Re bend Test		Mandrels dia. 6 to 224mm (Qualitative)
		Vickers Hardness	IS : 1501 (Pt. 1)- 2013	30 HV5 to 900 HV5 50 HV10 to 900 HV10 128 HV30 to 900 HV30

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164

Page 34 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Micro Vickers Hardness	IS : 1501 (Pt. 1)- 2013	2 HV0.01 to 300 HV0.01 2 HV2 to 1550 HV2
		Brinell Hardness	IS : 1501 (Pt. 1)- 2013	10/3000 HBW (100 to 650) 2.5 / 187.5 HBW (100 to 650) 5/750 HBW (100 to 650) 5/250 HBW (100 to 650)
		Rockwell Hardness-Scale-A	IS : 1586 (Part I)- 2012 ASTM :A-370-2016	20 HRA to 88 HRA,
		Rockwell Hardness-Scale-B	ASTM E 18- 16	20 HRBW to 100 HRBW
		Rockwell Hardness-Scale-C		20 HRC to 70 HRC
2.	Metallic Material	Tensile test of steel from room temp. to elevated temp. up to 900°C		
		1. Tensile Strength 2. 0.2% proof stress 3. yield strength 3.% Elongation 4.% Reduction	ASTM E-21-2009 ISO : 6892 (Pt-2)- 2011(E)	6 to 600 kN 0.40 to 80.0% 20.0 to 80.0%
3.	Welded Material	Tensile Strength	ASME Section- IX-2015, AWS D1.1/D1.1M :2015 AWS B 4.0:2007	2 to 100 kN 2 to 1000 kN
4.	All Metals	Izod Impact "V" Notch	IS : 1598- 1977 (RA 2015) ASTM :A-370-2016 ASTM E 23- 16b	2 to 160 Joules
		Charpy Impact "U" Notch	IS : 1499-1977 (RA 2015), ASTM :A-370.-2016	2 to 300 Joules at room temp.
		Charpy Impact "V" Notch	IS : 1757- 2014 ASTM :A-370-2016	2 to 300 Joules Up to to 60°C
5.	Steel	Jominy Harden ability Test	IS : 3848 : 1981 (RA 2009)	Qualitative

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National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Star Wire (India) Limited (Testing Division), 21/4, Mathura Road, Ballabgarh, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5164


Page 35 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
6.	Ferrous & Non Ferrous Welded Plate	Bend Test (Root Bend & Face Bend)	ASME Section-IX- 2015, AWS D1.1/D1.1M :2015 AWS B 4.0:2007	Mandrels dia. 6 to 224mm (Qualitative)
7.	Section of Ferrous Material steel and Cu, Cu Alloy, Al. & Al. Alloy and welded joints	Bend Test	IS : 1599-2012 (RA 2015) AWS B 4.0:2007	Mandrels dia. 6 to 224mm (Qualitative)
8.	Metal Sheets & Strips	Erichsen Cupping Test	IS 10175 Pt. 1 : 2012 (0.2 to 2.0mm)	1.0 to 18.0 mm
9.	Ferrous & Non Ferrous Pipes	Drift Expansion Test	IS : 2335 : 2005 (RA 2011)	15 to 100mm (Qualitative)
		Flattening Test	IS : 2328: 2005 (RA 2011)	Above 50 mm dia (Qualitative)
V.	METALLOGRAPHY TEST			
1.	Ferrous Metals & Alloys/ Bloom Forging & Casting	Macro Analysis	ASTM E-381-2001 (RA 2012) IS: 11371- 1985 (RA 2007)	Up to 10X (Qualitative)
2.	Stainless Steel	Inter granular test as per practice A,B,C & E	ASTM A262- 2015	Qualitative
3.	Ferrous Grey Iron-Malleable Iron, S.G. Iron & Steel in various H.T. Condition	Microstructure Analysis	IS: 7739 (Pt.-1)-1975 (RA 2010) IS: 7739 (Pt.-2)-1975 (RA 2007) IS: 7739 (Pt.-5)-1975 (RA 2007) IS: 7754-1975 (RA 2012), ASM VOL 9, Metallographic Microstructures	Qualitative


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Page 36 of 37

Validity 30.08.2018 to 14.01.2019

Last Amended on --

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
4.	Ferrous & Non-Ferrous Metals	Estimation of Grain Size by Microscopic Comparison & Intercept Method	ASTM E-112-2013, IS:4748- 2009	ASTM No. 1 to 8 (Qualitative)
5.	Steel	Inclusion Rating Method A & D K4 Value	ASTM E-45-2013, IS : 4163-2004 (RA 2010) DIN 50602 : 1985	Qualitative
		Non metallic Inclusion Rating Method A & D	ASTM E-45-2013, IS : 4163-2004 (RA 2010)	Qualitative
		Case depth	IS : 6416- 1988 (RA 2012) (by microscopic method)	0.01 to 5.0 mm
		Depth of decarburization	ASTM E-1077- 2014 IS : 6396- 2000 (RA 2012) (by microscopic method)	0.01 to 5.0 mm
		Case depth	IS : 6416- 1988 (RA 2012) (by hardness method)	Min. 0.1 mm
VI.	NOISE			
1.	Sound Level (Source)	Intensity of sound	IS: 4758-1968 (RA-2002)	35dB to 130dB

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Page 37 of 37

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NON- DESTRUCTIVE TESTING

I.	BUILDING MATERIALS- REINFORCED CONCRETE STRUCRTURE			
1.	Building Materials (Concrete)	Re-bound hammer test	IS 13311 (Pt.2) : 1992 RA 2008	10 to 70 N/mm ²
		Ultra sonic pulse velocity test	IS 13311 (Pt.1): 1992 RA 2008	1 to 7000 m/sec.

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