

Laboratory Raghavendra Spectro Metallurgical Laboratory, Plot No. 141,
Prashanti Nagar, Kukatpally, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7547 (in lieu of T-1781 & T-1782)

Page 1 of 5

Validity 15.07.2018 to 14.07.2020

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
-----	----------------------------	-------------------------	---	--

CHEMICAL TESTING

I.	METALS & ALLOYS			
1.	Ferrous Material and Alloys			
a.	Carbon & Low Alloy Steel	Carbon	IS 8811:1998 (RA 2018)	0.045 % to 1.36 %
		Manganese		0.20 % to 1.7 %
		Phosphorus		0.005 % to 0.09 %
		Sulphur		0.005 % to 0.12 %
		Silicon		0.02 % to 1.2 %
		Copper		0.02 % to 0.7
		Nickel		0.02 % to 4.13 %
		Chromium		0.09 % to 3.0 %
		Molybdenum		0.01 % to 0.98 %
		Vanadium		0.003 % to 0.500 %
		Aluminum		0.002 % to 0.40 %
		Cobalt		0.004 % to 0.03 %
		Tin		0.001 % to 0.008 %
		Lead		0.0002 % to 0.139 %
	Arsenic		0.004 % to 0.010 %	
b.	Stainless steel	Carbon	IS 9879:1998 (RA 2015)	0.017 % to 1.53 %
		Manganese		0.38 % to 10.0 %
		Phosphorus		0.017 % to 0.035 %
		Sulphur		0.001 % to 0.115 %
		Silicon		0.2 % to 1.22 %
		Copper		0.03 % to 3.35 %
		Nickel		0.10 % to 35.0 %
		Chromium		11.4 % to 25.0 %
		Molybdenum		0.07 % to 2.20 %
		Titanium		0.003 % to 0.50 %
	Aluminium		0.003 % to 1.00 %	
	Niobium		0.004 % to 0.65 %	
	Tin		0.003 % to 0.007 %	

Laboratory Raghavendra Spectro Metallurgical Laboratory, Plot No. 141,
Prashanti Nagar, Kukatpally, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7547 (in lieu of T-1781 & T-1782)

Page 2 of 5

Validity 15.07.2018 to 14.07.2020

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
		Cobalt		0.02 % to 1.00 %
		Vanadium		0.04 % to 0.9 %
c.	Tool steel	Carbon	RSML SOP/2-2011	0.60 % to 1.53 %
		Manganese	Issue No.01,	0.2 % to 0.4 %
		Phosphorus	Issue Date18.06/2011	0.02 % to 0.04 %
		Sulphur		0.02 % to 0.04 %
		Silicon		0.15 % to 0.3 %
		Cobalt		0.3 % to 8.0 %
		Chromium		2.9 % to 4.5 %
		Molybdenum		0.1 % to 9.41 %
		Vanadium		0.2 % to 1.8 %
		Tungsten		1.8 % to 17.8 %
2.	Copper & Its Alloys	Phosphorus	RSML SOP-1-2011	0.03 % to 0.7 %
		Sulphur	Issue No.01,	0.001 % to 0.16 %
		Silicon	Issue Date18.06/2011	0.006 % to 0.2 %
		Nickel		0.12 % to 3.2 %
		Chromium		0.03 % to 0.05 %
		Aluminium		0.007 % to 8.0 %
		Tin		0.05 % to 13.0 %
		Lead		0.08 % to 11.7 %
		Manganese		0.004 % to 5.2 %
		Arsenic		0.02 % to 0.25 %
		Zinc		0.006 % to 38.0 %
		Iron		0.01 % to 4.6 %
3.	Aluminium & Its Alloys	Manganese	ASTM E 1251-2017a	0.015 % to 0.7 %
		Silicon		0.15 % to 12.4 %
		Copper		0.01 % to 4.65 %
		Nickel		0.003 % to 1.1 %
		Chromium		0.02 % to 0.25 %
		Titanium		0.04 % to 0.35 %
		Tin		0.06 % to 0.14 %
		Lead		0.003 % to 0.5 %
		Magnesium		0.21 % to 4.83 %

Laboratory Raghavendra Spectro Metallurgical Laboratory, Plot No. 141,
Prashanti Nagar, Kukatpally, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7547 (in lieu of T-1781 & T-1782)

Page 3 of 5

Validity 15.07.2018 to 14.07.2020

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		0.08 5 % to 7.6 %
		Iron		0.2 % to 1.3 %
		Vanadium		0.007 % to 0.025 %
		Beryllium		0.001 % to 0.002 %
		Cobalt		0.018 % to 0.56 %
4.	Coated / Plated Articles	Neutral Saltspray Test	ASTM B-117-2016 IS 9844:1981 (RA 2015)	Qualitative

Laboratory Raghavendra Spectro Metallurgical Laboratory, Plot No. 141,
Prashanti Nagar, Kukatpally, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7547 (in lieu of T-1781 & T-1782)

Page 4 of 5

Validity 15.07.2018 to 14.07.2020

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
-----	----------------------------	-------------------------	---	--

MECHANICAL TESTING

I.	MECHANICAL PROPERTIES OF METALS			
1.	Metals and Alloys, Weldments	Tensile strength Yield stress % Elongation %Reduction in area 0.2% Proof Stress	IS 1608-2005 (RA 2017) ASTM A 370-2017a ASTM E 8-2016a ASME Section IX-2013 ASTM B 557-2015	100-2000 N/mm ² 100-2000 N/mm ² 0 to 85 % 0 to 80 % 100-2000 N/mm ²
		Bend test	IS 1599:2012 (RA 2017) ASME Section IX-2013 IS 7307 (Part 1): 1974 (RA 2013) ASTM E 290-2014	Qualitative (Mandrel Dia: 6,12,16,22,40,50,75,100,125)
2.	Metals and Alloys	Proof Load Nuts Bolts & Studs	IS 1367 (Part 6): 1994 (RA 2015) IS 1367 (Part 3): 2002 (RA 2007)	M 8 to M 30 M 8 to M 30
		Flattening Test for Tubes	IS 2328:2005 (RA 2017)	Upto OD 250 mm
		Brinell Hardness Test	IS 1500 (Part 1): 2013 ASTM E 10-2017	HBW 2.5/187.5 150 HBW to 400 HBW HBW 10/3000 150 HBW to 575 HBW
		Rockwell hardness testing	IS 1586 (Part 1): 2012 (RA 2017) ASTM E 18-2017e1	50 HRB to 100 HRBW 20 HRC to 68 HRC 60 HRA to 90 HRA
		Micro Vickers Hardness	IS 1501 (Part 1): 2013 ASTM E 384-2017	80 HV to 1000 HV1 80 HV to 1000 HV0.5 80 HV to 1000 HV0.2
		Vickers Hardness	ASTM E92-17 IS 1501 (Part 1): 2014	30-1400 HV5 120- 1900 HV30

Ajay Kumar Sharma
Convenor

N. Venkateswaran
Program Director

Laboratory Raghavendra Spectro Metallurgical Laboratory, Plot No. 141,
Prashanti Nagar, Kukatpally, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7547 (in lieu of T-1781 & T-1782)

Page 5 of 5

Validity 15.07.2018 to 14.07.2020

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
		Charpy Impact U Notch V Notch	IS 1499:77 (RA 2015) IS 1757 (Part 1): 2014	Upto 300 J LC 2J RT: Upto -50 °C
		Izod Impact	IS 1598:77 (RA 2015)	Upto 170 J, LC 2J Room Temp
3.	Steels	Total Case depth by Microscopy	IS 6416:1988 (RA 2018)	0.1 mm to 10 mm
		Effective case depth by Micro-hardness survey	IS 6416:1988 (RA 2018)	0.1 mm to 10 mm
		Decarburization Depth	IS 6396:2000 (RA 2018) ASTM E 1077-14	0 to 1 mm/0.01 mm
4.	Plated/ Coated Materials	Coating Thickness by Microscopic Method	IS 3203:1982 (RA 2016) IS 13677:1993 (RA 2016)	Upto 1000 µm/ 0.01 µm
	Stainless Steel	Inter-granular Corrosion Test (Practice B, C, E, F)	ASTM A 262-2015	Qualitative
5.	Metals & Alloys, Cast Iron and Weldments	Macrostructure & Grain Flow Studies	IS 11371:1985 (RA 2018) IS 13015:1991 (RA2018)	Qualitative (Magnification 1 x to 20x)
		Macro-etch Test	ASTM E 340-2017a ASTM E381-96 (RA 2012)	Qualitative
		Microstructure	IS 7739 (Part 1 to Part 9): 1975 (RA 2018) ASTM E 3-01 (2012) ASTM E 407-2018 IS 7754:1975 (RA 2018)	Qualitative
		Grain Size	IS 4748:2009 (RA 2017) ASTM E112-2013	Qualitative (Grain Size No.1 to 10)
		Inclusion rating of steel	IS 4163:2004 (RA 2017) ASTM E 45-2013	0 to 3