

Laboratory TUV SUD South Asia Pvt. Ltd., 344, Habibpur, Main Dadri Road,  
Greater Noida, Uttar Pradesh

Accreditation Standard ISO/IEC 17025: 2017

Certificate Number TC-7986

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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.	<b>METALS AND ALLOYS</b>			
1.	Stainless Steel	Carbon (C)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.010 % to 0.143 %
		Sulphur (S)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.0041 % to 0.028 %
		Phosphorus (P)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.0053 % to 0.025 %
		Manganese (Mn)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.686 % to 2.0 %
		Silicon (Si)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.270 % to 1.41 %
		Chromium (Cr)	ASTM E1086 -2014 IS 9879-98 Ra 2015	9.00 % to 31.00 %
		Nickel (Ni)	ASTM E1086 -2014 IS 9879-98 Ra 2015	6.12 % to 20.05 %
		Molybdenum (Mo)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.013 % to 2.77 %
		Titanium (Ti)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.3 % to 0.5 %
		Niobium (Nb)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.75 % to 1.1 %
		Vanadium (V)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.0346 % to 0.102 %
		Copper (Cu)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.0091 % to 0.276 %
		Aluminum (Al)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.020 % to 0.30 %
	Cobalt (Co)	ASTM E1086 -2014 IS 9879-98 Ra 2015	0.018 % to 0.116 %	

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		Nitrogen (N)	ASTM E1086 -2014 IS 9879-98	0.01 % to 0.063 %
2.	Low Alloy Steel/ Carbon Steel/Low Carbon/Plain Carbon	Carbon	ASTM E415-2017 IS 8811-98 Ra 2012	0.0065 % to 1.31 %
		Sulphur	ASTM E415-2017 IS 8811-98 Ra 2012	0.0026 % to 0.058 %
		Phosphorus	ASTM E415-2017 IS 8811-98 Ra 2012	0.0043 % to 0.059 %
		Manganese (Mn)	ASTM E415-2017 IS 8811-98 Ra 2012	0.162 % to 1.68 %
		Silicon	ASTM E415-2017 IS 8811-98 Ra 2012	0.0039 % to 1.12 %
		Chromium	ASTM E415-2017 IS 8811-98 Ra 2012	0.0055 % to 3.03 %
		Nickel	ASTM E415-2017 IS 8811-98 Ra 2012	0.016 % to 1.46 %
		Molybdenum (Mo)	ASTM E415-2017 IS 8811-98 Ra 2012	0.025 % to 0.83 %
		Titanium (Ti)	ASTM E415-2017 IS 8811-98 Ra 2012	0.01 % to 0.039 %
		Niobium (Nb)	ASTM E415-2017 IS 8811-98 Ra 2012	0.004 % to 0.134 %
		Vanadium (V)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0088 % to 0.49 %
		Cobalt (Co)	ASTM E415-2017 IS 8811-98 Ra 2012	0.004 % to 0.198 %
		Copper (Cu)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0089 % to 0.427 %
		Arsenic (As)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0020 % to 0.0021 %
		Aluminum (Al)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0018 % to 0.33 %
		Tin (Sn)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0067 % to 0.0086 %

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		Tungsten (W)	ASTM E415-2017 IS 8811-98 Ra 2012	0.001 % to 0.012 %
		Lead (Pb)	ASTM E415-2017 IS 8811-98 Ra 2012	0.0044 % to 0.0189 %
3.	High Manganese Steel	Carbon (C)	ASTM E2209-13	0.796 % to 1.18 %
		Sulphur (S)	ASTM E2209-13	0.009 % to 0.012 %
		Phosphorus (P)	ASTM E2209-13	0.031 % to 0.12 %
		Manganese (Mn)	ASTM E2209-13	8.32 % to 13.11 %
		Silicon (Si)	ASTM E2209-13	0.29 % to 0.86 %
		Chromium (Cr)	ASTM E2209-13	0.259 % to 2.22 %
		Nickel (Ni)	ASTM E2209-13	1.62 % to 4.17 %
		Molybdenum (Mo)	ASTM E2209-13	0.266 % to 1.31 %
		Titanium (Ti)	ASTM E2209-13	0.001 % to 0.0024 %
		Vanadium (V)	ASTM E2209-13	0.025 % to 0.052 %
		Cobalt (Co)	ASTM E2209-13	0.0048 % to 0.012 %
		Copper (Cu)	ASTM E2209-13	0.017 % to 0.022 %
		Nitrogen (N)	ASTM E2209-13	0.022 % to 0.041 %
		Aluminum (Al)	ASTM E2209-13	0.008 % to 0.13 %
4.	High Speed Tool Steel	Carbon (C)	JIS G 1253:2002	0.65 % to 1.02 %
		Sulphur (S)	JIS G 1253:2002	0.021 % to 0.039 %
		Phosphorus (P)	JIS G 1253:2002	0.022 % to 0.043 %
		Manganese (Mn)	JIS G 1253:2002	0.21 % to 0.41 %
		Silicon (Si)	JIS G 1253:2002	0.14 % to 0.30 %
		Chromium (Cr)	JIS G 1253:2002	2.9 % to 4.54 %
		Molybdenum (Mo)	JIS G 1253:2002	0.18 % to 9.41 %
		Vanadium (V)	JIS G 1253:2002	0.22 % to 1.82 %
		Cobalt (Co)	JIS G 1253:2002	0.08 % to 7.95 %
		Tin (Sn)	JIS G 1253:2002	0.014 % to 0.019 %
		Tungsten (W)	JIS G 1253:2002	1.8 % to 17.83 %
5.	Cast Iron	Carbon (C)	ASTM E 1999-2018 ASTM E351	1.916 % to 4.174 %
		Silicon (Si)	ASTM E 1999-2018 ASTM E351	1.30 % to 1.361 %

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		Manganese (Mn)	ASTM E 1999-2018 ASTM E351	1.0095 % to 1.798 %
		Phosphorus (P)	ASTM E 1999-2018 ASTM E351	0.0215 % to 0.0453 %
		Sulphur (S)	ASTM E 1999-2018 ASTM E351	0.0372 % to 0.0724 %
		Chromium (Cr)	ASTM E 1999-2018 ASTM E351	0.01 % to 0.0794 %
		Molybdenum (Mo)	ASTM E 1999-2018 ASTM E351	0.01 % to 0.0342 %
		Nickel (Ni)	ASTM E 1999-2018 ASTM E351	0.10 % to 0.205 %
		Aluminum (Al)	ASTM E 1999-2018 ASTM E351	0.001 % to 0.0072 %
		Cobalt (Co)	ASTM E 1999-2018 ASTM E351	0.01 % to 0.023 %
		Copper (Cu)	ASTM E 1999-2018 ASTM E351	0.01 % to 0.0117 %
		Tin (Sn)	ASTM E 1999-2018 ASTM E351	0.001 % to 0.0062 %
		Titanium (Ti)	ASTM E 1999-2018 ASTM E351	0.001 % to 0.007 %
		Vanadium (V)	ASTM E 1999-2018 ASTM E351	0.1 % to 0.179 %
		Zinc (Zn)	ASTM E 1999-2018 ASTM E351	0.0004 % to 0.0006 %
6.	Nickel and its Alloys	Carbon (C)	ASTM E3047-2016	0.014 % to 0.153 %
		Sulphur (S)	ASTM E3047-2016	0.0010 % to 0.163 %
		Phosphorus (P)	ASTM E3047-2016	0.0031 % to 0.0189 %
		Manganese (Mn)	ASTM E3047-2016	0.019 % to 1.68 %
		Silicon (Si)	ASTM E3047-2016	0.231 % to 1.22 %
		Chromium (Cr)	ASTM E3047-2016	0.073 % to 21.94 %
		Molybdenum (Mo)	ASTM E3047-2016	3.01 % to 19.72 %
		Vanadium (V)	ASTM E3047-2016	0.0181 % to 1.00 %

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		Cobalt (Co)	ASTM E3047-2016	0.02 % to 14.71 %
		Tungsten (W)	ASTM E3047-2016	0.04 % to 4.020 %
		Niobium (Nb)	ASTM E3047-2016	0.007 % to 5.31 %
		Aluminum (Al)	ASTM E3047-2016	0.008 % to 5.97 %
		Titanium (Ti)	ASTM E3047-2016	0.0421 % to 3.01 %
		Copper (Cu)	ASTM E3047-2016	0.0076 % to 32.41 %
		Iron (Fe)	ASTM E3047-2016	0.997 % to 38.4 %
7.	<b>Copper &amp; its Alloys</b>	Sulphur (S)	BS 15079-2015	0.0108 % to 0.063 %
		Phosphorus (P)	BS 15079-2015	0.0026 % to 0.076 %
		Manganese (Mn)	BS 15079-2015	0.001 % to 1.028 %
		Silicon (Si)	BS 15079-2015	0.002 % to 0.252 %
		Nickel (Ni)	BS 15079-2015	0.0421 % to 7.03 %
		Copper (Cu)	BS 15079-2015	79.61 % to 95.0 %
		Lead (Pb)	BS 15079-2015	0.0436 % to 4.8 %
		Arsenic (As)	BS 15079-2015	0.0074 % to 0.0512 %
		Aluminum (Al)	BS 15079-2015	0.0005 % to 7.87 %
		Tin (Sn)	BS 15079-2015	0.0311 % to 5.18 %
		Antimony (Sb)	BS 15079-2015	0.0254 % to 0.1822 %
		Iron (Fe)	BS 15079-2015	0.053 % to 3.55 %
		Zinc (Zn)	BS 15079-2015	0.13 % to 10.23 %
8.	<b>Aluminum &amp; its Alloys</b>	Silicon (Si)	ASTM E 1251-2011 IS 11035	0.0232 % to 8.49 %
		Manganese (Mn)	ASTM E 1251-2011 IS 11035	0.0019 % to 0.837 %
		Chromium (Cr)	ASTM E 1251-2011 IS 11035	0.0024 % to 0.185 %
		Nickel (Ni)	ASTM E 1251-2011 IS 11035	0.0071 % to 0.494 %
		Copper (Cu)	ASTM E 1251-2011 IS 11035	0.11 % to 3.73 %
		Lead (Pb)	ASTM E 1251-2011 IS 11035	0.1 % to 1.114 %
		Tin (Sn)	ASTM E 1251-2011 IS 11035	0.092 % to 0.187 %

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		Antimony (Sb)	ASTM E 1251-2011 IS 11035	0.02 % to 0.049 %
		Iron (Fe)	ASTM E 1251-2011 IS 11035	0.08 % to 1.38 %
		Magnesium ( Mg )	ASTM E 1251-2011 IS 11035	0.0031 % to 1.292 %
		Zinc (Zn)	ASTM E 1251-2011 IS 11035	0.0148 % to 7.55 %
9.	Steel & its alloys	Carbon (C)	ASTM E1019 -18	0.0271 % to 0.80 %
		Sulphur (S)	ASTM E1019 -18	0.005 % to 0.0206 %
10.	Cast iron & its alloys	Carbon (C)	ASTM E1019 -18	1.00 % to 2.33%
		Sulphur (S)	ASTM E1019 -18	0.01 % to 0.011%
11.	Ferrous & its alloys	Chromium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Nickel	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Molybdenum	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Vanadium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Tungsten	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Cobalt	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Niobium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Titanium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Copper	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
12.	Nickel & its alloys	Nickel	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Molybdenum	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis

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		Tungsten	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Cobalt	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Niobium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Titanium	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
13.	<b>Copper &amp; its alloys</b>	Copper	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Zinc	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Lead	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Tin	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
		Nickel	ASTM E1476-04(2014) PMI Analysis	Qualitative analysis
14.	<b>Stainless Steels</b>	IGC Tests	ASTM A262 – 2015	Qualitative analysis
		IGC Practice A		
		IGC Practice B		Quantitative analysis 2 mpy to 200 mpy
		IGC Practice C		Quantitative analysis 2 mpy to 200 mpy
		IGC Practice E		Qualitative analysis
15.	<b>Nickel &amp; its alloys</b>	IGC Method-A	ASTM G28-02(2015)	Quantitative analysis 2 mpy to 200 mpy
ii.	<b>CORROSION TESTS</b>			
1.	<b>Ferrous Metals</b>	HIC Test	NACE TM 0284(2011)	Qualitative analysis
		SSCC	NACE TM 0177(2005)	Qualitative Analysis
2.	<b>Ferrous &amp; Non Ferrous Metals</b>	Salt Spray Test	ASTM B117-2016	Qualitative Analysis

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**MECHANICAL TESTING**

<b>I. MECHANICAL PROPERTIES OF METALS</b>				
1.	<b>Ferrous &amp; Non Ferrous Metals, Weld in Metals and bolt &amp; Screw, machined Specimen</b>	<b>Tensile Test</b> UTS YS 0.2 & 1 % PS % EL % RA	ASTM A 370-2017a E 8/ E8M-16a IS 1608-2005 ASME SEC IX - 2017 ISO 6892-1 - 2016 ASME-IIC-2017 IS 1367-3-2018	2-100 KN 12-600 KN 20-1200 KN Load  %EL 2-80 %RA 10-80
		Through Thickness Tensile Test (% RA)	ASTM A770-03	10%-80%
		Brinell Hardness	ASTM A 370-2017a IS 1500(Pt.1)-2013 ASTM E10-2017	100 to 450 HBW At 10/3000Kgf 2.5/187.5
		Vickers' Hardness	IS1501(Pt. 1)-2013 ASTM E 92-2017	40 HV5 to 800 HV5
		Micro Vickers Hardness	IS1501(Pt. 1)-2013 ASTM E 384-2016	40-1500 HV 0.5
		Rockwell Hardness	IS 1586(Pt. 1)-2018 ASTM E 18-2017	20 HRA-90 HRA 30 HRB-100 HRB 20 HRC-70HRC 20 HR30N-90HR30N
		Bend Test	IS1599-2012 ASTM A 370-2017a ASTM E290-2014 ASTM E190-2014 ASME SEC IX-2017 IS: 2825-1969	Qualitative Analysis
2.	<b>HSD Bar, TMT Bar</b>	Re-bend Test Mass per meter	IS 1786-2008 IS 1786-2008	Qualitative Analysis 0.09-12 Kg/Mtr
3.	<b>Ferrous &amp; Non Ferrous Metals,</b>	Charpy V-Notch Impact Test	ASTM A 370-2017a ASTM E 23-2016b	2-450 Joules @ (-) 50° C

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	<b>Weld in Metals</b>	(35 to -90 °C) & -196 °C	IS 1757 Part-1: 2014 ISO-148-1-2016	
4.	<b>Tubes &amp; Pipes</b>	Flattening Test (Tubes & Pipes)	ASTM A 370-2017a ASTM B 968/B968M-16 IS 2328-2005 Ra 2017 IS 2501-95 Ra.2016	Qualitative analysis (OD 6mm to 600mm)
		Flaring / Drift Test (Tubes)	ASTM A 370-2017a IS 2335-2005 IS 2501-1995	Qualitative analysis (OD 10mm to 80 mm)
5.	<b>Metal Sheet &amp; Strips</b>	Erichson Cupping Test (Ferrous Sheet)	IS 10175(Pt-I)-2012 ISO 8490-1986	Qualitative analysis (0.20 to 2.00mm Thickness)
6.	<b>Ferrous &amp; Non Ferrous Metals</b>	Micro structure Examination	ASM Vol – 9 : 2004	Qualitative analysis 50X to 1000X
		Grain size (Comparison Method)	ASTM E112-13 IS 4748 -2009 Ra 2017	(ASTM Plate I, II, III, IV)
		Microstructure of Graphite in Cast Iron – Type, Size, & Distribution	IS 7754 –1975 ASTM A247 -2017	Qualitative analysis 100X
7.	<b>SG Iron</b>	Nodularity	ASTM A247-2017	Qualitative analysis 100X
8.	<b>Ferrous Metal</b>	Decarburization	IS 6396-2000 ASTM E1077-2014	0.01mm - 1.5 mm
9.	<b>Case Hardened Steel</b>	Case Depth (Micro vicker 's Hardness Method)	IS 6416-1988	0.01 – 5.0mm
		Case Depth	IS 6416-1988	0.01 - 1 mm
10.	<b>Coating in Metals</b>	Thickness of Coating	ASTM B487-85(2013)	0.01 - 1 mm
11.	<b>Steel</b>	Inclusion Rating	ASTM E45-2013 IS 4163 -2004	0.5 mm - 3.0 mm
		Ferrite Content	ASTM A799 – 2010 (2015) ASTM A800-2014	0.5% - 70%
12.	<b>Ferrous &amp; Non Ferrous Metals, Weld in Metals</b>	Macro etch Test	ASTM E340-2015 ASTM E381-2017	Qualitative Analysis

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**NON - DESTRUCTIVE TESTING**

AT LAB & AT SITE				
I.	<b>METALS AND ALLOYS</b>			
1.	<b>Ferrous and Non-Ferrous Metal and Alloys</b>	Ultrasonic Testing	ASME Sec V; Article 4,5,23:2017	
2.	<b>Weld</b>		ASME SE-273:2017	8 mm to 25 mm
3.	<b>Pipes &amp; Tubing</b>		ASME SE-213:2017 ASME SE-273:2017	10 mm to 100 mm
4.	<b>Forging</b>	Back Wall Method	ASME SA-388:2017	Dia 20 mm to 500 mm
5.	<b>Plate</b>		ASME SA -435:2017 ASME SA-577:2017 ASME SA-578:2017	8 mm to 300 mm
6.	<b>Casting</b>		ASME SA-609:2017	100 mm to 200 mm
7.	<b>Ferrous and Non-Ferrous Metal and Alloys for Plates, Forgings, Weld &amp; Tubes</b>	Ultrasonic Testing (Thickness Measurement)	ASME E 797:2017 ASME Sec V; Article 23: 2017	0.5 mm to 500 mm
8.	<b>Ferromagnetic Material</b>	Magnetic Particle Testing (Yoke) Visible & Fluorescent	ASME Sec V; Article7: 2017 ASME SE 709:2017	Surface & Sub Surface Flaws (Depth: 3mm Max) Qualitative
9.	<b>Ferrous and Non-Ferrous Metal and Alloys</b>	Liquid Penetrant Testing	ASME Sec V; ARTICLE 8:2017	Flaws opens to surface Qualitative
10.	<b>Ferrous and Non-Ferrous Metal and Alloys</b>	Eddy Current testing	ASME Sec V; Article 8:2017 ASME E 566:2014 ASME E 703:2014	Defect Upto 1 mm from surface Qualitative

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