

Laboratory SKB Metallurgical Services, 144/6, Dharmatala Road, Salkia, Howrah, West Bengal

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-8027 (in lieu of T-0639, T-0640 &, T-1478) Page 1 of 9

Validity 10.10.2018 to 09.10.2020 Last Amended on 23.10.2018

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.	METALS & ALLOYS			
1.	Carbon & Low Alloy Steel	Carbon	IS 8811-98(RA 2018), ASTM E415:2017	0.10 % to 0.65 %
		Manganese	IS 8811-98(RA 2018), ASTM E415:2017	0.30 % to 1.70 %
		Silicon	IS 8811-98(RA 2018), ASTM E415:2017	0.10 % to 1.25 %
		Sulphur	IS 8811-98(RA 2018), ASTM E415:2017	0.005 % to 0.060 %
		Phosphorus	IS 8811-98(RA 2018), ASTM E415:2017	0.005 % to 0.080 %
		Chromium	IS 8811-98(RA 2018), ASTM E415:2017	0.05 % to 1.80 %
		Nickel	IS 8811-98(RA 2018), ASTM E415:2017	0.05 % to 2.20 %
		Molybdenum	IS 8811-98(RA 2018), ASTM E415:2017	0.01 % to 0.50 %
		Copper	IS 8811-98(RA 2018), ASTM E415:2017	0.05 % to 0.50 %
		Aluminium	IS 8811-98(RA 2018), ASTM E415:2017	0.01 % to 0.055 %
		Vanadium	IS 8811-98(RA 2018), ASTM E415:2017	0.01 % to 0.50 %
		Niobium	IS 8811-98(RA 2018), ASTM E415:2017	0.01 % to 0.10 %
		Nitrogen	IS 8811-98(RA 2018), ASTM E415:2017	0.005 % to 0.020 %

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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
2.	Carbon & Low Alloy Steel	Carbon	IS 228(Pt-1)87,(RA 2018)	0.05 % to 1.25 %
		Manganese	IS 228(Pt-2) 87,(RA 2018)	0.10 % to 1.70 %
		Silicon	IS 228(Pt-8) 89,(RA 2014)	0.05 % to 2.00 %
		Sulphur	IS 228(Pt-9) 89,(RA 2014)	0.01 % to 0.25 %
		Phosphorus	IS 228(Pt-3) 87,(RA 2018)	0.01 % to 0.15 %
		Chromium	IS 228(Pt-6) 87,(RA 2014)	0.10 % to 2.50 %
		Nickel	IS 228(Pt-5) 87,(RA 2014)	0.10 % to 3.50 %
		Copper	IS 228(Pt-15) 92,(RA 2014)	0.05 % to 1.00 %
3.	Stainless Steel	Carbon	ASTM-E1086:17 IS 9879:98(RA 2015)	0.01 % to 0.30 %
		Manganese	ASTM-E1086:17 IS 9879:98(RA 2015)	0.10 % to 2.00 %
		Silicon	ASTM-E1086:17 IS 9879:98(RA 2015)	0.01 % to 2.00 %
		Sulphur	ASTM-E1086:17 IS 9879:98(RA 2015)	0.01 % to 0.10 %
		Phosphorus	ASTM-E1086:17 IS 9879:98(RA 2015)	0.01 % to 0.05 %
		Chromium	ASTM-E1086:17 IS 9879:98(RA 2015)	10.00 % to 22.00 %
		Nickel	ASTM-E1086:17 IS 9879:98(RA 2015)	2.00 % to 15.00 %
		Molybdenum	ASTM-E1086:17 IS 9879:98(RA 2015)	0.01 % to 2.50 %
4.	Stainless Steel	Carbon	IS 228(Pt-1) 87,(RA 2018)	0.03 % to 2.20 %
		Manganese	IS 228(Pt-2) 87,(RA 2018)	0.10 % to 2.00 %
		Silicon	IS 228(Pt-8) 89,(RA 2014)	0.10 % to 2.00 %
		Phosphorus	IS 228(Pt-3) 87,(RA 2018)	0.005 % to 0.080 %
		Chromium	IS 228(Pt-6) 87,(RA 2014)	0.10 % to 20.00 %
		Nickel	IS 228(Pt-5) 87,(RA 2014)	0.10 % to 15.00 %
		Molybdenum	IS 228(Pt-7) 90,(RA 2018)	1.00 % to 4.00 %

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5.	Manganese Steel	Carbon	ASTM-E2209-13	0.70 % to 1.40 %
		Manganese	ASTM-E2209-13	8.00 % to 17.00 %
		Silicon	ASTM-E2209-13	0.30 % to 1.40 %
		Sulphur	ASTM-E2209-13	0.01 % to 0.040 %
		Phosphorus	ASTM-E2209-13	0.030 % to 0.060 %
		Chromium	ASTM-E2209-13	0.05 % to 2.00 %
		Nickel	ASTM-E2209-13	0.05 % to 1.50 %
6.	Cast Iron	Molybdenum	ASTM-E2209-13	0.20 % to 0.70 %
		Carbon	ASTM-E1999:2011	2.00 % to 4.00 %
		Manganese	ASTM-E1999:2011	0.50 % to 1.00 %
		Silicon	ASTM-E1999:2011	0.50 % to 3.00 %
		Sulphur	ASTM-E1999:2011	0.02 % to 0.25 %
		Phosphorus	ASTM-E1999:2011	0.02 % to 0.08 %
		Chromium	ASTM-E1999:2011	0.10 % to 2.00 %
		Nickel	ASTM-E1999:2011	0.10 % to 2.00 %
7.	Cast Iron	Molybdenum	ASTM-E1999:2011	0.05 % to 1.20 %
		Copper	ASTM-E1999:2011	0.10 % to 0.75 %
		Carbon	IS 12308(Pt.-11) 91, (RA 2018)	1.50 % to 4.50 %
		Manganese	IS 12308(Pt.-10) 91, (RA 2018)	0.05 % to 1.50 %
		Silicon	IS 12308(Pt.-6) 91, (RA 2018)	0.10 % to 3.00 %
		Phosphorus	IS 12308(Pt.-5) 91, (RA 2018)	0.01 % to 0.50 %
		Chromium	IS 12308(Pt.-7) 91, (RA 2018)	0.10 % to 2.50 %
8.	Copper & its Alloys	Nickel	IS 12308(Pt.-8) 97, (RA 2018)	0.50 % to 4.50 %
		Tin	BS-EN 15079:07	0.05 % to 14.00 %
		Lead	BS-EN 15079:07	0.10 % to 17.00 %
		Zinc	BS-EN 15079:07	0.10 % to 45.00 %
		Iron	BS-EN 15079:07	0.05 % to 5.50 %
		Manganese	BS-EN 15079:07	0.10 % to 4.00 %

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		Nickel	BS-EN 15079:07	0.10 % to 6.00 %
		Phosphorus	BS-EN 15079:07	0.01 % to 1.00 %
		Aluminium	BS-EN 15079:07	0.10 % to 12.00 %
		Silicon	BS-EN 15079:07	0.01 % to 0.50 %
		Arsenic	BS-EN 15079:07	0.01 % to 0.35 %
		Antimony	BS-EN 15079:07	0.01 % to 0.50 %
9.	Copper & its Alloys	Copper	IS 440 64,(RA 2018), IS 3685 66, (RA 2018), IS 4027(Pt.-1)'87, (RA 2018)	55.00 % to 99.95 %
		Tin	IS 4027(Pt.-5)'87, (RA 2018), IS 3685-66, (RA 2018).	0.05 % to 13.00 %
		Lead	IS 3685 66, (RA 2018), IS 4027(Pt.-1) 87, (RA 2018)	0.10 % to 20.00 %
		Zinc	IS 3685 66, (RA 2018)	0.10 % to 40.00 %
9.	Copper & its Alloys	Iron	IS 4027(Pt.-5)'87, (RA 2018), IS 3685-66, (RA 2018).	0.05 % to 5.50 %
		Manganese	IS 3685-66, (RA 2018).	0.05 % to 5.00 %
		Nickel	IS 3685 66,(RA 2018),	0.05 % to 6.00 %
		Phosphorus	IS 4027(Pt.-5)'87, (RA 2018)	0.02 % to 1.00 %
10.	Aluminium & its Alloys	Copper	ASTM-E1251-2011	0.01 % to 6.00 %
		Silicon	ASTM-E1251-2011	0.01 % to 13.00 %
		Iron	ASTM-E1251-2011	0.20 % to 0.50 %
		Nickel	ASTM-E1251-2011	0.01 % to 2.00 %
		Manganese	ASTM-E1251-2011	0.01 % to 1.50 %
		Magnesium	ASTM-E1251-2011	0.03 % to 5.00 %
		Zinc	ASTM-E1251-2011	0.01 % to 0.70 %
		Tin	ASTM-E1251-2011	0.03 % to 0.50 %
		Titanium	ASTM-E1251-2011	0.01 % to 0.15 %
		Chromium	ASTM-E1251-2011	0.01 % to 0.25 %

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11.	Aluminium & its Alloys	Silicon	IS 504(Pt.-1) 02 (RA 2018)	0.30 % to 20.00 %
		Copper	IS 504(Pt.-3) 02 (RA 2018)	0.10 % to 7.00 %
		Manganese	IS 504(Pt.-5) 02 (RA 2018)	0.10 % to 1.50 %
		Magnesium	IS 504(Pt.-6) 02 (RA 2018)	0.01 % to 12.00 %
		Iron	IS 504(Pt.-2) 02 (RA 2018)	0.10 % to 2.00 %
		Nickel	IS 504(Pt.-7) 02 (RA 2018)	0.10 % to 4.00 %
12.	Tin & its Alloys	Tin	IS 1409-59,(RA 2016)	4.50 % to 93.00 %
		Lead	IS 1409-59,(RA 2016)	0.10 % to 10.00 %
		Antimony	IS 1409-59,(RA 2016)	6.00 % to 16.00 %
		Copper	IS 1409-59,(RA 2016)	0.10 % to 6.00 %
II.	METAL COATING & TREATMENT SOLUTION			
1.	Metal Coating	Mass of Zinc Coating	IS 6745-72 (RA 2016)	50 Gms/Sq.M to 1200 Gms/Sq.M
		Uniformity of Zinc Coating	IS 2633-86 (RA 2016)	Qualitative (Visual)
		Adhesion Test of Zinc Coating	IS 2629-85 (RA 2016)	Qualitative (Visual)

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MECHANICAL TESTING

I. MECHANICAL PROPERTIES OF METALS				
1.	Ferrous & Non-Ferrous Material-Alloys, Products and Weld test coupons	Tensile Test	IS 1608(Part1) :2018	40 KN to 1000 KN
		Yield Stress/Proof Stress	ASTM A 370-2017 ISO 6892-1:2016 ASME Sec IX:2017	
		Tensile Strength	AWS D1.1:2010 ISO 15614-1:08-09	
		% Elongation	IS 7307Pt1:74 (RA 2013) IS 7310Pt1:74 (RA 2013)	
		% Reduction Area	IS 3613:74 (RA 2010) IS 2825:69(RA 2017)	
2.	Ferrous Material-Alloys & Products	Proof Load (Bolt)	IS 1367:02 Pt-3/ ASTM A370:2017	40 KN to 1000 KN
		Proof Load (Nut)	IS 1367:04 Pt-6 ASTM A370:2017	40 KN to 1000 KN
3.	Ferrous & Non-Ferrous Material-Alloys , Products	Hardness Brinell	IS 1500:2013 ASTM A370-17	100 to 400 HBW 10/3000 70 to 400 HBW 5/750
4.	Ferrous Material-Alloys & Products	Hardness Rockwel	IS 1586 Pt-1:2012 ASTM A370-17	60 HRB to 100 HRB 20 HRC to 65 HRC
		Hardness Vickers	IS 1501:Pt-1 2013	100 to 800 HV 10 100 to 800 HV 30
		Bend Test	IS 1599:2012(RA 2017) ASTM A370:17	Angle 60° to 180° Mandrel dia. 8/12/16/20/30/40/50/60/ 70/75/80/90mm
		Flattening Test	IS 2328:05 (RA 2017)/ ASTM A370:17	Dia. 20mm to 250mm
		Charpy Impact Test	IS 1757:2014	2J to 300 J At Room Temp. To (-) minus 70 Degree C

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5.	Ferrous Rivet Bars & Rivets	Shear Test	IS 5242:79 (RA 2017)	Dia 12,16,20,22,24 mm
II.	METALLOGRAPHY TEST			
1.	Ferrous Material Alloys & Products.	Macro Structural Examination	IS 11371:85(RA 2018) ASTM E 381:79 ASTM E340:80	Qualitative
		Micro Structural Examination	ASM VOL-9:2004 IS 7754:75(RA 2018) IS 7739(Pt-1 to Pt5)	Qualitative
		Non-Metallic Inclusion Rating(Method A)	IS 4163:04(RA 2017) ASTM E 45:97	Qualitative
		Grain Size Determination (Microscopic Comparison Method)	IS 4748:2009 (RA 2017) ASTM E 112:88	Qualitative
		Depth of Decarburisation (Microscopic Method)	IS 6396:2000 (RA 2018)	Qualitative
		Case depth measurement by microscopic method	IS 6416:88(RA 2018)	Qualitative
		Coating Thickness (Ag, Sn, Zn, Cd, Cu, Ni, Cr)	IS 3203:82(RA 2016)	Qualitative

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NON DESTRUCTIVE TESTING

I.	METALS & ALLOYS			
A.	Ultrasonic Testing			
1.	Casting	Flaw Detection by A-Scan Contact Method	IS 3664-81(RA 2014) IS 7666:88 (RA 2014), IS9565:95(RA 2017), ASTM-A609:2012 ASTM-E-114:2015 SA-609-2017	10 mm to 300 mm
2.	Forging	Flaw Detection by A-Scan Contact Method	IS 3664-81(RA 2014) IS 8791:78(RA 2013) IS 11626:05(RA 2010), ASTM-A-388:2016a ASTM-E-114:2015 SA-388-2017,SA-745-17	10 mm to 500 mm
3.	Plate	Flaw Detection by A-Scan Contact Method	IS 11630:05(RA 2010) IS 4225:04(RA 2010), ASTM-A-435:2017 SA-578-2017	10 mm to 500 mm
4.	Pipe/Tube product	Flaw Detection by A-Scan Contact Method	IS 6394:2006(RA 2018) SE-213-2017 SE-273-2017	10 mm to 75 mm
5.	Weld	Flaw Detection by A-Scan Contact Method	IS-4260:04(RA 2015) IS7343:86(RA 2000) ASME Sec V Art. 4 :17	10 mm to 100 mm
6.	Thickness Measurement	Ultrasonic Thickness Measurement	ASME-E-797-2017	3 mm to 200 mm

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II.	MAGNETIC PARTICLE TESTING			
1.	Examination of Casting	Magnetic Particle Testing (Yoke Type) (Visible & Fluorescent.)	IS-7743:06(RA 2018), IS-3703:04(RA 2010)	Surface & Sub- surface discontinuity (Upto 3 mm depth)
2.	Examination of Forging	Magnetic Particle Testing (Yoke Type) (Visible & Fluorescent.)	SE-709-2017	Surface & Sub- surface discontinuity (Upto 3 mm depth)
3.	Examination of Weld	Magnetic Particle Testing (Yoke Type) (Visible & Fluorescent.)	IS-5334: 2014	Surface & Sub- surface discontinuity (Upto 3 mm depth)
III.	PENETRANT TESTING			
1.	Liquid Penetrant testing of Materials	Liquid Penetrant Test by: Solvent Removable type (Visible & Fluorescent)	IS 3658:99(RA 2014) SE-165-2017	Discontinuities open to surface only