

Laboratory **SGS India Pvt. Ltd.-Transportation, Plot No. 28 B/1 (SP), 28 B/2 (SP),
Second Main Road, Ambattur Industrial Estate, Ambattur, Chennai,
Tamil Nadu**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **TC-7250**

Page 1 of 7

Validity **18.05.2018 to 17.05.2020**

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
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CHEMICAL TESTING

I.	METALS & ALLOYS			
1.	Ferro Alloys	Carbon	ASTM E 1999 IS 15338	3.5 % to 4.20 %
		Silicon		0.40 % to 3.00 %
		Manganese		0.20 % to 1.50 %
		Phosphorus		0.010 % to 0.02 %
		Sulphur		0.03% to 0.08 %
		Nickel		0.10 % to 1.30 %
		Chromium		0.02 % to 0.30 %
		Molybdenum		0.009 % to 1.40 %
		Copper		0.05 % to 1.50 %
		Vanadium		0.02 % to 1.20 %
		Titanium		0.002 % to 0.10 %
		Tin		0.002 % to 0.006 %
		Magnesium		0.03 % to 0.50 %
2.	Alloy Steel	Carbon	ASTM E 415 IS 8811	0.003 % to 0.90 %
		Silicon		0.02 % to 2.20 %
		Manganese		0.30 % to 1.70 %
		Phosphorous		0.005 % to 0.07 %
		Sulphur		0.008 % to 0.08 %
		Nickel		0.02 % to 1.50 %
		Chromium		0.01 % to 5.30 %
		Cobalt		0.004 % to 0.04 %
		Molybdenum		0.009 % to 1.40 %
		Copper		0.06 % to 1.40 %
		Vanadium		0.02 % to 1.10 %
		Niobium		0.006 % to 0.01 %
		Aluminium		0.01 % to 0.80 %
Titanium	0.002 % to 0.10 %			
Boron	0.0002 % to 0.0070 %			

Naveen Jangra
Convenor

Alok Jain
Program Director

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Certificate Number TC-7250

Page 2 of 7

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3.	Stainless Steel	Carbon	ASTM E1086 IS 9879	0.03 % to 0.07 %
		Silicon		0.3 % to 3.40 %
		Manganese		0.3 % to 11.00 %
		Phosphorus		0.01 % to 0.05 %
		Sulphur		0.002 % to 0.04 %
		Nickel		1.7 % to 35.00 %
		Chromium		0.09 % to 20.00 %
		Molybdenum		0.10 % to 10.00 %
		Copper		0.10 % to 0.30 %
		Vanadium		0.05 % to 0.60 %
		Aluminium		0.003 % to 0.20 %
		Titanium		0.002 % to 1.50 %
		Cobalt		0.01 % to 0.20 %
		Niobium		0.007 % to 0.50 %
		Lead		0.01 % to 0.02 %
Boron	0.0005 % to 0.0010 %			
Tungsten	0.01 % to 1.00 %			
Nitrogen	0.09 % to 0.20 %			
4.	Copper Alloys	Tin	BS EN 15079	0.01 % to 10.00 %
		Lead		0.009 % to 10.00 %
		Iron		0.01 % to 5.00 %
		Aluminium		0.009 % to 9.00 %
		Nickel		0.02 % to 28.00 %
		Manganese		0.01 % to 1.30 %
		Phosphorus		0.005 % to 1.00 %
		Silicon		0.002 % to 0.70 %
		Sulphur		0.001 % to 0.10 %
		Cobalt		0.005 % to 2.90 %
		Bismuth		0.004 % to 5.30 %
		Arsenic		0.01 % to 0.20 %
		Antimony		0.01 % to 0.20 %
Silver	0.005 % to 0.10 %			
Zinc	0.008 % to 35.00 %			

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Certificate Number TC-7250

Page 3 of 7

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5.	Aluminium Alloys	Silicon	ASTM E 1251 IS 11035	0.10 % to 28.00 %
		Iron		0.10 % to 0.8 %
		Copper		0.05 % to 3.00 %
		Manganese		0.02 % to 0.8 %
		Magnesium		0.02 % to 5.00 %
		Chromium		0.009 % to 0.3 %
		Cobalt		0.002 % to 0.1 %
		Nickel		0.004 % to 3.00 %
		Zinc		0.01 % to 3.00 %
		Titanium		0.01 % to 0.3 %
		Lead		0.003 % to 0.20 %
		Bismuth		0.003 % to 1.30 %
		Beryllium		0.001 % to 0.06 %
		Calcium		0.001 % to 0.006 %
		Cadmium		0.001 % to 0.04 %
Vanadium	0.006 % to 0.009 %			
Tin	0.02 % to 1.9 %			
6.	Zinc Alloys	Silicon	IS 2599	0.02 % to 0.04 %
		Iron		0.01 % to 0.4 %
		Copper		0.003 % to 2.40 %
		Manganese		0.002 % to 0.05 %
		Magnesium		0.002 % to 0.10 %
		Chromium		0.009 % to 0.02 %
		Nickel		0.003 % to 0.03 %
		Aluminium		0.006 % to 28.00 %
		Cadmium		0.004 % to 0.006 %
		Lead		0.005 % to 0.006 %
Tin	0.002 % to 0.006 %			
II.	CORRISION TESTS			
1.	Metallic Components	Resistance to Corrosion	ASTM B117 ASTM G85 ISO 9227	Qualitative

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Page 4 of 7

Validity **18.05.2018 to 17.05.2020**

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			JIS Z 2371 ASTM B 368	
2.	Plastic Component and Raw Materials	Resistance to Corrosion	ASTM B117 ASTM G85 JIS Z 2371 ISO 9227 ASTM B 386	Qualitative

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Page 5 of 7

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<u>MECHANICAL TESTING</u>				
I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous and Non-Ferrous Components and Raw Materials	Rockwell Hardness	ASTM E18 IS 1586 (Part 1) ASTM A370 ISO 6508-1	20 HRA to 100 HRA 20 HRB to 100 HRB 20 HRC to 70 HRC
		Brinell Hardness 2.5 / 187.5 5 / 750 10 / 3000	ASTM E 10 IS 1500 (Part 1) ASTM A 370	100 HBW to 650 HBW
		Vickers Hardness	ASTM E92 IS 1501 (Part 1) ISO 6507-1	150 HV ₅ to 900 HV ₅ 150 HV ₁₀ to 900 HV ₁₀ 150 HV ₃₀ to 900 HV ₃₀
		Micro Vickers Hardness	ASTM E 92 ASTM E 384 IS 1501 (Part 1) ISO 6507-1	150 HV _{0.5} to 900 HV _{0.5} 150 HV _{0.2} to 900 HV _{0.2} 150 HV ₁ to 1000 HV ₁
		Tensile Testing at ambient temperature Tensile Strength Yield Strength 0.2 % Proof Strength % Elongation % Reduction in Area	ASTME8/E8M-16 IS1608-2005(RA2011) ISO6892-1-2016 ASTM A 370-17	Upto 600 kN Upto 600 kN Upto 600 kN Upto 60% Upto 60%
II.	METALLOGRAPHY TEST			
1.	Metallography Test	Average Grainsize	ASTM E 3 ASTM E 407 ASTM E 112 IS 4748 ISO 643 ASTM E 1382	Qualitative (Grain size No.1 to 10)

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Page 6 of 7

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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
		Inclusion content in steel	ASM Hand Book Volume-9 ASTM E 3 ASTM E 45 IS 4163 ISO 4967	Qualitative (Inclusion Rating: 0.5 to 3.0)
		Case Depth Effective Case Depth Total Case Depth	ASTM E 3 ASTM E 407 IS 6416	0.05 mm to 10 mm
		Depth of Decarburization	ASTM E 3 ASTM E 407 IS 6396 ASTM E 1077 ASM Hand Book Volume-9	1 µm to 2000 µm
		Micro Examination Coating Thickness	ASM Hand Book Volume-9 ASTM E 3 ASTM E 407 ASTM B 487 ISO 1463 SAE J 423 ASM Hand Book Volume-9	Qualitative (50X to 1000X) 100X: 1 µm to 1300 µm 200X: 1 µm to 650 µm 500X: 1 µm to 260 µm 1000X: 1 µm to 130 µm
		Graphite Analysis	ASTM E33 ASTM E407 ASM Hand Book Volume-9 ASTM A 247 IS 7754 ISO 945-1	Qualitative (50X to 1000X)
III.	PERFORMANCE/ DURABILITY/ SAFETY TEST			
1.	Plastic Component and Raw Materials	Sine and General Test	IS 9000 (Part 8) IEC 60068-2-6 JIS D 1601 ISO 10055	Freq.: 5 Hz to 2000 Hz Acceleration: 78 g Displacement: 3" (Pk-Pk) Velocity: 2.0 m/s Rated Force: 65 kN

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Page 7 of 7

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		Shock Test	IEC 60068-2-27 IS 9000 (Part 7 / Section 1) ISO 16750-3	Acceleration:150g, Velocity:2.5 m/s
		Random test	IEC 60068-2-64 IEC 61373	Freq.: 5 Hz to 2000 Hz Acceleration: 55 g Rated Force: 65 kN _{RMS}
		Cold	IEC 60068-2-1 (Test A) ISO 16750-4 (Low Temp.)	Temp.: (-) 40 °C to 180 °C 10 %RH to 95 %RH
		Heat	IEC 60068-2-2 (Test B) ISO 16750-4 (High Temp.)	Ambient to 400 °C
		Constant Climates	IEC 60068-2-78 ISO 16750-4 (Damp Heat and Steady)	Temp. (-) 40 °C to 180 °C
		Alternating Temp.	IEC 60068-2-14 (Test Nb) ISO 16750-4 (Temp. steps) ISO 16750-4 (Temp. cycling)	Temp. (-) 40 °C to 180 °C
		Alternating Climates	ISO 16750-4 (Damp Heat, Cyclic) ISO 16750-4 (Temp. / Humidity, Cyclic)	Temp. (-) 40 °C to 180 °C 10 %RH to 95 %RH

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