

Laboratory **Unitech Metallurgical Services, 12, Shyam Estate, Steel Town, Changodar, Ahmedabad, Gujarat**

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

Certificate Number **TC-7152 (in lieu of T-3410, T-2910)**

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Validity **05.04.2018 to 04.04.2020**

Last Amended on **13.04.2018**

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**

<b>I. METALS &amp; ALLOYS</b>				
<b>1.</b>	<b>Plain Carbon and low alloy steels</b>	Carbon	ASTM E 415	0.015 % to 1.50%
		Silicon	IS 8811	0.10 % to 1.80%
		Manganese		0.10 % to 2.00%
		Phosphorous		0.005 % to 0.075%
		Sulphur		0.005 % to 0.075%
		Chromium		0.050 % to 2.00%
		Molybdenum		0.050 % to 0.60%
		Nickel		0.050 % to 3.50%
		Copper		0.050 % to 1.00%
		Aluminum		0.010 % to 0.10%
		Columbium		0.030 % to 0.050%
		Vanadium		0.010 % to 0.25%
		Nitrogen		0.005 % to 0.015%
	Titanium		0.002 % to 0.004%	
<b>2.</b>	<b>Stainless steels</b>	Carbon	ASTM E-1086	0.010 % to 0.500%
		Silicon	IS 9879	0.10 % to 1.00%
		Manganese		0.10 % to 2.00%
		Phosphorous		0.005 % to 0.075%
		Sulphur		0.001 % to 0.080%
		Chromium		10.00 % to 28.00%
		Molybdenum		0.10 % to 4.10%
		Nickel		4.00 % to 20.00%
		Copper		0.050 % to 2.00%
			Aluminum	

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		Cobalt		0.015 % to 0.060%
		Columbium		0.015 % to 0.65%
		Vanadium		0.020 % to 0.15%
		Boron		0.001 % to 0.005%
		Nitrogen		0.010 % to 0.30%
		Titanium		0.01 % to 0.50%
3.	Copper base Alloys Brass/ Bronze	Silicon	BS EN 15079	0.002 % to 0.0085%
		Manganese		0.005 % to 0.010%
		Phosphorous		0.005 % to 0.11%
		Sulphur		0.003 % to 0.055%
		Nickel		0.040 % to 0.59%
		Aluminum		0.002 % to 0.30%
		Bismuth		0.002 % to 0.034%
		Tin		0.150 % to 12.00%
		Antimony		0.008 % to 0.20%
		Lead		0.050 % to 12.00%
		Zinc		0.050 % to 40.00%
		Iron		0.10 % to 0.350%
4.	Nickel base Alloys	Carbon	ASTM E 3047	0.02 % to 0.10%
		Silicon		0.60 % to 1.00%
		Manganese		0.20 % to 0.50%
		Phosphorous		0.030 % to 0.045%
		Sulphur		0.001 % to 0.010%
		Chromium		16.00 % to 22.00%
		Molybdenum		1.50 % to 18.00%
		Iron		1.35 % to 7.50%
		Copper		0.03 % to 0.80%
		Aluminum		0.10 % to 0.30%

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		Titanium		0.017 % to 0.070%
		Cobalt		0.10 % to 0.20%
		Vanadium		0.005 % to 0.1%
		Tungsten		3.00 % % to 15.00%
<b>II.</b>	<b>CORROSION TESTS</b>			
1.	<b>Metallic material ferrous and non ferrous coated material</b>	Salt spray	ASTM B 117	Qualitative

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<b><u>MECHANICAL TESTING</u></b>				
<b>I. MECHANICAL PROPERTIES OF METALS</b>				
1.	<b>Ferrous and non-ferrous metals</b>	Tensile Test UTS Proof stress Yield Strength Reduction in Area % Elongation	ASTM A 370-17a, ASTM E8 IS 1608 IS 1786 ISO 6892-1	12 kN to 600 kN , 100 N/mm <sup>2</sup> to 1300 N/mm <sup>2</sup> , 100 N/mm <sup>2</sup> to 700 N/mm <sup>2</sup> , 100 N/mm <sup>2</sup> to 1200 N/mm <sup>2</sup> , 5 % to 80%, 5 % to 80%
		Bend	IS 1599 ASTM A 370-17a ASTM E 290	Qualitative (Size of Mandrels 6 mm, 10 mm, 24 mm, 32mm , 44 mm, 25 mm , 65 mm , 150 mm ) (90°/180°)
2.	<b>Reinforcement Bar</b>	Bend test of TMT bar /Reinforcement Bar	IS 1599	Qualitative (Mandrel dia for Bend Test: 10 mm,24 mm, 32 mm,40 mm,48 mm, 60 mm and 150 mm and Rebend Test: 24 mm, 40 mm,48 mm,60 mm and 150 mm)
		Rebend test of TMT bar /Reinforcement Bar	IS 1786	
3.	<b>Ferrous and non ferrous tube &amp; Pipe products</b>	Flattening	ASTM A 370-17a, IS 2328 IS 1786	Qualitative (OD 6 mm to 250 mm)
4..	<b>Ferrous material</b>	Charpy V notch Impact Test (-)196°C, (-)100°C to (+)35°C	ASTM A 370-17a, ASTM E 23-16b	10 J to 240 J

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5.	Ferrous and non Ferrous products	Rockwell Hardness "C" Scale	ASTM A 370-17a, IS 1586 ASTM E-18	(20 to 70) HRC
		Rockwell Hardness "B" Scale	ASTM A 370-17a, IS 1586, ASTM E-18	(20 to 100) HRBW
		Micro Vicker's Hardness	IS 1501 (Part-1)	HV 0.1,0.2,0.3,0.5,HV1 (50 to 800)
6.	Welds and Welded Test specimen	Tensile UTS	ASTM E 370 ASME BVPC Section IX 2017	12 kN to 600 kN 100 N/mm <sup>2</sup> to 1300 N/mm <sup>2</sup>
		Bend	ASTM E 190 ASME BVPC Section IX 2017	Qualitative Size of Mandrels: 6 mm, 10 mm, 24 mm, 32mm , 44 mm, 25 mm , 65 mm, 150 mm (90°/180°),
II.	<b>METALLOGRAPHY TEST</b>			
1.	Metallic Material Ferrous and non-ferrous	Grain Size Measurement (Comparison Method)	ASTM E 112 Untwine Twine	ASTM grain size no. 3 to 10 (Plate I) ASTM grain size no. 1 to 8 (Plate II)
		Metallographic Analysis	ASTM E 407, ASM Hand book VOL-9	Qualitative 50X to 1000X
		Macro Etch	ASTM E 340, ASTM E 381	Qualitative Visual Examination
		Volume fraction	ASTM E 562	Qualitative 1% to 80% 50X, 100X ,250X , 500X And 1000X
		Inclusion Rating	ASTM E 45, IS 4163	Qualitative 0.5 to 3.0 A, B, C, D- Thin & Heavy

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2.	Cast iron	Nodularity In SG Iron Cast Iron	IS 1865	Qualitative (Visual Examination)
3.	Hardened metallic material	Case Depth (By microscopic)	IS 6416	0.01 mm to 1.8 mm
4.	Metallic Material Ferrous base	Thickness Of Coating (By Microscopic)	ASTM B 487 (95-2013)	0.01 mm to 1.8 mm
		Decarburization Depth (By microscopic)	ASTM E 1077 IS 6396	0.01 mm to 1.8 mm Magnification 50X, 100X, 200X
5.	Stainless Steel and Duplex stainless steel	Intermetallic phases	ASTM A 923 method A	500X & 1000X
6.	Welds and Welded Test specimen	Macrostructure Examination	ASME BVPC SECTION IX 2017	Qualitative (Visual Examination)
7.	Austenitic/ Ferritic and duplex SS	Pitting corrosion method A & method B	ASTM G 48	0.001 g/m <sup>2</sup> to 50 g/m <sup>2</sup>
		Resistance to inter granular corrosion of SS	ISO 3651-2	90°/180°/1t Qualitative
		Corrosion Test of Duplex SS	ASTM A 923 method C	Upto 10 mdd
8.	Wrought, Nickel-Rich, Chromium-Bearing Alloys	Susceptibility to intergranular corrosion method A	ASTM G 28	0.001 g/m <sup>2</sup> to 50 g/m <sup>2</sup>
9.	Austenitic stainless steel	IGC Test A	ASTM A 262	250X & 500X Qualitative
		IGC Test B	ASTM A 262	1 mpy to 60 mpy
		IGC Test C	ASTM A 262	1 mpy to 60 mpy
		IGC Test E	ASTM A 262	90°/180°/1t Qualitative
		IGC Test F	ASTM A 262	1 mpy to 60 mpy
10.	Ferritic stainless steel	IGC Test W	ASTM A 763	250X & 500X

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		IGC Test X	ASTM A 763	1 mpy to 60 mpy
		IGC Test T Y	ASTM A 763	1 mpy to 60 mpy
		IGC Test Z	ASTM A 763	90° /180°/1t