

Laboratory Alpha Laboratory Services, NH-27, Shapar (Veraval) Dist. Rajkot,
Gujarat

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7752 (in lieu of T-3064, T-3065) Page 1 of 6

Validity 05.08.2018 to 04.08.2020 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
<u>CHEMICAL TESTING</u>				
I. METALS & ALLOYS				
1.	Carbon & Low Alloy Steel	C	ASTM E-415-2017	0.020 % to 1.200 %
		Si		0.020 % to 1.900 %
		Mn		0.100 % to 2.000 %
		P		0.005 % to 0.085 %
		S		0.005 % to 0.250 %
		Cr		0.020 % to 3.500 %
		Mo		0.010 % to 1.200 %
		Ni		0.020 % to 4.000 %
		Cu		0.005 % to 0.500 %
		Al		0.005 % to 0.075 %
		Ti		0.001 % to 0.200 %
		V		0.001 % to 0.100 %
		As		0.001 % to 0.100 %
		Sn		0.005 % to 0.050 %
2.	Stainless steel	C	ASTM E1086-2014	0.005 % to 0.250 %
		Si		0.100 % to 1.500 %
		Mn		0.100 % to 2.000 %
		P		0.003 % to 0.150 %
		S		0.003 % to 0.065 %
		Cr		10.00 % to 30.00 %
		Mo		0.010 % to 6.500 %
		Ni		2.000 % to 35.00 %
		Cu		0.050 % to 3.500 %
		Al		0.010 % to 0.100 %

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3.	Cast Iron	Co		0.050 % to 0.400 %
		Nb		0.010 % to 0.500 %
		W		0.040 % to 0.200 %
		N		0.010 % to 0.500 %
		V		0.010 % to 0.200 %
		Sn		0.001 % to 0.010 %
		C	ASTM E-1999-2018	2.000 % to 4.500%
		Cr		0.030 % to 0.500%
		Cu		0.015 % to 0.750%
		Mn		0.030 % to 1.800%
		Mo		0.010 % to 1.200%
		Ni		0.020 % to 0.200%
		P		0.005 % to 0.400%
		Si		1.000 % to 3.500%
		S		0.005 % to 0.950%
Sn		0.050 % to 0.150%		
Ti		0.005 % to 0.050%		
V		0.005 % to 0.200 %		
4.	Copper & Its Alloys	Si	BS EN 15079-2015	0.005 % to 1.000 %
		Mn		0.010 % to 2.500 %
		P		0.005 % to 0.100 %
		Ni		0.400 % to 5.000 %
		Al		0.010 % to 13.00 %
		Sn		0.010 % to 15.00 %
		Pb		0.010 % to 15.00 %
		Zn		0.100 % to 40.00 %
		Fe		0.020 % to 5.000 %
		S		0.003 % to 0.200 %
		As		0.001 % to 0.300 %
		Sb		0.001 % to 0.650 %

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		Ag		0.002 % to 0.100 %
		Bi		0.001 % to 0.150 %
5.	Nickel & Its Alloys	C	ALS/AM-02/Rev.000/ Dated: 23.01.2014	0.010 % to 0.200 %
		S		0.002 % to 0.040 %
		P		0.003 % to 0.050 %
		Mn		0.080 % to 1.000 %
		Si		0.100 % to 1.500 %
		Cr		0.080 % to 27.00 %
		Mo		2.000 % to 20.00 %
		Al		0.060 % to 0.500 %
		Cu		0.100 % to 35.00 %
		W		0.030 % to 6.500 %
		Fe		2.000 % to 35.00 %
		Nb		0.100 % to 5.500 %
		Ti		0.030 % to 1.200 %
		Co		0.070 % to 0.500 %
		V		0.010 % to 0.800 %

Sangeeta Negi
Convenor

Mallika Gope
Program Manager

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<u>MECHANICAL TESTING</u>				
I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous & Non Ferrous Materials & Alloys	Tensile testing	ASTM A-370:2017 IS 1608: 2005 ASME Sec-IX:2017 DIN EN ISO15614-1:2017 BS EN 10002-1:2001	4 kN to 400 kN
		Tensile Strength 0.2 %Proof stress 1 % Proof stress Yield Strength % Elongation % Reduction Area	ASTM E8:2015a EN ISO 4136:2012	1% to 80% 1% to 80%
		Bend Test	ASTM A370:2017 DIN EN ISO15614-1:2017 ASME Sec-IX:2017 ISO 5173: 2009 BS EN 910: 1996	Qualitative (Mandrel Dia: 8, 10,12, 16,20,24,32 & 50 mm)
		HardnessTesting (Rockwell)	ASTM A-370:2017 ASTM E-18:2017 ISO 6508-1:2016	HRBW : 30 to 100 HRC : 20 to 70
		Charpy 'V' notch Impact Test	ASTM A370:2017 ASTM E23:2016 ISO 148-1:2016 ASTM A923 Method-B:2014	2 to 300 Joules R.T to -196°C
		Vickers Hardness	IS 1501-2013 ASTM E384:2017 ISO 6507-1:2018	HV10: 50 to 800 HV5: 50 to 650
		Brinell Hardness	ASTM E10:2017	HBW: 100 to 600

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			IS 1500:2013 ISO 6506-1: 2014	(10/3000)
II.	METALLOGRAPHY TEST			
1.	Ferrous & Non Ferrous Metal & Alloy	ASTM Grain Size Measurement	ASTM E 112:2013 Comparison Method & Planimetric Procedure	ASTM GS No.1 -14 Qualitative
		Inclusion Rating	ASTM E-45-2018 IS 4163:2004 (RA2010)	Type A,B,C,D 0.5-3.0 Qualitative
		Microstructure Examination	ASM Handbook Vol-9:2004	Qualitative
		Volume Fraction	ASTM E562:2011 ASTM E1245: 2003 (Ra 2016)	0.01% to 80 %
		Bearing Material Analysis	DIN SEP-1520:1998	Qualitative
		Microstructure Rating of Flake Graphite in C.I & Nodule in S.G Iron	ASTM A247:2016	Qualitative Decarburization Depth Measurement
		Decarburization Depth Measurement	IS 6396:2000 (Clause:6) (RA 2012)	0.010 mm to 0.8 mm
		Case Depth	IS 6416:1988 (Clause :7& 8) (RA 2012)	0.010 mm to 5.00 mm
		Classification of Structure	ASTM A923:2014, Method A	Qualitative
		Macro Examination	ASTM E381:2017 ASM Handbook Vol-9	Qualitative
		Ferritescope	ASTM A799-2010/	0.10% to 80%

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			A800-2014 ALS/MECH/28	
2.	Ferritic ,austenitic and duplex stainless steel	IGC Test	EN ISO 3651-2:1998, Method-A,B & C	Qualitative
3.	Austenitic Stainless steel	IGC Test IGC Test IGC Test IGC Test	ASTM A262:2015-Test A ASTM A262:2015-Test B ASTM A262:2015-Test E ASTM A262:2015-Test F	Qualitative 2 to 100 mpy Qualitative 2 to 100 mpy
4.	Stainless steels & Nickel Base Alloys	Pitting Corrosion test Critical Pitting Temp.Test	ASTM G-48:2011 Method A ASTM G-48:2011 Method E	Qualitative Qualitative
5.	Nickel Base Alloys	IGC Test	ASTM G-28-02(2015) Method-A	2 to 800 mpy
6.	Duplex & austenitic Steel	Pitting Corrosion Test	ASTM A923:2014 Method C	Qualitative
7.	Ferrous & Non Ferrous Alloys	Salt Spray Corrosion Resistance test	ASTM B117-2016 EN ISO 16151-2008 Method A ISO 9227: 2006	Qualitative