

**Laboratory** Western Heat & Forge Pvt. Ltd., J-2, S-Block, MIDC Bhosari, Pune, Maharashtra

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

**Certificate Number** TC-5671 (In lieu of T-2544 & T-2545)

Page 1 of 3

**Validity** 24.05.2017 to 23.05.2019

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
-----	----------------------------	-------------------------	---	--

**CHEMICAL TESTING**

I.	<b>METALS AND ALLOYS</b>			
<b>1.</b>	<b>Low Alloy Carbon Steel</b>	Carbon (C)	ASTM E 415	0.02 % to 1.10 %
		Silicon (Si)		0.10 % to 0.60 %
		Sulphur (S)		0.001 % to 0.050 %
		Phosphorus (P)		0.006 % to 0.050 %
		Chromium (Cr)		0.010 % to 2.25 %
		Nickel (Ni)		0.010 % to 5.00 %
		Manganese (Mn)		0.30 % to 1.85 %
		Molybdenum (Mo)		0.007 % to 0.60 %
		Vanadium (V)		0.003 % to 0.30 %
		Cobalt (Co)		0.006 % to 0.18 %
		Aluminium (Al)		0.006 % to 0.075 %
		Copper (Cu)		0.010 % to 0.50 %
		Titanium (Ti)		0.001 % to 0.080 %
		Niobium (Nb)		0.010 % to 0.050 %
		Tin (Sn)		0.005 % to 0.020 %
<b>2.</b>	<b>Stainless Steel</b>	Boron (B)		0.0004 % to 0.007 %
		Calcium (Ca)		0.003 % to 0.060 %
		Carbon (C)	ASTM E 1086	0.005 % to 0.25 %
		Silicon (Si)		0.10 % to 0.60 %
		Sulphur (S)		0.003% to 0.065 %
		Phosphorus (P)		0.003 % to 0.065 %
		Chromium (Cr)		10.00 % to 23.00 %
		Nickel (Ni)		3.00 % to 13.00 %
		Manganese (Mn)		0.40 % to 2.00 %
		Molybdenum (Mo)		0.003 % to 0.065 %
		Copper (Cu)		0.010 % to 5.00 %
		Tungsten (W)		0.001 % to 1.00 %
		Vanadium (V)		0.001 % to 0.35 %
		Nitrogen (N)		0.0005 % to 0.30 %

Naveen Jangra  
Convenor

N. Venkateswaran  
Program Director

**Laboratory** Western Heat & Forge Pvt. Ltd., J-2, S-Block, MIDC Bhosari, Pune, Maharashtra

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

**Certificate Number** TC-5671 (In lieu of T-2544 & T-2545)

Page 2 of 3

**Validity** 24.05.2017 to 23.05.2019

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
-----	----------------------------	-------------------------	---	--

**MECHANICAL TESTING**

<b>I. MECHANICAL PROPERTIES OF METALS</b>				
1.	<b>Ferrous Material</b>	Tensile Strength Yield Strength 0.2% Proof test % Elongation % Reduction in Area	ASTM A 370 IS 1608 ISO 6892	8 kN to 400 kN 8 kN to 360 kN 0.5 % to 80 % 10 % to 80 %
		Charpy Impact test (V notch)	ASTM E 23 IS 1757 ISO 148- 1	2J to 300 J Room temperature to (-) 80 °C
		Hardness by Brinell Method (Surface Hardness)	ASTM E10 IS 1500 (Part 1) ISO 6506 -1	125 to 485 HBW 10/3000, 125 to 485 HBW 5/750.
		Hardness by Rockwell C method (Surface Hardness)	ASTM E 18 IS 1586 (Part 1) ISO 6508 –1	20 HRC to 62 HRC
		Bend Test (Guidance Bend No Die )	IS 1599 ASTM A370 ASTM E 290	Qualitative Mandrel Dia (mm) 5, 6, 8, 10, 12, 14, 16, 20, 24, 36, 38, 40, 50
<b>II. METALLOGRAPHY TEST</b>				
1.	<b>Ferrous Material (Carbon, Low Alloy and Stainless Steel)</b>	Microstructure Analysis	ASM Metals Handbook Volume 9	Qualitative (Magnification 100X to 1000X)
		Estimation of Grain Size by Microscopic Method	ASTM E 112 IS 4748 Comparison Method	Qualitative (100 X Grain Size 1 to 9)
		Determination of inclusion rating	ASTM E 45 IS 4163 Type 'A' Method	Qualitative (A, B, C, D – 0.5 to 3.0, 100 X)
		Macro Examination	ASTM E 381	Qualitative

**Naveen Jangra**  
Convenor

**N. Venkateswaran**  
Program Director

**Laboratory** Western Heat & Forge Pvt. Ltd., J-2, S-Block, MIDC Bhosari, Pune, Maharashtra

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

**Certificate Number** TC-5671 (In lieu of T-2544 & T-2545)

Page 3 of 3

**Validity** 24.05.2017 to 23.05.2019

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
		Depth of Decarburization	ASTM E 1077	Magnification 100 X to 1000 X (0.01 mm to 2.5 mm)
2.	Multi-Phase Alloys	Volume fraction of phase	ASTM E 562	Qualitative Magnification 100 X to 500 x 2 % to 80 %
3.	Corrosion Test			
a.	Austenitic Stainless Steel	Resistance to intergranular corrosion Test practices A, sE	ASTM A 262	Qualitative Magnification For practice A 250 X to 500 x Magnification for practices E 20 X to 200X
b.	Duplex Steel (Austenite – Ferrite Stainless Steel)	Detecting presence of detrimental intermetallic phase	ASTM A 923 Method A & Method B	Qualitative Magnification 400 X to 500 X for method A

---

Naveen Jangra  
Convenor

---

N. Venkateswaran  
Program Director