

Laboratory Mineral and Metallurgical Laboratories, No.C-206, 1st Floor, 4th Cross, 1st Stage, Peenya Industrial Area, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 1 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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 AND ALLOYS			
1.	Low Alloy Steel	C	ASTM E 415-2015 IS 8811:1998 (RA 2012) Optical Emission Spectrometer	0.030 % to 1.20 %
		Si		0.025 % to 1.75 %
		Mn		0.050 % to 1.85 %
		P		0.004 % to 0.060 %
		S		0.005 % to 0.38 %
		Cr		0.05 % to 3.00 %
		Mo		0.02 % to 1.00 %
		Ni		0.030 % to 3.10 %
		Al		0.010 % to 0.10 %
		Co		0.013 % to 0.050 %
		Cu		0.010 % to 0.60 %
		N		0.010 % to 0.02 %
		Nb		0.010 % to 0.020 %
		Sn		0.006 % to 0.025 %
		Ti		0.010 % to 0.020 %
V	0.008 % to 0.52 %			
2.	Stainless Steel/ High Carbon High Chromium	C	ASTM E 1086-2014 IS 9879:1998 (RA 2015) Optical Emission Spectrometer	0.015 % to 3.40 %
		Si		0.25 % to 1.10 %
		Mn		0.11 % to 4.75 %
		P		0.010 % to 0.035 %
		S		0.006 % to 0.28 %
		Cr		15.0 % to 29.5 %
		Mo		0.025 % to 2.8 %
		Ni		0.65 % to 20.1 %
		Co		0.018 % to 0.12 %
		Cu		0.003 % to 0.25 %
		N		0.050 % to 0.30 %

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 2 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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3.	Tool Steel	C	ASTM E 1086-2014 IS 9879:1998 (RA 2015) Optical Emission Spectrometer	1.00 % to 2.50 %
		Si		0.065 % to 1.40 %
		Mn		0.25 % to 2.10 %
		S		0.020 % to 0.010 %
		P		0.020 % to 0.10 %
		Cr		3.80 % to 14.0 %
		Ni		0.55 % to 0.60 %
		Mo		2.10 % to 9.40 %
		Co		0.10 % to 7.95 %
		V		0.06 % to 1.15 %
4.	Cast Iron (Chilled Condition)	C	IS 15338:2003 (RA 2013) ASTM E 1999-2011 Optical Emission Spectrometer	1.90 % to 3.40 %
		Si		0.90 % to 3.50 %
		Mn		0.09 % to 1.90
		P		0.009 % to 0.78 %
		S		0.02 % to 0.14 %
		Cr		0.05 % to 1.95 %
		Mo		0.02 % to 1.35 %
		Ni		0.025 % to 1.75 %
		V		0.013 % to 0.37 %
		Al		0.010 % to 0.03 %
		Cu		0.04 % to 0.9 %
		5.		Aluminium Alloy
Mg	0.10 % to 1.26 %			
Si	1.30 % to 14.40 %			
Fe	0.30 % to 0.69 %			
Mn	0.02 % to 2.75 %			
Ni	0.065 % to 2.50 %			
Zn	0.13 % to 2.20 %			
Pb	0.003 % to 0.25 %			
Sn	0.05 % to 0.25 %			
Ti	0.020 % to 0.17 %			
Cr	0.13 % to 0.75 %			
V	0.009 % to 0.015 %			

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Convenor

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Page 3 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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6.	Copper Alloy	Sn	BS En 15079:2015 Optical Emission Spectrometer	0.016 % to 9.60 %
		Pb		0.003 % to 9.10 %
		Zn		0.03 % to 29.50 %
		Fe		0.10 % to 3.70 %
		Ni		0.10 % to 4.75 %
		As		0.034 % to 0.11 %
		Bi		0.023 % to 0.11 %
		Sb		0.050 % to 0.44 %
		Al		0.080 % to 9.20 %
		Si		0.030 % to 0.15 %
		Mn		0.03 % to 0.65 %
		P		0.001 % to 0.40 %
		S		0.002 % to 0.094 %
7.	Nickel & Its Alloys	C	Optical Emission Spectrometer DV6	0.05 % to 0.17 %
		Si		0.02 % to 0.40 %
		Mn		0.50 % to 2.85 %
		P		0.007 % to 0.011 %
		S		0.001 % to 0.004 %
		Cr		0.01 % to 19.25 %
		Al		0.03 % to 3.10 %
		Co		0.05 % to 13.50 %
		Cu		0.02 % to 32.20 %
		Fe		0.06 % to 2.80 %
		Mo		0.001 % to 4.00 %
		Ti		0.02 % to 3.10 %
		8.		Iron Base Alloys Stainless Steel
Si	IS 228 (Part 8): 1989 (RA 2004)		0.05 % to 4.0 %	
Mn	IS 228 (Part 2): 1987 (RA 2002)		0.1 % to 2.0 %	
S	IS 228 (Part 9): 1989 (RA 2004)		0.01 % to 0.25 %	

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Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 4 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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		P	IS 228 (Part 3): 1987 RA 2002	0.01 % to 0.25 %
		Cr	IS 228 (Part 6): 1987 RA 2002	0.1% to 35 %
		Ni	IS 228 (Part 5): 1987 RA 2002	0.1 % to 45 %
		Mo	IS: 228 (Part 10)-1989 RA 2004 IS: 228 (Part7)-1990 RA 2001	0.05 % to 1.5 % 1.0 % to 5.00 %
		V	MML/QTP/03/19/04/10 {based on Ferrous analysis by E.C.Pigotte (Method V, Page 521) IS 228 (Part 6): 1987 (RA 2002)	0.05 % to 1.0 %
		Cu	IS 228 (Part 15): 1992 (RA 2004)	0.05 % to 5.0 %
9.	Plain Carbon Steel	C	IS 228 (Part 1): 1987 (RA 2002)	0.025 % to 1.50 %
		Si	IS 228 (Part 8): 1989 (RA 2004)	0.05 % to 5.0 %
		Mn	IS 228 (Part 2): 1987 (RA 2002)	0.1 % to 2.0 %
		S	IS 228 (Part 9): 1989 (RA 2004)	0.01 % to 0.25 %
		P	IS 228 (Part 3): 1987 (RA 2002)	0.01 % to 0.25 %
		Cr	IS 228 (Part 6): 1987 (RA 2002)	0.1 % to 5 %
		Ni	IS 228 (Part 5): 1987 (RA 2002)	0.1% to 5 %
		Mo	IS 228 (Part 10): 1989 (RA 2004)	0.05 % to 1.0 %

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Page 5 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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			IS 228 (Part 7): 1990 RA 2001	1.0 % to 2 %
		V	MML/QTP/03/19/04/10 {based on Ferrous analysis by E.C.Pigotte (Method V, Page 521) IS 228 (Part 6): 1987 (RA 2002)	0.05 % to 3.0 %
		Cu	IS 228 (Part 15): 1992 (RA 2004)	0.05 % to 5.00 %
10.	Alloy Steels & Tool Steels	C	IS 228 (Part 1): 1987 (RA 2002)	0.025 % to 2.50 %
		Si	IS 228 (Part 8): 1989 (RA 2004)	0.05 % to 5.0 %
		Mn	IS 228 (Part 2): 1987 (RA 2002)	0.1 % to 2.0 %
		S	IS 228 (Part 9): 1989 (RA 2004)	0.01 % to 0.25 %
		P	IS 228 (Part 3) -1987 (RA 2002)	0.01% to 0.25 %
		Cr	IS 228 (Part 6) -1987 (RA 2002)	0.1 % to 35 %
		Ni	IS 228 (Part 5)-1987 (RA 2002)	0.1 % to 45 %
		Mo	IS 228 (Part 10): 1989 (RA 2004 IS 228 (Part 7): 1990 (RA 2001)	0.05 % to 1.5 % 1.0 % to 10.00 %
		V	MML/QTP/03/19/04/10 {based on Ferrous analysis by E.C.Pigotte (Method V, Page 521) IS 228 (Part 6): 1987 (RA 2002)	0.05 % to 3.0 %

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 6 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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11.	Cast iron S.G iron Pig iron	Cu	IS 228 (Part 15): 1992 (RA 2004)	0.05 % to 5.00 %
		C	IS 12308 (Part 11): 1991 (RA 2006)	1.50 % to 4.50 %
		Si	IS 12308 (Part 6): 1991 (RA 2006)	0.10 % to 6.0 %
		Mn	IS 12308 (Part 10): 1991 (RA 2006)	0.10 % to 7.00 %
		S	ASTM E351-93 (2006), Section-37 Ferrous Analysis by E.C.Pigotte (Method II, Page 457 to 459)	0.01 % to 0.25 %
		P	IS 12308 (Part 5): 1991 (RA 2006)	0.01 % to 0.50 %
		Cr	IS 12308 (Part 8): 1997 (RA 2002)	0.1 % to 28.00 %
		Ni	IS 12308 (Part 7): 1991 (RA 2002)	0.5 % to 36.0 %
12.	Copper and Copper Alloys a) Bronze b) Brass c) Copper	Mo	IS 12308 (Part 9): 1993 (RA 2006)	0.1 % to 1.00 %
		Sn	IS 4027 (Part 5): 1987 (RA 2006) IS 3685:1966 (RA 2006)	0.05 % to 15.00 %
		Pb	IS 3685:1966 (RA 2006)	0.05 % to 10.00 %
		Zn	IS 4027 (Part 6): 1987 (RA 2006) IS 3685:1966 (RA 2006)	0.2 % to 40.0 %
		P	IS 4027 (Part 6): 1987 (RA 2006) IS 3685:1966 (RA 2006)	0.01 % to 1.00 %
Fe	IS 4027 (Part 8): 1991 (RA 2006)	0.5 % to 8.0 %		
	IS 3685:1966 (RA 2006)	0.1 % to 8.0 %		

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Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 7 of 12

Validity 24.05.2018 to 23.05.2020

Last Amended on 22.06.2018

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		Cu	MML/QTP/02/19/04/10 (based on Scott's Std. methods of Chemical analysis, fifth edition, Vol.1 by Wilfred M. Scott. (Page 369 to 371)	50.0 % to 95.00 %
		Ni	IS 3685:1966 (RA 2006)	0.05 % to 8.00 %
		Al	IS 3685:1966 (RA 2006)	0.10 % to 12.00 %
13.	Aluminium Alloys	Si	IS 504 (Part 1): 2002	0.3 % to 15.0 %
		Fe	IS 504 (Part 2): 2002	0.1 % to 5.0 %
		Cu	IS 504 (Part 3): 2002	0.10 % to 5.0 %
		Zn	IS 504 (Part 4): 2002	0.1 % to 10.0 %
		Mn	IS 504 (Part 5): 2002	0.1 % to 1.50 %
		Mg	IS 504 (Part 6): 2002	0.01 % to 12.00 %
		Ni	IS 504 (Part 7): 2002	0.05 % to 4.00 %
		Cr	IS 504 (Part 8): 2002	0.05 % to 1.00 %
II.	ORES & MINERALS			
1.	Limestone, Calcite, Magnesite, Dolomite	SiO ₂	IS 1760 (Part 2): 1991 (RA 2001)	0.10 % to 10.0 %
		Al ₂ O ₃	IS 1760 (Part 3): 1992 (RA 2001)	0.10 % to 10.0 %
		CaO	IS 1760 (Part 3): 1992 (RA 2001)	0.10 % to 60.0 %
		MgO	IS 1760 (Part 3): 1992 (RA 2001)	0.10 % to 60.0 %
		Na ₂ O	IS 11477:1985 (RA 2006)	0.10 % to 1.00 %
		K ₂ O	IS 11477:1985 (RA 2006)	0.10 % to 1.00 %
		Loss On Ignition	IS 1760 (Part 1): 1991 (RA 2001)	40.0 % to 50.0 %
2.	Refractories	SiO ₂	IS 1527:1972 (RA 1996) IS 12107 (Part 2): 1987 (RA 2001)	0.10 % to 99.5 %

Laboratory

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Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 8 of 12

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		TiO ₂	IS 1527:1972 (RA 1996) IS 12107 (Part 5): 1987 (RA 2001)	0.10 % to 5.0 %
		Al ₂ O ₃	IS 1527:1972 (RA 1996) IS 12107 (Part 3): 1987 (RA 2001) IS 1335:1979 (RA 2001)	0.10 % to 99.8 %
		Fe ₂ O ₃	IS 2000 (Part 4): 1985 RA 2006)	0.10 % to 10.00 %
		CaO	IS 1527:1972 (RA 1996) IS 12107 (Part 8): 1987 (RA 2001)	0.10 % to 5.00 %
		MgO	IS 1527:1972 (RA 1996) IS 12107 (Part 8): 1987 (RA 2001)	0.10 % to 5.00 %
		Na ₂ O	IS 1527:1972 (RA 1996) IS 12107 (Part 9): 1987 (RA 2001)	0.10 % to 3.00 %
		K ₂ O	IS 1527:1972 (RA 1996) IS 12107 (Part 9): 1987 (RA 2001)	0.10 % to 3.00 %
		Loss On Ignition	IS 1527:1972 (RA 1996) IS 12107 (Part 1): 1987 (RA 2001)	0.10 % to 10.00 %
3.	Clays & Other Silica Minerals	SiO ₂	IS 11477:1985 (RA 2001) IS 12107 (Part 2): 1987 (RA 2001)	0.10 % to 80.00 %
		TiO ₂	IS 11477:1985 (RA 2001) IS 12107 (Part 5): 1987 (RA 2001)	0.10 % to 5.00 %
		Al ₂ O ₃	IS 11477:1985 (RA 2001) IS 12107 (Part 3): 1987 (RA 2001)	0.10 % to 65.00 %

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Page 9 of 12

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		Fe ₂ O ₃	IS 2000 (Part 4): 1985 (RA 2006)	0.10 % to 10.00 %
		CaO	IS 11477:1985 (RA 2001) IS 12107 (Part 8): 1987	0.10 % to 5.00 %
		MgO	IS 12107 (Part 8): 1987 (RA 2001)	0.10 % to 5.00 %
		Na ₂ O	IS 11477:1985 (RA 2001) IS 12107 (Part 9): 1987	0.10 % to 15 %
		K ₂ O	IS 11477:1985 (RA 2001) IS 12107 (Part 9): 1987	0.10 % to 15 %
		LOI	IS 12107 (Part 1): 1987 (RA 2001)	0.10 % to 10.00%
4.	Iron Ores	SiO ₂	IS 1493 (Part 1): 1981 (RA 2001)	0.50 % to 20.00 %
		Al ₂ O ₃	IS 1493 (Part 1): 1981 (RA 2001)	0.10 % to 10.00 %
		Fe ₂ O ₃	IS 1493 (Part 1): 1981 (RA 2001)	60.00 % to 95.00 %
		P	IS 1493 (Part 1): 1981 (RA 2001)	0.05 % to 1.00 %
		S	IS 1493 (Part 1): 1981 (RA 2001)	0.10 % to 1.00 %
5.	Manganese Ore	SiO ₂	IS 1473:2004	1.00 % to 15.00 %
		Al ₂ O ₃	IS 1473:2004	0.10 % to 5.00 %
		Fe ₂ O ₃	IS 1473:2004	1.0 % to 40.00 %
		P	IS 1473:2004	0.05 % to 0.20 %
		S	IS 1473:2004	0.05 % to 0.20 %
		Mn	IS 1473:2004	30.00 % to 65.00 %
6.	Ferro Alloys			
a.	Ferro Silicon	C	IS 1559:1961 (RA 2002)	0.05 % to 2.0 %
		Si	IS 1559:1961 (RA 2002)	50 % to 80 %
b.	Ferro Manganese	C	IS 1559:1961 (RA 2002)	0.05 % to 10 %
		Mn	IS 1559:1961 (RA 2002)	50 % to 80 %
c.	Ferro Chromium	C	IS 1559:1961 (RA 2002)	0.05 % to 10 %

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Certificate Number TC-7421 (in lieu of T-1430 & T-2962)

Page 10 of 12

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		Cr	IS 1559:1961 (RA 2002)	40 % to 75 %
III.	CORROSION TESTS			
1.	Coated Plates Ferrous & Non Ferrous Anodised Products Painted and Powder Coated Materials, Galvanised Products, Electrical and Electronic items Galvanised Items	Neutral Salt Spray	IS 9844-1981 ASTM B 117-2016	Qualitative
IV.	PLASTICS AND POLYMERS			
1.	Plastics and Polymer	Ash Content	ASTM D 5630-2013	0.05 % to 50 %

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Page 11 of 12

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MECHANICAL TESTING

I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous and Non Ferrous Metals and Alloys (Including Weld Metals) Pipes, Rods, Plates	Tensile Test Tensile strength	IS 1608:2005 ASTM E8/E8M-16a ASTM A370-17a	10 kN to 600 kN 100 MPa to 1850 MPa Grips size Round & Flat 1 mm to 15 mm 15 mm to 30 mm 30 mm to 45 mm
		Yield Strength	IS 1608:2005 ASTM E8/E8M-16a ASTM A370-17a	10 kN to 600 kN 100 MPa to 1500 MPa
		0.2% proof Stress	IS 1608:2005 ASTM E8/E8M-16a ASTM A370-17a	10 kN to 600 kN 100 MPa to 1000 MPa
		% Elongation	IS 1608:2005 ASTM E8/E8M-16a ASTM A370-17a	5 % to 80 %
		% Reduction in Area	IS 1608:2005 ASTM E8/E8M-16a ASTM A370-17a	10 % to 80 %
2.	Ferrous and Non Ferrous Metals Alloys and Welded Products	Bend Test	IS 1599-2012 (RA 2017) ASTM A370-17a	Qualitative
		Root Bend Face Bend Side Bend	IS 7307 (Part 2): 2012 IS 1599:2012 (RA 2017) ASTM A370-17a	Qualitative (Mandrel Diameter 8, 16, 20, 32, 40, 60, 80 in mm)
		Hardness Test Rockwell HRB HRC	IS 1586 (Part 1): 2012	20 HRB to 100 HRB 20 HRC to 70 HRC

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Page 12 of 12

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		Brinell Hardness	IS 1500 (Part 1): 2013	90 HBW to 350 HBW/ 2.5 mm/187.5 kgf 65 HBW to 170 HBW/ 5 mm/250 kgf
2.	Ferrous Metals and Alloys	Impact test – Charpy (V Notch)	IS 1757 (Part 1): 2014	1 J to 290 J Temperature: (-) 80°C to 20°C