

Laboratory **Electralloy Special Steel Castings Pvt. Ltd., Plot No.25, SIPCOT Industrial Complex, 6th Cross Road, Hosur, Tamil Nadu**

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

Certificate Number **TC-7420 (in lieu of T-3060, T-3018)**

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Validity **30.06.2018 to 29.06.2020**

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 |
|-----|----------------------------|-------------------------|---|--|
|-----|----------------------------|-------------------------|---|--|

CHEMICAL TESTING

| I. | METALS & ALLOYS | | | |
|----|---|----|--|------------------|
| 1. | Ferrous Alloys Plain Carbon & Low Alloy Steel | C | IS:8811-1998 (RA 2012), ASTM E415- 17 & ESSCPL/MSP/ Spectro –CS-LAS Rev.00 (Issue No.03 & Issue Date: 03.03.2016) | 0.01% to 1.40% |
| | | Mn | | 0.04 % to 1.70% |
| | | Si | | 0.05% to 1.90% |
| | | S | | 0.001% to 0.080% |
| | | P | | 0.008% to 0.080% |
| | | Cr | | 0.05% to 5.47% |
| | | Ni | | 0.030% to 4.60% |
| | | Cu | | 0.010% to 0.76% |
| | | Mo | | 0.001% to 1.5% |
| | | W | | 0.10% to 0.30% |
| | | V | | 0.001% to 0.50% |
| | | Nb | | 0.003% to 0.10% |
| | | Ti | | 0.05 % to 0.15% |
| | | Al | | 0.005% to 0.50% |
| | | B | | 0.001%to0.003% |
| | | N | | 0.004% to 0.020% |
| Co | 0.003% to 0.25% | | | |
| Pb | 0.0005%to0.020% | | | |
| Zr | 0.001% to 0.06% | | | |
| Sn | 0.001% to 0.13% | | | |
| Sb | 0.001% to 0.10% | | | |
| 2. | Ferrous Alloys Stainless & Duplex Steel | C | IS: 9879-1998 (RA 2015), ASTM E1086-14 & ASTM A751-14a ESSCPL/MSP/ Spectro –SS-DSS Rev.00 | 0.007% to 0.80% |
| | | Mn | | 0.10% to 2.50% |
| | | Si | | 0.10% to 1.3% |
| | | S | | 0.001% to 0.035% |
| | | P | | 0.006% to 0.055% |
| | | Cr | | 4.09% to 28.49% |

Malancha Das
Convenor

Battal Singh
Program Manager

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| | | Ni | (Issue No.03 & Issue Date: 03.03.2016) | 0.20% to 37.00% |
| | | Cu | | 0.02% to 5.0% |
| | | Mo | | 0.10% to 7.0% |
| | | W | | 0.01% to 6.5% |
| | | V | | 0.01% to 1.20% |
| | | Nb | | 0.005 % to 1.2% |
| | | Ti | | 0.001 % to 0.60% |
| | | Al | | 0.001% to 0.050% |
| | | B | | 0.0001% to 0.005% |
| | | N | | 0.01% to 0.32% |
| | | Co | | 0.01% to 0.20% |
| | | Sn | | 0.001% to 0.02% |
| | | Zr | | 0.001% to 0.003% |
| 3. | Nickel Base Alloy | C | ASTM E 3047-16 & ESSCPL/MSP/ Spectro –Ni Rev.00 (Issue No.03 & Issue Date: 03.03.2016) | 0.001% to 0.25% |
| | | Mn | | 0.10% to 1.3% |
| | | Si | | 0.02% to 1.2% |
| | | S | | 0.0001% to 0.03% |
| | | P | | 0.001% to 0.03% |
| | | Cr | | 0.01% to 24% |
| | | Cu | | 0.01% to 37.0% |
| | | Mo | | 0.01% to 33.0% |
| | | W | | 0.01% to 5.25% |
| | | V | | 0.01% to 0.50% |
| | | Nb | | 0.01% to 4.5% |
| | | Ti | | 0.01% to 1.0% |
| | | Al | | 0.01% to 0.40% |
| | | Co | | 0.01% to 1.1% |
| | | N | | 0.001% to 0.02% |
| | | Fe | | 1.0% to 35.0% |

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| <u>MECHANICAL TESTING</u> | | | | |
| I. | MECHANICAL PROPERTIES OF METALS | | | |
| 1. | Ferrous Materials | Tensile Test at RT Tensile Strength Yield Stress 0.2 (Offset) 1% Proof Stress % Elongation % Reduction in Area | IS 1608:2005 (RA 2017) ASTM E 8 –16a ASTM A 370-17 ISO 6892-1:2016 | 10000N to 180000 N 200 MPa to 1200 MPa 100 MPa to 800 MPa 100 MPa to 800 MPa 100 MPa to 800 MPa 2 to 80% 2 to 80% |
| | | Bend Test | IS 1599:2012 (RA 2017) ISO 7438:2016 ASTM A 370-17 ASTM E290:2014 | Mandrel Diameter 6,12,24 & 50mm (Qualitative) |
| | | Charpy Impact – V Notch Charpy Impact – U Notch | IS 1757-1:2014 IS 1499:1997(RA 2015) ISO 148-1: 2016 | 300 J / 2J Ambient Temperature to Minus 196°C |
| | | Brinell Hardness | IS 1500-1: 2013 ISO 6506-1: 2014 ASTM A 370 –17 ASTM E 10-17 | HBW 10/3000 100 - 450 HBW |
| | | Rockwell Hardness Scale – B & C | IS 1586-1: 2012(RA 2017) ISO 6508-1: 2016 ASTM E18 –17 ASTM A 370 –17 | HRBW 40 - 100 HRC 20 – 68 |
| | | Macro Examination | IS:11371-1985 (RA 2012) ASTM E 381-17 | 10x, 20x (Qualitative) |
| | | Microstructure Examination | ASM Handbook Volume 9 9th Edition 1992 | 100X, 200X, 500X (Qualitative) |
| | | Grain Size (Comparison Method) | IS 4748: 2009(RA 2017) ASTM E 112-13 ISO 643:2012 | ASTM No. 1 to 10 |

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| 2. | Duplex Stainless Steel | Sodium hydroxide Etch Test (Method A) | ASTM A 923 – 14 | 400X , 500X (Qualitative) |
| | | Ferrite Estimation | ASTM E 562-11 (Manual Point Count) | 15 % to 80% |
| | | Intergranular – Corrosion Test I)Practice A II)Practice B III)Practice E IV)Practice F | ASTM A 262 – 15 (Intergranular attack in Austenitic Stainless Steels) | 250X, 500X (Qualitative) 1 to 200Mils/Year 180° / 1T (Qualitative) 1 to 200Mils/Year |
| | | Method A | ISO 3651-2:1998 | 90° Bend / 1T (Qualitative) |
| | | Pitting Corrosion Test | ASTM G 48:11 (RA2015) (Method A) ASTM A 923 – 14 (Method C) | 0.1 g/m ² to 4.0 g/m ² 1 to 200 mdd |

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