

BHEL, Tiruchirappalli – 620014.	Quality Assurance	Technical Delivery Conditions
Product: NON FERROUS CASTINGS (VALVES)		
Document No.: TDC:0:413	Rev. No.: 01	Effective date: 31/01/2001 Page 1 of 2

Revision Record: Rev:00:01/07/94; Rev:01:Text rewritten, Cl.5.0 modified.

1.0 MATERIAL

Specification:ASTM:{Latest on date of Purchase Order (PO)}:

Monel "S" (Monel 505) : ASTM A494 Gr. M25S

Nickel Bronze : ASTM B584 C97800

Aluminium Bronze : IS 305 Gr. AB1

Stellite : G-Co65Cr27W6

Supernickron :

Additional Requirement:As listed below (supplementary to Specification)

Size, Qty.,Grade/Class: As per Purchase order & Drawing / Pattern.

2.0 CHEMICAL COMPOSITION & PROCESS

Chemical composition requirements are as below:

Element	Monel S	Al. Bronze	Ni.Bronze	Supernickron	Stellite
C	0.15 max.	--	--	0.35 max.	0.90-1.40
Mn	1.50 max.	1.0 max.	1.0 max.	1.0 max.	1.0 max.
Al	--	8.5-10.5	0.005 max.	--	--
Zn	--	0.5 max.	1.0-4.0	--	--
Sn	--	0.1 max.	4.0-5.5	--	--
Pb	--	0.05 max.	1.0-2.5	--	--
Mg	--	0.05 max.	--	--	--
Si	3.50-4.50	0.25 max.	0.15 max.	5.0 max.	1.5 max.
P	0.03 max.	--	0.05 max.	--	--
S	0.03 max.	--	0.08 max.	--	--
Fe	2.50 max.	1.5-3.5	1.5 max.	10.0 max.	3.0 max.
Ni	60 min.	1.0 max.	24 - 27	65 - 70	3.0 max.
Cu	27 - 33	Remainder	64 - 67	10 - 20	--
Cr	--	--	--	5.0 max.	27 - 31
Mo	--	--	--	--	1.5 max.
W	--	--	--	--	3.5-5.5
Co	--	--	--	--	Remainder

The total of Sn, Pb, Si & Mg shall not exceed 0.30% in the case of Aluminium bronze.

Aluminium bronze castings shall be made in chill moulds only. Stellite castings to be manufactured by investment casting (Lost wax) process.

3.0 DIMENSIONS AND TOLERANCES

Tolerances as per Drawing. Untoleranced dimensions for valve components: VL:STDC:023(latest).

4.0 HEAT TREATMENT (HT)

Monel castings: Solution annealed at 870 deg.C / 30 min / Oil quench. Additionally the test bars to be age hardened at 560 deg.C / 2 hours / air cool.

Supernickron castings: Age hardening to be done in electric furnace at 640 deg.C for a period of not less than 4 hours and then cooled in furnace or in air.

Aluminium bronze, Nickel bronze and Stellite castings can be supplied in the as cast condition, without heat treatment.

5.0 MECHANICAL TESTS

Test bars to be cast integral with the casting or separately. If cast separately, they shall be cast at the same time, same mould type as the castings & from the same ladle. A metal strip with heat number stamped to be fused with the test bar during casting, to maintain traceability. The test bars to be heat treated together with the castings they represent. If 1 casting is made from more than 1 heat, separate test bars for each cast to be poured & all test bars shall satisfy the requirements.

Product: **NON FERROUS CASTINGS (VALVES)**Document No.: **TDC:0:413**Rev. No.: **01**Effective date: **31/01/2001**

Page 2 of 2

Following tests to be conducted per heat / HT batch, as per ASTM A370.

Acceptance as shown:

Test	Monel S	Al. Bronze	Ni. Bronze	Supernickron	Stellite
Hardness	32-42 HRC	135 BHN min.	--	320-380 BHN	38-42 HRC
Tensile strength	--	55 Kg/sq.mm (min)	35.2 Kg/sq.mm (min)	60 Kg/sq.mm (min)	--
0.2% proof strength	--	21 Kg/sq.mm (min)	15.5 Kg/sq.mm (min) (0.5% proof)	--	--
% Elongation	--	18 min.	10 min.	--	--

6.0 FETTLING, DRESSING & CLEANING

Dressing of castings, free from risers, ingates, notches, under cuts, deep marks etc. Gas cutting if any to be done before HT. Castings to be sand/shot blasted both inside and outside for removal of fused sand, scales, etc. Fused wires, parting line fins, chills etc. to be removed by grinding. Visual inspection of castings for surface quality as per MSS-SP-55. Items to be proof machined wherever required.

7.0 NON DESTRUCTIVE TESTING(NDT) AFTER HEAT TREATMENT

Castings to be free from surface and internal defects like porosity, shrinkage, sand inclusion, crack, cold shut and other harmful defects.

Liquid Penetrant Inspection (LPI): As per ASTM E165 on all castings.

Acceptance: (ANSI B16.34): Cracks are not permitted. For rounded indications (circular or elliptical with length < 3 times width), 4 or more indications in a line separated by 3mm or less edge to edge are not acceptable. Maximum allowable diameter of the indication: 5mm for materials upto 13mm thick & 8mm for materials above 13mm thick.

8.0 REPAIR

Repairs involving fusion welding is prohibited.

9.0 MARKING AND PACKING

Details to be marked on each casting, using low stress stamps / etching / engraving:

1. Foundry code, 2. Specification, grade ("SINK" in the case of supernickron) & Melt number,
2. Other details as per drawing.

10.0 INSPECTION AND CERTIFICATION

Test certificate for each product with following details shall accompany the product & shall be countersigned by inspection agency nominated by BHEL, if specified in PO.

1. Purchase Order No.(BHEL), TDC No., Drawing & Test certificate number.
2. Specification and Grade with applicable year of code, Heat Number, Quantity & Size
3. Melting & Casting process, Chemistry including incidental elements - Heat wise.
4. Heat treatment details of the material and test bars.
5. Mechanical test results, NDE test results with reference & acceptance standard.
6. Dimensional Inspection Report where applicable.

11.0 AUDIT CHECKS AT BHEL

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL are liable for rejection..

S.Lakshmi
Prepared

R.Sasikumar(QA)
Reviewed

S.Kumar(Engg)

K.Rengachari
Approved