

**PHOSPHOR BRONZE SAND CHILL AND CENTRIFUGAL CASTINGS ,Gr:3****1.0 GENERAL:**

This specification governs the quality requirements of Phosphor Bronze Sand Chill And Centrifugal Castings.

2.0 APPLICATION:

For heavy duty bearings, bushes, gears and worm wheels.

3.0 CONDITION OF DELIVERY:

Unless otherwise specified, castings shall be supplied sand cast. Static chill cast or centrifugal chill cast shall be supplied when specified on BHEL order/drawing. Centrifugal chill castings shall be supplied in the homogenized condition as specified in Cl 8.0 below.

Castings shall not be painted

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following national standard and also meet the requirements of this specification.

IS:28-1985 (Reaffirmed 1996) | PHOSPHOR BRONZE INGOTS AND CASTINGS
Gr: 3

5.0 DIMENSIONS AND TOLERANCES:

The castings shall be true to the pattern/drawing.

Holes for machining up to and including 60 mm in diameter are to be cast solid, unless otherwise stated on BHEL order/drawing.

Unless otherwise specified on BHEL order/drawing, untoleranced dimensions for the castings shall be as per tolerance class 4 of BHEL standard AA 023 04 02.

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**6.0 FINISH:**

All castings shall be properly fettled, dressed and all surfaces shall be thoroughly cleaned.

7.0 FREEDOM FROM DEFECTS

Castings shall be free from defects such as porosity, blow holes, sand inclusion, shrinkage, cavities, hard spots, cold shuts, cracks, etc., which may adversely affect machining and utility of castings.

8.0 HEAT TREATMENT

Centrifugal chill castings shall be supplied in homogenized condition. Homogenization shall be done at 550⁰ C for about 2 hours.

9.0 CHEMICAL COMPOSITION

The chemical composition of the material, when analysed in accordance with IS:4027 (Methods of chemical analysis for bronzes) or any other conventional/instrumental methods shall be as specified below:

Element	Percent, min	Percent, max.
Tin	10.00	-
Phosphorus	0.50	-
*Lead	-	0.25
*Zinc	-	0.05
*Silicon	-	0.02
*Iron	-	0.10
*Aluminium	-	0.01
*Nickel	-	0.10
Total impurities	-	0.60
Copper	Remainder	

Note: These elements need not be determined when the material supplied conforms with the mechanical properties specified in this specification. However, the supplier shall ensure that the composition of the materials within the limits specified above.



10.0 TEST SAMPLES:

10.1 For Sand And Static Chill Castings:

Each heat shall be analysed for chemical composition.

Three tensile test specimens shall be poured from each heat/lot. A lot will consist of 450 kg of castings, or part thereof, if individual casting weigh more than 450kg.

If any tensile test specimen shows defects on machining or reveals casting defects, it shall be discarded and replaced by another specimen.

10.2 For Centrifugal Chill Castings:

In the case of centrifugal chill castings, test samples requirements shall be mutually agreed upon between BHEL and the supplier.

11.0 MECHANICAL PROPERTIES:

The test samples, when tested in accordance with IS:1608 shall show the following properties:

Property	Sand cast	Static chill cast	Centrifugal chill cast
Tensile strength, N/mm ² , min.	220	310	360
Elongation on 5.65 $\sqrt{S_0}$ gauge length, percent, min.	3	2	7

12.0 FRACTURE TEST:

One sample casting shall be broken in the presence of BHEL representative in such a manner that the area of the fracture is as large as practicable in order to determine the uniformity of grain structure of the metal. If the fracture shows segregation or dross or dirt spots or any other defect, all the castings produced from the same melt shall be rejected.

**13.0 ADDITIONAL TESTS:**

If specified on BHEL drawing/order, the following tests shall be conducted:

- 1) Pressure test
- 2) Radiographic test
- 3) Any other tests.

Methods of testing and norms of acceptance shall be as prescribed on BHEL order/drawing or mutually agreed upon.

14.0 RETEST:

Should any of the test pieces first selected, fail to pass the prescribed tests mentioned under various clauses in this specification, two further samples from the same batch shall be selected for testing, one of which shall be from the same casting from which the original test sample was taken, unless it has been withdrawn by the supplier.

Should the test pieces from both these additional samples pass, the batch represented by the test sample shall be accepted. Should the test pieces from either of these additional samples fail, the batch represented by the test sample shall be rejected.

15.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL's representative.

BHEL's representative shall have free access at all the times while the work on the contract is being performed to all the parts of the manufacturer's works. The manufacturer shall offer BHEL's representative all reasonable facilities without charge to satisfy the latter that the material is being furnished in accordance with this specification. The manufacturer shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities do not exist at his works, the manufacturer shall make necessary arrangements for carrying out the prescribed tests elsewhere. The manufacturer shall notify BHEL's representative in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL's works and the final acceptance of the material shall be based on these test results.

16.0 REPAIR OF CASTINGS:

Castings shall not be repaired without the prior permission of BHEL.

**17.0 TEST CERTIFICATES:**

Three copies of test certificates shall be supplied unless otherwise stated on BHEL order.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL order No:

AA 199 36 (Rev.No. 03)- Phosphor Bronze Sand Chill and Centrifugal Castings-Gr: 3

Supplier's reference and name:

Heat No.:

Drawing/Pattern No:

Method of manufacture:

Consignment/Identification No.:

Dimensional inspection.

Detail of heat treatment

Results of Chemical, Mechanical and other tests as called for in this specification.

18.0 PACKING AND MARKING

Castings shall be suitably packed to prevent corrosion and damage during transit. Each package or casting (when supplied separately) shall be legibly marked with the following information.

AA 199 36:

BHEL Order No.

Consignment/Identification No.

Heat No.

Weight

Supplier's Name and reference.

19.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. AA 023 04 02
2. IS:28
3. IS:1608
4. IS : 4027