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IS 318 (1981): Leaded Tin Bronze Ingots and Castings [MTD
8: Copper and Copper Alloys]



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IS : 318 - 1981
(Reaffirmed 1986)
REAFFIRMED
2006

Indian Standard
SPECIFICATION FOR
LEADED TIN BRONZE INGOTS AND CASTINGS
(*Second Revision*)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

AMENDMENT NO. 2 JUNE 2004
TO
IS 318 : 1981 SPECIFICATION FOR
LEADED TIN BRONZE INGOTS AND CASTINGS
(Second Revision)

(Page 4, Table 1) — Insert the following note under the table:

NOTE — Other impurities do not preclude the possible presence of other unnamed elements. However, analysis shall be regularly made only for the alloying elements listed in the table. By agreement between the manufacturer and the purchaser, the limits may be established for elements not specified and analysis done.'

(MTD 8)

Reprography Unit, BIS, New Delhi, India

(MTD 8)

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TO
IS 318 : 1981 SPECIFICATION FOR LEADED TIN
BRONZE INGOTS AND CASTINGS

(Second Revision)

(Page 4, clause 3.1) — Substitute the following for the existing matter:

“3.1 The material when analysed in accordance with relevant part of IS 4027 ‘Methods of chemical analysis of bronzes’, as given below, shall have the chemical composition, as given in Table 1:

Parts of IS 4027	Title
(Part 1) : 1987	Determination of copper and lead by electrolytic method <i>(first revision)</i>
(Part 2) : 1987	Determination of manganese-photometric method (<i>first revision</i>)
(Part 3) : 1987	Determination of phosphorus by volumetric method <i>(first revision)</i>
(Part 4) : 1987	Determination of nickel-dimethylglyoxime photometric method <i>(first revision)</i>
(Part 5) : 1987	Determination of tin-iodimetric method <i>(first revision)</i>
(Part 6) : 1987	Determination of zinc by complexometric (EDTA) method <i>(first revision)</i>
(Part 7) : 1990	Determination of antimony by Rhodamine B spectrophotometric method <i>(first revision)</i>
(Part 8) : 1991	Determination of iron <i>(first revision)</i>
(Part 9) : 1991	Determination of aluminium by AAS method (<i>first revision</i>)

For remaining portion which is not covered in above 9 parts, IS 4027 : 1967 ‘Methods of chemical analysis of bronzes’, shall be referred.”

(Page 7, clause 9.4.2, line 3) — Substitute ‘both’ for ‘one’.

Indian Standard

SPECIFICATION FOR LEADED TIN BRONZE INGOTS AND CASTINGS (Second Revision)

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Indian Standard
SPECIFICATION FOR
LEADED TIN BRONZE INGOTS AND CASTINGS
(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 29 May 1981, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first issued in 1952 and revised in 1962. In this revision, the composition of five grades has been modified and so also the mechanical properties and another grade has been included. Grades LTB 1 and LTB 2 meant for general castings, have a fair strength and good machining properties; they are used in valve fittings and pump castings, Grade LTB 3 is suitable for high speed and heavy pressure bearings, and is, in addition, used where Grade LTB 4 is also used for general castings, and as a moderate pressure, general purposes bearing metal. Grade LTB 5 is suitable for hard or moderately hard shafts with loads and speeds moderate or low with rather less adequate lubrication and alignment. Grade LTB 6 is used for bearing under light loads and high speeds. Previous grades have been redesignated as LTB 1, LTB 2, etc (see Table 1).

0.3 While preparing this standard, assistance has been derived from BS 1400 : 1973 'Specification for copper alloy ingots and copper and copper alloy castings', published by the British Standards Institution.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for six grades of leaded tin bronze ingots and castings.

*Rules for rounding off numerical values (revised).

2. SUPPLY OF MATERIAL

2.1 General requirements relating to the supply of material are laid down in IS : 1387-1969*.

3. CHEMICAL COMPOSITION

3.1 The material when analyzed in accordance with IS : 4027-1967† shall have the chemical composition as given in Table 1.

TABLE 1 CHEMICAL COMPOSITION

CONSTITUENT	GRADES, PERCENT					
	LTB 1	LTB 2	LTB 3	LTB 4	LTB 5	LTB 6
Tin	6.0-8.0	4.0-6.0	6.0-8.0	6.0-8.0	9.0-11.0	4.0-6.0
*Zinc	1.5-3.0	4.0-6.0	0.75 Max	0.75 Max	1.0 Max	1.0 Max
Lead	2.5-3.5	4.0-6.0	9.0-11.0	14.0-16.0	8.5-11.0	18.0-23.0
Nickel, Max	2.0	2.0	2.0	2.0	2.0	2.0
Aluminium, Max	0.01	0.01	0.01	—	0.01	—
Silicon, Max	0.01	0.02	0.02	0.02	0.02	0.01
Antimony, Max	0.3	0.4	0.5	0.5	0.5	0.5
Iron, Max	0.30	0.35	0.35	0.35	0.35	0.35
Total of all impurities, Max	0.70 (excluding Ni)	0.80 (excluding Ni)	0.80 (excluding Ni+Zn)	0.80 (excluding Ni+Zn)	0.80 (excluding Ni+Zn)	0.80 (excluding Ni+Zn)
Copper	Remain-der	Remain-der	Remain-der	Remain-der	Remain-der	Remain-der

*It shall be permissible to supply ingots containing zinc up to 0.25 percent more than the maximum specified.

4. MECHANICAL PROPERTIES

4.1 Tensile Test — The material, when tested in accordance with IS : 2654-1964‡, shall have the mechanical properties as given in Table 2.

4.1.1 Should a tensile test piece break outside the middle third of its gauge length and the elongation percentage obtained is lower than the minimum specified, the test may, at the option of the supplier, be discarded and another test made.

*General requirements for the supply of metallurgical materials (*first revision*).

†Methods of chemical analysis of bronzes.

‡Method for tensile testing of copper and copper alloys.

TABLE 2 MECHANICAL PROPERTIES

(Class 4.1)

MODE OF CASTING OF TEST PIECES		REQUIREMENT, Min					
		LTB 1	LTB 2	LTB 3	LTB 4	LTB 5	LTB 6
Sand cast (Separately cast)	Tensile strength, MPa, Min	250	190	175	160	190	140
	*0.2 percent proof stress, MPa, Min	130	100	75	70	80	60
	Elongation percent on gauge length of $5.65\sqrt{S_0}$, Min	16.0	13.0	4.0	4.0	5.0	5.0
Chill Cast	Tensile strength, MPa, Min	250	190	200	190	220	150
	*0.2 percent proof stress, MPa, Min	190	100	75	70	140	60
	Elongation percent on gauge length of $5.65\sqrt{S_0}$, Min	5.0	6.0	3.0	3.0	3.0	5.0

*For information only and not a requirement.

NOTE — 1 MPa = 0.102 kgf/mm².

5. PRESSURE TEST

5.1 If the purchaser requires castings to be tested for pressure, this shall be stated with the enquiry and order. The number of tests, the nature of the test, the test pressure, and the testing fluid shall be subject to agreement between the supplier and the purchaser.

6. FREEDOM FROM DEFECTS

6.1 **Ingots** — The ingots shall be of uniform quality and reasonably free from slag, dross and other harmful contaminations.

6.2 **Castings** — The castings shall be clean, and free from harmful defects, such as, blow-holes, gas cavities, etc. Castings shall not be repaired unless permission in writing has been obtained previously from the purchaser or his representative.

7. SIZE AND SHAPE

7.1 Unless otherwise agreed to between the supplier and the purchaser, ingots shall be of weight 10 ± 1 kg.

7.2 The dimensions of the casting shall be in accordance with the drawing. All surfaces marked for machining shall have sufficient allowance for that purpose but this shall not be too excessive resulting in more machining, and unnecessary increase in the weight of the casting. For those surfaces which are not to be machined and unless otherwise specified in the contract, the sectional thickness shall not exceed by more than 5 percent of the specified thickness, or by 2 mm, whichever is more.

8. MARKING

8.1 The name, initials or trade-mark of the manufacturer and the cast number and grade of the material shall be cast or otherwise legibly marked by stamping on each ingot or casting, by which the manufacturer and the grade of the material may be identified. In the case of small castings where it is difficult to cast on or stamp all the details, the marking shall be as shown in the drawings or as agreed to between the purchaser and the supplier.

8.1.1 The containers may also be marked with the Standard Mark.

8.1.2 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9. SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Lot — In any consignment, ingots/castings of the same grade (see Table 1) manufactured at the same place shall be grouped together to constitute a lot.

9.2 Sampling for Chemical Analysis — One sample shall be taken and analyzed from each cast of 1 000 kg or part thereof of the ingots/castings. However, in case more frequent chemical analysis is required, the same shall be agreed to between the supplier and the purchaser. The sampling for chemical analysis shall be taken by drilling or sawing in such a manner as to be representative of the entire cross section. Drillings and sawings

from ingots/castings shall be obtained in accordance with the appropriate procedure specified in IS : 1817-1961*.

9.3 Sampling for Mechanical Properties—Three test bars shall be separately cast along with the castings for tensile strength for every 1 000 kg or part thereof of the casting. These test bars shall be cast to shape in accordance with 4.3.1 and Appendix B of IS : 1408-1968†. These test bars shall be of suitable size for turning them to the standard dimensions of the test piece as laid down in IS : 2654-1964‡.

9.4 Retest

9.4.1 If the sample drawn for chemical analysis fails to meet the requirements stipulated in the standard, two more tests shall be conducted on the same sample in order to confirm that the analysis has been done properly. If both the test results satisfy the relevant requirements, the lot shall be accepted; and if either of the retests fails, the lot represented shall be deemed as not complying with the standard.

9.4.2 Should a test piece fail to meet the requirements of the tensile test requirements specified in the standard, two further test pieces which represent the same cast may be tested in the same manner. Should one of the further test pieces meet the requirements of the tensile test, the ingots or castings represented thereby shall be deemed to comply with the standard, otherwise the lot shall be rejected.

10. INFORMATION TO BE GIVEN BY THE PURCHASER

10.1 This standard contains a number of clauses in which the purchaser is allowed to exercise an option. The list of information to be given by the purchaser in respect to these clauses is given in Appendix A.

*Methods for sampling non-ferrous metals for chemical analysis.

†Recommended procedure for inspection of copper-base alloy sand castings (*first revision*).

‡Method for tensile testing of copper and copper alloys.

APPENDIX A
(Clause 10.1)

INFORMATION TO BE GIVEN BY THE PURCHASER

- A-1.** Whether the purchaser wishes to inspect the material at the supplier's works (see 2 and IS : 1387-1967*).
- A-2.** The alloy grade required.
- A-3.** Whether information is required concerning the works analysis.
- A-4.** Detailed drawings of castings.
- A-5.** In the case of ingots, whether purchaser prefers any special size, shape and mass of the ingots.
- A-6.** Preparation of test piece for tensile testing.
- A-7.** Marking details.

*General requirements for the supply of metallurgical materials (first revision).

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