भारतीय मानक

Indian Standard

IS 17126 : 2024
ISO 4381 : 2011

सादी बियरिंग्स — बहुपरत सादी बियरिंग्स के लिए टिन कास्टिंग एलॉय

(पहला पुनरीक्षण)

Plain Bearings — Tin Casting Alloys for Multilayer Plain Bearings

(First Revision)

ICS 21.100.10; 77.120.60

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March 2024 **Price Group 5**

Bearing Sectional Committee, PGD 13

NATIONAL FOREWORD

This Indian Standard (First Revision) which is identical to ISO 4381 : 2011 ‘Plain bearings — Tin casting alloys for multilayer plain bearings’ issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Bearing Sectional Committee and approval of the Production and General Engineering Division Council.

This standard was first published in 2019. In this revision of this standard has been undertaken to align it with the latest version of ISO 4381 : 2011.

The major change incorporated in this revision is:

a) Materials grades with lead-based alloys have been removed.

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’; and

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated.

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 1143 Metallic materials — Rotating bar bending fatigue testing	IS 5075 : 2023/ISO 1143 : 2021 : Metallic materials — Rotating bar bending fatigue testing (*second revision*)	Identical
ISO 4384-2 Plain bearings — Hardness testing of bearing metals — Part 2: Solid materials	IS 14802 (Part 2) : 2024/ISO 4384-2 : 2022 Plain bearings — Hardness testing of bearing metals: Part 2 Solid materials (*second revision*)	Identical
ISO 4386-2 Plain bearings — Metallic multilayer plain bearings — Part 2: Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm	IS 16478 (Part 2) :2024/ISO 4386-2 : 2019 Plain bearings — Metallic multilayer plain bearings: Part 2 Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm (*first revision*)	Identical

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 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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PLAIN BEARINGS — TIN CASTING ALLOYS FOR MULTILAYER PLAIN BEARINGS

(First Revision)

1 Scope

This International Standard specifies requirements for bearing metals based on tin casting alloys for multilayer plain bearings. The chemical composition and material properties refer to the original unprocessed material and are measured on representative samples. Testing results on final bearings can differ due to the influence of bearing production. Therefore, it is not intended that these results be compared with data given in this International Standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1143, *Metallic materials — Rotating bar bending fatigue testing*

ISO 4384-2, *Plain bearings — Hardness testing of bearing metals — Part 2: Solid materials*

ISO 4386-2:—[1)], *Plain bearings — Metallic multilayer plain bearings — Part 2: Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm*

3 Requirements

3.1 Chemical composition

The chemical composition of alloy elements shall be within the limits specified in Table 1. The chemical analysis is decisive for the acceptance of the bearing metals.

3.2 Material properties

Material properties shall be in accordance with the data given in Table 1.

All material property values are mean values or ranges and are regarded as typical values for the designer. In view of the range of possible alloy compositions and the marked influence exerted by the cooling conditions on the mechanical properties, relatively large deviations from the indicated values are to be expected in individual cases.

3.3 Selection of material

Guidance on uses of bearing metals and on the hardness of the mating bearing part (shaft) is given in Annex A.

1) Under preparation.

Table 1 — Tin casting alloy

Chemical element		Chemical composition, mass fraction %
		SnSb8Cu4
Sn		Remainder
Sb		7 to 8
Cu		3 to 4
Impurities		
Pb		<0,35
As		<0,1
Bi		<0,08
Fe		<0,1
Al		<0,01
Zn		<0,01
Cd		<0,05
Total others		0,2
Material properties		
Brinell hardness in accordance with ISO 4384-2 HBW 10/250/180	20 °C	22
	100 °C	10
0,2 % tensile yield stress $R_{p\,0,2}$ N/mm^2	20 °C	46
Tensile strength R_m N/mm^2	20 °C	77
0,2 % compressive yield stress $\sigma_{d\,0,2}$ N/mm^2	20 °C	47
	100 °C	27
Bond strength R_{Ch} N/mm^2		In accordance with ISO 4386-2:—, 8.1 and 8.2.
Rotating bar bending fatigue R_{rbf} in accordance with ISO 1143 10^7cycles, N/mm^2		± 29
Linear thermal expansion coefficient, α_l 10^{-6}/K		23,9
Melting temperature °C		233 to 360
Casting temperature °C		440 to 460
Density, ρ kg/dm^3		7,3

4 Designation

EXAMPLE A bearing metal having the chemical composition indicated by the symbol SnSb8Cu4 is designated as follows:

Bearing metal ISO 4381 — SnSb8Cu4

Annex A
(informative)

Guidance on use of bearing metals and the hardness of the mating bearing part (shaft)

Bearing alloy	Characteristics and principal uses	Minimum hardness of the shaft[a]
SnSb8Cu4	Good sliding properties, conformability and high toughness; good embeddability; suitable for high sliding velocities in the hydrodynamic range, mean load; impact stress at low frequency; insensitive to reversed bending stress. Used for high loaded rolling mill bearings; for the production of wrapped bushes, thin-walled bearing liners with a wall thickness of up to about 3 mm and thrust washers.	160 HB
[a] In multilayer plain bearings, the difference between the hardness of the bearing material and the shaft material should be such that welding under working conditions is safely avoided. The working conditions, in particular the lubrication conditions, have considerable influence on the selection of the shaft material. For this reason, the recommended hardness value for the shaft material is a minimum value. In general, unquenched and untempered shaft materials are used in the case of bearing materials based on tin.		

Bibliography

[1] ISO 4386-1, *Plain bearings — Metallic multilayer plain bearings — Part 1: Non-destructrive ultrasonic testing of bond*

[2] ISO 4386-3, *Plain bearings — Metallic multilayer plain bearings — Part 3: Non-destructive penetrant testing*

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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