INTERNATIONAL STANDARD

ISO 4381

Fourth edition
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Plain bearings — Tin casting alloys for multilayer plain bearings

Paliers lisses — Alliages moulés à base d'étain pour paliers lisses multicouches

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4381 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 2, *Materials and lubricants, their properties, characteristics, test methods and testing conditions*.

This fourth edition cancels and replaces the third edition (ISO 4381:2000), which has been technically revised.

Plain bearings — Tin casting alloys for multilayer plain bearings

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.		