International Standard 4383

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Plain bearings — Metallic multilayer materials for thin-walled plain bearings

Paliers lisses — Matériaux métalliques multicouches pour paliers lisses minces

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

Intenational Standard ISO 4383 was developed by Technical Committee ISO/TC 123, *Plain bearings*, and was circulated to the member bodies in September 1978.

It has been approved by the member bodies of the following countries :

Australia	Italy	South Africa, Rep. of
Chile	Korea, Rep. of	Spain
Czechoslovakia	Libyan Arab Jamahiriya	Sweden
France	Mexico	United Kingdom
Germany, F.R.	Netherlands	USA
India	New Zealand	USSR
Ireland	Poland	Yugoslavia

No member body expressed disapproval of the document.

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Plain bearings — Metallic multilayer materials for thin-walled plain bearings

1 Scope and field of application

This International Standard specifies requirements for metallic multilayer materials for the manufacture of thin-walled plain bearings (half bearings, bushes, thrust washers). The multilayer material consists of a steel backing, the bearing metal layer (cast, sintered, roll bonded) and possibly an electrodeposited overlay.

2 References

ISO 3548, *Plain bearings — Thin-walled half bearings — Dimensions, tolerances and methods of checking.*

ISO 4381, *Plain bearings — Lead and tin casting alloys for multilayer plain bearings.*

ISO 4382/1, *Plain bearings — Copper alloys — Part 1 : Cast copper alloys for solid and multilayer plain bearings.*

ISO 4384/1, *Plain bearings — Hardness testing on bearing metals — Part 1 : Compound materials.* [1]

ISO 6864, *Plain bearings — Thin-walled flanged half bearings — Dimensions, tolerances and methods of checking.* [1]

3 Requirements

3.1 Chemical composition

The chemical composition shall be within the limits specified in tables 1, 2, 3 and 4, where single figures denote maximum values.

3.2 Steel backings

The chemical composition of the steel for backings shall be the subject of agreement between manufacturer and purchaser. In general, low carbon steel will be used.

3.3 Bearing metal layers

Bearing metals based on lead and tin shall be according to table 1.

Bearing metals based on copper shall be according to table 2.

Bearing metals based on aluminium shall be according to table 3.

3.4 Overlays

Overlays according to table 4 may be used only for bearing metal layers according to tables 2 and 3. The thickness of the overlay and any additional layers between the bearing metal layer and the overlay shall be the subject of agreement between manufacturer and purchaser.

3.5 Guide to bearing metal properties and selection

A guide to bearing metal hardness in strip form and uses of bearing metals is given in tables 5 and 6.

4 Designation

Example : Designation of a multilayer material consisting of a steel backing, the bearing metal CuPb24Sn as cast (G) and the overlay PbSn10Cu2 :

Bearing metal ISO 4383 — G — CuPb24Sn — PbSn10Cu2.

1) At present at the stage of draft.

Table 1 — Lead and tin alloys

Chemical elements	Chemical composition, % (*m/m*)			
	PbSb10Sn6	**PbSb15SnAs**	**PbSb15Sn10**	**SnSb8Cu4**
Pb	Remainder	Remainder	Remainder	0,35
Sb	9,0 to 11,0	13,5 to 15,5	14,0 to 16,0	7,0 to 8,0
Sn	5,0 to 7,0	0,9 to 1,7	9,0 to 11,0	Remainder
Cu	0,70	0,70	0,70	3,0 to 4,0
As	0,25	0,8 to 1,2	0,60	0,10
Bi	0,10	0,10	0,10	0,08
Zn	0,005	0,005	0,005	0,005
Al	0,005	0,005	0,005	0,005
Cd	0,05	0,02	0,05	—
Fe	0,10	0,10	0,10	0,10
Total others	0,20	0,20	0,20	0,20

Table 2 — Copper alloys

Chemical elements	Chemical composition, % (*m/m*)				
	CuPb10Sn10 [1] G - cast P - sintered	**CuPb17Sn5** G - cast	**CuPb24Sn4** G - cast P - sintered	**CuPb24Sn** G - cast P - sintered	**CuPb30** P - sintered
Cu	Remainder	Remainder	Remainder	Remainder	Remainder
Pb	9,0 to 11,0	14,0 to 20,0	19,0 to 27,0	19,0 to 27,0	26,0 to 33,0
Sn	9,0 to 11,0	4,0 to 6,0	3,0 to 4,5	0,6 to 2,0	0,5
Zn	0,5	0,5	0,5	0,5	0,5
P	0,1	0,1	0,1	0,1	0,1
Fe	0,7	0,7	0,7	0,7	0,7
Ni	0,5	0,5	0,5	0,5	0,5
Sb	0,2	0,2	0,2	0,2	0,2
Total others	0,5	0,5	0,5	0,5	0,5

1) The chemical composition of this alloy differs from that of solid plain bearings (see ISO 4382/1).

Table 3 — Aluminium alloys

Chemical elements	Chemical composition, % (*m/m*)				
	AlSn20Cu	AlSn6Cu	AlSi4Cd	AlCd3CuNi	AlSi11Cu
Al	Remainder	Remainder	Remainder	Remainder	Remainder
Cu	0,7 to 1,3	0,7 to 1,3	0,05 to 0,15	0,7 to 1,3	0,7 to 1,3
Sn	17,5 to 22,5	5,5 to 7,0	—	—	0,2
Ni	0,1	1,3	—	0,7 to 1,3	0,1
Cd	—	—	0,8 to 1,4	2,7 to 3,5	—
Si	0,7[1)]	0,7[1)]	3,5 to 4,5	0,7[1)]	10,0 to 12,0
Fe	0,7[1)]	0,7[1)]	0,35	0,7[1)]	0,3
Mn	0,7[1)]	0,7[1)]	0,2	0,7[1)]	0,1
Ti	0,2	0,2	0,2	0,1	0,1
Total others	0,5	0,5	0,25	0,15	0,3

1) Total Si + Fe + Mn not exceeding 1,0 %.

Table 4 — Overlays

Chemical elements	Chemical composition, % (*m/m*)		
	PbSn10Cu2	PbSn10	PbIn7
Pb	Remainder	Remainder	Remainder
Sn	8,0 to 12,0	8,0 to 12,0	—
Cu	1,0 to 3,0	—	—
In	—	—	5,0 to 10,0
Total others	0,5	0,5	0,5

Table 5 — Guide to bearing metal hardness in strip form

(Hardness values may be increased by skin-rolling; tests carried out according to ISO 4384/1.)

Bearing alloys	As cast	Sintered	Rolled and annealed	Special treatments
PbSb10Sn6	19 to 23HV	–	–	15 to 19HV
PbSb15SnAs	16 to 20HV	–	–	–
PbSb15Sn10	18 to 23HV	–	–	–
SnSb8Cu4	17 to 24HV	–	–	–
CuPb10Sn10	70 to 130HB	60 to 90HB	–	–
CuPb17Sn5	60 to 95HB	–	–	–
CuPb24Sn4	60 to 90HB	45 to 70HB	–	–
CuPb24Sn	55 to 80HB	40 to 60HB	–	–
CuPb30	–	30 to 45HB	–	–
AlSn20Cu	–	–	30 to 40HB	–
AlSn6Cu	–	–	35 to 45HB	–
AlSi4Cd	–	–	30 to 40HB	50 to 70HB
AlCd3CuNi	–	–	35 to 55HB	–
AlSi11Cu	–	–	45 to 60HB	–

Table 6 — Guide for uses of bearing metals

Bearing alloys (overlays)	Characteristics and principle uses in high speed engines
PbSb10Sn6	Soft; corrosion resistant; relatively good performance with marginal lubrication; low fatigue strength; operates with hard or soft shafts.
PbSb15SnAs	
PbSb15Sn10	Lightly loaded main and connecting rod bearings; bushes; thrust washers.
SnSb8Cu4	Soft; good corrosion resistance; has the best performance of all bearing alloys under conditions of marginal lubrication; poor fatigue resistance; operates with hard or soft shafts. Lightly loaded main and connecting rod bearings; bushes; thrust washers.
CuPb10Sn10	Very high fatigue strength and shock resistance; good corrosion resistance; hard shaft desirable. Wrapped bushes; thrust washers; small end bushes.
CuPb17Sn5	Very high fatigue strength and shock resistance; hard shaft desirable; normally overlay plated when used as a bearing. Highly loaded main and connecting rod bearings; wrapped bushes; thrust washers.
CuPb24Sn4	High fatigue strength and shock resistance; suitable for high speed shafts, oscillating or rotating motion; hard shaft desirable; normally overlay plated when used as a bearing. Wrapped bushes; thrust washers; main and connecting rod bearings.
CuPb24Sn	High fatigue resistance with cast alloy; fair to high with sintered; normally plated with an overlay when used in bearing applications and in this form may be operated with hard or soft shafts; susceptible to corrosion by degraded oil when not overlay plated. Main and connecting rod bearings; thrust washers.
CuPb30	Moderate fatigue resistance; susceptible to corrosion by degraded oil if not overlay plated; operate with hard shafts unless overlay plated. Main and connecting rod bearings; wrapped bushes.
AlSn20Cu	Moderate fatigue strength; good corrosion resistance; relatively good performance in marginally lubricated conditions; can be operated with soft shafts. Main and connecting rod bearings; thrust washers and wrapped bushes.
AlSn6Cu	Moderate to high fatigue strength; good corrosion resistance; normally plated with an overlay and used with hard shafts. Main and connecting rod bearings and wrapped bushes.
AlSi4Cd	Moderate to high fatigue strength; good corrosion resistance; normally used with plated overlays in bearing applications; run against hard shafts. A heat-treated version has high fatigue strength. Main and connecting rod bearings; wrapped bushes and thrust washers.
AlCd3CuNi	Moderate to high fatigue strength; good corrosion resistance; normally used with plated overlays in bearing applications; run against hard shafts. A version with a positive manganese addition has high fatigue resistance. Main and connecting rod bearings; occasionally wrapped bushes and thrust washers.
AlSi11Cu	High fatigue strength; normally used with plated overlays in bearing applications; run against hard shafts; good corrosion resistance. Main and connecting rod.
PbSn10Cu2	Fatigue strength depends on thickness; soft; good corrosion resistance; relatively good performance under conditions of marginal lubrication. Applied to main and connecting rod bearings manufactured from copper-lead based alloys and the higher strength aluminium based alloys.
PbSn10	
PbIn7	