
**Plain bearings — Multilayer materials
for thin-walled plain bearings**

Paliers lisses — Matériaux multicouches pour paliers lisses minces



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Printed in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4383 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 third edition cancels and replaces the second edition (ISO 4383:1991), which has been technically revised.

Annex A of this International Standard is for information only.

Plain bearings — Multilayer materials for thin-walled plain bearings

1 Scope

This International Standard specifies requirements for 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 layer (cast, sintered, roll bonded) and possibly an electrodeposited overlay.

NOTE Environmental concerns will, in the future, restrict the use of some materials such as lead.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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 thick-walled plain bearings*.

ISO 6691, *Thermoplastic polymers for plain bearings — Classification and designation*.

3 Requirements

3.1 Chemical composition

The chemical composition shall be within the limits specified in Tables 1 to 5, 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.

For the bronze/polymer composite materials listed in Table 4, copper-coated steel may be used.

3.3 Bearing layers

Bearing metals based on lead and tin shall be in accordance with Table 1.

Bearing metals based on copper shall be in accordance with Table 2.

Bearing metals based on aluminium shall be in accordance with Table 3.

Bearing layers based on sintered porous bronze and polymers shall be in accordance with Table 4.

NOTE There is now a new class of aluminium-based materials containing both aluminium and silicon or manganese as well as a "soft" material such as lead or tin. Detailed information is available from individual manufacturers.

3.4 Overlays

Overlays in accordance with Table 5 may be applied for bearing metal layers as indicated in Table A.2. The thickness of the overlay and any additional layers between the bearing metal layer and the overlay shall be the subject of agreement between the manufacturer and purchaser.

3.5 Properties and selection of materials

Guidance on bearing metal hardness in strip form and uses of bearing metals is given in annex A.

4 Designation

EXAMPLE

A multilayer material consisting of a steel backing, the bearing metal CuPb24Sn as cast (G) and the overlay PbSn10Cu2 is designated as follows:

Bearing metal ISO 4383 - G - CuPb24Sn - PbSn10Cu2

Table 1 — Lead and tin alloys (see ISO 4381)

Chemical element	Chemical composition, % (m/m)			
	PbSb10Sn6	PbSb15SnAs	PbSb15Sn10	SnSb8Cu4
Pb	Remainder	Remainder	Remainder	0,35
Sb	9 to 11	13,5 to 15,5	14 to 16	7 to 8
Sn	5 to 7	0,9 to 1,7	9 to 11	Remainder
Cu	0,7	0,7	0,7	3 to 4
As	0,25	0,8 to 1,2	0,6	0,1
Bi	0,1	0,1	0,1	0,08
Zn	0,01	0,01	0,01	0,01
Al	0,01	0,01	0,01	0,01
Fe	0,1	0,1	0,1	0,1
Total others	0,2	0,2	0,2	0,2

Table 2 — Copper alloys

Chemical element	Chemical composition, % (m/m)				
	CuPb10Sn10 ^a	CuPb17Sn5	CuPb24Sn4	CuPb24Sn	CuPb30
	G - cast P - sintered	G - cast	G - cast P - sintered	G - cast P - sintered	P - sintered
Cu	Remainder	Remainder	Remainder	Remainder	Remainder
Pb	9 to 11	14 to 20	19 to 27	19 to 27	26 to 33
Sn	9 to 11	4 to 6	3 to 4,5	0,6 to 2	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	0,5	0,5	0,5	0,5	0,5
Total others	0,5	0,5	0,5	0,5	0,5

^a The chemical composition of this alloy differs from that of solid and multilayer thick-walled plain bearings (see ISO 4382-1).

Table 3 — Aluminium alloys

Chemical element	Chemical composition, % (m/m)			
	AlSn20Cu	AlSn6Cu	AlSi11Cu	AlZn5Si1,5Cu1Pb1Mg
Al	Remainder	Remainder	Remainder	Remainder
Cu	0,7 to 1,3	0,7 to 1,3	0,7 to 1,3	0,8 to 1,2
Sn	16,5 to 22,5	5,5 to 7	0,2	0,2
Ni	0,1	1,3	0,1	0,2
Si	0,7 ^a	0,7 ^a	10 to 12	1 to 2
Fe	0,7 ^a	0,7 ^a	0,3	0,6
Mn	0,7 ^a	0,7 ^a	0,1	0,3
Ti	0,2	0,2	0,1	0,2
Pb	—	—	—	0,7 to 1,3
Zn	—	—	—	4,4 to 5,5
Mg	—	—	—	0,6
Total others	0,5	0,5	0,3	0,4

^a Total Si + Fe + Mn content shall not exceed 1 %.

Table 4 — Sintered bronze with polymer running surface

Chemical element	Chemical composition, % (m/m)				
	CuSn10			CuPb10Sn10	
Cu	Remainder			Remainder	
Pb	—			9 to 12	
Sn	9 to 12			9 to 12	
P	0,3			0,3	
Total others	0,5			0,5	
Running surface and polymer impregnated with fillers against friction and wear (see ISO 6691)	PTFE	POM	PVDF	PTFE	PVDF
Porous sintered bronze	Porosity 20 % to 45 % (V/V)				

Table 5 — Overlays

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

Annex A (informative)

Guidance on properties and selection of materials

See Tables A.1 and A.2.

Table A.1 — Bearing metal hardness in strip form

Bearing alloy	As cast	Sintered	Rolled and annealed	Special treatments
PbSb10Sn6	19 HV to 23 HV	—	—	15 HV to 19 HV
PbSb15SnAs	16 HV to 20 HV	—	—	—
PbSb15Sn10	18 HV to 23 HV	—	—	—
SnSb8Cu4	17 HV to 24 HV	—	—	—
CuPb10Sn10	70 HB to 130 HB	60 HB to 90 HB	—	60 HB to 140 HB
CuPb17Sn5	60 HB to 95 HB	—	—	—
CuPb24Sn4	60 HB to 90 HB	45 HB to 70 HB	—	45 HB to 120 HB
CuPb24Sn	55 HB to 80 HB	40 HB to 60 HB	—	40 HB to 110 HB
CuPb30	—	30 HB to 45 HB	—	—
AlSn20Cu	—	—	30 HB to 40 HB	45 HB to 60 HB
AlSn6Cu	—	—	35 HB to 45 HB	—
AlSi11Cu	—	—	45 HB to 60 HB	—
AlZn5Si1,5Cu1Pb1Mg	—	—	45 HB to 70 HB	70 HB to 100 HB
NOTE Hardness values may be increased by skin-rolling; tests should be carried out in accordance with ISO 4384-1.				