

# INTERNATIONAL STANDARD

**ISO**  
**3547-4**

First edition  
1999-12-01

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## Plain bearings — Wrapped bushes —

### Part 4: Materials

*Paliers lisses — Bagues roulées —*

*Partie 4: Matériaux*

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Reference number  
ISO 3547-4:1999(E)

## 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 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.

International Standard ISO 3547-4 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 3, *Dimensions, tolerances and construction details*.

This first edition of ISO 3547-4, together with ISO 3547-1, ISO 3547-2 and ISO 3547-3, cancels and replaces ISO 3547:1976 the technical content of which has been revised and augmented.

ISO 3547 consists of the following parts, under the general title *Plain bearings — Wrapped bushes*:

- *Part 1: Dimensions*
- *Part 2: Test data for outside and inside diameter*
- *Part 3: Lubrication holes, lubrication grooves and lubrication indentations*
- *Part 4: Materials*

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# Plain bearings — Wrapped bushes —

## Part 4: Materials

### 1 Scope

This part of ISO 3547 gives specifications for solid and multilayer bearing materials, such as are used for wrapped bushes in accordance with ISO 3547-1, ISO 3547-2 and ISO 3547-3.

### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 3547. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 3547 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 3547-1, *Plain bearings — Wrapped bushes — Part 1: Dimensions.*

ISO 3547-2, *Plain bearings — Wrapped bushes — Part 2: Test data for outside and inside diameter.*

ISO 3547-3, *Plain bearings — Wrapped bushes — Part 3: Lubrication holes, lubrication grooves and lubrication indentations.*

ISO 4382-2, *Plain bearings — Copper alloys — Part 2: Wrought copper alloys for solid plain bearings.*

ISO 4383, *Plain bearings — Multilayer materials for thin-walled plain bearings.*

ISO 4384-1, *Plain bearings — Hardness testing of bearing metals — Part 1: Compound materials.*

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

### 3 Requirements

#### 3.1 Chemical analysis

Chemical analysis shall be definitive for the acceptance of the bearing metals. Arbitrary analyses or random sampling operations shall be performed in accordance with the most recent edition of "Analyse der Metalle" (the analysis of metals) issued by the "Chemikerausschuß der Gesellschaft Deutscher Metallhütten- und Bergleute e.V.", Vol. 1: "Schiedsanalysen" (random analysis) or Vol. 3: "Probenahme" (random sampling).

#### 3.2 Hardness values

The hardness values indicated in Tables 1 and 2 are mean values for each of the materials concerned. Taking into account the possible range of alloy compositions and the significant effect of the conditions of cooling on the mechanical properties, larger fluctuations from the indicated values may be assumed to occur in certain cases.

**Table 1 — Solid materials**

Key	Designation <sup>a</sup>	Hardness <sup>b</sup> (guide values) HB 2,5/62,5/10	Notes relating to use
Z1	Steel (hardened)	—	Suitable for secondary applications with lightly loaded sliding characteristics.
Y1	CuSn8P	120	Very high load capacity, good antifrictional properties, e.g. for vehicles, transmissions, conveyor systems and agricultural machinery.
Y2		150	
W1	CuZn31Si1	110	High load capacity, good antifrictional properties, e.g. for textile machinery, motor vehicles and agricultural machinery and lifts.
W2		140	
<sup>a</sup> Steel composition shall be agreed between supplier and user. It will normally have a carbon content of less than 0,25 %; composition of bearing material in accordance with ISO 4382-2.			
<sup>b</sup> Hardness testing in accordance with ISO 4384-2.			

Table 2 — Multilayer materials

Key	Designation <sup>a</sup>	Hardness <sup>b</sup> (guide values)		Notes relating to use
		Steel HB 1/30/10	Bearing material	
T1	Steel/ PbSb15SnAs	130	16 HV to 20 HV	Very good emergency running characteristics, fair load capacity, e.g. for pumps, compressors, automatic transmissions, starters and camshafts.
T2	Steel/ SnSb8Cu4	130	17 HV to 24 HV	As for the material with Key T1 plus wick lubrication and in corrosive environments, such as are encountered in refrigeration engineering.
S1	Steel/ G-CuPb24Sn	125	55 HB to 80 HB	High load capacity, with hardened shafts being necessary as a rule, e.g. for automatic transmissions, steering assemblies, camshafts and pumps.
S2	Steel/ P-CuPb24Sn	125	40 HB to 60 HB	
S3	Steel/ G-CuPb24Sn4	125	60 HB to 90 HB	
S4	Steel/ P-CuPb24Sn4	125	45 HB to 90 HB	As for the material with Keys S1 and S2; more suitable for the embossing of grooves. Very high load capacity, with hardened shafts being necessary as a rule, e.g. for gudgeon pins and rocker arm bearings, transmission shafts, steering assemblies and pumps. Available with greater Brinell hardness for special applications.
S5	Steel/ G-CuPb10Sn10	125	70 HB to 130 HB	
S6	Steel/ P-CuPb10Sn10	125	60 HB to 90 HB	
R1	Steel/ AlSn6Cu	170	35 HB to 45 HB	High load capacity, with hardened shafts being necessary as a rule, e.g. for transmissions and hydraulic pumps.
R2	Steel/ AlSn20Cu	170	30 HB to 40 HB	Good emergency running characteristics, fair load capacity, e.g. for refrigeration plant, compressors and pumps.
P1	Steel with porous sintered tin bronze or lead tin bronze, filler and surface coating (running-in coating) of PTFE with additives	140	—	Low friction; for vehicle suspension struts, gear levers, pivot bearings, pumps and lifting magnets; operating range from – 200 °C to + 280 °C, but not suitable for machining in the bearing bore; suitable for use as a dry bearing material.
P2	Steel with porous sintered tin bronze or lead tin bronze coated with thermoplastic	140	—	High load capacity, greased on assembly, e.g. for cranes, hoists, lifts, packaging machinery and agricultural machinery, some temperature limitation. <sup>c</sup>

NOTE The materials with Keys S1 to S6 and R1 can be supplied with an additional lead-based running-in coating by agreement with the manufacturer.

<sup>a</sup> Steel composition shall be agreed between supplier and user. It will normally have a carbon content of less than 0,25 %; composition of bearing material according to ISO 4383.

<sup>b</sup> Hardness testing in accordance with ISO 4384-1.

<sup>c</sup> Temperature limitation for continuous duty depends on type of thermoplastic, e.g.: POM: 90 °C, PVDF: 110 °C, PEEK: 250 °C.

## Bibliography

- [1] ISO 683-11, *Heat-treatable steels — Alloy steels and free-cutting steels — Part 11: Wrought case-hardening steels*.
- [2] ISO 6932, *Cold-reduced carbon steel strip with a maximum carbon content of 0,25 %*.

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