

Submitted for recognition as an American National Standard

BEARING BUSHING ALLOYS CHEMICAL COMPOSITION OF SAE BEARING AND BUSHING ALLOYS

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

- 1. Scope**—Compositions apply to the finished bearing or bearing lining, not necessarily to the alloy at an intermediate processing stage. All values not given as ranges are maxima. (See Tables 1 through 5.)
- 2. References**—There are no referenced publications specified herein.

TABLE 1—LEAD AND TIN-BASED ALLOYS

	SAE 12 ISO SnSb8Cu4	SAE 13 ISO PbSb10Sn6	SAE 14 ISO PbSb15Sn10	SAE 15 ISO PbSb1As	SAE 16 ⁽¹⁾ —	SAE 17 —
Pb	0.50 ⁽²⁾	Remainder	Remainder	Remainder	Remainder	0.50
Sn	Remainder	5.0–7.0	9.0–11.0	0.9–1.7	3.5–4.7	Remainder
Sb	7.0–8.0	9.0–11.0	14.0–16.0	13.5–15.5	3.0–4.5	7.5–9.0
Cu	3.0–4.0	0.7	0.7	0.7	0.4	3.0–4.0
Cd	—	0.05	0.05	0.02	0.05	1.0–1.5
As	0.10	0.25	0.6	0.8–1.2	0.6	0.10
Al	0.005	0.005	0.005	0.005	0.005	0.005
Bi	0.08	0.10	0.10	0.10	0.10	0.08
Fe	0.10	0.10	0.10	0.10	0.10	0.10
Zn	0.005	0.005	0.005	0.005	0.005	0.005
Total						
Others	0.20	0.20	0.20	0.20	0.40	0.20 ⁽³⁾⁽⁴⁾

- SAE 16 is cast into and on a porous sintered matrix, usually copper nickel or lead bronze, bonded to steel. For crankshaft bearings, the surface layer is 0.025 to 0.125 mm (0.001 to 0.005 in) in thickness.
- ISO SnSb8Cu4 has 0.35 max. Pb.
- A version of this alloy has 0.2 to 0.5 Ni.
- A version of this alloy has 0.01 to 0.1 Cr.

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TABLE 2—LEAD-BASED OVERLAYS

	SAE 191 ISO PbSn10	SAE 192 ISO PbSn10Cu2	SAE 193 —	SAE 194 ISO PbIn7
Pb	Remainder	Remainder	Remainder	Remainder
Sn	8.0–12.0	8.0–12.0	16.0–20.0	—
In	—	—	—	5.0–10.0
Cu	—	1.0–3.0	1.0–3.0	—
Total				
Others	0.5	0.5	0.5	0.5

TABLE 3—COPPER-BASED ALLOYS—STEEL BACKED

	SAE 48 ISO CuPb30	SAE 49 ISO CuPb24Sn	SAE 485 —	SAE 792 (1) ISO CuPb10Sn10	SAE 793 —	SAE 794(1) ISO CuPb24Sn4
Cu	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder
Pb	26.0–33.0	21.0–27.0 ⁽²⁾	36.0–58.0	9.0–11.0	7.0–9.0	21.0–25.0 ⁽³⁾
Sn	0.50 ⁽⁴⁾	0.6–2.0 ⁽⁵⁾	1.0–8.0	9.0–11.0	3.5–4.5	3.0–4.0 ⁽³⁾
Fe	0.7	0.7	0.5	0.7	0.7	0.7
Ni	0.50	0.50	—	0.50	0.50	0.50
P	0.10	0.10	—	0.10	0.10	0.10
Sb	0.50	0.50	—	0.50	0.50	0.50
Zn	0.50	0.50	—	0.50 ⁽⁶⁾	0.50 ⁽⁷⁾	0.50 ⁽⁷⁾
Total						
Others	0.50	0.50	1.0	0.50	0.50	0.50

1. SAE 792 now covers both cast and sintered versions of CuPb10Sn10 and SAE 794 covers both cast and sintered versions of CuPb24Sn4. The SAE 797 and SAE 799 designations for the sintered versions have been eliminated.
2. ISO CuPb24Sn has 19.0 to 27.0 Pb.
3. ISO CuPb24Sn4 has 19.0 to 27.0 Pb and 3.0 to 4.5 Sn.
4. A version of this alloy has 1.3 max. Sn.
5. A version of this alloy has 2.8 max. Sn.
6. A version of this alloy has 0.8 max. Zn.
7. A version of this alloy has 3.0 max. Zn.

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TABLE 4—COPPER-BASED ALLOYS—CAST ALLOYS NOT BONDED TO STEEL

	UNS C98400	UNS C98200	SAE 791 UNS C83520	UNS C93700	UNS C93720	UNS C94330	SAE 795 UNS C83420
Cu	Remainder ⁽¹⁾	Remainder ⁽¹⁾	Remainder ⁽¹⁾	78.0–82.0 ⁽¹⁾	83.0 min. ⁽¹⁾	68.5–75.5 ⁽¹⁾	88.0–92.0 ⁽¹⁾
Pb	26.0–33.0	21.0–27.0	3.5–4.5	8.0–11.0	7.0–9.0	21.0–25.0	0.50
Sn	0.50	0.6–2.0	3.5–4.5	9.0–11.0	3.5–4.5	3.0–4.0	0.25–0.7
Fe	0.7	0.7	0.30	0.7	0.7	0.7	0.10
Ni	0.50	0.50	1.0 ⁽¹⁾	0.50 ⁽¹⁾	0.50 ⁽¹⁾	0.5	—
(incl Co)							
P	0.10	0.10	—	0.10 ⁽²⁾	0.10 ⁽²⁾	0.10 ⁽²⁾	—
Sb	0.50	0.50	0.25	0.50	0.50	0.50	—
Zn	0.50	0.50	1.5–4.0	0.8	4.0	3.0	Remainder
Ag	1.5	—	—	—	—	—	—
Si	—	—	—	0.005	—	—	—
S	—	—	—	0.08	—	—	—
Al	—	—	—	0.005	—	—	—
Cu + Sum of Named Elements	99.5 min.	99.5 min.	99.8 min.	99.0 min.	99.0 min.	99.0 min.	99.3 min.
Approx. SAE Equivalent	SAE 48	SAE 49	—	SAE 792	SAE 793	SAE 794	—

1. In determining copper min., copper may be calculated as Cu + Ni.
2. For continuous castings, phosphorus shall be 1.5% max.

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TABLE 5—ALUMINUM-BASED ALLOYS

	SAE 770 ISO AlSn6Cu	SAE 780 —	SAE 781 ISO AlSi4Cd	SAE 782 ISO AlCd3CuNi	SAE 783 ISO AlSn20Cu	SAE 784 ISO AlSi11Cu	SAE 785 ISO AlZn5S12CuPb	SAE 786 ISO AlSn40	SAE 787 —	SAE 788 —
Al	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder
Sn	5.5–7.0	5.5–7.0	—	—	17.5–22.5	0.20	0.20	37–42	0.4–2.0	10.0–14.0
Cd	—	—	0.8–1.4	2.7–3.5	—	—	—	—	—	—
Si	0.7	1.0–2.0	3.5–4.5	0.30 ⁽¹⁾	0.50 ⁽²⁾	10.0–12.0	1.0–2.0 ⁽³⁾	0.3	3.5–4.5	1.8–3.5 ⁽⁴⁾
Cu	0.7–1.3	0.7–1.3	0.05–0.15	1.0–1.5 ⁽¹⁾	0.7–1.3	1.7–1.3	0.7–1.3	0.35–0.7	0.5–2.0 ⁽⁵⁾	0.4–1.2 ⁽⁴⁾
Ni	0.7–1.3 ⁽⁶⁾	0.20–0.7	—	0.7–1.3	0.10	0.10	0.20	0.10	—	0.10
Zn	—	—	—	—	—	—	4.5–5.5 ⁽³⁾	—	—	—
Pb	—	—	—	—	—	—	0.7–1.3	—	4.0–10.5 ⁽⁵⁾	1.0–2.4 ⁽⁴⁾
Mg	—	—	0.05–0.20 ⁽⁷⁾	—	—	—	—	—	— ⁽⁵⁾	—
Mn	0.10 ⁽⁶⁾	0.10	0.10	1.2–1.6 ⁽¹⁾	0.10 ⁽²⁾	0.10	0.10	0.10	— ⁽⁵⁾	0.10
Fe	0.7	0.7	0.35	0.30 ⁽¹⁾	0.50 ⁽²⁾	0.30	0.30	0.30	0.50	0.35
Cr	—	—	—	—	—	—	—	—	—	0.25
Sb	—	—	—	—	—	—	—	—	—	0.45
Sr	—	—	—	—	—	—	—	—	—	0.30
Ti	0.10 ⁽⁶⁾	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total										
Others	0.30	0.15	0.25	0.15	0.15 ⁽²⁾	0.30	0.30	0.30	0.30	0.30

1. ISO AlCd3CuNi has 0.7 to 1.3 Cu, 0.7 max. Si, 0.7 max. Mn, 0.7 max. Fe, 1.0 max. Si + Fe + Mn.
2. ISO AlSn20Cu has 0.7 max. Si, 0.7 max. Mn, 0.7 max. Fe, 1.0 max. Si + Fe, 1.0 max. Si + Fe + Mn, 0.5 max. total others.
3. A version of this alloy has 3.0 to 4.0 Zn, 2.5 to 3.5 Si.
4. A version of this alloy has 3.5 to 5.0 Si, 1.8 to 2.1 Cu and no lead.
5. A version of this alloy has 0.05 to 0.15 Cu, 0.05 to 0.15 Mg, 0.20 to 0.40 Mn.
6. ISO AlSn6Cu has no lower limit to Ni, 0.7 max. Mn, 0.2 max. Ti, 1.0 max Si + Fe + Mn.
7. ISO AlSi4Cd has no Mg, 0.2 max. Mn, 0.2 max. Ti.

3. Notes

3.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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