

Eccentric Shaft Bearing & Packing Adjusting Ring in Leaded Gunmetal (2.1090 / CuSn7ZnPb / C93200)

Material selection reference for pump, valve, compressor and general-machinery applications — covering composition, engineering limits, assembly locations and upgrade paths.

2.1090

CuSn7ZnPb

C93200

SAE 660

Leaded gunmetal

Bearing bronze

1. Material identity

The three designations below identify the same leaded tin bronze (commonly called leaded gunmetal or standard bearing bronze); they differ only by standard system.

Table 1 — Equivalent grades across standard systems

Standard system	Grade	Note
Germany DIN / Werkstoff	2.1090 (formerly Rg7, G-CuSn7ZnPb)	German cast grade
European chemical (EN)	CuSn7ZnPb (near CC493K / CuSn7Zn4Pb7-C)	Leaded tin bronze
USA UNS / SAE	C93200 (SAE 660)	"Standard bearing bronze"

2. Composition & engineering properties

Table 2 — Typical chemical composition (mass fraction, %)

Element	Cu	Sn	Pb	Zn	Ni
Range	Rem. (81–85)	6.3–7.5	6–8	2–4	≤ 1.0

Trace limits (Fe, P, S, Al, etc.) follow the applicable ASTM / EN specification; confirm with the chosen casting method.

Table 3 — Reference mechanical & physical values (verify per casting method & standard)

Property	Reference value	Comment
Tensile strength	≥ 240 MPa (sand cast)	Continuous / centrifugal castings may exceed

Property	Reference value	Comment
Yield strength	~ 120–150 MPa	Typical
Hardness	≈ 65–70 HB (typical)	Brinell; some references cite up to ~80 HB
Density	~ 8.9 g/cm ³	—
Allowable compressive stress	up to ~ 40 MPa at low velocity	Decreases as velocity increases
PV value (limit reference)	~ 10 MPa·m/s under continuous lubrication	Lower under boundary lubrication
Allowable velocity	reference ~ 2 m/s (lubricated)	Confirm against duty cycle
Operating temperature	–40 °C to ~ 200 °C (typical)	Bound by lubricant choice

Values above are typical references, not guaranteed design minima. Final selection must reference the governing standard and the component's duty cycle.

3. Application locations

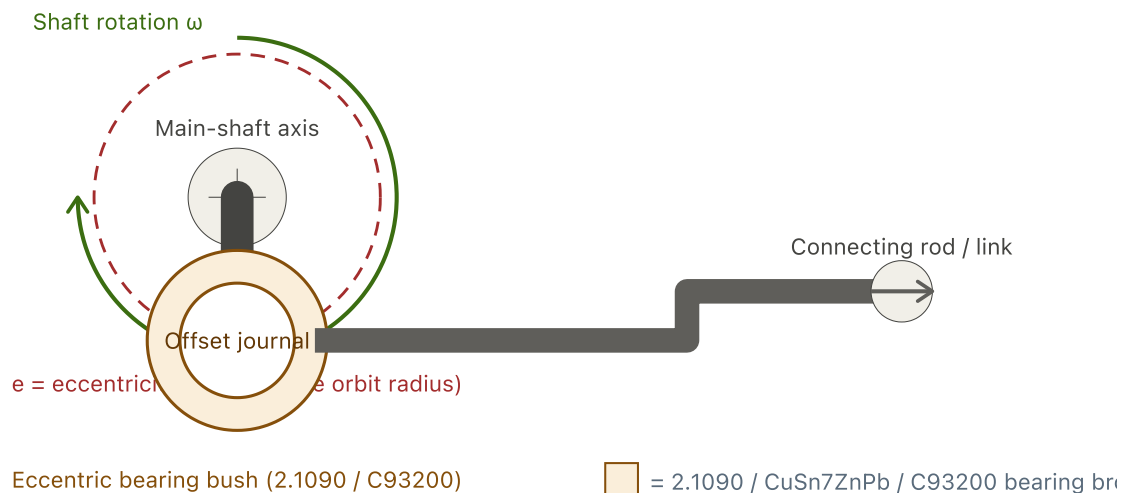
3.1 Eccentric shaft bearing

The bearing bush is fitted on the *offset journal* (eccentricity = e) of the eccentric shaft. As the main shaft rotates, the bush centre follows a circular orbit of radius e , converting rotation into oscillating / reciprocating motion of the connecting rod. The contact is **oscillating rather than continuously rotating**, often under boundary or intermittent lubrication and paired with a steel journal.

Typical equipment: rotary / refrigeration compressor crankshafts, rotary vane pumps, eccentric presses, cone-crusher eccentric sleeves, worm-gear reducers (eccentric sleeve for bore / centre-distance correction), hydraulic cylinder stuffing-box main bushes.

① Eccentric shaft bearing · assembly position

Bush on offset journal; main-shaft rotation → orbital oscillation



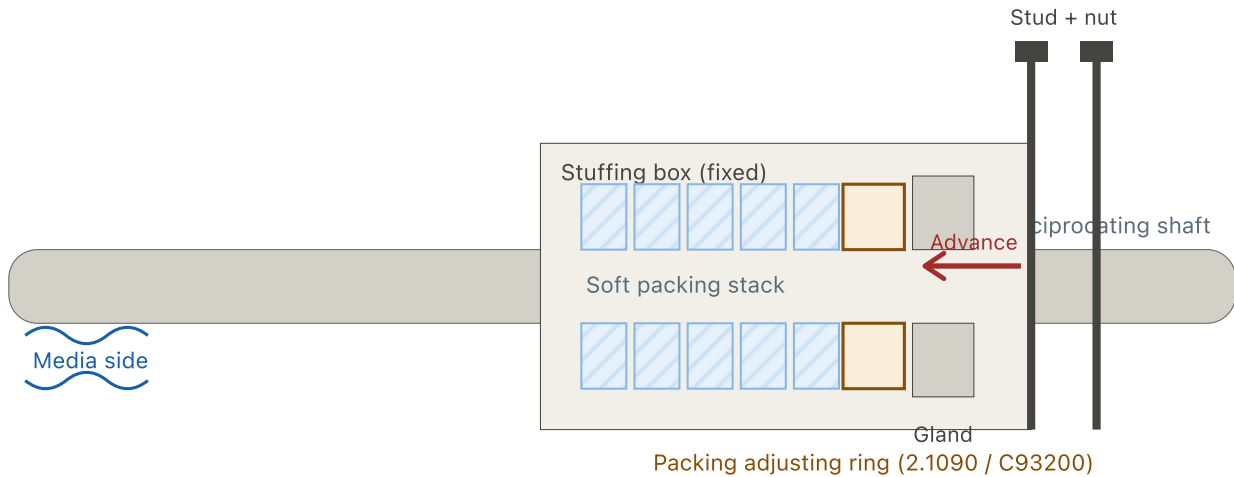
3.2 Packing adjusting ring

The ring sits at the *outer end of the soft-packing stack* inside the stuffing box. Together with the gland follower and the stud nuts, it compresses the packing axially onto the rotating or reciprocating shaft to form a dynamic seal. The amount of gland advancement directly sets the seal contact pressure.

Typical equipment: centrifugal pumps, reciprocating pumps, compressors, and valve-stem packing glands; the media side faces the process fluid.

② Packing adjusting ring · stuffing-box position

At outer end of packing stack; gland advancement compresses packing axially



Advance gland → axial packing compression → seal pressure rises

- Ring/bush = 2.1090 / CuSn7ZnPb / C93200
- = soft packing (graphite / PTFE / woven fibr

4. Why this material for both parts

- **Scoring resistance & embedability:** lead is present as dispersed particles in the copper-tin matrix, supporting embedment of abrasive contaminants and reducing the likelihood of shaft scoring — relevant to the oscillating, boundary-lubricated eccentric bearing.
- **Operation under marginal lubrication:** the alloy sustains duty under limited or intermittent lubrication, lowering the risk of seizure relative to unalloyed bronzes in oscillating contacts.
- **Machinability:** the lead phase improves chip breaking, supporting precise internal / external threads and close-tolerance faces required on the adjusting ring.
- **Corrosion response:** resistance in fresh water, seawater and mild process fluids is generally higher than that of common bronzes — relevant where the seal faces the media side.
- **Non-sparking characteristic:** relevant for service in potentially flammable atmospheres (e.g., pumps / compressors handling volatile media).
- **Supply & cost profile:** C93200 is a broadly stocked bearing bronze, supporting general-purpose medium / low-load wear components with predictable sourcing.

5. Selection boundaries & alternatives

- **Higher load / velocity:** consider C93800 (high-lead tin bronze), aluminium bronzes C95400 / C95500 / C95800 (improved seawater resistance), or nickel aluminium bronze C63000 (improved fatigue strength).

- **More aggressive corrosion (seawater / chemical):** favour the C954 / C955 / C630 aluminium-bronze series.
- **Maintenance-free / no lubrication:** consider graphite-embedded bronze composites or metal-polymer lined bushings.
- **Joining note:** weldability is limited; design as cast / turned integral parts. If welding is required, specify brazing and confirm with the foundry.

6. Standards & references

- ASTM B505 / B271 / B584 — C93200 castings
- SAE J461 / J462 — SAE 660
- DIN 1705 / EN 1982 — CuSn7ZnPb, 2.1090 (CC493K)
- ISO 1338 — continuous cast copper alloys

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Disclaimer. The content on this page is provided for general reference only and does not constitute a specification, warranty, or engineering recommendation. Chemical ranges, mechanical values and engineering limits are typical references that vary with casting method, heat treatment and governing standard. Before adoption, verify all data against the applicable ASTM, DIN, EN or ISO specification and confirm the selection with the component manufacturer or a qualified engineer for the specific duty cycle.