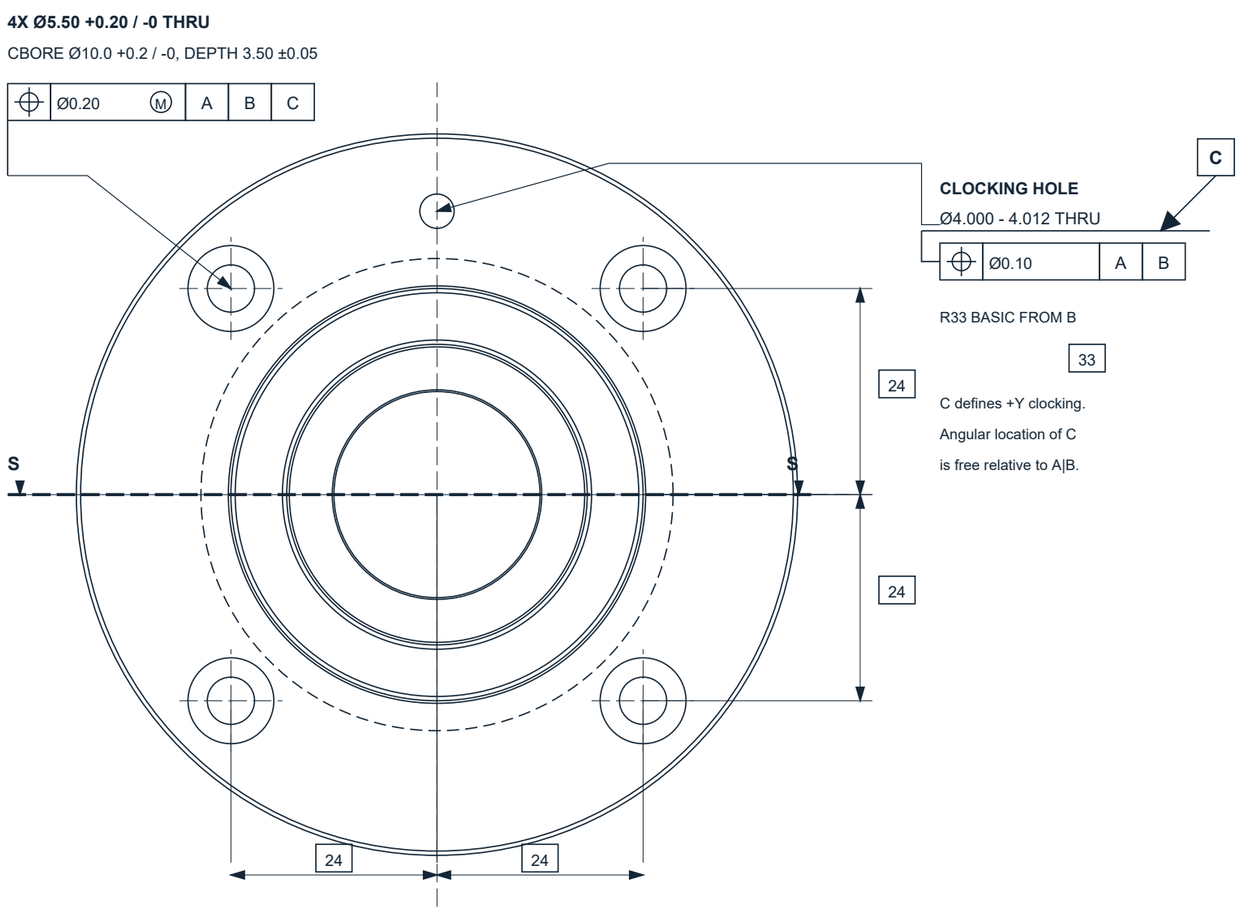
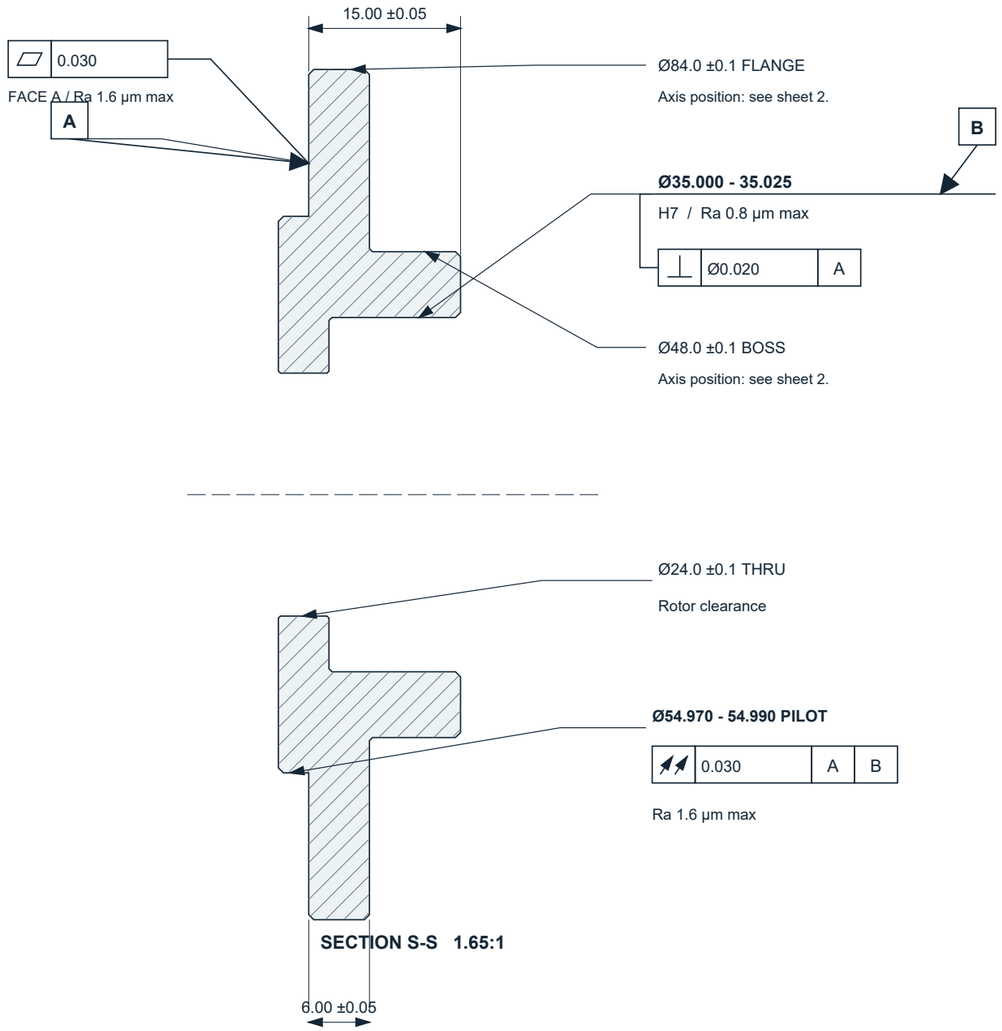
**BH / 01**

# PRECISION BEARING HOUSING

Manufacturing definition / turned geometry and mounting pattern




**FRONT / MOTOR SIDE 1.4:1**



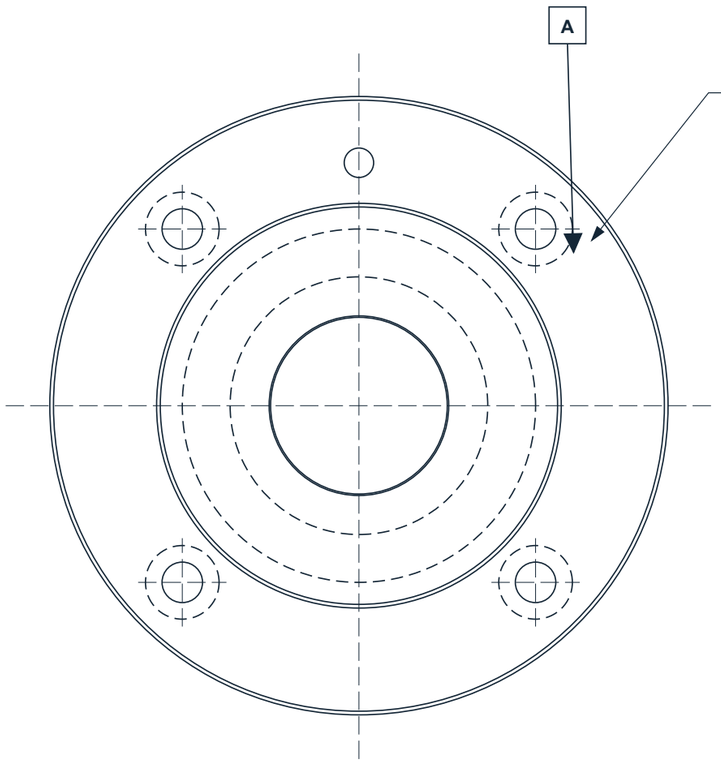

**SECTION S-S 1.65:1**

## GENERAL MANUFACTURING NOTES

1. Material: 6061-T6 aluminum billet. All dimensions apply at 20 °C, unrestrained.
2. Interpret dimensions and GD&T per ASME Y14.5-2018. Boxed dimensions are basic.
3. Unspecified linear dimensions ±0.10; angles ±0.5°. Surface texture: Ra 3.2 µm max.
4. Precision limits override general tolerances. Datum B and C references are RMB (no modifier).
5. Turn A, bore B and pilot in one controlled datum setup; see process and inspection sheet 4.
6. No coating on precision surfaces. Deburr holes 0.05-0.10 max; do not bell-mouth B or C.
7. See sheet 2 for edge/axial details and counterbore control. PDF governs annotated definition.

# FEATURE DETAILS & EDGE DEFINITION

Manufacturing definition / rear face and enlarged local sections




**A = REAR ANNULAR MOUNTING FACE**

Excludes pilot, holes and edge chamfers.

Pilot is a controlled feature; it is not datum B.

**REAR / MOUNTING SIDE 1.2:1**

## AXIAL LEVELS FROM A

Rear pilot end: z = -3.00 ±0.05

Datum A: z = 0

Relief shoulder: z = +2.00 ±0.05

Flange front: z = +6.00 ±0.05

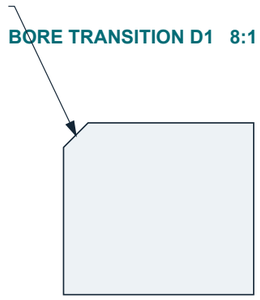
Boss front: z = +15.00 ±0.05

B straight seat: z = 2.30 to 14.50 REF

| ⌖ | Ø0.20 | A | B |
|---|---|---|---|

**Ø48 AND Ø84 AXES**

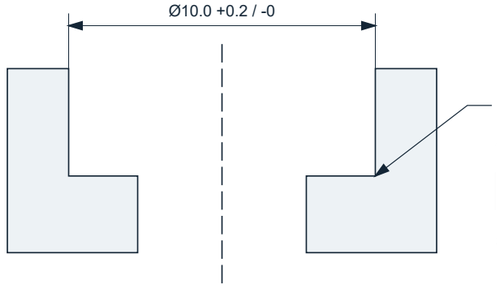
## BORE TRANSITION D1 8:1




Local section at bore mouth, z = 15.

Ø35 limits apply below lead-in.

## COUNTERBORE D2 5:1




**4X CBORE AXES:**

| ⌖ | Ø0.30 | A | B | C |
|---|---|---|---|---|

Same basic coordinates as Ø5.5 holes.

Floor thickness: 2.40 min by stack.

## EDGE SCHEDULE - ALL CHAMFERS 45° ±0.5°

E1 Flange OD, both ends: 0.50 ±0.05.

E2 Boss OD at z = 15: 0.50 ±0.05.

E3 Pilot OD at z = -3: 0.50 ±0.05.

E4 Bore mouth at z = 15: 0.50 ±0.05 (D1).

E5 Bore root at z = 2: 0.30 ±0.05, clears bearing corner.

E6 Ø24 clearance, both ends: 0.20 ±0.05.

E7 Boss/flange external root: 0.30 ±0.05 bevel (added material).

E8 A/pilot locating corner: burr-free, R0.10 max.

Model includes E1-E7. E8 and small hole deburr are not modeled.

## ASSEMBLY CLEARANCE CHECK

Assumed M5 screw: shank Ø5.00 max; socket head Ø8.50 max.

Head height 5.00 max: protrudes 1.55 max above flange front.

Counterbore Ø10 min leaves 0.75 radial head clearance.

Hole/CB relative axis error is bounded by (0.40 + 0.30)/2 = 0.35.

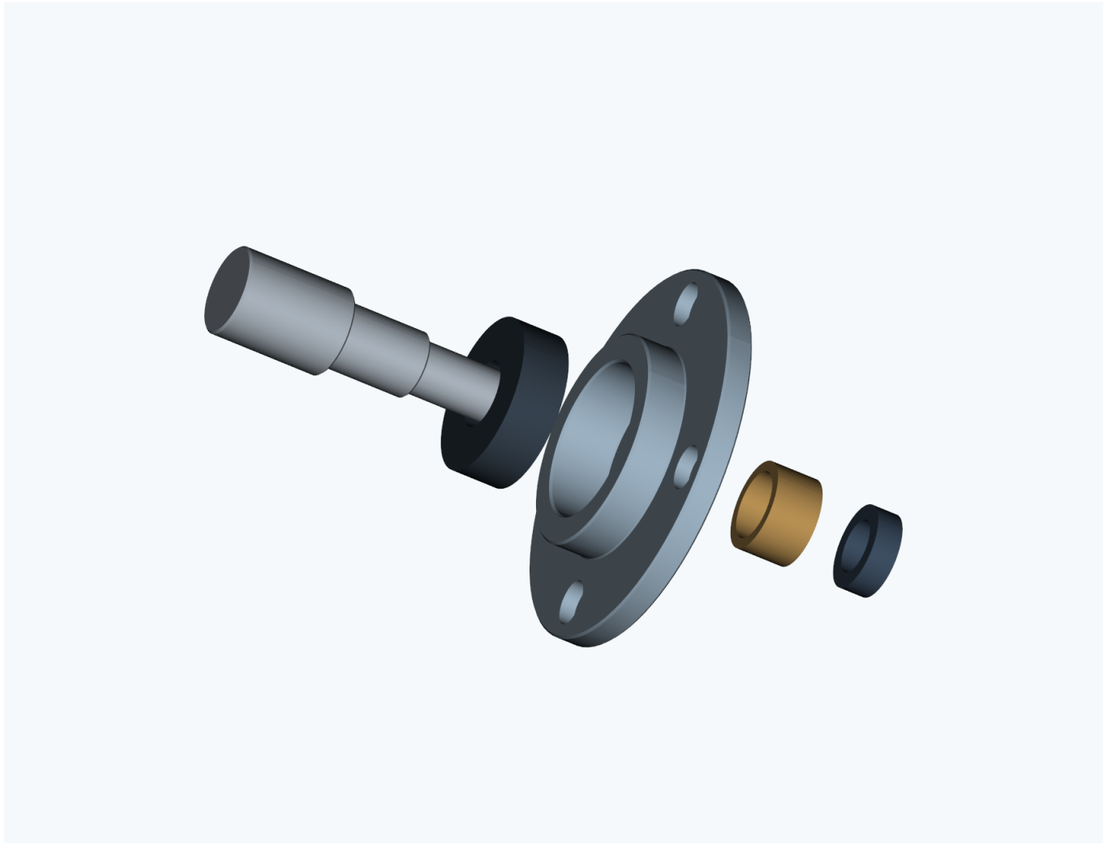
This leaves 0.40 radial margin before screw tilt and head form.

Torque and thread engagement require the mating frame design.

# BH / 01

# ASSEMBLY & MATING INTERFACES

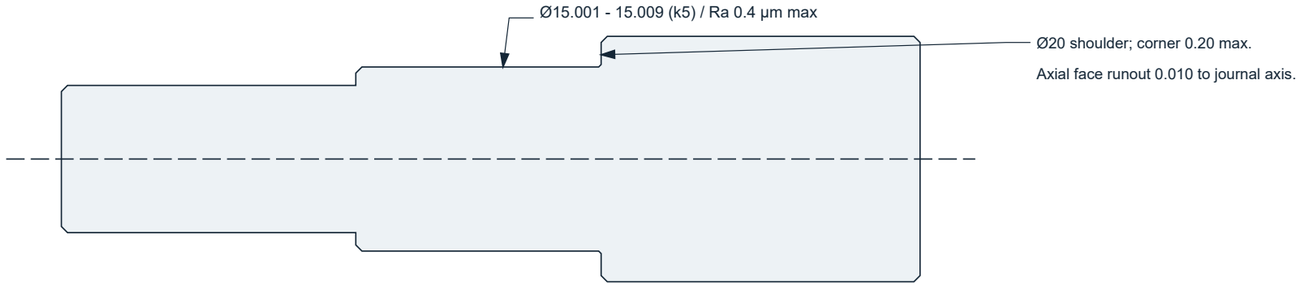
Reference assembly / housing is the detailed manufactured component



## EXPLODED VIEW / NTS

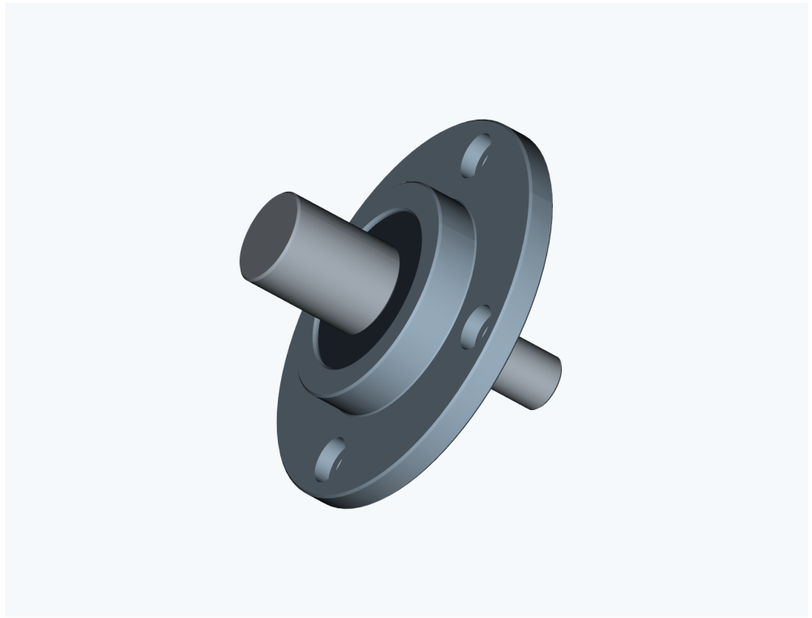
Nut > spacer > housing > bearing > shaft (along the assembly axis)

## SHAFT INTERFACE / NTS / LIMITS GOVERN




M12 × 1 on z = -16 to -6; threads and locking mechanism are schematic.

Journal z = -6 to +14; bearing front seats at z = 14.00 ±0.05 relative to A in the motor assembly.



## ASSEMBLED / NTS

Bearing and threaded components shown as envelopes.

## REFERENCE BILL OF MATERIALS

1 BH01-001 housing / 6061-T6 / qty 1

2 6202 sealed bearing, 15 × 35 × 11 / qty 1

3 Shaft interface, ground steel / qty 1

4 Spacer, Ø20 / Ø15.2 × 11 / qty 1

5 M12 × 1 locking nut, Ø19 envelope / qty 1

4 × M5 screws and motor frame omitted.

## FUNCTIONAL ASSUMPTIONS

Opposite motor bearing locates rotor axially.

This outer ring floats; no axial clamp on housing.

Nut/spacer clamp the inner ring to shaft shoulder.

Assembly adjustment absorbs bearing width variation.

A mating Ø55.000-55.030 recess receives the pilot.

C may be inspection-only; optional relieved/diamond

pin provides tangential clocking without radial lock.

Remote bearing, rotor, frame and seals are out of scope.

# BH / 01 DATUM STRATEGY & INSPECTION

Functional controls / measurement sequence / bonus tolerance

## A / SEAT THE PART

Primary mounting plane removes Z translation and rotation about X and Y. Its 0.030 flatness limit supports stable seating without using the bolt preload to flatten the part.

## B / ESTABLISH THE AXIS

Secondary datum is the Ø35 bore. With A established, B removes X and Y translation. The Ø0.020 perpendicularity zone keeps the bore axis square to the mounting plane.

## C / CLOCK THE PATTERN

The Ø4 hole fixes the final rotation about B. C is referenced at RMB, so no datum-shift credit is taken. A relieved mating pin, if used, must allow radial freedom.

## INSPECTION PLAN

| | | |
|---|---|---|
| 01 | **Free-state face A** | Sweep a surface-plate setup or CMM plane; report minimum-zone flatness <= 0.030. |
| 02 | **B size and orientation** | Bore gauge at multiple depths/directions; CMM axis square to A, cylindrical zone Ø0.020. |
| 03 | **Establish A \| B \| C** | Use A simulator, constrained B bore simulator and C clocking simulator in precedence. |
| 04 | **Pilot total runout** | Rotate about datum axis B while maintaining A seating; sweep the complete pilot length. |
| 05 | **Bolt position at MMC** | Check size separately. CMM positional result: 2 sqrt(dx² + dy²); include axis tilt over depth. |
| 06 | **C and counterbores** | C position Ø0.10 to A\|B; counterbores Ø0.30 to A\|B\|C. No bonus on either control. |
| 07 | **Surface texture / edges** | Profilometer on A, B and pilot; verify axial levels, lead-ins, burrs and counterbore depth. |

## BONUS TOLERANCE / ONE MOUNTING HOLE

Hole limits: Ø5.50-5.70; MMC = Ø5.50.

Position at MMC = Ø0.20; virtual condition = 5.50 - 0.20 = Ø5.30.

At measured size Ø5.62: bonus = 5.62 - 5.50 = 0.12.

Total allowed position = Ø0.32; radial axis offset limit = 0.16.

Example dx = 0.10, dy = 0.08: position = 0.256 < 0.320, passes.

Full-depth axis and size/form requirements must also pass.

## PROCESS & MEASUREMENT CAUTIONS

Rough turn; finish A, bore and pilot from one spindle reference.

Reverse in soft jaws/expanding mandrel to finish remaining faces.

Mill, counterbore and ream pattern using the established bore/face.

RMB simulators are variable, not a fixed Ø4 pin plus Ø35 plug.

CMM least-squares fits alone do not establish ASME datum simulation.

A fixed Ø5.30 pattern gauge checks VC only with correct datum setup.

# BH / 01

# FIT, FLOAT & VERIFICATION RECORD

Assumptions / worst-case calculations / manufacturing feasibility

## INTERFACE LIMITS AT 20 °C

Housing B: Ø35.000-35.025 (H7). Assumed normal bearing OD: Ø34.989-35.000.

Mean-diameter clearance: 0.000 to 0.036. Zero minimum is line-to-line, not guaranteed free sliding.

Shaft: Ø15.001-15.009 (k5). Assumed normal bearing bore: Ø14.992-15.000.

Mean-diameter shaft interference: 0.001 to 0.017. Check installed bearing clearance after fitting.

Bearing width assumption: 10.880-11.000. Catalog mean-diameter limits do not bound every local diameter.

Pilot Ø54.970-54.990 in frame Ø55.000-55.030: 0.010-0.060 diametral clearance.

## AXIAL FLOAT / WORST CASE

Nominal outer-ring front = z14.00; assembly setting ±0.05; combined relative axial movement ±0.25.

Root transition ends at z = (2.00 + 0.05) + (0.30 + 0.05) = 2.40 max.

Minimum bearing rear = 14.00 - 0.05 - 0.25 - 11.00 = 2.70; rear clearance = 0.30 min.

Mouth transition starts at z = (15.00 - 0.05) - (0.50 + 0.05) = 14.40 min.

Maximum bearing front = 14.00 + 0.05 + 0.25 = 14.30; front engagement margin = 0.10 min.

Result: the complete nominal-width envelope remains on the straight bore over assumed travel.

## RADIAL ALIGNMENT / SCREENING BOUND

Pilot total runout 0.030 gives 0.015 eccentricity only for an ideal cylindrical pilot with parallel axes.

Idealized center-offset bound = 0.015 + (0.060 / 2) + (0.036 / 2) = 0.063 mm.

This excludes frame alignment, bore tilt, bearing internal clearance, shaft runout and elastic deflection.

It is not a rotor-air-gap guarantee. A second-bearing/frame tolerance study is needed for that result.

## MANUFACTURABILITY & OPERATING ENVELOPE

Assume horizontal shaft, radial load fixed in frame, 300 N radial load and 3,000 rpm for concept sizing.

No significant external axial load at this end. Ambient/part temperature 20-60 °C; no life or FEA rating claimed.

At equal +40 °C rise, assumed CTE Al = 23 and steel = 12 µm/m/K adds about 0.0154 mm diametral bore clearance.

Unequal temperatures, cold operation and rotating outer-ring loads require a new fit/creep assessment.

25 µm bore size band and 20 µm squareness are plausible with precision boring; grind the 8 µm shaft band.

Boss wall: 6.50 nominal, 6.3375 min including OD position. Counterbore edge ligament nominal 3.059.

Shop capability and measurement uncertainty remain to be established; inspect after unclamping.

## SOURCE BASIS / SEE README FOR CLICKABLE REFERENCES AND EXACT SCOPE

ASME Y14.5-2018 (R2024 listing); SKF Rolling Bearings, normal tolerances & interfaces; NSK 6202 product dimensions.