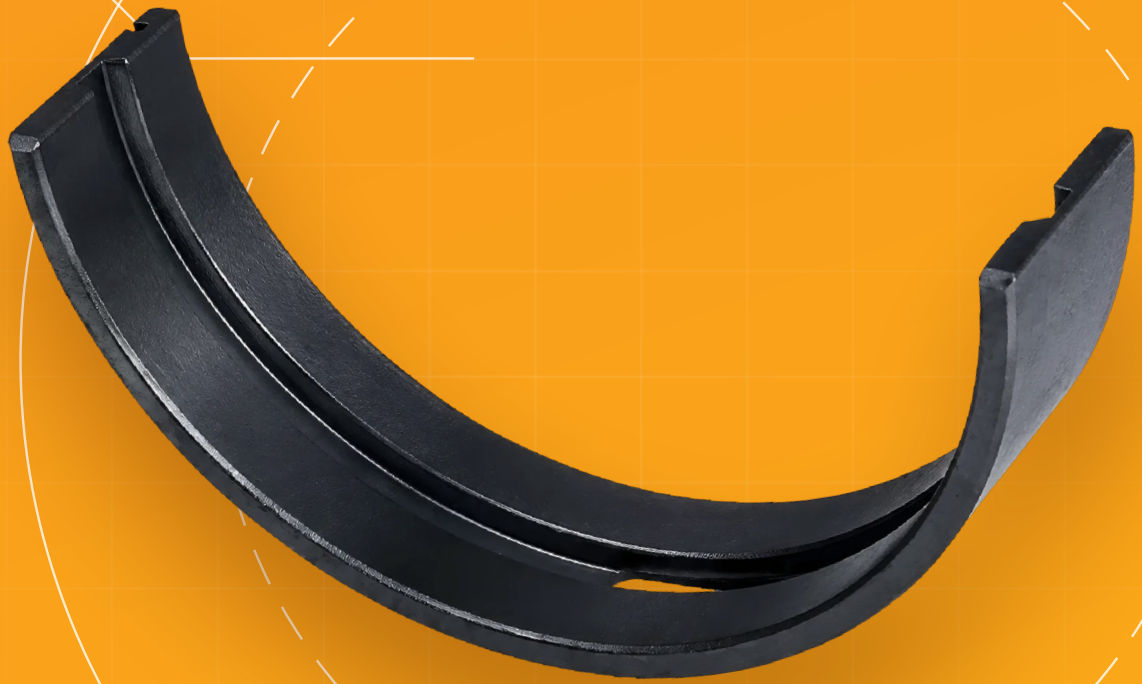




TECHNICAL GUIDE

# How much oil clearance should a bearing have?

Where and how to measure, and what number to start from

## ■ What this guide is for

Oil clearance is the small gap left between the crankshaft journal and the bearing so oil can flow through it. One number does not suit every engine. This guide shows how to measure the clearance and what number to start from.

## ■ How to use it

The numbers in this guide are only starting points. If the engine manual gives a clearance, use that one.

### Tip

This guide is general help for people who work on engines. Always take the exact figure from the vehicle or engine workshop manual.

03    **Where and how to measure clearance**

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04    **What number to start from**

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05    **Why every engine has its own number**

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06    **Is tighter or looser better**

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07    **Summary in six rules**

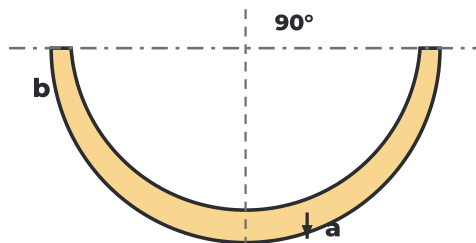
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## Where and how to measure clearance

Oil clearance is the gap between the crankshaft journal and the fitted bearing. There is no single answer to “how much”, because it depends on the engine, the oil and the work the engine does. But there is a number to start from.

The wall of a bearing half is not the same thickness everywhere. In the middle, 90 degrees from the parting line, it is thickest, and it gets a little thinner toward the two ends. This is done on purpose so the bearing fits the parts around it and oil can move under the journal more easily while running.

Near the two ends there is also a slight thinning. The reason is that if the cap shifts a little, or the two halves differ by a few hundredths, no step forms at the parting line.



Wall thickness of a bearing half: thicker in the middle (a) and thinner near the parting line (b).

### ■ Measure the clearance like this

- 01 **Always square to the parting line.** Clearance is taken at 90 degrees to the parting line, where the bearing wall is thickest.
- 02 **Best way: a dial bore gauge.** Tighten the bearings to the correct torque, leave the crankshaft out, and read the inside diameter with a bore gauge. Then measure the journal with a micrometer and subtract.
- 03 **Measure in three places.** On each bearing: once at the front, once in the middle and once at the rear.
- 04 **Other way: Plastigage.** Lay a strip of Plastigage on the journal, tighten the cap to torque and read the width of the flattened strip (step by step in the “Engine Bearing Installation Guide”).

## What number to start from

For most engines, about 0.075 to 0.1 mm of clearance for every 100 mm of journal diameter is a good place to start.

For high-power and racing engines, add about 0.013 mm to the larger figure. These are only starting numbers. The engine and its work will tell you whether to go lower or higher.

| Crankshaft journal diameter | Usual clearance (mm) | Most for a high-power engine |
|-----------------------------|----------------------|------------------------------|
| 40 mm                       | 0.030 to 0.040       | 0.053                        |
| 50 mm                       | 0.038 to 0.050       | 0.063                        |
| 60 mm                       | 0.045 to 0.060       | 0.073                        |
| 70 mm                       | 0.053 to 0.070       | 0.083                        |
| 80 mm                       | 0.060 to 0.080       | 0.093                        |

### Important

If the engine manual gives its own clearance, use that. This table is only for when you do not have the factory figure.



# Why every engine has its own number

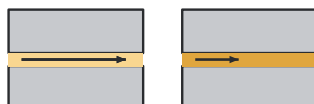
A simple example: put the allowed sizes of the parts together and see what range the final clearance falls in. The number of each table row is the number on the drawing.

A clearance of 0.079 is usually too much for a passenger car. But the same engine in a pickup that pulls a trailer and uses a thicker oil will accept the larger clearance more easily.



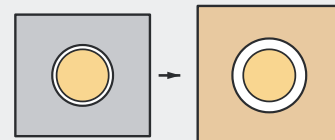
## Matching the parts

The factory usually matches parts to each other so the clearance does not go past the allowed limit; fitted without care, the parts would make the engine noisy and shaky.



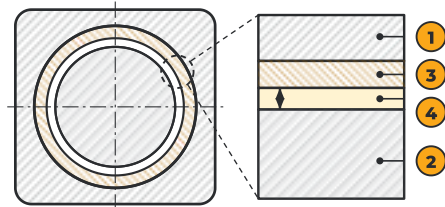
## Thin oil

Most newer engines run thin oils such as 5W-30. These oils pass through a small clearance more easily.



## Aluminium block

In aluminium-block engines the clearance is kept tighter to reduce noise and vibration.



1 housing (block or rod), 2 crankshaft journal, 3 bearing (the wall of the two halves), 4 oil clearance, the narrow gap between journal and bearing. The left drawing is a section of the bearing; the right drawing is a slice of its wall, enlarged so the clearance can be seen.

| Item                                                                      | Value (mm) |
|---------------------------------------------------------------------------|------------|
| 1 — allowed variation in housing diameter                                 | 0.025      |
| 2 — allowed variation in journal diameter                                 | 0.025      |
| 3 — allowed variation in thickness of the two bearing halves (0.008 each) | 0.015      |
| 4 — total of 1, 2 and 3: the oil clearance can shift by this much         | 0.066      |
| 4 — if the smallest clearance is 0.013, the largest becomes               | 0.079      |

## Is tighter or looser better

Clearance affects how the bearing works and also leaves room for error. So tight and loose each have their place.

A bearing that has run for a while should show wear marks over two-thirds to three-quarters of its surface. Look for this on the loaded half: the lower half of a main bearing and the upper half of a rod bearing.

### Tighter clearance

The journal and bearing are closer, the oil film is wider and the load on the bearing is spread over a larger area. Result: the bearing lasts longer, as long as the parts are well machined and finished.

### Looser clearance

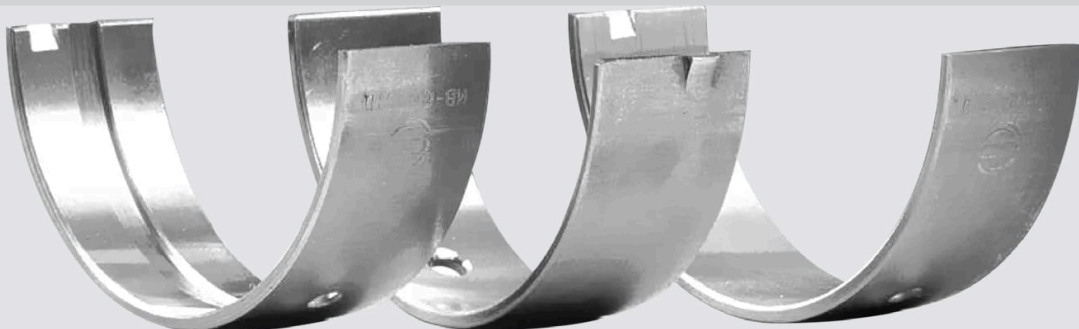
When parts are a little bent or rough, a looser clearance prevents failure. A high-power engine runs hotter and its oil gets thinner, and the crankshaft and block flex more, so it wants a bigger clearance. Synthetic oil helps too.

### Coated bearing

Part of the coating wears away while the bearing beds in, and the clearance grows a little. That is why some makers set the starting clearance about 0.013 mm smaller. Ask our technical team for the clearance of the Golden polymer bearing.

### What else affects clearance

- Oil thickness (type and grade)
- Engine temperature and oil pressure
- Engine speed
- Position of the oil holes in the block and crankshaft
- Grooves in the bearing and how they are made
- The bearing coating and the accuracy of your own measuring



## Summary in six rules

Before you get to a number, remember these six.

- 01 **Factory number first.** If the manual gives a clearance, use it.
- 02 **If there is no factory number.** Start from 0.075 to 0.1 mm for every 100 mm of journal diameter; up to 0.013 more in a high-power engine.
- 03 **Measure square to the parting line.** At the front, middle and rear of each bearing.
- 04 **Measure under torque.** Tighten the bearing to the factory torque with the crankshaft out; or use Plastigage.
- 05 **Add up the allowed variations.** See how far the clearance can shift with the allowed variation of housing, journal and bearing.
- 06 **Think about the engine's work.** Oil type, temperature, load and engine change the right number. A used bearing should also show marks over two-thirds to three-quarters of its surface.

**Tip** If you are unsure about an engine, send our technical team the engine type, the oil used and the journal sizes.





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