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**BMW 3-Series and Z4 (99-05) Includes 2006 325ci/330ci Coupe and Convertible models Haynes Online Manual.**

# 1 General information

## How to use this Chapter

This Part of [Chapter 2](#) describes the repair procedures that can reasonably be carried out on the engine while it remains in the vehicle. If the engine has been removed from the vehicle and is being disassembled or replaced as described in Part B, any preliminary disassembly procedures can be ignored.

Note that, while it may be possible physically to overhaul items such as the piston/ [connecting rod](#) assemblies while the engine is in the car, such tasks are not usually carried out as separate operations. Usually, several additional procedures are required (not to mention the cleaning of components and oilways); for this reason, all such tasks are classed as major overhaul procedures, and are described in Part B of this Chapter.

Part B describes the removal of the engine/transmission from the car, and the overhaul or replacement procedures that can then be carried out.

## Engine description

### General

The M52, M54 and M56 engines are of 6-cylinder double overhead [camshaft](#) design, mounted in-line, with the transmission bolted to the rear end. The main differences between the engines are that the M54 and M56 units are equipped with fully electronic [throttle](#) control, and tuned for lower emissions.

A [timing chain](#) drives the exhaust [camshaft](#), and the intake camshaft is driven by a second chain from the end of the exhaust camshaft. Hydraulic lifters are installed between the camshafts and the valves. Each camshaft is supported by seven bearings incorporated in bearing castings in the [cylinder head](#).

The [crankshaft](#) runs in seven main bearings of the usual bearing-type. Endplay is controlled by thrust bearings on the Number 6 main bearing.

The pistons are selected to be of matching weight, and incorporate fully-floating wrist pins retained by circlips.

The oil pump is chain-driven from the front of the [crankshaft](#).

### Variable camshaft timing control

On all models, a variable camshaft timing control system, known as VANOS, is installed. The VANOS system uses data supplied by the DME engine management system (see [Chapter 6](#)), to adjust the timing of both the intake and exhaust camshafts independently via a hydraulic control system using engine oil as the hydraulic fluid. The camshaft timing is varied according to engine speed. Retarding the timing (opening the valves later) at low and high engine speeds improves low-speed driveability and maximum power respectively. At medium engine speeds, the camshaft timing is advanced (opening the valves earlier) to increase mid-range torque and to improve exhaust emissions.

## Repairs with engine in place

The following operations can be carried out without having to remove the engine from the vehicle:

- A. Removal and installation of the cylinder head.
- B. Removal and installation of the timing chain and sprockets.
- C. Removal and installation of the camshafts.
- D. Removal and installation of the oil pan.
- E. Removal and installation of the connecting rod bearings, connecting rods, and pistons.\*
- F. Removal and installation of the oil pump.
- G. Replacement of the engine/transmission mounts.
- H. Removal and installation of the flywheel/driveplate.

\* Although it is possible to remove these components with the engine in place, for reasons of access and cleanliness it is recommended that the engine is removed.