

General

This repair group covers cylinder head and valvetrain service and repair. Procedures described here require that the cylinder head first be removed as described in ⇒ [113 Cylinder Head Removal and Installation](#).

Note:

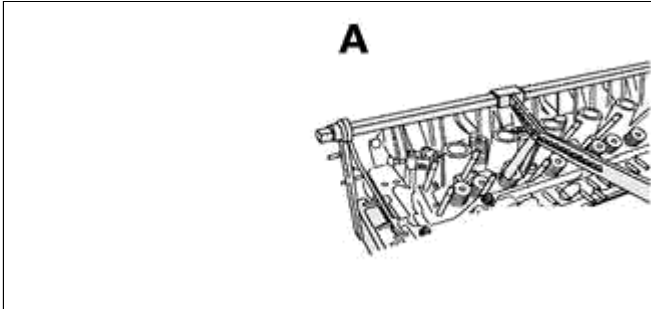
- ◆ *For timing chain and VANOS repair information, see ⇒ [117 Camshaft Timing Chains](#).*
- ◆ *If it is determined that the cylinder head will require significant reconditioning work, a remanufactured cylinder head may be a good alternative. Remanufactured cylinder heads are available from an authorized BMW dealer.*

The information given in this repair group is organized according to engine code. For engine application information, see ⇒ [100 Engine—General](#).

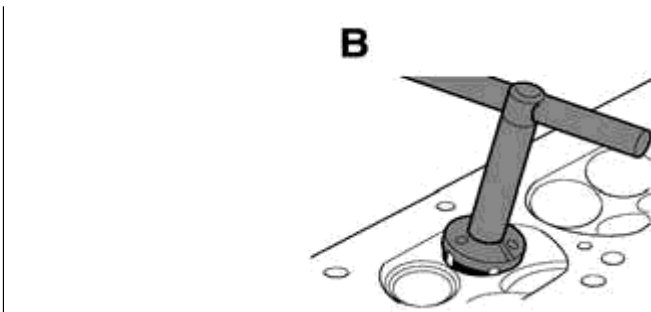
Special tools

BMW special tools are required for most cylinder head service described in this repair group. Many of these tools are expensive and only available through an authorized BMW dealer. If the special tools are not available, have the cylinder head disassembled and removed by an authorized BMW dealer. Be sure to read each procedure thoroughly before starting a job to determine which special tools and equipment will be necessary.

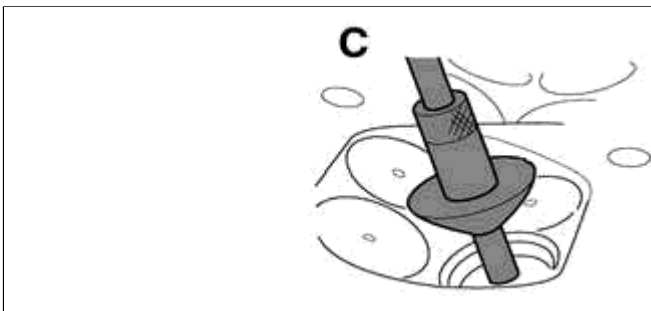
Most of the repairs to a cylinder head require precision machine work to specific tolerances. This type of work should be performed by an authorized BMW repair facility or an ASE certified machinist.



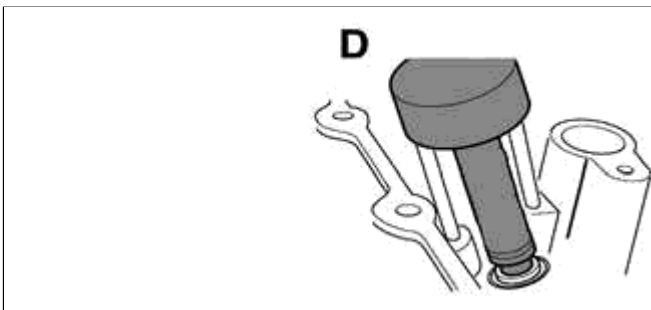
◀ Cylinder head jig BMW 00 1 490



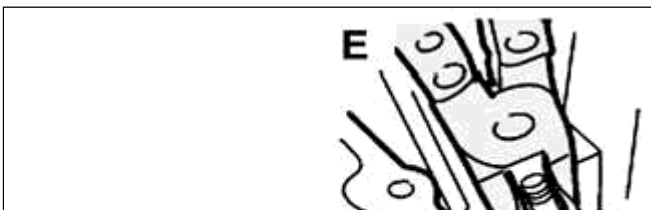
◀ Valve seat grinder BMW 00 3 520



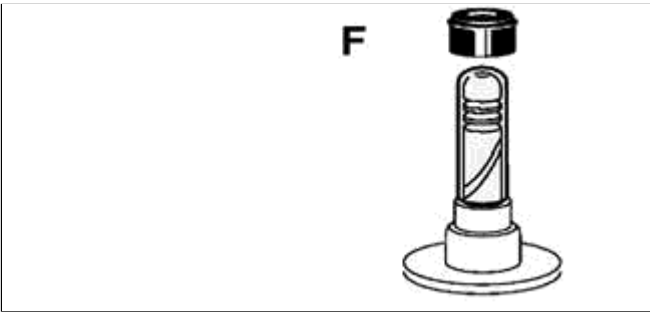
◀ Valve guide reamer BMW 00 4 210



◀ Valve stem seal driver BMW 11 1 200



◀ Valve stem seal puller BMW special tool 11 1 480



◀ Valve stem seal guide BMW special tool 11 1 960

Cylinder Head

This section provides the specifications and special reconditioning information necessary to repair the cylinder heads covered by this manual.

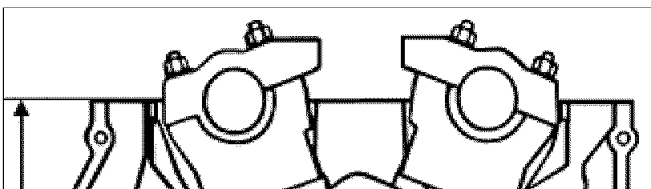
The disassembled cylinder head should be inspected for warpage and cracks. Check the valve guides and valve seats for wear before machining a warped head. Always decarbonize and clean the head before inspecting it. A high-quality straight edge can be used to check for warpage.

Visually inspect the cylinder head for cracks. If a cracked cylinder head is suspected and no cracks are detected through the visual inspection, have the head further tested for cracks by an authorized BMW dealer or an ASE certified machinist. A cracked cylinder head must be replaced.

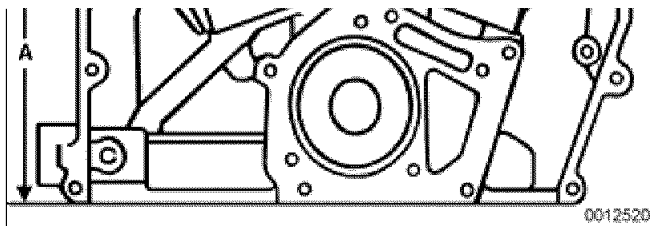
Note:

When disassembling and inspecting the cylinder head on an engine, be sure to check the camshaft carrier bearing surfaces for warpage.

A warped cylinder head can be machined provided no more than 0.3 mm (0.012 in.) of material is removed. If further machining is required, the head should be replaced. Removing more than this amount will reduce the size of the combustion chamber and adversely affect engine performance. A 0.3 mm thicker gasket is available from an authorized BMW parts department for machined heads.



Before machining the head to correct for warpage, measure the total height (A) (thickness of the cylinder head). Minimum height specifications are



given in $\Rightarrow$ [Table a.](#)

Table a. Cylinder head height	
New	Minimum height (dimension A)
140.0 mm (5.512 in)	139.7 mm (5.500 in)

Valves, leak test

To test the valves for leakage, the cylinder head must be disassembled with camshafts and camshaft carriers removed. Install the valve assemblies and the spark plugs in each cylinder. Place the cylinder head on a workbench with the combustion chamber facing upward. Fill each combustion chamber with a thin non-flammable liquid, such as a parts cleaning fluid. After fifteen minutes, check the level of the fluid. If the fluid level in any cylinder drops, that cylinder is not sealing properly.

Camshaft

- Camshaft wear is usually caused by insufficient lubrication. Visually inspect camshaft lobes and journals for wear. Camshaft wear specifications are given in $\Rightarrow$ [Table b.](#)

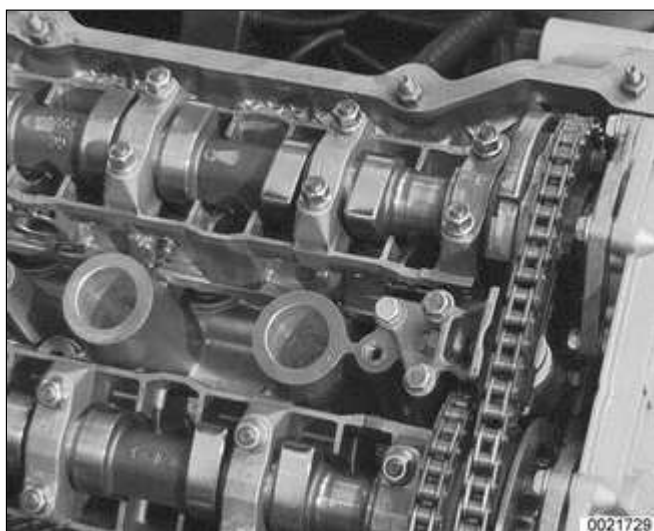
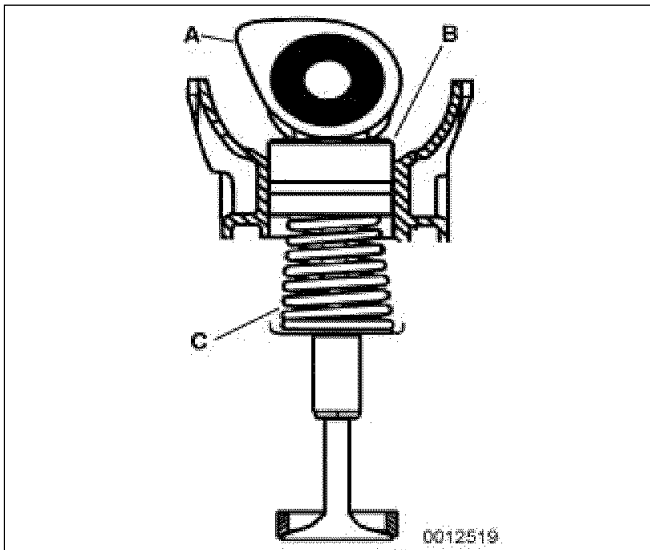


Table b. Camshaft wear specifications	
Axial play	0.150-0.330 mm (0.0060-0.013 in.)
Radial play (Plastigage)	0.020-0.054 mm (0.0008-0.0021 in.)

CAUTION!

If the camshaft is being replaced due to cam lobe wear, it is recommended that the corresponding lifters should also be replaced to avoid damaging the new camshaft.

Hydraulic lifters, checking and replacing



- ✦ Modern BMW 6 cylinder engines use self-adjusting hydraulic lifters to keep the valve clearances within a limited working range. (A) section view of camshaft, (B) hydraulic lifters are sealed units and require no maintenance, (C) valve with conical valve spring.

Under some circumstances, such as a cold start, the cam followers may become noisy. Hydraulic lifter noise is usually a high-pitched tapping or chattering noise. In most instances, this is considered normal as long as the noise goes away in a few minutes (maximum 20 minutes). If the noise does not go away, either the lifter is faulty or the oil pressure to the lifter is low. Hydraulic lifter replacement requires that the camshaft first be removed.

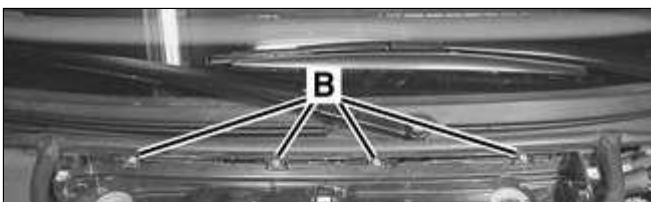
Note:

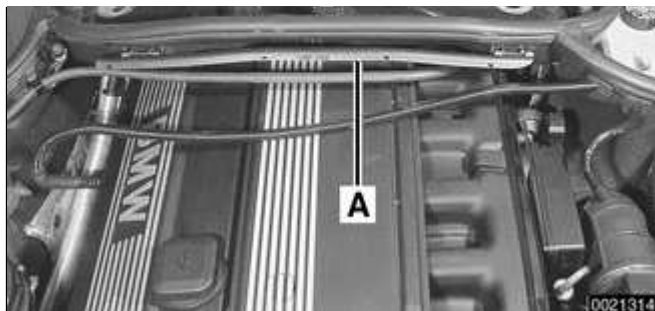
Before checking hydraulic lifters, make sure engine oil is fresh and at the proper level.

- Run engine until it reaches normal operating temperature.

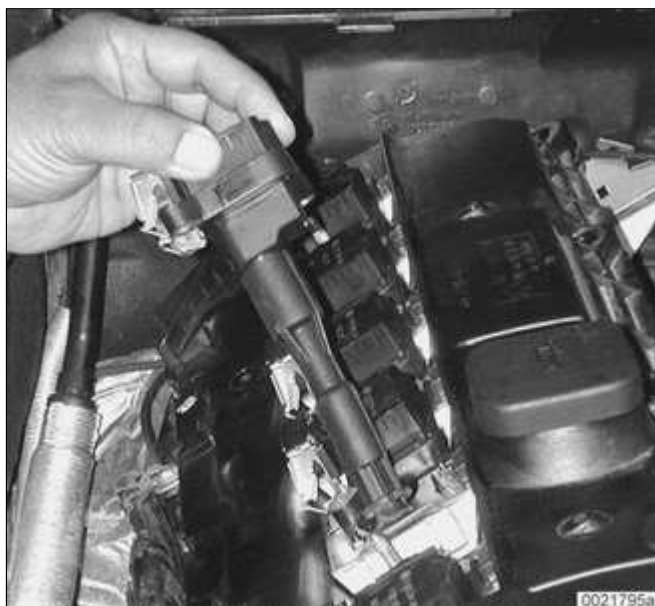
- ✦ Remove microfilter housing:

- ◆ Remove microfilter for interior ventilation.





- ◆ Open wiring harness loom (**A**), remove harness and lay aside.
- ◆ Unfasten screws (**B**) and take off lower microfilter housing.
- Remove engine cover.
- Detach positive and ground connections from intake manifold and cylinder head cover, as necessary.



- ✦ Remove ignition coils.
- ◆ Disconnect ignition coil harness connectors and lay harness aside.
- ◆ Remove coil grounding straps.
- ◆ Remove coils.
- ◆ Remove spark plugs.
- Remove cylinder head cover mounting fasteners and remove cylinder head cover.

Note:

The cylinder head cover mounting bolt insulators and gaskets should be reinstalled in their original locations. Make note of their arrangement during removal.



- ✦ Remove oil baffle cover from above intake camshaft.



- ✦ Use a plastic or wooden stick to press down on top of lifter. If there is any noticeable clearance, the lifter is faulty and should be replaced.

Note:

When checking a hydraulic lifter, make sure the corresponding camshaft lobe is facing up so that there is no valve spring pressure on the follower.

- To replace a hydraulic lifter, remove appropriate camshaft. Refer to camshaft removal procedures given in ⇒ [113 Cylinder Head Removal and Installation](#).
- Once camshaft is removed, withdraw faulty lifter and replace with new one. Inspect lifter bores for wear and scoring.
- Camshaft, timing chain and cylinder head cover reassembly is reverse of disassembly.

Valves

Valves, removing and installing

- Remove cylinder head as described in ⇒ [113 Cylinder Head Removal and Installation](#).

CAUTION!

- ♦ *Do not let the hydraulic lifters fall out as the camshaft carrier is removed. Special suction cups are available from BMW to hold the hydraulic lifters in place during carrier removal.*
- ♦ *Hydraulic cam lifters should be stored in an upright position. If necessary, use a magnetic tool to aid in removal of the lifters.*
- Remove valves using a valve spring compressor.

CAUTION!

Label each valve assembly as it is removed so it can be installed in its original position.

- Remove and discard valve stem oil seals from valve guides. See ⇒ [Valve stem oil seals](#) later in this section.
- Valve installation is reverse of removal.

Valve specifications are listed in ⇒ [Table c](#). Remove carbon deposits from

the valves using a wire brush or wire wheel.

Table c. Valve specifications	
Specification	M 52TU 2.5/2.8 engines (1999 - 2000) M 54 2.5/3.0 engines (2000 - 2001)
Valve head dia.	
Intake	33.0 mm (1.299 in.)
Exhaust	30.5 mm (1.201 in.)
Valve stem dia. Standard	
Intake	6.0 ^{-0.015} mm
	(0.2362 ^{-0.0006} in.)
Exhaust	6.0 ^{-0.015} mm
	(0.2362 ^{-0.0006} in.)
Oversize 1	
Intake	6.1 ^{-0.025} mm
	(0.2401 ^{-0.0010} in.)
Exhaust	6.1 ^{-0.040} mm
	(0.2401 ^{-0.0016} in.)
Oversize 2	
Intake	6.2 ^{-0.025} mm
	(0.2441 ^{-0.0010} in.)

Table c. Valve specifications

Specification	M 52TU 2.5/2.8 engines (1999 - 2000) M 54 2.5/3.0 engines (2000 - 2001)
Exhaust	$6.2^{-0.040}$ mm
	($0.2441^{-0.0016}$ in.)

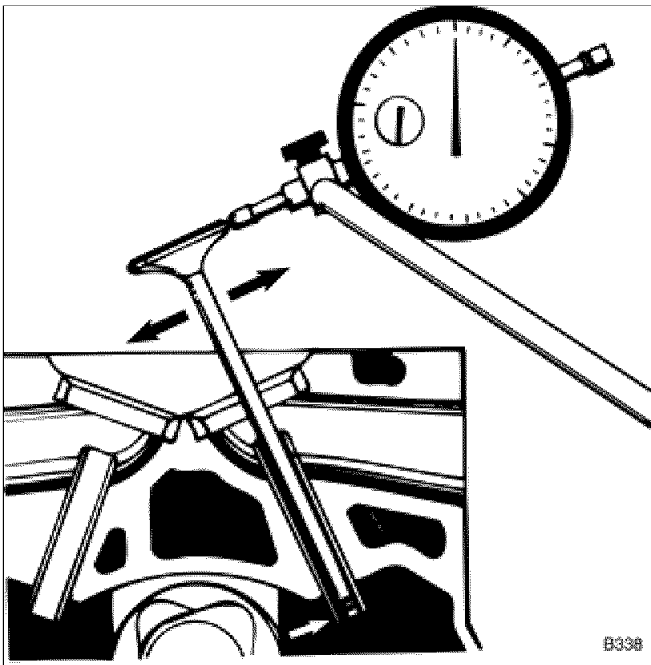
Valve guides

BMW does not supply valve guides as replacement parts. If a valve guide is excessively worn, it should be reamed to accept oversized valve stems. Valve guide specifications are listed in ⇒ [Table d.](#)

- ✦ Valve guides should be checked for wear using a new valve. Be sure to thoroughly inspect the cylinder head to ensure that it can be reused before reworking the guides.

Note:

- ✦ *International Organization for Standardization (ISO) tolerance classes are listed in ⇒ [Table c.](#) ISO allowances are based on nominal sizes and should be used to determine proper fit. Most machine shops should have this information available.*
- ✦ *Replacement valve guides may be available through aftermarket suppliers. Valve guide replacement requires special tools and a press. It is also necessary to heat the cylinder head and chill the*



valve guides when replacing the guides.

BMW supplies oversize valves. See ⇒ [Table d](#) for additional information.

Table d.Valve guide specifications	
Specifications	M52TU / M54 engine(1999 - 2001)
Valve guide wear, maximum (valve tilt clearance measured with new valve)	0.5 mm (0.020 in.)
Valve guide inside diameter, installed (tolerance per ISO allowance H7)	
Standard	6.0 mm (0.236 in.)
Oversize 1	6.1 mm (0.240 in.)
Oversize 2	6.2 mm (0.244 in.)

Valve stem oil seals

The purpose of the valve stem oil seal is to prevent excess oil from entering the combustion chamber. The sign of faulty valve stem oil seals is excessive oil consumption and smoke from the exhaust immediately after starting and during deceleration

Note:

Valve stem oil seals should not be reused. If valves are removed, new valve stem oil seals should be installed.

Valve stem oil seal replacement requires that the cylinder head be

disassembled and the valves removed as described above under ⇒ [Valves, removing and installing](#).

Note:

BMW special tools are available to remove the valve stem oil seals. As an alternative, standard valve seal removal tools are available from most automotive parts stores.

Lubricate new seal and install using hand pressure only. Be sure to install valve spring seat(s) before installing seal.

Valve seats

The valve seats should be resurfaced whenever new valves or valve guides are installed. Cutters are required to resurface the seats. Always check the valves for leaks after reconditioning a valve seat as described above. ⇒ [Table e](#) lists valve seat dimensions.

Note:

Standard size replacement valve seats are not available from BMW. Replacement valve seats are only available from BMW in 0.4 mm oversize (oversized in both height and diameter). The manufacturer does not provide specifications for valve seat replacement for the engines covered by this manual.

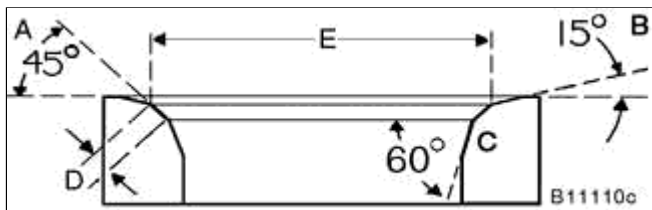


Table e. Valve seat specifications

Specification	M52TU/M54 engines (1999-2001)
A: Valve seat angle	45°

Table e. Valve seat specifications	
Specification	M52TU/M54 engines (1999-2001)
B: Correction angle, outside	15°
C: Correction angle, inside	60°
D: Valve seat width	
intake	1.65 ± 0.25 mm (0.065 ± 0.010 in)
exhaust	1.65 ± 0.25 mm (0.065 ± 0.010 in)
E: Valve seat outside dia.	
intake	32.4 mm (1.276 in)
exhaust	30.0 mm (1.181 in)

Valve springs

The valve springs should be checked for fatigue. To quickly check the springs, line them up in a row. Place a straight edge across the top of the springs. Any spring that is significantly shorter than the others is worn and should be replaced.

Note:

Valve spring specifications and wear limits are not available from BMW.