Contents

Attach

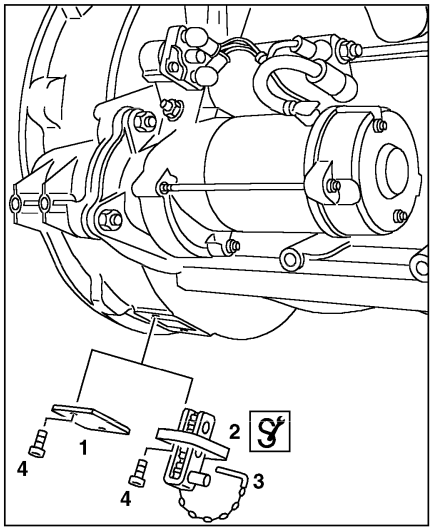
1 Remove cover (1) on flywheel housing.

2 Attach cranking/blocking device (2) with bolts (4) to flywheel housing.
The cranking/blocking device (2) must be removed before starting engine, otherwise the flywheel or the cranking/blocking device (2) is damaged.
The cranking/blocking device (2) can be blocked by plugging in pin (3).

Detach

3 Remove cranking/blocking device (2) from the flywheel housing.

4 Attach cover (1) with bolts (4) to the flywheel housing.

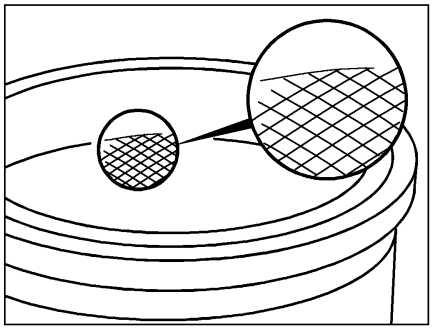


W03.30-0001-02

AH01.40-N-0001-01A	Notes for assessing wear to cylinder wall in the case of dust damage	Engines 401.9, 402.9, 441.9, 442.9, 446.9, 447, 457.9, 489, 541.9, 542.9, 900.9, 902.9, 904.9, 906.9, 924.9, 926.9	

Cylinder contact surfaces or cylinder liners without dust damage

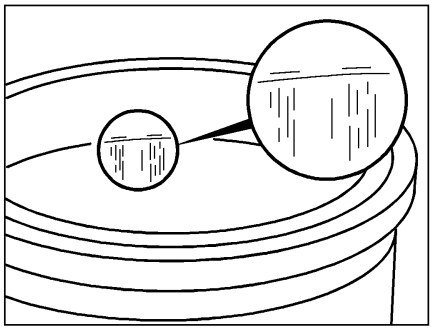
The honing pattern is more or less clearly recognizable over the entire running surface.
The hone marks may be partially worn away at the travel limit of the first piston ring.


W03.10-0014-01

Cylinder contact surfaces or cylinder liners with dust damage

The traces of processing by honing are only just visible or are no longer visible. If the wear is substantial, a ridge can be felt at the travel limit of the first piston ring.

Dust and particulate damage are caused by poor sealing, cracks and abrasion in the intake tract's collars, ducts and hoses.
Carefully inspect all intake ducts, collars and hoses, even in areas where access is difficult, when performing service and maintenance operations.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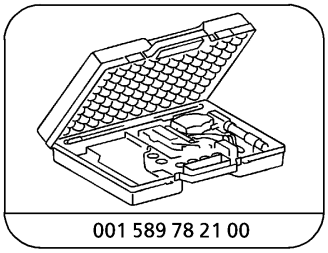
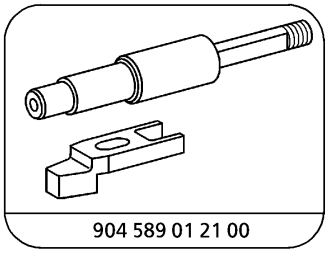


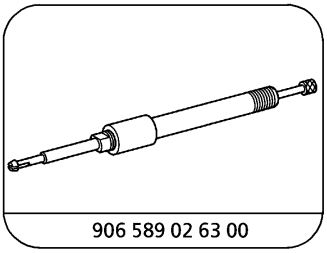
001 589 78 21 00

Compression recorder



904 589 01 21 00

Connection piece



906 589 02 63 00

Extraction tool

AS00.00-Z-0005-01A	**Risk of accident** as vehicle may start off by itself with the engine running. **Risk of injury** as working around the engine during start-up or while running may result in contusions and burns	Secure vehicle to prevent it from moving off by itself. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	⚠ **Danger!**

Possible hazards

Risk of accident
from vehicle starting off during starting operation
(e.g. when testing compression pressure) **as a result of gear engaged** or when engine running, or vehicles with automatic transmission **as a result of selector lever position "P" or "N" not engaged**
(exception: some vehicles do not have a selector lever position **"P"**).

Injury hazard
Severe injuries may be caused by unshielded rotating parts in the area of the running engine.
The heat produced by the running engine can result in severe burns if contact is made with individual, unshielded parts.

First aid measures in the event of burns
- Do not rub the skin areas affected; flush with plenty of cold water and cover skin with sterile bandages.
- Consult a doctor without delay.

Procedural guidelines and safety precautions
- As a general rule, carry out work on the running engine only if this is absolutely necessary.
- Before starting the engine, **apply parking brake.**
- On models with manual transmission **move gearshift lever into Neutral position**.
- On vehicles with automatic transmission **move selector lever into position "P" or "N"** (exception: some vehicles do not have a selector lever position **"P"**).
- On models which **do not have selector lever position "P", secure selector lever to prevent it from being operated unintentionally.**
- Wear closed and close-fitting work clothes.
- All items of jewelry like chains or rings must be taken off.
- Restrain long hair by wearing an appropriate head cover.
- Before commencing any work on the running engine, familiarize yourself with the location of potentially hot parts.
- When carrying out work when starting the engine or when engine is running **do not touch any hot and rotating parts.**

AR01.40-G-0003CH	Check cylinder barrel for wear and damage	26.5.04

MODEL 000.001 with ENGINE 457.960

	Check		
1	Remove cylinder head		**Page 23**
2 Information on working sealing surfaces when carrying out engine repairs	Clean crankcase sealing surface	Engine 457.9, 541.9, 542.9, 900.9, 902.9, 904.9, 906.9, 924.9, 926.9	**Page 16**
3 Notes for evaluation of cylinder contact surface	Rotate crankshaft until the piston of the cylinder to be checked is positioned on BDC, then assess the cylinder barrel by means of a visual inspection	Engine 457.9, 541.9, 542.9, 902.9, 904.9, 906.9, 924.9, 926.9 If wear or a damage is determined on the piston crown or on the cylinder barrel: ↓ Check piston and cylinder liner matchup Cylinder liner inner dia. Piston dia. If wear, damage or variation of the specified values was determined: ↓ Install new piston Install new cylinder liner.	**Page 34** **Page 37** BE01.40-N-1001-03K BE03.10-N-1001-02N **Page 69**
4	Install cylinder head		**Page 23**

Test values of cylinder liner

Number	Designation			Engine 457.960
BE01.40-N-1001-03K	Cylinder liner inner dia.	Code letter A	mm	127.990...127.995
		Code letter B	mm	127.995...128.005
		Code letter C	mm	128.005...128.010

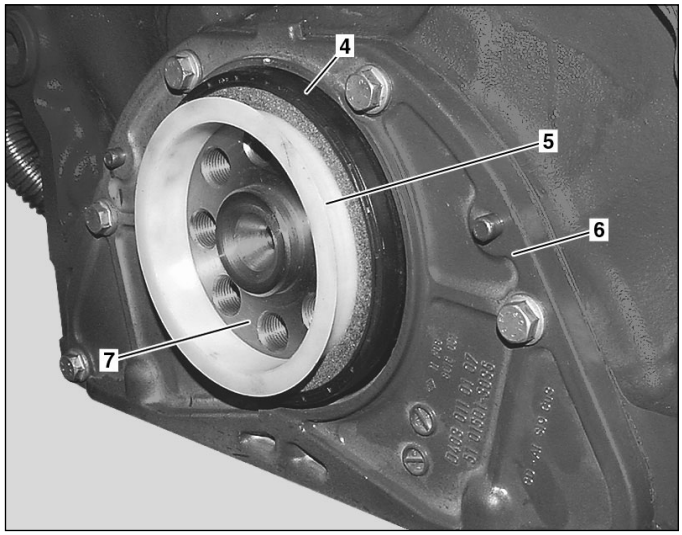
Test values for pistons

Number	Designation				Engine 457.960
BE03.10-N-1001-02N	Piston dia.	Group identification	BA	mm	127.743...127.751
			BC	mm	127.749...127.757

1 Moisten crankshaft flange (7) with engine oil.

2 Position crankshaft radial sealing ring (4) on crankshaft flange (7) with installation aid (5).

3 Press crankshaft radial sealing ring (4) into front housing cover (6) and remove installation aid (5).

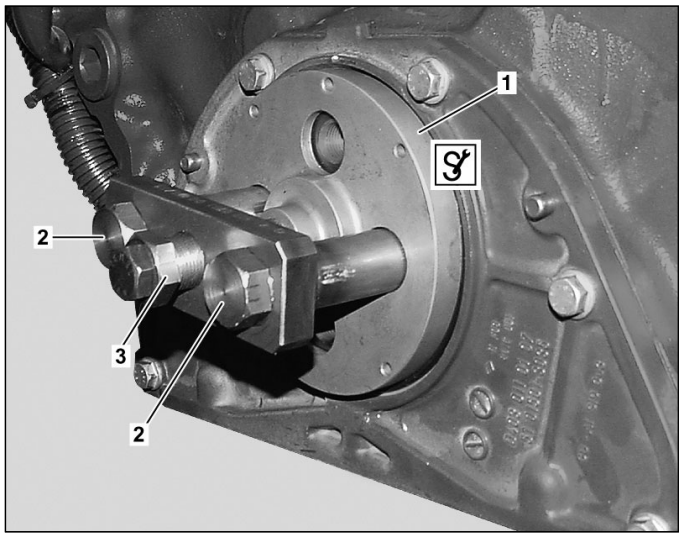


G03.20-3111-11

4 Attach 🔧 removal and insertion device (1) to crankshaft flange with bolts (2).
ℹ When tightening bolts (2) ensure that the 🔧 removal and insertion device (1) does not make contact with the crankshaft radial sealing ring (4), if necessary, unscrew bolt (3).

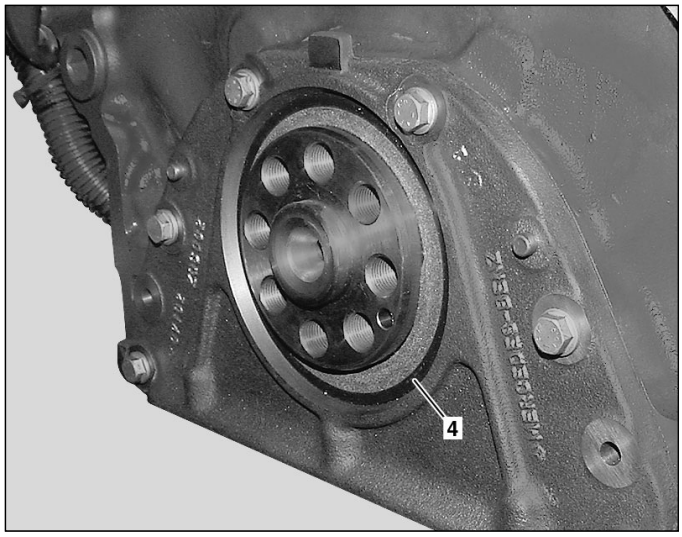
5 Press crankshaft radial sealing ring (4) down to perceptible stop with 🔧 removal and insertion device (1) by screwing in bolt (3).

6 🔧 Remove removal and insertion device (1).



G03.20-3108-11

7 Check installation position of the crankshaft radial sealing ring (4).

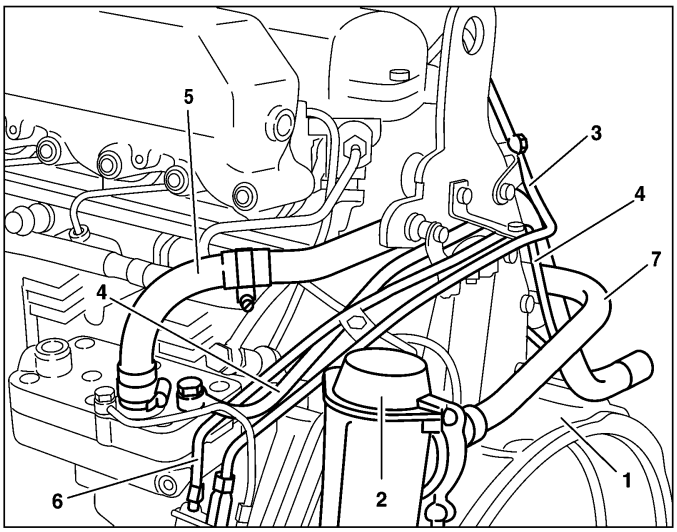


G03.20-3110-11

AR01.60-G-8200CH	Remove/install timing case	8.6.04

MODEL 000.001 with ENGINE 457.960

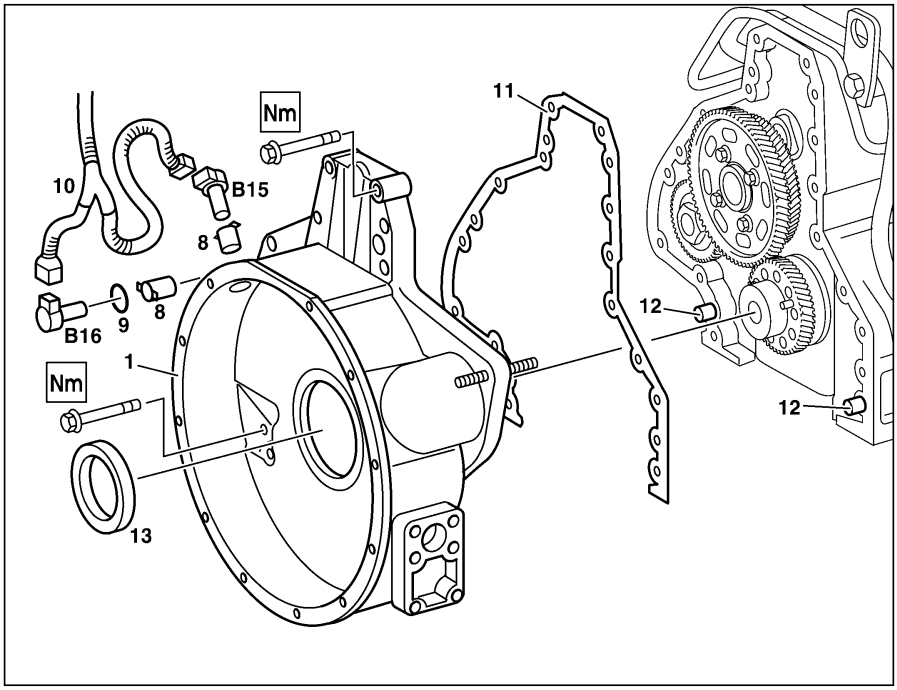
1 Timing case
2 Oil separator
3 Compressed-air line (constant throttle)
4 Coolant line (compressor)
5 Air intake pipe (compressor)
6 Compressed air line (engine brake)
7 Vent tube (crankcase ventilation)



W01.60-1004-11

1 Timing case
8 Locking bush
9 *O-ring*
10 Engine wiring harness
11 Gasket
12 Dowel pins
13 Radial seal ring

B15 Crankshaft angle position sensor
B16 Cylinder 1 TDC sensor



G01.60-3104-06

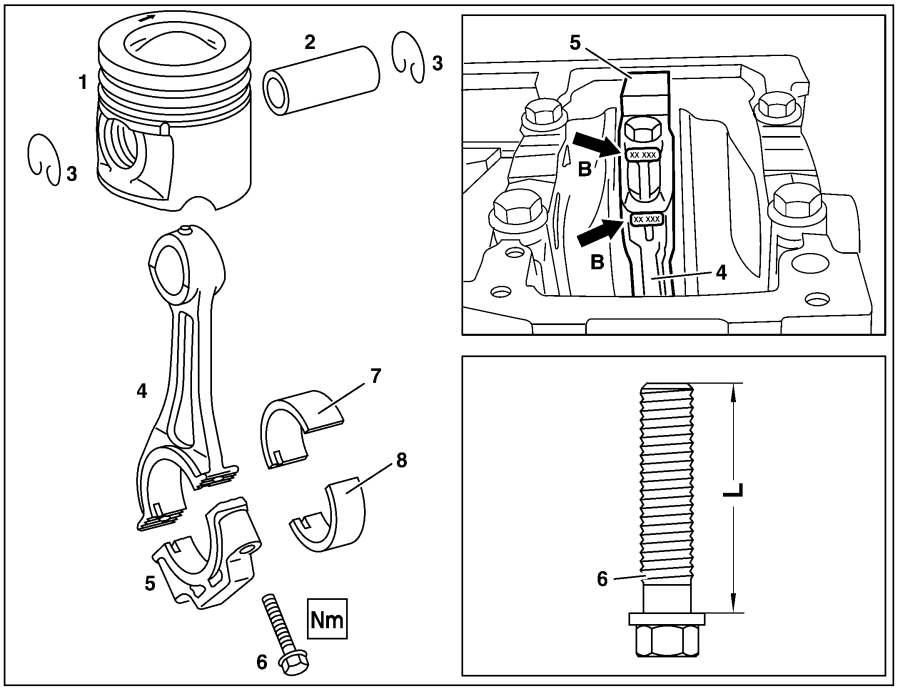
	Remove/Install		
	Notes on self-locking nuts and bolts	All models	**Page 59**
1 AP	Drain engine oil Engine - oil and filter change		**Page 185**
2	Remove engine		
3	Attach engine to engine repair stand		WE58.40-Z-1001-11A WE58.40-Z-1015-11A
4	Remove starter		**Page 177**

AR03.10-G-7021CH	Remove/install piston	8.6.04

MODEL 000.001 with ENGINE 457.960

1 Pistons
2 Piston pin
3 Circlip
4 Conrods
5 Connecting rod bearing cap
6 Connecting rod bolt
7 Connecting rod bearing shell
8 Connecting rod bearing shell

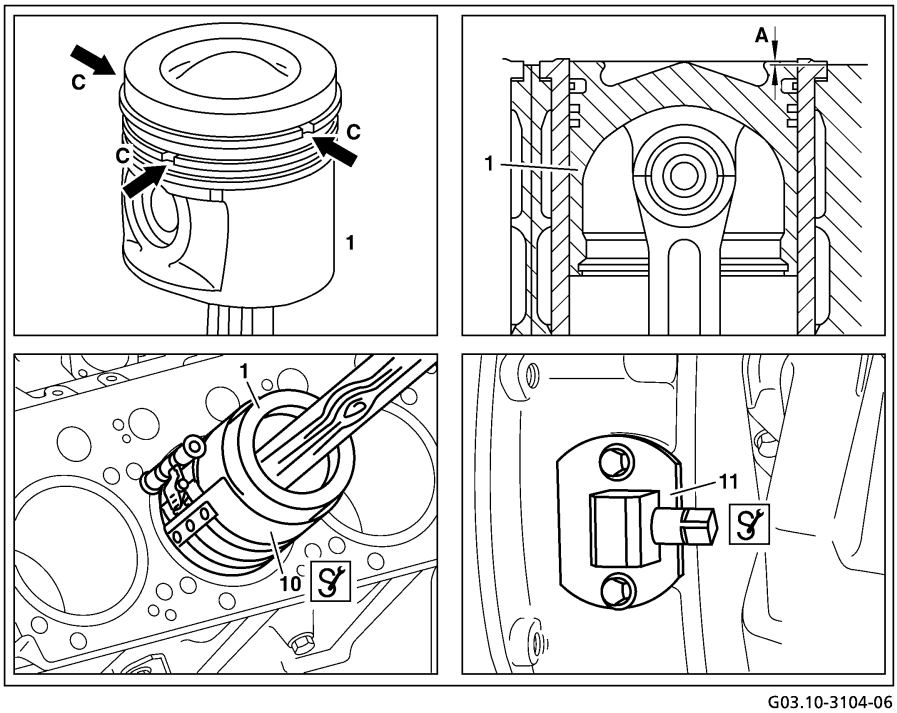
L Shank length of the connecting rod bolt



G03.10-3103-06

1 Pistons
10 Tensioning strap
11 Cranking device

A Piston projection



G03.10-3104-06

	Remove		
	Information on working sealing surfaces when carrying out engine repairs	Engine 457.9, 541.9, 542.9, 900.9, 902.9, 904.9, 906.9, 924.9, 926.9	**Page 16**
	Notes for assessing piston wear from dust/particulate damage	Engine 401.9, 402.9, 441.9, 442.9, 446.9, 447, 457.9, 489, 541.9, 542.9, 900.9, 902.9, 904.9, 906.9, 924.9, 926.9	**Page 73**

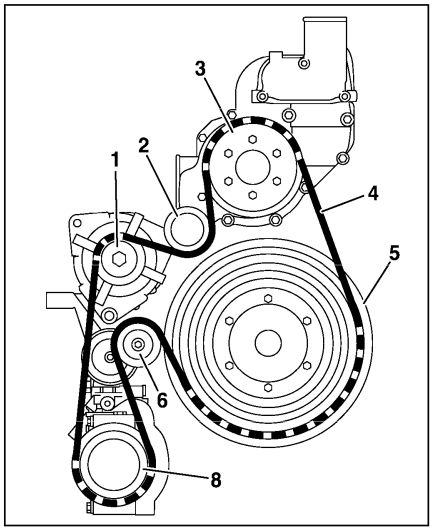
AR03.20-G-0002CH	**Additional tests when carrying out a repair to the crankshaft, main bearing or connecting rod bearing**	16.6.04

MODEL 000.001 with ENGINE 457.960

	Check		
1 AP	Remove oil filter element and check for outer metal abrasion or swollen condition of the oil filter element disks Engine - oil and filter change	Only if there is advanced wear or damage to engine components.	**Page 185**
2	Replace oil/water heat exchanger	Only if metal abrasion is present at oil filter element disks or in the engine oil circuit.	**Page 205**
3	Remove, disassemble and check oil pump through a visual inspection for wear	Only remove if reinforced metal abrasion was found at oil filter element. If wear is present, replace oil pump if necessary.	**Page 199**
4	Fill engine oil circuit	Only if engine was repaired because of crankshaft bearing damage.	**Page 191**
5 AP	Replace engine oil and oil filter element. Engine - oil and filter change	If metal abrasion or swollen condition of oil filter element (coolant in engine oil circuit):	**Page 185**

Belt drive for alternator, coolant pump and AC compressor
(Vehicles with code (H03) Air conditioning in front end)

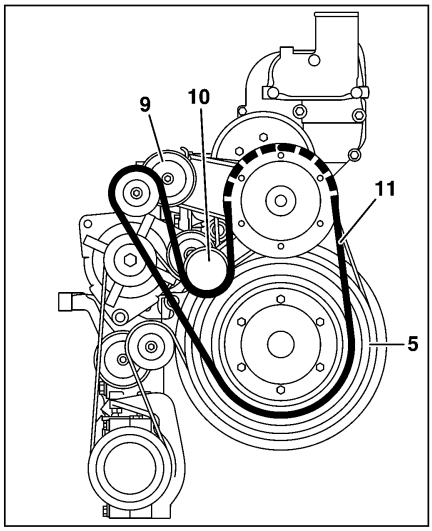
1 Belt pulley alternator
2 Guide pulley
3 Belt pulley coolant pump
4 Poly-V-belt
5 Belt pulley/vibration damper
6 Tensioning device with tensioning pulley
8 Belt pulley AC compressor



W13.20-1002-02

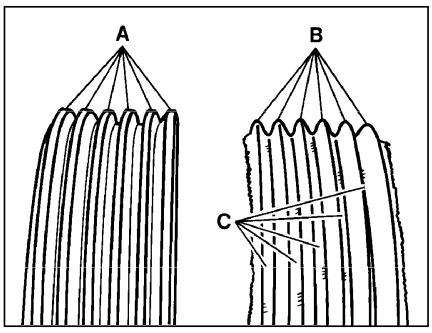
Belt drive for fan

5 Belt pulley/vibration damper
9 Tensioning device with tensioning pulley for poly-V-belt for fan
10 Guide pulley for poly-V-belt for fan
11 Poly-V-belt for fan



W13.20-1003-02

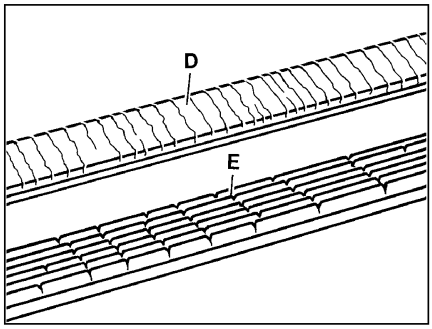
AP13.22-D-1351-01A	Damage patterns for poly V-belt		



N13.22-2068-01

Wear to flank - ribs wedge-shaped (B) and cord visible in base of rib (C),
condition of ribs when new is trapezoidal in shape (A)

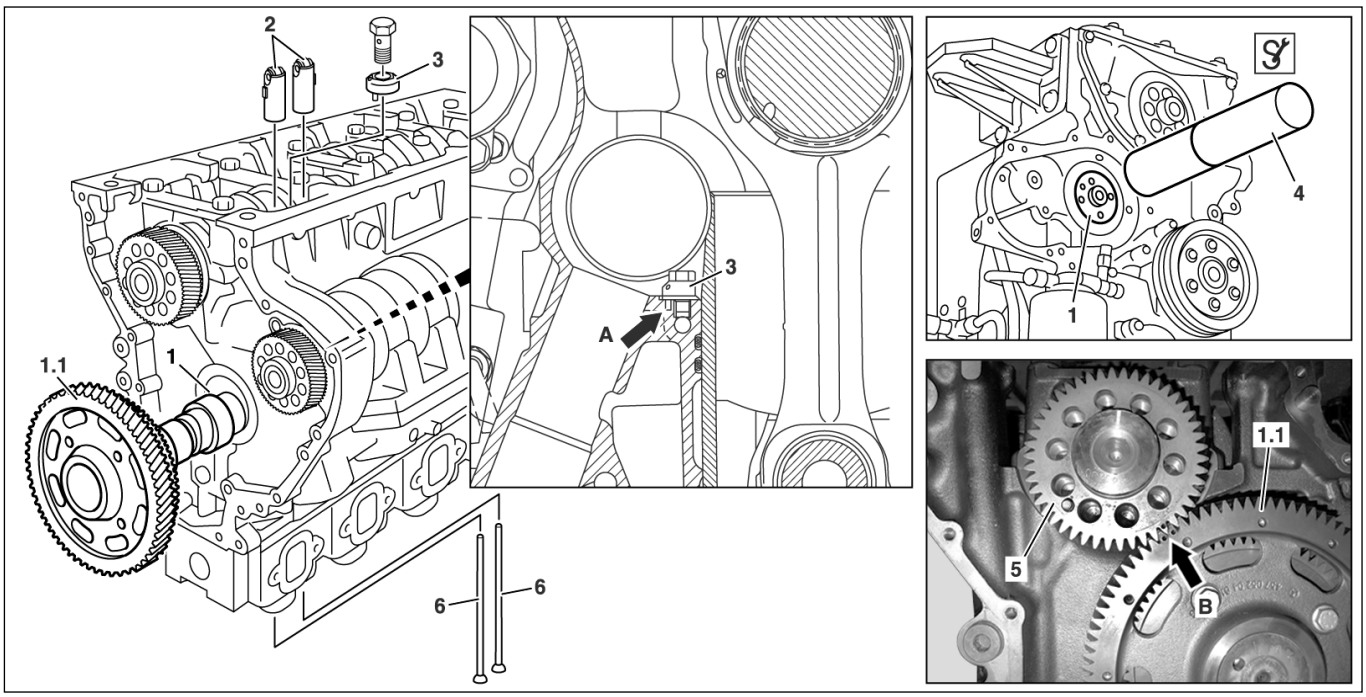
Splits across the back (D)
Splits across several ribs (E)



N13.22-2066-01

AR05.20-G-6292CH	Remove/install camshaft	21.7.04

MODEL 000.001 with ENGINE 457.960

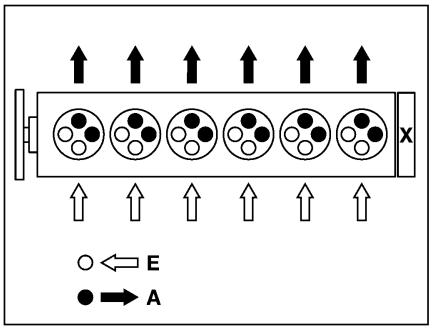


G05.20-3108-09

1 Camshaft
1.1 Camshaft sprocket
2 Roller tappet
3 Oil spray nozzle
4 Guide sleeve
5 Crankshaft gear
6 Push rod

	Removal, installation		
1	Attach engine to engine assembly bracket		WE58.40-Z-1001-11A WE58.40-Z-1015-11A
2	Remove camshaft sprocket (1.1)		**Page 109**
3	Remove timing case		AR01.60-G-8200C
4	Remove MR/PLD unit pumps		**Page 135**
5	Remove rocker arms assembly		**Page 105**
6	Pull out push rods (6)	**Installation:** Oil push rods (6) with engine oil and check whether roller tappets (2) are seated correctly	
7	Turn engine in engine assembly support	Turn engine approx. 180° so that roller tappets (2) loosen from camshaft (1) WE58.40-Z-1001-11A WE58.40-Z-1015-11A	
8	Tighten guide sleeve (4) to camshaft (1) at front		457 589 00 14 00
9	Pull out camshaft (1)	Carefully pull camshaft (1) out of crankcase to prevent damaging camshaft bearing	

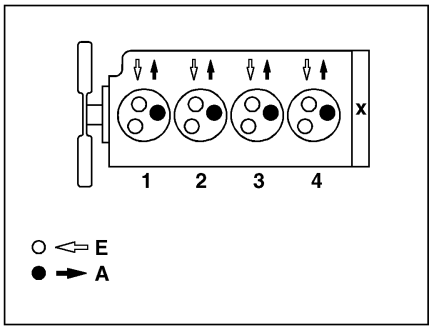
AH05.30-N-1000-01D	General information on adjusting valve clearance	Engine 457.9, 900.9, 902.9, 904.9, 906.9, 924.9, 926.9 Method 2	i



A01.00-0001-01

Engine 457.9

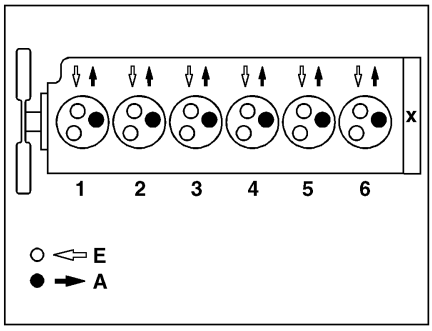
A Outlet valve
E Inlet valve
X Flywheel side



N01.00-0347-01

Engines 900.9, 904.9, 924.9

A Outlet valve
E Inlet valve
X Flywheel side



N01.00-0348-01

Engines 902.9, 906.9, 926.9

A Outlet valve
E Inlet valve
X Flywheel side

Method 2:
Set inlet and exhaust valves at two crankshaft positions, as shown in the table.

4-cylinder
Position cylinder 4 in the valve overlap TDC (cylinder 1 in ignition TDC), then position cylinder 1 in valve overlap TDC (cylinder 4 in ignition TDC).

6-cylinder
Position cylinder 6 in the valve overlap TDC (cylinder 1 in ignition TDC), then position cylinder 1 in valve overlap TDC (cylinder 6 in ignition TDC).

Motor	Crankshaft position	Cylinder/valves to be set					
		1	2	3	4	5	6
4-cylinder	Cyl. 4 valve overlap TDC	E/A	E	A	-		
	Cyl. 1 valve overlap TDC	-	A	E	E/A		
6-cylinder	Cyl. 6 valve overlap TDC	E/A	E	A	E	A	-
	Cyl. 1 valve overlap TDC	-	A	E	A	E	E/A

AP05.30-G-0560-01CH	Check and adjust valve clearance		

Test values for valves

Number	Designation			Engine 457.960
BE05.30-N-1001-01M	Valve clearance	Inlet	mm	0.40
		Outlet	mm	0,60
BE05.30-N-1002-01M	Inspection tolerance of valve clearance		mm	-0.10/+0.20

Nm **Engine timing - general**

Number	Designation		Engine 457.960
BA05.00-N-1002-01K	Locknut at adjusting bolt of rocker arm	Nm	50

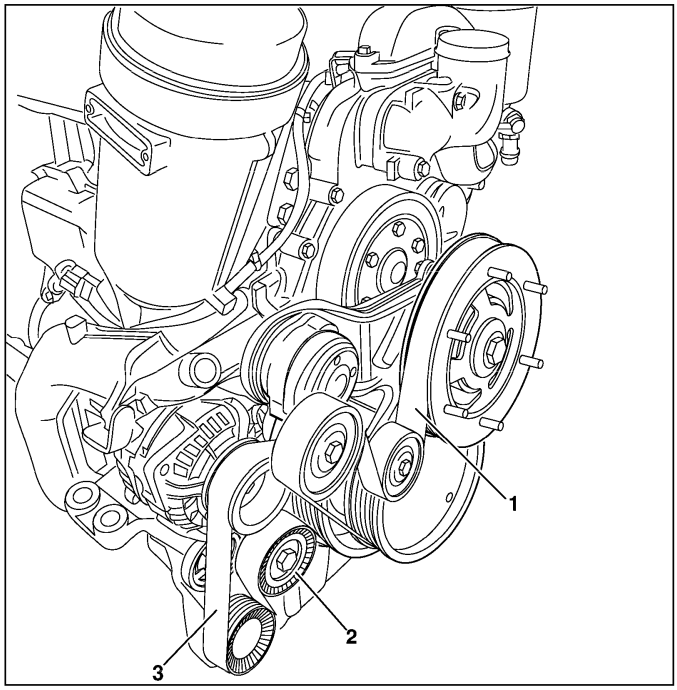
	Remove/install		
⚠ **Danger!**	**Risk of injury** to skin and eyes caused by scalding from contact with hot coolant spray. **Risk of poisoning** from swallowing coolant.	Do not open cooling system unless coolant temperature is below 90°C. Open cap slowly and release the pressure. Do not pour coolant into beverage containers. Wear protective gloves, protective clothing and safety glasses.	**Page 26**
1	Drain and collect coolant	ⓘ Only when removing the MR/PLD unit pumps (1) from cylinders 1 to 3. **Installation:** In line with the coolant regulations, only approved anticorrosion/antifrost agents may be used otherwise engine damage may occur. The following should be observed: ↓	
☞BB	Coolant specifications	Sheet 310.1	BB00.40-P-0310-01A
☞BB	Anticorrosion/antifreeze agent	Sheet 325.2	BB00.40-P-0325-02A
2	Detach coolant pipe at crankcase	ⓘ Only when removing the MR/PLD unit pumps (1) from cylinders 1 to 3.	
3	Remove charge air manifold		**Page 153**
⚠ **Danger!**	**Risk of explosion** caused by fuel igniting, **risk of poisoning** caused by inhaling and swallowing fuel as well as **risk of injury** to eyes and skin caused by contact with fuel.	No fire, sparks, open flames or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**Page 27**
4	Remove injection line (5)	ⓘ Seal holes at nozzle holder combination and at MR/PLD unit pump (1).	**Page 139**
5	Take off engine wiring harness (6) at MR/PLD unit pump (1)	ⓘ Loosen bolts at solenoid valve and separate both push-fit clips for this step.	
6	Mark MR/PLD unit pump (1) to the relevant cylinder	ⓘ Only when removing several or all MR/PLD unit pumps (1).	
7	Loosen bolts (4)	ⓘ For safety reasons, the bolts (4) must be loosened by around 4 to 5mm only and the MR/PLD unit pump unit (1) tensioned by spring force. ⓘ **Installation:** Install MR/PLD unit pump (1) by slowly and alternately screwing bolt (4) into crankcase Nm	BA07.15-N-1005-01F
8	Pull MR/PLD unit pump (1) with extractor to stop on bolt heads (4)	Tight MR/PLD unit pumps (1) must not be pressed out at the solenoid valve or at the housing flange, otherwise damage may occur to the MR/PLD unit pumps (1). S	355 589 01 63 00
9	Completely unscrew bolt (4) and pull out MR/PLD unit pump (1)	ⓘ **Installation:** Lightly grease housing of MR/PLD unit pump (1), surface of black O-rings (2), green O-ring (3) as well as holes in crankcase with high temperature bearing grease. Insert the MR/PLD unit pump (1) with the self-made assembly pins into the crankcase.	BR00.45-Z-1058-06A

AR13.22-G-0003CH	Remove/install alternator poly-V-belt	5.7.04

MODEL 000.001 with ENGINE 457.960

Shown with fan wheel removed

1 Poly-V-belt (fan)
2 Tensioning device (alternator poly-V-belt)
3 Poly-V-belt (alternator)



W20.40-1063-12

⛶	**Removal**		
⚠ **Danger!**	**Injury hazard** from **pinching** when working on springs and spring bodies under tension	Use only approved tensioning devices, if necessary shield hazardous areas additionally Check special tools for damage and proper function (visual inspection). Wear protective gloves.	**Page 91**
1	Remove poly-V-belt (1)		**Page 157**
2	Pivot tensioning pulley for tensioning device (2) downward and hold		
3	Remove poly-V-belt (3) from belt pulleys		
4	Pivot back tensioning pulley for tensioning device (2)		
5	Press fan wheel toward front and remove poly-V-belt (3)	ⓘ Do not damage poly-V-belt (3) when removing	
◁	**Test**		
6	Check belt pulleys and tensioning pulleys for damage and smoothness, replace if necessary.		
7 ☞AP	Check poly-V-belt (3) for condition, replace if necessary Damage pattern for poly-V-belt		**Page 92**
⛶	**Installation**		
8	Press fan wheel toward front and position poly-V-belt (3) on belt pulley	ⓘ Observe belt route of poly-V-belt	**Page 91**
9	Pivot tensioning pulley for tensioning device (2) downward and hold		

5	Remove control line (3)	Nm	BA13.30-N-1006-01J
6	Remove compressor (6) from timing case	i **Installation:** Observe various bolt lengths Nm	 BA13.30-N-1001-01J
7	Reinstall in opposite order		
8 AP	Correct engine oil level Engine oil and filter change		 **Page 185**
9	Check coolant level, correct is necessary		

Nm **Compressor (compressed air system)**

Number	Designation			Engine 457.960
BA13.30-N-1001-01J	Bolt, compressor to crankcase		Nm	60
BA13.30-N-1002-01J	Banjo bolt, coolant line to compressor	M16x1.5	Nm	40
		M14X1.51	Nm	35
BA13.30-N-1004-01J	Fittings, compressed air line to compressor		Nm	80
BA13.30-N-1005-01J	Fittings, intake line to compressor		Nm	80
BA13.30-N-1006-01J	Banjo bolt, control line to compressor		Nm	15

AH20.00-N-2080-01A	Notes on coolant	All engines	(!)

Coolant composition
passenger car and commercial vehicle engines (normally)
50 water in % by volume and
50 corrosion/antifreeze agent in % by volume.

Different coolant composition for CV engines, refer to **MB Specifications for Operating Fluids**.

Tasks of corrosion and frost protection
- Corrosion and cavitation protection of all components in cooling system
- Antifreeze protection (frost protection)
- Increase the boiling point so that coolant does not evaporate so rapidly. Avoiding ejection of coolant at high coolant temperatures.

Water
Use water which is clean and not too hard. Drinking water often satisfies requirements, but not always the contents of dissolved substances in the water may be of significance for the occurrence of corrosion. If in doubt, analyze the water.
For fresh water specifications refer to **MB Specifications for Operating Fluids**.

Period of use
The maximum permissible period of use of the coolant can be taken from the maintenance booklet; from the applicable service/maintenance sheet or the **MB-Specifications for Operating Fluids** respectively.

For the period of use for a varying coolant composition for CV engines, refer to **MB Specifications for Operating Fluids**.

Antifreeze protection
50 % by volume of anticorrosion/ antifreeze agent offers antifreeze protection down to approx. **-37 °C**. A higher concentration is only necessary if the ambient temperatures are even lower. 55 % by volume of anticorrosion/antifreeze agent offers antifreeze protection down to approx. **-45 °C**.

(!) A concentration of more than 55 % by volume of anticorrosion/ antifreeze agent should not be used as the maximum antifreeze protection is already reached. An even higher concentration once reduces antifreeze protection and impairs heat dissipation. Reduced heat dissipation can lead to damage to components in the cooling system or damage to the engine.

(!) Before pouring in fresh coolant, flush the used coolant out of the cooling system. In the event of high pollution or oil fouling levels, clean the cooling system, otherwise damage can occur to the components of the cooling system.

Disposing of coolants
Pay attention to legal provisions and local wastewater regulations.
For workshops located in the Federal Republic of Germany refer to:
"Environmental Protection Manual for Automotive Repair Workshops"
Publisher: Association of Automotive Industry e.V. (VDA)
60625 Frankfurt am Main, Westendstraße 61