Workshop Manual
Mercedes OM501 OM502

272 pages

Engines OM 501, OM 502
(Mod. des. 541.9, 542.9)

Order No. 6517 5030 02

	Contents	Part 1

	Contents	Part 2

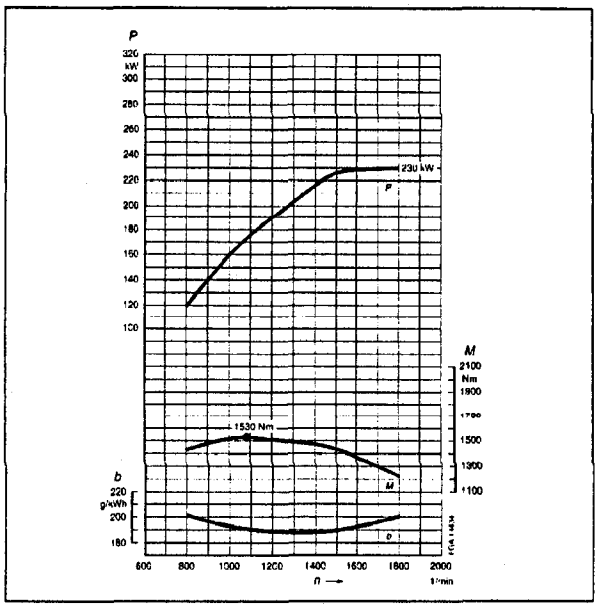
	Contents	Part 3

GF01.00-W-2000B	Technical data engine - complete	28.11.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927

GF01.00-W-1000-01D	Technical data engine	Engine 541.920/926	GF

P Engine output
M Engine torque
n Rated speed
b Specific fuel consumption



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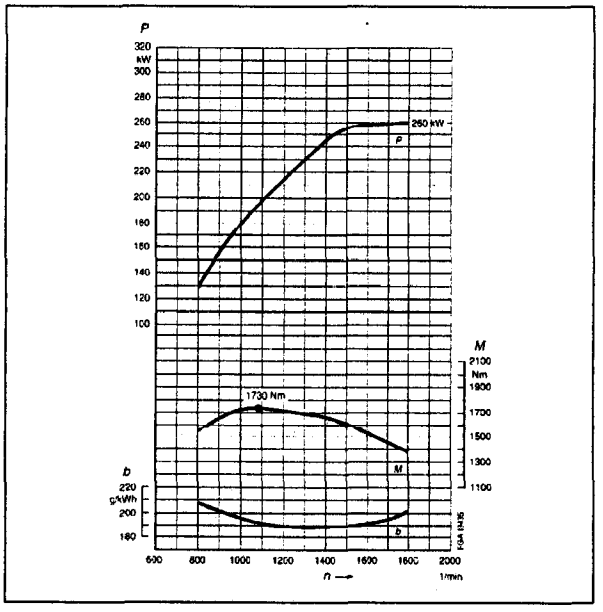
Additional Information

Engine model designation		**541.920 (low)** **541.928 (high)**
Engine type		OM 501LA. II/1
Engine output (P)	kW/HP	230/313
	rpm	1800
Engine torque (M) max.	Nm	1530
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	11946
Compression	ε	17.25
Firing order		1-4-2-5-3-6
No. of cylinders/arrangement		6 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

P *Engine output*
M *Engine torque*
n *Rated speed*
b *Specific fuel consumption*

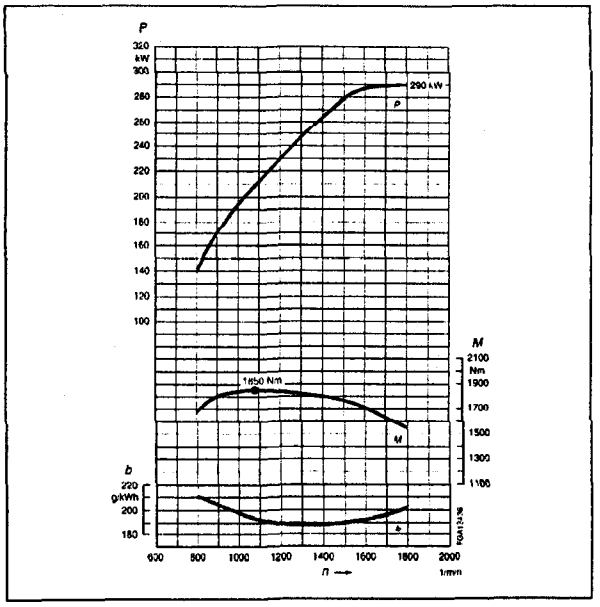


W01.00-0008-12

Engine model designation		**541.922** (low) **541.927** (high)
Engine type		OM 501LA. II/2
Engine output (P)	kW/HP	260/354
	rpm	1800
Engine torque (M) max.	Nm	1730
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	11946
Compression	ε	17.25
Firing order		1-4-2-5-3-6
No. of cylinders/arrangement		6 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

GF01.00-W-1000-01F	Technical data engine	Engine 541.923/924	GF

P *Engine output*
M *Engine torque*
n *Rated speed*
b *Specific fuel consumption*



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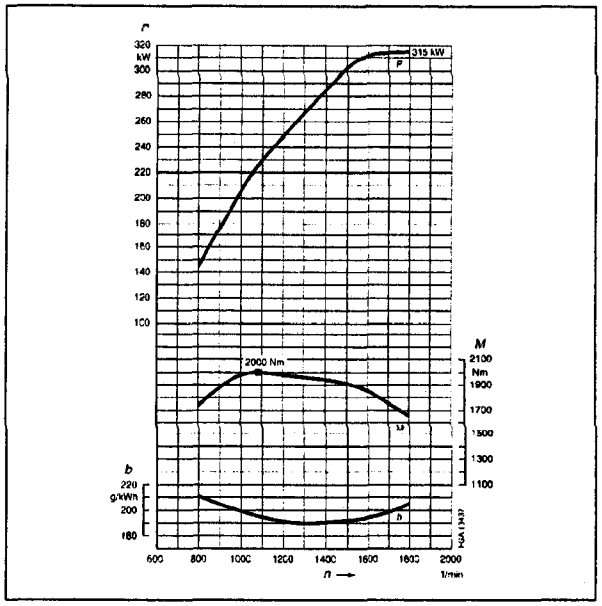
Engine model designation		**541.923** (low) **541.924** (high)
Engine type		OM 501LA. II/3
Engine output (P)	kW/HP	290/394
	rpm	1800
Engine torque (M) max.	Nm	1850
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	11946
Compression	ε	17.25
Firing order		1-4-2-5-3-6
No. of cylinders/arrangement		6 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

P *Engine output*
M *Engine torque*
n *Rated speed*
b *Specific fuel consumption*



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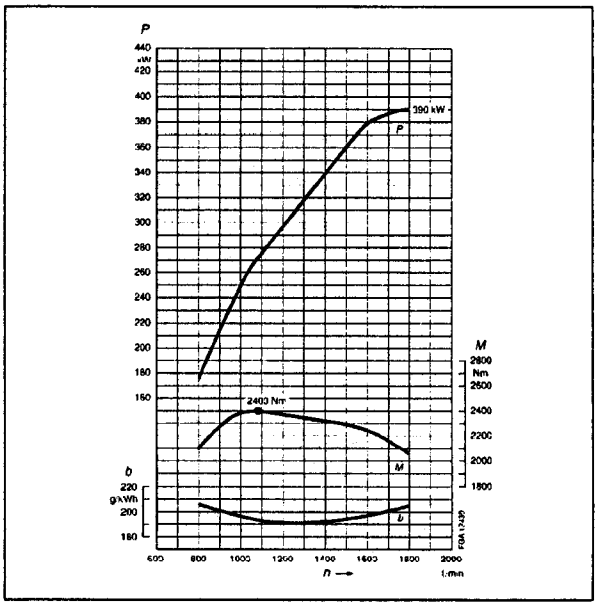
Engine model designation		**541.921** (high) **541.925** (low)
Engine type		OM 501LA. II/4
Engine output (P)	kW/HP	315/428
	rpm	1800
Engine torque (M) max.	Nm	2000
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	11946
Compression	ε	17.25
Firing order		1-4-2-5-3-6
No. of cylinders/arrangement		6 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

ENGINE 542.920 /921 /922 /923 /925 /926

P *Engine output*
M *Engine torque*
n *Rated speed*
b *Specific fuel consumption*



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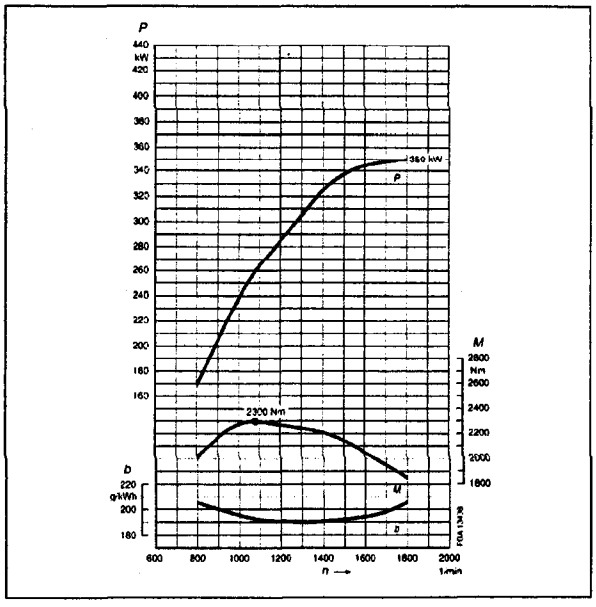
Engine model designation		**542.920 (low)**
Engine type		**OM 502LA. II/2**
Engine output (P)	**kW/HP**	**390/530**
	rpm	**1800**
Engine torque (M) max.	**Nm**	**2400**
	rpm	**1080**
Rated speed	**rpm**	**1800**
Bore	**mm**	**130**
Stroke	**mm**	**150**
Total displacement	**cm^3**	**15928**
Compression	**ε**	**17.25**
Firing order		**1-5-7-2-6-3-4-8**
No. of cylinders/arrangement		**8 in V arrangement**
Valves	**Inlet**	**2**
	Exhaust	**2**
Operating method	**4-stroke diesel with direct injection**	
Combustion method	**Exhaust turbocharging and intercooling**	
Injection method	**Single unit pump with pump-line-nozzle system (PLD)**	
Control	**Electronic engine management with solenoid valve-controlled injection**	
Specific fuel consumption (b)	**g/kWh (see diagram)**	

P ***Engine output***
M ***Engine torque***
n ***Rated speed***
b ***Specific fuel consumption***



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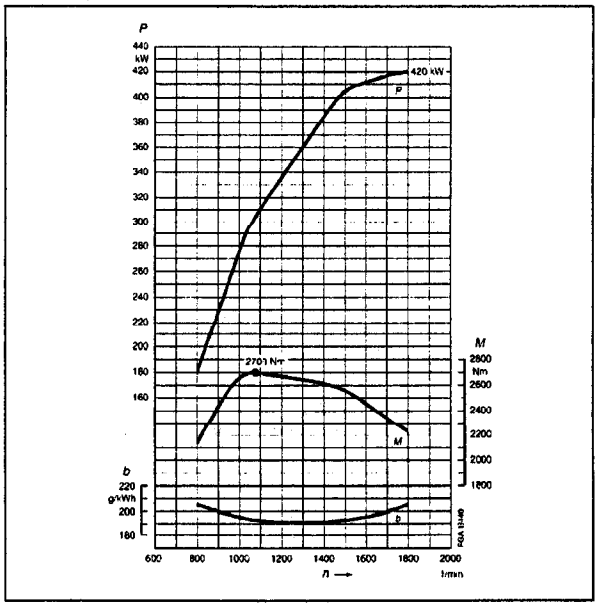
Additional Information

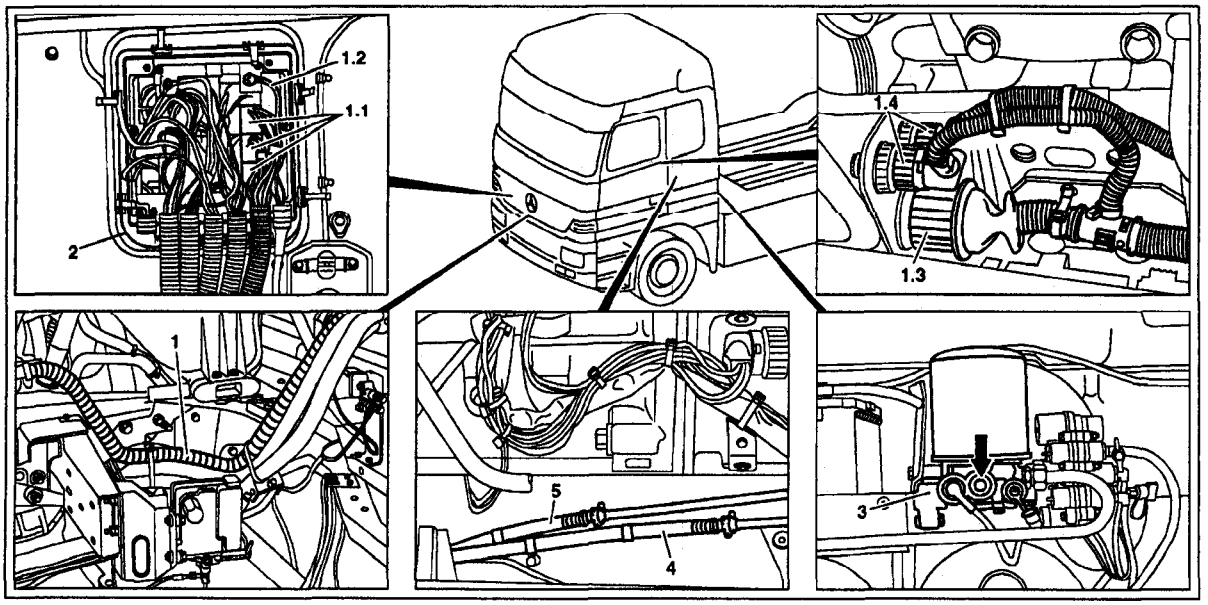
Engine model designation		**542.921** (low) **542.925** (high)
Engine type		OM 502LA. II/1
Engine output (P)	kW/HP	350/476
	rpm	1800
Engine torque (M) max.	Nm	2300
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	15928
Compression	ε	17.25
Firing order		1-5-7-2-6-3-4-8
No. of cylinders/arrangement		8 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

P *Engine output*
M *Engine torque*
n *Rated speed*
b *Specific fuel consumption*



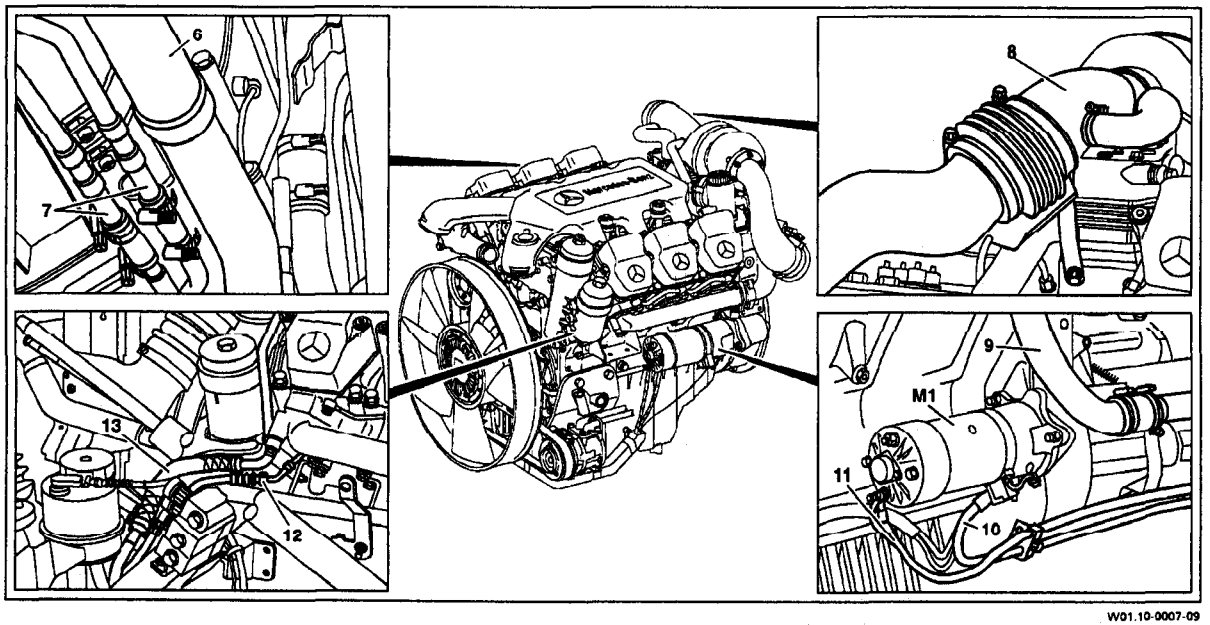
Engine model designation		**542.922 (low)** **542.923 (high)**
Engine type		OM 502LA. II/3
Engine output (P)	kW/HP	420/571
	rpm	1800
Engine torque (M) max.	Nm	2700
	rpm	1080
Rated speed	rpm	1800
Bore	mm	130
Stroke	mm	150
Total displacement	cm^3	15928
Compression	ε	17.25
Firing order		1-5-7-2-6-3-4-8
No. of cylinders/arrangement		8 in V arrangement
Valves	Inlet	2
	Exhaust	2
Operating method	4-stroke diesel with direct injection	
Combustion method	Exhaust turbocharging and intercooling	
Injection method	Single unit pump with pump-line-nozzle system (PLD)	
Control	Electronic engine management with solenoid valve-controlled injection	
Specific fuel consumption (b)	g/kWh (see diagram)	

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W01.10-0006-09

1 Engine wiring harness
1.1 Connector
1.2 Electric cable (red)
1.3 Connector (EPS transmission)
1.4 Connector (retarder)
2 Cab-chassis connection point
3 Compressed air regulator with air drier
4 Fuel pipe (supply)
5 Fuel pipe (return flow)



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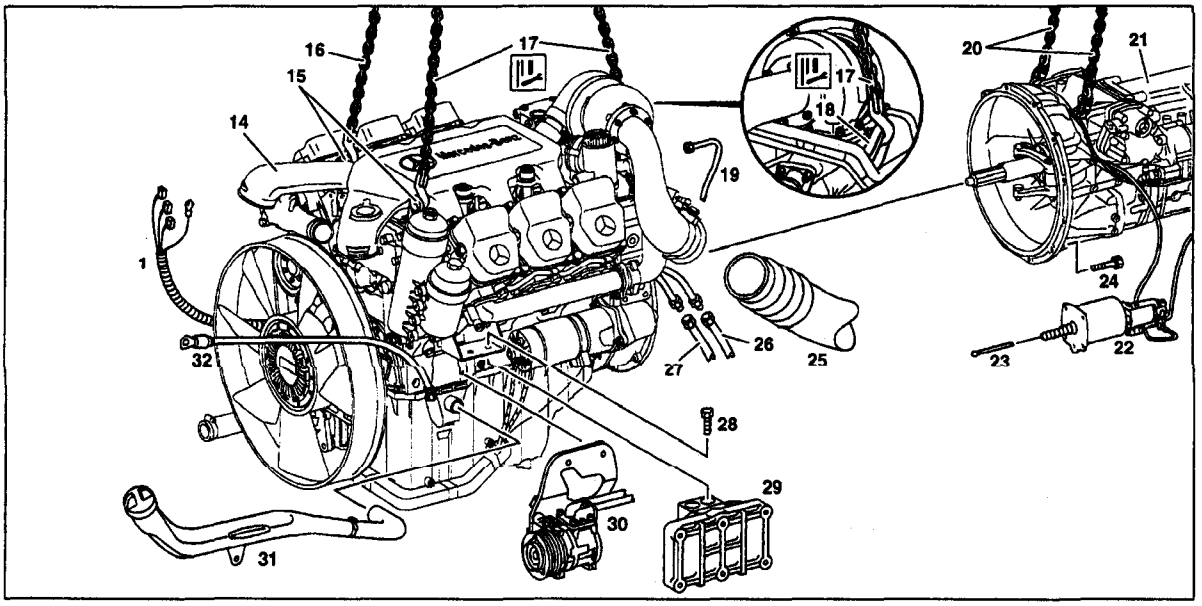
6 Coolant pipe (retarder)
7 ATF pipes
8 Air intake manifold
9 Coolant pipe (retarder)
10 Starter cables
11 Ground cable (starter)
12 Hydraulic steering fluid delivery pipe
13 Hydraulic steering fluid return flow pipe

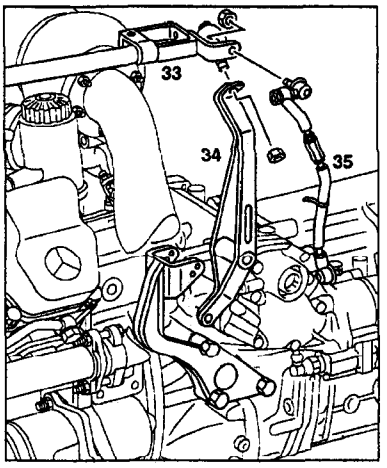
M1 Starter



W01.10-0005-09

1 Engine wiring harness
14 Engine
15 Front lifting eyes
16 Chain block
17 Engine hoist
18 Rear lifting eyes
19 Compressed air pipe (compressor)
20 Chain tackle or steel rope tackle
21 Transmission
22 Clutch servo unit
23 Plunger
24 Bolt
25 Exhaust pipe
26 Compressed air pipe (constant throttle)
27 Compressed air pipe (engine brake)
28 Bolt
29 Engine mount
30 Refrigerant compressor (air conditioning)
31 Oil filler guide
32 Dipstick guide tube

33 Selector linkage (MPS transmission)
34 Relay lever (MPS transmission)
35 Linkage (MPS transmission)
36 Direction of rotation



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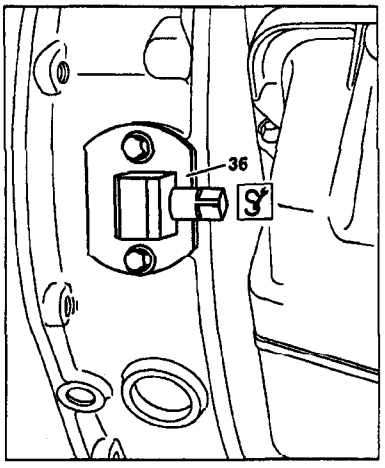


W01.10-0009-02

Modification notes

6.2.97	Inspecting four-circuit protection valve for coking added	Step 17	**Page 12**
	Tightening torque for engine mounts added	Step 27	
	If a reconditioned engine or a new PLD control unit is installed, the vehicle keys have to be reprogrammed	Step 37	
	Inspecting engine oil level with electric display	Step 43 modified	
29.6.98	Enter engine number in FDOK after replacing engine	Step 45 added	

	Removing, installing		
Ⓟ **Installation**	Replace all self-locking nuts and bolts		
1	Disconnect battery		
2	Open maintenance flap		
3	Take off cover at cab - chassis connection point (2)	ⓘ Installation: cover at cab - chassis connection point must be closed tight	
4	Separate cable (red) (1.2) and connectors (1.1) at cab - chassis connection point (2). Unclip engine wiring harness (1) and place down	Ⓟ Do not damage engine wiring harness (1)	
⚠ **Danger**	Risk of injury from bruises and jamming when tilting cab	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 18**
5	Tilt cab		
Ⓟ	Notes on tilting cab	Model 950, 952, 953, 954	**Page 18**
6	Detach air cleaner housing over engine (14) and remove bracket at front left lifting eye (15)	ⓘ Only for plate-type air filter	
7	Remove noise encapsulation at top, rear, on left and right		
8	Remove trim panel over transmission		
9	Remove radiator		AR20.20-W-3865B
10	Detach engine wiring harness (1) at fixture and frame and tie up at engine	If warm water auxiliary heater fitted, remove heater unit	
11	Separate connectors (1.3, 1.4) of engine wiring harness (1) at transmission holder	ⓘ If EPS transmission, retarder and PTO fitted	
12	Remove air intake manifold (8) at turbocharger		
13	Separate compressed air lines (26, 27) of engine brake and constant throttle and detach bracket at transmission		
14	Remove exhaust pipe (25) at engine brake flap connection	ⓘ Installation: clean sealing surfaces and inspect clip for wear; replace clip if necessary	
15	Remove shift linkage (33) between shift lever and relay lever (34)	ⓘ Only with MPS transmission	
16	Remove relay lever (34) at transmission	ⓘ Only with MPS transmission	

17	Unbolt compressed air line (19) at compressor and inspect for coking	ℹ If coking present, it is then necessary to additionally inspect compressed air line between compressor and compressed air drier with integrated pressure regulator (3) and the 4-circuit protection valve. Replace coked parts. ℹ Installation: inspect compressed air line for leaks	
18	Tie up oil filler line (31) and dipstick guide tube (32) at engine		
19	Release poly V-belt and take off	ℹ Only on vehicles with AC	AR13.25-W-3200B
20	Detach AC compressor (30) with bracket at engine	ℹ Only on vehicles with AC. Do not separate refrigerant lines. Nm Supporting bracket of AC compressor to crankcase Nm Support to fixture of AC compressor and supporting bracket of generator	 BA01.40-N-1012-01D BA83.55-N-1002-01C
21	Separate starter cable (10) and ground cable (11) at starter (M1)		
22	Detach cables (10, 11) at timing case		
23	Remove clutch servo unit (22) at transmission and tie up at frame	Do not separate hydraulic line and compressed air line	
24	Pull plunger (23) out of the release lever of the clutch	ℹ Installation: grease head of plunger	BR00.45-Z-1001-06A
25	Separate ATF lines (7)	ℹ Collect ATF which flows out	
26	Separate coolant lines (6, 9) at transmission and retarder	ℹ Collect coolant which flows out	
27	Unscrew bolts (28) at both engine mounts (29)	Nm Engine support to engine mount	BA22.10-N-1004-01D
⚠ Danger	Risk of explosion from ignition. Risk of poisoning from inhaling and swallowing fuel. Risk of injury as a result of fuel coming into contact with skin and eyes.	No fire, naked flame or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**Page 19**
28	Separate fuel feed line at fuel tank and fuel lines (4, 5) at connection points in the frame longitudinal member and seal	Collect fuel which flows out ℹ Installation: pay attention to marking of fuel lines	
29	Separate steering fluid pressure line (12) and steering fluid return flow line (13)	ℹ Collect hydraulic fluid which flows out	
30	Attach transmission (21) or support		
31	Unscrew bolts (24) at transmission housing (21)		
32	Attach engine hoist (17)	Attach engine hoist to one of the front lifting eyes (15) and to the rear lifting eye (18); attach additionally with chain block and second front lifting eye (15) and secure engine (14) to prevent it tipping	WH58.30-Z-1001-07A
33	Separate engine from transmission	ℹ Installation: if the splines of the clutch plate and the transmission shaft are not aligned when fitting together engine and transmission: ↓	

		Attach cranking device (35) for starter ring gear at timing case. Rotated starter ring gear sufficiently so that the internal splines of the clutch are aligned with the splines of the input shaft. Ⓟ Remove cranking device (35) before starting the engine. S Nm Cover of TDC inspection hole at timing case	 407 589 00 63 00 BA01.60-N-1001-01B
34	Lift out engine	i Installation: lightly grease transmission shaft. Lift engine into frame and align so that the clutch plate is lined up with transmission shaft	BR00.45-Z-1001-06A
35	Inspect engine mounts (29) for wear	i If wear present ↓ Replace engine mounts Nm Engine mount to frame	 BA22.10-N-1006-01D
36	Remove clutch	i If wear present ↓ Replace clutch	 AR25.10-W-0050B
37	Install in reverse order	i If an exchange engine or only a new PLD control unit is fitted, the vehicle keys have to be relearned	AR80.57-W-0010A
38	Fill brake system of vehicle with compressed air	i Fill brake system from external source up to governed pressure at tire inflation connector of pressure regulator (3)	
39	Bleed brake system		**Page 19**
⚠ **Danger** 40	**Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.** Start engine	Secure vehicle to prevent it starting off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts. Ⓟ Crank engine with starter for not more than 20 seconds. Wait about 2 minutes before repeating attempt at starting.	**Page 20**
41	Inspect oil pressure when engine idling	Ⓟ Do not rev up engine (14) so long as no oil pressure is indicated. i The oil pressure gage should indicate oil pressure after about 10 seconds.	BE18.00-N-1001-01D
42.1	Check engine oil level at electric gage	i Only if oil level sensor is parameterized. See ACTROS operating insctructions part 3	
42.2	Check engine oil level with dipstick	i If oil level sensor is not parameterized. See ACTROS operating insctructions part 4	
43	Switch off engine and inspect for leaks		
44	Check coolant level		AP20.00-W-2010A
45	Enter engine number in FDOK screen 1111	i Only if exchange engine is fitted	

Test data engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idling speed	min. bar	0.5	0.5
		maximum speed	min. bar	2.5	2.5

Crankcase, timing case cover, end cover

Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1012-01D	Carrier of refrigerant compressor/ hydraulic pump/frigoblock to crankcase	Nm	160	160

Timing case

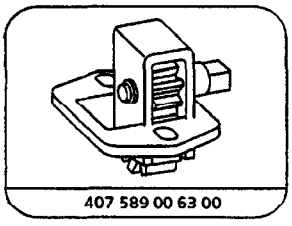
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-018	End cover of TDC inspection hole to timing case	Nm	25	25

Engine mounts, engine support

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA22.10-N-1004-01D	Engine support to engine mount	front	Nm	330	330
		rear	Nm	330	330
BA22.10-N-1006-01D	Engine mount to frame	front	Nm	150	150
		rear	Nm	150	150

Refrigerant compressor

Number	Designation		Model 950	Model 952	Model 953	Model 954
BA83.55-N-1002-01C	Support to fixture of refrigerant compressor/frigoblock and generator carrier	Nm	50	50	50	50



Cranking device

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1001-07A	Engine hoist (self-locking)	Bäcker Herderstraße D-42853 Remscheid	3188

Repair products

Number	Designation	Order number
BR00.45-Z-1001-06A	MB longlife grease	000 989 63 51

Bearbeitungsvermerk

Datum	*Ersteller*	*Vermerk*	*Seite*

AS60.80-Z-0001-01A	Injury hazard from pinching and crushing when cab is tilted	When tilting ensure that no one is present in the tilting area of the cab. Always tilt cab to end position and secure with safety brace.	⚠ Danger!

Injury hazard

A damaged tilting mechanism or improper handling of the tilting mechanism can lead to severe injuries when tilting the cab.

Rules of behavior/protective measures

Before tilting cab:

- Shut off engine.
- Apply parking brake.
- Secure vehicle against rolling.
- On vehicles with manual transmission move shift lever to neutral position.
- On vehicles with automatic transmission move selection lever to position "N".

When tilting cab:

- Protect tilting area and particularly tilting device against unauthorized access, e.g. by blocking off or with human guard.
- Attach safety cable before tilting when so specified in the vehicle operating instructions.
- Never work under cab when partially tilted.
- Always tilt cab to end position and secure with safety brace.

AH60.80-N-0003-01A	Notes on tilting the cab	Models 673,674, 675, 676, 677, 678, 679, 950, 952, 953, 954, 957, 970, 971, 972, 973, 974, 975, 976	Ⓑ

Before tilting the cab

- Switch off engine
- Apply parking brake
- Secure vehicle to stop it rolling away
- Remove all loose objects (e.g. cans, bottles, tools, bags etc.) from the cab
- On vehicles with manual transmission move shift lever to neutral position
- Model 957: release steering column and open front flap

On vehicles with a refrigerator box

- The refrigerator box must be switched off before the cab is tilted.
- The refrigerator box may only be switched on 10 minutes after tilting the cab back again.

  ⓘ Also refer to the refrigerator box manufacturer's Operating Instructions and the red information plate on the refrigerator box.

The coupling pin must be inserted correctly.

ⓘ Always tilt cab up to its final position.

AS47.00-Z-0001-01A	**Risk of explosion from ignition of fuel, risk of poisoning if fuel is inhaled or swallowed and risk of injury if skin or eyes come into contact with fuel**	**Fire, the creation of sparks, naked lights and smoking prohibited. Only pour fuels into containers which are suitable and are correspondingly marked. Wear protective clothing when handling fuels.**	**⚠ Danger!**

Potential dangers

Risk of explosion, poisoning and injury
Fuels are highly flammable and are poisonous if swallowed. Fuel can cause damage to the skin. Contact with gasoline fuel, for example, removes the skin's natural oils. Fuel vapors are explosive and invisible, and spread out along the floor. They are poisonous if inhaled and can cause unconsciousness in high concentrations.

Protective measures/rules for handling fuels
- Observe local national safety regulations.
- Fire, the creation of sparks, naked lights and smoking forbidden.
- Make sure that the work area is sufficiently well ventilated.
- Never drain or add fuels over workshop pits.
- Always put drained fuel into containers which are suitable and can be properly closed off.
- Immediately remove any fuel which has been spilt.

Working on the vehicle using a naked flame
(e.g. when welding etc.).
- Before carrying out such work, remove the relevant parts of the fuel system and seal off open fuel lines with plugs.

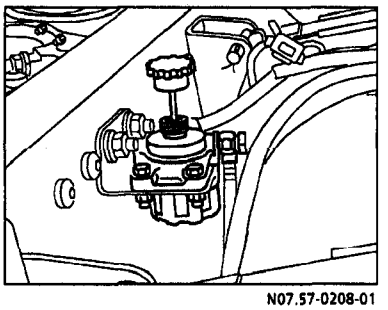
First aid measures
- Wash any fuel from skin using soap and water.
- Change out of clothing on which fuel has been spilt as soon as possible.
- If fuel is splashed into the eyes, rinse out the eyes immediately with water; consult a doctor if appropriate.

AP47.00-W-1720-01A	Bleeding air in fuel system		

1 Loosen handle on manual pump.

2 Actuate manual pump until overflow valve opens audibly.

3 Tighten handle on manual pump.



N07.57-0208-01

AS00.00-Z-0005-01A	Risk of accident as a result of vehicle starting off when engine is running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it from moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	⚠ Danger!

Possible dangers

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 and 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").

Risk of injury
Severe injuries may be caused by freely rotating parts in the area of the running engine. The heat produced by the engine when it is operating can result in severe burns if contact is made with individual, unshielded parts.

Rules of conduct / Protective measures
- As a general rule, carry out work on the running engine only if this is absolutely essential.
- Before starting the engine, apply parking brake.
- On models with manual transmission, move gearshift lever into Neutral position.
- On models 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.
- Take off any jewelry, such as chains, rings etc.
- If you have long hair, wear a suitable head cover.
- Before commencing work on the running engine, check to obtain a general picture of the positioning of parts which may be hot.
- When carrying out work when starting the engine or when engine is running, do not touch any hot and rotating 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.
- Immediately consult a physician.

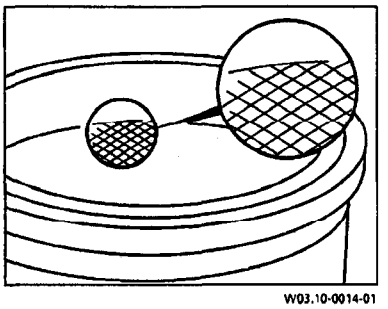
AR01.00-W-0001A	Inspecting engine for dust damage	30.11.95

ENGINE 904 /, 906, 541, 542

⛶	**Removing**		
🛈	If the oil consumption is high or if the engine fails, it is often not clear whether dust damage or normal wear and tear exists		
1	Remove pistons	Engine 904, 906 Engine 541, 542	AR03.10-W-7021A **Page 75**
◁	**Inspecting**		
2	Inspect intake tract between air cleaner and engine for dust deposits	🛈 Severe dust deposits in the elbows of the intake pipes and hoses are a reliable indication of dust damage. A very fine film is permissible on engines with oil bath air cleaner.	
3	Inspect pistons and cylinder wall for wear (dust damage)	🛈 The wear patterns of the stems of the pistons and the honing patterns of the cylinders make it possible to recognize damage caused by severe dust deposits. If wear exists ↓ Install new cylinder liner Engine 904, 906 Replace cylinder liner Engine 541, 542 Replace piston, engine 904, 906 Replace piston, engine 541, 542	 AR01.40-W-9273A **Page 53** AR03.10-W-7021A **Page 75**
🛈	Notes for assessing wear of cylinder walls in the case of dust damage	Engine 541, 542, 904, 906	**Page 21**
🛈	Notes for assessing wear of pistons in the case of dust damage	Engine 541, 542, 904, 906	**Page 22**

AH01.40-N-0001-01A	Notes for assessing wear of cylinder wall if dust damage present	Engines 904, 906, 541, 542	🛈

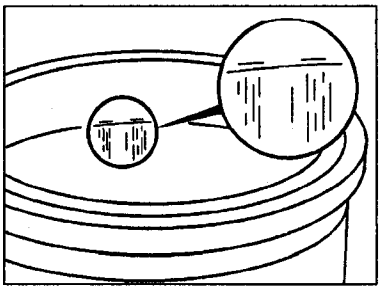
Cylinder walls and cylinder liners without dust damage
The honing is more or less clearly visible on the entire contact surface. The honing may be partially worn at the reversal point of the first piston ring.



W03.10-0014-01

Additional Information

Cylinder walls and cylinder liners with dust damage
The traces of machining from honing are only very faintly visible or not at all. If the wear is well advanced, a wear step can be felt at the reversal point of the first piston ring.

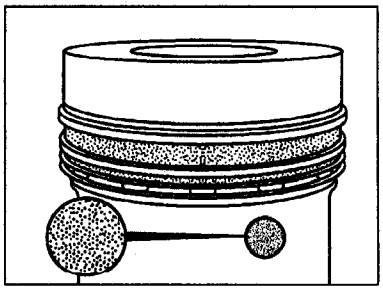


W03.10-0015-01

ⓘ
Dust damage is caused by poor sealing, splits, chafing damage of the intake lines, seals and hoses.
When carrying out repair and service work, make a careful inspection of intake lines, seals and hoses, also at points not easily accessible.

AH03.10-N-0001-01A	Notes for assessing wear to pistons in the case of dust damage	Engine 541, 542, 904, 906	ⓘ

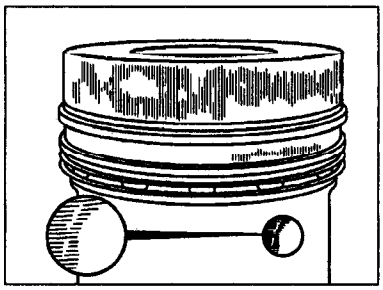
Pistons without dust damage
The contact surface of the piston stem is visible over a large area and the machining grooves can still be recognized within this area.



W03.10-0012-01

ⓘ
The machining grooves at the circumference are intentional recesses which are filled with oil and contribute to better lubrication.

Pistons with dust damage
The contact pattern at the stem has a mat (pumiced) appearance and the machining grooves are completely worn away within the contact surface. In the advanced stage of wear, slight traces of seizure are already present on the stem and the piston rings are sharp-edged.

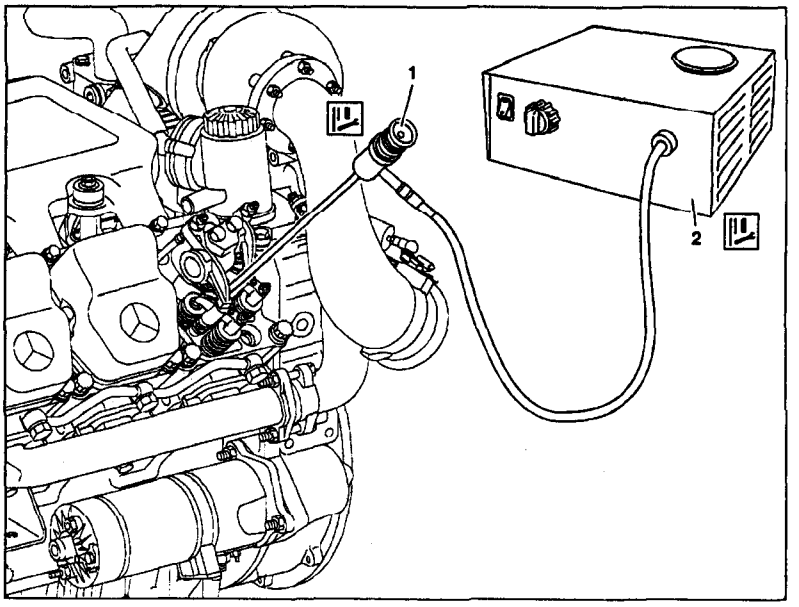


W03.10-0013-01

AR01.00-W-0200B	Inspecting cylinders with light probe	5.7.96

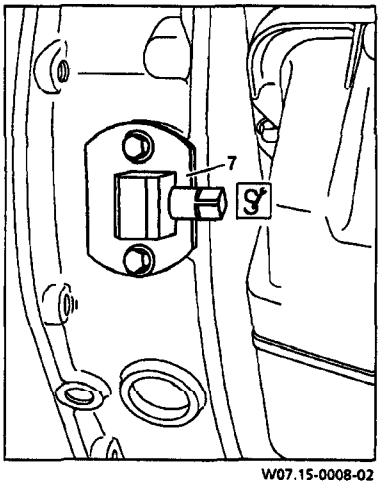
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Test probe
2 Cylinder inspection light



W01.00-0014-06

7 Cranking device



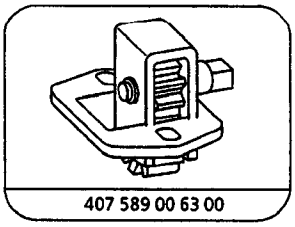
W07.15-0008-02

	Testing		
1	Attach cranking device (7) to timing case	Cranking device should be removed before starting the engine. End cover to timing case	 407 589 00 63 00 BA01.60-N-1001-01B
2	Remove nozzle holder combination		AR07.03-W-6831B
3	Rotate crankshaft with the cranking device	Position piston of cylinder to be inspected to BDC	

4	Connect cylinder inspection light (2) and insert test probe (1) through the protective sleeve bore into the cylinder	Cylinder inspection light Connection of cylinder inspection light, see operating instructions of equipment manufacturer.	WH58.30-Z-1028-05A
5	Inspect cylinder barrel and piston pin	Cylinder barrels must not have any scorch streaks and fretting streaks. Isolated minor drawing grooves are not critical. Inspect condition of piston crown, if necessary ↓ Remove cylinder head.	**Page 21** **Page 32**
6	Inspect remaining cylinders in the same way		
7	Install in the reverse order		

Nm Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover of TDC inspection hole to timing case	Nm	25	25



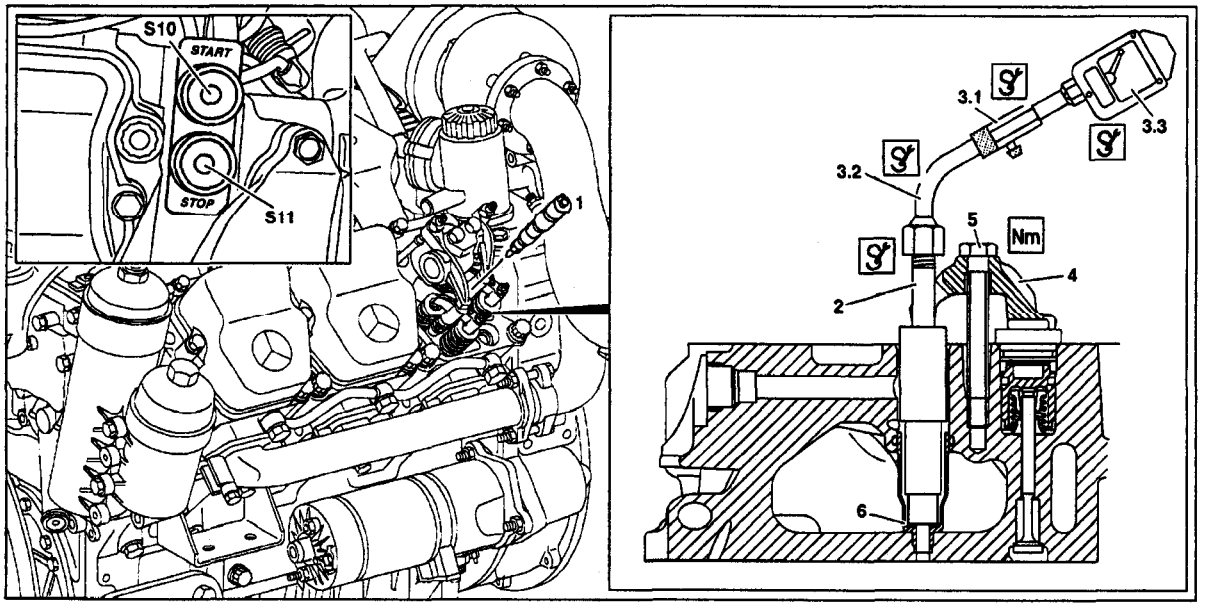
407 589 00 63 00

Turning device

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1028-05A	Cylinder inspection light Motoskop TW (dichroic light) with lens probes 103 26 CW (570 mm) and 103 26 CT (210 mm)	Karl Storz GmbH D-78532 Tuttlingen	

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W01.00-0015-09

1 Nozzle holder combination
2 Connection piece
3.1 Compression recorder
3.2 Angled connection
3.3 Diagram sheet
4 Tensioning clamp
5 Bolt
6 Seal
S10 Start switch
S11 Stop switch

	Removing		
⚠Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	**Page 20**
1	Set valve clearance	Carry out setting only when engine is cold, or thoroughly warmed through. Wait at least 30 minutes after switching off engine.	AP05.30-W-0560A
2	Warm engine up to operating temperature	Coolant temperature approx. 70 to 95 °C	
3	Remove nozzle holder combination (1)		AR07.03-W-6831B
4	Install connection piece (2) with seal (6) and clamp tight with tensioning clamp (4)	Tensioning clamp of injection nozzle and constant throttle to cylinder head Install tensioning clamp turned through 180°.	BA07.15-N-1003-01B 904 589 01 21 00
5	Crank engine with starter by simultaneously pressing the Start switch (S10) and Stop switch (S11).	Crank engine several times to eliminate combustion residues.	

Additional Information

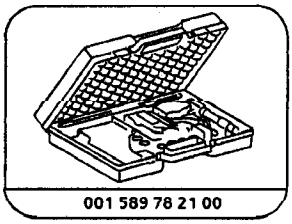
6	Assemble compression recorder (3.1) and angled connection (3.2)	See operating instructions for connecting the compression recorder.	001 589 78 21 00
7	Connect compression recorder (3.1) to the connection piece (2)		001 589 78 21 00 904 589 01 21 00
8	Insert diagram sheet (3.2) into the compression recorder (3.1)		001 589 78 21 00
	Testing		
9	Crank engine with starter by simultaneously pressing the Start switch (S10) and Stop switch (S11).	at least 8 engine revolutions	
10	Test remaining cylinders in the same way		
11	Compare the measurements on the diagram sheet (3.2) with the specified values	Compression pressure at starter speed. Permissible difference between the individual cylinders. If the compression pressure is below the minimum or if the permissible difference between the individual cylinders is exceeded, determine cause and rectify ↓ Detach cylinder head	BE01.00-N-1001-01B BE01.00-N-1002-01B **Page 32**
	Installing		
12	Detach compression recorder (3.1) and connection piece (2) together with seal (6)		
13	Install nozzle holder combination (1)		AR07.03-W-6831B

Test data of compression pressure

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE01.00-N-1001-01B	Compression pressure at starter speed	bar	≥28	≥28
BE01.00-N-1002-01B	Permissible difference between the individual cylinders	bar	≤4	≤4

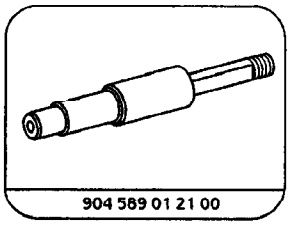
Diesel injection system with unit pumps (MR/PLD)

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BA07.15-N-1003-01B	Tensioning clamp of injection nozzle and constant throttle to cylinder head	Nm	50	50



001 589 78 21 00

Compression recorder



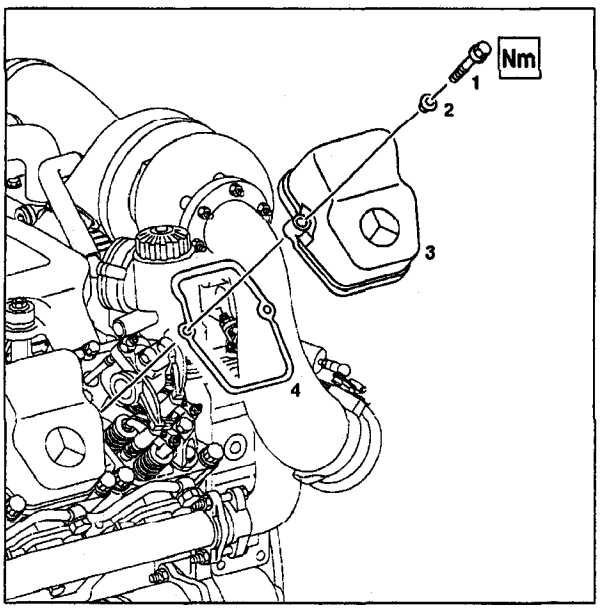
904 589 01 21 00

Connector

AR01.20-W-5014B	Removing, installing cylinder head cover	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Bolt
2 Seal
3 Cylinder head cover
4 Gasket



W01.20-0003-12

Modification notes

6.2.97	Tightening torque of cylinder head cover modified	Step 2	**Page 28**

	Removing, installing		
⚠ **Danger!** 1	**Risk of injury from bruises and jamming when tilting cap** Tilt cab	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 18**
Ⓘ 2	Notes re tilting cab Unscrew bolts (1)	Models 950, 952, 953, 954 **i** Installation: replace seals (2) Nm Cylinder head cover to cylinder head	**Page 18** BA01.20-N-1001-01C
3	Take off cylinder head cover (3)	**i** Installation: clean sealing surfaces and replace gasket (4)	
4	Install in the reverse order		

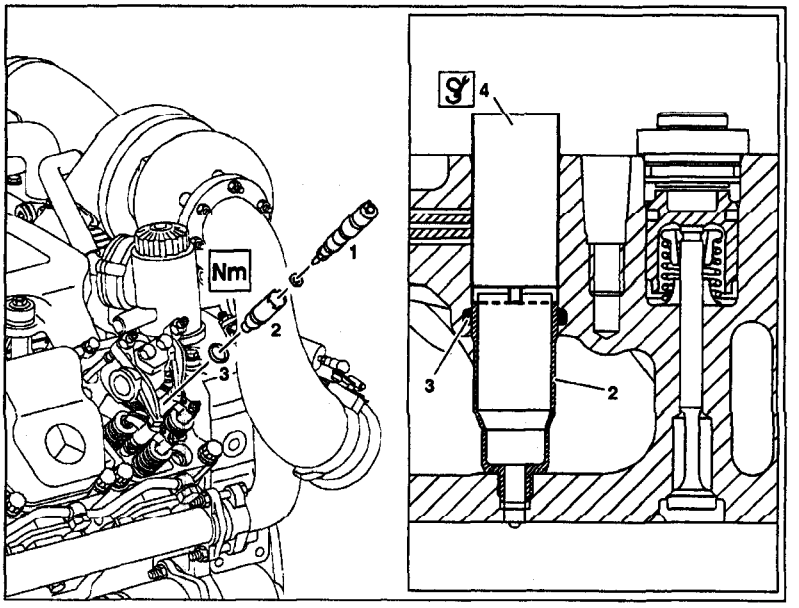
Nm **Crankcase ventilation, cylinder head cover**

Number	Designation	Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.20-N-1001-01C	Cylinder head cover to cylinder head Nm	20	20

AR01.30-W-5461B	Removing, installing protective sleeve	5.2.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Nozzle holder combination*
2 *Protective sleeve*
3 *O-ring*
4 *Pronged wrench*

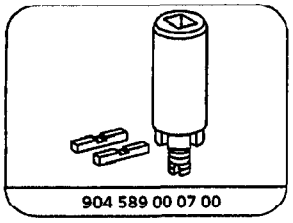


W01.30 0012-06

	Removing, installing		
Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	Page 30
1	Drain coolant	Collect coolant.	AP20.00-W-2080A
	Notes on coolant	All engines	Page 31
2	Remove nozzle holder combination (1)		AR07.03-W-6831B
3	Use pronged wrench (4) to remove protective sleeve (2)	Installation: clean sealing surfaces of the protective sleeves and of the cylinder head. Nm Protective sleeve to cylinder head	904 589 00 07 00 BA01.30-N-1001-01D
4	Remove O-ring (3) from the cylinder head	Installation: replace O-ring and coat with acid-free grease.	BR00.45-Z-1018-06A
5	Install in the reverse order		

Nm Cylinder head

	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.30-N-1001-01D	Protective sleeve to cylinder head	Nm	40	40



Pronged wrench

Repair products

Number	Designation	Order number
BR00.45-Z-1018-06A	ATE grease	-

AS20.00-Z-0001-01A	**Risk of injury to skin and eyes from scalding from hot coolant which splashes out..Risk of poisoning from swallowing coolant.**	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	⚠ **Danger!**

Possible dangers

Risk of injury
The cooling system is pressurized when the engine is warm. **Risk of scalding from hot coolant which splashes out if the cooling system is opened suddenly.**

Risk of poisoning
If coolant is swallowed, the person affected is likely to show signs of poisoning such as headaches, giddiness and stomach aches, paralysis of the respiratory system, unconsciousness, nausea, and convulsions.

Protective measures/rules of conduct
- Allow cooling system to cool down to a coolant temperature of less than 90 °C.
- Open coolant system cap slowly; open a conventional type of coolant system cap to the first detent and open a screw-type coolant system cap about $^1/_2$ turn, and allow the pressure to release.
- Wear protective gloves, protective clothes, and eye protection.
- Do not pour coolant into containers for drinks.

First aid measures
- Pour large quantities of cold water over the affected area of skin and cover over with sterile bandages.
- Have person affected drink plenty of water to which medicinal carbon has been added.
- Consult a doctor if the person affected has severe burns or has swallowed considerable quantities.

AH20.00-N-2080-01A	Instructions re coolant		

Coolant composition
Passenger car and commercial vehicle engine (normal case):
50 % by volume water and
50 % by volume anticorrosion/antifreeze agent.
See **MB Specifications for Service Products** for differing coolant composition for commercial vehicle engines.

Purposes of anticorrosion/antifreeze agent
- Corrosion and cavitation protection for all components in the cooling system
- Antifreeze protection
- Increasing boiling point so that the coolant does not evaporate so rapidly. Ejection of coolant is avoided at high coolant temperatures.

Antifreeze protection
50 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. **–37 °C**.
A higher concentration is only practical at even lower ambient temperatures.
55 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. **–45 °C**.

Ⓟ **Before pouring fresh coolant into the system, flush the used** coolant out of the cooling system. Clean cooling system if severe soiling or oil contamination exist.

Ⓟ A concentration of anticorrosion/antifreeze agent higher than 55 % by volume should not be used as the maximum antifreeze protection is thus reached. An even higher concentration again reduces the antifreeze protection and impairs heat dissipation.

Water
Use water which is clean and not too hard. Drinking water frequently, but not always, satisfies the requirements. The contents of dissolved substances in the water can be of importance for the occurrence of corrosion. In cases of doubt, analyze the water. See **MB Specifications for Service Products** for fresh water regulations.

Operation of monitoring of coolant
Inspect coolant for resistance to low temperatures before the start of the cold season of the year.
In countries with high ambient temperatures, inspect the anticorrosion/antifreeze concentration once a year.
The corrosion protection in the coolant is reduced during operation. Such coolants have a severely corrosive effect.
The maximum permissible period of use of the coolant is for passenger car and commercial vehicle engines (normal case) 3 years.
See MB Specifications for Service Products for the period of use for differing coolant composition for commercial vehicle engines.

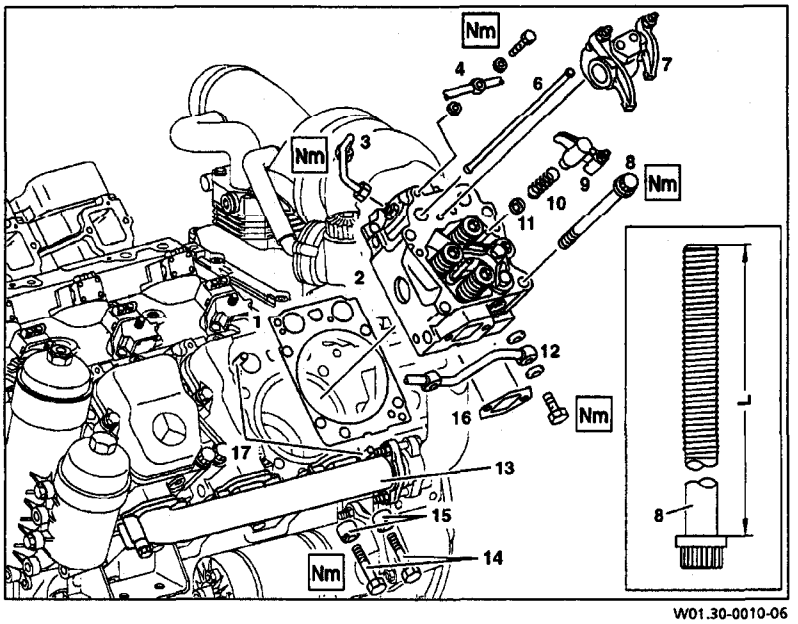
Disposing of coolants
Observe legal regulations and local wastewater regulations.
For workshops located in the Federal Republic of Germany see:
"Umweltschutz-Handbuch für Kfz-Reparaturbetriebe"
(Environmental protection manual for vehicle repair workshops)
Publisher: Verband der Automobilindustrie e.V. (VDA)
D-60625 Frankfurt am Main, Westendstraße 61

AR01.30-W-5800B	Removing, installing cylinder head	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Cylinder head gasket
2 Cylinder head
3 Injection pipe
4 Leak fuel pipe
6 Tappet rod
7 Rocker arm assembly
8 Cylinder head bolt
9 Valve bridge
10 Spring
11 Packing
12 Decompression brake pipes
13 Exhaust manifold with turbocharger
14 Bolts
15 Tensioning sleeves
16 Exhaust manifold gasket
17 Centering sleeves

L Shank length of cylinder head bolt



W01.30-0010-06

Modification notes

6.2.97	Tightening torques of cylinder head bolts modified	Step 11	**Page 32**
	Checking engine oil level with electric indication	Step 22 modified	

	Removing, installing		
⚠ **Danger!**	**Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant**	**Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.**	**Page 30**
1	Drain coolant	Collect coolant	AP20.00-W-2080A
Ⓑ	Notes re coolant	All engines	**Page 31**
2	Remove charge air housing		AR09.41-W-8681B
3	Remove noise encapsulation on right or left		
4	Detach leak fuel pipe (4) at cylinder head (2)	ℹ Installation: replace seals Nm Air pipe of constant throttle to cylinder head	BA01.30-N-1003-01D
5	Remove injection pipes (3)		AR07.15-W-9235B
6	Detach constant throttle pipes (12) at cylinder head (2)	ℹ Installation: replace seals	
7	Disconnect exhaust manifold (13) at cylinder head (2)	On engine 541.920- 927 ℹ Detach exhaust manifold at the remaining cylinder heads	AR14.10-W-3915B

		On engine 542.920- 923/925/926 [i] Detach exhaust manifold at the remaining cylinder heads	AR14.10-W-3915C
8	Remove rocker arm assembly (7)		AR05.00-W-5521B
9	Take off valve bridge (9), springs (10) and packing (11)	Ⓟ Mark valve bridge relative to the valves. If the valve seat rings in the cylinder head or the valves have been machined, it is then necessary to set the valve bridges when removed.	
10	Remove tappet rods (6)	[i] Rotate tappet rods when pulling out so that they are detached in the roller tappet and the roller tappet is not pulled out of the crankcase. Installation: oil tappet rods with engine oil and ensure they are correctly installed in the roller tappet.	
11	Unscrew cylinder head bolts (8)	[S] Ⓟ It is necessary to maintain all the tightening torque stages to ensure even compression of the cylinder head gasket [i] Installation: oil cylinder head bolts with engine oil. Pay attention to tightening instruction for cylinder head bolts. [Nm] Cylinder head bolts to crankcase	422 589 02 09 00 **Page 35** BA01.30-N-1002-01D
12	Take off cylinder head (2)	Ⓟ Place down cylinder head to the side so that the installed nozzle holder combination is not damaged. [i] Installation: fit cylinder head over the centering sleeves (17)	
13	Take off cylinder head gasket (1)	[i] Seal oil and coolant bores and crankcase. Clean and inspect crankcase contact surface. [i] Installation: fit new cylinder head gasket over the centering sleeves (17) onto the face of the crankcase. Pay attention to installation position of cylinder head gasket.	
14	Take off exhaust manifold gasket (16)	[i] Installation: replace exhaust manifold gasket [◁] Inspect exhaust manifold gasket at the remaining cylinder heads, if necessary ↓ remove exhaust manifold (13) and replace exhaust manifold gasket On engine 541.920 - 927 On engine 542.920 - 923/925/926	 AR14.10-W-3915B AR14.10-W-3915C
15	Clean threaded, oil and coolant bores in the crankcase		
	Inspecting		
16	Measure length of shank of cylinder head bolts (8)	If the maximum shank length (L) has been exceeded, replace cylinder head bolt	BE01.30-N-1001-01C
17	Clean cylinder head (2) and inspect for cracks and damage	[i] If problem exists ↓	

		replace cylinder head	
18	Inspect contact surface of cylinder head (2) for distortion	If distortion exists ↓ face cylinder head contact surface	BE01.30-N-1002-02C **Page 37**
19	Inspect seat of roller tappets in crankcase		
20	Install in the reverse order		
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	**Page 20**
21	Start engine and check oil pressure gage at idling speed	Crank engine with the starter for not more than 20 seconds. Wait about 2 minutes before making a repeat attempt at starting. Do not rev up engine until oil pressure is indicated. Oil pressure gage should indicate pressure after about 10 seconds.	BE18.00-N-1001-01D
22.1	Check engine oil level with electric gage	Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
22.2	Check engine oil level with dipstick	If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
23	Switch off engine and check for leaks		
24	Inspect coolant level		AP20.00-W-2010A

Test data of cylinder head bolts

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/ 923/925
BE01.30-N-1001-01C	Cylinder head bolts	shank length when new	mm	210	210
		max. shank length	mm	212	212

Test data of cylinder head

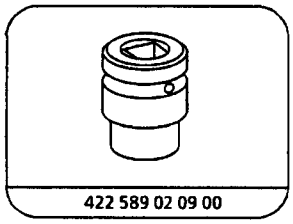
Number	Designation			Engine 541.920/921/922/923/ 924/925/926/927 542.920/921/9
BE01.30-N-1002-02C	Permissible difference of flatness of bottom contact surface in longitudinal direction	over a length of	mm	≤0.015

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idling speed	min. bar	0.5	0.5
		max. speed	min. bar	2.5	2.5

Cylinder head

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.30-N-1002-01D	Cylinder head bolts to crankcase	1st stage	Nm	10	10
		2nd stage	Nm	50	50
		3rd stage	Nm	100	100
		4th stage	Nm	200	200
		5th stage	°∡	90	90
		6th stage	°∡	90	90
		Tightening instructions see		AR01.30-W-5800-07B	AR01.30-W-5800-07B
BA01.30-N-1003-01D	Air pipe of decompression brake to cylinder head		Nm	45	45



422 589 02 09 00

Wrench socket

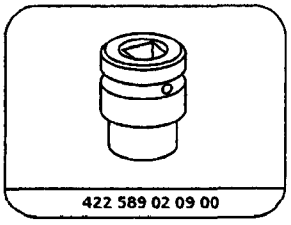
AR01.30-W-5800-07B	Tightening instructions for cylinder head bolts		

Modification notes

6.2.97	Tightening torques of cylinder head bolts modified		AR01.30-W-5800-07B

Cylinder head

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.30-N-1002-01D	Cylinder head bolts to crankcase	1st stage	Nm	10	10
		2nd stage	Nm	50	50
		3rd stage	Nm	100	100
		4th stage	Nm	200	200
		5th stage	∡ °	90	90
		6th stage	∡ °	90	90
		Tightening instructions see		AR01.30-W-5800-07B	AR01.30-W-5800-07B



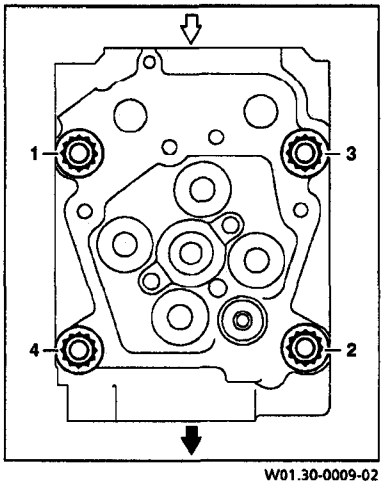
Wrench socket

Use wrench socket to tighten cylinder head bolts.

It is important to observe all the tightening torque stages and to keep to the sequence stated in order to avoid twisting the cylinder head (2); see tightening diagram.

If the tightening torque of a cylinder bolt is exceeded, unscrew the cylinder head bolts, inspect the shank length (replace cylinder head bolt, if necessary) and tighten again, starting with stage 1.

The cylinder head bolts are not re-tightened.



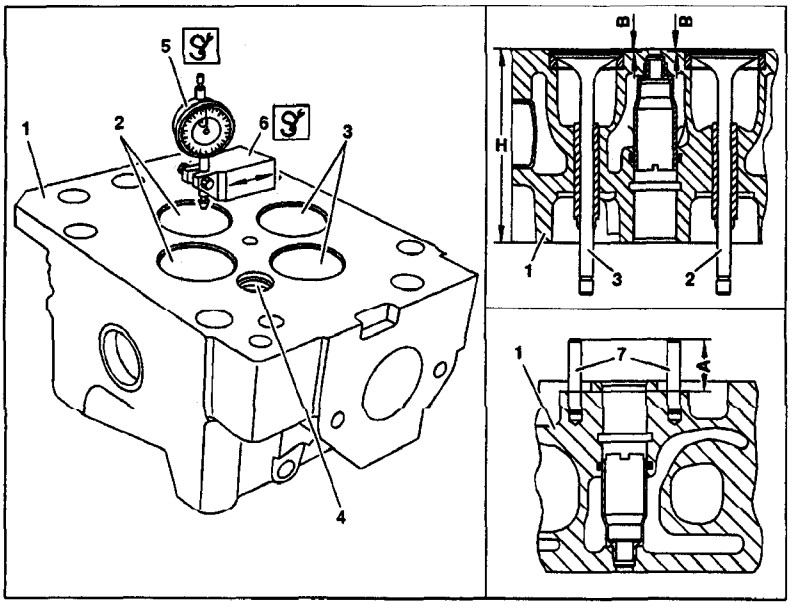
W01.30-0009-02

AR01.30-W-7162B	Checking, facing cylinder head contact surface	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Cylinder head
2 Inlet valve
3 Exhaust valve
4 Decompression brake valve
5 Dial gauge
6 Dial gauge holder
7 Guide pin

A Projection of guide pin
B Amount by which valve stands back
H Height of cylinder head



W01.30-0013-06

Modification notes

6.2.97	Measuring difference in amount by which valve stands back, added	Step 12	**Page 37**

☒	**Removing**		
1	Remove cylinder head (1)		**Page 32**
2	Remove nozzle holder combination		AR07.03-W-6831B
3	Remove valves (2, 3)		AR05.30-W-3511B
4	Remove decompression brake valve (4)		**Page 61**
	Inspecting		
5	Clean cylinder head (1)		
6	Inspect cylinder head contact surface (combustion chamber side) for flatness	Permissible difference of flatness of bottom contact surface in longitudinal direction	BE01.30-N-1002-02C
7	Measure total height of cylinder head (H)	ℹ If the height measured is less than the permissible minimum height (H), replace cylinder head (1)	BE01.30-N-1001-02C
	Machining		
8	Face cylinder head contact surface (combustion chamber side)	ⓘ It is important to maintain the surface quality (surface roughness R_{3z}/peak-to-valley height W_t) of the cylinder head contact surface.	BE01.30-N-1003-02C

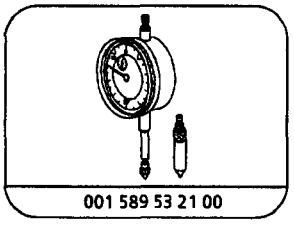
		ⓘ Only machine cylinder head contact surface if measurement reveals impermissible difference of flatness in longitudinal direction or if porous, damaged points exist. The height after stock removal at the cylinder head (1) must not be less than the permissible minimum height (H).	BE01.30-N-1002-02C
9	Clean cylinder head (1)		
	Measuring		
10	Once again measure total height of cylinder head	Height of cylinder head (1)	BE01.30-N-1001-02C
11	Insert valves (2, 3) into the cylinder head	ⓘ Pay attention to marking of the valves (2, 3)	
12	Measure amount by which valve stands back (B) relative to cylinder head contact surface		**Page 39**
		Measure amount by which valve stands back at both inlet and exhaust valves, and note	BE05.30-N-1001-01C
		Permissible difference between both valve pairs must not be exceeded	BE05.30-N-1009-01C
			001 589 53 21 00
			343 589 00 40 00
		ⓘ If the reading obtained is not within the permissible tolerance ↓	
		machine valve seat rings on both inlet or exhaust valve seat ring	AR05.30-W-4511B
	Installing		
13	Install decompression brake valve (4)		**Page 61**
14	Install valves (2, 3)		AR05.30-W-3511B
15	Install nozzle holder combination		AR07.03-W-6831B
16	Install cylinder head		**Page 32**

Test data of cylinder head

Number	Designation			Engine 541.920/921/922/923/924/925/926/927 542.920/921/922/923/925/926
BE01.30-N-1001-02C	Height of cylinder head	when new	mm	113.85–114.15
		after stock removal	mm	≥ 113.5
BE01.30-N-1002-02C	Permissible difference of flatness of bottom contact surface in longitudinal direction	over a length of 150 mm	mm	≤ 0.015
BE01.30-N-1003-02C	Surface quality of cylinder head contact surface	surface roughness R_{3z}	µm	8
		peak-to-valley height W_t	µm	5

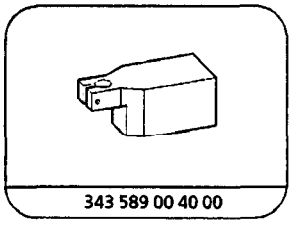
Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-01C	Amount by which valve stands back relative to cylinder head contact surface		mm	0.70–1.05	0,70–1,05
BE05.30-N-1009-01C	Permissible difference in amount by which valve stands back relative to cylinder head contact surface for each cylinder	Inlet	mm	≤0.2	≤0,2
		Exhaust	mm	≤0.2	≤0,2



001 589 53 21 00

Dial gauge



343 589 00 40 00

Dial gauge holder

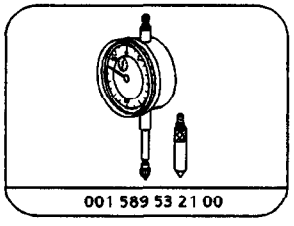
AR05.30-W-4100-01B	Measuring amount by which valve stands back relative to cylinder head		

Modifiction notes

6.2.97	Measuring difference in amount by which valve stands back, added	Step 4 modified	AR05.30-W-4100-01B

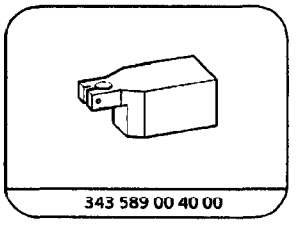
Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-01C	Amount by which valve stands back relative to cylinder head contact surface		mm	0.70–1.05	0.70–1.05
BE05.30-N-1009-01C	Permissible difference in amount by which valve stands back relative to cylinder head contact surface for each cylinder	Inlet	mm	≤0.2	≤0.2
		Exhaust	mm	≤0.2	≤0.2



001 589 53 21 00

Dial gauge



343 589 00 40 00

Dial gauge holder

1 Attach dial gauge (4) to dial gauge holder (5).

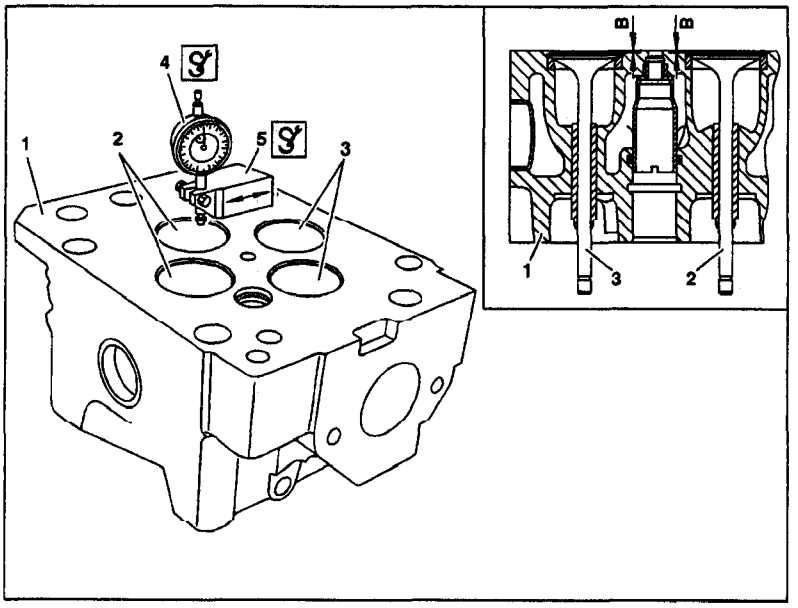
2 Fit dial gauge (4) with preload onto the plane face of the cylinder head (1).

3 Set scale of dial gauge to "0".

4 Move dial gauge (4) sufficiently so that the tracer pin is positioned on the valve disc of the inlet valves (2) or of the exhaust valves (3).

i

Measure amount by which valve stands back at both inlet and exhaust valves and note. Permissible difference between both valves must not be exceeded.



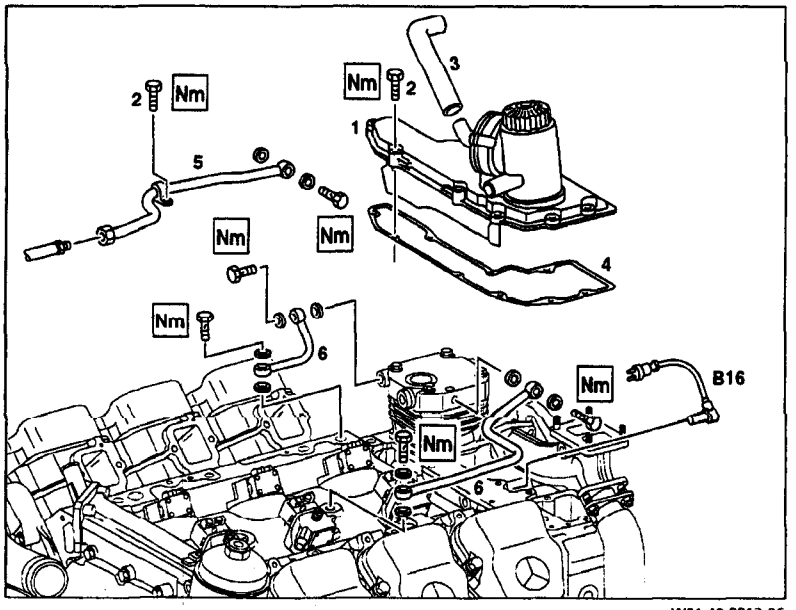
W05.30-0042-06

AR01.40-W-8000A	Removing, installing timing case cover	5.2.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

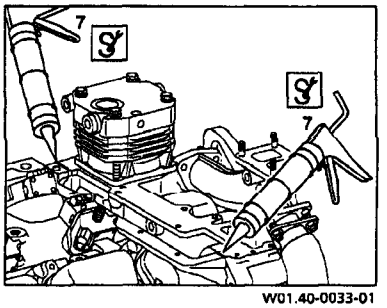
1 Timing case with crankcase breather (oil separator)
2 Bolt
3 Crankcase breather hose
4 Gasket
5 Fuel pipe
6 Coolant pipes

B16 TDC sensor cylinder 1



W01.40-0013-06

7 Hand-held pressure gun



W01.40-0033-01

Modification notes

6.2.97	Sealing timing case and crankcase, added	Step 11	**Page 41**

	Removing		
1	Remove turbocharger		
2	Remove boost air manifold/boost air housing		AR09.41-W-8681B
3.1	Remove boost air pipe	On engine 542.920 - 923/925/926	AR09.41-W-1311B
⚠ Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 30**
4	Drain coolant	ℹ Do not drain coolant completely. Collect coolant.	AP20.00-W-2080A

Ⓑ 5	Notes on coolant Remove both coolant pipes (5) at the compressor and crankcase	All engines ⓘ Collect coolant which flows out. ⓘ Installation: replace seals. Nm Coolant pipe to crankcase Nm Coolant pipe to compressor	**Page 31** BA01.40-N-1005-01D BA13.30-N-1001-01B
⚠ Danger! 6	Fuel vapors present an explosion hazard. Fuel is toxic when inhaled or swallowed. Contact with fuel can cause skin and eye injury. Remove fuel pipe (6)	Fire, open lights and smoking prohibited. Fill fuel only into containers intended for this purpose. Wear protective clothing when handling fuel. ⓘ Installation: replace seals Nm Fuel pipe to fuel pump Nm Screw connection between fuel pipes	**Page 19** BA47.25-N-1002-01B BA47.25-N-1011-01B
7	Remove connector of the camshaft sensor (B16) at the bracket and separate		
8	Separate crankcase breather hose (3) at the crankcase breather (oil separator)		
9	Remove timing case cover (1)	ⓘ Tilt timing case cover slightly when pulling out ⓘ Installation: pay attention to tightening diagram Nm Timing case with oil separator to timing case and crankcase	**Page 43** BA01.40-N-1014-01D
10	Take off gasket (4)	ⓘ Installation: replace gasket.	
11	Clean sealing surfaces at timing case cover (1), timing case and crankcase	ⓘ Installation: seal both joints between timing case and crankcase with sealant S	BR00.45-Z-1026-01A 000 589 01 25 00
12	Install in the reverse order		
13	Check coolant and adjust to correct level		AP20.00-W-2010A

Nm **Crankcase, timing case cover, end cover**

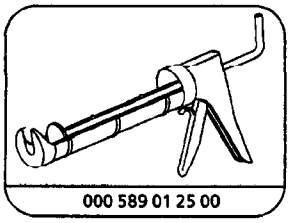
Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1005-01D	Coolant pipe (compressor) to crankcase	M14×1.5	Nm	35	35
BA01.40-N-1014-01D	Timing case cover with oil separator to timing case in crankcase		Nm	25	25

Nm **Compressor (compressed air system)**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1001-01B	Coolant pipe to compressor	Nm	30	30

Nm **Fuel pipes/hoses**

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.25-N-1002-01B	Fuel pipe to fuel pump	M16×1.5	Nm	40	40
BA47.25-N-1011-01B	Screw connection between fuel pipes		Nm	45	45



Hand-pressure gun

Service products for repair

Number	Designation	Order number
BR00.45-Z-1026-01A	Sealant	001 989 29 20

AR01.40-W-8000-02A	Tightening diagram of timing case cover		

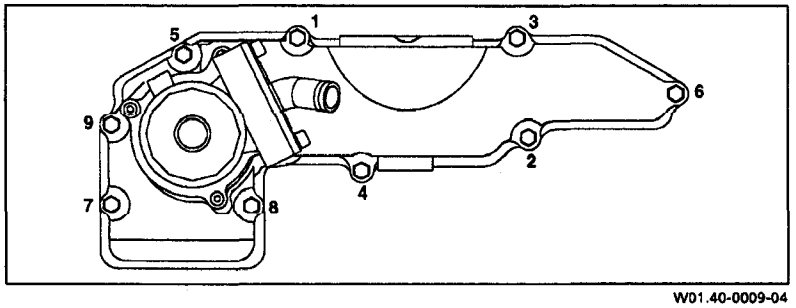
Nm **Crankcase. timing case cover. end cover**

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1014-01D	Timing case cover with oil separator to timing case and crankcase		Nm	25	25

Tighten bolts at timing case cover.

i

Pay attention to tightening sequence; see tightening diagram.

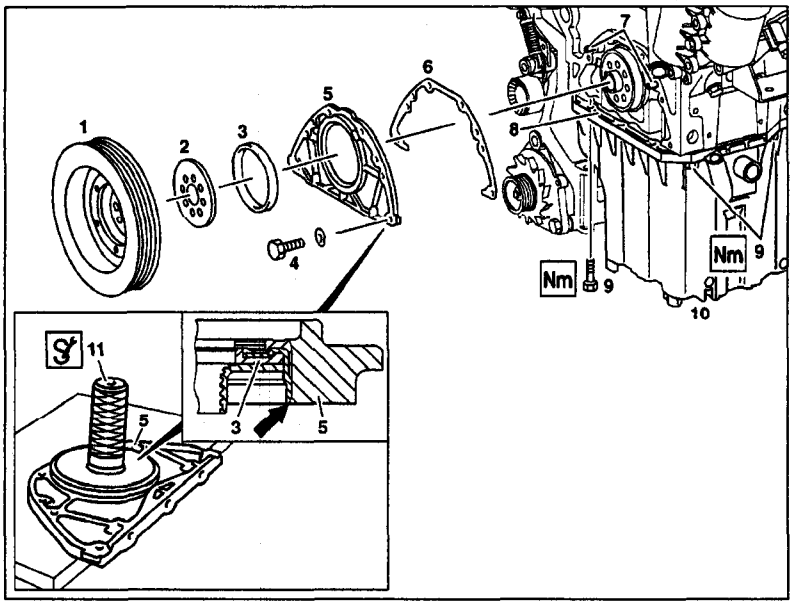


W01.40-0009-04

AR01.40-W-8810A	Removing, installing front radial seal in housing cover	25.3.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

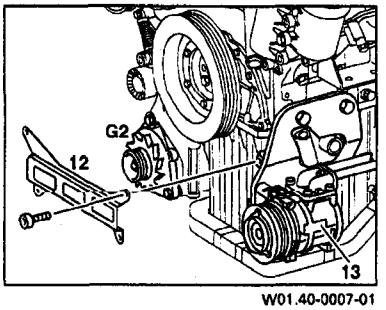
1 Vibration damper
2 Splash ring
3 Radial seal
4 Bolt
5 Housing cover
6 Gasket
7 Dowel pins
8 Gasket
9 Bolts
10 Oil sump
11 Drift



W01.40-0006-06

12 Strut
13 Refrigerant compressor

G2 Generator



W01.40-0007-01

Modification notes

6.2.97	Tightening torque for oil sump bolts modified Checking engine oil level with electric gage	Step 6 Step 12 modified	**Page 44**

	Removing, installing		
1	Remove vibration damper (1)		**Page 100**
2	Take off splash ring (2)		
3.1	Remove connecting strut (12) at generator (G2) and at refrigerant compressor (13)	If air conditioning fitted Nm Support to fixture of refrigerant compressor and generator carrier	BA83.55-N-1002-01C
4.1	Remove refrigerant compressor (13) at crankcase and tie up	If air conditioning fitted i Do not separate refrigerant pipes Nm Carrier of refrigerant compressor to crankcase	BA01.40-N-1012-01D

5	Unscrew front bolts (9) at the sump (10) in the area of the housing cover (5)		
6	Slacken remaining bolts (9) at the oil sump (10) and lower sump (10)	Do not damage gasket (8): If damaged ↓ Remove oil sump and replace gasket (8) Installation: pay attention to tightening diagram. Nm Oil sump to crankcase	 **Page 57** **Page 46** BA01.45-N-1001-01C
7	Take off housing cover (5) and remove gasket (6)	Cover over opening at oil sump Installation: clean contact surfaces. Oil contact surface at crankshaft with engine oil. Replace gasket (6) and fit housing cover over the dowel pins (7) onto the crankcase. Nm Front end cover to crankcase	 BA01.40-N-1009-01D
8	Inspect crankshaft flange at front for signs of wear and scoring produced by the radial seal	If worn ↓ Install race on the crankshaft flange	 **Page 84**
9	Use drift (11) to take radial seal (3) out of the housing cover (5)	Installation: install radial seal into the housing cover dry. Place housing cover down flat on an even surface and install radial seal flush into the housing cover using a drift as a base. If a race is installed on the front crankshaft flange, a radial seal with coil spring has to be installed. S	 312 589 13 15 00
10	Install in the reverse order		
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	**Page 20**
11	Start engine and check oil pressure gage at idling speed	Crank engine with the starter for not more than 20 seconds. Wait about 2 minutes before making a repeat attempt at starting. Do not rev up engine until oil pressure is indicated. Oil pressure gage should indicate pressure after about 10 seconds.	BE18.00-N-1001-01D
12.1	Check engine oil level with electric gage	Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
12.2	Check engine oil level with dipstick	If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
13	Switch off engine and check for leaks		

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idle speed	min. bar	0.5	0.5
		maximum speed	min. bar	2.5	2.5

Crankcase, timing case cover, end cover

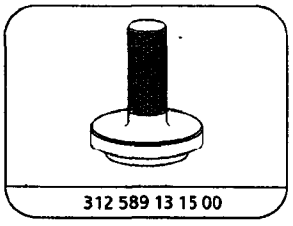
Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1009-01D	Front end cover to crankcase	Nm	25	25
BA01.40-N-1012-01D	Carrier of refrigerant compressor/hydraulic pump/frigoblock to crankcase	Nm	160	160

Oil sump

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.45-N-1001-01C	Oil sump to crankcase	light alloy	Nm	55	55
		plastic	Nm	35	35

Refrigerant compressor

Number	Designation		Model 950	Model 952	Model 953	Model 954
BA83.55-N-1002-01C	Support to fixture of refrigerant compressor/frigoblock and generator carrier	Nm	50	50	50	50



Drift

AR01.45-W-7500-01A	Tightening diagram of oil sump bolts		

Modification notes

6.2.97	Tightening torque for oil sump bolts modified		AR01.45-W-7500-01A

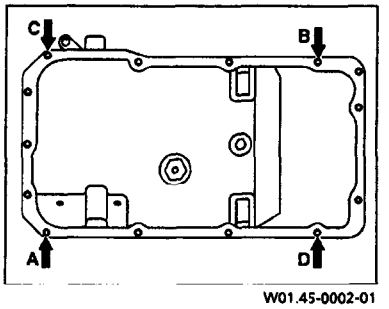
Nm **Oil sump**

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.45-N-1001-01C	Oil sump to crankcase	light alloy	Nm	55	55
		plastic	Nm	35	35

1 Tighten corner bolts (A, B) and (C, D) at the oil sump diagonally.

2 Tighten remaining bolts in their order around the circumference, starting from the corner bolt last tightened.

3 Retighten corner bolts (pay attention to sequence, see step 1).



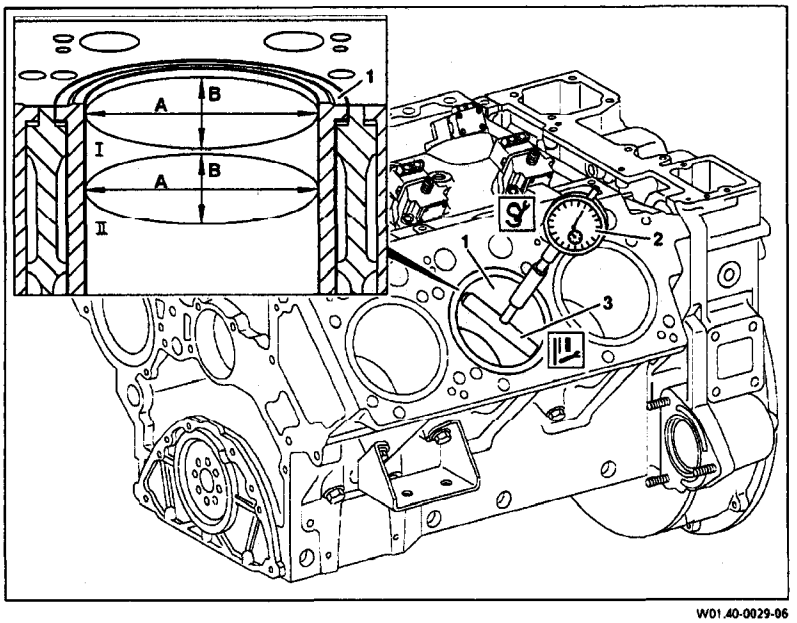
W01.45-0002-01

AR01.40-W-9202B	Measuring cylinder bores	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

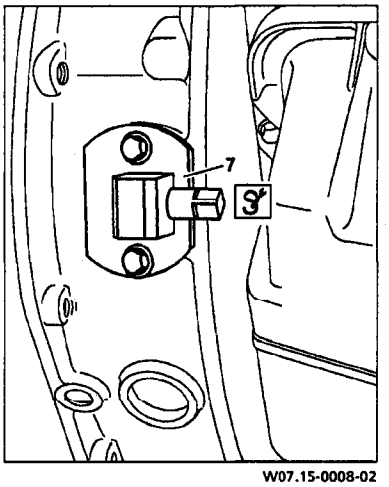
1 Cylinder liner
2 Dial gage
3 Quick calipers for internal measurements

A, B Directions of measurement of cylinder liner
I Measuring points in unworn area (top land zone)
II Measure points at top reversal point of first piston ring



W01.40-0029-06

7 Cranking device



W07.15-0008-02

	Removing		
1	Remove cylinder head		**Page 32**
2	Thoroughly clean cylinder liner (1)		
3	Attach cranking device (7) to timing case	Cranking device should be removed before starting the engine. End cover to timing case	 407 589 00 63 00 BA01.60-N-1001-01B
4	Rotate crankshaft with cranking device	Set piston of cylinder liner to be inspected (1) to BDC.	

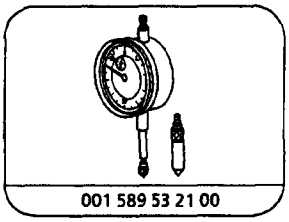
5 ⓘ	Inspect cylinder liners (1) Notes for assessing wear of pistons in the event of dust damage	ⓘ Cylinder liners must not have any scorch streaks. Isolated minor drawing grooves are not critical. Engine 541, 542, 904	 **Page 22**
	Measuring		
6	Set dial gage (2) and quick calipers (3) with the micrometer to the inner diameter of the cylinder liner	ⓘ Preload 5 mm. Quick calipers Micrometer	BE01.40-N-1001-03C 001 589 53 21 00 WH58.30-Z-1019-12A WH58.30-Z-1028-12A
7	Measure inner diameter of cylinder liner and set dial gage (2) to "0"	ⓘ Measure in unworn area (top land zone) above top reversal point of first piston ring. Directions of measuring in direction of travel (A) and in transverse direction (B).	BE01.40-N-1001-03C
8	Measure difference in diameter of cylinder liner	ⓘ Measure at top reversal point of first piston ring to top land zone. Directions of measuring in direction of travel (A) and in transverse direction (B). Ⓑ The values must be maintained. Cylinder liner must not be remachined, if necessary ↓ Replace cylinder liner	BE01.40-N-1005-03C **Page 53**
9	Install in the reverse order		

Test data of cylinder liner

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE01.40-N-1001-03C	Cylinder liner inner Ø	Code letter A	mm	129.990–129.995	129.990–129.995
		Code letter B	mm	129.995–130.005	129.995–130.005
		Code letter C	mm	130.005–130.010	130.005–130.010
BE01.40-N-1005-03C	Wear of cylinder liner at top reversal point of first piston ring		mm	≤ 0.08	≤ 0.08

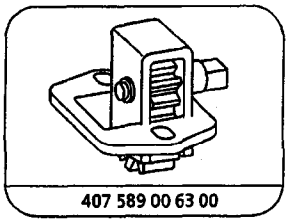
Nm Timing case

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.60-N-1001-01B	End cover of TDC inspection holder timing case	Nm	25	25



001 589 53 21 00

Dial gage



407 589 00 63 00

Turning device

Commercially available tools (see Workshop Equipment Manual)

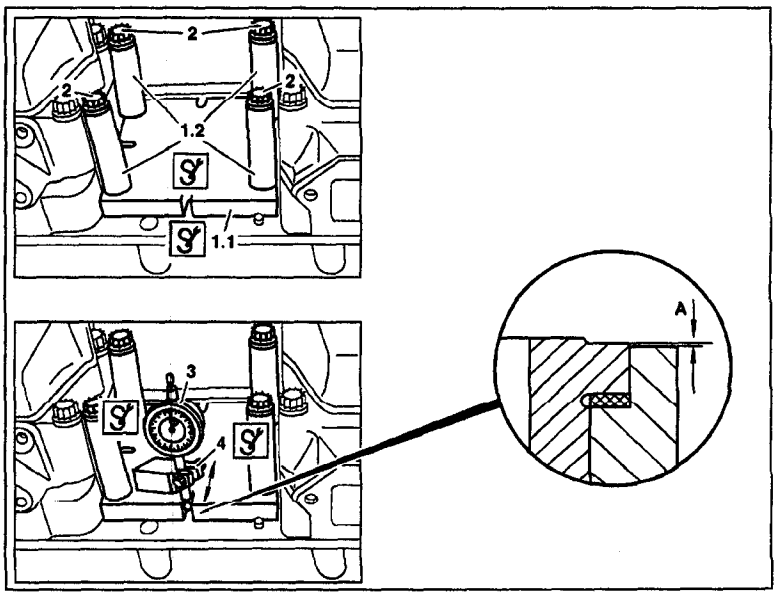
Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1019-12A	Quick calipers for internal measurements, ∅ 120–140 mm		
WH58.30-Z-1028-12A	Micrometer 125–150 mm	Hahn und Kolb Borsigstr. 50 D–70469 Stuttgart	313346 125

AR01.40-W-9314A	Measuring projection of cylinder liner	23.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1.1 Measuring plate
1.2 Spacer tube
2 Cylinder head bolts
3 Dial gauge
4 Dial gauge holder

A Projection of cylinder liner

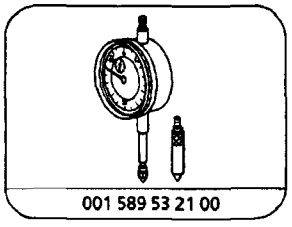


W01.40-0008-06

	Measuring		
1	Remove cylinder head of the relevant cylinder		Page 32
2	Clean collar of cylinder liner		
3	Attach measuring plate (1.1) to the cylinder liner	Screw measuring plate and spacer tube (1.2) tight with the cylinder head bolts (2), 50 Nm	
			541 589 00 21 00
4	Attach dial gauge (3) with the extension to the dial gauge holder (4) and insert with a preload through one of the recesses in the measuring plate (1.1)	Set scale of dial gauge to "0"	
			001 589 53 21 00
			541 589 00 21 00
			343 589 00 40 00
5	Move dial gauge (3) together with dial gauge holder (4) from collar of cylinder liner to crankcase	Enter measurements in the test sheet 800.98.452.00.	BE01.40-N-1003-03C
6	Conduct measurement of the projection at each recess in the measuring plate (1.1)	Set the scale of the dial gauge (3) to "0" for each measurement. Compare the measurements entered in the test sheet. Max. difference of the 4 measurement points for each cylinder liner 0,02 mm If the measurements differ ↓ Remove cylinder liners.	Page 53
7	Take off measuring plate (1.1)		541 589 00 21 00

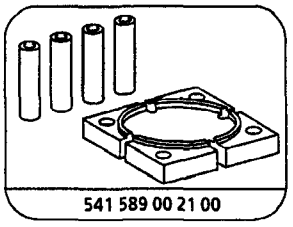
Test data of cylinder liner

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE01.40-N-1003-03C	Projection of cylinder liner with preloaded cylinder liner	mm	0,245–0,315	0,245–0,315



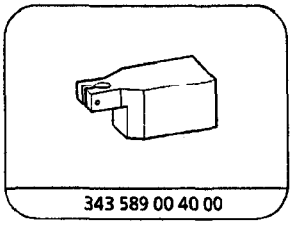
001 589 53 21 00

Dial gauge



541 589 00 21 00

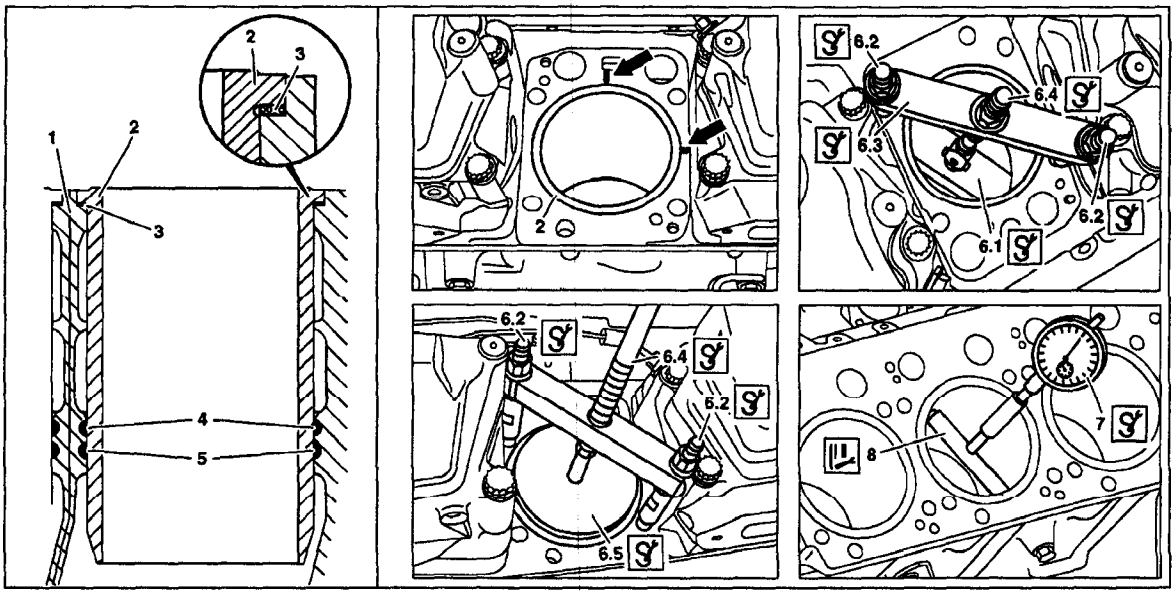
Measuring plate



343 589 00 40 00

Dial gauge holder

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W01.40-0014-09

1 Crankcase
2 Cylinder liner
3 Tombak ring
4 O-ring
5 O-ring
6.1 Removal tool
6.2 Stud bolts
6.3 Counter-support
6.4 Spindle
6.5 Insertion tool
7 Dial gauge
8 Quick-calipers for internal measurements

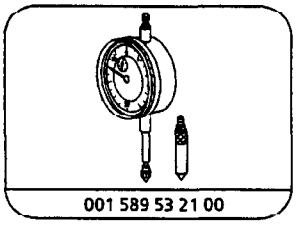
	Removing		
1	Remove piston		**Page 75**
2	Mark cylinder liner (2) relative to crankcase (1) (arrow)		
3	Fit on removal tool (6.1) and pull out cylinder liner (2)	Cylinder liner collar seat must not be reworked	**Page 55**
			541 589 00 33 00
4	Take off tombak ring (3)		
5	Remove O-rings (4, 5) from the crankcase (1)		
6	Clean cylinder liner (2), cylinder liner contact surface and grooves for O-rings (4, 5)		
	Installing		
7	Insert O-rings (4, 5) for sealing the cylinder liner at the bottom into the crankcase (1)	Replace O-rings and insert dry	
8	Fit tombak ring (3) over the cylinder liner (2) onto the liner collar	Installation: replace tombak ring	

Additional Information

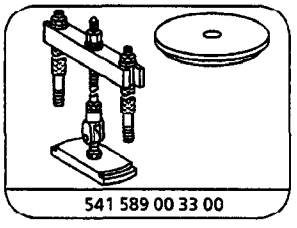
9	Insert liner (2) into the crankcase (1)	Lightly grease bottom fit surface and slip chamfer of cylinder liner (2). If cylinder liner is re-used, install offset 90° (arrows) relative to old installation position. If a new cylinder liner is installed, pay attention to marking of piston and liner.	BR00.45-Z-1018-06A **Page 55**
10	Fit on insertion tool (6.5) and press in cylinder liner (2)	541 589 00 33 00	**Page 56** 541 589 00 33 00
11	Measure projection of cylinder liner (2)		**Page 51**
12	Measure inner diameter of cylinder liner (2) at 3 points, each offset 60°, in the area of the lower fit	001 589 53 21 00 WH58.30-Z-1019-12A Quick calipers for internal measurements If an out-of-roundness is measured, remove cylinder liner (2) and check whether O-rings (4, 5) are correctly installed in crankcase and replace. Clean both grooves in crankcase (1).	BE01.40-N-1004-03C 001 589 53 21 00 WH58.30-Z-1019-12A
13	Install piston		**Page 75**

Test data of cylinder liner

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE01.40-N-1004-03C	Out-of-roundness of cylinder wall at bottom fit	mm	≤0.015	≤0.015



Dial gage



Removal and installation tool

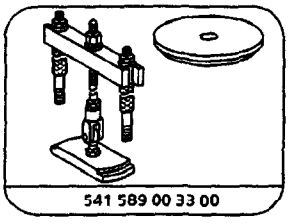
Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1019-12A	Quick calipers for internal measurements, Ø 120 – 140 mm		

Repair products

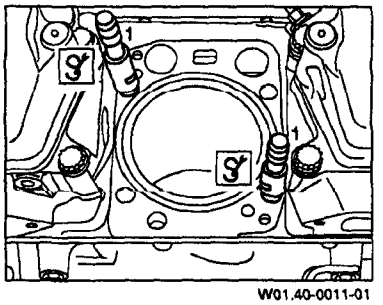
Number	Designation	Order number
BR00.45-Z-1018-06A	ATE grease	-

AR01.40-W-9324-01A	Removing cylinder liner		



Removal and insertion device

1 Screw stud bolts (1) into opposite threaded holes for the cylinder head bolts.



W01.40-0011-01

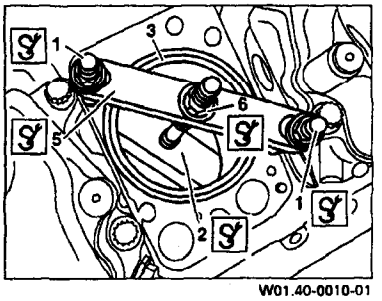
2 Insert removal device (2) into the cylinder liner (3).

i

Guide collar of the removal device (2) must be positioned in the cylinder liner (3); do not twist removal device.

3 Fit counter-support (5) onto the spindle and stud bolts (1) and screw tight.

4 Pull out cylinder liners (3) by turning the nut (6).



W01.40-0010-01

AR03.10-W-7021-02A	Assigning normal-size pistons to cylinder bore		

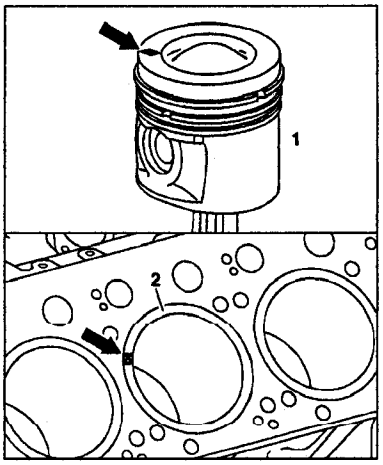
Test data of cyliner liner

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE01.40-N-1001-03C	Cylinder liner inner Ø	Code letter A	mm	129.990–129.995	129.990–129.995
		Code letter B	mm	129.995–130.005	129.995–130.005
		Code letter C	mm	130.005–130.010	130.005–130.010

Check identification of tolerance group on piston crown (arrow) and assign the marking of the cylinder liners (2) on the edge of the liner (arrow).

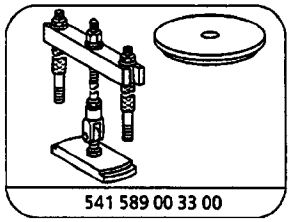
Marking
Piston (1) → Cylinder liners (2)

BA → A or B
BC → B or C



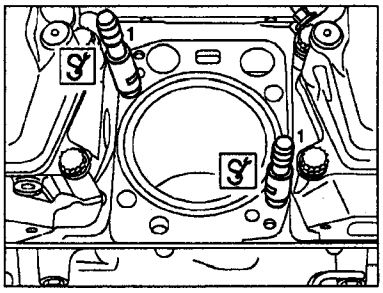
W03.10-0029-02

AR01.40-W-9324-02A	Inserting cylinder liner		



Removal and insertion device

1 Screw stud bolts (1) into opposite threaded holes for the cylinder head bolts.



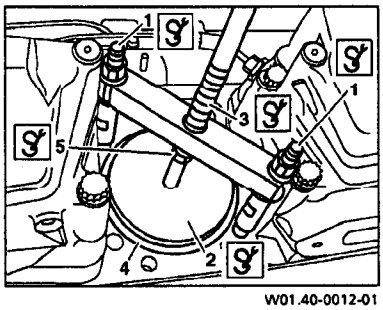
W01.40-0011-01

2 Fit pressure plate (2) onto the cylinder liner.

3 Place insertion device (spindle with counter-support) (3) onto stud bolts (1) and screw tight.

4 Press the cylinder liner (4) into the crankcase by turning the nut (5) at the spindle (3).

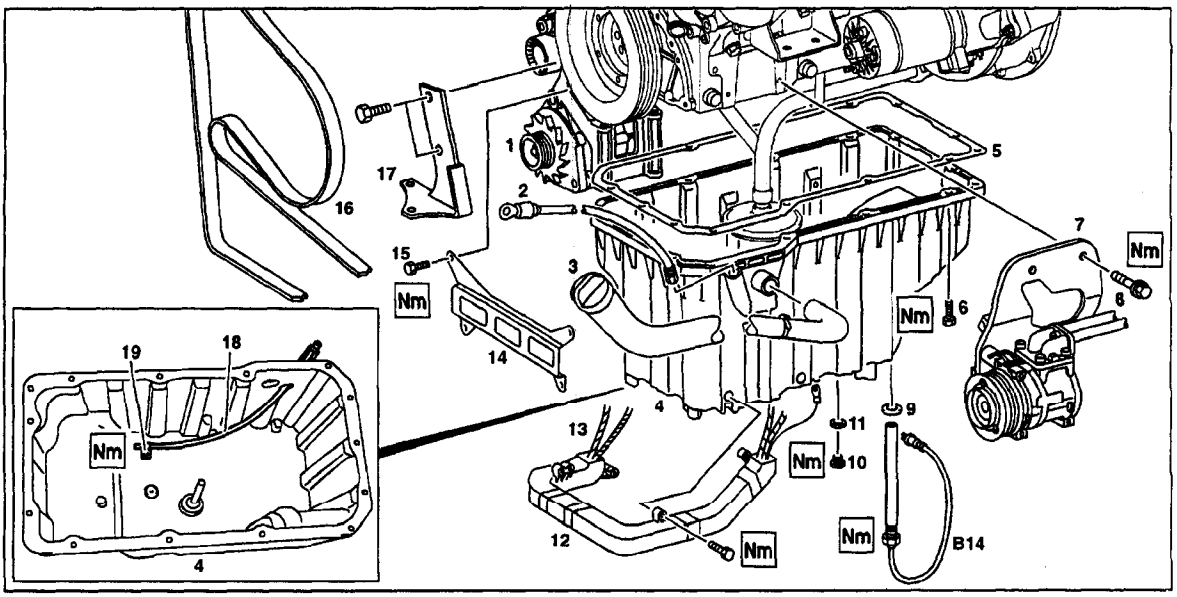
5 Take off insertion tool (3) and remove stud bolts (1) at the crankcase.



W01.40-0012-01

AR01.45-W-7500B	Removing and installing oil pan	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



1 *Carrier with generator and poly V-belt tensioning device*
2 *Dipstick guide tube*
3 *Oil filler pipe*
4 *Oil sump*
5 *Gasket*
6 *Bolt*
7 *Refrigerant compressor (air conditioning)*
8 *Bolt*
9 *Seal*
10 *Oil drain plug*
11 *Seal*
12 *Ducting (engine wiring harness)*
13 *Engine wiring harness*
14 *Connecting strut (air conditioning)*
15 *Bolt*
16 *Poly V-belt*
17 *Mounting bracket for ATF pipes*
18 *Oil extraction tube*
19 *Bolt*

B14 *Engine oil level sensor*

Modification notes

6.2.97	Tightening torques for oil pan bolts modified	Step 13	**Page 57**
	Checking engine oil level with electric gage	Step 16 modified	

	Removing, installing		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 18**
1	Tilt cab		
Ⓑ	Notes re tilting cab	Models 950, 952, 953, 954	**Page 18**
2	Remove bottom noise encapsulation	ⓘ Installation: quick-locks must engage properly.	
3	Drain or extract engine oil		AP18.00-W-0101A
4.1	Remove poly V-belt (16)	If air conditioning fitted	AR13.22-W-1202B

Additional Information

5	Remove dipstick guide (2) at oil sump (4)	Nm Connection of dipstick guide tube to oil pan Nm Dipstick guide tube to connection	BA01.45-N-1003-01C BA01.45-N-1006-01C
6	Take off oil filler pipe (3) at oil sump (4)		
7.1	Remove connecting strut (14) at carrier (1) and at refrigerant (7)	If air conditioning fitted Nm Support to fixture of refrigerant compressor/frigoblock and generator carrier	BA83.55-N-1002-01C
8.1	Remove refrigerant compressor (7) at crankcase and tie up at frame	i If air conditioning fitted Do not separate coolant at refrigerant compressor Nm Refrigerant compressor carrier to crankcase	BA01.40-N-1012-01D
9	Take off mounting bracket (17) for ATF pipes at carrier (1)		
10	Separate connector of engine oil level sensor (B14) at engine wiring harness (13)		
11	Take off engine wiring harness (13) at left of oil sump (4)		
12	Take off ducting (12) of engine wiring harness (13) at oil sump and tie up to the front at viscous fan	Do not damage engine wiring harness. Nm Cable duct to oil pan	BA01.45-N-1005-01C
13	Unscrew bolts (6) and take off oil sump (4)	Clean oil sump and contact surface at crankcase. i Installation: replace gasket (5). Pay attention to installation position i Pay attention to tightening diagram of oil sump bolts Nm Oil pan to crankcase Replace seal (11). Tighten oil drain plug (10). Nm Oil drain plug to oil pan i Replace seal (9). Screw engine oil level sensor (B14) tight. Nm Oil level sensor to oil pan i The dipstick is guided in the oil sump by an oil extraction pipe (18) which is attached to the oil sump by the bolt (19) Nm Dipstick guide tube to oil pan	Page 46 BA01.45-N-1001-01C BA01.45-N-1002-01C BA18.40-N-1002-01D BA01.45-N-1004-01C
14	Install in the reverse order		
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	Page 20

15	Start engine and check oil pressure gage at idling speed	Crank engine with the starter for not more than 20 seconds. Wait about 2 minutes before making a repeat attempt at starting. Do not rev up engine until oil pressure is indicated. Oil pressure gage should indicate pressure after about 10 seconds.	BE18.00-N-1001-01D
16.1	Check engine oil level with electric gage	Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
16.2	Check engine oil level with dipstick	If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
17	Switch off engine and check for leaks		

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idling speed	min. bar	0.5	0.5
		max. speed	min. bar	2.5	2.5

Crankcase, timing case cover, end cover

Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1012-01D	Carrier of refrigerant compressor/ hydraulic pump/frigoblock to crankcase	Nm	160	160

Oil sump

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.45-N-1001-01C	Oil sump to crankcase	light alloy	Nm	55	55
		plastic	Nm	35	35
BA01.45-N-1002-01C	Oil drain plug to oil sump	light alloy	Nm	80	80
		plastic	Nm	40	40
BA01.45-N-1003-01C	Connection of dipstick guide tube to oil sump	light alloy	Nm	50	50
		plastic	Nm	35	35
BA01.45-N-1004-01C	Dipstick guide tube to oil sump		Nm	25	25
BA01.45-N-1005-01C	Cable ducting to oil sump		Nm	10	10
BA01.45-N-1006-01C	Dipstick guide tube to connection		Nm	20	20

Nm **Oil level sensor, oil pressure sensor**

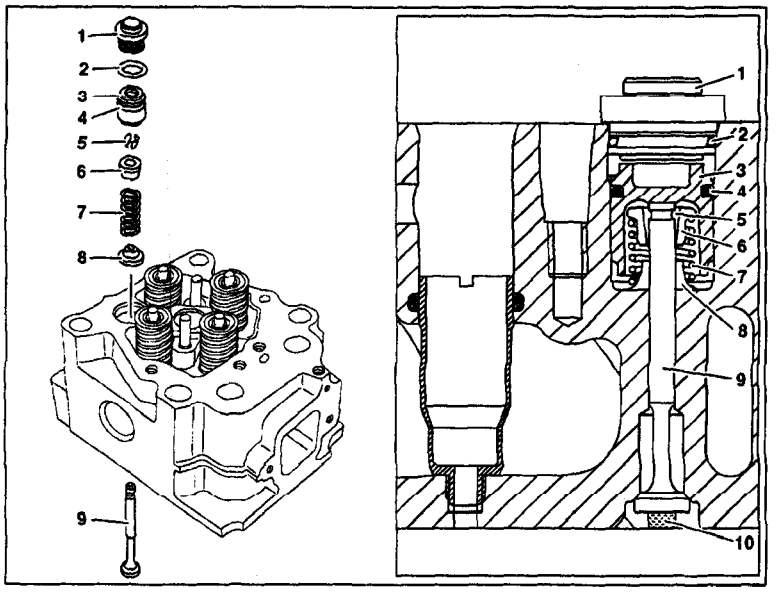
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.40-N-1002-01D	Oil level sensor to oil sump	Nm	25	25

Nm **Refrigerant compressor**

Number	Designation		Model 950	Model 952	Model 953	Model 954
BA83.55-N-1002-01C	Support to fixture of refrigerant compressor/frigoblock and generator carrier	Nm	50	50	50	50

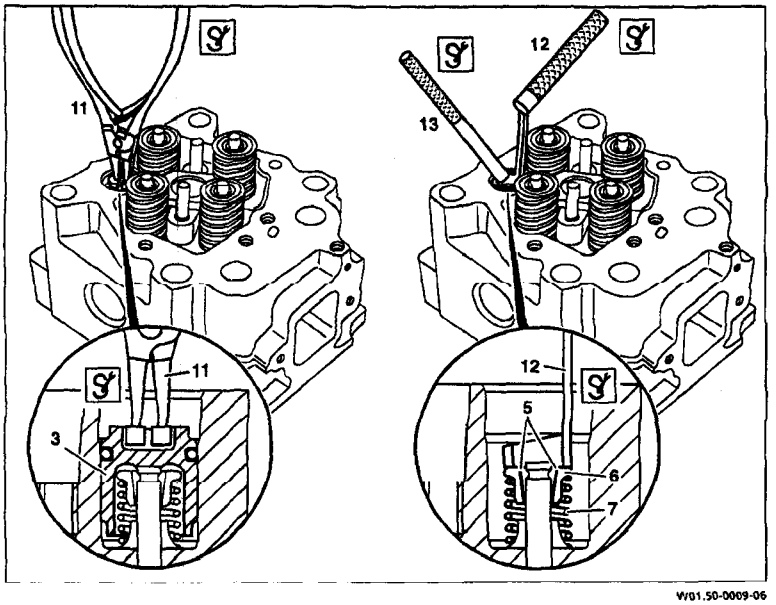
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Screw cap*
2 *O-ring*
3 *Piston*
4 *Seal*
5 *Locking wedge*
6 *Spring retainer*
7 *Spring*
8 *Spring guide*
9 *Valve*
10 *Spacer*



W01.50-0008-06

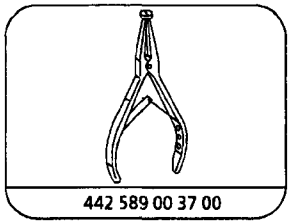
3 *Piston*
5 *Locking wedge*
6 *Spring retainer*
7 *Spring*
11 *Pliers*
12 *Spring retainer depressor*
13 *Magnetic pin*



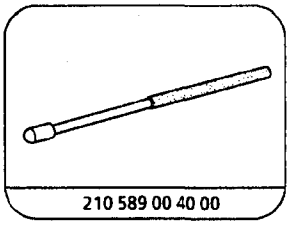
W01.50-0009-06

	Removing, installing		
1	Remove cylinder head		**Page 32**
2	Remove nozzle holder combination		AR07.03-W-6831B
3	Remove end cover (1)	**Installation:** Replace O-ring (2).	
4	Insert a suitable spacer (10) between valve disk and base	Spacer should have a height of about 6.0 mm.	

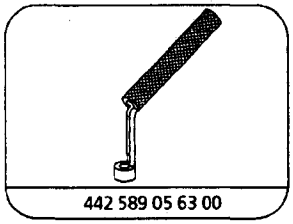
5	Use pliers (11) to remove piston (3)		442 589 00 37 00
6	Inspect seal (4) at piston (3) for signs of wear and damage	If worn or damaged ↓ Replace piston with seal **Installation:** Oil piston, seal and do not damage.	
7	Remove spring (7)	Use spring retainer depressor (12) to compress spring and use magnetic pin (13) to take out locking wedges (5). **Installation:** Fit spring retainer depressor (12) onto the top spring retainer (6) and compress spring sufficiently until the locking wedges engage. 	 210 589 00 40 00 442 589 05 63 00
8	Release pressure on spring (7), take out top spring retainer (6), spring and spring guide (8)	Do not mix up top spring retainer and spring guide. **Installation:** Fit spring guide, spring and spring retainer onto the stem of the valve of the constant throttle. Insert locking wedges (5) into the spring retainer.	
9	Turn cylinder head and pull out valve (9)	Mark valve. **Installation:** Oil valve stem, insert valve and place spacer (10) (height about 6.0 mm) below the valve disk.	
10	Install in the reverse order		



Pliers

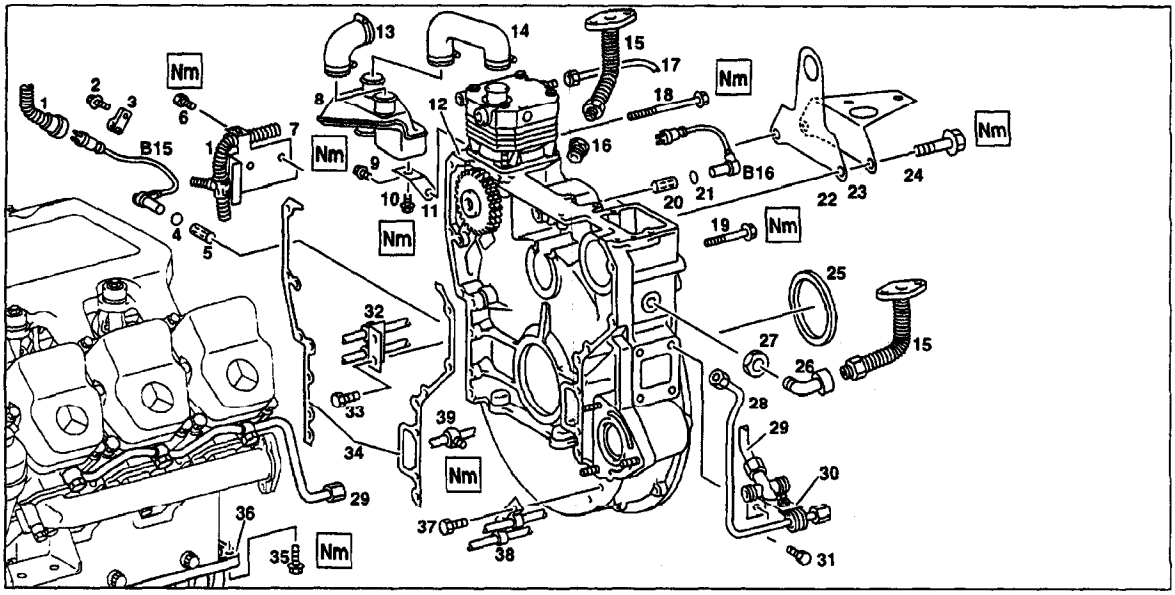


Magnetic pin



Spring retainer depressor

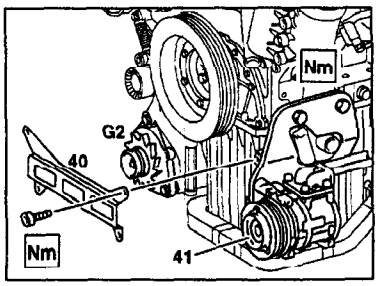
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

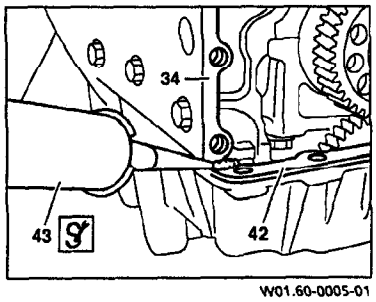


1 Engine wiring harness
2 Bolt
3 Clip
4 O-ring
5 Securing bush
6 Bolt
7 Engine wiring harness bracket
8 Resonance tank
9 Bolt
10 Bolt
11 Bracket
12 Timing case
13 Hose
14 Hose
15 Oil return flow pipe (turbocharger)
16 Nut
17 Compressed air pipe (compressor)
18 Bolt (M12×167)
19 Bolt (M12×57)
20 Securing bush
21 O-ring
22 Lifting eye
23 Bracket
24 Bolt
25 Radial seal
26 Angled connection fitting
27 Nut
28 Compressed air pipe (engine brake)
29 Compressed air pipes (constant throttle)
30 Bracket
31 Bolt
32 Bracket with gear oil pipes
33 Bolt
34 Gaskets
35 Bolt
36 Oil pan
37 Bolt
38 Electric cables (Starter)
39 Bracket with fuel pipes
B15 Crankshaft position sensor
B16 TDC sensor cylinder 1

34 Gasket
40 Connection strut
41 Refrigerant compressor
42 Oil pan gasket
43 Hand-operated pressure gun

G2 Generator





	Removing, installing		
1	Remove noise encapsulations	At top, rear, on left and right.	
2	Remove starter		AR15.30-W-7100B

3	Remove flywheel		**Page 102**
4.1	Take off resonance tank (8)	On engine 541.920 - 927 Nm End cover of compressor opening on side of timing case Nm Resonance tank to bracket	 BA01.60-N-1003-01B BA13.30-N-1010-01B
5	Remove power steering, fuel pump unit		AR46.30-W-0400A
6	Unbolt compressed air pipe (17) and compressor		
7	Inspect compressed air pipe (17) between compressor and pressure regulator for coking	If coked ↓ Replace compressed air pipe or pressure regulator.	
8.1	Remove intake manifold	On engine 542.920 - 923/925/926	AR09.20-W-1310A
9	Remove timing case cover		**Page 41**
10	Take off propshaft or hydraulic pump at rear engine output	With rear engine output	
11	Detach bracket wtih fuel pipes (39) at timing case (12)	Nm Bracket of fuel pipe to timing case cover and timing case	BA47.25-N-1008-01B
12	Detach bracket with gear oil pipes (32) at timing case (12)		
13	Detach bracket (7) with engine wiring harness (1) and attached parts at timing case (12)	Nm Bolt of wiring harness to timing case	BA15.18-N-1003-01A
14	Pull out crankshaft position sensor (B15) and take off clip (3) at timing case (12)	Installation: Replace O-ring (4), press in securing bush (5) and crankshaft position sensor as far as the stop. Nm Bolt of wiring harness to timing case	 BA15.18-N-1003-01A
15	Pull out camshaft TDC sensor (B16)	Installation: Replace O-ring (21), press in securing bush (20) and camshaft TDC sensor as far as the stop.	
16.1	Remove exhaust plenum chamber at timing case (2)	On engine 541.920 - 927	AR14.10-W-3920A
16.2	Remove lifting eye (22) and bracket (23) at rear of timing case	On engine 542.920 - 923/925/926 Nm Rear lifting eyes to timing case	 BA22.10-N-1003-01D
18.1	Remove connection strut (40) at generator (G2) and at refrigerant compressor (41)	If AC fitted Nm Support to fixture	 BA83.55-N-1002-01C
18.2	Remove refrigerant compressor (41) at crankcase and tie up	If AC fitted Do not separate refrigerant pipes. Nm Carrier of refrigerant compressor to crankcase	 BA01.40-N-1012-01D
19	Unscrew bolts (35) at the oil pan (36) in the area of the timing case (12)	Nm Oil pan to crankcase	BA01.45-N-1001-01C
20	Slacken remaining bolts (35) at the oil pan (36) and lower oil pan (36)	Do not damage oil pan gasket, if necessary ↓ Remove oil pan and replace oil pan gasket.	 **Page 57**

		Installation: Pay attention to tightening diagram	Page 46
		Nm Oil pan to crankcase	BA01.45-N-1001-01C
21	Separate compressed air pipes (28, 29) of engine brake and constant throttle and take off bracket (30)		
22.1	Detach oil return flow pipe (15) at timing case (12)	On engine 541.920 - 927	
		Nm Nut for oil return flow of turbocharger on left at timing case	BA01.60-N-1004-01B
22.2	Detach both oil return flow pipes (15) at timing case (12)	On engine 542.920 - 923/925/926	
		Nm Nut for oil return flow of turbocharger on left at timing case	BA01.60-N-1004-01B
23	Detach timing case (12)	Cover over opening at oil pan. Inspect timing case for signs of damage and wear, if necessary ↓	
		Replace timing case and use all existing attached parts	
		Use existing compressor	AR13.30-W-5511A
		Remove, install, set bracket of crankshaft position sensor	AR07.15-W-1640A
		Use existing rear engine output	AR23.20-W-9440A
		Nm End cover of TDC inspection hole to timing case	BA01.60-N-1001-01B
		Nm End cover of compressor opening on side to timing case	BA01.60-N-1003-01B
		Nm Nuts (16, 27) and angled connection fitting (26) for oil return flow pipe (turbocharger to timing case)	BA01.60-N-1004-01B
		Nm End cover (engine output) to timing case	BA01.60-N-1005-01B
		Nm Screw plug of oil return flow of turbocharger in timing case	BA01.60-N-1006-01B
		Installation: Fit timing case onto the crankcase over the dowel pins	
		Nm Bolts of timing case to crankcase	BA01.60-N-1002-01B
24	Replace gaskets (34)	Installation: Clean contact surfaces. Fit gaskets over the dowel pins onto the crankcase and cut to length. Seal timing case gasket and oil pan gasket with sealant.	BR00.45-Z-1026-01A
		S	000 589 01 25 00
25	Replace radial seal (25) in timing case (12)		Page 68
		S	403 589 04 15 00
		Inspect flywheel for signs of scoring of radial seal, if necessary ↓	
		Install radial seal with coil spring in flywheel housing	
		Install race on the flywheel	AR03.30-W-8350A

26	Install in the reverse order		
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it starting off. Wear closed and close-fitting work clothes. Secure vehicle to prevent it starting off.	Page 20
27	Start engine and observe oil pressure gage when engine idling	Ⓘ Crank engine with starter for not more than 20 seconds. Wait about 2 minutes before making repeat attempt at starting. Do not rev up engine so long as oil pressure is not indicated. Oil pressure gage should indicate oil pressure after about 10 seconds. ℹ Oil pressure gage should indicate oil pressure after about 10 seconds.	BE18.00-N-1001-01D
28.1	Check engine oil level at electric gage	ℹ Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
28.2	Check engine oil level with dipstick	ℹ If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
29	Switch off engine and check for leaks		

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idle speed	min. bar	0.5	0.5
		maximum speed	min. bar	2.5	2.5

Nm Crankcase, timing case cover, end cover

Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1012-01D	Carrier of refrigerant compressor/ hydraulic pump to crankcase	Nm	160	160

Nm Oil pan

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.45-N-1001-01C	Oil pan to crankcase	light alloy	Nm	55	55
		plastic	Nm	35	35

Timing case

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover of TDC inspection hole to timing case		Nm	25	25
BA01.60-N-1002-01B	Bolts of timing case to crankcase	M12×57	Nm	100	100
		M12×167	Nm	80	80
BA01.60-N-1003-01B	End cover of compressor opening on side to timing case		Nm	50	50
BA01.60-N-1004-01B	Nut for oil return flow on turbocharger on left to timing case	M26×1.5	Nm	50	50
BA01.60-N-1005-01B	End cover (engine output) to timing case		Nm	25	25
BA01.60-N-1006-01B	Screw plug of oil return flow of turbocharger in timing case		Nm	80	80

Compressor (compressed air system)

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1010-01B	Resonance tank to bracket	Nm	25	25

Engine wiring harness

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA15.18-N-1003-01A	Bolt of wiring harness to timing case	Nm	25	25

Engine mounts, engine supports

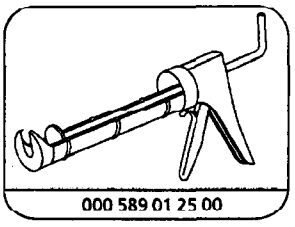
Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA22.10-N-1003-01D	Rear lifting eyes to timing case	Nm	150

Fuel pipes/hoses

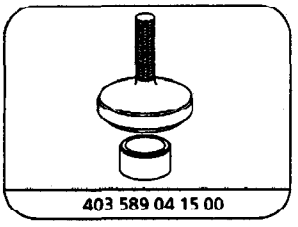
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.25-N-1008-01B	Bracket of fuel pipe to timing case cover and timing case	Nm	25	25

Refrigerant compressor

Number	Designation		Model 950	Model 952	Model 953	Model 954
BA83.55-N-1002-01C	Support to fixture of refrigerant compressor/Frigoblock and generator carrier	Nm	50	50	50	50



Hand-held pressure gun

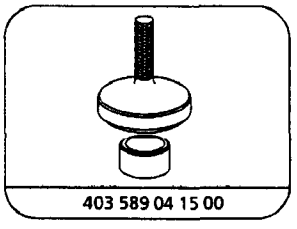


Drift

Repair products

Number	Designation	Order number
BR00.45-Z-1026-01A	Sealant	001 989 29 20

AR01.60-W-8200-01B	Replacing seal in timing case		



Drift

1 Place on timing case (1) flat.

2 Use a suitable drift to remove radial seal (2).

3 Use the drift (3) to press new radial seal (2) into the timing case cover (1) flush.

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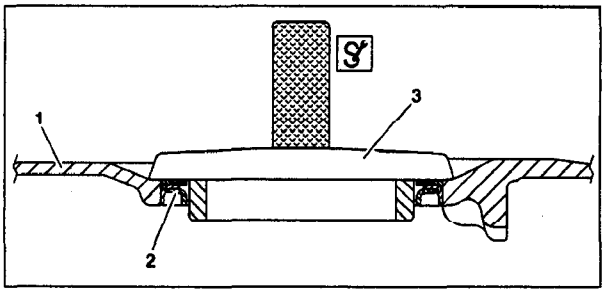
Press in radial seal (2) dry and axis parallel and evenly around the entire circumference. Pay attention to installation position of radial seal (2). Do not damage radial seal (2) when installing.

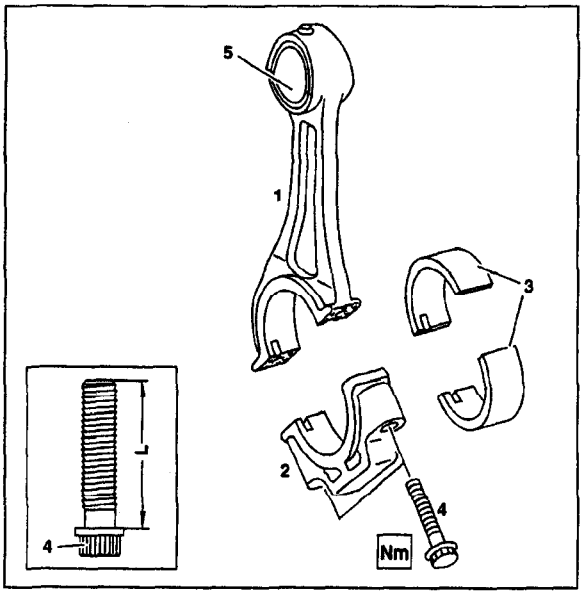


W01.60-0004-10

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Conrod
2 Conrod bearing cap
3 Conrod bearing shells
4 Conrod bolt
5 Conrod bush

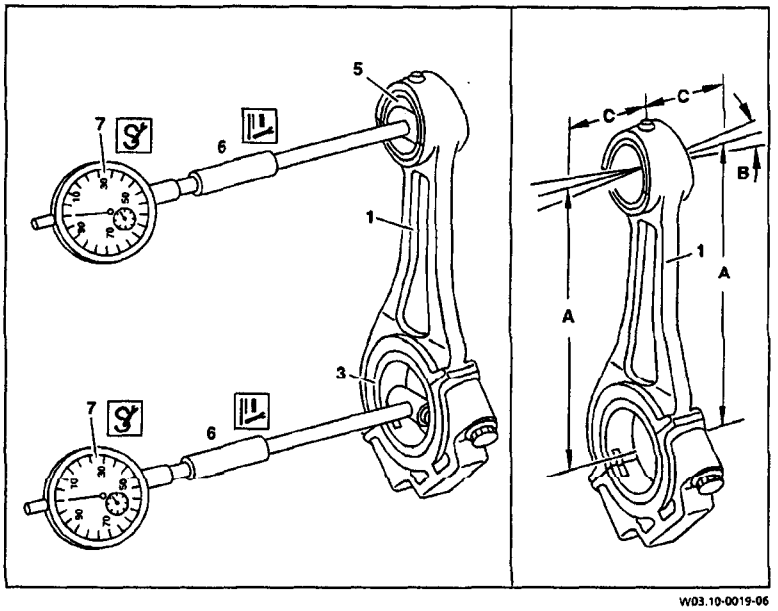
L Shank length of conrod bolt



W03.10-0018-12

1 Conrod
3 Conrod bearing shells
5 Conrod bush
6 Dial gauge
7 Dial gauge holder

A Distance from center of conrod bearing bore to center of conrod bush bore
B Permissible difference of axial parallelism between conrod bearing bore and conrod bush bore, related to measured distance
C Measured distance



W03.10-0019-06

	Removing		
1	Remove piston		**Page 75**
	Inspecting		
2	Inspect conrod bearing seat in conrod (1) for blue discoloration, cross scores at notches	Conrod with blue discoloration (caused by bearing damage), with cross scores at notches must not be re-used. Conrod must be replaced.	

3	Inspect conrod (1) for twisting and dimensional tolerance	Permissible difference (size B) of axial parallelism between conrod bearing and conrod bush bore to measure distance (size C)	BE03.10-N-1002-01C
		Distance (size A) from center of conrod bearing bore to center of conrod bush bore	BE03.10-N-1003-01C
		If the specifications are exceeded, replace conrod (1). Conrod (1) must not be straightened.	
4	Inspect inner diameter of conrod bush (5)	If the specification is exceeded, replace conrod (1).	BE03.10-N-1004-01C
			001 589 53 21 00
		Quick calipers for internal measurements	WH58.30-Z-1004-12A
5	Install conrod bearing (3), gauge	Pay attention to installation position of conrod bearing shell halves. Never screw conrod bearing cap (2) tight without conrod bearing shells (3) inserted at conrod (1); only fit on	**Page 72**
		Conrod bearing inner diameter	BE03.10-N-1001-01C
		Conrod bolt shank length (L)	BE03.10-N-1005-01C
		Conrod bearing journal diameter	BE03.20-N-1004-02C
		Bolts of conrod bearing caps to conrod	BA03.10-N-1001-01C
			422 589 02 09 00
			001 589 53 21 00
		Quick calipers for internal measurements	WH58.30-Z-1001-12A
		Micrometer	WH58.30-Z-1013-12A
	Installing		
6	Install piston		**Page 75**

Test data of conrod

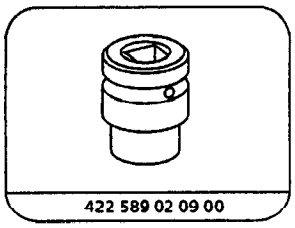
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.10-N-1001-01C	Conrod bearing inner Ø with conrod bearing shells inserted	Standard	mm	94.054–94.096	94.054–94.096
		Undersize 0.10	mm	93.954–93.996	93.954–93.996
		Undersize 0.25	mm	93.804–93.846	93.804–93.846
		Undersize 0.5	mm	93.554–93.596	93.554–93.596
		Undersize 0.75	mm	93.304–93.346	93.304–93.346
		Undersize 1.0	mm	93.054–93.096	93.054–93.096
BE03.10-N-1002-01C	Permissible difference of axial parallelism between conrod bearing bore and conrod bush bore over length of 50 mm		mm	≤0,025	≤0,025
BE03.10-N-1003-01C	Distance from center of conrod bearing bore to center of conrod bush bore		mm	273.00–273.02	273.00–273.02
BE03.10-N-1004-01C	Conrod bush inner Ø		mm	52.055–52.065	52.055–52.065
BE03.10-N-1005-01C	Conrod bolt	Thread Ø	M	16×1.5	16×1.5
		Max. shank length	mm	74.5	74.5

Test data of crankshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1004-02C	Conrod bearing journal Ø	Standard	mm	93.98–94.00	93.98–94.00
		Undersize 0.1	mm	93.88–93.90	93.88–93.90
		Undersize 0.25	mm	93.73–93.75	93.73–93.75
		Undersize 0.5	mm	93.48–93.50	93.48–93.50
		Undersize 0.75	mm	93.23–93.25	93.23–93.25
		Undersize 1.0	mm	92.98–93.00	92.98–93.00

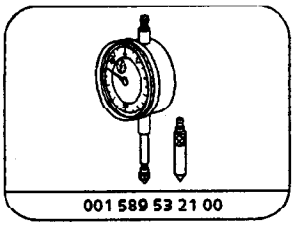
Nm Conrod

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA03.10-N-1001-01C	Bolts of conrod bearing cap to conrod	1st stage	Nm	110	110
		2nd stage	° ∡	90	90



422 589 02 09 00

Wrench socket



001 589 53 21 00

Dial gauge

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1001-12A	Quick calipers for internal measurements Ø 80 – 100 mm		
WH58.30-Z-1004-12A	Quick calipers for internal measurements Ø 40 – 60 mm		
WH58.30-Z-1013-12A	Micrometer 75 – 100 mm		

AR03.10-W-6111-06B	Installing, gauging conrod bearings		

Test data of conrod

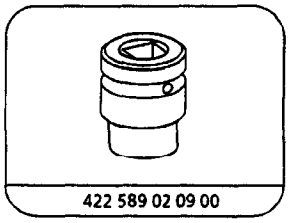
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.10-N-1001-01C	Conrod inner Ø with conrod bearing shells inserted	Standard	mm	94.054–94.096	94.054–94.096
		Undersize 0.10	mm	93.954–93.996	93.954–93.996
		Undersize 0.25	mm	93.804–93.846	93.804–93.846
		Undersize 0.5	mm	93.554–93.596	93.554–93.596
		Undersize 0.75	mm	93.304–93.346	93.304–93.346
		Undersize 1.0	mm	93.054–93.096	93.054–93.096
BE03.10-N-1005-01C	Conrod bolt	Thread Ø	M	16×1.5	16×1.5
		Max. shank length	mm	74.5	74.5

Test data of crankshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1004-02C	Conrod bearing journal Ø	Standard	mm	93.98–94.00	93.98–94.00
		Undersize 0.1	mm	93.88–93.90	93.88–93.90
		Undersize 0.25	mm	93.73–93.75	93.73–93.75
		Undersize 0.5	mm	93.48–93.50	93.48–93.50
		Undersize 0.75	mm	93.23–93.25	93.23–93.25
		Undersize 1.0	mm	92.98–93.00	92.98–93.00

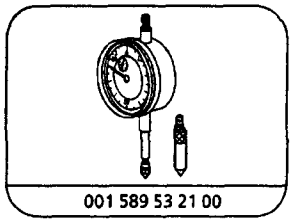
Nm Conrod

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA03.10-N-1001-01C	Bolts of conrod bearing caps to conrod	1st stage	Nm	110	110
		2nd stage	° ∠	90	90



422 589 02 09 00

Wrench socket



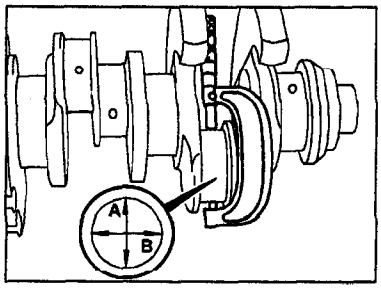
001 589 53 21 00

Dial gauge

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1001-12A	Quick calipers for internal measurements Ø 80 – 100 mm		
WH58.30-Z-1013-12A	Micrometer 75 – 100 mm		

1 Use a micrometer to measure conrod bearing journal at two points (A, B) and note the measurements. Calculate the average of the conrod bearing journal diameter from these two measurements.



W03.10-0020-01

2 Use a chamois leather to clean the bearing points of the conrod (1) and the conrod bearing cap (2).

3 Insert conrod bearing shells (3) into the conrod (1) and the conrod bearing cap (2).

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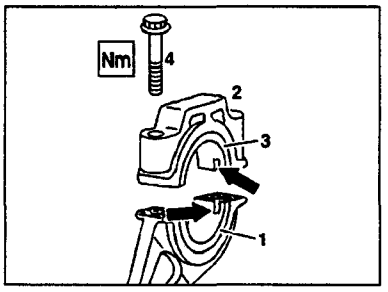
Pay attention to marking on the conrod bearing shells (3) and the code numbers of the conrod (1) relative to the conrod bearing cap (2).
If the conrod bearings are replaced, install conrod bearing shells (3) of a matching repair size; pay attention to measured conrod bearing journal diameter. The locking lugs (arrows) of the conrod bearing shells (3) must be located in the slots of the basic bore of the conrod bearing cap (2) and of the conrod (1).



W03.10-0021-01

4 Fit conrod bearing cap (2) onto the conrod (1) so that it is exactly located.

!

The code numbers on the conrod (1) and on the conrod bearing cap (2) must be aligned and be positioned on one side. The cracked contact surface must not be damaged.

5 Nm Lightly oil the thread of the conrod bolt (4) and screw tight with wrench socket.

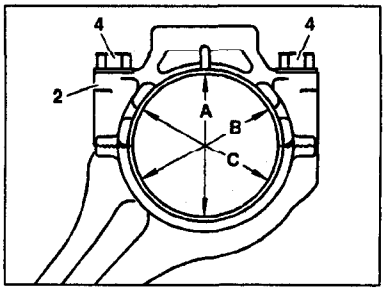
i Press on conrod bearing cap (2) and the conrod (1) by hand when screwing in the conrod bolt (4).

!

Clamp the conrod (1) just below the conrod bearing in order to prevent the conrod (1) being twisted.

6 Set dial gauge and quick-calipers with 5 mm preload to the previously calculated measurement (average value) of the conrod bearing journal diameter.

7 Use dial gage and quick calipers to measure conrod bearing bore at three points (A, B, C) (vertically and each about 30° up and down from the separation points). Note the measurements.
i If one of the measurements obtained (A, B, C) is not within the tolerance, replace conrod bearing shell.
Conrod bearing shells are factory-supplied ready for installation. It is not permitted to perform any machining work.



W03.10-0017-01

8 Take off conrod bearing cap (2) again.

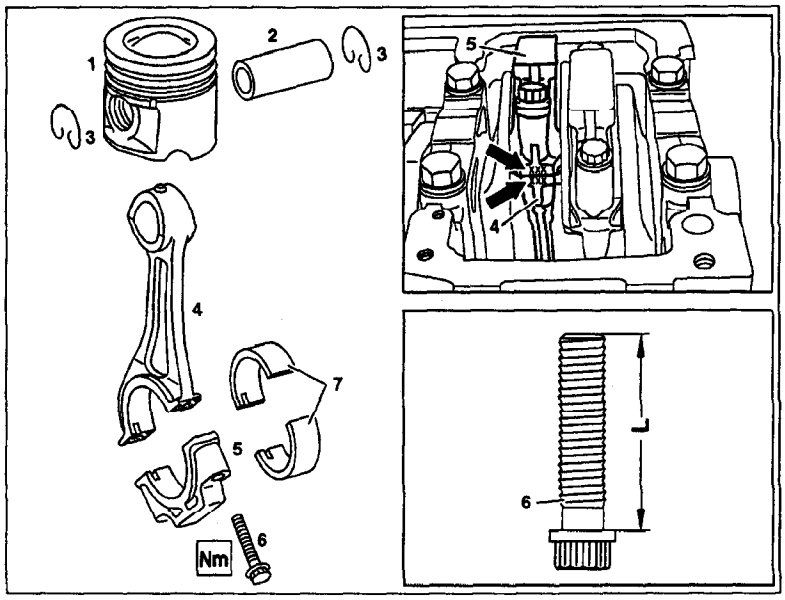
!

Never screw conrod bearing cap (2) tight without the conrod bearing shells (3) being inserted at the conrod (1); fit on only.
Before re-installing the conrod bolts (4), it is necessary to measure the shank length.

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

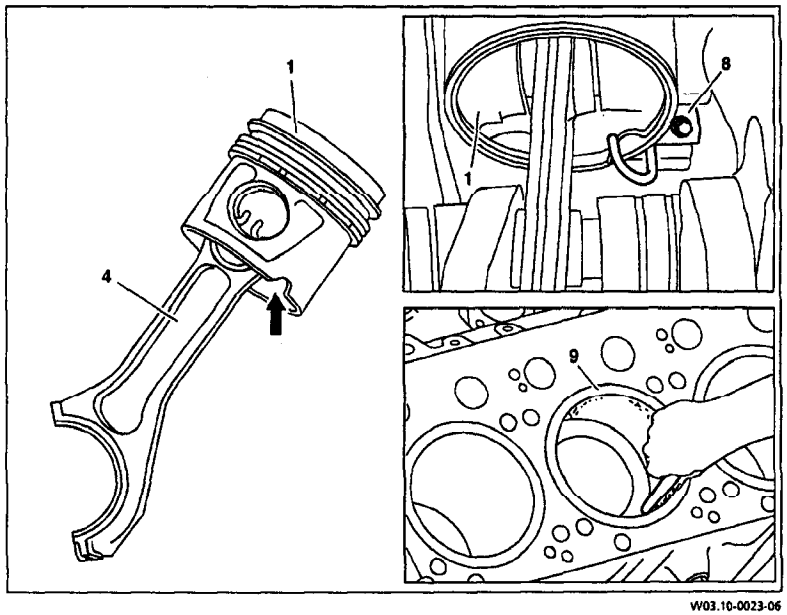
1 Piston
2 Piston pin
3 Circlip
4 Conrod
5 Conrod bearing cap
6 Conrod bolt
7 Conrod bearing shells

L Shank length of conrod bolt



W03.10-0022-06

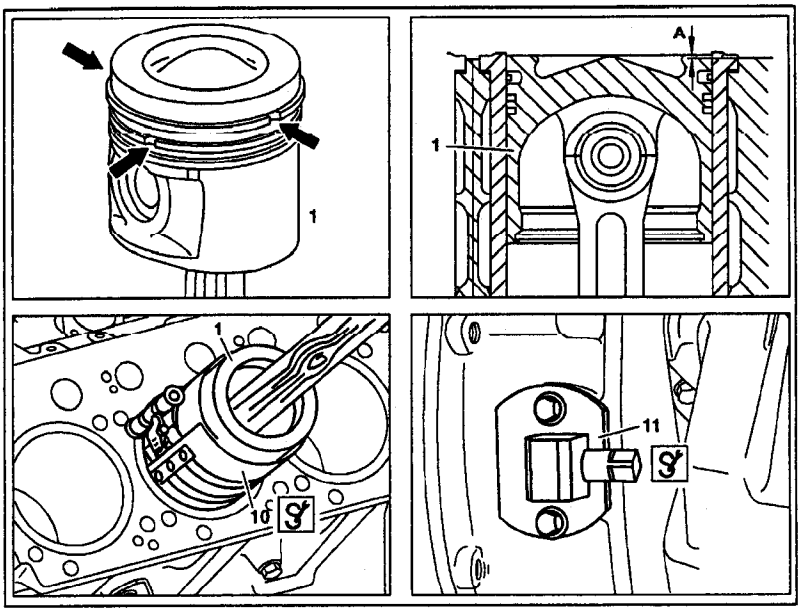
1 Piston
4 Conrod
8 Oil spray nozzle
9 Cylinder liner



W03.10-0023-06

1 *Piston*
10 *Tensioning strap*
11 *Cranking device*

A *Piston projection*



W03.10-0024-06

Modification notes

6.2.97	Inspecting crankshaft flange for damage and wear	Step 13 included for the first time	**Page 75**

	Removing		
1	Remove cylinder head		**Page 32**
2	Remove oil sump		**Page 57**
3	Use a scraper to carefully remove combustion residues above the top land zone in the cylinder wall	This ensures that the piston rings are not damaged when removing the pistons (1)	
4	Unscrew conrod bolt (6)		422 589 02 09 00
5	Take off conrod bearing cap (5)	The cracked contact surface must not be damaged, if necessary ↓ replace conrod (4) Ensure that the matching conrod bearing caps and conrods (4) are marked	
6	Take piston (1) together with conrod (4) out of the crankcase	Use a wooden handle positioned at edge at piston stem to press piston out of crankcase. The cracked contact surface at the conrod must not be damaged; if necessary, replace conrod. Do not damage oil spray nozzle (8), if necessary ↓ remove oil spray nozzle (8) and inspect	 AR18.00-W-40008
7	Mark conrod bearing shells (7) to conrod bearing cap (5) and conrod (4) and remove	Never tighten conrod bearing caps without conrod bearing shells inserted at conrod	
8	Clamp conrod (4) with piston (1) in a vice	Use soft protective jaws for clamping	
9	Remove circlip (3)		
10	Press out piston pin (2) and take piston (1) off the conrod (4)	Piston pin bore	BE03.10-N-1002-02D

		Piston pin outer Ø Conrod bush inner Ø	BE03.10-N-1003-02D BE03.10-N-1004-01C
◁	**Inspecting**		
11	Inspect piston (1) and cylinder walls for dust damage	If worn ↓ replace cylinder liner replace piston	**Page 21** **Page 53**
12	Inspect used pistons (1) at piston stem, piston crown and piston rings before reinstalling	Always inspect piston rings visually for signs of spalling of the coating, if necessary ↓ replace piston rings inspect piston crown and piston stem for signs of damage; replace piston if necessary	**Page 82**
13	Inspect crankshaft flange for signs of damage and wear	i If necessary, measure crankshaft and install in new bearings	**Page 92**
▷	**Installing**		
14	Assemble piston (1) and conrod (4)	i If new pistons are installed ↓ assign piston to cylinder liner Cylinder liner inner Ø i Insert conrod into the piston so that the longer side of the conrod which is split at an angle is aligned with the recess (arrow) for the oil spray nozzle at the piston	**Page 55** BE01.40-N-1001-03C
15	Oil piston pin (2) and insert by hand into the piston (1) and conrod (4)		
16	Install circlips (3)		
17	Oil piston (1) and offset piston ring gaps (arrows) in turn by 120°		
18	Guide tensioning strap (10) loosely over the piston rings and pull tight to the outer diameter of the piston (1)	i The seal of the tensioning strap must still be able to be moved 🔧	000 589 38 31 00
19	Insert conrod bearing shell (7) into the conrod (4) and oil contact surface	i Pay attention to marking, lug on conrod bearing shell should be located in the slot on the conrod	BE03.10-N-1001-01C
20	Insert piston (1) into the crankcase until the tensioning strap (9) is touching the crankcase	i The recess for the oil spray nozzle at the piston should be facing in toward center of engine ! Turn piston slightly when inserting to ensure the oil spray nozzle (8) is not damaged when installing the conrod (4). If damaged ↓ remove oil spray nozzle (8) and inspect	AR18.00-W-4000B
21	Press piston (1) into the crankcase until the conrod bearing shell (7) is touching the conrod journal of the crankshaft		
22	Take off tensioning strap (10)	🔧	000 589 38 31 00

23	Measure conrod bolt (6)	ℹ If the max. shank length (L) is exceeded ↓ replace conrod bolt	BE03.10-N-1005-01C
24	Insert conrod bearing shell (7) into the conrod bearing cap (5) and oil contact surface	ℹ Pay attention to marking, lug on conrod bearing shell should be located in the slot of the conrod bearing cap	BE03.10-N-1001-01C
25	Fit conrod (4) and bearing cap (5) onto the crankshaft	ℹ Code numbers on conrod and conrod bearing cap should agree and be positioned on the same side. Conrod and conrod bearing caps should be accurately touching the crankshaft journal; apply pressure by hand when inserting the conrod bolt (6)	
26	Lightly oil thread of conrod bolt (6) with engine oil and tighten	Nm Bolts of conrod bearing caps to conrod	BA03.10-N-1001-01C
27	Install cranking device (11) for the engine at the timing case	Ⓘ Cranking device should be removed before starting the engine 🔧 Nm End cover to timing case	 407 589 00 63 00 BA01.60-N-1001-01B
28	Rotate crankshaft and check to ensure it rotates freely		
29	Measure piston projection at all pistons	ℹ Remove deposits on piston (1) and crankcase 🔧 🔧 If the dimensions for piston projection are not achieved, inspect conrod (4) and replace if necessary	**Page 80** 001 589 53 21 00 541 589 01 21 00 BE03.10-N-1001-02D
30	Fit on oil sump		**Page 57**
31	Install cylinder head		**Page 32**

Test data of cylinder liner

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE01.40-N-1001-03C	Cylinder liner inner Ø	Code letter A	mm	129.990–129.995	129.990–129.995
		Code letter B	mm	129.995–130.005	129.995–130.005
		Code letter C	mm	130.005–130.010	130.005–130.010

Test data of conrod

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.10-N-1001-01C	Conrod bearing inner Ø with conrod bearing shells inserted	Standard	mm	94.054–94.096	94.054–94.096
		Undersize 0.10	mm	93.954–93.996	93.954–93.996
		Undersize 0.25	mm	93.804–93.846	93.804–93.846
		Undersize 0.5	mm	93.554–93.596	93.554–93.596
		Undersize 0.75	mm	93.304–93.346	93.304–93.346
		Undersize 1.0	mm	93.054–93.096	93.054–93.096
BE03.10-N-1003-01C	Distance from center of conrod bearing bore to center of conrod bush bore		mm	273,00–273,02	273,00–273,02
BE03.10-N-1004-01C	Conrod bush inner Ø		mm	52.055–52.065	52.055–52.065
BE03.10-N-1005-01C	Conrod bolt	Thread Ø	M	16×1.5	16×1.5
		Max. shank length	mm	74.5	74.5

Test data of pistons

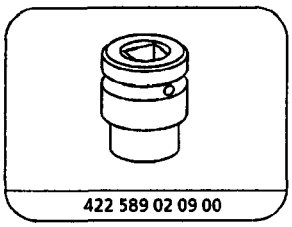
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.10-N-1001-02D	Piston projection in TDC relative to contact surface of crankcase	mm	0.27–0.61	0.27–0.61
BE03.10-N-1002-02D	Piston pin bore	mm	52.004–52.012	52.004–52.012
BE03.10-N-1003-02D	Piston pin outer Ø	mm	51.992–52.000	51.992–52.000

Nm Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover TDC inspection hole to timing case	Nm	25	25

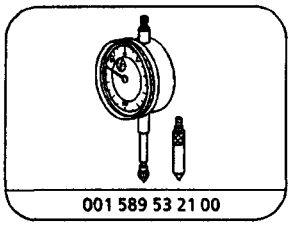
Nm Conrod

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA03.10-N-1001-01C	Bolts of conrod bearing cap to conrod	1st stage	Nm	110	110
		2nd stage	°∠	90	90



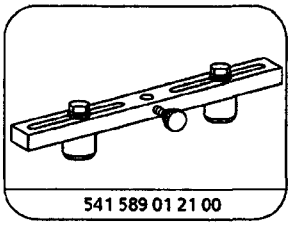
422 589 02 09 00

Wrench socket insert



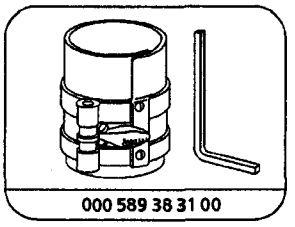
001 589 53 21 00

Dial gage



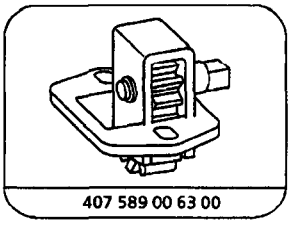
541 589 01 21 00

Measuring bridge



000 589 38 31 00

Tensioning strap



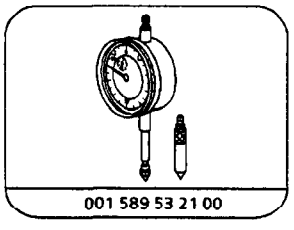
407 589 00 63 00

Cranking device

AR03.10-W-7041-01B	Measuring piston projection		

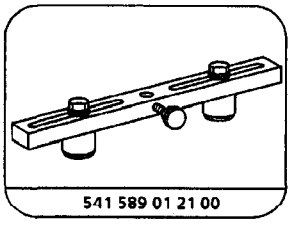
Test data of pistons

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.10-N-1001-02D	Piston projection in TDC relative to contact surface of crankcase	mm	0.27–0.61	0.27–0.61



001 589 53 21 00

Dial gauge



541 589 01 21 00

Measuring bridge

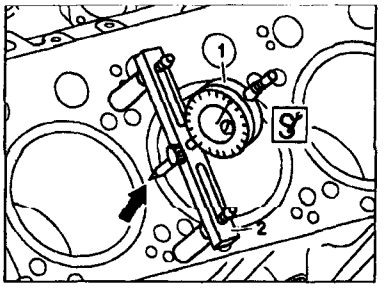
1

Measure projection between piston crown and contact surface of crankcase without cylinder head gasket fitted.
The measurement should be conducted in the piston pin direction in order to eliminate the piston rock.

1 Rotate crankshaft until the piston to be measured is positioned about 1 cm before TDC.

2 Attach dial gage (1) with preload to measuring bridge (2).

3 Mount measuring bridge (2) onto the contact surface of the crankcase (arrow) and set scale of dial gage to "0".



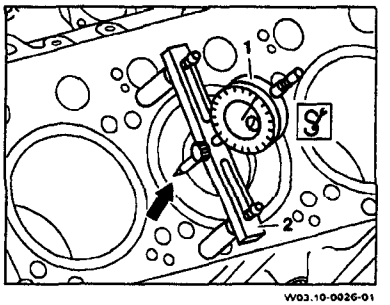
W03.10-0025-01

4 Move measuring bridge (2) from the contact surface of the crankcase until it is positioned over the cylinder bore.

Pull back tracer pin on dial gauge (1) when moving dial gauge holder.

5 Rotate crankshaft until the piston to be measured is at TDC.

6 Tracer pin of dial gage (1) is pushed back by the piston crown (arrow); the reading obtained is the amount of the piston projection.

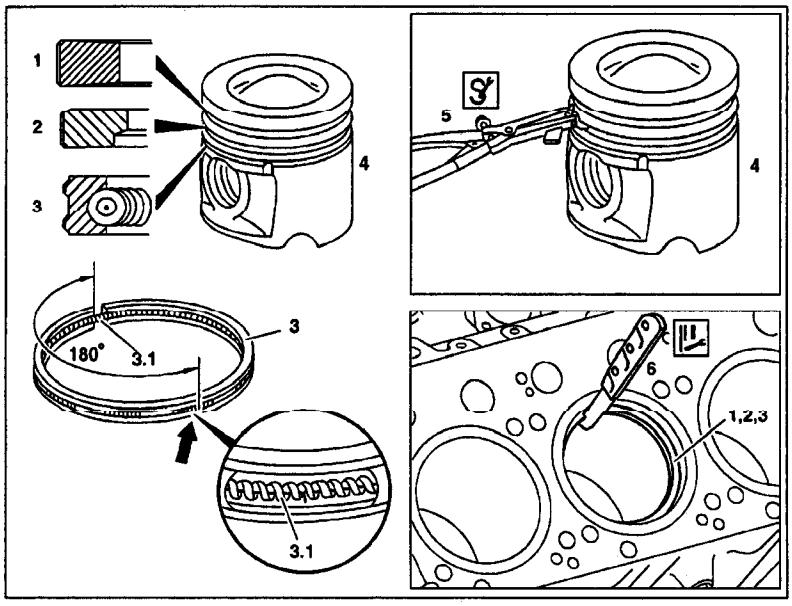


W03.10-0026-01

AR03.10-W-7311B	Removing and installing piston rings	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Keystone ring (groove I)
2 Tapered compression ring with internal angle (groove II)
3 Oil control ring with coiled spring (groove III)
3.1 Coiled spring
4 Piston
5 Pliers
6 Feeler gauge

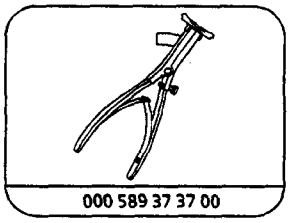


W03.10-0027-06

	Removing, installing		
1	Remove piston (4)		Page 75
2	Remove piston rings (1, 2, 3) in the sequence from top to bottom	Installation: it is important to inspect the piston rings for spalling of the coating before re-installing and after installing; replace piston rings if necessary Pay attention to installation position; marking "TOP" must face toward piston crown	000 589 37 37 00
3	Measure gap clearance of the piston rings (1, 2)	Insert piston rings in the unworn area (above the top reversal point of the 1st piston ring) of the cylinder liner and measure gap clearance with feeler gauge	BE03.10-N-1001-05D
4	Measure gap clearance of the piston ring (3)	Remove coiled spring (3.1) from the piston ring. Insert piston ring in the unworn area (above the top reversal point of the 1st piston ring) of the cylinder liner and measure gap clearance with feeler gauge Installation: install coiled spring (3.1) into the piston ring. Gap of coil spring must be offset 180° relative to piston ring gap.	BE03.10-N-1001-05D
5	Install in the reverse order		

Test data of piston rings

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BE03.10-N-1001-05D	Max. piston ring gap clearance	Groove I keystone ring When new	mm	0.60–0.75	0.60–0.75
		Groove I keystone ring Wear limit	mm	≤ 1.0	≤ 1.0
		Groove II tapered compression ring with internal angle When new	mm	0.40–0.55	0.40–0.55
		Groove II tapered compression ring with internal angle Wear limit	mm	≤ 1.0	≤ 1.0
		Groove III oil control ring with coiled spring When new	mm	0.30–0.45	0.30–0.45
		Groove III oil control ring with coiled spring Wear limit	mm	≤ 0.8	≤ 0.8



000 589 37 37 00

Pliers

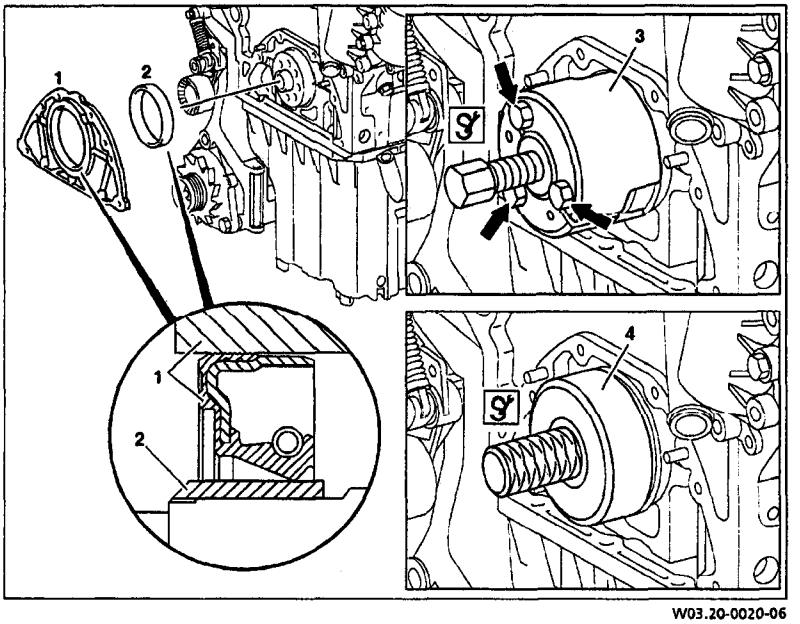
Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gauge	Stiefelmayer D–73734 Esslingen	59

AR03.20-W-2570A	Removing, installing race on crankshaft	20.1.97

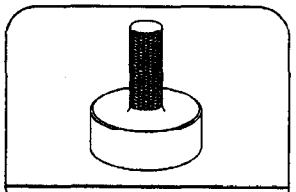
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Housing cover with radial seal
2 Race
3 Puller
4 Drift



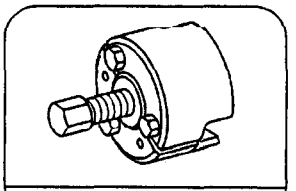
W03.20-0020-06

	Removing		
1	Remove housing cover (1)		**Page 44**
2	Pull off race (2) on crankshaft	Fit on both halves of puller over the race and tighten bolts (arrows), and pull off race.	442 589 00 33 00
	Installing		
3	Insert new race (2) with rounded edge in direction of drift and heat	Temperature max. 200 °C	403 589 03 15 00
4	Fit race (2) onto the crankshaft		403 589 03 15 00
5	Install housing cover (1)	Install new radial seal with coil spring into the front housing cover.	**Page 44**



403 589 03 15 00

Drift

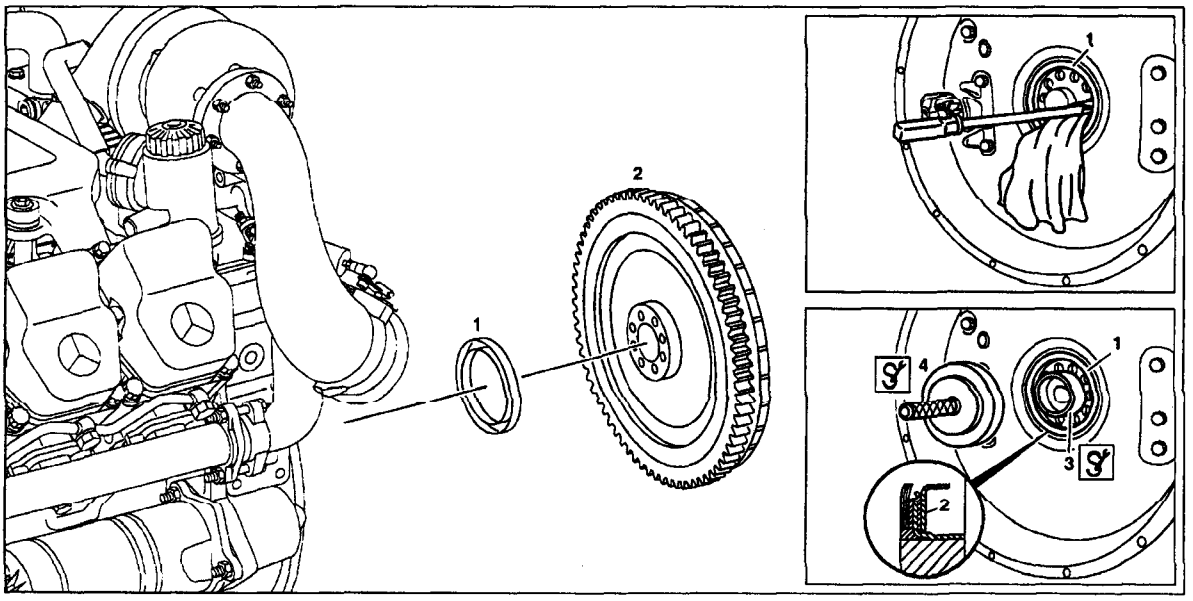


442 589 00 33 00

Puller

AR03.20-W-3063B	Replacing rear crankshaft radial seal	17.1.96

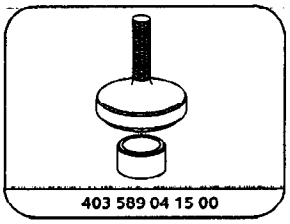
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W03.20-0015-09

1 Radial seal
2 Flywheel
3 Spacer sleeve
4 Drift

	Removing		
1	Remove flywheel (2)	Inspect flywheel flange for signs of wear and scoring resulting from radial seal, if necessary ↓	**Page 102**
		install race and flywheel flange	AR03.30-W-8350A
2	Press out radial seal (1)	Cover over crankshaft with a cleaning rag as a protection	
	Installing		
3	Fit spacer sleeve (3) over the crankshaft		403 589 04 15 00
4	Fit radial seal (1) onto the crankshaft and press in with the drift (4) until the drift (4) is making contact with the spacer sleeve (3)	Install radial seal dry and inspect sealing lips to ensure they are correctly positioned on the crankshaft after installing If a race is installed on the front flywheel flange, a radial seal with a coil spring has to be fitted	 403 589 04 15 00
5	Install flywheel (2)		**Page 102**

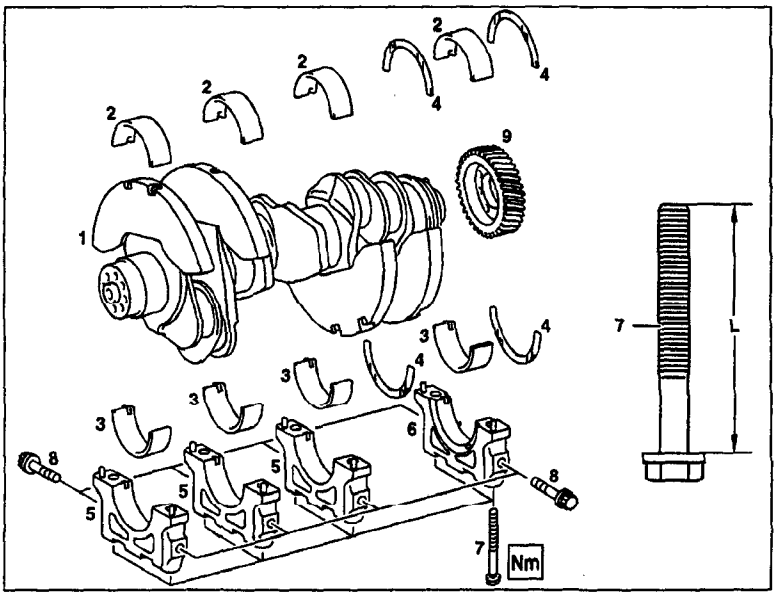


Drift

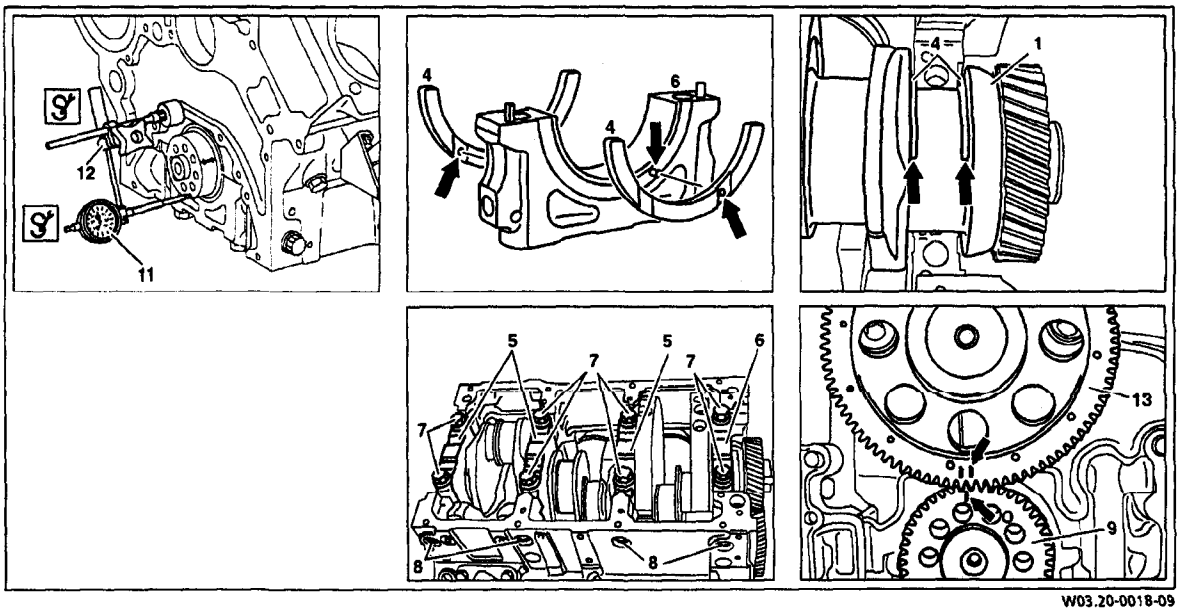
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Crankshaft
2 Top crankshaft bearing shells
3 Bottom crankshaft bearing shells
4 Thrust washers (fit bearings)
5 Main bearing caps
6 Main bearing cap (fit bearing)
7 Main bearing cap bolts
8 Main bearing cap bolts (side)
9 Crankshaft gear

L Length of shank of main bearing cap bolts



W03.20 0017 06



W03.20-0018-09

1 Crankshaft
4 Thrust washers (fit bearings)
5 Main bearing caps
6 Main bearing cap (fit bearing)
7 Main bearing cap bolts
8 Main bearing cap bolts (side)
11 Dial gage
12 Dial gage holder
13 Crankshaft gear

	Removing		
1	Remove engine		Page 12

2	Remove timing case		**Page 63**
3	Remove housing cover at front		**Page 44**
4	Remove pistons		**Page 75**
5	Remove PLD control unit		AR07.15-W-1628B
6	Remove oil pump		AR18.10-W-6020B
7	Remove main bearing caps (5, 6)	ℹ Mark main bearing caps according to the sequence On engine 541.920 - 927 the fit bearing thrust washers (4) are installed at the 4th main bearing cap. On engine 542.920 - 923/925/926 the fit bearing thrust washers (4) are installed at the 5th main bearing cap.	
8	Take off crankshaft bearing shells (3)	ℹ Mark crankshaft bearing shells to the relevant main bearing cap (5, 6).	
9	Lift crankshaft (1) out of the crankcase with a lifting tackle	🔧	403 589 02 63 00
10	Take out crankshaft bearing shells (2)	ℹ Mark crankshaft bearing shells to the crankcase.	
11	Measure crankshaft and fit into bearings		**Page 92**
⚒	Installing		
12	Install crankshaft (1) with a tackle	ℹ Marking on crankshaft gear (9) should be between the markings of the camshaft gear (13). 🔧	 403 589 02 63 00
13	Measure central main bearing bolts (7)	ℹ If the shank length (L) is exceeded, replace main bearing bolt.	BE01.40-N-1002-02C
14	Install main bearing caps (5)	ℹ All main bearing caps have dowel pins and are identified with numbers (arrows). The main bearing caps should be installed in accordance with the numbers in ascending order, starting from the front, and must not be mixed up. Oil main bearing bolts. ℹ Pay attention to the tightening sequence; first of all fully tighten the central main bearing bolts (7), then the side main bearing bolts (8). Nm central main bearing bolts (7) Nm side main bearing bolts (8)	 BA01.40-N-1013-01D BA01.40-N-1016-01D
15	Determine thickness of the fit bearing thrust washer and install main bearing cap (6)	 Fit bearing journal width Axial play Wall thickness of fit bearing thrust washers ℹ Pay attention to tightening sequence; first of all, fully tighten central main bearing bolts (7), then the side main bearing bolts (8).	**Page 90** BE03.20-N-1002-02C BE03.20-N-1006-02C BE03.20-N-1013-02C

		Nm central main bearing bolts (7)	BA01.40-N-1013-01D
		Nm side main bearing bolts (8)	BA01.40-N-1016-01D
		S	001 589 53 21 00
		S	363 589 02 21 00
16	Mount conrod in bearings and install		**Page 69**
17	Install pistons		**Page 75**
18	Install oil pump		AR18.10-W-6020B
19	Install timing case		**Page 63**
20	Install housing cover at front		**Page 44**
21	Install PLD control unit		AR07.15-W-1628B
23.1	Replace oil-water heat exchanger	⑬ Only in the case of material abrasion.	AR18.30-W-6840B
24	Replace oil filter element		AP18.00-W-0101A
25	Install engine		**Page 12**
26	Fill engine oil circuit		AR18.00-W-1600B

Test data of crankcase

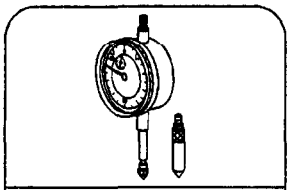
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE01.40-N-1002-02C	Main bearing cap bolts	thread ∅	M	18	18
		length of shank when new	mm	173	173
		max. shank length	mm	176	176

Test data of crankshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1002-02C	Fit bearing journal width	Standard	mm	42.000–42.062	42.000–42.062
		Oversize 0.5	mm	42.500–42.562	42.500–42.562
		Oversize 1.0	mm	43.000–43.062	43.000–43.062
BE03.20-N-1003-02C	Main bearing journal width		mm	42.000–42.016	42.000–42.016
BE03.20-N-1006-02C	Axial play		mm	0.150–0.351	0.150–0.351
BE03.20-N-1013-02C	Fit bearing thrust washers wall thickness	Standard	mm	5.375–5.425	5.375–5.425
		Oversize 0.5	mm	5.625–5.675	5.625–5.675
		Oversize 1.0	mm	5.875–5.925	5.875–5.925

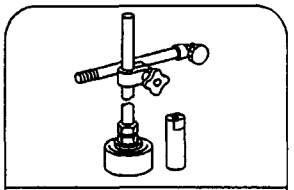
Crankcase, timing case cover, end cover

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1013-01D	Central bolt of main bearing cap to crankcase	1st stage	Nm	320	320
		2nd stage	°∠	90	90
BA01.40-N-1016-01D	Side bolt of main bearing cap to crankcase		Nm	125	125



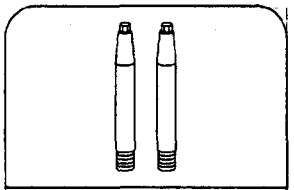
001 589 53 21 00

Dial gage



363 589 02 21 00

Dial gage holder



403 589 02 63 00

Drift

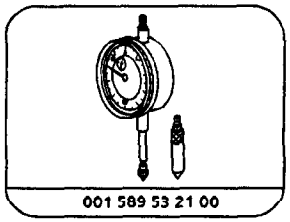
AR03.20-W-4351-01A	Determining thickness of fit bearing thrust washers of crankshaft		

Test data of crankshaft

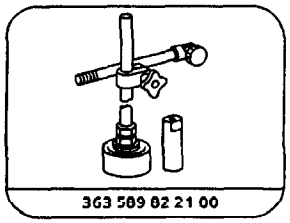
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1002-02C	Fit bearing journal width	Standard	mm	42.000–42.062	42.000–42.062
		Oversize 0.5	mm	42.500–42.562	42.500–42.562
		Oversize 1.0	mm	43.000–43.062	43.000–43.062
BE03.20-N-1006-02C	Axial play		mm	0.150–0.351	0.150–0.351
BE03.20-N-1013-02C	Fit bearing thrust washers wall thickness	Standard	mm	5.375–5.425	5.375–5.425
		Oversize 0.5	mm	5.625–5.675	5.625–5.675
		Oversize 1.0	mm	5.875–5.925	5.875–5.925

Crankcase, timing case, end cover

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1013-01D	Central bolt of main bearing cover to crankcase	1st stage	Nm	320	320
		2nd stage	°∠	90	90
BA01.40-N-1016-01D	Side bolt of main bearing cover to crankcase		Nm	125	125



Dial gage

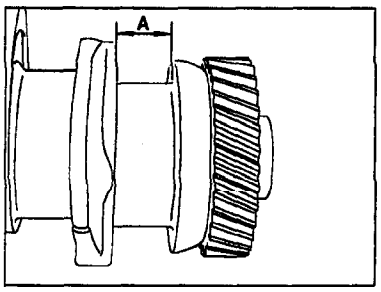


Dial gage holder

1 Measure crankshaft fit bearing journal width (A) and assign thrust washers to match the installation stage measured.

i

The dimensions of the installation stages stated in the table should be maintained. Thrust washers are factory-supplied ready for installation and also in oversizes for repairs. It is not permitted to carry out any reworking.

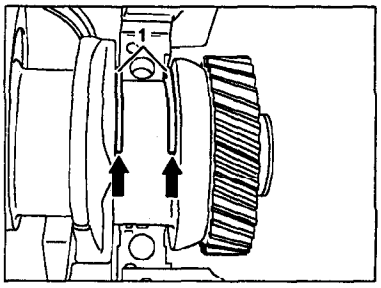


W03.20-0028-01

2 Oil thrust washers (1) and push into the guides between crankshafts (fit bearings) and the contact surface in the crankcase.

i

Only thrust washers (1) of the same wall thickness should be installed.



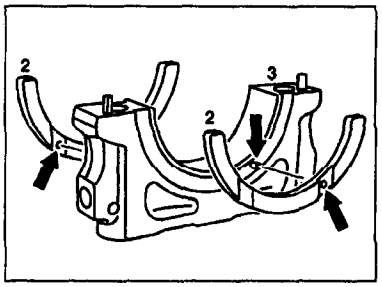
W03.20-0029-01

3 Oil thrust washers (2) and insert into the groove at the main bearing cap (fit bearing) (6).

4 Nm Install main bearing cap (fit bearing) (3) and bolt tight.

i

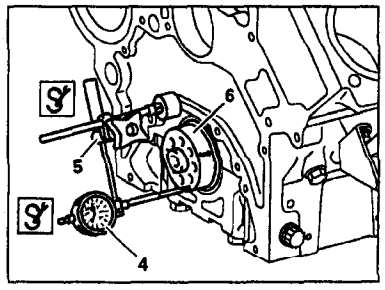
The main bearing cap has dowel pins and is identified with a number. Oil main bearing bolts. Pay attention to tightening order; first of all tighten the central bolts fully, then the side main bearing bolts.



W03.20-0026-01

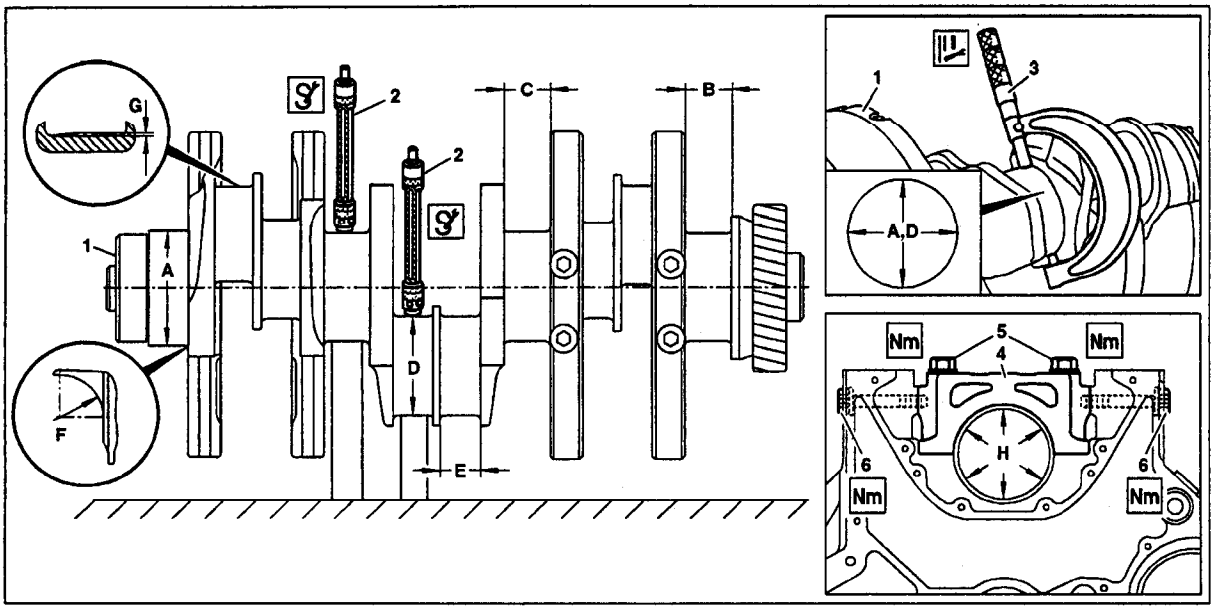
5 Rotate crankshaft by hand and inspect ease of operation.

6 Attach S dial gage holder (4) and S dial gage (5) with preload to crankcase. Move crankshaft (6) from stop to stop and read off measurement on gage (axial play).



W03.20-0027-01

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

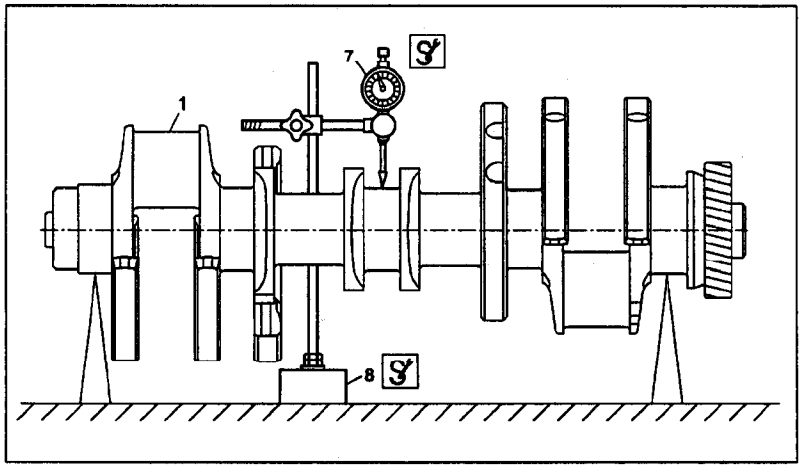


W03.20-0030-09

1 *Crankshaft*
2 *Drop hardness tester*
3 *Micrometer*
4 *Main bearing cap*
5 *Central main bearing bolts*
6 *Side main bearing bolts*

A *Main bearing journal diameter*
B *Fit bearing journal width*
C *Main bearing journal width*
D *Conrod bearing journal diameter*
E *Conrod bearing journal width*
F *Main, conrod bearing journal fillet radii*
G *Main, conrod bearing journal roundness*
H *Main bearing inner diameter when installed*

1 *Crankshaft*
7 *Dial gage*
8 *Dial gage holder*



W03.20-0031-05

	Inspecting		
1	Remove crankshaft		Page 87
2	Clean crankshaft		

3	Inspect crankshaft flange at front for wear	If worn or grooves caused by radial seal, a race should be fitted onto the crankshaft flange.	**Page 84**
4	Inspect main, conrod bearing journals for damage and cracks	If damaged or cracked ↓ Replace crankshaft.	
5	Test hardness of main and crankshaft bearing journals with drop hardness tester (2)	A base should be placed below the bearing journal to be tested for the test. Specified hardness should be achieved around at least thwo-thirds of the circumference of bearing journal. If specified hardness is not achieved ↓ Reharden crankshaft or replace.	BE03.20-N-1009-02C 000 589 20 21 00 BE03.20-N-1009-02C
	Measuring		
6	Measure crankshaft (1) for radial runout	On engine 541.920 - 927 Measured at the two middle main bearing journals, mounted at outer main bearing journals. On engine 542.920 - 923/925/926 Measured at middle main bearing journal, mounted at outer main bearing journals.	BE03.20-N-1007-02C BE03.20-N-1007-02C
7	Measure main, conrod bearing journals	Measure main bearing journal diameter (A) with the micrometer at two points (offset about 90°). Micrometer Main bearing journal width (C) Fit bearing journal width (B) Measure conrod bearing journal diameter (D) with micrometer at two points (offset about 90°). Micrometer Conrod bearing journal width (E) Fillet radii (F) of main, conrod bearing journals Roundness (G) of main, conrod bearing journals If damaged and worn, machine crankshaft to the next undersize. The balancing weights should be taken off for machining the crankshaft (1) and recentered again after fitting on.	BE03.20-N-1001-02C WH58.30-Z-1027-12A BE03.20-N-1003-02C BE03.20-N-1002-02C BE03.20-N-1004-02C WH58.30-Z-1013-12A BE03.20-N-1005-02C BE03.20-N-1008-02C BE03.20-N-1010-02C
	Mounting		
8	Mount crankshaft (1) radially		**Page 97**
		Main bearing journal diameter (A)	BE03.20-N-1001-02C
		Crankshaft main bearing inner diameter (H) when installed.	BE03.20-N-1012-02C

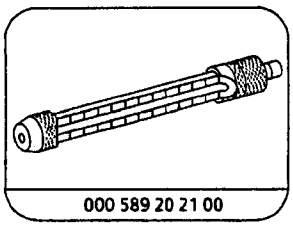
		Pay attention to tightening sequence; first of all, tighten fully the central main bearing bolt (5), then the side main bearing bolts (6).	
		Nm central main bearing bolts	BA01.40-N-1013-01D
		Nm side main bearing bolts	BA01.40-N-1016-01D
			001 589 53 21 00
		Quick calipers	WH58.30-Z-1009-12A
		Micrometer	WH58.30-Z-1027-12A
9	Install crankshaft (1)		**Page 87**

Test data of crankshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1001-02C	Main bearing journal Ø	Standard	mm	107.98–108.00	107.98–108.00
		Undersize 0.10	mm	107.88–107.90	107.88–107.90
		Undersize 0.25	mm	107.73–107.75	107.73–107.75
		Undersize 0.5	mm	107.48–107.50	107.48–107.50
		Undersize 0.75	mm	107.23–107.25	107.23–107.25
		Undersize 1.0	mm	106.98–107.00	106.98–107.00
BE03.20-N-1002-02C	Fit bearing journal width	Standard	mm	42.000–42.062	42.000–42.062
		Oversize 0.5	mm	42.500–42.562	42.500–42.562
		Oversize 1.0	mm	43.000–43.062	43.000–43.062
BE03.20-N-1003-02C	Main bearing journal width		mm	42.000–42.016	42.000–42.016
BE03.20-N-1004-02C	Conrod bearing journal Ø	Standard	mm	93.98–94.00	93.98–94.00
		Undersize 0.1	mm	93.88–93.90	93.88–93.90
		Undersize 0.25	mm	93.73–93.75	93.73–93.75
		Undersize 0.5	mm	93.48–93.50	93.48–93.50
		Undersize 0.75	mm	93.23–93.25	93.23–93.25
		Undersize 1.0	mm	92.98–93.00	92.98–93.00
BE03.20-N-1005-02C	Conrod bearing journal width		mm	37.000–37.010	81.000–81.014
BE03.20-N-1007-02C	Radial runout measured at middle main bearing journal (mounted at outer main bearing journals)		mm	≤0.06	≤0.06
BE03.20-N-1008-02C	Fillet radii	main bearing journals	mm	3.5–4.0	3.5–4.0
		conrod bearing journals	mm	3.5–4.0	3.5–4.0
BE03.20-N-1009-02C	Hardness of main bearing and conrod bearing journals (Rockwell hardness)		HRC	53–59	53–59
BE03.20-N-1010-02C	Roundness	main bearing journals	mm	0.002±0.002	0.002±0.002
		conrod bearing journals	mm	0.002±0.002	0.002±0.002
BE03.20-N-1012-02C	Crankshaft main bearing inner Ø when installed	Standard	mm	108.056–108.102	108.056–108.102
		Undersize 0.10	mm	107.956–108.002	107.956–108.002
		Undersize 0.25	mm	107.806–107.852	107.806–107.852
		Undersize 0.5	mm	107.556–107.602	107.556–107.602
		Undersize 0.75	mm	107.306–107.352	107.306–107.352
		Undersize 1.0	mm	107.056–107.102	107.056–107.102

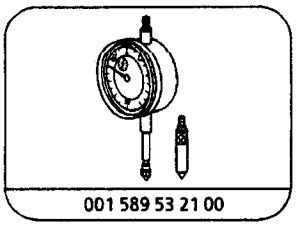
Crankcase, timing case cover, end cover

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1013-01D	Central bolt of main bearing cap to crankcase	1st stage	Nm	320	320
		2nd stage	°∠	90	90
BA01.40-N-1016-01D	Side bolt of main bearing cap to crankcase		Nm	125	125



000 589 20 21 00

Hardness tester



001 589 53 21 00

Dial gage

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1009-12A	Quick calipers for internal measurements, ∅ 100 – 120 mm		
WH58.30-Z-1013-12A	Micrometer 75 – 100 mm		
WH58.30-Z-1027-12A	Micrometer 100–125 mm	Hahn und Kolb Borsigstr. 50 D–70469 Stuttgart	313346 100

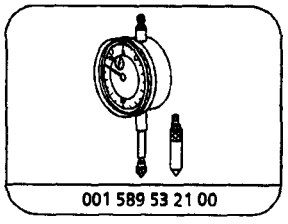
AR03.20-W-4355-01A	Positioning crankshaft in mounts radially		

Test data of crankshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE03.20-N-1001-02C	Main bearing journal Ø	Standard	mm	107.98–108.00	107.98–108.00
		Undersize 0.10	mm	107.88–107.90	107.88–107.90
		Undersize 0.25	mm	107.73–107.75	107.73–107.75
		Undersize 0.5	mm	107.48–107.50	107.48–107.50
		Undersize 0.75	mm	107.23–107.25	107.23–107.25
		Undersize 1.0	mm	106.98–107.00	106.98–107.00
BE03.20-N-1012-02C	Crankshaft main bearing inner Ø when installed	Standard	mm	108.056–108.102	108.056–108.102
		Undersize 0.10	mm	107.956–108.002	107.956–108.002
		Undersize 0.25	mm	107.806–107.852	107.806–107.852
		Undersize 0.5	mm	107.556–107.602	107.556–107.602
		Undersize 0.75	mm	107.306–107.352	107.306–107.352
		Undersize 1.0	mm	107.056–107.102	107.056–107.102

Crankcase, timing case cover, end cover

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1013-01D	Central bolt of main bearing cap to crankcase	1st stage	Nm	320	320
		2nd stage	° ∠	90	90
BA01.40-N-1016-01D	Side bolt of main bearing cap to crankcase		Nm	125	125



001 589 53 21 00

Dial gage

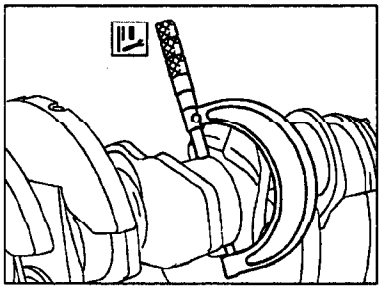
Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1009-12A	Quick calipers for internal measurements, Ø 100 – 120 mm		
WH58.30-Z-1027-12A	Micrometer 100–125 mm	Hahn und Kolb Borsigstr. 50 D–70469 Stuttgart	313346 100

1 Clean bearing points of the crankshaft with a chamois leather.

2 Use the micrometer to measure main bearing journal Ø to two points (offset about 90°.

ⓘ
The dimensions stated in the table should be maintained. If one of the readings obtained is not within the tolerance range, machine crankshaft.

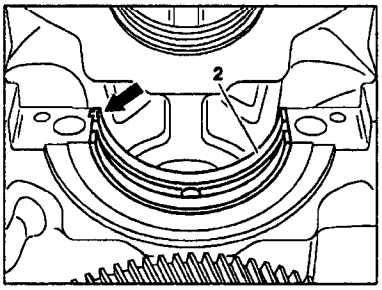


W03.20-0022-01

3 Clean bearing points in crankcase and main bearing caps with a chamois leather.

4 Insert crankshaft bearing shells (2) into the crankcase in the sequence marked.

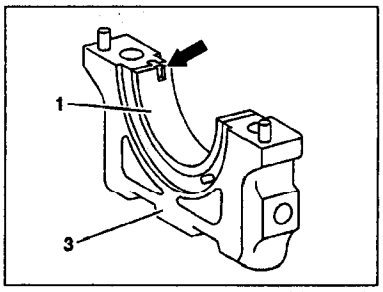
ⓘ
The locking lugs (arrow) of the crankshaft bearing shells (2) should be positioned in the slots of the crankcase basic bores. Oil drillings in the crankshaft bearing shell (2) and crankcase should be aligned.



W03.20-0023-01

5 Insert crankshaft bearing shells (1) into the main bearing caps (3, 4) in the sequence marked.

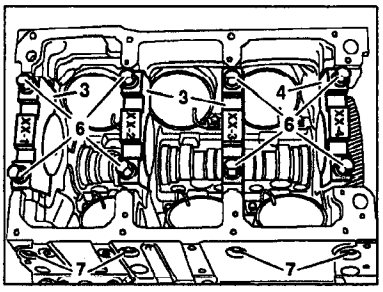
ⓘ
The locking lugs (arrows) of the crankshaft bearing shells (1) should be located in the slots of the main bearing caps (3).



W03.20-0024-01

6 Attach main bearing caps (3, 4) to the crankcase.

ⓘ
All the main bearing caps (3, 4) have dowel pins and are identified with numbers. They should be installed in accordance with the numbers in ascending order, starting from the front.
Oil main bearing bolts (6, 7) and pay attention to tightening order: first of all fully tighten the central main bearing bolts (6, 7) and then the side bolts.



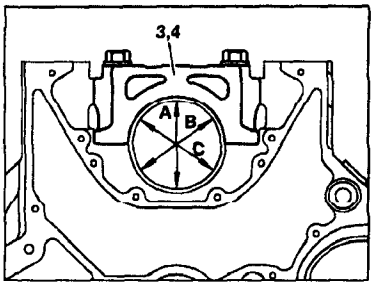
W03.20-0025-01

7 Set dial gage and quick calipers to the nominal dimension of the main bearing journal with the micrometer (preload 5 mm)

8 Use the dial gage and quick calipers to measure crankshaft bearing bores in the crankcase at three points (A, B, C) (vertically and each about 30° away from the separation points).

i

The dimensions stated in the tables should be observed. If one of the readings obtained (A, B, C) is not within the tolerance range, replace main bearing shells in accordance with the measured main bearing journals.
Main bearing shells are factory-supplied ready for installation and also in oversizes for repairs. It is not permitted to carry out any reworking.



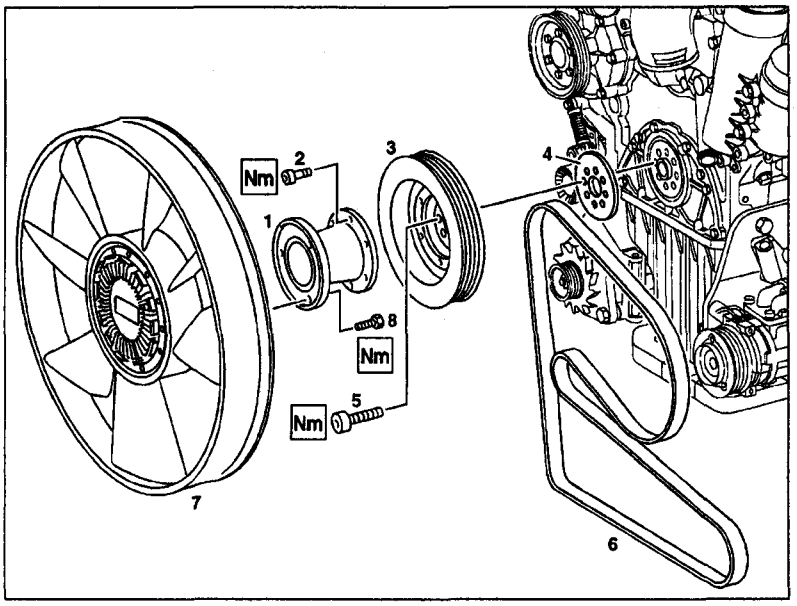
W03.20-0019-01

9 Attach main bearing caps (3, 4) again.

AR03.30-W-1600B	Removing, installing belt pulley/vibration damper	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Intermediate piece
2 Bolt
3 Vibration damper
4 Splash ring
5 Bolt
6 Poly V-belt
7 Viscous fan
8 Bolt



W02.30-0011-06

	Removing, installing		
1	Slacken poly V-belt (6) and take off	On engine 542.920-923/925/926	AR13.25-W-3200B
2	Detach cover at timing case	Nm End cover to timing case	BA01.60-N-1001-01B
3	Block engine at flywheel	i Use a suitable tool to block flywheel at ring gear	
4.1	Remove viscous fan (7)	On engine 541.920 - 927; 542.920/921/925/926	AR20.40-W-5614A
4.2	Remove viscous fan (7) and fan drive	On engine 542.922/923	AR20.40-W-5614B
5.1	Remove intermediate piece (1)	On engine 541.920 - 927; 542.920/921/925/926 Nm Intermediate piece to vibration damper	BA03.30-N-1003-01F
6	Unscrew bolts (2) and take off vibration damper (3)	Nm Vibration damper to crankshaft	BA03.30-N-1002-01F
7	Take off splash ring (4)		
8	Install in the reverse order		

Nm Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover TDC inspection hole to timing case	Nm	25	25

Flywheel, driven plate, vibration damper, starter ring gear

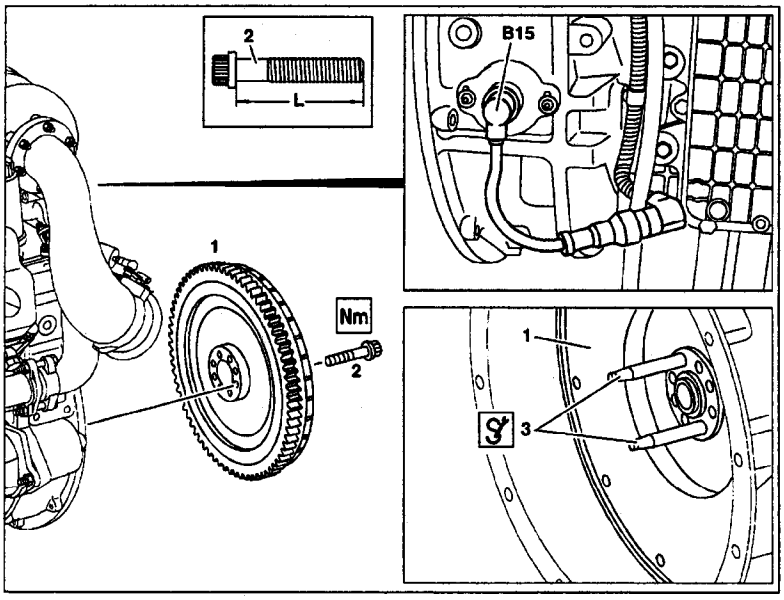
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA03.30-N-1002-01F	Vibration damper to crankshaft	Nm	200	200
BA03.30-N-1003-01F	Intermediate piece to vibration damper	Nm	30	30

AR03.30-W-8002B	Removing, installing flywheel	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Flywheel
2 Flywheel bolt
3 Drifts

B15 Crankshaft position sensor
L Shank length of flywheel bolt



W03.30-0012-06

	Removing, installing		
1	Remove clutch		AR25.10-W-0050B
2	Pull crankshaft position sensor (B15) about 8 mm out of the timing case	Do not damage crankshaft position sensor with the ring gear when pulling off the flywheel (1) Installation: press crankshaft position sensor into the timing case as far as a stop	
3	Detach cover at timing case	End cover to timing case	BA01.60-N-1001-01B
4	Block engine at flywheel (1)	Use a suitable tool to block flywheel at ring gear	
5	Unscrew flywheel bolts (2) at flywheel (1)	Installation: lightly oil flywheel bolts Flywheel to crankshaft	BE03.30-N-1004-03C BA03.30-N-1001-01F
6	Screw drifts (3) into two opposite threaded holes		403 589 02 63 00
7	Remove flywheel (1) over the drifts (3)	If flywheel is tight, screw two bolts (M10×1.5) into opposite threaded holes and pull off flywheel Installation: grease ring gear with longlife grease	BR00.45-Z-1001-06A
	Inspecting		
8	Measure flywheel bolts (2)	If the max. shank length (L) is exceeded, replace flywheel bolt	BE03.30-N-1004-03C
9	Inspect clutch surface at flywheel (1)	If scorching, scores or cracks are present in the clutch surface ↓ machine flywheel	Page 105

Additional Information

		If the scores or cracks are deeper than the maximum permissible stock removal, the flywheel has to be replaced	
10	Inspect flywheel flange for wear and scoring produced by radial seal	ⓘ If wear or scoring present ↓ install race at flywheel flange	AR03.30-W-8350A
11	Inspect ring gear for wear	ⓘ If worn ↓ replace ring gear of flywheel (1)	AR03.30-W-8312B
12	Install in the reverse order		

Test data of flywheel

Number	Designation			Engine 541.920/921/922/923/924/925/926/927
BE03.30-N-1004-03C	Flywheel bolt	Thread Ø	M	16×1.5
		Shank length when new	mm	74.0
		Max. shank length	mm	75.0

Test data of flywheel

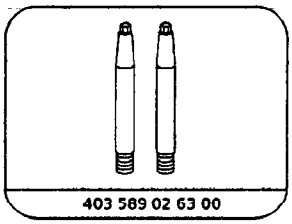
Number	Designation			Engine 542.920/921/922/923/925/926
BE03.30-N-1004-03C	Flywheel bolt	Thread Ø	M	16×1.5
		Shank length when new	mm	74.0
		Max. shank length	mm	75.0

Nm Timing case

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.60-N-1001-01B	End cover TDC inspection hole to timing case	Nm	25	25

Nm Flywheel, driven plate, vibration damper, starter ring gear

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA03.30-N-1001-01F	Flywheel to crankshaft	1st stage	Nm	210	210
		2nd stage	° ∡	90	90



Drift

Repair products

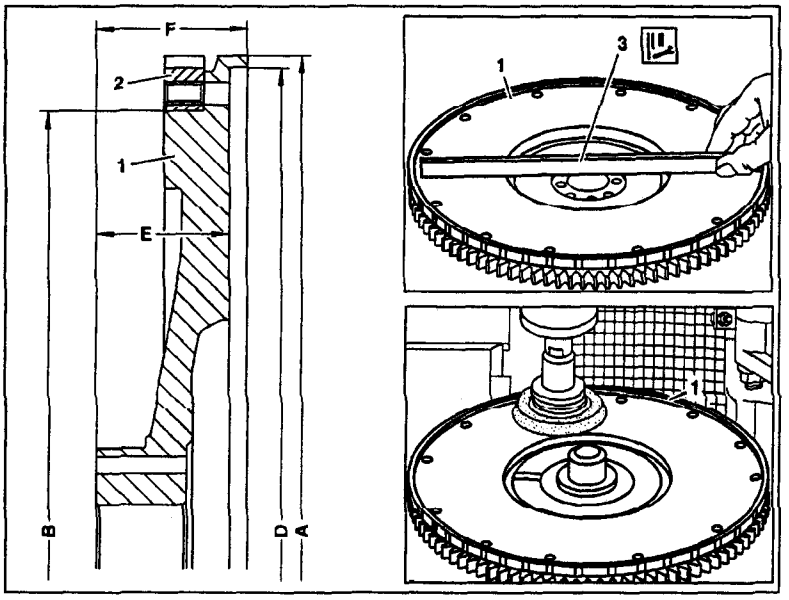
Number	Designation	Order number
BR00.45-Z-1001-06A	MB longlife grease	000 989 63 51

AR03.30-W-80228	Checking and re-machining flywheel	29.2.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Flywheel
2 Ring gear
3 Knife-edge straightedge

A Flywheel outer diameter
B Flywheel diameter for mounting ring gear
D Flywheel diameter for mounting clutch
E Flywheel minimum width between friction surface and contact flange when performing repairs
F Flywheel overall width



W03.30-0013-06

	Removing		
1	Remove flywheel (1)		**Page 102**
	Inspecting		
2	Clean flywheel (1) and inspect clutch surface (friction surface) for signs of scorching, scores and cracks and inspect flatness with knife-edge straightedge (3)	If a fault exists, the clutch surface (friction surface) must be machined by grinding or precision turning. Before machining the flywheel, check whether stock removal is still possible. If the scores or cracks are deeper than the maximum permissible stock removal, the flywheel should be replaced.	
	Machining		
3	Machine flywheel (1)	Flywheel outer diameter (A) Flywheel diameter for mounting starter ring gear (B) Flywheel diameter for mounting clutch (D)	BE03.30-N-1001-03C
		Flywheel overall width (F) When machining the clutch surface (friction surface), the width between friction surface and contact surface must not be less than flywheel minimum width (E)	BE03.30-N-1003-03C
		If the surface roughness of the clutch friction surface is excessive, this increases the wear of the clutch lining. If the surface roughness is insufficient, this may result in clutch separation problems. The friction surface must not have any shrink holes or chatter marks after machining.	BE03.30-N-1002-03C

	Installing		
4	Install flywheel (1)		Page 102

Test data of flywheel

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE03.30-N-1001-03C	Flywheel ∅	Outer (A)		mm	487
		For mounting starter ring gear (B)	Standard	mm	432.490–432.645
			Undersize 0.5	mm	431.990–432.145
		For mounting clutch (D)		mm	475.000–475.063
			Fig. see		AR03.30-W-8022-01A
BE03.30-N-1002-03C	Clutch friction surface		Surface roughness (R_z)	µm	16
			Flatness	mm	≤0,03
BE03.30-N-1003-03C	Flywheel	Overall width (F)		mm	70
		Minimum width between friction surface and contact flange when performing repairs (E)		mm	60
			Fig. see	mm	AR03.30-W-8022-01A

Test data of flywheel

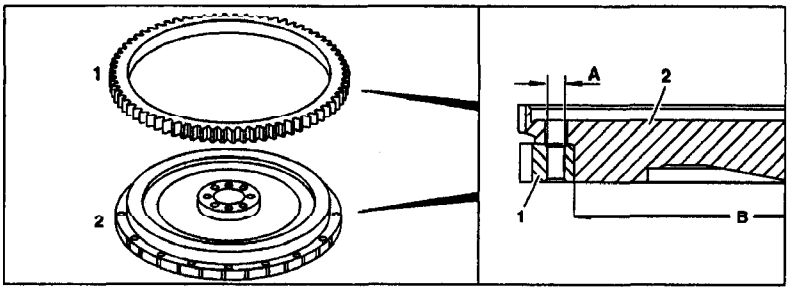
Number	Designation				Engine 542.920/921/922/923/925/926
BE03.30-N-1001-03C	Flywheel ∅	Outer (A)		mm	487
		For mounting starter ring gear (B)	Standard	mm	432.490–432.645
			Undersize 0.5	mm	431.990–432.145
		For mounting clutch (D)		mm	475.000–475.063
			Fig. see		AR03.30-W-8022-01A
BE03.30-N-1002-03C	Clutch friction surface		Surface roughness (R_z)	µm	16
			Flatness	mm	≤0,03
BE03.30-N-1003-03C	Flywheel	Overall width (F)		mm	70
		Minimum width between friction surface and contact flange when performing repairs (E)		mm	60
			Fig. see	mm	AR03.30-W-8022-01A

AR03.30-W-8312B	Replacing ring gear of flywheel	29.2.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Ring gear
2 Flywheel

A Bore Ø for mounting clutch pressure plate (M10×1.5)
B Flywheel Ø for mounting starter ring gear



W03.30-0014-04

⛶	**Removing**		
1	Remove flywheel		AR03.30-W-8002B
	Replacing		
2	Use welding torch to rapidly heat ring gear (1) and press off from the flywheel (2)		
3	Measure flywheel diameter (B) for mounting the ring gear (1)	ⓘ If the diameter is less than the standard diameter (B), the flywheel diameter must be re-machined for mounting the ring gear . Pay attention to undersize.	BE03.30-N-1001-03C
4	Measure inner diameter of ring gear	Pay attention to size of overlap at ring gear (1) relative to flywheel (2)	BE03.30-N-1002-04C
5	Heat new ring gear (1)	ⓘ Temperature is reached once ring gear has a bright yellow annealing color	BE03.30-N-1002-04C
6	Press ring gear (1) onto the flywheel (2) as far as the contact face	ⓘ The permissible radial runout of the fitted ring gear must not be exceeded	BE03.30-N-1002-04C
	Drill holes (A) in ring gear (1) for mounting the clutch pressure plate and tap thread (M10×1.5)		
⛶	**Installing**		
7	Install flywheel		AR03.30-W-8002B

Test data of flywheel

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE03.30-N-1001-03C	Flywheel Ø	Outer (A)		mm	487
		For mounting starter ring gear (B)	Standard	mm	432,490–432,645
			Undersize 0,5	mm	431,990–432,145
		For mounting clutch (D)		mm	475,000–457,063
				Fig. see	AR03.30-W-8022-01A

Test data of flywheel

Number	Designation				Engine 542.920/921/922/923/925/926
BE03.30-N-1001-03C	Flywheel ∅	Outer (A)		mm	487
		For mounting starter ring gear (B)	Standard	mm	432,490–432,645
			Undersize 0,5	mm	431,990–432,145
		For mounting clutch (D)		mm	475,000–457,063
			Fig. see		AR03.30-W-8022-01A

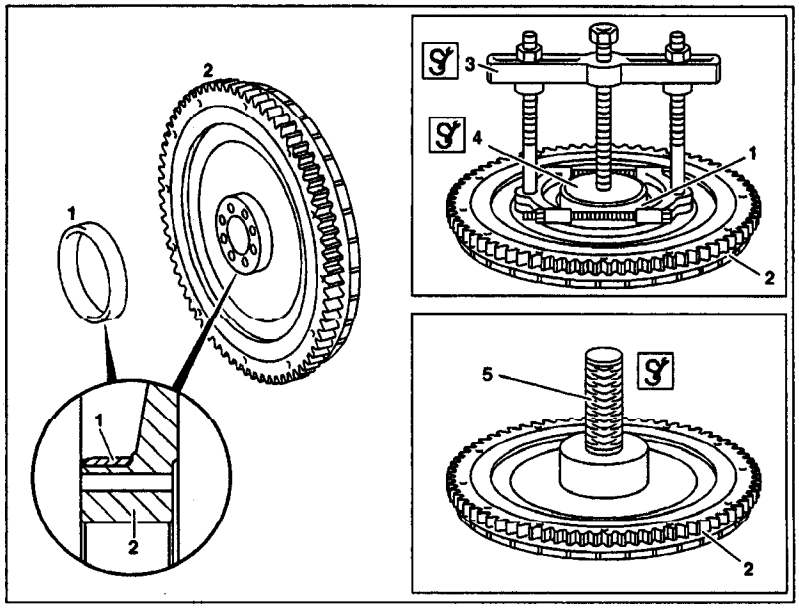
Test data of starter ring gear

Number	Designation				Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE03.30-N-1002-04C	Starter ring gear	Inner ∅	Standard	mm	432,000–432,115	432,000–432,115
			Undersize 0,5	mm	431,500–431.615	431,500–431,615
		Flywheel overlap		mm	0,375–0,645	0,375–0,645
		Permissible radial runout of flywheel		mm	≤0,5	≤0,5
		Width		mm	18,4–18,6	18,4–18,6
		Fitting temperature		°C	200–230	200–230

AR03.30-W-8350A	Removing, installing race on flywheel	23.10.96

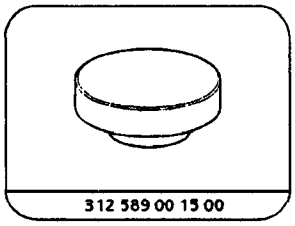
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Race*
2 *Flywheel*
3 *Puller*
4 *Thrust piece*
5 *Drift*

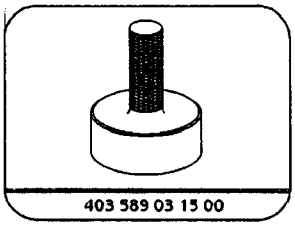


W03 30-0016-06

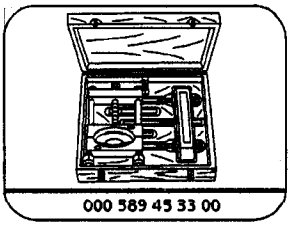
	Removing		
1	Remove flywheel (2)		AR03.30-W-8002B
2	Pull off race (1) on flywheel (2)		000 589 45 33 00 312 589 00 15 00
	Installing		
3	Use drift (5) to insert new race (1) and heat	With rounded edge facing drift. Temperature max. 200 °C	403 589 03 15 00
4	Fit race (1) onto flywheel (2)		403 589 03 15 00
5	Install new radial seal with coil spring in timing case		AR03.20-W-3063B
6	Install flywheel (2)		AR03.30-W-8002B



Thrust piece



Drift

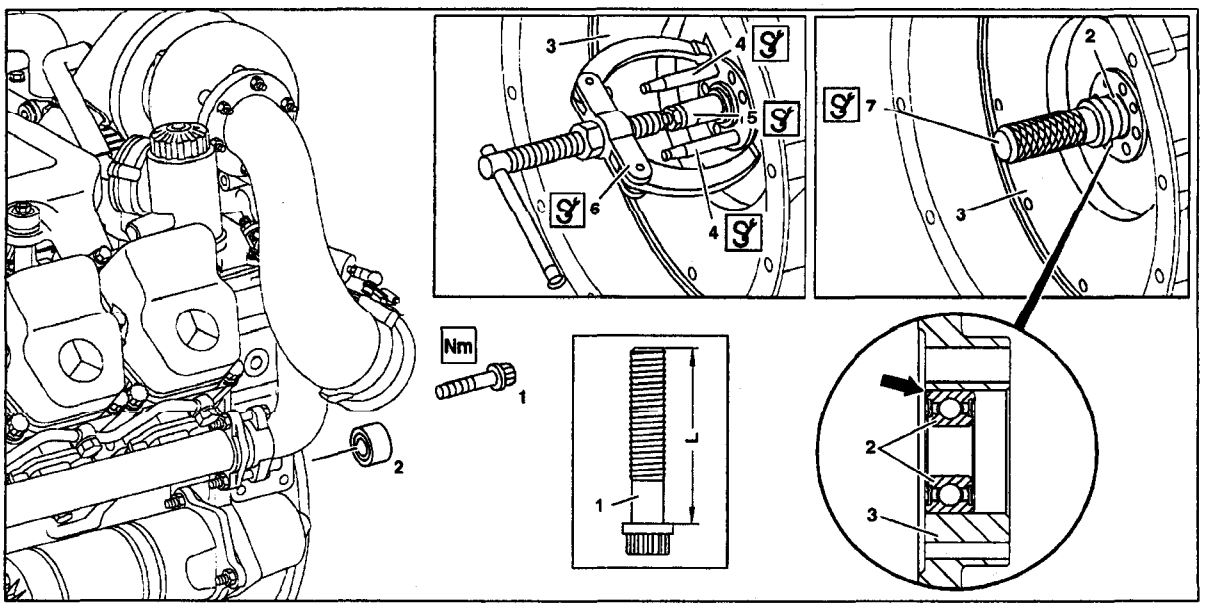


Puller

Additional Information

AR03.30-W-8401B	Removing, installing guide bush in flywheel	7.2.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W03.30-0015-09

1 Flywheel bolt
2 Guide bush
3 Flywheel
4 Drift
5 Internal extractor
6 Counter-support
7 Drift

Modification notes

31.1.97	Tightening torque/tightening angle of flywheel bolts modified	Step 4	

	Removing, installing		
1	Remove clutch		AR25.10-W-0050B
2	Take off cover at timing case	Nm End cover to timing case	BA01.60-N-1001-01B
3	Block engine at flywheel (3)	Use a suitable tool to block flywheel at ring gear	
4	Unscrew flywheel bolts (1) at flywheel (3)	Installation: lightly oil flywheel bolt Nm Flywheel to crankshaft	 BA03.30-N-1001-01F
5	Measure shank length (L) of flywheel bolts (1)	If max. shank length is exceeded ↓ replace flywheel bolts	BE03.30-N-1004-03C
6	Screw drifts (5) into two opposite threaded holes		403 589 02 63 00
7	Install internal extractor (6) into guide bush (2)		000 589 27 33 00
8	Attach counter-support (7) to internal extractor (6) and pull out guide bush (2)	(19) Place bases, e.g. copper plates, below the ends of the counter-support to avoid damaging the flywheel (3)	000 589 27 33 00

		☑ ℹ Installation: use drift (8) to install new guide bush (2) flush relative to bolt contact surface. Guide bush must not project. Grease guide bush ☑	000 589 34 33 00 BR00.45-Z-1001-06A 403 589 05 15 00
9	Install in the reverse order		

Test data of flywheel

Number	Designation			Engine 541.920/921/922/923/924/925/926/927
BE03.30-N-1004-03C	Flywheel bolt	Thread ∅	M	16×1,5
		Shank length when new	mm	74,0
		Max. shank length	mm	75,0

Test data of flywheel

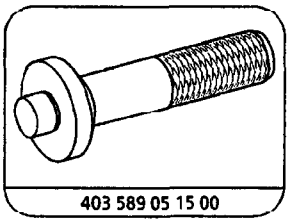
Number	Designation			Engine 542.920/921/922/923/925/926
BE03.30-N-1004-03C	Flywheel bolt	Thread ∅	M	16×1,5
		Shank length when new	mm	74,0
		Max. shank length	mm	75,0

Nm Timing case

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA01.60-N-1001-01B	End cover TDC inspection hole to timing case	Nm	25	25

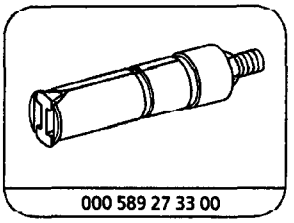
Nm Flywheel, driven plate, vibration damper, starter ring gear

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA03.30-N-1001-01F	Flywheel to crankshaft	1st stage	Nm	210	210
		2nd stage	° ∡	90	90



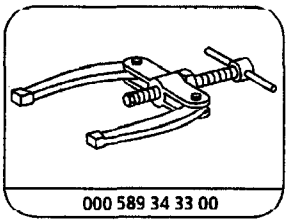
403 589 05 15 00

Drift



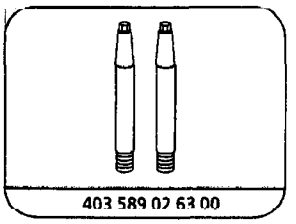
000 589 27 33 00

Internal extractor



000 589 34 33 00

Counter-support



403 589 02 63 00

Drift

Repair products

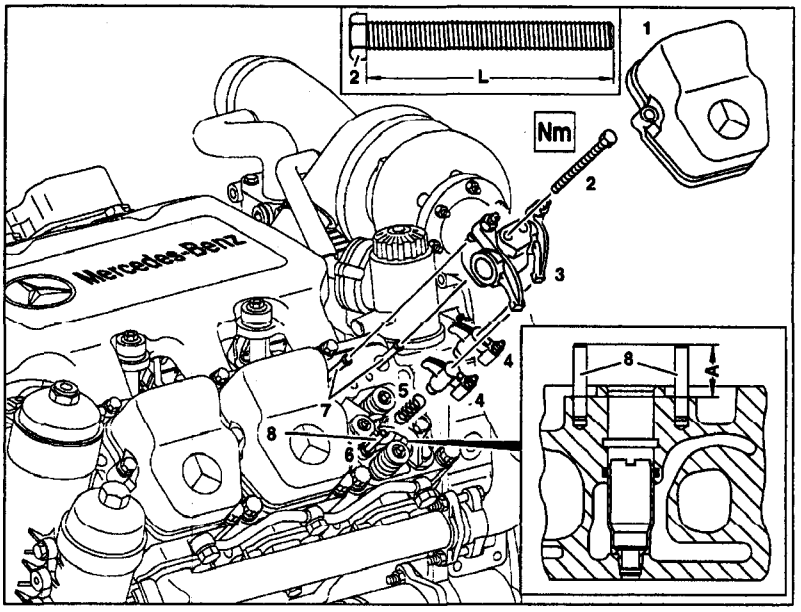
Number	Designation	Order number
BR00.45-Z-1001-06A	MB longlife grease	000 989 63 51

AR05.00-W-5521B	Removing, installing rocker arm assembly	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Cylinder head cover
2 Bolt
3 Rocker arm assembly
4 Valve bridge
5 Springs
6 Packing
7 Tappet rod
8 Guide pin of valve bridge

A Projection of guide pin from cylinder head
L Shank length of bolt (2)



W05.00-0004-06

Operation no. of operation texts or standard texts and flat rates

Op. no.	Operation text
05-5312-5542	Rocker arms

Modification notes

6.2.97	Tightening angle of rocker arm assembly bolts added	Step 2 revised	Page 9
	Measuring shank length of rocker arm assembly bolts	Step 3 included for first time	
	Basic setting of valve bridges modified	Step 4	
	Tightening torque of locknut of valve bridge modified	Step 4	

	Removing, installing		
1	Remove cylinder head cover (1)		AR01.20-W-5014B
2	Remove rocker arm assembly (3)	Inspect rocker arm assembly for signs of wear; disassemble rocker arm assembly if necessary and replace worn parts Installation: Ensure tappet rods (7) are correctly located in roller tappet. Oil tappet rod sockets (7) with engine oil. Pay attention to tightening order.	BA05.00-N-1003-01B
3	Measure shank length of bolts (2)	If max. shank length (L) was exceeded, replace bolt	BE05.30-N-1002-04C
4	Take off valve bridges (4)	Inspect valve bridges for wear, if necessary ↓ replace valve bridges. Installation: Set valve bridges.	Page 10

		Nm Lock nut at adjusting bolt of valve bridge Ⓟ Basic setting of valve bridges must not be carried out when installed. ⓘ If the valve seat rings in the cylinder head or the valves have been machined, the valve bridges have to be set Carry out setting only when engine cold or thoroughly warmed through. Wait at least 30 minutes after switching off engine.	BA05.00-N-1002-01B
5	Take off springs (5) and packing (6)		
6	Measure projection (A) of guide pins (8) from cylinder head	If differences in dimensions ↓ Take out guide pins and replace ⓘ Installation: pay attention to projection (A) of guide pins	BE05.30-N-1001-04C BE05.30-N-1001-04C
7	Install in the reverse order		
8	Adjust valve clearance		AP05.30-W-0560A

Test data of valve timing

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925/926
BE05.30-N-1001-04C	Valve bridge - guide pin projection from cylinder head (A)		mm	36.5	36.5
		Fig see		AR05.00-W-5521-01A	AR05.00-W-5521-01A
BE05.30-N-1002-04C	Bolt of rocker arm bearing bracket to cylinder head	Thread diameter	M	10	10
		Shank length	mm	≤91	≤91

Nm Engine timing - general

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA05.00-N-1002-01B	Locknut to setting bolt of valve bridge		Nm	25	25
BA05.00-N-1003-01B	Rocker arm bearing bracket to cylinder head	1st stage	Nm	60	60
		2nd stage	°∠	90	90

AR05.00-W-5521-02A	Adjusting valve bridge		

Modifiction notes

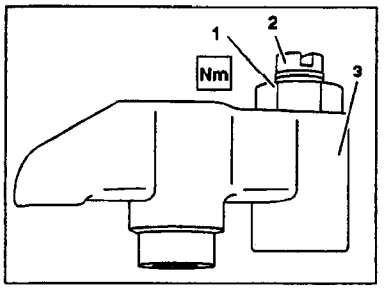
6.2.97	Basic setting of valve bridges modified Tightening torque of locknut of valve bridge modified		AR05.00-W-5521-02A

Nm Engine timing general

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BA05.00-N-1002-01B	Locknut to adjusting bolt of valve bridge	Nm	25	25

i
Carry out setting of valve bridges (3) only when engine cold or thoroughly warmed through. Wait at least 30 minutes after switching off the engine.

1 Clamp valve bridges (3) in a vise, slacken locknut (1) and unscrew setting bolt (2) about 3 turns.

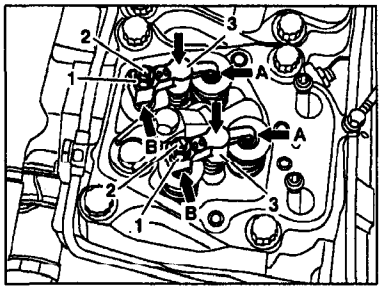


W05.00-0009-01

2 Install valve bridges (3) over the guide pins of the cylinder head.

3 Press valve bridge (3) down (against spring force) and hold. Valve bridge (3) should be touching the valve stem (arrow A).

i
Setting bolts (2) point toward exhaust manifold.



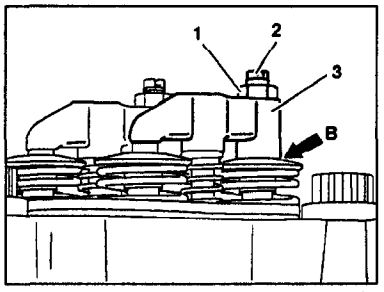
W05.00-0005-01

4 With valve bridge (3) pressed down, screw in setting bolt (2) by hand until the setting bolt (2) just touches the valve stem (arrow B).

i
Valve bridge (3) must not move up.

5 Tighten locknut (1) by hand until it makes contact.

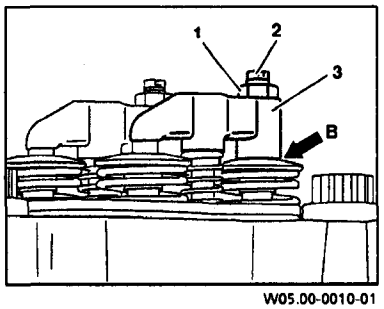
6 Take off valve bridges (3) at cylinder head.



W05.00-0010-01

7 Clamp valve bridges (3) in a vise, tighten setting bolt (2) and locknut (1) to tightening torque.

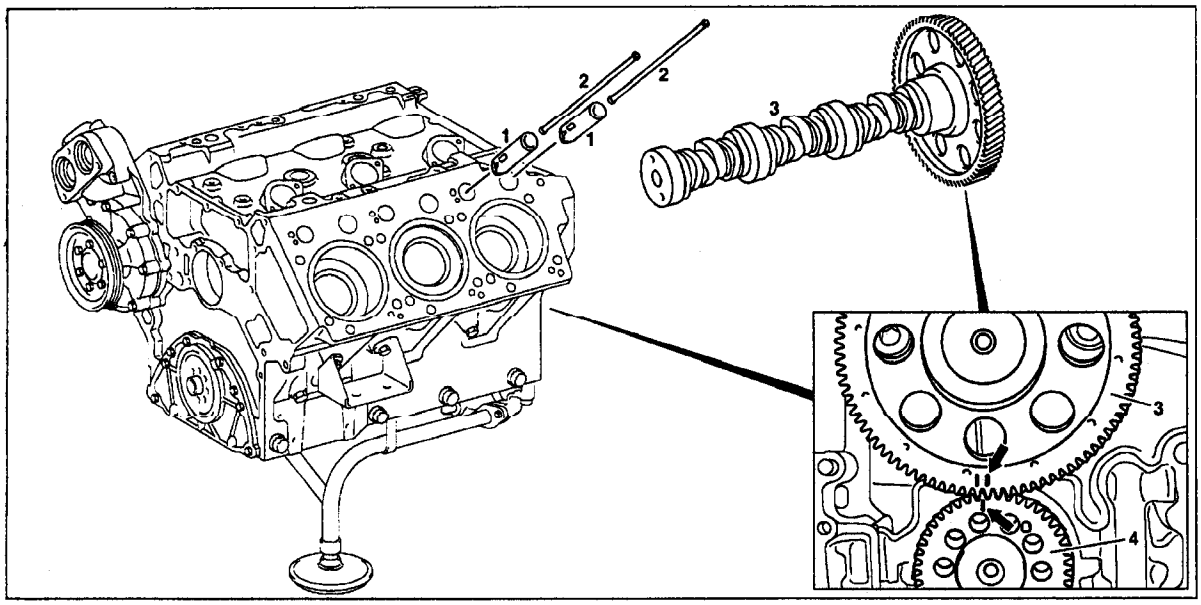
8 Install valve bridges (3) over the guide pins on the cylinder head.



W05.00-0010-01

AR05.20-W-6292B	Removing and installing camshaft	14.6.96

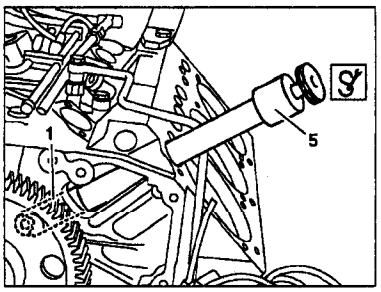
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



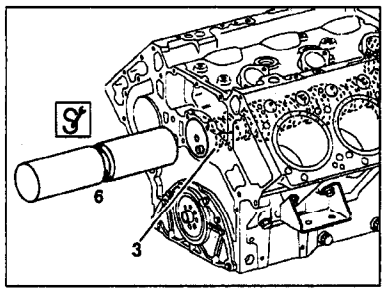
W05.20-0010-09

1 Roller tappet
2 Tappet rods
3 Camshaft with camshaft gear
4 Crankshaft gear

1 Roller tappet
3 Camshaft with camshaft gear
5 Clamp holder
6 Installation sleeve



W05.20-0011-01



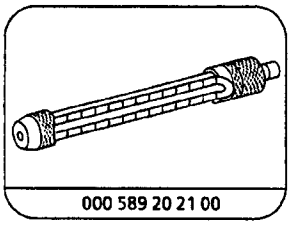
W05.20-0009-01

	Removing, installing		
1	Remove engine		AR01.10-W-2400B
2	Attach engine to engine repair stand	Engine repair stand	WE58.40-Z-1001-11A
		Attachment angle bracket	WE58.40-Z-1005-11A
3	Remove oil pan		AR01.45-W-7500B
4	Remove timing case		AR01.60-W-8200B
5	Remove oil filter housing		AR18.20-W-3471B
6	Remove all PLD unit pumps		Page 63
7	Remove all cylinder heads		AR01.30-W-5800B

8	Remove tappet rods (2)	ℹ Rotate tappet rods when pulling out so that they are detached in the roller tappet and the roller tappet is not pulled out of the crankcase. ℹ Installation: Oil tappet rods with engine oil and ensure that they are correctly installed in the roller tappet.	
9	Use assembly tool to pull roller tappet (1) out of crankcase	ℹ Mark roller tappet relative to crankcase. ℹ Installation: Use assembly tool to push in roller tappet; pay attention to groove in crankcase during this step. 🔧	541 589 00 63 00
10	Inspect roller tappet (1) for signs of damage and wear	If damaged or worn ↓ Replace roller tappet	
11	Remove camshaft (3)	Use assembly sleeve to carefully pull camshaft out of crankcase. ℹ Installation: Use assembly sleeve to carefully insert camshaft into crankcase. Do not damage camshaft bearings. Rotate camshaft until the markings "1-1" (arrow) on the camshaft gear are aligned with the marking "1" on the crankshaft gear (4). 🔧	541 589 00 14 00
	Inspecting		
12	Inspect camshaft (3)	ℹ For hardness, concentricity and cam elevations Hardness of cams and bearing journals Camshaft radial runout Cam elevation of inlet and exhaust valve cams Cam elevation of unit pump cams 🔧 🔧 🔧	Page 15 BE05.20-N-1006-04C BE05.20-N-1007-04C BE05.20-N-1008-04C BE05.20-N-1009-04C 000 589 20 21 00 001 589 53 21 00 363 589 02 21 00
13	Install in the reverse order		
14	Fill engine oil circuit		AR18.00-W-1600B

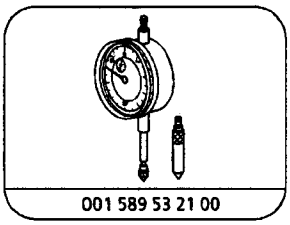
Test data of camshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE05.20-N-1006-04C	Hardness of cams and bearing journals		HRC	58–62	58–62
BE05.20-N-1007-04C	Camshaft radial runout when mounted at outer bearing journals	Cam base circle	mm	≤0.050	≤0.050
		Bearing point	mm	≤0.050	≤0.050
BE05.20-N-1008-04C	Cam elevation - valve cams over base circle Ø	Inlet	mm	8.0–8.3	8.0–8.3
		Exhaust	mm	8.3–8.5	8.3–8.5
BE05.20-N-1009-04C	Cam elevation - unit pump over base circle Ø		mm	17.7–18.0	17.7–18.0



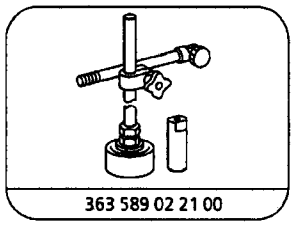
000 589 20 21 00

Hardness tester



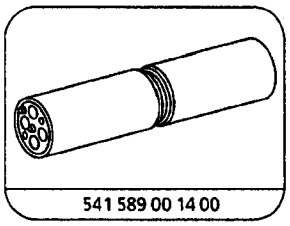
001 589 53 21 00

Dial gage



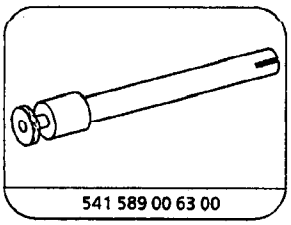
363 589 02 21 00

Dial gage holder



541 589 00 14 00

Guide sleeve



541 589 00 63 00

Clamp holder

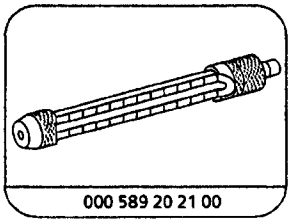
Workshop equipment/MB testers (see Workshop Equipment Manual)

WE58.40-Z-1001-11A	Engine repair stand
WE58.40-Z-1005-11A	Attachment angle bracket, Schairer GmbH, Weidenstraße 5, 72459 Albstadt (Laufen); MSW / V 500

AR05.20-W-6292-03B	Inspecting camshaft		

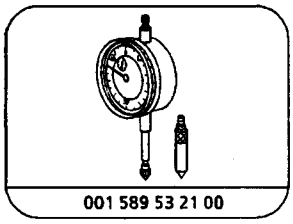
Test data of camshaft

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE05.20-N-1006-04C	Hardness of cams and bearing journals		HRC	58–62	58–62
BE05.20-N-1007-04C	Camshaft radial runout when mounted at outer bearing journals	Cam base circle	mm	≤0.050	≤0.050
		Bearing point	mm	≤0.050	≤0.050
BE05.20-N-1008-04C	Cam elevation - valve cam over base circle Ø	Inlet	mm	8.0–8.3	8.0–8.3
		Exhaust	mm	8.3–8.5	8.3–8.5
BE05.20-N-1009-04C	Cam elevation - unit pump over base circle Ø		mm	17.7–18.0	17.7–18.0



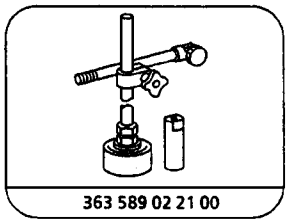
000 589 20 21 00

Hardness tester



001 589 53 21 00

Dial gage



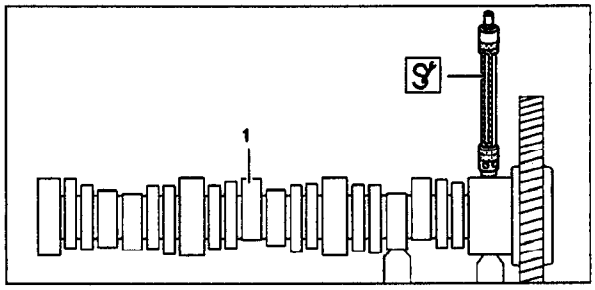
363 589 02 21 00

Dial gage holder

1 Test hardness of the cams and bearing journals at the camshaft (1) with the 🔧 hardness tester.

ℹ

Place a hard base below the cam or bearing journal to be tested for the test.

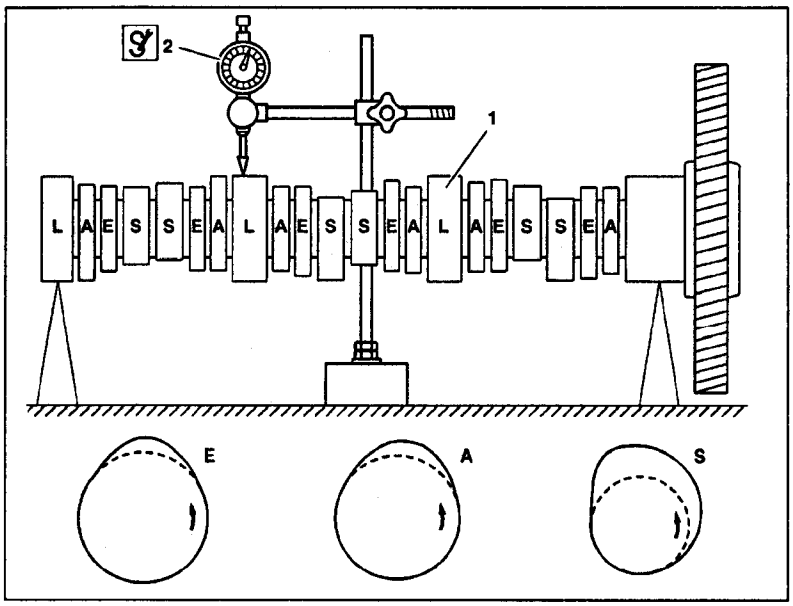


W05.20-0008-10

2 Mount camshaft (1) at the outer bearing journals.

3 Measure radial runout at all the cam base circles or bearing points (L) with the 🔧 dial gage (2).

4 Measure cam elevation of all the valve cams of the inlet valves (E) and exhaust valves (A) and also of the unit pump cams (S) with the 🔧 dial gage (2).

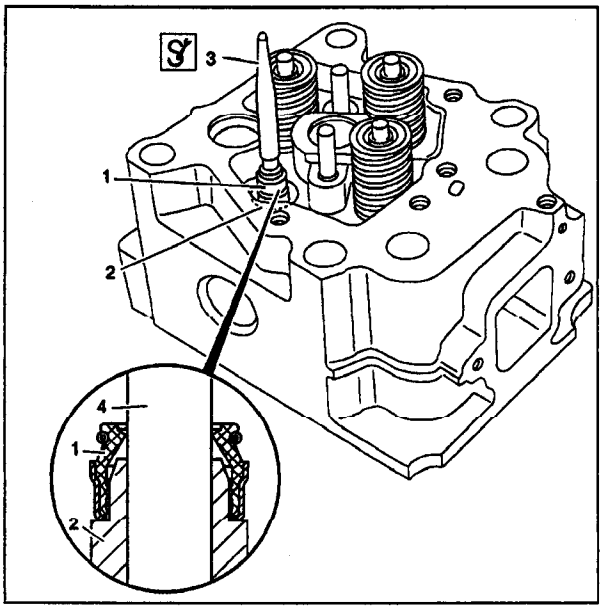


W05.20-0007-06

AR05.30-W-3510B	Replacing valve stem seals	8.2.96

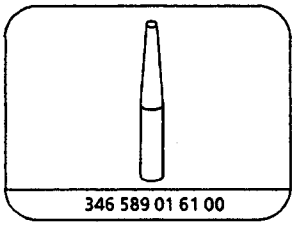
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Valve stem seals
2 Base washers
3 Sleeve
4 Valve stem



W05.30-0041-12

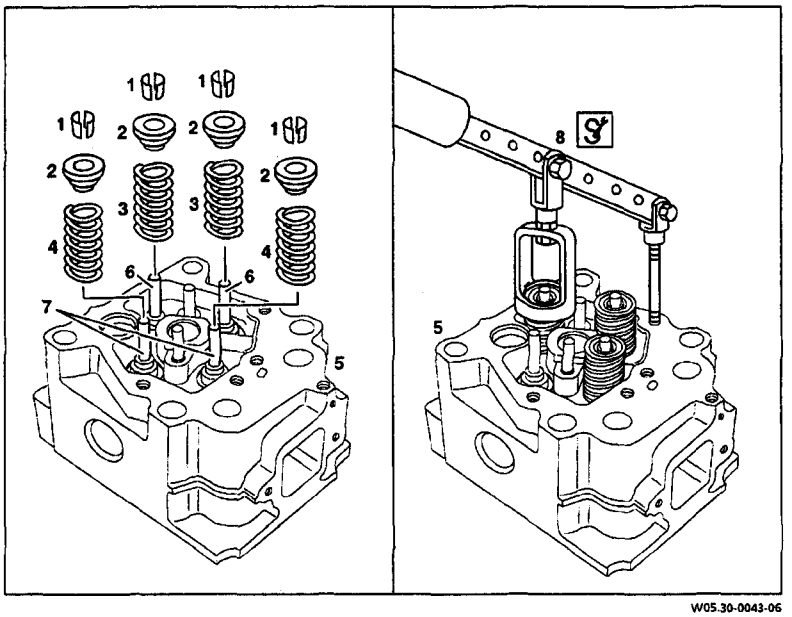
	Removing		
1	Remove valve springs	Do not remove valves.	Page 18
2	Pull off valve stem seals (1)	Do not damage valve guide (2) .	
	Installing		
3	Push sleeve (3) over the valve stem (4) onto the valve guide (2) as far as the stop		346 589 01 61 00
4	Press new valve stem seal (1) onto the valve guide (2)	Use a suitable drift to press on valve stem seal by hand over the sleeve (3) as far as the stop. Inspect valve stem seal (1) to ensure it is tightly installed at valve guide collar.	
5	Take off sleeve (3)		346 589 01 61 00
6	Install valve springs		Page 18



Sleeve

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

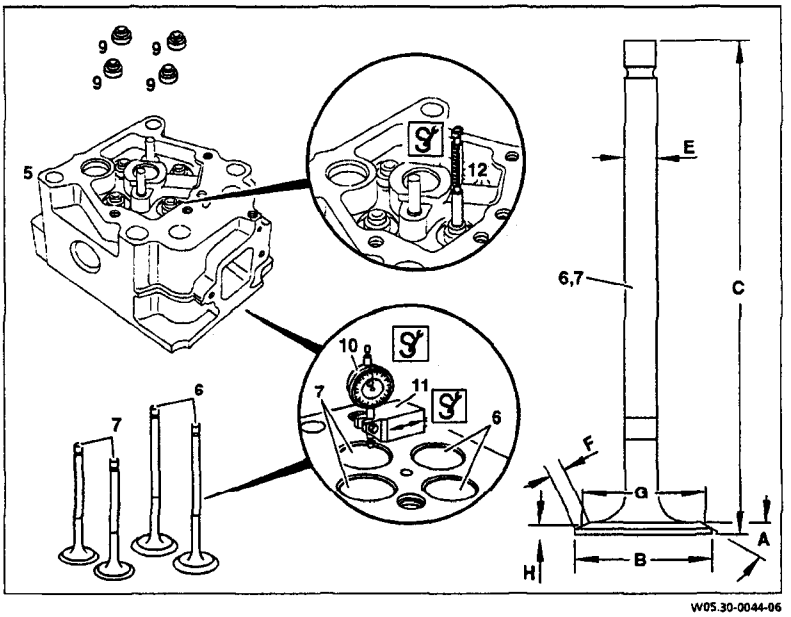
1 Collets
2 Valve spring retainer
3 Inlet valve springs
4 Exhaust valve springs
5 Cylinder head
6 Inlet valves
7 Exhaust valves
8 Valve lifter with additional piece



W05.30-0043-06

5 Cylinder head
6 Inlet valves
7 Exhaust valves
9 Valve stem seals
10 Dial gauge
11 Dial gauge holder
12 Gauging drift

A Valve seat angle
B Valve disc diameter
C Valve length
E Valve stem diameter
F Valve seat width at valve disc
G Valve seat surface diameter
H Valve seat surface machining dimension related to valve seat surface diameter



W05.30-0044-06

Modifiction notes

6.2.97	Measuring difference of amount by which valve stands back, added	Step 3 modified	**Page 18**

	Removing, installing		
1	Remove cylinder head (5)		AR01.30-W-5800B
2	Remove nozzle holder combination		**Page 55**

3	Measure amount by which valve stands back relative to cylinder head contact surface		**Page 23**
		Inspect amount by which valve stands back at both inlet and exhaust valve.	BE05.30-N-1001-01C
		Permissible difference between both valves must not be exceeded.	BE05.30-N-1009-01C
		[S]	001 589 53 21 00
		[S]	343 589 00 40 00
		[i] If the measurement obtained is not within the permissible tolerance ↓	
		Inspect on machined valve seat rings at both inlet or exhaust valve ring pairs.	**Page 44**
		Replace valve seat rings at both inlet or exhaust valve ring.	**Page 28**
4	Fit cylinder head (5) onto the support of the valve removal tool and attach with the clamping claws	[W] Valve removal tool	WH58.30-Z-1001-14A
5	Screw stud bolt of the valve lifter (8) into a free threaded hole in the cylinder head (5) unscrew in valve lifter (8) at the stud bolt		
		[S]	442 589 00 31 00
		[S]	904 589 00 31 00
6	Press down valve spring retainer (2) with valve lifter (8) and take off collets (1) with the magnetic pin	[i] Counterhold valves (6, 7) at valve disk	
		[S]	210 589 00 40 00
		[i] Installation: Insert collets into the groove of the valve stem. Ⓟ Inspect valve spring (3), valve spring retainer and collets to ensure correctly installed	
7	Relieve pressure on valve lifter (8) and take off valve spring retainer (2) and valve springs (3, 4)		
8	Pull valves (6, 7) out of cylinder head	[i] Mark valves. Installation: Oil valve stems with engine oil. Pay attention to marking of valves.	
9	Pull off valve stem seals (9)	Installation: Replace valve stem seals.	**Page 17**
10	Inspect valve guides with gaging drift (12) for wear	[S]	117 589 03 23 00
		Valve stem Ø (E)	BE05.30-N-1003-01C
		Valve guide	BE05.30-N-1001-02C
		[i] If it is possible to insert the side of the gaging drift mark with "+" into the valve guide ↓	
		Replace valve guides.	**Page 25**

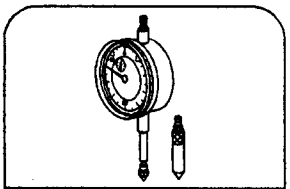
11	Inspect whether valves (6,7) can be reused	ⓘ The valve stem ends must not have any surface damage. Valve collet grooves must not be worn and the chrome layer on the valve stems must be complete. Valve seats must not be scorched, if necessary ↓ Grind or replace valves.	 **Page 41**
12	Inspect valves (6,7) for concentricity and dimensional tolerance	Concentricity of valve seat to valve stem Valve stem Ø (E) Machining dimension of inlet valve seat surfaces (H) relative to valve seat surface Ø (G) Machining dimension of exhaust valve surfaces (H) relative to valve seat surface Ø (G) Micrometer ⓘ It is not permitted to straighten valves. Minor differences in concentricity can be corrected by regrinding the valve seat on the valve grinding machine, or replacing valves.	BE05.30-N-1006-01C BE05.30-N-1003-01C BE05.30-N-1004-01C BE05.30-N-1005-01C WH58.30-Z-1005-12A **Page 41**
13	Inspect valve seat rings at both inlet or exhaust valve ring	ⓘ If valve seats are slightly worn, this can be corrected by reworking without replacing valve seat rings Machining valve seat rings. Replacing valve seat rings.	 **Page 44** **Page 28**
14	Inspect valve springs (3,4)	If fault exists, replace valve springs.	
15	Install in the reverse order		
16	The amount by which the valve stands back and the permissible difference have to be measured at the machined valves (6,7)	ⓘ If the reading obtained is not within the permissible tolerance ↓ Inspect valves at both inlet or exhaust valve.	

Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-01C	Amount by which valve stands back relative to cylinder head		mm	0.70–1.05	0.70–1.05
BE05.30-N-1003-01C	Valve seat angle (A)	Inlet	° ∡	30	30
		Exhaust	° ∡	45	45
	Valve disc Ø (B)	Inlet	mm	45.4–45.6	45.4–45.6
		Exhaust	mm	40.9–41.1	40.9–41.1
	Valve seat width at valve disc (F)	Inlet	mm	3.5–3.6	3.5–3.6
		Exhaust	mm	3.5–3.6	3.5–3.6
	Valve length (C)	Inlet	mm	≥ 145	≥ 145
		Exhaust	mm	≥ 145	≥ 145
	Valve stem Ø (E)	Inlet	mm	8.935–8.950	8.935–8.950
		Exhaust	mm	8.925–8.940	8.925–8.940
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1004-01C	Machining dimension of inlet valve seat surface (H) relative to valve seat surface Ø (G)	Size G	mm	42	42
		Size H	mm	2.8–3.0	2.8–3.0
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1005-01C	Machining dimension of exhaust valve seat surface (H) relative to valve seat surface Ø (G)	Size G	mm	39	39
		Size H	mm	2.9–3.1	2.9–3.1
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1006-01C	Concentricity of valve seat to valve stem	Inlet	mm	≤ 0.03	≤ 0.03
		Exhaust	mm	≤ 0.03	≤ 0.03
BE05.30-N-1009-01C	Permissible difference of amount by which valve stands back relative to cylinder head contact surface for each cylinder	Inlet	mm	< 0.2	< 0.2
		Exhaust	mm	≤ 0.2	≤ 0.2

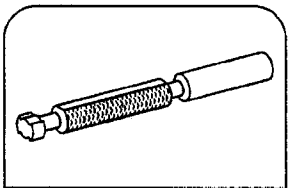
Test data of valve guides

Number	Designation				Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-02C	Valve guide	Outer Ø (A1)	Standard	mm	15.028–15.046	15.028–15.046
			O'ersize 0.2	mm	15.228–15.246	15.228–15.246
			O'ersize 0.4	mm	15.428–15.446	15.428–15.446
		Bore Ø in cylinder head (A)	Standard	mm	15.000–15.018	15.000–15.018
			O'ersize 0.2	mm	15.200–15.218	15.200–15.218
			O'ersize 0.4	mm	15.400–15.418	15.400–15.418
		Inner Ø (machin. dimension) (B)		mm	9.000–9.022	9.000–9.022
		Length (C)		mm	61.7–62.3	61.7–62.3
		Distance of valve guide top edge to cylinder head contact surface (D)	Inlet	mm	21.1–21.5	21.1–21.5
			Exhaust	mm	21.1–21.5	21.1–21.5
		Fig. see			AR05.30-W-3731-07A	AR05.30-W-3731-07A



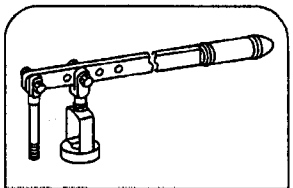
001 589 53 21 00

Dial gauge



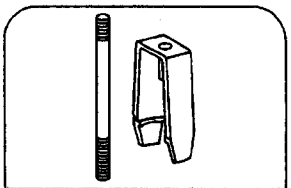
117 589 03 23 00

Drift



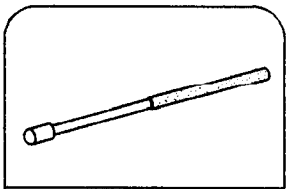
442 589 00 31 00

Valve lifter



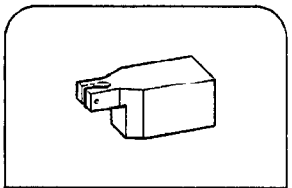
904 589 00 31 00

Additional piece



210 589 00 40 00

Magnetic pin



343 589 00 40 00

Dial gauge holder

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1005-12A	Micrometer 0 – 25 mm	Hahn und Kolb Borsigstr. 50 D-70469 Stuttgart	
WH58.30-Z-1001-14A	Valve removal tool	Model K2000 Hunger D-81309 München	221 00 200

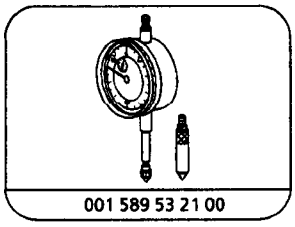
AR05.30-W-4100-01B	Measuring amount by which valve stands back relative to cylinder head		

Modifiction notes

6.2.97	Measuring difference in amount by which valve stands back, added	Step 4 modified	AR05.30-W-4100-01B

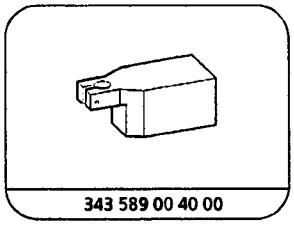
Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-01C	Amount by which valve stands back relative to cylinder head contact surface		mm	0.70–1.05	0.70–1.05
BE05.30-N-1009-01C	Permissible difference in amount by which valve stands back relative to cylinder head contact surface for each cylinder	Inlet	mm	≤0.2	≤0.2
		Exhaust	mm	≤0.2	≤0.2



001 589 53 21 00

Dial gauge



343 589 00 40 00

Dial gauge holder

1 Attach dial gauge (4) to dial gauge holder (5).

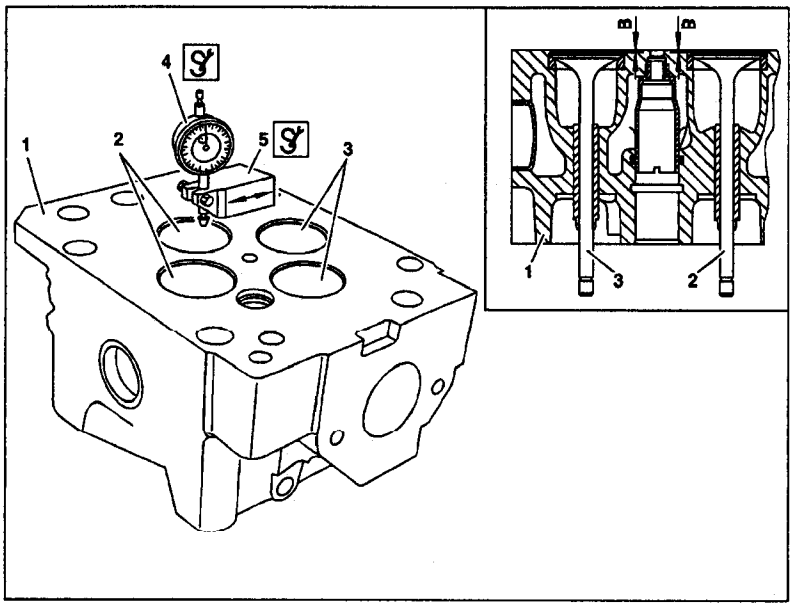
2 Fit dial gauge (4) with preload onto the plane face of the cylinder head (1).

3 Set scale of dial gauge to "0".

4 Move dial gauge (4) sufficiently so that the tracer pin is positioned on the valve disc of the inlet valves (2) or of the exhaust valves (3).

i

Measure amount by which valve stands back at both inlet and exhaust valves and note. Permissible difference between both valves must not be exceeded.

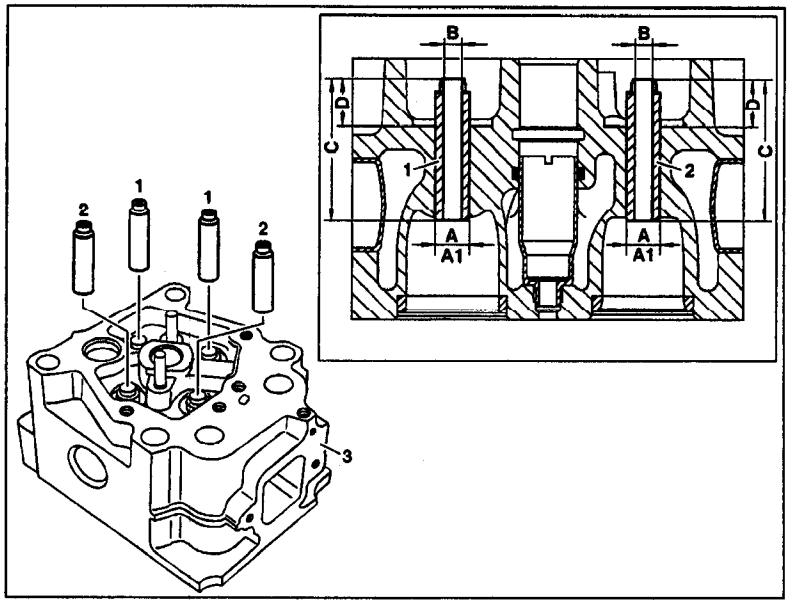


W05.30-0042-06

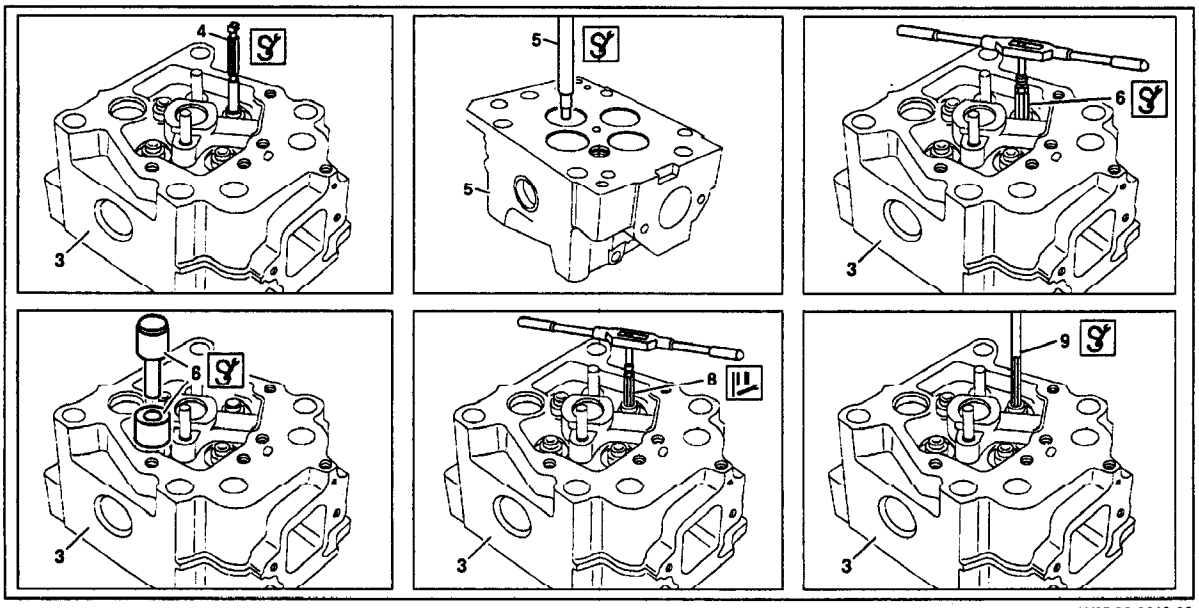
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Valve guides of inlet valve
2 Valve guides of exhaust valve
3 Cylinder head

A Valve guide bore diameter in cylinder head
A1 Valve guide outer diameter
B Valve guide inner diameter
C Valve guide length
D Distance from valve guide top edge to contact surface of valve springs



W05.30-0048-06



W05.30-0049-09

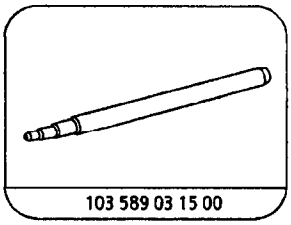
3 Cylinder head
4 Drift
5 Stepped drift
6 Reamer (adjustable)
7 Drift with bush
8 Reamer (adjustable)
9 Reamer

	Removing		
1	Remove valves		**Page 18**
2	Clamp cylinder head (3)		

3	Inspect valve guides (1, 2)	Inner Ø dimension (B) [S] [i] If it is possible to insert the side of the gage marke with " + " into the valve guide ↓ Remove valve guide	BE05.30-N-1001-02C 117 589 03 23 00
4	Remove valve guides (1, 2) from the cylinder head (3) from the combustion side	[S]	103 589 03 15 00
[X]	Installing		
5	Measure bores of valve guides dimension (A) in cylinder head (3)	[i] If the measurements differ from the test data, the basic bores then have to be machined to the next oversize of the valve guides, dimension (A).	
6	Ream bore of valve guides dimension (A) in cylinder head (3) to the next oversize	[i] Turn reamer only clockwise. Pay attention to overlap of valve guide relative to cylinder head. [S]	BE05.30-N-1001-02C BE05.30-N-1002-02C 000 589 18 53 00
7	Insert valve guide (1) into supercooling box and fill with liquid nitrogen	[S] [i] Supercool valve guide for about 20 to 30 min. Do not touch the liquid nitrogen or the supercooled valve guide.	346 589 00 63 00
8	Use drift and spacer bush (6) to press in new valve guide (1)	[i] Pay attention to distance (D) from valve guide top edge to contact surface of valve springs. [S]	BE05.30-N-1001-02C 541 589 00 43 00
9	Widen bore of valve guide by reaming	[R] Reamer [i] Widen bore diameter to 8.95 mm by reaming. Turn reamer only clockwise.	WH58.30-Z-1014-12A
10	Ream bore of valve guide to the dimension (B)	[i] Turn reamer only clockwise. [S]	BE05.30-N-1001-02C 000 589 10 53 00
11	Clean valve guide (1) with cleaning brush	[S]	366 589 00 69 00
12	Machine valve seat rings		**Page 44**
13	Install valves		**Page 18**

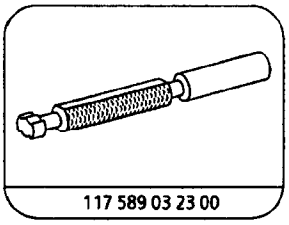
Test data of valve guides

Number	Designation				Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-02C	Valve guide	Outer Ø (A1)	Standard	mm	15.028–15.046	15.028–15.046
			Oversize 0.2	mm	15.228–15.246	15.228–15.246
			Oversize 0.4	mm	15.428–15.446	15.428–15.446
		Bore Ø in cylinder head (A)	Standard	mm	15.000–15.018	15.000–15.018
			Oversize 0.2	mm	15.200–15.218	15.200–15.218
			Oversize 0.4	mm	15.400–15.418	15.400–15.418
		Inner Ø (machining dimension) (B)		mm	9.000–9.022	9.000–9.022
		Length (C)		mm	61.7–62.3	61.7–62.3
		Distance (D) from valve guide top edge to valve spring contact surface	Inlet	mm	21.1–21.5	21.1–21.5
			Exhaust	mm	21.1–21.5	21.1–21.5
		Fig. see			AR05.30-W-3731-07A	AR05.30-W-3731-07A
BE05.30-N-1002-02C	Valve guide overlap in cylinder head			mm	0.010–0.046	0.010–0.046



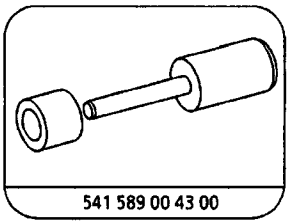
103 589 03 15 00

Stepped drift



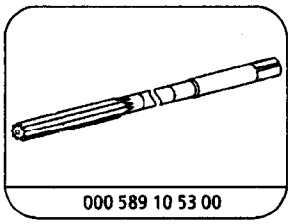
117 589 03 23 00

Drift



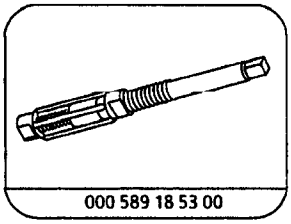
541 589 00 43 00

Drift with bush



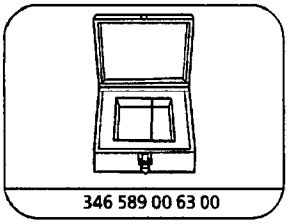
000 589 10 53 00

Reamer



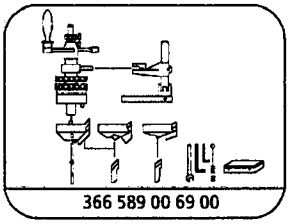
000 589 18 53 00

Reamer



346 589 00 63 00

Supercooling box



366 589 00 69 00

Valve seat turning kit

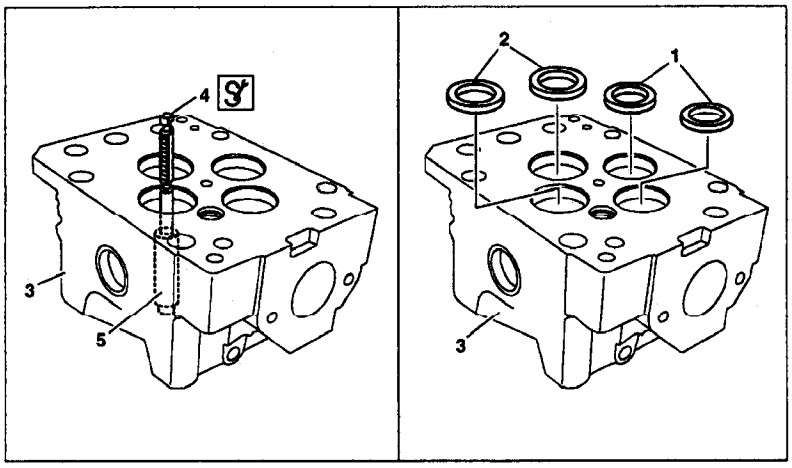
Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1014-12A	Reamer (adjustable Ø 7.5 – 8.0 mm)	Hunger D-81309 München 70	140 05 000

AR05.30-W-3831B	Replacing valve seat rings	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

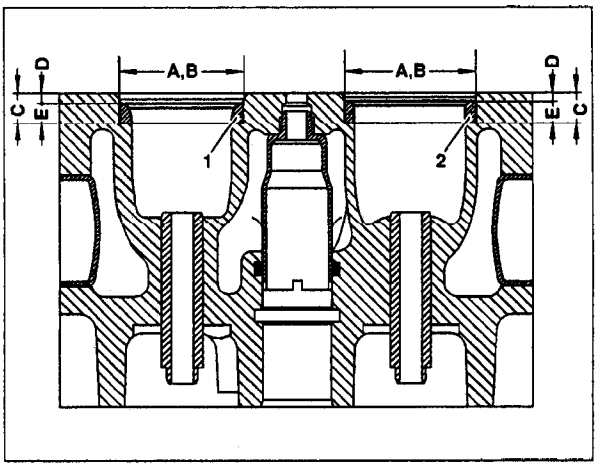
1 Exhaust valve seat rings
2 Inlet valve seat rings
3 Cylinder head
4 Plug gage
5 Valve guide



W05.30-0050-05

1 Exhaust valve seat ring
2 Inlet valve set rings

A Valve seat ring outer diameter
B Bore diameter of valve seat rings in cylinder head
C Bore depth of valve seat rings in cylinder head
D Distance between contact surface of cylinder head and face end of valve seat ring
E Valve seat ring height



W05.30-0039-11

	Removing, installing		
1	Remove valves		**Page 18**
2	Clamp cylinder head (3) on the valve removal tool	Valve removal tool	WH58.30-Z-1001-14A
3	Use plug gage (4) to inspect inner diameter of valve guide (5) for wear		BE05.30-N-1001-02C
		Drift punch	117 589 03 23 00
		If it is possible to insert the side of the dial gage marked with " + " into the valve guide ↓	
		Replace valve guide	**Page 25**
4	Remove valve seat rings (1, 2) from the cylinder head (3)		**Page 33**
		Puller	000 589 28 33 00
		Internal extractor	000 589 29 33 00

		Countering support	000 589 34 33 00
		Valve seat turning kit	366 589 00 69 00
		Valve seat ring turning tool	WH58.30-Z-1025-05A
5	Measure valve seat ring bore diameter, dimension (B)	Overlap between valve seat ring dimension (A) and basic bore in cylinder head dimension (B) should be assured. If the dimensions differ from the test data ↓ Machine basic bores to the next oversize of the valve seat rings diameter (A).	BE05.30-N-1003-03C
		Bore ∅ (B) of inlet and exhaust valve seat rings	BE05.30-N-1007-03C
		Inlet valve seat rings outer ∅ (A)	BE05.30-N-1001-03C
		Exhaust valve seat rings outer ∅ (A)	BE05.30-N-1002-03C
		Dial gauge	001 589 53 21 00
		Quick calipers for internal measurements	WH58.30-Z-1004-12A
6	Machine valve seat ring basic bores in cylinder head		**Page 35**
		Inlet valve seat rings outer ∅ (A) and height (E)	BE05.30-N-1001-03C
		Exhaust valve seat rings outer ∅ (A) and height (E)	BE05.30-N-1002-03C
		Overlap of valve seat rings in cylinder head	BE05.30-N-1003-03C
		Distance between contact surface of cylinder head and face end of valve seat ring (D)	BE05.30-N-1004-03C
		Bore ∅ (B) of inlet, and exhaust valve seat rings	BE05.30-N-1007-03C
		Bore depth of valve seat rings (C)	BE05.30-N-1008-03C
		Dial gauge	001 589 53 21 00
		Valve seat ring turning tool	WH58.30-Z-1025-05A
		Quick calipers for internal measurements	WH58.30-Z-1004-12A
		Micrometer	WH58.30-Z-1007-12A
		Valve removal tool	WH58.30-Z-1001-14A
7	Insert valve seat rings (1, 2) into supercooling box and pour in liquid nitrogen	Supercooling box Supercool valve seat rings for about 20 to 30 min. Do not touch the liquid nitrogen or the supercooled valve seat ring.	346 589 00 63 00
8	Heat cylinder head (3) in water bath	Temperature approx. 80° C	
9	Use pliers to remove valve seat rings (1, 2) from the supercooling box and place onto the bores of the heated cylinder head (3)		
10	Use a suitable drift to press in valve seat rings (1, 2)	Valve seat rings should be pressed in immediately.	
11	Maching valve seat rings (1, 2)		**Page 44**
12	Install valves	Use new valve or ↓	**Page 18**

Test data of valve guides

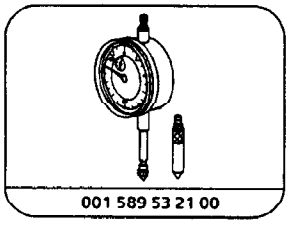
Number	Designation				Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-02C	Valve guide	Outer Ø (A1)	Standard	mm	15.028–15.046	15.028–15.046
			Oversize 0.2	mm	15.228–15.246	15.228–15.246
			Oversize 0.4	mm	15.428–15.446	15.428–15.446
		Bore Ø in cylinder head (A)	Standard	mm	15.000–15.018	15.000–15.018
			Oversize 0.2	mm	15.200–15.218	15.200–15.218
			Oversize 0.4	mm	15.400–15.418	15.400–15.418
		Inner Ø (machining dimension) (B)		mm	9.000–9.022	9.000–9.022
		Length (C)		mm	61.7–62.3	61.7–62.3
		Distance (D) from top edge of valve guide to contact surface of valve spring	Inlet	mm	21.1–21.5	21.1–21.5
			Exhaust	mm	21.1–21.5	21.1–21.5
		Fig. see			AR05.30-W-3731-07A	AR05.30-W-3731-07A

Test data of valve seat rings

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE05.30-N-1001-03C	Inlet valve seat rings	Outer Ø (A)	Standard	mm	47.38–47.39
			Oversize 0.2	mm	47.58–47.59
			Oversize 0.4	mm	47.78–47.79
		Height (E)	Standard	mm	7.7–7.8
			Oversize 0.2	mm	7.9–8.0
			Oversize 0.4	mm	8.1–8.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1002-03C	Exhaust valve seat rings	Outer Ø (A)	Standard	mm	43.08–43.09
			Oversize 0.2	mm	43.28–43.29
			Oversize 0.4	mm	43.48–43.49
		Height (E)	Standard	mm	8.0–8.1
			Oversize 0.2	mm	8.2–8.3
			Oversize 0.4	mm	8.4–8.5
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1003-03C	Valve seat ring overlap in cylinder head		Inlet	mm	0.055–0.090
			Exhaust	mm	0.055–0.090
BE05.30-N-1004-03C	Distance between contact surface of cylinder head and face end of valve seat ring (D)		Inlet	mm	3.1–3.4
			Exhaust	mm	2.8–3.1
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1007-03C	Bore Ø	Inlet valve seat rings in cylinder head (B)	Standard	mm	47.300–47.325
			Oversize 0.2	mm	47.500–47.525
			Oversize 0.4	mm	47.700–47.725
		Exhaust valve seat rings in cylinder head (B)	Standard	mm	43.000–43.025
			Oversize 0.2	mm	43.200–43.225
			Oversize 0.4	mm	43.400–43.425
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1008-03C	Bore depth of valve seat rings in cylinder head (C)		Standard	mm	10.9–11.1
			Oversize 0.2	mm	11.1–11.3
			Oversize 0.4	mm	11.3–11.5
			Fig. see		AR05.30-W-3831-03A

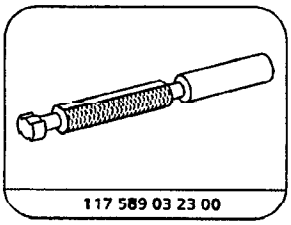
Test data of valve seat ring

Number	Designation				Engine 542.920/921/922/923/925/926
BE05.30-N-1001-03C	Inlet valve seat rings	Outer Ø (A)	Standard	mm	47.38–47.39
			Oversize 0.2	mm	47.58–47.59
			Oversize 0.4	mm	47.78–47.79
		Height (E)	Standard	mm	7.7–7.8
			Oversize 0,2	mm	7.9–8.0
			Oversize 0.4	mm	8.1–8.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1002-03C	Exhaust valve seat rings	Outer Ø (A)	Standard	mm	43.08–43.09
			Oversize 0.2	mm	43.28–43.29
			Oversize 0.4	mm	43.48–43.49
		Height (E)	Standard	mm	8.0–8.1
			Oversize 0.2	mm	8.2–8.3
			Oversize 0.4	mm	8.4–8.5
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1003-03C	Valve seat ring overlap in cylinder head		Inlet	mm	0.055–0.090
			Exhaust	mm	0.055–0.090
BE05.30-N-1004-03C	Distance between contact surface of cylinder head and face end of valve seat ring (D)		Inlet	mm	3.1–3.4
			Exhaust	mm	2.8–3.1
			Fig. see		
BE05.30-N-1007-03C	Bore Ø	Inlet valve seat rings in cylinder head (B)	Standard	mm	47.300–47.325
			Oversize 0.2	mm	47.500–47.525
			Oversize 0.4	mm	47.700–47.725
		Exhaust valve seat rings in cylinder head (B)	Standard	mm	43.000–43.025
			Oversize 0.2	mm	43.200–43.225
			Oversize 0.4	mm	43.400–43.425
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1008-03C	Bore depth of valve seat rings in cylinder head (C)		Standard	mm	10.9–11.1
			Oversize 0.2	mm	11.1–11.3
			Oversize 0.4	mm	11.3–11.5
			Fig. see		AR05.30-W-3831-03A



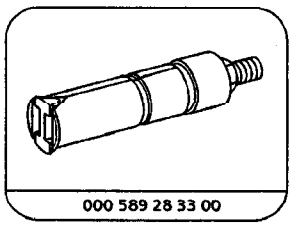
001 589 53 21 00

Dial gage



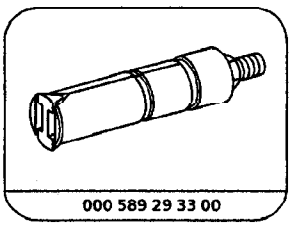
117 589 03 23 00

Drift



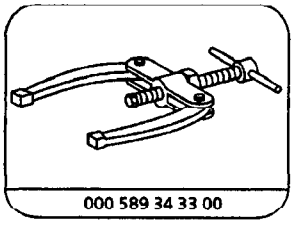
000 589 28 33 00

Puller Ø 28-37 mm



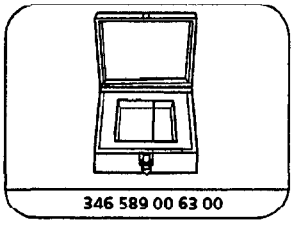
000 589 29 33 00

Internal extractor



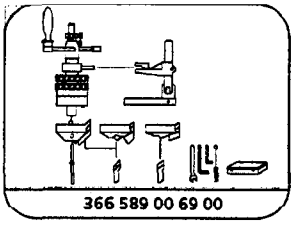
000 589 34 33 00

Countersupport



346 589 00 63 00

Supercooling box



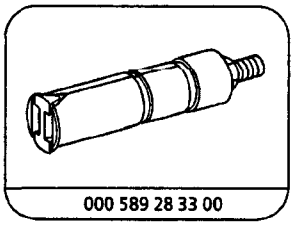
366 589 00 69 00

Valve seat turning kit

Commercially available tools (see Workshop Equipment Manual)

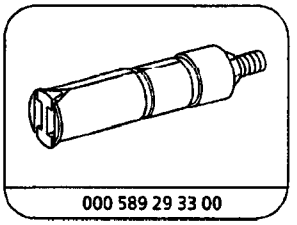
Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1025-05A	Valve seat turning tool	Model RDS2 Hunger D-81309 München 70	220 00 100
WH58.30-Z-1004-12A	Quick calipers for internal measurements, ∅ 40 – 60 mm		
WH58.30-Z-1007-12A	Micrometer 25 – 50 mm	Hahn und Kolb Borsigstr. 50 D-70469 Stuttgart	33520 080
WH58.30-Z-1001-14A	Valve removal tool	Model K2000 Hunger D-81309 München	221 00 200

AR05.30-W-3831-01B	Removing valve seat rings		



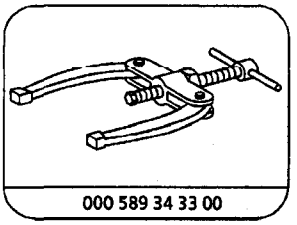
000 589 28 33 00

Internal extracter



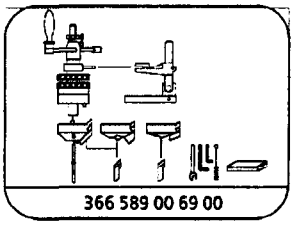
000 589 29 33 00

Internal extracter



000 589 34 33 00

Countersupport



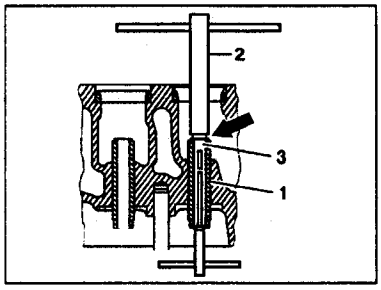
366 589 00 69 00

Valve seat turning kit

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1025-05A	Valve seat ring turning tool	Model RDS2 Hunger D-81309 München 70	220 00 100

1 Insert pilot (2) (9 mm Ø) into the valve guide (1) until the stop (arrow) of the collet chuck (3) is positioned on the valve guide (1); press collet chuck (3) down with the screwdriver, if necessary. Turn tight with the drift insert into the pilot (2) at top and bottom.



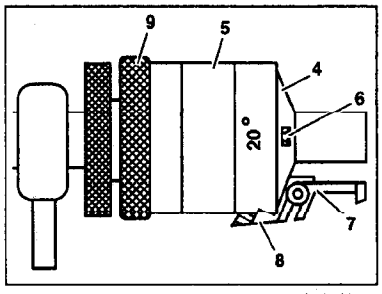
W05.30-0007-01

2 Attach turning head D2/20° (4) to the turning tool (5), loosely screw in both hexagon socket screws (6), align turning head (4) so that the distance between the toothed side, the rack and the opposite side is about 0.5 to 0.8 mm. Then tighten both hexagon socket screws fully.

ⓘ

It should be possible to move the tool slide (8) back and forward relatively easily with the quick-adjustment (9).

3 Screw cutting tool C6 (7) tight onto the turning head (4).



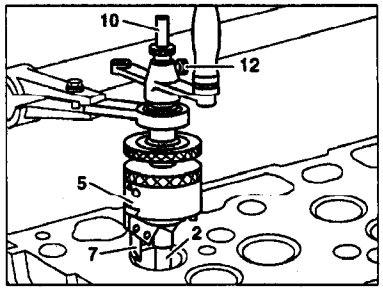
W05.30-0052-01

4 Moisten pilot (2) with oil.

5 Insert turning tool (5) over the pilot (2) until the stop pin is resting on the pilot (2) or the cutting tool (7) is resting on the cylinder head.

⚠

The cutting tool must not strike the cylinder head, otherwise the carbide metal tip will be damaged.



W05.30-0009-01

6 Turn quick-adjustment (8) until the cutting tool (7) is touching the pilot (2) or until it is positioned in front of the valve seat ring, but not touching.

7 Hold turning tool (5) tight, slacken clamping screw (12) of the stop pin (10), carefully lower turning tool until the blade of the cutting tool (7) dimension (X) is positioned about 1 mm above the inner edge of the valve seat ring (11). Press stop pin against pilot (2), tighten clamping screw (12).

8 Clamp pendulum guide (13) tight horizontally, approximately in the middle of the guide, with the steadyrest clamp (14).

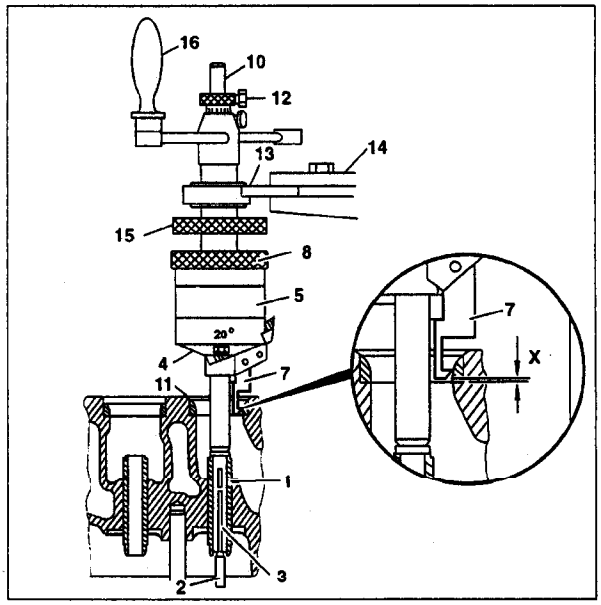
ⓘ

It should now still be possible to easily turn the turning tool as before.

9 Hold knurled disk (15) for infeed mechanism tight and rotate handcrank (16) clockwise. This usually produces an irregular chip removal.

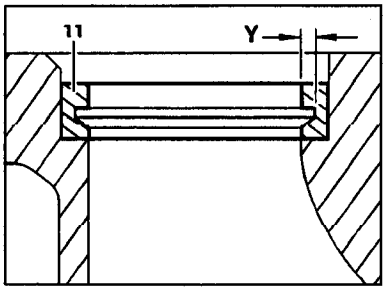
ⓘ

Inspect distance dimension (X) approx. 1 mm at valve seat ring (11).



W05.30-0010-12

10 Turn handcrank (16) clockwise and at the same time hold the knurled disk (15) tight. As the turning resistance increases, briefly release knurled disk. Annular groove depth dimension Y approx. 2 to 3 mm.



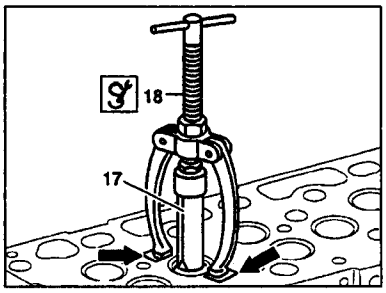
W05.30-0006-01

i

Do not take off too large a chip. It should be possible to easily rotate the turning tool, which is achieved by briefly releasing the knurled disk.

11 Take off turning tool.

12 Position internal extractor (17) for inlet or exhaust valve seat ring (8) in the annular groove and use countersupport (18) to remove valve seat ring.



W05.30-0011-01

Place copper plate (arrow) below the contact surfaces of the countersupport so that the cylinder head surface is not damaged.

AR05.30-W-3831-02B	Machining valve seat ring basic bore		

Test values of valve seat rings

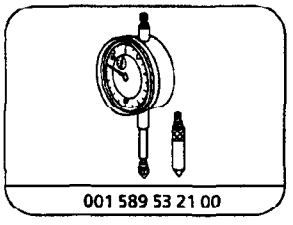
Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE05.30-N-1001-03C	Inlet valve seat rings	Outer Ø (A)	Standard	mm	47.38–47.39
			Oversize 0.2	mm	47.58–47.59
			Oversize 0.4	mm	47.78–47.79
		Height (E)	Standard	mm	7.7–7.8
			Oversize 0.2	mm	7.9–8.0
			Oversize 0.4	mm	8.1–8.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1002-03C	Exhaust valve seat rings	Outer Ø (A)	Standard	mm	43.08–43.09
			Oversize 0.2	mm	43.28–43.29
			Oversize 0.4	mm	43.48–43.49
		Height (E)	Standard	mm	8.0–8.1
			Oversize 0.2	mm	8.2–8.3
			Oversize 0.4	mm	8.4–8.5
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1003-03C	Valve seat ring overlap in cylinder head		Inlet	mm	0.055–0.090
			Exhaust	mm	0.055–0.090
BE05.30-N-1004-03C	Distance between contact surface of cylinder head and face end of valve seat ring (D)		Inlet	mm	3.1–3.4
			Exhaust	mm	2.8–3.1
			Fig. see		AR05.30-W-3831-03A

Test values of valve seat rings

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE05.30-N-1007-03C	Bore Ø	Inlet valve seat rings in cylinder head (B)	Standard	mm	47.300–47.325
			Oversize 0.2	mm	47.500–47.525
			Oversize 0.4	mm	47.700–47.725
		Exhaust valve seat rings in cylinder head (B)	Standard	mm	43.000–43.025
			Oversize 0.2	mm	43.200–43.225
			Oversize 0.4	mm	43.400–43.425
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1008-03C	Bore depth for valve seat rings in cylinder head (C)		Standard	mm	10.9–11.1
			Oversize 0.2	mm	11.1–11.3
			Oversize 0.4	mm	11.3–11.5
			Fig. see		AR05.30-W-3831-03A

Test values of valve seat rings

Number	Designation				Engine 542.920/921/922/923/925/926
BE05.30-N-1001-03C	Inlet valve seat rings	Outer Ø (A)	Standard	mm	47.38–47.39
			Oversize 0.2	mm	47.58–47.59
			Oversize 0.4	mm	47.78–47.79
		Height (E)	Standard	mm	7.7–7.8
			Oversize 0.2	mm	7.9–8.0
			Oversize 0.4	mm	8.1–8.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1002-03C	Exhaust valve seat rings	Outer Ø (A)	Standard	mm	43.08–43.09
			Oversize 0.2	mm	43.28–43.29
			Oversize 0.4	mm	43.48–43.49
		Height (E)	Standard	mm	8.0–8.1
			Oversize 0.2	mm	8.2–8.3
			Oversize 0.4	mm	8.4–8.5
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1003-03C	Valve seat ring overlap in cylinder head		Inlet	mm	0.055–0.090
			Exhaust	mm	0.055–0.090
BE05.30-N-1004-03C	Distance between contact surface of cylinder head and face end of valve seat ring (D)		Inlet	mm	3.1–3.4
			Exhaust	mm	2.8–3.1
			Fig. see		
BE05.30-N-1007-03C	Bore Ø	Inlet valve seat rings in cylinder head (B)	Standard	mm	47.300–47.325
			Oversize 0.2	mm	47.500–47.525
			Oversize 0.4	mm	47.700–47.725
		Exhaust valve seat rings in cylinder head (B)	Standard	mm	43.000–43.025
			Oversize 0.2	mm	43.200–43.225
			Oversize 0.4	mm	43.400–43.425
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1008-03C	Bore depth for valve seat rings in cylinder head (C)		Standard	mm	10.9–11.1
			Oversize 0.2	mm	11.1–11.3
			Oversize 0.4	mm	11.3–11.5
			Fig. see		AR05.30-W-3831-03A

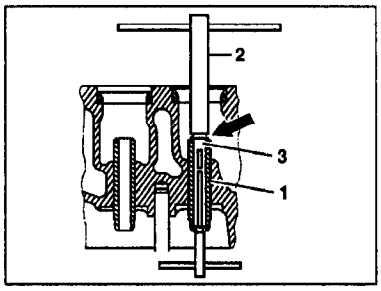


Dial gage

Commercially available tools (see Workshop Equipment Manual)

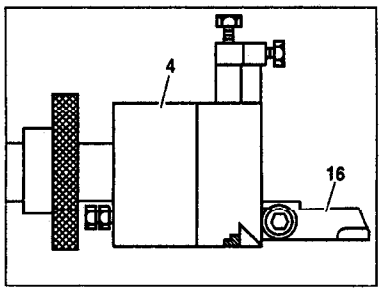
Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1025-05A	Valve seat ring turning tool	Model RDS2 Hunger D-81309 München 70	220 00 100
WH58.30-Z-1004-12A	Quick calipers for internal measurements, Ø 40 – 60 mm		
WH58.30-Z-1007-12A	Micrometer 25 – 50 mm	Hahn und Kolb Borsigstr. 50 D-70469 Stuttgart	33520 080
WH58.30-Z-1001-14A	Valve removal tool	Model K2000 Hunger D-81309 München	221 00 200

1 Insert pilot (2) (9 mm Ø) into the valve guide (1) until the stop (arrow) of the collet chuck (3) is resting on the valve guide; press collet chuck down if necessary with the screwdriver. Turn tight with the drift inserted into the pilot at top and bottom.



W05.30-0007-01

2 Attach cutting tool (16) tight to the turning tool (4).

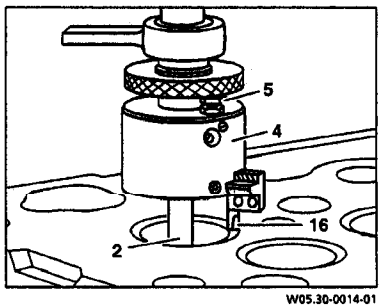


W05.30-0013-01

3 Moisten pilot (2) with oil. Insert turning tool (4) over the pilot until the stop pin (5) is resting on the pilot or the cutting tool (16) is resting on the cylinder head.

Cutting tool must not strike the cylinder head, otherwise the carbide metal tip will be damaged.

4 Turn quick-adjustment (5) until the cutting tool (16) has moved horizontally beyond the bore, then push the turning tool (4) down until the cutting tool touches the cylinder head.



W05.30-0014-01

5 Hold turning tool (4) tight, slacken clamping screw (6) of the stop pin (7), carefully lower turning tool and tighten clamping screw.

6 Set the height of the cutting tool (16) so that it is just clear by turning the knurled disk (8).

7 Clamp pendulum guide (9) tight horizontally, approximately in the middle of the guide, with the steadyrest clamp (10). It should now still be possible to rotate the turning tool (4) as easily as before.

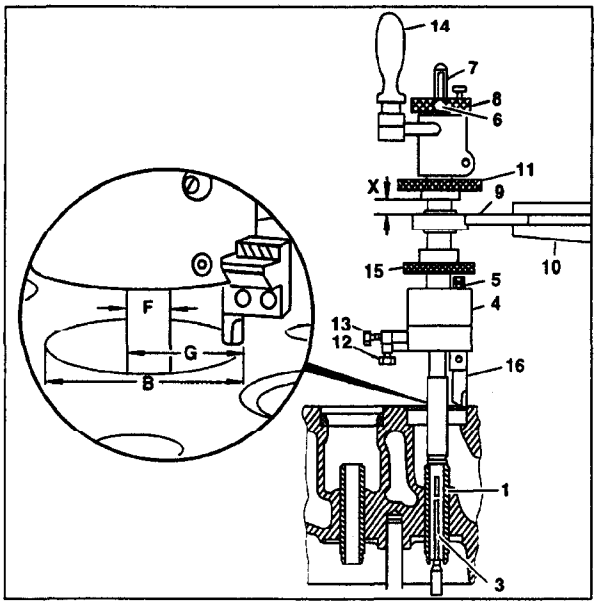
ℹ
The working depth (X) should be set between positioning ring (11) and pendulum guide during this step.

8 Calculating setting "G" basic bore oversize "B" and pilot diameter dimension "F" divided by 2.

Example:
Dimension B = 47.50 mm (basic bore)
Dimension F = 14.55 mm (pilot diameter)

$$\text{Dim. G} = \frac{B + F}{2}$$

$$\text{Dim. G} = \frac{47.50\ \text{mm} + 14.55\ \text{mm}}{2} = 31.025\ \text{mm}$$

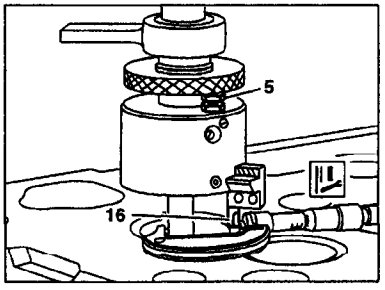


W05.30-0015-12

9 Set micrometer to the setting "G".

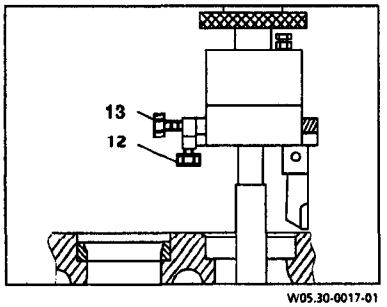
10 Slacken quick-adjustment (5), raise turning tool slightly and position micrometer on pilot. Use the quick-adjustment to set the cutting tool (16) to setting "G." Tighten quick-adjustment.

ℹ
It is good practice to set the cutting tool 0.1 mm less in diameter for the first cut.



W05.30-0016-01

11 Slacken clamping screw (12), screw in horizontal stop screw (13) until it makes contact with the housing and then tighten clamping screw.

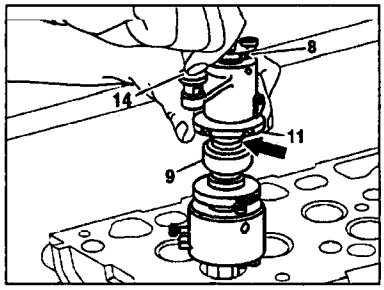


W05.30-0017-01

12 Fix knurled screw (8) with the hexagon bolt.

13 Turn out the basic bore for the valve seat ring by turning the handcrank (14) and at the same time holding the upper knurled disk (11) for vertical infeed tight, until the positioning ring (arrow) is resting against the steadyrest bearing (9).

Reset cutting tool (16) as often as necessary until the calculated setting "G" is achieved. After this, turn fully once again without any cut infeed.

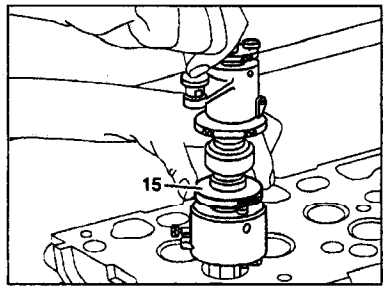


W05.30-0018-01

14 Raise turning tool (4) slightly. Slacken quick-adjustment (5) and move back cutting tool (16).

15 Turn the face end at the bottom by turning the handcrank (14) and at the same time holding the bottom knurled disk (15) for horizontal infeed tight, until the stop screw (13) is touching the turning tool (4).

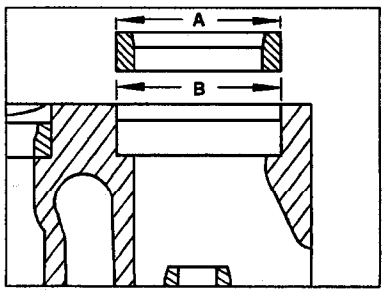
16 Take off turning tool.



W05.30-0019-01

17 Use the quick calipers for internal measurement and dial gage to measure the basic bores (B) for the valve seat rings in the cylinder head.

Overlap between valve seat ring dimension (A) and basic bore dimension (B) should be assured.

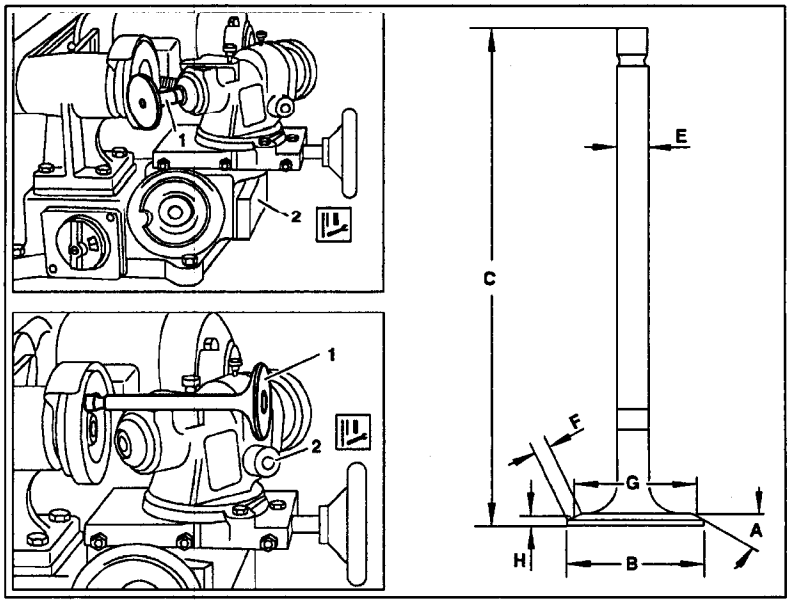


W05.30-0020-01

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Valve
2 Valve grinding machine

A Valve seat angle
B Valve disc diameter
C Valve length
E Valve stem diameter
F Valve seat width at valve disc
G Valve seat surface diameter
H Valve seat surface machining dimension related to valve seat surface diameter (G)



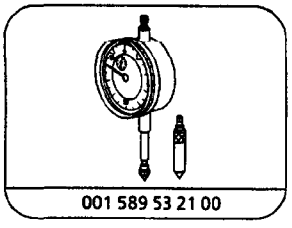
W05.30-0023-06

	Grinding		
1	Clean valves (1)	Remove any adhering oil carbon.	
2	Clamp valve (1)	As close as possible behind valve disk into valve grinding machine (2). This avoids disturbing vibrations.	WH58.30-Z-1022-05A
3	Set valve grinding angle on the valve grinding machine (2)		BE05.30-N-1003-01C WH58.30-Z-1022-05A
4	Slowly move valve (1) with the infeed toward the rotating grinding wheel until the wheel comes into contact with the seat surface of the valve (1)		
5	Continue grinding with a small infeed until the entire circumference of the valve seat is smooth and free of chatter marks	The measurements obtained must not be less than the specification after this operation	
		Valve disk Ø (B) and valve seat width at valve disk (F)	BE05.30-N-1003-01C
		Inlet valve seat surface machining dimension (H) related to valve seat surface Ø (G)	BE05.30-N-1004-01C
		Exhaust valve seat surface machining dimension (H) related to valve seat surface Ø (G)	BE05.30-N-1005-01C
		Concentricity of valve seat relative to valve stem	BE05.30-N-1006-01C
			001 589 53 21 00

			363 589 02 21 00
6	Remove valve (1) from clamp at valve grinding machine		WH58.30-Z-1022-05A
7	Face-grinding of the valve stem end must be performed on the device attached to the valve grinding machine	The length of the valve (C) must not be less than the specified length after this operation	BE05.30-N-1003-01C WH58.30-Z-1022-05A

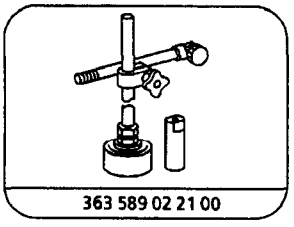
Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1003-01C	Valve seat angle (A)	Inlet	° ∠	30	30
		Exhaust	° ∠	45	45
	Valve disk Ø (B)	Inlet	mm	45.4–45.6	45.4–45.6
		Exhaust	mm	40.9–41.1	40.9–41.1
	Valve seat width at valve disc (F)	Inlet	mm	3.5–3.6	3.5–3.6
		Exhaust	mm	3.5–3.6	3.5–3.6
	Valve length (C)	Inlet	mm	≥ 145	≥ 145
		Exhaust	mm	≥ 145	≥ 145
	Valve stem Ø (E)	Inlet	mm	8.935–8.950	8.935–8.950
		Exhaust	mm	8.925–8.940	8.925–8.940
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1004-01C	Machining dimension of inlet valve seat surface (H) relative to valve seat surface Ø (G)	Size G	mm	42.0	42.0
		Size H	mm	2.8–3.0	2.8–3.0
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1005-01C	Machining dimension of exhaust valve seat surface (H) relative to valve seat surface Ø (G)	Size G	mm	39	39
		Size H	mm	2.9–3.1	2.9–3.1
		Fig. see		AR05.30-W-4202-01A	AR05.30-W-4202-01A
BE05.30-N-1006-01C	Concentricity of valve seat to valve stem	Inlet	mm	≤ 0.03	≤ 0.03
		Exhaust	mm	≤ 0.03	≤ 0.03



001 589 53 21 00

Dial gauge



363 589 02 21 00

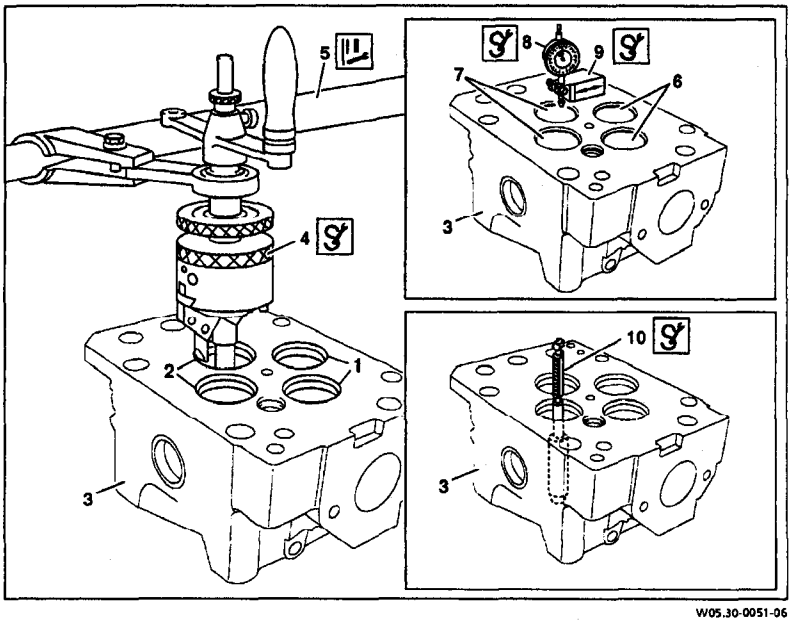
Dial gauge holder

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1022-05A	Valve grinding machine	Model VKM1A Hunger D-81309 München 70	231 00 001 231 00 002

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

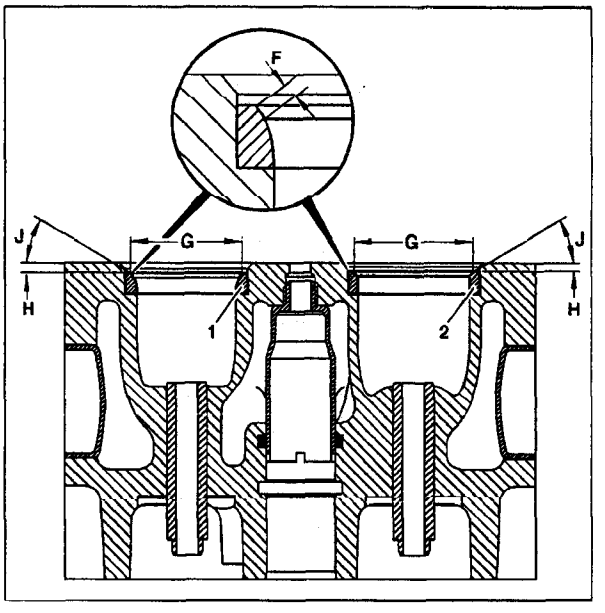
1 Valve seat rings - exhaust valve
2 Valve seat rings - inlet valve
3 Cylinder head
4 Turning tool
5 Valve removing tool
6 Exhaust valve
7 Inlet valve
8 Dial gage
9 Dial gage holder
10 Plug gage



W05.30-0051-06

1 Valve seat ring - exhaust valve
2 Valve seat ring - inlet valve

F Valve seat width at valve seat ring (inspection dimension related to depth (H))
G Valve seat diameter at valve seat ring
H Depth (inspection dimension related to valve seat width (F))
J Valve seat angle at valve seat ring



W05.30-0038-12

	Removing		
1	Remove valve spring		**Page 18**
2	Clamp cylinder head (3) on valve removing tool (5)	Valve removing tool	WH58.30-Z-1001-14A
	Inspecting		
3	Measure amount by which valve stands back to cylinder head (3)		**Page 23**

		Ⓘ Measure amount by which valve stands back at both inlet and exhaust valves and note. Permissible difference between both valves must not be exceeded. ☑ ☑ ⓘ If the measurement obtained is not within the permissible tolerance, the valve (6, 7) has to be inspected. If worn, replace valve and inspect valve seat rings (1, 2).	BE05.30-N-1001-01C BE05.30-N-1009-01C 001 589 53 21 00 343 589 00 40 00
4	Remove valves (6, 7) from the cylinder head (3)	ⓘ Mark valves.	
5	Inspect valve seat rings (1, 2)	ⓘ If valve seats are slightly worn, it is possible to machine both inlet or exhaust valve rings without replacing the valve seat rings. The amount by which the valve stands back and the permissible difference between both valves must not be exceeded. If worn ↓ Replace valve seat ring.	**Page 28**
6	Inspect valve guide inner diamter for wear with plug gage (10)	☑ ⓘ If it is possible to insert the side of the plug gage marked with "+" into the valve guide ↓ Replace valve guide.	BE05.30-N-1001-02C 117 589 03 23 00 **Page 25**
	Machining		
7	Machine valve seat ring (1, 2) in cylinder head (3)	Ⓘ Machine valve seat rings at both inlet or exhaust valve seat ring. ☑ Valve seat angle at valve seat ring (J) and valve seat width at valve seat ring (F) Valve seat ∅ at valve seat ring (finish-machined) machining dimension (G) related to depth (H) of cylinder head contact surface ⓘ If the measurements obtained after machining are less than the test data ↓ Replace valve seat ring.	**Page 48** 366 589 00 69 00 BE05.30-N-1005-03C BE05.30-N-1006-03C **Page 28**
◁	**Inspecting**		
8	Inspect concentricity of valve seat relative to valve guide	☑ Inspection kit for valve seats ⓘ If measurements differ from test data ↓	**Page 51** BE05.30-N-1003-02C 366 589 00 69 00 WH58.30-Z-1019-05A

		Once again machine valve seat ring (1, 2).	Page 48
	Installing		
9	Install valves (6, 7)	Use new valves or ↓ Grind used valves before installing.	Page 18 Page 41
10	Once again measure amount by which valve stands back and permissible difference at both inlet and exhaust valves		

Test data of valves

Number	Designation			Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-01C	Amount by which valve stands back relative to cylinder head contact surface		mm	0.70–1.05	0.70–1.05
BE05.30-N-1009-01C	Permissible difference of amount by which valve stands back relative to cylinder head contact surface for each cylinder	Inlet	mm	≤0.2	≤0.2
		Exhaust	mm	≤0.2	≤0.2

Test data of valve guides

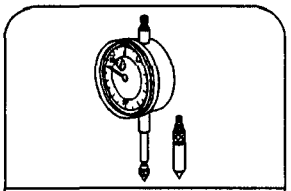
Number	Designation				Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1001-02C	Valve guide	Outer Ø (A1)	Standard	mm	15.028–15.046	15.028–15.046
			Oversize 0.2	mm	15.228–15.246	15.228–15.246
			Oversize 0.4	mm	15.428–15.446	15.428–15.446
		Bore Ø in cylinder head (A)	Standard	mm	15.000–15.018	15.000–15.018
			Oversize 0.2	mm	15.200–15.218	15.200–15.218
			Oversize 0.4	mm	15.400–15.418	15.400–15.418
		Inner Ø (machining dimension) (B)		mm	9.000–9.022	9.000–9.022
		Length (C)		mm	61.7–62.3	61.7–62.3
		Distance (D) from valve guide top edge to valve spring contact surface	Inlet	mm	21.1–21.5	21.1–21.5
			Exhaust	mm	21.1–21.5	21.1–21.5
		Fig. see			AR05.30-W-3731-07A	AR05.30-W-3731-07A
BE05.30-N-1003-02C	Valve seat concentricity relative to valve guide			mm	≤0.04	≤0.04

Test data of valve seat rings

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE05.30-N-1005-03C	Valve seat	Valve seat angle at valve seat ring (J)	Inlet	° ∡	30
			Exhaust	° ∡	45
		Valve seat width at valve seat ring (F)	Inlet	mm	2.2
			Exhaust	mm	2.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1006-03C	Valve seat ∅ at valve seat ring (finish-machined), machining dimension (G) related to depth (H) of cylinder head contact surface	Inlet	Dim. (G)	mm	41.99–42.01
			Dim. (H)	mm	4.00–4.15
			Fig. see		AR05.30-W-3831-03A
		Exhaust	Dim. (G)		38.99–39.01
			Dim. (H)		3.80–3.95
			Fig. see		AR05.30-W-3831-03A

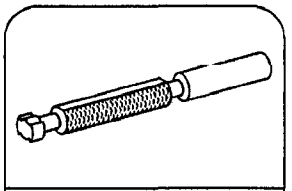
Test data of valve seat ring

Number	Designation				Engine 542.920/921/922/923/925/926
BE05.30-N-1005-03C	Valve seat	Valve seat angle at valve seat ring (J)	Inlet	° ∡	30
			Exhaust	° ∡	45
		Valve seat width at valve seat ring (F)	Inlet	mm	2.2
			Exhaust	mm	2.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1006-03C	Valve seat ∅ at valve seat ring (finish-machined), machining dimension (G) related to depth (H) of cylinder head contact surface	Inlet	Dim. (G)	mm	41.99–42.01
			Dim. (H)	mm	4.00–4.15
			Fig. see		AR05.30-W-3831-03A
		Exhaust	Dim. (G)		38.99–39.01
			Dim. (H)		3.80–3.95
			Fig. see		AR05.30-W-3831-03A

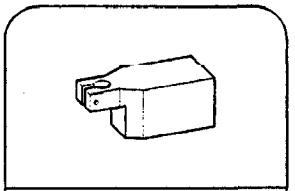


001 589 53 21 00

Dial gage

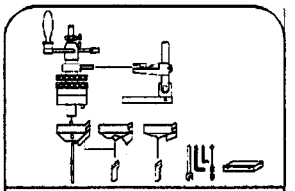


117 589 03 23 00



343 589 00 40 00

Dial gage holder



366 589 00 69 00

Valve seat turning kit

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1019-05A	Inspection kit for valve seats	Hunger D-81309 München 70	216.93.300

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1001-14A	Valve removing tool	Model K2000 Hunger D-81309 München	221 00 200

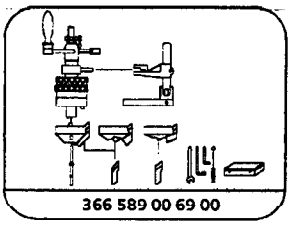
AR05.30-W-4532-01B	Machining valve seat rings with turning tool	If the measurements obtained during machining are less than the test data ↓ Replace valve seat rings	AR05.30-W-3831B

Test data of valve seat rings

Number	Designation				Engine 541.920/921/922/923/924/925/926/927
BE05.30-N-1005-03C	Valve seat	Valve seat angle at valve seat ring (J)	Inlet	° ∠	30
			Exhaust	° ∠	45
		Valve seat width at valve seat ring (F)	Inlet	mm	2.2
			Exhaust	mm	2.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1006-03C	Valve seat Ø at valve seat ring (finish-machined), machining dimension (G) related to depth (H) of cylinder head contact surface	Inlet	Dim. (G)	mm	41.99–42.01
			Dim. (H)	mm	4.00–4.15
			Fig. see		AR05.30-W-3831-03A
		Exhaust	Dim. (G)		38.99–39.01
			Dim. (H)		3.80–3.95
			Fig. see		AR05.30-W-3831-03A

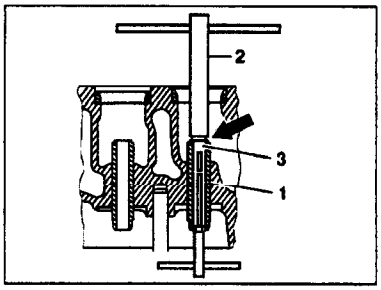
Test data of valve seat rings

Number	Designation				Engine 542.920/921/922/923/925/926
BE05.30-N-1005-03C	Valve seat	Valve seat angle at valve seat ring (J)	Inlet	° ∠	30
			Exhaust	° ∠	45
		Valve seat width at valve seat ring (F)	Inlet	mm	2.2
			Exhaust	mm	2.2
			Fig. see		AR05.30-W-3831-03A
BE05.30-N-1006-03C	Valve seat Ø at valve seat ring (finish-machined), machining dimension (G) related to depth (H) of cylinder head contact surface	Inlet	Dim. (G)	mm	41.99–42.01
			Dim. (H)	mm	4.00–4.15
			Fig. see		AR05.30-W-3831-03A
		Exhaust	Dim. (G)		38.99–39.01
			Dim. (H)		3.80–3.95
			Fig. see		AR05.30-W-3831-03A



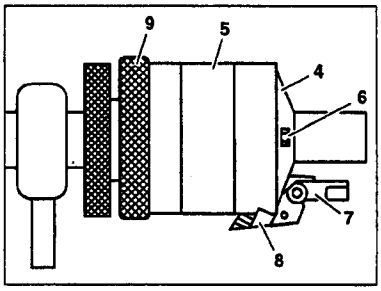
Valve seat turning kit

1 Insert pilot (2) (9 mm ∅) into the valve guide (1) until the stop (arrow) of the collet chuck (3) is resting on the valve guide; press collet chuck down, if necessary, with a screwdriver. Turn tight with the drift inserted into the pilot at top and bottom.



W05.30-0007-01

2 Attach turning head (4) to the turning tool (5), screw in both hexagon sockets screws (6) loosely, match up turning head so that the distance between the rack and the side opposite is about 0.5 to 0.8 mm. Then, tighten both hexagon socket screws.
Inlet valve → turning head D2/30°
Exhaust valve → turning head D2/45°



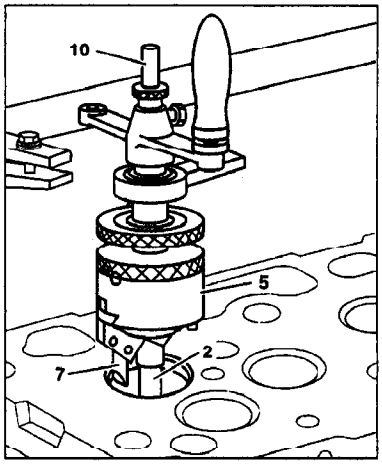
W05.30-0027-01

i
It must be possible to move the tool slide (8) back and forward relatively easily with the quick-adjustment (9).

3 Screw cutting tool (7) at the turning head (4).

4 Moisten pilot (2) with oil.

5 Introduce turning tool (5) over the pilot (2) until either the stop pin (10) is resting on the pilot or the cutting tool (7) is resting on the cylinder head.



W05.30-0028-02

Ⓘ
Cutting tool must not strike the cylinder head otherwise the carbide metal tip will be damaged.

6 Turn quick-adjustment (9) until the cutting tool (7) is positioned over the middle of the valve seat ring.

7 Hold turning tool (5) tight, slacken clamping screw (12) of the stop pin (10), carefully lower turning tool until the blade of the cutting tool (7) is resting on the middle of the valve seat ring (11). Press stop pin against pilot (2), tighten clamping screw.

8 Clamp pendulum guide (13) tight horizontally, approximately in the middle of the guide, with the steadyrest clamp (14).

i

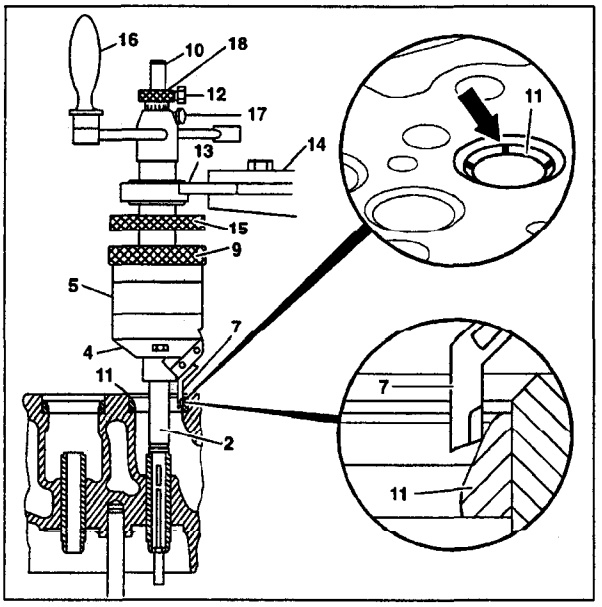
It should now be possible to rotate the turning tool (5) just as easily as before.

9 Make three colored markings (arrows) on the valve seat ring (11) with a marker pen, offset about 120°.

10 Raise turning tool (5) and position cutting tool (7) next to the inner valve seat edge by turning the quick-adjustment (9).

i

Do not make any cut infeed.



W05.30-0029-12

11 Hold knurled disk (15) for infeed mechanism tight and turn handcrank (16) clockwise. This usually produces an irregular stock removal.

12 After turning fully, move the cutting tool (7) back again next to the inner valve seat edge with the quick-adjustment (9).

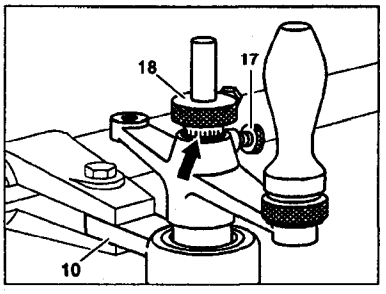
13 Slacken locking screw (17) and turn the knurled disk (18) about 1/2 to 1 graduation (arrow) counter-clockwise. Tighten locking screw.

i

1 graduation = 0.1 mm infeed

14 Hold knurled disk (15) for infeed mechanism tight and turn handcrank (16) clockwise; over-turn the valve seat to the outside with the tip of the cutting tool (7).

15 Stock removal has to be carried out as often as necessary (steps 13 and 14) until the valve seat is smooth and free of chatter marks and valve seat width and valve seat diameter is achieved, see test data.



W05.30-0012-01

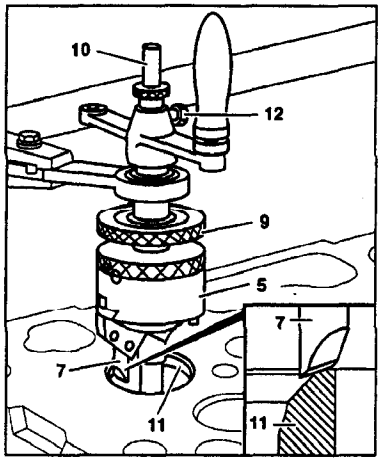
16 Correct valve seat (11) on outside.

17 Raise turning tool (5) and slacken clamping screw (12) of the stop pin (10).

18 Turn quick-adjustment (9) so that the cutting tool (7) is resting on the outer valve seat edge.

Ⓑ
Lower cutting tool onto the valve seat edge carefully.

19 Press stop pin (10) down until it is resting on the pilot. Tighten clamping screw (12).



W05.30-0031-02

20 Slacken locking screw (17) and turn knurled disk (18) about 1/2 graduation (arrow) counter-clockwise. Tighten locking screw again.

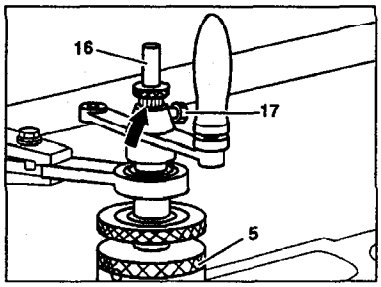
21 Hold crank arms with both hands and move turning tool (5) around pilot by applying slight pressure downward.

22 Repeat steps 20 and 21 until the required valve seat width is achieved, see test data.

i
After this, turn fully once again without any infeed.

23 Take off turning tool.

i
Do not remove pilot (2).

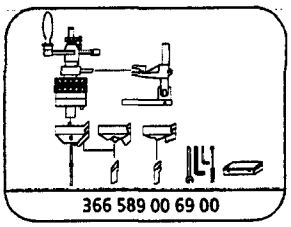


W05.30-0032-01

AR05.30-W-4532-02B	Inspecting concentricity of valve seat to valve guide	i If measurement differs from test values ↓ Machine valve seat ring.	AR05.30-W-4532-01B

Test data of valve guides

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE05.30-N-1003-02C	Concentricity of valve seat to valve guide	mm	≤0.04	≤0.04



Valve seat turning kit

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1019-05A	*Inspection kit for valve seats*	*Hunger* D-81309 München 70	*216.93.300*

1 Insert clamping ring (1) over the installed valve turning tool pilot and clamp tight.

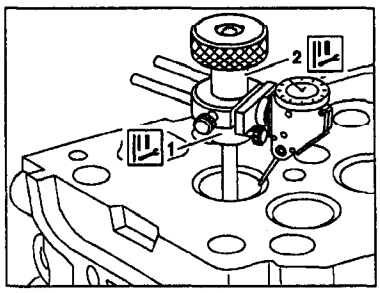
2 Mount inspection tool (2) onto the clamping ring (1).

3 Set tracer pin of inspection tool (2) onto the middle of the valve seat with a preload.

4 Slowly turn inspection tool around the pilot.

5 Inspect radial runout of valve seat relative to valve guide, see test data.

6 Take off inspection tool (2), clamping ring (1) and pilot.



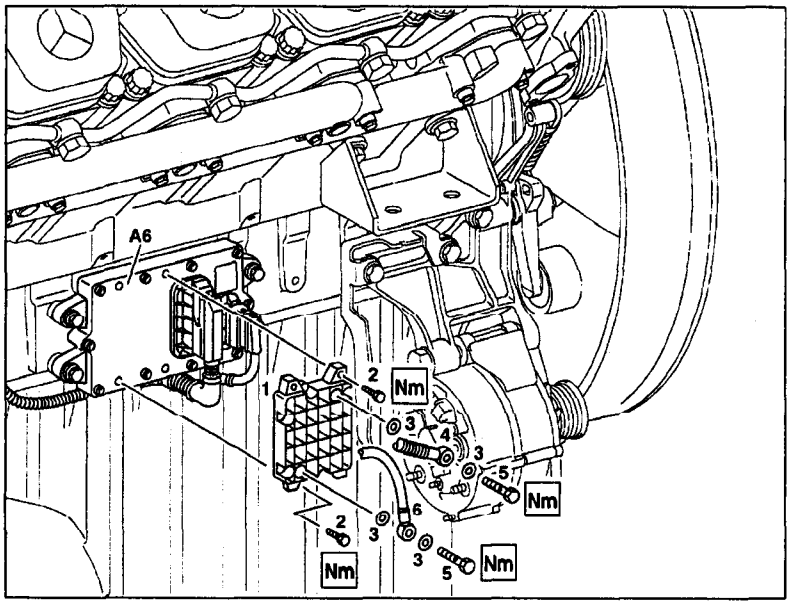
W05.30-0026-01

AR47.21-W-5621B	Removing and installing fuel heat exchanger	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Fuel heat exchanger
2 Bolts
3 Seals
4 Fuel pipe
5 Banjo bolts
6 Fuel pipe

A6 PLD control unit



W07.10-0008-06

	Removing, installing		
1	Remove noise encapsulation	i at bottom	
⚠ Danger!	Risk of explosion from ignition. Risk of poisoning from inhaling and swallowing fuel. Risk of injury as a result of fuel coming into contact with skin and eyes.	No fire, naked flame or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	Page 54
2	Detach fuel pipes (4, 6) at fuel heat exchanger (1)	i Collect fuel which flows out. i Installation: Replace seals (3). Nm Fuel pipe to fuel heat exchanger	BA47.25-N-1001-01B
3	Detach fuel heat exchanger (1) PLD control unit (A6)	Fuel heat exchanger must not be disassembled! Nm Fuel heat exchanger to PLD control unit	BA07.15-N-1006-01B
4	Install in the reverse order		
5	Bleed fuel system		Page 54

Nm Diesel injection system with unit pumps (MR/PLD)

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BA07.15-N-1006-01B	Fuel heat exchanger to MR/PLD control unit	Nm	8	8

Fuel pipes/hoses

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.25-N-1001-01B	Fuel pipe to fuel heat exchanger	M16×1.5	Nm	40	40

AS47.00-Z-0001-01A	**Risk of explosion** from ignition of fuel, risk of poisoning if fuel is inhaled or swallowed and risk of injury if skin or eyes come into contact with fuel	Fire, the creation of sparks, naked lights and smoking prohibited. Only pour fuels into containers which are suitable and are correspondingly marked. Wear protective clothing when handling fuels.	⚠ Danger!

Potential dangers

Risk of explosion, poisoning and injury
Fuels are highly flammable and are poisonous if swallowed. Fuel can cause damage to the skin. Contact with gasoline fuel, for example, removes the skin's natural oils. Fuel vapors are explosive and invisible, and spread out along the floor. They are poisonous if inhaled and can cause unconsciousness in high concentrations.

Protective measures/rules for handling fuels
- Observe local national safety regulations.
- Fire, the creation of sparks, naked lights and smoking forbidden.
- Make sure that the work area is sufficiently well ventilated.
- Never drain or add fuels over workshop pits.
- Always put drained fuel into containers which are suitable and can be properly closed off.
- Immediately remove any fuel which has been spilt.

Working on the vehicle using a naked flame
(e.g. when welding etc.).
- Before carrying out such work, remove the relevant parts of the fuel system and seal off open fuel lines with plugs.

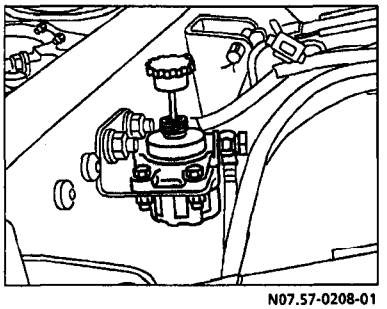
First aid measures
- Wash any fuel from skin using soap and water.
- Change out of clothing on which fuel has been spilt as soon as possible.
- If fuel is splashed into the eyes, rinse out the eyes immediately with water; consult a doctor if appropriate.

AP47.00-W-1720-01A	Bleeding air in fuel system		

1 Loosen handle on manual pump.

2 Actuate manual pump until overflow valve opens audibly.

3 Tighten handle on manual pump.

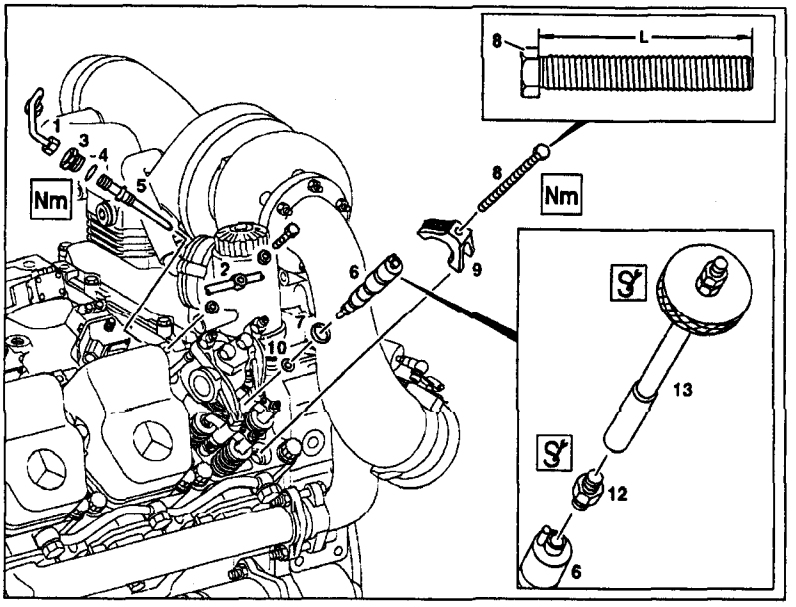


N07.57-0208-01

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

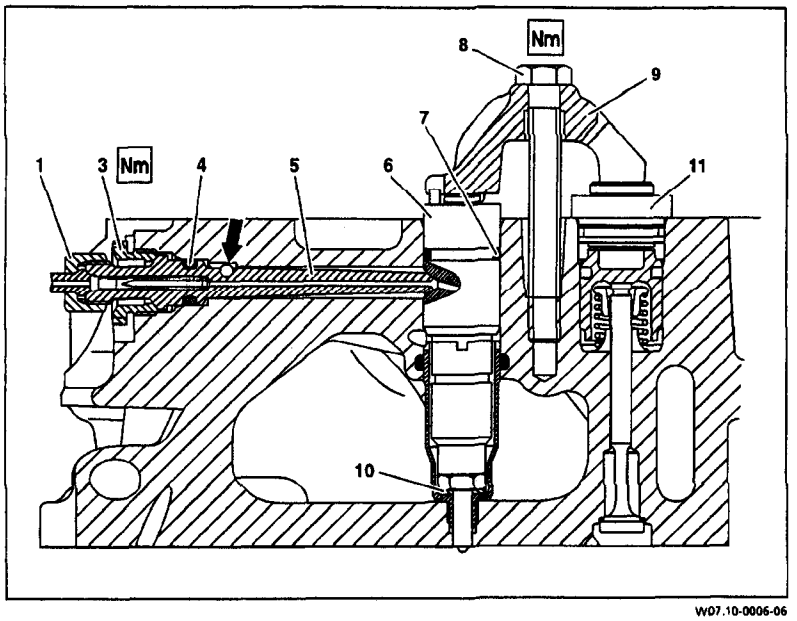
1 Injection pipe
2 Leak fuel pipe
3 Thrust screw
4 O-ring
5 Pressure pipe fitting
6 Nozzle holder combination
7 O-ring
8 Bolt
9 Tensioning plate
10 Seal
12 Adapter
13 Impact extracter

L Length of shank of bolt (8)



W07.10-0007-06

1 Injection pipe
3 Thrust screw
4 O-ring
5 Pressure pipe fitting
6 Nozzle holder combination
7 O-ring
8 Bolt
9 Tensioning plate
10 Seal
11 End cover of constant throttle



W07.10-0006-06

	Removing		
1	Remove cylinder head cover		AR01.20-W-5014B
⚠ Danger!	Risk of explosion from ignition. Risk of poisoning from inhaling and swallowing fuel. Risk of injury as a result of fuel coming into contact with skin and eyes.	No fire, naked flame or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**Page 54**

2	Detach leak fuel pipe (2) at cylinder head		
3	Remove injection pipe (1)		**Page 66**
4	Take out thrust screw (3) and remove delivery pipe fitting (5)		
5	Remove tensioning plate (9)		
6	Attach adapter (12) and impact extractor (13) to inner thread (M 8) of nozzle holder combination (6)	S S	355 589 01 63 00 904 589 00 63 00
7	Pull out nozzle holder combination (6)	**Nozzle holder combination must not be disassembled.** If wear or problem exists, nozzle holder combination should be replaced.	
8	Detach adapter (12) and impact extractor (13) at the nozzle holder combination (6)		
9	Take off seal (10)		
	Installing		
10	Measure bolt (8)	If max. shank length is exceeded ↓ Replace bolt.	BE07.10-N-1002-01C
11	Replace O-ring (7) at nozzle holder combination (6)	Coat O-ring with lubricant.	BR00.45-Z-1018-06A
12	Fit seal (10) onto nozzle holder combination (6)	Replace seal. Pay attention to thickness of seal removed (produces nozzle projection relative to cylinder head contact surface).	
13	Install nozzle holder combination (6)	Pay attention to installation position of nozzle holder combination relative to delivery pipe fitting hole. Turn nozzle holder combination with clamping plate (9) in cylinder head until clamping plate (9) engages at the locating point on the end cover of the constant throttle (11).	
14	Attach clamping plate (9).	Nm Tensioning plate of injection nozzle and constant throttle to cylinder head.	BA07.15-N-1003-01B
15	Replace O-ring (4) at pressure pipe fitting (5)	Coat O-ring with lubricant.	BR00.45-Z-1018-06A
16	Install pressure pipe fitting (5) and tighten thrust screw (3)	Nm Pressure pipe fitting to cylinder head. Pay attention to installation position of inserted bolt (arrow) at pressure pipe fitting; it should be inserted into the groove (arrow) in the cylinder head.	BA07.15-N-1005-01B
17	Install injection pipe (1)		**Page 66**
18	Install leak fuel pipe (2)	Replace seals. Nm Leak fuel pipe to cylinder head.	 BA01.30-N-1004-01D
19	Install cylinder head cover		AR01.20-W-5014B

Test and setting data of injection nozzles

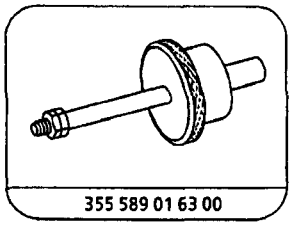
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE07.10-N-1002-01C	Bolt of tensioning plate of nozzle holder combination/constant throttle to cylinder head	Thread diameter	M	10	10
		Shank length	mm	≤91	≤91

Nm Cylinder head

Number	Designation		Engine 541.920/921/ 922/923/924/925/926/ 927	Engine 542.920/921/ 922/923/925/926
BA01.30-N-1004-01D	Leak fuel pipe	Nm	15	15

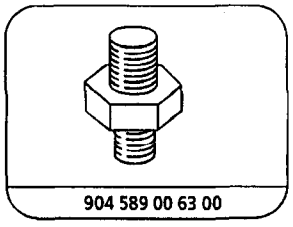
Nm Diesel injection system with unit pumps (PLD)

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA07.15-N-1003-01B	Tensioning plate of injection nozzle and constant throttle to cylinder head	Nm	50	50
BA07.15-N-1005-01B	Pressure pipe fitting to cylinder head	Nm	40	40



355 589 01 63 00

Impact extractor



904 589 00 63 00

Threaded insert

Repair products

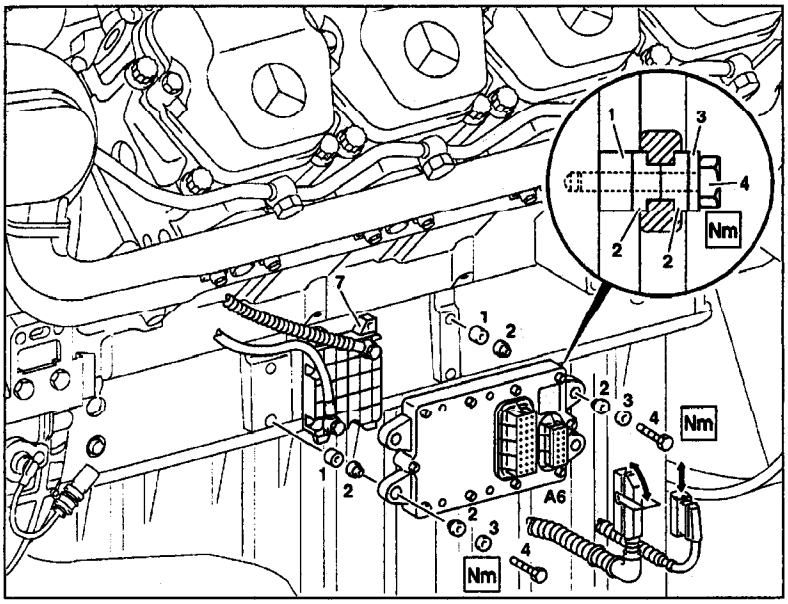
Number	Designation	Order number
BR00.45-Z-1018-06A	ATE grease	

AR07.15-W-1628B	Removing and installing MR/PLD control module	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Spacer
2 Rubber dampers
3 Washers
4 Bolts
5 Vehicle wiring harness connector
6 Engine wiring harness connector
7 Fuel heat exchanger

A6 MR/PLD control module



W07.15-0078-06

Operation no. of operation texts or standard texts and flat rates

Division	Op. no.	Operation text
S	07-1628	Control module

	Removal, installation		
1	Switch off ignition		
⚠ Danger!	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 60**
Ⓘ	Notes re tilting cab	Models 950, 952, 953, 954	**Page 60**
2	Tilt cab		
3	Remove fuel heat exchanger (7)	ℹ Fuel pipes remain attached to fuel heat exchanger.	**Page 53**
4	Release and unplug vehicle wiring harness connector (5) at PLD control module (A6)	ℹ Release connector by pressing the locking arm.	
5	Release and unplug engine wiring harness connector (6) at PLD control module (A6)	ℹ Release connector by swiveling the locking arm.	
6	Remove PLD control unit (A6) at crankcase	Ⓘ The PLD control unit must not be disassembled. ℹ Installation: install spacers (1) with rubber dampers (2) fitted on and at PLD control unit. Pay attention to installation position of rubber dampers (2). Nm PLD control module to crankcase.	BA07.15-N-1002-01B
7	Install in the reverse order	ℹ If a new PLD control module is installed ↓	

		program transponder keys.	AR80.57-W-0010A

Nm **Diesel injection system with unit pumps (MR/PLD)**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BA07.15-N-1002-01B	MR/PLD control module to crankcase	Nm	15	15

Bearbeitungsvermerk

Datum	*Ersteller*	*Vermerk*	*Seite*

AS60.80-Z-0001-01A	Injury hazard from pinching and crushing when cab is tilted	When tilting ensure that no one is present in the tilting area of the cab. Always tilt cab to end position and secure with safety brace.	⚠ Danger!

Injury hazard
A damaged tilting mechanism or improper handling of the tilting mechanism can lead to severe injuries when tilting the cab.

Rules of behavior/protective measures
Before tilting cab:
- **Shut off engine.**
- **Apply parking brake.**
- **Secure vehicle against rolling.**
- **On vehicles with manual transmission move shift lever to neutral position.**
- **On vehicles with automatic transmission move selection lever to position "N".**

When tilting cab:
- **Protect tilting area and particularly tilting device against unauthorized access, e.g. by blocking off or with human guard.**
- **Attach safety cable before tilting when so specified in the vehicle operating instructions.**
- **Never work under cab when partially tilted.**
- **Always tilt cab to end position and secure with safety brace.**

AH60.80-N-0003-01A	Notes on tilting the cab	Models 673,674, 675, 676, 677, 678, 679, 950, 952, 953, 954, 957, 970, 971, 972, 973, 974, 975, 976	

Before tilting the cab
- **Switch off engine**
- **Apply parking brake**
- **Secure vehicle to stop it rolling away**
- **Remove all loose objects (e.g. cans, bottles, tools, bags etc.) from the cab**
- **On vehicles with manual transmission move shift lever to neutral position**
- **Model 957: release steering column and open front flap**

On vehicles with a refrigerator box
- **The refrigerator box must be switched off before the cab is tilted.**
- **The refrigerator box may only be switched on 10 minutes after tilting the cab back again.**
  i Also refer to the refrigerator box manufacturer's Operating Instructions and the red information plate on the refrigerator box.

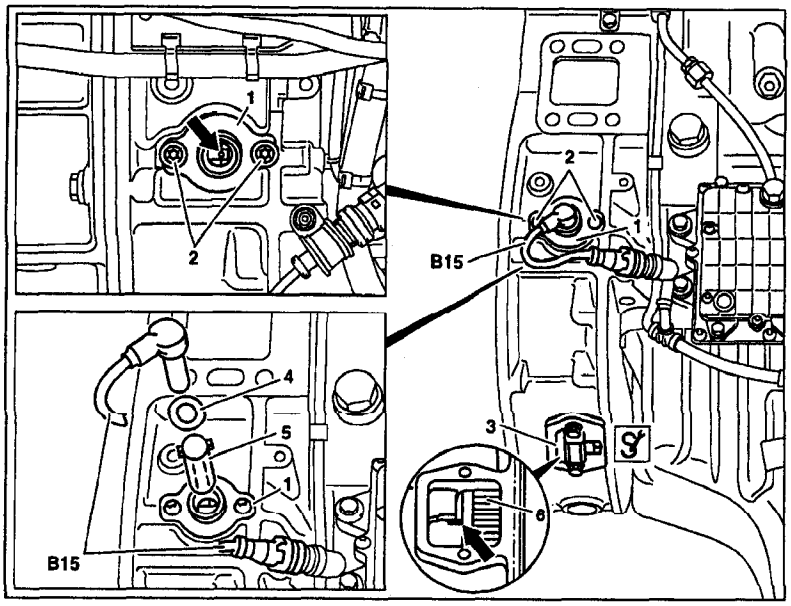
The coupling pin must be inserted correctly.

i Always tilt cab up to its final position.

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Bracket
2 Shear bolts
3 Cranking device
4 O-ring
5 Securing bush
6 Flywheel

B15 Crankshaft position sensor



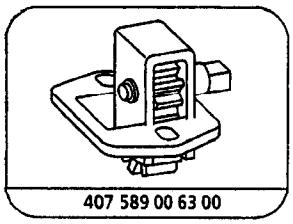
W07.15-0077-06

	Removing		
1	Remove noise encapsulation	At bottom	
2	Pull out crankshaft position sensor (B15) at bracket (1)		
3	Pull out securing bush (5)		
4	Take off end cover of TDC inspection hole at timing case		
5	Attach cranking device (3) to timing case	 End cover of TDC inspection hole to timing case	407 589 00 63 00 BA01.60-N-1001-01B
6	Rotate crankshaft with the cranking device (3)	Until the TDC marking on the flywheel (arrow) is positioned in the middle of the mounting hole of the crankshaft position sensor (B15). The TDC marking is located in one of the longitudinal grooves.	
7	Block crankshaft to prevent it turning		
8	Mark flywheel (6) relative to reference edge in TDC inspection hole	If flywheel is taken off, mark vibration damper relative to crankcase.	
9	Use a suitable tool to slacken shear bolts (2) and remove, take off bracket (1) together with O-ring.		
	Setting		

10	Attach bracket (1) together with O-ring and align	TDC marking on flywheel (arrow) should be positioned in the middle of the mounting hole of the crankshaft position sensor (B15). Inspect marking on flywheel relative to reference edge in TDC inspection hole or vibration damper relative to crankcase.	
11	Tighten shear bolts (2) until they shear off		
	Installing		
12	Press securing bush (5) in as far as the stop		
13	Press crankshaft position sensor (B15) into the timing case as far as the stop	Inspect O-ring (4) for signs of damage, replace if necessary.	
14	Remove blocking and cranking device (3)	Cranking device should be removed before starting the engine.	407 589 00 63 00
15	End cover to timing case	End cover of TDC inspection hole to timing case	BA01.60-N-1001-01B

Timing case

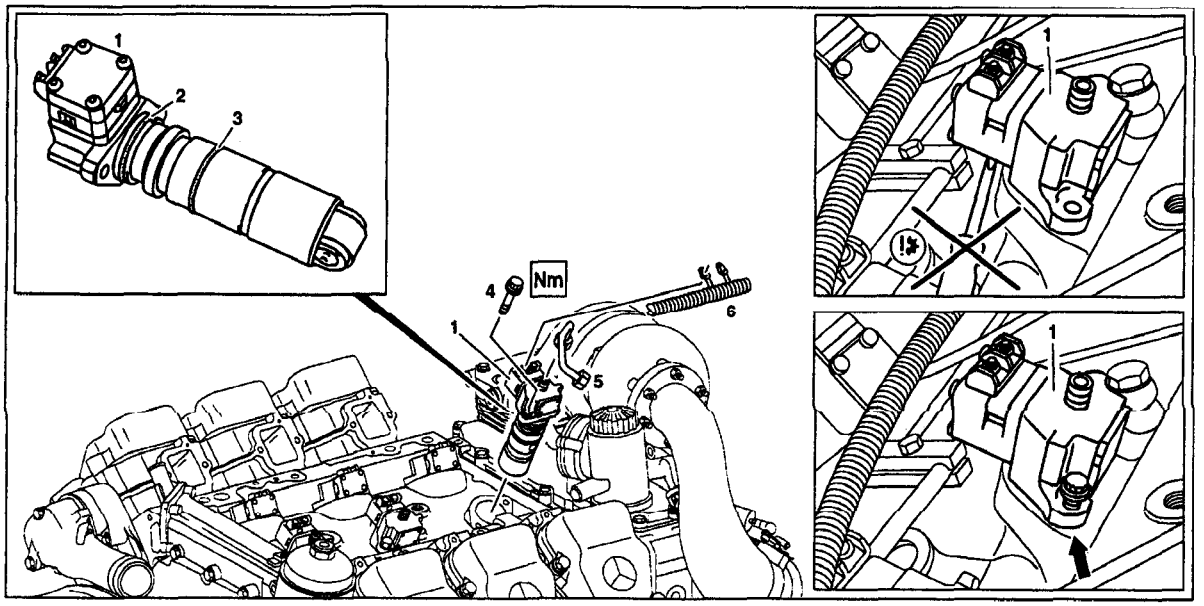
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover of TDC inspection hole to timing case	Nm	25	25



Cranking device

AR07.15-W-8950B	Removing and installing MR/PLD unit pump	17.1.96

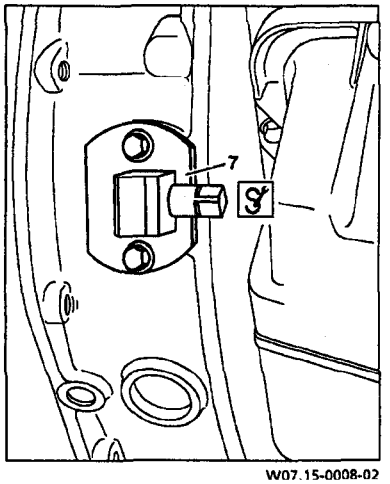
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



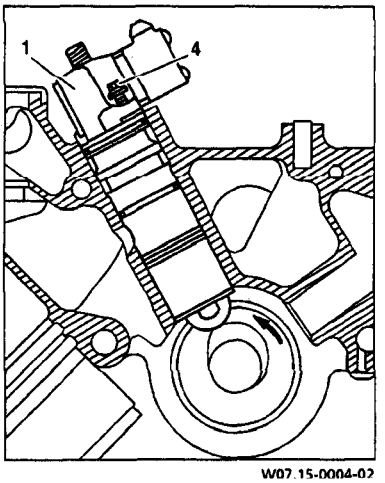
W07.15-0003-09

1 PLD unit pump
2 O-ring (black)
3 O-ring (brown)
4 Serrated bolt
5 Injection pipe
6 Engine wiring harness

1 PLD unit pump
4 Serrated bolt
7 Cranking device



W07.15-0008-02



W07.15-0004-02

	Removing, installing		
1	Install cranking device (7) for the engine at the timing case	Cranking device must be removed before starting the engine End cover to timing case	 407 589 00 63 00 BA01.60-N-1001-01B
2	Remove injection pipe (5)		**Page 66**
3.1	Remove charge air pipe	On engine 542.920-923/925/926	**Page 80**

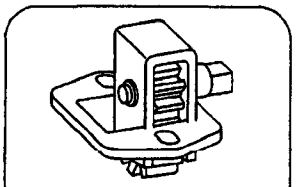
4	Disconnect engine wiring harness (6) at all the left or right PLD unit pumps (1)	Slacken bolts at solenoid valve and separate both clips	
5	Unscrew serrated bolt (4) about 6 mm	Nm	BA07.15-N-1001-01B
6	Remove PLD unit pump (1)	Rotate crankshaft with the cranking device until the pump cam at the camshaft pushes the PLD unit pump out of the crankcase. If the PLD unit pump (1) is tight, it must not be pushed out at the solenoid valve and housing flange ↓ Carefully press out PLD unit pump (1) at the recess (arrow) in the unit pump housing Installation: rotate crankshaft with the cranking device until the pump cam at the camshaft is positioned in the base circle. Press PLD unit pump into the crankcase by hand against the force of the spring (clearance about 4 mm).	
7	Unscrew serrated bolt (4) and pull out PLD unit pump (1)	PLD unit pump must not be disassembled. If it is worn or if a problem exists, the PLD unit pump must be replaced.	
8	Remove O-rings (2, 3) at the unit pump (1)	Installation: replace O-rings. Pay attention to color coding of O-rings and coat with lubricant.	BR00.45-Z-1018-06A
9	Install in the reverse order		

Nm Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover of TDC inspection hole to timing case	Nm	25	25

Nm Diesel injection system with unit pumps (MR/PLD)

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BA07.15-N-1001-01B	MR/PLD unit pump to crankcase	Nm	65	65



407 589 00 63 00

Cranking device

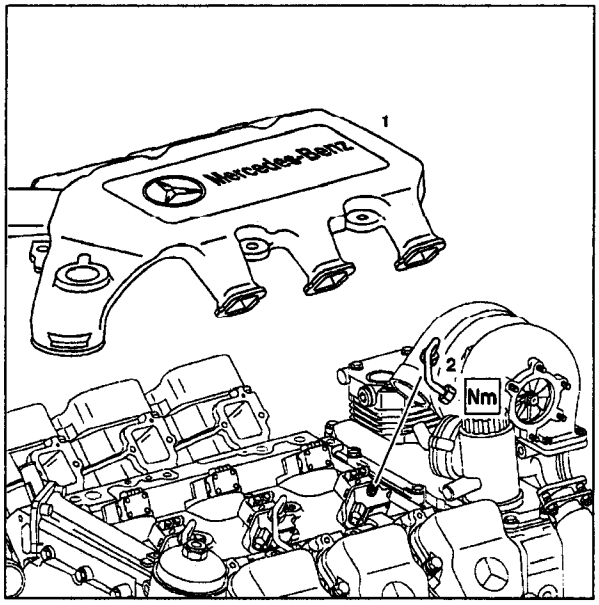
Repair products

Number	Designation	Order number
BR00.45-Z-1018-06A	ATE grease	-

AR07.15-W-9235B	Removing and installing MR/PLD injection pipes	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Charge air housing
2 Injection pipe



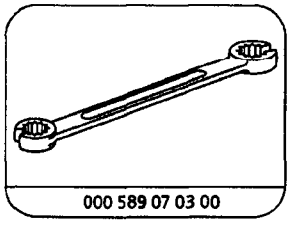
W07.10-0005-12

⊠	Removing		
1	Remove charge air housing (1)		**Page 83**
⚠ Danger!	Risk of explosion from ignition. Risk of poisoning from inhaling and swallowing fuel. Risk of injury as a result of fuel coming into contact with skin and eyes.	No fire, naked flame or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**Page 54**
2	Remove injection pipe (2)	Injection pipe must not be detached for bleeding the fuel system. Injection pipe must not be bent.	
		⊠	000 589 07 03 00
		⊠	000 589 68 03 00
⊠	Installing		
3	Install injection pipe (2)	Injection pipe must not be bent. Pay attention to installation position.	
		⊠	000 589 07 03 00
		⊠	000 589 68 03 00
		Nm Injection pipe to delivery pipe connection fitting or unit pump	BA07.15-N-1004-01B
4	Install charge air housing (1)		**Page 83**
5	Bleed fuel system		AP07.57-W-0780A
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	**Page 68**

6	Start engine and run	Crank engine with the starter for not more than 20 seconds. Wait about 2 minutes before repeating the attempt at starting.	
7	Pay attention to injection pipe (2). Check both screw connections for leaks.	Use a mirror to inspect injection pipe at the unit pump (below charge air housing). If a leak exists, replace relevant injection pipe.	
8	Switch off engine		

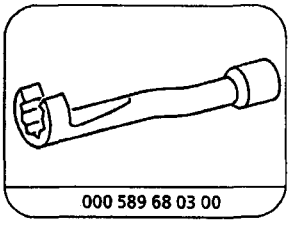
Diesel injection system with unit pumps (MR/PLD)

Number	Designation		Engines 541.920/ 921/922/923/ 924/925/926/927	Engines 542.920/ 921/922/923/925 /926
BA07.15-N-1004-01B	Injection pipe to delivery pipe connection fitting or unit pump	Nm	30	30



000 589 07 03 00

Ring wrench



000 589 68 03 00

Box wrench socket

AS00.00-Z-0005-01A	**Risk of accident as a result of vehicle starting off when engine is running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.**	Secure vehicle to prevent it from moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	⚠ **Danger!**

Possible dangers

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 and 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").

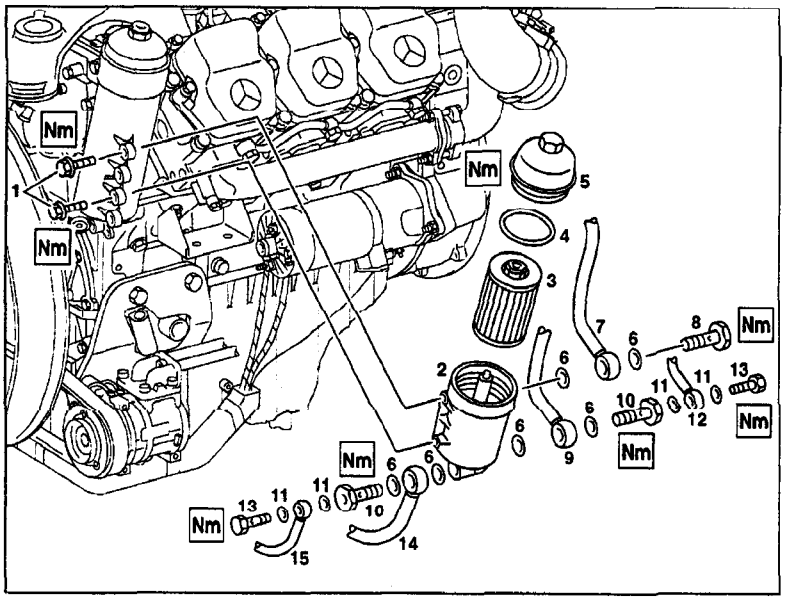
Risk of injury
Severe injuries may be caused by freely rotating parts in the area of the running engine. The heat produced by the engine when it is operating can result in severe burns if contact is made with individual, unshielded parts.

Rules of conduct / Protective measures
- As a general rule, carry out work on the running engine only if this is absolutely essential.
- Before starting the engine, apply parking brake.
- On models with manual transmission, move gearshift lever into Neutral position.
- On models 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.
- Take off any jewelry, such as chains, rings etc.
- If you have long hair, wear a suitable head cover.
- Before commencing work on the running engine, check to obtain a general picture of the positioning of parts which may be hot.
- When carrying out work when starting the engine or when engine is running, do not touch any hot and rotating 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.
- Immediately consult a physician.

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Bolts*
2 *Fuel filter housing*
3 *Fuel filter element*
4 *Gasket*
5 *Fuel filter cap*
6 *Seals*
7 *Fuel pipes (feed)*
8 *Banjo bolt*
9 *Fuel pipes (to fuel ports)*
10 *Banjo bolts*
11 *Seals*
12 *Fuel pipes (flame starting system)*
13 *Banjo bolts*
14 *Fuel pipe (return flow)*
15 *Fuel pipe (leak fuel pipe)*



W07.57-0002-06

	Removing, installing		
⚠ **Danger!**	**Risk of injury from bruises and jamming** when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 60**
1	Tilt cab		
(19)	Notes re tilting cab	Model 950, 952, 953, 954	**Page 60**
⚠ **Danger!**	**Risk of explosion** from ignition. **Risk of poisoning** from inhaling and swallowing fuel. **Risk of injury** as a result of fuel coming into contact with skin and eyes.	No fire, naked flame or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**Page 54**
2	Unscrew fuel filter cap (5) together with fuel filter element (3).	i When fuel filter is removed, the fuel flows back out of the fuel filter housing along the fuel return flow pipe into the fuel tank. i Installation: Inspect seal (4), replace if necessary. Nm Cap to fuel filter housing.	BA47.20-N-1002-02C
3	Detach fuel pipes at fuel filter housing (2)	i Collect fuel which flows out. Installation: Replace all seals. Nm Fuel pipe to fuel filter housing Nm Leak fuel pipe to banjo bolt Nm Fuel pipe (flame starting system) to banjo bolt	 BA47.25-N-1003-01B BA47.25-N-1006-01B BA47.25-N-1007-01B
4	Detach fuel filter housing (2) at oil filter housing	Nm Fuel filter housing to oil filter housing	BA07.57-N-1001-01C

5	Install in the reverse order		
6	Bleed fuel system		Page 54

Fuel filter

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.20-N-1001-02C	Fuel filter housing to oil filter housing	Nm	25	25
BA47.20-N-1002-02C	Cap to fuel filter housing	Nm	25	25

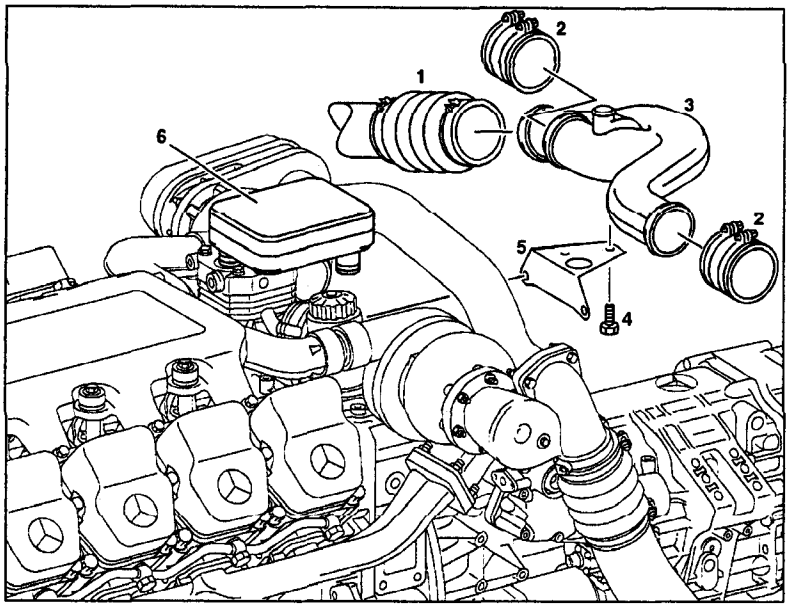
Fuel pipes/hoses

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.25-N-1003-01B	Fuel pipe to fuel filter housing	M16×1,5	Nm	40	40
BA47.25-N-1006-01B	Leak fuel pipe to banjo bolt of fuel filter housing	M8×1	Nm	15	15
BA47.25-N-1007-01B	Fuel pipe (flame starting system) to banjo bolt and valve	M8×1	Nm	15	15

AR09.20-W-1310A	Removing and installing intake manifold	8.10.96

ENGINE 542.920 /921 /922 /923 /925 /926

1 Intake pipe
2 Connectors
3 Intake manifold
4 Bolt
5 Bracket
6 Resonance tank



W09.20-0001-06

⊠ ⊠	Removing, installing		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	Page 60
1	Tilt cab		
Ⓑ	Notes re tilting cab	Model 950, 952, 953, 954	Page 60
2	Remove noise encapsulation	ⓘ on side right and at rear	
3	Detach intake pipe (1) at intake manifold (3)		
4	Separate hose from resonance tank at intake manifold (3)		
5	Detach intake manifold (3) at bracket (5)	Nm Air intake manifold to bracket	BA09.20-N-1001-02C
6	Slacken connectors (2) at intake manifold (3) and at both turbochargers and push toward intake manifold or turbocharger	ⓘ Installation: clean sealing surfaces.	
7	Take out intake manifold (3)		
8	Install in the reverse order		

Nm Intake manifold, intake manifold preheater

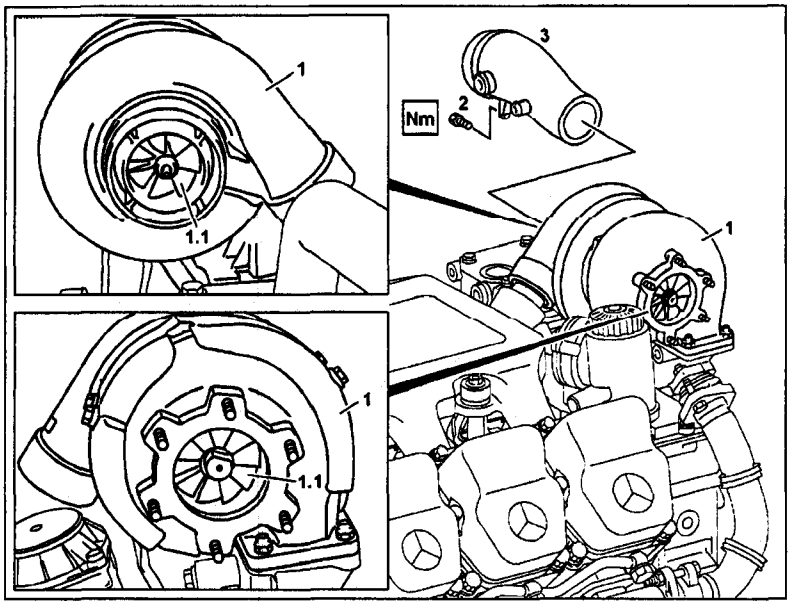
Number	Designation	Engine 542.920/ 921/922/923/ 925/926
BA09.20-N-1001-02C	Air intake manifold to bracket Nm	50

Additional Information

AR09.40-W-5910B	Inspecting turbocharger	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Turbocharger
1.1 Rotor shaft
2 Bolt
3 Intake manifold



W09.40-0007-06

	Removing, installing		
1.1	Remove engine brake flap connection	On engine 541.920 - 927 On engine 542.920 - 923/925/926 At left-hand turbocharger	AR14.15-W-6302B AR14.15-W-6302C
1.2	Remove transverse exhaust pipe	On engine 542.920 - 923/925/926 At right-hand turbocharger	AR14.10-W-3925A
2.1	Detach intake manifold (3)	On engine 541.920 - 927 with air intake above cab Do not detach connection piece with integrated compensating ring at turbocharger. Air intake manifold to bracket	BA09.20-N-1001-02C
2.2	Detach intake hose	On engine 541.920 - 927 with plate-type air filter Take off compensating ring. Installation: compensating ring should rest against turbocharger flange.	
2.3	Remove intake manifold	On engine 542.920 - 923/925/926	**Page 71**
	Inspecting		
3	Inspect turbocharger rotor shaft (1.1) for unobstructed operation	Axle play and radial play are correct if there is no indication of rotor shaft rubbing against turbocharger housing on either side. If there is an indication of rotor shaft rubbing against turbocharger housing ↓ replace turbocharger On engine 541.920 - 927	**Page 73** **Page 75**

Nm Intake manifold, intake manifold preheater

Number	Designation	Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.20-N-1001-02C	Air intake manifold to bracket Nm	50	50

AR09.40-W-5910-01A	Inspecting axial play and radial play at rotor shaft	If there is any indication of the rotor shaft touching the turbocharger housing ↓	
		Replace turbocharger	
		On engine 904.905- 907/909- 911/921/ 922 and 906.910/911/920- 923/940/ 941	AR09.40-W-6020A
		On engine 904.908/923	AR09.40-D-6020D
		On engine 541.920- 927	AR09.40-W-6020B
		On engine 542.920- 923/925	AR09.40-W-6020C

1 Rotate rotor shaft (1) at the shaft nut or at the turbine wheel; inspect rotor shaft to ensure that it rotates without obstruction and evenly. Move the rotor shaft back and forward for this purpose until it is free of oil carbon deposits.

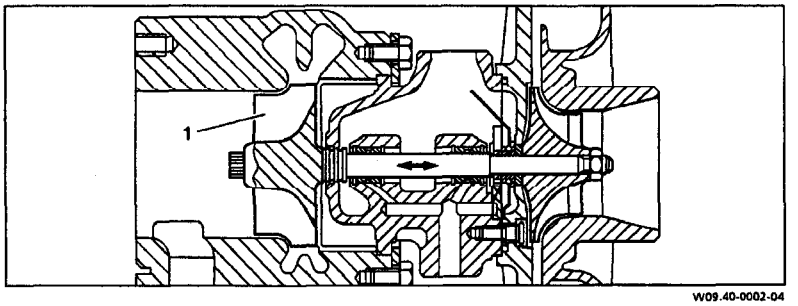
i

The rotor shaft is centrifugally stabilized and is guided in its mount with a relatively large play.

2 Inspecting axial play: move rotor shaft (1) in longitudinal direction and inspect whether there is any sign of it touching the turbine or compressor wheel.

i

If there is no indication of the rotor shaft touching the turbocharger housing on either side, the axial play is ok. If there is any sign of it touching, replace the turbocharger.

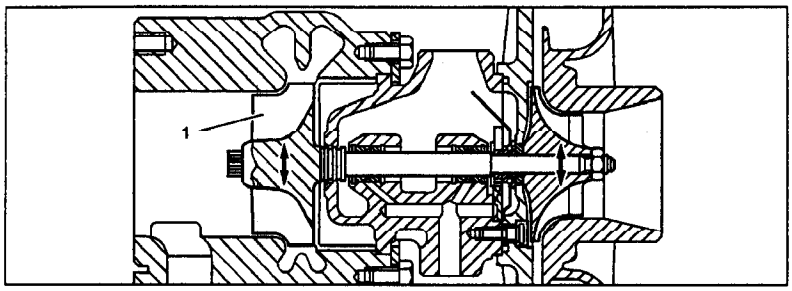


W09.40-0002-04

3 Inspecting radial play: deflect rotor shaft (1) in radial direction; turn it when doing this and inspect whether there is any indication of the turbine or compressor wheel touching.

i

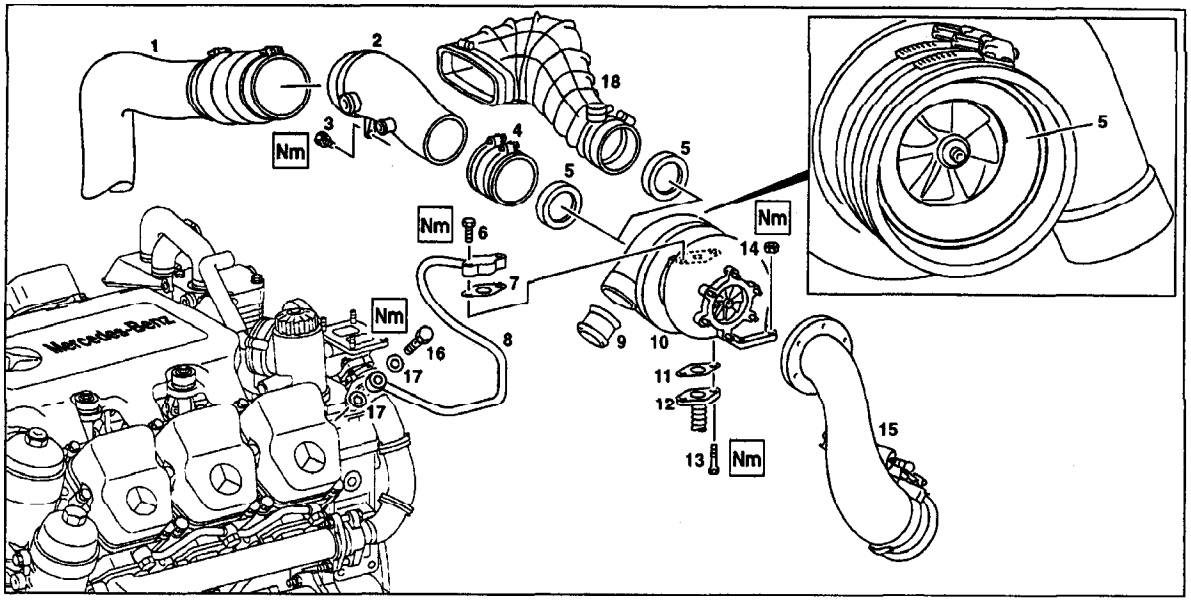
If there is no sign of the rotor shaft touching the turbocharger housing on either side, the radial play is ok. If there is a sign of it touching, replace the turbocharger.



W09.40-0003-04

AR09.40-W-6020B	Removing and installing exhaust gas turbocharger	25.10.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927



W09.40-0008-09

1 *Intake pipe*
2 *Intake manifold*
3 *Bolt*
4 *Connector*
5 *Compensating rings*
6 *Bolt*
7 *Gasket*
8 *Oil delivery pipe*
9 *Intermediate piece*
10 *Turbocharger*
11 *Gasket*
12 *Oil return flow pipe*
13 *Bolt*
14 *Nuts*
15 *Engine brake flap connection*
16 *Banjo bolt*
17 *Seals*
18 *Suction hose (with plate-type air filter)*

	Removing, installing		
1	Remove engine brake flap connection (15)		AR14.15-W-6302B
2.1	Remove intake pipe (1)	With air intake above cab	
3	Separate resonance tank hose and breather hose at intake manifold (2)		
4.1	Detach intake manifold (2)	With air intake above cab	
4.2	Detach intake hose (18)	With plate-type air filter	
5	Remove oil delivery pipe (8)	Seal opening at turbocharger (10) and at crankcase. Installation: before attaching the oil delivery pipe, fill turbocharger bearing housing through oil inlet opening with engine oil. Rotate turbocharger shaft by hand when pouring in oil so that the bearing points are provided with a film of oil. Replace gasket (7) and seal (17). Nm Oil delivery pipe for turbocharger to crankcase	BA01.40-N-1011-01D

		Nm Oil delivery pipe to turbocharger	BA09.40-N-1001-01C
6	Detach oil return flow pipe (12) at turbocharger (10)	i Installation: replace gasket (11). Seal opening. Nm Oil return flow pipe to turbocharger	BA09.40-N-1003-01C
7	Detach turbocharger (10) at exhaust plenum chamber	i Installation: replace nuts (14). i Seal openings at turbocharger and exhaust plenum chamber. Nm Turbocharger to exhaust plenum chamber	BA09.40-N-1002-01C
8.1	Detach connector (4) with compensating ring (5) at turbocharger (10)	With air intake above cab. i Installation: attach connector to turbocharger, then install the compensating ring. Pay attention to installation position. Compensating ring should rest against turbocharger.	
8.2	Detach intake hose (18) with compensating ring (5) at turbocharger (10)	With plate-type air filter i Installation: pay attention to installation position. Compensating ring should rest against turbocharger.	
9	Pull out intermediate piece (9) at turbocharger (10) or charge air manifold	i Installation: replace intermediate piece.	
10	Fit existing heat insulation to turbocharger (10)	Nm Insulation above turbocharger i When replacing turbocharger.	BA09.40-N-1004-01C
11	Install in the reverse order	i Installation: inspect intake manifold, charge air pipe, charge air manifold, exhaust manifold, oil delivery pipe, oil return flow pipe for foreign bodies, impurities and damage.	

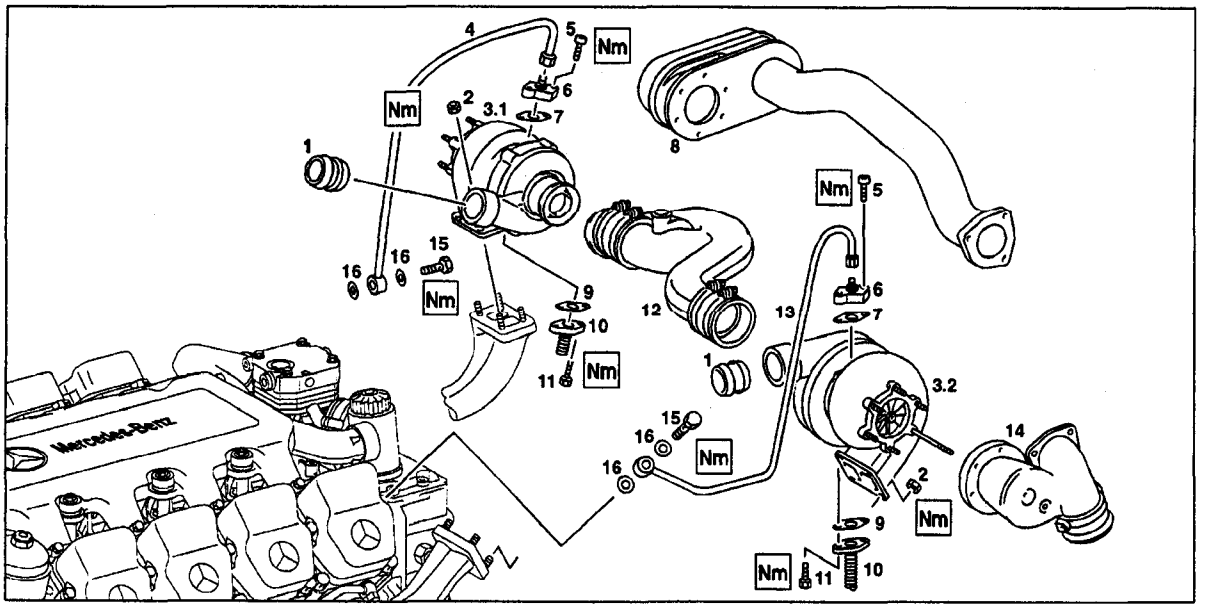
Nm Crankcase, timing case cover, end cover

Number	Designation			Engine 541.920/ 921/922/ 923/924/ 925/926/ 927
BA01.40-N-1011-01D	Oil delivery pipe for turbocharger to crankcase	M14×1.5	Nm	35

Nm Turbocharger

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927
BA09.40-N-1001-01C	Oil delivery pipe to turbocharger	Nm	25
BA09.40-N-1002-01C	Turbocharger to exhaust plenum chamber	Nm	50
BA09.40-N-1003-01C	Oil return flow pipe to turbocharger	Nm	25
BA09.40-N-1004-01C	Insulation above turbocharger	Nm	50

ENGINE 542.920 /921 /922 /923 /925 /926



W09.40-0009-09

1 Intermediate pieces
2 Nuts
3.1 Turbocharger (right)
3.2 Turbocharger (left)
4 Oil delivery pipe
5 Bolts
6 Intermediate flange
7 Gaskets
8 Transverse exhaust pipe
9 Gaskets
10 Oil return flow pipes
11 Bolts
12 Intake manifold
13 Oil delivery pipe
14 Engine brake flap connection
15 Banjo bolts
16 Seals

⊠ ⊠	Removing, installing		
1	Remove intake manifold (12)		**Page 71**
2.1	Remove transverse exhaust pipe (8)	At right-hand turbocharger (3.1)	AR14.10-W-3925A
2.2	Remove engine brake flap connection (14)	At left-hand turbocharger (3.2)	AR14.15-W-6302C
3	Detach oil delivery pipe (4 or 13) at intermediate flange (6)	Nm Oil delivery pipe to turbocharger i Seal openings. Installation: before attaching the oil delivery pipe, fill turbocharger bearing housing through oil inlet opening with engine oil. Rotate turbocharger shaft by hand when pouring in oil so that the bearing points are provided with a film of oil.	BA09.40-N-1001-01C
4.1	Detach oil delivery pipe (4) at timing case	At right-hand turbocharger (3.1) Seal openings. i Installation: replace seal (17).	
4.2	Detach oil delivery pipe (13) at crankcase	At left-hand turbocharger (3.2) Seal openings. i Installation: replace seal (17).	

		Nm Oil delivery pipe for turbocharger to crankcase	BA01.40-N-1011-01D
5	Detach oil return flow pipe (10) at turbocharger (3.1 or 3.2)	i Seal opening. i Installation: replace gasket (9). Nm Oil return flow pipe to turbocharger	 BA09.40-N-1003-01C
6	Detach turbocharger (3.1 or 3.2) at exhaust manifold	i Seal openings at turbocharger and exhaust manifold. i Installation: replace nuts (2). Nm Turbocharger to exhaust manifold	 BA09.40-N-1005-01C
7	Pull out intermediate piece (1) at turbocharger (3.1 or 3.2) or at charge air pipe	i Installation: replace intermediate piece.	
8	Fit on existing flange (6) of oil delivery pipe. Replace gasket (7)	i When replacing turbocharger Nm Oil delivery pipe to turbocharger	 BA09.40-N-1001-01C
9	Fit on existing heat insulation at turbocharger (3.1 or 3.2)	i When replacing turbocharger Nm Insulation above turbocharger	 BA09.40-N-1004-01C
10	Rotate turbine and compressor housing at turbocharger (3.1 or 3.2) accordingly	i Only one turbocharger version is stocked in the Parts Sector. Nm Bolt of compressor housing to bearing housing Nm Bolt of turbine housing to bearing housing	 BA09.40-N-1006-01C BA09.40-N-1007-01C
11	Install in the reverse order	i Installation: inspect intake manifold, charge air pipe, charge air manifold, exhaust manifold, oil delivery pipe, oil return flow pipe for foreign bodies, impurities and damage.	

Nm Crankcase, timing case cover, end cover

Number	Designation			Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1011-01D	Oil delivery pipe for turbocharger to crankcase	M14×1.5	Nm	35

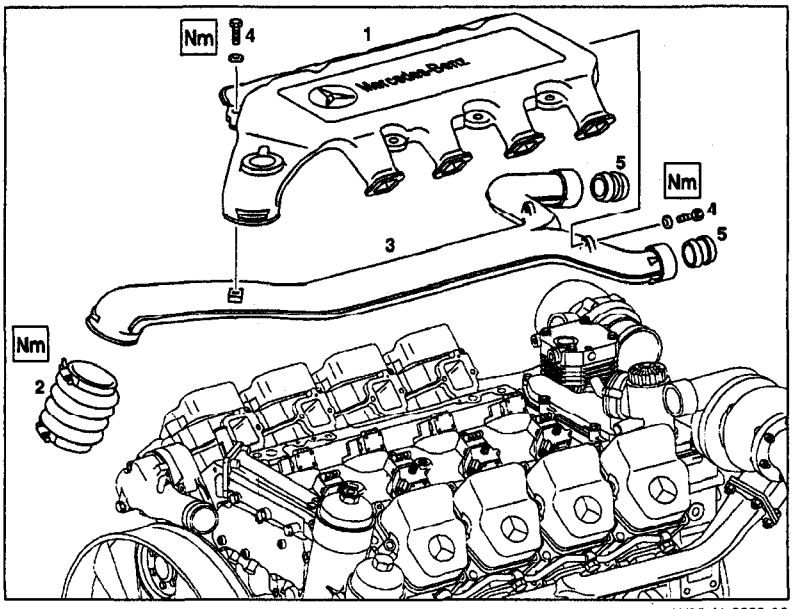
Nm **Turbocharger**

Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA09.40-N-1001-01C	Oil delivery pipe to turbocharger	Nm	25
BA09.40-N-1003-01C	Oil return flow pipe to turbocharger	Nm	25
BA09.40-N-1004-01C	Insulation above turbocharger	Nm	50
BA09.40-N-1005-01C	Turbocharger to exhaust manifold	Nm	50
BA09.40-N-1006-01C	Bolt of compressor housing to bearing housing	Nm	10
BA09.40-N-1007-01C	Bolt of turbine housing to bearing housing	Nm	20

AR09.41-W-1311B	Removing and installing charge air pipe	17.1.96

ENGINE 542.920/921/922/923/925/926

1 *Charge air manifold/charge air housing*
2 *Charge air hose (red)*
3 *Charge air pipe*
4 *Bolts*
5 *Adapter piece*



W09.41-0003-06

	Removing, installing		
1	Remove charge air manifold/charge air housing (1)		**Page 83**
2	Remove charge air hose (2)	Installation: charge air hose must not be mixed up. The red charge air hose is temperature-resistant and must always be installed between charge air pipe (3) and intercooler. Nm Charge air hose to charge air housing/charge air pipe and intercooler	BA09.41-N-1006-01C
3	Remove charge air pipe (3) and adapter pieces (5)	Inspect adapter piece for signs of wear and replace if necessary. Nm Charge air pipe to charge air housing	BA09.41-N-1005-01C
4	Install in the reverse order		

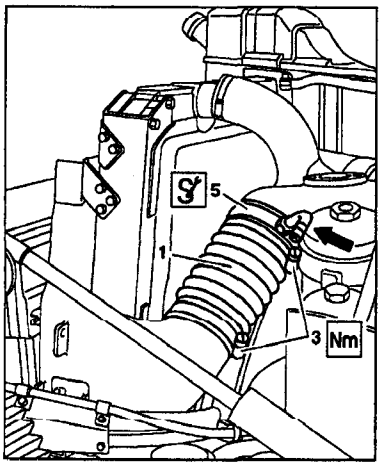
Nm **Charge air pipe/intercooler**

Number	Designation		Engine 542.920/921/922/923/925/926
BA09.41-N-1005-01C	Charge air pipe to charge air housing	Nm	25
BA09.41-N-1006-01C	Charge air hose to charge air housing/charge air pipe and intercooler	Nm	7.5

AR09.41-W-6800A	Testing intercooler and charge air hoses for leaks	21.11.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Charge air hose (black)*
2 *Charge air hose (red)*
3 *Clips*
4 *Test flange with compressed air connection*
5 *Test flange*
6 *Tester with gage*



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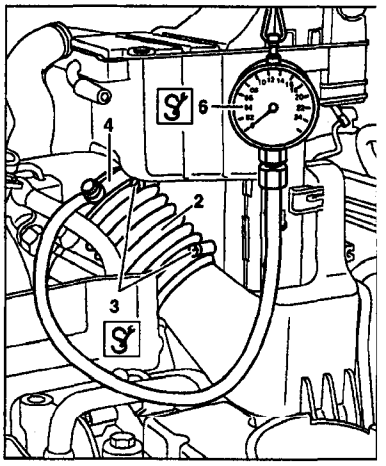
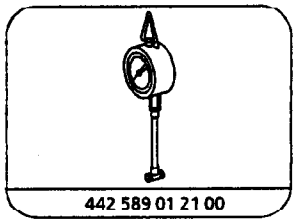


W09.41-0008-02

	Testing		
1	Detach charge air hoses (1, 2) at charge air manifold and charge air pipe		
2	Install test flanges (4, 5) at the charge air hoses (1, 2)	i Inspect clips (3) for signs of wear. Test flanges should be additionally supported at the openings of the charge air manifold or charge air pipe. Nm Charge air hose to charge air housing/ charge air pipe and intercooler	541 589 01 63 00 BA09.41-N-1006-01C
3	Attach tester (6) to the test flange (4)		442 589 01 21 00
4	Fill intercooler and charge air hoses at test flange (5) with compressed air	i Test pressure 1.5 bar gage.	
5	Observe indication on tester (6) to determine whether pressure drops	i If pressure drops, inspect intercooler and charge air hoses (1, 2) for damage, replace if necessary.	
6	Remove tester (6) and test flanges (4, 5)	i Release pressure.	
7	Install charge air hoses (1, 2) at charge air manifold and charge air pipe	Nm Charge air hose to charge air housing/ charge air pipe and intercooler	BA09.41-N-1006-01C

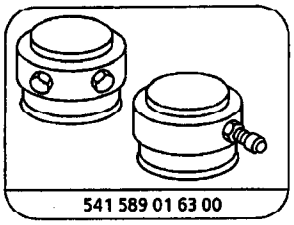
Nm Charge air pipe/intercooler

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.41-N-1006-01C	Charge air hose to charge air housing/ charge air pipe and intercooler	Nm	7.5	7.5



442 589 01 21 00

Tester

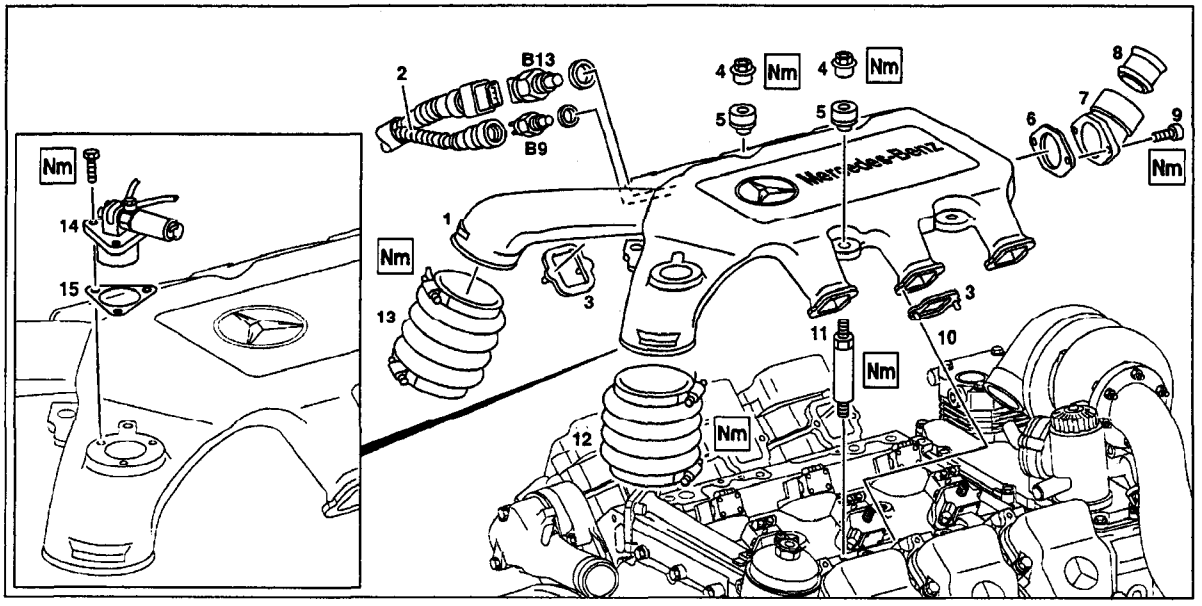


541 589 01 63 00

Test flange

AR09.41-W-8681B	Removing and installing charge air manifold	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W09.41-0004-09

1 Charge air manifold/charge air housing
2 Engine wiring harness
3 Gaskets
4 Nuts
5 Tensioning element
6 Gasket
7 Flange
8 Adapter piece
9 Bolt
11 Threaded pin
12 Charge air hose (black)
13 Charge air hose (red)
14 Flange of flame starting system
15 Gasket
B9 Charge air temperature sensor
B13 Charge air pressure sensor

Modification notes

6.2.97	Gasket getween charge air manifold/charge air housing and cylinder head modified; the headless setscrews in the cylinder head are thus discontinued.	Step 9	**Page 83**

	Removing, installing		
⚠ Danger!	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 60**
1	Tilt cab		
Ⓑ	Notes re tilting cab	Models 950, 952, 953, 954	**Page 60**
2.1	Remove air filter housing	If plate-type air filter fitted	

Additional Information

3.1	Remove charge air hoses (12, 13)	On engine 541.920- 927 ℹ Installation: charge air hoses (12, 13) must not be mixed up. ⑬ The red charge air hose (13) is temperature-resistant and must always be installed between charge air pipe and intercooler. Nm Charge air hose to charge air housing/charge air pipe and intercooler	BA09.41-N-1006-01C
3.2	Remove charge air hose (12)	On engine 542.920-923/925/926 Nm Charge air hose to charge air housing/charge air pipe	BA09.41-N-1006-01C
4	Remove flange (14) of flame starting system complete with flame plug	ℹ Installation: replace gaskets (15). Nm Bolt of flame starting system bracket to charge air pipe	BA09.30-N-1001-01A
5.1	Remove flange (7) and adapter piece (8)	On engine 541.920 - 927 ℹ Replace gasket (6). Inspect adapter piece for signs of wear and replace if necessary. Nm Connection fitting to charge air housing	BA09.41-N-1004-01C
6	Separate connector (2) of engine wiring harness at charge air temperature sensor (B9) and charge air pressure sensor (B13)		
7.1	Disconnect charge air manifold/charge air housing (1) at charge air pipe	On engine 542.920-923/925/926 Nm Charge air pipe to charge air housing	**Page 80** BA09.41-N-1005-01C
8	Unscrew nuts (4) and pull tensioning element (5) out of charge air housing (1)	ℹ Counter-hold threaded pin (11). Inspect tensioning elements for signs of wear and replace if necessary. Nm Charge air housing to threaded pin	BA09.41-N-1001-01C
9	Take out charge air manifold/charge air housing (1)	ℹ Installation: Replace gaskets (3) between charge air manifold/charge air housing and cylinder head. Pay attention to installation position.	
10	Tighten threaded pin (11) at crankcase	Nm Threaded pin to crankcase	BA09.41-N-1002-01C
11	Tighten threaded pin (11) at bracket of oil filter housing	Nm Threaded pin to bracket of oil filter housing	BA09.41-N-1003-01C
12	Install in the reverse order		

Nm Intake air preheater

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.30-N-1001-01A	Bolt of bracket of flame starting system to charge air pipe	Nm	20	20

Charge air pipe/intercooler

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.41-N-1001-01C	Charge air housing to threaded pin	Nm	40	40
BA09.41-N-1002-01C	Threaded pin to crankcase	Nm	40	40
BA09.41-N-1003-01C	Threaded pin to bracket of oil filter housing	Nm	40	40
BA09.41-N-1004-01C	Connection fitting to charge air housing	Nm	25	–
BA09.41-N-1005-01C	Charge air pipe to charge air housing	Nm	–	25
BA09.41-N-1006-01C	Charge air hose to charge air housing/ charge air pipe and intercooler	Nm	7.5	7.5

AR13.22-W-1202B	Removing and installing poly V-belt	17.1.96

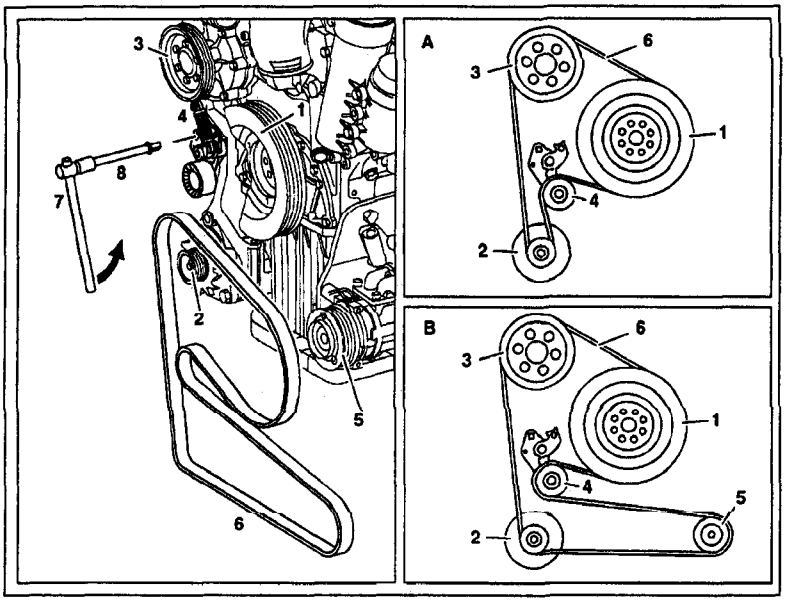
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

Running diagram of poly V-belt

A ***Engine without refrigerant compressor***

B ***Engine with refrigerant compressor***

1 Vibration damper
2 Generator belt pulley
3 Coolant pump belt pulley
4 Tensioning device with tensioning pulley
5 Refrigerant compressor/hydraulic pump belt pulley
6 Poly V-belt
7 Tommy bar
8 1/2" extension (approx. 90mm)



W13 22-0002-06

Modification notes

6.2.97	Safety note for springs or sprung bodies included for first time	Step 3 modified	**Page 86**
	Removal/installation sequence of poly V-belt modified	Steps 6 and 7 modified	

	Removing		
⚠ Danger!	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 60**
1	Tilt cab		
Ⓟ	Notes re tilting cab	Models 950, 952, 953, 954	**Page 60**
2	Remove noise encapsulation at side and bottom		
⚠ Danger!	**Risk of injury from fingers being pinched or jammed when working on springs or sprung bodies which are tensioned**	Use only approved tensioning devices; additionally shield off hazardous area, if necessary. Inspect special tools for damage and proper operation (visual inspection). Wear protective gloves.	**Page 87**
3	Swing tensioning pulley up	1 Insert tommy bar (7) with 1/2" extension (8) into the tensioning device (4)	
4	Take poly V-belt (6) off the tensioning pulley (4), belt pulleys (2, 3, 5) and vibration damper (1) and remove through the gap between the radiator shroud and the fan casing	Ⓟ Do not kink or damage poly V-belt when removing; rotate fan during this step. Inspect condition of poly V-belt, if necessary ↓	AP13.22-W-1351A

		replace poly V-belt.	
5	Swing tensioning pulley back		
6	Inspect vibration damper (1), belt pulleys of generator (2), of coolant pump (3), tensioning device with tensioning pulley (4) for signs of damage and for concentricity.	If damage or wear exists ↓ Replace vibration damper (1). Replace belt pulleys of generator (2). Replace belt pulleys of coolant pump (3). Replace tensioning device with tensioning pulley (4).	 AR03.30-W-1600B AR15.40-W-5032B AR20.10-W-1271B **Page 88**
	Installing		
7	Fit poly V-belt (6) onto all belt pulleys (2, 3, 5) and vibration damper (1), with the exception of tensioning pulley (4)	Push poly V-belt through the gap between radiator shroud and fan casing; rotate fan for this step.	
8	Use tommy bar (7) and 1/2" extension (8) to swivel tensioning pulley (4) up and hold		
9	Fit poly V-belt (6) onto the tensioning pulley (4) and swing tensioning pulley (4) back again. Take off tommy bar (7) with extension (8)	Check that poly V-belt (6) is correctly fitted on the belt pulleys (2, 3, 5).	
10	Install noise encapsulation at side and bottom		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 60**
11	Tilt back cab in direction of travel		

AS00.00-Z-0001-01A	Risk of injury from fingers being pinched or jammed when working on springs or sprung bodies which are tensioned	Only use approved clamping devices; provide additional shielding for danger area if appropriate. Check special tools for damage and malfunction (visual check); wear protective gloves.	⚠ Danger!

Risk of fingers etc. being jammed or crushed when working on parts which are under tension.
When releasing or removing parts which are under great tension, the use of non-approved clamping devices may result in severe injury.

Instructions/precautions
Only use approved clamping devices for repair work on springs, sprung bodies, spring actuators and other parts under tension.

Spring clamps
On no account use an impact wrench for tensioning and releasing operations.
Checking clamping devices
- The pressing screw must move easily and be undamaged.
- Clamping plates must not be warped.
- Ensure that the right clamping plates are used with the right springs.

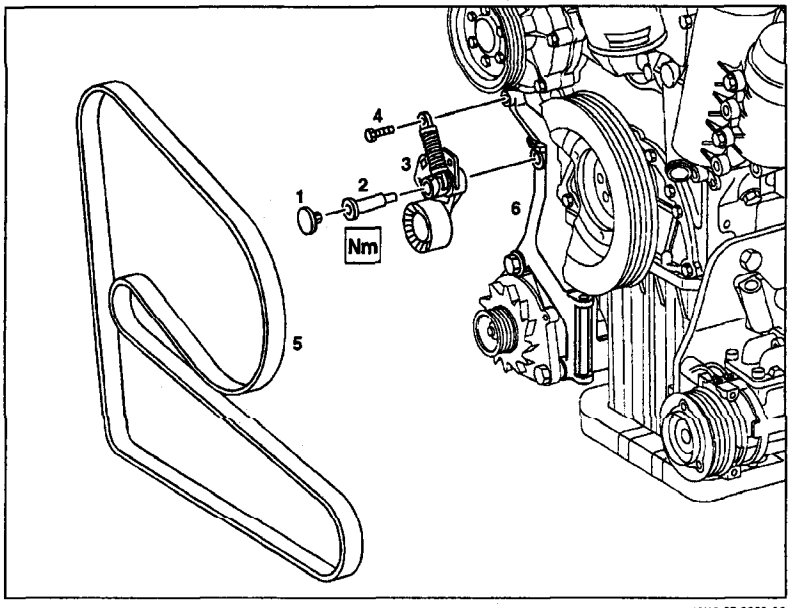
The coil diameter of the springs must correspond to the groove in the clamping plate.

Wear protective gloves for all work operations.

AR13.25-W-3200B	Removing and installing poly V-belt tensioning device	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *End cover*
2 *Hexagon socket screw*
3 *Tensioning device with tensioning pulley*
4 *Bolt*
5 *Poly V-belt*
6 *Carrier*



W13.25-0002-06

Modifiction notes

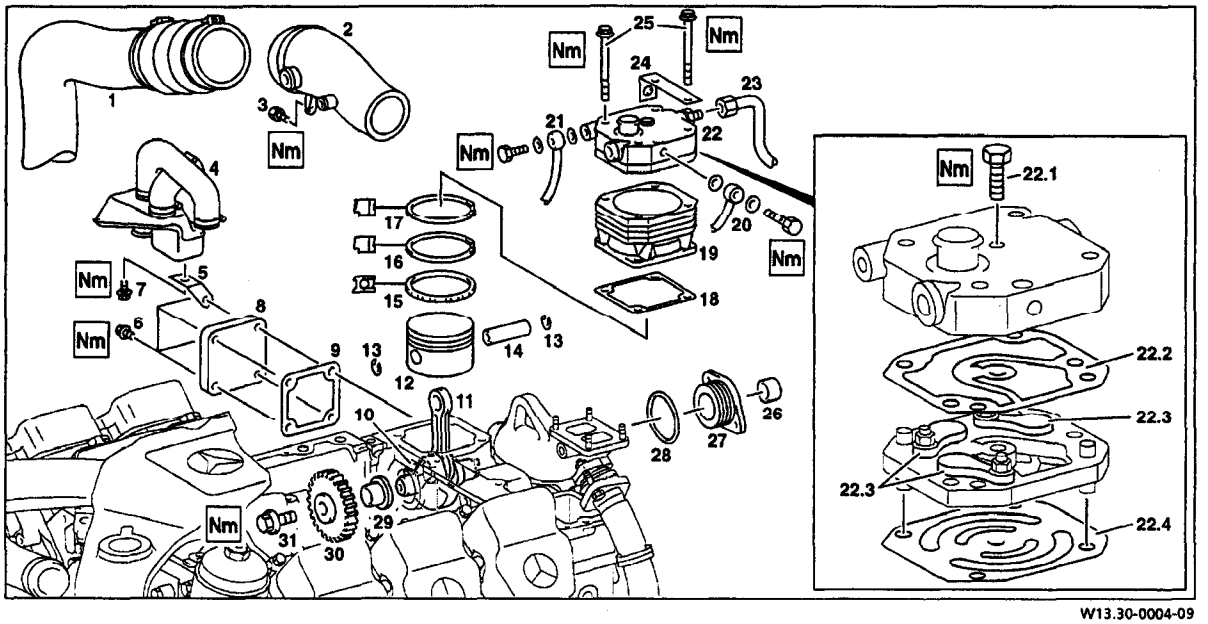
6.2.97	Tightening torque of poly V-belt tensioning device to carrier modified	Step 2	**Page 88**

	Removing, installing		
1	Slacken poly V-belt (5) and take it off the tensioning pulley (3)	Slacken tensioning device.	**Page 86**
2	Take off end cover (1) and remove hexagon socket screw (2)	Nm Poly V-belt tensioning device to carrier	BA13.25-N-1001-01D
3	Unscrew bolt (4) at tensioning element of the tensioning device (3)	Nm Tensioning element to tensioning device	BA13.25-N-1003-01D
4	Take off tensioning device (3)	Nm Belt pulley to tensioning device	BA13.25-N-1002-01D
5	Install in the reverse order		

Nm **Belt tensioning device**

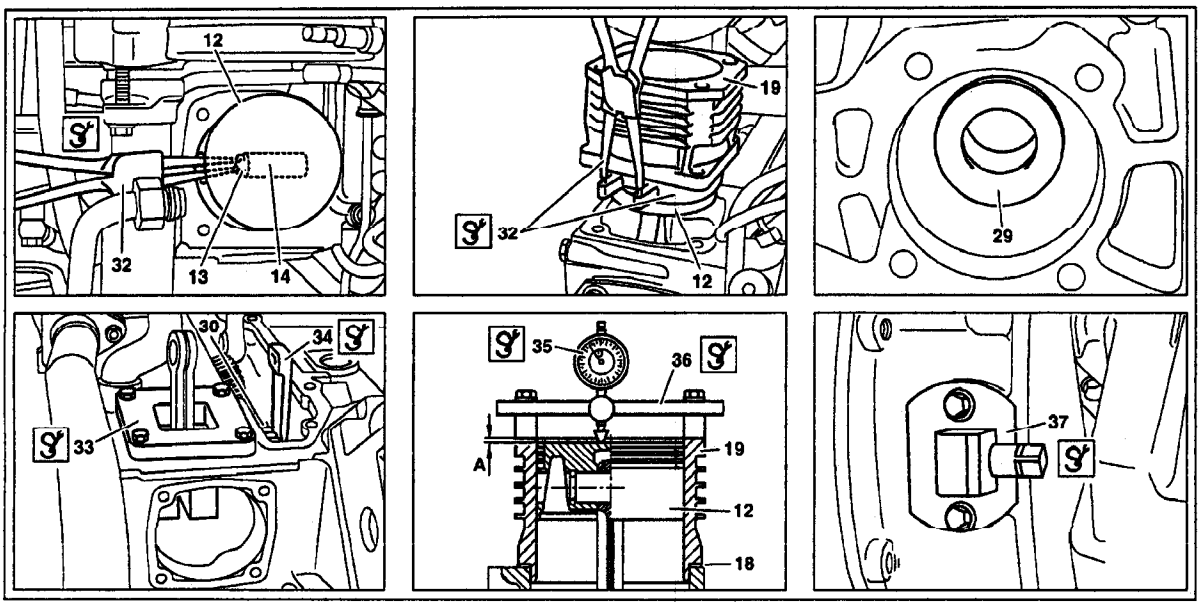
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.25-N-1001-01D	Poly V-belt tensioning device to carrier	M10	Nm	50	50
		M18	Nm	105	105
BA13.25-N-1002-01D	Belt pulley to tensioning device		Nm	50	50
BA13.25-N-1003-01D	Tensioning element to tensioning device		Nm	35	35

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W13.30-0004-09

1 *Intake pipe*
2 *Intake manifold*
3 *Bolt*
4 *Resonance tank with hoses*
5 *Bracket*
6 *Bolt*
7 *Bolt*
8 *Cover*
9 *Gasket*
10 *Crankshaft*
11 *Conrod*
12 *Piston*
13 *Circlip*
14 *Piston pin*
15 *Piston ring - groove III (top beveled oil control ring with coil spring)*
16 *Piston ring - groove II (taper-faced hook scraper ring)*
17 *Piston ring - groove I (taper-faced hook scraper ring with molybdenum coating)*
18 *Gasket*
19 *Cylinder liner*
20 *Coolant pipe*
21 *Coolant pipe*
22 *Cylinder head with valve intermediate plate*
22.1 *Bolt*
22.2 *Gasket*
22.3 *Delivery valve discs*
22.4 *Suction valve disc*
23 *Compressed air pipe*
24 *Bracket*
25 *Bolts*
26 *Bearing bush*
27 *Bearing flange*
28 *O-ring*
29 *Bearing flange in timing case*
30 *Drive gear*
31 *Bolt*



W13.30-0026-09

12 Piston
13 Circlip
14 Piston pin
18 Gasket
19 Cylinder liner
29 Bearing flange in timing case
30 Drive gear
32 Piston ring tensioning pliers
33 Blocking device
34 Ring wrench
35 Dial gage
36 Measuring bridge
37 Cranking device

A Pistons setback

	Removing, installing		
Danger!	**Risk of injury from bruises and jamming when tilting cap**	**No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.**	**Page 60**
1	Tilt cab		
	Notes re tilting cab	Model 950, 952, 953, 954	**Page 60**
2	Detach intake pipe (1)		
3.1	Remove resonance tank (4)	On engine 541.920 - 927	
		Cover of compressor opening on side of timing case	BA01.60-N-1003-01B
		Resonance tank to bracket	BA13.30-N-1010-01B
3.2	Remove resonance tank	On engine 542.920 - 923/925/926	
4.1	Remove intake manifold (2) at intermediate piece	On engine 541.920 - 927	
		Air intake manifold to bracket	BA09.20-N-1001-02C

⚠ Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 96**
5	Drain coolant	Collect coolant.	AP20.00-W-2080A
(!)	Notes re coolant	All engines	**Page 96**
6	Detach coolant pipe (20, 21) at compressor cylinder head (22)	Installation: replace seals. Nm Coolant pipe to compressor	 BA13.30-N-1001-01B
7	Detach compressed air pipe (23) at compressor cylinder head (22)	Installation: tighten compressed air pipe and inspect for leaks.	
8	Inspect compressed air pipe (23) between compressor, compressed air drier with integrated pressure regulator and four-circuit protection valve for coking	(!) If coking present ↓ Replace compressed air pipe, pressure regulator or four-circuit protection valve.	
9	Detach compressor cylinder head (22)	Installation: replace suction valve disc (22.4) and gasket (18). Pay attention to installation position and roll pins in valve intermediate plate. Nm Cylinder head and cylinder liner to timing case	 BA13.30-N-1005-01B
10	Disassemble compressor cylinder head (22) and assemble		**Page 97**
		Nm Screw plug (M26×1.5)	BA13.30-N-1003-01B
		Nm Screw plug (M14×1.5)	BA13.30-N-1004-01B
		Nm Connection (M26×1.5)	BA13.30-N-1006-01B
		Nm Valve intermediate plate to compressor cylinder head	BA13.30-N-1007-01B
		Nm Pressure disc valves to valve intermediate plate	BA13.30-N-1008-01B
		Nm Connection (M36×2)	BA13.30-N-1011-01B
11	Remove cylinder liner (19)	Installation: inspect cylinder liner and	BE13.30-N-1002-01B
		piston marking.	BE13.30-N-1003-01B
		If the existing cylinder liner is installed, turn cylinder liner through 90°. Use piston ring pliers (32) to compress piston rings (15 to 17) and install cylinder liner. Remove piston ring pliers (32).	
		Cylinder liner height from timing case	BE13.30-N-1010-01B
			541 589 00 37 00
		Measure piston setback to contact surface of cylinder liner	**Page 99**
		If the dimension for piston setback (A) is not achieved, inspect conrod, crankshaft and gasket between timing case and cylinder liner.	BE13.30-N-1005-01B

		Nm Cylinder head and cylinder liner to timing case	BA13.30-N-1005-01B
		S	001 589 53 21 00
		S	541 589 01 21 00
		S	407 589 00 63 00
12	Take off gasket (18)	i Installation: replace gasket.	
13	Cover over opening at crankcase		
14	Remove bottom noise encapsulation		
15	Attach cranking device (37) for engine to timing case	S	407 589 00 63 00
		Nm Cover of TDC inspection hole to timing case	BA01.60-N-1001-01B
16	Rotate engine with the cranking device (37)	S i Until piston pin (14) is accessible.	407 589 00 63 00
17	Use pliers to remove circlip (13) and pull out piston pin (14)	S i Installation: oil piston pin.	541 580 00 37 00
18	Remove piston (12)	Cylinder liner inner Ø	BE13.30-N-1002-01B
		Piston outer Ø	BE13.30-N-1003-01B
		Offset piston ring gaps in turn by 120° and oil piston.	
19	Remove piston rings (15 to 17)	i Inspect piston ring gap clearance; if specification not achieved, replace piston rings.	Page 100
		Piston ring gap clearance	BE13.30-N-1004-01B
		S	000 589 37 37 00
		Feeler gage	WH58.30-Z-1008-12A
20	Remove timing case cover		AR01.40-W-8000A
21	Remove fuel/power steering pump unit		AR46.30-W-0400A
22	Remove cover (8) on side of timing case	i Installation: replace gasket (9).	
		Nm Cover of compressor opening on side of timing case	BA01.60-N-1003-01B
23	Rotate engine with the cranking device (36)	S i Until compressor piston is at TDC.	407 589 00 63 00
24	Remove crankshaft (10), conrod (11) and outer bearing flange (27)		Page 102
		S	442 589 00 03 00
		S	442 589 09 63 00
		i Installation: install crankshaft.	Page 103
		Piston stroke	BE13.30-N-1001-01B
		Crankshaft conrod bearing journal Ø	BE13.30-N-1006-01B
		Crankshaft bearing axial play	BE13.30-N-1007-01B
		Nm Drive gear to compressor with special tool	BA13.30-N-1002-01B
		Nm Power steering pump/fuel pump to timing case	BA46.30-N-1001-01C
		S	442 589 00 03 00

		[S]	001 589 53 21 00
		[S]	363 589 02 21 00
		[S]	442 589 09 63 00
25	Inspect bearing bush (26) in outer bearing flange (27)	Bearing bush inner Ø [i] If worn ↓ replace bearing bush [S]	BE13.30-N-1008-01B Page 105 730 589 03 15 00
26	Inspect bearing flange (29) in timing case	Bearing bush inner Ø [i] If worn ↓ replace bearing flange [S] [S] [S]	BE13.30-N-1008-01B Page 105 730 589 03 15 00 000 589 29 33 00 000 589 34 33 00
27	Install in the reverse order		
28	Inspect coolant level		AP20.00-W-2080A

Test data of compressor

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE13.30-N-1001-01B	Piston stroke	Single-cylinder compressor	mm	48	48
		Two-cylinder compressor	mm	38	38
BE13.30-N-1002-01B	Cylinder liner inner Ø	Marking B	mm	100.000–100.010	100.000–100.010
		Marking C	mm	100.010–100.020	100.010–100.020
		Marking D	mm	100.020–100.030	100.020–100.030
BE13.30-N-1003-01B	Piston outer Ø	Marking B	mm	99.925–99.935	99.925–99.935
		Marking C	mm	99.935–99.945	99.935–99.945
		Marking D	mm	99.945–99.955	99.945–99.955
BE13.30-N-1004-01B	Piston ring gap clearance	Groove I, II, III	mm	0.20–0.40	0.20–0.40
BE13.30-N-1005-01B	Piston setback to top edge of cylinder liner		mm	0.6–1.4	0.6–1.4
BE13.30-N-1006-01B	Crankshaft conrod bearing journal Ø		mm	43.959–43.975	43.959–43.975
BE13.30-N-1007-01B	Crankshaft bearing play	axial	mm	0.050–0.150	0.050–0.150
BE13.30-N-1008-01B	Bearing bush inner Ø		mm	37.980–38.035	37.980–38.035
BE13.30-N-1010-01B	Cylinder liner height from timing case	Single-cylinder compressor	mm	88.8–89.0	88.8–89.0
		Two-cylinder compressor	mm	83.8–84.0	83.8–84.0

Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	Cover of TDC inspection hole to timing case	Nm	25	25
BA01.60-N-1003-01B	Cover of compressor opening on side of timing case	Nm	50	50

Intake manifold, intake manifold preheater

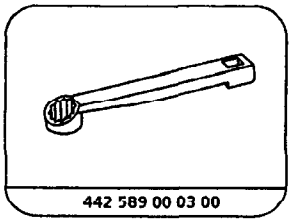
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925926
BA09.20-N-1001-02C	Air intake manifold to bracket	Nm	50	50

Compressor (compressed air system)

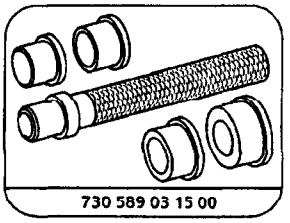
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1001-01B	Coolant pipe to compressor		Nm	30	30
BA13.30-N-1002-01B	Drive gear to compressor	(direct)	Nm	360	360
	with special tool	(indirect)	Nm	270	270
BA13.30-N-1003-01B	Screw plug to compressor cylinder head	M26×1.5	Nm	80	80
BA13.30-N-1004-01B	Connection for coolant pipe to compressor cylinder head	M14×1.5	Nm	30	30
BA13.30-N-1005-01B	Cylinder head and cylinder liner to timing case		Nm	40	40
BA13.30-N-1006-01B	Connection for compressed air pipe to compressor cylinder head	M26×1.5	Nm	80	80
BA13.30-N-1007-01B	Valve intermediate plate to compressor cylinder head		Nm	12	12
BA13.30-N-1008-01B	Delivery disc valve to valve intermediate plate		Nm	12	12
BA13.30-N-1010-01B	Resonance tank to bracket		Nm	25	25
BA13.30-N-1011-01B	Connection for intake air pipe to compressor cylinder head	M36×1.5	Nm	80	80

Power steering pump

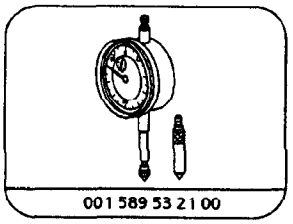
Number	Designation		Steering 765.889 with engine 541, 542
BA46.30-N-1001-01C	Power steering pump/fuel pump to timing case	Nm	60



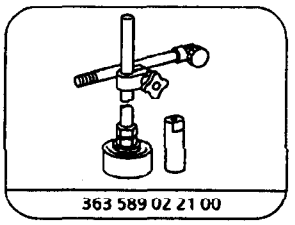
Ring wrench



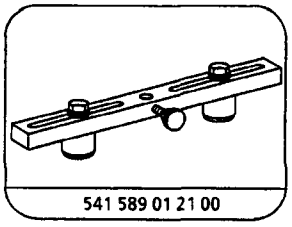
Drift



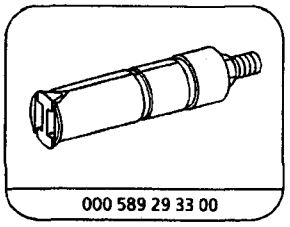
Dial gage



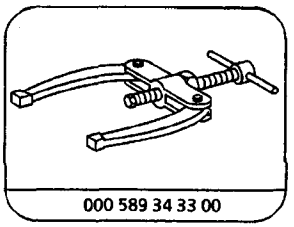
Dial gage holder



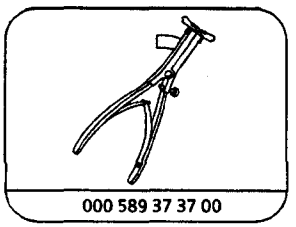
Measuring bridge



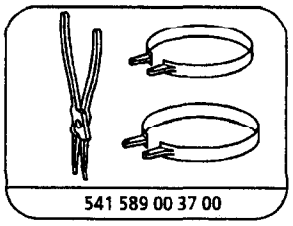
Internal extractor



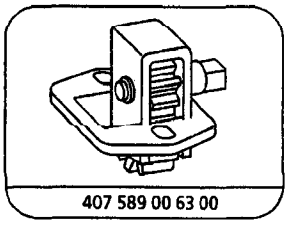
Countersupport



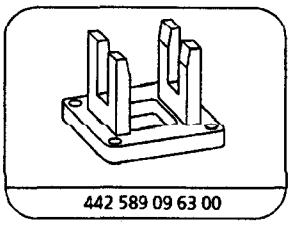
Pliers



Piston ring tensioning pliers



Cranking device



Blocking device

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gage	Stiefelmayer D–73734 Esslingen	59

AS20.00-Z-0001-01A	Risk of injury to skin and eyes from scalding from hot coolant which splashes out..Risk of poisoning from swallowing coolant.	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	⚠ Danger!

Possible dangers

Risk of injury
The cooling system is pressurized when the engine is warm. Risk of scalding from hot coolant which splashes out if the cooling system is opened suddenly.

Risk of poisoning
If coolant is swallowed, the person affected is likely to show signs of poisoning such as headaches, giddiness and stomach aches, paralysis of the respiratory system, unconsciousness, nausea, and convulsions.

Protective measures/rules of conduct
- Allow cooling system to cool down to a coolant temperature of less than 90 °C.
- Open coolant system cap slowly; open a conventional type of coolant system cap to the first detent and open a screw-type coolant system cap about $^1/_2$ turn, and allow the pressure to release.
- Wear protective gloves, protective clothes, and eye protection.
- Do not pour coolant into containers for drinks.

First aid measures
- Pour large quantities of cold water over the affected area of skin and cover over with sterile bandages.
- Have person affected drink plenty of water to which medicinal carbon has been added.
- Consult a doctor if the person affected has severe burns or has swallowed considerable quantities.

AH20.00-N-2080-01A	Instructions re coolant		

Coolant composition
Passenger car and commercial vehicle engine (normal case):
50 % by volume water and
50 % by volume anticorrosion/antifreeze agent.
See MB Specifications for Service Products for differing coolant composition for commercial vehicle engines.

Purposes of anticorrosion/antifreeze agent
- Corrosion and cavitation protection for all components in the cooling system
- Antifreeze protection
- Increasing boiling point so that the coolant does not evaporate so rapidly. Ejection of coolant is avoided at high coolant temperatures.

Antifreeze protection
50 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. –37 °C.
A higher concentration is only practical at even lower ambient temperatures.
55 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. –45 °C.

⏩ A concentration of anticorrosion/antifreeze agent higher than 55 % by volume should not be used as the maximum antifreeze protection is thus reached. An even higher concentration again reduces the antifreeze protection and impairs heat dissipation.

Water
Use water which is clean and not too hard. Drinking water frequently, but not always, satisfies the requirements. The contents of dissolved substances in the water can be of importance for the occurrence of corrosion. In cases of doubt, analyze the water. See MB Specifications for Service Products for fresh water regulations.

Operation of monitoring of coolant
Inspect coolant for resistance to low temperatures before the start of the cold season of the year.
In countries with high ambient temperatures, inspect the anticorrosion/antifreeze concentration once a year.
The corrosion protection in the coolant is reduced during operation. Such coolants have a severely corrosive effect.
The maximum permissible period of use of the coolant is for passenger car and commercial vehicle engines (normal case) 3 years.
See MB Specifications for Service Products for the period of use for differing coolant composition for commercial vehicle engines.

Ⓟ Before pouring fresh coolant into the system, flush the used coolant out of the cooling system. Clean cooling system if severe soiling or oil contamination exist.

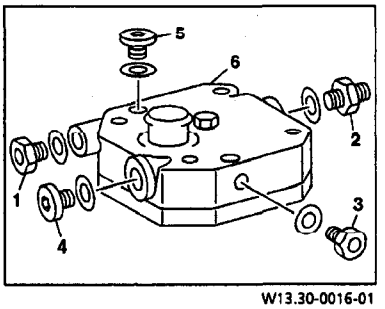
Disposing of coolants
Observe legal regulations and local wastewater regulations.
For workshops located in the Federal Republic of Germany see:
"Umweltschutz-Handbuch für Kfz-Reparaturbetriebe"
(Environmental protection manual for vehicle repair workshops)
Publisher: Verband der Automobilindustrie e.V. (VDA)
D-60625 Frankfurt am Main, Westendstraße 61

AR13.30-W-5511-04A	Disassembling and assembling compressor cylinder head		

Nm Compressor (compressed air system)

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1003-01B	Screw plug to compressor cylinder head	M26×1.5	Nm	80	80
BA13.30-N-1004-01B	Connection for coolant pipe to compressor cylinder head	M14×1.5	Nm	30	30
BA13.30-N-1006-01B	Connection for compressed air pipe to compressor cylinder head	M26×1.5	Nm	80	80
BA13.30-N-1007-01B	Valve intermediate plate to compressor cylinder head		Nm	12	12
BA13.30-N-1008-01B	Pressure disc valve to valve intermediate plate		Nm	12	12
BA13.30-N-1011-01B	Connection for air intake pipe to compressor cylinder head	M36×1.5	Nm	80	80

1 Unscrew connections (1, 2, 3) and screw plugs (4, 5) at cylinder head (6) and take off seals.



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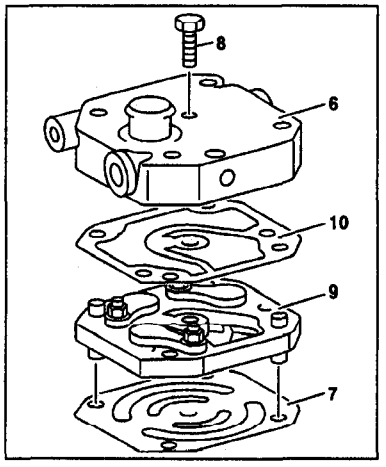
2 Take off suction valve disc (7) at cylinder head (6).

3 Unscrew bolt (8) and take off valve intermediate plate (9) and gasket (10).



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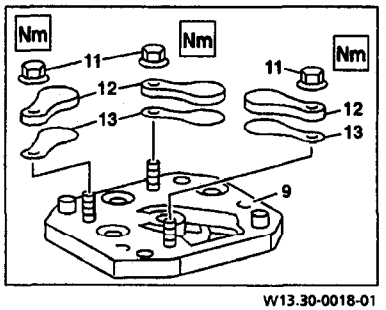
4 Unscrew nuts (11) and take off valve plates (12), delivery valve disc (13) at the valve intermediate plate (9).

5 Fit on valve plates (12) and new delivery valve discs (13).

ℹ
Valve plates (12) and delivery valve discs (13) should lock in position at the anti-twist lock of the stud bolts.

6 Tighten nuts (11).

ℹ
Pay attention to tightening torque.



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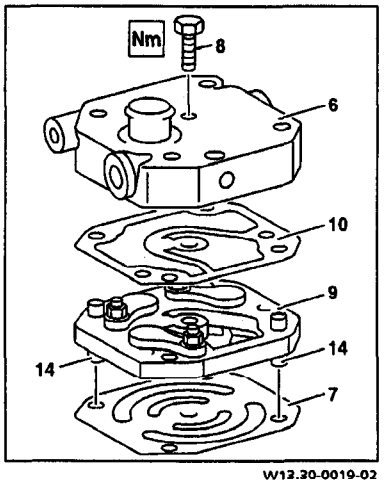
7 Fit on valve intermediate plate (9) and new gasket (10). Tighten bolt (8).

ℹ
Pay attention to installation position relative to roll pins (14). Thicker end should point toward cylinder liner. Pay attention to tightening torque.

8 Fit on new suction valve disc (7) at cylinder head (6).

⑬
Pay attention to installation position for suction valve disc.

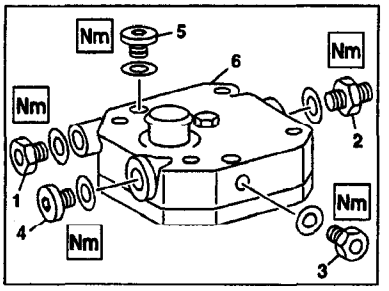


W13.30-0019-02

9 Tighten connections (1, 2, 3), screw plugs (4, 5) and new seals at cylinder head (6).

ⓘ

Pay attention to tightening torques.



W13.30-0020-01

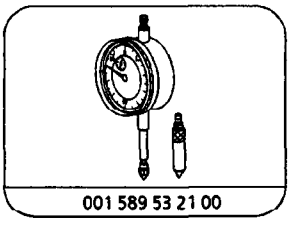
AR13.30-W-5511-06A	Measuring compressor piston setback		

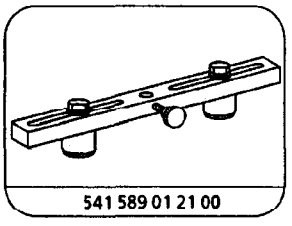
Test data of compressor

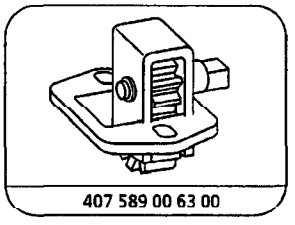
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE13.30-N-1005-01B	Piston setback relative to top edge of cylinder liner	mm	0.6–1.4	0.6–1.4

Nm **Compressor (compressed air system)**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1005-01B	Cylinder head and cylinder liner to timing case	Nm	40	40


001 589 53 21 00
Dial gage

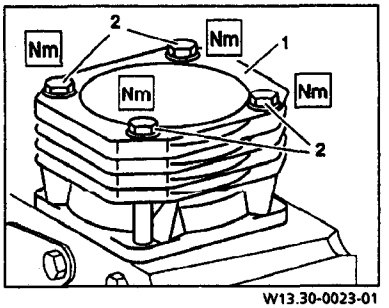

541 589 01 21 00
Measuring bridge


407 589 00 63 00
Cranking device

1 Use suitable bolts (2) to bolt cylinder liner (1) tight at timing case.

ⓘ

Pay attention to tightening torque.
Gasket between cylinder liner (1) and timing case should be installed. Measure piston setback between piston crown and top edge of cylinder liner without the gasket fitted.



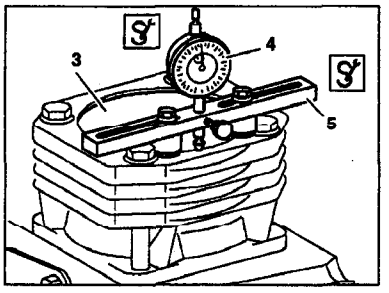
W13.30-0023-01

2 Rotate engine at flywheel with the [S] cranking device.

[i]
Position piston (3) to approx. 1 cm before TDC.

3 Attach [S] dial gage (4) with a preload in the [S] measuring bridge (5).

4 Mount [S] measuring bridge (5) onto the contact surface of the cylinder liner and set dial gage scale to "0". Pay attention to millimeter pointer.



W13.30-0024-01

5 Move [S] measuring bridge (5) from the contact surface of the cylinder liner (1) to above the cylinder bore.

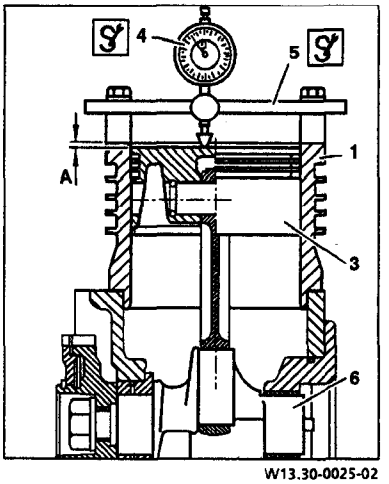
[i]
Pull back tracer pin on [S] dial gage (4) when moving.
The measurement has to be carried out in the direction of the piston pin in order to eliminate the piston rock at the piston.

6 Rotate engine at flywheel with the [S] cranking device.

[i]
Rotate crankshaft (6) until the piston (3) is positioned at TDC.

7 Read off [S] dial gage (4). The reading obtained is the piston setback dimension (A). Pay attention to millimeter pointer.

[i] If the dimension for the piston setback (A) is not achieved, inspect conrod, crankshaft and gasket between timing case and cylinder liner.

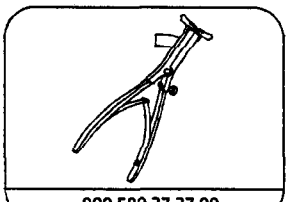


W13.30-0025-02

AR13.30-W-5511-01A	Removing and installing compressor piston rings		

Test data for compressor

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE13.30-N-1004-01B	Piston ring gap clearance	Groove I, II, III	mm	0.20–0.40	0.20–0.40

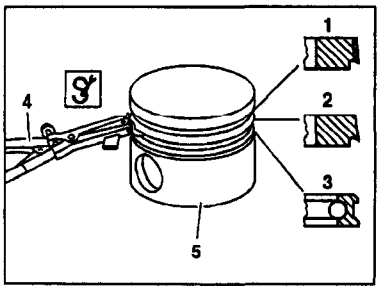

000 589 37 37 00

Pliers

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gage	Stiefelmayer D–73734 Esslingen	59

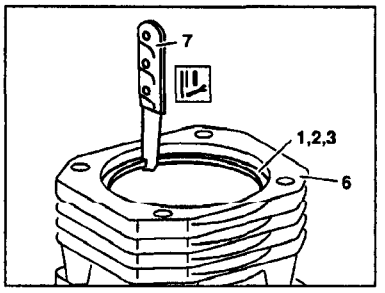
1 Use the pliers (4) to remove piston rings (1, 2, 3) at piston (5) in the order from top to bottom.



W13.30-0005-01

2 Measure piston ring gap clearance of the piston rings (1, 2, 3).

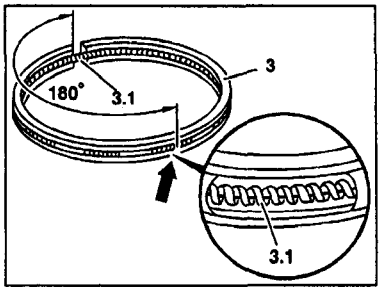
Insert piston rings (1, 2, 3) in the unworn area (above top reversal point of 1st piston ring) of the cylinder liner (6) and measure gap clearance with feeler gage (7).



W13.30-0006-01

3 The coil spring (3.1) has to be removed for this purpose at the piston ring (3). After the measurement, install coil spring (3.1) in the piston ring (3).

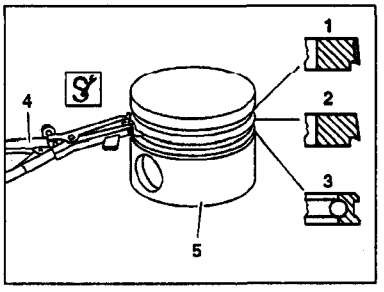
Coil spring gap should be offset 180° to the piston ring gap.



W13.30-0007-01

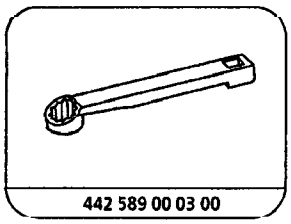
4 Use pliers (4) to install piston rings (1, 2, 3) at the piston (5) in the order from bottom to top.

Before reinstalling and after installing the piston rings (1, 2, 3), inspect them visually to determine if there is any spalling of the coating; replace piston rings if necessary. Pay attention to installation position. Marking "TOP" should point toward piston crown. Pistonring (1) of groove I is a taper-faced hook scraper ring with molybdenum coating.



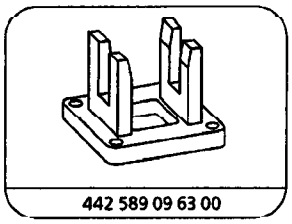
W13.30-0005-01

AR13.30-W-5511-02A	Removing compressor crankshaft		



442 589 00 03 00

Ring wrench

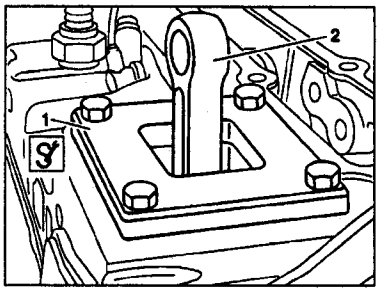


442 589 09 63 00

Blocking device

1 Fit 🔧 blocking device (1) over the conrod (2) onto the crankshaft and bolt tight.

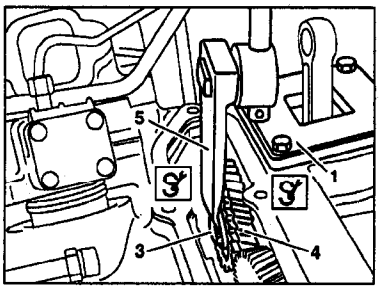
ℹ
Crankshaft journal should be facing up.



W13.30-0008-01

2 Use 🔧 ring wrench (5) to unscrew bolt (3) at drive gear (4) and take out drive gear (4).

3 Detach 🔧 blocking device (1).

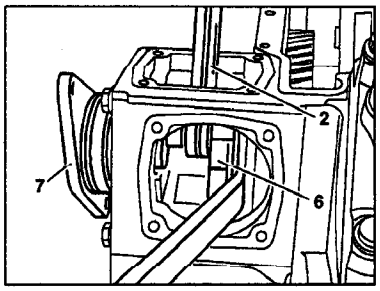


W13.30-0009-01

4 Press crankshaft (6) together with conrod (2) out of the timing case and take off the outer bearing flange (7).

5 Lift crankshaft (6) and conrod (2) up and out.

6 Take off conrod (2) at the crankshaft (6).



W13.30-0010-01

AR13.30-W-5511-03A	Installing compressor crankshaft		

Test data for compressor

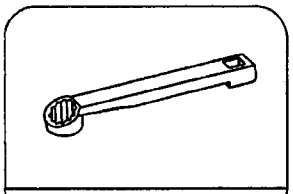
Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE13.30-N-1001-01B	Piston stroke	Single-cylinder compressor	mm	48	48
		Two-cylinder compressor	mm	38	38
BE13.30-N-1006-01B	Crankshaft conrod bearing journal Ø		mm	43.959–43.975	43.959–43.975
BE13.30-N-1007-01B	Crankshaft bearing play axial		mm	0.050–0.150	0.050–0.150

Nm Compressor (compressed air system)

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA13.30-N-1002-01B	Drive gear to compressor	(direct)	Nm	360	360
	with special tool	(indirect)	Nm	270	270

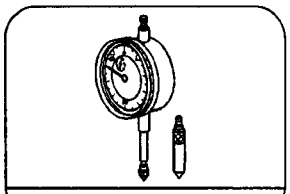
Nm Power steering pump

Number	Designation		Steering 765.889 with engine 541, 542
BA46.30-N-1001-01C	Power steering pump/fuel pump to timing case	Nm	60



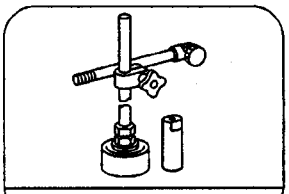
442 589 00 03 00

Ring wrench



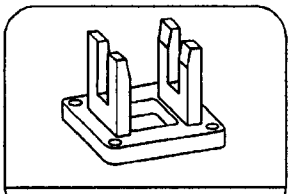
001 589 53 21 00

Dial gage



363 589 02 21 00

Dial gage holder



442 589 09 63 00

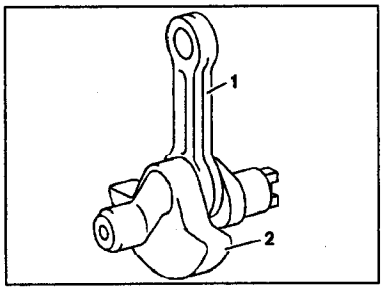
Blocking device

1 Install conrod (1) over the crankshaft (2).

i

Oil crankshaft (2) with engine oil at the bearing surfaces.

2 Insert crankshaft (2) with conrod (1) from above into the timing case (inner bearing flange).



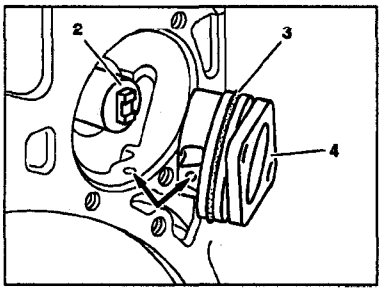
W13.30-0011-01

3 Replace O-ring (3) at outer bearing flange (4).

4 Oil bearing flange (4) at fit and O-ring (3).

5 Push crankshaft (2) into the inner bearing flange and position the outer bearing flange (4) at the timing case.

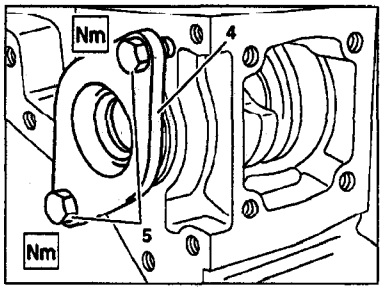
i
Oil drillings (arrows) in timing case and bearing flange (4) should be aligned.



W13.30-0012-01

6 Draw in bearing flange (4) by evenly tightening the bolts (5).

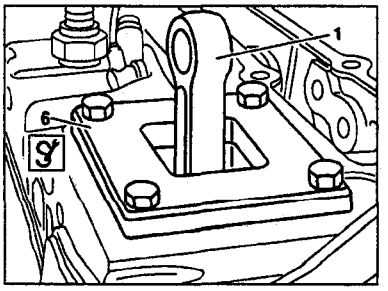
i
Pay attention to tightening torque.



W13.30-0013-01

7 Crankshaft has to be rotated sufficiently until the crankshaft journal with conrod (1) is facing up.

8 Fit 🔧 blocking device (6) over the conrod (1) onto the crankshaft (2) and bolt tight.



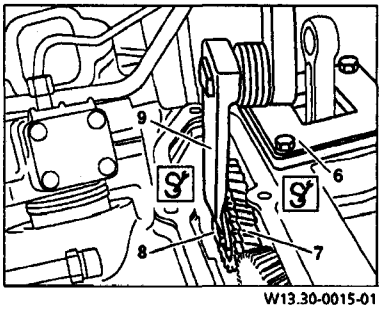
W13.30-0014-01

9 Fit on drive gear (7) with bolt (8).

10 Tighten bolt (8) with 🔧 ring wrench (9).

i
Pay attention to tightening torque. Using the 🔧 ring wrench (9) results in a modified tightening torque. Torque wrench and 🔧 ring wrench (9) should be positioned to each other in a line.

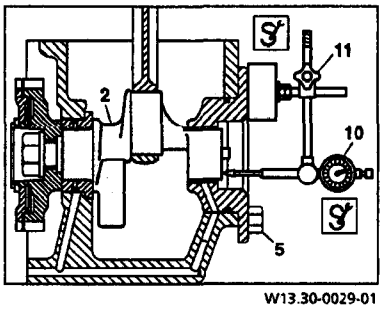
11 Detach 🔧 blocking device.



W13.30-0015-01

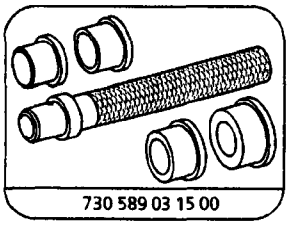
12 Use 🔧 dial gage (10) and 🔧 dial gage holder (11) to inspect axial play of crankshaft (2).

13 Remove bolts (5) again.



W13.30-0029-01

AR13.30-W-5511-05A	Removing and installing bearing bush in outer bearing flange		

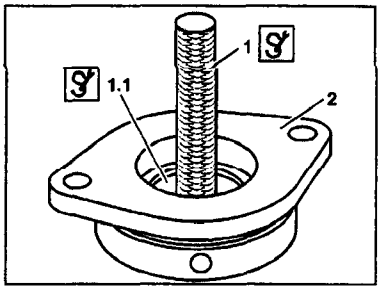


730 589 03 15 00

Drift

1 Use a suitable drift to remove bearing bush from the bearing flange (2).

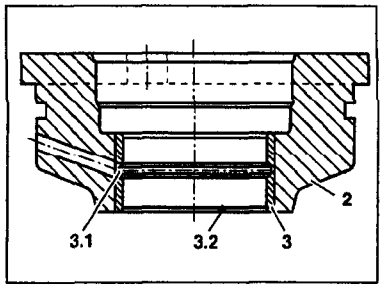
2 Use drift (1) and insert (1.1) to install bearing bush (3) flush into the bearing flange (2).



W13.30-0021-01

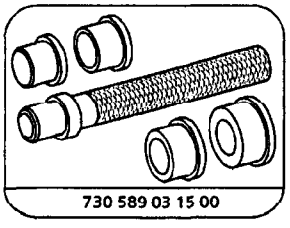
i

Oil drilling (3.1) in bearing bush (3) and in bearing flange (2) should be aligned.
Pay attention to notch (3.2) in the bearing bush (3).
Installation position in direction of compressor crankshaft.



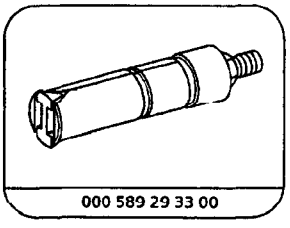
W13.30-0022-01

AR13.30-W-5511-07A	Removing, installing bearing flange for compressor		



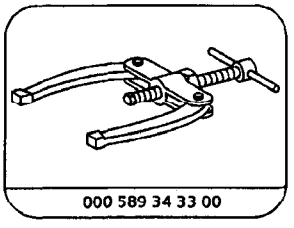
730 589 03 15 00

Drift



000 589 29 33 00

Internal extractor



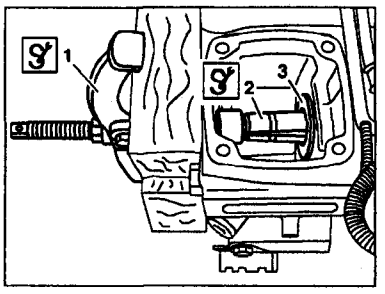
000 589 34 33 00

Countersupport

1 Assemble [S] countersupport (1) and [S] internal extractor (2).

2 Use [S] internal extractor (2) to pull out bearing flange (3).

[i]
Use a suitable square timber to support [S] countersupport (1) at timing case.



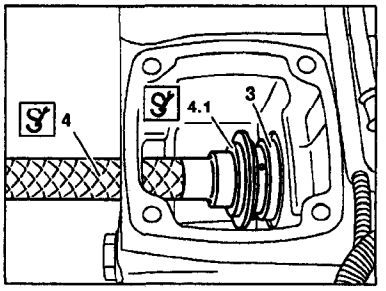
W13.30-0027-01

Installing:

3 Use [S] drift (4) and [S] insert (4.1) to press in bearing flange (3) flush.

[i]
There should be an overlap of bearing flange (3) to timing case.

4 Oil bearing flange (3) with engine oil.

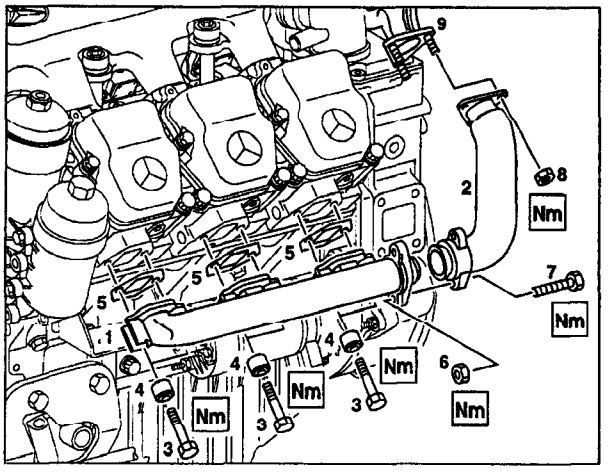


W13.30-0028-01

AR14.10-W-3915B	Removing and installing exhaust manifold	17.1.96

ENGINE 541.920 /922 /923 /924 /925 /926 /927

1 *Exhaust manifold*
2 *Exhaust pipe*
3 *Bolts*
4 *Tensioning sleeves*
5 *Gaskets*
6 *Nut*
7 *Bolt*
8 *Nut*
9 *Exhaust header*



W14.10-0002-11

	Removing, installing		
	Replace all self-locking nuts and bolts		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	Page 4
1	Tilt cab		
	Notes re tilting cab	Models 950, 952, 953, 954	Page 4
2	Remove noise encapsulation	At side right or left and rear	
3	Disconnect exhaust pipe (2) at exhaust manifold (1)	Exhaust pipe to exhaust manifold	BA14.10-N-1005-01C
4	Disconnect exhaust manifold (1) at the cylinder heads	Installation: clean sealing surfaces and replace gaskets (5). Pay attention to installation position of tensioning sleeve (4).	
		Exhaust manifold to cylinder head	BA14.10-N-1001-01C
5	Remove exhaust pipe (2) at exhaust header (9)	Installation: clean sealing surfaces.	
		Exhaust pipe to exhaust header	BA14.10-N-1003-01C
6	Install in the reverse order		

Nm Exhaust manifold

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927
BA14.10-N-1001-01C	Exhaust manifold to cylinder head	Nm	50
BA14.10-N-1003-01C	Exhaust pipe to exhaust header	Nm	50
BA14.10-N-1005-01C	Exhaust pipe to exhaust manifold	Nm	50

Additional Information

AS60.80-Z-0001-01A	Injury hazard from pinching and crushing when cab is tilted	When tilting ensure that no one is present in the tilting area of the cab. Always tilt cab to end position and secure with safety brace.	⚠ Danger!

Injury hazard
A damaged tilting mechanism or improper handling of the tilting mechanism can lead to severe injuries when tilting the cab.

Rules of behavior/protective measures
Before tilting cab:
- Shut off engine.
- Apply parking brake.
- Secure vehicle against rolling.
- On vehicles with manual transmission move shift lever to neutral position.
- On vehicles with automatic transmission move selection lever to position "N".

When tilting cab:
- Protect tilting area and particularly tilting device against unauthorized access, e.g. by blocking off or with human guard.
- Attach safety cable before tilting when so specified in the vehicle operating instructions.
- Never work under cab when partially tilted.
- Always tilt cab to end position and secure with safety brace.

AH60.80-N-0003-01A	Notes on tilting the cab	Models 673,674, 675, 676, 677, 678, 679, 950, 952, 953, 954, 957, 970, 971, 972, 973, 974, 975, 976	ⓟ

Before tilting the cab
- Switch off engine
- Apply parking brake
- Secure vehicle to stop it rolling away
- Remove all loose objects (e.g. cans, bottles, tools, bags etc.) from the cab
- On vehicles with manual transmission move shift lever to neutral position
- Model 957: release steering column and open front flap

The coupling pin must be inserted correctly.

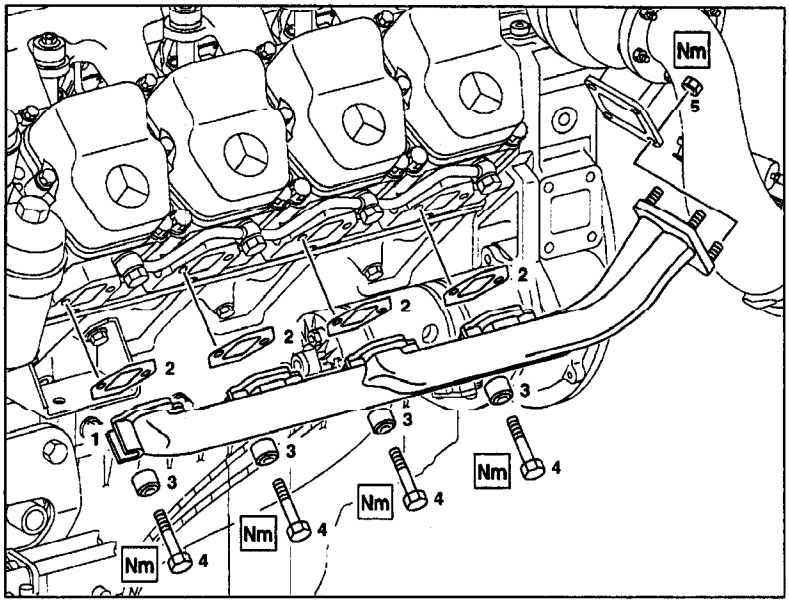
ⓘ Always tilt cab up to its final position.

On vehicles with a refrigerator box
- The refrigerator box must be switched off before the cab is tilted.
- The refrigerator box may only be switched on 10 minutes after tilting the cab back again.
  ⓘ Also refer to the refrigerator box manufacturer's Operating Instructions and the red information plate on the refrigerator box.

AR14.10-W-3915C	Removing and installing exhaust manifold	23.1.96

ENGINE 542.920 /921 /922 /923 /925 /926

1 Exhaust manifold
2 Gaskets
3 Tensioning sleeves
4 Bolts
5 Nut



W14.10-0003-06

⊠ ⊠	**Removing, installing**		
Ⓡ	Replace all self-locking nuts		
⚠ **Danger!**	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
1	Tilt cab		
Ⓡ	**Notes re tilting cab**	**Models 950, 952, 953, 954**	**Page 4**
2	Remove noise encapsulation	ℹ At side right or left	
3	**Disconnect exhaust manifold (1) at turbocharger**	ℹ **Installation: clean sealing surfaces.**	
3		Nm Flange manifold to turbocharger	BA14.10-N-1006-01C
4	**Disconnect exhaust manifold (1) at the cylinder heads**	ℹ **Installation: clean sealing surfaces and replace gaskets (2). Pay attention to installation position of tensioning sleeves (3).**	
		Nm Exhaust manifold to cylinder head	BA14.10-N-1001-01C
5	Install in the reverse order		

Nm **Exhaust manifold**

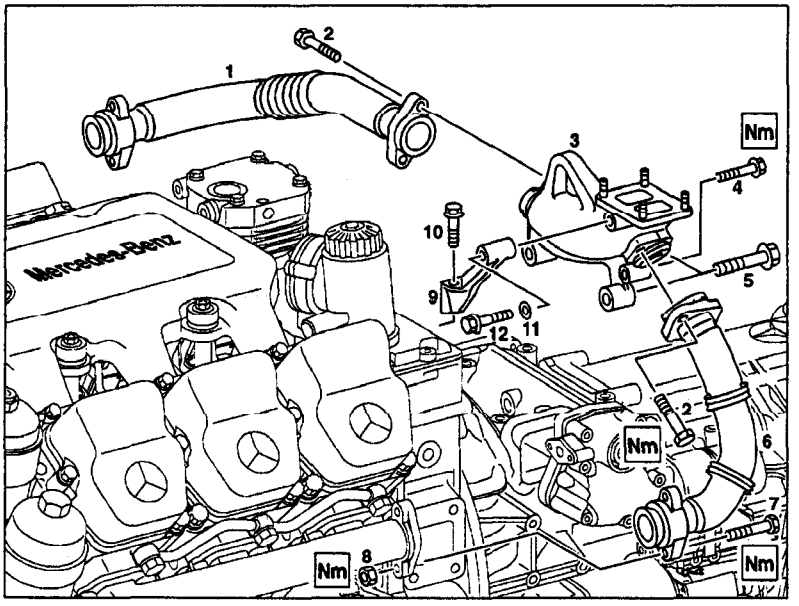
Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA14.10-N-1001-01C	Exhaust manifold to cylinder head	Nm	50
BA14.10-N-1006-01C	Flange manifold to turbocharger	Nm	50

Additional Information

AR14.10-W-3920A	Removing and installing exhaust gas plenum chamber	8.10.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927

1 Exhaust pipe
2 Bolts
3 Exhaust plenum chamber
4 Bolt
5 Bolt
6 Exhaust pipe
7 Bolt
8 Nut
9 Support
10 Bolt
11 Washer
12 Bolt



W14.10-0005-06

⊠ ⊠	Removing, installing		
Ⓘ Installation	Replace all self-locking nuts and bolts		
1	Remove turbocharger		AR09.40-W-6020B
2	Remove noise encapsulation	ℹ at top, at rear, on left and right	
3	Remove exhaust pipes (1, 6)	ℹ Installation: clean sealing surfaces Nm Exhaust pipe to exhaust plenum chamber Nm Exhaust pipe to exhaust manifold	 BA14.10-N-1003-01C BA14.10-N-1005-01C
4	Remove support (9)	Nm Support to exhaust plenum chamber Nm Support/plenum chamber to timing case	BA14.10-N-1008-01C BA14.10-N-1009-01C
5	Take off exhaust plenum chamber	Nm Exhaust plenum chamber to timing case (turbocharger carrier)	BA14.10-N-1004-01C
6	Install in the reverse order		

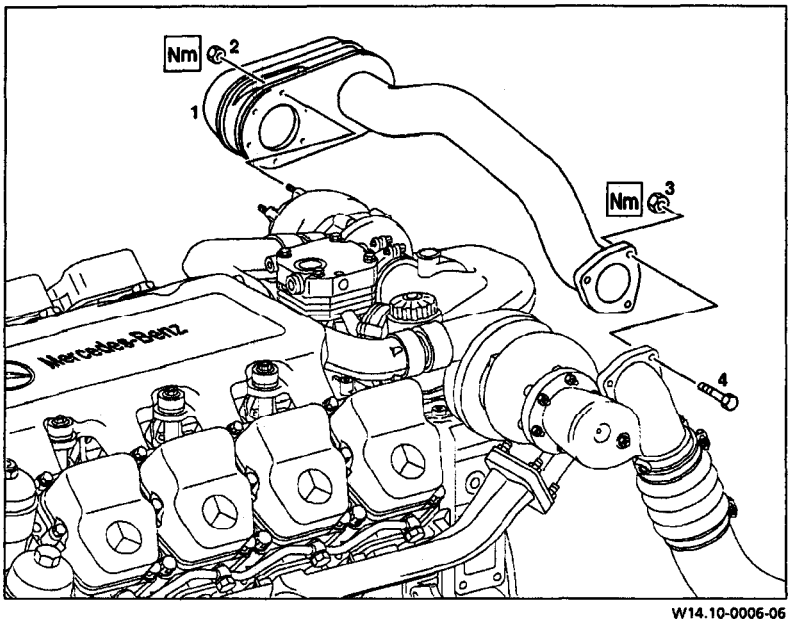
Exhaust manifold

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927
BA14.10-N-1003-01C	Exhaust pipe to exhaust plenum chamber		Nm	50
BA14.10-N-1004-01C	Exhaust plenum chamber to timing case (turbocharger carrier)	M16	Nm	150
		M12	Nm	100
BA14.10-N-1005-01C	Exhaust pipe to exhaust manifold		Nm	50
BA14.10-N-1008-01C	Support to exhaust plenum chamber		Nm	40
BA14.10-N-1009-01C	Support/exhaust plenum chamber to timing case		Nm	40

AR14.10-W-3925A	Removing and installing transverse exhaust pipe	18.10.96

ENGINE 542.920 /921 /922 /923 /925 /926

1 Transverse exhaust pipe
2 Nut
3 Nut
4 Bolt



W14.10-0006-06

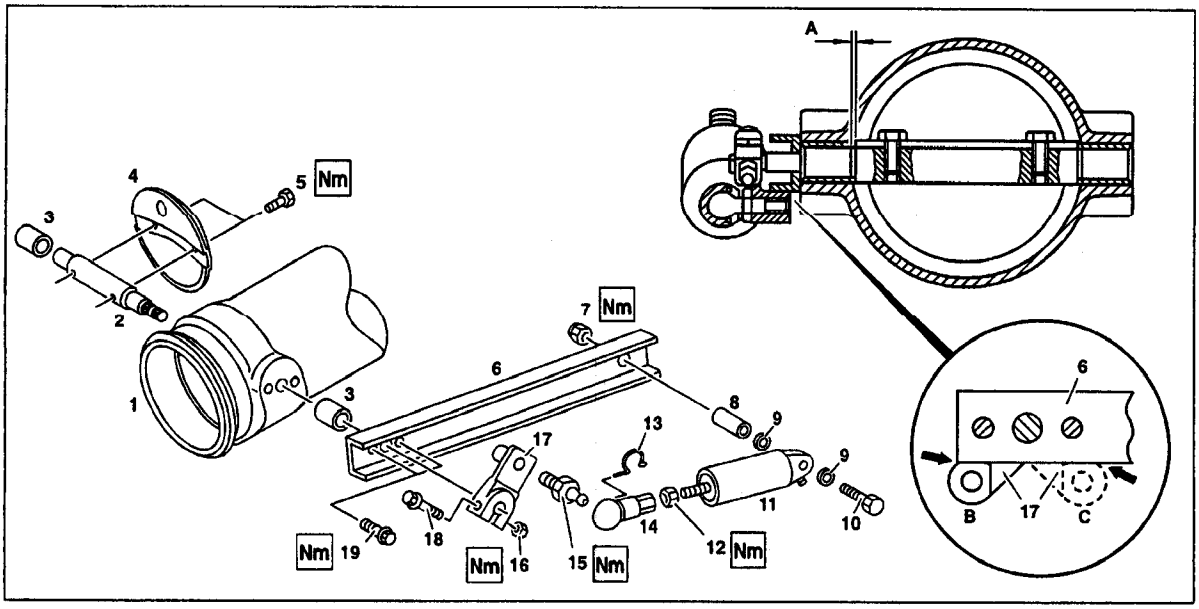
	Removing, installing		
Installation	**Replace all self-locking nuts and bolts**		
Danger!	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
1	Tilt cab		
	Notes re tilting cab	Model 950, 952, 953, 954	**Page 4**
2	Remove noise encapsulation	at side right and at rear	
3	Detach transverse exhaust pipe (1) at engine brake flap connection	Nm Transverse exhaust pipe to flange manifold and flap connection **Installation:** clean sealing surfaces.	BA14.10-N-1007-01C
5	Detach transverse exhaust pipe (1) at turbocharger	Nm Flange manifold to turbocharger **Installation:** clean sealing surfaces.	BA14.10-N-1006-01C
6	Install in the reverse order		

Nm **Exhaust manifold**

Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA14.10-N-1006-01C	Flange manifold to turbocharger	Nm	50
BA14.10-N-1007-01C	Transverse exhaust pipe to flange manifold and flap connection	Nm	50

AR14.15-W-5810B	Repairing engine brake flap connection	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W14.15-0006-09

1 *Engine brake flap connection*
2 *Engine brake shaft*
3 *Bearing bush*
4 *Engine brake flap*
5 *Bolt*
6 *Bracket*
7 *Nut*
8 *Bush*
9 *Washers*
10 *Bolt*
11 *Engine brake cylinder*
12 *Nut*
13 *Circlip*
14 *Ball socket*
15 *Ball stud*
16 *Nut*
17 *Adjusting lever*
18 *Bolt*
19 *Bolt*

A *Axial play of engine brake shaft*
B *Position of adjusting lever stop with engine brake flap closed*
C *Position of adjusting lever stop with engine brake flap opened*

	Disassembling		
1	Remove engine brake flap connection (1)	On engine 541.920 - 927 On engine 542.920 - 923/925/926	**Page 12** **Page 13**
2	Remove engine brake cylinder (11)	Release ball socket (14).	
3	Take off adjusting lever (17)	Mark adjusting lever relative to notch in engine brake shaft (2).	
4	Take off bracket (6)		
5	Remove engine brake flap (4)		
6	Remove engine brake shaft (2) and bearing bush (3)	1 Use a suitable drift.	
	Assembling		
7	Install bearing bush (3) on bracket side	1 With projection (about 3 mm) to inner contact surface. Use a suitable drift.	

		Depth gage Coat bearing point with hot lubricating paste.	WH58.30-Z-1012-12A BR00.45-Z-1006-06A
8	Insert engine brake shaft (2) into engine brake flap connection (1)	Coat bearing point with hot lubricating paste.	BR00.45-Z-1006-06A
9	Knock in second bearing bush (3)	Center engine brake shaft (2) to throttle valve diameter. Projection of both bearing bushes to inner contact surface should be the same. Use a suitable drift.	
10	Knock back bearing bushes (3) evenly on both sides until axial play (A) of engine brake shaft (2) is achieved	Use a suitable drift. Feeler gage	BE14.15-N-1002-01A WH58.30-Z-1008-12A
11	Install engine brake flap (4)	Pay attention to installation position of hole in engine brake flap. Bolt heads (5) should point toward engine when engine brake flap closed. Center engine brake flap in engine brake flap connection (1). Nm Throttle valve to shaft	BA14.15-N-1003-01A
12	Measure annular gap at engine brake flap (4)	Engine brake flap must not be touching engine brake flap connection (1) in closed position (B). Feeler gage	WH58.30-Z-1008-12A
13	Fit on bracket (6)	Nm Engine brake bracket to flap connection	BA14.15-N-1001-01A
14	Install adjusting lever (17)	Fit adjusting lever onto the splines of the engine brake shaft (2); pay attention to marking on adjusting lever relative to notch in engine brake shaft (2). Bolt heads (5) should point toward engine when engine brake flap (4) closed. Adjusting lever stop should be touching bracket (6) when engine brake flap (4) fully opened and closed. Nm Adjusting lever to engine brake shaft Nm Ball stud to adjusting lever	BA14.15-N-1002-01A BA14.15-N-1007-01A
15	Attach engine brake cylinder (11) to bracket (6)	Nm Bearing pin of engine brake cylinder to bracket Replace nut (7).	BA14.15-N-1004-01A
16	Set preload of engine brake cylinder (11) at ball socket (14)	Engine brake flap (4) in opened position (C) Nm Locknut to engine brake cylinder piston rod	BE14.15-N-1001-01A BA14.15-N-1005-01A
17	Clip in ball socket (14) at ball stud (15) and secure	Coat ball stud with hot lubricating paste.	BR00.45-Z-1006-06A
18	Install engine brake flap connection (1)	On engine 541.920 - 927 On engine 542.920 - 923/925/926	**Page 12** **Page 13**

Test data of engine brake

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE14.15-N-1001-01A	Engine brake cylinder preload	mm	2.5–3.5	2.5–3.5
BE14.15-N-1002-01A	Engine brake shaft axial play	mm	0.4–0.7	0.4–0.7

Nm Engine brake

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA14.15-N-1001-01A	Bracket of engine brake to flap connection	Nm	35	35
BA14.15-N-1002-01A	Lever on throttle valve shaft	Nm	15	15
BA14.15-N-1003-01A	Throttle valve to shaft	Nm	30	30
BA14.15-N-1004-01A	Bearing pin of engine brake cylinder to bracket	Nm	25	25
BA14.15-N-1005-01A	Locknut to engine brake cylinder piston rod	Nm	20	20
BA14.15-N-1007-01A	Ball stud of engine brake to lever	Nm	50	50

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gage	Stiefelmayer D–73734 Esslingen	59
WH58.30-Z-1012-12A	Depth gage, range 0 - 200 mm	Stiefelmayer D–73734 Esslingen	040 202

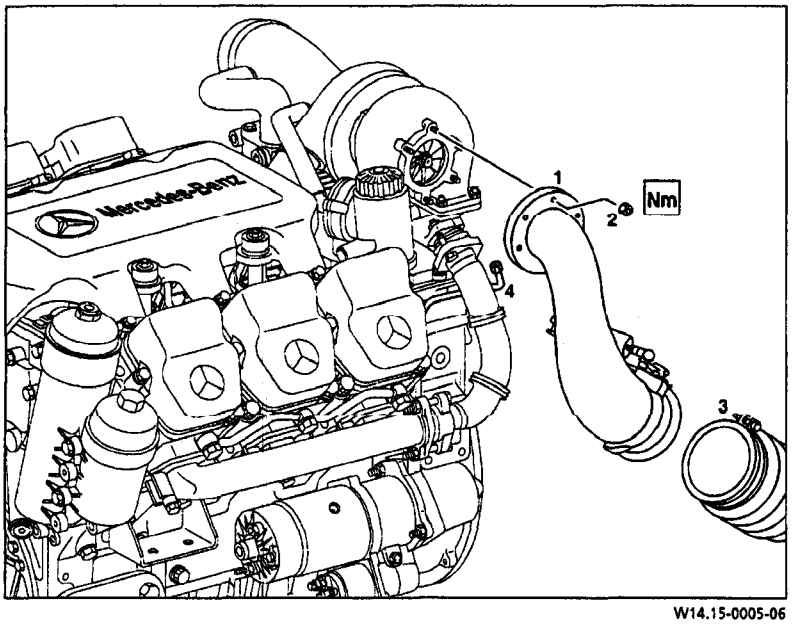
Repair products

Number	Designation	Order number
BR00.45-Z-1006-06A	Hot lubricating paste	000 989 76 51

AR14.15-W-6302B	Removing, installing engine brake flap connection	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927

1 Engine brake flap connection
2 Nut
3 Exhaust pipe
4 Compressed air pipe



W14.15-0005-06

	Removing, installing		
Installation	Replace all self-locking nuts and bolts		
Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	Page 4
1	Tilt cab		
	Notes re tilting cab	Model 950. 952. 953. 954	Page 4
2	Remove noise encapsulation	on side left and at rear	
3	Detach compressed air pipe (4) at engine brake cylinder		
4	Detaching exhaust pipe (3) at engine brake flap connection (1)	Installation: clean sealing surfaces.	
5	Detach engine brake flap connection (1) at turbocharger	Nm Exhaust pipe flap connection to turbocharger Installation: clean sealing surfaces.	BA14.10-N-1002-01C
6	Install in the reverse order		

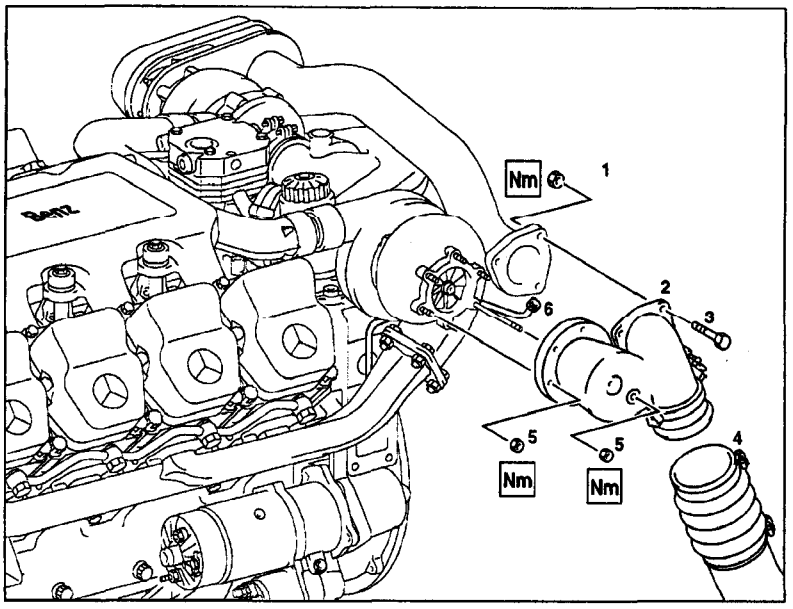
Nm Exhaust manifold

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927
BA14.10-N-1002-01C	Exhaust pipe flap connection to turbocharger	Nm	50

AR14.15-W-6302C	Removing, installing engine brake flap connection	18.10.96

ENGINE 542.920 /921 /922 /923 /925 /926

1 Nut
2 Engine brake flap connection
3 Bolt
4 Exhaust pipe
5 Nuts
6 Compressed air pipe



W14.15-0004-06

	Removing, installing		
Installation	**Replace all self-locking nuts and bolts**		
Danger!	**Risk of injury from bruises and jamming when tilting cap**	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
1	Tilt cab		
	Notes re tilting cab	Model 950, 952, 953, 954	**Page 4**
2	Remove noise encapsulation	on side left and at rear	
3	Detach compressed air pipe (6) at engine brake cylinder		
4	Detach exhaust pipe (4) at engine brake flap connection (2)	Installation: clean sealing surfaces.	
5	Detach transverse exhaust pipe at engine brake flap connection (2)	Transverse exhaust pipe to flange manifold and flap connection Installation: clean sealing surfaces.	BA14.10-N-1007-01C
6	Detach engine brake flap connection (2) at turbocharger	Flange manifold to turbocharger Installation: clean sealing surfaces.	BA14.10-N-1006-01C
7	Install in the reverse order		

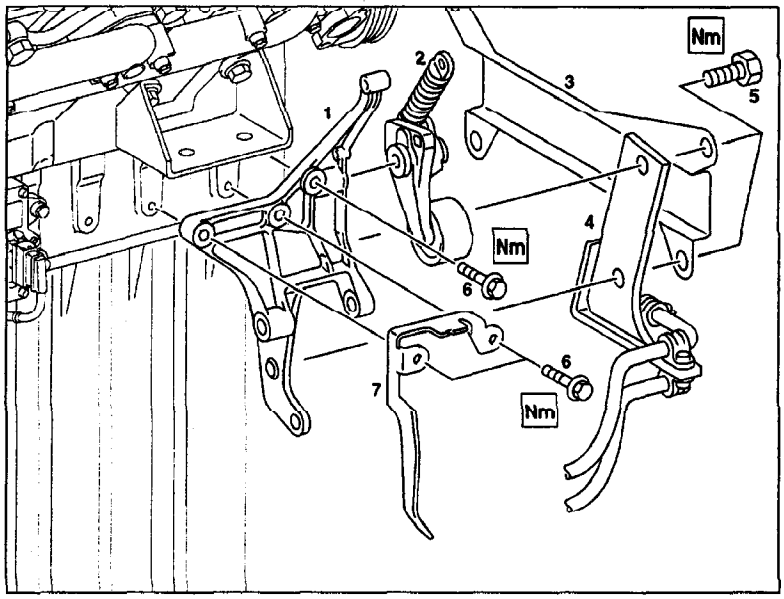
Exhaust manifold

Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA14.10-N-1006-01C	Flange manifold to turbocharger	Nm	50
BA14.10-N-1007-01C	Transverse exhaust pipe to flange manifold and flap connection	Nm	50

AR15.40-W-6232A	Removing and installing the generator support	13.9.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Generator support
2 Poly V-belt tensioning device
3 AC compressor support
4 Bracket of ATF pipes
5 Bolt
6 Bolt
7 Bracket of engine wiring harness



W15.40-0003-06

	Removing, installing		
1	Remove generator		AR15.40-W-5032B
2	Remove poly V-belt tensioning device (2)		AR13.25-W-3200B
3.1	Detach support of AC compressor (3) at support (1)	If AC fitted Nm Support to fixture of AC compressor and generator support	BA83.55-N-1002-01C
4	Detach bracket of ATF pipes (4) at support (1)	i Do not disconnect ATF pipes	
5	Detach bracket of engine wiring harness (7) and support (1)	Nm Support generator/poly V-belt tensioning device to crankcase	BA01.40-N-1010-01D
6	Install in the reverse order		

Nm Crankcase, timing case cover, end cover

Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1010-01D	Support of generator/poly V-belt tensioning device to crankcase	Nm	160	160

Additional Information

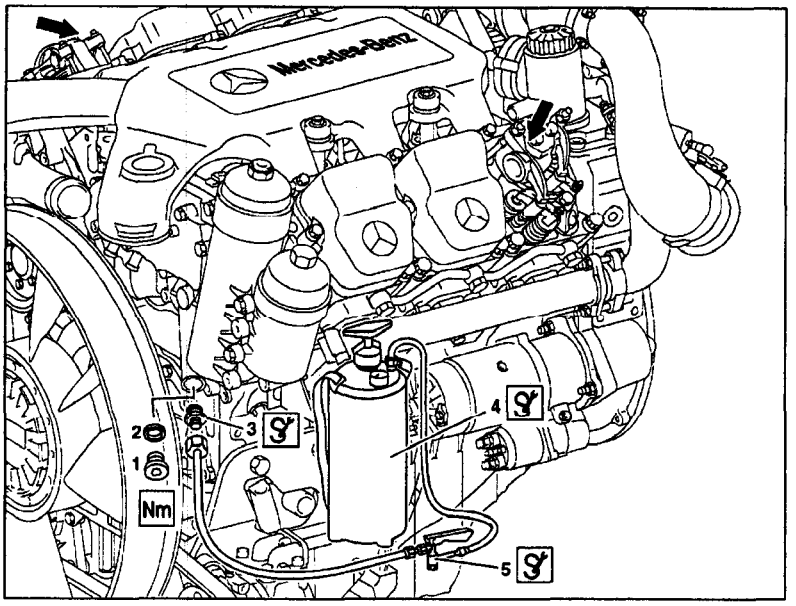
Nm AC compressor

Number	Designation		Model 950	Model 952	Model 953	Model 954
BA83.55-N-1002-01C	Support to fixture of AC compressor/ frigoblock and generator support	Nm	50	50	50	50

AR18.00-W-1600B	Filling engine oil circuit	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

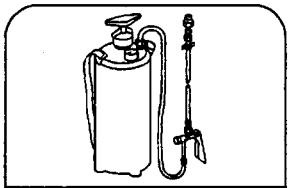
1 *Screw plug (M33×2)*
2 *Seal*
3 ⚿ *Adapter*
4 ⚿ *Oil filling reservoir*
5 ⚿ *Shut-off valve*



W18.00-0003-06

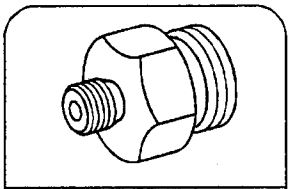
⚿ ⚿	Removing, installing		
1	Remove cylinder head covers at first and last cylinder		AR01.20-W-5014B
2	Remove noise encapsulation	ⓘ on left	
3	Remove screw plug (1)	Nm Screw plug (M33×2)	BA18.20-N-1003-01C
4	Attach adapter (3) firmly to oil filter housing (6) (insert)	⚿ ⚿	352 589 11 63 00 541 589 02 63 00
5	Attach connection hose of oil filler reservoir (4) tight to connection fitting (3)	⚿	352 589 11 63 00
	Filling		
6	Pour 5 liters of approved engine oil into oil filling reservoir and close	⚿	352 589 11 63 00
7	Create a pressure of about 3 bar with the integral priming pump	ⓘ Shut-off valve (5) closed.	
8	Open shut-off valve (5) long enough until about 4 liters of engine oil has been pumped from the oil filling reservoir (4) into the oil galleries and the engine oil flows out free of bubbles at the rocker arms (arrows)	ⓘ The pressure in oil filling reservoir should not drop below 1.5 ar; re-pump if necessary. Do not completely empty oil filling reservoir otherwise air will be pumped in. ⚿	352 589 11 63 00
	Install in the reverse order		
9	Pour in remaining engine oil at filler neck		AP18.00-W-0101A

⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruizes and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it starting off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	Page 19
10	Start engine and observe oil pressure gage when engine idling	Ⓓ Crank engine with starter for not more than 20 seconds. Wait for about 2 minutes before making repeated attempt at starting. Do not rev up engine so long as oil pressure is not indicated. ⓘ Oil pressure gage should indicate oil pressure after about 10 seconds.	BE18.00-N-1001-01D
11.1	Inspect engine oil level at electric gage	ⓘ Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
11.2	Inspect engine oil level with dipstick	ⓘ If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
12	Switch off engine and check for leaks		



352 589 11 63 00

Oil filling reservoir



541 589 02 63 00

Adapter M33

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idle speed	min. bar	0.5	0.5
		maximum speed	min. bar	2.5	2.5

Nm Oil filter

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.20-N-1003-01C	Screw plug to oil filter housing	M14×1.5	Nm	25	25
		M16×1.5	Nm	25	25
		M24×1.5	Nm	25	25
		M33×2	Nm	65	65

AS00.00-Z-0005-01A	Risk of accident as a result of vehicle starting off when engine is running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it from moving off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	⚠ Danger!

Possible dangers

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 and 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").

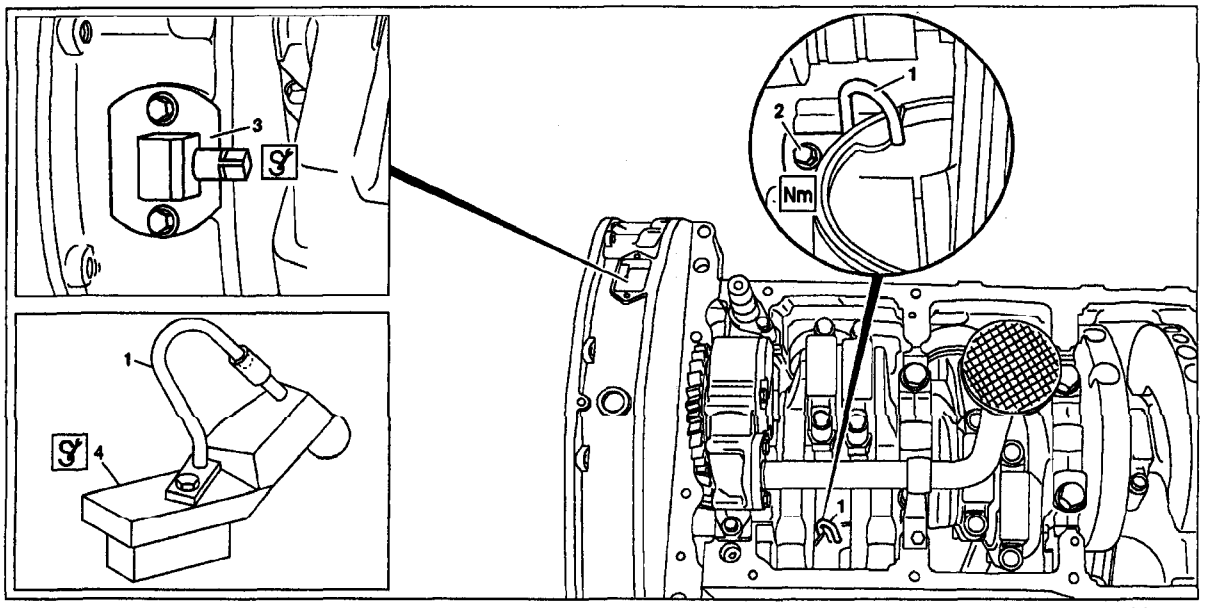
Risk of injury
Severe injuries may be caused by freely rotating parts in the area of the running engine. The heat produced by the engine when it is operating can result in severe burns if contact is made with individual, unshielded parts.

Rules of conduct / Protective measures
- As a general rule, carry out work on the running engine only if this is absolutely essential.
- Before starting the engine, apply parking brake.
- On models with manual transmission, move gearshift lever into Neutral position.
- On models 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
- Take off any jewelry, such as chains, rings etc.
- If you have long hair, wear a suitable head cover.
- Before commencing work on the running engine, check to obtain a general picture of the positioning of parts which may be hot.
- When carrying out work when starting the engine or when engine is running, do not touch any hot and rotating 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.
- Immediately consult a physician.

AR18.00-W-4000B	Removing and installing oil spray nozzles (pistons)	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W18.00-0004-09

1 Oil spray nozzle
2 Bolt
3 Cranking device
4 Gage

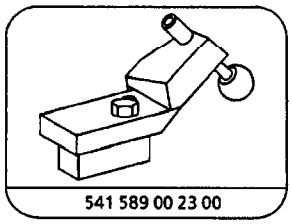
	Removing, installing		
1	Remove oil pan		AR01.45-W-7500B
2	Attach cranking device (3) for engine to timing case	Cranking device has to be removed before starting engine Cover of TDC inspectio hole to timing case	 407 589 00 63 00 BA01.60-N-1001-01B
3	Rotate crankshaft until the oil spray nozzle (1) to be removed is accessible		
4	Remove oil spray nozzle (1)	Installation: the guide at the oil spray nozzle should engage in the hole in the crankcase. Oil spray nozzles to crankcase	 BA18.00-N-1001-01C
5	Inspect oil spray nozzle (1) for damage	 Bolt oil spray nozzle tight to gage (4). Inspect oil spray pipe with guide for deformation, if necessary ↓ adjust oil spray pipe or replace oil spray nozzle	541 589 00 23 00
6	Install in the reverse order		

Nm **Timing case**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	Cover of TDC inspection hole to timing case	Nm	25	25

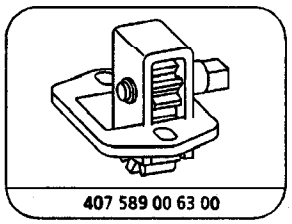
Nm **Engine lubrication, engine oil cooling - general**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.00-N-1001-01C	Oil spray nozzles (pistons) to crankcase	Nm	25	25



541 589 00 23 00

Gage



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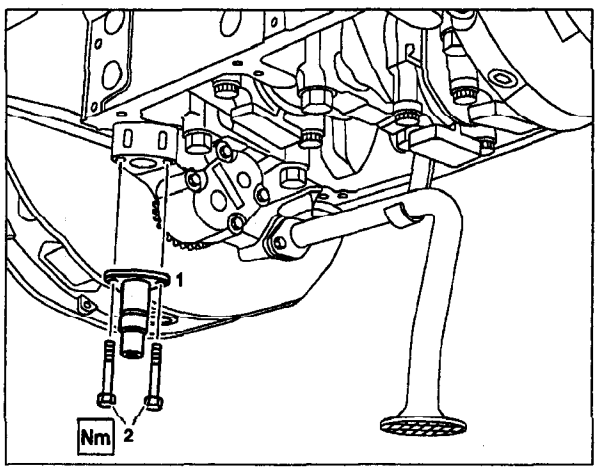
Cranking device

AR18.10-W-5031B	Removing and installing oil pressure relief valve	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Oil pressure relief valve
2 Bolt



W18.10-0004-11

	Removing, installing		
1	Remove oil sump		AR01.45-W-7500B
2	Unscrew bolts (2) and take off oil pressure relief valve (1)	Collect engine oil which flows out. Oil pressure relief valve must not be disassembled. If a problem exists, replace oil pressure relief valve. Nm Oil pump with pressure relief valve to crankcase	BA18.10-N-1003-01C
3	Clean sealing surface	Do not damage sealing surface.	
4	Install in the reverse order		
5	Fill engine oil circuit		**Page 17**

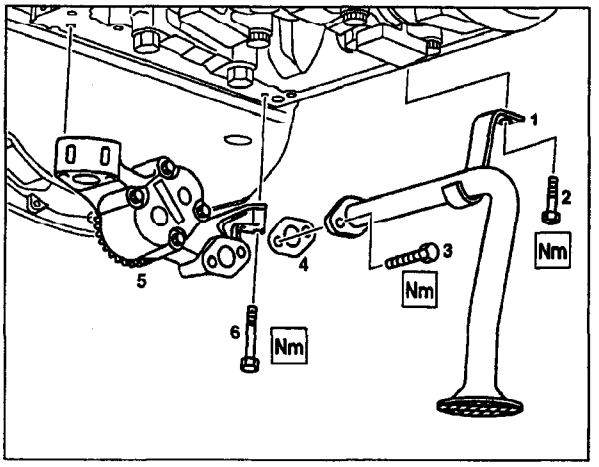
Nm **Oil pump**

Number	Designation	Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.10-N-1003-01C	Oil pump with pressure relief valve to crankcase Nm	25	25

AR18.10-W-6020B	Removing and installing oil pump	17.1.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 *Oil suction pipe*
2 *Bolt*
3 *Bolt*
4 *Gasket*
5 *Oil pump*
6 *Bolt*



W18.10-0005-11

Modifiction notes

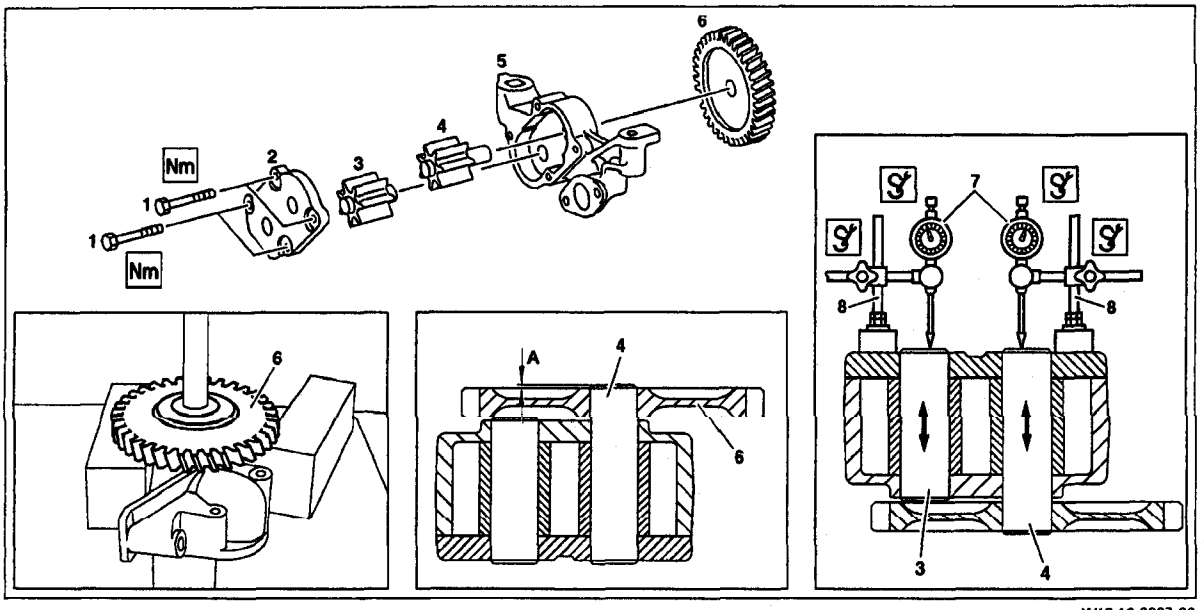
6.2.97	Tightening torque of bracket to crankcase and oil suction pipe at oil pump modified	Steps 2 and 4	**Page 23**

⊠ ⊠	Removing, installing		
1	Remove oil pressure relief valve		**Page 22**
2	Unscrew bolts (2) at the bracket of the oil suction pipe (1)	Nm Bracket of oil pump suction pipe to crankcase	BA18.10-N-1002-01C
3	Unscrew bolts (6) and take off oil pump (5) together with oil suction pipe (1)	i Collect engine oil which flows out. Nm Oil pump with pressure relief valve to crankcase	BA18.10-N-1003-01C
4	Unscrew bolts (3) and take off oil suction pipe (1) at oil pump (5)	i Replace gasket (4). Nm Suction pipe to oil pump	BA18.10-N-1001-01C
5	Clean sealing surfaces at oil pump (5), oil suction pipe (1) and crankcase	Do not damage sealing surfaces.	
6	Install in the reverse order		
7	Fill engine oil circuit		**Page 17**

Nm **Oil pump**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.10-N-1001-01C	Suction pipe to oil pump	Nm	35	35
BA18.10-N-1002-01C	Bracket of oil pump suction pipe to crankcase	Nm	35	35
BA18.10-N-1003-01C	Oil pump with pressure relief valve to crankcase	Nm	25	25

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W18.10-0007-09

1 Bolts
2 Cover
3 Driven oil pump gear
4 Driving oil pump gear
5 Oil pump housing
6 Drive gear
7 Dial gage
8 Dial gage holder

A Amount by which drive gear stands back relative to drive shaft

	Disassembling		
1	Remove oil pump		**Page 23**
2	Mesure axial play of oil pump gears (3, 4)	Fit dial gage (7) and dial gage holder (8) with preload onto oil pump housing (5). Position tracer pin on shaft of oil pump gear and move shaft up and down. Check reading on gage. If the specification is exceeded ↓ replace or repair oil pump 	BE18.10-N-1002-01A 001 589 53 21 00 363 589 02 21 00
3	Take off cover (2)	Do not damage sealing surface	
4	Take driven gear (3) out of oil pump housing (5)		
5	Use a suitable drift to press driving gear (4) out of drive gear (6)		
	Assembling		
6	Insert driving gear (4) into oil pump housing (5)		
7	Insert driven gear (3) into oil pump housing (5)		

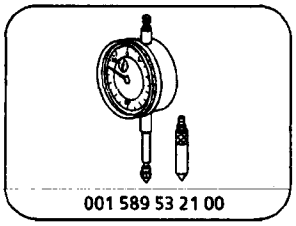
8	Inspect backlash of oil pump gears	Backlash of oil pump gears Feeler gage	BE18.10-N-1003-01A WH58.30-Z-1008-12A
9	Attach cover (2) tight	Cover to oil pump	BA18.10-N-1004-01C
10	Heat drive gear (6) and press onto drive shaft	Heat drive gear to about 80 °C; pay attention to amount by which it stands back. Drive gear should rotate easily.	BE18.10-N-1004-01A
11	Install oil pump		Page 23

Test data of oil pump

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.10-N-1002-01A	Axial play of oil pump gear - oil pump housing	mm	0.050–0.128	0.050–0.128
BE18.10-N-1003-01A	Backlash of oil pump gears	mm	0.312–0.476	0.312–0.476
BE18.10-N-1004-01A	Amount by which drive shaft stands back to drive gear	mm	0.5	0.5

Oil pump

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.10-N-1004-01C	Cover to oil pump	Nm	25	25



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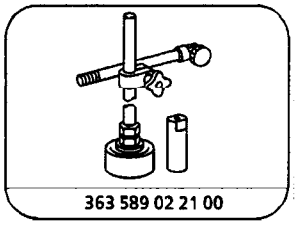
Dial gage



363 589 02 21 00

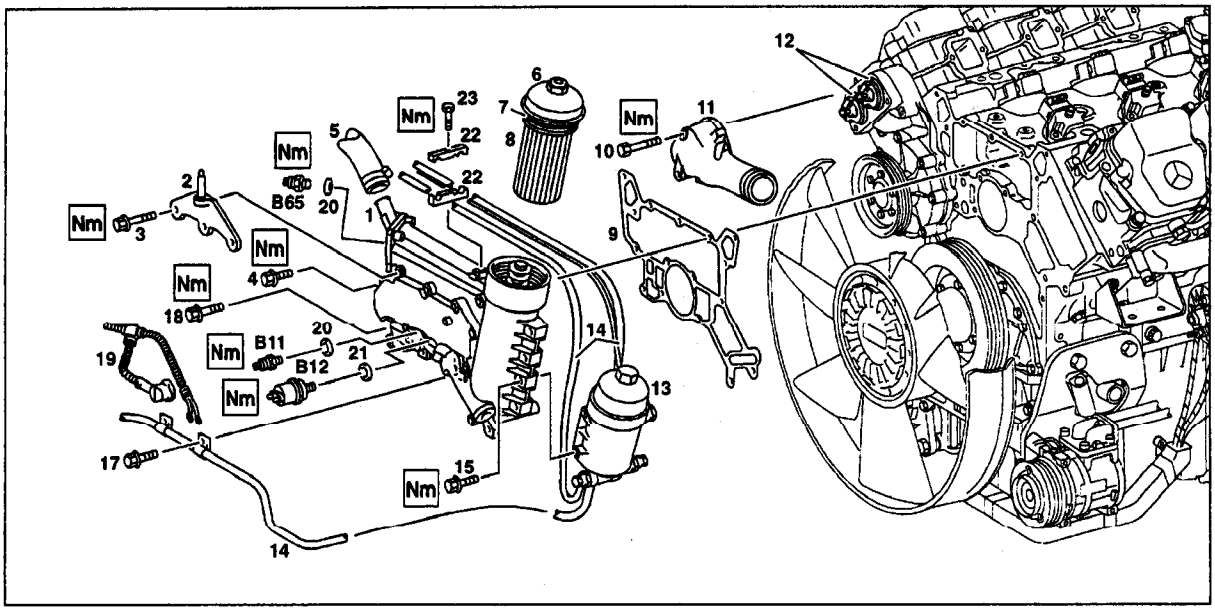
Dial gage holder

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gage	Stiefelmayer D–73734 Esslingen	59

AR18.20-W-3471B	Removing and installing oil filter housing	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926



W18.20-0003-09

1 Oil filter housing
2 Bracket
3 Bolt
4 Bolt
5 Coolant hose
6 Oil filter cap
7 Seal
8 Oil filter element
9 Gasket
10 Bolt
11 Coolant connection
12 Seal
13 Fuel filter housing
14 Fuel pipes
15 Bolt
17 Bolt
18 Bolt
19 Engine wiring harness
20 Seals
21 Seal
22 Bracket
23 Bolt

B65 Coolant temperature sensor
B12 Oil pressure sensor
B11 Oil temperature sensor

	Removing, installing		
1	Remove charge air housing		AR09.41-W-8681B
2.1	Remove charge air pipe	On engine 542.920 - 923/925/926	AR09.41-W-1311B
3	Slacken poly V-belt and take off at coolant pump belt pulley		AR13.22-W-1202B
⚠ Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 29**
4	Drain coolant	Collect coolant.	AP20.00-W-2080A
Ⓑ	Notes re coolant	All engines	**Page 30**
5	Detach coolant connection (11)	Nm Coolant pipe to coolant pump Ⓘ Inspect seals (12), replace if necessary.	BA20.10-N-1003-01D

6	Detach coolant hose (5) at oil filter housing (1)		
7	Detach bracket (22) of fuel pipes	Nm Bracket of fuel pipe to oil filter housing	BA47.25-N-1009-01B
8	Unscrew oil filter cap (6) together with oil filter element (8)	Nm Oil filter cap to oil filter housing i The engine oil flows back into the oil pan when the oil filter element is removed.	BA18.20-N-1001-01C
9	Detach fuel filter (13) at bottom of oil filter housing (1)	Nm Fuel filter housing to oil filter housing i Do not separate fuel pipes (14)	BA47.20-N-1001-02C
10	Detach fuel pipe (14) at oil filter housing (1)	Nm Bracket of fuel pipe to oil filter housing i Do not separate fuel pipe	BA47.25-N-1009-01B
11	Detach engine wiring harness (19)	i To oil pressure sensor (B12), oil temperature sensor (B11) and coolant temperature sensor (B65)	
12	Unclip engine wiring harness (19) at oil filter housing (1)		
13	Puli out oil filter cap (6)	i Collect engine oil which drips out of oil filter element (8). i Installation: inspect seal (7), replace if necessary.	
14	Inspect oil filter element (8) for signs of damage and dirt	If damaged or dirt is present, replace oil filter element.	AP18.00-W-0101A
15	Detach oil filter housing (1) at crankcase	i Collect engine oil which flows out.	BA18.20-N-1002-01C
16	Take off gasket (9) and clean sealing surfaces	i Installation: replace gasket.	
17	Inspect oil-water heat exchanger for external damage	i If damage present ↓ replace oil-water heat exchanger.	**Page 31**
18	Install in the reverse order	i Installation: when replacing oil filter housing ↓ install existing oil-water heat exchanger. Install existing screw plugs, coolant temperature sensor (B65), oil pressure sensor (B12) and oil temperature sensor (B11). Replace seals. Nm Oil temperature sensor Nm Coolant temperature sensor Nm Screw plugs Nm Oil pressure sensor	**Page 31** BA15.60-N-1001-01A BA15.60-N-1002-01A BA18.20-N-1003-01C BA18.40-N-1001-01D
19	Fill engine oil circuit		**Page 17**
⚠ Danger!	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruizes and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it starting off. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts.	**Page 19**

20	Start engine and observe oil pressure gage when engine idling.	Crank engine with starter for not more than 20 seconds. Wait about 2 minutes before making a further attempt at starting. Do not rev up engine so long as oil pressure is not indicated. The oil pressure gage should indicate oil pressure after about 10 seconds.	BE18.00-N-1001-01D
21.1	Inspect engine oil level at electric gage	Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
21.2	Inspect engine oil level with dipstick	If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
22	Switch off engine and check for leaks		

Test data of engine oil pressure

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BE18.00-N-1001-01D	Engine oil pressure at	idle speed	min. bar	0.5	0.5
		maximum speed	min. bar	2.5	2.5

Nm Fuel filter

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/925 /926
BA47.20-N-1001-02C	Fuel filter housing to oil filter housing	Nm	25	25

Nm Temperature sensor

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA15.60-N-1001-01A	Oil temperature sensor to oil filter housing	M14×1.5	Nm	30	30
BA15.60-N-1002-01A	Coolant temperature sensor to oil filter housing	M14×1.5	Nm	30	30

Nm Oil filter

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.20-N-1001-01C	Oil filter cap to oil filter housing		Nm	40	40
BA18.20-N-1002-01C	Oil filter, oil-water heat exchanger housing to crankcase		Nm	50	50
BA18.20-N-1003-01C	Screw plug to oil filter housing	M14×1.5	Nm	25	25
		M16×1.5	Nm	25	25
		M24×1.5	Nm	25	25
		M33×2	Nm	65	65

Nm **Oil level, oil pressure sensor**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.40-N-1001-01D	Oil pressure sensor to oil filter housing	Nm	40	40

Nm **Coolant pump, coolant thermostat**

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA20.10-N-1003-01D	Coolant pipe to coolant pump	M8	Nm	25	25

Nm **Fuel pipes/hoses**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA47.25-N-1009-01B	Bracket of fuel pipe to oil filter housing	Nm	25	25

AS20.00-Z-0001-01A	Risk of injury to skin and eyes from scalding from hot coolant which splashes out..Risk of poisoning from swallowing coolant.	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	⚠ Danger!

Possible dangers

Risk of injury
The cooling system is pressurized when the engine is warm. Risk of scalding from hot coolant which splashes out if the cooling system is opened suddenly.

Risk of poisoning
If coolant is swallowed, the person affected is likely to show signs of poisoning such as headaches, giddiness and stomach aches, paralysis of the respiratory system, unconsciousness, nausea, and convulsions.

Protective measures/rules of conduct
- Allow cooling system to cool down to a coolant temperature of less than 90 °C.
- Open coolant system cap slowly; open a conventional type of coolant system cap to the first detent and open a screw-type coolant system cap about $^1/_2$ turn, and allow the pressure to release.
- Wear protective gloves, protective clothes, and eye protection.
- Do not pour coolant into containers for drinks.

First aid measures
- Pour large quantities of cold water over the affected area of skin and cover over with sterile bandages.
- Have person affected drink plenty of water to which medicinal carbon has been added.
- Consult a doctor if the person affected has severe burns or has swallowed considerable quantities.

AH20.00-N-2080-01A	Instructions re coolant		

Coolant composition
Passenger car and commercial vehicle engine (normal case):
50 % by volume water and
50 % by volume anticorrosion/antifreeze agent.
See MB Specifications for Service Products for differing coolant composition for commercial vehicle engines.

Purposes of anticorrosion/antifreeze agent
- Corrosion and cavitation protection for all components in the cooling system
- Antifreeze protection
- Increasing boiling point so that the coolant does not evaporate so rapidly. Ejection of coolant is avoided at high coolant temperatures.

Antifreeze protection
50 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. **–37 °C**.
A higher concentration is only practical at even lower ambient temperatures.
55 % by volume of anticorrosion/antifreeze concentration offers antifreeze protection down to approx. **–45 °C**.

(19) Before pouring fresh coolant into the system, flush the used coolant out of the cooling system. Clean cooling system if severe soiling or oil contamination exist.

(13) A concentration of anticorrosion/antifreeze agent higher than 55 % by volume should not be used as the maximum antifreeze protection is thus reached. An even higher concentration again reduces the antifreeze protection and impairs heat dissipation.

Water
Use water which is clean and not too hard. Drinking water frequently, but not always, satisfies the requirements. The contents of dissolved substances in the water can be of importance for the occurrence of corrosion. In cases of doubt, analyze the water. See MB Specifications for Service Products for fresh water regulations.

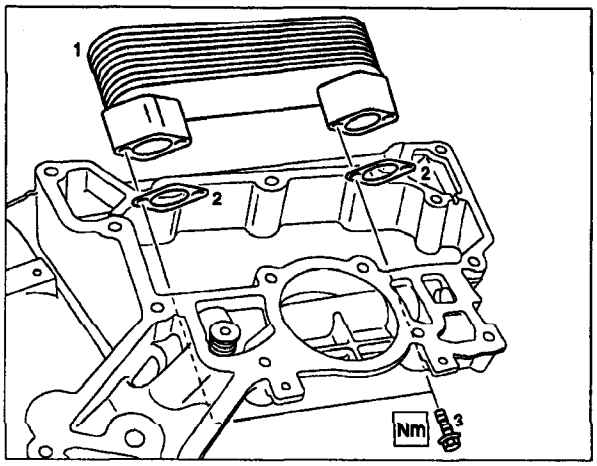
Operation of monitoring of coolant
Inspect coolant for resistance to low temperatures before the start of the cold season of the year.
In countries with high ambient temperatures, inspect the anticorrosion/antifreeze concentration once a year.
The corrosion protection in the coolant is reduced during operation. Such coolants have a severely corrosive effect.
The maximum permissible period of use of the coolant is for passenger car and commercial vehicle engines (normal case) **3 years**.
See MB Specifications for Service Products for the period of use for differing coolant composition for commercial vehicle engines.

Disposing of coolants
Observe legal regulations and local wastewater regulations.
For workshops located in the Federal Republic of Germany see:
"Umweltschutz-Handbuch für Kfz-Reparaturbetriebe"
(Environmental protection manual for vehicle repair workshops)
Publisher: Verband der Automobilindustrie e.V. (VDA)
D-60625 Frankfurt am Main, Westendstraße 61

AR18.30-W-6840B	Removing and installing the oil/water heat exchanger	17.10.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Oil-water heat exchanger
2 Gaskets
3 Bolt



W18.30-0002-11

	Removing, installing		
1	Remove oil filter housing		**Page 26**
2	Remove oil-water heat exchanger (1)	i Oil-water heat exchanger should be replaced if external damage exists and if material abrasion present in engine oil. i Installation: clean sealing surfaces and replace gaskets (2). Nm Oil-water heat exchanger to oil filter housing	BA18.30-N-1001-01D
3	Install in the reverse order		

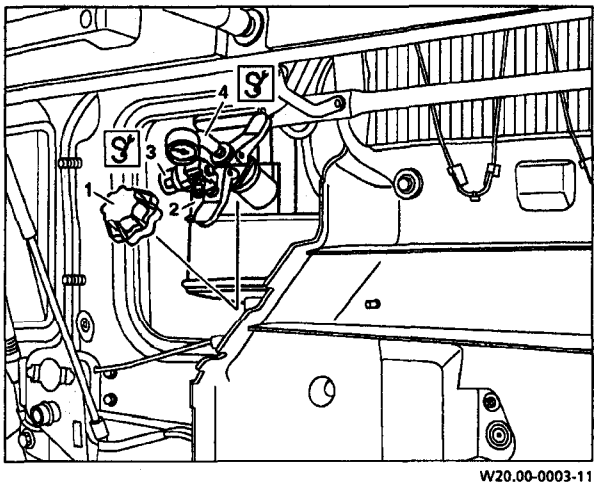
Nm **Oil cooling system**

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA18.30-N-1001-01D	Oil-water heat exchanger to oil filter housing	Nm	25	25

AR20.00-W-1010A	Checking cooling system for leaks	11.12.96

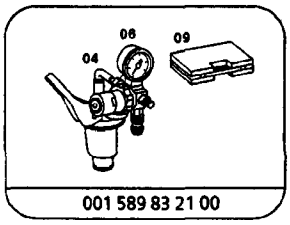
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Cap
2 Expansion reservoir
3 Adapter
4 Tester



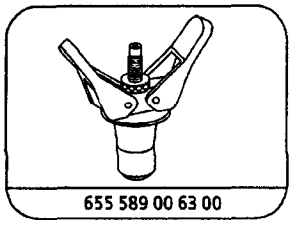
W20.00-0003-11

	Checking		
⚠ Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 29**
1	Open cap (1) at expansion reservoir (2)	Release pressure and then unscrew cap.	
(19)	Notes re coolant	All engines	**Page 30**
2	Set heater switches to maximum heating capacity		
3	Inspect coolant level	Adjust coolant level to correct level, if necessary.	AP20.00-W-2010A
4	Attach adapter (3) and tester (4) to expansion reservoir (2)		001 589 83 21 00 655 589 00 63 00
5	Fill cooling system at tester (4) with compressed air	Test pressure about 1.0 bar gage If there is a leak in cooling system, a pressure drop is visible at gage, if necessary ↓ inspect cooling and heating hoses, coolant pipes and connection points for condition and loss of coolant. Inspect hose clips for condition and correct installation.	
6	Detach adapter (3) and tester (4) at expansion reservoir	Release pressure.	655 589 00 63 00
7	Rectify leak in cooling system	Retighten or replace hose clips. Replace gaskets, cooling and heating hoses.	
8	Screw cap (1) tight onto expansion reservoir (2)	Adjust coolant to correct level	AP20.00-W-2010A



001 589 83 21 00

Tester



655 589 00 63 00

Adapter

AR20.00-W-1030B	Removing grease and scale in cooling system	10.11.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

	Removing grease		
⚠ **Danger!**	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 29**
1	Drain coolant completely and collect		AP20.00-W-2080A
Ⓘ	Notes re coolant	All engines	**Page 30**
2	Fill cooling system with a 5 % solution of mildly alkaline cleaner and fresh water	P3 Croni Mixing ratio: 50 g cleaner to 1 liter water	BR00.45-Z-1011-04A
		Grisiron 7220	BR00.45-Z-1012-04A
⚠ **Danger!**	Risk of accident as a result of vehicle starting off when engine running. Risk of injury as a result of bruises and burns if you insert your hands into engine when it is being started or when it is running.	Secure vehicle to prevent it moving off. Wear closed close-fitting work clothes. Do not touch hot or rotating parts.	**Page 19**
3	Warm up engine speed to a coolant temperature of approx. 80 °C at moderate revs and maintain this coolant temperature for about 5 minutes	ⓘ If necessary, the radiator can be covered over.	
4	Switch off engine and allow coolant temperature to cool down to about 50 °C		
5	Drain solution completely from cooling system	ⓘ Dispose of solution in accordance with environmental regulations.	
6	Flush cooling system twice with fresh water; run the engine each time for about 5 minutes	ⓘ Dispose of water in accordance with environmental regulations.	
	Removing scale		
7	Fill cooling system with a 10 % solution of water and citric, tartaric or oxalic acid	ⓘ Before removing scale, always remove grease in cooling system even if there is no visible sign of oiling. Chromic acid or products containing chrome must not be used in order to avoid pollution of the wastewater. ⓘ It is best to use citric acid. Mixing ratio: 100 g citric acid to 1 liter water. ⓘ Chemicals for preparing solutions can also be obtained from the chemical trade. Commercially available products composed of the acids mentioned, can also be used for removing scale and rust.	
8	Warm up engine to about 80 °C at moderate revs and hold at this temperature for about 10 minutes		
9	Switch off engine and allow to cool down to about 50 °C		

10	Drain solution completely	ⓘ Dispose of solution in accordance with environmental regulations.	
11	Rinse cooling system at least 3 times with fresh water; run engine each time for 5 minutes	ⓘ Dispose of water in accordance with environmental regulations.	
12	Fill cooling system with specified coolant and inspect for leaks		AP20.00-W-2080A

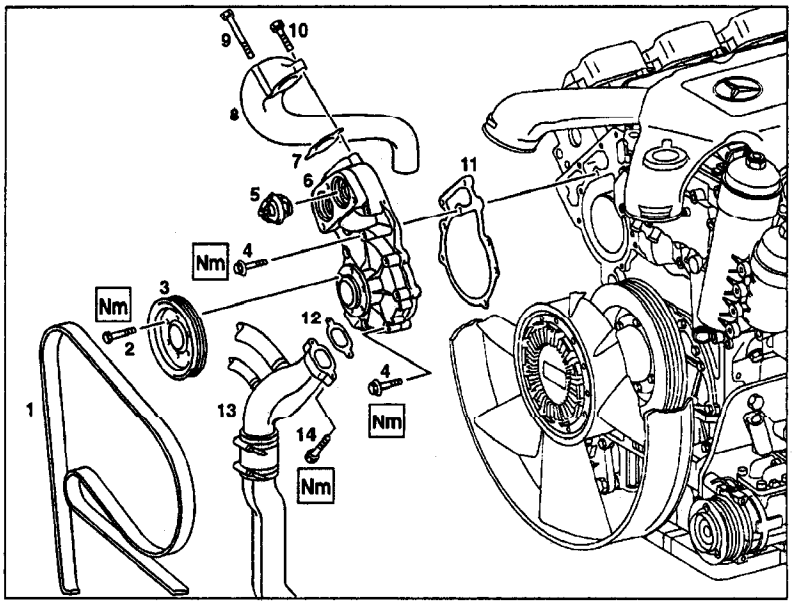
Repair products

Number	Designation	Order number
BR00.45-Z-1011-04A	P3 Croni	Henkel
BR00.45-Z-1012-04A	Grisiron 7220	Hoechst

AR20.10-W-1271B	Removing and installing engine coolant pump	14.6.96

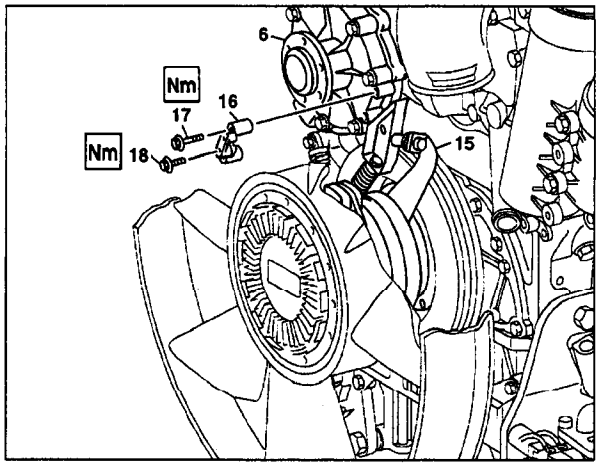
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Poly V-belt
2 M8×12 bolt
3 Belt pulley
4 M8×60 bolt
5 Coolant thermostat
6 Coolant pump
7 Gasket
8 Coolant pipe (retarder)
9 M10×90 bolt
10 M10×50 bolt
11 Gasket
12 Gasket
13 Coolant pipe
14 Bolt



W20.10-0011-06

6 Coolant pump
15 Fan drive
16 Support
17 Bolt
18 Bolt



W20.10-0012-11

⊠ ⊠	Removing, installing		
1	Remove noise encapsulation	i at right and bottom	
2	Remove coolant thermostat (5)		Page 43
3	Slacken belt pulley (3)	i Counterhold belt pulley Nm Belt pulley to coolant pump	BA20.10-N-1002-01D
4	Slacken poly V-belt (1) and take off		AR13.22-W-1202B
5	Remove belt pulley (3)		
6.1	Detach fan drive (15) and support (16) and rotate	Nm On engine 542.922/923	BA20.40-N-1004-01C
6.2	Detach support (16) at coolant pump (6)	Nm On engine 542.922/923	BA20.40-N-1005-01C

7.1	Detach coolant pipe (8) at coolant pump (6)	With retarder Installation: replace gasket (7) Coolant pipe to coolant pump	 BA20.10-N-1005-01D
8	Detach coolant pipe (13) at coolant pump (6)	Collect coolant which flows out Installation: replace gasket (12) Coolant pipe to coolant pump	 BA20.10-N-1005-01D
9	Remove coolant pump (6) and take off gasket (11)	Installation: replace gasket (11) Coolant pump to crankcase	 BA20.10-N-1001-01D
10	Clean sealing surfaces on crankcase and coolant pump (6)		
11	Install in the reverse order		
12	Inspect coolant level		AP20.00-W-2080A

Coolant pump, coolant thermostat

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA20.10-N-1001-01D	Coolant pump to crankcase		Nm	25	25
BA20.10-N-1002-01D	Belt pulley to coolant pump		Nm	25	25
BA20.10-N-1005-01D	Coolant pipe (inlet connection) to coolant pump	M10	Nm	50	50

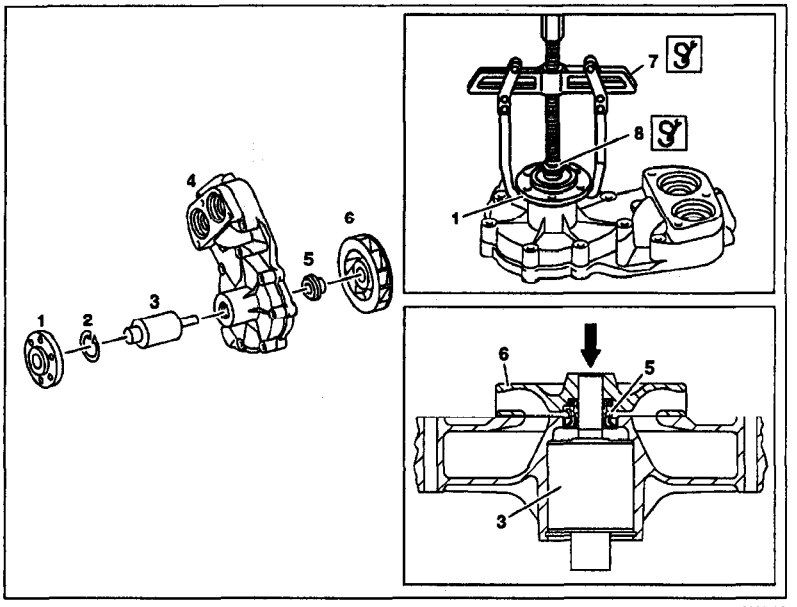
Fan, fan clutch

Number	Designation		Engine 542.922/ 923
BA20.40-N-1004-01C	Fan drive to support	Nm	30
BA20.40-N-1005-01C	Support to coolant pump	Nm	30

AR20.10-W-1401B	Disassembling, assembling coolant pump	4.9.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

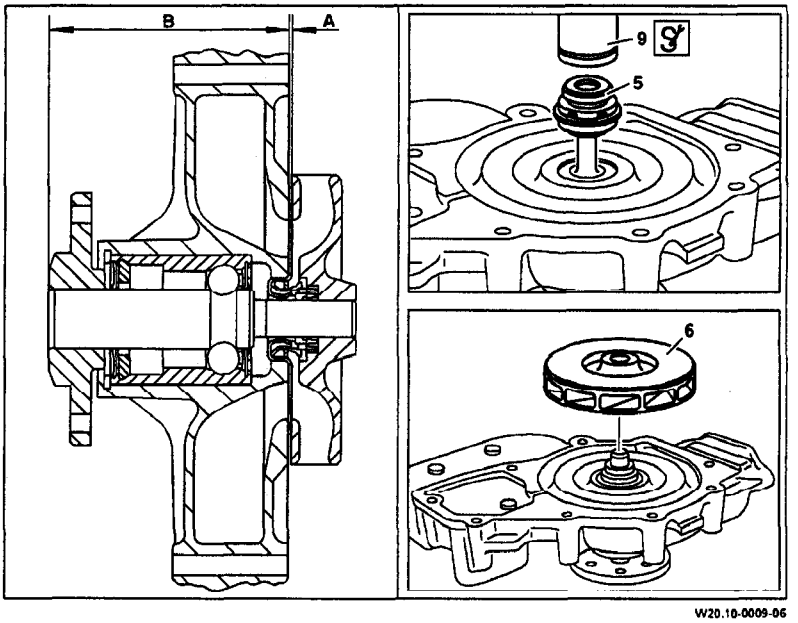
1 *Flange*
2 *Circlip*
3 *Bearing with shaft*
4 *Coolant pump housing*
5 *Cassette-type seal*
6 *Impeller*
7 *Puller*
8 *Thrust piece*



W20.10-0008-06

5 *Cassette-type seal*
6 *Impeller*
9 *Drift*

A *Gap between impeller and coolant pump housing*
B *Clearance between coolant pump housing and flange*



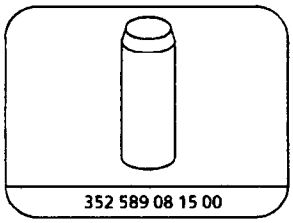
W20.10-0009-06

	Disassembling		
1	Remove coolant pump		Page 36
2	Pull flange (1) off bearing shaft (3)	000 589 65 33 00 321 589 00 63 00	
3	Remove circlip (2)		

4	Use a suitable drift to press bearing shaft (3) out of impeller (6) and coolant pump housing (4)	Fixed workshop press 65 t	WE58.40-Z-1001-12A
5	Remove cassette-type seal (5)		
	Assembling		
6	Oil outer race of bearing (3) with engine oil and press into the coolant pump housing (4) with a suitable drift	Press in bearing only at outer race Fixed workshop press 65 t	 WE58.40-Z-1001-12A
7	Install circlip (2)		
8	Heat flange (1) and press onto bearing shaft (3)	Heat flange to about 80 °C. Counterhold at bearing shaft when pressing on. Measure dimension (B) clearance between coolant pump housing (4) and flange (contact surface of belt pulley). Fixed workshop press 65 t	BE20.10-N-1002-01C WE58.40-Z-1001-12A
9	Fit on new cassette-type seal (5) over the bearing shaft (3) and press in as far as coolant pump housing (4) with the drift	 Inspect seat of cassette-type seal on shaft and in coolant pump housing	352 589 08 15 00
10	Press impeller (6) onto bearing shaft (3)	Counterhold at bearing shaft when pressing on Measure size of gap (A) between impeller and coolant pump housing (4) Feeler gage	 BE20.10-N-1001-01C WH58.30-Z-1008-12A
11	Rotate coolant pump at flange (1) and check to ensure it runs freely		
12	Install coolant pump		**Page 36**

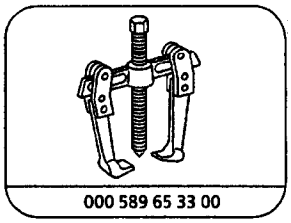
Test and setting data of coolant pump

Number	Designation		Engine 541.920/921/922/923/924/925/926/927	Engine 542.920/921/922/923/925/926
BE20.10-N-1001-01C	Gap beween impeller and coolant pump housing (A)	mm	0,6–1,0	0,6–1,0
		Fig. see	AR20.10-W-1401-01A	AR20.10-W-1401-01A
BE20.10-N-1002-01C	Clearance between coolant pump housing and flange (B)	mm	100	100
		Fig. see	AR20.10-W-1401-01A	AR20.10-W-1401-01A



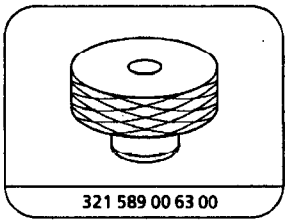
352 589 08 15 00

Drift



000 589 65 33 00

Puller



321 589 00 63 00

Thrust piece

Commercially available tools (see Workshop Equipment Manual)

Number	Designation	Make (e.g.)	Order number
WH58.30-Z-1008-12A	Feeler gage	Stiefelmayer D–73734 Esslingen	59

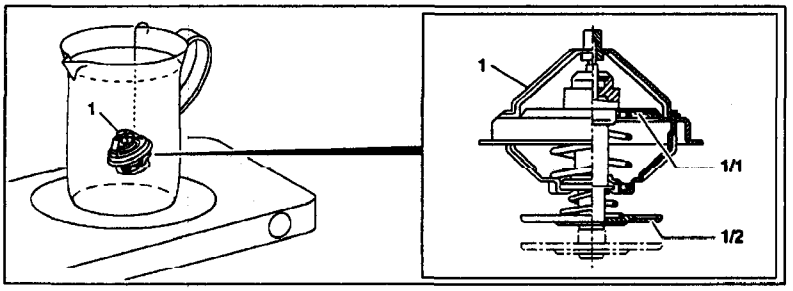
Workshop equipment/MB testers (see Workshop Equipment Manual)

WE58.40-Z-1001-12A	Fixed workshop press 65 t, e.g. Matra-Werke GmbH, D-60314 Frankfurt/Main

AR20.10-W-2455A	Testing coolant thermostat	19.7.95

ENGINE 904.905 /906 /907 /908 /909 /910 /911 /921 /922, 906.910 /911 /920 /921 /922 /923
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926
ENGINE 906.940 /941

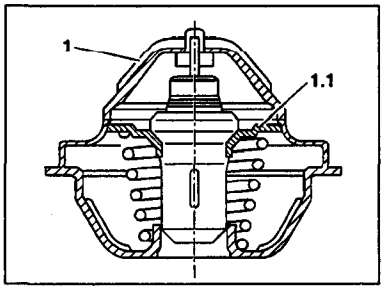
1 Coolant thermostat
1/1 Main valve
1/2 Bypass valve



W20.10-0005-04

Shown on engine 906.920- 923

1 Coolant thermostat
1/1 Main valve



W20.10-1001-01

	Testing		
1	Remove coolant thermostat (1)	On engine 904.905 - 907/909- 911/921/922 and 906.910/911/920- 923/940/941 On engine 904.908 in model 668, 670 On engine 541.920 - 927 On engine 542.920 - 923/925/926	AR20.10-W-2460A **Page 43**
2	Suspend coolant thermostat (1) with a wire in a vessel filled with water		
⚠ Danger! 3	Risk of injury to skin and eyes through handling hot or glowing objects Use a suitable source of heat to heat the water. Stir water so that the water temperature is the same at all points.	Wear safety gloves, protective clothes and if necessary, eye protection. ⑲ On no account use a welding torch or soldering iron for heating the coolant thermostat (1).	**Page 42**
4	Measure water temperature	ℹ The rate at which the water is heated up should not be more than 1° to 2 °C/min. from about 8 °C below the start of opening of the coolant thermostat. Pay attention to standard or tropical version of coolant thermostat (1).	BE20.10-N-1001-02A BE20.10-N-1001-02B
5.1	Heat water to the full opening temperature of the bypass valve (1/2)	ℹ Except engine 906.920- 923	BE20.10-N-1003-02A BE20.10-N-1003-02B
6	Heat water to the full opening temperature of the main valve (1/1) and measure stroke	ℹ The main valve (1/1) must be fully open after 6 to 8 minutes. If the test values are not achieved ↓	BE20.10-N-1002-02A

			BE20.10-N-1002-02B
		Replace coolant thermostat (1).	BE20.10-N-1002-02A
7	Install coolant thermostat (1)	On engine 904.905 - 907/909- 911/921/922 and 906.910/911/920- 923/940/941 On engine 904.908 in model 668, 670 On engine 541.920 - 927 On engine 542.920 - 923/925/926	AR20.10-W-2460A Page 43

Test data of coolant thermostat

Number	Designation		Engines 904.904/905/906/907/908/909/910/911/915/916/917/921/922/923/926/932, 906.910/911/915/916/919/9229/932/933
BE20.10-N-1001-02A	Coolant thermostat - start of opening	°C	83±2
BE20.10-N-1002-02A	Coolant thermostat - main valve fully open at temperature and min. stroke (A)	°C	95
		mm	8
BE20.10-N-1003-02A	Coolant thermostat - bypass valve closed at	°C	92

Test data of coolant thermostat

Number	Designation		Engines 541.920/921/922/923/924/925/926/927	Engines 542.920/921/922/923/925/926
BE20.10-N-1001-02B	Coolant thermostat - start of opening	°C	83±2	83±2
BE20.10-N-1002-02B	Coolant thermostat - main valve	fully open at °C	95	95
		Stroke in mm	≥8	≥8
BE20.10-N-1003-02B	Coolant thermostat - bypass valve closed at	°C	92	92

AS00.00-Z-0002-01A	Risk of injury to skin and eyes from handling hot or glowing objects	Wear heat resistant gloves, protective clothing and protective goggles if necessary	⚠ Danger!

Injury hazard

Contact with hot or glowing objects without suitable protective clothing can cause severe burns to skin and eyes.

When glowing objects make contact with water hot water vapor and droplets are produced which can lead to severe burns to skin and eyes.

If hot or glowing objects come into contact with unprotected skin or eyes severe, possibly permanent damage can result.

ⓘ Contact between glowing objects and combustible materials poses a fire hazard.

Protective measures/rules of behavior

- Wear protective clothing, protective goggles and heat resistant gloves.
- Transport hot or glowing objects only with the aids provided for such purposes.
- Avoid formation of sparks and contact with combustible materials when handling glowing objects.

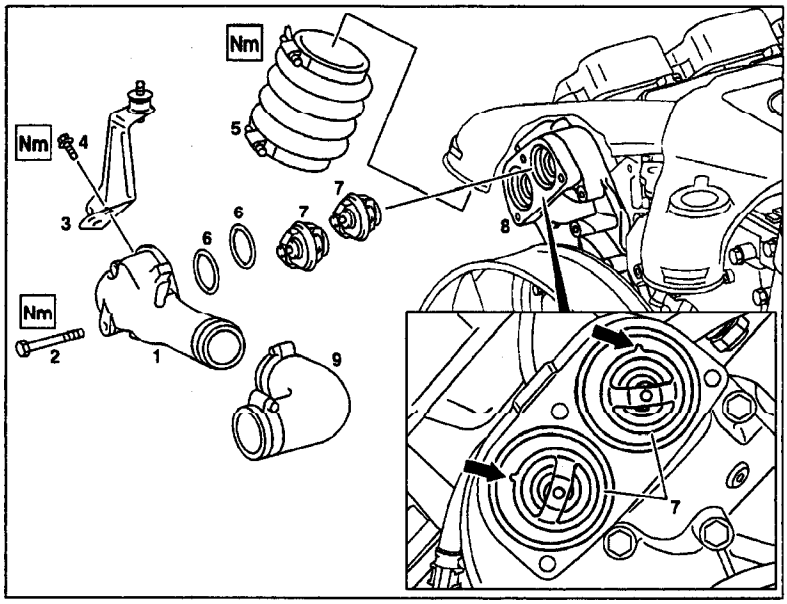
First-aid measures

- Rinse affected areas of skin with large quantities of cold water and cover with sterile dressings.
- Consult physician immediately.

AR20.10-W-2460B	Removing and engine installing coolant thermostat	14.6.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Coolant fitting
2 Bolt
3 Bracket for plate-type air cleaner
4 Bolt
5 Charge air hose (red)
6 Seals
7 Coolant thermostat
8 Coolant pump
9 Coolant hose



W20.10-0010-06

	Removing, installing		
⚠ **Danger!**	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
1	Tilt cab		
Ⓘ	Notes re tilting cab	Model 950, 952, 953, 954	**Page 4**
2	Remove noise encapsulations	side right	
3	Remove red charge air hose (5)	Inspect condition of charge air hose and hose clips, replace if necessary Installation: charge air hoses must not be mixed up. Ⓘ Red charge air hose is temperature-resistant and must be installed between charge air pipe and intercooler Nm Charge air hose to charge air housing/charge air pipe and intercooler	BA09.41-N-1006-01C
4.1	Remove plate-type air cleaner	If plate-type air cleaner fitted	
5.1	Bracket (3) for plate-type air cleaner	If plate-type air cleaner fitted Nm Front bracket to suspension eye or coolant fitting	BA09.00-N-1001-01A
⚠ **Danger!**	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 29**

6 Ⓘ	Drain coolant Notes re coolant	Collect coolant. All engines	AP20.00-W-2080A **Page 30**
7	Remove coolant fitting (1)	Collect coolant which flows out. Coolant pipe to coolant pump	 BA20.10-N-1003-01D
8	Remove coolant thermostat (7)	Installation: replace seals (6). Pay attention to installation position of coolant thermostat; the vent openings (arrows) must always face up	
9	Test coolant thermostat (7)		**Page 41**
10	Install in the reverse order		
11	Inspect coolant level		AP20.00-W-2080A

Air intake, turbocharging, general

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.00-N-1001-01A	Front bracket to lifting eye or coolant fitting	Nm	25	25

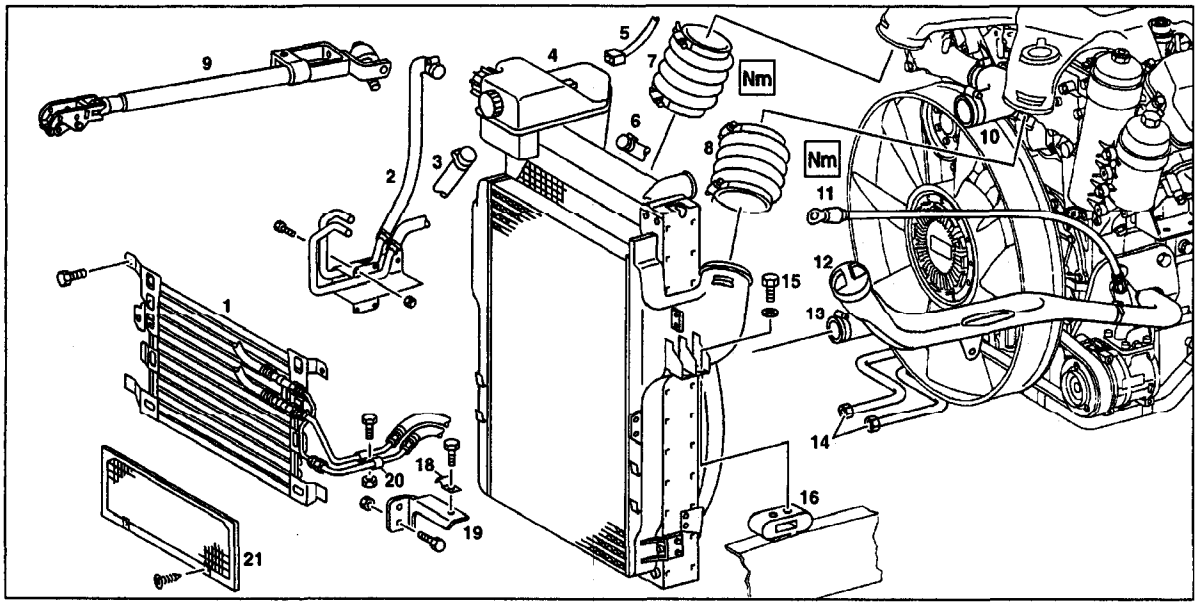
Charge air pipe/intercooler

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.41-N-1006-01C	Charge air hose to charge air housing/charge pipe and intercooler	Nm	7,5	7,5

Coolant pump, coolant thermostat

Number	Designation			Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA20.10-N-1003-01D	Coolant pipe to coolant pump	M8	Nm	25	25

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

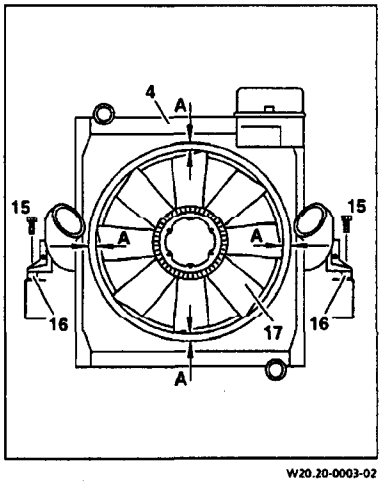


W20.20-0002-09

1 Heat exchanger (air conditioning)
2 Bracket with heating pipes
3 Coolant hose (vent)
4 Radiator with intercooler and coolant expansion reservoir
5 Plug connector
6 Coolant hose
7 Charge air hose (red)
8 Charge air hose (black)
9 Selector rod
10 Coolant hose (coolant pump)
11 Dipstick guide tube
12 Oil filler pipe
13 Coolant hose
14 Gear oil pipes
15 Bolt
16 Radiator mounting
18 Clip (refrigerant pipes)
19 Bracket (refrigerant pipes)
20 Clips (refrigerant pipes)
21 Protective grille

4 Radiator with intercooler and coolant expansion reservoir
15 Bolt
16 Radiator mounting
17 Viscous fan

A Clearances between radiator shroud and viscous fan



W20.20-0003-02

	Removing, installing		

Additional Information

⚠ Danger!	Risk of injury to skin and eyes from scalding from hot coolant which splashes out. Risk of poisoning from swallowing coolant	Do not open the cooling system unless the coolant temperature is below 90 °C. Open cap slowly and allow the pressure to release. Do not pour coolant into containers for drinks. Wear protective gloves, protective clothes, and eye protection.	**Page 29**
(P)	Notes re coolant	All engines	**Page 30**
(P) Installation	Replace all self-locking nuts and bolts		
1	Drain coolant	ℹ Collect coolant.	AP20.00-W-2080A
2	Open maintenance flap		
3.1	Remove bracket (19) at bottom left of intercooler	If A/C fitted	
4.1	Detach clips (20) at both coolant pipes	If A/C fitted ℹ Do not disconnect coolant pipes.	
5.1	Remove heat exchanger (1) at intercooler	If A/C fitted ℹ Tie up heat exchanger at cab mounting. Do not disconnect coolant pipes.	
6	Remove protective grille (1) at intercooler		
7	Detach gear oil pipes (14) at bottom of radiator (4)	ℹ Collect gear oil which flows out. Seal openings with plugs.	
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
8	Tilt cab		
(P)	Notes re tilting cab	Model 673 - 679, 950, 952, 953, 954	**Page 4**
9.1	Detach air cleaner housing above engine	If plate-type air cleaner	
10	Remove noise encapsulation at side and below		
11.1	Detach selector rod (9) at relay lever, push together and tie up at cab	ℹ If MPS transmission	
12	Unplug connector (5) of coolant gage at coolant expansion reservoir (4)		
13	Remove charge air hoses (7, 8)	ℹ Inspect condition of charge air hoses and hose clips, replace if necessary. ℹ Installation: Charge air hoses must not be mixed up. (P) Red charge air hose (7) is temperature-resistant and always has to be installed between charge air pipe and intercooler (4). Nm	BA09.41-N-1006-01C
14	Detach coolant hoses (3, 6, 10, 13)	ℹ Collect coolant which flows out. Inspect condition of coolant hoses and hose clips, replace if necessary.	
15	Remove bracket, oil filler pipe (12) and dipstick guide tube (11) and tie up at engine		
16	Unscrew bolts (15) at radiator mounting (16)	ℹ Inspect radiator mounting (16) for wear, replace if necessary.	

17	Lift radiator together with intercooler and coolant expansion reservoir (4) up and out	1 Attach tackle to intercooler to side left and right. (19) Do not damage radiator and intercooler, coolant expansion reservoir and heat exchanger of air conditioning (1). 1 Installation: After inserting the radiator, center radiator to viscous fan until the same clearance exists on all sides between radiator shroud and the viscous fan.	
18	Install in the reverse order		
19	Inspect coolant level and adjust to correct level		AP20.00-W-2010A
20	Inspect cooling system for leaks		AP20.00-W-2050A
21	Inspect gear oil level	1 Top up oil to lower edge of oil filler opening	AP26.00-W-2601A

Nm Charge air pipe/intercooler

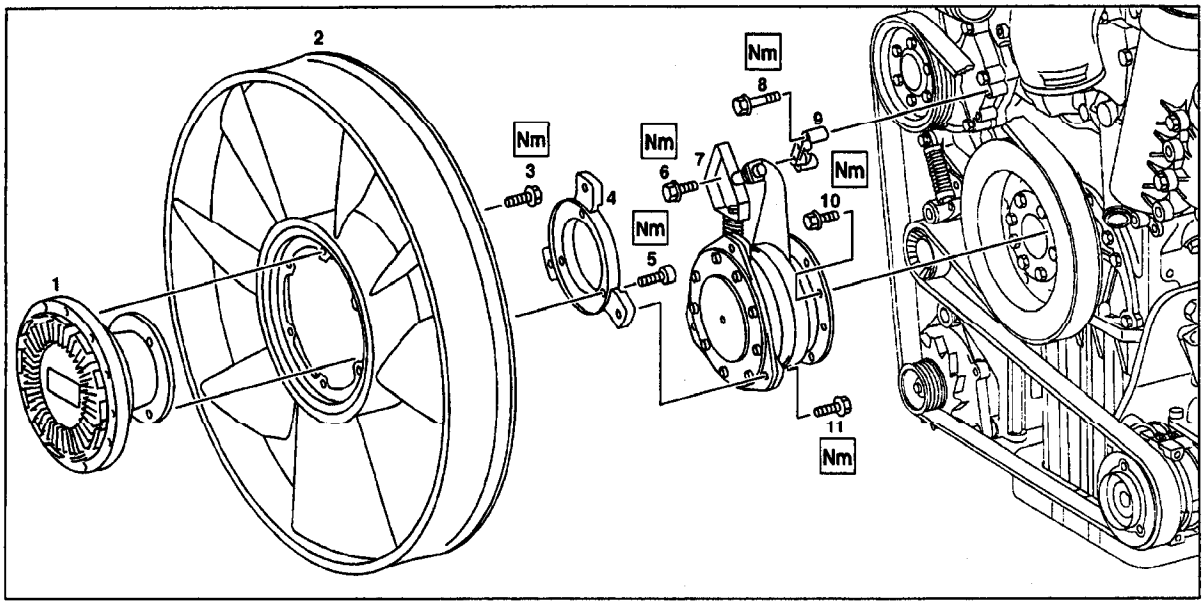
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA09.41-N-1006-01C	Charge air hose to charge air housing/ charge air pipe and intercooler	Nm	7.5	7.5

Nm Fan, fan clutch

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/925/926
BA20.40-N-1001-01C	Viscous fan clutch to intermediate piece	Nm	50	50
BA20.40-N-1002-01C	Fan to viscous fan clutch	Nm	30	30

AR20.40-W-5614B	Removing and installing fan	17.12.96

ENGINE 542.922 /923



W20.40-0002-09

1 *Viscous fan clutch*
2 *Fan*
3 *Bolt*
4 *Intermediate piece*
5 *Bolt*
6 *Bolt*
7 *Fan drive*
8 *Bolt*
9 *Support*
10 *Bolt*
11 *Bolt*

	Removing, installing		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	Page 4
1	Tilt cab		
	Notes re tilting cab	Model 950, 952, 953, 954	Page 4
2	Remove noise encapsulation	bottom and side right	
3	Take off cover (TDC inspection hole) at timing case	End cover to timing case	BA01.60-N-1001-01B
4	Block engine at flywheel	Use a suitable tool to block flywheel at ring gear	
5	Detach viscous fan clutch (1) together with fan (2) and intermediate piece (4) at fan drive (7) and take down and out	Installation: viscous fan clutch and fan should be stored upright for at least 1 hour before installing Fan drive to intermediate piece	 BA20.40-N-1006-01C
6	Detach fan drive (7) at support (9)	Fan drive to support	BA20.40-N-1004-01C
7	Detach fan drive (7) at vibration damper	Fan drive to vibration damper	BA20.40-N-1003-01C
8	Detach intermediate piece (5) and viscous fan clutch (1)	Viscous fan clutch to intermediate piece	BA20.40-N-1001-01C

9	Detach viscous fan clutch (1) at fan (2)	Nm Fan to viscous fan clutch	BA20.40-N-1002-01C
10	Detach support (9) at coolant pump	Nm Support to coolant pump	BA20.40-N-1005-01C
11	Install in the reverse order		

Nm **Timing case**

Number	Designation		Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-018	End cover of TDC inspection hole to timing case	Nm	25

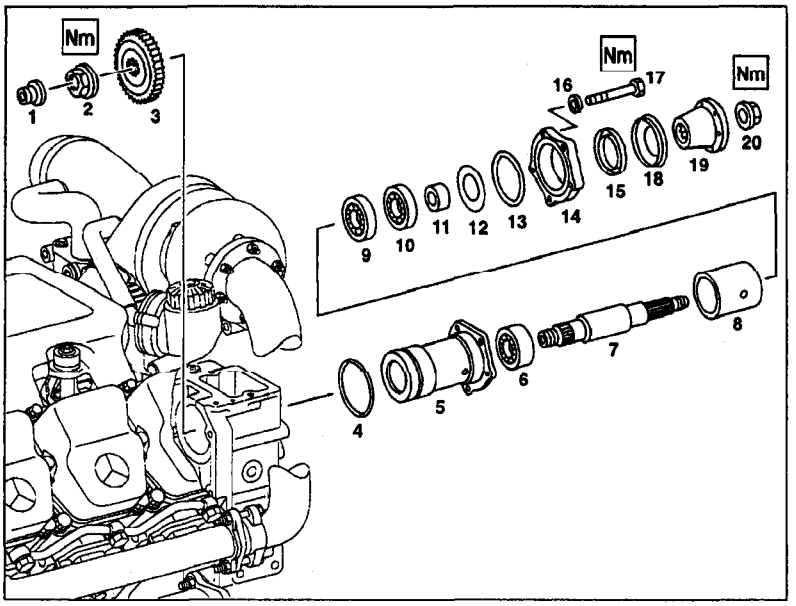
Nm **Fan, fan clutch**

Number	Designation		Engine 542.922/ 923
BA20.40-N-1001-01C	Viscous fan clutch to intermediate piece	Nm	50
BA20.40-N-1002-01C	Fan to viscous fan clutch	Nm	30
BA20.40-N-1003-01C	Fan drive to vibration damper	Nm	30
BA20.40-N-1004-01C	Fan drive to support	Nm	30
BA20.40-N-1005-01C	Support to coolant pump	Nm	30
BA20.40-N-1006-01C	Fan drive to intermediate piece	Nm	50

AR23.20-W-9440A	Disassembling and assembling rear engine output	20.3.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926
with CODE (N51) Rear engine output, output torque 392 Nm
with CODE (N52) Rear engine output, output torque 600 Nm

1 *Oil spray nozzle*
2 *Nut*
3 *Gear*
4 *O-ring*
5 *Bearing housing*
6 *Roller bearing*
7 *Shaft*
8 *Spacer tube*
9 *Ball bearing*
10 *Roller bearing*
11 *Race*
12 *Shim*
13 *O-ring*
14 *Bearing cap*
15 *Radial seal*
16 *Spring lock washer*
17 *Bolt*
18 *Cover plate*
19 *Output flange*
20 *Nut*



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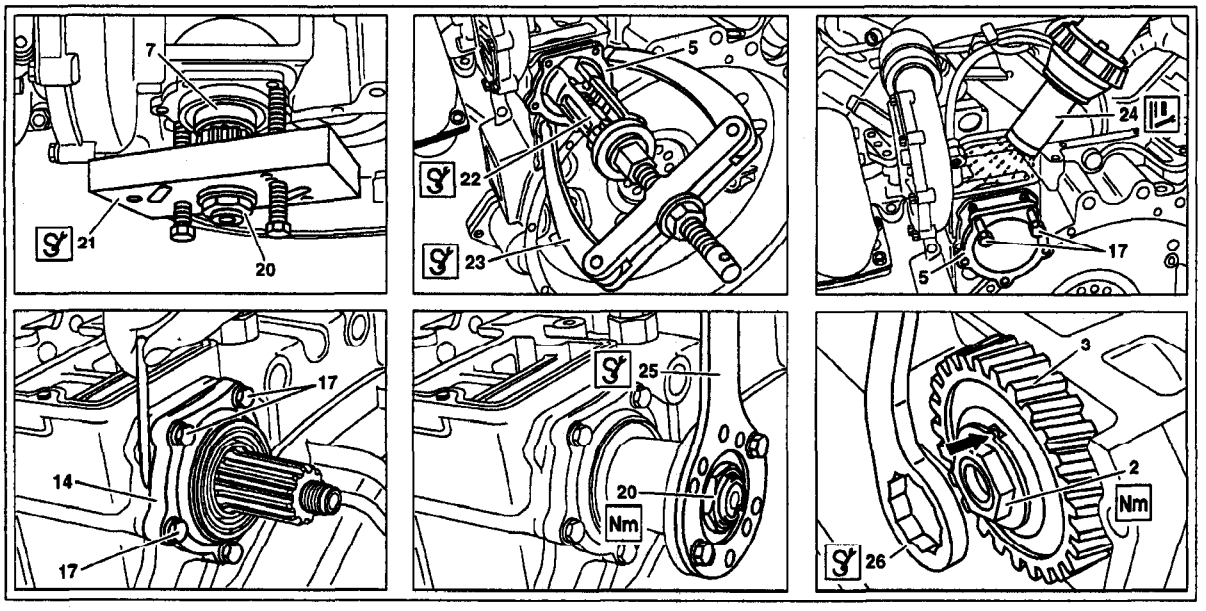
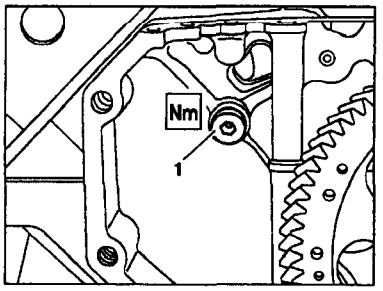


W23.20-0009-09

2 *Nut*
3 *Gear*
5 *Bearing housing*
7 *Shaft with bearing*
14 *Bearing cap*
17 *Bolt*
20 *Nut*

21 *Puller*
22 *Internal extractor*
23 *Countersupport*
24 *Hot air blower*
25 *Retaining wrench*
26 *Box wrench*

1 Oil spray nozzle



W23.20-0010-01

	Disassembling		
⚠ Danger!	**Risk of injury from bruises and jamming when tilting cap**	**No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.**	**Page 4**
1	Tilt cab		
(i)	Notes re tilting cab	Models 950, 952, 953, 954	**Page 4**
2	Detach propeller shaft		
3	Detach right and rear noise encapsulation		
4	Remove timing case cover		AR01.40-W-8000A
5	Slacken nut (2) for gear (3) with box wrench (26)	1 Counterhold output flange (19).	
		S	402 589 03 03 00
		S	460 589 01 31 00
6	Unscrew nut (20)	1 Counterhold flange (19) with retaining wrench (25).	
		S	460 589 01 31 00
7	Take off output flange (19) and cover plate (18)		
8	Remove bearing cap (14)	1 Collect engine oil which flows out.	
9	Take off O-ring (13) and shim (12)		
10	Tighten nut (20) with puller (21)	(i) Place protective padding below the bolt of the puller.	
		S	745 589 00 33 00
11	Use puller (21) to pull out shaft (7) and bearings (6, 9, 10) and at the same time unscrew nut (2)		
12	Take input gear (3) out of the timing case		
13	Take spacer tube (8) out of the bearing housing (5)		
14	Use internal extractor (22) and counter-support (23) to pull bearing housing (5) out of the timing case	(i) Place protective pads below the countersupport (23)	
		S	000 589 35 33 00
		S	000 589 68 33 00
15	Take off O-ring (4) at bearing housing (5)		

16	Remove bearings (6, 9, 10) at the shaft (7) and install		**Page 56** 001 589 19 33 00
	Assembling		
17	Check that oil nozzle (1) in the crankcase is tightly located	Oil nozzle to crankcase	BA01.40-N-1006-01D
18	Fit O-ring (4) over the bearing housing (5)	Replace O-ring	
19	Insert bearing housing (5) in the timing case	Machined face pointing toward timing case cover. Fix bearing housing in place with bolts.	
20	Heat timing case with hot air blower and knock bearing housing (5) into the timing case		
21	Insert spacer sleeve (8) into the bearing housing (5)	Pay attention to locking lug.	
22	Insert shaft (7) with bearings (6, 9, 10) into the bearing housing (5)	When inserting the shaft, fit the input gear (3) over the splines and screw in the new nut (2) onto the thread of the shaft.	
23	Insert radial seal (15) and O-ring (13) into the bearing cap (14) Fit on shim (12)		
24	Install bearing cap (14)	Tighten bolts (17) diagonally to 10 Nm.	
25	Measure distance between bearing cap (14) and bearing bush (5)	Specification = 0.10 mm to 0.20 mm. If the distance is greater, install a thinner shim (12); if the distance is less, install thicker shim.	
26	Tighten bearing cap (14)	Bearing housing to timing case	BA23.20-N-1001-01A
27	Fit cover plate (18) onto the shaft (7)		
28	Install input flange (19)	Replace nut (20) and secure. Counterhold input flange. Output flange to shaft	 460 589 01 31 00 BA23.20-N-1003-01A
29	Use box wrench (26) to tighten nut (2) at the gear (3) and secure	Counterhold input flange (19) with retaining wrench (25). Input gear to shaft	 460 589 01 31 00 402 589 03 03 00 BA23.20-N-1002-01A
30	Install timing case cover		AR01.40-W-8000A
31	Fit on propeller shaft		
32	Install noise encapsulation		
⚠ Danger! 33	Risk of injury from bruises and jamming when tilting cap Tilt cab in direction of travel	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	**Page 4**
34	Start engine	Crank engine with starter for not more than 20 seconds. Wait about 2 minutes before making a repeat attempt at starting.	

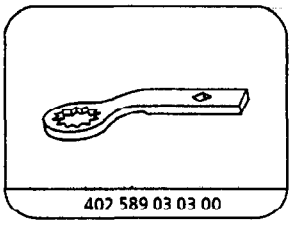
35.1	Check engine oil level at electric gage	Only if oil level sensor is parameterized. See ACTROS Operating Instructions Part 3	
35.2	Check engine oil level with dipstick	If oil level sensor is not parameterized. See ACTROS Operating Instructions Part 4	
36	Switch off engine and check for leaks		

Crankcase, timing case cover, end cover

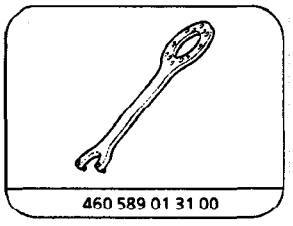
Number	Designation		Engine 541.920/ 921/922/ 923/924/ 925/926/ 927	Engine 542.920/ 921/922/ 923/925/ 926
BA01.40-N-1006-01D	Oil nozzle for oil supply (PTO) to crankcase	M18×1.5 Nm	80	80

Rear engine outpout

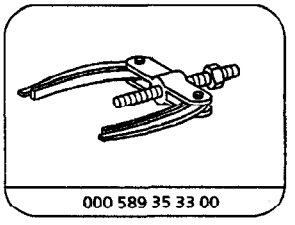
Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA23.20-N-1001-01A	Bearing housing to timing case	Nm	25	25
BA23.20-N-1002-01A	Input gear to shaft	Nm	300	300
BA23.20-N-1003-01A	Output flange to shaft	Nm	300	300



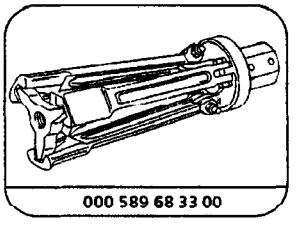
Box wrench



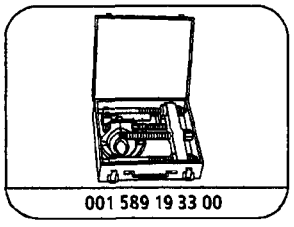
Retaining wrench



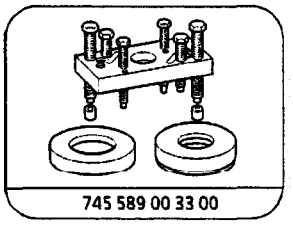
Countersupport



Internal extractor

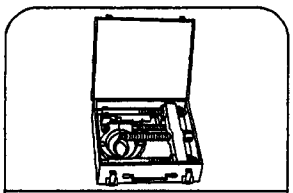


Puller



Pulling device

AR23.20-W-9440-02A	Removing and installing bearings in rear engine output		



001 589 19 33 00

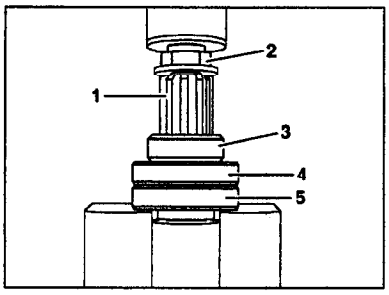
Puller

1 Press the bearings (4, 5) and bearing race (3) at the output end off the shaft (1).

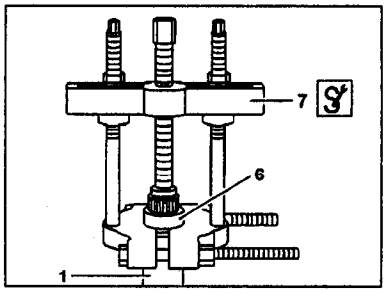
Screw nut (2) flush onto the shaft (1) as a protection for the thread.

2 Use puller (7) to pull bearing inner race (6) for the input end roller bearing off the shaft (1).

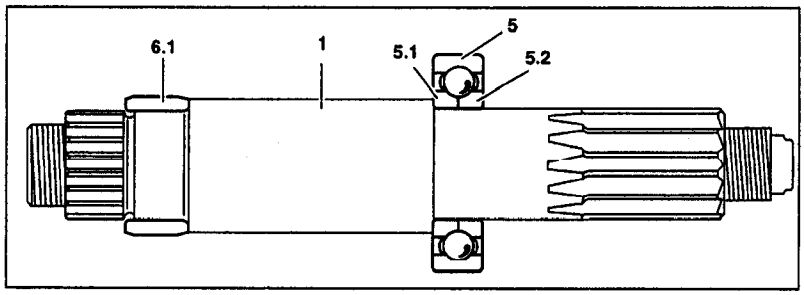
3 Heat inner race (6.1) for rear bearing on a heating plate to about 80° C and fit it onto the shaft (1) at the input end.



W23.20-0002-01



W23.20-0003-01



W23.20-0004-04

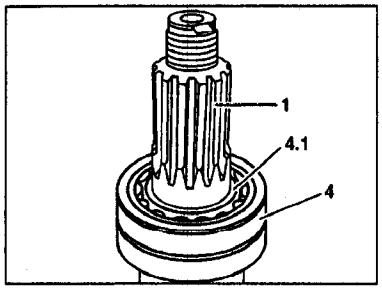
4 Heat first half of split inner race (5.1) of angular-contact ball bearing (5) to about 80° C and fit onto the shaft (1) - at output side.

5 Fit ball bearing (5) onto the bearing inner race (5.1).

6 Heat second half of the split inner race (5.2) of the angular-contact ball bearing to about 80° C, fit it onto the shaft (1) and press it fully on.

7 Heat inner race (4.1) - at output side - of roller bearing to about 80° C, fit onto the shaft (1) and press into final position.

8 Fit roller bearing (4) onto the bearing inner race (4.1).



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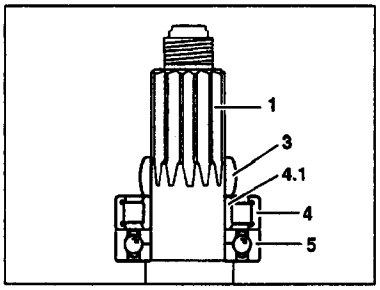
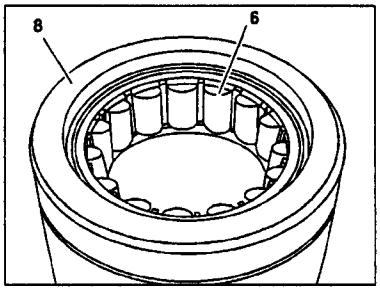


W23.20-0006-01

9 Heat race (3) for the shaft seal to about 80° C and fit it onto the shaft (1).

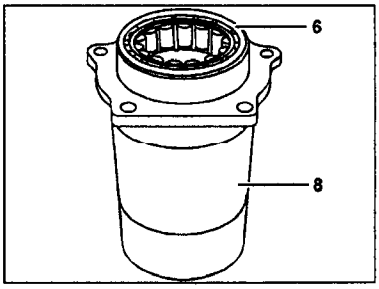
10 Oil both bearings (4, 5).

11 Press input end roller bearing (6) out of the bearing flange (8).



W23.20-0007-01

12 Insert roller bearing (6) into the bearing flange (8).
Oil roller bearing (6).



W23.20-0008-01

		Nm Suction line on elbow/power steering pump Nm Pressure line on connection piece/power steering pump	BA46.30-N-1003-01C BA46.30-N-1006-01C
6	Detach power steering pump/fuel pump unit (1) from timing case	i Installation: Replace O-ring (2) and turn power steering pump/fuel pump unit shaft until the guide of the cross-type disc (3) is upright. Nm Power steering pump/fuel pump on timing case	 BA46.30-N-1001-01C
7	Remove cross-type disc (3)	i Installation: Turn engine with turning device until the cross-type disc guide on the compressor crankshaft is horizontal, put on cross-type disc and secure with grease to prevent it from slipping.	
8	If power steering pump/fuel pump unit (1) is replaced, rebuild connection piece (5) and elbow (10)	i Installation: Replace sealing rings (4,7). Nm Suction line elbow on power steering pump Nm Pressure line connection piece on power steering pump	 BA46.30-N-1002-01C BA46.30-N-1005-01C
9	Install in reverse order		
10	Bleed fuel system		Page 61
11	Replenish hydraulic fluid in steering system and bleed system		AR46.25-W-3300A

Nm Timing case

Number	Designation		Engines 541.920/921/922/923/924/925/926/927	Engines 542.920/921/922/923/925/926
BA01.60-N-1001-01B	End cover, TDC inspection hole on timing case	Nm	25	25

Nm Power steering pump

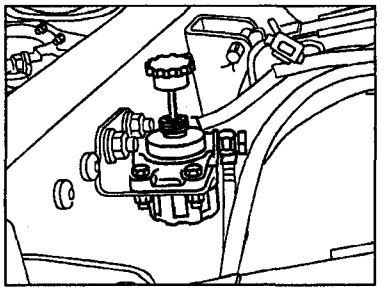
Number	Designation		Steering 765.889 with engine 541, 542
BA46.30-N-1001-01C	Power steering pump/fuel pump on timing case	Nm	60
BA46.30-N-1002-01C	Suction line elbow on power steering pump	Nm	80
BA46.30-N-1003-01C	Suction line on elbow/power steering pump	Nm	100
BA46.30-N-1005-01C	Pressure line connection piece on power steering pump	Nm	80
BA46.30-N-1006-01C	Pressure line on connection piece/power steering pump	Nm	80

AP47.00-W-1720-01A	Bleeding air in fuel system		

1 Loosen handle on manual pump.

2 Actuate manual pump until overflow valve opens audibly.

3 Tighten handle on manual pump.



N07.57-0208-01

AR47.20-W-5712A	Removing and installing fuel pump/power steering pump unit	8.10.96

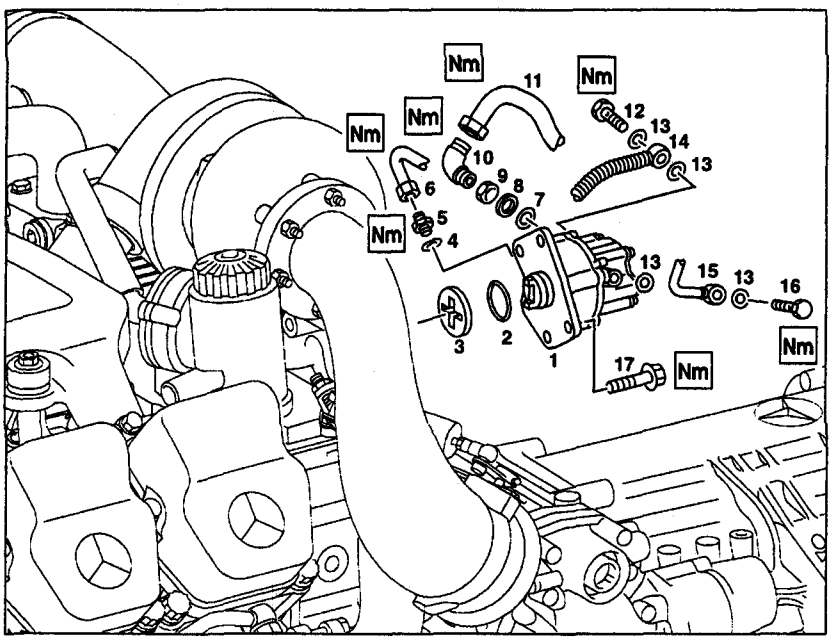
ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

	Removing, installing		
	Remove fuel pump/power steering pump unit, install		Page 58

AR46.30-W-0400A	Removing and installing power steering/fuel pump unit	8.10.96

STEERING 765.889 with ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /922 /923 /925 /926

1 Power steering pump/fuel pump unit
2 O-ring
3 Cross-type disc
4 Sealing ring
5 Connection piece
6 Steering line (pressure)
7 Sealing ring
8 Pressure ring
9 Nut
10 Elbow
11 Steering line (suction)
12 Banjo bolt
13 Sealing ring
14 Fuel line (suction)
15 Fuel line (pressure)
16 Banjo bolt
17 Bolt



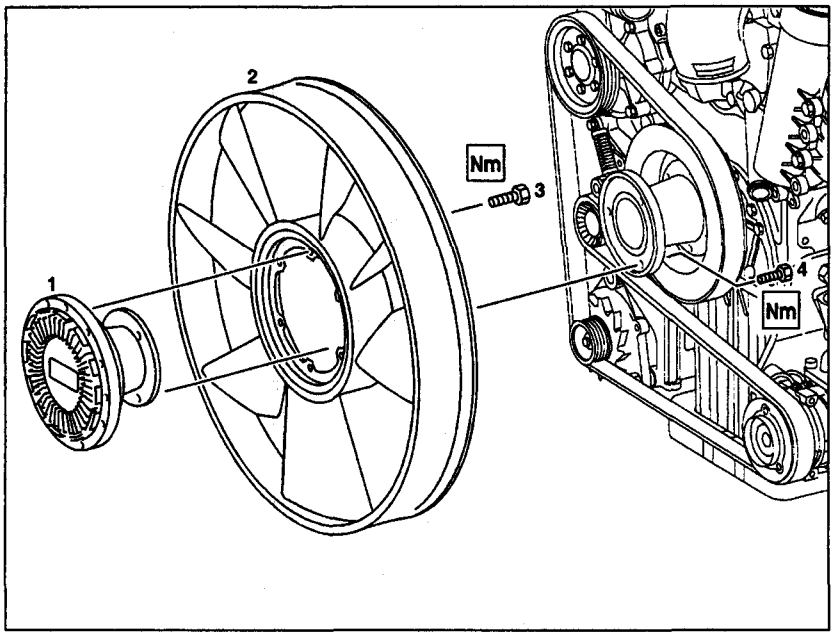
W46.30-0003-06

	Removing, installing		
⚠ **Danger!**	**Risk of injury due to being trapped or crushed when tilting the cab.**	**Nobody should be within the tilting range of the cab while tilting. Always tilt the cab up to its final position and secure with a safety support.**	**Page 4**
1	Tilt cab		
	Notes on tilting cab	Models 950, 952, 953, 954	**Page 4**
2	Remove engine encapsulation	ℹ below	
3	Attach turning device for engine to timing case	The turning device must be removed before starting the engine. 407 589 00 63 00 Nm End cover on timing case	 BA01.60-N-1001-01B
⚠ **Danger!**	**Risk of explosion due to ignition, risk of poisoning from inhaling and swallowing fuel as well as risk of injury due to fuel coming into contact with the skin and eyes.**	**Fire, sparks, naked flame and smoking forbidden. Only pour fuels into suitable, appropriately marked containers. Wear protective clothing when handling fuel.**	**Page 60**
4	Remove fuel lines (14, 15) on power steering pump/fuel pump unit (1)	ℹ Collect fuel which runs out. Installation: Replace sealing rings (13). Nm Fuel line on fuel pump	 BA47.25-N-1002-01B
5	Detach steering lines (6, 11) from power steering pump/fuel pump unit (1)	ℹ Steady connection piece (5) and elbow (10) when loosening and collect any hydraulic fluid which runs out. ℹ Installation: Steady connection piece (5) and elbow (10) when tightening	

AR20.40-W-5614A	Removing and installing fan	29.10.96

ENGINE 541.920 /921 /922 /923 /924 /925 /926 /927, 542.920 /921 /925 /926

1 *Viscous fan clutch*
2 *Fan*
3 *Bolt*
4 *Bolt*



W20.40-0001-06

	Removing, installing		
⚠ Danger!	Risk of injury from bruises and jamming when tilting cap	No person should be in the tilting area of the cab when it is being tilted. Always tilt cab as far as the end position and secure with a safety prop.	Page 4
1	Tilt cab		
	Notes re tilting cab	Model 950, 952, 953, 954	Page 4
2	Remove noise encapsulation	bottom	
3	Take off cover at timing case	End cover at timing case	BA01.60-N-1001-01B
4	Block engine at flywheel	Use a suitable tool to block flywheel at ring gear	
5	Detach viscous fan clutch (1) together with fan (2) at intermediate piece and take down and out	Installation: viscous fan clutch and fan should be stored upright for at least 1 hour before installing Viscous fan clutch to intermediate piece	BA20.40-N-1001-01C
6	Detach viscous fan clutch (1) at fan (2)	Fan to viscous fan clutch	BA20.40-N-1002-01C
7	Install in the reverse order		

Timing case

Number	Designation		Engine 541.920/ 921/922/923/ 924/925/926/927	Engine 542.920/ 921/922/923/ 925/926
BA01.60-N-1001-01B	End cover of TDC inspection hole to timing case	Nm	25	25