01–001 Engine and model survey

Engine	Model	Sales designation	kW at 1/min
110.921[1])	114.060	280	118/5500
110.921[1])	114.073	280 C	118/5500
110.922[1])	116.020	280 S	118/5500
110.923	123.030	280	115/5500
110.923 NV	123.030	280	105/5500
110.923	123.050	280 C	115/5500
110.923 NV	123.050	280 C	105/5500
110.924	126.021	280 S	115/5500
110.924 NV	126.021	280 S	115/5500
110.931 NV	114.060	280	107/5500
110.931 NV	114.073	280 C	107/5500
110.932 NV	116.020	280 S	107/5500
110.981	114.062	280 E	136/6000
110.981	114.072	280 CE	136/6000
110.982	107.022	280 SLC	136/6000
110.982	107.042	280 SL	136/6000
110.983	116.024	280 SE	136/6000
110.983	116.025	280 SEL	136/6000
110.984	123.007[2])	280 E Special body long	130/6000
110.984[1])	123.033	280 E	130/6000
110.984	123.053	280 CE	130/6000
110.984	123.093	280 TE	130/6000
110.985[1])	116.024	280 SE	130/6000
110.985[1])	116.025	280 SEL	130/6000
110.986	107.022	280 SLC	130/6000
110.986	107.042	280 SL	130/6000
110.987	126.022	280 SE	136/5800
110.987	126.023	280 SEL	136/5800
110.991 NV	114.062	280 E	125/6000
110.991 NV	114.072	280 CE	125/6000
110.992 NV	107.022	280 SLC	125/6000
110.992 NV	107.042	280 SL	125/6000
110.993 NV	116.024	280 SE	125/6000
110.993 NV	116.025	280 SEL	125/6000

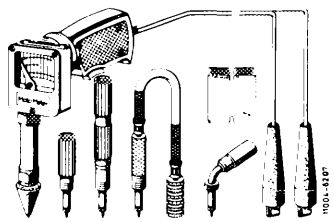
[1]) for USA
2) Sweden only
NV = low compression (SA 012.276)
SA = special equipment

01–010 Checking compression

Test values in bar for engine at operating temperature

Engine	Compression ratio ε : 1	Compression normal	Min. Compression	Max. difference between separate cylinders
Normal compression	9,0	10–12	approx. 8,5	
Low compression				max. 1,5
(USA) (S) (J) starting 1976 (AUS) starting 1977	8,0	9–10	approx. 7,5	

Special tool

Compression recorder with attachments and contact grip.		001 589 46 21 00

Notes

Check compression with coolant at temperature of 80° C.

Check cylinders for leaks if compression is less than the minimum specification (01–015).

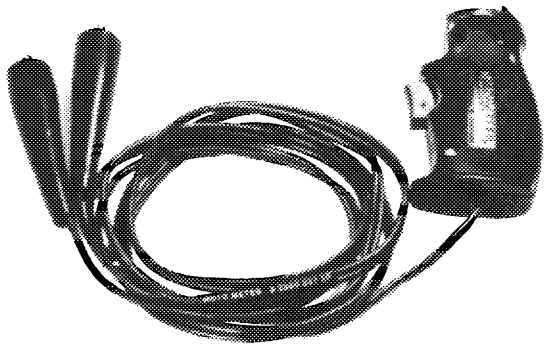
Unscrew all spark plugs for testing.

Checking

Models 107, 114 and 116

Connect contact handle to battery + and terminal 50 on starter.

Disconnect cable on ignition coil terminal 1.

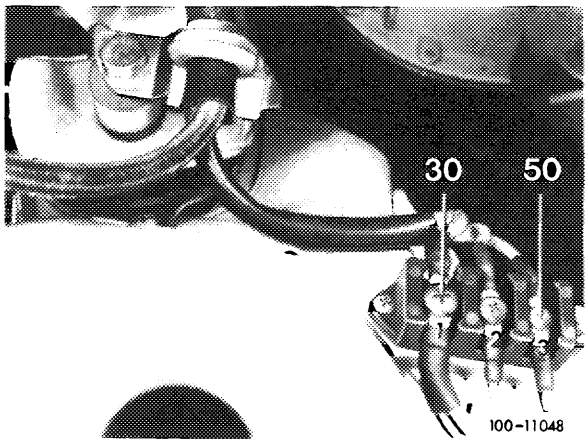


105-9061

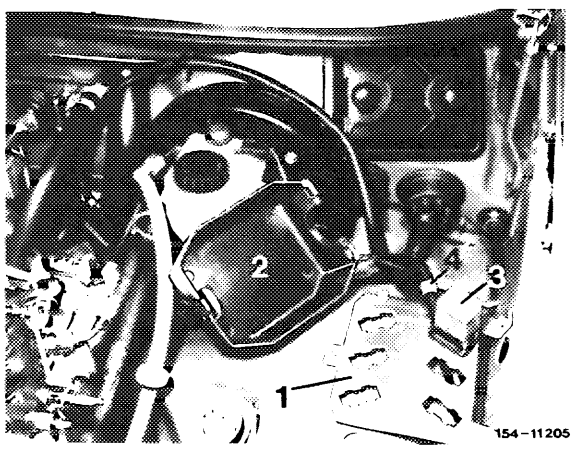
Model 123

Connect contact handle to terminal 30 and to terminal 50 on cable connector.

Disconnect cable on ignition coil terminal 1.

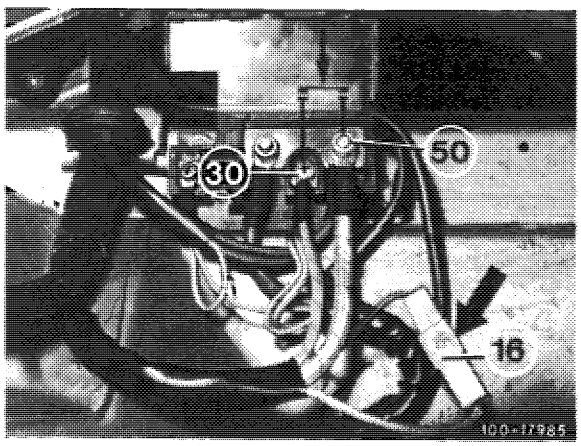


Attention!
On engines with CIS injection system, pull-off relay with code number 21 (3) for fuel pump—warm-up compensator.



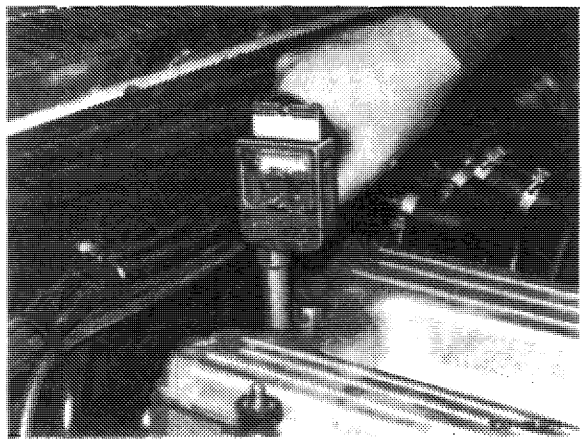
Model 126

Separate cable plug, arrow terminal 16, so that the ignition coil, and on engines with CIS the fuel pump, cannot be activated. Connect terminal 30 and 50.



1 Rotate engine for several turns with ignition switched off and idle speed or selector lever position „P" so that residue and soot will be blown out.

2 For testing, rotate engine for eight turns while opening throttle valve.

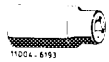


01–015 Checking cylinders for leaks

Data

Total pressure loss	max 25%
On valves and cylinder head gasket	max 10%
On piston and piston rings	max 20%

Special tool

Socket 27 mm for rotating engine		001 589 65 09 00

Conventional tool

Cylinder leak tester	e.g. made by Bosch, EFAW 210 A made by SUN, CLT 228

Checking

1 Run engine up to operating temperature.

2 Unscrew spark plugs.

3 Remove radiator cap and add coolant.

4 Remove oil filler plug.

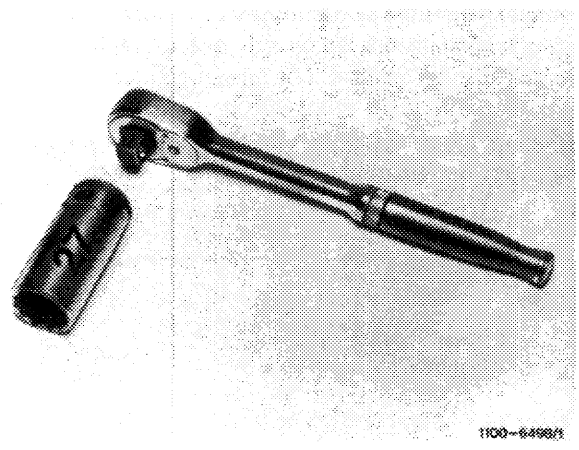
5 Remove air filter.

6 Connect cylinder leak tester to a compressed air source. Calibrate tester.

7 Set piston of cylinder 1 to ignition TDC.

For this purpose, turn engine on crankshaft by means of tool combination.

8 Set throttle valve to fully open.

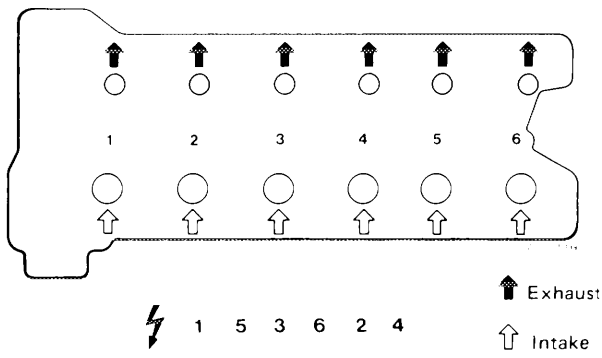


9 Screw connection hose into first spark plug bore and couple to connecting hose of tester. Crankshaft should not rotate.

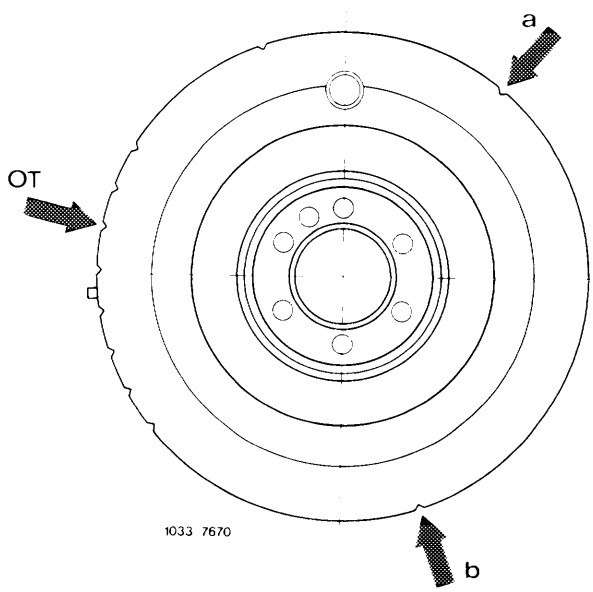
10 Read pressure loss on tester.

11 Check by listening whether pressure escapes via intake pipe, exhaust, oil filler cap, spark plug bore of adjacent cylinder or radiator cap.

12 Check all cylinders in ignition sequence.



Note: The respective pistons are in TDC position when the markings on vibration damper as shown in adjacent drawing are below TDC indicator.



TDC position of pistons

TDC Piston 1 and 6
a Piston 3 and 4
b Piston 2 and 5

Note: There is the possibility that the piston ring gaps of individual pistons are directly one above the other, so that the test result will be misrepresented.

When in doubt, continue running vehicle and check cylinders for leaks once again later on.

01–020 Evaluating cylinder bores

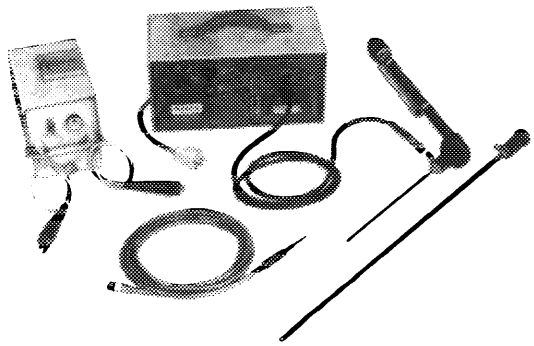
Conventional tool

Cylinder illuminating lamp	e.g. made by Karl Storz GmbH, 7200 Tuttlingen Motoskop TW (cold light) with lens attachment 210 mm long.

Note

Visual inspections can be made with a cylinder illuminating lamp on mounted cylinder head.

When illuminating because of oil consumption or blue smoke, run engine warm, shut off and illuminate cold, or immediately following deceleration (coasting).



103-15713

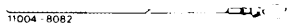
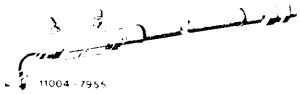
When evaluating scored or streaky cylinder walls, it is often no easy job for a workshop to decide whether the respective damage is bad enough to require removal of engine or repairs, or whether the marks are insignificant. The following information will help in making an expert and correct decision.

With regard to marks on cylinder walls the first important difference is between "optical streaks" and "seizure streaks". In most cases "optical streaks" are about 3 mm wide, they are produced by the piston ring gaps and the honing structure will still be visible; while "seizure streaks" will obliterate the honing structure.

"Longitudinal streaks" (in piston pin direction) are not the result of shaft scratches or seizure, since there is no contact between piston skirt and cylinder wall.

01–025 Measuring oil consumption

Special tools

Oil dipstick with millimeter scale for engines with oil suction		115 589 15 21 00
Oil dipstick with millimeter scale for engines without oil suction		110 589 11 21 00
Telethermometer		116 589 27 21 00
Valve for interrupting oil return flow from oil cooler		110 589 00 91 00

Note

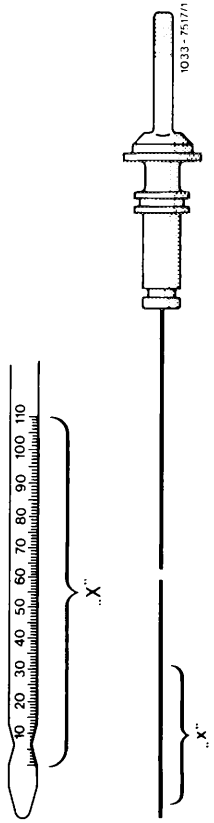
The oil consumption can be measured by means of oil dipstick with millimeter scale and the pertinent diagram on back of data sheet.

Data sheets

Engine 110	Print no.
Engines with oil suction	800 99 403 00 German/English 800 99 403 01 French/Spanish
Engines without oil suction	800 99 227 00 a German/English 800 99 227 01 a French/Spanish

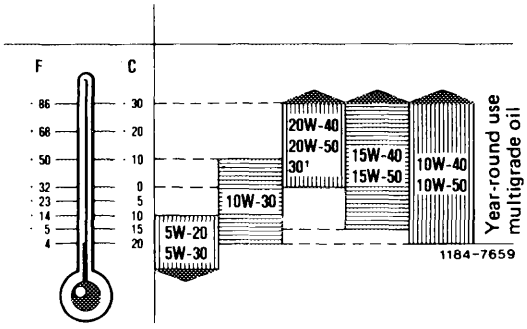
The measuring procedure is explained on front page of data sheet.

To avoid faulty measuring, check engine oil for dilution by fuel prior to measuring.



01–030 Removal and installation of engine (oil filling capacity)

Specified viscosity classes
according to SAE
during constant outside temperatures



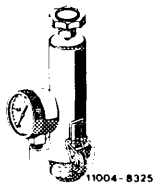
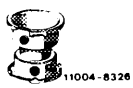
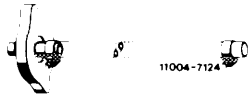
¹) During constant outside temperatures above + 30°C (+ 86° F) SAE 40 may be used.

Oil filling capacity in liters (for approved engine oil grades refer to specifications for service products)

Color code of oil dipstick	total capacity when refilling engine
Wine red pink brown (USA 1975/76 only)	7
yellow-green	6.5

Tightening torques		Nm
Oil drain plug to oil pan		40
Fastening screw for oil filter lower half		40
Screws for engine carrier on engine mount front	M 12	70
	M 10	40

Special tools

Tester for cooling system and radiator cap	 11004-8325	001 589 48 21 00
Double connection for radiator cap test in combination with tester	 11004-8326	000 589 73 63 00
Radiator cap with hose for leak test	 11004-7124	605 589 00 25 00

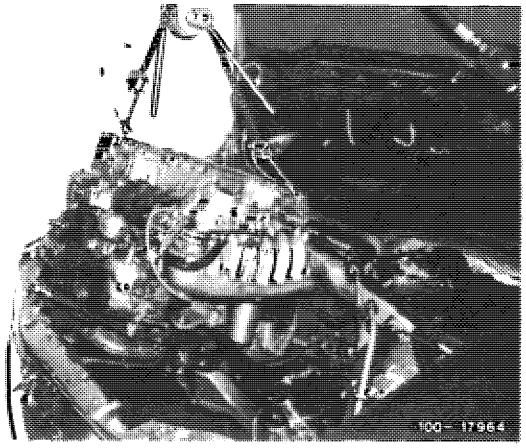
Conventional tool

Engine hoist (Motordirigent) size 1.5	e.g. made by Bäcker, D-5630 Remscheid order no. 3178

Note

Remove and install engine with transmission by means of an engine hoist in diagonal position.

If removal and installation is performed on a lifting platform, the engine of model 126 can be placed on cross yoke center piece at the rear during installation.

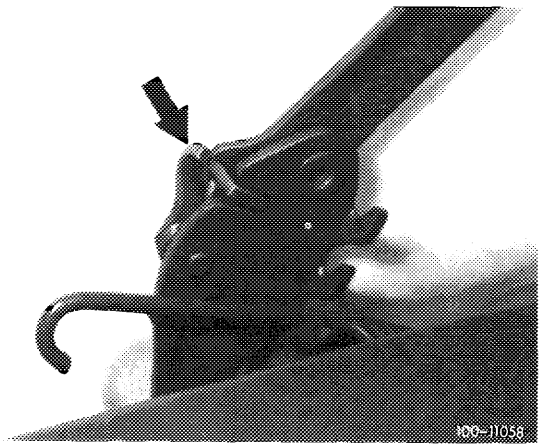


Removal

1 On model 123 and 126 move engine hood into 90° position and let left-hand locking lever (arrow) engage.

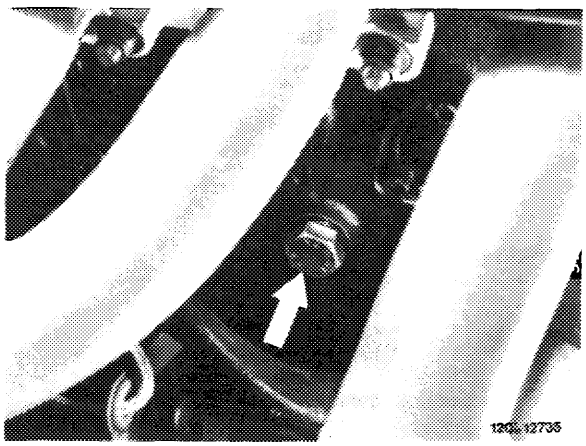
On other models, remove engine hood.

2 Disconnect battery cable.



3 Drain coolant (arrow).

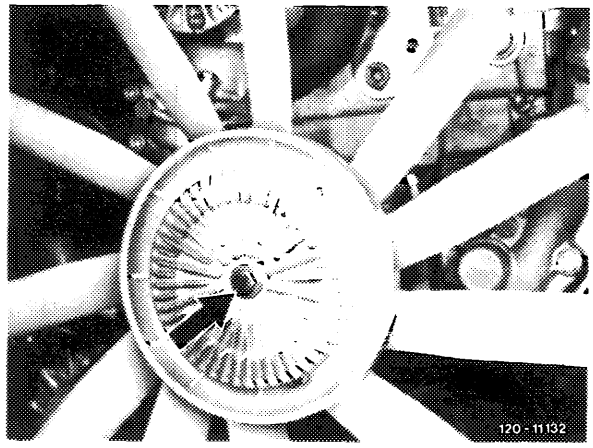
4 Disconnect and close lines for air oil cooler and transmission oil cooler on radiator and close, so that no oil will run out.



5 Remove radiator together with air oil cooler, while suspending fan cover over fan.

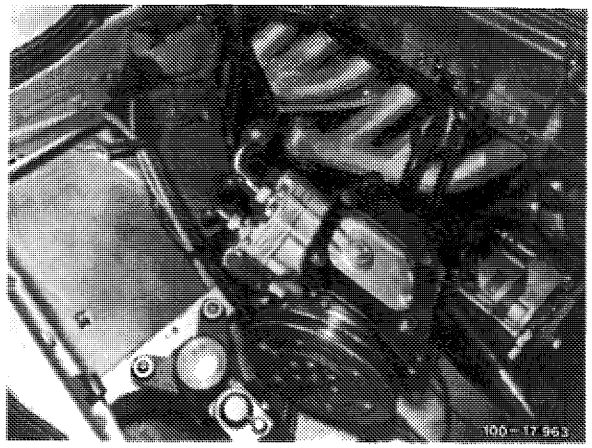
6 Remove fan.

For this purpose, loosen screw (arrow) on magnetic fan.

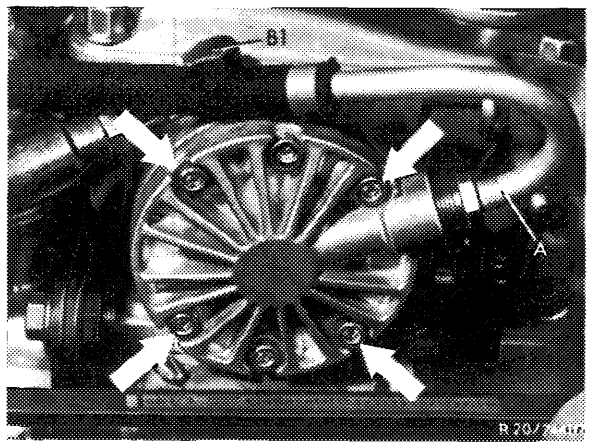


7 On vehicles with air conditioning, unscrew refrigerant compressor and put aside with lines connected.

When removing refrigerant compressor, drain air conditioning system (83–516).

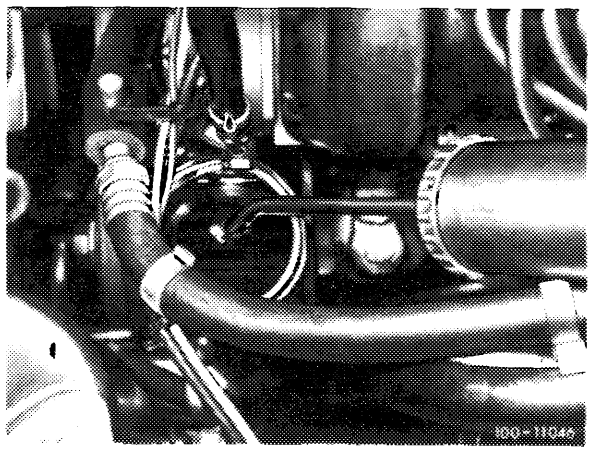


8 Disconnect lines at oil pressure pump. Only loosen bolts (arrows) to detach oil pressure pump.



9 Draw oil out of power steering pump tank.

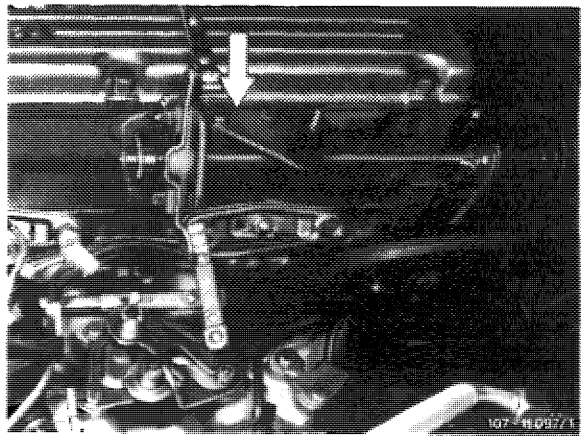
10 Disconnect hoses at power steering pump.



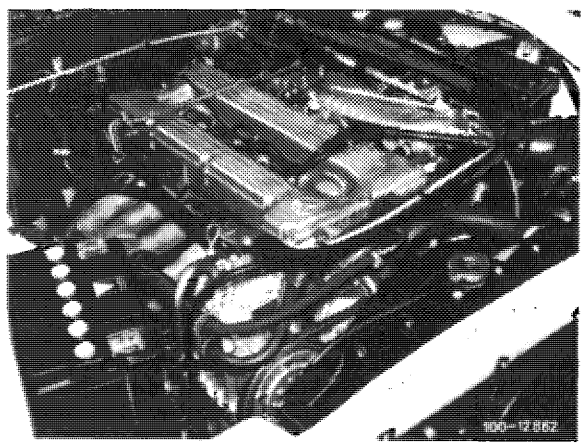
11 Disconnect electric harness for starter motor and alternator.

12 Disconnect all electric connections on engine.

13 Remove longitudinal control shaft.

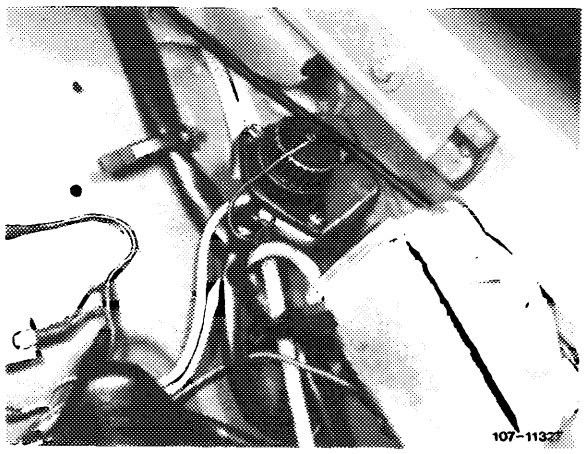


14 Disconnect all coolant, vacuum. oil and electric lines leading to the engine.

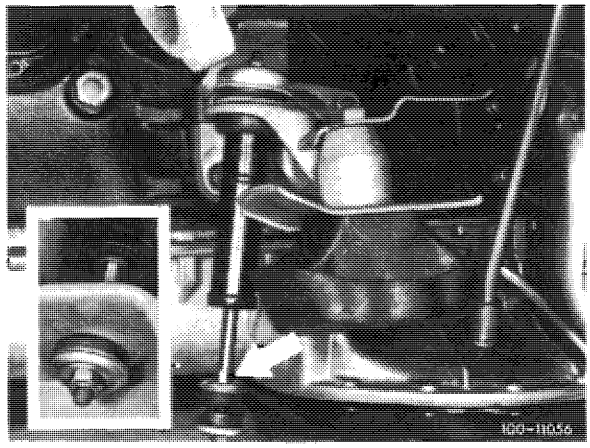


15 Pull off TDC transmitter wires at test socket. This requires unscrewing test socket at holder.

16 Detach exhaust pipes at exhaust manifold and exhaust strut at transmission.



17 Unscrew engine shock absorbers left and right (00–240).

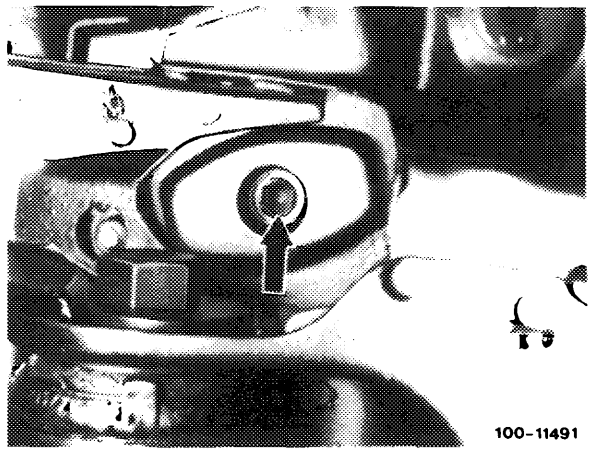


Model 123

18 Remove engine mounting bolts from engine mount.

Model 114 from above.

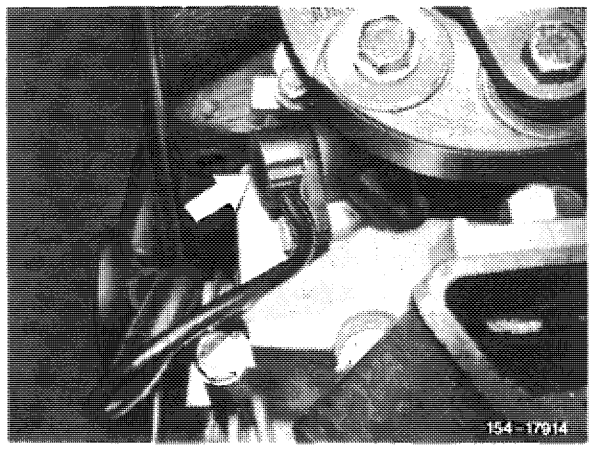
Models 107, 116, 123 and 126 from bottom of vehicle (arrow).



19 Remove rear engine carrier with engine mount.

20 Disconnect tachometer shaft on transmission.

Models with inductance transmitter (arrow): Disconnect inductance transmitter for tachometer. For this purpose, unscrew screw M 6 and pull out inductance transmitter.



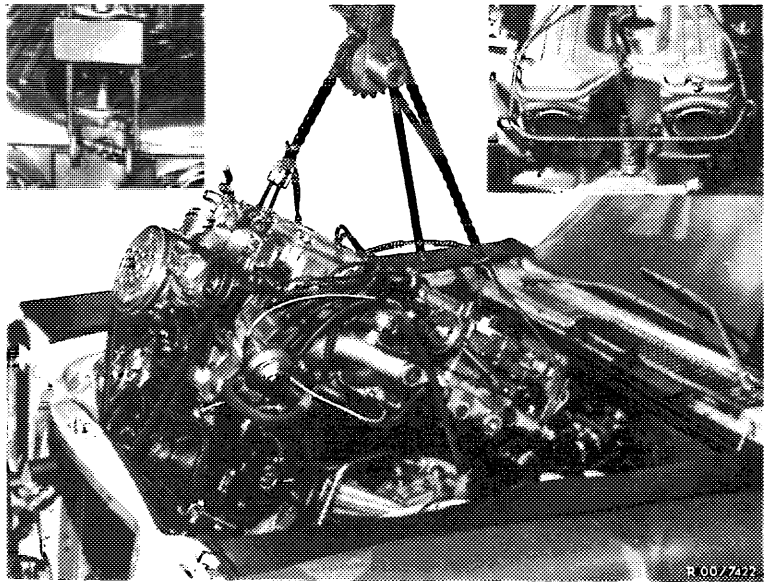
21 Disconnect propeller shaft on transmission and slide back.

Support propeller shaft, so that shaft will not abut against transmission flange when installing engine.

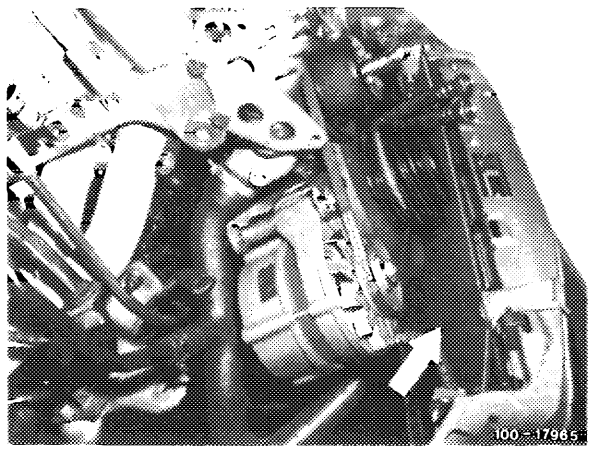
22 Loosen all connections and shift rods on transmission.

23 Attach engine at rear and front to suspension eyes.

24 Lift engine with transmission by means of engine hoist in an approx. 45° diagonal position. Make sure that the partition for unit compartment (model 126) is not damaged, since its damping effects will be lost by absorbed splash water.



Attention!
On vehicles with air conditioning, cover condenser with a hard fiber board (arrow).

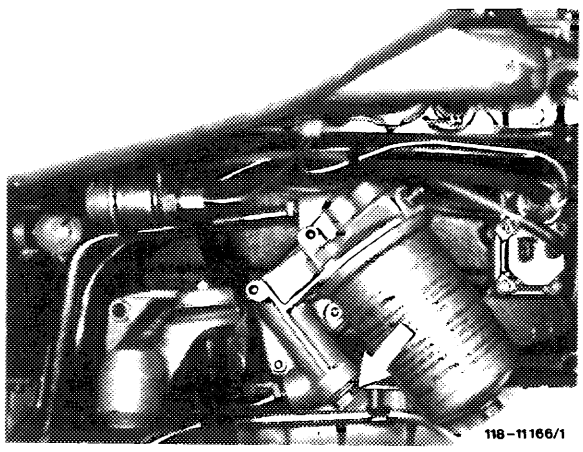


Installation

Attention!
When installing an engine because of previous bearing damage, flush out the oil cooler and oil hoses. Clean oil filter housing.

25 Check engine mounts, engine shock absorbers, coolant, oil and fuel hoses and replace them if necessary.

26 Prior to flanging-on manual transmission, check radial ball bearing in crankshaft and throw-out of clutch and renew, if required.



27 Install engine and connect.

28 Adjust rear engine mount free of tension (00–220).

29 Connect propeller shaft.

30 Check all drain plugs for tight seat.

31 Add oil and coolant (20–010).

32 Check cooling system for leaks with leak tester.

Note: On vehicles with auxiliary heater, bleed coolant circuit (refer to repair instructions auxiliary heater 83–415).

33 Check coolant for antifreeze.

34 Clean air filter and renew, if required.

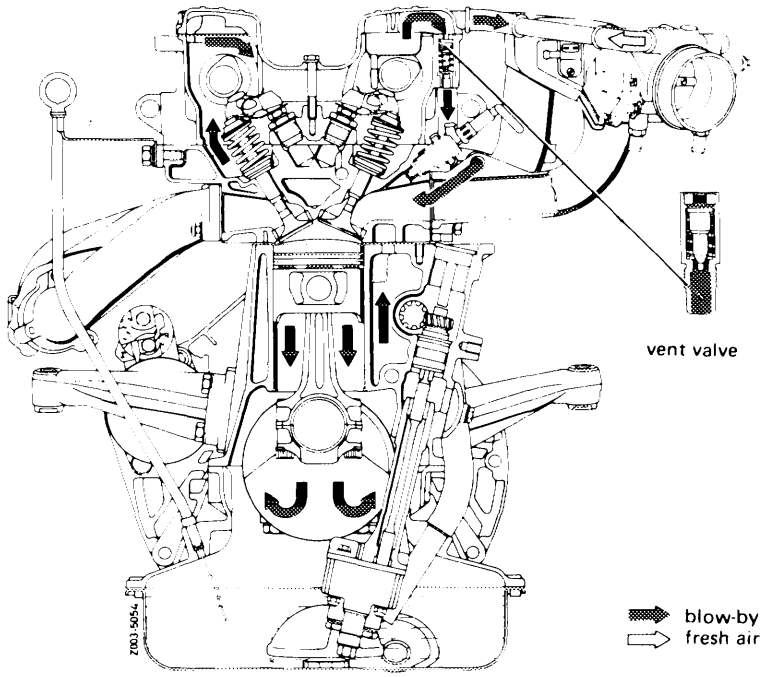
35 Check dwell angle and firing point.

36 Adjust idle speed and emission value (07.2–100).

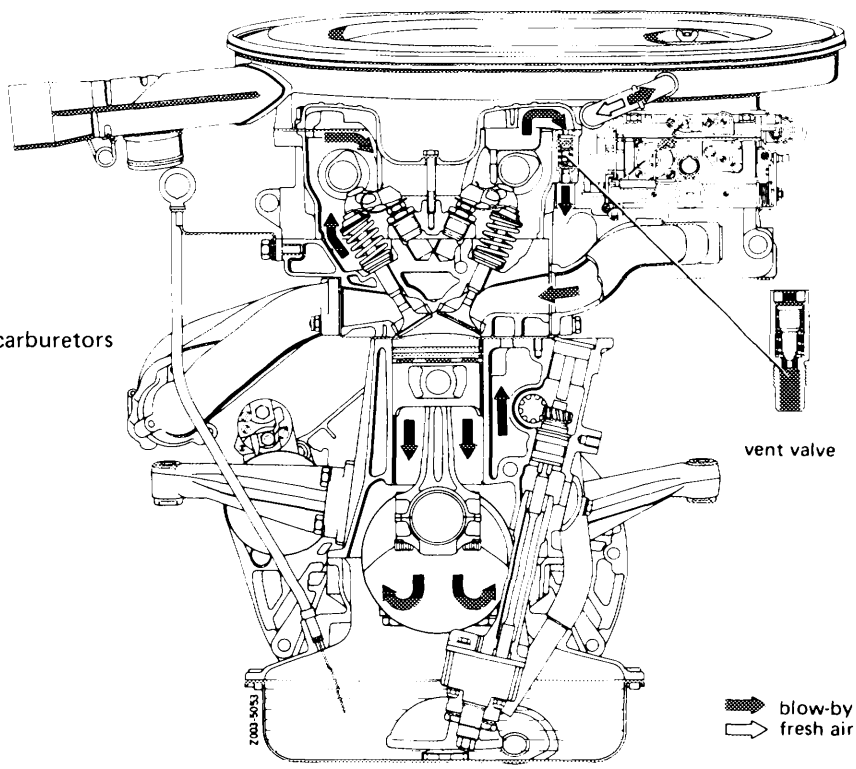
37 Check regulating shaft for function.

A. Engine with vent valve

This engine has a closed crankcase vent system which does not require maintenance.



Engine with electronic fuel injection system.

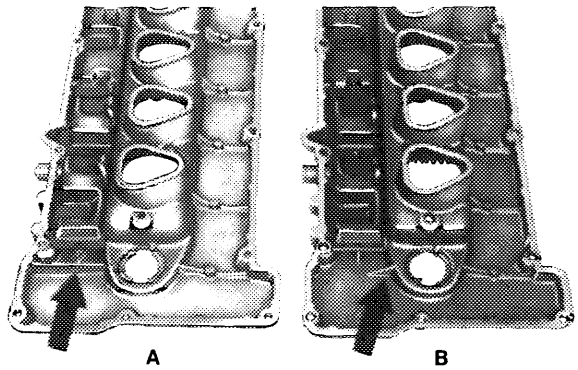


Engine with twin two-stage carburetors

First version with vent valve

The blow-by gases flow via an oil separator in the cylinder head cover to the vent valve.

Attention!
Only use cylinder head covers of version A with oil protection ribs.



101-9341

At idle speed and lower speed ranges the blow-by gas will enter the combustion chamber via the vent valve and intake manifold or idle air passage.

The vent valve spring works against the intake manifold vacuum pressure.

Depending on intake manifold vacuum pressure the valve cone will be pulled or pressed up by the valve spring and thus changes the through-flow cross section opening.

Since the through-flow capacity of the vent valve is larger than the amount of blow-by gas from the crankcase, fresh air is also drawn off from the air cleaner of a carburetor engine or from the throttle housing in front of the throttle valve via a pipe of an engine with fuel injection.

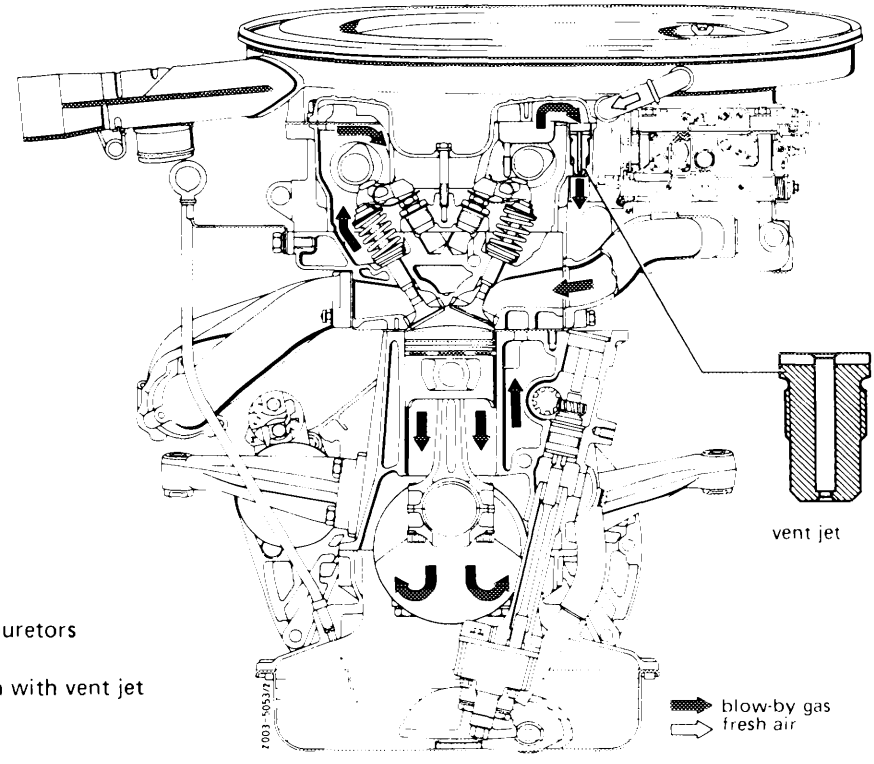
The additional fresh air is taken from an air cleaner of a carburetor engine via a hose.

When coasting the high intake manifold pressure will close the vent valve. The very slight amounts of blow-by gas in this case will now travel in reverse direction to the throttle housing via a pipe or the air cleaner via a hose and are drawn off at these points.

Note: Carburetor engines with a vent valve can also be equipped with a vent jet.

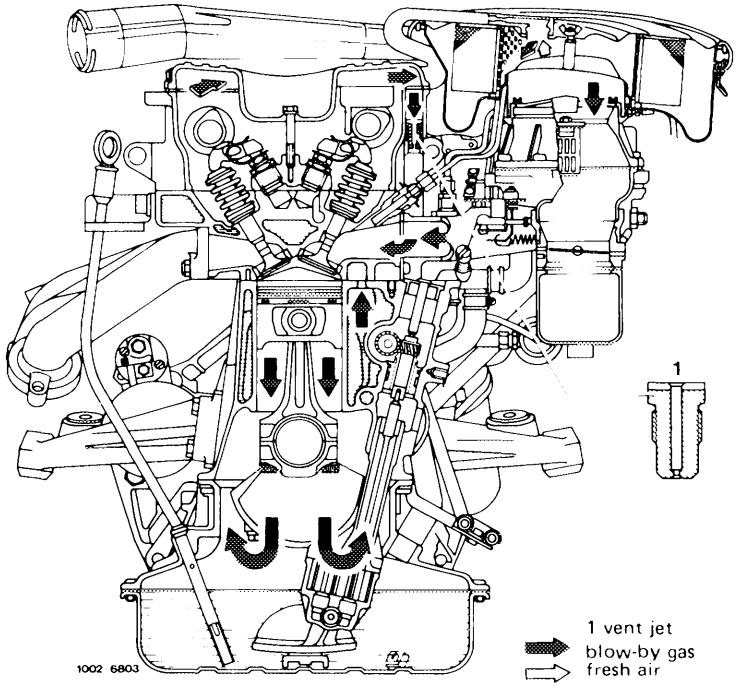
B. Engine with vent jet

This engine has a closed crankcase vent which does not require maintenance.



Engine with twin two-stage carburetors

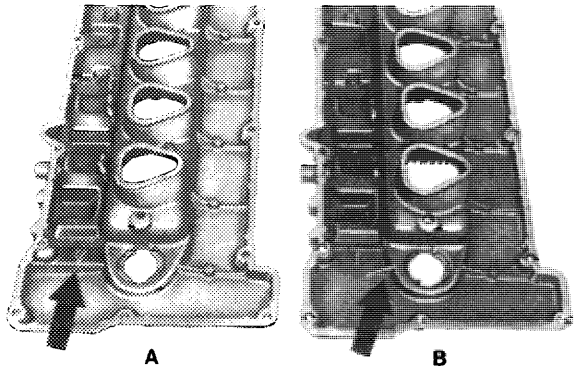
Second version and USA version with vent jet (including model year 1979).



Engine with continuous fuel injection

The blow-by gases flow to the vent jet via an oil separator in the cylinder head cover.

Attention!
Only use cylinder head covers of version A with oil protection ribs.



101-9341

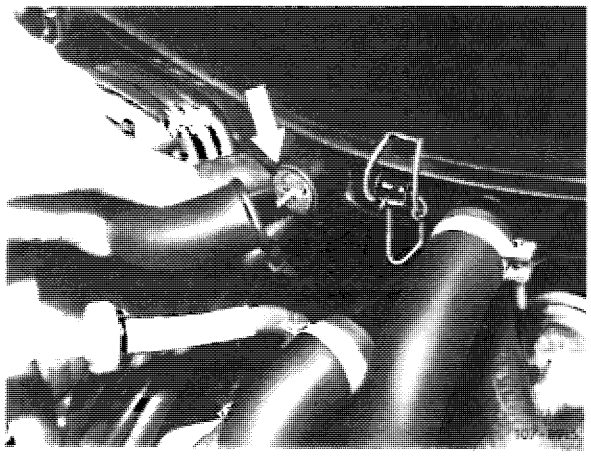
At idle speed and in low speed ranges the blow-by gas will enter into the combustion chambers via the vent jet and intake manifold or idle air passage.

In lower and medium speed ranges the intake manifold vacuum will cause fresh air to be drawn in from the air cleaner via a hose in addition to the blow-by gas.

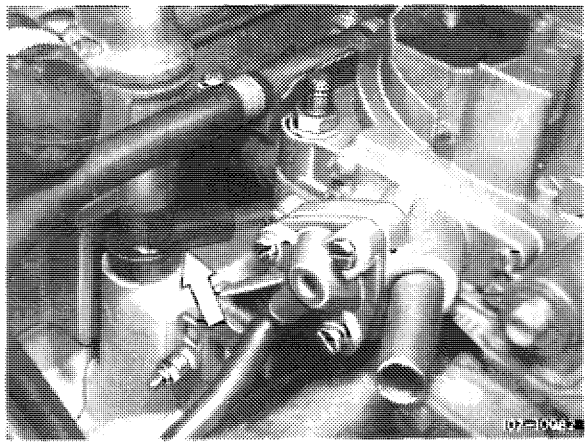
In the upper speed range blow-by gas will also flow from the fresh air side of the air cleaner depending on the blow-by quantity.

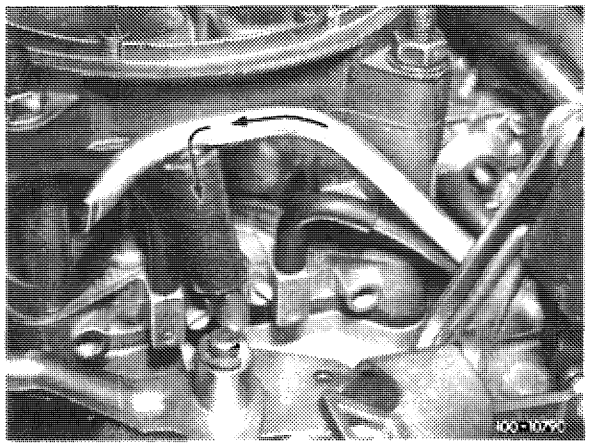
This is drawn off to the combustion chambers via the carburetor or air flow sensor and intake manifold.

Models for USA, Australia and Japan up to model year of 1977 have a flame guard (arrow) in the engine vent connection.

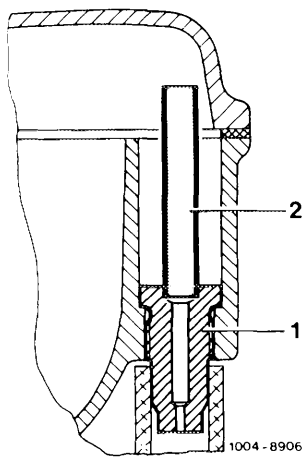


For 1975 and 1976 USA models, 1976 Sweden model and 1976 Japan models the blow-by gas is drawn off to the carburetor via an angle connector (arrow).





On USA vehicles starting model year 1980 the vent nozzle is mounted with an overflow pipe (2), so that no engine oil is carried along in idle speed air duct.



Data

Group number[1]		0	1	2
Standard dimension 86.0	piston dia.	85.970–85.982	85.980–85.992	85.990–86.002
	cylinder dia.	85.998–86.008	86.008–86.018	86.019–86.028
Repair stage 1 + 0.5	piston dia.	86.470–86.482	86.480–86.492	86.490–86.502
	cylinder dia.	86.498–86.508	86.508–86.518	86.519–86.528
Repair stage 2 + 1.0	piston dia.	86.970–86.982	86.980–86.992	86.990–86.002
	cylinder dia.	86.998–86.008	87.008–87.018	87.019–87.028

[1]) Decisive for association is the smallest measured cylinder dia. and the largest measured piston dia.

Max. wear limit in driving or transverse direction of cylinder bores at upper reversing point of 1st piston ring		0,10
Piston clearance	When new	0,025–0,035
	Wear limit	0,08

Machining tolerances

Permissible deviation (radial distance) from cylinder shape	When new	0,007
	Wear limit	0,025
Permissible deviation from square with reference to cylinder height		0,05
Mean height of roughness		0,002–0,004
Permissible height of waviness		50 % of roughness
Chamfer of cylinder bores		see fig. point 2

Conventional tools

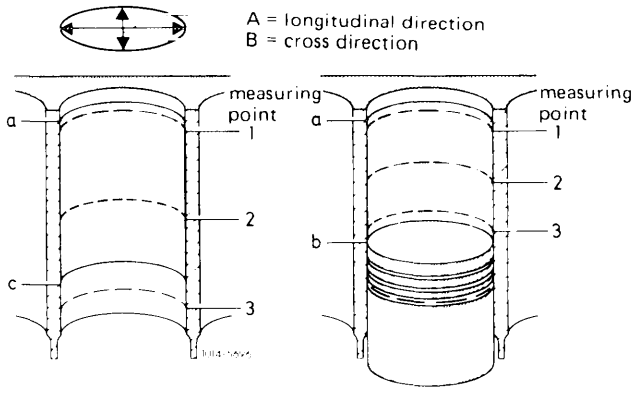
Inside measuring instrument for 50–150 mm dia., with 0.01 mm readout and measuring point pressure relief	e.g. made by Hommel Handel, 5000 Köln 71 Sunnen GRM-2125

Note

In particular for a complaint concerning "excessive oil consumption" a measurement of the cylinder bores is essential in addition to a visual inspection.

1 Measure the cleaned cylinder bores with an internal tester at measuring points 1, 2 and 3 in longitudinal direction A (piston pin axis) and in cross direction B.

When the pistons are installed measuring point 3 will be just barely above the piston, which must be at BDC.



a top reversing point of first piston ring
b BDC of piston
c bottom reversing point of oil scraper ring

The group number punched into crankcase (arrow), matches the group number of the pistons installed as standard equipment.

On used engines, the original cylinder dia. shows up after thorough cleaning of top land zone.

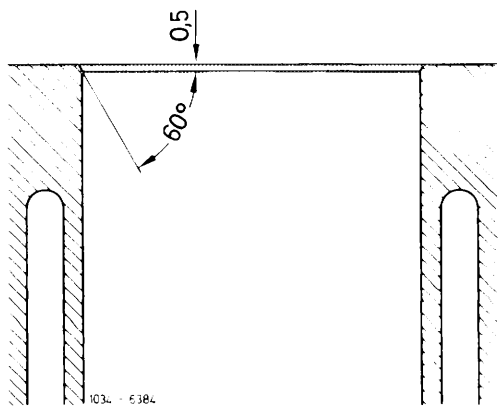
The difference in diameter of dimension shown on top land zone and the dimension at measuring point 1 generally indicates the respective max. wear.

In the event of repairs, hone cylinder bores according to dimensions of available pistons plus piston clearance.

The processing machines used for boring (pre-honing), finish-honing and polishing should be set in accordance with respective operating instructions.

Upon boring, the cylinder bores should be chamfered at upper cylinder end according to drawing.

The lower cylinder end should remain sharp edged without burr.



01—120 Grinding crankcase mating surface

Data

Height of new crankcase	213.1—213.2
Min. height after removal of necessary material	212.8
Permissible deviation from parallel of upper parting surface in relation to lower parting surface in longitudinal direction	0,1
Permissible deviation from flatness of upper parting surface	0,03
Mean height of roughness of upper parting surface	0,005—0,020
Leak test with 1.5 bar air gauge pressure under water. Permissible leak rate in cc/min	10
Chamfer of cylinder bores	see note

Piston spacing in relation to parting surface

Engines with		normal compression		USA version and low compression	
Distance between piston crown and crankcase mating surface	Standard size piston	Below	min. 0.20 max. 0.70	above 0.25 below 0.15	
	Oversizes + 0.5 and 1.0	Below	min. 1.0 max. 1.5	below	min. 0.55 max. 0.95

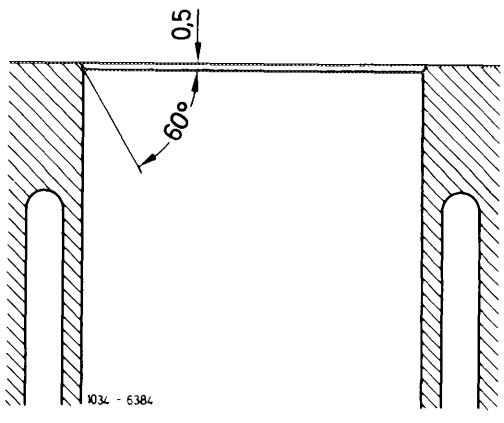
Conventional tools

Surface grinding machine	e.g. made by Ruaro u. Fi., Schio/Italy Scledum, type RTY
Knife-edge straightedge approx. 750 mm long	

Note

Chamfer cylinder bores after grinding.

Adjust valve timing (05—215), if crankcase mating surface has been machined.

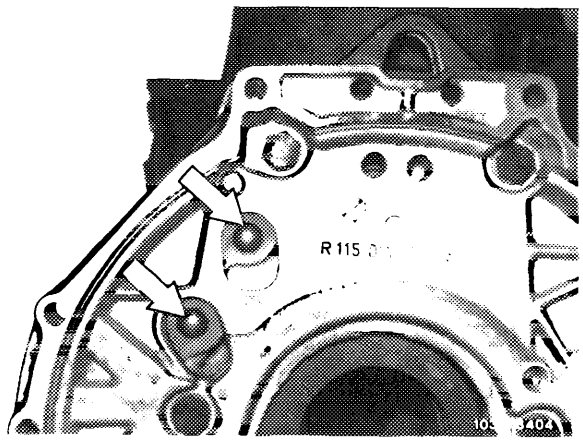


01–130 Knocking-out and inserting steel balls for main oil ducts

Tightening torques		Nm
Fastening bolts for intermediate flange		65
Closing plug for main oil duct		40
Pressure relief valve in main oil duct front		40
Closing plug pressure relief valve		50
Screw M 8 x 65 for vibration damper		35
Screw M 18 x 1.5 x 45 on crankshaft		400–450
Necked-down screw for driven plate and flywheel	initial torque	40
	torque angle	90°–100°

Note

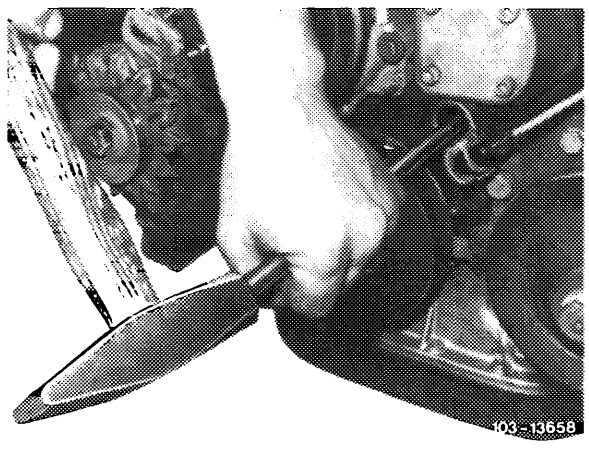
Since October 1976 the 2 main oil ducts (arrows) in cylinder crankcase at transmission end are closed by means of steel balls 15 mm dia. VO DIN 5401 part no. 005401 515001.



For cleaning main oil ducts during engine repairs, the steel balls must be knocked-out from direction of front end of engine.

Undamaged steel balls can be used several times without refinishing ball seat in crankcase.

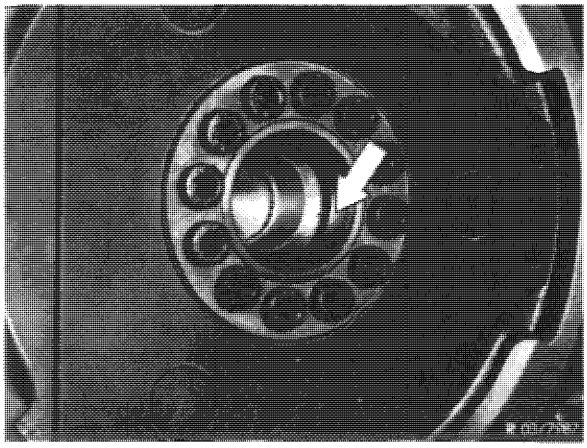
Damaged and rusty steel balls should be replaced.



Knocking-out steel ball in upper main oil duct

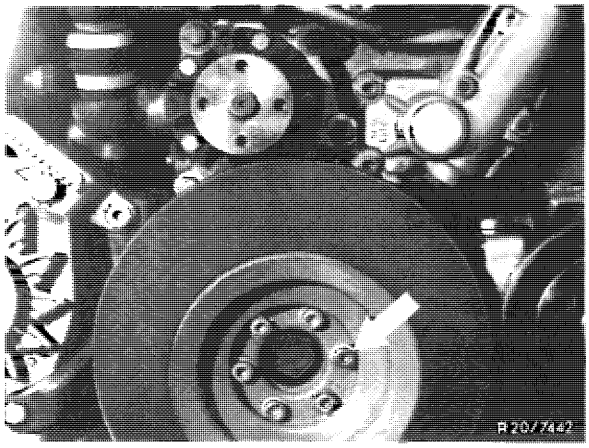
1 Remove transmission.

2 Remove flywheel (03–410).



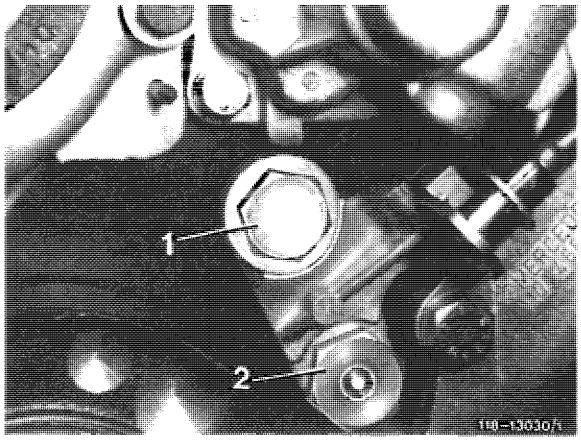
3 Remove radiator (20–420).

4 Remove vibration damper (03–340).



5 Unscrew closing plug (1) and screw oil pressure relief valve out of main oil duct.

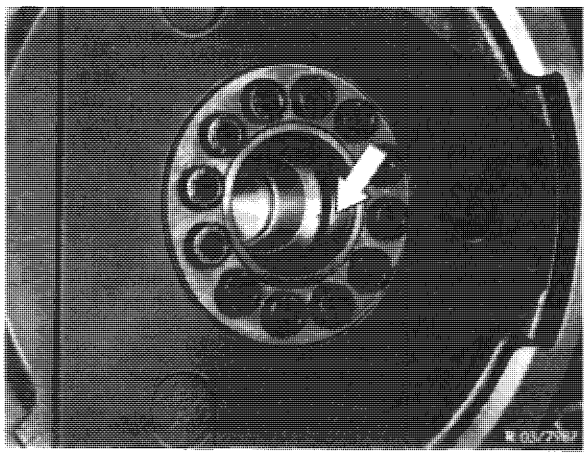
6 Knock-out steel ball from direction of engine front end by means of a round steel bar 13 mm dia. and approx. 700 mm long.



Knocking-out steel ball in lower main oil duct

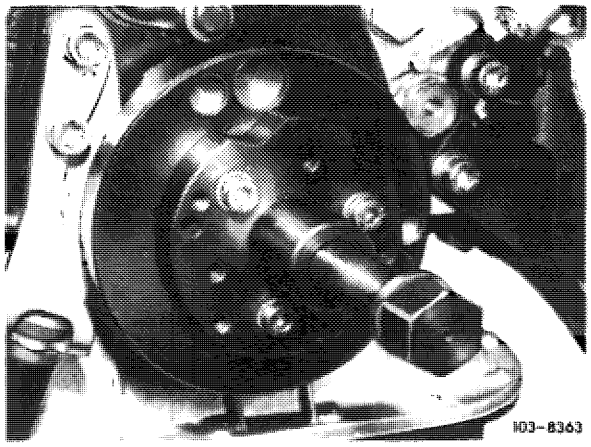
1 Remove transmission.

2 Remove flywheel (03–410).



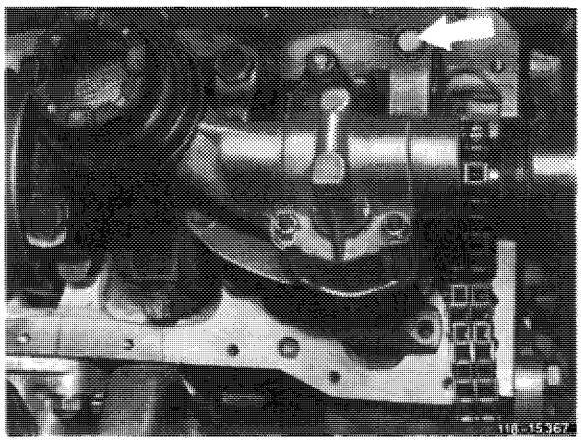
3 Remove radiator (20–420).

4 Remove vibration damper and compensating weight (03–340).



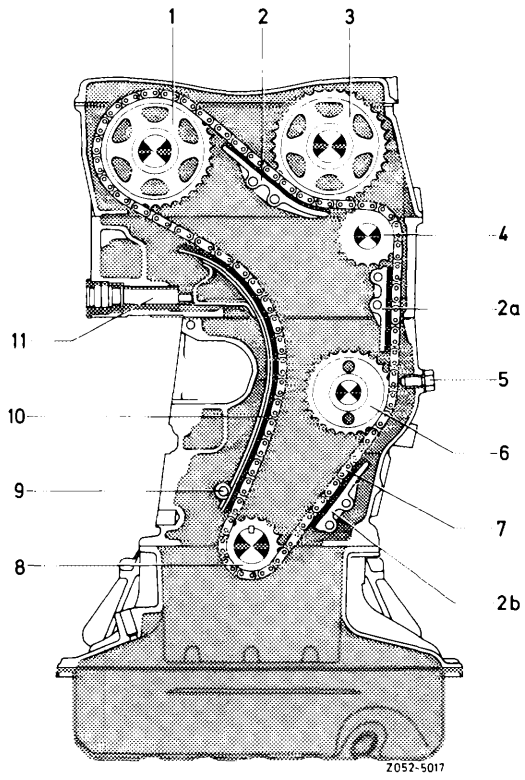
5 Remove complete oil pan (01–310).

6 Remove oil pump (18–210).



7 Remove slide rail (2b) in crankcase (05–340).

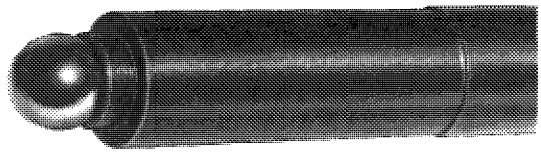
8 Knock-out steel ball from direction of engine front end by means of a round steel bar 13 mm dia. and approx. 700 mm long.



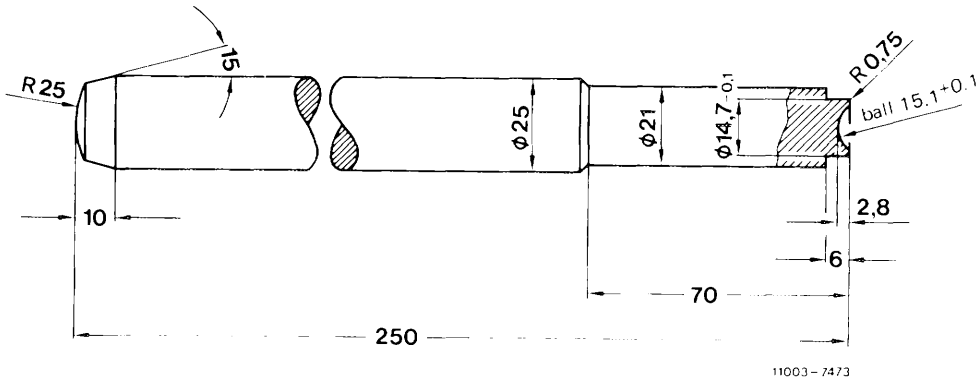
Closing main oil duct

1 Thoroughly clean ball seat and bore in main oil duct.

2 Coat up on self-made knocking-in mandrel with grease and place steel ball into cup.



103-13405



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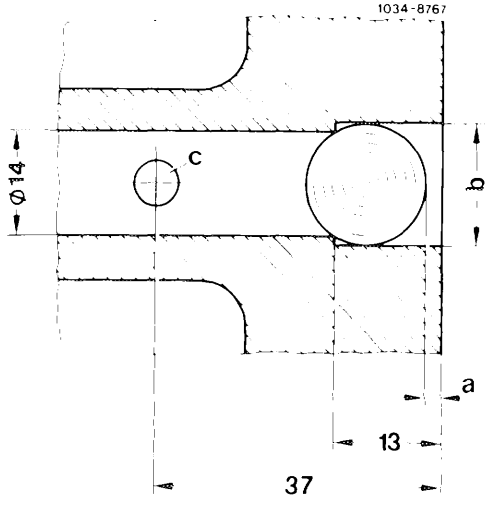
Material: C 45

3 Position steel ball with knocking-in mandrel and knock-in up to stop on mandrel.

If the mandrel has no stop, do not exceed dimension a = max. 3 mm to prevent cracking of crankcase.



a = max. 3 mm
b = dia. 14.75 to 14.86 mm
c = oil ducts to crankshaft bearing

4 Mount all parts taken off or removed.

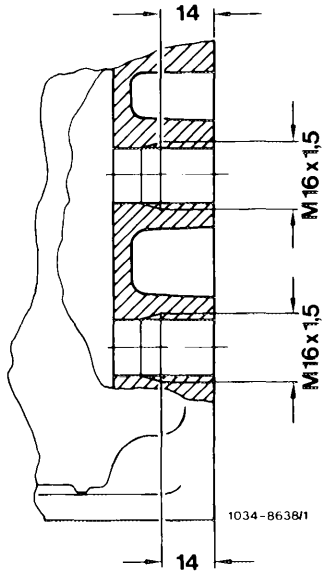
5 Run engine warm and check for leaks.

Note: If oil flows out as the result of a leaking ball seat, knock-out respective steel ball and close main oil duct with a closing plug after cutting the required threads into duct.

Closing main oil duct with closing plug

1 Cut threads M 16 x 1.5 mm approx. 14 mm deep into respective main oil duct.

2 Carefully clean main oil duct.



3 Screw closing plug M 16 x 1.5 mm DIN 908, part no. 000 908 016 001 with aluminum sealing ring A 16 x 22 mm DIN 7603 – AL, part no. 007 603 016 102, and tighten to 40 Nm.

Conrod bolt sizes

Version	Part Number	Distance a and b (fig., point 1) a	b	Thread dia. d	Expansion stem dia. c when new (fig., point 1)	Min. Expansion stem dia.
1st version	110 038 01 71	5.5	3	M 10x1	8.4–0.1	8.0
2nd version	110 038 03 71		4.5			
3rd version	110 038 04 71	6.6				
Conrod bolt installation pressure					45000 N	

Conrod nut torque

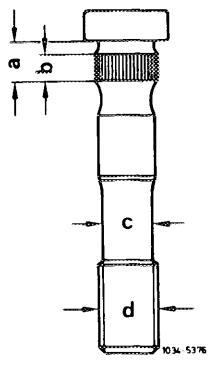
Initial torque	40–50
Torque angle	90–100°

Self-made tool

Steel plate	see fig., point 3

Checking

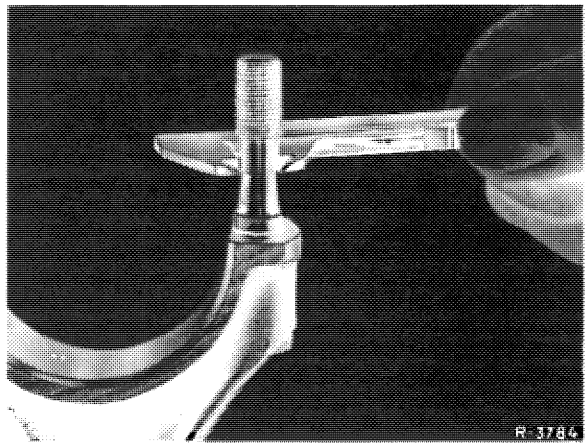
1 Measure smallest expansion stem diameter before reusing.



Note: If the minimum expansion stem diameter reaches or is less than 8.0 mm, **replace conrod bolt.**

Only knock out a conrod bolt to replace it.

Use third version conrod bolts for repairs.

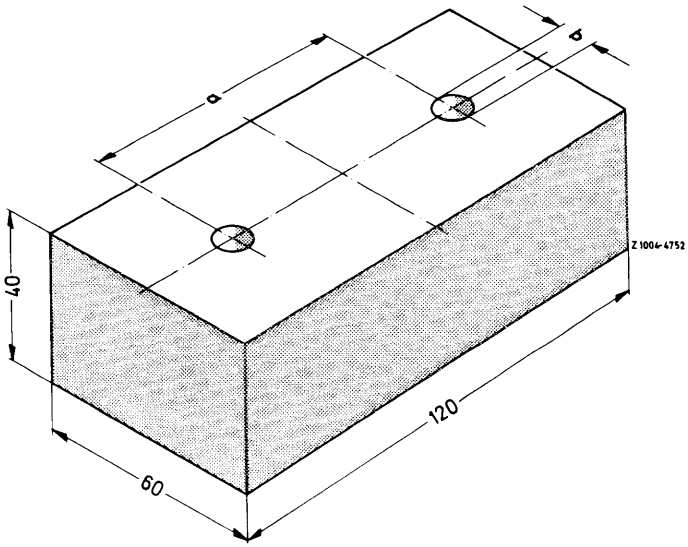


Replacing

2 Knock out conrod bolts.

3 Press new bolts into conrod with a pressure of about 45000 N, or knock in with a hammer and mandrel.

Place the connecting rod on a ground steel plate when knocking in or pressing in conrod bolts.



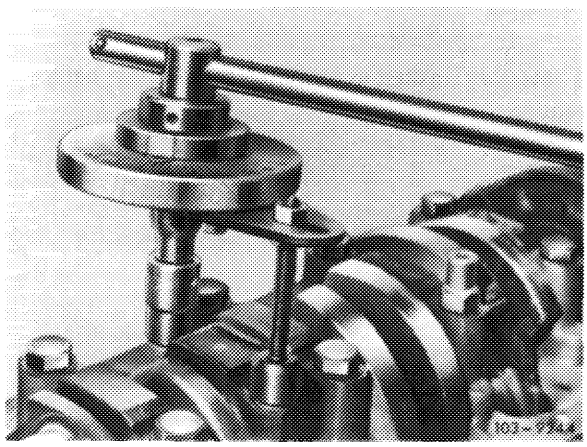
Distance between holes a = 64.6 mm
Bore b = 11 mm

Tightening

4 Lubricate nuts and threads.

5 Tighten conrod nuts to a torque pressure of 40–50 Nm and a torque angle of 90–100°.

Attention!
Tighten conrod bolts knocked in with a hammer to a torque pressure of 60–70 Nm and a torque angle of 90–100° for the first time.



Make sure that this instruction is observed, since otherwise the nuts **of the conrod bolts may** become loose.

Note: If no angle of rotation wrench is available, the connecting rod nuts can also be tightened by means of a normal socket wrench with toggle **in one step** by an angle of 90–100°. Estimate angle as accurately as possible. **To eliminate angle faults, do not use a torque wrench** for tightening according to angles of rotation.

Data

Center of conrod bearing bore to center of conrod bushing bore	131.950 / 130.050
Width of conrod at conrod bearing bore and conrod bushing bore	27.890 / 27.857
Basic bore for conrod bearing shells	51.619 / 51.600
Basic bore for conrod bushing	26.021 / 26.000
Conrod bushing inside dia.	23.013 / 23.007
Peak to valley height on inside of conrod bushing	0.004
Permissible stagger of conrod bore to conrod bushing bore in reference to a length of 100 mm	0.1
Permissible difference in parallel between axes: conrod bearing bore to conrod bushing bore in reference to a length of 100 mm	dia. 0.015
Permissible deviation of conrod bearing bore from true	0.020
Permissible difference in weight of all connecting rods of one engine	5 gr.

Tightening torque

Conrod nuts	Initial torque	40–50 Nm
	Torque angle	90–100°

Conventional tool

Connecting rod checking and straightening tool	Made by Krupp GmbH, 5309 Meckenheim e.g. Model CL 6

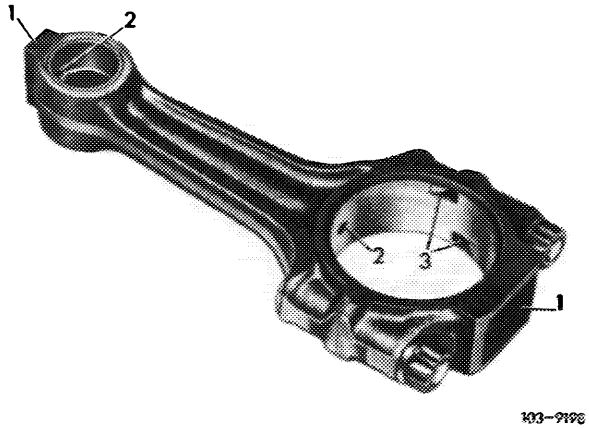
Note

Connecting rods, which are overheated (blue discoloration) due to bearing damage, may not be re-used.

The connecting rod and its cap are marked to fit together. The connecting rod stem must not show cross scoring and notches.

Connecting rods with a machined conrod bushing are delivered as replacement parts.

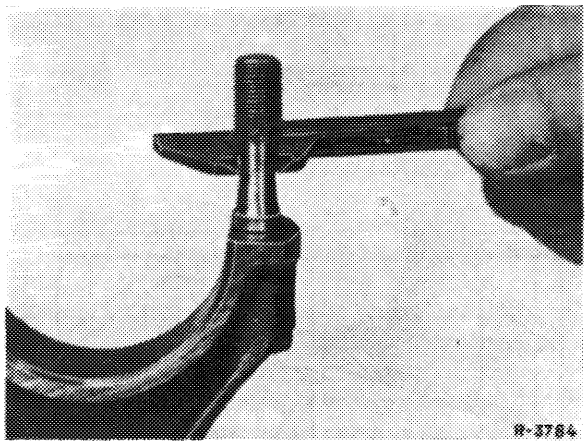
When renewing conrods pay attention to different weights of rods.



103–9198

Repairing

1 Check conrod bolts and replace if necessary (03–310).



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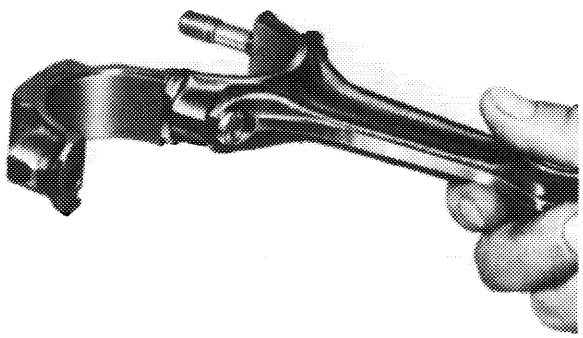
2 Check conrod bolt bores.

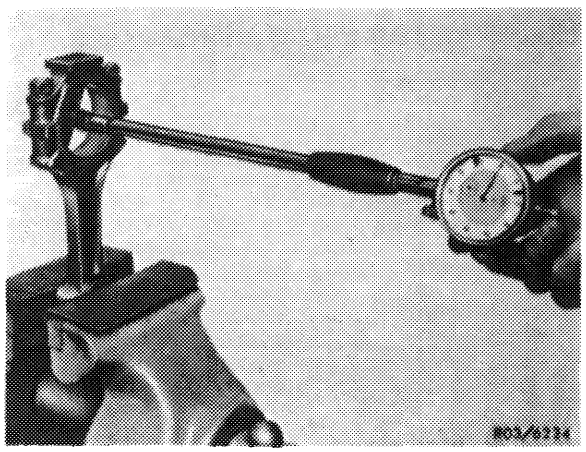
Place conrod cap on a conrod bolt. If the conrod cap moves down by its own weight, the connecting rod must be replaced.



103-9237

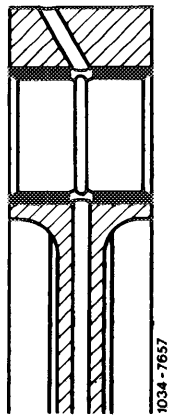
3 Mount connecting rod bearing cap and tighten to 40–50 Nm and 90–100° angle of rotation torque.

4 Measure conrod bearing basic bore. If a basic bore exceeds the value of 51.62 mm or shows conicity, hone bearing surface of bearing cap on a surface plate up to max. 0.02 mm.



5 Press in new conrod bushing that oil bores match.

Installation pressure 2500 Nm.



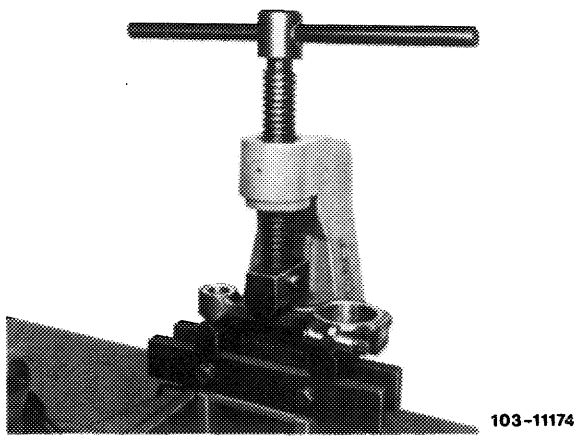
6 Mill or ream out conrod bushing.

7 Hone side bearing surfaces of connecting rod on a surface plate.

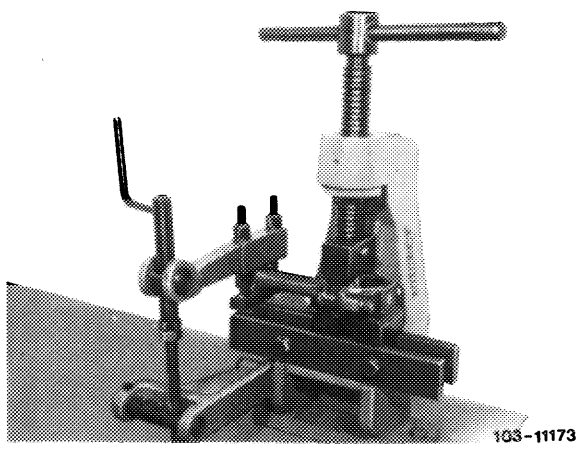
Squaring

8 Square connecting rod with a conrod tester.

9 Align parallel of conrod bore to conrod bushing bore.



10 Correct stagger of conrod bore to conrod bushing bore.



Association piston – cylinder[1])

Group number		0	1	2
Standard dimension	Piston dia	85.970–85.982	85.980–85.992	85.990–86.002
	Cylinder dia	85.998–86.008	86.009–86.018	86.019–86.028
1st repair stage + 0.5	Piston dia	86.470–86.482	86.480–86.492	86.490–86.502
	Cylinder dia	86.498–86.508	86.509–86.518	86.519–86.528
2nd repair stage + 1.0	Piston dia	86.970–86.982	86.980–86.992	86.990–86.002
	Cylinder dia	86.998–86.008	87.009–87.018	87.019–87.028

[1]) The smallest measured cylinder dia and the largest measured piston dia are decisive for association.

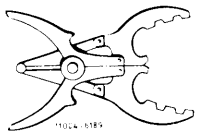
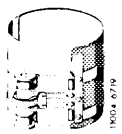
Piston code number and piston distance

Engine		Compression ratio ϵ : 1		Piston code number	Distance between piston crown and cylinder crankcase parting surface
Normal compression					
110.921	110.983	9.0 ± 0.2 8.7 ± 0.2	Std	37, 40, 50, 60, 64, 69 80[1]), 83, 86[1]), 89	Standback 0.20 to 0.70
110.922	110.984				
110.923	110.985				
110.924	110.986		+ 0.5	38, 41, 51, 67, 70, 84, 90	Standback 1.0 to 1.50
110.981	110.987				
110.982			+ 1.0	39, 42, 52, 68, 71, 85, 91	
Low compression					
110.921	110.984	8.0–0.4	Std	28, 54, 72, 75	0.25 standout up to 0.15 standback
110.922	110.985				
110.923	110.991				
110.924			+ 0.5	29, 55, 73, 76	Standback 0.55 to 0.95
110.931	110.992		+ 1.0	30, 56, 74, 77	
110.932	110.993				

[1]) Installed in engine 110.984, 110.985, 110.986 and 110.987 as standard equipment. Not available as repair stages. Use only together with piston of same piston code number.

Test values		New (Installation tolerance)	Wear limit
Piston clearance		0.016 to 0.040	0.08
Difference in weight of pistons in one engine		4 g	10 g
Piston pin dia.		22.996 to 23.00	
Piston pin clearance	in conrod bushing	0.007 to 0.017	
	in piston	0.002 to 0.011	
Piston ring gap	groove 1	0.30 to 0.45	1.0
	groove 2	0.30 to 0.45	0.8
	groove 3	0.25 to 0.40	0.8
Piston ring clearance	groove 1	0.05 to 0.08	0.15
	groove 2	0.03 to 0.06	0.08
	groove 3	0.01 to 0.04	0.08

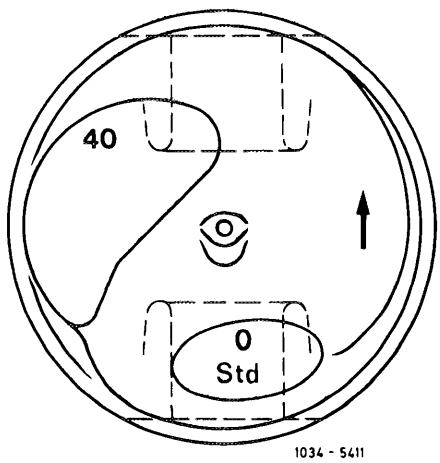
Tightening torque		
Connecting rod nuts	torque pressure	40–50 Nm
	torque angle	90–100°

Special tools		
Piston ring pliers		000 589 51 37 00
Piston ring compressor		000 589 04 14 00

Note

The piston version (std, + 0.5 or + 1.0), the group number (0, 1 or 2), the piston code (e.g. 40) and an arrow for forward direction are stamped in the piston crown.

The group number is also stamped in the crankcase mating surface.



The group number of pistons (e.g. 1) is the same as the group number of cylinder bores (production).

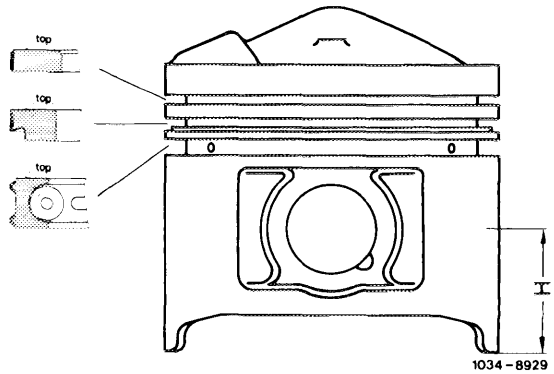
This will guarantee the specified piston clearance.

When repairing, the cylinder bores should be honed according to the sizes of the existing pistons plus the piston clearance.

Pistons and piston pins are matched.

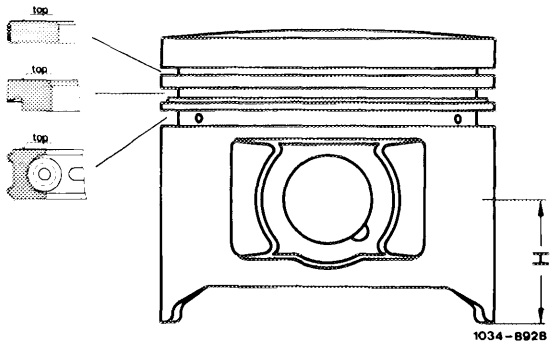
The measuring point for nominal diameter of pistons is offset by 90° in relation to piston pin axis at level H.

On used pistons the measured value does not necessarily correspond with nominal diameter of a new piston, since piston in range of measuring point and at shaft tab may "recede" already after a short operating period, that is, the nominal diameter may become smaller by up to 0.070 mm.



Piston normal compression
dimension H = 32 mm

If used pistons are used again, make sure that the oil drain bores in 3rd piston ring groove are cleaned.



Piston low compression and
USA version
dimension H = 32 mm

Removal

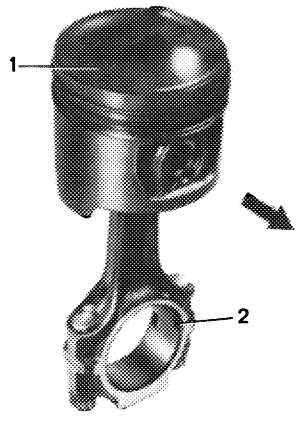
1 Take out connecting rod with piston from above.

2 Remove piston pin circlips and press out piston pin.

3 Repair and square connecting rod (03–313).

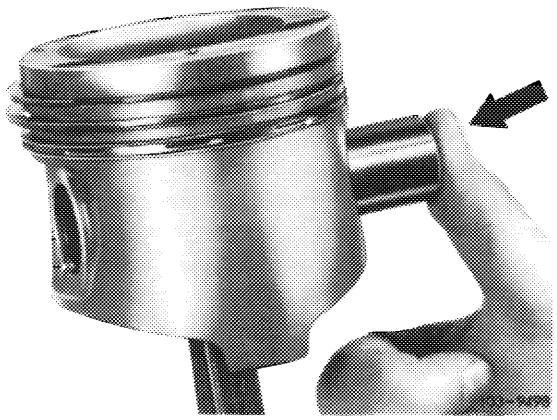
Installation

4 Place piston on connecting rod that arrow (1) faces in forward direction and circlip grooves (2) in connecting rod face to left side of engine (intake manifold).



Attention!
Don't heat piston.

5 Press in piston pin coated with engine oil **by hand.**

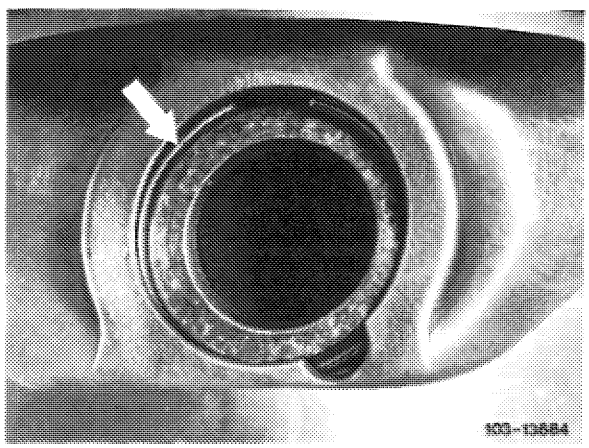


6 Insert piston pin circlips in grooves.

When installing used pistons, check piston ring gaps and clearances.

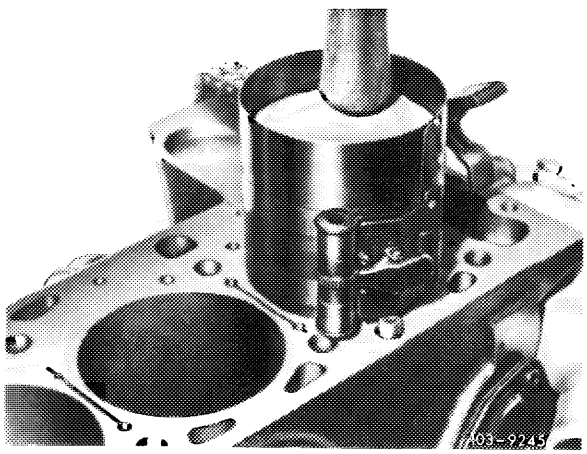
Check piston rings for easy movement.

7 Lubricate cleaned cylinder bores, conrod bearing journals, conrod bearing shells and the pistons.



8 Distribute gaps of piston rings around piston circumference evenly.

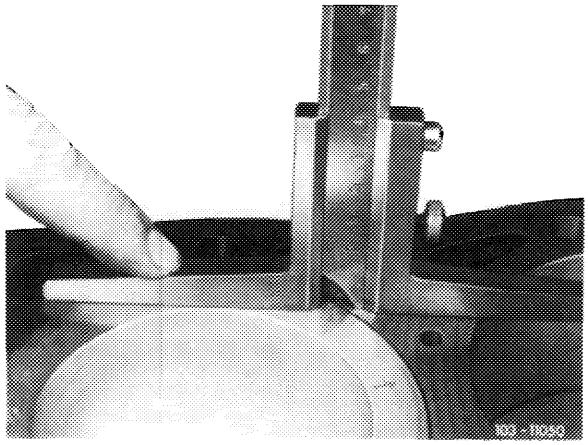
9 Install piston ring compressor and guide in piston with arrow facing forward.



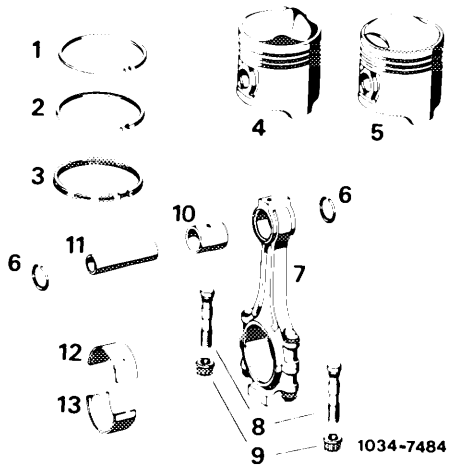
10 Place connecting rod bearing caps with code numbers facing each other on connecting rod and tighten connecting nuts to 40–50 Nm initial torque and to 90–100° angle of rotation torque.

11 Turn crankshaft and check clearance between piston pin boss and connecting rod.

12 Measure distance between piston crown and crankcase mating surface when piston is positioned at TDC (see chart).



Pistons and connecting rods



1 Plain compression ring
2 Oil scraper ring
3 Bevelled compression ring with hose lined spring
4 Piston
5 Piston, USA and low compression
6 Circlip
7 Connecting rod with conrod cap
8 Conrod bolt
9 Nut
10 Conrod bushing
11 Conrod pin
12 Conrod bearing upper half with oil bore
13 Conrod bearing lower half

Data

Crankshaft Standard size & undersizes	Crankshaft bearing journal dia.	Width of journal at thrust bearing	Conrod bearing journal dia.	Conrod bearing journal width
Standard size	59.96 59.95	29.00 29.02	47.96 47.95	28.00 28.08
1st Undersize	59.71 59.70	to 29.60	47.71 47.70	to 28.30
2nd Undersize	59.46 59.45		47.46 47.45	
3rd Undersize	59.21 59.20		47.21 47.20	
4th Undersize	58.96 58.95		46.96 46.95	

Crankshaft journal dia. for mounting compensating weight		0.030
Permissible deviation of crankshaft journal prior to mounting compensating weight	from cyl. shape	0.005
	from true[1)]	0.030
Permissible deviation of crank pins and crankshaft bearing journals from true		0.0025
Permissible deviation of crank pin cyl. line from parallel		0.010
Permissible deviation of running surfaces of fitted bearing from parallel[1)]		0.020
Permissible deviation of running surface of rear radial sealing ring from concentric true[1)]		0.015
Permissible deviation of flywheel flange from axial true[1)]		0.010
Permissible deviation of crankshaft bearing journal from concentric true[1)]	journal II, VI	0.070
	journal III, IV, V	0.100
Fillets on crankshafts and crank pins		2.5 to 3

Scleroscope hardness of crankshaft bearing journals and crank pins	when new	74–84
	boundary value	60[2]
Permissible unbalance of crankshaft		15 cmg

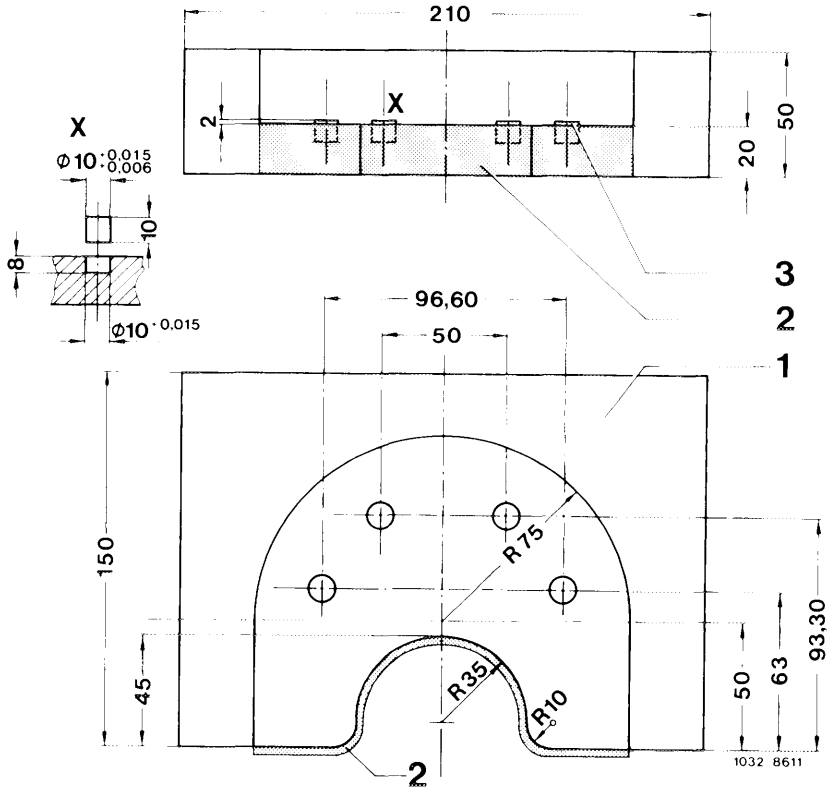
1) When mounting crankshaft on outer crankshaft bearing journal I and VII after one full turn.
2) Boundary value should be available at min. 2/3 of journal circumference.

Special tool

Impact hardness tester		000 589 20 21 00

Self-made tool

Rivet support for riveting counterweight to crankshaft.



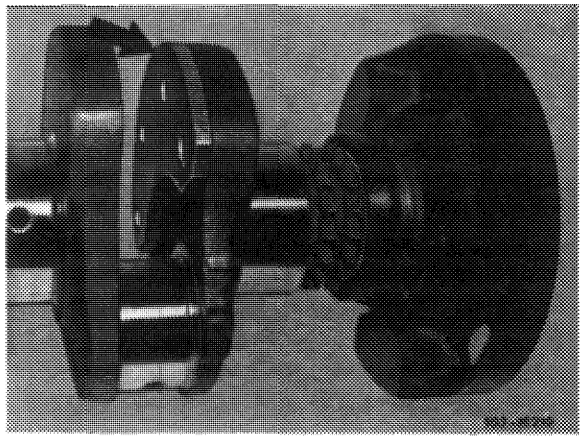
Note

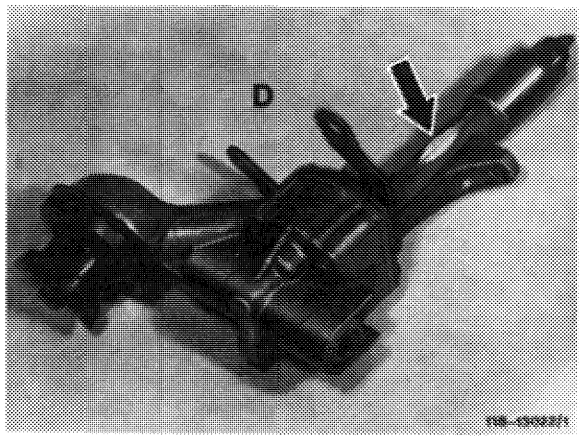
Since December 1978, the crankshaft of engine 110 is provided with an additional weight.
Remove additional weight when machining first crank pin.
After machining crank pin, rivet additional weight on again. Then check crankshaft for runout, and balance together with flywheel and balancing disc, also when re-using the old additional weight.

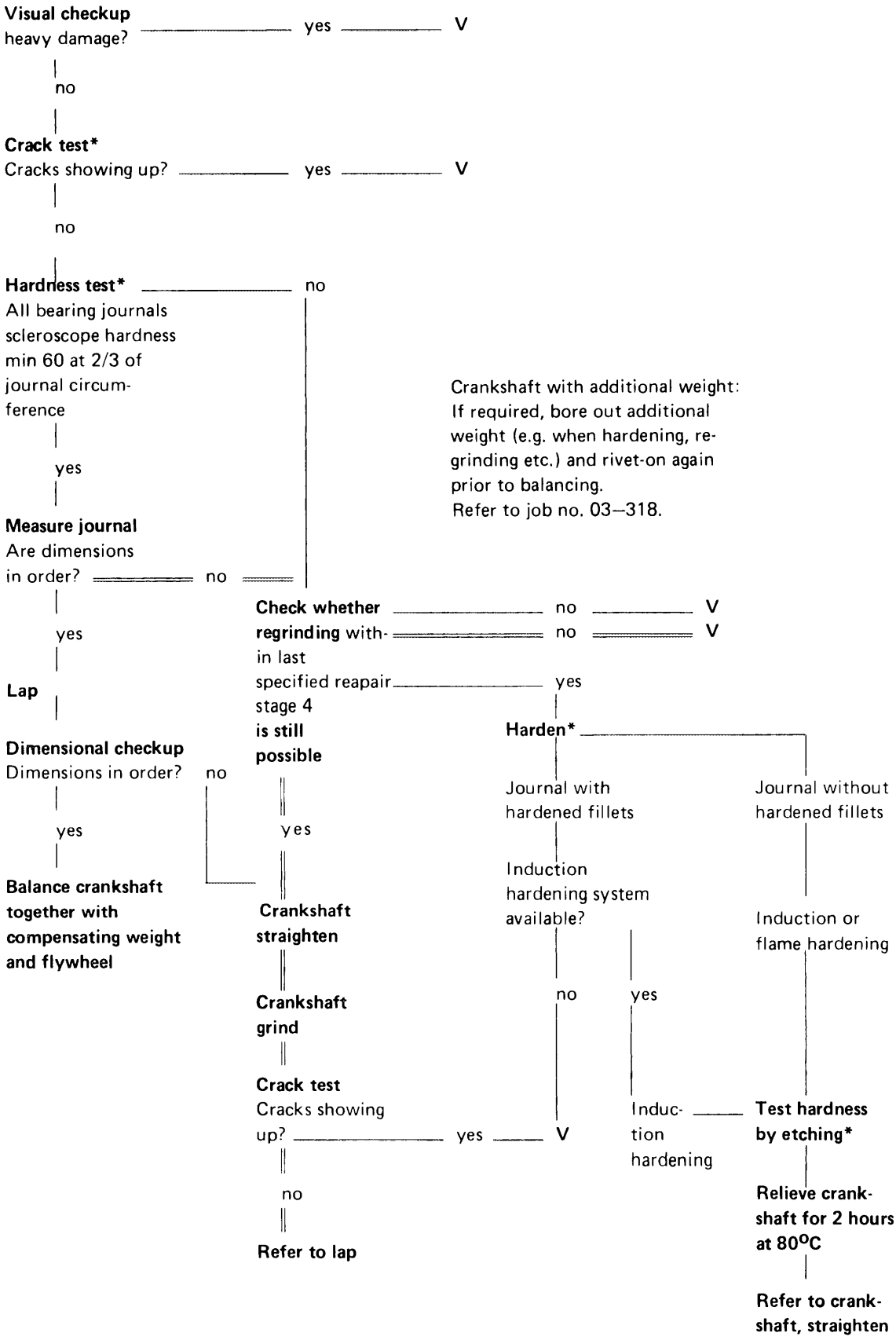
The crankshaft with riveted-on additional weight may be used only together with a modified oil pump which is provided with a recess (arrow) on housing shaft.

When checking and reconditioning crankshafts, proceed in sequence of the following diagram and pertinent explanations.

For grinding crank pins, a difference of only one repair stage per crankshaft is permitted.







Explanations concerning diagram

Crack test

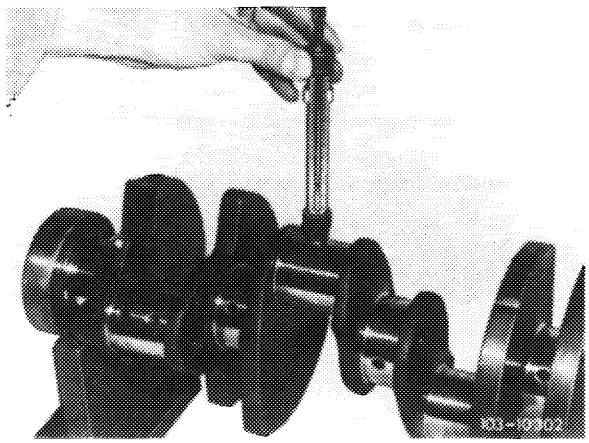
Clean crankshaft. Bearing journals should be free of oil and grease. Magnetize crankshaft and apply fluorescent powder (flux). A color penetration method (insertion in bath or with spray can) can also be applied.

Aids: paint or fluorescent powder,
cleaning agent,
developer.

Hardness test

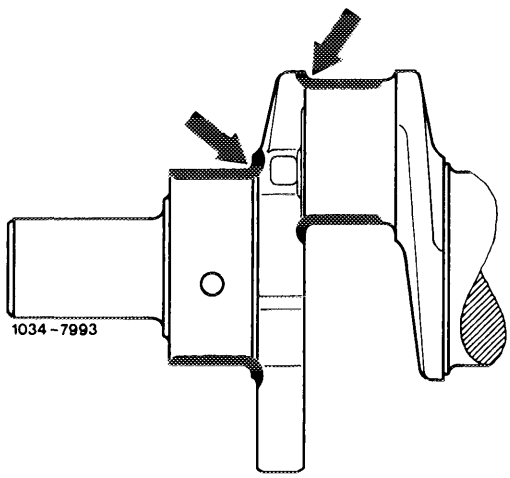
Test hardness with impact hardness tester (scleroscope hardness).

Scleroscope hardness of 60 should be available at 2/3 of journal circumference.

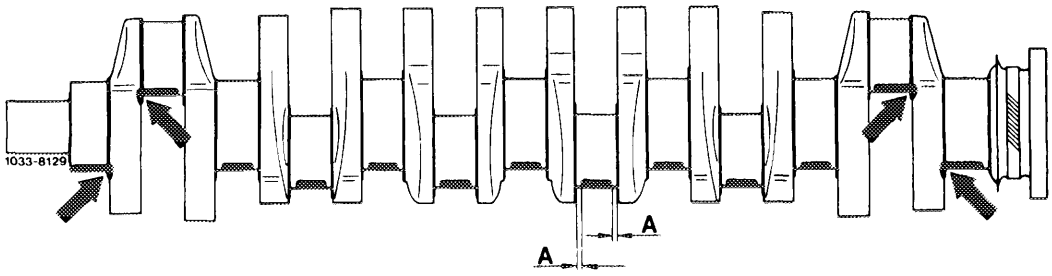


Hardening

Journals without hardened fillets can be hardened inductively or by flame hardening. Journals with hardened fillets (arrows) should be inductance-hardened on principle. If this is not possible, scrap crankshaft.



When hardening journals without hardened fillets, maintain distance A between runout of hardened surface and fillet (4–5 mm).



Checking hardening procedure

For a good hardening job, test adjustment of hardening plant by metallographic grinding tests.

These tests can be made by testing scrapped crankshafts.

Check hardening by etching surface of journal with a 2% alcoholic nitric acid (HNO_3).

No dark spots should show up at surface of journal.

Non-hardened fillets will become dark.

The hardened fillets, on the other hand, should be as bright as surface of journal.

For comparison, perform an etching job on a metallographically controlled journal.

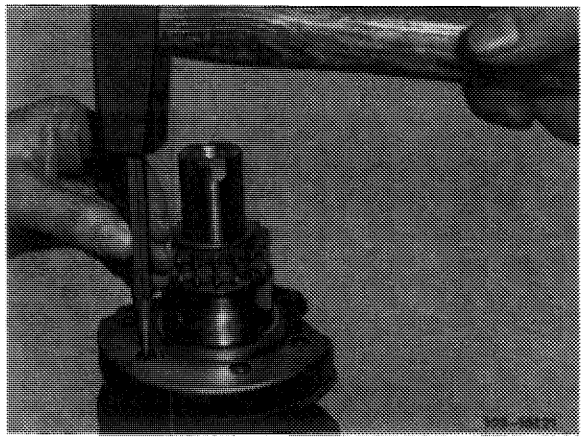
Then, carefully wash off nitric acid by means of alcohol.

Corrosion protection

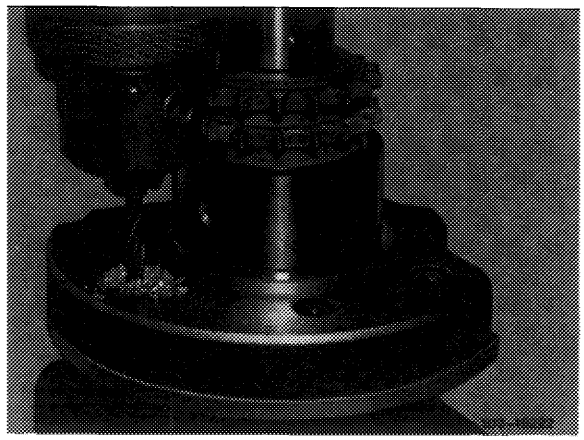
Crankshafts which are not immediately installed again should be lubricated with engine initial operation oil (SAE 30).

Riveting additional weight off and on

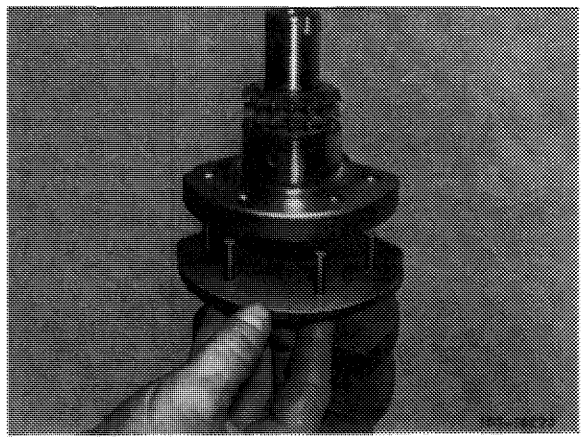
1 Punch mark countersunk rivet 6 x 28 mm accurately in center.



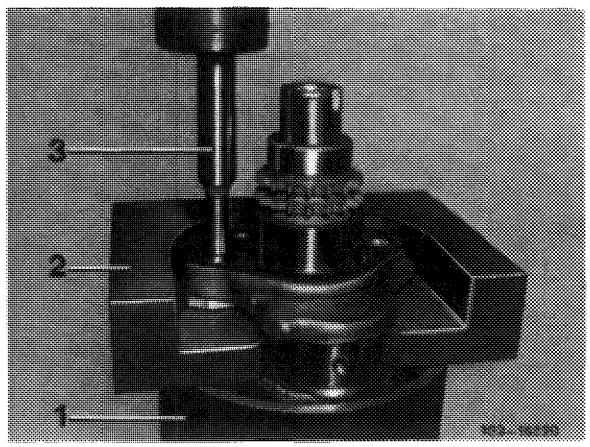
2 Drill into rivet heads with a 6.5 mm dia. drill and knock out.



3 Slip-on new or former, undamaged additional weight together with 4 countersunk rivets.



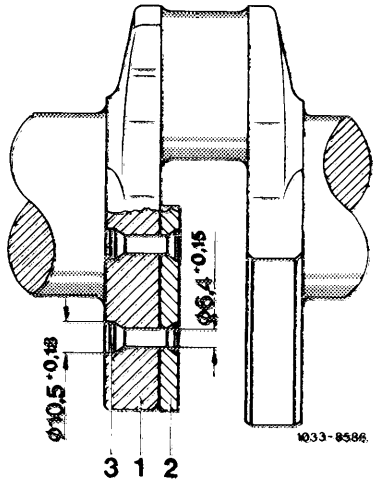
4 Introduce crankshaft into a suitable steel tube (approx. 165 mm dia. x 420 mm long) and place self-made rivet support (2) underneath.



1 Steel tube 165 mm dia. x 420 mm long
2 Self-made rivet support
3 Snap die

5 Rivet countersunk rivet by means of a hydraulic press. The additional weight should then rest fully against crankshaft cheek without leaving any intermediate space.

6 Then check crankshaft for runout of bearing journals and balance together with balancing disc and flywheel, even if the former additional weight is used again.



1 Crankshaft
2 Additional weight 110 031 05 01
3 Countersunk rivet 6 x 28 mm DIN 661 MUSt 34

Series production of riveted-on additional weight starting December 1978

starting engine end no.	starting chassis end no.
110.992 –10–038 031 –12–062 390	116.020–112 253
110.923 –10–012 665 –12–015 613	123.030–025 675 123.050–002 801
110.932 –10–009 748 –12–002 556	116.020–112 253
110.984 –10–014 634 –12–051 160	123.033–050 600 123.053–013 292
110.984 –10–014 634 –12–051 160	123.093–001 229
110.985 –10–011 106 –12–052 660	116.024/025–131 270
110.986 –10–002 276 –12–005 142	107.022–006 288 107.042–005 285

Data

Crankshaft standard dimension and repair stages	Crankshaft bearing journal dia	Width of journal on fitted bearing	Crankpin dia	Width of crankpin
Standard dimension	59.965 / 59.955	29.021 / 29.000	47.965 / 47.955	28.084 / 28.000
1st repair stage	59.715 / 59.705	up to 29.60	47.715 / 47.705	up to 28.30
2nd repair stage	59.465 / 59.455		47.465 / 47.455	
3rd repair stage	59.215 / 59.205		47.215 / 47.205	
4th repair stage	58.965 / 58.955		46.965 / 46.955	

Basic bore and bearing play		Crankshaft bearing	Connecting rod bearing
Basic bore dia		67.00 / 67.02	51.60 / 51.62
Perm. out-of-round and conicity of basic bore		0.01	
Radial bearing play	when new	0.031 to 0.053[1]	0.025 to 0.065[1]
	wear limit	0.08	
Axial bearing play	when new	0.10–0.24	0.11–0.23
	wear limit	0.30	0.50

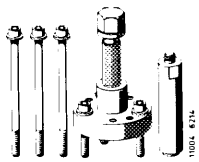
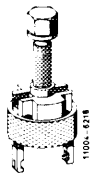
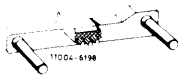
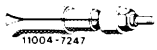
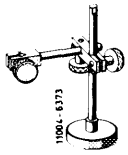
[1]) Try for mean value of radial play (vertical runout).

Bearing shells	Wall thickness crankshaft bearing	Width of fitted bearing shells	Wall thickness connecting rod bearing
Standard dimension	3.500–3.513	28.78–28.90	1.804–1.814
1st repair stage	3.625–3.638	29.4–29.6[3]	1.929–1.939
2nd repair stage	3.750–3.763		2.054–2.064
3rd repair stage	3.875–3.888		2.179–2.189
4th repair stage	4.000–4.013		2.304–2.314

1) Measured at apex of bearing shell.
2) The fitted bearing shells for 1st to 4th repair stage are supplied in oversize width and should be refinished in accordance with ground crankshaft bearing journal.

Tightening torques		Nm
Crankshaft bearing bolts		80
Connecting rod nuts	initial torque	40–50
	angle of rotation torque	90–100°
Balancing disc to crankshaft		400–450
Necked down screws for flywheel or driven plate	initial torque	30–40
	angle of rotation torque	90–100°

Special tools

Puller for balancing disc		116 589 10 33 00
Puller for crankshaft gear		615 589 01 33 00
Detent		110 589 00 40 00
Countersupport for internal puller		000 589 33 33 00
Internal puller 14.5–18.5 mm for radial ball bearing		000 589 25 33 00
Dial gauge holder for measuring end play		116 589 12 21 00

Note

Engine removed and disassembled.

Main oil duct in crankcase open (if with steel balls, refer to 01–130). Oil ducts in crankcase and in crankshaft carefully cleaned.

Test crankshaft for cracks, accuracy and hardness (03–318).

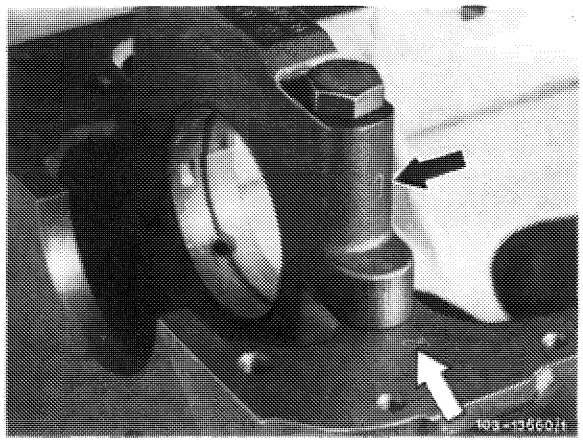
When grinding crankpins a difference of one repair stage only permitted per crankshaft.

Associating cranskhaft bearings, installing crankshaft

1 Install crankshaft bearing cap. Pay attention to identification, 1 is at front (arrows).

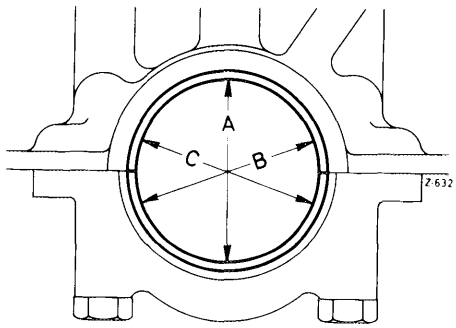
Do not mix up crankshaft bearing caps.

2 Tighten bolts to 80 Nm.



3 Measure basic bore in direction A, B and C in two levels (conicity).

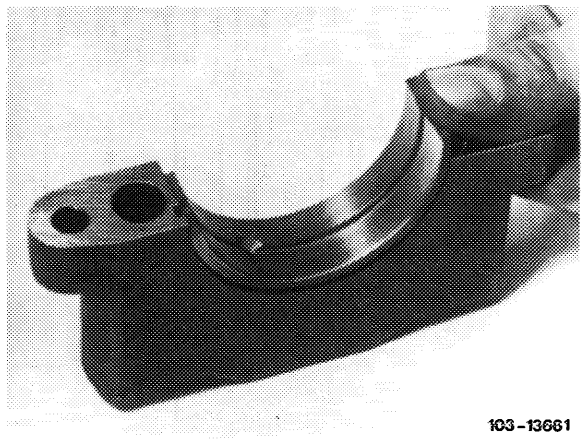
If a basic bore exceeds the specified value or is conical, touch up bearing cap at its contact surface on a surface plate up to max. 0.02 mm.



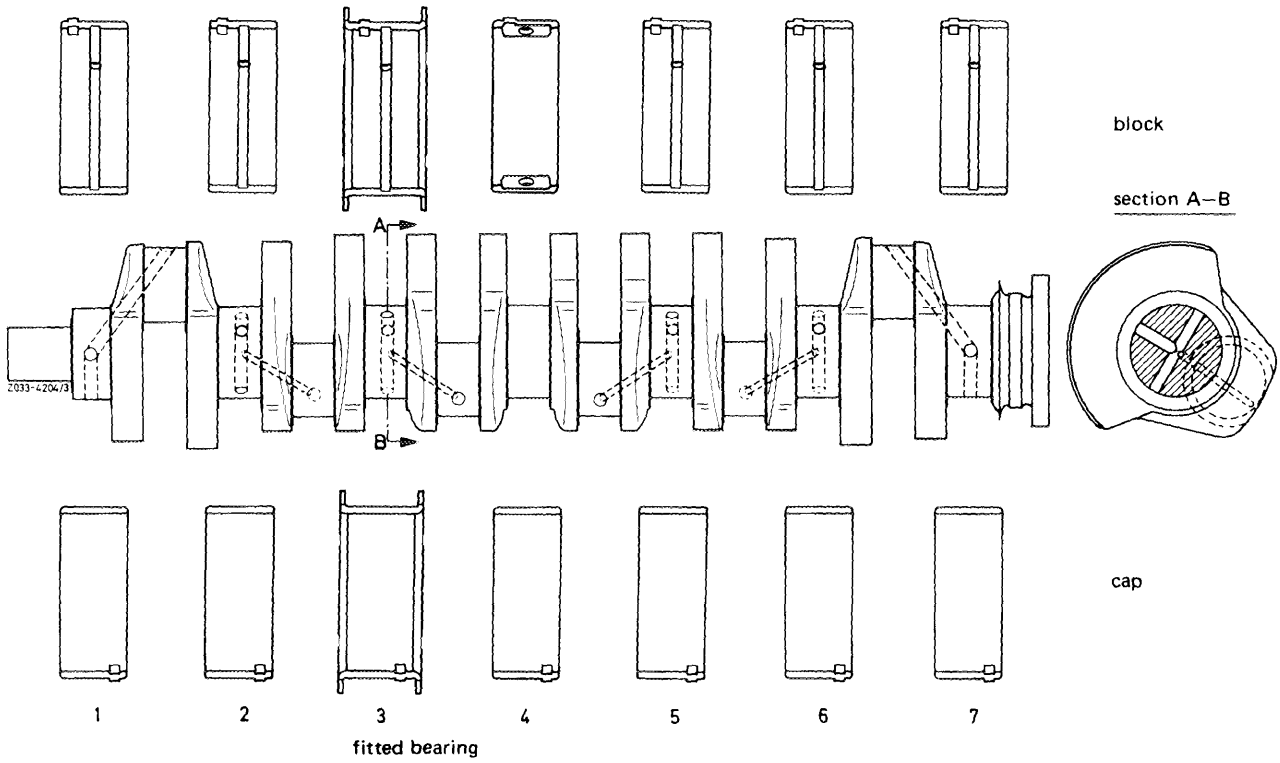
4 Insert crankshaft bearing shells and mount bearing cap. Tighten bolts to 80 Nm torque.

Attention!
When associating crankshaft bearing shells, observe the two different crankshafts.

On crankshafts with tapered bore (2nd version) install crankshaft bearing shells with 360° oil groove.

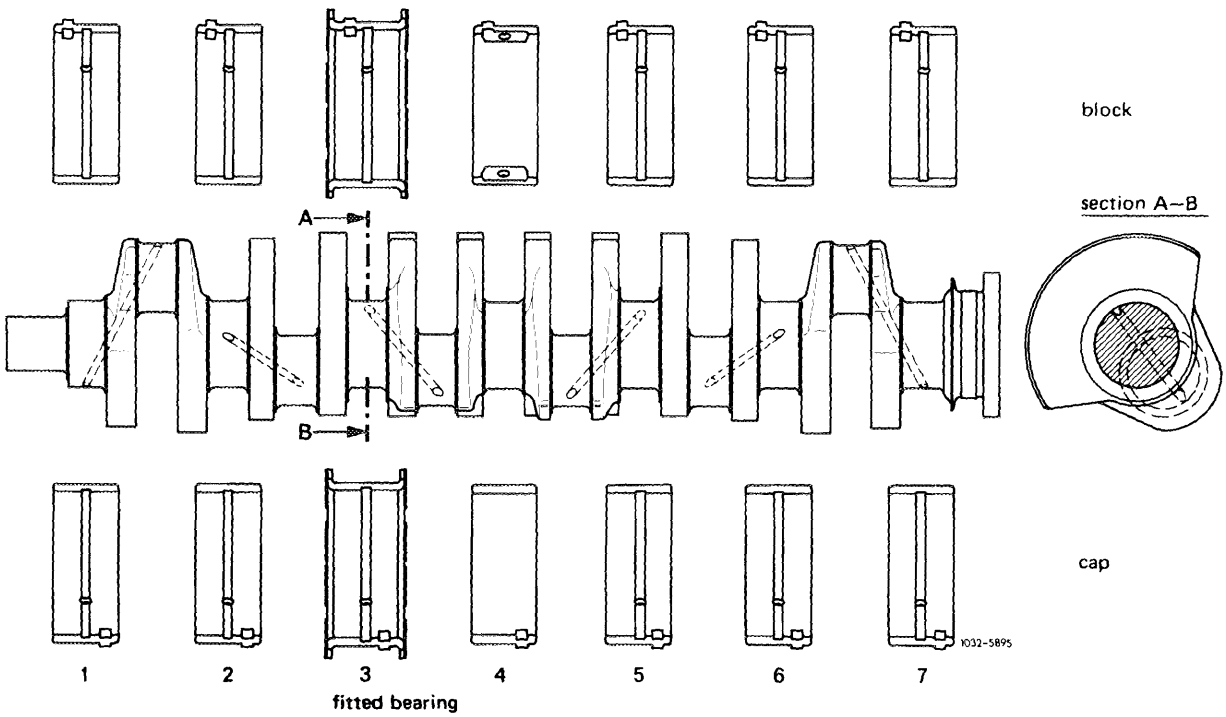


103-13661



1st version

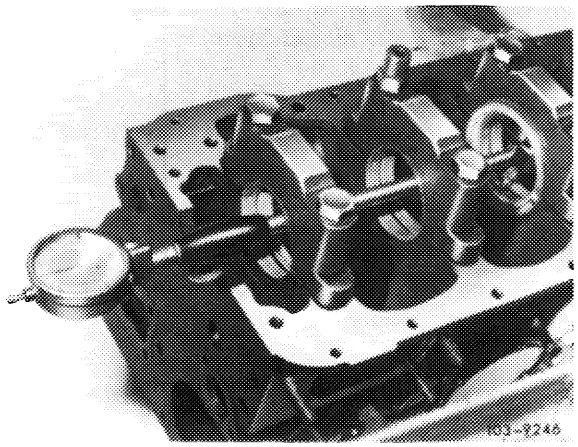
Crankshaft with T-bore, bearing shells with 180° oil groove.



2nd version

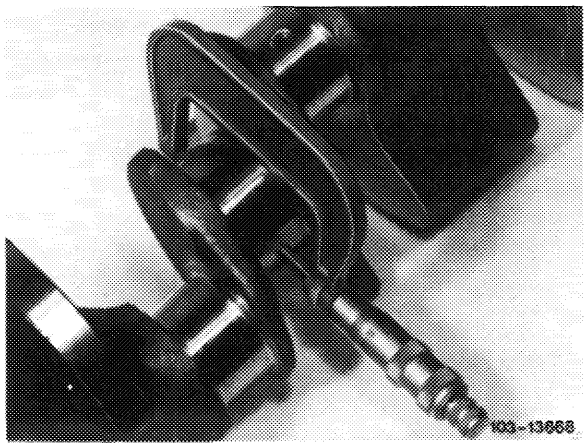
Crankshaft with inclined bore, bearing shells with 360° oil groove.

5 Measure bearing dia and write down.



6 Measure crankshaft bearing journal, find radial crankshaft bearing play (vertical runout).

Note: The bearing play can be corrected by exchanging bearing shells, while trying for lower value (0.031 mm) of specified bearing play. Crankshaft bearing shells without color code are thicker than those with a blue color code, but the fact must be taken into consideration that a wall thickness without and one with color code may overlap.

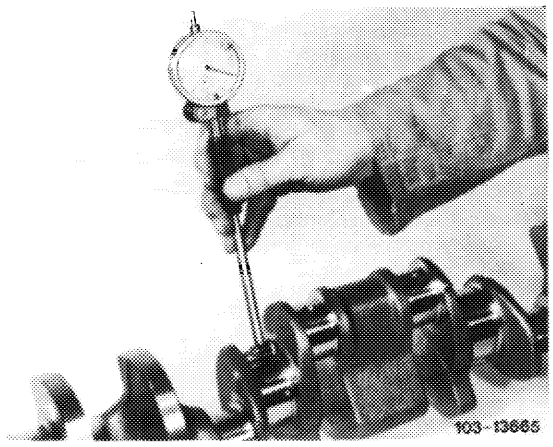


7 Measure width of fitted bearing journal and fitted bearing.

Measure crankshaft bearing end play.

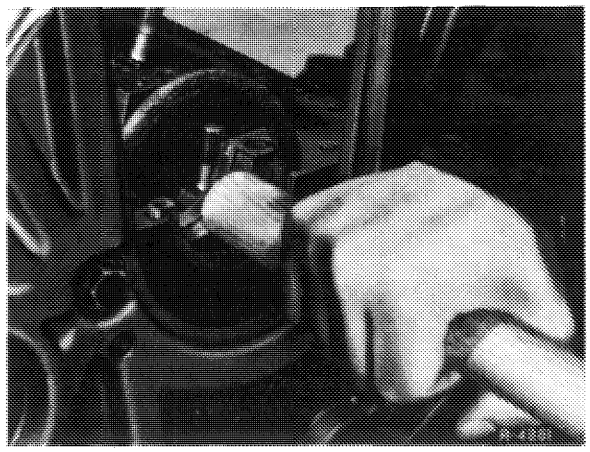
Note: The fitted bearing shells of the repair stages are supplied at oversize.

Both fitted bearing shells must be machined on both sides down to width of fitted bearing journal minus end play. Try for lower value of 0.10 mm.



8 Replace rear crankshaft radial sealing ring (03–327).

9 Provide bearing shells, crankshaft and radial sealing ring with engine oil and install crankshaft.

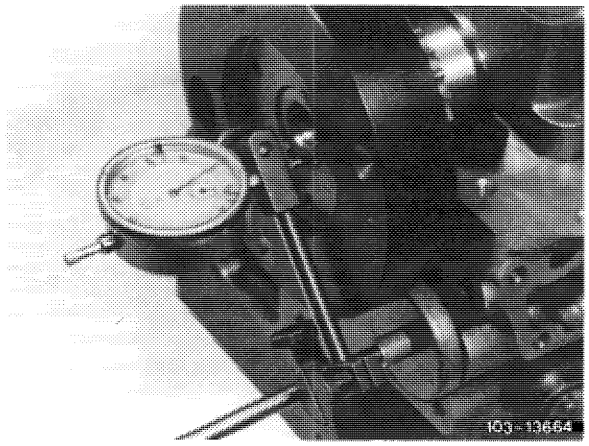


10 Provide screws on threads and on screw head contact surface with oil and tighten to 80 Nm.

Note: Since January 1976 there are no more washers on crankshaft bearing bolts.

11 Measure end play of crankshaft bearings.

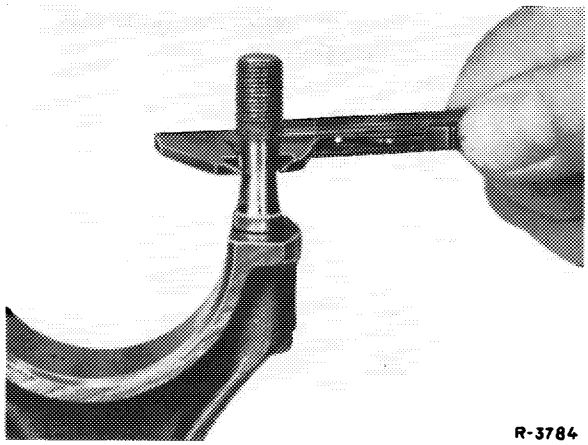
12 Rotate crankshaft manually and check whether shaft is freely running.



Associating connecting rod bearings and installing connecting rods

13 Check connecting rod bolts (03–310).

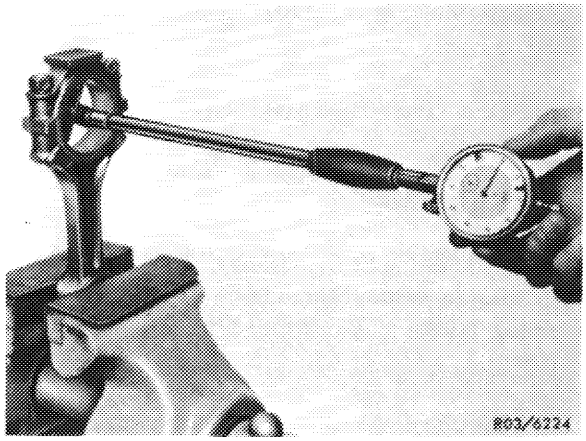
14 Recondition connecting rods and square (03–313).



R-3784

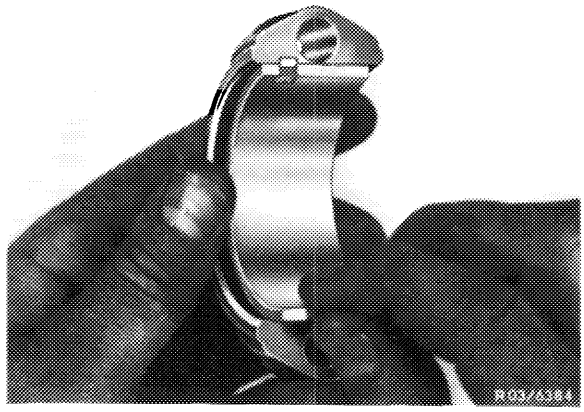
15 Mount connecting rod bearing caps while paying attention to identification. Tighten connecting rod nuts to 40–50 Nm.

16 Measure basic bore in two directions. If a basic bore exceeds the specified value or is tapered, touch up bearing cap at its contact surface on a surface plate up to max 0.02 mm.



17 Insert connecting rod bearing shells, mount connecting rod bearing caps with bearing shells and tighten connecting rod nuts to 40–50 Nm.

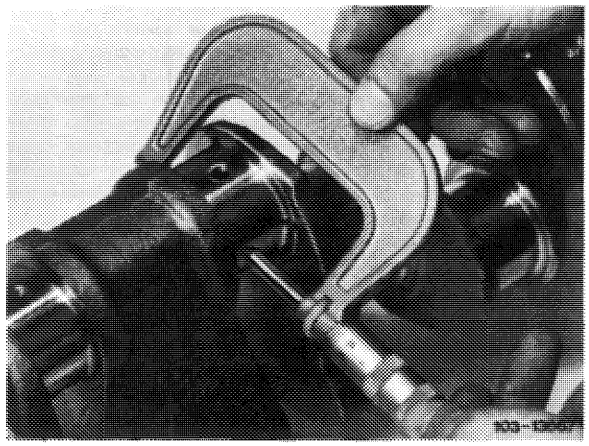
Attention!
Connecting rod bearing shell in connecting rod has an oil bore for lubricating piston pin.



18 Measure bearing dia and write down.

19 Measure crankpins, determine radial play (vertical runout) of connecting rod bearings.

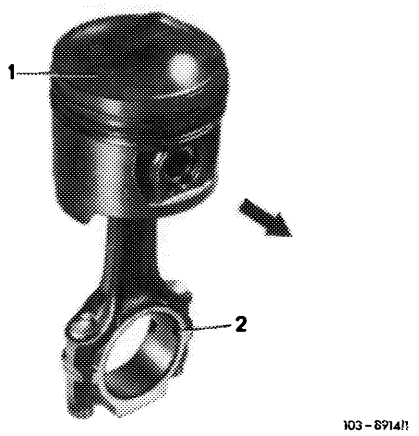
Note: The bearing play can be corrected by exchanging bearing shells, while trying for mean value (0.04 mm) of specified bearing play. Crankshaft bearing shells without color code are thicker than those with a blue color code, but the fact must be taken into consideration that a wall thickness without and one with color code may overlap.



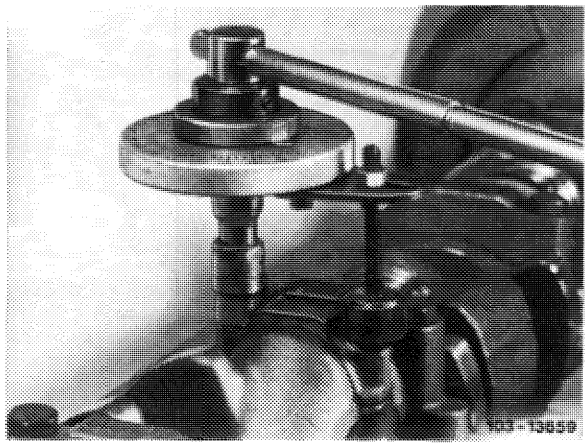
20 Mount piston on connecting rod (03–316).

21 Provide bearing shells, crankshaft, piston and cylinder with engine oil. Install connecting rod with piston (03–316).

Pay attention to identification.



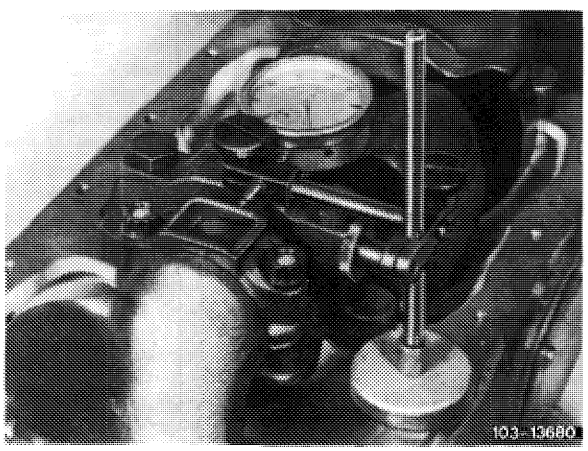
22 Tighten connecting rod nuts to 40–50 Nm **initial torque** and 90–100° **angle of rotation.**



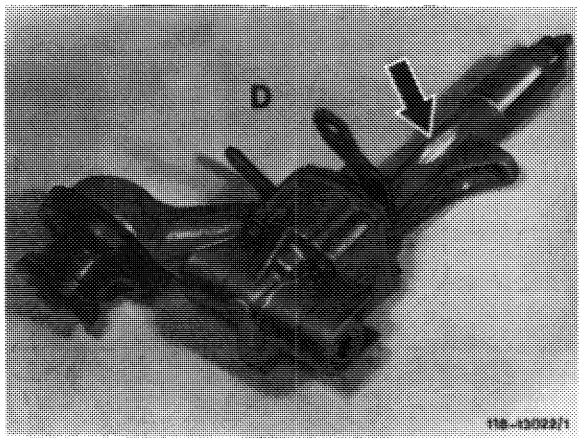
23 Measure end play of connecting rod bearing. Check connecting rod in piston for unobstructed operation.

Attention!
Disassemble and clean oil pump, renew if required. Renew oil pressure relief valve. Disassemble oil filter top and clean. Carefully clean air-oil cooler.

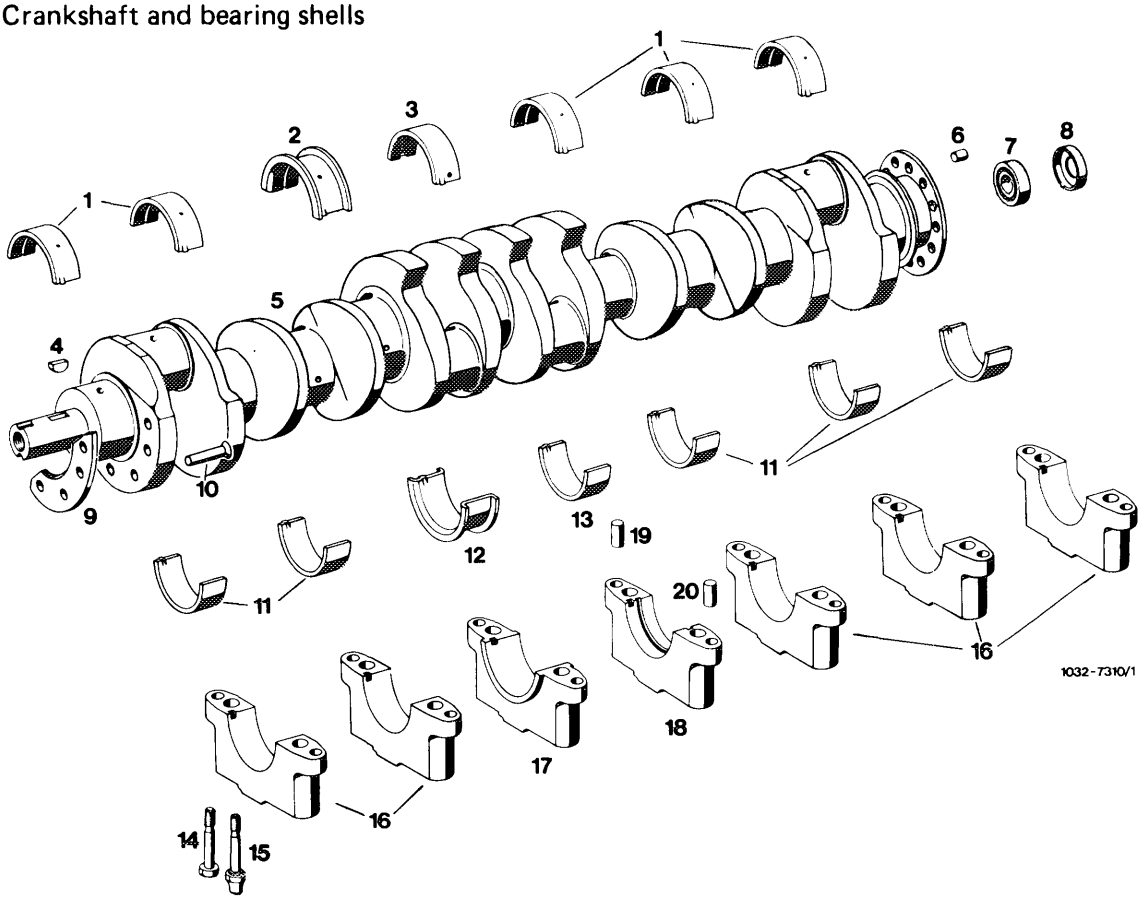
Install initial operation oil filter element. Change engine oil and oil filter element after 1000–1500 km.



Crankshafts with riveted-on additional weight may not be used together with oil pumps, which are provided with a recess (arrow) on housing shaft.



Crankshaft and bearing shells



1 Crankshaft bearing shells with oil groove and oil bore for bearing 1, 2, 5, 6 and 7
2 Fitted bearing shell with oil groove and oil bore for bearing 3
3 Crankshaft bearing shell with 2 oil pockets and 2 oil bores for bearing 4
4 Woodruff key
5 Crankshaft
6 Cyl. pin 10h 8 x 18
7 Radial ball bearing
8 Closing ring
9 Additional weight
10 4 Countersunk rivets 6 x 28 mm DIN 661 MUSt 34
11 1st version crankshaft bearing shells without oil groove and oil bore for bearing cap 1, 2, 5, 6 and 7 and crankshaft with T-bore

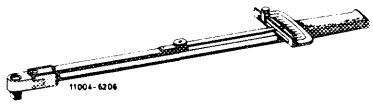
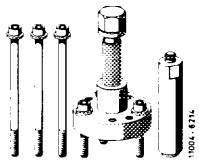
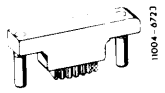
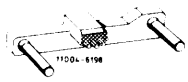
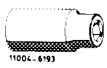
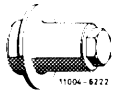
2nd version crankshaft bearing shells with oil groove and oil bore for bearing cap 1, 2, 5, 6 and 7 and crankshaft with 360° tapered bore

12 1st version fitted bearing shell without oil groove and oil bore for crankshaft with T-bore

2nd version fitted bearing shell with oil groove and oil bore for crankshaft with 360° tapered bore
13 Crankshaft bearing shell without oil groove and oil bore for bearing cap 4
14 12 screws for crankshaft bearing cap
15 2 screws for crankshaft bearing cap (for fastening oil pump)
16 Crankshaft bearing cap 1, 2, 5, 6 and 7
17 Crankshaft bearing cap 4 (fitted bearing)
18 Crankshaft bearing cap 4 (with oil groove)
19 7 cyl. pins 10 m 6 x 16
20 7 cyl. pins 8 m 6 x 16

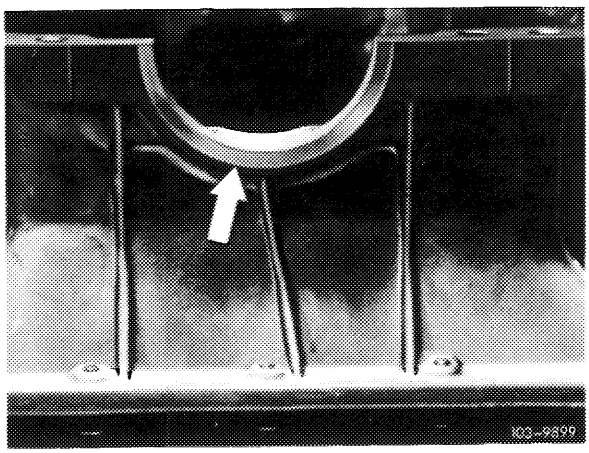
Tightening torques	Nm
Bolt M 18x1.5x45 on crankshaft	400
Bolt M 8 x 65	35

Special tools

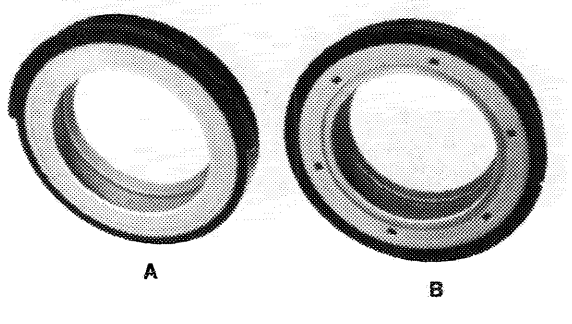
Torque wrench 150–500 Nm (15–50 kpm) 3/4" square		001 589 31 21 00
Puller for balance disc		116 589 10 33 00
Holder		116 589 01 40 00 or
Holder		110 589 00 40 00
27 mm socket 1/2" square		001 589 65 09 00
Puller for spacer		616 589 00 33 00
Radial oil seal installer		110 589 07 61 00

Note

Install radial sealing rings, part no. 004 997 66 47 (twc component ring) or 003 997 03 47 (solid viton ring), with all-around shoulder only in engines with oil pan milled flat (arrow).
Radial sealing rings, part no. 008 997 04 47 (two-component ring) or 008 997 05 47 (solid viton ring) with half-round shoulder are provided for oil pans not milled flat.
Prior to installation, provide all radial sealing rings with longterm grease between sealing lip and dust lip.



Install radial oil seals with a half shoulder in engines without a surface milled oil pan.

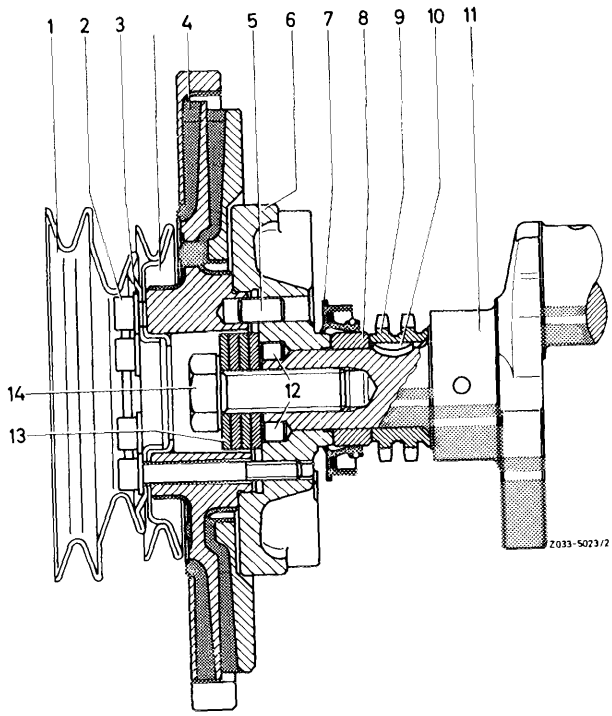


A Radial oil seal with half shoulder
B Radial oil seal with full shoulder

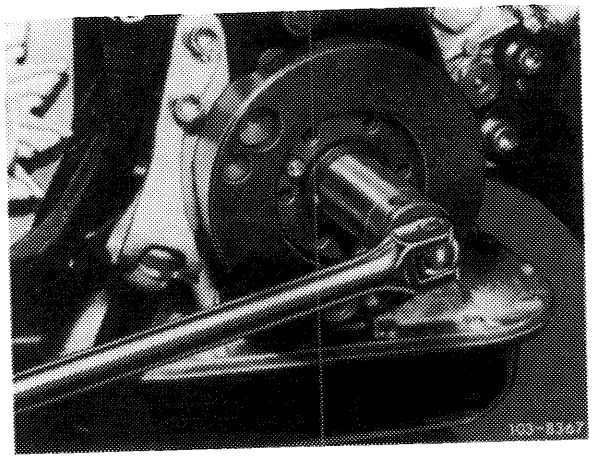
Removal

1 Remove radiator and fan.

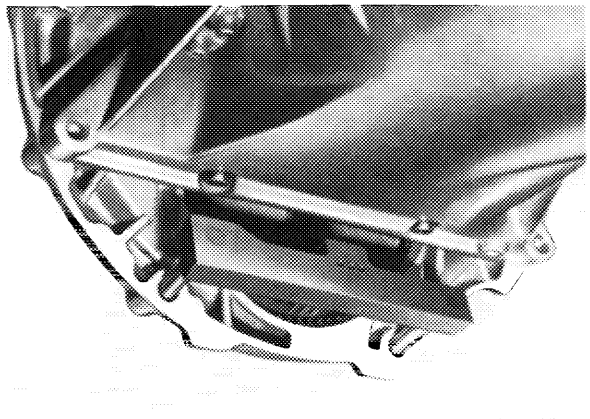
2 Remove pulley (1) and vibration damper (4) (03–340).



3 Loosen bolt on crankshaft.



4 Counterhold crankshaft with holder.



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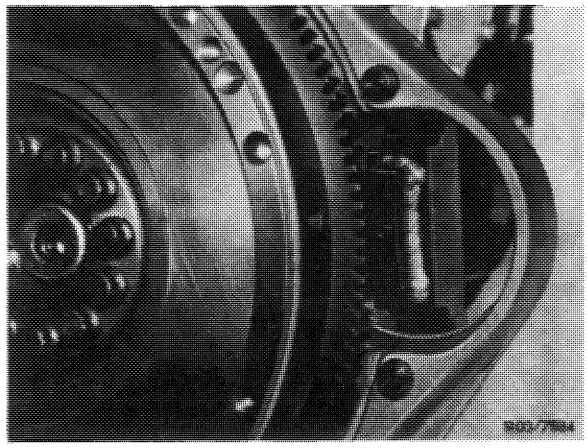
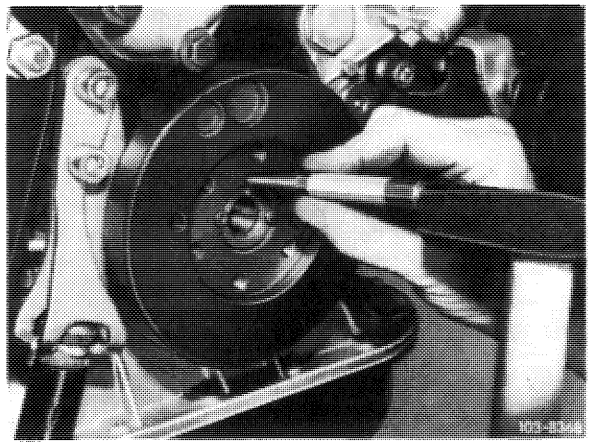
Holder 100 589 00 40 00

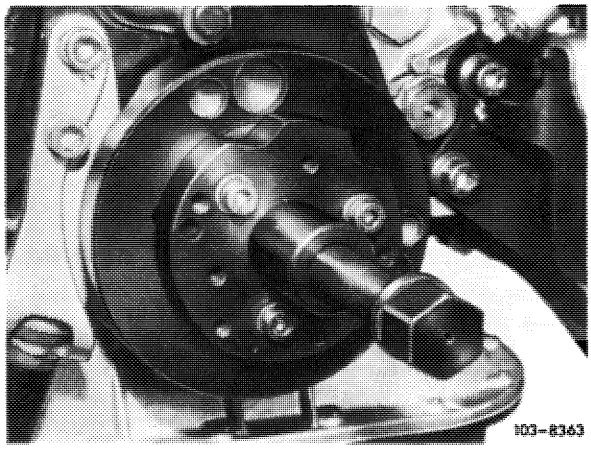


Holder 116 589 01 40 00
when starter is removed

5 Mark balance disc and crankshaft together with a punch mark.



6 Pull off balance disc with an extractor.



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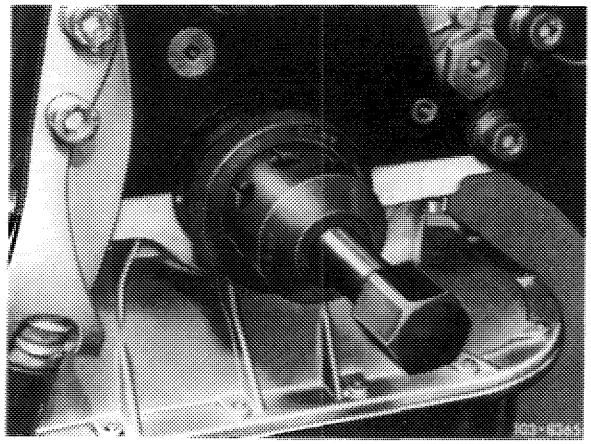
7 Press out radial oil seal with a screwdriver.

Attention!
Be careful not to damage crankshaft journals and radial oil seal bore.

8 If wear can be felt, pull off spacer with an extractor.



Installation

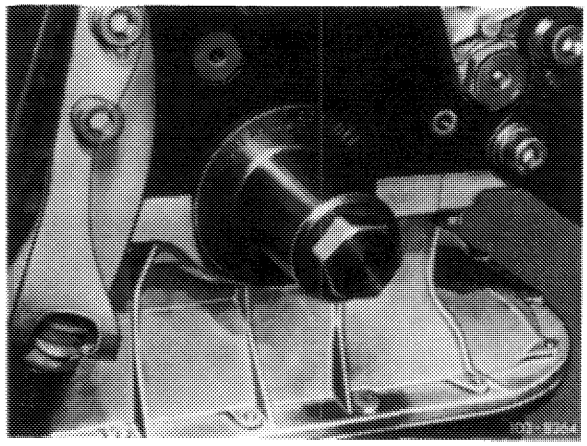
9 Deburr and clean radial oil seal bore.

Note: If the removed radial sealing ring has been leaking at outer shoulder, coat new radial sealing ring prior to insertion on outer shoulder in range of joints with sealing compound, part no. 001 989 29 20 or part no. 001 989 46 20. Permit sealing compound to harden for approx. 3 hours and do not remove inserting tool until then.

10 Fill new radial sealing ring behind sealing lip with longterm grease.

11 Insert radial sealing ring with inserting tool.
For radial sealing rings inserted with sealing compound, remove inserting tool only after 10—15 minutes.

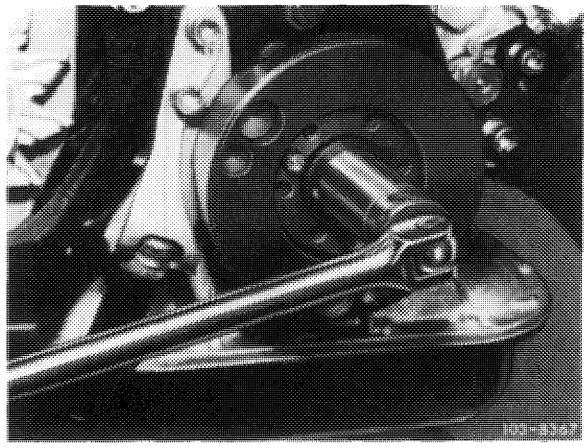
Attention!
The radial oil seal must be at an exact right angle to the crankshaft journal, since otherwise a perfect seal cannot be reached.



12 Install new spacing ring or turn spacing ring used up to now around and mount in such a manner that the worn groove comes to rest toward the rear.

13 Place balance disc on crankshaft, that the dowel pin bores align.

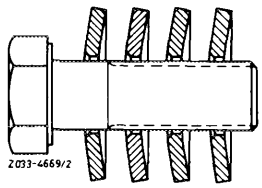
Note: The balance disc is located on the crankshaft by **two offset** dowel pins.



14 Pull balance disc on to crankshaft with M 18x1.5x45 bolt and one belleville spring washer.

Knock in both dowel pins.

15 Install four belleville spring washers with concave surface facing bolt head.



16 Tighten bolt on crankshaft to torque of 400 Nm (40 kpm), while counterholding the crankshaft with a holder.

17 Install vibration damper, pulley, fan and radiator (03–340).

03–327 Replacing rear crankshaft radial oil seal

Tightening torques		Nm
Necked down screw for camshaft gear		80
Connecting rod nuts	initial torque	40–50
	angle of rotation torque	90–100°
Necked down screws for flywheel or driven plate	initial torque	30–40
	angle of rotation torque	90–100°
Crankshaft bearing bolts		80

Self-made tool	
Gage	see fig., point 4

Note

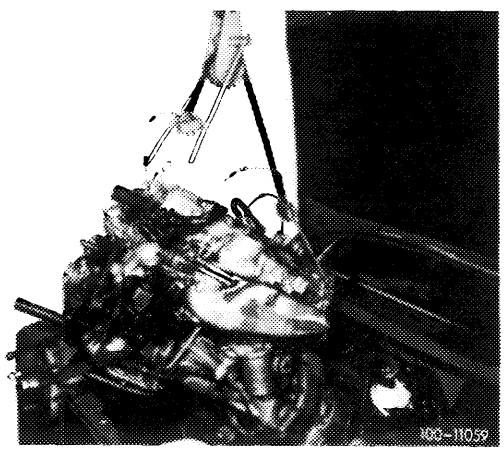
When repairing engines 110, use radial sealing ring 000 997 90 41 (yellow-brown) and cut off with 0.5 mm projection.

Exception: On engines which are provided with a new or a newly machined (refinished) crankshaft and new crankshaft bearings during repairs, install radial sealing ring 000 997 69 41 (graphite-grey) and cut off with 1 mm projection.

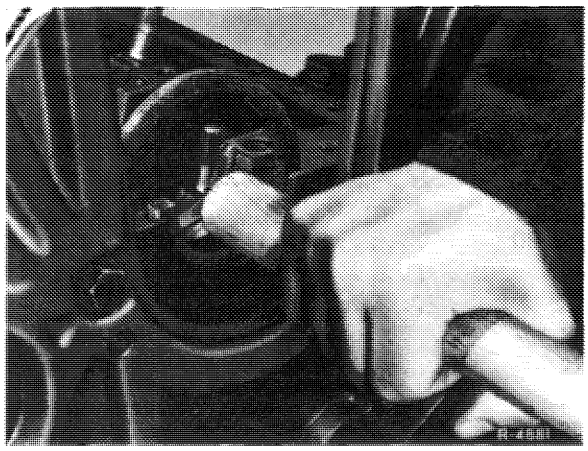
Replacing

1 Remove engine (01–030).

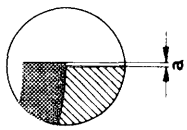
2 Remove crankshaft.



3 Place radial oil seal in crankcase and oil pan, and rub in with an oiled hammer handle.

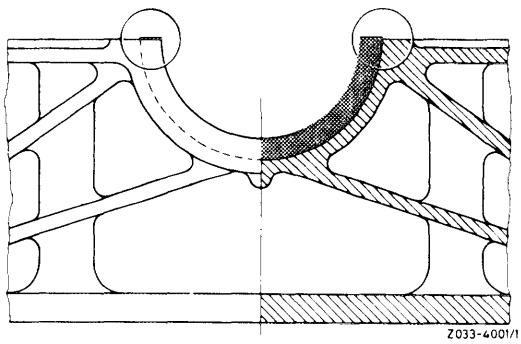


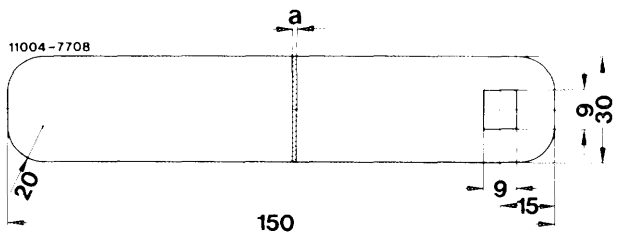
4 To provide an overlap, cut off radial oil seal in crankcase and oil pan about 0.5 mm or 1.0 mm above mating surface.



Note: For cutting off, a self-made gauge according to drawing can be used.

Radial sealing ring, part no.	Dimension a (mm)
000 997 69 41 (graphite-grey)	1.0
000 997 90 41 (yellow-brown)	0.5





5 Coat radial oil seal with oil before installation of crankshaft.

6 Install crankshaft.

7 Install oil pan, turn crankshaft and check for easy movement.

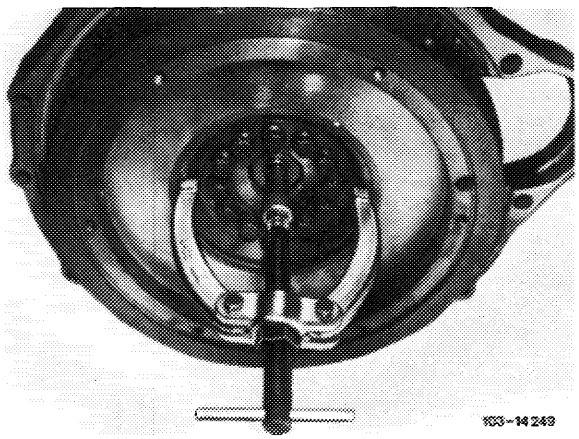
03–330 Removal and installation of radial ball bearing and closing ring in crankshaft

Special tools

Countersupport for internal puller		000 589 33 33 00
Internal puller 14.5–18.5 mm		000 589 25 33 00

Removal

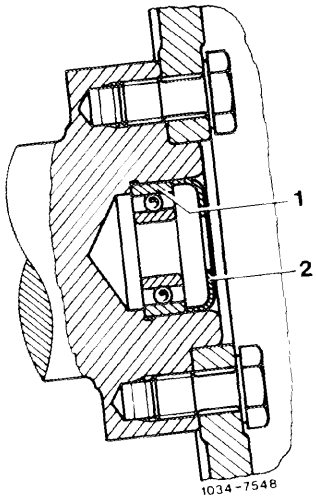
1 Pull ball bearing and closing ring out of crankshaft together with countersupport and internal puller.



Installation

2 Provide new ball bearing (1) with anti-friction bearing grease and knock into crankshaft with a suitable mandrel.

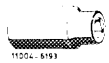
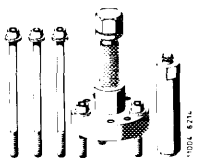
3 Knock-in closing ring (2).



03–340 Removal and installation of pulley, vibration damper and balancing disc

Tightening torques	Nm
Screw M 18 x 1.5 x 45 on crankshaft	400–450
Screw M 8 x 65	35

Special tools

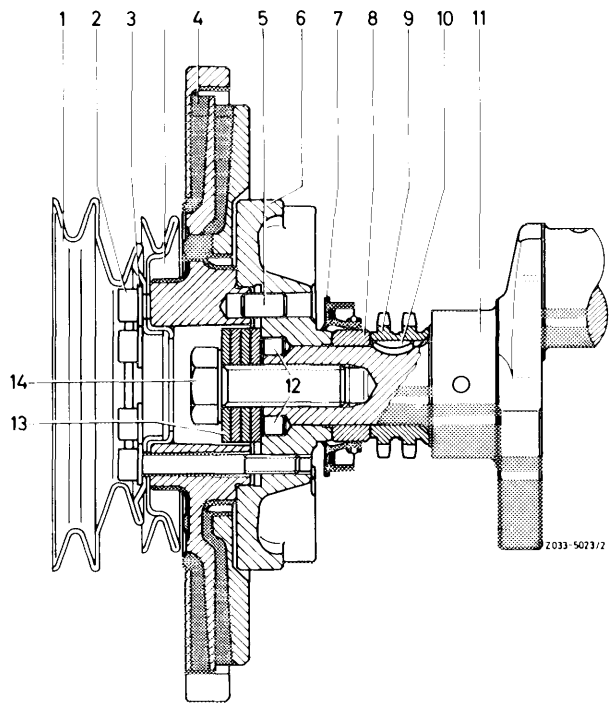
Socket 27 mm 1/2" square		001 589 65 09 00
Torque wrench 150–500 Nm (15–50 kpm), 3/4" square		001 589 31 21 00
Detent		110 589 00 40 00 or
Detent		116 589 01 40 00
Puller for balancing disc		116 589 10 33 00

Note

The **vibration damper** can be replaced **without balancing.**

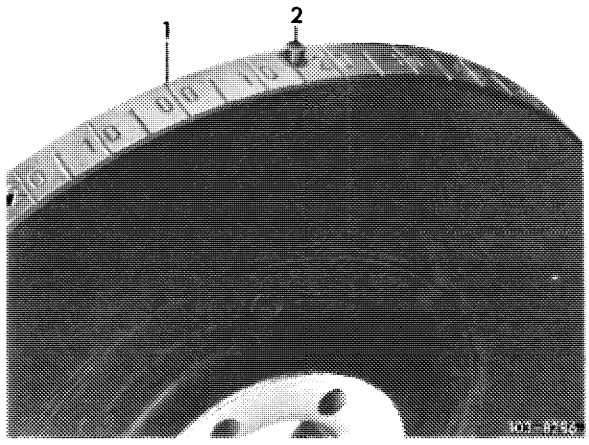
If the **balancing disc** is renewed, static **balancing is required** (03–344).

Since May 1974 a balancing disc with 3 cutouts for removing tensioning rail bearing bolt is installed.



1 Pulley
2 Screw M 8 x 65
3 Disc
4 Vibration damper 254 mm dia
5 Cyl. pin 10h 8 x 18
6 Balancing disc
7 Radial sealing ring
8 Spacing ring
9 Crankshaft gear
10 Woodruff key
11 Crankshaft
12 Set pin 8 x8
13 Cup spring
14 Screw M 18 x 1.5 x 4!

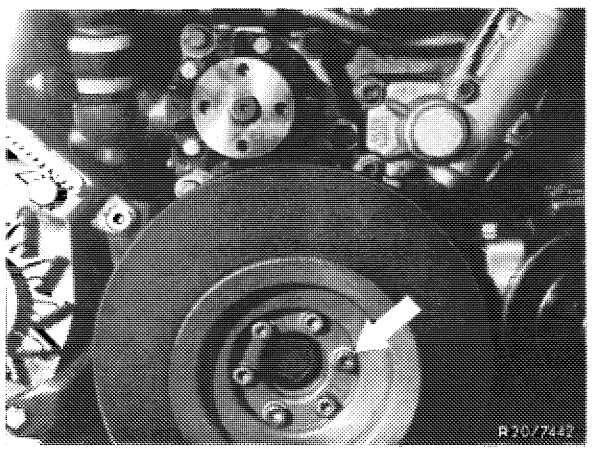
Attention!
For engines which have a "0/0" mark for BDC on the vibration damper besides TDC, the **TDC mark** in the vibration damper is **next to the pin.**



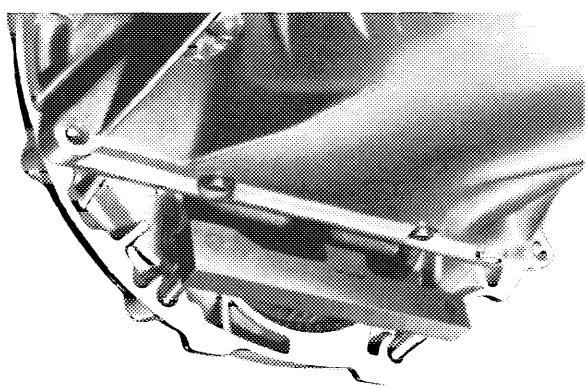
Removal

1 Remove radiator and fan.

2 Remove pulley and vibration damper.



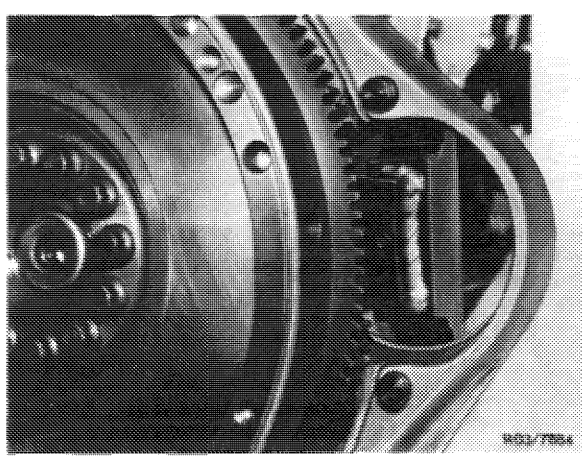
3 Counterhold crankshaft with holder.



Holder 110 589 00 40 00

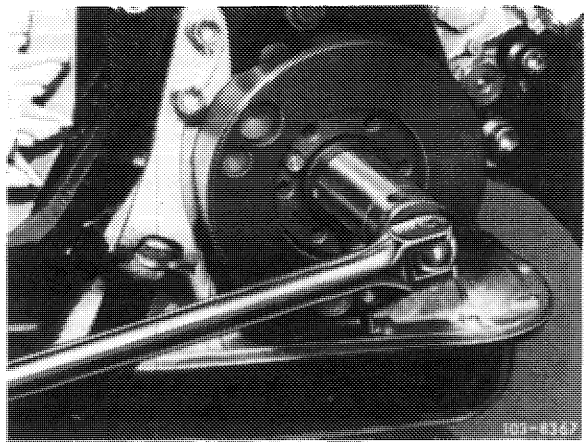
103-9243

Also remove starter of engines with a manual transmission.

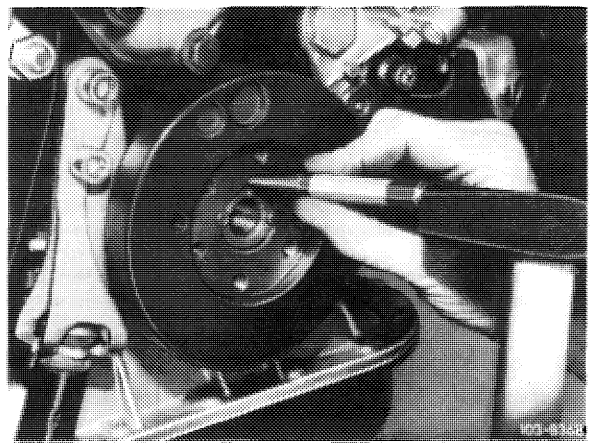


Holder 116 589 01 40 00

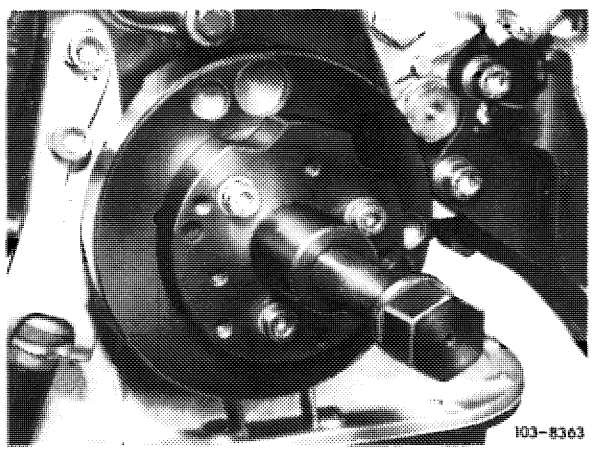
4 Remove bolt in crankshaft.



5 Mark balance disc and crankshaft together with a punch mark.



6 Pull off balance disc with an extractor.



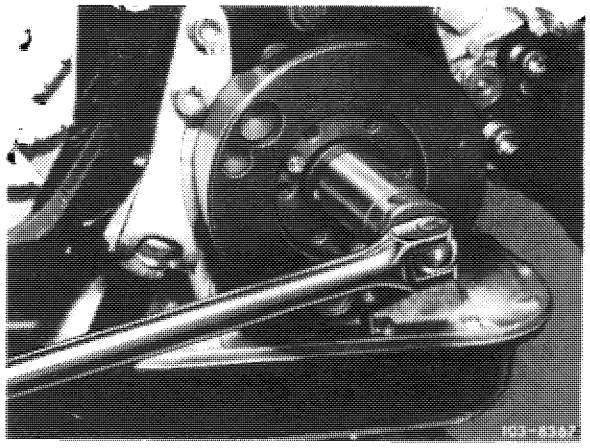
Installation

7 Install balance disc on crankshaft that bores for dowel pins align.

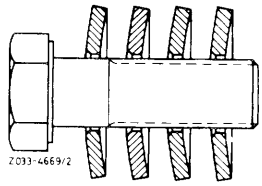
Note: The balance disc is located on the crankshaft by two **offset** dowel pins.

8 Pull balancing disc on crankshaft with screw M 18 x 1.5 x 45 and a cup spring.

9 Knock-in both set pins.



10 Mount four cup springs with convex face facing screw head.



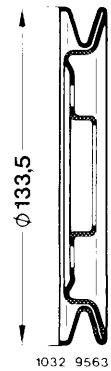
11 Tighten screw on crankshaft to 400 Nm while applying counterhold to crankshaft by means of detent.

Note: Damaged threads M 18 x 1.5 in crankshaft journal at the front can be repaired by inserting a helicoil insert 0130 0184027.

12 Install vibration damper, pulley, viscofan and radiator.

Note: Take association of pulley on crankshaft for various engines 110 from the following list.

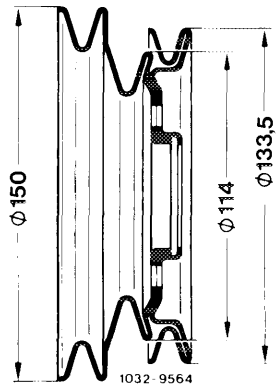
Pulley	Engine
110 155 00 15	110.921 110.931 110.981 110.991



110 155 00 15

Pulley	Engine
110 466 01 15	110.921*
	110.931*
	110.922 version 1
	110.032 version 1
	110.981*
	110.991*
	110.982
	110.992
	110.983
	110.993

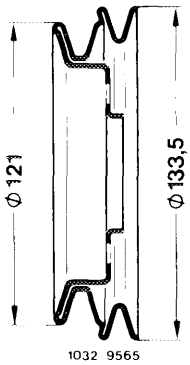
* with special version power steering or air conditioning



110 466 01 15

Pulley	Engine
123 032 00 04	110.922 version 2
	110.932 version 2
	110.923 version 1*
	110.924 version 1*
	110.984 version 1*
	110.985
	110.986
	110.987 version1*
	110.994

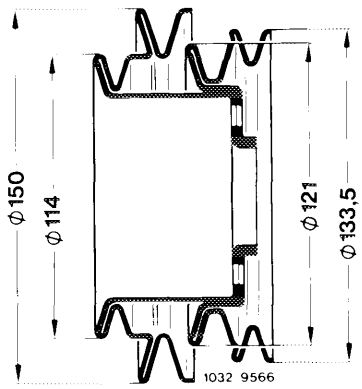
* with 55 Ah alternator



123 032 00 04

Pulley	Engine
123 032 01 04	110.922*
	110.932*
	110.923*
	110.924*
	110.984*
	110.985*
	110.986*
	110.987*
	110.994*

* with special version air conditioning or emission control



123 032 01 04

Pulley 110 032 08 04[1)]

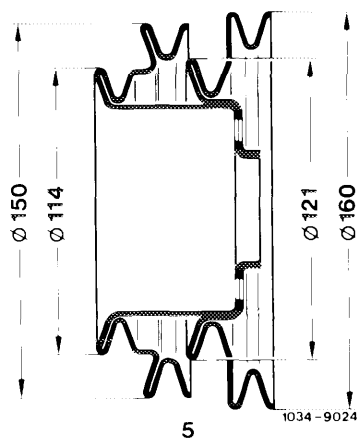
Introduction into series (J) August 1978

starting engine end no.	starting chassis end no.
110.984–12–043 370	123.033–12–043 906
110.985–12–044 308	123.053–12–010 554

Introduction into series (S)[2)] and (USA) March 1980

starting engine end no.	starting chassis end no.
110.984 –10–023 276	123.007[2)]
–12–076 809	123.033 019 600
	123.053
110.985 –12–075 271	116.024–157 385

1) Together with 65 Ah alternator
2) (S) only



5

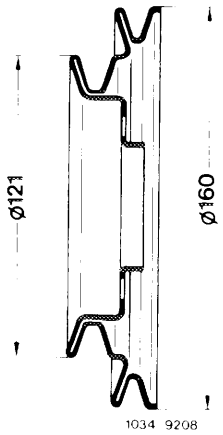
110 032 08 04

Pulley 110 032 09 04* (formerly 123 032 00 04)

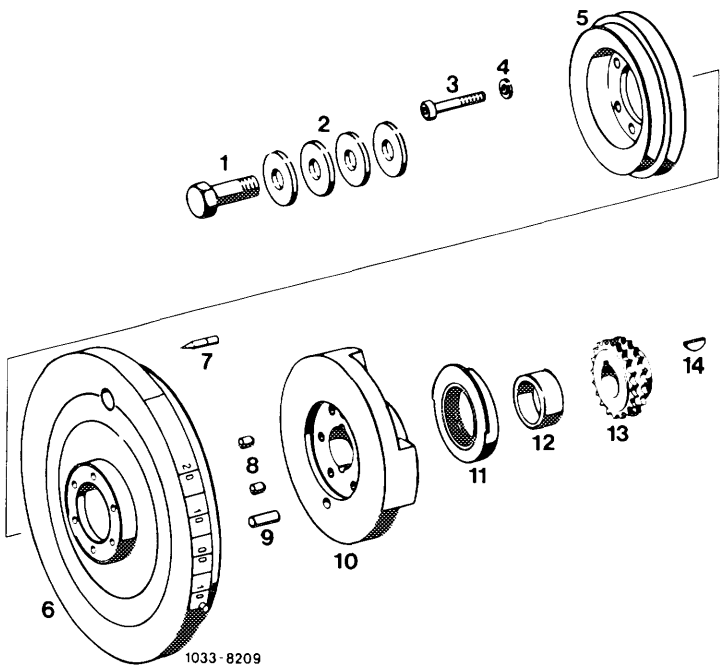
Introduction into series March 1980

	starting engine end no.	starting chassis end no.
110.923	–10–014 965	123.030–029 250
	–12–018 195	123.050–003 705
110.924	–10–000 356	126.021–001 320
	–12–001 102	
110.984	–10–023 276	123.033–073 349
	–12–076 809	123.053–019 600
110.985	–12–075 271	126.024/025–157 385
110.987	–10–000 675	126.022/023–004 070
	–12–003 696	

* together with 65 Ah alternator



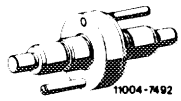
Pulleys, vibration damper and balancing disc



1 Screw M 18 x 1.5 x 45
2 Cup springs
3 6 screws M 8 x 65
4 6 washers 8.4
5 Pulley
6 Vibration damper 254 mm dia
7 Adjustment indicator
8 2 set pins 8 x 8
9 Cyl. pin 10h 8 x 18
10 Balancing disc
11 Radial sealing ring
12 Spacing ring
13 Crankshaft gear
14 Woodruff key

03–344 Static balancing of balance disc

Special tool

Balance disc holder		617 589 02 63 00

Conventional tool

Rolling device	Trebel, D-4030 Ratingen, type EO, order no. 03600/0904/E 0010

Note

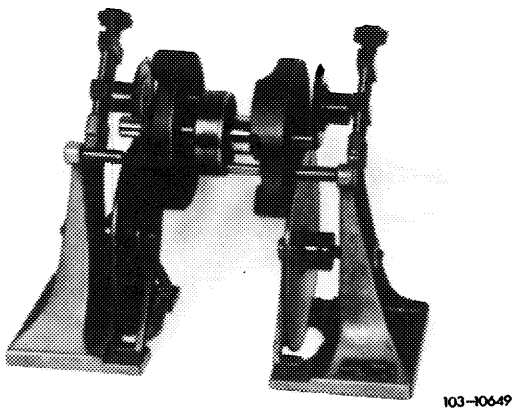
The balance condition of the old balance disc must be transferred to the new balance disc.

All parts of a broken balance disc must be pasted together and be statically balanced with a new balance disc.

Static balancing

1 Place new balance disc on balancing holder with an offset of 180° over old one.

2 Let balancing holder with both balance discs oscillate on rolling device.

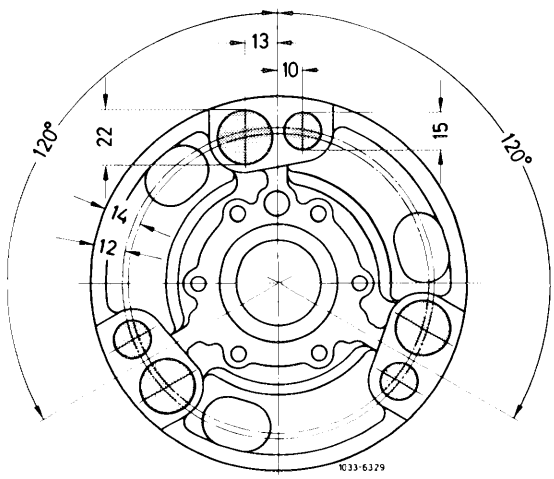


103–10649

3 Drill new balance disc in such a manner, that the balance discs remain still without oscillating in any position on the rolling device.

Pay attention to position of balancing bores (illustration).

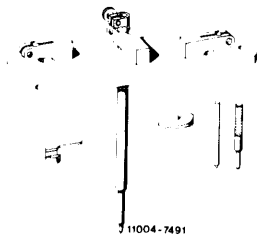
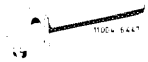
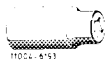
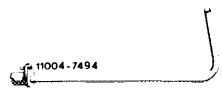
Hole depth max 25 mm.



Balancing disc rear

Tightening torque	Nm
Bolts and capped nuts for cylinder head cover	5

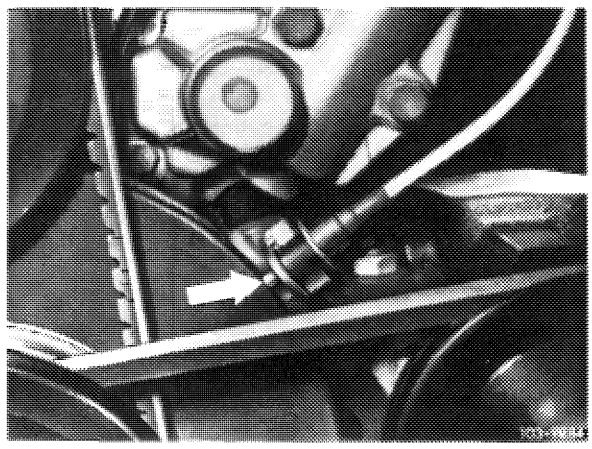
Special tools

TDC tester		110 589 10 21 00
Locating device for adjusting slide (2nd version of adjusting slide)		116 589 19 21 00
27 mm socket to turn engine		001 589 65 09 00
Locating device for TDC transmitter (1st version of adjusting slide)		110 589 08 21 00
Guide for TDC transmitter (1st version of adjusting slide)		110 589 06 61 00

Note

With the crankshaft position at 20° the TDC transmitter must be exactly above the TDC pin in the vibration damper (arrow).

Distance between TDC transmitter and guide pin in vibration damper 0.2–2.0 mm.



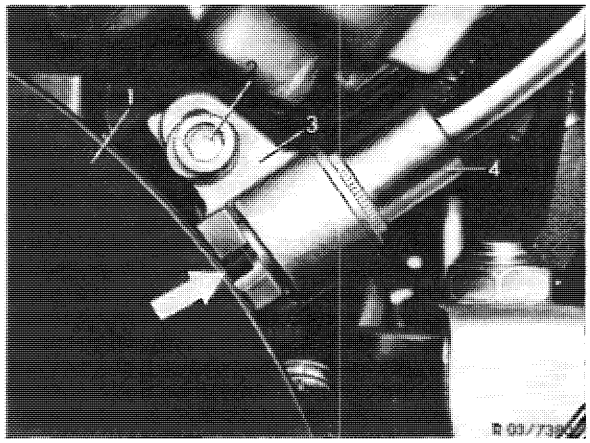
2nd version of adjusting slide

The adjustment of the TDC transmitter must be checked and corrected:

a) when replacing TDC transmitter adjusting slide,

b) when replacing crankshaft with balance disc and vibration damper, and

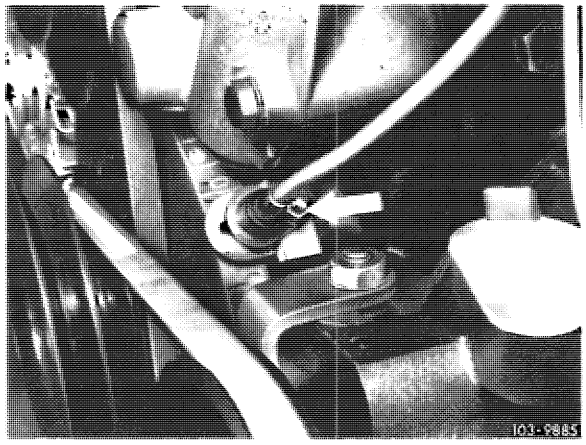
c) when completing a partial engine.



1st version of adjusting slide

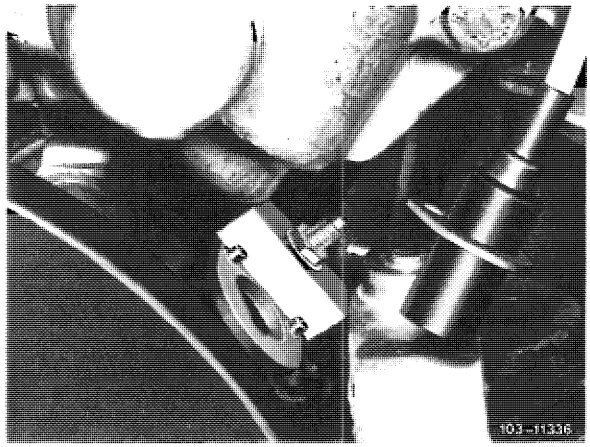
Checking

1 Unscrew TDC transmitter (arrow).



2 Pull out TDC transmitter.

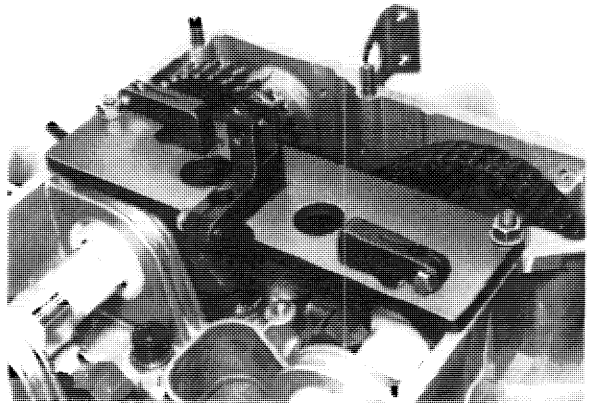
Note: TDC transmitters (1st version), which are fastened with a socket head cap screw, must be loosened and removed with guide 110 589 06 61 00.



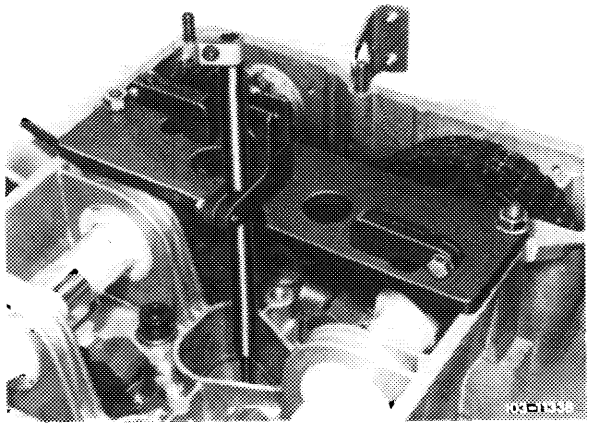
3 Take off cylinder head cover.

4 Unscrew spark plug of 1st cylinder.

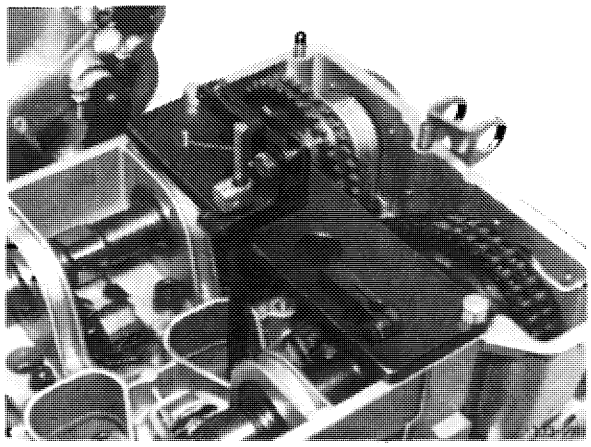
5 Screw-on tester above 1st cylinder.



6 Guide in gage extension, do not clamp.

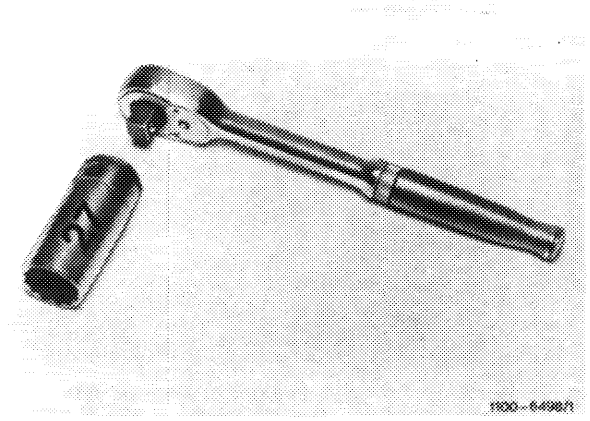


7 Insert adjusting pin (1) and press down.

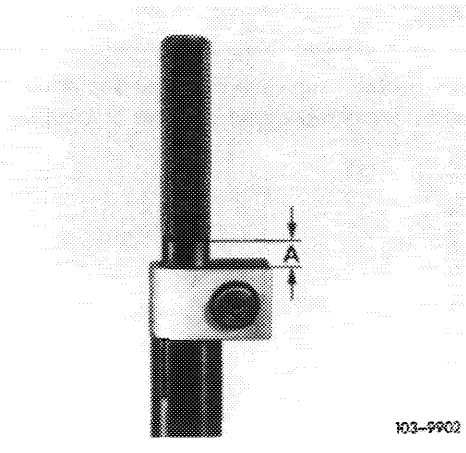


8 Turn crankshaft with tool combination until adjusting pin is at its highest point.

The piston is at TDC.



9 Clamp the gage extension in the tester that distance A will be about 5 mm when the adjusting pin is pressed down.



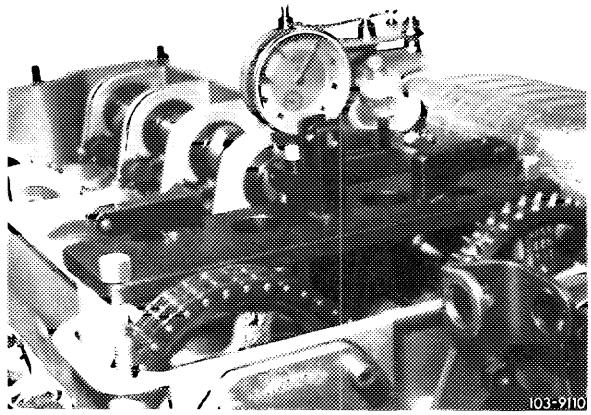
10 Remove adjusting pin. Insert dial gage and clamp it with preload of about 5 mm.

11 Turn crankshaft and adjust TDC accurately with dial gage.

Always turn crankshaft in direction of rotation.

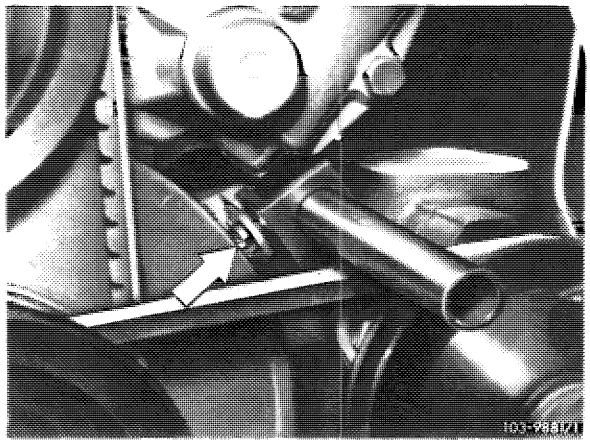
12 Turn dial gage scale until needle points to 0.

13 Continue turning crankshaft until dial gage goes back by **3.07 mm.**



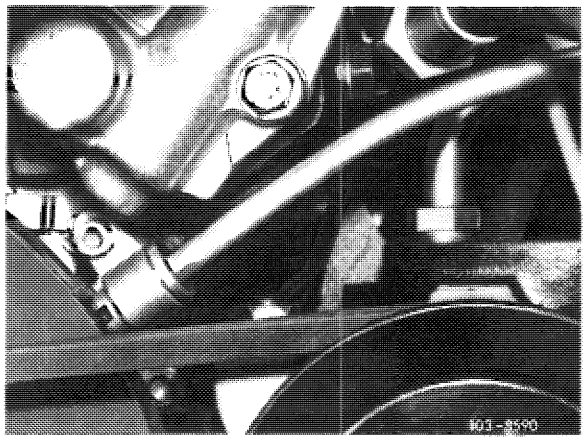
14 Insert locating device in adjusting slide.

Pin of vibration damper should engage in groove of locating device (arrow).



2nd version of adjusting slide, locating device 116 589 19 21 00

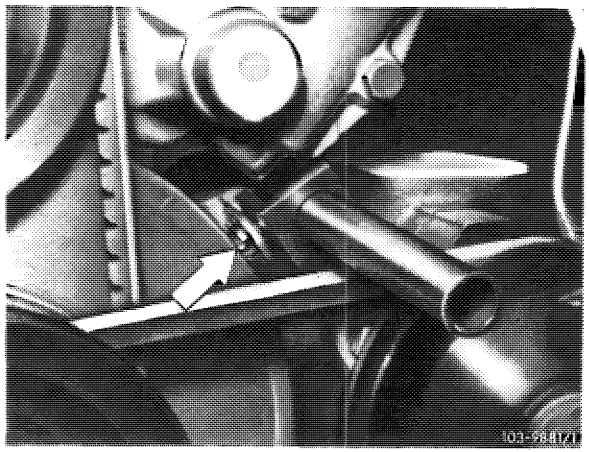
Note: Use locating device 110 589 08 21 00 for 1st version of adjusting slide.



1st version of adjusting slide, locating device 110 589 08 21 00

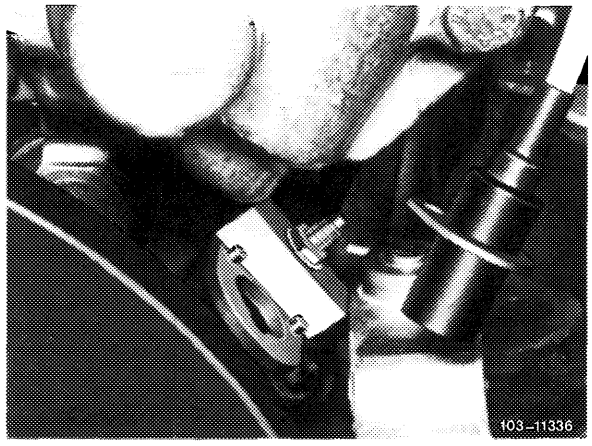
Correcting

15 Loosen adjusting slide and displace until pin of vibration damper enters groove of locating device.

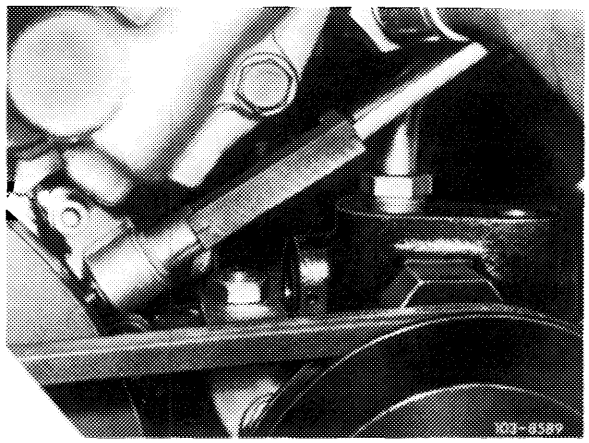


16 Tighten adjusting slide and remove locating device.

17 Install and fasten TDC transmitter.



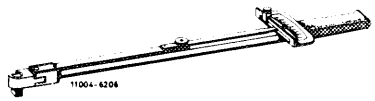
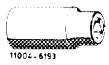
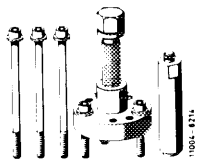
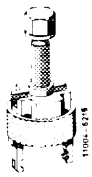
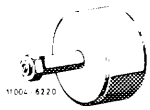
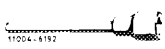
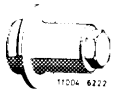
Note: For 1st version of adjusting slide install the TDC transmitter with guide 110 589 06 61 00 and fasten with a socket head cap screw.

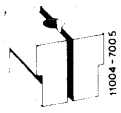


03–350 Removal and installation of crankshaft sprocket

Tightening torques	Nm
Bolt M 18 x 1.5 x 45 on crankshaft	400–450
Bolts and capped nuts for cylinder head cover	5

Special tools

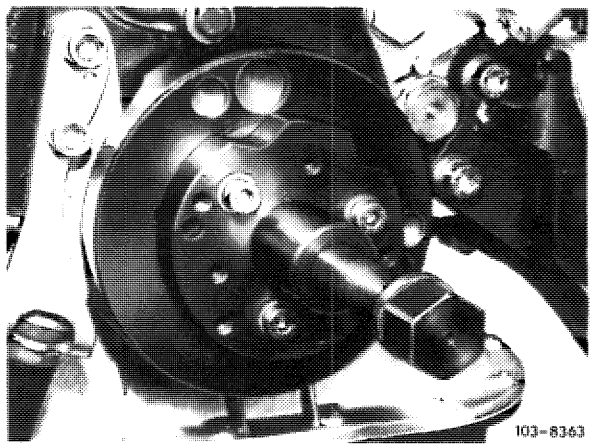
Torque wrench 150–500 Nm (15–50 kpm), 3/4" square		001 589 31 21 00
Socket 27 mm, 1/2" square		001 589 65 09 00
Detent		110 589 00 40 00
Detent		116 589 01 40 00
Puller for balancing disc		116 589 10 33 00
Puller for spacing ring		102 589 00 33 00
Crankshaft sprocket extractor		615 589 01 33 00
Bearing pin impact extractor (basic unit)		116 589 20 33 00
Threaded pin M 6 x 50 for impact extractor		116 589 01 34 00
Threaded pin M 10 x 100 for impact extractor		116 589 03 34 00
Stud socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Radial oil seal installer		110 589 07 61 00

Chain tensioner holder		110 589 02 31 00
Knocking-out mandrel 9 mm dia		110 589 02 15 00

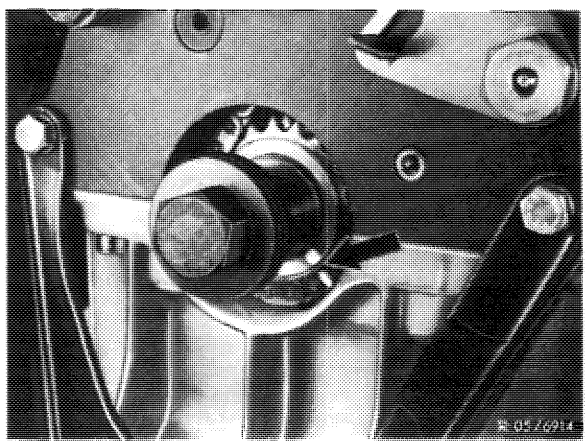
Removal

1 Remove radiator and fan.

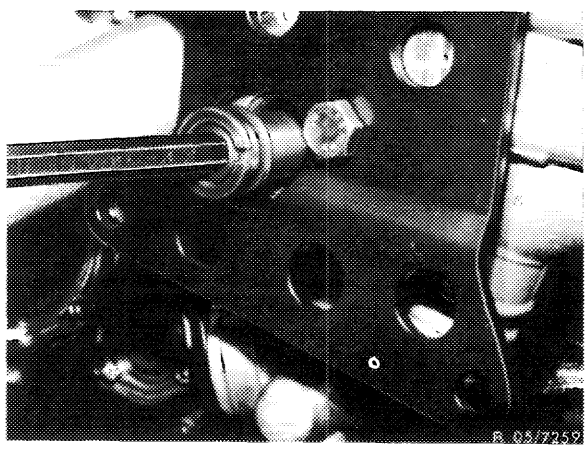
2 Remove front crankshaft radial oil seal (03–324).



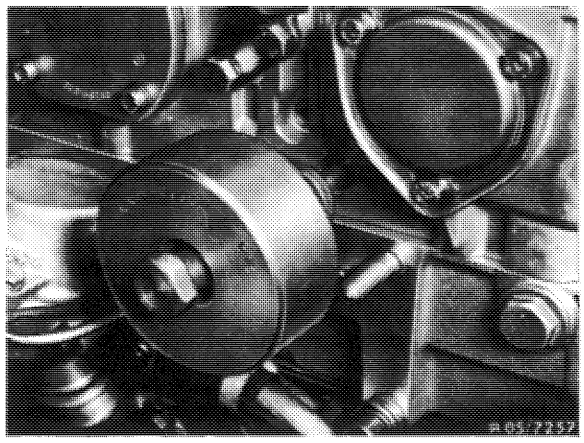
3 Use paint to mark both camshaft sprockets and camshaft sprocket to timing chain (arrow).



4 Remove chain tensioner (05–310).



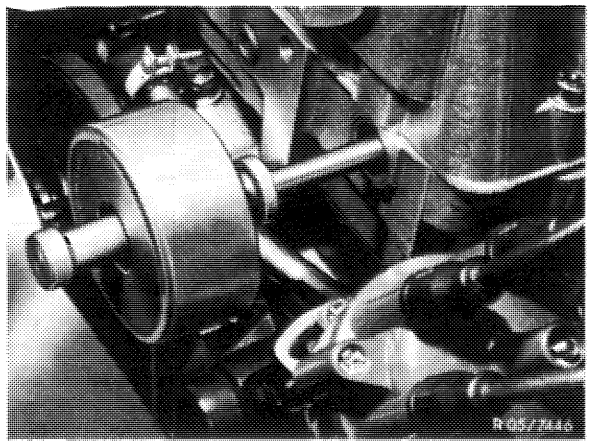
5 Remove guide rail in camshaft housing.



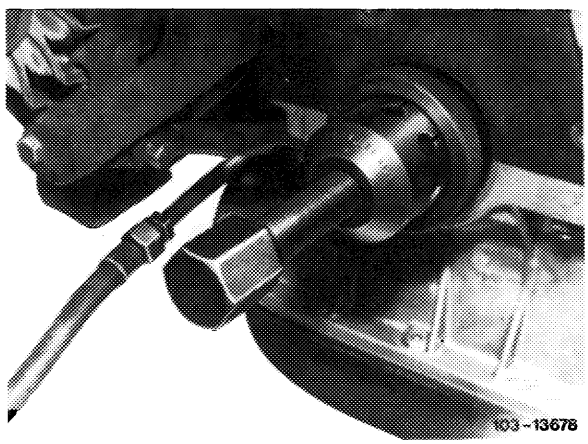
6 Remove reversing wheel. This requires unscrewing the plug and knocking out the bearing pin with an impact extractor (M 10 threaded pin).

7 Remove reversing wheel with a wire hook upward.

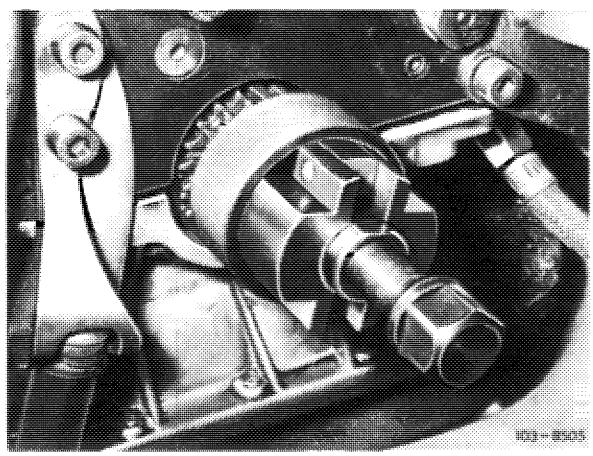
8 Remove oil pan to an extent that the timing chain can be taken off of the crankshaft sprocket.



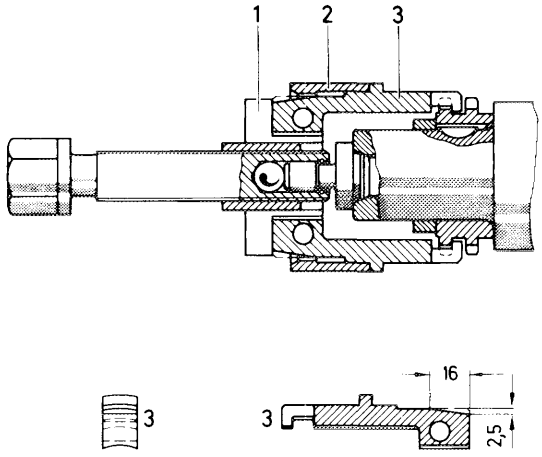
9 Pull-off spacing ring with puller.



10 Pull off crankshaft sprocket with an extractor.

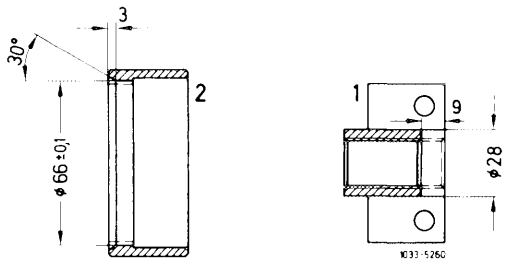


Note: Change puller 615 589 01 33 00 to dimensions shown in drawing.



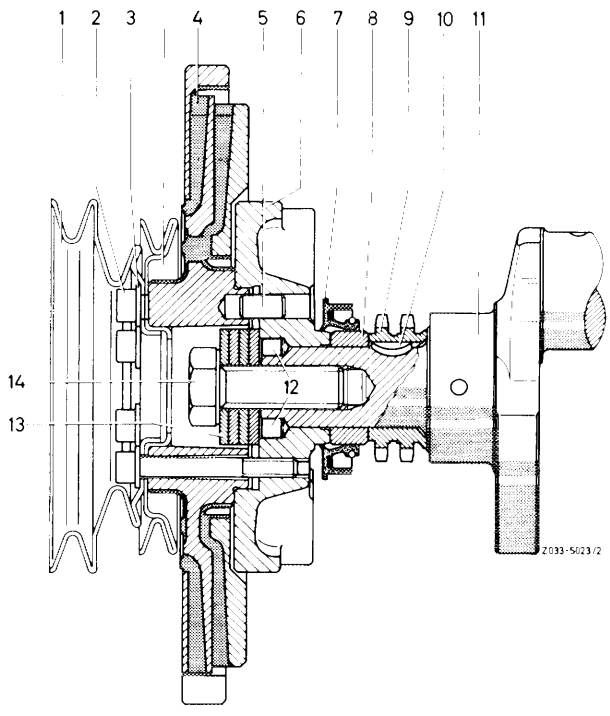
Installation

11 Transfer color marks from old to new crankshaft gear.



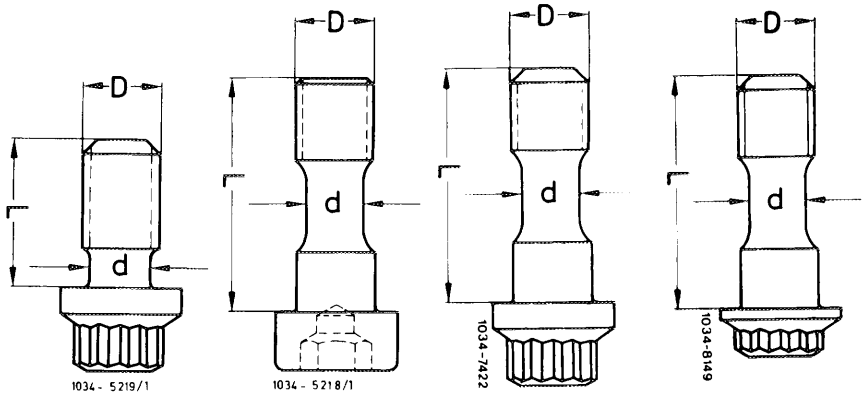
12 Heat crankshaft gear on a hot plate (approx. 80 °C) and slip on crankshaft.

13 Slip spacing ring on crankshaft.



14 For further installation proceed vice versa, paying attention to pertinent color marks.

Necked down screws	for manual transmission	for automatic transmission		



			1st version	2nd version	3rd version
Part no.		615 032 05 7	108 990 03 19	110 990 03 19	110 990 04 19
Thread dia D		M 10 x 1	M 10 x 1	M 10 x 1	M 10 x 1
Necked down dia d	when new	8.5–0.2	7.7–0.2	7.7–0.2	7.7–0.2
	minimum dia	8.1	7.3	7.3	7.3
Length L		20	31	31	31

Tightening torques

Necked down screw for driven plate and flywheel	Initial torque	40 Nm
	Torque angle	90–100°

Special tool

Detent		116 589 01 40 00

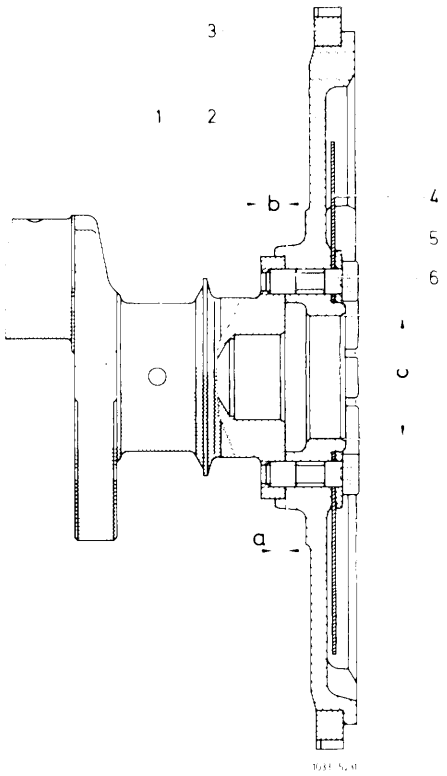
Note

Do not mix up flywheel for automatic transmission of 110 engine with flywheel for automatic transmission of 4-cylinder engines **115** and **615.**

Engine 110 dimension a = 4.5 mm

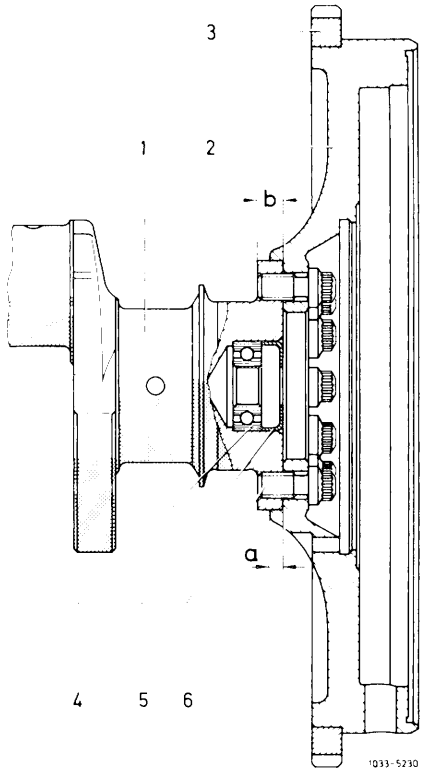
Engine 115 and 615 dimension a = 6.5 mm

On exchange engines, the mounting bore in flywheel of 35 mm dia can be bored to 50.00–50.016 mm dia (50 H6) for transmission with hydraulic clutch (722.200/202).



Layout of flywheel and driven plate for automatic transmission

1	Crankshaft	a =	4.5 mm
2	Flywheel	b =	10 mm
3	Ring gear	c =	50 mm dia (transmission with hydraulic clutch 722.200/202), transmission type K4C025
4	Driven plate		
5	Disc		
6	Necked down screw	c =	35 mm dia. (transmission with torque converter 722.1), transmission type W4B025



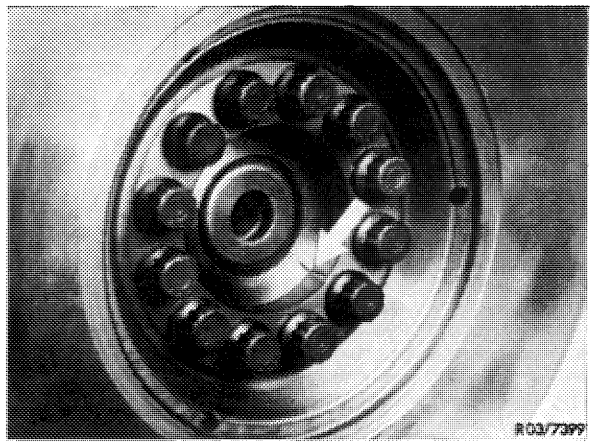
Layout flywheel for manual transmission

1	Crankshaft	5	Closing ring
2	Flywheel	6	Necked down screw
3	Ring gear	a =	5 mm
4	Ball bearing	b =	10 mm

Removal

1 Loosen necked down screws, remove flywheel, driven plate and spacing washer.

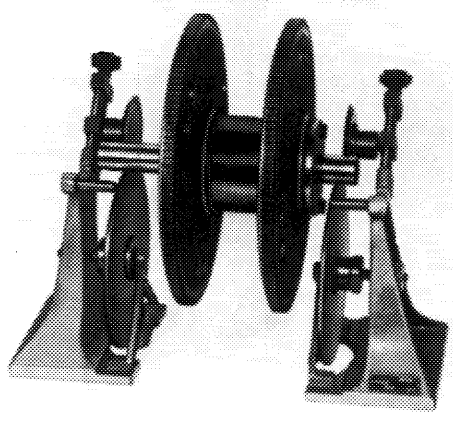
Note: The flywheels and the crankshaft are marked together (arrow).



Flywheel manual transmission

Installation

Note: If a new flywheel is installed, unbalance should be the same as for old flywheel (03–440).



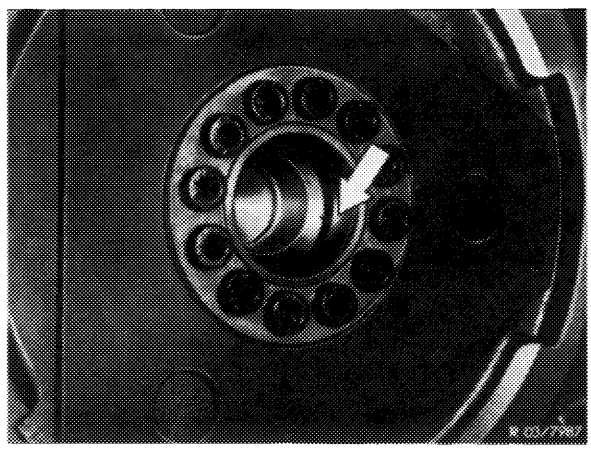
103-10648

2 Measure necked down dia d of necked down screws.

When the minimum dia is attained, replace necked down screws.

Necked down screws 1st and 2nd version for automatic transmission can be replaced by 3rd version.

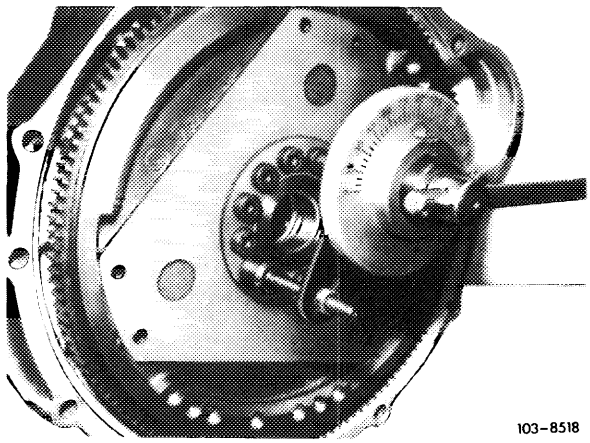
3 Position flywheel on crankshaft journal in such a manner that the markings (arrow) are in alignment.

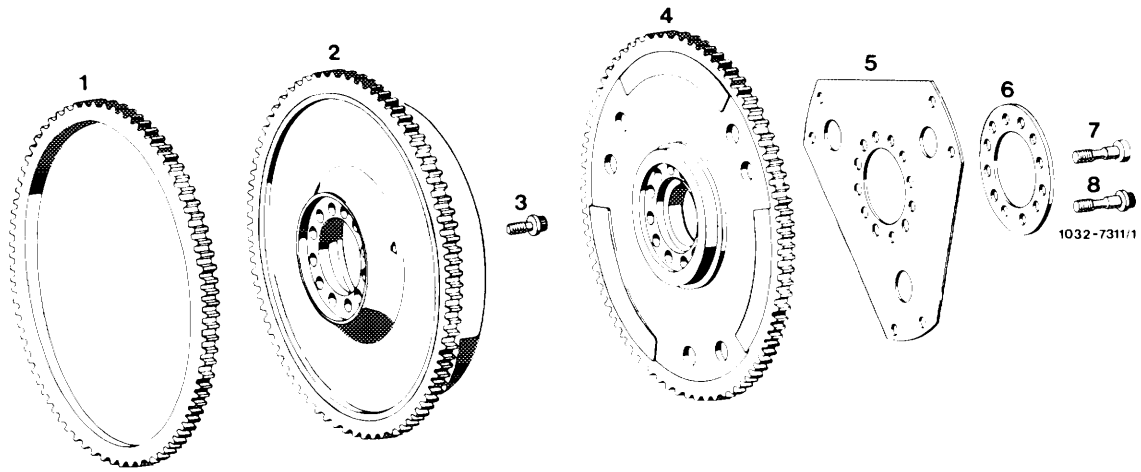


Flywheel automatic transmission

4 Screw-in necked down screws and pre-tighten to 30—40 Nm with torque wrench.

5 Complete angle of rotation torque 90—100° by means of angle of rotation wrench.





1 Starter ring gear
2 Flywheel with starter ring gear for manual transmission
3 12 necked down screws
4 Flywheel with starter ring gear for automatic transmission
5 Driven plate
6 Spacing ring
7 12 necked down screws 1st version
8 12 necked down screws 2nd and 3rd version

03–420 Machining flywheel

Data

Distance a		19.4 + 0.1
Distance b	New	18.5
	Machining limit	17.5
Permissible axial runout		0.05

Note

Machine a flywheel for manual transmissions having grooves, cracks or burnt spots by grinding or milling.

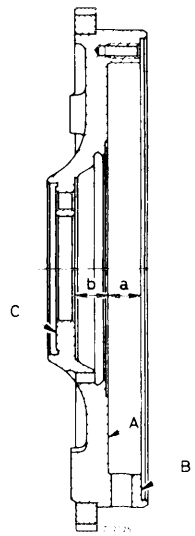
If grooves or cracks are deeper than the max permissible allowance, replace flywheel.

If clutch surface A is machined, mounting surface B must also be machined to maintain distance a.

Machining must never reduce distance b.

The flywheel must be held perfectly for machining, so that the permissible axial runout of 0.05 mm will not be exceeded.

After machining the clutch surface must not show blow-holds or chatter marks.



03–430 Replacing ring gear

Data

Permissible axial runout measured on ring gear	max 0.4
Centering flange dia for ring gear	268.31–268.39
Shrink-on temperature	max 250°C
Annealing color	red brown

Conventional accessory

Temperature measuring chalk for 220°C	e.g. made by AW Faber-Castell D-8504 Stein bei Nürnberg Color no. 2815/220 (white) thermochrome

Note

The ring gear is hardened. To protect hardened structure a max temperature of 250 °C should never be exceeded at any point when heating ring gear. Heating can be reliably done by means of a hot plate or a heating furnace only.

A flame may be used as an exception only. Flame should cover inside of ring gear only.

Following replacement of ring gear, no balancing of flywheel is required.

Only ring gears with chamfered teeth are supplied as spare parts.

These ring gears can also be installed on vehicles with manual transmission in place of ring gears without chamfer.

Replacement

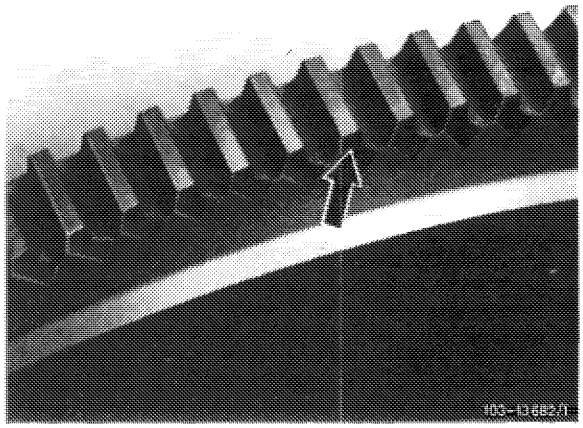
1 Drill into old ring gear and break up with a chisel, or heat quickly and then remove immediately.

2 Clean contact surface of ring gear on flywheel.

3 Uniformly heat new ring gear on a hot plate or in a heating furnace.
For this purpose, use temperature measuring chalk according to instructions.

4 Fit heated ring gear immediately on flywheel.

Attention!
The tooth chamfer (arrow) should face starting motor.

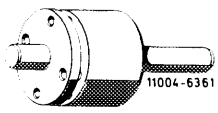


03–440 Static balancing of flywheel

Data

Flywheel for	Balance bores max. drilling depth	Drill dia.	Hole locating dia.
manual transmission	20 + 1	11	251
automatic transmission	drilled through		

Special tool

Balancing mandrel (flywheel for automatic and manual transmissions)	 11004-6361	617 589 00 63 00

Conventional tool

Rolling device for static balancing	Trebel, D-4030 Ratingen type EO, order no. 03600/0904/E 0010

Note

Crankshaft, balance disc and flywheel are balanced together.

A new flywheel must be balanced to the same value of the one removed.

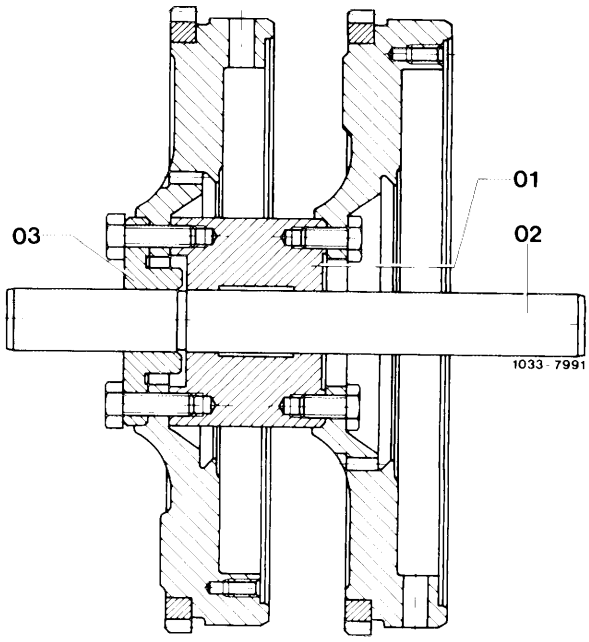
The balancing condition of a flywheel for manual transmission can be transferred to a flywheel for automatic transmission by static balancing (and vice versa).

Static balancing

1 Place old and new flywheels on top of each other that all bores align and both clutch surfaces face in one direction.

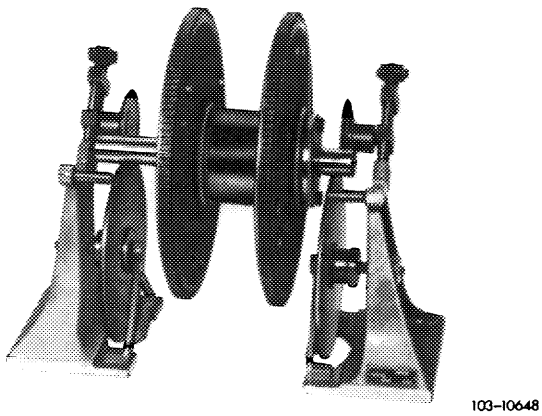
2 Transfer mark from old to new flywheel.

3 Apply balancing mandrel and bolt new flywheel with an offset of exactly 180° over old unit.



01 Mounting fixture
02 Shaft
03 Centering disc

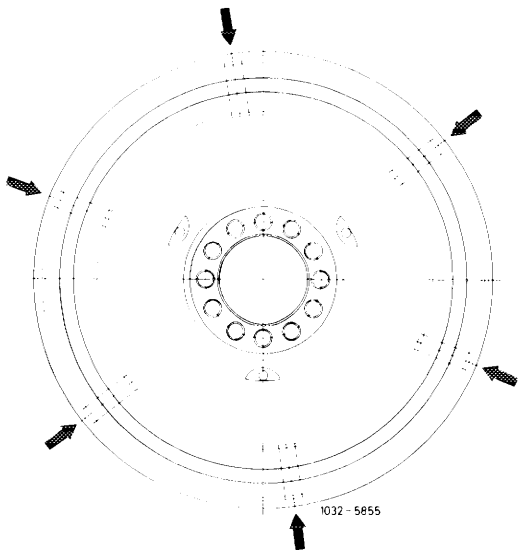
4 Let balancing mandrel with both flywheels oscillate on rolling device.



5 If an unbalance is found, drill so many holes in mass of new flywheel until the flywheels remain still without oscillating in any position.

Attention!
The hole circle dia, the drill dia and the max drilling depth must be maintained (refer to table).

The dust bores (arrows) must not be drilled.

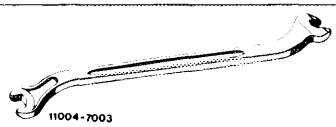
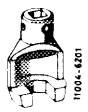
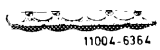
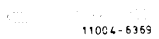
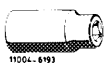
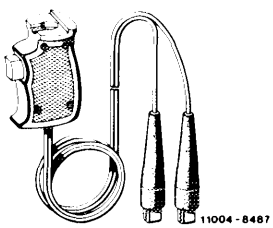


Valve clearance	cold engine (approx. 20 °C)	warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperature below –20 °C.

Tightening torques	Nm
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5

Special tools

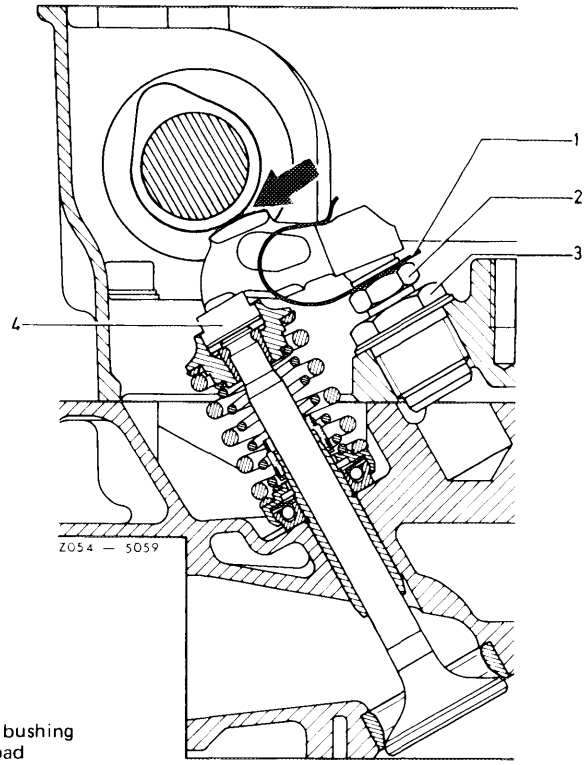
Valve adjusting wrench 17 mm		 11004-7003	110 589 00 01 00
Valve adjusting wrench 17 mm, 1/2" square, for checking torque of adjusting screw		 11004-6201	110 589 00 01 00
Slip gauge		 11004-6364	617 589 00 40 00
Slip gauge blades	0.10 mm thick	 11004-6369	617 589 00 23 00
	0.15 mm thick		617 589 01 23 00
	0.20 mm thick		117 589 00 23 00
	0.25 mm thick		117 589 01 23 00
	0.30 mm thick		617 589 02 23 00
Socket wrench insert 27 mm, 1/2" square		 11004-6193	001 589 65 09 00
Contact grip to turn engine (part of compression recorder 001 589 46 21 00)		 11004-8487	001 589 46 21 08

Note

Check and adjust valve clearance **of cold or warm engine.**

Install a thinner pressure pad (4) if the room for adjustment is no longer sufficient. Pressure pads are available in thicknesses of 2.5, 3.5 and 4.5 mm.

Attention!
The torque of easy going valve adjusting screws (2) must be checked. This requires removing all spring clamps (1) with a screwdriver and checking the torque with a valve adjusting wrench, part number 110 589 00 01 00, and a torque wrench (e. g. part number 000 589 27 21). If the torque of the valve adjusting screw is less than 20 Nm (2 kpm), replace valve adjusting screw (2) or threaded bushing (3) with valve adjusting screw (2).



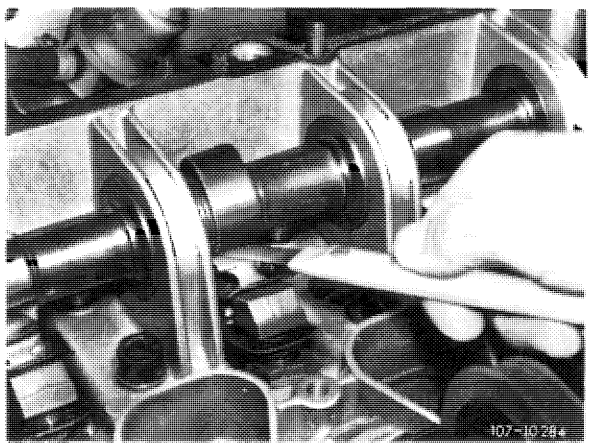
1 Spring clamp
2 Valve adjusting screw
3 Threaded bushing
4 Pressure pad

Adjusting valve clearance

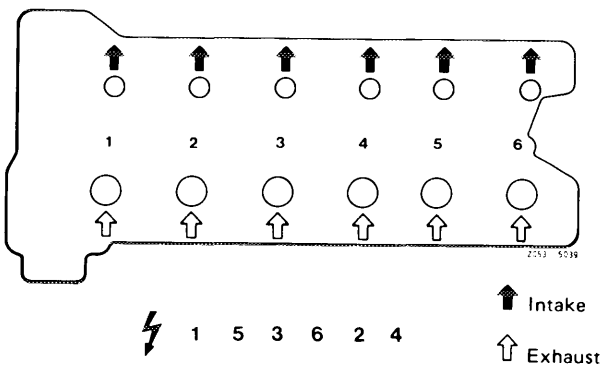
1 Remove rubber seals.

2 Check valve clearance between rocker arm and camshaft, whereby the cam peak must be up.

The valve clearance is correctly adjusted, if the slip gauge fits tight when pulled through.

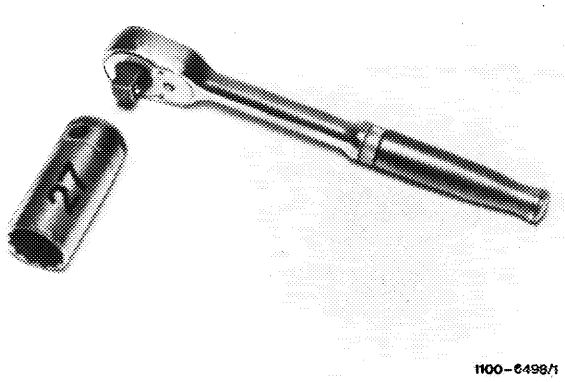


3 Note layout of intake and exhaust valves.



The engine can be turned as follows:

a) with the combination tool at front end of crankshaft.



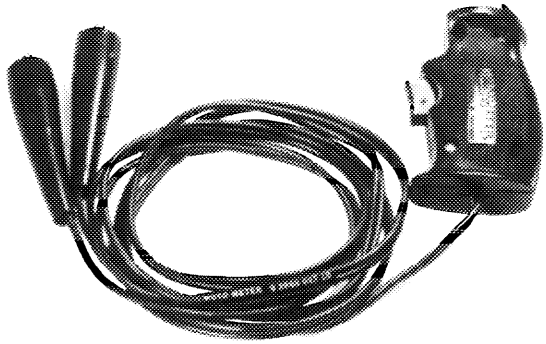
1100-6498/1

b) with the starter and contact grip.

Models 107, 114 and 116

Connect contact grip to battery plus and terminal 50 to starter.

Disconnect cable on ignition coil terminal 1.

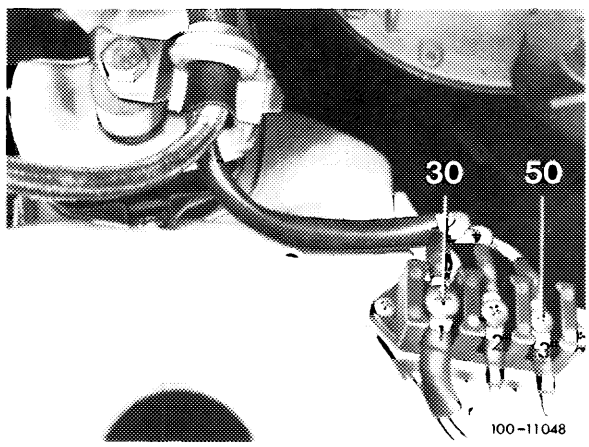


105-9061

Model 123

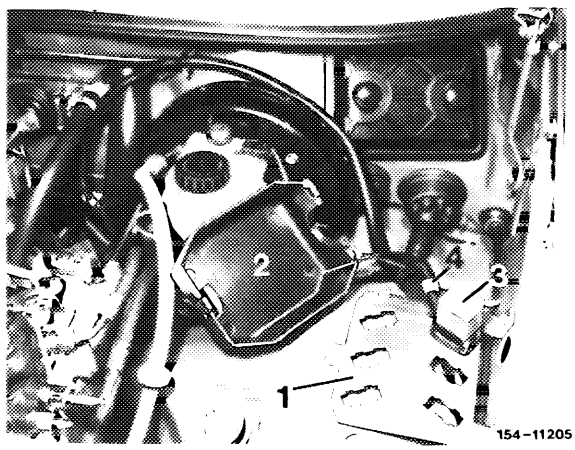
Connect contact grip to terminal 30 and terminal 50 to wire connector.

Disconnect cable on ignition coil terminal 1.



100-11048

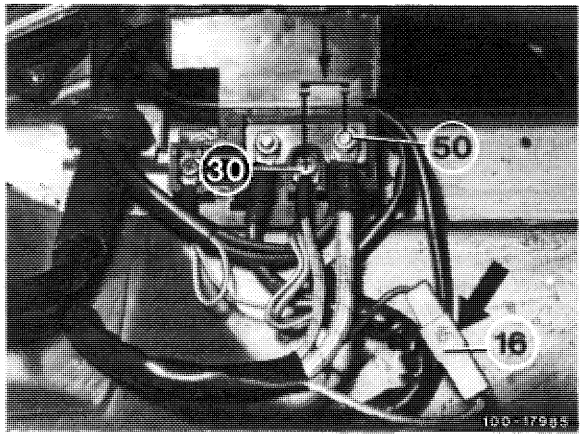
Disconnect fuel pump relay (3) of engines with continuous fuel injection.



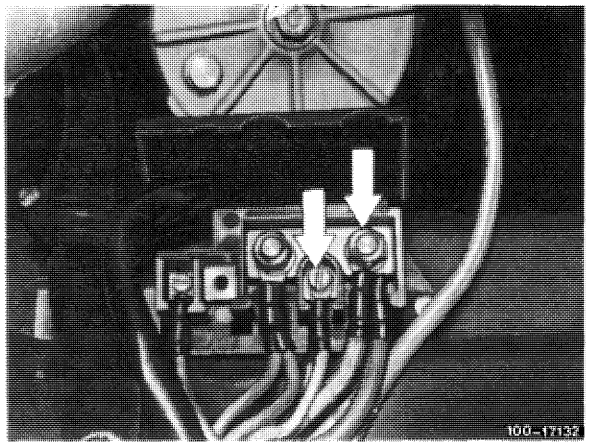
154-11205

Model 126

Separate cable plug (terminal 16, arrow) so that ignition coil and on engines with CIS the fuel pump cannot be activated.



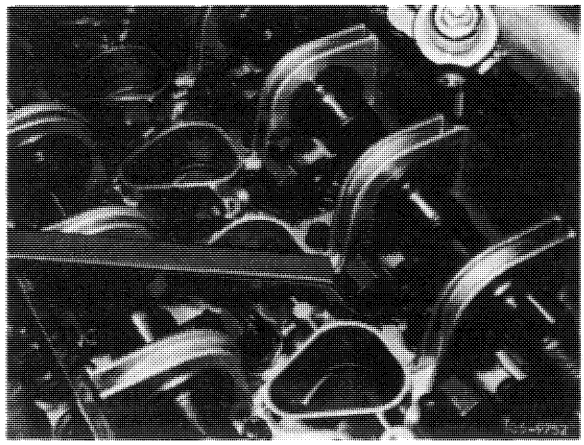
Connect terminals designated with arrows.



4 Adjust valve clearance by turning the valve adjusting screw with a valve adjusting wrench.

5 Check spring clamps for perfect fit.

6 Check seals, replacing if necessary.

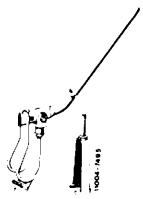
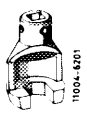
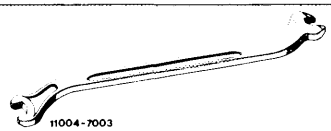
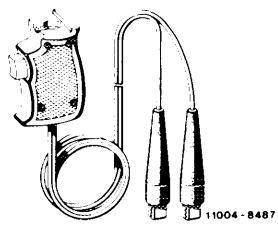


Valve clearance	Cold engine (approx. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below –20 °C.

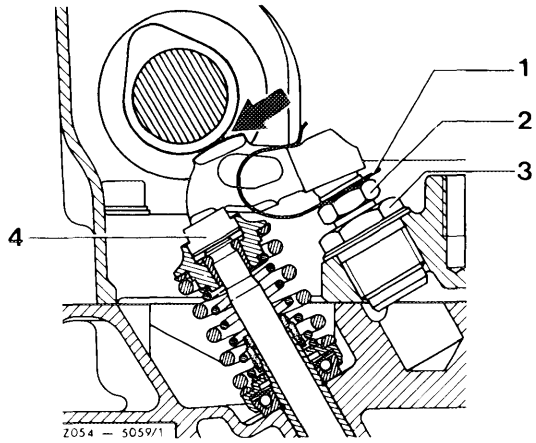
Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Cylinder head threaded bushing	80
Valve adjusting screw	20–40

Special tools

Depressor for valve spring		110 589 04 61 00
Valve adjusting wrench 17 mm, 1/2" square, for checking torque of adjusting screw		110 589 00 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Contact grip to turn engine (part of compression recorder 001 589 46 21 00)		001 589 46 21 08

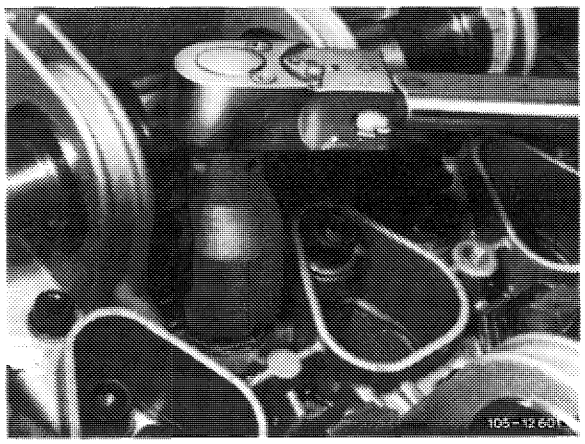
Note

If torque of valve adjusting screw is less than 20 Nm (2 kpm), replace valve adjusting screw (2) or threaded bushing (3) with valve adjusting screw (2).



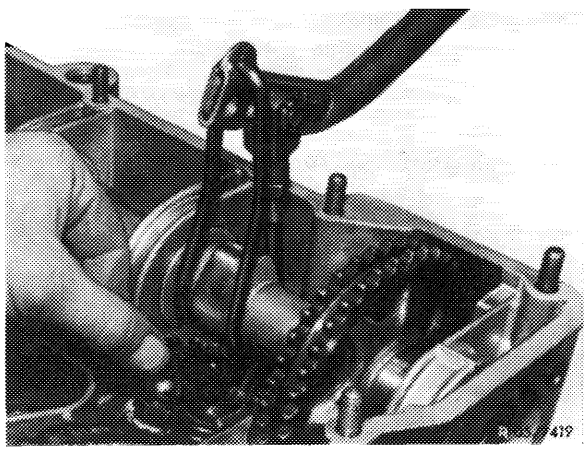
1 Spring clamp
2 Valve adjusting screw
3 Threaded bushing
4 Pressure pad

The torque can be checked with a valve adjusting wrench, part number 110 589 00 01 00 and a torque wrench (e. g. part number 000 589 27 21).

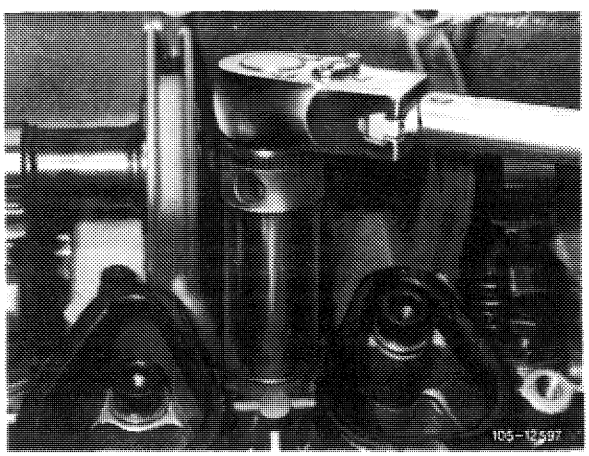


Replacing

1 Remove rocker arms (05–230).



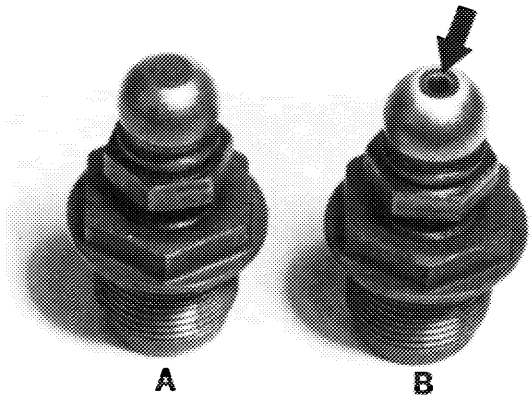
2 Unscrew threaded bushing with valve adjusting screw.



Attention!
Only use valve adjusting screws with an oil bore (arrow).

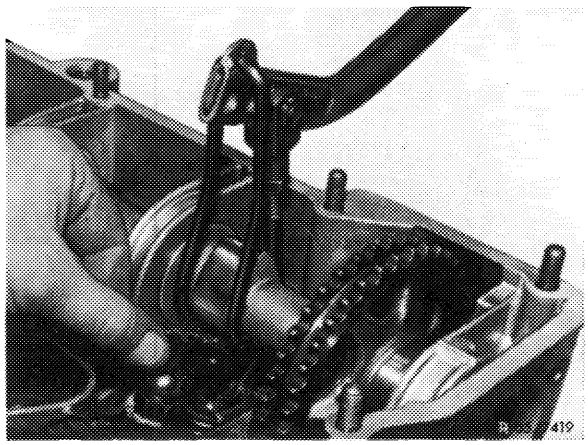
3 Coat threads of threaded bushing with valve adjusting screw with tallow, install and tighten threaded bushing to a torque of 80 Nm (8 kpm).

Attention!
Threaded bushing must be free of burrs when installing, since these would find their way into the oil circuit.

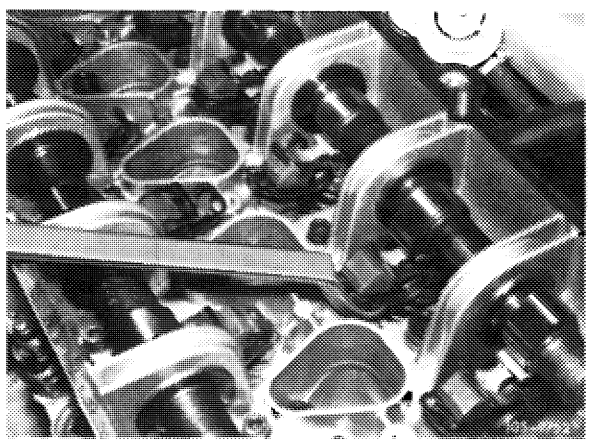


105-12453

4 Install rocker arms (05–230).



5 Adjust valve clearance (05–210).



Timing at 2 mm valve lift

Version		all	Exceptions (USA) California 1974	(USA) Federal 1973 and 1974	(J) (USA) 1981
Camshaft code number[1])	Exhaust	24, 57, 71, 78	24	20, 95	78
	Intake	25, 67, 74	25, 74	33, 91	74
Intake valve	Opens after TDC	7°		11°	7°
	Closes after BDC	21°		15°	21°
Exhaust valve	Opens before BDC	30°		22°	34°
	Closes before TDC	12°		14°	16°

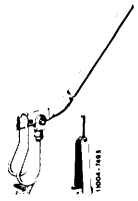
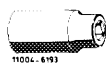
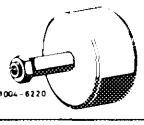
[1]) Camshaft code number is punched into rear end of camshaft.

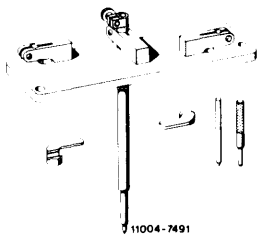
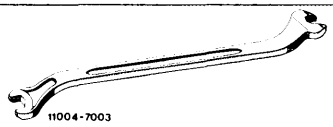
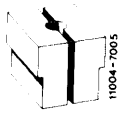
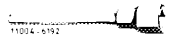
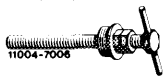
Valve clearance	On cold engine (approx. 20 °C)	On warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm larger during lasting outside temperatures below −20 °C.

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Expansion bolts for camshaft sprockets	80
Ball locating ring in chain tensioner	25
Valve adjusting screw	20–40

Special tools

Depressor for valve springs		110 589 04 61 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Impact extractor for bearing pins (Basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00

Timing test tool		110 589 10 21 00
Camshaft holding wrench		116 589 01 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Holding jaws for chain tensioner		110 589 02 31 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Chain tensioner rigid		110 589 03 31 00

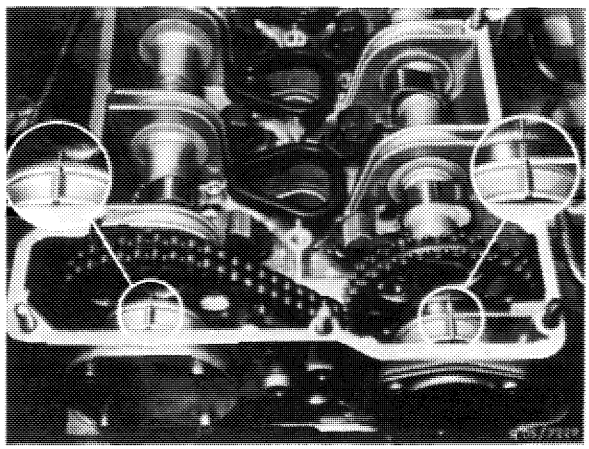
Conventional tool

Dial gauge A 1 DIN 878	e.g. made by Mahr, 7300 Esslingen order no. 810

Note

Check when intake valve begins to open and exhaust valve of 1st cylinder stops to close.

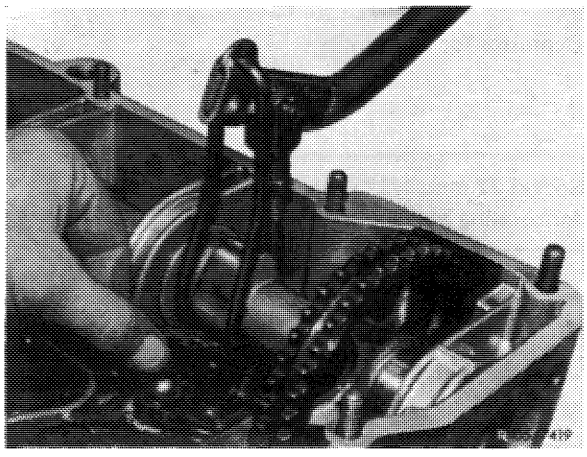
For assembly jobs it is sufficient when the marks on the camshafts are aligned for ignition TDC position of 1st cylinder.



Checking

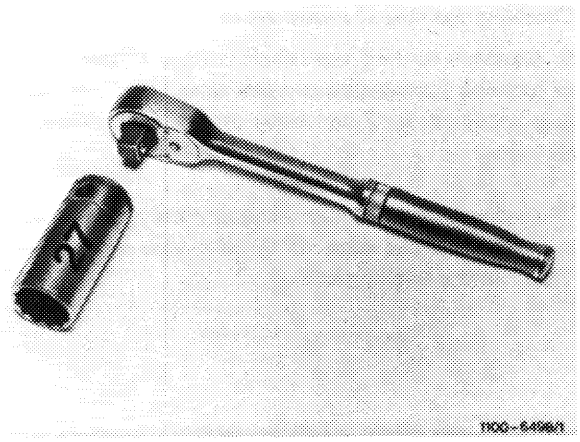
1 Remove both rocker arms of 1st cylinder with the installation and removal tool.

This requires turning the crankshaft until the cam peak is up.

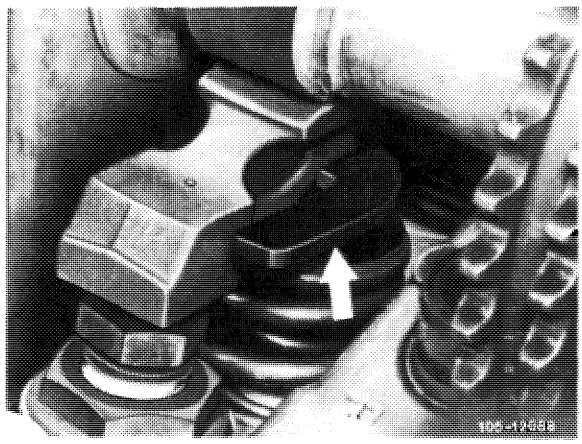


Turn crankshaft with combination tool.

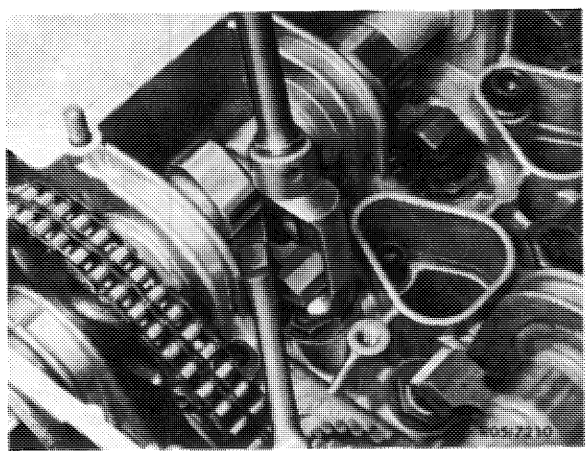
Attention!
Never turn engine on camshafts.



2 Replace both pressure pads by test pads (arrow) and install rocker arms without spring clamps.



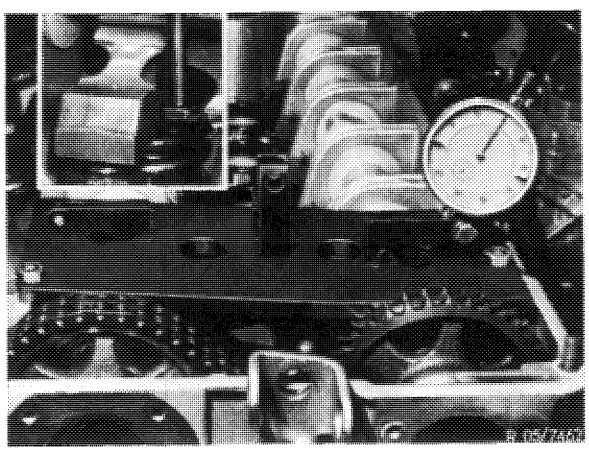
3 Turn valve adjusting screw until rocker arm rests free of play against cam base circle.



4 Set up and install tester.

5 When valve is closed, i. e. the cam faces up, insert the dial gage with an extension pin into the tester. Adjust for a preload of 3 mm (small indicator must point to 3) and clamp the dial gage.

Turn the adjustable dial, until the large indicator points to "0".



Checking opening of intake valve

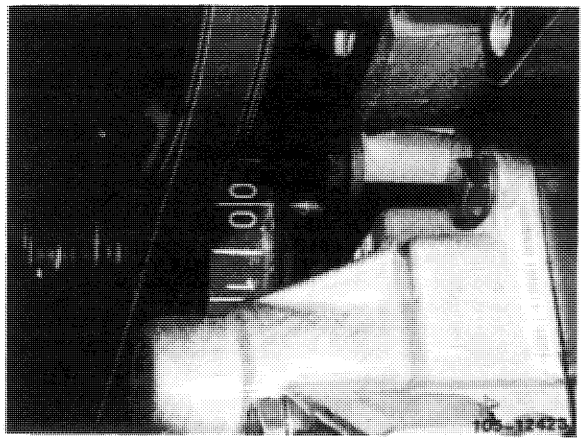
6 Continue turning crankshaft in engine's direction of rotation (cam begins to open valve), until the dial gage goes back by 2 mm (valve stroke) to a preload of 1 mm.

The value on the vibration damper must correspond with the specified value for "intake valve opens after TDC" in this engine position.

Checking closing of exhaust valve

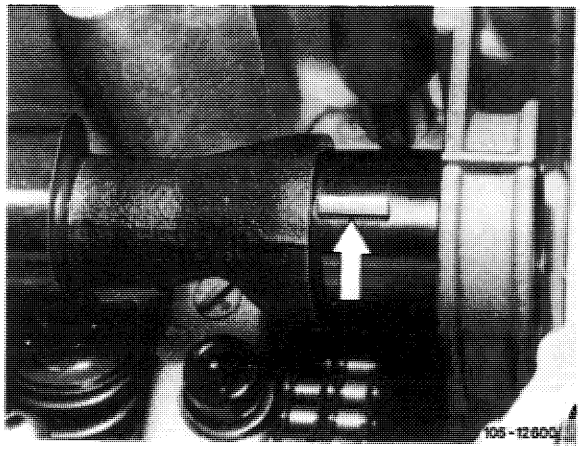
7 Continue turning crankshaft in engine's direction of rotation. The exhaust valve will be opened and the dial gage returns to "0". Now when closing the exhaust valve, the dial gage pin returns to position and the indicators begin to turn. The small indicator must stop at 1 and the large indicator at "0".

The value on the vibration damper must correspond with the specified value for "exhaust valve closes before TDC" in this engine position.



Adjusting

If the timing has to be corrected, an offset woodruff key or a new timing chain, if chain stretching is excessive, must be installed.

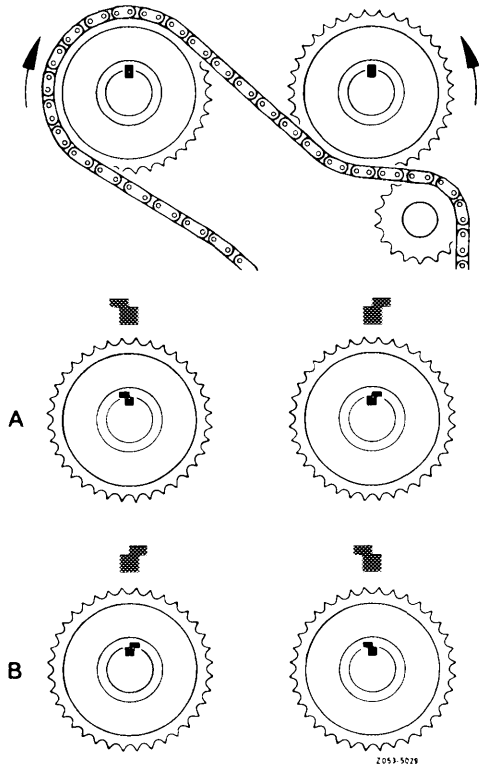


Woodruff keys are available in the following sizes.

Offset in mm	Part number	for correction of about
0.7	621 991 04 67	4° crankshaft
0.9	621 991 02 67	6 1/2° crankshaft
1.1	621 991 01 67	8° crankshaft
1.3	621 991 00 67	10° crankshaft

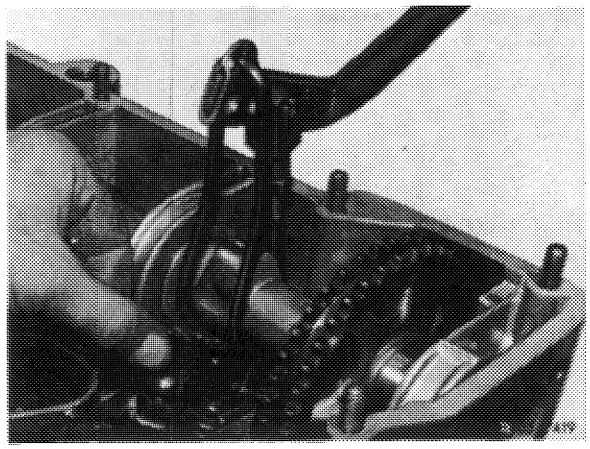
An offset of 1 tooth on the camshaft sprocket means about 18° on the crankshaft.

Since both camshafts rotate against each other, the installed position is important when installing an offset woodruff key.

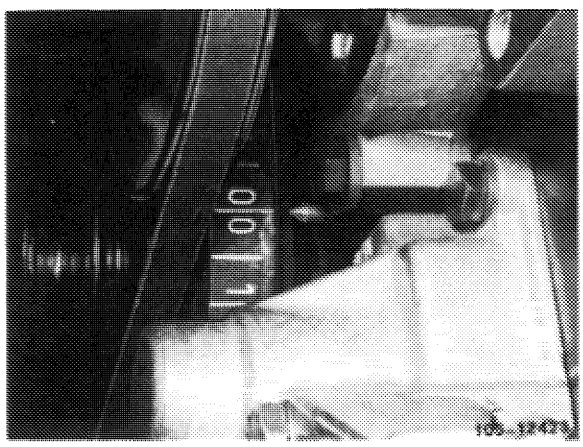


With installed position "A" opening begins earlier
With installed position "B" opening begins later

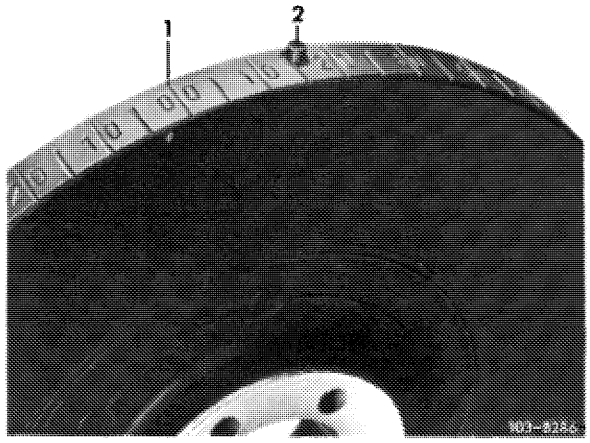
8 Remove all rocker arms on camshaft to be adjusted (05–230).



9 Set first cylinder of engine at ignition TDC. Marks on camshaft sprockets and camshaft housing must align.

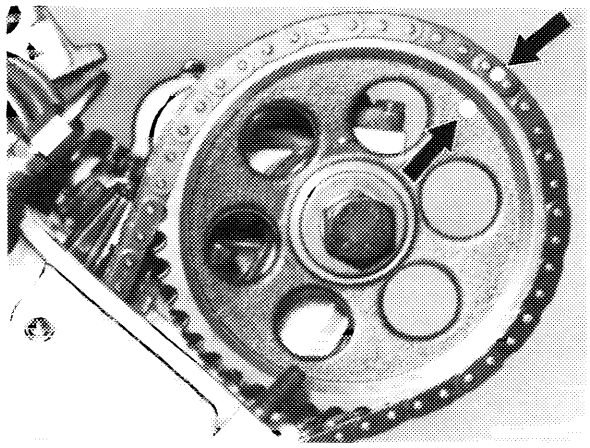


Attention!
If the vibration damper of an engine has a "0/0" mark for BDC in addition to one for TDC, the TDC mark is next to the pin in the vibration damper.

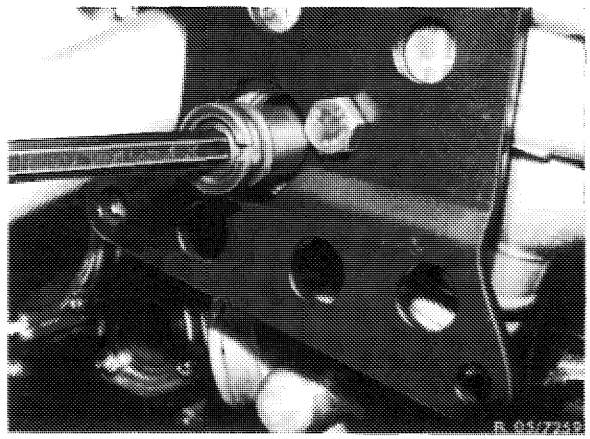


1 TDC mark

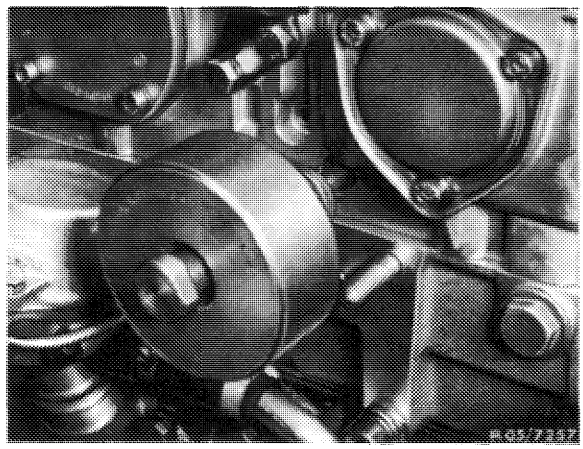
10 Mark relation between camshaft sprockets and chain with paint to facilitate assembly.



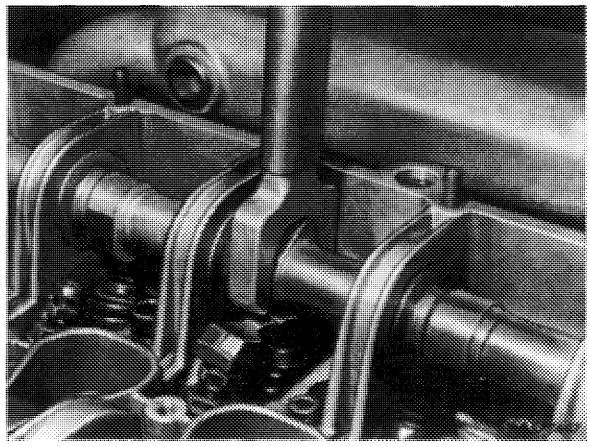
11 Remove chain tensioner (05–310).



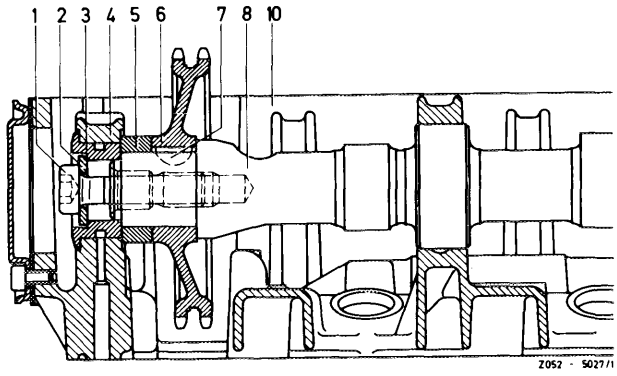
12 Knock out only the bottom bearing pin of the sliding rail in the camshaft housing with an impact extractor.



13 Remove expansion bolt for camshaft sprocket, counterholding camshaft with a holding wrench.



14 Press back camshaft and remove camshaft sprocket. Take spacer (5) off of intake camshaft.

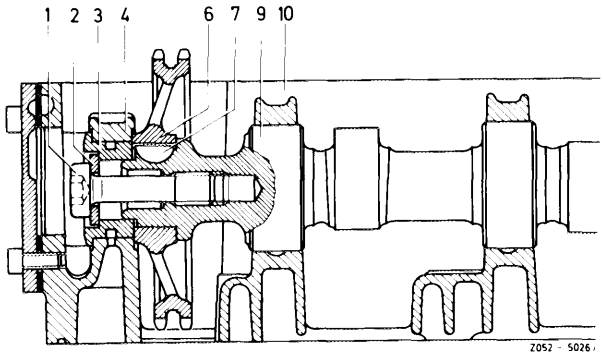


Intake camshaft

1	Expansion bolt	6	Camshaft sprocket
2	Washer	7	Woodruff key
3	Spacer	8	Camshaft
4	Bearing	10	Camshaft housing
5	Spacer		

15 Place a clean cloth in timing chain housing underneath the camshaft and remove the woodruff key.

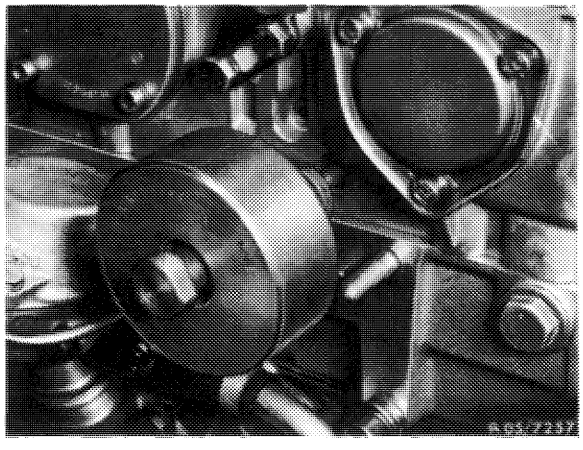
16 Install a woodruff key (7) selected according to the diagram.



Exhaust camshaft

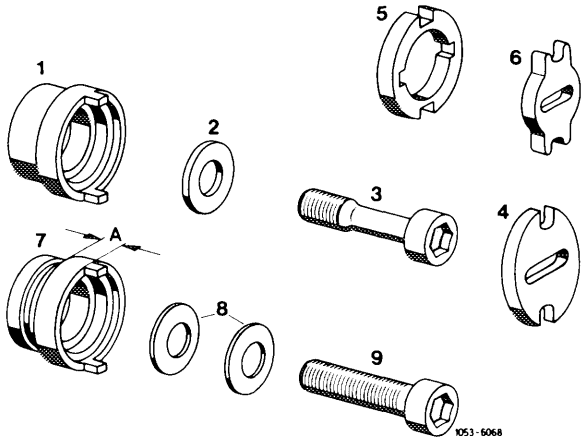
1	Expansion bolt	6	Camshaft sprocket
2	Washer	7	Woodruff key
3	Spacer	9	Camshaft
4	Bearing	10	Camshaft housing

17 Install camshaft sprocket and bottom sliding rail bearing pin, so that the timing chain cannot jump.



Note: Use only expansion bolt (3) with washer (2) for repairs.

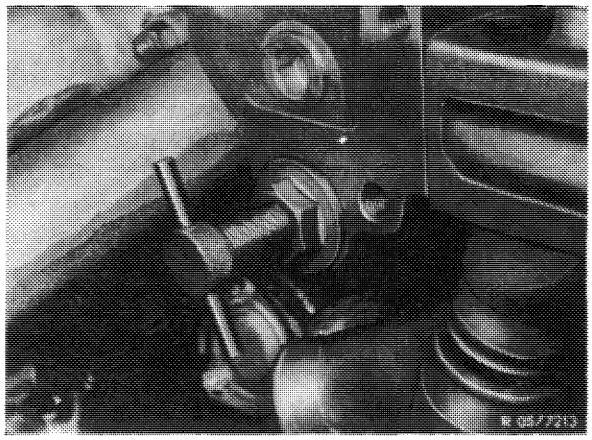
1 Spacer 2nd version without lubricating groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog for pressure oil pump and vacuum pump 2nd version
5 Dog for vacuum pump 1st version
6 Dog 1st version for pressure oil pump
7 Spacer 1st version with lubricating groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)



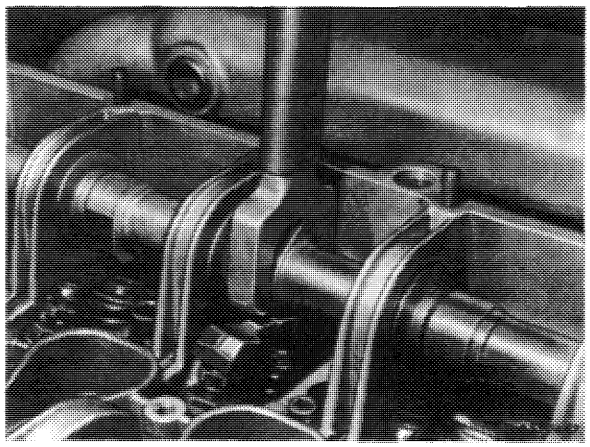
18 Install rigid chain tensioner and tension by hand.

19 Turn crankshaft with combination tool.

20 Check timing.



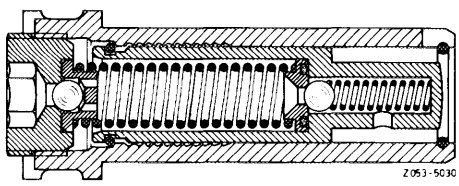
21 Torque expansion bolts for camshaft sprocket to 80 Nm (8 kpm), counterholding with a holding wrench.



22 Position chain tensioner for installation and install (05–310).

23 Install rocker arms (05–230).

24 Adjust valve clearance (05–210).



Chain tensioner positioned for installation.

Timing with 2 mm valve stroke

Version		all	Exceptions (USA) California 1974	(USA) Federal 1973 and 1974	(J) (USA) 1981
Camshaft code[1])	Exhaust	24, 57, 71, 78	24	30, 95	78
	Intake	25, 67, 74	25, 74	33, 91	74
Intake valve	Opens after TDC	7°		11°	7°
	Closes after BDC	21°		15°	21°
Exhaust valve	Opens before BDC	30°		22°	34°
	Closes before TDC	12°		14°	16°

[1]) Camshaft codes are stamped on rear end of camshaft.

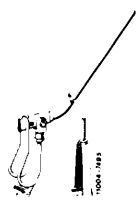
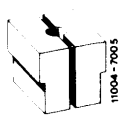
Valve clearance	Cold engine (approx. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

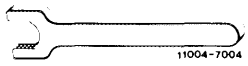
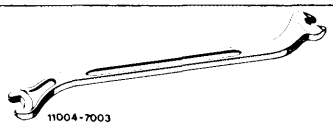
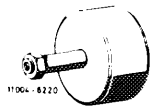
[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Data

Permissible runout of center bearing journal and camshaft sprocket seat when camshaft turns on outer bearing journals	0.025
Scleroscope hardness of cams	68–82

Special tools

Depressor for valve spring		110 589 04 61 00
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00

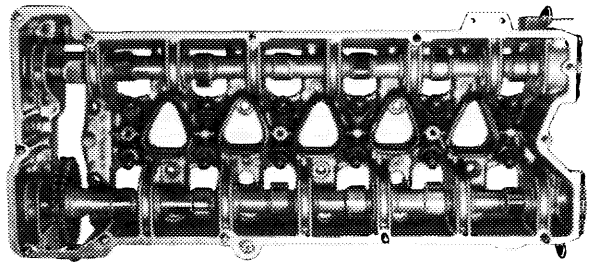
Camshaft holding wrench		116 589 01 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 27 mm, 1/2" square to turn engine		001 589 65 09 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00

Tightening torques	Nm
Cylinder head bolts M 12 x 1.5	100
Bolts M 8 camshaft housing to cylinder head and crankcase	25
Necked-down screw for camshaft sprockets	80
Chain tensioner oil jet	25
Valve adjusting screw	20–40
Cylinder head cover bolts and capped nuts	5
Level control pump to camshaft housing	9

Note

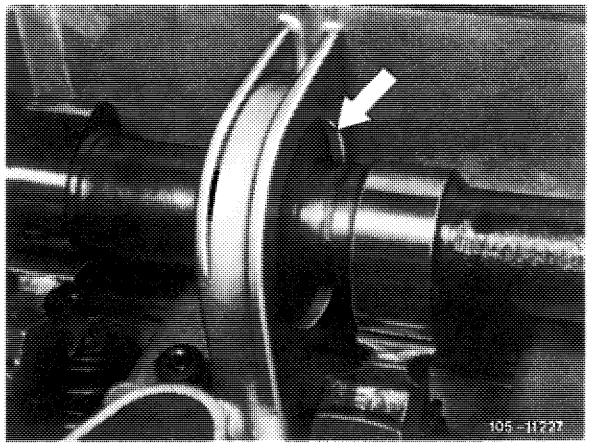
Camshafts can be removed from an installed engine only together with the camshaft housing.

If a new camshaft has to be installed, the rocker arms must also be replaced.



105-8003

Camshafts with **wide** bearing journals (e.g. 21 mm) can be exchanged against camshafts with **narrow** bearing journals (arrow) (e.g. 16 mm).



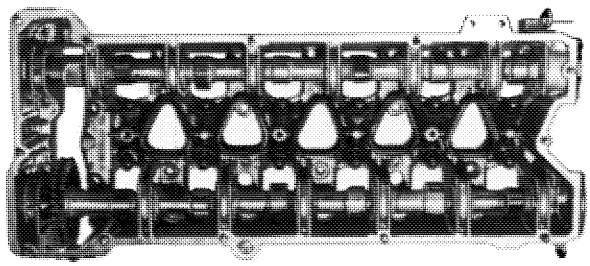
Attention!
Exchange engines are partially delivered with camshaft bearing journals ground to intermediate or repair stage dimension (01–471).

Install camshafts with reground bearing journals in a camshaft housing with a pertinent bearing diameter (05–225).

Also refer to coordination camshaft housing and camshafts (01–471).

Removal

1 Remove camshaft housing (01–470).



105-8003

2 Unscrew both rear covers on camshafts housing.

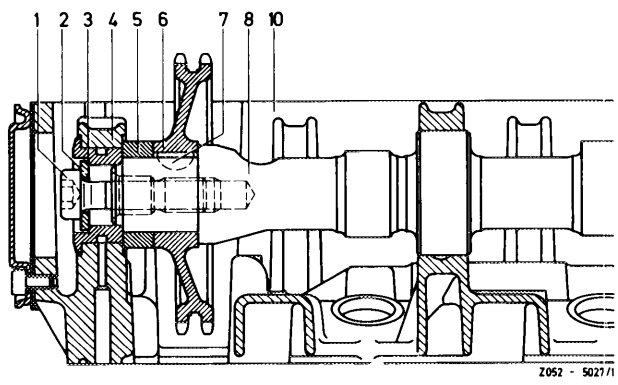
3 Unscrew necked-down screw of lefthand camshaft while applying counterhold with holding wrench.

4 Press back camshafts and remove camshaft sprocket.

5 Remove both camshafts toward rear.

Installation

6 Coat camshaft bearings with engine oil and guide in left camshaft (intake). Slide on camshaft sprocket (6) and spacer (5). Coat spacer (3) with engine oil and install.

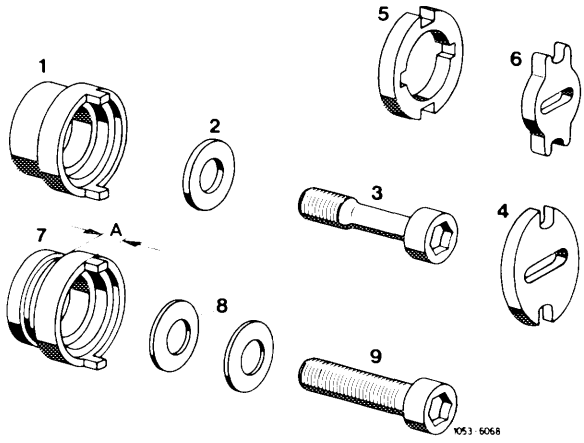


Intake camshaft

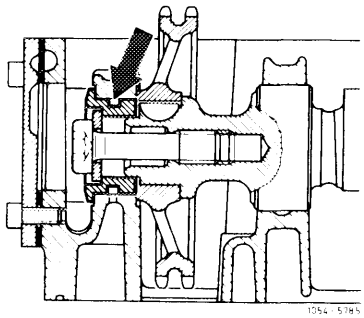
1 Expansion bolt
2 Washer
3 Spacer
4 Bearing
5 Spacer
6 Camshaft sprocket
7 Woodruff key
8 Camshaft
10 Camshaft housing

7 Expansion bolt (3) with washer (2) **must be installed for repair jobs.** Mounting bolt (9) and spring washers (8) must not be used.

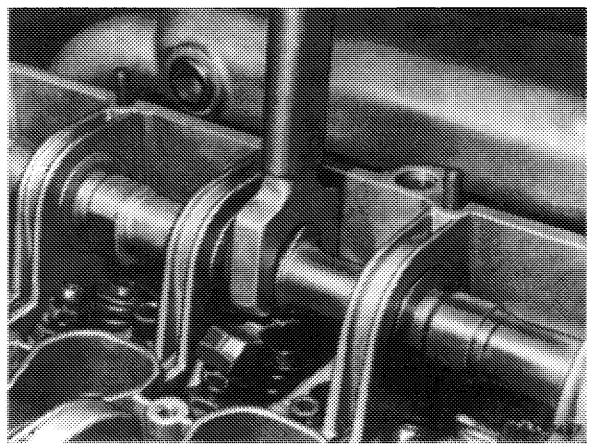
1 Spacer 2nd version without lubricating groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog (for pressure oil pump and vacuum pump 2nd version)
5 Dog (for vacuum pump 1st version)
6 Dog 1st version (for pressure oil pump)
7 Spacer 1st version with lubricating groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)



Note: Lubricating groove in spacing sleeve (arrow) no longer in place starting January 1974.



8 Tighten torque camshaft expansion bolt to 80 Nm (8 kpm), counterholding camshaft with a holding wrench.

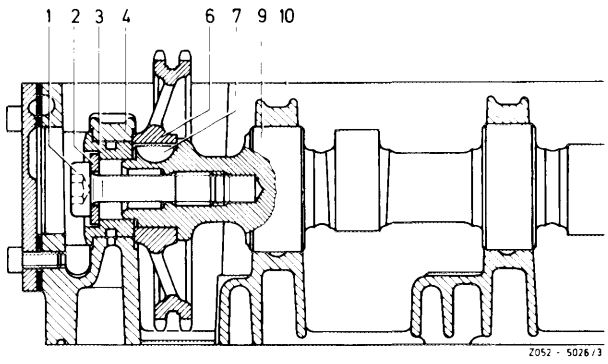


9 Guide right camshaft (exhaust) into lubricated bearings.

The right camshaft sprocket is installed after the camshaft housing has been mounted.

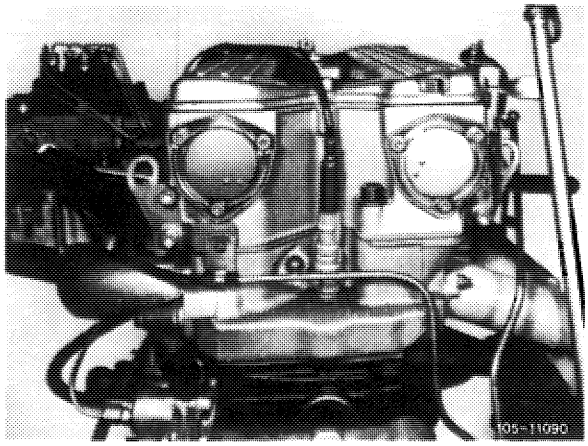
Exhaust camshaft

1 Expansion bolt
2 Washer
3 Spacer
4 Bearing
6 Camshaft sprocket
7 Woodruff key
9 Camshaft
10 Camshaft housing



10 Install both rear covers with gaskets on camshaft housing.

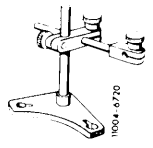
11 Install camshaft housing (01—470).



Data

Mean roughness of camshaft bearing journal						0.005	
Deviation of camshaft bearing journal from true when mounted at camshaft sprocket seat and rear camshaft bearing journal						0.030	
Deviation of camshaft bearing journal from true						0.010	
Bearing points (fig., refer to note)		1, 9	2	3, 10, 11	4,5,12,13	6,7,14,15	8
Standard dimension	bearing dia.	38.016 38.000	50.066 50.050	50.016 50.000	51.519 51.500	53.019 53.000	54.019 54.000
	journal dia.	23.993 23.980	49.950 49.934	49.950 49.934	51.440 51.421	52.940 52.921	53.940 53.921
Intermediate stage –0.1 mm (exchange engines)	bearing dia.		49.966 49.950	49.916 49.900	51.419 51.400	52.919 52.900	53.919 53.900
	journal dia.		49.850 49.834	49.850 49.834	51.340 51.321	52.840 52.821	53.840 53.821
1st repair stage –0.25 mm	bearing dia.		49.816 49.800	49.765 49.750	51.269 51.250	52.769 52.750	53.769 53.750
	journal dia.		49.700 49.684	49.700 49.684	51.190 51.171	52.690 52.671	53.690 53.671
2nd repair stage –0.5 mm	bearing dia.		49.566 49.550	49.516 49.500	51.019 51.000	52.519 52.500	53.519 53.500
	journal dia.		49.450 49.434	49.450 49.434	50.940 50.921	52.440 52.421	53.440 53.421
Camshaft bearing play	radial	0.057 0.124	0.100 0.132	0.050 0.082	0.060 0.098	0.060 0.098	0.060 0.098
	axial	0.050 0.120					
Sleeve for bearing a	OD	37.950 37.925	ID	24.013 24.000			

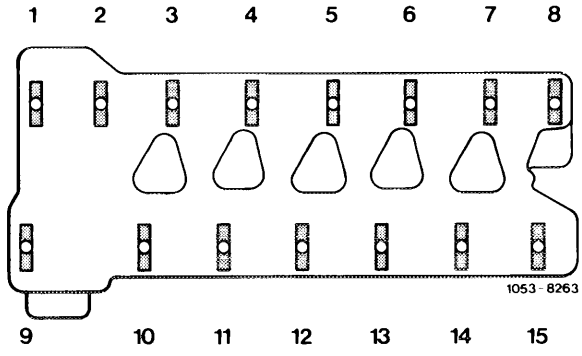
Special tool

Dial gauge holder for camshaft axial play		136 589 04 21 00

Note

For camshafts with reground bearing journals, **camshaft housings with repair stages –0.25 mm and –0.50 mm** are available.

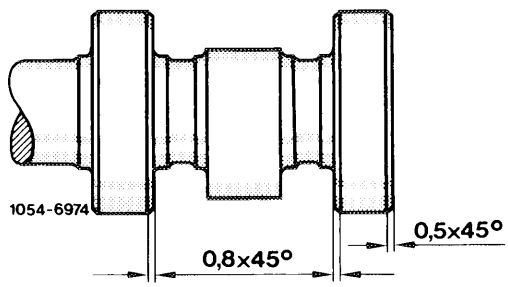
The bearing journals are not hardened.



Some exchange engines are delivered with camshaft bearings in intermediate and repair sizes. This means that a standard camshaft cannot be installed in this camshaft housing, since the bearing journals are larger in diameter than the bearings.

Also refer to coordination camshaft housing and camshafts (01–471).

Chamfer bearing journals after grinding (see sketch for dimensions).



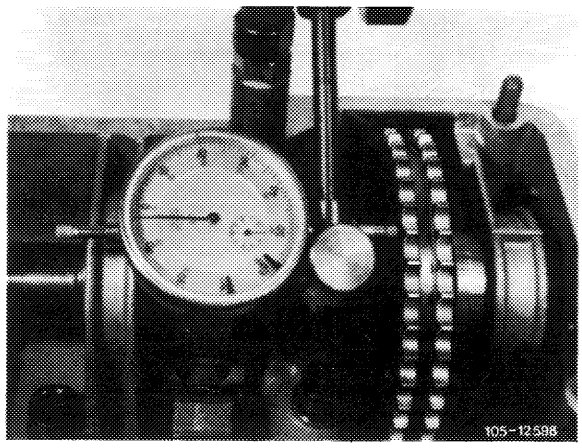
Checking axial play

1 Bolt dial gauge holder to camshaft housing.

2 Clamp dial gauge with a preload of about 3 mm.

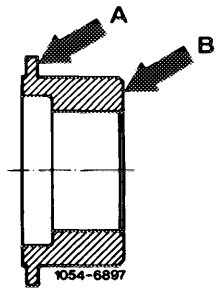
3 Press back camshaft and set needle at 0.

4 Press camshaft forward and read axial play.

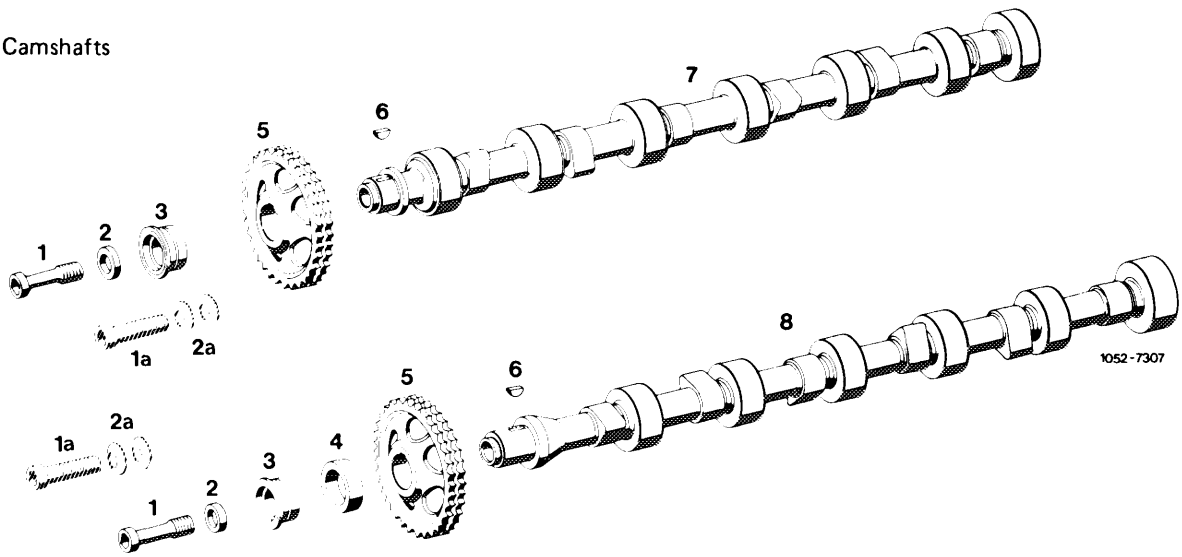


Note: If the end play is too small, grind spacing sleeve or driver at face B as required.

If the axial play is too large, the spacer or dog must be ground at collar A.



Camshafts



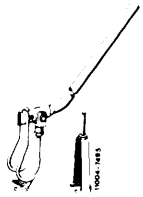
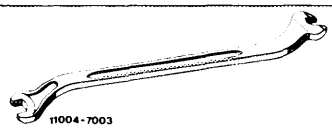
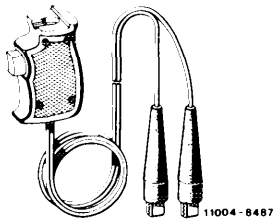
1 2 expansion bolts 2nd version
1a 2 bolts 1st version (not valid)
2 2 washers 2nd version
2a 4 washers 1st version (not valid)
3 2 spacers
4 Spacer
5 2 camshaft sprockets
6 2 woodruff keys 4 x 6.5
7 Exhaust camshaft
8 Intake camshaft

Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Tightening torque	Nm	(kpm)
Cylinder head cover bolts and capped nuts	5	(0.5)

Special tools

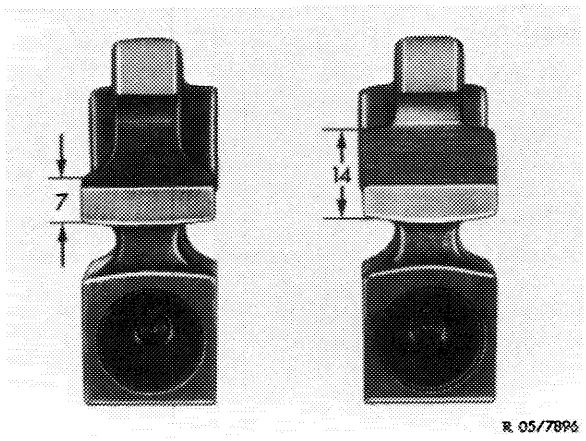
Depressor for valve spring		110 589 04 61 00
Valve adjusting wrench, 17 mm		110 589 01 01 00
Contact grip to turn engine (Part of compression recorder 001 589 46 21 00)		001 589 46 21 08

Note

1st version rocker arm, guiding surface 7 mm.

2nd version rocker arm, guiding surface 14 mm.

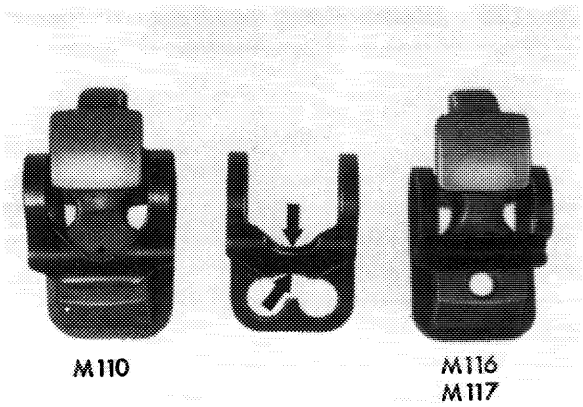
A 1st version rocker arm is replaced by a 2nd version rocker arm when repairing.



Attention!
The rocker arms and spring clamps of engines 110 are not interchangeable with the rocker arms and spring clamps of engines 116 and 117.

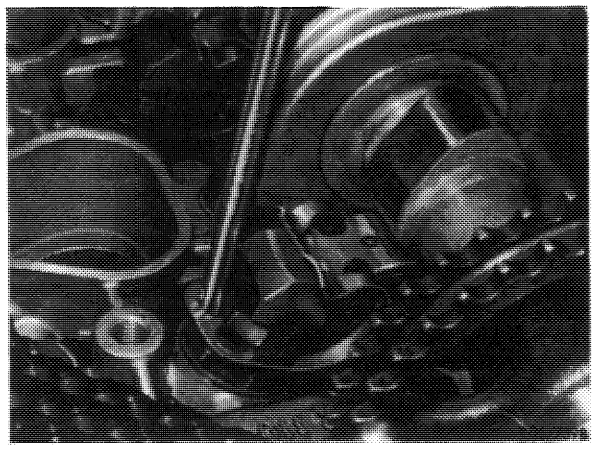
The standard spring clamps (arrows) can be installed in engines 110, 116 and 117.

Always install rocker arms on cam from which they were removed.



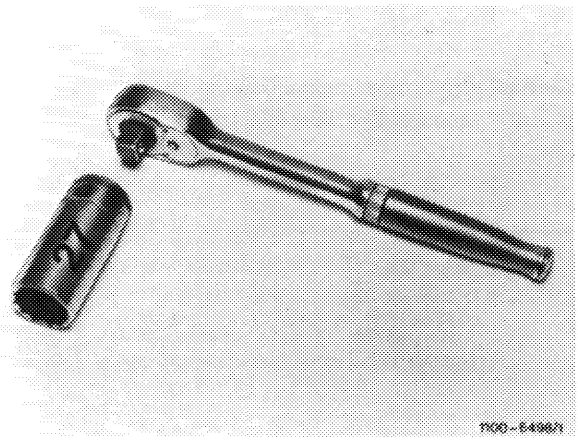
Removal

1 Press off spring clamps with a screwdriver.

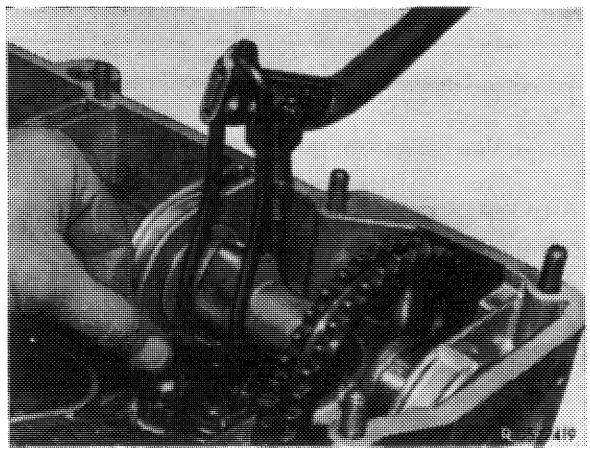


2 Turn crankshaft with combination tool until cam peak is up.

Never turn engine on camshafts.



3 Remove rocker arms with installation and removal tool.



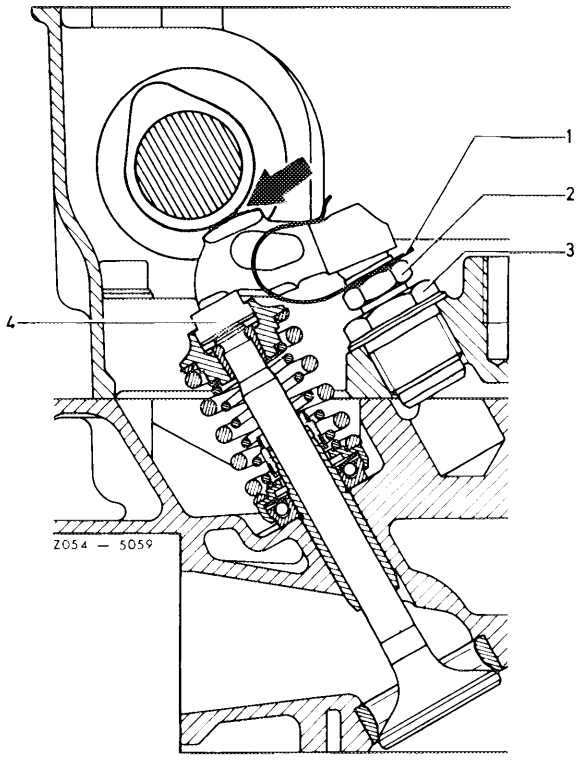
Installation

4 Check oil spray bore in rocker arm for plugging.

5 Coat bearing surfaces of rocker arm with oil and install rocker arm.

6 Press spring clamps into grooves of adjusting screws.

7 Adjust valve clearance (05–210).



1 Spring clamp
2 Adjusting screw
3 Threaded bushing
4 Pressure pad

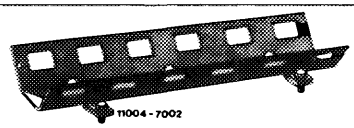
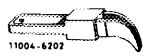
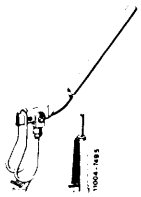
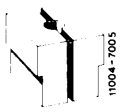
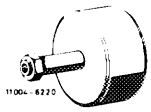
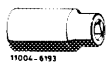
05–250 Removal and installation of valve springs

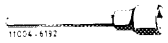
Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Tightening torques	Nm
Cylinder head bolts M 12 x 1.5	100
M 8 bolts for camshaft housing	25
Mounting bolts for camshaft sprockets	80
Ball locating ring in chain tensioner	25
Cylinder head cover bolts and capped nuts	5

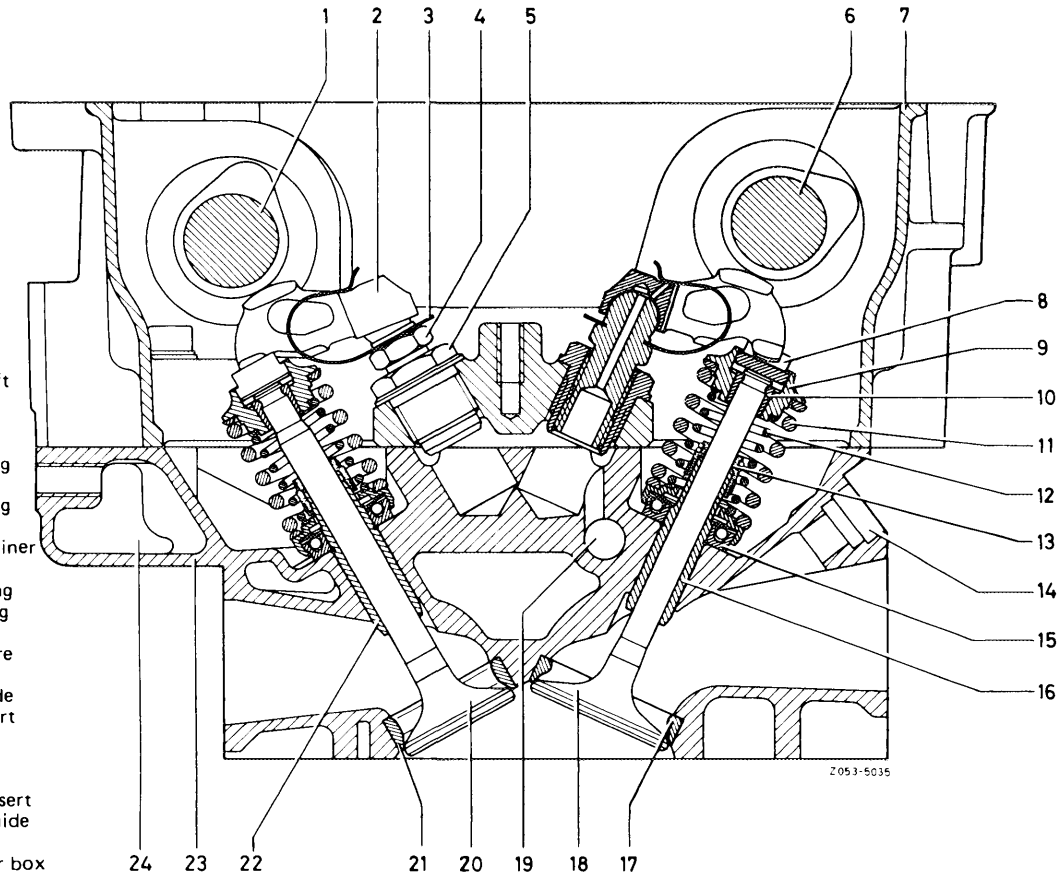
Special tools

Rail to hold down valve springs		110 589 06 62 00
Magnetic lifter for valve collets		116 589 06 63 00
Depressor for valve spring		110 589 04 61 00
Chain tensioner holder		110 589 02 31 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
Valve adjusting wrench 17 mm, 1/2" square		110 589 00 01 00
Wrench socket 27 mm, 1/2" square to turn engine		001 589 65 09 00

Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00

Conventional tool

Cylinder leak tester	e.g. made by Bosch EFAW 210 A e.g. made by SUN CLT 228



Valve timing

1 Exhaust camshaft
2 Rocker arm
3 Spring clamp
4 Adjusting screw
5 Threaded bushing
6 Intake camshaft
7 Camshaft housing
8 Pressure pad
9 Valve spring retainer
10 Valve cone
11 Outer valve spring
12 Inner valve spring
13 Valve stem seal
14 Fuel injector bore
15 Rotocap
16 Intake valve guide
17 Intake valve insert
18 Intake valve
19 Oil bore
20 Exhaust valve
21 Exhaust valve insert
22 Exhaust valve guide
23 Cylinder head
24 Measuring sensor box

Removal

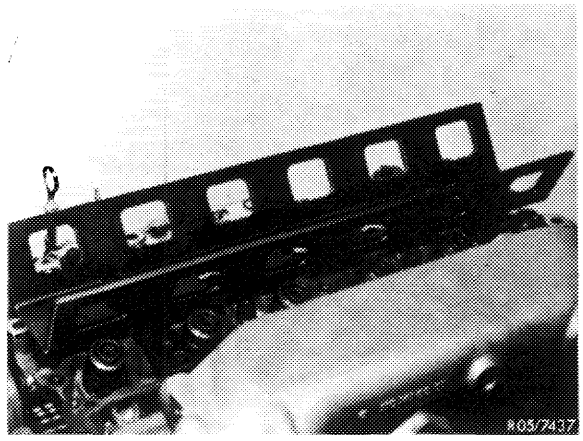
1 Remove camshaft housing (01–470).

2 Remove pressure pads (8).

3 Unscrew spark plug of respective cylinder and set piston to ignition TDC to prevent valves from dropping in.

4 Bolt hold-down rail to cylinder head.

5 Support valves with pneumatic air (cylinder leak tester).

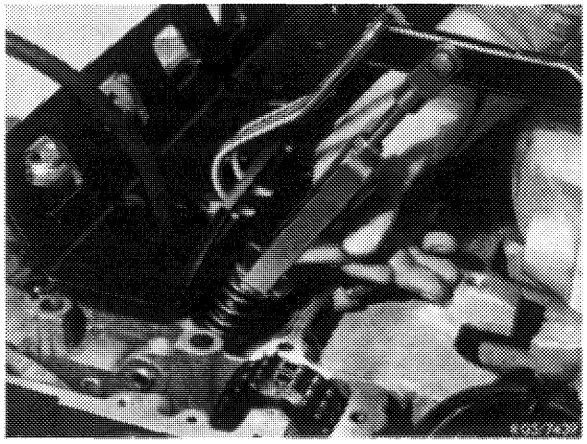


6 Loosen valve collets by applying light knocks from a hammer to valve spring retainers.

7 Press down valve spring retainer with removal and installation tool and remove valve collets with magnetic lifter.

Attention!
Valves must not rest on piston skirt, since this could bend the valves.

8 Remove valve spring retainer, outer and inner valve springs.



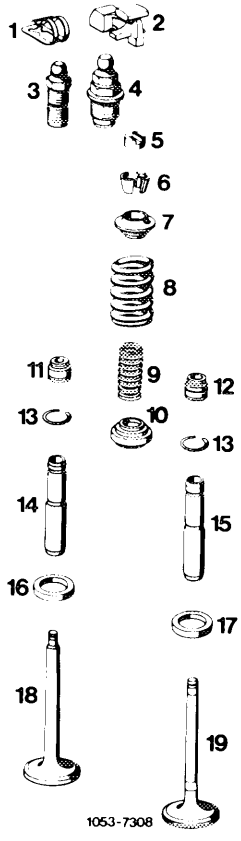
Installation

9 Check valve springs and replace if necessary (05–260).

10 Replace valve stem seals (05–270).

11 Further installation in reverse sequence of removal.

Attention!
Install valve springs that tighter coil ends rest on rotocap.



Valves and rocker arms

1 Spring clamp
2 Rocker arm
3 Adjusting screw
4 Threaded bushing with adjusting screw
5 Pressure pad
6 Valve cone
7 Valve spring retainer
8 Outer valve spring
9 Inner valve spring
10 Rotocap
11 Exhaust valve stem seal
12 Intake valve stem seal
13 Circlip
14 Exhaust valve guide
15 Intake valve guide
16 Exhaust valve insert
17 Intake valve insert
18 Exhaust valve
19 Intake valve

Valve springs

	Part No.	Color code	Outside dia. mm	Wire gage dia. mm	Relaxed length mm	Spring force at pretensioned length mm	New N	Limit N
Inner	130 053 00 22	yellow/brown or violet/brown	22—22.4	2.5	45	21.5	235	224—246
Outer (optional)	110 053 02 20	yellow	33.8—34.1	4.6	49.5	30.5	863	843—902
	110 053 01 20	violet/red yellow/red	34.2	4.75	49			

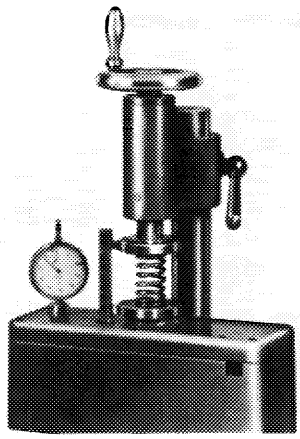
Checking

1 Check valve springs with a valve spring tester or a spring testing scale.

2 Check spring force at specified length.

3 If value is less than limit, replace valve springs.

Note: Prior to installation, check wire surface of used valve springs for corrosion.



R 05/6383

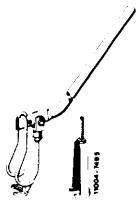
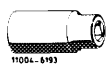
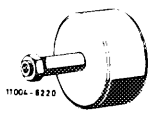
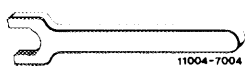
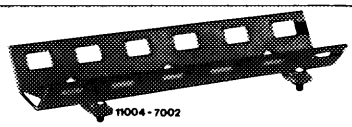
05–270 Replacing valve stem seals

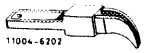
Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Cylinder head bots M 12 x 1.5	100
Bolts M 8 for camshaft housing to cylinder head and crankcase	25
Necked-down screws for camshaft sprockets	80
Ball locating ring in chain tensioner	25

Special tools

Depressor for valve spring		110 589 04 61 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
Camshaft holding wrench		116 589 01 01 00
Rigid chain tensioner		110 589 03 31 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Rail to hold down valve springs		110 589 00 62 00

Chain tensioner holder		110 589 02 31 00
Assembly mandrel for valve stem seals intake and exhaust 9 mm dia.		116 589 00 43 00
Installation mandrel for exhaust valve stem seals 11 mm dia.		116 589 01 43 00
Magnetic lifter for valve collets		116 589 06 63 00
Valve adjusting wrench 17 mm		110 589 01 01 00

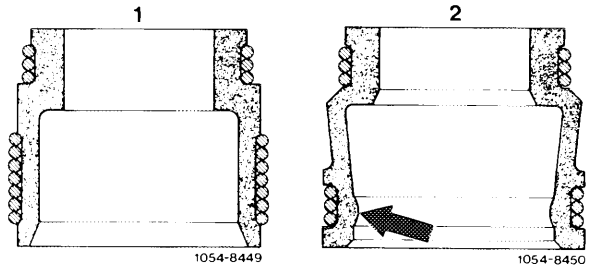
Note

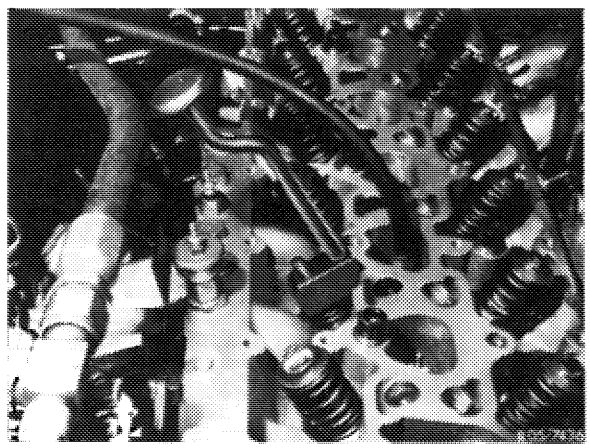
Remove camshaft housing with camshafts (01–470) and pertinent valve springs (05–250) to replace valve stem seals.

Valve stem seals are supplied in a repair kit with assembly sleeves.

The exhaust valve stem seal with 9 mm ID for engines starting April 1978 (emission-controlled engines starting model year 1980) has a holding bead inside (arrow) Do not mix up with intake valve stem seal without holding bead.

Valve guides, which are worn at the groove for the valve stem seal, must be replaced.





Valve stem seals

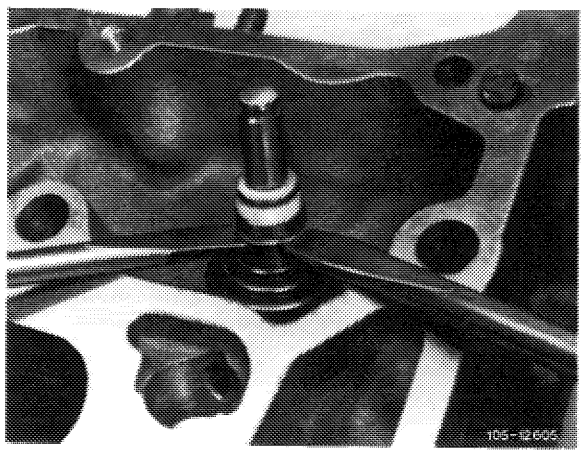
Repair set 123 586 03 05 (up to April 1978 or up to model year 1980 (USA)).

Repair set 110 586 03 05 (starting April 1978 or starting model year 1980 (USA)).

Replacing

1 Press off valve stem seals.

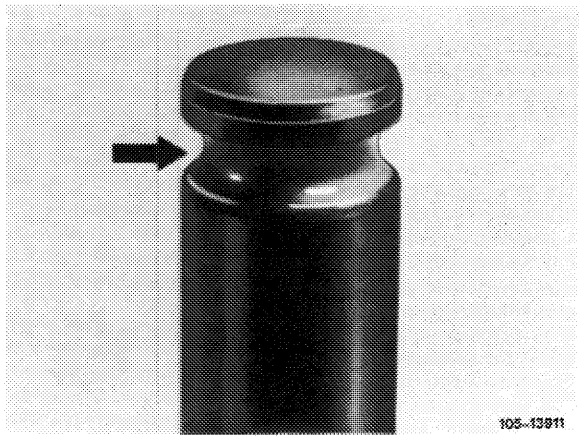
Attention!
Don't damage valve stem and valve guide.



2 Deburr valve stem at groove (arrow).

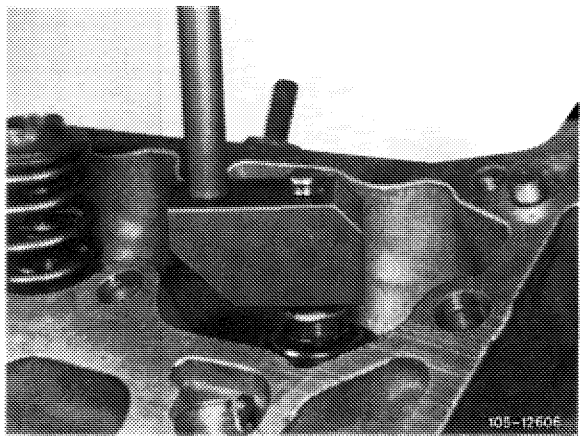
3 Replace dented valve cones and spring retainers.

4 Check Rotocap and replace if necessary.

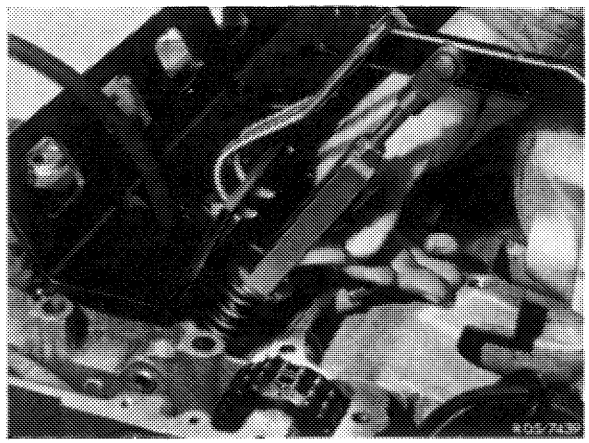


5 Lubricate valve stem seals and install with installation mandrel.

Use assembly sleeve on intake valve.



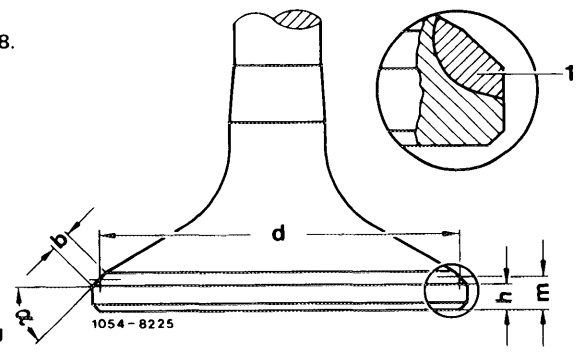
6 Install valve springs (05–250) and camshaft housing (01–470).



Data

		Intake valve	Exhaust valve Version 1	Exhaust valve[2] Version 2
Valve retainer dia.		45.1–45.3	37.0–37.2	38.9–39.01
Valve stem dia.		8.95–8.97	10.94–10.96	8.94–8.96
Valve length		115	118	118
Code number at end of stem		E 110 06 E 110 07[1])	A 110 00 A 110 00 C	A 117 00 A 117 00 C
Filled-in sodium		without	with	with
Valve seat plating		with	with	with
Height „h" of valve retainer	When new	1.5	2.5	2.5
	Limit value	1.0	2.0	2.0
Width „b" of valve seat		1.8–3.0	1.5–2.5	
Dia. „d" on valve seat center		44.2	36.1	38.0
Height „m" up to valve seat center	When new	2.1–2.3	3.1–3.3	3.1–3.3
	Limit value	1.6–1.8	2.6–2.8	2.6–2.8
Adjusting angle for machining valves			45^{o} + 15′	
Permissible runout on valve stem and valve seat max.			0.03	
Permissible runout at face of valve stem when held at valve stem			0.015	

[1]) Valve with spherical section.
[2]) Standard (except emission controlled engines) starting April 1978. Emission controlled engines starting model year 1980.



1 Valve seat plating

Conventional tools

Valve cone grining machine or Valve cone machining tool	e.g. made by Krupp, D-5309 Meckenheim model VS e.g. made by Hunger, D-8000 München 55 type VKDR 1, order no. 203.00.200

Note

The exhaust valves are filled with sodium!

Observe safety regulations when scrapping. Because of the danger of explosion sodium filled valves must not be melted or converted into tools (punches, etc.), without first removing the sodium filling.

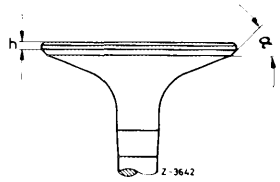
Be careful when removing sodium from valves, since sodium reacts violently and explosion-like when combined with water and watery solutions, to avoid any risk of fire caused by the resulting hydrogen gas.

Sodium from cut and broken valves can be neutralized in the open air in a vessel container in a mixture of 2 liters of spirits of alcohol and 1 liter of water.

Sodium filled valves can be collected and sent for neutralization to the Warranty Checking Department at Stuttgart-Untertürkheim.

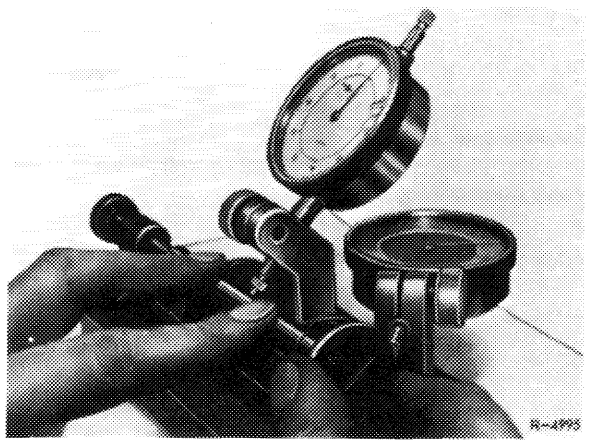
Checking and machining

1 Clean valves and inspect visually.



Valves with a burnt valve head, with insufficient height „h" of valve head and valves with a worn or scored valve stem, must be replaced.

2 Check valve stem runout. If runout measure exceeds 0.03 mm, replace valve.

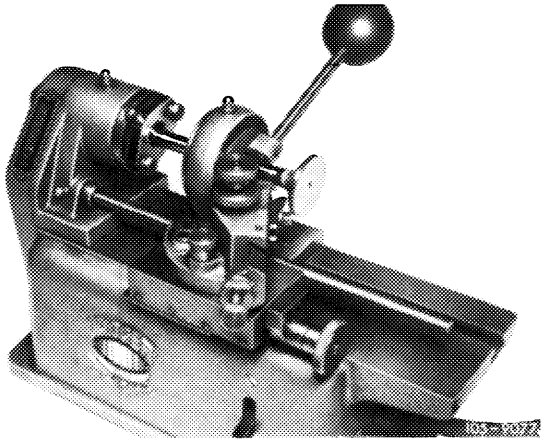


3 Machine valve seat.

Observe instructions supplied with machining equipment and adjusting angle of 45°.

4 Measure valve seat runout and valve head height „h".

Replace valve, if limits have been reached.



Valve guides

Step settings and part no.		OD	Color code	Basic bore in cylinder head	Code number in cylinder head [1]	Valve guide ID
intake	Standard dimension (110 050 25 24)	14.016–14.023	green	14.000–14.006	1	9.000–9.015
		14.021–14.028	without	14.007–14.012	2	
		14.026–14.033	brown	14.013–14.018	3	
	Intermediate stage 110 050 26 24	14.034–14.040	gray-green	– [1]		
		14.039–14.046	gray	– [1]		
		14.045–14.051	gray-brown	– [1]		
	1st repair stage 110 050 27 24	14.216–14.233	red	14.200–14.218		
	2nd repair stage 110 050 28 24	14.416–14.433	white	14.400–14.418		
exhaust 11 mm ϕ	Standard dimension 110 050 33 24	15.016–15.023	green	15.000–15.006	1	11.000–11.018
		15.021–15.028	without	15.007–15.012	2	
		15.026–15.033	brown	15.013–15.018	3	
	Intermediate stage 110 050 34 24	15.034–15.040	gray-green	– [1]		
		15.039–15.046	gray	– [1]		
		15.045–15.051	gray-brown	– [1]		
	1st repair stage 110 050 35 24	15.216–15.233	red	15.200–15.218		
	2nd repair stage 110 050 36 24	15.416–15.433	white	15.400–15.418		
	3rd repair stage 110 050 37 24	16.2 (roughing dim.) [2]	–	16.000–16.018		
exhaust 9 mm ϕ	Standard dimension 110 050 40 24	15.016–15.023	green	15.000–15.006	1	9.000–9.015 [3]
		15.021–15.028	without	15.007–15.012	2	
		15.026–15.033	brown	15.013–15.018	3	
	Intermediate stage 110 050 41 24	15.034–15.040	gray-green	– [1]		
		15.039–15.046	gray	– [1]		
		15.045–15.051	gray-brown	– [1]		
	1st repair stage 110 050 42 24	15.216–15.233	red	15.200–15.218		
	2nd repair stage 110 050 43 24	15.416–15.433	white	15.400–15.418		
	3rd repair stage 110 050 44 24	16.2 (roughing dim.) [2]	–	16.000–16.018		

For overlap of valve guide in cylinder head refer to table: Association basic bore valve guide

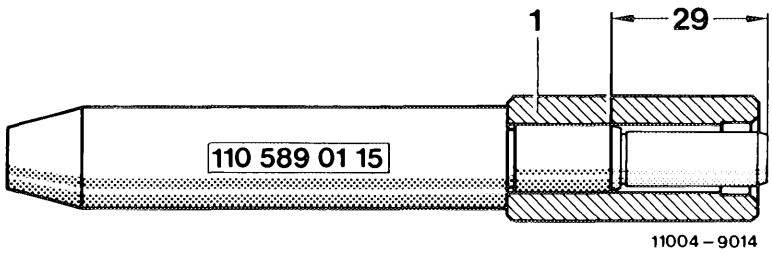
[1] After kocking-out valve guide, the basic bore is not essentially larger than the series basic bore. On exchange engines the basic bore is machined and does not correspond to series basic bore.
[2] For machining OD 16.016–16.033.
[3] Series (except emisssion-controlled engines) starting April 1978. Emission-controlled engines starting model year 1980.

Special tools

Master mandrel 9 mm dia. intake and exhaust		116 589 08 21 00
Master mandrel 11 mm dia. exhaust		116 589 09 21 00

Knock-out mandrel 9 mm dia. intake and exhaust		110 589 02 15 00
Knock-out mandrel 11 mm dia. exhaust		110 589 03 15 00
Knock-in mandrel 9 mm dia. intake		116 589 20 15 00
Knock-in mandrel 11 mm dia. exhaust [1])		116 589 19 15 00
Reamer 8.99 mm dia. H 7 intake and exhaust		000 589 10 53 00
Reamer 10.99 mm dia. H 7 exhaust		000 589 15 53 00

[1]) Change former knock-in mandrel 110 589 01 15 00 according to following drawing, so that exhaust valve guides with 9 mm ID can also be knocked-in. Press-off sleeve (1), machine guide pin (dimension 29 mm), press sleeve (1) on again.



11004 – 9014

Conventional tool

Internal precision measuring instrument 8–12 mm dia.	e.g. made by Hommel, D-5000 Köln 71 Subito, order no. 33 830 103

Note

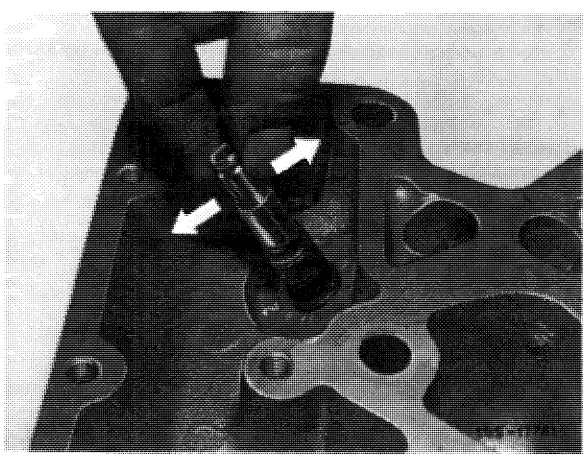
Valve guides which must be renewed due to wear, should permit installation in original basic bore in cylinder head without additional machining.

Valve guides which are loosely seated in cylinder head must be inserted in newly made basic bores.

Checking valve guide

Upon removal of valve spring and valve stem seal, the wear on valve guide can be determined in installed condition by moving valve stem predominantly cross-wise in relation to engine.

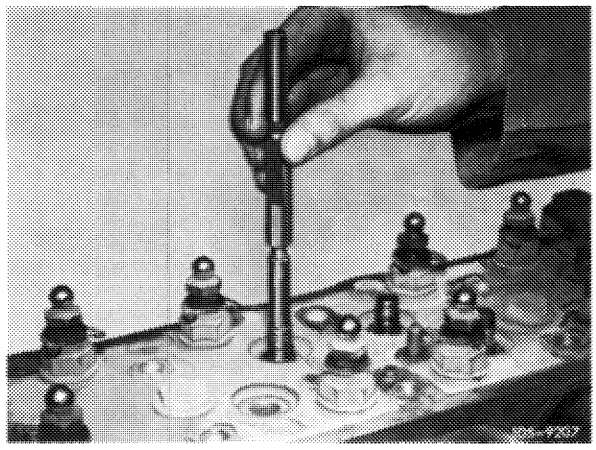
As a reference value, a max. wear of approx. 1.2 μm for 1000 km (0.12 mm for 100 000 km) should be assumed.



However, this value does not apply to upper and lower range of valve guide, since experience has shown that the wear at these points is higher.

Check valve guides with inspection mandrel and cylinder head disassembled.

Valve guides, which are worn outside on seat of valve stem seal, should be replaced, since the valve stem seal is no longer tightly seated.

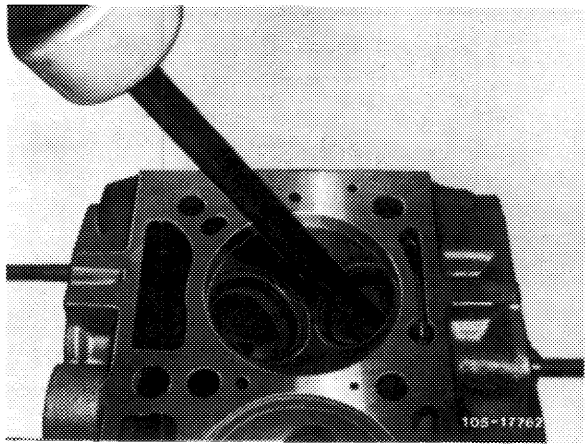


Assigning and inserting valve guides

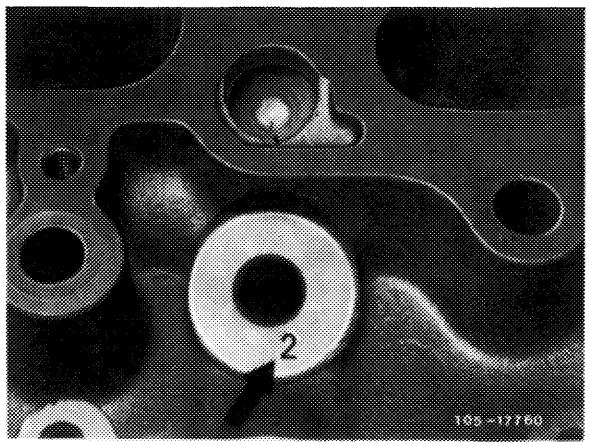
1 Knock-out valve guide with knock-out mandrel from direction of combustion chamber or press out.

2 Visually check basic bore in cylinder head for score marks and deposits.

Equalize deposits (if any) by means of a small file.



Attention!
A basic bore with punched-in code number, e.g. 2 (arrow) should be associated with the respective valve guide with regard to the applied color code or the measured OD.



On **exchange engines** the basic bore in cylinder head is larger than normal. This means, that the punched-in code numbers in cylinder head are no longer in accordance with basic bores according to table.

In such a case, measure basic bore or OD of knocked-out valve guide prior to pertinent association.

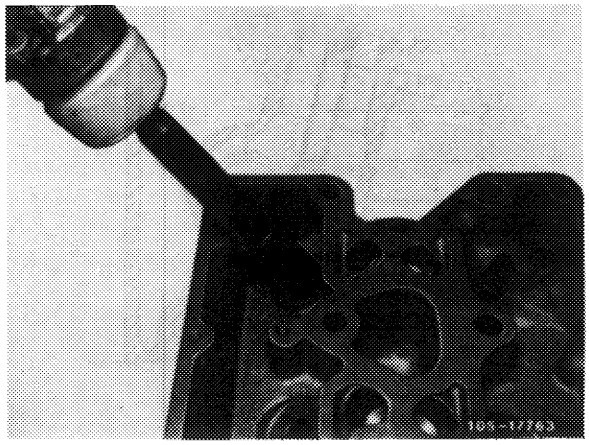
Association of a valve guide with a not-refinished basic bore in cylinder head

Punched-in code number adjacent to basic bore in cylinder head[1])	Color code of valve guide[2])	Overlap in cylinder head	Machining note
	without	0.015—0.028	Knock-in valve guide with knock-in mandrel.
0	brown	0.020—0.027	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-green[3])	0.028—0.040	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
	brown	0.019—0.026	Knock-in valve guide with knock-in mandrel.
1	gray-green	0.022—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray[3])	0.027—0.039	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
	gray-green	0.016—0.027	Knock-in valve guide with knock-in mandrel.
2	gray	0.021—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-brown[3])[4])	0.027—0.038	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream with reamer.

1) After knocking-out valve guide, the basic bore is not essentially larger than the series basic bore.
On exchange engines the basic bore is machined and does no longer correspond to series bore.
2) Valve guides with color code "green", overlap 0.010—0.023 mm, should not be used since they may become loose.
3) Use valve guides which require inside reaming after knocking-in, should be used only if no other valve guides are available.
4) Valve guide gray-brown with 0.027—0.038 mm overlap, may also be installed into cylinder head instead of a slightly loose valve guide without refinishing basic bore.

3 Insert valve guide for approx. 3–4 minutes into liquid oxygen, then insert **immediately** into knock-in mandrel and **immediately** into respective bore while following-up with a hammer.

Note: If the valve guide is not knocked-in immediately up to locking ring, it will absorb the temperature of the cylinder head and can then be completely knocked-in with considerable difficulty.

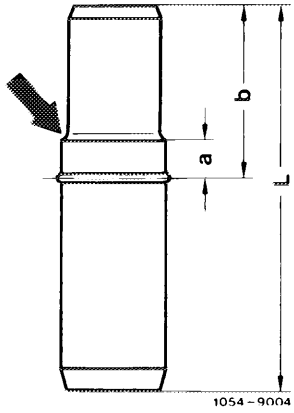


4 If no liquid oxygen is available, heat cylinder head in a water bath, e.g. a parts washing system or a heating oven to max. 80 °C (176 °F).

5 Coat valve guide with tallow and knock-in with knock-in mandrel until circlip or knock-in mandrel rests against cylinder head.

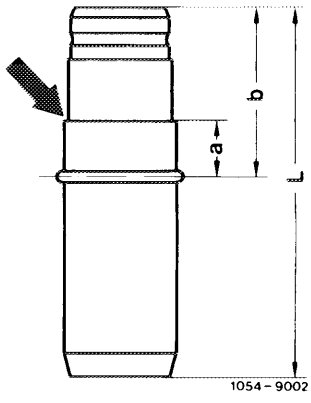
Attention!
Use specified knock-in mandrel only.

The stop in knock-in mandrel is adapted to valve guide and dimension a in such a manner that the valve guide can be knocked into end position without damage.



Intake valve guide

	Intake	Exhaust
a	5	7.5
b	23	20.5
L	51.5	54
ID	9	9 starting April 1978 starting (USA) 1980
		11 up to April 1978 up to (USA) 1980

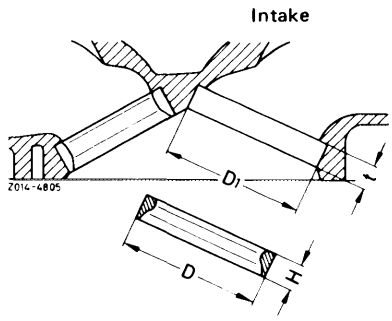


Exhaust valve guide

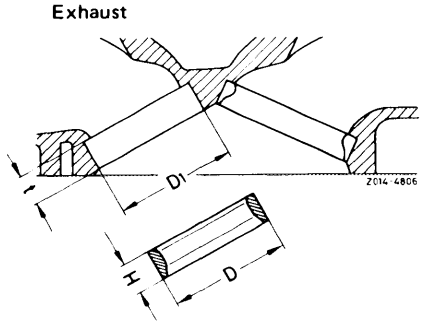
Data

Overlap of valve seat rings in cylinder head	0.08–0.10

Intake	Normal dimension	Repair stage
D	47.10 / 47.09	Rough dimension 48.30
D1	47.00 / 47.01	Max. up to 48.00
t	8.60 / 8.70	
H	8.60 / 8.51	



Exhaust	Normal dimension		Repair stage	
	Version 1	Version 2 [1]	Version 1	Version 2 [1]
D	40.10 / 40.09	42.10 / 42.09	Rough dimension 41.3	43.3
D1	40.00 / 40.01	42.00 / 42.01	max. up to 41.00	max. up to 43.00
t	10.50 / 10.60			
H	10.50 / 10.39			



[1]) Series (except emission-controlled engines) starting April 1978. Emission-controlled engines starting model year 1980.

Conventional tools

Plug gauge 9 mm dia. for intake and exhaust valve guide		116 589 08 21 00
Plug gauge 11 mm dia. for exhaust valve guide		116 589 09 21 00

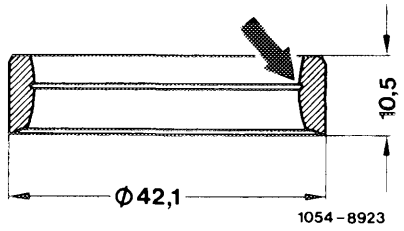
Conventional tools

Cylinder head clamping device	e.g. made by Christ, D-6801 Neckarhausen order no. DBK 60-2
Ring seat machining tool	e.g. made by Hunger, D-8000 München size 2, order no. 220.03.110
Valve seat machining tool	e.g. made by Hunger, D-8000 München order no. 236.03.308, type VDSNL 1/45/30
Test set for valves	e.g. made by Hunger, D-8000 München order no. 216.93.300

Internal micrometer (range 25–60 mm)	e.g. made by Mahr, D-7300 Esslingen order No. 844
External micrometer (range 25–50 mm)	e.g. made by Mahr, D-7300 Esslingen order No. 40 S

Note

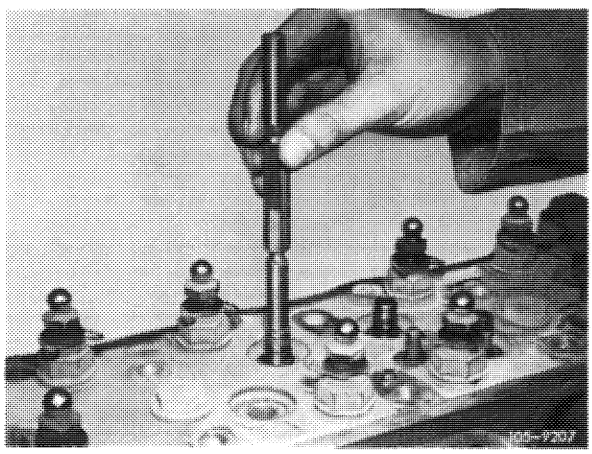
Exhaust valve seat rings for unleaded fuel with red or blue color dot on inside may be installed only in USA engines starting model year 1975. Starting model year 1980 these valve seat rings are identified by a machined groove (arrow).



Replacing

1 Unscrew old valve seat ring by means of ring seat machining tool.

2 Check valve guides, replacing if necessary (05–285).



3 Measure basic bore D1.

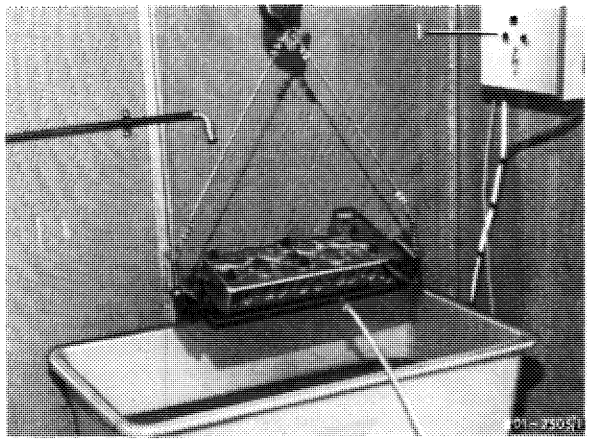
A new standard size valve seat insert can be used, if the specified overlap is given.

4 Machine basic bore repair stage D1 with ring seat machining tool in such a manner that bore is just cleaned.

5 Measure machined basic bore.

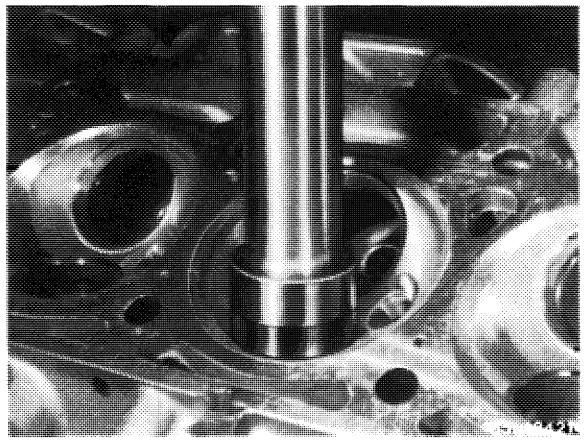
6 Provide specified overlap by machining the oversize valve seat inserts.

7 Heat cylinder head in water to approx. 80 °C (176 °F).



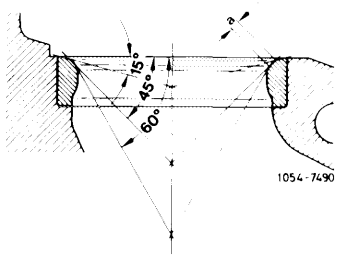
8 Undercool valve seat insert with fluid air.

9 Knock in valve seat insert with a pertinent mandrel.



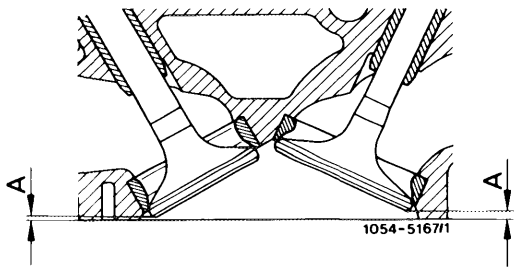
10 Machine valve seats (05–291).

Data	Intake	Exhaust
Valve seat width a	1.8–2.5	1.5–2.0
Valve seat angle	45°	
Correction angle, top	15°	
Correction angle, bottom	60°	
Permissible runout of valve seat	0.05	

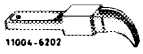


		Minimum distance A with new valves and new valve seats, cylinder head parting surface not machined	Minimum distance A with new valves and new valve seats, cylinder head parting surface 0.4 mm milled off
Intake		3.3	2.9
Exhaust	Valve retainer dia. 37 mm	0.6	0.2
	Valve retainer dia. 39 mm	0.04	0.36 standout
		Max. distance A with new valves and machined valve seats, cylinder head parting surface not machined	Max. distance A with new valves and machined valve seats, cylinder head parting surface 0.4 mm milled off
Intake		4.2	3.8
Exhaust	Valve retainer dia. 37 mm	1.5	1.1
	Valve retainer dia. 39 mm	0.94	0.54

Max. distance A is reduced by the same dimension by which the cylinder head parting surface has been machined down.



Special tools

Magnetic lifter for valve cone halves	 11004-6202	116 589 06 63 00
Master mandrel 9 mm dia. for intake and exhaust valve guide	 11004-6211	116 589 08 21 00
Master mandrel 11 mm dia. for exhaust valve guide		116 589 09 21 00

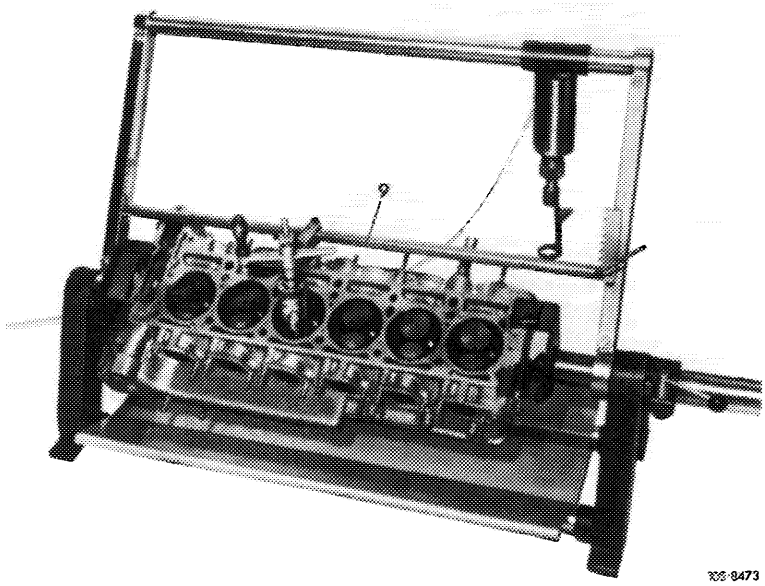
Conventional tools

Cylinder head clamping device	e.g. made by Rothenberger, D-6233 Kelkheim order no. 2.9900
Valve seat machining tool	e.g. made by Hunger, D-8000 München type VDSNL 1/45/30 order No. 236.00.308
Test set for valve seats	e.g. made by Hunger, D-8000 München order No. 216.93.300
60° correcting bit No. 13 for bottom correction angle	e.g. made by Hunger, D-8000 München order No. 216.64.622

Note

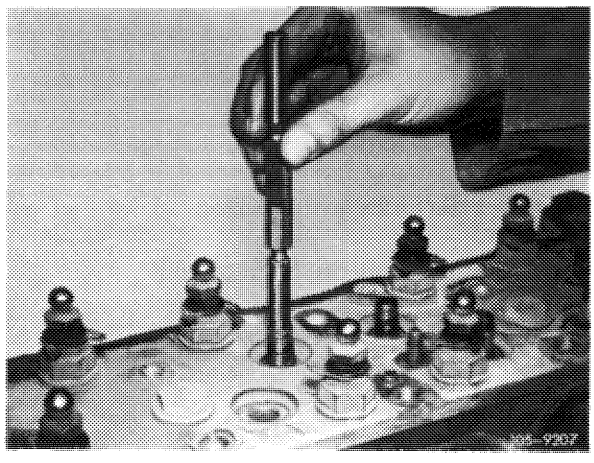
Clamp cylinder head in clamping device for disassembly and machining.

Machine valve seats with valve seat machining tool, valve seat grinding machine or with a valve seat cutter.



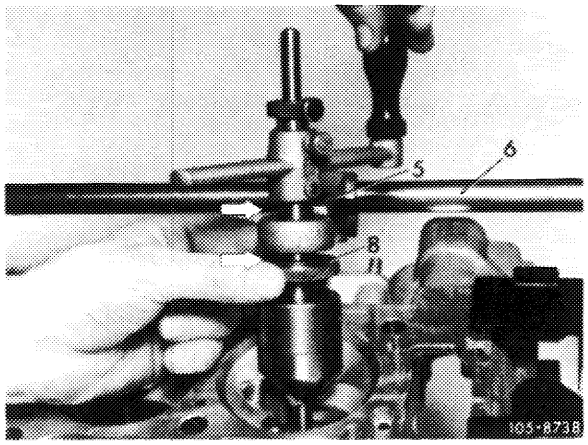
Machining valve seats

1 Check valve guides, replacing if necessary (05–295).



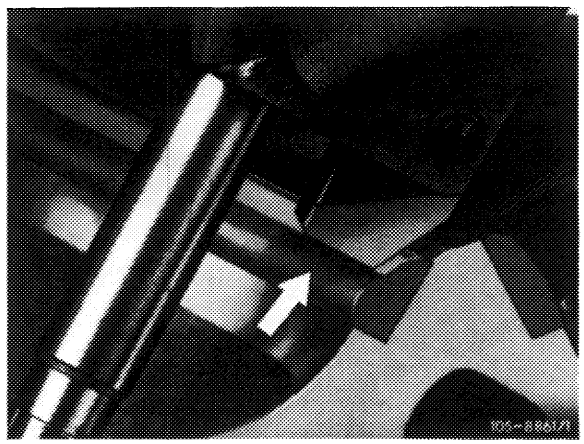
2 Machine valve seat (45°) according to instructions of tool manufacturer.

Attention!
First loosen pilot after runout of valve seat has been checked (point 5).

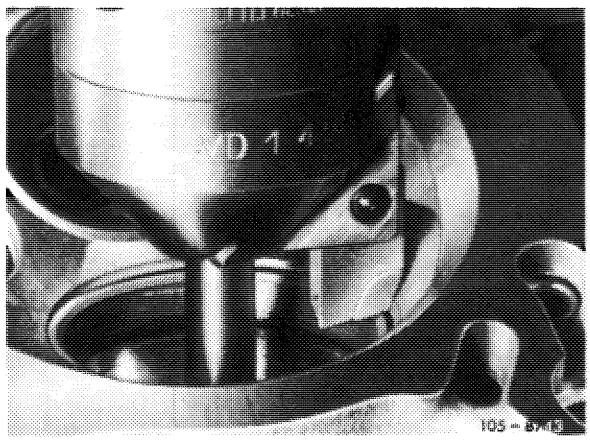


3 Correct bottom of valve seat to 60°.

Attention!
Do not machine bead (arrow) on lower part of valve seat.

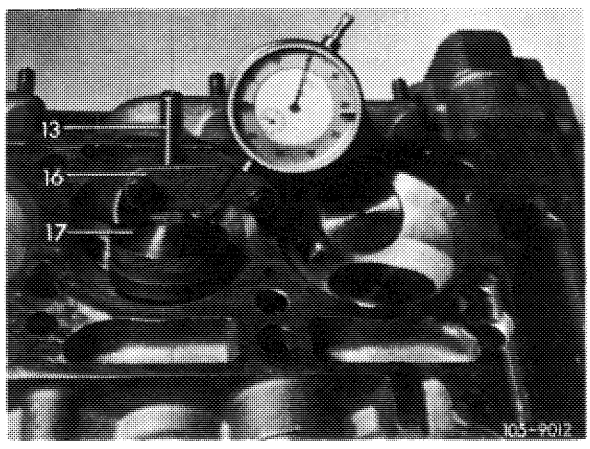


4 Measure valve seat width, and, if necessary, correct top to 15°.



5 Check valve seat runout.

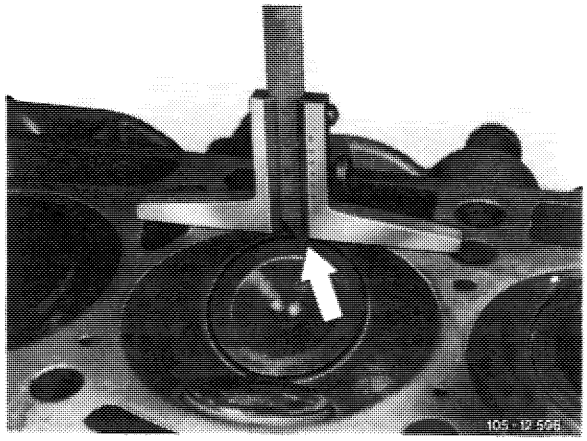
This requires sliding test sleeve (17) with dial gage holder (16) and dial gage on to pilot, and turning test sleeve. In so doing the permissible runout must not exceed 0.05 mm.



13 Pilot
16 Dial gage holder
17 Test sleeve

6 Guide in new valve and check max. distance A (arrow).

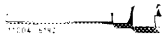
If necessary, replace valve seat insert (05–140).



05–310 Removal and installation of chain tensioner

Tightening torques	Nm
Ball locating ring (oil jet) in chain	25
Plug	50
Threaded ring	50

Special tool

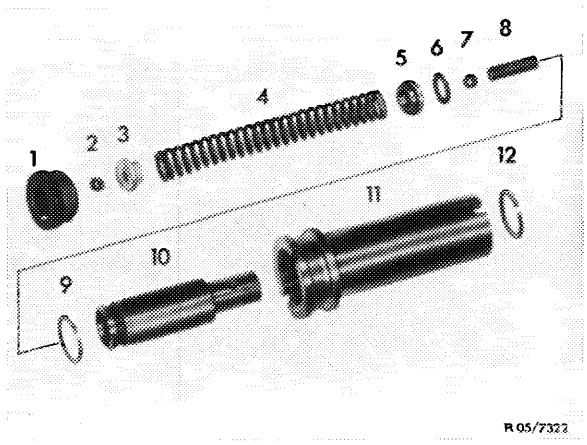
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Holder for chain tensioner		110 589 02 31 00

Conventional tools

Screwdriver socket 19 mm 1/2" square	e.g. made by Hazet, D-5630 Remscheid order No. 985–19
Screwdriver socket 17 mm 1/2" square	e.g. made by Hazet, D-5630 Remscheid order No. 985–17

Note

Chain tensioners are available in two versions and interchangeable with each other.



1st version

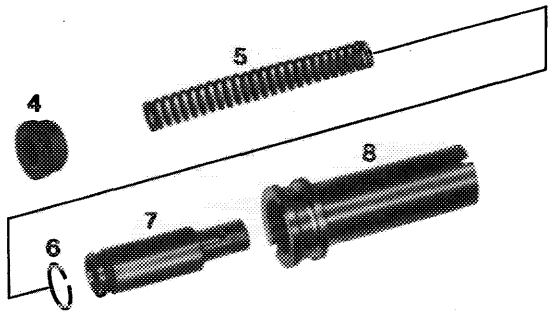
1 Ball seat ring with 3.0 mm bore
2 Ball
3 Ball cage
4 Spring
5 Valve disc
6 O-ring
7 Ball
8 Spring
9 Snap ring
10 Pressure pin
11 Housing
12 Snap ring

The 2nd version chain tensioner does not have valves and its oil jet (4) has a 1.1 mm bore.

Difference when installed:

1st version: bore in ball locating ring closed by ball.

2nd version: bore in oil jet can be checked for plugging with a piece of 1 mm dia. wire.



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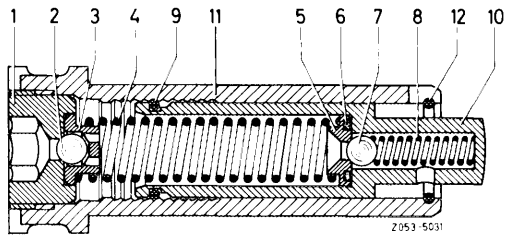
2nd version

4 Oil nozzle with 1.1 mm bore
5 Spring
6 Snap ring
7 Pressure pin
8 Housing

Attention!
Without counterpressure from the clamping rail the pressure pin (10) with snap ring (9) will be pressed forward up to the stop by spring (4).

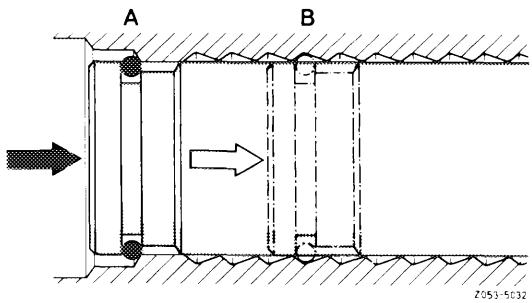


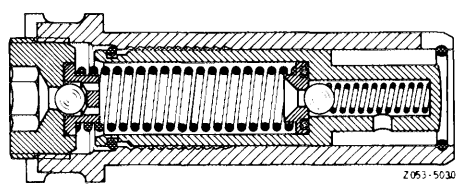
Chain tensioner in operating position

1 Ball locating ring
2 Ball
3 Ball cage
4 Spring
5 Valve disc
6 O-ring
7 Ball
8 Spring
9 Snap ring
10 Pressure pin
11 Housing
12 Snap ring

The pressure pin cannot be pressed back beyond the saw tooth type catch in assembly position „A".

Thus the chain tensioner must be disassembled before each installation to move the pressure pin to assembly position „A", since otherwise the timing chain would be too tight.

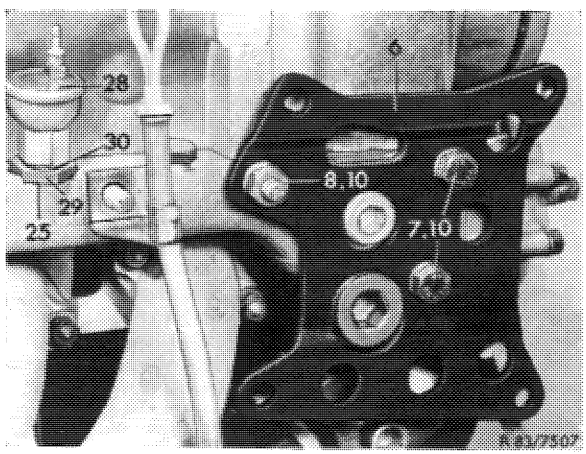




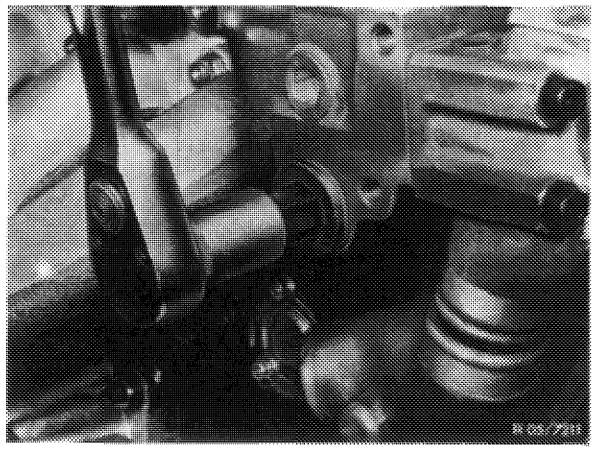
Chain tensioner in assembly position.

Removal

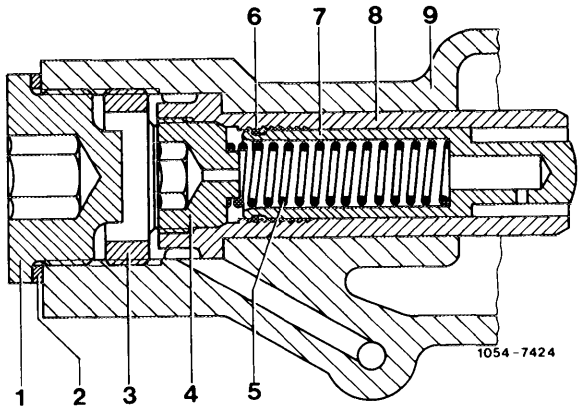
1 Remove battery and compressor of models with an air conditioner.



2 Remove plug with the 17 mm screwdriver socket.

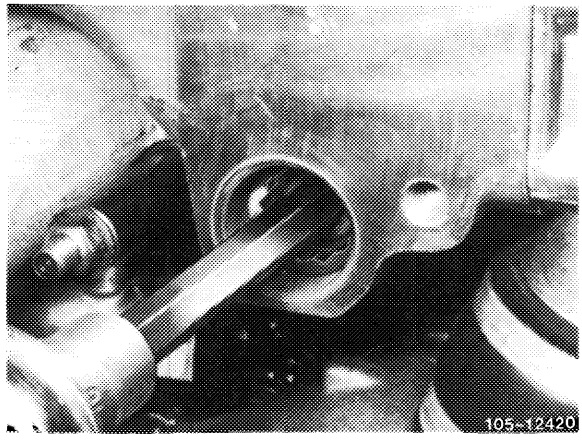


Attention!
If a 2nd version chain tensioner is installed, during **assembly** it will be sufficient to **first remove spring** (5) of an installed chain tensioner at the chain drive (e.g. remove camshaft sprocket or tensioning rail).

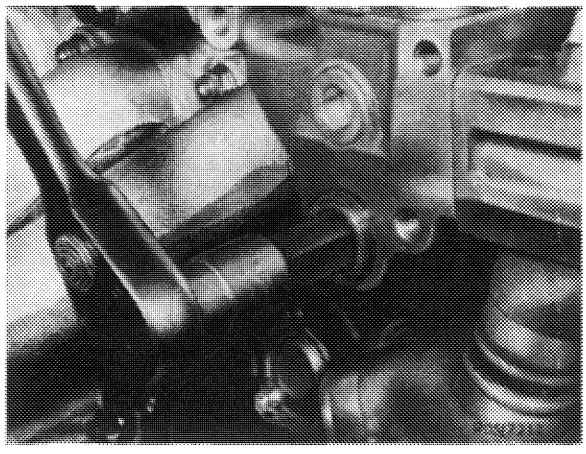


3 Loosen ball locating ring (oil jet) by about 2 turns with a socket wrench.

This requires that the threaded ring be tightened.



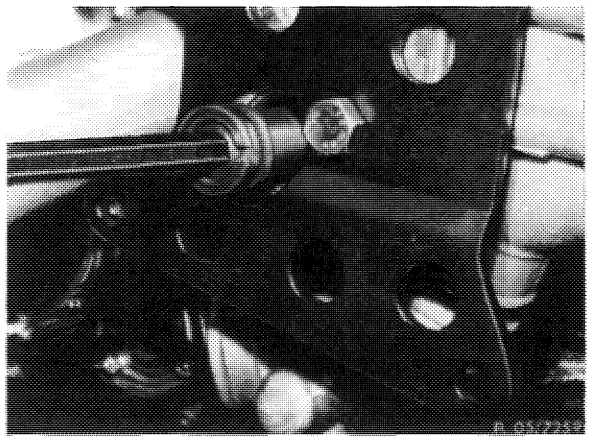
4 Remove threaded ring with a 19 mm screwdriver socket.



5 Pull out chain tensioner with a 10 mm socket wrench.

This requires that the socket wrench be canted slightly and the chain tensioner turned to the right.

For pulling out stuck chain tensioner, screw a M 18 x 1.5 screw into chain tensioner housing instead of ball seat ring (oil nozzle).

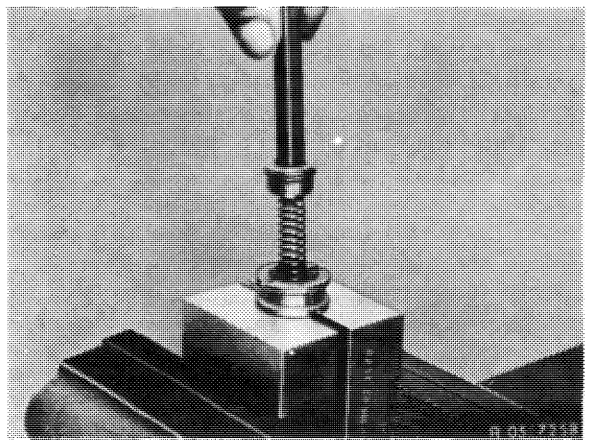


Disassembling

6 Clamp chain tensioner in holders.

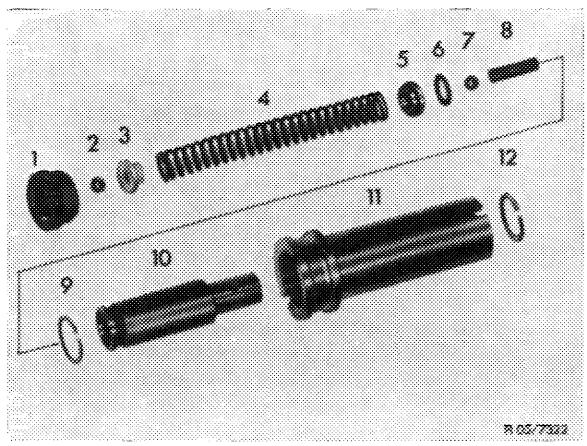
7 Unscrew ball seat ring (oil nozzle) with hex. socket wrench.

When disassembling be careful of the spring force and apply counterpressure with a socket wrench.



8 Remove spring (4) with ball cage (3), ball (2) and valve disc (5).

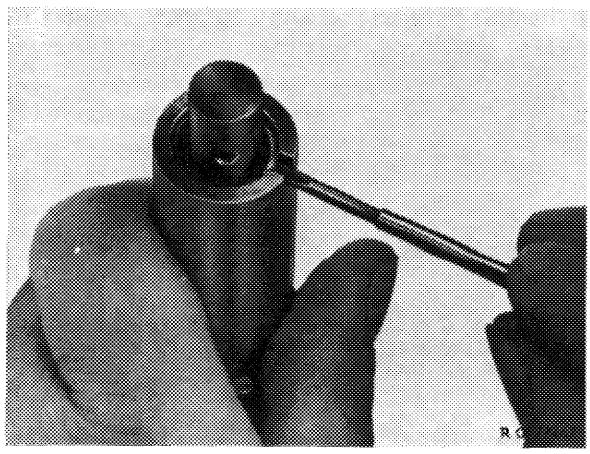
9 Relief chain tensioner, remove ball (7) and spring (8) from pressure limit valve.



10 Take off snap ring (12) with a small screwdriver.

11 Pull out pressure pin toward front (pressure direction).

12 Clean out parts thoroughly.

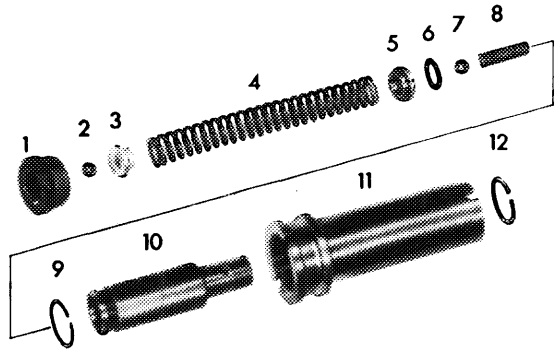


Assembling and installation

1st version

13 Clamp housing (11) with installed snap ring (12) in holders.

14 Install pressure pin (10) with snap ring (9) from above. The snap ring rests on the assembly chamfer and prevents the pressure pin from falling through onto a catch.



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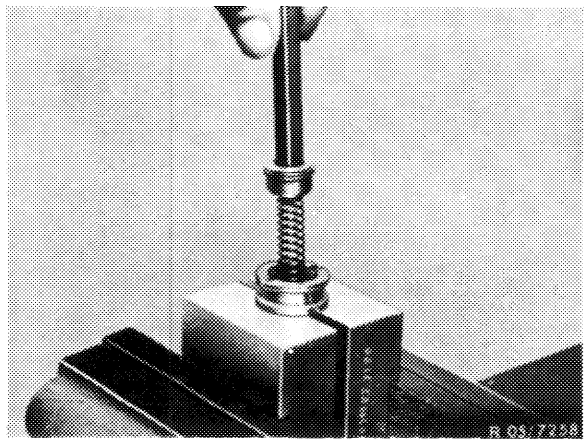
15 Install spring (8) and ball (7) of pressure limit valve.

16 Install spring (4) with valve disc (5) and O-Ring (6).

17 Place ball cage (3) and ball (2) on spring (4).

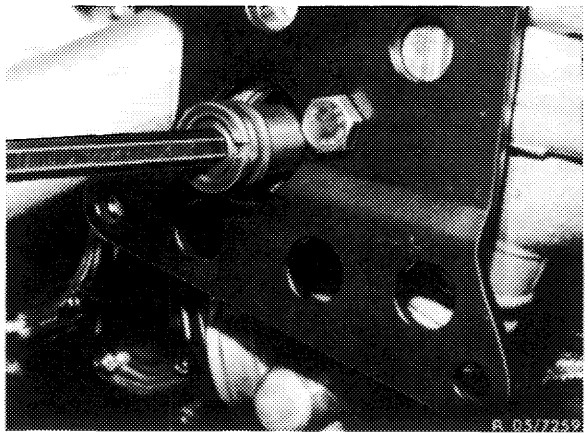
18 Install ball locating ring (1) on ball cage with an internal socket wrench. Compress spring (4) and screw ball locating ring into housing by **about 2** turns.

Attention!
Don't tighten ball locating ring, since otherwise the pressure pin will jump forward and the chain tensioner will have to be disassembled again.



19 Guide chain tensioner into chain tensioner hole in cylinder head with an internal socket wrench.

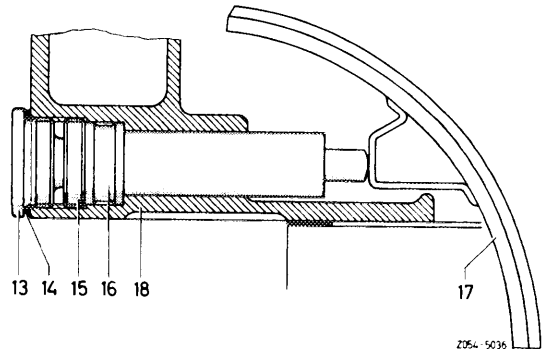
Attention!
Don't apply knocks to socket wrench, since otherwise the pressure pin will jump forward.



20 Install threaded ring (15) and tighten to a torque of 50 Nm.

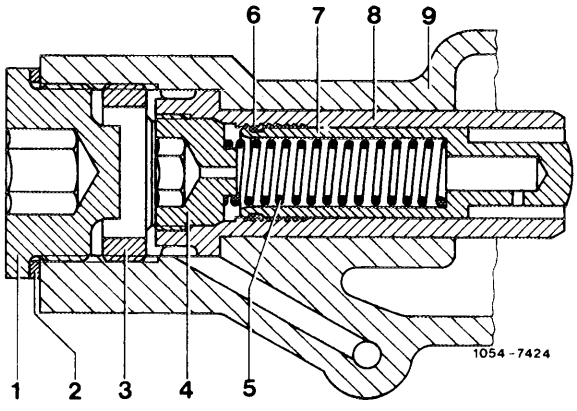
21 Tighten ball locating ring to 25 Nm whereby the pressure pin must **make a clicking noise** as it jumps forward.

22 Install plug (13) with seal (14) and torque to 50 Nm.

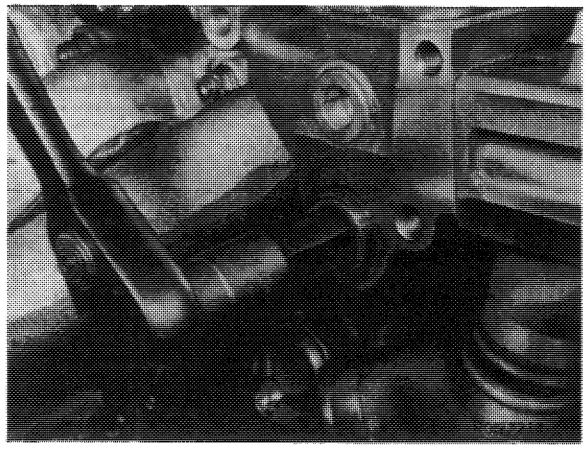


2nd version

23 Guide housing (8) into cylinder head.

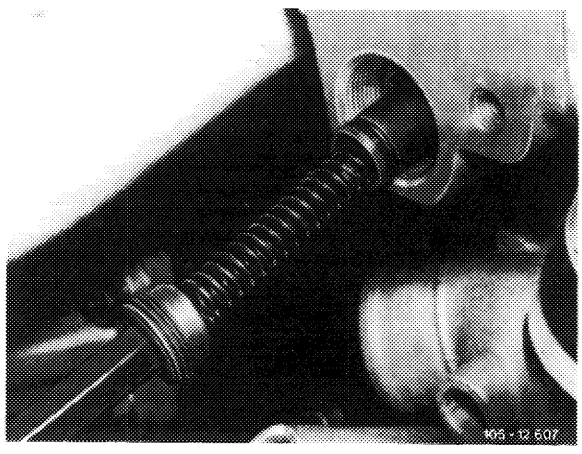


24 Install threaded ring (3) and torque to 50 Nm.



25 Install pressure pin (7) with installed snap ring (6) and spring (5) in housing and torque oil jet (4) to 25 Nm, whereby the pressure pin must **make a clicking noise** as it jumps forward.

26 Install plug (1) with seal (2) and torque to 50 Nm.

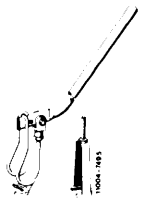
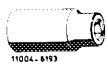
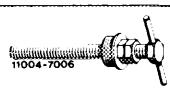
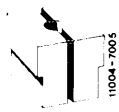
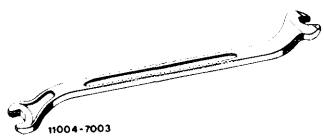
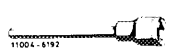


Valve clearance	Cold engine (approx. 20 °C) (68 °F)	Warm engine (60 °C ± 15 °C) (140 °F ± 59 °F)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below –20 °C (–4.0 °F).

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Chain tensioner ball locating ring	25
Valve adjusting screw	20–40

Special tools

Depressor for valve springs		110 589 04 61 00
27 mm wrench socket, 1/2" square, to turn engine		001 589 65 09 00
Rigid chain tensioner		110 589 03 31 00
Holder for chain tensioner		110 589 02 31 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00

Note

For repairs a repair chain with plug link, part no. 000 997 69 94 is available.

If only an endless timing chain with 130 links is available, chain can be split by grinding into **both pins of a link** and using a plug link for assembly. (Do not apply pressure, since this would result in lateral deflection). Use only one plug link, part no. 000 997 05 98 with two lock washers.

Check sprockets for scoring and pitting.

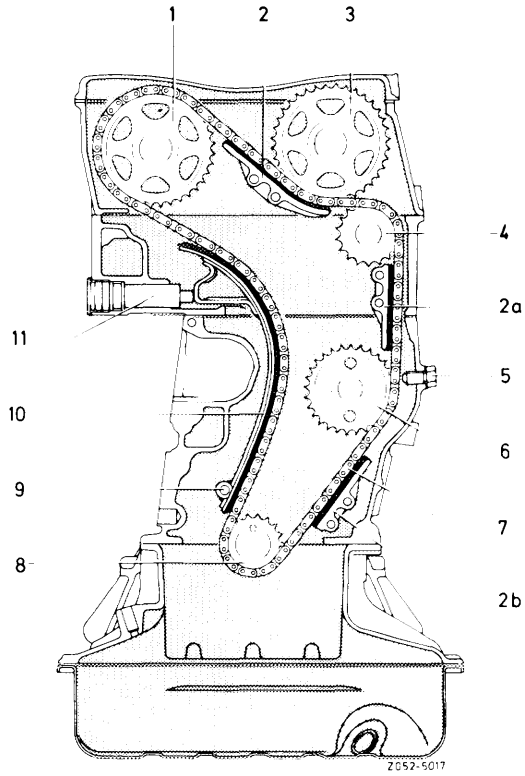
105-9259

Replacing

1 Remove spark plugs and take off cylinder head cover.

2 Remove rocker arm of righthand camshaft (exhaust) (05–230), so that camshaft will not rotate in jerks.

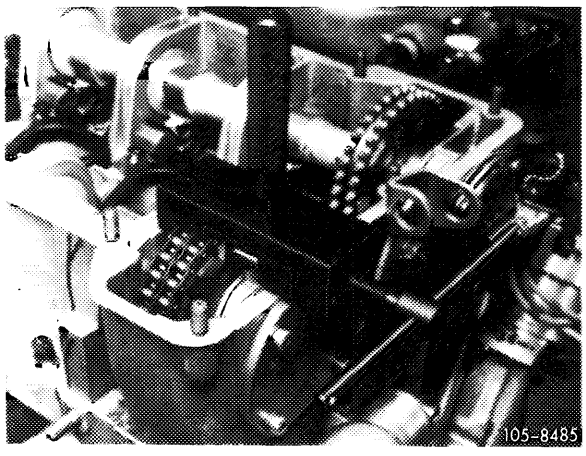
3 Remove chain tensioner (05–310). Install rigid chain tensioner and tighten by hand.



Chain drive

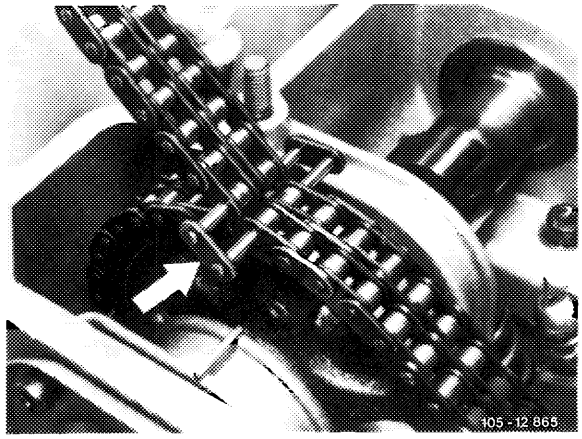
1 Exhaust camshaft sprocket
2-2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Lock screw
6 Intermediate gear
7 Timing chain
8 Camshaft sprocket
9 Bearing pin tensioning rail
10 Tensioning rail
11 Hydraulic chain tensioner

4 Cover chain housing with a clean cloth and break timing chain with chain separating device or grind off both chain pins of **one link.**



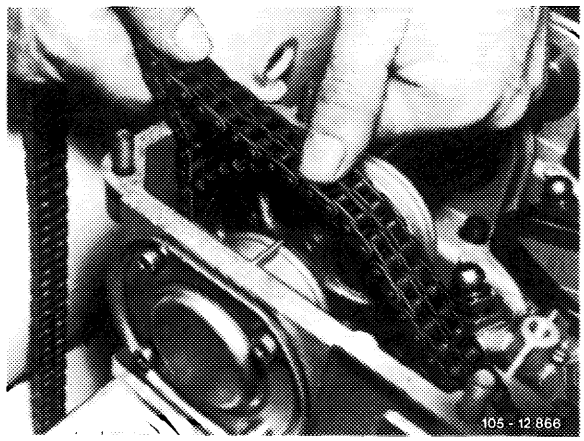
105-8485

5 Connect new timing chain to old timing chain with one link, whereby the broken link is pressed out.

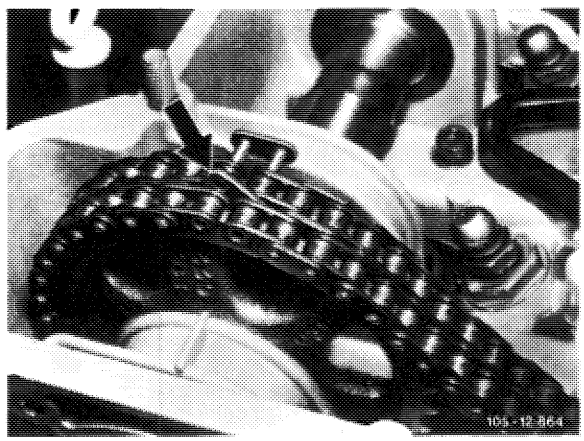


6 Turn crankshaft in engine's direction of rotation slowly with a 27 mm socket wrench and a ratchet, and at the same time lift the old chain until the link is at the uppermost point of the right camshaft sprocket.

Attention!
While turning the timing chain must be in constant engagement on both camshaft sprockets.



7 Detach old timing chain and connect ends of new timing chain with one link. Install center bar (arrow) and outer bar. Press on lock washers.

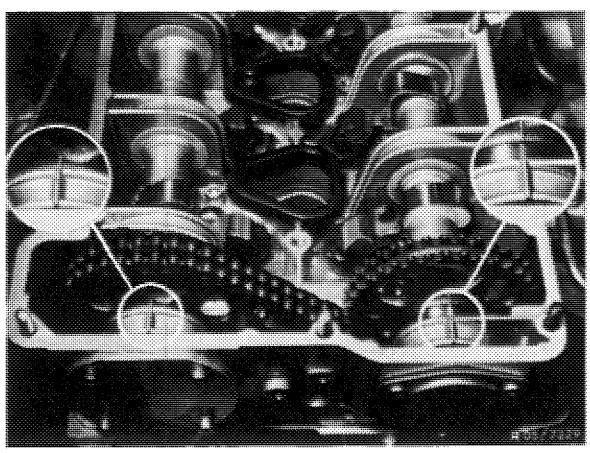


8 Turn crankshaft and check adjustment marks with engine in TDC position.

9 Disassemble chain tensioner, move to assembly position and install (05–310).

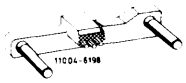
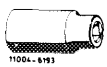
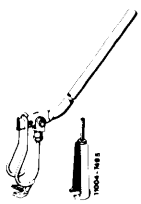
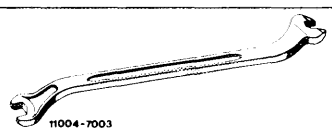
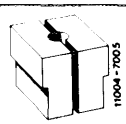
10 Install rocker arms (05–230).

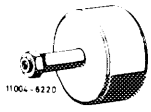
11 Adjust valve clearance of exhaust camshaft (05–210).



Tightening torques	Nm
Expansion bolt for camshaft sprocket	80
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5
Balance disc to cranskhaft	400 + 50
Pulley and vibration damper to balance disc	35
Ball locating ring in chain tensioner	25

Special tools

Torque wrench 150–500 Nm (15–50 kpm) 3/4" square		001 589 31 21 00
Holder		110 589 00 40 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Depressor for valve spring		110 589 04 61 00
Puller for bearing bolt (basic unit)		115 589 20 33 00
M 8 x 30 bolt for extractor		115 589 00 34 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Chain tensioner holder		110 589 02 31 00

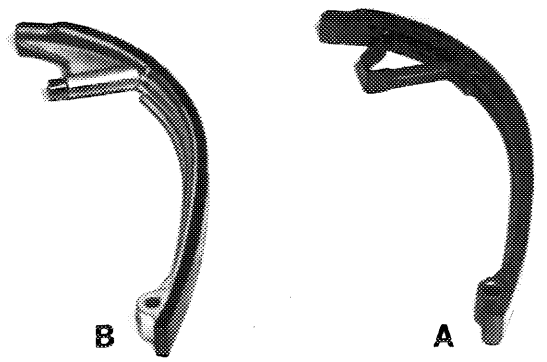
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00

Conventional tools

Connection 3/4" square socket to 1/2" square head	e.g. made by Hazet, D-5630 Remscheid 1 order no. 1058 R-1

Note

A 1st version tensioning rail (A) can be replaced by a 2nd version tensioning rail (B).

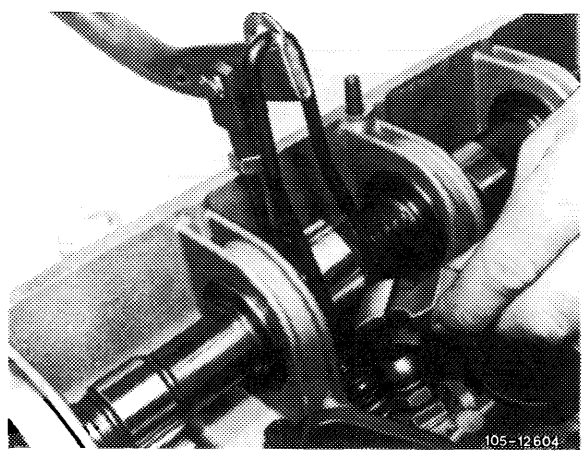


105-12452

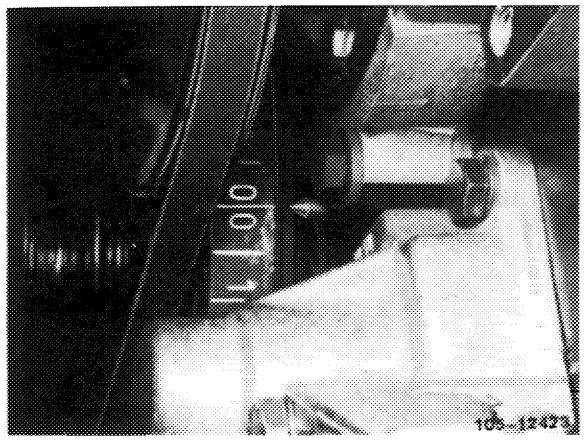
Removal

1 Remove radiator (20–240).

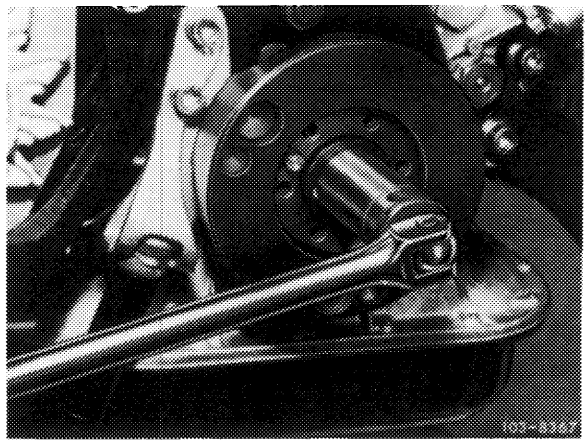
2 Remove rocker arms of right camshaft (exhaust) (05–230).


105-12604

3 Position engine at ignition TDC.

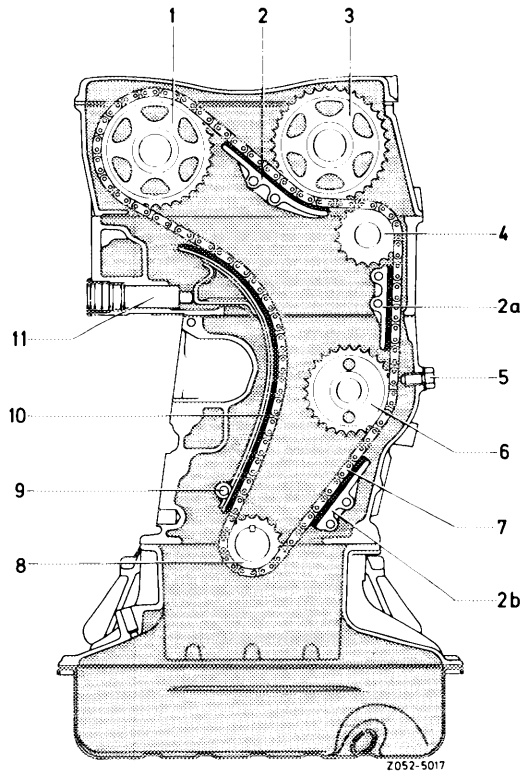


4 Remove vibration damper (03–340). Remove balance disc without bore to extract the tensioning rail bearing pin (03–340).



5 Remove chain tensioner (05–310).

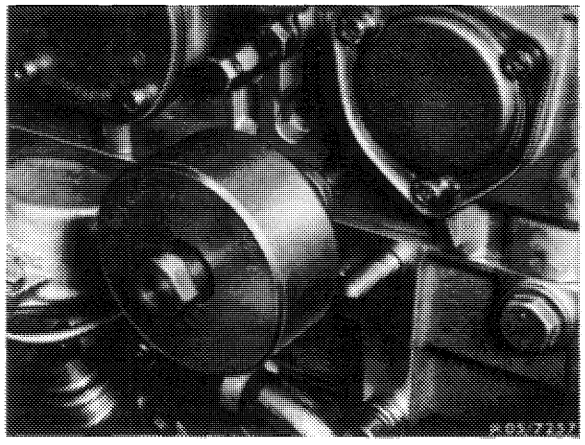
6 Mark relation of left and right camshaft sprockets and timing chain with paint, and remove **right** camshaft sprocket (1).



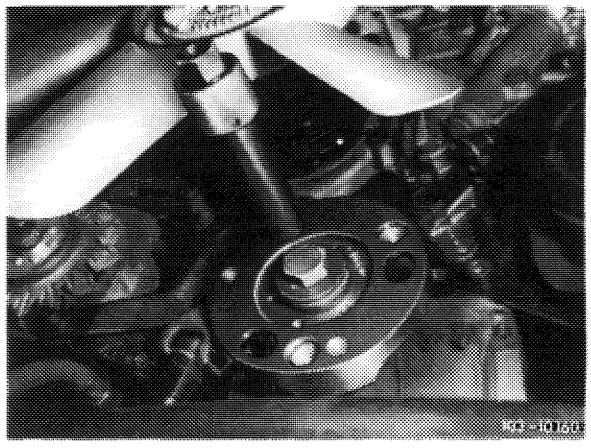
Chain drive

1 Exhaust camshaft sprocket
2–2b Sliding rails
3 Intake camshaft sprocket
4 Guide wheel
5 Lock screw
6 Intermediate wheel
7 Timing chain
8 Crankshaft sprocket
9 Bearing pin tensioning rail
10 Tensioning rail
11 Hydraulic chain tensioner

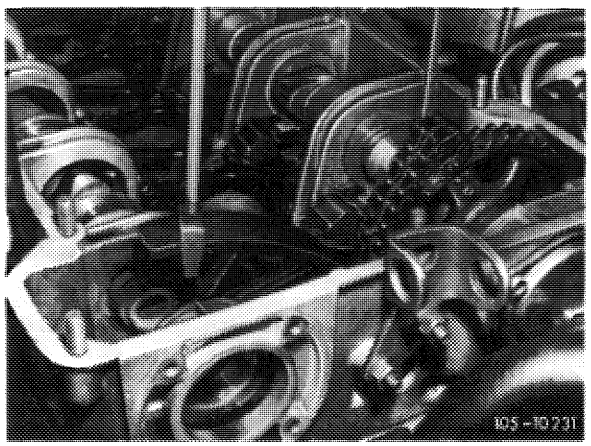
7 Remove sliding rail in camshaft housing.



8 Pull out tensioning rail bearing pin with extractor.

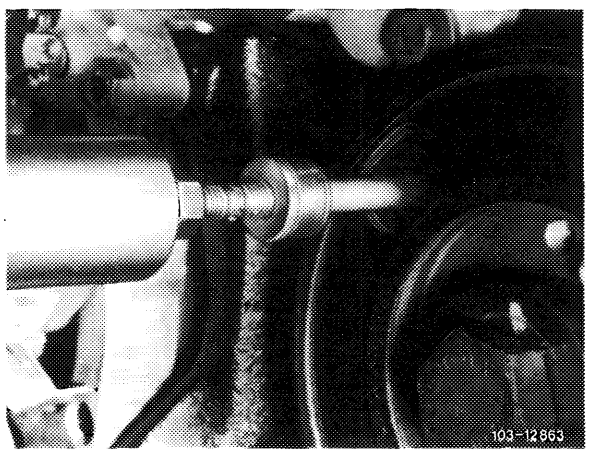


9 Remove tensioning rail upward.



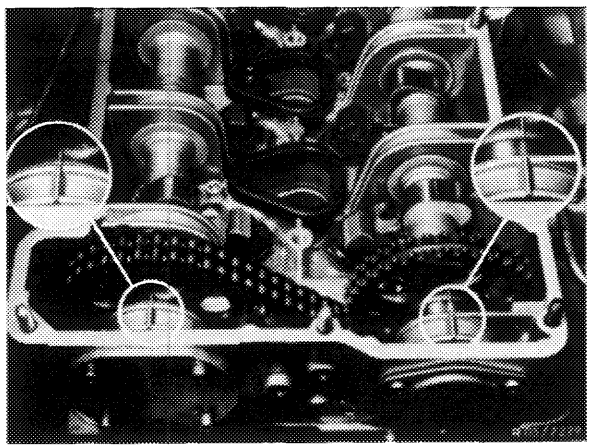
Installation

10 Guide in tensioning rail. Coat bearing pin with a sealing compound and knock in.



11 Install righthand camshaft sprocket, while paying attention to color symbol on camshaft sprocket and timing chain.

Marks on camshaft sprockets and camshaft housing must align when engine is set at TDC position.



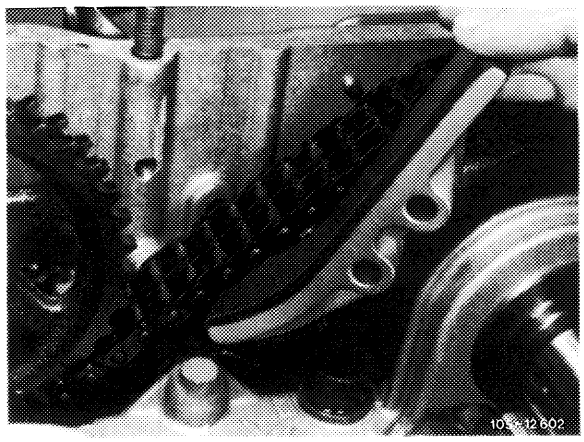
12 Insall sliding rail in camshaft housing (05–340).

13 Set chain tensioner at assembly position and install (05–310).

14 Install balance disc and vibration damper (03–314).

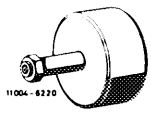
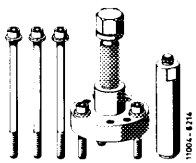
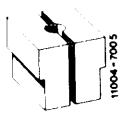
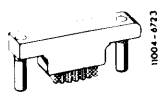
15 Install rocker arms (05–230).

16 Install radiator.



Tightening torques	Nm
Cylinder head cover capped nuts and bolts	5
Radiator drain plug	10
Ball locating ring in chain tensioner	25
Necked-down screw camshaft sprocket	80
Balance disc to crankshaft	400+50
Oil cooler drain plug	35

Special tools

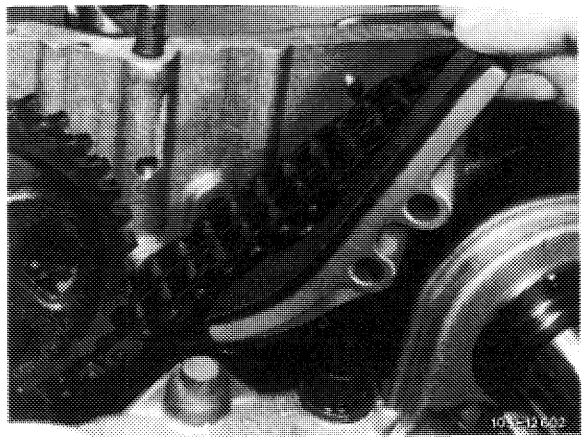
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
Bolt 6 x 50 for impact extractor		116 589 01 34 00
Bolt 6 x 150 for impact extractor		116 589 02 34 00
Bolt 10 x 100 for impact extractor		116 589 03 34 00
Balance disc extractor		116 589 10 33 00
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Holder		116 589 01 40 00

Sliding rail (2) in camshaft housing

1 Remove valve cover and knock out sliding rail pin with an impact extractor.
Remove sliding rail.

2 Watch position of sliding rail when installing.

Coat collar of sliding rail pin with a sealing compound.



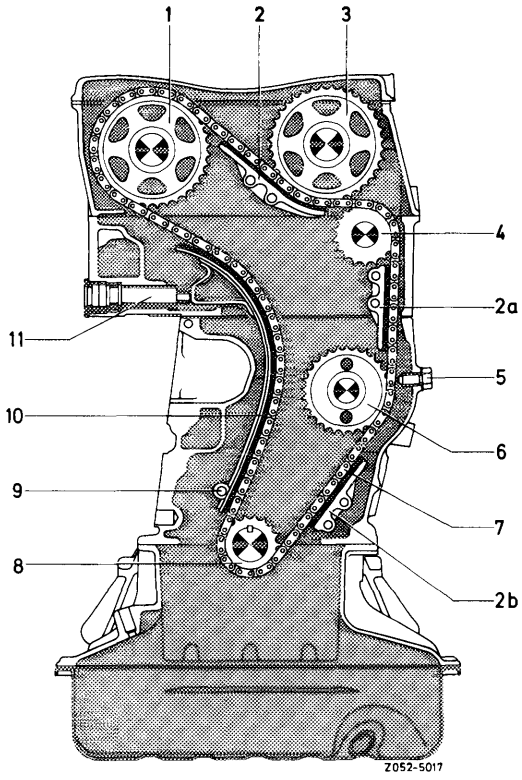
Sliding rail (2a) in cylinder head

1 Remove radiator.

2 Remove chain tensioner or spring in chain tensioner (05–310).

3 Mark relation of camshaft sprockets and timing chain with paint.

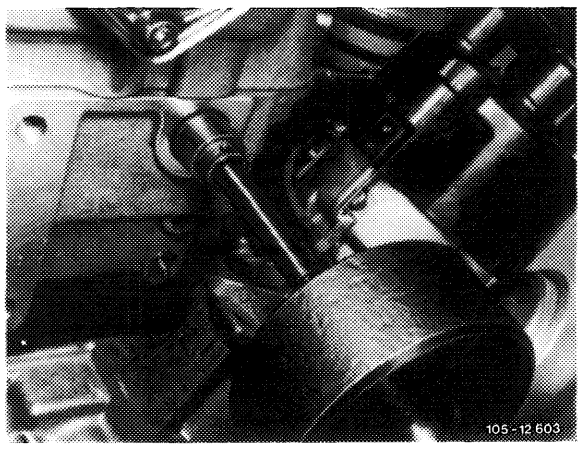
4 Remove sliding rail (2) in camshaft housing.



Chain drive

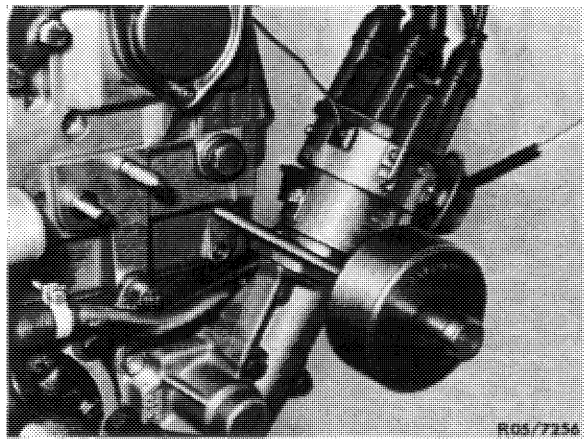
1 Exhaust camshaft sprocket
2–2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Lock screw
6 Intermediate wheel
7 Timing chain
8 Crankshaft sprocket
9 Tensioning rail bearing pin
10 Tensioning rail
11 Hydraulic chain tensioner

5 Connect a wire hook (5 mm thick) to guide wheel (4) and knock out the bearing pin with an impact extractor (10 mm bolt).
Remove guide wheel.



6 Knock out sliding rail pin with an impact extractor and pull out sliding rail with a wire hook.

7 Installation in reverse sequence of removal.



Sliding rail (2b) in crankcase

1 Remove radiator.

2 Remove entire oil pan (01–310).

3 Remove vibration damper and balance disc (03–340).

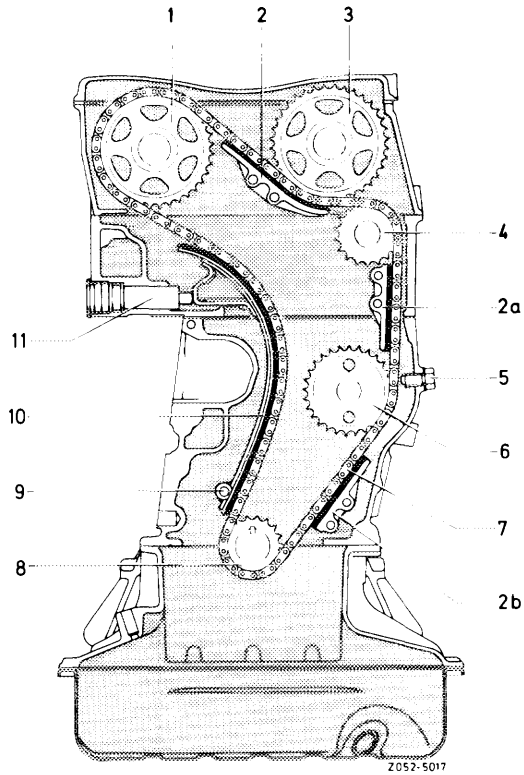
4 Mark relation of camshaft sprockets and timing chain with paint.

5 Remove sliding rail (2) and guide wheel (4).

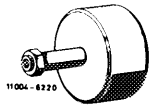
6 Remove chain tensioner or compression spring (05–310).

7 Knock out sliding rail pin with an impact extractor and remove sliding rail.

8 Installation in reverse sequence of removal.



Special tools

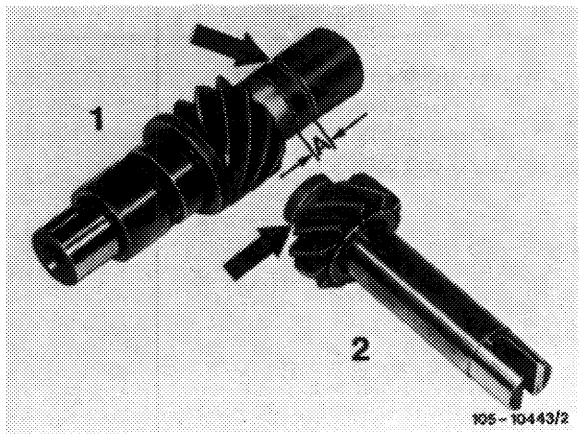
Impact puller for bearing bolt (basic unit)		116 589 20 33 00
Threaded bolt M 6 x 150 for impact puller		116 589 02 34 00

Note

The oil pump drive comprises the **intermediate gear shaft (1)** and the **helical gear shaft (2)**, and may be **replaced in sets** only (05–412).

In the event of repairs, install oil pump drive part no. 110 050 02 06:

Intermediate gear (1): 9 teeth, groove (arrow), dimension A = 5 mm
Helical gear (2): 12 teeth, groove (arrow).



Standard installation oil pump drive 110 050 02 06

Engine	Engine end no. from	to
110.921 – 10 –	009381	009738
– 12 –	039115	040762
110.922 – 10 –	018226	019645
and starting	033340 (1.1978)	
– 12 –	027657	030434
and starting	055136 (1. 1978)	
110.923 – 10 –	010452 (1. 1978)	
– 12 –	012890 (1. 1978)	
110.931 – 10 –	001071	001080
– 12 –	000137	000138
110.932 – 10 –	002861	003151
and starting	007879 (1. 1978)	
– 12 –	000432	000491
and starting	001954 (1. 1978)	
110.981 – 10 –	010491	010636
– 12 –	022258	022809
110.982 – 10 –	000547	000704
– 12 –	001196	001528
110.983 – 10 –	013511	014341
– 12 –	035853	038811
110.984 – 10 –	005137 (1. 1977)	
– 12 –	013900 (1. 1977)	

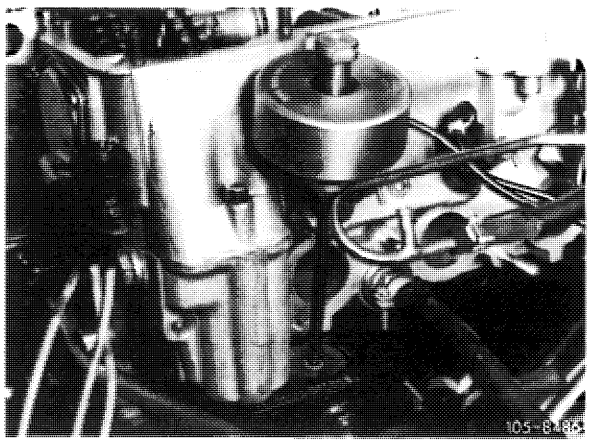
110.985 – 10 –	002060 (1. 1977)
– 12 –	009179 (1. 1977)
110.986 – 10 –	000461 (1. 1977)
– 12 –	000991 (1. 1977)

All exchange engines starting unit no. 464 130 are provided with oil pump drive part no. 110 050 02 06.

Removal

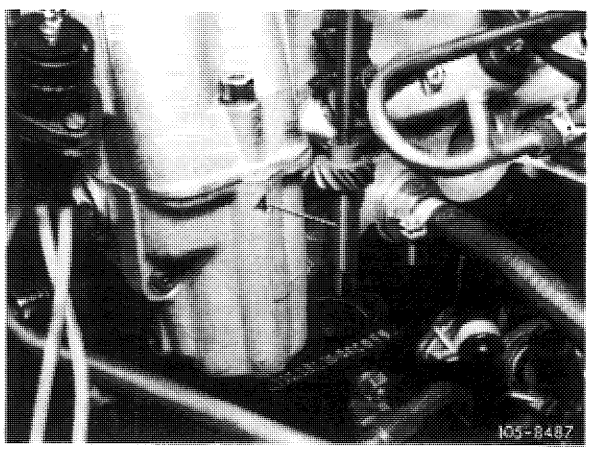
1 Remove intake pipe (09–400).

2 Knock out closing cover by means of impact puller (6 mm threaded bolt).



3 Pull out helical gear shaft (4) in upward direction by means of an M-6 screw.

Note: The bearing body together with bearing bushing for helical gear shaft can be knocked out in upward direction with intermediate gear shaft removed.

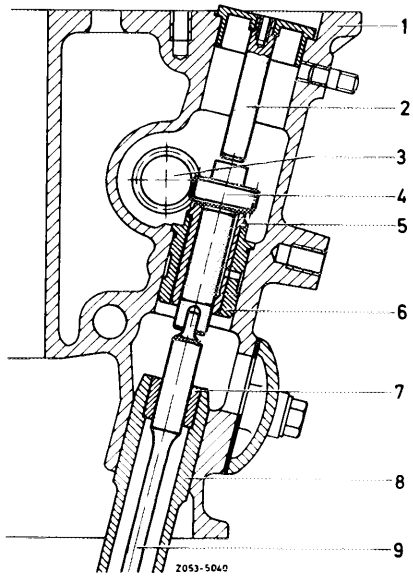


Installation

4 Guide in helical gear shaft (4).
Oil pump drive shaft (9) must engage in dog claws of helical gear shaft (4).

5 Knock in new cover (2) with a pertinent sleeve (approx. 35 mm dia.).

6 Install intake manifold with a new gasket (09–400).

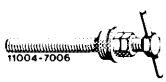
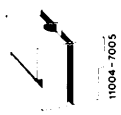
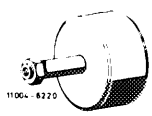
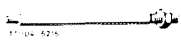
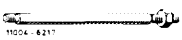
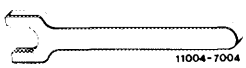
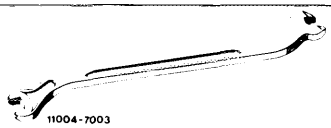
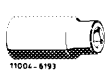


Oil pump drive

1 Crankcase
2 Cover with stop pin
3 Intermediate gear shaft of oil pump drive
4 Helical gear shaft of oil pump drive
5 Bearing bushing
6 Bearing
7 Bearing bushing of oil pump housing
8 Oil pump housing
9 Oil pump drive shaft

Tightening torques	Nm
Bolt on intermediate gear shaft	25
Expansion bolt for camshaft sprocket	80
Valve adjusting screw	20—40
Cylinder head cover capped nuts and bolts	5
Ball locating ring in chain tensioner	25
Oil pressure relief valve in main oil bore	40
Plug for oil pressure relief valve	40

Special tools

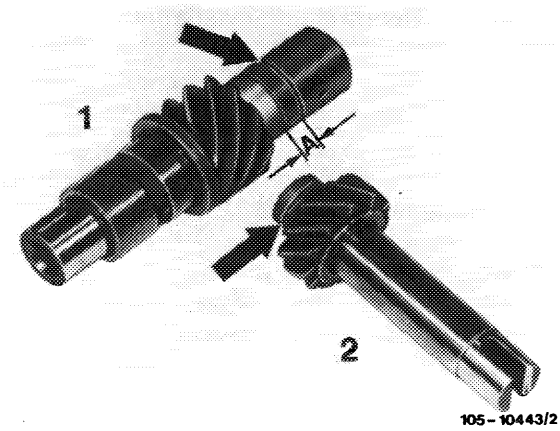
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
M 6 x 150 bolt for impact extractor		116 589 02 34 00
M 8 x 150 bolt for impact extractor		616 589 00 34 00
Camshaft holding wrench		116 589 01 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Wrench socket 27 mm, 1/2" square to turn engine		001 589 65 09 00

Note

The oil pump drive consists of **intermediate gear shaft (1)** and **helical gear shaft (2)**, and must always be **replaced in pairs** (05–410).

For repairs, install oil pump drive part no. 110 050 02 06.

Intermediate gear (1): 9 teeth, groove (arrow). Dimension A = 5 mm.
Helical gear (2): 12 teeth, groove (arrow), standard installation refer to 05–410.

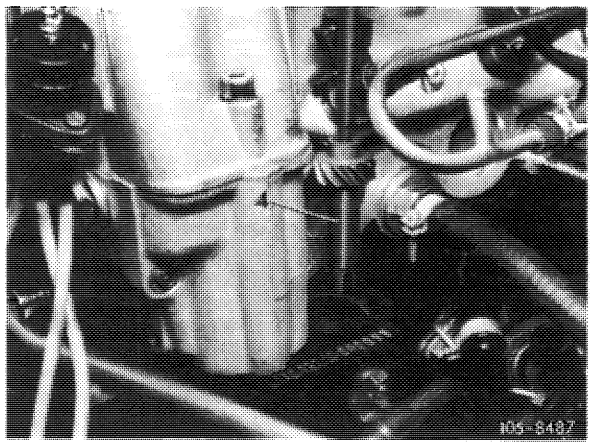


Removal

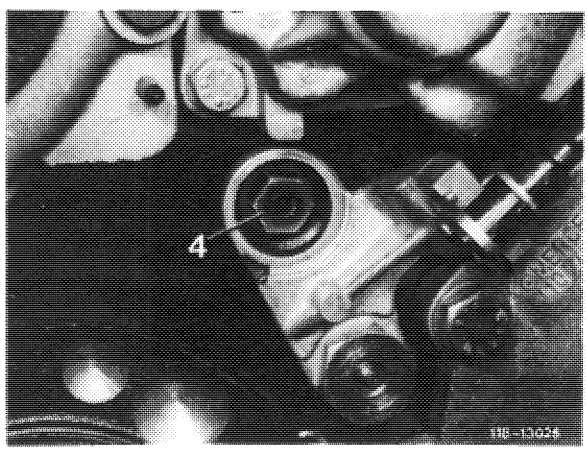
1 Partially drain coolant. Remove fan and radiator.

2 Remove helical gear shaft (05–410).

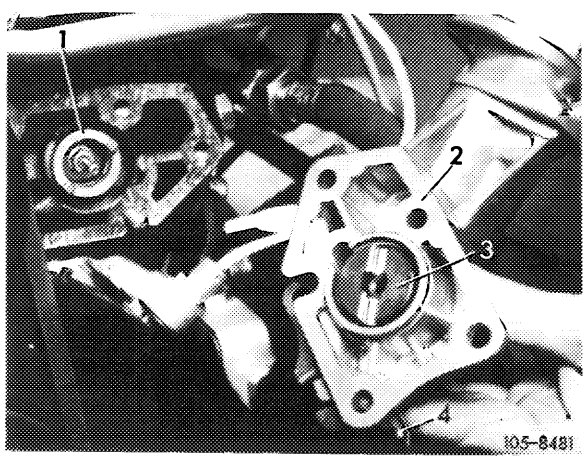
3 Remove vibration damper and pulley (03–340).



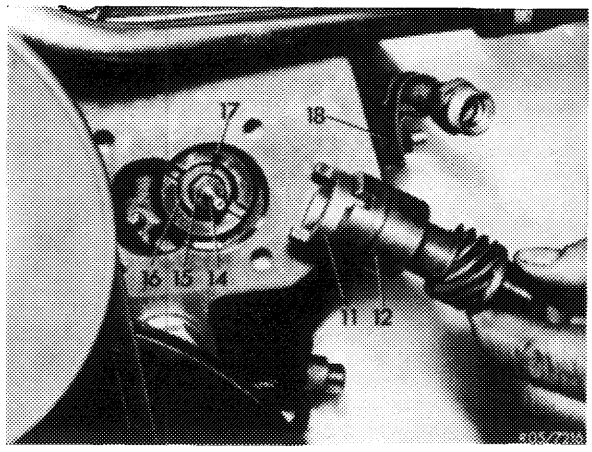
4 Unscrew plug in crankcase and remove oil pressure relief valve (4).



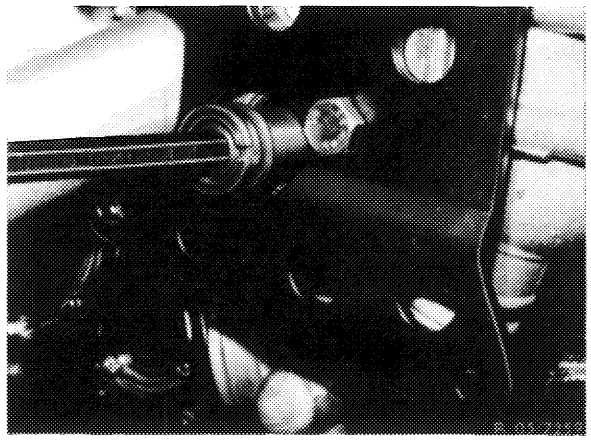
5 Remove distributor housing (2) and take off dog (1). Do not take distributor drive shaft (3) out of distributor housing (2).



6 Remove screw (15) and washer (16).

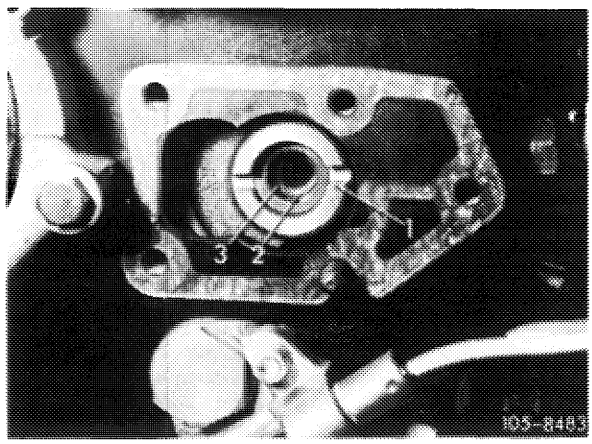


7 Remove chain tensioner (05–310).



8 Relief tension on timing chain at intermediate wheel by turning crankshaft backwards briefly. Remove chain lock screw.

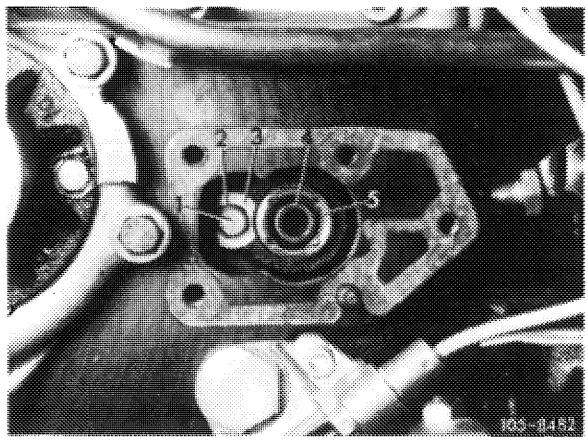
9 Knock in intermediate wheel shaft (3) and at the same time pull off intermediate wheel (1) forward.



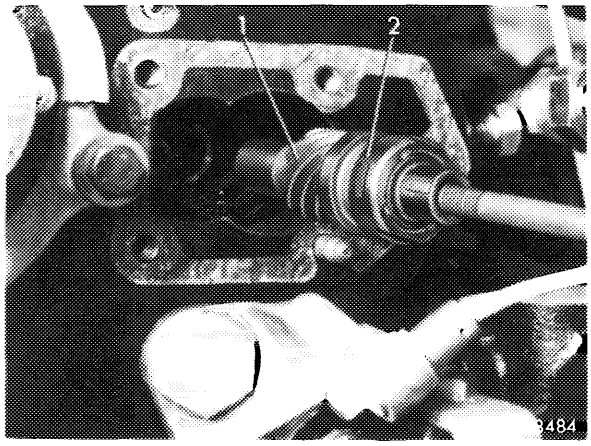
10 Place intermediate wheel down until bolt (1) is accessible.

11 Cover bottom of chain case with a cloth.

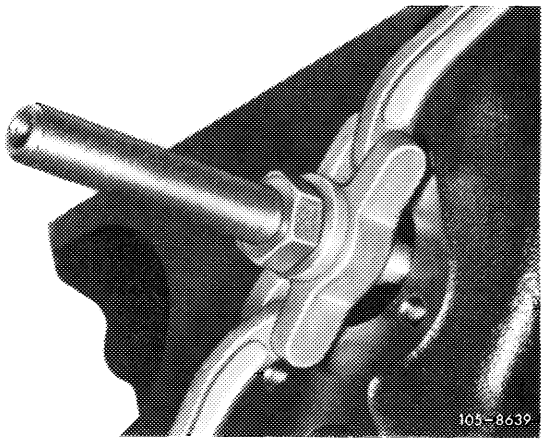
12 Unscrew bolt (1). Remove circlip (2) and lock washer (3).



13 Pull out intermediate wheel shaft (1) and bearing sleeve (2) with a M 8 bolt.

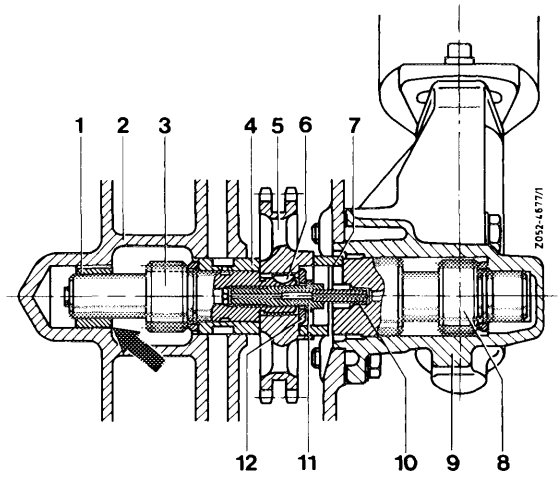


14 Pull out rear bearing bushing with an internal claw extractor.

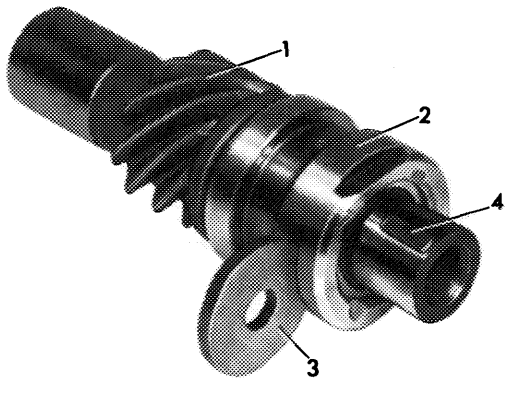


Installation

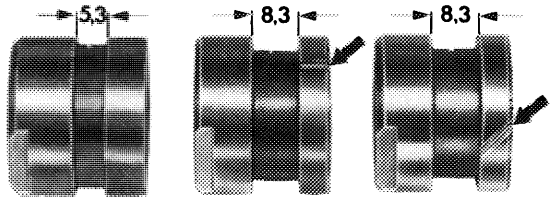
15 Knock in rear bearing bushing (1) with groove facing up using a 17 mm dia. stepped mandrel until it is flush with crankcase (arrow).



16 Install new intermediate wheel shaft (1) with woodruff key (4), bearing bushing (2) and lock washer (3).



Attention!
Use bearing bushing (2) part no. 110 052 00 06 with straight splash groove only.



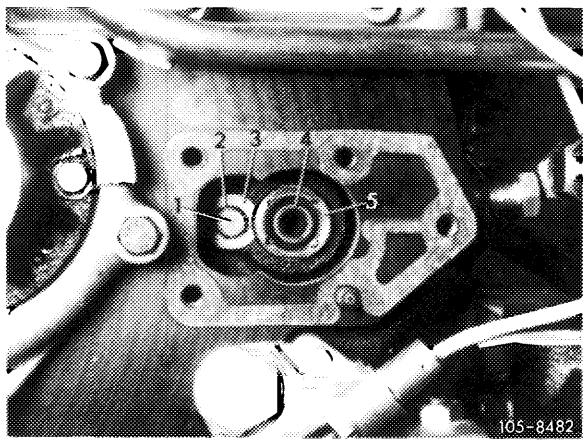
Front bearing bushing

Version 2 : valid
Version 1 and 3 : not valid

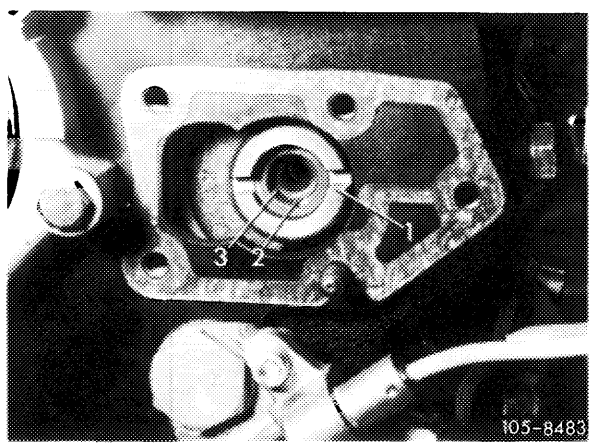
1 2 3

105-8287

17 Install bolt (1) with circlip (2) and washer (3), and tighten.

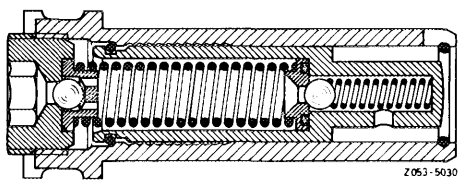


18 Position intermediate wheel on intermediate wheel shaft and pull on with a M 8 bolt. In so doing the woodruff key must be aligned with groove in intermediate wheel. Teeth of intermediate wheel must grasp timing chain.

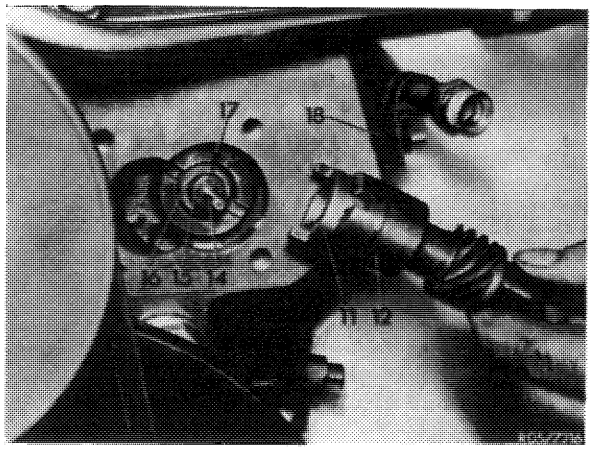


19 Move chain tensioner to assembly position and install (05–310).

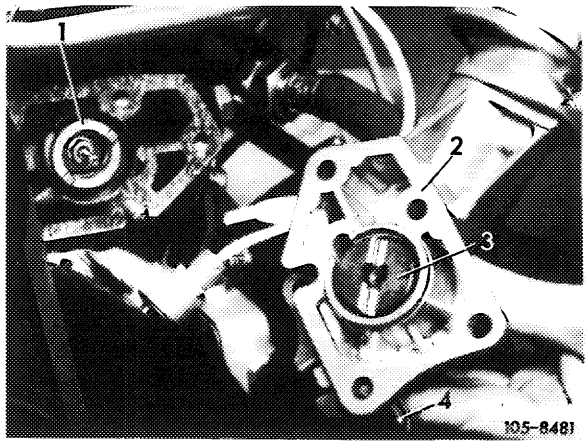
Chain tensioner in assembly position



20 Install bolt (15) with oil tube (14) and washer (16), and torque to 25 Nm.

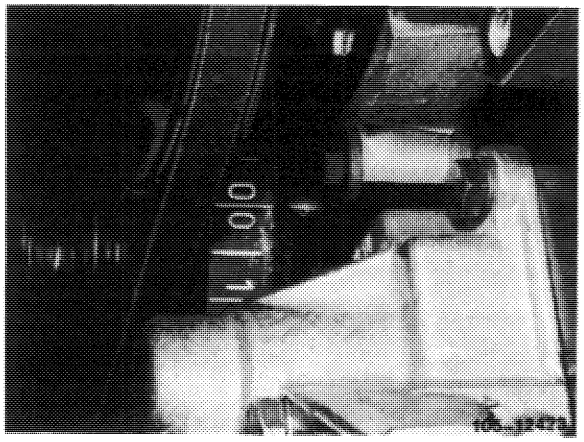


21 Place dog (1) on intermediate wheel and install distributor housing (2) with drive gear (3). Also fasten TDC pointer (4).



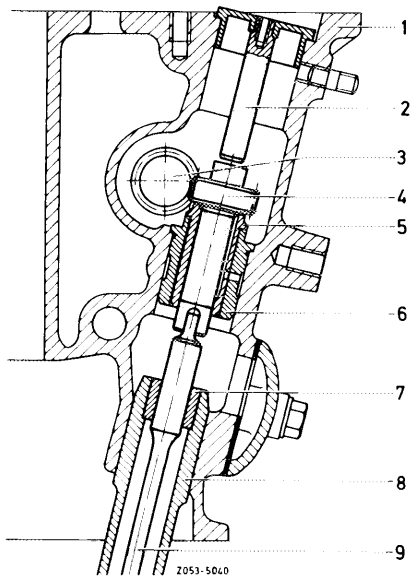
22 Set piston 1 at ignition TDC and install distributor.

23 Install new helical gear (4). Turn engine until oil pump drive shaft (9) engages in helical gear.



24 Knock in new cover (2) with an approx. 35 mm dia. sleeve.

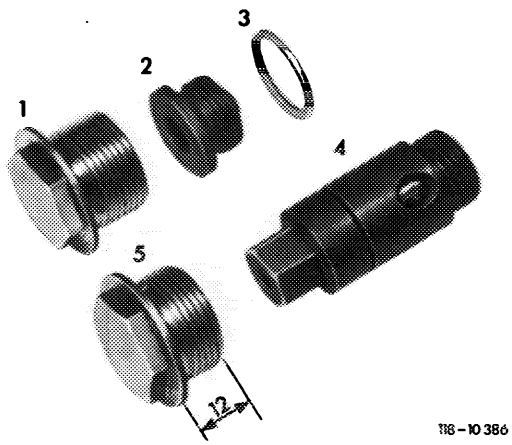
25 Install intake manifold.



Attention!
Additionally install an oil pressure relief valve 114 180 02 15 with 5 bar gauge pressure into main oil duct in cylinder crankcase together with oil pump drive 110 050 02 06.
Standard installation refer to 18–020.

26 Install 5 bar oil pressure relief valve (4) without seal in main oil bore of crankcase and torque to 40 Nm.

27 Coat plug (5) with a sealing compound, install without seal and torque to 40 Nm.



1 Plug
2 Oil bore plug
3 Aluminium seal
4 Oil pressure relief valve (5 bar)
5 Plug for oil pressure relief valve

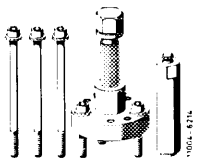
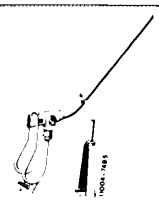
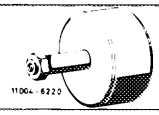
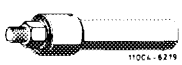
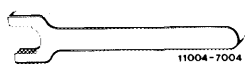
28 Install vibration damper and pulley (03–340).

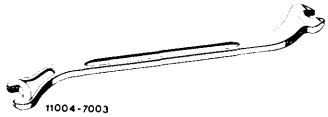
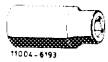
29 Install radiator and fan (20–420).

30 Check and adjust ignition timing (07.5–510).

Tightening torques	Nm
Intermediate wheel shaft bolt	25
Camshaft sprocket expansion bolt	80
Valve adjusting screw	20—40
Cylinder head cover capped nuts and bolts	5
Balance disc to crankshaft	400+50
Ball locating ring in chain tensioner	25

Special tools

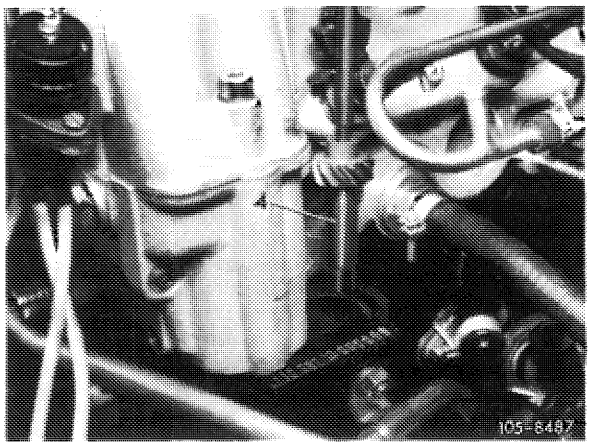
Torque wrench single-arm, 3/4" square, 150—500 Nm		001 589 31 21 00
Balance disc extractor		116 589 10 33 00
Holder		110 589 00 40 00
Depressor for valve spring		110 589 04 61 00
Impact extractor for bearing pin (basic unit)		116 580 20 33 00
Threaded bolt M 8 x 150 long (for impact puller)		616 589 00 34 00
Puller for bearing bolt (basic unit)		115 589 20 33 00
M 8 x 30 bolt for extractor		115 589 00 34 00
Camshaft holding wrench		116 589 01 01 00

Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 27 mm, 1/2" square		001 589 65 09 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00

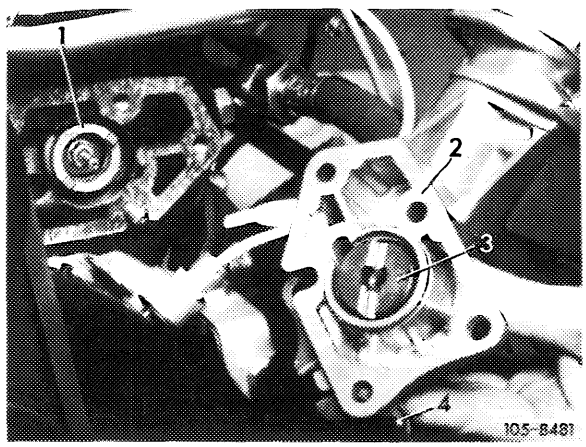
Removal

1 Remove radiator and fan.

2 Remove oil pump drive helical gear shaft (4) (05–410).

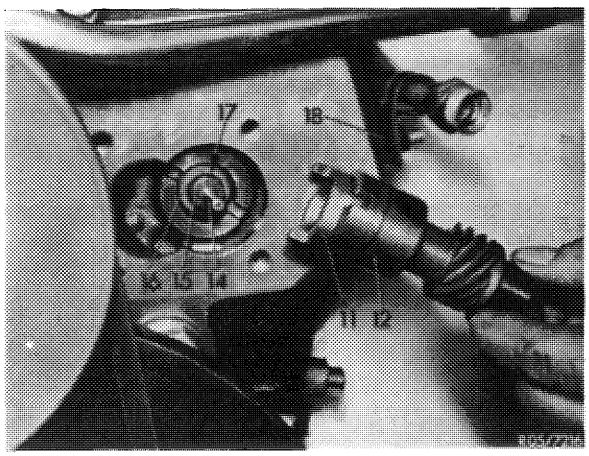


3 Remove distributor housing (2) with drive gear (3) for distributor drive (05–450).

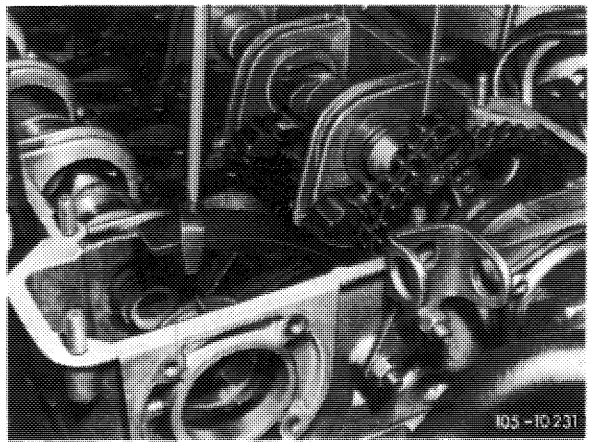


4 Remove bolt (15) with oil tube (14), lock washer (17) and washer (16).

5 Unscrew chain lock screw (18).

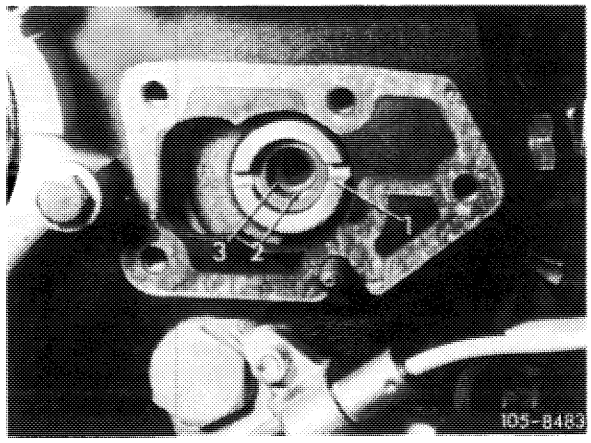


6 Remove tensioning rail (05–330).



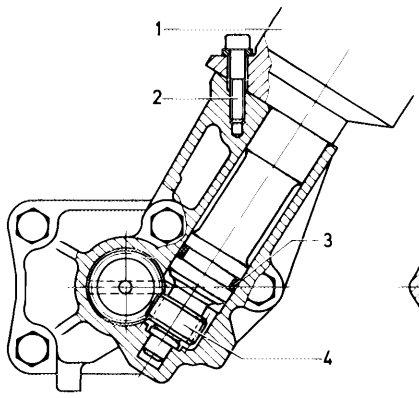
7 Turn intermediate wheel shaft (3) until woodruff key (2) is up.

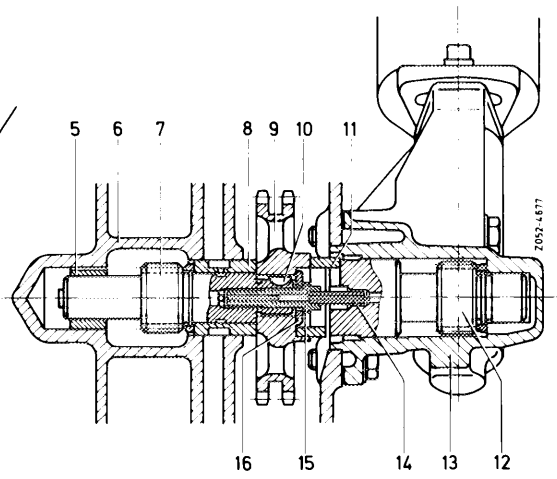
8 Press back intermediate wheel shaft (3) until intermediate wheel (1) can be removed upward. Watch woodruff key.



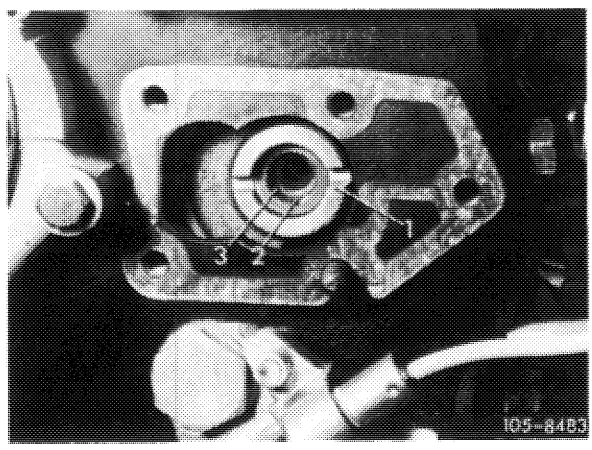
Installation

9 Guide intermediate wheel into chain case and install on intermediate wheel shaft.



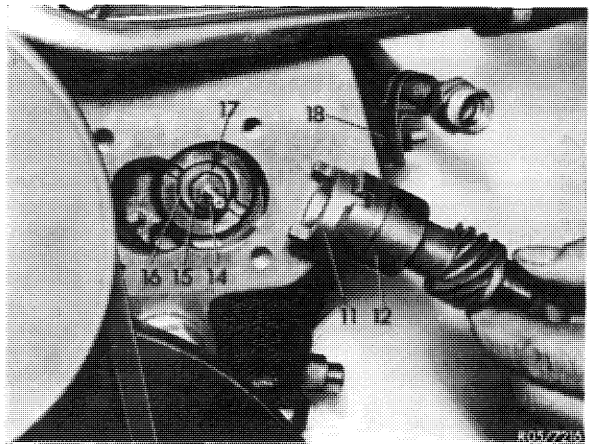


10 Pull intermediate wheel shaft (3) forward carefully with a M 8 bolt and at the same time turn intermediate wheel (1) until woodruff key (2) slides into groove of intermediate wheel.

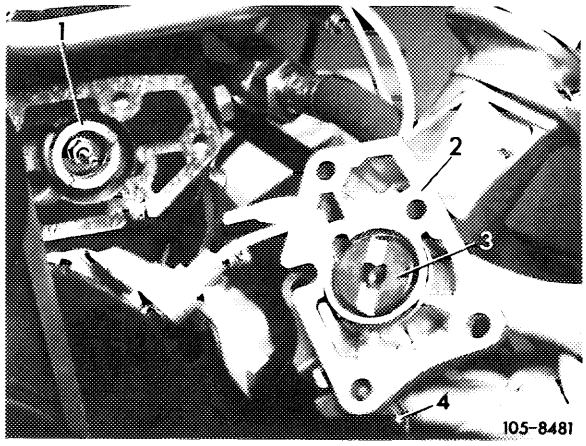


11 Install bolt (15) with oil tube (14), lock washer (17) and washer (16), and torque to 25 Nm.

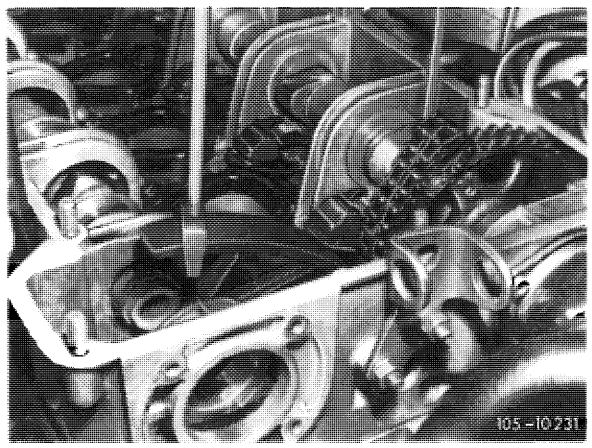
Install chain lock screw (18).



12 Install distributor housing with drive gear for distributor drive (05–450).

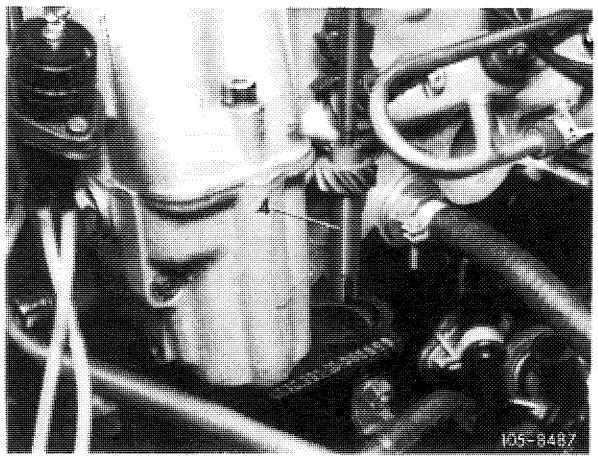


13 Install tensioning rail (05–330).



14 Install helical gear shaft for oil pump drive (05–410).

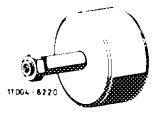
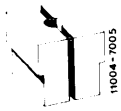
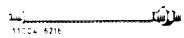
15 Install radiator and fan.



05—440 Removal and installation of guide wheel

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Ball locating ring in chain tensioner	25

Special tools

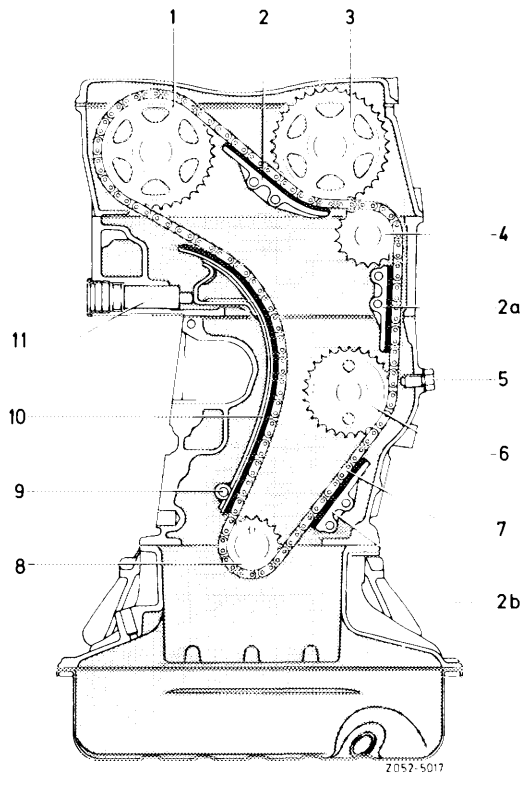
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
Chain tensioner holder		110 589 02 31 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
M 6 x 50 mm bolt for impact extractor		116 589 01 34 00
M 10 x 100 mm bolt for impact extractor		116 589 03 34 00

Removal

1 Mark relation to timing chain and left camshaft sprocket with paint.

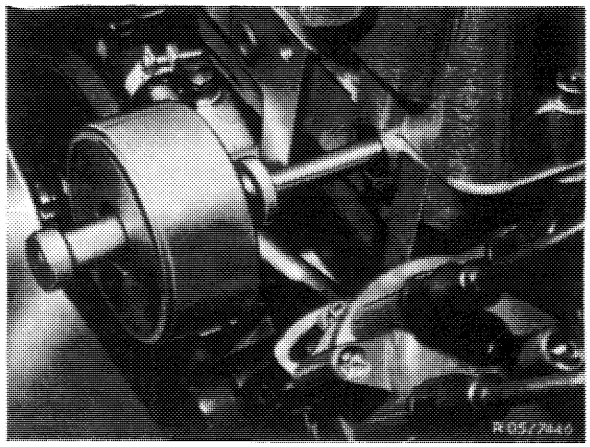
2 Remove chain tensioner or spring (05—310).

3 Remove sliding rail (2) in camshaft housing. This requires knocking out bearing pin with impact extractor (05—340).



1 Exhaust camshaft sprocket
2– 2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Locking screw
6 Intermediate wheel
7 Timing chain
8 Camshaft sprocket
9 Tensioning rail bearing pin
10 Tensioning rail
11 Hydraulic chain tensioner

4 Hold guide wheel with a 5 mm dia. wire hook and knock out bearing pin with an impact extractor (10 mm bolt).

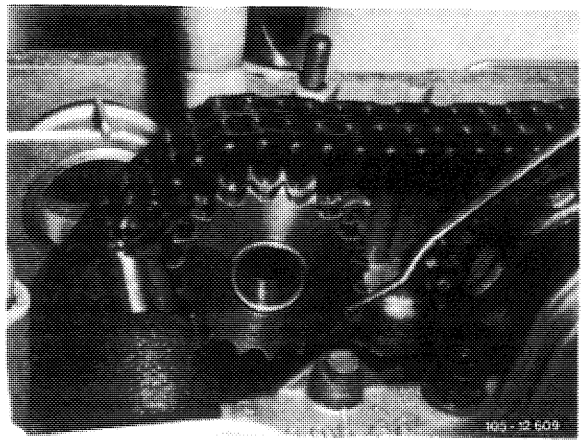


Installation

5 Guide in guide wheel with a 5 mm dia. wire hook, position correctly and knock in bearing pin with an impact extractor.

6 Install sliding rail in camshaft housing, noting marks on timing chain and left camshaft sprocket.

7 Set chain tensioner at assembly position and install, or install spring (05–310).

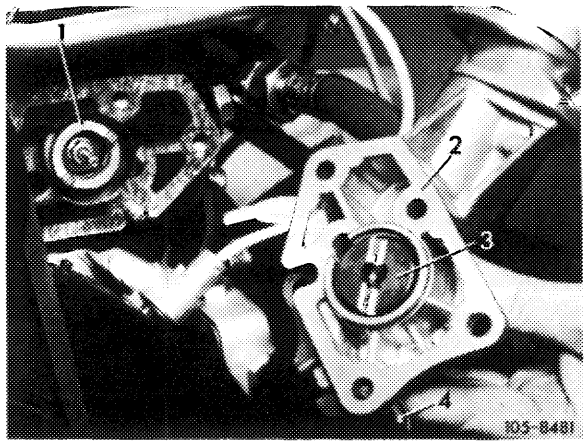


Removal

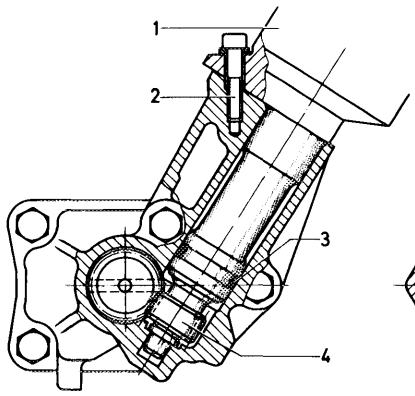
1 Remove radiator and fan.

2 Remove distributor housing (2) with distributor and take off dog (1).

3 Mark location of drive gear (3) to distributor housing.



Installation

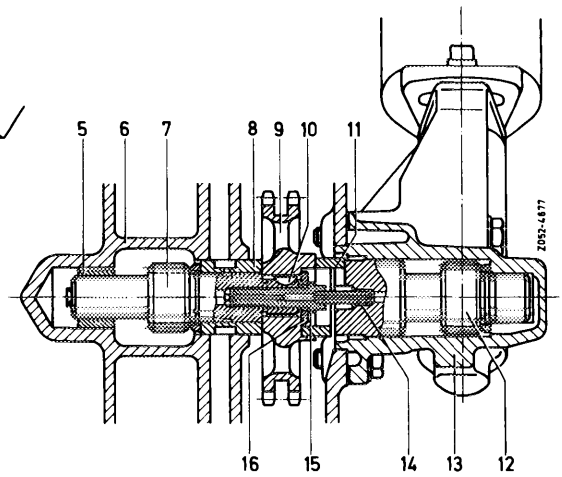


4 If drive gear has been taken out, coat it with engine oil and slide it into distributor housing, watching marks.

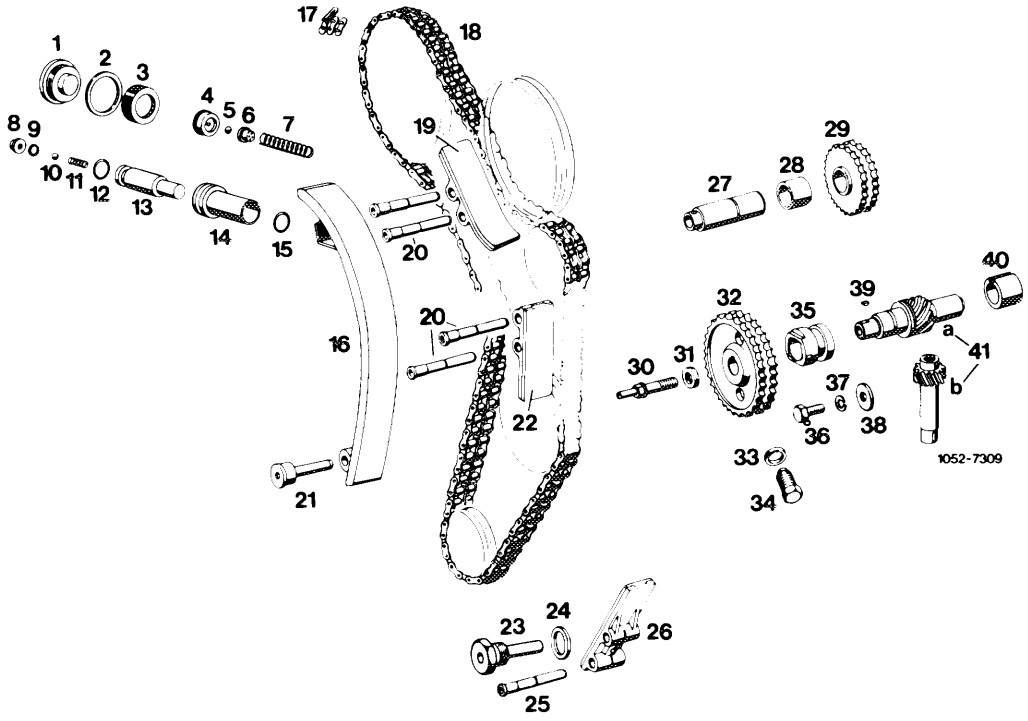
5 Place dog (11) on intermediate wheel (9) and install distributor housing (13) with a new gasket, also bolting the TDC pointer.

6 Check and adjust distributor adjustment (07.5–510).

7 Install fan and radiator.



1 Distributor
2 Screw M 6 x 30
3 Seal
4 Distributor drive gear
5 Rear bearing bushing
6 Crankcase
7 Intermediate wheel shaft
8 Front bearing bushing
9 Intermediate wheel
10 Woodruff key 3 x 3.7
11 Dog
12 Distributor drive gear
13 Distributor housing
14 Oil tube
15 Bolt with oil tube (14)
16 Washer



1 Plug
2 Seal A 30 x 36
3 Threaded ring
4 Ball locating ring (oil jet)
5 Ball 5 mm dia. (version 1 only)
6 Ball cage (version 1 only)
7 Spring
8 Valve disc (version 1 only)
9 O-ring (version 1 only)
10 Ball 5 mm dia. (version 1 only)
11 Spring (version 1 only)
12 Snap ring
13 Pressure pin
14 Chain tensioner housing
15 Circlip
16 Tensioning rail
17 Connecting link
18 Timing chain
19 Sliding rail in camshaft housing
20 4 bearing pins for sliding rails
21 Tensioning rail bearing pin
22 Sliding rail in cylinder head
23 Bearing pin with plug
24 Seal A 20 x 24
25 Bearing pin
26 Sliding rail in crankcase
27 Guide wheel bearing journal
28 Bushing
29 Guide wheel with bushing
30 Bolt with oil tube
31 Intermediate wheel washer
32 Intermediate wheel
33 Seal A 12 x 17
34 Chain drive lock screw
35 Front bearing bushing
36 Screw M 6 x 12
37 Circlip B 6
38 Washer
39 Woodruff key 3 x 3.7
40 Rear bearing bushing
41 a Intermediate wheel shaft
b Helical gear wheel

National version (J) (USA)

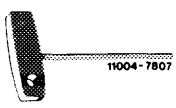
Identification: Information label in national language on radiator cross member.

Adjust engines according to data on respective emission label.

Testing and adjusting values

Model year	Idle speed 1/min	On-off ratio in % Test value	Adjusting value
(J) Identification: Label in Japanese language.			
1981/82	750 ± 50	40–60	50 ± 10
(USA) Identification: Label, black.			
1980/81	750 ± 50	40–60	50 ± 10

Special tools

Oil telethermometer		116 589 27 21 00
Puller for safety plug		123 589 05 33 00
Installer for safety plug		123 589 00 15 00
Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00

Conventional testing instruments

Revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03
Lambda control tester KDJE-P 600	e.g. made by Bosch

Adjustment

1 Connect digital tester or revolution counter, oil telethermometer and lambda control tester.

2 Switch off air conditioning or automatic climate control. Move selector lever into position "P".

3 Run engine to 75–85 °C.

4 Check whether throttle valve lever rests against idle speed stop.

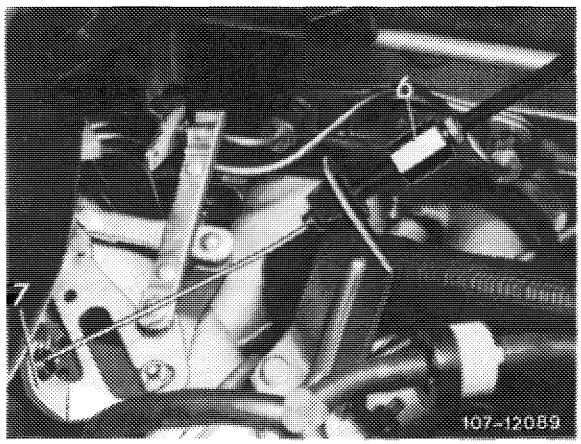
5 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

6 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

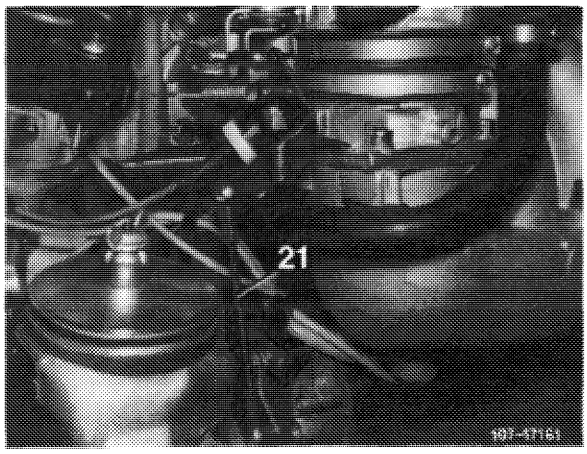
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting nut (6), if required.



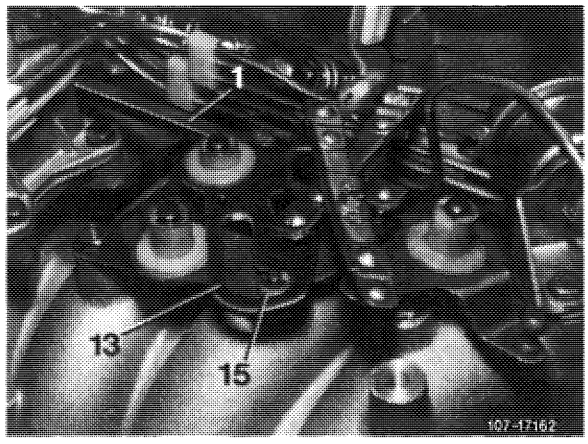
Cruise control/tempomat, electrical

Check whether actuator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise to idle speed stop.

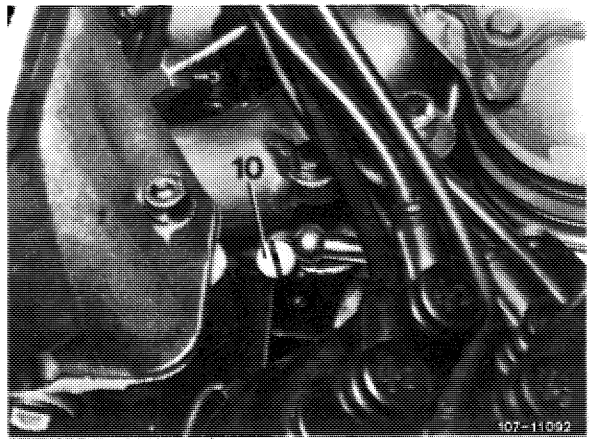
When connecting pull rod (21), make sure that lever of the actuator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.



7 Check whether roller (15) in slotted lever (13) rests free of tension against final stop. Adjust with connecting rod (1), if required.



8 Run engine at idle, switch off all electrical auxiliary consumers. Adjust an idle speed of 750–50/min by means of idle speed air screw (10).



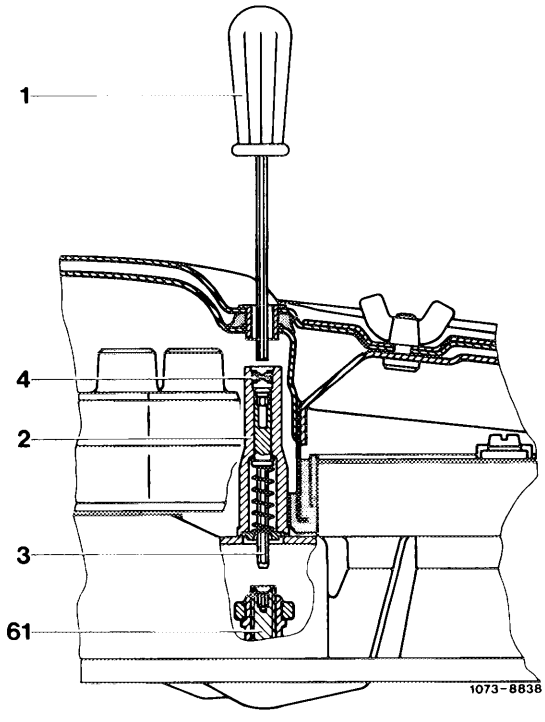
9 Check on-off ratio and adjust, if required.
(J) starting 1981, (USA) 1980.

Note: Air cleaner need not be removed for adjusting on-off ratio at idle.

Read on-off ratio on tester, if value is between 40–60 %, on-off ratio is in order. If not, pull out safety plug (4) by means of puller.

Insert screw driver (1) through cutout in air cleaner top and push against adjusting device (2). Push adjusting device down by means of screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = 60 % (leaner)
Turning clockwise = 40 % (richer)



Release screw driver, compression spring will push adjusting device out of mixture control screw.

Accelerate for a short moment, check on-off ratio and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

(USA) 1981

Note

The adjusting device (2) is provided with a protective steel cap (4). Remove this cap only in the event of repairs, e.g. when renewing fuel distributor.

Read on-off ratio on tester, if value is between 40–60 %, on-off ratio is in order. If not, remove air cleaner.

Punch mark protective cap (4) and drill through sleeve with a 2 mm twist drill.

Screw 2.5 mm sheet metal screw (cut off tip) into hole and pull out protective cap (4) by means of pliers.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

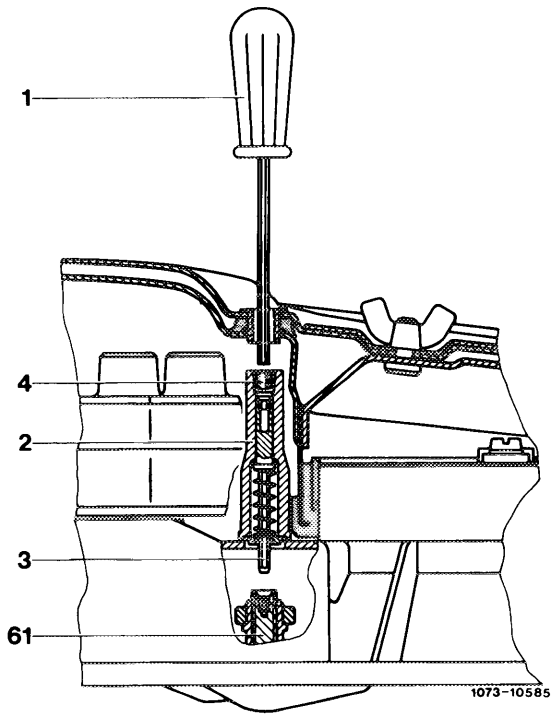
Turning counterclockwise = 60 % (leaner)
Turning clockwise = 40 % (richer)

Release screw driver, compression spring will then push adjusting device out of mixture control screw.

Mount air cleaner, accelerate for a short moment, check on-off ratio and readjust, if required.

Following adjustment, install new protective cap (4), part no. 116 070 00 54.

10 Move selector lever into driving position, switch on air conditioning, turn power steering to full lock, engine should now run smoothly. Readjust speed, if required.



A. Standard version

Testing and adjusting values

Engine	Idle speed 1/min	Idle speed emission value % CO
110.984/985/986/987	750–850	0.5–1.5
110.988/989/990	700–800	

Battery voltages

Rest potential	12.2 V
Starting voltage, min.	10 V

Voltages at ignition coil (with engine stopped and ignition switched on)

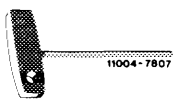
Transistorized ignition system TSZ 4

Voltage at terminal 15	approx. 4.5 V
Voltage at terminal 1	0.5–2.0 V
Pre-resistance bridge (when starting)	10 V

Transistorized ignition system TSZ 8 u

Terminal 15 (bushing 5 on diagnosis socket) against mass	Battery voltage
Terminal 1 and 15 (bushing 5 and 4 at diagnosis socket)	0 V

Special tools

Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00

Oil telethermometer		116 589 27 21 00

Conventional testing instruments and accessories

CO-measuring instrument, revolution counter, stroboscope, voltmeter, oscilloscope
Digital tester — e.g. made by Bosch, MOT 001.03

Note

Do not regulate engine of it is too hot, e.g. immediately following a fast drive or after measuring output on chassis dynamometer.

Regulation

1 Switch-off air conditioning or automatic climate control. Move selector lever into position "P".

2 Remove air cleaner.

3 Check engine regulating linkage for easy operation and wear. Lubricate all bearing points and ball sockets.

4 Perform full throttle checkup from inside vehicle (30–300).

5 Connect test instruments: CO-measuring instrument, revolution counter, stroboscope, oscilloscope, digital tester, oil telethermometer.

6 Evaluate oscilloscope display.

7 Check firing point and adjust, if required. Check centrifugal and vacuum ignition adjustment (15–501).

8 Test battery voltages.

Note: Voltmeter connection remains unchanged during tests a) and b).

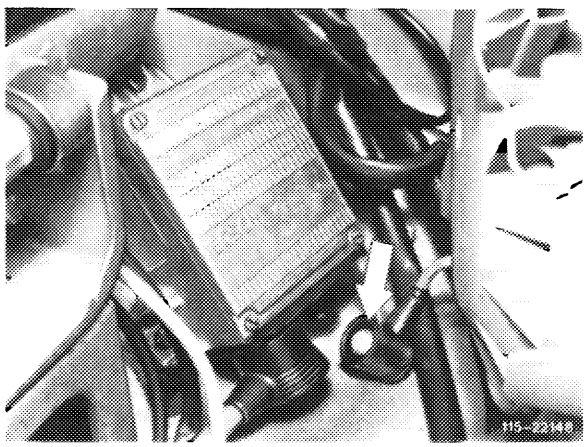
a) Rest potential

Connect voltmeter to battery while paying attention to polarity and read voltages. Nominal value 12.2 Volts.

b) Starting voltage

Pull plug from transmitter of ignition distributor on switching unit (green cable) or protective plug, part no. 102 589 02 21 00, plug on diagnosis socket.

Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts; if nominal value is not attained, test battery, charge or replace, if required.



9 Voltages on ignition coil:

Transistorized ignition system TSZ 4

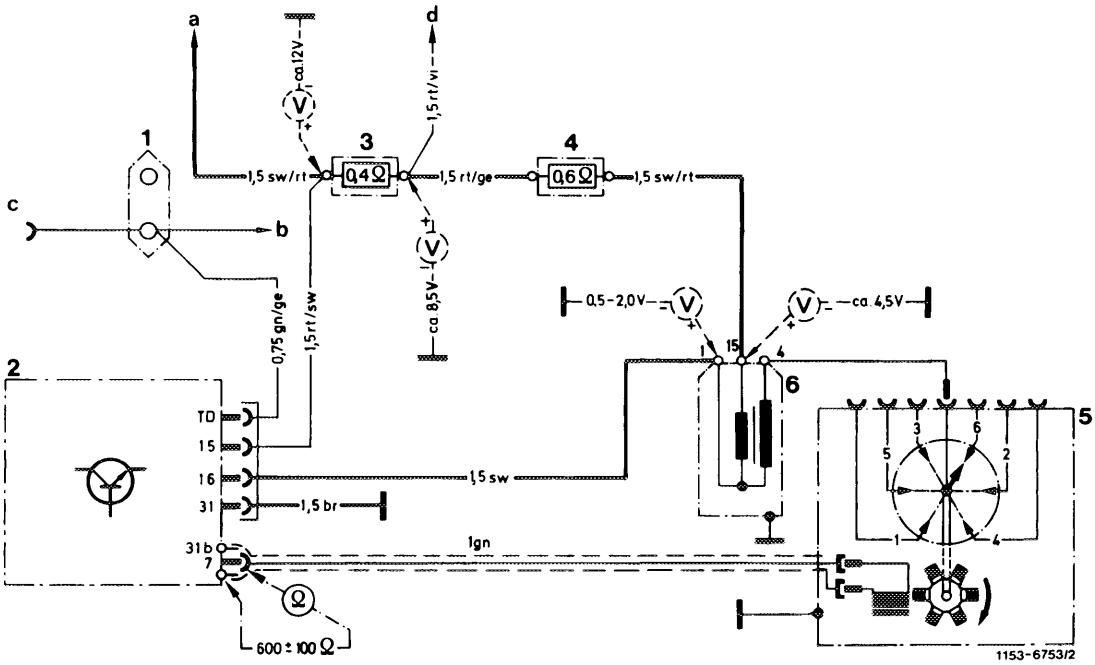
Test voltage on terminal 15 of ignition coil. For this purpose, disconnect positive cable of voltmeter from battery and connect to terminal 15 of ignition coil.

Switch-on ignition and read voltage. Nominal value approx. 4.5 volts.

Voltage test on terminal 1 of ignition coil. For this purpose, disconnect positive cable of voltmeter from terminal 15 and connect to terminal 1 of ignition coil.

Switch-on ignition and read voltage. Nominal value 0.5–2.0 Volts.

Test pre-resistance bridge by starting engine and reading voltage during starting procedure. Nominal value 10 Volts.



Wiring diagram breakerless transistorized ignition TSZ 4

1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

a Ignition starting switch
b Instrument cluster revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Transistorized ignition system TSZ 8 u

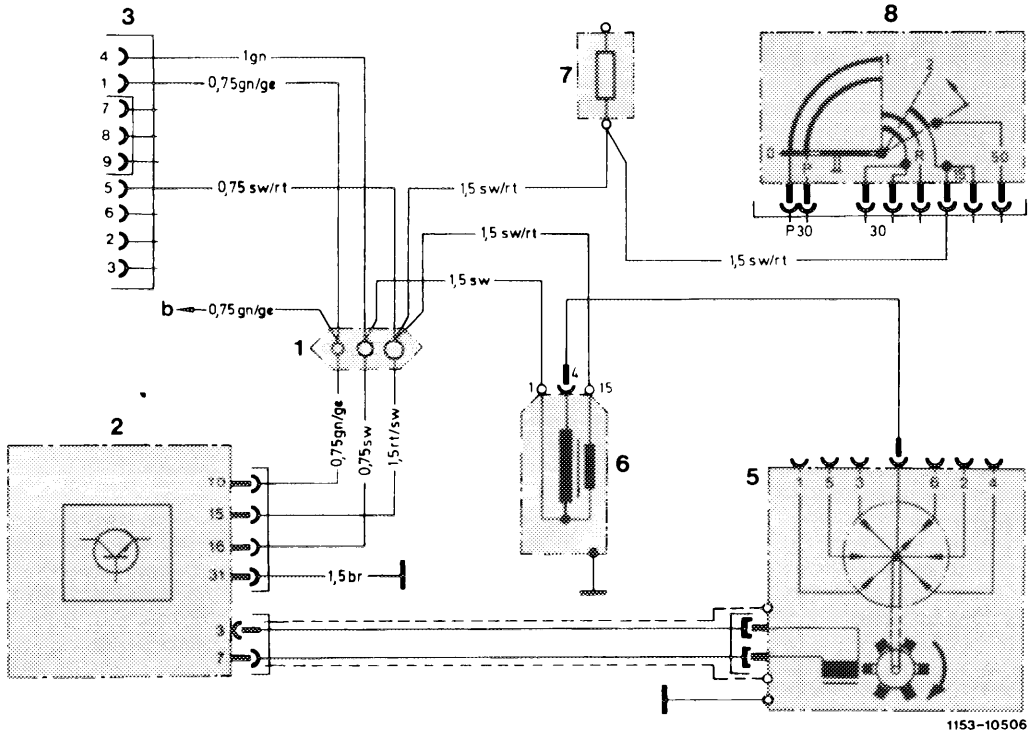
Switch-on ignition with engine stopped. Check voltage on jack 5 of diagnosis socket (3). Test terminal 15 against ground.

Nominal value: Battery voltage.

Test voltage difference between terminal 15 and terminal 1 on jack 5 and 4 of diagnosis socket (3).

Nominal value: 0 Volt.

If nominal values are not attained, test ignition system (15–562).

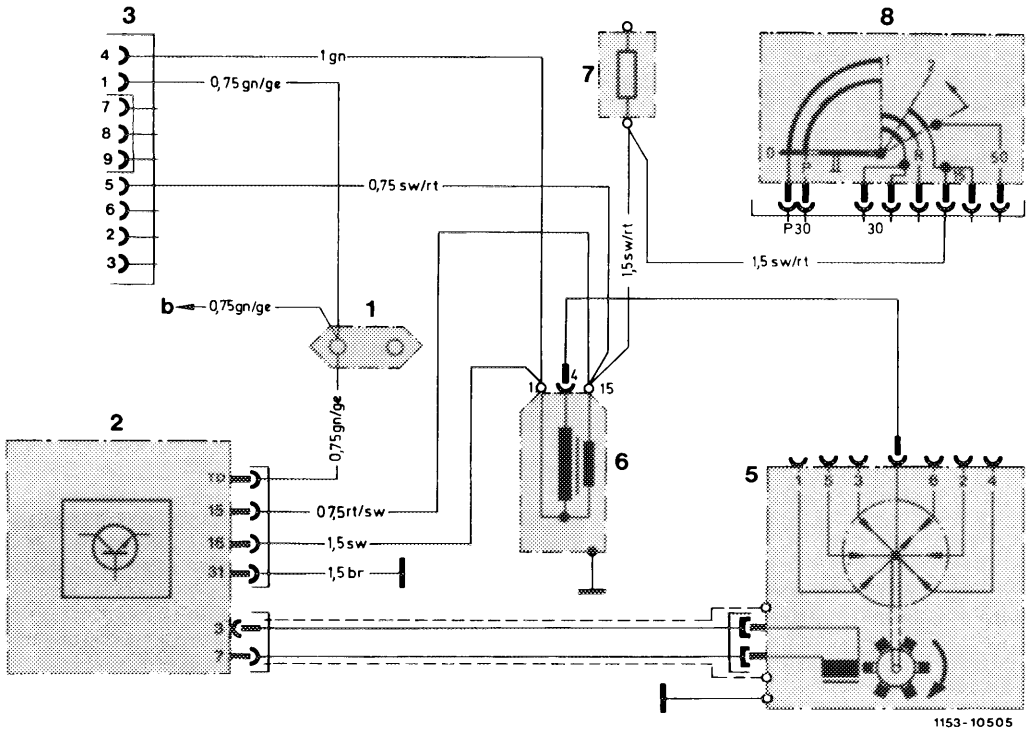


Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 123

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 107, 126

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

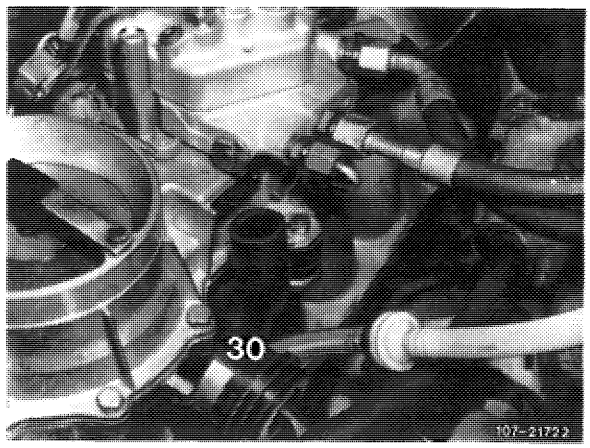
10 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

Checking decel shutoff:

Checking on chassis dynamometer

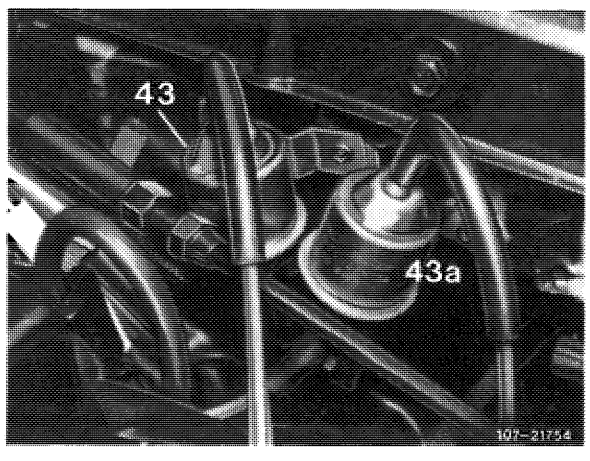
Run on chassis dynamometer at approx. 70 km/h in 4th speed or driving position "D". Release accelerator pedal, air flow sensor plate will then move into zero position. When combustion starts again at approx. 1100 /min or approx. 1300/min with refrigerant compressor, the air flow sensor plate will move into idle speed position. Check decel shutoff valve and its activation, if required (07.3–140).



Checking without chassis dynamometer (07.3–140).

Run engine at idle.

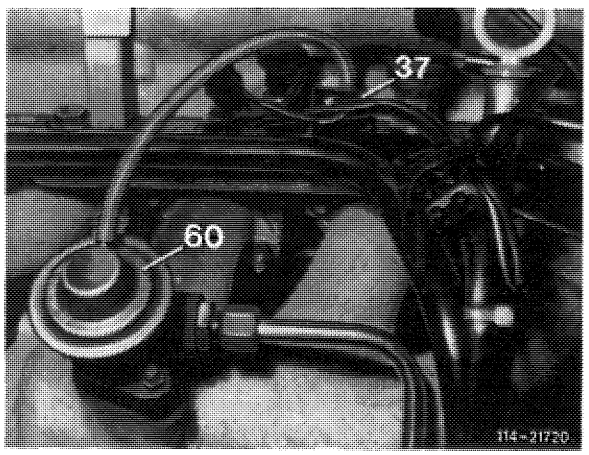
Pull vacuum lines from switchover valve (43a) and connect with each other. Decel shutoff valve (30) opens, engine should now stop. Check activation, if required.



43 Switchover valve air conditioning (identification: green cap)
43a Switchover valve decel shutoff (identification: gray cap)

12 Check EGR.

Pull vacuum line from EGR valve (60), plug-on test hose and activate with a vacuum. If engine is not clearly running worse, replace EGR valve. Check activation, if required (14–475).

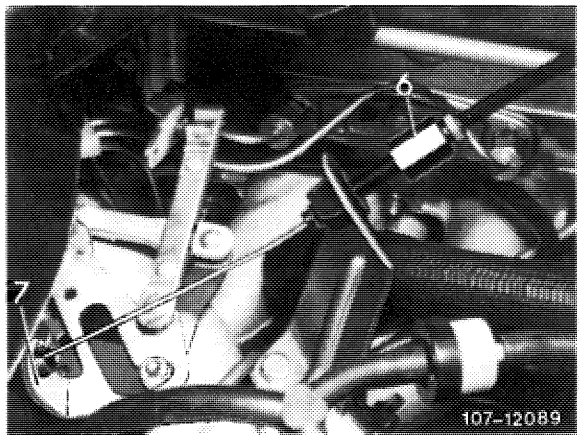


13 Run engine to 75–85 °C oil temperature.

14 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

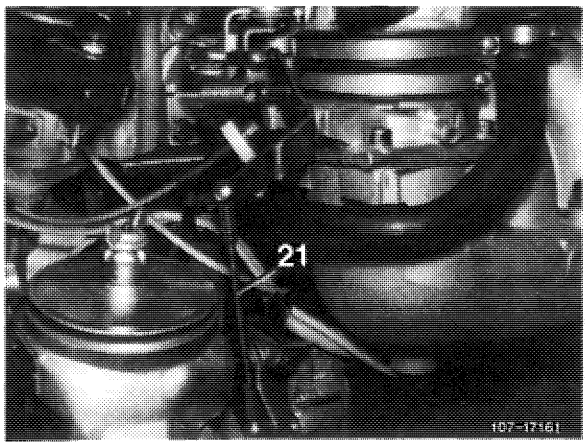
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting nut (6), if required.



Cruise control/tempomat, electrical

Check whether actuator rests against idle stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise against idle speed stop.

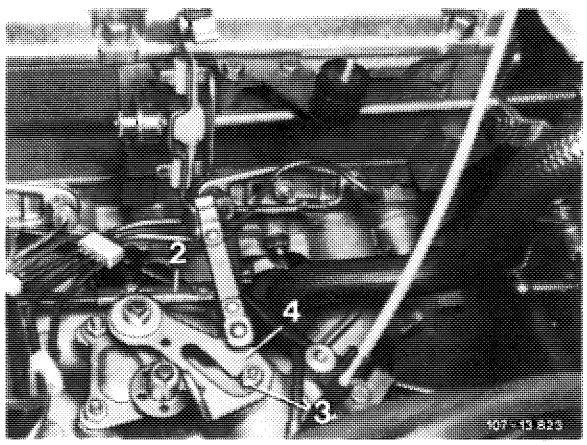
When connecting pull rod (21), make sure that the lever of the actuator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.

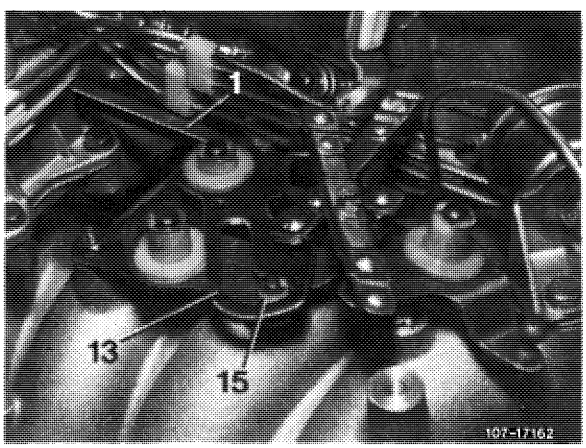


15 Check whether throttle valve rests against idle speed stop. Disconnect connecting rod for this purpose.

16 Check whether roller (3 and 15) on slotted lever (4 and 13) rests free of tension against final stop. Adjust with connecting rod (1 and 2), if required.

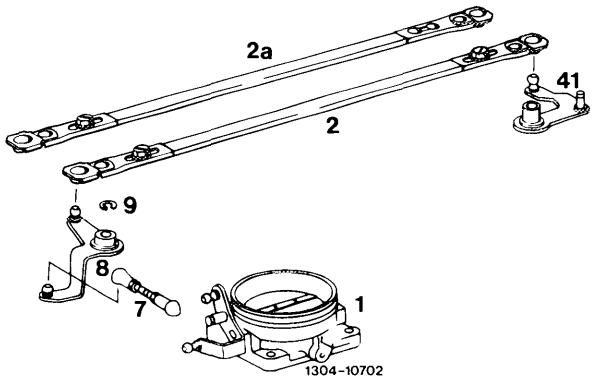
Model 123





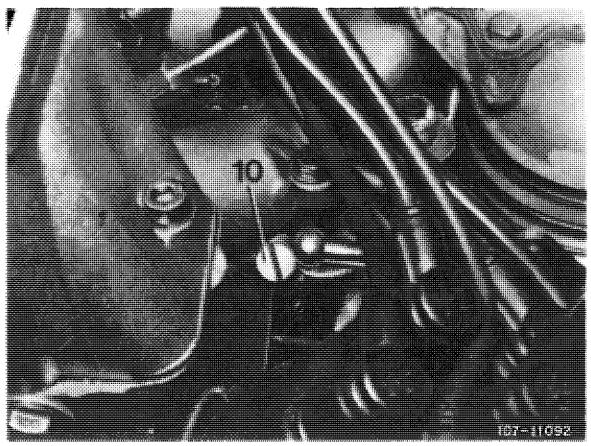
Model 126

The connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



2 Former version
2a Present version

17 Set to specified engine speed by means of idle speed air screw (10).

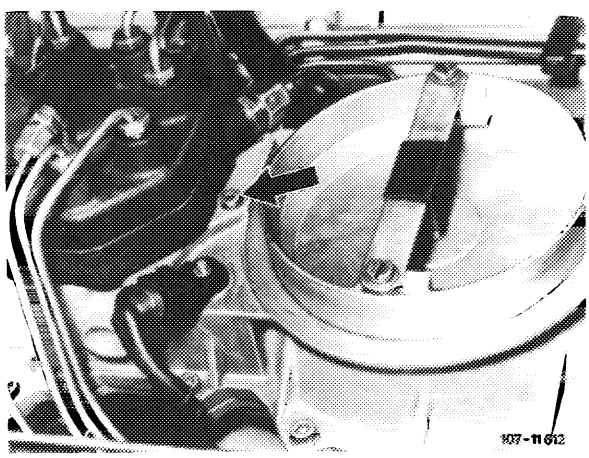


18 Adjust idle speed emission value:

With gray iron fuel distributor

For this purpose, unscrew closing plug (arrow).

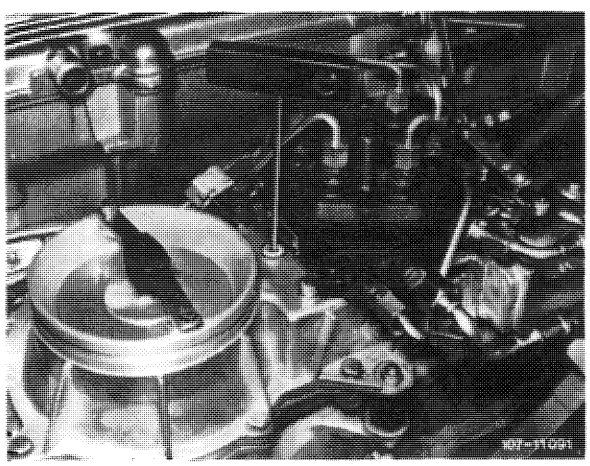
Attention!
On vehicles manufactured after 1.10.1976, remove safety plug first.



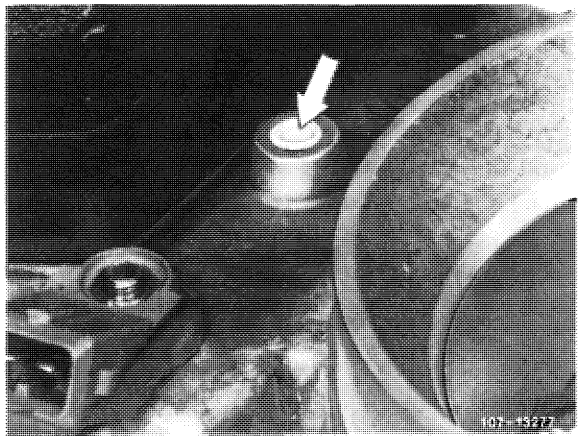
Insert screw driver through bore against idle speed mixture control screw and adjust emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value and readjust, if required.



Following adjustment, install a blue safety plug (arrow), part no. 000 997 59 86 on vehicles manufactured after 1.10.1976.



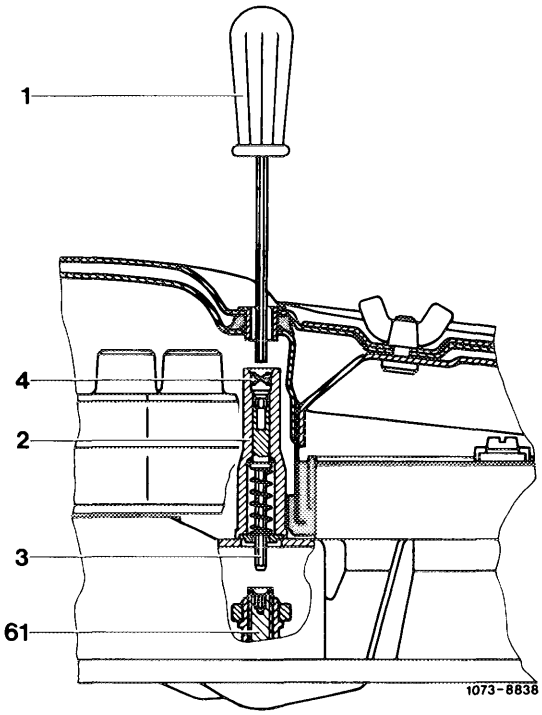
With light alloy fuel distributor

Pull out safety plug (4) by means of puller.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the compression spring will disengage adjusting device from mixture control screw.



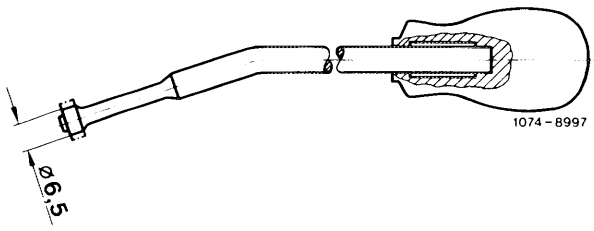
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking back safety plug for protective cap of mixture control screw (61) had to be changed from 8 mm to 6.5 mm.

In spare parts sector only installers with changed diameter are now available. On former installers, grind diameter down to 6.5 mm.



19 Mount air cleaner. Check idle speed and idle speed emission value once again and readjust, if required.

20 Move selector lever into driving position, engage air conditioning, turn power steering to full lock, engine should run smoothly. Readjust engine speed, if required.

B. National version (AUS) (J) (S) (USA)

Identification: Label in national language on radiator cross member.
Adjust engines according to data of respective emission label.

Testing and adjusting values

National version and model year	Idle speed 1/min	Idle speed emission value % CO **without air injection**
(AUS) Label: Color code silver.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(J) Label: In Japanese language.		
1977–1980	800	0.4–2.0
(S) Label: Color code blue.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(USA) Label: Color code Federal black, California yellow.		
1977–1979	800	0.4–2.0

Battery voltages

Rest potential	12.2 V
Starting voltage min.	10 V

Voltages on ignition coil (with engine stopped and ignition switched on)

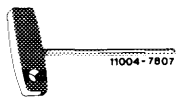
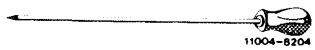
Transistorized ignition system TSZ 4

Voltage at terminal 15	approx. 4.5 V
Voltage at terminal 1	0.5 –2.0 V
Pre-resistance bridge (while starting)	10 V

Transistorized ignition system TSZ 8 u

Terminal 15 (bushing on diagnosis socket) against ground	Battery voltage
Terminal 1 and 15 (bushing 5 and 4 on diagnosis socket)	0 V

Special tools

Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00
Oil telethermometer		116 589 27 21 00

Conventional testing instruments and accessories

CO-measuring instrument, revolution counter, stroboscope, oscilloscope, voltmeter	
Digital tester	e.g. made by Bosch, MOT 001.03

Note

Do not regulate engine when engine is too hot, e.g. immediately after a fast drive or after measuring output on chassis dynamometer.

Regulation

1 Switch-off air conditioning or automatic climate control. Move selector lever into position "P"

2 Remove air cleaner.

3 Check engine regulating linkage for easy operation and wear. Lubricate all bearing points and ball sockets.

4 Perform full throttle checkup from inside vehicle (30–300).

5 Connect test instruments: CO-measuring instrument, revolution counter, stroboscope, oscilloscope, digital tester, oil telethermometer.

6 Evaluate oscilloscope display.

7 Check firing point and adjust, if required. Check centrifugal and vacuum ignition adjustment (15–501).

8 Test battery voltages.

Note: Voltmeter connection remains unchanged during tests a) and b).

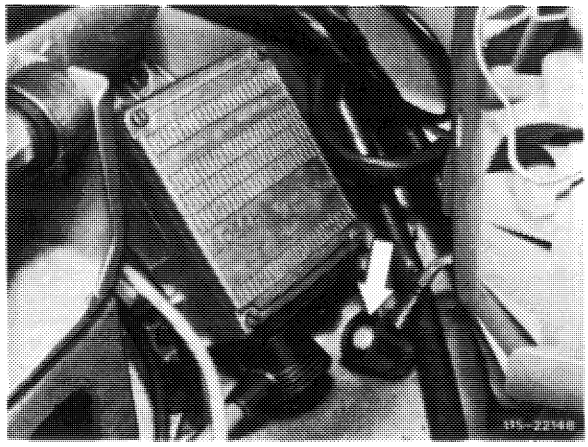
a) Rest potential

Connect voltmeter to battery while paying attention to polarity and read voltages. Nominal value 12.2 Volts.

b) Starting voltage

Pull plug from transmitter of ignition distributor on switching unit (green cable) or plug protective plug, part no. 102 589 02 21 00 on diagnosis socket.

Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts. If nominal value is not attained, test battery, charge and renew, if required.



9 Voltages on ignition coil:

Transistorized ignition system TSZ 4

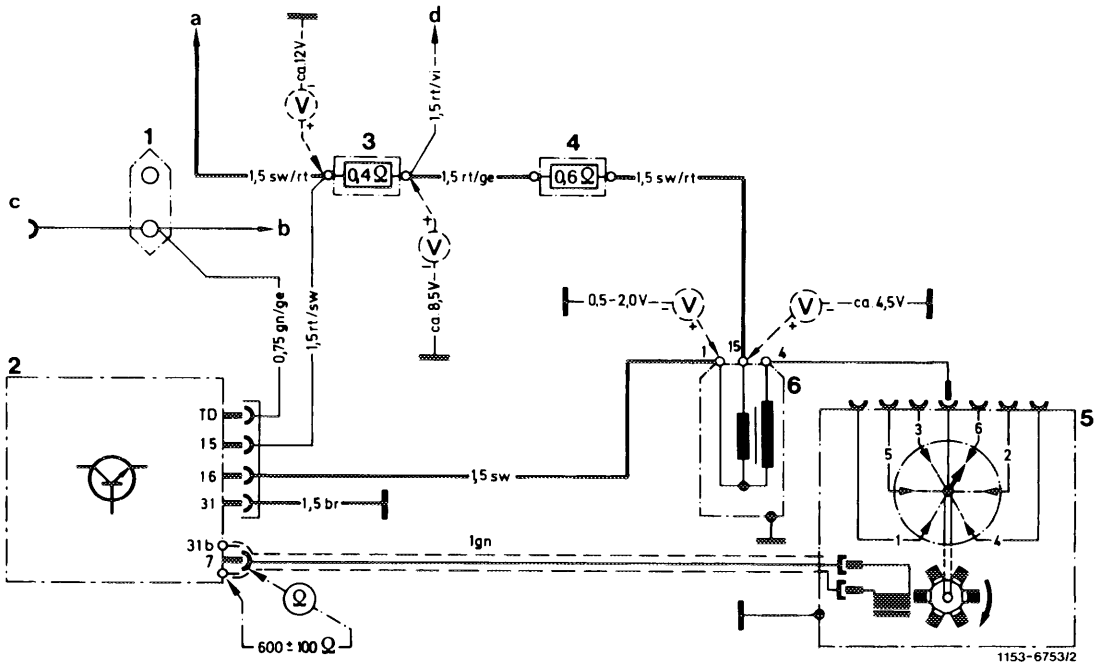
Test voltage on terminal 15 of ignition coil. For this purpose, disconnect voltmeter from battery and connect to terminal 15 of ignition coil.

Switch-on ignition and read voltage. Nominal value approx. 4.5 Volts.

Test voltage on terminal 1 of ignition coil. For this purpose, disconnect positive cable of voltmeter from terminal 15 and connect to terminal 1 of ignition coil.

Switch-on ignition and read voltage. Nominal value 0.5–2.0 Volts.

Test pre-resistance bridge by starting engine and read voltage during starting procedure. Nominal value 10 Volts.



Wiring diagram breakerless transistorized ignition system TSZ 4

1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

a Ignition starting switch
b Instrument cluster revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Transistorized ignition system TSZ 8 u

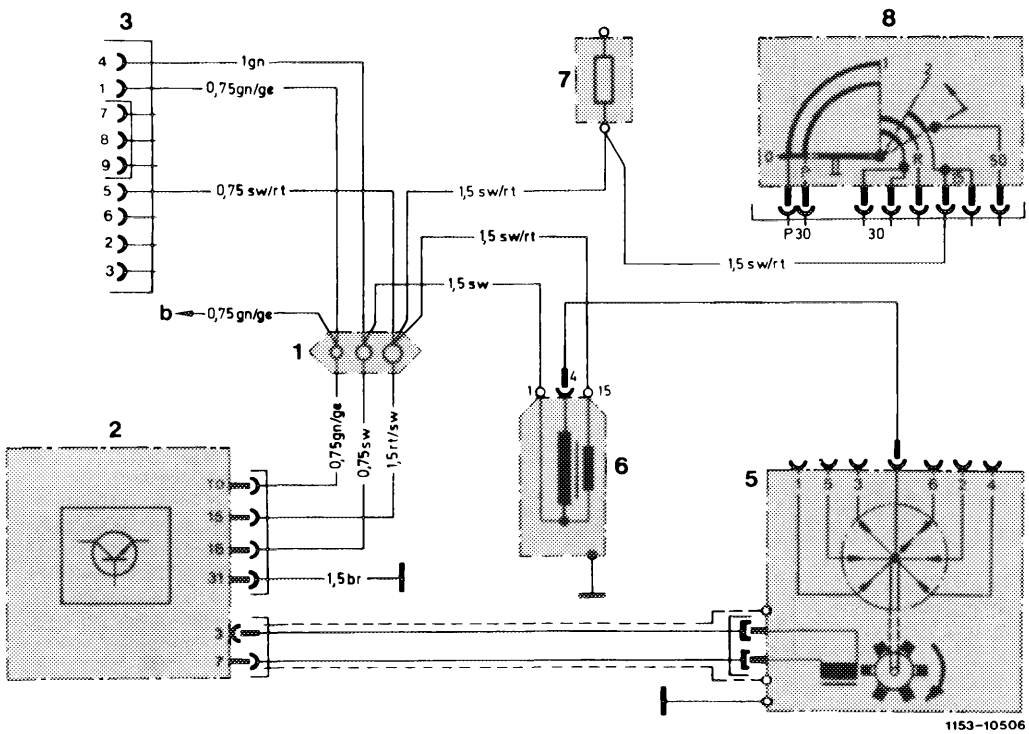
Switch-on ignition with engine stopped. On jack 5 of diagnosis socket (3) test voltage, terminal 15 against ground.

Nominal value: Battery voltage.

On jack 4 and 5 of diagnosis socket (3) test voltage difference between terminal 15 and terminal 1.

Nominal value: 0 Volt.

If nominal voltages are not attained, test ignition system (15–562).

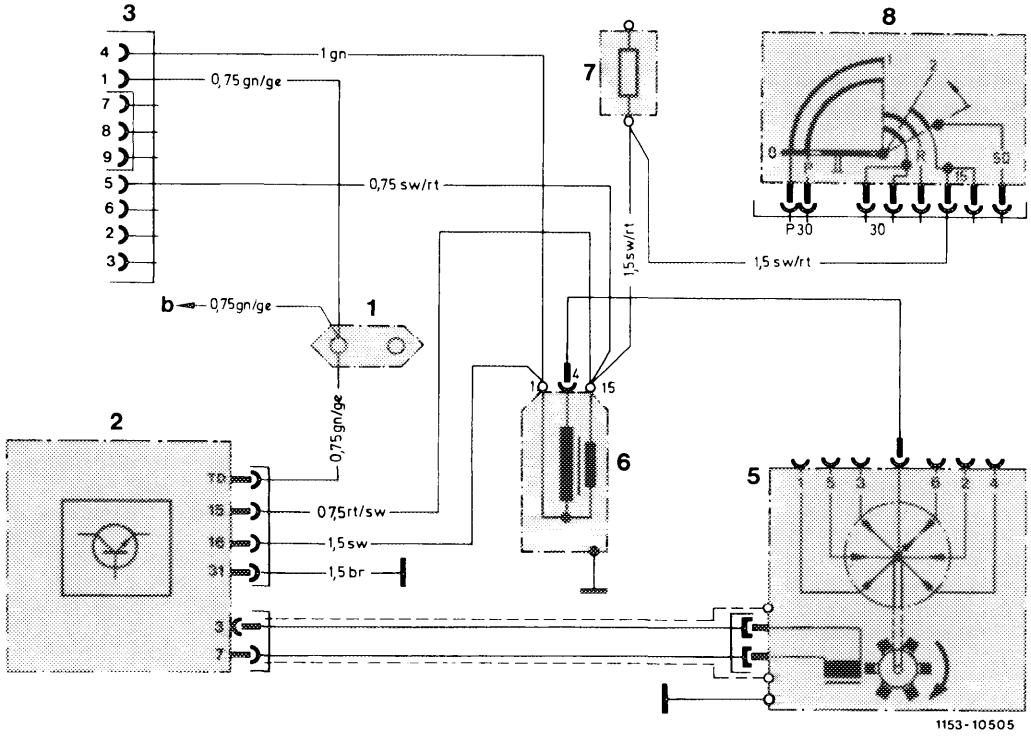


Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 123

1 Line connector
2 Switching unit
3 Diagnosis plug
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 107, 126

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

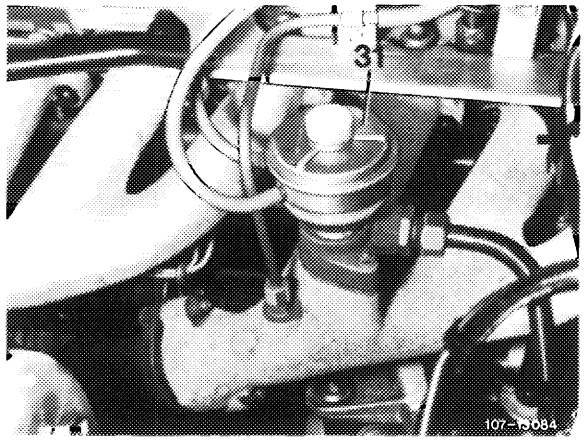
Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

10 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors), pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

11 Check EGR.

Pull red/purple vacuum line from EGR valve (31). Plug-on test hose and activate with a vacuum. If the engine is not running noticeably worse, replace EGR valve.

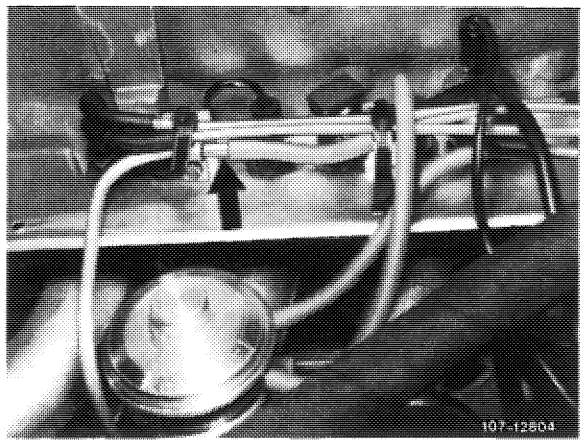


12 Run engine to 75–85 °C oil temperature.

13 Connect CO-measuring instrument.

For this purpose, pull connecting hose (arrow) of measuring point (exhaust back pressure line) on (J) and (USA) version.

Respective model years:
(J) 1977–1980
(USA) 1977–1979



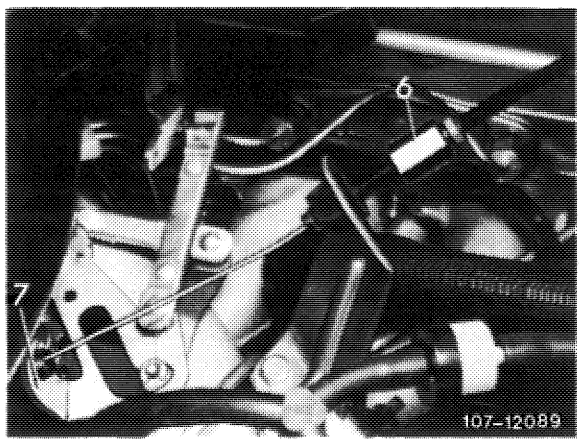
Connect CO-measuring instrument and exhaust back-pressure line by means of a hose.

No catalyst is installed on (USA) tourist vehicles, for this reason, the exhaust gas value can be measured on exhaust tail pipe.

14 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

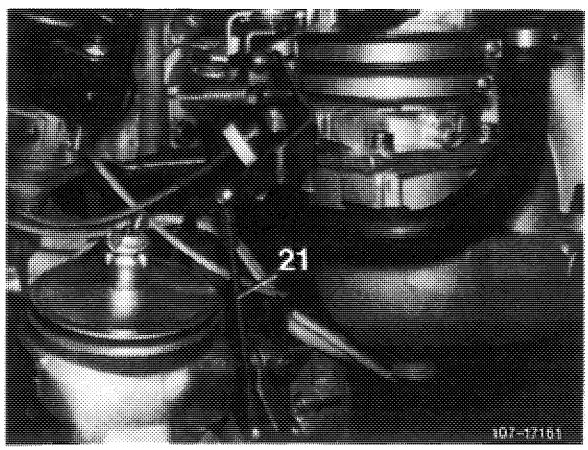
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting screw (6), if required.



Cruise control/tempomat, electric

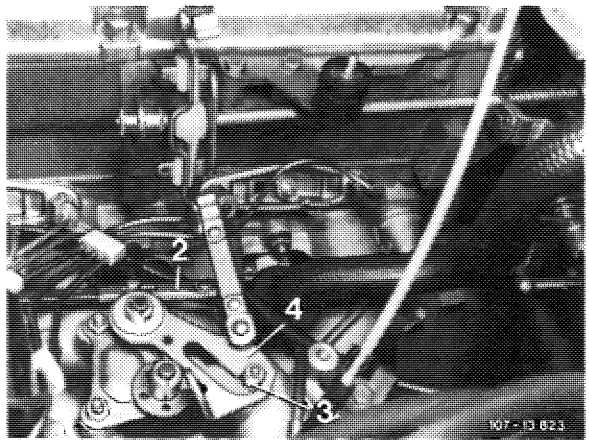
Check whether activator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of activator clockwise against idle speed stop.

When connecting pull rod (21), make sure that lever of activator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.

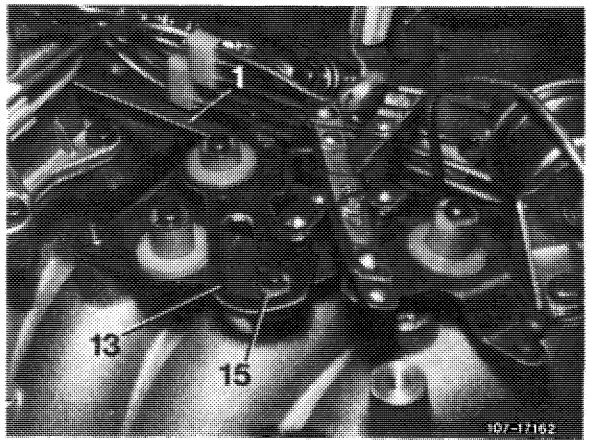


15 Check whether throttle valve rests against idle speed stop. Disconnect connecting rod for this purpose.

16 Check whether roller (3 and 15) in slotted lever (4 and 13) rests free of play against final stop. Adjust by means of connecting rod (1 and 2), if required.

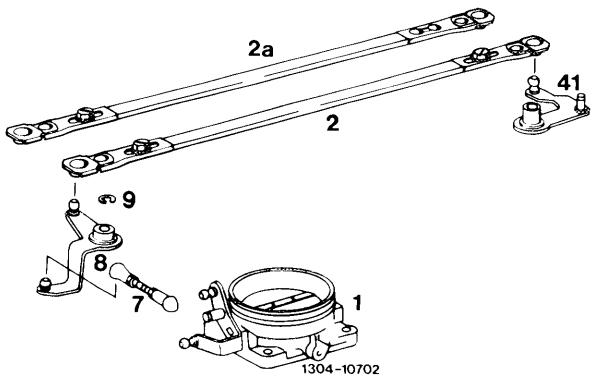


Model 123



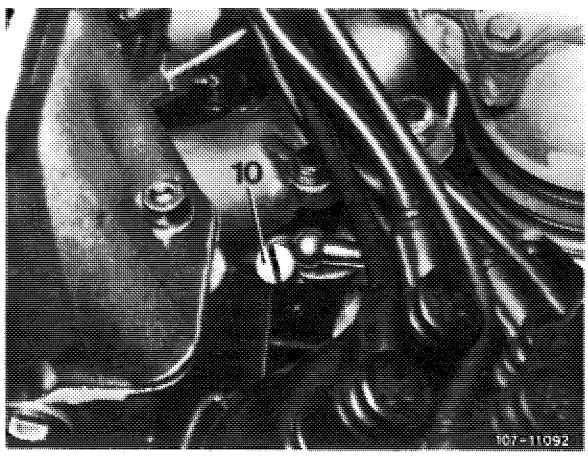
Model 126

Connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



2 Former version
2a Present version

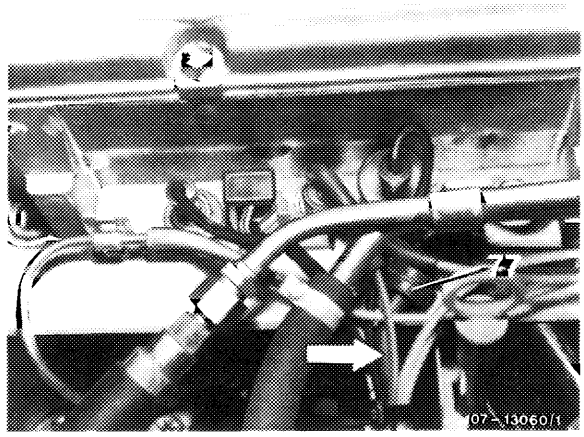
17 Adjust to specified engine speed by means of idle speed air screw (10).



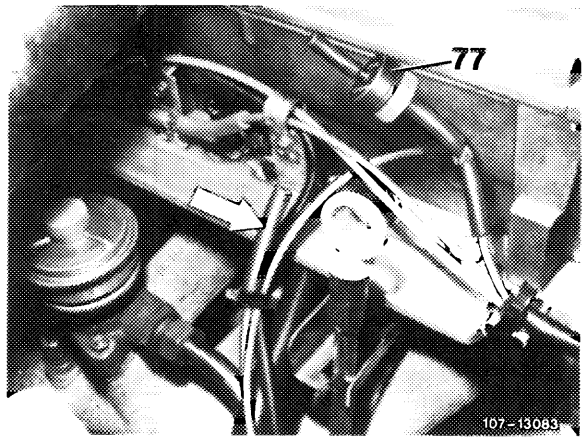
18 Check idle speed emission value:

(AUS) 1977–1982
(S) 1977–1982

Check idle speed emission value **without** injecting air. For this purpose, pull blue/purple vacuum line (arrow) from delay valve (77) and close small tube. The air injection is now disconnected.



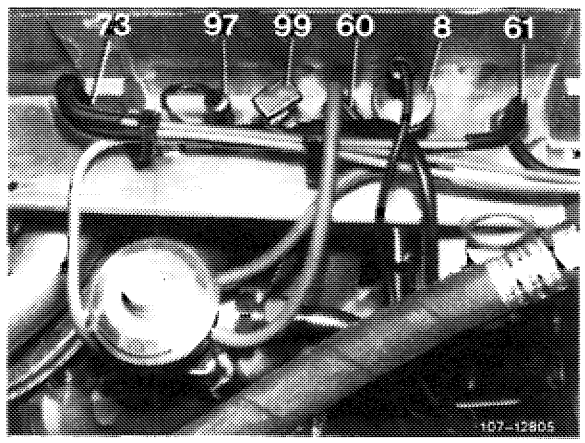
(AUS)



(S)

(J) 1977–1980
(USA) 1977–1979

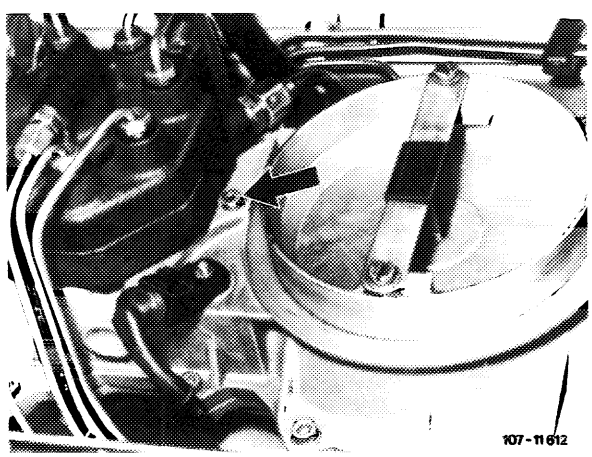
Check idle speed emission value **without** air injection in cylinder head. For this purpose, pull blue vacuum line from blue thermovalve (60) and close line. The air injection is now disconnected.



19 Adjust idle speed emission value:

With gray iron fuel distributor

Unscrew closing plug (arrow) for this purpose.



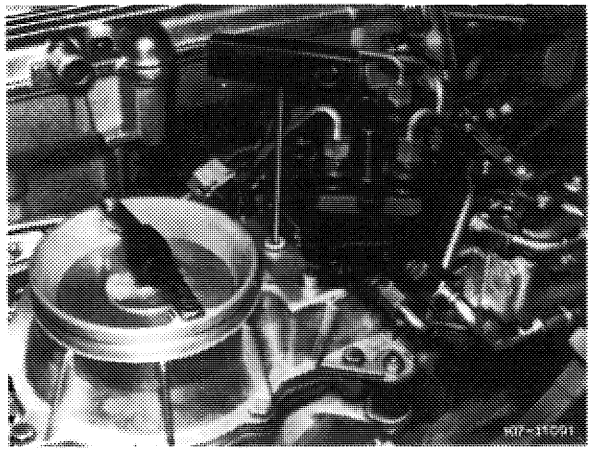
Insert screw driver through bore against idle speed mixture control screw and set emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value once again and readjust, if required.

Put back vacuum line on thermovalve.

Check idle speed emission value once again (air injection operational). The idle speed emission value should be **below** previously set value.



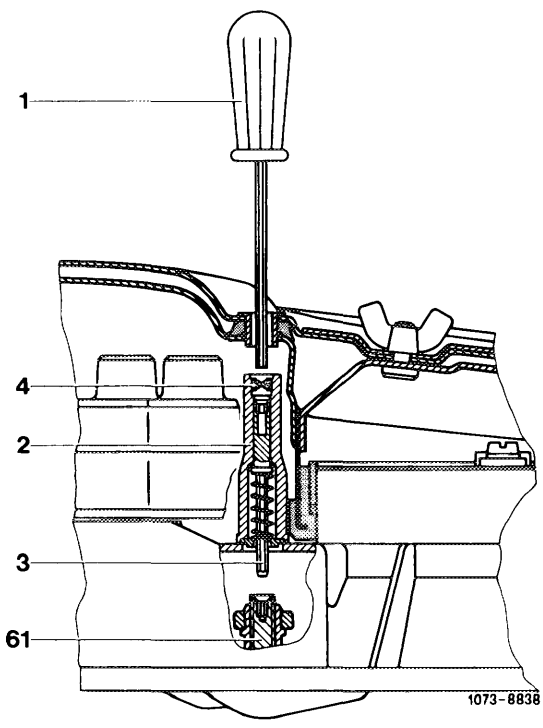
With light alloy fuel distributor

Pull out fuse plug (4) with puller.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the coil spring will push adjusting device automatically out of mixture control screw.



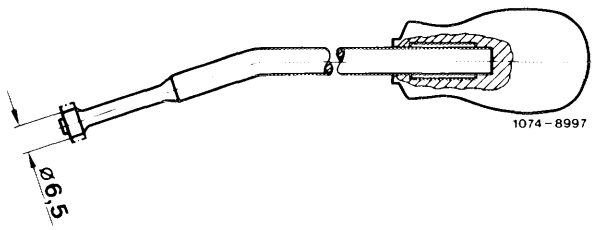
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking-in safety plug for protective cap of mixture control screw (61) has been changed from 8 mm to 6.5 mm.

In spare parts sector only installers with reduced diameter are now available. On former installers, grind diameter down to 6.5 mm.



20 Mount air cleaner. Check idle speed and idle speed emission value once again and readjust, if required.

21 Place selector lever into driving position, engage air conditioning, turn power steering to full lock, engine should be running smoothly. Readjust engine speed, if required.

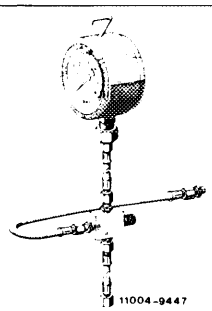
07.3–125 Checking choke system

Test values in bar gauge pressure

Engine		110.984/985 110.986/987	110.988/989 110.990
System pressure at idle with engine cold or at operating temperature		5.0–5.6	
Control pressure at idle with engine at operating temperature	Warm-up compensator stabilized	3.4–3.8 at 530 mbar [1]	3.6–4.0
	Full load enrichment at idle (vacuum hose pulled of)	2.8–3.2	
Control pressure according to ambient temperature at idle with engine cold		min. 0.5 (refer to diagram)	
Starting voltage		10 V	

[1] If the control pressure is not attained, check intake manifold vacuum (section "Checking control pressure at idle with engine at operating temperature").

Special tool

Pressure measuring device		102 589 00 21 00

Conventional tools

Voltmeter and ohmmeter

Revolution counter

Checking

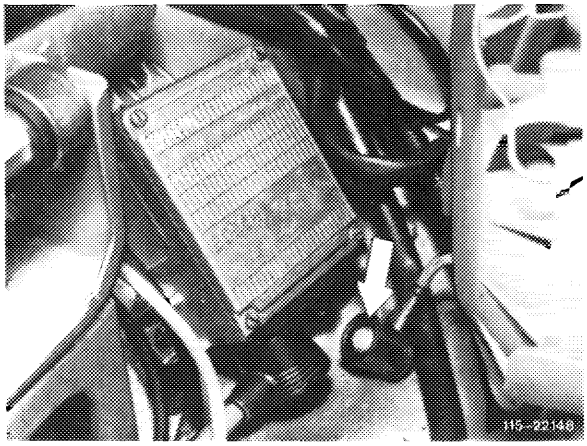
1 Pull cable plug from warm-up compensator and from cold starting valve.

2 Checking starting voltage.

Pull plug from ignition transmitter on switching unit (green cable) or plug protective plug, part no. 102 589 02 21 00, on diagnosis socket.

Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts. If nominal value is not attained, test battery, charge or replace, if required.

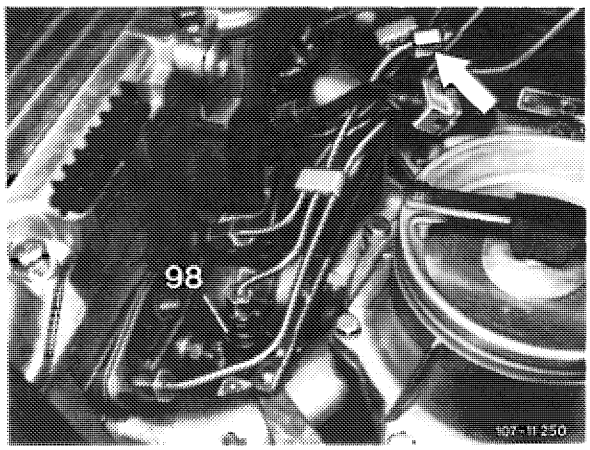
3 Check air flow sensor plate and control piston for easy operation, check fuel pressures and for internal leaks, as well as stabilizing time of warm-up compensator (07.3–120).



Checking cold-starting valve for function and leaks

4 Unscrew fuel line on cold-starting valve (98) and remove cold-starting valve.

5 Loosen fuel line (arrow) on fuel distributor and turn in such a manner that the cold starting valve can be again connected. Then hold cold starting valve into a container.



Checking function

6 Switch-on ignition.

7 Connect cold starting valve with separate cable to B + and ground. Cold starting valve should eject in shape of cone.

Attention!
Connect cable first to cold starting valve so that no sparking occurs.

No separate cable need be used below +15 °C, plug-on cable plug instead and pull cable plug from safety switch.

Checking for leaks

8 Loosen separate cable connection on cold starting valve. Dry cold starting valve on nozzle. No drops should form.

9 Switch off ignition.

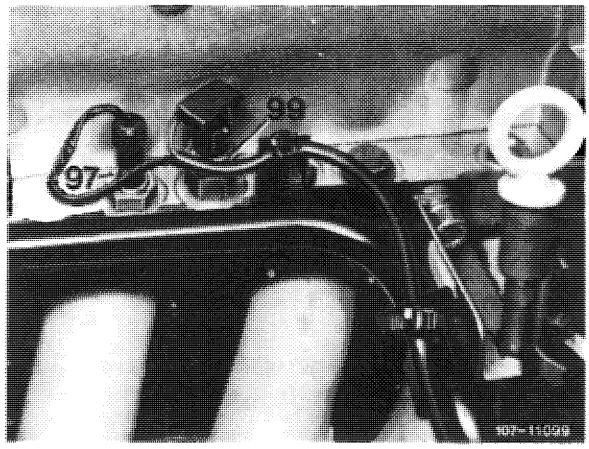
10 Mount cold starting valve with new seal.

11 Plug cable plug on safety switch and on cold-starting valve again.

Testing thermo time switch

The cold starting valve is actuated by closed thermo time switch only at coolant temperatures below +15 °C.

The actuating time increases with decreasing temperature and attains approx. 12 seconds at −20 °C.



99 Thermo time switch

Testing below +15 °C coolant temperature

12 Connect voltmeter to connection of cold starting valve.

13 Actuate starter. Depending on coolant temperature, voltmeter should then indicate 10 Volts for a given period.

The switching time increases with decreasing temperature by approx. 1.5 seconds per 5 °C.

e.g. + 15 °C = 0 seconds
+10 °C = 1.5 seconds

It is recommended to test thermo time switch additionally with an ohmmeter for this test.

Test value **below** +15 °C:

Connection G-ground = approx. 48 Ω
Connection W-ground = approx. 0 Ω

(Contacts in switch closed).

Testing above +15 °C coolant temperature

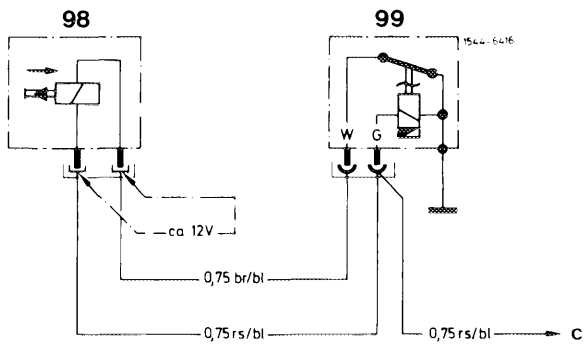
Above +15 °C coolant temperature the thermo time switch can be tested only by means of an ohmmeter. For this purpose, pull plug from thermo time switch.

Test values **above** +15 °C:

Connection G-ground = approx. 62 Ω
Connection W-ground = approx. 270 Ω

(Contacts in switch open).

Re-attach plug.



98 Cold starting valve
99 Thermo time switch
c To terminal 50

Testing cutoff point of auxiliary air valve

14 Following a cold start, the engine speed should amount to approx. 800–1000/min. The speed will then increase to approx. 1200–1300/min, and will drop to normal idle speed at approx. 70 °C.

15 Stop engine. Disconnect pressure measuring device while catching fuel with a rag.

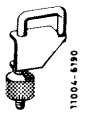
16 Connect fuel lines, run engine once again and check all fuel connections for leaks.

07.3–130 Checking delivery capacity of fuel pump

Test values

Voltage at fuel pump min.	11.5 V
Delivery capacity min.	1 liter/30 seconds

Special tool

Clamp for fuel hose		000 589 40 37 00

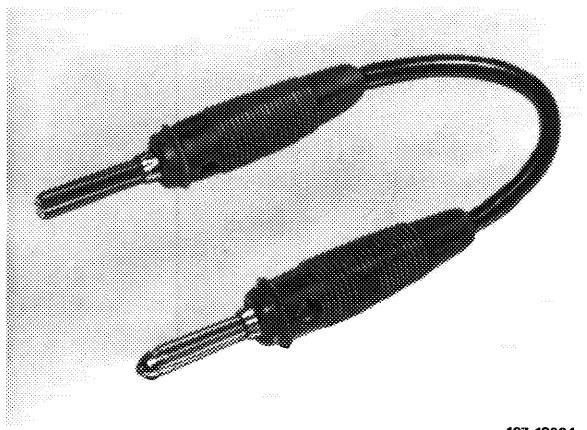
Conventional tools

Voltmeter, graduated measuring glass or measuring cup (at least 1 liter), stop watch

Self-made fuel hose

Fuel hose	500 mm long
Tube with sealing cone	
Coupling nut	M 14 x 1.5

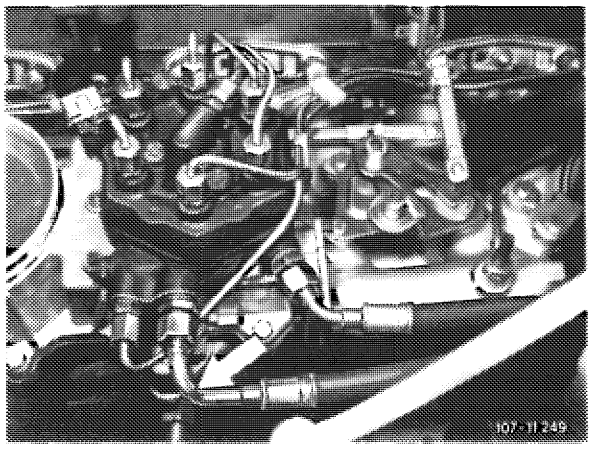
Contact bridge



107-19204

Checking

1 Check delivery capacity of fuel pump during fuel return flow. For this purpose, unscrew fuel return hose (arrow) on fuel distributor.

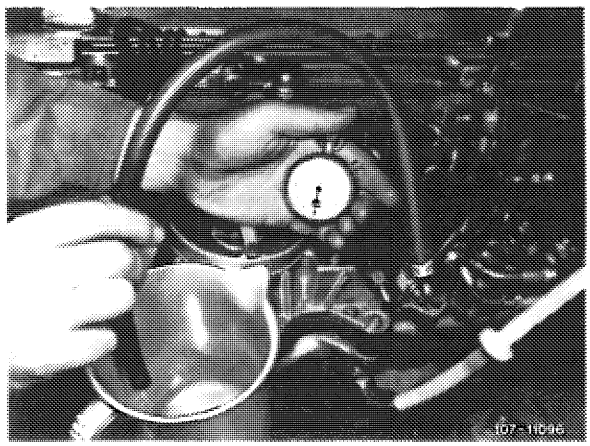


2 Screw self-made fuel hose to fuel distributor and hold into measuring glass or cup.

3 Check delivery:

Mixture control unit **with** safety switch

Switch-on ignition. Pull cable plug from safety switch in mixture control unit and put cable plug back again after 30 seconds.



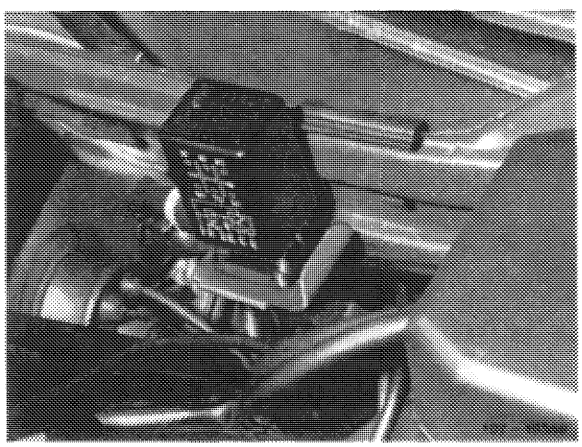
Mixture control unit **without** safety switch

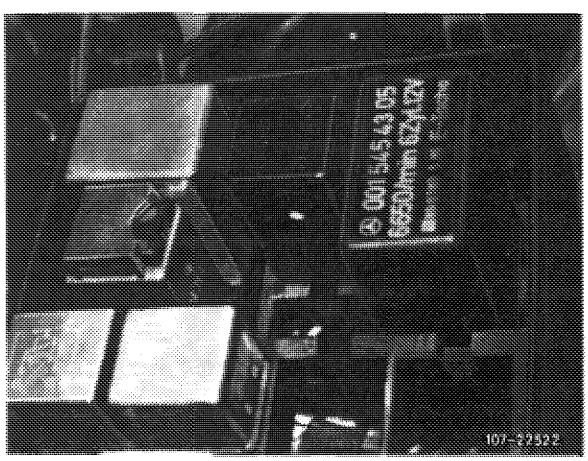
Pull off fuel pump relay and bridge the two bushings (wiring diagram 07.3–120). This will provide voltage for fuel pump.

Pull off contact bridge after 30 seconds.

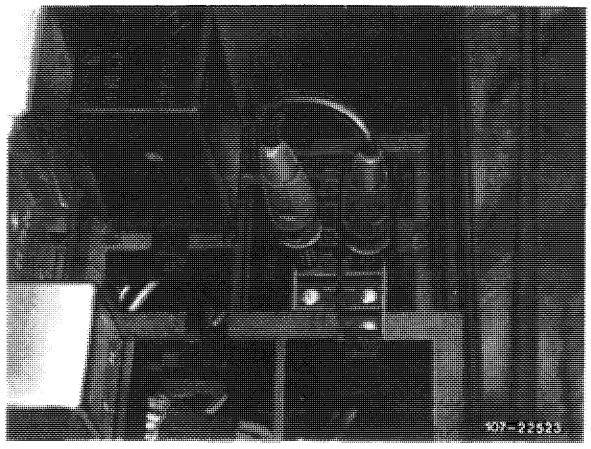
Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.

Model 123





Model 126



4 If the delivery volume is less than 1 liter/30 seconds, check the following items:

a) Check strainer in feed connection of fuel distributor for passage.

b) Check voltage at fuel pump.
Nominal value = min. 11.5 Volts (with engine stopped).

c) Check fuel lines for restrictions (squeezed lines).

d) Pinch leak line between fuel reservoir and intake damper. Check delivery once again. If specified delivery volume is attained, replace fuel reservoir.

e) Replace fuel filter.

5 If delivery volume is still too low, replace fuel pump.

6 Connect fuel return flow hose. Mount relay.

07.3–140 Checking decel shutoff

Test values

Speed km/h	Engine speed 1/min without refrigerant compressor	with refrigerant compressor
> 35	> 1100	> 1300

Conventional tools

Revolution counter, volt-ohmmeter

Digital multimeter with means for measuring AC (for impulse transmitter test)

Note

Since decel shutoff requires engine speed impulses and driving speeds, the respective component can be tested only on a dynamometer or on the road.

A function test of impulse transmitter can also be made by means of workshop oscilloscope Bosch MOT 300/400, 202 and SUN 1080, 1019, 2110 in position "Primary, special "or "Generator test".

Testing on dynamometer

Remove air cleaner.

Run on dynamometer at approx. 70 km/h in 4th speed or driving position "D". Release accelerator pedal, air flow sensor plate will move into zero position. As soon as combustion starts again at approx. 1100/min or approx. 1300/min with refrigerant compressor, the air flow sensor plate will move into idle position. Check decel shutoff valve and its activation, if required.

Testing without dynamometer (road test)

Run engine at idle.

Test decel shutoff valve (30).

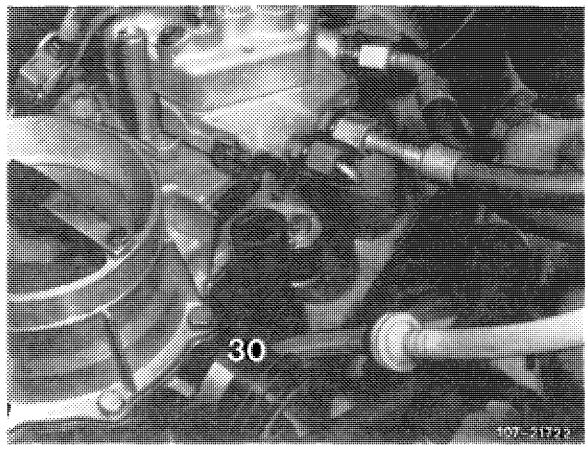
Test activation of switchover valve (43a).

Test speed-dependent control.

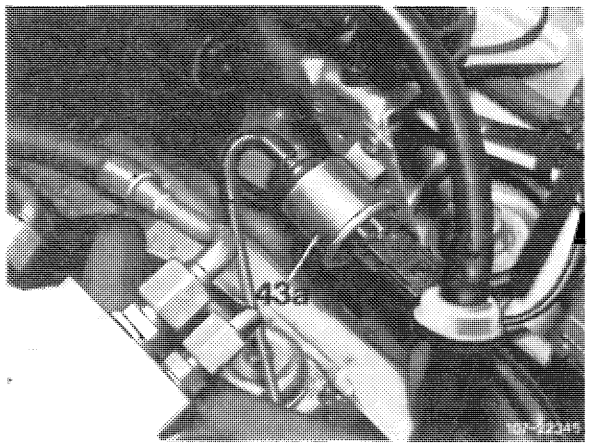
Testing

Testing decel shutoff valve (30)

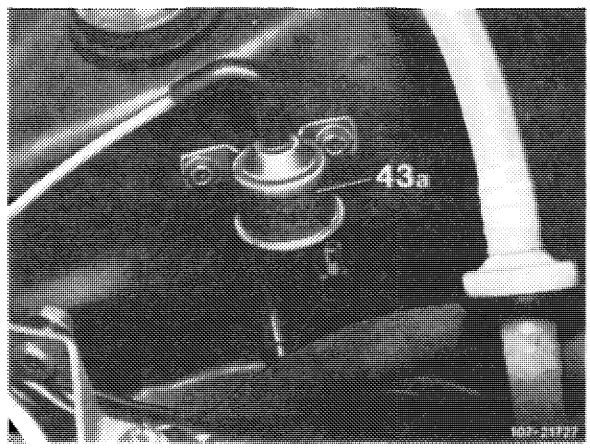
1 Run engine at idle. Pull off vacuum lines on switch over valve (43a) and connect with each other. Decel shutoff valve (30) will then open and the engine should stop.
If engine keeps running, check vacuum lines. Intake manifold vacuum should be available at idle. If vacuum is available, replace decel shutoff valve (30).



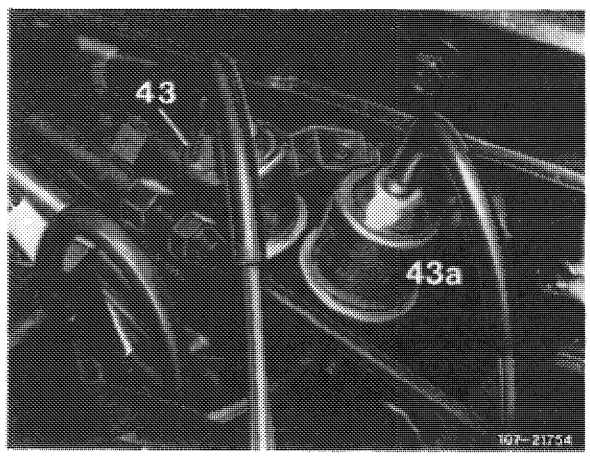
Layout switchover valves (43a)



Model 107



Model 123

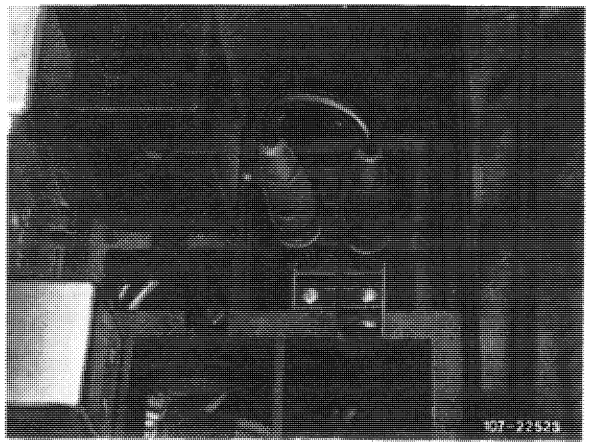


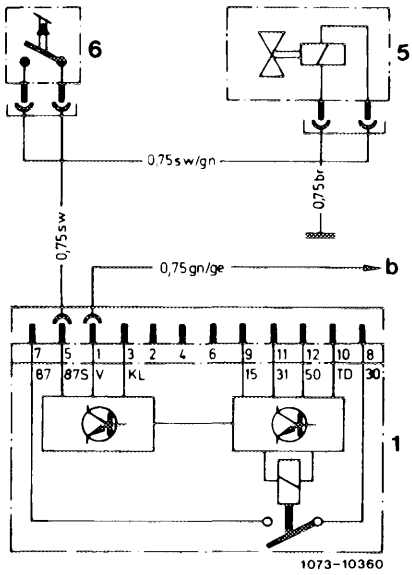
Model 126
43 Switchover valve air conditioning (identification: green cap)
43a Switchover valve decel shutoff (identification: gray cap)

Checking activation of switchover valve

2 Pull off fuel pump relay. Bridge jack 7 (terminal 87) and 8 (terminal 30), so that fuel pump will run. Start engine, connect jack 5 (terminal 87 S) of coupler with battery voltage. Engine should now stop.

If engine does not stop, check microswitch (3 or 6) or switchover valve (43a or 5).





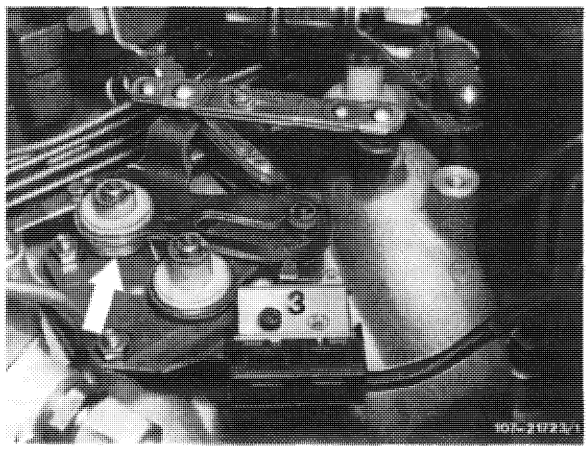
1 Electronic fuel pump relay
5 Switchover valve
6 Microswitch
b Tachometer transmitter

Testing microswitch (3)

Pull off coupler on microswitch. Connect ohmmeter.

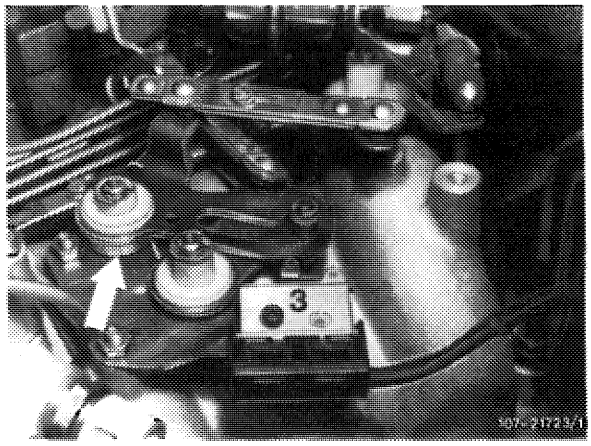
Readout: At idle 0 Ω
When accelerating ∞ Ω.

Check adjustment of slotted lever, if required. Roller in slotted lever should rest free of tension against final stop. Check rotary spring (arrow), if required.

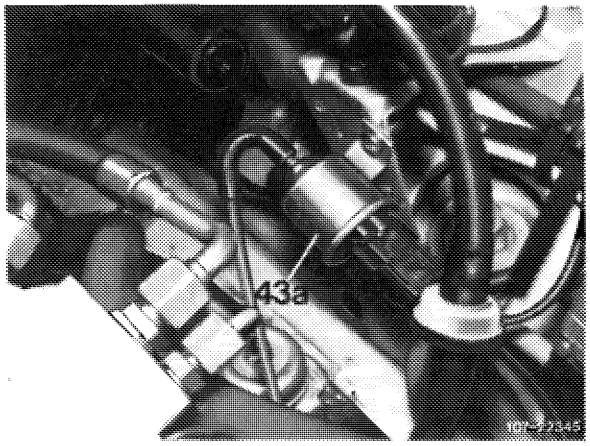


Testing switchover valve (43a)

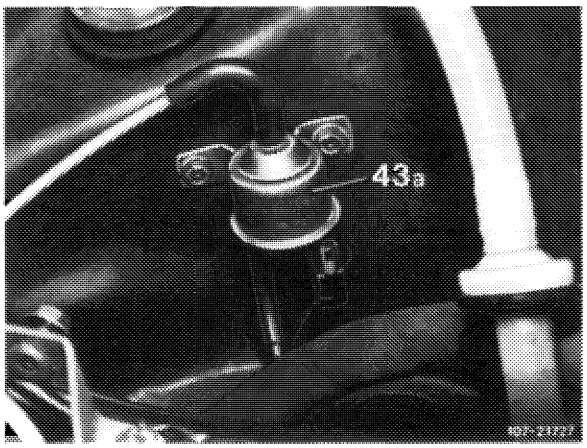
Pull coupler from microswitch (3) and connect cable, color black/green, to battery voltage, engine should now stop. If engine does not stop, test line with an ohmmeter for passage or replace switchover valve (43a).



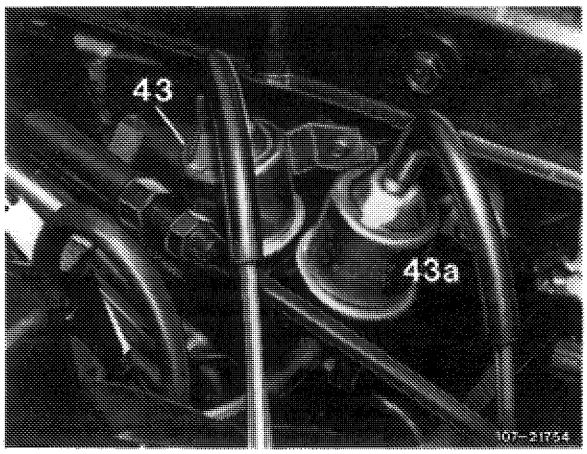
Layout switchover valves (43a)



Model 107



Model 123

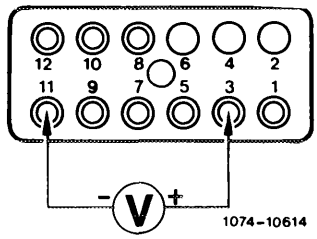


Model 126
43 Switchover valve air conditioning (identifiaction: green cap)
43a Switchover valve decel shutoff (identifiaction: gray cap)

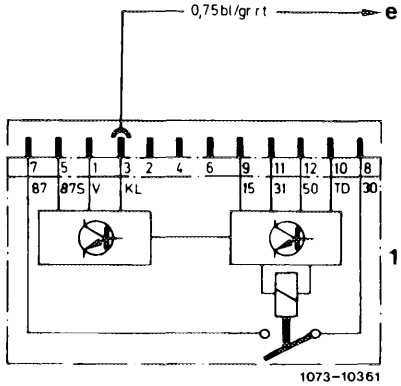
3 Check cutting-in impulse of refrigerant compressor. For this purpose, run engine at idle. Connect positive cable (red) of voltmeter to jack 3 (terminal KL) and negative cable (black) to jack 11 (terminal 31).

When switching-on refrigerant compressor, battery voltage should be available.

If no voltage is available, test line blue/gray/red (terminal KL) to refrigerant compressor for interruption.



Note: With air-conditioning system switched on, voltage should be available at jack 3 (terminal KL) of fuel pump relay (refer to wiring diagram group 83 air-conditioning system).



1 Fuel pump relay
e Refrigerant compressor

Test speed-dependent control

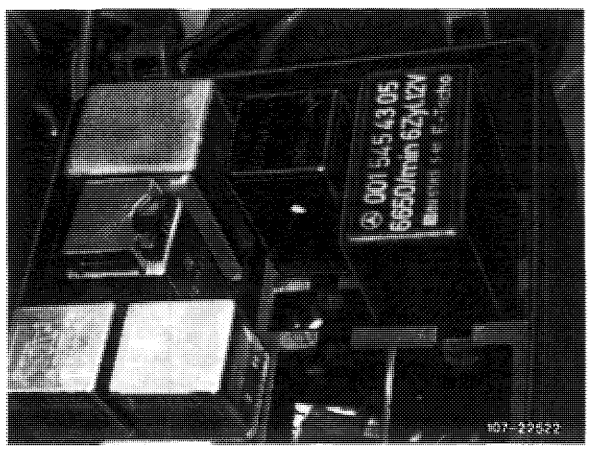
4 Pull coupler from switchover valve (43a) and connect voltmeter to coupler. Operate on dynamometer or on road in 4th gear, or in driving position "D" at 70 km/h. Release accelerator pedal, battery voltage should be available. If there is no voltage, test impulse transmitter on tachometer or replace fuel pump relay, if required.

There should be no voltage below approx. 1100/min or approx. 1300/min with refrigerant compressor.

Testing impulse transmitter on tachometer

5 A prerequisite for a signal is that the speed indicator is operational.

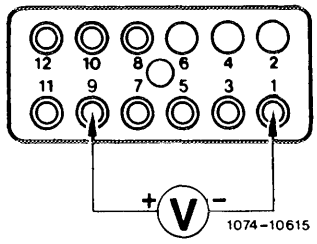
Test impulses for decel shutoff. Pull off fuel pump relay for this purpose.



Electronic tachometer

a) Testing output signal

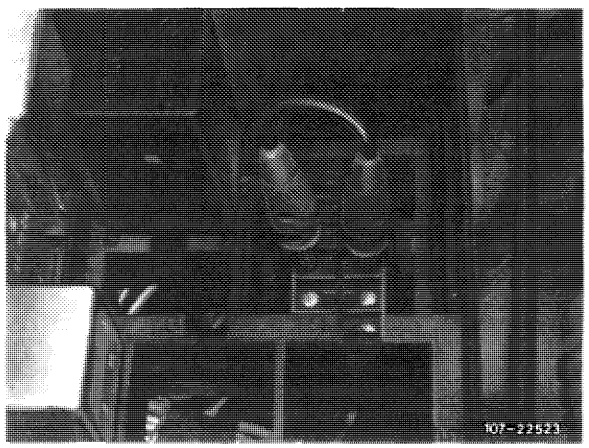
Connect digital multimeter (position V = DC). For this purpose, connect positive cable (red) to jack 9 (terminal 15), grounding cable (black) to jack 1 (terminal V).



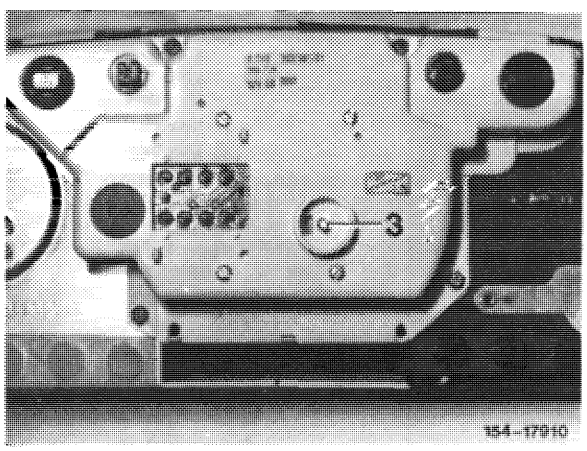
Attention!
Perform measurements in position V = only. Wrong handling will damage tachometer electronics.

Bridge jack 7 (terminal 87) and jack 8 (terminal 30), fuel pump will then run.

Operate on dynamometer or on road in 4th gear or in driving position "D" at 70 km/h. Readout should indicate $\geqq$ 1 Volt DC (in position V =). Measuring value increases with increasing vehicle speed.



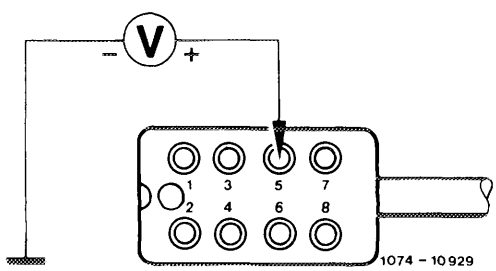
If there is no readout, test cable from jack 1 (terminal V) to impulse transmitter connection (3) by means of an ohmmeter for passage.



Model 107, 126
3 Impulse transmitter connection

Test speed readout of tachometer.

If there is no readout, remove instrument cluster. Remove 8-pole plug on tachometer.



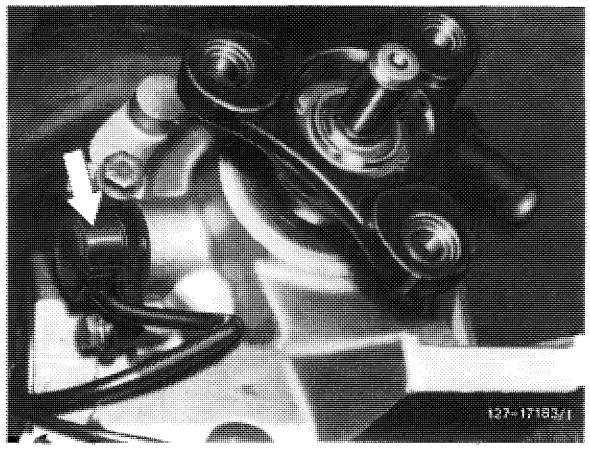
b) Testing input signal

Connect digital multimeter with means for measuring AC (in position V ~ or V $\wedge$) to jack 5.

Red = positive (jack 5)
Black = vehicle ground

Operate on dynamometer or on road in 4th gear or in driving position "D" at 70 km/h. Readout $\geqq$ should amount to 1 Volt AC (in position V ~). Measuring value increases with increasing driving speed.

If there is no readout, test cable for passage by means of an ohmmeter or replace cable or impulse transmitter (arrow) in transmission.



Impulse transmitter automatic transmission

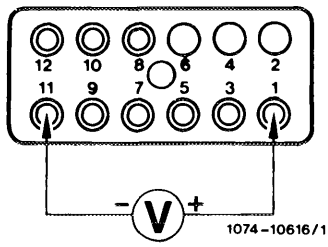
Mechanical tachomater

Connect digital multimeter with means for measuring AC (in position V ~or$\overset{\sim}{\sqcup}$). For this purpose, connect position cable (red) to jack 1 (terminal V), grounding cable (black) to jack 11 (terminal 31).

Bridge jack 7 (terminal 87) and jack 8 (terminal 30), fuel pump will now run.

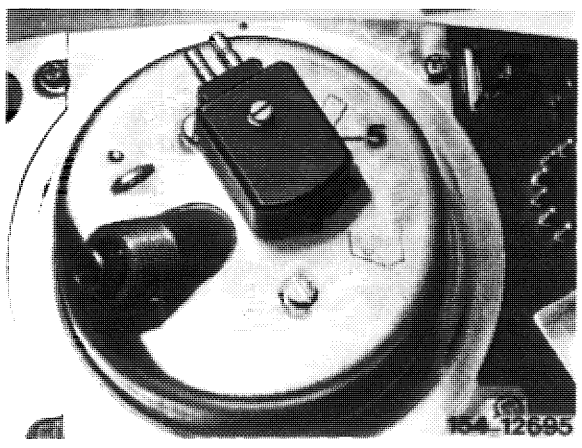
Operate on dynamometer or on road in 4th gear or in driving position "D" at approx. 70 km/h. Readout $\geqq$ should amount to 1 Volt AC (in position V ~). Measuring value increases with increasing vehicle speed. speed.

If there is no readout, test cable for passage by means of an ohmmeter. Replace cable or impulse transmitter (5) on tachometer, if required.

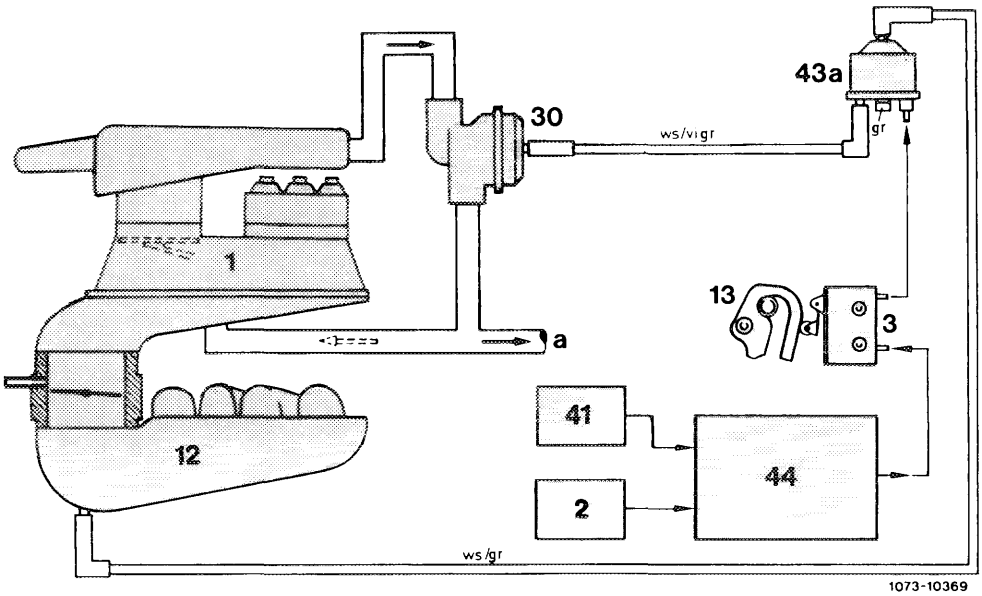


Test resistance of impulse transmitter (5). Nominal = 650 – 1370 Ω.

If the nominal value is exceeded or not attained, replace impulse transmitter.



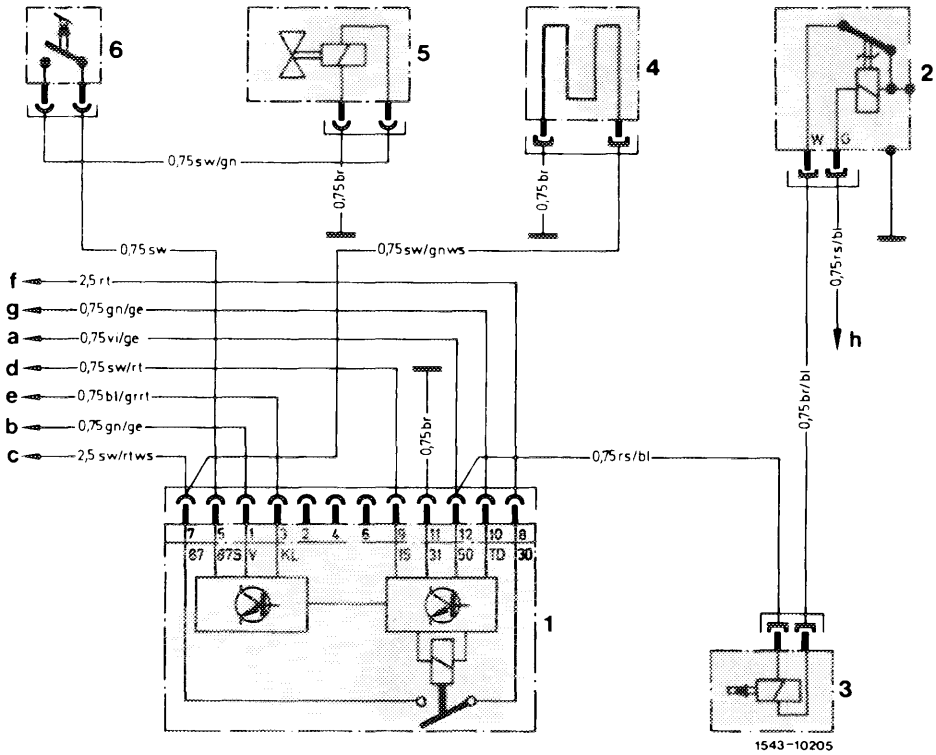
Model 123
5 Impulse transmitter



Function diagram decel shutoff

1	Mixture controller	41	Impulse transmitter mechanical tachometer	Color code	
2	Transistorized switching unit			gr	= gray
3	Microswitch	43a	Switchover valve decel shutoff	vi	= purple
12	Intake manifold			ws	= white
13	Slotted lever	44	Fuel pump relay		
30	Decel shutoff valve	a	To idle speed air distributor		

Note: For operation of decel shutoff and idle speed stabilization refer to 07.3–500.

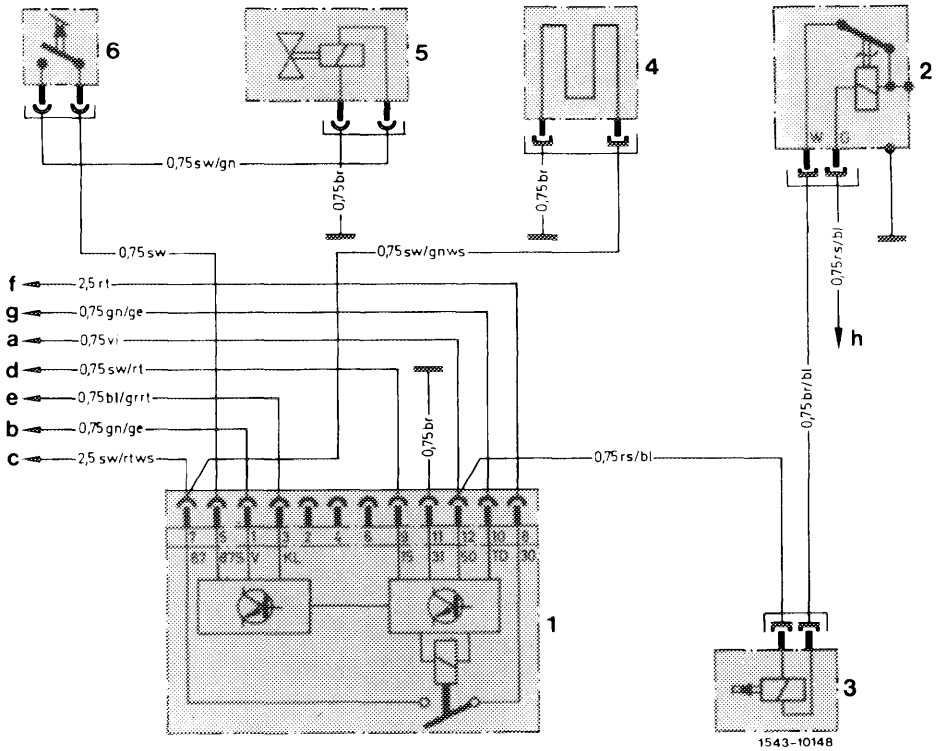


Wiring diagram decel shutoff model 123

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a To output starter lockout and backup lamp switch
b Transmitter mechanical tachometer
c Fuel pump
d Fuse 12 terminal 15 access
e Refrigerant compressor
f Cable connector engine terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white

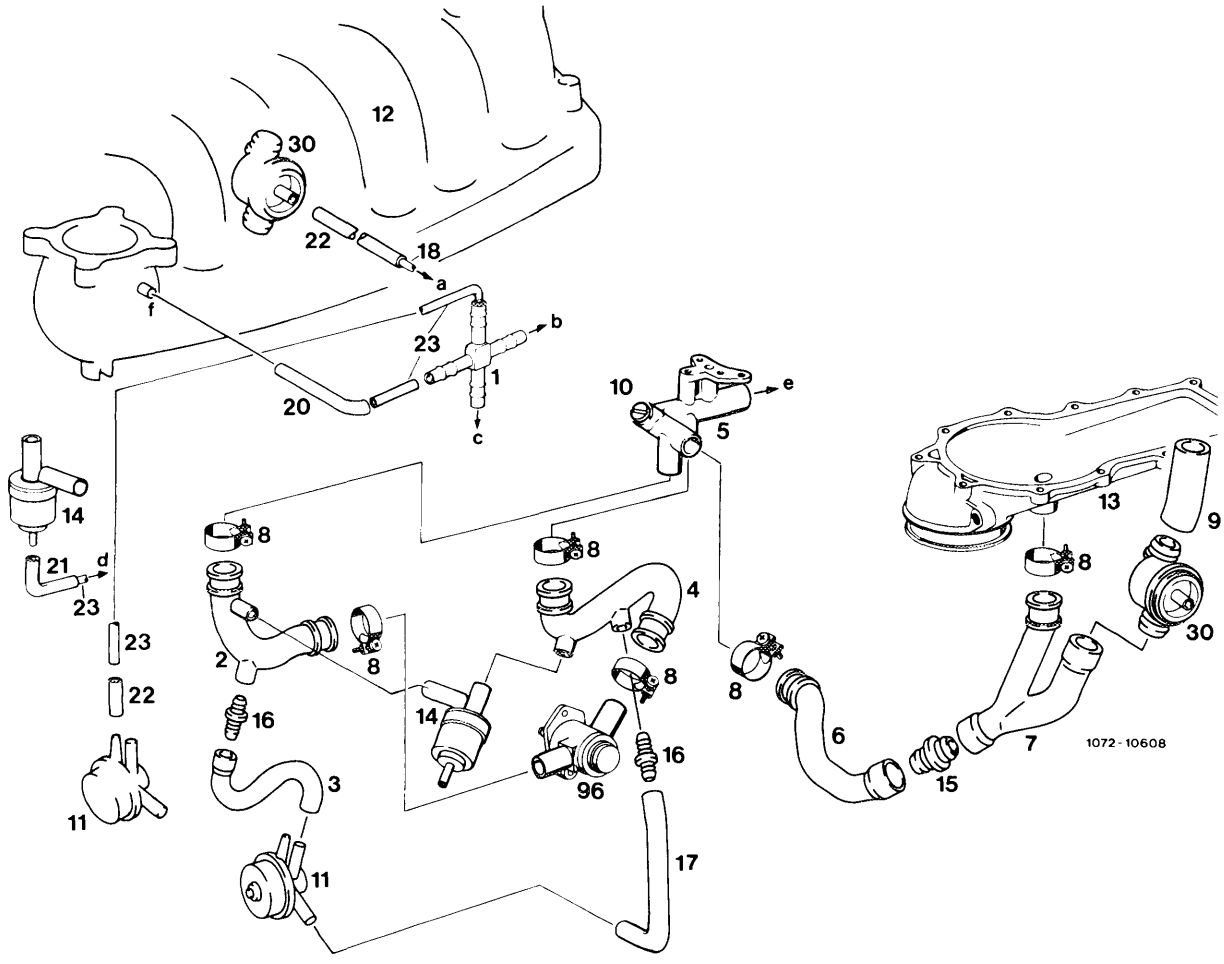


Wiring diagram decel shutoff model 107, 126

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a Cable connector engine terminal 50
b Transmitter electronic tachometer
c Fuel pump
d Fuse 14 terminal 15 access
e Refrigerant compressor
f Cable connector terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



Decel shutoff and idle speed stabilization

1 Multiple distributor
2 Contour hose
3 Contour hose
4 Contour hose
5 Idle speed air distributor
6 Contour hose
7 Contour hose
8 Hose clip
9 Contour hose for air filter
10 Idle speed air screw
11 Decel circulating air valve
12 Intake manifold
13 Air guide housing
14 Bypass valve air conditioning
15 Plug connection
16 Plug connection
17 Contour hose
20 Contour hose
21 Contour hose
22 Connecting hose
23 Vacuum line
30 Decel shutoff valve
96 Auxiliary air valve

a To switchover valve decel shutoff
b To switchover valve decel shutoff
c To switchover valve air conditioning
d To switchover valve air conditioning
e Connection idle speed air
f Vacuum connection intake manifold

Conventional tool

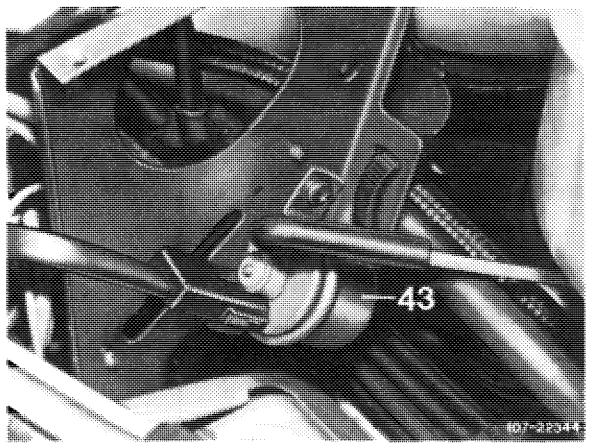
Voltmeter, revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03

Testing

1 Run engine at idle. When adding refrigerant compressor, the idle engine speed should increase by approx. 80/min.

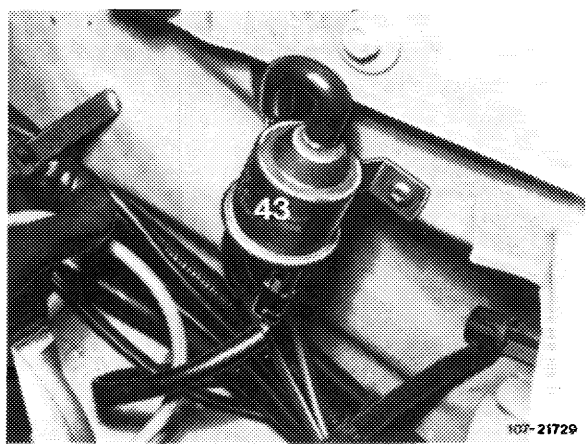
If the idle speed is not increasing, pull upper and lower vacuum line from switchover valve (43).

Vacuum should be available at upper line.

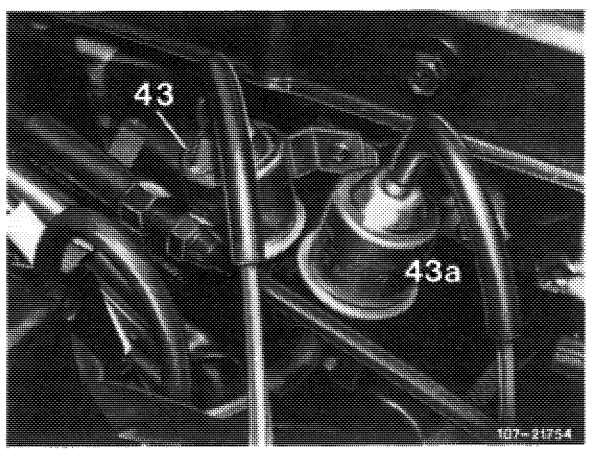


Model 107
43 Switchover valve (mounted on mounting bracket for coolant expansion tank).

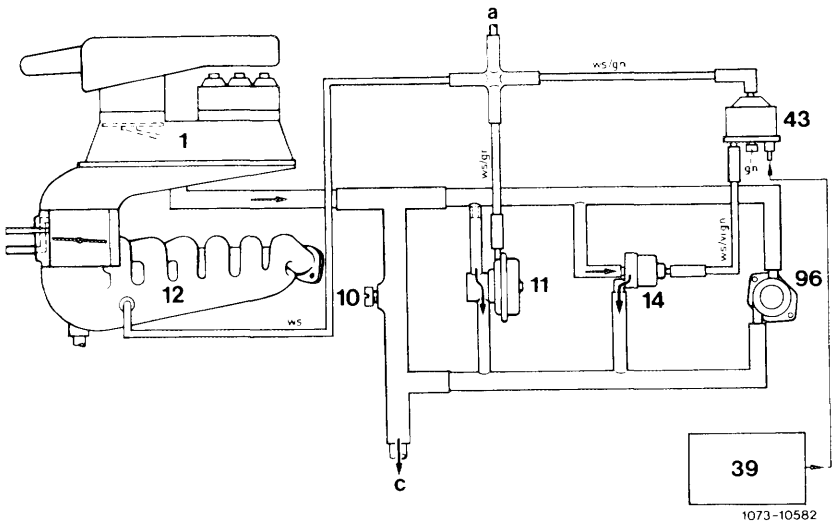
Layout switchover valves (43).



Model 123



Model 126
43 Switchover valve air conditioning (identification: green cap)
43a Switchover valve decel shutoff (identification: gray cap)



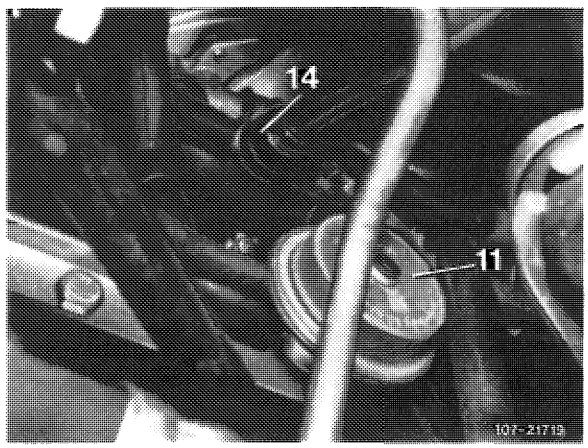
Function diagram idle speed stabilization on engines with refrigerant compressor

1 Mixture controller
10 Idle speed air screw
11 Decel circulating air valve
14 Bypass valve air conditioning
39 Relay air conditioning
43 Switchover valve rpm increase air conditioning
96 Supplementary air valve
a Connection switchover valve decel shutoff
c To idle speed air duct in intake manifold

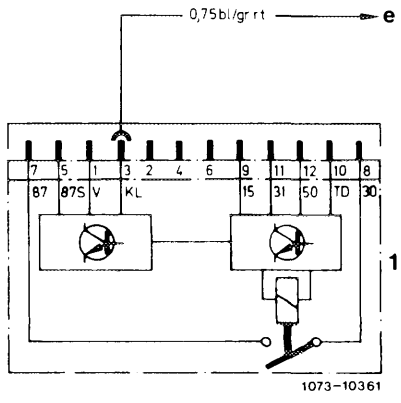
Color code
gn = green
vi = purple
ws = white

Note: For operation decel shutoff and idle speed stabilization refer to 07.3–500.

2 Connect both vacuum lines with each other, idle speed should then increase by approx. 80/min. If not, renew bypass valve (14).



3 If the engine speed increases, check electric activation of switchover valve (43). For this purpose, pull off coupler: with refrigerant compressor switched on, battery voltage should be available. If voltage is available, replace switchover valve. If no voltage is available, test voltage supply according to wiring diagram (refer to wiring diagram group 83 Air conditioning system).



1 Fuel pump relay
e Refrigerant compressor

07.3–150 Checking idle speed stabilization with rpm increase following start

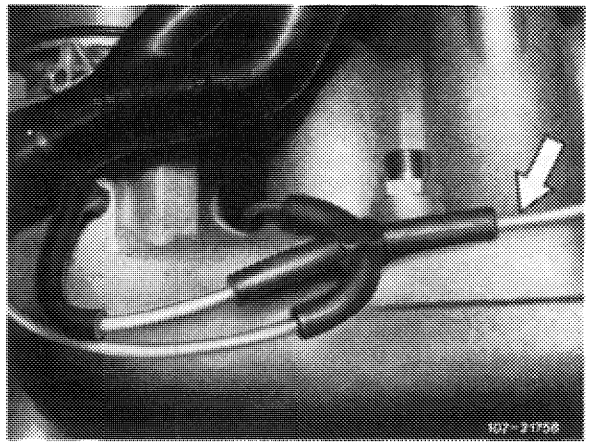
Conventional tools

Revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.3

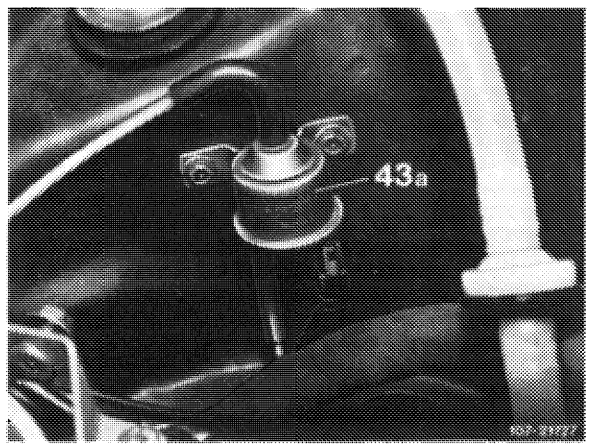
Testing

1 Run engine at idle.

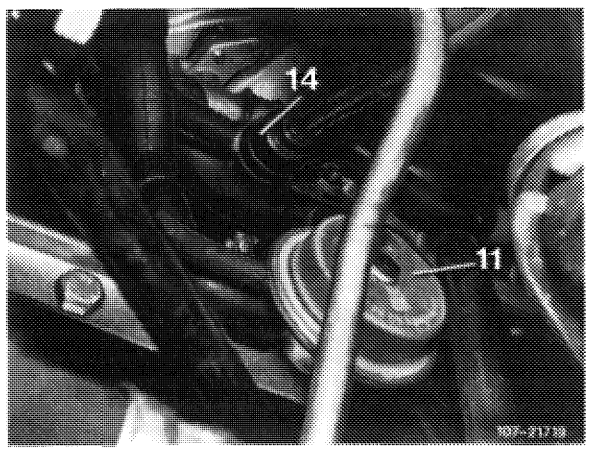
2 Pull off gray/black vacuum line (arrow) on 3 or 4-point rubber distributor (to reduce vacuum), put back again after approx. 3 seconds; idle speed should increase by approx. 500/min for a short period.

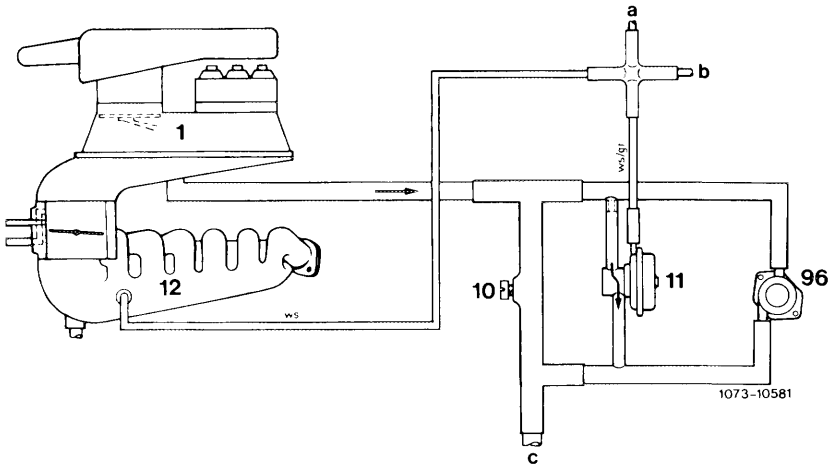


Note: On model 123 and 126, owing to better access, the upper vacuum line can be pulled from switchover valve (43a). As a result, the decel circulating air valve (11) is provided with atmospheric air via 3 or 4-point rubber distributor (refer to function diagram).



If there is no rpm increase, check line for passage. Renew decel circulating air valve (11), if required.





1 Mixture controller
10 Idle speed air screw
11 Decel circulating air valve
12 Intake manifold
96 Auxiliary air valve

a Connection switchover valve decel shutoff
b Connection switchover valve rpm increase air conditioning
c To idle speed air duct in intake manifold

Color code
gr = gray
ws = white

Note: For operation decel shutoff and idle speed stabilization refer to 07.3–500.

07.3–160 Checking fuel distributor for constant delivery

Test values

Load range	Fixation of air flow sensor plate at approx. . . cc/min	max. dissipation in cc/min
With gray iron fuel distributor		
Idle	6	1.2
Partial load	30	6.0
Full load	100	10.0
With light alloy fuel distributor		
Idle	6	0.8
Partial load	30	4.0
Full load	100	10.0

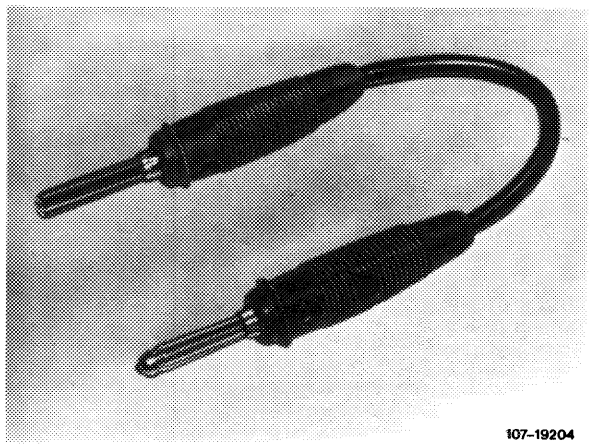
Conventional Bosch testers and accessories

Designation	order designation
Fuel distribution reference unit	KDJE–P 300
Tester carriage [1]	M 200/2 or KDJE–W 100

[1] If the tester carriage is used for fuel distribution reference unit, an additional angle plate is required. The plate can be self-made or obtained from a Bosch representative.

Self made tool

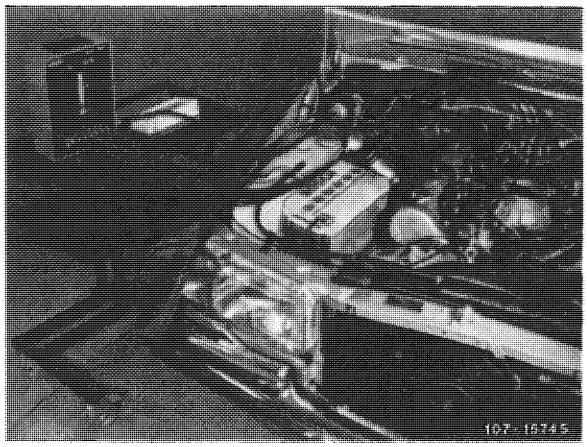
Contact bridge



107-19204

Note

A fuel distribution reference unit is available for testing fuel distributor in vehicle. The unit serves to measure the individual amounts of fuel which the fuel distributor dispenses to the injection valves. Measurements are made with engine stopped. Operating conditions (idle, partial or full load) are simulated and set in air flow sensor plate by means of an adjusting device.

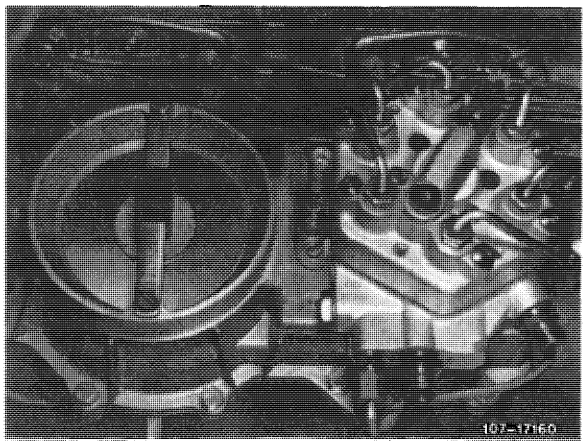


Testing

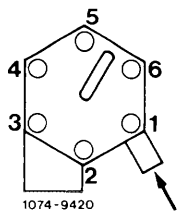
1 Set up fuel distribution reference unit horizontally adjacent to vehicle (tool or tester carriage).

2 Remove air cleaner.

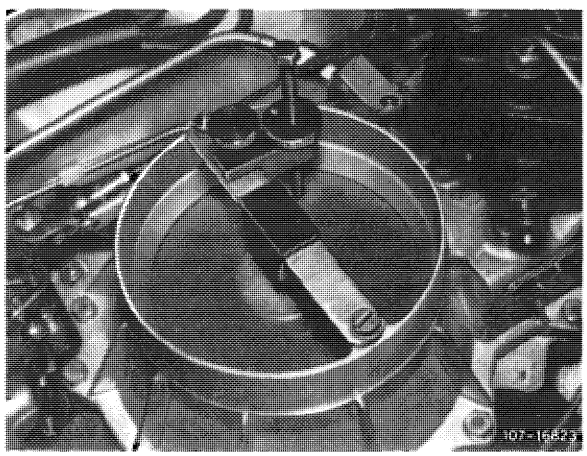
3 Unscrew injection lines on fuel distributor and loosen at injection valves, unscrew, if required.



4 Connect connecting lines of fuel distribution reference unit to fuel distributor (sequence according to Fig.) and plug fuel return line into filler neck of fuel tank.



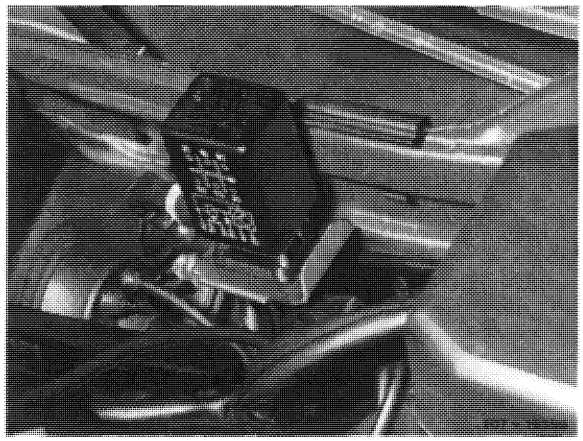
5 Clamp adjusting device for locating air flow sensor plate to stop bracket of air funnel (cone).



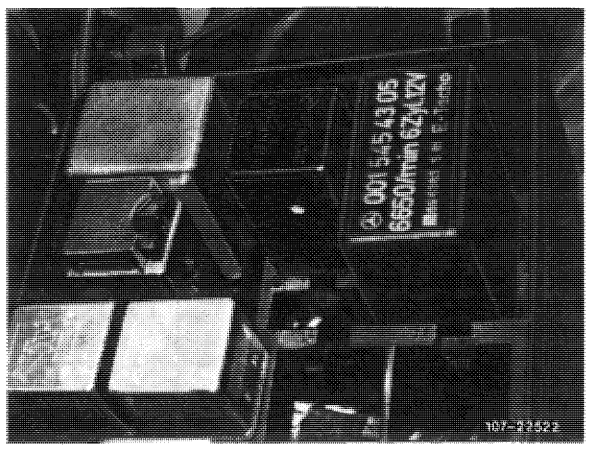
6 Switch-on ignition.

On vehicles without safety switch, pull off fuel pump relay and bridge the two jacks. This will connect the fuel pump to voltage.

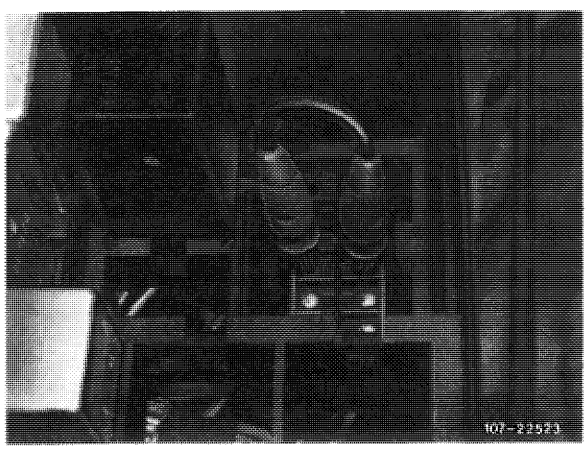
Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.



Model 123



Model 126



7 Deflect air flow sensor plate and push buttons 1 to 6 for venting unit individually for a short moment.

8 Keep one button pushed, deflect air flow sensor plate with adjusting device and locate at a flow rate of 6 cc/min (idle).

9 Push remaining buttons, read individual flow rates and enter on data sheet.

Note: Orders for data sheets, print no. 800.99.472.00 should be mailed by service establishments and representatives in the Federal Republic of Germany with punch cards to the "Drucksachen-Zentrallager in Stuttgart-Untertürkheim" and by the general representatives in export countries to "ZKD/F 2", Stuttgart-Untertürkheim. Data sheets are supplied in blocks of 50 sheets each.

10 Calculate difference between lowest and highest flow rate and compare with tolerance value (refer to test values).

11 For partial and full load, locate air flow sensor plate as described under item 7 at a flow rate of 30 cc/min or 100 cc/min. Then also calculate difference between lowest and highest flow rate and compare with tolerance value.

12 If the dispersion is outside tolerance, exchange fuel distributor.

13 Run engine and check all fuel connections for leaks.

14 Adjust idle speed (07.3–100).

07.3–165 Checking fuel pump relay with electronic rpm regulation (breakaway)

Breakaway speeds

Engine	MB-part no.	Breakaway speed 1/min	Speed signal
Without decel shutoff			
Standard version and (AUS) (J) (S) (USA) starting model year 1981			
110.984 110.986 110.987	001 545 07 05 001 545 14 05	6650 ± 50	–
With decel shutoff			
Standard version			
110.988	001 545 42 05	6650 ± 50	Mechanical tachometer
110.989 110.990	001 545 43 05		Electronic tachometer

Conventional testers

Voltmeter, revolution counter

Layout fuel pump relay

Model 107

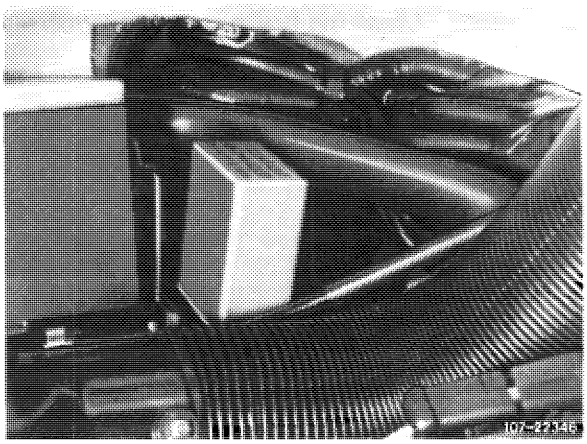
Lefthand steering

At the right inside vehicle behind glove box. For repairs, remove glove box.

Righthand steering

Model 107

At the right inside vehicle above pedals.

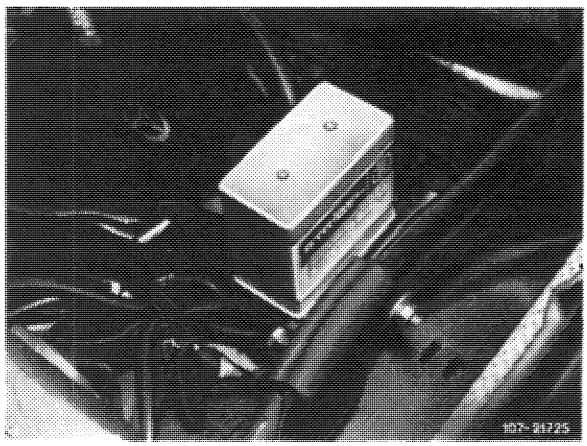


Model 123

Lefthand steering

At the left on wheel house.

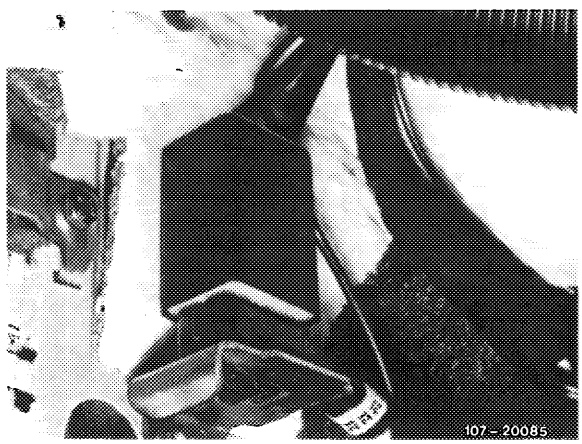
Model 123



Righthand steering

At the left inside vehicle behind side panelling. Remove cover for repairs.

Model 123

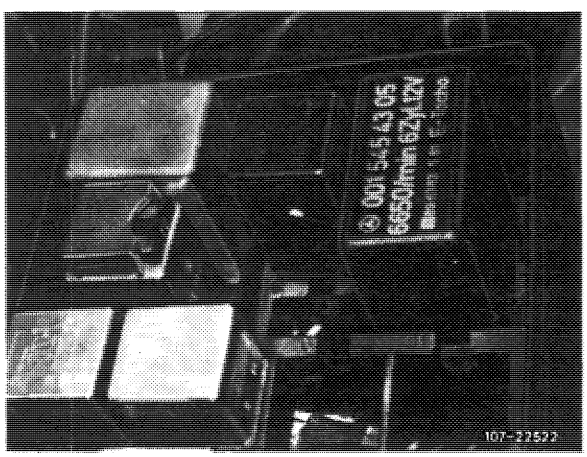


Model 126

Lefthand and righthand steering

At the left in fuse box.

Model 126

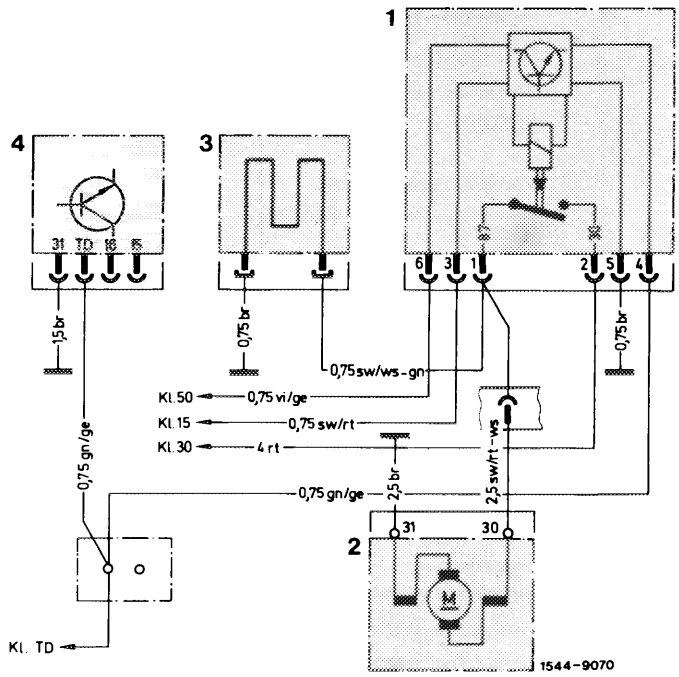


A. Prior to September 1981

Testing

Test condition

Battery charged to min. 60 %.

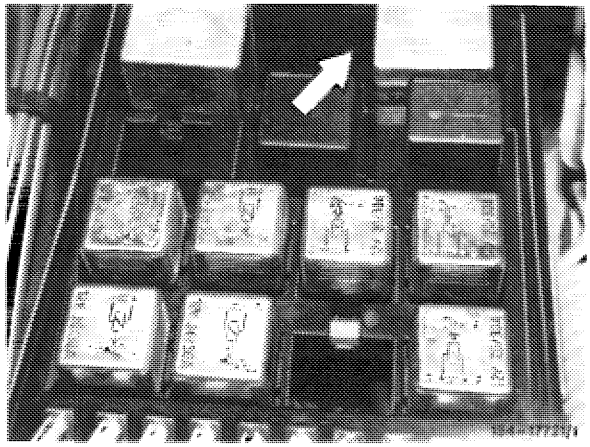


1 Fuel pump relay
2 Fuel pump
3 Warm-up compensator
4 TSZ (transistorized coil ignition) switching unit

Testing activation of fuel pump relay

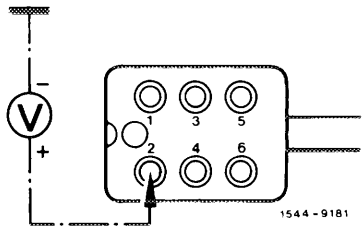
Remove fuel pump relay.
Connect negative cable (black) of voltmeter to vehicle ground). Measure voltage with positive cable (red) of voltmeter on jack 2 (terminal 30) of coupler.

approx. 12 Volts	0 Volt



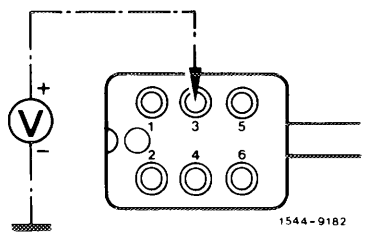
Test line (terminal 30, red) to cable connector engine harness for interruption.

Remove interruption.



Switch-on ignition.
Measure voltage by means of positive cable of voltmeter on jack 3 (terminal 15) of coupler.

approx. 12 Volts	0 Volt

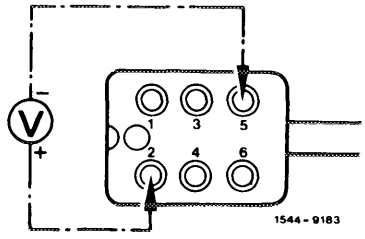


Test line (terminal 15, black/red) to ignition starting switch for interruption.

Remove interruption.

Connect positive cable (red) of voltmeter to jack 2 (terminal 30) and negative cable (black) of voltmeter to jack 5 (terminal 31) of coupler and measure voltage.

approx. 12 Volts	0 Volt



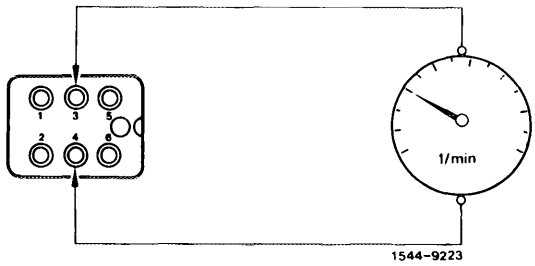
Test line (terminal 31, brown) to grounding point for interruption.

Remove interruption.

Connect revolution counter to jack 3 (terminal 15) and jack 4 (terminal TD) of coupler.

Operate starter.

approx. 200/min	0/min



Test line (terminal TD, green/yellow) to TSZ (transistorized coil ignition) switching unit for interruption.

Replace switching unit, if line is in order.

Testing operation of fuel pump relay

Connect negative cable (black) of voltmeter to vehicle ground. Plug fuel pump relay on coupler in such a manner that the voltage can be measured at connection 1 (terminal 87) of fuel pump relay by means of positive cable (red) of voltmeter. For this purpose, operate starter.

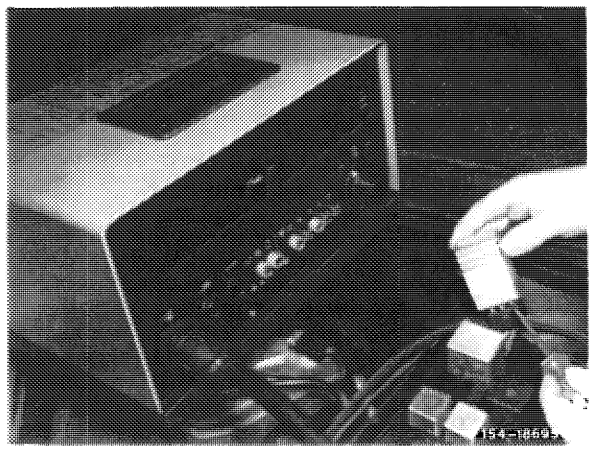
approx. 12 Volts	0 Volt

Replace fuel pump relay.

Run engine at idle.

Engine running.	Engine not running

Replace fuel pump relay.

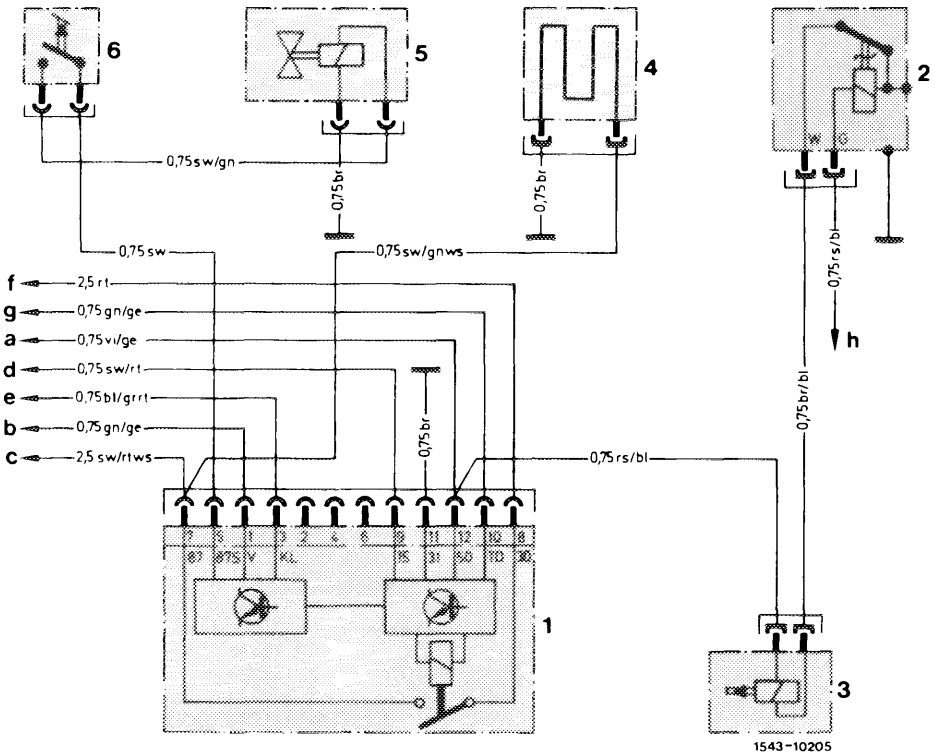


If engine is not regulated (breakaway) when attaining max. speed of engine, replace fuel pump relay.

The respective breakaway speed is punched into fuel pump relay.

End of test

B. Starting September 1981

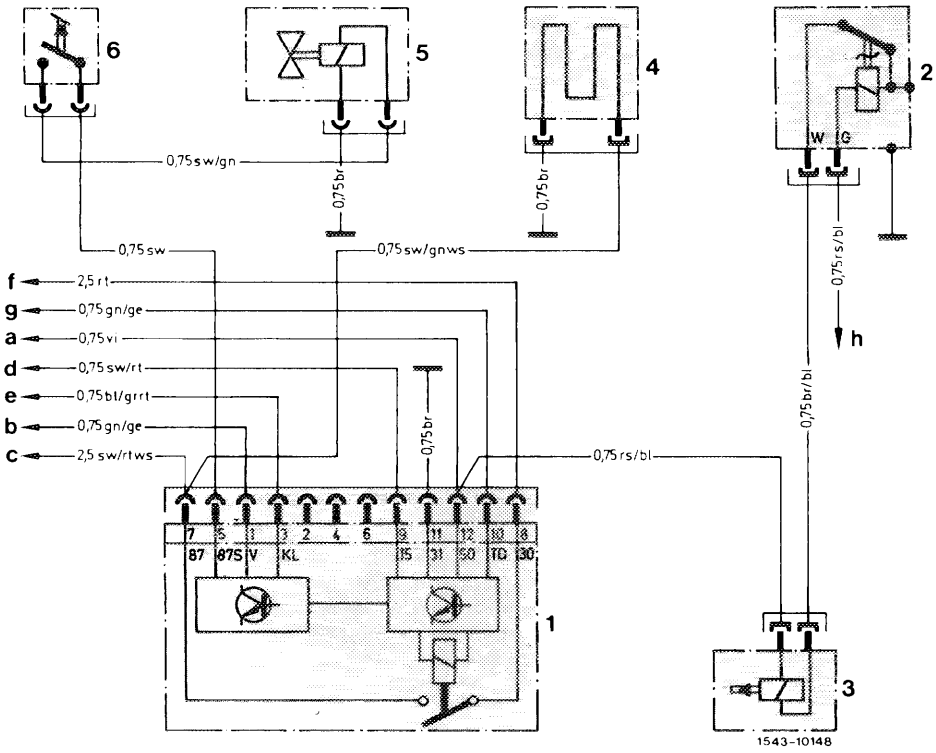


Wiring diagram model 123

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a To output starter lockout and backup lamp switch
b Transmitter mechanical tachometer
c Fuel pump
d Fuse 12 terminal 15 access
e Refrigerant compressor
f Cable connector engine terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



Wiring diagram model 107, 126

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up regulator
5 Switchover valve
6 Microswitch

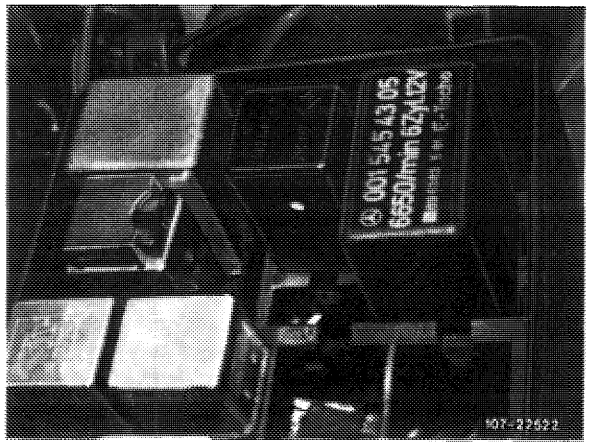
a Cable connector engine terminal 50
b Transmitter electronic tachometer
c Fuel pump
d Fuse 14 terminal 15 access
e Refrigerant compressor
f Cable connector terminal 30
g Cable connector terminal TD
h Cable connector terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white

Testing activation of fuel pump relay

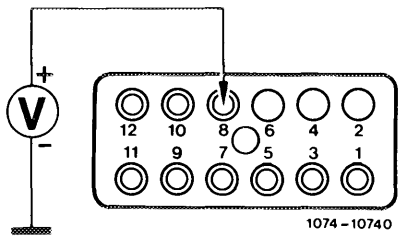
Remove fuel pump.
Connect negative cable (black) of voltmeter to vehicle ground. Measure voltage by means of positive cable (red) of voltmeter on jack 8 (terminal 30) of coupler.

approx. 12 Volts	0 Volt



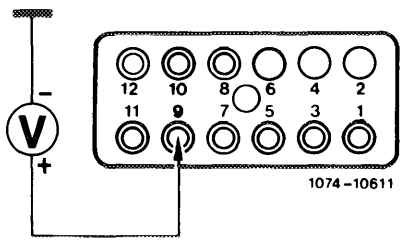
Test line (terminal 30, red) to cable connector engine harness for interruption.

Remove interruption.



Switch-on ignition.
Measure voltage by means of positive cable (red) of voltmeter on jack 9 (terminal 15) of coupler.

approx. 12 Volts	0 Volt

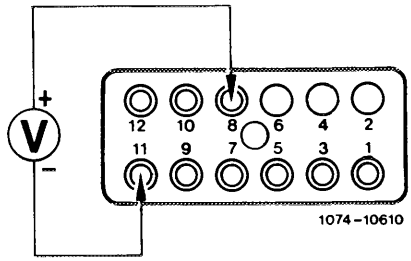


Test line (terminal 15, black/red) to fuse box for interruption.

Remove interruption.

Connect positive cable (red) of voltmeter to jack 8 (terminal 30) and negative cable (black) of voltmeter to jack 11 (terminal 31) of coupler and measure voltage.

approx. 12 Volts	0 Volt



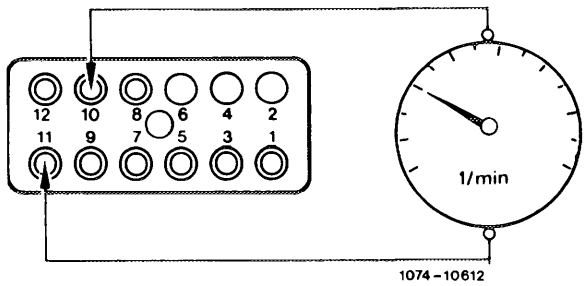
Test line (terminal 31, brown) to ground connection point for interruption.

Remove interruption.

Connect revolution counter to jack 10 (terminal TD) and jack 11 (terminal 31) of coupler.

Operate starter.

approx. 200/min	0/min



Test line (terminal TD, green/yellow) to TSZ (transistorized coil ignition) switching unit for interruption.

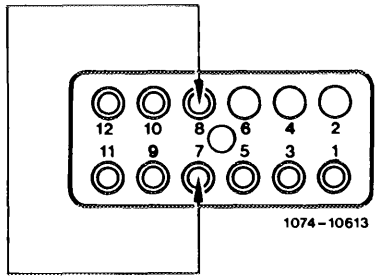
Replace switching unit if line is in order.

Testing operation of fuel pump relay

Bridge jack 7 (terminal 87) and 8 (terminal 30).
Fuel pump should now be heard starting.

Fuel pump running.

Yes	No



Test line (terminal 87, black/red/white) to fuel pump for interruption.

Remove interruption.

Fuel pump running.

Yes	No

Renew fuel pump.

Fuel pump running.

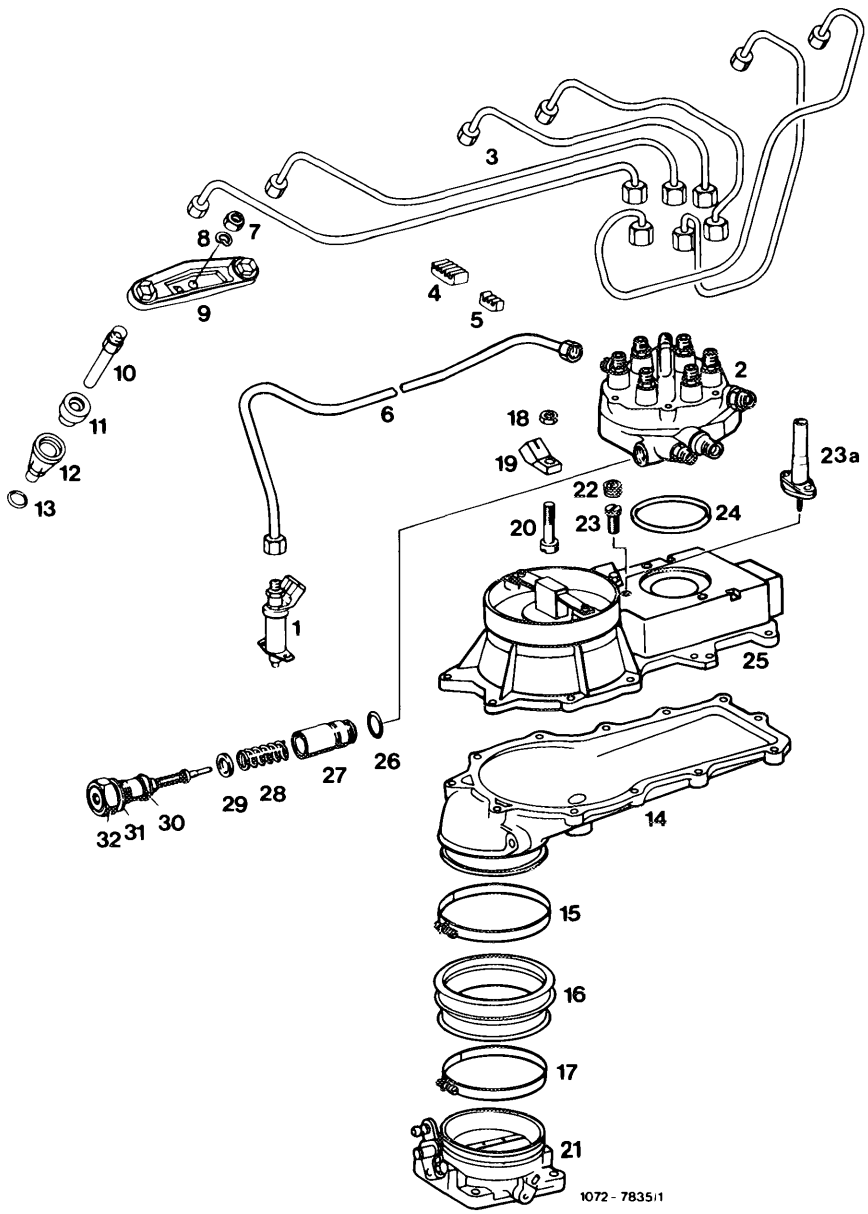
Yes	No

Renew fuel pump

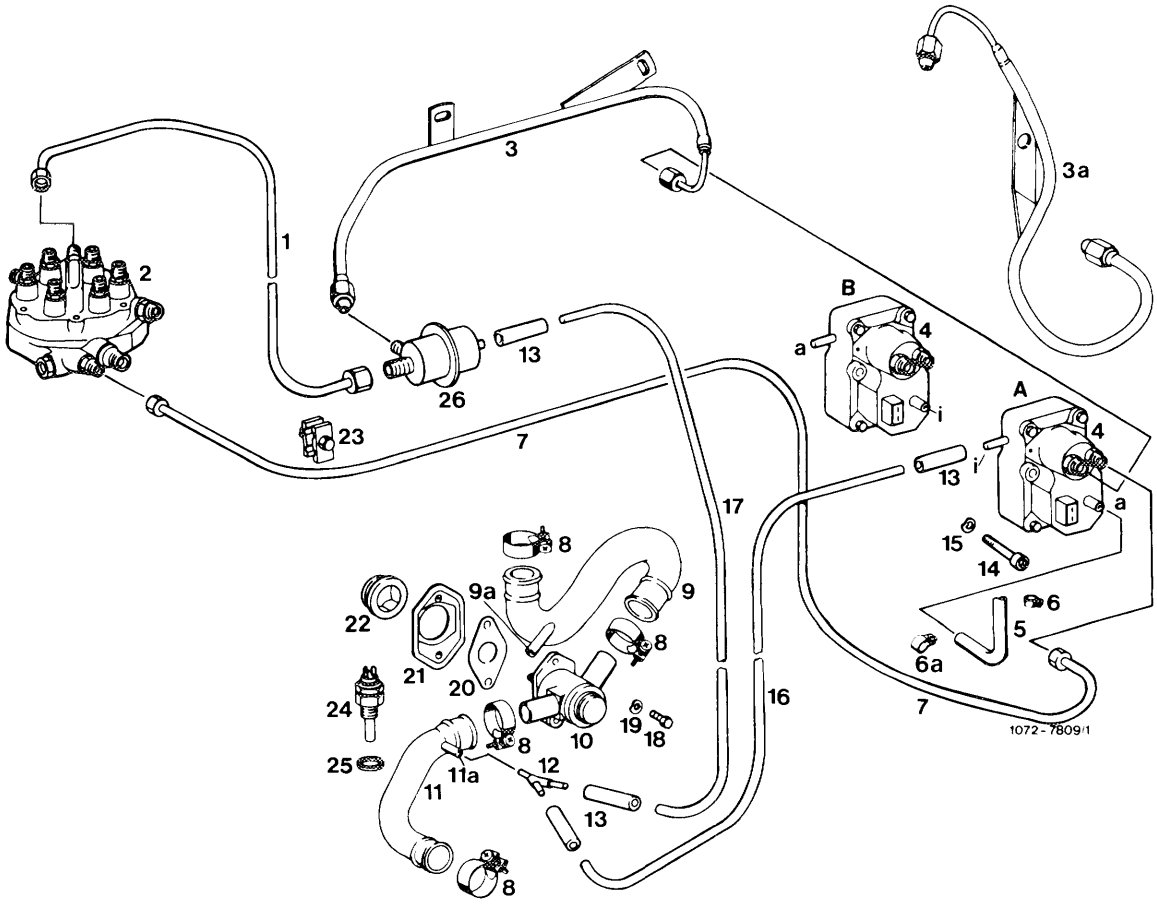
End of test

If engine is not regulated (breakaway) when engine max. speed is attained, replace fuel pump relay.

The respective breakaway speed is punched into fuel pump relay.



1 Cold starting valve
2 Fuel distributor
3 Injection lines
4 Plastic clip
5 Plastic clip
6 Fuel line
7 Nut
8 Corrugated washer
9 Fastening bridge
10 Injection valve
11 Rubber ring
12 Plastic sleeve
13 O-ring
14 Air guide housing
15 Hose clamp
16 Rubber sleeve
17 Hose clamp
18 Polystop nut
19 Safety switch
20 Screw
21 Throttle valve housing
22 Closing plug
23 Closing plug
23a Adjusting device
24 O-ring
25 Air flow sensor
26 O-ring
27 Regulator piston
28 Compression spring
29 Adjusting washers
30 O-ring
31 Copper sealing ring
32 Closing plug



1 Control pressure line
2 Fuel distributor
3 Control pressure line with Tecalan 1st version
3a Control pressure line with Tecalan 2nd version, starting with increased output
4 Warm-up compensator
5 Vacuum hose for full load enrichment
6 Hose clamp
6a Hose clamp for emission version only
7 Fuel return line
8 Hose clamp
9 Contour hose
9a Connection for ignition retard
10 Auxiliary air valve
11 Contour hose
11a Connection leak line 1st version
12 Distributor
13 Connecting hose
14 Screw
15 Corrugated washer
16 Leak line
18 Screw
19 Corrugated washer
20 Gasket
21 Flange
22 Closing plug
23 Fastening holder
24 Thermo time switch
25 Sealing ring
26 Pressure damper

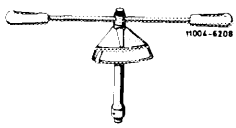
A Warm-up compensator prior to September 1981
a Vacuum connection for full load enrichment
i Connection to leak line (atmosphere)

B Warm-up compensator starting September 1981
a Vacuum connection for full load enrichment
i Connection to leak line (atmosphere)

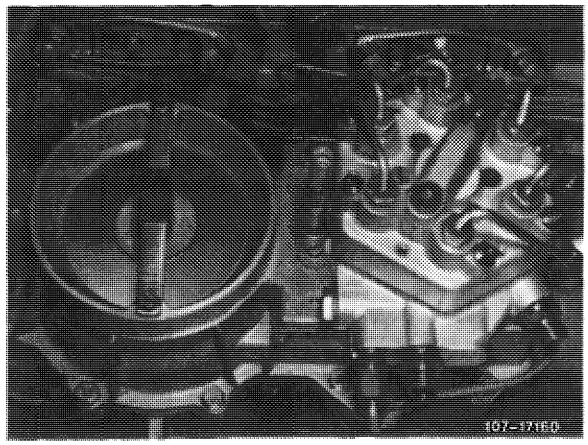
07.3–200 Removal and installation of mixture controller

Tightening torques	Nm
Hex. screws mixture controller to air guide housing	9–10
Hex. nuts mixture controller to intake manifold (rubber buffer)	9–10
Injection lines and fuel lines to fuel distributor (reference value)	10–12
Injection lines to injection valves (reference value)	10–15

Special tool

Torque wrench 1/4" square, 4–16 Nm		000 589 67 21 00

Removal



1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag.

Close fuel feed and return line blind.

3 Pull electric connecting cable, to the extend installed, from safety switch.

4 Unscrew all hex. screws and both hex. nuts from mixture controller.

5 Remove mixture controller.

6 Renew air guide housing according to condition. For this purpose, loosen hose clamp on rubber sleeve and on contour hose for idle air.

7 Mount air guide housing.

8 Install mixture controller with Curil K 2 or Hylomar in vice versa sequence.

9 Tighten hex. screws and hex. nuts to 9–10 Nm.

10 Connect injection lines and fuel lines. Pay attention to tightening torques as reference values.

Attention!
When tightening injection lines and fuel lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

11 Run engine and check all fuel connections for leaks.

12 Adjust idle speed (07.3–100).

07.3–205 Replacement of fuel distributor

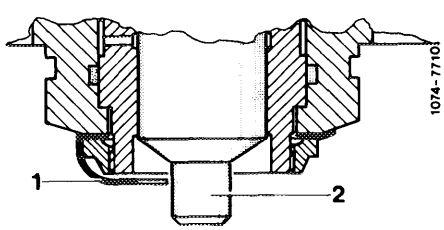
Tightening torques (reference values)	Nm
Injection lines to fuel distributor	
Fuel line for cold starting valve to fuel distributor	
Fuel return line from warm-up compensator to fuel distributor	10–12
Control pressure line to fuel distributor	
Control pressure line to pressure damper	
Injection lines to injection valves	10–15

Note

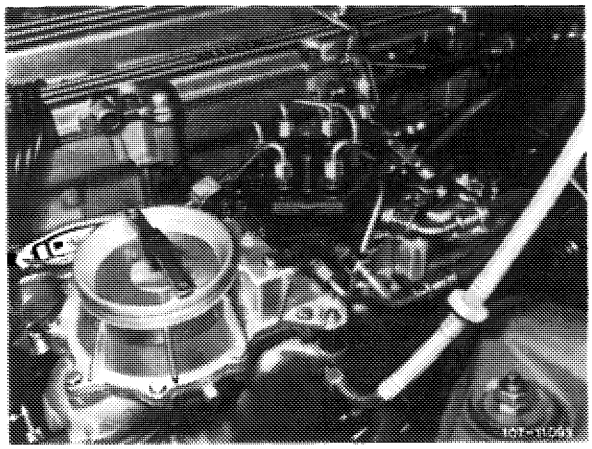
After stocks of fuel distributor made of gray iron have been used up, only fuel distributors made of light alloy are available as spare parts

Note that for engines 110.984/985/986 they are manufactured with the characteristic of the fuel distributor made of gray casting and without pressure compensating valve. This fuel distributor i s not identical with the light alloy distributor installed in production vehicles (series).

The fuel distributor (gray iron starting Bosch production date 725 and light alloy fuel distributor) is provided with a sheet metal lock (1), which prevents control piston (2) from falling out. The sheet metal lock serves to facilitate assembly, as well as a safety device during transportation, and should not be removed.



Removal



1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag. Close fuel feed and return line blind.

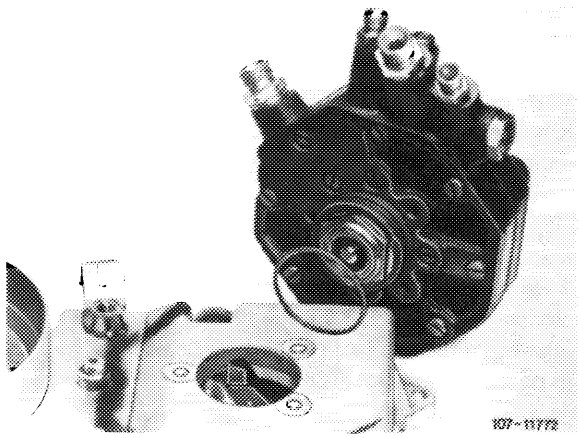
3 Unscrew double thread connection for control pressure line on fuel distributor.

4 Unscrew the three fastening screws on fuel distributor.

5 Remove fuel distributor by turning distributor back and forth.

Attention!
When removing fuel distributor which is not provided with a sheet metal lock, make sure that the control piston is not falling out.

Installation



6 Slip new rubber ring on fuel distributor.

7 Slightly lubricate rubber ring and **carefully** mount fuel distributor.

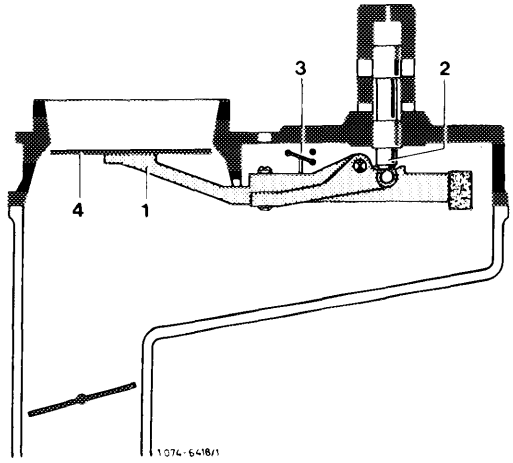
Attention!
Do not damage rubber ring during assembly, since otherwise false air will be sucked in.

8 Screw-in the three fastening screws on fuel distributor.

9 Screw-on double thread connection for control pressure line on fuel distributor.

10 Connect all fuel lines except injection lines.

11 Check adjusting lever (1) in air flow sensor and control piston (2) in fuel distributor for easy operation. In addition, on:



Mixture controller **with** safety switch

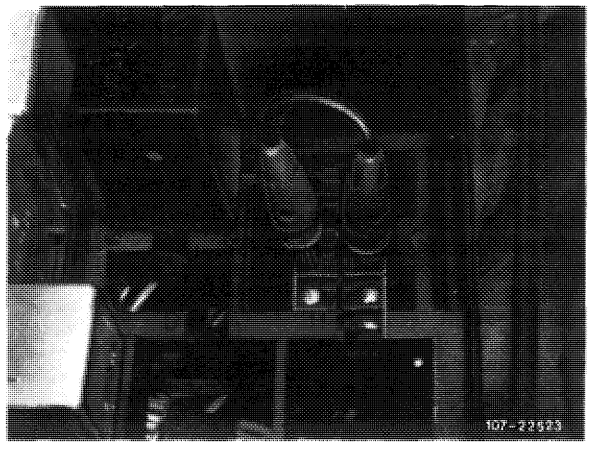
Pull plug from safety switch (3), switch-on ignition for a short moment to establish control pressure.

Mixture controller **without** safety switch

Pull-off fuel pump relay and bridge the two jacks for a short period to establish control pressure.

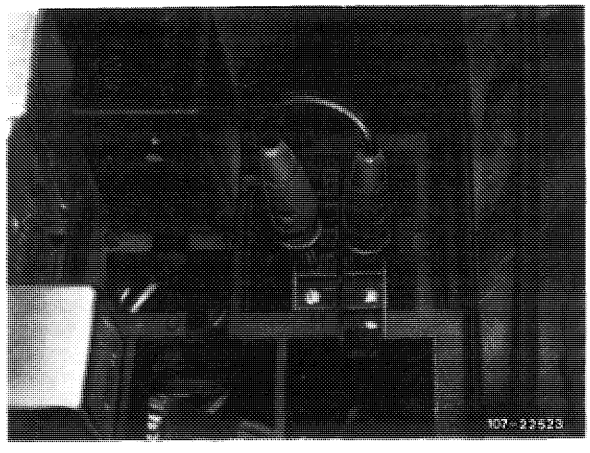
Prior to September 1981: Jacks 1 and 2.
Starting Spetember 1981: Jacks 7 and 8.

Push air flow sensor plate (4) manually down. A uniform resistance should be felt across entire path. During fast upward movement, no resistance should be felt, since the slowly following control piston lifts from adjusting lever. During a slow upward movement the control piston should follow closely.



12 Check association of control piston with air flow sensor plate and adjust, if required. For this purpose, switch-on ignition, pull cable plug from safety switch or pull off fuel pump relay and bridge the two jacks. The fuel should now just stop flowing at output connection to injection lines, adjust association by means of idle speed mixture control screw, if required.

Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.



13 Mount injection lines.

14 Run engine and check all fuel connections, as well as rubber ring on fuel distributor for leaks by spraying.

15 Adjust idle speed (07.3–100).

Test values

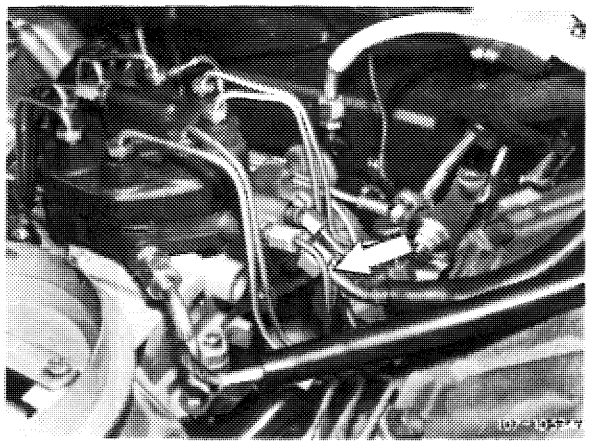
System pressure (engine cold or warm) at idle	5.0–5.6 bar gauge pressure

Conventional tools

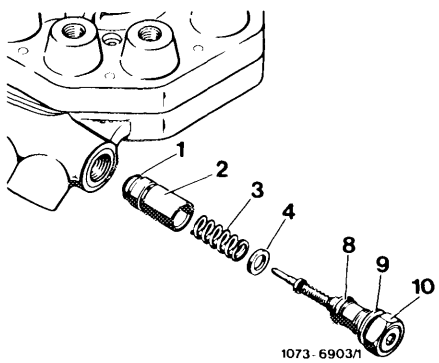
Screw driver element 992–T 30	e.g. made by Hazet, D-5630 Remscheid

Reconditioning system pressure regulator

1 Discharge fuel pressure. For this purpose, unscrew fuel return flow hose (arrow) on fuel distributor. Catch fuel with a rag. Close fuel return flow hose blind.



2 Disassemble system pressure regulator. Unscrew closing plug (10). When screwing out, make sure that the compression spring (3) and the adjusting washers (4) are not falling out.



3 Remove regulator piston (2) with a magnet or a wooden stick (pencil).

4 Install parts from repair kit. O-ring (1) is also available as a single part.

Attention!
The regulator piston (2) is fitted for fuel distributor and should not be replaced. If required, completely replace fuel distributor.

Place new O-ring (1) on regulator piston (2), lubricate slightly and mount regulator piston with compression spring (3).

Mount assembly group with removed adjusting washers (4) and copper sealing ring (9) included in delivery.

5 Test system pressure (07.3–120). If system pressure deviates from nominal value, remove system pressure regulator once again and adjust system pressure by adding or removing adjusting washers (4).

Adjusting washers are available as follows:

0.1 mm
0.15 mm
0.3 mm
0.4 mm
0.5 mm thick

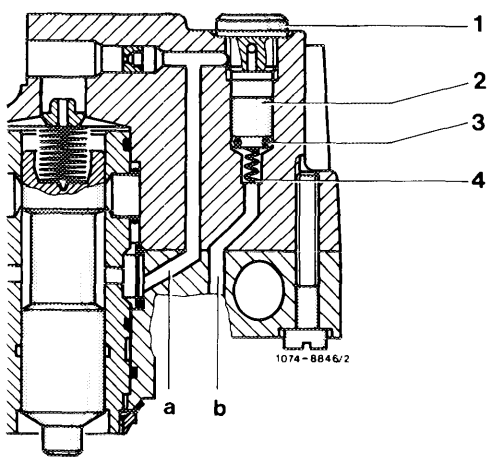
The adjusting washers are available in repair kit.

0.1 mm provides approx. 0.2 bar gauge pressure for system.

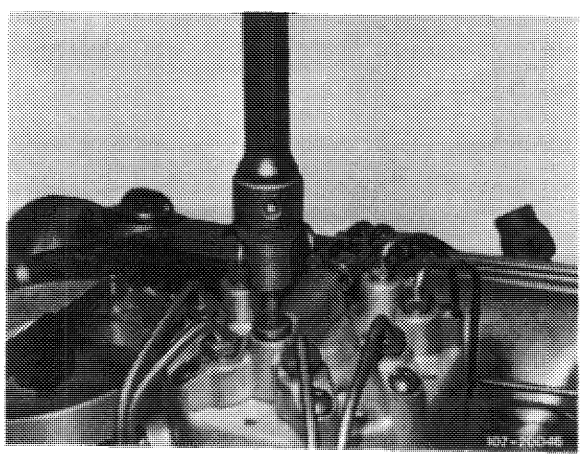
Reconditioning pressure compensating valve

6 Unscrew closing plug (1). Remove piston (2) with contour ring (3).

7 Install parts of repair kit.



For loosening closing plug (1), use screw driver element, e.g. made by Hazet, D-5630 Remscheid, order no. 992–T 30.



Tightening torques (reference values)	Nm
Injection lines to fuel distributor	10–12
Injection lines to injection valves	10–15

Removal

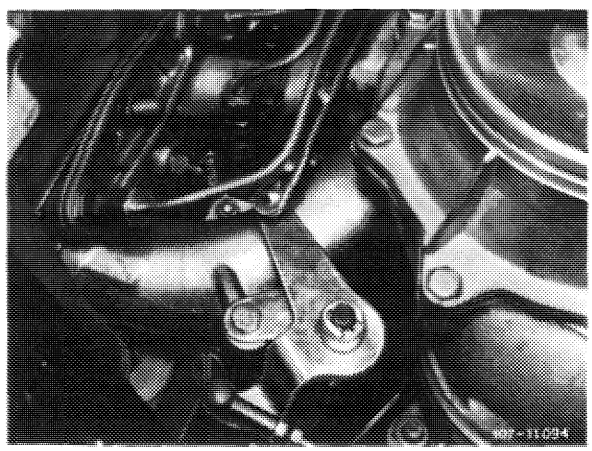
1 Remove air cleaner.

2 Unscrew injection lines from injection valves and on fuel distributor. When loosening injection lines, apply counterhold to injection valves.

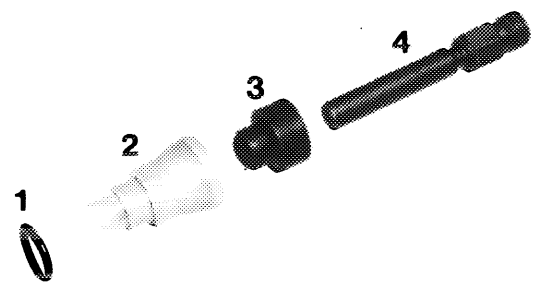
3 Loosen fastening nuts and remove fastening bridges.

For removing injection valves from cylinder 5, remove 6 pressure dampers.

Attention!
When removing fastening bridges, apply counterhold to injection valves, so that injection valves and insulating sleeves are not pulled out at the same time.



4 Pull out injection valves while applying counterhold to insulating sleeves (2). If the insulating sleeves are pulled out, install new O-rings (1).



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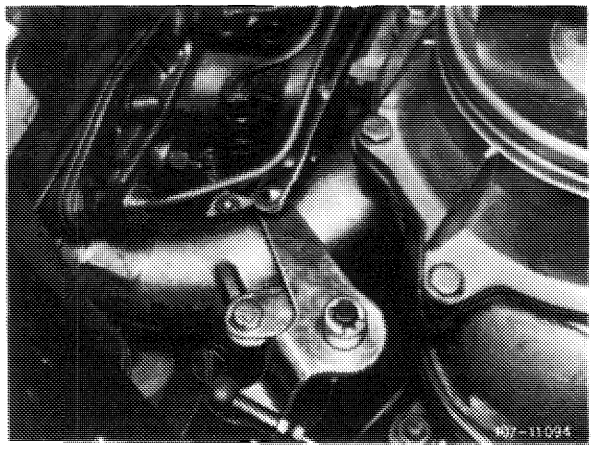
Installation



5 Install injection valves in vice versa sequence. For this purpose, transfer rubber sealing rings (3) or replace, if required.

Install fastening bridges in such a manner that the lugs are at the left.

Note: Mount pulled-out insulating sleeves with new O-rings.

6 Connect injection lines while paying attention to tightening torques as reference values.

Attention!
When tightening injection lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

7 Run engine and check all fuel connections for leaks.

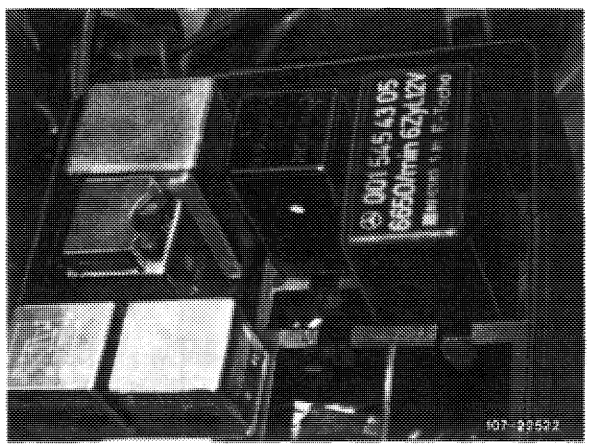
Note

Following installation of light alloy fuel distributor in production vehicles (series), the safety switch on air flow sensor is no longer installed. An electronic relay is used instead (for operation, refer to 07.3–500).

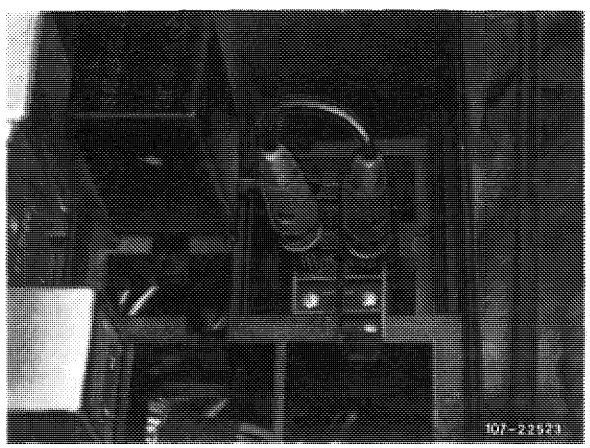
Layout and testing of fuel pump relay (07.3–165).

For test jobs performed with engine stopped and fuel pump *running*, pull off fuel pump relay and bridge the two jacks.

Prior to September 1981: Jack 1 and 2.
Starting September 1981: Jack 7 and 8.



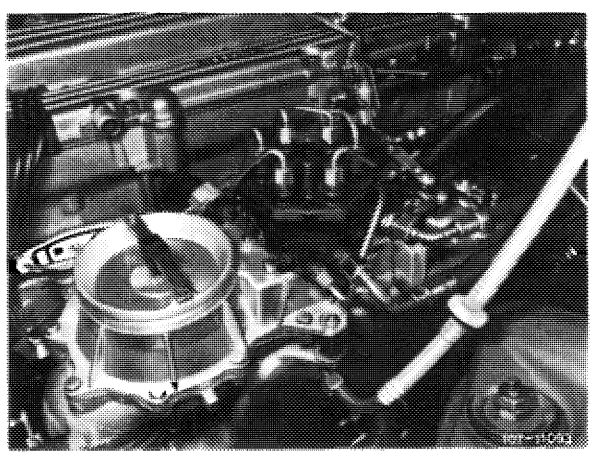
Model 126



Replacement

1 Remove and install mixture controller (07.3–200).

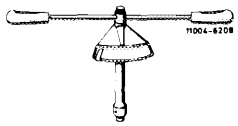
2 Remove and install fuel distributor (07.3–205).



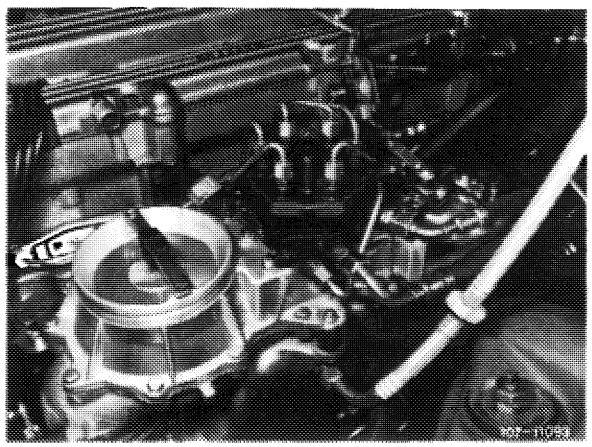
07.3–225 Removal and installation of mixture controller with air guide housing

Tightening torques	Nm
Hex. nuts mixture controller to intake manifold (rubber buffer)	9–10
Injection lines and fuel lines to fuel distributor (reference value)	10–12
Injection lines to injection valves (reference value)	10–15

Special tool

Torque wrench 1/4" square, 4–16 Nm		000 589 67 21 00

Removal



1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag.

Close fuel feed and return flow line blind.

3 Pull electric connecting cables, to the extent installed, from safety switch.

4 Loosen hose clamp on rubber sleeve between air guide housing and throttle valve housing.

5 Unscrew both hex. nuts on rubber buffers.

6 Lift off mixture controller with air guide housing, while pulling off idle air hose.

Installation

7 For installation proceed vice versa.

8 Tighten both hex. nuts to specified tightening torques by means of a torque wrench.

9 Connect injection lines and fuel lines, while paying attention to tightening torques as reference values.

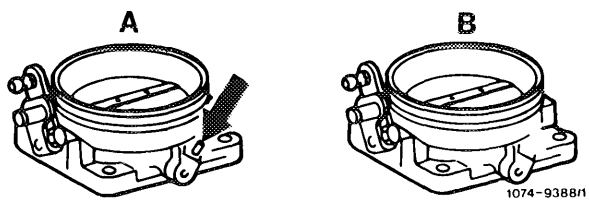
Attention!
When tightening injection lines and fuel lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

10 Run engine and check all fuel connections for leaks.

11 Adjust idle speed (07.3–100).

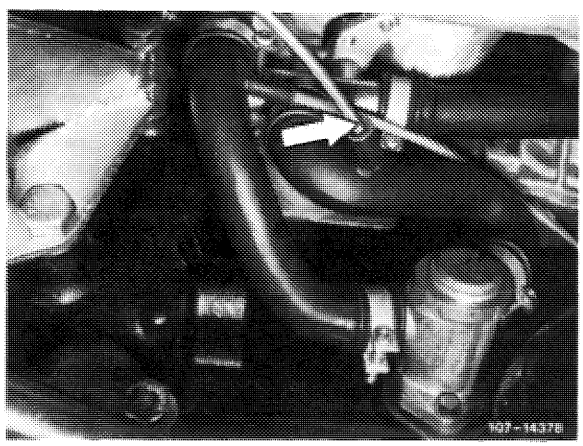
Note

Connection (arrow) for ignition retard on throttle valve housing is no longer installed.



A Former version
B Present version

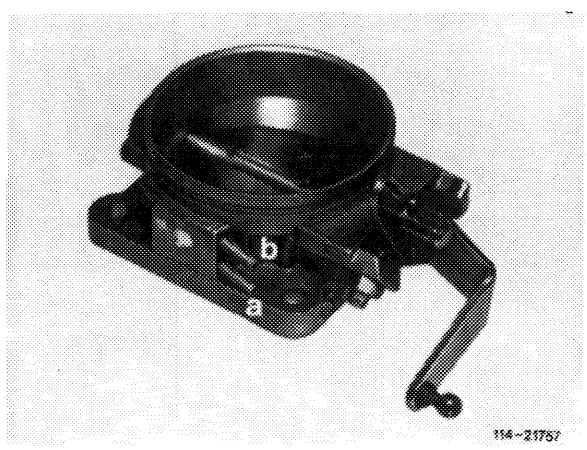
To obtain a higher speed following a cold start at low outside temperatures, the connection on throttle valve housing for ignition retard has been transferred from throttle valve housing to contour hose between auxiliary air valve and idle speed air distributor starting April 1978. In-between, the connection on throttle valve housing has been closed by means of a rubber cap.



Starting September 1981, the throttle valve housing is provided with 2 connections.

Connection "a" for EGR (function diagram refer to 14–500).

Connection "b" for ignition advance.



Removal

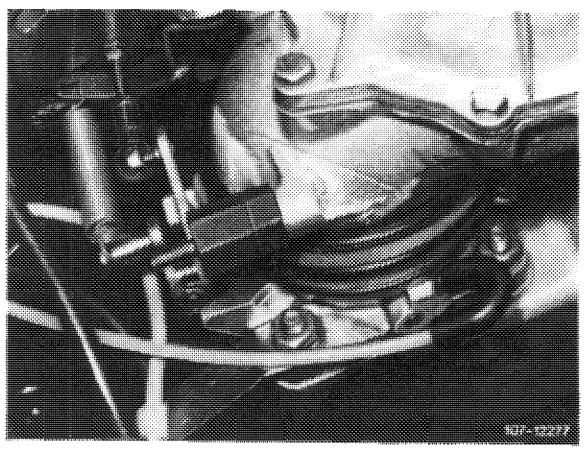
1 Remove mixture controller with air guide housing (07.3–225).

2 Loosen and remove rubber sleeve.

3 Disconnect regulating linkage and return spring.

4 Pull off vacuum connections.

5 Loosen fastening nuts and remove throttle valve housing.



Installation

6 For installation proceed vice versa, using new gasket.

7 Adjust regulating linkage (30–300).

8 Adjust idle speed (07.3–100).

When installing a new engine or an exchange engine without safety switch (19) on air flow sensor and distributor rotor with rpm limitation in vehicles which have been installed with these components up to now, use safety switch and distributor rotor from old engine.

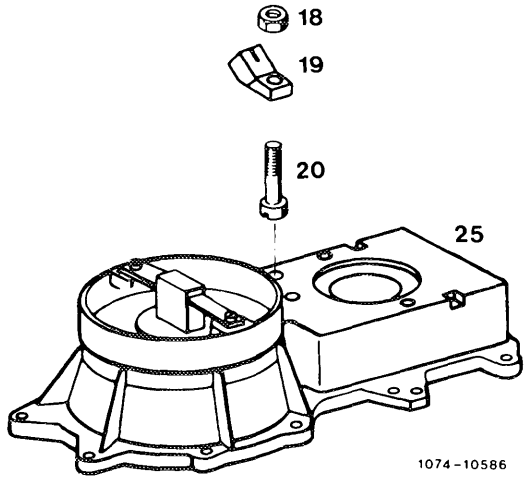
Installation

1 Remove mixture controller from new engine.

2 Install safety switch (19) as shown in Fig.. Do not use removed disk.

Attention!
When mounting safety switch, make sure that insulating disk is correctly mounted under leaf spring.

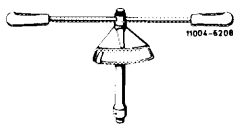
3 Install distributor rotor with rpm limitation into new engine.



07.3–245 Replacement, centering and zero position of air flow sensor plate

Tightening torque	Nm
Hex. screw	5.0–5.5

Special tool

Torque wrench 1/4" square, 4–16 Nm		000 589 67 21 00

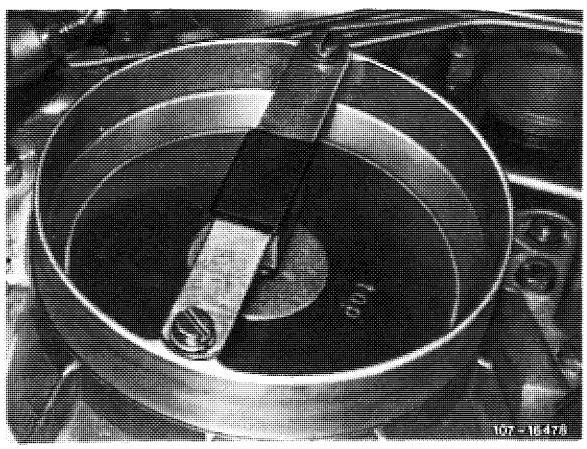
Conventional equipment and tools

Hot air blower, tap M 6

Removal

1 Remove air cleaner.

2 Unscrew stop bracket.



3 Heat fastening screw with a hot air blower and screw out with care (risk of tearing threads).

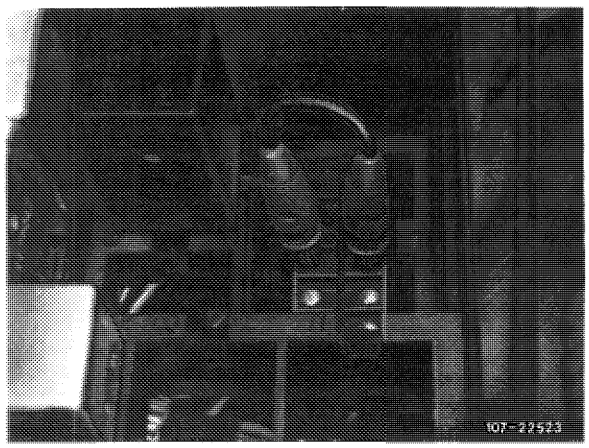
Attention!
The fastening screw is micro-encapsulated.

4 Clean bore for fastening air flow sensor plate with M 6 tap.

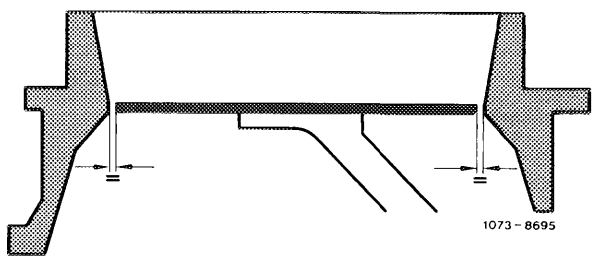
5 Install parts contained in repair kit. Make sure that the letters "TOP" are on top and insert air flow sensor plate. Lightly screw-in micro-encapsulated fastening screw (self-locking).

6 Center air flow sensor plate. For this purpose, pull off fuel pump relay (arrow) and bridge the two jacks **short**, or pull off plug on safety switch. Switch-on ignition for a short moment to establish control pressure.

Prior to September 1981: Jacks 1 and 2
Starting September 1981: Jacks 7 and 8



Use slip gauge 0.10–0.20 mm and make sure that the air flow sensor plate is accurately centered. Plate should not bind even under light lateral pressure (bearing play cancelled).

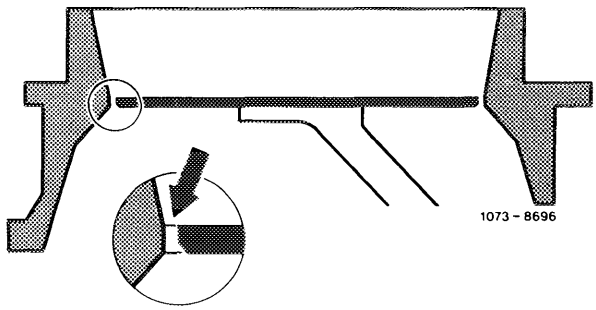


7 Tighten fastening screw to 5.0–5.5 Nm.

8 Check air flow sensor plate for easy operation. For this purpose, push plate down manually. Plate should not bind. Release plate, which should also not bind when moving back and should audibly abut against resilient contact. Center air flow sensor plate again, if required.

9 Check zero position (rest position) of air flow sensor plate. Upper edge of plate should close accurately flush with cylindrical part of of air funnel (arrow) along entire circumference. A higher location up to max. 0.5 mm is permitted.

Note: To check zero position, bridge electric safety circuit (refer to item 6). This will provide control piston with control pressure.



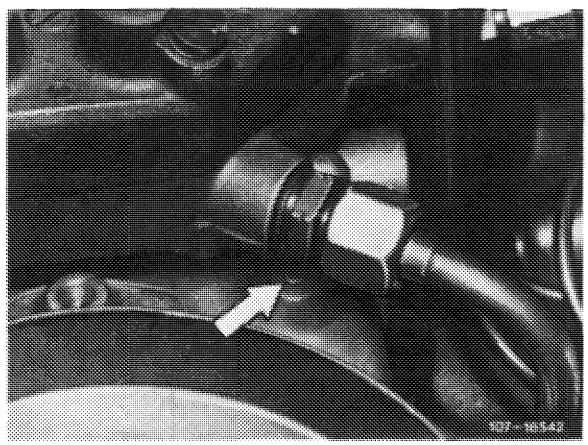
10 Adjust zero position of air flow sensor plate:

a) If too high, lock guide pin (arrow) by means of a mandrel to required depth.

b) If too low, remove mixture controller and knock-in guide pin from below (07.3–200).

Attention!
Do not knock-in guide pin too low.

Avoid repeated adjustments in both directions, since the press fit of the pin will become too loose.



11 Mount stop bracket and fuel pump relay or attach plug to safety switch.

12 Adjust idle speed (07.3–100).

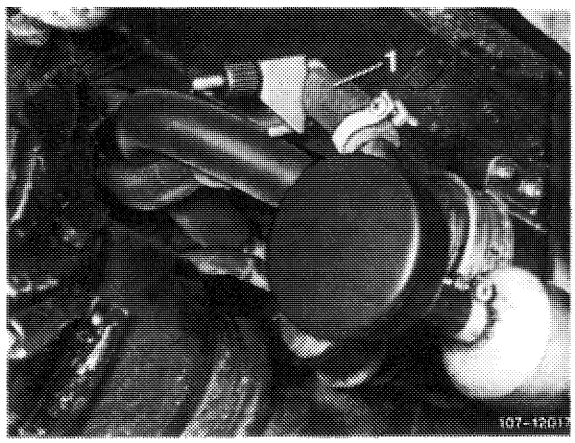
Special tool

Clamp for fuel hose		000 589 40 37 00

Removal

1 Unscrew protective case.

2 Pinch fuel intake hose (arrow) with a clamp.



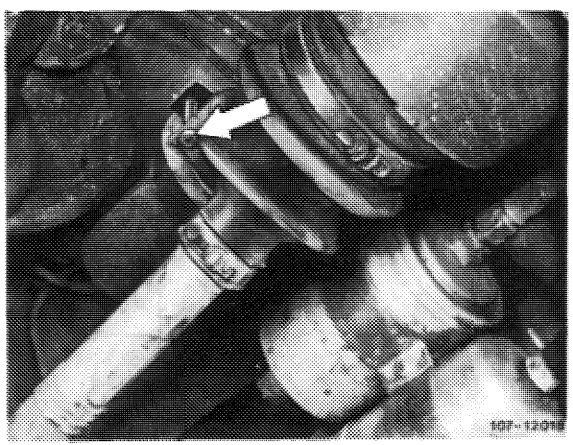
1st version

3 Pinch fuel feed hose.

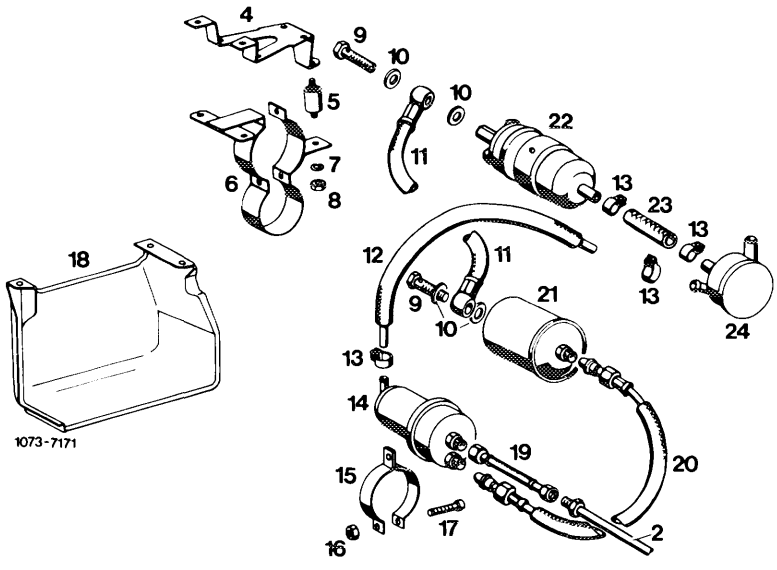
4 Unscrew both fuel hoses on fuel reservoir, also pinch leak hose, loosen and pull off.

5 Loosen fastening screws (arrow) for clamp and remove fuel reservoir.

6 For installation proceed vice versa. Pay attention to correct connection of fuel hoses, fasten fuel feed hose to center connection of fuel reservoir.



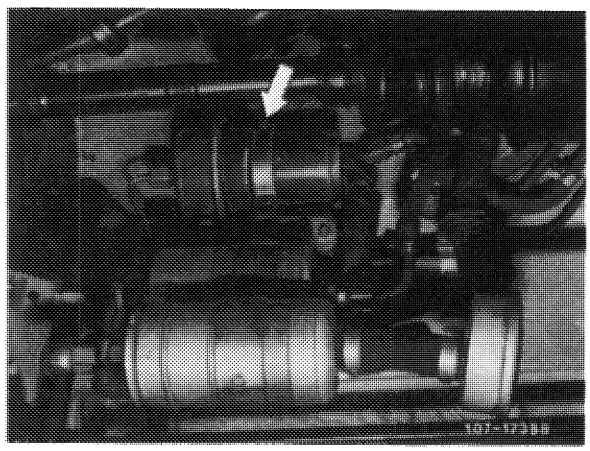
2 Fuel feed line
4 Mounting bracket
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper



2nd version

7 Unscrew fuel line on fuel reservoir, also pinch leak hose, loosen and pull off.

8 Loosen fastening screw (arrow) for clamp and remove fuel reservoir.



Installation

9 For installation proceed vice versa.

10 Remove clamp on fuel suction hose.

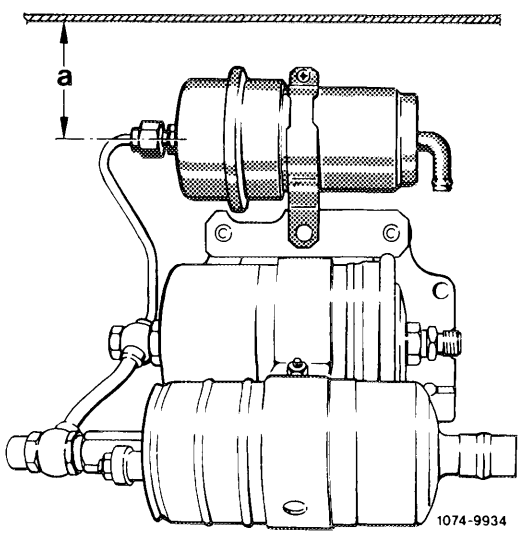
11 Run engine and check for leaks.

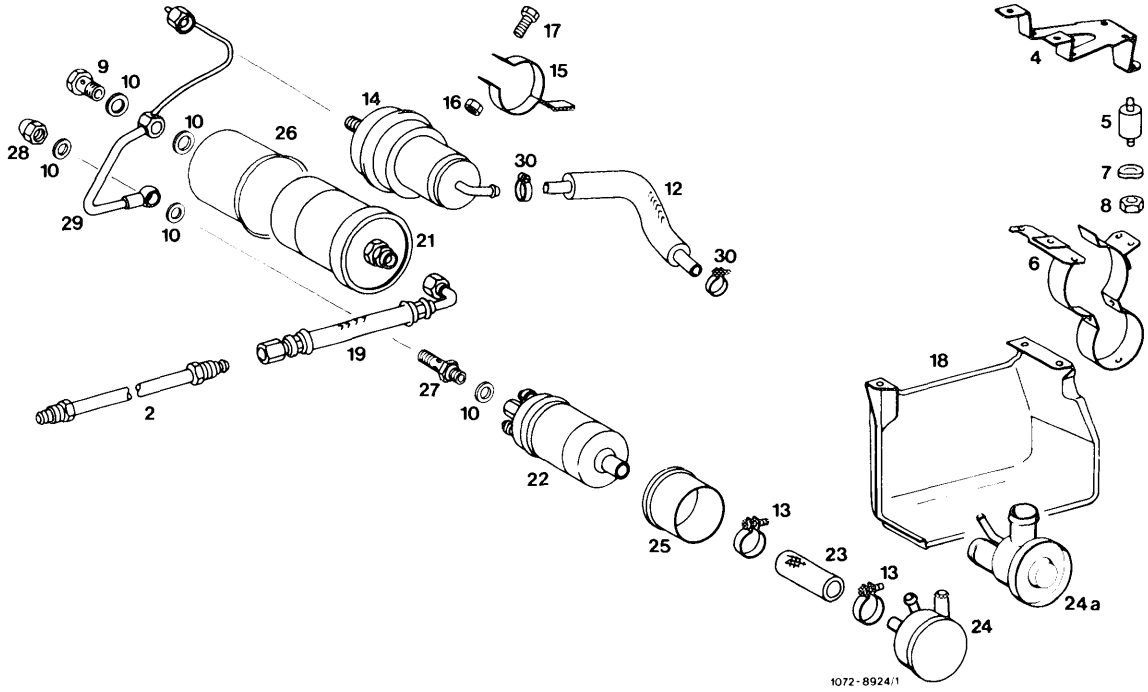
12 Mount protective case.

Note: On model 126, measure distance between fuel reservoir and body floor as shown in Fig.

Nominal dimension = 62 mm.

If required, push fuel reservoir in upward direction. For this purpose, apply manual counterhold against fuel pump.





2	Fuel feed line	18	Protective case
4	Mounting bracket	19	Fuel hose
5	Anti-vibration buffer	21	Fuel filter
6	Holder	22	Fuel pump
7	Snap ring	23	Fuel hose
8	Nut	24	Damper 1st version
9	Hollow screw	24a	Diaphragm damper 2nd version
10	Sealing ring	25	Plastic sleeve
12	Fuel hose	26	Plastic sleeve
13	Hose clamp	27	Check valve
14	Fuel reservoir	28	Cap nut
15	Holder	29	Steel line
16	Nut	30	Hose clamp
17	Screw		

07.3–275 Removal and installation of fuel filter

Special tool

Clamp for hose lines		000 589 40 37 00

Note

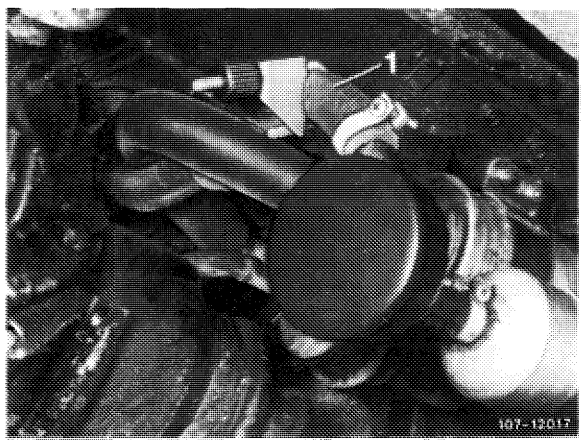
The fuel filter is especially provided with an integrated damper for silencing. To prevent contact corrosion, the fuel filter is provided with a plastic sleeve.

When exchanging fuel filter, make sure that the plastic sleeve is installed between fuel filter and mounting bracket. Also make sure that sleeve projects on both sides of bracket, since direct contact of fuel filter with bracket may result in contact corrosion.

Removal

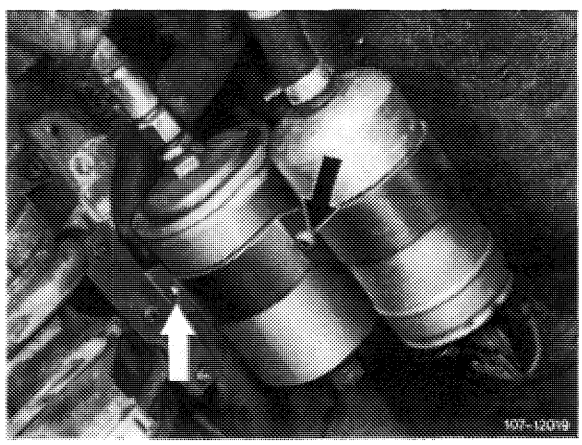
1 Unscrew protective case.

2 Pinch fuel suction hose (1) with a clamp.

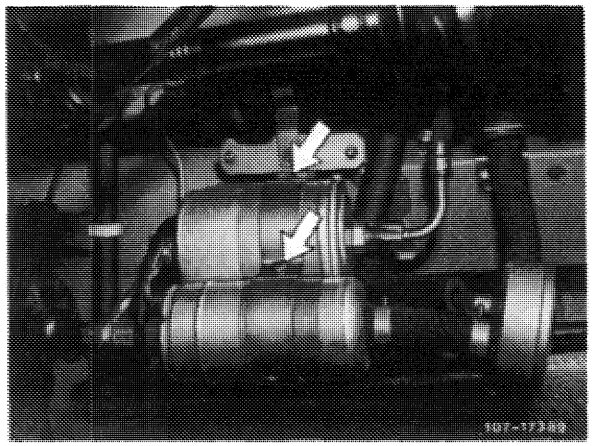


3 Unscrew fuel line and fuel hose from fuel filter.

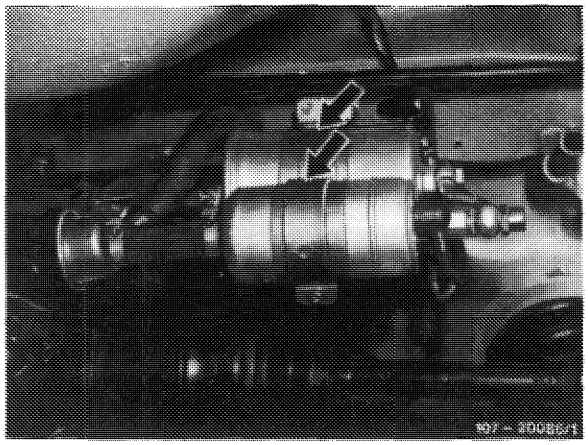
4 Loosen both fastening screws (arrow) and remove fuel filter.



1st version



2nd version

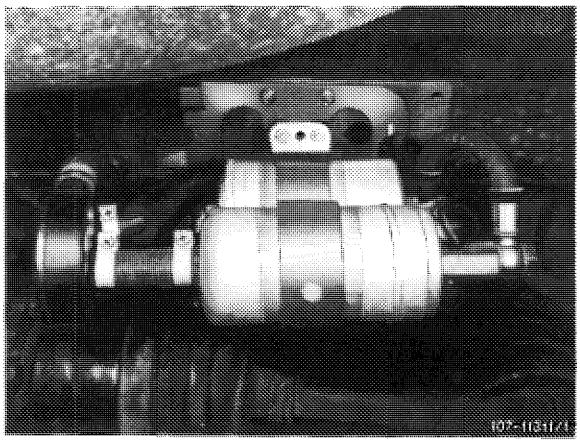


3rd version

Installation

5 For installation proceed vice versa, using new sealing rings.

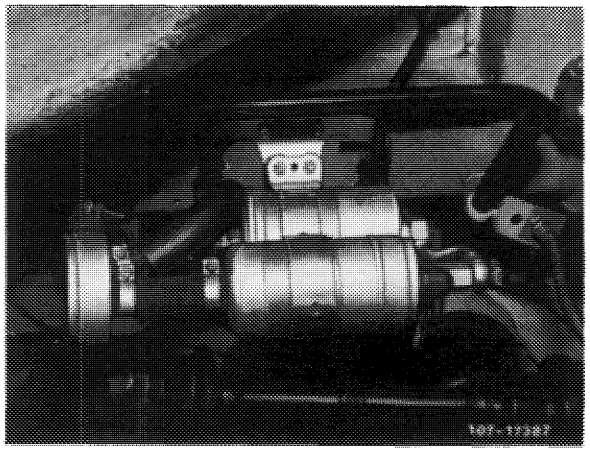
6 Locate fuel filter with plastic sleeve in holder. Plastic sleeve should project on both sides of holder, since direct contact of fuel filter with holder may lead to contact corrosion.



7 Remove clamp on fuel suction hose.

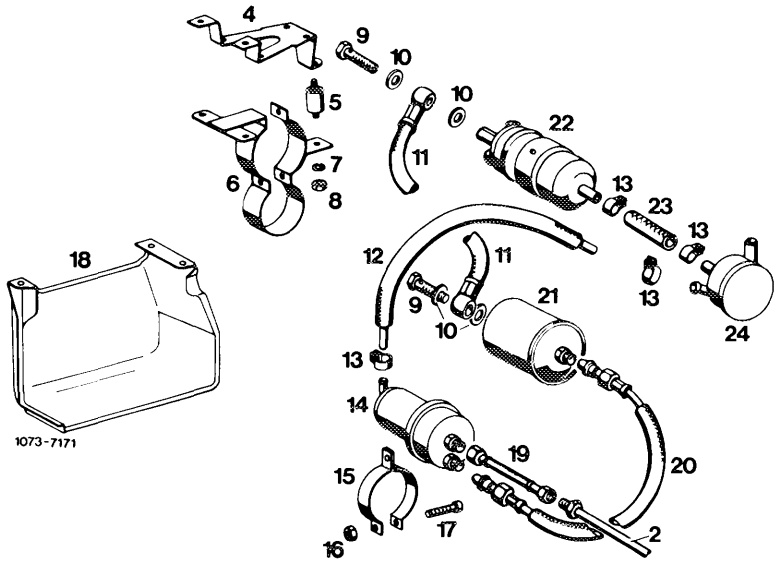
8 Run engine and check for leaks.

9 Mount protective case.

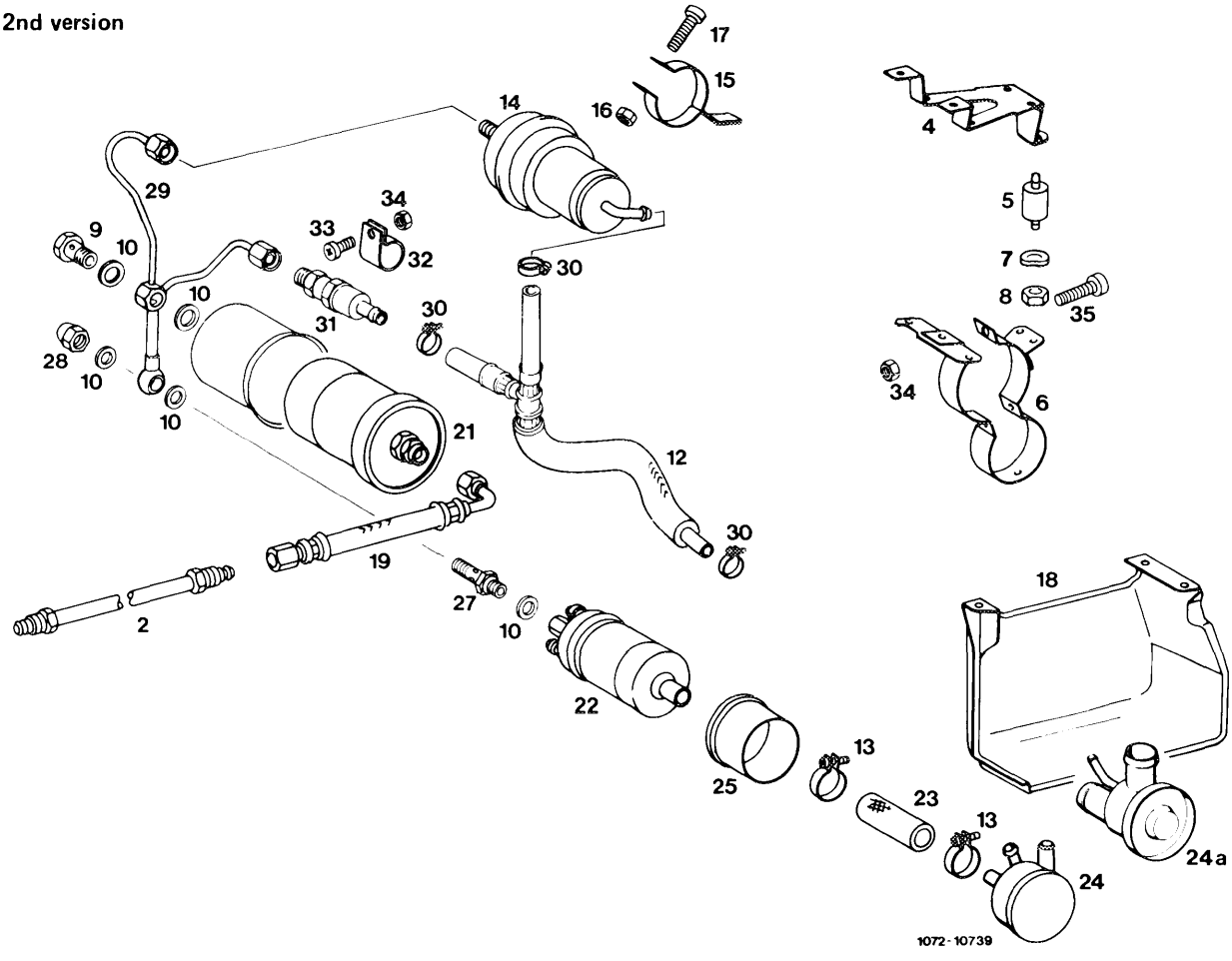


1st version

2 Fuel feed line
4 Mounting bracket
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper

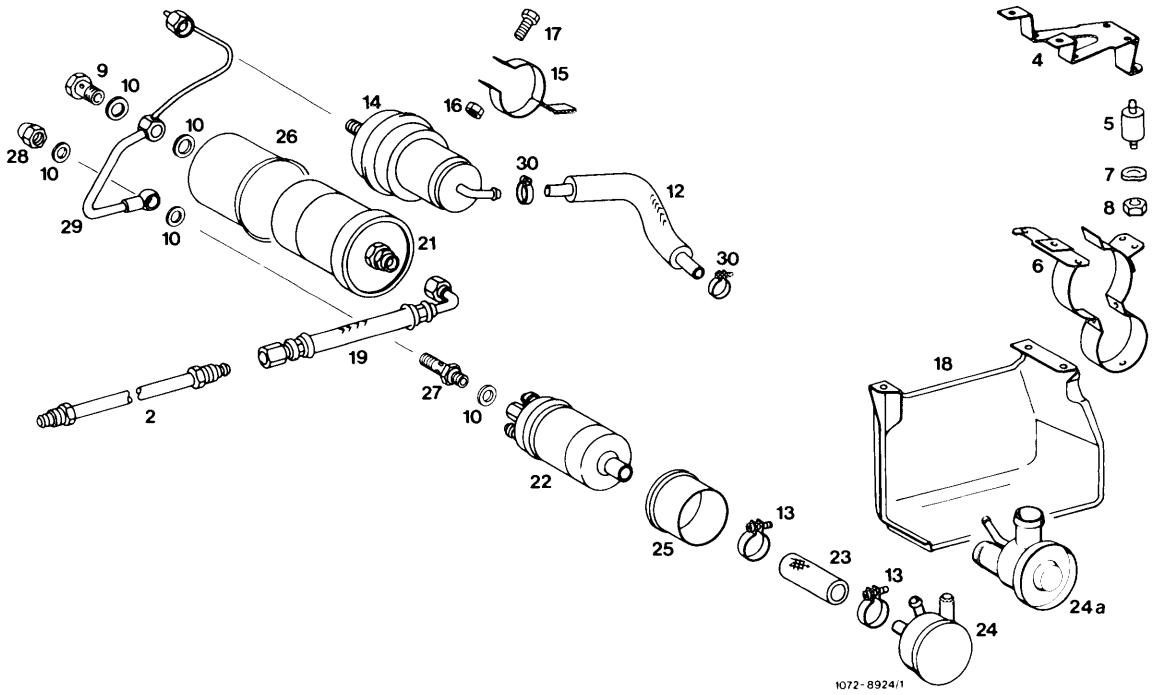


2nd version



2 Fuel feed line
4 Mounting bracket
5 Anti-viration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper 1st version
24a Diaphragm damper 2nd version
25 Plastic sleeve
26 Plastic sleeve
27 Check valve
28 Cap nut
29 Steel line
30 Hose clamp
31 Pressure relief valve
32 Clamp
33 Screw
34 Nut
35 Screw

3rd version



2	Fuel feed line	14	Fuel reservoir	24a	Diaphragm damper 2nd version
4	Mounting bracket	15	Holder	25	Plastic sleeve
5	Anti-vibration buffer	16	Nut	26	Plastic sleeve
6	Holder	17	Screw	27	Check valve
7	Snap ring	18	Protective case	28	Cap nut
8	Nut	19	Fuel hose	29	Steel line
9	Hollow screw	21	Fuel filter	30	Hose clamp
10	Sealing ring	22	Fuel pump		
12	Fuel hose	23	Fuel hose		
13	Hose clamp	24	Damper 1st version		

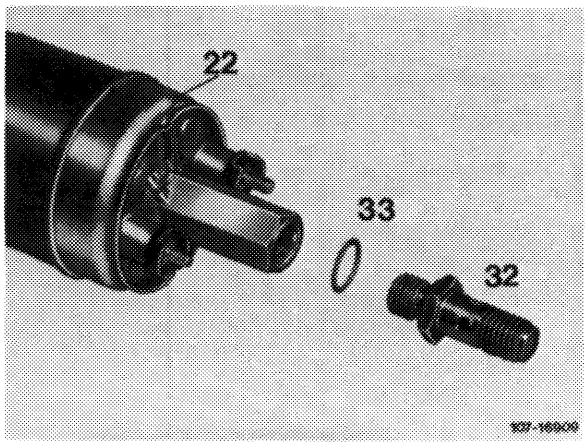
Special tools

Clamp for hose lines		000 589 40 37 00

Note

The fuel pump is provided with a special coating on roller running surface, an exchangeable check valve and, to prevent contact corrosion, a plastic sleeve.

The check valve has been moved in outward direction and can be separately replaced in the event of failure.



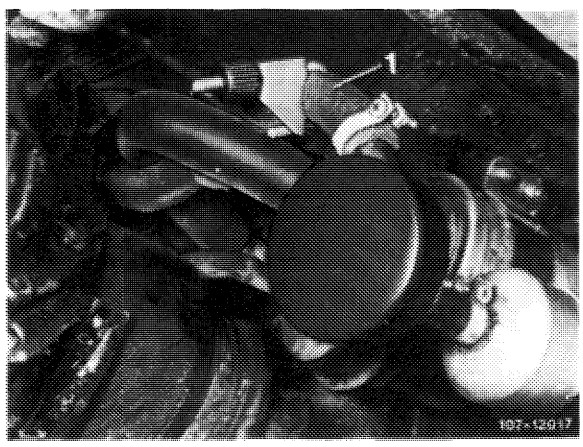
22 Fuel pump
32 Check valve
33 Sealing ring

When exchanging fuel pump, make sure that the plastic sleeve is mounted in-between fuel pump and holder. Sleeve should project on both sides of holder, since direct contact of fuel pump with holder may lead to contact corrosion.

Removal

1 Unscrew protective case.

2 Pinch fuel suction hose (1) with a clamp.

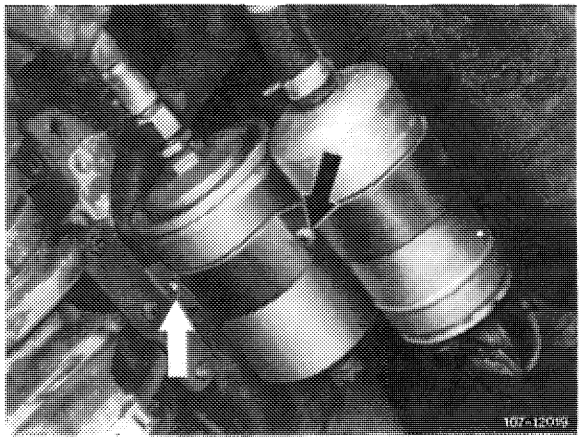


1st version

3 Loosen fuel hoses, pull off and unscrew.

4 Disconnect electric connecting cable.

5 Loosen fastening screw (arrow) and remove fuel pump.

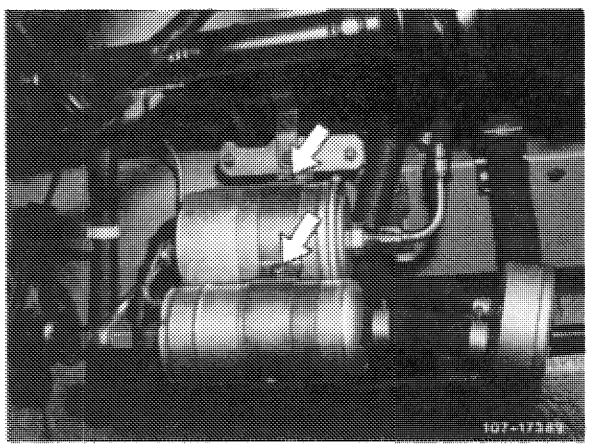


2nd version

6 Loosen fuel line on fuel filter and fuel reservoir. Loosen fuel line on fuel pump, pull off and unscrew.

7 Disconnect electric connecting cable.

8 Loosen fastening screw (arrow) and remove fuel pump.



Installation

9 For installation proceed vice versa using new sealing rings.

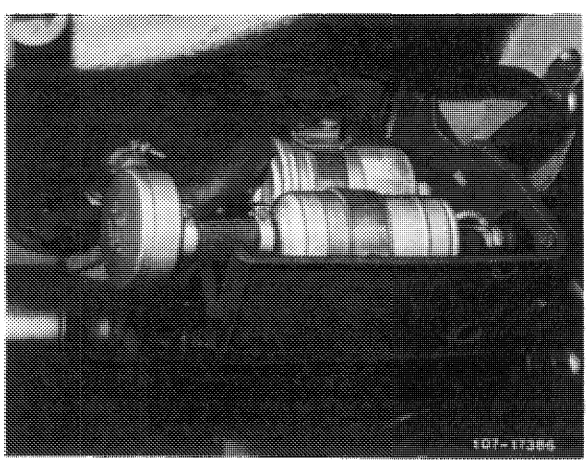
Pay attention to perfect installation of fuel hoses, also to correct polarity. In installation position, terminals should be horizontal.

10 Locate fuel pump in holder by means of plastic sleeve. Plastic sleeve should project on both sides of holder, since direct contact of fuel pump with holder may lead to contact corrosion.

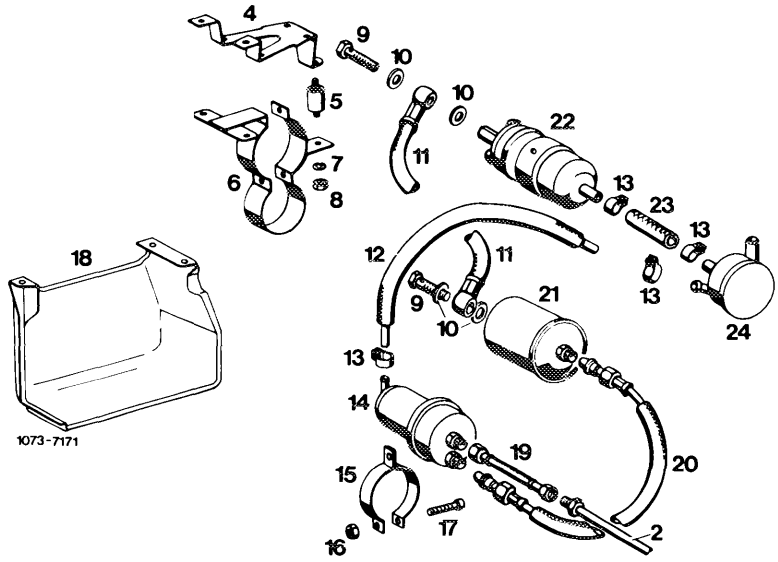
11 Remove clamp on fuel suction hose.

12 Run engine and check for leaks.

13 Mount protective case.

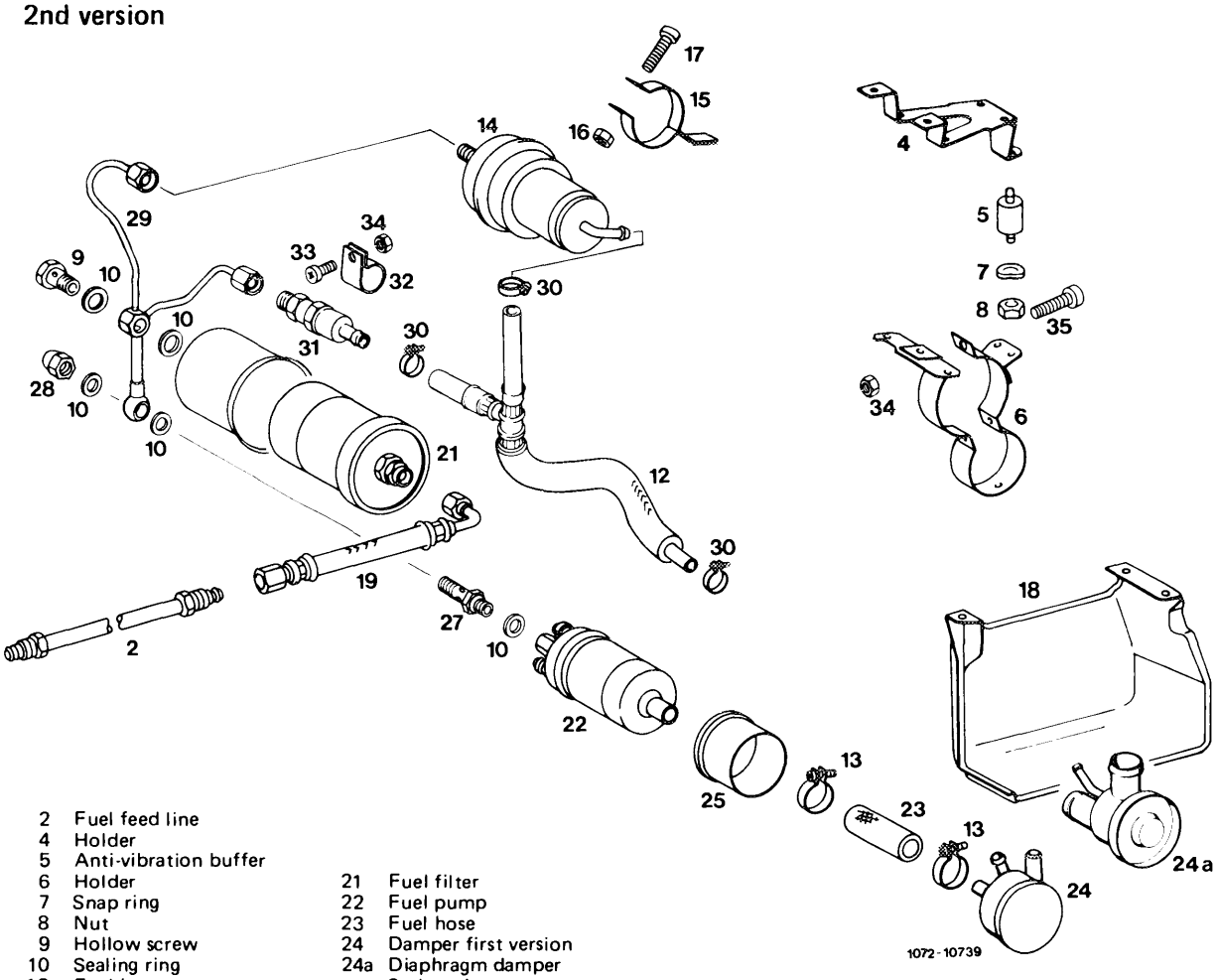


1st version



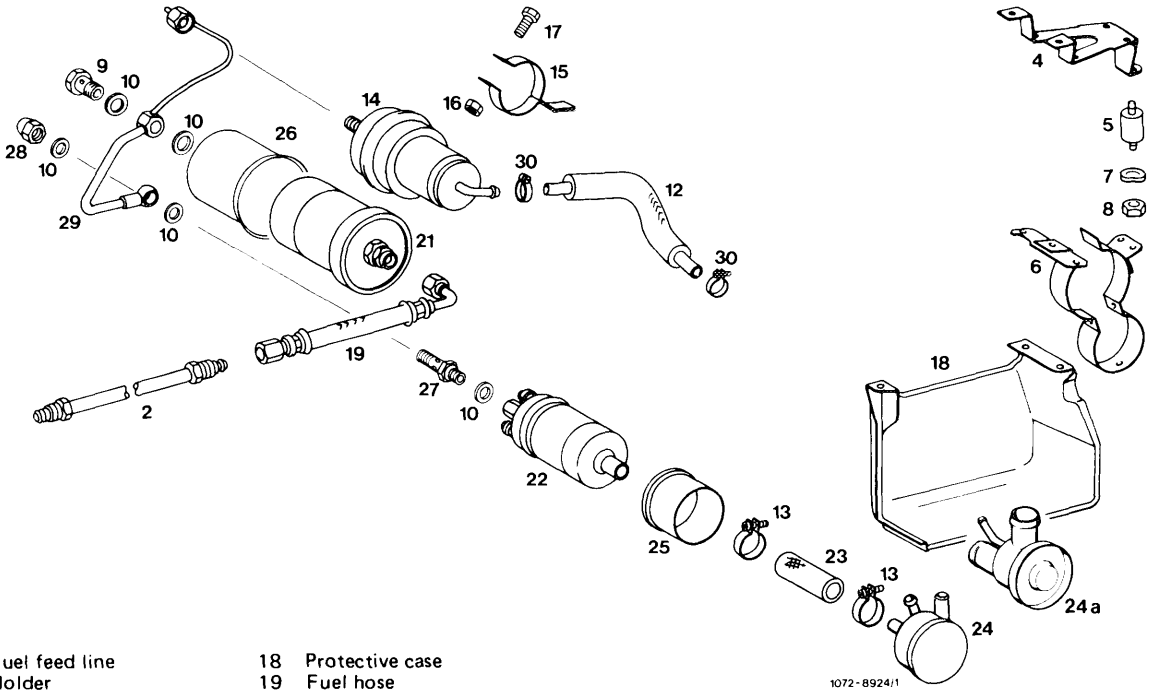
2 Fuel feed line
4 Holder
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper

2nd version



2 Fuel feed line
4 Holder
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper first version
24a Diaphragm damper 2nd version
25 Plastic sleeve
26 Plastic sleeve
27 Check valve
28 Cap nut
29 Steel line
30 Hose clamp
31 Pressure relieve valve
32 Clamp
33 Screw
34 Nut
35 Screw

3rd version



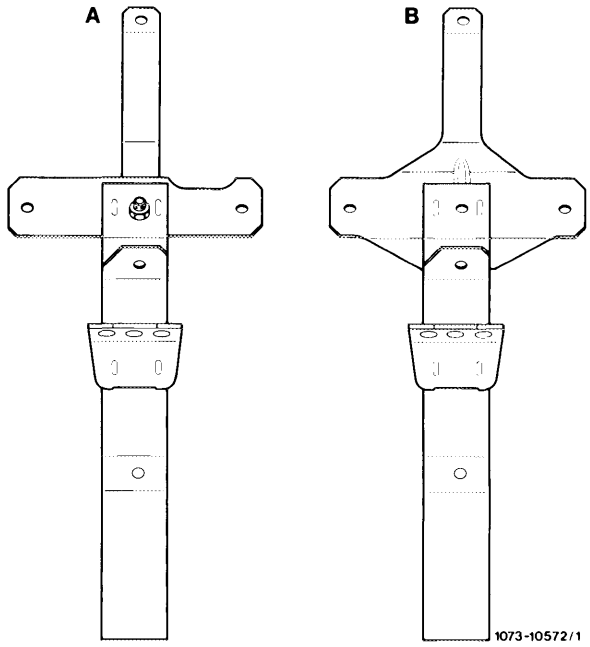
2	Fuel feed line	18	Protective case
4	Holder	19	Fuel hose
5	Anti-vibration buffer	21	Fuel filter
6	Holder	22	Fuel pump
7	Snap ring	23	Fuel hose
8	Nut	24	Damper 1st version
9	Hollow screw	24a	Diaphragm damper 2nd version
10	Sealing ring	25	Plastic sleeve
12	Fuel hose	26	Plastic sleeve
13	Hose clamp	27	Check valve
14	Fuel reservoir	28	Cap nut
15	Holder	29	Steel line
16	Nut	30	Hose clamp
17	Screw		

07.3–281 Replacement of holder for fuel pump, fuel filter and fuel reservoir

For renewing holder, remove
fuel reservoir (07.3–270),
fuel filter (07.3–275),
fuel pump (07.3–280).

Note

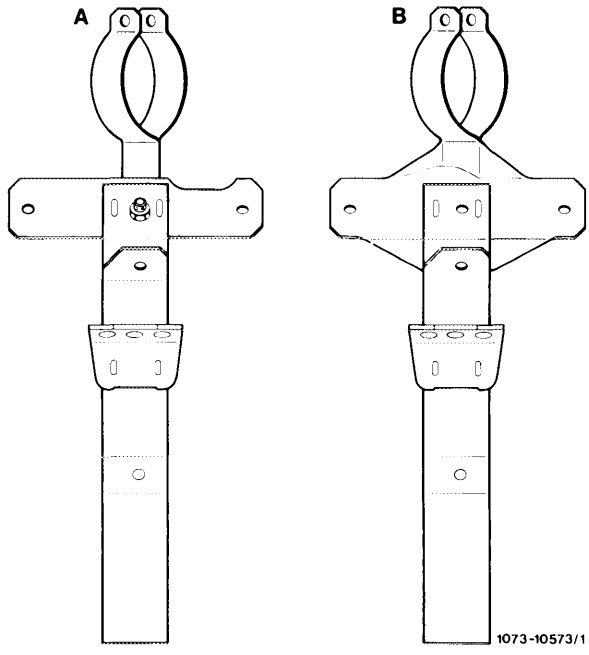
Holder has been modified to improve installation position and to increase rigidity.



Model 107, 123
A Former version
B Present version

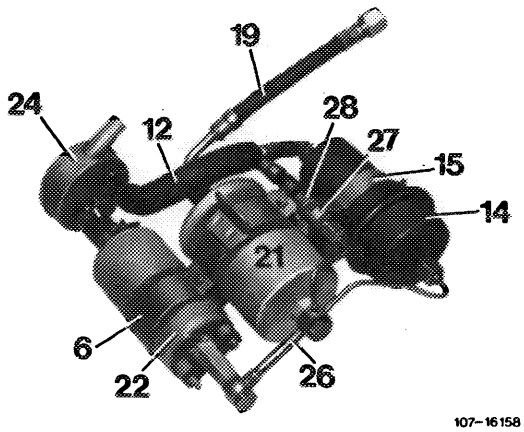
On model 126 the shape of the fuel line between pump, filter and reservoir has also been modified.

Start of series production: November 1981.



Model 126
A Former version
B Present version

In front of fuel filter (21) is an additional pressure compensating valve (27), which closes in the event of pressure in system. If the fuel volume in system is reduced when the fuel is cooling down, the pressure compensating valve will open. This will prevent that the control piston in fuel distributor will be pulled to full load under influence of vacuum, since otherwise during a cold start the full fuel quantity might be injected for a short period and the engine might be excessively enriched.

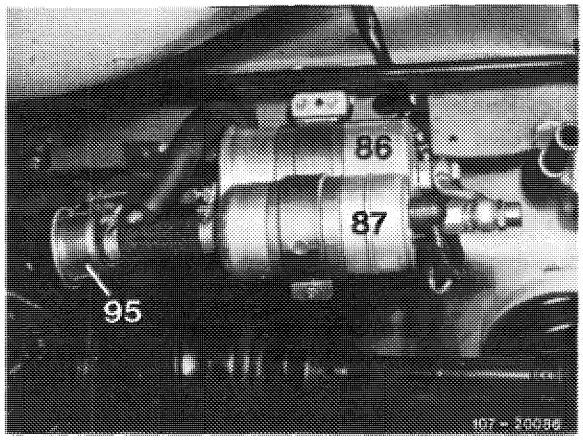


107-16158

B. Scope

Note

On models 107 and 126 fuel filters will be installed with damper (86), as well as a diaphragm damper (95). This will reduce noises caused by fuel pump.



86 Fuel filter with damper
87 Fuel pump
95 Diaphragm damper

On vehicles in national version (AUS) (J) (S) and (USA) with CIS injection system prior to model year 1981, the respective components can also be installed. On vehicles of model year 1981, the changes are already in place. However, the fuel pump assembly differs by a fuel filter of larger diameter (owing to revised maintenance intervals).

Introduction into series

Model	Starting chassis end no.	Remarks
107.022 107.042	010166 010715	Fuel filter with damper and diaphragm damper (since April 1981)
126.022/023	004661	Fuel filter with damper (since April 1980)
126.022/023	016862	Diaphragm damper (since October 1980)

On vehicles with lower chassis end no. the components can be subsequently installed in the event of complaints about "Fuel pump loud".

Special tool

Clamp for hose lines		000 589 40 37 00

Spare parts

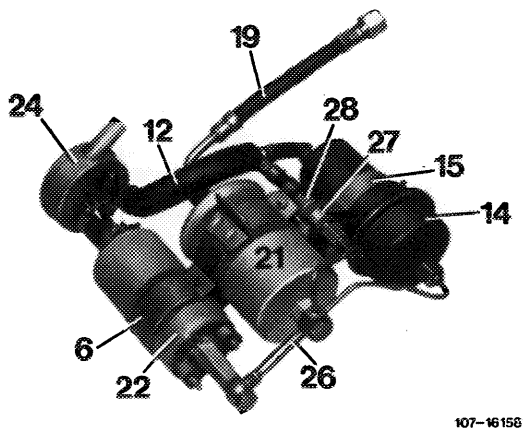
Designation	Part no.
Conversion kit	123 470 05 93
Steel line for engines with light alloy fuel distributor	126 470 01 64

Responsible for delivery: Plant 50 (PEW Sindelfingen)

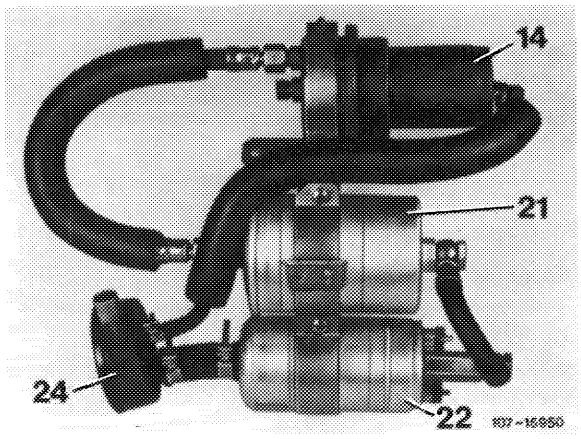
Note

When exchanging fuel filter (21), fuel pump (22) or pressure compensating valve (27) make sure that a plastic sheet or plastic sleeve is mounted between these parts and holder (6, 15, 28). Sleeve should project on both sides of holder, since direct contact of parts with holder may lead to contact corrosion.

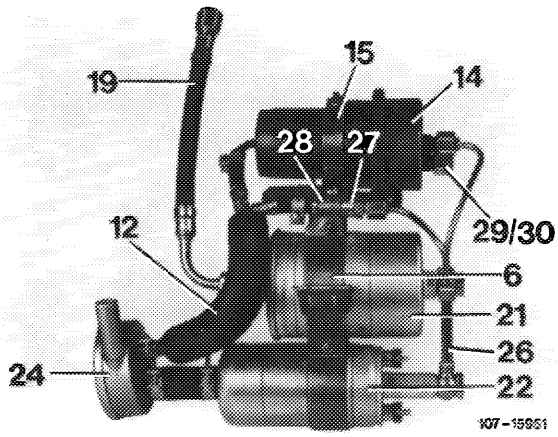
On vehicles in (AUS) and (J) version, a pressure compensating valve may not be subsequently installed.



Layout fuel pump assembly



Former layout
14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper



Present layout
6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Fuel compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut

For conversion, the following parts may be used again:

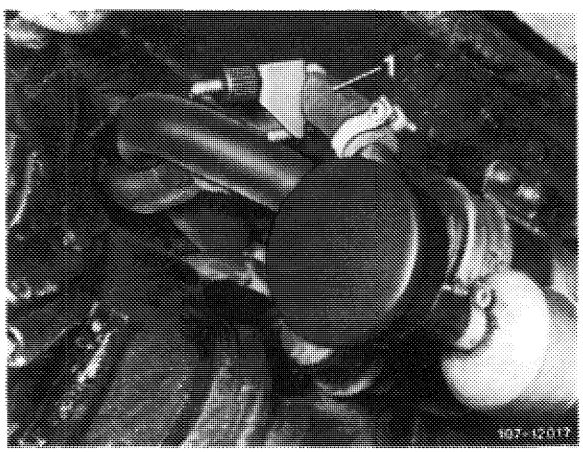
Fuel pump,
suction damper,
pressure reservoir,
fuel filter.

Conversion

1 Unscrew protective case.

2 Disconnect electric connections.

3 Pinch fuel suction hose (1) between fuel tank and suction damper by means of a clamp.

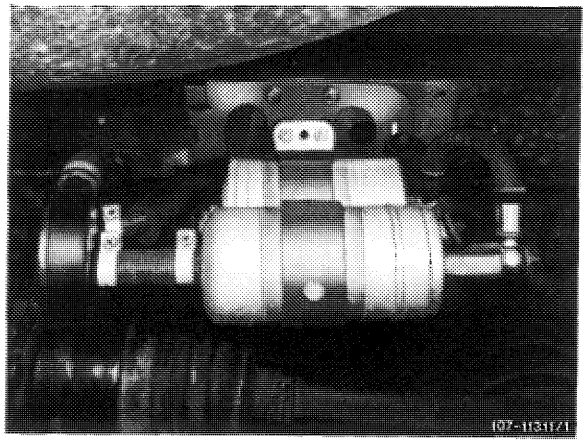


4 Loosen suction hose on suction damper and pull off.

5 Unscrew fuel pressure line from feed line to engine compartment. Clean screw connection first.

6 Unscrew fastening nuts of anti-vibration buffers and remove "fuel pump assembly".

7 Disassemble fuel pump assembly.

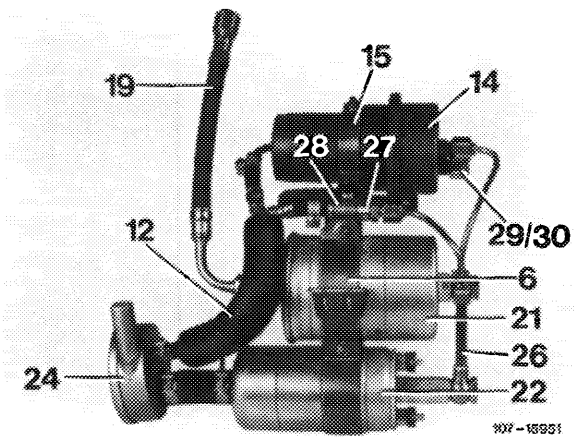


8 Clean fuel pump and fuel filter externally and mount in addition to plastic sleeve (slip up to bead of pump).

As an exception, a sheet (e.g. Tesafilm) may be glued on instead of plastic sleeve.

Attach plastic sleeve or sheet always in such a manner that it projects on both sides of holder. A direct contact of holder and pump or filter may lead to contact corrosion.

9 Assemble with components of conversion kit pump assembly, as shown in illustration. Slip fuel pump (22) up to bead into holder (6) and mount clamp (28) for pressure compensating valve (27) under holder of pressure reservoir. Prior to tightening screws of holder, position fuel pressure line (26) at pump, filter and pressure reservoir, align parts in relation to each other and tighten screws. On pressure reservoir, close the off-center connection with a closing cone (29) and a coupling nut (30).



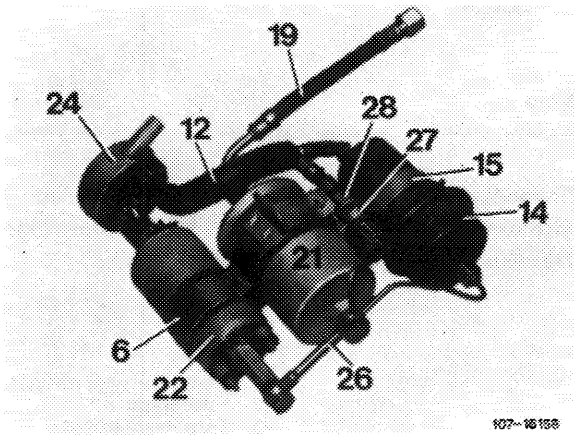
10 Install pump assembly and fuel hoses, and make electrical connections.

11 Remove clamp on suction hose, run engine and check system for leaks.

12 Mount protective case. Then make sure that fuel hoses are not exposed to chafing.

Note: On vehicles with auxiliary heater, the leak line is approx. 50 mm in front of suction damper. Insert a T-fitting. Here, the protective anti-chafing hose must be shortened.

A. General



Since February 1979 the pressure reservoir (14) is connected in front of fuel filter, and an additional pressure compensating valve (27) is also installed. As a result, the cold engine will fire much easier and smooth running directly following a cold start will be improved.

As a result of the installation of light alloy fuel distributor, the pressure compensating valve is integrated in fuel distributor.

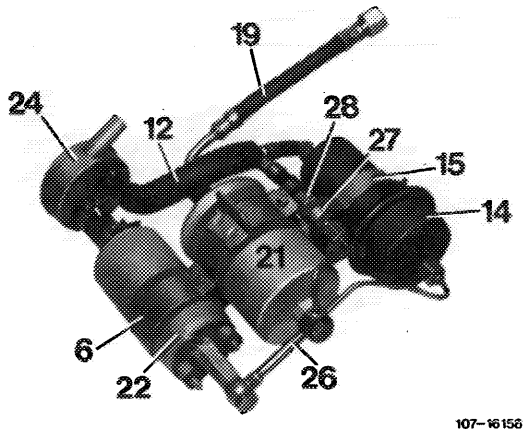
For **start of series production** refer to "Technical revisions".

Note: Since February 1981 the pressure reservoir (14) is connected in front of fuel filter on model 123.093. On this model, the pressure compensating valve (27) is not installed owing to installation position of fuel tank.

Operation

The pressure reservoir (14) has now only one connection and owing to a throttle is filled only slowly with fuel. From fuel filter the fuel flows directly into feed line toward engine. As a result, the fuel pressure is building up much faster at injection valves.

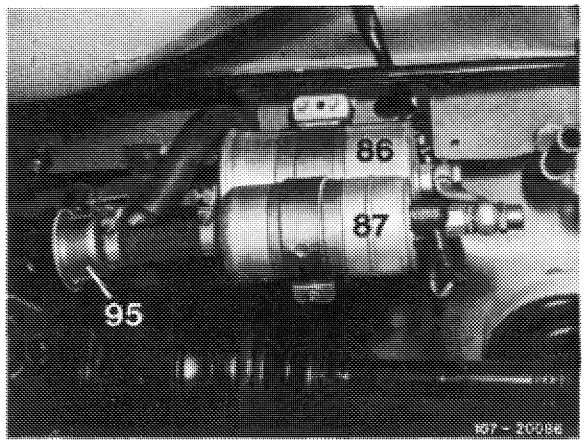
In front of fuel filter (21) is an additional pressure compensating valve (27), which closes in the event of pressure in system. If the fuel volume in system is reduced when the fuel is cooling down, the pressure compensating valve will open. This will prevent that the control piston in fuel distributor will be pulled to full load under influence of vacuum, since otherwise during a cold start the full fuel quantity might be injected for a short period and the engine might be excessively enriched.



B. Scope

Note

On models 107 and 126 fuel filters will be installed with damper (86), as well as a diaphragm damper (95). This will reduce noises caused by fuel pump.



86 Fuel filter with damper
87 Fuel pump
95 Diaphragm damper

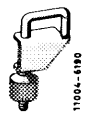
On vehicles in national version (AUS) (J) (S) and (USA) with CIS injection system prior to model year 1981, the respective components can also be installed. On vehicles of model year 1981, the changes are already in place. However, the fuel pump assembly differs by a fuel filter of larger diameter (owing to revised maintenance intervals).

Introduction into series

Model	Starting chassis end no.	Remarks
107.022 107.042	010166 010715	Fuel filter with damper and diaphragm damper (since April 1981)
126.022/023	004661	Fuel filter with damper (since April 1980)
126.022/023	016862	Diaphragm damper (since October 1980)

On vehicles with lower chassis end no. the components can be subsequently installed in the event of complaints about "Fuel pump loud".

Special tool

Clamp for hose lines		000 589 40 37 00

Spare parts

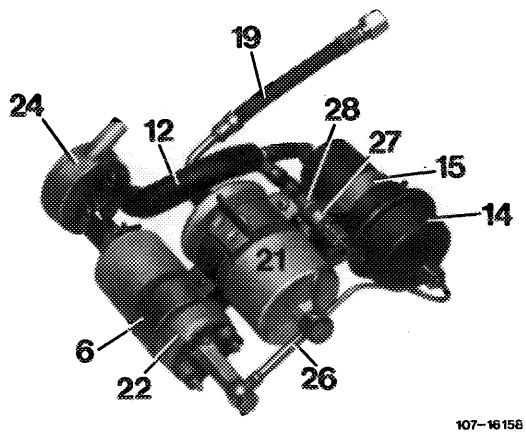
Designation	Part no.
Conversion kit	123 470 05 93
Steel line for engines with light alloy fuel distributor	126 470 01 64

Responsible for delivery: Plant 50 (PEW Sindelfingen)

Note

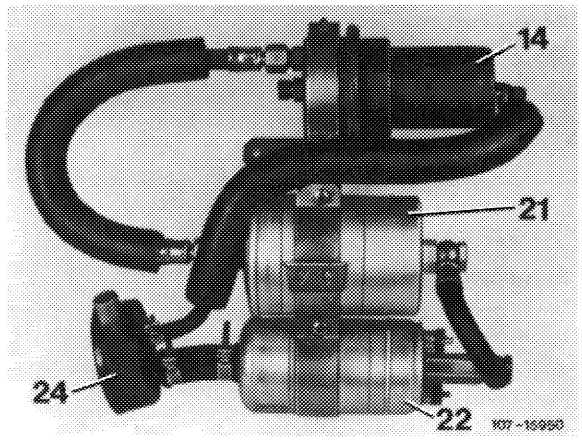
When exchanging fuel filter (21), fuel pump (22) or pressure compensating valve (27) make sure that a plastic sheet or plastic sleeve is mounted between these parts and holder (6, 15, 28). Sleeve should project on both sides of holder, since direct contact of parts with holder may lead to contact corrosion.

On vehicles in (AUS) and (J) version, a pressure compensating valve may not be subsequently installed.

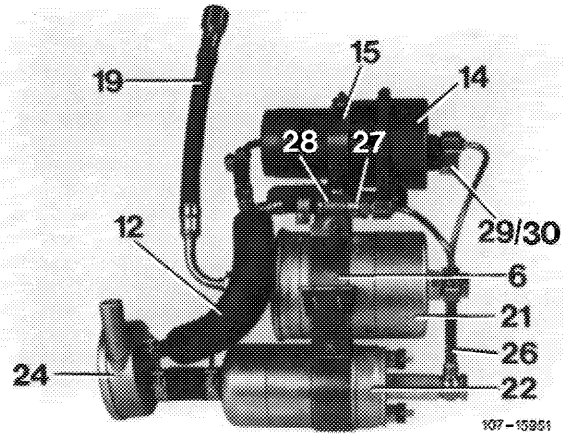


107-16158

Layout fuel pump assembly



Former layout
14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper



Present layout
6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Fuel compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut

For conversion, the following parts may be used again:

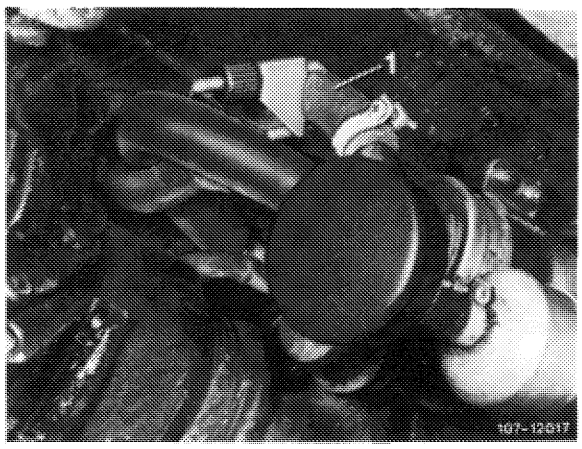
Fuel pump,
suction damper,
pressure reservoir,
fuel filter.

Conversion

1 Unscrew protective case.

2 Disconnect electric connections.

3 Pinch fuel suction hose (1) between fuel tank and suction damper by means of a clamp.

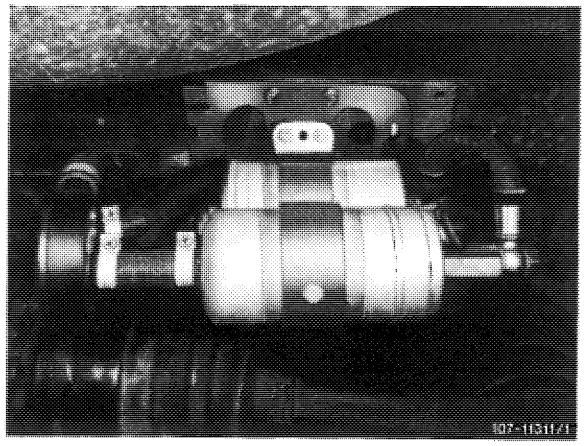


4 Loosen suction hose on suction damper and pull off.

5 Unscrew fuel pressure line from feed line to engine compartment. Clean screw connection first.

6 Unscrew fastening nuts of anti-vibration buffers and remove "fuel pump assembly".

7 Disassemble fuel pump assembly.

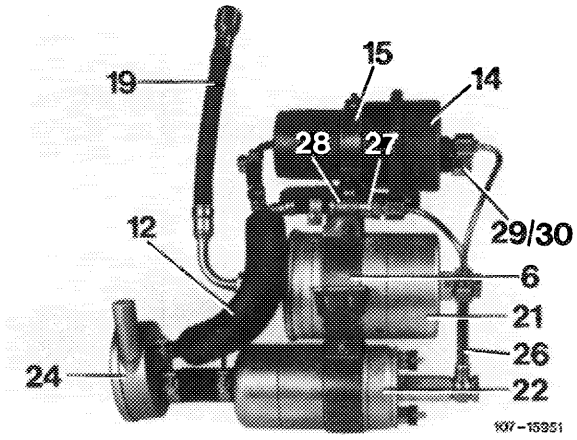


8 Clean fuel pump and fuel filter externally and mount in addition to plastic sleeve (slip up to bead of pump).

As an exception, a sheet (e.g. Tesafilm) may be glued on instead of plastic sleeve.

Attach plastic sleeve or sheet always in such a manner that it projects on both sides of holder. A direct contact of holder and pump or filter may lead to contact corrosion.

9 Assemble with components of conversion kit pump assembly, as shown in illustration. Slip fuel pump (22) up to bead into holder (6) and mount clamp (28) for pressure compensating valve (27) under holder of pressure reservoir. Prior to tightening screws of holder, position fuel pressure line (26) at pump, filter and pressure reservoir, align parts in relation to each other and tighten screws. On pressure reservoir, close the off-center connection with a closing cone (29) and a coupling nut (30).



10 Install pump assembly and fuel hoses, and make electrical connections.

11 Remove clamp on suction hose, run engine and check system for leaks.

12 Mount protective case. Then make sure that fuel hoses are not exposed to chafing.

Note: On vehicles with auxiliary heater, the leak line is approx. 50 mm in front of suction damper. Insert a T-fitting. Here, the protective anti-chafing hose must be shortened.

Note

In the event of a complaint concerning "Engine fires poorly when warm" an internal leak of fuel pump shows up, a check valve can be subsequently mounted to fuel pump.

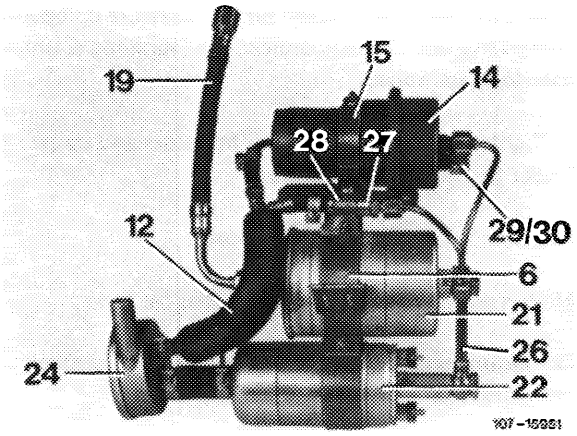
Installation

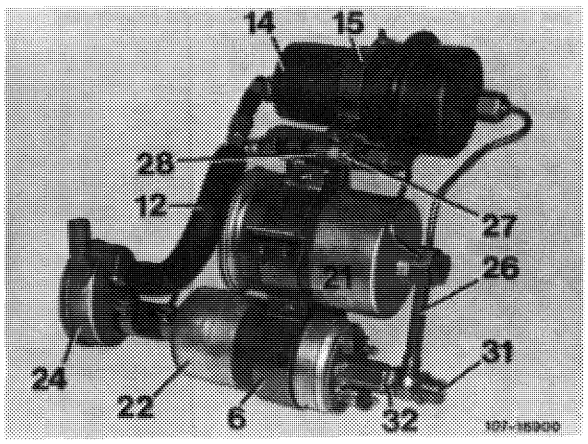
Fuel pump assembly with steel line between fuel pump and filter

1 Unscrew protective case.

2 Pinch fuel hoses (from fuel tank and to line toward engine) with one clamp each.

3 Unscrew fuel pump assembly on both front anti-vibration buffers.

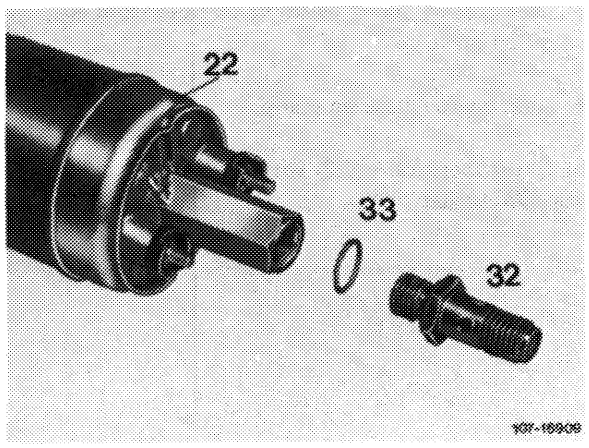




6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Pressure compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut
31 Closing nut
32 Check valve
33 Sealing ring

4 Unscrew steel line (26) on fuel pump, filter, reservoir and pressure compensating valve.

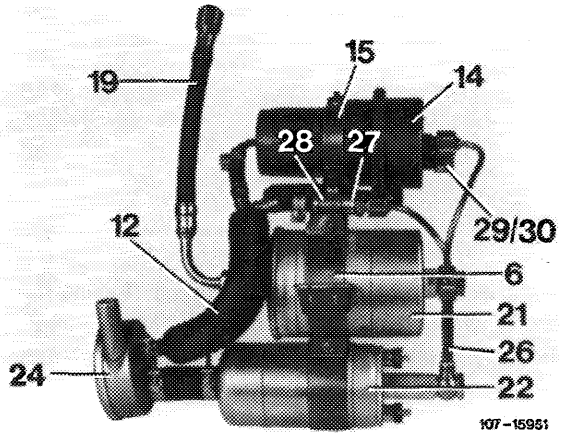
5 Screw check valve (32) with new copper sealing ring (33) to fuel pump.



6 Mount steel lines. For this purpose, slip fuel pump up to bead into holder. Connect steel line with new copper sealing rings and closing nut (screw-on closing nut only lightly). Hollow screw is no longer used.

Note: The plastic sheeting or plastic sleeve of pump and filter should project on holder of both sides. Be sure to replace if demaged. Remove pump and filter for this purpose.

7 Mount fuel filter in holder in such a manner that the steel line is in alignment with fuel pump.



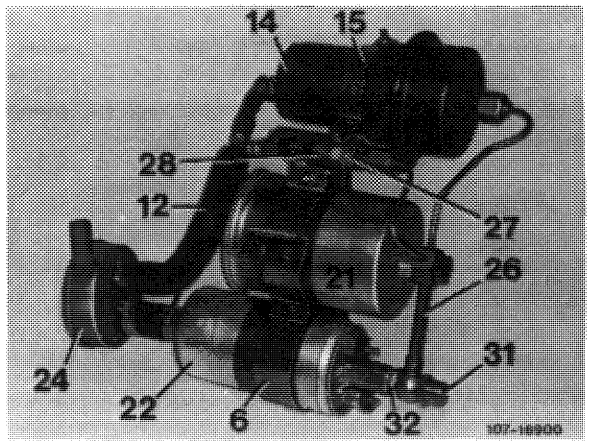
8 Mount steel line on reservoir and pressure compensating valve and tighten connections (applying counter-hold to check valve).

9 Tighten fuel pump and filter in holder and screw holder to anti-vibration buffers.

10 Remove clamps from fuel hoses.

11 Run engine and check connections for leaks.

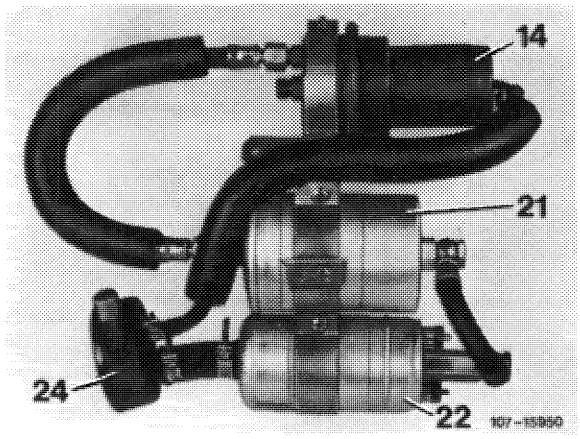
12 Mount protective case. Make sure that the steel line is not chafing against protective case.



Fuel pump assembly with hose between pump and filter

1 Unscrew protective case.

2 Pinch fuel hoses with clamps.

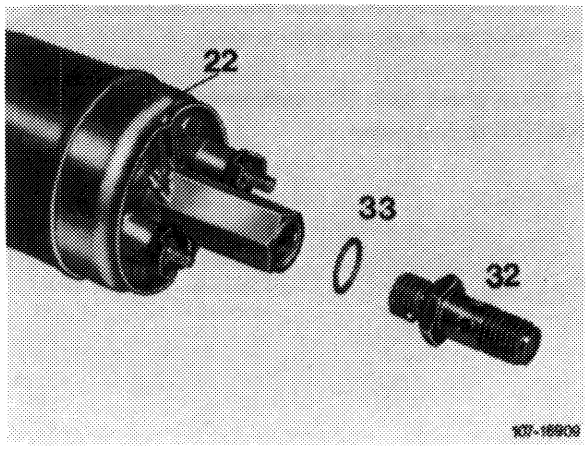


14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper

3 Unscrew fuel pump assembly on both front anti-vibration buffers.

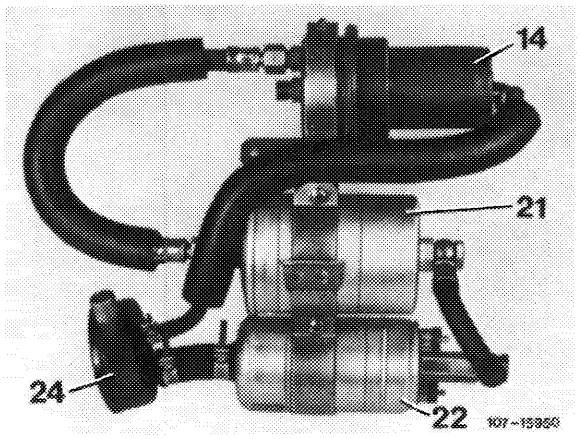
4 Unscrew fuel hose on pump.

5 Screw check valve (32) with new copper sealing ring (33) to fuel pump.



6 Clip fuel pump in holder approx. 15 mm to the left (so that closing nut is no longer chafing against protective case) and mount fuel hose with 2 new copper sealing rings and closing nut to check valve (while applying counterhold to check valve). Hollow screw is no longer installed.

Note: Plastic sheet or plastic sleeve of pump and filter should project on holder on both sides and must be replaced if damaged. For this purpose, remove pump and filter.



7 Tighten fuel pump and filter in holder and mount holder on anti-vibration buffers.

8 Remove clamps from fuel hoses.

9 Run engine and check system for leaks.

10 Mount protective case. Make sure that fuel hose is not chafing against protective case.

Closing angle (dwell angle)

Normal coil ignition (S)

Closing angle (dwell angle) Testing and **adjusting value** at idle[1])	Change between idle and 3000/min
39–42°	max. ± 3°

[1]) When installing new breaker points, adjust closing angle (dwell angle) to 42 ± 1°.

Transistorized ignition system (J) (USA)

Identification: blue ignition coil, two pre-resistors and transistorized switchgear.

Closing angle (dwell angle) Testing and **adjusting value** at idle[2])	Change between idle and 3000/min
30–40°	max. ± 3°

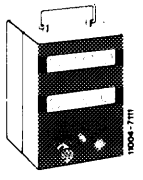
[2]) When installing new and when adjusting used breaker points, adjust closing angle (dwell angle) to 34 ± 1°.

Firing point

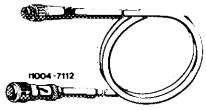
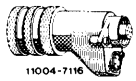
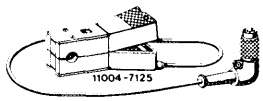
Ignition distributor Bosch no.	Adjusting value of firing point	Test value Ignition adjustment without vacuum			Vacuum adjustment after		Installation value of ignition distributor at starting speed
	with vacuum at idle	1500/min	3000/min	4500/min	"retard" at idle	"advance" at 4500/min (total)	without vacuum
(S) **1976**							
0 231 309 001	TDC	11–17°	26–30°	26–30°	4–6°	8–12° (34–42°)	5° before TDC
(J) **1976**							
0 231 311 001	7° before TDC	10–16°	26–33°	29–35°	–	–	7° before TDC
(USA) **1973/74**							
0 231 310 002	4° after TDC	13–17°	31–35°	37–41°	9–13°	–	7° before TDC
(USA) **1975/76**							
0 231 311 001	7° before TDC	10–16°	26–33°	29–35°	–	–	7° before TDC

Special tools

Digital tester



001 589 54 21 00

Connecting cable		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Conventional tools

Revolution counter, stroboscope, closing angle (dwell angle) measuring instrument

Checking and adjusting closing angle (dwell angle)

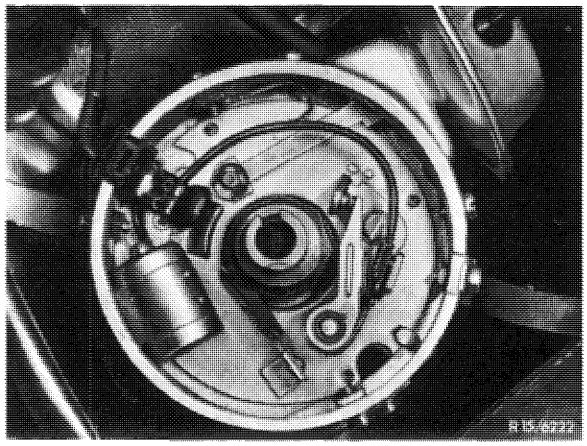
1 Measure closing angle (dwell angle) at idle speed.

2 Measure closing angle (dwell angle) change between idle speed and 3000/min, max. change ± 3°.

3 Adjust closing angle (dwell angle), if required or replace breaker points (07.5–505).

With used breaker points, the closing angle (dwell angle) can be adjusted only with transistorized ignition.

Large dwell angle – small point spacing
Small dwell angle – large point spacing



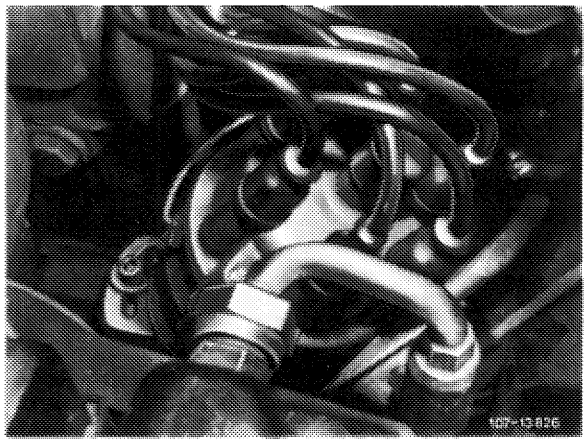
Checking and adjusting firing point

4 Measure firing point with stroboscope or digital tester at specified speed with or without vacuum.

5 Loosen ignition distributor and set adjusting value of firing point by turning ignition distributor.

Screw down ignition distributor and check firing point.

6 Check centrifugal and vacuum adjustment of ignition distributor. For this purpose, run through specified test values with or without vacuum adjustment.



07.5–503 Removing, preventing formation of layer on breaker points (breaker-controlled transistorized ignition)

Conventional tool	
Voltmeter with measuring range	0–3 volts

The formation of a blue or a dark grey layer on breaker points of transistorized ignition systems may result in misfiring when in a progressive stage due to the insulating characteristics of such a layer – no matter whether a GE or an SI switchgear is installed. Pertinent complaints resulted in an unjustified exchange of switchgear.

The formation of layers on breaker points is the result of various influences which are shortly explained below:

Blue layer

The blue layer (tungsten oxide) is formed by the arch occurring during the closing stage and the resulting burning of contact material. This arch is above all caused by the discharge of the anti-interference capacitor in ignition distributor.

A large closing angle (small contact spacing) favors the intensity of the arch and thereby the formation of a layer.

Dark grey layer

The dark grey layer is the result of burnt grease, oil or dirt particles formed between breaker points.

A remedy with regard to complaints concerning the formation of layers requires the following jobs:

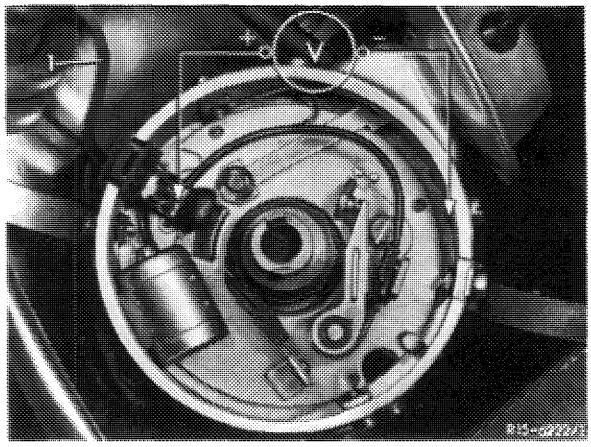
1. Check on ignition distributor whether

   a) a layer shows up on breaker point,

   b) the cams are showing score marks (check with finger nail).

2. If a visual checkup shows no distinct fault, check function of points by measuring voltage drop. Use voltmeter with measuring range of 0–3 volts.

   The voltage drop may amount to 0.5 volt with contact closed. A larger voltage drop is already indicating the formation of a layer.



1 Control line with capacitor

Remedies

1. Lining on breaker points:

   a) Exchange breaker points.

   b) Remove control line with capacitor (1) and replace by **shielded control line without capacitor.**

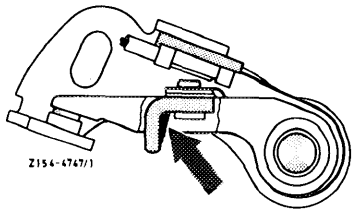
2. Score marks in distributor cam or rubbed-through lubricator felt:

   Exchange ignition distributor. Prior to installation, fit a shielded control line without capacitor to new ignition distributor.

Repair instructions

Breaker points

When renewing breaker points, be sure to coat slide piece (arrow) with a special grease pencil (special grease Bosch Ft 1 v 4). Without grease, the dwell angle will increase (smaller contact gap) due to the heavier wear of the slide piece. This in turn will favor the formation of a layer and may result in misfiring.



Arrow: point to be greased

Closing angle (dwell angle)

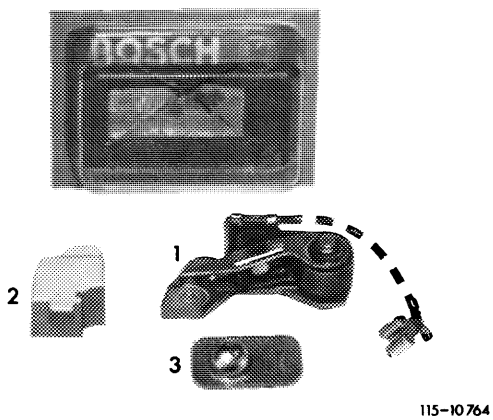
Set dwell angle to lower tolerance limit (07.5—500). This will guarantee that the dwell angle will not change beyond the specified value after running-in period of slide piece.

Adjusting values (lower tolerance) 34°

Protective breaker cap

Always mount protective breaker cap. Cap protects breaker point against grease, oil or dirt.

To make sure that during installation of breaker points the slide piece is greased and the protective cap is mounted, the breaker points are supplied with grease capsule and protective cap from now on.



115-10764

1 Breaker point
2 Protective cap
3 Grease capsule

Closing angle (dwell angle)

Normal coil ignition (S)

Closing angle (dwell angle) Testing and **adjusting value** at idle[1])	Change between idle and 3000/min
39–42°	max. ± 3°

1) When installing new breaker points, adjust closing angle (dwell angle) to 42 ± 1°.

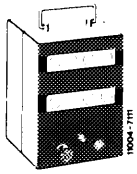
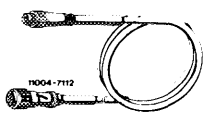
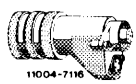
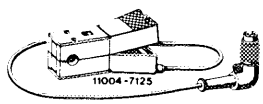
Transistorized ignition system (J) (USA)

Identification: blue ignition coil, two pre-resistors and transistorized switchgear.

Closing angle (dwell angle) Testing and **adjusting value** at idle[2])	Change between idle and 3000/min
34–40°	max. ± 3°

2) When installing new and when adjusting used breaker points, adjust dwell angle to 34 ± 1°.

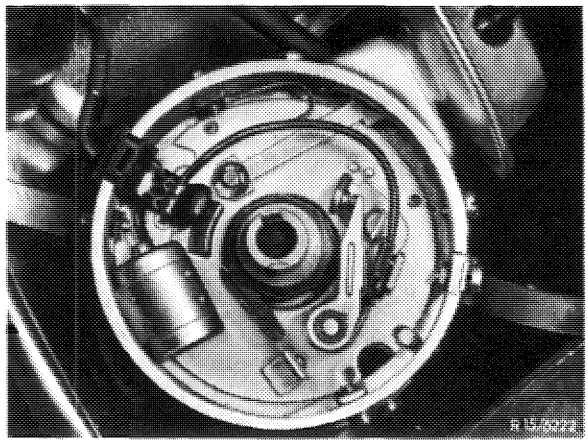
Special tools

Digital tester		001 589 54 21 00
Connecting cable		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Conventional tools

Closing angle (dwell angle) measuring instrument

Installation

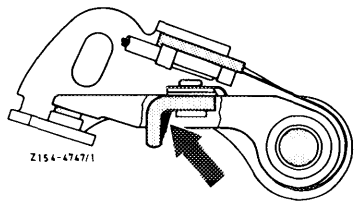


When renewing contacts, proceed as follows:

1 Wipe contacts prior to installation with a lintfree cloth to remove moisture or grease.

2 Coat slide piece of contact breaker, its bearing point and the cams of the distributor shaft with some Bosch special grease Ft 1 v 4.

3 When closed, contact breakers must be in parallel and at similar level in relation to each other.

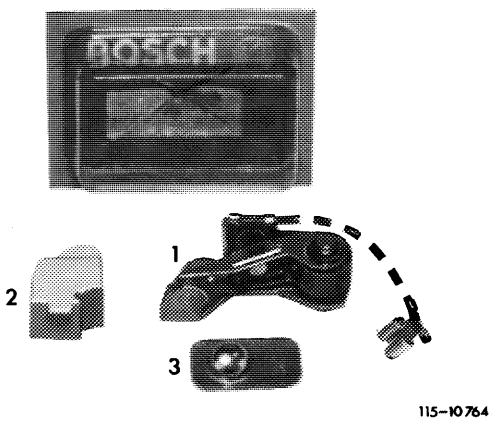


Arrow: spot to be greased

4 Set closing angle (dwell angle) to specified value.

Mount protective breaker cap. Cap protects contact against grease, oil or dirt particles.

To make sure that during installation of breaker points the slide piece is greased and the protective cap is mounted, the breaker points are supplied with grease capsule and protective cap from now on.



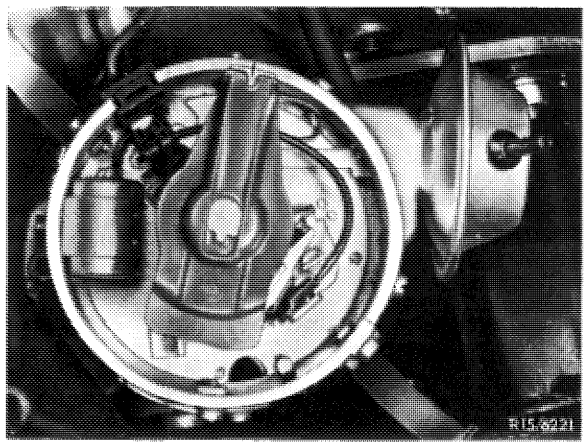
1 Breaker point
2 Protective cap
3 Grease capsule

5 Check firing point and adjust (07.5–500).

Removal

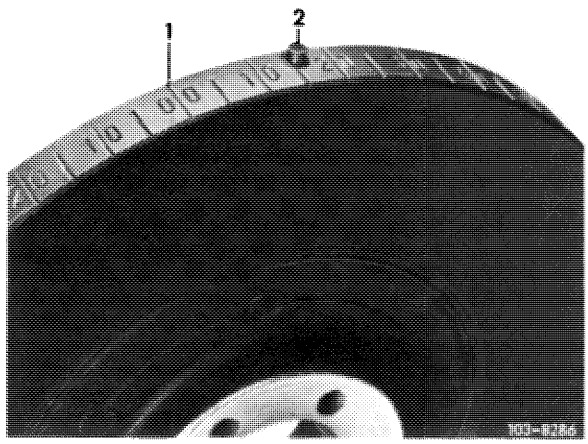
1 Remove protective cap, distributor cover, cable plug connections and vacuum line.

2 Set engine to ignition TDC of 1st cylinder. For this purpose, the markings on the distributor rotor and on distributor housing should be in alignment.



In addition, the pointer on crankcase should be above TDC mark of vibration damper.

Attention!
On engines where the vibration damper carries a "010" mark also for BDC in addition to mark for TDC, the TDC mark is adjacent to pin in vibration damper.

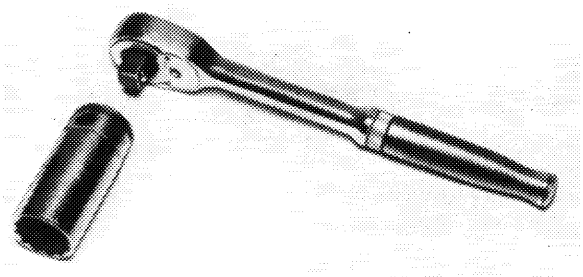


1 TDC mark

Rotate engine with combination tool.

Attention!
Do **not** rotate engine at fastening bolts of camshaft gears. Do not **rotate** engine **in reverse.**

3 Loosen hex. socket screw of distributor attachment and remove ignition distributor.

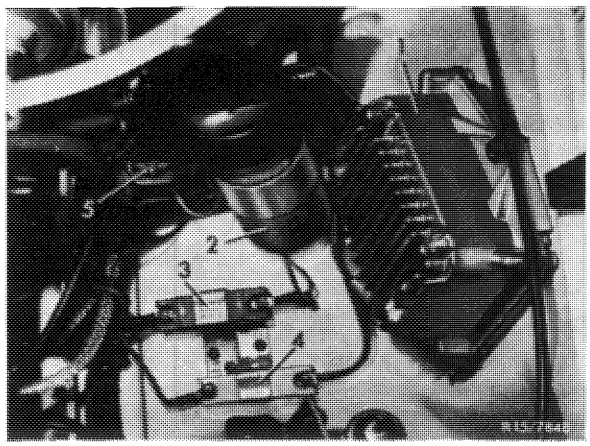


R 100/6498

4 For installation proceed vice versa. Pay special attention to markings (refer to item 2).

5 Check closing angle (dwell angle) and firing point and adjust (07.5–500).

Layout of transistorized ignition



The system comprises:

Switchgear
Ignition coil
Pre-resistor 0.4 ohm (3)
Pre-resistor 0.6 ohm (4)

Operation

The ignition coil current is controlled by a transistorized circuit instead of the breaker point. The transistorized circuit is controlled by the breaker point.

With the breaker point closed, the switching transistor is conductive. When the breaker point opens, the transistor locks and the ignition coil current is interrupted. As a result of the interrupted circuit in the primary winding, the ignition voltage is induced in the secondary winding as before for conventional coil ignition.

To increase the ignition voltage, the 0.4 ohm pre-resistor is bridged by contact 16 on starter while starting.

Switchgear (1)

The switchgear has several transistors, resistors and other electronic components in a metal housing. This housing protects the components against mechanical damage and splash water and also serves to dissipate the heat due to energy losses. Contact on switchgear is made by a 4-way round plug connection with separate coaxial connection for activation.

In the event of repairs, only the complete switchgear can be exchanged.

Ignition coil (2)

Layout and external dimensions of ignition coil correspond to those of a normal heavy-duty ignition coil. But the design of the winding is different. The ratio amounts to approx. 1:185 as compared with 1:100 for conventional ignition coils.

External identification: painted blue.

Pre-resistors

Resistors 0.4 ohm and 0.6 ohm are designed similar to the ignition coil pre-resistors installed up to now: A ceramic body encloses the resistor winding, with extending connections.

A sheet metal clamp is placed around ceramic body for attachment. The color of this clamp informs about the resistance value, which is additionally punched in as a number.

Color	Code number	Resistor
blue, anodised	0.4	0.4 ohm
metallic, anodised	0.6	0.6 ohm

General information

On vehicles with transistorized systems, do not operate engine without battery connected.

When using rapid charging units for charging vehicle battery, separate battery from other vehicle circuits.

Starting assistance with rapid chargers is not permitted.

When installing battery, pay attention to correct polarity.

Do not confuse line connections on switchgear (e.g. when testing switchgear in installed condition).

Switchgear may suffer damage if these instructions are not observed.

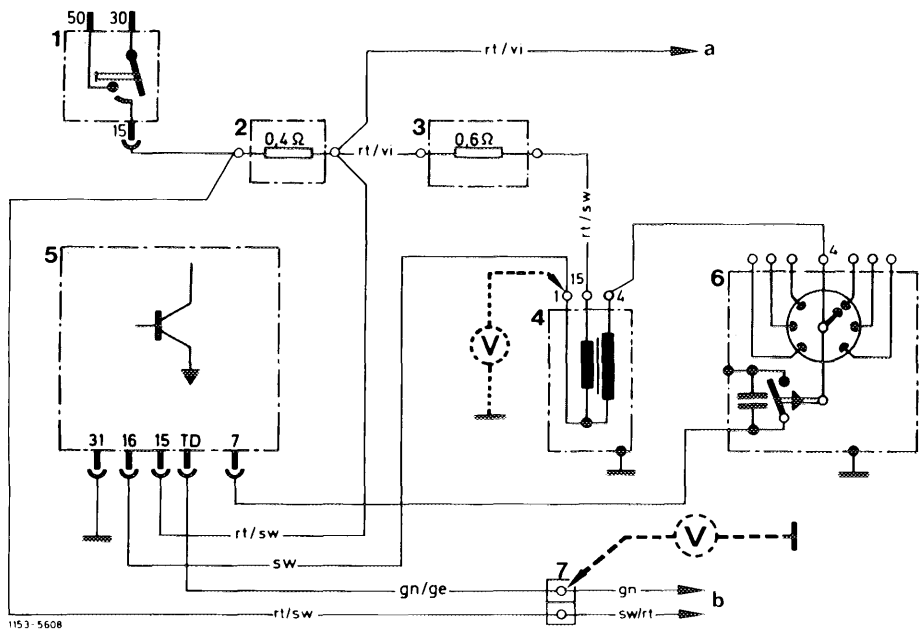
Instructions concerning test jobs

On engines with transistorized coil ignition, speed and dwell angle cannot always be measured in the usual manner.

Depending on type of tester used, connection at different points of ignition system is required. Always refer to operating instructions for tester. To facilitate connection of speed and dwell angle testers, an empty, offset cable shoe is screwed underneath cable connector 7.

Transistorized switchgear — standard switchgear — with SI transistor

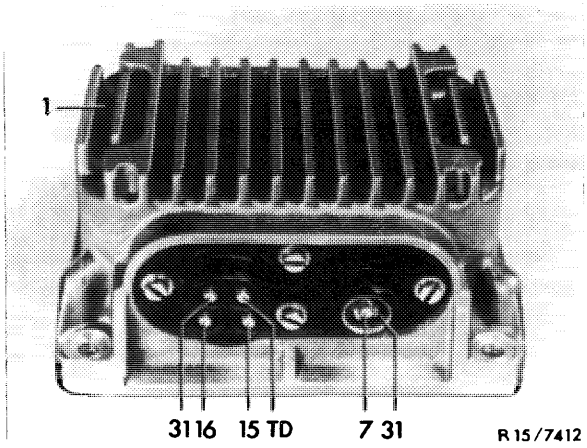
Bosch order no.	installed in model	
0 227 051 014	114.060/073	(USA) up to including model year 1974
0 227 051 024	114.060/073 116.020	(J) model year 1976 (USA) model year 1975/76



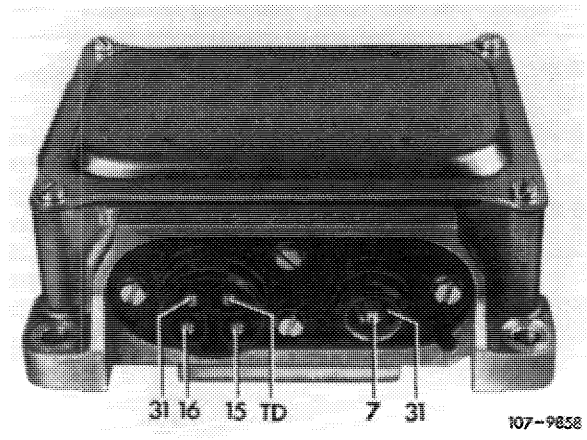
Wiring diagram

1 Ignition starting switch
2 Pre-resistor 0.4 ohm
3 Pre-resistor 0.6 ohm
4 Ignition coil
5 Switchgear
6 Ignition distributor
7 Cable connector with test terminal TD
a To starter terminal 16

ge = yellow
gn = green
rt = red
sw = black
vi = purple



Switchgear 0 227 051 014



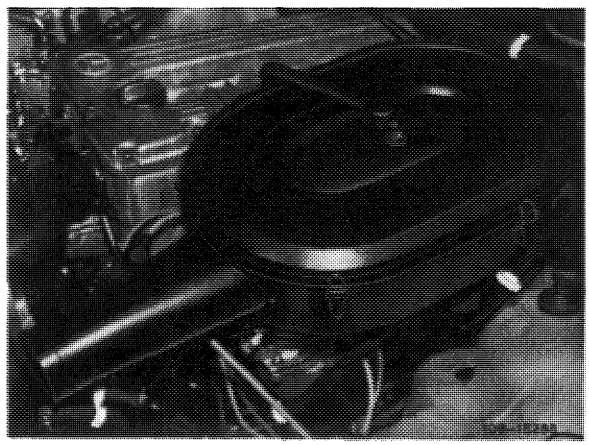
Switchgear 0 227 051 024

Note

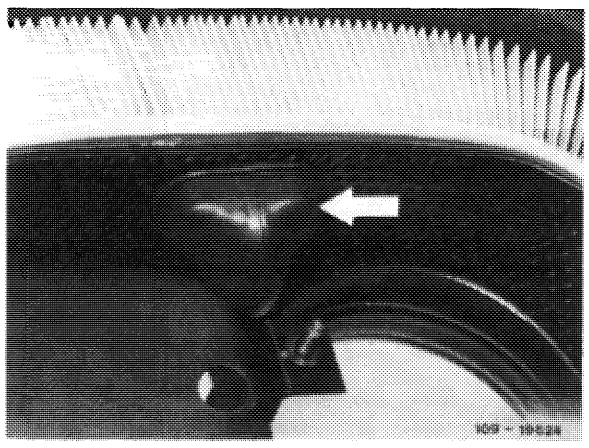
The air cleaner top is provided with a recess (arrow) for adjusting idle speed mixture.

As a result, the air cleaner need no longer be removed for adjusting idle speed mixture.

On air cleaner 2nd version the air intake proceeds directly at air cleaner, the connecting hose is no longer required.



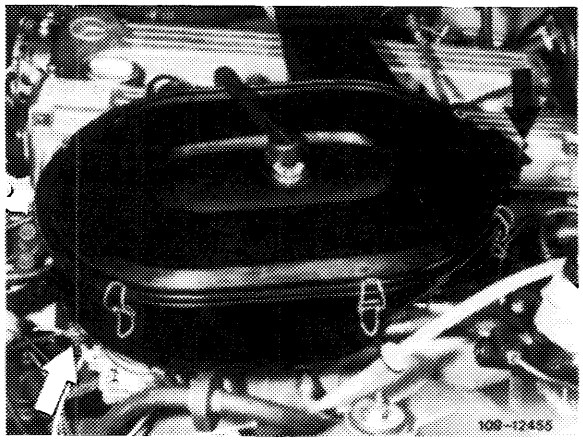
The connection for the decel shutoff valve is at air cleaner lower half.
Air intake is by way of a rubber scoop (arrow) at clean air side.



Removal

1 Unscrew both fastening nuts on vibration dampers.

2 Remove air cleaner, while pulling off contour hose for crankcase breather.

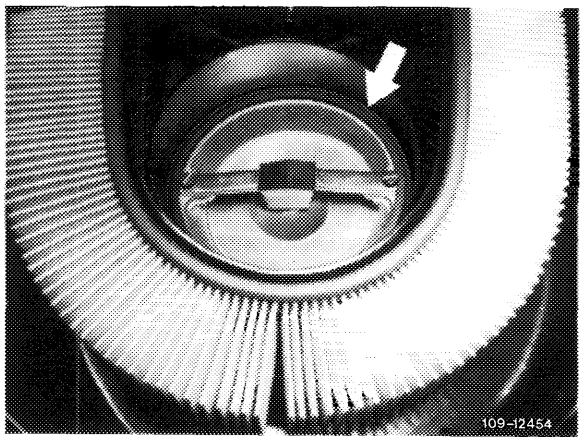


Installation

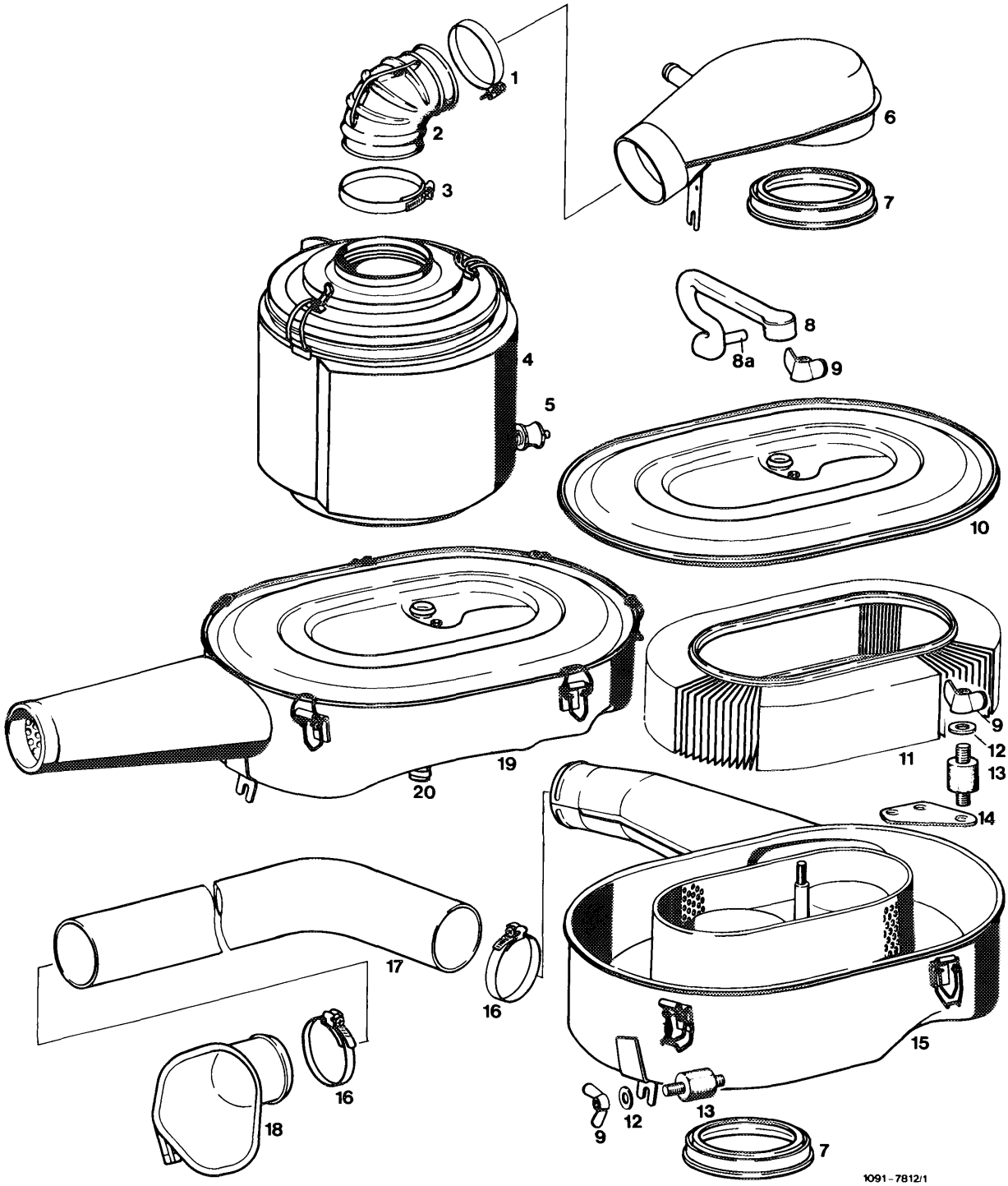
3 Remove air cleaner cover.

4 Mount air cleaner. Pay attention to correct seat of sealing ring (arrow) between air flow sensor and air cleaner.

5 Mount air cleaner cover.



Air cleaner



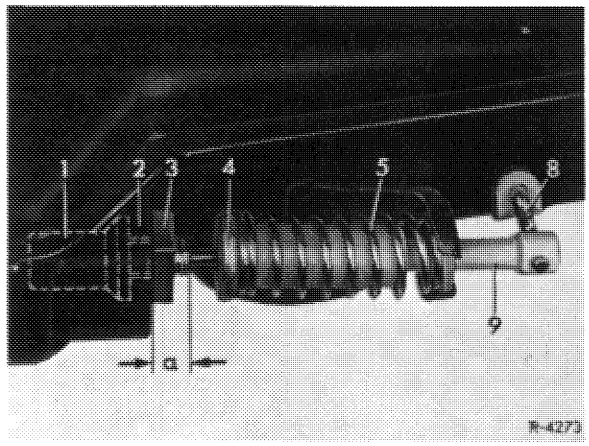
Model 107

1 Hose clamp
2 Rubber scoop
3 Hose clamp
4 Air cleaner
5 Vibration damper
6 Intake pipe

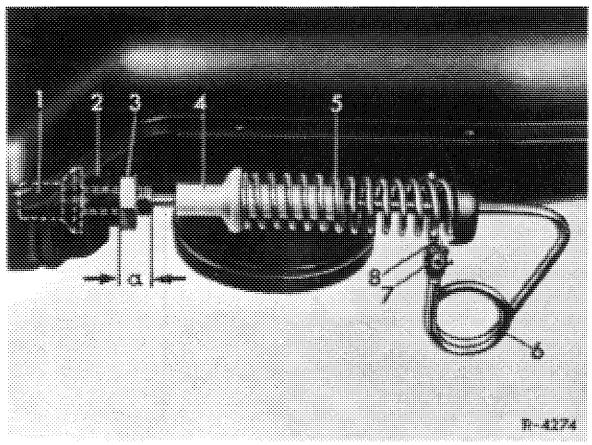
Models 116, 123, 126

7 Rubber sealing ring
8 Vent line
9 Wing nut
10 Air cleaner cover
11 Air cleaner element
12 Washer
13 Vibration damper
14 Holder
15 Air cleaner lower half 1st version
16 Hose clamp
17 Intake hose
18 Intake scoop
19 Air cleaner 2nd version
20 Connection for decel shutoff

Preheating of the intake air is automatically controlled by a termostat (1) installed in intake pipe of air filter and by an air valve (8).



Knecht version

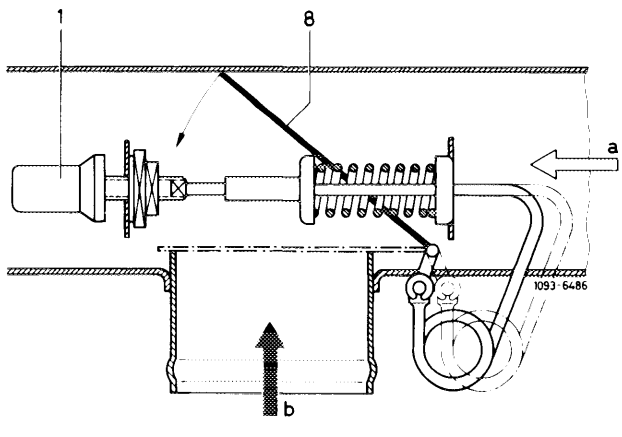


Mann und Hummel version

At thermostat temperature:

Below + 15 °C the fresh air input is closed by air valve (8) via duct "a". The warm air input via duct "b" is opened by the air valve, so that air preheated by the exhaust manifold will be drawn in.

Above + 35 °C the warm air supply is closed by air valve (8) via duct "b", so that only fresh air will be drawn in via duct "a".

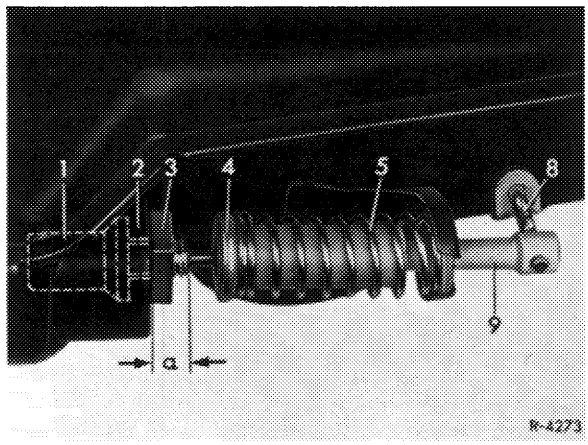


Testing and adjusting value

Thermostat, dimension "a"	7–8 mm

A. Knecht version

Removal



1 Compress compression spring (5) and push actuating bolt (9) from air valve shaft (8) and out of fastening eye.

2 Pull actuating bolt (9) together with guide sleeve (4) out of actuating pin of thermostat.

3 Unscrew square nut (3) and remove air filter cover.

4 Remove thermostat from inside out of intake pipe.

Attention!
Do not turn or push out plastic fastening nut (2).

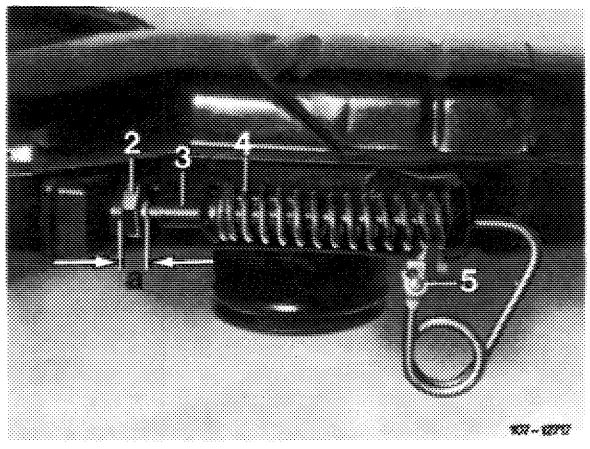
Installation

5 Screw thermostat (1) from inside into plastic fastening nut (2) until dimension "a" = **7–8 mm** is attained. Lock thermostat by means of square counternut (3).

6 Install actuating bolt (9) with guide sleeve (4) and compression spring (5).

B. Mann und Hummel version

Removal



1 Push guide sleeve (3) against spring (4) and disconnect from pressure pin.

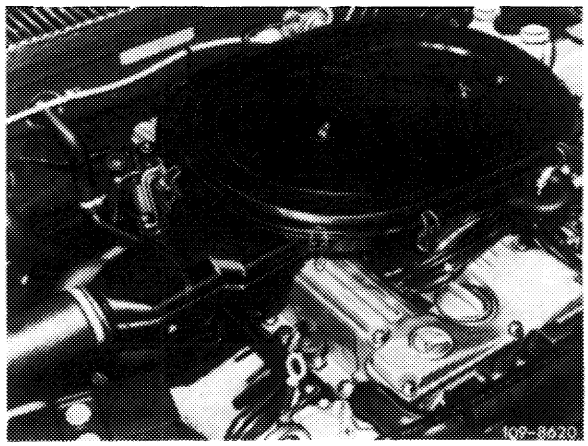
2 Remove air filter cover. Unscrew hex nut (2), unscrew thermostat from inside out of air filter housing.

3 Install thermostat in vice versa sequence and set dimension "a".

Removal

1 Pull off fresh air, warm air and crankcase breather hose.

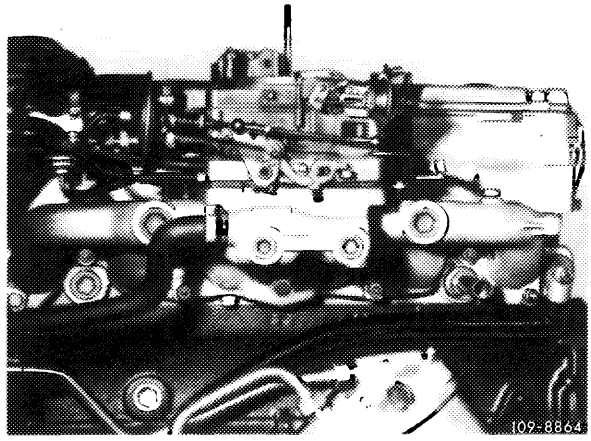
2 Loosen fastening nut as well as wing nut and remove air filter.



Installation

3 Install air filter in vice versa sequence. Pay attention to correct seat of sealing ring between carburetor and air filter and replace sealing ring, if required.

Removal



1 Partially drain coolant.

2 Remove air filter.

3 Remove carburetor (07.2—194).

4 Disconnect engine longitudinal regulating shaft and regulating rods.

5 Loosen all connections on intake pipe.

6 Loosen intake pipe fastening nuts or screws and remove intake pipe.

Installation

Install intake pipe in vice versa sequence as follows:

7 Install new intake pipe flange gasket.

8 Add coolant and check cooling system for leaks.

9 Adjust idle speed, while checking intake system for leaks (07.2—100).

Adjusting values

V-belts (width of profile in mm)	New V-belts (KG-scale on measuring instrument)	Used V-belts (KG-scale on measuring instrument)
9.5	30	20–25
12.5	50	40–45

Conventional tool

Measuring instrument (Krikit)	e.g. made by Gates GmbH, Gravener Straße 191–193, D-4018 Langenfeld 2
	e.g. Gates Rubber Company 999 S. Broadway USA-80217 Denver/Colorado

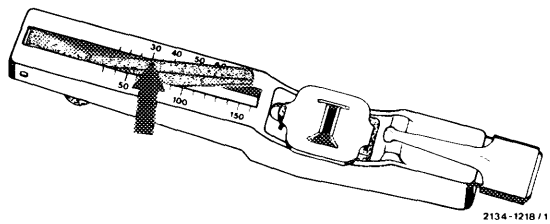
Checking condition of V-belts

Renew cracked, porous, burnt or worn V-belts.

Checking tension

For handling of instrument refer to operating instructions and tensioning V-belts (13–340).

The specified adjusting values refer to KG-scale of measuring instrument (arrow).



Used V-belts

Check tension of V-belts and compare with values for used V-belts (e.g. V-belt, width of profile 9.5 mm = adjusting value 20—25) shown on table and retension accordingly, if required.

Mounting and tensioning of new V-belts

Perfect assembly of a V-belt requires loosening of respective secondary unit or tensioning device of V-belt to the extent that the V-belt can be easily mounted. In addition, the running surfaces on V-belt pulleys should be free of burr, rust and dirt.

Keep away from oil, grease, chemicals. Do not use belt wax or similar compounds. Then make sure of optimal adjustment of belt tension (for adjusting values refer to table) to avoid complaints such as squealing V-belts and short life.

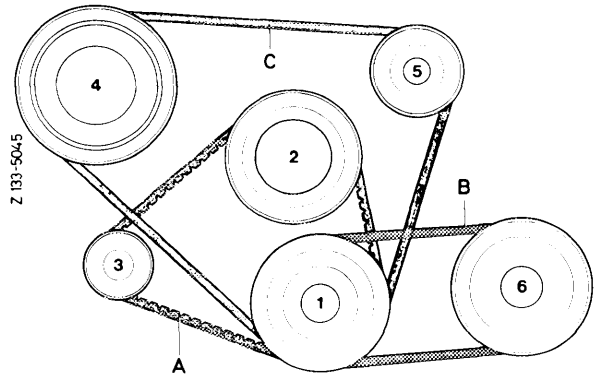
During maintenance jobs, mount V-belt **prior** to engine checkup and tension to value for **new V-belts** named in table (e.g. V-belt, width of profile 9.5 mm = adjusting value 30).

If possible, run engine approx. 10—15 minutes with all consumers connected. Then check tension. The value measured in this manner should be in agreement with value for **used V-belts** shown on table (e.g. V-belt, width of profile 9.5 mm = adjusting value 20—25). If it is less, retension V-belt to this value.

If the engine cannot be run in shop, check V-belt tension during final inspection or following a test drive.

V-belt	Models 107, 114, 116	Models 107[1]), 116[1])	Models 123, 126	Adjusting value KG-scale on measuring instrument
A Alternator	9.5 x 960		9.5 x 930	20–25
B Power steering pump	12.5 x 784 12.5 x 818[2])	12.5 x 825 12.5 x 818[2])		40–45
C Refrigerant compressor	12.5 x 1375[3])	12.5 x 1285		

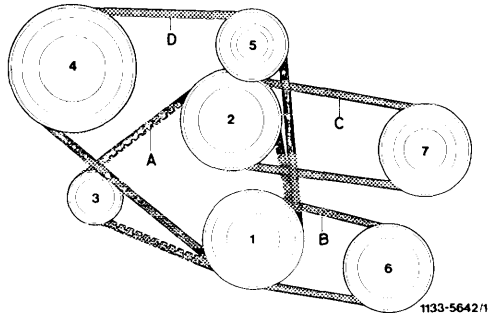
[1]) Power steering pump with cast-on reservoir.
[2]) Standard starting 5.1978.
[3]) Version 1 (swivelling tensioning roller), of models 114.060/062/072/073.



1 Crankshaft
2 Water pump
3 Alternator
4 Refrigerant compressor
5 Tensioning roller
6 Power steering pump

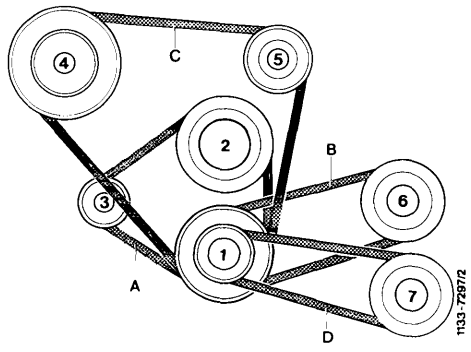
V-belt	California Model year 1974	California Model year 1975 (J) (S) (USA) Model year 1976	(AUS) (J) (S) (USA) Model year 1977/78	Adjusting value KG-scale on measuring instrument
A Alternator	9.5 x 960 9.5 x 980[1])			20–25
B Power steering pump	12.5 x 725	12.5 x 715	12.5 x 825 12.5 x 818[2])	40–45
C Air pump	9.5 x 910 optional 9.5 x 913		9.5 x 825	20–25
D Refrigerant compressor	12.5 x 1285			40–45

[1]) On 65-A alternator (J) 1979, with KW-pulley 110 032 08 04 (formerly 123 032 01 04).
[2]) Standard starting 5.1978.



Model year 1974–1976

1 Crankshaft
2 Water pump
3 Alternator
4 Refrigerant compressor
5 Tensioning roller
6 Power steering pump
7 Air pump



Model year 1977/78

1 Crankshaft
2 Water pump
3 Alternator
4 Compressor
5 Roller
6 Power steering pump
7 Air pump

Special tools

Wrench socket 8 mm, 1/2" square, 130 mm long		000 589 33 07 00

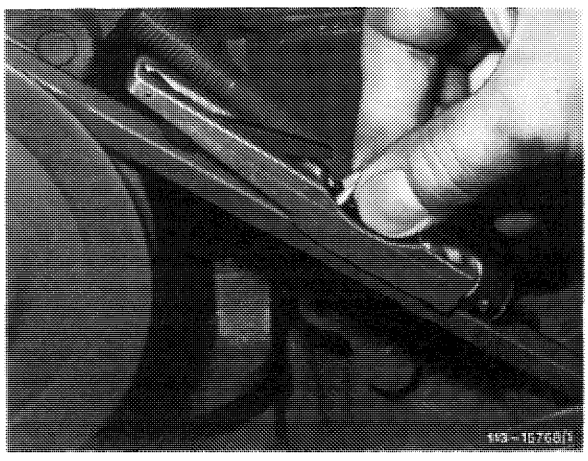
Note

Measuring instrument "Krikit" is recommended for checking V-belt tension.

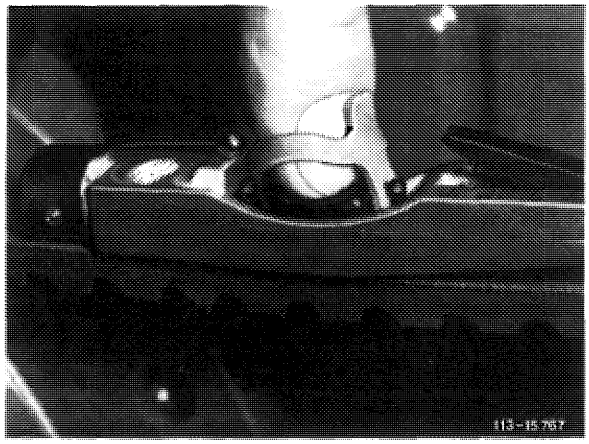
Handling of measuring instrument

For checking V-belt tension the measuring instrument can be held in different ways:

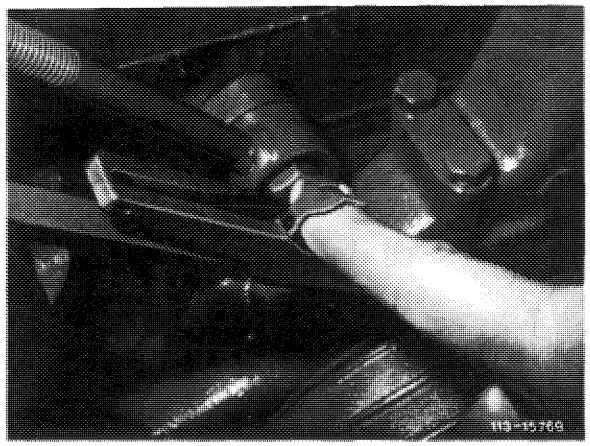
a) With thumb and forefinger on rubber loop, with finger tips resting on push button.



b) With forefinger from above in rubber loop.



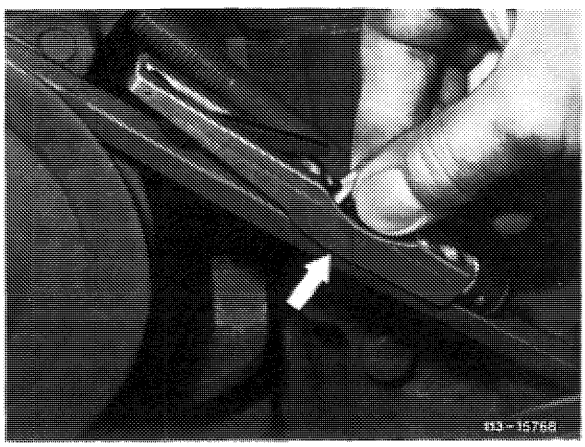
c) With forefinger laterally between rubber loop and push button.



Checkup

1 Lower indicating arm on measuring instrument.

2 Place measuring instrument on V-belt in center between pulleys. Lateral stop on measuring instrument should rest laterally against V-belt (arrow).



Attention!
On double belt drive make sure that measuring instrument rests only on one V-belt.

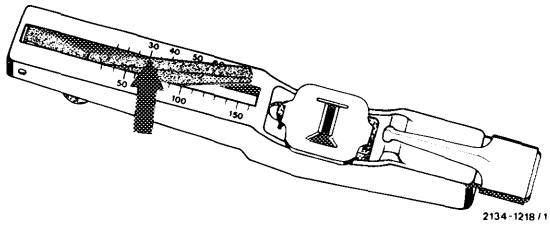
3 Exert uniform vertical pressure on top of V-belt by means of push button until click spring disengages audibly (or noticeably).

Note: Upon disengagement of click spring do not continue pushing measuring instrument, since this will result in a wrong indication.

4 Lift measuring instrument **carefully** from V-belt. Prevent impacts which may change position of indicating arm.

5 Read tension value on point of intersection of indicating arm on upper scale (arrow).

The specified adjusting values refer to KG-scale of measuring instrument.



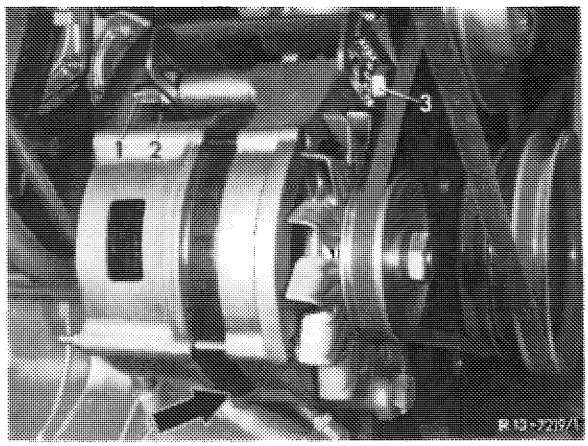
Tensioning

Belt A Alternator – coolant pump up to and including 1974

1 Loosen nut (2) and mounting bolt (arrow).

2 Adjust belt tightness at 6 mm square (1) or hexagon of tightening bolt (3).

3 Tighten nut (2) and mounting bolt (arrow).

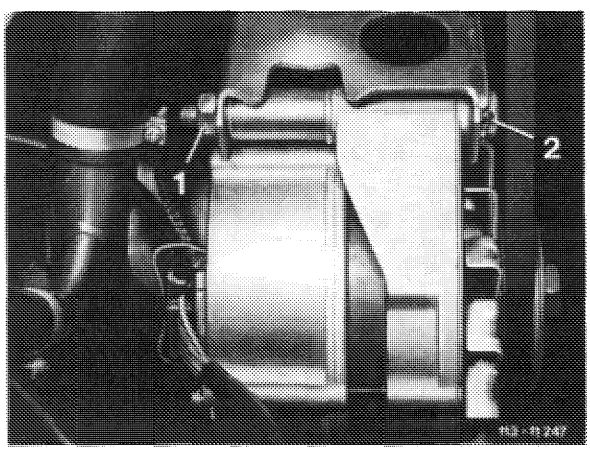


Belt A Alternator – coolant pump starting 1975

1 Loosen nut (1).

2 Adjust belt tightness with tightening bolt (2).

3 Tighten nut (1).

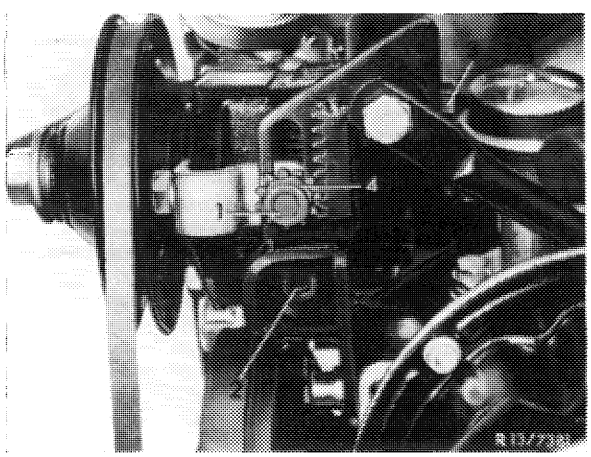


Belt B Power steering pump

1 Loosen mounting bolts (1, 2 and 3).

2 Adjust belt tightness with toothed disc (4).

3 Tighten mounting bolts (1, 2 and 3).

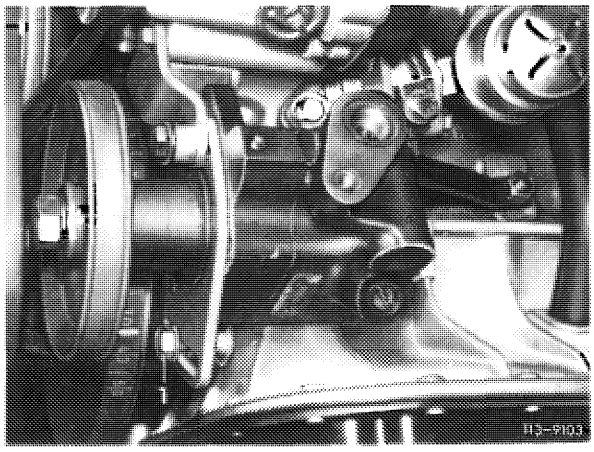


Belt B Power steering pump
USA version 1974 models

1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out power steering pump.

3 Tighten mounting bolt (1).

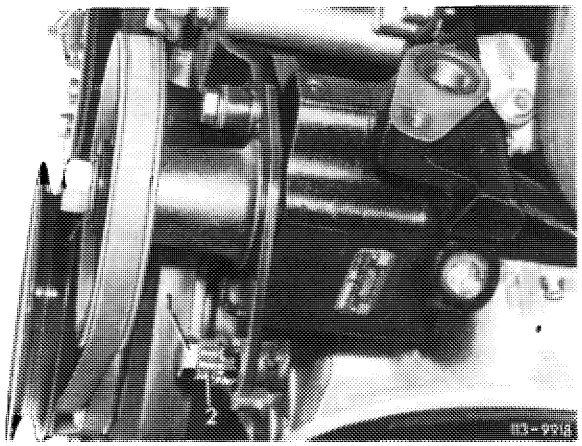


Belt B Power steering pump
USA version 1975/76 models
Sweden, Japan version
1976 models

1 Loosen mounting bolt (1).

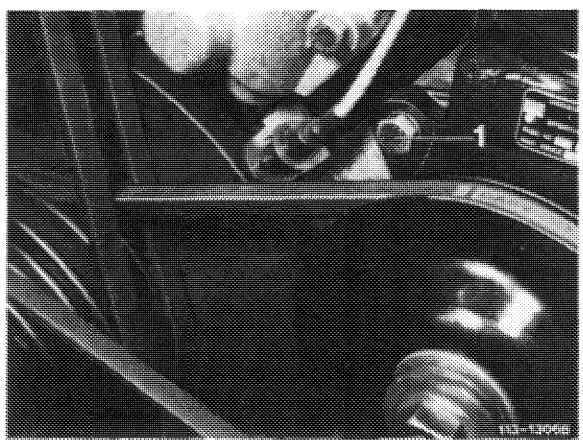
2 Adjust belt tightness with toothed disc (2).

3 Tighten mounting bolt (1).



Belt B Power steering pump model 123
Standard version
and starting model year 1977

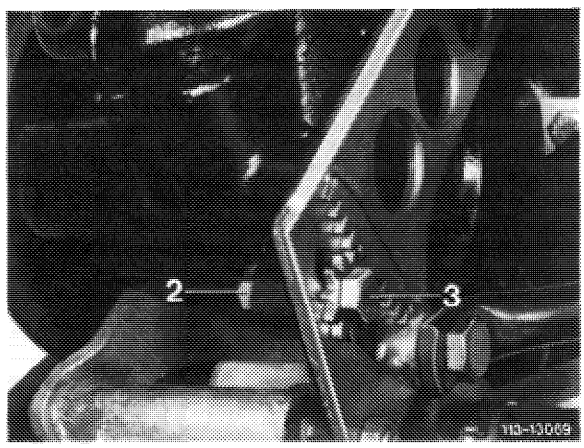
1 Loosen screw (1) on face of power steering.



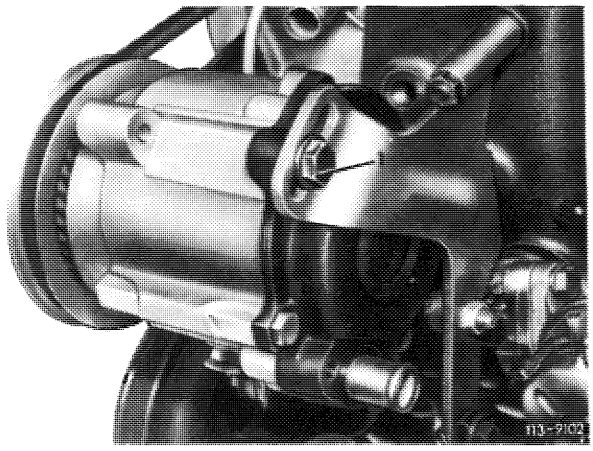
2 Loosen nut (2).

3 Tension belt with tensioning screw (3).

4 Tighten nut (2) and screw (1).



Belt C Air pump
USA version from 1974 – 1976 models
Sweden version from
1976 models
Japan version from
1976 models

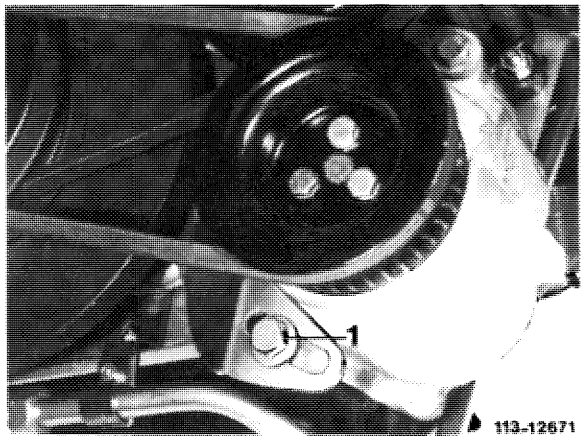


1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out air pump.

3 Tighten mounting bolt (1).

Belt C Air pump starting model year 1977
Australia, Japan, Sweden,
USA version

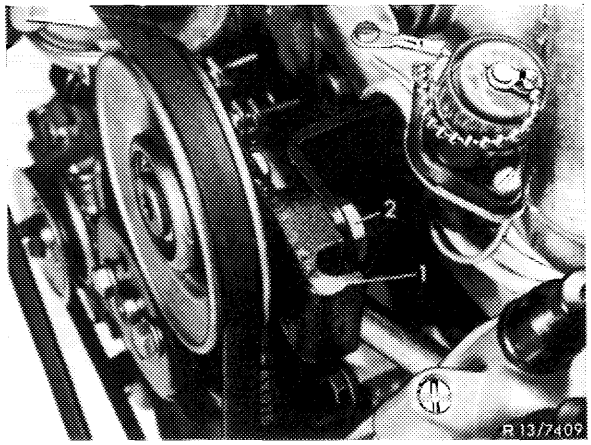


1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out air pump.

3 Tighten mounting bolt (1).

Belt D 1st version compressor



1 Guide an appropriate tool with an approx. 8 mm dia. into opening of holder (1).

2 Loosen mounting bolt (2).

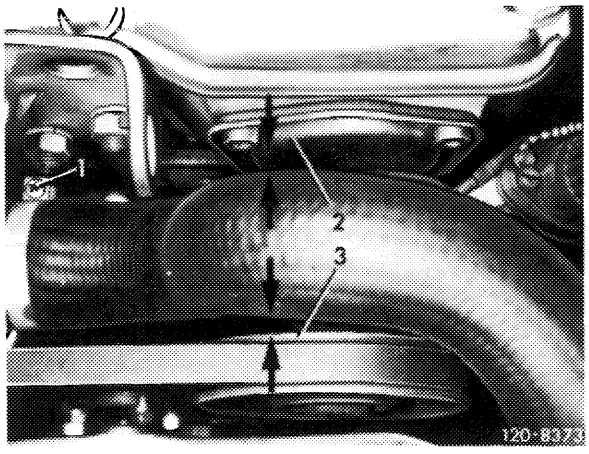
3 Adjust belt tightness by swinging holder (1) clockwise.

4 Tighten mounting bolt (2).

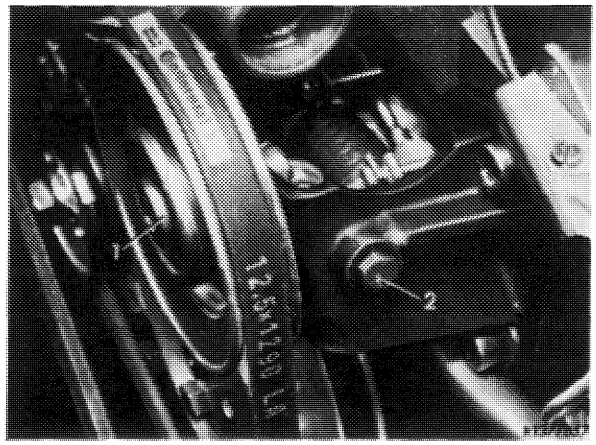
Attention!
Check the following distances of a re-tightened belt.
Distance from coolant hose to cover (2) is approx. 5 mm.

Distance from coolant hose to belt roller (3) is approx. 10 mm.

If these distances cannot be reached by loosening the hose clamp (1) and twisting the coolant hose, the tightening device must be converted to the 2nd version.



Belt D Refrigerant compressor version 2



1 Loosen expansion bolt (1).

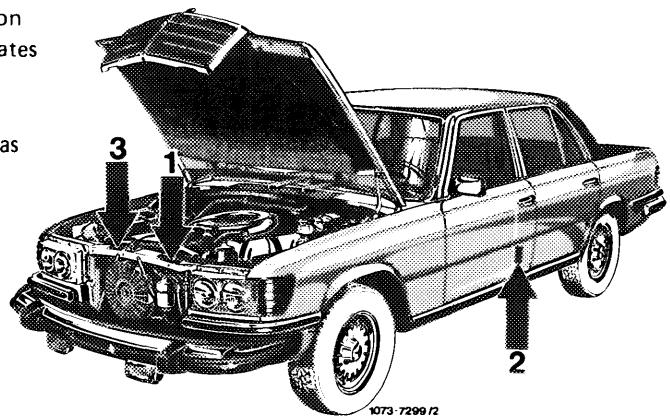
2 Adjust belt tightness with tightening bolt (2).

3 Torque expansion bolt (1) to 16 Nm.

Note: A number of vehicles has been delivered with the counternut on the tightening bolt (2). For this version the belt tightness is adjusted with the counternut. However, it would be more advantageous to exchange the M 6 x 90 adjusting bolt against a M 6 x 75 bolt, part number 000 933 006 176, and to install this bolt without a counternut.

The various emission control systems of USA version vehicles are identified by respective information plates (arrows 1, 2 and 3).

The respective plate shows the identification data, as well as all the important engine adjusting data.



Recognising emission control system from color of information plate – basic color/lettering

Model year	Federal version	California version	Federal version high altitudes	Federal version tourist vehicles	California version tourist vehicles
1973	black/silver	black/silver	–	–	–
1974		green/silver	–	–	–
1975		green/silver	–	yellow/silver	yellow/silver
1976					
1977	black/white	yellow/black	red/black	black/white	yellow/black
1978			–		
1979			–		
1980		black/white	–		black/white
1981					

1. Information plate on cross-member in front of radiator

VEHICLE EMISSION CONTROL INFORMATION DAIMLER-BENZ AG. STUTTGART-UNTERTUERKHEIM
DISPLACEMENT: 167.5 CU. IN. ENGINE FAMILY: 78/2B/L6E/28 APPROVED M.B. EMISSION CONTROL SYSTEM: FI/EGR/Also/DBC.
THIS VEHICLE IS CERTIFIED FOR BOTH LOW AND HIGH ALTITUDE LOCATIONS. IDLE-RPM: 800. TIMING: TDC AT IDLE. (VACUUM CONNECTED). CO-SET
(MEASURED AT EXHAUST MANIFOLD TAP CYL. 1-3 DISCONNECT EXHAUST HOSE TO EGR TRANSDUCER) 0.4-2.0% (AIR INJECTION DISCONNECTED.
TRANSMISSION IN NEUTRAL ACCESSORIES NOT IN OPERATION. OIL TEMP. 80° C. IN ADDITION SEE WORKSHOP MANUALS).
VALVE LASH AT WATER TEMP. BELOW 30°C. INTAKE 0.10 mm EXHAUST 0.25 mm. VALVE LASH AT WATER TEMP. ABOVE 45 °C. INTAKE 0.15 mm EXHAUST 0.30 mm
THIS VEHICLE CONFORMS TO U.S.E.P.A. REGULATIONS APPLICABLE TO 1978 MODEL YEAR NEW MOTOR VEHICLES. IT ALSO CONFORMS TO CALIFORNIA
REGULATIONS APPLICABLE TO 1978 MODEL YEAR NEW MOTOR VEHICLES. THE VEHICLE ALSO CONFORMS TO APPLICABLE CANADIAN EMISSION STANDARDS.
123 584 94 21

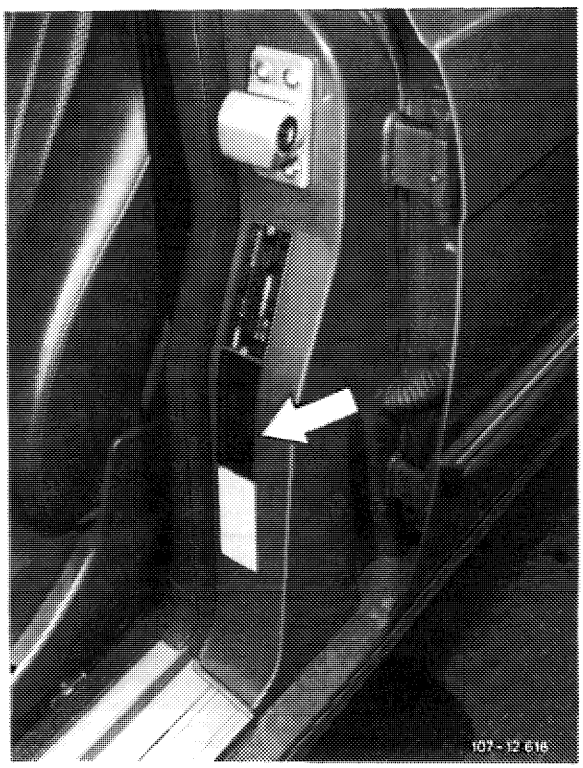
1074 – 7957

Recognising catalyst from color of information plate
Basic color/lettering

Model year	Federal version	California version	Federal version high altitudes	Federal version tourist vehicles	California version tourist vehicles
1977	black/silver	green/silver	black/silver	red/silver	blue/silver
1978		red/silver	–		red/silver
1979			–		
1980		black/silver	–		
1981					

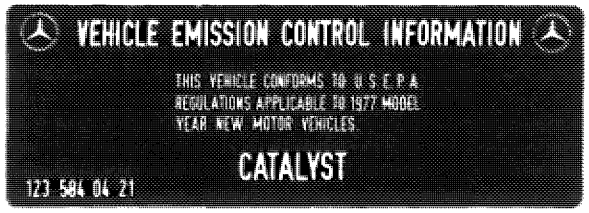
2. Information plate on door post of driver's door

This plate shows whether vehicle is provided with or without catalyst (s).



Information plates

This vehicle is provided with catalyst(s).



1074 – 8259

Tourist vehicle

This vehicle is not provided with catalyst(s) by manufacturer.

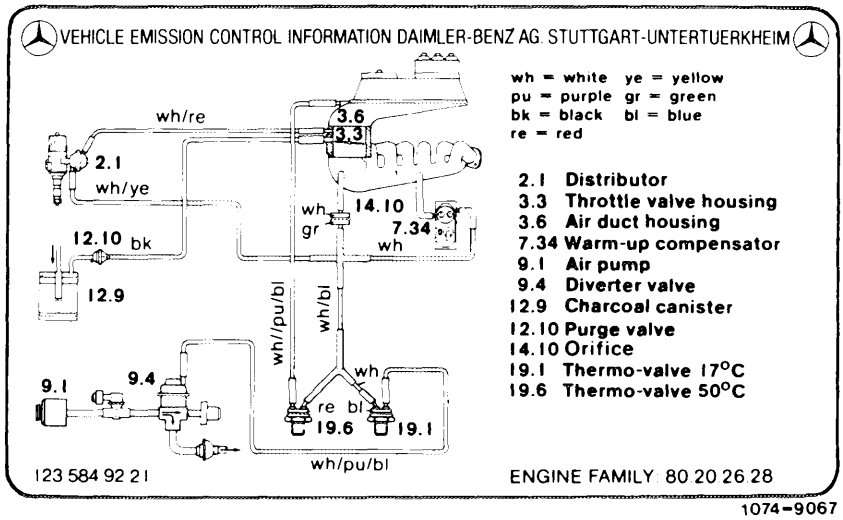
Catalyst(s) must be installed following import into USA.

1074 – 8260

3. Information plate for vacuum line layout on cross member in front of radiator (for California only starting model year 1980).

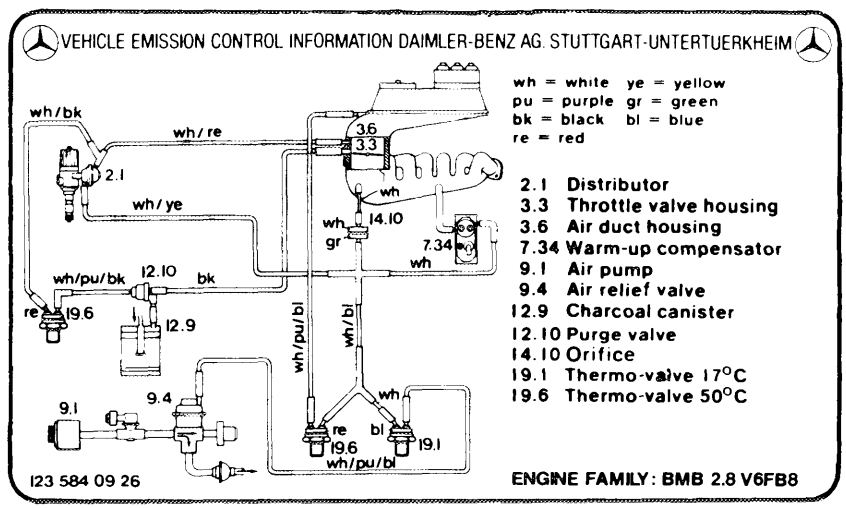
This plate shows the vacuum line layout for all emission system components in engine compartment.

Model year 1980



1074-9067

Model year 1981



1143-9843

For conplaints such as: On/off ratio cannot be regulated, poor warm-up characteristics of engine, hunting at idle, engine not accepting gas or splashing during acceleration, proceed as follows:

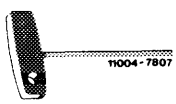
Check lambda control.

Check air injection.

Check fuel evaporation control system.

Assumption: CIS injection system and ignition system in order.

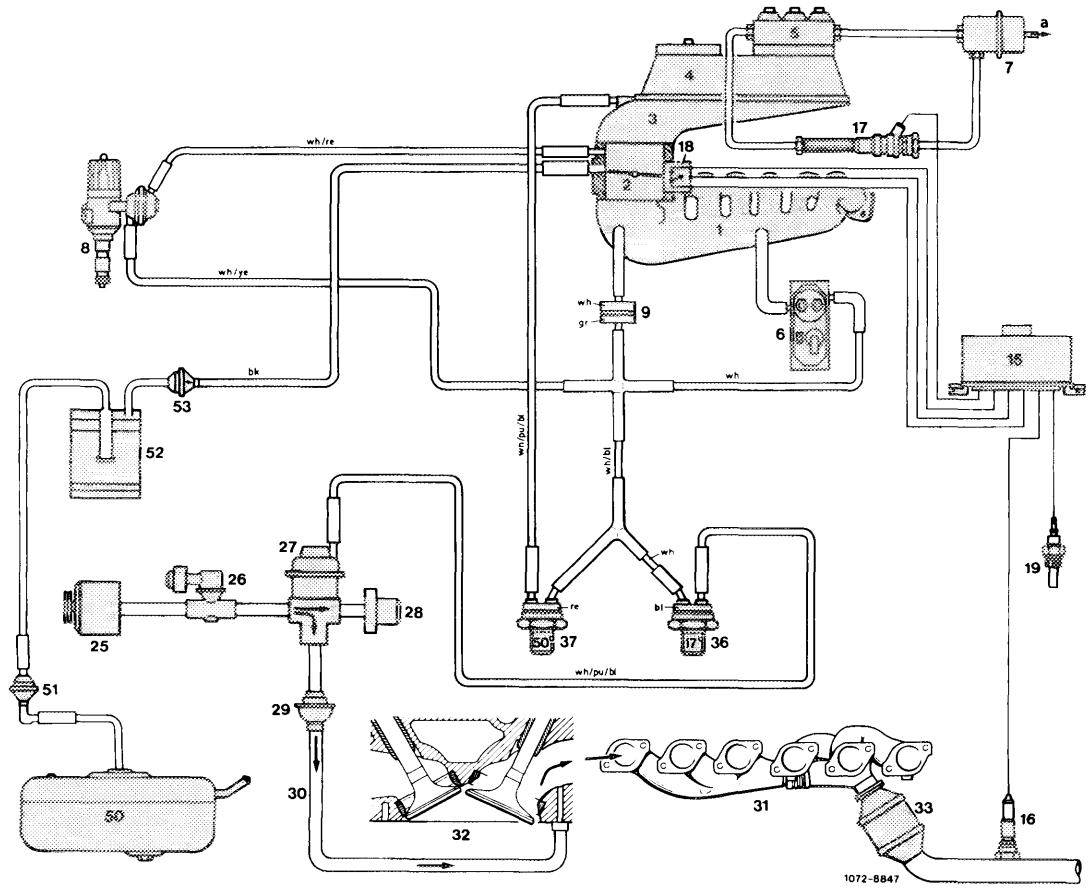
Special tools

Oil telethermometer		116 589 27 21 00
Allen wrench for hex socket screw 3 mm		000 589 14 11 00
Adapter for checking electric lines and components		110 589 14 21 00

Conventional tools

Revolution counter, multimeter (volt-ohmmeter)	
Lambda control tester	KDJE–P 600

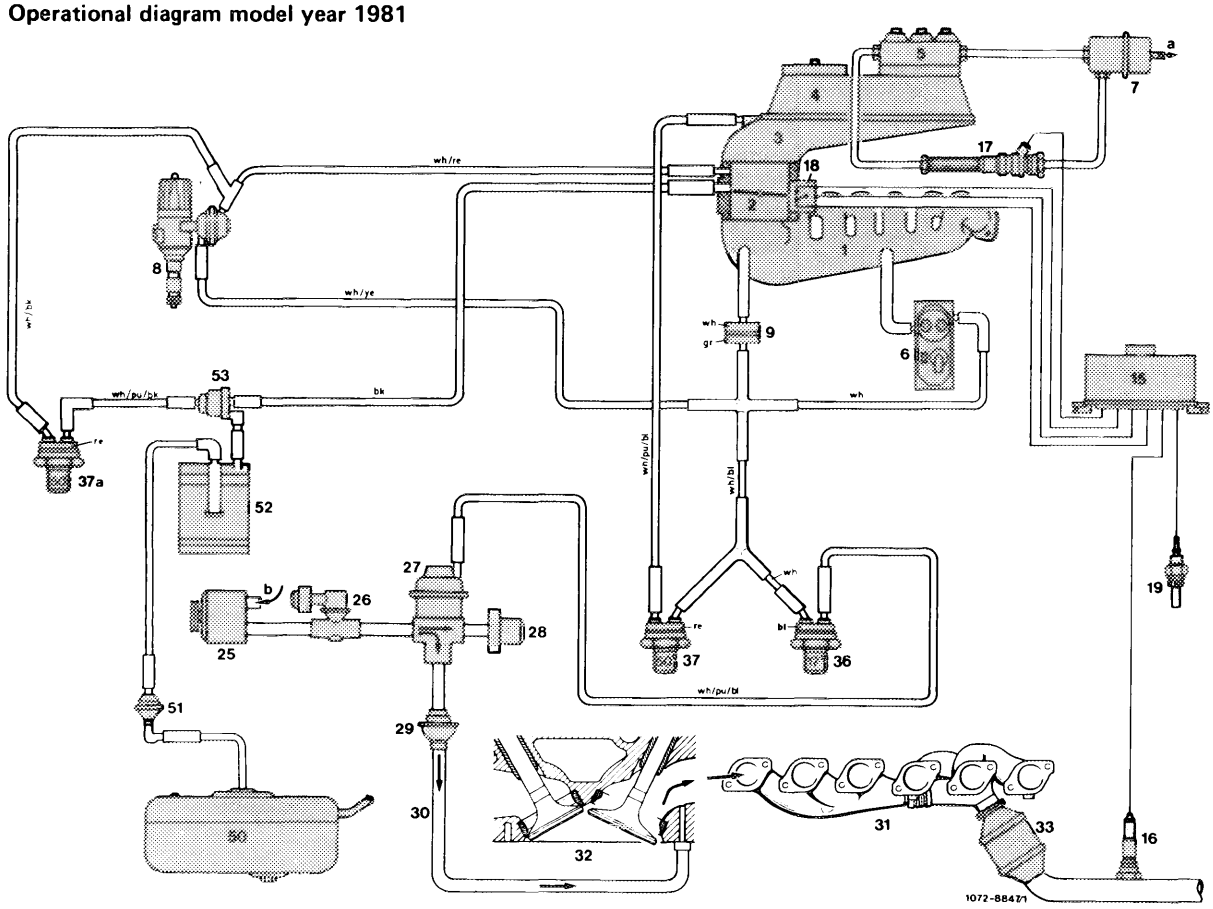
Operational diagram model year 1980



1 Intake manifold
2 Throttle valve housing
3 Air guide housing
4 Air flow sensor
5 Volume distributor
6 Warm-up compensator
7 Damper
8 Ignition distributor
9 Orifice
15 Control unit
16 Oxygen sensor
17 Frequency valve
18 Throttle valve switch
19 Temperature switch oil 16 °C/61 °F
25 Air pump
26 Pressure relief valve
27 Diverter valve
28 Damper filter (silencer)
29 Check valve
30 Injection line
31 Exhaust manifold
32 Cylinder head
33 Primary catalyst
36 Thermovalve 17 °C/62 °F
37 Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve
a Leak-off connection

Color code
bk = black
bl = blue
gr = green
ye = yellow
re = red
wh = white
pu = purple

Operational diagram model year 1981



1	Intake manifold	18	Throttle valve switch	36	Thermovalve 17 °C/62 °F	Color code	
2	Throttle valve housing	19	Temperature switch oil 16 °C/61 °F	37	Thermovalve 50 °C/122 °F	bk	= black
3	Air guide housing	25	Air pump	37a	Thermovalve 50 °C/122 °F	bl	= blue
4	Air flow sensor	26	Pressure relief valve	50	Fuel tank	gr	= green
5	Fuel distributor	27	Diverter valve	51	Vent valve unit	ye	= yellow
6	Warm-up compensator	28	Damper filter (silencer)	52	Charcoal canister	re	= red
7	Damper	29	Check valve	53	Purge valve	wh	= white
8	Ignition distributor	30	Injection line	a	Leak-off connection	pu	= purple
9	Orifice	31	Exhaust manifold	b	From air cleaner		
15	Control unit	32	Cylinder head				
16	Oxygen sensor	33	Primary catalyst				
17	Frequency valve						

A. Quick test with lambda control tester KDJE–P 600

The lambda control tester can be used for adjusting on/off ratio at idle, but also for a quick diagnosis of lambda control.

Connect lambda control tester to diagnosis socket and revolution counter. Connect oil telethermometer.

Note: If the specified nominal value is not attained, refer to quick test with adapter.

Scope of test	Actuation	Readout/nominal value
a) Engine oil temperature < 13 °C/55 °F	Engine at idle	Constant between 56–64 %
b) Simulation	Pull plug from temperature switch 16 °C/61 °F and connect to ground	Readout as above

Warm-up control

a) Engine oil temperature > 20 °C/68 °F, oxygen sensor not yet ready for operation (< approx. 300 °C/572 °F)	Engine at idle	Constant between 46–54 %
b) Simulation	Separate plug of oxygen sensor	Readout as above

Control at operating temperature

Engine oil temperature approx. 80 °C, oxygen sensor ready for operation (> approx. 300 °C)	Engine at idle	50 % ± 10 % slowly swinging needle
Idle contact closed	Throttle valve at idle stop	Deflection of needle approx. 8–12 % around nominal value
Idle contact open	Slightly open throttle valve	Deflection of needle approx. 13–23 % around nominal value
Full throttle contact closed	Apply full throttle for a short moment	Constant between 56–64 %
Lean stop control unit	Separate plug of oxygen sensor, connect plug of control unit to 2 volt output of tester **for a short moment**	Constant < approx. 20 % < approx. 20 %
Rich stop control unit	Separate plug of oxygen sensor, connect plug for control unit to ground **for a short moment**	Constant > approx. 87 %
Air injection	Pull blue/purple vacuum line from air guide housing and close **for a short moment**	Constant approx. 87 %

B. Quick test with adapter

Connect adapter to plug, control unit and multimeter to adapter.

Test set-up	Circuit or component tested	Setting of controls	Specified value . . . If deviating, see individual component test program sections
Adapter to position 1 with voltmeter	Supply voltage	Ignition turned on	U = 12 ± 2 V light on If deviating, see section I.
Adapter to position 2 with ohmmeter	Throttle valve switch	Ignition off Idle position . . . Full throttle position . . .	R = ∞ Ω R = 0 Ω If deviating, see sections IV and V.
	Switch 16 °C/ 61 °F	Ignition off	< 13 °C R = 0 Ω > 19 °C R = ∞ Ω If deviating, see sections II and III.
Adapter to position 3 with ohmmeter	Throttle valve switch	Ignition off Idle position . . . Advance slightly throttle linkage . . .	R = 0 Ω R = ∞ Ω If deviating, see sections IV and V.
Adapter to position 4 with voltmeter	Frequency valve	Ignition on Crank engine	U = 12 ± 2 V If deviating, see sections VI and IX.
Adapter to position 5 with ohmmeter	Oxygen sensor probe cable and connection to electronic control unit	Ignition off Pull off oxygen sensor connection and bridge plug going to electronic control unit	R = ∞ Ω R = 0 Ω If deviating, see sections VII and VIII.
Disconnect adapter and re-insert plug into control unit. Connect lambda control tester		Run engine until operating temperature is attained	On/off ratio = 50 % ± 10 % If deviating, see section X.
Pull blue/purple vacuum line from air guide housing and close		Start engine for a short moment	On/off ratio = > 80 % If deviating, see section XI.
Pull draw-off line (purge line) to throttle valve housing from charcoal canister		Start engine Idle approx. 2000/min	No vacuum Vacuum available If deviating, see section XII.

C. Component test program

Test section A

Test conditions: Connect adapter to plug, control unit and multimeter to adapter.

Connect oil telethermometer.

I. Testing voltage supply of control unit

Rotary switch on adapter to position 1, multimeter to measuring range 0–30 volts, ignition switched on, read indicator.

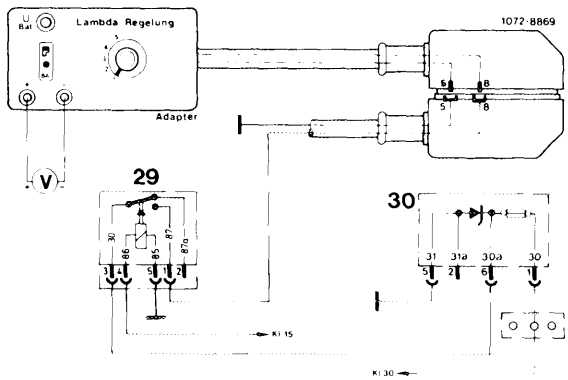
Indicator lamp of adapter:

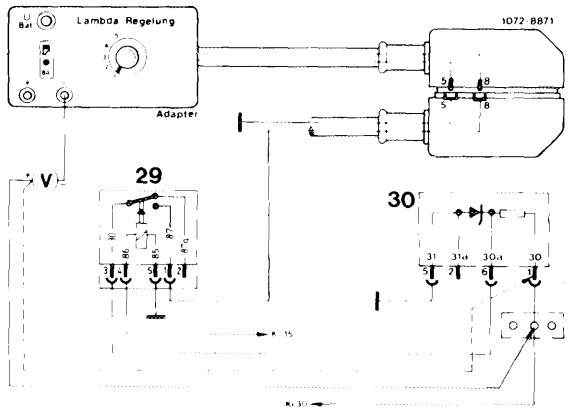
Lighting up	Not lighting up
Readout	
approx. 12 volts	0 volt

Pull plus (positive) cable of voltmeter from adapter. Measure voltage: on connector of engine harness (terminal 30), on plug of overload protection (30) jack 1.

Readout	
approx. 12 volts	0 volt

Check line for break and correct, if required. Readout approx. 12 volts.



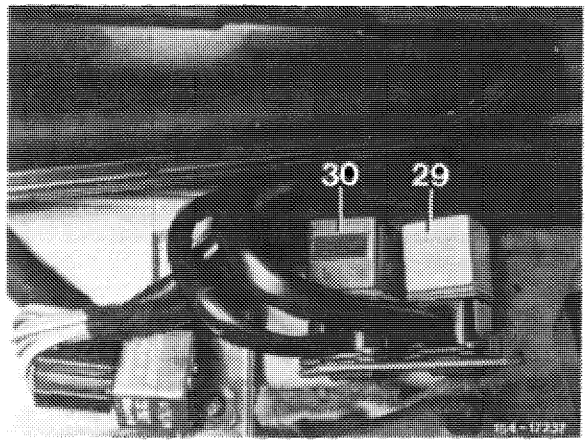


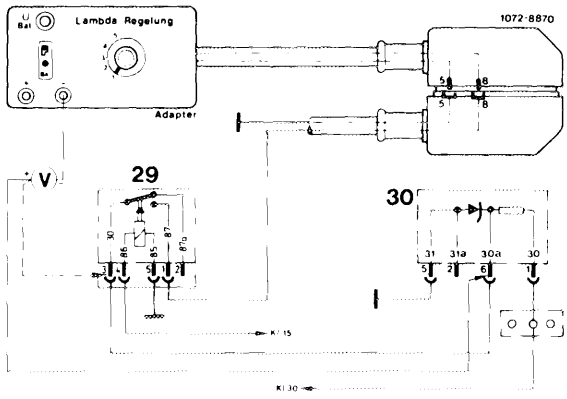
Attach overload protection (30) to plug in such a manner that the voltage on terminal 6 can be measured with plus (positive) cable of voltmeter.

Readout

approx. 12 volts | 0 volt

Renew overload protection (30).
Readout approx. 12 volts

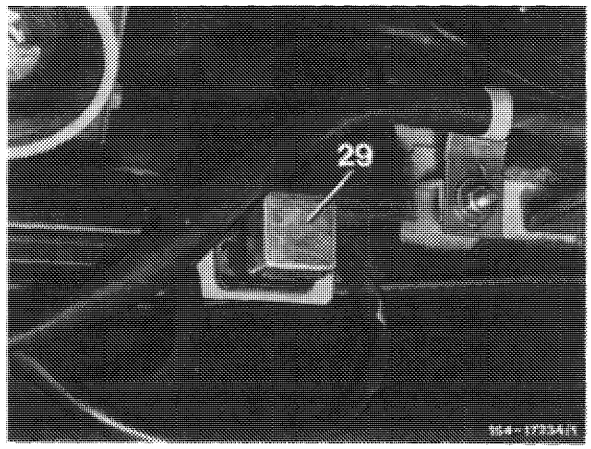




Attach relay for voltage supply (29) to plug in such a manner that voltage on jack 3 can be measured with plus (positive) cable of voltmeter.

Readout

approx. 12 volts | 0 volt



Check line to overload protection for break and correct, if required.
Readout approx. 12 volts.

Check voltage on jack 4 with ignition switched on.

Readout

approx. 12 volts | 0 volt

Check line to terminal 15 for break and correct, if required.
Readout approx. 12 volts.

Connect voltmeter to jack 3 and 5.

Readout

approx. 12 volts | 0 volt

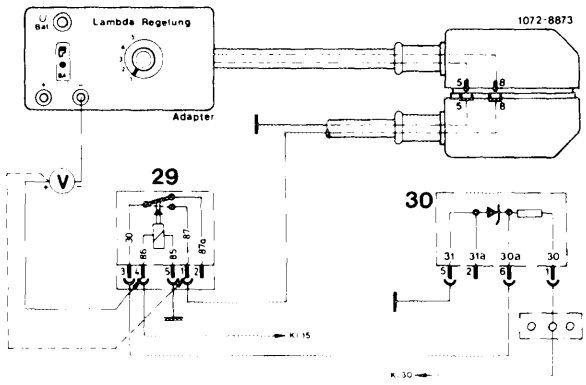
Check ground connection line (jack 5) for break and correct, if required.
Readout approx. 12 volts.

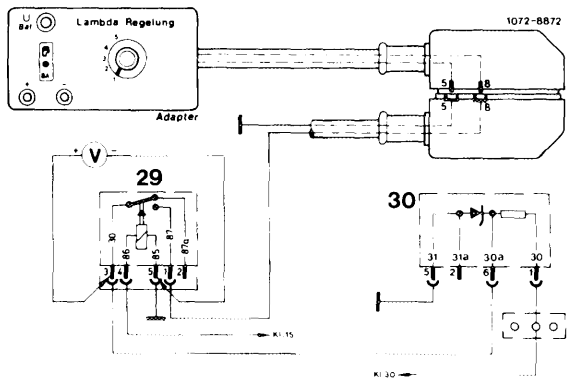
Attach relay for voltage supply (29) to plug in such a manner that voltage on jack 1 can be measured.

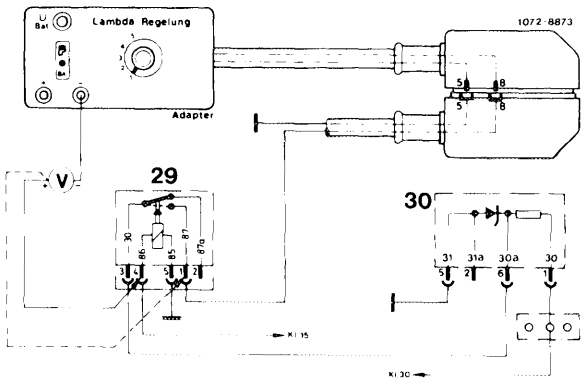
Readout

approx. 12 volts | 0 volt

Renew relay.
Readout approx. 12 volts.





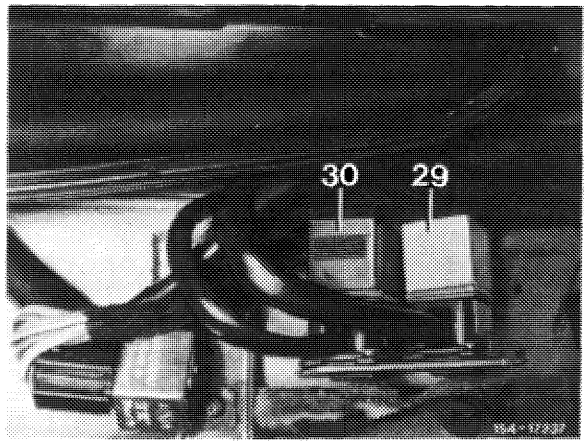


Connect voltmeter to adapter and check voltage.

Readout

approx. 12 volts | 0 volt

Check line from plug of relay voltage supply (29) to plug of control unit for break and correct, if required. Readout 12 volts.



End of test

II. Testing temperature switch oil 16 °C/61 °F (engine oil temperature < 13 °C/55 °F)

Rotary switch on adapter in position 2, multimeter on measuring range 0 – ∞ ohm, ignition switched off, disconnect plug of throttle valve switch, read indicator.

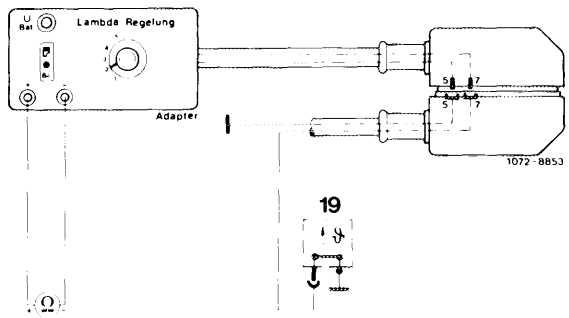
Readout

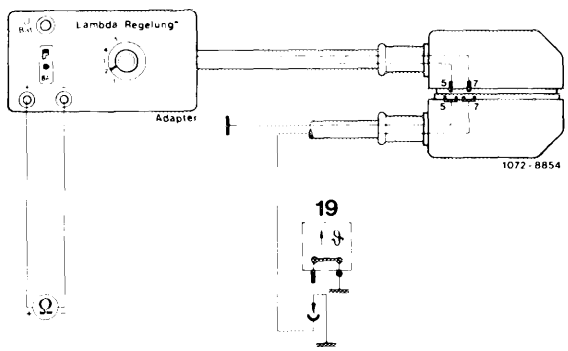
0 ohm | ∞ ohm

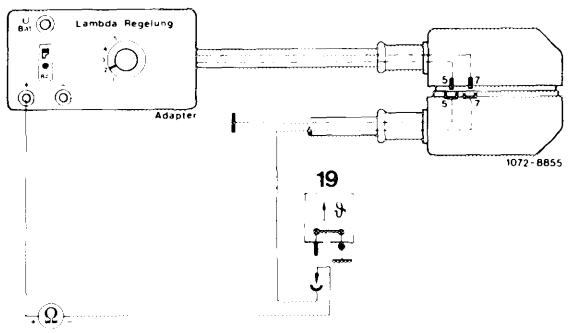
Pull plug of temperature switch and connect to ground.

If readout is 0 ohm, renew temperature switch.

If readout is ∞ ohm, check line of control unit plug (terminal 7) to temperature switch for break.







End of test

III. Testing temperature switch oil 16 °C/61 °F (engine oil temperature > 20 °C/68 °F)

Rotary switch on adapter in position 2, multimeter on measuring range 0—∞ ohm, ignition switched off.

Disconnect plug of throttle valve switch (arrow). Read indicator.

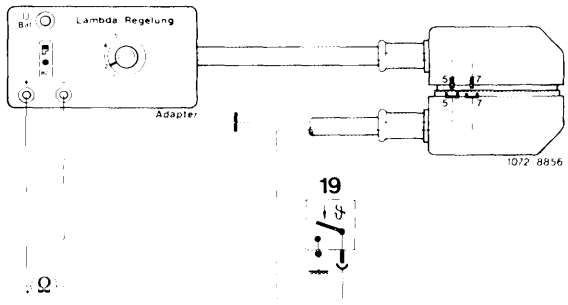
Readout	
∞ ohm	0 ohm

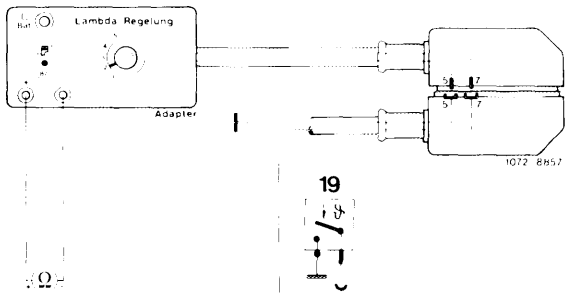
Pull plug on temperature switch.

If readout is ∞ ohm, renew temperature switch.

If readout is 0 ohm, check line from plug of control unit (terminal 7) to temperature switch for ground connection.

End of test





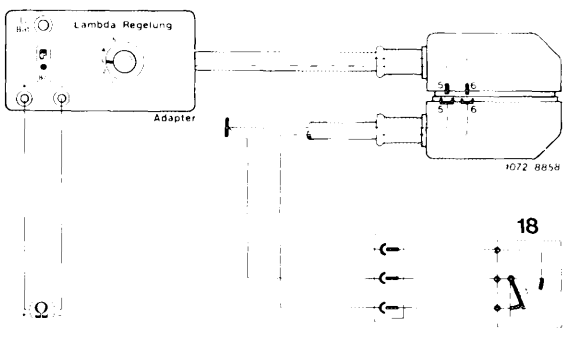
IV. Testing throttle valve switch (idle speed stop, engine oil temperature > 20 °C/68 °F)

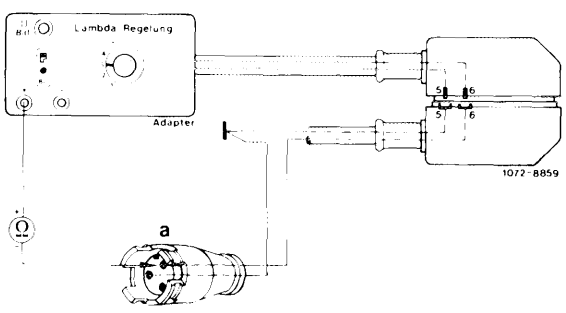
Rotary switch on adapter in position 3, multimeter on measuring range 0—∞ ohm, ignition switched off.

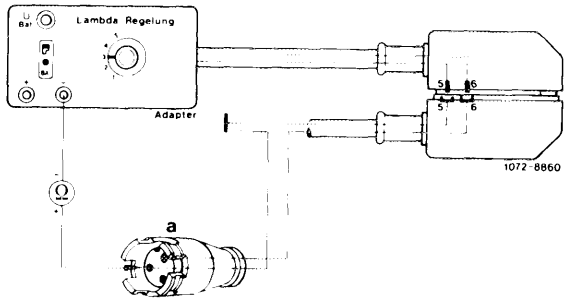
Regulating linkage at idle speed stop. Read indicator.

Readout	
Idle speed stop 0 ohm	∞ ohm
Lightly operate regulating linkage ∞ ohm	0 ohm

Disconnect plug of throttle valve switch.
Check lines from plug (a) to plug of control unit (terminal 6 or 15) for break according to wiring diagram.
If lines are in order, renew throttle valve switch.







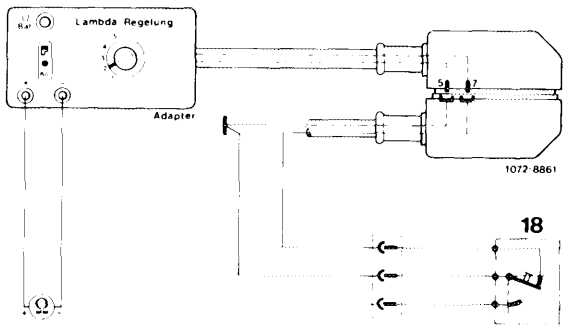
End of test

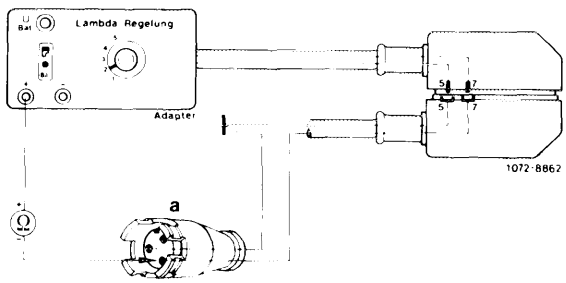
V. Testing throttle valve switch (full throttle stop, engine oil temperature > 20 °C/68 °F)

Rotary switch on adapter in position 2, multimeter on measuring range 0—∞ ohm, ignition switched off.

Plug on temperature switch oil pulled off. Regulating linkage at full throttle stop. Read indicator.

	Readout
Full throttle stop 0 ohm	∞ ohm
Slightly release regulating linkage ∞ ohm	0 ohm





Disconnect plug of throttle valve switch. Check line from plug (a) to plug of control unit (terminal 7) for break. If line is in order, renew throttle valve switch.

End of test

VI. Testing frequency valve

Rotary switch of adapter in position 4, multimeter on measuring range 0–30 volts, ignition switched on, operate starter. Read indicator.

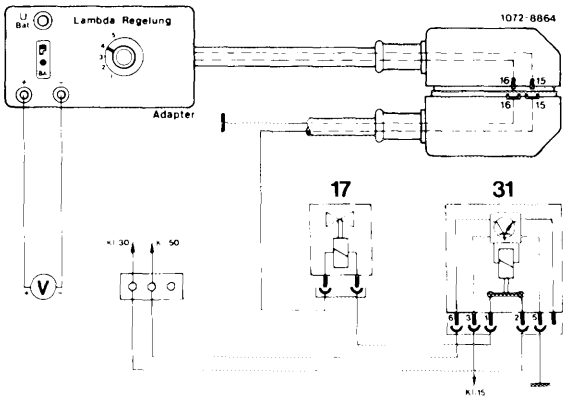
Readout	
approx. 12 volts	0 volt

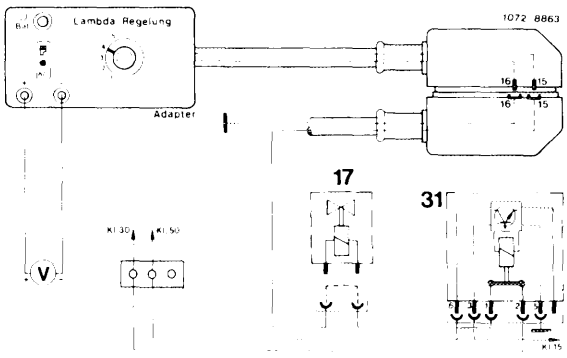
Pull plug from frequency valve and bridge. Operate starter. Readout 12 volts: replace frequency valve.

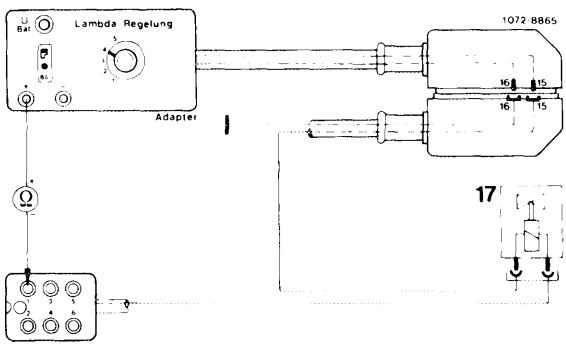
Readout 0 volt: switch off ignition, multimeter to measuring range 0–∞ ohm.

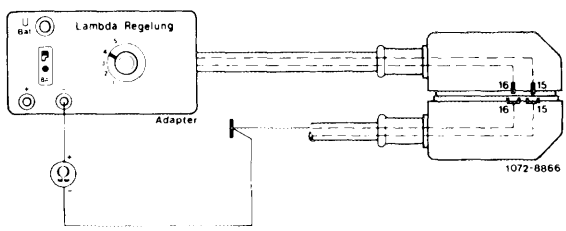
Test line from plug (control unit, terminal 15) to plug of electronic fuel pump relay (terminal 1), as well as line from plug of control unit (terminal 16) to ground connection point in legroom at the right under instrument panel for break.

End of test









VII. Testing supply line to oxygen sensor

Rotary switch on adapter in position 5, multimeter on measuring range 0—∞ ohm, ignition switched off, plug oxygen sensor disconnected. Read indicator.

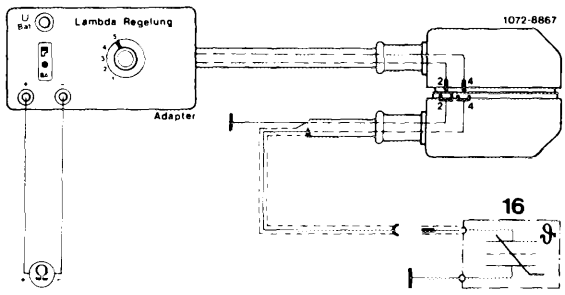
Readout	
∞ ohm	0 ohm

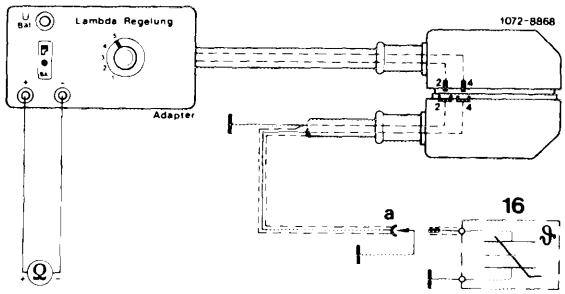
Line from plug of oxygen sensor to plug of control unit shorted.

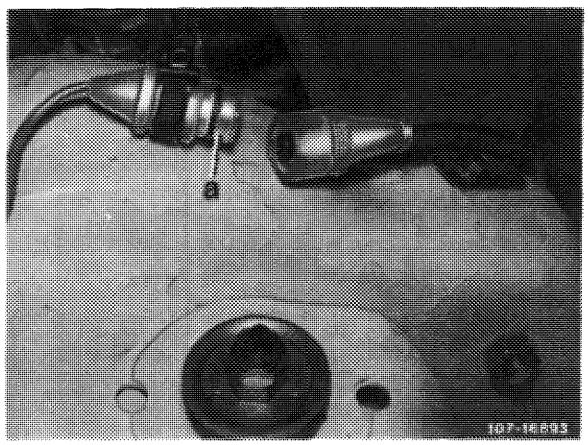
Connect plug member (a) to ground.

Readout 0 ohm, line in order.

Readout ∞ ohm, line interrupted.







End of test

Test section B

Test conditions: Remove adapter, connect plug to control unit. Connect tester on/off ratio to diagnosis socket.

Start engine (plug of oxygen sensor connected).

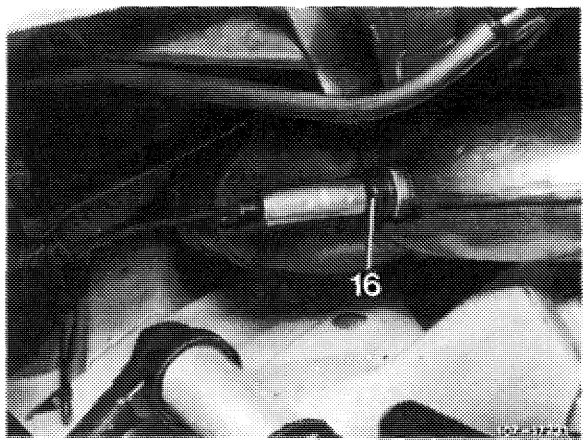
VIII. Testing oxygen sensor

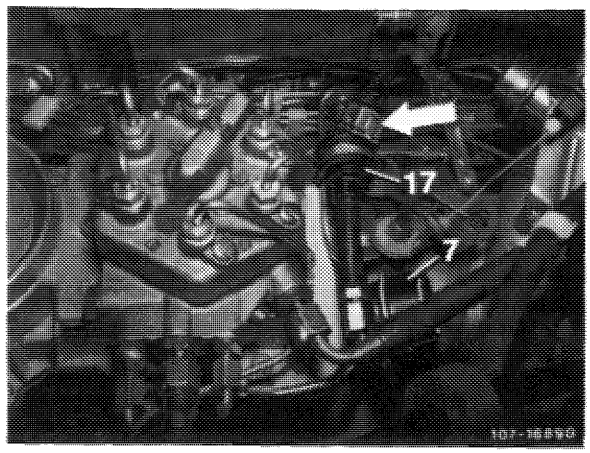
Temperature of oxygen sensor below + 300 °C/ 572 °F. Read indicator on/off ratio.

Readout	
constant 50 %	constant 92 %

Oxygen sensor shorted, renew oxygen sensor.

End of test





IX. Testing frequency valve (17)

Engine oil temperature > 20 °C/68 °F. Engine at idle.

Place one hand on frequency valve.

Frequency valve noticeably operating.	Frequency valve not operating.

Renew frequency valve.

End of test

X. Testing lambda control

Engine oil temperature approx. 80 °C/176 °F.
Engine at idle (750 ± 50/min).

Read indicator on/off ratio.

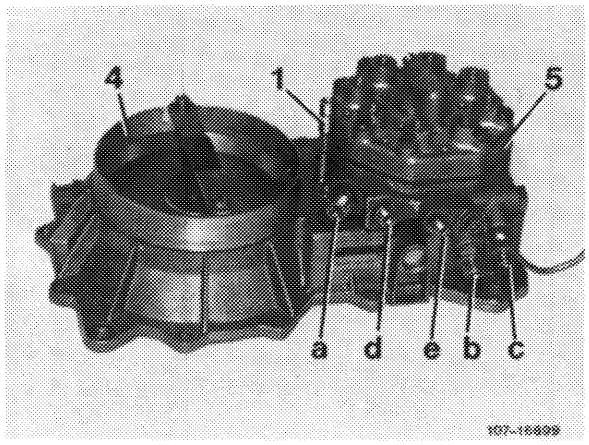
Readout	
between 40–60 %	< 40 % or > 60 % Constant 50 %

Adjust on/off ratio on mixture regulating screw (1) in such a manner that readout is around 50 ± 5 %.

If on/off ratio cannot be regulated, check thermovalve 50 °C/122 °F (37) for passage.
If passage is clear, renew control unit.

Readout constant 50 %, oxygen sensor defective, renew.

End of test

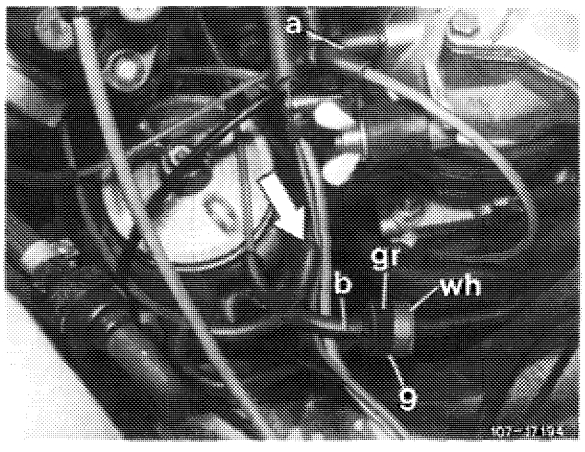


XI. Testing air injection

Engine oil temperature approx. 80 °C/176 °F, engine at idle (750 ± 50/min), pull blue/purple vacuum line (a) from air guide housing. Close vacuum line with finger for a short moment.

Read indicator on/off ratio.

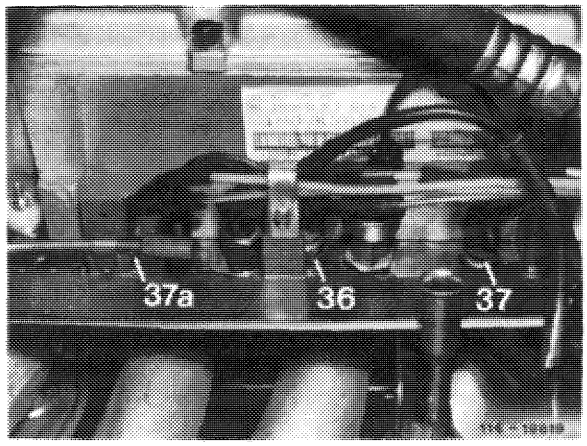
Readout	
Constant > approx. 87 %	Remains constant



Testing vacuum lines

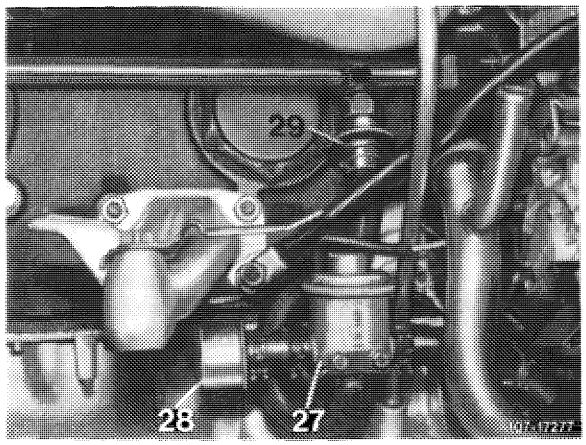
The blue/purple vacuum line from air guide housing leads to straight connection of thermovalve (37), the blue/purple vacuum line from diverter valve (27) leads to straight connection of thermovalve (36).

Thermovalves (36 and 37) are connected to the diagonal connections by means of a 3-point distributor. From there, a blue vacuum line leads to 4-point distributor, which is connected to the intake manifold by means of orifice (9) and a rubber hose.



Testing vacuum

Pull 3-point distributor from diagonal connections of thermovalves (36 and 37) and check for presence of vacuum at distributor. If there is no vacuum: blow out connection on intake manifold with compressed air.

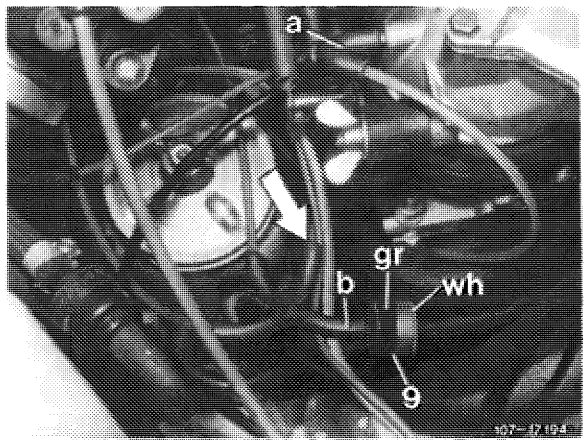


Check 3-point distributor, blue vacuum line, 4-point distributor, orifice (9) and rubber hose for passage.

If vacuum is present: check thermovalves (36 and 37) for passage and renew, if required.

If passage is available on both thermovalves, renew diverter valve (27).

If readout of on/off ratio is still constant upon completion of these tests, check V-belt tension and delivery capacity of air pump.

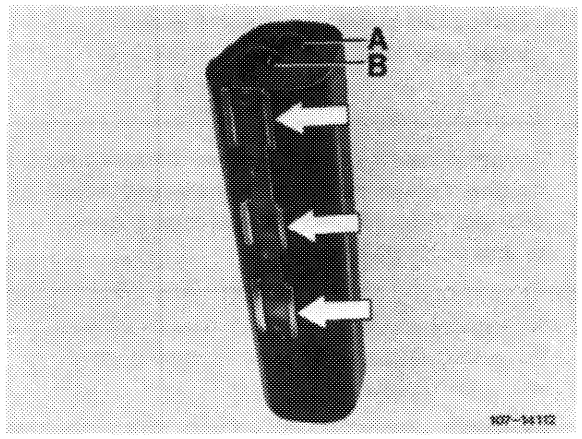


End of test

XII. Testing fuel evaporation control system model year 1980

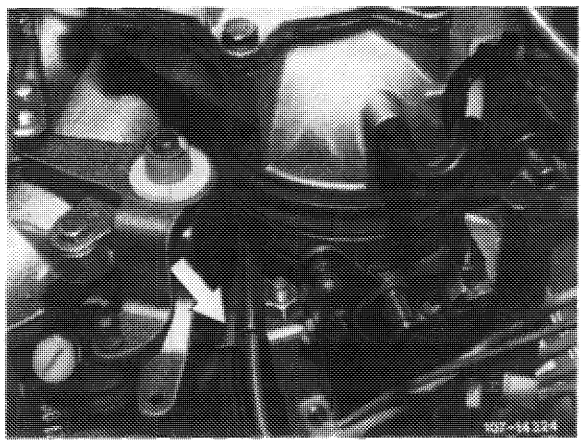
Pull draw-off hose (A) toward throttle valve housing from charcoal canister and keep closed with one finger. Slowly increase engine speed above approx. 2000/min.

No vacuum at idle. Increasing vacuum with increasing speed.	No vacuum increase with increasing speed.



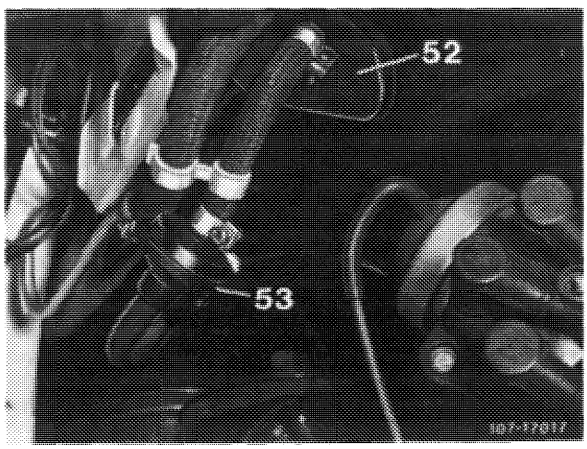
Checking draw-off connection and purge valve

Draw-off connection should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.



If there is still no vacuum, pull off draw-off hose in front of purge valve (53) and repeat checkup.

If vacuum is present, renew purge valve.

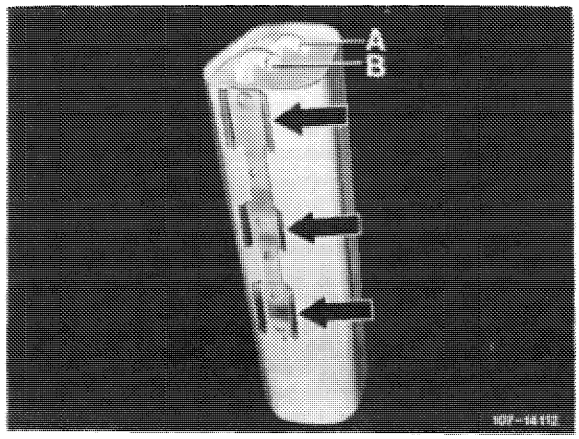


End of test

XII. Testing fuel evaporation control system model year 1981

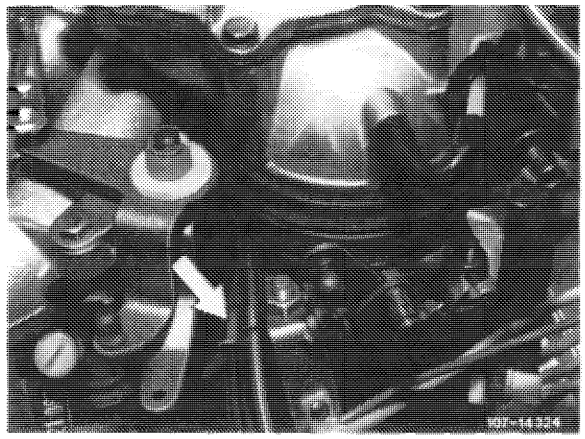
Pull off draw-off hose (A) toward throttle valve housing from charcoal canister and keep closed with one finger. Slowly increase engine speed to approx. 2000/min.

No vacuum at idle. Increasing vacuum at increasing speed.	No vacuum increase at increasing speed.



Checking draw-off connection

Draw-off connection should be plugged to throttle valve housing (arrow). Check hose for leaks and blow through connection on throttle valve housing.

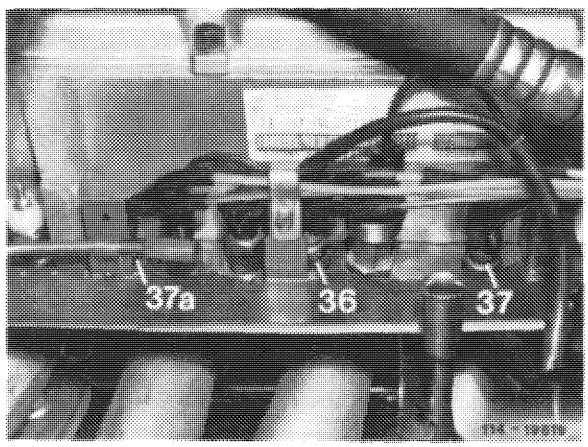


If there is still no vacuum:

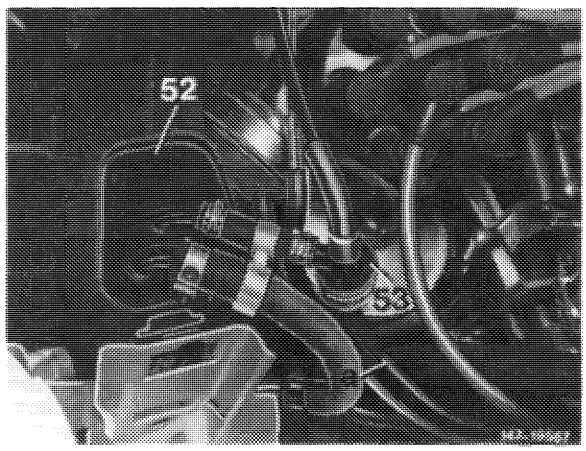
Checking thermovalve (37a) and purge valve (53)

Pull off white/purple/black vacuum line on purge valve and check for presence of vacuum.

If vacuum is present, renew purge valve, if not, renew thermovalve.



End of test



Tightening torques	Nm
Self-locking nuts on exhaust manifold to exhaust flange	20–25
Self-locking hex nuts on lateral support of clamp	7
Hex bolts of flange connection	20
Oxygen sensor	50–60

Removal

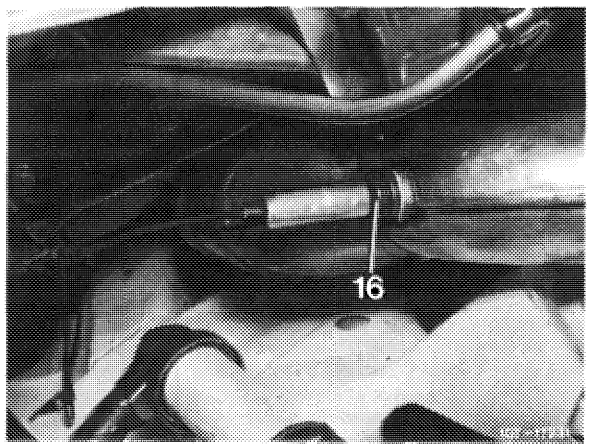
1 Remove oxygen sensor (16).

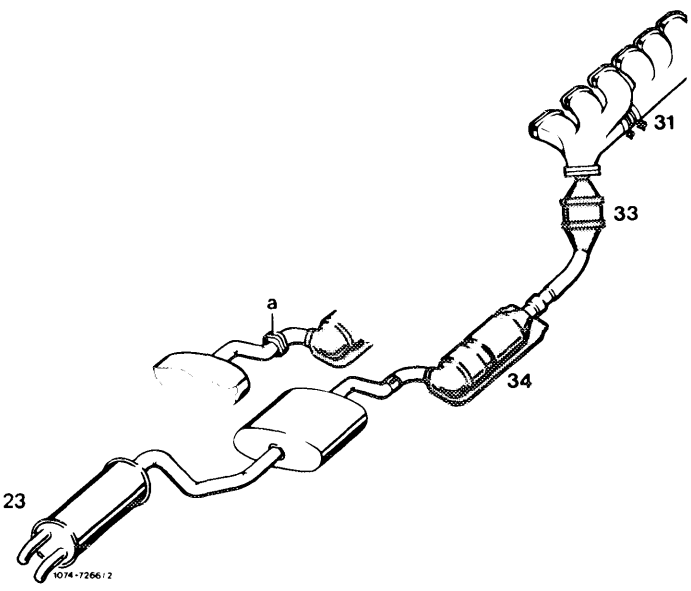
2 Remove exhaust system (49–100).

3 On model 116, loosen plug flange connection between underfloor catalyst and center muffler and remove catalysts by means of a slight turning motion.

Note: If the plug flange connection cannot be separated, heat exhaust pipe. For safety reasons, place a protective panel against frame floor prior to heating pipe.

4 On model 123, loosen flange connection (a) and remove catalysts.





31 Exhaust manifold
33 Primary catalyst
34 Underfloor catalyst
a Flange connection on model 123

Installation

5 Flange catalysts to exhaust system or on model 116 slip catalysts into plug flange connection. Slightly tighten bolts of flange connection.

6 Install exhaust system (49–100).

7 Coat threads of oxygen sensor with hot lubricating paste, part no. 000 989 88 51.

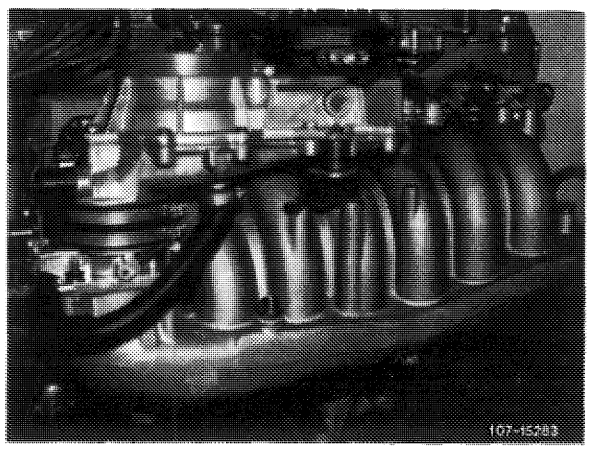
8 Install oxygen sensor.

9 Start engine and check exhaust system for leaks.

14–450 Removal and installation of intake manifold, replacement of gasket

Note

When removing and installing intake manifold, the mixture controller with air guide housing need not be removed.



Layout and shape of intake manifold have been changed starting from date of increased output. As a result, the following additional changes were made:

1. Injection lines for cylinders 4–6.
2. Control pressure line from fuel distributor to pressure damper.
3. Control pressure line from warm–up compensator to pressure damper.
4. Return line from warm-up compnesator to fuel distributor.
5. Connection for idle air on air guide housing.
6. Additional holder for supporting mixture controller.
7. Holder for fastening pressure damper to intake manifold.
8. Regulating lever.
9. Air guide housing.
10. Contour hose.
11. Support for intake manifold.
12. Rubber hose for full load enrichment.

Installation: April 1978

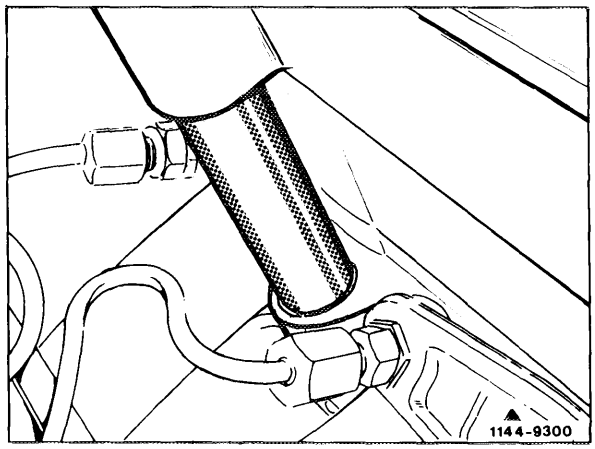
Model	Starting chassis end No.
107.022	005201
107.042	004222
116.024/025	113919
123.033	039906 (035262)[1])
123.053	008540 (006171)[1])
123.093	000021
126.022/023	Start of series

[1]) Righthand steering in England version.

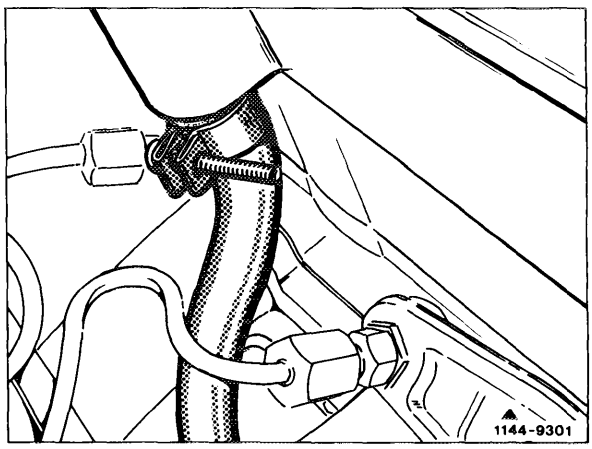
Vent connection to intake manifold
Engine 110.984/985/986

Connection has been changed for better distribution of vent vapors. This required a modification of contour hose.

After the former intake manifold has been used up, only the modified intake manifold together with contour hose will be available.



1st version



2nd version

Installation: September 1979

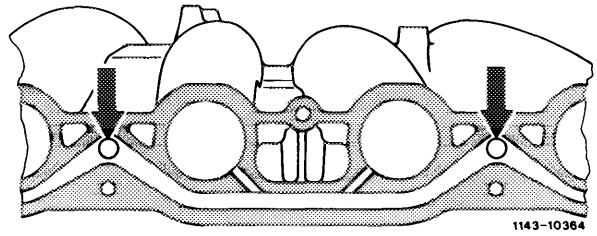
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No.
107.022 107.042	110.986	003146	007150	007614 006812
116.024 116.025	110.985	014021 069693		151315
123.033 123.053 123.093	110.984	019774	066923	064566 017098 004432
126.022 126.023	110.987	start of series		

Idle air feed

The idle air feed now proceeds via 2 connections instead of the former central air intake.

Air distribution to the individual cylinders will be improved.

Smooth running of engine following a cold start is also improved by the said measure.



Installation: September 1981

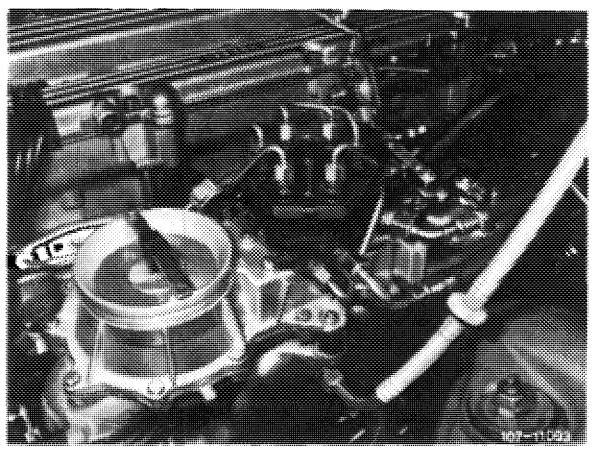
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No. Installation mixed	Installation continuous
107.042	110.990	start of series		010107–011567	011569
123.007 123.033 123.053 123.093	110.988	start of series		085174–096468 024129–024416 010064–010252	096496 024417 010253
126.022 126.023	110.989	start of series		021381–043198 039922–042786	043199 042787

Removal

1 Remove air cleaner.

2 Drain coolant.

3 Unscrew all fuel and injection lines while catching fuel with a rag. Close fuel lines blind.



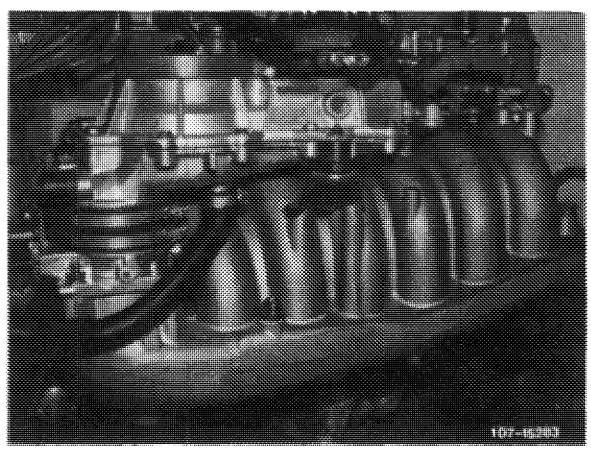
1st version

4 Pull cable plug from mixture controller (if installed) and from cold start valve.

5 Disconnect connecting rod for longitudinal regulating shaft. On model 126, remove longitudinal regulating shaft (30–310).

6 Pull off vacuum line for automatic transmission and central locking system.

7 Unscrew cable strap for electric cable harness (cold start valve, warm-up compensator, safety switch).



2nd version

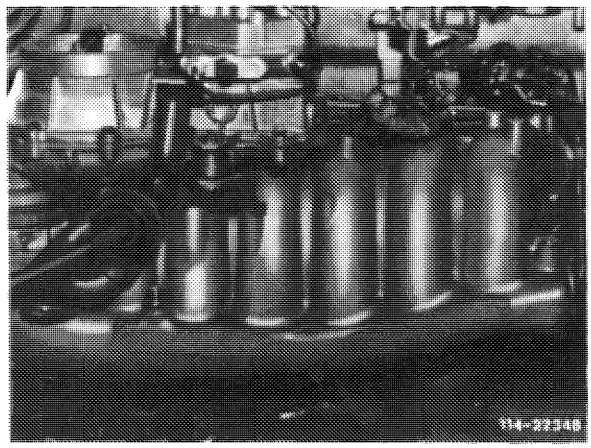
8 Remove heater hose from dashboard.

9 Pull off vacuum line for ignition timing.

10 Unscrew line for diagnosis plug.

11 Unscrew vacuum line for brake unit.

12 Remove decel shutoff valve.

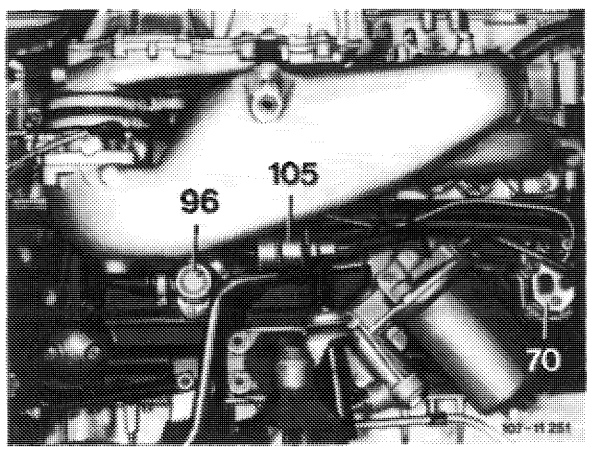


3rd version
with decel shutoff

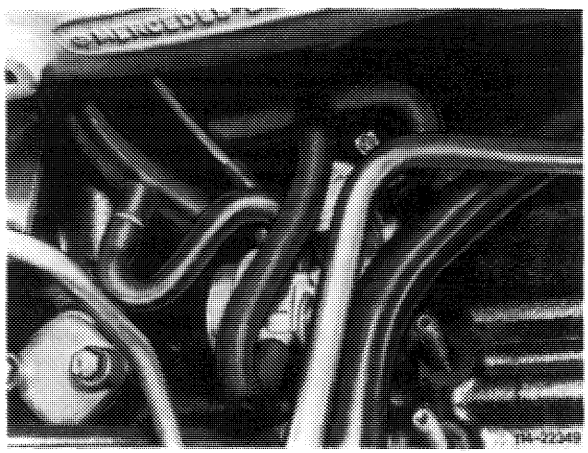
13 Pull off contour hoses after loosening hose clamp and leak line on idle air distributor.

14 On engines prior to increased output, unscrew control pressure line on diaphragm damper (105) and return flow line on warm-up compensator (70).

On model 126, unscrew high-pressure oil line for power steering pump.



15 Unscrew all fastening nuts and screws on intake manifold as well as on support.



16 Unscrew both fastening screws for engine mounts and engine damper. Lift engine with pitlift until intake manifold can be taken off.

On model 126, pull engine to the right and remove intake manifold.

17 Clean intake manifold and check flange faces with straightedge, refinish on surface plate, if required.

Installation

18 For installation proceed vice versa, using a new gasket.

Prior to tightening intake manifold, introduce return flow line from warm-up compensator.

19 Tighten fastening screws for engine mounts to 75 Nm.

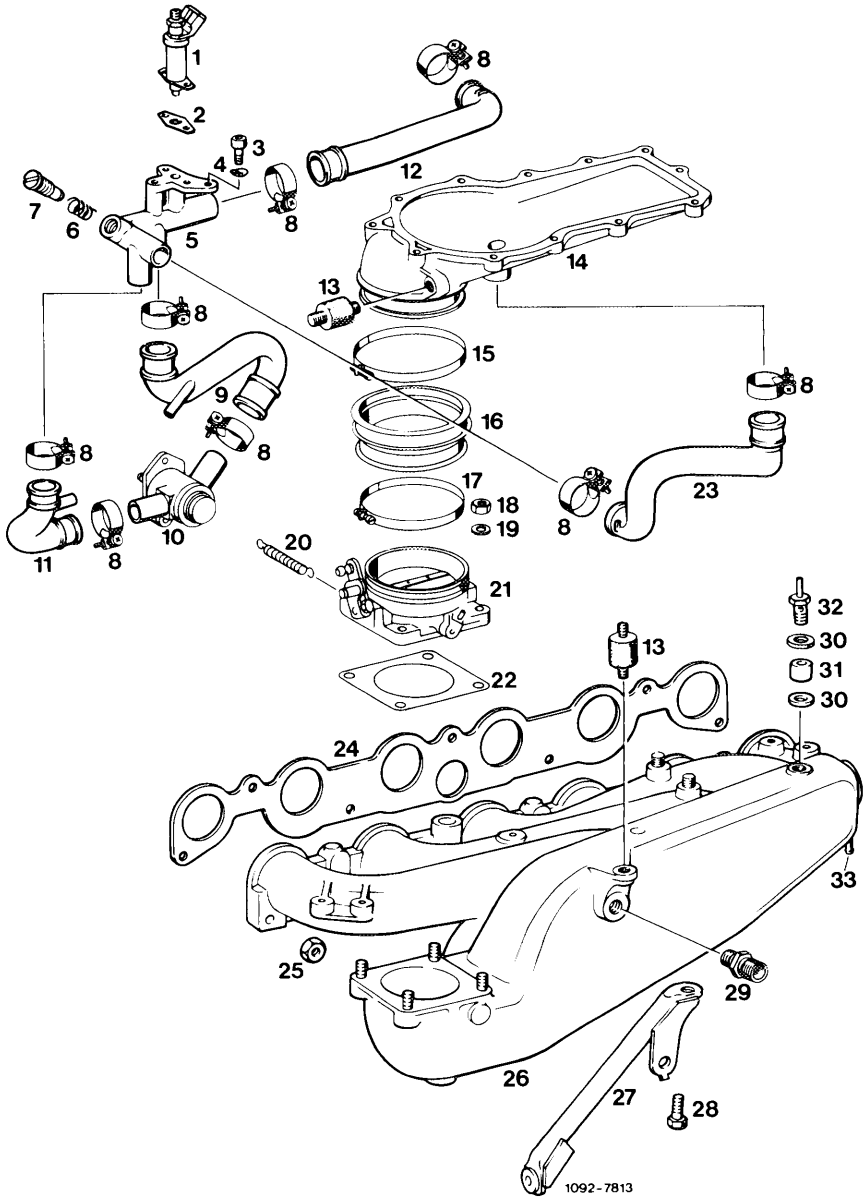
20 Fill-in coolant.

21 Adjust regulating linkage (30–300). Check for easy operation.

22 Run engine, check fuel lines for leaks. Check intake system, fuel distributor and injection valves for leaks by spraying with Iso-Oktan or benzine.

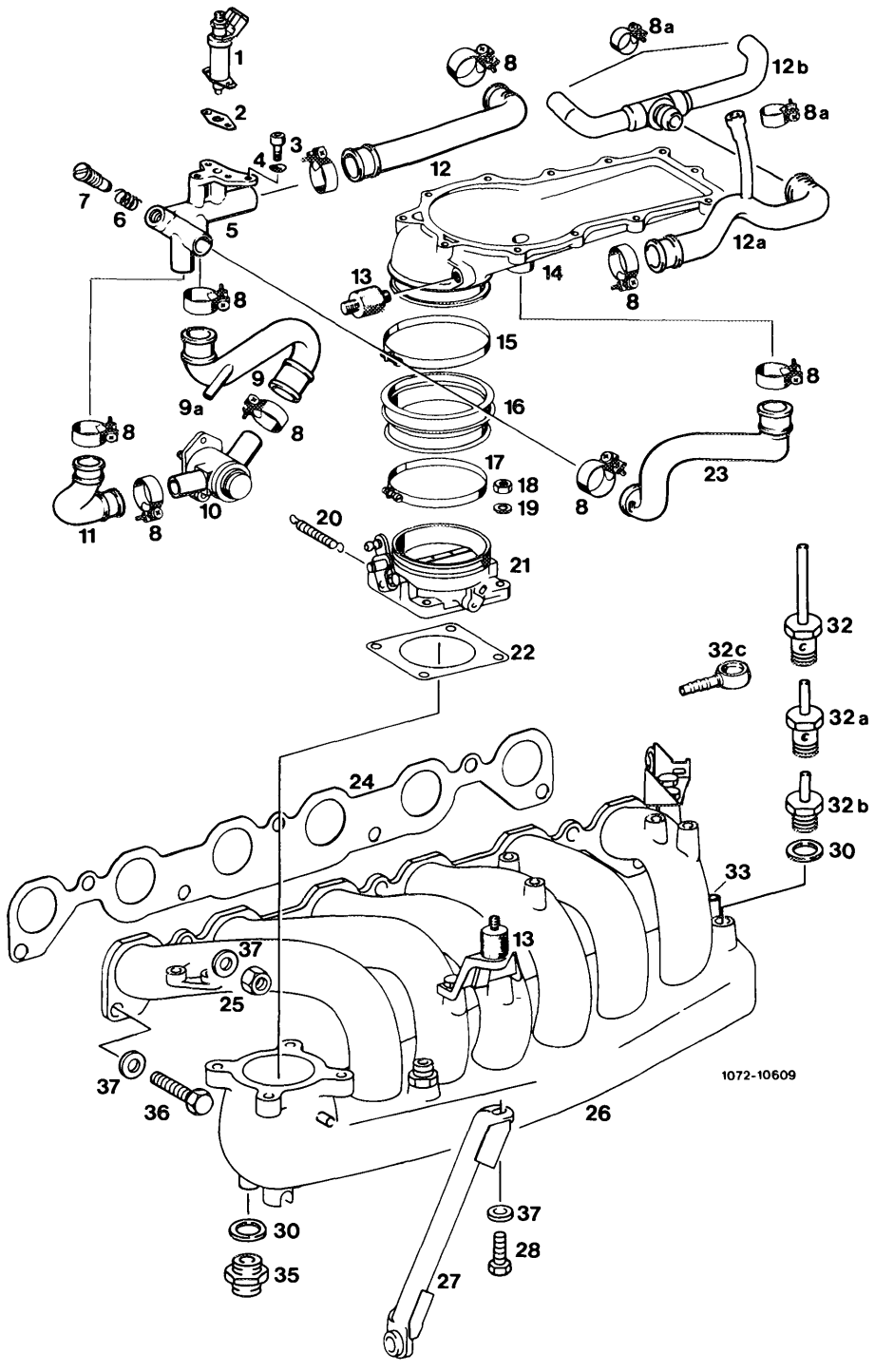
23 Adjust idle speed (07.3–100).

Intake manifold
1st version
up to increased output



1 Cold start valve
2 Gasket
3 Hex. socket screw
4 Corrugated washer
5 Idle speed air distributor
6 Compression spring
7 Idle speed air screw
8 Hose clamp
9 Contour hose
10 Auxiliary valve
11 Contour hose
12 Contour hose
13 Vibration damper
14 Air guide housing
15 Hose clamp
16 Rubber sleeve
17 Hose clamp
18 Nut
19 Washer
20 Return spring
21 Throttle valve housing
22 Gasket
23 Contour hose
24 Gasket
25 Nut
26 Intake manifold
27 Supporting bracket
28 Hex. bolt
29 Double connection
30 Sealing ring
31 Spacing sleeve
32 Vacuum connection
33 Vacuum connection for full load enrichment

2nd version
starting with increased output



1 **Cold start valve**
2 Gasket
3 Hex. socket screw
4 Corrugated washer
5 Idle speed air distributor
6 Compression spring
7 Idle speed air screw
8 Hose clamp
8a Hose clamp
9 Contour hose
9a Connection ignition retard
10 Auxiliary air valve
11 Contour hose
12 Contour hose 1st version
12a } Contour hose
12b } 2nd version starting September 1981
13 Vibration damper
14 Air guide housing
15 Hose clamp
16 Rubber sleeve
17 Hose clamp
18 Nut
19 Washer
20 Return spring
21 Throttle valve housing
22 Gasket
23 Contour hose
24 Gasket
25 Nut
26 Intake manifold
27 Supporting bracket
28 Hex. screw
30 Sealing ring
32 Vacuum connection
32a } e. g.: automatic transmission
32b } Central locking system, light
32c } range control
33 Vacuum connection for full load enrichment
35 Double connection for EGR
36 Screw
37 Washer

Renewing

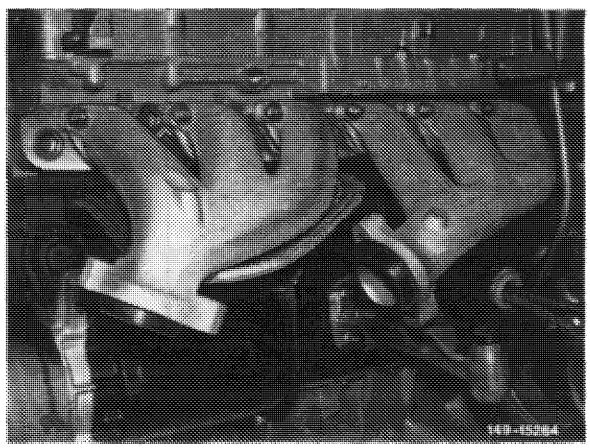
1 Remove and install intake manifold (09–400).

2 Remove and install mixture controller with air guide housing (07.3–230).

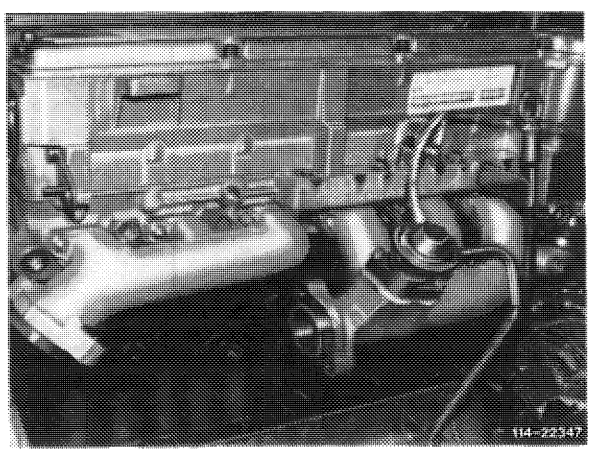
3 Unscrew all unscrewable parts on removed intake manifold and mount to new intake manifold together with new gaskets.

Note

Starting with increased output, the cross section of the exhaust manifold has been slightly enlarged and the connection for the exhaust pipes was changed to outer ball (up to now inner ball). For installation date refer to 14—450.



Prior to September 1981

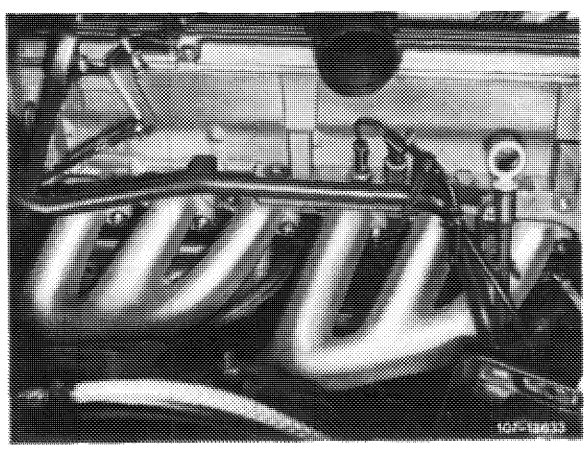


Starting September 1981

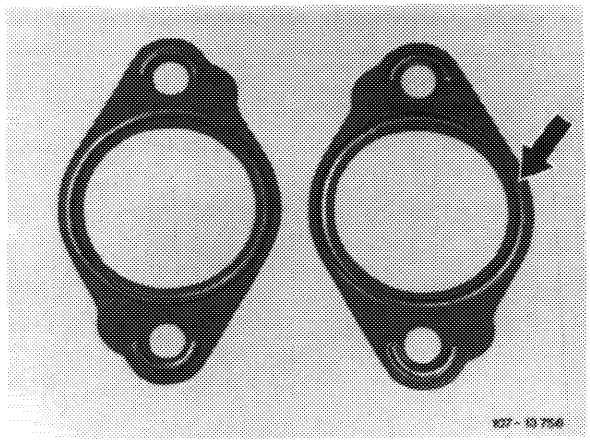
Removal and installation

1 Remove and install exhaust system (49—100).

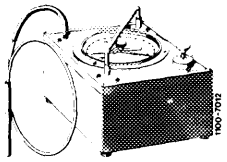
2 Unscrew all exhaust nuts and remove exhaust manifold.



3 Mount exhaust manifold with new gaskets. Make sure that the bead (arrow) points toward exhaust manifold.



Special tool

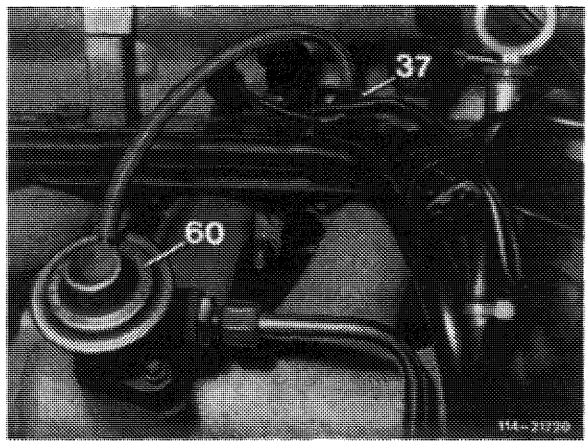
Vaccum tester		116 589 25 21 00

Conventional tool

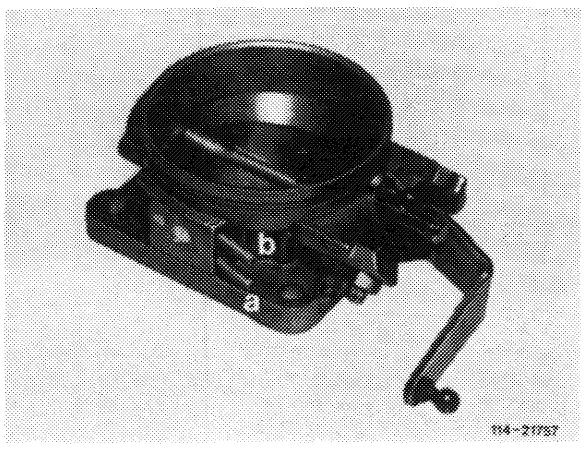
Revolution counter

Testing EGR

1 Pull vacuum line from EGR valve (60), plug-on test hose and activate with vacuum. If operation of engine is not getting clearly worse, replace EGR valve.

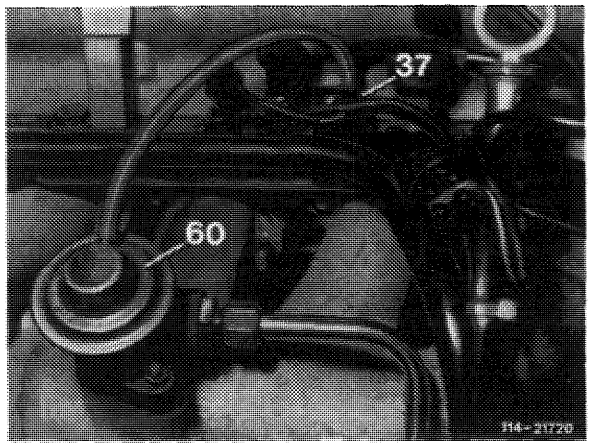


2 Check activation of EGR valve. Pull off vacuum line at EGR valve (60) and connect to vacuum tester. Increase engine speed slowly to approx. 3000 rpm. There should be no vacuum up to approx. 1800 rpm. Vacuum connections on throttle valve housing may be mixed up.

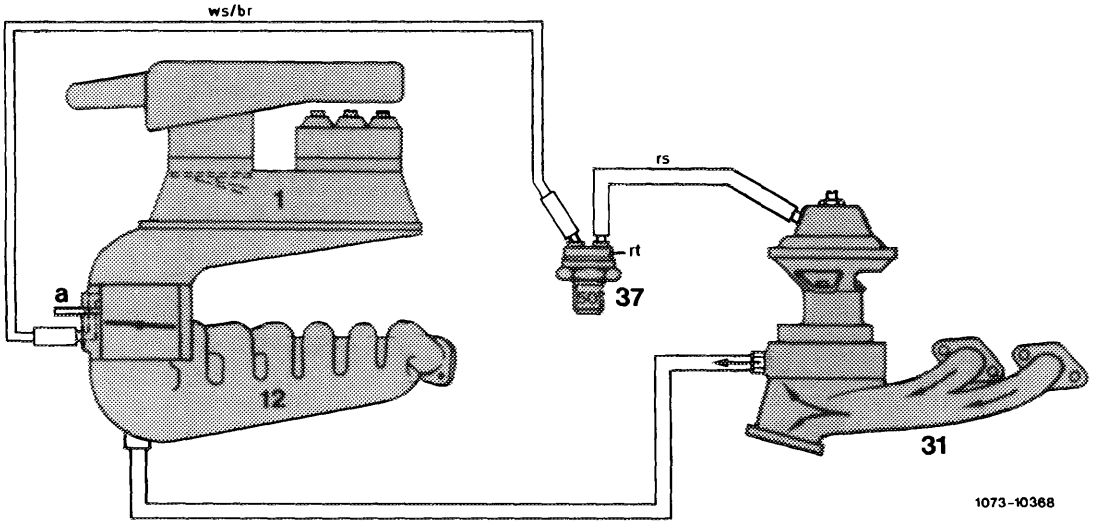


a To thermovalve for EGR
b To ignition distributor

3 Check thermovalve (37) 50 °C. Pull vacuum line white/brown/purple from EGR valve and activate with vacuum. At coolant temperatures < 50 °C no passage on thermovalve.

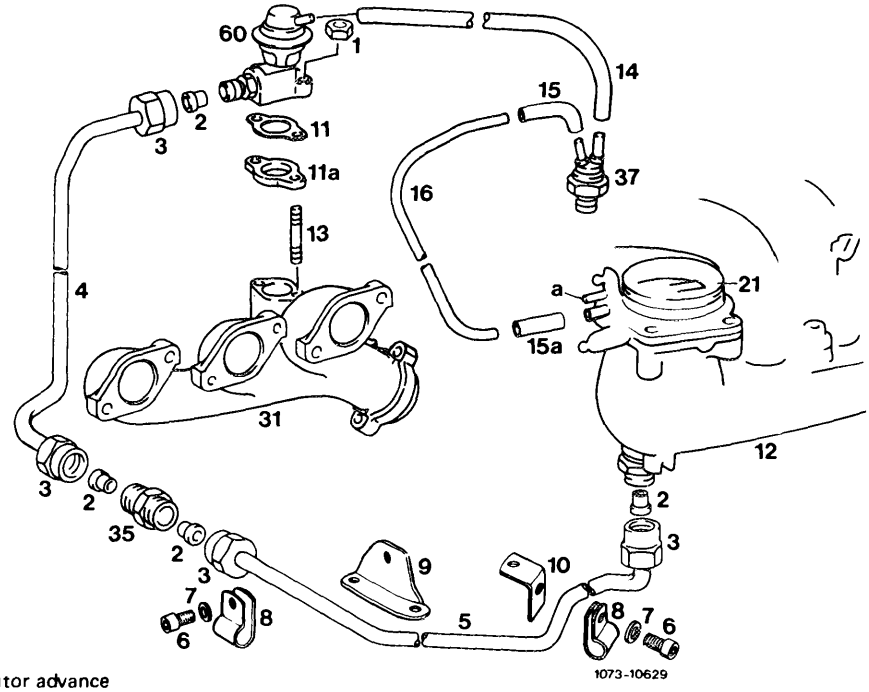


Function diagram EGR



1	Mixture controller	37	Thermovalve 50 °C	Color code	
12	Intake manifold	60	EGR valve	br	= brown
31	Exhaust manifold	a	To ignition distributor	rs	= pink
				rt	= red
				ws	= white

EGR



1 Nut
2 Sealing cone
3 Coupling nut
4 EGR line
5 EGR line
6 Screw
7 Washer
8 Clamp
9 Holder
10 Holder
11 Gasket
11a Asbestos gasket
12 Intake manifold
13 Stud
14 Vacuum hose
15 Contour hose
15a Contour hose
16 Vacuum line
21 Throttle valve housing
31 Exhaust manifold
35 Double thread connection
37 Thermovalve 50 °C
60 EGR valve

a Connection ignition distributor advance

Installation: September 1981

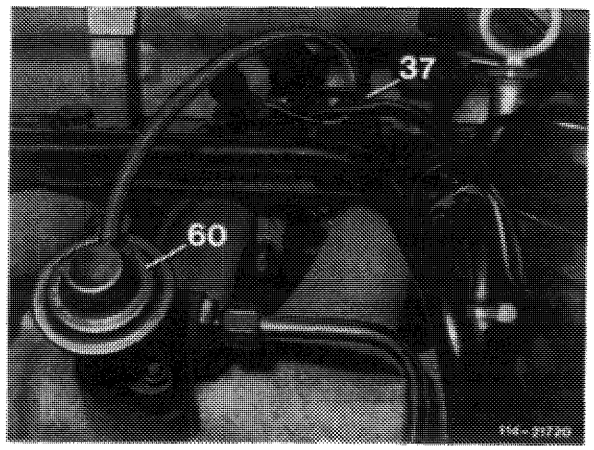
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No. Installation mixed	Installation continuous
107.042	110.990	start of series		010107–011567	011569
123.007 123.033 123.053 123.093	110.988			085174–096468 024129–024416 010064–010252	096496 024417 010253
126.022 126.023	110.989			021381–043198 039922–042786	043199 042787

Description of operation

To reduce the forming of nitric oxides (NO_X) a portion of the exhaust gases is recirculated out of exhaust manifold by way of a valve into the intake manifold.

The recirculated exhaust gases are adapted to the load conditions of the engine in such a manner that no operating faults will occur.

Starting from a coolant temperature of approx. 50 °C in cylinder head a portion of the exhaust gases is recirculated into the intake manifold in medium and upper partial load range. Adding exhaust gases to the fuel/air mixture will decrease the combustion temperature and thereby reduce forming of nitric oxides. The amount of recirculated exhaust gases is dependent on the valve position (vacuum at throttle valve).



37 Thermovalve 50 °C
60 EGR valve

Depending on the throttle valve position, more or less vacuum will act on the EGR valve (60).

The EGR valve (60) which is mounted on the exhaust manifold opens and a given amount of exhaust gases is routed via recirculating line into intake manifold.

EGR proceeds:

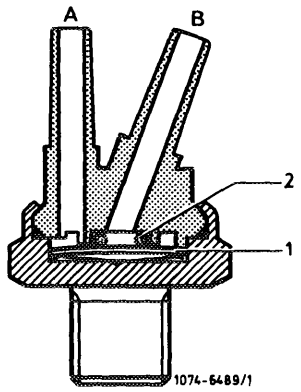
Above 50 °C coolant temperature.
In medium and upper partial load range.

No exhaust gas is recirculated at idle, during deceleration and in low partial load range. There will also not be enough vacuum at full load to keep EGR valve open.

Below 50 °C coolant temperature the bimetallic strip rests against O-ring and closes connection "B".

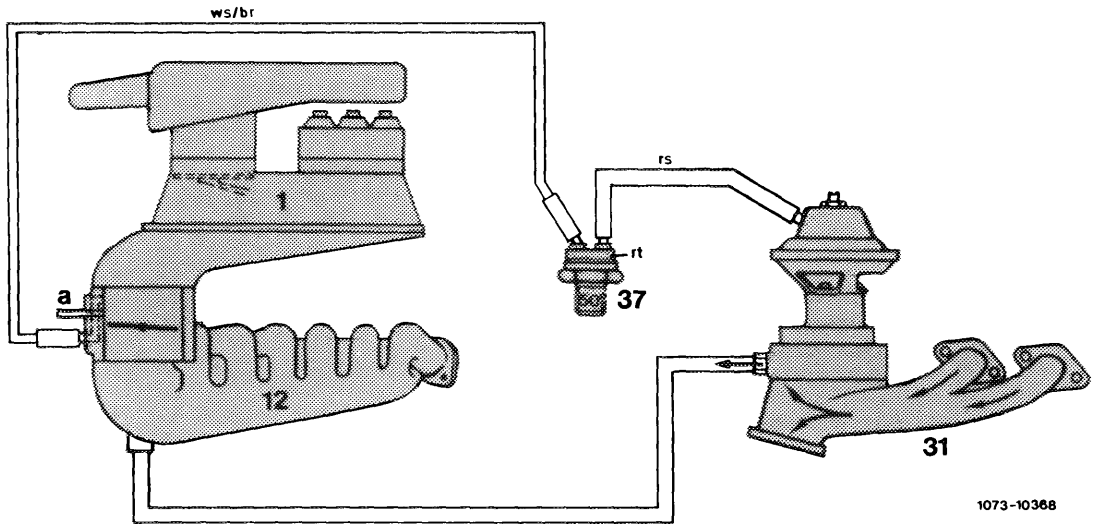
Above 50 °C coolant temperature the bimetallic strip will snap downwards under influence of heat. Both connections are connected to each other.

The vacuum line to EGR valve must be plugged to connection "A", since this alone will guarantee absolute tightness between bimetallic strip and O-ring.



1 Bimetallic strip
2 O-ring
A To EGR valve
B To throttle valve housing (vacuum side)

Function diagram EGR



1 Mixture controller
12 Intake manifold
31 Exhaust manifold
37 Thermovalve 50 °C
60 EGR valve
a To ignition distributor

Color code
br = brown
rs = pink
rt = red
ws = white

Testing and adjusting values

Standard version

Engine	Ignition distributor Bosch No.	Adjusting value[1] of firing point without vacuum 3500/min	Test value Ignition adjustment with/without vacuum			Vacuum adjustment in direction of		Installation value of ignition distributor at starting speed without vacuum
			Idle with	1500/min without	3000/min without	"retard" at idle	"advance" at 3500/min	
110.984 110.985 110.986 110.987 110.994	0 237 302 002	30° [2]	OT ± 3° [3]	16–20°	30°	8–12°	8–12°	10° before TDC
	0 237 302 003			18–23°				
	0 237 302 005 0 237 304 003 0 237 302 017 0 237 304 012		OT ± 3° [3]	15–25°	30°	8–12°	8–12°	
110.988 110.989 110.990	0 237 306 045		7–13°	20–24°	29–33°	–	10–14°	12° before TDC

[1] If normally compressed engines are operated with fuel uder 98 RON (min. 88 MON), adjust firing point in direction of "retard" and match to octane rating of fuel used. The reference value for this adjustment is: set firing point back by 1–2 ° crank angle per 1 RON. Max. setback should not exceed 6 ° crank angle.
Attention!
Taking firing point back is considered an **"emergency measure"**. Reduced output and increased fuel consumption will result. In addition, the engine should not be fully loaded. As soon as fuel with specified octane number is available, set again to full advance.

[2] To set firing point, pull off both vacuum lines for ignition adjustment.

[3] Switch off air conditioner, automatic transmission in position "N" or "P".

National version

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum		Vacuum adjustment in direction of		Installation value of ignition distributor at starting speed without vacuum
		1500/min	3000/min	"retard" at idle	"advance" at 3000/min	

(AUS) **1977**

Identification: silver information plate on cross member in front of radiator.

0 237 302 002	TDC	14–19°	25–35°	8–12°	8–12°	10° before TDC

(AUS) **1978/79/80**

0 237 302 005 0 237 302 017	TDC	15–25°	26–35°	8–12°	8–12°	10° before TDC

(AUS) **1981**

0 237 304 018	2° after TDC	12–18°	25–31° 3500/min	9–11°	8–12°	10° before TDC

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum 1500/min	3000/min	Vacuum adjustment in direction of "retard" at idle	"advance" at 3000/min	Installation value of ignition distributor at starting speed without vacuum
(AUS) 1982						
0 237 304 021	2° after TDC	8–12°	19–23° 3500/min	9–11°	8–12°	10° before TDC
(J) 1977/78/79						
Identification: Information plate on cross member in front of radiator in Japanese language.						
0 237 304 001	TDC	16–20°	28–34°	8–12°	8–12°	10° before TDC
(J) 1980						
0 237 304 003 0 237 304 010	TDC	15–25°	27–34°	8–12°	8–12°	10° before TDC
(J) 1981						
0 237 304 018	10° before TDC[1])	18–22°	28–34°	9–11°	8–12°	10° before TDC
(J) 1982						
0 237 304 021	10° before TDC[1])	8–12°	19–23° 3500/min	9–11°	8–12°	TDC
(S) 1977						
Identification: Blue information plate in Swedish language on cross member in front of radiator.						
0 237 302 002	TDC	14–19°	28–34°	8–12°	8–12°	10° before TDC
(S) 1978/79/80						
0 237 302 005	TDC	15–20°	26–35°	8–12°	8–12°	10° before TDC
(S) 1981						
0 237 304 018	2° after TDC	12–18°	25–31° 3500/min	9–11°	8–12°	10° before TDC
(S) 1982						
0 237 304 021	2° after TDC	8–12°	19–23° 3500/min	9–11°	8–12°	TDC

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum 1500/min	3000/min	Vacuum adjustment in direction of "retard" at idle	"advance" at 3000/min	Installation value of ignition distributor at starting speed without vacuum
(USA) 1977						
Identification: green/black information plate in English language on cross member in front of radiator						
0 237 304 001	TDC	16–20°	28–34°	8–12°	8–12°	10° before TDC
(USA) 1978/79						
0 237 304 003	TDC	15–25°	27–34°	8–12°	8–12°	10° before TDC
(USA) 1980						
0 237 304 003	10° before TDC[1])	15–25°	27–34°	8–12°	8–12°	10° before TDC
(USA) 1981						
0 237 304 018	10° before TDC[1])	18–22°	28–34°	9–11°	8–12°	10° before TDC

[1]) Adjusted with engine at operating temperature. Vacuum retard will be switched off above 50 °C engine temperature.

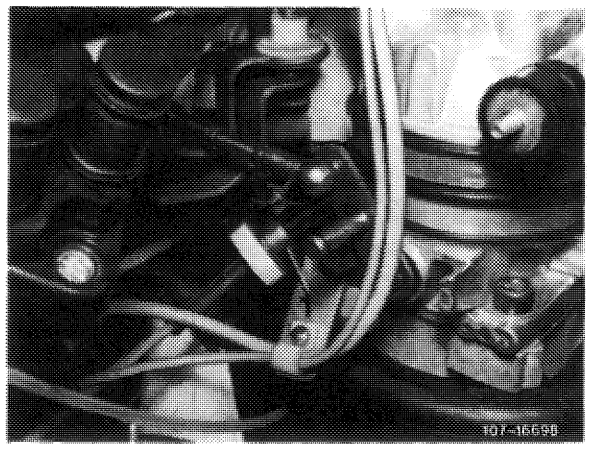
Conventional tool

Digital tester	e. g. made by Bosch, MOT 001.03

Note

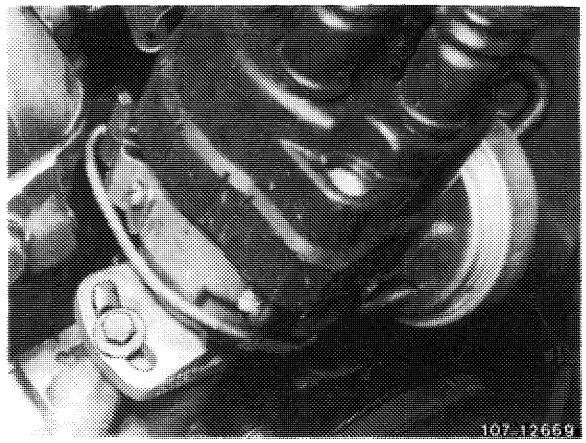
To improve emission values, standard engines are provided with a delay valve which is installed into vacuum line for vacuum advance.

When the throttle valve is quickly opened, the vacuum control unit will be activated with a vacuum under delay.



1 Delay valve

Testing and adjusting



1 Test firing point with stroboscope or digital tester at specified speed and with or without vacuum.

2 Loosen ignition distributor fastening, if required, and set adjusting value of firing point by turning ignition distributor.

Screw down ignition distributor and check firing point once again.

3 Check centrifugal and vacuum adjustment of ignition distributor. For this purpose, run through specified test values with or without vacuum adjustment.

When testing vacuum advance, note that on engines with delay valve the vacuum will be established slightly slower.

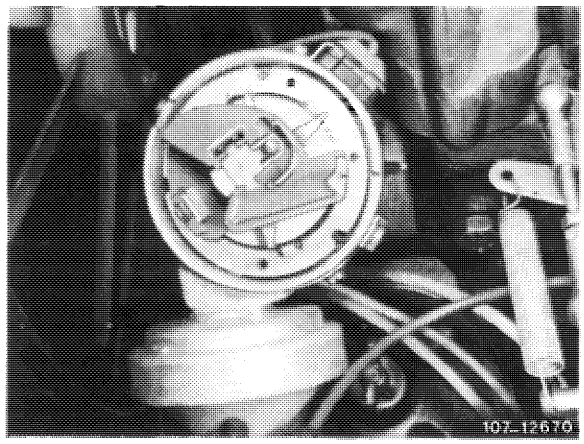
Note

Turn crankshaft in direction of engine rotation at fastening screw of V-belt pulley only.

Removal

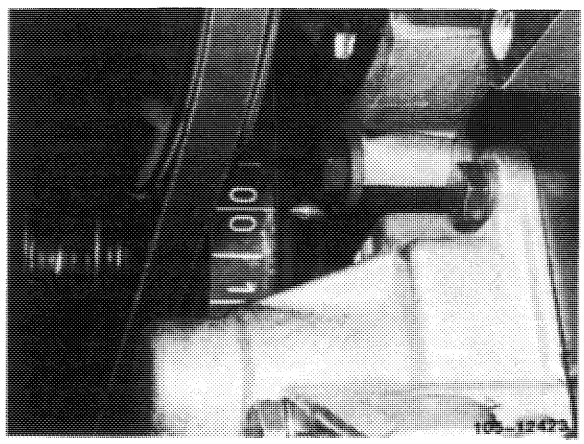
1 Remove ignition distributor cap, cable plug connections and vacuum lines.

2 Set engine to ignition TDC of 1st cylinder. For this purpose, the markings on the distributor rotor and on distributor housing should be in alignment.



3 In addition, the pointer on crankcase should be above TDC mark of vibration damper.

4 Loosen ignition distributor attachment and pull out ignition distributor.



Installation

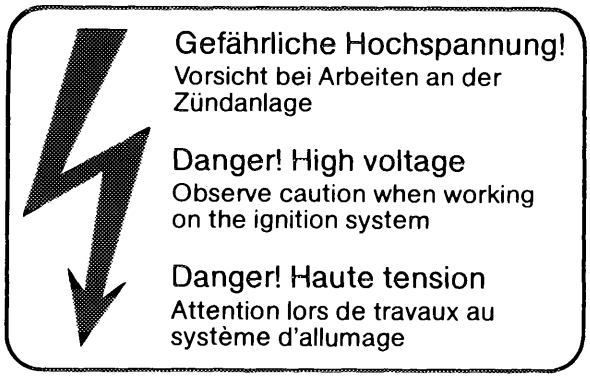
5 For installation proceed vice versa. Pay special attention to ignition TDC of 1st cylinder and to markings on distributor housing and vibration damper.

6 Adjust firing point (15–501).

Note

Attention!
When working on breakerless transistorized ignition system, be sure to observe the following safety instructions:

- Persons with heart stimulators should not work on such ignition systems.



Information plate in engine compartment

1154-9352

- With the engine running or at starting speed, do not touch, pull off etc. components of ignition system, ignition cable, ignition coil, spark plug connector.

- Perform assembly jobs on ignition system only with engine stopped and ignition switched off.

Also connect and disconnect test instruments only with engine stopped and ignition switched off (15–531).

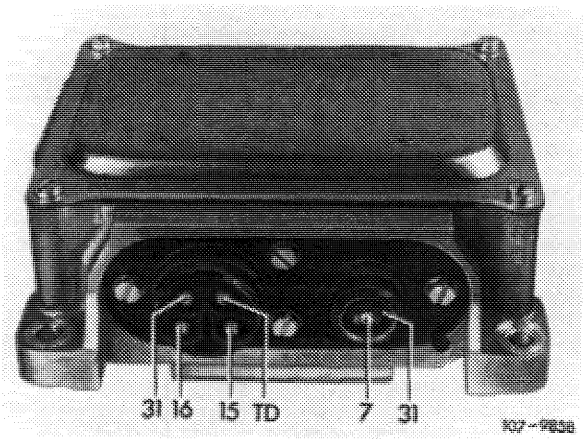
- Do not install adapters or transmitters, e. g. for stroboscope, into ignition cable, e. g. cylinder 1, which are metallically bright.

A. TSZ 4

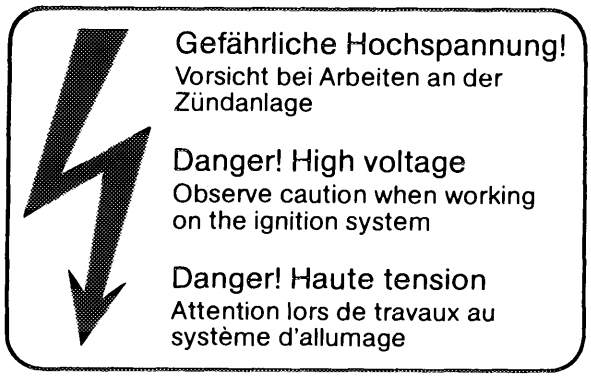
Note

This ignition system is widely free of maintenance requirements and guarantees adequate ignition voltage even at max. speeds and a more accurate adherence to firing point.

Identification: Yellow paint dot on housing top up to production date 930 and Bosch No. 0227 100 001.



Components of ignition system



Ignition coil

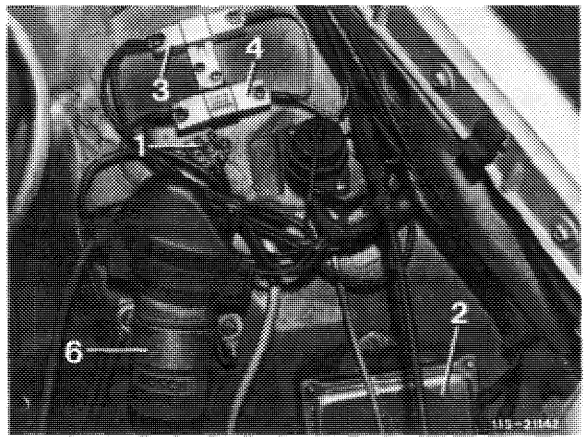
Design and external dimensions of the ignition coil are similar to those of a normal high-performance ignition coil. However, the coil layout is different. The transformation ratio amounts to approx. 1:185 as compared with 1:100 for conventional ignition coils.

Identification: blue paintwork and sticker
Transistor Bosch No. 0 221 12201.

Pre-resistors (series resistors)

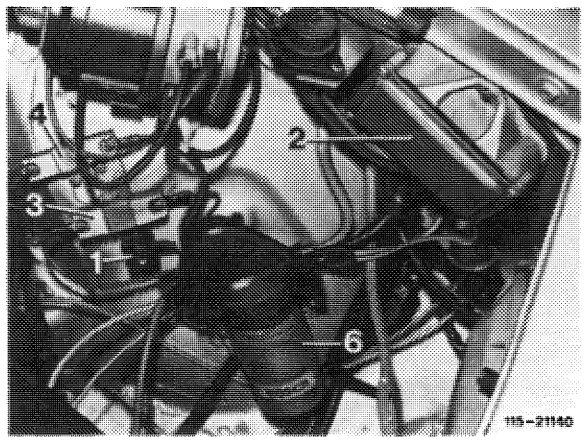
Pre-resistors 0.4 Ω and 0.6 Ω are similar to those of former ignition coil resistors: The resistance coil is surrounded by a ceramic body with projecting connections.

A sheet-metal clamp is placed around ceramic body for attachment. The color of this clamp provides information with regard to resistance value, which is also punched in as a number.



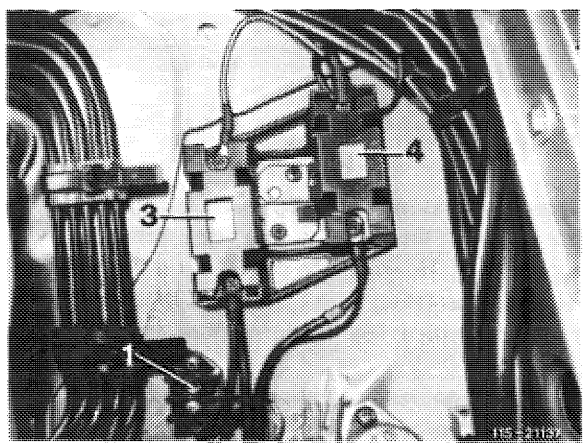
Model 126

1 Cable connector
2 Switching unit TSZ 4
3 Pre-resistor 0.6 Ω
4 Pre-resistor 0.4 Ω
6 Ignition coil



Model 123

1 Cable connector
2 Switching unit
3 Pre-resistor 0.6 Ω
4 Pre-resistor 0.4 Ω
6 Ignition coil



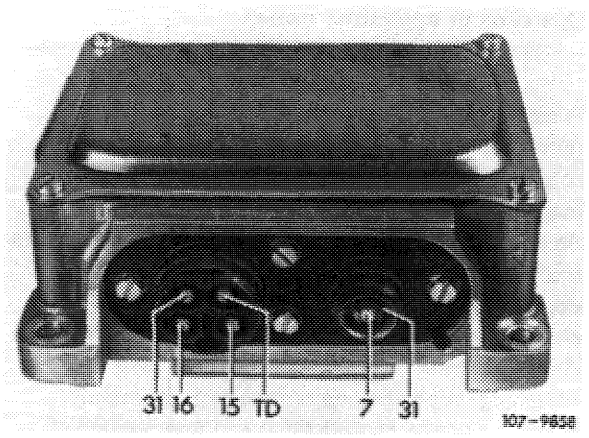
Model 126

3 Covered pre-resistors
4 Covered pre-resistors

Color	Code No.	Resistance
Anodized, blue	0.4	0.4 Ω
Anodized, metallic	0.6	0.6 Ω

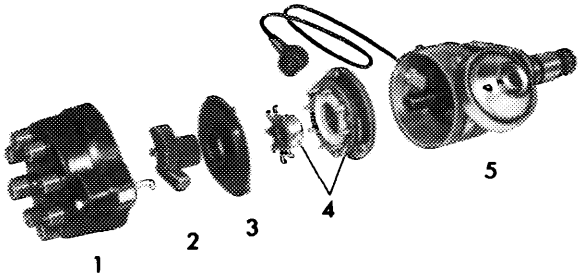
Switching unit

The switching unit contains several transistors, resistors and other electronic components in a metal housing. This metal housing protects the components against mechanical damage and splash water and serves also for eliminating dissipated electric heat. In the event of repairs, only the complete switching unit can be replaced.



Ignition distributor

Instead of the contact breaker, the ignition distributor is provided with a transmitter section, which operates according to the induction principle. Ignition timing by centrifugal force and vacuum is similar to former ignition distributors.

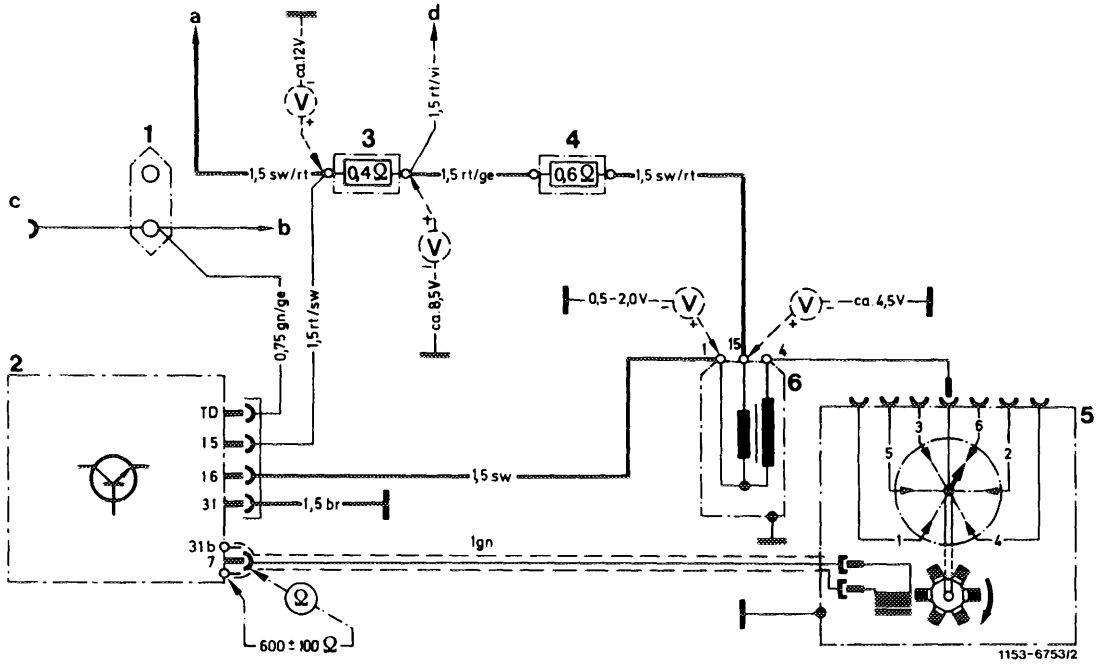


1 Ignition distributor cap
2 Ignition distributor rotor
3 Shielding cap
4 Transmitter section
5 Ignition distributor housing

Operation of transmitter section

A rotor with its number of teeth corresponding to number of engine cylinders produces during its rotation per tooth a change of magnetic flux in a magnetic field established by a permanent magnet. As a result, an induction coil located in magnetic field established a control voltage (0.3 V – 100 V) which depends in its size on engine speed, with a steep change from positive to negative half wave. This steep change of polarity of control voltage is used in switching unit following zero passage for impulse shaping, impulse amplification and interruption of primary current.

If the primary current is interrupted, the ignition voltage is induced in secondary winding of ignition coil. The dwell angle control in switching unit adapts the current flow time of primary current to the engine speed, that is, the dwell angle will also become larger with increasing speed, so that adequate ignition voltage is assured also in upper speed range.



Wiring diagram breakerless transistorized ignition system TSZ 4

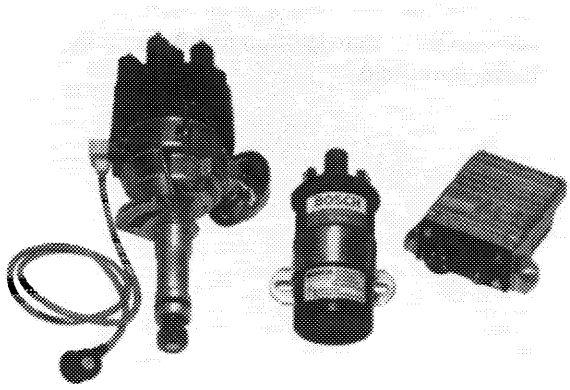
1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

a Ignition starter switch
b Instrument cluster, revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Notes concerning jobs on ignition system

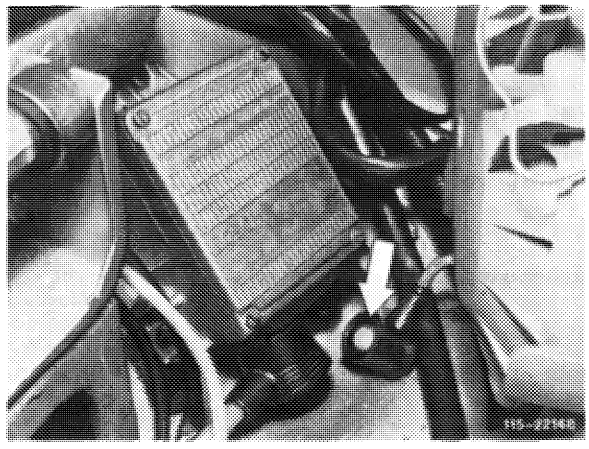
Since model year 1981 national versions and standard version since September 1981, engines 110 are provided with the breakerless transistorized ignition system without rest potential and without pre-resistors TSZ 8 u. Compared with systems known up to now the output of this ignition system has been increased.



118-21530

- Prior to jobs at starting speed and jobs with ignition cables pulled off e. g. when testing compression pressure, switch off ignition and pull off plug (transmitter in ignition distributor) on switching unit (green cable) or attach protective plug ignition system, part No. 102 589 02 21 00 on diagnosis socket.

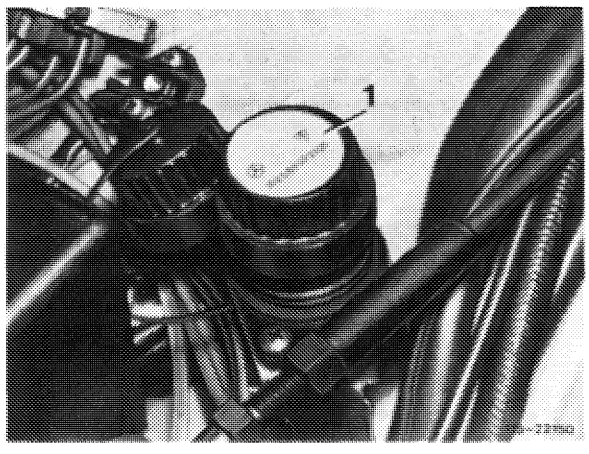
- Prior to rotating engine – e. g. for testing pressure loss, adjust valve clearance – switch off ignition, pull off plug (transmitter in ignition distributor) on switching unit (green cable) or attach protective plug ignition system, part No. 102 589 02 21 00 to diagnosis socket.



Note concerning prevention of damage on ignition system

- Do not connect e. g. a suppression capacitor or test lamp to terminal 1 of ignition coil.

- Do not short terminal 1 and 15 of ignition coil against ground (e. g. as a burglar alarm).

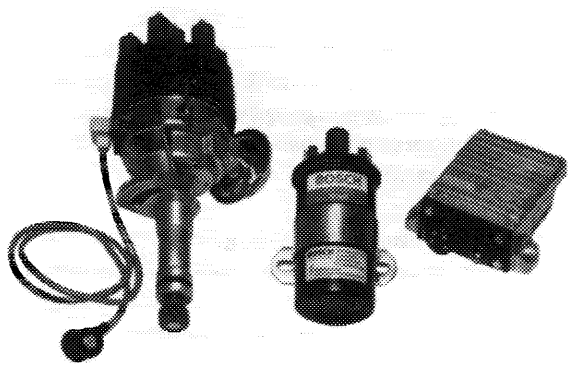


- Do not disconnect battery with the engine running.
- Install only original components of ignition system (refer to components of ignition system).

  Do not operate ignition system at starting speed without completely connected ignition harness.
- With the engine running, tests like, e. g., testing ignition cable 4 at a distance against ground (spark gap at starting speed) as well as pulling off of a spark plug connector are no longer permitted. If insulation damage is suspected, evaluate scope pattern at idle speed and with driving position engaged.
- Testing of ignition voltage while starting with cable 4 pulled from ignition distributor is no longer permitted.

Components of ignition system

The ignition system comprises the ignition coil, the ignition distributor, the ignition harness and the switching unit:



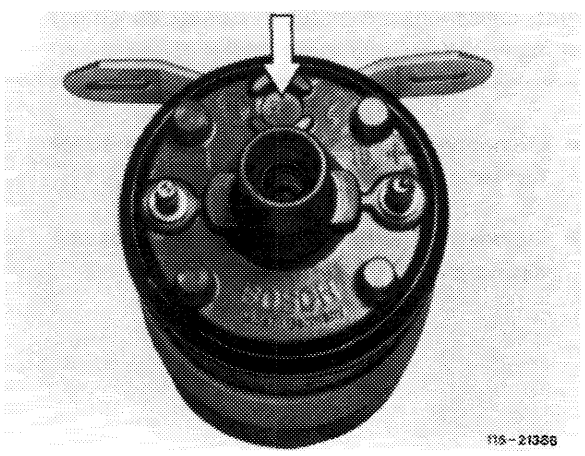
115-21530

Ignition coil

The ignition coil is adapted to the TSZ switching unit and designed for a higher ignition performance.

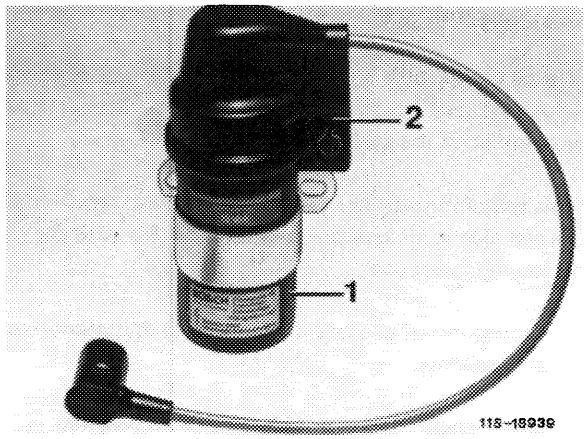
Different characteristics in relation to former ignition coils are:

1. The safety plug in cover of ignition coil (arrow).
2. A higher dome.
3. Cable connection to terminal 1 with thread M 5.
4. Cable connection to terminal 15 with thread M 6.



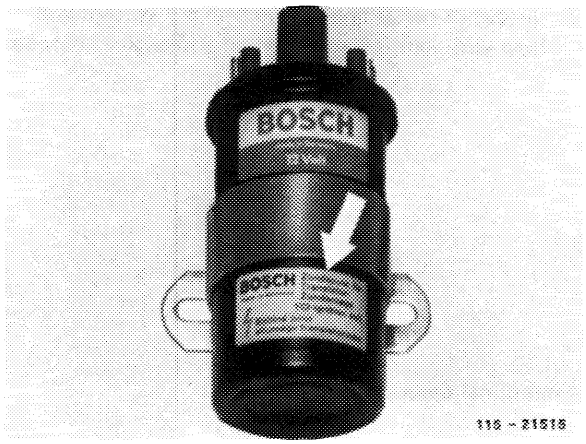
115-21388

The cover of ignition coil has an opening of 5.5 mm dia. which is closed with a plug. This plug will be released in the event of overpressure in switching unit caused by an intensive development of heat under influence of a defective final stage. To prevent uncontrolled release of plug or of sealing compound out of ignition coil, the ignition coil is provided with a protective cover.



To prevent mixups, the ignition coil of the TSZ 8 u has a yellow information label (arrow) Bosch No. 0221 111 83 07.

Never replace ignition coil by one of the former ignition coils.

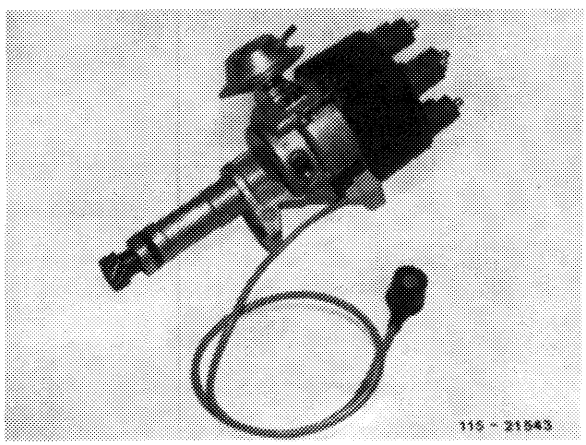


Ignition distributor

In principle, this ignition distributor with inductance transmitter corresponds with the version already known, except that its characteristic has been changed, together with a simplified vacuum control unit for ignition advance.

The line of the inductance transmitter from distributor to switching unit is a two-core line, it is insulated against ground and shielded.

The distributor rotor has an interference suppression resistor of 1 kΩ (code number R 1, on distributor rotor).



Ignition harness

The partially shielded spark plug connections and offset distributor plugs are designed to the higher ignition voltage.

An interference suppression resistor of 1 kΩ is installed in spark plug connectors.

They can be screwed off (thread M 4).

Switching unit

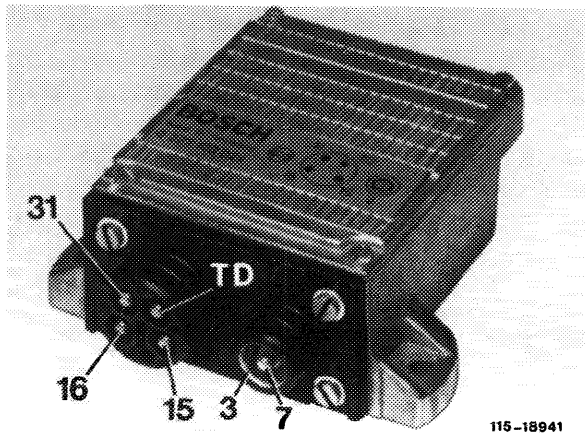
The switching unit is considerably smaller and lighter in weight. The housing has no vent bores. Connections are similar to the version already known.

This switching unit has been provided with new, special electronic components (control IC) with the following functions:

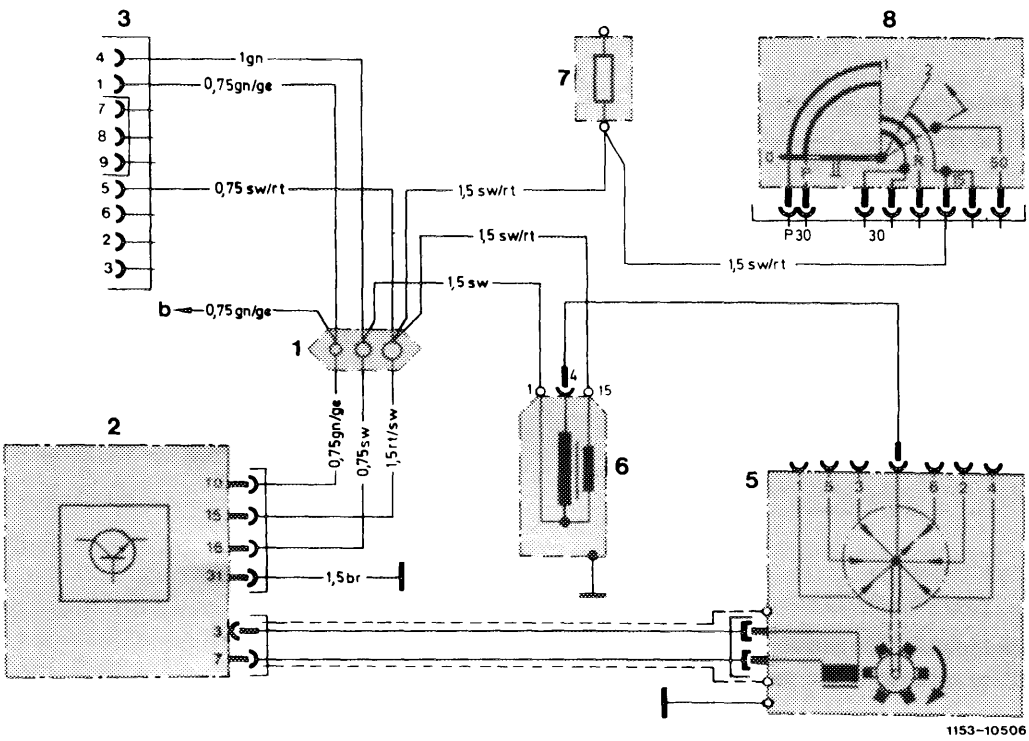
1. Limitation of primary current; there elimination of pre-resistors.

2. Dwell angle control at different battery voltage and engine speed, by max. primary current.

3. Cutout of rest potential; no primary current will flow with ignition switched on and engine stopped.



Functional description



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u

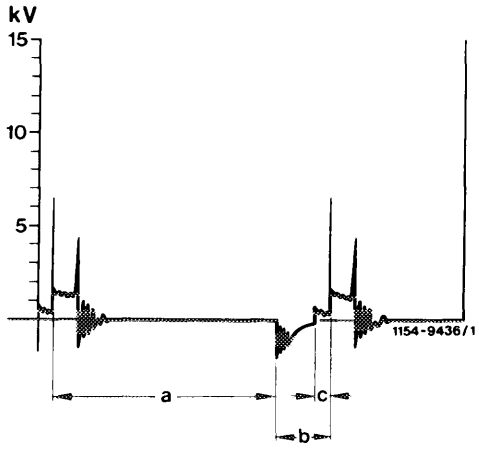
1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starter switch

b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gr = green
rt = red
sw = black

The max. primary current of the ignition coil is no longer determined by pre-resistors, but by a current limitation in switching unit. This current limitation is applied after the max. possible primary current has been attained.

The current limitation is indicated on oscilloscope at idle.



kV Voltage

a Opening
b Dwell angle
c Current limitation

The optimal output of the ignition system is attained by the dwell angle control in switching unit. Within range of possible regulation, the dwell angle is regulated in such a manner that the same primary current will always be approximately attained in any operating condition, that is, at varying battery voltages and engine speeds.

With the engine stopped and the ignition switched on the primary current is switched off via switching unit (rest potential cutout). The primary current is switched on only in the event of a given impulse sequence from transmitter in ignition distributor.

The revolution counter in instrument cluster is connected to terminal TD.

15–531 Notes concerning use of test instruments on breakerless transistorized ignition system without pre-resistors TSZ 8 u

- Connect and disconnect test instruments only with engine stopped and ignition system switched off.

- Engine tester or individual instruments for measuring rpm and dwell angle which cannot be connected to diagnosis socket may be connected for tapping signals to cable connector of switching unit terminal TD only.

- To prevent faulty measurements the trigger clamp should be attached directly behind ignition distributor to ignition cable cylinder 1.

- The shorting equipment in engine testers (comparing cylinders, cylinder balance) which are stopping the engine upon actuation may no longer be used, since the current flow through ignition coil might lead to destruction of ignition coil.

- The separate ignition coil test may now be made only with the additional adapter cable, with a defined ignition coil load, to prevent damage to ignition coil.

A. TSZ 4

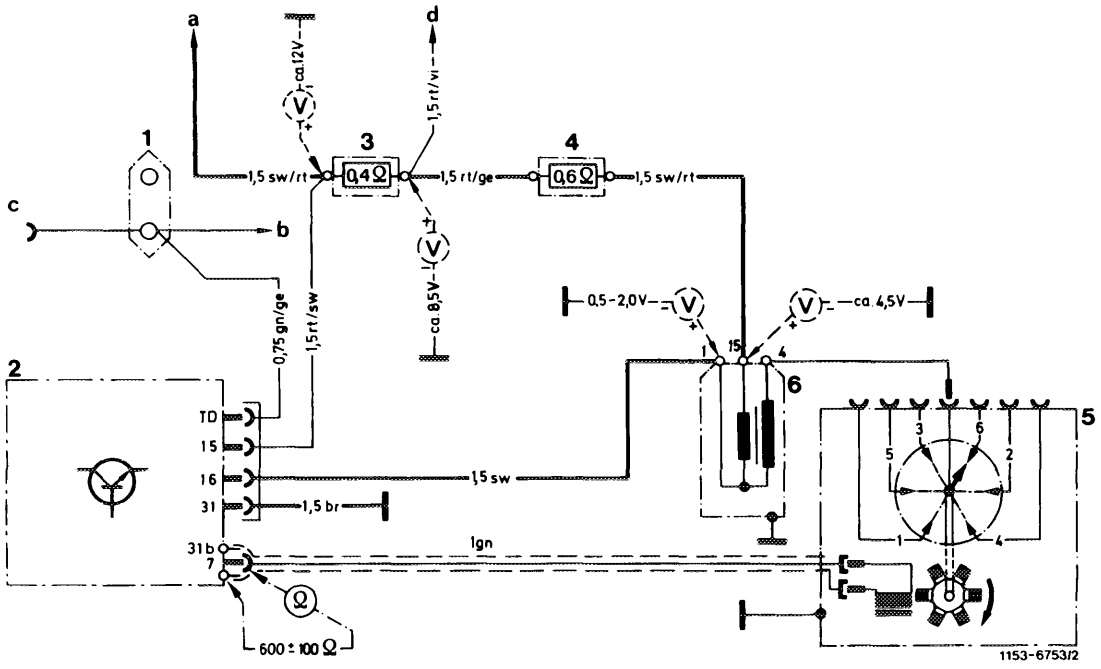
Conventional testers

Voltmeter, ohmmeter, dwell angle measuring instrument, revolution counter

Test values

Rest potential battery		approx. 12 V
Voltage ignition coil	Terminal 1 and ground	0.5–2.0 V
	Terminal 15 and ground	approx. 4.5 V
Input voltage pre-resistor (series resistor)		approx. 12 V
	primary terminal 1 and 15	0.33–0.46 Ω
	secondary terminal 1 and 4	7–12 kΩ
Transmitter resistance between terminal 7 and 31d		600 ± 100 Ω
Transmitter coil with control line terminal 7 and ground		∞
Dwell angle at	approx. 1500 rpm	33–51 °
	approx. 5000 rpm [1])	45–55°

[1]) Perform dwell angle test at 5000 rpm only if complaints refer to misfiring at high speeds.



Wiring diagram breakerless transistorized ignition TSZ 4

1 Double cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

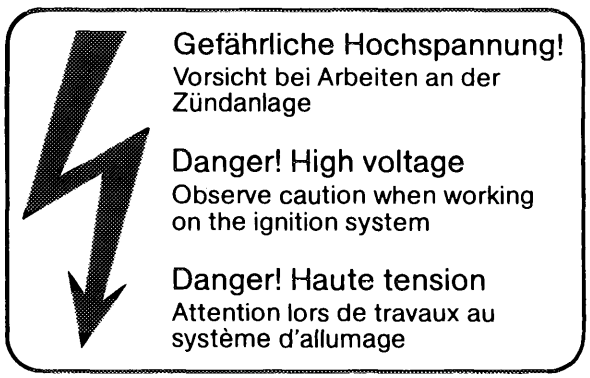
a Ignition switch terminal 15
b Instrument cluster, revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Note

In the event of complaints about misfiring, test high voltage side of ignition system first (spark plugs, ignition cable, spark plug connectors).

If the complaints refer to firing of engine, complete the following tests on ignition system in addition to tests at fuel end:



1154-9352

Visual checkup

Check electrical screw connections and plug connections of ignition system for tight seat.

Voltage test

Note: With the ignition switched on and the engine stopped a primary current of approx. 8 amps will flow continuously through system.

1 Input voltage at series resistor 0.4
Cable color black/red:

Rated value approx. 12 volts

2 Voltage at ignition coil at approx. 20 °C:

Terminal 15 and ground = approx. 4.5 volts
Terminal 1 and ground = 0.5–2.0 volts

a) If value at terminal 1 is exceeded, the switching unit is defective and should be replaced.

b) If value at terminal 1 is attained, but no ignition voltage (ignition spark) is induced, check transmitter section in ignition distributor and secondary winding of ignition coil.

Resistance values of ignition coil:

Primary winding terminal 15 and terminal 1 = 0.33–0.46 Ω .

Secondary winding terminal 1 and terminal 4 = 7–12 kΩ

Testing dwell angle

Note: The dwell angle cannot be adjusted. Testing is a functional inspection of switching unit (dwell angle control).

Connect dwell angle measuring unit (connection similar to SI standard switching unit).

Rated value at

Engine speed	Dwell angle
1500 ± 50/min	33–51 °
5000 ± 50/min[1])	45–55 °

[1]) Test at 5000/min only in the event of complaints about misfiring at high speeds.

If this value is not attained when measuring dwell angle, check ignition distributor transmitter section first. If transmitter section is in order, replace switching unit.

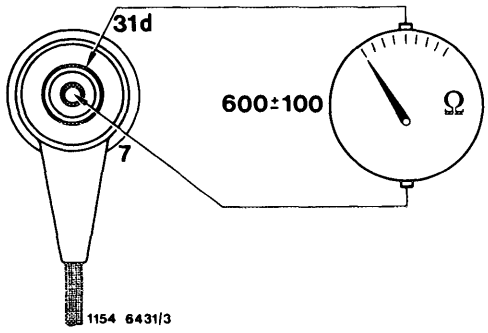
Testing ignition distributor transmitter section

Pull control line of ignition distributor from switching unit and connect ohmmeter.

1 Check transmitter resistance between terminal 7 and 31 d.

Rated value: 600 ± 100 Ω

Note: On cold engine, the ohmic value should be in lower half of specified value, on warm engine in upper half.

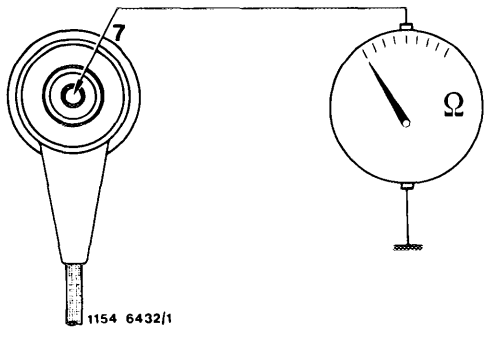


2 Test transmitter coil including control line for ground connection between terminal and ground.

Rated value: ∞

3 Check transmitter for mechanical damage. Check for presence of air gap between rotor and stator.

Note: If the transmitter section is defective, replace complete ignition distributor.



B. TSZ 8 u

Conventional test instruments

Voltmeter, ohmmeter, dwell angle measuring instrument, revolution counter	
Digital tester	e. g. made by Bosch, MOT 001.03

Test values

Resistors

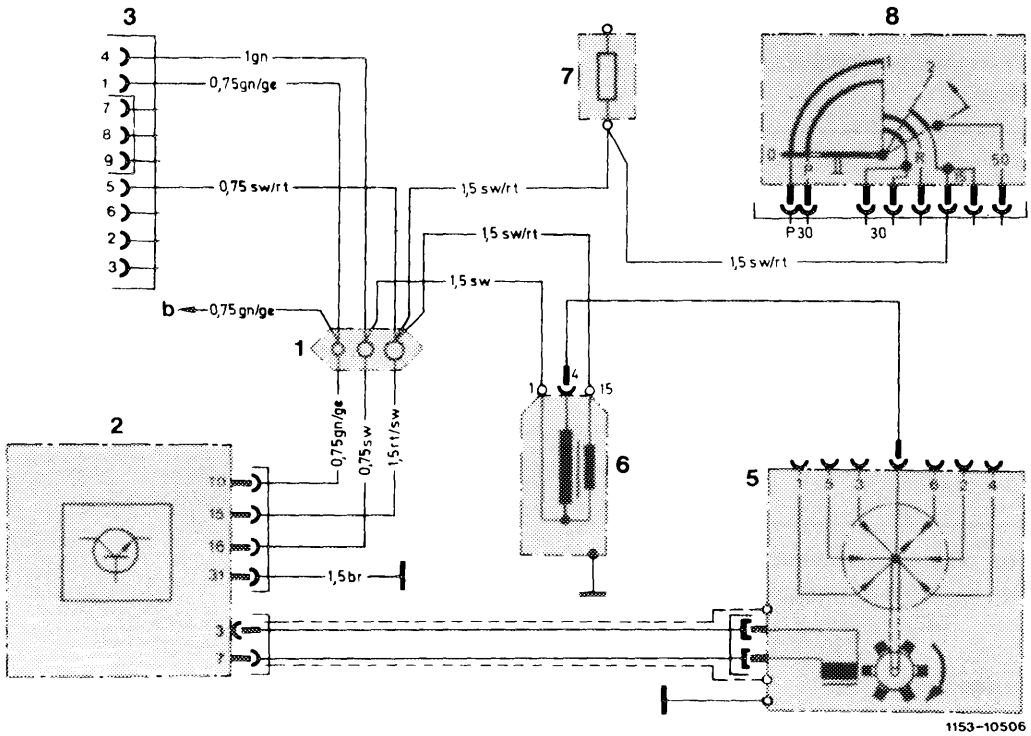
Ignition coil	primary (terminal 1 and 15)	approx. 0.5–0.9 Ω
	secondary (terminal 1 and 4)	6–16 kΩ
Distributor cap		1 kΩ
Distributor rotor, spark plug connector		1 kΩ
Ignition distributor transmitter section	Resistance of winding	600 ± 100 Ω
	Resistance against ground	$\geq$ 200 kΩ

Voltages, stopped engine, ignition switched on

Terminal 15 (jack 5 diagnosis socket)	Battery voltage
between terminal 15 and 1 (jack 5 and 4 diagnosis socket)	0 Volt

Dwell angle

Terminal TD at starting speed	from 7 ° to 25 °



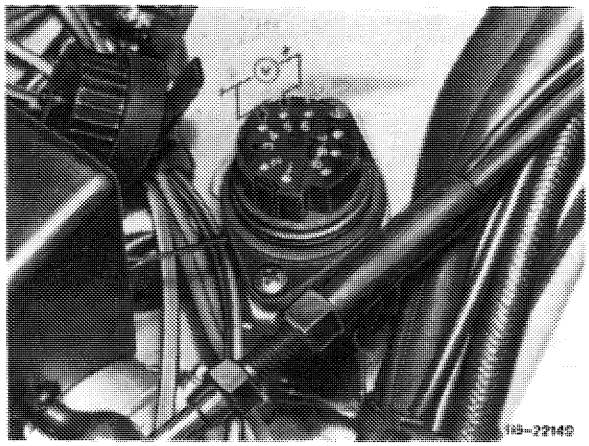
Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starter switch

b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Test



Test voltage (terminal 15) against ground at jack 5 of diagnosis socket. Ignition switched on.

Nominal value: battery voltage

Nominal value correct.	Nominal value wrong.

Test voltage supply via ignition lock.

Test voltage difference between jack 5 and 4 (terminal 15 and 1) of diagnosis socket.

Nominal value: 0 volt

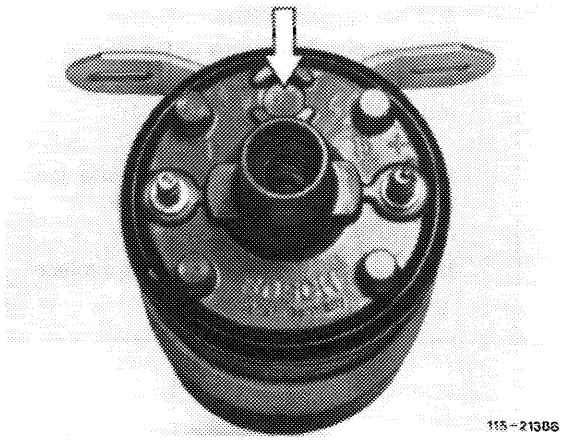
Nominal value correct.	Nominal value wrong (voltage > 0.1 volt). Switch off ignition immediately.

Replace switching unit.

Test plug in ignition coil and primary resistance of ignition coil (between terminal 1 and 15) 0.5–0.9 Ω.

With plug ejected or wrong ohmic value, replace ignition coil.

End of test.



Test dwell angle at starting speed at diagnosis socket or terminal TD.

Nominal value: from 7–25°.

Nominal value correct.	Nominal value not indicated.	Nominal value higher than 34°

Replace switching unit.

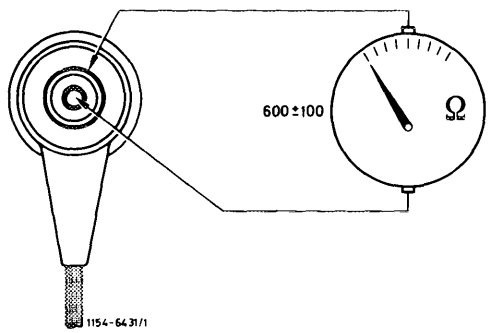
End of test

Test ignition distributor transmitter section for interruption and interturn short.

Pull off green control line on switching unit. Test resistance with ohmmeter between terminal 7 and 3.

Nominal value: 600 ± 100 Ω

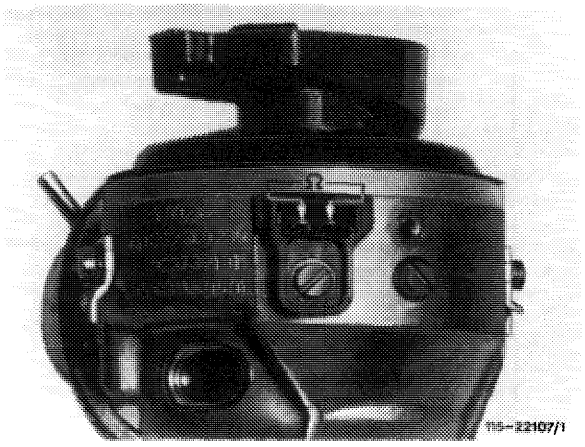
Nominal value correct.	Nominal value wrong.



Pull off plug connection of green cable on ignition distributor and test with ohmmeter at plugs whether 600 ± 100 Ω is indicated.

If nominal value is attained, replace green cable.

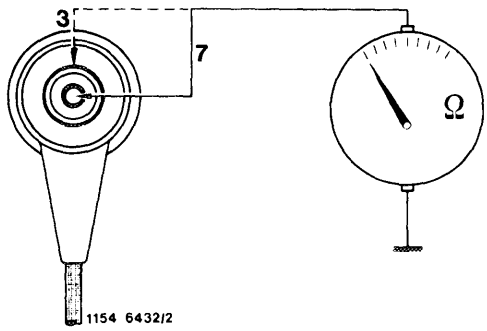
If nominal value is not attained, replace ignition distributor.



Test ignition distributor transmitter section for ground connection.

Pull off green cable on switching unit. Connect ohmmeter to terminal 3 or 7 and to ground.

Nominal value: ≧ 200 kΩ

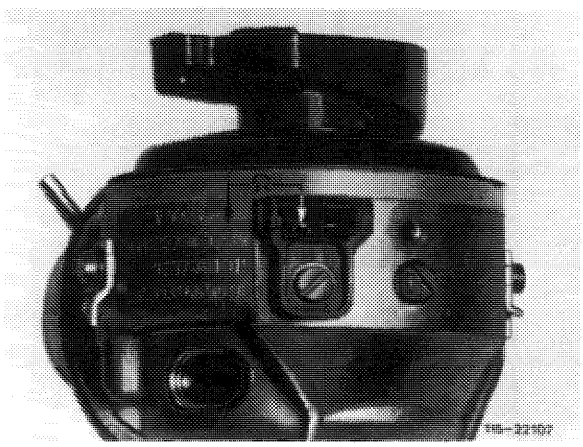


Nominal value correct.	Nominal value wrong.

Pull off plug connection of green cable on ignition distributor. Test resistance against ground.

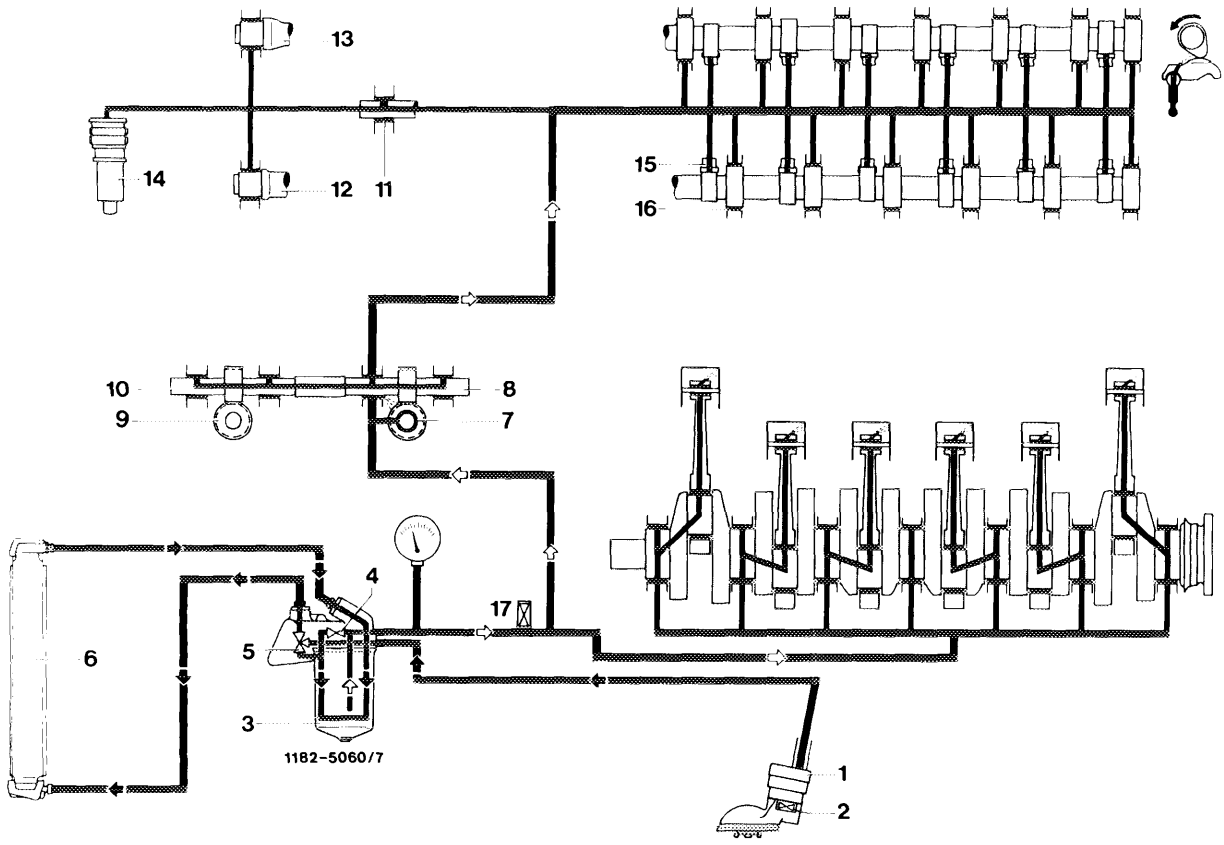
Nominal value at both plugs: ≧ 200 kΩ

If nominal value is not attained at one plug, replace ignition distributor.



End of test

Oil circuit with air oil cooler



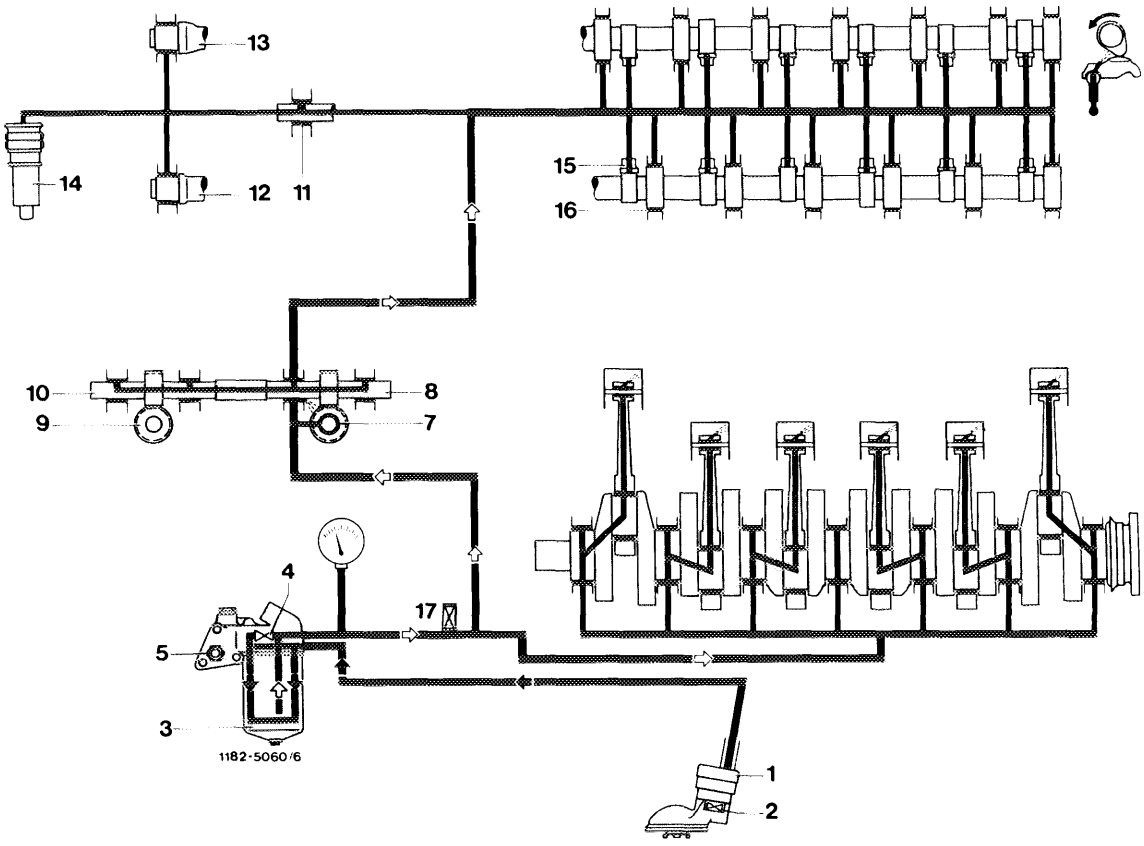
1 Oil pump
2 Pressure relief valve (7 bar) (built-in oil pump)
3 Oil filter
4 Bypass valve filter element
5 Thermostat with control valve
6 Air oil cooler
7 Oil pump drive
8 Intermediate wheel shaft
9 Distributor drive
10 Intermediate wheel shaft
11 Guide wheel
12 Intake camshaft
13 Exhaust camshaft
14 Chain tensioner
15 Rocker arms
16 Camshaft bearings
17 Pressure relief valve in front main oil bore (5 bar)

Attention!
The oil circuit is controlled by a thermostat (5) in the oil filter upper section.

Starting at an oil temperature of approx. 95 °C or 110 °C (203 °F or 230 °F) beginning with model 126, the oil flows via air oil cooler. The bypass circuit is only opened as long os the oil temperature is below approx. 95 °C or 110 °C (203 °F or 230 °F).

If for any reason the air oil cooler (6) is disconnected or the connections on oil filter top are closed blind, **removal of thermostat with control valve and compression spring is absolutely required** (18–125). If this is not done, the oil supply to the bearing points will be interrupted at oil temperatures above approx. 95 °C or 110 °C (203 °F or 230 °F).

Oil circuit without air oil cooler



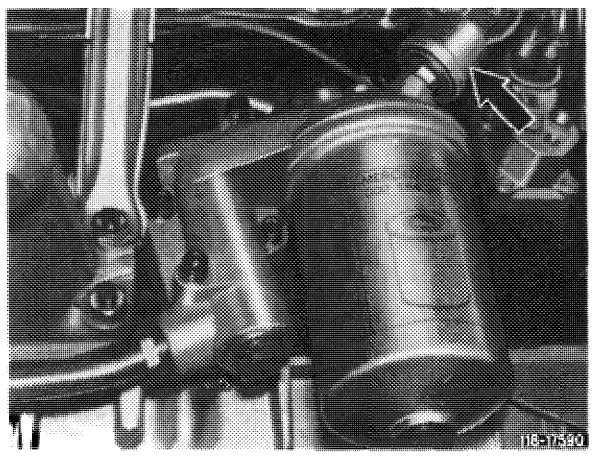
1 Oil pump
2 Pressure relief valve (7 bar) (built in oil pump)
3 Oil filter
4 Bypass valve filter element
5 17°C temperature switch
7 Oil pump drive
8 Intermediate wheel shaft
9 Distributor drive
10 Intermediate wheel shaft
11 Guide wheel
12 Intake camshaft
13 Exhaust camshaft
14 Chain tensioner
15 Rocker arms
16 Camshaft bearings
17 Pressure relief valve in front main oil bore (5 bar)

Oil pressure

At operating temperature the oil pressure at idle may drop to 0.5 bar gauge pressure.

Upon acceleration the oil pressure should immediately increase again and should attain min. 3 bar gauge pressure at 3000 rpm.

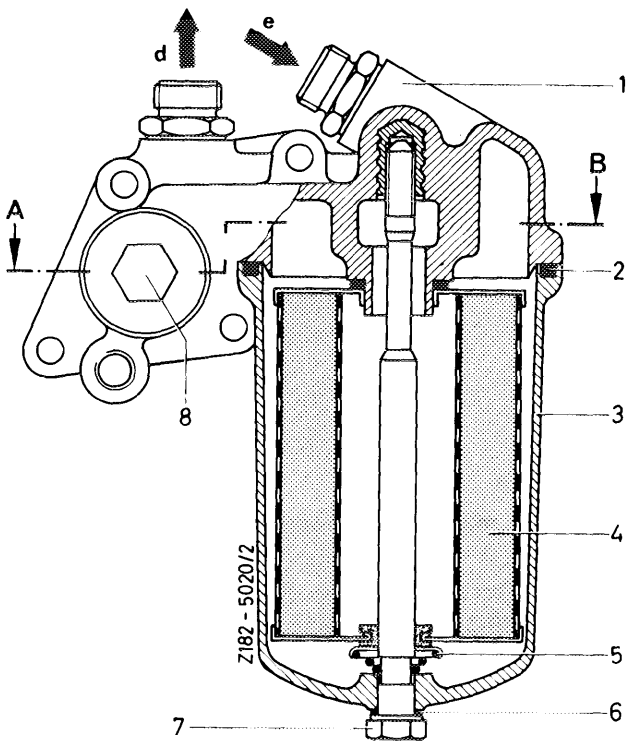
On model 126 the oil pressure is not indicated as before by means of a capillary tube connected to a pressure gauge in instrument cluster, but by means of a pressure transmitter which is electrically activated. The pressure transmitter is screwed to oil filter top (arrow).



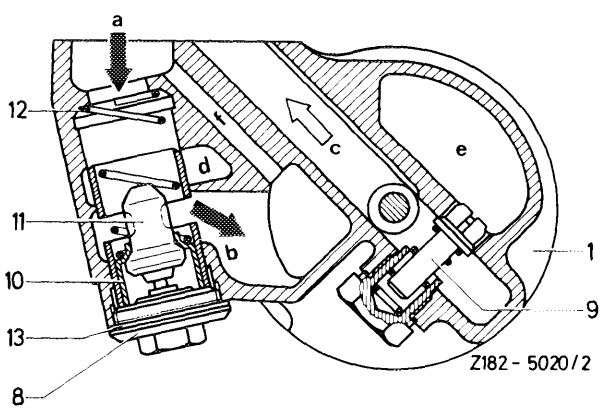
Oil filter with pressure transmitter

Opening pressures of pressure relief and bypass valve	bar relief pressure
Pressure relief valve (2) for oil pump	7
Bypass valve (4) for filter cartridge	3.5
Pressure relief valve (17) in front main oil bore	5

Oil filter models 107, 114, 116



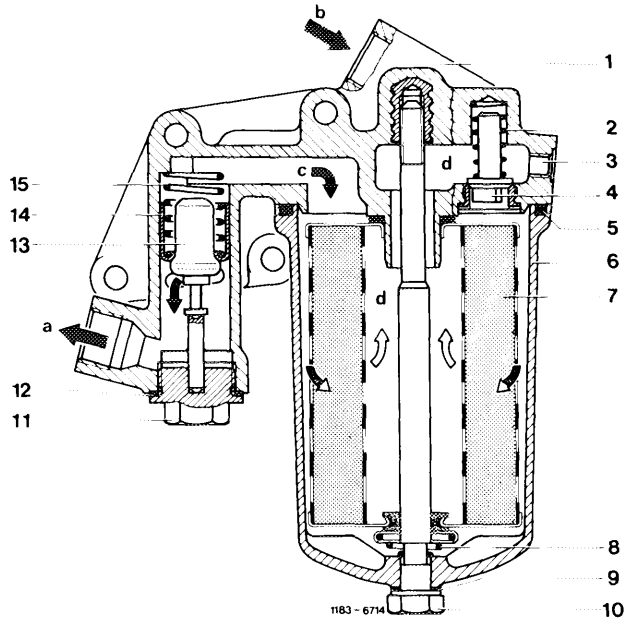
Section A–B



1 Filter upper section
2 Seal
3 Filter lower section
4 Filter cartridge
5 Spring with spring retainer
6 Seal
7 Hex. head screw
8 Plug
9 Bypass valve – filter cartridge
10 Control valve
11 Thermostat
12 Spring
13 Seal

a from oil pump
b to filter lower section
c to bearings
d to air oil cooler
e from air cooler to filter lower section
f bypass bore

Oil filter model 123 and models 107, 116 with continuous fuel injection, 2nd version carburetor engine

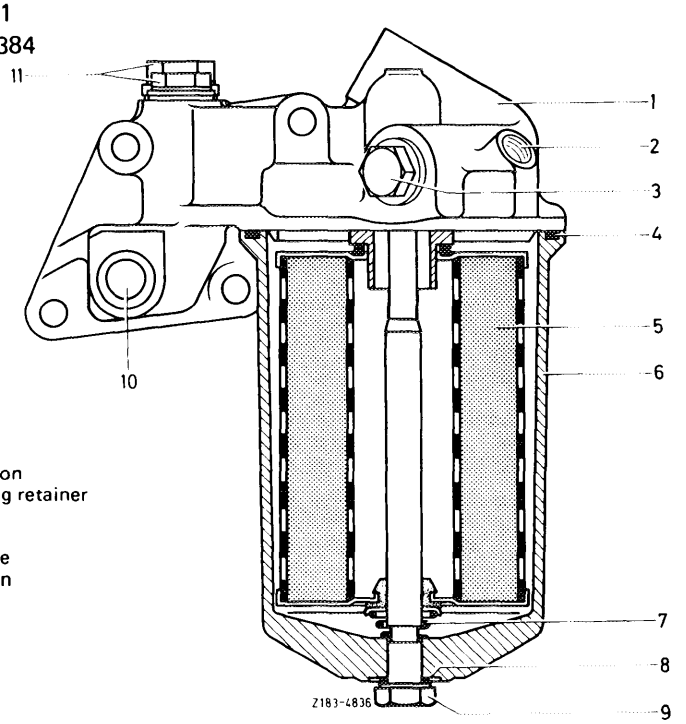


1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Bypass valve/filter cartridge
5 Seal
6 Filter lower section
7 Filter cartridge
8 Spring with spring retainer
9 Seal
10 Hex. head screw
11 Plug
12 Seal
13 Thermostat
14 Control valve
15 Spring

a to air oil cooler
b from air oil cooler
c from oil pump
d to bearings

Oil filter, model 114 USA version

Model 280 (114.060) up to chassis end No. 014 231
Model 280 C (114.073) up to chassis end No. 003 384

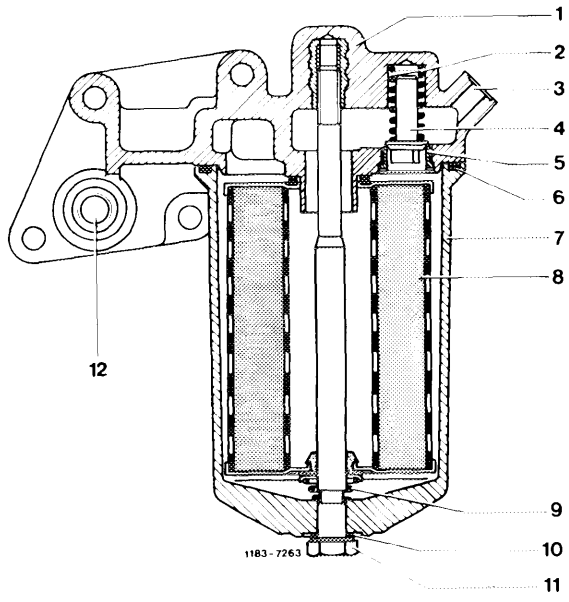


1 Filter upper section
2 Oil pressure gage connection
3 Plug for filter cartridge bypass valve
4 Seal
5 Filter cartridge
6 Filter lower section
7 Spring with spring retainer
8 Seal
9 Hex. head screw
10 17°C temperature switch connection
11 Plugs

Oil filter models 114 and 116.020 USA and Sweden version

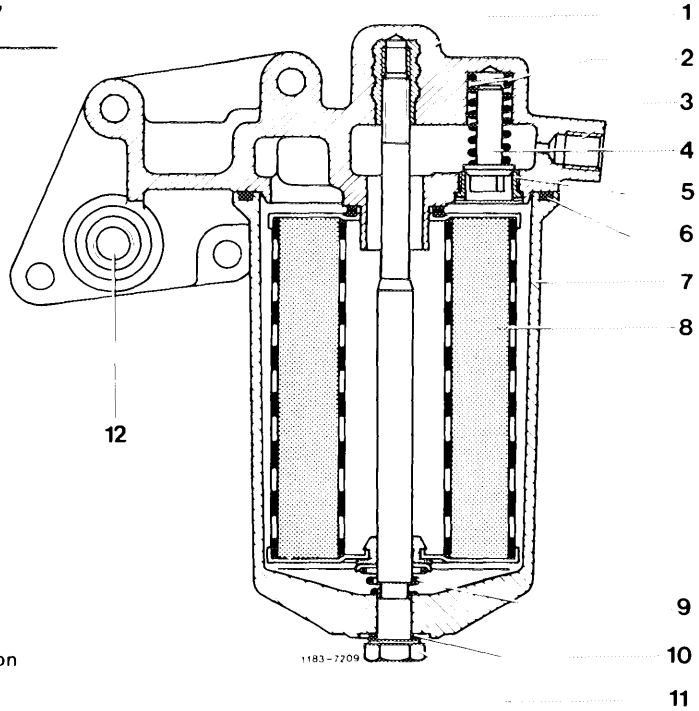
Model 280 (114.060) from chassis end No. 014 232
Model 280 C (114.073) from chassis end No. 003 385

Note: Oil filters up to and from the specified chassis end numbers are interchangeable.



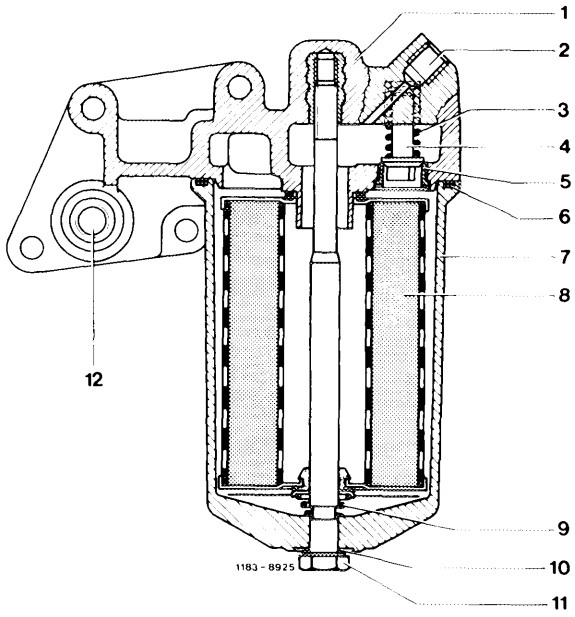
1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Filter cartridge bypass valve
5 Valve seat
6 Seal
7 Filter lower section
8 Filter cartridge
9 Spring with spring retainer
10 Seal
11 Hex. head screw
12 17°C temperature switch connection

Oil filter without air oil cooler, model year 1977



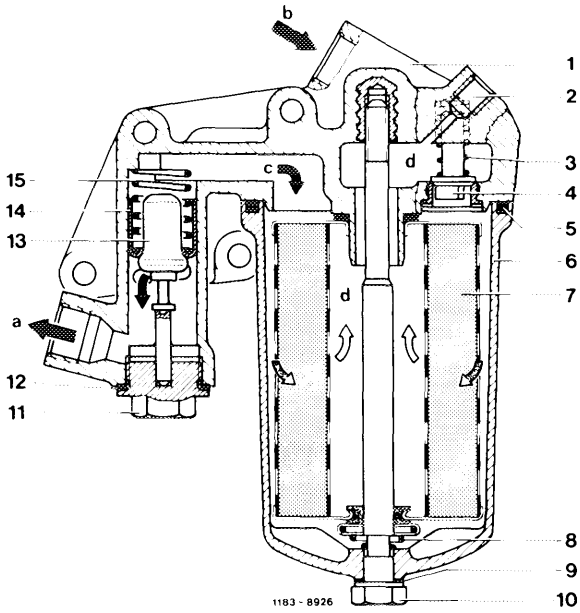
1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Filter cartridge bypass valve
5 Valve seat
6 Seal
7 Filter lower section
8 Filter cartridge
9 Spring with spring retainer
10 Seal
11 Hex. head screw
12 17°C temperature switch connection

Oil filter model 126 without air oil cooler



1 Filter top
2 Connection for oil pressure transmitter
3 Compression spring
4 Filter cartridge bypass valve
5 Valve seat
6 Sealing ring
7 Filter lower section
8 Filter cartridge
9 Compression spring with spring retainer
10 Sealing ring
11 Hex. head screw
12 17 °C temperature switch connection

Oil filter model 126 with air oil cooler



1 Filter upper section
2 Connection for oil pressure transmitter
3 Compression spring
4 Filter cartridge bypass valve
5 Sealing ring
6 Filter lower section
7 Filter cartridge
8 Compression spring with spring retainer
9 Sealing ring
10 Hex. head screw
11 Closing plug
12 Sealing ring
13 Thermostat
14 Control valve
15 Compression spring

a To air oil cooler
b From air oil cooler
c From oil pump
d To bearing points

Note

Engines 110 are provided with oil filter elements of engines 116, 117 as standard equipment. The part no. of the filter element on oil filter bowl has been changed from the former 000 184 98 25 to 00 184 99 25.

The former filter element, part no. 000 184 98 25 is valid as a running-in filter up to 1st inspection.

Starting 1980, the oil filters, part no. 001 184 64 25 are valid as running-in filters or 001 184 65 25 as constant operation filters.

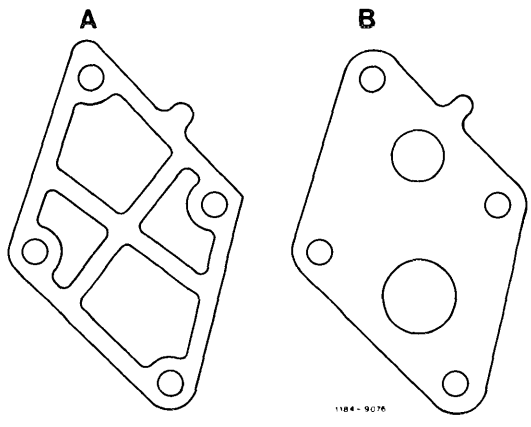
When the oil filter is removed, remainders of gasket may stick to flange surface of cylinder crankcase.

To prevent such remainders from entering the pure oil duct of the cylinder crankcase during removal (e.g. by scraping), the bores should be covered or closed first.

New oil filters are supplied with running-in filter elements which may be used on new engines up to first inspection.

These filter elements have a restricted operating life and should be exchanged against normal filter elements when new oil filters are installed on run-in engines.

To prevent that the former gasket (A), part no. 110 184 03 80, is pushed out and thereby made leaking, the present version (B), part no. 110 184 05 80, is perforated only in range of forward or return flow.



Standard application

Engine	starting engine end no. manual transmission	automatic transmission
110.922	040354	067119
110.923	013226	017239
110.932	010320	002765
110.984	019263	065273
110.985	013841	068010
110.986	003040	006862

Oil filling capacity in liters	Oil dipstick color code	pink/wine red	yellow/green
Refill capacity (dry engine)		7.5[1])	7[1])
Total filling capacity during oil and filter change		6.5	6
Oil pan max./min.		6/4.5	5.5/4

[1]) On vehicles without air oil cooler deduct 0.5 liter refill capacity from total filling capacity.

Oil level checkup

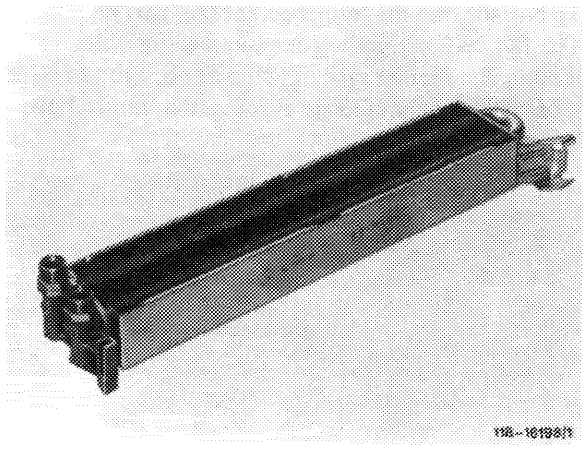
The oil level depends, among others, from oil temperature and return flow period of oil after stopping the engine. For this reason, measure oil level only approx. 2 minutes after stopping worn engine.

Prior to checking oil level, always pull out dipstick first and wipe off.

Air oil cooler

Model 126.021 with engine 110.924 is not provided with an air oil cooler.

Models 126.022/023 are provided with a double tube light alloy air oil cooler.



Double tube light alloy air oil cooler

18–020 Additional installation of oil pressure relief valve in main oil duct

Tightening torques	Nm
Pulley bolts M 8	35
Pressure relief valve	40
Plug (5)	50

Spare parts

Pressure relief valve	114 180 02 15
Plug	110 184 00 56
Plug[1])	110 184 01 56

[1]) only for models with fuel evaporation system, which have connection at plug.

Note

In the event of repairs or when installing an oil pump drive, part no. 110 050 02 06, install a 5 bar pressure relief valve, part no. 114 118 02 15 into main oil duct front in addition to pressure relief valve in oil pump. For this purpose, use a new closing plug.

On vehicles with fuel evaporation control system without charcoal canister, install line of evaporation control system from cylinder crankcase to cylinder head.

Standard installation 5 bar pressure relief valve in main oil duct

Engine	starting engine end no.
110.921 – 10 –	008705
– 12 –	035819
110.922 – 10 –	015494
– 12 –	022259
110.923 – 10 –	starting begin of series
– 12 –	starting begin of series
110.931 – 10 –	001058
– 12 –	000126

110.932	– 10 –	002153
	– 12 –	000350
110.981	– 10 –	009994
	– 12 –	020700
110.982	– 10 –	000109
	– 12 –	000285
110.983	– 10 –	011397
	– 12 –	028536
110.984		starting begin of series
110.985		starting begin of series
110.986		starting begin of series
110.991	– 10 –	000065
	– 12 –	000030
110.992		starting begin of series
110.993	– 10 –	000043
	– 12 –	000010

All exchange engines starting unit no. 464130 are provided with 5 bar pressure relief valve in main oil duct.

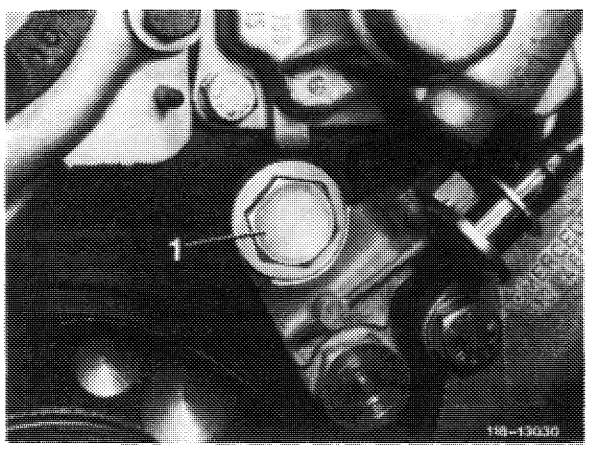
Removal

1 Remove radiator (20–420).

2 Remove fan clutch.

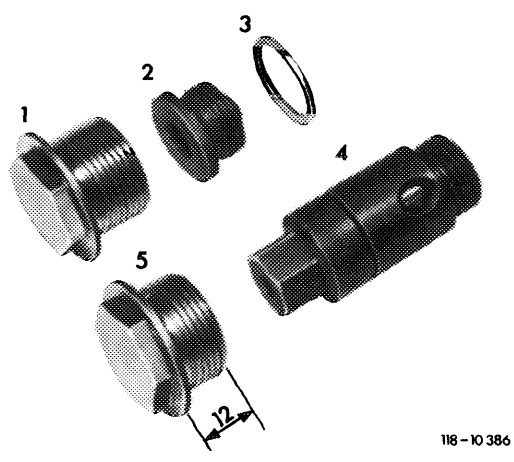
3 Remove pulley and vibration damper (03–340).

4 Remove plug (1).



5 Unscrew plug (2) for oil bore with a lubricated 8 mm internal socket wrench and pull out carefully.

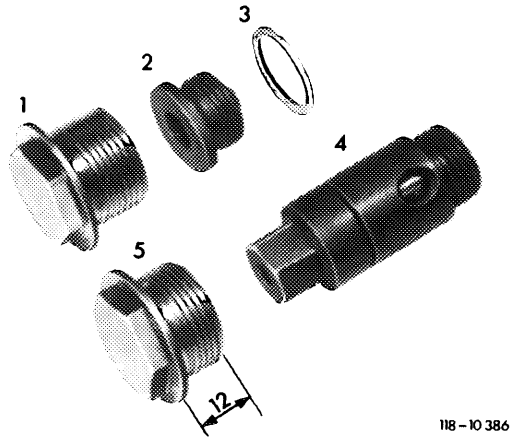
6 For protection insert a long piece of welding wire in oil bore and remove the press fit aluminium seal (3) from countersink of oil bore with a screwdriver.



118-10386

Attention!
Do not use old closing plug (1), 16 mm long, together with pressure relief valve (4).

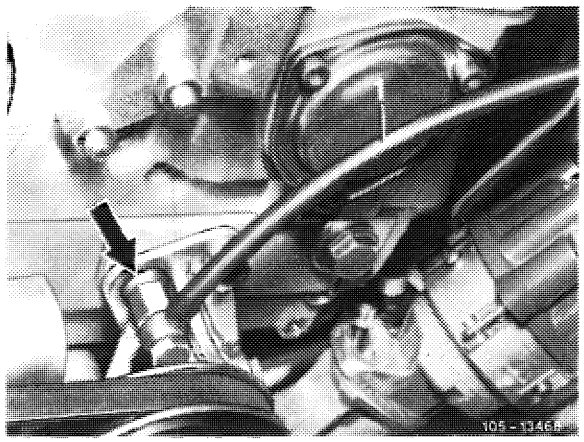
When installing a 5 bar pressure relief valve, use screw connection (5), part no. 110 184 0056 (or part no. 110 184 0156 with tank breather on vehicles for (AUS), (J), (USA)), since otherwise the pressure relief valve will not operate.

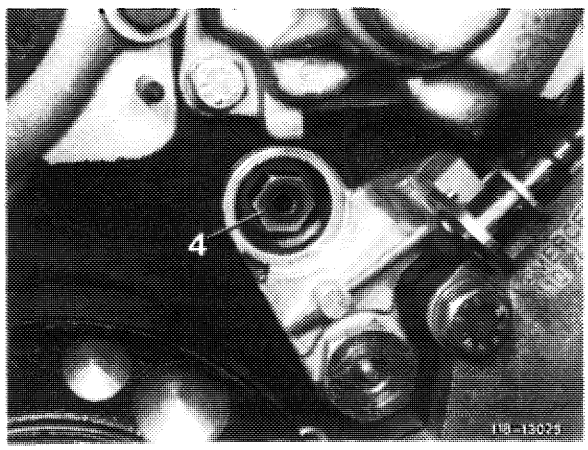


For subsequent installation of a 5 bar pressure relief valve into the following vehicle models, connect line of fuel evaporation control system to cylinder head (arrow):

Model years
(AUS) starting 10.1974 up to start of model year 1977.
(J) starting 1.1973 up to start of model year 1976.
(USA) starting model year 1972 to 1974.

For this purpose, use conversion set, part no. 114 010 26 99. Also refer to repair instructions engine 110, combustion III, programmed repairs, group 47.





Installation

7 Install pressure relief valve (4) and torque to 40 Nm.

8 Coat threads of new plug (5) with a sealing compound, install and torque to 50 Nm.

9 Install vibration damper and pulley.

10 Install fan clutch.

11 Install and tighten belt.

12 Install radiator housing and radiator.

13 Add coolant.

14 Run engine, check oil pressure and for leaks.

Note

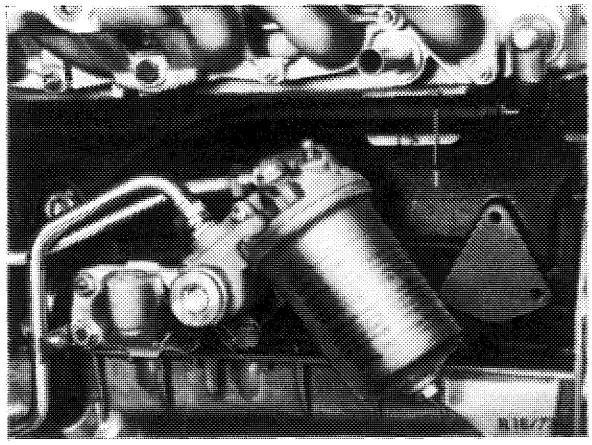
The intake manifold of fuel injection engines has to be detached for replacement of the return line (1).

Removal

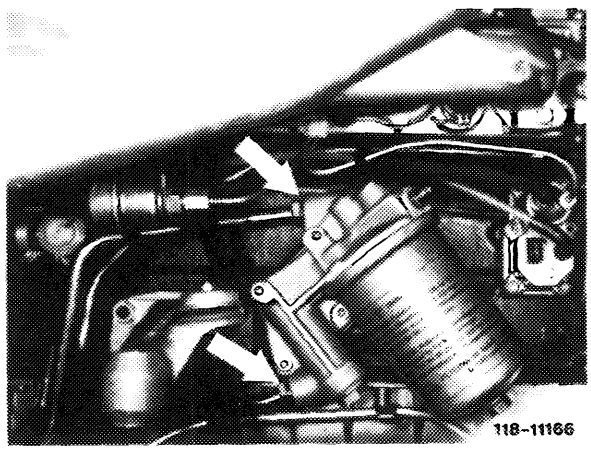
1 Detach oil return adaptor at cylinder head.

2 Detach both oil lines to air oil cooler at filter upper section and loosen clamps (arrows).

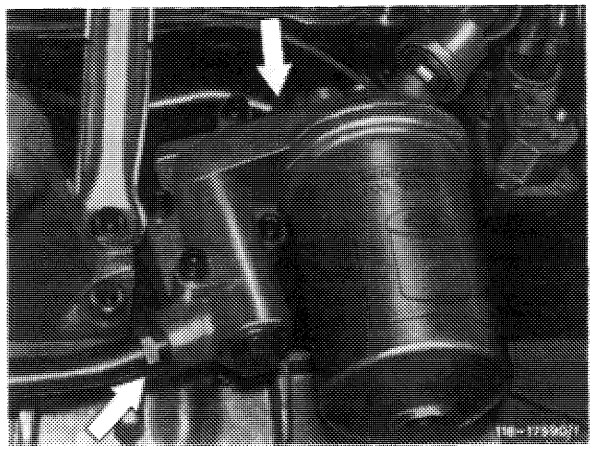
3 Pull oil return line off of adaptor at oil pan and oil return adaptor.



Models 114 and 116



Models 116 with CIS and 123



Model 126

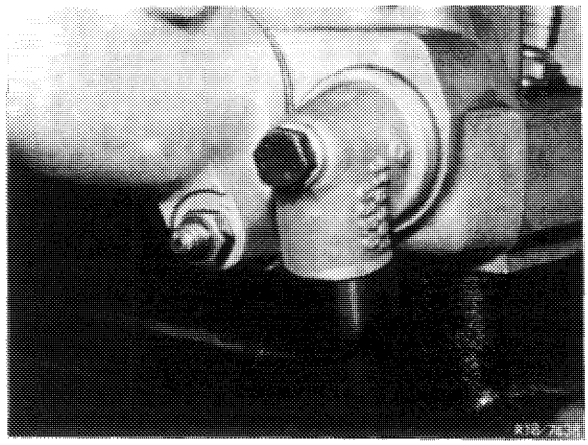
Installation

4 Install new oil return line on oil return adaptor.

5 Soften lower end of oil return line by placing in boiling water and then install on oil pan adaptor up to stop without delay.

6 Install oil return adaptor with new gasket and both oil lines.

7 Run engine and check for leaks.



Thermostat opening temperatures

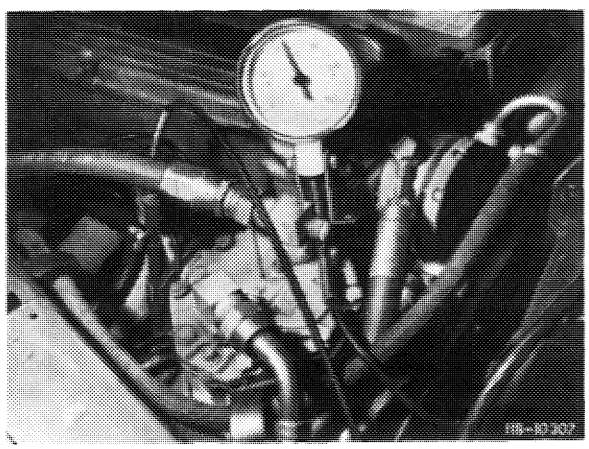
Application	Begin of opening °C	Fully opened °C/mm
Up to December 1979	95 ± 4	approx. 110/8 + 2
Starting January 1980	110 ± 4	approx. 125/8 + 2

Special tool

Temperature sensor for measuring engine oil temperature		116 589 27 21 00

Note

Engines without air oil cooler have no thermostat in oil filter.



Checking

1 Exchange oil dipstick against flexible temperature sensor.

2 Run engine at high speed and watch temperature gage.

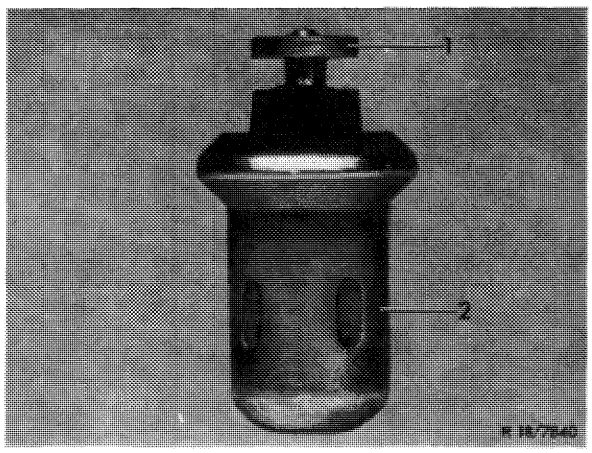
3 At 95 °C ± 110 °C engine oil temperature the start of the opening period of thermostat should be clearly noticeable manually by the increasing oil temperature on oil cooler.

18–125 Removal and installation of thermostat in oil filter upper section

Tightening torques	Nm
Closing plug oil thermostat	120–140
Oil drain plug on air oil cooler, models 107, 114, 116	30–35

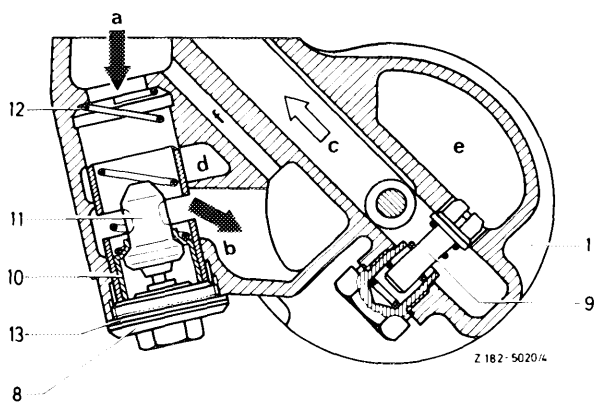
Attention!
A well functioning thermostat may only be removed at temperatures **below 60°C**, since otherwise the pressure pin will be pressed out.

Pressure pin (1) must never be pulled out of wax thermostat (2), since otherwise the function cannot be guaranteed.



Models 107, 114, 116

Section A – B

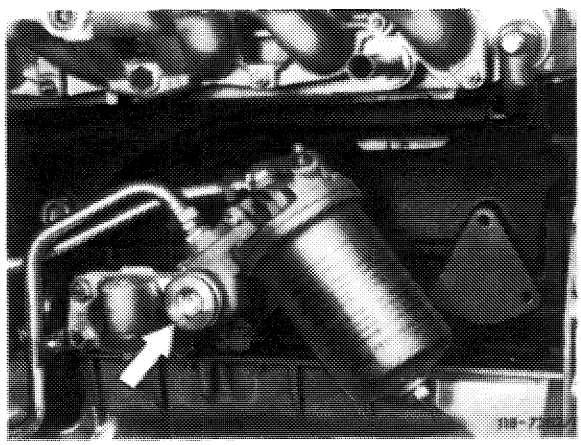


8 Plug
10 Control valve
11 Thermostat
12 Spring
13 Seal

Removal

1 Unscrew plug (arrow) and catch escaping engine oil.

2 Remove thermostat (11) with control valve (10) and spring (12).



Installation

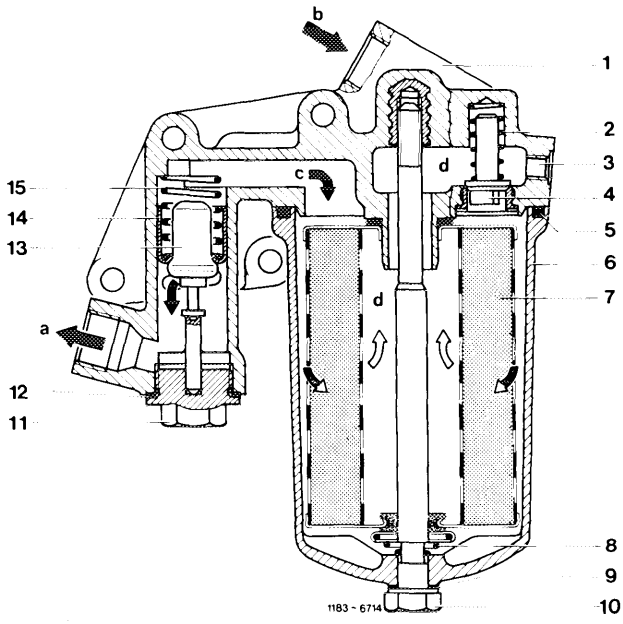
3 Guide thermostat (11) with control valve (10) and spring (12) into filter upper section and position spring in housing by turning the control valve.

4 Torque plug to 120–140 Nm.

5 Check function of thermostat (18–120) and check plug for leaks.

6 Correct oil level.

Model 123 and models 107, 116 with continuous fuel injection
Model 116.020 2nd version and Model 126

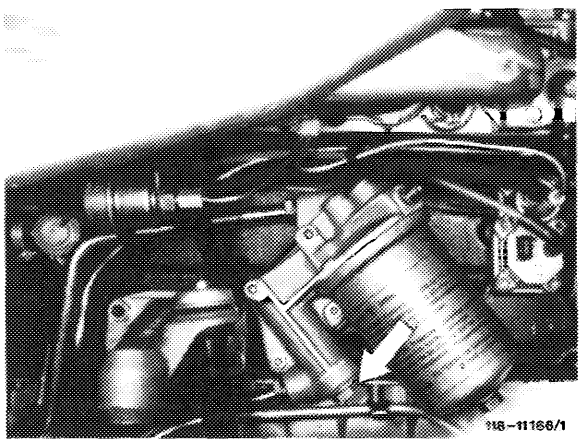


11 Plug
12 Seal
13 Thermostat
14 Control valve
15 Spring

Removal

1 Unscrew plug (arrow) and catch escaping engine oil.

2 Remove thermostat (13) with control valve (14) and spring (15).



Installation

3 Guide thermostat (13) with control valve (14) and spring (15) into filter upper section.

4 Torque plug (11) to 120–140 Nm.

5 Check function of thermostat (18–120) and plug for leaks.

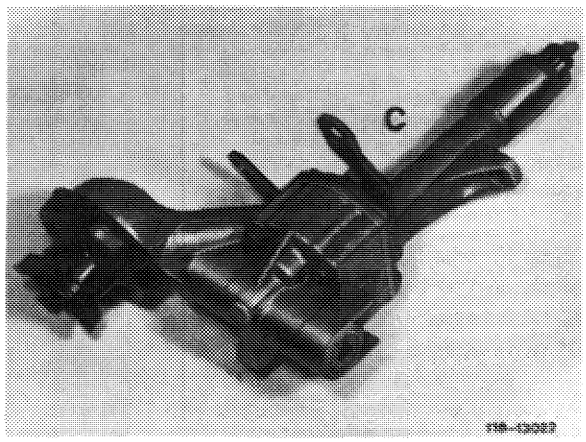
6 Correct oil level.

Tightening torques	Nm
Pressure relief valve for oil pump	40
Plug for built-in pressure relief valve	30
Oil pump to crankcase and bearing caps	30
Oil pan lower section to upper section	11
Crankshaft bearing bolt	80

Note

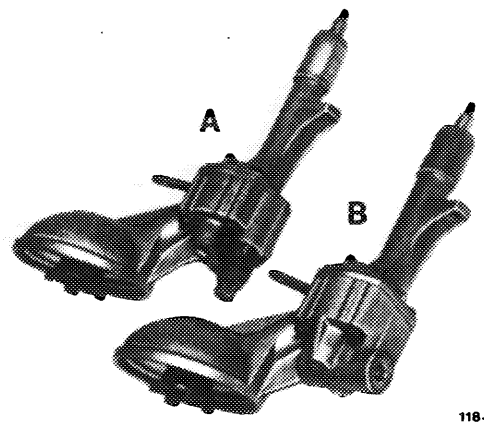
In the event of repairs or when installing an oil pump drive, part no. 110 050 02 06, install oil pump, part no. 110 180 27 01 (version C).

This oil pump has a strainer of 60 mm dia. and **two screwed-on holders.** Install pump only in combination with a 5-bar pressure relief valve in main oil duct (18–020).



Version C

Oil pumps (version A and B) used up to now are provided with a strainer of 110 mm dia. and **one screwed-on holder.**

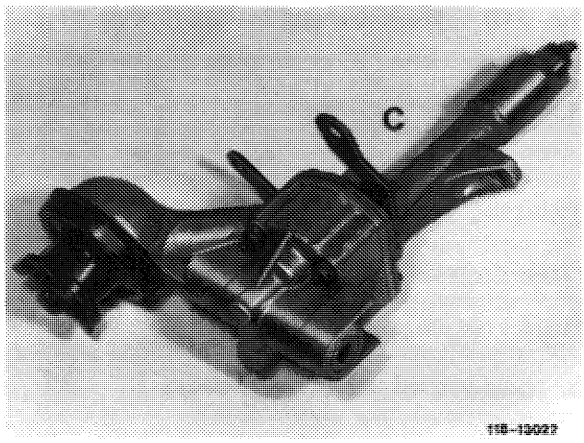


Version A and B

118-12585

Standard installation oil pump version C

Engine	Starting engine no.
110.921 – 10 –	010368
– 12 –	045651
110.922 – 10 –	024583
– 12 –	041571
110.923 – 10 –	003252
– 12 –	004341
110.931 – 10 –	001115
– 12 –	000152
110.932 – 10 –	004456
– 12 –	000841
110.981 – 10 –	010906
– 12 –	023759
110.982 – 10 –	001323
– 12 –	002835
110.983 – 10 –	017358
– 12 –	050438
110.984 – 10 –	002646
– 12 –	006072
110.985	starting begin of series
110.986	starting begin of series



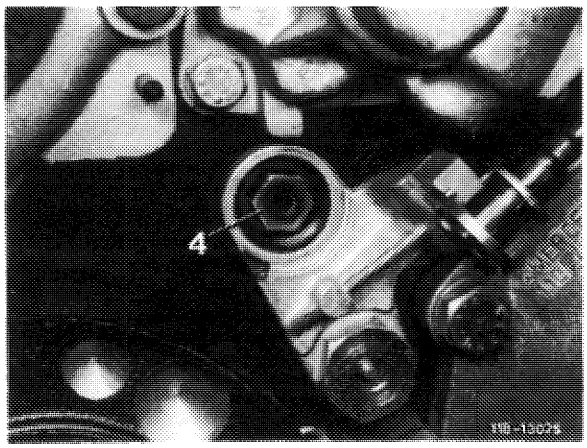
All exchange engines starting unit no. 464130 are provided with oil pump version C with 60 mm dia. strainer.

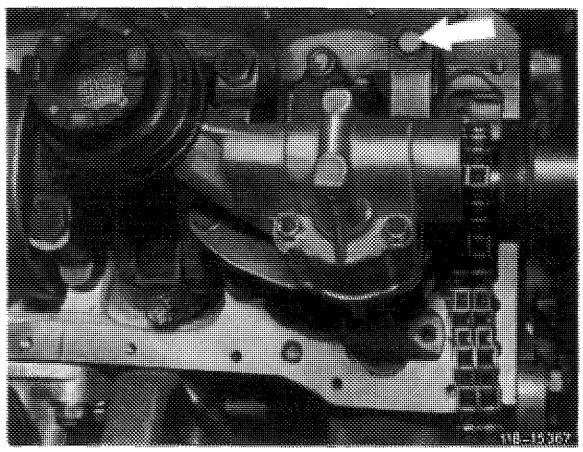
Install oil pump version C only in combination with a 5-bar pressure relief valve in main oil duct (4) (18–020).

Note: Standard installation for carburetor engines is oil pump 110 180 27 01 **with** a drive cam for fuel pump, and for injection engines oil pump 110 180 26 01 **without** drive cam.

As a spare part, only oil pump 110 180 27 01 with drive cam will be supplied.

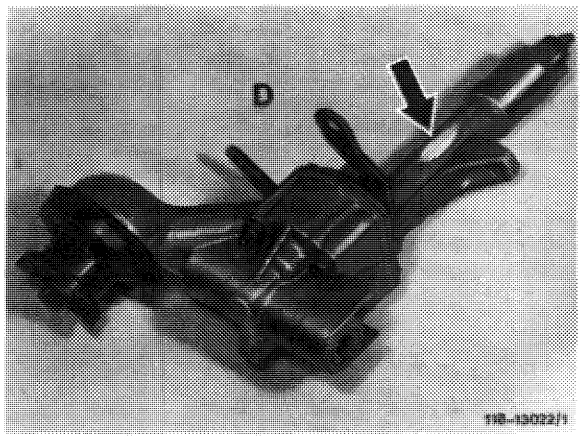
For subsequent installation of oil pump 110 180 27 01 mount a crankshaft bearing bolt 108 011 00 71 with internal threads for additional holder (arrow) on 1st crankshaft bearing cap and tighten to 80 Nm.





To save space, the oil pump has been modified by means of an additional weight on crankshaft. The pump has a recess (arrow) on housing shaft, to provide enough distance between crankshaft and oil pump.

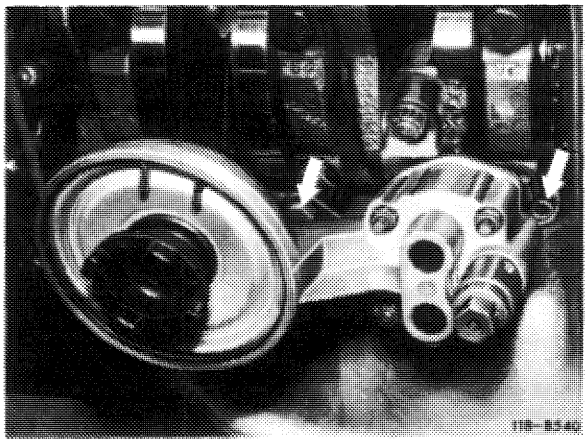
When changing the oil pump, check whether a crankshaft with additional weight is installed. If yes, install only modified oil pump, part no. 110 180 33 01 for injection engines or 110 180 32 01 for carburetor engines with recess in housing shaft.



Standard application

Model	starting chassis end no.
107.022	006288
107.042	005285
116.020	112253
116.024/025	131270
123.030	025657
123.033	050600
123.050	002801
123.053	013292
123.093	001229

Removal



1 Remove fuel pump of carburetor engine.

2 Take off oil pan lower section.

3 Unscrew mounting bolt on crankcase and bearing cap.

4 Pull out oil pump.

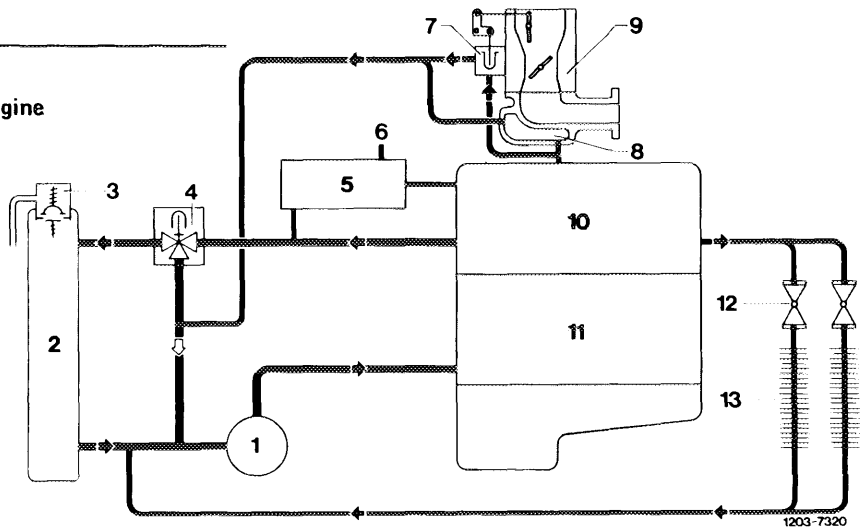
Installation

5 For installation proceed vice versa.

6 Correct oil level and check engine for leaks.

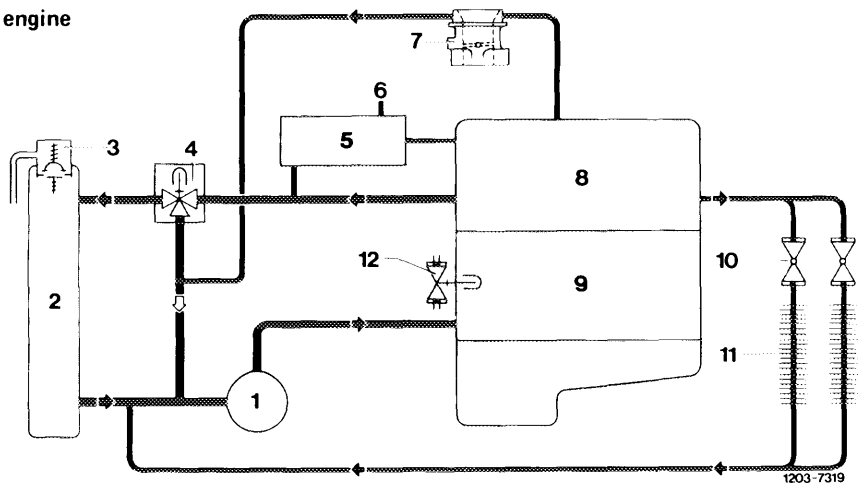
Coolant circuit

Coolant circuit for carburetor engine



1 Coolant pump
2 Radiator
3 Radiator cap, code number 100
4 Thermostat 87 °C
5 Measuring sensor box
6 Temperature sensor for temperature gage
7 Automatic choke heating
8 Intake manifold heating
9 Carburetor
10 Cylinder head
11 Crankcase
12 Control cocks for car heating
13 Heat exchanger

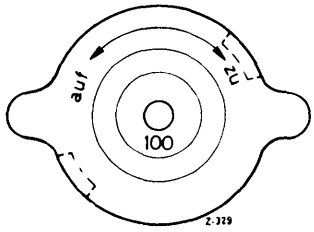
Coolant circuit for fuel injection engine



1 Coolant pump
2 Radiator
3 Radiator cap, code number 100
4 Thermostat 87 °C
5 Measuring sensor box
6 Temperature sensor for temperature gage
7 Throttle housing pre-heating
8 Cylinder head
9 Crankcase
10 Control cocks for car heating
11 Heat exchanger
12 Warm-up throttle bypass valve

Note: The line for pre-heating the throttle housing (7) is omitted on engines with continuous fuel injection (CIS).

Engine cooling

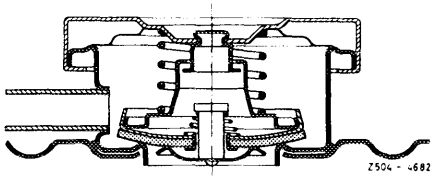


The spring-loaded radiator cap establishes a gauge pressure of approx. 1 bar in cooling system.

The factory fills the cooling system with an all year coolant, which consists of about 55% water and 45% anti-freeze by volume.

This provides protection against freezing at temperatures down to –30°C and the additives in the anti-freeze will prevent corrosion in the cooling system. Since the additives are subject to an aging process, the coolant must be replaced every two years.

To provide adequate protection against corrosion, the concentration of anti-freeze must offer protection against freezing of at least –20°C (30% by volume).



If an anti-freeze is not available and only water is filled, it is essential to add 1% of anti-corrosion oil (10 cc/liter water).

For the model 114 1 % or 10 cc/liter of anti-corrosion oil must be added even when using an anti-freeze to lubricate the heater cocks thoroughly.

The anti-freeze of the mixture filled at the factory will increase the boiling point, which is about 118°C for water at gauge a pressure of 1 bar, to approximately 125 °C.

The red mark on the temperature gauge begins at 122 (since the middle of may 1975, previously 115 °C).

This point deserves special attention, if only water with an anti-corrosion oil is used. Coolant could be thrown out, before the coolant temperature gauge needle reaches the red mark.

For full throttle, mountainous and caravan driving, high speed highway driving followed by traffic jams or when driving in areas with high outside temperatures, the coolant temperature gauge needle could move to the red mark when the anti-freeze protection is at least –30°C without throwing out coolant or having any engine trouble.

If the engine of a stationary car has to run for a long time, i.e. in traffic jams, it would be advantageous to move the selector lever of models with an automatic transmission to "N". This will reduce the development of heat in the transmission and thus any additional heating of the coolant via the transmission oil cooler.

An appropriately mixed coolant must be added when there is any loss of coolant through a leak in the cooling system or throwing out due to overheating.

The amount missing due to evaporation can be replaced with drinking water.

Mixing ratio of anti-freeze[1]) and water[2])[3])

Protection down to	Anti-freeze/water in liters for models 107	114	116	123	126
–20 °C	4.25/7.75	3.75/7.25	3.75/7.25	3.5/6.5	3.75/6.75
–30 °C	5.5/6.5	5.0/6.0	5.0/6.0	4.5/5.5	4.75/5.75
–40 °C	6.25/5.75	5.75/5.25	5.75/5.25	5.25/4.75	5.50/5.0
Total amount in liters	12	11	11	10	10.5

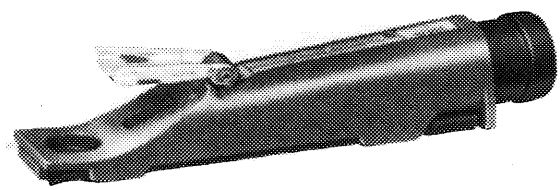
[1]) see service product specifications on page 325.
[2]) see service product specifications on page 310.
[3]) add 1 % or 10 cc of anti-corrosion oil/liter to water for model 114, even when using an anti-freeze (see service product specifications on page 311).

Tightening torques	Nm
Radiator drain plug, models 107, 114, 116	6–10
Radiator drain plug, model 123	1.5–2[1])

[1]) This torque can be established by means of a washer or coin.

Conventional tool

Antifreeze tester
Prestone-VU-Check (Union-Carbide)
e.g. made by Philipp Gather, D-4020 Mettmann 2

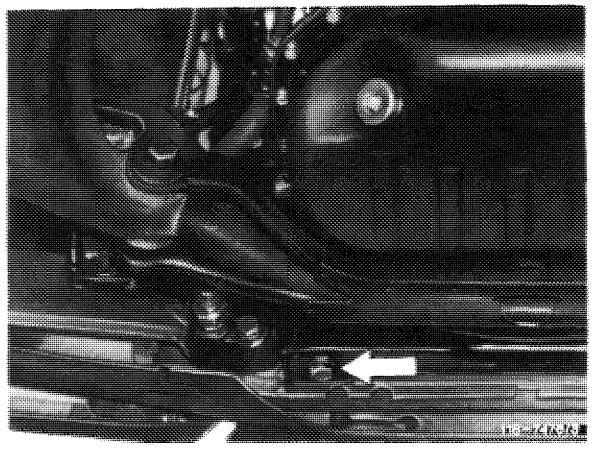


R-4789

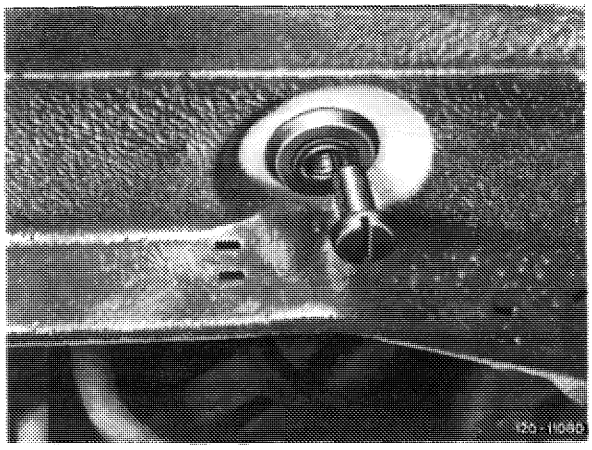
Draining

1 *Open radiator cap or expansion tank in steps* **(only below 90 °C)** (194 °F).

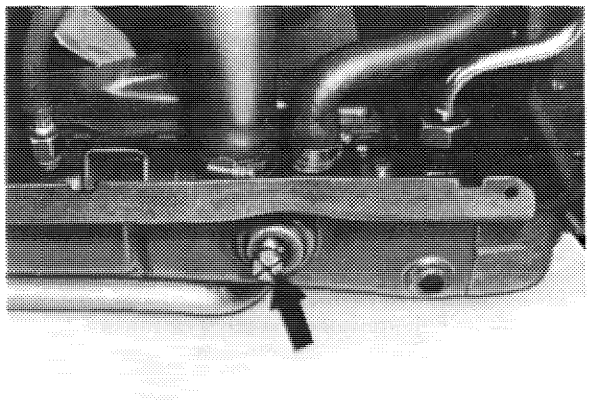
2 Unscrew radiator drain plug.



Models 107, 114, 116



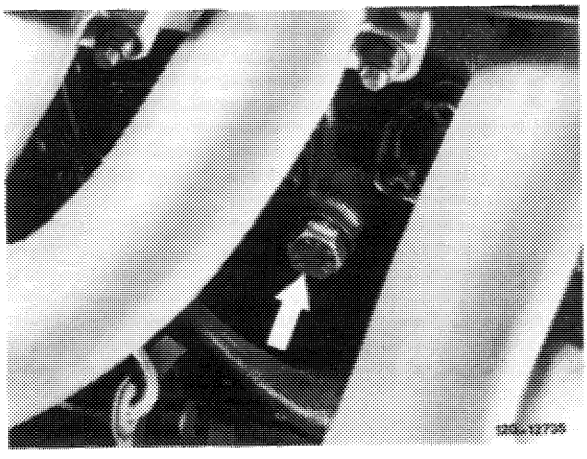
Model 123



Model 126

120-17587

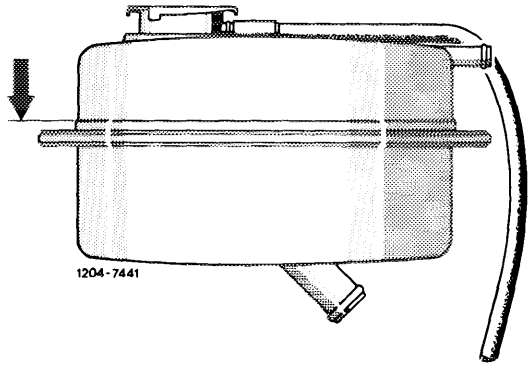
3 Remove drain plug on right side of engine block behind engine carrier.



Filling

4 Set both heater levers or temperature dials on model 126 to "warm" position.

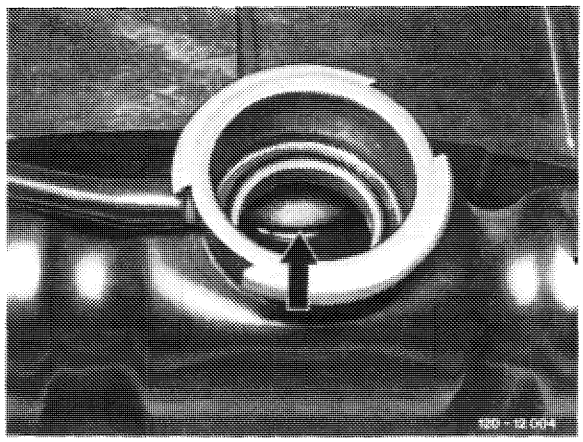
5 Add coolant **slowly** until level is at mark.



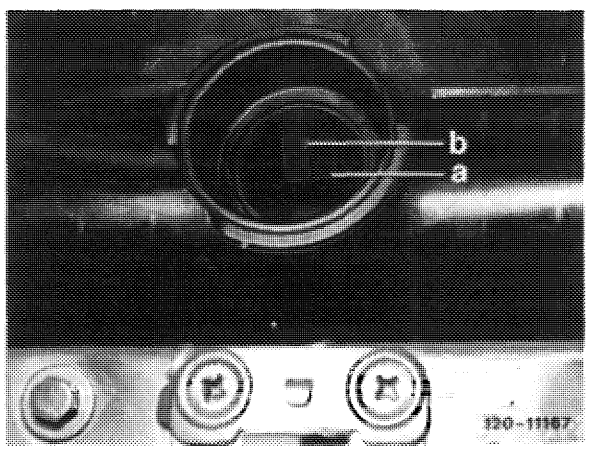
Model 107

6 Run engine warm by intermittent acceleration and keep radiator cap closed as from 70 °C (158 °F) until thermostat opens.

7 Check coolant level and correct to specified level.



Models 114, 116



Model 123, 126

a cold
b warm

A. Removing oil

1 Drain all of coolant.

2 Remove thermostat and set heater lever or temperature dials to warm.

3 Fill cooling system with a 5 % solution of water and neutral cleaner or with an alcaline cleaner such as P 3-Croni (supplier: Henkel or Grisiron 7220 (supplier: Farbwerke Hoechst).

Attention!
On these vehicles **(light alloy cylinder head and light alloy radiator)** do not use heavily alcaline cleaner such as P 3-Standard (supplier: Henkel).

4 Run engine warm at medium speed until at about 80 °C (176 °F) and hold at this temperature for about 5 minutes.

5 Switch off engine and let cooling system cool down to about 50 °C (122 °F).

6 Drain entire solution.

7 Flush cooling system twice immediately afterwards with clear water, run engine warm (about 5 minutes) and drain.

B. Deliming and removing rust

Attention!
The cooling system must be removed of oil before deliming, even if there is no visible indication of oil.

1 After flushing the cooling system for the 2nd time during oil removing operations fill cooling system with a 10 % (100 g/l) solution of water and citric, tartaric or oxalic acid (supplied by chemical companies), whereby the citric acid should be preferred.

2 Run engine warm at medium speed until at about 80°C (176°F) and hold at this temperature for about 10 minutes.

3 Switch off engine and let coolant cool down to about 50°C (122°F).

4 Drain all of deliming solution.

5 Flush cooling system with clear water at least three times, running the engine for 5 minutes after each flushing action.

It might be necessary to repeat this treatment for a seriously limed cooling system. This would mean using a fresh batch of deliming solution and repeating the flushing operations.

6 Install thermostat with a new seal.

7 Add specified coolant to cooling system (service product specifications on pages 310–325).

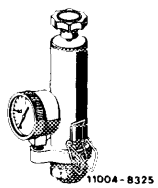
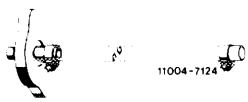
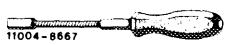
Note: Commercial products, which consist of the above mentioned acids, can also be used for deliming and removing rust.

Chromic acids or products containing chromic acids must not be used to prevent contamination of sewage systems.

Tightening torques		Nm
Radiator drain plug	Models 107, 114, 116	6–10
	Models 123, 126	1.5–2[1])
Air oil cooler drain plug		30–35
Vibration damper mounting bolts		35
Coolant pump to coolant pump housing		9
Visco-fan clutch to coolant pump		25
Magnetic fan clutch to coolant pump		20–25

[1]) This torque can be established by means of a washer or coin.

Special tools

Tester for cooling system	 11004-8325	001 589 48 21 00
Radiator cap with hose for leak test	 11004-7124	605 589 00 25 00
Socket wrench with 7 mm hex. head on flexible shaft for hose clamps with worm drive	 11004-8667	123 589 12 09 00

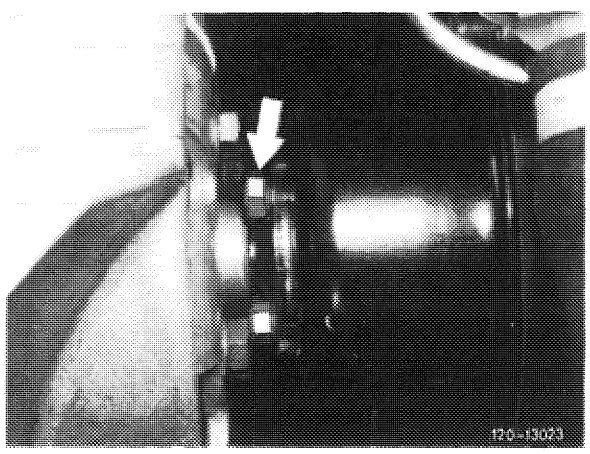
Removal

1 Drain coolant (20–010).

2 Remove radiator (20–420).

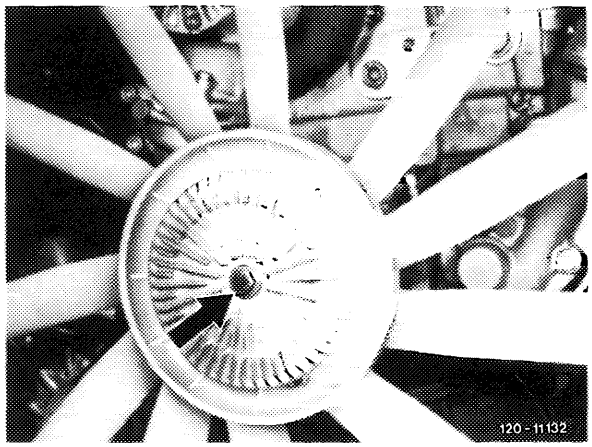
Models 107, 114, 116

3 Remove fan with visco-fan clutch.



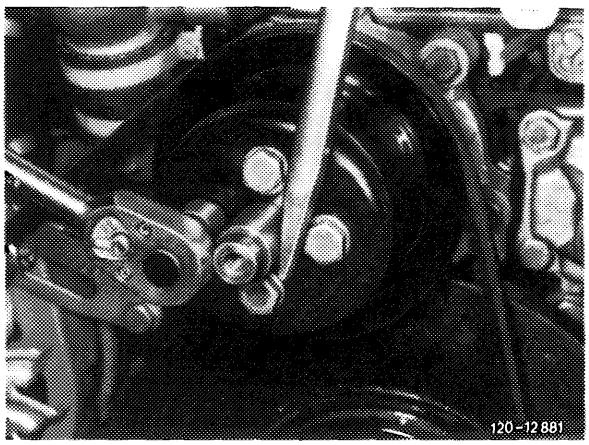
Models 123, 126

3 Detach magnetic fan clutch.



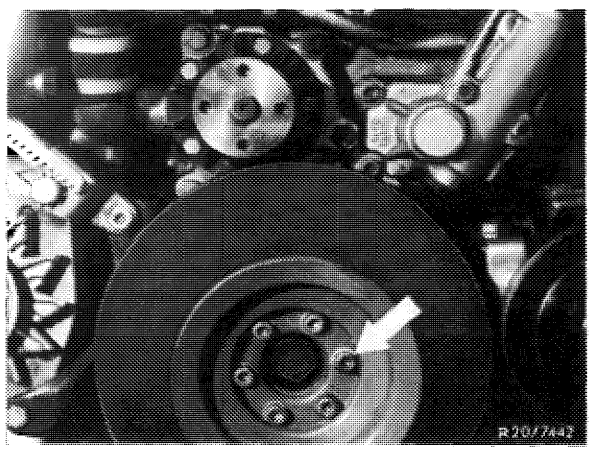
Magnetic fan clutch

4 Unscrew pulley.



5 Unscrew vibration damper.

6 Remove coolant pump.



Installation

7 Install in reverse sequence of removal.

Function

The visco-fan clutch is a service free, hydraulic clutch which operates independent of temperature and free of steps.

When starting engine (cold start), fan will initially start at higher speed until oil has flown back from working chamber (16) into reservoir (15) (approx. 1–3 minutes). Visco-fan clutch will then switch off. Fan speed in disconnected condition depends on engine speed, but a fan speed of approximately 2100/min should not be exceeded.

This condition remains intact as long as engine keeps its normal operating temperature.

If the cooling water temperature increases as the result of a higher load or high outside temperature, the air flowing through the radiator and influencing the bimetallic strip will become warmer. The bimetallic strip (10) will change its shape at increasing heat and will open a valve at approximately 73°C by means of a thrust pin (9), so that the oil can flow from the reservoir (15) to the working chamber (16) to engage fan.

During the sequence, the water temperature is between 90 and 95°C.

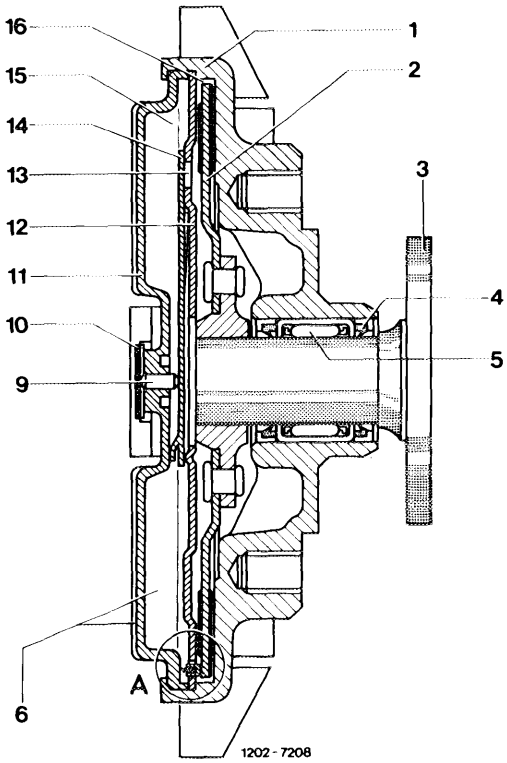
With the clutch engaged, the fan speed in the lower range increases approximately proportionally with the increasing speed, but will not exceed the upper speed range of 3500/min.

Checking cut-in temperature

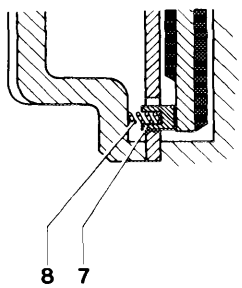
Run engine at 4000–4500/min. When cooling water temperature is at 90–95°C, fan speed should increase by approximately 1000/min which can be checked clearly acoustically.

Repairing

A defective clutch cannot be repaired with normal workshop equipment; it must be replaced by a new clutch.



Detail A



1 Clutch body (secondary part)
2 Drive plate (primary part)
3 Flanged shaft
4 Seal
5 Needle bearing
6 Cooling fins
7 Oil scraper
8 Spring
9 Thrust pin
10 Bimetallic strip
11 Cover with holder
12 Intermediate washer
13 Feed bore
14 Valve lever
15 Reservoir
16 Working chamber

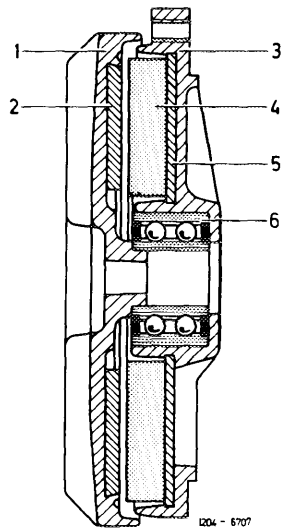
Transport and storage

Temperature controlled visco-fan clutches must be transported and stored in upright position. Clutch may be placed on flange end for short moments (for example during assembly), but never on front end.

Function

The main parts of a torque controlled magnetic fan clutch are the so-called hysteresis disc (2) made of a permanently magnetized material on the primary or drive side and a disc shaped permanent magnet (4) on the secondary side. Both clutch discs are divided into 8 magnetic segments with 4 each north and south poles, which are opposite each other alternately in a unloaded condition.

When under load both clutch discs will turn agains each other somewhat, so that the magnetic field characteristics receive a component even in circumferential direction and thus transmit a torque of up to 1.8 Nm.

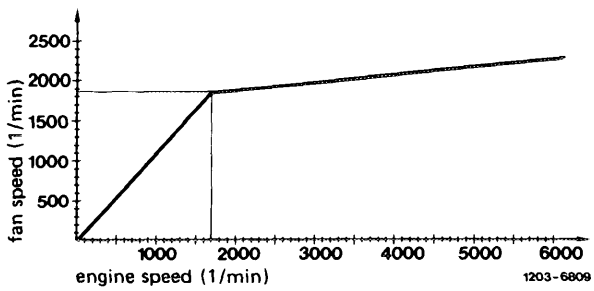


1 Primary disc
2 Hysteresis disc
3 Secondary disc
4 Permanent magnet
5 Steel disc
6 Bevelled ball bearing

At an engine speed of about 1700/min the fan moment will be higher than the torque transmitted by the magnetic clutch. The clutch "tears off" and begins to slip.

The now existing difference in speed leads to a permanent demagnetization of the hysteresis disc by way of the secondary side permanent magnets. In this manner there is an additional eddy current, because of which the transmitted torque and thus the fan speed will increase slightly as the engine speed increases (as shown in the diagram).

The switching in and off of the fan cannot be heard.



Checking magnetic fan clutch

To check, turn fan by hand with the engine stopped. There must be a springy, definitely noticeable resistance.

Fan clutches, which can be turned without resistance or produce a noise when turned, are defective and must be replaced.

Handling magnetic fan clutches

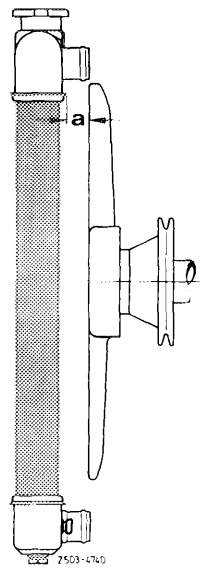
Attention!
The magnetic fan clutch must be removed before performing any work on engine or front end, during which grinding or filing burrs could fall on the fan.

Protect fan clutches against falling or serious knocks.

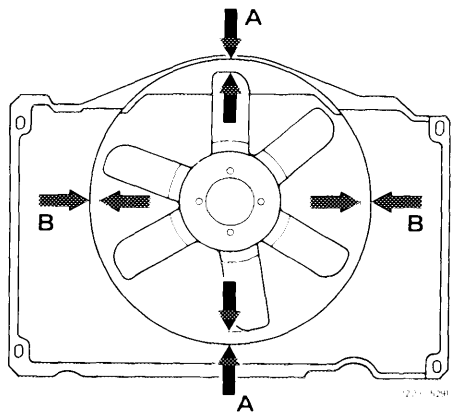
The magnetic clutch is free of maintenance, cannot be repaired with normal workshop equipment and must never be disassembled. Replace a defective magnetic clutch.

Installation dimensions for radiator, fan and fan cover

Model	Fan distance "a" to radiator, approx. mm	Fan distance to fan cover A	B
107.022/042	23		
114.060/062	15		
116.020/024/025	31	25	15
123.007/030/033/050/053/093	35		
126.021/022/023	50	28	



Radiator/fan

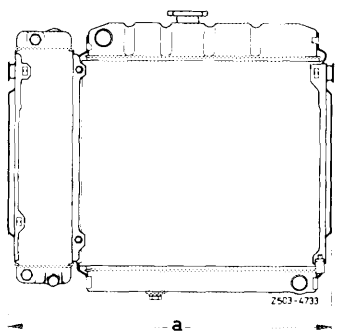


Fan cover/fan

Installation dimensions for radiator–air oil cooler

Model	dimension "a"
107	730 ± 1
114	555 ± 1[1]) 633 ± 1[2])
116	685 ± 1
123 126	608 ± 4

[1]) At 565 mm front end width.
[2]) At 643 mm front end width.

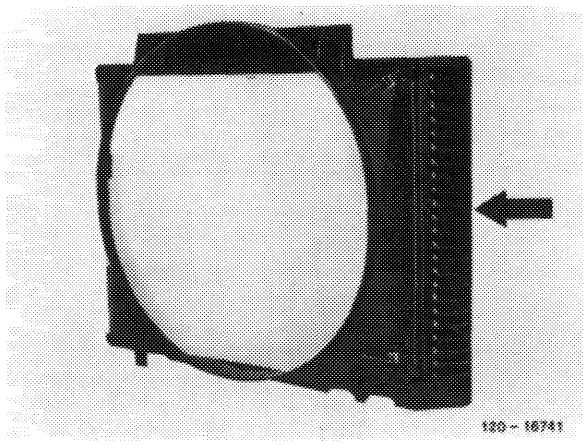


Tightening torques		Nm
Radiator plug	Models 107, 114, 116	6–10
	Models 123, 126	1.5–2[1])
Air oil cooler drain plug	Models 107, 114, 116	30–35

[1]) This torque can be established by means of a washer or coin.

Note

Starting November 1979 the fan cover of model 123 is provided with a lateral covering (arrow) as a protection against engine compartment contamination.



Removal

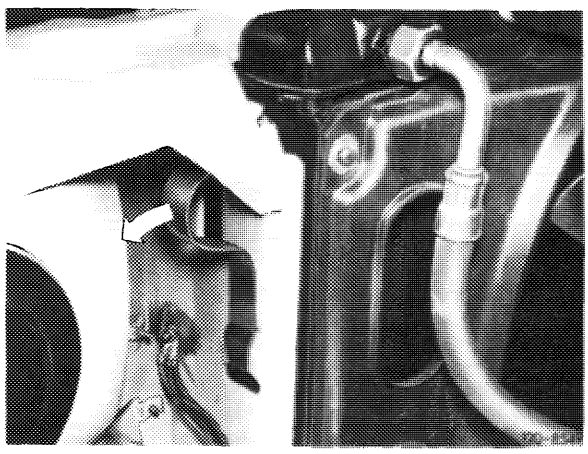
1 Drain coolant from radiator (20–010).

Models 107, 114, 116

2 Drain oil from air oil cooler by loosening coupling nut of upper oil hose.

3 Detach coolant hoses and hose connections at cooler. Plug oil hoses and connections with plastic caps.

4 Unscrew top of radiator housing, pull down out of clips and place above fan.



Models 107, 116

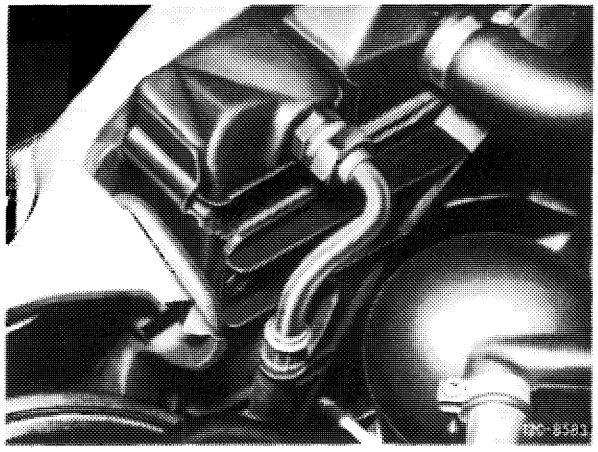
5 Press holder (arrow) outward.

6 Lift out radiator with air oil cooler.

Model 114

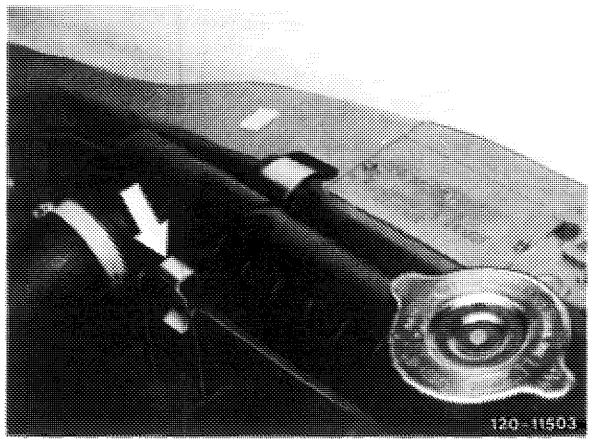
7 Press rubber straps (arrow) out of holder.

8 Remove radiator with air oil cooler in upward direction.

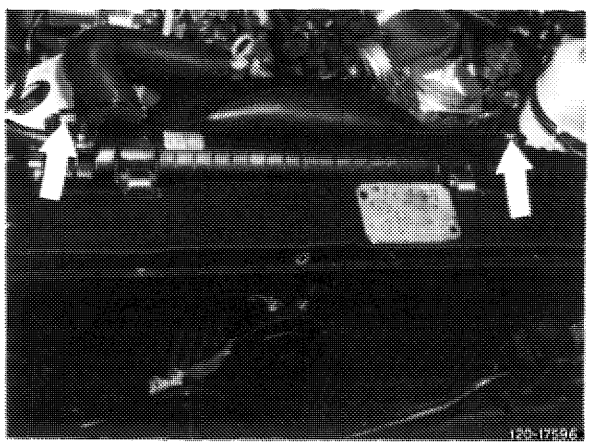


Models 123, 126

9 Pull two clips (arrow) up and out of radiator housing.

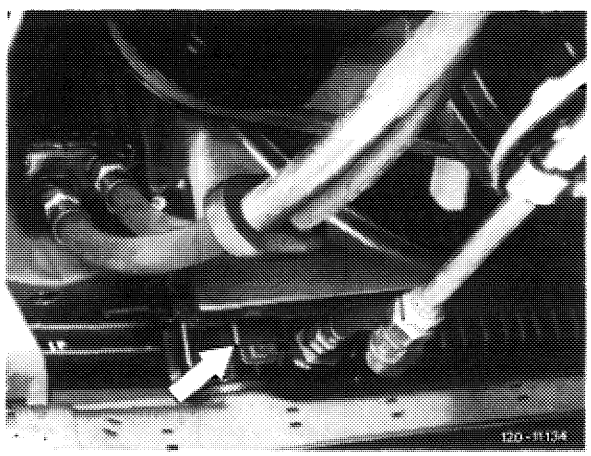


Model 123

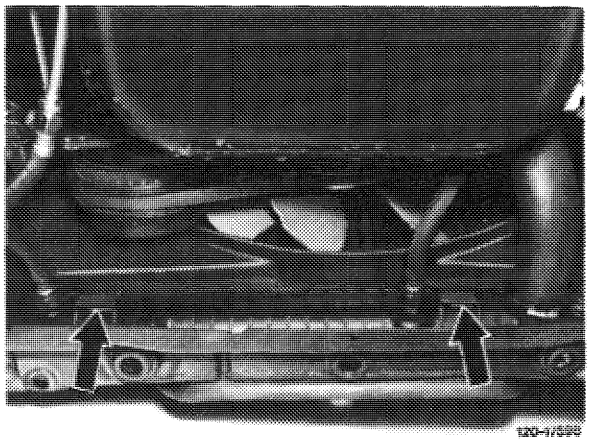


Model 126

10 Lift radiator housing out of lower straps (arrow) and place behind fan.

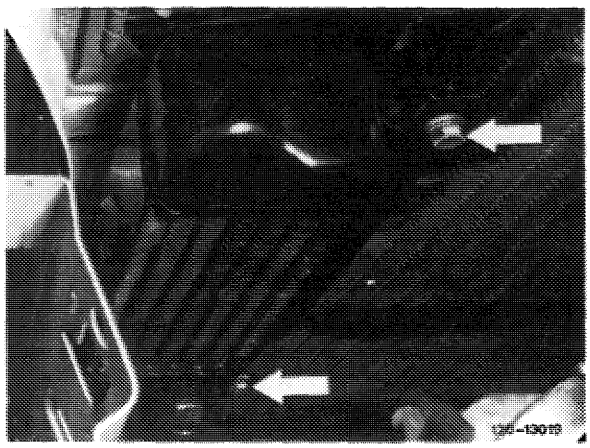


Model 123



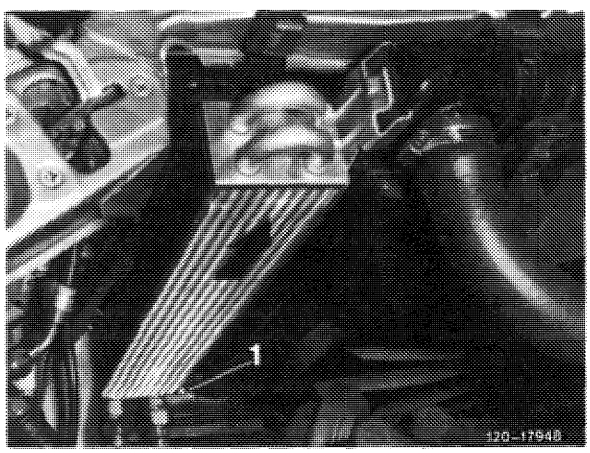
Model 126

11 Unscrew air oil cooler (arrows).



Model 123

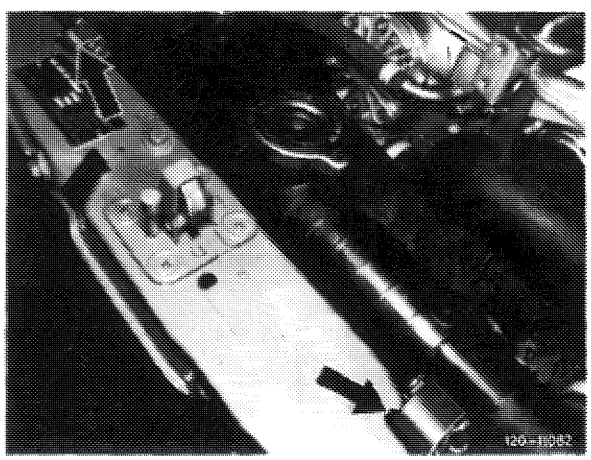
Unscrew screw (1) and pull air oil cooler out of guide on radiator in upward direction (arrow) and put aside (model 126 only).



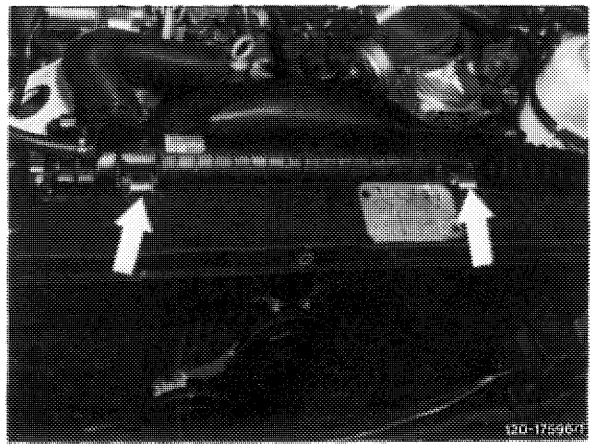
Model 126

12 Disconnect coolant hoses and transmission oil cooler hoses for models with an automatic transmission.

13 Pull off holder (arrows) upward and lift out radiator.



Model 123



Model 126

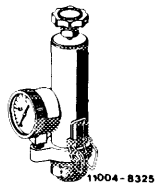
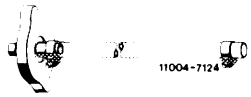
Installation

14 For installation proceed vice versa.

Pay attention to distance of fan in relation to radiator and fan cover.

15 Test cooling system with pressure tester.

Special tools

Tester for cooling system		001 589 48 21 00
Radiator closing cap with hose for leak test		605 589 00 25 00
Socket wrench hexagon 7 mm on flexible shaft for hose clips		123 589 12 09 00

Note

Since light alloy radiators with plastic coolant tanks cannot be repaired by soldering, a sealing compound has been developed and approved.

Heavy-metal (non ferrous) radiators can also be sealed with this compound.

The sealing compound is a product on silicone caoutchouc base which is permanently elastic in its final condition. Temperature resistance from −50 °C to +200 °C.

Due to the different accessibility on radiator (e.g. more difficult in core than on coolant tank), the sealing compound is available diluted and non-diluted.

The different sealing compound versions and the priming fluid are combined in a repair set, part Nr. 123 989 00 20.

Designation	Purpose
Priming fluid	Preparation of adhesive base (wash primer).
Sealing compound non-diluted	For sealing easily accessible areas.
Sealing compound diluted	For sealing poorly accessible areas (e.g. laterally on cooling tubes).

Sealing compound and priming fluid have a shelf life of approx. 1 year, if they are always closed airtight upon use.

Cloudy priming fluid should no longer be used.

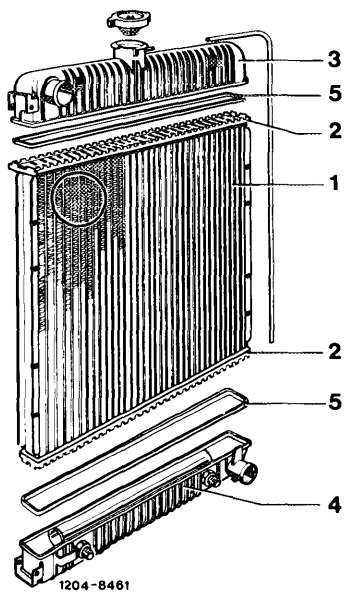
Individually, the following parts or areas in coolant circuit can be sealed with sealing compound:

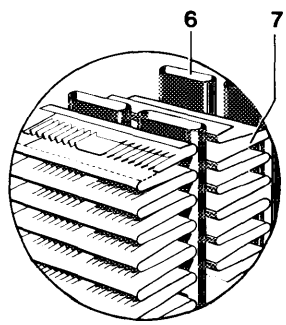
a) Plastic coolant tanks (3 and 4).

b) Heavy-metal coolant tanks (holes up to 1.5 mm dia.).

c) Light alloy and heavy-metal cooling tubes (6).

d) Tube plate (2).





1 Radiator core
2 Tube plate
3 Coolant tank top
4 Coolant tank bottom
5 Gasket
6 Cooling tubes
7 Ribs

e) Beaded flange (connection between radiator core and coolant tank).

f) Heat exchanger of heating system.

Damaged parts on coolant tanks which are exposed to higher loads, such as torn or broken fastening plates, cracks in fillet of connections, breaks and very long or large cracks on top should not be repaired, since the sealing compound can absorb very light loads only.

Plastic coolant tanks of radiators made by Behr can be exchanged by means of special tools or fixtures in Behr radiator repair shops or Inter-Radia service stations.
If required, contact nearest Behr repair shop or Inter-Radia service station to find out whether such repairs can be made there.

If this is not possible, the radiator must be replaced.

On heavy-metal radiators with plastic coolant tanks, soldering jobs on core may be performed only up to a distance of 20 mm from coolant tank, since otherwise the high soldering temperature will damage the gasket (5) and the coolant tanks (3 or 4). Leaks which are closer to coolant tank, should be sealed with sealing compound.

If the leaky spot can be clearly localized in installed condition, the radiator need not be removed. In such a case it will be enough to drain the coolant and to pressure-test the cooling system upon sealing.

When handling priming fluid and sealing compound observe the following:

The priming fluid is easily inflammable (observe safety rules, dangerous materials class A 1).

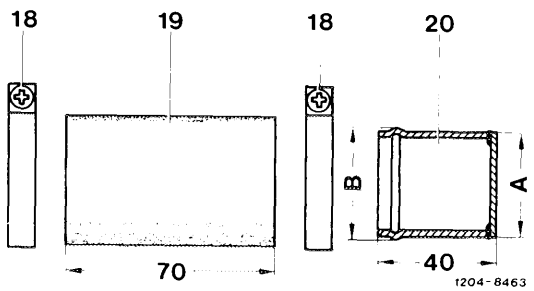
Acetic acid will be released up to complete cross linking (setting) of sealing compound. For this reason, avoid skin contact. Clean affected spots immediately with water and soap, rinse eyes with water and see doctor, if required.

Sealing

1 If the leaking spot cannot be accurately localized in installed condition, remove radiator (20—420).

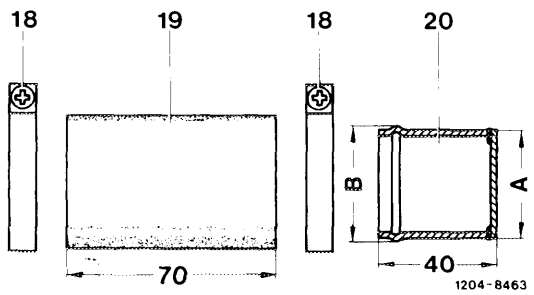
2 Clean radiator.

3 Connect hose connections to self-made closing caps.



18 Clamp L 36—46 (part no. 916 026 036 000)
19 Hose section (part no. 123 501 13 82)
20 Cap made of 36 mm dia. tubing

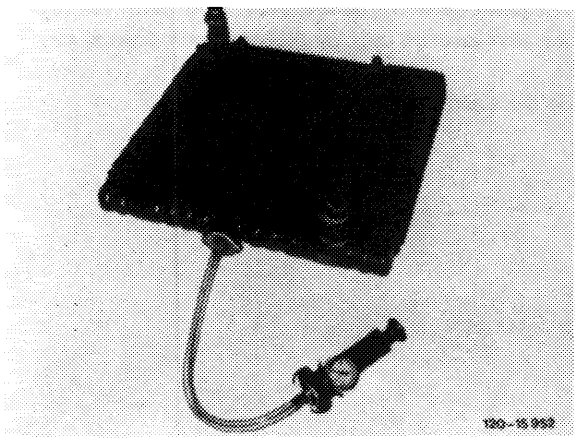
On model 107, additionally close pipe connection for coolant flow from expansion tank on radiator.



18 Clamp L 20—27 (part no. 916 026 020 001)
19 Hose section (part no. 900 271 018 063)
20 Cap made of a piece of tubing
A = 18 mm dia., B = 19 mm dia.

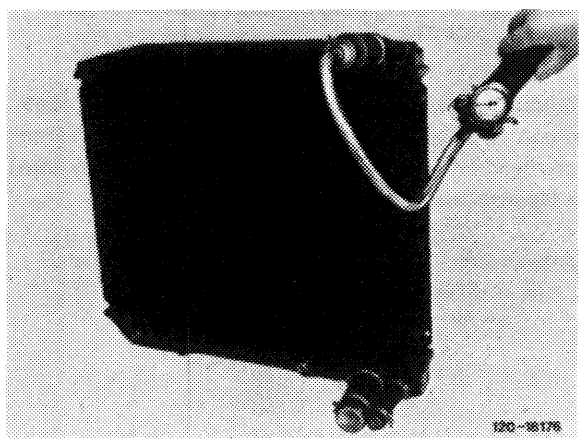
4 Close oil cooler connections with plastic caps or plugs from old oil cooler lines. For this purpose, saw off the oil cooler lines directly behind nipple and close by soldering.

5 Connect tester to radiator.



Radiator with filler neck

Note: On model 107.026 pull hose from radiator cap for leak test and attach to radiator overflow connection.



Radiator without filler neck

6 Place radiator into a water bath.

7 Put radiator under pressure with tester and watch where air bubbles are rising.

8 Mark leak.

9 Remove radiator and release pressure.

10 Blow radiator dry with compressed air.

11 Clean spot to be sealed with a commercially available cleaner (e.g. Tri or benzine). Always clean slightly larger area than the spot to be sealed (e.g. for cracks approx. 20—30 mm beyond end of crack).

The paint need not be removed. Then blow radiator dry at respective spot by means of compressed air.

No dust and grease residue should remain.

12 Apply priming fluid uniformly and very thinly by means of a brush.

Similar to cleaning, apply priming fluid beyond spot about to be sealed. To prevent the priming fluid from getting dirty in tank, pour the required quantity into a separate vessel.

Attention!
Observe safety rules!

13 Let priming fluid dry at ambient temperature for approx. 10 minutes.

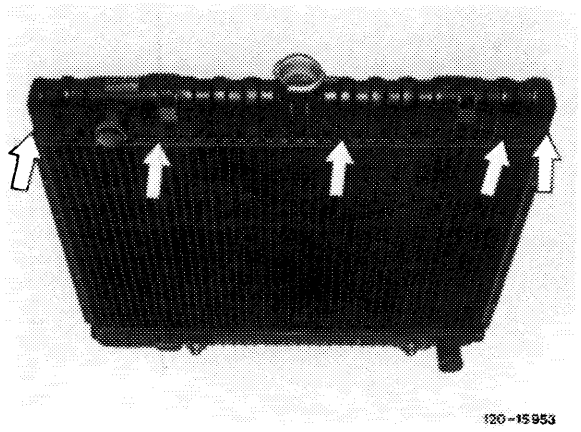
14 Set up radiator in such a manner that the sealing compound cannot run away from spot to be sealed.

15 Depending on accessibility, apply diluted or non-diluted sealing compound. Use a brush, a spatula or the like for distributing the sealing compound.

Attention!
During application and distribution make sure that no air pockets will occur.

Similar to cleaning and priming, apply sealing compound beyond spot about to be sealed.
If there are several leaking spots on beaded flange (arrows), it will be of advantage to seal beaded flange all around.

Seal leaks in core from both sides.



At end of sealing procedure, close tube immediately. Acetic acid will be released up to complete cross linking (setting) of sealing compound. Avoid skin contact. Clean affected spots immediately with water and soap, rinse eyes with water, see doctor, if required.

16 Leave radiator lying or standing at least for 3 hours to dry sealing compound. Depending on quantity of applied sealing compound and size of sealed spot, complete cross linking (setting) of sealing compound into a permanent, elastic connection if completed after max. 24 hours at ambient temperature.

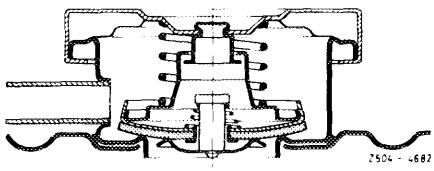
17 Pressuretest radiator in water bath for approx. 5 minutes at 1.5 bar gauge pressure.

If leaks are still showing up, repeat sealing procedure starting item 7.

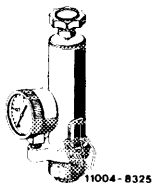
18 Remove tester and locks.

19 Upon reinstallation of radiator, pressuretest cooling system with tester.

Radiator or expansion tank closing cap

Pressure relief valve opens at	new cap $1.0\ ^{+0.15}_{-0.1}$ bar gauge pressure	
	used cap 1.0–0.2 bar gauge pressure	
Vacuum valve opens starting at	0.1 bar vacuum	

Special tools

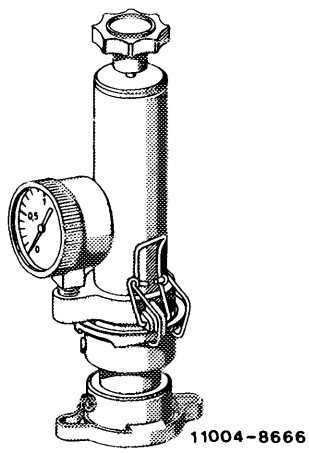
Tester for cooling system and radiator cap		001 589 48 21 00
Double connection for radiator cap in combination with cooling system tester		000 589 73 63 00

Checking pressure relief valve

1 Attach double connection to leak tester by means of holding clips.

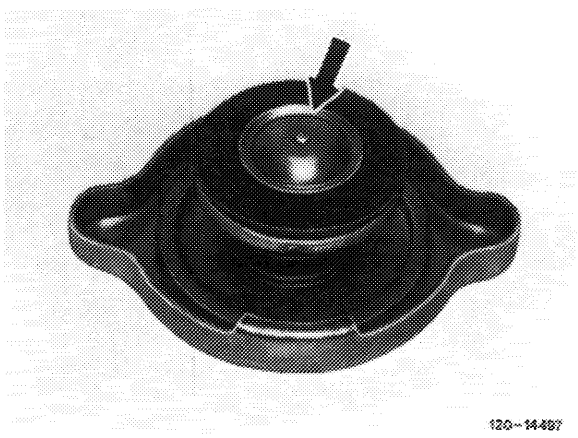
2 Place radiator cap on double connection.

3 Check opening pressure by pumping.



Checking vacuum valve

Vacuum valve (arrow) should rest against rubber seal, should lift off easily and snap back following release.



Model 107

1 Unscrew screw (11).

2 Turn holder (10) and shielding plate (13) away in lateral direction.

3 Unscrew engine mount (19) from cross member.

4 Lift engine with pit lift at oil pan.

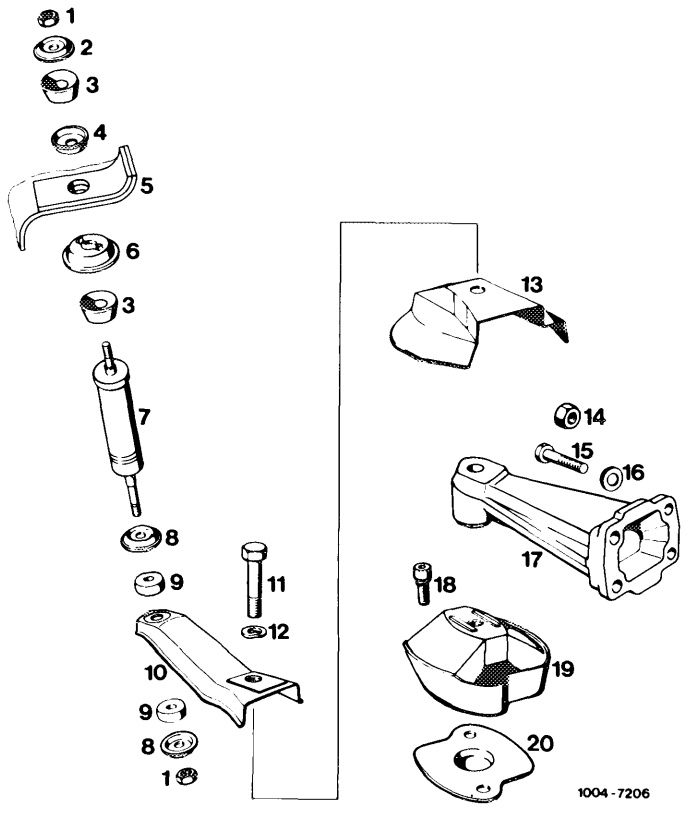
Note: Use wooden block to prevent damaging oil pan.

5 Remove engine mount together with shim (20).

6 For installation proceed vice versa.

7 Tighten screw (11) to 75 Nm.

Attention!
Check regulating linkage for function.



1 Nut
2 Cup spring 30 mm dia.
3 Rubber buffer 26 mm dia.
4 Cup spring 26 mm dia.
5 Holder
6 Cup spring 32 mm dia.
7 Engine shock absorber
8 Cup spring 26 mm dia.
9 Rubber buffer 22 mm dia.
10 Holder
11 Screw M 12 x 65
12 Spring washer
13 Shielding plate
14 Nut M 10 (7 each)
15 Screw M 10 x 65 (1 each)
16 Washer A 10.5 (6 each)
17 Engine carrier
18 Combination screw M 8 x 18
19 Engine mount
20 Shim

1 Unscrew screw (1).

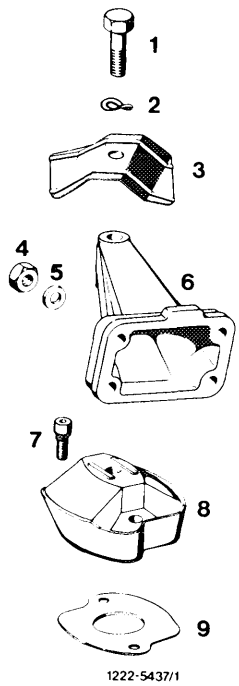
2 Lift engine with pit lift at oil pan.

Note: Use wooden block to prevent damaging oil pan.

3 Unscrew screws from engine carrier and remove engine mount with shim.

4 For installation proceed vice versa.

5 Tighten screw (1) to 75 Nm.



1 Screw M 12 x 55
2 Spring washer B 12
3 Shielding plate (right)
4 Nut M 10
5 Washer A 10.5
6 Engine carrier
7 Combination screw M 8 x 18
8 Engine mount
9 Shim

1 Unscrew screw (11, arrow) from underside of vehicle.

2 Unscrew nut (12) below on engine shock absorber.

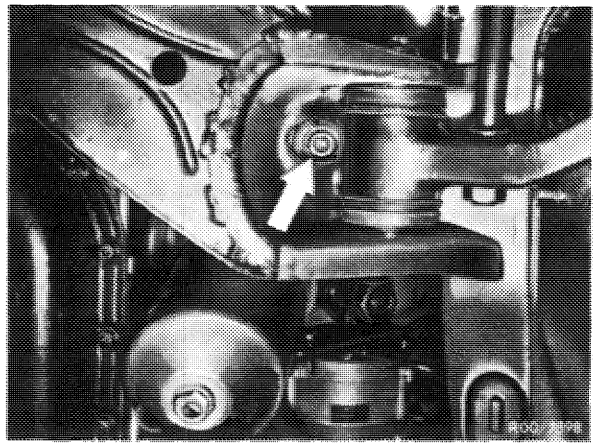
3 Lift engine with pit lift at oil pan.

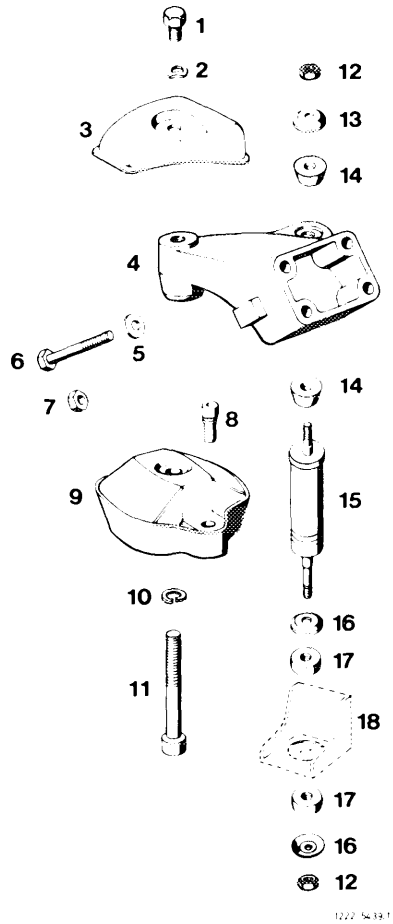
Note: Use wooden block to prevent damaging oil pan.

4 Unscrew screws (8) and remove engine mount (9).

5 For installation proceed vice versa.

6 Tighten screw (11) to 75 Nm.





1 Screw
2 Spring washer
3 Shielding plate (right)
4 Engine carrier
5 Washer A 10.5 (6 each)
6 Screw M 10 x 65 (1 each)
7 Nut M 10 (7 each)
8 Combination screw M 8 x 18
9 Engine mount
10 Snap ring 12
11 Screw M 12 x 40
12 Nut M 6
13 Cup spring 30 mm dia.
14 Rubber buffer 26 mm dia.
15 Engine shock absorber
16 Cup spring 26 mm dia.
17 Rubber buffer 22 mm dia.
18 Holder

1 Unscrew screw (11, arrow) from underside of vehicle.

2 Unscrew nut below on engine shock absorber.

3 Lift engine with pit lift at oil pan.

Note: Use wooden block to prevent damaging oil pan.

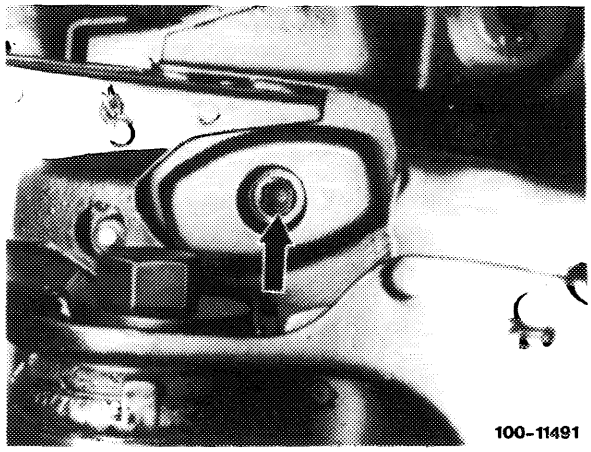
4 Unscrew screws (8) and remove engine mount.

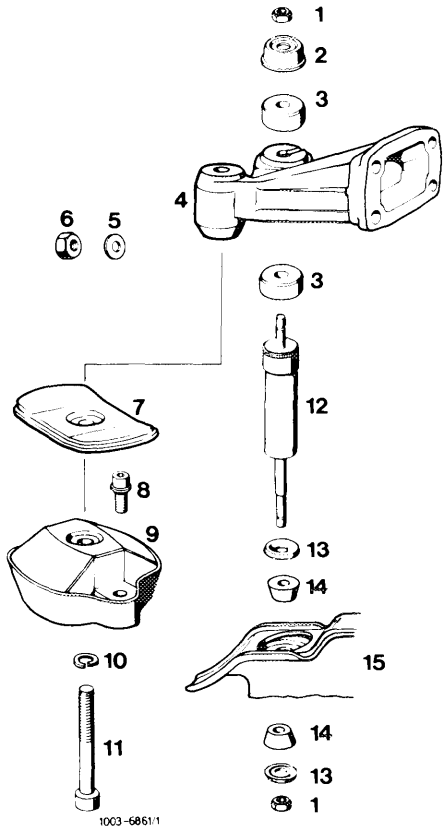
5 For installation proceed vice versa.

Note: Engine mounts left and right are different.

The shielding plate is located at the right.

6 Tighten screw (11) to 75 Nm.





1 Nut M 6
2 Cup spring 44 mm dia.
3 Rubber buffer 36 mm dia.
4 Engine carrier
5 Washer A 10.5 (6 each)
6 Nut M 10 (8 each)
7 Shielding plate
8 Combination screw M 8 x 18
9 Engine mount 123 241 10 13 (right)
Engine mount 123 241 12 13 (left)
10 Snap ring 12
11 Screw M 12 x 35
12 Engine shock absorber
13 Cup spring 30 mm dia.
14 Rubber buffer 27 mm dia.
15 Holder

1 Unscrew screw (15, arrow) from underside of vehicle.

2 Unscrew nut (1) below on engine shock absorber.

3 Lift engine with pit lift at oil pan.

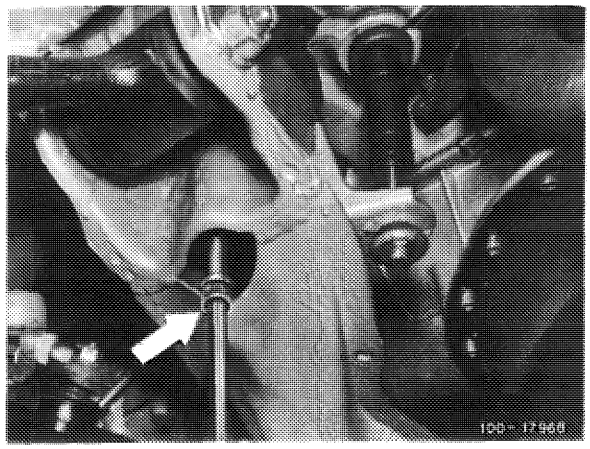
Note: Use wooden block to prevent damaging oil pan.

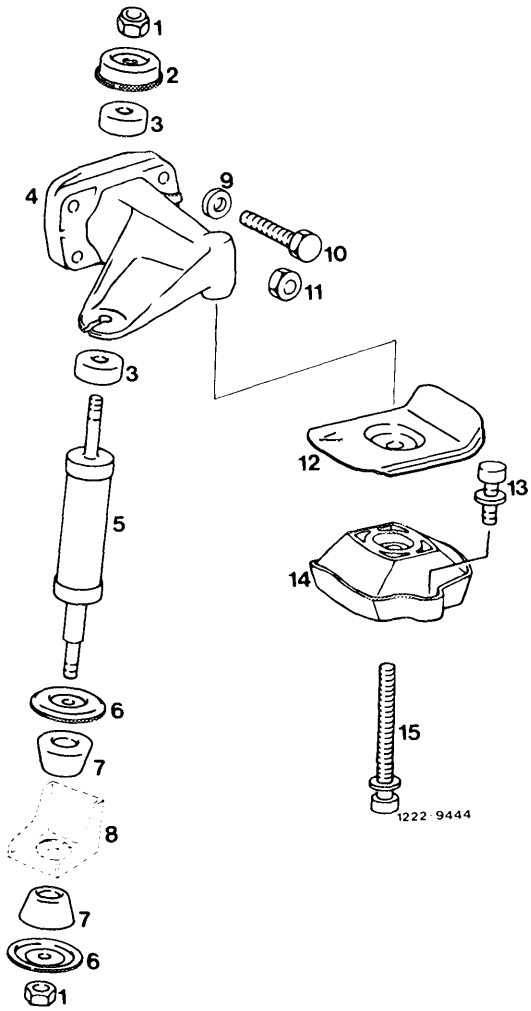
4 Unscrew screws (13) and remove engine mount.

5 For installation proceed vice versa.

Note: The shielding plate is located at the left.

6 Tighten screw (15, arrow) to 70 Nm.





1 Nut M 6
2 Cup spring
3 Rubber buffer
4 Engine carrier
5 Engine shock absorber
6 Cup spring
7 Rubber buffer
8 Holder
9 Washer
10 Screw
11 Nut
12 Shielding plate
13 Combination screw
14 Engine mount
15 Screw

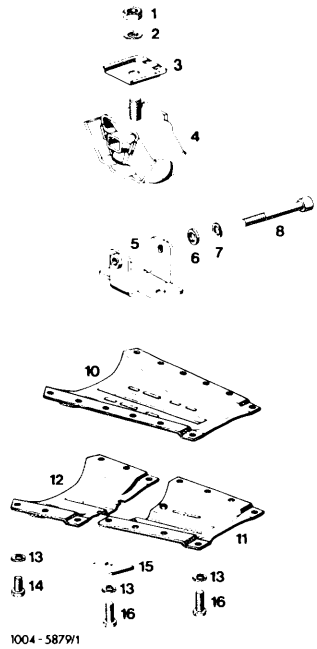
Model 107

Attention!
For removal of engine mount (4) do not unscrew closing plate (10 or 12).

Attach engine mount free of tension to closing plate.

After installing engine mount, run engine at idle for a short period with adjusting screw released. With engine stopped, tighten adjusting screw (8) to 40 Nm.

Attention!
Check regulating linkage for function.



1 Nut M 12 x 1.5
2 Spring washer B 12
3 Holding plate
4 Holder
6 Washer 8.4
7 Snap ring A 8
8 Adjusting screw M 8 x 75
10 Closing plate manual transmission
11 Closing plate automatic transmission
12 Closing plate automatic transmission
13 Snap ring A 8
14 Screw M 8 x 20
15 Shim
16 Screw M 8 x 32

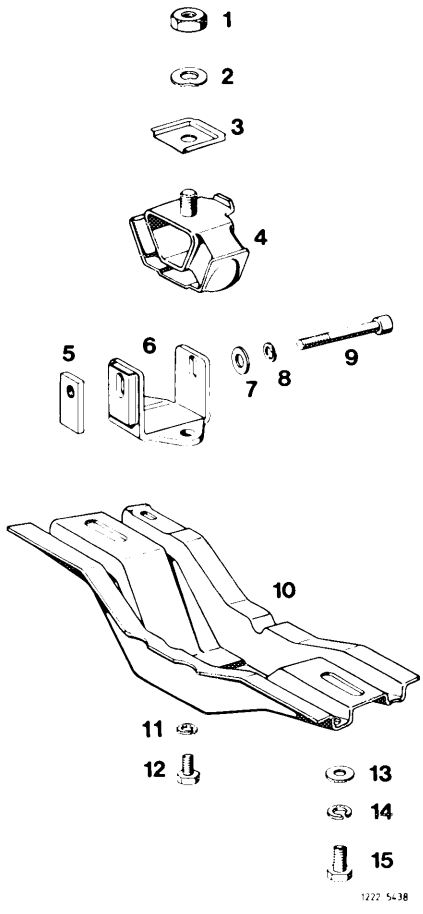
Model 114

Note: The engine mount for automatic transmission and for 5-speed transmission is provided with a stop.

For removing engine mount (4), do not unscrew engine carrier (10).

Following installation of engine mount, run engine for a short period at idle with adjusting screw (9) released. With engine stopped, tighten adjusting screw (9) to 40 Nm.

Attention!
Shims between engine carrier and frame floor are decisive for alignment of propeller shafts and should be added again at the same spot.

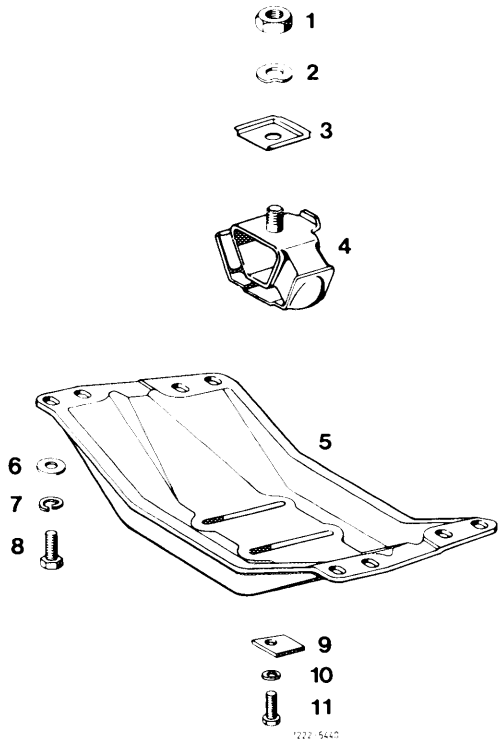


1 Nut M 12 x 1.5
2 Spring washer B 12
3 Holding plate
4 Engine mount
5 Threaded plate
6 Holder
7 Washer
8 Snap ring
9 Adjusting screw M 8 x 75
10 Engine carrier
11 Snap ring B 10
12 Screw M 8 x 12
13 Washer
14 Snap ring B 10
15 Screw M 10 x 25

Model 116

Attention!
For removal of engine mount (4) do not unscrew engine carrier (5).

Attach engine mount free of tension to engine carrier.



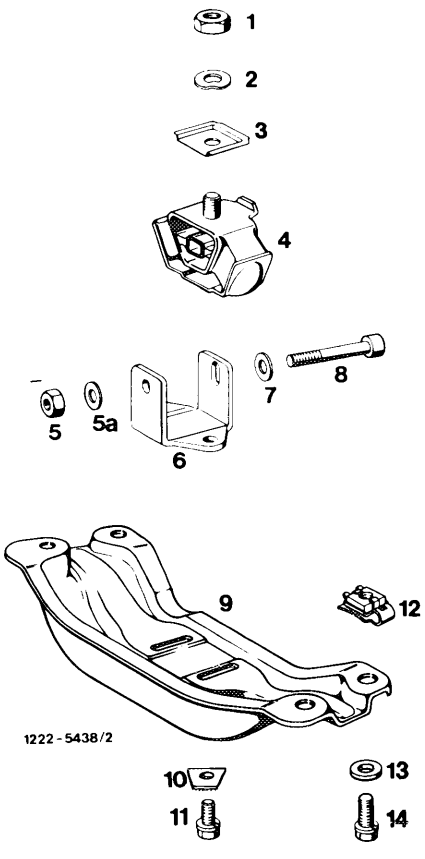
1 Nut M 12 x 1.5
2 Spring washer
3 Holding plate
4 Engine mount
5 Engine carrier
6 Washer 8.4
7 Snap ring A 8
8 Screw M 8 x 20
9 Shim
10 Snap ring A 8
11 Screw M 8 x 18

Model 123

Attention!
For removal of engine mount (4) do not unscrew engine carrier (9).

Upon installation of engine mount run engine at idle for a short period with adjusting screw released.

With engine stopped, tighten adjusting screw (8) to 40 Nm.



1 Nut 12 x 1.5
2 Spring washer B 12
3 Holding plate
4 Engine mount 123 240 22 18
5 Nut
5a Washer
6 Holder
7 Washer
8 Screw M 8 x 75
9 Engine carrier
10 Washer
11 Combination screw M 8 x 18
12 Cage nut 123 990 05 91
13 Washer
14 Combination screw M 10 x 22

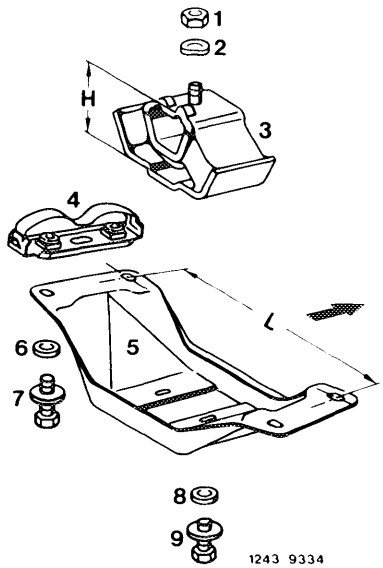
Attention!
To remove engine mount (3) do not unscrew engine carrier (5).

Engine mount (3) and engine carrier (5) are different for manual and automatic transmission.

Differences:

Transmission	manual	automatic
Engine mount	H = 62–64 mm	H = 67–69 mm
Engine carrier	L = 356 mm	L = 301 mm

When installing engine mount (3) attach free of tension to engine carrier (5) with oblong holes by means of screws (9).



1 Nut M 12 x 1.5
2 Spring washer
3 Engine mount
manual 123 240 25 18
automatic 116 240 04 18
4 Nut holder
5 Engine carrier
6 Washer 10.5
7 Combination screw M 10 x 22
8 Washer
9 Combination screw M 8 x 15

Model 107, engine shock absorber left and right

1 For removing righthand engine shock absorber, remove expansion tank.

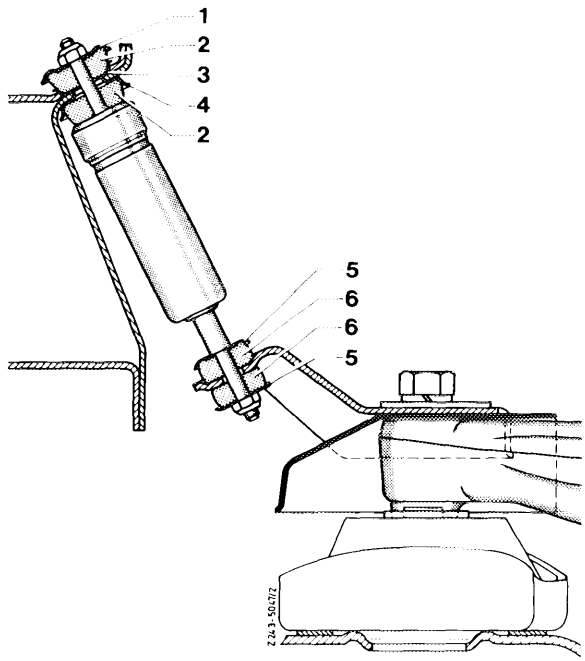
2 For removing lefthand engine shock absorber, remove pressure regulator (injection engine).

3 Unscrew screw for attaching engine from engine mount and engine shock absorber.

4 Remove engine shock absorber together with holder.

Attention!
During installation, pay attention to position of rubber buffers and cup springs (22–211).

On USA vehicles starting model year 1975, use the upper rubber buffers made of heat-resistant material.



Engine shock absorber right, seen from the front

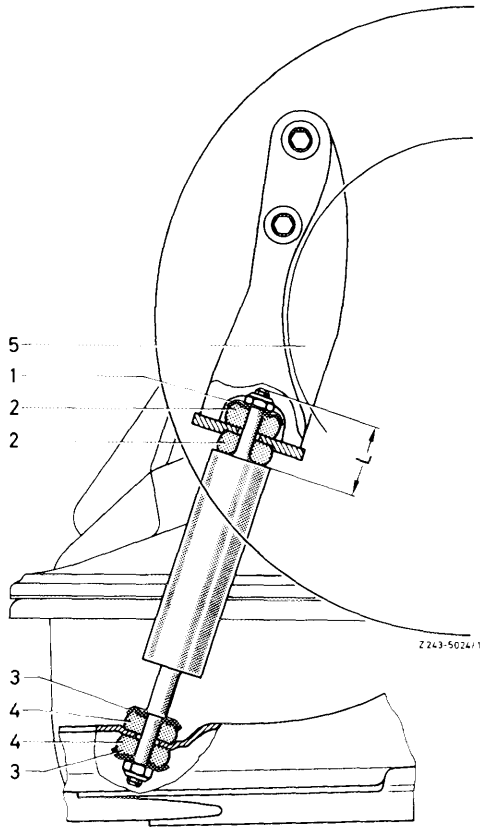
1 Cup spring 30 mm dia.
2 Rubber buffer 26 mm dia.
3 Cup spring 26 mm dia.
4 Cup spring 32 mm dia.
5 Cup spring 26 mm dia.
6 Rubber buffer 22 mm dia.

Model 114, engine shock absorber right

On engines with **air conditioning,** remove radiator and vibration damper (03–340) for removal of righthand engine shock absorber with holder.

On engines **without air conditioning,** remove alternator with holder and carrier for removing righthand engine shock absorber.

Attention!
During installation, pay attention to position of rubber buffer and cup springs.



Engine shock absorber right, seen from the front

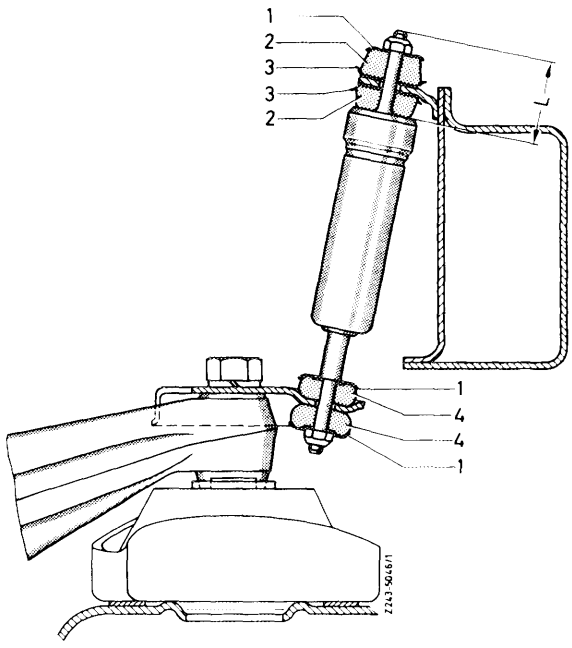
1st version L	= 28 mm	3	Cup spring	26 mm dia.
1 Cup spring	26 mm dia.	4	Rubber buffer	22 mm dia.
2 Rubber buffer	22 mm dia.	5	Holder part no.	110 241 02 02
2nd version L	= 34 mm	3	Cup spring	26 mm dia.
1 Cup spring	31 mm dia.	4	Rubber buffer	22 mm dia.
2 Rubber buffer	26 mm dia.	5	Holder part no.	110 241 03 02

Model 114, engine shock absorber left

1 Unscrew screw from engine mount. Loosen engine shock absorber at top.

2 Remove engine shock absorber together with holder.

Attention!
During installation, pay attention to position of rubber buffers and cup springs.



Engine shock absorber left, seen from the front
L = 34 mm

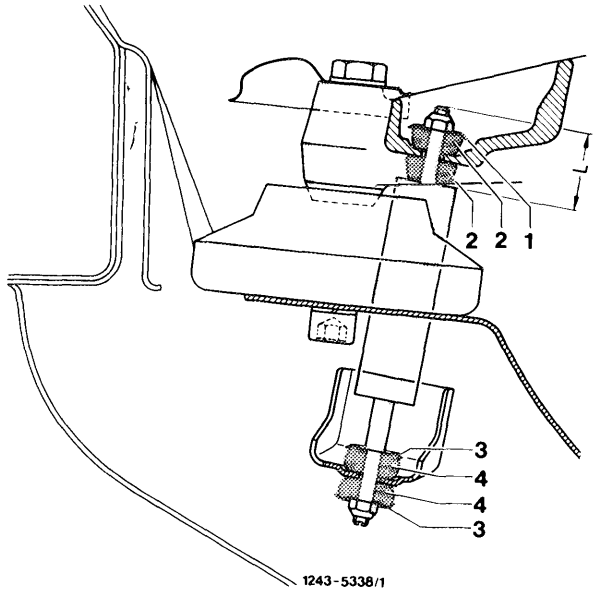
1 Cup spring	108 241 00 12	26 mm dia.
2 Rubber buffer	123 241 03 65	26 mm dia.
3 Cup washer	115 241 08 12	31 mm dia.
4 Rubber buffer	107 241 00 65	22 mm dia.

Model 116, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

On USA vehicles starting model year 1975, use the two upper rubber buffers part no. 115 241 17 65.

Engine shock absorber and layout are similar at the left and right.



Engine shock absorber right, seen from the front

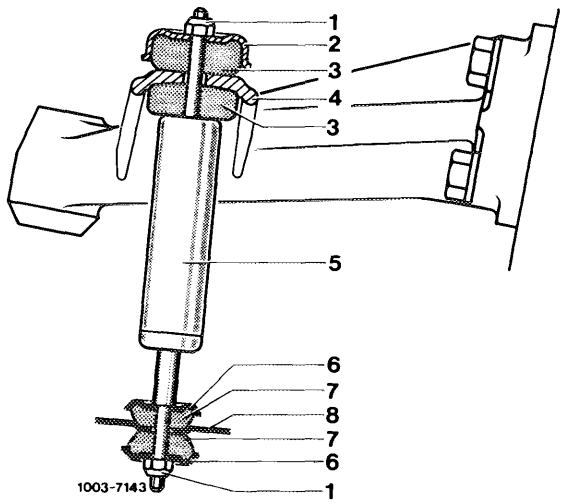
L = 34 mm

1	Cup spring	30 mm dia.
2	Rubber buffer	26 mm dia.
3	Cup spring	26 mm dia.
4	Rubber buffer	32 mm dia.

Model 123, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

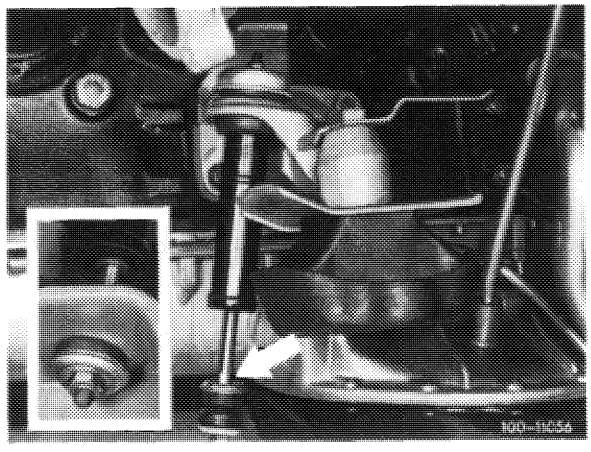
Engine shock absorber and layout are similar at left and right.



Engine shock absorber left, seen from the rear

1	Nut	
2	Cup spring	44 mm dia.
3	Rubber buffer	36 mm dia.
4	Engine carrier	
5	Engine shock absorber	
6	Cup spring	30 mm dia.
7	Rubber buffer	27 mm dia.

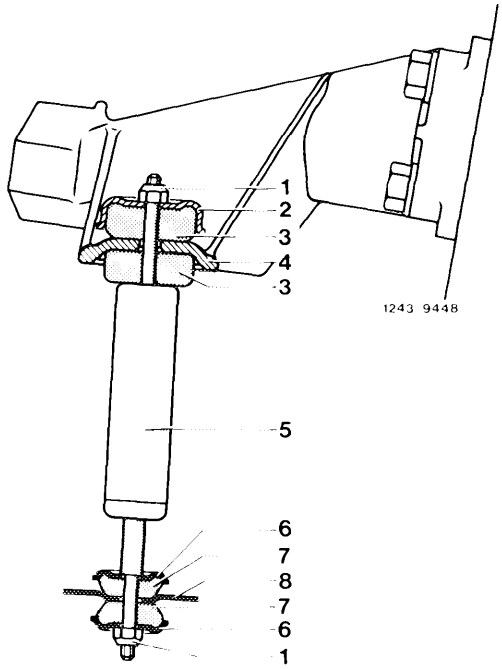
Attention!
For removal and installation of engine shock absorber, hold piston rod in position at flat provided (arrow).



Model 126, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

Engine shock absorber and layout are similar at left and right.



Engine shock absorber right seen from the front

A. Lefthand steering models 107, 116, 123, 126
Righthand steering models 107, 116, 126

Adjusting values in mm

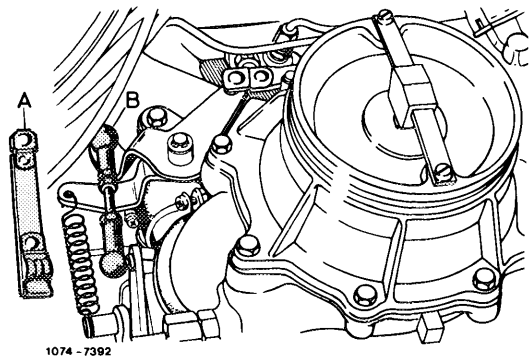
Model	107	116	123	126
Length of connecting rod (B) from throttle valve housing to guide lever	75			
Length of connecting rod (2) from guide lever to slotted lever	345			
Length of connecting rod (10) via cylinder head cover (automatic transmission 722.1 (W 4 B 025) only)	306			
Length of pushrod (5) from longitudinal regulating shaft to accelerator pedal	105	68	186	220

Adjustment

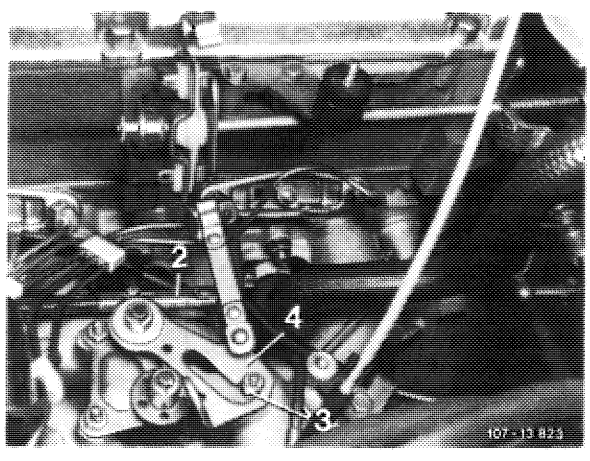
1 Check regulating linkage for easy operation and bends. Replace linkage, if required.

2 Disconnect connecting rod (B) on throttle valve housing. Check whether throttle valve rests against idle speed stop. Reconnect connecting rod free of tension, adjust to specified length, if required.

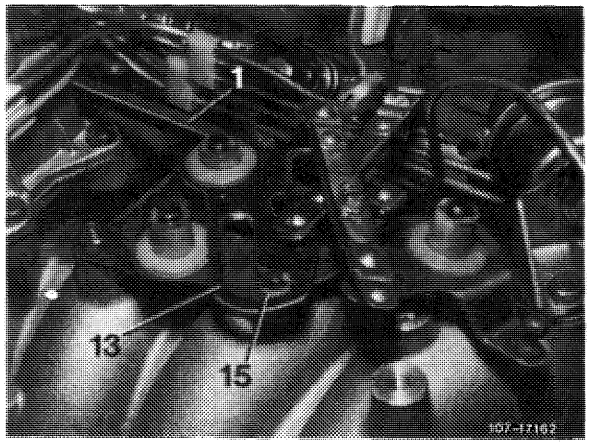
Note: The connecting rod (B) should be made of round material with screwed-on ball sockets. Replace profilated sheet metal-connecting rod (A).



3 Adjust connecting rod (1, 2) in such a manner that the rollers (3, 15) in slotted lever (4, 13) are resting free of tension against final stop.

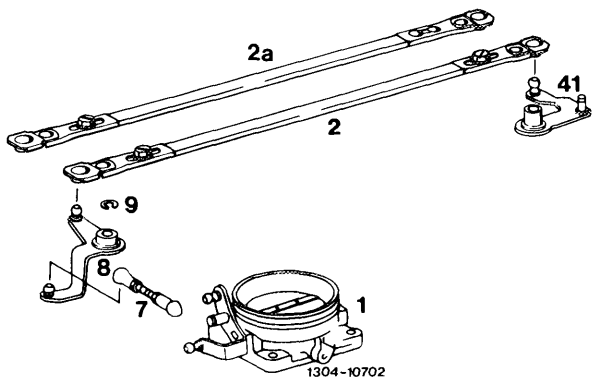


Model 123



Model 126

The connecting rod (2a) can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



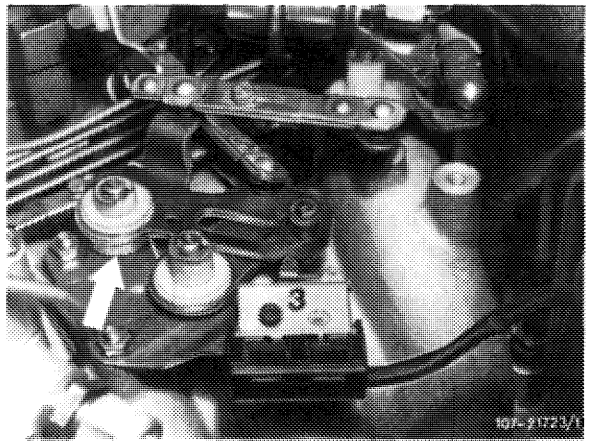
2 1st version
2a 2nd version

Installation: January 1982

Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No.
107	110.990	000 333	000 727	012 560
123.033 123.053 123.093	110.988	001 431	004 447	099 669 025 300 010 978
126.022 126.023	110.989	001 665	009 354	053 569

Engines with decel shutoff

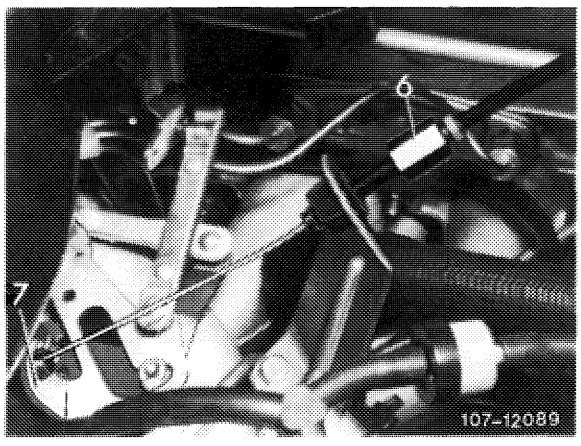
To guarantee operation of microswitch (3) the slotted lever (13) is provided with a restoring spring (arrow). As a result, the slotted lever will return reliably against final stop.



4 Vehicles with cruise control/Tempomat:

Cruise control/Tempomat, pneumatical

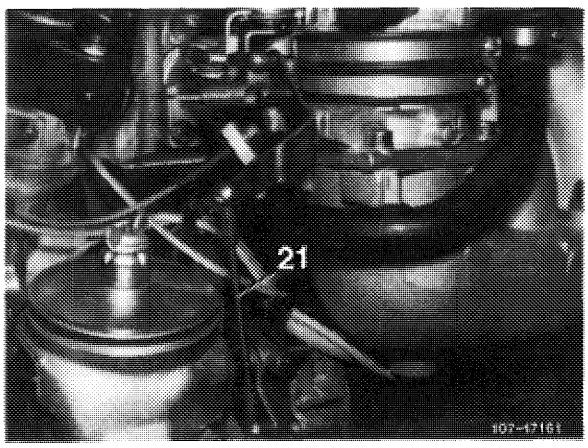
Check whether Bowden wire for cruise control/ Tempomat rests free of tension against regulating lever (7). Adjust by means of adjusting nut (6), if required.



Cruise control/Tempomat, electrical

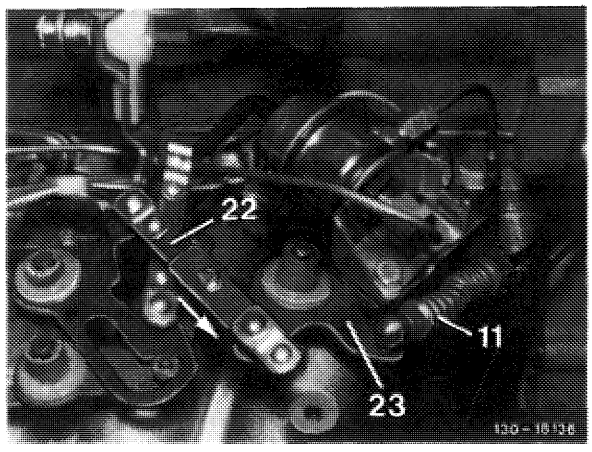
Check whether actuator rests against idle speed stop of cruise control/Tempomat. For this purpose, disconnect pullrod (21) and push lever of actuator clockwise against idle speed stop.

When connecting pullrod (21) make sure that lever of actuator is lifted by approx. 1 mm from idle speed stop. Adjust pullrod, if required.



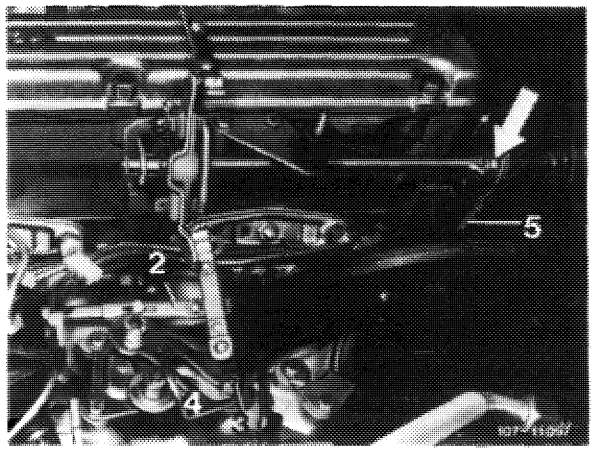
Testing and adjusting full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



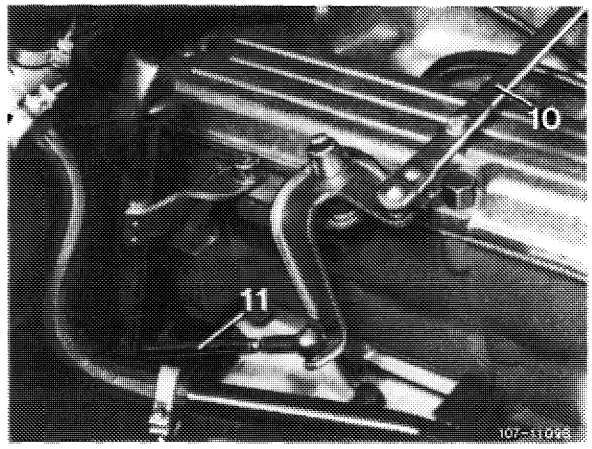
5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or on automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, loosen adjusting screw (arrow). Adjust regulating linkage in such a manner that throttle valve lever rests against full throttle stop.

If the full throttle or idle speed stop is not attained with this adjustment, set pushrod (5) from longitudinal regulating shaft to accelerator pedal to specified length, measured from center of ball socket to center of damping ring.



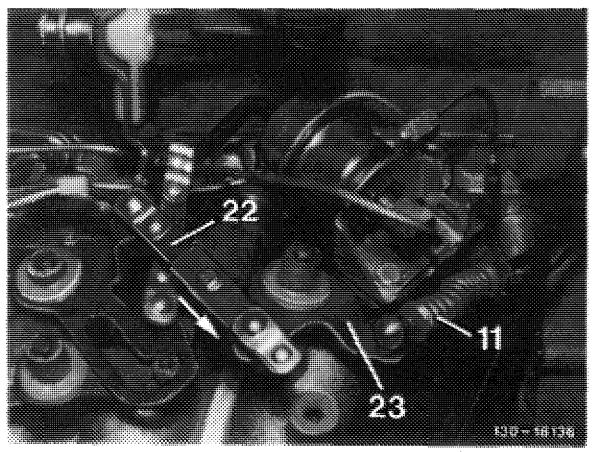
6 Vehicles with automatic transmission:

a) Adjust control pressure rod (11) with engine stopped. For this purpose, disconnect control pressure rod, push completely toward the rear against stop and reconnect free of tension. Adjust ball socket, if required.



Control pressure rod with automatic transmission 722.1 (W 4 B 025)

b) Adjust Bowden wire (11) with engine stopped. For this purpose, disconnect connecting rod (22) and pull guide lever (23) in direction of arrow noticeably against idle speed stop on automatic transmission. Reconnect connecting rod (22) free of tension and adjust, if required.



Bowden wire with automatic transmission 722.3 (W 4 A 040)

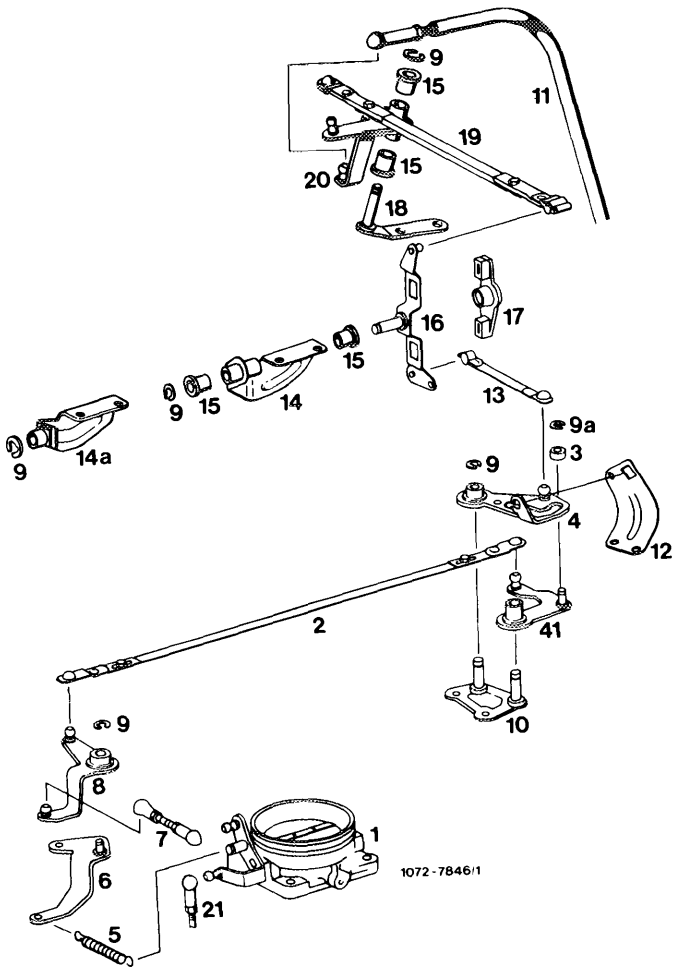
Engine regulating

Lefthand steering models 107, 116, 123, 126

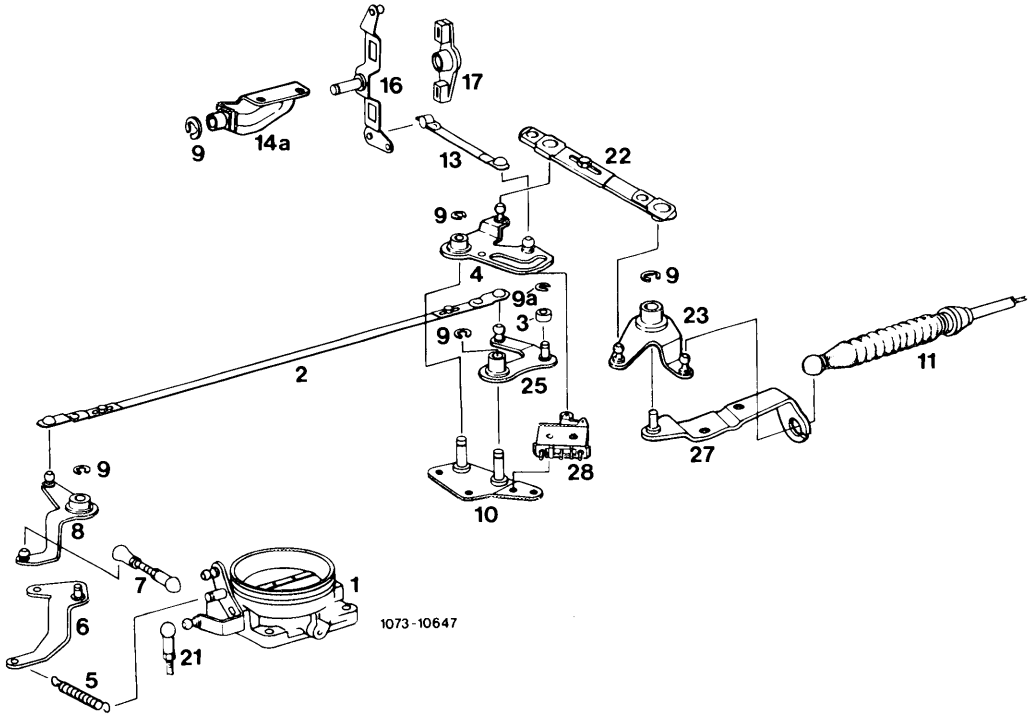
Righthand steering models 107, 116

Prior to September 1981

1 Throttle valve housing
2 Connecting rod
3 Roller
4 Slotted lever
5 Restoring spring
6 Lever
7 Connecting rod
8 Guide lever
9 Lock
9a Lock
10 Bearing bracket
11 Control pressure rod
12 Holder for Bowden wire
Cruise control/Tempomat, pneumatical
13 Connecting rod
14 Holder 1st version
14a Holder 2nd version
15 Plastic sleeve 1st version
16 Lever
17 Plastic link
18 Bearing bracket
19 Connecting rod
20 Guide lever
21 Connecting rod
Cruise control/Tempomat, electrical
41 Guide lever



Starting September 1981



1 Throttle valve housing
2 Connecting rod
3 Roller
4 Slotted lever
5 Restoring spring
6 Lever
7 Connecting rod
8 Guide lever
9 Lock
9a Lock
11 Bowden wire automatic transmission
13 Connecting rod
14a Holder
16 Lever
17 Plastic link
21 Connecting rod
Cruise control/Tempomat, electrical
22 Connecting rod
23 Guide lever
25 Guide lever
27 Holder
28 Microswitch

Adjusting values in mm

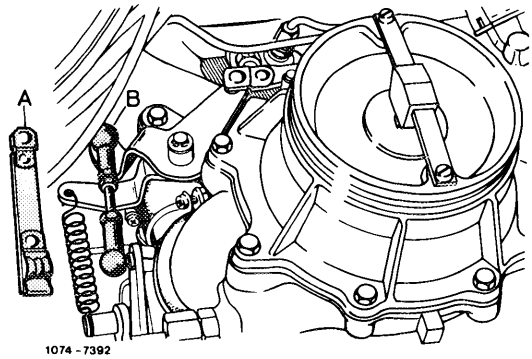
Length of connecting rod (B) from throttle valve housing to guide lever	75
Length of connecting rod (2) from guide lever to slotted lever	345
Length of connecting rod (10) above cylinder head cover (automatic transmission 722.1 (W 4 B 025) only)	306

Adjustment

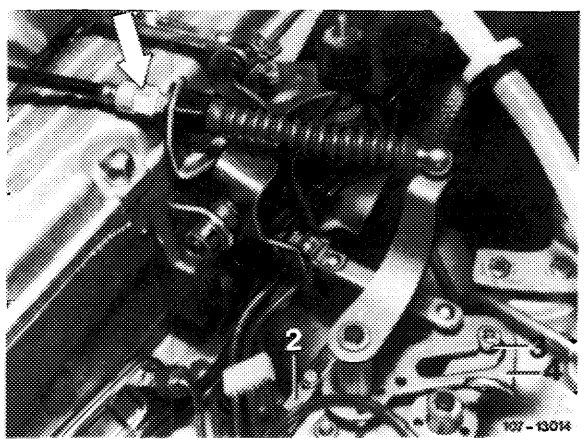
1 Check regulating linkage and Bowden wire for easy operation, distortion and absence of kinks. Replace individual parts, if required.

2 Disconnect connecting rod (B) on throttly valve housing. Check whether throttle valve rests against idle speed stop. Reconnect connecting rod free of tension and adjust to specified length, if required.

Note: Connecting rod (B) should be made of round material with screwed on ball sockets. Replace profilated sheet metal-connecting rod (A).

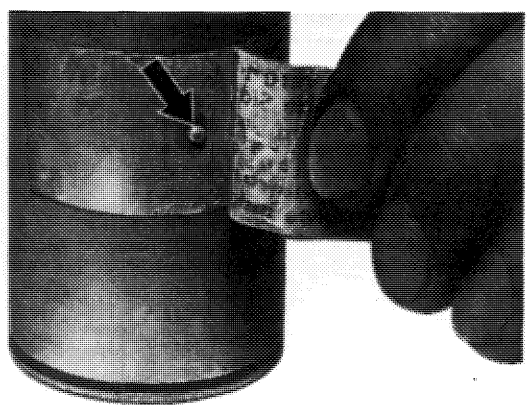


3 Adjust connecting rod (2) in such a manner that roller (3) in slotted lever (4) rests free of tension against final stop.



The connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).

For installation date refer to section "A" Lefthand steering.

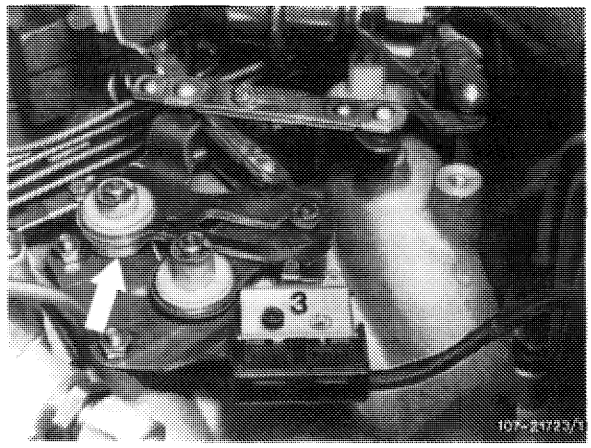


2 1st version
2a 2nd version

107-10702

Engines with decel shutoff

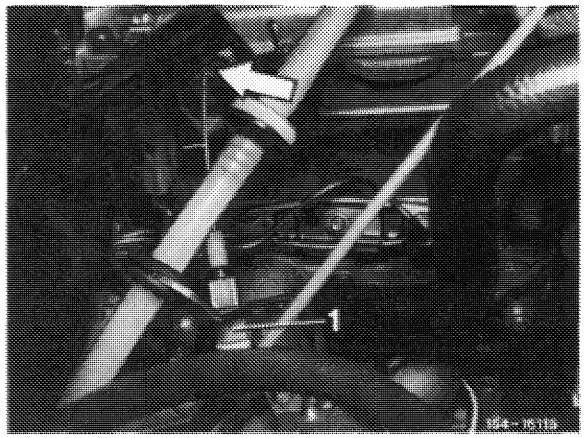
To guarantee operation of microswitch (3), the slotted lever (13) is provided with a restoring spring (arrow). As a result, the slotted lever will return reliably to end stop.



4 **Vehicles with cruise control/Tempomat:**

Tempomat, pneumatical

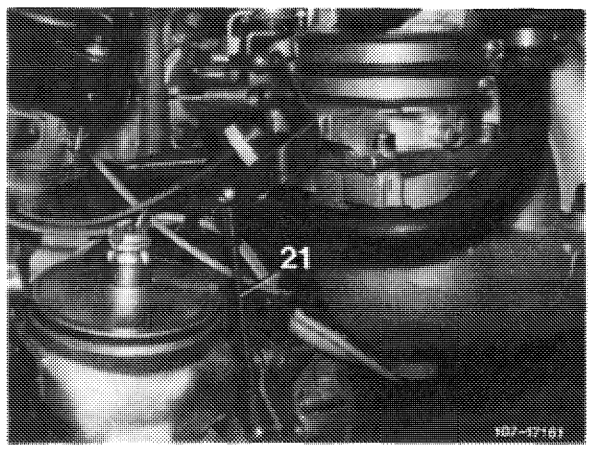
Check whether Bowden wire for cruise control/ Tempomat rests free of tension against regulating lever (arrow). Adjust with adjusting nut (1), if required.



Cruise control/Tempomat, electrical

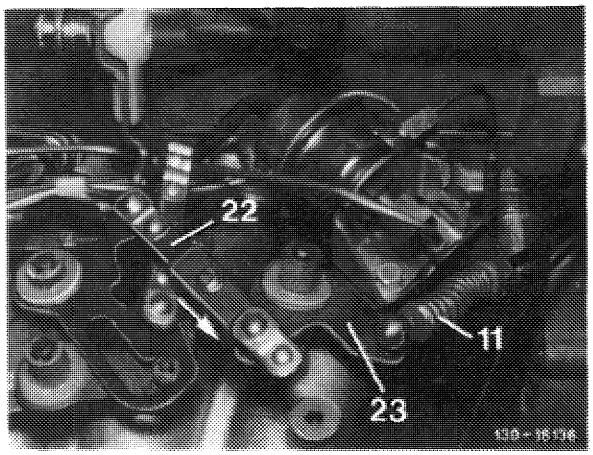
Check whether actuator rests against idle speed stop of cruise control/Tempomat. For this purpose, disconnect pullrod (21) and push lever of actuator clockwise against idle speed stop.

When connecting pullrod (21), make sure that the lever of the actuator is lifted by approx. 1 mm from idle speed stop. Adjust pullrod, if required.

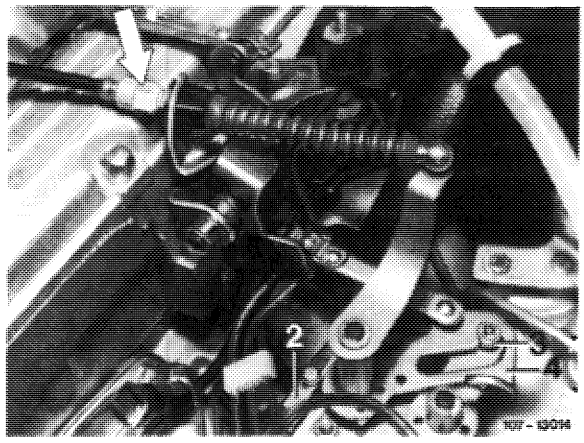


Checking full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11), reconnect after adjusting full throttle stop.

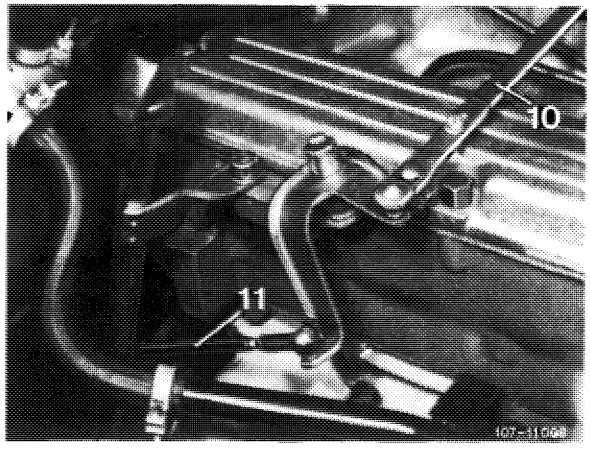


5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or on automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.



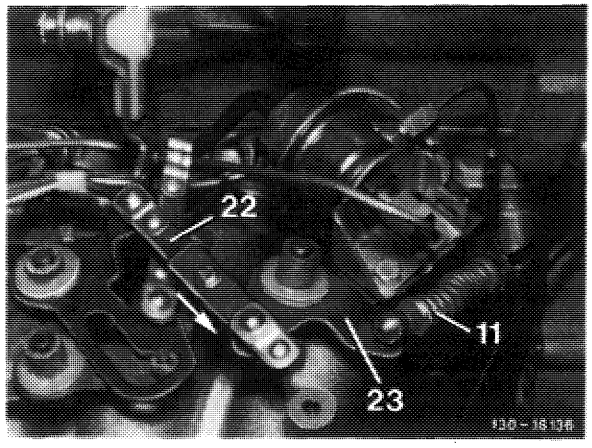
6 Vehicles with automatic transmission:

a) Adjust control pressure rod (11) with engine stopped. For this purpose, disconnect control pressure rod, push completely toward the rear against stop and reconnect free of tension. Adjust ball socket, if required.



Control pressure rod with automatic transmission 722.1 (W 4 B 025)

b) Adjust Bowden wire (11) with engine stopped. For this purpose, disconnect connecting rod (22) and pull guide lever (23) in direction of arrow noticeably against idle speed stop on automatic transmission. Reconnect connecting rod (22) free of tension and adjust, if required.

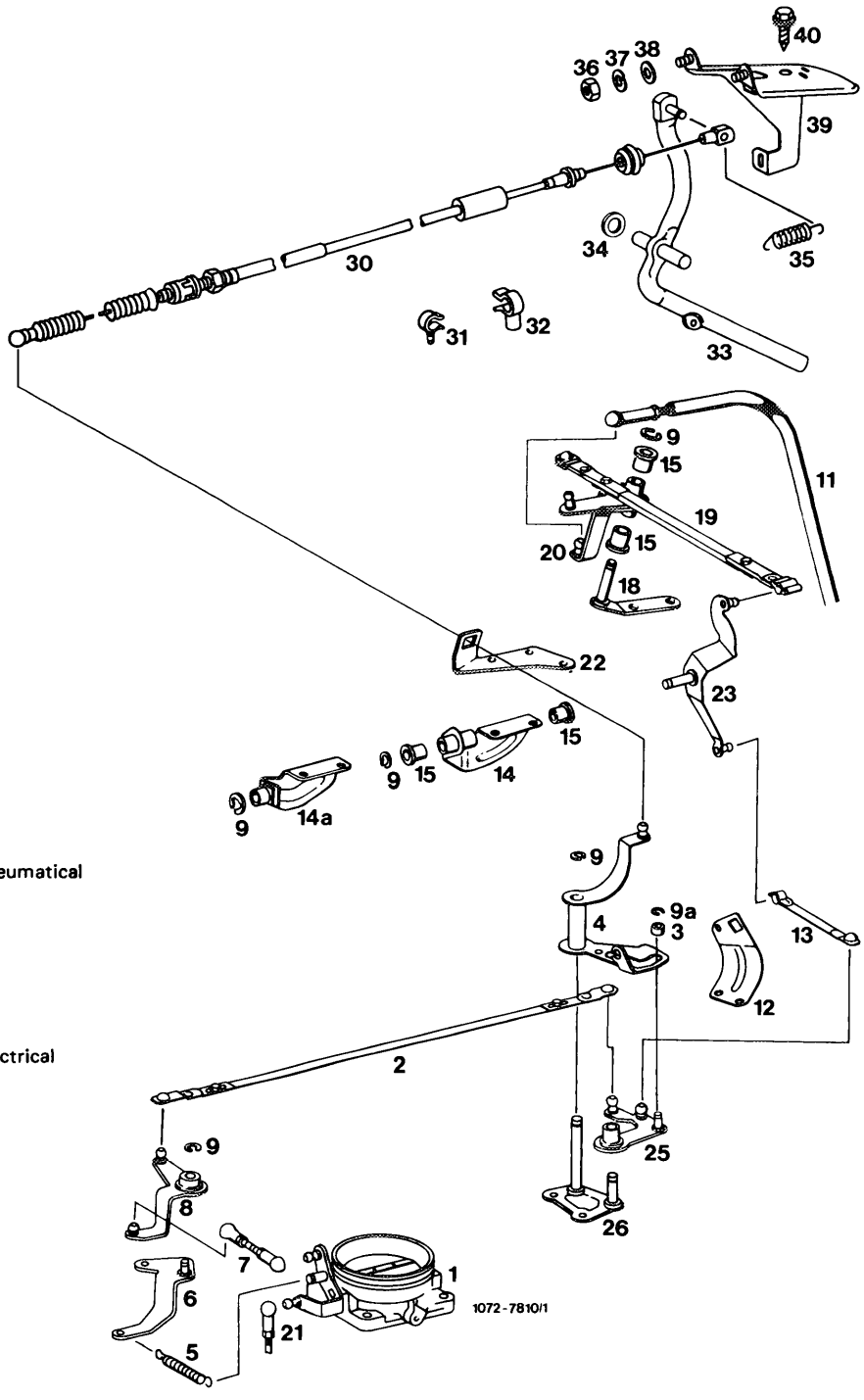


Bowden wire with automatic transmission 722.3 (W 4 A 080)

Engine and chassis regulation

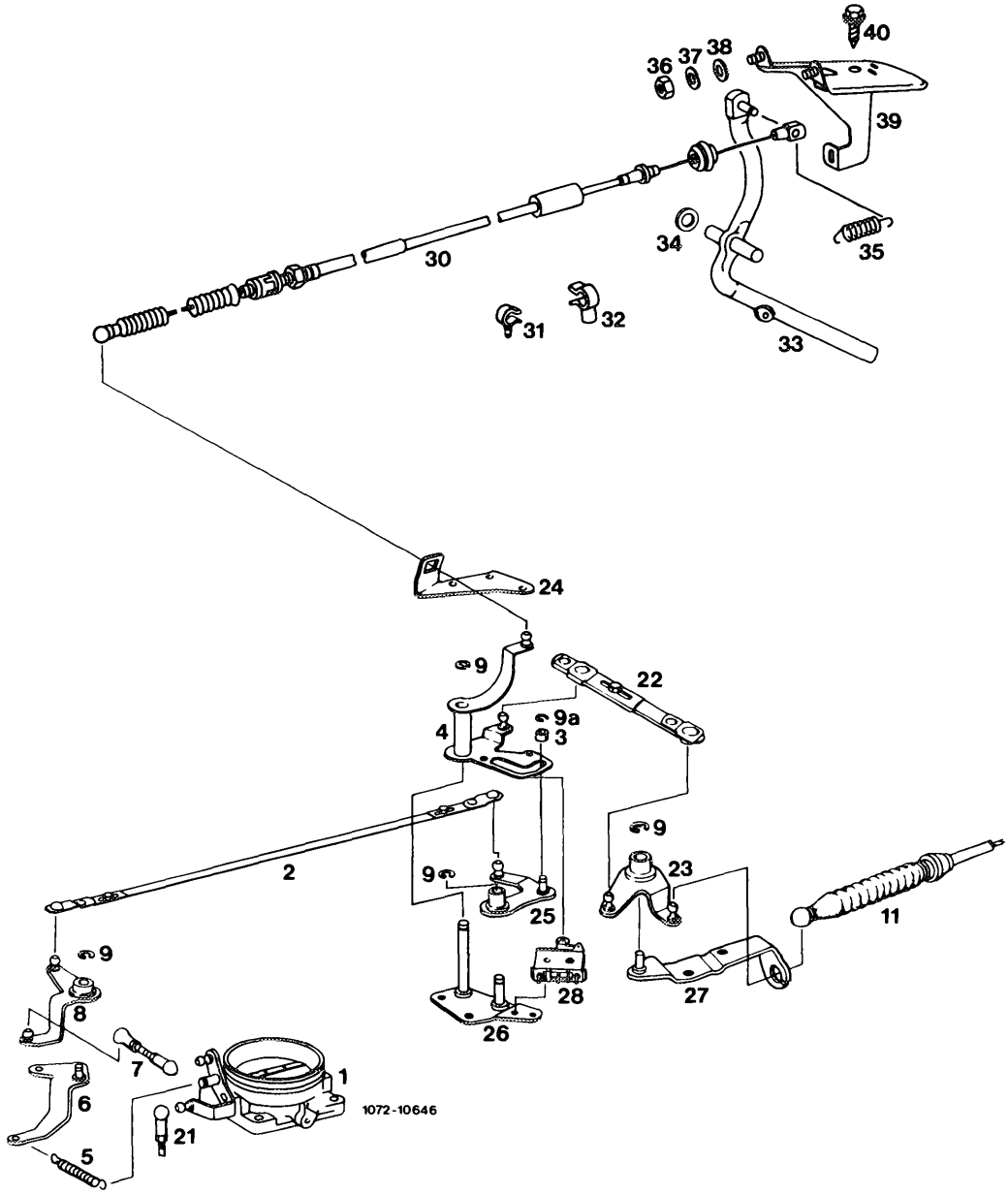
Righthand steering model 123

Prior to September 1981



1	Throttle valve housing
2	Connecting rod
3	Roller
4	Slotted lever
5	Restoring spring
6	Lever
7	Connecting rod
8	Guide lever
9	Lock
9a	Lock
11	Control pressure rod
12	Holder for Bowden wire
	Cruise control/Tempomat, pneumatical
13	Connecting rod
14	Holder 1st version
14a	Holder 2nd version
15	Plastic sleeve
18	Bearing bracket
19	Connecting rod
20	Guide lever
21	Connecting rod
	Cruise control/Tempomat, electrical
22	Holder
23	Guide lever
25	Guide lever
26	Bearing bracket
30	Bowden wire
31	Clip
32	Clip
33	Accelerator lever
34	Spacer ring
35	Restoring spring
36	Nut
37	Corrugated washer
38	Washer
39	Holder
40	Screw

Starting September 1981

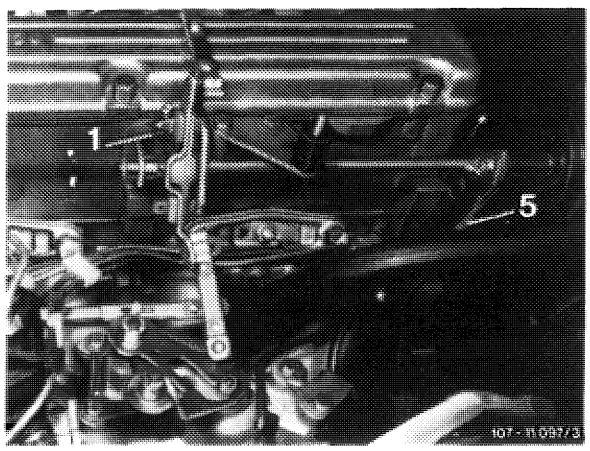


1	Throttle valve housing
2	Connecting rod
3	Roller
4	Slotted lever
5	Restoring spring
6	Lever
7	Connecting rod
8	Guide lever
9	Lock
9a	Lock
11	Bowden wire automatic transmission
21	Connecting rod Cruise control/Tempomat, electrical
22	Connecting rod
23	Guide lever
24	Holder
25	Guide lever
26	Bearing bracket
27	Holder
28	Microswitch
30	Bowden wire
31	Clip
32	Clip
33	Accelerator lever
34	Spacing ring
35	Restoring spring
36	Nut
37	Corrugated washer
38	Washer
39	Holder
40	Screw

Removal

1 Disconnect regulating rod (5).

2 Remove lock (1) and remove longitudinal regulating shaft toward the rear.



Installation

3 For installation proceed vice versa. Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

4 Adjust regulating linkage (30–300).

A. Model 107

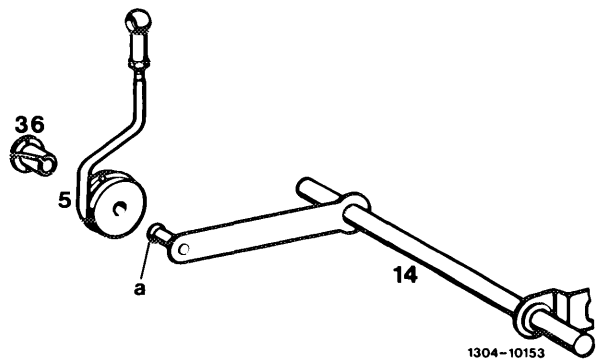
Adjusting value in mm

Length of pushrod (5)	105

Note

Since February 1981, pushrod (5) is mounted with a bearing bushing and collar (36) on front wall regulating shaft (14).

Subsequent installation is possible as follows:



Installation: February 1981

Model	Engine	Chassis end No.
107.022	110.986	009866
107.042		010249

1 Slightly grease knob bolt (a) with Molykote-Longterm 2.

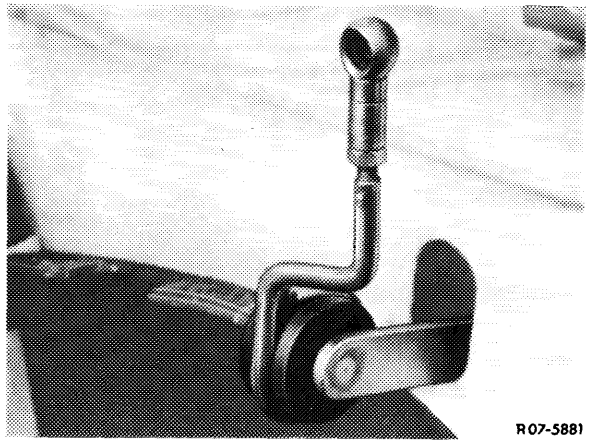
2 Insert bearing bushing with collar (36) in pushrod (5) and press pushrod on knob bolt (a). Pay attention to correct seat of bearing bushing.

Removal

1 Push regulating rod with damping ring from lever of regulating shaft.

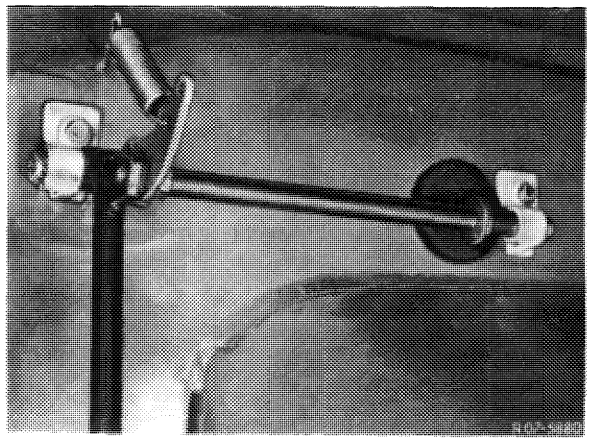
2 Remove accelerator pedal (30–330).

3 Remove heater box (83–100).



4 Disconnect restoring spring and unscrew fastening screws from plastic bearings.

5 Push out plastic bearings in upward direction and remove regulating shaft with bearing.



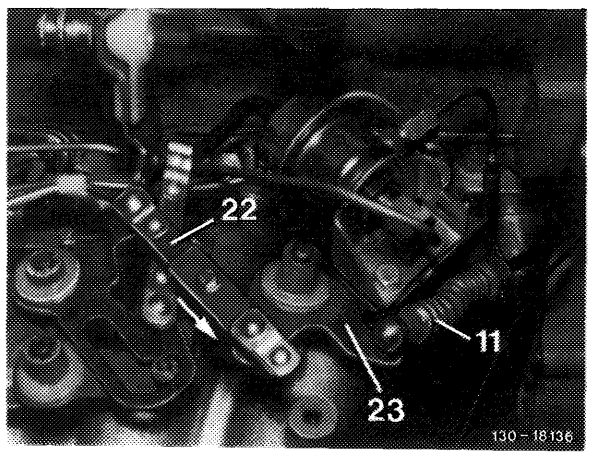
Installation

For installation proceed vice versa, while attaching restoring spring to inner hole.

Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

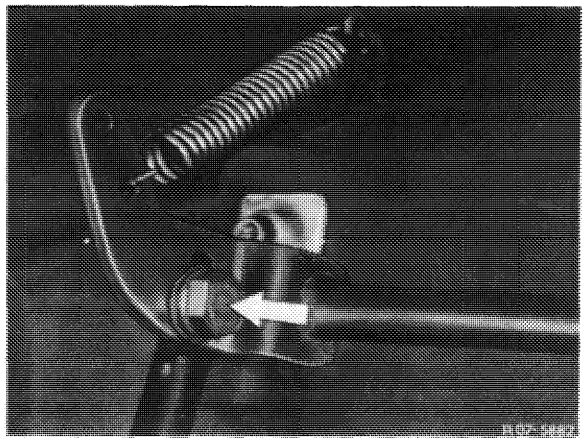
Checking and adjusting full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



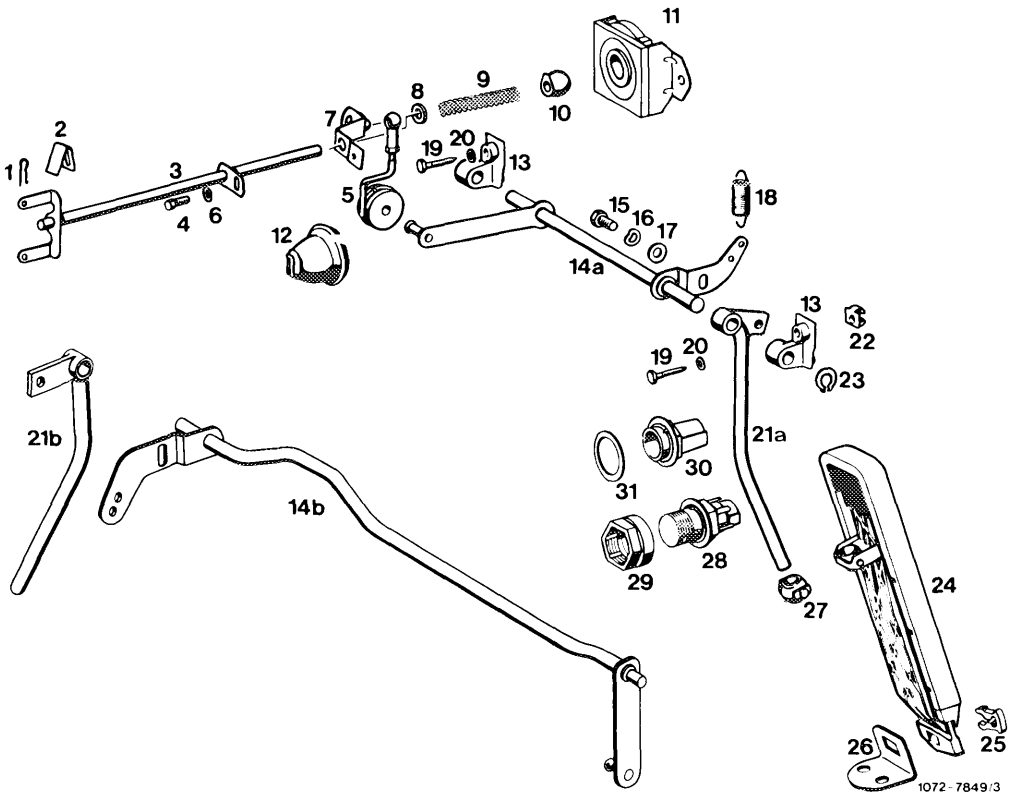
6 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

If the full throttle or idle speed stop is not attained with this adjustment, set pushrod from longitudinal regulating shaft to accelerator pedal to 105 mm length, measured from center of ball socket to center of damping ring (refer to Fig. item 1).



Chassis regulation

Model 107



1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Plastic spacer ring
9 Compression spring
10 Plastic ball
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14a Front wall regulating shaft lefthand steering
14b Front wall regulating shaft righthand steering
15 Hex. screw
16 Corrugated washer
17 Washer
18 Restoring spring
19 Screw
20 Washer
21a Accelerator lever lefthand steering
21b Accelerator lever righthand steering
22 Cage nut
23 Lock
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Transition switch (kickdown)
29 Adjusting nut
30 Full throttle stop
31 Washer

Adjusting value in mm

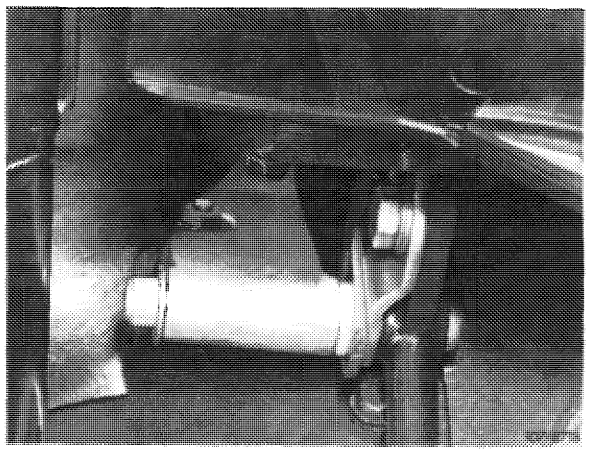
Length of connecting rod from accelerator pedal to guide lever	122
Length of pushrod (5)	68

Removal

1 Remove accelerator pedal (07.3–330).

2 Disconnect connecting rod.

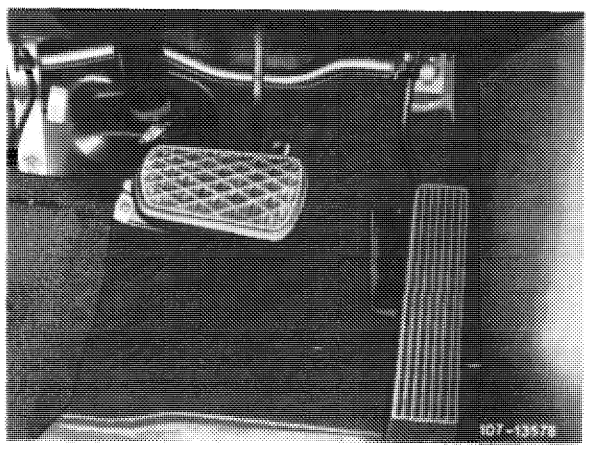
3 Disconnect restoring spring, unscrew fastening nuts from bearing bracket and remove regulating shaft with bearing bracket.



Lefthand steering

Installation

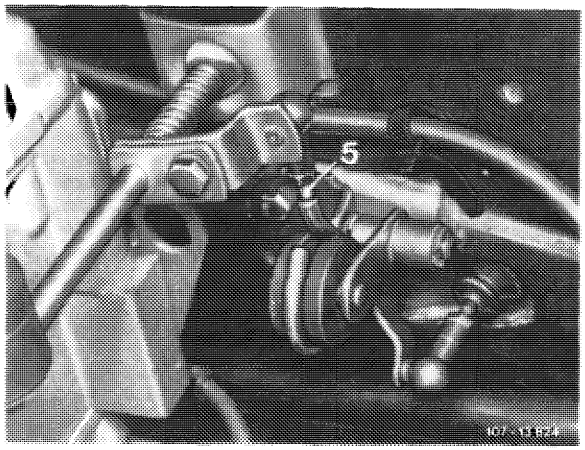
4 For installation proceed vice versa, while connecting restoring spring to inner hole. Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.



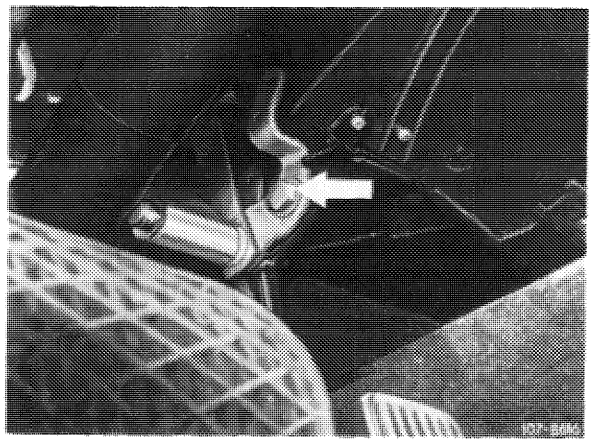
Righthand steering

Checking and adjusting full throttle stop

5 With engine stopped, step on accelerator from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.
If the full throttle or idle speed stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 68 mm in length, measured from center of ball socket to center of damping ring.

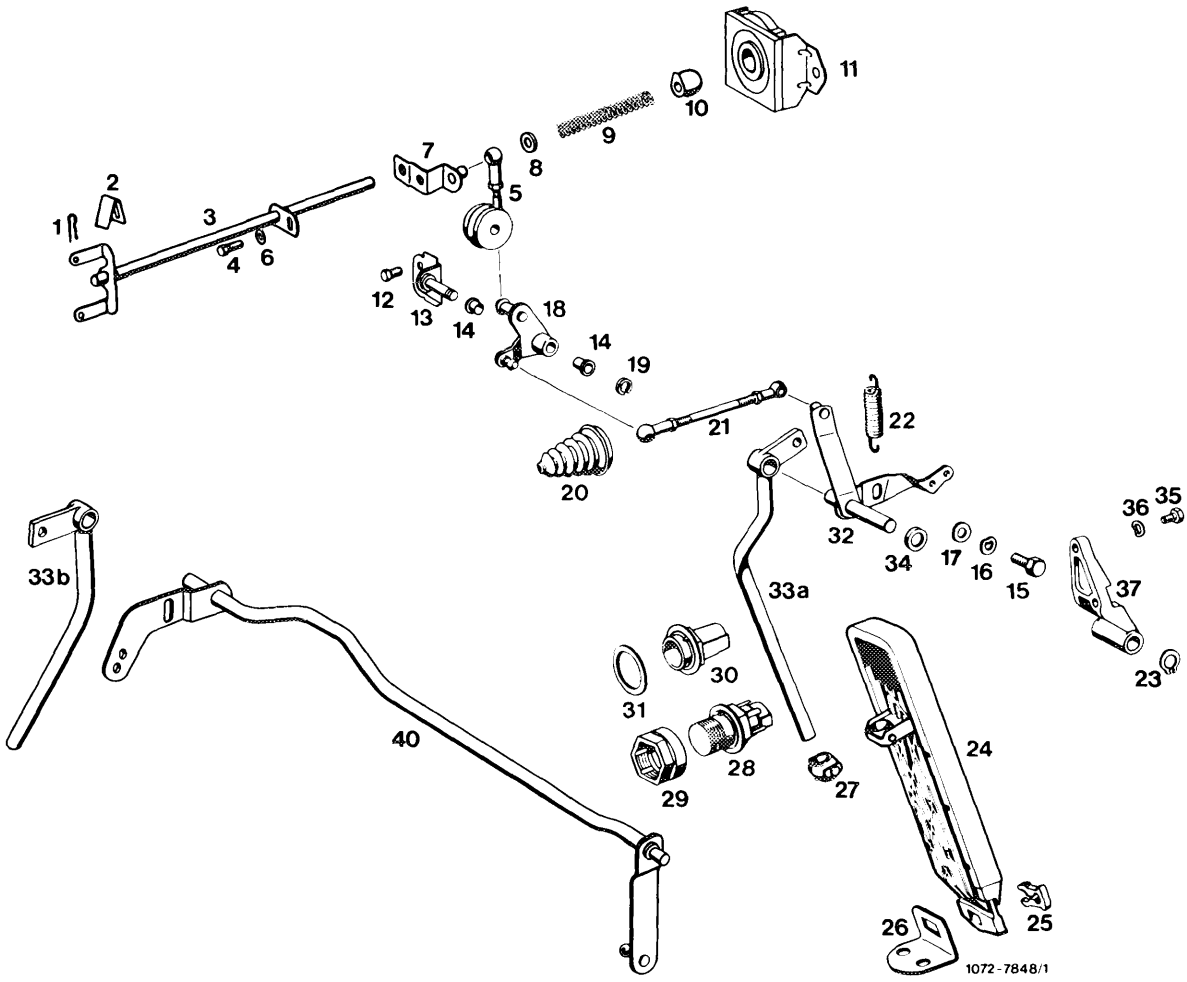


If the full throttle or idle speed stop is not attained with this adjustment, adjust connecting rod from guide lever engine compartment to accelerator pedal to 122 mm, measured from center of ball socket to center of ball socket. If required, adjust regulating lever inside vehicle. For this purpose, loosen fastening screw (arrow), pull accelerator pedal slightly in upward direction and tighten fastening screw again.



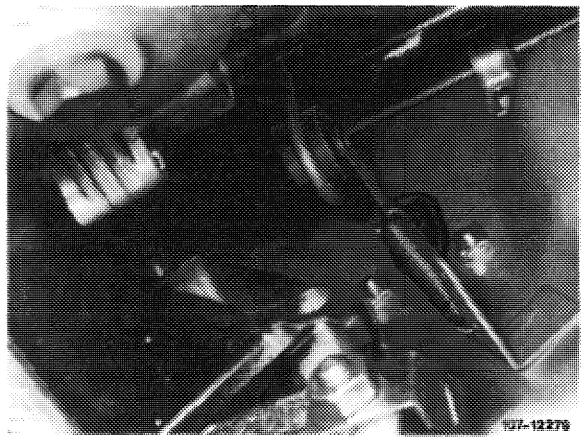
Chassis regulation

Model 116



1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Plastic spacer ring
9 Compression spring
10 Plastic ball
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14 Plastic bushing
15 Hex. screw
16 Corrugated washer
17 Washer
18 Guide lever
19 Lock
20 Rubber grommet
21 Connecting rod
22 Restoring spring
23 Lock
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer
32 Guide lever
33a Accelerator lever lefthand steering
33b Accelerator lever righthand steering
34 Plastic spacer ring
40 Front wall regulating shaft righthand steering

C. Model 123

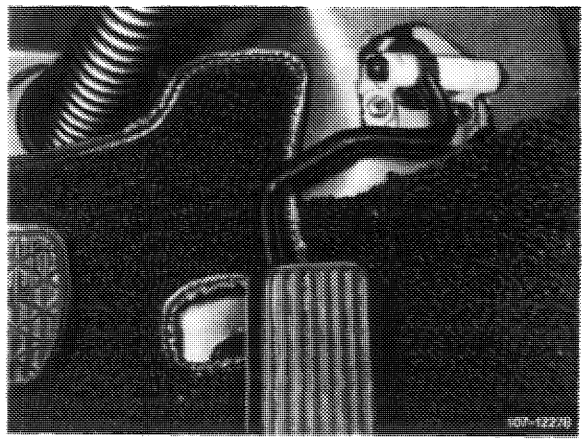


Removal

1 Remove accelerator pedal (07.3–330).

2 Disconnect restoring spring and pushrod.

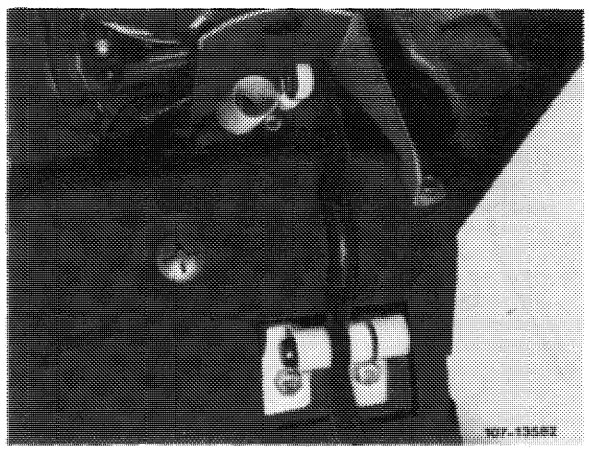
3 Unscrew plastic bearing inside vehicle and remove shaft by turning.



Installation

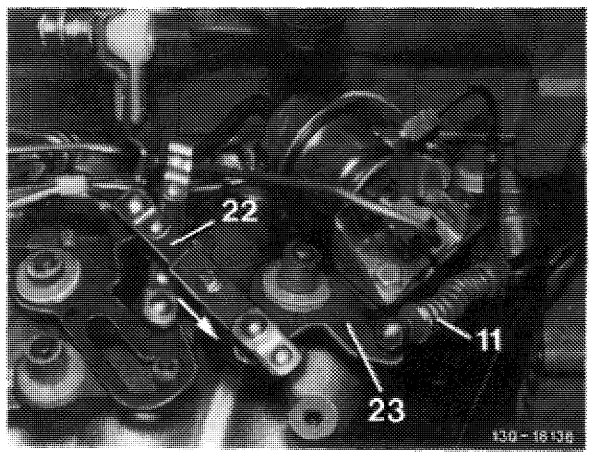
4 For installation proceed vice versa, while connecting restoring spring to inside hole. Grease bearing points as well as ball socket of regulation with Molykote-Longterm 2.

Lefthand steering



Righthand steering

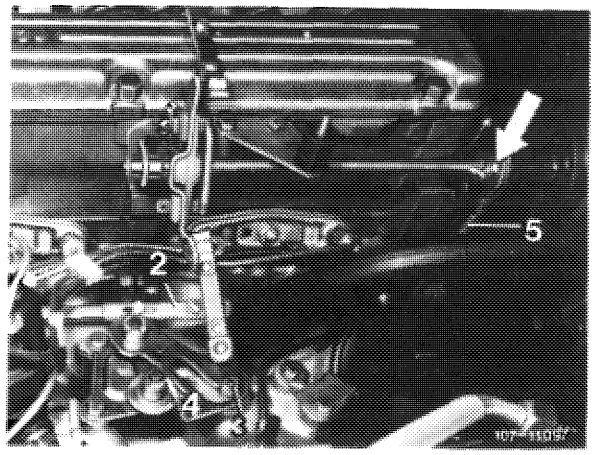
Checking and adjusting full throttle stop



Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.

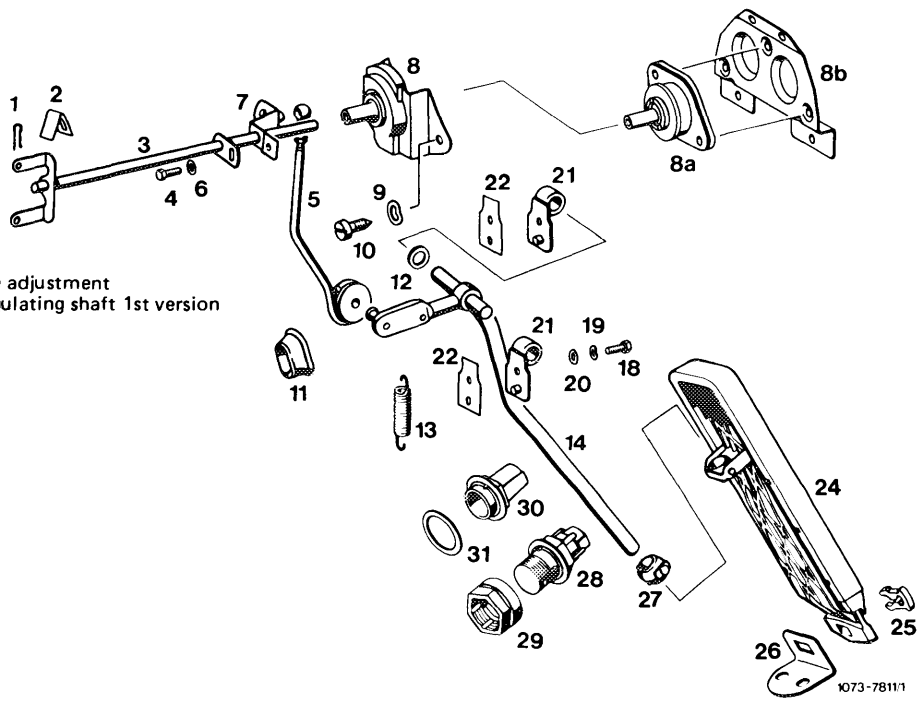
5 With the engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

If the full throttle or idle speed stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 186 mm length, measured from center of ball socket to center of damping ring.



Chassis regulation

Model 123



1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Bearing for longitudinal regulating shaft 1st version
8a Bearing 2nd version
8b Fastening plate 2nd version
9 Corrugated washer
10 Screw
11 Rubber grommet
12 Plastic spacer ring
13 Restoring spring
14 Accelerator lever
18 Hex. screw
19 Corrugated washer
20 Washer
21 Bearing
22 Gasket
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer

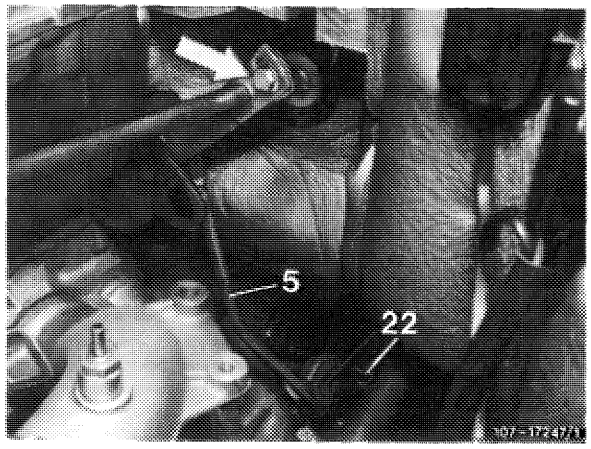
Adjusting values in mm

Lefthand steering	
Length of pushrod (5) from longitudinal regulating shaft to accelerator pedal	220
Righthand steering	
Length of connecting rod (21) from accelerator pedal to guide lever	172
Length of connecting rod (40)	597

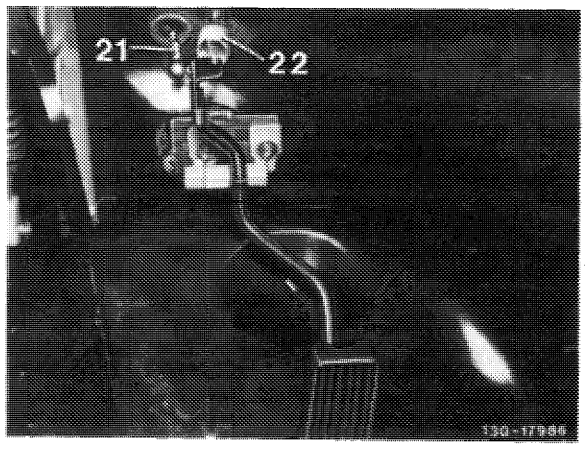
Removal

1 Disconnect restoring spring (22) and push off connecting rod (5 or 21).

2 Remove accelerator pedal (30–330).

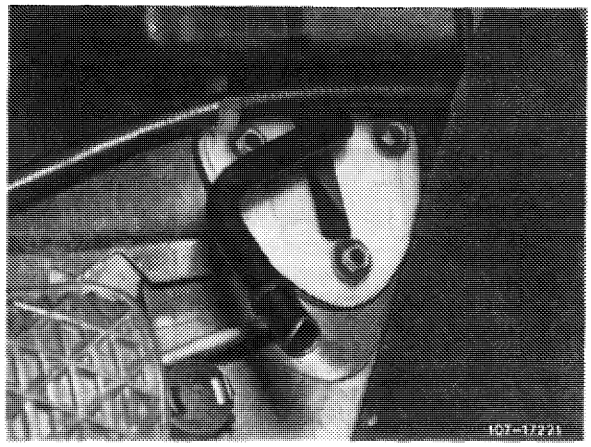


Lefthand steering

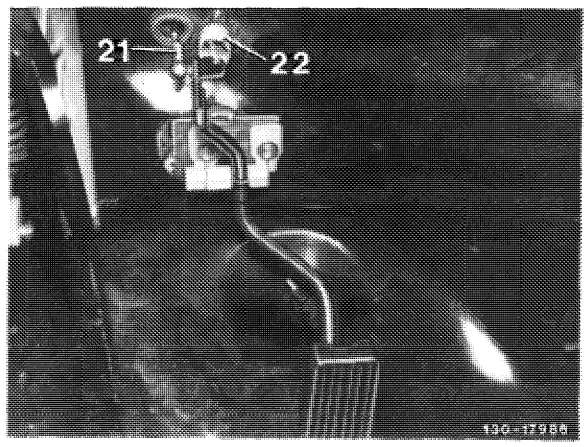


Righthand steering

3 Unscrew fastening screws on bearing bracket, remove bearing bracket and accelerator lever.



Lefthand steering



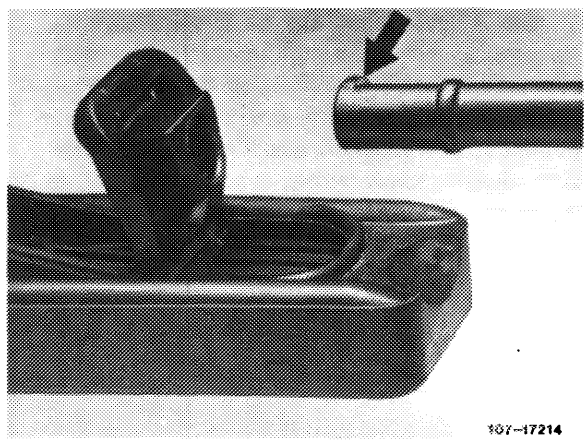
Righthand steering

Installation

4 For installation proceed vice versa.

Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

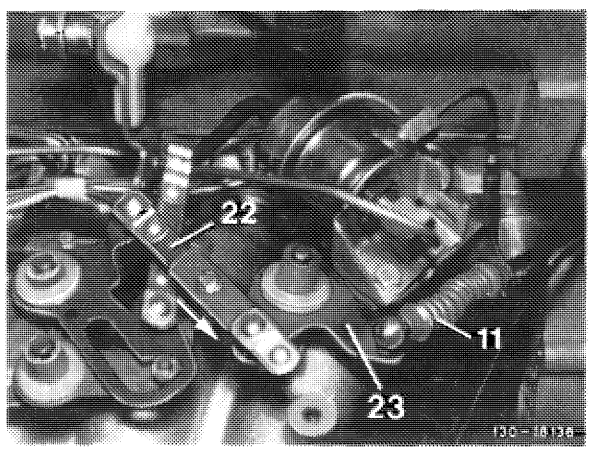
The connection from accelerator lever to accelerator pedal is maintenance-free and requires no lubrication.



Checking and adjusting full throttle stop

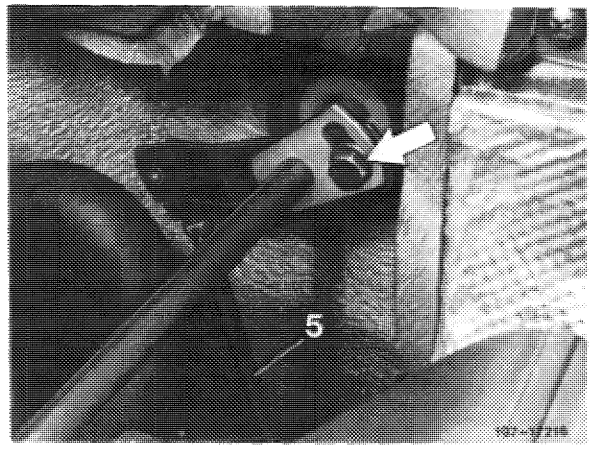
Lefthand steering

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



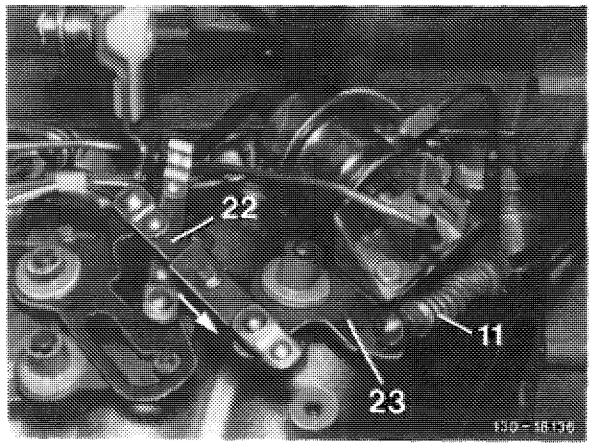
5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

If the full throttle or idle stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 220 mm in length measured from center of ball socket to center of damping ring.

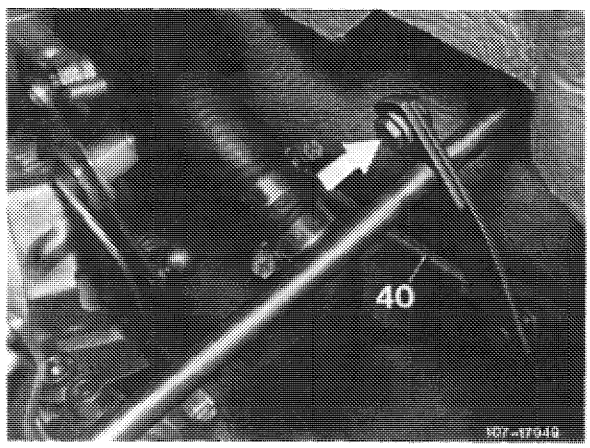


Righthand steering

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.

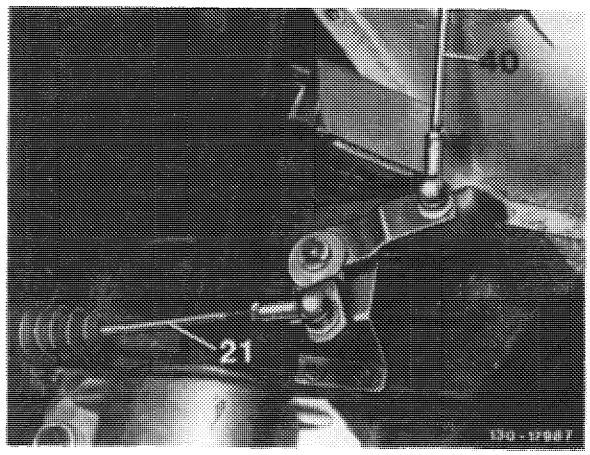


6 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.



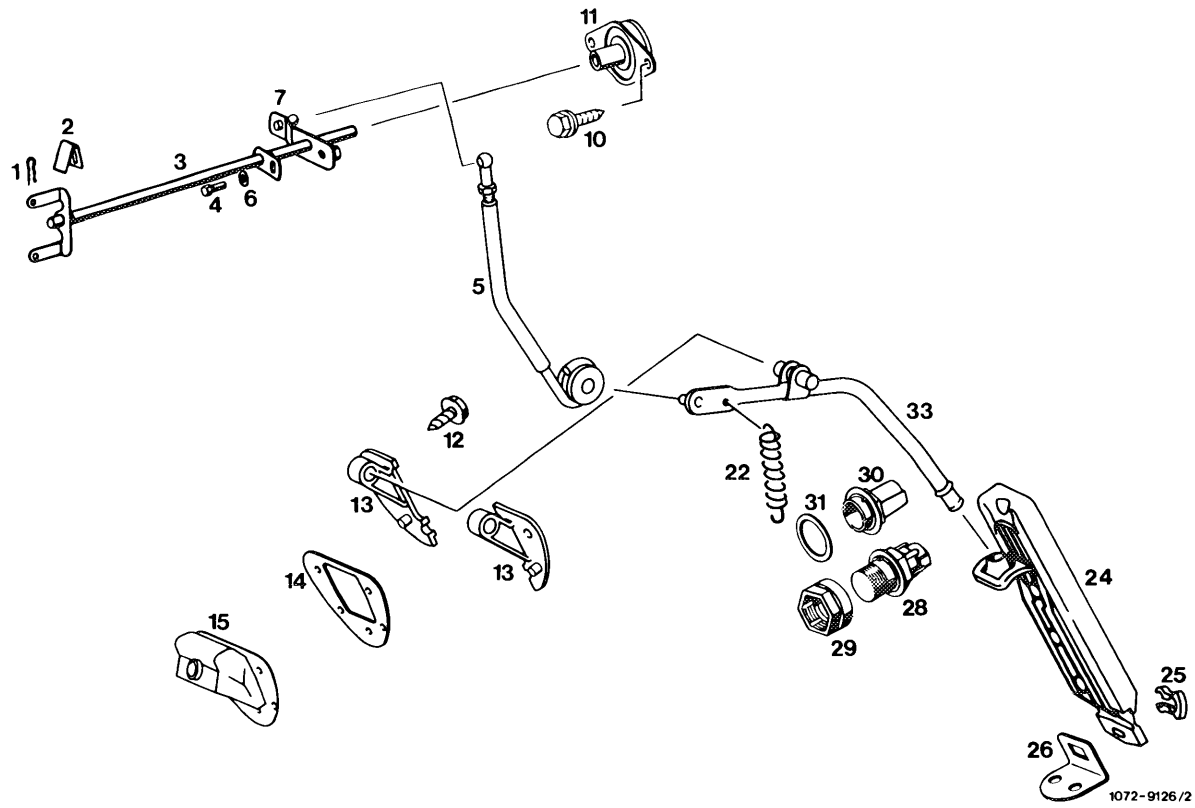
If the full throttle or idle speed stop is not attained with the previous adjustment, adjust connecting rod (21) from guide lever engine compartment to accelerator pedal and connecting rod (40) to specified length, measured from center of ball socket to center of ball socket.

Connecting rod (21) 172 mm
Connecting rod (40) 597 mm



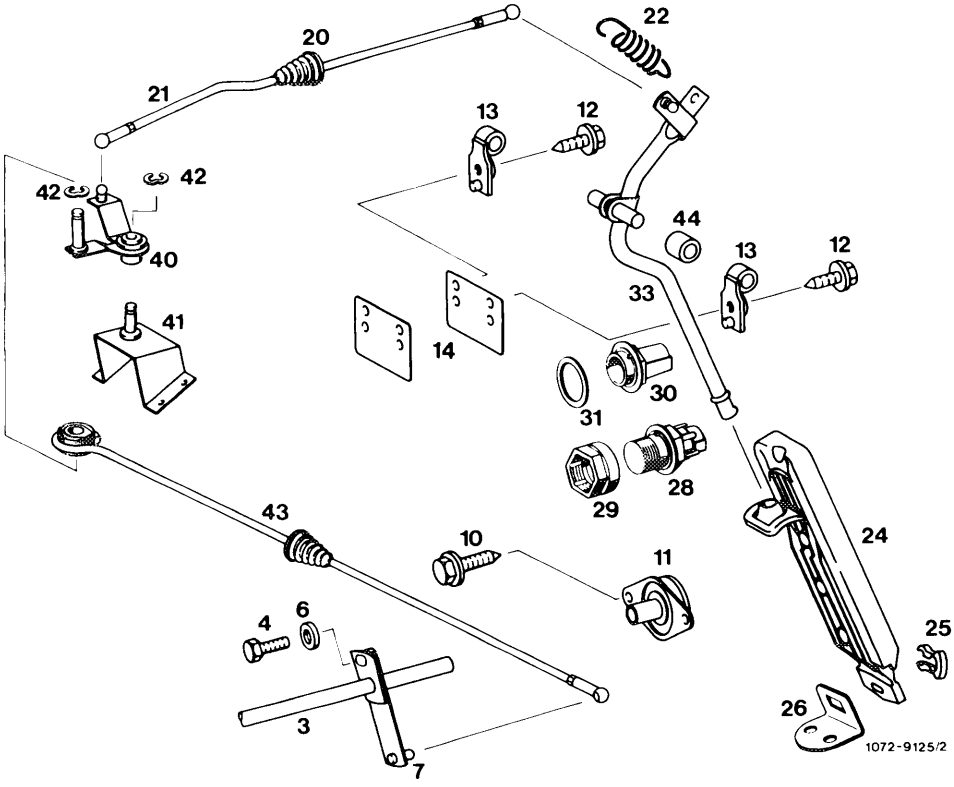
Chassis regulation

Lefthand steering model 126



1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
10 Hex. screw
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14 Intermediate plate
15 Rubber sleeve
22 Restoring spring
24 Accelerator pedal
25 Clip
26 Fastening plate
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer
33 Accelerator lever

Righthand steering model 126

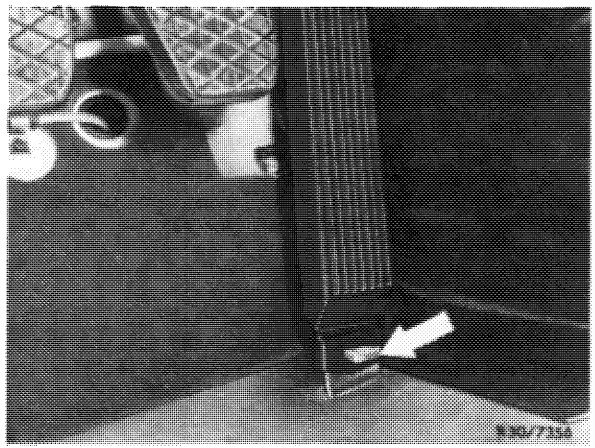


3	Longitudinal regulating shaft
4	Hex. screw
5	Pushrod
6	Washer
7	Guide lever for full throttle adjustment
10	Hex. screw
11	Bearing for longitudinal regulating shaft
12	Hex. screw
13	Bearing
14	Intermediate plate
15	Rubber sleeve
20	Rubber sleeve
21	Connecting rod
22	Restoring spring
24	Accelerator pedal
25	Clip
26	Fastening plate
28	Kickdown switch
29	Adjusting nut
30	Full throttle stop
31	Washer
33	Accelerator lever
40	Guide lever
41	Bearing bracket
42	Lock
43	Connecting rod
44	Spacer sleeve

A. Models 107, 116, 123

Removal

1 Compress expanding clip (arrow) behind accelerator pedal and pull out.



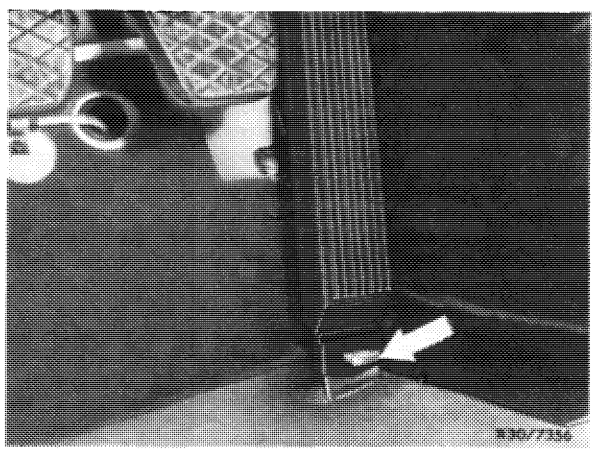
Installation

2 During installation, make sure that expanding clip is securely engaging.

B. Model 126

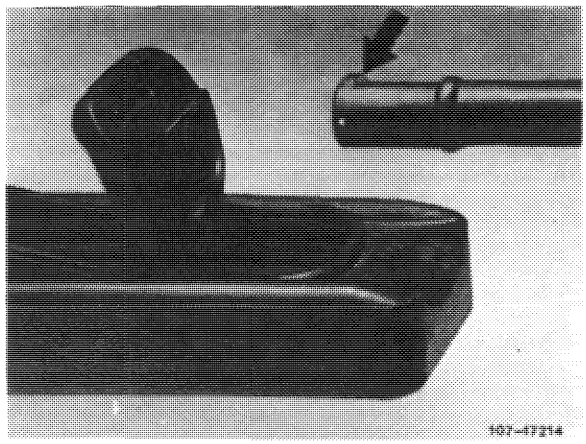
Removal

1 Compress expanding clip (arrow) behind accelerator pedal and pull out.



2 Push accelerator pedal up and turn around by 180°.

3 Pull off accelerator pedal in downward direction, lug (arrow) on accelerator lever should be in alignment with groove in accelerator pedal.



Installation

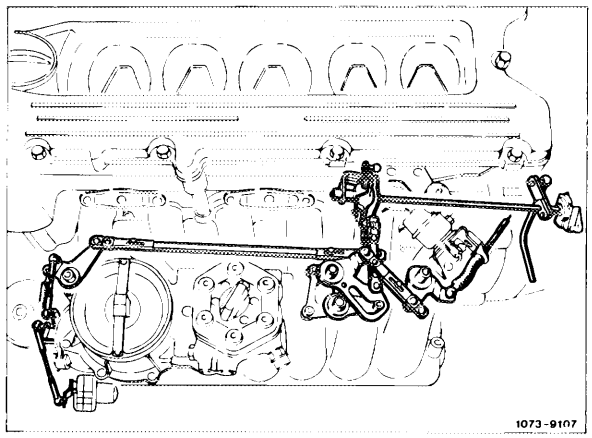
4 For installation proceed vice versa, making sure that the expanding clip is securely engaging.

The connection from accelerator lever to accelerator pedal is maintenance-free and requires no lubrication.

Following each car wash and preservation of engine compartment, lubricate **all bearing points of all regulating shafts, regulating levers, joints of regulating linkage and cable controls by means of an oil can.**

On **USA version** vehicles only the following hydraulic fluids may be used:

BP Aero-Hydraulik 1
Castrol DB Hydraulik Fluid
Esso Univers J-13
Mobil Aero HFA
Shell Aero Fluid 4

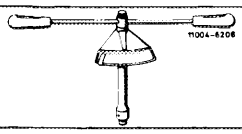


Filling capacities in liters

Model	107	116	123.03/05	123.09	126
Full readout	approx. 85	approx. 96	approx. 80	approx. 70	approx. 90
Warning lamp – reserve	approx.11,5	approx. 13	approx.11,5	approx. 11	approx.12,5

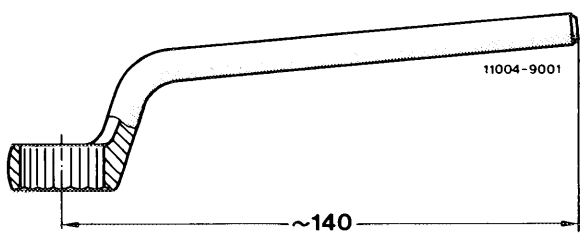
Tightening torques	Nm		
Fastening screws or fastening nuts for fuel tank	17–25	26–34	17–25
Immersion tube transmitter	35–43		
Fuel strainer			
Suction hose	24–32		
Return hose			31–39

Special tool

Torque wrench, double-arm, 15–63 Nm		00 589 27 21 00

Self made tool – model 126

Conventional, offset box-end wrench (SW 19), length according to drawing



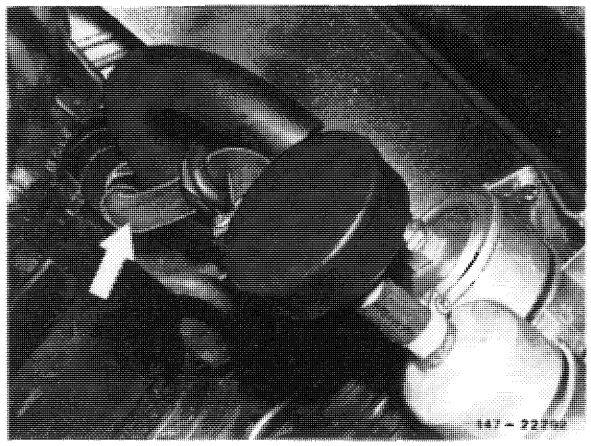
Attention!
When removing fuel tank, pay attention to safety rules.

Removal

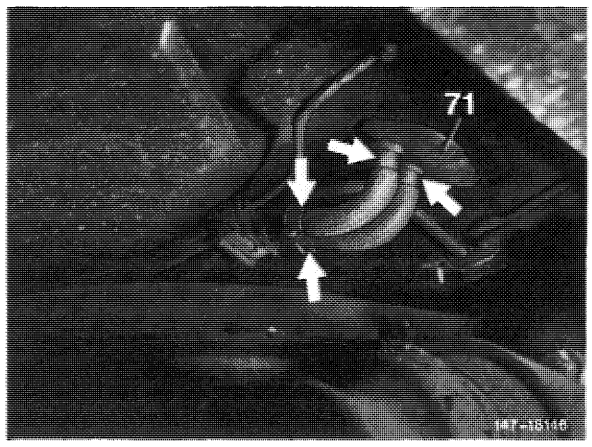
1 Disconnect grounding line on battery.

2 Drain fuel tank. Carefully pump out fuel, so that no residual fuel remains in fuel tank.

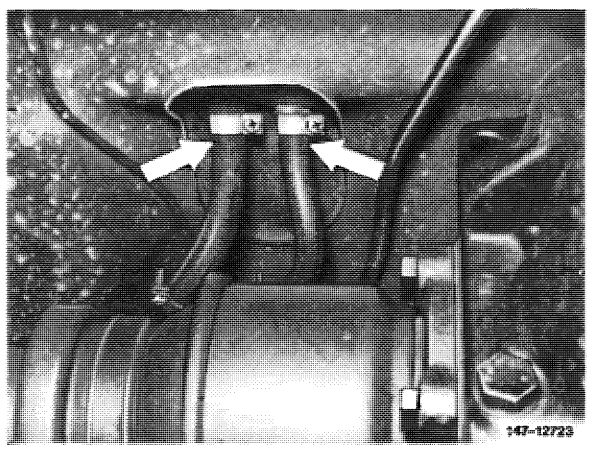
3 Loosen suction hose, fuel return hose and vent hose. Catch residual fuel from hoses. Close hoses and connections.



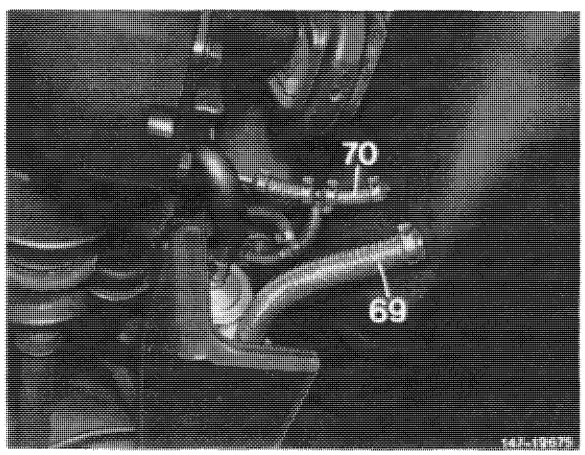
Model 107, 116, 123
Suction hose



Model 107.02
Vent and return flow hose

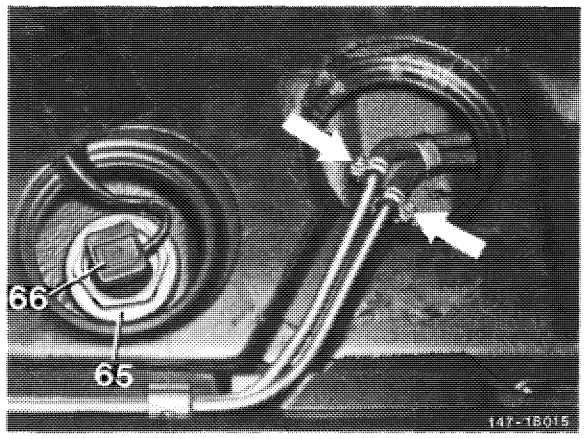


Model 116, 123.03/05
Vent and return flow hose



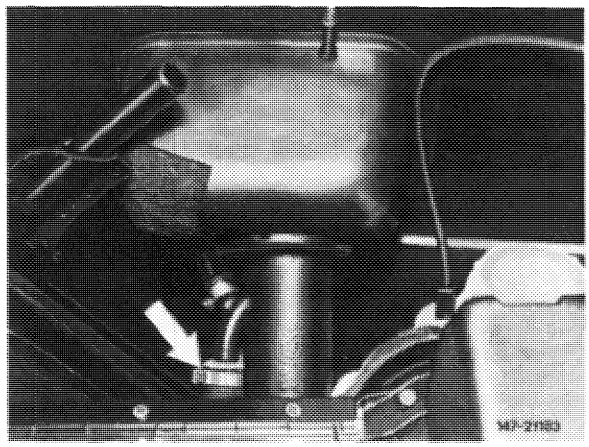
Model 123.09
69 Suction hose
70 Return flow hose

4 On T-sedan, remove luggage compartment floor and intermediate compartment. Pull off vent hoses (arrows) and coupling (66).

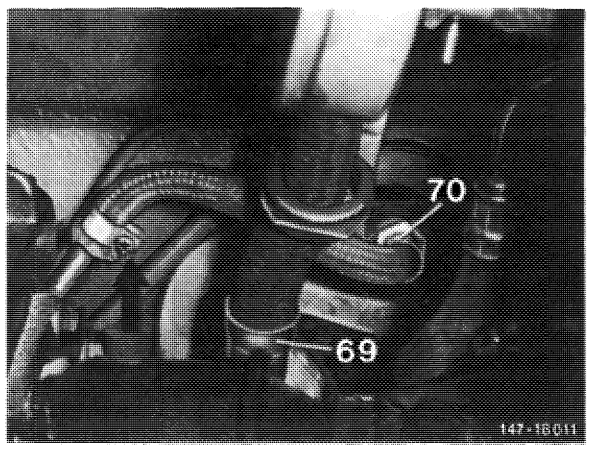


Model 123.09

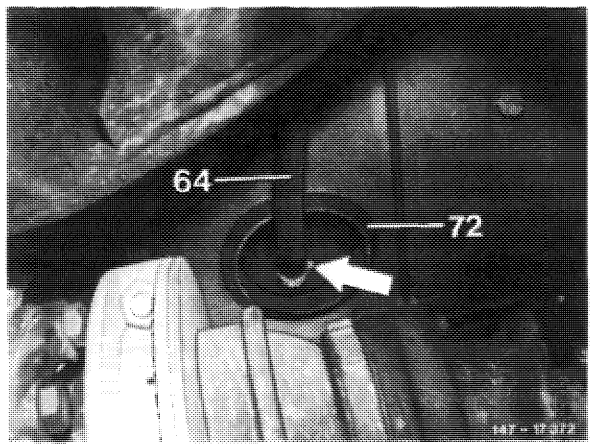
5 Loosen hose clamp (arrow) and pull off vent hose. Close hose and pipe connection.



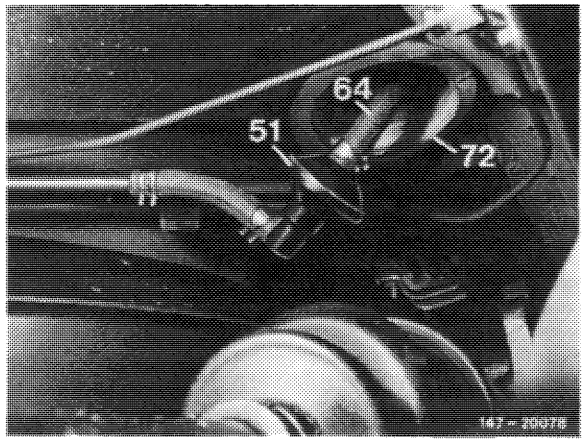
Model 123.09
Vent hose



Model 126
69 Suction hose
70 Return flow hose



Model 126
64 Vent hose

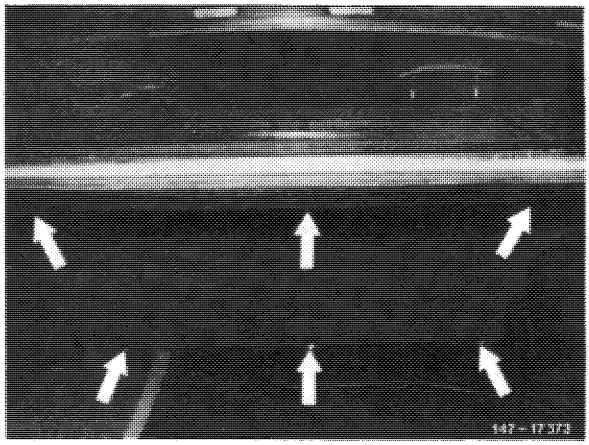


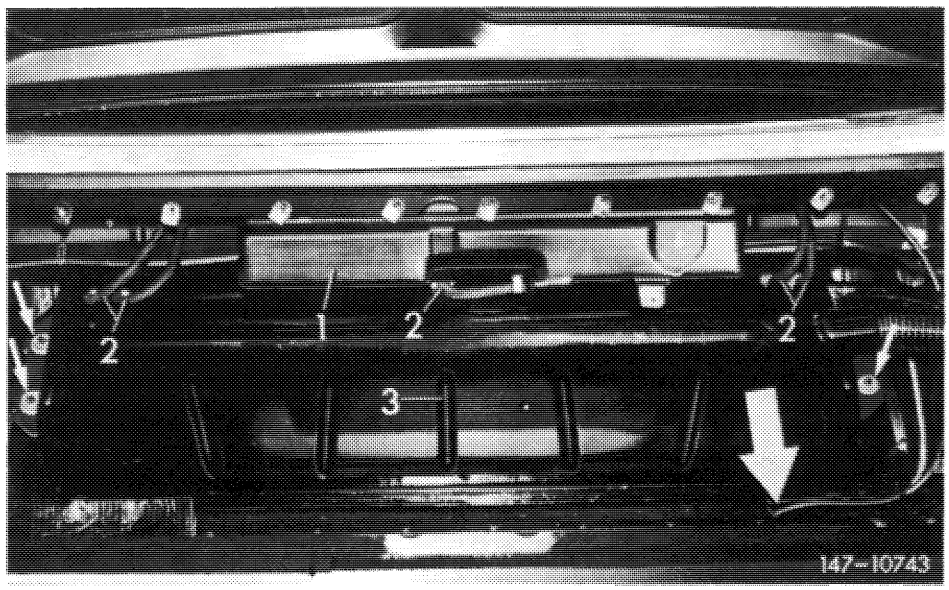
Model 126 (J)
51 Vent valve
64 Vent hose
72 Sealing sleeve

6 Remove luggage compartment mat.

7 Unscrew rear wall and remove.

8 On model 107.04, remove fuel expansion tank (1) (47–705).



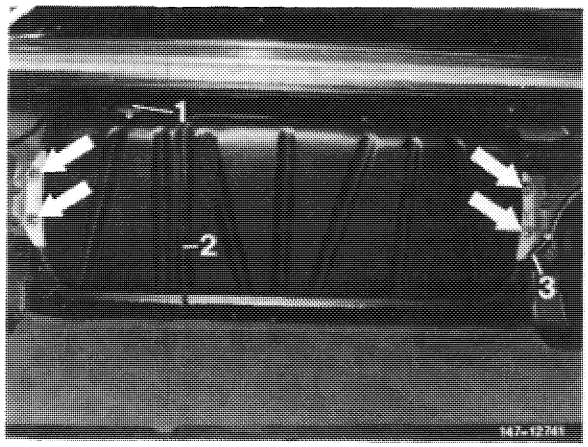


Model 107.04
1 Fuel expansion tank
2 Fuel hoses
3 Fuel tank
Arrow = Vent line

9 Unscrew fastening nuts.

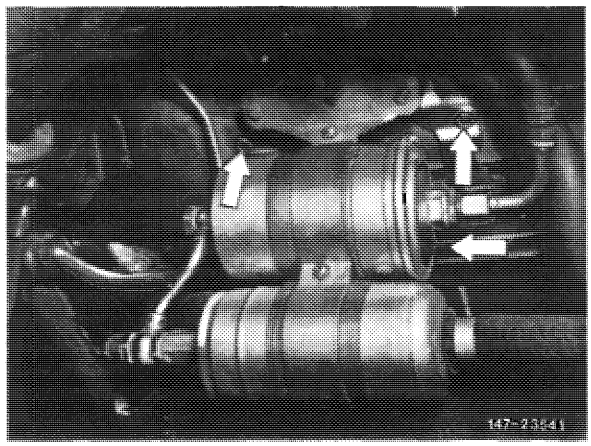
10 Slightly pull out fuel tank and pull off coupling for fuel readout on immersion tube transmitter.

11 Remove fuel tank.



1 Coupling immersion tube transmitter
Arrows = Fastening nuts

Note: On T-sedans, for removing fuel tank remove protective casing for pump assembly. Then unscrew the three fastening screws (arrows) for combination holder pump assembly/fuel tank. Disconnect harness for fuel pump at edge of fuel tank.

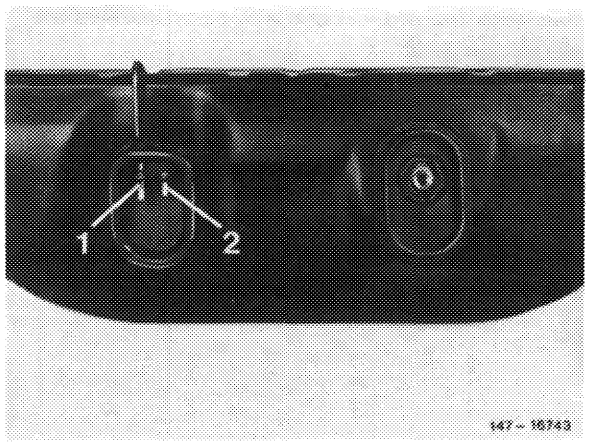


Model 123.09

Installation

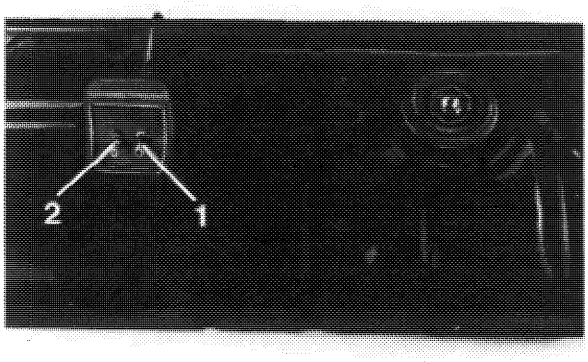
12 Install fuel tank in vice versa sequence, proceed as follows:

a) Glue both gaskets to bottom of fuel tank by means of MB universal glue, part No. 000 989 92 71. For installation, coat both gaskets on sealing surface or bead with sliding compound (talcum, wax or the like).



Model 107.02/123

1 Positive and negative vent line
2 Return flow line



Model 116

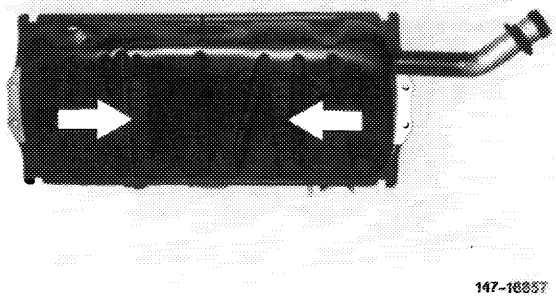
1 Positive and negative vent line
2 Return flow line

147 – 16744

b) Check whether foam rubber strip on fuel tank is rigidly attached and glue down with MB universal glue, part No. 009 989 02 71, if required.

c) On model 123.09, glue foam rubber strips on fuel tank at level of filler neck crosswise to driving direction.

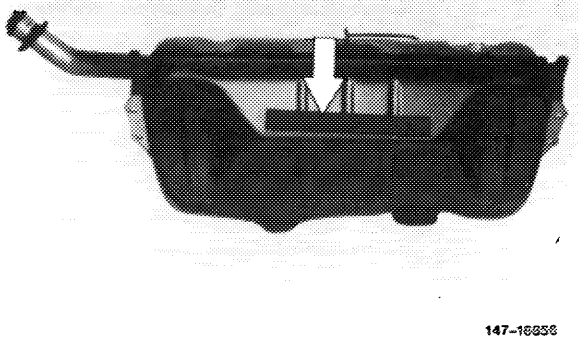
Note: Never use felt or similar material, since otherwise corrosion damage may occur.



147-16857

d) Blow out strainer (b) and check for damage. Renew sealing ring (a). Install fuel strainer (68) and tighten to 35–43 Nm.

Note: The strainer jacket (b) comprises a square mesh fabric with 0.1 mm mesh width. To prevent mixups, the word "Benzin" (gasoline) is printed on metal section.

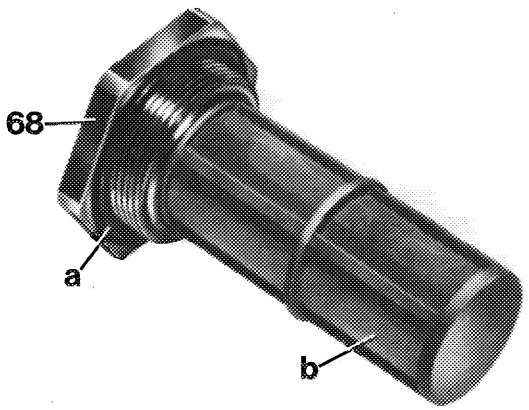


147-16858

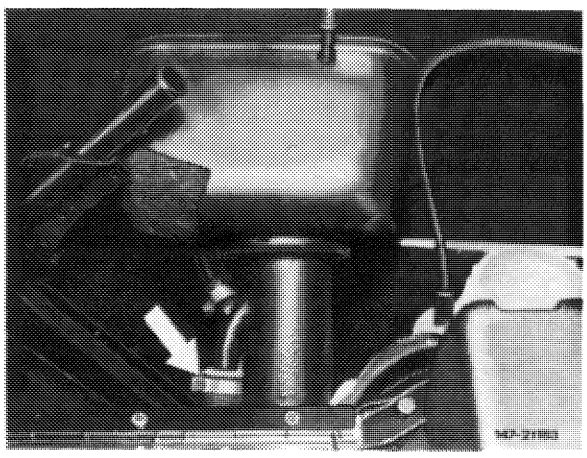
e) Install fuel tank with specified reinforcing sheet metal and washers. Tighten fastening nuts to 17–25 Nm.
On model 123.09, tighten self-locking fastening nuts to 26–34 Nm.

f) Install vent hose (arrow) between fuel tank and filler neck free of kinks and with a continuous slope toward fuel tank.
The slipped-on O-ring serves for sealing at passage toward interior.

g) Pay attention to correct seat of sleeves on filler neck.

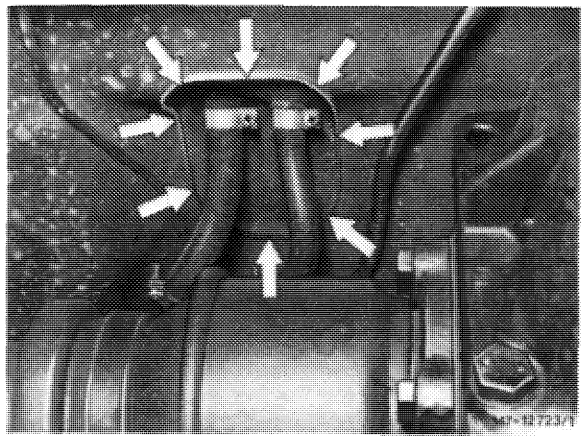


147-17012/1



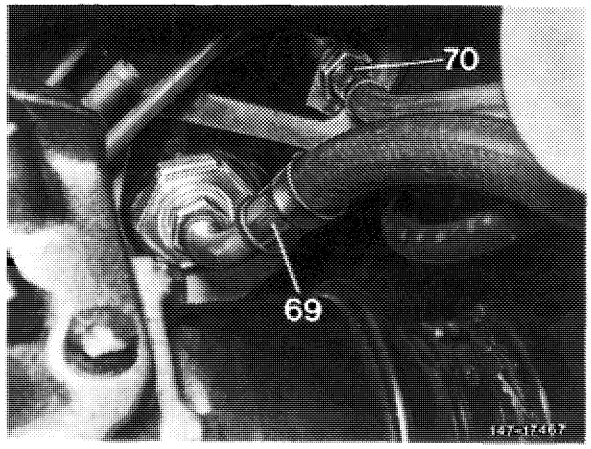
Model 123.09

h) On model 123, check seal between fuel tank and rear floor and seal again, if required. For this purpose, carefully apply Unionzement by means of a brush or the like against circumference of opening (arrows).



i) Check fuel hoses and renew, if required.

j) On model 126, renew copper seal between fuel tank and return flow hose (70).

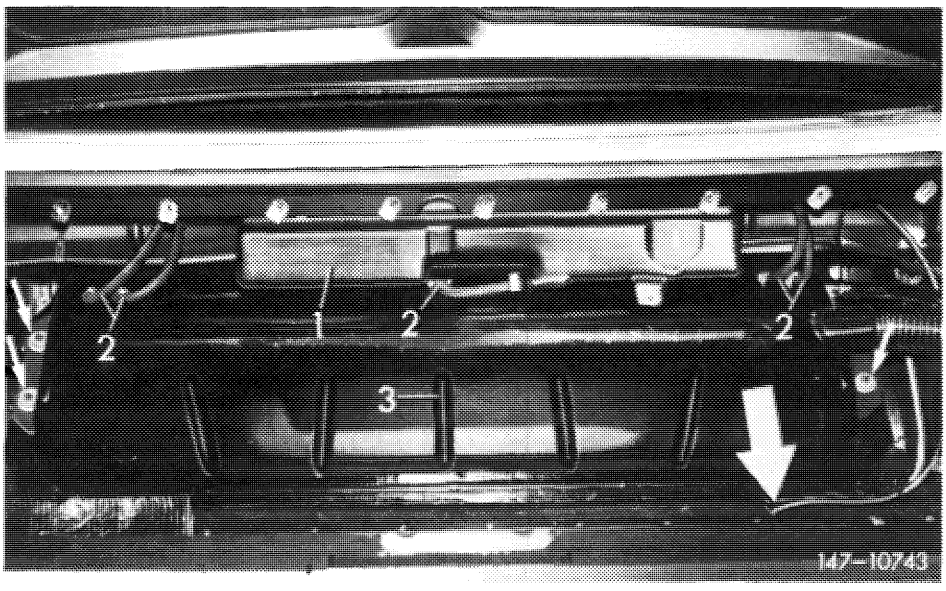


Model 126

k) For installing expansion tank on model 107.04, install vent line behind filler neck first.

l) When tightening hose clamps, apply counterhold to connections of expansion tank.

m) Plug on protective sleeve at end of vent line.



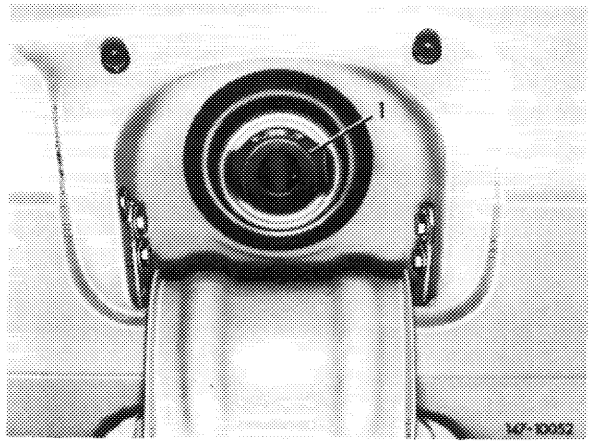
1 Fuel expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow = Vent line

n) Check function of fuel readout (ground connection on battery connected).

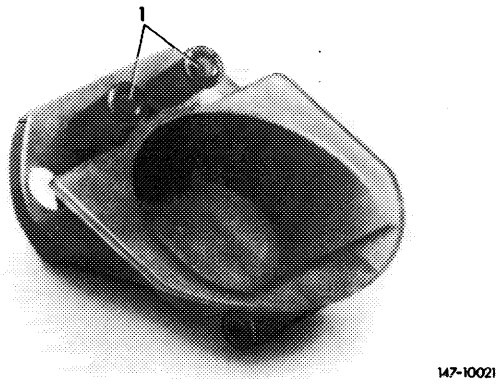
o) Check fuel system for leaks.

(USA) starting 1977

On these vehicles a guide funnel (1) is installed in filler neck to accommodate the small fuelling guns for lead-free fuel.

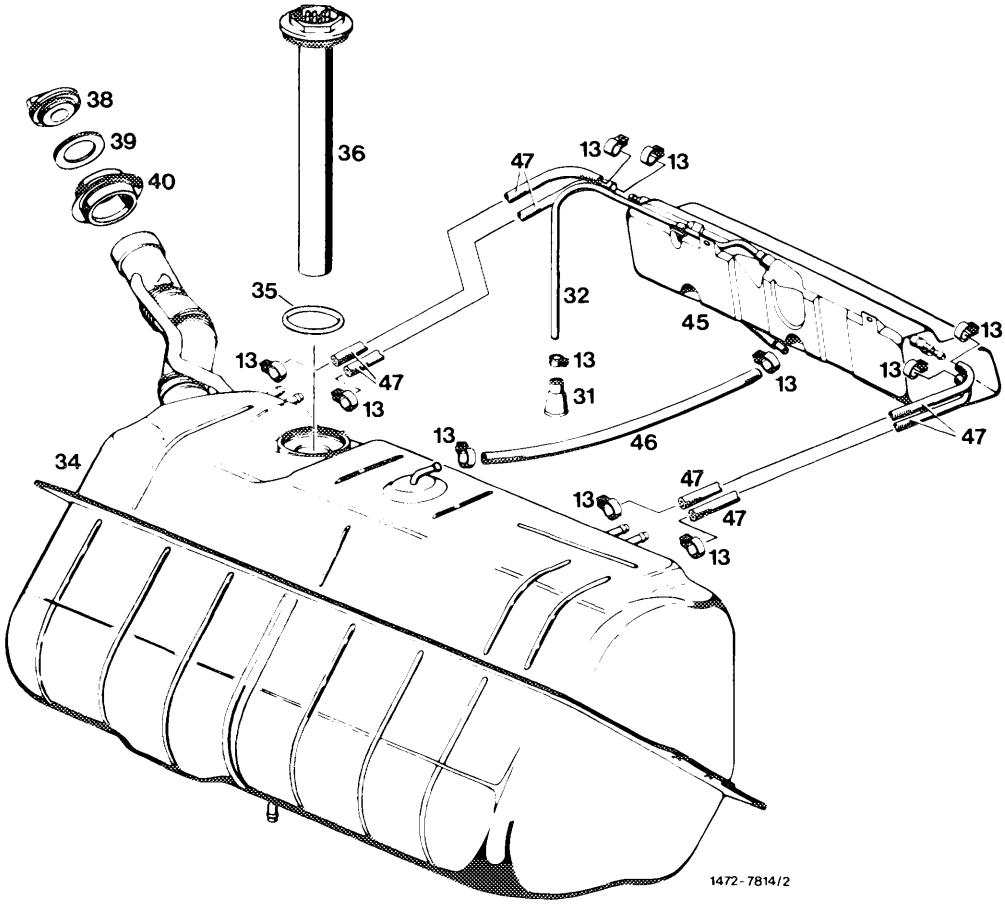


If a fuel tank on these vehicles is renewed, simultaneously install a guide funnel **in USA vehicles only.** For this purpose, prior to assembly of fuel tank, insert guide funnel into filler neck and knock in fastening rivet (1) up to stop by means of a mandrel.



Fuel tank positive and negative venting lines

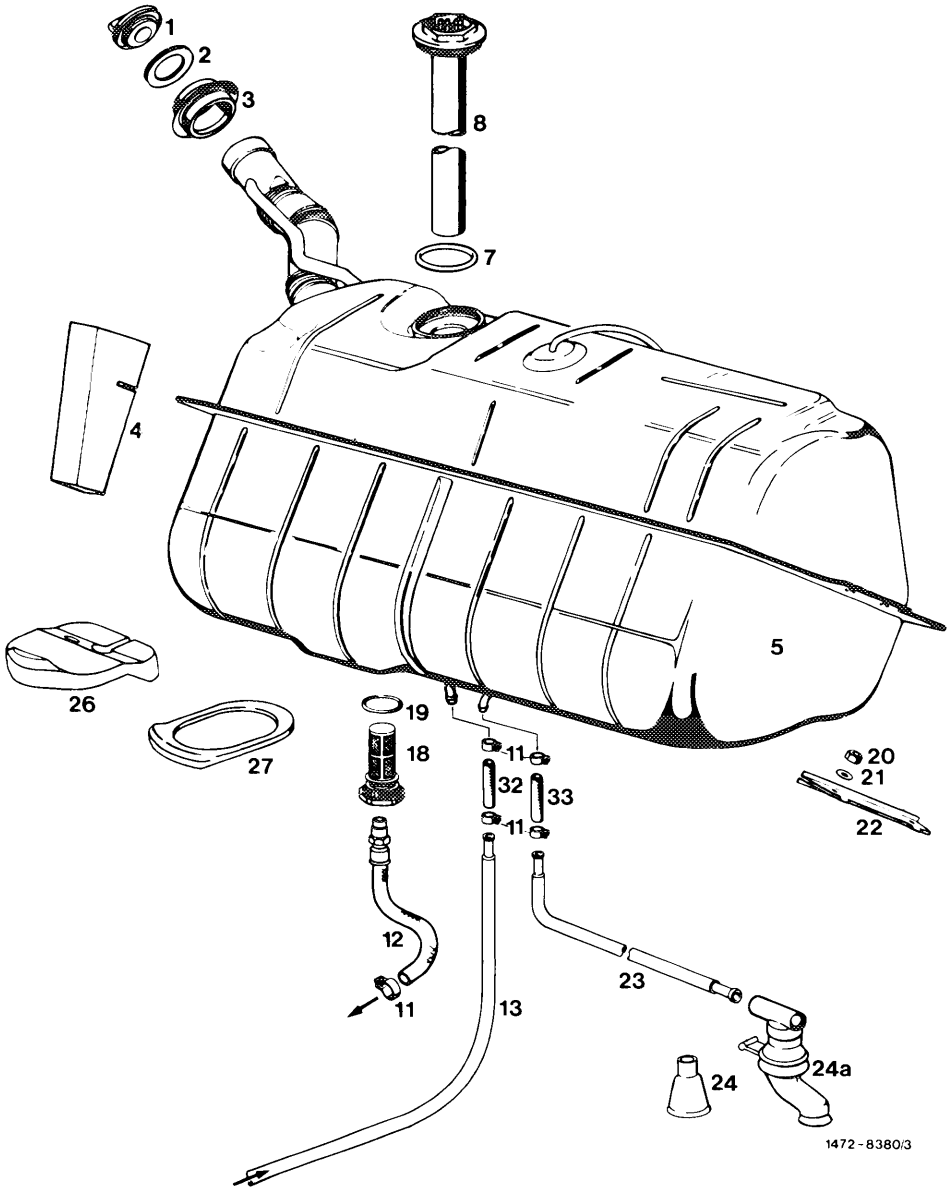
Model 107.04



13	Hose clamps	38	Closing cap
31	Protective sleeve	39	Seal
32	Vent line	40	Rubber grommet
34	Fuel tank	45	Expansion tank
35	Sealing ring	46	Fuel hose
36	Immersion tube transmitter	47	Fuel hose

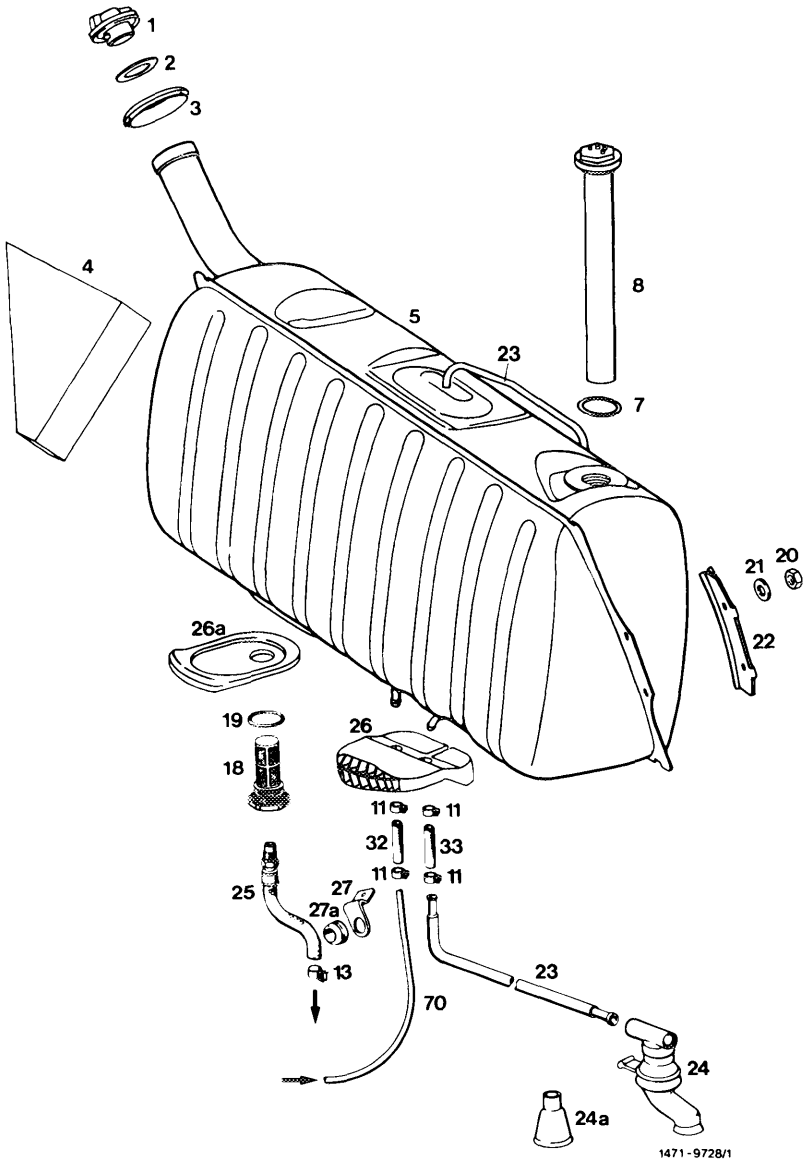
Fuel tank

Model 107.02, 116



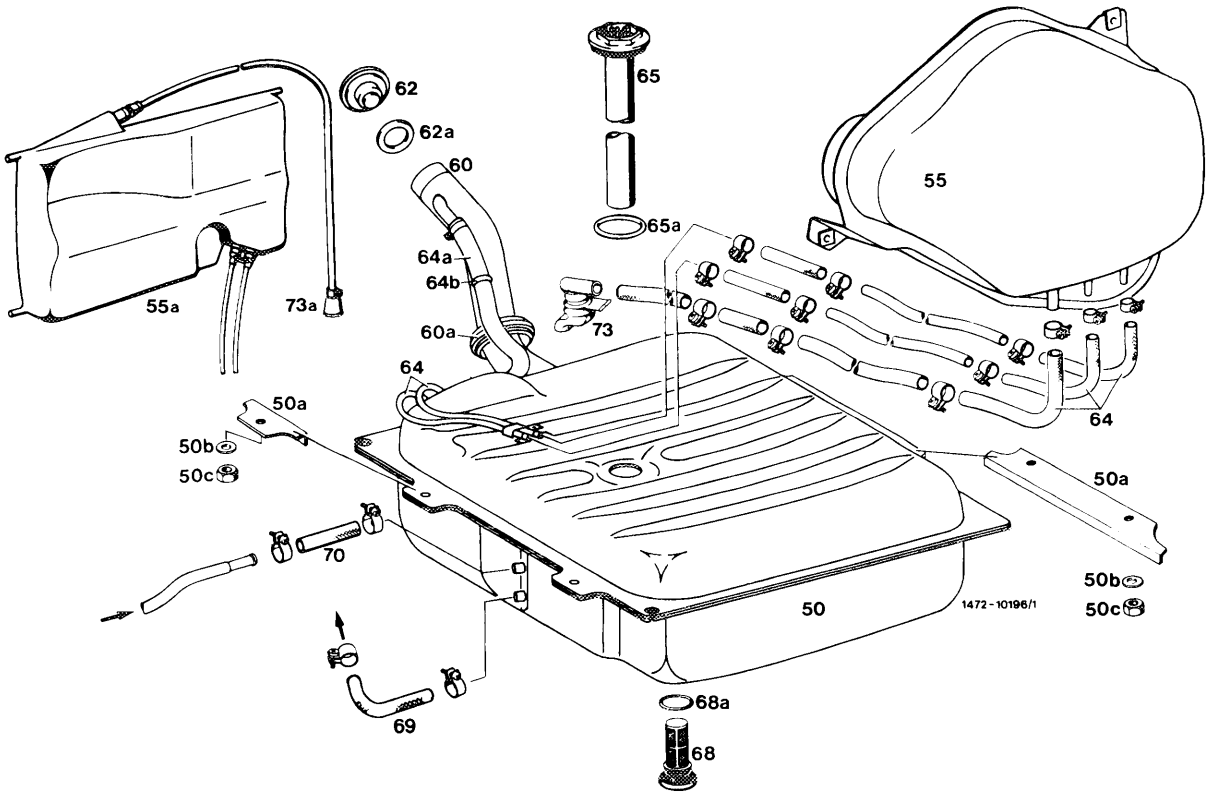
1	Filler cap	12	Fuel feed	24	Vent sleeve 1st version
2	Seal	13	Fuel return flow	24a	Vent sleeve 2nd version
3	Rubber sleeve	18	Fuel strainer	26	Rubber gasket
4	Damping shim	19	Sealing ring	27	Rubber gasket
5	Fuel tank	20	Nut	32	Fuel hose
7	Sealing ring	21	Washer	33	Fuel hose
8	Immersion tube transmitter	22	Reinforcing strip		
11	Hose clamp	23	Vent line		

Fuel system, fuel tank positive and negative vent lines
Model 123 sedan and coupe



1	Filler cap	18	Fuel strainer	26	Rubber gasket
2	Seal	19	Sealing ring	26a	Rubber gasket
3	Rubber sleeve	20	Nut	27	Holder
4	Damping shim	21	Washer	27a	Grommet
5	Fuel tank	22	Reinforcing strip	32	Fuel hose
7	Sealing ring	23	Vent line	33	Fuel hose
8	Immersion tube transmitter	24	Vent sleeve (2nd version)	70	Fuel return flow line
11	Hose clamp	24a	Vent sleeve (1st version)		
13	Hose clamp	25	Fuel suction hose		

Fuel system, fuel tank positive and negative vent lines
Model 123 T-sedan and special vehicles with special body

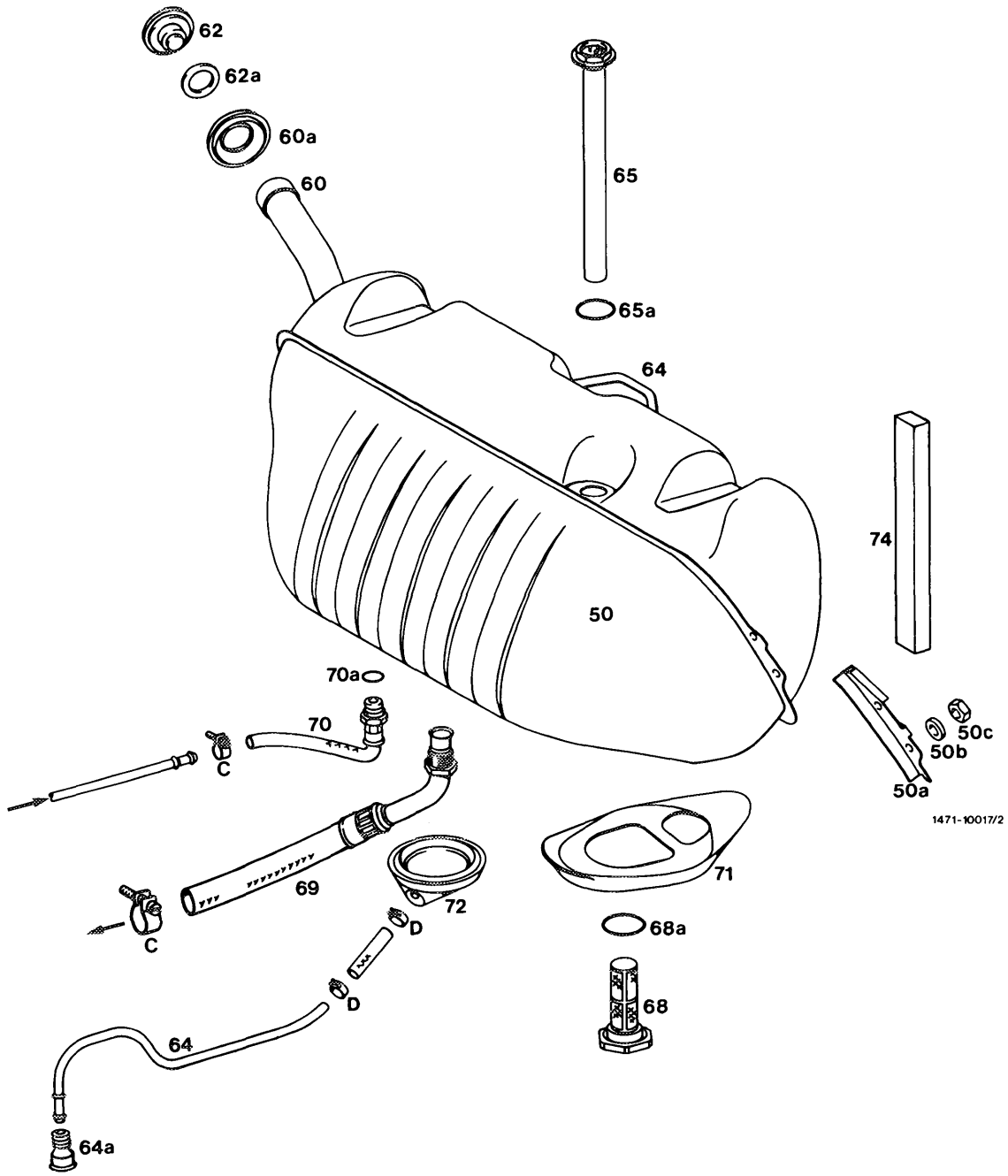


50 Fuel tank
50a Reinforcing sheet metal
50b Washer
50c Nut, self-locking
55 Expansion tank
T-sedan and 2nd version
Special vehicles with special body
55a Expansion tank 1st version
Special vehicles with special body

60 Filler neck
60a Sealing sleeve (2 each)
62 Closing cap
62a Sealing ring
64 Vent lines
64a Vent line
64b Sealing ring
65 Immersion tube transmitter
65a Sealing ring

68 Fuel strainer
68a Sealing ring
69 Feed
70 Return flow
73 Vent sleeve 2nd version
73a Protective sleeve 1st version

Fuel tank
Model 126



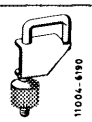
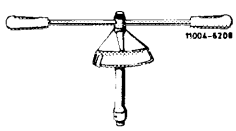
50	Fuel tank	62a	Sealing ring	69	Suction hose
50a	Reinforcing sheet metal	64	Vent line	70	Return flow line
50b	Shim	64a	Protective sleeve	70a	Copper sealing ring
50c	Nut	65	Immersion tube transmitter	71	Gasket
60	Filler neck	65a	Sealing ring	72	Sealing sleeve
60a	Sealing sleeve	68	Fuel strainer	74	Damping shim
62	Closing cap	68a	Sealing ring		

A. Model 114

Filling capacity in liters	(J) (S) (USA) 1973/74	(USA) 1975/76
Full readout	65	78
Warning lamp reserve approx.	9	9

Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	20–25	(2–2.5)
Self-locking fastening nuts	26–34	(2.6–3.4)
Fuel drain plug	35–43	(3.5–4.3)

Special tools

Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square, 15–65 Nm (150–650 kpcm)		000 589 27 21 00
Torque wrench, double arm, 1/4" square, 4–16 Nm (40–160 kpcm)		000 589 67 21 00

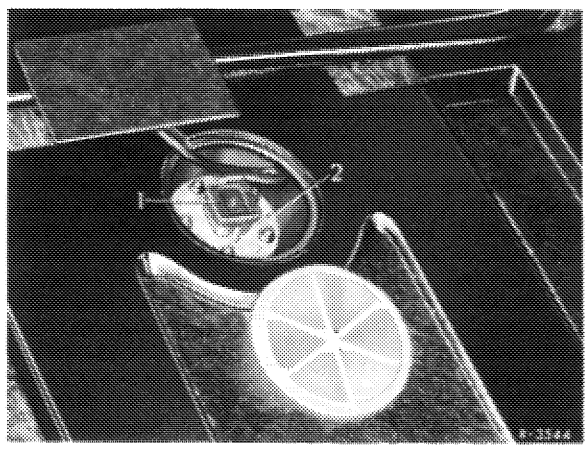
Attention!
When removing fuel tank, pay attention to safety rules.

Removal

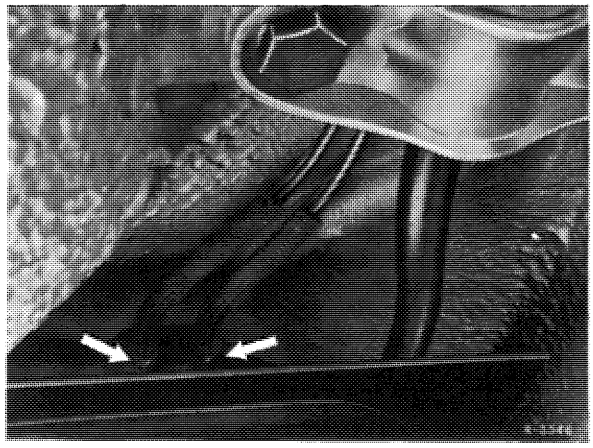
1 Disconnect ground line on battery.

2 Drain fuel tank while unscrewing fuel drain plug (4 in fig. item 5).

3 Pull coupler (1) for fuel readout from immersion tube transmitter (2).

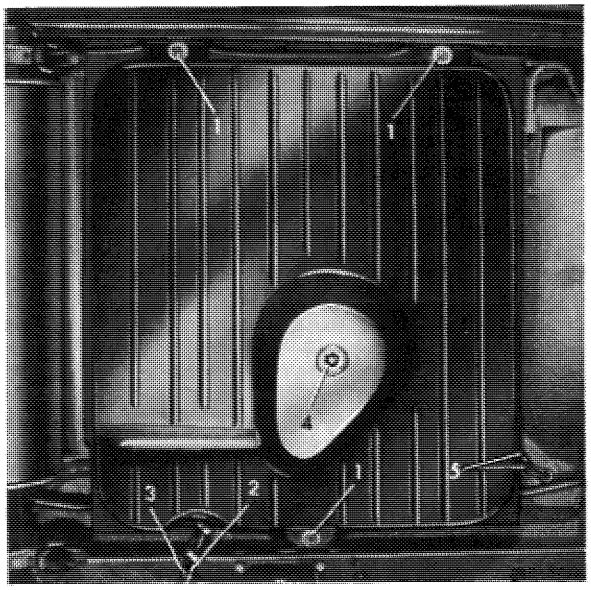


4 Pull off positive and negative venting line on fuel tank (arrows).



5 Pinch fuel hoses (2 and 3) with a clamp. Loosen hose clips and pull fuel hoses from fuel tank.

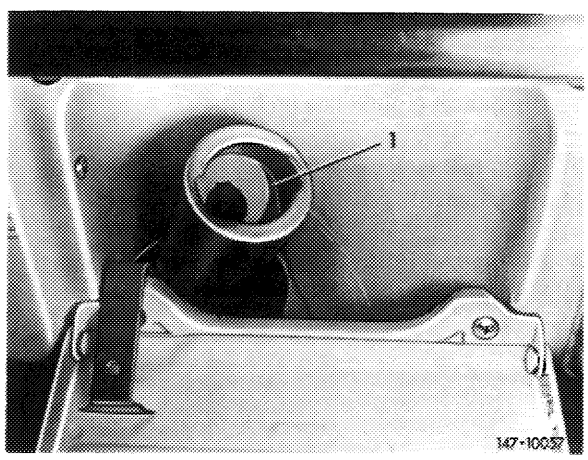
6 Loosen fastening nuts (1) and remove fuel tank.



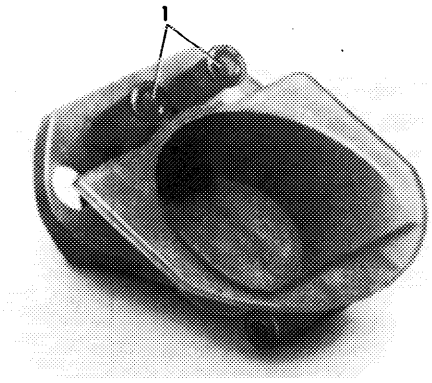
Installation

(USA) 1975/76

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.



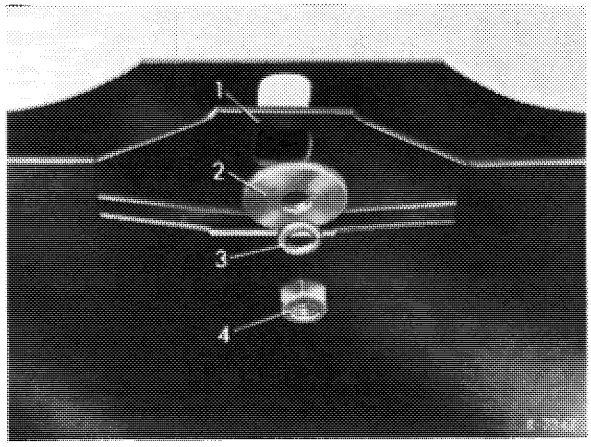
1 Fastening rivets

147-10023

Install fuel tank in reverse order. Pay attention to the following items:

7 Mount fuel tank with reinforcing panels (1) and washers (2) provided.

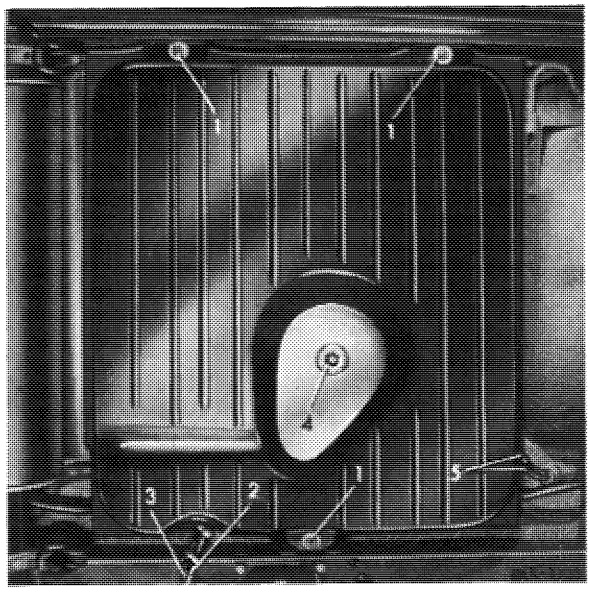
If the reinforcing panels are left out or the washers used are too small, the holding brackets on fuel tank may be torn off.



8 Check whether foam rubber strips on fuel tank are tight and glue down with MB universal glue part no. 000 989 92 71, if required.

Note: Never use felt or similar material, since this may lead to corrosion damage.

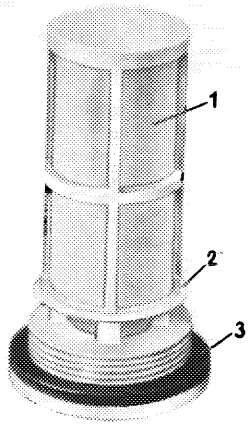
9 Tighten the three fastening nuts (1) to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).



10 Blow out strainer jacket (1) of fuel drain plug and check for damage. Install closing plug and tighten to 35–43 Nm (3.5–4.3 kpm).

Note: The filter is made of square mesh fabric of **0.1 mm mesh width**. To prevent mixing up closing plug, the word "diesel" is punched-in on diesel engines.

11 Connect ground line to battery. Check function of fuel readout.



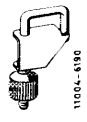
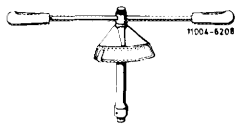
R-1330

B. Model 116

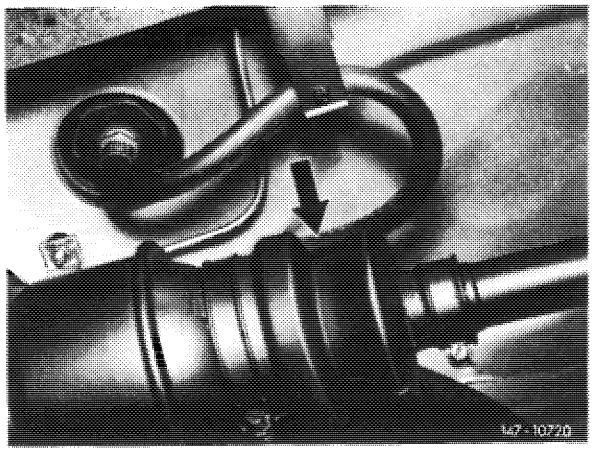
Full readout	approx. 96
Warning lamp – reserve	approx. 13

Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	17–25	(1.7–2.5)
Immersion tube transmitter	19–27	(1.9–2.7)

Special tools

Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square 15–65 Nm (150–650 kpcm)		000 589 27 21 00

Attention!
When removing fuel tank, pay attention to safety rules.

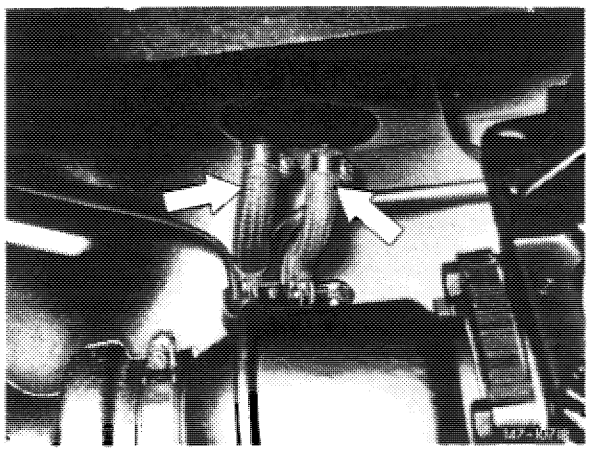


Removal

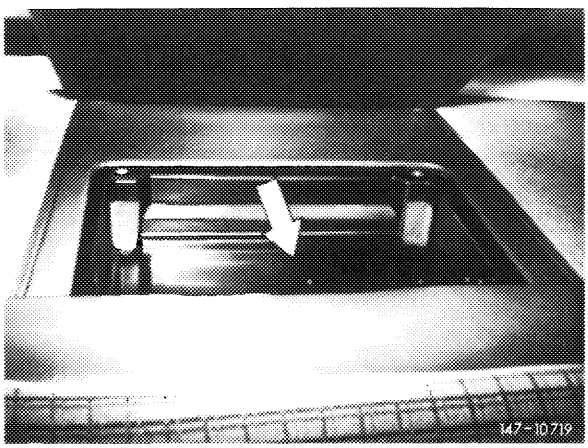
1 Disconnect ground line on battery.

2 Drain fuel tank. For this purpose, pinch fuel suction hose (arrow) with clamp. Loosen hose clamp on fuel feed line, pull off hose and drain fuel.

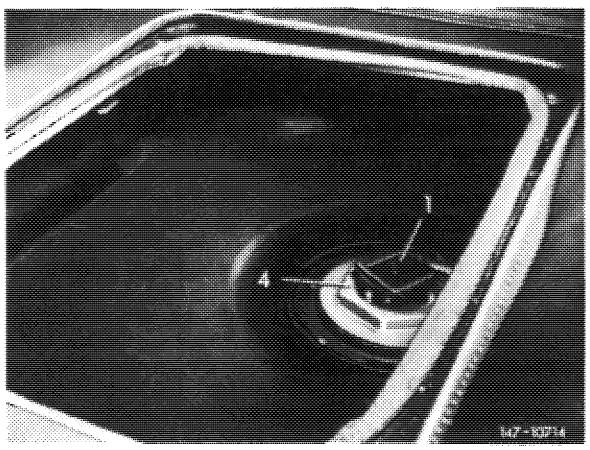
3 Loosen hose clamps on fuel return hose and fuel tank vent hose (arrows) and pull hoses from fuel tank.



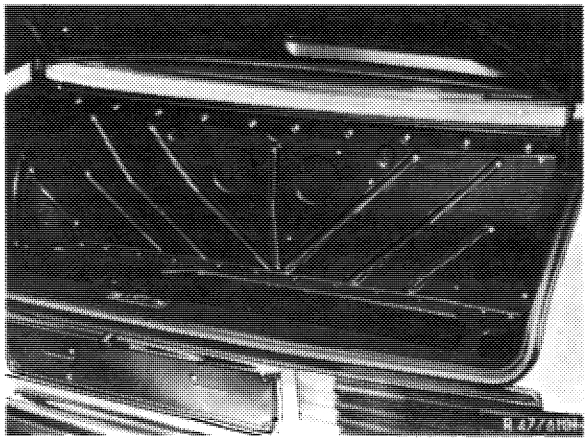
4 Remove first aid kit and first aid kit mounting tray (arrow).



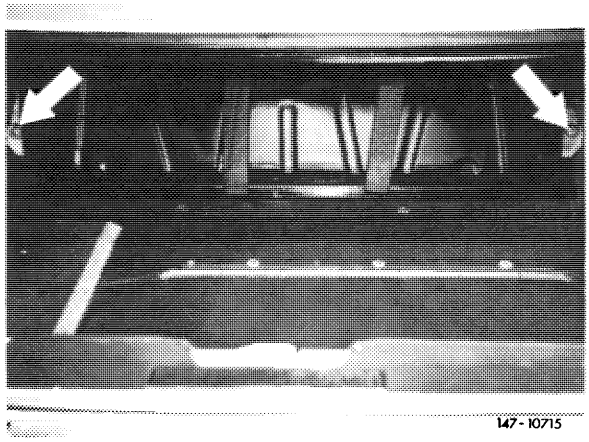
5 Pull coupler (1) for fuel readout from immersion tube transmitter (4) and protect against slipping off with a wire.



6 Remove rear wall for fuel tank cover.



7 Unscrew fuel tank fastening nuts (arrows) and remove fuel tank.

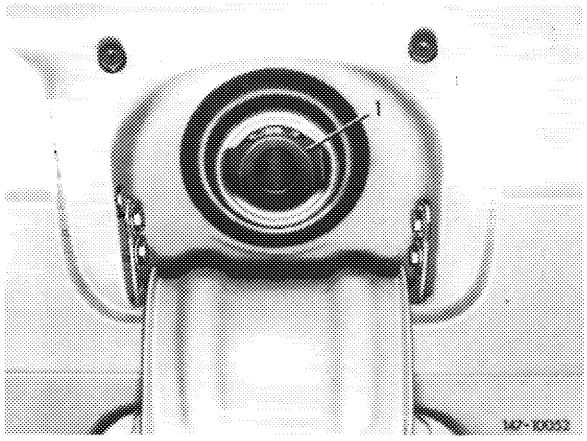


147-10715

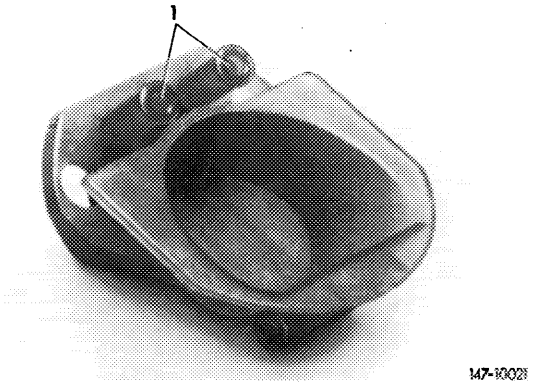
Installation

(USA) 1975/76 only

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.

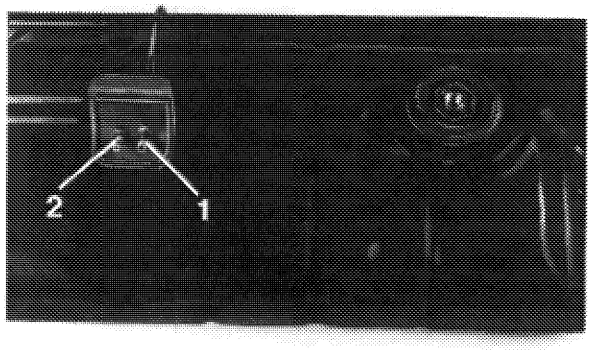


1 Fastening rivets

147-10028

8 Install fuel tank in reverse order as follows:

a) Glue both gaskets to bottom of fuel tank with MB universal glue, part no. 000 989 92 71. For installation, coat both gaskets on sealing surface or bead with sliding agent (talcum, wax or the like).



1 Positive and negative vent line
2 Fuel return line

147 – 16744

b) Check whether foam rubber strips on fuel tank are tight; if required, glue down for example with MB universal glue, part no. 000 989 92 71.

c) Mount fuel tank with specified reinforcing panels and washers. Tighten fastening nuts to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).

d) Pay attention to correct seat of rubber sleeve on filler neck.

e) Mount coupler for fuel readout and check for function.

A. Model 107.04

Note

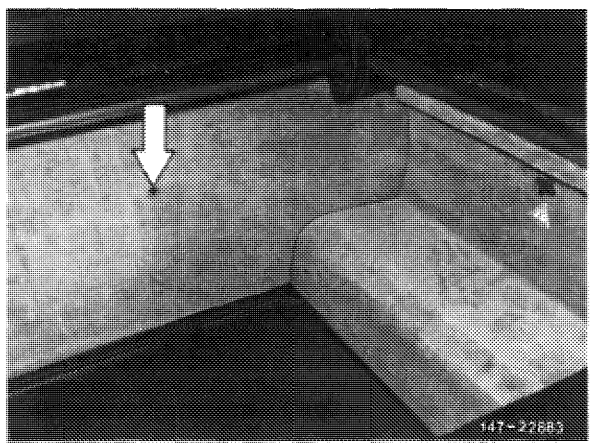
On models 107.02, 116, 123 and 126 sedan and coupe the fuel expansion tank is integrated in fuel tank and cannot be disassembled.

Removal

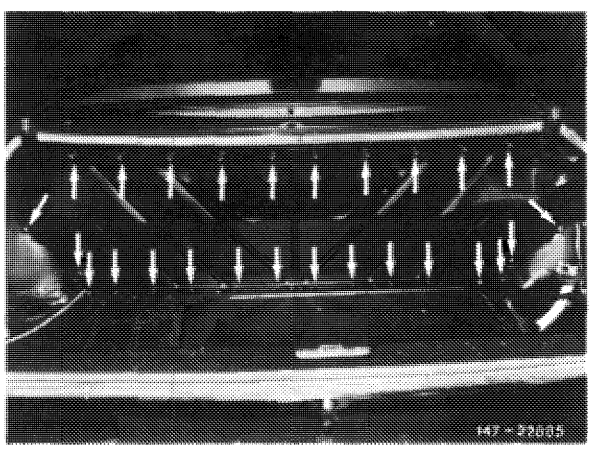
1 Remove hard top. Open top lock and remove top.

2 Remove trunk mat.

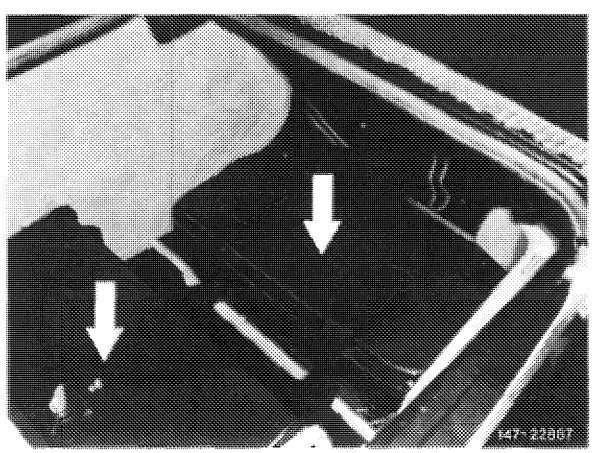
3 Unscrew fastening screw (arrow) for expansion tank.



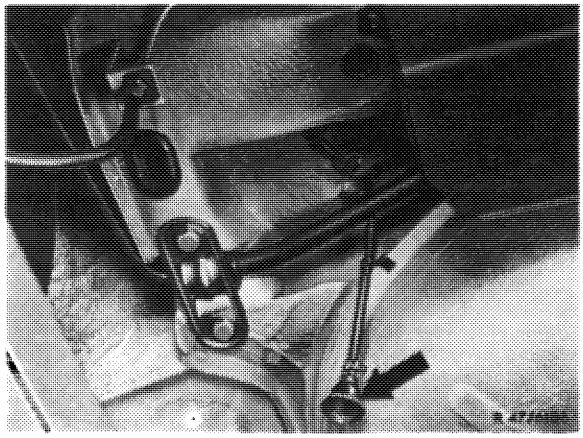
4 Unscrew rear wall and remove. For this purpose, loosen lining in upper edge range and laterally and unscrew fastening screws (arrows).



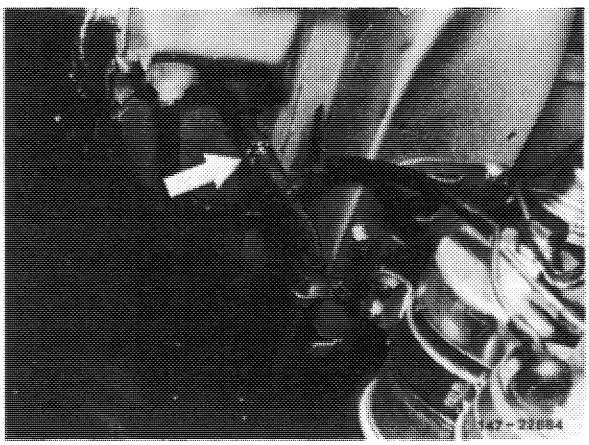
5 On vehicles with battery in trunk, remove battery and battery encasing (arrows).



6 Remove protective sleeve (arrow) and unclip vent line from holding clamp.

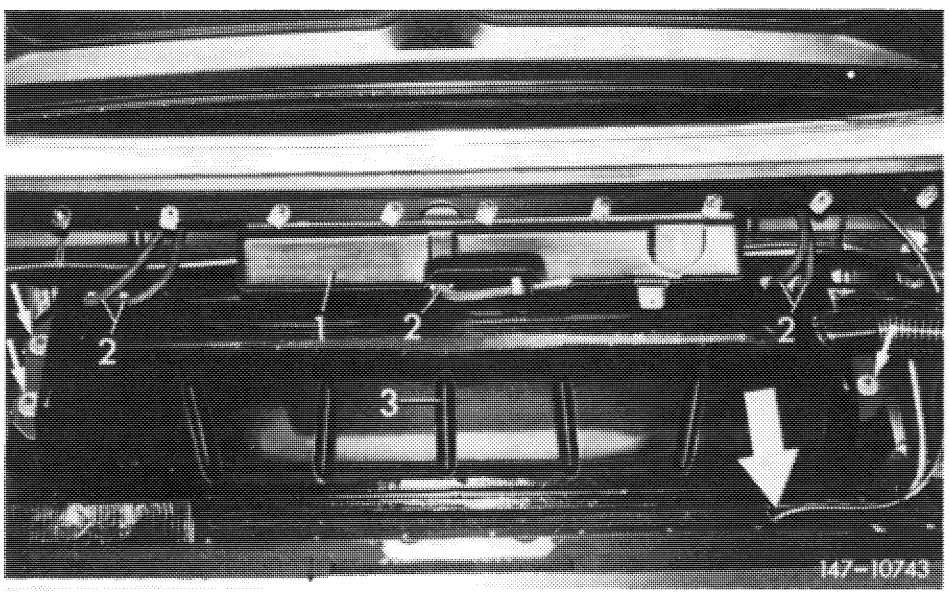


7 On (AUS), (J) and (USA) version vehicles, pull fuel hose (arrow) from vent line.



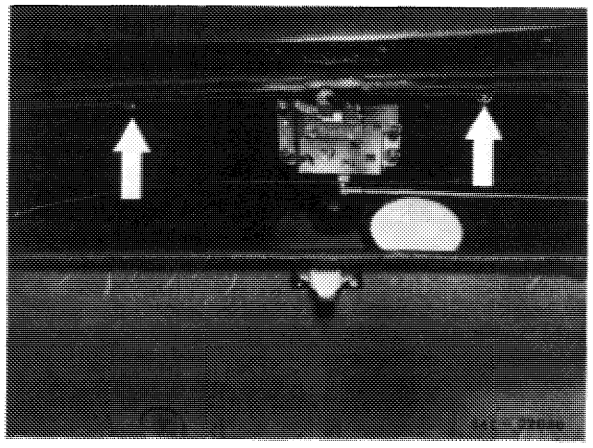
8 Remove fuel hoses (2) on fuel tank or on expansion tank.

Note: If the fuel hoses are removed or mounted on expansion tank, apply counterhold to connections when loosening or tightening hose clamps.



1 Expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow
= Vent line

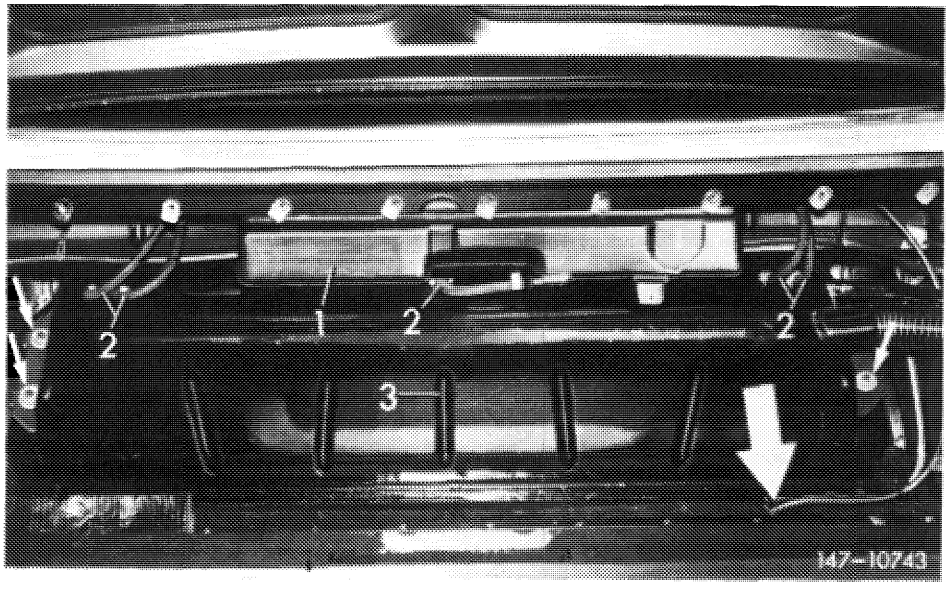
9 Unscrew fastening screws (arrows) and remove expansion tank, while pulling out black vent line in upward direction through trunk floor.



Installation

10 For installation proceed vice versa. Make sure that the vent line is installed first behind filler neck of fuel tank.

Note: Check fuel system for leaks.

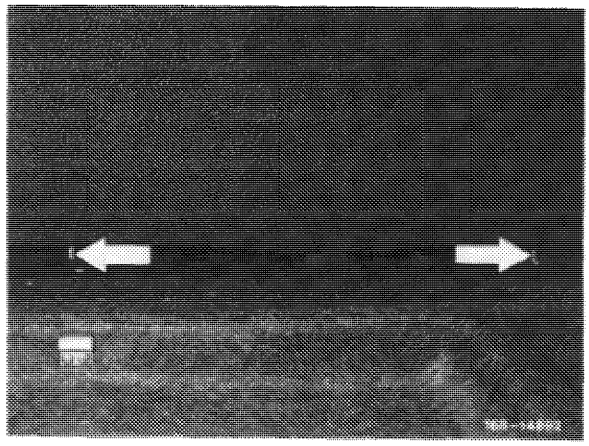


Large arrow
= Vent line

Removal

1 Remove spare wheel casing and spare wheel.

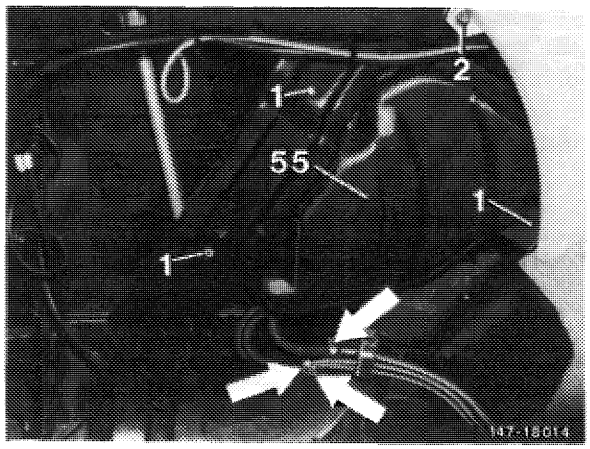
Slightly lift spare wheel casing during removal until pins (arrows) are disengaging.



2 Unscrew fastening screw (2) of lateral lining.

3 Loosen hose clamps (arrows) on vent lines and pull off hoses, tightly close lines and hoses.

4 Unscrew fastening screws (1) of expansion tank (55). For this purpose, slightly lift side and wheel house panelling at front fastening screw seen in driving direction. Remove expansion tank.



Installation

5 For installation proceed vice versa.

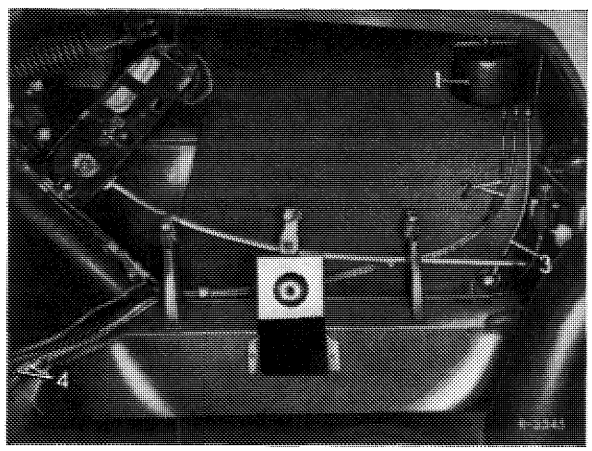
Note: Check hose connections for leaks.

Removal

1 Remove spare wheel and plastic cover rail for vent lines (2).

2 Pull vent lines (2) out of connecting hoses (4).

3 Remove fuel expansion tank (1) complete with positive and negative vent line.



1 Fuel expansion tank
2 Positive vent lines to fuel tank
3 Negative vent line to atmosphere
4 Connecting hoses

Installation

4 For installation proceed vice versa.

Attencion!
Avoid sharp bends in positive and negative vent lines during installation.

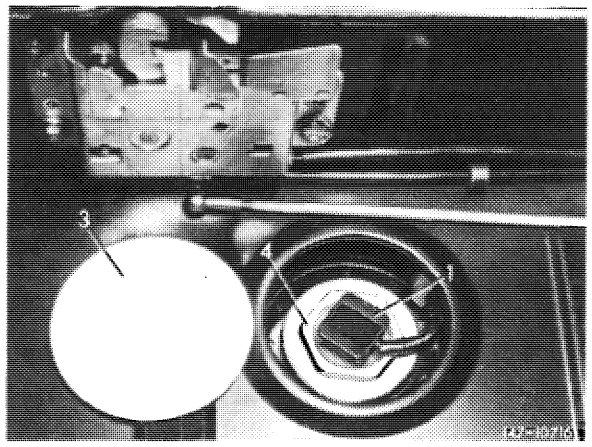
Tightening torque	Nm
Immersion tube transmitter	35–43

Removal

Model 107, 116, 123 sedan and coupe

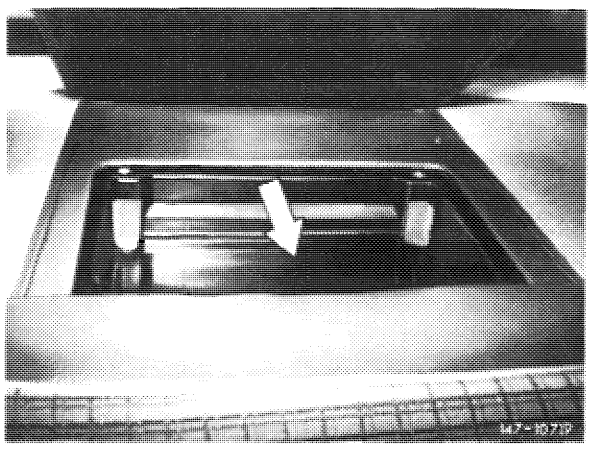
1 Remove hard top on 107.04, open top lock and unfold top.

2 Remove closing cover (3).



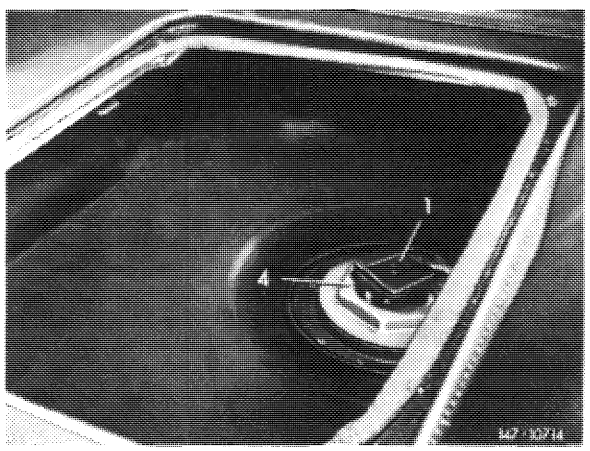
Model 107.04

3 Remove first aid kit and plastic tray (arrow) on models 107.02, 116 and 123.



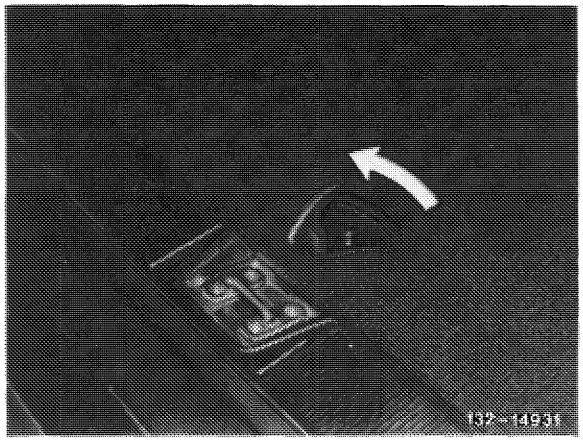
4 Pull off coupling (1) on immersion tube transmitter (4) and secure with a wire against slipping off.

5 Unscrew immersion tube transmitter.

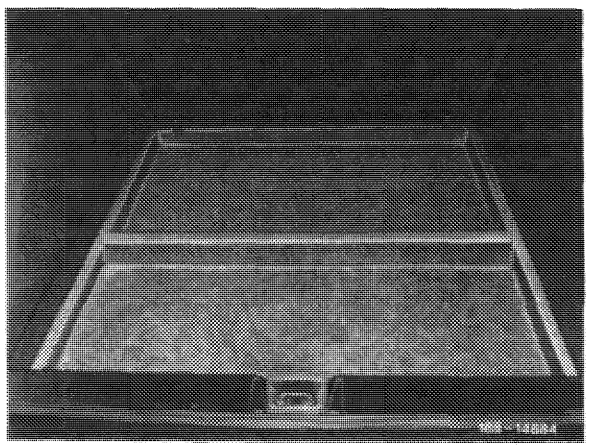


Model 123 T-sedan

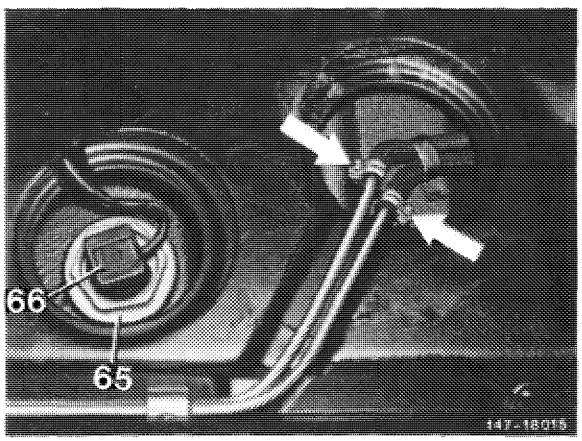
1 Loosen luggage compartment floor by turning toggle lock and remove.



2 Remove storage compartment.



3 Pull off coupling (66) for fuel gage and unscrew immersion tube transmitter (65).



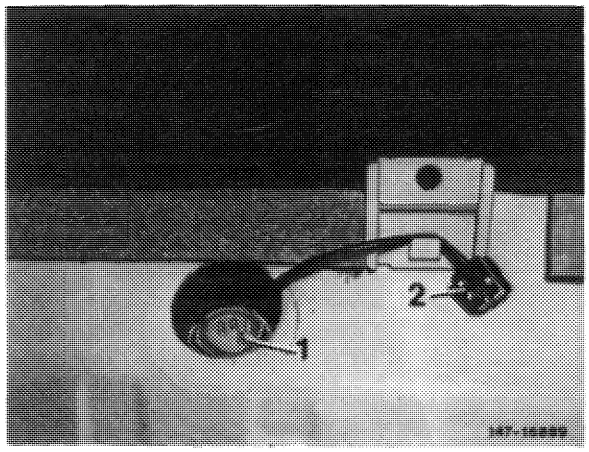
Model 126

1 Remove rear seat bench and backrest (refer to body).

2 Remove closing cover.

3 Pull off coupling (66) and protect against slipping off.

4 Unscrew immersion tube transmitter (65).

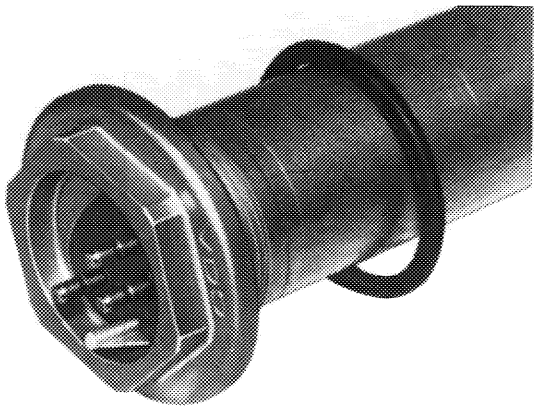


Installation

All models

4 For installation proceed vice versa as follows:

a) Use new rubber sealing ring.



147-10810

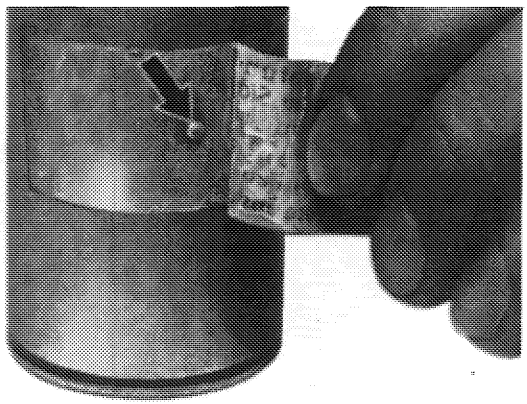
b) Remove locking pin (arrow) prior to installing immersion tube transmitter.

c) Check function of fuel gage.

d) Tighten immersion tube transmitter to 35–43 Nm.

e) Plug on coupling for fuel gage.

f) Check for leaks.



107-10702

A. Model 114

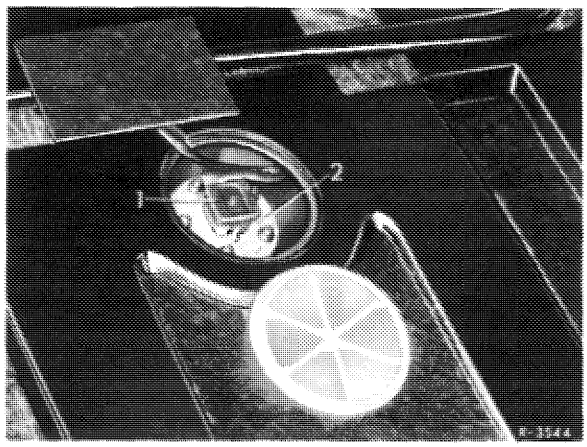
Removal

1 Take rubber mat from trunk and remove closing cover from floor of trunk.

2 Pull plug (1) from immersion tube transmitter (2).

3 Unscrew fastening nuts and pull out immersion tube transmitter.

4 Remove gasket from fuel tank, making sure that no remains of gasket are dropping into tank.



Installation

5 For installation proceed vice versa as follows:

a) Use new gasket.

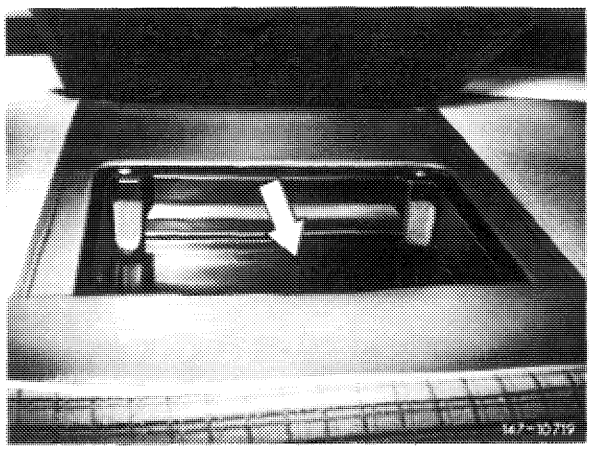
b) Tighten fastening nuts crosswise to 3.5–4 Nm (35–40 kpcm).

c) Check function of fuel gauge.

Tightening torques	Nm	(kpm)
Hex. closing plug for immersion tube transmitter or screw-type immersion tube transmitter	19–27	(1.9–2.7)

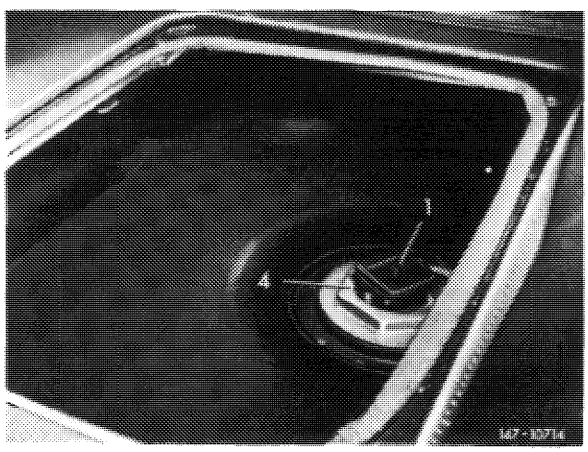
Removal

1 Remove first aid kit and first aid kit holding tray (arrow).



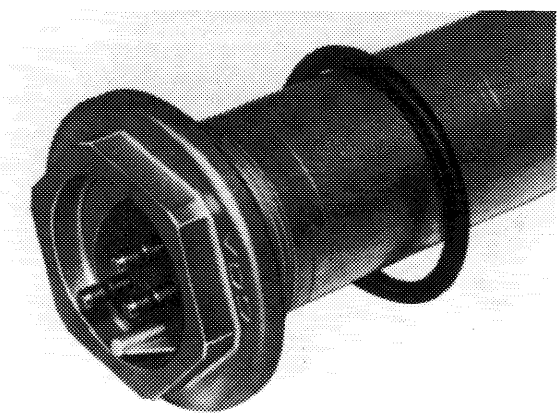
2 Pull plug (1) for fuel gauge from immersion tube transmitter and protect with a wire against slipping off.

3 Unscrew hex. closing plug (4) and remove immersion tube transmitter.



Immersion tube transmitter version 1

Immersion tube transmitter of the latest version are directly screwed into fuel tank.



Immersion tube transmitter version 2

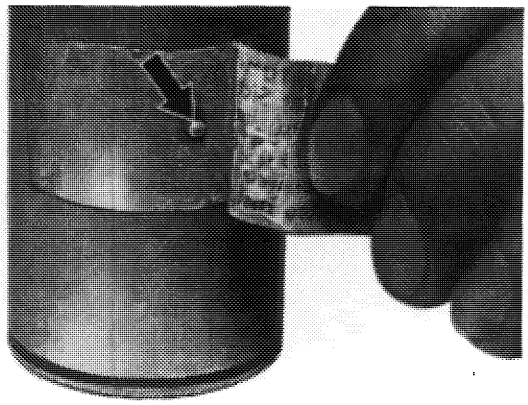
Installation

4 For installation proceed vice versa as follows:

a) There are two different immersion tube transmitter versions for model 116 available from spare parts stockroom. During replacement, make sure to install like for like.

b) Use new rubber sealing ring.

c) Prior to installing immersion tube transmitter, remove locking pin (arrow).



107-10702

d) Install immersion tube transmitter in such a manner that the locking cam engages in recess of fuel tank or that brass locating pin for electric plug points in driving direction to the rear.

The above is not necessary on immersion tube transmitters of the latest version.

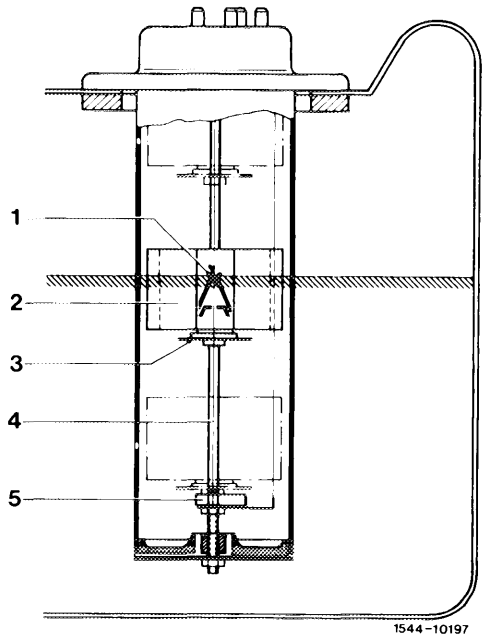
Note: If an immersion tube transmitter with locking cams is installed in a fuel tank without recess, remove locking cam.

e) Check function of fuel gauge.

All models

When the fuel drops, the sliding contact (1) on float (2) of immersion tube transmitter increases the resistance, the voltage drops and the needle in the instrument will swing back.

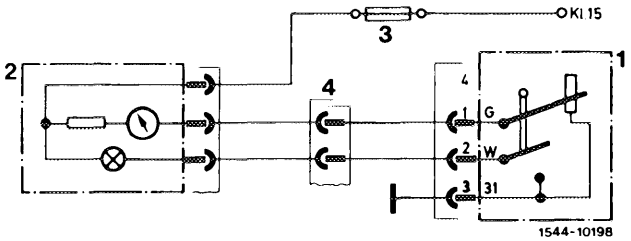
When the fuel level drops still further, the reserve warning contact (5) in immersion tube transmitter is closed and will connect the reserve warning light to ground.



Immersion tube transmitter

1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Reserve warning contact

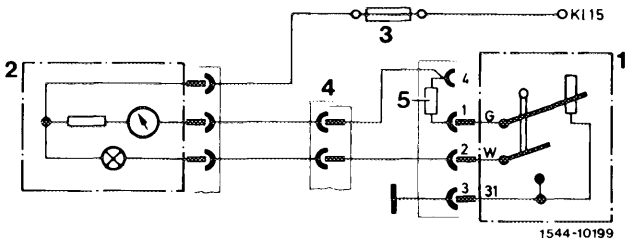
When the ignition is switched on, the indicating instrument and the reserve warning lamp will be energized via fuse.



Sedan

1 Immersion tube transmitter
2 Fuel gage
3 Fuse
4 Cable connector

On T-sedans and special vehicles with special body a compensating resistor 4.7 Ω (color rings yellow/purple/gold/gold) is installed in coupling of immersion tube transmitter, so that in spite of different fuel tanks the same fuel gage can be used.



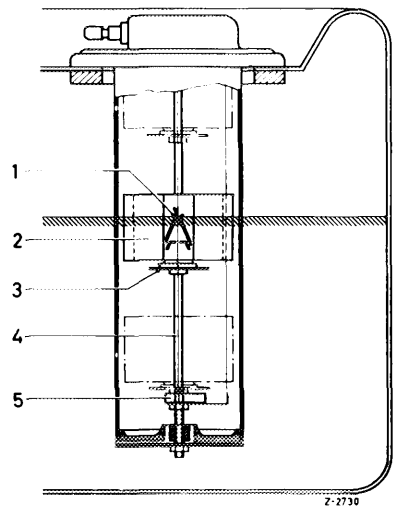
T-sedan and special vehicles with special body

1 Immersion tube transmitter
2 Fuel gage
3 Fuse
4 Cable connector
5 Resistor 4.7 Ω

Check fuel gage (54–269).

When the fuel level drops, the sliding contact (1) on float (2) of immersion tube transmitter increases the resistance, the voltage drops and the needle in instrument will swing back.

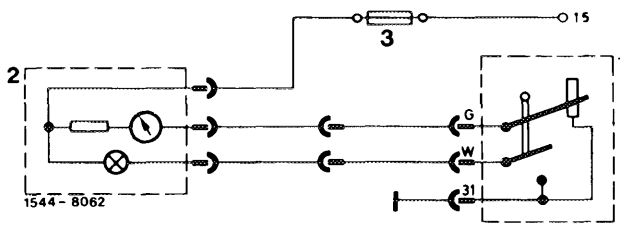
When the fuel level drops still further, the reserve warning contact (5) in immersion tube transmitter is closed and will connect the reserve warning light to ground.



Immersion tube transmitter

1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Reserve warning contact

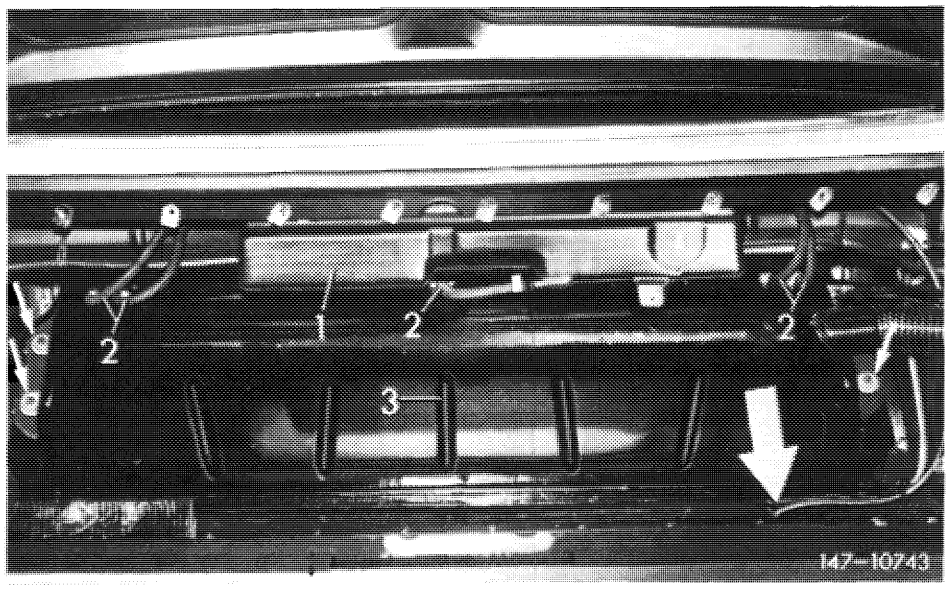
When the ignition is switched on, the indicating instrument and the reserve warning lamp will be energized.



1 Immersion tube transmitter
2 Fuel gauge with warning lamp in instrument cluster
3 Fuse

On model 107.04 and 123.09 an expansion tank is located outside fuel tank.

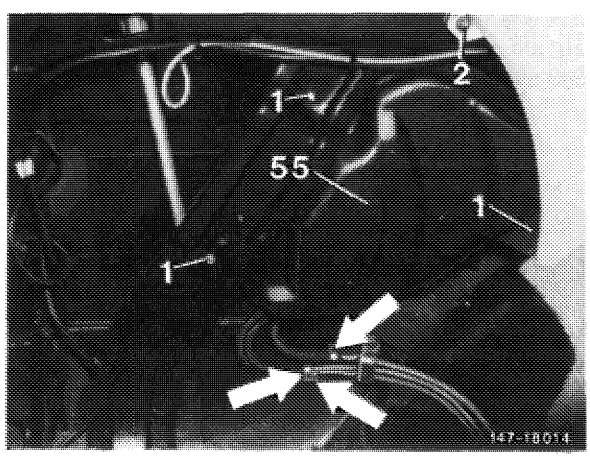
Model 107.02 is provided with an expansion tank which is installed in fuel tank and can therefore not be removed.



Model 107.04

1 Expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow
= Vent line

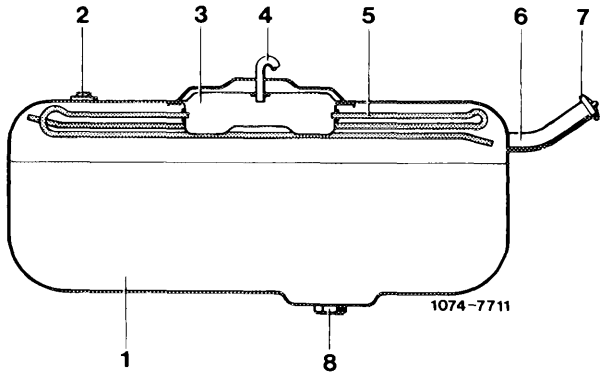
The fuel vapors escape from fuel tank into expansion tank and from there through vent line into atmosphere.



Model 123.09

55 Expansion tank
Arrows = Connecting lines to fuel tank and vent line

Models 116, 123 and 126 are provided with a vent system comprising a collecting tray and a pipe system.



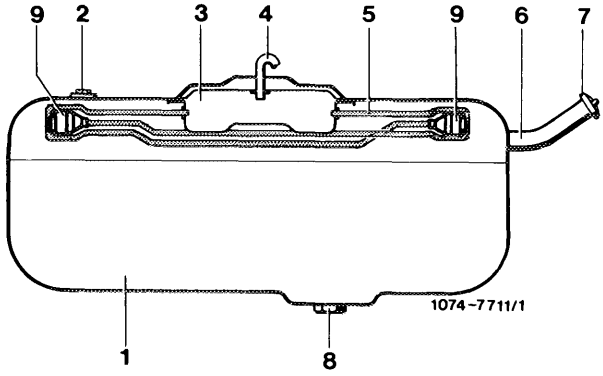
3 Collecting tray
4 Vent line
5 Pipe system

Since April 1980 additional check vessels are attached to ends of pipe system of model 126.

The following national version vehicles are also provided with check vessels:

(J) 1979 entering production model 123
1980 model 116

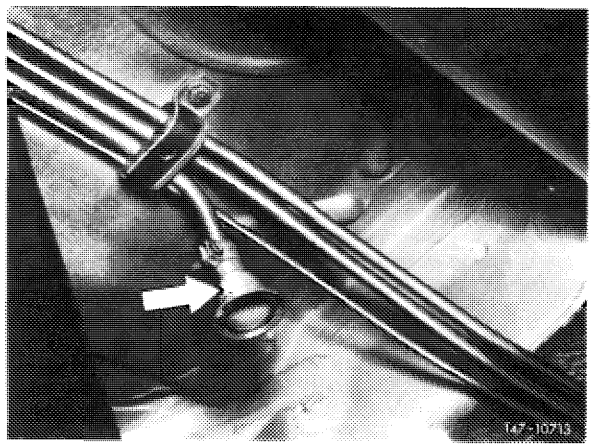
(USA) 1980/81, model 123



9 Check vessels

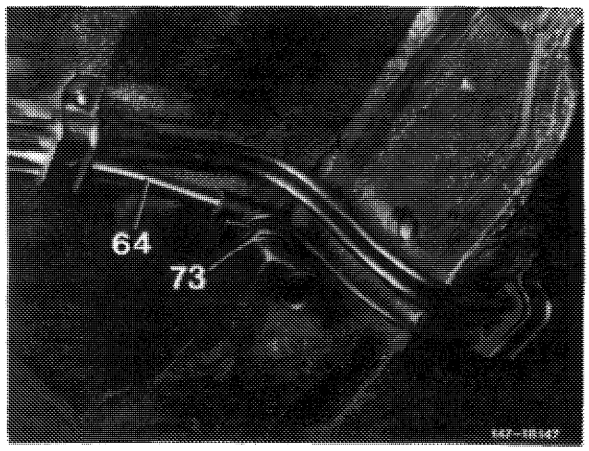
The fuel vapors escape through vent system to vent line and from there into atmosphere.

A protective sleeve (arrow) is plugged on at end of vent line on models 107.04, 126 and on all vehicles manufactured up to February 1979.



Model 126
Arrow = Protective sleeve

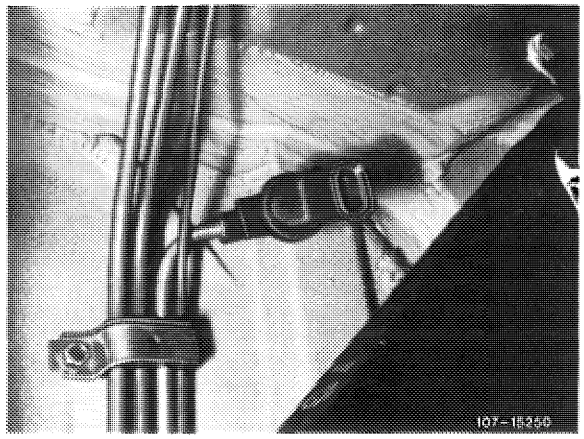
Starting March 1979 all vehicles (except model 107.04 and 126) are provided with a vent sleeve at end of vent line.

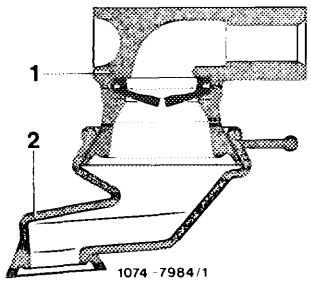


64 Vent line
73 Vent sleeve

When repairing older vehicles, also install only vent sleeve with diaphragm. In such a case, the vent line must be rebent with a suitable mandrel in such a manner that the vent sleeve is pointing downwards.

Attention!
Avoid kinks in vent line when rebending.

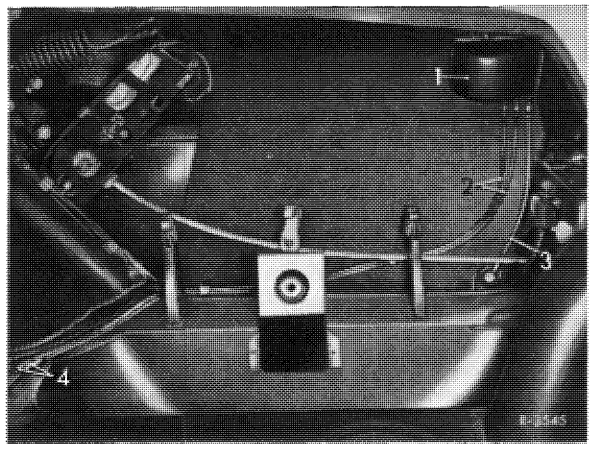




Vent sleeve with diaphragm

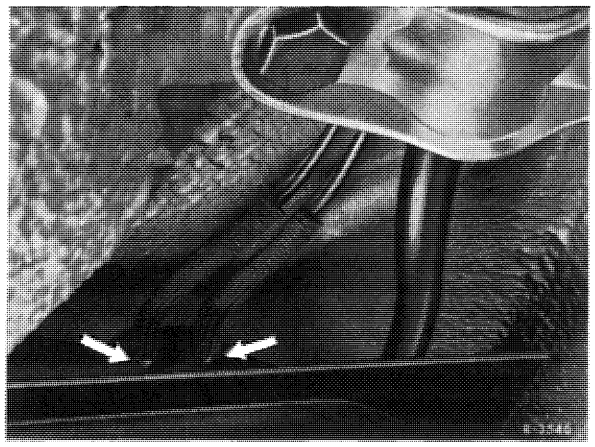
(J) up to January 1973
(S) up to end of series

An expansion tank (1) in trunk serves for positive and negative venting of fuel tank.



1 Expansion tank
2 Positive venting line to fuel tank
3 Negative venting line to atmosphere
4 Connecting hoses

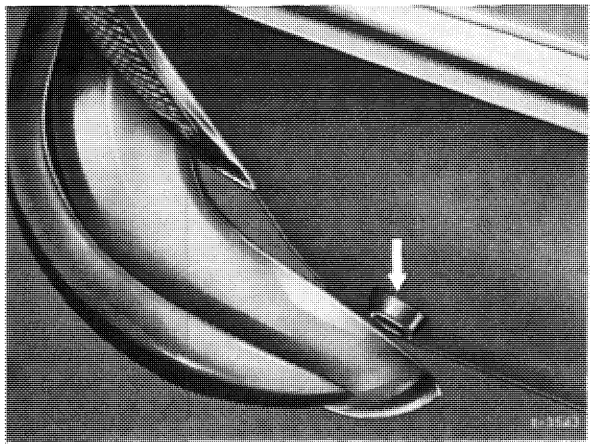
The expansion tank is connected to two positive venting lines (arrows) entering the fuel tank and with one negative venting line (3) to atmosphere.



Arrows = positive venting lines on fuel tank

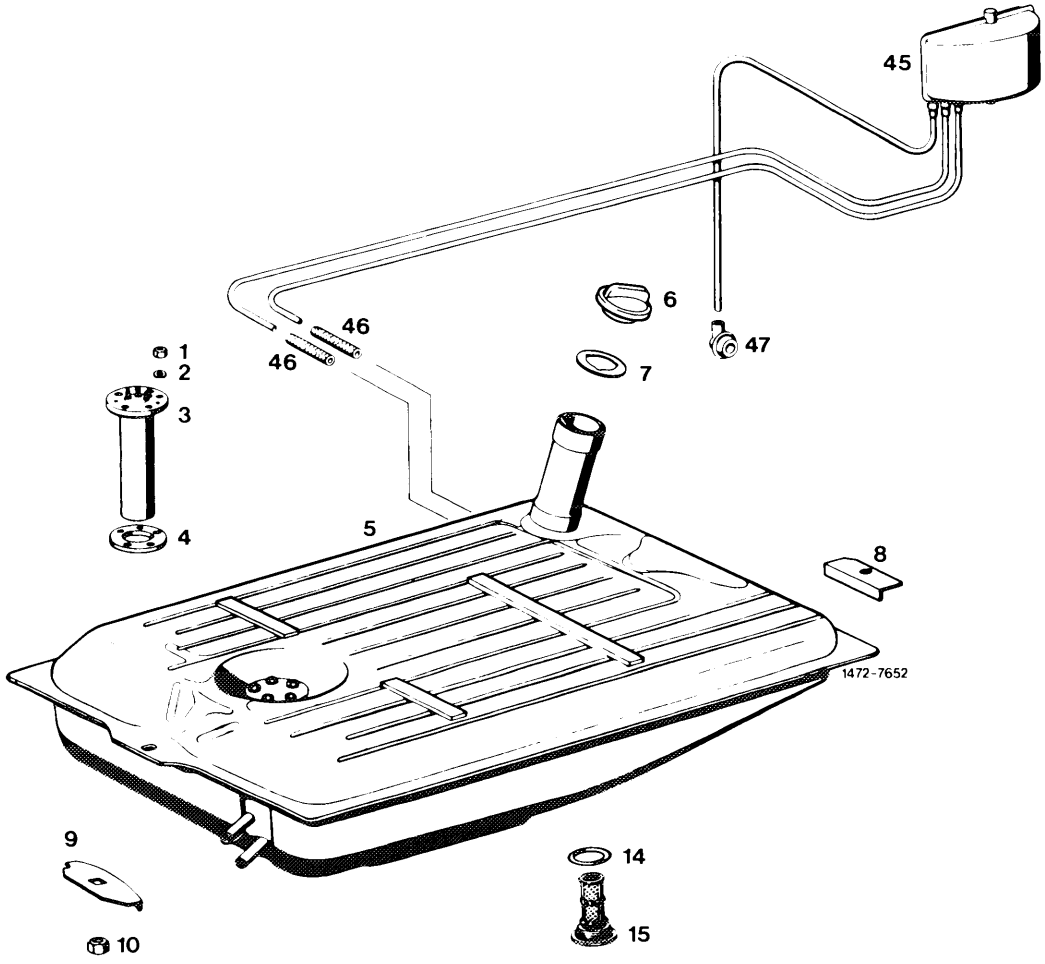
If with the fuel tank filled, fuel is forced into positive venting line (2), the fuel can rise up to expansion tank. As soon as one of the two positive venting lines is free of fuel, the fuel will immediately flow back into fuel tank, while the fuel vapors escape into the open air through negative venting line (3).

The fuel vapors escape into the atmosphere at point shown in illustration (arrow).



Arrow = outlet of fuel vapors into the atmosphere

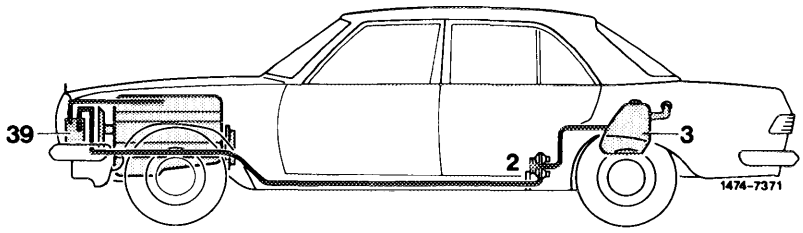
Model 114 Fuel system, fuel tank positive and negative venting



1 Nut
2 Spring washer
3 Immersion tube transmitter
4 Gasket
5 Fuel tank
6 Filler lock
7 Gasket
8,9 Reinforcing panel
10 Hex. nut
14 Sealing ring
15 Fuel drain plug with filter
45 Fuel expansion tank
46 Fuel hose
47 Rubber sleeve

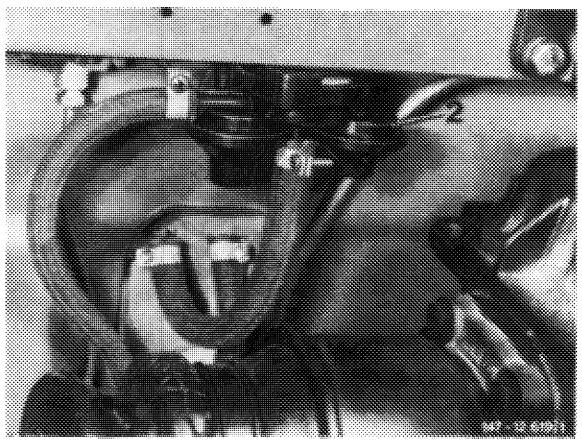
(AUS) (USA) 1977
(J) 1977/78

The fuel evaporation control system which prevents the escape of evaporation vapors from fuel system into the atmosphere comprises the following components:



2 Valve system
3 Fuel tank
39 Charcoal canister

Valve system



The valve system is mounted underneath vehicle at level of rear legroom.

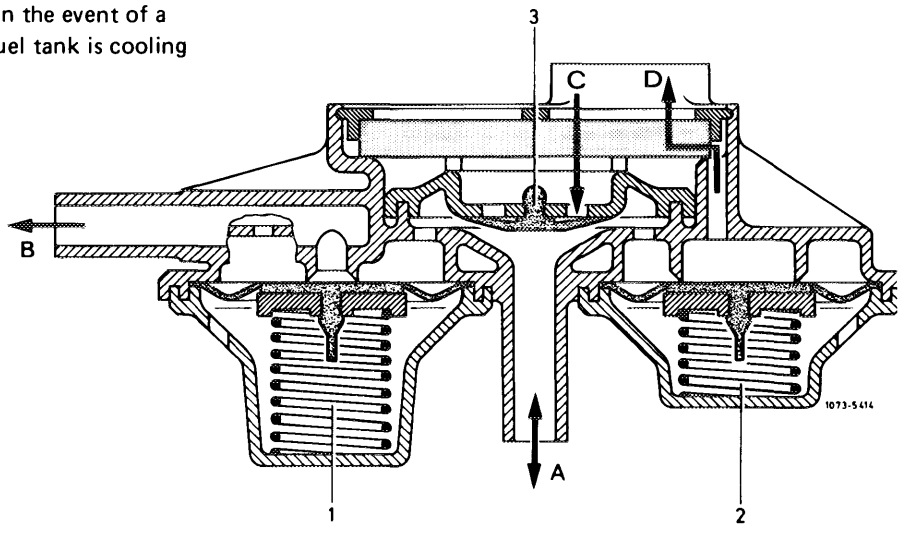
The valve system comprises three valves:

1. Pressure relief valve (negative vent valve)
2. Safety valve
3. Vacuum relief valve (positive vent valve)

The **pressure relief valve** opens at a slight overpressure. The evaporation vapors will flow through pressure relief valve (1) (direction B) in a line toward charcoal canister.

The **safety valve** opens in the event of overpressure in fuel evaporation control system. The fuel vapors will be vented directly into the atmosphere.

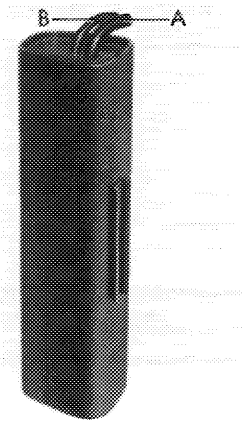
The **vacuum relief valve** opens in the event of a vacuum established when the fuel tank is cooling down.



1 Pressure relief valve
2 Safety valve
3 Vacuum relief valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet safety valve

Charcoal canister

The fuel evaporation vapors from fuel tank are stored in charcoal canister and drawn off again while driving.

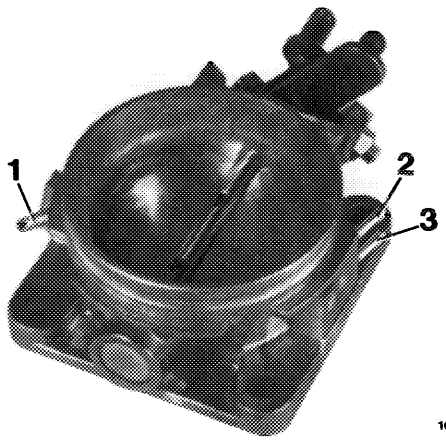


A Connection, fuel vapors from tank
B Connection, throttle valve housing

107-9128

Throttle valve housing

The throttle valve housing is provided with a connection for drawing evaporation vapors from charcoal canister.



1 Vacuum connection ignition retard
2 Vacuum connection ignition advance
3 Vacuum connection charcoal canister

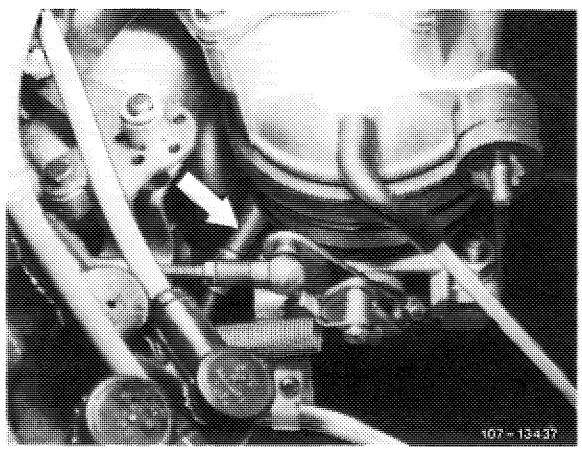
107-13053

The fuel tank with fuel expansion tank and the valve system correspond to the already known version.

Description of operation

The fuel vapors from fuel tank are routed to charcoal canister via valve system (2). The fuel evaporation vapors are stored in charcoal canister when the engine is stopped and are drawn off into throttle valve housing when the engine is running as from a given throttle valve position.

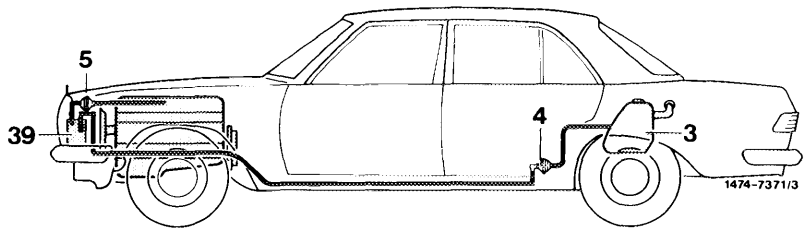
For checkup refer to: Exhaust gas test program



Arrow = Draw-off line to throttle valve housing

(AUS) (USA) **1978–1980**
(J) **1979/80**

The fuel evaporation control system has been completely revised to meet the new limits specified by law.

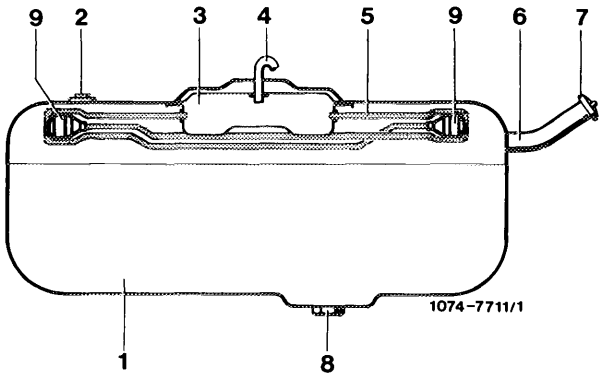


3 Fuel tank
4 Vent valve unit
5 Purge valve
39 Charcoal canister

The system comprises the following components:

Fuel tank

The fuel tank with the tube system and the collecting tray are identical to the already known versions.

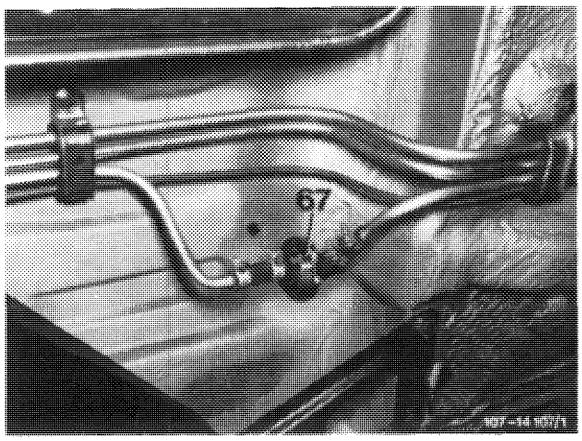


1 Fuel tank
2 Immersion tube transmitter
3 Expansion tank
4 Connection vent valve unit
5 Tube system
6 Filler neck
7 Closing cover
8 Connection fuel feed line
9 Check vessels entering production starting 1979
(J) (model 123)
(USA) starting 1980 (model 123)
(J) (USA) model 126 starting 1981

Vent valve unit

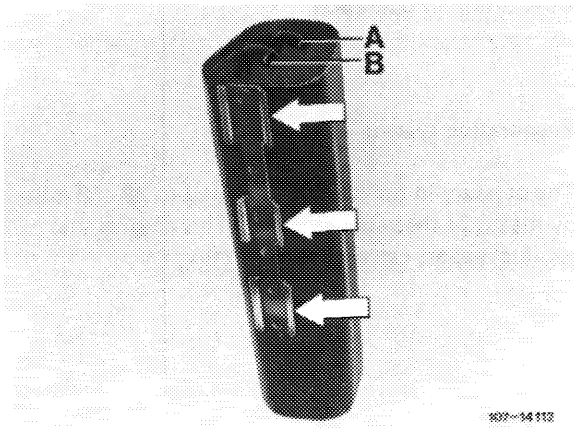
The vent valve unit (67) is mounted underneath vehicle at level or rear legroom and replaces the valve system known from model year 1977.

The unit comprises a pressure relief valve (negative vent valve) and a vacuum relief valve (positive vent valve).



Charcoal canister

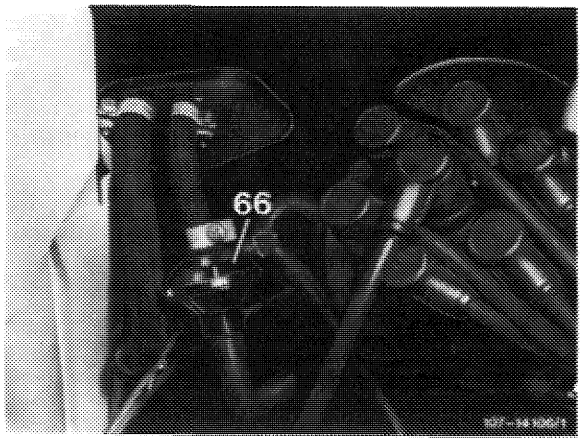
The charcoal canister is identical with the already known version, except that the fastening bracket (arrows) has been modified.



A Draw-off line to throttle valve housing
B Fuel tank vent line

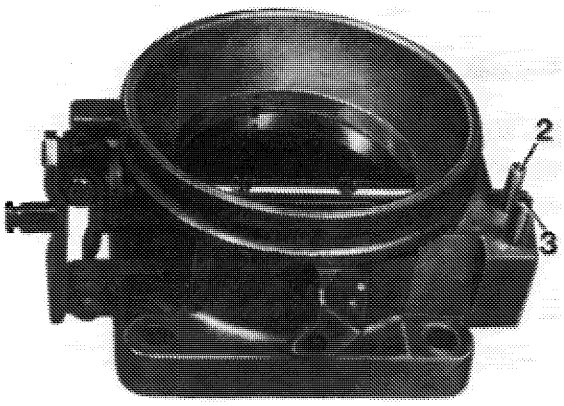
Purge valve

The purge valve (66) is located in purge line from charcoal canister to throttle valve housing.



Throttle valve housing

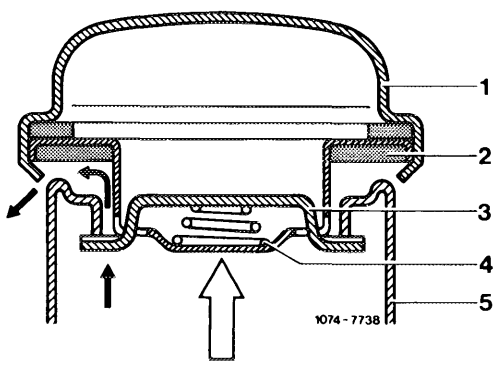
In comparison to model year 1977 the throttle valve housing has been slightly modified. To prevent a mix-up of the vacuum lines, the outside diameter of the vacuum line to the charcoal canister has been increased from 4 to 5 mm. To purge the fuel vapors from the charcoal canister, two purge bores are provided above the throttle valve.



2 Vacuum connection, ignition advance
3 Vacuum connection, charcoal canister

Fuel tank cap

To avoid excessive pressure in fuel tank, the fuel tank cap has been modified.



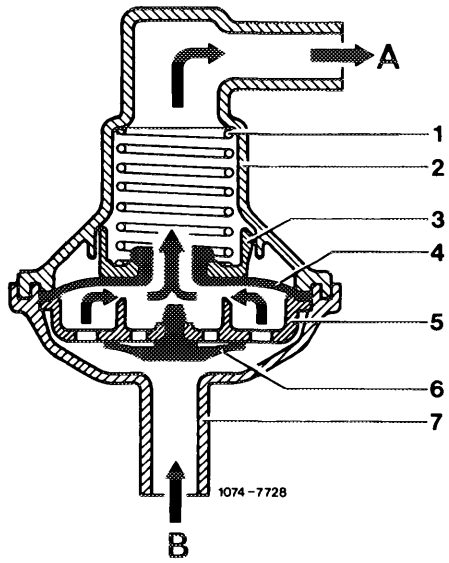
1 Fuel tank cap
2 Gasket
3 Locking tab
4 Compression spring
5 Filler neck

Description of operation

Evaporation system

The pressure in fuel tank is increased to 30–50 mbar by means of the vent valve (67). This ensures that less fuel vapors can escape from tank.

If a pressure of 30–50 mbar is reached in the fuel tank, the pressure relief valve (4) opens and permits the fuel vapors to travel to the charcoal canister, where they are stored if the engine is not running.

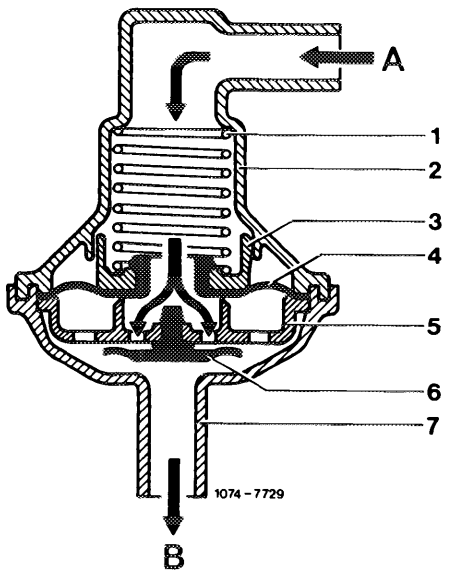


Vent valve unit, open to charcoal canister

1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disk
6 Vacuum relief valve
7 Connection fitting

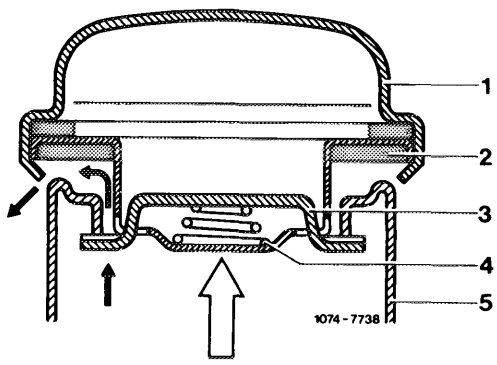
A Connection, charcoal canister
B Connection, fuel tank

When the fuel cools down, the decreasing volume is balanced by the intake of air or of fuel evaporation vapors from charcoal canister via vacuum relief valve (6) starting at a vacuum of 1–16 mbar. If the vacuum in the fuel tank drops below 1 mbar, the vacuum relief valve (6) closes.



Vent valve unit, open to fuel tank

If the pressure in the fuel tank increases above 100–300 mbar due to a malfunction in the fuel evaporation system, the fuel vapors can escape via the fuel filler cap.

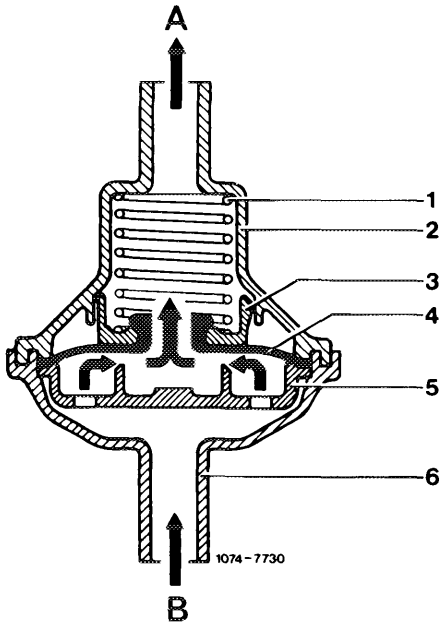


1 Fuel tank cap
2 Sealing ring
3 Locking tab
4 Compression spring
5 Filler neck

Purge system

The charcoal canister is connected with the throttle valve housing by a hose in which the purge valve is installed.

When the engine is running and the vacuum in the purge line exceeds 30—50 mbar, the purge valve opens. The fuel vapors stored in the charcoal canister can be drawn into the throttle valve housing depending on the throttle valve position.

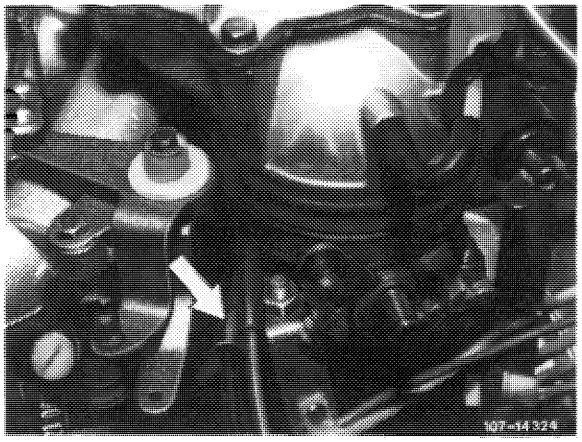


Purge valve open

1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disk
6 Connection fitting

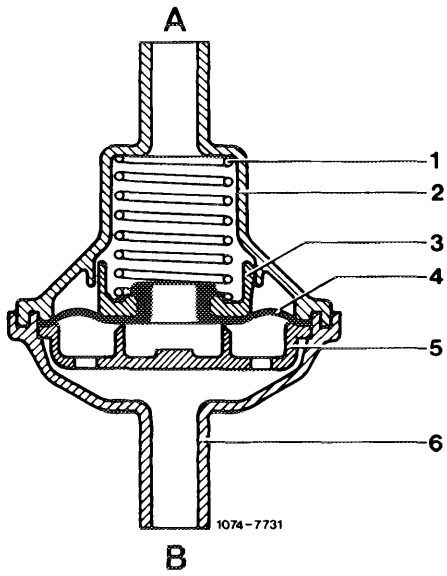
A Connection, throttle valve housing
B Connection, charcoal canister

As the throttle valve is opened, the two purge bores in the throttle valve housing, which terminate in a common passage, are progressively exposed to the venturi vacuum. This will result in a metered purging in the lower partial load operating range of the engine without influencing the driving characteristics.



Arrow = Draw-off connection of throttle valve

At idle and during coasting (throttle valve closed) both purge bores are located on the atmosphere side of the throttle valve. The purge valve is closed and, therefore, no purging of fuel vapors from the charcoal canister takes place.

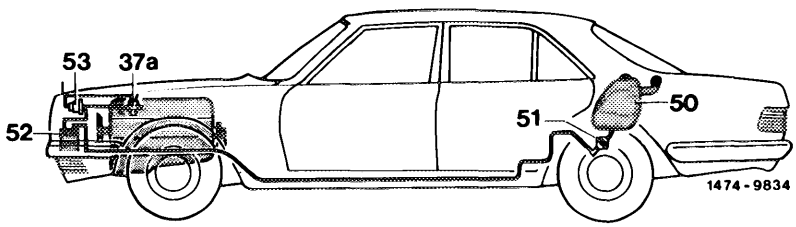


Purge valve, closed

The fuel evaporation control system has been revised in comparison to model year 1980. The purge system is controlled by means of a thermovalve and is effective only above approx. 50 °C/122 °F coolant temperature.

Functional diagram

37a Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve

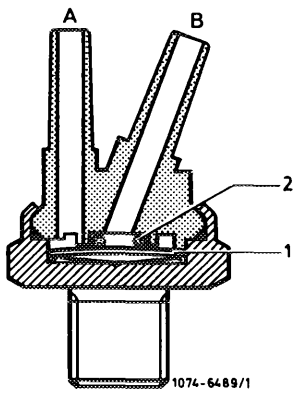


Components of fuel evaporation control system

Only the new components are shown here.

Thermovalve 50 °C/122 °F (37a, color code red)

The thermovalve is installed in the sensor box on the cylinder head and opens at an engine cooling temperature of 50 °C/122 °F.

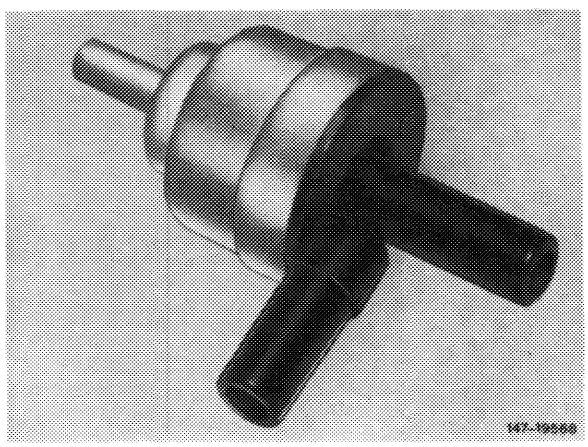


1 Bimetallic plate
2 O-ring

A To purge valve
B To throttle valve housing

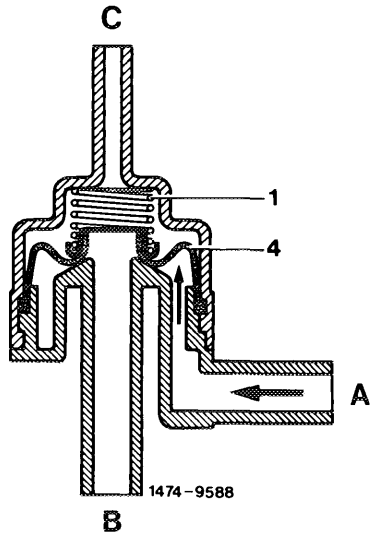
Purge valve (53, vacuum-controlled)

The purge valve is installed in the purge line from the charcoal canister to the throttle valve housing. It can be recognized by the vacuum connection to thermovalve 50 °C.



Purge system

The charcoal canister is connected to the throttle valve housing by a line in which the purge valve is installed.

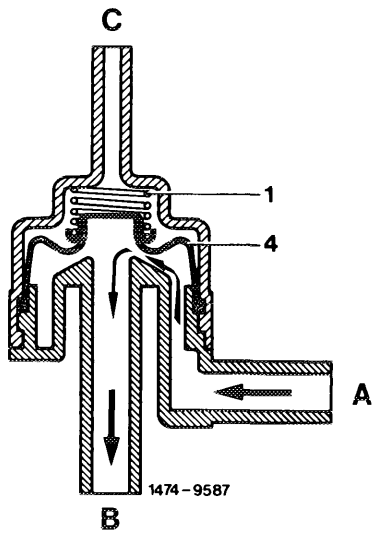


Purge valve closed

A Connection, charcoal canister
B Connection, throttle valve housing
C Vacuum connection
1 Compression spring
4 Diaphragm

When the engine is running at a coolant temperature above approx. 50 °C/122 °F, intake manifold vacuum is applied to the purge valve through the thermovalve with the throttle valve slightly raised. The diaphragm (4) is pulled in upward direction against the spring force and connection from A to B is made.

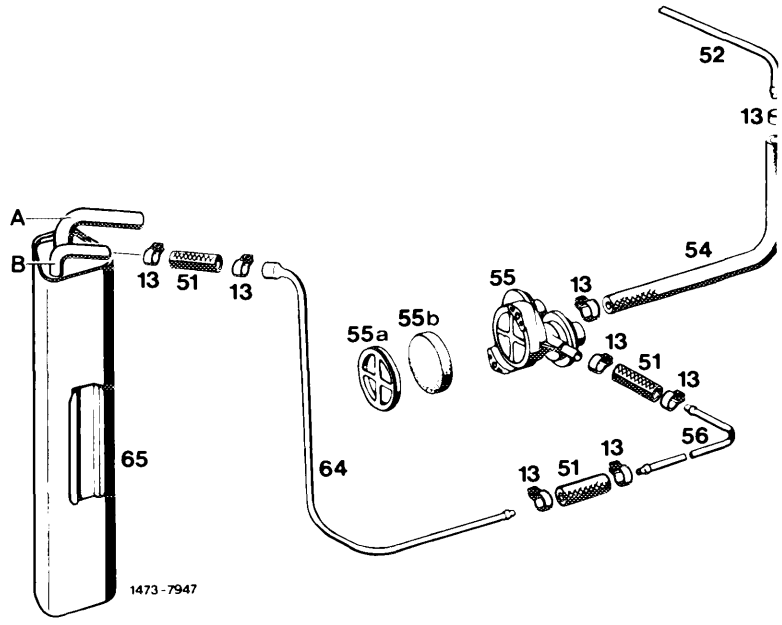
When the throttle valve is opened still further, the two purge openings, which terminate in a common passage, are progressively exposed to the venturi vacuum. This will result in a metered purging in the lower partial load operating range of the engine without influencing the driving characteristics.



Purge valve, open

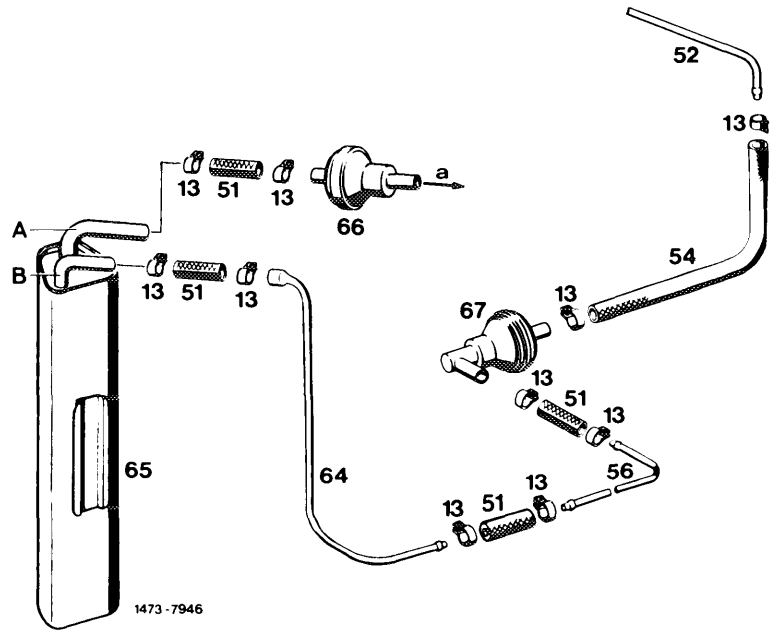
Fuel evaporation control system

(AUS) (USA) 1977
(J) 1977/78

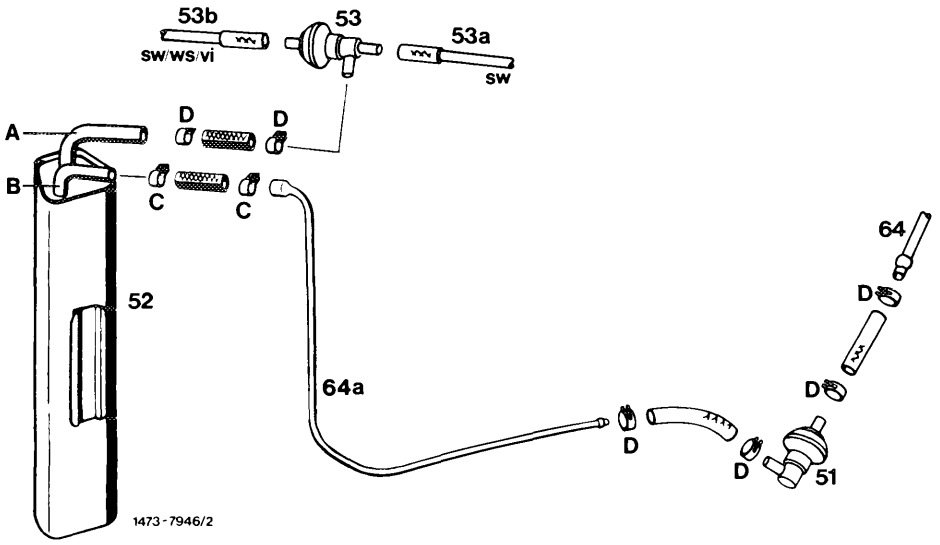


13	Hose clamp
51	Fuel hose
52	Vent line from fuel tank
54	Fuel hose
55	Valve system
55a	Cover
55b	Filter
56	Vent line
64	Vent line
65	Charcoal canister
A	Draw-off line to throttle valve housing
B	Fuel tank vent line

(AUS) (USA) 1978–1980
(J) 1979/80



13	Hose clamp
51	Fuel hose
52	Vent line from fuel tank
54	Fuel hose
56	Vent line
64	Vent line
65	Charcoal canister
66	Purge valve
67	Vent valve unit
a	To throttle valve housing
A	Draw-off line to purge valve
B	Fuel tank vent line



51	Vent valve	A	To purge valve	Color code	
52	Charcoal canister	B	To fuel tank	sw	= black
53	Purge valve	C	Hose clamp	vi	= purple
53a	Draw-off line to throttle valve	D	Clamp	ws	= white
53b	Vacuum line				
64	Vent line from fuel tank				
64a	Vent line to charcoal canister				

Note

(J) starting January 1973 up to production model year 1976
(USA) 1973, 1974 Federal

High outside temperatures and self-heating of returning fuel will also heat fuel tank. Legislation in a number of countries does not permit these fuel evaporation vapors to escape into the atmosphere.

For this reason, the fuels are drawn from fuel tank via crankcase breather into the combustion chambers when the engine is running, and they are stored in crankcase when the engine is stopped.

Model 114

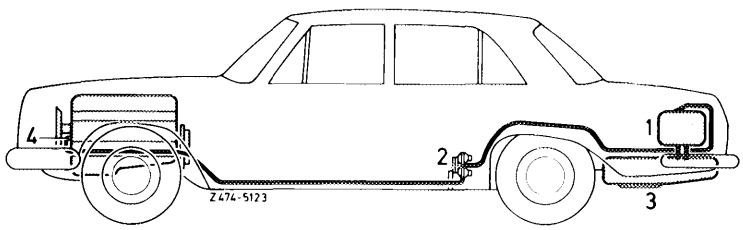
From fuel tank, two lines are leading to expansion tank (capacity 4.5 l). The expansion tank is mounted at the right in trunk.

Both lines serve as venting, overflow or discharge lines depending on position of fuel level in fuel tank, on fuel volume and on temperature.

At the highest point of the expansion tank is the connection for the positive and negative venting line to valve system (2).

The fuel evaporation control system comprises:

Fuel expansion tank (1)
Valve system (2)
Fuel tank (3)
Draw-off connection on crankcase (4)

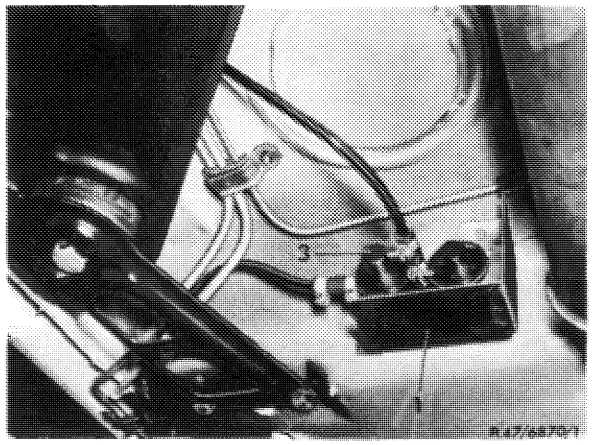


Valve system

The valve system is mounted underneath vehicle at level of rear legroom.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

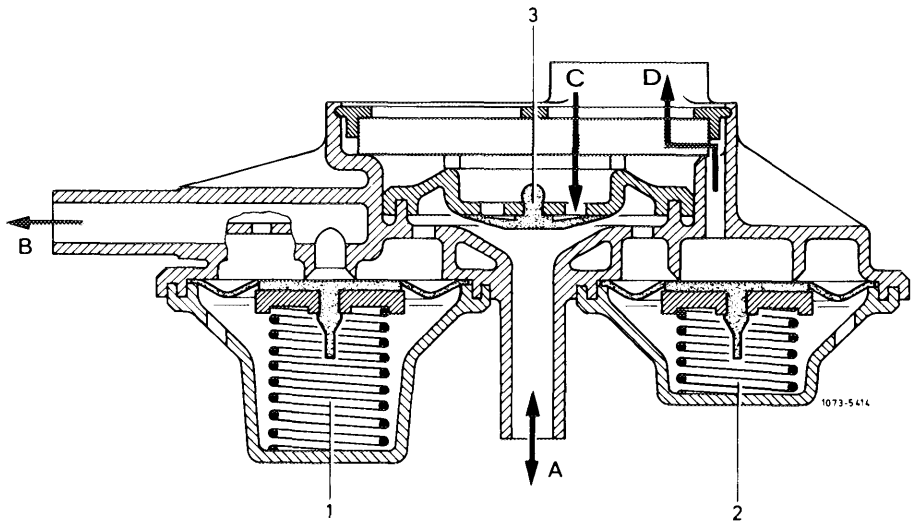


1 Protective box
3 Valve system

The **negative vent valve** (1) opens at slight overpressure. The evaporation vapors are flowing via a negative vent valve (1, direction B) into a line toward engine. The line enters into cylinder crankcase at connection point.

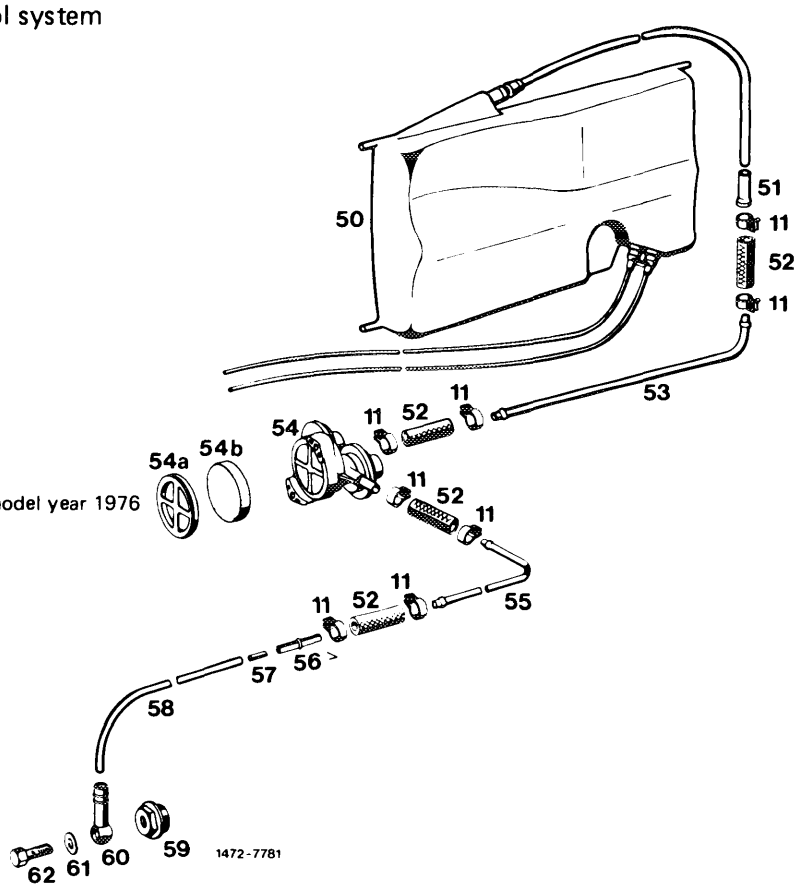
The ***pressure relief valve*** (2) opens as a safety valve in the event of overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

The **positive vent valve** (3) opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To crankcase
C Fresh air inlet
D Outlet pressure relief valve

Model 114 Fuel evaporation control system



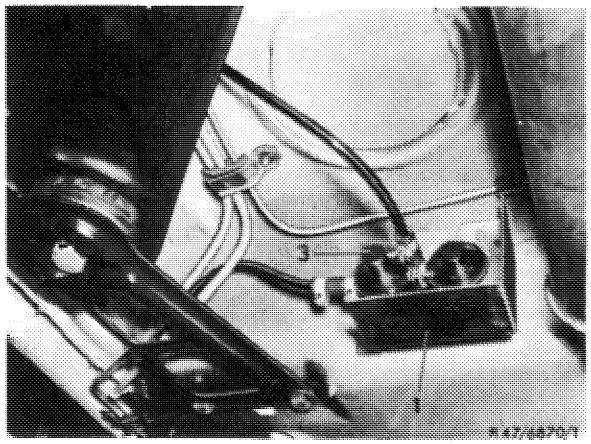
(J) starting January 1973 up to production model year 1976
(USA) 1973, 1974 Federal

11 Hose clamp
50 Fuel expansion tank
51 Connecting pipe
52 Fuel hose
53 Negative venting line
54 Valve system
54a Cover
54b Filter
55 Negative vent line
56 Connecting pipe
57 Throttle
58 Negative vent line
59 Closing plug
60 Ring fitting
61 Sealing ring
62 Hollow screw

(USA) California 1974 and (USA) 1975/76
(J) 1976

A fuel evaporation control system has been installed to improve emissions which are not directly connected with engine combustion.

Components of fuel evaporation control system



1 Protective box
3 Valve system

Valve system

The valve system is mounted underneath vehicle in level of rear legroom.

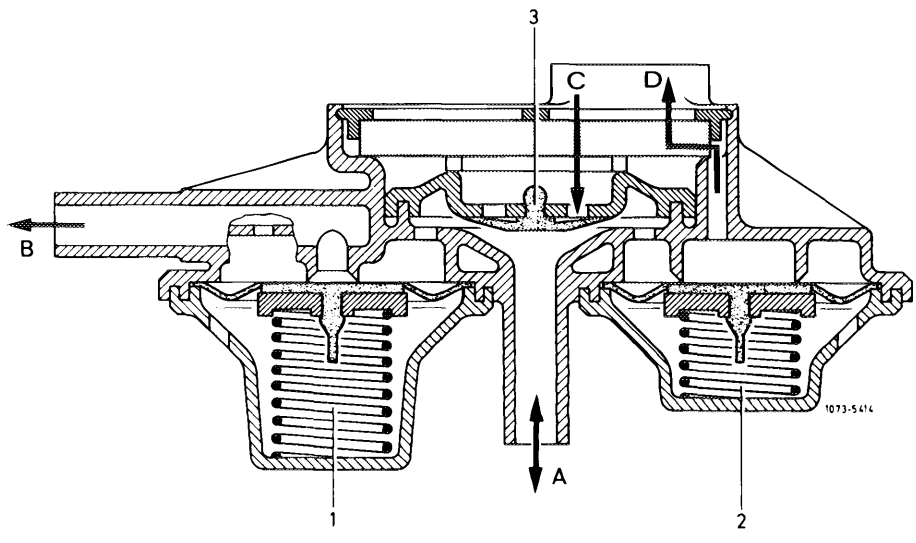
The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

The **negative vent valve** opens at a slight overpressure. The evaporation vapors are flowing via negative vent valve (1, direction B) into the line toward charcoal canister.

The **pressure relief valve** opens as a safety valve in the event of an overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

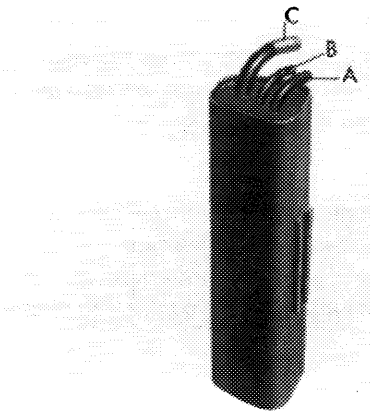
The **positive vent valve** opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet pressure relief valve

Charcoal canister

The fuel evaporation vapors from fuel tank and from float chamber are stored in charcoal canister and are drawn again out of canister when driving.

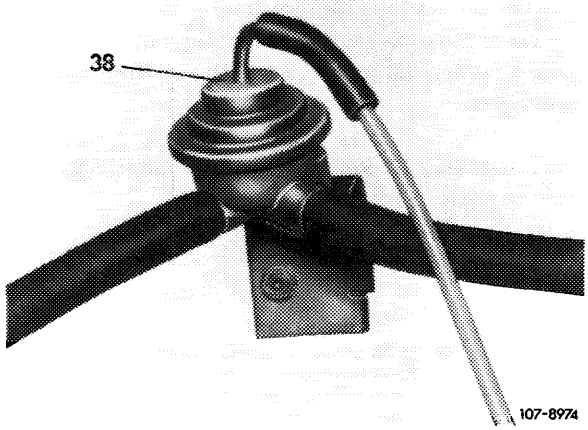


A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

107-9131

Draw-off valve (purge valve)

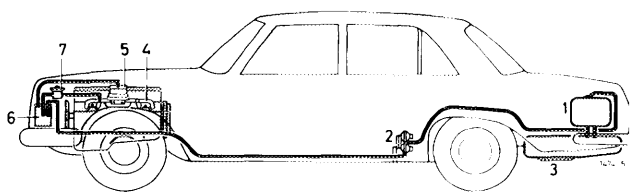
The draw-off valve (purge valve) controls the volume of the fuel evaporation gases, which are drawn off by way of a connection in front of carburetor throttle valve depending on throttle valve position.



107-8974

Operation

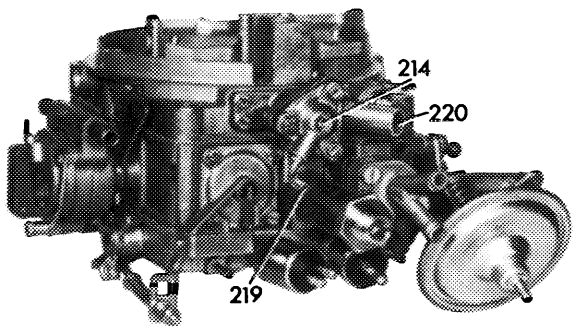
Function diagram



1 Expansion tank
2 Valve system
3 Fuel tank
4 Intake pipe
5 Carburetor with positive vent valve
6 Charcoal canister
7 Draw-off valve (purge valve)

The fuel evaporation gases from fuel tank and from float chamber of carburetor are stored in charcoal canister when the engine is stopped, and are drawn from charcoal canister when the engine is running, depending on intake pipe vacuum.

The fuel evaporation vapors are routed directly into charcoal canister.

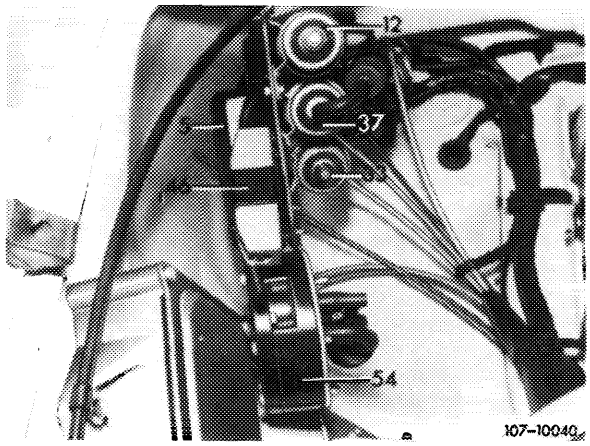


214 Float chamber positive vent valve
219 Vacuum connection
220 Negative vent connection

107-10093

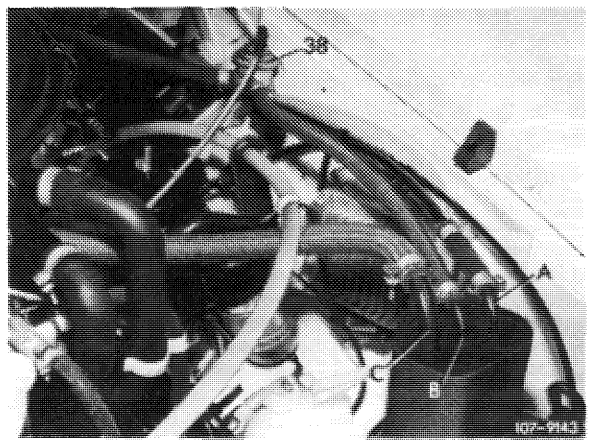
The fuel evaporation vapors from float chamber are flowing to charcoal canister only when the engine is stopped and the float chamber positive vent valve is open and are stored in charcoal canister.

With the engine running, the switchover valve (37) is energized and the diaphragm of the float chamber positive vent valve is provided with a vacuum, the valve will close and interrupt the connection to charcoal canister.



In dependence of the throttle valve position of the I. stage of the carburetor the diaphragm of the draw-off valve (38) is provided with a vacuum, the valve opens.

The intake pipe vacuum will draw the stored vapors from charcoal canister for burning.

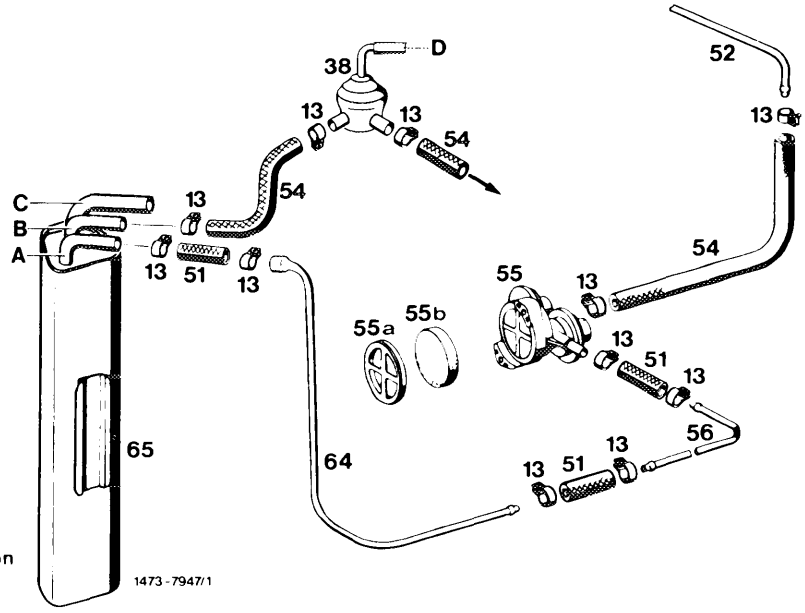


38 Draw-off valve (purge valve)
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

Fuel evaporation control system

(USA) 1974 California, 1975/76 Federal and California

(J) 1976



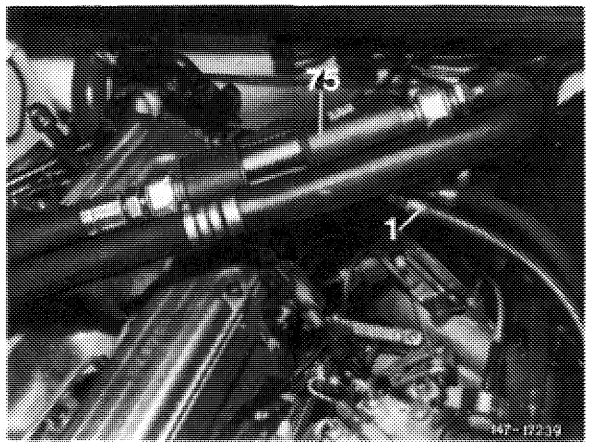
13 Hose clamp
38 Draw-off valve (purge valve)
51 Fuel hose
52 Negative vent line from fuel tank
54 Fuel hose
55 Valve system
55a Cover
55b Filter
56 Negative vent line
64 Negative vent line
65 Charcoal canister
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection
D Vacuum line
Arrow = draw-off connection carburetor

(J) starting 1979, (USA) starting 1980

Model 116, 123, 126

General

To keep the fuel temperature as low as possible also at high outside temperatures, a fuel cooler is installed in refrigerant line from evaporator to refrigerant compressor. This is essentially a double tube version, with the refrigerant (R 12) flowing through the inner tube and the fuel to be cooled through the annular space between outer and inner tube.

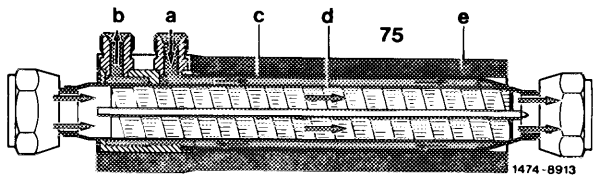


1 Return flow line
75 Fuel cooler

Operation

With the engine running, the excess fuel in fuel distributor flows without pressure through return flow line (1) and fuel cooler (75) back into fuel tank.

As long as the refrigerant compressor is switched on, the gaseous refrigerant, which flows through the inner tube of the fuel cooler, will extract heat from the fuel.



a Fuel inlet
b Fuel outlet
c Outer tube
d Inner tube
e Armaflex hose

A. Model 107, 116, 123

Tightening torques	Nm
Self-locking nut at lateral support of clamp	7
Self-locking nut at exhaust manifold and exhaust flange connection	30
Hex. bolts of lateral support on transmission	20

Removal and installation of exhaust system is not fully explained, only a few particularly important items are described which must be observed during removal and installation or during partial renewal, e. g. of rear muffler with plug connection.

Removal

1 If a plug connection is hard to separate, heat exhaust pipes. For safety reasons, place a protective shield between frame floor and exhaust pipes of vehicle prior to heating pipes.

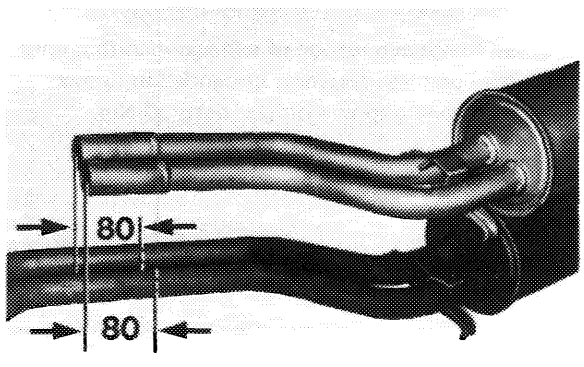
2 Check fastening member for re-use and replace, if required.

Installation

Renewal of rear muffler.

3 Place new rear muffler with plug connection accurately above removed system and mark pipe length of new rear muffler on removed unit.

Cut pipe 80 mm minus 10 mm from mark in direction of rear muffler to guarantee a plug-in depth of 70–80 mm.

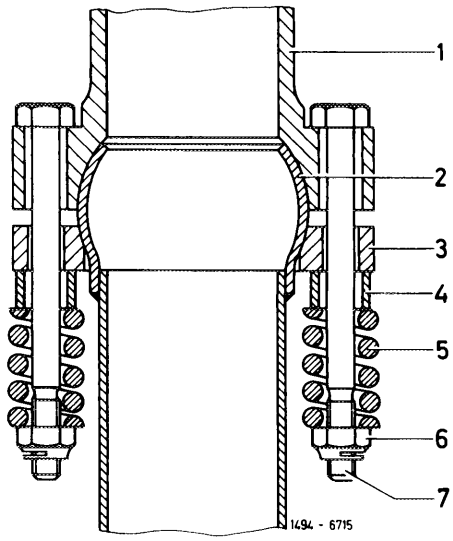


4 Always replace self-locking hex. nuts on principle.

5 Exhaust pipe – manifold connection of 1st version.

Uniformly tighten spring (5) coil to coil, then loosen again by 2–3 turns.

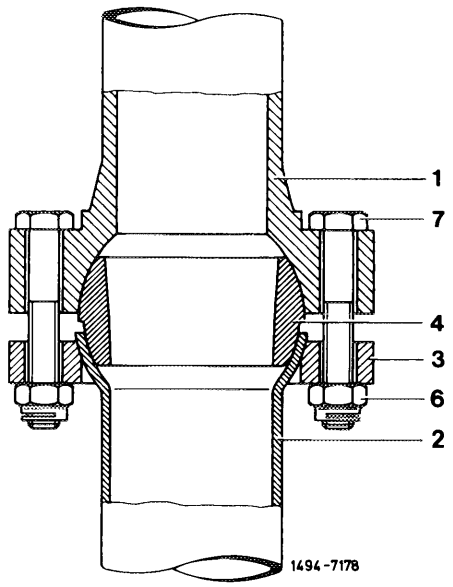
1 Exhaust manifold
2 Exhaust pipe with ball
3 Flange
4 Spacing member
5 Spring
6 Self-locking hex. nut
7 Hex. bolt



6 Exhaust pipe – manifold connection of 2nd version.

Tighten flange connection to exhaust manifold only after the complete system is suspended in rubber rings. Pay attention to correct seat of ball connection (4). Tightening torque of hex. bolts 30 Nm.

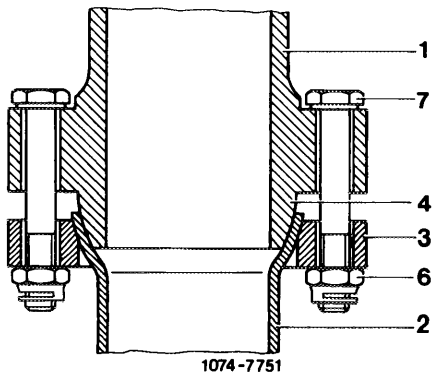
1 Exhaust manifold
2 Flared exhaust pipe
3 Flange
4 Ball connection
6 Self-locking hex. nut
7 Hex. bolt



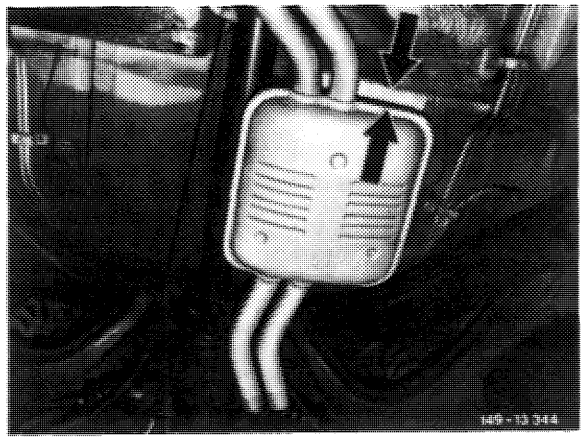
7 Exhaust pipe – manifold connection of 3rd version.

Tighten flange connection of exhaust manifold only after the complete system is suspended in rubber rings. Tightening torque of hex. bolts 30 Nm.

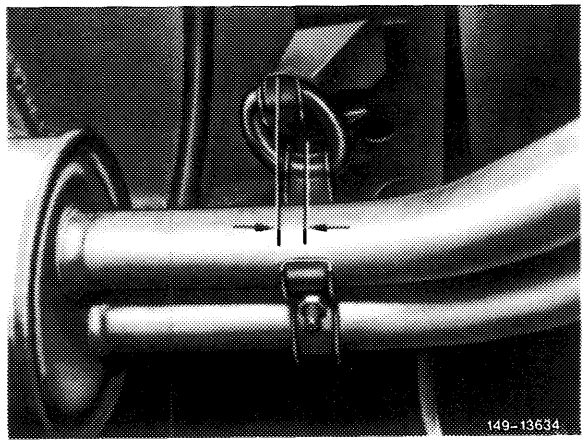
1 Exhaust manifold with outer ball
2 Flared exhaust pipe
3 Flange
4 Ball connection firmly connected to exhaust manifold
6 Self-locking hex. nut
7 Hex. bolt



8 Pay attention to distance between center muffler and frame floor (distance approx. 20 mm, arrows).

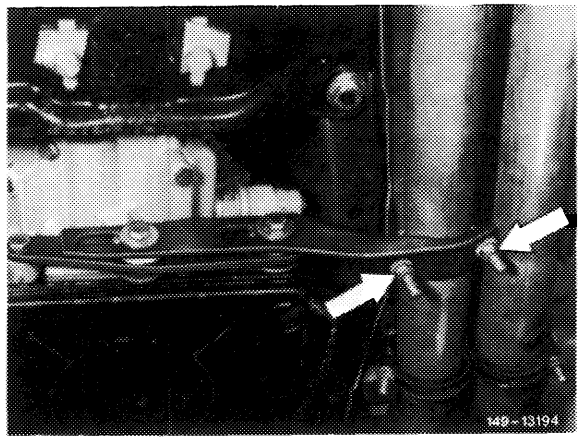


9 Mount rear muffler in such a manner that the clamps of the rear muffler are located **approx. 10 mm in front of** holders on frame floor (arrows), so that the correct installation position is assured if the system becomes elongated.

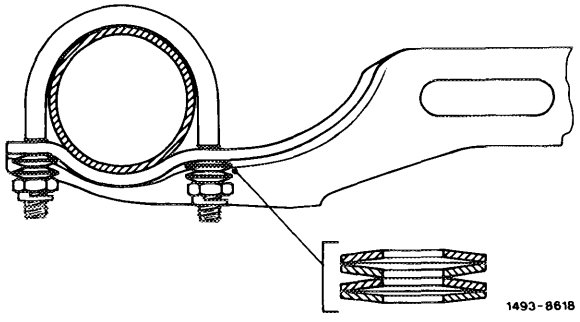


10 On vehicles with lateral support on transmission, mount lateral support free of tension. Mount clamps with 4 cup springs each in front of self-locking hex. nuts and tighten to 7 Nm (arrows).

Model 123



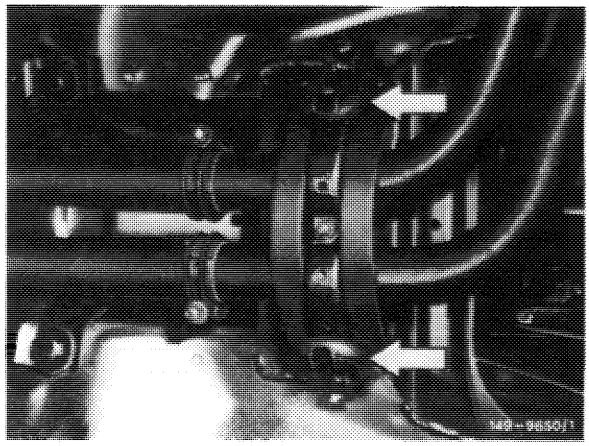
Note: Mount 4 cup springs each per side on holding bracket in such a manner that the respective crowns are opposite each other (as shown in illustration).



Layout of 4 cup springs on clamp

Note: Rubber rings are available in two versions of shore hardness. Hardness is recognized by compressing rings.

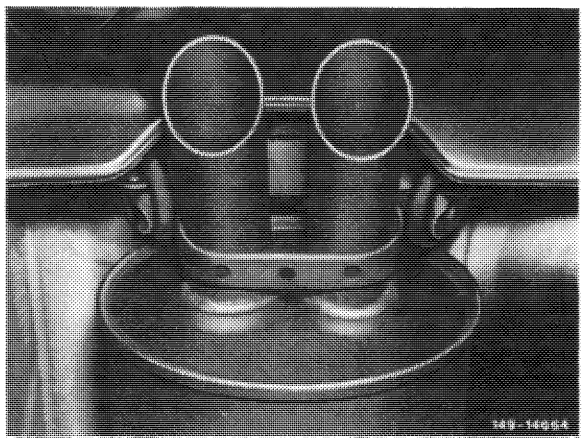
11 On front suspension of exhaust on model 116 use softer rubber rings only (arrows).



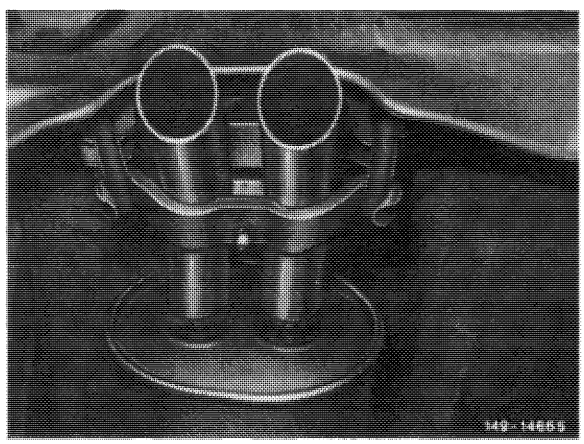
Model 116

12 Repair solution for rear muffler on model 116.

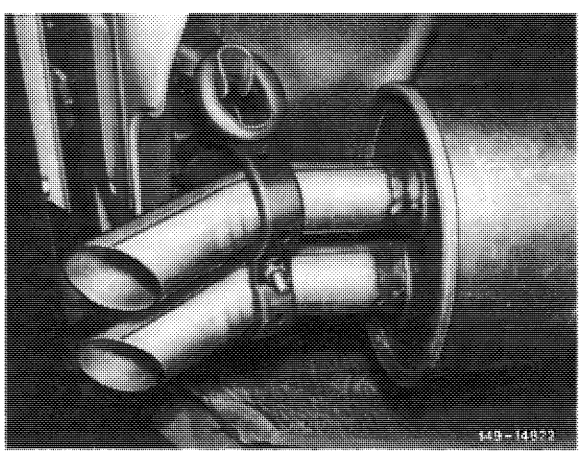
Since the end of October 1977 rear mufflers are installed with tailpipes sloping in downward direction. Only this type of pipes may be used as a spare part, also for vehicles with straight tailpipes. Since the rear muffler is delivered without the rear holder, two different holding bracket repair kits are available.



Rear holding bracket, welded
Rear muffler modified from start of series



Rear holding bracket, screw-type
Rear muffler modified up to start of series



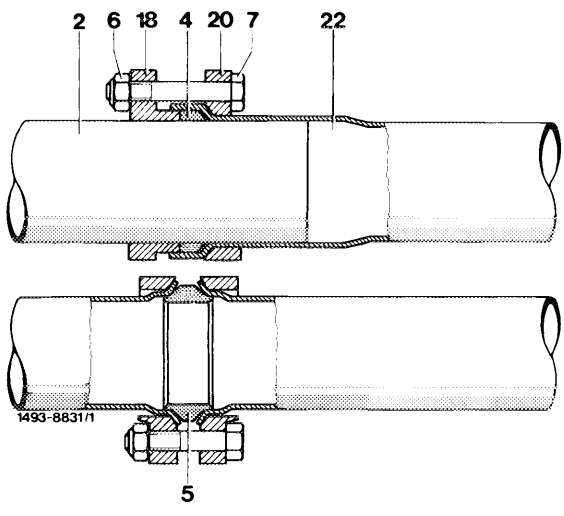
Rear holding bracket, screw-type
Rear muffler modified from start of series

13 Run engine and check exhaust system for leaks.

B. Model 126

Tightening torques	Nm
Self-locking hex. nuts at lateral support of clamp	7
Self-locking hex. nuts at exhaust manifold and exhaust flange connection	30
Self-locking hex. nut of exhaust pipe flange connection	20
Hex. bolts of lateral support on transmission	20

Removal and installation of exhaust system is not fully explained, only a few particularly important items are described which must be observed during removal and installation or during partial renewal, e. g. of rear muffler with plug connection.



Removal

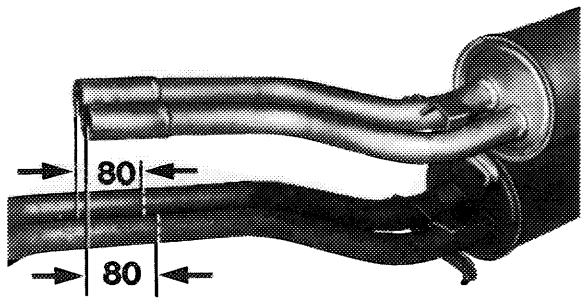
1 Check suspension members for re-use and replace, if required.

2 Prior to assembly of exhaust system make sure that the flanges for exhaust manifold are not distorted and straighten flange, if required. If required, clean cone connections of pipes (2 and 22) with emery cloth from combustion or corrosion residue.

Replacement of rear muffler

3 Place new rear muffler with plug connection accurately above removed unit and mark pipe length of new rear muffler on removed unit.

Cut pipe 80 mm minus 10 mm from mark in direction of rear muffler to guarantee a plug-in depth of 70–80 mm.

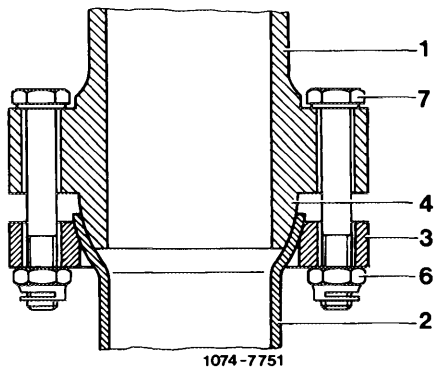


149-13369

4 Always replace self-locking hex. nuts and sintered sealing ring on principle.

5 Exhaust pipe – manifold connection.

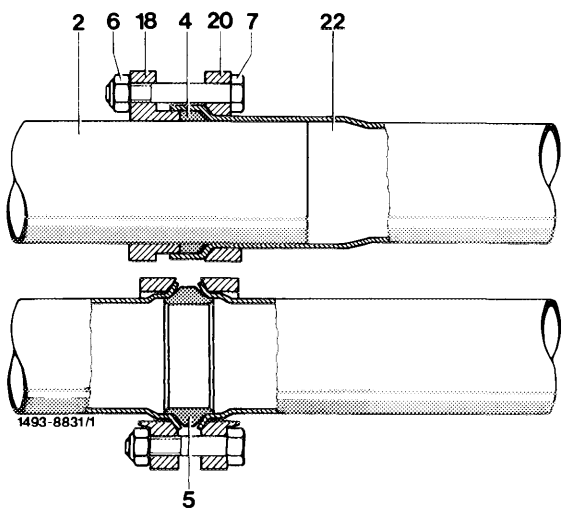
Tighten flange connection to exhaust manifold only after the complete system is suspended in rubber rings. Tightening torque of hex. bolts 30 Nm.



1074-7751

1 Exhaust manifold with outer ball
2 Flared exhaust pipe
3 Flange
4 Ball connection rigidly connected to exhaust manifold
6 Self-locking hex. nut
7 Hex. bolt

6 Mount sealing ring (4) and sintered sealing ring (5) on flange connection and pay attention to correct seat. Tightening torque of self-locking hex. nuts 20 Nm.

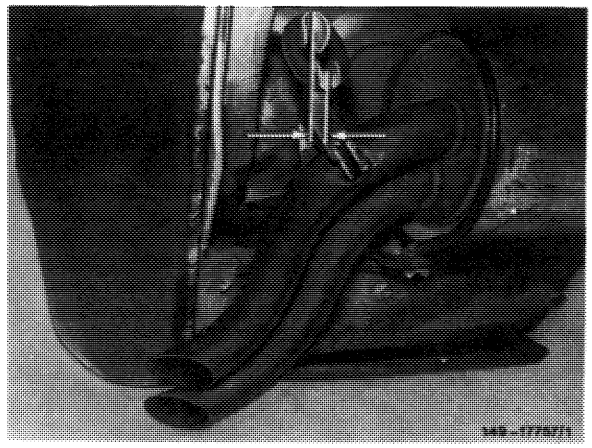


1493-8831/1

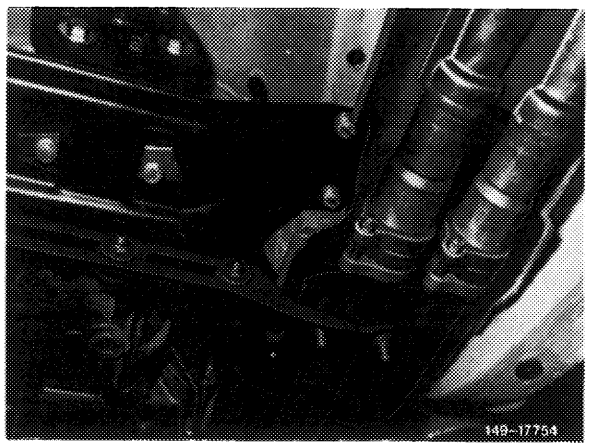
2 Front exhaust pipe
4 Sealing ring
5 Sintered sealing ring
6 Self-locking hex. nut
7 Hex. bolt
18 Flange, front
20 Flange, rear
22 Rear exhaust pipe

7 Mount rear muffler in such a manner that the clamps of the rear muffler are located approx. 10 mm in front of holders on frame floor (arrow), so that the correct installation position is assured if the system becomes elongated.

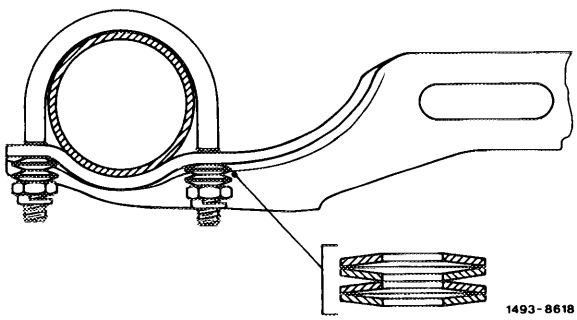
Note: The above applies only to mufflers of the repair version with plug connection between center and rear muffler.



8 Mount exhaust lateral support free of tension. Tightening torque of self-locking hex. nuts on clamp 7 Nm, hex. bolts of lateral support on transmission 20 Nm.

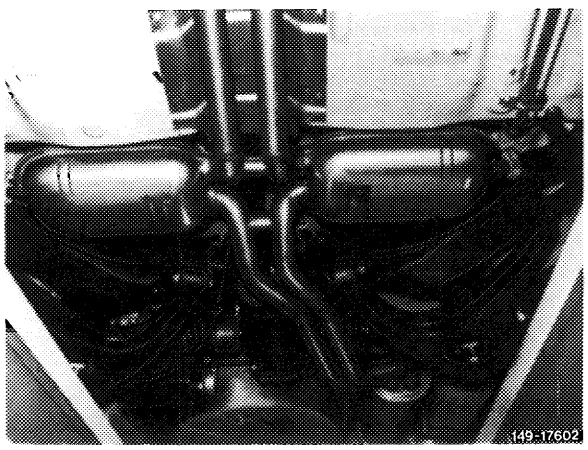


Note: Mount 4 cup springs each per side on clamp in such a manner that their respective crowns are opposite to each other (as shown in Fig.).

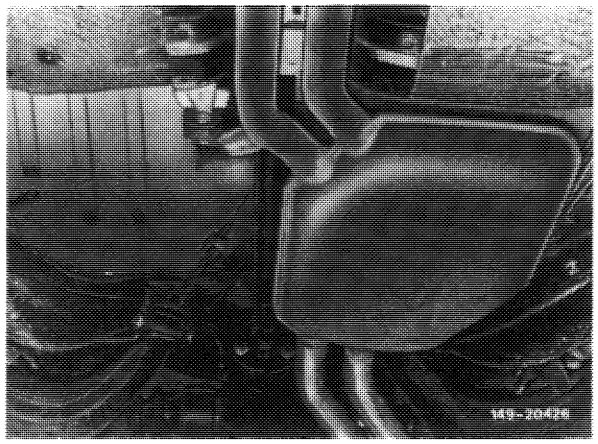


Layout of 4 cup springs on clamp

9 Center muffler 1st version (up to September 1980).



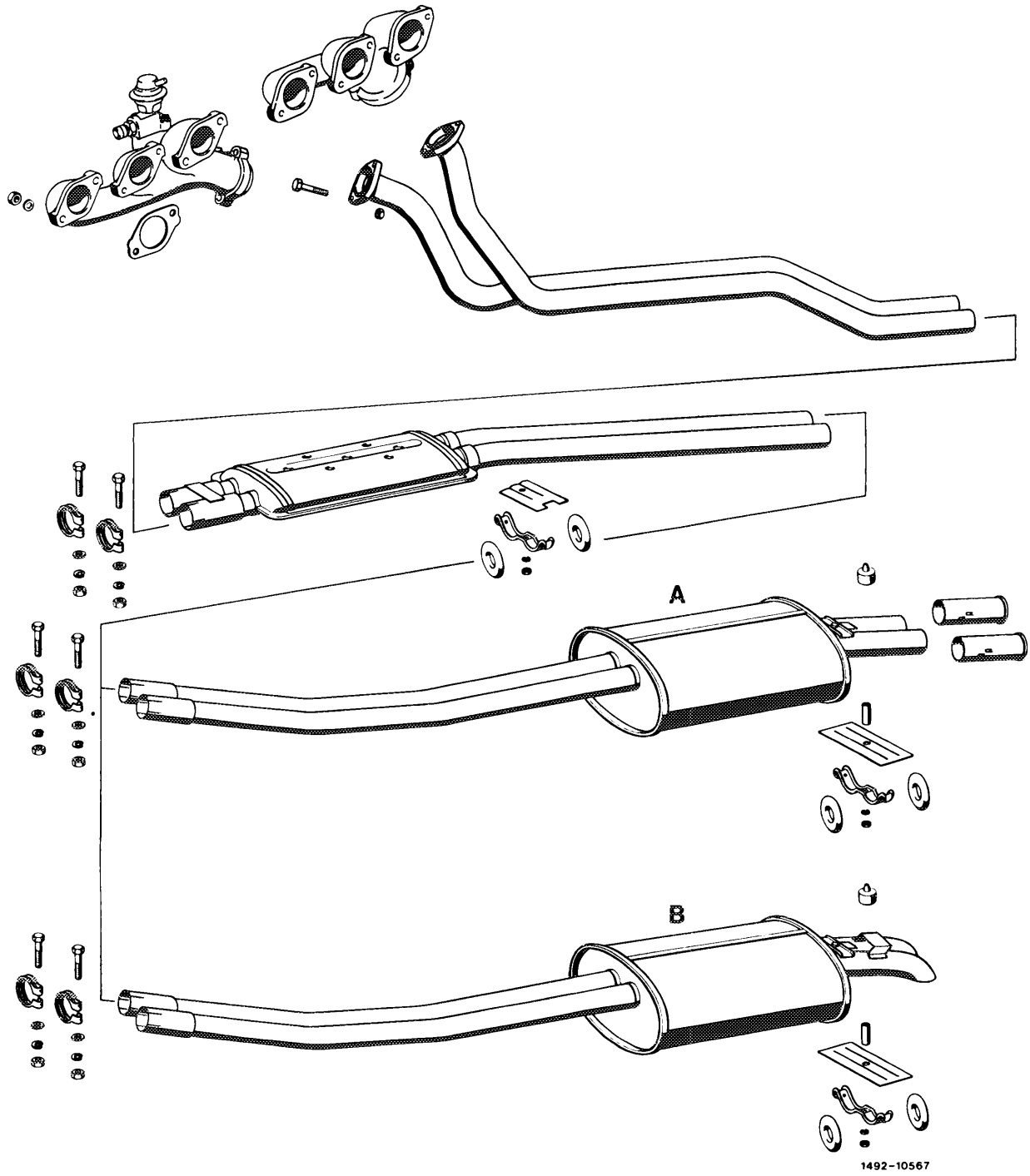
10 Center muffler 2nd version (starting October 1980).



11 Run engine and check exhaust system for leaks.

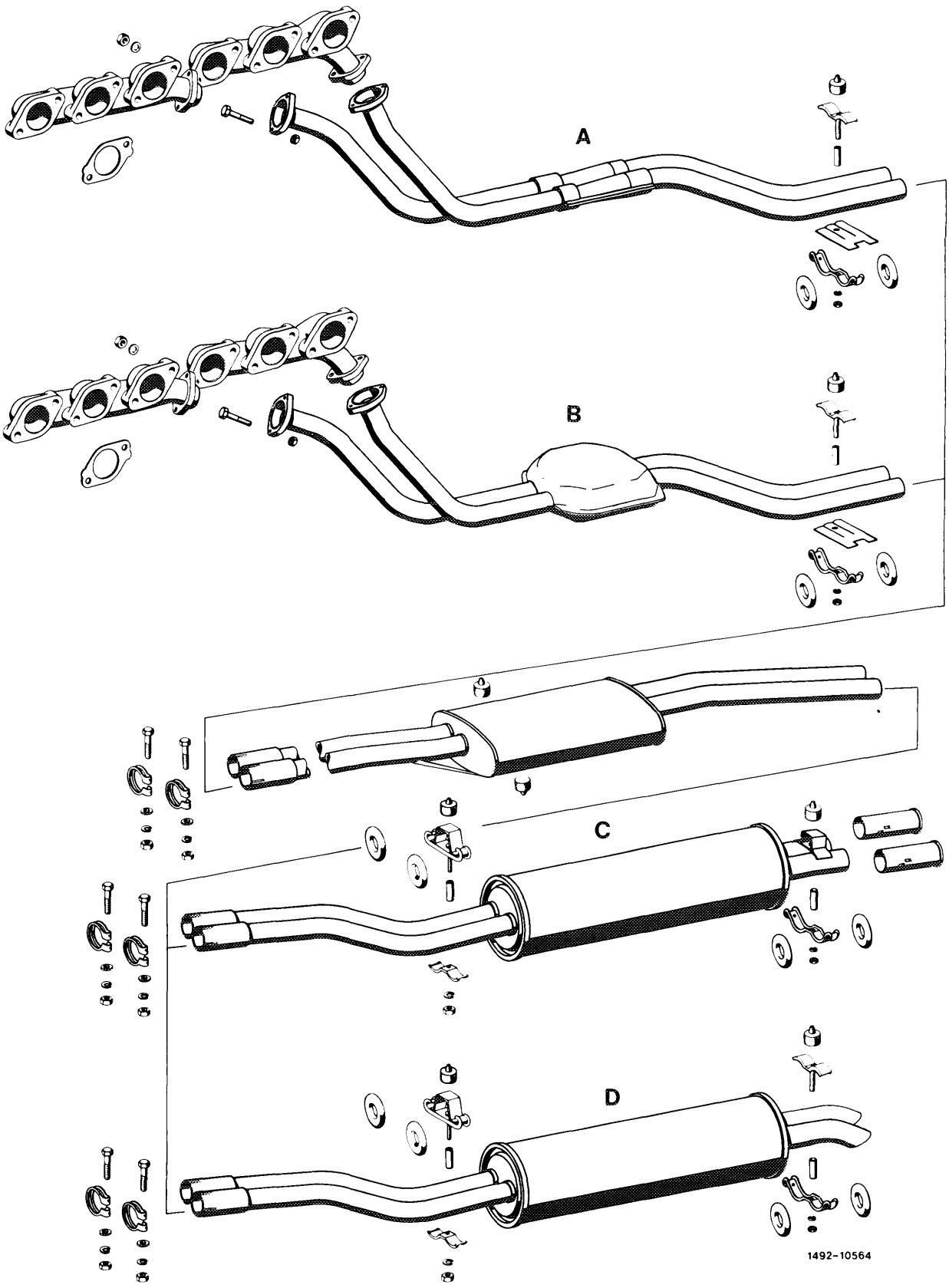
Exhaust manifold with complete exhaust system

Model 107.022/042

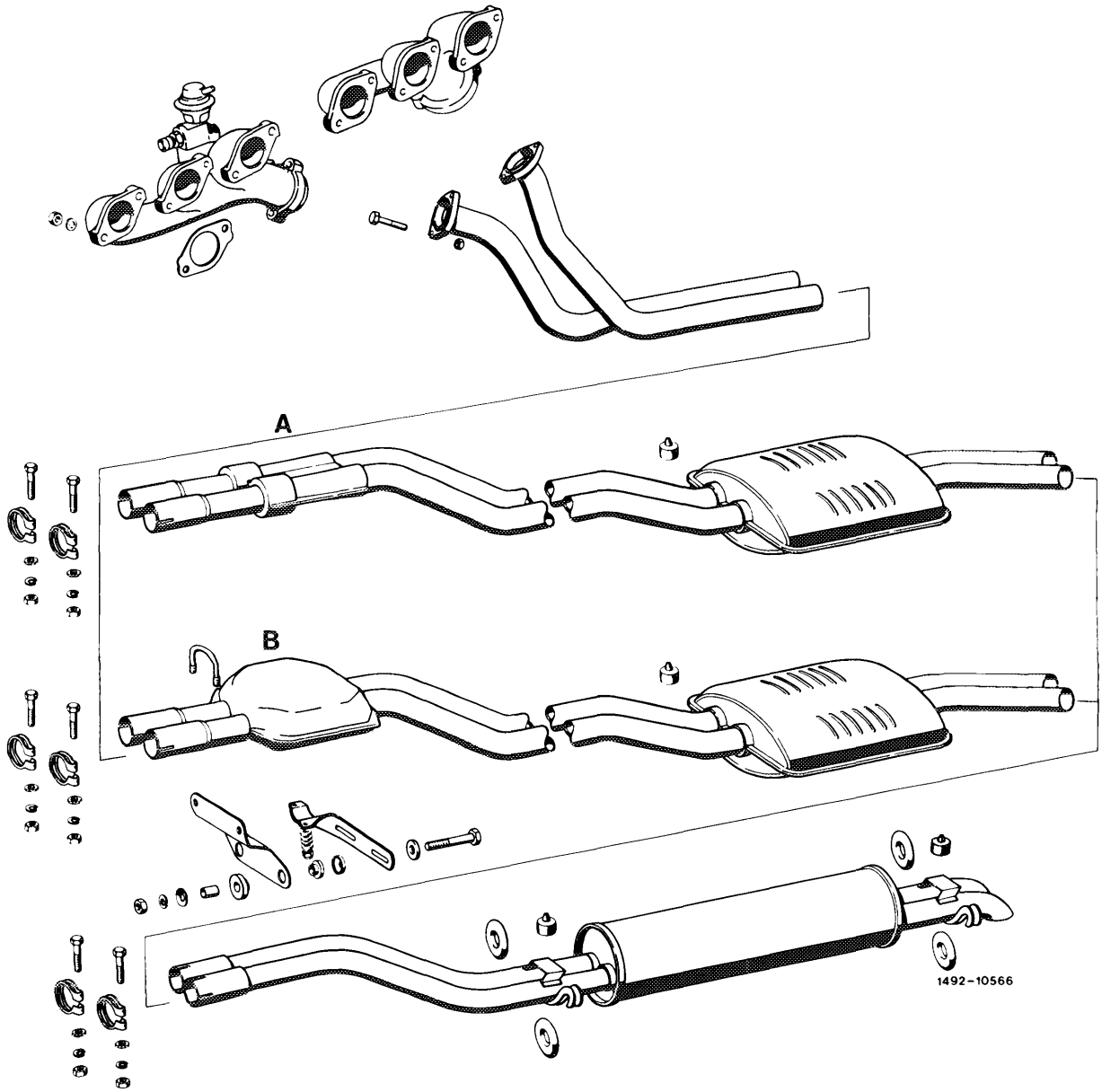


A Rear muffler with straight tailpipes (up to September 1977)
B Rear muffler with tailpipes sloping in downward direction (starting October 1977)

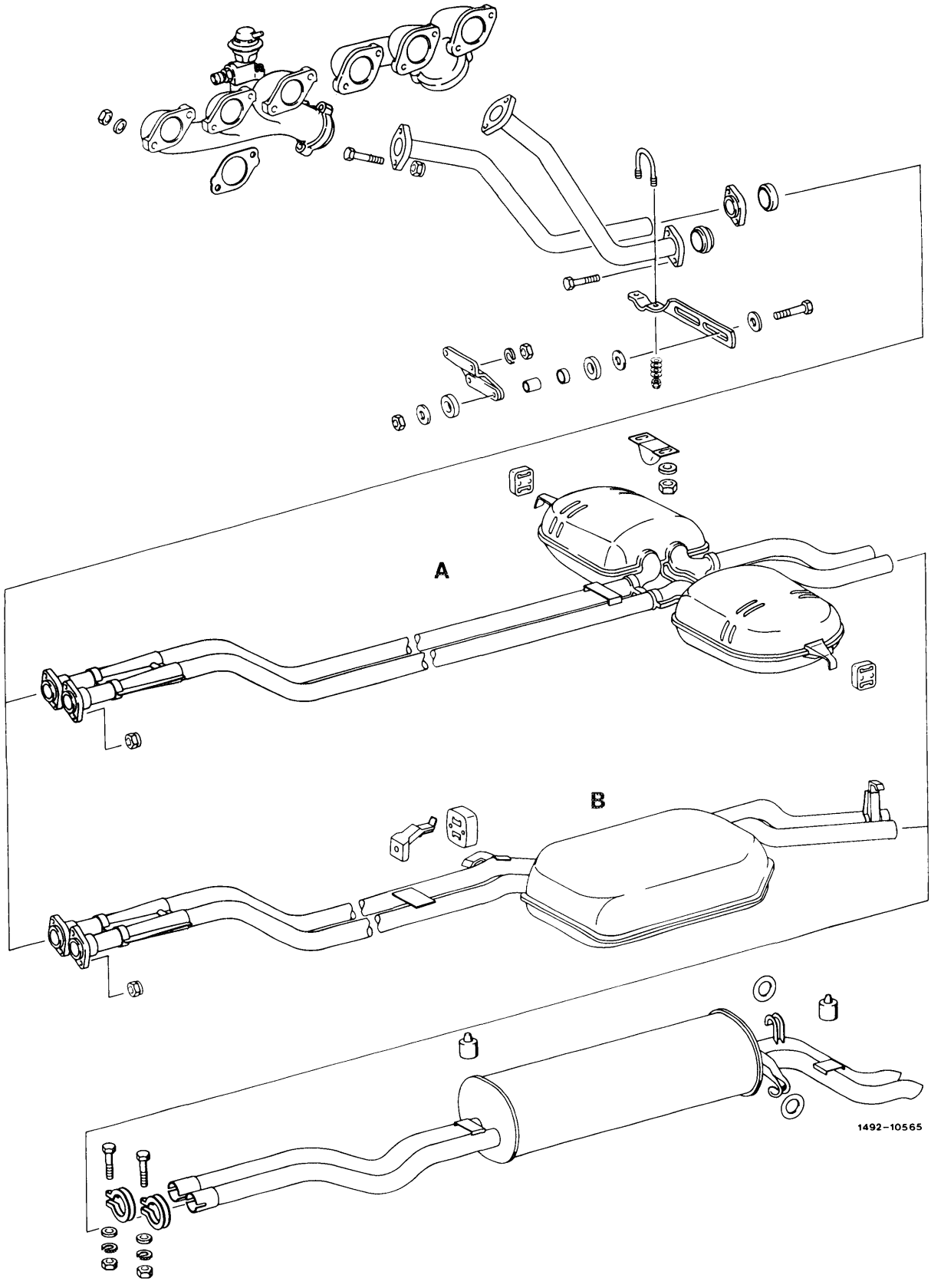
Model 116.024/025



A 1st version (up to March 1978)
B 2nd version (starting April 1978)
C Rear muffler with straight tailpipes (up to September 1977)
D Rear muffler with tailpipes sloping in downward direction (starting October 1977)



A 1st version (up to April 1978)
B 2nd version (starting May 1978)



A 1st version (up to September 1980)
B 2nd version (starting October 1980)