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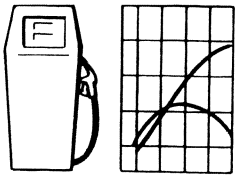
Order number: 35752/1
Supersedes TP 12275/2, 35049/1, 35138/1 and 35008/2

Specifications

Two kinds of tightening torque will be found in this Service manual:
I 'Tighten to **40 Nm**' indicates that a torque wrench must be used for tightening.
II 'Tightening torque: 40 Nm' is a guide value: tightening need not be done with a torque wrench.

GENERAL

Compression ratio, fuel octane requirements, output, torque



Engine	Compression ratio	Research Octane Number	Output, ISO*		Max. torque, ISO* Nm at r/s
			kW at r/s	hp at r/min	
B14.0E B14.0S	9.5:1	-87 87-	96 95(LFF)	51/92	70/5500108/58
B14.1E B14.1S	9.25;1		96	51/92	70/5500108/58
B14.2S B14.2E	9.25:1		96	51/92	70/5500105/42
B14.3S B14.3E B14.4E(D) B14.4E B14.4S + oxi-cat	9.25:1 9.25:1 9.25:1 9.25:1	-87 87-	96 95(LLF) 96 95(LFF) 95(LLF)	47/92 51/90 52/90 50/85	64/5500105/50 69/5400106/67 72/5400108/60 68/5100105/60
B14.4S	9.25:1	-87 87-	96 95(LFF)	50/92	68/5500110/42
B14.4O B13.4E	8.2:1 8.9:1	91	92 96 95	49/90 49/90	67/540098/50 66/5400108/60

LLF = leaded petrol
LFF = unleaded petrol

* Output figures are given in accordance with the ISO standard for standardization purposes. (This standard is approximately 1 to 2% under the DIN standard.)

Other general data	**B13**	**B14**
Number of cylinders	4	4
Bore ....Ømm	73	76
Stroke ....mm	77	77
Displacement....dm^3(litres)	1,289	1,397
Firing order	1-3-4-2	1-3-4-2
Compression pressure (normal value, see note)....MPa (kg/cm^2)	1.2-1.4 (12-14)	1.2-1.4 (12-14)

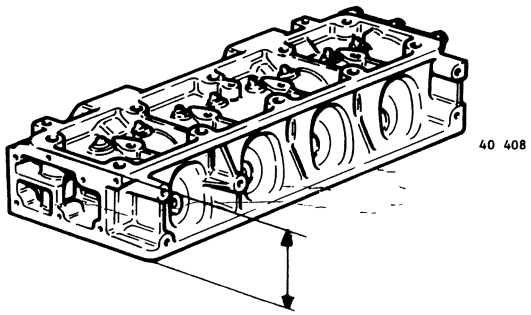
Note
Compression pressure measured with a hot engine, the throttle valve fully open and with the engine cranked by the starter motor.

Permissible engine speed with the engine running under no-load conditions of 20-25 r/s (1,200-1,500 r/min) when one of the spark plug leads is interrupted....r/s (r/min)	1.67 (100)
Permissible difference in compression pressure between the cylinders....kPa (kg/cm^2)	50 (0.5)

ENGINE

Cylinder block		**B13/B14**
Height of cylinder block	mm	240±0.1
Bore:		
- cylinder liner	Ømm	80.600-80.654
- push rod guides	Ømm	19.000-19.021
- main bearing	Ømm	58.700-58.731
Distributor drive shaft bushing	Ømm	16.000-16.018
Camshaft bushing	Ømm	38.000-38.025

Cylinder head



			Maximum height	**Minimum height**
Height	mm	B14.0	= 72.60	72.10
		B14.1/2/3/4/S	= 72.35	71.40
		B13.4E	= 72.20	71.40
		B14.3E/4E	= 72.20	71.40
		B14.4O	= 73.60±0.05	71.40

		B13/B14
Maximum warp	mm	0.1
Combustion chamber volume (not B14.0)	cm^3	36.590-37.590
Squareness of cylinder head joint face relative to water pump joint face (max)	mm	0.1

Cylinder liners

Overall length	mm	133.685-134.315

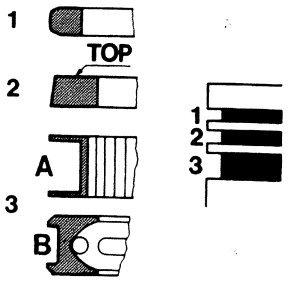
		B13	**B14**
Diameter of fitted sleeve:			
- top end	mm	80.510-80.564	80.510-80.564
- bottom end	mm	80.180-80.400	80.180-80.400
Height of mounting face	mm	95.005-95.305	95.005-95.035
Not available singly; supplied as a matched set consisting of cylinder liner, piston and gudgeon pin.			
Nominal diameter	mm	73	76
Projection of cylinder liners above cylinder block (without O-rings)	mm	0.02-0.09	0.02-0.09
Maximum relative difference in height	mm	0.04	0.04
O-ring diameter	mm	1.15-1.35	1.15-1.35

Pistons

Weight	grams	328	300-316
Max. permissible difference in weight between any two pistons in the same engine	grams	2	2
Height	mm	62.7	64
Piston clearance	mm	0.045-0.065	0.045-0.065
Diameter (nominal)	mm	75.945	72.945

The piston diameter is measured at right-angles to the gudgeon pin bore and **23 mm** from the underside of the oil scraper ring groove.

Piston rings		**B13/B14**
Upper compression ring:		
- height	mm	1.730-1.740
axial clearance in piston groove	mm	0.030-0.060
gap, measured in cylinder	mm	0.30-0.45
Lower compression ring:		
- height	mm	1.980-1.990
axial clearance in piston groove	mm	0.025-0.050
gap, measured in cylinder	mm	0.25-0.40
Oil scraper ring:		
- height, version A	mm	3.95-4.00
version B	mm	3.98-4.00
axial clearance in piston groove	mm	
version A	mm	0.025-0.070
version B	mm	0.025-0.070
gap, measured in cylinder	mm	
version A	mm	none
version B	mm	0.25-0.40



Note: version A of the oil scraper ring is the U-FLEX type and version B is the GOETZE type.

Gudgeon pins		
Fit, in connecting rod		press fit
Fit, in piston	mm	0.0006-0.012
Gudgeon pin length	mm	64.000-63.700
Diameter	mm	19.991-20.000
Out-of-round	mm	0.0015 max.

Valves and rocker gear

Valve clearances		**When checking/when adjusting**
Inlet valves:		
- cold engine	mm	0.15
- hot engine	mm	0.20
Exhaust valves:		
- cold engine	mm	0.20
- hot engine	mm	0.25

Valve stem diameter		
Inlet	mm	7.010-7.032
Exhaust	mm	7.020-7.042

Valves		
Valve stem length, inlet	mm	90.60-90.75
exhaust	mm	88.60-88.75

Engine type	Chassis No.	Valves	Diameter (A)	Seat angle (B)	Seat width (C)
B14.0E B14.0S	-393689 -458000	inlet valve exhaust valve	33.5 mm ~~30.3~~ mm	45° 45°	1.1 - 1.4 mm 1.4 - 1.7 mm
B14.1E/S B14.2E/S B14.3S	388000- -610000* -610000*	inlet valve exhaust valve	34.2 mm 29 mm	60° 45°	1.1 - 1.4 mm 1.4 - 1.7 mm
B14.2E B14.3E/S B14.4E/S/O B13.4E	610000-* 610000-* 810500- 731626-	inlet valve exhaust valve	34.2 mm 29 mm	45° 45°	1.1 - 1.4 mm 1.1 - 1.4 mm

* The Netherlands and Belgium: chassis no. 610000-
Other countries: chassis no. 672000-
B14.4O: no valve stem seal on the inlet valve.

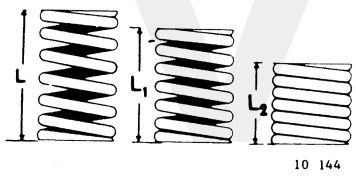
Valve seats		**B13/B14**
Valve seats are not available as separate parts.		
Valve seat inside diameter:		
- exhaust	mm	25.00 - 25.210
- inlet	mm	30.20 - 30.450
Height of valve seat:		
- exhaust	mm	6.00 - 6.090
- inlet	mm	9.00 - 9.110
Minimum grip length, oversize	mm	0.17

Valve guides		**B14.0**	**B14.1/2/3/4, B13.4**
Distance from underside of valve guide to upper surface of valve seat:			
- inlet	mm	26.2	25.2
- exhaust	mm	41.5	30.5
Length, valve guide:			
- inlet valve	mm	41.5	36
- exhaust valve	mm	41.5	41.5
Outside diameter:			
- standard, no grooves	mm	11.120	11.140
- oversize 1, one groove	mm	11.189	11.201
- oversize 2, two grooves	mm	11.370	11.390
- minimum oversize, grip length	mm	0.10	
Inside diameter	mm	7.000-7.022	7.000-7.022
Clearance in valve guide:			
- inlet valve	mm	0.02-0.084	0.02-0.084
- exhaust valve	mm	0.01-0.069	0.01-0.069

Rocker shaft			
Diameter Rocker shaft	mm	14.00 - 13.820	
Bore in rockers	mm	14.000-14.018	14.000-14.018
Bore in rocker shaft pedestals	mm	14.000-14.027	14.000-14.027

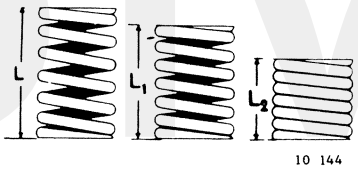
Valve springs

The Netherlands and Belgium, up to chassis no. 610000; other countries, up to chassis no. 672000



	Length	Loading
L	42.2 mm	0
L_1	32.0 mm	190-210 N
L_2	25.0 mm	342-378 N

The Netherlands and Belgium, as from chassis no. 610000; other countries, as from chassis no. 672000



	Length	Loading
L	46.9 mm	0
L_1	32.0 mm	232-272 N
L_2	24.5 mm	360-400 N

Tappets		**B13/B14**
Diameter	mm	18.968 - 19.987
Height	mm	33 - 34
Clearance, tappet in cylinder block	mm	0.013 - 0.047
Push rods, length	mm	173

Valve gear

Camshaft, bearing diameter	mm	37.025 - 37.050
Distributor drive shaft, diameter	mm	15.966 - 15.984
Max. cam lift:		
- inlet cam	mm	4.949 - 5.151
- exhaust cam	mm	4.934 - 5.176
Radial clearance	mm	0.05 - 0.10
End float	mm	0.05 - 0.10
With a theoretical valve lift height of 1 mm:		
- inlet valve opens, BTDC		0.5°
- inlet valve closes, ABDC		36°
- exhaust valve opens, BBDC		44°
- exhaust valve closes, ATDC		0.5°
Max. out-of-true	mm	0.03 - 0.05
Timing gears:		
- crankshaft sprocket	number of teeth	17
- camshaft sprocket	number of teeth	34

CRANKSHAFT ASSEMBLY

Crankshaft

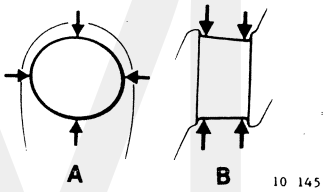
End float	mm	0.045 - 0.23
Radial clearance (main bearings)	mm	0.030 - 0.071
Max. out-of-true	mm	0.01
Oil seal running surface, flywheel end	mm	79.778 - 80.000
Flywheel mounting face	mm	46.984 - 47.000

Big-end bearings

End float	mm	0.310 - 0.604
Radial clearance	mm	0.022 - 0.067

Main bearing journals

Max. ovality (A)	mm	0.0025
Max. taper (B)	mm	0.0025
Diameter:		
- standard	mm	54.795 - 54.805
- undersize 1	mm	54.545 - 54.555



Big-end bearing journals

Max. ovality (A)	mm	0.0025
Max. taper (B)	mm	0.0025
Diameter:		
- standard	mm	43.960 - 43.980
- undersize 1	mm	43.710 - 43.730
Bearing recess width	mm	17.5 - 17.75

Thrust washer segments

Thickness:		
- standard	mm	2.80
- oversize	mm	2.95

Connecting rods

Max. permissible weight difference between connecting rods in same engine	grams	2
Weights: marked green-black	grams	508 - 510
marked yellow	grams	526 - 528
Clearance on crankshaft:		
- axial	mm	0.31-0.57
- radial	mm	0.022-0.067
Little-end diameter	mm	19.945 - 19.957
Max. permissible difference in length between big and little-end	mm	0.1

Flywheel

Max. axial throw, measured at a radius of 80	mm	0.07

Pulley hub

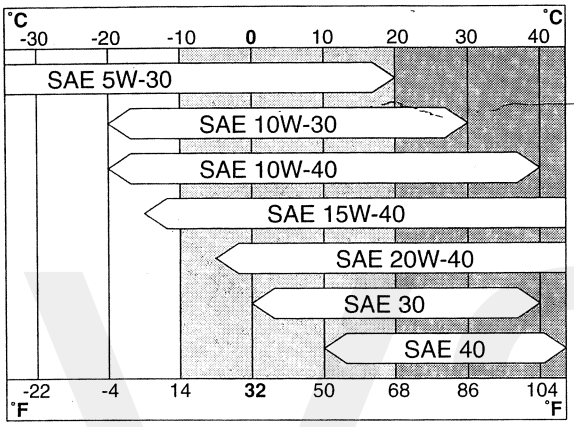
Diameter, oil seal joint face	mm	34.840 - 35.000

LUBRICATION SYSTEM

General data

Oil capacity,	
excl. oil filter ..... litres	3.5
incl. oil filter ..... litres	4.0
Difference between Max-Min marks ..... litres	1.0
Type of oil filter	Full-flow
Oil pressure with a new filter and a hot engine:	
- at 800 r/min ..... kPa (kg/cm^2)	150 - 250 (1.5 - 2.5)
- at 1,000 r/min ..... kPa (kg/cm^2)	300 - 400 (3.0 - 4.0)
- at 3,000 r/min ..... kPa (kg/cm^2)	400 - 450 (4.0 - 4.5)
Engine oil, type and quality	CCMC Service classification G2 or G3 API Service classification SF

Viscosity Temperature range (at stable ambient air temperature)



Under extreme driving conditions which can lead to abnormally high oil consumption, such as when driving in mountainous areas with frequent braking on the engine or high-speed motorway driving, the recommended oils are SAE 15W/40 or SAE 20W/40. However, always bear in mind the lowest temperature limit.

Oil pump

Type	Gear pump
Number of teeth per gear	11
End float ..... mm	0.020 - 0.086
Radial clearance (excl. bearing clearance) ..... mm	0.095 - 0.222
Max. clearance between gears and pump body ..... mm	0.200
Bearing clearance:	
- drive shaft ..... mm	0.024 - 0.049
- idler shaft ..... mm	0.013 - 0.037

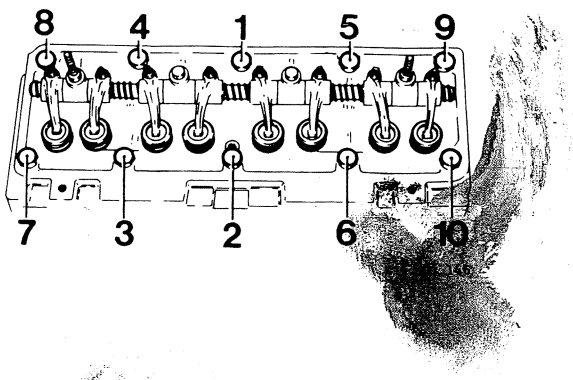
Relief valve spring

Length under various loadings

	Length	Loading
L	46 mm	0 N
L_1	22 mm	25.1 - 27.9 N
L_2	18 mm	29.3 - 32.3 N

Oil pressure switch

Cut-in pressure ..... kPa(kg/cm^2)	2.7 - 4.3 (0.27 - 0.43)



Tightening the cylinder head bolts

The cylinder head bolts should be tightened in the correct sequence and in two stages.
1st stage: tighten to **27 Nm.**
2nd stage: tighten to **60 Nm.**

FUEL SYSTEM

CO-content at idling speed (hot engine)

Engine type	CO-content*		Idling speed	
	Adjusting	Checking	r/s r/min	
B13.4			MT: 15 ± 0.8	900 ± 50
B14.0	2.5	1.5 - 4.0	12,5	750
B14.1/2/3/4**	2.0	1.5 - 3.0	AT: 13.3 ± 0.8	800 ± 50

*- Engines outside the check values must be adjusted to the specified setting.
- Engines within the check values need no further adjustment, providing the engine is running satisfactorily.
- Pulsair system (if fitted) disconnected and blanked off.

** B14 engines with a thermo-electric cooling fan (from 1984 onwards) should never be adjusted while the fan is rotating. Adjustments should be made within three minutes of the thermostat opening.

Fuel tank

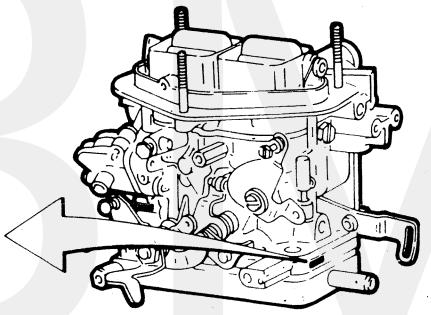
Total capacity .....litres 45
Reserve capacity (warning lamp in fuel gauge).....litres 5

Carburettors

Weber 32 DIR carburettors (49/50/51/52 kW engines)

Identification number

32 DIR-00-000



Carburettor specifications for Weber 32 DIR up to model year 1982

	93-100/95-100		Others	
	1st stage	2nd stage	1st stage	2nd stage
Venturi inside diameter .....mm	24	24	23	24
Main jet (fuel).....	110-115	132-135	125-130*	117-123
Main jet (air).....	135-155	155-175	170-190	125-145
Emulsion tube	F20	F6	F53	F6
Idle jet (fuel).....	42-48	47-53	44-50	55-65**
Idle jet (air).....	125-145	65-75	105-125	-
Accelerator pump injector.....	60	-	50	-
Mechanical choke valve opening.....mm	3.5-4.5	3.5-4.5	3.5-4.5	3.5-4.5
Pneumatic choke valve opening .....mm	5.5-6.5	5.5-6.5	4-5***	4-5***
Throttle valve opening at full choke.....mm	0.85-0.95	-	0.85-0.95	-
Needle valve .....ømm	1.75		1.75	
Float weight .....grams	11		11	
Float height (measured with gasket).....mm	7		7	
Float chamber air valve, stroke.....mm	2 ± 0.5		2 ± 0.5	

* for 84 - 100: 127 - 133
** for 74 - 100/83 - 100/85 - 100: 0
*** for 85 - 100: 5.5 - 6.5

Service
If 32 DIR 73 - 100, 32 DIR 57 - 8400, 32 DIR 74 - 100 or 32 DIR 48 - 6200 carburettors have to be renewed, fit 32 DIR 57 - 8401 and 32 DIR 48 - 6201, respectively.
If the second stage is still fitted with an open idle jet, this must be replaced by a blind jet, Part No. 3277425-9.

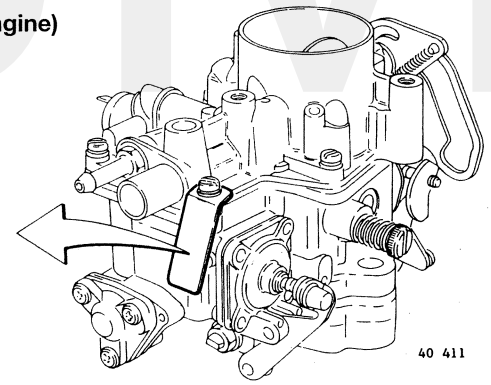
Carburettor specifications for Weber 32 DIR 93 - 101/95 - 101, model years 1982 - 1983 and Weber 32 DIR 104 - 100/105 - 100, model year 1984.
The specifications of the Weber 32 DIR 109 (B14.4E), model year 1986 (with fuel cut-off) are identical to those of the Weber 32 DIR 104. Weber 32 DIR 109 Rep 101 (B13.4E, B14.4E): main jet = 122.
The specifications of the Weber 32 DIR 110 (B14.4O), model year 1986 (no fuel cut-off) are identical to those of the Weber 32 DIR 105.

	93-101/95-101		104-100/105-100*****		110/110	
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Venturi inside diameterr.....mm	24	24	23	24	23	24
Main jet (fuel))	110-115	132-135	120-125**	135-140	115-120	135-140
Main jet (air)	145-165*	-	180-200	180-200	185-195	185-195
Emulsion tube	F20	F6	F20	F20	F20	F20
Idle jet (fuel)	47-53	0	47-53	47-53	50	50
Idle jet (air)	125-145	65-75	130-140***	65-75	135	70
Accelerator pump injector	45	45	45	45	45	-
Mechanical choke valve opening.....mm	3.5-4.5	3.5-4.5	3.5-4.5	-****	3.5-4.5	-
Pneumatic choke valve opening.....mm	5.5-6.5	5.5-6.5	5.5-6.5	-****	5.5-6.5	-
Throttle valve opening at full choke .....mm	0.85-0.95	-	0.85-0.95	-	-	-
Needle valve .....Ømm	1.75	1.75	1.75			
Float weight .....grams	11	11	11			
Float height (measured with gasket).....mm	7	7	7			

* for 95 - 101: 135 - 155
** for 105 - 100: 122 -127
*** for 105 - 100: 120 - 125
**** The choke valve in the 2nd stage was discontinued with effect from model year 1984.
***** For 104 (101 - 102): no bypass in the idle jet.

Solex carburettor 32 - SEIA REN 796 and 814-828 (47 kW engine)
Identification number

32 - SEIA REN 796
32 - SEIA REN 814
32 - SEIA REN 828



Carburettor specifications	32 - SEIA REN 796	32 - SEIA REN 814	32 - SEIA REN 828
Venturi diameter.....mm	24	24	24
Auxiliary venturi	Asymmetrical	Symmetrical	Symmetrical
Main jet (fuel)	125.5 - 130.5	120 - 125	120 - 125
Main jet (air	150 - 160	160 - 170	160 - 170
Idle jet	42 - 48	40 - 46	40 - 46
Accelerator pump injector	35	35	35
Needle valve.....ømm	1.5	1.5	1.5
Float weight.....grams	5.2	5.2	5.2
Float height.....mm	22.7	22.7	22.5
Mechanical choke valve opening.....mm	4 - 5	4 - 5	4 - 5
Throttle valve opening with full choke.....mm	0.8	0.8	0.8
Emulsion tube	X16	X17	X17
Float chamber air valve.....mm	3.5 ± 0.5	3.5 ± 0.5	3.5 ± 0.5

Air supply

Type of system:	thermostatic (Europe, up to chassis number 332021: mechanical)
Control range:	
up to chassis number 388000 °C	17.5 - 26
chassis number 388000 - 545000 °C	20 - 35
from chassis number 545000 °C	25 - 35

Decelerating mechanism

Value when adjusting:	
B14.0S, with microswitch r/s (r/min)	26.7 - 28.3 (1600 - 1700)
with vacuum control unit (engine speed -dependent switch) r/s (r/min)	32.5 - 34.2 (1950 - 2050)
B14.1S/2S r/s (r/min)	25.0 - 26.7 (1500 - 1600)
B14.3S automatic r/s (r/min)	25.0 - 26.7 (1500 - 1600)
B14.3S manual r/s (r/min)	32.5 - 34.2 (1950 - 2050)
B14.4S/O r/s (r/min)	25.0 - 26.7 (1500 - 1600)

Vacuum switch

Type	Solex Calorstat
Operating pressure kPa (kg/cm^2)	73.5 ± 5 (0.735 ± 0.05)

Air filter

Filter element	Paper cartridge
Change interval:	
up to model year 1981 km	20,000
from model year 1981 km	40,000

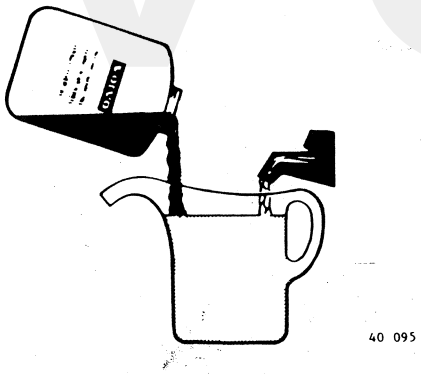
Fuel pump

Delivery pressure measured at same height as pump at 16.6 r/s (1,000 r/min) kPa (kg/cm^2)	16 - 26 (0.16 - 0.26)

Fuel tank

Total capacity litres	45
Reserve capacity litres	5

COOLING SYSTEM



General data

Coolant composition

- The coolant should be changed after two winters (every third autumn). After this period the corrosion-protective additives in the coolant will have lost some of their effect.

- Never fill the cooling system with water on its own. Use genuine Volvo coolant diluted with clean water in the proportions shown below..

Coolant mixture

Nordic countries:
part Volvo coolant to 1 part water.
Europe and Overseas (with the exception of Nordic countries): 1 part Volvo coolant to 2 parts water.
CKD countries:
mixing ratio: 1 part coolant to 30 parts water.

Cooling system capacity

Up to model year 1985 litres	approx. 5.5
From model year 1985 litres	approx. 6.5

Expansion tank

The pressure relief valve in the filler cap opens at:	
positive pressure.....kPa (kg/cm²)	75 (0.75)
vacuum .....kPa (kg/cm²)	7 (0.07)

Thermostat

	B13/B14		B14.4O
Type.....	1	2	1
Markings.....	89	92	83
Starts to open at.....°C	86-89	89-92	80-83
Fully open at .....°C	100	105	93

Thermal switch, engine cooling fan

Type.....	270 F
Engaging temperature .....°C	87.5 ± 2
Disengaging temperature .....°C	82.5 ± 2

Fan belts

B14, - 81	DA - 95 - 1215 LA
B14, 82-	AV - 10 - 1235 LA
B14, with air-conditioning	A13/12.5-875 LA

IGNITION SYSTEM

Note:
With effect from model year 1984, all petrol engines were equipped with a 'Renix' electronic ignition system. The specifications of this system are completely different from those of earlier systems.

Spark plugs

Engine type	Model year	Part No.	Electrode gap in mm
B13.4E	89-	3344473-8	0.8-0.9
B14.OE/OS	-79	271412-9	0.7
B14	80 - 83	273597-5	0.7
B14	84 - 86	271409-5	0.7
B14.4	87-	3344473-8	0.8-0.9

Conventional ignition system (mechanical breaker type)

Engine type	B14.0E/S	B14.1/2/3S B14.1/2E	B14.3E
Number of degrees BTDC	3° ± 1°	6° ± 1°	10° ± 1°

Distributor

Direction of rotation.....	clockwise
Contact breaker points gap.....mm	0.4 - 0.5*
Dwell angle at 8.3 r/s (500 r/min).....	57° ± 3°**

* SEV Marchal: only the dwell angle can be adjusted
** AC Delco: 50° ± 3°.

Engine type	Distributor	Type
B14.0E.....	Ducellier 6623	with breaker points
B14.0S.....	Ducellier 6624	with breaker points
B14.1E/1S/2S.....	Ducellier 525182*	with breaker points
B14.2E/3S.....	Ducellier 525295	with breaker points
B14.3E up to model year 1984.....	Ducellier 525351A	with breaker points
B14.3E from model year 1984.....	Ducellier 525352	breakerless**

* B14.1E: 488547-516644 with AC Delco or SEV Marchal.
** The dwell angle cannot be checked or adjusted.

Centrifugal control (vacuum hose disconnected)

Advance in distributor degrees	**B14.0**	**B14.1/2/3S**	**B14.3E**
Total advance, distributor degrees	15 ± 1	12 ± 1	10 ± 1
Advance begins at a distributor speed of ....r/s (r/min)	9.2 (550)	10 (600)	12.5 (750)

Distributor speed for degrees of advance past static setting

		B14.0	**B14.1/2/3S**	**B14.3E tot 1984**
5°	r/s (r/min)	14.3 (860)	17.5 (1050)	19 (1150)
9°	r/s (r/min)	25.3 (1520)	28.3 (1700)	30 (1800)
max	r/s (r/min)	41.6 (2500)	45.8 (2750	33.3 (2000)

Vacuum control
Advance in distributor degrees
Direction of adjustment: positive
Note:
When checking the undermentioned values on the engine, they have to be doubled and then added to the static setting value in order to convert from distributor degrees to engine degrees. This applies both to centrifugal and vacuum advance.

	B14.0E	**B14.0S**	**B14.1/2S**	**B14.2E/3S**	**B14.3E**
Total advance, distributor degrees	11	9.3	7.5	9.3	10
Advance begins at mmHg	80	25	125	80	80
2° advance at mmHg	100	30	145	100	110
5° advance at mmHg	-	-	-	15	170
Maximum advance at mmHg	370	52	400	350	320

Ignition coil

Resistance, primary winding, between terminals 1 and 15....ohms	1.32
Resistance, secondary winding, between the HT terminal and terminal 1 ....k-ohms	7.5
Ballast resistor at 20°C....ohms	0.68

Electronic ignition
Fitted with effect from model year 1984 (non-adjustable).

Ignition timing point
Given in degrees BTDC and measured with the vacuum hose disconnected.

Engine type	**Modelj year**	**Ignition unit**	**Plug C disconnected and**		**Plug C connected and**
			15 r/s	**42 r/s**	**15 r/s**
B13.4E	1989 -	402	6° ± 3°	20° ± 3°	-
B14.3E	1984 - 1986	401	10° ± 2°	21° ± 3°	-
B14.4E/O*	1984 - 1986	402	6° ± 2°	20° ± 3°	-
B14.4S*	1984 - 1986	402	6° ± 2°	20° ± 3°	MT: 3° ± 2°, AT: 0° ± 2°
B14.4E/O	1987 -	412	6° ± 3°	20° ± 3°	MT: 3° ± 2°, AT: 0° ± 2°
B14.4S	1987 -	412A	6° ± 3°	20° ± 3°	MT: 3° ± 2°, AT: 0° ± 2°
B14.E(D)	1988 -	412	6° ± 3°	20° ± 3°	MT: 3° ± 2°, AT: 0° ± 2°

* Version with change-up indicator.
Note: the ignition units are not interchangeable.

Distributor
B13.4E/B14.3E/B14.4E/S/O ....
Ducellier, breakerless

Ignition coil

Resistance, primary winding....ohms	0.4 - 0.8
Resistance, secondary winding ....ohms	2.5 - 5.5

Sensor module

Internal resistance ....ohms	220 ± 60

Tightening torques

The tightening torques specified here apply to oiled bolts and nuts; degreased (washed) components must be oiled before fitting.

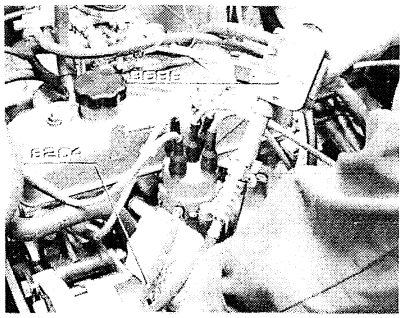
	Nm
Cylinder head (see tightening sequence)	60
Main bearing caps	60
Big-end bearing caps	42
Flywheel (use new bolts)	53
Camshaft sprocket	30
Camshaft lockplate	10
Crankshaft pulley bolt	80
Sump bolts	9
Timing case cover (nuts and bolts)	8
Rocker shaft pedestal (bolt/nut)	16
Fuel pump (bolt/nut)	17
Timing chain tensioner	10
Water pump body and cover	8
Engine mounting pads in cylinder block	53
Oil pump body and cover, bolts	8
Oil pressure switch	20
Subframe to engine, bolt	47
Oil drain plug, removable nut	25
captive nut	35
Valve cover, nuts	5
Lambda sensor, plug	23
Ignition unit, bolts	23
Engine mounting pad, clutch housing end	30
mounting bracket end	47
Engine mounting bracket to front axle	23
Valve cover to rocker pedestal, stud	18
Stud on manifold	28
Sensor in clutch housing	10
Oil passage, plug	20
Air filter, bolts	10
nuts	5
Choke cable, nipple	10
Throttle cable, nipple	10
Stabilizer rod	23
Inlet and exhaust manifolds	18
Throttle linkage on manifold	8
Thermal switch (radiator)	18
Cylinder head, rear cover plate	11
Water pump cover (-1980)	8
Water pump plate (1981-)	8
Water pump pulley with fan	15
Water pump pulley without fan	21
Water pump body to cylinder head	8
Carburettor on manifold	18
Exhaust downpipe to manifold, M8	20
M10	40
Radiator securing bolts	20
Fuel tank, bolts	23
Radiator mounting bracket, bolt	10
Self-tapping screw, fan	8
Temperature transmitter in cylinder head or water pump	20
Spark plugs	18
Fuel pump, stud	23
Idle solenoid	5
Coolant drain plug	20
Distributor, nut	12

Special tools

115	Description
8264	Extension hose: used in combination with compression pressure gauge 999-9689
8281-4	Assembly sleeve: for locating pistons in cylinder liners
8942	Cutting tool: for machining valve guides

998	Description
5422	Piston ring tool: for removing/fitting piston rings
6052	Valve spring compressor: for removing/fitting inlet and exhaust valves

999	Description
1801	Standard handle: used in combination with drifts 5944 and 5953
2520	Universal stand: used in combination with engine support 5800
2810	Lifting beam: for hoisting the engine in and out
2901	Clamping tongs: for pinching off the fuel hose
2903	Oil filter wrench: for removing the oil filter
5112	Locking sector: for locking the flywheel in position
5270	Oil pressure gauge: for measuring the oil pressure
5363	Fixture: used as a holding tool when working on the cylinder head
5800	Engine support: used in combination with universal stand 2520
5801	Valve clearance adjusting tool: for adjusting the valves
5802	Fixture: used as a holding tool when working on the cylinder head
5803	Clamping plates: for retaining the cylinder liners
5807	Drift: for timing cover oil seal (also centring tool)
5809	Drill set: for replacing valve guides
5810	Drift: for pressing in valve guides
5810-2	Spacer sleeve: used in combination with drift 5810
5811	Slip gauge: used in combination with slip gauge 5812 (for measuring projecting height of cylinder liners)
5812	Slip gauge: used in combination with slip gauge 5811 (for measuring projecting height of cylinder liners)
5813	Adjusting wrench: for altering position of gear segment (ignition)
5847	Baseplate: for pressing gudgeon pins in and out
5849	Extractor: for removing oil seals
5870	Lifting eye: for hoisting the engine in and out
5871	Lifting eye: for hoisting the engine in and out
5872	Spacer sleeve: used in combination with drift 5810
5944	Drift: for pressing in the pilot bearing
5950	Guide bush: for inserting pistons in cylinder liners
5953	Drift: for locating the oil seal at the flywheel end
9151	Stop collar: used in combination with baseplate 5847
9152	Stop collar: used in combination with baseplate 5847
9153	Handle: for inserting gudgeon pins in piston/con. rod assemblies
9155	Guide mandrel: used in combination with handle 9153
9684	Clock gauge: for measuring the projecting height of cylinder liners
9689	Compression gauge: used in combination with extension hose 115-8264
9696	Magnetic base: used in combination with clock gauge 9684
9921	Monotester: used for adjusting the ignition timing in combination with sensor 9938 or stroboscope 9940
9938	Sensor: used for checking the ignition timing in combination with Monotester 9921
9940	Stroboscope: used for checking the ignition timing in combination with Monotester 9921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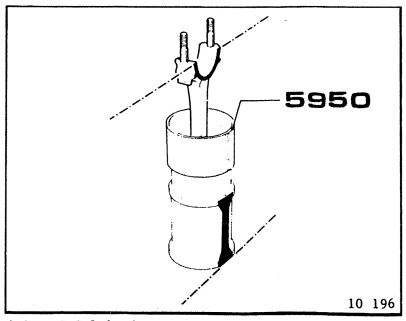

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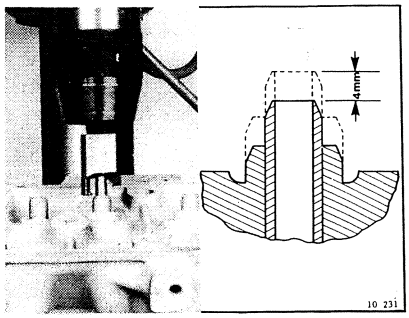

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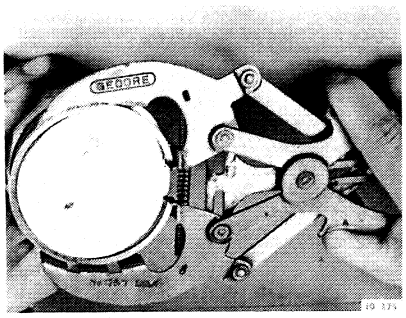

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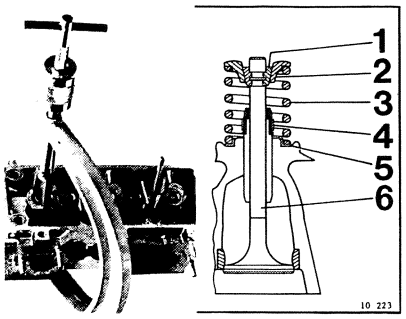

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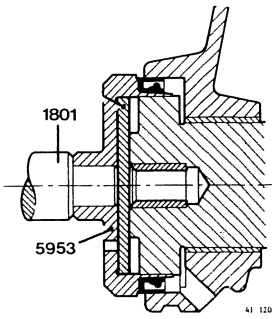

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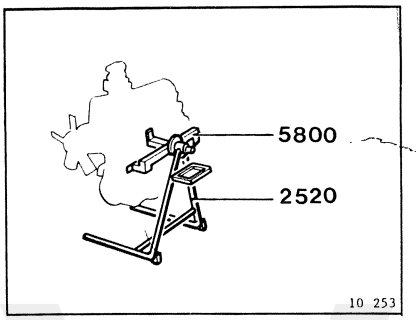

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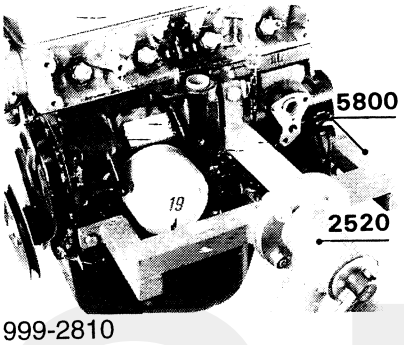

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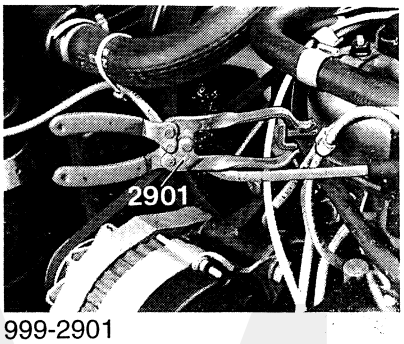

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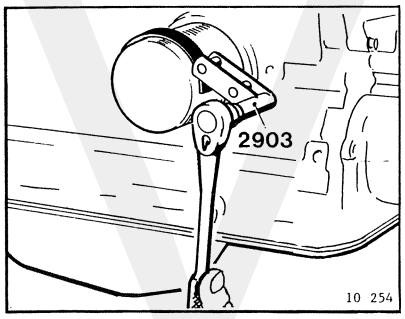

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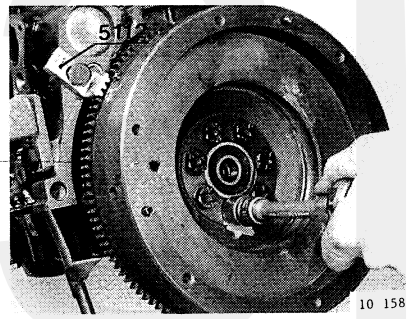

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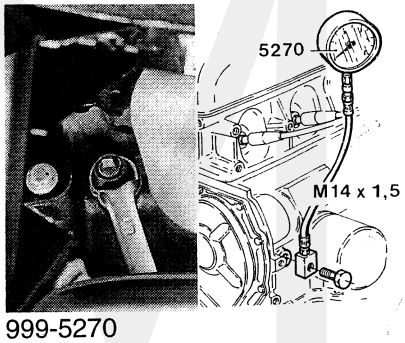

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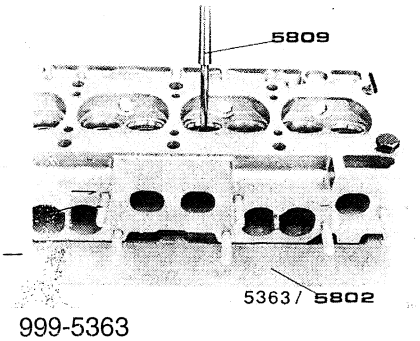

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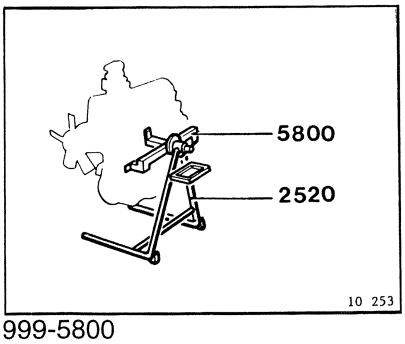

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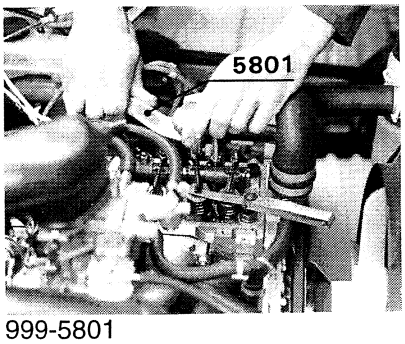

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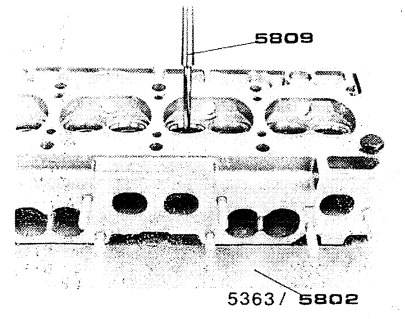

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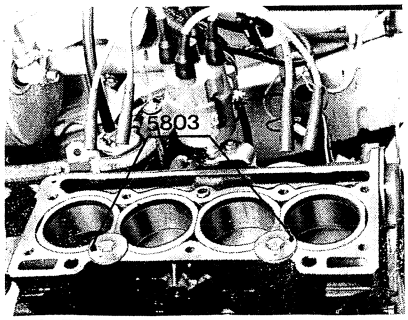

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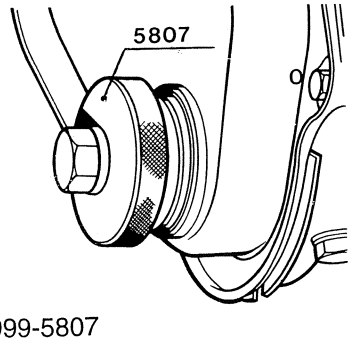

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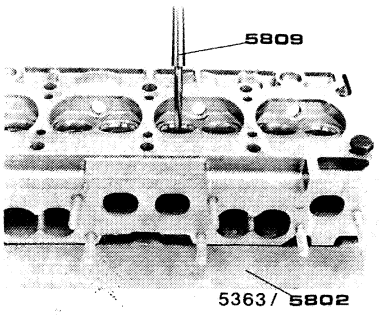

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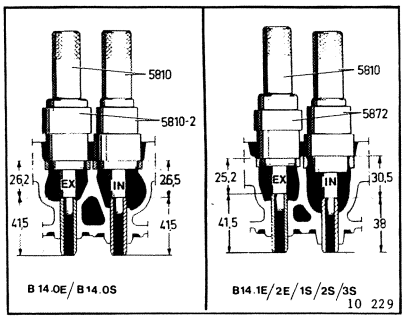

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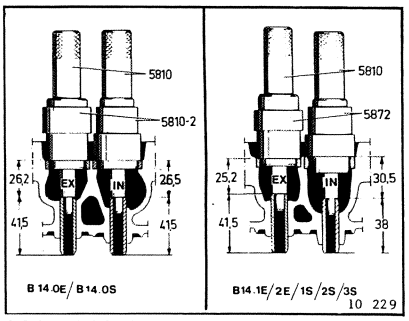

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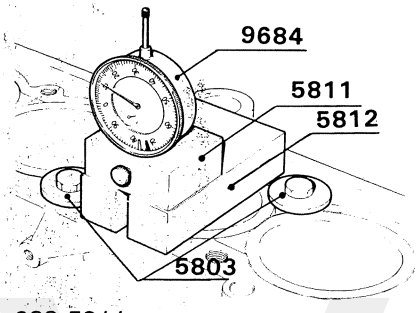

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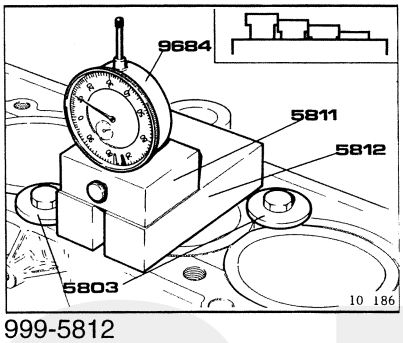

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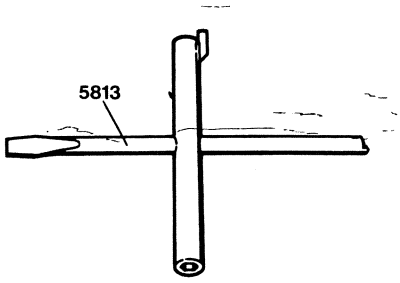

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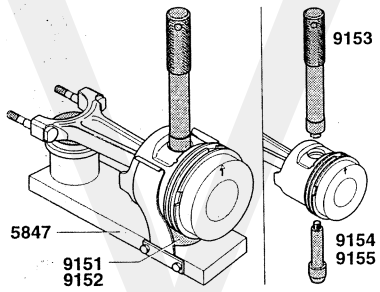

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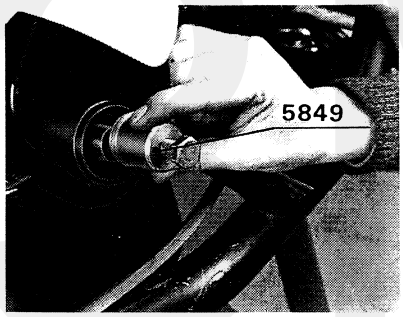

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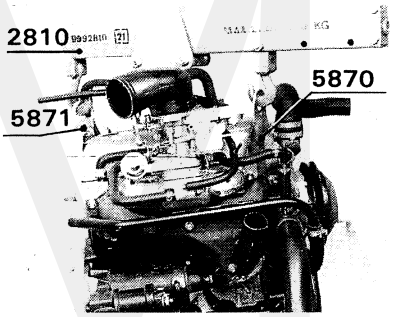

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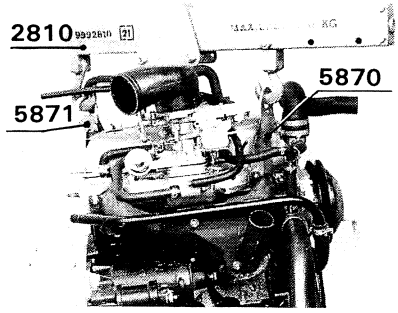

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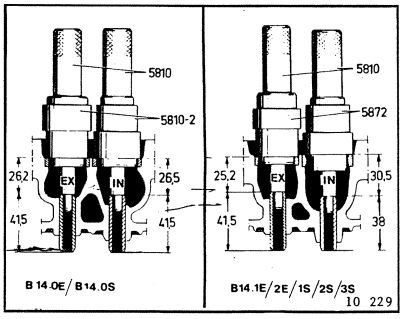

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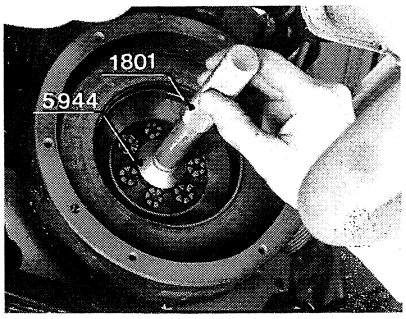

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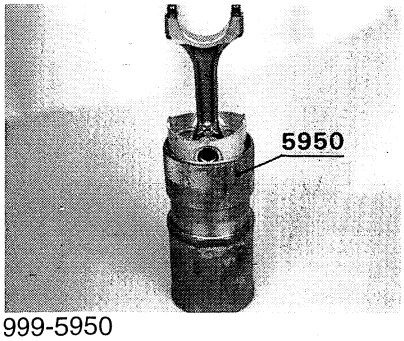

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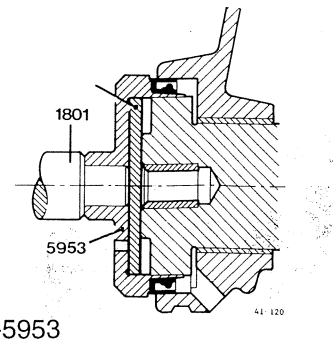

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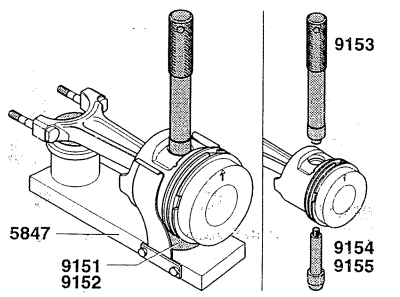

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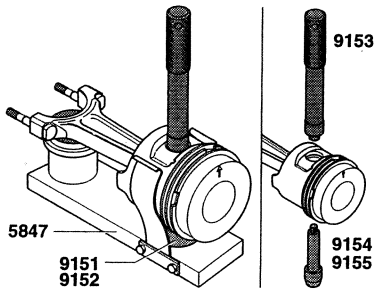

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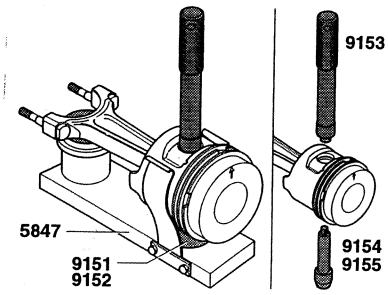

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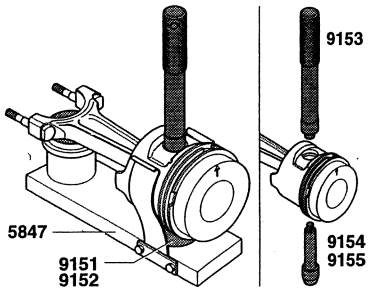

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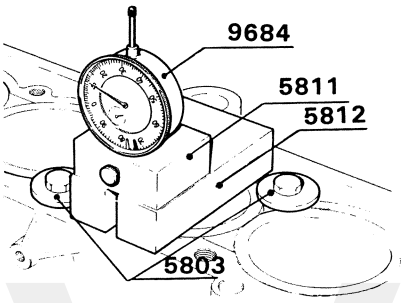

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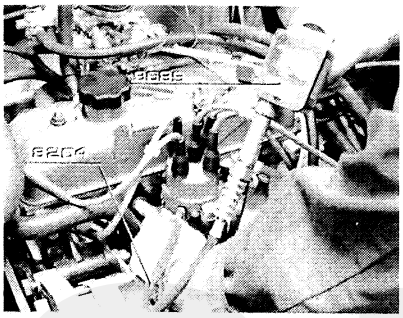

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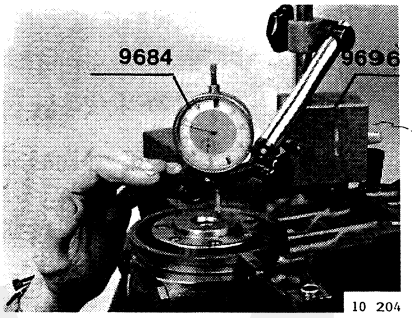

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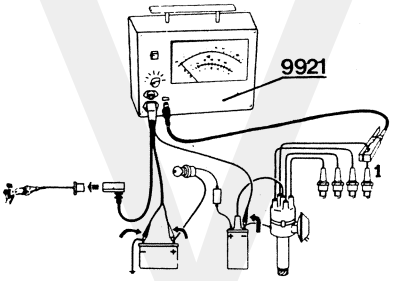

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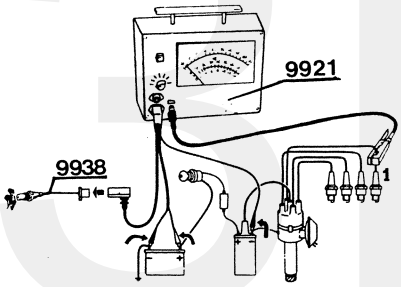

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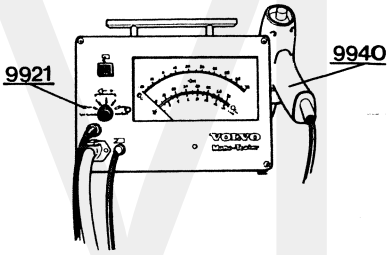
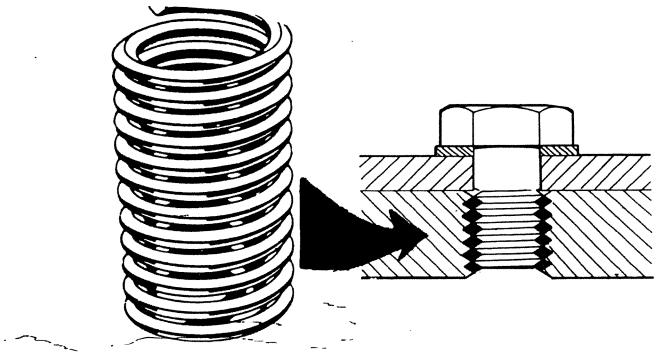


999-9940

A. Thread repairs



A1

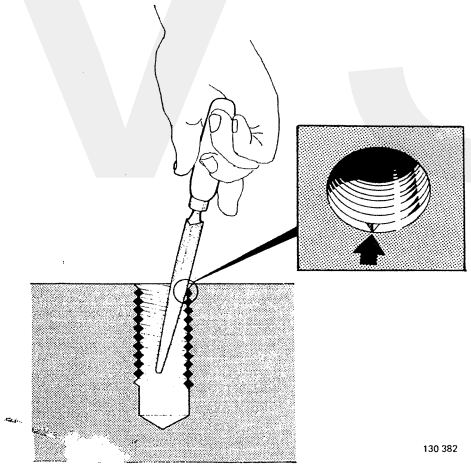
Thread inserts

For the B13 and B14 engines the following thread inserts are used.

Thread	length in mm
M 6 x 1.0	8.5
	11.5
M 7 x 1.0	10.0
	13.5
M 8 x 1.25	11.4
	15.4
M10 x 1.5	14.2
	19.2
M14 x 1.25*	9.9
M14 x 1.25*	13.9

* Spark plug holes may only be repaired with a threaded sleeve.

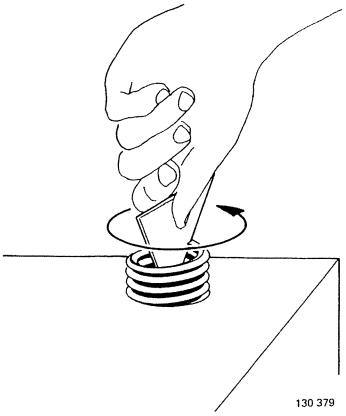
A2-A4. Removing the thread insert



A2

File a groove in the thread insert.

Use a triangular file and make a groove in the top thread of the insert, approximately of a thread from the end. Take care not to damage the thread in the stock holding the insert.



A3

Remove the thread insert

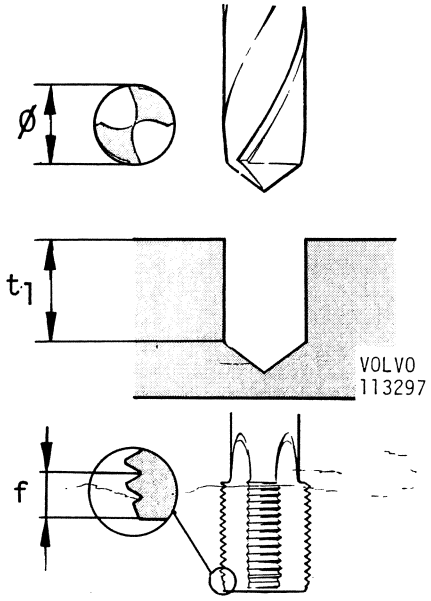
Insert a sharp edge of a triangular scraper in the groove. Press downwards and rotate counter-clockwise until the insert is fully unscrewed.

A4

Fit the thread insert

Restore the thread in the hole with a tap.
Clean up the hole and fit a new insert.

A5-A7. Fitting (new) thread inserts



A5

Measure the depth of the hole to be repaired and drill it out

Measure the depth (t1) of the hole to be repaired and **never drill deeper than this dimension.**

A6

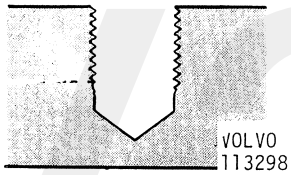
Tap the hole

Note: the taps must be bevelled (f).
Clean the hole.

A7

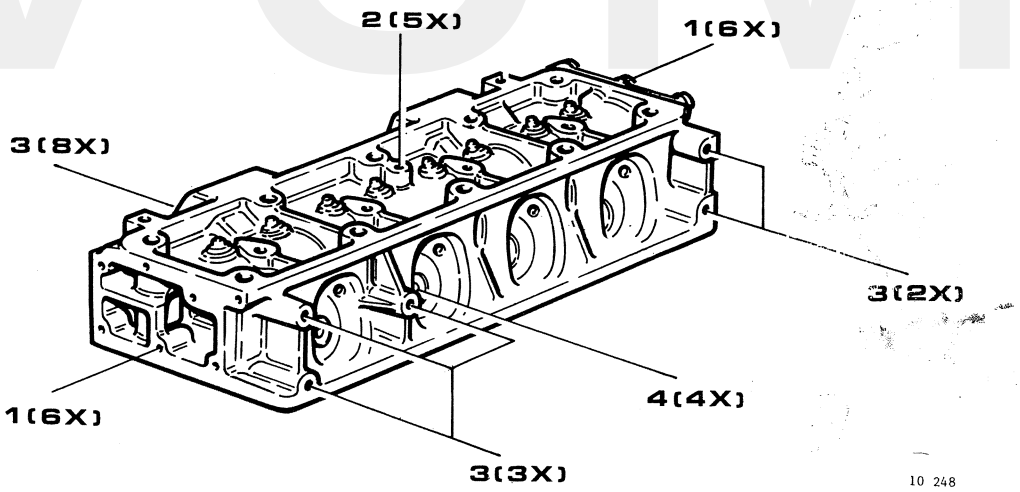
Fitting a threaded sleeve in a spark plug hole

Note: when screw thread has to be made for a spark plug, there is no need to drill it out.
For this thread a special tap is used (998-5823-5).



A8-A10. Choice of thread insert and drilling diameter

A8

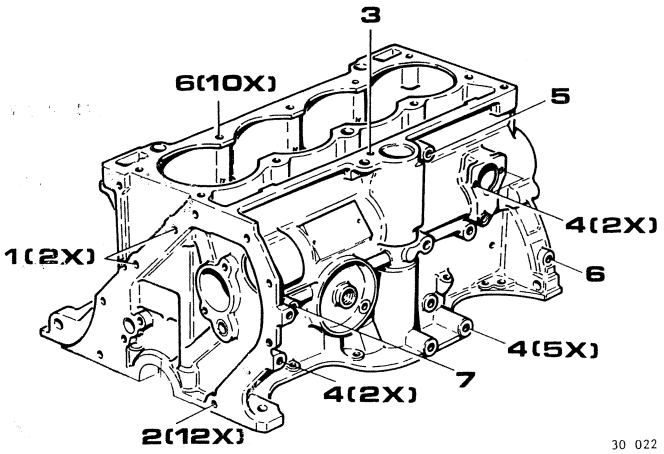


Hole No.	Thread	Thread insert (Part No.)	Drilling diameter (mm)	Remarks
1	M 6 x 1.0	956015-2	6.3	
2	M 7 x 1.0	948015-3	7.3	
3	M 8 x 1.25	956019-4	8.4	
4	M14 x 1.25	947844-7	-	1) 2)
	M14 x 1.25	948756-2	-	1)

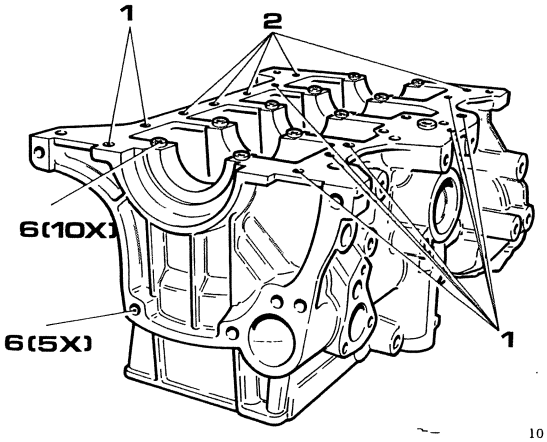
1) Do not drill out
2) Short shank

A9

Cylinder block



30 022

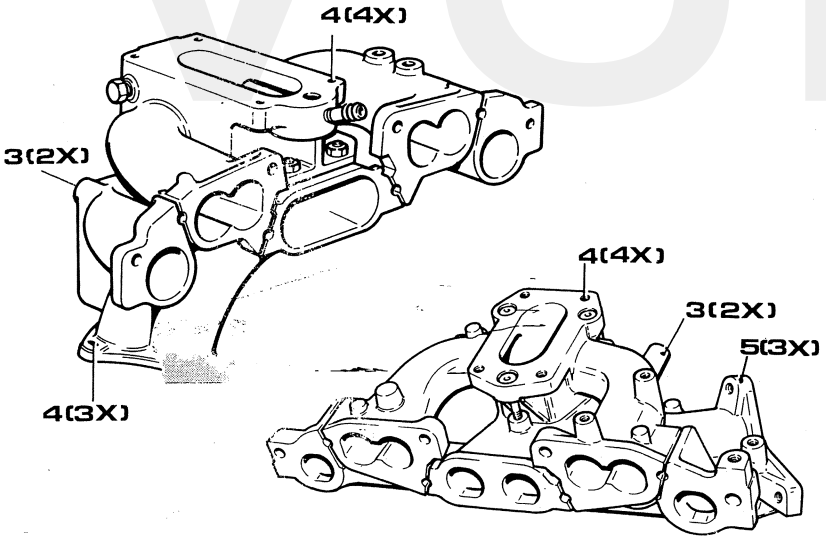


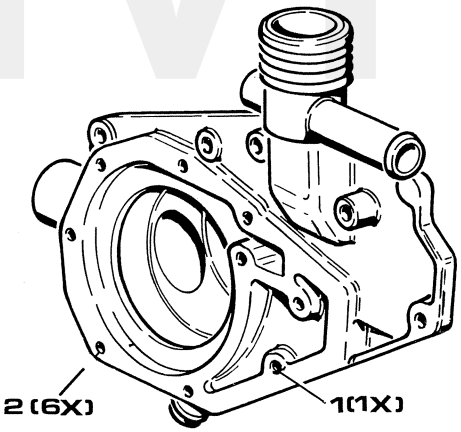
10 249

Hole No.	Thread	Thread insert (Part No.)	Drilling diameter (mm)
1	M 6 x 1.0	956014-5	6.3
2	M 6 x 1.0	956015-2	6.3
3	M 7 x 1.0	948015-3	7.3
4	M 8 x 1.25	956019-4	8.4
5	M10 x 1.5	956022-8	10.5
6	M10 x 1.5	956023-6	10.5
7	M14 x 1.25	947844-7	14.5
8	M12 x 1.5	948095-8	12.5
		956028-5	12.5

A10

Manifold/water pump

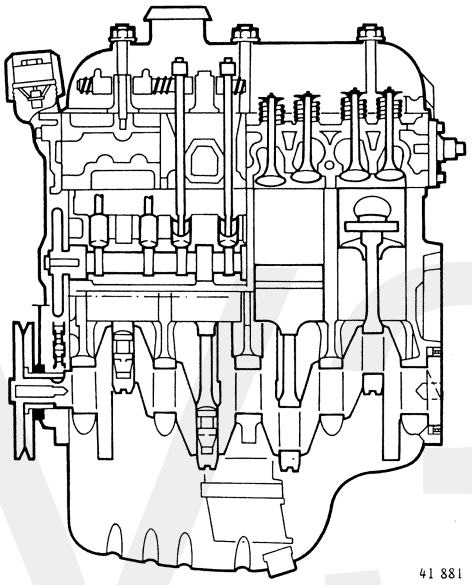




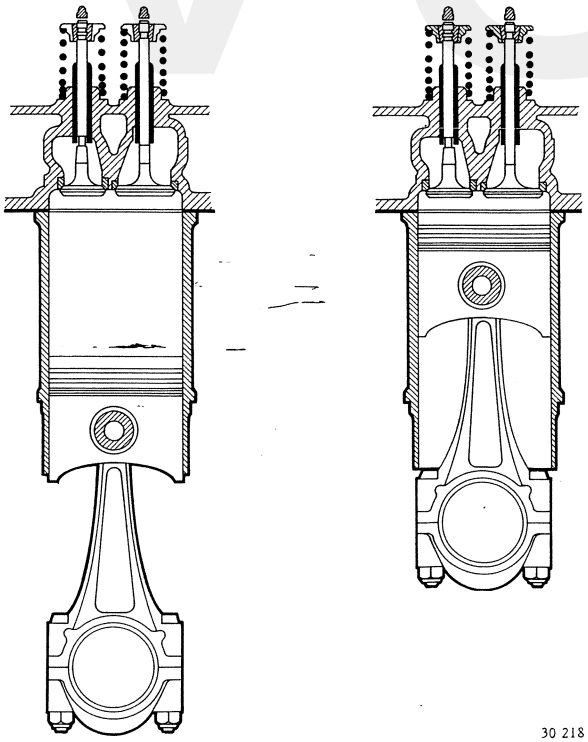
Hole No.	Thread	Thread insert (Part No.)	Drilling diameter (mm)
1	M 6 x 1.0	956014-5	6.3
2	M 6 x 1.0	956015-2	6.3
3	M 7 x 1.0	948015-3	7.3
4	M 8 x 1.25	956019-4	8.4
5	M10 x 1.5	956022-8	10.5

Group 20. Engine B13/B14

General



41 881



30 218

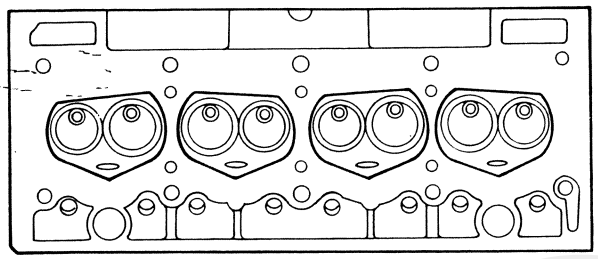
Key features

The B13/B14 engine is a water-cooled, 4-cylinder in-line combustion engine with overhead valves and a camshaft located high in the cylinder block.
Various types of the B14 engine have been produced. The main differences between these engines consist of modifications to the ignition system and the carburettor (including the combustion chambers, compression ratio, Pulsair, system, EGR (Exhaust Gas Recirculation) and the decelerating mechanism) in order to obtain the required power and to conform to current exhaust emission requirements.

Combustion chambers

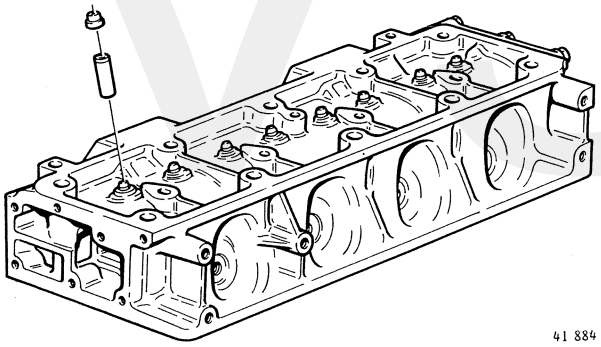
The cylinder head is cast to a high degree of accuracy, thereby minimizing the relative differences between the combustion chambers. The spark plugs and valves are positioned so as to combine with the shape of the combustion chambers and provide an optimum charge of fuel/air mixture and almost complete combustion. This results in a self-cleaning effect on the cylinder walls and low carbon deposits in the combustion chambers.

Group 21. Engine assembly - B13/B14


41 883

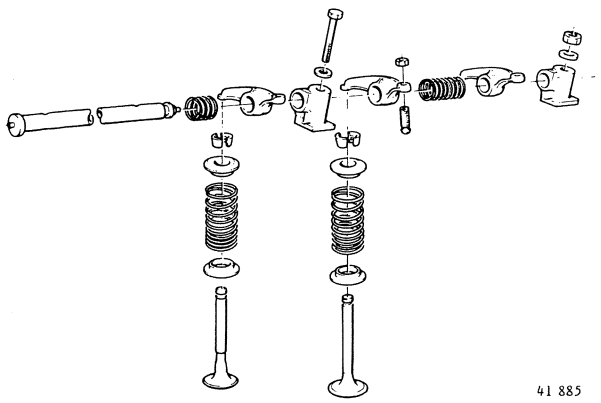
Cylinder head

The cylinder head is made of aluminium alloy. Besides reducing the actual weight of the cylinder head, this material also gives good heat dissipation which reduces the risk of thermal stress caused by temperature variations.
The water pump is mounted on the front end of the cylinder head.


41 884

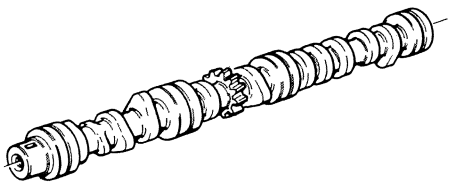
Valve guides and valve seats

The cylinder head has press-fit guides for the inlet and exhaust valves.
These valve guides are made of brass and have a seal to prevent oil leakage past the valve stem. The valve seats, which are shrunk in the cylinder head, are likewise made of a durable material. In practice, this means that they hardly ever need to be renewed and no problems are encountered when running on LPG (Liquefied Petroleum Gas).


41 885

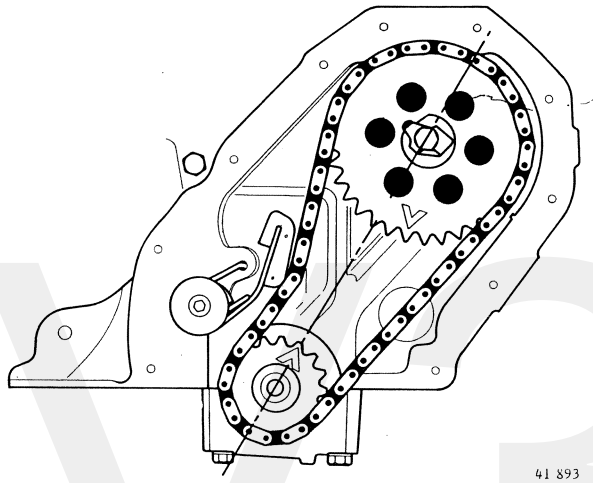
Valves

The valves are coated with Stellite steel on account of the great differences in operating temperature to which they are exposed. The valves are operated by the camshaft via tappets, push rods and rocker arms.



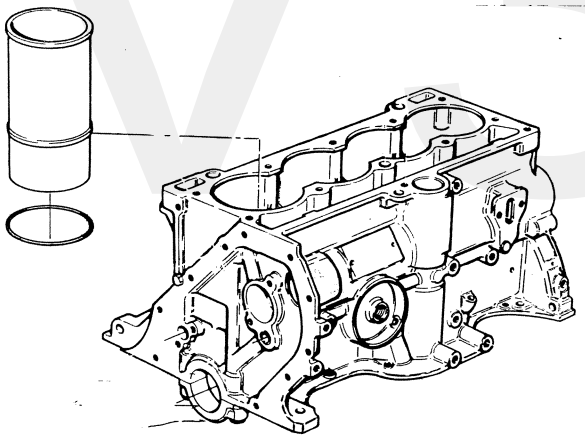
Camshaft

The camshaft is located high in the cylinder block at the same side as the distributor. It should not be confused with an overhead camshaft (OHC) or camshaft in head (CIH) engine. This location of the camshaft makes it possible to use short push rods. Another benefit is the favourable flow that is obtained between the inlet and exhaust ducts in the cylinder head relative to the angled valves. The camshaft is supported in the cylinder block by four bearings and runs submerged in oil, thereby minimizing wear to tappets and cams.



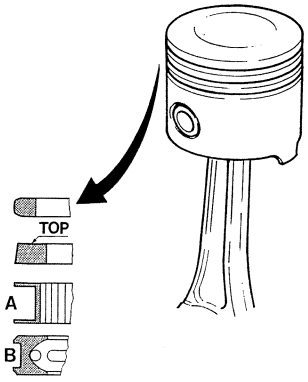
Timing gear

The camshaft is driven from the crankshaft by a single chain. Correct chain tension is obtained by a self-adjusting chain tensioner.
This mechanically controlled chain tensioner ensures correct chain tension, particularly at low engine speeds, and in this way provides a low-noise chain drive.



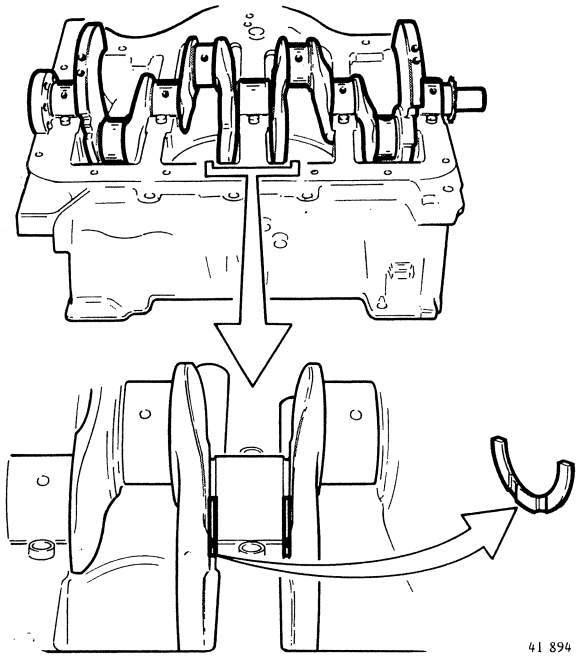
Cylinder block

The cylinder block is made of cast iron with separate cylinder liners. This makes the cylinder block almost completely resistant to wear and it therefore has a virtually unlimited life.
Furthermore, if it is necessary to renew the cylinder liners, this design reduces the work involved to a simple operation.



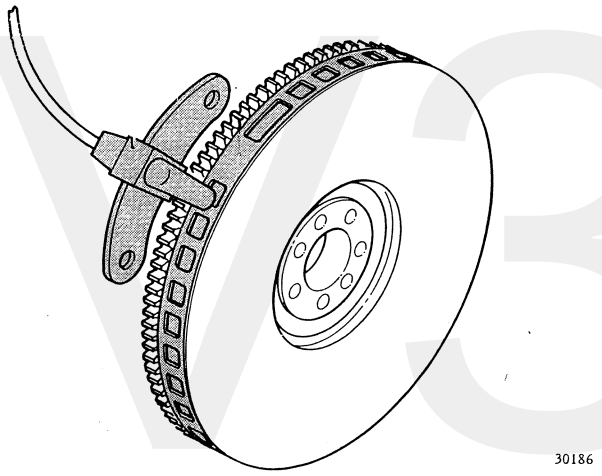
Pistons

The gudgeon pin is retained in the little-end of the connecting rod by a press fit, and by bushings in the piston. The gudgeon pin is located off-centre relative to the piston. For this reason, when fitting the piston you should take good note of the arrow on the piston crown. This arrow should point towards the flywheel.
The piston rings are of the conventional design, with the gaps located at 120° to each other. The connecting rods are made of forged steel.



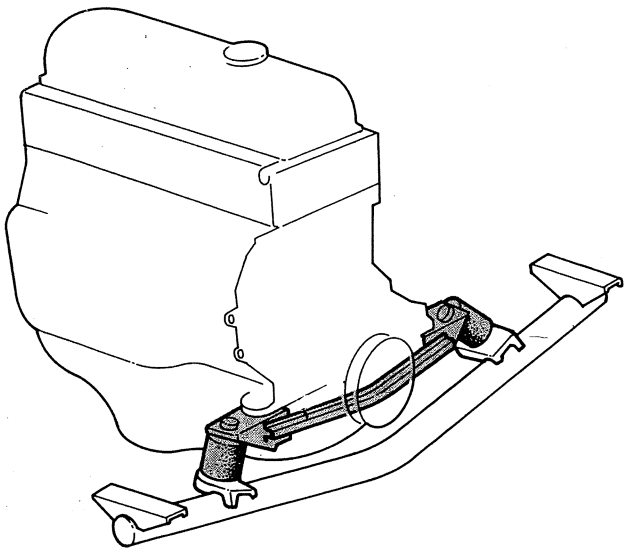
Crankshaft

The crankshaft of the B13/B14 engine is supported by five bearings. The end-float setting of the crankshaft is achieved with the aid of two thrust washer segments located at each side of the central main bearing. The thrust washers are available in two sizes.
The main bearing journals and connecting rod journals can be ground to one undersize.
Crankshaft sealing is by means of oil seals with 'reverse flow' ridges on their lips to prevent oil seepage.



Flywheel

The hole pattern in the flywheel is asymmetrical, so it can only be fitted on the flywheel in one way. A heavier flywheel is used on manual transmission versions.
With effect from model year 1984, the flywheel features an additional sensor gear with 38 short teeth and two long teeth. This sensor gear also has two 'double teeth', located directly opposite each other (180°). With this special sensor gear the electronic ignition can precisely determine the Top Dead Centre and the engine speed by means of a sensor module. The flywheel also has marks for checking/adjusting the ignition timing point. These marks are: 0°, 3°, 6° and 10°.



Engine mountings

Up to and including model year 1984, the engine mounting pads at the front end are located horizontally on the engine cross member.
With effect from model year 1985, the engine mounting pads are located by means of another bracket at an angle of 45°. This design absorbs engine vibrations and greatly reduces the transmission of engine noise to the passenger compartment.

Operations with the engine installed in the car

B. Compression test

Special tools: 115-8264, 999-9689

Move the gear lever or selector lever into neutral.

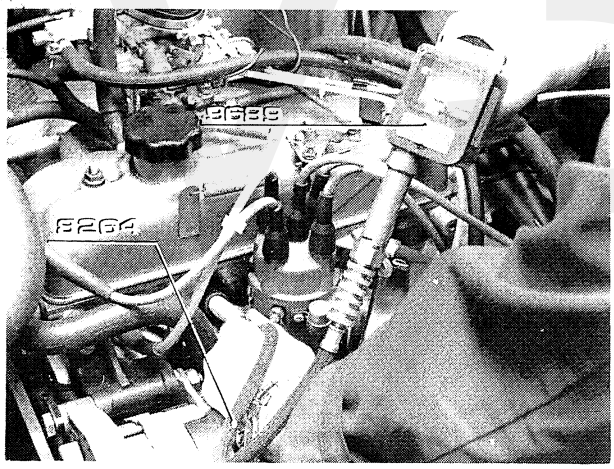
B1

Preliminary operations

Remove/disconnect:
- spark plug leads;
- HT cable from the ignition coil or the ignition unit;
- spark plugs.

Note: clean the spark plug wells.

B2



Measure the compression

Carry out the test with a hot engine **(oil temperature approx. 60°C and the throttle valve fully open).**
Press compression pressure gauge **999-9689** firmly into the spark plug hole; if necessary, use extension hose **115 8264.**
Crank the engine with the starter motor.

Compression pressure.....MPa (kg/cm^2).....1.2-1.4 (12-14)

Maximum permissible deviation between the cylinders: 0.5 kg/cm^2.

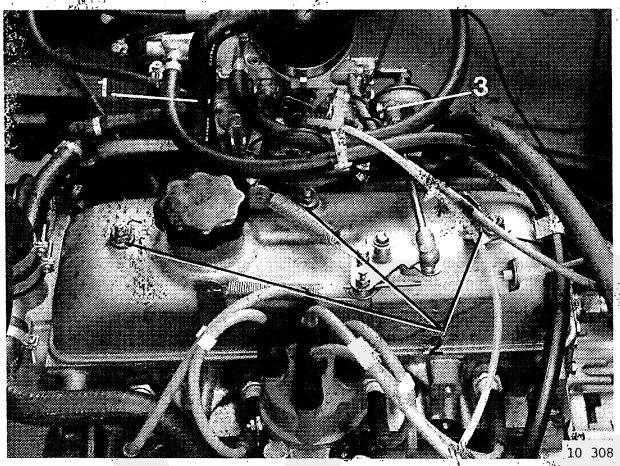
B3

Fit:

- spark plugs (check the electrode gap); tightening torque: 18 Nm;
- HT cable for the ignition coil or the ignition unit;
- spark plug leads

C. Adjusting the valve clearances

Special tools: 999-5801

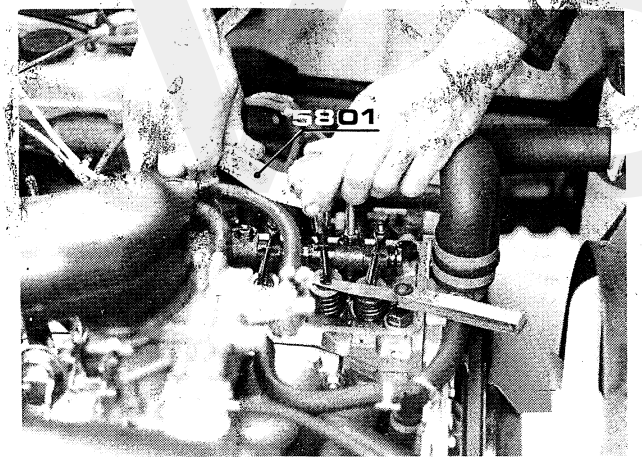


C1

Remove the valve (rocker) cover

Disconnect the hose (1) from the crankcase ventilation.
Remove the nuts, bracket, support and washers (2).

Up to model year 1981:
Release the throttle control rod (3) at the carburettor.
Put the valve cover to one side.
From model year 1981:
Remove the distributor cap and rotor arm.



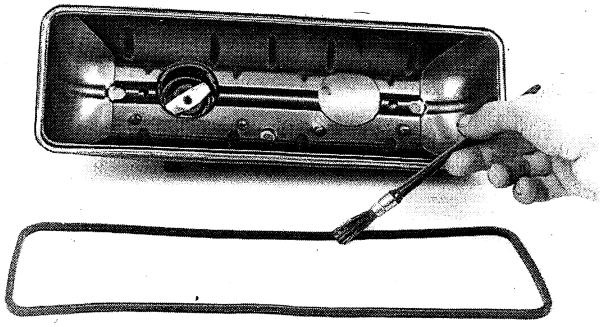
C2

Check/adjust the valve clearances

Rotate the crankshaft with the crankshaft pulley bolt until the inlet and exhaust valves of No. 1 cylinder are at their peak.
Now adjust the valve clearance of No. 4 cylinder with valve clearance adjusting tool **999-5801.**
Proceed in the same way for No. 3, 4 and 2 cylinders.

Valve clearance in mm	**warm**	**cold**
Inlet valve	**0.20**	**0.15**
Exhaust valve	**0.25**	**0.20**

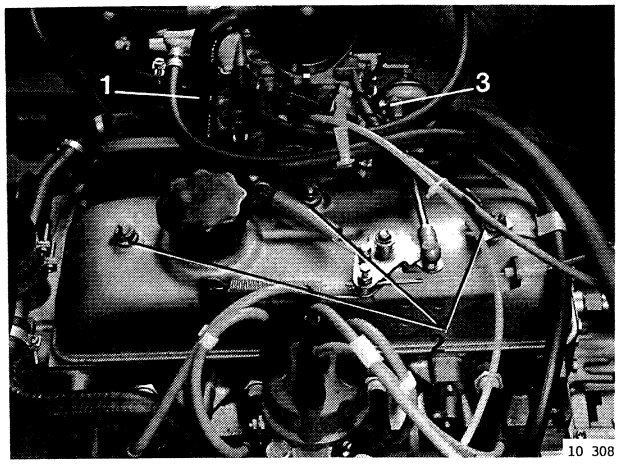
Warm engine: after allowing to cool for about 50 minutes.
Lock nut tightening torque: 15 Nm.



C3

Renew the valve cover gasket (if necessary)

Clean the inside and outside of the valve cover.
Check that the crankcase ventilation port is open.
Take out the gasket and clean the groove.
Apply glue to the new gasket and insert it in the groove.



C4

Fit the valve (rocker) cover

Fit the washers, the choke cable support and the fuel hose bracket with the nuts (2) and tighten. Tightening torque: 5 Nm.
Connect up the crankcase ventilation hose.

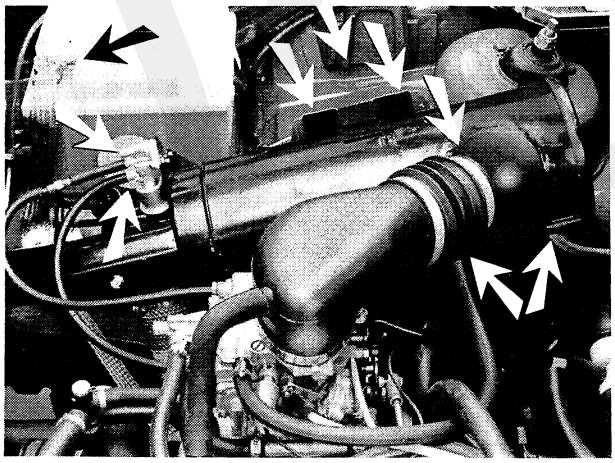
Up to model year 1981:
Secure the throttle control rod (3).
From model year 1981:
Fit the rotor arm and distributor cap.

D. Removing the cylinder head

Special tools: 999-5803

D1

Up to model year 1981: remove the screenwash reservoir.



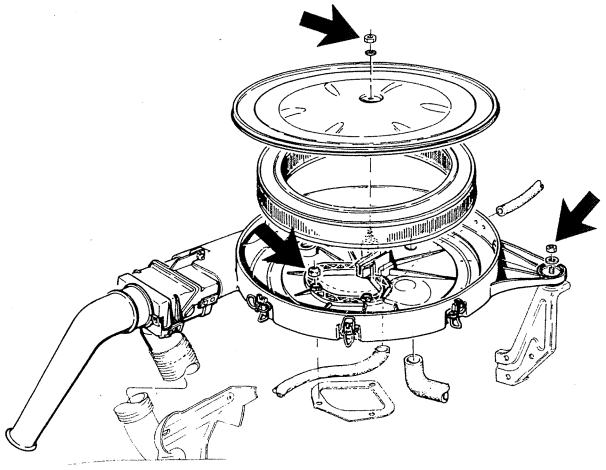
D2

Disconnect the battery negative cable

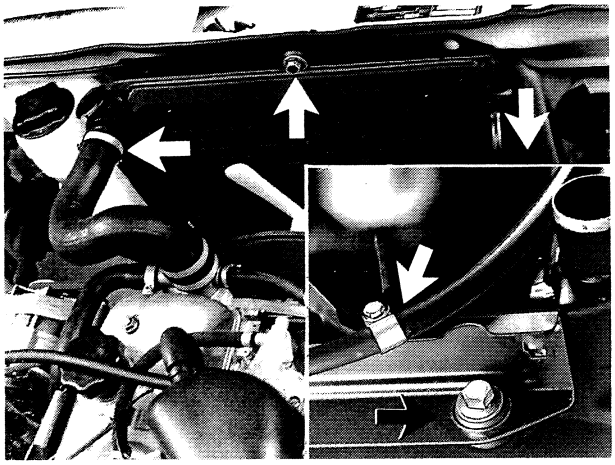
D3

Remove the air filter

Up to model year 1981:
Remove the hoses from the air filter.
Slacken the clamp on the air bellows.



From model year 1981:
Remove the hoses from the air filter.
Remove the attachments from the air filter housing:
- Weber: 3x nut;
- Solex: 2x bolt.



D4

Drain the cooling system

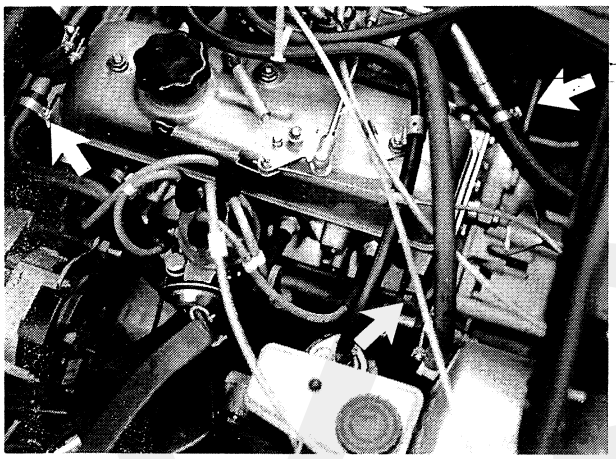
See Operation ZZ3.

D5

Remove the radiator and/or engine cooling fan

See Operation AB2.

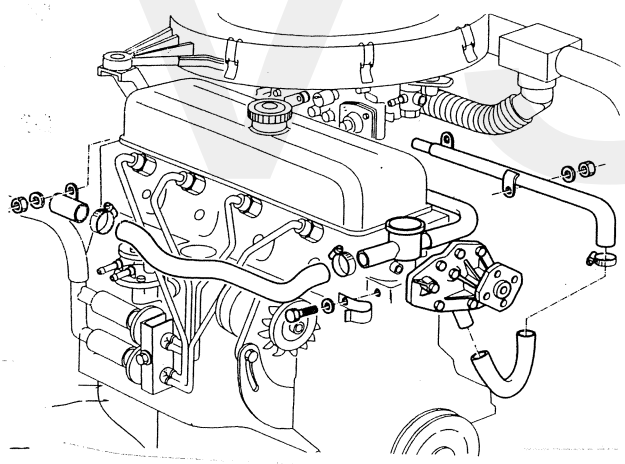
Note: as from model year 1986 there is no need to remove the radiator; the thermo-electric fan does, however, have to be removed. See Operation AC1.



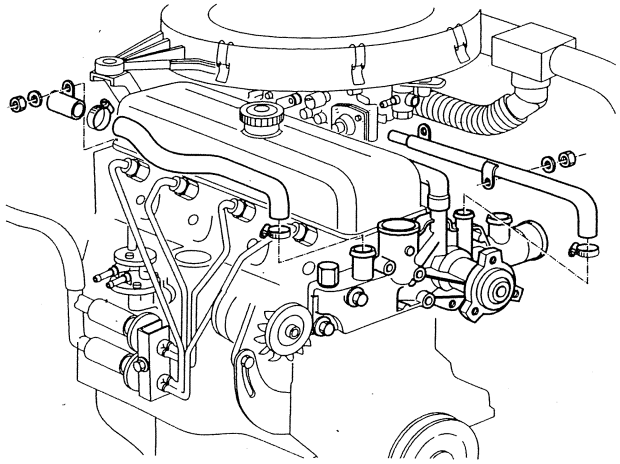
D6

Disconnect the heater hoses

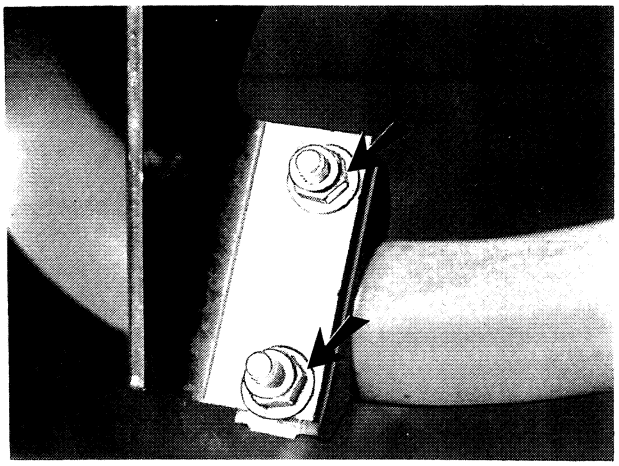
Up to model year 1981:
- hose from heater pipe at rear-right;
- hose from water pump at front-left;
- connecting pipe from cylinder head at rear-left.



Model year 1981:
- hose from heater pipe at rear-right;
- pipe from cylinder head at rear-right;
- pipe in the middle of the cylinder block;
- hose from water pump at front-left;
- bracket from cylinder head at front-left (if fitted);
- connecting pipe from cylinder head at rear-left.



From model year 1982:
- hose from heater pipe at rear-right;
- pipe from cylinder head at rear-right;
- pipe in the middle of the cylinder block;
- hose from water pump at the right;
- hose from water pump at the left.



D7

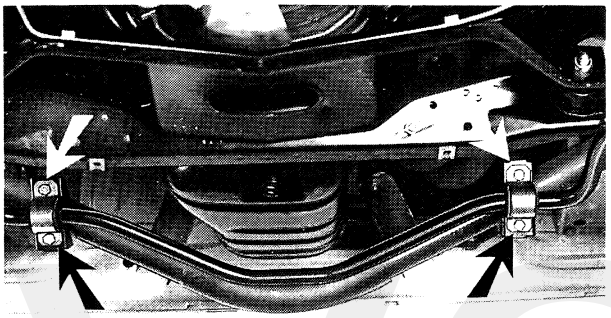
Remove the U-bolt and strap from the exhaust

(up to model year 1981)

D8

Remove the engine splash guard

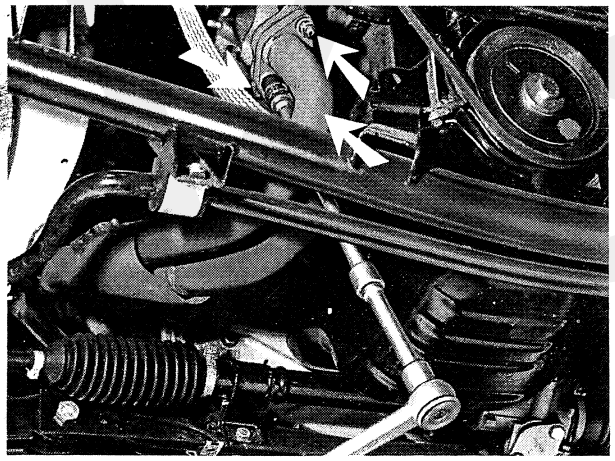
Up to model year 1981: two sections.
From model year 1981: one section.



D9

Release the stabilizer rod at the front end

(up to model year 1981)



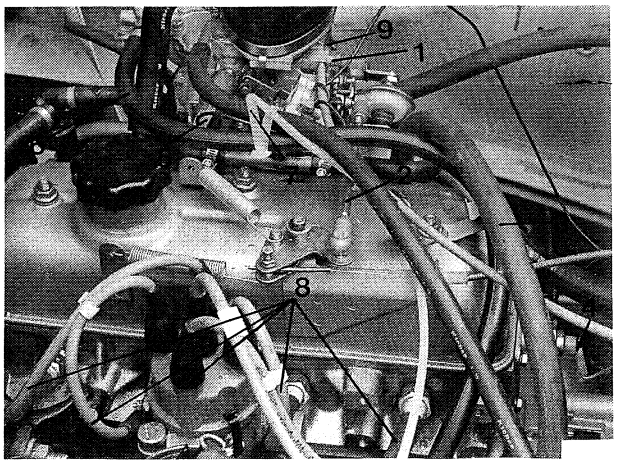
D10

Release the exhaust pipe from the manifold

Up to model year 1981:
Remove the six nuts and three washers and pull the exhaust pipe away from the manifold.
Remove the gasket.

From model year 1981:
Release the bracket on the exhaust pipe and slacken the bracket at the side near the starter motor.
Remove the three nuts and pull the exhaust pipe to the rear.
Remove the gasket.

B14.3E with single downpipe
Remove the two nuts.

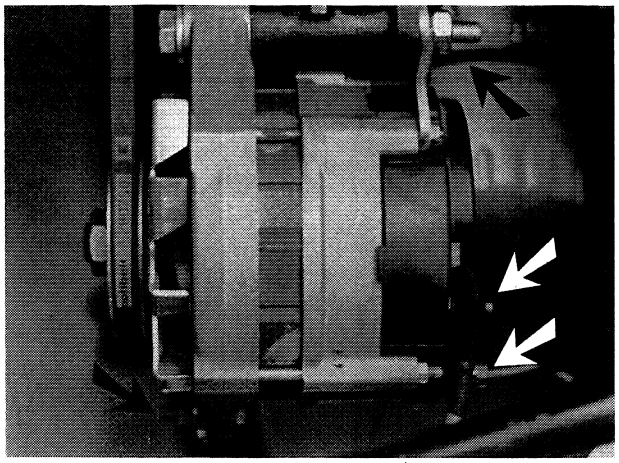


D11

Release the following connections on the engine

1 Choke cable.
2 Up to model year 1982: throttle control rod at carburettor.
From model year 1982: release the throttle cable.
3 Vacuum hose from the brake booster.
4 Temperature transmitter/switch wiring.
5 Idle solenoid wiring.
6 Fuel hose at carburettor.
7 Distributor vacuum hose at carburettor.
8 Distributor cap and spark plug leads.
9 EGR connections (if fitted).

On cars with automatic transmission:
- Vacuum hose from the electrically controlled vacuum valve.
- Microswitch wiring (if fitted).



D12

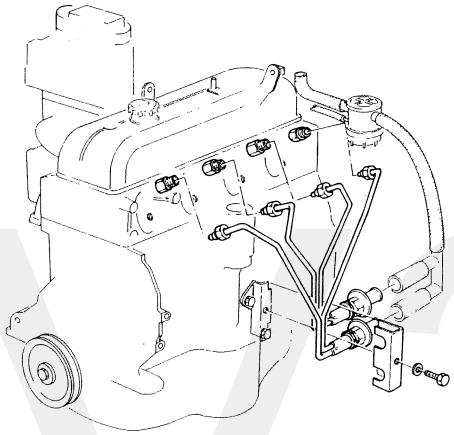
Remove the valve (rocker) cover

See Operation *C1.*

D13

Remove the alternator

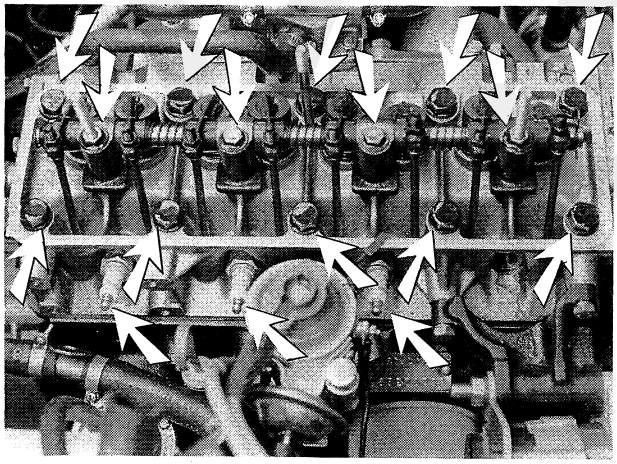
Disconnect the wiring.
Remove the nuts and bolts.
Remove the fan belt.



D14

Disconnect the Pulsair system (if fitted)

Unscrew the four union nuts.
Remove the bracket.
Pull the pipes away from the connecting hoses.

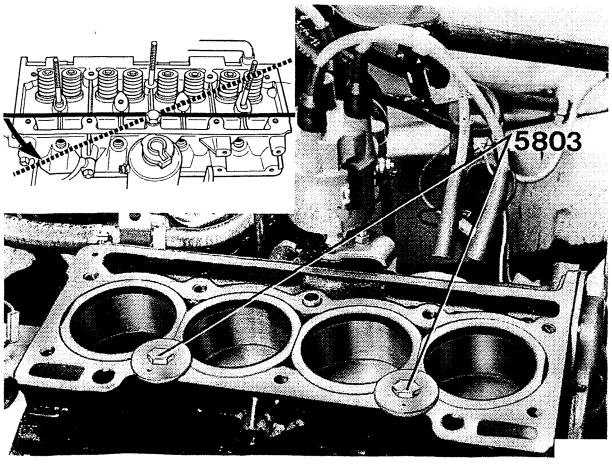


D15

Remove the cylinder head

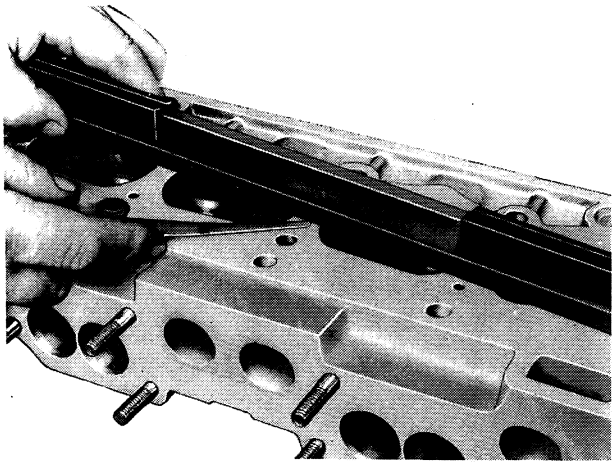
Remove the rocker shaft assembly.
Remove the push rods.
Remove the spark plugs.
Remove the cylinder head bolts, except for the middle one at the distributor side.

IMPORTANT! Only slacken this bolt: leave it in contact with the cylinder head.



IMPORTANT! Do not raise the cylinder head because the gasket will be stuck to the cylinder block, the cylinder liners and the cylinder head. Any attempt to raise the cylinder head will break the watertight seal under the cylinder liners. Tap against the side of the cylinder head at both ends until it releases. The cylinder head must be able to rotate around the locating bush at the cylinder head bolt which is still fitted.

Remove the last cylinder head bolt.
Remove the cylinder head.
Fit the two clamping plates **999-5803.**



D16

Clean the cylinder head

Remove all traces of the old gasket.
Note: prevent gasket remnants from entering the oil-ways of the cylinder head when cleaning.

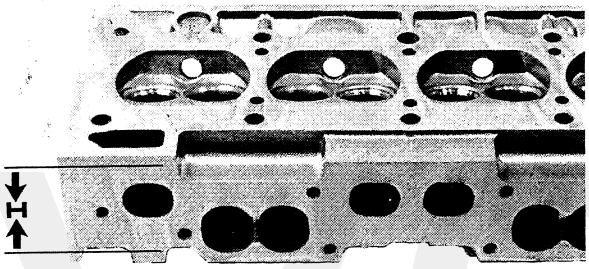
D17

Inspect the cylinder head for cracks or other damage and for flatness

Use a straight-edge and a feeler gauge.
The maximum permissible deviation from flatness, measured diagonally and across the width of the cylinder head, is **0.1 mm.**
If necessary, reface the cylinder head.
Note: renew the cylinder head if the height after refacing is lower than the specified minimum.

Minimum height of cylinder head:

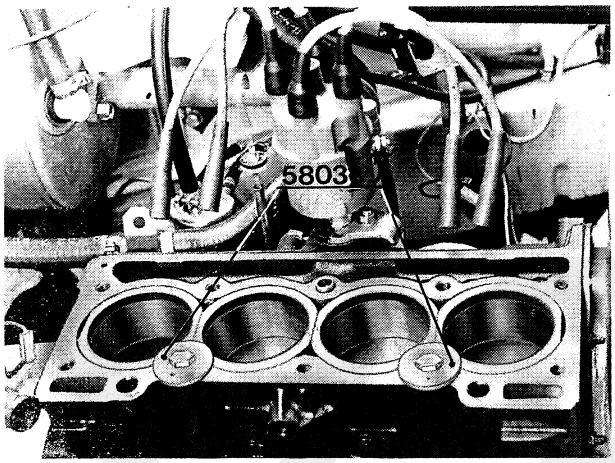
B14.0	mm	72.1
B14.1/2/3/4	mm	71.4
B13.4	mm	71.4



E. Inspecting/reconditioning the cylinder head

For inspecting/reconditioning the cylinder head, see page 77, Operations W1 to W23.

F. Fitting the cylinder head



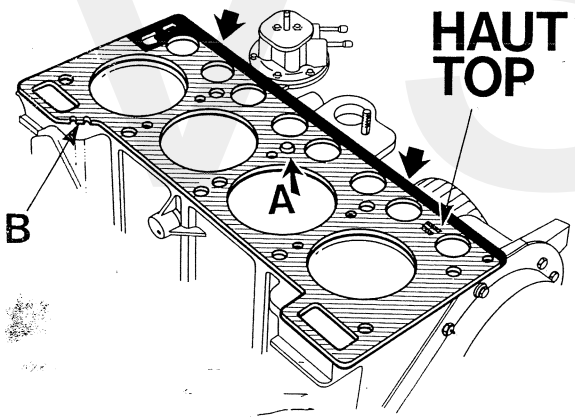
F1

Clean the cylinder block and other components

Remove all gasket remnants.
Remove any oil found in the threaded holes for the cylinder head bolts.
Note: prevent gasket remnants from entering the oil-ways and coolant passages of the cylinder block when cleaning.

F2

Remove the clamping plates 999-5803

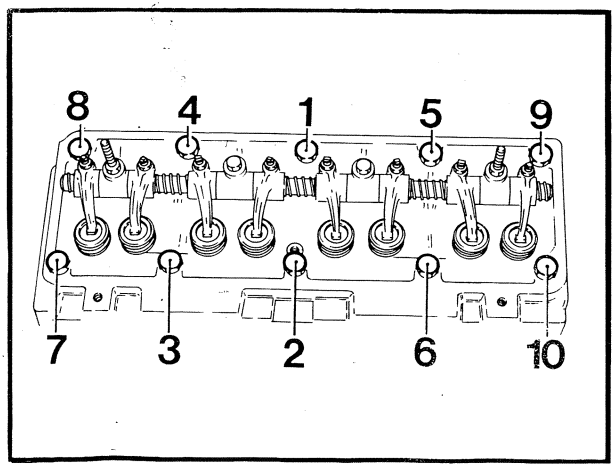


F3

Locate the cylinder head gasket

Always use a new cylinder head gasket.
Centre the cylinder head gasket with the centring bush (A) on the cylinder block.

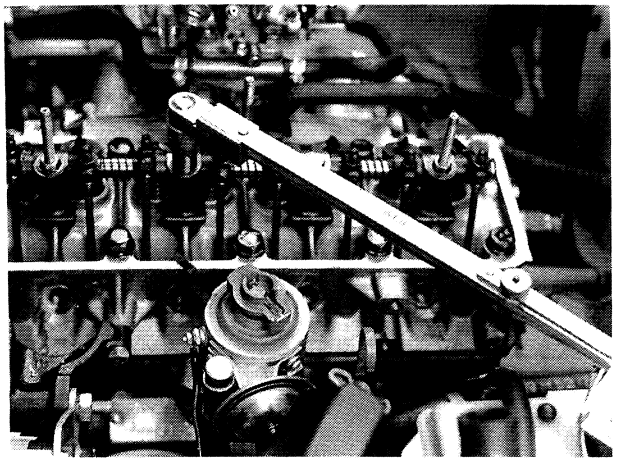
The inscription 'HAUT-TOP' on the cylinder head gasket should be facing upwards.
The two notches (B) indicate that this gasket can be used on all types of B13 and B14 engines.



F4

Fit the cylinder head

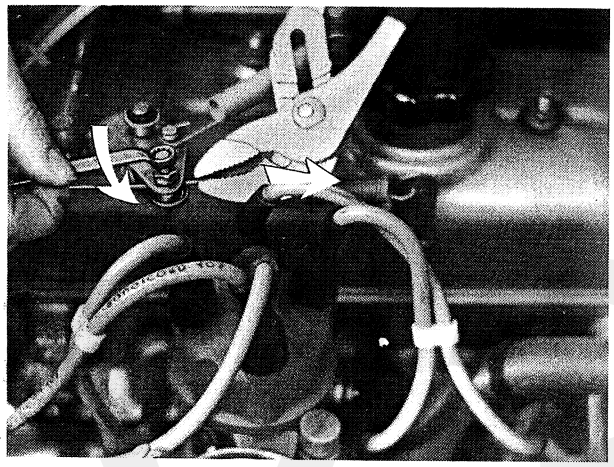
Locate the cylinder head.
Oil the bolts.
Locate the thick washers and the bolts.
The cylinder head bolts should be tightened **in the correct sequence** and in two stages.
1st stage: tighten to **27 Nm.**
2nd stage: tighten to **60 Nm.**



F5

Fit the push rods and the rocker shaft assembly

Insert the push rods.
Locate the rocker shaft.
Caution! The push rod ends must engage the rocker arm adjuster screws.
Fit the washers, bolts and nuts and tighten to **16 Nm.**



F6

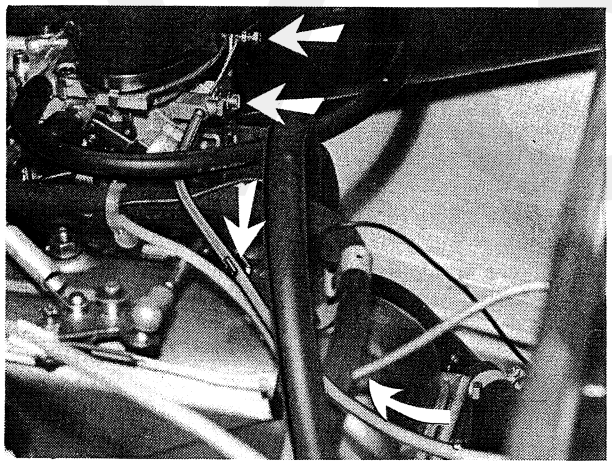
Adjust the valve clearances

See Operation *C2*.

F7

Fit the valve (rocker) cover gasket and the valve cover

See Operations *C3* and *C4*.



F8

Fit and adjust the throttle cable

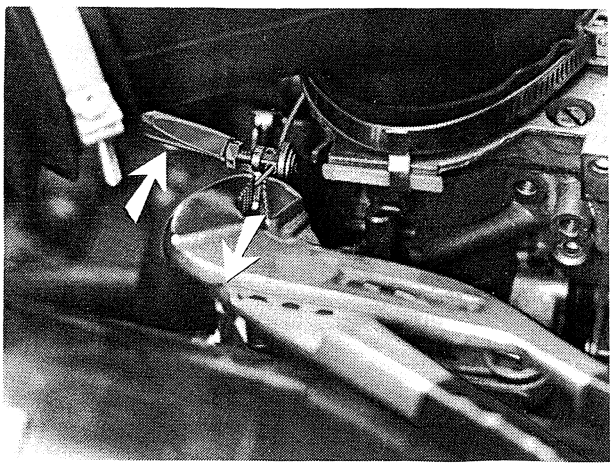
Check that the throttle valve abuts against the stops in the throttle released and full throttle positions.
Tightening torques:
- throttle cable lock screw: 10 Nm;
- throttle cable bracket on the cylinder head: 8 Nm.

Automatic transmission: check that the kick-down comes into operation in the full throttle position (accelerator pedal against its stop).

F9

Secure the choke cable at the engine

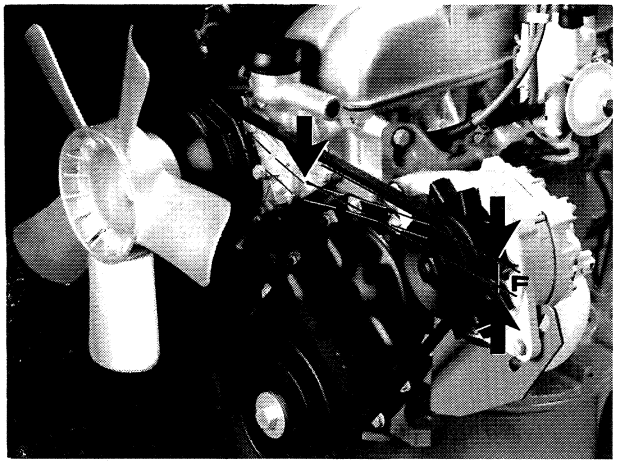
Pass the choke cable through the carburettor bracket and the nipple and secure the outer cable (jacket). Tightening torque: 10 Nm.
Locate the choke cable in the bracket on the valve cover.
B14.3E from 1982: fit the choke inner cable over the pin.



F10

Adjust and secure the choke cable

Open the choke valves to their full extent by means of the lever on the carburettor.
Pull the inner cable taut and tighten the lock screw in the nipple. Tightening torque: 10 Nm.
B14.3E from 1982:
Push in the choke knob fully and open the choke valve to its full extent.
Secure the outer cable to the carburettor choke lever.



F11

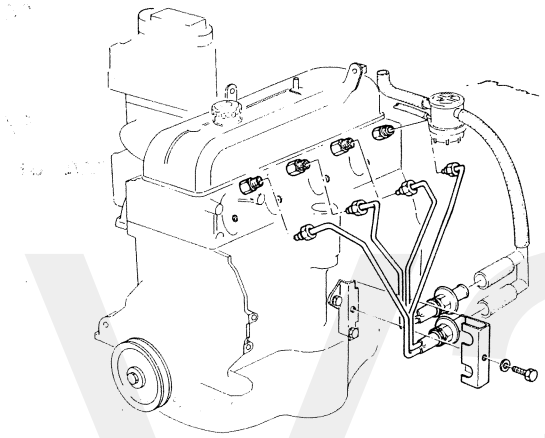
Fit the alternator

Locate the alternator and fit it finger-tight to the mounting bracket and the adjusting link.
Fit and tension the fan belt (deflection F approx. 10 mm; see the illustration).
First tighten the attachment on the adjusting link and then the attachment on the mounting bracket.
Connect up the wiring.

F12

Fit the spark plugs.

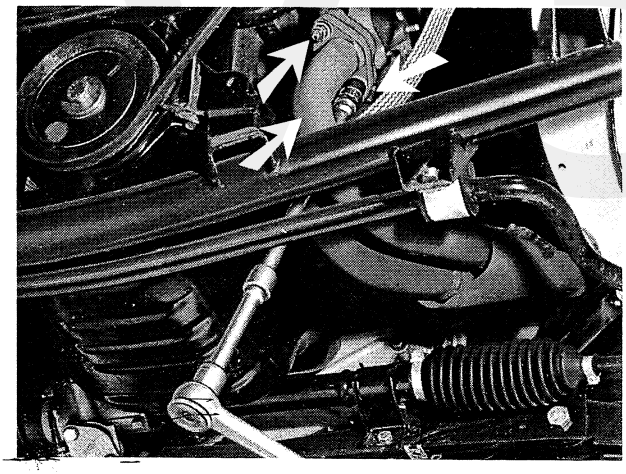
See Operation *X8*.



F13

Connect up the Pulsair system (if fitted)

Fit the pipes to the connecting hoses.
Secure the pipes to the cylinder block with the bracket.
Tighten the four union nuts. Tightening torque: 25 Nm.



F14

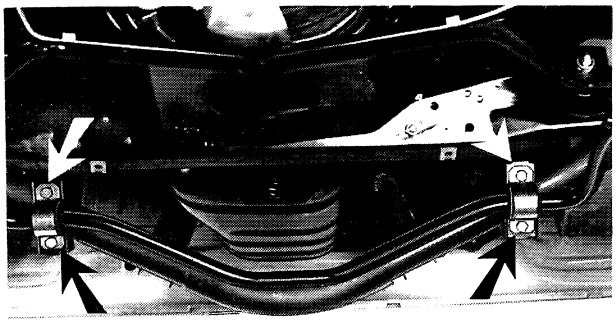
Fit the downpipe to the exhaust manifold

Up to model year 1981:
Clean both mating faces.
Fit a new gasket.
Locate the three washers and tighten the nuts.
Fit three additional lock nuts.
Note: always use copper nuts.

From model year 1981:
Clean both mating faces.
Fit a new gasket on the exhaust manifold.
Secure the exhaust pipe.
Locate the three washers with new nuts and tighten the nuts.

B14.3E (with single downpipe)
Fit and tighten the two nuts.

Tightening torques:
- M8 nuts ..... 20 Nm
- M10 nuts ..... 40 Nm.



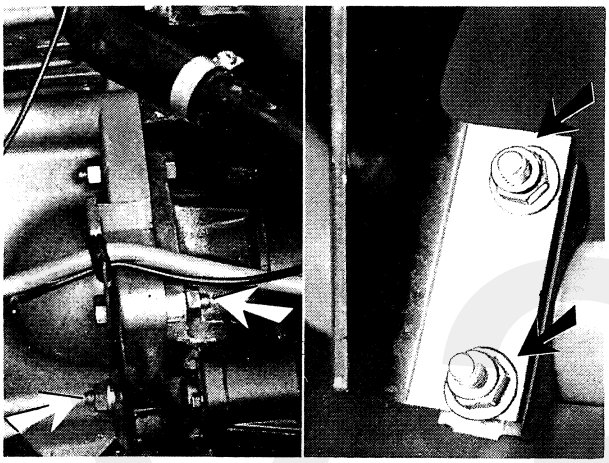
F15

Up to model year 1981: secure the stabilizer rod at the front end

Fit and tighten the bolts. Tightening torque: 23 Nm.

F16

Fit the engine splash guard



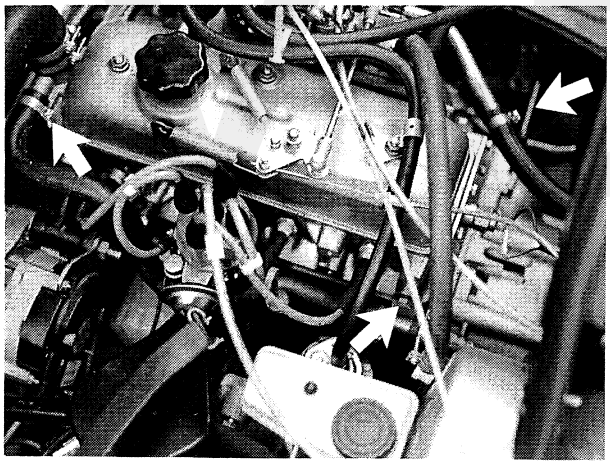
F17

Fit the exhaust pipe mounting to the clutch housing

Up to model year 1981:
Slacken the two bolts on the clutch housing bracket.
Locate the U-bolt and strap.
Tighten the two self-locking nuts on the strap. Tightening torque: 23 Nm.
Tighten the two bolts and nuts on the clutch housing. Tightening torque: 23 Nm.

From model year 1981:
Locate the bracket on the downpipe.
Fit and tighten the bolt. Tighten the bolt at the starter motor end. Tightening torque: 23 Nm.

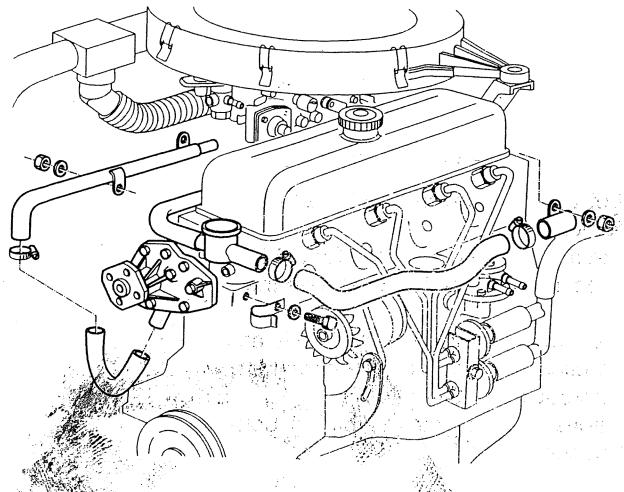
Note: this sequence is important in order to ensure stress-free mounting of the exhaust pipe.



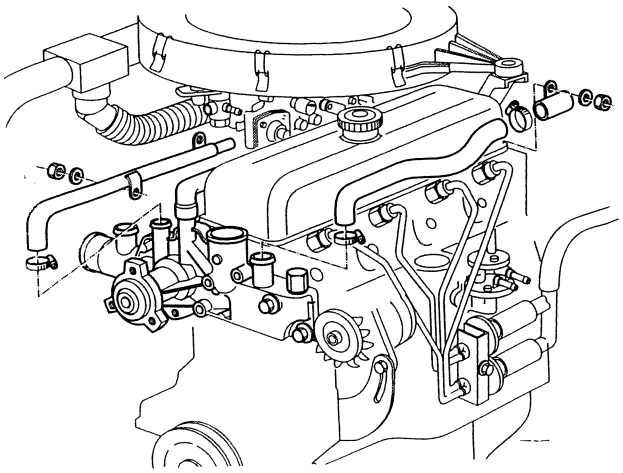
F18

Connect up the heater hoses

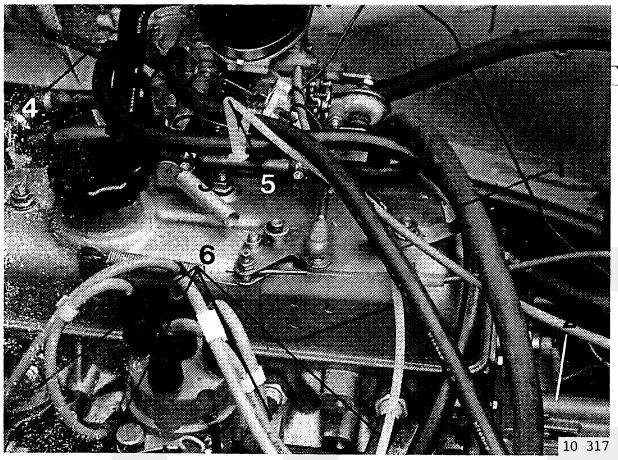
Up to model year 1981:
- connecting pipe to cylinder head at rear-left;
- hose to water pump at front-left;
- hose to heater pipe at rear-right.



Model year 1981:
- connecting pipe to cylinder head at rear-left;
- bracket to cylinder head at front-left (if fitted);
- hose to water pump at front-left;
- pipe in the middle of the cylinder block;
- pipe to cylinder head at rear-right;
- hose to heater pipe at rear-right.



From model year 1982:
- hose to water pump at the left;
- hose to water pump at the right;
- pipe in the middle of the cylinder block;
- pipe at rear-right of the cylinder head;
- hose to heater pipe at rear-right.

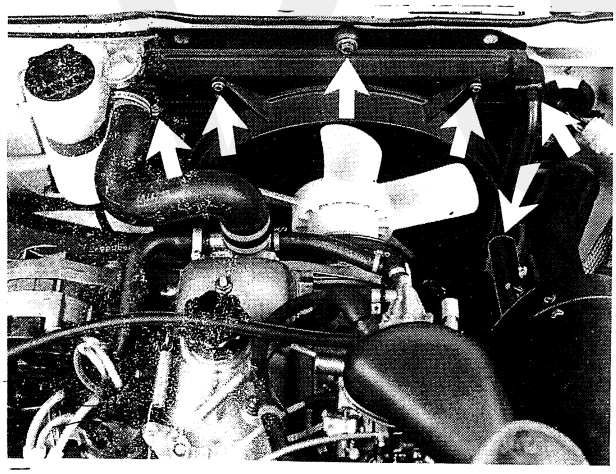


F19

Connect up the following engine hoses and electrical wiring

1 Brake booster vacuum hose.
2 Temperature transmitter/switch wiring.
3 Idle solenoid wiring.
4 Fuel hose.
5 Distributor vacuum hose.
6 Distributor cap and spark plug leads.
7 EGR connections (if fitted).

On cars with automatic transmission:
- Vacuum hose for the electrically controlled vacuum valve.
- Microswitch wiring (if fitted).



F20

Fit the engine cooling fan and/or radiator

See Operations *AB4* and *AC4*.

F21

Reconnect the battery negative cable

F22

Fit the air filter

See Operation *UU8*.

F23

Up to model year 1981: fit the screenwash reservoir

F24

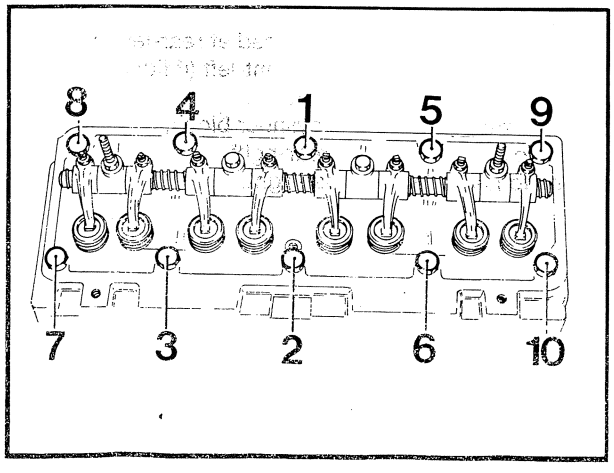
Fill and bleed the cooling system

See Operations *ZZ4* and *ZZ5*.

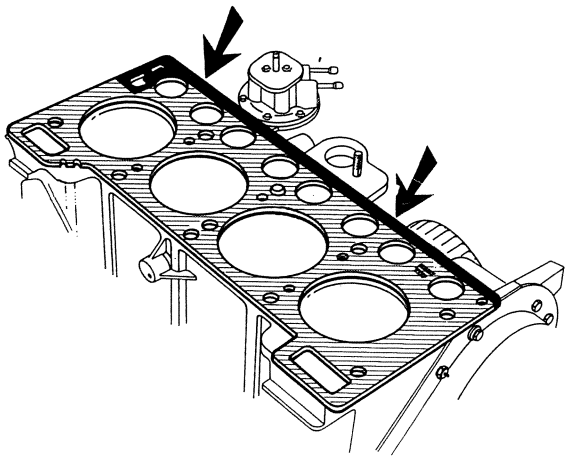
F25

Retorque the cylinder head bolts

Let the engine warm up for **20 minutes** and then check for leakage.
Let the engine cool down for **2.5 hours.**
From model year 1982: remove the air filter.



Retorque the cylinder head bolts as follows.
Slacken No. 1 cylinder head bolt a quarter turn and then retorque it to **60 Nm.**
Repeat this for the remaining bolts in the correct sequence.



The edge of the cylinder head gasket is coated with a layer of glue; see the illustration. This glue guarantees a tight seal when it has been heated to the correct temperature and then allowed to cool down.

F26

Adjust the valve clearances

See Operations *C2* to *C4.*

F27

From model year 1982: fit the air filter

See Operations *UU8.*

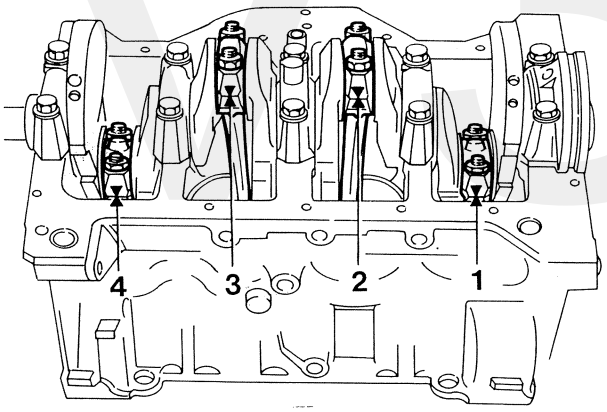
G. Removing/fitting cylinder liners, pistons and piston rings

Special tools: 999-5803, 5811, 5812, 5847, 9684

G1

Remove:

- the cylinder head; see Operations D1 to D17.
- the sump; see Operations L1 to L5.



G2

Remove the cylinder liners and pistons with connecting rods

See Operations *T13*, *T14* and *U10*.

G3

Fit the cylinder liners and pistons with connecting rods

See Operations *U27*, and *V11* to *V13*.

G4

Fit:

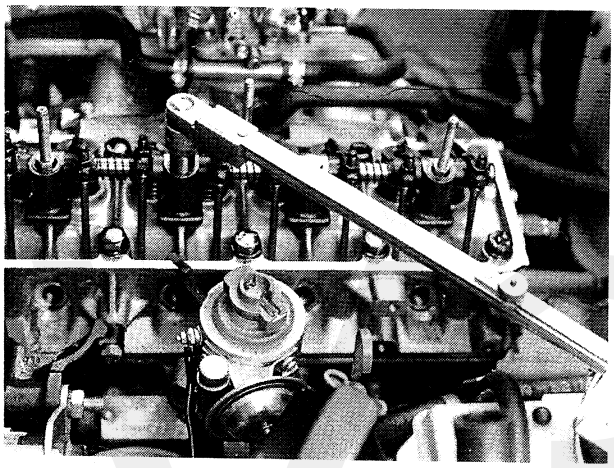
- the sump; see Operations *L6* to *L10*.
- the cylinder head; see Operations *F1* to *F27*.

H. Removing/fitting the rocker arms

H1

Remove the valve (rocker) cover

See Operation *C1*.



H2

Remove/inspect and fit the rocker shaft assembly

See Operations *T2*, *W21*, *W22*, *W23* and *X3*.

H3

Adjust the valve clearances

See Operation *C2*.

H4

Fit the valve (rocker) cover

See Operations *C3* and *C4*.

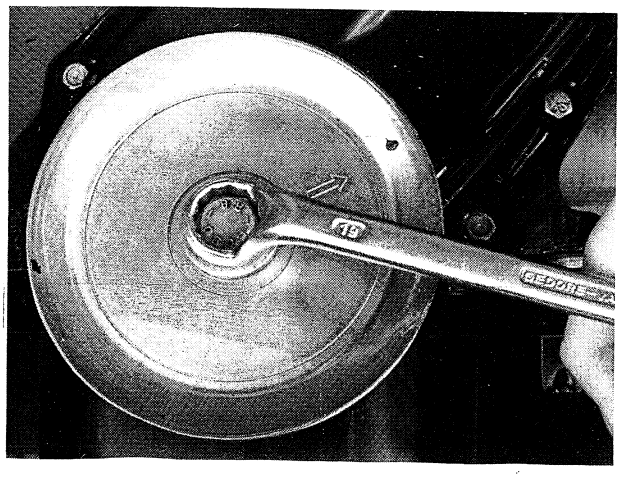
J. Renewing the timing chain and/or timing chain tensioner

Special tools: 999-5807

J1

Remove the sump

See Operations *L1* to *L5*.



J2

Remove the fan belt

J3

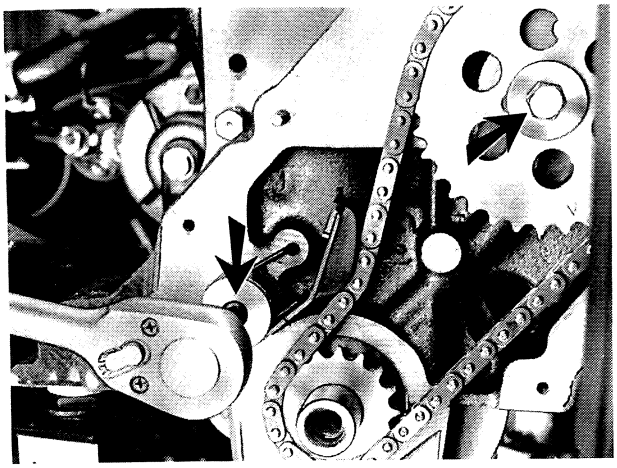
Remove the crankshaft pulley and hub

Tap the bolt loose with a ring spanner and a soft-tip hammer.

J4

Remove the timing cover

See Operation *T10*.



J5

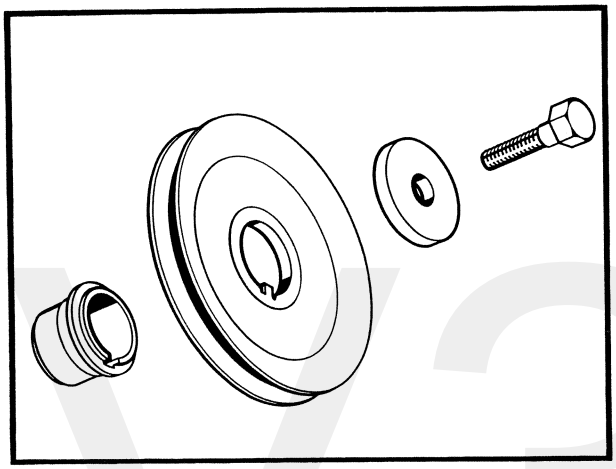
Remove the chain tensioner, chain and sprockets

See Operations *T11, V16, V17* and *V18*.

J6

Fit the timing cover

See Operations *V19* to *V21*.



J7

Fit the hub and crankshaft pulley

Note: polish the pulley hub if it is scored; renew the hub if it is too deeply scored.
Tighten the bolt to **80 Nm.**

J8

Fit the fan belt

Fit the belt and adjust the tension. Deflection: approx. 10 mm.

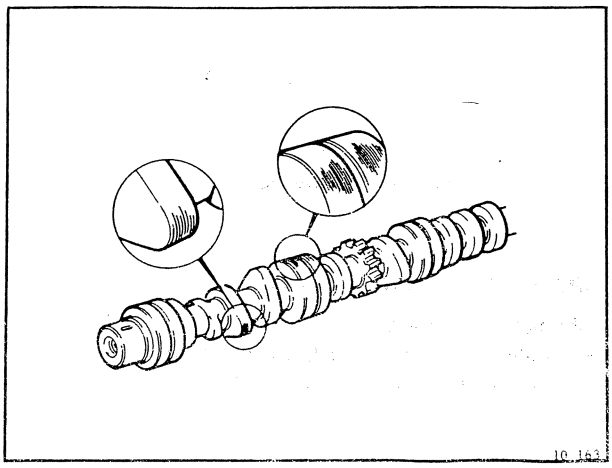
J9

Fit the sump

See Operations *L6* to *L10*.

K. Removing/fitting the camshaft

Special tools: 999-1801, 5803, 5807



K1

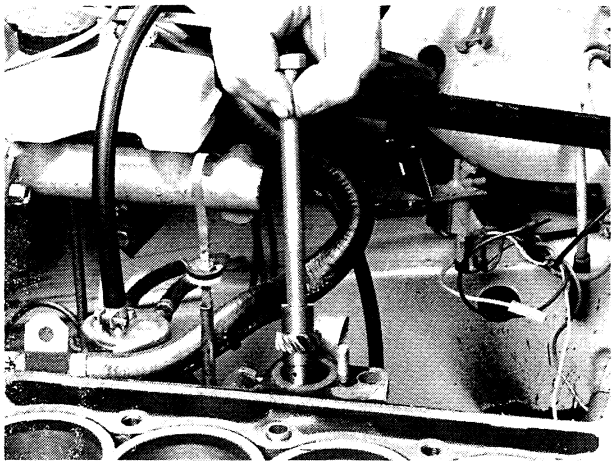
If the camshaft has to be renewed as a result of wear

It is essential that the engine is flushed out thoroughly before new components are fitted.
Damage which regularly occurs to tappets and the camshaft is due to impurities in the engine.

K2

Flush out the engine

Change the engine oil and renew the oil filter.
Let the engine warm up for about 10 minutes.
Drain the oil and remove the oil filter.
Fit the drain plug together with a new washer and tighten. Tightening torque: 30 Nm.



K3

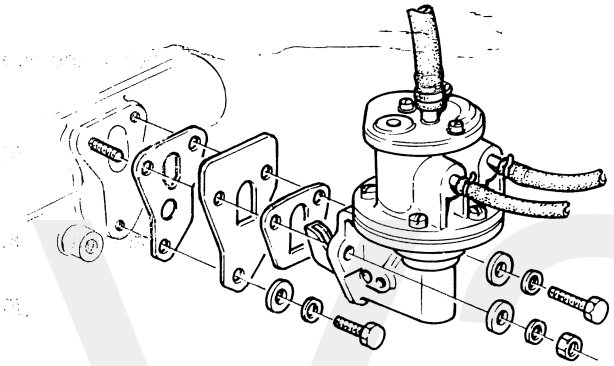
Remove:

- the grille;
- the cylinder head; see Operations *D1* to *D17;*
- the sump; see Operations *L1* to *L5;*

K4

Remove the distributor and drive shaft

Remove the distributor.
Remove the drive shaft from the distributor with an M12x1.5 bolt.



K5

Remove the fuel pump and insulating flange

Leave the fuel hoses attached to the pump.

K6

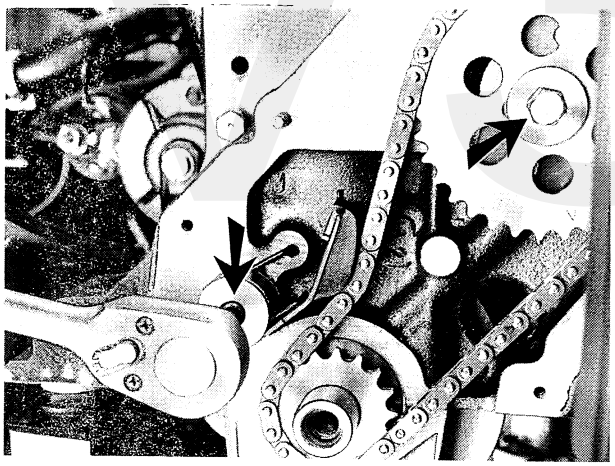
Remove the crankshaft pulley and hub

See Operation *J3*.

K7

Remove the timing cover

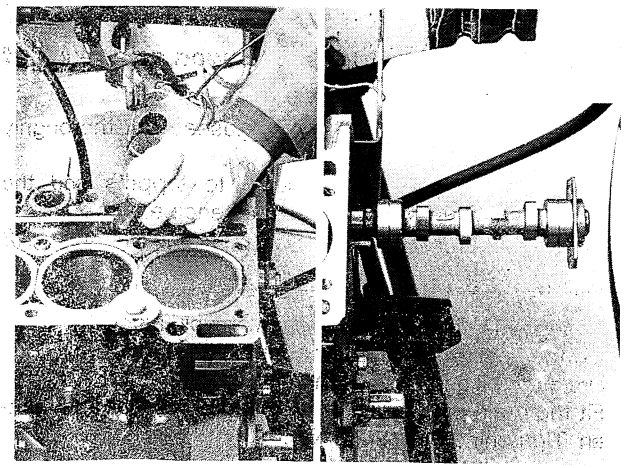
See Operation *T10*.



K8

Remove the chain tensioner, camshaft sprocket and chain

Remove the hexagon socket-head screw from the chain tensioner.
Straighten the lockplate tab by tapping it back (if fitted).
Release the camshaft sprocket bolt.



K9

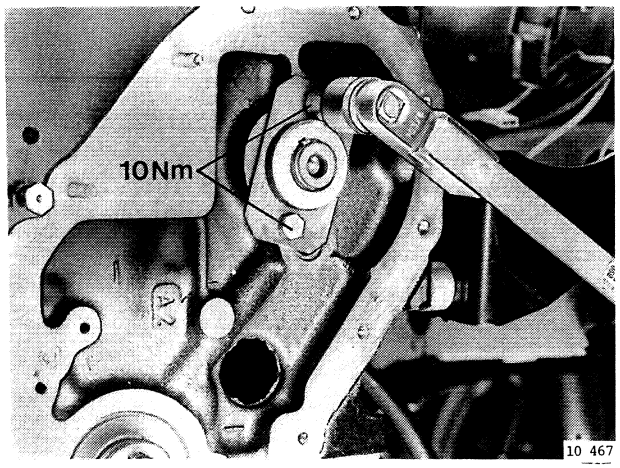
Remove the camshaft

Remove the push rod guides.
Remove the bolts from the retaining flange and withdraw the camshaft from the cylinder block, at the same time pulling the engine towards the exhaust side.

K10

Clean and inspect all parts

Check the clearance:
- of the retaining flange: 0.05-0.10 mm;
- of the tappets: 0.013-0.047 mm.



K11

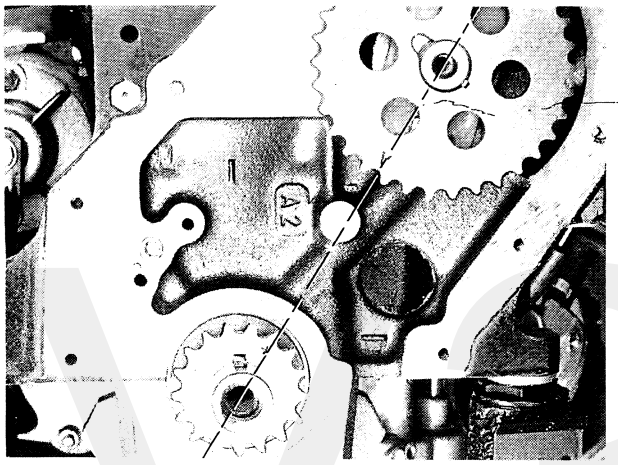
Renew the camshaft

See Operations *U1* to *U5*.

K12

Nokkenas aanbrengenFit the camshaft

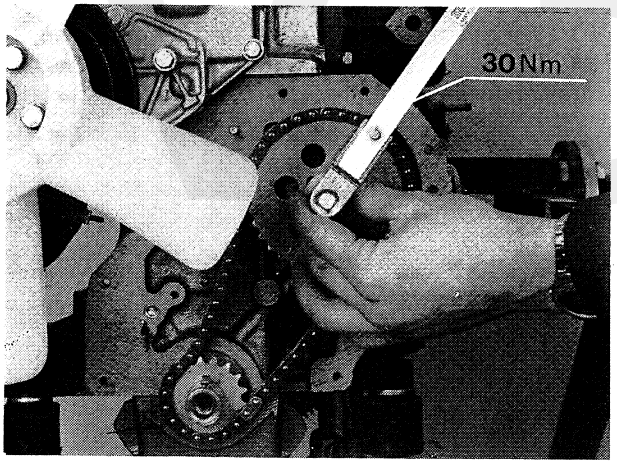
Coat the camshaft bearings with engine oil.
Insert the camshaft in the cylinder block.
Fit the two lock washers and bolts. Tighten the bolts to **10 Nm.**



K13

Adjust the camshaft

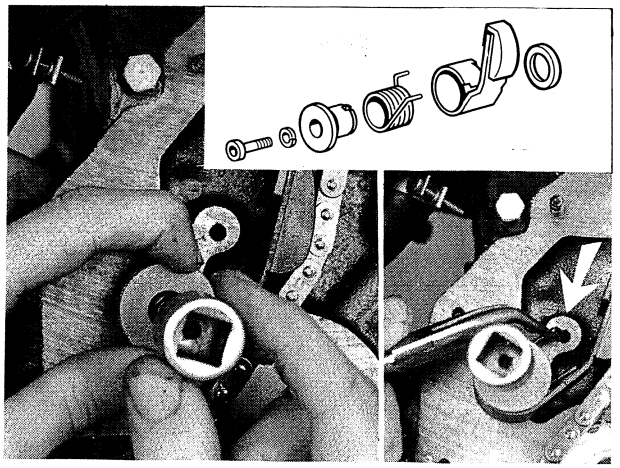
Locate the camshaft sprocket with the timing mark facing outwards.
Rotate the two sprockets until the two timing marks are aligned.
Remove the camshaft sprocket without altering the position of the camshaft.



K14

Fit the timing chain

Locate the chain over the camshaft sprocket and then over the crankshaft sprocket.
Slide the camshaft sprocket on to the camshaft.
Fit the washer, lockplate and bolt and tighten. Tighten the bolt to **30 Nm.**
Note: the timing mark on the camshaft sprocket must be aligned with the timing mark on the crankshaft sprocket.



K15

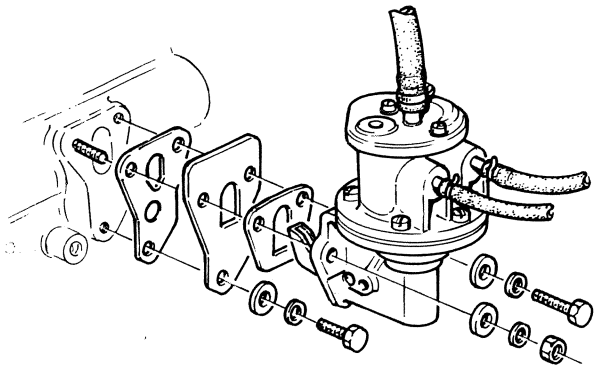
Fit the chain tensioner

See operation *V18*.

K16

Fit the timing cover

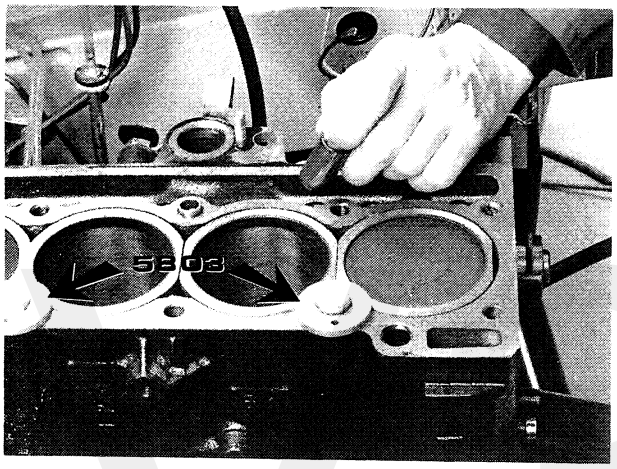
See Operations *V19* to *V21*.
Remove centring tool 999-5807.



K17

Fit the fuel pump

Use new gaskets.
Fit the gaskets with the insulating flange and the fuel pump.
Fit the two lock washers, the nut and the bolt and secure finger-tight.
Tighten the nut and bolt evenly. Tightening torque: 17 Nm.



K18

Fit the push rod guides

Coat the push rod guides with engine oil and insert them in the cylinder block.

K19

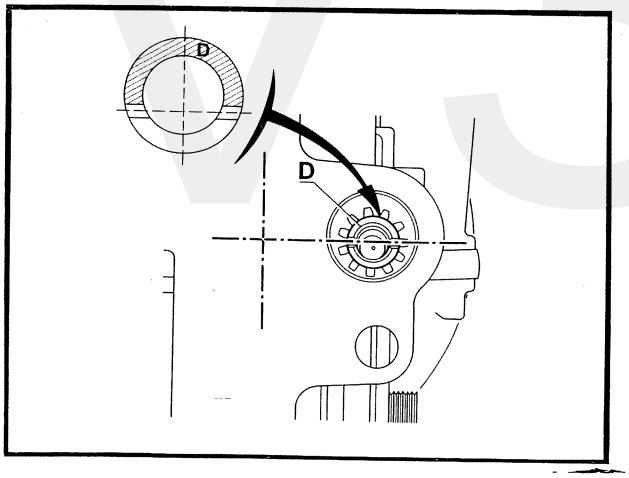
Fit the hub and the crankshaft pulley

See Operations *J7* and *J8*.

K20

Fit the cylinder head

See Operations *F1* to *F24*.



K21

Fit the distributor drive shaft

See operation *X5*.

K22

Fit the distributor

Use a new washer.
Locate the distributor, thrust plate, lock washer and nut and secure finger-tight.
Note. Up to model year 1984: provisionally adjust the ignition timing.
Secure the distributor. Tightening torque: 18 Nm.

K23

Fit:

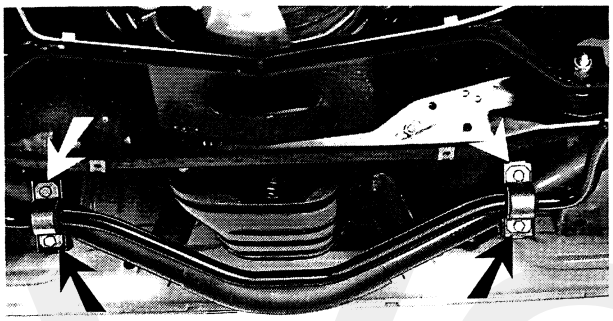
- the sump; see Operations *L6* to *L10;*
- the grille;
- Retorque the cylinder head; see Operations *F25* to *F27.*
  Note. Up to model year 1984: adjust the ignition timing; see Operations *AL1* to *AL6.*
- Adjust the engine idling speed and the CO-content; see Operations:
  - Weber: *JJ1* and *JJ2;*
  - Solex: *MM1* and *MM2.*

L. Removing/fitting the sump

L1

Remove the engine splash guard

Up to model year 1981: two sections.
From model year 1981: one section.



L2

Drain the engine oil

Note: fit a new washer and screw the drain plug back into the sump.
Tightening torque:
- removable nut: 25 Nm;
- captive nut: 35 Nm.

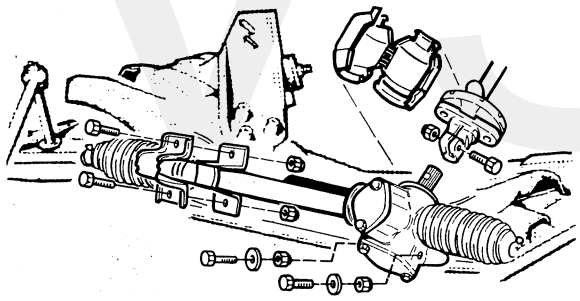
L3

Release the stabilizer rod at the front end

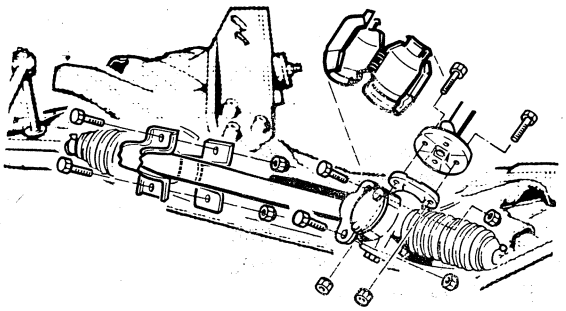
L4

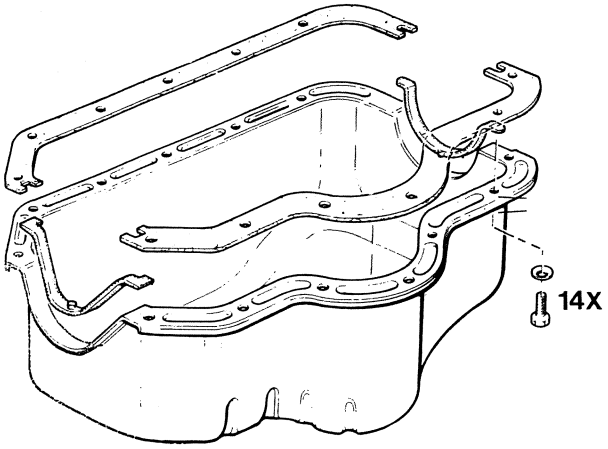
Release the steering gear from the engine rear cross member

Up to model year 1982:
Remove the plastic dust cover, the hexagon socket-head screw and the self-locking nut.
Remove the four bolts and nuts.
Pull the steering gear downwards.



From model year 1982:
Remove the pinion shaft from the steering joint.
Remove the four bolts and nuts.
Pull the steering gear downwards.



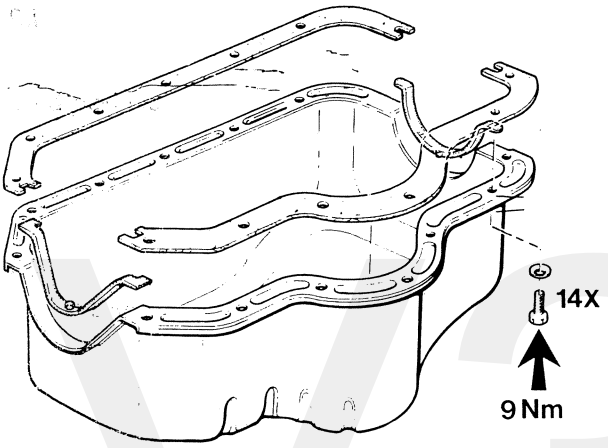


L5

Remove the sump

Remove the old gaskets and all gasket remnants from the cylinder block and the sump.
Clean and inspect the joint faces of the sump where it abuts the cylinder block.
If necessary, renew the sump.

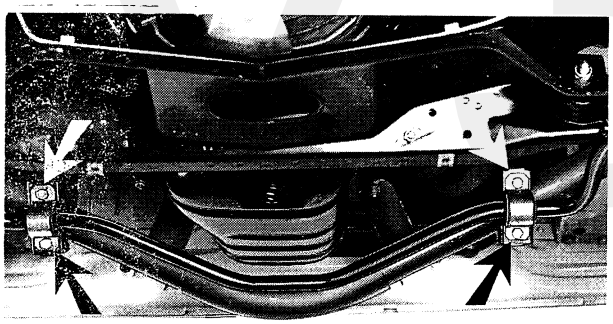
Note: renew the front oil seal if it is leaking. See Operations *M1* to *M5.*



L6

Fit the sump

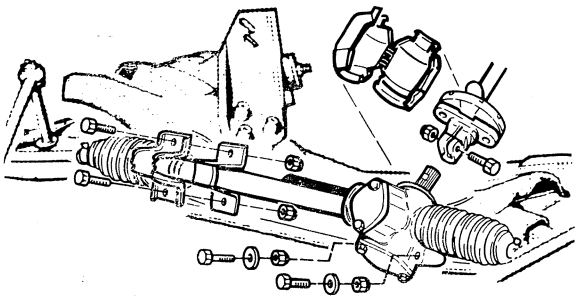
Fit the new rubber gaskets in the timing case cover and the rear main bearing cap.
Fit the two cork gaskets.
The cork gaskets must overlap the lips of the rubber gaskets.
Affix the gasket to the cylinder block with liquid gasket cement, Part No. 1161026-8.
Locate the fourteen bolts and washers and tighten evenly. Tighten the bolts to **9 Nm.**



L7

Fit the stabilizer rod

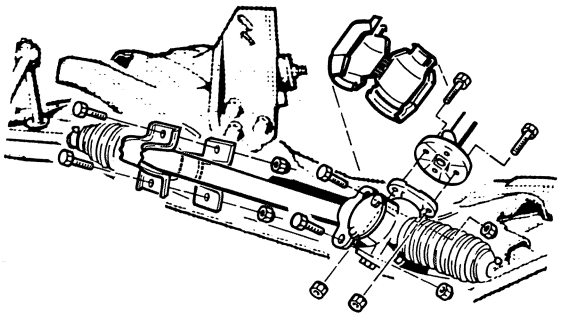
Tightening torque: 23 Nm.



L8

Fit the steering gear

Up to model year 1982:
Slide the pinion shaft into the steering joint clamp.
Fit and tighten the two clamps at the right.
Fit the four bolts and **new** self-locking nuts and secure finger-tight.
Fit the hexagon socket-head screw of the steering joint clamp and a **new** self-locking nut and secure finger-tight.
Now tighten the steering gear bolts and then the hexagon socket-head screw. Tightening torque: 25 Nm.
Fit the plastic dust cover.



From model year 1982:
Fit and tighten the two clamps at the right.
Fit the four bolts and **new** self-locking nuts and secure finger-tight.
Fit the pinion shaft to the steering joint.
Now tighten the steering gear bolts and then the bolts of the steering joint. Tightening torque: 25 Nm.

L9

Fit the engine splash guard

L10

Fill the engine with oil

Capacity, excl. oil filter	liter	3.5
incl. oil filter	liter	4.0

Quantity of oil between MAX and MIN marks: 1 litre.

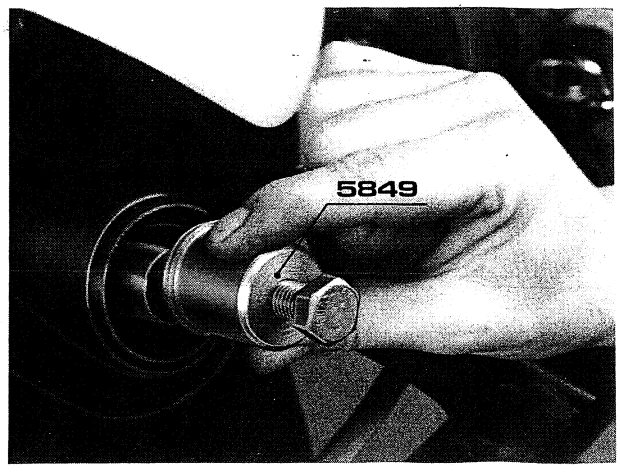
M. Removing/fitting the crankshaft oil seal at the timing gear end

Special tools: 999-5807, 5849

M1

Remove:

- fan belt;
- engine splash guard;
- crankshaft pulley and hub; see Operation *J3*.

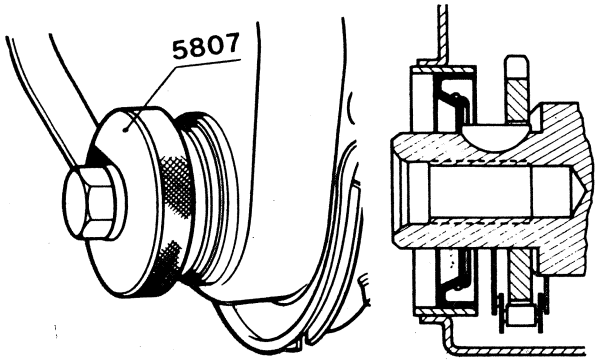


M2

Remove the oil seal

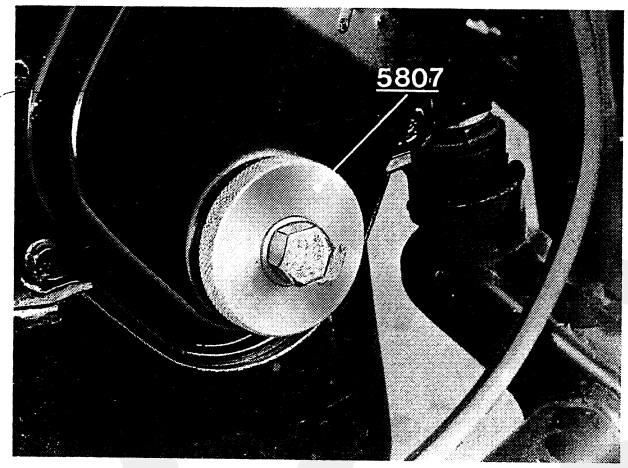
Unscrew the bolt to its full extent and push extractor **999-5849** into the oil seal until the collar falls behind the lip of the oil seal.
Tighten the bolt in order to remove the oil seal.

M3



Check the position of the timing cover

With the aid of centring tool **999-5807**, check whether the timing cover is correctly centred.
If the timing cover is correctly centred, continue with Operations *M4* and *M5*.
If the timing cover is not correctly centred, remove the sump and continue with Operations *V19* to *V22*.



M4

Fit the oil seal

Coat the lip of the **new** oil seal with grease, Part No. 1161001-1.
Fit the oil seal with special tool **999-5807** and the washer and bolt.
Tighten the bolt as far as the stop.

M5

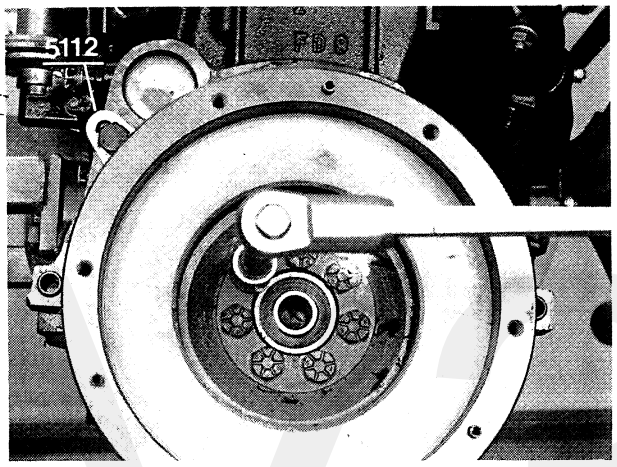
Fit:

- the crankshaft pulley and hub; see Operation *J7;*
  Note: polish the pulley hub if it is scored; renew the hub if it is too deeply scored.
- the engine splash guard;
- the fan belt; see Operation *J8.*

N. Renewing the crankshaft oil seal at the flywheel end

Special tools: 999-1801, 5112, 5953

For this repair the propeller shaft, clutch housing and clutch must be removed.
For these operations see Service manuals:
- MT: Repairs & Maintenance, Section 4 (41-46), Power transmission 300, 1979-1991, November 1990, TP 35717/1;
- AT: Repairs & Maintenance, Section 4 (41-43), Power transmission, CVT, 300, 1976-1991, May 1991, TP 35724/**1**.



N1

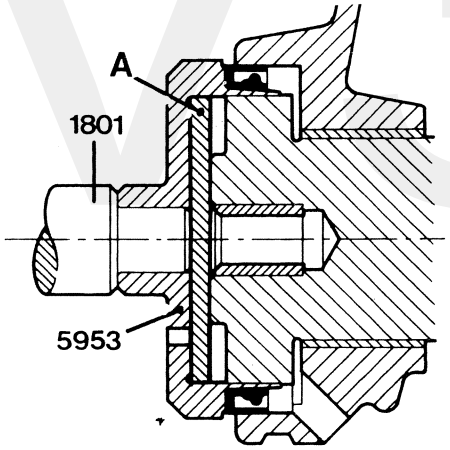
Remove the flywheel

Use locking sector **999-5112.**
Note: inspect the pilot bearing and renew if necessary; see Operation *V9.*

N2

Remove the oil seal

Take care not to damage any components.

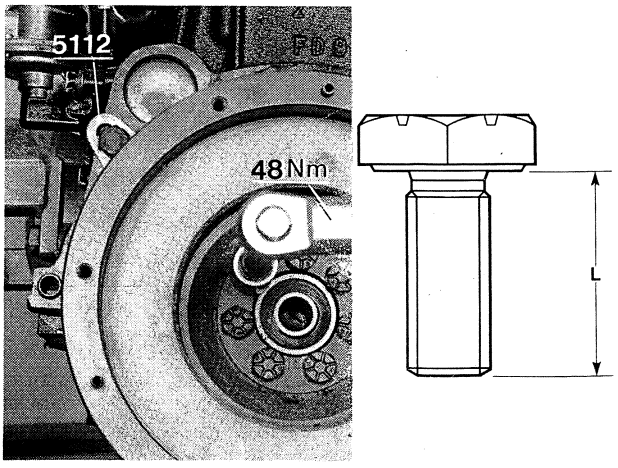


N3

Fit the oil seal

Coat the lip of the **new** oil seal with grease, Part No. 1161001-1.
Shallow scoring in the running surface must be removed by polishing.
Fit the oil seal with drift **999-5953** and handle **999-1801.**

If the scoring is too deep, the oil seal must be pressed in 1.5 mm **less deep.**
Proceed as follows:
- insert the oil seal halfway;
- place a 1.5 mm spacer ring (A) in drift **999-5953** (use some grease);
- fit the oil seal.



N4

Fit the flywheel

Coat the mating face of the flywheel with locking fluid, Part No. 1161059-9.
Caution! One of the seven bolt holes is staggered.
Always use **new** bolts.
Available sizes:

	Thread length
AT	L = **32 mm**
AT and MT	L = **36 mm**

Coat the bolts with liquid gasket cement, Part No. 277917-1.

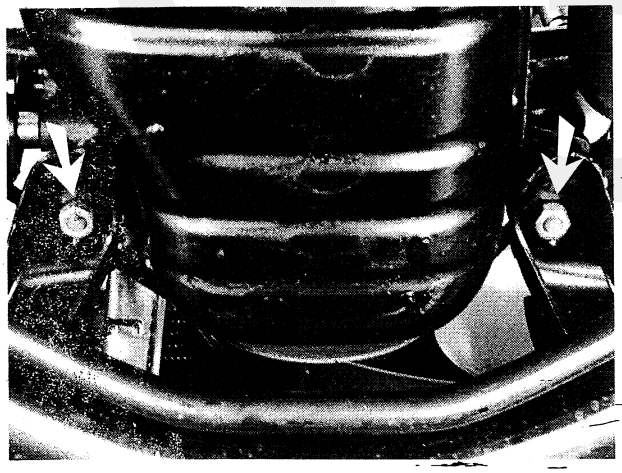
Lock the flywheel with locking sector **999-5112**. Tighten the bolts to **53 Nm.**

N5

Fit the clutch, clutch housing and propeller shaft

See Service manuals:
- MT: Repairs & Maintenance, Section 4 (41-46), Power transmission 300, 1979-1991, November 1990, TP 35717/1;
- AT: Repairs & Maintenance, Section 4 (41-43), Power transmission, CVT, 300, 1976-1991, May 1991, TP 35724/1.

O. Removing/fitting the engine front mounting pads and/or mounting bracket

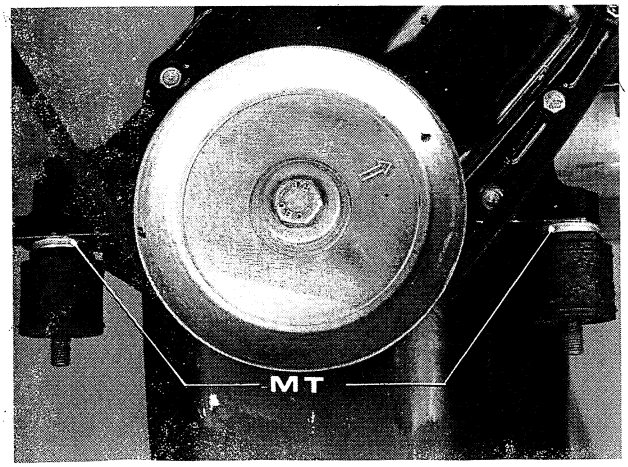


Removing mounting pads up to model year 1985:

O1

Release the front mounting pads from the engine cross member

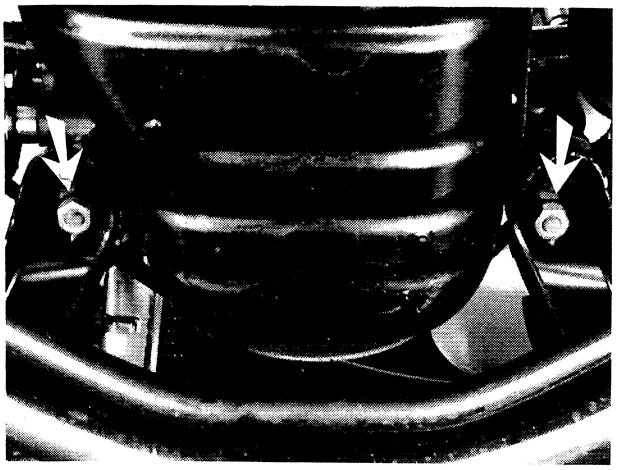
Remove the engine splash guard.
Place a stand under the engine.
Remove the two nuts and washers.
Raise the engine until the mounting pads come away from the cross member.



O2

Remove the front mounting pads from the cylinder block

Note: on MT versions a shim is located between the mounting pad and the cylinder block.



O3

Fit new mounting pads to the cylinder block

Screw the front mounting pads into the cylinder block. Tightening torque: 53 Nm.
Lower the engine until the threaded ends engage the engine cross member.
Fit the two washers and nuts and tighten. Tightening torque: 47 Nm.
Fit the engine splash guards.
Note: in the case of an exchange engine, first check that the pitch of the thread matches that of the engine mounting pad.

Removing mounting pads from model year 1985

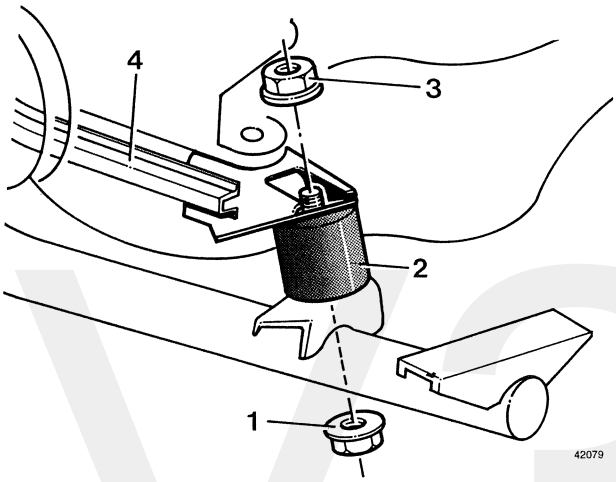
O4

Remove the engine splash guard

O5

Remove the front mounting pads

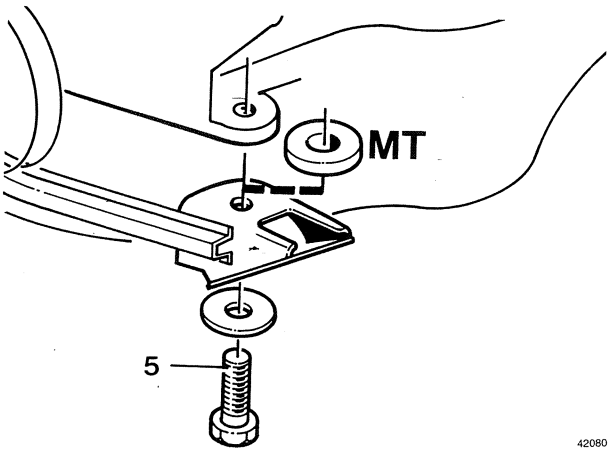
Remove the two lower nuts (1) from the mounting pads (2).
Raise the engine sufficiently to remove the mounting pads.
Remove the upper nuts (3) and take off the engine mounting pads.
Note: if the engine mounting bracket (4) is also (or only) being renewed, carry out Operations *O7* to *O9.*



O6

Fit the engine mounting pads

Locate the engine mounting pads on the engine mounting bracket and secure the nuts finger-tight.
Position the mounting pads above the holes in the cross member and lower the engine.
Secure the two nuts finger-tight.
Tighten all the nuts. Tightening torque: 47 Nm.

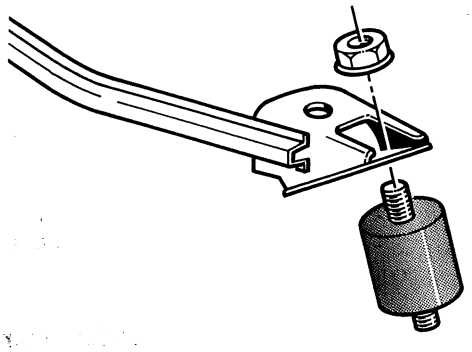


O7

Remove the engine mounting bracket

Note: first complete Operation *O1.*

Release the bolts (5); note the thick washer between the cylinder block and the engine mounting bracket on cars with manual transmission.
Remove the engine mounting bracket.



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O8

Fit the mounting pads on the new engine mounting bracket

Clamp the engine mounting bracket in a bench vice and remove the two mounting pads. Clamp the new engine mounting bracket in a bench vice and fit the mounting pads; secure the nuts finger-tight.

O9

Fit the engine mounting bracket

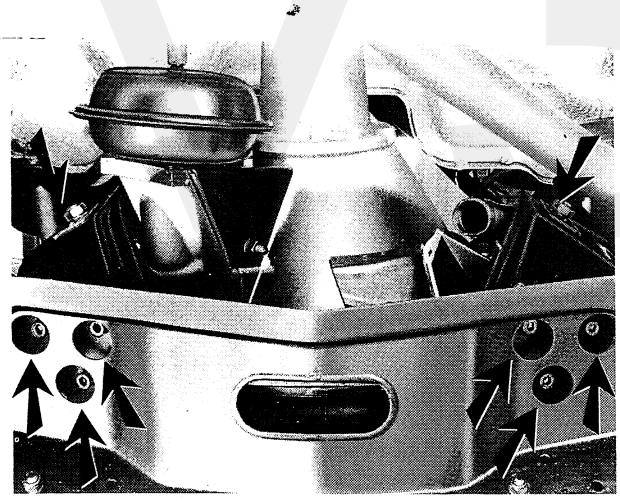
Fitting is in reverse order to removal; see Operation *O7.*
Tightening torques:
- the two bolts to the cylinder block: 52 Nm;
- mounting pad nuts: 47 Nm.

Note: in the case of an exchange engine, first check that the pitch of the thread matches that of the engine mounting pad.

P. Removing/fitting the engine rear mounting pads

P1

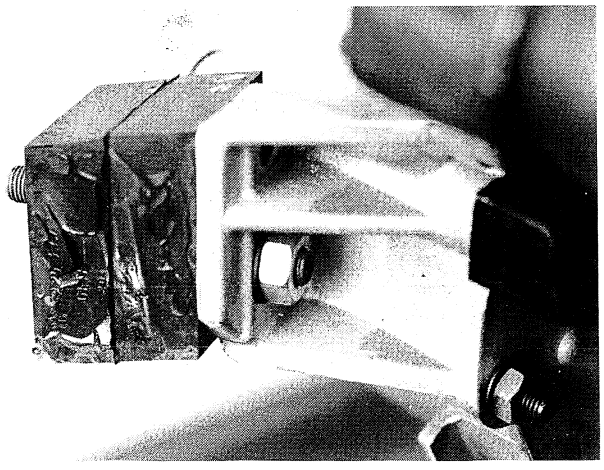
Remove the engine splash guard



P2

Remove the left and right-hand engine mounting brackets

Place a stand under the engine.
Remove the nuts, lock washers and retainer plates.
Remove the six hexagon socket-head screws and lock washers.



P3

Remove the engine mounting pads from the clutch housing

Remove the two nuts and washers.

P4

Fit the engine mounting pads to the clutch housing

Fit and tighten the two washers and nuts. Tightening torque: 30 Nm.

P5

Fit the left and right-hand engine mounting brackets

Locate the engine mounting brackets.
Secure the two retainer plates, lock washers and nuts finger-tight.
Fit and tighten the six hexagon socket-head screws and lock washers. Tightening torque: 23 Nm.
Remove the engine stand.
Now tighten the two nuts. Tightening torque: 47 Nm.

P6

Fit the engine splash guard

Q. Removing the engine from the car

Special tools: 999-2810, 5870, 5871

Note: the engine is removed together with the clutch housing as a single unit.

Q1

Preliminary operations

- remove the engine splash guard;
- drain the coolant; see Operation *ZZ3*;
- drain the engine oil;
- remove the propeller shaft:
  - MT: Repairs & Maintenance, Section 4 (41-46), Power transmission 300, 1979-1991, November 1990, TP 35717/1;
  - AT: Repairs & Maintenance, Section 4 (41-43), Power transmission, CVT, 300, 1976-1991, May 1991, TP 35724/1.

Q2

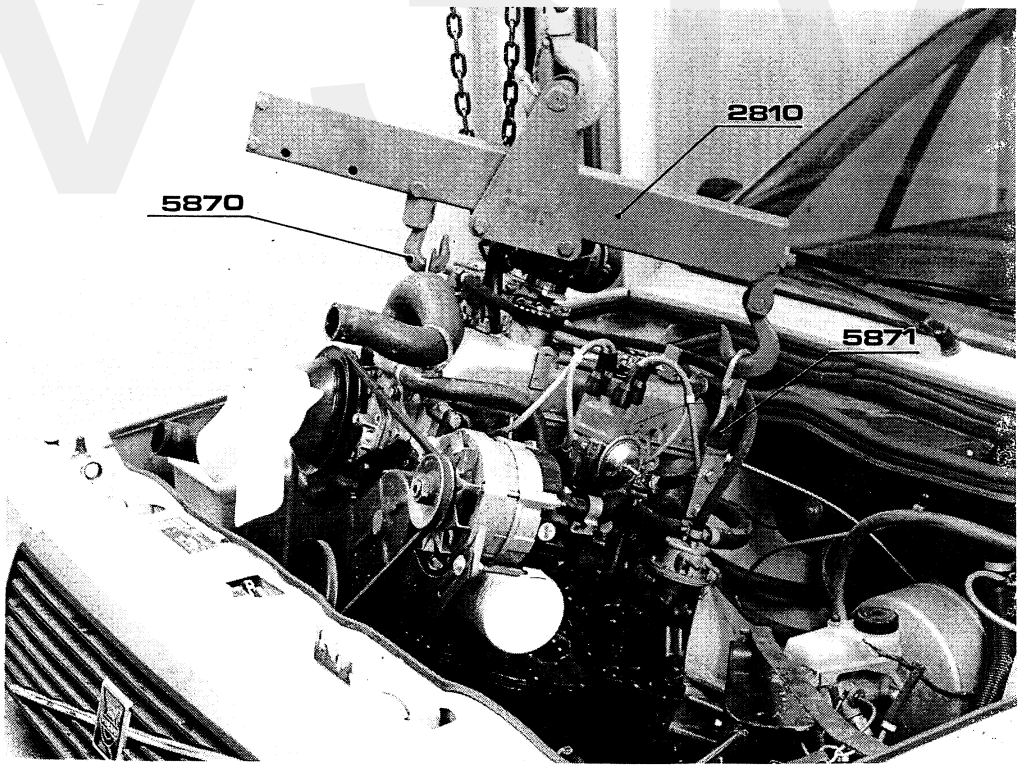
Remove the following components:

- bonnet;
- spare wheel;
- screenwash reservoir (up to model year 1981);
- air filter;
- radiator with fan shroud (up to model year 1984);
- thermo-electric fan (from model year 1985).

Q3

Release the following connections:

- various hoses, control cables and electrical connections;
- exhaust pipe from exhaust manifold;
- exhaust mounting bracket from exhaust pipe and clutch housing;
- engine front and rear mountings from cross members;
- EGR connections;
- Pulsair system.



Q4

Lift out the engine

Attach lifting eyes **999-5870** (up to model year 1982) and **999-5871** and use lifting beam **999-2810**.
Raise the engine and then slide it forwards.
Now hoist the engine out of the car at an angle.

R. Engine components

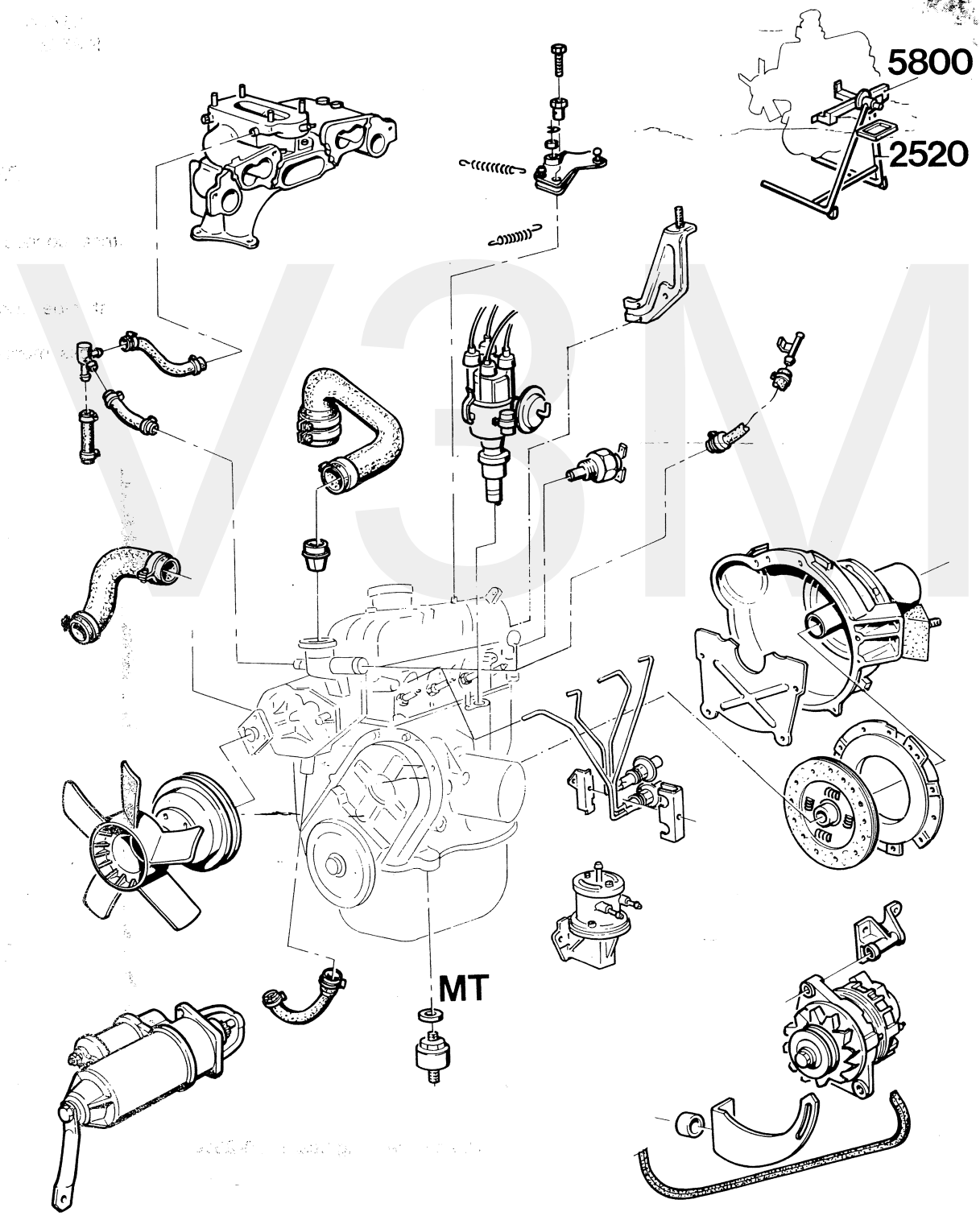
Special tools: 999-2520, 5112, 5800

R1

Transfer engine components

Remove the engine components illustrated below and fit them on the new engine.
Note: see Operation *O3* in the case of an exchange engine with regard to fitting the front mounting pads.

In the case of an exchange engine, also transfer the flywheel.
Note: when reconditioning the engine, the engine components illustrated below should likewise be removed and then fitted back on the engine after reconditioning.



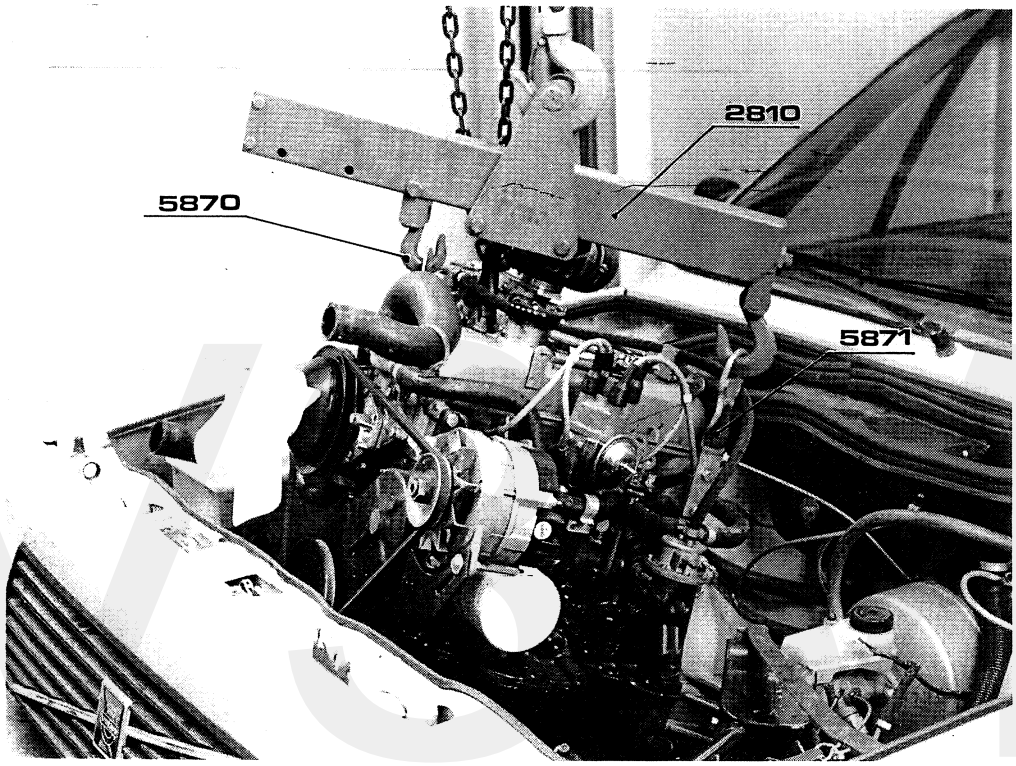
S. Installing the engine

Special tools: 999-2810, 5870, 5871

S1

Locate the engine

Attach lifting eyes **999-5870** (up to model year 1982) and **999-5871** and use lifting beam **999-2810.**
Lower the engine and clutch assembly into the car at an angle and then slide it to the rear.



S2

Make the following connections:

- engine front and rear mountings on cross members;
- exhaust pipe to exhaust manifold;
- exhaust mounting bracket to exhaust pipe and clutch housing;
- various hoses, control cables and electrical connections;
- EGR connections;
- Pulsair system.

S3

Fit the following components:

- thermo-electric fan (from model year 1985);
- radiator with fan shroud (up to model year 1984);
- air filter;
- screenwash reservoir (up to model year 1981); spare wheel;
- bonnet.

S4

Fitting, adjusting and filling operations

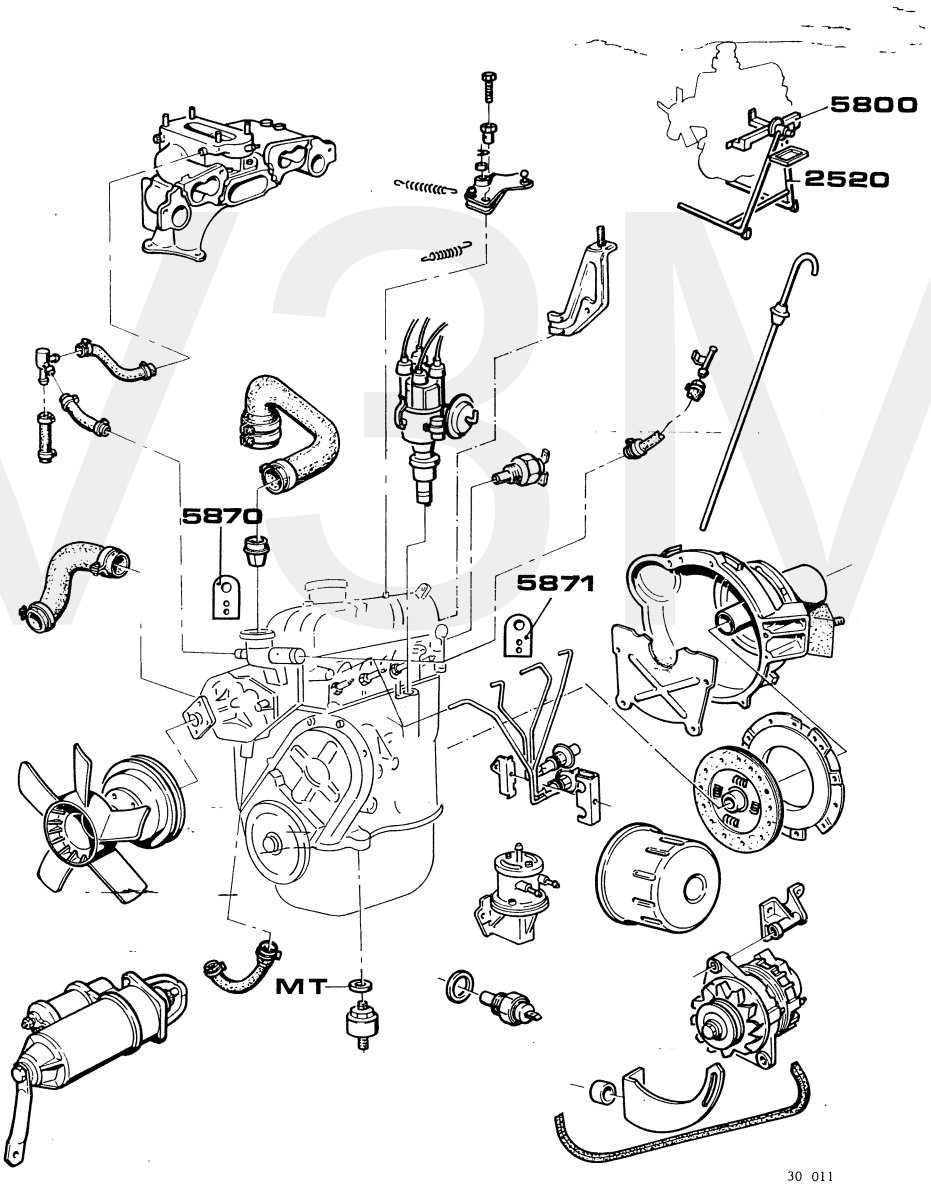
- adjust the propeller shaft and clutch:
  - MT: Repairs & Maintenance, Section 4 (41-46), Power transmission 300, 1979-1991, November 1990, TP 35717/1;
  - AT: Repairs & Maintenance, Section 4 (41-43), Power transmission, CVT, 300, 1976-1991, May 1991, TP 35724/1;
- engine splash guard;
- engine oil;
- fill and bleed cooling system; see Operations *ZZ4* and *ZZ5;*
- if the engine has been reconditioned, retorque the cylinder head bolts and adjust the valve clearances (let the engine warm up);
- adjust the idling speed, CO-content and the ignition timing point (up to model year 1982).

Operations with the engine removed from the car

Reconditioning the engine

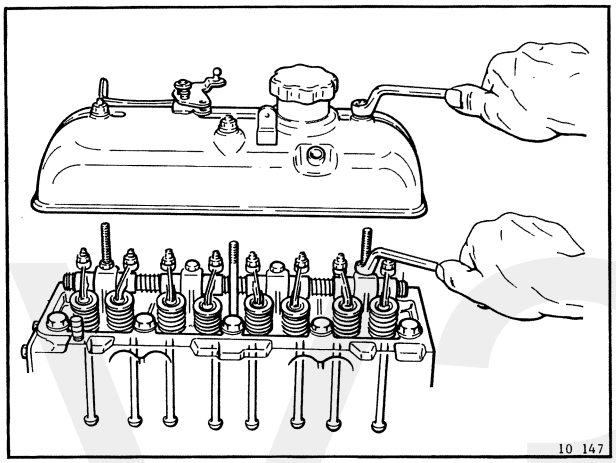
Special tools: 999-1801, 2520, 2903, 5112, 5800, 5803, 5807, 5811, 5812, 5847, 5944, 5950, 5953, 9153, 9155, 9684, 9696

General
For the reconditioning operations described in this manual it is presumed that the components illustrated on page 53 have already been removed.
The engine is mounted on universal stand **999-2520** with engine support **5800.**



T. Disassembling the engine

Special tools: 999-5112, 5803, 5849



T1

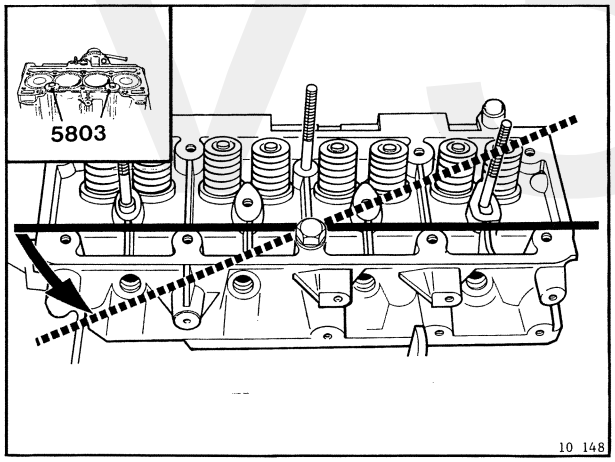
Remove the valve cover

T2

Remove the rocker shaft assembly

T3

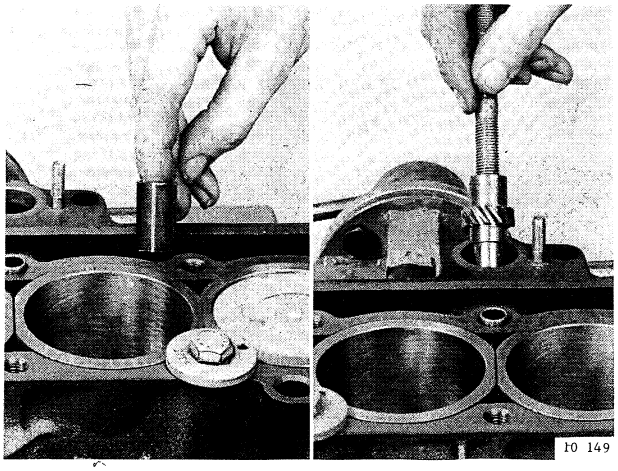
Remove the push rods



T4

Remove the cylinder head

Remove the cylinder head bolts, except the bolt near the distributor drive shaft.
Only slacken this bolt.
Using a plastic-tip hammer, tap against the side of the cylinder head at both ends to release it.
Remove the last bolt.
Remove the cylinder head.
Remove the cylinder head gasket.
Fit the clamping plates **999-5803.**



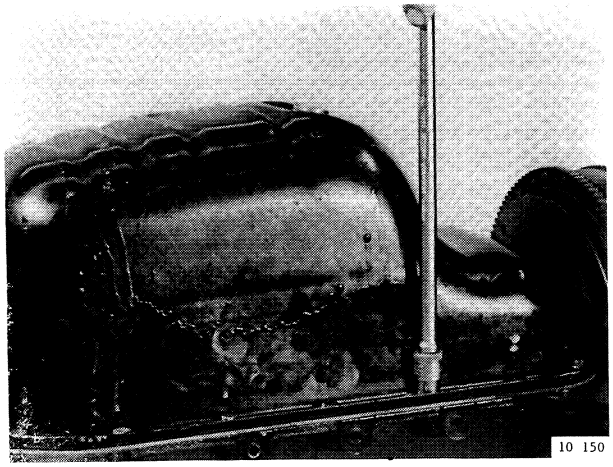
T5

Remove the push rod guides

T6

Remove the distributor drive shaft

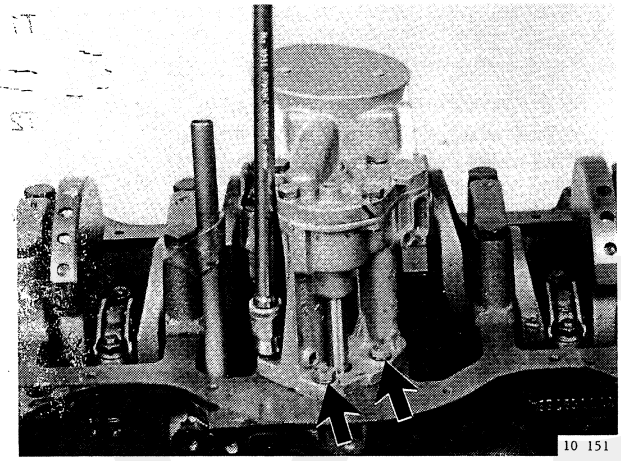
If necessary, use an M12 x 1.5 bolt.



T7

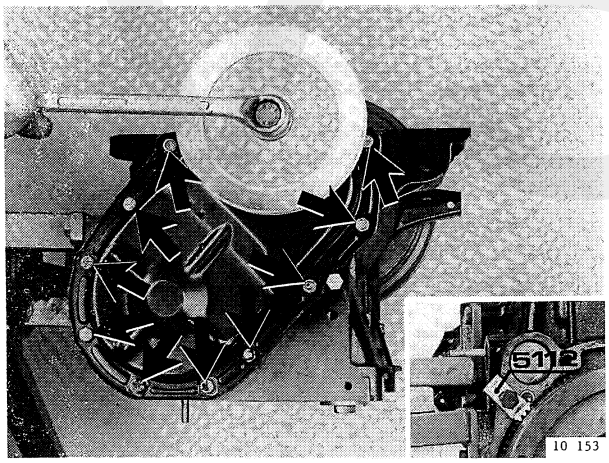
Remove the sump

Remove the cork and rubber gaskets



T8

Remove the oil pump



T9

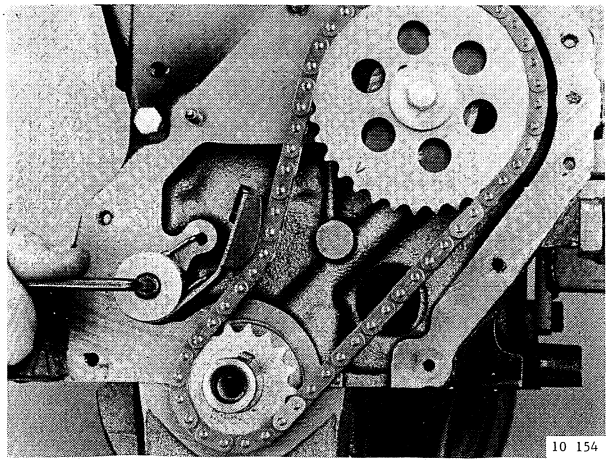
Remove the crankshaft pulley and hub

Lock the flywheel with locking sector **999-5112.**

T10

Remove the timing cover

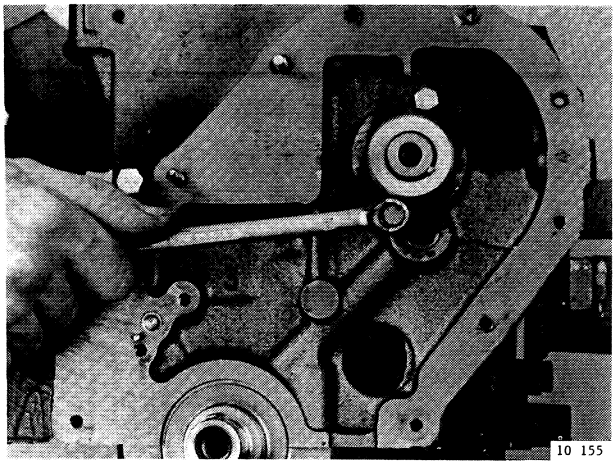
Remove the gasket.
Remove the oil seal from the cover.



T11

Remove the chain tensioner, sprockets and chain

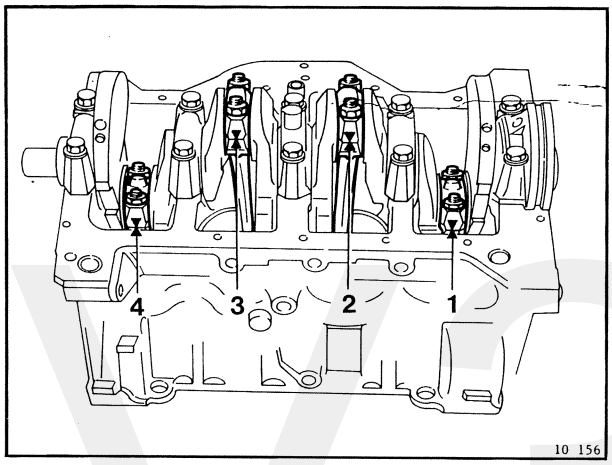
Unscrew the hexagon socket-head screw from the chain tensioner.
Straighten the lockplate tab by tapping it back (if fitted).
Release the camshaft sprocket bolt.


10 155

T12

Remove the camshaft

Remove the bolts from the retaining flange.
Withdraw the camshaft from the cylinder block.

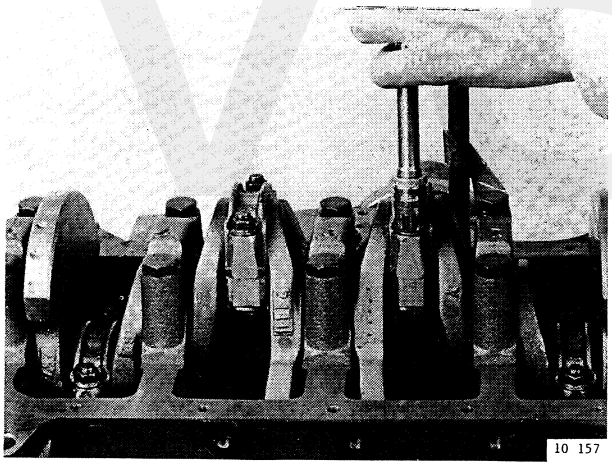


10 156

T13

Mark the connecting rods and bearing caps.

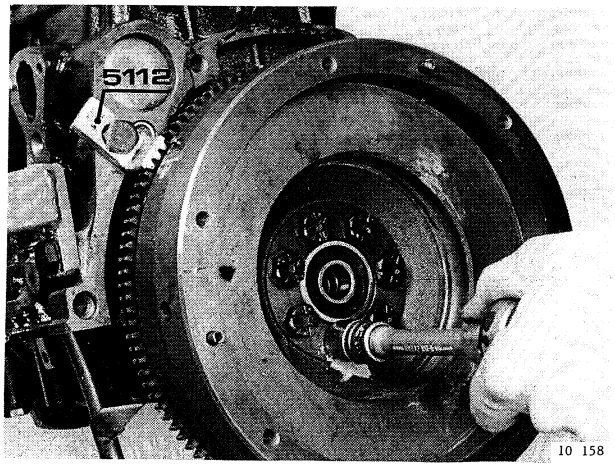
Mark the connecting rods and bearing caps in relation to each other, opposite the camshaft side.
Start with No. 1 at the flywheel end.


10 157

T14

Remove the cylinder liners, pistons and connecting rod assemblies

Remove the bearing cap together with the bearing shell.
Remove the clamping plates **999-5803.**
Withdraw the piston together with the cylinder liner.

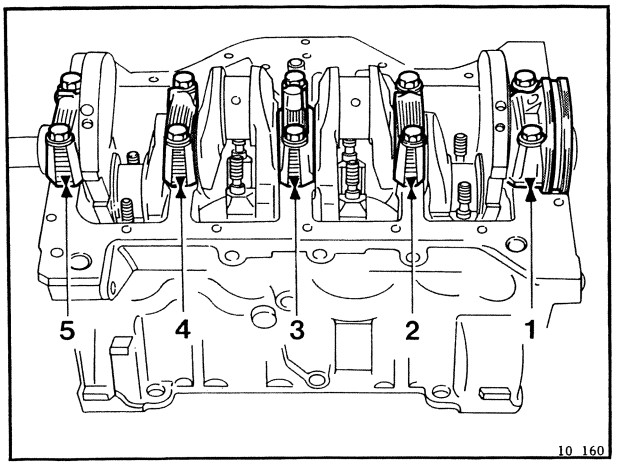


10 158

T15

Remove the flywheel

Lock the flywheel with locking sector **999-5112.**

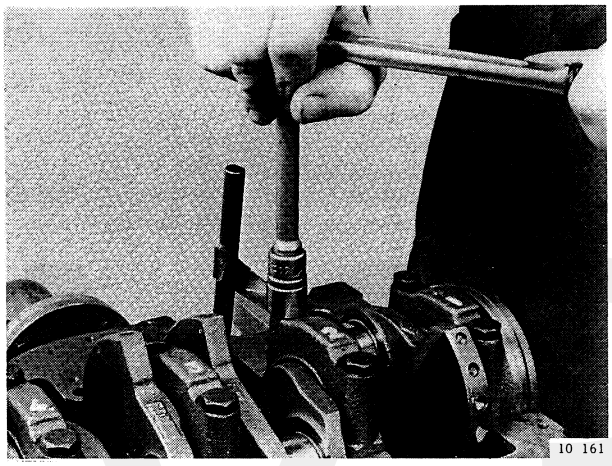


T16

Mark the main bearing caps

(if not already marked)

Check whether the bearing caps are marked; mark if necessary opposite the camshaft side.



T17

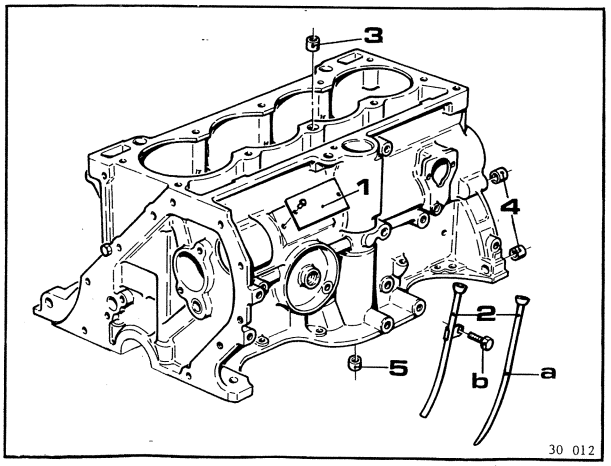
Remove the crankshaft

Remove the bearing caps, bearing shells and (if fitted) the dipstick guide.
Withdraw the crankshaft, thrust washer segments and bearing shells from the cylinder block.
Remove the oil seal and key from the crankshaft.

T18

Clean all the parts

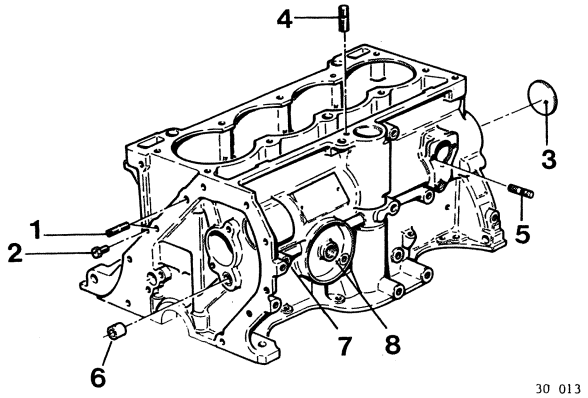
Thoroughly clean the gasket contact faces and the other mating faces.
Use compressed air to thoroughly clean the oilways, water passages and threaded holes of the cylinder block and crankshaft.
Pay special attention to cleaning the mating faces for the cylinder liners and the cylinder block.



T19

Transfer the following parts when renewing the cylinder block

1. Type plate
2. Dipstick tube (2 versions)
   A. Tap the dipstick tube out of the block from the sump end.
   B. Remove the bolt.
3. Locating bush for the cylinder head
4. Locating bush (2x) for the clutch housing
5. Locating bush for the oil pump

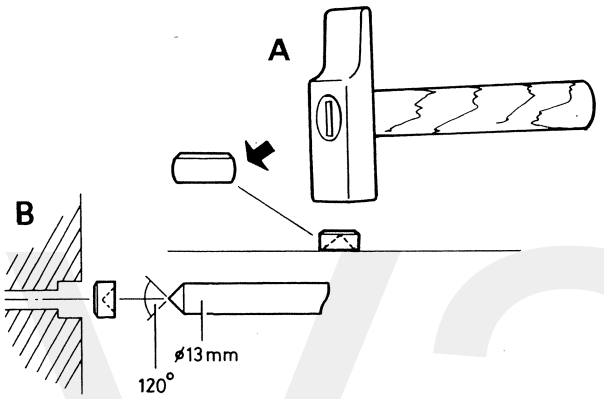


30 013

T20

Fit new parts on the new cylinder block (if not already fitted)

1. Stud (2x) for securing the timing gear cover. Tightening torque: 8 Nm.
2. Coolant drain plug (use liquid gasket cement, part No. 277917-1) Tightening torque: 20 Nm.
3. Plug for camshaft (use sealant/locking agent); upset the plug to secure it.
4. Stud for distributor attachment. Tightening torque: 18 Nm.
5. Stud for fuel pump attachment. Tightening torque: 23 Nm.
6. Plug for camshaft (upset), if fitted.
7. Oil pressure switch. Tightening torque: 20 Nm.
8. Oil filter (new).



41 326

T21

Fit the main oilway plugs (2x)

Thoroughly clean the mating faces.
Upset the two plugs.
Coat the plugs with a locking agent.
Insert the plugs and tap them into the cylinder block, using a 13 mm diam. punch bevelled at one end to 120°.

T22

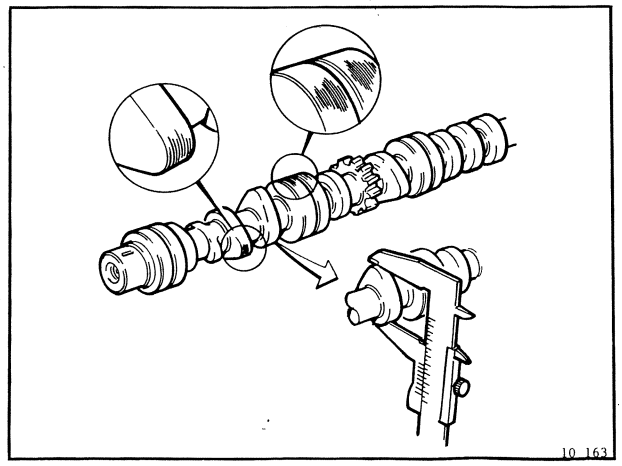
Mark the main bearing caps.

See Operation *T16*.

U. Inspecting and reconditioning the engine

Special tools: 115-8281-4, 998-5422, 999-1801, 5803, 5811, 5812, 5847, 5950, 9152, 9153, 9154, 9155, 9684

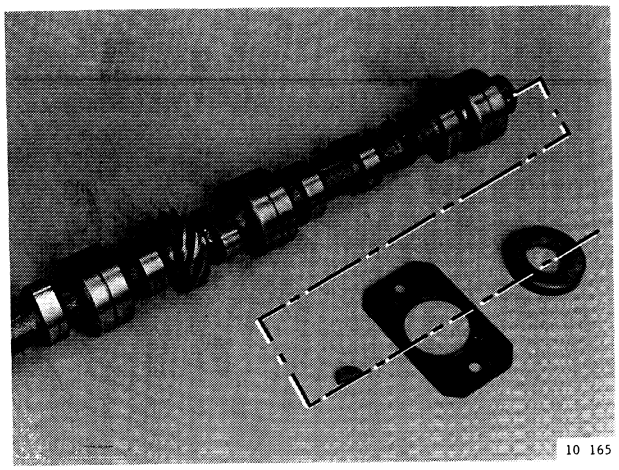
The parts of the piston/cylinder liner set are matched and their dimensions do not have to be verified. This also applies to the compression rings sets.
Remove the preservative coating and check the parts for damage.
Note: mark the matching parts of the sets to ensure that they are not interchanged.


10 163

U1

Check the camshaft

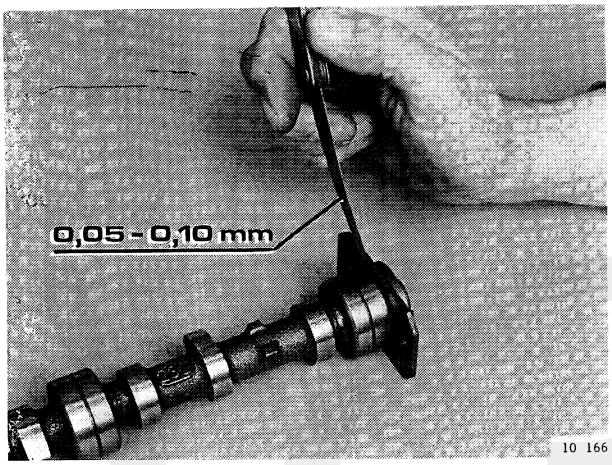
Cams and bearings should show no evidence of wear or scoring.
Check the sprocket for damage.
Measure the height of the cams with a vernier caliper.
The mutual difference in cam height must not exceed **0.1 mm**; see the specifications.


10 165

U2

Assemble the new camshaft

Clean the new camshaft (grease).
Locate the key.
Locate the new retaining flange with a new spacer ring over the key.
Press the spacer ring on to the camshaft, up to the shoulder, with the **bevelled edge** on the camshaft side.
Note: always use a **new** retaining flange and spacer ring.

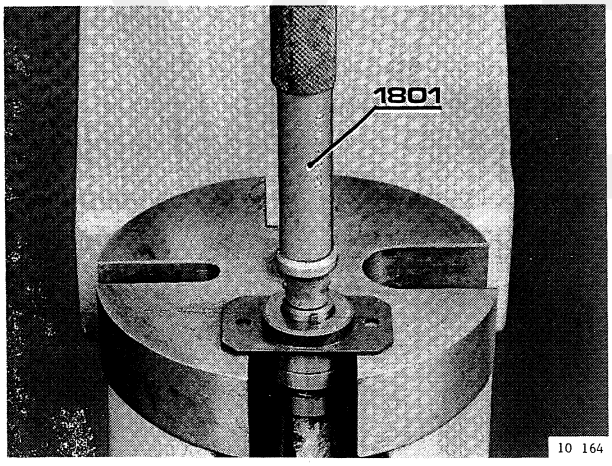


10 166

U3

Check the retaining flange to camshaft clearance

The permissible clearance is **0.05 - 0.10 mm.**
Note: if the measured clearance is incorrect, check again after fitting a new retaining flange and spacer ring.



10 164

U4

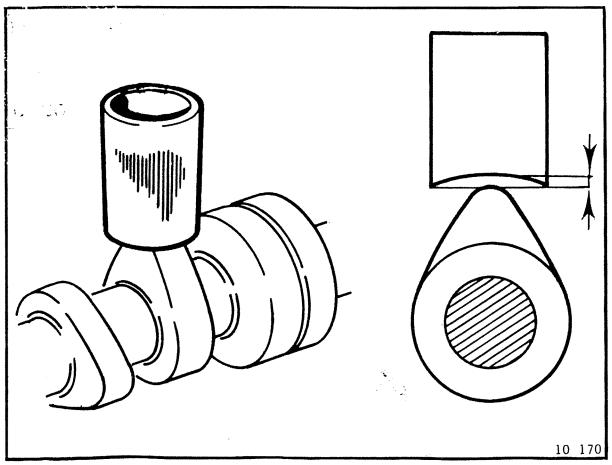
Remove the retaining flange in the case of incorrect clearance on an old camshaft

Press the retaining flange off the camshaft with handle **1801.**
Remove the key.

U5

Fit a new retaining flange with a new spacer ring

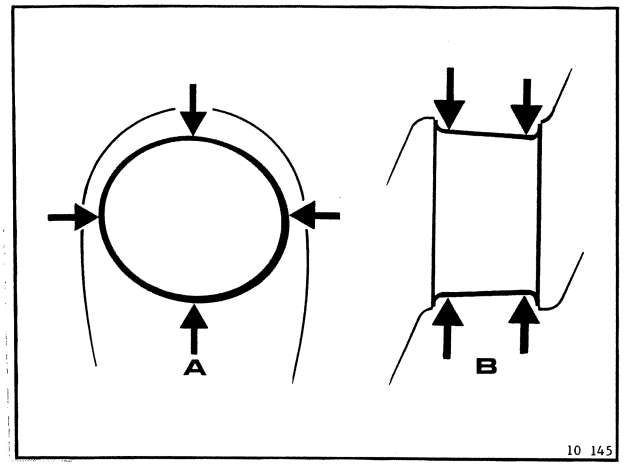
See Operation *U2*.


10 170

U6

Check the push rod guides

Check whether the running surface is worn or scored.
Check the periphery for worn spots and/or scoring.
Renew if necessary.



10 145

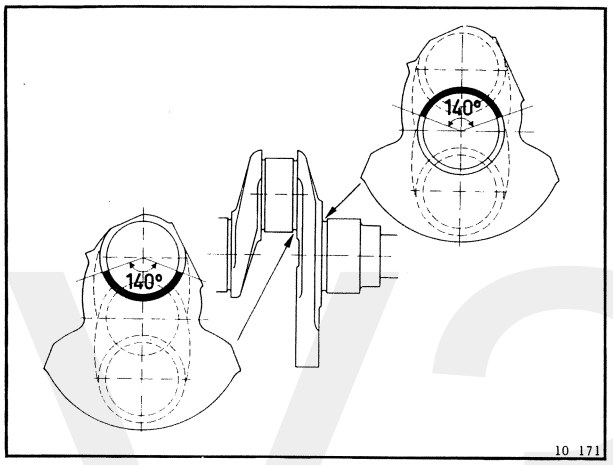
U7

Check the crankshaft

Measure the out-of-round and taper of the bearing journals with a micrometer.
Measurements should be taken diagonally on the periphery and lengthwise.

Dimensions of main bearing journals

	B13/B14
A. Maximum out-of-round.....mm	**0.0020**
B. Maximum taper.....mm	**0.0025**
Standard diameter.....mm	**54.785-54.805**
Undersize .....mm	**54.535-54.555**



10 171

U8

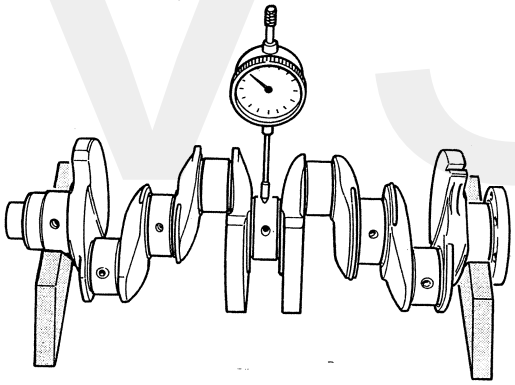
Dimensions of big-end bearing journals

	B13/B14
A. Maximum out-of-round.....mm	**0.0020**
B. Maximum taper.....mm	**0.0025**
Standard diameter.....mm	**43.960-43.980**
Undersize .....mm	**43.710-43.730**

Dimensions of thrust washer segments

	B13/B14
Standard thicknesses.....mm	**2.80**
.....mm	**2.95**

Note: When grinding the crankshaft, the roll-hardened zones must remain intact over a 140° section.
Regrind the running surface of the seal with very fine abrasive paper.

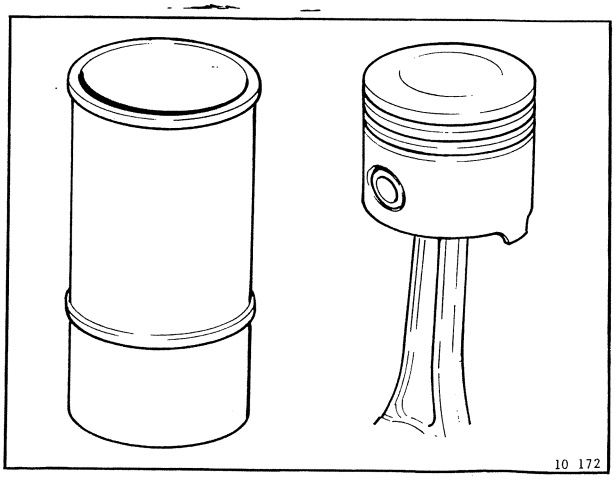

20 054

U9

Check for straightness

If the crankshaft is suspected to be out-of-true, it can be measured with a clock gauge.
Support the two outer main bearing journals in vee-shaped blocks.

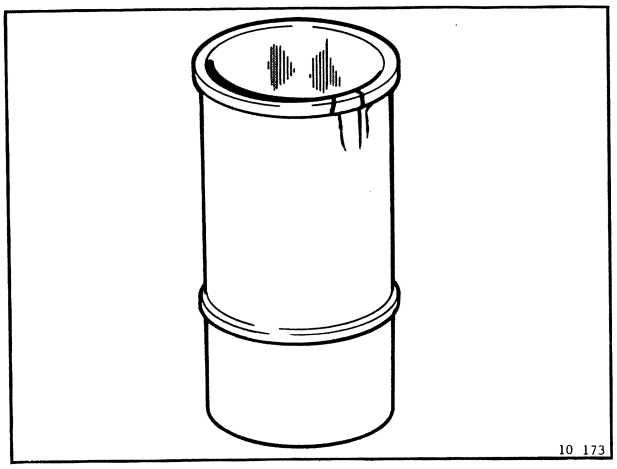
Rotate the crankshaft one revolution and measure the maximum out-of-true. The maximum permissible out-of-true is **0.01 mm.**


10 172

U10

Remove the pistons from the cylinder liners

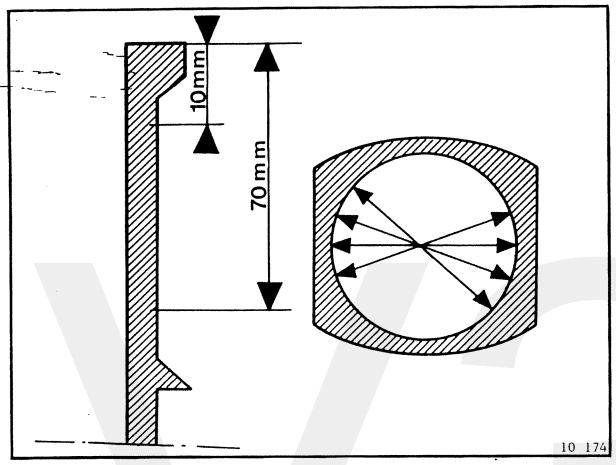
Note: make sure that the connecting rod/piston assemblies and the cylinder liners are not mixed up.



U11

Check the cylinder liners

Check the cylinder liners for cracks and scoring.
Note: if the liner has to be renewed, carry out Operation *U15.*
The cylinder liner, piston and gudgeon pin are only available as a set.



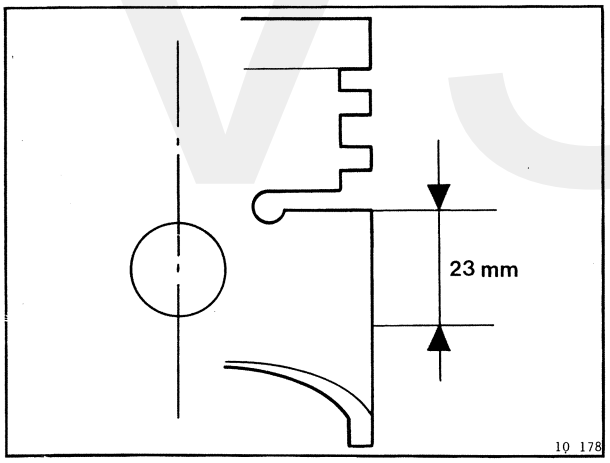
U12

Measure the diameter of the cylinder liner

Measure the diameter at right angles to the flat surface.
Note the measured values.
Measure **4x** at a distance of **10 mm** and **4x** at a distance of **70 mm** from the top edge of the cylinder liner.
Add up the results of the measurements and divide the total by 8.
The diameter must be between:

	B13	B14
.....mm	**73.00-73.03**	**76.00-76.03**

Renew if necessary.
Note: if the liner has to be renewed, carry out Operation *U15.*
The cylinder liner, piston and gudgeon pin are only available as a set.



U13

Measure the piston diameter

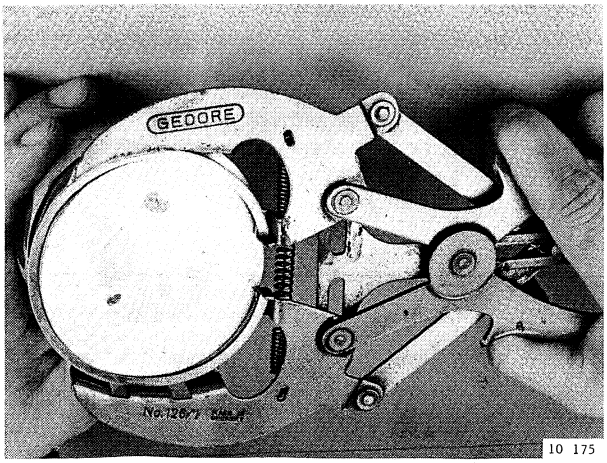
Measure the diameter at right-angles to the gudgeon pin hole and **23 mm** from the underside of the oil scraper ring groove. The permissible clearance between the piston and the cylinder liner is:

	B13/B14
minimum .....mm	**0.045**
maximum .....mm	**0.065**

Renew if necessary.
Note: if the piston has to be renewed, carry out Operation U15.

The cylinder liner, piston and gudgeon pin are only available as a set.

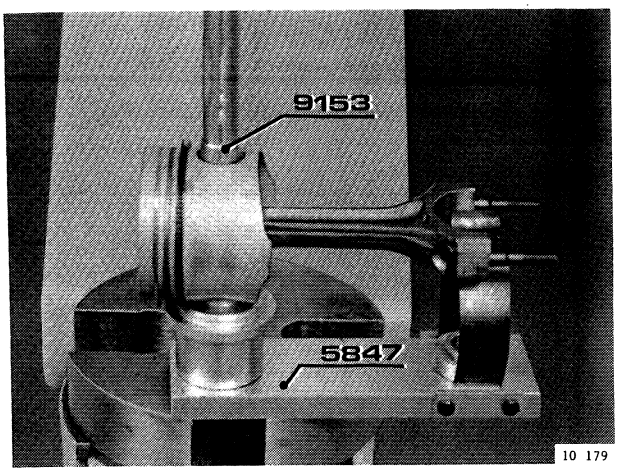
Caution! the maximum permissible weight difference between pistons in the same engine is **2 grams.**



U14

Remove the piston rings

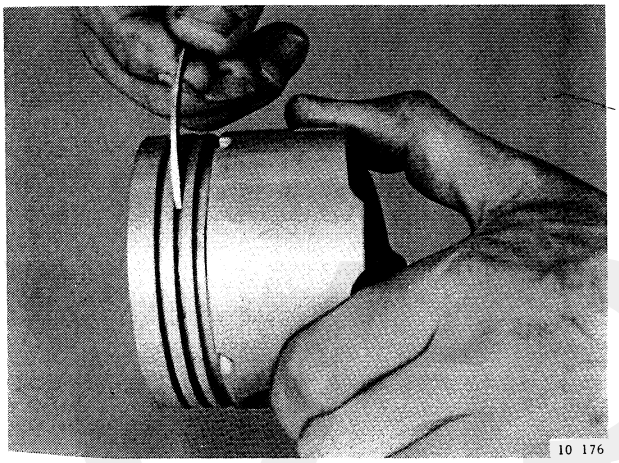
Use piston ring tool **998-5422.**



U15

Separate the connecting rod from the piston

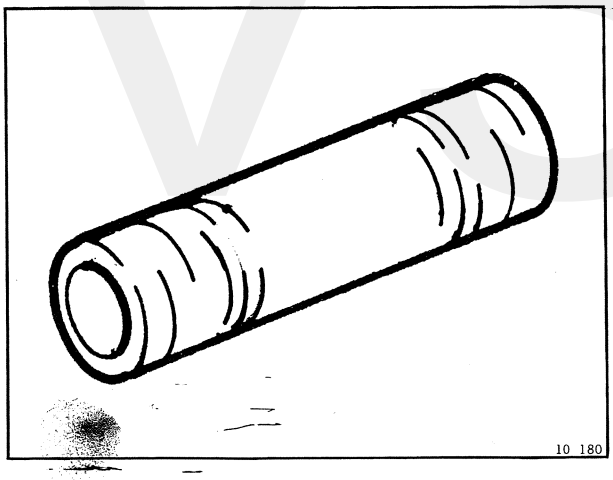
Press the gudgeon pin out of the piston/connecting rod assembly.
Use baseplate **999-5847** and handle **999-9153.**



U16

Clean and check the pistons

Remove all carbon deposits.
Scrape the piston ring grooves clean with a ring groove cleaner or with a broken and ground piston ring.
Check for:
- damage;
- wear;
- cracks.



U17

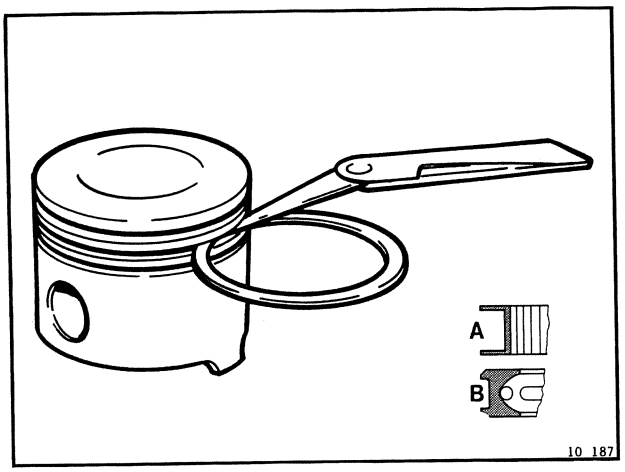
Check the gudgeon pin

Check the gudgeon pin for damage.

U18

Check the gudgeon pin fit in the piston

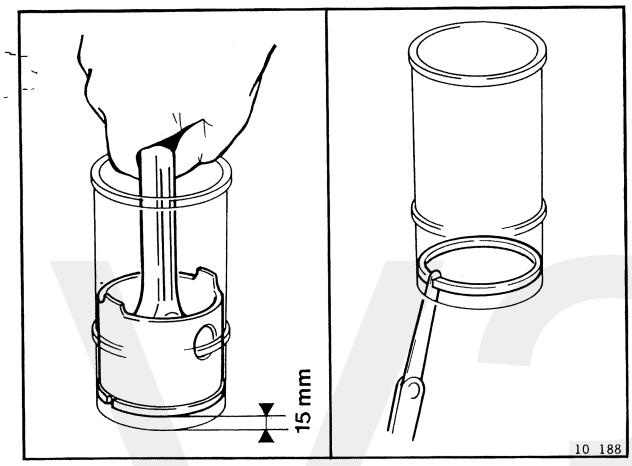
It should be possible to press the gudgeon pin through the piston with thumb pressure (sliding fit).
The gudgeon pin must never have any noticeable play.



U19

Measure the axial clearance of new piston rings (on old pistons only)

	B13/B14
Upper compression ring .....mm	**0.030-0.060**
Lower compression ring .....mm	**0.025-0.050**
Oil scraper ring:	
- A, U-flex.....mm	**0.025-0.070**
- B, Goetze.....mm	**0.025-0.050**

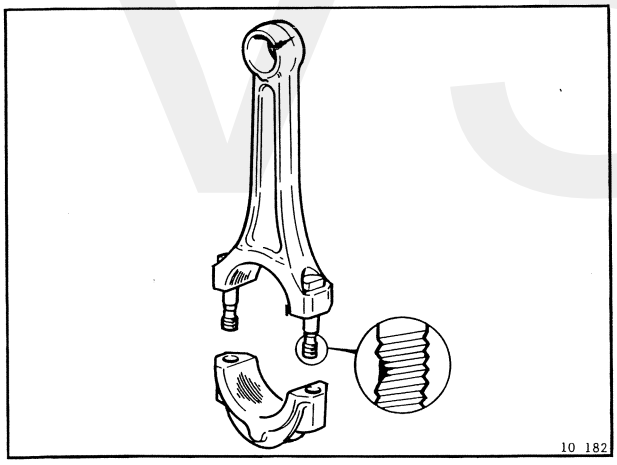


U20

Measure the piston ring gap

Fit the piston ring in the cylinder liner. Use an inverted piston to position the piston ring correctly.
Check the piston ring gap with the piston ring positioned 15 mm away from the lower edge of the cylinder liner. Check the piston ring gap with a feeler gauge.

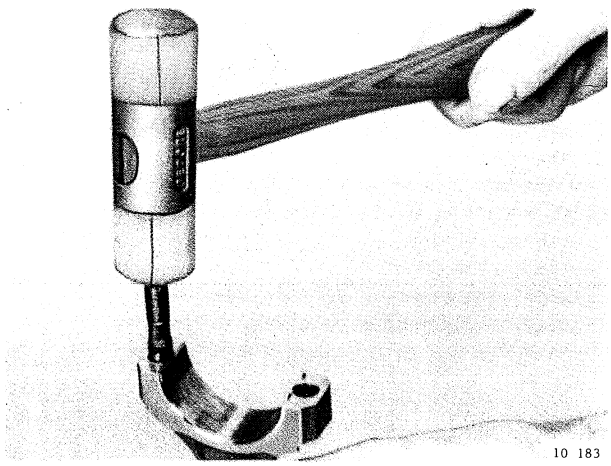
	B13/B14
Upper compression ring .....mm	**0.03-0.45**
Lower compression ring .....mm	**0.25-0.40**
Oil scraper ring:	
U-flex.....mm	**geen**
Goetze.....mm	**0.25-0.40**



U21

Check the connecting rod and bearing cap

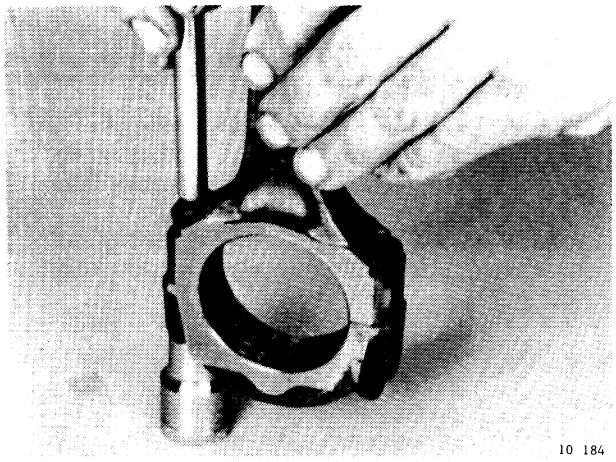
Check for:
- damage
- worn spots
- cracks
- damaged thread



U22

Remove the damaged bolt from the connecting rod

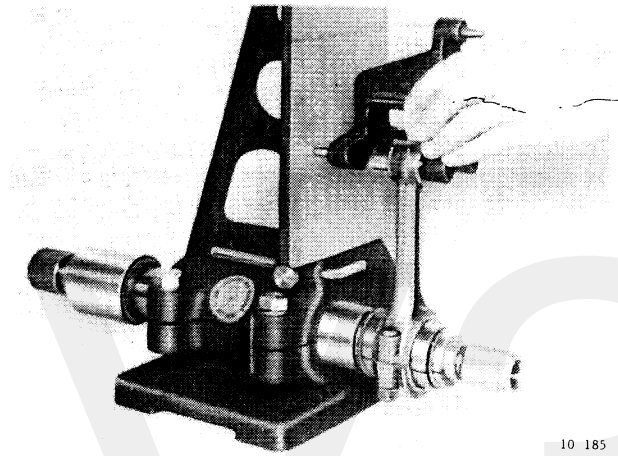
Place the connecting rod on a hard, level surface.
Tap out the bolt with a plastic-tip hammer.


10 184

U23

Fit a new bolt

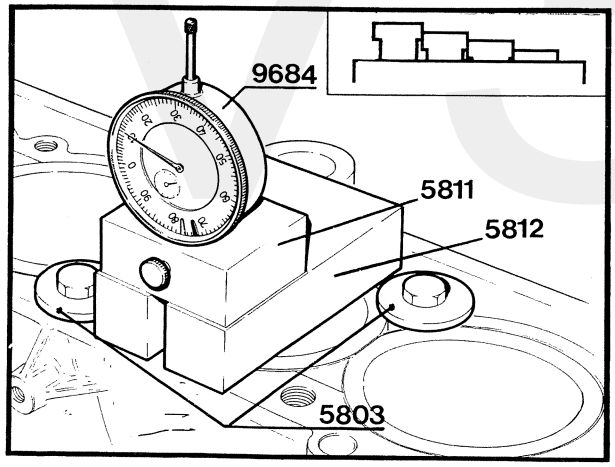
Locate the bearing cap on the connecting rod.
Place a socket under the bearing cap.
Press the new bolt into the connecting rod.


10 185

U24

Check the connecting rod in a con-rod alignment gauge

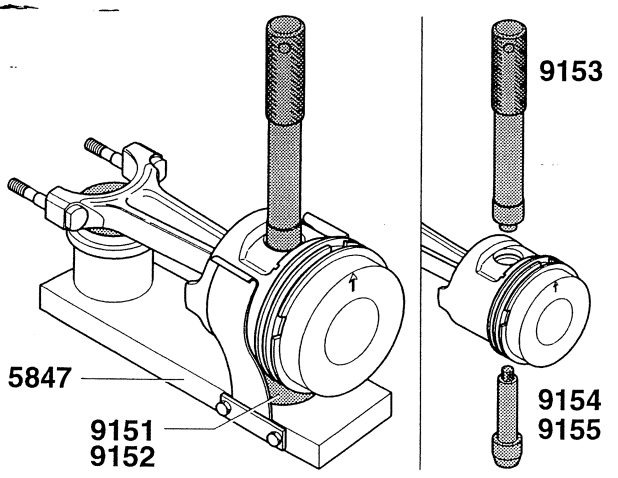
Check the connecting rod for out-of-true, twist and possible S-shape; see the specifications.



U25

Check the projecting height of the cylinder liners above the cylinder block

Insert the cylinder liners in the cylinder block without the O-ring seals.
Fit the clamping plates **999-5803.**
Use slip gauges **999-5811** and **999-5812** and clock gauge **999-9684.**
The specified projecting height is between **0.02** and **0.09 mm.**
The maximum permissible difference is projecting height between cylinder liners is **0.04 mm.**
The projecting heights may run stepwise from No. 1 cylinder to No. 4 cylinder, or vice-versa.
If the projecting height deviates from specification, use a new set of pistons-cylinder liners to check whether the deviation is caused by the cylinder block or by the cylinder liners.
Make a note of the correct position for fitting, in connection with the correct connecting rod sequence.



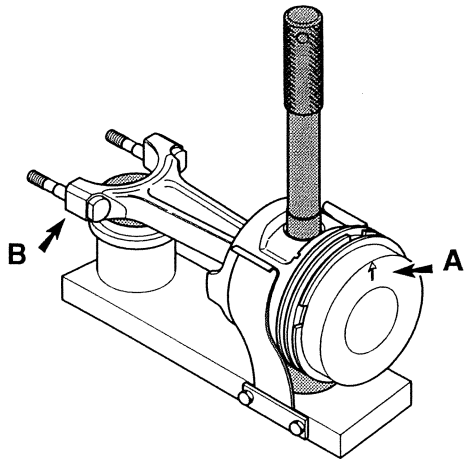
U26

Assemble the piston and connecting rod

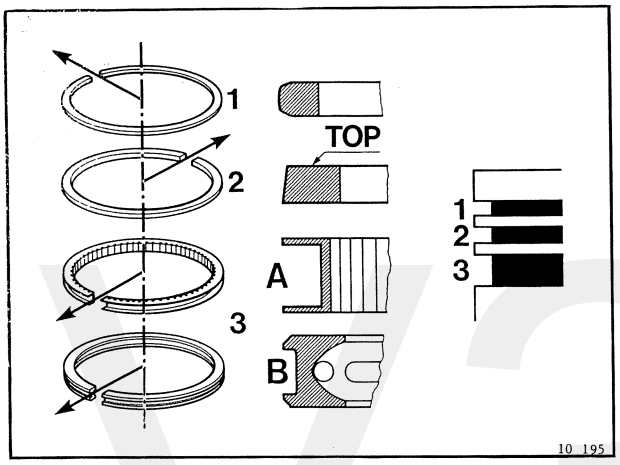
Heat the little-end of the connecting rod on an electric boiling plate to **250°C.**
Meanwhile, assemble the gudgeon pin, handle **999-9153** and the guide mandrel (do not tighten):
- B13: **999-9154**
- B14: **999-9155.**

Centre the assembly in the piston and tighten.
Coat the gudgeon pin with engine oil.
Place the piston on baseplate **999-5847** and the stop collar:
- B13: **999-9151**
- B14: **999-9152.**

with the arrow on the piston crown pointing upwards.



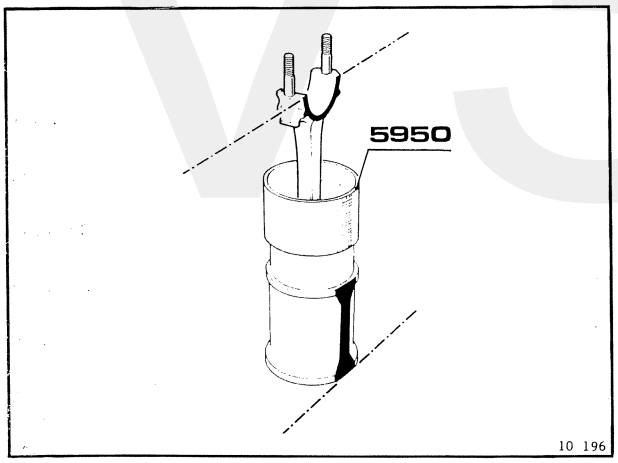
Slide the connecting rod into the piston with the previously made mark (B) facing towards you.
Note the correct position of the piston (A), connecting rod (B) and the tool in the illustration.
Press the gudgeon pin assembly into the piston, as far as the stop.
Remove the tool after a few seconds.
Note: check that the gudgeon pin is slightly recessed at both sides of the piston.



U27

Fit the piston rings

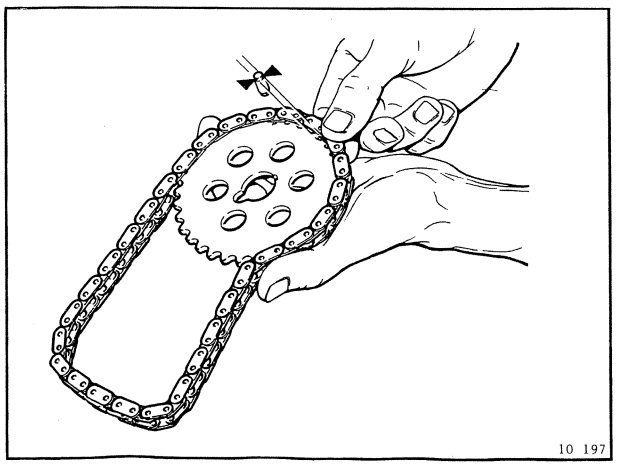
Use piston ring tool **998-5422.**
Fit:
3 The oil scraper ring (two interchangeable versions).
2 The tapered compression ring.
1 The upper compression ring.
Coat the piston rings with engine oil and locate the gaps at an angle of 120° to each other.



U28

Insert the piston-connecting rod assembly in the cylinder liner

Coat the cylinder liner wall with engine oil.
Place guide bush **999-5950** (or assembly sleeve **115-8281-4**) on the cylinder liner.
The machined flat on the big-end of the connecting rod must be parallel with the flats on the cylinder liner.

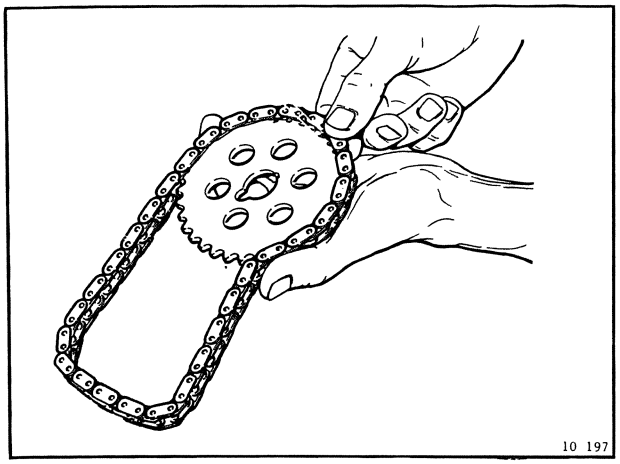


U29

Check the timing chain

Check for:
- formation of rust;
- longitudinal stretch (freedom from play);
- excessive sag;
- damaged rollers.

Fit the chain around a **new** camshaft sprocket and pull it taut at the open end.
Pull the chain towards you at the end enclosing the sprocket.
If a sprocket tooth then becomes visible, the chain must be renewed.



U30

Check the camshaft and crankshaft sprocket

Fit a **new** chain around the camshaft sprocket and pull it taut at the open end.
Pull the chain towards you at the end enclosing the sprocket.
If a sprocket tooth then becomes visible, the sprocket must be renewed.

Repeat this operation with the crankshaft sprocket.

Note: when checking the sprockets with a 9.5 ±0.01 mm diam. gauge, the opening on the underside must be visible.

U31

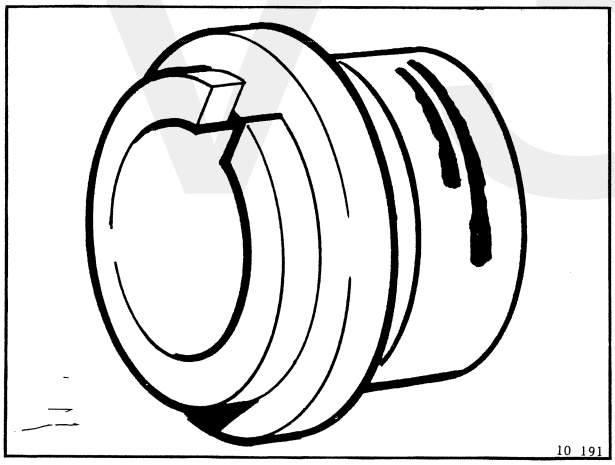
Check the chain tensioner

Check the running surface for scoring.
Renew the tensioner if it is too deeply scored or in case of doubt.

U32

Check the spring of the chain tensioner

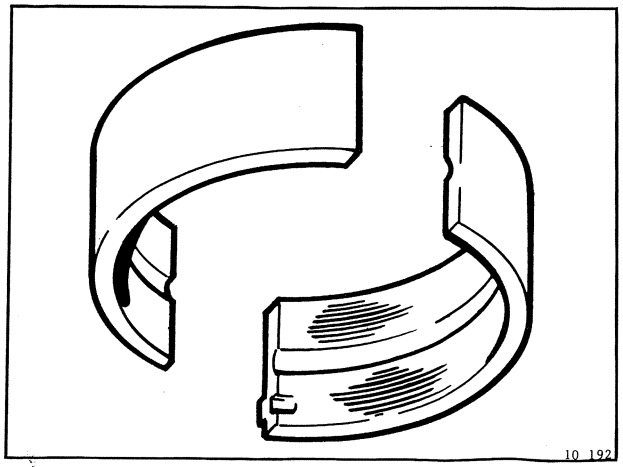
Move the spring through 90°: the spring tension should be 0.25 kgm.



U33

Check the pulley hub

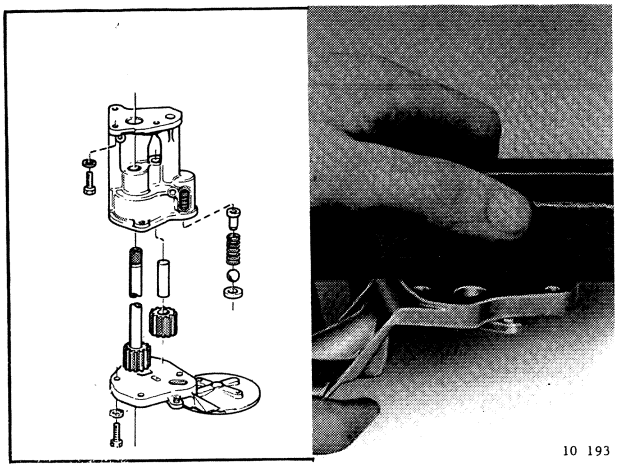
Regrind the pulley hub with very fine abrasive paper.
Renew the pulley hub if it is scored.



U34

Check the bearing shells

The bearing shells must never show evidence of scoring or worn spots.
Note: it is always advisable to renew the bearing shells.


10 193

U35

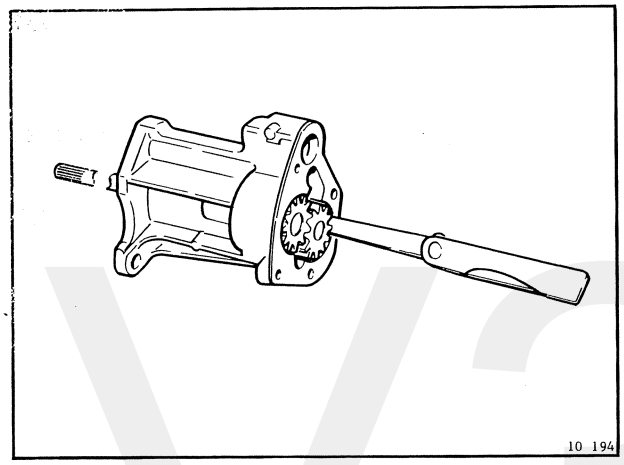
Disassemble the oil pump

Remove: the cover, ball seat, ball, return spring, spring guide, gears and spindle.

U36

Check the oil pump cover for damage and wear

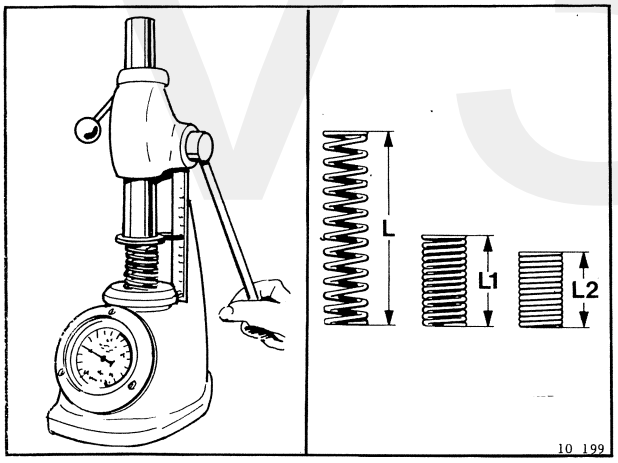
Check the flatness of the cover with a straight-edge.
If necessary, true up the cover by surface sanding.
If necessary, renew the cover.


10 194

U37

Check the clearance between the gears and the pump body

Insert the spindle and gears in the pump body.
Check the clearance with a feeler gauge.
Maximum permissible clearance is **0.2 mm.**
If the clearance is greater, the gears must be renewed.
Check the clearance again.
If the clearance is still excessive, the oil pump body must be renewed.

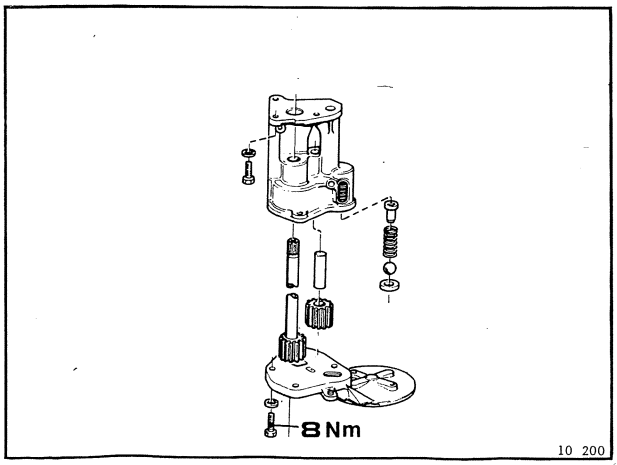


10 199

U38

Check the return spring

Length in mm		Load in N
L	= 46	Unloaded
L_1	= 22	25.1-27.9
L_2	= 18	29.3-32.3

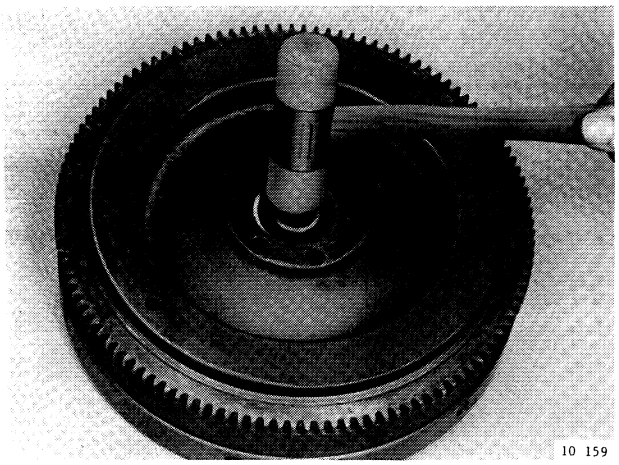


10 200

U39

Assemble the oil pump

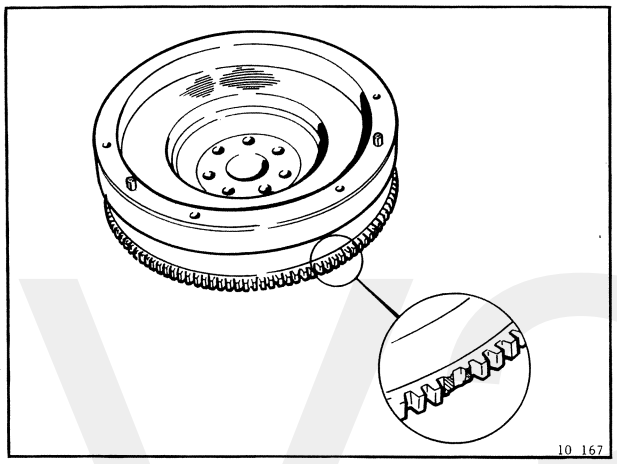
It is always advisable to renew the ball, spring and ball seat.
Insert the spring guide, return spring, ball and ball seat.
Fit and tighten the four bolts with lock washers.
Tighten the bolts to **8 Nm.**


10 159

U40

Remove the pilot bearing

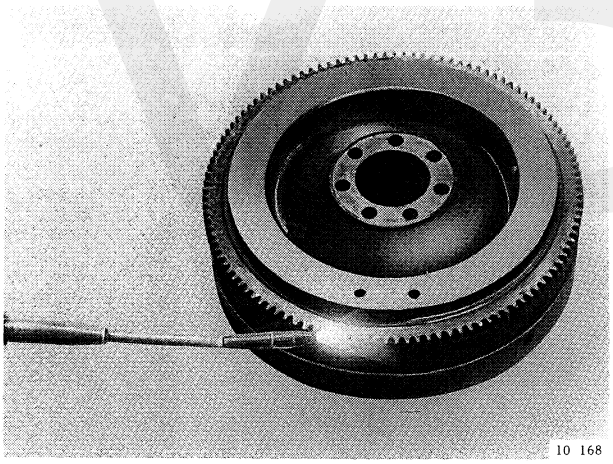
Tap the bearing out of the flywheel with a plastic-tip hammer.


10 167

U41

Check the flywheel and ring gear

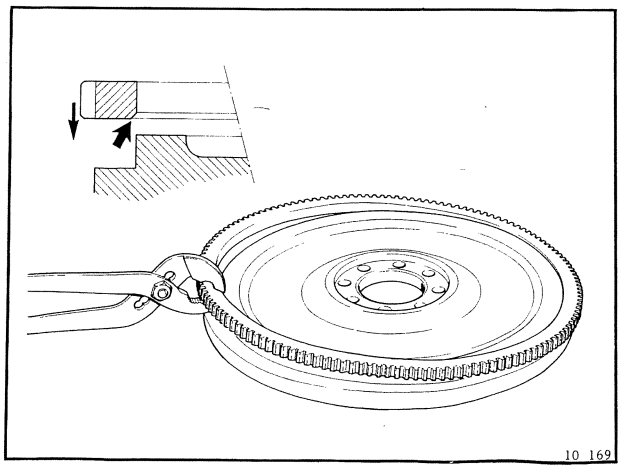
Check the wearing surface of the flywheel for damage. If necessary, renew the flywheel.
Note: a new flywheel is always supplied complete with ring gear. Check the teeth of the ring gear for damage.


10 168

U42

Remove the ring gear

Note: the ring gear can be removed without heating; remove it with a cold chisel.


10 169

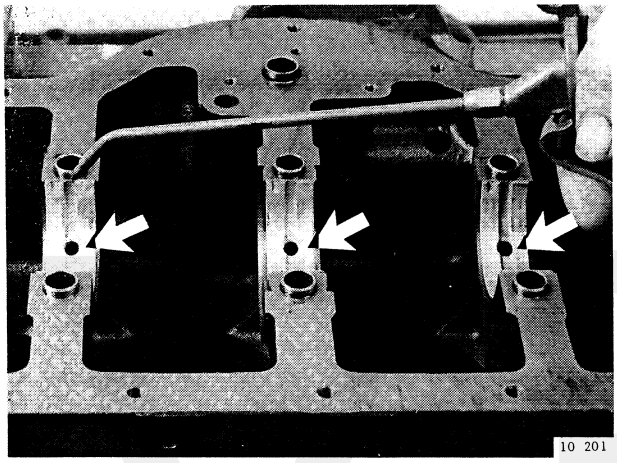
U43

Fit the new ring gear

Degrease the new ring gear.
Heat the ring gear uniformly to **220°C** with a blowtorch or in an oven.
Check the temperature with solder (40% tin, 60% lead; this solder melts at 220-230°C).
Next fit the ring gear on the flywheel, at this temperature, with the bevelled side facing the flywheel.
Apply firm pressure to the ring gear to bed it down properly around the entire circumference.

V. Assembling the cylinder block

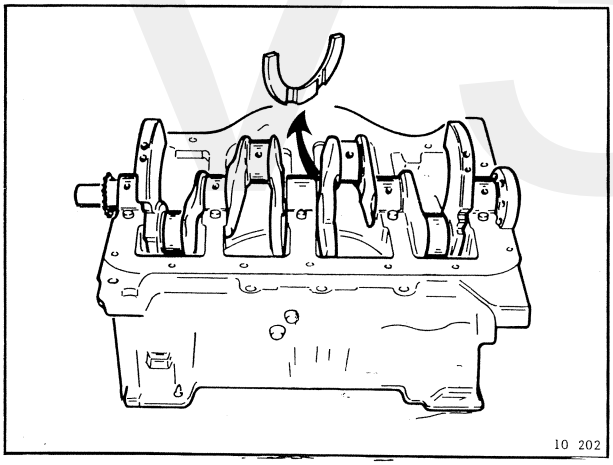
Special tools: 999-1801, 5112, 5803, 5807, 5944, 5953, 9684, 9696


10 201

V1

Fit the main bearing shells in the cylinder block and the main bearing caps

Caution! The holes in the bearing shells must coincide with the oilways in the cylinder block.
Note: make sure that there is no oil between the bearing shell and the cylinder block.


10 202

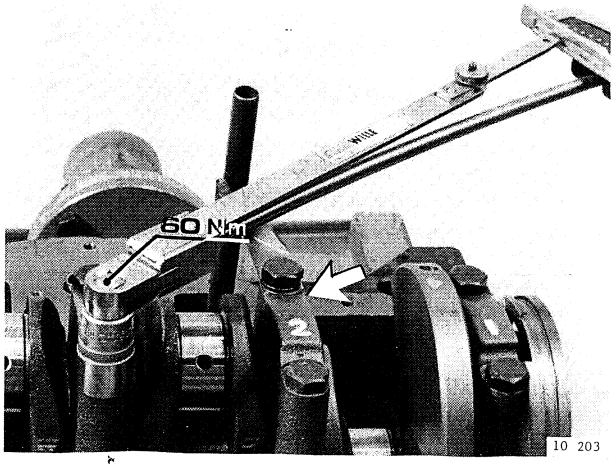
V2

Coat the main bearing shells with engine oil and locate the crankshaft

V3

Fit the thrust washer segments

Caution! The oil grooves in the thrust washer segments must be facing towards the crankshaft.

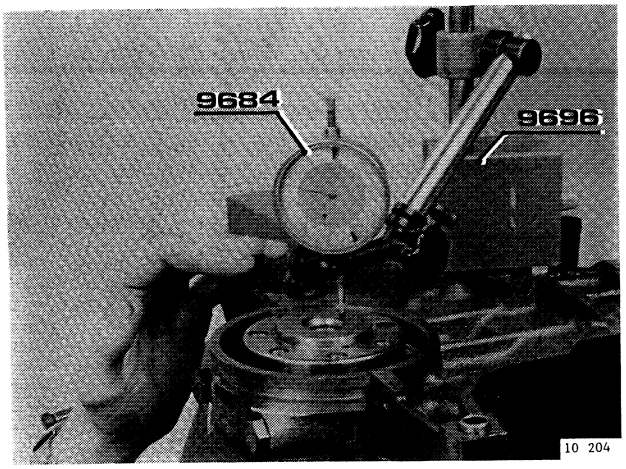


10 203

V4

Coat the main bearing shells with engine oil and fit the main bearing caps

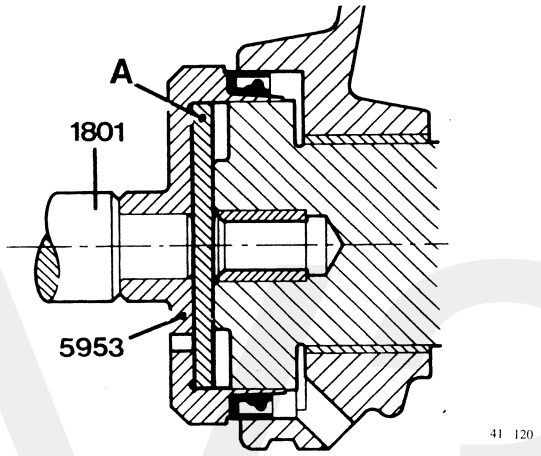
Caution! The main bearing caps are numbered opposite the camshaft side.
No. 1 must be located at the flywheel end.
Fit the dipstick guide (if present) at No. 2 bearing cap and also place a washer under the bolt head.
Fit the bolts. Tighten the bolts to **60 Nm.**
Note: check that the crankshaft turns over smoothly. If not, disassemble and again clean the parts just fitted.



V5

Check the crankshaft end float

Use clock gauge **999-9684** and magnetic base **999-9696.**
Move the crankshaft lengthwise back and forth.
Measure the clearance.
End float: **0.05-0.23 mm.**



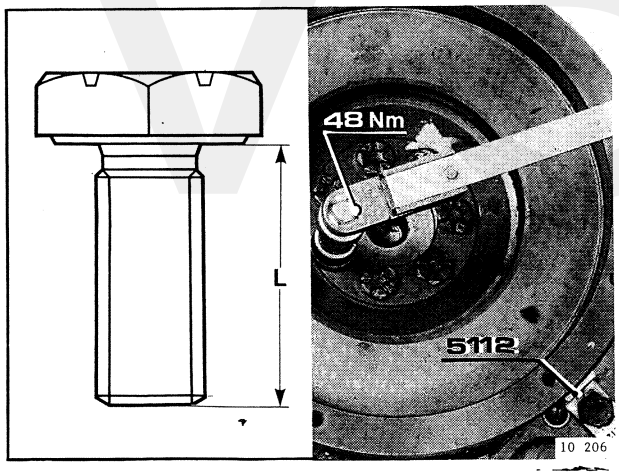
V6

Fit the crankshaft rear oil seal

Coat the lip of the **new** oil seal with grease, part number 1161001-1.
Shallow scoring in the running surface must be removed by polishing.
Fit the oil seal with drift **999-5953** and handle **999-1801**.

If the scoring is too deep, then the oil seal must be pressed into the cylinder block 1.5 mm **less deep.**
Proceed as follows:
- press the oil seal halfway in;
- place a 1.5 mm spacer ring (A) in drift **999-5953** (use some grease);

Now press the oil seal in as far as the stop.



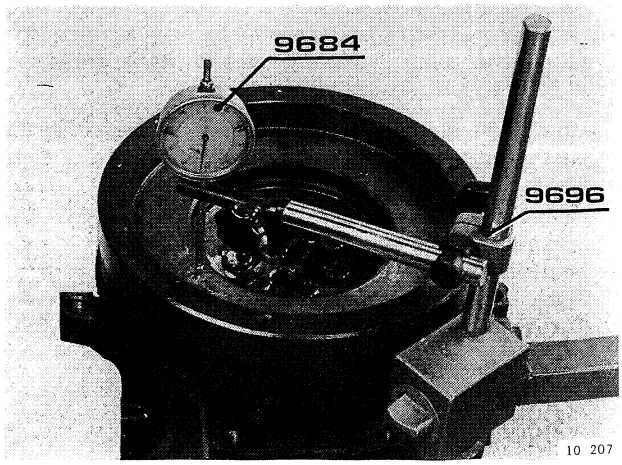
V7

Fit the flywheel

Coat the mating face of the flywheel with locking fluid, Part No. 1161059-9.
Caution! One of the seven bolt holes is staggered.
Always use **new** bolts.
Available sizes:

	Thread length
AT	L = **32 mm**
AT and MT	L = **36 mm**

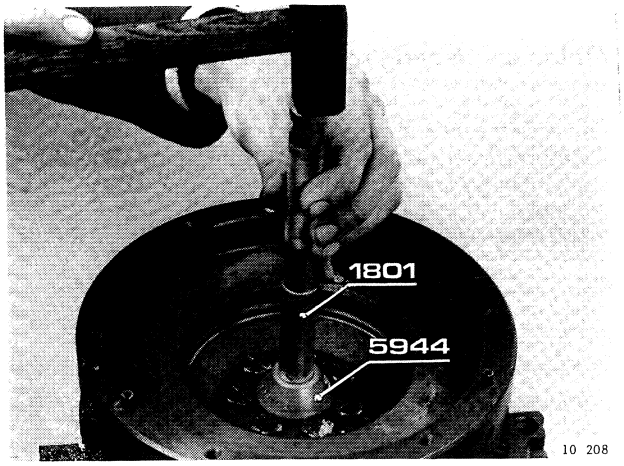
Coat the bolts with liquid gasket cement, Part No. 277917-1.
Lock the flywheel with locking sector **999-5112.** Tighten the bolts to **53 Nm.**



V8

Check the flywheel for warp

Use clock gauge **999-9684** and magnetic base **999-9696.**
Place the clock gauge plunger on the flywheel at a radius of **80 mm.**
Maximum permissible warp: **0.07 mm.**
Note: if the warp is greater, check again with a new flywheel.

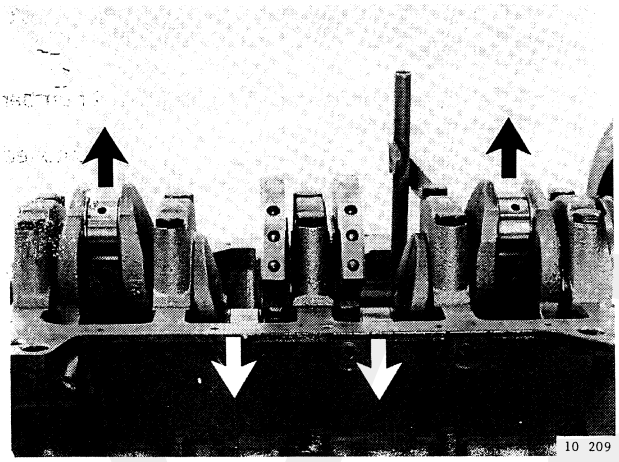


V9

Fit the (new) pilot bearing

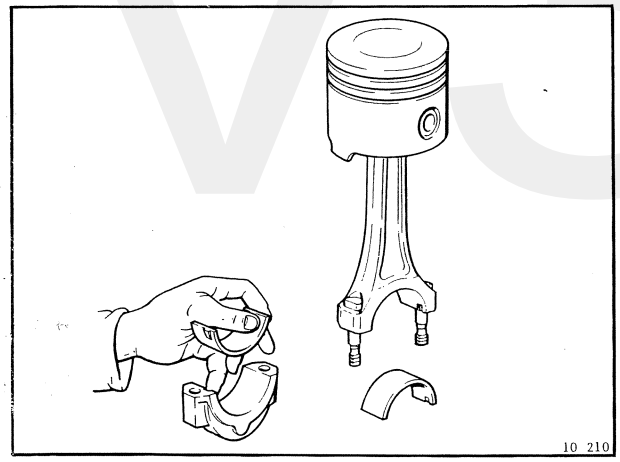
Use drift **999-5944** and handle **999-1801.**

On the MT variant only, up to chassis number **385680**, a needle bearing is used.
Fit this with a plastic-tip hammer.



V10

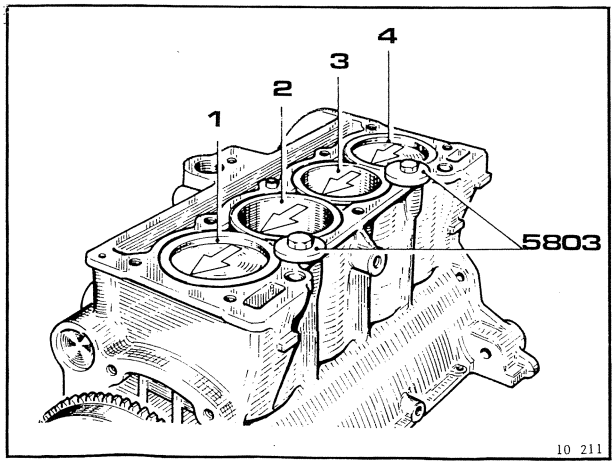
Rotate the crankshaft until the big-end journals are aligned with the centre line of the cylinder block



V11

Fit the bearing shells in the connecting rods and bearing caps

Coat the bearing shells and big-end journals with engine oil.
Note: make sure that there is no oil between the bearing shell and the connecting rod.

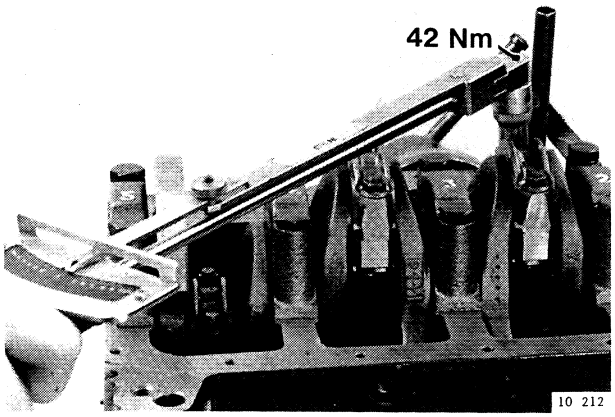


V12

Locate the piston-cylinder liner assemblies in the cylinder block

Clean the mating faces.
Fit **new** O-ring seals over the cylinder liners up to the mating faces.
Locate No. 1 piston at the flywheel end.
The arrow on the piston crown must be pointing towards the flywheel.
Fit the clamping plates **999-5803.**

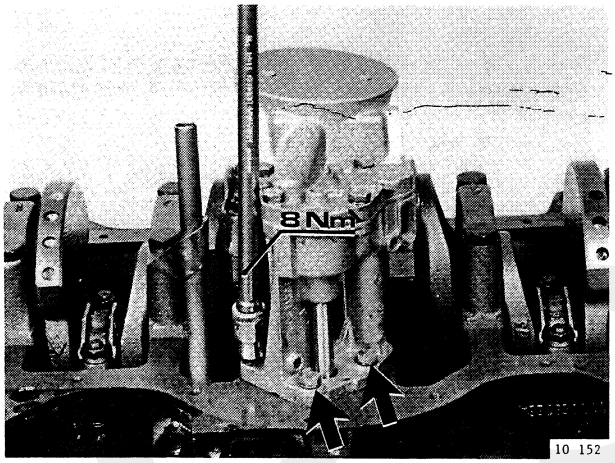
V13



Fit the connecting rods to the crankshaft

Pull the connecting rods on to the crankshaft.
Fit the bearing caps.
Caution! The marks on the connecting rods and bearing caps must be opposite the camshaft.
Fit **new** self-locking nuts.
Tighten the nuts to **42 Nm.**

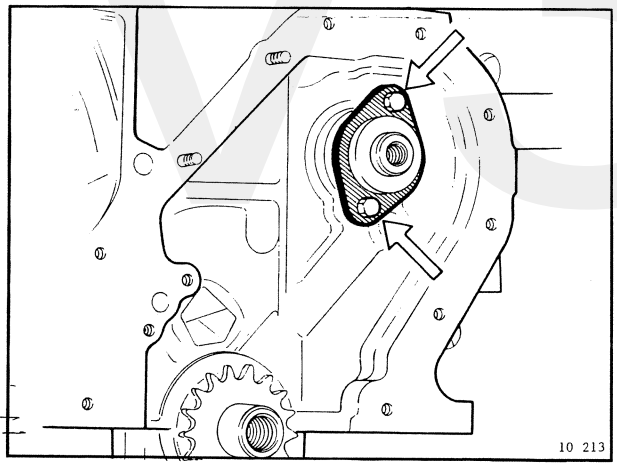
V14



Fit the oil pump

Locate the oil pump and tighten the bolts.
Tighten the bolts to **8 Nm.**

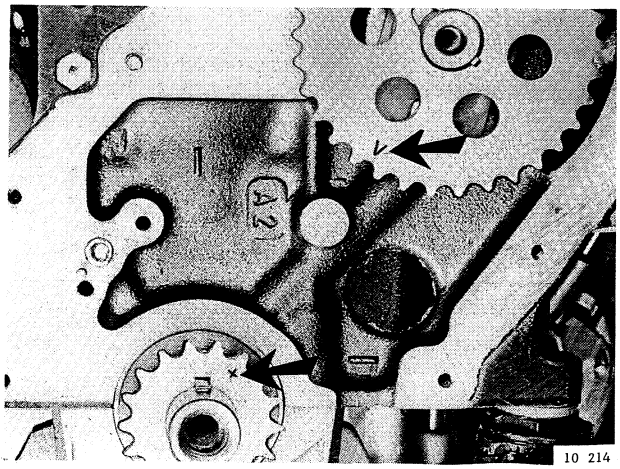
V15



Fit the camshaft

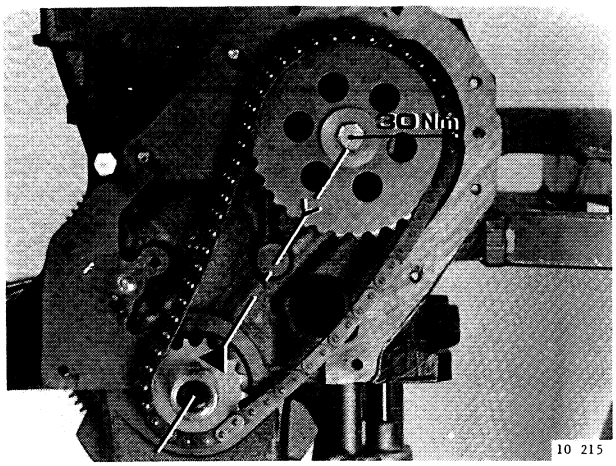
Coat the camshaft bearing surfaces with engine oil.
Insert the camshaft in the cylinder block.
Fit the two lock washers and bolts. Tightening torque: 10 Nm.

V16



Adjust the camshaft

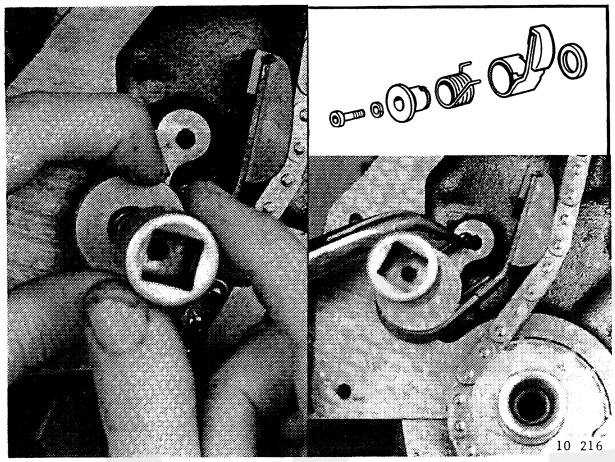
Fit the key for the crankshaft sprocket.
Locate the sprockets with the timing marks facing towards each other.
Rotate the two sprockets until the mark on the camshaft sprocket is aligned with the mark on the crankshaft sprocket.
Remove the camshaft sprocket without altering the position of the camshaft.



V17

Fit the timing chain

Hold the camshaft sprocket and fit the timing chain around it.
Fit the chain over the crankshaft sprocket and slide the camshaft sprocket on to the camshaft.
Locate the washer or new lockplate and bolt.
Tighten the bolt to **30 Nm.**
On earlier versions, lock the bolt with the lockplate.
Note: check that the timing marks on both sprockets are still aligned.



V18

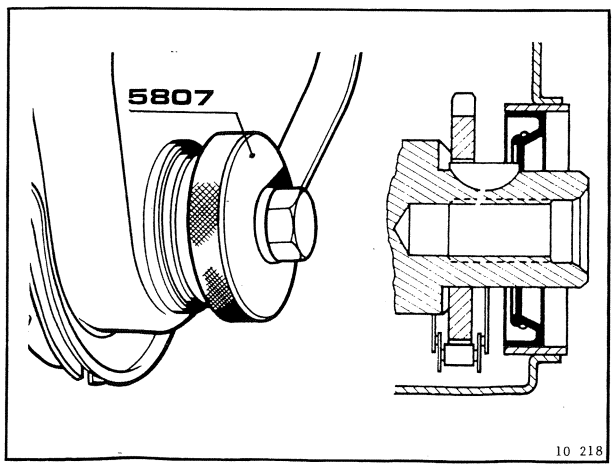
Fit the chain tensioner

Assemble the chain tensioner.
Hook the end of the spring into the recess in the cylinder block casting.
Turn the sleeve so that the peg engages the slot.
Locate the lock washer and the socket-head screw and secure finger-tight.
Now hook the end of the spring into the hole in the cylinder block.
Tighten the socket-head screw. Tightening torque: 10 Nm.
Note: the sprockets will turn slightly so that the timing marks are no longer aligned.

V19

Fit the (new) oil seal in the timing cover

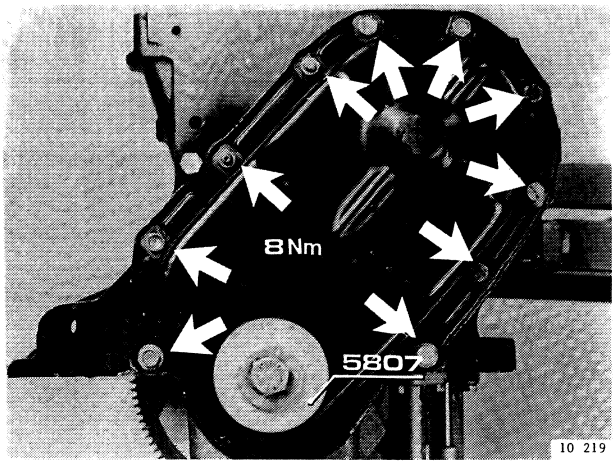
Coat the lip of the oil seal with grease, part number 1161001-1.
Use special tool **999-5807.**



V20

Centre the timing cover

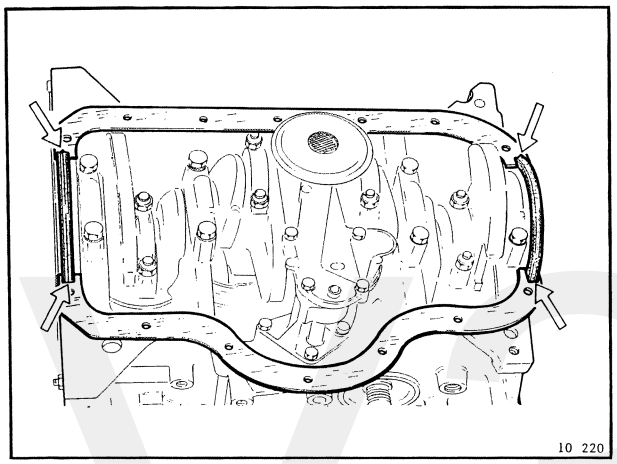
Fit a **new** gasket on the engine.
Centre the timing cover with centring tool **999-5807** and secure it with the **bolt** of the crankshaft pulley attachment.
Tighten the bolt as far as the stop.
This also ensures that the oil seal is now correctly located.



V21

Fit the timing cover

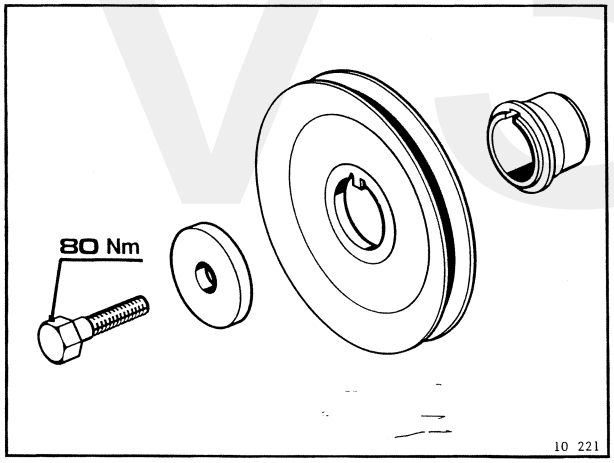
Fit the two washers and nuts and the eight special washers and bolts and tighten to **8 Nm.**



V22

Fit the sump

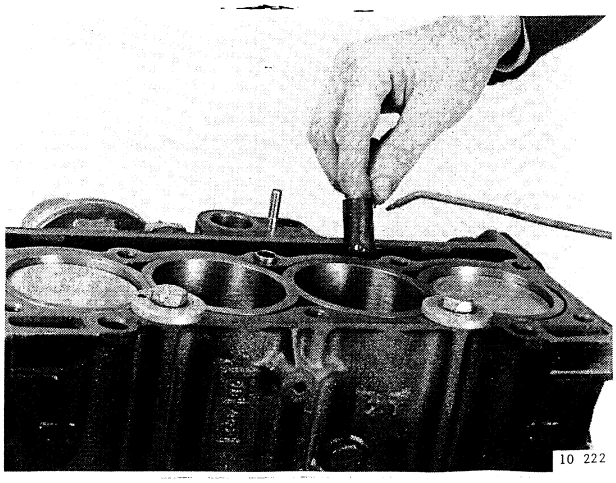
Fit **new** rubber gaskets in the timing cover and in the rear main bearing cap.
Fit **new** cork gaskets, which must overlap the lips of the rubber gaskets.
Locate the sump.
Locate the washers and bolts and tighten evenly. Tighten the bolts to **9 Nm**.
Remove centring tool **999-5807.**



V23

Fit the pulley hub and pulley

Lock the flywheel with locking sector **999-5112.**
Tighten the bolt to **80 Nm**.



V24

Fit the push rod guides

Coat the push rod guides with engine oil.
Fit the push rod guides.

Assemble the engine (see page 82)

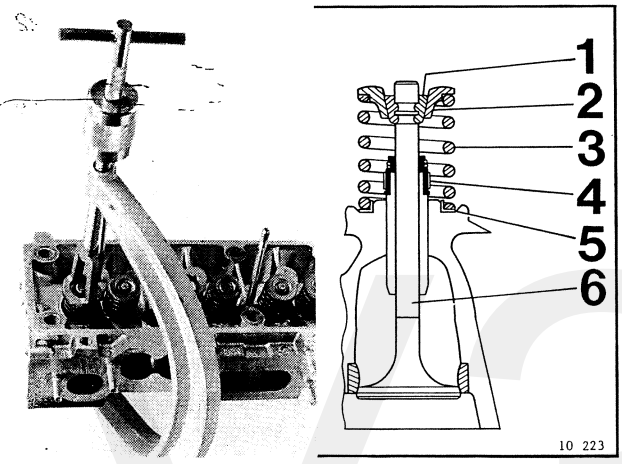
W. Inspecting/reconditioning the cylinder head

Special tools: 115-8942, 998-6052, 999-5363, 5802, 5809, 5810, 5810-2, 5872

W1

Remove the following parts from the cylinder head:

- engine cooling fan or pulley;
- water pump;
- rear cover plate;
- connecting nipple(s);
- studs and brackets.

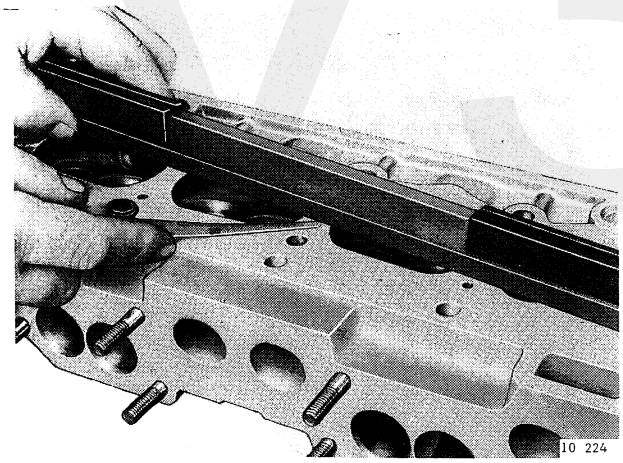


W2

Remove the inlet and exhaust valves

IMPORTANT! Do not interchange the various parts.

Depress the valve springs with a valve spring compressor **(998-6052).**
Remove:
1 Split cones
2. Valve spring retainer (upper)
3. Valve spring
4. Oil seal
5. Valve spring retainer (lower)
6. Valve



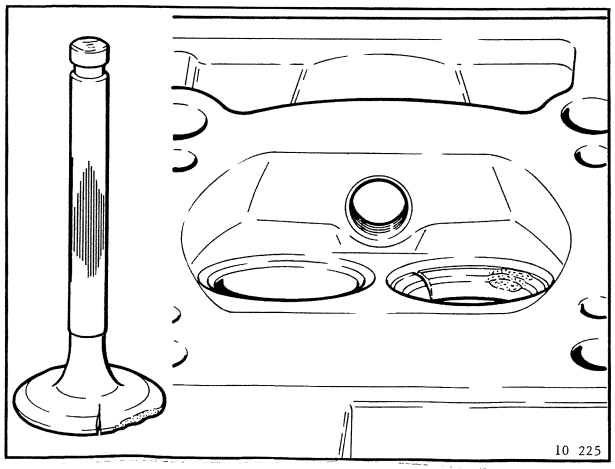
W3

Clean all the parts

W4

Check the cylinder head for flatness

See Operation *D17*.

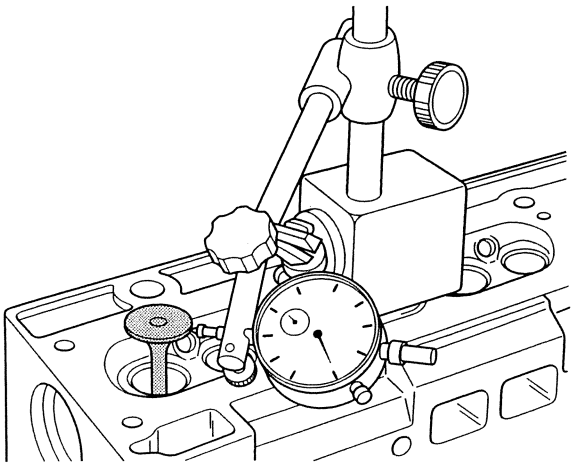


W5

Check the valves and valve seats

Renew the valve seat if it is cracked or damaged.
Check the valves for:
- pitted valve heads
- scored valve stems
- badly scored or damaged valve stem ends.

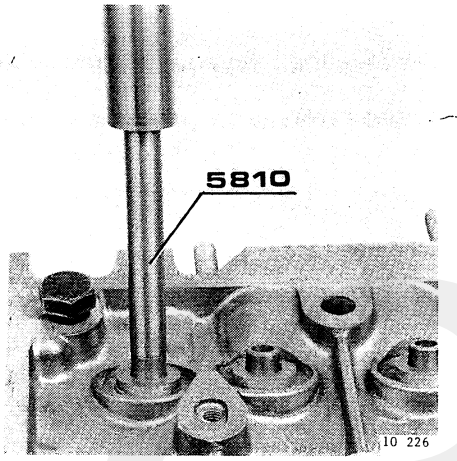
If necessary, renew the valves.
Note: if the valve stems are scored, the valve guides must also be renewed.



W6

Check the clearance of the valve guides

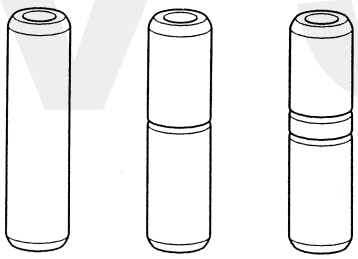
Insert a **new** valve and ensure that the end of the valve stem is flush with the end of the valve guide.
Measure the clearance at the side of the valve head.
The maximum permissible clearance in the valve guide is **1.3 mm.**



W7

Remove the valve guide

Locate the cylinder head on fixture **999-5802** or **999-5363** with the gasket contact surface abutting against the fixture.
Press the guide out of the cylinder head with drift **999-5810.**
Measure the outside diameter of the guide and select the oversize guide.

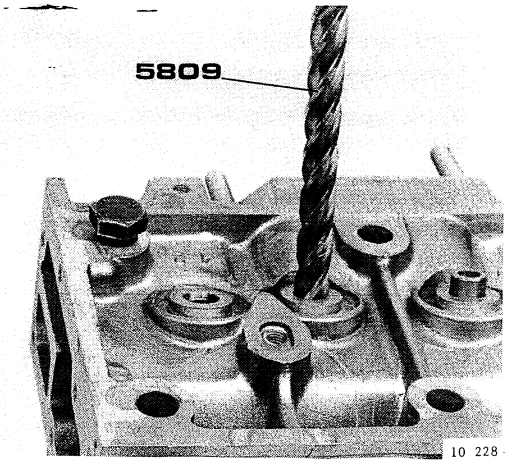


W8

Determine the new size of the valve guides

Valve guides are marked with grooves. Check whether the new valve guide has as many grooves as the old valve guide.

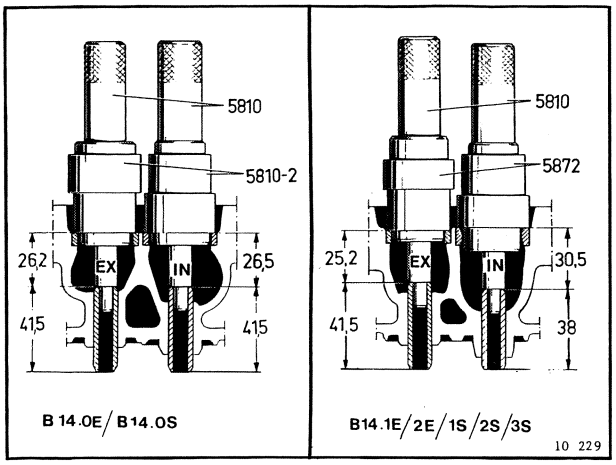
Number of grooves	Size	Diameter in mm
0	Standaard	11.120-11.140
1	1st oversize	11.189-11.201
2	2nd oversize	11.370-11.390



W9

Valve guide bores in the cylinder head

It is no longer necessary to ream out the valve guide bore in the cylinder head with the reamer kit if the above-mentioned range of valve guide dimensions is used: in that case, the grip is sufficient.
Note: the relevant dimension on B14.0 engines may be small. In that case, use the correct drill bit from kit **999-5809** to ream out the bores in the cylinder head.



W10

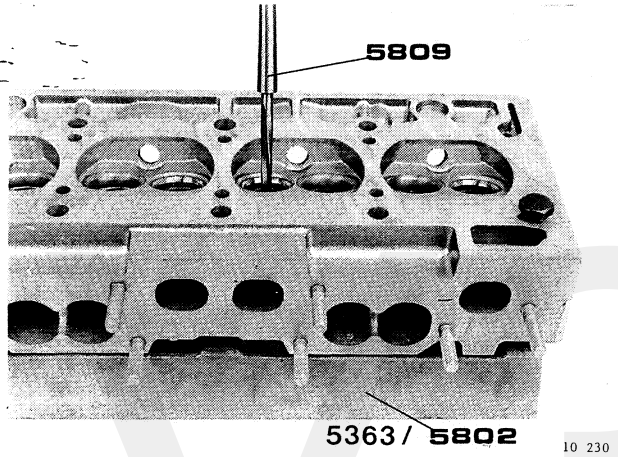
Press in the valve guides

Locate the cylinder head on fixture **999-5802** or **999-5363** with the rocker shaft side abutting against the fixture.
Locate drift **999-5810** as shown in the illustration.

Spacers:

B14.0E/S	**999-5810-2**
B14.1/2/3/4	**999-5872**
B13.4	**999-5872**

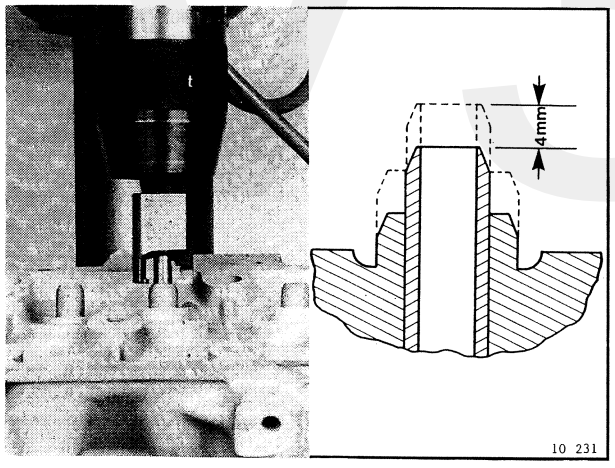
Locate the spacer in the correct position.
Place the valve guide on drift **999-5810.**
Coat the valve guides with engine oil.
Press the guides into the cylinder head up to the stop.



W11

Ream the valve guides with a reamer from kit 999-5809

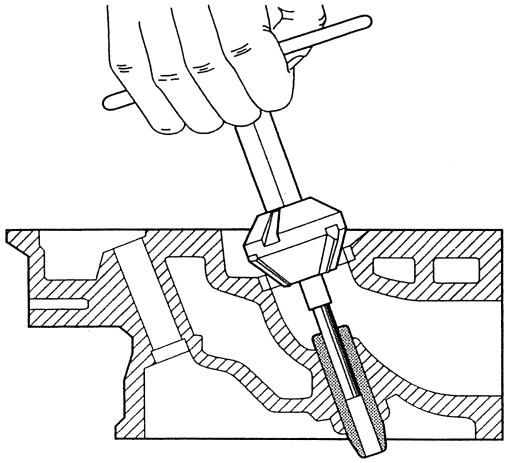
Note: the inside diameter **must** be reamed out.
Adjust the speed of the drilling machine to approx. 400 r/min.
Ream the valve guides (use cutting oil).
Clean the cylinder head.



W12

Machine the inlet valve guides to fit an oil seal ring

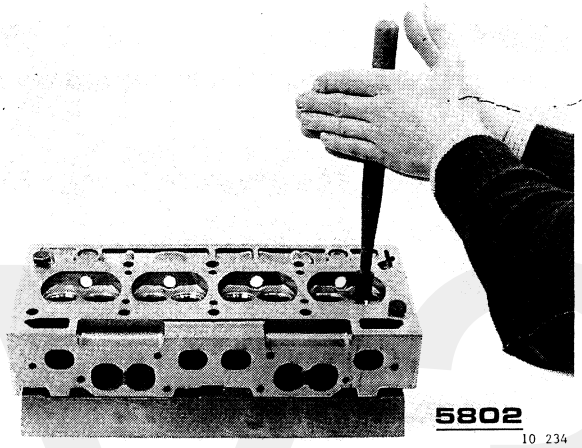
Note: only the valve guides on **B14.0** engines can be machined to fit a seal.
All other engine types, which are **not** fitted with seals, must not be machined!
Consequently, **no** seals can be fitted on these engines.
$W
Fit the cylinder head on support fixture **999-5802** with its gasket contact surface abutting against the fixture.
Insert cutting tool **115-8942** in a drilling machine.
Remove material from the cylinder head with the outer blades of the cutting tool until the inner blade just touches the valve guide.
Now shorten the valve guide by **4 mm.**



W13

Recut the valve seat

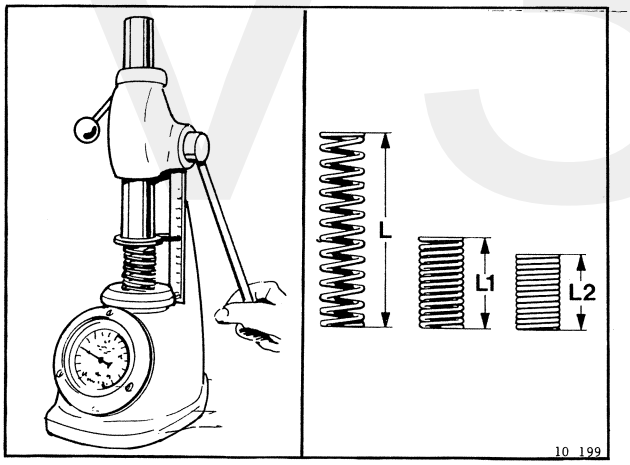
Coat the inner wall of the valve guide with engine oil.
Locate the guide mandrel.
Select a cutter with the correct cutting angle.
Note: new valves are always supplied with a face angle of 45°. A valve seat with an angle of 120° can be recut to an angle of 45°.
Locate the cutter and handle on the guide mandrel.
Recut the valve seat.
Clean the cylinder head.
Note: if the permissible width of the contact surface is exceeded, correct this by cutting the contact angles with a suitable cutter.



W14

Grind-in the inlet and exhaust valves on their seats

Coat the valve stems and valve guides with engine oil.
Grind-in the valves with grinding paste.
Take out the valves and place them to one side in the correct sequence.
Carefully clean the grinding paste from the cylinder head and valves.

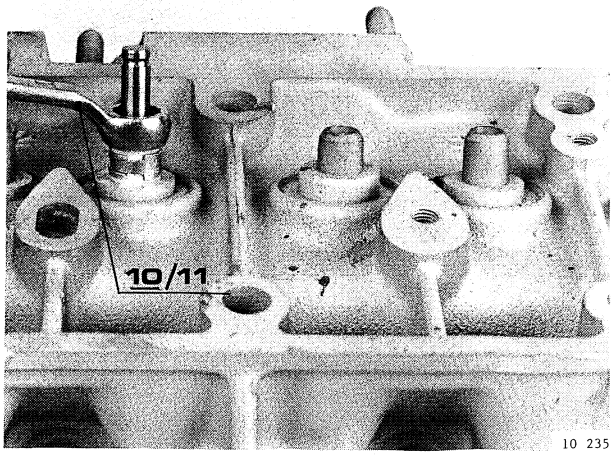


W15

Check the valve springs

The Netherlands and Belgium, up to chassis no. 610000; other countries, up to chassis no. 672000.

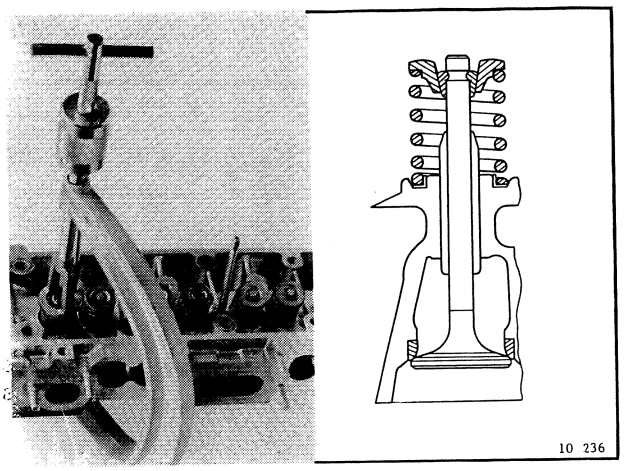
	Length	Loading
L	42.2 mm	0
L_1	32.0 mm	190-210 N
L_2	25.0 mm	342-378 N
L	46.9 mm	0
L_1	32.0 mm	232-272 N
L_2	24.5 mm	360-400 N.



W16

Fit the oil seal rings (not all engine types)

Insert the inlet valves.
Locate the plastic guard caps for the seals over the valve stems.
Fit the oil seals and press them up to the valve guide shoulder with a 10 mm diam. ring spanner.
Fit the exhaust valves.

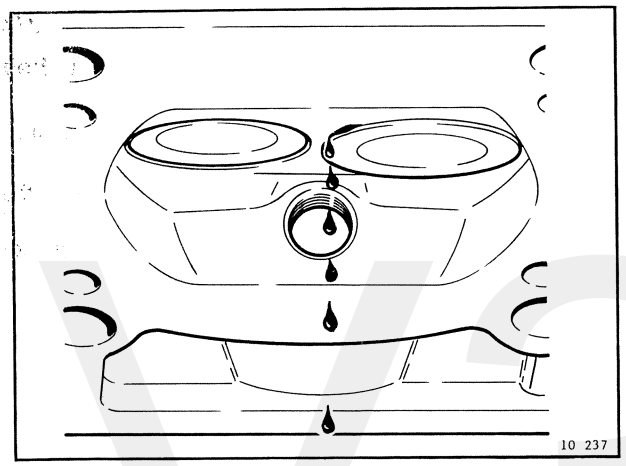


W17

Fit the inlet and exhaust valves

Use valve spring compressor **998-6052**
Fit:
- the valve spring retainer (lower)
- the valve spring (smallest coil winding at the bottom)
- the valve spring retainer (upper)
- the split cones

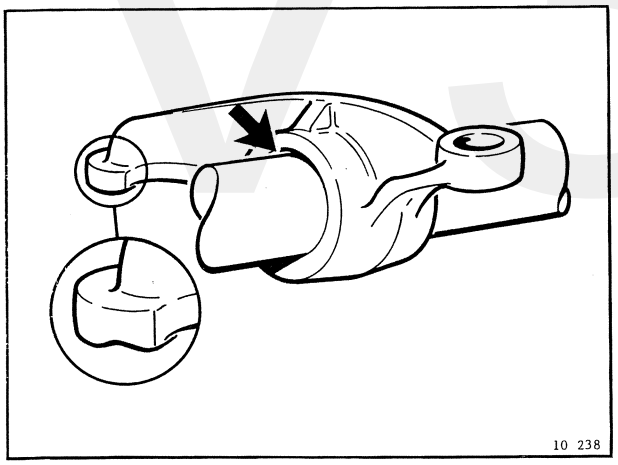
Caution!
Make sure that the correct split cones are used:
- inlet valve: 1 or 2 grooves;
- exhaust valve: 2 grooves.



W18

Check the seat-tightness of the inlet and exhaust valves

Check the seat-tightness by pouring a cleaning spirit into the inlet and exhaust ducts.
The valve seating is permitted to 'sweat', but must not leak.
If necessary, regrind a leaking valve.



W19

Fit the Pulsair plugs (if applicable)

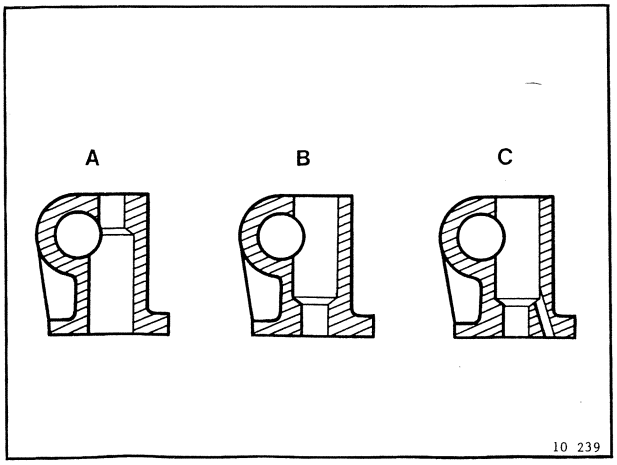
Tightening torque: 30 Nm.

W20

Check the rocker shaft assembly

Check:
- clearance between rocker shaft and rocker arms;
- wear of rocker arm face;s
  Note: if necessary, dress off the rocker arm face (A).

If necessary, renew the parts.



W21

Different versions of rocker shaft pedestals

Type	A	B	C
B14.0E/S	4x		
B14.0E MO 56765-, B14.1E/2E		3x	1x
B14.0S MO 16673-, B14.1S/2S/3S		3x	1x
B13.4E and other B14 engines			4x
For service purposes (all engine types)			4x

Note: never fit type B at the flywheel end.

W22

Assemble the rocker shaft

Smear all the parts with oil and locate them in the correct sequence on the rocker shaft.
The oil holes in the rocker shaft must be facing towards the push rods.
Note: never mix up exhaust rockers (which have oil holes) with inlet rockers.

W23

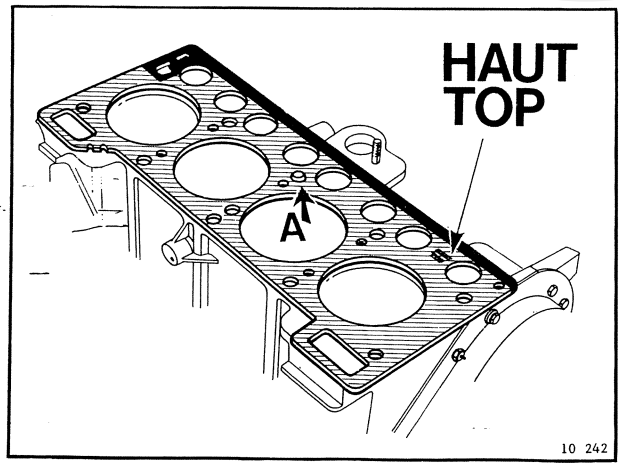
Fit the following parts on the cylinder head:

- M8 studs; tightening torque: 28 Nm;
- M7 studs for the valve cover; tightening torque: 18 Nm;
- connecting nipple(s) (use liquid gasket cement, Part No. 277917-1); tightening torque: 20 Nm;
- rear end cover plate and water pump; tightening torque: 8 Nm;
- engine cooling fan (tightening torque: 15 Nm) or pulley (tightening torque: 21 Nm);
- brackets; tightening torque: 23 Nm.

Note: when fitting the rear end cover plate and water pump, use **new** gaskets without any adhesive or sealant.

X. Assembling the engine

Note: remove any oil found in the threaded holes for the cylinder head bolts.

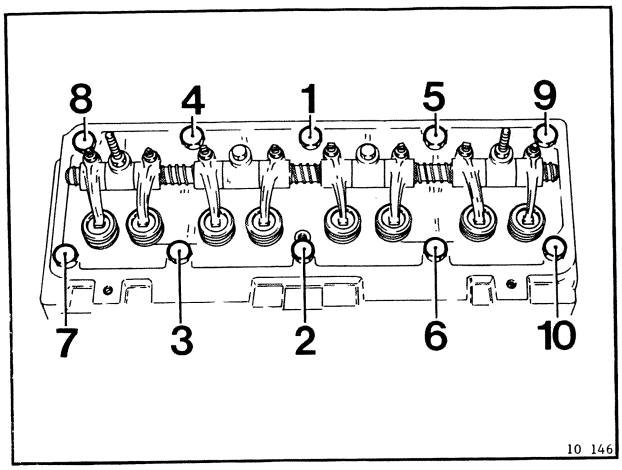


X1

Locate the cylinder head gasket

Remove the clamping plates **999-5803.**
Always use a new cylinder head gasket.
Centre the cylinder head gasket with the centring bush (A) on the cylinder block.

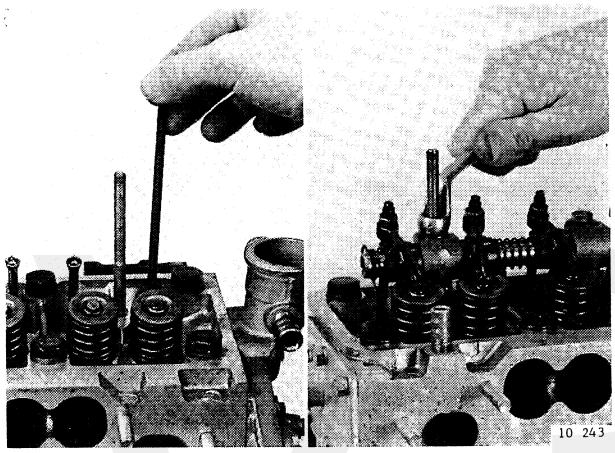
The inscription 'HAUT-TOP' on the cylinder head gasket should be facing upwards.
The two notches (B) indicate that this gasket can be used on all types of B13 and B14 engines.



X2

Fit the cylinder head

Locate the cylinder head.
Oil the bolts.
Locate the thick washers and the bolts.
The cylinder head bolts should be tightened **in the correct sequence** and in two stages.
1st stage: tighten to **27 Nm.**
2nd stage: tighten to **60 Nm.**

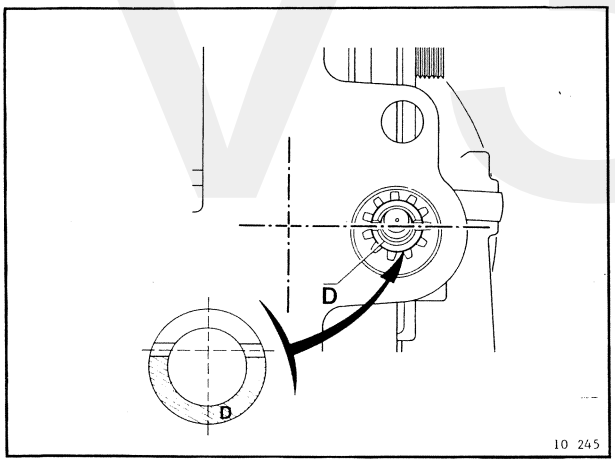


X3

Fit the push rods and the rocker shaft assembly

Insert the push rods.
Locate the rocker shaft.
Caution! The push rod ends must engage the rocker arm adjuster screws.
Fit the washers, bolts and nuts and tighten. Tightening torque: 16 Nm.

IMPORTANT! Never fit type B pedestal at the flywheel end.



X4

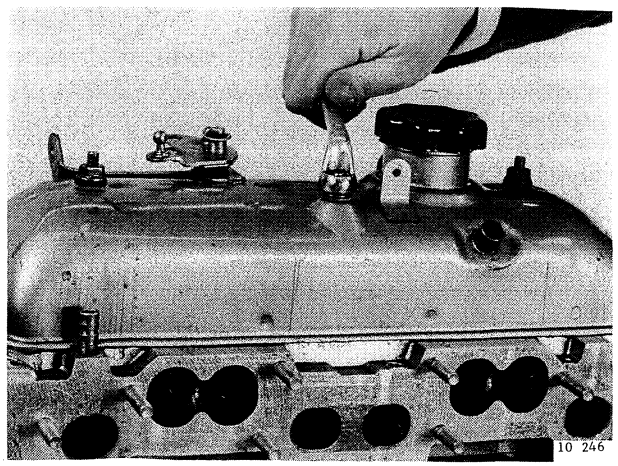
Adjust the valve clearances

See Operation C2.

X5

Fit the distributor drive shaft

Rotate the crankshaft until the valves of No. 4 cylinder are at their peak.
The groove in the drive shaft should be located at right-angles to the cylinder block, while the greatest arc should be pointing towards the flywheel.



X6

Renew the valve cover gasket

Take out the gasket and clean the groove.
Apply glue to the new gasket and insert it in the groove.

X7

Fit the valve cover

Fit the washers and nuts.
Tighten the nuts. Tightening torque: 5 Nm.

X8

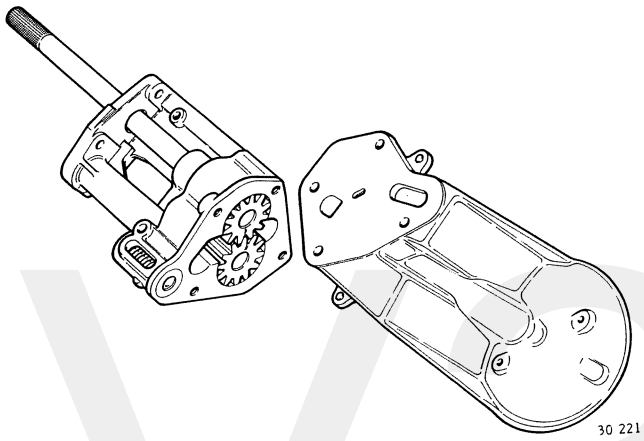
Fit the spark plugs

Check the electrode gap (see the specifications).
Tightening torque: 18 Nm (do not oil the screw thread).

Group 22. Lubrication system

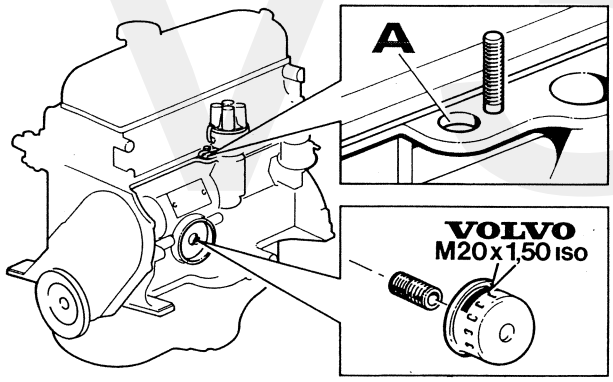
General

The various engine components are lubricated in the following way. The oil pump in the sump draws the oil out of the sump through a filter and pumps it through the main oil passages in the cylinder block and cylinder head to the various engine components which require lubrication. The oil in the main oil passages, which looks after the lubrication of the crankshaft bearings, camshaft bearings and rocker arms, is kept at a predetermined pressure (system or line pressure) by a spring-loaded valve. The pistons, gudgeon pins, timing chain and sprockets are lubricated by splash lubrication. The valves are lubricated by jets of oil from the rocker arms. The camshaft is always submerged in oil.



Oil pump

The oil pump on the B13/B14 engine is a gear type pump. The driving gearwheel of the oil pump is itself driven through reduction gear by the camshaft.
At the delivery side of the pump there is a pressure regulating valve. This valve ensures that the pressure is kept within certain limits.



Oil filter

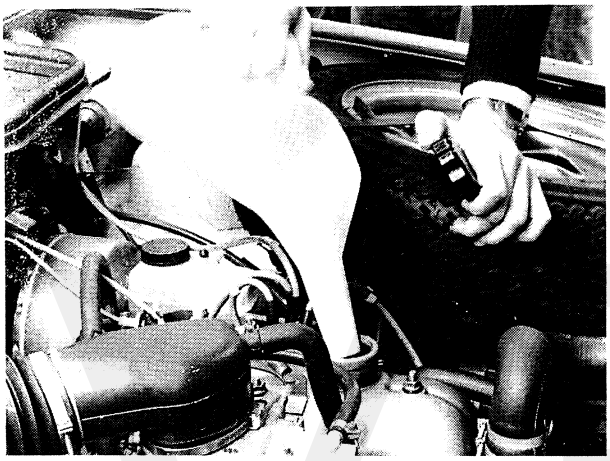
On B14-engined Volvos after chassis number 896600 an oil filter is fitted with **M20** screw thread; this is clearly shown on the filter (M20x1.5). Temporary use was made of an adaptor from 3/4" (for the cylinder block) to M20 thread (for the filter). This modification is recognizable by bore 'A', which is not drilled right through. In the 'Full Flow' filter system there is a valve which ensures that the oil cannot drain out of the oil filter when the engine is stationary.

Dipstick tube

The dipstick tube extends down to the bottom of the sump. This makes it possible to drain (i.e. extract) the engine oil through the dipstick tube. This arrangement also provides more accurate measurement of the oil level. The dipstick seal is matched to the dipstick tube. The flat type of dipstick is **not** interchangeable with the earlier type.

Y. Changing the engine oil/Renewing the oil filter

Special tools: 999-2903



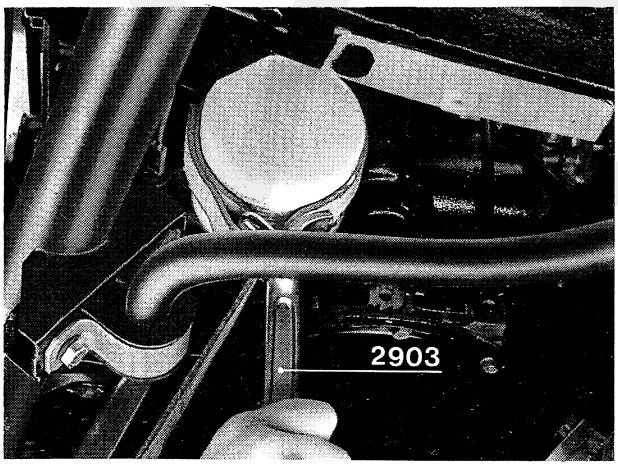
Y1

Engine oil

Always use a **new** washer.
Drain plug tightening torque:
- earlier type of plug (removable nut): 25 Nm;
- new type of plug (captive nut): 35 Nm.

Sump capacity, excl. oil filter.....litres 3.5
incl. oil filter.....litres 4.0

The distance between the MAX and MIN marks on the dipstick is equivalent to 1.0 litre.
Engine oil quality: see the specifications.



Y2

Renew the oil filter

Remove the engine splash guard.
Use the oil filter wrench **999-2903** to remove the old filter.
Clean the mating face.
Smear the O-ring with oil and secure the filter finger-tight.
Then tighten the oil filter a further quarter turn.
If the oil filter is renewed without changing the engine oil, then **0.5 litres** of oil must be added.
Fit the engine splash guard.
Note: do not use tools to fit the oil filter.
Make sure that the correct type of filter is used.

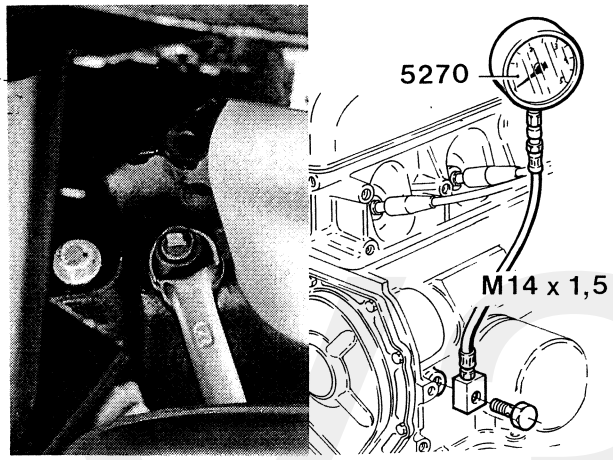
Z. Checking the oil pressure

Special tools: 999-5270

Z1

Preliminary operations

- Check the oil level and top-up as required;
- Let the engine warm up until the thermostat has opened or until the thermo-electric fan starts to operate.



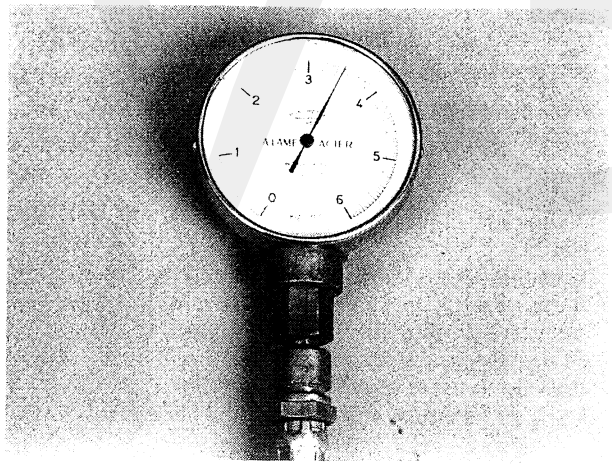
Z2

Connect up the oil pressure gauge

Earlier version:
- remove the oil pressure switch.

New version:
- remove the plug (socket-head) alongside the fuel pump.

Fit a banjo union on the oil pressure gauge **999-5270.** Connect it to the cylinder block with two washers and a banjo bolt with **M14x1.5** screw thread.



Z3

Check the oil pressure

Engine speed in r/s (r/min)	Oil pressure in kPa (kg/cm^2)
13.8 (800)	150-250 (1.5-2.5)
16.6 (1000)	300-400 (3.0-4.0)
50 (3000)	400-450 (4.0-4.5)

Z4

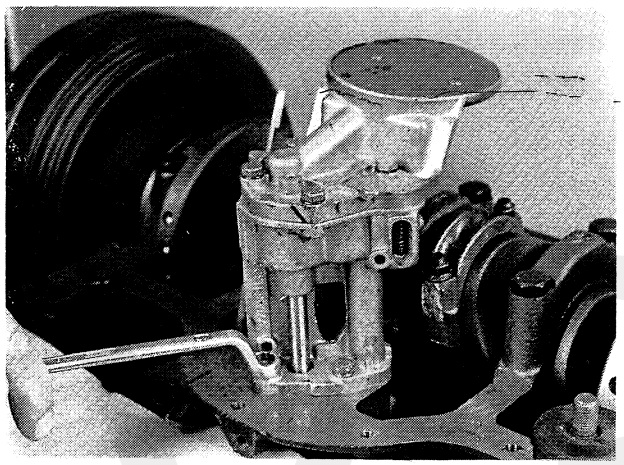
Fit the oil pressure switch or plug

Switch off the engine.
Remove the oil pressure gauge.

Earlier version:
Fit a new washer on the oil pressure switch.
Fit and tighten the oil pressure switch. Tightening torque: 20 Nm.
Connect up the wiring.
Note: the switch is available with a screw thread length of **8 mm** and **14 mm.** When renewing the oil pressure switch, always use the same thread length as the old switch.

New version:
Fit a new washer on the plug and tighten. Tightening torque: 20 Nm.

AA. Removing/reconditioning/fitting the oil pump



AA1

Remove the sump

See Operations *L1* to *L5.*

AA2

Remove the oil pump

Remove the three bolts and the serrated lock washers.

AA3

Inspect/recondition the oil pump

See Operations *U34* to *U38.*

AA4

Fit the oil pump on the engine

Fit the three bolts and the serrated lock washers.
Tightening torque: 8 Nm.

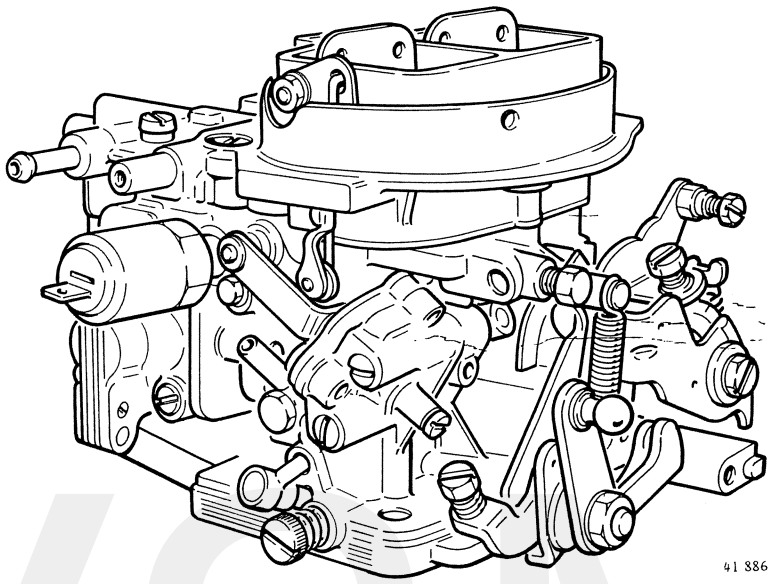
AA5

Fit the sump

See Operations *L6* to *L10.*

Group 23. Fuel system

Weber carburettor

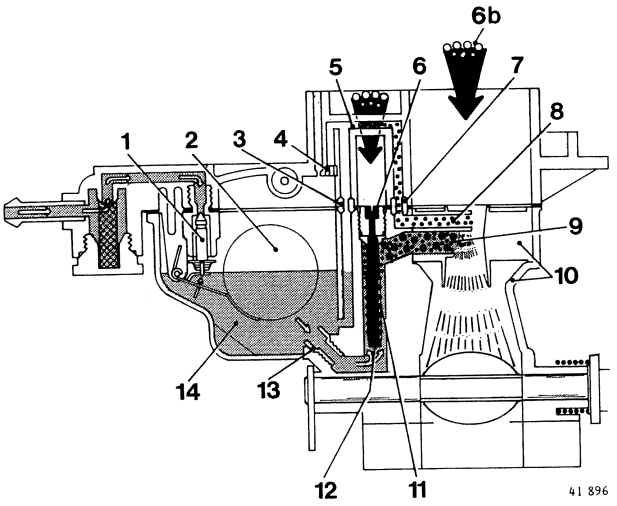


General

The carburation of the B13/B14 engine (49, 50, 51 and 52 kW) is looked after by a twin-choke Weber carburettor. One of the reasons for fitting a twin-choke carburettor is to combine good fuel economy with a good reserve of engine power. When the accelerator is partly depressed, only the throttle valve of the first choke (i.e. first stage barrel) is open. However, If more power is required, i.e. if the accelerator is pushed in further, the second barrel throttle valve will also open when the first barrel throttle valve reaches a certain position.

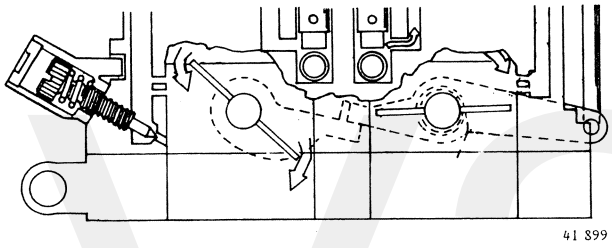
We can subdivide the carburettor into the following parts:
Main body: full load and partial load section
Idling and pick-up section
Acceleration section
Choke section

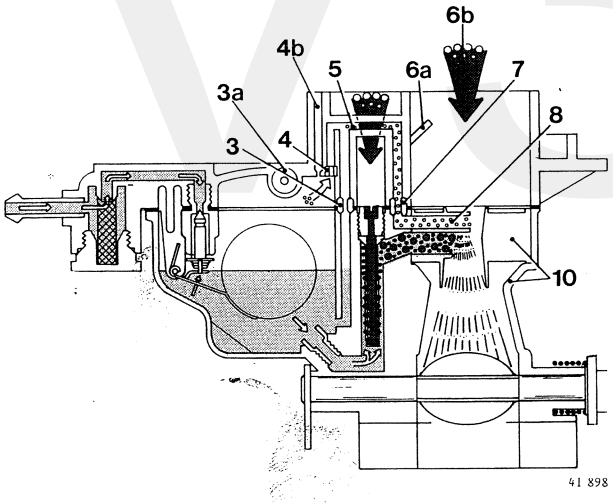
The 'S' engines are further equipped with a decelerating mechanism which is used in order to keep the hydrocarbon content of the exhaust emissions within the statutory requirements when decelerating.
Prior to model year 1978 a microswitch was connected to the carburettor on AT versions. This switching gear has been discontinued since model year 1978 and replaced by a vacuum control unit (with a built-in tachometric relay linked to engine speed) and a hydraulic high-pressure switch.
These components are not connected to the carburettor. There are versions with and without a 'constant CO' system.



Main body operating at partial load

The main body of the carburettor is where the air and fuel flow into the carburettor and are mixed. The fuel first passes through a filter and then enters the float chamber (14) via the needle valve (1). The float (2) regulates the supply of fuel by moving the needle valve (1) up (fuel supply closed) and down (fuel supply open). In this way, a constant fuel level is maintained in the float chamber. From the float chamber the fuel flows through the main jet (13) to the primary well (12) where it is mixed with air from the ports in the emulsion tube (11). This air enters the emulsion tube through the correction jet (6). The mixture is drawn into the carburettor by the depression in the venturi (10) and then joins the airflow (6b), which enters the carburettor from the air filter, through orifice (9).



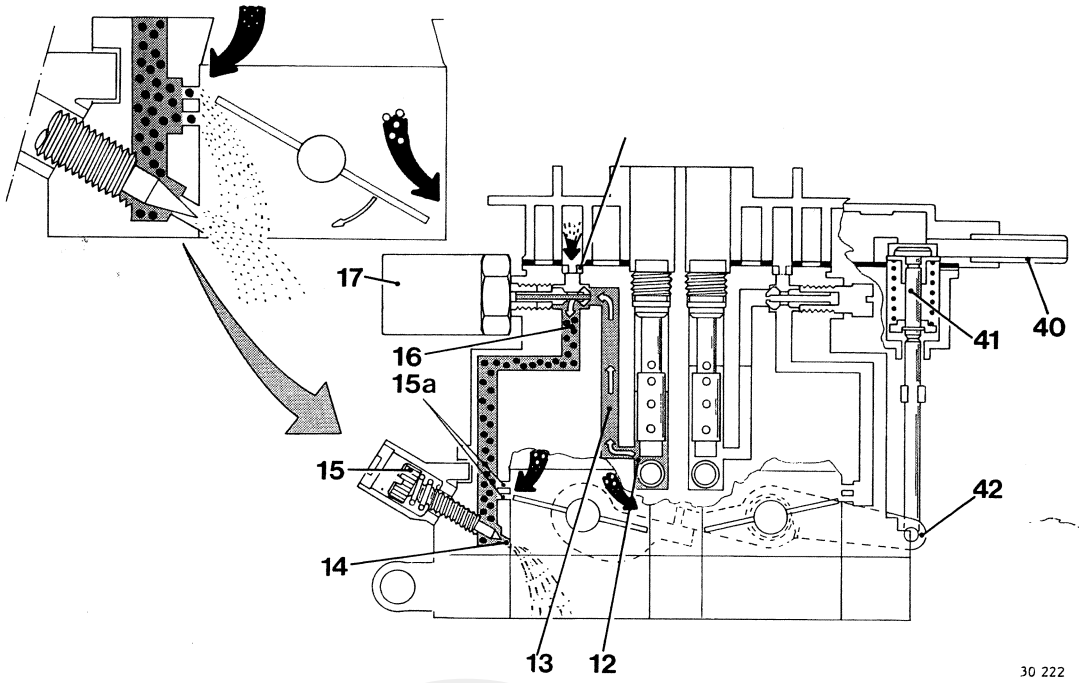


Main body operating at full load

When maximum engine power is required, for example:
- in order to drive at top speed;
- when driving in hilly or mountainous country;
- when towing a caravan;

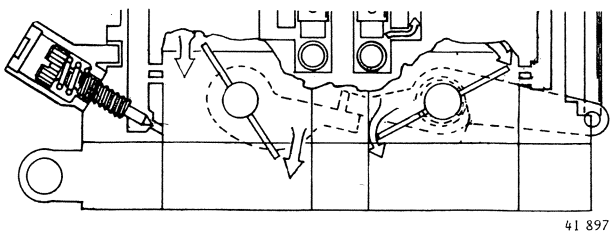
full load enrichment occurs in both barrels of the carburettor (on DIR 93/95 versions only in the second barrel; and from 1983: pneumatic full load enrichment in the first barrel (or first stage)). The high air velocity in the venturi (10) also makes it possible for the fuel to be drawn through passage (5). This fuel is then mixed with air which comes from the air orifice (4). This mixture then joins the airflow from the air filter via passage (8). Orifices (3), (4) and (7) are calibrated; this is not the case for model year 1984, DIR 104/105. For the system to function properly, there must be neither overpressure nor depression in the float chamber. As a result, the float chamber has to be ventilated. This is done by permanently ventilating the inside of the float chamber through the passage (4b) in the cover. The float chamber is also internally ventilated through the hose (3a) which is connected to the air filter.

Idling and pick-up section

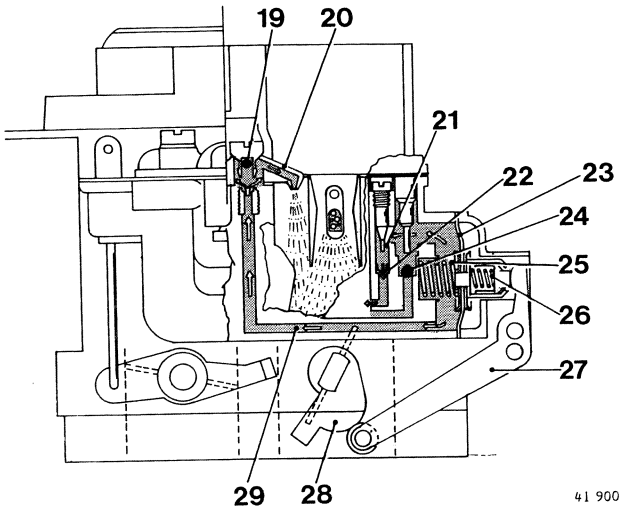


The idling part of the carburettor allows the engine to run smoothly and evenly, without stalling, when the throttle is released. The following description of the way in which this is achieved applies only to carburettors which are not equipped with a 'constant CO' system. The fuel from the float chamber reaches the primary well (12) in exactly the same way as in the main body of the carburettor. The fuel is drawn further into the system by the depression prevailing under the throttle valve.
From the primary well (12) the fuel flows through passage (13) to the idle jet (17). The idle jet is opened and closed electrically (idle solenoid). Here it is mixed with air. This air is supplied through calibrated orifice (18). The mixture now flows through passage (16) to orifice (14) under the throttle valve. The air is supplied through the bypass bores (15a) above the throttle valve and by leakage around the throttle valve. The size of orifice (14) can be adjusted with the idle adjusting screw (15).

As soon as the ignition is switched off, the idle jet closes. This is done to prevent the engine from running-on (dieseling).
When the engine speed progresses from idling to partial load, the bypass bores ensure a smooth pick-up.
When the throttle valve is opened, fuel flows through the bypass bores instead of air. The airflow from the air filter again flows normally around the throttle valve, mixes with the fuel mixture and then continues on to the combustion chambers.

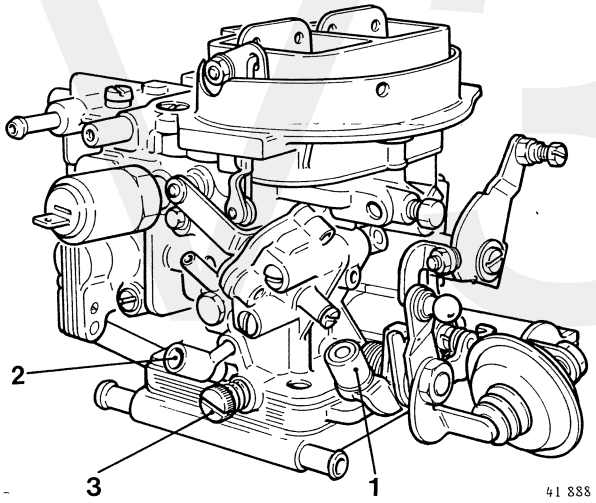


At idling speed, external ventilation of the float chamber is obtained via the filter or air header (40). As soon as the throttle valve is opened, valve (41) is operated by lever (42) and in this way closes off this external ventilation. The closing action of this external ventilation valve prevents petrol fumes in the float chamber from entering the venturi when the engine is running at idle and after the engine has been switched off.
The second barrel is progressively brought into operation by the cams on the first barrel throttle valve, which catch on the second barrel throttle valve at a certain accelerator position. In the second barrel the fuel is mixed with air in the same way as in the main body of the carburettor.



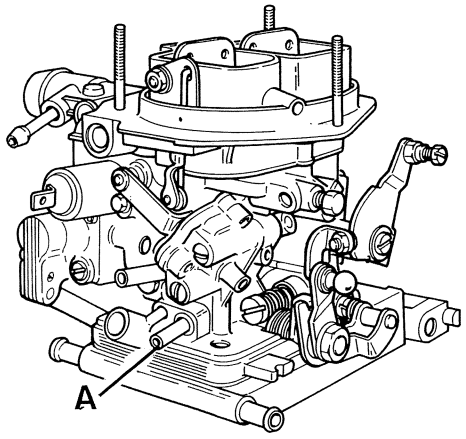
Acceleration section

The accelerator pump obtains its fuel as follows: as soon as the opened throttle valve is closed, diaphragm (23) is pushed to the right by spring (25) until lever (27) abuts against cam (28). This causes fuel to be sucked out of the float chamber through non-return valve (24). In this way, when the throttle valve is closed the accelerator pump chamber is filled with fuel.
Depressing the accelerator pedal opens the throttle valve. At the same time, cam (28) pushes lever (27) against diaphragm (23), thereby exerting mechanical pressure on the diaphragm and causing fuel to be injected into the first barrel of the carburettor. This takes place by way of passage (29), non-return valve (19) and pump injector (20). This extra supply of fuel is necessary in order to compensate for the fuel deficiency which occurs when the throttle valve is opened (enrichment of the mixture). The excess amount of fuel supplied by the accelerator pump is returned to the float chamber through passage (21) and calibrated orifice (22). Abruptly opening the throttle valve compresses spring (26). If the throttle valve is held in this position, spring (26) will extend and force back diaphragm (23) and spring (25). This causes the accelerator pump to continue to inject fuel for a short time. The function of spring (26) is, therefore, to extend the period of time during which the accelerator pump injects fuel.



'Constant CO' system (from model year 1981 to 1984)

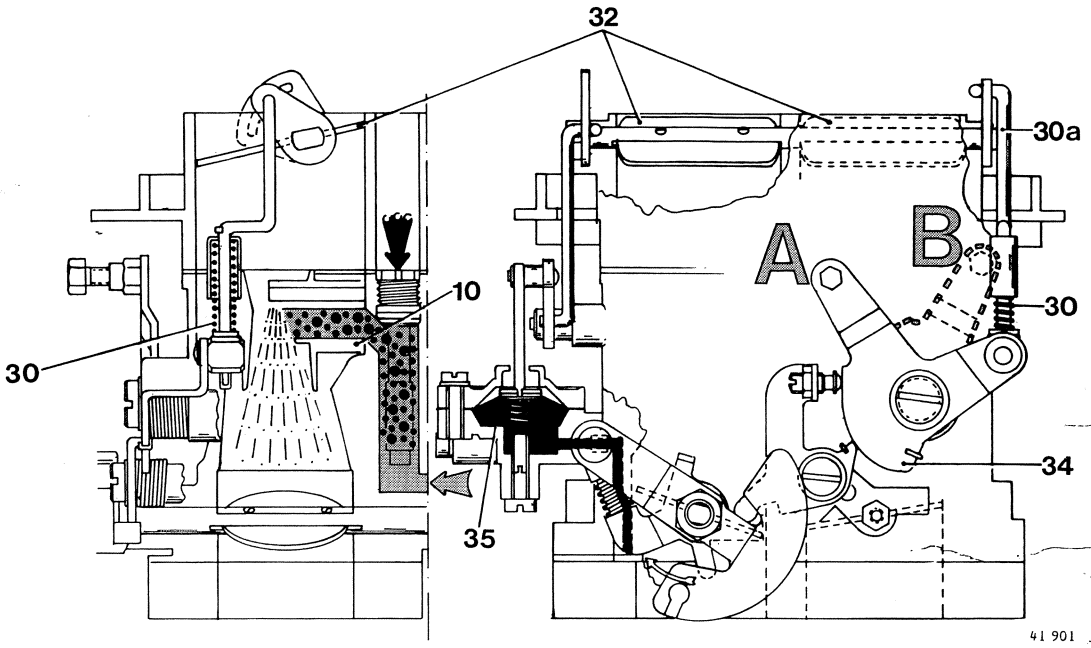
The 32 DIR 83, 32 DIR 85, 32 DIR 84, 32 DIR 93 and 32 DIR 95 carburettors are equipped with a 'constant CO' system which consists of an additional throttle valve air bypass and an extra air trimming screw (3).
On these carburettors the throttle stop screw (1) is set and sealed by the manufacturer.
Adjustment of the CO-content in the exhaust gases is done with the mixture control screw (2). (On the 32 DIR 83 and 32 DIR 93 this screw is sealed after adjustment with a tamper-proof seal.)
Idle adjustment is now possible by means of the air trimming screw (3) which permits the idling speed to be adjusted within certain limits, without noticeably affecting the CO-content (± 400 r/min.).



Weber carburettor (with effect from model year 1984)

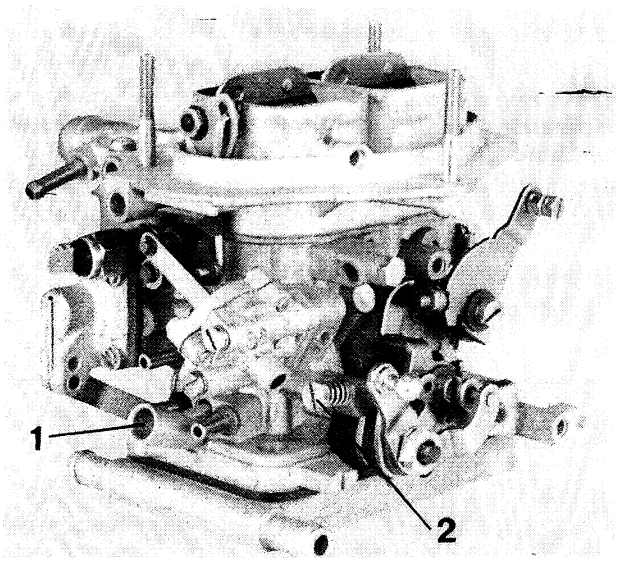
In conjunction with the integrated electronic ignition system, the vacuum connection (A) was relocated to a position under the throttle valve (previously above the throttle valve). This Weber carburettor is not interchangeable with the earlier version.

Choke section



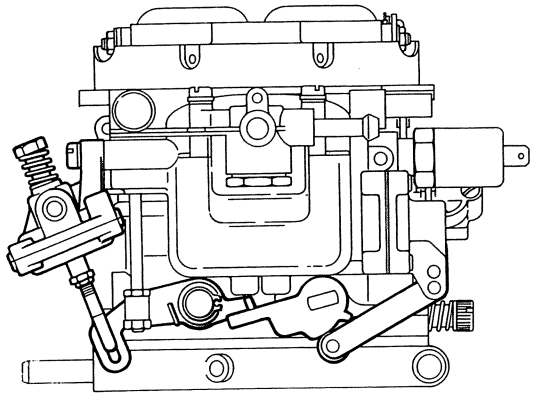
To facilitate cold-starts, the carburettor is equipped with a choke. The principle of operation of the choke is as follows. By closing off the airflow the engine draws in a mixture consisting almost entirely of petrol. It is the job of this rich mixture to ensure that the engine starts easily.
In practice, this takes place as follows: the strangler (choke) valves at the top of the carburettor body are opened and closed by a Bowden cable. On later versions only one valve is used (in the first barrel). When the choke is pulled out, lever (34) is brought to position A and the strangler valves (32) close off the carburettor air intake(s). When the choke is pulled out, the cam on lever (34) opens the throttle valve of the first barrel partway. A rich mixture is now drawn into the auxiliary venturi (10) and this helps the engine to start easily.

A separate device is incorporated in the carburettor to prevent the engine from flooding when the choke is in use. When the engine is running after having been started from cold, the strangler valves are held partway open against the pressure of spring (30) by the constant depression prevailing in the diaphragm valve (35); they open as far as the stop for the rod (30a) on lever (34) (mechanical stop).
When the choke is pushed back partway, the strangler valves (32) are pulled slightly further open by the diaphragm valve (35) until the stop in the diaphragm valve is reached (pneumatic stop).
This allows air to flow into the carburettor (venturi), thus avoiding an over-rich mixture which could otherwise flood the engine when it is running.



Modified Weber carburettor for B14.4E/4S engines

With effect from model year 1985 a totally different jet arrangement was introduced for the Weber carburettor compared with the earlier version. The 'constant CO' system was discontinued. The idling speed and CO-content of the exhaust gases are regulated with the throttle stop screw (2) and the mixture control screw (1), as was the case on earlier versions from 1981 onwards.
The modified Weber carburettor is not interchangeable with earlier versions.
Carburettor type identification:
- B14.4E: 32 DIR 104/REP 100;
- B14.4S: 32 DIR 105/REP 100.



41 887

Decelerating mechanism ('S' engines only)

Introduction

The purpose of the decelerating mechanism is to briefly keep the throttle valve partway open when the accelerator pedal is released. In this way, not all of the fuel (which is released by the inertia of the fuel) is passed through the idling section of the carburettor at a high velocity: instead, as the throttle valve is closed progressively the fuel passes through the venturi in the normal way.

The fuel is then mixed with air, so that a normal combustible mixture is still obtained. This is necessary in order to keep within the statutory exhaust emission regulations for hydrocarbons when decelerating.

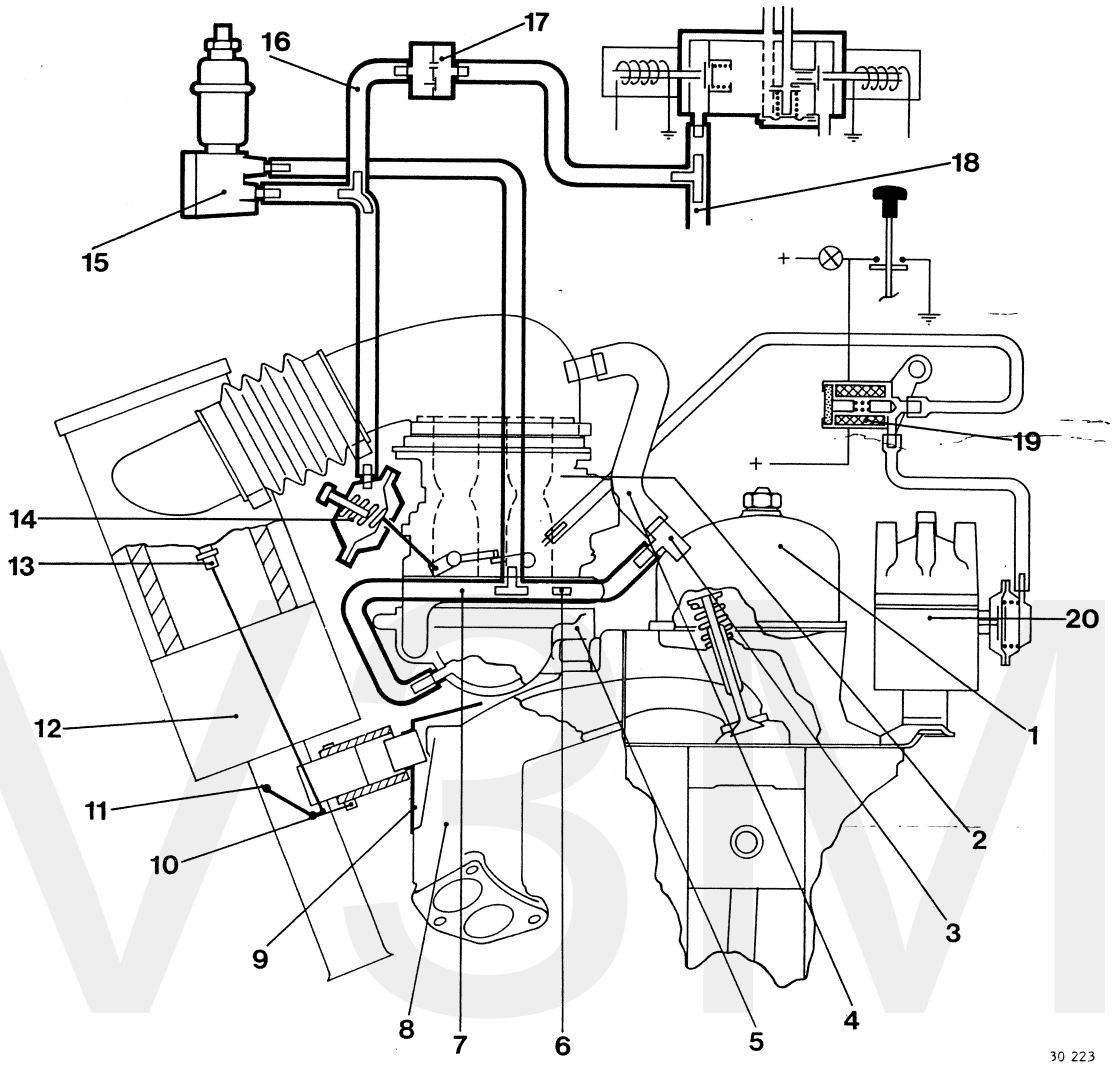
Technical profile of the decelerating mechanism

See the illustrations on the following pages

The depression from connection (19) (overdrive depression) enters the diaphragm valve (14) on the carburettor through reducing valve (17) and hose (16). This depression causes the throttle valve of the first barrel to open slightly by means of a diaphragm and a rod incorporated in the diaphragm valve (14). This is the situation when driving with the accelerator pedal depressed. In this situation, however, the throttle valve is of course further open (accelerator depressed) than it would be as a result of the depression in the diaphragm valve.
Control valve (15) opens under high depression from vacuum hose (7) and is closed in the situation described above. When the accelerator pedal is released, however, a high depression is created under the throttle valve and in the vacuum hose (7), causing control valve (15) to open. Reducing valve (17) maintains the depression in hose (16).

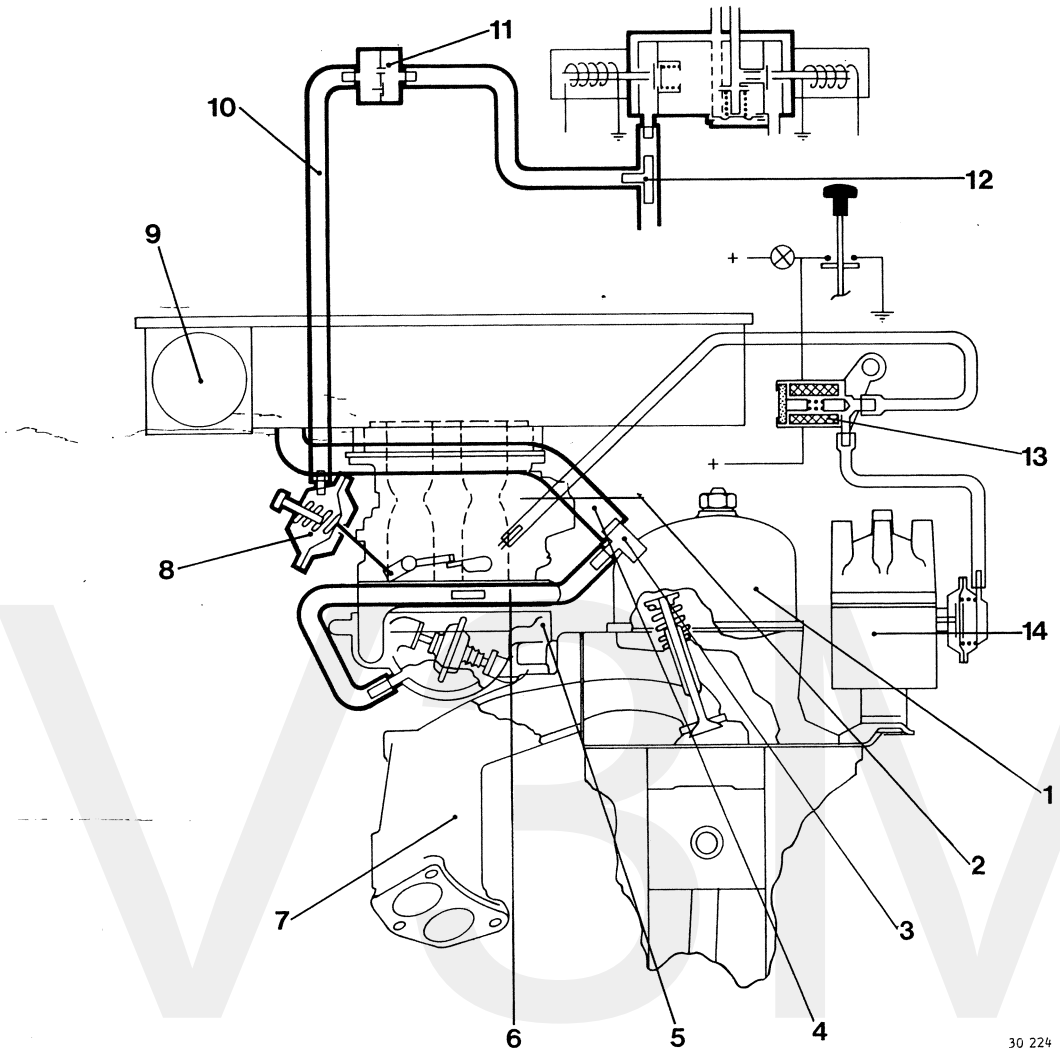
In the meantime, the high depression from the inlet manifold is also admitted from vacuum hose (7), through the port in control valve (15) into hose (16) and diaphragm valve (14). This depression therefore keeps the throttle valve open via the diaphragm valve. The decreasing engine speed and slightly opened throttle valve create a lower depression in vacuum hose (7). This lower depression causes control valve (15) to close. Meanwhile, the overdrive depression has also been eliminated as a result of the tachometric relay in the vacuum control unit being switched off. The depression in hose (16) now falls off gradually as a result of a calibrated orifice in reducing valve (17), which offers resistance and prevents this depression from falling off abruptly. Because of this gradual ebbing away of the depression in hose (16), and consequently in diaphragm valve (14), the throttle valve closes gradually. The engine speed likewise drops gradually, from approx. 1,600 r/min to idle.

Decelerating mechanism: B14 ('S' engines) up to model year 1980, inclusive

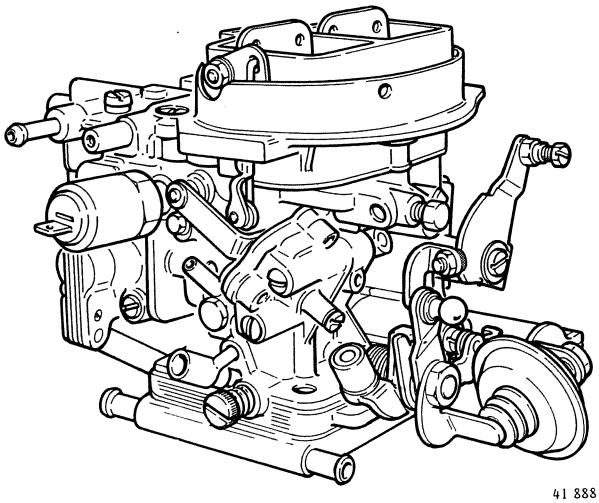


1 Engine
2 Carburettor
3 Oil separator
4 Crankcase ventilation hose
5 Inlet manifold
6 Calibrated orifice
7 Hose
8 Exhaust manifold
9 Pre-heating plate
10 Warm air hose
11 Valve
12 Air filter
13 Thermostat
14 Diaphragm valve
15 Vacuum control valve
16 Hose to automatic transmission - overdrive depression
17 Vacuum reducing valve
18 Hose to automatic transmission - overdrive depression
19 Electrically operated 3-way valve
20 Distributor

Decelerating mechanism: B14 ('S' engines) from model year 1981



1 Engine
2 Carburettor
3 Oil separator
4 Crankcase ventilation hose
5 Inlet manifold
6 Hose
7 Exhaust manifold
8 Diaphragm valve
9 Air filter
10 Hose to automatic transmission - overdrive depression
11 Vacuum reducing valve
12 Hose to automatic transmission - overdrive depression
13 Electrically operated 3-way valve
14 Distributor

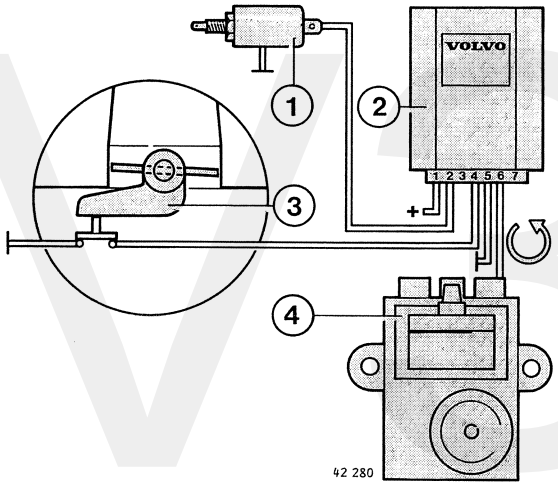

41 888

Dashpot (MT versions - Sweden)

In addition to the decelerating mechanism, the 32 DIR 85 (MT Sweden) is also equipped with a dashpot (A).
This dashpot acts as a damper for the throttle valve and comes into operation during brief periods of deceleration (for example, when changing gear).
In this way, the hydrocarbon content of the exhaust gases when decelerating is kept below the maximum permissible level.

Automatic fuel cut-off when decelerating - MT versions only (from model year 1987)

When the accelerator pedal is abruptly released above a specified engine speed, the fuel supply is interrupted via the idle solenoid. This has a favourable influence on fuel consumption, especially in city-street driving.



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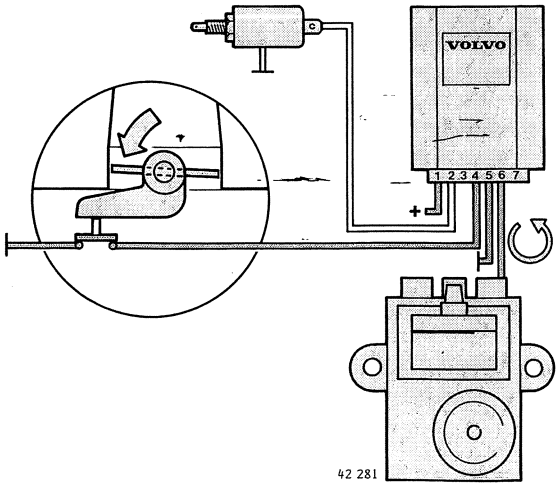
Principle of operation

On the carburetor there is a switch which is operated by the throttle valve lever. The switch is in circuit with the Electronic Control Unit. Engine speed data are transmitted to the ECU by the Renix electronic ignition system.

1 Idle solenoid
2 Electronic Control Unit
3 Throttle valve lever
4 Renix ignition unit

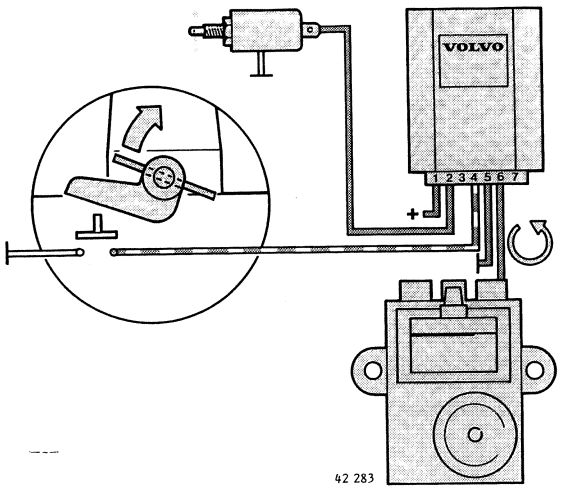
Current
Voltage



42 281

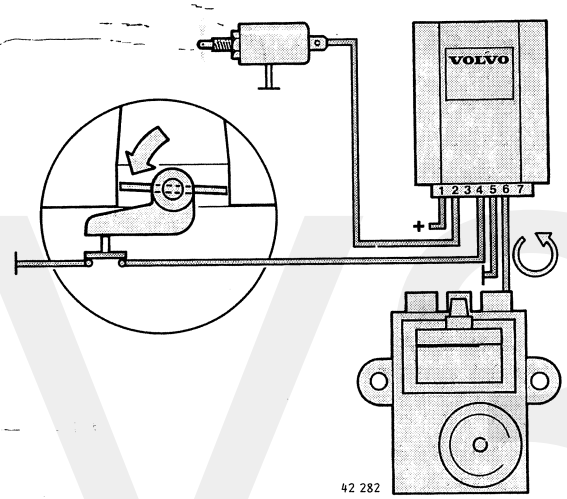
Situation A

When the accelerator pedal is abruptly released, this is reported to the ECU by means of the throttle valve switch. If the engine speed is higher than a specified value (1,600 r/min) at that moment, the ECU will interrupt the current supply to the idle solenoid, causing the fuel supply to be interrupted via this electrically controlled fuel jet.



Situation B

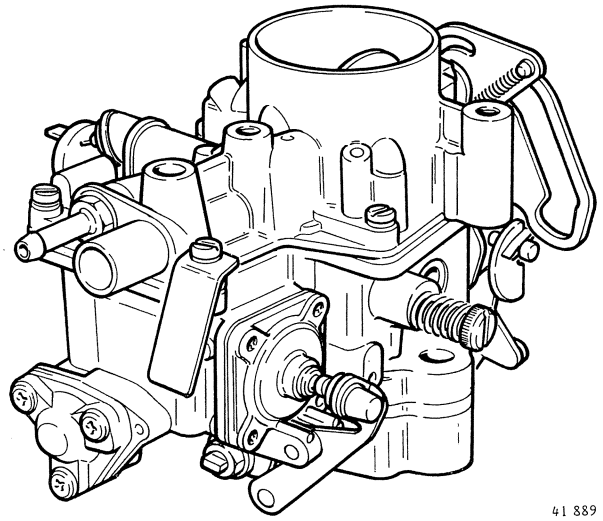
The fuel supply is automatically resumed at engine speeds below the value indicated in situation A.



Situation C

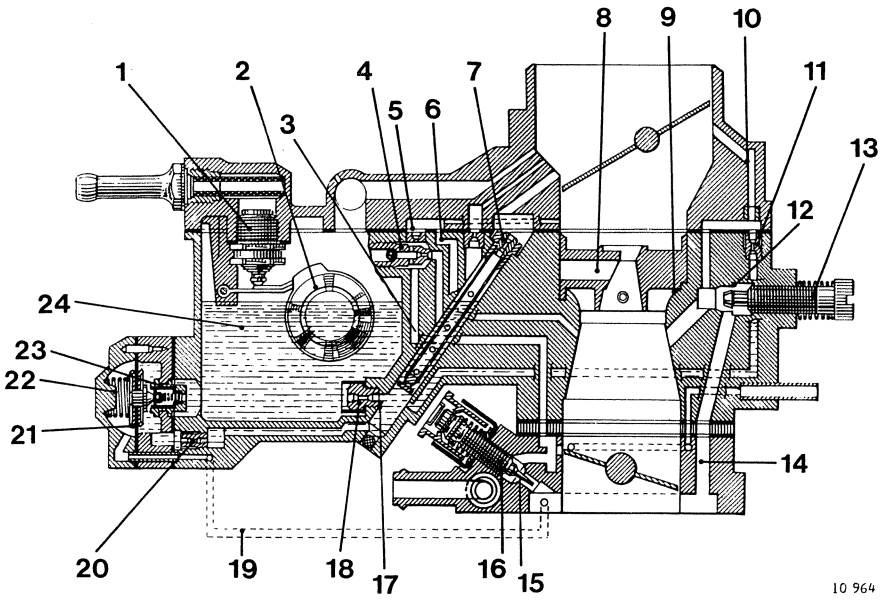
When the throttle valve is opened, the throttle valve switch interrupts the control current to the ECU.
The ECU is then deactivated and the supply of fuel takes place in the normal way via the idle solenoid.

Solex carburettor



Carburettor - B14.3E engine

The carburettor on the B14.3E is a Solex single barrel downdraught carburettor. Type designation: 32-SEIA REN 796/814/828.
The Solex carburettor has a 'constant CO' system. This system consists of an additional air passage above the throttle valve and an adjusting screw (A).
With this adjusting screw the idling speed can be changed approx. 6.6 r/s (400 r/min) without noticeably influencing the CO-content of the exhaust gases.
Initial setting of the CO-content at idle is done at the factory, after which the mixture control screw is sealed.



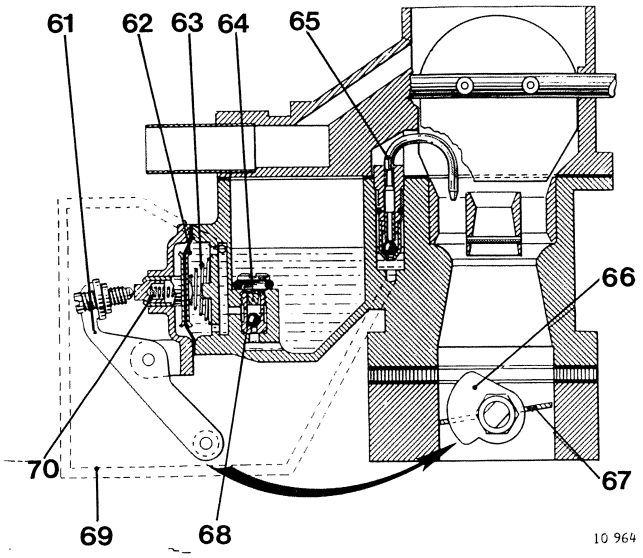
Principle of operation of the carburettor

The fuel and air are mixed in the main body of the carburettor. The fuel flows through the needle valve (1) in the float chamber (24) where the float (2) regulates the needle valve opening, so that the fuel level in the float chamber remains constant. The fuel from the float chamber reaches the primary well (17) through the main jet (18). This fuel is mixed with air from the ports in the emulsion tube (6) and the air jet (7) and enters the venturi (9) through port (8).

The carburettor has pneumatic full-load enrichment. Valve (23), which is connected to diaphragm (21), is operated by the interaction between spring (22) and diaphragm (21). The diaphragm is controlled by the depression in the inlet manifold with which it is in communication via passage (19). At full engine load the depression in the inlet manifold becomes so low that spring (22) moves diaphragm (21) to the right. This opens valve (23) and causes fuel to flow out of the float chamber (24) through valve (23) and jet (20) to the main carburation system.

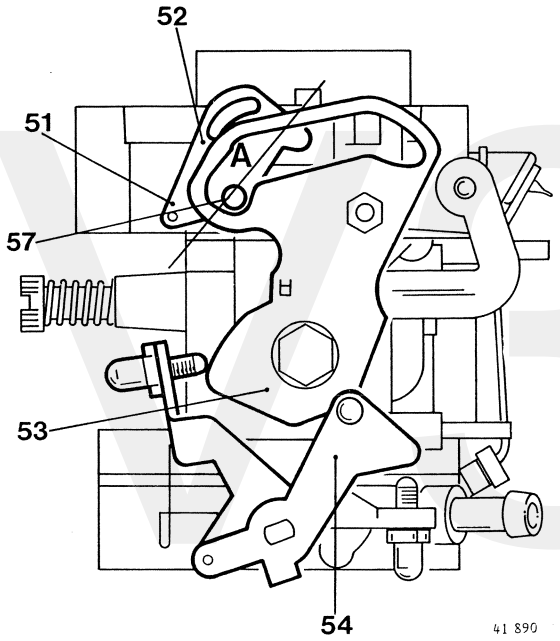
Idling system

The idling system of the carburettor is equipped with a bypass. Air from the air idle jet (5) is mixed with fuel from the fuel idle jet (4). This mixture flows through passage (3) and orifice (15), which can be adjusted with screw (16) (adjustment of the CO-content), to the venturi under the throttle valve. Mixture is also supplied via passage (14) of the bypass system (which is also called the 'constant CO' system). The mixture is created by mixing air from passage (10) with fuel from jet (11). This mixture flows through orifice (12), which can be adjusted with screw (14) (idling speed), to the venturi under the throttle valve. When the throttle valve is opened, a mixture also flows through the oblong groove in the venturi, thereby ensuring a progressive increase in engine speed.
At idling speed, external ventilation of the float chamber is achieved via a small valve in the float chamber cover. As soon as the throttle valve is opened the valve closes off this external ventilation. This prevents petrol fumes in the float chamber from entering the venturi when the engine is running at idle and after the engine has been switched off.



Accelerator pump

When the throttle valve (67) is closed, lever (61) swings across on cam (66) of the accelerator pump. The pressure of spring (63) pushes back diaphragm (62) and fuel is drawn out of the float chamber through non-return valve (64). When the throttle valve is opened again, cam (66) compresses diaphragm (62) via lever (61), thereby injecting fuel into the venturi through passage (69), non-return valve (68) and accelerator pump injector (65). Abruptly opening the throttle valve compresses spring (70). If the throttle valve is held in this position, spring (70) will extend and force back diaphragm (62) and spring (63). This will cause the accelerator pump to continue to inject fuel for a short time.



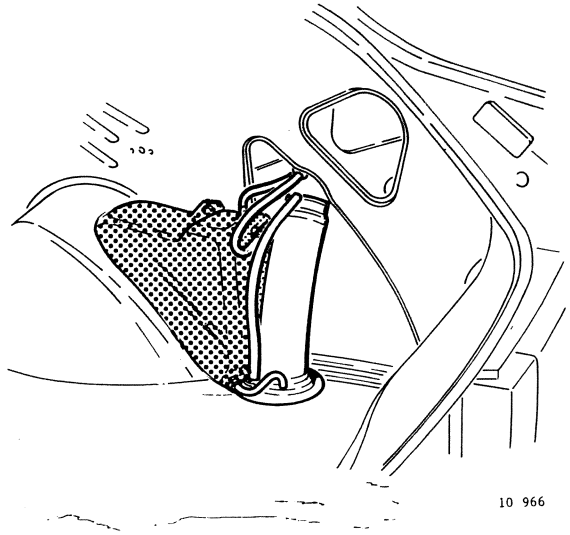
Choke system

The strangler (choke) valve, which is operated by a Bowden cable, makes it possible for the engine to start and run at idle in cold weather. When lever (52) is in position (A), the strangler valve closes off the carburettor air intake. The throttle valve is held partway open by cam (53) and lever (54). When the engine is cranked, a rich mixture is drawn into the auxiliary venturi and this enables the engine to start easily. Once the engine is running, engine depression pulls the strangler valve partway open against the pressure of spring (51); this allows the engine to run smoothly at fast idle without the mixture becoming too rich.
At higher engine loads and engine speeds, the flow of air/fuel mixture is able to push the strangler valve further open against the pressure of spring (51), because the cam (57) of lever (52) can move in the oblong slot in lever (53).

Solex carburettor (with effect from model year 1984)

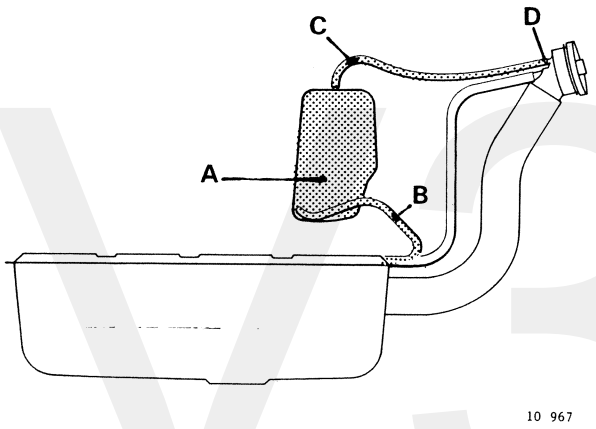
Type 32-SEIA REN 828, B14.3E engine.
In conjunction with the integrated electronic ignition system, the vacuum connection was relocated to a position under the throttle valve (previously above the throttle valve). This Solex carburettor is not interchangeable with the earlier versions.

Fuel tank



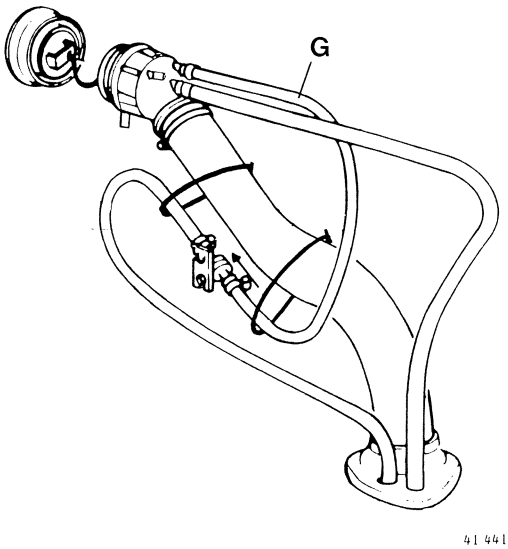
Expansion tank added to fuel tank (with effect from model year 1983)

To prevent fuel spillage via the filler pipe due to expansion in hot weather when the fuel tank is full, an expansion tank was added. This tank is located at the right-hand side behind the boot trim panel.



Principle of operation

The bottom of the expansion tank (A) is in communication with the highest point of the fuel tank by means of a hose (B).
At the highest point of the expansion tank (C) there is a hose which is in communication with a calibrated orifice (D) in the filler neck.
When refuelling, the fuel in the fuel tank will rise as far as the connecting hose (B) but will be prevented from flowing into the expansion tank by the calibrated orifice (D).
After the petrol cap has been replaced, expanding fuel can spill over from the fuel tank into the expansion tank.



Roll-over valve (with effect from model year 1983)

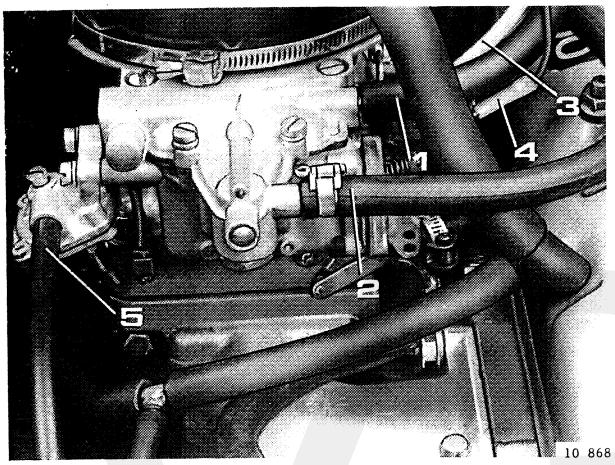
To prevent fuel spillage from the fuel system after a 'roll-over' crash, a special check valve ('roll-over' valve) is fitted in hose (G).
There is a flow directional arrow on the black section on top of the valve (to indicate the correct direction of flow).

BB. Removing/fitting the Weber carburettor

Risks to avoid when working on the carburettor

When working on the carburettor it is not uncommon for petrol to spill over the engine. If the engine is hot, there is not only a risk of the petrol igniting but also a health hazard on account of the high benzene content in the surrounding air. The **lead** in petrol also constitutes a health hazard.

Such risks can be avoided by pinching off the fuel line ahead of the carburettor and running the engine until there is no fuel left in the carburettor before starting to work on it.



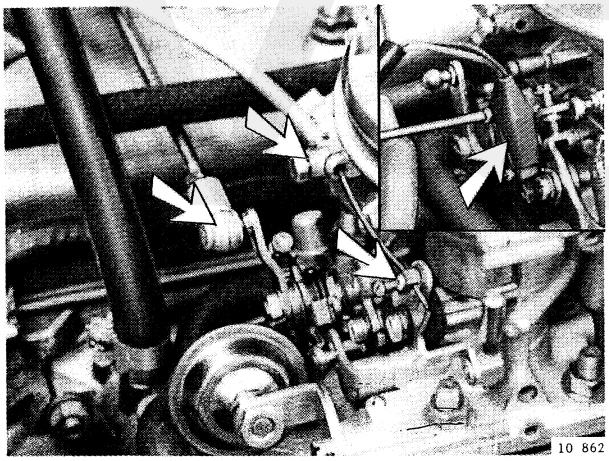
BB1

Remove the air filter

BB2

Disconnect the following hoses and electrical connections

1 Hose to the air filter (-1981).
2 Fuel supply hose.
3 Hose to the distributor.
4 Electrical connection from the idle solenoid.
5 Hose for the decelerating mechanism (if fitted) (hose to the EGR valve).

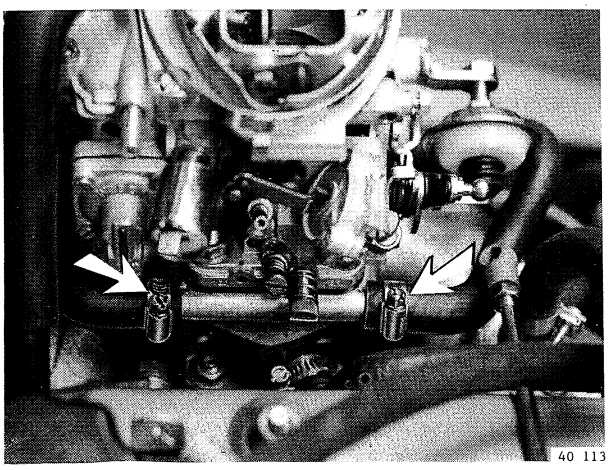


BB3

Disconnect the choke cable and the throttle control rod

BB4

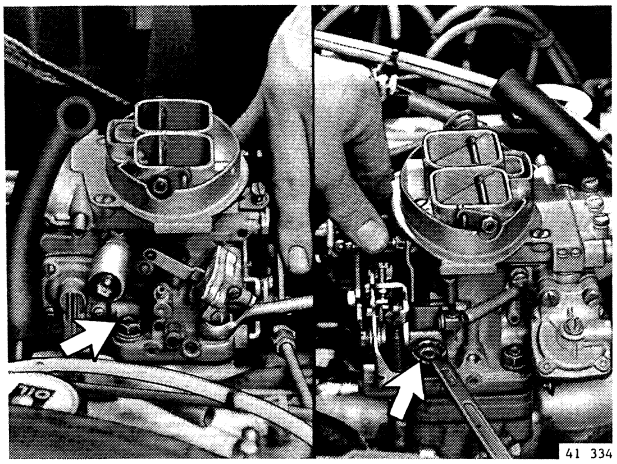
Release the microswitch (up to model year 1978)



BB5

Disconnect both coolant hoses from the pre-heating flange

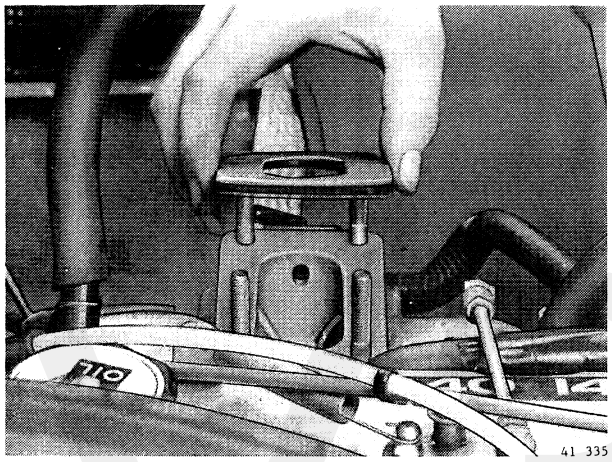
Note: some coolant will be lost.


41 334

BB6

Remove the carburettor from the inlet manifold

Remove the four retaining nuts.
Note: when loosening the nuts at the engine bulkhead side, the choke lever and throttle valve lever must be raised slightly.


41 335

BB7

Remove the insulating flange from the inlet manifold

BB8

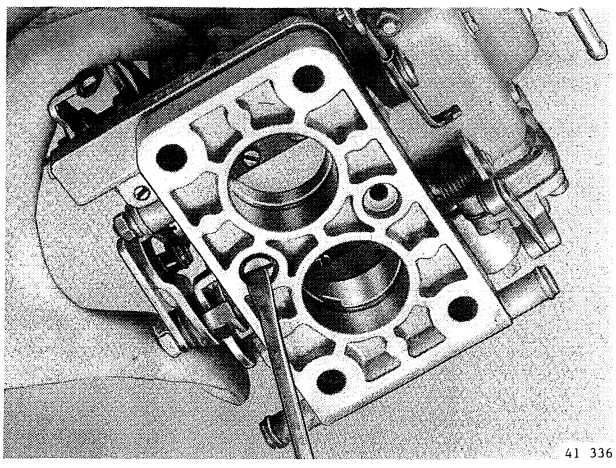
Fitting

- Fitting is in reverse order to removal.
  Note: always fit the insulating flange with new gaskets.
- Fit the choke cable first and then adjust it.
- Fit the throttle control rod.
- Check the working of the choke and throttle linkage.
- Adjust the carburettor; see Operations *JJ1*, *JJ2* and *JJ3*.

Tightening torques:
- nuts: 17 Nm;
- choke cable nipple: 10 Nm;
- cable in carburettor body: 10 Nm.

CC. Reconditioning the Weber carburettor

Note: there are only minor differences between the various Weber carburettors. These consist principally of a slightly different location of a number of jets, control units and the 'constant CO' system. Consequently, the various Weber carburettors are not described separately.


41 336

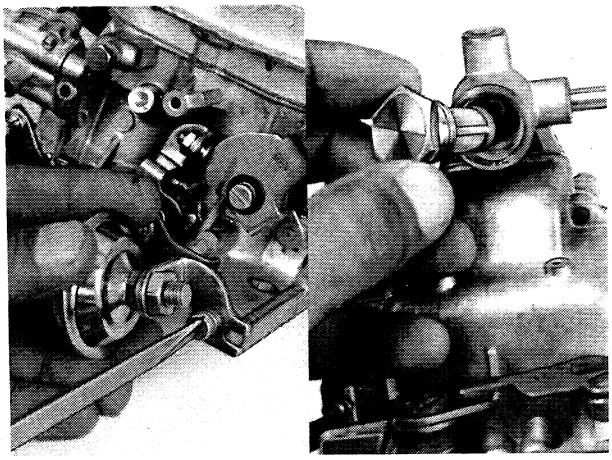
CC1

Remove the pre-heating flange from the carburettor

CC2

Clean the various parts

Remove any gasket remnants.
Caution! Make sure that no gasket remnants fall into the manifold.
Clean the carburettor and blow it dry with compressed air.



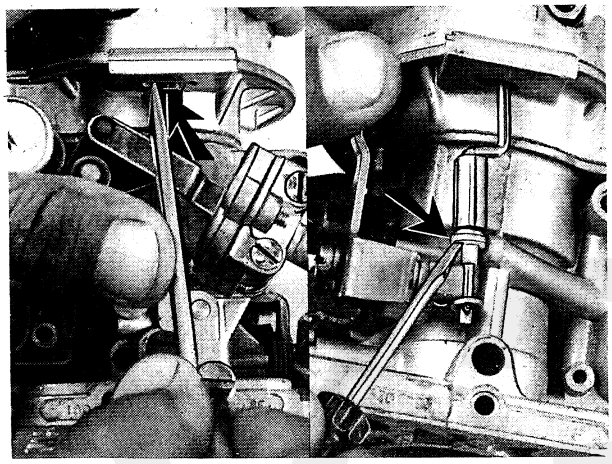
CC3

Remove the dashpot

(if fitted)

CC4

Remove the fuel supply filter



CC5

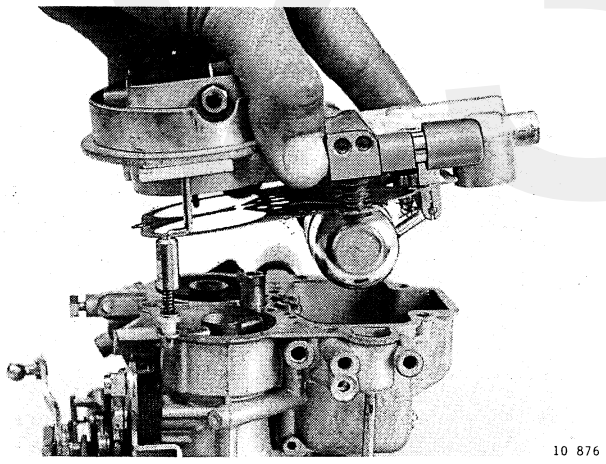
Release the control rod from the pneumatic choke

Remove the spring clip.
Press the control rod out of the lever.

CC6

Release the control rod from the mechanical choke

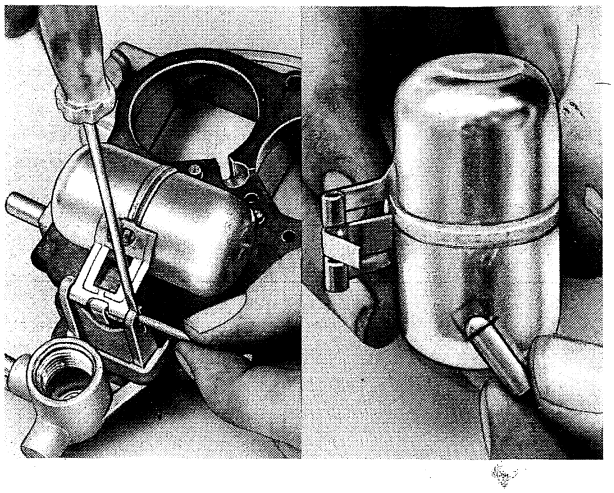
Press the choke lever slightly inwards.
Press the nylon locking sleeve upwards against spring pressure and then withdraw the control rod sideways out of the lever.



CC7

Remove the cover from the float chamber

Remove the five retaining screws.
Remove the cover vertically from the float chamber.
Note: take care not to damage the float.



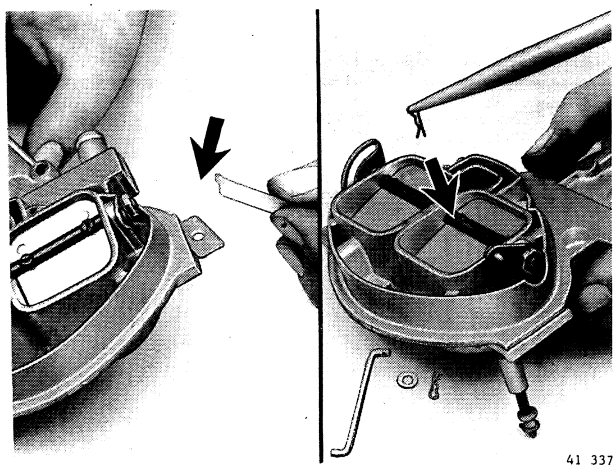
CC8

Remove the float from the cover

Prise open the spindle support just sufficiently to remove the spindle.

CC9

Remove the needle valve from the float



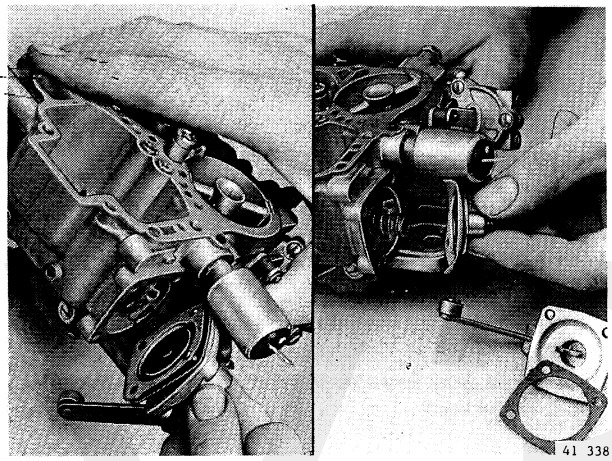
CC10

Remove the gasket from the cover

CC11

Remove both choke control rods and the plastic seals from the cover

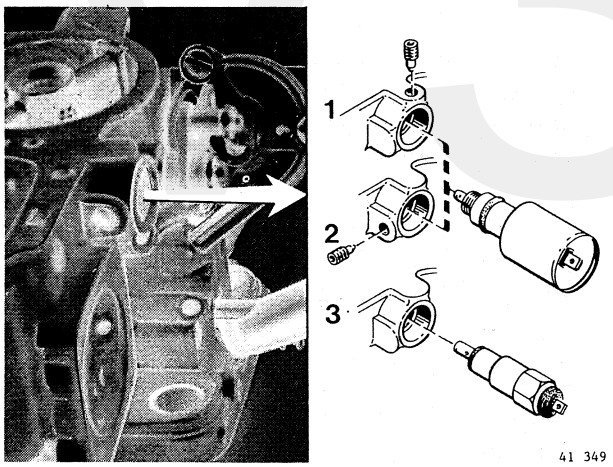
Pull off the spring clips and remove the control rods.
Remove the small caps and seals.



CC12

Remove the accelerator pump

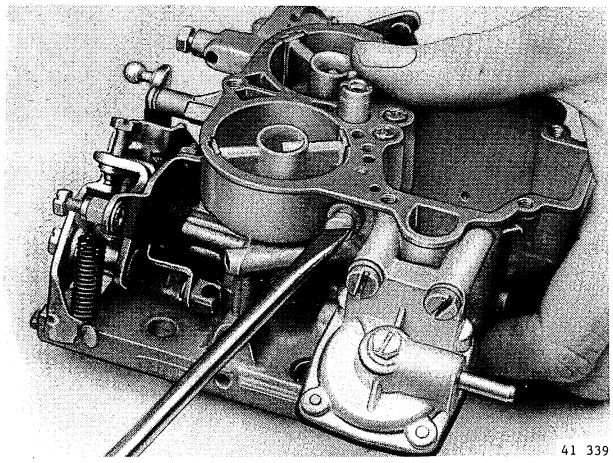
Remove the four retaining screws.
Remove the cover, the diaphragm and the spring.



CC13

Remove the idle solenoid

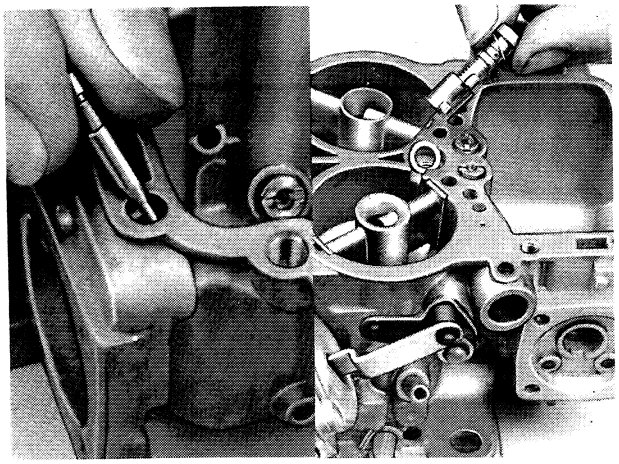
Note! there are three types of solenoid.
Slacken the socket-head screw (if fitted).
Unscrew the idle solenoid.
Check that the seat is not scored or otherwise damaged (due to poor or erratic idling).



CC14

Remove the idle jet from the second stage (barrel) (if still in use)

Note: this open idle jet has meanwhile been superseded by a blind jet (with the exception of DIR 93-100/95-100).

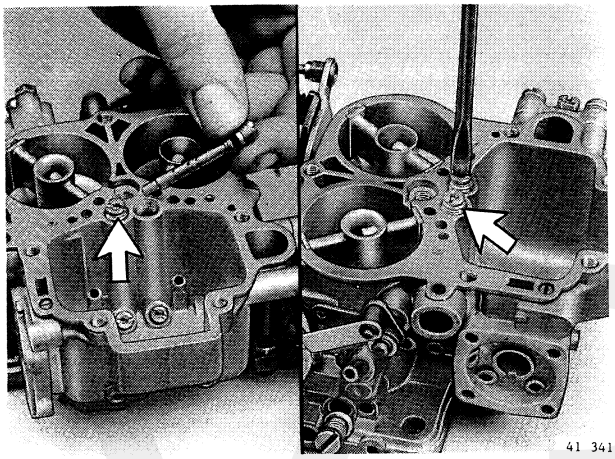


CC15

Remove the accelerator pump injector

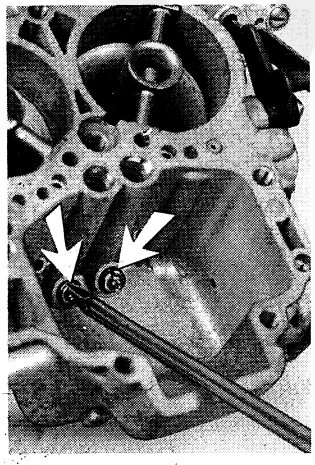
CC16

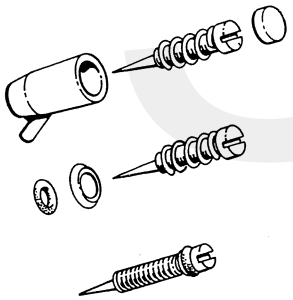
Remove the calibrating screw from the accelerator pump



CC17

Remove both air correction jets and emulsion tubes





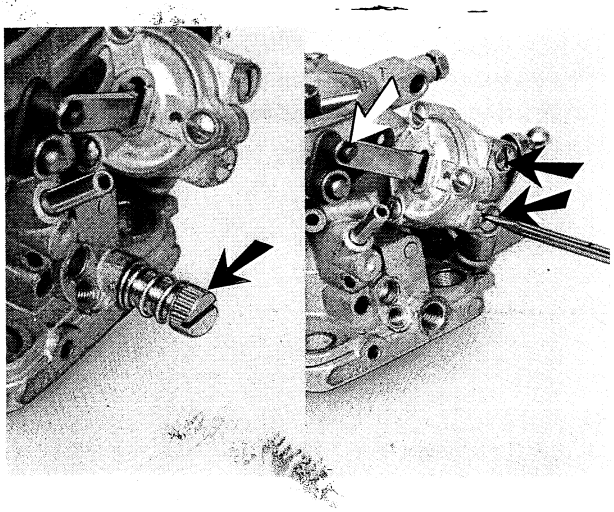
CC18

Remove both main jets

CC19

Remove the mixture control screw

If fitted, first remove the tamper-proof seal.
Note: there are four types.



CC20

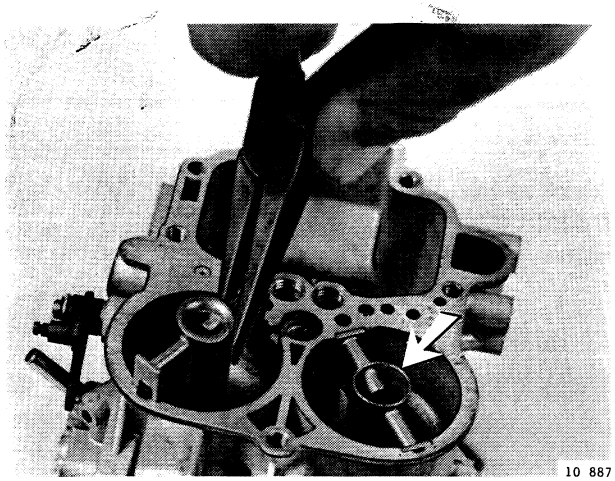
Remove the idle adjusting screw

In the case of carburettors with the 'constant CO' system.

CC21

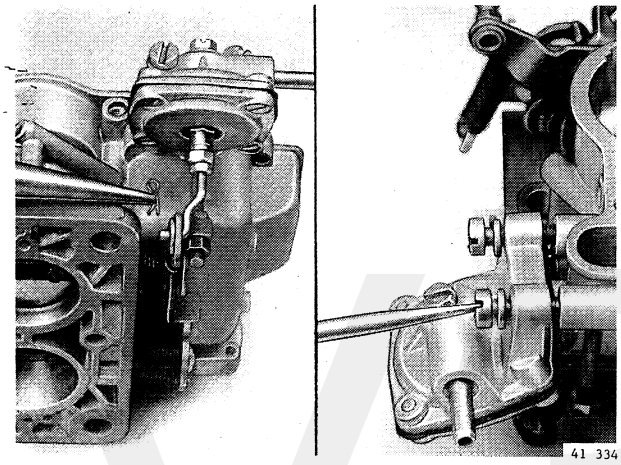
Remove the pneumatic choke

Remove the circlip.
Remove the two retaining screws.
Remove the diaphragm valve from the carburettor.
Note the O-ring.



CC22

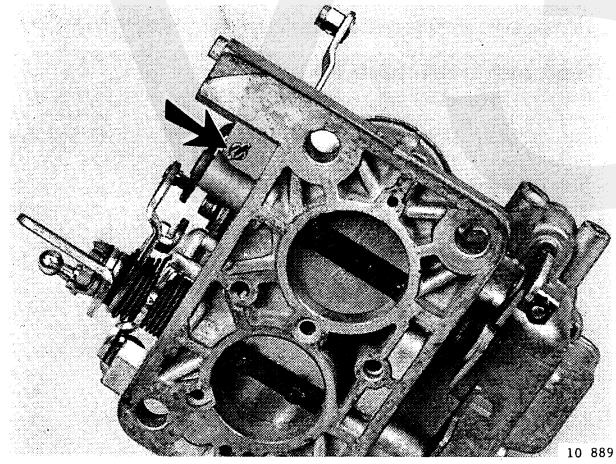
Remove both auxiliary venturis



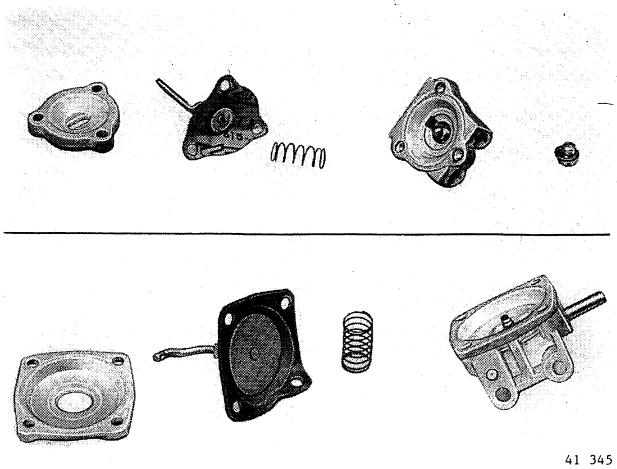
CC23

Remove the diaphragm valve from the decelerating mechanism

(if fitted)

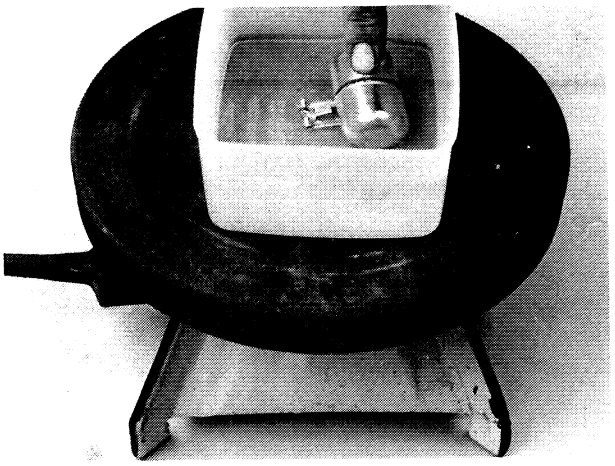


Note: never alter the setting of the throttle stop screw; this could cause the throttle valve to stick.



CC24

Disassemble the diaphragm valve of the pneumatic choke and the decelerating mechanism ('S' version)



CC25

Clean and check

Clean and check all the parts of the carburettor.
Blow through the jets and passages with compressed air

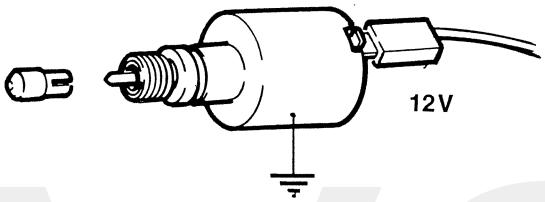
CC26

Check the float for leakage

Immerse the float in a bowl of warm water.
There must be no air bubbles.

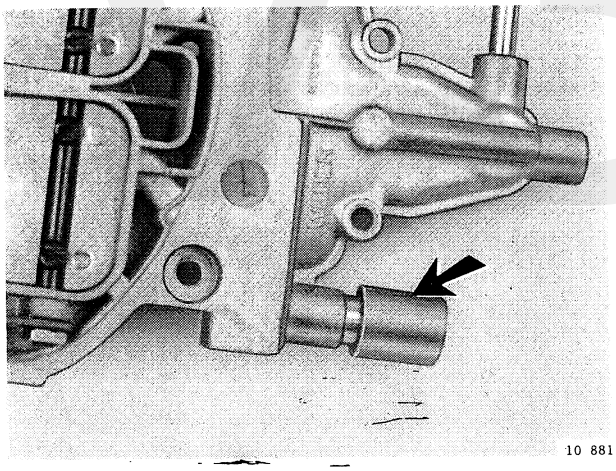
CC27

Check the idle solenoid for correct operation



10 114

Remove the nozzle from the solenoid.
Connect the solenoid to a 12 V source and earth and check whether the jet needle pulls in.
If not, renew the solenoid.



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CC28

Blow through the vent valve

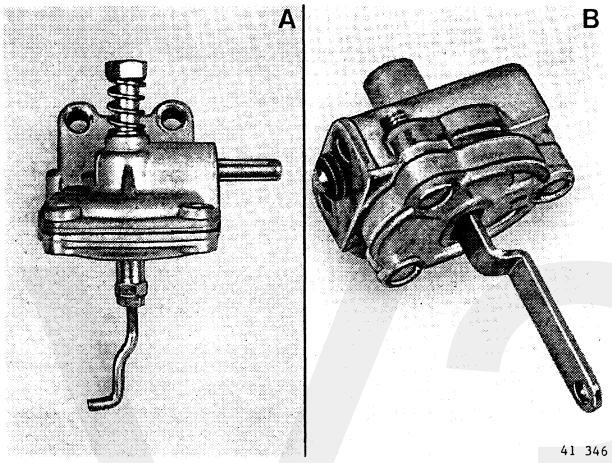
Remove the cap and replace it after blowing through the vent valve.
Note: on earlier versions there is a filter at this position.
Lever the filter out of the carburettor body and clean it.
Coat the filter with Loctite and replace it.

CC29

Remove the tamper-proof seal from the 'constant CO' system

In the case of carburettors with a constant CO system the tamper-proof seal (A) must be removed.
The tamper-proof seal must **not** be fitted back on the carburettor.

DD. Assembling the Weber carburettor

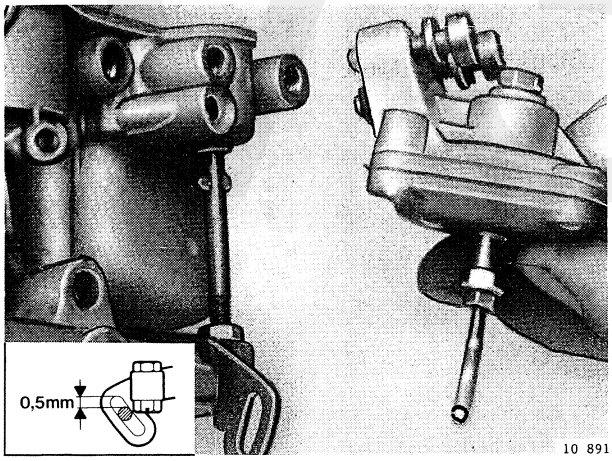


41 346

DD1

Assemble the diaphragm valve of the decelerating mechanism (A) ('S' version) and the pneumatic choke (B)

A: the control rod must be turned 180° in relation to the vacuum connection.
B: the flat side of the control rod must be parallel to the mating face.

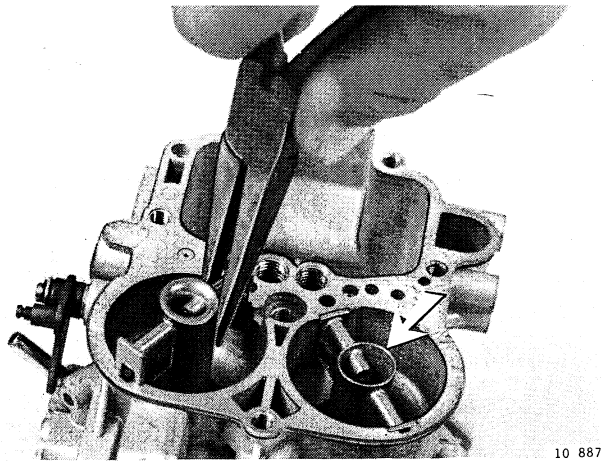


10 891

DD2

Fit the diaphragm valve of the decelerating mechanism on the carburettor

Use a new O-ring.
The length of the control rod must be adjusted to obtain **0.5 mm** clearance between the lever and the control rod.
Locate the washer and insert the locking pin.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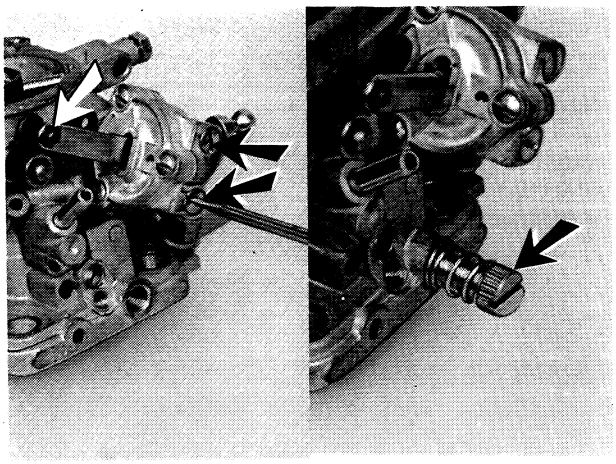
DD3

Fit the auxiliary venturis

Note: the auxiliary venturis must be located so that the ports in the side of the auxiliary venturis are opposite the ports in the float chamber.
The first stage venturi has a swirl rod.



DD4

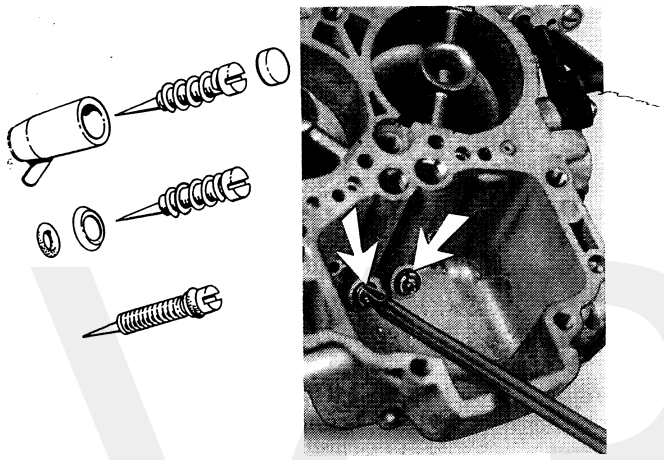
Fit the diaphragm valve of the pneumatic choke

Use a new O-ring.

DD5

Fit the idle adjusting screw

'Constant CO' system.
Fit the spring and fully tighten the adjusting screw; then back it off **1.5 to 2** turns.



DD6

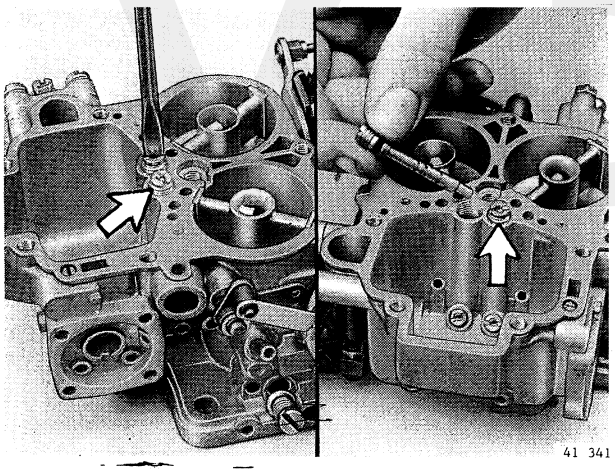
Fit the mixture control screw

Fully tighten the mixture control screw; then back it off 1.5 to 2 turns.
Note: do not yet fit the tamper-proof seal.

DD7

Fit the main jets

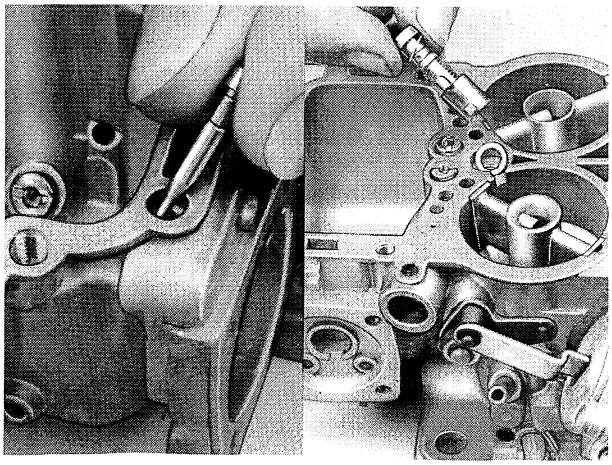
See the specifications.



DD8

Fit the emulsion tubes and the air correction jets

See the specifications.



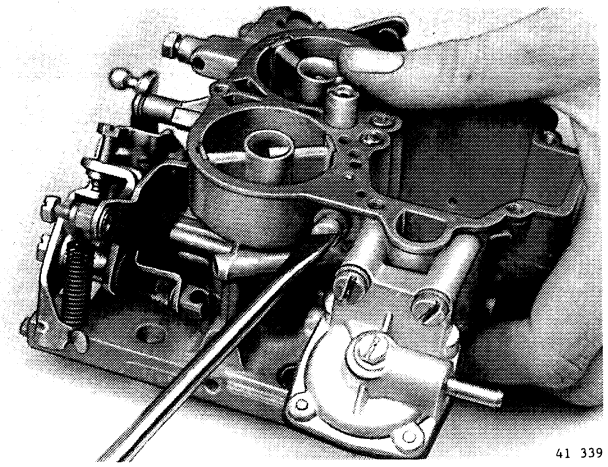
DD9

Fit the accelerator pump calibrating screw

DD10

Fit the accelerator pump injector

Push the injector into the carburettor body; take care not to damage the pipe.


41 339

DD11

Fit the second stage idle jet

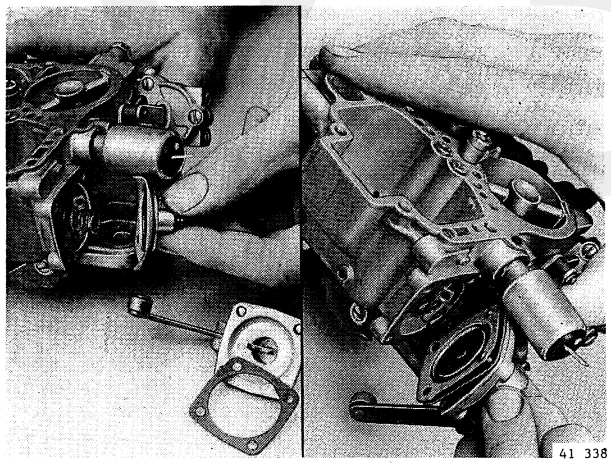
Note: the open idle jet has meanwhile been superseded by a blind jet. If this has not yet been done, the open jet must now be replaced by a **blind** jet (with the exception of DIR 93-100/95-100).
Part number 3277425-9.

DD12

Fit the idle solenoid

Carburettor	Engine	Part No.
32DIR-85	B14.0E/S	3277332-7
	B14.1E	
	B14.1/2S	
32DIR-93 and higher	B14.2E	3342556-2
	B14.3S	
	B14.4S	
	B14.4O	
	B14.4E	

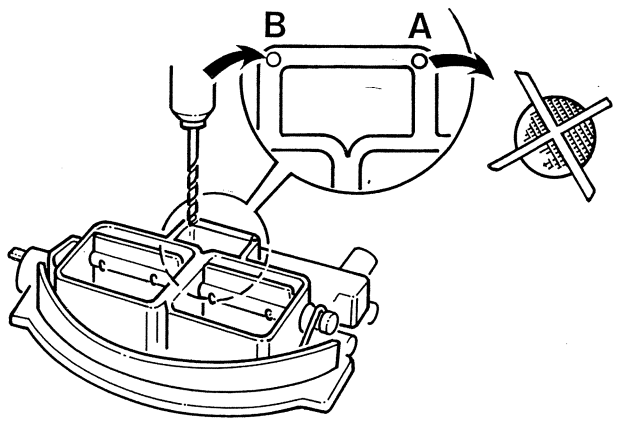
Tightening torque: 5 Nm.


41 338

DD13

Fit the accelerator pump

Fit the spring, diaphragm, gasket and cover.
Tighten the screws.

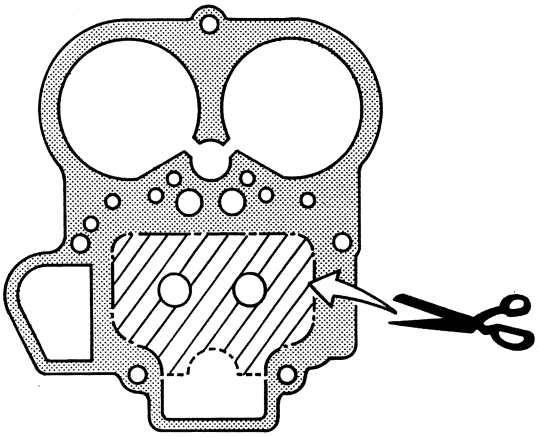


42 472

DD14

Check the float chamber cover

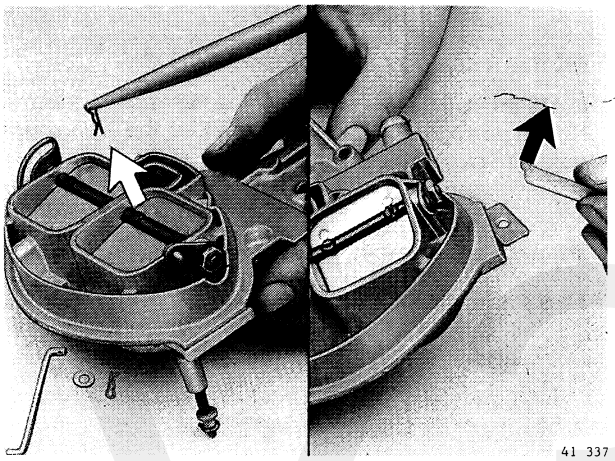
Before reassembling, first check that the two 4 mm diam. holes (A and B) are present in the cover.
If hole (B) is not present, it must in that case be drilled in the cover (4 mm diam.)
If there is a filter in hole (A) and/or (B), this must be removed.



DD15

Modify the gasket for the float chamber cover

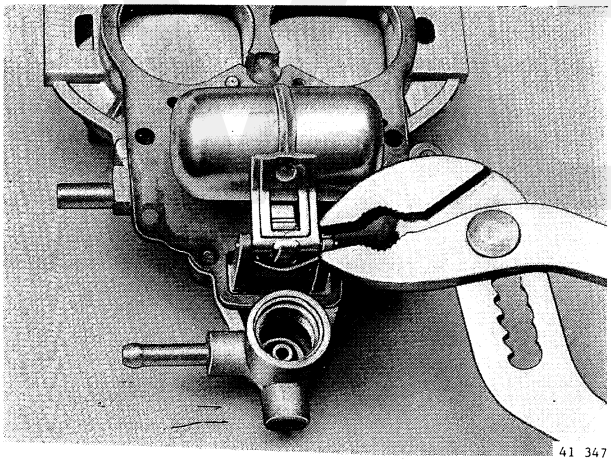
Use a **new** gasket and cut out the shaded section (see drawing) if this is present.



DD16

Fit both choke control rods, the seals and the caps in the cover

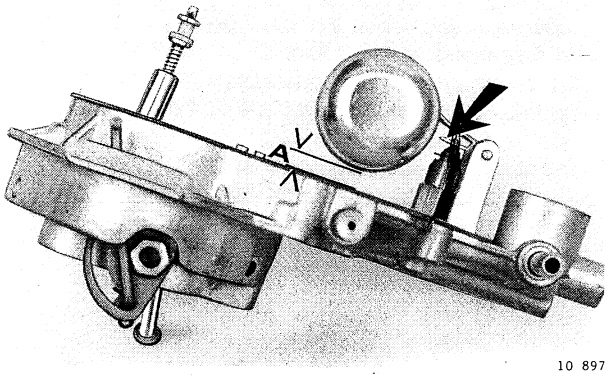
Fit the washers and spring clips.



DD17

Fit the float to the cover

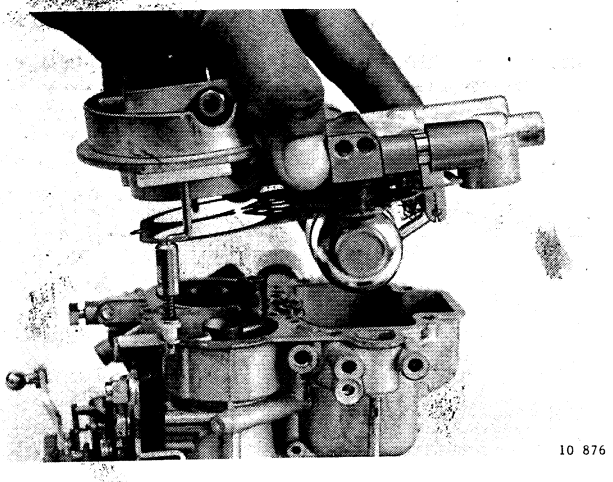
Place a new gasket on the cover.
Fit the needle valve to the float.
Insert the float spindle and close the spindle support with a pair of pliers.



DD18

Adjust the float height

Hold the cover so that the float is just touching the needle valve.
Dimension (A) should now be **7 mm** (measured at the soldered seam).
If necessary, correct this dimension by bending the lip.
Note: make sure that the gasket is lying flat on the cover.

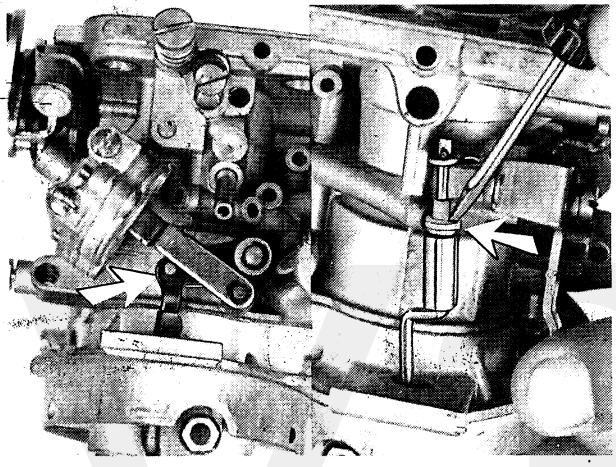


10 876

DD19

Fit the cover on the float chamber

Make sure that the choke control rods are correctly located.
Tighten the retaining screws (if necessary, use Loctite).
Note: use screws with wavy washers.



DD20

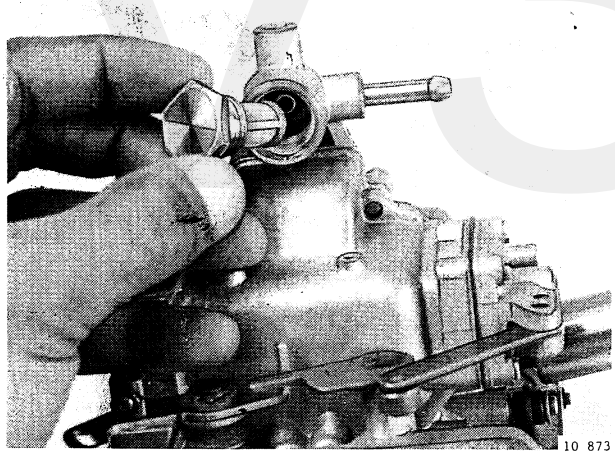
Fit the mechanical choke control rod

Press the nylon sleeve upwards against spring pressure. Fit the control rod in the lever and let the nylon sleeve spring back in the guide.

DD21

Fit the pneumatic choke control rod

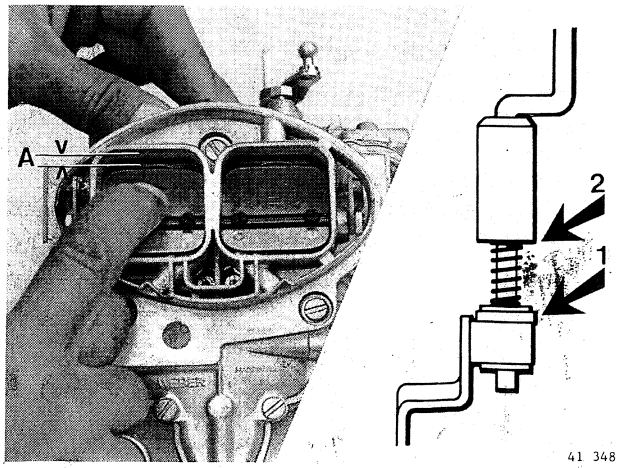
Fit the spring clip.



10 873

DD22

Fit the fuel supply filter



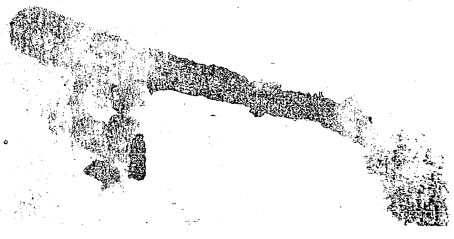
41 348

DD23

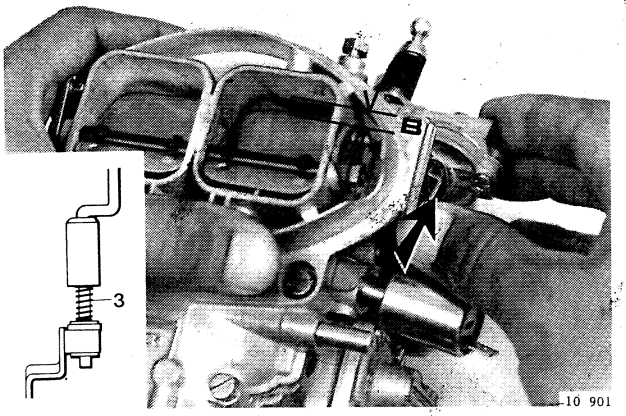
Check/correct the mechanical choke setting

Checking: press in the choke lever against the stop and keep the lever in this position.
Press the choke valves back as far as the stop.
Dimension (A) should now be **4 ±0.5 mm.**

Correcting: the choke opening can be altered by fitting a shim (1) with a different thickness and/or by grinding a small amount of material from the spacer (2).

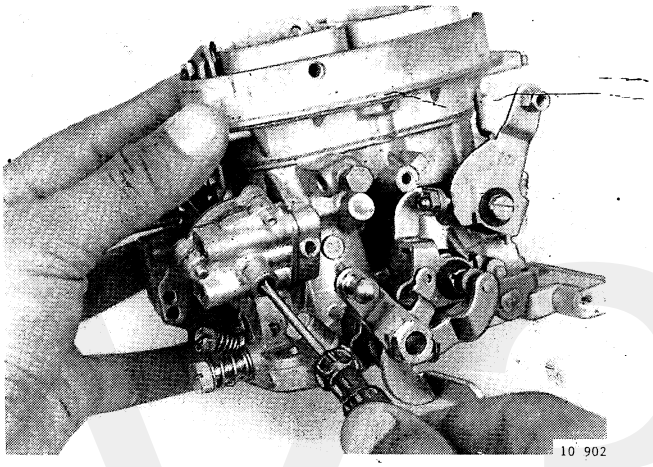


DD24



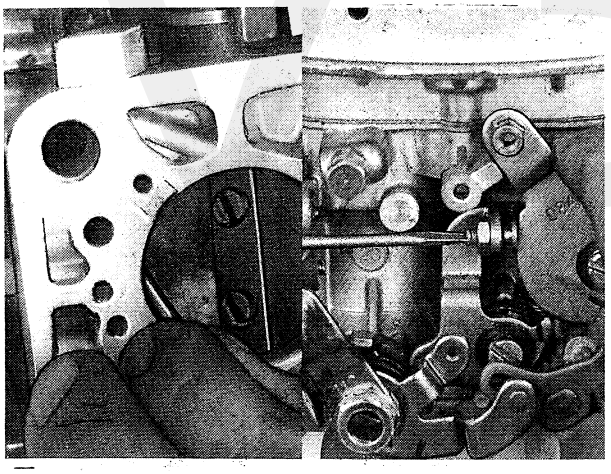
Check/correct the pneumatic choke setting

Checking: press in the mechanical choke lever to the point where the spring (3) is about to be compressed; hold the lever in this position.
Now press in the control rod on the diaphragm valve to its full extent.
Measure the distance; see the specifications.



Correcting: remove the cap or screw, respectively, from the diaphragm valve.
This exposes an adjusting screw which can be used to correct the choke opening.
After correction, reseal with the screw or the cap.

DD25

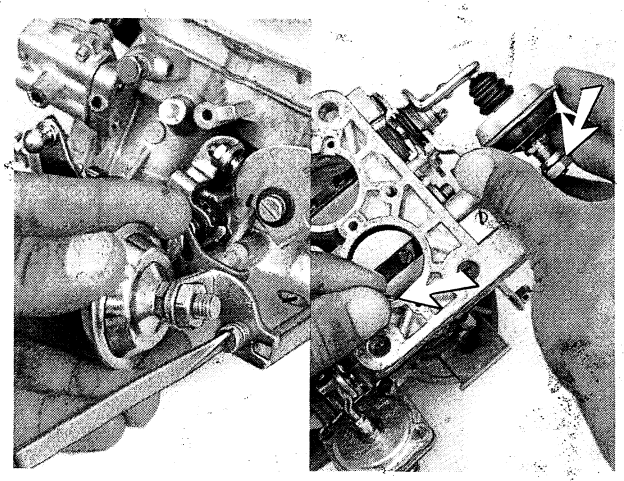


Check/correct the throttle valve opening with full choke

Checking: press in the choke lever against the stop.
Check the opening of the throttle valve in the first stage.
Correct setting: **0.9 ±0.05 mm.**

Correcting: press in the choke lever against the stop.
Slacken the lock nut and correct the throttle valve opening with the adjusting screw.
Tighten the lock nut again.

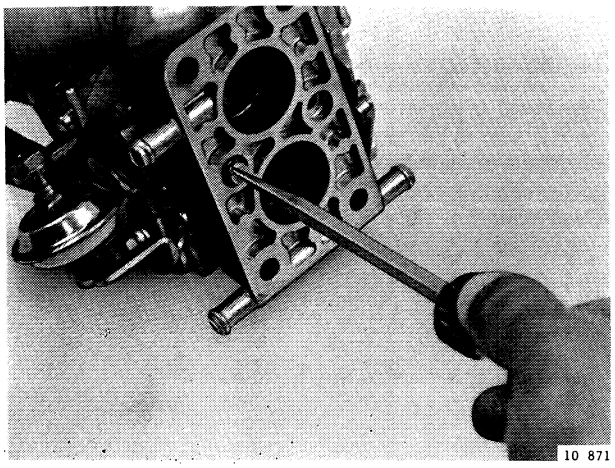
DD26



Fit and adjust the dashpot (if fitted)

Fitting:
Tighten the retaining screw.

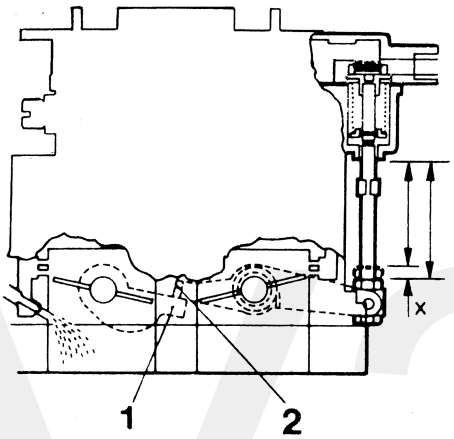
Adjusting:
The throttle control lever must just touch the dashpot when the first stage throttle valve is open **1.5 mm.**
Lock the dashpot with the lock nut.


10 871

DD27

Fit the pre-heating flange on the carburettor

Note: use new gaskets.



10 907

DD28

Check the working of the vent valve and correct the setting if necessary

Checking: the vent valve should close as soon as the throttle lever is moved.

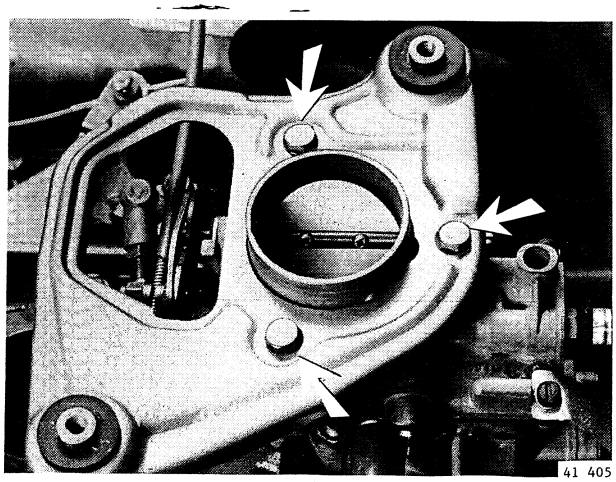
Correcting: measure the length of the control rod. Then open the throttle valve so that the cam (1) just releases the lever (2).
Measure the length of the control rod again.
The measured difference in length is the maximum stroke of the vent valve.
This stroke should be **2.5 mm** and can be adjusted with the nuts on the control rod.

EE. Removing and fitting the Solex carburettor

Risks to avoid when working on the carburettor

When working on the carburettor, it is not uncommon for petrol to spill over the engine. If the engine is hot, there is not only a risk of the petrol igniting but also a health hazard on account of the high benzene content in the surrounding air. The **lead** in petrol also constitutes a health hazard.

Such risks can be avoided by pinching off the fuel line ahead of the carburettor and running the engine until there is no fuel left in the carburettor before starting to work on it.


41 405

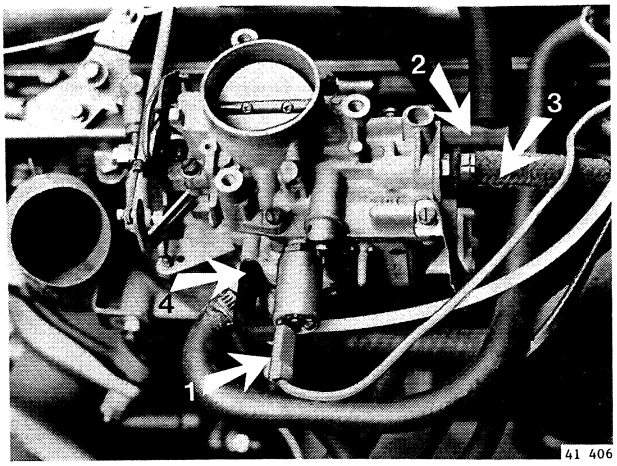
EE1

Remove the air filter

EE2

Remove the air filter bracket

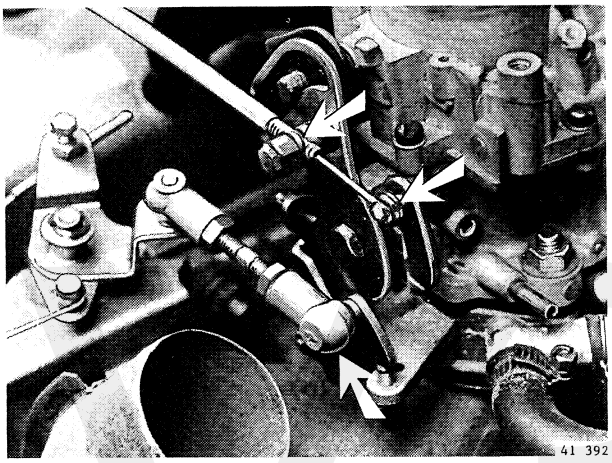
Remove the three bolts (take note of the washers).



EE3

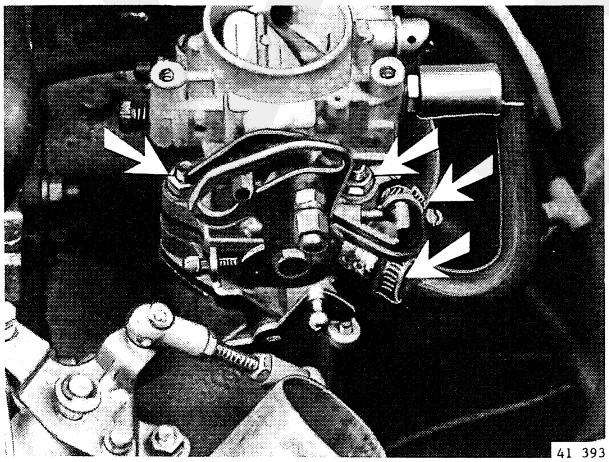
Disconnect the hoses and the electrical connection

1 Connection for the idle solenoid.
2 Hose for the crankcase ventilation.
3 The fuel supply hose.
4 The hose to the distributor.



EE4

Disconnect the choke cable and the throttle control rod



EE5

Release the coolant hoses from the throttle valve housing

EE6

Remove the carburettor from the manifold

Remove the two nuts and washers.

EE7

Remove the insulating flange from the manifold

EE8

Fitting:

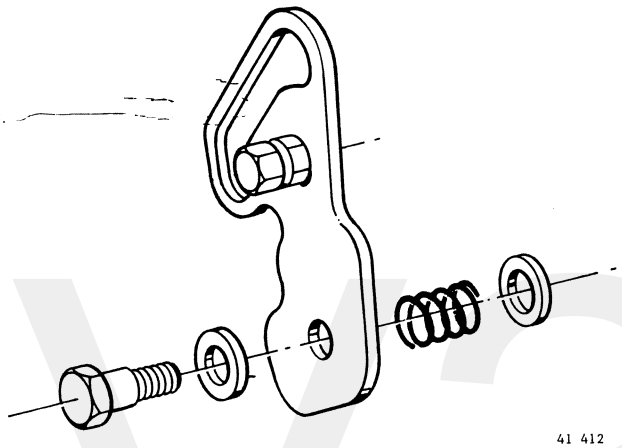
- Fitting is in reverse order to removal. Tightening torque of nuts: 17 Nm.
  Note: always fit the insulating flange with new gaskets.
- Fit the choke cable first and then adjust it. Tightening torque of nipple: 10 Nm.
- Fit the throttle control rod.
- Check the choke and throttle linkage for correct operation.
- Fit the air filter assembly and tighten the bracket. Tightening torque: 10 Nm.
- Adjust the carburettor; see Operations *MM1* and *MM2.*

FF. Reconditioning the Solex carburettor

FF1

Clean the various parts

Remove any gasket remnants.
Caution! Make sure that no gasket remnants fall into the manifold.
Clean the carburettor and blow it dry with compressed air.

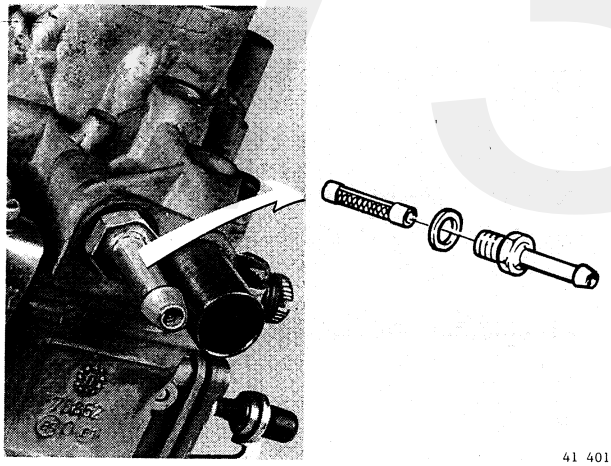


41 412

FF2

Remove the choke lever (if necessary)

Take note of the ball and the return spring.

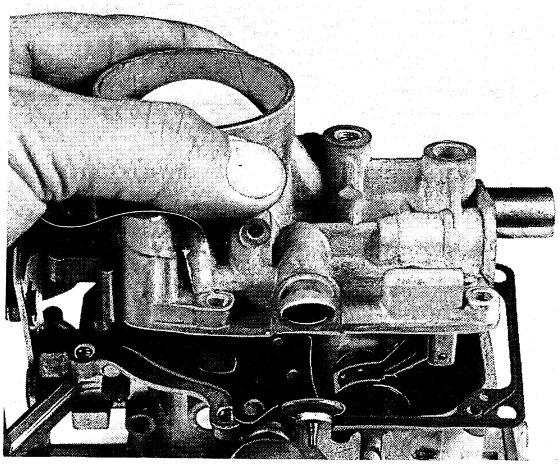


41 401

FF3

Remove the fuel supply union

Remove the nipple, copper packing ring and filter.

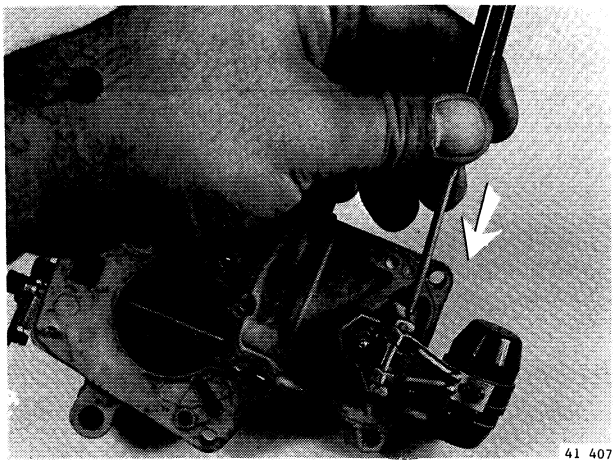


41 394

FF4

Remove the cover from the float chamber

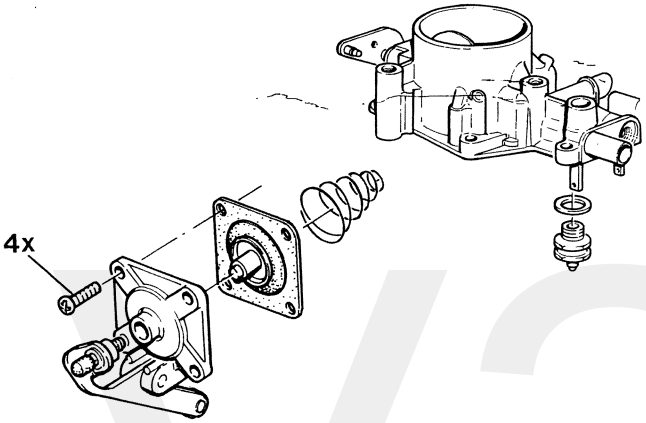
Remove the five retaining screws.
Remove the cover vertically from the float chamber.
Take care not to damage the gasket and remember the position of the identification plate.


41 407

FF5

Remove the float from the cover

Remove the pivot pin with a drift.



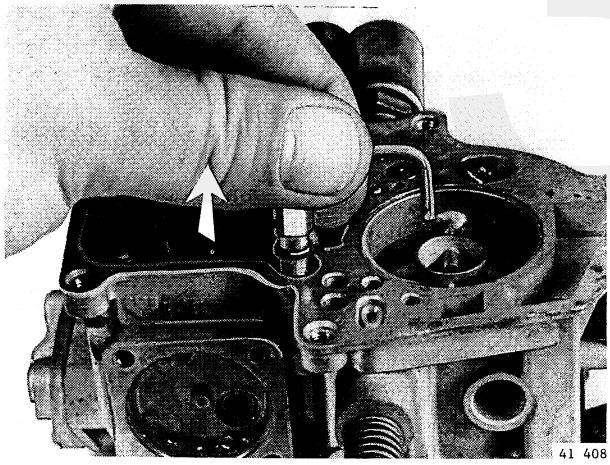
FF6

Remove the needle valve from the cover

FF7

Remove the accelerator pump

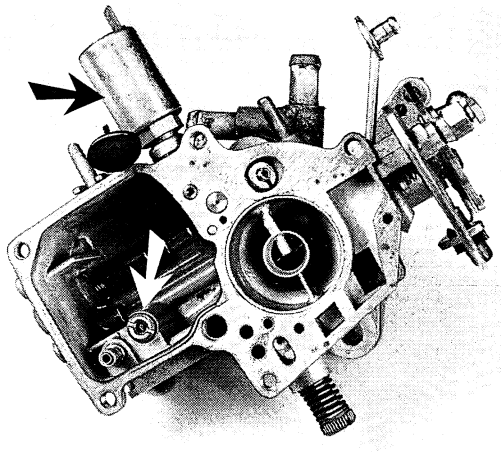
Remove the four retaining screws.
Lift off the cover together with the lever.
Remove the diaphragm and spring.


41 408

FF8

Remove the accelerator pump injector

Pull the injector out of the carburettor.

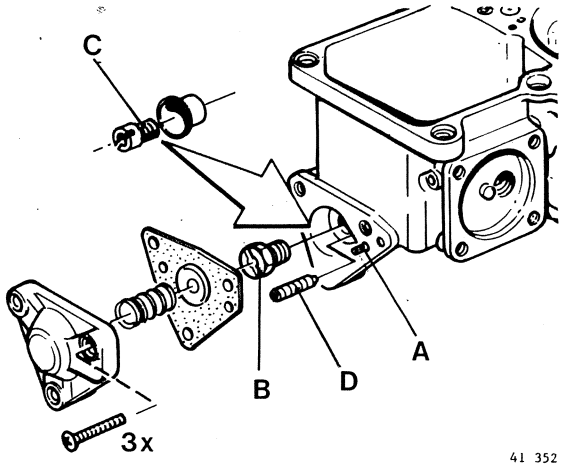

41 409

FF9

Remove the non-return valve from the accelerator pump injector

FF10

Remove the idle solenoid



41 352

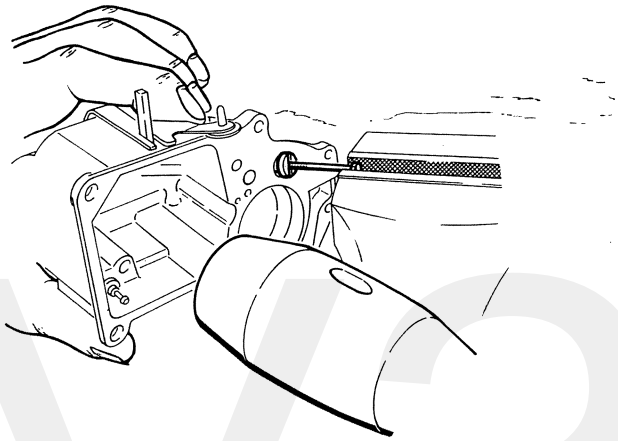
FF11

Remove the full-load section

Remove the three retaining bolts.
Remove the cover, return spring and diaphragm.

Take note of the calibrated through-pipe (A).

Remove the full-load delivery valve (B) and the calibrated screw (D).



40 012

FF12

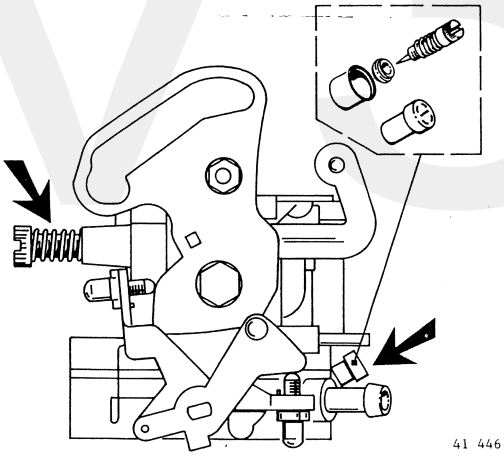
Remove the main jet

Remove the main jet (C), together with the sleeve, through the aperture of the full-load section.

FF13

Remove the air correction jet and emulsion tube

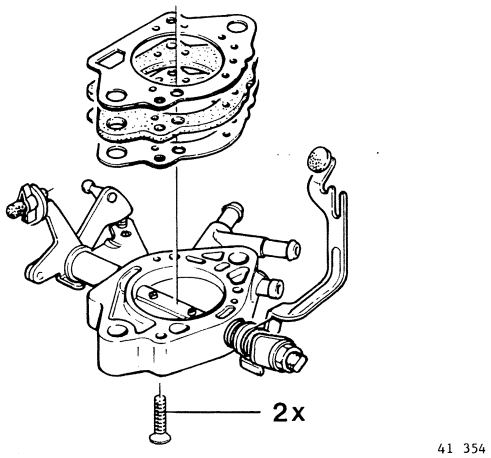
Unscrew the air correction jet.
Screw an **M4x1** bolt into the emulsion tube in the place of the air correction jet.
Clamp the bolt in a bench vice and carefully tap the carburettor body with a plastic-tip hammer.



41 446

FF14

Remove the mixture control screw and the idle adjusting screw

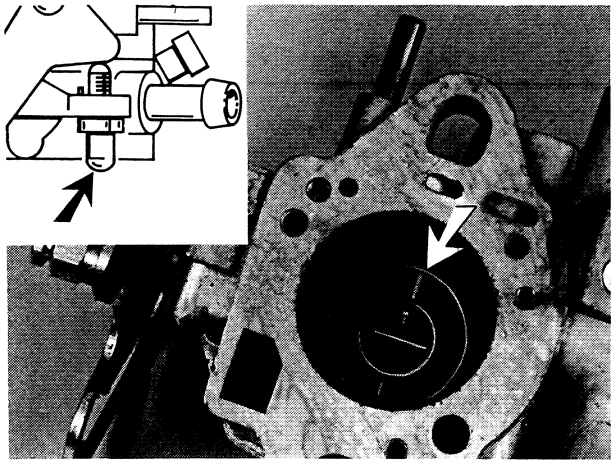


41 354

FF15

Remove the throttle valve housing

Remove the two screws.
Lift off the throttle valve housing.
Note: remember the position of the throttle valve spring.



FF16

Remove the auxiliary venturi

Tap carefully against the bottom of the auxiliary venturi.
Take care not to damage any parts of the carburettor.

FF17

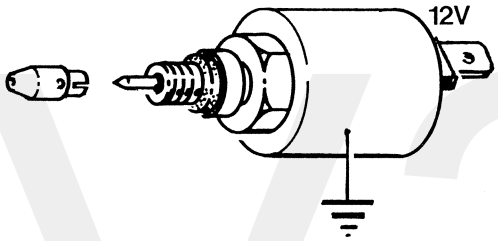
Clean and check

Clean and check all the parts of the carburettor.
Blow through the jets and passages with compressed air.
Check the ball in the accelerator pump injector; it must not be stuck.
Note: never alter the setting of the throttle stop screw.

FF18

Check the float for leakage

Immerse the float in a bowl of warm water.
There must be no air bubbles.

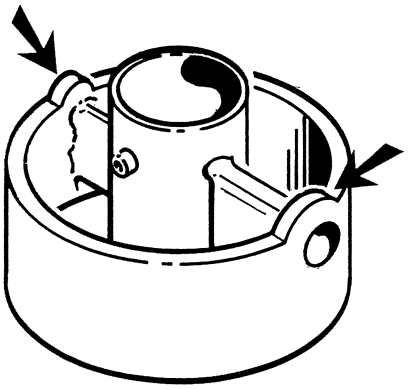


FF19

Check the idle solenoid for correct operation

Remove the nozzle from the solenoid.
Connect the solenoid to a 12 V source and earth and check whether the jet needle pulls in.
If not, renew the solenoid.

GG. Assembling the Solex carburettor

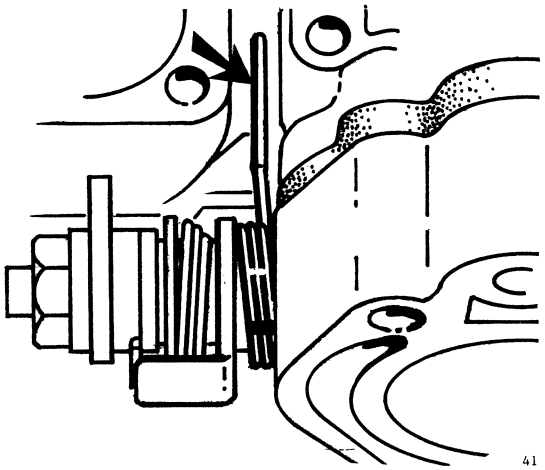


41 355

GG1

Fit the auxiliary venturi

Fit the auxiliary venturi with the aid of a plastic-tip hammer.
Caution! Make sure that the big and small lugs at the bottom are correctly located.
Make sure that the opening on the side of the auxiliary venturi is aligned with the opening in the carburettor body.

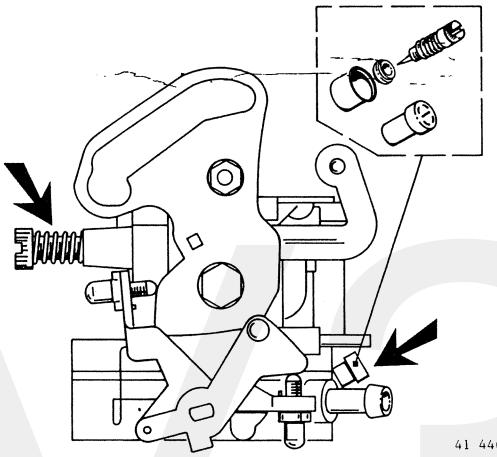


41 356

GG2

Fit the throttle valve housing

Fit the insulating flange with **new gaskets.**
Locate the throttle valve housing and tighten the two screws.
Note: make sure that the spring of the vent valve abuts against the underside of the carburettor body.



41 446

GG3

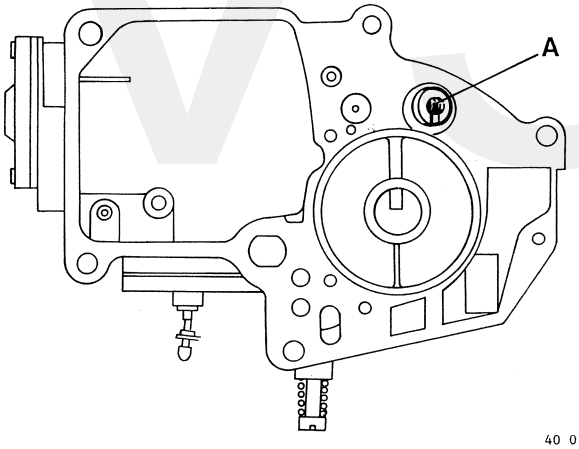
Fit the idle adjusting screw

Locate the spring and first tighten the adjusting screw **fully**; then back it off **4 turns.**

GG4

Fit the mixture control screw

Locate the spring and O-ring and first tighten the mixture control screw **fully**; then back it off **2.5 turns.**
Note: do not yet fit the seal.

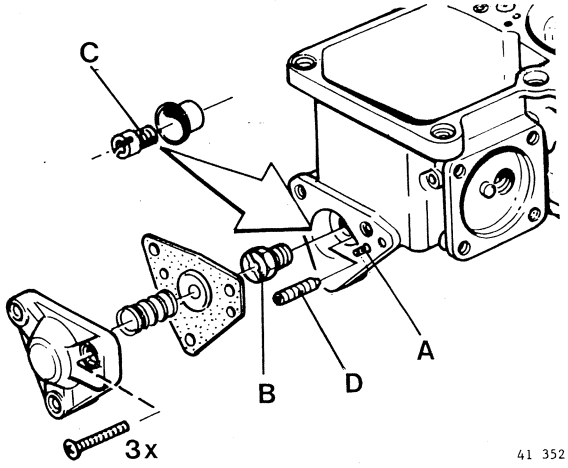


40 013

GG5

Fit the emulsion tube and air correction jet

Fit the emulsion tube (A) with the aid of a plastic-tip hammer.
Caution! The slit in the head of the emulsion tube must be pointing towards the auxiliary venturi.
Fit the air correction jet.



41 352

GG6

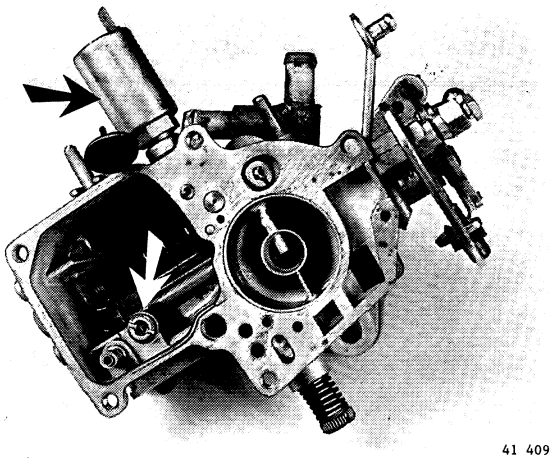
Fit the main jet

Remember the sleeve.

GG7

Fit the full-load section

Fit the calibrated screw and the full-load delivery valve.
Locate the diaphragm, return spring and cover.
Tighten the three retaining screws.
Note: the side of the diaphragm with the pin must be facing the full-load delivery valve.



41 409

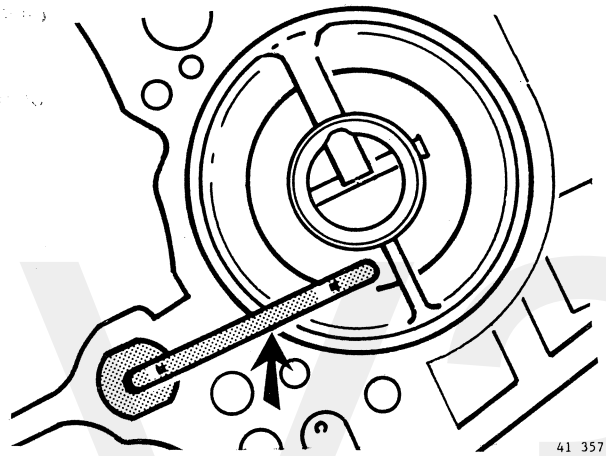
GG8

Fit the idle solenoid

If necessary, renew the packing ring.
Tightening torque: 1 Nm.

GG9

Fit the non-return valve for the accelerator pump injector

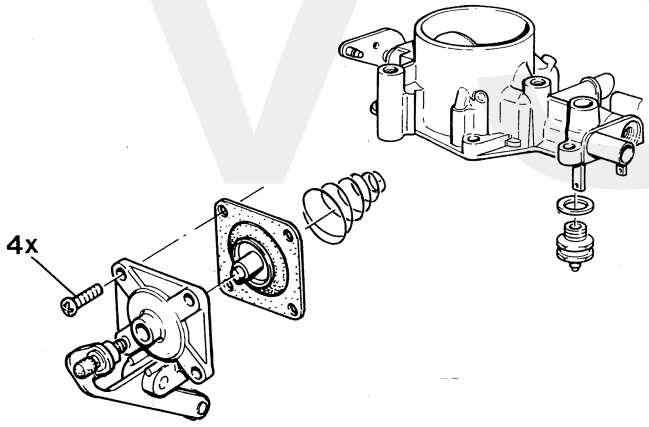


41 357

GG10

Fit the accelerator pump injector

Remember the O-ring.
Press the injector into position.
Note: the injector must be facing the venturi, but must not be in contact with it.



GG11

Fit the accelerator pump

Locate the return spring, diaphragm and cover.
Tighten the four screws.

GG12

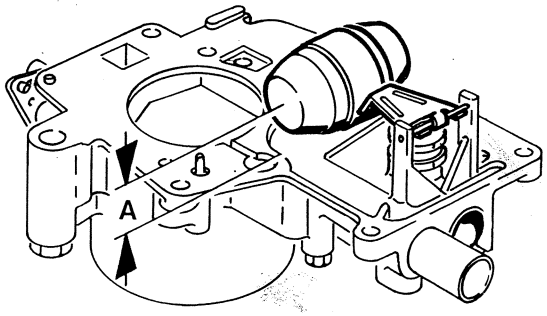
Fit the needle valve in the cover

Use a **new** copper packing ring.

GG13

Fit the float

Locate the float in the correct position and fit the pivot pin.



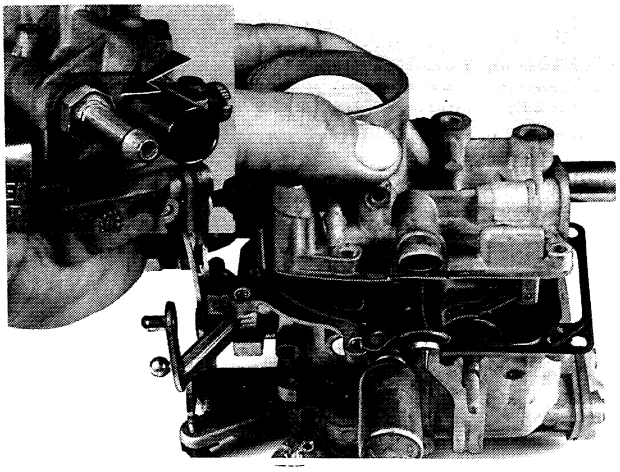
40 011

GG14

Check/correct the float height

Checking:
Hold the float chamber cover upside-down and measure the distance between the centre of the float and the mating face (dimension A).
Dimension A should be **22.7 ±1 mm.**

Correcting:
Correct, if necessary, by bending the float lever.
Note: make sure that the float can pivot freely.



GG15

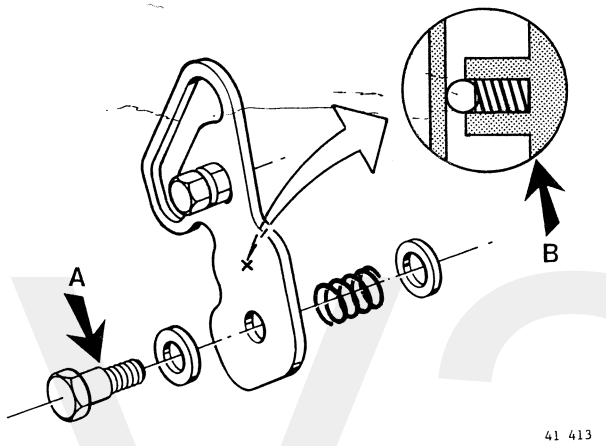
Fit the float chamber cover

Fit a new gasket and tighten the five retaining screws.

GG16

Fit the fuel supply union

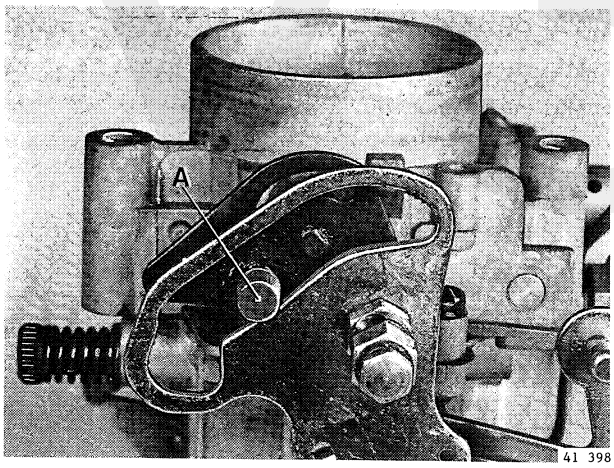
Locate the filter, O-ring and connecting nipple.



GG17

Fit the choke lever (if released earlier)

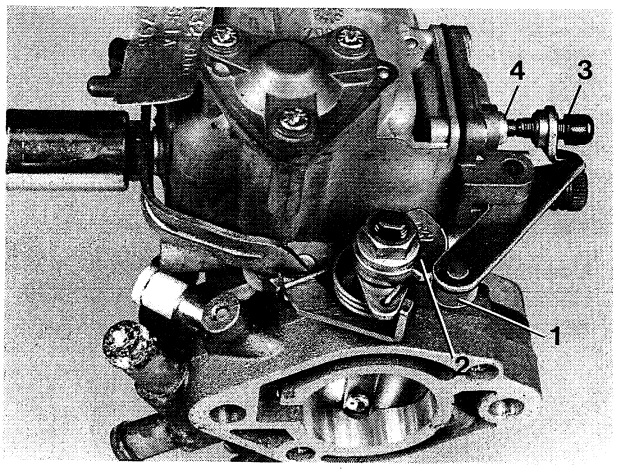
Note: if the choke lever was released earlier, the pivot pin (A) must be coated with Loctite 242 before fitting; or it must be replaced by a special self-locking bolt, Part No. 3287186-5.
When fitting, also take note of the correct position of the return spring and ball (see illustration B).



GG18

Check that the choke mechanism works smoothly

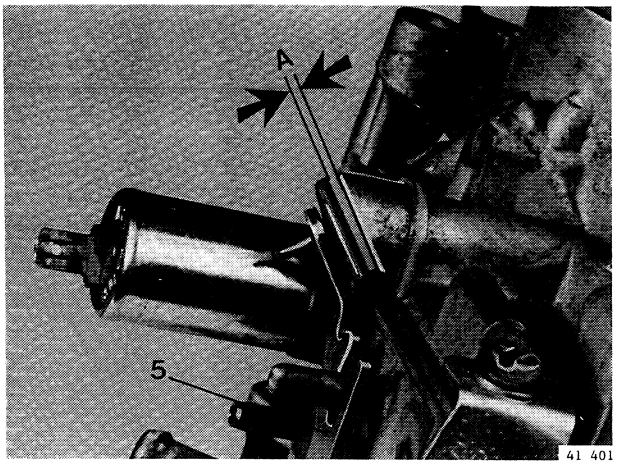
Note: coat the guide cam (A) with BR2S grease, Part No. 1161029.



GG19

Adjust the stroke of the accelerator pump

- Press the throttle valve to the idling position (carburettor removed from engine).
- Press the roller (1) against the cam (2).
- Tighten the adjusting screw (3) until it just touches the plunger (4); then tighten a further half-turn.
  Replace the rubber cap.



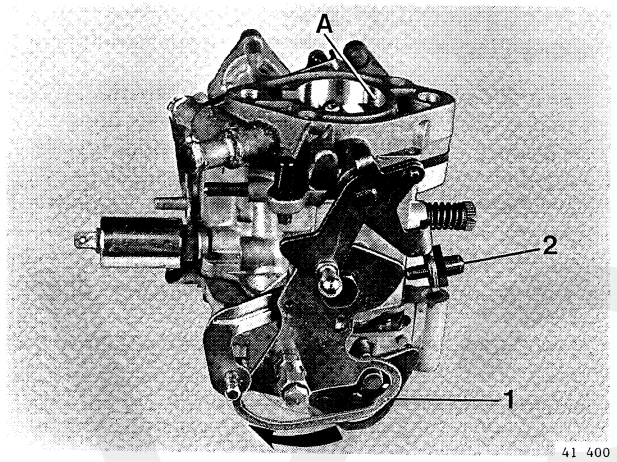
GG20

Check/correct the opening for float chamber ventilation

Checking:
- Press the throttle valve to the idling position.
- Measure distance A.

Distance A should be **3.5 ±0.5 mm.**

Correcting:
Make any necessary corrections by slightly bending the lever (5) at the bottom.



GG21

Check/correct the throttle valve opening with full choke

Checking:
- Close the choke (strangler) valve fully by moving the lever (1) in the direction of the arrow.
- Measure the throttle valve opening (A). The opening should be **0.8 mm.**

Correcting:
Make any necessary corrections with the adjusting screw (2).
Replace the rubber cap.

HH. General guidelines for adjusting the CO-content

Before any adjustments are made the following must be checked and, if necessary, corrected
- compression;
- valve clearances;
- condition of the spark plugs;
- ignition system.

Also check for leakage in the inlet and/or exhaust system and confirm that the air filter is not clogged. The choke and throttle controls and the crankcase ventilation should also be checked for correct operation.

The Pulsair system (if fitted) should be released and plugged before measuring the CO-content. When measuring the CO-content, it is important that the carburettor is maintained at a uniform temperature. Run the engine at idling speed for at least 5 minutes: by that time the temperature of the carburettor and the fuel will have become uniform.

Important! The thermo-electric cooling fan must no longer be rotating.

Now measure the CO-content. This should be done while the engine is running at idle.

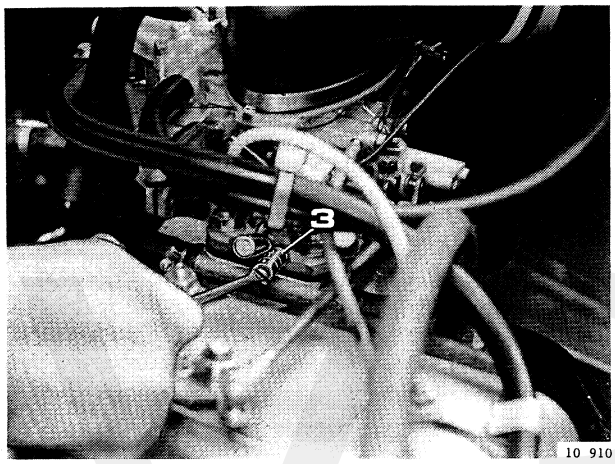
Connecting up the CO-meter
The probe of the CO-meter must be inserted as far as possible into the exhaust pipe. This is to prevent the exhaust gases from being mixed with fresh air.
The probe must be inserted at least 45 cm.

Cars with a catalytic converter
The CO-content must be measured ahead of the catalytic converter. For this purpose, remove the plug.
Warning! The catalytic converter can be extremely hot.
Check the CO-content at idling speed and with the thermo-electric fan stationary.

Adjusting the Weber carburettor

JJ. Idling speed and CO-content

Note: put the selector lever or gear lever in neutral. Make sure that the ignition timing and valve clearances are correctly adjusted, that the air filter is clean and that the idle solenoid is operating and properly secured.



JJ1

Idling speed

Raise the engine speed to approximately 50 r/s (3,000 r/min) and let it run until the thermostat has opened.
Now check the idling speed (see the specifications).
Adjust the idling speed with throttle stop screw 1 (old type carburettors) or adjusting screw 3 (constant CO system).
Note: on carburettors with adjusting screw 3, the throttle stop screw is sealed and its setting must not be changed.
If correct idling cannot be obtained with adjusting screw 3, the basic setting will have to be corrected; see Operations *PP1* and *PP2*.

JJ2

CO-content (of the exhaust gases)

Note: first read the general guidelines on page 123.

Checking:
Connect up the CO-meter.
Check the CO-content (see the specifications).
The CO-content must be measured at idling speed. In the case of B14.S engines, the Pulsair system must be pinched off with clamps or disconnected and plugged.
If the CO-content is correct, fit a tamper-proof seal (cap) on the CO adjusting screw (if this has not already been done).

JJ3

Adjusting:

If the CO-content is incorrect, it can be corrected with adjusting screw (4) (new type carburettor), or with adjusting screw (2) (old type).
If necessary, remove the seal.
Adjust the idling speed again.
Fit a new tamper-proof seal.

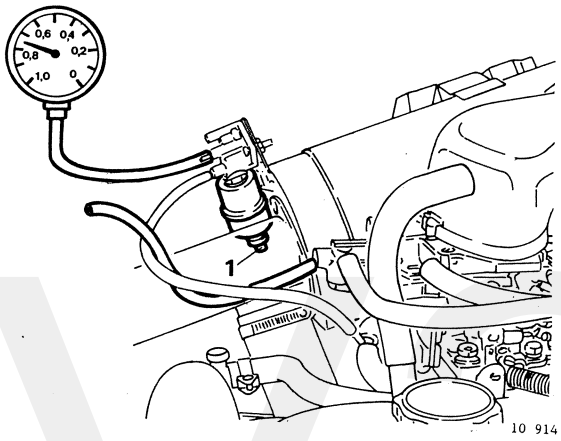
Note: in the case of B14.S engines, after adjusting the idling speed and the CO-content the decelerating mechanism must also be checked; see Operations *KK1* to *KK5*.

JJ4

Improved driveability for B14.S with EGR valve

Place a calibrated orifice with a bore of 3 mm in the upper opening of the EGR valve.
For the method of removing and fitting the EGR valve, see Operation *XX5*.

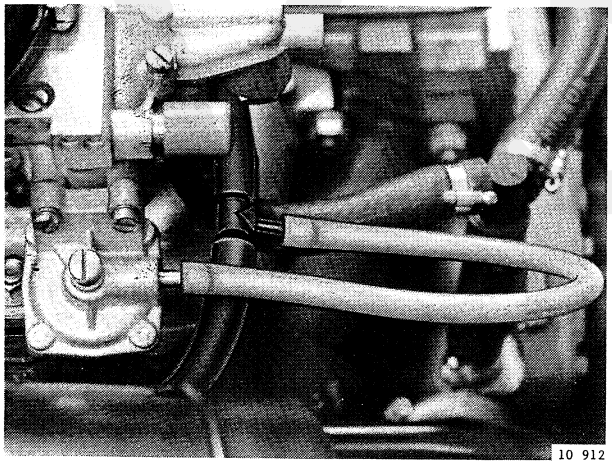
KK. Checking/adjusting the decelerating mechanism - B14.S engines



KK1

Check and, if necessary, adjust the decelerating mechanism diaphragm valve

Connect the diaphragm valve directly to the T-piece on the inlet manifold.
Raise the engine speed to 41.7 r/s (2,500 r/min) and maintain this speed for a few seconds.
Release the throttle.
The engine speed should now remain constant at a specified speed (see the specifications).
Make any necessary corrections with the adjusting screw (1) on the diaphragm valve.
Reconnect the hoses of the decelerating mechanism in their original position.



KK2

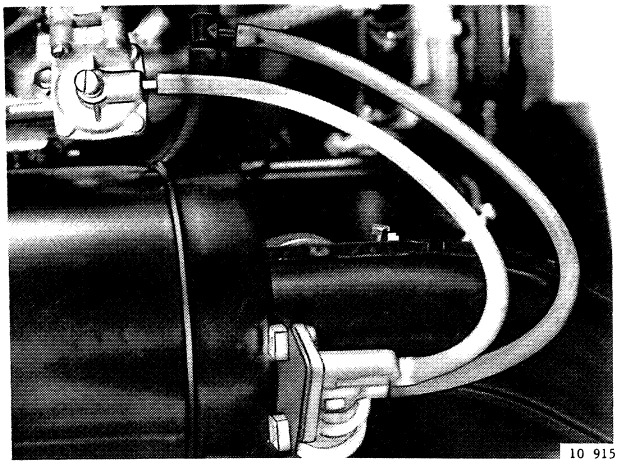
Check and, if necessary, adjust the vacuum valve (only up to and including model year 1980)

Disconnect the top hose from the vacuum valve.
Connect up a vacuum gauge at this position.
Raise the engine speed to 41.7 r/s (2,500 r/min) and maintain this speed for a few seconds.
Release the throttle.
The vacuum gauge should now show a constant reading:
73.5 ±5 kPa (750 ±50 g/cm^2).
If the vacuum reading drops, this indicates that the vacuum valve is defective and it must be renewed.
An incorrect reading can be corrected with adjusting screw (1) under the vacuum valve.

KK3

Check the reducing valve (if fitted)

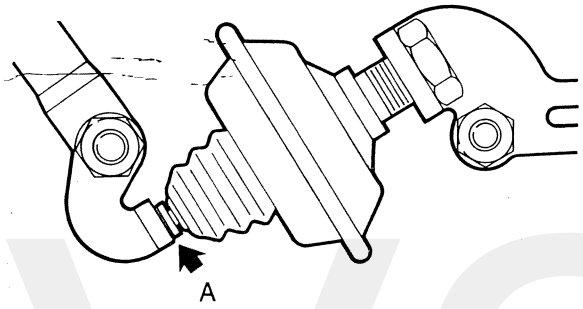
Remove the reducing valve.
Blow through the valve from the 'DIST' side: a whistling noise should then be heard.
If this is not the case, the valve must be renewed.
Fit with the 'Vac' side (old version: 'DIST' side) facing towards the 4-way valve.


10 915

KK4

Check the decelerating mechanism for correct operation

Remove the vacuum gauge and reconnect the top hose of the vacuum valve.
Raise the engine speed to 41.7 r/s (2,500 r/min) and maintain this speed for a few seconds.
Release the throttle.
The engine speed should now fall back evenly to idling speed.



10 911

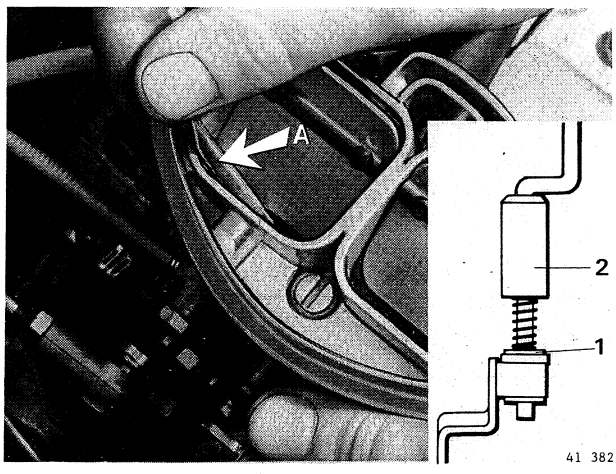
KK5

Check the dashpot for correct operation (if fitted)

Press in the throttle control rod until the dashpot is released.
Then abruptly release the control rod.
It should now take a few seconds before idling speed is regained.
If the throttle valve closes too slowly, too fast and/or unevenly, then the dashpot is defective and must be renewed.
Note: the dashpot should just start to come away from the throttle lever (A) at 66.6 r/s (4,000 r/min).
The setting is then correct.

LL. Checking/adjusting the choke setting (carburettor installed)

Note: put the selector lever or gear lever in neutral. Make sure that the ignition timing is correctly adjusted, that the air filter is clean and that the idle solenoid is operating and properly secured.



41 382

LL1

Remove:

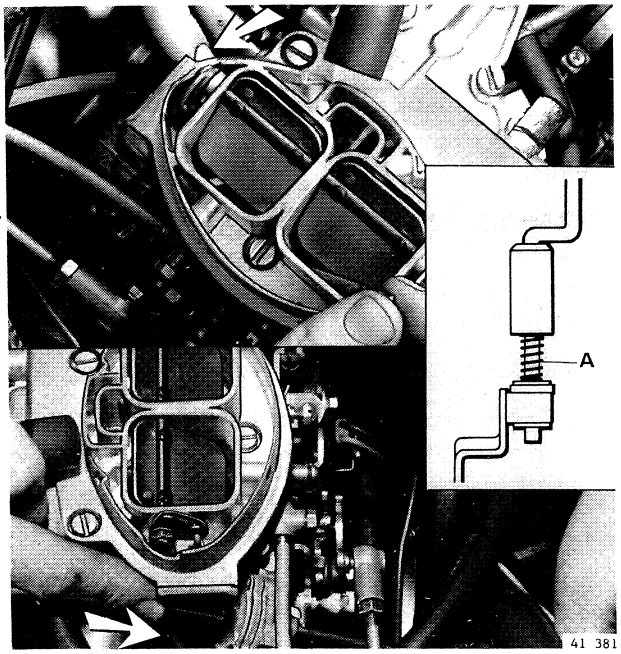
- air filter supply pipe (up to and including model year 1980);
- air filter (from model year 1981).

LL2

Mechanical choke setting

Checking:
Pull out the choke knob to its full extent and press the choke valves against their stop.
The opening (A) should be **4 ± 0.5 mm.**

Correcting:
The choke opening can be adjusted by fitting a different thickness shim (1) and/or by slightly grinding down the spacer (2).



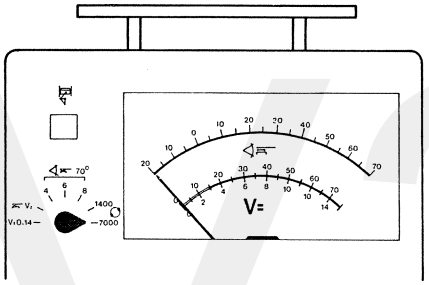
LL3

Pneumatic choke setting

Checking:
Press in the mechanical choke until the spring (A) is about to be compressed.
Now push in the control rod of the pneumatic choke to its full extent.
The choke valves should now be open to a specified value (see the specifications for checking/adjusting values)

Correcting:
Correct the setting with the adjusting screw in the diaphragm valve.
Note: first remove the sealing screw or cap.
After correcting, replace the seal.

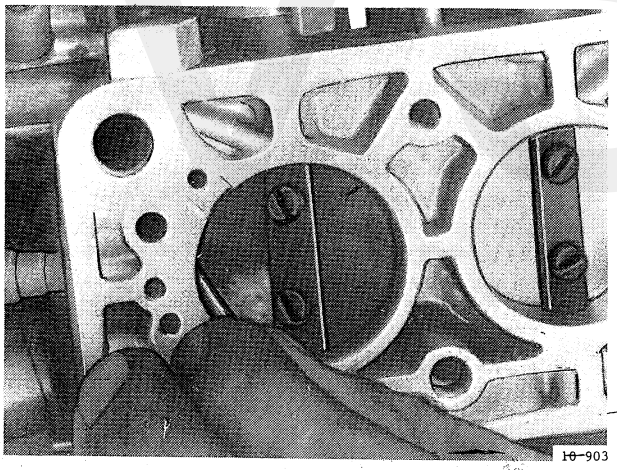
Replace the air supply pipe or air filter.



LL4

Choke adjustment with the engine cold

Checking:
Connect up the exhaust gas extractor hose.
Connect up the Volvo Monotester.
Pull out the choke to its full extent and start the engine.
The engine speed should now be between **30 and 33.3 r/s** (1,800-2,000 r/min).

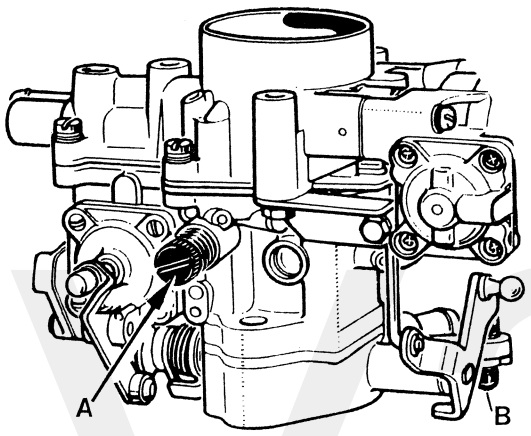


Correcting:
Switch off the engine.
Remove the carburettor and adjust the throttle valve opening with the choke pushed in fully; see Operation *DD24.*
Fit the carburettor back on the engine and again check the operation of the choke while the engine is cold.

Adjusting the Solex carburettor

MM. Idling speed and CO-content

Note: put the selector lever or gear lever in neutral.
Make sure that the ignition timing is correctly adjusted, that the air filter is clean and that the idle solenoid is operating correctly.

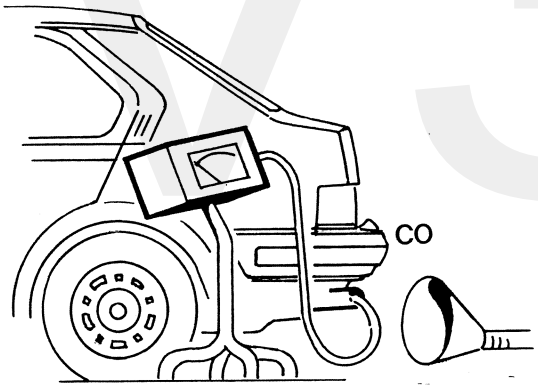


41 415

MM1

Idling speed

Raise the engine speed to approximately **50 r/s** (3,000 r/min) and let the engine run until the thermostat has opened.
Now check the idling speed (see the specifications).
Adjust the idling speed with adjusting screw (A).
Note: the throttle stop screw (B) is sealed and its setting must not be changed.
If correct idling cannot be obtained with adjusting screw (A), the basic setting will have to be corrected; see Operations *PP1* and *PP2*.



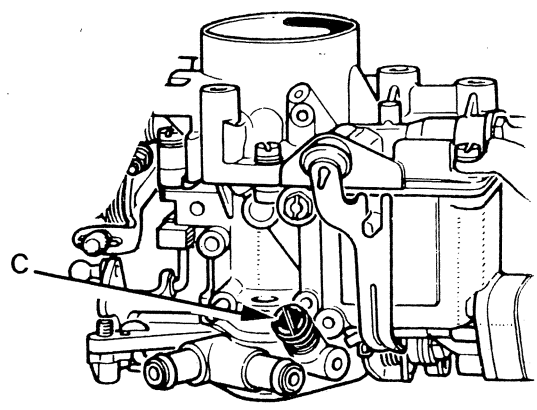
41 433

MM2

CO-content (of the exhaust gases)

Note: first read the general guidelines on page 123.

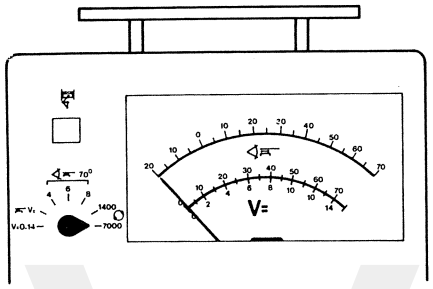
Checking:
Connect up the CO-meter.
Check the CO-content (see the specifications).
The CO-content must be measured at idling speed.
If the CO-content is correct, fit a seal (cap) (if this has not already been done).



41 416

Adjusting
If the CO-content is incorrect, it can be corrected with adjusting screw (C).
If necessary, remove the seal.
Adjust the idling speed again.
Fit a new seal.

NN. Checking/adjusting the choke setting (carburettor installed)

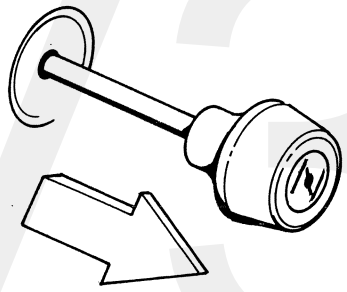


10 908

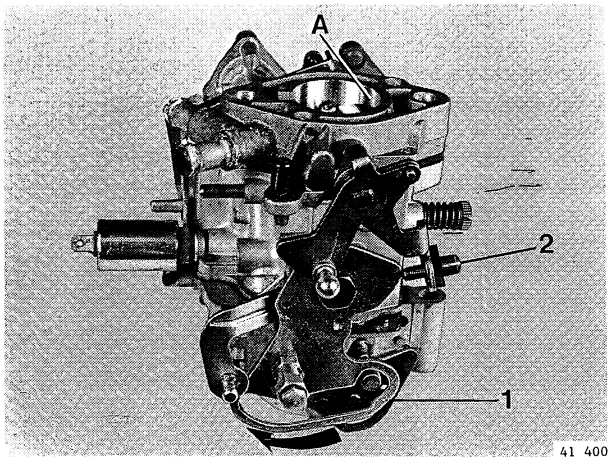
NN1

Choke adjustment with the engine cold

Checking:
Connect up the exhaust gas extractor hose.
Connect up the Volvo Monotester.
Pull out the choke to its full extent and start the engine.
The engine speed should now be between **30 and 33.3 r/s** (1,800-2,000 r/min).



41 437



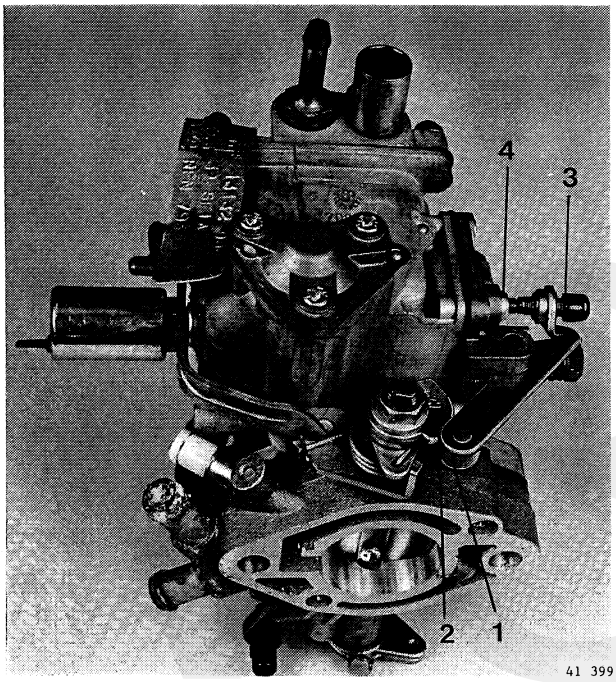
41 400

Correcting:
Switch off the engine.
Remove the carburettor.
Close the choke valve completely by moving the lever (1) in the direction indicated by the arrow.
Measure the throttle valve opening (A).
The opening should be **0.8 mm.**
Correct with the adjusting screw (2).
Replace the rubber cap.

Note: if high fuel consumption is reported on cars up to model year 1983, this can be reduced by removing the carburettor and fitting a conversion kit, Part No. 3287496-8.

OO. Other adjustments (carburettor installed)

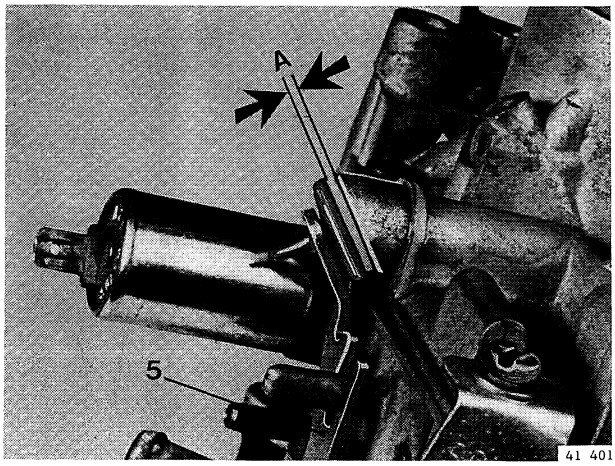
1 Stroke of the accelerator pump
2. Opening for float chamber ventilation



OO1

1 Stroke of the accelerator pump

- Remove the rubber cap from the adjusting screw (3).
- Press the throttle valve to the idling position.
- Press the roller (1) against the cam (2).
- Turn the adjusting screw (3) until it just touches the plunger (4); then tighten a further half-turn.
  Replace the rubber cap.



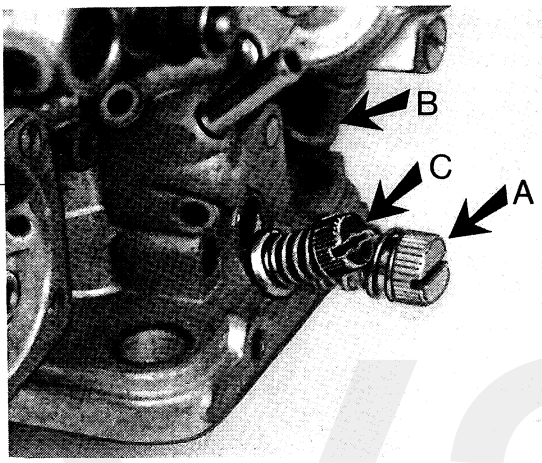
OO2

2 Opening for float chamber ventilation

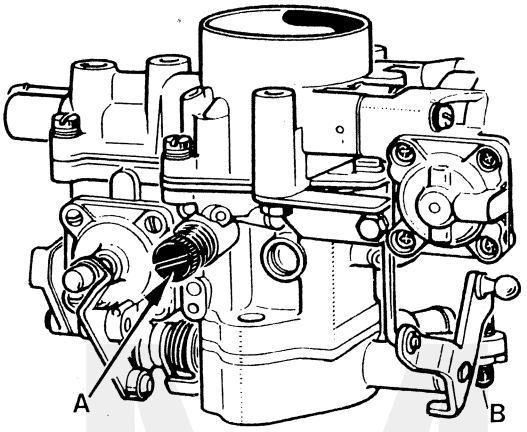
- Press the throttle valve to the idling position.
- Measure distance A.
  Distance A should be **3.5 ±0.5 mm.**
- Make any necessary corrections by slightly bending the lever (5) **at the bottom.**

PP. Basic setting of throttle valve stop screw for constant CO system

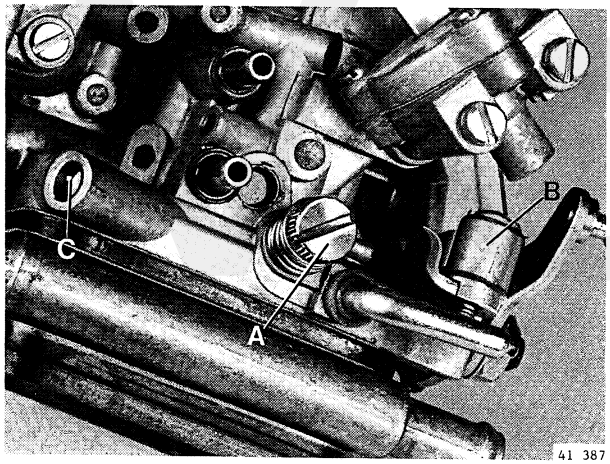
Note: this adjustment should be made with the engine at operating temperature.



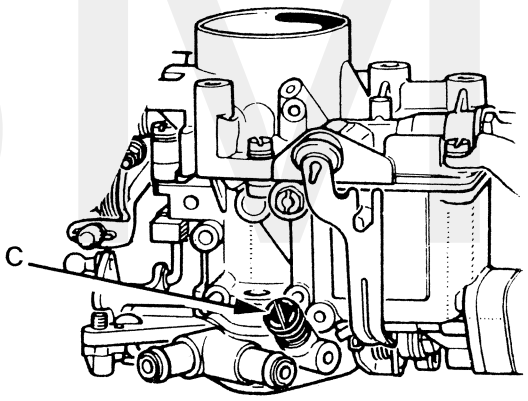
10 895



41 415



41 387



41 416

PP1

Preliminary operations

Weber: remove the tamper-proof seal from the throttle stop screw (B) and from the mixture control screw (C).
Note: do not fit the tamper-proof seal back on the screw.

Solex: remove the rubber cap from the throttle stop screw (B) and the tamper-proof seal from the mixture control screw (C) (if fitted).

PP2

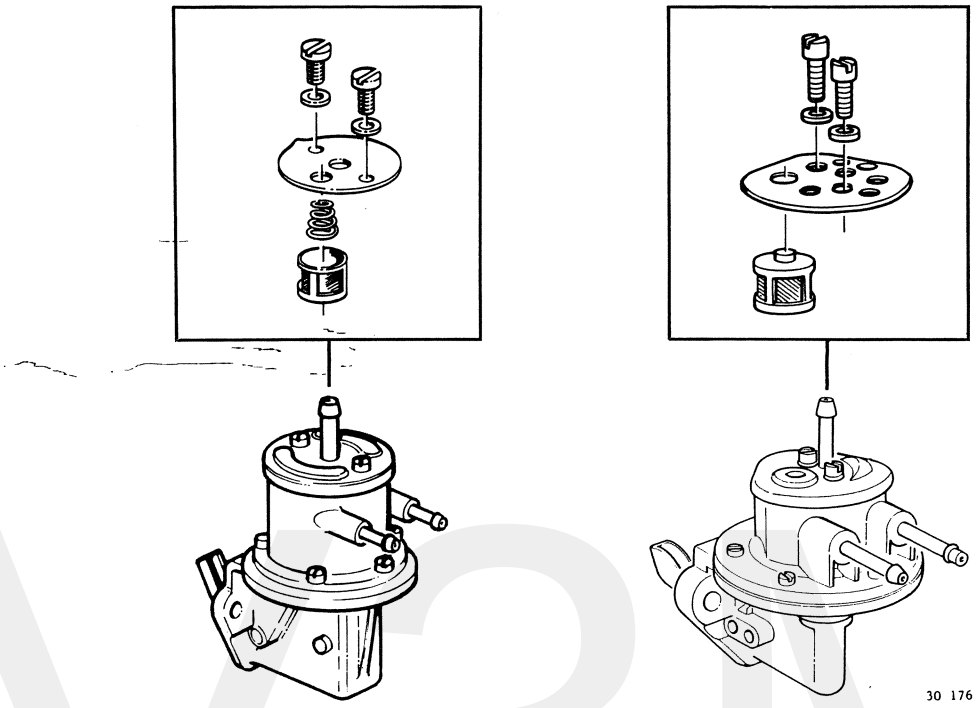
Adjusting

- Fully tighten the idle adjusting screw (A).
- Fully tighten the mixture control screw (C) and then back it off 2.5 turns.
- Start the engine and adjust the idling speed to approx. **10 r/s** (600 r/min) with the throttle stop screw (B).
- Now adjust to the correct idling speed with the adjusting screw (A) (see the specifications).
- Check the CO-content of the exhaust gases; correct if necessary with the mixture control screw (C); see Operation *JJ2* (Weber) or *MM2* (Solex).
- Seal the mixture control screw again.

QQ. Fuel pump

B14 old

B14 new



QQ1

Fuel pump removal (spare wheel removed)
Release the three hoses.
Remove the nut and bolt.
Clean the fuel pump and remove any gasket remnants.
If necessary, remove the insulating flange.
Note: when the insulating flange is removed some oil will drain from the cylinder block.

QQ2

Fuel pump installation

Note:
- If there is an oil leak past the insulating flange, a steel flange must be fitted.
- Always use new gaskets and hose clips.

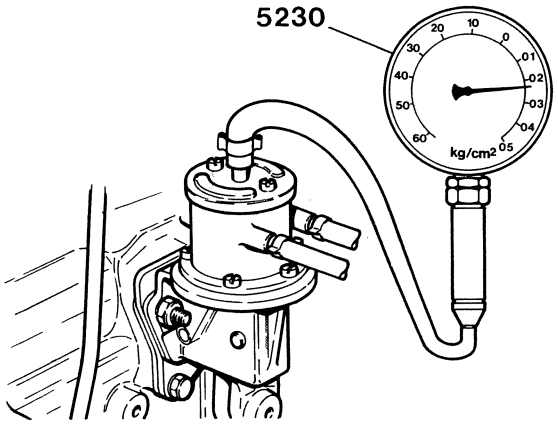
Fit the insulating flange (if necessary).
Fit the fuel pump.
Fit and tighten the nut and bolt. Tightening torque: 17 Nm.
Reconnect the three hoses.

QQ3

Renew the filter

Disconnect the fuel hose from the cover.
Remove the two screws.
Take off the cover and gasket.
Withdraw the filter.

Fitting is in reverse order to removal.
Note: always use a new gasket.



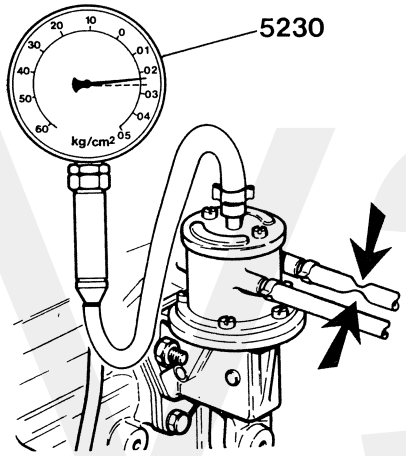
QQ4

Check/correct the fuel delivery pressure

(Spare wheel removed.)
Checking:
The fuel delivery pressure must be measured at the same height as the pump and at idling speed.
Connect up the pressure gauge and run the engine until the pressure has stopped rising.
The fuel pressure should be **15-27 kPa.**

Pressure too high:
Insert more gaskets between the pump and the insulating flange.

Pressure too low
Check whether the filter in the fuel pump is clogged.
If necessary, fit a new set of filters and check the pressure again.
If the filter is not clogged and the pressure is still too low: renew the pump.



QQ5

Check the fuel return line

Connect up the pressure gauge and run the engine until the pressure has stopped rising.
Pinch off the return hose with clamping tongs.
The fuel delivery pressure should now rise slightly.

Pressure rises: return line in order.

Pressure does not rise:
Place a drip tray under the pump.
Disconnect the return hose from the pump and check whether fuel flows out of the return line connection on the pump. Blow through the hose and check again.

Yes: fuel return hose clogged or kinked.
No: fuel pump contaminated or defective.

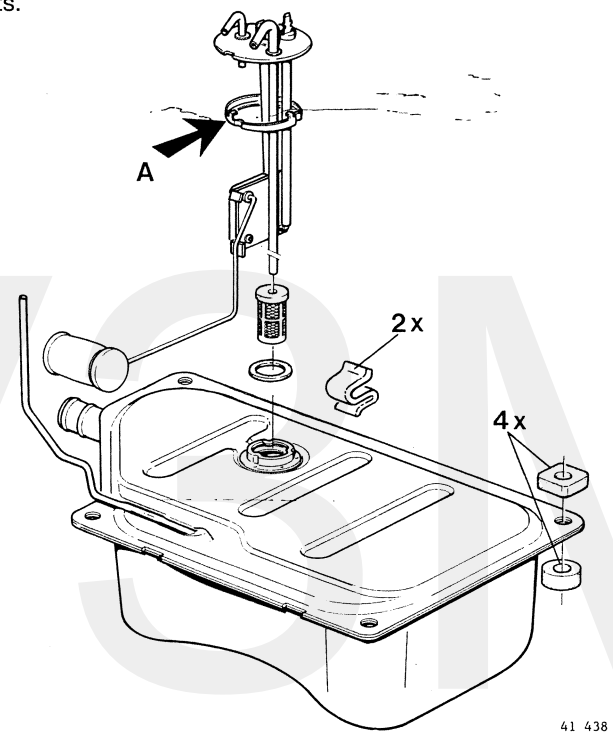
RR. Removing and installing the fuel tank

Note: siphon the fuel from the tank through the filler pipe.

RR1

Removal

- Remove the cover plate in the boot and release the hoses and the electrical connection from the tank transmitter unit.
- Disconnect the filler hose and the overflow hose from the fuel tank
  Note: on cars up to model year 1984, the overflow hose extends into the boot; this makes it necessary to remove the side panel.
  - Release the breather hose (pull the hose out of the clips).
  - Remove the four retaining bolts.



RR2

When a new fuel tank is being installed, transfer the following parts:

- Rubber mountings (4x).
- ~~Tank~~ transmitter unit: unscrew the clamping ring. Fit the transmitter unit with a new rubber sealing ring.
- The clips for the breather hose.
  If necessary, the following modifications will have to be made on cars up to model year 1984:
- shorten the breather pipe to the correct length;
- shorten the filler hose by 2 cm.

Warning! do **not** use metal tools due to the danger of sparks and fire.

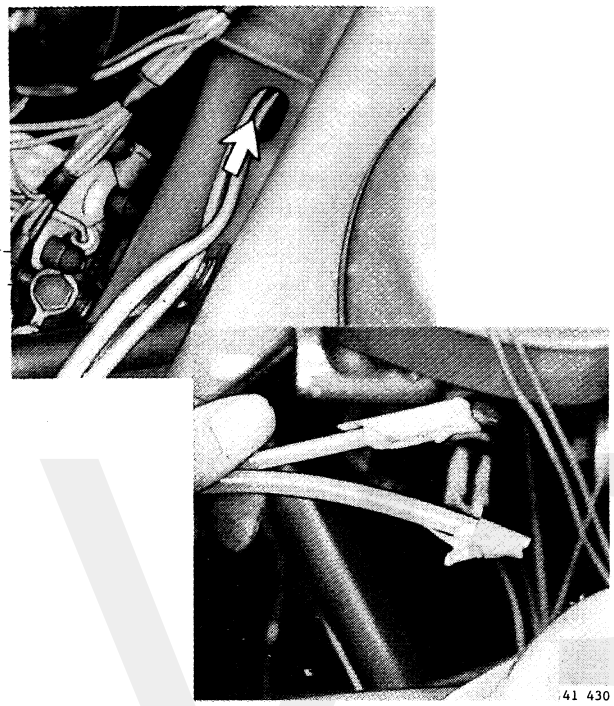
RR3

Installation

Installation is in reverse order to removal. Tightening torque of bolts: 23 Nm.
Note:
- always use new hose clips on the tank transmitter unit;
- fill the fuel tank;
- check for leakage;
- check the fuel gauge for correct operation.

SS. Renewing the fuel lines

Note: a new fuel line must always be blown through before fitting.



41 430

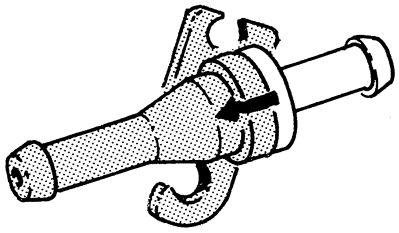
SS1

Fuel lines

When fitting, the fuel lines are routed through the body side members to the rear.
To prevent dirt from entering the lines, the ends must be sealed with tape before fitting.
Always use **new** hose clips.
Note: the large diameter line is the fuel supply line; the small diameter line is the fuel return line

TT. Miscellaneous

1 Roll-over valve (check valve)
2 Fuel tank filler pipe neck and cap
3 Expansion tank
4 Tank transmitter unit



41 421

TT1

1. Roll-over valve (check valve)

Correct direction of flow
The arrow on the black part on top of the check valve indicates the correct direction of flow (flow directional arrow).

The arrow must point towards the discharge opening of the overflow hose (to atmosphere).

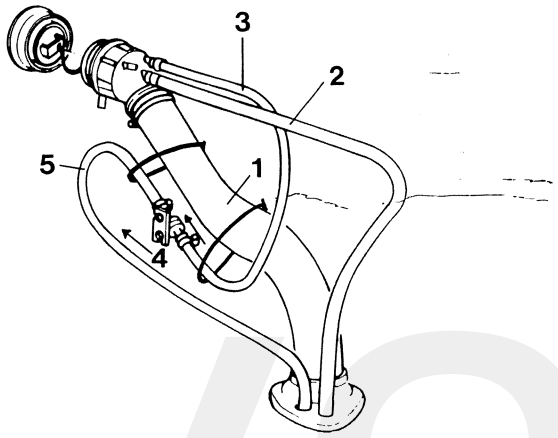
TT2

2. Fuel tank filler pipe neck and cap

With effect from chassis number 614469, the filler pipe neck and petrol cap of the fuel tank were modified.
The modified version is only interchangeable with the previous type **as a set.**
Fit a new roll-over valve (not included in the set).

Removal
Remove the right-hand side panel in the boot.
Disconnect all the hoses from the filler pipe neck.
Press in the lugs and remove the filler pipe neck.

Fitting
Locate the rubber seal.
Insert the filler pipe neck in the side of the rear wing.
Press down until the filler pipe neck clicks into place.



TT3

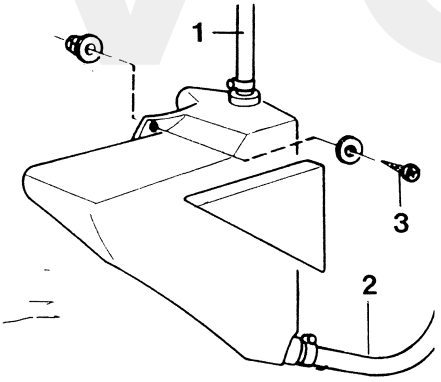
Connect up the hoses

Important! Use hose clips on all hose connections.

Secure the filler hose (1) and the breather hose (2) to the filler pipe neck.
Connect the hose (3) (supplied with the kit) to the filler pipe neck and the check valve (4).

Important! Note the flow directional arrow on the check valve body.

Connect the existing breather hose (5) to the check valve.
Position the check valve correctly and secure it with two tie-fasteners to the filler hose.



TT4

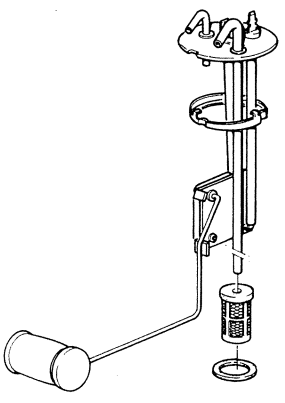
3. Renewing the expansion tank

Note: there must be no fuel in any part of the filler pipe.
Remove the right-hand side panel in the boot.
Disconnect hoses (1) and (2) from the expansion tank.
Release the check valve from the expansion tank.
Remove the self-tapping screw (3).
Fitting is in reverse order to removal.

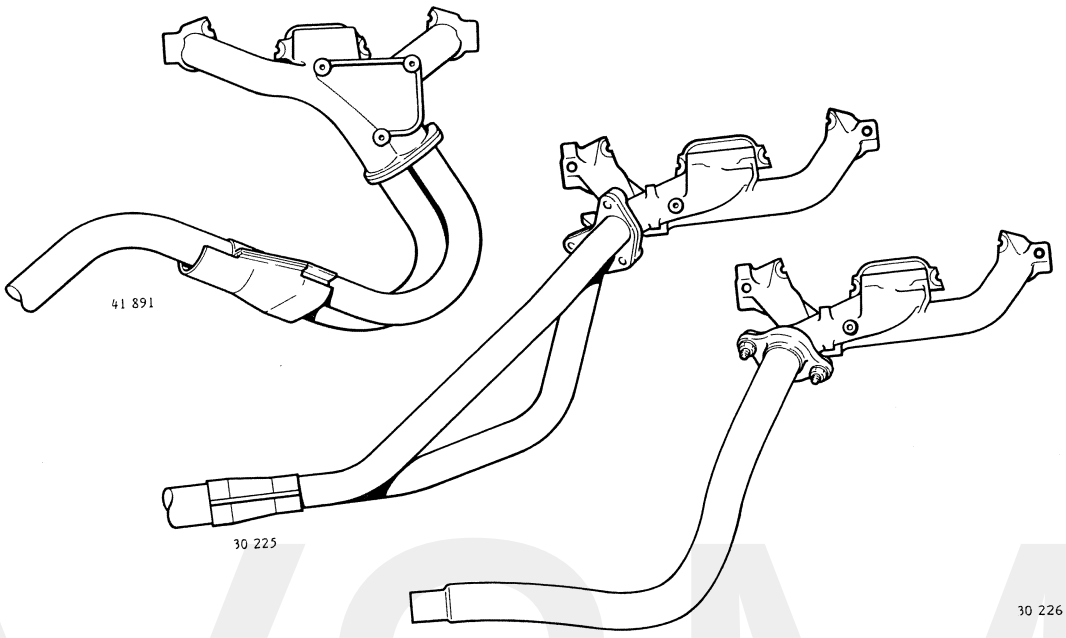
TT5

4. Renewing the tank transmitter unit (on the car)

Remove the cover plate in the boot.
Release the hoses and the electrical connection.
Turn the clamping ring or tank transmitter unit and remove them from the car.
Warning!: do not use metal tools due to the danger of sparks and fire.
Fitting is in reverse order to removal.
Always use **new** seals and hose clips.

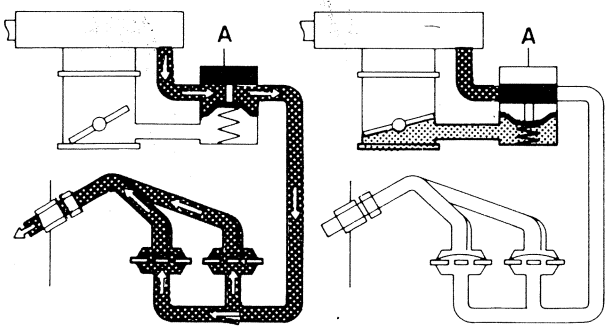


Group 25. Inlet and exhaust system



The inlet and exhaust manifolds are mounted in single unit construction at the right-hand side of the cylinder head. The inlet manifold is made of aluminium alloy whereas the exhaust manifold is made of cast iron. On the B14.3E engine the inlet and exhaust manifolds are made entirely of cast iron.
The exhaust system is attached to the exhaust manifold by a flange connection. The exhaust system consists of three sections, namely:

- The front section, which is connected to the exhaust manifold and consists of dual pipes branching through a Y-piece to a single pipe. One exception to this is the B14.3E engine, which has a single pipe instead of dual pipes.
- Middle silencer.
- Main silencer.

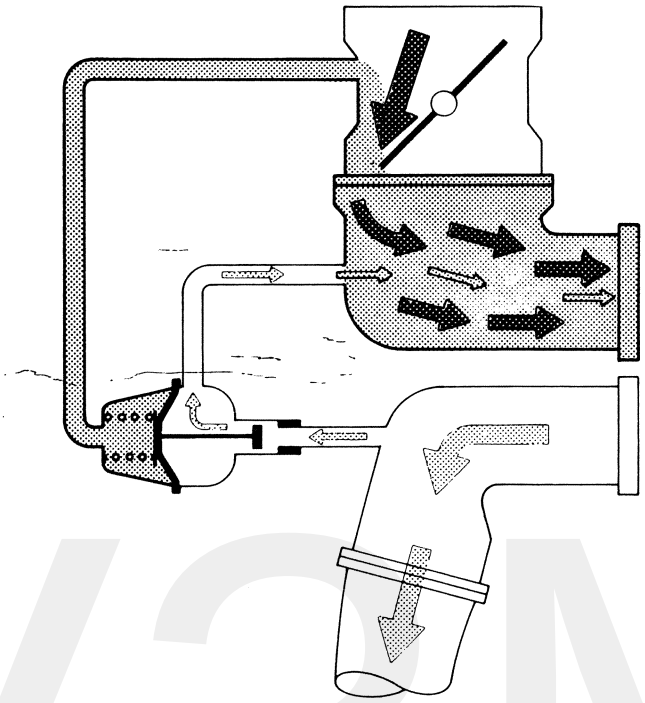


Pulsair and EGR systems

This system is connected to the exhaust manifold, immediately after the exhaust valves, and to the carburettor and air filter. Two check valves are incorporated in the system.
The various constituents of the exhaust gases include carbon monoxide and hydrocarbons. If the exhaust gases are mixed with air (oxygen) while still very hot, the carbon monoxide and hydrocarbons will be partly burnt. In this way cleaner exhaust emissions will be obtained.
The function of the 'Pulsair' system is to add air (oxygen) to the exhaust gases.
The Pulsair system utilizes the pressure variations of the exhaust gases caused by the changes between overpressure and depression in the exhaust system. When depression is present, air is sucked into the engine. When overpressure is present, the check valves prevent the exhaust gases from being forced into the air filter.
The Pulsair system is controlled by a vacuum valve which opens when depression is present (A).

Exhaust gas recirculation (EGR)

EGR = Exhaust Gas Recirculation



With this system some of the exhaust gases are conducted back to the engine where they again participate in the combustion process. This causes, among other things, a decrease in the combustion temperature, thereby reducing the oxides of nitrogen (NOx) in the exhaust gases.

The system consists of the following components:
- a pipe between the exhaust and inlet manifolds
- an EGR valve
- a vacuum hose on the carburettor

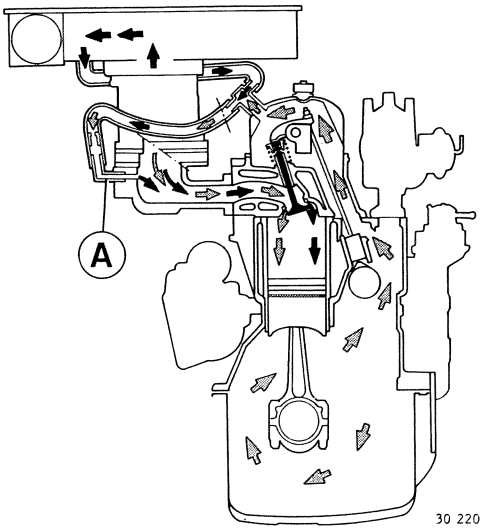
The EGR system comes into operation when the engine speed is raised above idle. The opening for the amount of exhaust gases conducted back to the engine is infinitely regulated. At its maximum opening, about 10% of the exhaust gases are conducted back to the engine.

Principle of operation of the EGR system

Exhaust gas recirculation is not desired at idling speed, partly to avoid erratic idling and partly because the proportion of oxides of nitrogen is not so high at idle.
The vacuum valve (EGR valve) is operated by the depression prevailing ahead of the butterfly valve in the inlet manifold. When this butterfly
valve is closed (idling speed), the pressure prevailing at the connection is almost atmospheric. The vacuum valve is therefore closed, so that no exhaust gases are conducted back to the engine. When the throttle valve (in the throttle valve housing) opens, this reduces the pressure in the inlet manifold and causes the vacuum valve to open fully.

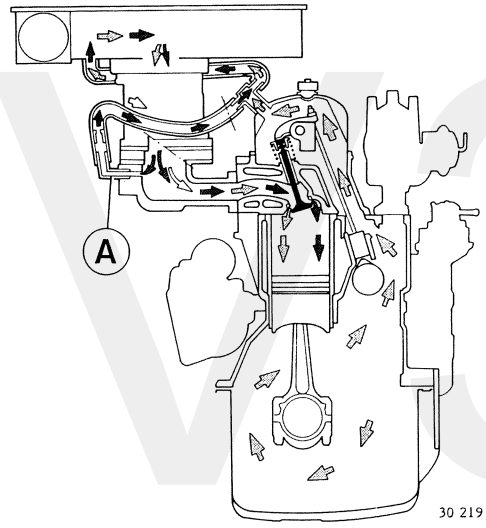
With effect from chassis number 307662, the B14.4S engines were equipped with an oxidizing catalytic converter (oxicat) for a number of countries. This unit reduces the emission of carbon monoxide and hydrocarbons.
These engines may only run on unleaded petrol, otherwise the catalytic converter will be damaged and rendered ineffective. A plug is fitted ahead of the catalytic converter to enable the CO-content to be measured.

Crankcase ventilation



Old and new versions

Depression draws the crankcase (sump) fumes via separate hoses through the inlet manifold and the carburettor and so into the engine, where they again participate in the combustion process.
The hose connected to the inlet manifold contains a calibrated orifice (A). At idling speed and partial engine load (= high depression) the crankcase fumes are returned through the inlet manifold.



At maximum engine load, when the depression in the inlet manifold is low, the crankcase fumes are channelled back through the carburettor, thereby preventing a too lean mixture in the combustion chambers. This depression is mainly required to prevent oil leakage past the seals and gaskets and also to comply with exhaust emission requirements.
If the system is blocked, this will be revealed by the reading on the CO-meter; a regular check is therefore necessary.

UU. Removing/fitting the air filter assembly

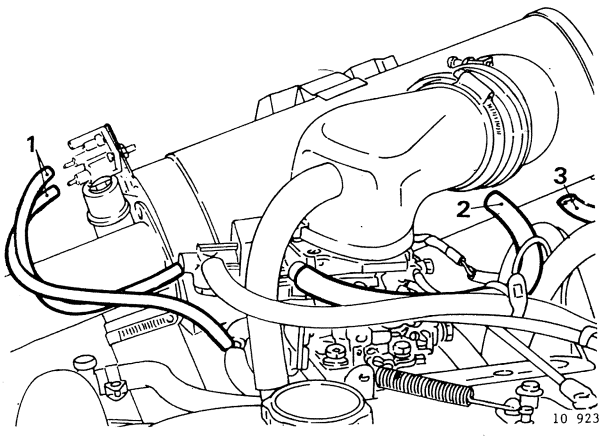
Up to model year 1981

UU1

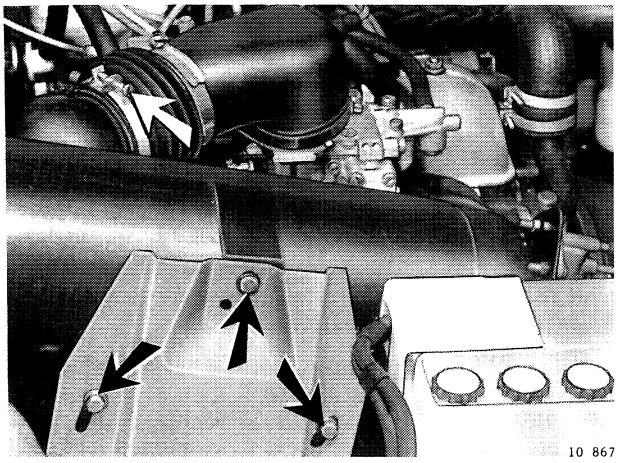
Remove the screenwash reservoir.

UU2

Disconnect the hoses from the air filter and the air supply pipe



1 Both hoses from the vacuum valve (if fitted).
2 The hose to the carburettor.
3 The hose to the electromagnetic valve (AT).


10 867

UU3

Remove the air filter assembly

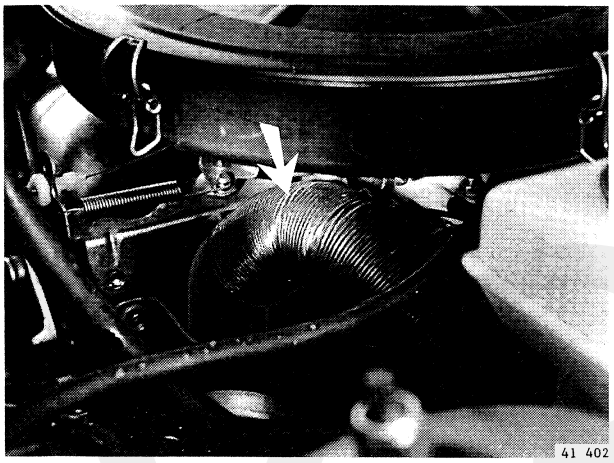
Slacken the clamp and release the bellows.
Remove the three retaining bolts.
Remove the air filter assembly.

UU4

Fitting

Fitting is in reverse order to removal. Tightening torque: 10 Nm.
Note: the rear cover must be removed in order to renew the air filter.
When doing this, make sure that the stub for the air supply is properly positioned.

From model year 1981

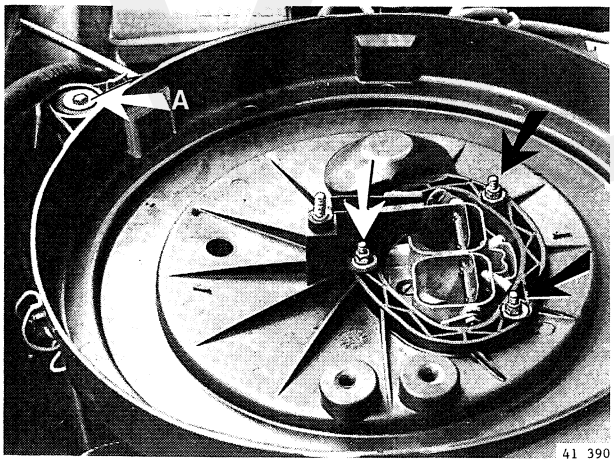

41 402

UU5

Release the pre-heating hose from the manifold

UU6

Remove the cover and the air filter element

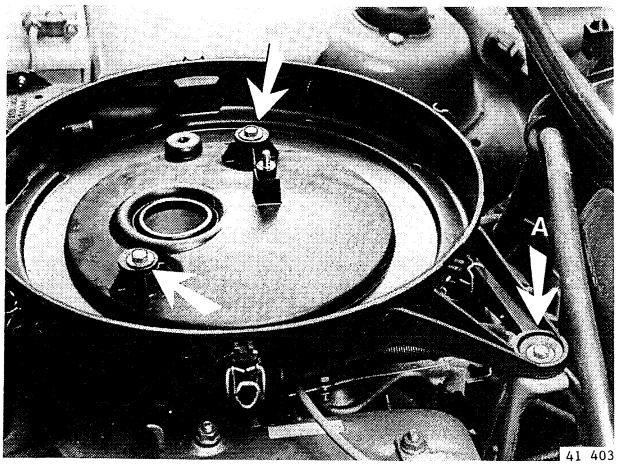


41 390

UU7

Remove the air filter housing

Weber carburettor
Release the bracket (A) (if fitted).
Remove the three lock nuts and washers.
Pull the filter housing upwards.
Release the hoses from the filter housing (note the spacers and washers).
Note: remove the bracket (A) (if fitted); it must **not** be replaced.



41 403

Solex carburettor

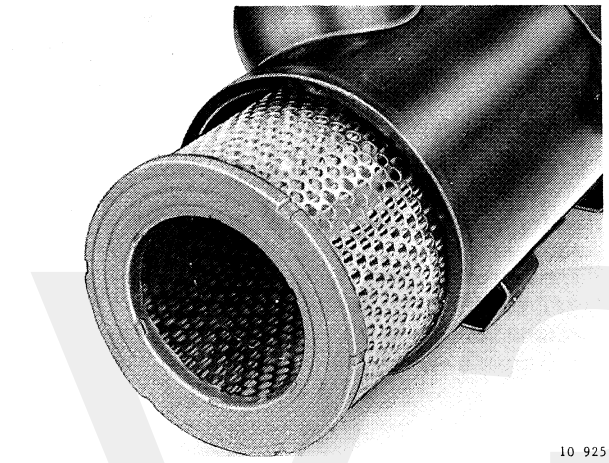
Release the bracket (A) (if fitted).
Remove the two bolts and washers.
Pull the filter housing upwards.
Release the hoses from the filter housing.

UU8

Fitting

Always use a **paper** gasket for Weber carburettors.
Fitting is in reverse order to removal. Tightening torques:
- nuts: 5 Nm;
- bolts: 10 Nm.

VV. Renewing/testing the thermostat



10 925

Up to model year 1981

(air filter removed from the car)

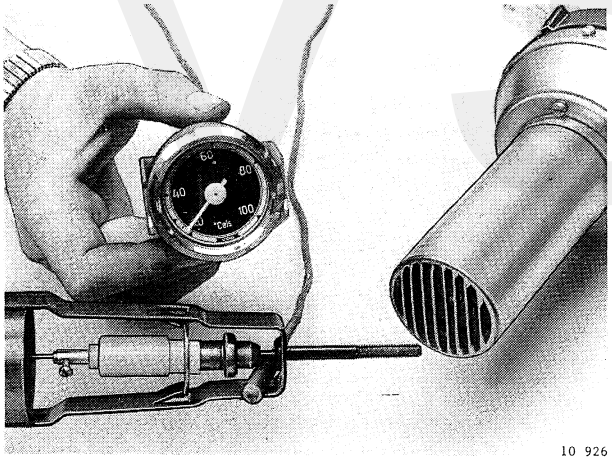
VV1

Remove the filter element

VV2

Remove the cover at the intake air end

Mark the cover and the air filter housing as an aid for subsequent assembly.

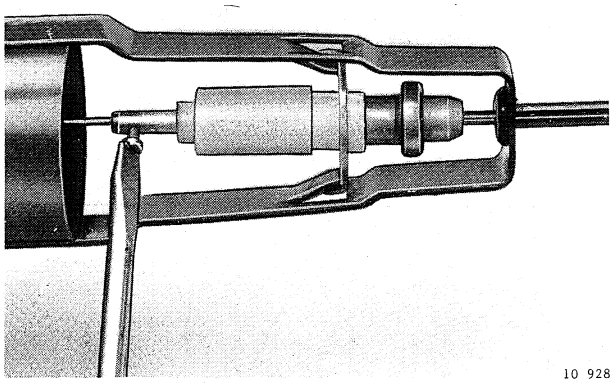


10 926

VV3

Check the thermostat for correct operation

Heat the thermostat with a blow drier; the shutter should now close.
Cool down the thermostat; the shutter should now open.
(For temperature data, see the specifications.)

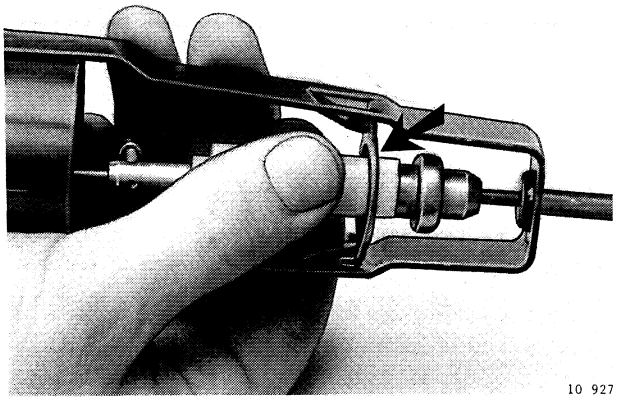


10 928

VV4

Adjust the thermostat shutter (control valve)

Slacken the set screw and heat the thermostat to **above +35°C.**
Adjust the shutter so that the opening for warm air supply is closed off entirely.
Retighten the set screw.
Cool the thermostat to **below +17.5°C.**
Check whether the cold air supply opening is completely closed off.
If necessary, repeat this procedure until the correct control range is obtained.


10 927

VV5

Renew the thermostat

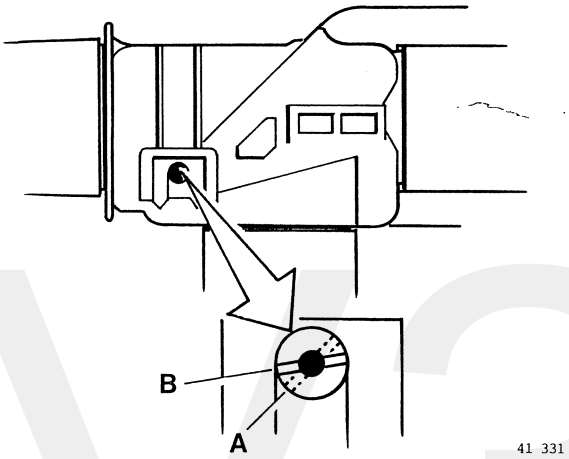
Press the nylon sleeve upwards.
Twist the supporting ring (A) out of the lugs in the thermostat frame.
Remove the thermostat.

Fitting is in reverse order to removal.
Check for correct operation.
If necessary, adjust the thermostat shutter; see Operation *VV4.*

VV6

Assembly

Assembly is in reverse order to disassembly.
Note: make sure that the marks on the cover and the air filter housing are opposite each other.

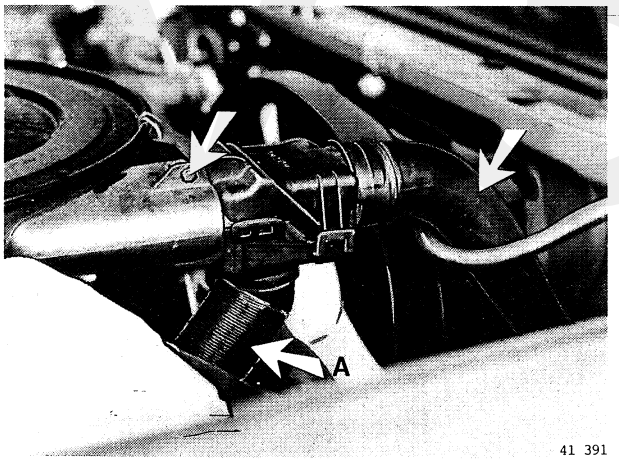


41 331

From model year 1981

VV7

Note: a rough check of the working of the thermostat shutter can be carried out in the engine compartment. The projection on the end of the pivot pin is in the diagonal position (A) at temperatures below +20°C. At temperatures above +35°C the mark is approximately horizontal (position B).

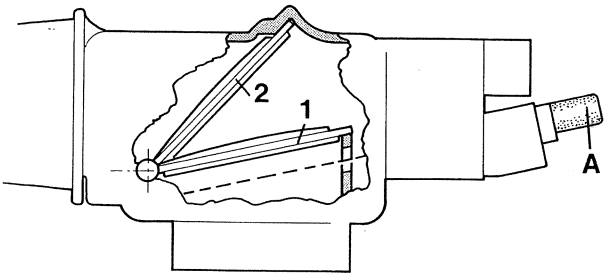


41 391

VV8

Remove the thermostat

Remove the air supply pipe.
Remove the retaining bolt and nut.
Pull the thermostat housing out of the air filter housing.
Turn the thermostat housing 180° relative to the hose (A) and then remove it.

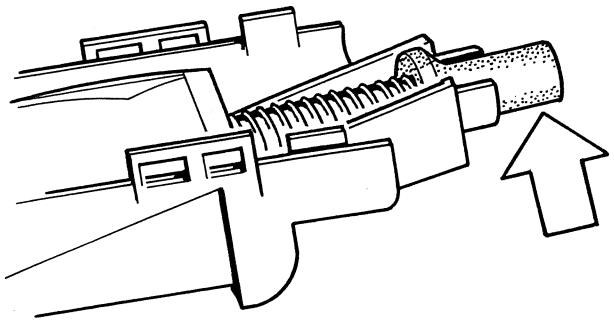


41 332

VV9

Test the thermostat

(thermostat housing removed from the car)
Heat the thermostat (A) with a blow drier; the shutter should now close (1).
Cool down the thermostat; the shutter should now open (2).
(For temperature data, see the specifications.)



41 372

VV10

Renew the thermostat

Press back the tabs on both sides and at the front and then separate the two halves of the thermostat housing.
Press the thermostat out of its frame.

VV11

Fit the thermostat

Fitting is in reverse order to removal.
Check the thermostat for correct operation.

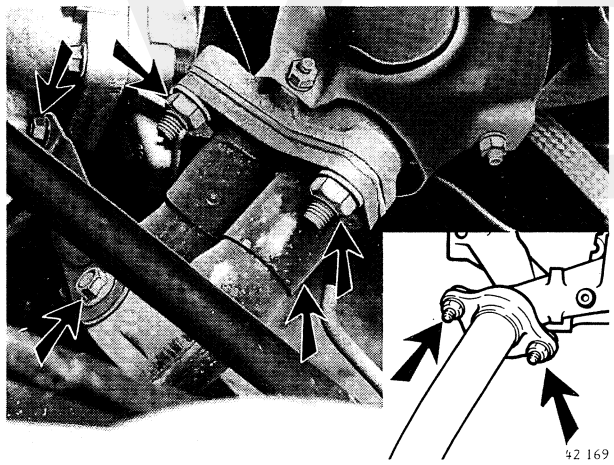
WW. Removing/fitting the inlet and exhaust manifolds or gaskets

Note: if it is only a question of renewing the gaskets, there is no need to remove the carburettor.

WW1

Remove the carburettor

Weber: see Operations *BB1* to *BB7.*
Solex: see Operations *EE1* to *EE7.*



42 169

WW2

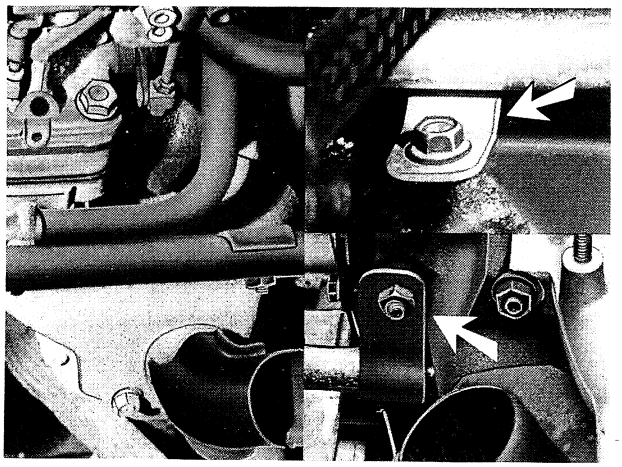
Disconnect the battery negative cable

WW3

Remove the exhaust downpipe from the manifold

Weber carburettor
Release the exhaust pipe from the exhaust bracket.
Up to model year 1981: remove the right-hand engine splash guard.
Release the bolts of the exhaust bracket on the clutch housing.
Remove the three nuts and washers from the exhaust flange and release the pipe from the manifold.

Solex carburettor
Remove the nuts and washers from the exhaust flange.

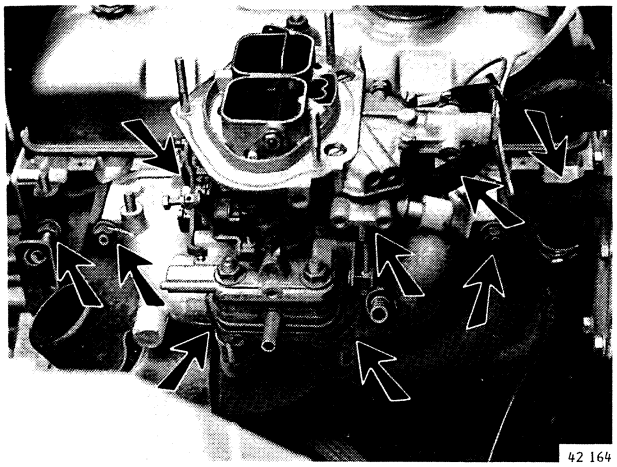


WW4

Remove the pre-heating cover from the exhaust manifold

Up to model year 1981
Release the coolant pipe at the front and rear end.
Remove the nuts and lock washers from the pre-heating cover.
Push the coolant pipe to one side so that the pre-heating cover can be removed.

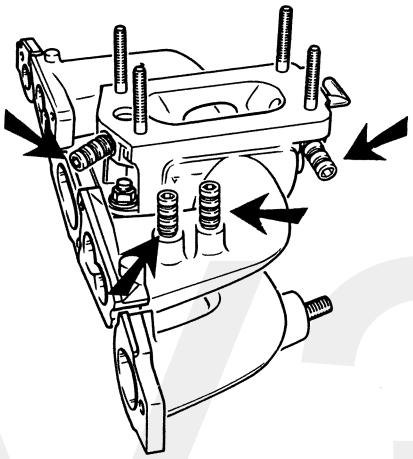
From model year 1981
Remove the nut (B) from the exhaust manifold and the bolt (C) from the cylinder block.



WW5

Remove the inlet and exhaust manifold from the cylinder head

Remove the nuts and washers and take off the manifolds.
Remove the gasket.



WW6

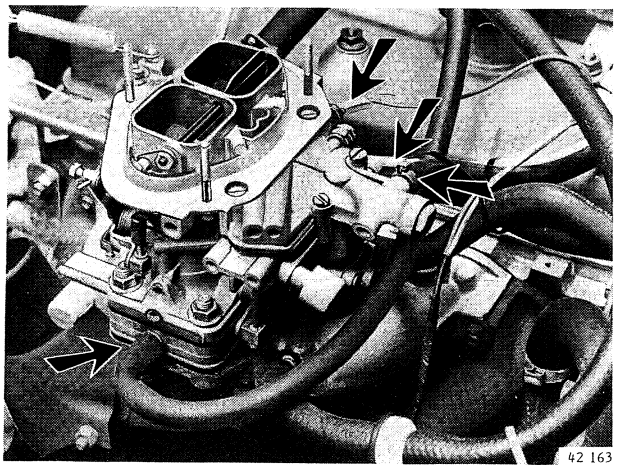
Transfer various parts to the new inlet and exhaust manifold

Clean the mating faces.
Transfer the connecting nipple(s) to the inlet manifold.
Transfer the heat shield for the starter motor (if fitted).
Always use **new** gaskets.
Note: transfer the connecting nipple for the electromagnetic vacuum valve (AT) (if fitted).

WW7

Fit the inlet and exhaust manifold

- Fitting is in reverse order to removal.
- Clean the mating face of the cylinder head.
- Always use **new** gaskets.
  Note: when tightening the manifold nuts, always start with the middle nuts. Tighten the exhaust bracket so that it is stress-free. Tightening torque: 23 Nm.



WW8

Fit the carburettor

Weber: see Operation *BB8*.
Solex: see Operation *EE8*.

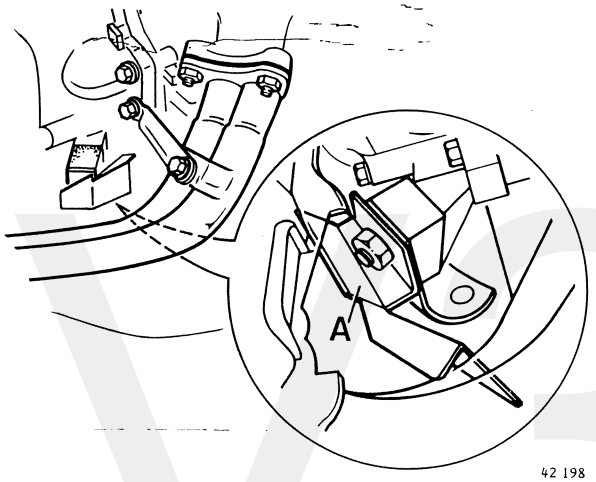
Check the choke and throttle linkage for correct operation.

XX. Exhaust system

Fitting the complete exhaust system
When fitting the exhaust system, it is important to follow the sequence given below in order to ensure stress-free mounting.

General
- Always use new gaskets.
- The exhaust pipes must overlap approx. 60 mm at their connecting joints.
- There should be a minimum clearance of 25 mm between the exhaust components and the fixed parts of the body.
- If necessary, renew the rubber mounting straps.
- The exhaust clips must always be located evenly over the slit section of the pipe.

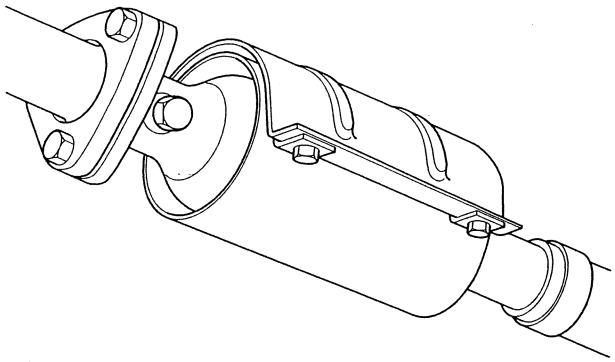
XX1



Exhaust downpipe

Release the mounting bracket bolt(s) on the clutch housing.
Use a **new** gasket (except for engines with a Solex carburettor).
Secure the exhaust downpipe finger-tight to the exhaust manifold and the mounting bracket.
Tighten the attachment on the manifold.
Secure the exhaust pipe to the mounting bracket.
Tighten the mounting bracket.
Note: on engines with a Solex carburettor the exhaust downpipe must first be correctly aligned.
From model year 1984 onwards a larger diameter downpipe is fitted on B14.4E/S engines.
When renewing the exhaust downpipe on earlier versions, a heat shield (A) must be fitted near the rear-right engine mounting pad.
Tightening torques:
- M8 nuts: 20 Nm;
- M10 nuts: 40 Nm;
- M8 bolts: 23 Nm.

Note: use copper nuts on the manifold end.

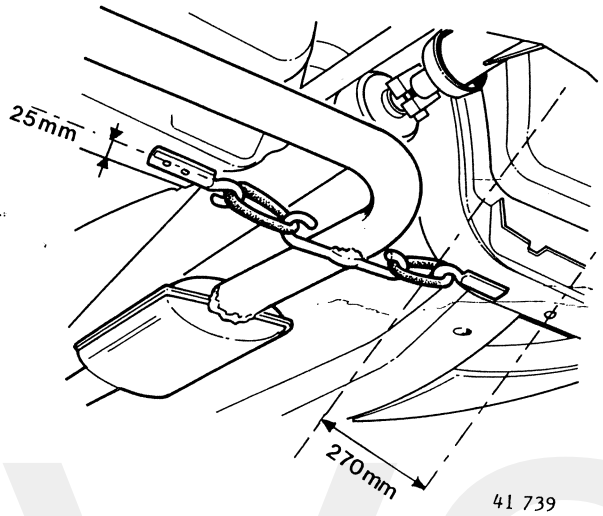


XX2

Oxidizing catalytic converter (oxi-cat)

Remove the bolts.
Remove the heat shield.
Always use new gaskets.
Tightening torques:
- heat shield: 10 Nm;
- catalytic converter: 40 Nm.

Fitting the extra exhaust mounting point
With effect from model year 1985, an extra mounting point was added for the exhaust system at the chassis cross-member for the gearbox mounting. All exhausts supplied for Service purposes include this extra mounting point.



XX3

Fit the mounting hooks

Fit the exhaust.
AT models: remove the splash guard.
Position the hooks and centre-punch the holes which are to be drilled as shown in the illustration.
Drill 3 mm diam. holes through the cross-member.
Enlarge the holes to a diameter of 6 mm.
Caution! There are fuel lines inside the cross-member.
Coat the edges of the holes with an anti-rust primer.

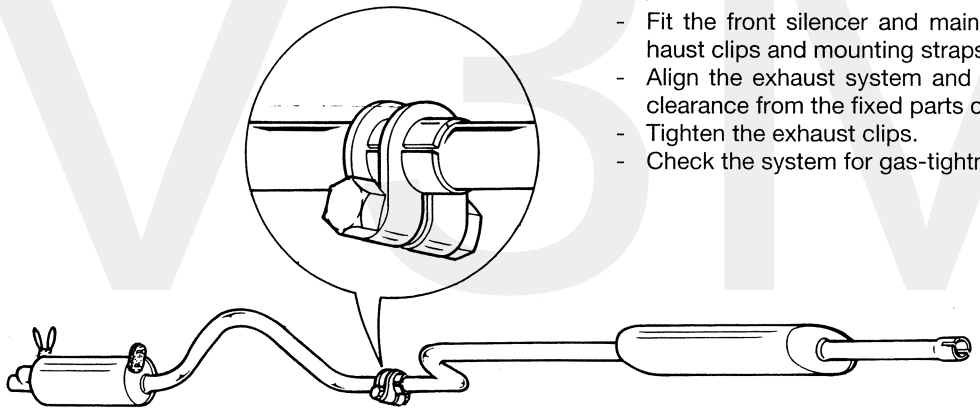
Secure the hooks with M6x20 bolts and self-locking nuts. Tightening torque: 10 Nm.

Fit the two rubber straps to the exhaust pipe and the hooks.

XX4

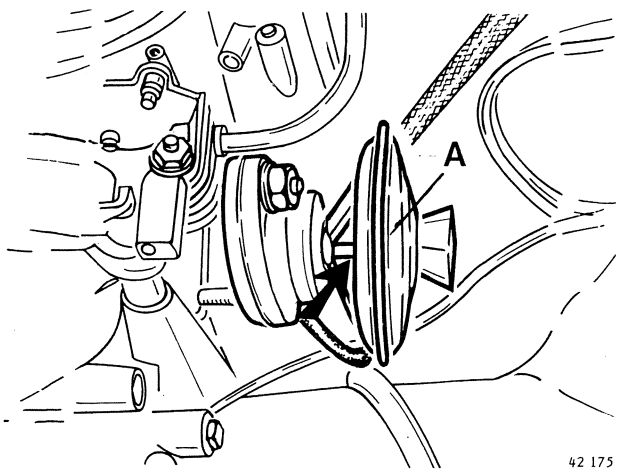
Silencers and exhaust pipes

- Fit the front silencer and main silencer with the exhaust clips and mounting straps.
- Align the exhaust system and observe the specified clearance from the fixed parts of the body.
- Tighten the exhaust clips.
- Check the system for gas-tightness.

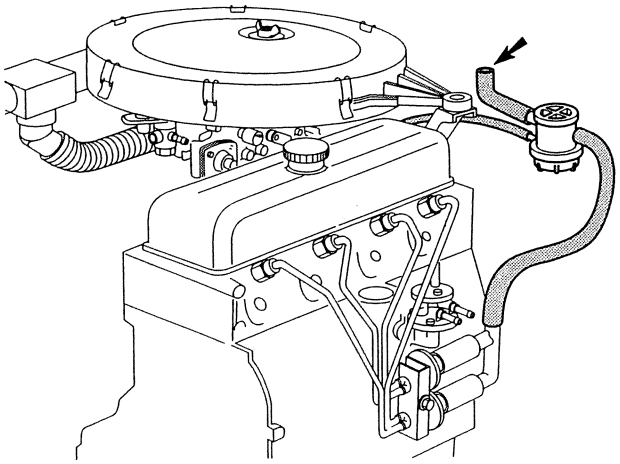


XX5

Testing/renewing the EGR vacuum valve



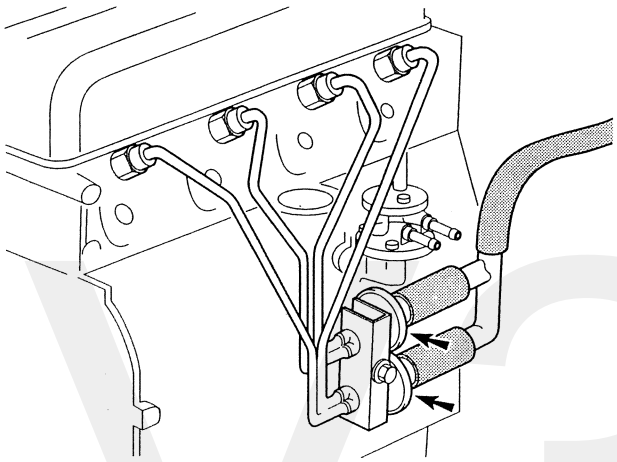
Start the engine.
The vacuum valve (A) on the exhaust manifold must be closed when the engine is running at idle.
At higher engine speeds the valve should open. If not, it must be renewed.
Removal:
Remove the two nuts (M8 and M10).
Remove the vacuum valve together with the gasket.
Fitting:
Fitting is in reverse order to removal.
Use new gaskets.
Tightening torques:
- M10 nut: 25 Nm.
- M8 nut: 18 Nm.



XX6

Testing/renewing the vacuum valve of the Pulsair system

The vacuum valve must be tested with the engine running at idle.
Disconnect the hose at the air filter.
At engine speeds above idle you should be able to feel the air being sucked in.
If this is not the case, the valve must be renewed.
Reconnect the hose.

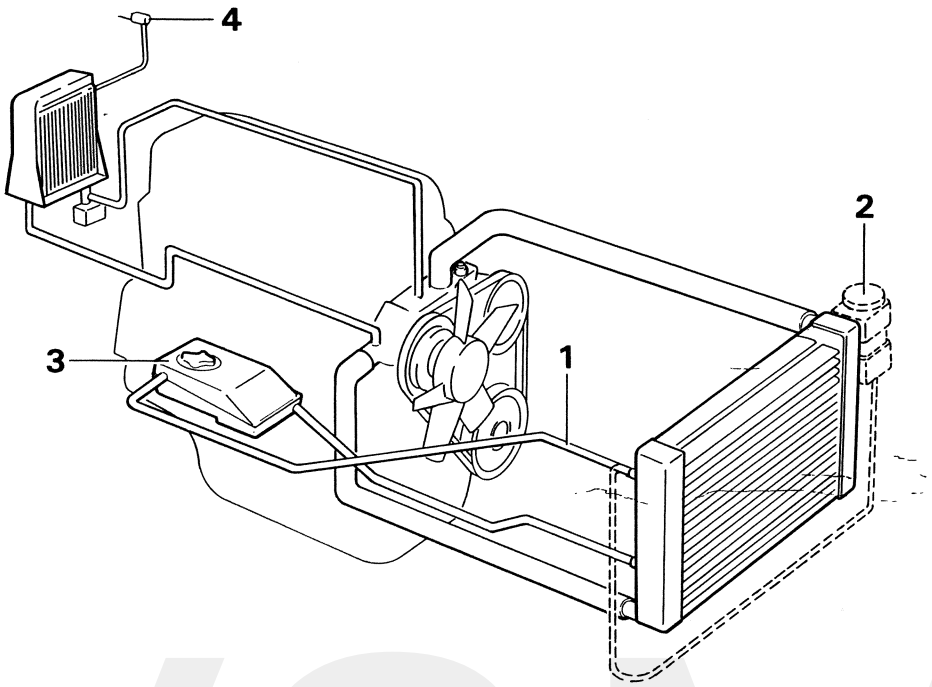


XX7

Test/renew the non-return valves

(hot engine)
Disconnect the hoses from the non-return valves.
Start the engine.
Hold your hand over the (warm) valves).
You should be able to feel the air being sucked in by the valves.
If this is not the case, renew the non-return valves.

Group 26. Cooling system

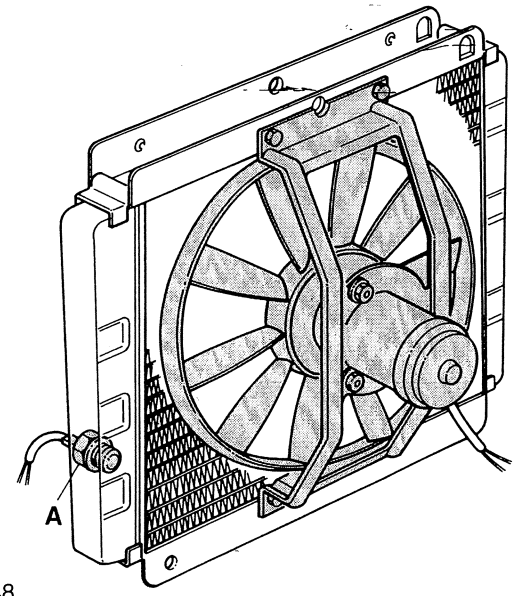


1 Extra connection for automatic bleeding
2 Expansion tank, old version
3 Expansion tank, new version
4 Bleedscrew

The sealed cooling system features a crossflow radiator with side water tanks and a separate expansion tank (A). On the old type of cooling system the filler pipe of the expansion tank is level with the top of the radiator and there is a filler cap on the radiator. On the new type of system the expansion tank (B) is higher: this makes it easier to bleed the cooling system.
The expansion tank collects the expanding coolant as it warms up. As the cooling system cools down, the expansion tank releases the coolant back into the system and in this way ensures that the radiator and cooling system are always filled with coolant. Any air that enters the cooling system when filling or topping-up will collect in the top part of the expansion tank.

This will of course result in a reduction of the amount of coolant in the expansion tank, which is why it is important to check the coolant level after filling or topping-up. The expansion tank pressure cap is equipped with a vacuum/excess pressure relief valve. The cooling system should always be topped-up by adding coolant to the expansion tank after first removing the pressure cap.

Up to model year 1984, an asymmetric 5-blade plastic (polypropylene) engine cooling fan was used.

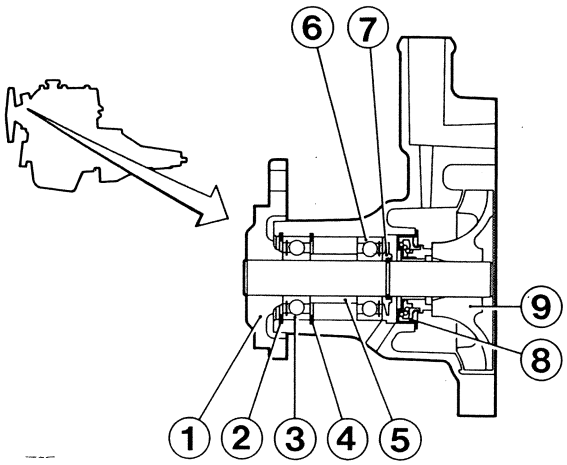


Thermo-electric engine cooling fan

With effect from model year 1984, the engines were equipped with a **thermo-electric engine cooling fan.** This engine cooling fan is activated by a thermal switch (A) in the radiator and only comes into operation when necessary, i.e. when there is a danger of the ideal engine temperature being exceeded. The fan is located ahead of the radiator.

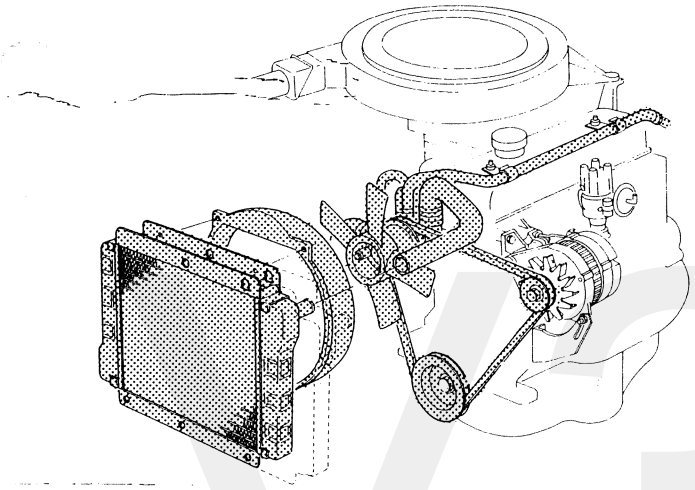
With effect from model year 1986, the engine cooling fan was located behind the radiator. The radiator is located **ahead of** the front plate.

Advantages of the thermo-electric engine cooling fan (compared with the conventional fixed fan):
- engine warm-up time is shorter;
- more engine output;
- better fuel consumption;
- lower noise level inside the car.



New type of water pump
With effect from model year 1982, all engines were equipped with a new type of water pump, shown in cross section in the adjacent drawing.

1 Flange
2 Circlip
3 Ball-type bearing
4 Circlip
5 Spacer
6 Ball-type bearing
7 Locating ring
8 Seal
9 Impeller

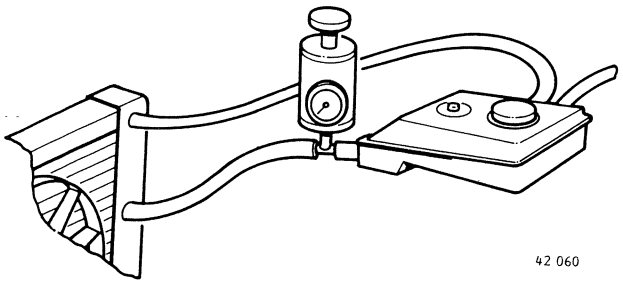


The introduction of this new water pump necessitated the modification of several other parts.
The following parts were modified:

1 Fan, fan belt and fan shroud
2 Crankshaft pulley, alternator pulley and shaft
3 Radiator hoses and heater hoses

Note: with effect from model year 1984, the engines were equipped with a thermo-electric engine cooling fan.

YY. Pressure testing the cooling system



YY1

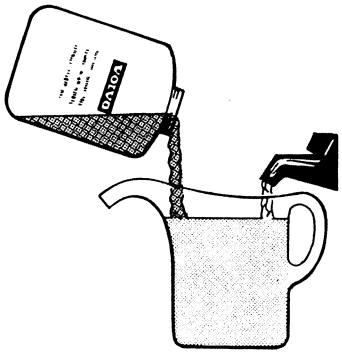
Connect the pressure gauge between the radiator and the expansion tank

Increase the pressure with the manual pump and check the opening pressure of the filler cap; also check the system for leakage.

- the opening pressure should be between 65 and 85 kPa
- the pressure reading on the gauge should not drop noticeably for a period of at least 30 seconds.

ZZ. Coolant

ZZ1



40 095

Topping-up the cooling system

Topping-up should be done exclusively with original Volvo coolant in the following proportions:

Nordic countries:
1 part Volvo coolant to 1 part water.
Europe:
1 part Volvo coolant to 2 parts water.

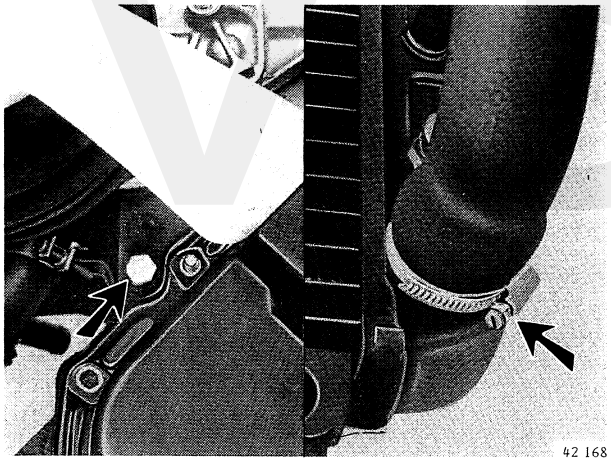
ZZ2

Changing the coolant

Coolant composition

- The coolant should be changed after two winters, i.e. every third autumn. After this period the corrosion-protective additives will have lost some of their effect.
- Never fill the cooling system with water on its own. Use genuine Volvo coolant diluted with clean water in the proportions indicated in Operation **ZZ1.**

ZZ3

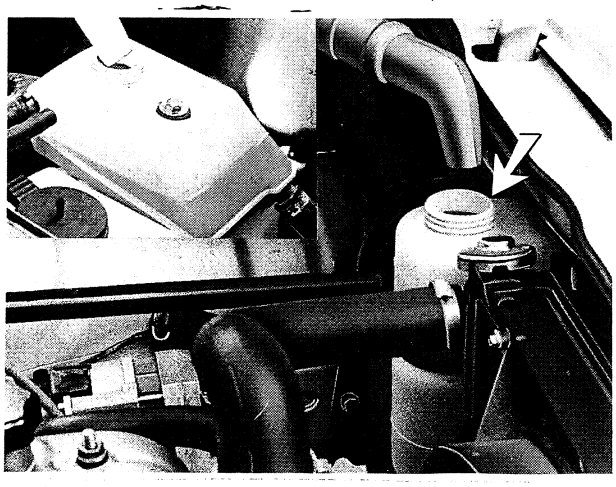


42 168

Drain the cooling system

Remove the engine splash guard.
Locate a drip tray under the engine and radiator.
Disconnect the bottom coolant hose from the radiator and the drain plug from the cylinder block.
Note: coat the thread of the drain plug with liquid gasket cement before replacing it. Tightening torque: 20 Nm.

ZZ4

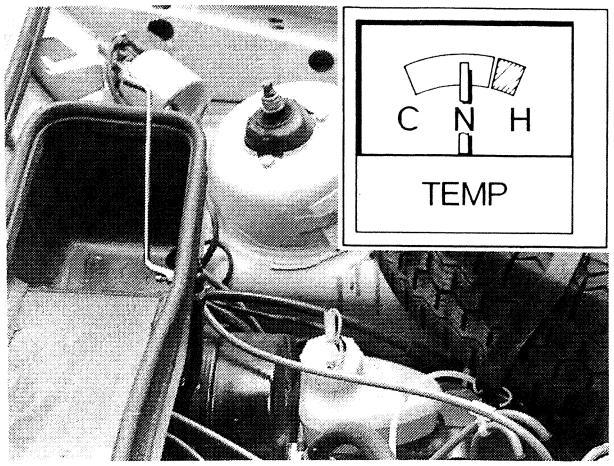


Fill the cooling system

Up to model year 1981
Remove the filler cap from the radiator and fill the radiator.
Replace the filler cap and fill the expansion tank up to the 'MAX' mark.

From model year 1981
Remove the pressure cap from the expansion tank and fill the tank up to the 'MAX' mark.
Replace the pressure cap.
Run the engine until it is warm and top-up as necessary.
Check the cooling system for leakage as described in Operation *YY1.*
The total capacity of the cooling system is:

- up to model year 1985: approx. 5.5 litres;
- from model year 1985: approx. 6.5 litres.

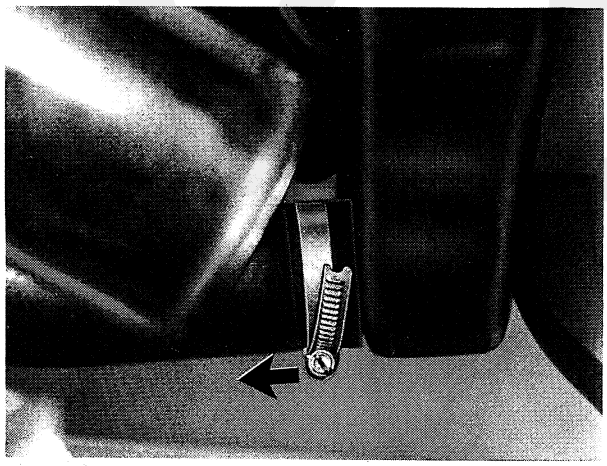


ZZ5

Bleed the cooling system (up to model year 1981)

Run the engine until it is warm and the thermostat has opened; the pointer of the coolant temperature gauge is then at 'N' or '90'.
Open the bleedscrew in the air inlet unit until coolant flows out steadily without air bubbles.
Note: when the cooling system has been bled, check and if necessary top-up the coolant level in the radiator and expansion tank.

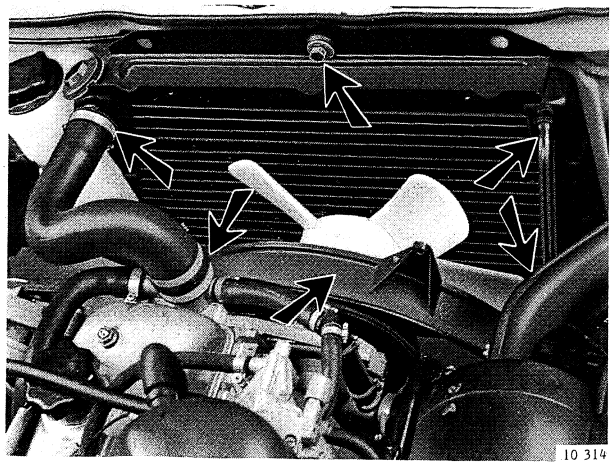
AB. Removing/fitting the radiator



AB1

Drain the coolant

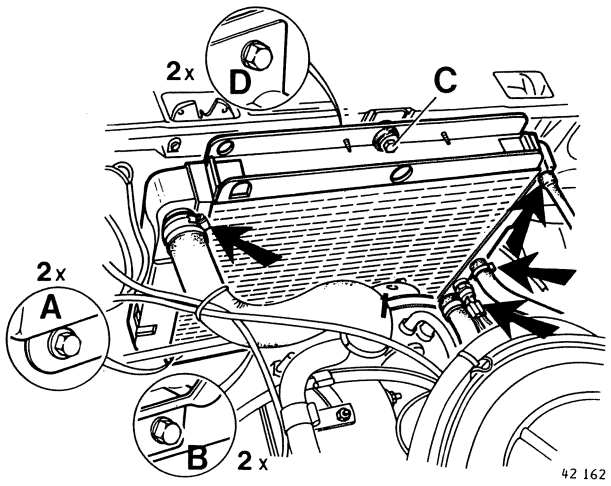
Remove the engine splash guard.
Locate a drip tray under the radiator.
Remove the filler cap and (if fitted) the pressure cap.
Disconnect the bottom coolant hose from the radiator.



AB2

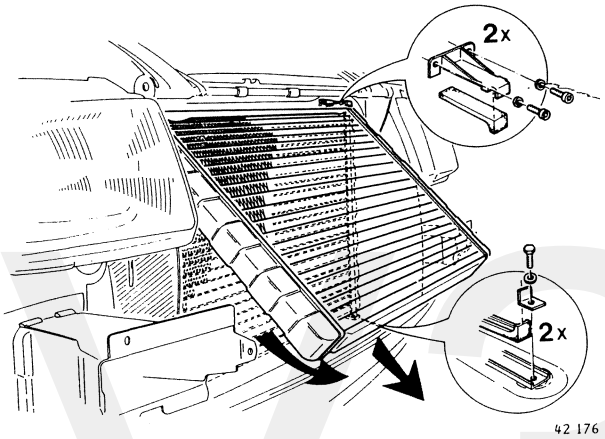
Remove the radiator

Up to model year 1983
Release the fan shroud and place it over the water pump.
Remove the lower retaining bolts.
Release the upper radiator hose at the radiator end.
Pull the expansion tank hose off the radiator.
Remove the upper radiator attachment.
Remove the radiator.



42 162

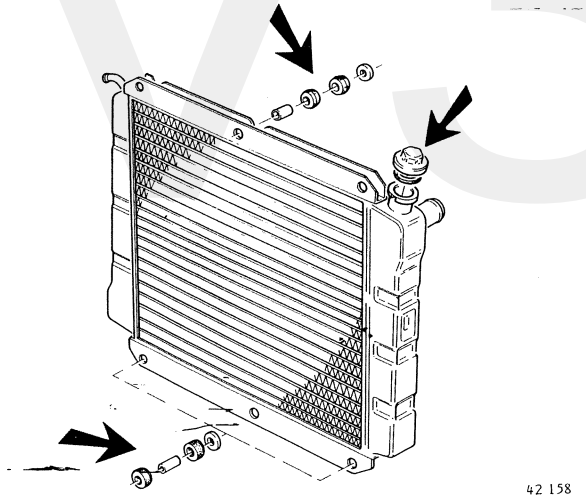
From model year 1983 to model year 1985 inclusive
Disconnect both wiring terminals from the thermal switch.
Remove the lower retaining bolts (A) from the radiator and the upper screws (B) from the fan bracket.
Release the upper radiator hose and both hoses from the expansion tank at the radiator end.
Release the upper radiator attachment (C) and remove the upper screws (D) from the fan bracket; rest the fan against the front plate.
Remove the radiator.



42 176

From model year 1986
Remove the grille.
Disconnect all the hoses from the radiator.
Unplug the connector from the thermal switch.
Remove the bolts and brackets.
Remove the radiator.

AB3


42 158

Transfer various parts to the new radiator

Transfer the rubber mountings, spacers and (if fitted) the pressure cap.
If the thermal switch has to be transferred, always fit a new packing ring. Tightening torque: 18 Nm.

AB4

Fit the radiator

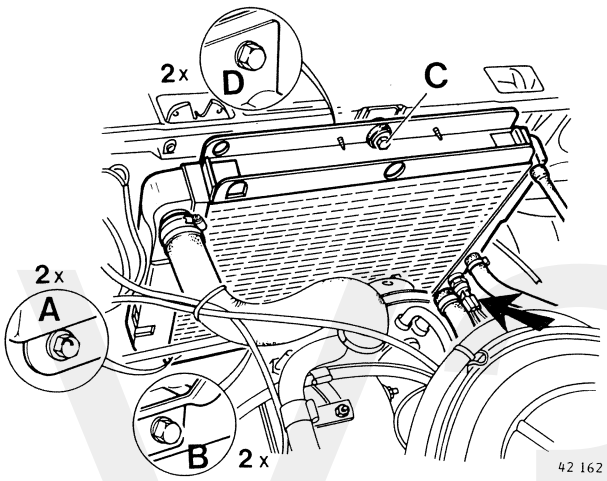
Fitting is in reverse order to removal.
Tightening torques:
- self-tapping screw: 8 Nm;
- bolts, radiator bracket: 10 Nm;
- M8 bolt: 23 Nm.

AB5

Fill and bleed the cooling system

See Operations *ZZ1* to *ZZ5*..

AC. Removing/fitting the thermo-electric engine cooling fan



AC1

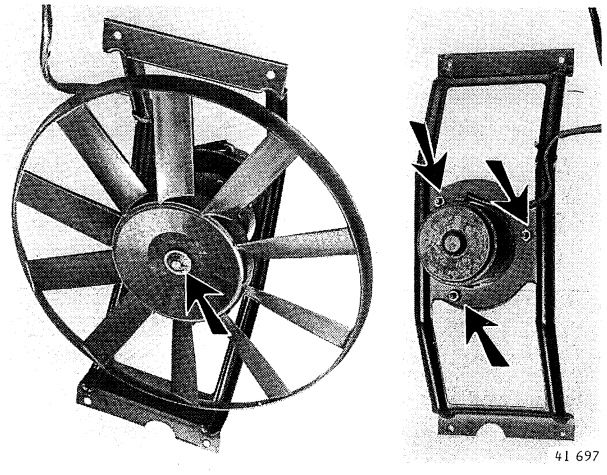
Remove the fan

From model year 1983 to model year 1985 inclusive

Release the lower retaining bolts (A) from the radiator.
Remove the lower screws (B) from the fan bracket.
Remove the grille.
Disconnect the wiring from the thermal switch and the engine wiring harness.
Remove the upper retaining bolt (C) from the radiator and the screws (D) from the fan bracket.
Withdraw the fan and bracket assembly through the grille aperture.

From model year 1986

Disconnect the wiring from the thermal switch and the engine wiring harness.
Remove the lower screws (A) and the upper screws (B) from the fan bracket.
Remove the fan and bracket assembly from the engine compartment.



AC2

Remove the fan blade

Remove the circlip and washer and take the fan blade off the shaft.

AC3

Remove the fan motor from the bracket

Remove the three nuts and take the motor out of the bracket.

AC4

Fit the engine cooling fan

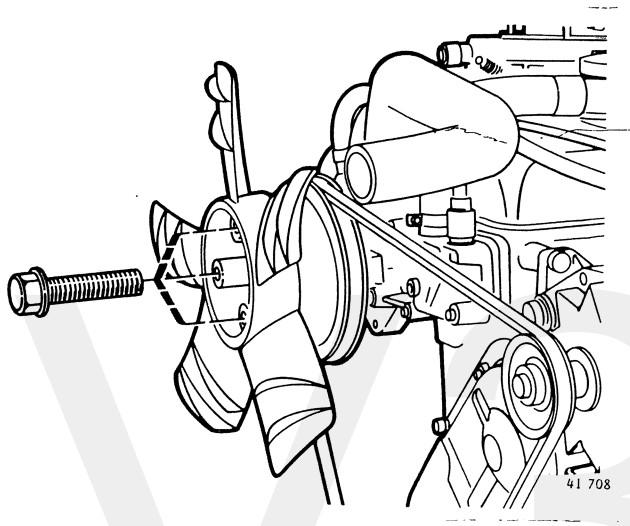
Fitting is in reverse order to removal. Tightening torques:
- self-tapping screws: 8 Nm;
- M8 radiator bolt: 23 Nm.

Note the location of the cable on the bracket.
Connect the fan wiring to the thermal switch and to the engine wiring harness.

AC5

Extra cooling fan

If the car is used to tow a caravan or a heavy trailer, it is strongly recommended that an **extra cooling fan** be fitted (especially for driving in hilly country). This fan must be fitted on the water pump pulley.



AC6

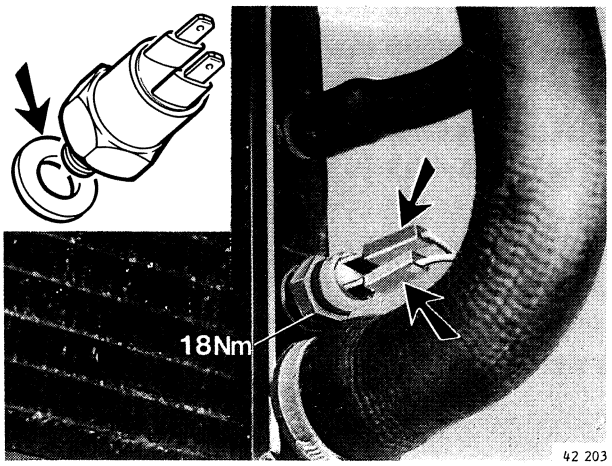
Fit the cooling fan

Remove the three bolts from the water pump pulley.
Fit the fan on the pulley with three **M8x40** flange bolts.
Tightening torque of flange bolts: 15 Nm.

Important! When a customer has a towing bracket fitted to his car, always enquire what he intends to tow and advise him to fit an extra fan if the above is applicable in his case.

Fuel consumption may increase when an extra cooling fan is fitted. If the towing activities are restricted to one trip a year with the caravan through hilly or mountainous areas, for example, it is advisable to remove the extra fan immediately after the journey.
The tightening torque of the water pump pulley bolts is 21 Nm.

AD. Removing/fitting the thermal switch



AD1

Remove the thermal switch

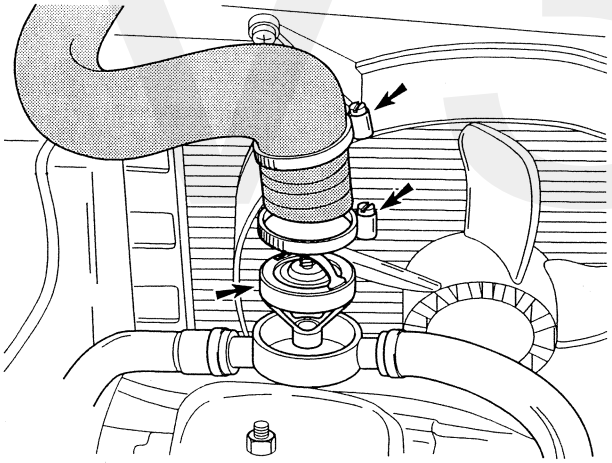
Unplug the two connectors.
Note: before removing the thermal switch you should first fit a new sealing washer on the new thermal switch. Fit the new thermal switch quickly to avoid unnecessary loss of coolant.

AD2

Fit the thermal switch

Tighten the thermal switch to **18 Nm.**
Reconnect the wiring at the two connectors.
If necessary, top-up with coolant.

AE. Checking/renewing the coolant thermostat



AE1

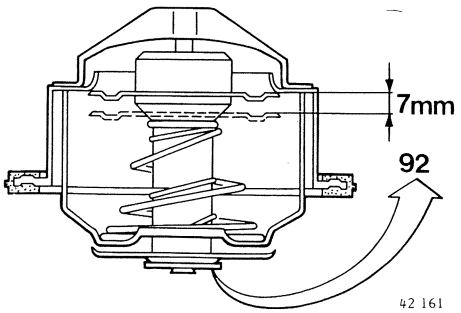
Drain the cooling system

Only drain the radiator (release the lower coolant hose).

AE2

Remove the thermostat

Disconnect the upper radiator hose from the water pump.
Release the upper clip.
Remove the thermostat from the radiator hose.



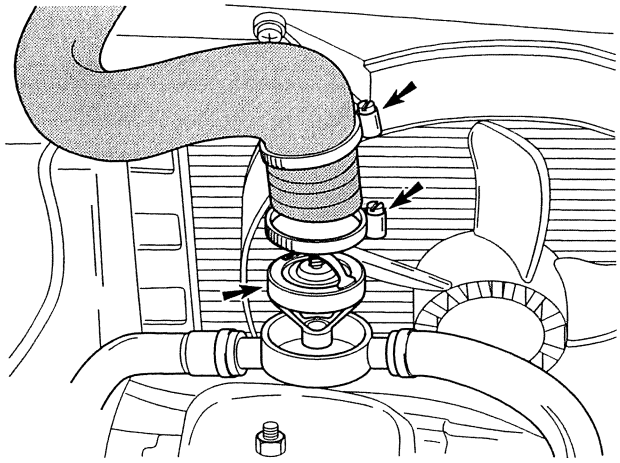
AE3

Check the thermostat

If necessary, test the thermostat in warm water.

Marking	Opens between	Fully open at
83	80-83 °C	93 °C
89	86-89 °C	100 °C
92	89-92 °C	105 °C

Minimum opening: 7 mm.



AE4

Fit the thermostat

Slide the thermostat up against the stop in the radiator hose.
The thermostat bridge must be pointing in the direction of travel.
Secure the thermostat with the upper hose clip.
Secure the radiator hose to the radiator and to the water pump.
Fit the lower coolant hose.

AE5

Fill and bleed the cooling system

See Operations *ZZ1* to *ZZ5.*

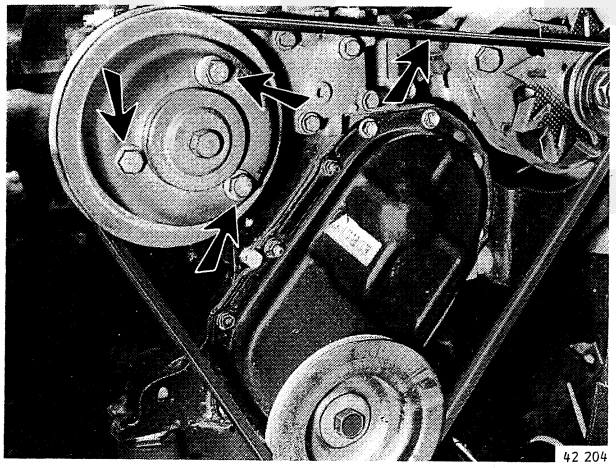
Run the engine until it is warm and check whether the thermostat is open.

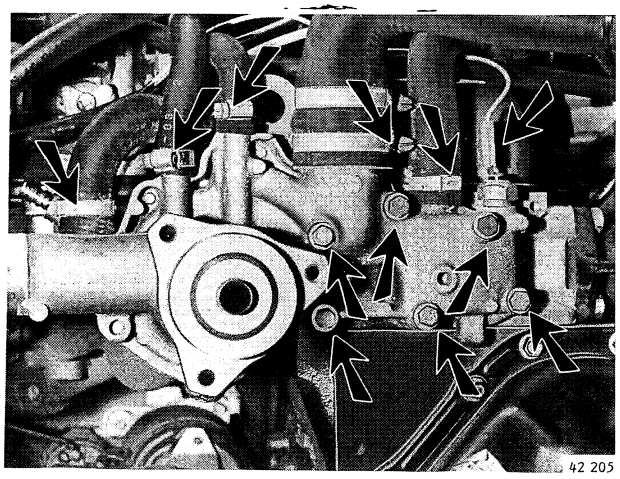
AF. Removing/fitting the water pump

AF1

Drain the cooling system

Disconnect the lower coolant hose from the radiator.





AF2

Preliminary operations

Remove
(up to model year 1983):
- fan shroud from the radiator;
- fan belt from the alternator;
- fan;
- water pump pulley;
- radiator.

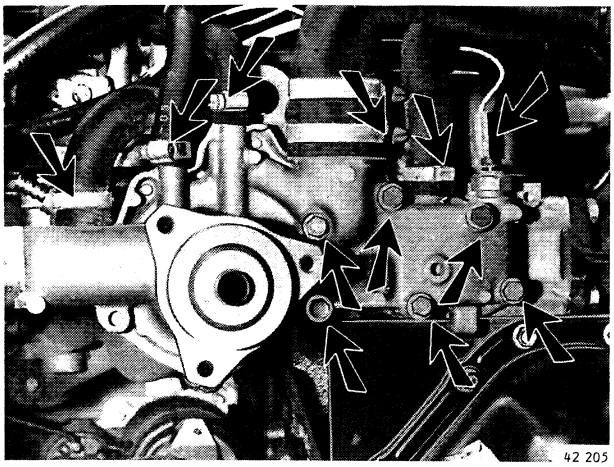
From model year 1983 to 1985 incl.:
- fan belt from the alternator;
- fan (if fitted);
- water pump pulley.

From model year 1986:
- thermo-electric engine cooling fan;
- fan belt from the alternator;
- water pump pulley.

AF3

Remove the water pump assembly

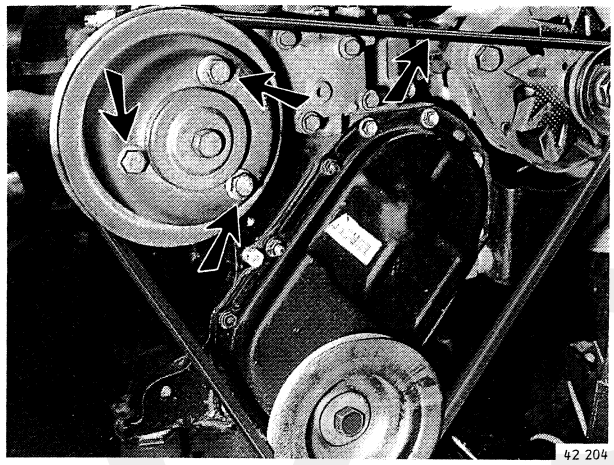
Disconnect the electrical terminal from the temperature transmitter (if fitted).
Remove the coolant hoses.
Remove the six bolts.



AF4

Fit the water pump

Use a new gasket.
Fit and tighten the six bolts and washers. Tightening torque: 8 Nm.
Now tighten the four bolts of the water pump cover. Tightening torque: 8 Nm.
Connect up the coolant hoses.
Connect up the electrical terminal for the temperature transmitter.
Note: always fit the new gasket dry, i.e. without any adhesive of sealing compound.



AF5

Fit:

- water pump pulley with fan (if removed earlier); tighten to **15 Nm;**
- fan shroud to the radiator (if removed earlier);
- water pump pulley without fan; tighten to **21 Nm;**
- alternator fan belt; adjust the tension: deflection approx. 5-10 mm;
- radiator (up to model year 1983).

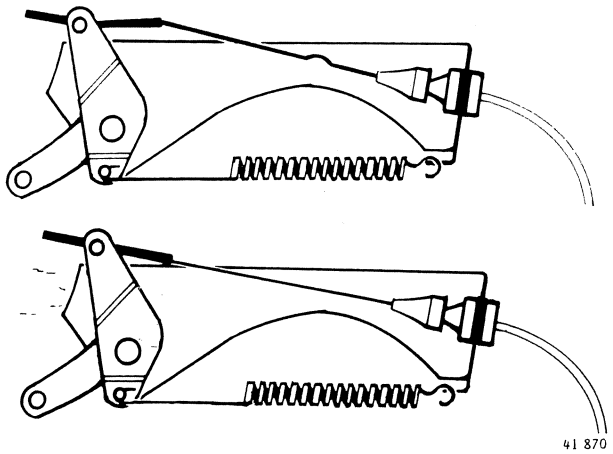
AF6

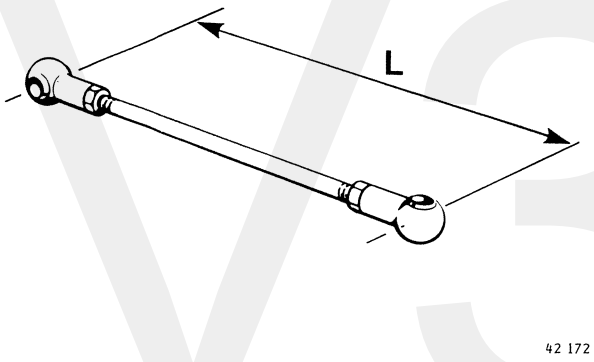
Fill and bleed the cooling system

See Operations *ZZ1* to *ZZ5*.

Group 27. Engine controls

AG. Throttle and choke controls





AG1

General

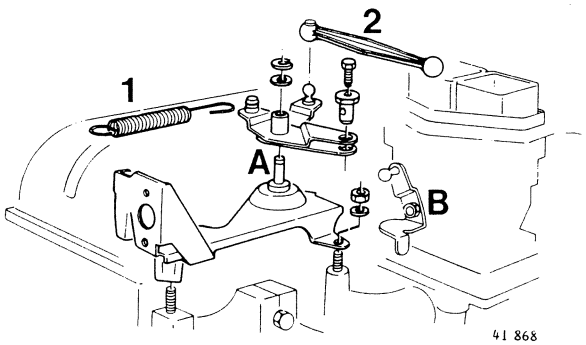
- Kinks in the throttle and choke cables are not permitted since this can adversely influence the useful life and operation of the cables.
- In the throttle-released position the inner cable should be in line with the outer cable. Correct if necessary by bending the outer cable attachment bracket.
- When the accelerator pedal is operated the inner cable should run in a straight line inside the outer cable. Correct if necessary by bending the accelerator pedal at the cable end fitting.
- Up to model year 1982, control rods with the following lengths are fitted on the various engine types:

B14.OE up to engine no. 32249
B14.OS up to engine no. 9421 L= 198-200 mm

B14.OE from engine no. 32249
B14.OS from engine no. 9421 L= 190-192 mm

B14.1E from engine no. 10.022 and B14.1S from the very first engine with a control rod length of 190-192 mm: shorten to 184-186 mm.

With effect from model year 1982, the length of the control rod was shortened to 70 ±0.5 mm.

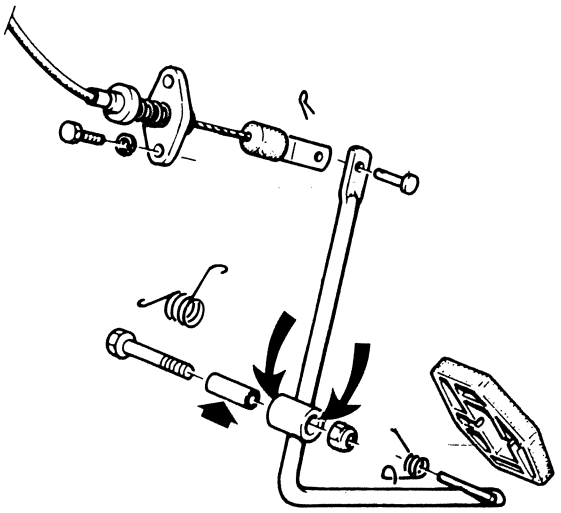


AG2

Check the throttle linkage pivoting points

Unhook the return spring (1).
Remove the throttle control rod (2).
Check that the lever pivoting point (A) and the valve spindle linkage (B) on the carburettor move smoothly.
Lubricate these points with oil.
Fit the control rod and the return spring.
If necessary, adjust the throttle cable.

When fitting a new accelerator pedal, or in the case of stiff operation, grease the following pivoting points:
- pivoting point of the throttle linkage on the inlet manifold;
- pivoting point of the accelerator pedal;
- pivoting point of the inner cable on the accelerator pedal.



AG3

Check the run of the throttle cable

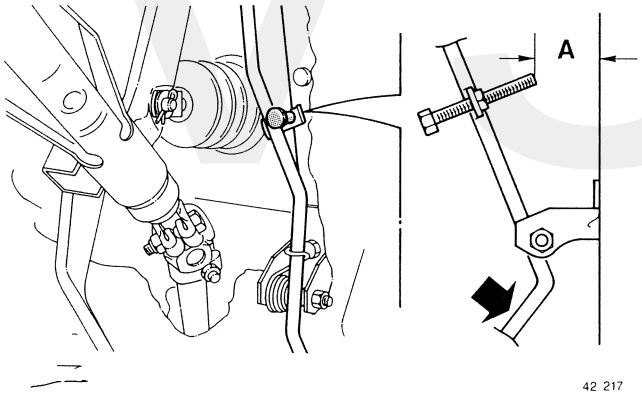
Remove the trim panel under the dashboard at the driver's side.
Check the run of the throttle cable and verify that it operates smoothly. It must be clear of other parts and run as straight as possible in the outer cable.
Correct if necessary by bending the accelerator pedal (at the cable end fitting).
Check the throttle cable for fraying and kinks; if necessary, renew the cable.

AG4

Check the bush at the accelerator pedal pivoting point

Check the accelerator pedal pivoting point.
The accelerator pedal must pivot smoothly.
If this is not the case, proceed as follows:
- remove the bolt, nut and bush;
- grease the bush and the pedal.

Part numbers of grease
1161079-7: tube, 225 grams
1161029-9: cartridge, 400 grams
Fit the accelerator pedal; use a new lock nut.



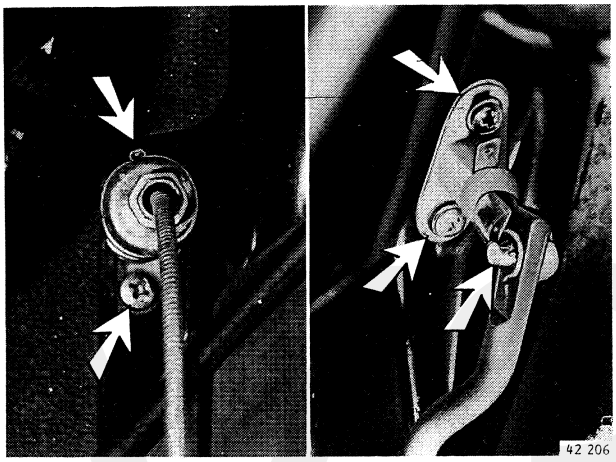
AG5

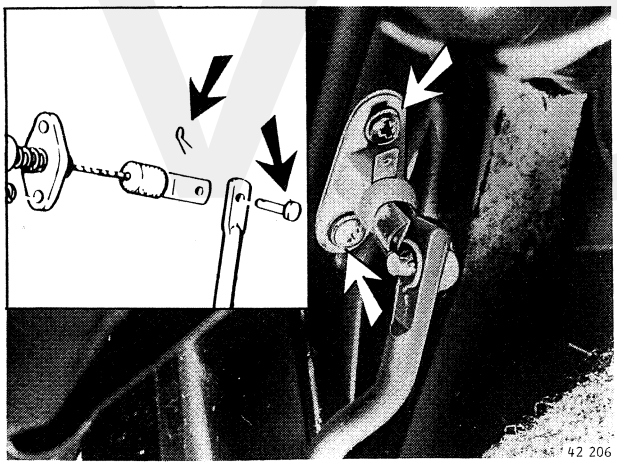
Accelerator pedal adjustment

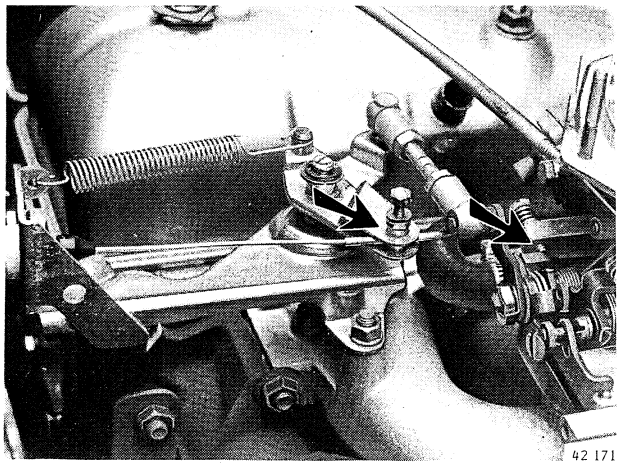
A new accelerator pedal must be adjusted as follows:
- push the accelerator pedal down against the pedal stop;
- now adjust the bolt (dimension A) to obtain a value of 35.5 +1 mm between the pedal box and the adjusting bolt;
- fit the throttle cable to the carburettor and adjust the cable.

Caution! Do not bend the accelerator pedal.

AH. Renewing/adjusting the throttle cable







AH1

Disconnect the throttle cable in the engine compartment

AH2

Remove the throttle cable from the pedal box

Remove the trim panel under the dashboard at the driver's side.

Up to model year 1981

Release the inner cable from the pedal.
Remove the cross-slotted screws and lock washers.
Withdraw the throttle cable, working from the passenger compartment.
Remove the seal.

From model year 1981

Release the inner cable from the pedal.
Remove the cross-slotted screws and lock washers.
Withdraw the throttle cable, working from the engine compartment.

Note: cars with AT: release the kick-down cable connector from the throttle cable.
Leave the earth cable attached to the plug.

AH3

Connect the throttle cable to the pedal box

Up to model year 1981

Locate the seal.
Fit and tighten the two cross-slotted screws and lock washers.
Hook the inner cable into the pedal.

From model year 1981

Fit and tighten the two cross-slotted screws and lock washers.
Connect the inner cable to the pedal.

Note: cars with AT: locate the plug with the earth cable in the upper attachment.
Secure the kick-down cable connector.

AH4

Connect up and adjust the throttle cable at the engine

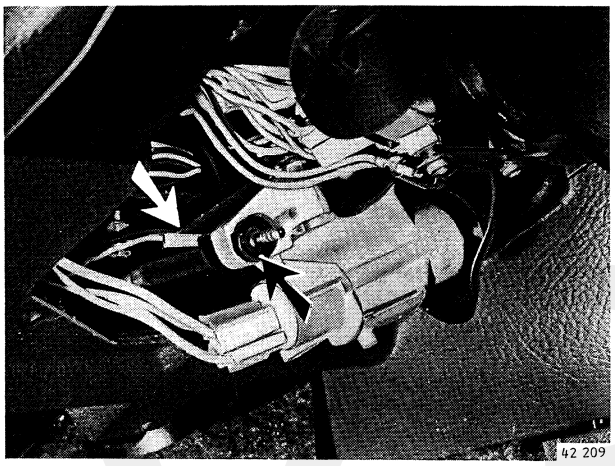
Fit the retaining clip on the outer cable.
Pull the inner cable taut and tighten the lock screw.
Check that the throttle valve comes up against the stops in the throttle-released and full throttle positions.
Cars with AT: check whether the kick-down comes into operation in the full throttle position (accelerator pedal against the stop).

AJ. Renewing/adjusting the choke cable

AJ1

Remove the air filter assembly

From model year 1981.



AJ2

Disconnect the choke cable at the engine

AJ3

Remove the steering column cover

Remove the ignition key.
Unscrew the choke knob.
Remove the bottom cover attachment.

AJ4

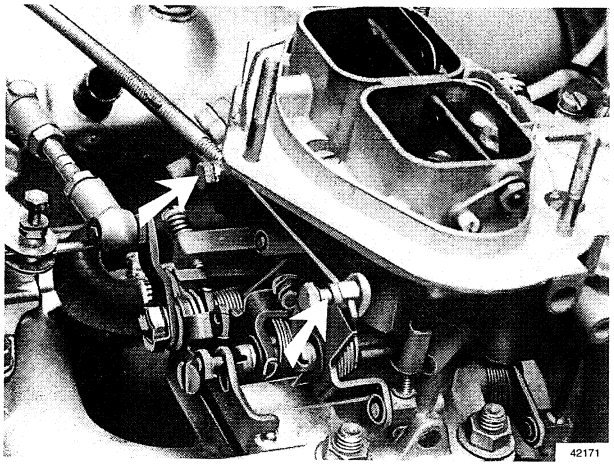
Remove the choke cable from the steering column

Remove the cover.
Remove the nut.
Withdraw the choke cable.
Release the cable tag for the warning lamp.
Remove the choke cable from inside the car.
Note: leave the grommet in the bulkhead.

AJ5

Fit the choke cable

Fitting is in reverse order to removal. Tightening torque of choke cable nipple: 5 Nm.



AJ6

Adjust and secure the choke cable

Weber carburettor
First release the inner cable at the nipple (if necessary).
Open the choke valves fully with the lever on the carburettor.
Pull the inner cable taut and tighten the lock screw in the nipple. Tightening torque: 10 Nm.

Solex carburettor
Connect the inner cable to the choke operating lever.
Pull the inner cable taut together with the outer cable.
Secure the outer cable with the lock screw in the nipple.
Tightening torque: 10 Nm.

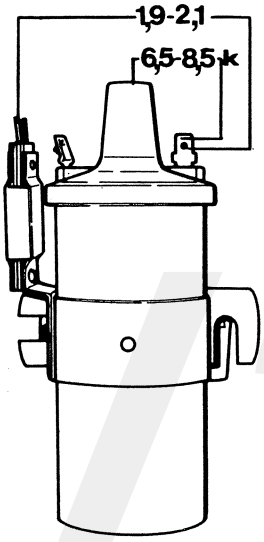
AJ7

Fit the air filter assembly

(If removed earlier.)

Group 28. Ignition system

AK. Fault tracing in the conventional ignition system (mechanical breaker type)



AK1

Test the ignition coil and ballast resistor for continuity

Test conditions: ignition coil and ballast resistor temperature approx. 20°C.
All cables must be disconnected from the terminals which are being tested.

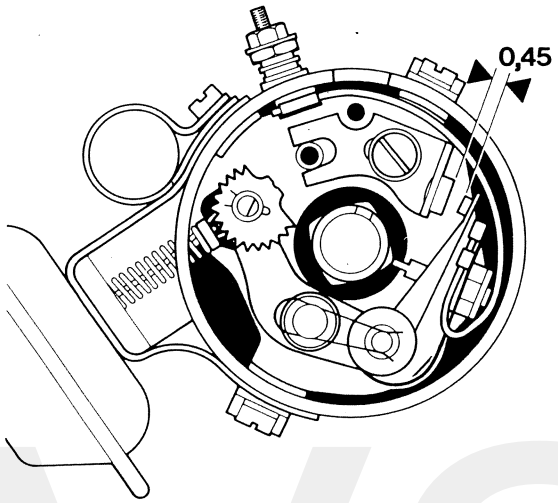
Resistance of primary winding, measured between terminal 1 and the ballast resistor:
1.9-2.1 ohms.

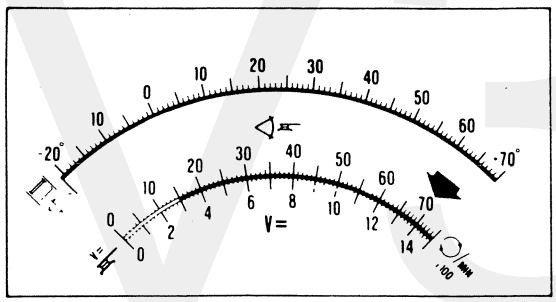
Resistance of secondary winding, measured between terminal 1 and HT:
6.5-8.5 k-ohms.

Note: the resistance of the PTC is **0.68 ohms** at a temperature of 20°C. The resistance increases with higher temperatures.

AL. Repair and maintenance of the conventional ignition system, up to model year 1984

Special tools: 999-9921, 9938, 9940





Distributor - general

AL1

Renewing and adjusting contact breaker points

Remove the distributor cap, the rotor arm and the anti-condensation cap.
Remove the old breaker points.
Clean the rotor arm shaft.
Fit the new breaker points.
Lightly smear the rotor arm shaft with grease.
Note: the SEV Marchal distributor has cassette-type contact breaker points. Apply a few drops of oil to the felt lubrication pad (if fitted).

Crank the engine until the highest point of a cam on the rotor arm shaft is located under the small fibre heel of the contact breaker points.
Now use a feeler gauge to set the gap between the points at **0.45 mm** (with the exception of the SEV Marchal distributor).
Ducellier distributor: check the stroke of the vacuum diaphragm unit: it must be within the fixed contact point; if necessary, correct with spindle (A).

Connect up the Volvo Monotester.
Turn the Monotester test switch to position 4.

Crank the engine with the starter motor and read off the dwell angle on the 0-70 scale, (see Operation *AL3*).
If necessary, adjust the gap between the points.
Fit the rotor arm, the anti-condensation cap and the distributor cap.

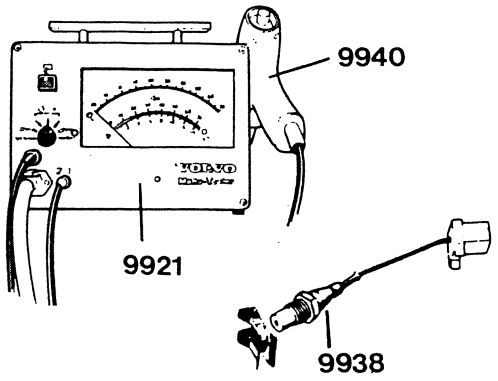
AL2

Type of distributor	Dwell angle
Ducellier	**54° - 60°**
AC Delco	**47° - 53°**
SEV marchal	**59° - 65°**

AL3

Ignition timing points

Ignition timing point	B14.0E/0S	B14.1E/2E B14.1S/2S/3S	B14.3E
Static	3° ± 1°	6° ± 1°	10° ± 1°
Dynamic at idling speed of	3° ± 1°	6° ± 1°	10° ± 1°
41.7 r/s (2,500 r/min)	18° ± 2°	20° ± 2°	22° ± 2°



AL4

Adjusting the ignition timing (general)

Note: the ignition timing must be adjusted with the Volvo Monotester **999-9921** and the sensor with adaptor **999-9938.**

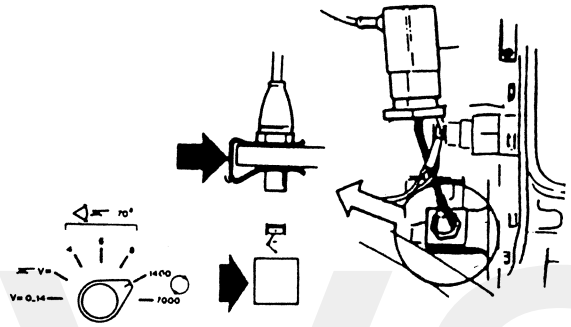
However, on cars with a manual gearbox, up to chassis number 410680, the sensor cannot be used to check the ignition timing.

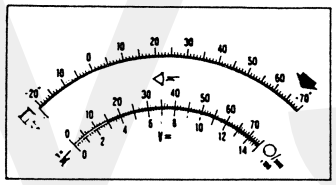
On these cars the ignition timing has to be adjusted with the Volvo Monotester **999-9921** and the stroboscope lamp **999-9940.**

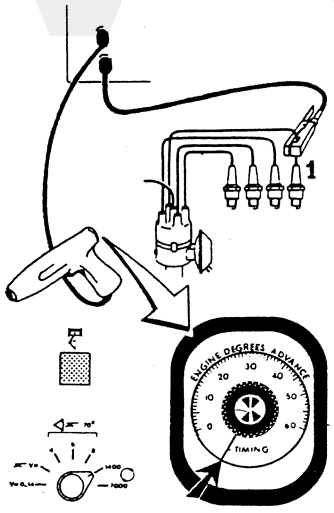
AL5

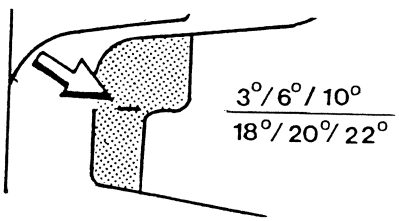
Adjust the ignition timing with the sensor

Connect up the Monotester and locate the sensor.
Disconnect the vacuum hose from the distributor.
Release the distributor attachment.
Run the engine at idling speed. Turn the Monotester test switch to position 1400.
Press the red button on the Monotester and read off the ignition timing point on the -20°C - +70°C scale (see table).
Correct, if necessary, by turning the distributor.
Turn the test switch to position 7000.
Run the engine at 41.7 r/s (2,500 r/min).
Again read off the ignition timing point (see table).
If the timing is not according to specification, the distributor will have to be tested on a distributor test bench and, if necessary, reconditioned.
Tighten the distributor attachment.
Connect up the vacuum hose.





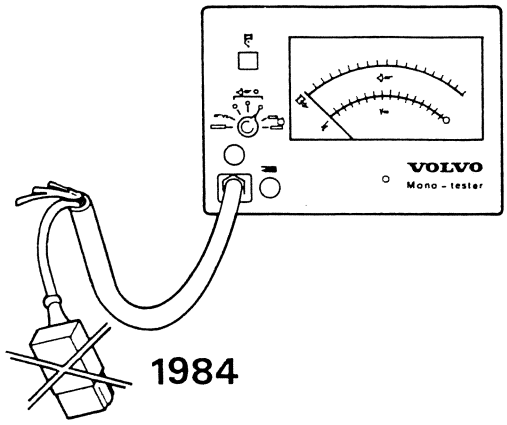




AL6

Adjust the ignition timing with the stroboscope lamp

Connect up the Monotester and locate the induction clamp on the spark plug cable of No. 1 cylinder (flywheel end).
Disconnect the vacuum hose from the distributor.
Release the distributor attachment.
Turn the test switch to position 1400.
Press the red button to switch off the Monotester.
Run the engine at idling speed.
Turn the graduated scale of the stroboscope to 'timing'.
Press the stroboscope switch and aim the lamp at the marks on the flywheel.
The lamp should flash at **3°, 6° or 10°** BTDC; see Operation *AL3.*
Correct, if necessary, by turning the distributor.
Repeat this procedure at 41.7 r/s (2,500 r/min.).
The lamp should flash at **18°, 20° or 22°** BTDC; see Operation *AL3.*
If the timing is not according to specification, the distributor will have to be tested on a distributor test bench (see *AO*) and, if necessary, reconditioned.
Tighten the distributor attachment.
Connect up the vacuum hose.



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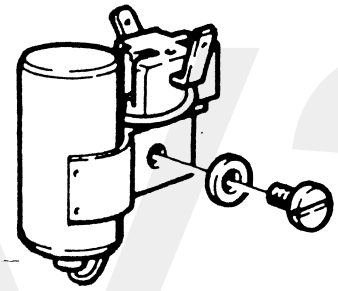
AL7

Check the ignition timing with a separate stroboscope lamp

With effect from model year 1984, the use of the separate sensor (special tool 999-9938) to check the ignition timing was discontinued.

The only way to check the ignition timing as from this model year is with an adjustable stroboscope lamp.

Connect up the stroboscope lamp.
Aim the lamp at the mark on the flywheel.
Turn the graduated scale on the stroboscope lamp until the mark is opposite the '0°' symbol.
Read off the ignition advance on the graduated scale of the stroboscope lamp.



AL8

Capacitor

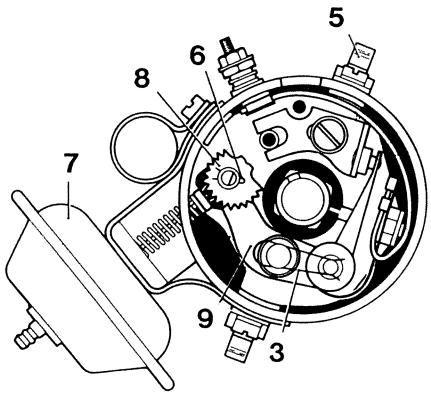
Symptoms of a burnt-out capacitor:
1 Engine starts poorly.
2 Contact breaker points rapidly become pitted.
3 Engine runs erratically and misfires.

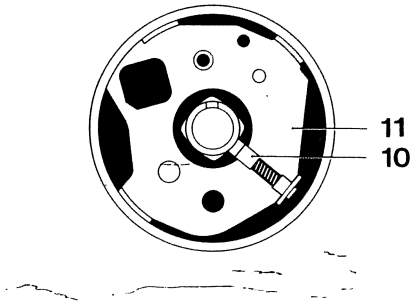
Ducellier	outside
AC Delco	inside (under the distributor cap)
SEV marchal	outside (after removing the cap, rotor arm and dust cover)

Renew the capacitor and check whether the fault has been remedied.

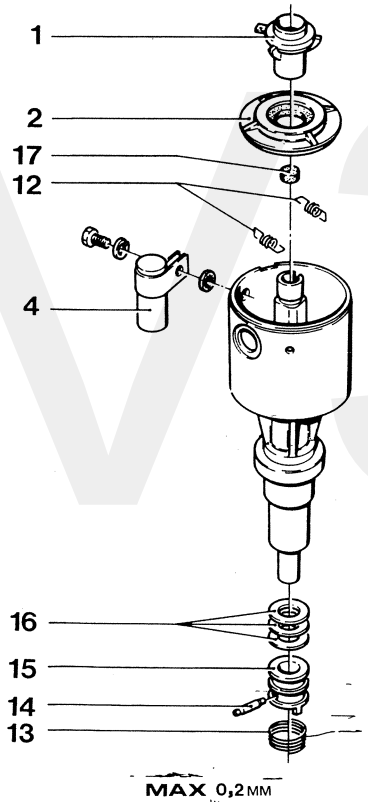
AM. Reconditioning the Ducellier distributor

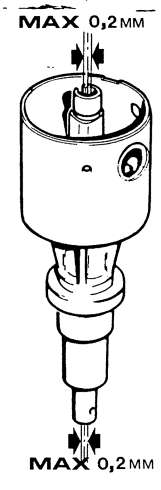
Note: the Ducellier distributor is the only type that can be reconditioned.





AM1





Remove the distributor from the car

Remove:
- distributor cap;
- rotor arm (1) and anti-condensation cap (2);
- contact breaker points and hairpin spring (3);
- capacitor (4);
- both hold-down clips (5);
- hairpin spring (6);
- vacuum diaphragm unit (7) together with the toothed segment (8)
- adjusting lever (9).

Press the thrust block (10) against the spring and remove the baseplate (11). (Make sure that the thrust block does not fly away.)
Remove the two pull-off springs (12) from the centrifugal advance unit.
(Note: the springs are not identical.)
Remove the retaining spring (13) and coupling pin (14).
Remove the drive dog (15) and the shims (16).
Caution! Mark the position of the drive dog (15) relative to the distributor drive shaft.
Remove the felt lubrication pad (17) from the rotor arm shaft.

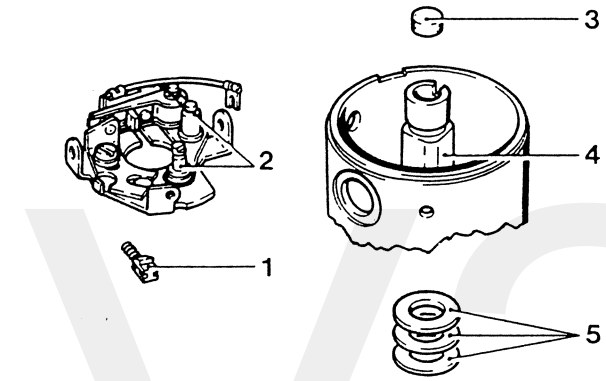
AM2

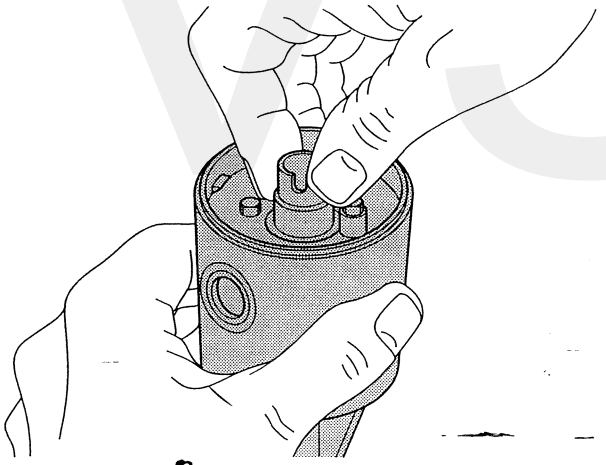
Clean and check all parts

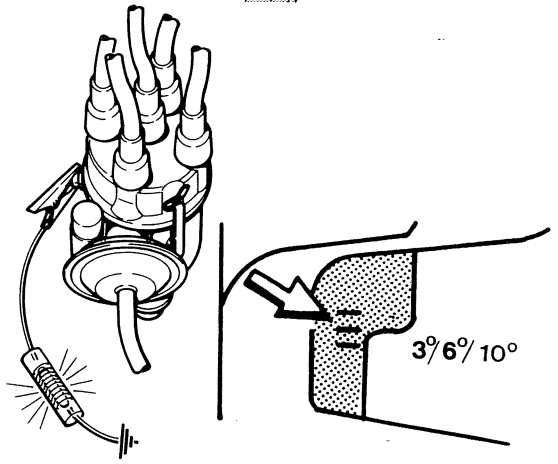
Check the distributor drive shaft for radial bearing play.
Maximum permissible bearing play: **0.2 mm.**
Check all parts for wear and damage.

Renew the rotor arm and the distributor cap if the contact points are worn or excessively pitted.
Also check the distributor cap for hairline cracks.

AN. Assembling the distributor







AN1

Lubricate the parts

Lubricate the parts during assembly as follows:
1 Coat the thrust block with a thin film of grease
2 Lubricate the pivoting points with grease
3 Soak the felt lubrication pad in oil
4 Coat the distributor drive shaft cams with a thin film of grease
5 Coat the shims with grease

Assembly is in reverse order to disassembly; see Operation *AM1.*
Note: do not yet fit the distributor cap.

Caution! Fit the centrifugal advance pull-off springs in the correct position.
Locate the drive dog correctly in relation to the distributor drive shaft.

AN2

Test the distributor on a distributor test bench

See Operation *AO.*

AN3

Fit the distributor

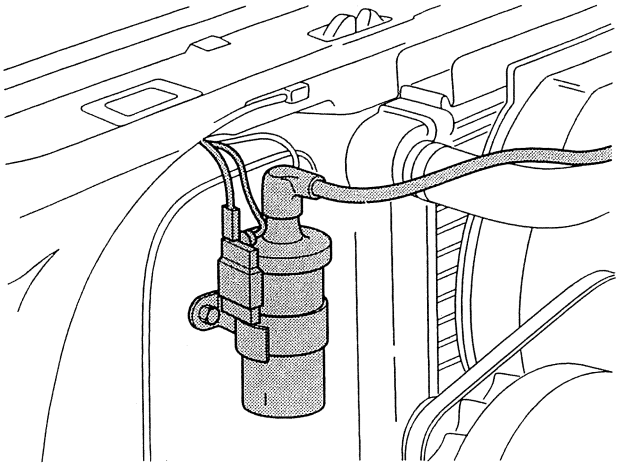
Use a new gasket.
Locate the distributor and rotate the rotor arm shaft until the drive dog engages the groove in the drive shaft.
Caution! Take special care when assembling because the drive dog is located off-centre.
Locate the clamping plate but do not yet tighten the nut.
Fit the anti-condensation cap, the rotor arm and the distributor cap.
Connect up the wiring.
The Renix distributor can be fitted in one position only.

AN4

Basic setting (up to model year 1984)

Connect a pilot lamp between the low tension terminal of the distributor and earth.
Crank the engine until the mark on the flywheel for static setting (see the specifications) is opposite the correct point on the clutch housing.
Switch on the ignition.
Turn the distributor counter-clockwise until the lamp lights up.
Tighten the clamping plate.
Adjust the ignition timing; see Operations *AL4* to *AL7.*

AN5



Remove/fit the distributor

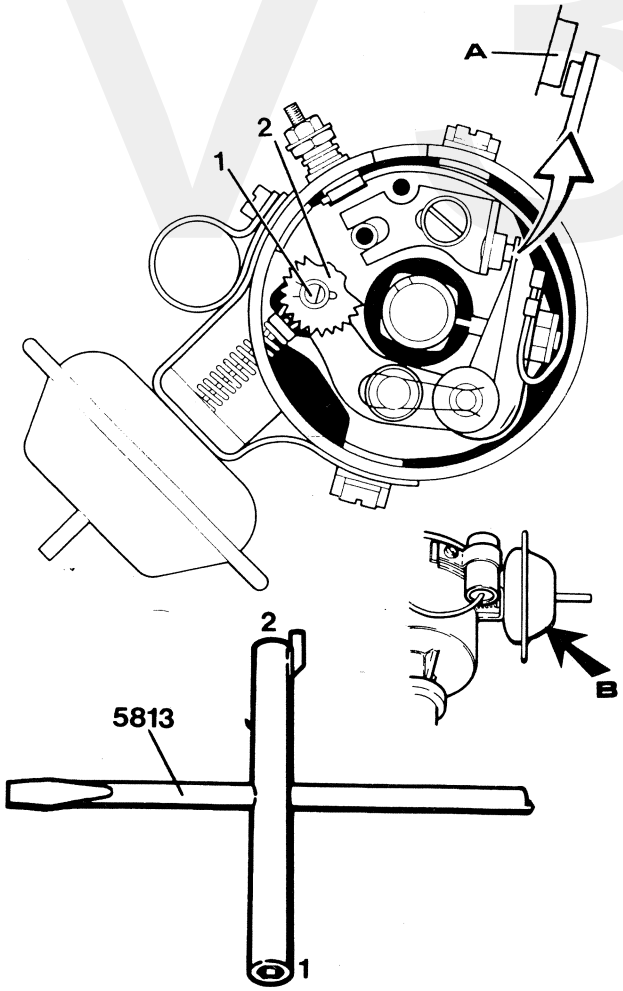
Disconnect the electrical terminals.
Release the retaining bolts.

Fitting is in reverse order to removal. Tightening torque: 23 Nm..

AO. Testing the distributor on a distributor test bench (Ducellier)

Special tools: 999-5813

Note: for the procedure to be followed in this test, refer to the instructions provided by the test bench manufacturer. Some additional information is given below concerning the distributor itself.



1 Self-cleaning contact breaker points
The distributor features self-cleaning contact breaker points.
With this type the dwell angle can sometimes deviate from specification when the vacuum advance comes into operation.
This is due to the contact breaker points being incorrectly adjusted in relation to each other (A).
The position of the points can be corrected by turning the eccentrically located pin (1).
Method:
Turn the pin (1) so that the moving contact point is located approximately in the middle of the fixed contact point at half vacuum advance.

2 Vacuum advance
Some vacuum governors are provided with a compensation port (B).
This port must be blanked off during the vacuum advance test.

The vacuum advance can be adjusted at the distributor by turning the toothed segment (2).

Note: both the pin (1) and the toothed segment (2) can be turned with the aid of adjusting wrench **999-5813.**

For further information, see the specifications.

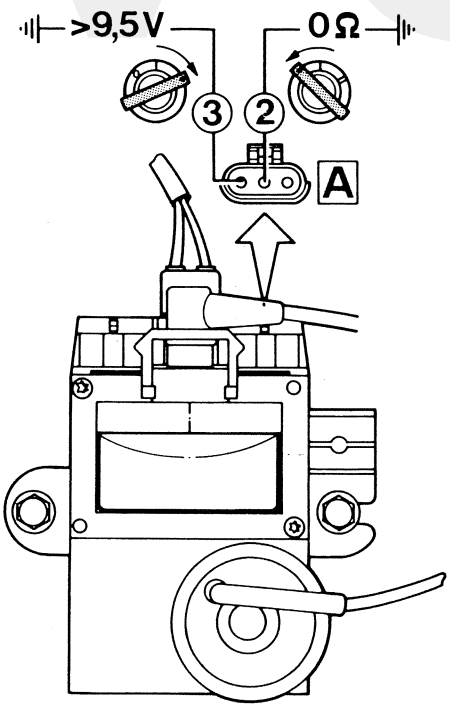
AP. Fault tracing - electronic ignition

The two main problems that may be encountered are:
- the engine fails to start; see Operations *AP1* to *AP8;*
- the engine starts with difficulty and/or runs erratically; see Operations *AP9* to *AP10.*

In all cases, however, always check the following items first:
- plugs A, B and (if fitted) C;
- the spark plugs;
- the spark plug leads and the ignition coil HT lead;
- the distributor cap and rotor arm.

Note: never let sparks (for instance from the ignition coil HT lead) arc across to the ignition unit. This will damage the unit irreparably.

AP1-AP8. Engine fails to start



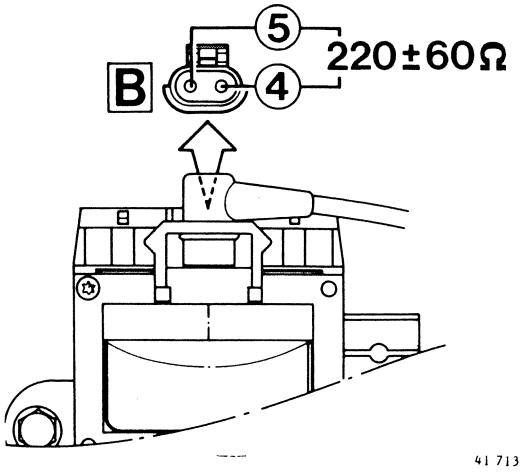
41 712

AP1

Disconnect plug A.
Switch on the ignition.
Crank the starter motor and use a voltmeter to measure the voltage between plug terminal 3 and earth.
The voltage should be at least **9.5 V.**
No voltage: wiring interrupted.
Voltage too low: check the battery voltage.
Voltage 9.5 V or higher: see Operation *AP2.*
Switch off the ignition.

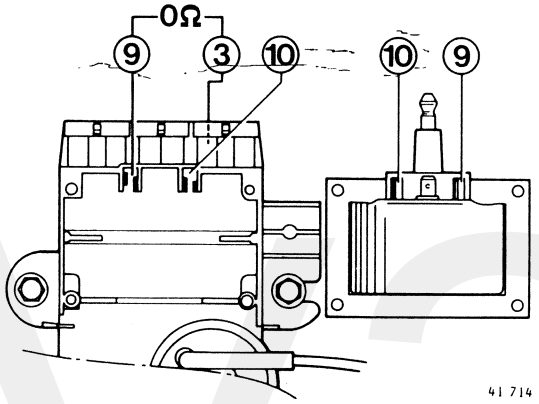
AP2

Measure with an ohmmeter the resistance across plug terminal 2 and earth.
The resistance should be **0 ohms.**
Resistance higher: check the earth connection.
Resistance 0 ohms: see Operation *AP3.*



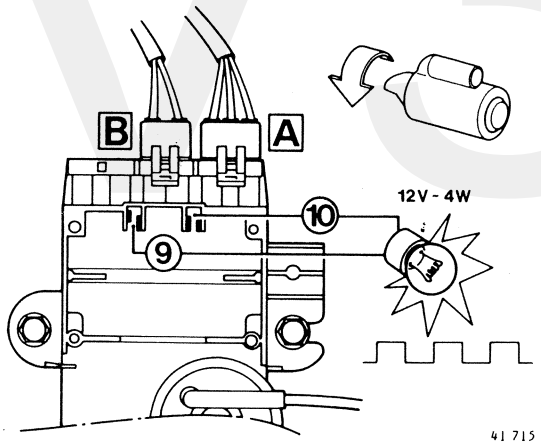
AP3

Disconnect plug B.
Measure the resistance of the sensor module across plug terminals 4 and 5.
The resistance should be **220 ±60 ohms.**
Resistance higher or lower: renew the sensor module.
Resistance 220 ±60 ohms: see Operation *AP4.*
Note: check the sensor module and the flywheel for dirt and other impurities.



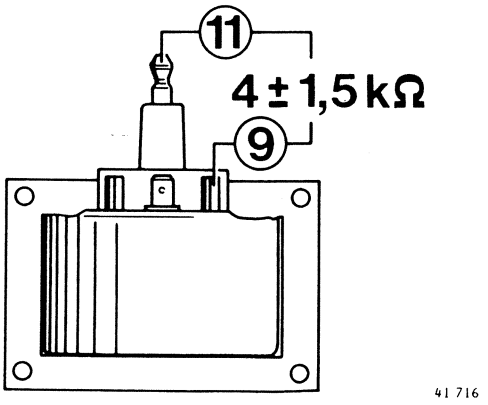
AP4

Disconnect the HT lead from the ignition coil.
Remove the ignition coil.
Check terminals 9 and 10 for corrosion.
Measure the resistance across terminals 3 and 9 of the ignition unit.
The resistance should be **0 ohms.**
Resistance higher: renew the ignition unit.
Resistance 0 ohms: see Operation *AP5.*



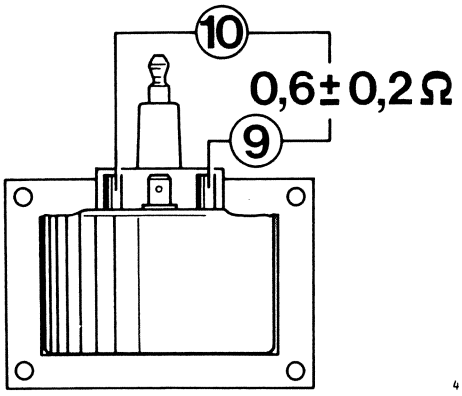
AP5

Reconnect plugs A and B.
Switch on the ignition.
Connect up a 12V test lamp with a minimum power rating of 4 W between terminals 9 and 10 of the ignition unit.
Crank the starter motor: the test lamp should flash.
Lamp does not flash: renew the ignition unit.
Lamp flashes: see Operation *AP6.*



AP6

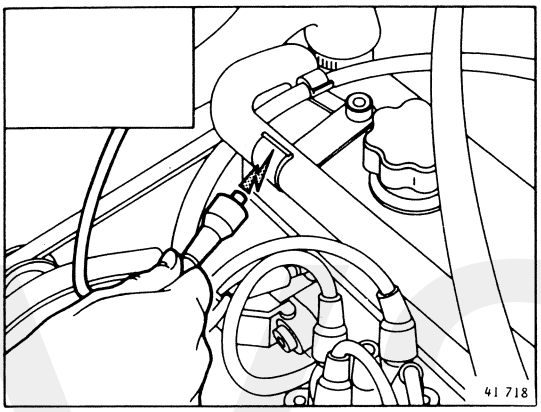
Measure with an ohmmeter the resistance of the secondary winding of the ignition coil across terminals 9 and 11.
The resistance should be **4,000 ±1,500 ohms.**
Resistance higher or lower: renew the ignition coil.
Resistance 4,000 ±1,500 ohms: see Operation *AP7.*



41 717

AP7

Measure with an ohmmeter the resistance of the primary winding of the ignition coil across terminals 9 and 10.
The resistance should be **0.6 ±0.2 ohms.**
Resistance higher or lower: renew the ignition coil.
Resistance 0.6 ±0.2 ohms: see Operation *AP8.*


41 718

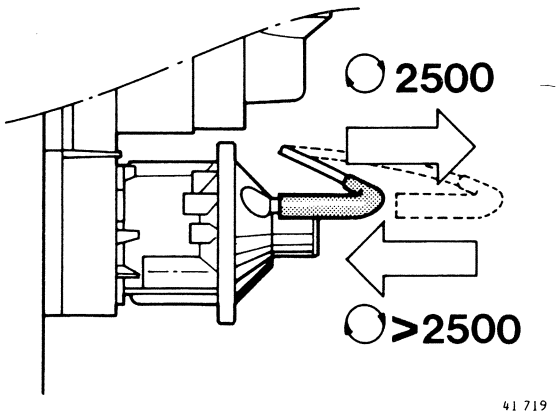
AP8

Fit the ignition coil (tightening torque : **3.5 Nm**) and connect up the HT lead.
Disconnect the HT lead from the distributor cap and hold it approx. 20 mm away from the cylinder block while cranking the engine with the starter motor.
No spark: renew the ignition unit.
Spark present: ignition unit is operating correctly.

Note: never let sparks arc across to the ignition unit housing.

AP9-AP12. Engine starts with difficulty and/or runs erratically

- Check the power supply and earth connection of the ignition unit; carry out Operations *AP1* and *AP2.*
- Check the sensor module; carry out Operation *AP3.*



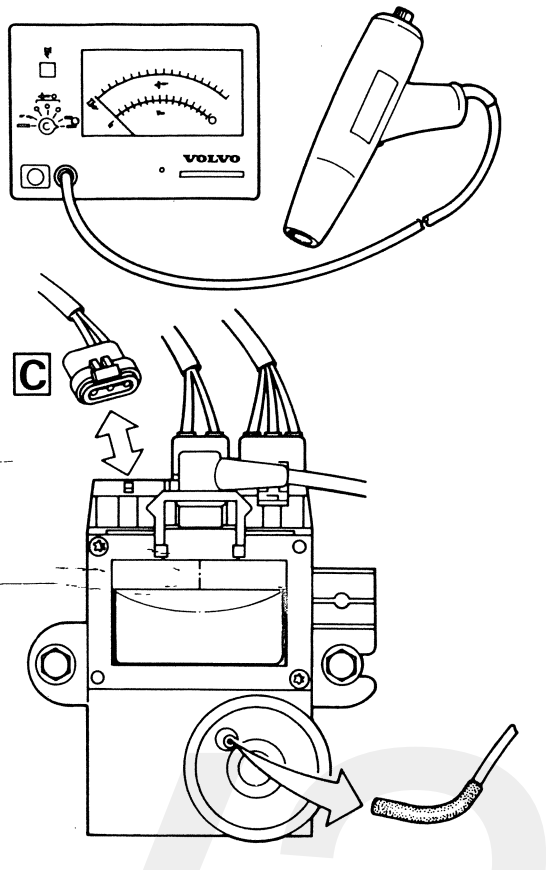
41 719

AP9

Check the vacuum diaphragm unit

Connect up a rev-counter.
Pull the hose away from the vacuum diaphragm unit.
Run the engine at a steady speed of 2,500 r/min.
Reconnect the hose: the engine speed should now increase.
Engine speed does not increase: renew the ignition unit.
Engine speed increases: see Operation *AP10.*

Switch off the engine.



AP10

Check the ignition timing

On B14.4S engines: disconnect plug C from the ignition unit.
Connect up a stroboscope lamp.
Disconnect the engine vacuum hose from the vacuum diaphragm unit.
Measure the ignition advance at max. 900 and 2,500 r/min; the test values are as follows :

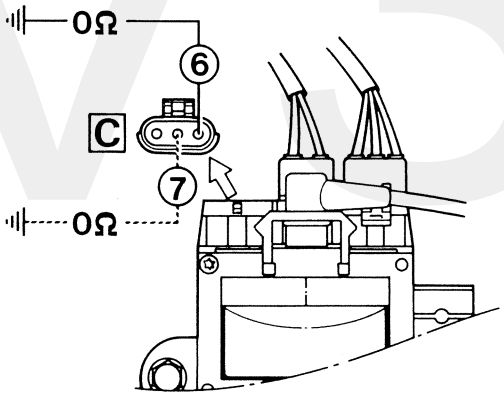
Engine type	900 r/min.	2,500 r/min.
B14.3E	10° ± 2°	21° ± 3°
B14.4E/4S	6° ± 2°	20° ± 3°

Measured test values outside tolerance: renew the ignition unit.
Measured test values correct: ignition in order.

AP11

B14.4S engines

Reconnect plug C.
Measure the ignition advance at 900 r/min.
The test values are now as follows:
B14.4S + manual gearbox: 3° ±2°
B14.4S + automatic transmission: 0° ±2°
Test values correct: ignition in order.
Test values incorrect: see operation *AP12.*



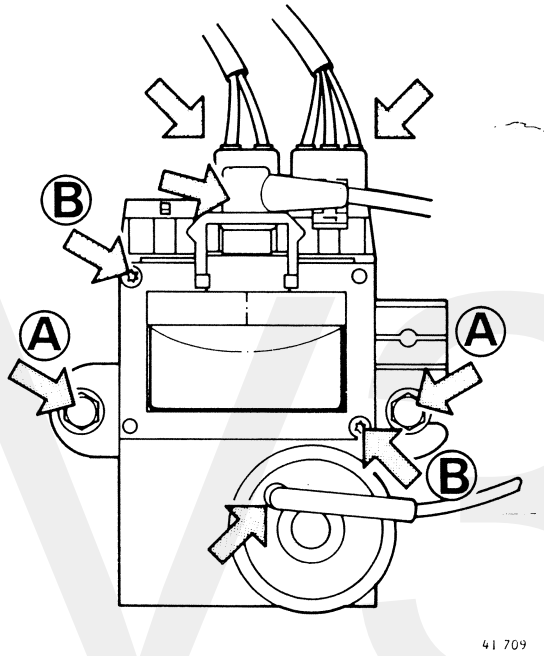
AP12

Disconnect plug C.
Manual and automatic transmission: measure with an ohmmeter the resistance across plug terminal 6 and earth.

Automatic transmission: also measure the resistance across plug terminal 7 and earth.

Resistance 0 ohms: renew the ignition unit.
Resistance higher: check the earth connection.

AQ. Repair and maintenance of the Renix ignition system

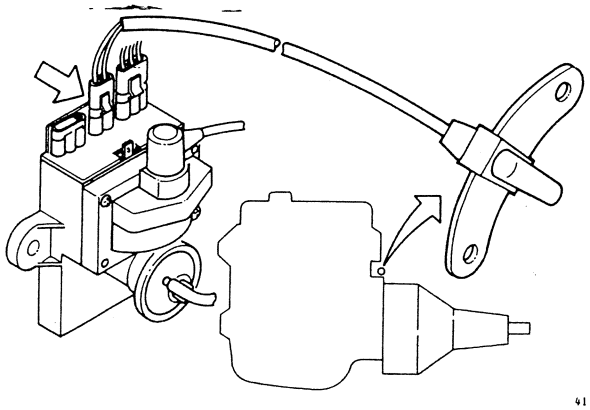


41 709

AQ1

Remove/fit the ignition unit and ignition coil

Disconnect the wiring, the ignition coil HT lead and the vacuum hose.
Remove the two retaining bolts (A) and take the ignition unit out of the car. The ignition coil can be withdrawn from the ignition unit by removing the two bolts (B).
Note: the vacuum diaphragm unit cannot be removed.
Fitting is in reverse order to removal.
Tightening torques: ignition coil: 3.5 Nm
bolts: 23 Nm


41 710

AQ2

Remove/fit the sensor module

Remove the two retaining bolts from the sensor module on the clutch housing.
Slacken the clamping straps and remove the sensor module.
Note: if the plug of the sensor module is being renewed, it is important not to mix up the cables when they are connected to the new plug.
Fitting is in reverse order to removal. Tightening torque: 10 Nm.

AR. Change-up indicator

Preliminary operations
Disconnect the vacuum hose from the Renix unit and connect it to a vacuum pump. Connect up a rev-counter. Start the engine and **slowly** increase the engine speed until the indicator lamp lights up (this is necessary because there is a cut-in delay of 0.8-1.5 seconds).

Important!
The vacuum depression data (gauge readings) must be carefully observed during the tests, otherwise it will not be possible to carry out the tests correctly.

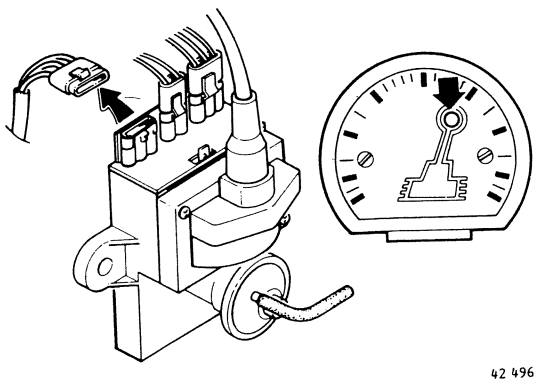
AR1

Check whether the indicator lamp lights up at the following vacuum depressions and engine speeds

Test	Pump vacuum up to (kPa)	Engine speed r/min
1	55	1,650 ± 250
2	32.5	2,950 ± 250
3	17.5	3,850 ± 250

Remove the vacuum pump and rev-counter.
Reconnect the vacuum hose.

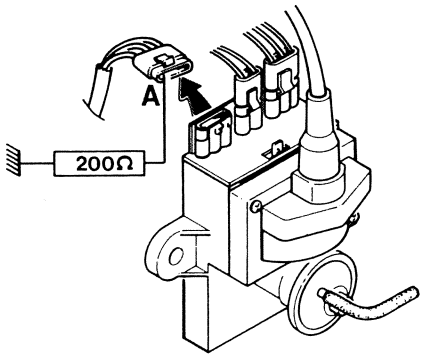
AS. Fault tracing - change-up indicator



AS1

Change-up indicator warning lamp stays on

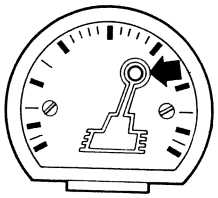
Remove the left-hand connector from the ignition unit.
If the warning lamp remains on: check the wiring.
Warning lamp extinguishes: renew the ignition unit.



AS2

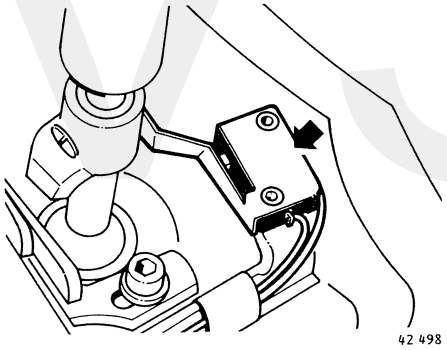
Warning lamp does not light up

Remove the left-hand connector from the ignition unit.
Connect the left-hand terminal (A) of the connector with a 200 ohms resistor to earth. If the warning lamp lights up: renew the ignition unit.



42 497

Warning lamp does not light up: check the wiring. If the wiring is in order and the warning lamp does not light up, see Operation *AS3.*

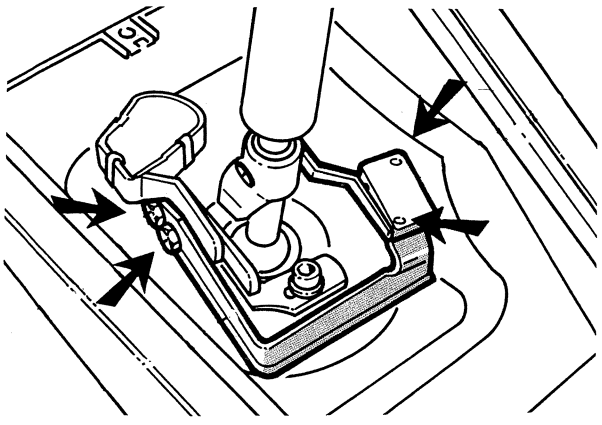


42 498

AS3

Check the microswitch

Remove the dust gaiter from the gear lever.
Test the microswitch alongside the gear lever. With the ignition switched on and the gear lever in neutral, voltage should be present at both terminals.
Replace the gear lever dust gaiter.



42 083

AS4

Renew the microswitch

Remove the dust gaiter from the gear lever.
Unplug the connector from the microswitch.
Remove the three bolts and lift out the switch together with the bracket.
Drill out both rivets with a 3 mm bit and remove the switch from the bracket.
Rivet the new switch to the bracket.
Fit this assembly together with the reversing switch on the bracket. Tightening torque: 10 Nm.
Replace the gear lever dust gaiter..

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Notes