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Order number TP 35738/1
Supersedes TP 35157/1, TP 35130/2
and partly TP 35138/1, TP35008/2

Contents

Specifications

Compression ratio, fuel octane requirements, output, torque

Engine	Compression ratio	Fuel octane	Output, ISO		Max. torque, ISO**
			kW by r/s	pk by r/min	Nm by r/s
B19A 568, 854 906, 982, 984	9.2:1	96	70/90	95/5400	150/60
B19A 552, 566 658, 660	10:1	98	68/90*	92.4/5400*	152/55
B19A 902	8.5:1	91	67/90	91/5100	140/55
B19E 554, 556 862, 864	10:1	98	85/95	115/5700	160/60
* B19A (658) 68/92 en 94/5500					
B200 K					
Nordic/Europe - 87	10.0:1	98	75/95	102/5700	157/50
87 -	10.0:1	95 (lead-free)			
Overseas 928	9.2:1	92	75/95	98/5700	157/50
B200 E					
Nordic/Europe - 87	10.0:1	98	85/95	116/5700	160/70
87 -	9.2:1	91 (lead-free)	82/97	112/5800	157/70
Overseas	9.2:1	92	82/97	112/5800	157/70
B200 EA					
Nordic/Europe	9.2:1	91 (lead-free)	82/97	112/5800	157/70
Australië (oxycat)	9.2:1	91 (lead-free)	80/100	109/6000	150/70
B200 F	9.2:1	91 (lead-free)	80/100	109/6000	150/70

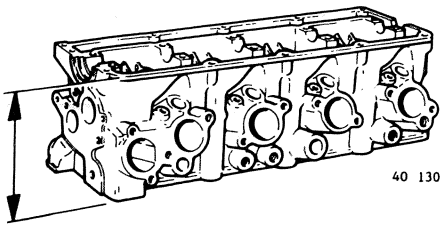
** Due te standardization the engine output is now indicated by ISO standards. (This standard is approx. 1 to 2 % lower than the DIN standard.

Other general data

Number of cilinders	4	
Bore....mm	88,9	
Stroke....mm	80	
Displacement....dm^3 (liter)	1.986	
Firing order	1 - 3 - 4 - 2	
Compression (normal pressure, see note) ....MPa (kg/cm^2)	**B200/B19A**	**B19E**
	0.9 - 1.1 (9 - 11)	1.1 - 1.25

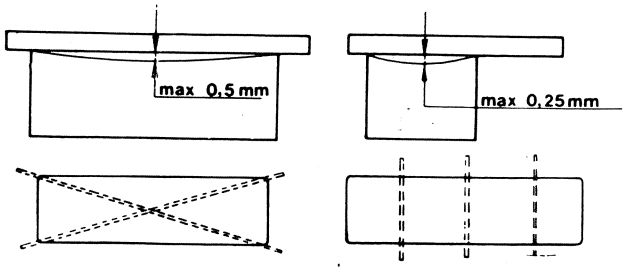
Note:
Compression measured with hot engine, fully opened throttle valve and with engine turned over by starter motor.

Cilinder head



Height, new:	mm	146.1
minimum height after refacing	mm	145.6

Maximum warp ..... (see fig.)



		B200	B19
Cylinder head gasket, thickness, ...			
unloaded	mm	1.3	1.2
loaded (compressed)	mm	1.2	1.0

Cylinder block

Bore

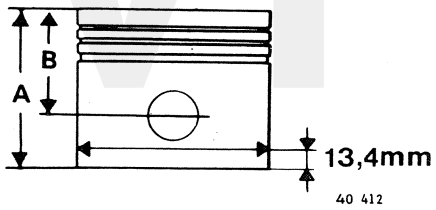
		B19/B200
Standaard (marked C)	mm	88.90 - 88.91
(marked D)	mm	88.91 - 88.92
(marked F)	mm	88.92 - 88.93
(marked G)	mm	88.94 - 88.95
Oversize 1	mm	89.29 - 89.30
Oversize 2	mm	89.67 - 89.68

Cylinders should be rebored when wear reaches 0.10 mm (if the engine's oil consumption is abnormally high).

Pistons

Diameters

Standard, class C	mm	88.88 - 88.89
Standard, class D	mm	88.89 - 88.90
Standard, class E	mm	88.90 - 88.91
Standard, class G	mm	88.92 - 88.93
Oversize 1	mm	89.27 - 89.28
Oversize 2	mm	89.65 - 89.66



		B19A	B19A	B19E	B19A
Motortype		568, 854	552, 566	554, 556	902
		906, 982, 984	660	862, 864	
Compression ratio		(9.2:1)	(10:1)	(10:1)	(8.5:1)
Height, dimension A	mm	71.5	73.9	73.9	71
dimension B	mm	46.5	46.7	46.7	46
Weight (tolerance)	grammes	496 - 508	509 - 521	509 - 521	496
Max. permissible weight difference between any 2 pistons in same engine	grammes	12	12	12	12
Max. piston clearance (sie note)		0.01 - 0.03	0.01 - 0.03	0.01 - 0.03	0.01 - 0.03

Note:
B19
The piston diameter is measured at right-angles to the gudgeon pin hole and 7 mm from the underside of the piston.

	B200K/O 928, 938 EO EA 942, F 778	B200E/E-E/S-K/S 622, 624, 626, 628
Compression ratio	9.2:1	10.0:1
Height, class A ..... mm	67.7	69.9
class B ..... mm	39.7	41.9
Weight (tolerance) ..... grammes	440 (± 8)	440 (± 8)
Max. permissible weight difference between any 2 pistons in same engine ..... grammes	16	16
Max. piston clearance (sie note) - 1985 ..... mm	0.003 - 0.027	0.003 - 0.027
Max. piston clearance 1986 - ..... mm	0.01 - 0.03	0.01 - 0.03

B200
Note: The piston diameter is measured at right-angles to the gudgeon pin hole and 13.4 mm from the underside of the piston; for the method of measuring the clearance see the Service manual.

Piston rings

	Upper compression ring	Lower compression ring	Oil scraper ring
Height ..... B200 mm	1.728 - 1.740	1.728 - 1.740	3.475 - 3.490
..... B19 mm	1.728 - 1.740	1.978 - 1.990	3.978 - 3.990
Axial clearance (measured with compression ring on piston) ..... B200 mm	0.060 - 0.092	0.030 - 0.062	0.020 - 0.055
..... B19 mm	0.040 - 0.072	0.040 - 0.072	0.030 - 0.062
Ring gap (measured in cylinder, see illustration) ..... B200 mm	0.30 - 0.50	0.30 - 0.55	0.25 - 0.50
..... B19 mm	0.35 - 0.65	0.35 - 0.55	0.25 - 0.60

Gudgeon pin

Fit, in connecting rod	light thumb pressure (close sliding fit)
in piston	thumb pressure (sliding fit)
Diameter, standard B200/B19 ..... mm	23.00/24.00
oversizet B200/B19 ..... mm	23.05/24.05
length ..... mm	60

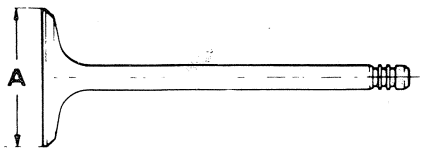
Valve system

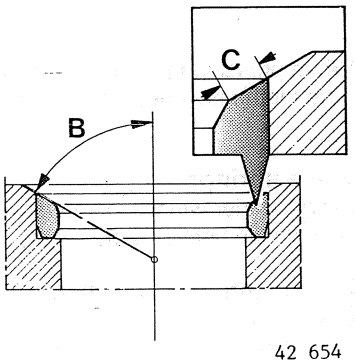
Valve clearances

	When checking	When adjusting
Inlet and exhaust valves:		
cold engine ..... mm	0.35 - 0.40	0.35 - 0.40
hot engine ..... mm	0.35 - 0.45	0.40 - 0.45
Shims, thickness ..... mm	3.30 - 4.50 increasing by increments of 0.05 mm	

Valves

Special note: the exhaust valves are coated with Stellite steel and therefore cannot be machined. They can, however, be ground with grinding paste to obtain a gastight seal.





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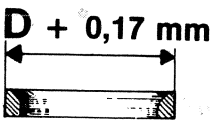
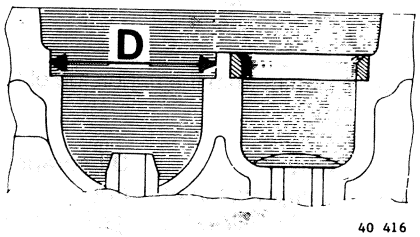
Engine type	Valves	Diameter (A)	Seat angle (B)	Seat width (C)
B19/B200	inlet valve exhaust valve	44 mm 35 mm	45° 45°	1.6 ± 0.3 mm 2.0 ± 0.3 mm

Valve seats

		Inlet	Exhaust
Valve seat, diameter, standard	mm	46.00	38.00
oversize 1	mm	46.25	38.25
oversize 2	mm	46.50	38.50





Inlet valve seat — Exhaust valve seat

Note: when renewing valve seats, there must be a clearance of 0.17 mm between the valve seat and the cylinder head recess, i.e. the valve seat diameter must be 0.17 mm larger than the diameter of the recess in the cylinder head.

Valve guides

		Inlet valve	Exhaust valve
Length	mm	52	52
Inside diameter	mm	8.000 - 8.022	8.000 - 8.022
Heigth above upper face of cylinder head	mm	15.4 - 15.6	17.9 - 18.1
Clearance, valve stem guide (measured with new valve,) new	mm	0.030 - 0.060	0.060 - 0.090
maximum	mm	0.15	0.15

There are three oversizes of valve guides and these are marked with grooves.

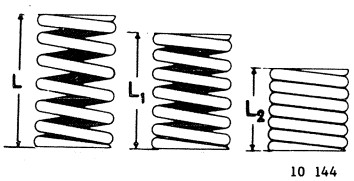
		Markings	Reamer for outside diameter of valve guides
Standard		No groove	-
Oversize	1	1 groove	5161
	2	2 grooves	5162
	3	3 grooves	5163

When pressing in a valve guide the force used must be at least 9000 N (900 kg.). If the force used is less, ream out the bore for the next oversize and press in the corresponding size of valve guide.

Valve springs

Length under various loadings.
Outside diameter: 32.5

	Length	Loading
L	45 mm	0 N
L_1	38 mm	280 - 320 N
L_2	27 mm	710 - 790 N



Outside diameter: 25.9

	Length	Loading
L	45.5 mm	0 N
L_1	38 mm	280 - 320 N
L_2	27.5 mm	702 - 782 N

Tappets

Diameter	mm	36.975 - 36.995
Height	mm	30 - 31
Clearance, shim-tappet	mm	0.009 - 0.064
tappet-cylinder head	mm	0.030 - 0.075

Shims (for valve clearance)

Thickness	mm	3.30 - 4.50 increasing by increments of 0.05
Diameter	mm	32.980 - 33.000

Timing gear

Engine type	Camshaft shape	Max. licht height	Control values valve (with cold motor) valve clearance no.1 inlet valve	inlet valve opens at
B200 K (Europa),B19A '82- B200 K (Nordic + overseas) B200 E, B19E, B19A -'82 B200 F	L Y A M	9.8 mm 10.35 mm 10.50 mm Inlet 9.5 mm Exhaust 10.5 mm	0.7 mm 0.7 mm 0.7 mm 0.7 mm 0.7mm	5° voor BDP 8° voor BDP 13° voor BDP 6° voor BDP 44° voor ODP

General data

Markings		A, L, M of Y
Camshaft journal, diameter	mm	29.050 - 29.070
Radial clearance,		
new	mm	0.030 - 0.071
max.	mm	0.15
End float B200/B19	mm	0.20 - 0.50/0.1 - 0.4
Camshaft bearing diameter	mm	30.000 - 30.021

Countershaft

		Bearing journal	Bearing in cylinder block
Diameter, front	mm	46.975 - 47.000	47.020 - 47.050
intermediate	mm	43.025 - 43.050	43.070 - 43.100
rear	mm	42.925 - 42.950	42.970 - 43.000
Radial clearance	mm	0.020 - 0.075	
End float	mm	0.20 - 0.46	

Crankshaft

		B200	B19
Max. out-of-true	mm	0.025	0.05
Crankshaft, max. end float	mm	0.08 - 0.270	0.25
radial clearance (main bearings), old	mm	0.024 - 0.072	0.028 - 0.083
radial bearings (main bearings), new	mm	0.024 - 0.061	-
Big-end bearings, axial clearance	mm	0.15 - 0.35	0.15 - 0.35
radial clearance	mm	0.023 - 0.067	0.024 - 0.070

Main bearing journals

Max. ovality (A)	mm	0.004	0.07	
Max. Taper (B)	mm	0.004	0.05	
		B200		B19
		Old variant	New variant	
Diameter, standard.	mm	54.987 - 55.000	62.987 - 63.000	63.451 - 63.464
undersize 1	mm	54.737 - 54.750	62.737 - 62.750	63.197 - 63.210
undersize 2	mm	54.487 - 54.500	62.487 - 62.500	62.943 - 62.956
Bearing recess, width	mm	22.9 - 25.1		
Width on crankshaft for flange bearing shells:		B200	B19	
standard	mm	31.960 - 32.000	38.960 - 39.000	
oversize 1	mm	32.210 - 32.250	39.061 - 39.101	
oversize 2	mm	32.460 - 32.500	39.163 - 39.203	

Special note: different types of main bearings are used, so **always** use the same type of bearing at top and bottom! The upper and lower main bearing shell on the same journal must be of the same make.

Big-end bearing journals

		B200	B19
Max. ovality	mm	0.004	0.05
Max. taper	mm	0.004	0.05
Diameter, standard	mm	48.984 - 49.005	58.987 - 54.000
undersize 1	mm	48.734 - 48.755	53.733 - 53.746
undersize 2	mm	48.484 - 48.505	53.479 - 53.492
Bearing recess, width	mm	23.9 - 26.1	29.95 - 30.05

One of the following alternatives is used.
Alt. 1: two bearing shells colour-coded yellow
Alt. 2: one bearing shell colour-coded blue (in the connecting rod) and one colour-coded red (in the bearing cap).
Only yellow colour-coded bearing shells are applied for Service purposes.

Connecting rods	B200	B19
Axial clearance at crankshaft ..... mm	0.25 - 0.45	0.15 - 0.35
Length, centre-to-centre ..... mm	152	145 ± 1
Max. weight difference between con-rods in the same engine ..... grammes	20	10

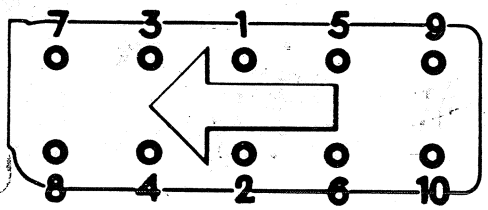
Flywheel	B200	B19
Max. axial throw, measured on diameter	0.02 mm/100 mm diameter	0.05 mm/150 mm diameter

Tightening torques

The tightening torques shown here apply to oiled bolts and nuts. Degreased (washed) components should be oiled before fitting.

	Nm
Cilinder head: tighten in stages	
Main bearing caps	110
Big-end bearing caps, first stage	
B200 first stage	20
second stage (an additional quarter-turn)	
B19 old bolts	63
new bolts	70
Flywheel (fit new bolts)	70
Camshaft sprockets	50
Countershaft sprockets	50
Camshaft bearing caps	20
Crankshaft central pulley bolt (short)	165
Crankshaft central pulley bolt (long)	250
Cooling fan bolt	9
Spark plugs (thread not oiled)	25
Engine mounting pads (lock nuts)	45
Oil drain plug	25

Tightening sequence for cylinder head bolts



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Tightening the cylinder head bolts

The cylinder head bolts should be tightened in correct sequence and in stages.

Old type bolt:
1st stage: tighten to **60 Nm.**
2nd stage: tighten to **110 Nm.**
Run the engine warm for 20 minutes.
Allow the engine to cool down for 2.5 hours.
Slacken cylinder head bolt No. 1 a quarter-turn and then retighten to **110 Nm.**
Repeat this in the correct sequence for the remaining bolts.

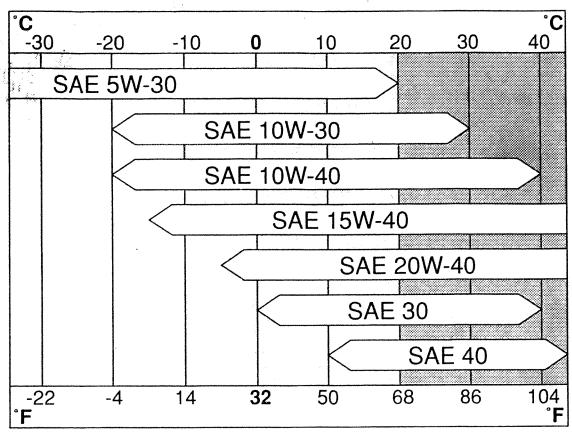
New type bolt:
1st stage: tighten to 20 Nm.
2nd stage: tighten to 60 Nm.
3rd stage: tighten a further quarter-turn.
Note: there is no need to run the engine warm.

Lubricating system

General data	
Oil capacity, excl. oil filter ..... litre	4.0
incl. oil filter ..... litre	4.5
Difference between max.-min ..... litre	1.0
Oil pressure at 33 r/s (2000 r/min) with hot engine and new oil filter ..... MPa(kg/cm^2)	250 - 600 (2.5 - 6.0)
Engine oil, type and quality	CCMC Service classification: G2 or G3
	API Service classification: SF*

* SF/CC and SF/CD oils also comply with this classification.

Viscosity: Temperature range (stable ambient temperature)



Under extreme driving conditions which can result in an abnormally high oil temperature and higher 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, but always bear in mind the lowest temperature limit.

Oil pump

	B200	B19
Axial clearance ..... mm	0.02 - 0.12	0.02 - 0.12
Radial clearance (excl. bearing clearance) ..... mm	0.02 - 0.09	0.02 - 0.09
Backlash (excl. bearing clearance) ..... mm	0.15 - 0.35	0.15 - 0.35
Bearing clearance, drive shaft ..... mm	0.032 - 0.070	0.024 - 0.049
idler shaft ..... mm	0.014 - 0.043	0.013 - 0.037

Relief valve spring

Length under various loadings

	Length	Loading
L	39.20 mm	0
L1	26.25 mm	46 - 54 N
L2	21.00 mm	62 - 78 N

CO% at idling speed (hot engine)

Engine type	CO-percentage*		Idling speed	
	Setting value	Control value	r/s	r/min
B19A 568, 854, 906, 982, 984, 902	2.0	1.5 - 3.0	15 ± 0.8	900 ± 50
B19A 552, 566, 658, 660	1.5	1.0 - 2.5	15 ± 0.8	900 ± 50
B19E 554, 556, 862, 864	1.0	0.5 - 2	15 ± 0.8	900 ± 50

* Pulsair system (if fitted) must be disconnected
Lambda probe disconnected and measured ahead of the catalytic converter
* Measured ahead of the catalytic converter.

Engine type	CO-percentage*		Idling speed	
	Setting value	Control value	r/s ± 0.8	r/min ± 50
B200K, B200 K(D) ***	1.5	1.0 - 2.5	15.0	900
B200E/B200EA/B200ES	1.0	0.5 - 2.0	15.0	900
B200F**	0.6	0.4 - 0.8	15.0	900
B200EO (oxicat)***	1.0	0.5 - 2.0	15.0	900

* Pulsair system (if fitted) must be disconnected
** Lambda probe disconnected and measured ahead of the catalytic converter
(after connecting up the Lambda sensor the CO-level and the engine speed must remain unchanged).
***Measured ahead of the catalytic converter.

Fuel tank

Total capacity	litre	57
Reserve capacity (warning lamp in fuel gauge)	litre	5

Fuel pump

		B200K / B19A
Delivery pressure, measured at same height as pump, at 16.6 r/s (1000 r/min)	kPa(kg/cm²)	15 - 27 (0.15 - 0.27)

Fuel system, carburettor engines

Carburettor

Make and type		Zenith 175 CD-2SE

Air supply

Type of system		thermostatic
Control range	°C	20 - 30

Afstelling dashpot

Draai de Dashpot zover terug dat bij een volledige ingedrukte zuiger van de dashpot en het aanliggen van de bedieningsrol tegen de aanslag de afstelwaarde 0.5 ± 0.1 mm is.

Carburettor

Make and type ..... Solex 34 - 34 CISAC

Solex 34 - 34 CISAC		1st stage	2nd stage
Venturi diameter	mm	15	27
Main jet, (fuel)	mm	120	115
(air)	mm	145	130
Emulsion tube	mm	ZN	ZC
Idle jet, (fuel)	mm	44	60
(air)	mm	100	100
Accelerator pump injector	mm	60	-
Needle valve	øm	2.1	
Float weight	grammes	6.11	
Float height (measured with gasket)	mm	22.5	

	r/s	omw/min
Decelerating mechanism, specified speed (for Switzerland and Sweden)	25.0 - 28.3	1500 - 1700

Air supply

Type of system		thermostatic
Control range	°C	20 - 30

Fuel system, injection engine

Make and type..... Bosch LE - jetronic (B200 F = LU - jetronic)*
* LU - jetronic has Lambda control.

Specifications

Auxiliary air valve

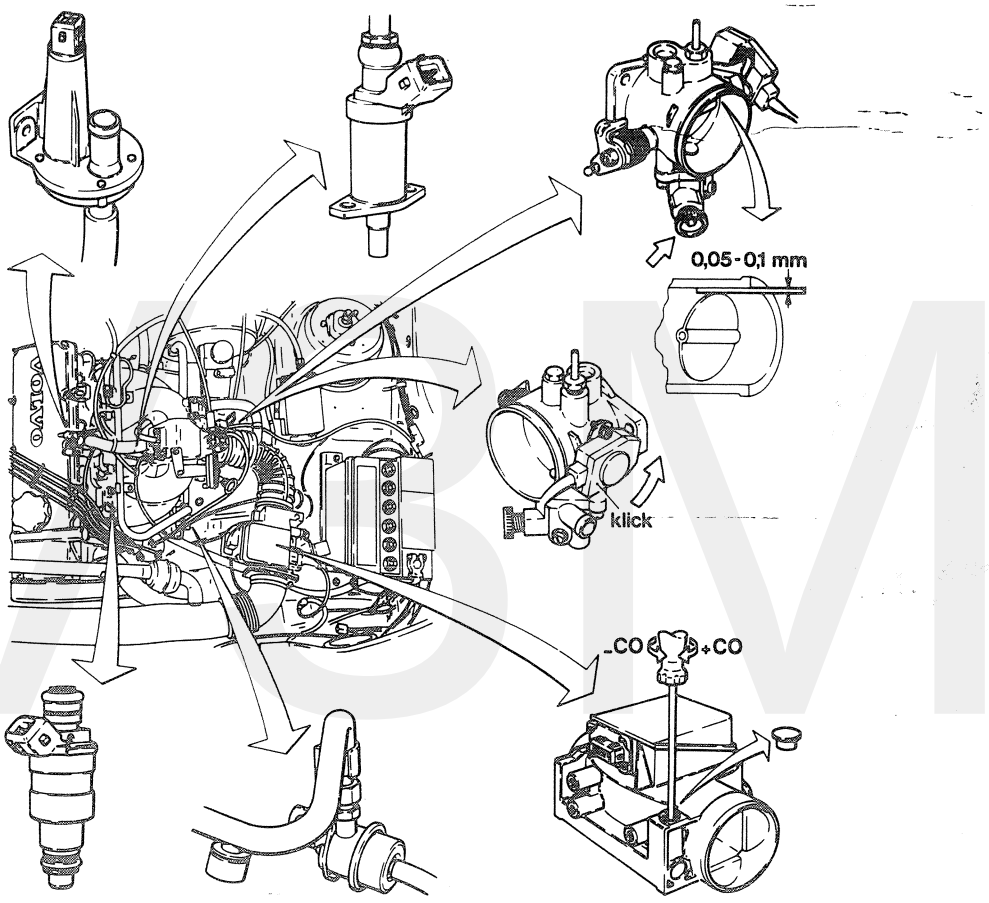
Resistance.....40 - 60 ohms
Fully open at..... - 30°C
Fully closed at..... + 70°C
The auxiliary air valve is electrically operated and should be fully closed within 5 minutes after starting at an ambient temperature of 20°C.

Cold-start injector

Injection time dedreasing from 7 s at -20°C to 0 s at + 35°C.

Idle adjusting screw

Idling speed.....15 r/s (900 r/min)



Fuel injector

Resistance at +20°C.....15 - 17.5 Ohm
Resistance at +80°C..... 17 - 19 Ohm
Potential defference across the points:
immediately after starting.....1V
after a short time.....0.6V
hot engine.....0.4V

Injection pressure regulator

Line pressure (2.5 kg/cm^2).... 250 kPa
Residual pressure (2.3 - 2.4 kg/cm^2) ..... 230 - 240 kPa

Air flow (volume) meter

Resistance:
between terminals 8 and E: 150 ohms
between terminals 9 and E: 50 ohms (+20°C)
between terminals 5 en 7, varying from min 100 ohms (approx) to max. 1000 ohms, depending upon the position of the valve.

Air supply

Type of system	thermostatic
Control range °C	25 - 35

Fuel pump

Capacity at 250 kPa (2.5 kg/cm^2)

12V and + 20°C	1.0l/30 sec. (120 l/h)
Current rating	6.5 A

Oxygen sensor

Potential difference across the points..... mV 300-600
Tightening torque.....Nm 50.

Coolant mixture .....

General data

Coolant composition

- The coolant should be changed every second autumn. After this period the corrosion-protective additives will have lost some of their effect.

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

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

Capacity of cooling system

	B19	B200
up to 1980 .....litre	8.0	-
from 1981 .....litre	8.0	7.0

Expansion tank

The pressure valve in the filler cap opens at:	B19	B200
overpressure .....kPa (kg/cm²)	75 (0.75)	75 (0.75)
underpressure .....kPa (kg/cm²)	7 (0.07)	7 (0.07)

Thermostat

	B19	B200	
Type	1	1	2
Markings	92	87	92
Starts to open at.....°C	91-93	86-88	91-93
Fully open at .....°C	102	97	102

Viscous coupling cooling fan (temperature-sensitive)

Starts to engage at 55°C
Fully engaged at 70°C

* air temperature ahead of cooling fan

Fan belts

B19/B200	HC 38 - 925, HC co9 x 913
Powerassisted steering	HC 38 co9 x 938

Tightening torques

The tightening torques shown here apply to oiled bolts and nuts. Degreased (washed) components should be oiled before fitting.

	B19/B200
Radiator .....Nm	10
Temp. transmitter .....Nm	20
B200/B19	
Self-locking bolt for fixed cooling fan, front.....Nm	9
Viscous coupling cooling fan, transmitter .....Nm	15

General data

Note:
With effect from model year 1984 the engines are equipped with a **"Renix"** electronic ignition system. The specifications of this system are totally different to other existing systems. For this reason any data specific to this system are shown separately.
The electronic ignition on these engines cannot be adjusted; all values shown are given only for checking purposes.

Firing order 1-3-4-2

Ignition timing

Engine type	B19A	B19A, B19AS - '83	B19E, B19AE '83 -
Degrees BDP	982, 984, 568 10° ± 2°	566, 552 7° ± 2°	566, 554 10° ± 2°

Spark plugs

Engine type	Model year	Set no.
B19A (CH - 810500)	80 - 83	273597 - 5
B19A (CH 810501 -)	84 -	271409 - 5
B19E	82 -	271415 - 2
B200EA/EE/EO/ES	85 -	271415 - 2
B200F	85 -	271415 - 2
B200F/ (CH/S)	85 -	3344311 - 0
B200KE/KO/KS/KD	85 -	271409 - 5

Engine type	Distributor	B19A, B19E, B200 Type
B19A up to 1984	Bosch JFU 4	with breaker points
B19A from 1984	Bosch JV 4	breakerless**
B19E	Bosch JHFU 4	breakerless, working on "Hall-effect"- principle
B200K/E	Bosch JV 4	breakerless**

	B19A	B19E
Direction of rotation	clockwise	clockwise
Breaker point gap ..... mm	0.4 min.	not applicable
Dwell angle at 8.3 r/s (500 r/min)	62° ± 3°	62° ± 3°

** Dwell angle cannot be checked or adjusted (electronically controlled)

Mechanical ignition centrifugal control (vacuum hose disconnected) *

Advance in distributor degrees	B19A up to 1984	B19E
Total advance, distributor degrees.....	12.5 ± 1	12.0 ± 1
Advance begins at a distributor speed of.....r/s	6.7 - 10	6.6 - 10
r/min	400 - 600	400 - 600

* Does not apply to B19A engines of model year 1984.

Distributor speeds for degrees of advance beyond static position

		B19A 854, 906, 982, 984, 902 up to 1984	B19A 552, 556 up to 1984	B19E
5°	r/s	13 - 14.3	13.3 - 17.5	15.8 - 21.7
	r/min	780 - 860	800 - 1050	950 - 1300
7°	r/s	-	16.7 - 20	-
	r/min	-	1000 - 1200	-
9°	r/s	-	-	-
	r/min	-	-	-
10°	r/s	19.2 - 23.3	25 - 35	26.6 - 32.5
max.	r/s	25	41.7	33.3
	r/min	1500	2500	2000

Vacuumcontrol
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. This applies to both centrifugal and vaccuum advance.

	B19A up to 1984	B19E
Total advance, distributor degrees	7.5	8
Advance begins at mm Hg	130	170
2° advance at mm Hg	152	195
5° advance at mm Hg	190	240
Max. advance at mm Hg	220	280

* Does not apply to B19A engines of model year 1984 .

Ignition coil

	B19A	B19E
Resistance, primary winding, between terminals 1 and 15.....ohm	1.9	0.7 - 0.8
Resistance, secondary winding, between High-Tension terminal and terminal 1.....kilo-ohm	9.5	7.7
Ballast resistor (thermistor) at 20° C.....ohm	1.3	n.a.

Elektronic ignition
Petrol engines from model year 1984 onwards

Ignistion timing point
Indicated in degrees before BDP and measured with the vacuum hose disconnected.

Engine type	Model year	ignition unit	Plug C disconnected and		Plug C connected and
			15 r/s	42 r/s	15 r/s
B19A	1984 -	404	15 ± 2	24 ± 3	-
B200K **	1985 - 1986	406, 407	15 ± 2	24 ± 3	-
B200E	1985 - 1986	405, 408 *	12 ± 2	30 ± 3	-
B200K	1987 -	414	15 ± 3	20 ± 3	-
B200K(D)	1987 -	414	15 ± 3	20 ± 3	10 ± 3
B200EA	1987 -	411	11 ± 2	22 ± 3	-
B200E/F	1987 -	411	11 ± 2	22 ± 3	-

* Variant with engine speed limiter.
** Variant with change-up indicator.

Ignition coil

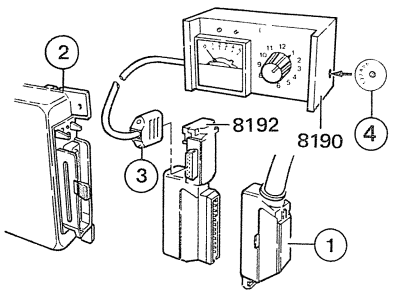
Resistance, primary winding .....ohm	0.4 - 0.8
Resistance, secondary winding, between the HT.....ohm	2.5 - 5.5

Sensor module

Internal resistance.....ohm	220 ± 60

Special tools

998-	Description
8190	Testbox
8192	Adaptor
999-	
1801	Standard handle
2810	Lifting beam, for removing/fitting cylinder block
2895	Press tool, for carburettor jet
2897	Press tool, for carburettor jet
2901	Clamping tool
2903	Oil filter wrench
2962	Gauge, for carburettor jet
5011	Pressure gauge
5021	Press tool, for removing/fitting camshaft
5022	Press tool, for adjusting valve clearances
5024	Drift, for fitting crankshaft front oil seal
5025	Drift, for fitting camshaft and countershaft oil seal
5026	Pliers, for removing tappet pads (valve clearance)
5027	Drift, for pressing in valve guides (inlet valves)
5028	Drift, for pressing in valve guides (exhaust valves)
5029	Drift, for fitting valve seats (inlet valves)
5034	Counterhold, for crankshaft, camshaft, countershaft
5035	Bracket, for removing/fitting the cylinder block
5112	Locking sector, for flywheel
5116	Hose
5159	Adjusting tool, CO-content
5160	Reamer, oversize
5164	Reamer for valve guide
5197	V-belt tension gauge
5199	Counterhold, for new type of camshaft sprocket
5218	Drift, for pressing out valve guide
5219	Tool, for removing/fitting valve guide seal
5220	Drift, for fitting valve seat (exhaust valve)
5222	Gauge, for checking valve stem height relative to camshaft
5224	Reamer, for valve guide inside diameter
5265	Union connector
5266	Plug
5270	Pressure gauge, for testing engine oil pressure
5276	Press tool, for fitting crankshaft rear oil seal
5280	Test diode
5283	Drift, for fitting oil seal on crankshaft
5284	Counterhold, for vibration damper
5402	Drift, for fitting expansion plugs in cylinder block
5843	Vacuum pump
6450	Voltmeter
9689	Compression meter
9920	CO-meter
9921	Monotester, for adjusting ignition timing and engine idle
9940	Stroboscope lamp



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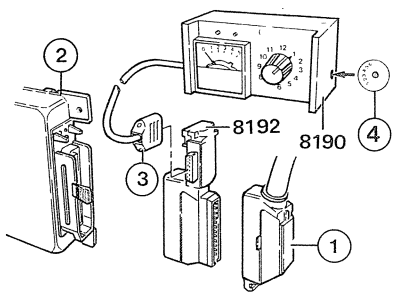

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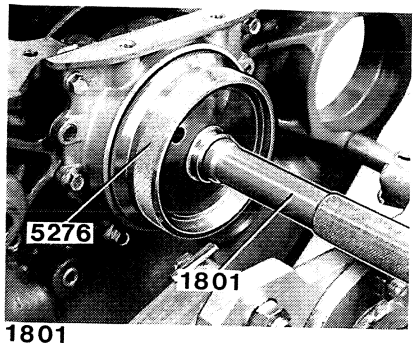

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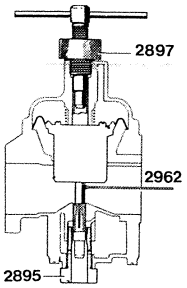

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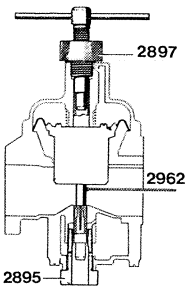

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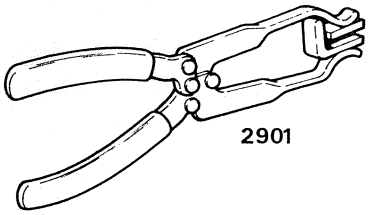

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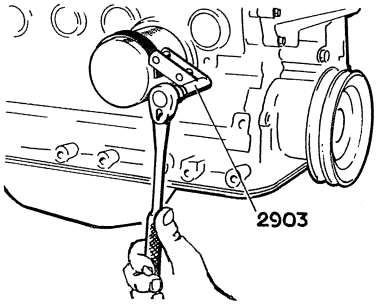

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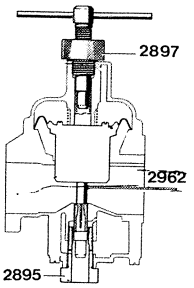

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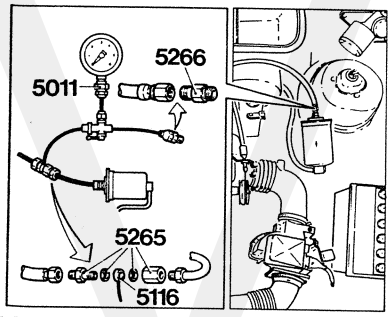

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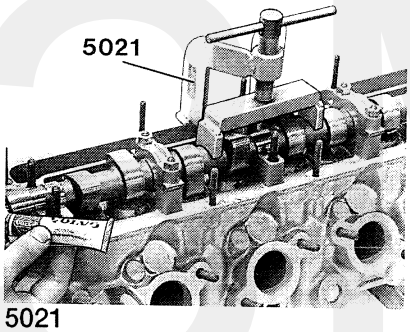

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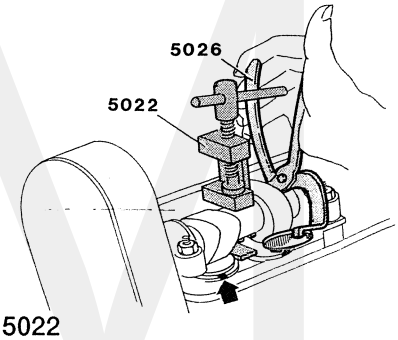

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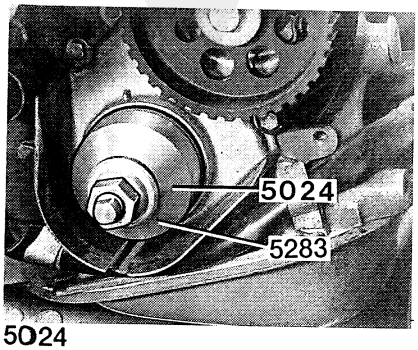

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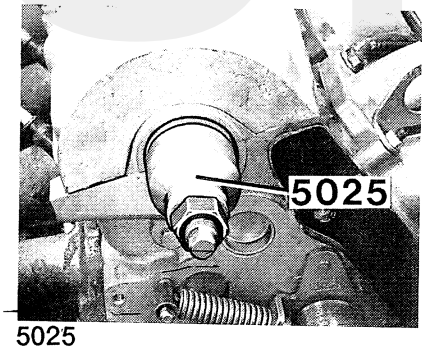

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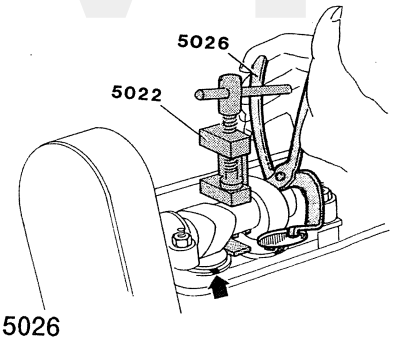

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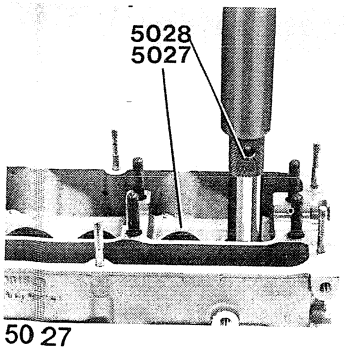

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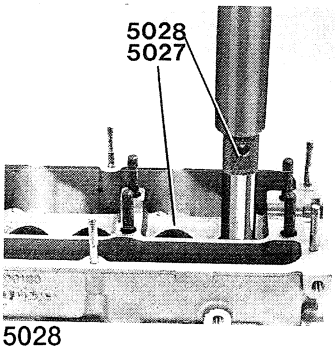

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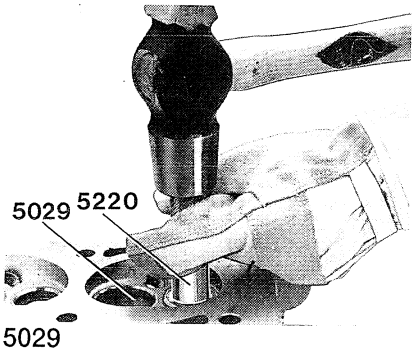

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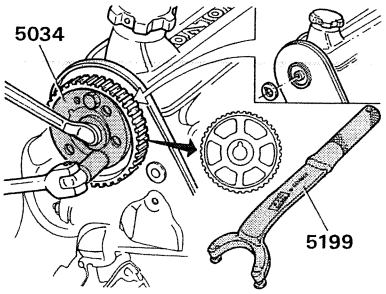

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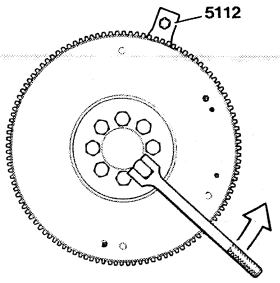

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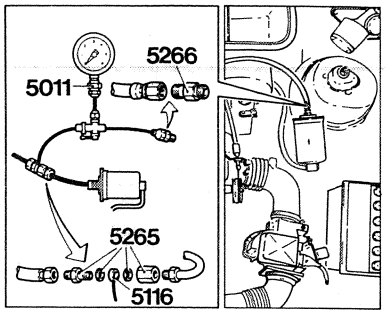

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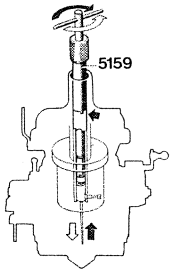

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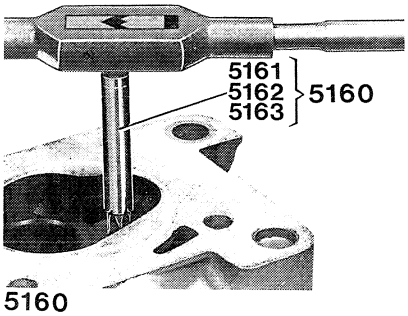

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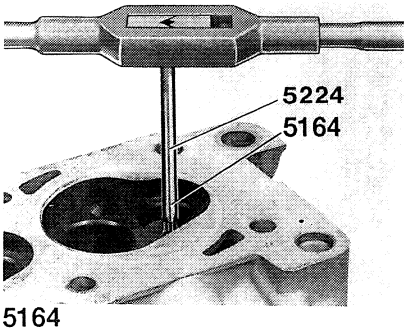

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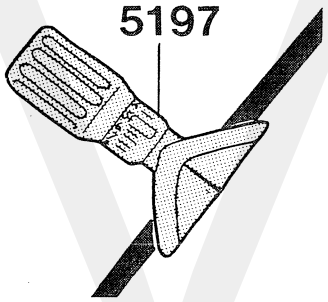

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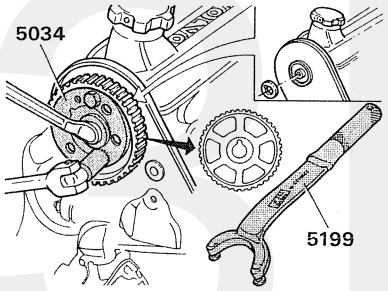

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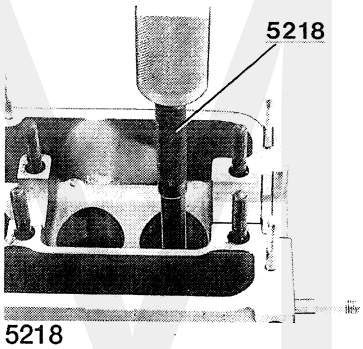

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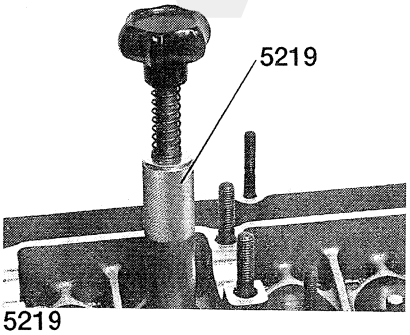

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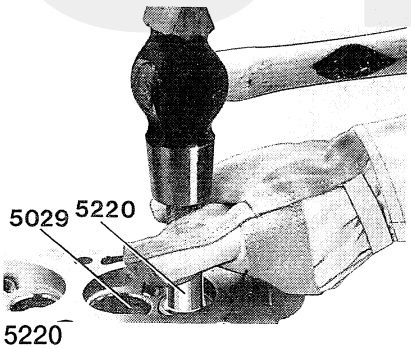

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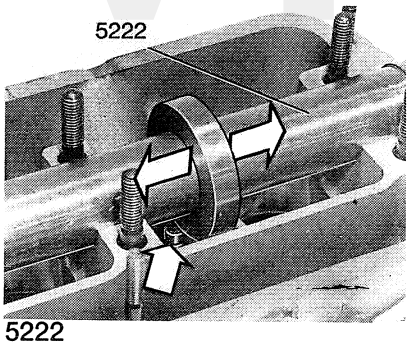

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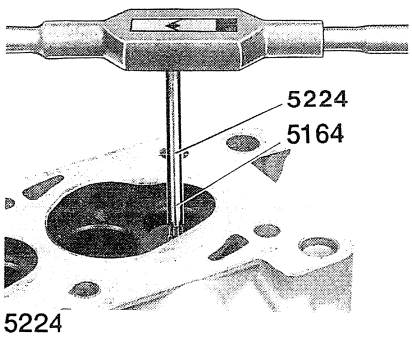

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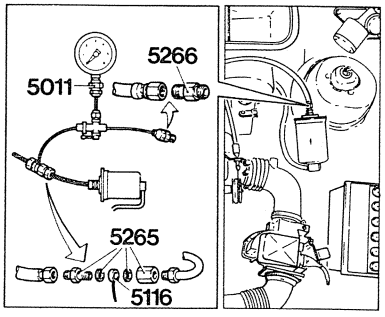

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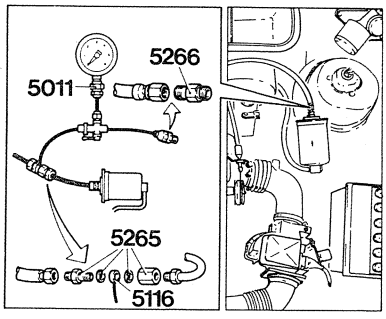

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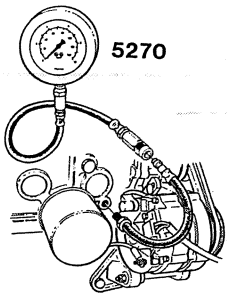

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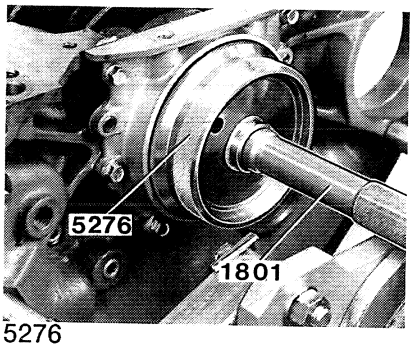

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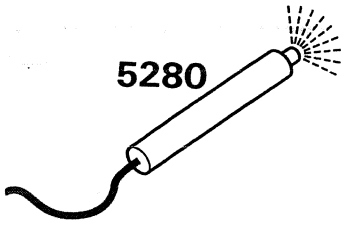

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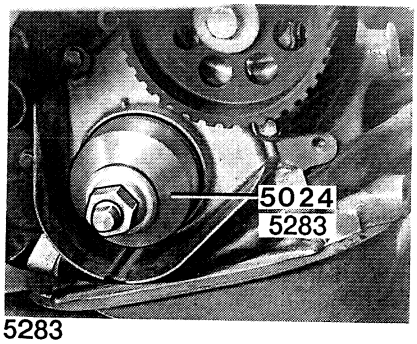

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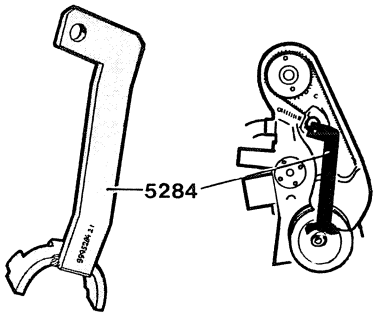

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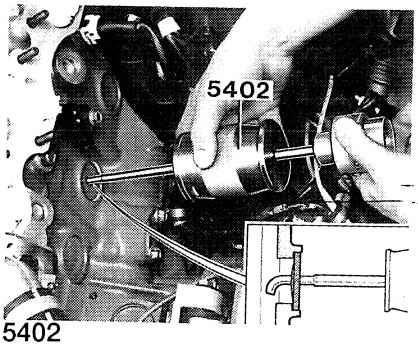

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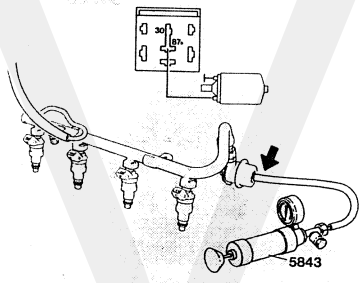

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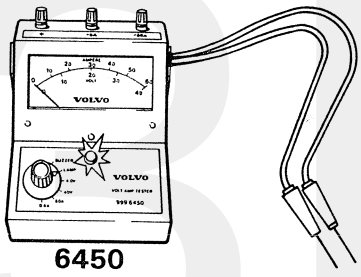

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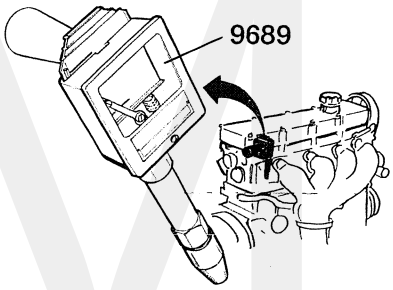

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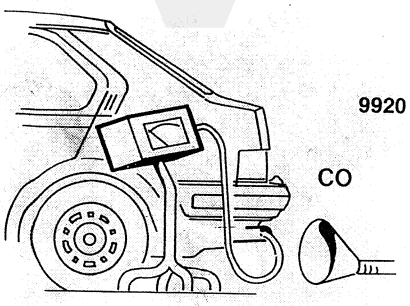

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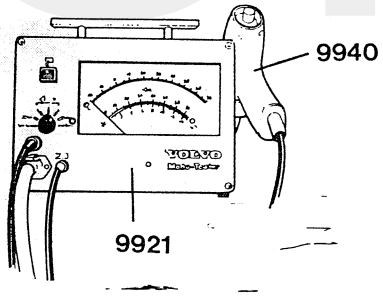

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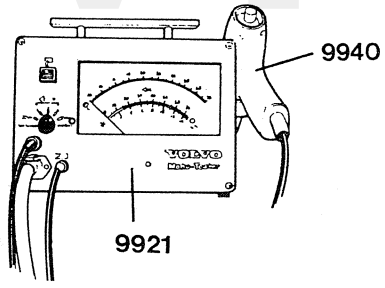


9940

Group 21. Engine assembly and mountings

A1-A3. Compression test

Special tools: 9689

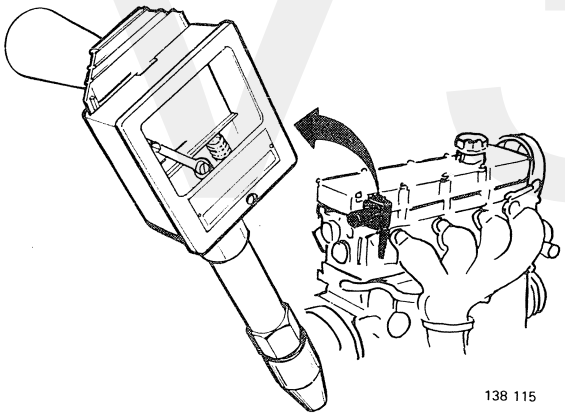
Note: the compression test should be carried out while the engine is hot.

A1

Preliminary operations

Remove:
- the spark plug leads;
- the power supply connector from the injection unit or ignition coil;
- the spark plugs (clean the spark plug wells before removing).

A2



Test the compression

Locate compression tester **9689** in a spark plug bore.
Crank the engine with the starter motor, with the accelerator pedal fully depressed.
Repeat this for each cylinder.
Note the compression pressure.
Minimum permitted value: 0.9 MPa (9kg/cm2).
Maximum relative pressure difference between the cylinders: 0.2 MPa (2 kg/cm2).

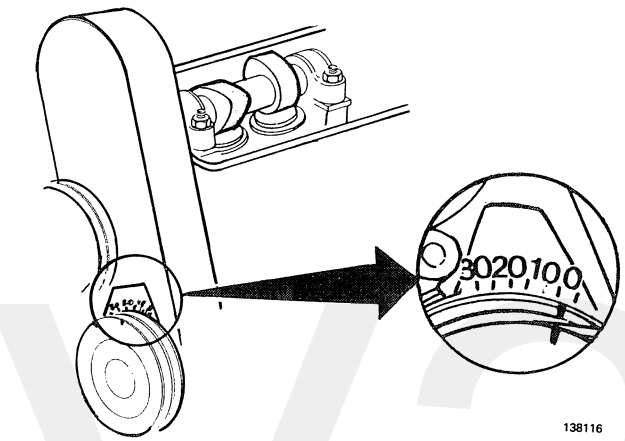
A3

Fitting

Fit the spark plugs and leads. Spark plug tightening torque: 25 Nm ± 5 Nm.
Fit the connector back on the injection unit or ignition coil.

B1-B9. Adjusting the valve clearances

Special tools: 5022, 5026



138116

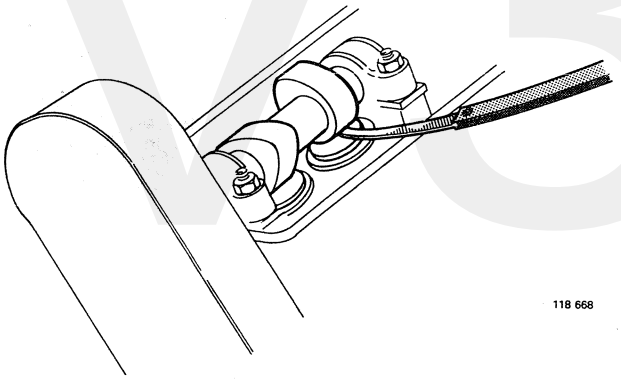
B1

Remove the valve cover

B2

Move the camshaft to TDC - No. 1 cylinder on ignition stroke

The cams for No. 1 cylinder must be angled obliquely upwards and the ignition timing mark on the pulley must be at 0°.
Note: always crank the engine with the central bolt on the crankshaft.

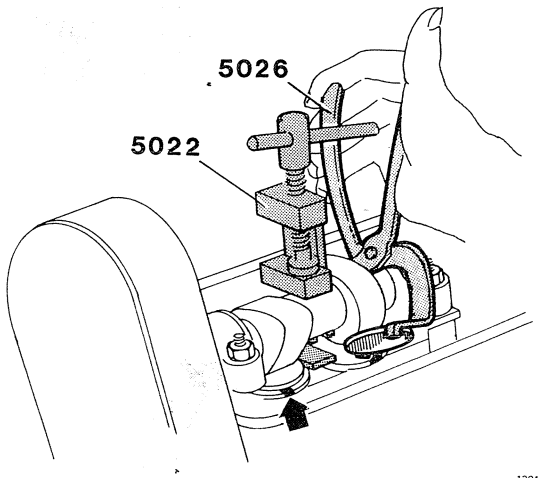

118 668

B3

Check and note the valve clearances of No. 1 cylinder

Cold engine:	
- when checking	0.30-0.40 mm
- when adjusting	0.35-0.40 mm
Hot engine:	
- when checking	0.35-0.45 mm
- when adjusting	0.40-0.45 mm

The inlet and exhaust valves have the same valve clearance.

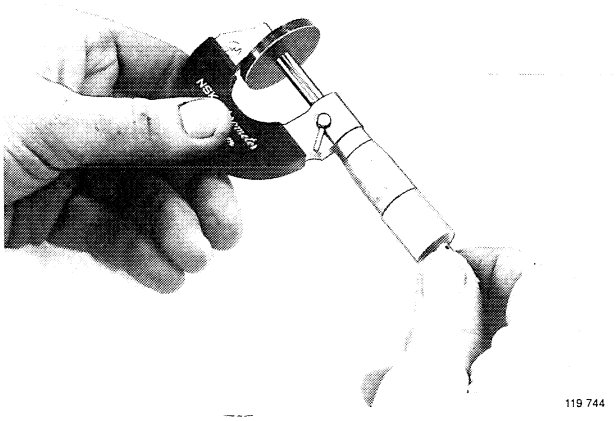


138113

B4

Adjust the valve clearance

Turn the tappets so that the grooves are at right-angles to the camshaft.
Depress the tappet with valve adjusting tool **5022**.
Remove the tappet pad with special tool **5026**.


119 744

B5

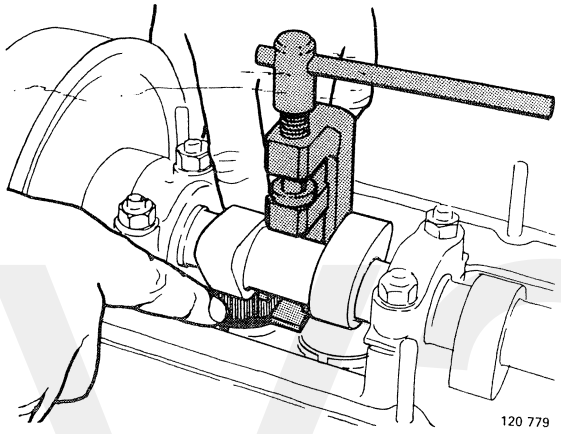
Calculate the tappet pad thickness that gives the correct clearance

Tappet pads are available in thicknesses from **3.30 mm to 4.50 mm**, increasing by increments of 0.05 mm. **Always use new** tappet pads.

Measure the thickness of the old tappet pad with a micrometer.

Example:

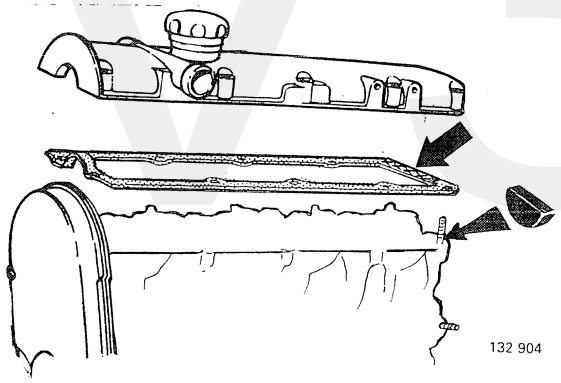
Correct valve clearance	0.40 mm
Measured valve clearance	0.25 mm
Difference	-0.15 mm
Measured thickness of old tappet	3.80 mm
Difference in clearance.....	-0.15 mm
Correct thickness of new tappet pad	3.65 mm


120 779

B6

Fit the new tappet pad and remove the tool

Note: the tappet pad must be oiled and fitted with the figures underneath (facing towards the tappet).


132 904

B7

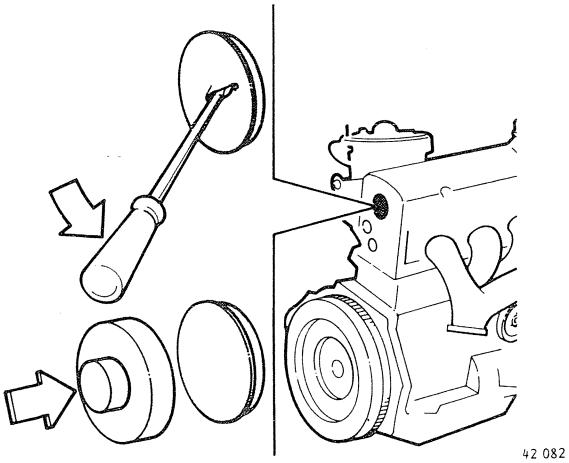
Fit the valve cover

Apply silicone compound to the corners; see the illustration.
Always use a **new** gasket.
Note: do not forget the rubber seal (half-moon) at the rear end of the cylinder head.

B8

Check/adjust

- ignition timing (B19), if necessary;
- CO-content;
- engine idling speed.


42 082

B9

B200: plastic seal at rear end of cylinder head

Removal
Pierce the seal with a screwdriver and prise it out of the cylinder head.
Clean the mating surface.

Fitting
Fit the new seal with a flat drift.
Note: the seal must not be recessed in the cylinder head.

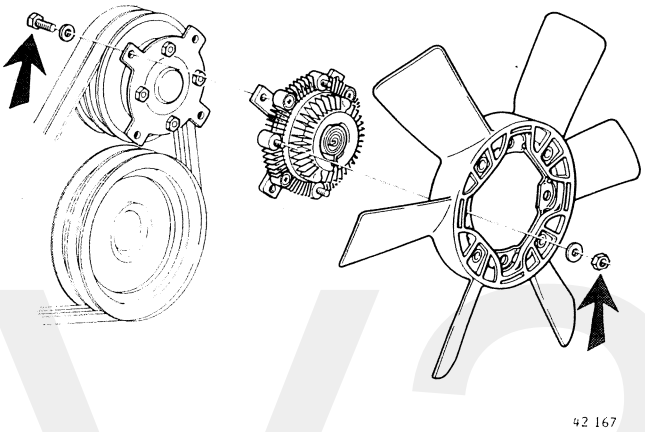
C1-C20. Renewing the timing belt

Special tools: 5284

C1

Preliminary operations

- disconnect the battery negative cable;
- remove the cooling fan shroud;
- remove the engine front splash guard.

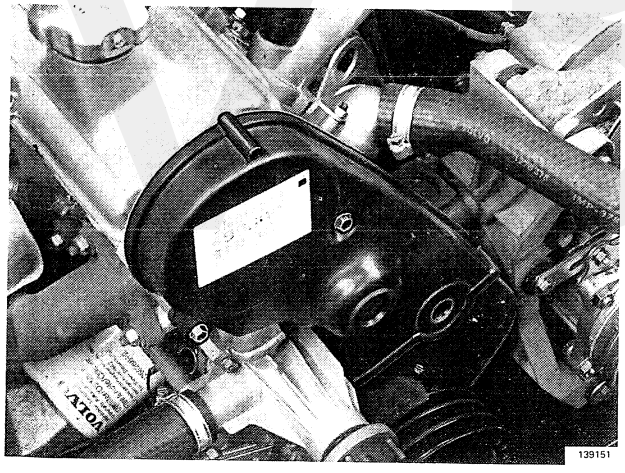


C2

Remove the water pump pulley

B19
Slacken the bolts on the water pump and crankshaft pulleys.
Remove the V-belts.
Remove the engine cooling fan and the water pump pulley.

B200
Remove the air filter and air intake pipe with brackets.
Remove the viscous coupling cooling fan assembly.
Slacken the bolts on the water pump pulley.
Remove the V-belts.
Remove the water pump pulley.

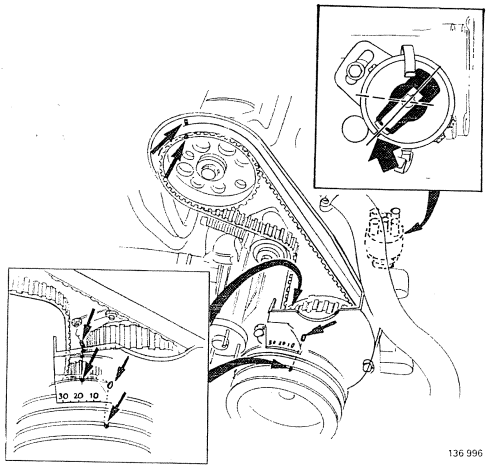


C3

Remove the timing case cover

B19
Remove the bolts (4x) and take off the cover.

B200
Remove the bolts (3x) and take off the upper cover.



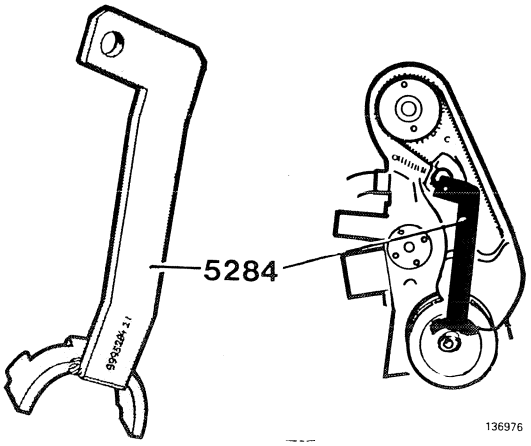
C4

Align the camshaft, crankshaft and countershaft marks

Turn the crankshaft clockwise with the central bolt until the marks on the flywheel are directly opposite each other; see the illustration.
Note: on B200 engines, align the mark on the crankshaft pulley with the 0 on the lower timing case cover.

Remove the distributor cap and make sure that the rotor arm is opposite the mark.

C5

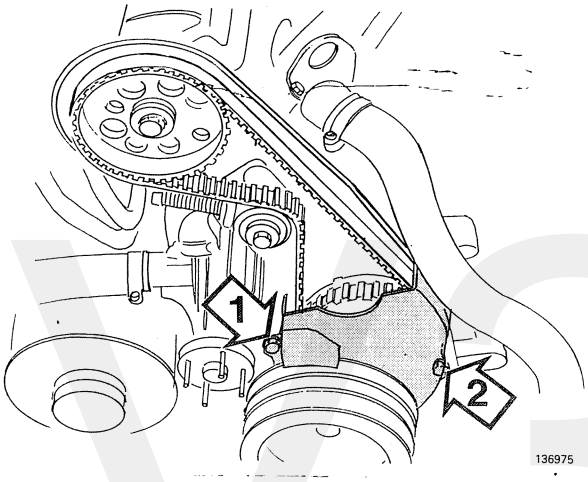


B200. Remove the vibration damper

Remove the nut and washer from the tensioner.
Fit counterhold **5284**.
Fit and tighten the nut on the tensioner.
Remove the bolt for the vibration damper.
Remove counterhold 5284.
Check the positioning of the 0 mark and adjust if necessary.
Remove the vibration damper.

B19. Remove the crankshaft pulley
Remove the bolts and take off the pulley.

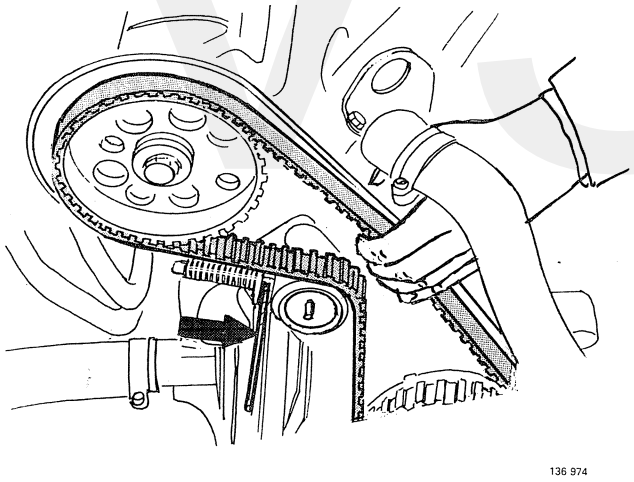
C6



B200. Remove the lower timing case cover

Remove the bolts (2x).
1 = M6 bolt (10 mm socket).
2 = M8 bolt (12 mm socket).

C7

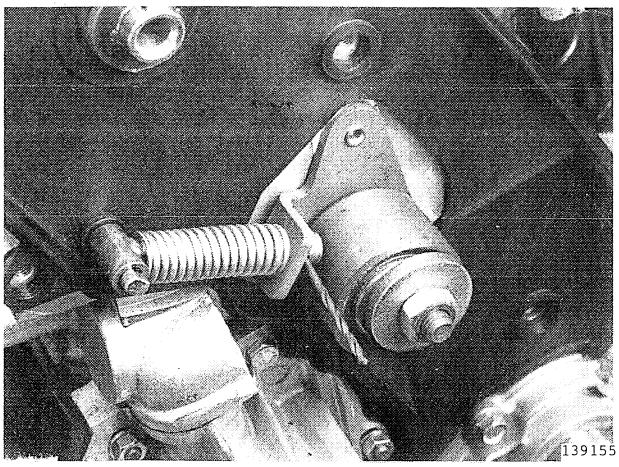


Remove the timing belt

Pull on the belt to compress the tensioner spring and lock it with a ; **3 mm** drill bit.
Remove the belt.

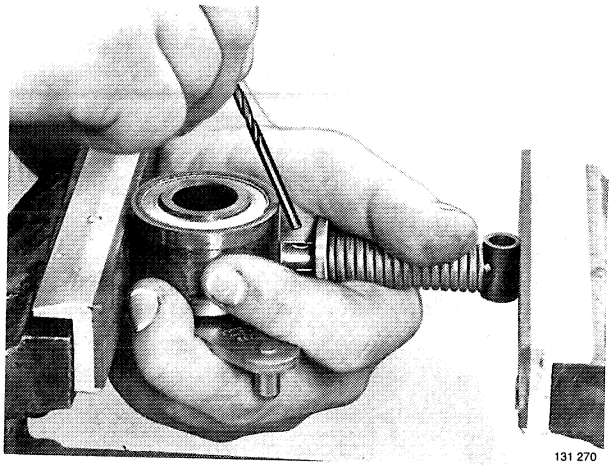
> **IMPORTANT!** Do not rotate the crankshaft or camshaft, otherwise the pistons may strike the valves.

C8



Check the tensioner

Rotate the tensioner rapidly and listen for unusual noises in the bearing. Check the running surface for evidence of scoring or traces of rubber from the belt.



C9

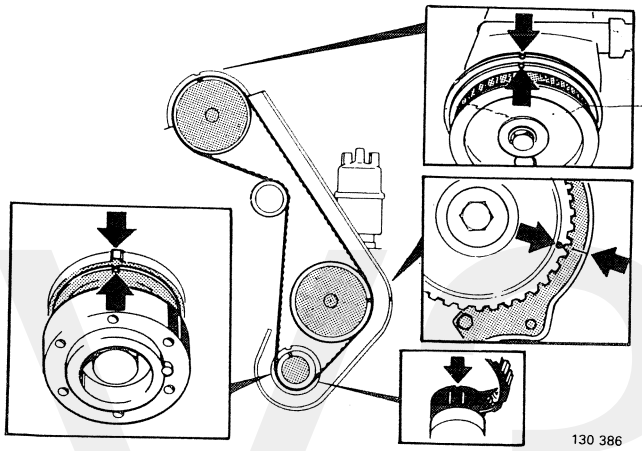
Remove the tensioner

Pull out the tensioner with a straight-line motion.

C10

Assemble and fit the (new) tensioner

Assemble the tensioner in a bench vice. Lock the spring with a ; 3 mm drill bit.

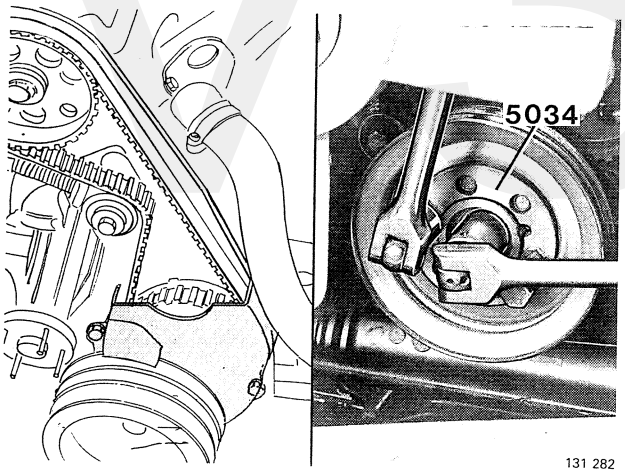


C11

Fit the timing belt

IMPORTANT! Do not rotate the crankshaft or camshaft, otherwise the pistons may strike the valves.

- Position the belt sprockets as indicated by the marks.
- Locate the belt around the crankshaft and countershaft. The two lines on the belt must be positioned opposite the mark on the crankshaft.
- Tension the belt and place it over the camshaft and tensioner.
- Check the belt for correct run and positioning and verify that the marks on the belt sprockets are opposite the mark on the engine.
- Pull on the belt to compress the tensioner spring and then remove the drill bit.



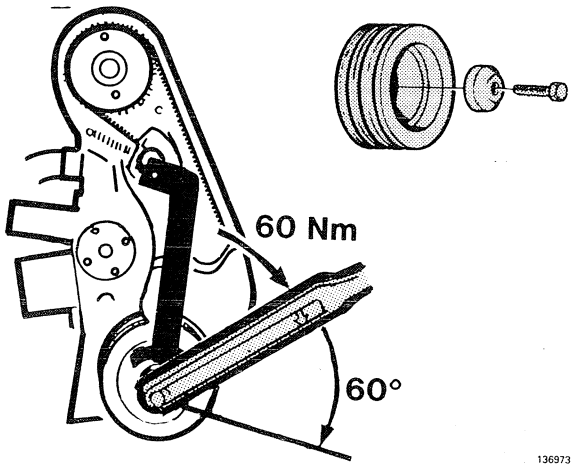
C12

B200. Fit the lower timing case cover

C13

B19. Fit the crankshaft pulley

Fit and tighten the bolts.



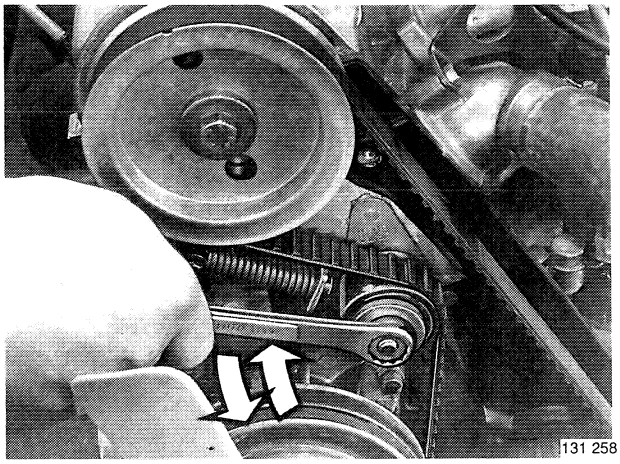
C14

B200. Fit the vibration damper

Make sure that the packing shim abuts accurately.
Locate the vibration damper.

IMPORTANT! The vibration damper can be fitted in one position only. There is a pin on the crankshaft sprocket which must engage the vibration damper.

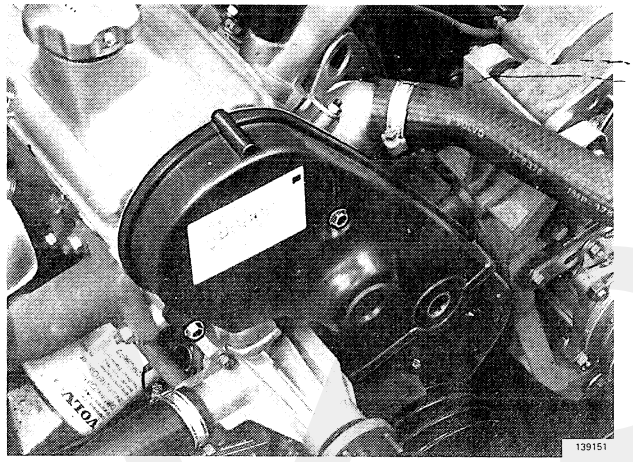
Fit the washer and the crankshaft pulley bolt.
Locate counterhold **5284** and secure it with a nut. Tighten the crankshaft pulley bolt in two stages.
Stage 1: torque-tighten to **60 Nm**.
Stage 2: angle-tighten to **60°**.
Remove counterhold 5284.
Fit the washer and secure the tensioner bolt finger-tight.


131 258

C15

Tension the timing belt

- Turn the engine to TDC.
- Slacken the tensioner nut (the spring then tensions the belt).
- Tighten the tensioner nut.

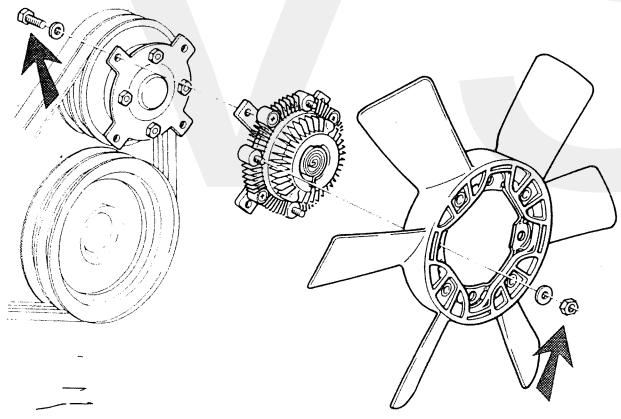

139151

C16

Fit the timing case cover

B200
Locate the upper cover and fit the bolts (3x).

B19
Locate the cover and fit the bolts (4x).


42 167

C17

Fit the water pump pulley

B200
Fit and tighten the pulley.
Fit the V-belts.
Locate the viscous coupling cooling fan and tighten the bolts. Fit the brackets, air intake pipe and air filter.

B19
Fit the pulley and engine cooling fan and tighten the bolts.
Fit the V-belts.

C18

Tension the V-belts

When correctly tensioned, the V-belt can be deflected 5 to 10 mm with light hand pressure.

C19

Fitting

- fit the engine front splash guard;
- fit the cooling fan shroud;
- connect up the battery negative cable.

C20

Run the engine warm and check/adjust

- ignition timing (B19), engine idling speed and CO-content;
- timing belt tension; see Operation *C15*.

Note: first remove the rubber plug from the timing case cover.

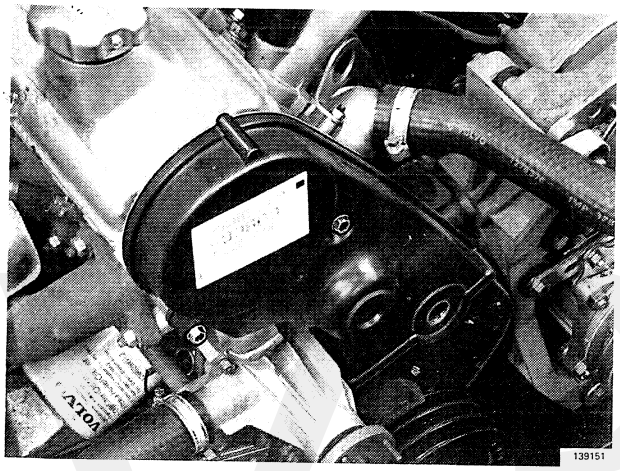
D1-D6. Removing the cylinder head

Special tools: 5034, 5199

D1

Drain the cooling system

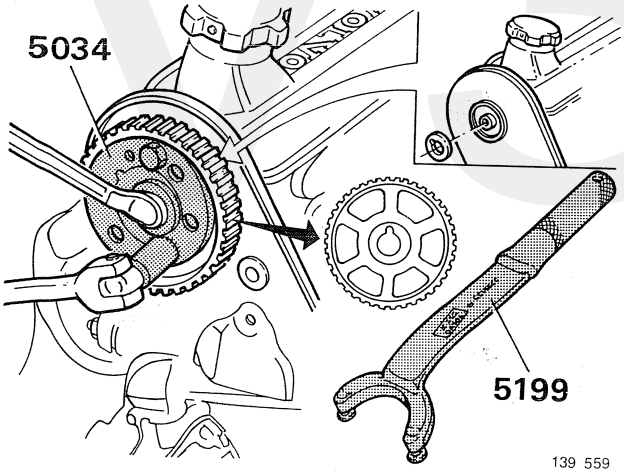
Remove the engine splash guard.
Fit a hose on the drain tap at the right-hand side of the engine.
Open the tap and collect the escaping coolant.



D2

Removal

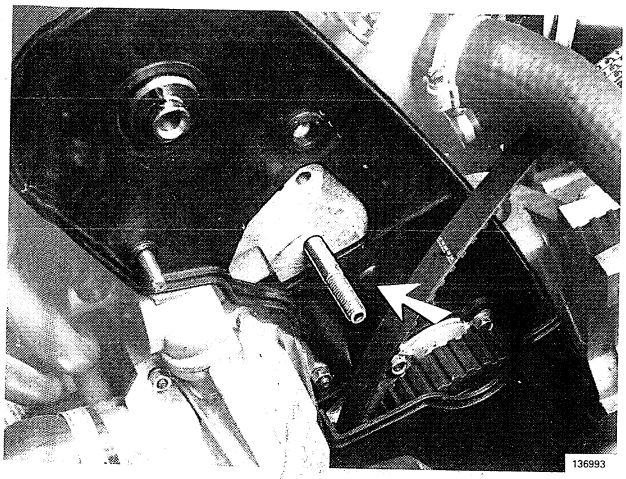
- disconnect the battery negative cable;
- remove the spark plug leads and the distributor cap;
- remove the timing belt; see Operations *C1* to *C7*.



D3

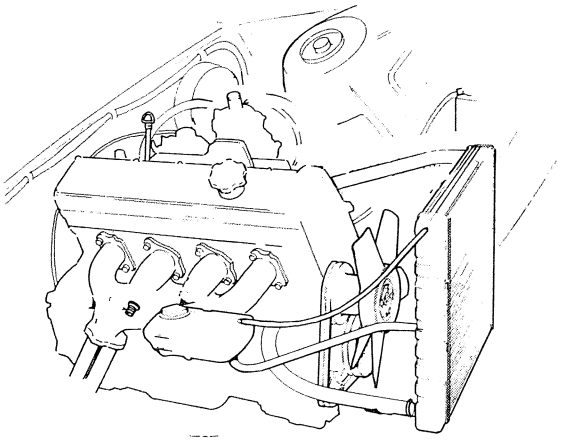
Remove the camshaft sprocket (with shim)

B19/B200: old type sprocket; use counterhold **5034**.
Remove the sprocket together with the shim.
B200: new type sprocket; use counterhold **5199**.
Remove the sprocket.
Note: do not lose the sunk key when removing the sprocket.



D4

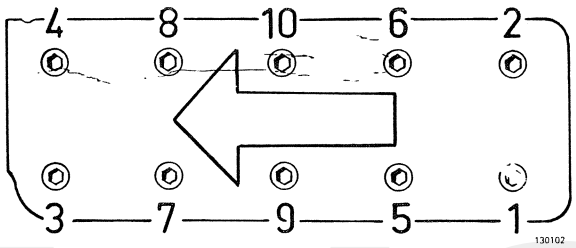
Remove the stud for the tensioner



D5

Remove the following parts from the cylinder head

Engines with EGR/Pulsair: pipes from the inlet and exhaust manifolds.
Remove the inlet and exhaust pipes.
Note: remove the exhaust pipe bolt from the front exhaust bracket.
Unplug the connectors from the sensors.
Remove the coolant hoses.
Remove the spark plugs.



D6

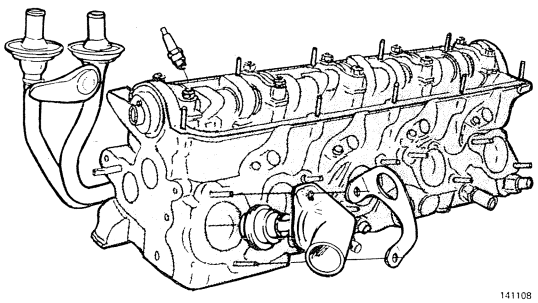
Remove the cylinder head

Remove the valve cover.
Slacken the bolts in the sequence shown in the illustration.

IMPORTANT! The cylinder head is made of aluminium alloy. To prevent possible damage, place the head on two blocks of wood or another soft material.

E1-E5. Disassembling the cylinder head

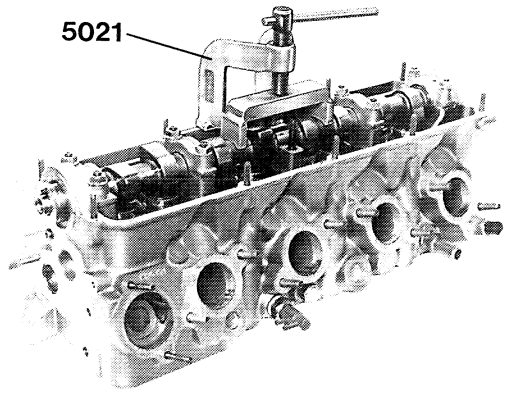
Special tools: 5021 and 5219



E1

Remove the following parts from the cylinder head

- Thermostat housing, thermostat and lifting eye;
- Pulsair line (if fitted);
- Rubber seal (half-moon).

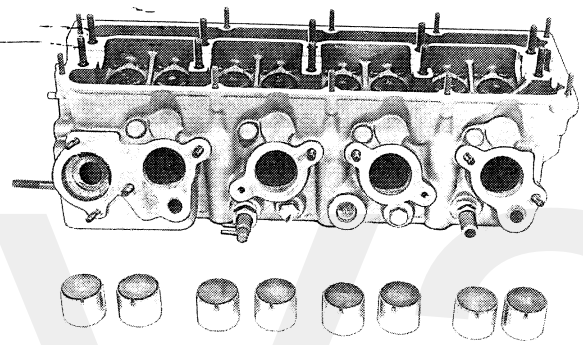


141077

E2

Remove the camshaft

Remove the two bolts and take off the middle camshaft bearing cap.
Locate clamping tool **5021** and press the camshaft down.
Remove the other four bearing caps.
Remove clamping tool 5021 and take off the camshaft with the oil seal.
B200: remove the seal at the rear end.



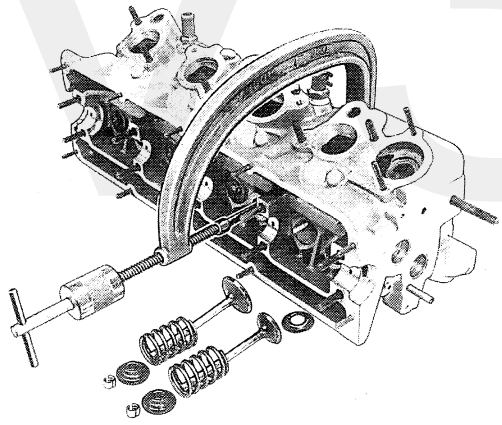
141 215

E3

Remove the tappets

Take the following parts out of the cylinder head:
- the tappets and tappet pads;
- the valve stem seals.

IMPORTANT! The various parts must not be interchanged. Mark them or place them in the correct order to prevent this.



141214

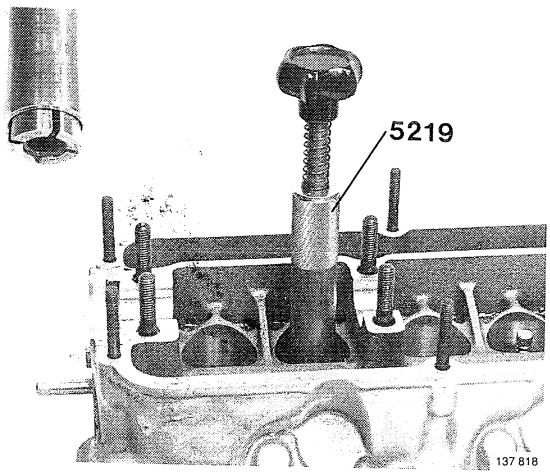
E4

Remove the valve springs and valves

IMPORTANT! The various parts must not be interchanged. Mark them or place them in the correct order to prevent this.

Depress the valve springs with standard valve spring compressor 998-6052.

Remove:
- valve cotters;
- valve spring upper cups;
- valve springs;
- valve spring lower collars;
- valves.



137 818

E5

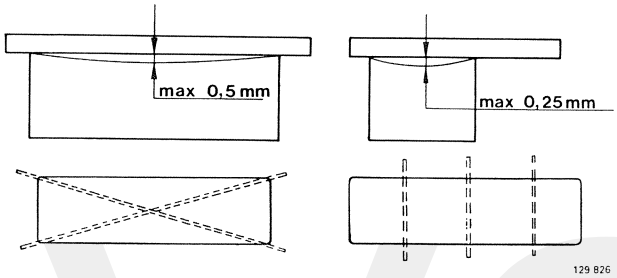
Remove the valve stem seals

Pull the seals off the inlet valve guides with special tool **5219**.

Note: these seals are only fitted on the inlet valves.

F1-F26. Cleaning and inspecting the cylinder head

Special tools: 5027, 5028, 5029, 5160, 5164, 5218, 5220, 5224



129 826

F1

Clean the cylinder head and the joint face

If necessary, remove the locating dowels and the pulse generators.

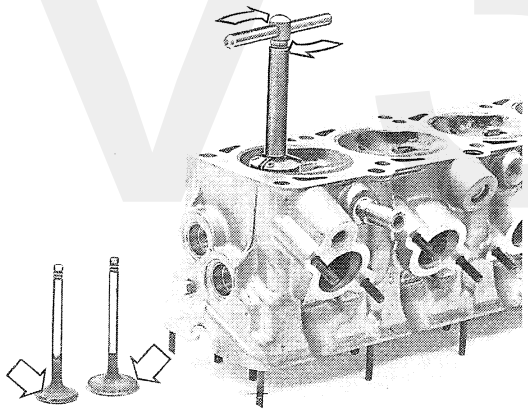
F2

Check the cylinder head for flatness

Use a steel straight-edge and a feeler gauge.
The maximum permitted warp in the longitudinal direction is **0.5 mm and 0.25 mm** in the transverse direction.

IMPORTANT! If the warp in the longitudinal direction is more than 1.0 mm and more than 0.5 mm in the transverse direction, then the cylinder head must not be resurfaced. In that case a new cylinder head must be fitted.

Height of cylinder head,
new ..... **146.1 mm**
minimum (after resurfacing) ..... **145.6 mm**


130 133

F3

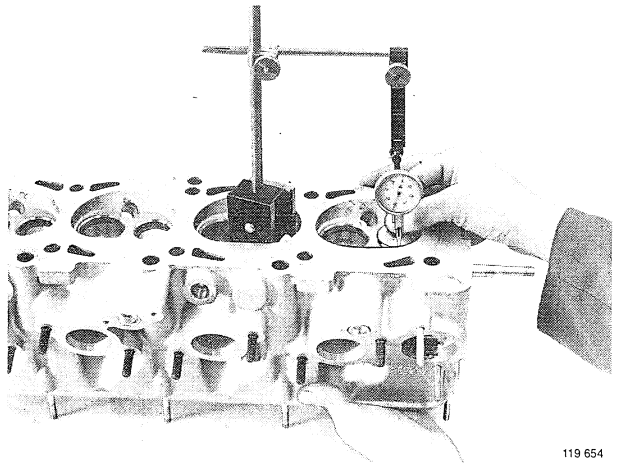
Clean and inspect the valves and valve seats

Clean the valve seats with a milling cutter.

Remove all carbon deposits from the combustion chambers and from the valves.

The valve seats must not be cracked or damaged in any way. If they are damaged, they will have to be renewed.

Clean the thread in the spark plug bores and inspect them for evidence of damage.


119 654

F4

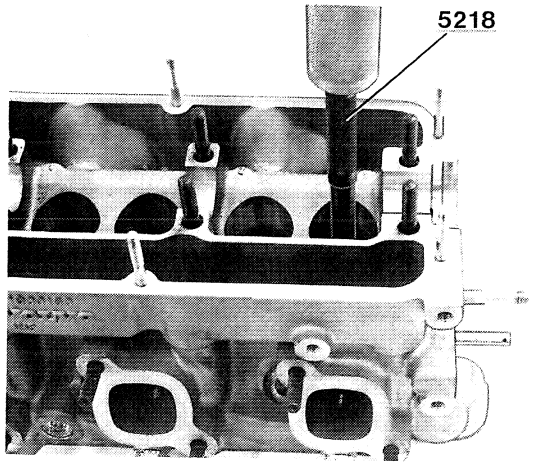
Examine the valve guides for evidence of wear

Use a magnetic base and a clock gauge.

Use new valves and push the valves up **1-2 mm** with a finger while measuring.

Clearance with new valve and new valve guide:
Inlet valve ..... 0.030-0-060 mm
Exhaust valve ..... 0.060-0.090 mm

Permitted maximum clearance, measured with a new valve and an old valve guide:
Inlet valve ..... **0.15 mm**
Exhaust valve ..... **0.15 mm**



119 658

F5

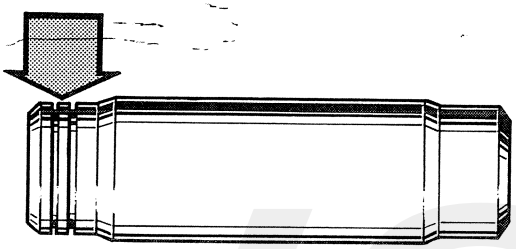
Press out the valve guide

Heat the cylinder to **100** ± **10°C**.

Press out the valve guide towards the combustion chamber, using drift **5218**.

Check whether the valve guide has been damaged during the removal operation.

If this is the case, ream the valve guide bore to an oversize.

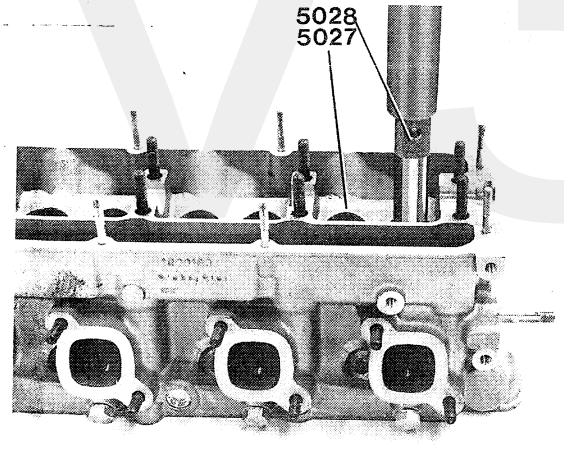

113 946

F6

Determine the size of the new valve guide

Valve guides are marked with grooves.
Check that the new valve guide has the same number of grooves as the old valve guide.

Number of grooves	Size
0	Standard
1	Oversize 1
2	Oversize 2
3	Oversize 3



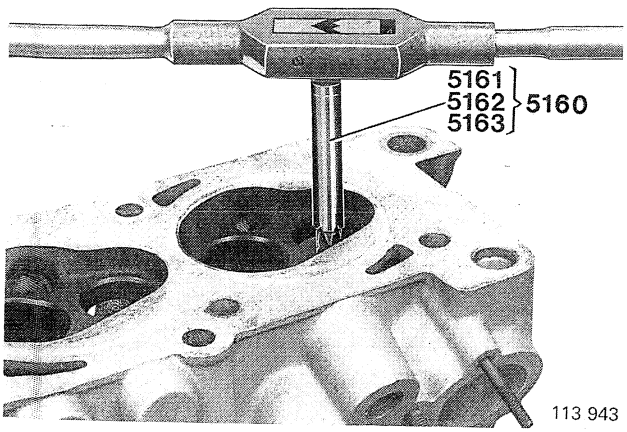
117817

F7

Press in the new valve guide

The cylinder head must be at ambient air temperature. Use drift **5027** for inlet valves and drift **5028** for exhaust valves. Press the valve guide down into the cylinder head until the drift abuts against the cylinder head. The valve guide is then positioned at the correct height.

IMPORTANT! The mounting pressure exerted on the valve guide must be at least **9000 N**. If the mounting pressure is lower, the valve guide will have to be removed again. Ream the valve guide bore to the next oversize and press in the corresponding valve guide.



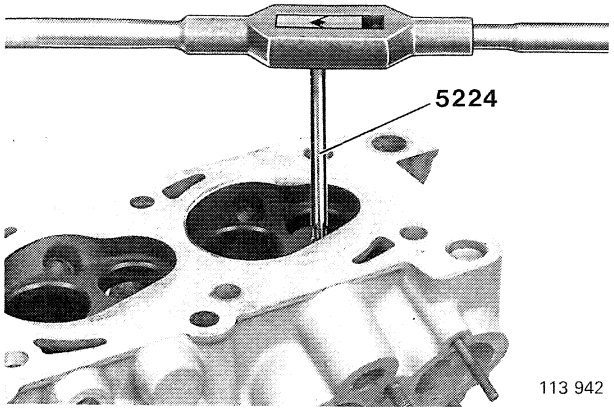
113 943

F8

Fit the oversize valve guide

Ream the bore in the cylinder head to accept an oversize valve guide.

Oversize	Reamer
1	5161
2	5162
3	5163

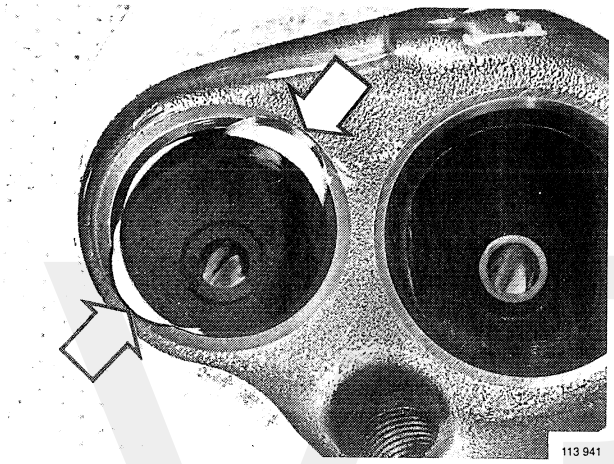


F9

Ream the valve guide inner bore

Use reamer **5224**.
Reamer **5164** may also be used.

After a new valve guide has been fitted, the valve must be lapped on to the valve seat.

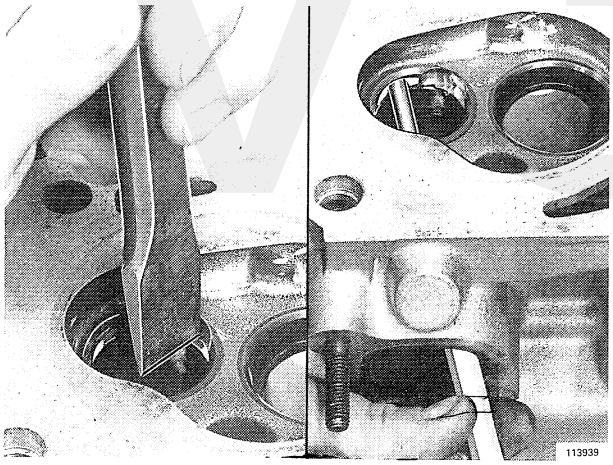


F10

Renew the valve seats

IMPORTANT! Renew the valve guides before fitting new valve seats.

Cut two recesses in the old valve seat.
This is done in order to lower the tension in the seat. Also grind a notch in the seat insert so as to obtain a good 'grip' with the cold chisel.
Work carefully in order not to damage the cylinder head.



F11

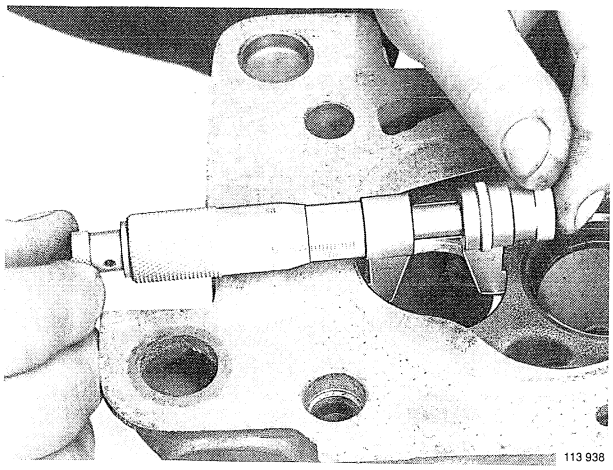
Break the valve seat into pieces

Use a cold chisel and work carefully.
Cut through the seat insert with the chisel at the previously made notch.

F12

Tap out the valve seat

Use a long drift through the inlet or exhaust duct in the cylinder head.



F13

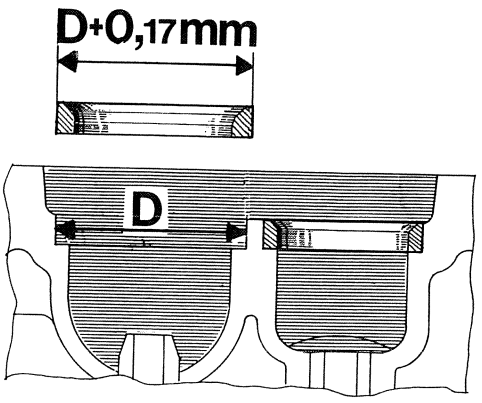
Examine the valve seat mating surface

If the valve seat mating surface is damaged, it will have to be reamed (recut) to the next oversize.

F14

Measure the diameter of the valve seat mating surface

Use an internal micrometer.



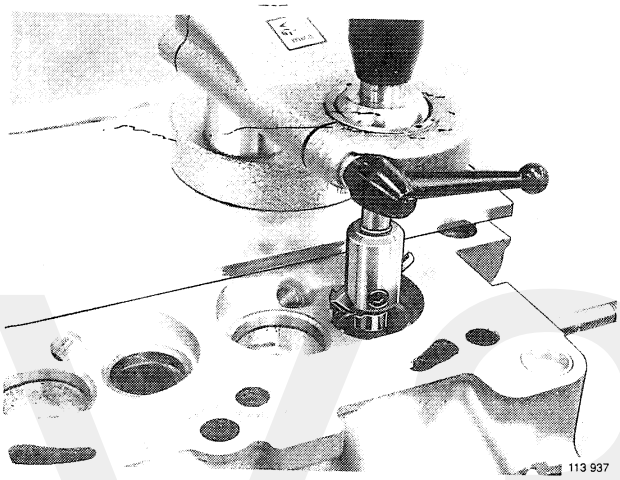
113 945

F15

Select a new valve seat with the correct size

Valve seats are not marked but have to be measured. Valve seats are available in two oversizes.

The valve seat must be **0.17 mm larger** than the diameter in the cylinder head.



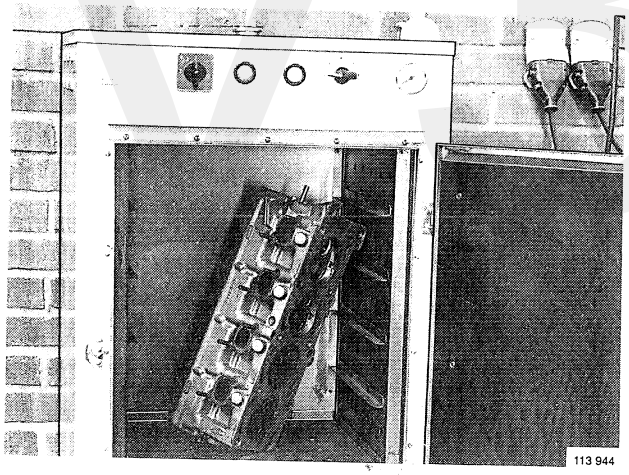
113 937

F16

If the valve seat has insufficient 'grip' (less than 0.17 mm)

Ream the bore in the cylinder head to an oversize.
Use a valve seat cutter, e.g. Volvo Part No. 9986045-5.
Also refer to the manufacturer's instructions.

Valve seat diameter	Inlet	Exhaust
Standard ..... mm	46.00	38.00
Oversize 1 ..... mm	46.25	38.25
Oversize 2 ..... mm	46.50	38.50



113 944

F17

Heat the cylinder head

Heat the cylinder head to **+100°C**

130135

F18

Fit a new valve seat on the drift

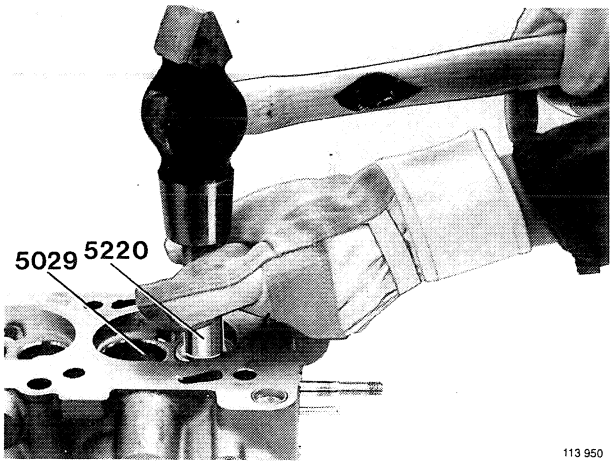
Use drift **5029** for an inlet valve seat and drift **5220** for an exhaust valve seat.

F19

Cool the valve seat down to -70°C

Cool the valve seat with carbon dioxide snow or a similar product.

WARNING! Always use safety goggles and gloves.



F20

Fit the valve seat in the cylinder head

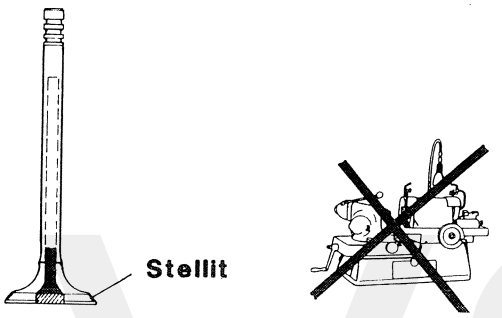
This operation must be carried out very quickly - within **3-4 seconds** - because the parts must be fitted while they are still at their specified temperature.

F21

Check the fit of the valve seat

Check the seat for absence of lateral rocking and ensure that it abuts accurately. If not, an oversize valve seat will have to be be used.

After a new valve seat has been fitted, it must be cut and matched to the valve by grinding.



F22

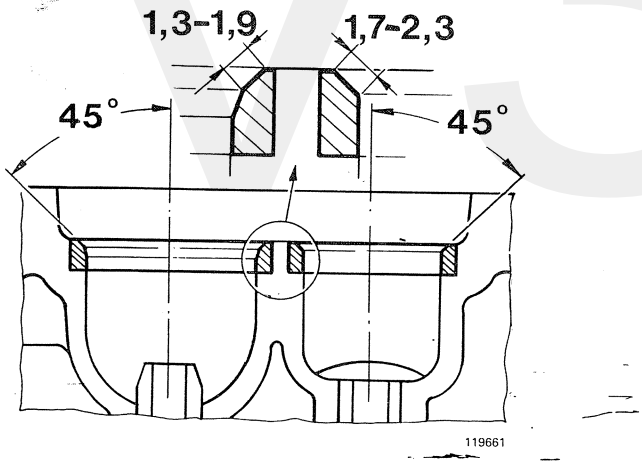
Grind or machine-cut the valve seats

IMPORTANT! The exhaust valves are protected by a coating of Stellite steel and **must not be machine-ground**. Lapping the valves on to the seat with paste is the only sort of grinding permitted. Machining removes the Stellite coating and this impairs the heat resistance of the valves.

The valve seat angle is 45°, both for the inlet and exhaust valves.

Valve seat width

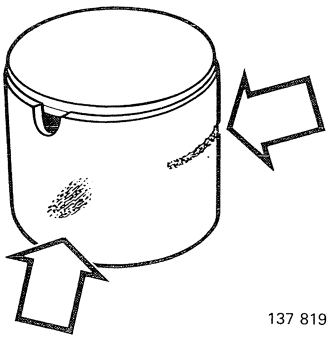
Inlet valves	**1.3-1.9 mm**
Exhaust valves	**1.7-2.3 mm**



F23

Check that the valves abut accurately against their seats

If necessary, grind the valves to their seats with grinding paste.

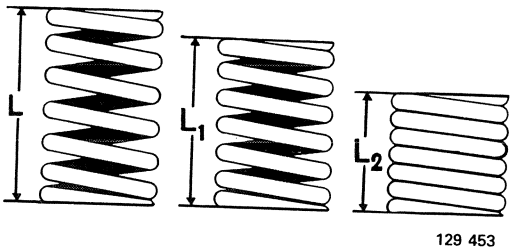


F24

Examine the tappets

Examine the tappets for scoring and other visible damage.

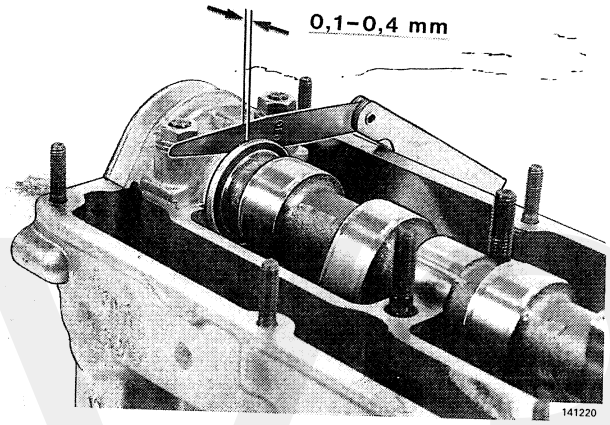
F25



Check the valve springs

	Length (mm)	Loading (N)
L	45.0	0
L1	38.0	280-320
L2	27.0	710-790

F26



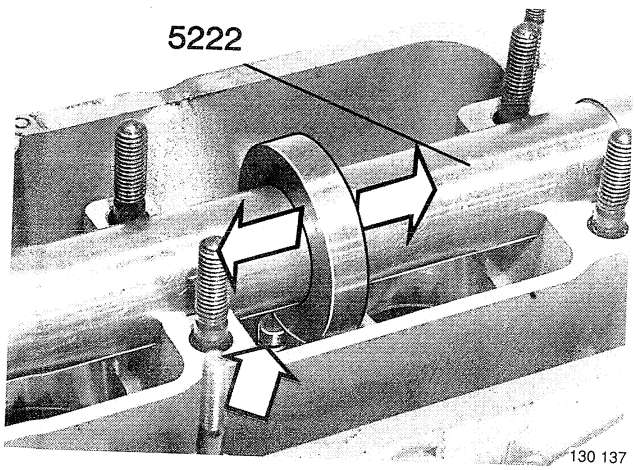
Check the camshaft end float

Position the camshaft in the head.
Fit the rear bearing cap.
Slide the camshaft backwards and forwards.
The clearance should be **0.1-0.4 mm**. Measure the clearance with a feeler gauge.
If the clearance is excessive, renew the rear bearing cap.

G1-G8. Cylinder head assembly

Special tools: 5021, 5025, 5219, 5222

G1



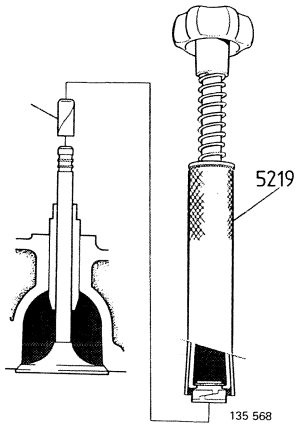
Check the position of the valve stem relative to the camshaft

This check is necessary to ensure that there is sufficient space for adjusting the valve clearance.

Locate gauge **5222** in the camshaft bearing seats. Depress the valve on to the valve seat and slide the gauge ring over the valve stem.
The valve stem must not contact the gauge.
If it does, material will have to be dressed off the valve stem.

Maximum dress-off length: **0.5 mm**.

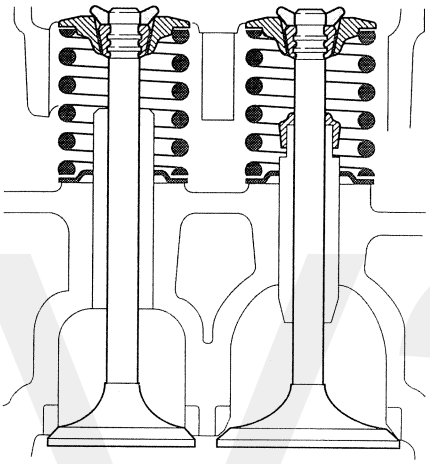
Minimum clearance between the valve cotter and the end of the valve stem: **3.5 mm**.



G2

Fit new seals on the valve stems

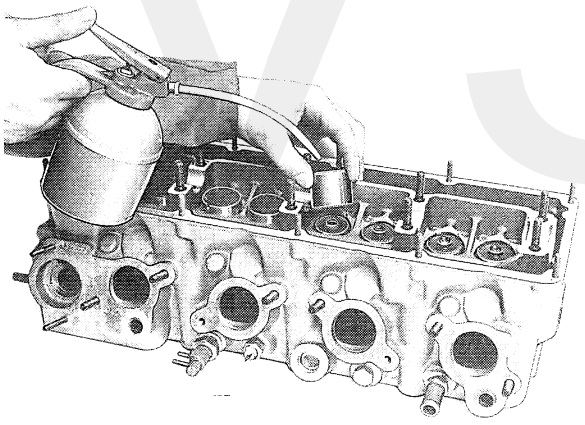
The seals are only fitted on the **inlet valves**.
Always use the protective sleeve which is supplied with the gasket sets.
Oil the valve and locate it in the head.
Slide the protective sleeve over the valve stem.
Fit the seal. Use special tool **5219**.
When fitting, the tool must abut the flange of the seal.
Remove the protective sleeve.



G3

Fit the valves and valve springs

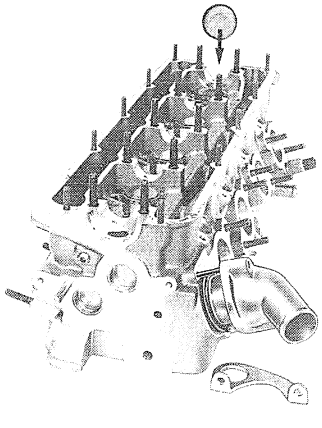
- valve spring lower collars;
- valve springs;
- valve spring upper cups;
- valve cotters;
- rubber rings.



G4

Lubricate and fit the tappets and tappet pads

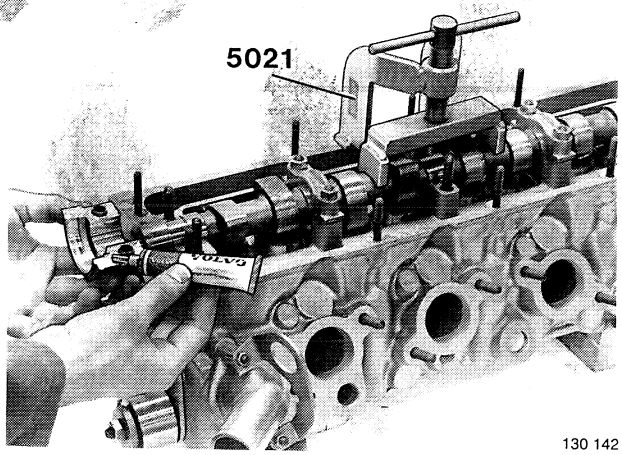
Fit these parts back in their original position.



G5

Fit the following parts on the cylinder head

- thermostat with O-ring seal and the thermostat housing;
- lifting eye;
- B19: rubber seal (half-moon);
  B200: round rubber seal.

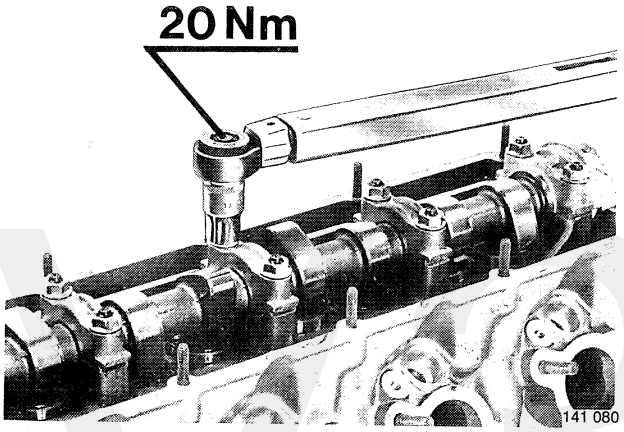


130 142

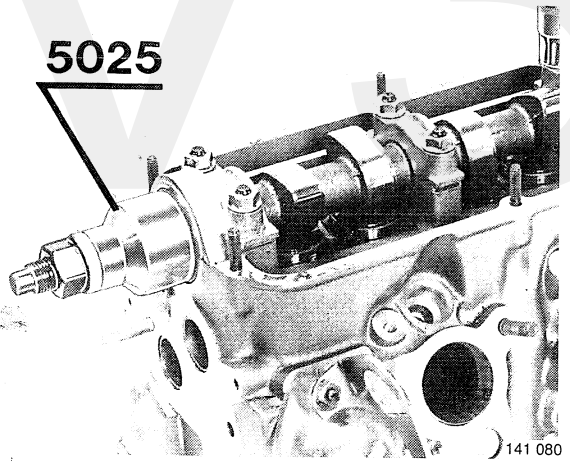
G6

Fit the camshaft and bearing caps

Oil the running surfaces of the shell bearings, bearing caps, camshaft, tappets and tappet pads.
Apply gasket cement (Part No. 1161027-6) to the joint face of the front and rear bearing cap and the cylinder head.
Fit the camshaft and the rear bearing cap (the thrust bearing).
The sunk key for the camshaft sprocket must be pointing upwards.
Depress the camshaft with special tool **5021**.
Use the rear bearing cap as a guide.
Secure the nuts for the rear bearing cap finger-tight.
Fit three bearing caps and secure the nuts finger-tight.
Remove special tool 5021.
Fit the middle bearing cap and secure the nuts finger-tight.
Tighten the nuts to a torque of **20 Nm**.



141 080



141 080

G7

Fit a new camshaft (front) oil seal

Clean the mating surface and coat the lip of the seal and camshaft with grease.
Fit the seal with drift **5025**.
Examine the rubber lip of the seal to ensure that it has not been damaged during assembly.

G8

Adjust the valves

Rotate the camshaft a few times and note the position of the cams.
See Operations *B2* to *B8*.

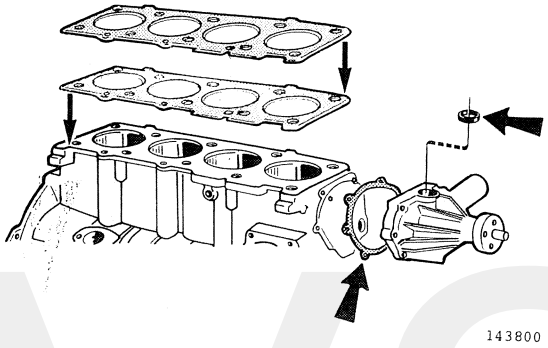
H1-H9. Fitting the cylinder head

Special tools: 5034, 5199

H1

Check the position of the crankshaft and camshaft

Check that the piston of No. 1 cylinder is at TDC and that the cams of No. 1 cylinder are pointing upwards at an oblique angle.



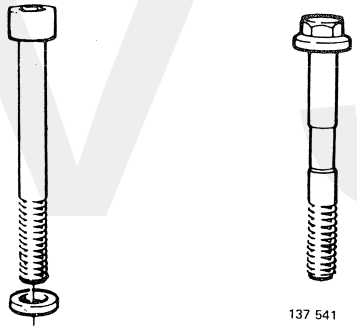
143800

H2

Fit the cylinder head

Fit the new head gasket(s), leaving the oilways clear and with the water pump O-ring accurately located in the groove.
Note: see the Specifications before fitting the head gasket(s) (one or two).

IMPORTANT! Do not rotate the crankshaft or camshaft, otherwise the pistons may strike the valves.



137 541

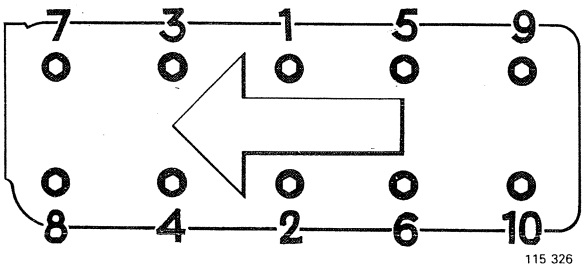
H3

Fit the cylinder head bolts

There are two types of cylinder head bolts which **must not be used together** on the same engine.

New type cylinder head bolts
- Cylinder head bolts which show evidence of stretch, which is first apparent in the thin middle section, must be renewed.
- Cylinder head bolts may only be used (retorqued) not more than five times.
  In case of doubt, err on the side of caution and use new the cylinder head bolts.

Oil the bolts.
Fit the bolts and tighten them in the indicated sequence and stages.

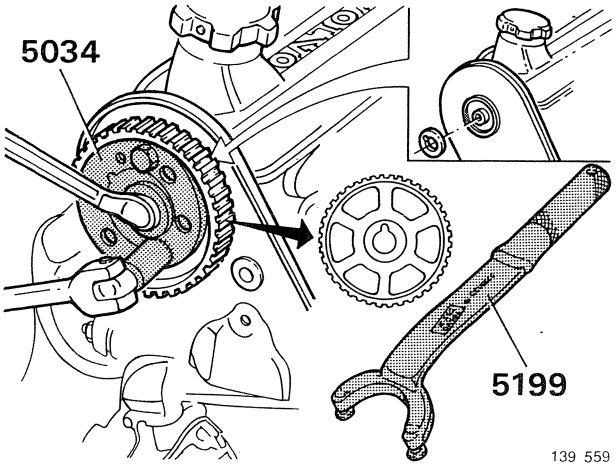


115 326

Old type
1st stage: torque-tighten to **60 Nm**
2nd stage: torque-tighten to **110 Nm**

New type
1st stage: torque-tighten to **20 Nm**
2nd stage: torque-tighten to **60 Nm**
3rd stage: **angle-tighten a further -turn (90°)**

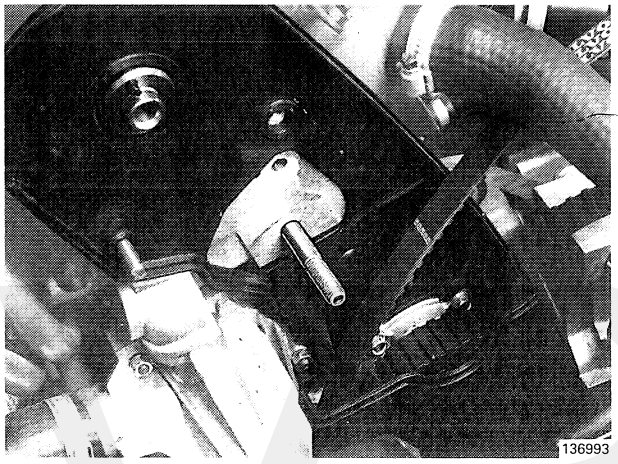
Note: old type cylinder head bolts must be retorqued after **1,000 km.**



H4

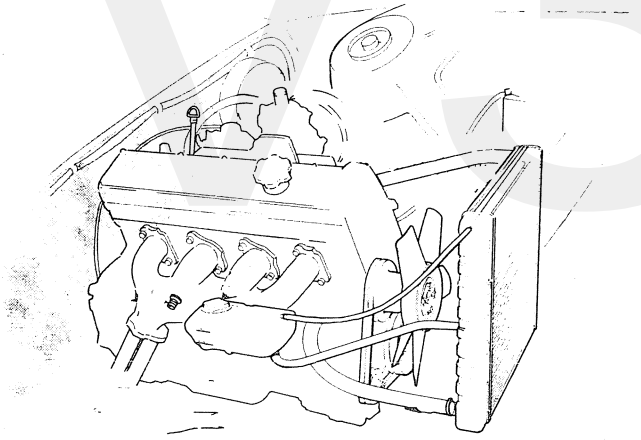
Fit the camshaft sprocket (with shim)

Insert the sunk key in the camshaft.
B19/B200: old type sprocket.
Fit and tighten the sprocket together with the shim.
Use counterhold **5034**.
Tighten the bolt to **50 Nm**.
B200: new type sprocket.
Fit and tighten the sprocket.
Use counterhold **5199**.
Tighten the bolt to **50 Nm**.



H5

Tighten the stud for the tensioner

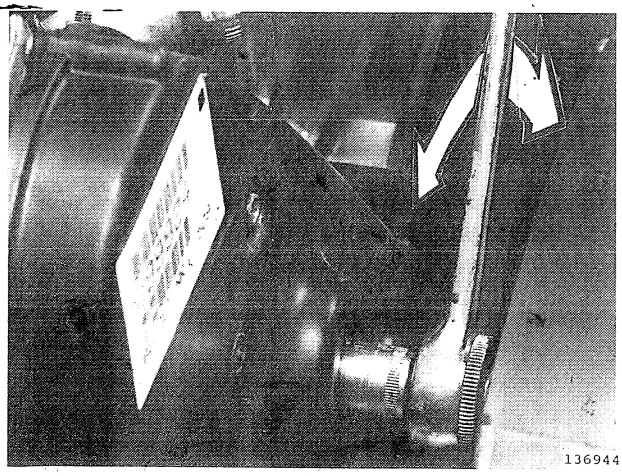


H6

Fit the following parts on the cylinder head

- inlet and exhaust manifolds;
- valve cover;
- coolant hoses;
- spark plugs, leads and distributor cap;
- connectors on sensors.

Engines with EGR/Pulsair: fit the pipes on the inlet and exhaust manifolds.
Note: fit the exhaust pipe bolt on the front exhaust bracket.



H7

Fit the timing belt

See Operations *C11* to *C19*.

H8

Fill the cooling system

See Operation *R6*.

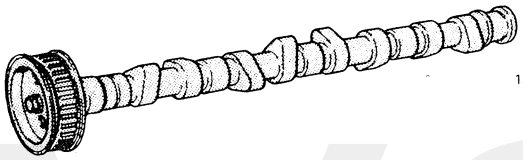
H9

Run the engine warm and check/adjust

- ignition timing (B19), engine idling speed and CO-content;
- timing belt tension; see Operation *C15*;

Note: first remove the rubber plug from the timing case cover.

J1-J5. Fitting a new camshaft


133 662

J1

If the camshaft has to be renewed due to wear

It is essential to flush out the engine before fitting new components.
It has been established that recurrent damage to the camshaft and tappets is caused by foreign matter in the engine.

J2

Flush out the engine

Change the engine oil and fit a new oil filter.
Run the engine warm for about 10 minutes.
Drain the oil and remove the oil filter.
Fit and tighten the drain plug, using a **new** joint washer.
Tightening torque: 22 Nm.

J3

Fit a new camshaft

See Operations *D2, D3, E2, G6, G7, H4* and *H7.*

J4

Fill the engine with oil

Fit a new oil filter.

J5

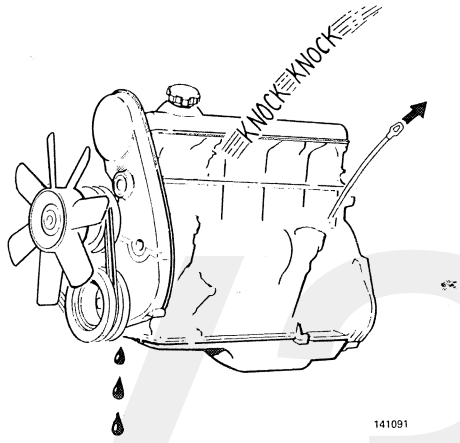
Run the engine warm and check/adjust

- ignition timing, engine idling speed and CO-content;
- timing belt tension; see Operation *C15.*

Note: first remove the rubber plug from the timing case cover.

K1-K15. Renewing the camshaft/countershaft and/or crankshaft oil seal at the timing gear end

Special tools: 5024, 5025, 5034, 5283

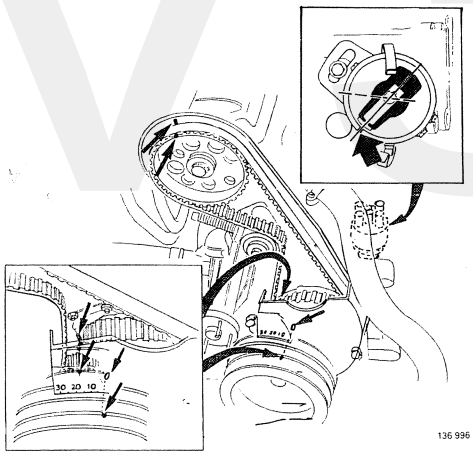


141091

K1

Check for blockage of the flame baffle

A blocked flame baffle impedes the operation of the crankcase ventilation and results in overpressure in the crankcase.
Characteristics of a blocked flame baffle:
- The oil dipstick is forced upwards.
- Oil leakage past the seals in the cylinder block. If there is leakage past the seals as a result of a blocked flame baffle, it will not always be necessary to renew the seal; removing the blockage may be all that is required. However, always check for leakage.
- The engine knocks. If necessary, fit a new type flame baffle, as used on later engine versions.



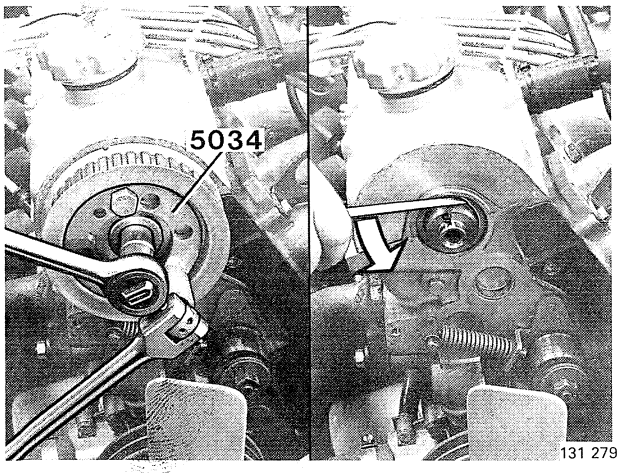
136 996

K2

Remove the timing belt

See Operations *C1* to *C7*.

Camshaft oil seal



131 279

K3

Remove the camshaft sprocket

See Operation *D3*.

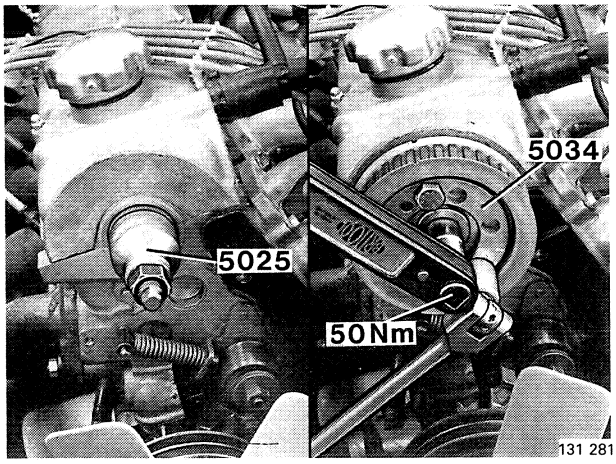
K4

Remove the inner timing case cover

K5

Remove the camshaft oil seal

Use a screwdriver.
Take care not to damage the mating surface.



K6

Fit a new camshaft oil seal

Clean the mating surfaces.
Smear the oil seal and the mating surfaces with grease.
Fit the oil seal with drift **5025**.
Note: when fitting the oil seal, do not flatten or damage it in any way.

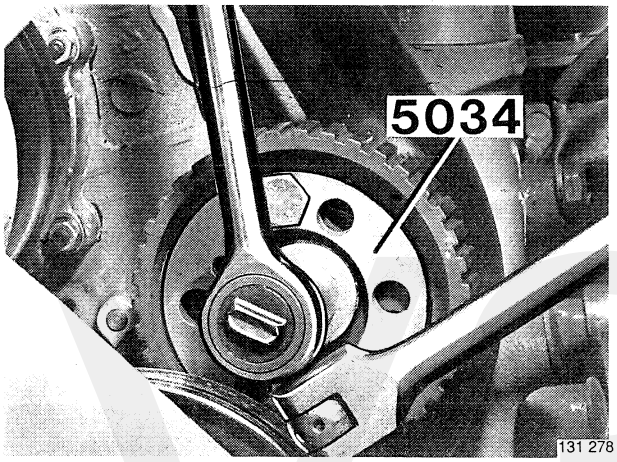
K7

Fit the inner timing case cover

K8

Fit the camshaft sprocket

See Operation *H4.*

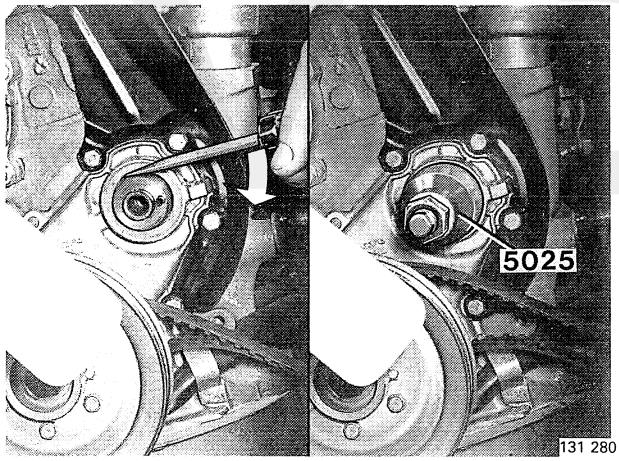


Countershaft oil seal

K9

Remove the countershaft sprocket

Use counterhold **5034** and remove the retaining bolt.
Remove the sprocket and take the sunk key out of the countershaft.



K10

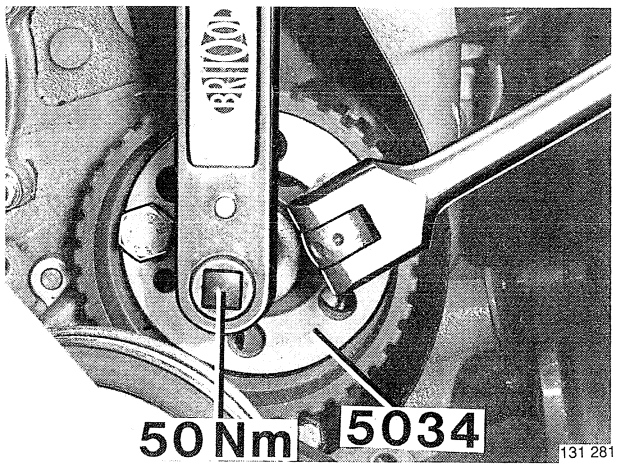
Remove the countershaft oil seal

Remove the oil seal with a screwdriver.
Take care not to damage the mating surface.

K11

Fit a new countershaft oil seal

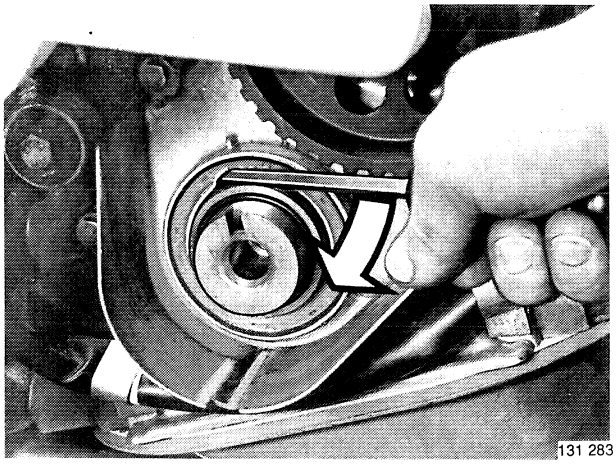
Clean the mating surfaces.
Smear the oil seal and the mating surfaces with grease.
Fit the oil seal with drift **5025**.
Note: when fitting the oil seal, do not flatten or damage it in any way.



K12

Fit the countershaft sprocket

Locate the sunk key in the countershaft.
Fit the sprocket on the countershaft.
Fit and tighten the retaining bolt. Use counterhold **5034**.
Tighten the bolt to **50 Nm**.

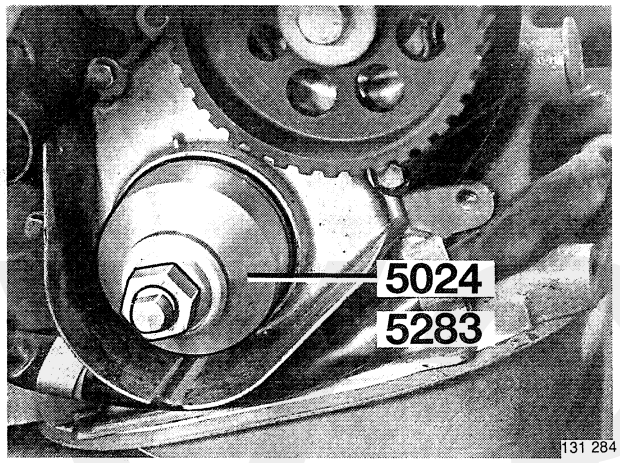


Crankshaft oil seal

K13

Remove the crankshaft oil seal

Remove the oil seal with a screwdriver.
Take care not to damage the mating surface.



K14

Fit a new crankshaft oil seal

Clean the mating surfaces.
Smear the oil seal and the mating surfaces with grease.
B19/B200 without a vibration damper:
Fit the oil seal with drift **5024**.
B200 with vibration damper:
Fit the oil seal with drift **5283**.
Note: when fitting the oil seal, do not flatten or damage it in any way.

K15

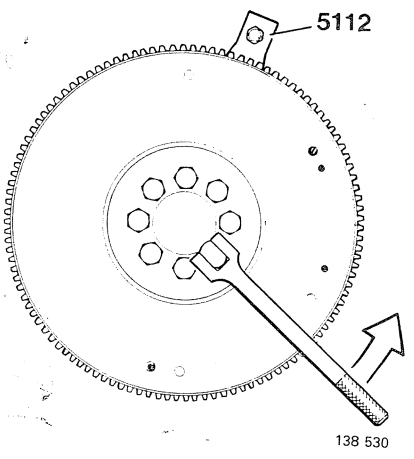
Fit the timing belt

See Operations *C11* to *C20*.

L1-L7. Renewing the crankshaft rear oil seal

Special tools: 1801, 5112, 5276

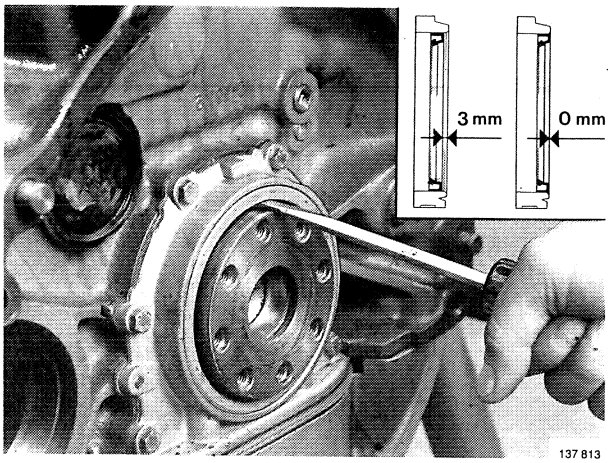
The clutch assembly cover, the pressure plate assembly and the driven plate (clutch disc) must be removed for this repair. See the Repairs & Maintenance Service Manual, Section 4 (41-46), Power Transmission, 300, 1979-1991, November 1990, TP 35717/1.



L1

Remove the flywheel

Use counterhold **5112**.



L2

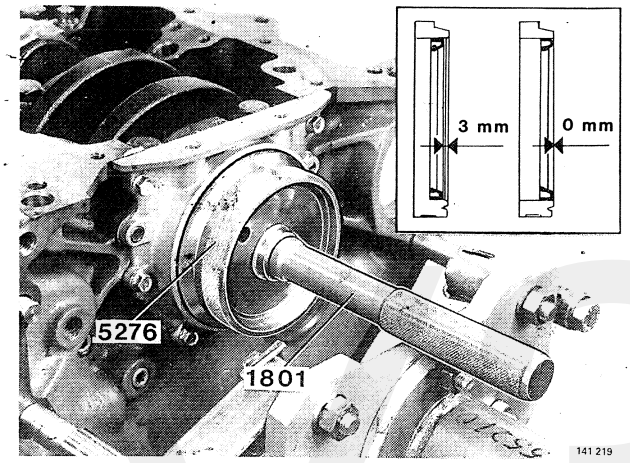
Remove the crankshaft oil seal

Remove the oil seal with a screwdriver.
Take care not to damage the mating surface.

IMPORTANT! Note the position of the seal relative to the oil seal carrier so that the position is known when fitting.

L3

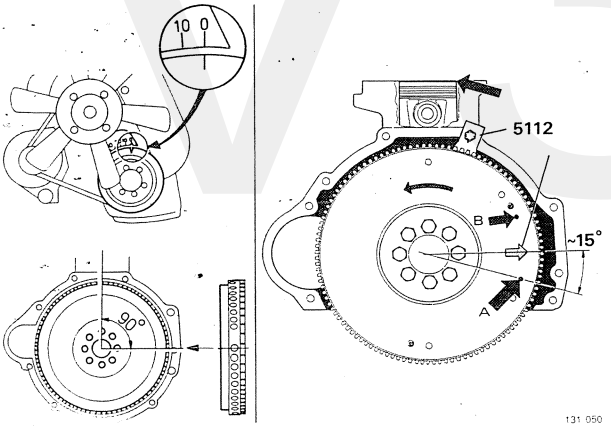
Clean and inspect the mating surfaces of the crankshaft and the oil seal carrier.



L4

Fit a new oil seal

Assemble standard handle **1801** and drift **5276**.
Oil the mating surface of the seal to the carrier and the lips of the seal.
Slide the seal on to the drift.
If there is a worn spot on the running surface of the crankshaft, the seal will have to be pressed deeper into the carrier than before.
Remove **one** shim from the drift if the old seal was flush-mounted with the carrier.
Remove **two** shims from the drift if the old seal was recessed 3 mm in the carrier.
If the crankshaft is undamaged, leave both shims in the drift.
Tap in the seal until the drift abuts against the crankshaft.



L5

Fit the flywheel

Turn the crankshaft so that No. 1 cylinder is at TDC by aligning the ignition timing mark on the crankshaft pulley.

B19
Position the flywheel on the crankshaft so that pin A is approximately 15° below the horizontal; see the illustration.
NB. Two pins are provided, A and B, which must not be interchanged.

B19/B200 with a Renix ignition system

The circumference of the flywheel has a number of equally spaced holes, except for two holes with **wider** spacing. Locate the flywheel so that the **first hole after this wider spacing** is at 90° to the centre-line of the engine; see the illustration.

Fit new bolts. Prevent the flywheel from turning with counterhold **5112**.
Tighten the bolts to **70 Nm**. Remove the counterhold.

L6

Check the flywheel for correct fitting (with a Renix ignition system)

To check whether the flywheel is accurately fitted, the crankshaft pulley must be rotated 90° past TDC so that the **first** hole after a blind section is located under the sensor position.

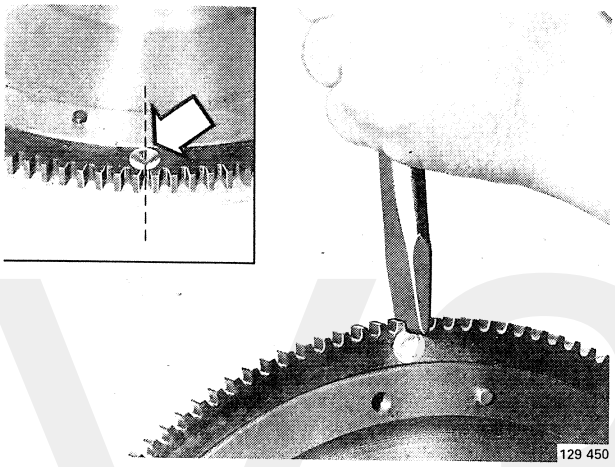
L7

Fit the driven plate, pressure plate assembly and clutch assembly cover.

See the above-mentioned Repairs & Maintenance Service Manual, Section 4 (41-46), Power Transmission, 300.

M1-M5. Renewing the flywheel starter ring (flywheel removed)

The clutch assembly cover, the pressure plate assembly and the driven plate (clutch disc) must be removed for this repair. See the Repairs & Maintenance Service Manual, Section 4 (41-46), Power Transmission, 300, 1979-1991, November 1990, TP 35717/1.


129 450

M1

Remove the flywheel

See Operation *L1*.

M2

Remove the flywheel starter ring

Use a **10 mm** drill bit. Drill a hole approximately 9 mm deep.

IMPORTANT! Do not drill in the flywheel as this may cause imbalance.

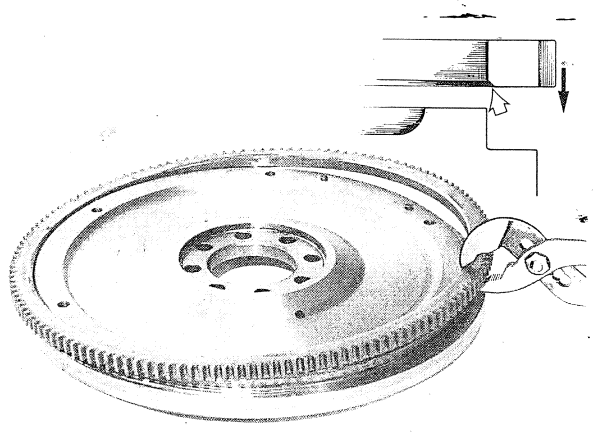
Secure the flywheel in a bench vice with copper jaws. Lever off the flywheel starter ring with a screwdriver. If necessary, break the starter ring with a hammer and chisel at the drilled hole. Clean the flywheel mating surfaces.

M3

Heat the starter ring to +230°C

Heat the starter ring in an oven or with an oxyacetylene flame.
When an oven is used, place the starter ring in the oven before switching it on.
When an oxyacetylene flame is used, the starter ring must be heated immediately prior to fitting.

Check the temperature with solder containing 40% tin and 60% lead. This solder melts at +220-230°C.


129 449

M4

Fit the new starter ring

Fit the starter ring on the flywheel.

IMPORTANT! The bevelled inner edge must be fitted facing towards the flywheel.

If necessary, tap the starter ring down so that it abuts accurately. Use a copper drift.
Let the starter ring cool down.

M5

Fit the flywheel

See Operations *L5* and *L6*.

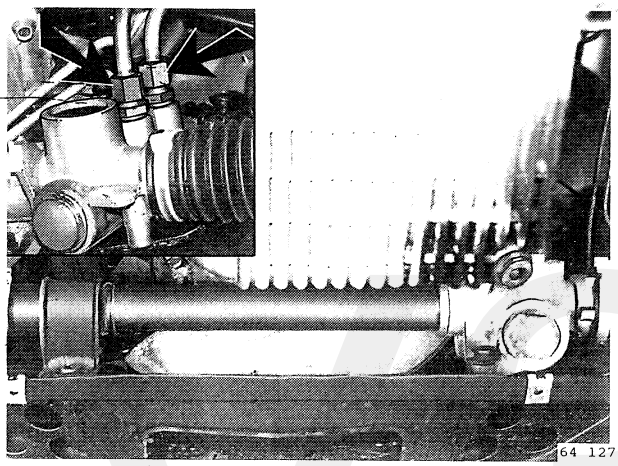
N1-N11. Removing/fitting the sump

N1

Remove/disconnect

- The battery negative cable.
- The engine splash guard.
- The steering gear heat shield (if fitted).
- The drain plug from the sump.

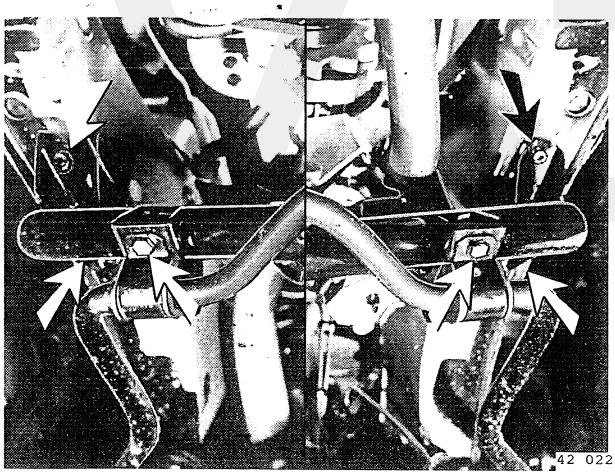
Note: fit the drain plug back in the sump with a new joint washer and tighten to torque. Tightening torque: 22 Nm.



N2

Remove the steering gear

Steering gear without power assistance: see the Repairs & Maintenance Service Manual, Section 6, Front end and steering, 340, 1976-19...
Steering gear with power assistance: see the Repairs & Maintenance Service Manual, Section 6 (60-64), Power steering, 360, 1988-19.., May 1988.



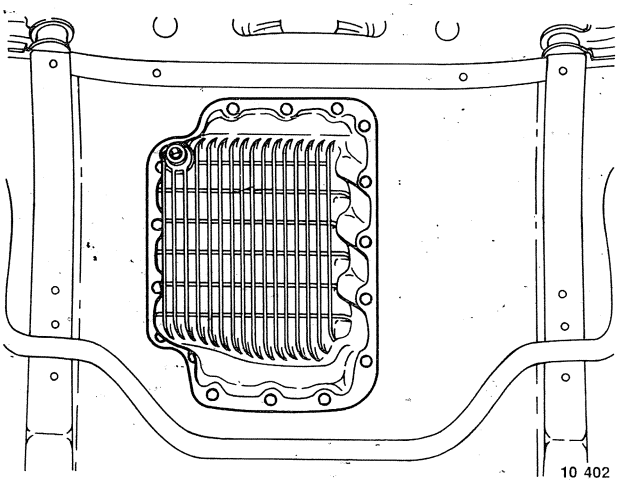
N3

Remove the flywheel guard

N4

Release the front cross member

Remove the four retaining bolts from the cross member.



N5

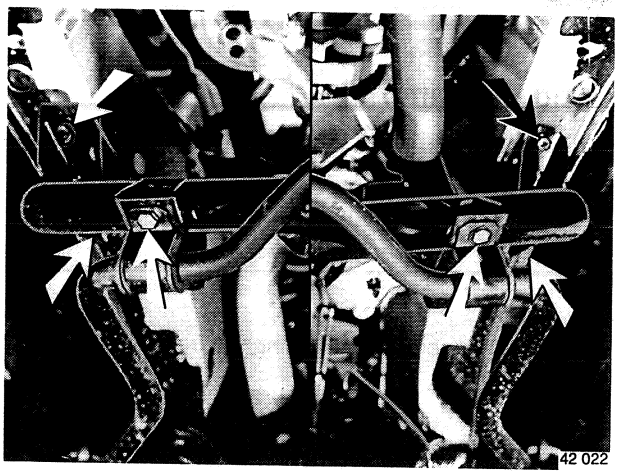
Remove the sump

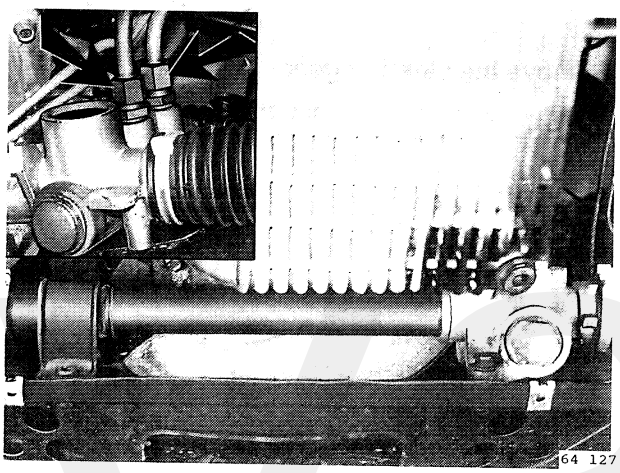
Remove the bolts.
Tap the sump to release it from the block.
Remove all traces of the old gasket from the sump and cylinder block.
Examine the mating surfaces for damage.

N6

Fit the sump

Fit a **new** gasket on the sump.
Offer up the sump and position it accurately.
Fit two bolts.
Then fit and tighten all the bolts.
Tightening torque: 11 Nm.





N7

Fit the front cross member

Fit and tighten the four retaining bolts.

N8

Fit the flywheel guard

N9

Fit the steering gear

Steering gear without power assistance: see the Repairs & Maintenance Service Manual, Section 6, Front end and steering, 340, 1976-19...
Steering gear with power assistance: see the Repairs & Maintenance Service Manual, Section 6 (60-64), Power steering, 360, 1988-19.., May 1988.

N10

Fit/connect up

- The steering gear heat shield (if fitted).
- The engine splash guard.
- The battery negative cable.

N11

Fill the engine with oil

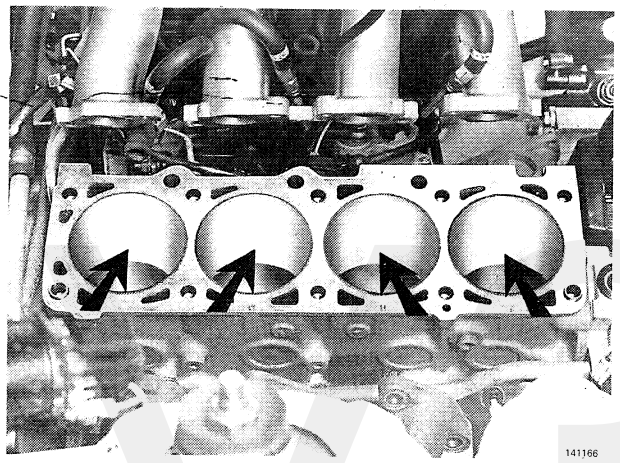
See Operation *S1*.

O1-O22. Fitting new piston rings

O1

Remove

- The cylinder head; see Operations *D1* to *D6*.

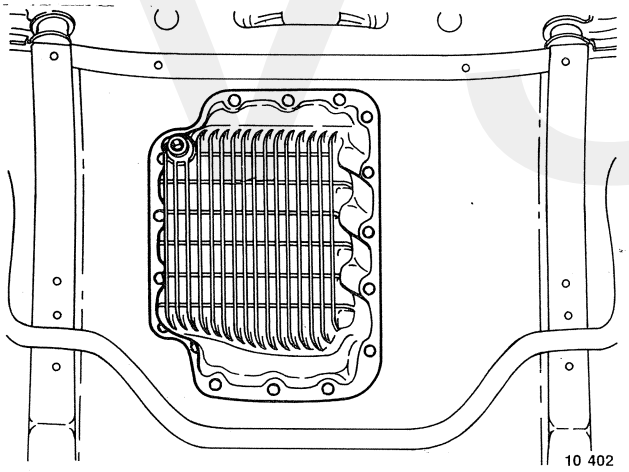


O2

Examine the cylinder walls

Examine the cylinder walls for scoring and other visible damage.

NB. If there is visible damage, **the cylinder head will have to be fitted with at least six bolts** before the engine is removed for reconditioning.
To remove the engine, see Operations *Q1* to *Q4*.



O3

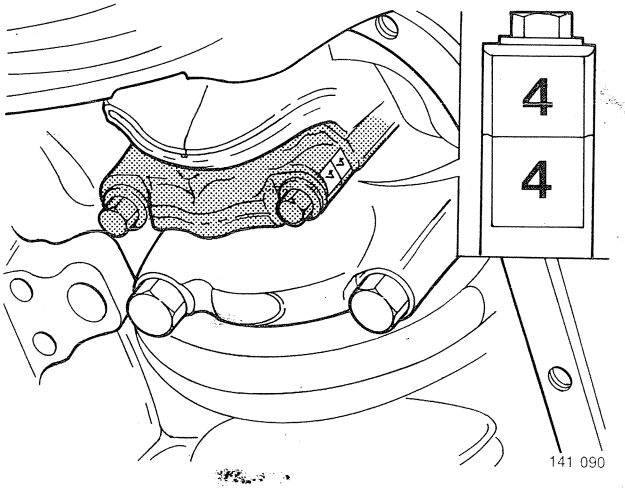
Remove the sump

See Operations *N1* to *N5*.

O4

Remove the oil pump and high pressure pipe

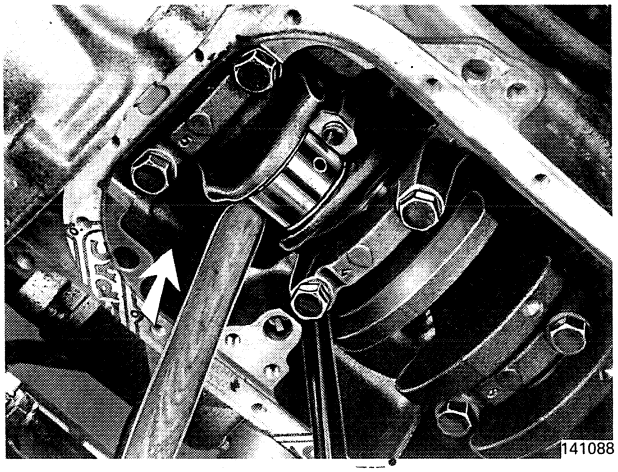
See Operation *U2*.



O5

Rotate the crankshaft

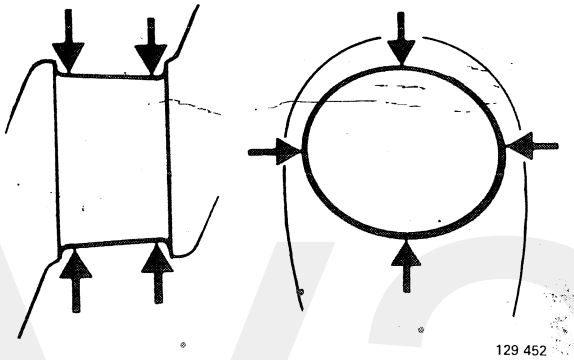
Rotate the crankshaft so that the big-end bearing caps for No. 1 and No. 4 cylinders, or No. 2 and No. 3 cylinders, are in their lowest positions.
Check that the bearing caps are marked so that they cannot be interchanged when fitting.


141088

O6

Remove the piston and connecting rod assemblies

Remove the bolts from the connecting rods.
Remove the bearing caps complete with shell bearings.
First polish out any ridges at the top of the cylinder bores.
Lift out the piston and connecting rod assemblies (towards the top).
Examine the shell bearings for scoring and other visible damage.
Note: do not interchange the various parts.

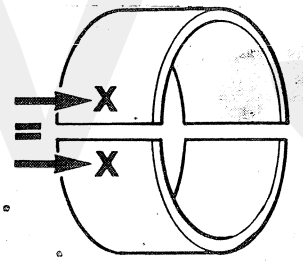

129 452

O7

Check the out-of-round and taper of the big-end bearing journals

Measure the out-of-round and taper of the bearing journals with a micrometer.
Measurements should be taken at several points on the journal circumference and over the entire length.

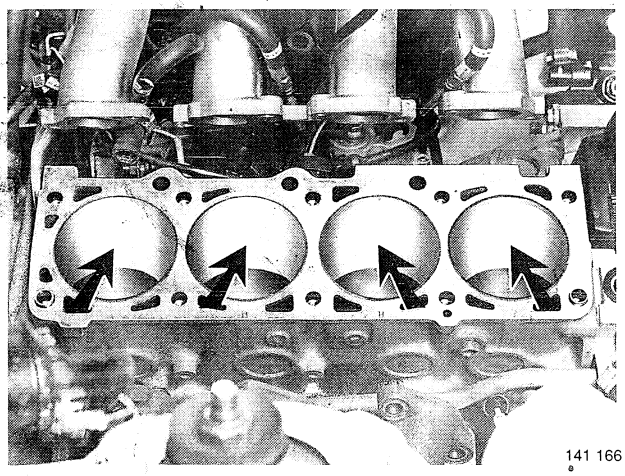
Maximum permissible out-of-round:		
B19	mm	0.05
B200	mm	0.004
Maximum permissible taper:		
B19	mm	0.05
B200	mm	0.004
Diameter:		
standard		
B19	mm	58.987-54.000
B200	mm	48.984-49.005
undersize 1		
B19	mm	53.733-53.746
B200	mm	48.734-48.755
undersize 2		
B19	mm	53.479-53.492
B200	mm	48.484-48.505
Bearing recess, width:		
B19	mm	29.95-30.05
B200	mm	23.90-26.10



144 268

One of the following alternatives is used:
Alt. 1: two shell bearings with yellow markings.
Alt. 2: one shell bearing with blue markings (in the connecting rod) and one with red markings (in the bearing cap).
The only type of shell bearings supplied for Service purposes have yellow markings.

If the big-end bearing journals are visibly damaged or have excessive out-of-round or taper, then the engine will have to be removed and the crankshaft renewed or reground.

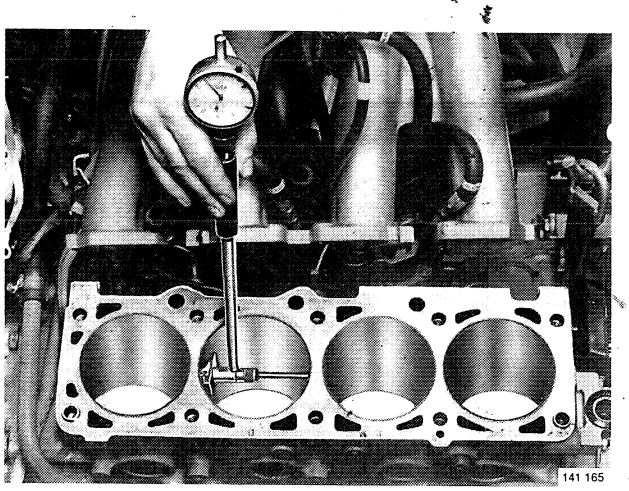

141 166

NB. The cylinder head must be fitted with at least six bolts before removing the engine.
To remove the engine, see Operations *Q1* to *Q4.*

O8

Polish the cylinder walls

Insert some paper at the bottom of the cylinder bores to prevent dirt from entering the crankshaft oilways.
Polish the cylinder walls with fine-grade waterproof sandpaper or a honing tool.


141 165

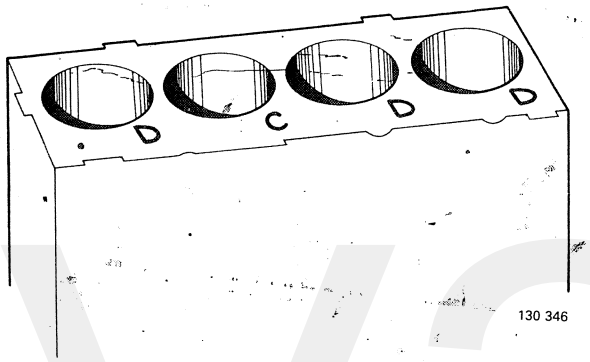
O9

Measure the cylinder walls

Use an internal micrometer with a range of 50-100 mm.

Measure the **greatest wear** in the transverse direction of the engine, just under the piston ring upper travel limit (ridge).

Measure the **smallest wear** in the longitudinal direction of the engine at the piston ring lower travel limit.



130 346

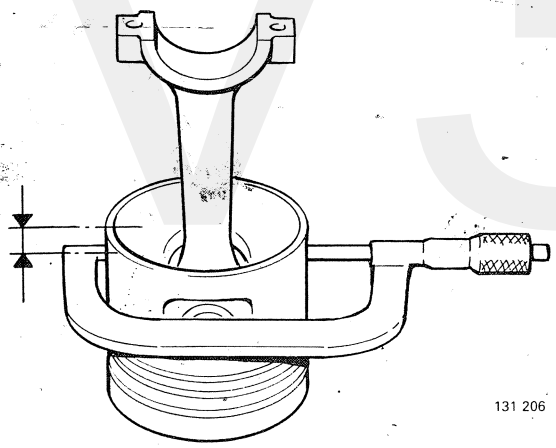
O10

Measure the diameter of the cylinder bores

Each cylinder is marked with a letter indicating the class of tolerance (C, D, E or G).
Oversizes are shown by the abbreviation öD1 or öD2. After boring out, the new class of tolerance letter must be stamped in the block.

Standard:		
Marked C	mm	88.90-88.91
Marked D	mm	88.91-88.92
Marked E	mm	88.92-88.93
Marked G	mm	88.94-88.95
Oversize:		
öD1	mm	89.29-89.30
öD2	mm	89.67-89.68

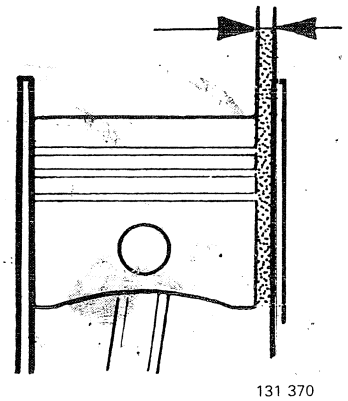
Note: when the wear is 0.10 mm, the cylinder bores must be honed (if the engine has abnormal oil consumption).


131 206

O11

Measure the piston diameter

Standard:		
Class C	mm	88.88-88.89
Class D	mm	88.89-88.90
Class E	mm	88.90-88.91
Class G	mm	88.92-88.93
Oversize 1	mm	89.27-89.28
Oversize 2	mm	89.65-89.66

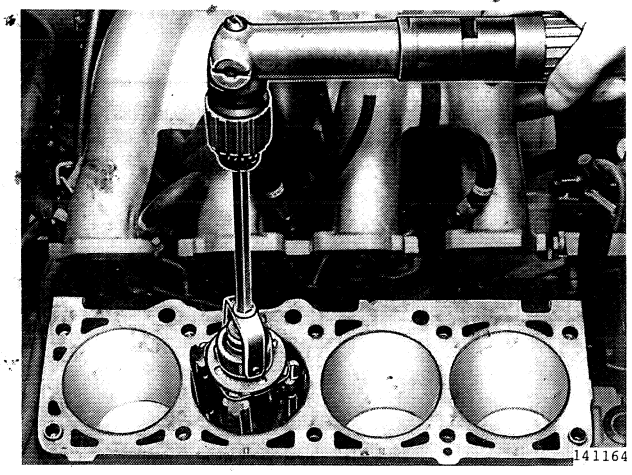

131 370

O12

Calculate the piston clearance

Example:			
Measured cylinder bore diameter	mm	smallest 88.91	largest 88.92
Measured piston diameter	mm	-88.90	-88.89
The piston clearance is	mm	0.01 to	0.03

The specified piston clearance is:
B19/B200 ... mm **0.010-0.030**
B200, 1985 model year ... mm **0.003-0.027**
Excessive piston clearance in a G-marked cylinder bore or oversize: secure the cylinder head with at least six bolts and remove/recondition the engine; see Operations *Q1* to *Q4*.



O13

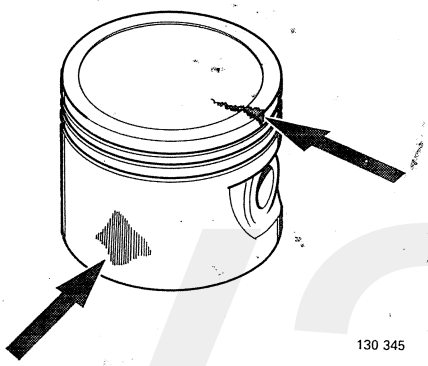
Hone the cylinder wall to the next size

Excessive piston clearance in cylinder bore marked with the letter C, D or E.

Use a honing tool. After the honing operation, wipe all traces of residue from the cylinder walls.

NB. Rotate the crankshaft a quarter-turn so that the honing tool cannot strike the big-end bearing caps.

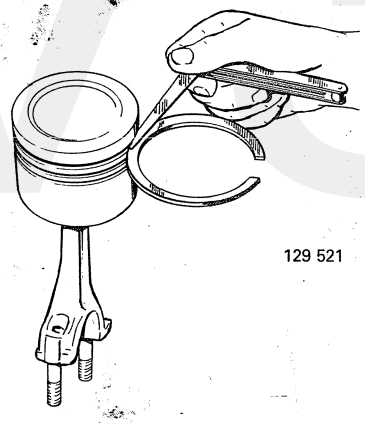
Oil the cylinder walls.



O14

Clean and inspect the pistons

Remove the piston rings. Use a piston ring spreader/compressor. Remove all carbon deposits. Scrape the ring grooves clean with a ring groove cleaning tool or with a piece of suitably ground piston ring.
Check for:
- damage;
- wear.



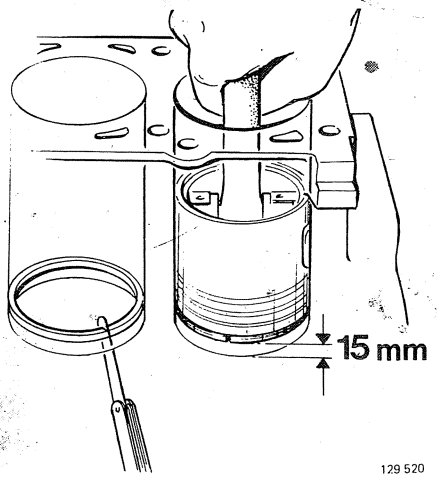
O15

Check the axial clearance of the piston rings

Use new piston rings.

Upper compression ring:	
B19 .....mm	**0.040-0.072**
B200 .....mm	**0.060-0.092**
Lower compression ring:	
B19 .....mm	**0.040-0.072**
B200 .....mm	**0.030-0.062**
Oil scraper ring:	
B19 .....mm	**0.030-0.062**
B200 .....mm	**0.020-0.055**

Note: in the case of excessive clearance, fit a new piston.

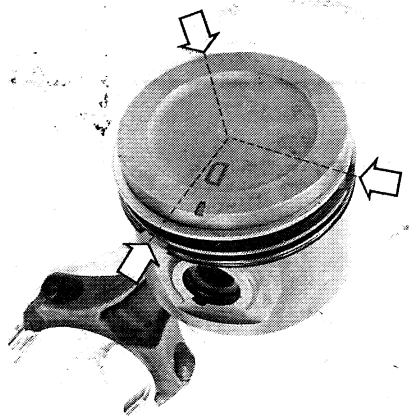


O16

Measure the piston ring gap

Place the piston ring in the cylinder bore. Use a piston inserted upside down to locate the piston ring accurately. Measure the piston ring gap with the ring **15 mm** from the lower edge of the cylinder bore. Measure with a feeler gauge.

Upper compression ring:	
B19 .....mm	**0.35-0.65**
B200 .....mm	**0.30-0.50**
Lower compression ring:	
B19 .....mm	**0.35-0.55**
B200 .....mm	**0.30-0.50**
Oil scraper ring:	
B19 .....mm	**0.35-0.60**
B200 .....mm	**0.25-0.50**

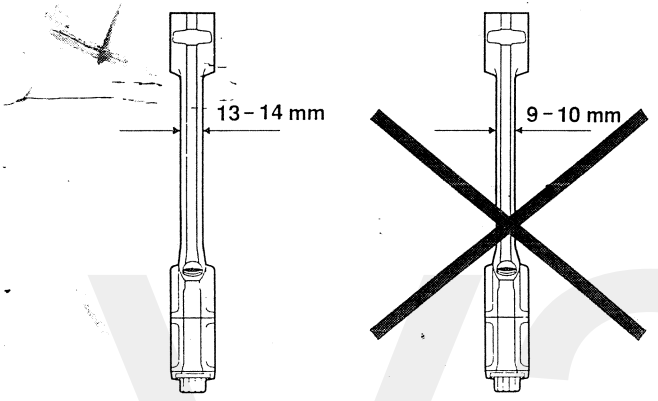


119 698

O17

Fit new piston rings

Use a piston ring spreader/compressor.
Fit the piston rings with the gaps located at 120° to each other.



147932

O18

Examine the connecting rods

B200
Measure the thickness of a connecting rod. If this is 9-10 mm, then all four connecting rods will have to be replaced by new connecting rods with a thickness of 13-14 mm (Part No. 271451-7).

B19/B200
Examine the connecting rods for straightness and play.

O19

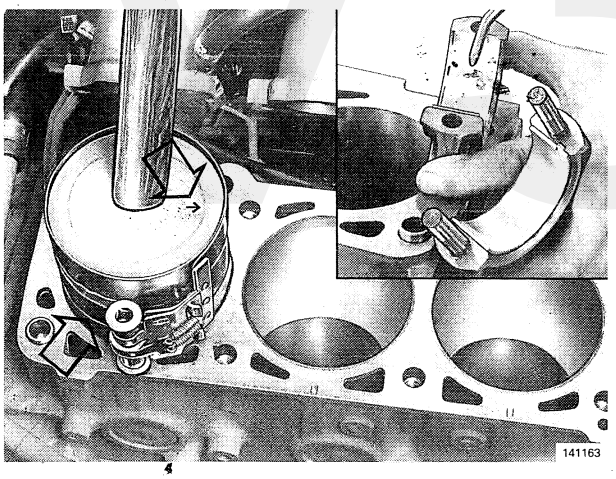
Locate the shell bearings in the connecting rods and bearing caps

Oil the shell bearings, big-end bearing journals, cylinder walls and pistons.

O20

Insert the piston in the cylinder bore

Rotate the crankshaft so that the big-end bearing cap for the cylinder in question is pointing straight down.
Fit the piston. Use a piston ring spreader/compressor.
Push the piston down with a wooden handle and guide the connecting rod into position.



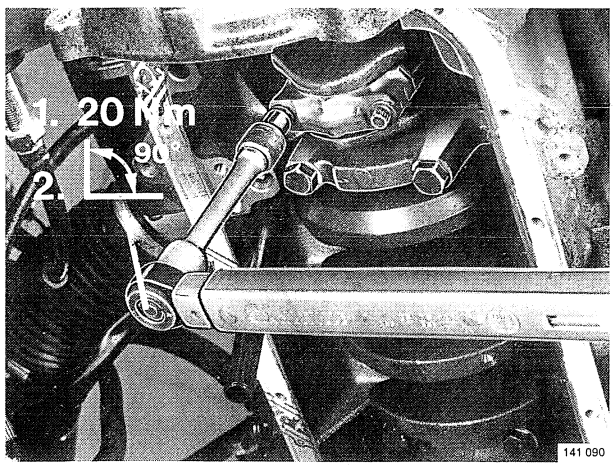
141163

IMPORTANT! The directional arrow on the piston crown must be pointing towards the timing gear end.

O21

Secure the connecting rods to the crankshaft

Pull the connecting rods down on to the crankshaft.
Check the marks. The marks on the connecting rod and bearing cap must be opposite each other. Check the bolt length.
Old bolts may still be used, providing they are not longer than 55.5 mm.
Oil and fit the bolts.
Tighten the bolts in two stages:
- torque-tighten in the first stage to **20 Nm**;
- angle-tighten in the second stage to **90°**.



141 090

O22

Fitting

- fit the high pressure pipe and oil pump; see Operation *U10*;
- fit the sump; see Operations *N6* to *N11*;
- fit the cylinder head; see Operations *H1* to *H9*.

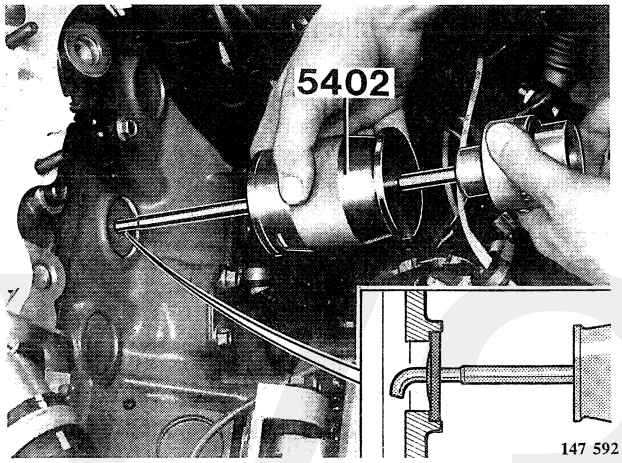
P1-P4. Fitting new expansion plugs in the cylinder block

Special tools: 5402

P1

Preliminary operations

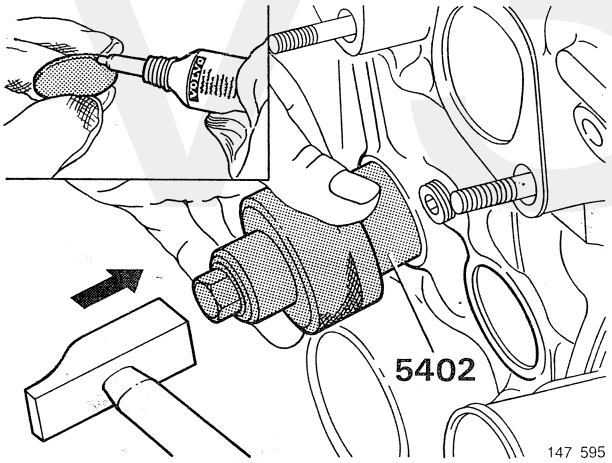
- remove the air filter housing (B19E, B200E) and the exhaust manifold;
- remove the Pulsair pipes (if fitted);
- drain the cooling system; see Operation *D1.*
- disconnect the return line at the water pump.



P2

Remove the old plug

Drill a hole in the plug.
Remove the plug with special tool **5402**.
Clean the plug seat.



P3

Fit a new plug

Apply liquid gasket cement, Part No. 1161053-2, to the edge of the new plug.

> **WARNING!**
> The liquid gasket cement contains methacrylate ester, a product which can cause irritation of the skin upon prolonged physical contact. You should also wear safety goggles to shield your eyes.

Fit the plug with a hammer and the lower part of drift **5402**. Use a bolt to avoid damaging the threaded hole.
Check for correct fitting: push the centre drift against the plug and try to move the guide bush of the tool.
With a correctly fitted expansion plug there will be no axial play between the centre drift and the guide bush.

P4

Fitting

Restore all connections and removed parts to their original positions.
Fill the cooling system; see Operation *R6.*

Q1-Q4. Removing the engine

Special tools: 2810, 5035

Q1

Remove/disconnect:

- the battery negative cable;
- the bonnet.

Q2

Drain the cooling system

Remove the engine splash guard.
Fit a hose on the drain tap at the right-hand side of the engine.
Open the tap and collect the escaping coolant.
Disconnect the bottom hose from the radiator and collect the escaping coolant.

Q3

Remove/disconnect under the engine:

- all engine splash guards;
- flywheel guard;
- clutch cable;
- exhaust bracket on torque tube from exhaust downpipe;
- exhaust downpipe from exhaust manifold;
- lower retaining bolts from clutch housing and starter motor;
- nuts from rubber mounting pads;
- lower end of cooling fan shroud;
- lower end of shock absorber (if applicable);
- retaining bolts from front cross member.

Working above the engine compartment

- engine cooling fan;
- front exhaust bracket on clutch housing;
- hose with brackets from air filter;
- upper end of cooling fan shroud;
- coolant hoses;
- breather hose from carburettor;
- bellows from carburettor;
- crankcase ventilation hose from cylinder block;
- brake booster hose from inlet manifold;
- fuel hose from fuel pump;
- throttle and choke cables.

Electrical connections

- connector for voltage regulator;
- earth lead on valve cover;
- wiring harness connector;
- HT lead on distributor;
- earth lead on cylinder block;
- positive cable on starter motor.

Q4

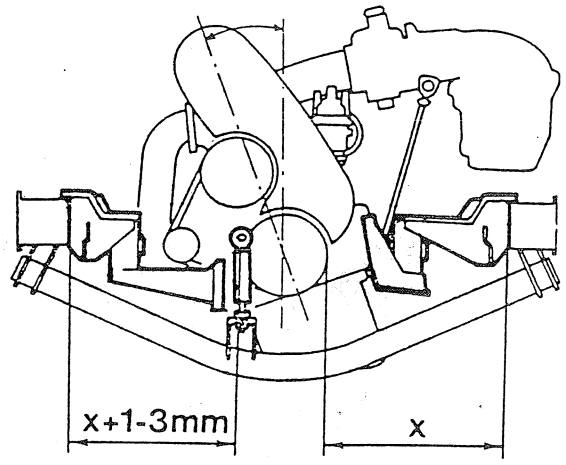
Lift out the engine

Locate bracket **5035**.
Fit lifting beam **2810** on the bracket and adjust the bracket.
Remove the engine mounting bolts on the cylinder block.
Support the torque tube at the front end.
Pull the engine forwards and lift it out of the engine compartment.

R1-R7. Installing the engine

Special tools: 2810, .5035

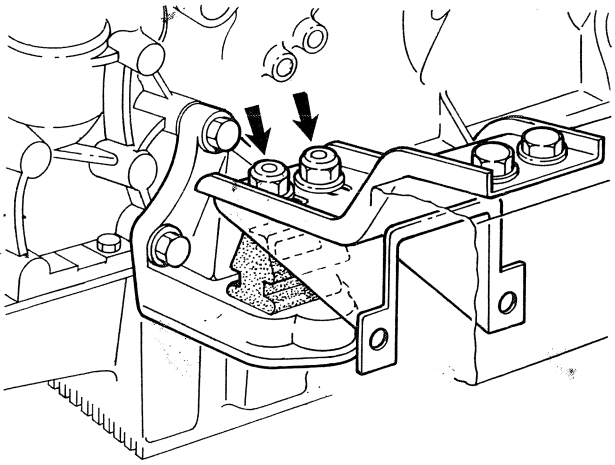
Installation is a reversal of the removal procedure.
- Do not yet tighten the nuts on the engine mounting pads.
- Do not yet fit the engine splash guards.



R1

Check the engine for correct alignment

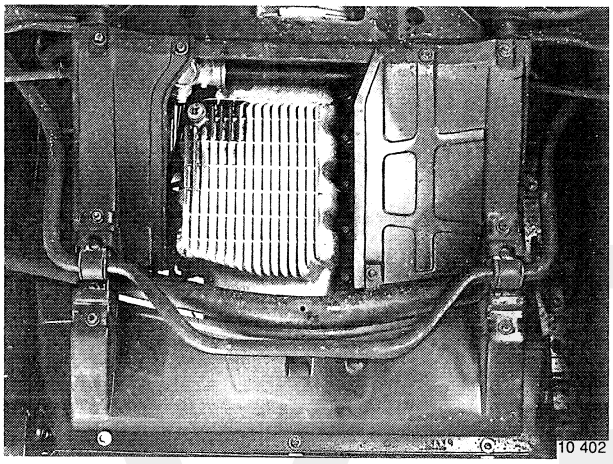
Measure the distance between the locating holes in the chassis members and the outside of the crankshaft pulley at both sides.
The distance at the right-hand side should be 1-3 mm more than the distance measured at the left-hand side.



R2

If necessary, adjust the engine alignment

Release the two upper nuts on the left-hand body support bracket.
Move the engine to the correct position.
Tighten the nuts on the body support bracket.



R3

Tighten the nuts on the underside of both engine mounting pads

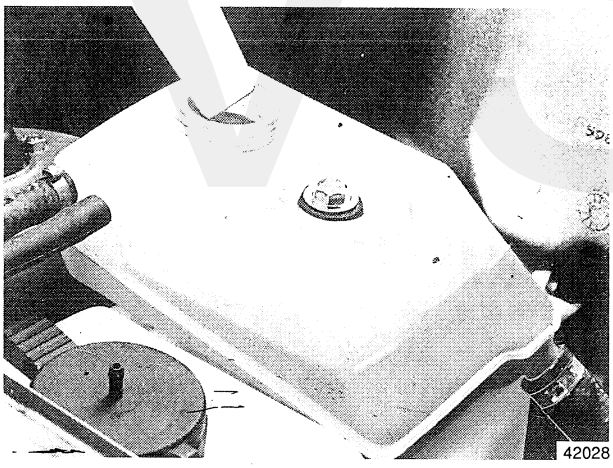
R4

Fit the engine splash guards.

R5

Adjust the clutch cable

See the Repairs & Maintenance Service Manual, Section 4 (41-46), Power Transmission, 300, 1979-1991, November 1990, TP 35717/1.



R6

Fill the cooling system

Capacity:
B19 .....litres 8.0
B200 .....litres 7.0
Run the engine warm until the thermostat opens.
Top-up as necessary.

R7

Check/adjust:

- ignition timing (B19) (if necessary);
- engine idling speed.
- CO-content;

Group 22. Lubrication system

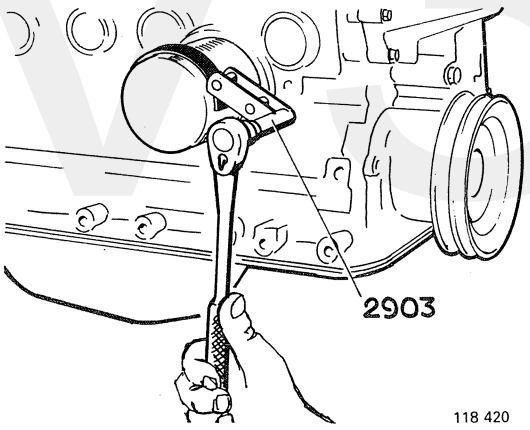
S1-S2. Changing the engine oil/renewing the oil filter

special tools: 2903

S1

Oil capacity, B19/B200

Excl. oil filter	litres	4.0
Incl. oil filter	litres	4.5
Difference between MAX-MIN marks	litres	1.0



118 420

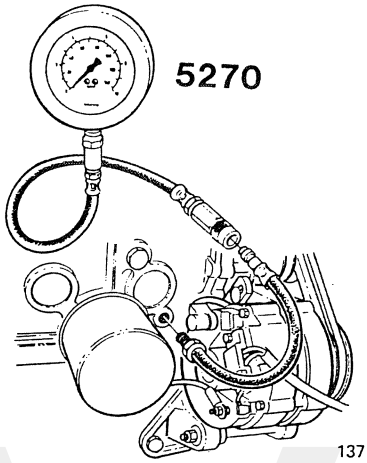
S2

Fit a new oil filter

Release the old filter with oil filter wrench **2903**.
Take the filter out of the engine compartment from above.
Read the instructions on the filter body before fitting the new filter.
If the filter is being renewed without changing the engine oil, then the engine should be topped-up with an extra **0.5 litres** of oil.
Note: do not use tools to fit the oil filter (hand-tighten).

T1-T3. Checking the oil pressure

Special tools: 5270



137 425

T1

Fit a new oil filter

See Operation *S2*.

T2

Check the oil pressure

Connect oil pressure gauge **5270** to the test connection for the oil pressure transmitter.

With a hot engine, the correct oil grade* and a new oil filter the oil pressure should be at least **2.5 bar** (250 kPa) at 2,000 r/min (33 r/s).

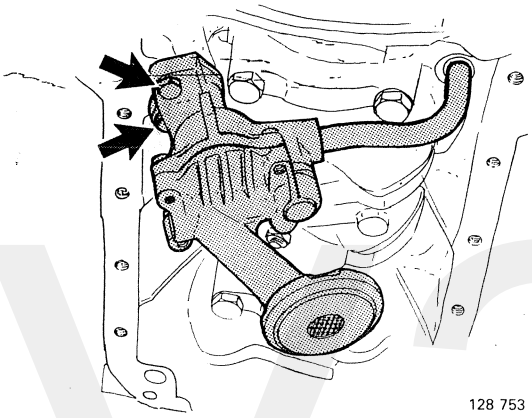
*Specified sort, grade and viscosity.

If the oil pressure is not to specification, check:

- the oil level;
- for oil leakage;
- the oil pressure reducing valve in the oil pump.

U1-U12. Removing/fitting and reconditioning the oil pump

Note: two different types of oil pump are used.



128 753

U1

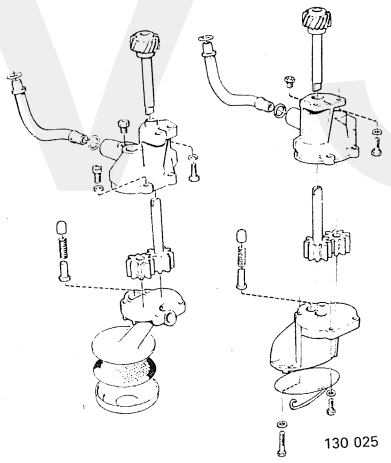
Remove the sump

See Operations *N1* to *N5*.

U2

Remove the oil pump

Remove the retaining bolts and lift out the oil pump together with the high pressure pipe.



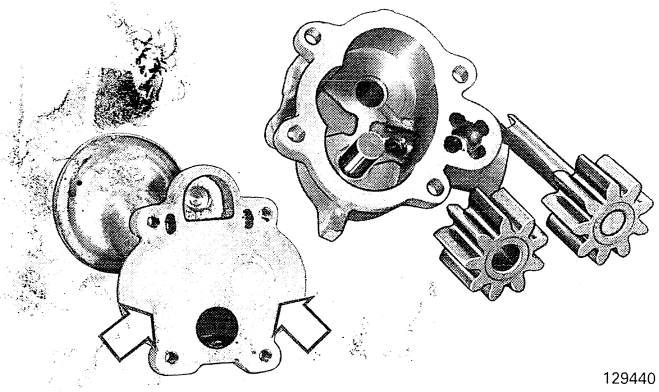
130 025

U3

Disassemble the oil pump

Old type:
- Remove the spring clip and take the oil strainer out of the pump.
- Remove the four cover bolts and take the cover off the pump.

New type:
- Remove the two socket-head screws and take the cover off the pump.



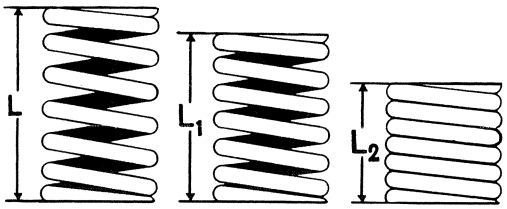
129440

U4

Clean the oil pump

Examine the gears, pump body and cover for wear and damage.

U5

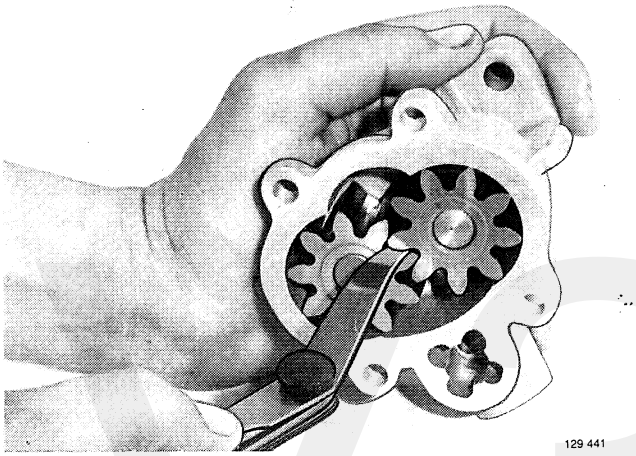


129 453

Check the spring for the oil pressure reducing valve

Loading in N (kg)	Length in mm
0	39.2
46-54 (4.6-5.4)	26.25
62-78 (6.2-7.8)	21.0

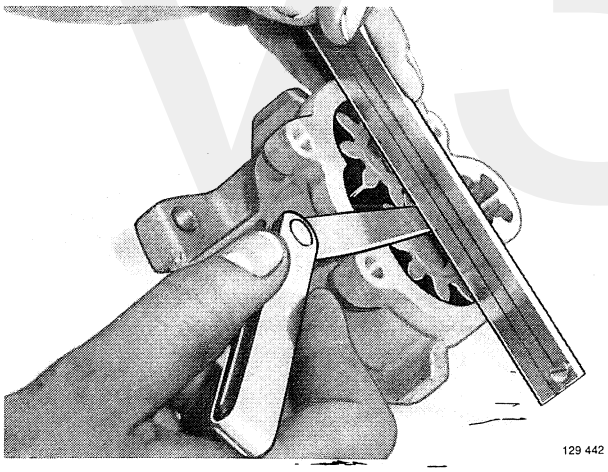
U6


129 441

Check the backlash

The backlash should be **0.15-0.35 mm**.

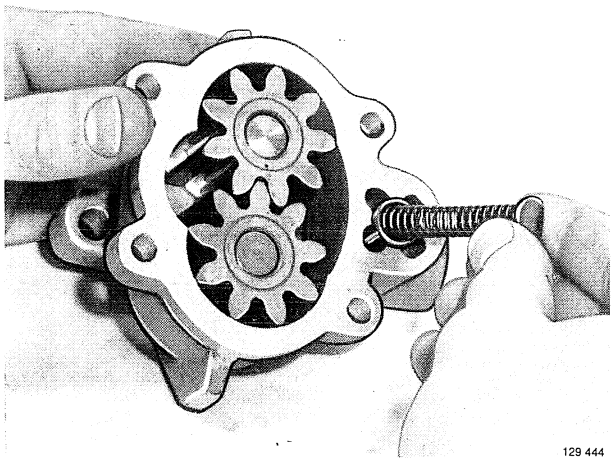
U7


129 442

Check the axial clearance of the pump gears

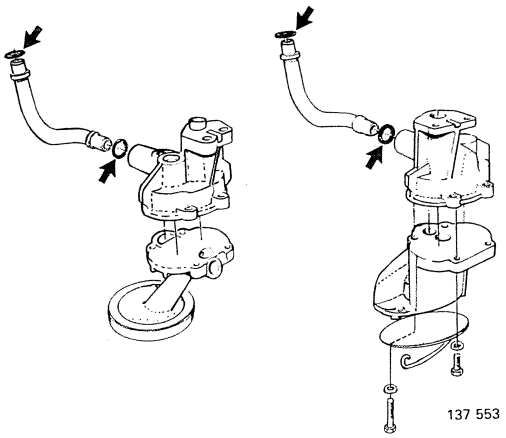
The specified clearance is **0.02-0.12 mm**.

U8


129 444

Locate the oil pressure reducing valve and spring in the pump

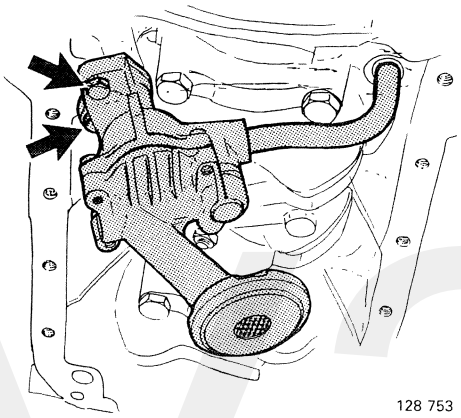
The earlier type of oil pump also has a ball in the pressure reducing valve.



U9

Assemble the oil pump

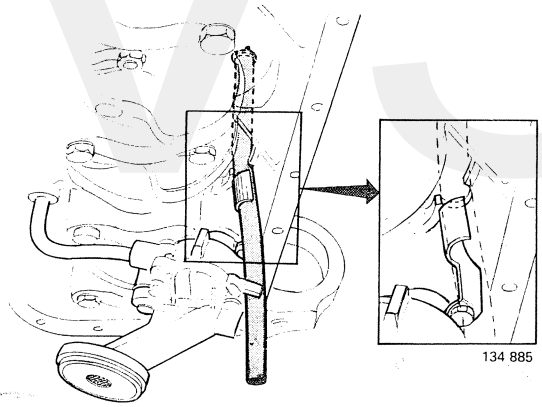
Fit new joint washers on the high pressure pipe.
Connect up the high pressure pipe.



U10

Fit the oil pump and high pressure pipe assembly

Use a new O-ring.
Take care not to damage the O-ring when fitting.
Secure the oil pump by tightening the two bolts.

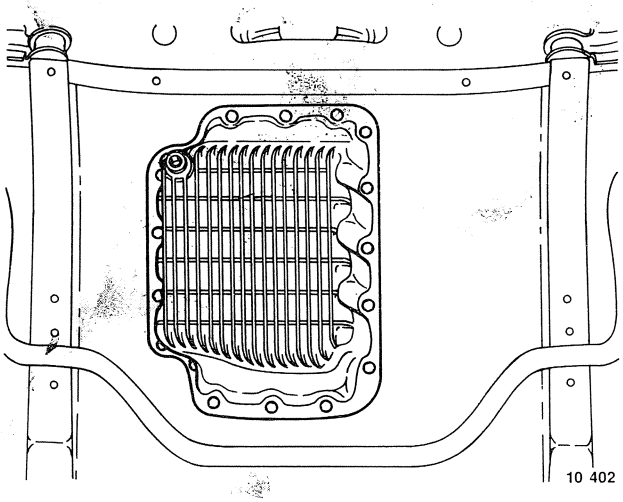


U11

Secure the oil separator drain hose (engines from 1981 to 1985)

Fit the mounting bracket for the oil separator drain hose on the oil pump retaining bolt.
Make sure that the hose is clamped securely behind the lug on the oil pump.

IMPORTANT! The hose must have the specified length and must not be shortened.



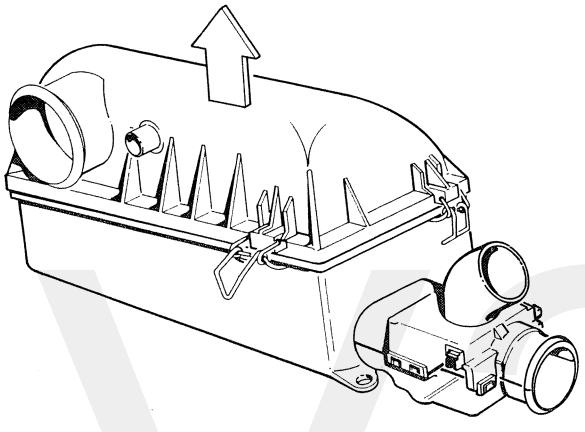
U12

Fit the sump

See Operations *N6* to *N11*.

Group 23. Fuel system

V1-V2. Removing/fitting the air filter assembly, B19/B200


41 404

V1

Removal

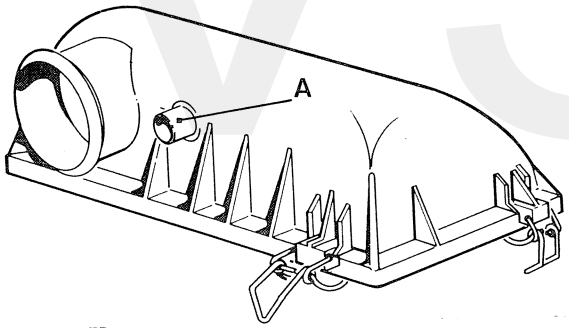
Disconnect the hoses from the air filter housing.
Pull the air filter housing off the rubber mounts.
Note: one or more of the rubber mounts may be pulled out together with the filter housing.
Reinsert these rubber mounts in the body.

V2

Fitting

Pull the rubber mounts through the holes in the air filter housing.
Reconnect the hoses.

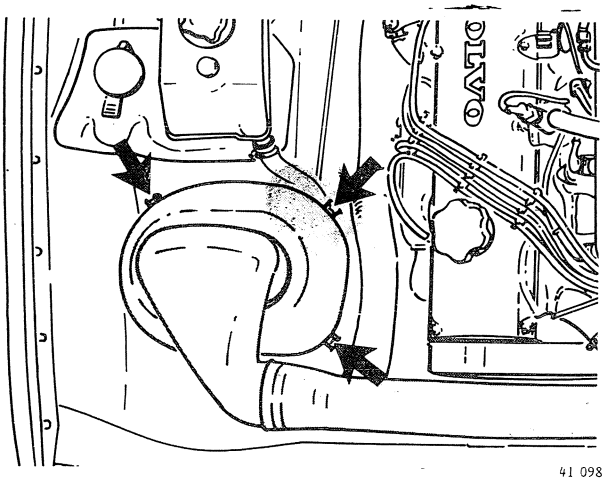
W1-W2. Renewing the air filter cover, B19/B200



41 383

W1

Note: the only type of cover supplied for Service purposes is the one that is suitable for connecting up to the Pulsair system.
This type is provided with an extra connecting point (A).
On European variants this hole must be blanked off with a rubber plug.

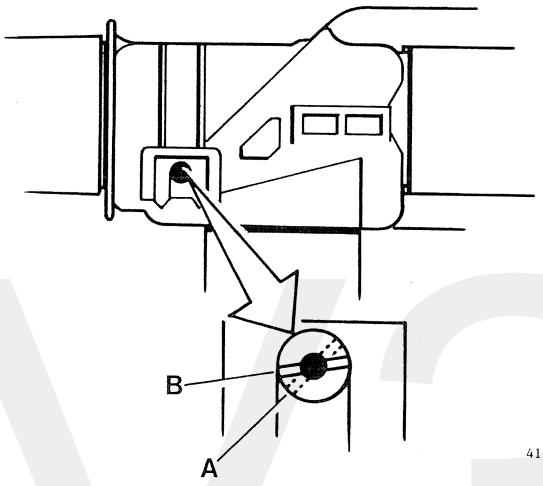

41 098

W2

B19/B200 with LE-Jetronic

Remove the air filter assembly
Release the air intake unit with the upper connecting pipe from the air filter.
Lift the air filter assembly vertically out of the rubber mounts.
Fitting is in reverse order to removal.

X1-X4. Inspecting/renewing the thermostat, B19/B200



41 331

X1

General check of the thermostat valve

The lug on the end of the pivot pin should be in the diagonal position (A) at temperatures below +20C.
At temperatures above +35° C the raised lip on the lug should be approximately horizontal (position B).

X2

Remove the thermostat

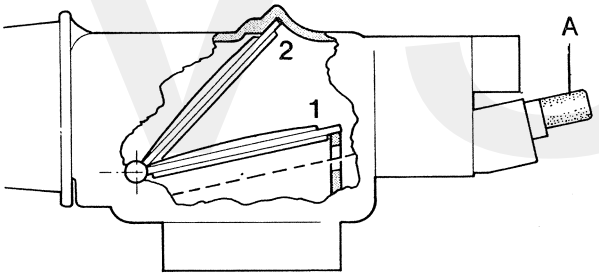
Remove the air supply pipe.
Remove the retaining bolt and nut.
Pull the thermostat housing out of the air filter housing.
Turn the thermostat housing 180° relative to the hose (A) and then remove it.

X3

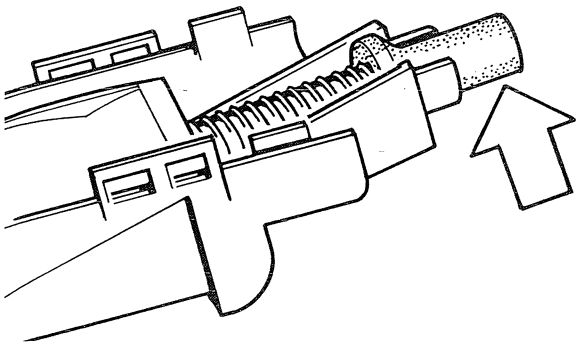
Check the thermostat

(thermostat housing removed)

Heat the thermostat (A) with a blow drier; the valve should now close (1).
Cool the thermostat; the valve should now open (2).
(For opening/closing temperatures, see the specifications.)



41 332



41 372

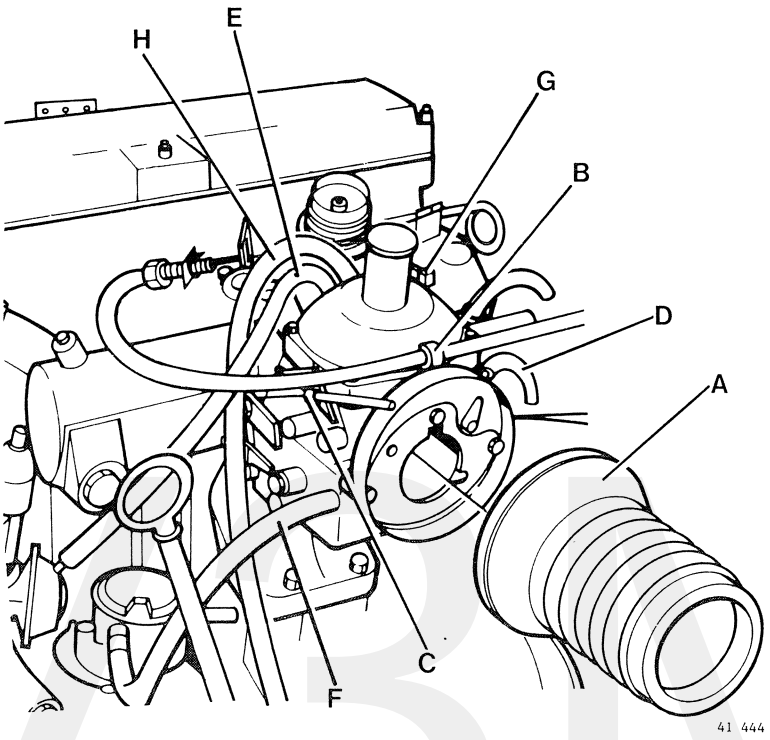
X4

Renew the thermostat

Press back the lips on both sides and at the front and then separate the two halves of the thermostat housing.
Press the thermostat out of its frame.
Fitting is in reverse order to removal.
Check for correct operation.

Y1-Y3. Removing/fitting the Zenith Stromberg carburettor

Special tools: 2901



Y1

Run the carburettor dry

Pinch off the fuel line (F) with clamping tool **2901**.
Run the engine until it stops. Remove 2901.

Y2

Removal

Release various parts:
- bellows (A) at carburettor end;
- throttle cable from clip (B);
- choke cable (C);
- hoses (D, E and F);
- EGR hose (H);
- throttle control rod (G).

Note: close off the manifold opening with a cleaning rag.

Y3

Installation

Note: always use a new gasket.
Fit the choke and throttle controls in the correct sequence: .

1. Adjust the throttle cable.
2. Adjust the choke cable.
3. Fit the link rod.

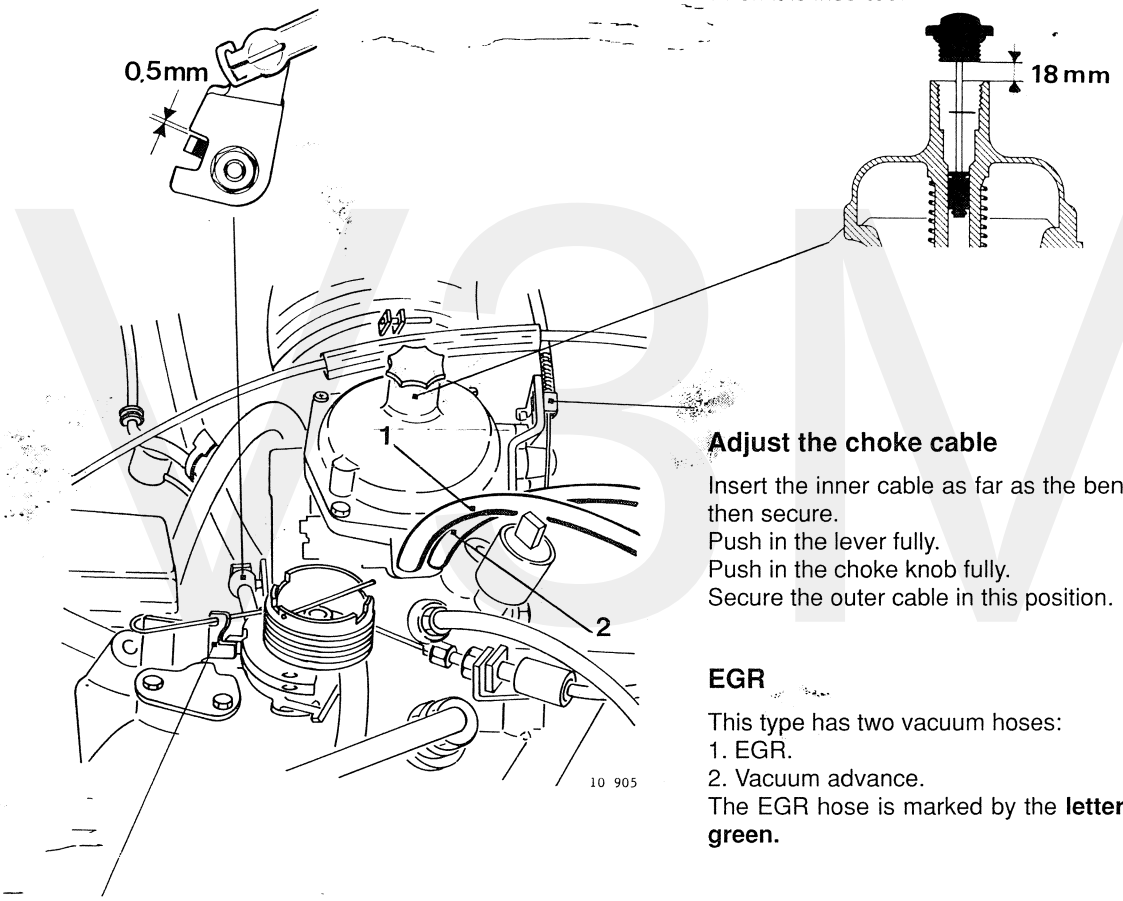
Fit and adjust the throttle link rod.

Adjust the length of the link rod so that there is **0.5 mm** clearance between the cam and the flange of the throttle valve spindle.

Fill the damper cylinder with oil

Specified oil: ATF.

Fill with oil until the damper piston starts to encounter resistance **18 mm** above the neck of the carburettor when it is inserted.



Adjust the choke cable

Insert the inner cable as far as the bend in the lever and then secure.
Push in the lever fully.
Push in the choke knob fully.
Secure the outer cable in this position.

EGR

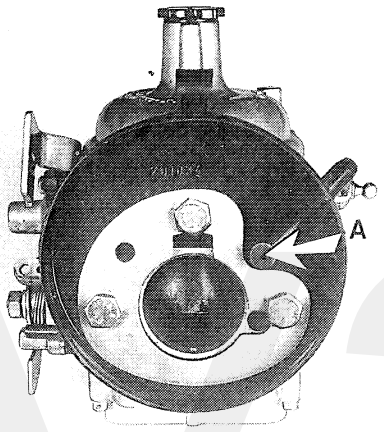
This type has two vacuum hoses:
1. EGR.
2. Vacuum advance.
The EGR hose is marked by the **letter E** or is **coloured green.**

Adjust the throttle cable

With the throttle cable tensioned, the lug of the control roller must be against the stop.
- Dashpot: see Operations *AM1-AM4.*
- Note the correct way of connecting up the 3-way valve; see Operation *XX5.*
- Check the working of the choke and throttle controls.
- Adjust the carburettor; see Operations *CC1-CC12.*

Reconditioning the Zenith Stromberg carburettor

Z1-Z5. Disassembling the carburettor



41 386

Z1

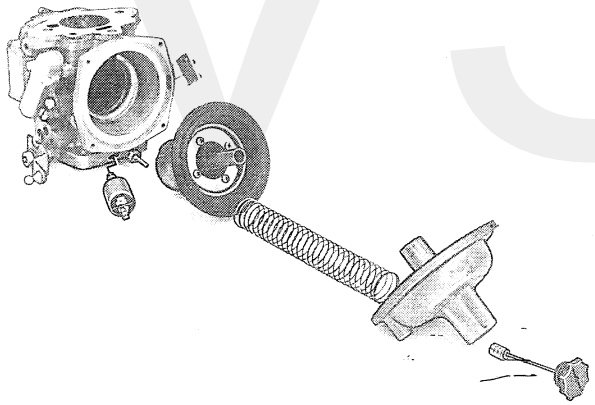
Remove the connecting plate on the air filter side of the carburettor

Remove the three bolts.

Z2

Clean the various parts

Clean the carburettor with petrol; blow dry with compressed air.
Remove all traces of the old gaskets from the flanges, connecting plate and manifold.
(Make sure that no pieces of the old gaskets finish up in the manifold.)

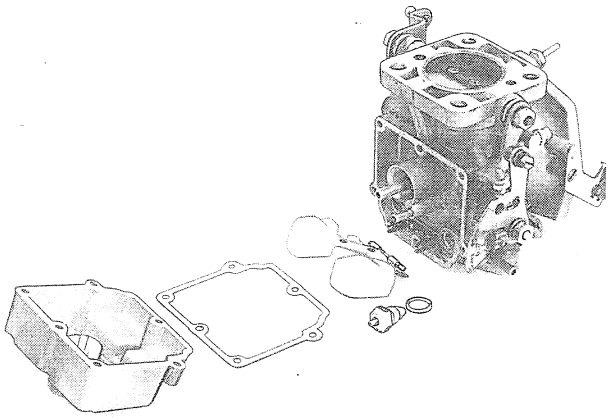


41 358

Z3

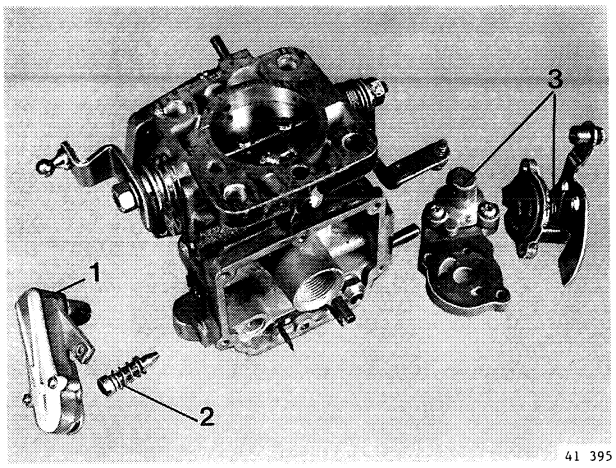
Remove various parts from the carburettor

From the top end:
- damper piston;
- suction chamber cover;
- return spring;
- air valve with diaphragm.



41 359

From the bottom end:
- float chamber cover with gasket;
- float with spindle;
- needle valve with washer.
- take the filter off the needle valve.



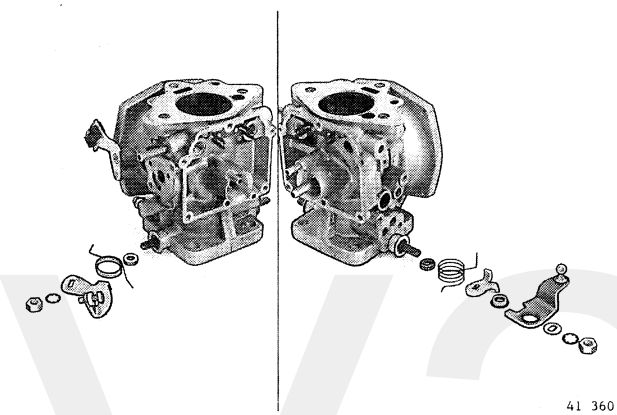
41 395

Z4

Miscellaneous:

- temperature compensator (1); remember the rubber seal;
- mixture adjusting screw (2);
- cold-start injector (3) complete with intermediate flange and air metering (slide) valve.

Remove the gasket.


41 360

Z5

Remove from the throttle valve spindle:

- the levers;
- the springs (remember their position);
- the seals (lever out with a small screwdriver);

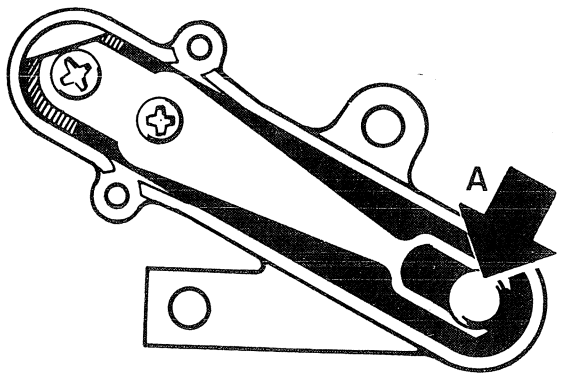
Note: never alter the setting of the throttle stop screw.

AA1-AA17. Inspection/adjustment/renewal of parts

Special tools: 2895, 2897, 2962, 5159

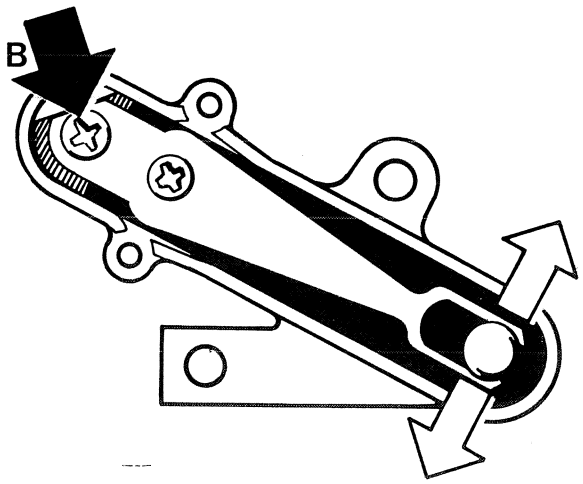
AA1

Check the temperature compensator



41 361

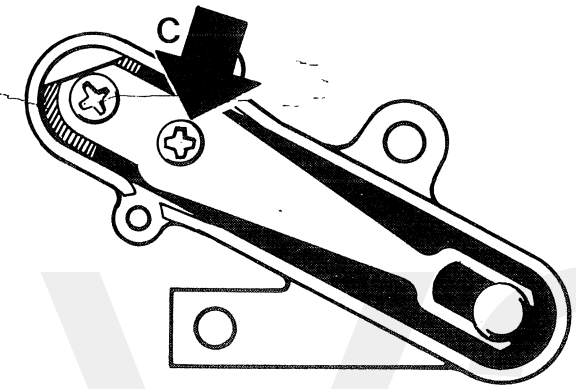
Remove the plastic cover and press in the valve (A).
The valve should move under extremely light pressure and return to its original position without sticking. (This applies at temperatures above +26°C).
Readjust the valve if it sticks or runs stiffly (see Operation *AA2*).
If the valve is scored or coated with deposits, the entire temperature compensator unit must be renewed.



AA2

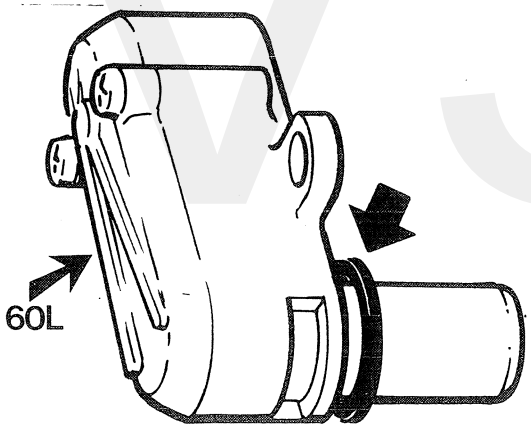
Adjust the temperature compensator

1. **Centring:**
   Back off the cross-recessed screw (B) a short distance and centre the valve (in the transverse direction).
   Retighten the cross-recessed screw.
   The valve should move under extremely light pressure and return to its original position without sticking.



41 362

2. **Opening temperature**
   At +20°C the valve should start to open, i.e. the valve should lift from its seat.
   If necessary, adjust with the cross-recessed screw (C).
   Replace the plastic cover.

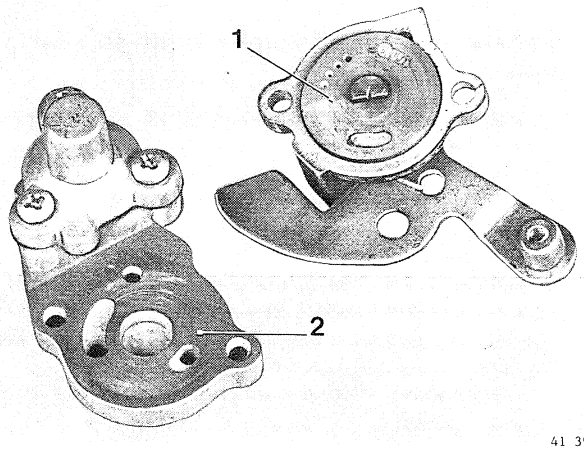


41 363

AA3

Fit a new temperature compensator

The temperature compensator must always be renewed as a complete unit.
Also renew the rubber seal.
Identification number: 60 L.

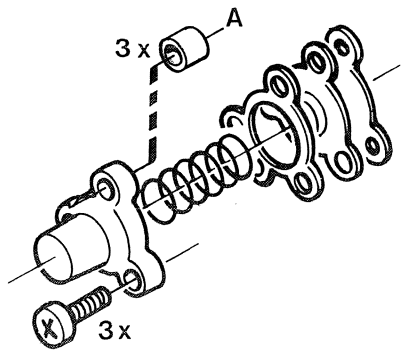


41 397

AA4

Check the cold-start injector

Check that the cold-start injector does not stick.
Check the valve disc (1) of the cold-start injector and the corresponding mating surface of the intermediate flange (2).
Minor scoring can be polished away with fine emery cloth and grinding paste. In the case of more severe scoring, the valve disc and/or intermediate flange must be renewed.

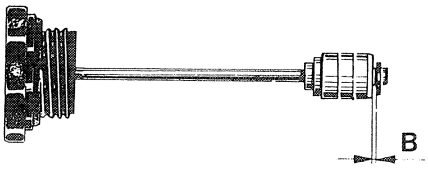


41 364

AA5

Check the air valve

Remove the housing, return spring, diaphragm and gaskets from the intermediate flange.
Note: make sure that the three spacers (A) are not mislaid.
Check the diaphragm for damage.
Renew if necessary.

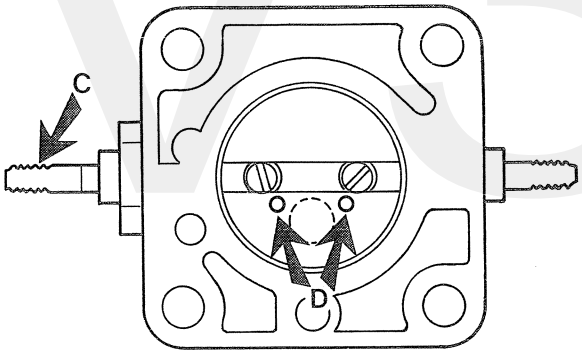


41 365

AA6

Check the damper piston

The clearance (B) must be **1.0-1.8 mm**.
A defective damper piston must be renewed as a complete unit.
Note: if the engine does not respond properly when accelerating, this may be due to an incorrect damper piston clearance and/or too low damper oil level.

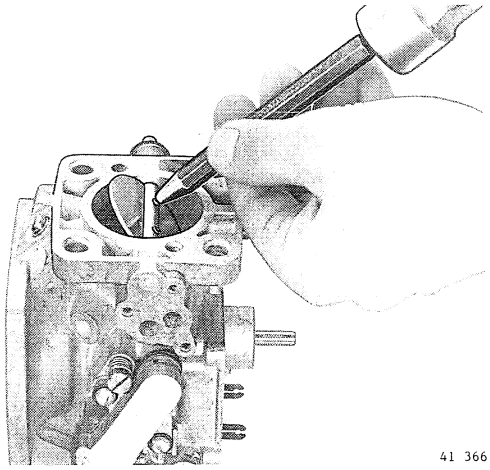


41 422

AA7

Check the throttle valve and throttle valve spindle

The throttle valve spindle must rotate smoothly without binding or sticking.

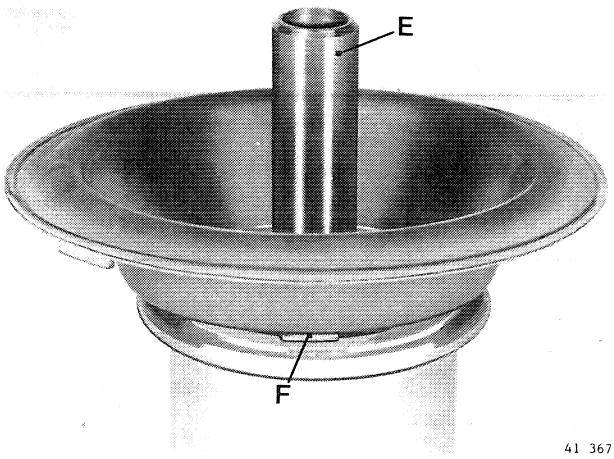


41 366

AA8

Renew the throttle valve and throttle valve spindle

Release the two screws and remove the throttle valve from the spindle.
Remove the throttle valve.
Fitting is in reverse order to removal.
Note: the longest, flat section of the spindle (C) must point to the left.
The small metal nibs (D) in the throttle valve must face downwards and towards the inlet manifold flange.
Centre the throttle valve before final-tightening the two screws; the throttle valve must not stick.
After tightening, stake the **threaded end** of the bolts with a centre punch.

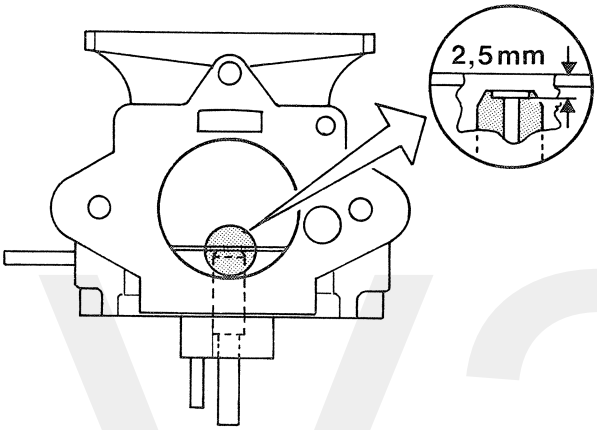


41 367

AA9

Check the air valve with diaphragm

Check the fit of the air valve guide (E) relative to the suction chamber cover.
Check whether the diaphragm is torn or swollen.
Renew as necessary.
CAUTION! The rubber lug (F) on the diaphragm must engage the recess in the air valve.



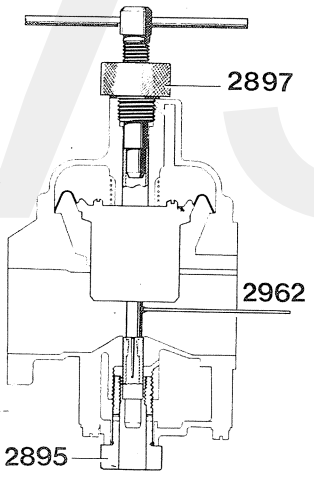
AA10

Check the fuel jet and metering needle

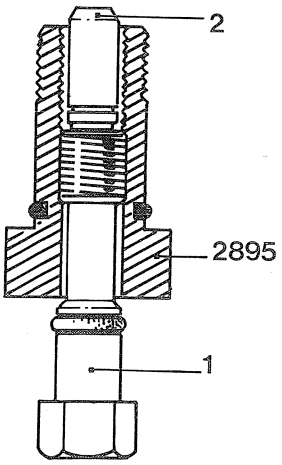
Check whether the orifice of the jet (in the carburettor) is round and centralized.
Also check the height alignment of the fuel jet.
The fuel jet must be located under the bridge of the carburettor body:
- on versions up to and including 1979: **2.5 mm**;
- on versions from 1980 to 1984 inclusive: **3 mm**.

If necessary, press up the jet with special tool **2895**, or press it down with special tool **2897** and gauge **2962**.
Check the metering needle for damage and wear.

Note: if the carburettor and other engine components (ignition, valves, etc.) are correctly adjusted and the engine is still not running properly (high fuel consumption, etc.), it will be necessary to renew the fuel jet and metering needle.



41-328



41 369

AA11

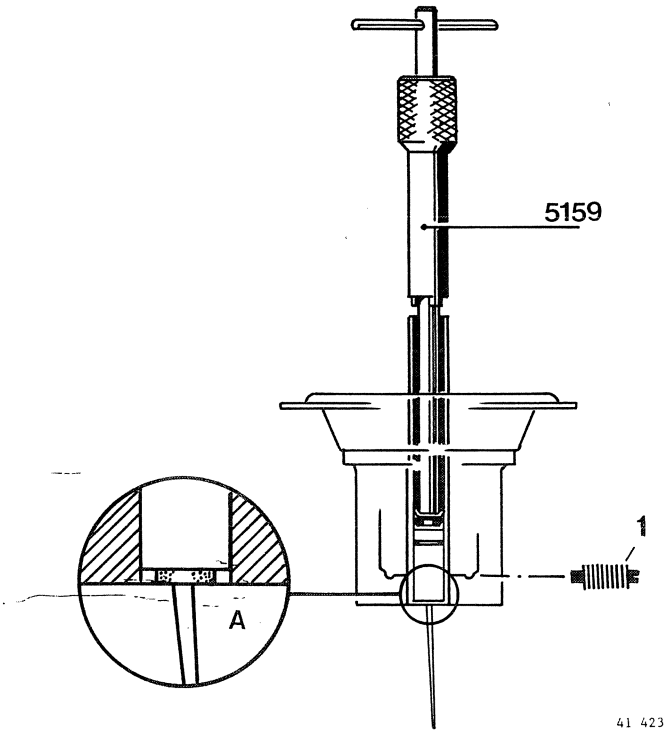
Renew the fuel jet

Removal

Tap the jet downwards and out of the carburettor with a drift.

Fitting

Unscrew the centre drift (1) of tool **2895** to its full extent.
Place the jet (2) in the centre drift aperture.
Screw tool **2895** into the carburettor.
Now screw in the centre drift until the top of the jet is **2.5 or 3 mm** under the bridge of the carburettor body.
For adjustments, see Operation *AA10*.



AA12

Renew the metering needle

Removal

Remove the grub screw (1).
With adjusting tool **5159**, turn the adjusting screw counter-clockwise until the metering needle is released.

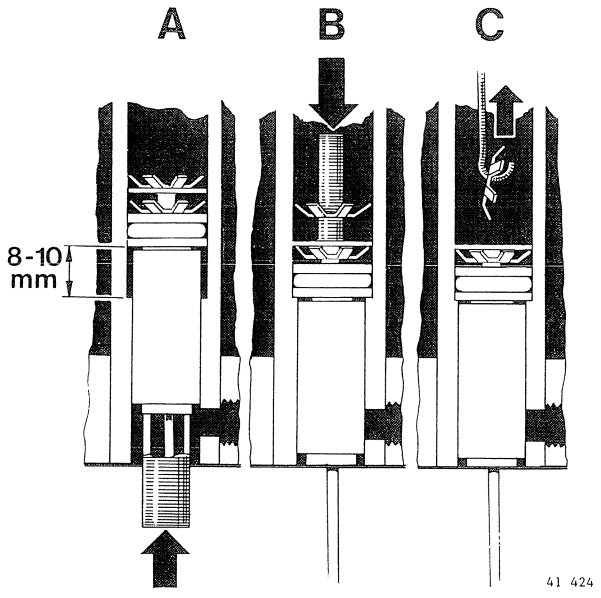
Fitting

Make sure that the grub screw engages the groove in the needle base.
Adjust the height of the metering needle (basic setting).
With tool **5159**, turn the adjusting screw clockwise until the bottom of the needle base is flush with the bottom of the air valve (A).
Metering needle specification: **B1FG**.
(K-engines 1983-: B2BG.)

AA13

Check the adjusting screw

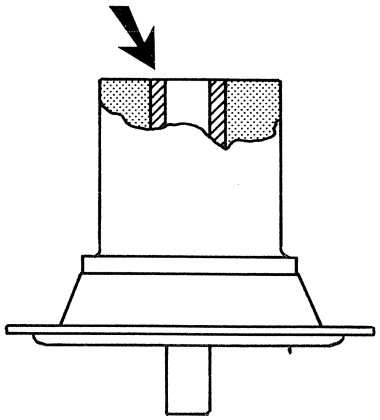
Check whether the adjusting screw can be turned.
If this is not the case, for example because the carrier head at the top of the adjusting screw has sheared off, then the adjusting screw will have to be renewed.
Always replace a copper adjusting screw with a steel one, Part No. 237806-5.
Proceed as follows:



AA14

Remove the adjusting screw

Remove the grub screw.
Press the adjusting screw and metering needle upwards in the damper cylinder about 8-10 mm (use, for example, a pipe with an outside diameter of at least 3 mm and a length of 100 mm (A)). Then press the adjusting screw into its lowest position. The lock washer must stay at the top. Use a drift with a max. diameter of 3 mm (B).
Tilt the lock washer and pull it up with a piece of wire (C).
Press the adjusting screw and metering needle upwards through the damper cylinder. For this, again use the small pipe as described above.

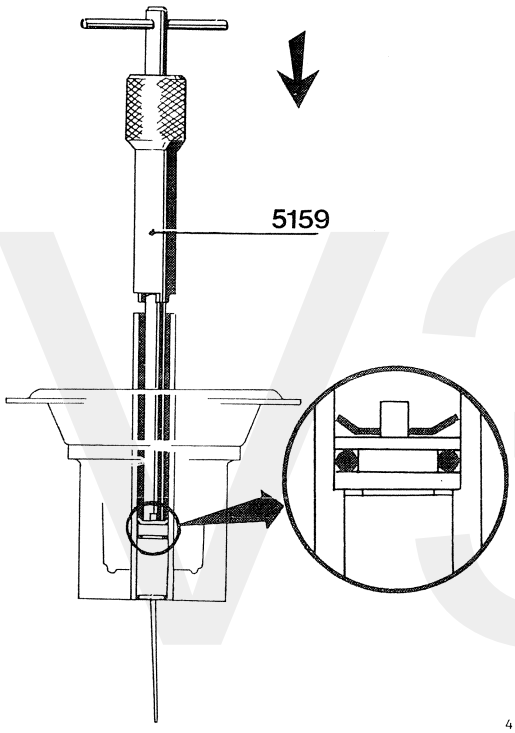


41 425

AA15

Check the air valve and damper cylinder

Clean the air valve and damper cylinder.
Check whether the lower edge of the damper cylinder is precisely flush with the air valve.
If necessary, correct the height of the damper cylinder with the aid of a sleeve.

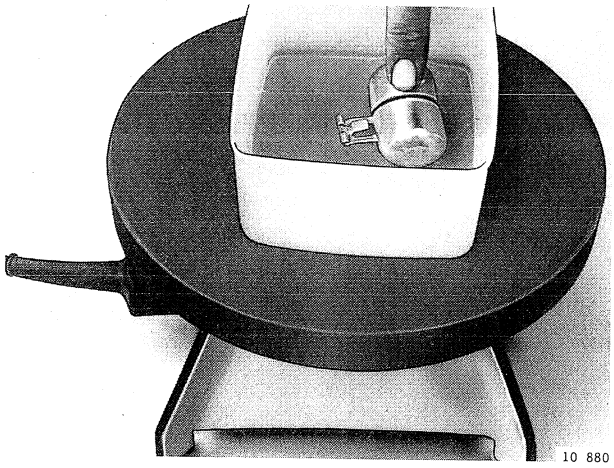


41 426

AA16

Fit the adjusting screw

Use a steel adjusting screw, Part No. 237806-5.
Fit a new O-ring on the adjusting screw.
Oil the O-ring.
Using tool **5159**, press the adjusting screw down against the stop in the damper cylinder.
Fit the new lock washer with tool **5159**.
Note the position of the lock washer in the adjacent illustration.
Fit the metering needle; see Operation *AA12*.



10 880

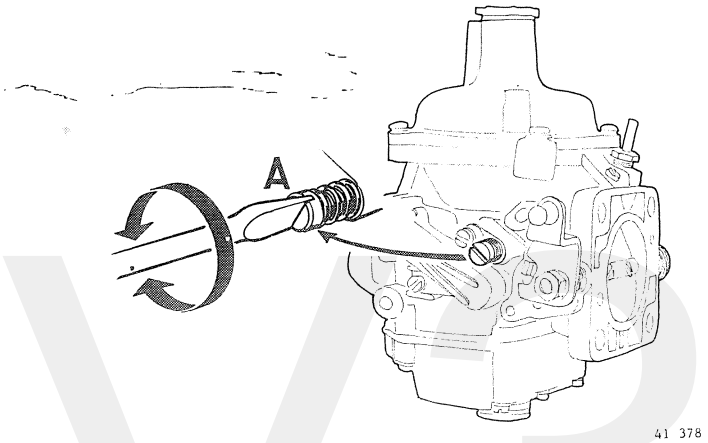
AA17

Check the float and needle valve

Immerse the float in a bowl of warm water. No air bubbles must be visible.
Check the joint washer on the needle valve.

BB1-BB6. Assembling the Zenith Stromberg carburettor

Assembly is in reverse order to disassembly.
Note: use new gaskets and joint washers/seals.
Coat the bolts of the connecting plate with Loctite 242, Part No. 1161053, or use new self-locking bolts.

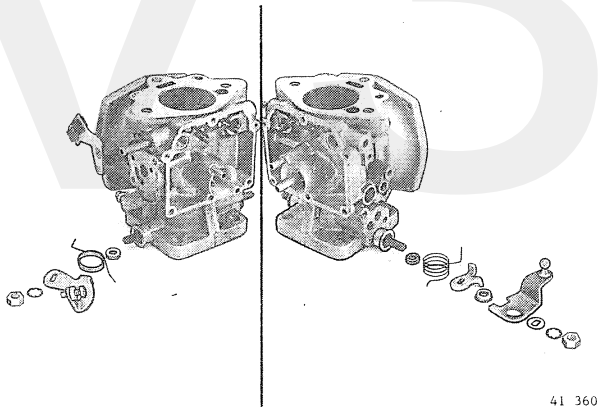


41 378

BB1

Mixture adjusting screw

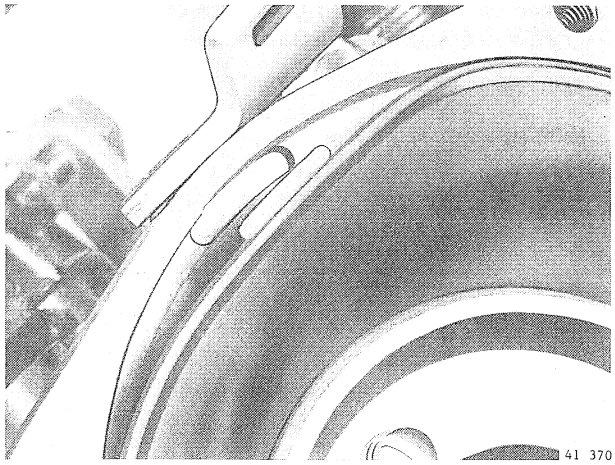
Locate the spring and tighten the adjusting screw fully.


41 360

BB2

Throttle controls

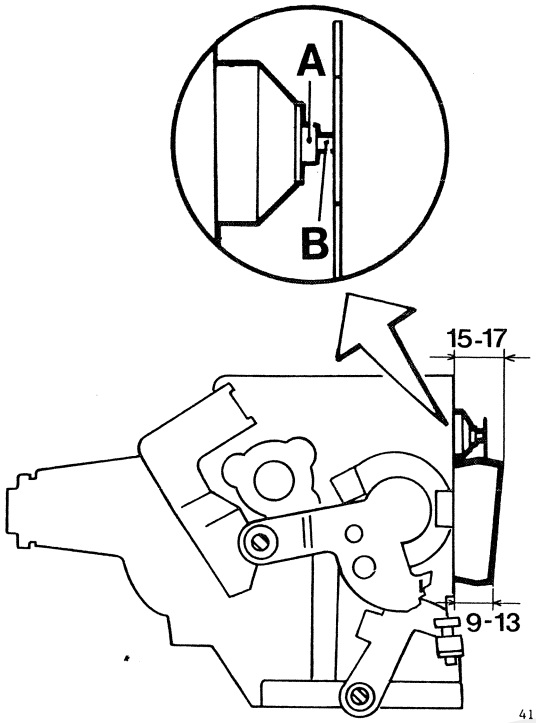
Make sure that the springs and all other parts are correctly fitted.
Note: assemble the joint washers/seals before fitting.


41 370

BB3

Air valve and diaphragm

The rubber lug on the diaphragm must engage the recess in the carburettor body.



41 371

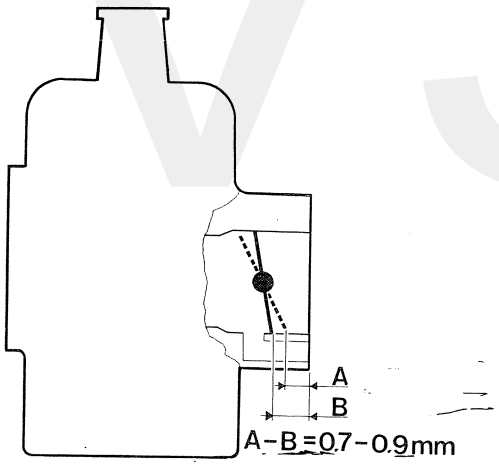
BB4

Float assembly

Check and correct the float level as described below.
Place the carburettor on the workbench with the connecting manifold flange facing downwards.
Make sure that the needle valve (A) is pushed in fully.
Tilt the carburettor so that the float lever just touches the spring-loaded pin (B). (The spring-loaded pin must **not** be pressed in).
In this position, measure the float height.
15-17 mm at the highest side of the float
9-13 mm at the lowest side
Make any necessary corrections to the float height by bending the float lever.

Checking/adjusting the throttle stop position (basic setting)

(carburettor removed from engine)

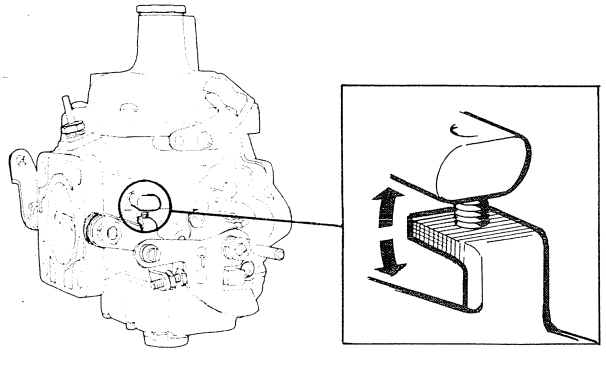


41 427

BB5

Checking

Release the cold-start lever from the throttle valve spindle.
Move the throttle valve to the closed position.
Measure dimension A and make a note of this dimension.
Fit the cold-start lever back on the spindle (note the spring).
Now measure dimension B.
Dimension B should be 0.7-0.9 mm smaller than dimension A.



41 428

BB6

Correcting

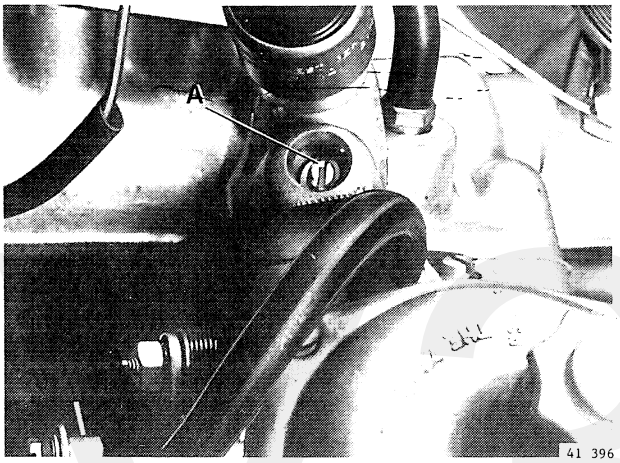
Bend the stop of the cold-start injector until the specified dimensions are obtained.

CC. Carburettor adjustments - Zenith Stromberg

CC1-CC12. Engine idling speed, CO-content and fast idle

Special tools: 2895, 2897, 2962, 5159, 9920, 9921

Note: put the gear lever in neutral.
- Make sure that the ignition timing and valve clearances are correctly adjusted and that the air filter is clean.
- Check the oil level in the damper cylinder (see Operation *Y3*).

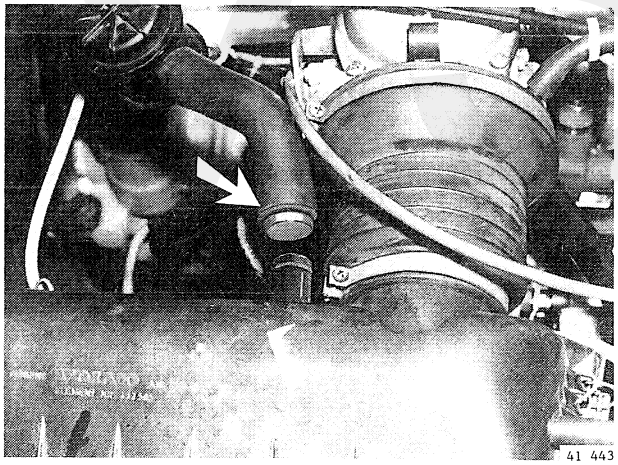


41 396

CC1

Engine idling speed

Raise the engine speed to approx. **25 r/s** (1,500 r/min) and let it run until the thermostat has opened. (Feel the radiator top hose: when it begins to get warm the thermostat has opened.)
Adjust the idling speed with the adjusting screw (A) to **15 r/s** (900 r/min).
Note: if correct idling cannot be obtained with adjusting screw A, check the CO-content and the basic setting.

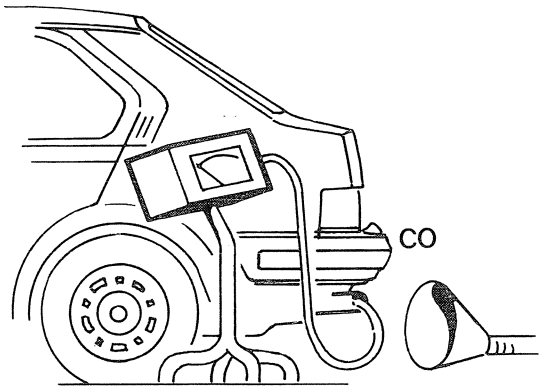

41 443

CC2

CO-content (of exhaust gases)

Note: read the General Guidelines first; see Operation *KK*.

Disconnect the Pulsair hose at the air filter.
Plug the hose.

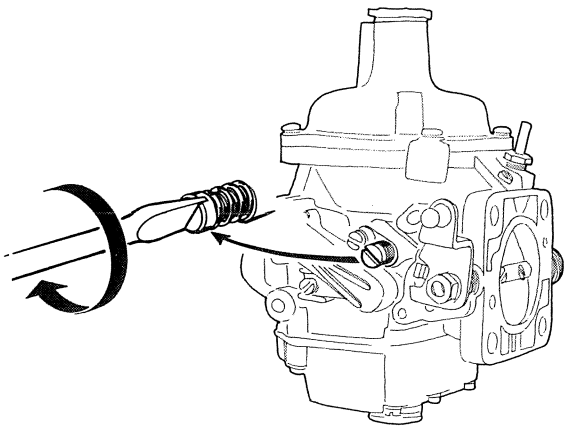


41 433

CC3

Checking

Connect up the CO-meter.
Check the CO-content.
Note: before taking the reading on the CO-meter the engine speed must always be raised to **25 r/s** (1,500 r/min) so that cold petrol can flow through the carburettor. Afterwards the engine speed must be lowered to idle. Tap lightly against the suction chamber with the handle of a screwdriver so that the valve can take up its correct position.

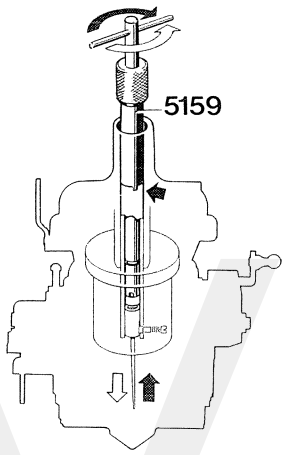


41 378

CC4

Adjusting

Small deviations in the CO-content (approx. ±1%) can be corrected with the mixture adjusting screw (A).
Greater deviations in the CO-content must be corrected by changing the height alignment of the metering needle. Do this with special tool **5159**.
Note: before doing this, fully tighten screw A.
Remove the damper piston.
Turning the tool clockwise increases the CO-content; turning it counter-clockwise reduces the CO-content.
The lugs of the tool must properly engage the recesses in the air valve spindle to prevent damage to the diaphragm in the carburettor when making adjustments.
Note: the total adjustment range of the adjusting screw is approx. 4 turns.
Remove tool 5159, check the oil level and replace the damper piston.
Again check the CO-content.
Follow the general guidelines.

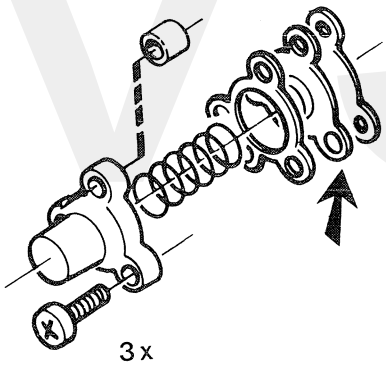


41 329

When the CO-content cannot be corrected with the normal adjusting modes:

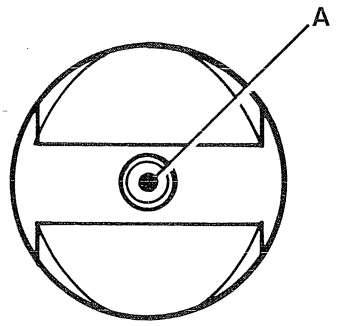
CC5

1 check the diaphragm of the air metering valve for tears and other damage. These can be the cause of a high CO-content.



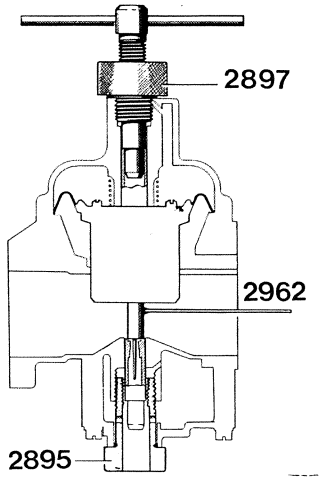
41 364

CC6



41 374

2 Check the height alignment and condition of the fuel jet and metering needle.
- Check the jet orifice (A): (suction chamber cover and air valve with diaphragm removed).
  The jet orifice must be round and centralized.
  Renew as necessary (see Operation *AA11*).
- The top of the jet must be **2.5 mm** under the bridge of the carburettor body on versions up to and including1979, and **3 mm** on versions from 1980 to 1984 inclusive.
- The metering needle must not be damaged.



41 328

CC7

Correcting

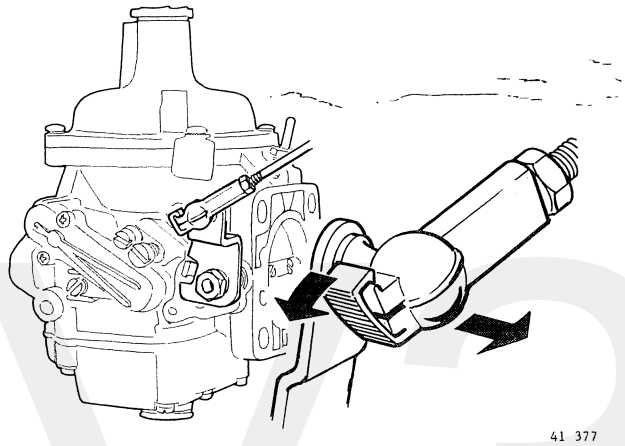
- The jet can be pressed down with press tool **2897** and gauge **2962**.
  (Air valve with diaphragm and suction chamber cover replaced; air supply hose disconnected.)
- The jet can be pressed up with press tool **2895**. (Float chamber removed.)
  Note: the ring of the metering needle must be flush with the bottom of the damper piston (B). Readjust the idling speed and CO-content.

Fast idle

CC8

1 Check the choke operation

Disconnect the link rod from the carburettor.
Pull out the choke. Check that the cable makes its full stroke. Push the choke back in. Check that the lever abuts the lower stop and that the fast idle adjusting screw (A) is clear of the lever.
Adjust if necessary.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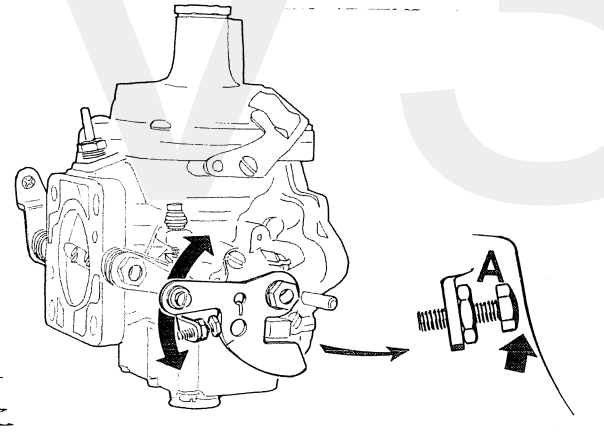
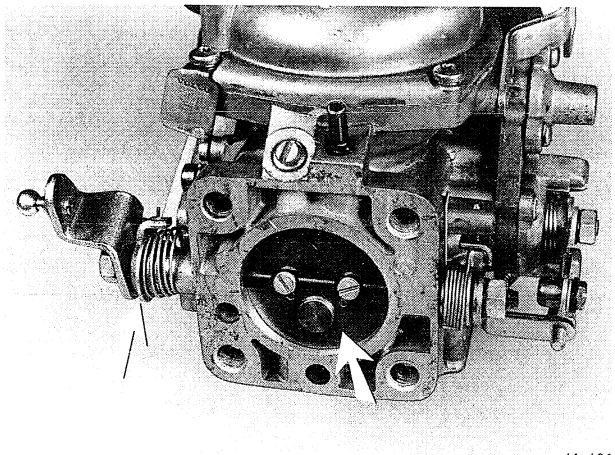


41 376

CC9

2 Check the operation of the throttle valve and the throttle valve spindle

The throttle valve and spindle must turn smoothly without sticking.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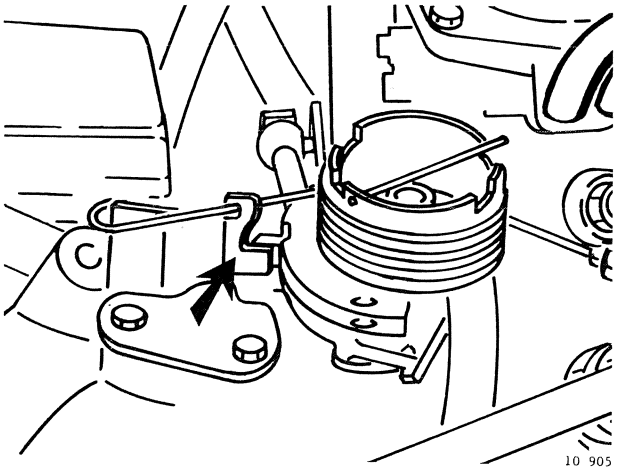
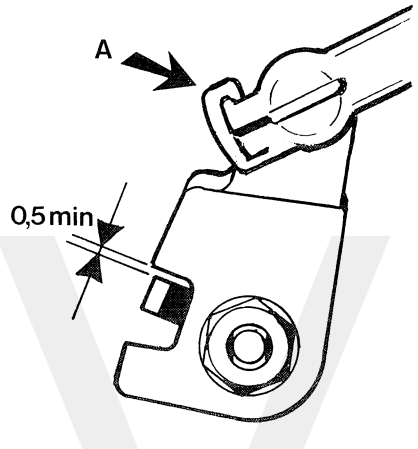

10 905

CC10

3 Adjust the throttle cable

With the throttle cable tensioned the cable lug must abut the stop.

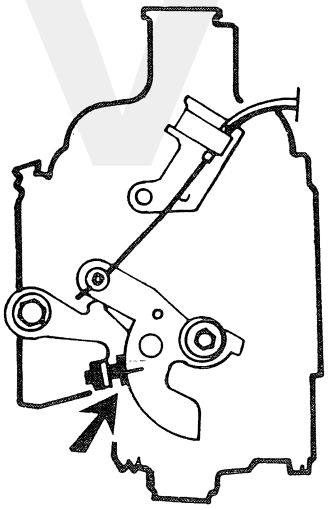


41 375

CC11

4 Fit and adjust the link rod

Lock the link rod with the tab (A). Adjust the length of the link rod so that there is **0.5 mm** clearance between the cam and the flange of the throttle valve spindle.



40 134

CC12

5 Check/correct the fast idle setting

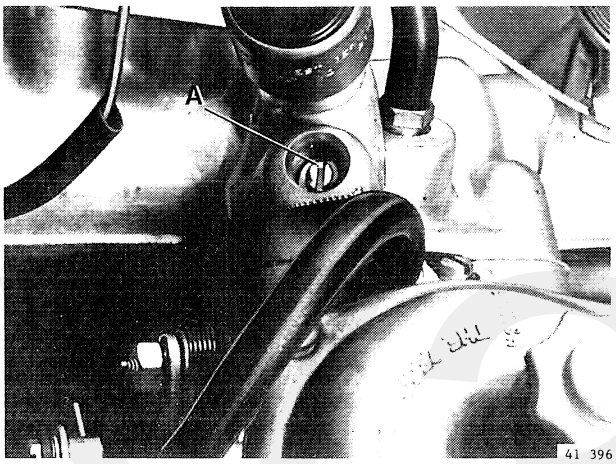
Start the engine.
Turn the choke lever so that the mark is opposite the adjusting bolt.
The engine speed should now be **20.8-22.5 r/s** (1,250-1,350 r/min).
Correct if necessary with the adjusting bolt.

Basic setting of throttle stop screw (hot engine), Zenith Stromberg

Special tools 9920, 9921

Note: carry out these operations when it is not possible to obtain the correct CO-content and/or idling speed in the normal way.

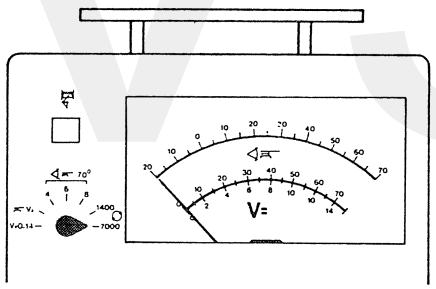
- All carburettor components must be free of wear and/or damage.
- First carry out the adjustments indicated in Operations *CC1-CC12.*
- Adjust the CO-content and idling speed as accurately as possible.
- Disconnect and plug the hose(s) to the distributor (and the Pulsair system).



41 396

DD1

Screw in the idle adjusting screw as far as possible and then back it off four turns



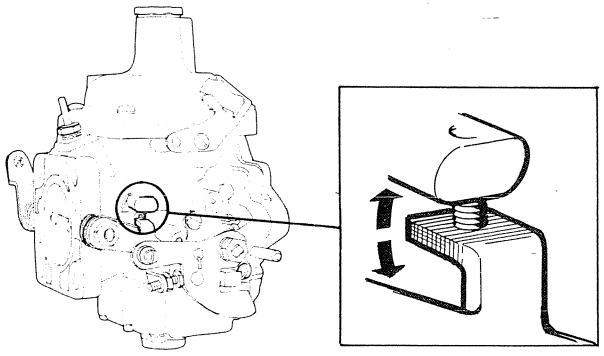
10 908

DD2

Check the engine speed

Start the engine. The engine speed should lie between **18.3-20 r/s** (1,100-1,200 r/min).

Correction
If necessary, bend the throttle stop until the correct engine speed is obtained.


41 428

DD3

Adjust the idling speed and CO-content

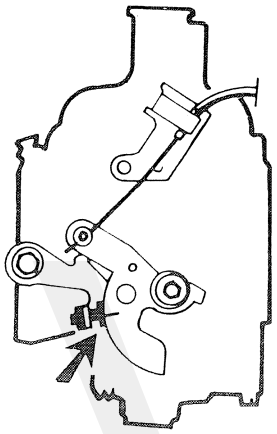
If necessary, see Operations *CC1-CC4.*
Reconnect the vacuum hoses.

EE1-EE7. Cold-start problems, B19A -1983

If the engine runs roughly and erratically after a cold start, there are three possible causes:

1 The fast idle setting is too low.
2 The diameter of the air metering orifice in the slide valve is too small.
3 The diameter of the air metering orifice in the connecting plate to the air filter is too small.

The method used to check and make corrections is given below.
Note: other engine settings such as ignition timing, valve clearances, spark plugs, etc., must be correct.
The air filter must be clean.

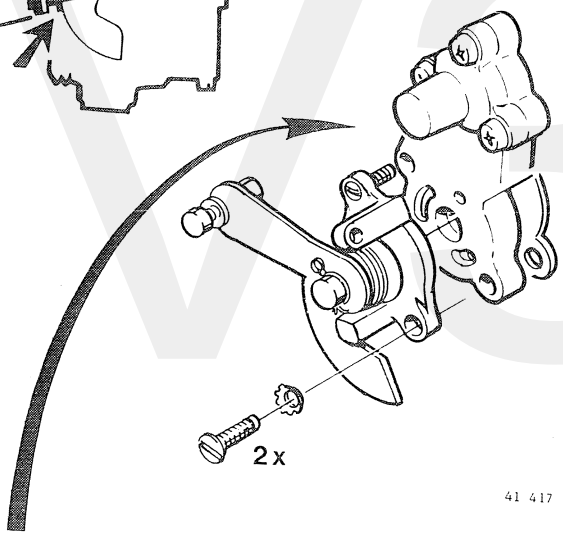


23,3 r/s
(1400 rpm)

EE1

1 Fast idle
Check the setting (see Operation *CC12*).
Note: in the event of cold-start problems, the fast idle setting should be raised to **23.3 r/s** (1,400 r/min).

2 Slide valve (air metering): check/correct the calibrated orifice

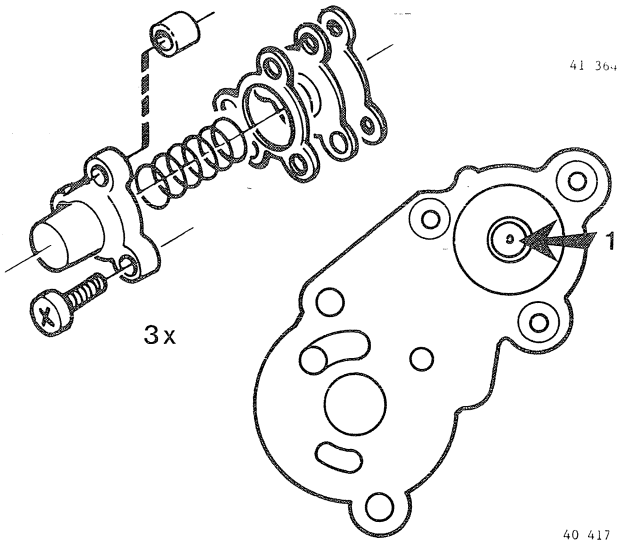


41 417

EE2

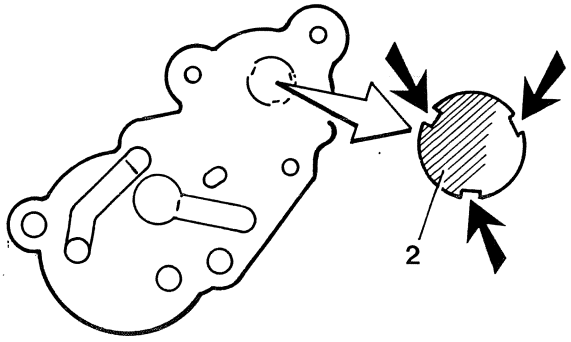
Checking

Remove the cold-start injector together with the intermediate flange and gasket.
Remove the slide valve from the intermediate flange.
Make sure that you do not misplace the three spacers.
Check the diameter of the calibrated orifice (1) with a ;1.0 mm drill bit.
If the orifice is smaller than 1.0 mm, it will have to be enlarged.



41 364

40 417

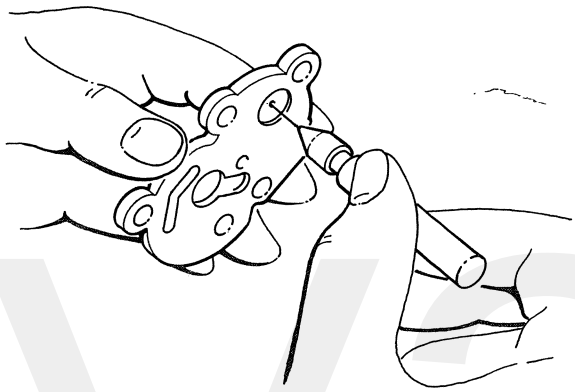


41 418

EE3

Proceed as follows

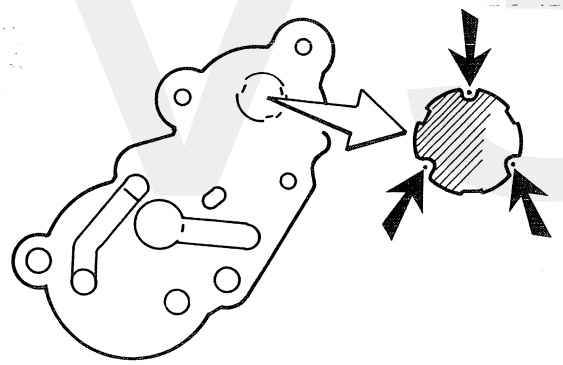
Scrape away the three small lugs which hold the filter (2) in position on the intermediate flange.
Do this with a sharp, pointed scraper and take care not to damage the filter.



41 419

EE4

Carefully enlarge the orifice to 1.0 mm.
Do this with a precision hand drill; when drilling, make sure that the drill bit passes **straight** through the orifice.
Blow the orifice clean with compressed air.



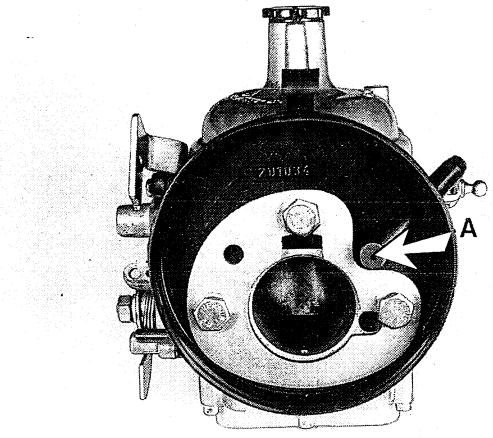
41 420

EE5

Locate the filter and use a centre punch to secure it by bending the edge of the hole slightly inwards at three points, in between the positions where the lugs were scraped away.

EE6

Reassemble the various parts.
(Use new gaskets.)



41 386

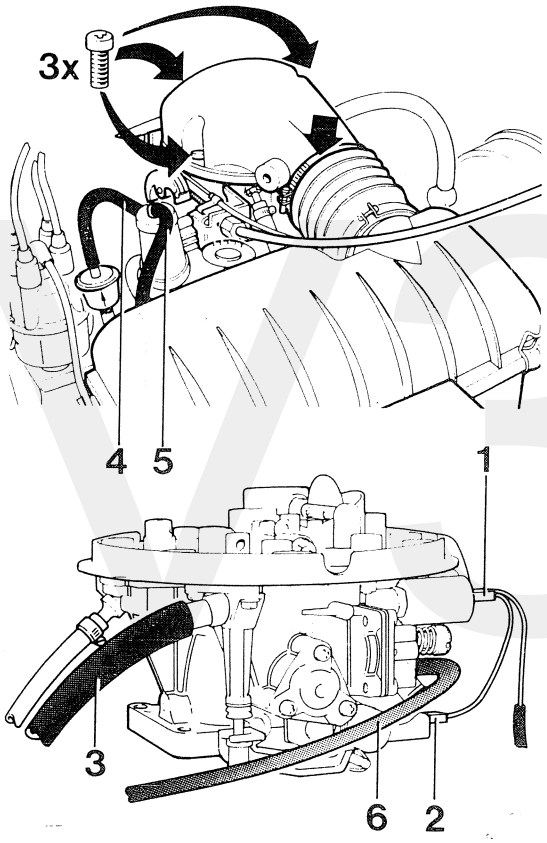
Connecting plate to air filter: check/correct the calibrated orifice

EE7

Checking

Disconnect the air hose from the connecting plate.
Check the orifice (A) with a ;1.9 mm drill bit.
If the orifice is smaller than this, it will have to be enlarged.
Remove the connecting plate from the carburettor.
Enlarge the orifice to **1.9 mm**.

FF1-FF6. Removing/fitting the Solex Cisac carburettor



FF1

Remove the air filter cover

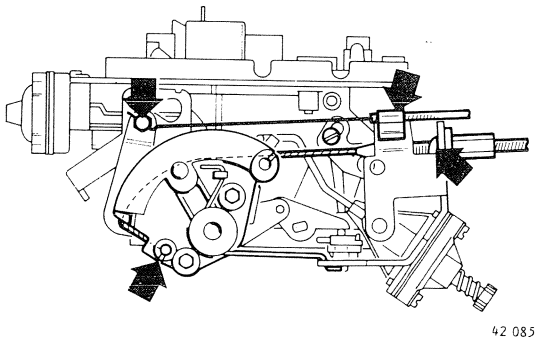
Release the clamping strap and remove the three screws from the air filter cover.
Release the cover from the corrugated hose.

FF2

Disconnect the wiring and hoses

Disconnect the wiring from the idle solenoid (1) and the preglowing plate (2).

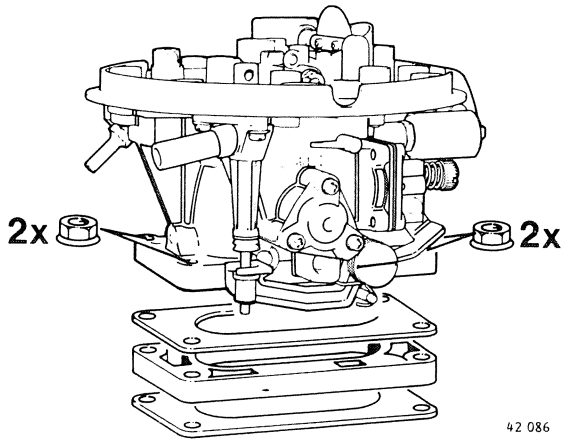
Disconnect the following hoses:
3 the ventilation hose from the float chamber;
4 the fuel delivery hose;
5 the fuel return hose;
6 the ignition system vacuum hose.



FF3

Disconnect the carburettor control cables

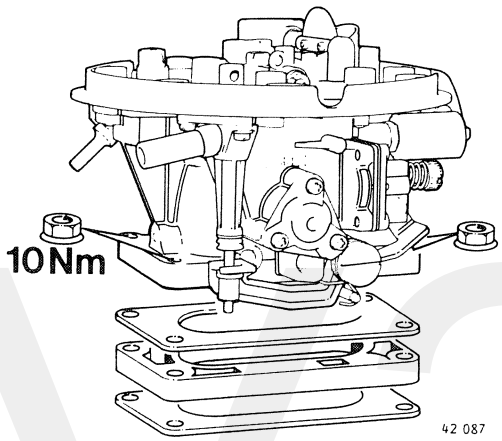
Disconnect the choke cable first and then the throttle cable.



FF4

Remove the carburettor

Clean the retaining bolts.
Remove the four nuts.
Lift the carburettor off the manifold.
Remove the insulating flange together with the two gaskets.



FF5

Fit the carburettor

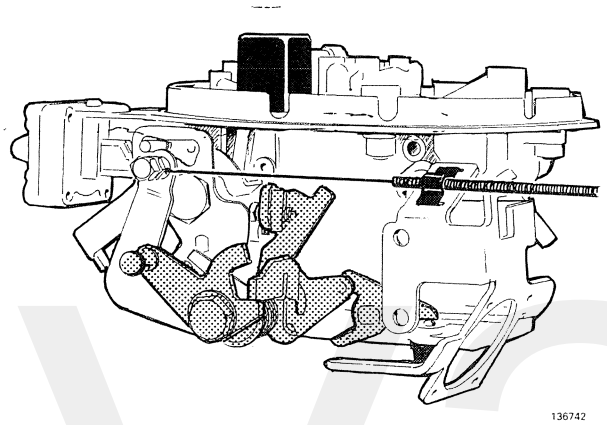
Clean the mating surfaces of the inlet manifold and carburettor.
Locate the insulating flange together with the two gaskets.
Note: always use **new** gaskets.
Fit the carburettor and tighten the four nuts.
Tightening torque: 10 Nm.

FF6

Connect/fit the carburettor control cables, hoses, wiring and air filter cover

These parts are fitted in reverse order to removal.
Adjust the throttle and choke cables.

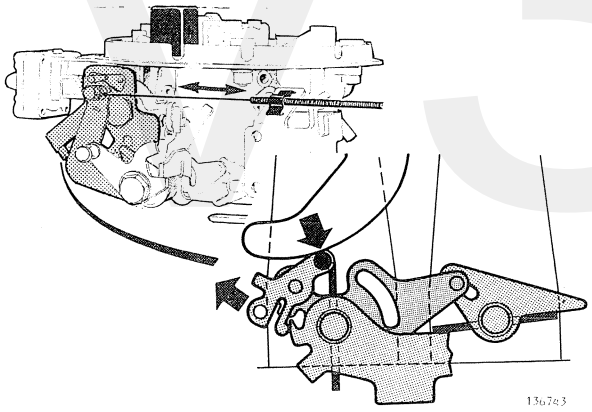
GG1-GG7. Inspecting/adjusting the Solex Cisac carburettor



GG1

Check the operation of the throttle valve

Remove the air filter cover.
Check the operation of the throttle valve by hand.
The throttle valve must open smoothly without sticking.
The second stage must only start to open when the first stage is already 2/3 open, but only when the choke is pushed in all the way.
Check that the cam abuts the stop.

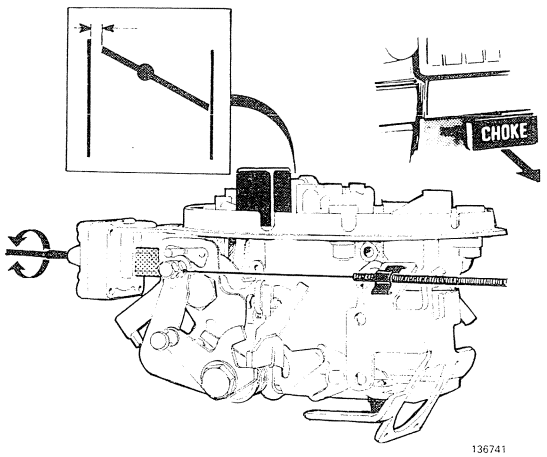


GG2

Check the operation of the choke

Check the mechanism and the cable for kinks and smooth sliding action.

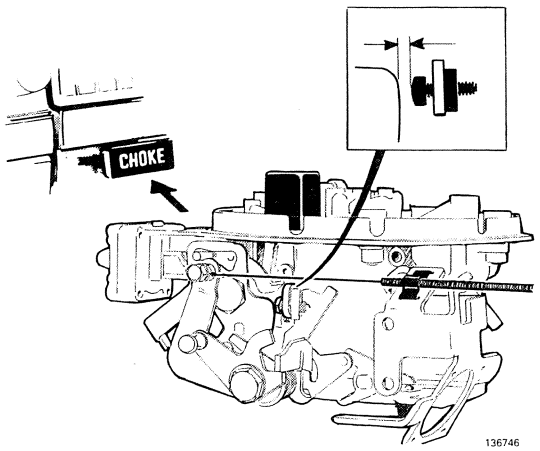
When the choke is pulled out, it must not be possible to operate the second stage via the throttle linkage.



GG3

Check/adjust the choke

Pull out the choke so that the choke valve is closed.
Push in the vacuum valve control rod as far as it will go.
Check the gap between the valve and the carburettor body.
Do this with a ;2.5 and ;3 mm drill bit.
The reference value for checking purposes is 2.7 mm.
Adjust the gap by turning the screw on the vacuum valve.



GG4

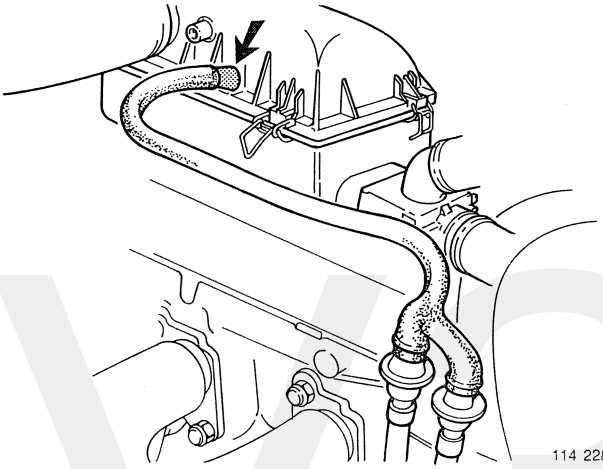
Check/adjust the engine idling speed

Push the choke back in.
Measure the distance between the cam and the adjusting screw with a feeler gauge.
The reference value for checking and adjusting purposes is 1 mm.

GG5

Check the ventilation valve

See Operation *JJ8-JJ9*.

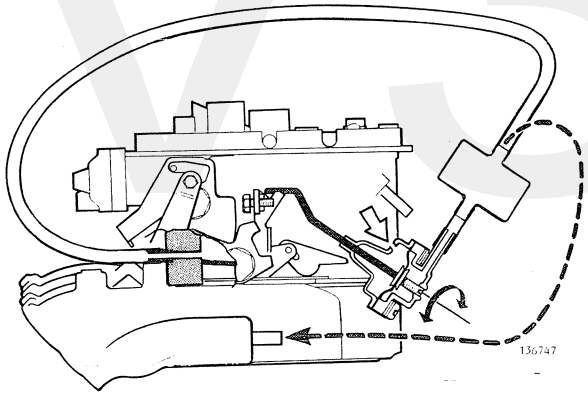


GG6

Check the CO-content (of the exhaust gases)

Note: read the General Guidelines first; see Operation *KK*.

Disconnect and plug the Pulsair hose.
Run the engine warm at 15 r/s (900 r/min) until the thermostat has opened. (Feel the radiator top hose: when it starts to get warm the thermostat has opened.)
If necessary, adjust the idling speed to 15 r/s (900 r/min).
Check the CO-content.
Reference value for checking ... .1.0-2.5%.
Reference value for adjusting ... .1.5%.
Connect up the Pulsair hose: the CO-content should now decrease.

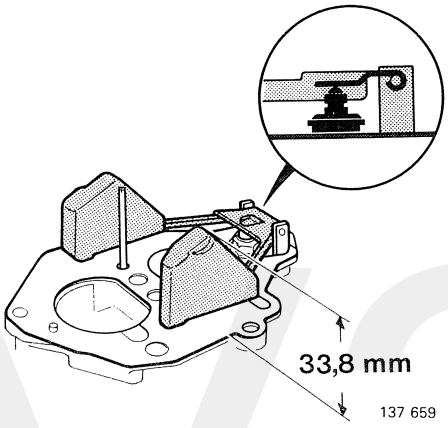


GG7

Check/adjust the dashpot

Connect the dashpot hose to the inlet manifold. The dashpot should now open the first stage throttle valve and the engine speed should gradually increase to 1,600 r/min. If necessary, adjust the dashpot and then lock the adjusting screw with lacquer.
Remove the hose from the inlet manifold.
The engine speed should gradually decrease. If this is not the case, renew the dashpot.
Reconnect the vacuum hose.

HH1-HH2. Reconditioning/assembling the Solex Cisac carburettor



HH1

Check/adjust the float height

Measure the height of both floats together with the gasket.
If necessary, correct the float height by bending the lever.
Make sure that the ball valve is accurately positioned.
Reference value for checking and adjusting .....33.8 mm.

HH2

Assemble the carburettor

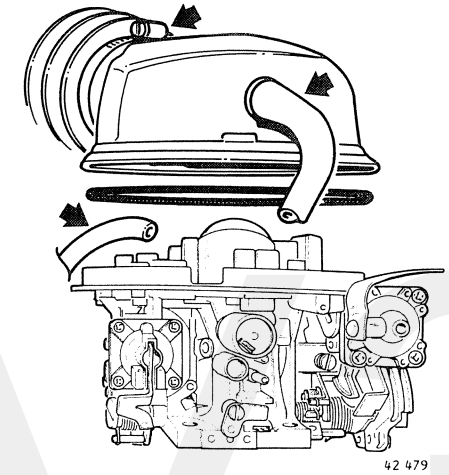
Note: use new gaskets and joint washers/seals.

IMPORTANT!
- Do not change the position of the throttle valve adjusting screws. This is preset in production.
- Do not remove the throttle valves and spindles.

1 Lock
2 Fuel filter
3 The spindle must slide easily
4 Basic setting: tighten the screw fully and then back off five turns
5 Basic setting: tighten the screw fully and then back off eight turns
6 Fit the tamper-proof seal

JJ1-JJ9. Solex Cisac ventilation valve

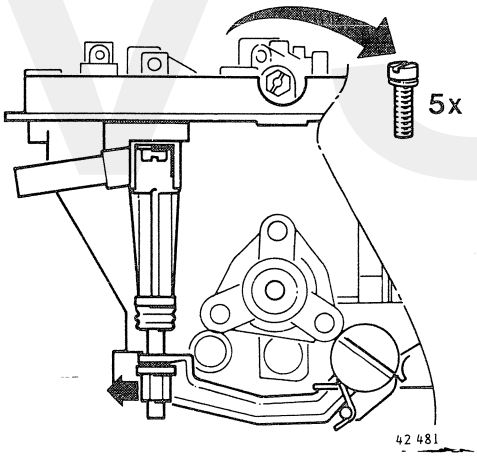
Incorrect operation of the ventilation valve may cause start problems with a hot engine, and/or excessive fuel consumption. This can be remedied by modifying the ventilation valve as described in the following operations. Checking/adjusting should be done at every 10,000 km service, before checking the CO-content.



JJ1

Remove:

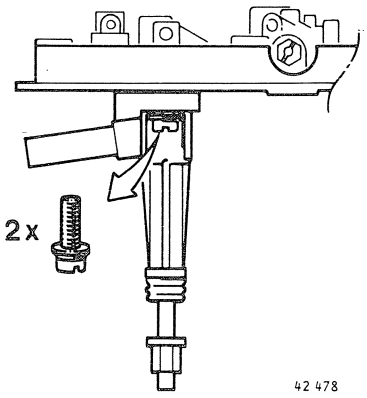
- crankcase ventilation hose;
- clamping strap on air filter bellows;
- carburettor header assembly;
- O-ring seal;
- breather hose.



JJ2

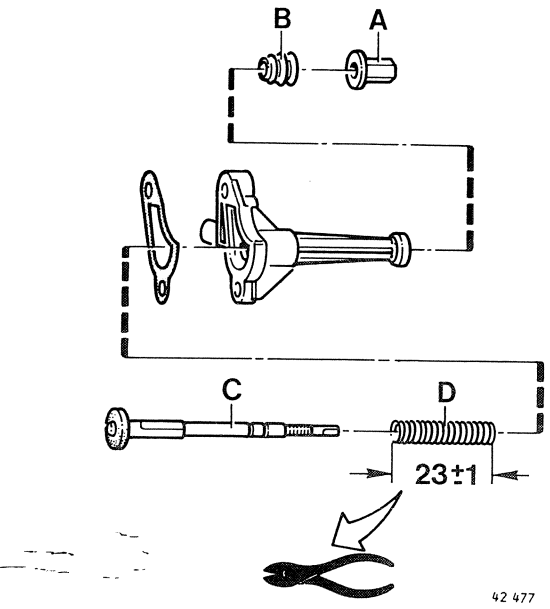
Remove the carburettor cover

Remove the five screws;
Lift the valve out of the operating arm.
Note: take care not to damage the float.



JJ3

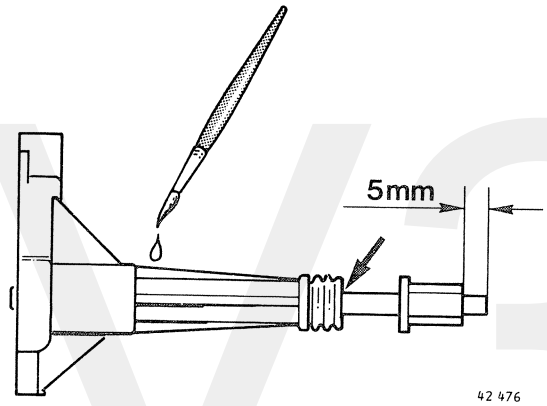
Remove the ventilation valve



JJ4

Modify the ventilation valve

Remove the nut (A), the flexible rubber bellows (B), the spindle (C) and pull out the spring (D) with a straight-line motion.
Clean these parts.
Fit a new spring or shorten the existing spring (D) to 23 ±1 mm.

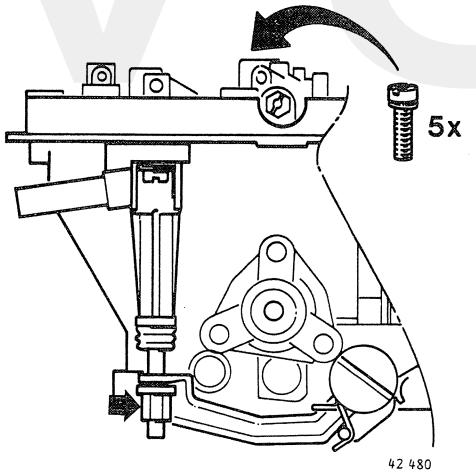


JJ5

Fit the ventilation valve

Fit the flexible rubber bellows with the largest aperture facing towards the housing; the other end must engage the groove.
Fit the nut so that the threaded end projects approx. 5 mm.
Note: insert the spring with the cut-off end facing towards the bottom of the cover (E) and always use a new gasket when reassembling.

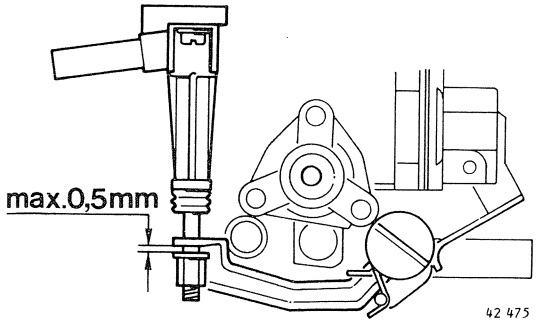
Clean the valve thoroughly and remove all traces of grease. Then mark the valve with white paint (to indicate that the modification has been carried out).
Note: also fit a new gasket under the valve.



JJ6

Fit the carburettor cover

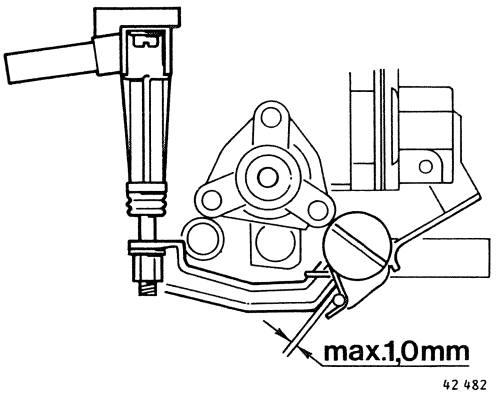
Use a new gasket.
Take care not to damage the float.
When fitting the cover, hook the operating arm into the ventilation valve at the same time (take care not to damage the choke operating mechanism when doing this).
Fit the five screws.



JJ7

Adjust the ventilation valve

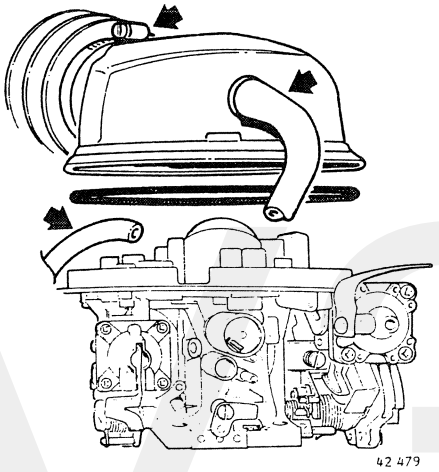
Close the throttle valve.
Move the choke valve to the fully open position.
Adjust the ventilation valve with the adjusting nut to obtain a clearance of 0.1-0.5 mm between the operating arm and the nut (use a feeler gauge).



JJ8

Check the operation of the valve

Open the throttle valve, blow into the ventilation valve and slowly close the throttle valve until it is 1 mm (dimension A) ahead of the throttle stop.
The ventilation valve should now just start to open.



JJ9

Fit:

- O-ring seal, carburettor header assembly and crankcase ventilation hose;
- breather hose;
- clamping strap.

Check for correct operation.

KK. General guidelines for adjusting the CO-content

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

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

B19A

When measuring the CO-content it is important that the temperature of the carburettor is correct (15-25°C).
When the engine is running at idle it heats up the carburettor.
Initially, however, the rate of flow of cold fuel through the jets is low.
As the carburettor heats up, the viscosity of the fuel decreases and the rate of flow through the jets becomes higher, causing the CO-content to increase.

To be certain that the measured CO-content is correct, the reading must be taken **within eight minutes** from the time the coolant thermostat has opened.
The CO-content must be measured at idling speed.

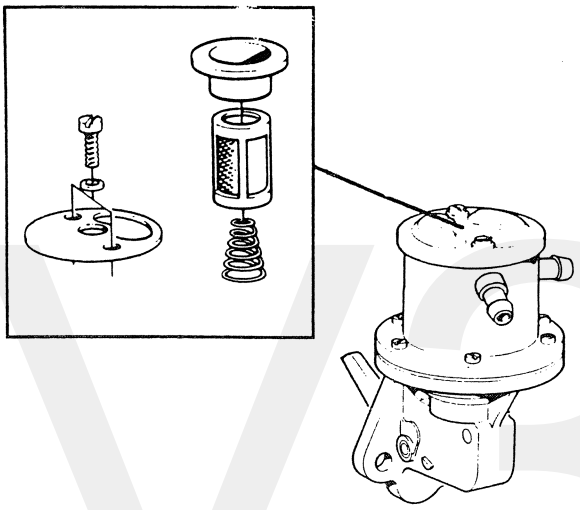
If adjustment is not done within eight minutes the engine, and consequently the carburettor, will become too hot. In that case, run the engine at a higher speed - 41-50 r/s (2,500-3,000 r/min) - for about one minute. This causes the coolant to circulate through the radiator and cool the engine; at the same time, the flow of cold fuel through the carburettor will cool the float chamber. (If you are not sure of the engine's temperature, it is best to run the engine as described above before taking a reading of the CO-content.)

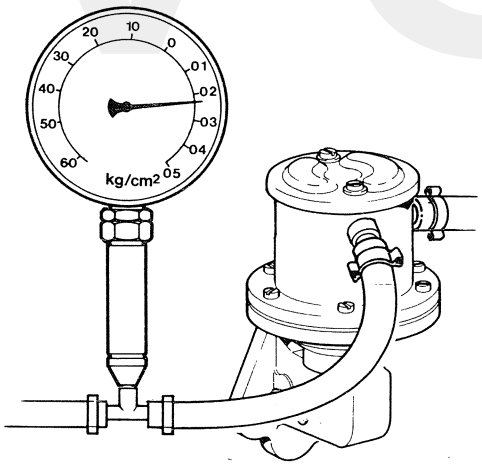
Before every reading of the CO-meter, tap lightly on the suction chamber (for example, with the handle of a screwdriver) so that the valve assumes the correct position. Also remember the time factor (eight minutes).

Connecting up the CO-meter

The CO-meter probe 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 should be inserted at least 45 cm.

LL1-LL4. Fuel pump, B19/B200





41 380

LL1

Remove the fuel pump

Clean the fuel pump and remove all traces of the old gasket.

LL2

Fit the fuel pump

Note: if there is an oil leak past the insulating flange, an aluminium flange must be fitted.
Always use **new** gaskets and hose clips.
Tighten the bolts to a torque of **21 Nm.**

LL3

Fit a new filter

Remove the two screws and take off the cover.

LL4

Check/correct the fuel delivery pressure

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 delivery pressure should be: **15-27 kPa** (0.15-0.27 kg/cm^2).

Pressure too high:
renew the pump.

Pressure too low: check whether the filter in the fuel pump is clogged.
If necessary, fit a new set of filters (see Operation *LL3*) and check the pressure again.
If the filter is not clogged and the pressure is still too low: renew the pump.

MM1-MM4. LE-Jetronic fuel injection system

MM1

The LE-Jetronic fuel injection system

The LE-Jetronic, like the CI-system used on the Volvo 200 series, is a port injection system. This means that there is an injector at the inlet port of each cylinder. However, whereas the CI-system is operated mechanically and gives continuous injection with varying fuel flow, the LE-Jetronic system is electrically operated with intermittent injection. The injectors are opened and closed once every crankshaft revolution and the volume of injected fuel is controlled by the length of time the injectors remain open.
The identification letters 'LE' stand for 'Luftmengenmesser-Europa' or in English, 'Air mass meter, European version'. The complete LE-Jetronic system consists of three functional sections:

- the fuel supply system;
- the sensors;
- the control system.

MM2

The fuel supply system

Following the schematic system diagram (*MM5*), we look first of all at the fuel supply system. This carries fuel from the tank (J) through a fuel pump (I) and a filter (H) to the injection manifold (C). This supplies the injectors (B) with fuel regulated to a constant pressure by the fuel pressure regulator (D). A cold-start injector (M) supplies extra fuel to the engine at low temperatures while the starter is in use. The electrical supply to operate this cold-start injector is controlled by a thermal time switch (L) which in turn is supplied via the starter motor relay when the ignition switch (E) is in the start position.

MM3

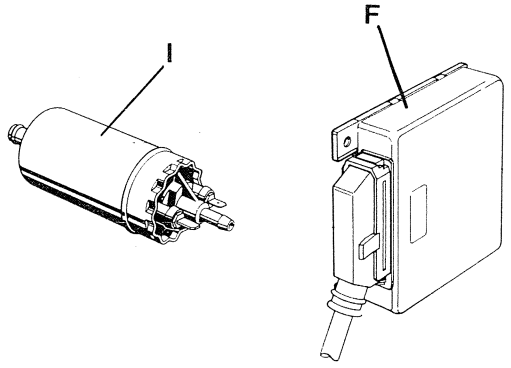
The sensors

The sensors measure the most important factors affecting fuel combustion. Signals for these measurements and other information are passed to the electronic control unit (ECU). An air mass meter (P) measures the induction air flow and a sensor (Q) measures the air temperature. A throttle butterfly switch (O) senses a fully opened or closed throttle, and the engine coolant temperature is signalled from a temperature sensor (K). An engine speed signal is obtained from the low tension terminal of the ignition coil (A). During starting, a signal is also sent to the ECU from the ignition switch (E).

MM4

The control system

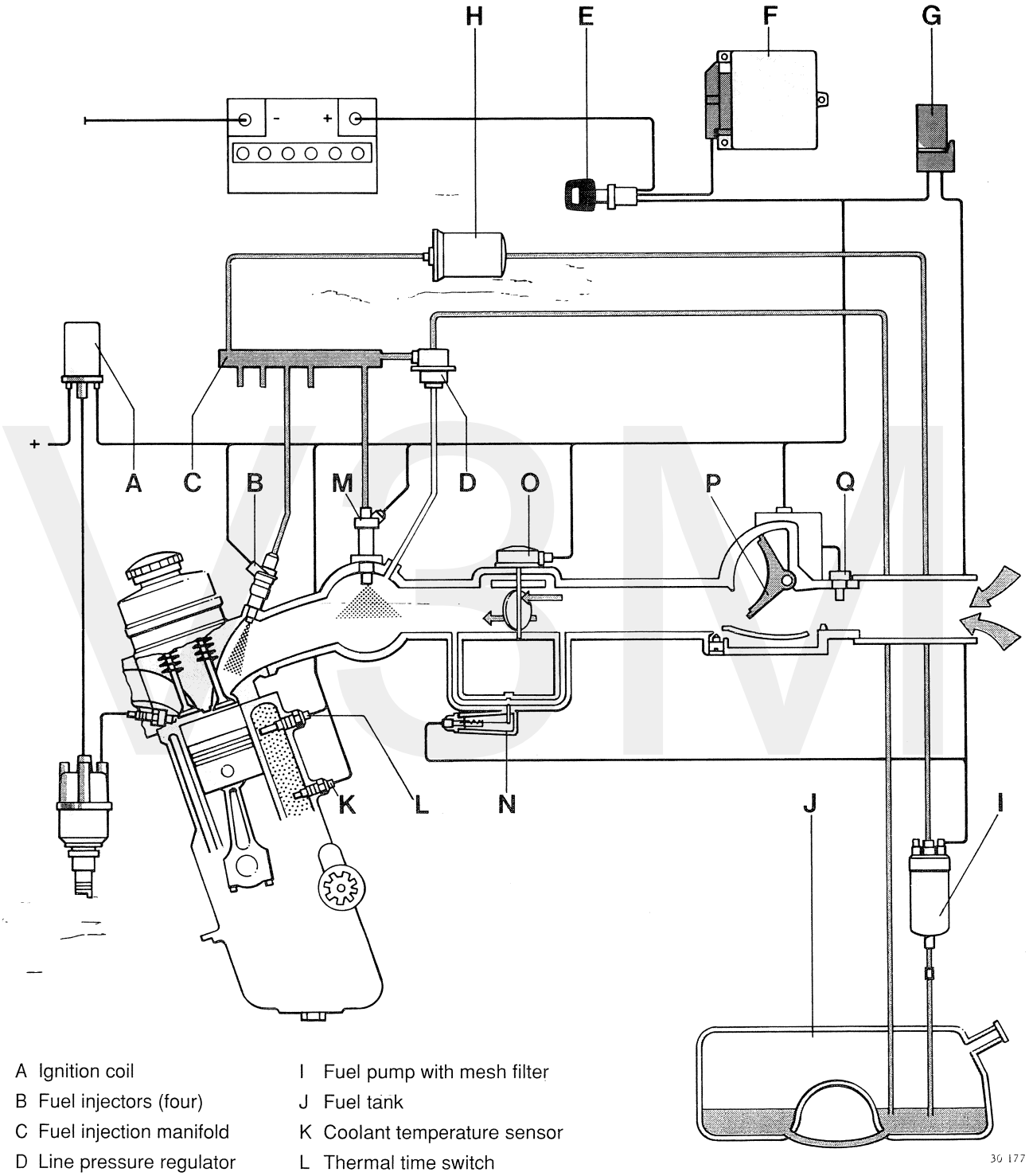
The power supply for the ECU (F) is routed via the control relay (G).
The ECU receives and evaluates readings from sensors around the engine and uses them to calculate the correct amount of fuel to be injected, all within a fraction of a second. The ECU is programmed to take account of all variations in engine operating conditions.



LE-Jetronic system components

All the components concerned with the LE-Jetronic system are located in the engine compartment, with the exception of the fuel pump (I) with its mesh filter in the fuel line by the fuel tank, and the ECU (F) inside the car behind the centre console of the dashboard.

MM5. Schematic system diagram, LE-Jetronic fuel injection

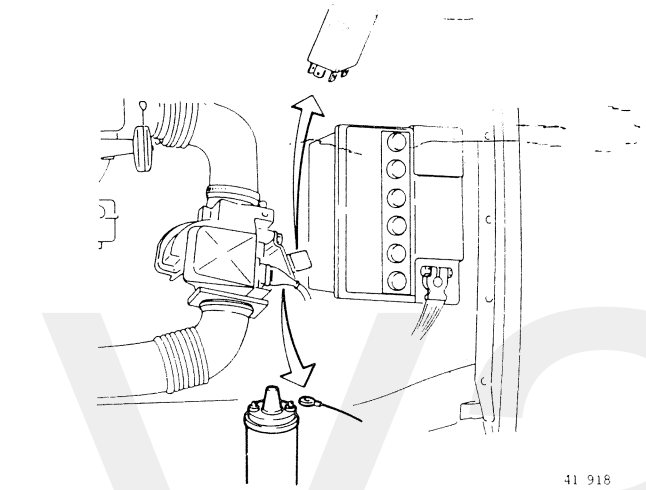


A Ignition coil
B Fuel injectors (four)
C Fuel injection manifold
D Line pressure regulator
E Ignition switch
F Electronic control unit (ECU)
G Control relay
H Fuel filter
I Fuel pump with mesh filter
J Fuel tank
K Coolant temperature sensor
L Thermal time switch
M Cold-start injector
N Auxiliary air valve
O Throttle butterfly switch
P Air mass meter
Q Induction air temperature sensor

Fault tracing - LE-Jetronic fuel injection system

NN. Important! Workshop rules

In the **LE-Jetronic** system the injection of fuel is regulated by an **electronic control unit** (ECU). This ECU is located inside the car behind the centre console of the dashboard. To prevent possible damage to the ECU it is very important that the following workshop rules are strictly observed.

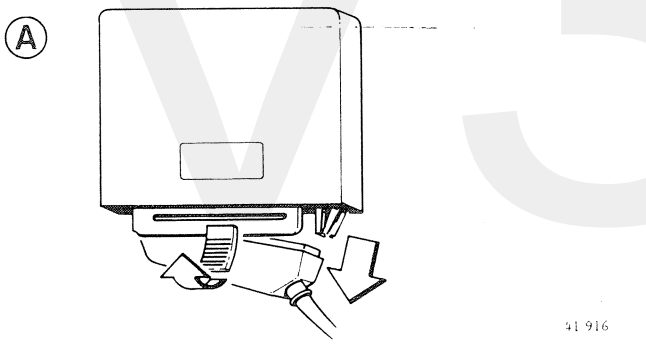


Measuring the compression pressure

- disconnect the power supply cable from the ignition (to prevent spark discharge (arcing) to the wiring harness of the LE-Jetronic system);
- take the control relay out of the connector (to prevent the engine from flooding, which could otherwise cause dilution of the engine oil, etc.).

Switch off the ignition when:

- unplugging and connecting the electrical connector of the ECU;
- disconnecting and connecting the ignition coil and spark plug leads;
- connecting and disconnecting test instruments.

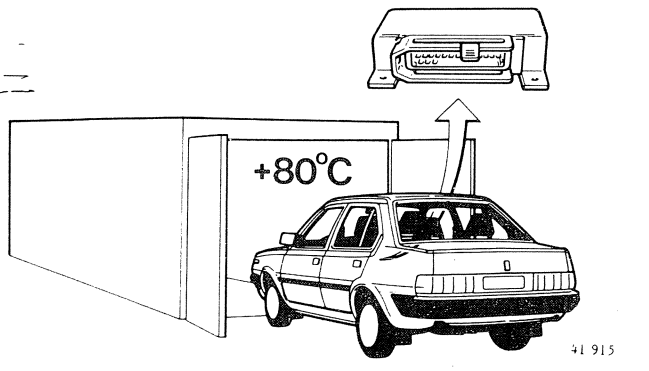


Battery

- do not disconnect the cable when the engine is running;
- always disconnect the battery cables when charging the battery with a quick-charger;
- do not use a quick-charger or a voltage higher than 16V when starting from an auxiliary power source.

Electronic Control Unit

- remove the ECU before stove-drying. The ECU must not be exposed to temperatures above +80°C;
- unplug the ECU connector before starting any electric welding on the car;
- never renew the ECU without first checking the wiring and components because a fault in these parts may damage the new ECU in the same way as the old one.



Fuel pump

- never interchange the electrical connections of the fuel pump as this will damage the pump beyond repair.

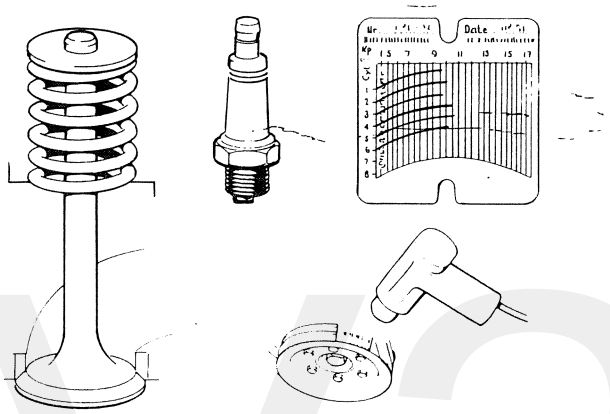
Risks to avoid when working on the fuel system

When work is being carried out on the fuel system it is possible for fuel to spill over the engine. If the engine is hot, there is not only a risk of the petrol igniting but there is also a health hazard on account of the high benzene content in the surrounding air. **Lead** in the petrol also presents a health hazard.

OO. Fault tracing

General

Before attempting any check or diagnosis of malfunctions in the LE-Jetronic system, you must first check the items listed below.



Mechanical

- compression*;
- valve clearances;
- vacuum connections/hoses;
- throttle cable operation;
- air filter;
- inlet manifold.

Electrical

- spark plugs and leads;
- distributor cap;
- ignition coil;
- ignition timing and advance;
- wiring.

Purification of exhaust gases

- crankcase ventilation;
- EGR and Pulsair systems (Sweden).

***CAUTION!** When carrying out the compression test, the power supply cable to the ignition must be disconnected. The reason for this is that arcing (discharge of large sparks of 2 cm or more in length) must be avoided as this could damage the ECU and the ignition unit.
Also take the control relay out of the connector to prevent fuel from being injected when the compression pressure is measured.

Fault tracing
This manual describes only the commonest kind of malfunctions which may occur and are relatively easy to trace.
Carry out a 'Complete check of the LE-Jetronic injection system' (Operations *RR1-RR35*) if:
- no malfunction is discovered after following the fault tracing procedure;
- there is no easily traced malfunction;
- a number of malfunctions occur at the same time.

In the following pages you will find a summary of the commonest kind of malfunctions and their symptoms as well as the checks that have to be carried out.
After each check there is a letter and a figure, e.g. *RR2*. These refer to the corresponding operation in the 'Complete check of the LE-Jetronic injection system'. See Operations *RR1-RR35*.
Also refer to the wiring diagram at the back of this Service Manual.
$W
The LE-Jetronic system can also be tested with testbox **998-8190, 8192**. See Operation *QQ*.

PP. Symptoms, possible causes and remedies

Engine does not start

Probable malfunctions	Operation
Induction system, air leakage	*RR2*
Fuel pump does not work	*SS1*
Air mass meter or wiring	*RR28-RR34*
Coolant temperature sensor	*RR27*
Line pressure incorrect	*RR9-RR12*
Cold-start injector does not work	*RR4-RR5*

Difficult to start when cold

Probable malfunctions	
Cold-start injector does not work	*RR4-RR5*
Auxiliary air valve	*RR7-RR8*

Difficult to start when hot

Probable malfunctions	
Cold-start injector is leaking	*RR5*
Residual pressure is too low	*RR12*
Line pressure is incorrect	*RR9-RR12*

Difficult to start both hot and cold

Probable malfunctions	
Induction system, air leakage	*RR2*
Line pressure incorrect	*RR9-RR12*
Air mass meter	*RR28-RR34*

Erratic running when cold and during warming-up period

Probable malfunctions	
Auxiliary air valve	*RR4-RR5*
N.T.C. air mass meter	*RR32*
Induction system, air leakage	*RR2*

Erratic running when hot

Probable malfunctions	Operation
Line pressure incorrect	*RR9-RR12*
Induction system, air leakage	*RR2*

Erratic running both hot and cold

Probable malfunctions	
Induction system, air leakage	*RR2*
Line pressure incorrect	*RR9-RR12*
One injector is not working	*SS9*
Incorrect setting of CO-content	*TT3*
Air valve in air mass meter is not working properly	*RR28-RR34*

Erratic running + high fuel consumption

Probable malfunctions	
Cold-start injector is leaking	*RR5*
Line pressure incorrect	*RR9-RR12*
Fuel leakage	-
Incorrect setting of CO-content	*TT3*
Air mass meter	*RR28-RR34*

Low top speed and engine has no tractive power

Probable malfunctions	
Throttle linkage incorrectly adjusted, throttle valve does not open fully	-
Line pressure incorrect when hot or when engine is running	*RR9-RR12*
Fuel pump capacity too low	*SS7-SS8*
Incorrect setting of CO-content	*TT3*

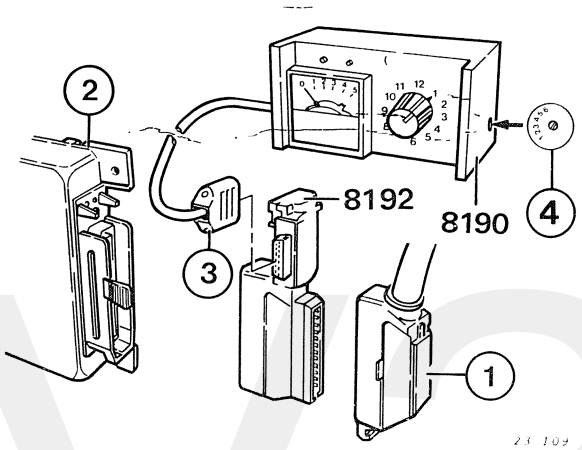
Erratic running at idle

Probable malfunctions	
Engine not running on all cylinders	*RR15*
Induction system, air leakage	*RR2*
Air mass meter is sticking	*RR32*
Throttle butterfly switch	*SS11/TT1*
Leaking injectors, bad spray pattern	*SS9-SS10*

QQ. Fault tracing with a testbox - LE-Jetronic fuel injection system

Special tools: 998-8190, 998-8192

The illustration shows how testbox 998-8190 has to be connected up. In the following pages the fault tracing procedure is executed step by step.



Plug the diagnostic connector on to the ECU

Important: switch off the ignition.
Remove the panel at the left-hand side of the centre console. Press the retaining tab outwards and pull the connector (1) off the ECU (2). Fit the special adaptor **998-8192** (3) on the ECU and the connector on the adaptor.
Turn the switch (4) to position 1.

Start the engine

- engine starts: continue from 'Engine starts but runs erratically';
- engine fails to start: crank the engine with the starter motor and continue with the table below.

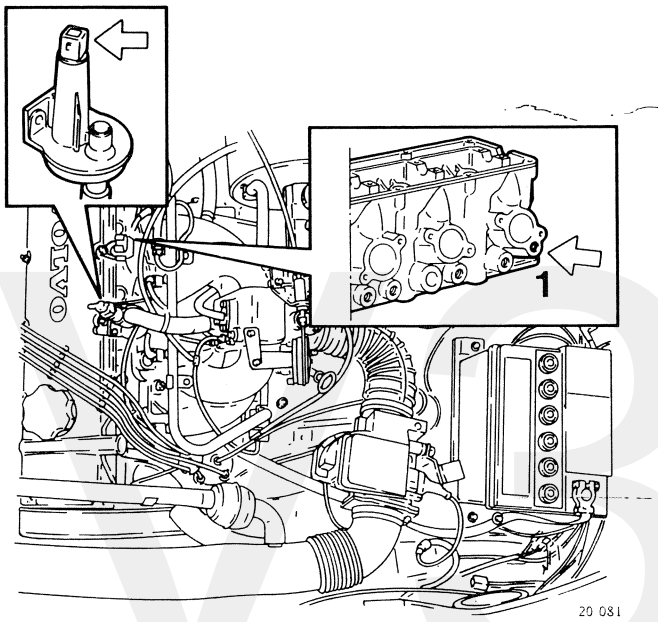
Switch in position	Function	Correct value	Fault signal	Check	Operation
4	Signal from ignition system	Approx 4,5	0	Cable between ignition coil terminal 1 and ECU terminal 1.	*RR23*
6	Injectors	Approx 0,4	0	Cable between battery and system relay. Cable between injector and ECU terminal 12. Cable between injector and ECU terminal 12.	*RR3* *SS9*

Engine starts but runs erratically

Switch in position	Function	Correct value	Fault signal	Check	Operation
LL-lamp	Throttle butterfly switch in idle position	LL-lamp glows green when throttle butterfly switch is closed.	LL-lamp extinguished when butterfly is closed. LL lamp does not extinguish when butterfly opens	Throttle butterfly switch incorrectly adjusted. No voltage at throttle butterfly switch. Cable between throttle butterfly switch and ECU terminals 2, 3.	*RR24*
VL-lamp	Throttle butterfly switch in fully open position.	VL-lamp should glow green when butterfly is fully open.	VL-lamp does not light up when butterfly is fully open.	Throttle butterfly switch incorrectly adjusted. No voltage at throttle butterfly switch. Cable between throttle butterfly switch and ECU terminals 2,3.	*RR24*
1	Air mass meter	Approx 2,2	0 or 5	Cable between air mass meter terminal 8-7 and ECU terminals 7-8.	*RR26 RR28-RR34*
2 (F-engine)	Lambda-sensor N.B.! Engine must be at operating temperature	Oscillates between 0 and 1,0.	Constant 0,2 Constant 0,5 Constant 0,8	0,2 = air leakage at air intake pipe. 0,5 = cables to Lambda sensor not connected up 0,8 = leaking injector	*RR2* *diagram page 152* *RR5,RR12*
6	Injectors, litres/hour	Approx 0,4(x5=20 l/h with engine at operating temp.			RR13-RR19
7 (F engine only)	CO-setting	Oscillates between 0,5 and 2,0 Decreasing from 2,8-0,3	2,0 = mixture too rich 3,0 = mixture too lean	Adjust CO-content. Leaking injector, etc. Air leakage at air intake pipe	*RR35 RR5,RR12* *RR2*
8	Battery and charing system	Approx 4,5(x3=13,5 volt).	Under 4(x3=12 volt)	Under 4(x3=12 volt)	*diagram page 152*
11	Engine temperature transmitter	Approx 2,2 bij 20°C Approx 0,4 bij 80°C	0 or 5	Cable between engine temperature transmitter and ECU terminal 10. Cable between engine temperature transmitter and earth.	*RR27*
12	Air temperature in air mass meter	Approx 0,40	0 or 5	Cable between air mass meter terminal 8 and ECU terminal 8. Cable between air mass meter terminal 9 and ECU terminal 9.	*RR32*

RR1- RR35. Complete check of the LE-Jetronic injection system

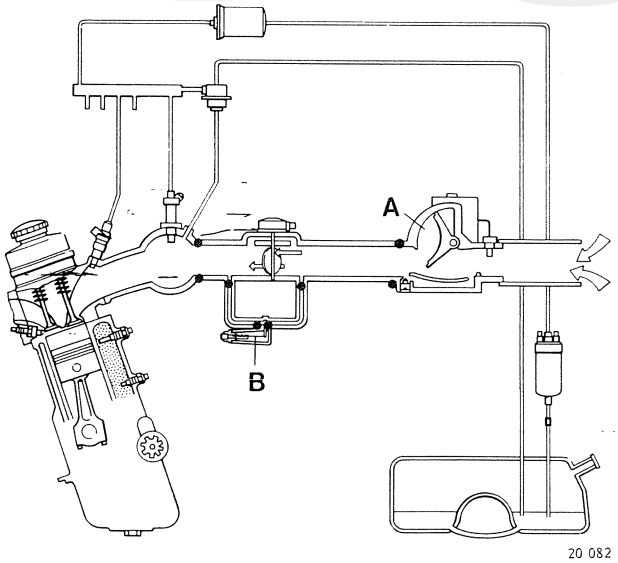
RR1-RR2. Preliminary operations



RR1

Unplug the connectors from the auxiliary air valve and the thermal time switch

The two connectors must be unplugged as they will otherwise be exposed to heat during the complete test of the system; this would make it impossible to check them for correct operation.
If the auxiliary air valve is engaged, it will take a very long time to cool down again to the same temperature as that of the ambient air.



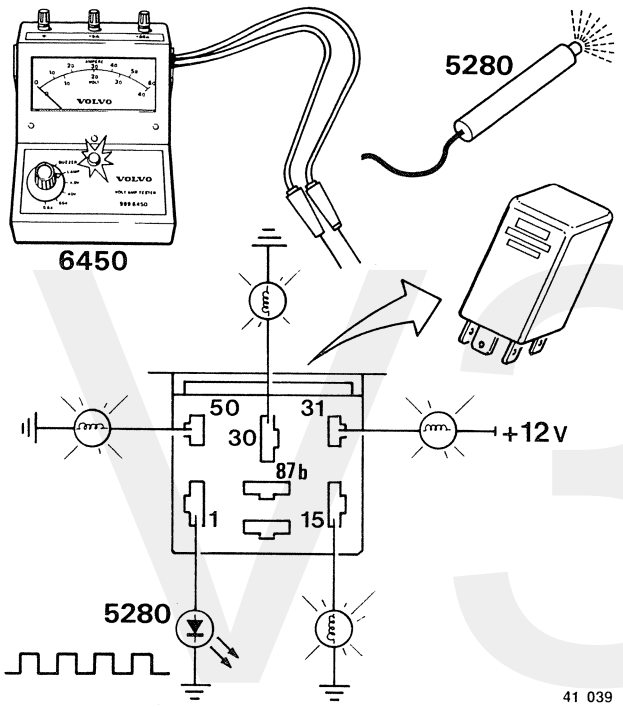
RR2

Check the system for air leakage

No air leakage may occur between the air mass meter (A) and the engine.
For this reason, check:
- the hose connections at the auxiliary air valve (B) and the pipe for the cold-start injector; also check the vacuum hoses;
- the O-ring seals of the injectors and the cold-start injector;
- that all bolted connections are tightened down;
- that the injectors are properly located and that the rubber gaskets are intact.

RR3. Fuel pump and control relay

Special tools: 5280, 6450



RR3

Check the fuel pump and control relay for correct operation

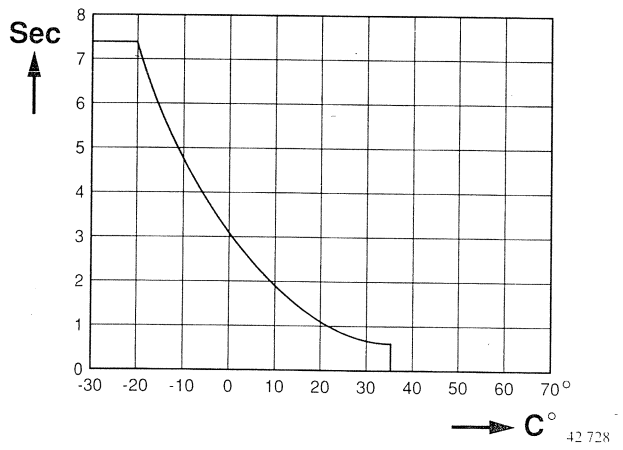
Engine runs: continue from Operation *RR4*.

Engine does not run: check the cable terminals of the connector.
Use special tool **5280** (LED) and test:
- Between the battery negative post and terminal 1: the lamp should flash when starting. If the lamp does not flash, check the grey cable between terminal 1 and the ignition and check the ignition unit.
  Use special tool **6450** and test:
- Between the battery positive post and terminal 31.
  This is a brown cable running to earth on the manifold.
- Between the battery negative post and terminal 30.
  This is a red cable running to the battery positive post.
- Between the battery negative post and terminal 15 (ignition switched on).
  This is a brown cable running to ignition terminal 15.
- Between the battery negative post and terminal 50 (while starting).
  This is a blue-yellow cable running to the starter motor.

If there is no signal, or an incorrect one: check the wiring.
If the signal is correct: bridge terminals 30 and 87b and terminals 30 and 87. Listen to check whether the fuel pump is working and test for voltage at terminal 9 of the air mass meter.
Pump is not working: see Operation *SS1*.
Pump is working: fit a new relay and start the engine.
Engine does not run: the relay is not the cause of the malfunction; fit the old relay again.

RR4-RR6. Cold-start injector and thermal time switch

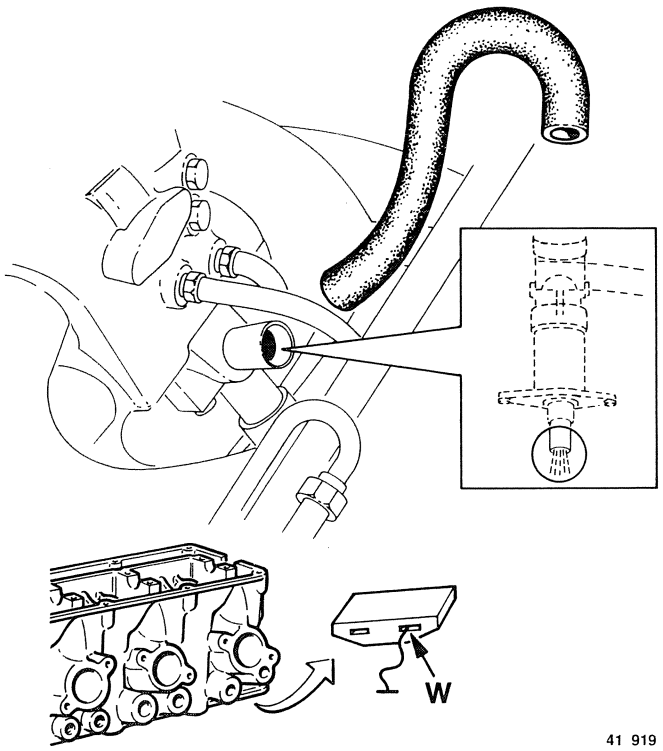
Special tools: 5280, 6450



RR4

Check the cold-start injector for correct operation (system must be at operating pressure)

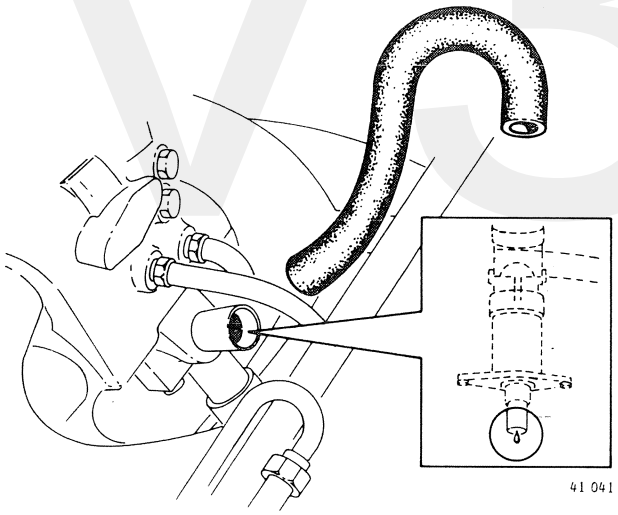
Disconnect the upper hose between the auxiliary air valve and the inlet manifold.
Unplug the connector from the thermal time switch. Connect terminal 'W' in the connector to earth.
Crank the engine with the starter motor and look in the inspection port in the inlet manifold.
The cold-start injector should inject fuel (not longer than 7 seconds) as long as the starter motor is turning over.



41 919

Cold-start injector does not work

Check whether voltage is present as far as the injector (with the starter motor turning over).
Check the resistance of the cold-start injector (this should be 2-3 ohms at 20°C).
Check the wiring between the injector and the thermal time switch.
If this is all in good order, you will have to try a new cold-start injector.



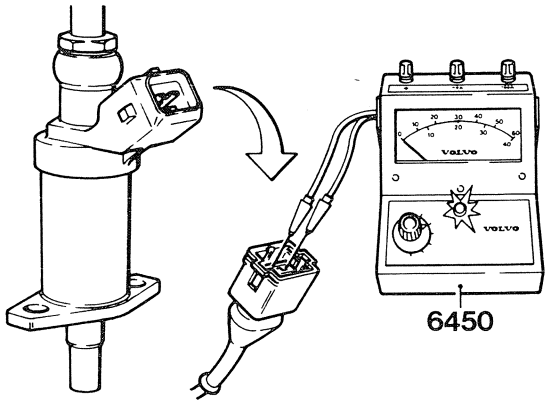
41 041

RR5

Check the cold-start injector for leakage

Switch off the ignition.

Check whether the cold-start injector leaks.
The maximum permissible leakage rate is 1 drop of fuel per minute. Renew the cold-start injector if the leakage is excessive.



41 920

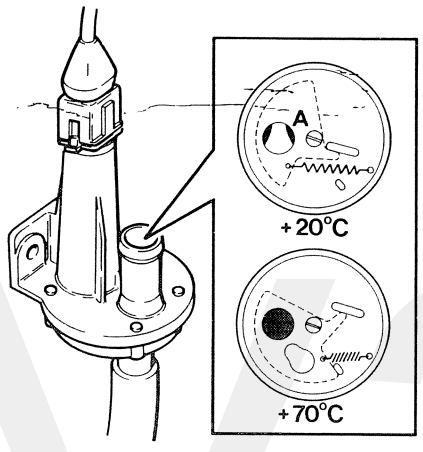
RR6

Check the thermal time switch

Unplug the connector from the cold-start injector. Connect special tool **6450** to the connector.
Crank the engine with the starter motor and watch the test lamp. The lamp should light up for a few seconds when the starter motor is activated.
Note: the length of time that the lamp lights up depends upon the temperature of the engine.

Lamp does not light up: see Operation *SS2*.

RR7-RR8. Auxiliary air valve



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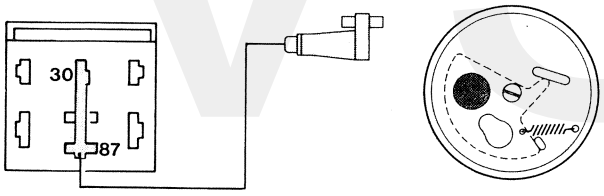
RR7

Check the open position of the auxiliary air valve

The auxiliary air valve (A) should be part-way open at approx. +20°C ambient air temperature. (At -30°C it should be fully open and fully closed at +70°C.)

If the auxiliary air valve is not (part-way) open, gently tap the housing; if it still fails to open, renew the auxiliary air valve.



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RR8

Check the closing action of the auxiliary air valve

Bridge terminals 87 and 30 of the control relay connector (remove the control relay).

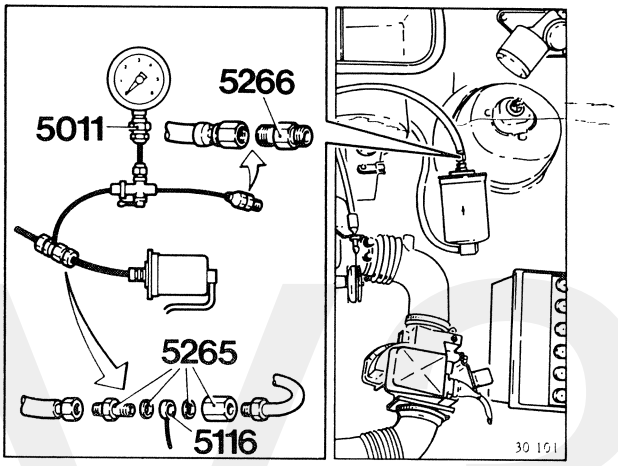
The auxiliary air valve should now close fully after approx. 5 minutes at +20°C ambient air temperature.

If the auxiliary air valve does not close, tap it gently. If it then closes, it is in good working order (the tapping imitates the vibrations of the engine).

If this does not help: see Operation *SS3*.

RR9-RR12. Checking the line pressure

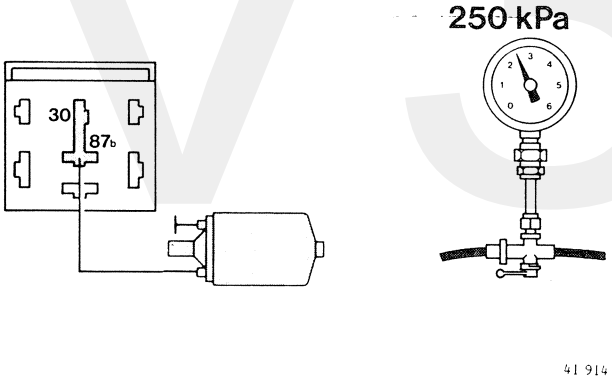
Special tools: 5011, 5116, 5265, 5266, 5843



RR9

Connect up the pressure gauge

Depressurize the system by unscrewing the line from the fuel filter (1). Catch the escaping fuel with a cloth.
Connect pressure gauge **5011** between the filter and the line.
Use hose **5116** and union connector **5265**.
Plug the open end of the pressure gauge hose with screwed plug **5266**.
Move the cock of pressure gauge **5011** to position 1 (the cock then points in the direction of hose **5116**).



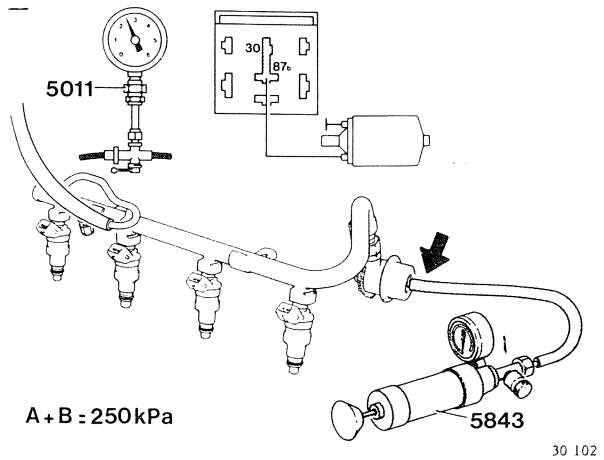
RR10

Check the line pressure

Bridge terminals 30 and 87b of the control relay connector.
Listen to check whether the fuel pump is working.
Note: the pulsating action can also be felt in the line.
The line pressure should then rise to **250 kPa**.

Line pressure too high: see Operation *SS5*.

Line pressure too low: see Operations *SS6-SS8*.

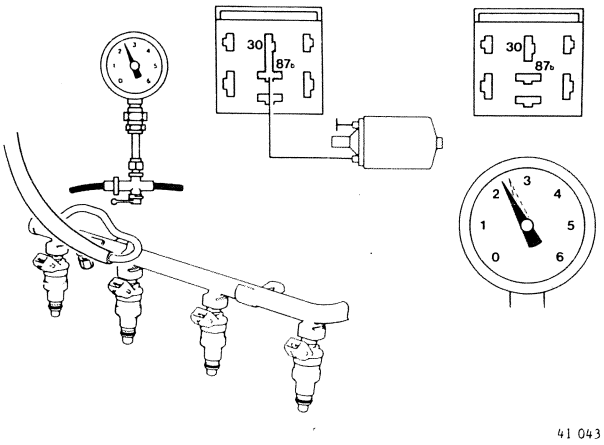


RR11

Check the pressure regulator

Connect vacuum pump **5843** to the vacuum connection of the pressure regulator.
The line pressure should now be **250 kPa**.
Draw vacuum into the pressure regulator.
The line pressure should now drop the same amount as the reading shown on the vacuum pump gauge.

Therefore: the sum of the vacuum and the pressure remaining in the line should again be 250 kPa.
Vacuum + line pressure = 250 kPa.
Remove the vacuum pump.



41 043

RR12

Check the residual pressure

The line pressure should now be **250 kPa**.
Stop the fuel pump by removing the bridge.
The pressure should now drop **immediately** by 0.1-2 kg/cm2.

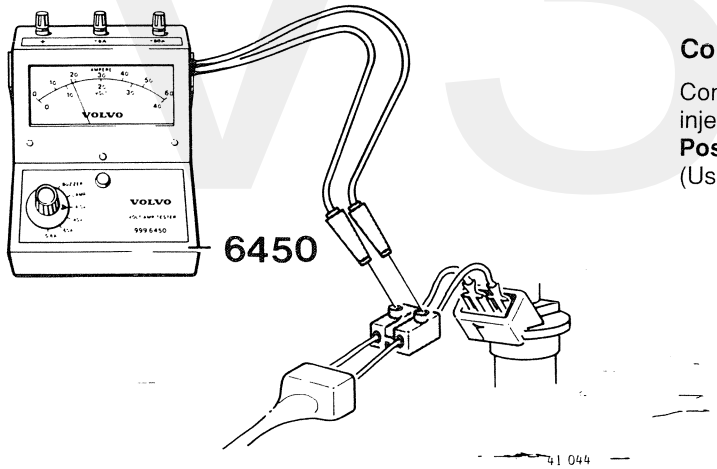
If the pressure drop is more: see Operation *SS8.*
If the residual pressure continues to fall, check the injectors for leakage.

Fit the control relay back in the connector.

RR13-RR19. Checking the system functions for correct operation

Special tools: 6450

Note: the indicated values apply to a system check conducted with an initial engine temperature of approx. 20°C.

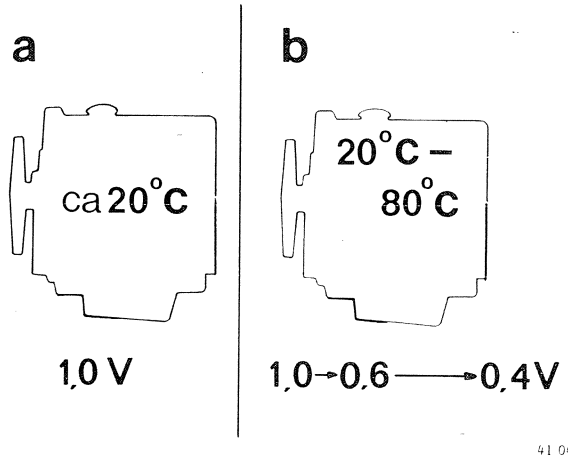


41 044

RR13

Connect voltmeter 6450 to an injector

Connect voltmeter **6450** across the pins of one of the injectors.
Positive (+) to the blue terminal.
(Use an adaptor as shown here).

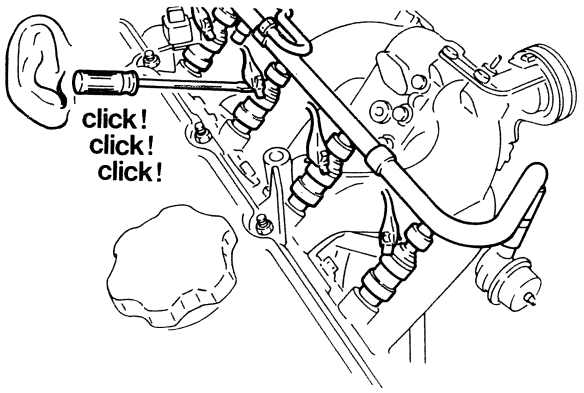


41 045

RR14

Measure the voltage immediately after starting and during the warming-up period

Start the engine.
a) Immediately after starting, the voltage should be approx. 1V (cold engine).
b) During the warming-up period the voltage should drop fairly quickly to 0.6 V and then decrease slowly to 0.4 V (hot engine).



41 046

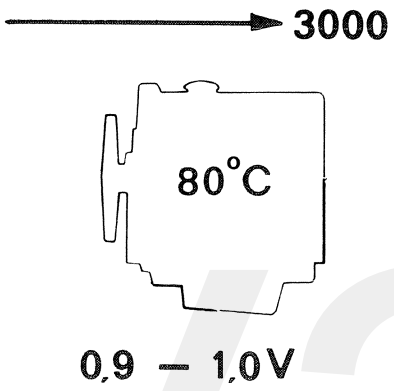
RR15

Check the injectors for correct operation

If the engine runs **erratically**, check all the injectors for correct operation.
Hold a screwdriver or stethoscope **against the injector housing**. The injectors should make a distinctly audible clicking noise.

Clicking noise cannot be heard: see Operation *SS9*.

Clicking noise can be heard and the engine runs erratically at idle: see Operation *SS10*.

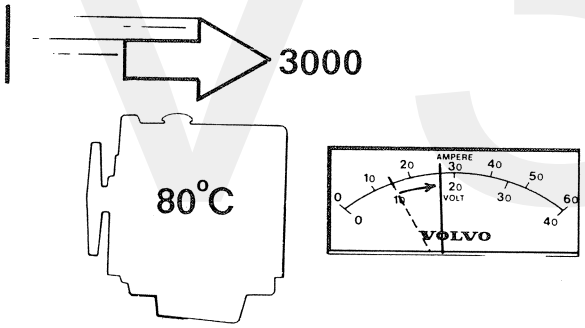


41 047

RR16

Check the voltage at the injectors at engine speeds up to 3,000 r/min.

When the engine has reached its operating temperature, slowly increase the engine speed to **3,000 r/min**.
The voltage should then rise to 0.9-1.0 V.

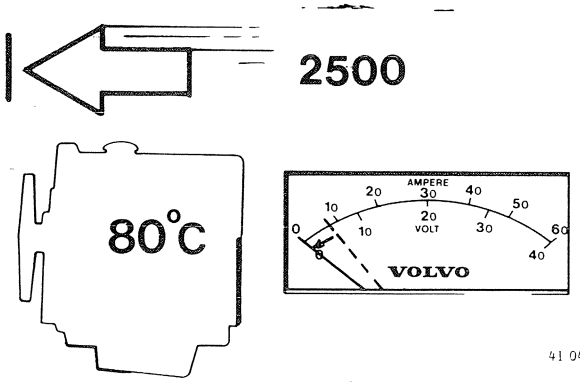


41 048

RR17

Check the voltage at the injectors during acceleration

Let the engine speed drop back to idle and then raise it **quickly** to **3,000 r/min**.
The voltage should then be momentarily **higher than 0.9-1.0 V** (depending upon the speed of acceleration) and should then decrease to 0.9-1.0 V.



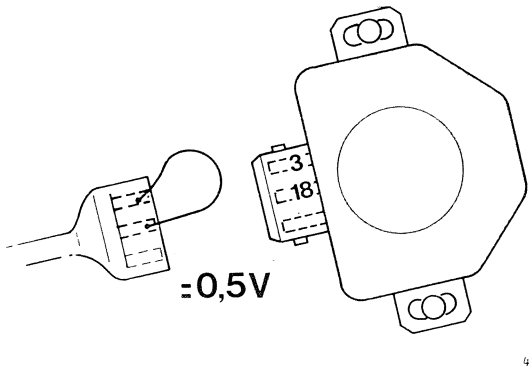
41 049

RR18

Check the deceleration system (during deceleration)

Let the engine speed drop **suddenly** from approx. 2,500 r/min.
The voltage should now decrease to zero until the engine speed has dropped below 1,300-1,400 r/min. After this the voltage should regain its idling speed level of 0.4 V.

Voltage does not drop to 0 V: see Operation *SS11*.



41 050

RR19

Check the full-load enrichment

Unplug the connector from the throttle butterfly switch. Bridge connector terminals 3 and 18: the voltage at the injectors should now rise approximately **0.1 V**.

No voltage rise: check the wiring that runs to the ECU (see Operation *RR24*).

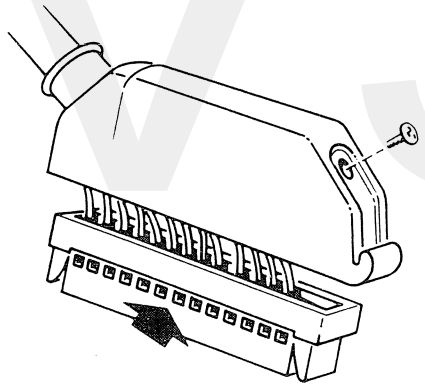
If the wiring is in order: renew the ECU.

Plug the connector back on to the injector.

RR20-RR27. Checking the signals received by the ECU connector

Special tools: 5280, 6450

CAUTION: Switch off the ignition before unplugging the connector from the ECU!



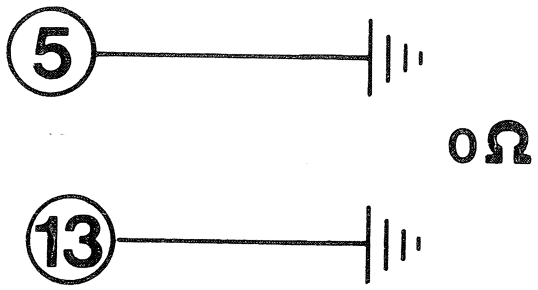
41 051

RR20

Unplug the connector from the ECU

Remove the left-hand access panel from the centre console.
Unplug the connector from the ECU. (If this is difficult to do: see Operation *UU1*).
Remove the cap from the connector.

Important!
- **Never** check the terminals via the front end of the connector. Experience has shown that this can damage the terminals and possibly cause failures.
- Check the terminals via the holes in the side of the connector; do this carefully to avoid damaging the contacts.
- The numbers of the terminals are shown on the side of the connector.

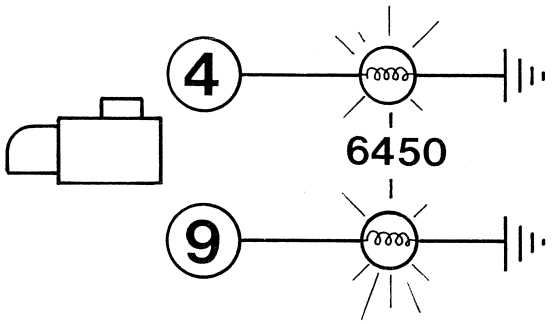


41 052

RR21

Check earth points 5 and 13

Check earth points **5** and **13** with an ohmmeter.
Measure the resistance between 5 and earth and between 13 and earth.
The test value should be **O ohms**.



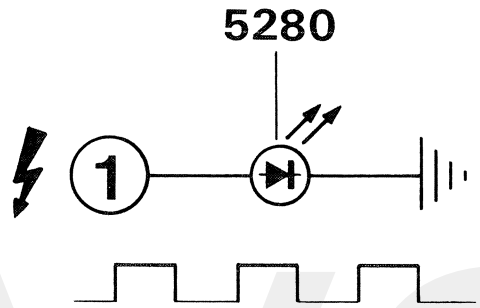
41 053

RR22

Check the voltage while the starter motor is in operation

Check the voltage feed, **while the starter motor is turning over**, with special tool **6450**.

Measure between the following terminals:
4 and **earth**: the lamp should light up.
9 and **earth**: the lamp should light up.

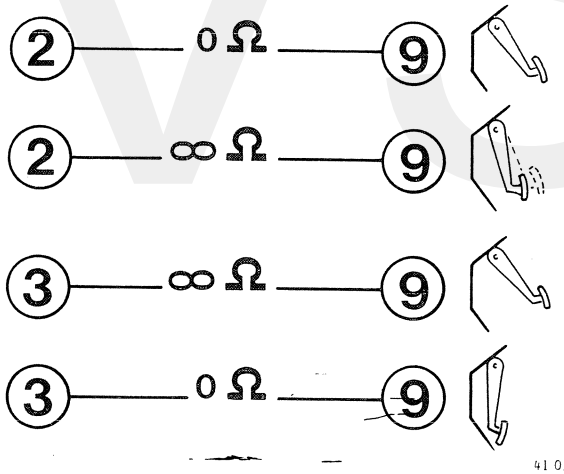


RR23

Check the ignition signal

Check the ignition signal with special tool **5280** (LED).
Measure between terminal **1** and **earth**.
Start the engine.
The test lamp should now flash.

If the test lamp does not flash or light up: see Operation *RR3*.



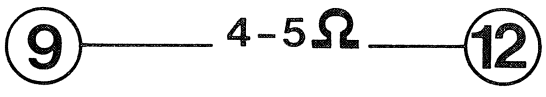
41 055

RR24

Check the operation of the throttle butterfly switch

Check the operation of the throttle butterfly switch with an ohmmeter.
Measure between terminals **2** and **9**: the test value should be 0 ohms.
Slightly depress the accelerator pedal: the resistance should be infinite.
Measure between terminals **3** and **9**: the resistance should be infinite.
Depress the accelerator **fully**: the test value should be 0 ohms.

If incorrect: see Operation *SS11*.

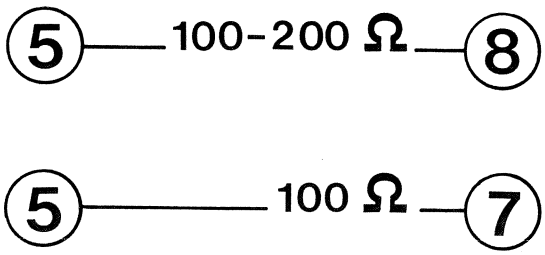


41 056

RR25

Check the resistance of the injectors

Check the resistance of the injectors with an ohmmeter.
Measure between terminals **9** and **12**: the test value should be **4** to **5 ohms**. If the test value is incorrect, this indicates bad connections; or one or more of the injectors are defective. In that case check all connectors and injectors.
Correct resistance of each injector:
15-17.5 ohms at approx. +20°C.
17-19 ohms at approx. +80°C.

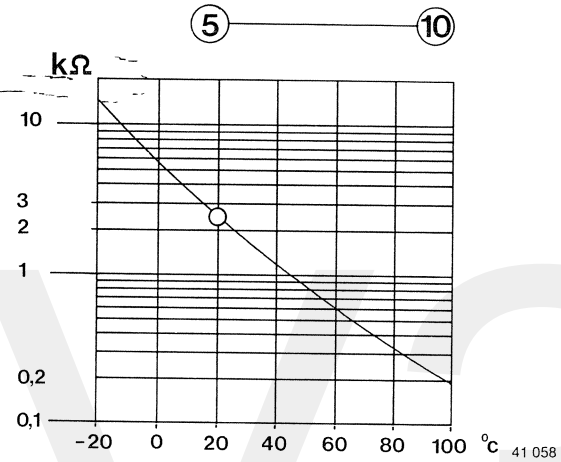


41 057

RR26

Check the resistance of the air mass meter

Check the operation of the air mass meter with an ohmmeter.
Measure between terminals **5** and **8**: the test value should be approx. **100-200 ohms**.
Measure between terminals **5** and **7**: the test value should be approx. **100 ohms**.
If a test value is incorrect: check the wiring according to the wiring diagram.



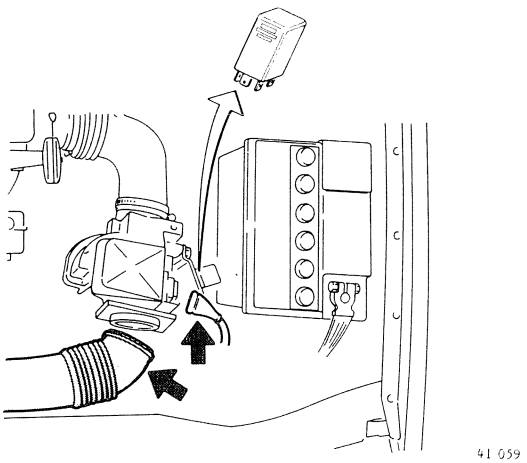
41 058

RR27

Check the resistance of the coolant temperature sensor

Check the coolant temperature sensor with an ohmmeter.
Measure between terminals **5** and **10**.
Resistance should be **2 to 3 kilo-ohms** at +20°C.
For other resistance values, refer to the adjacent graph.
Plug the connector back on to the ECU. (If this is difficult to do: see Operation *UU1*.

RR28-RR35. Testing the air mass meter

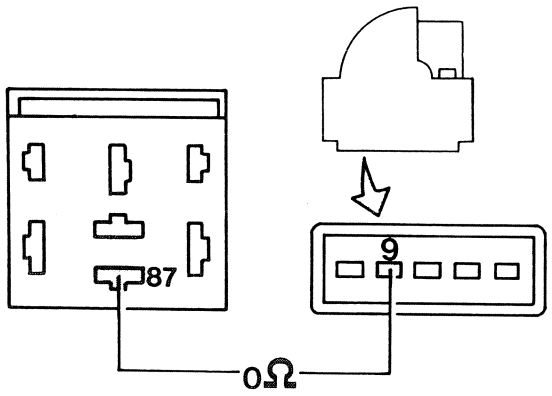


41 059

RR28

Remove the air supply hose and connector

Disconnect the air supply hose and unplug the connector from the air mass meter.
Remove the control relay.

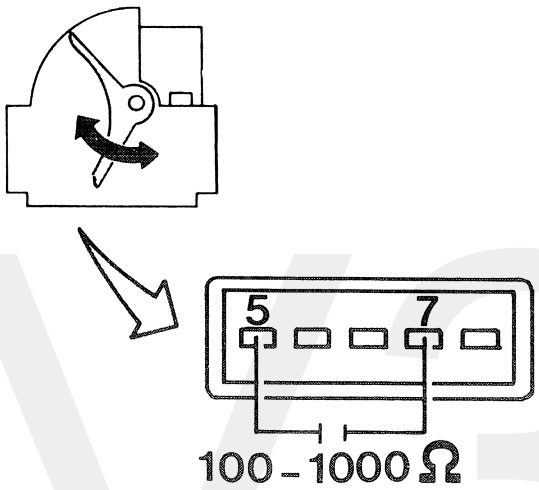


41 060

RR29

Check the wiring between the control relay and the air mass meter

Measure the resistance between terminal **87** of the control relay connector and terminal **9** of the air mass meter connector.
Resistance should be **0 ohms** (meter shows maximum deflection).

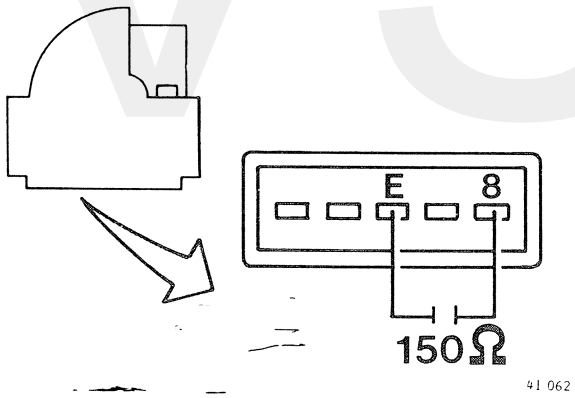


41 061

RR30

Check the variable resistor of the air mass meter

Move the air valve of the air mass meter up and down and measure the resistance between terminals **5** and **7**.
Resistance should vary between **approx. 80 ohms** (rest position) and **1000 ohms** (maximum travel).

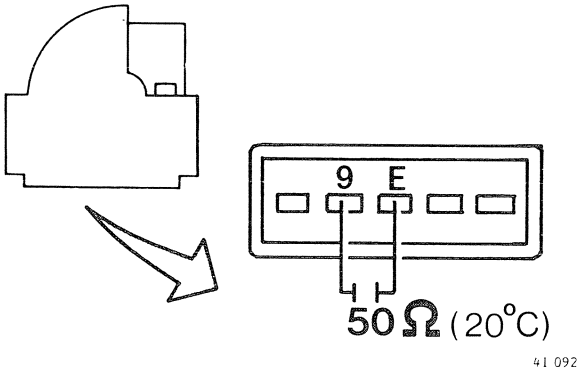


41 062

RR31

Check the fixed resistor of the air mass meter

Measure between terminals **8** and **E** of the air mass meter.
Resistance should be approx. **150 ohms**.

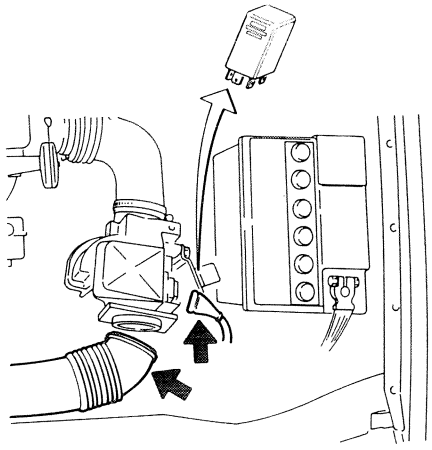


41 092

RR32

Check the temperature transmitter in the air mass meter

Measure between terminals **9** and **E** of the air mass meter (N.T.C.).
Resistance should be **50 ohms** at **+20°C**.
To measure the resistance at other temperatures, the temperature of the transmitter can be raised with a blow-drier or lowered with compressed air.


41 059

RR33

Check the mechanical condition of the air valve.

Check the mechanical condition of the air valve:
- it should not be damaged or bent out of true;
- it should move smoothly up and down;
- it should return smoothly to its neutral (rest) position).

RR34

Fit the air supply hose, the connector and the control relay

RR35

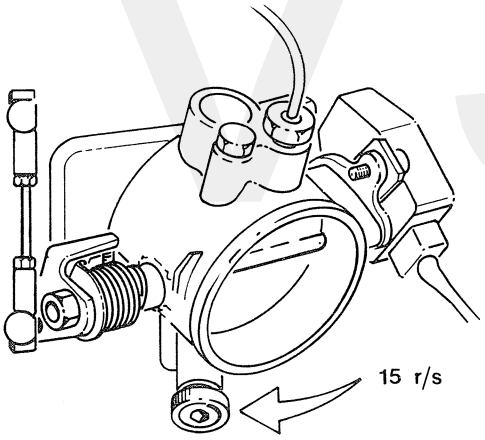
Checking the CO-content and idling speed

Co-content:

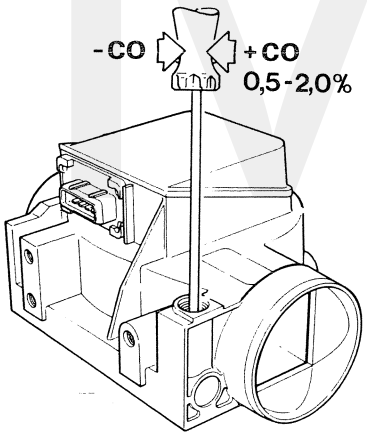
when adjusting.....	1% (Pulsair system blanked off)
when checking.....	0.5-2.0% (Pulsair system blanked off)
idling speed...	15 r/s (900 r/min)

Note: If the engine still fails to run (properly) after finishing the complete check of the LE-Jetronic system, and when all defects have been remedied, the ECU will have to be renewed.

In the case of excessive deviation from the specified CO-content: check the injectors and the cold-start injector for leakage.



20 078

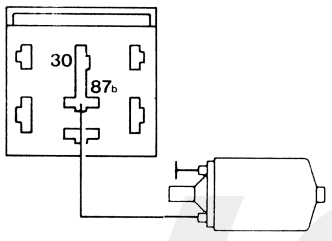


20 079

SS1-SS11. Checking the component parts

Special tools: 5280, 6450

This section describes in detail the malfunctions listed in section *RR*, in order to determine the exact cause of these malfunctions. The malfunction in question is therefore stated in the heading of each operation.



41 914

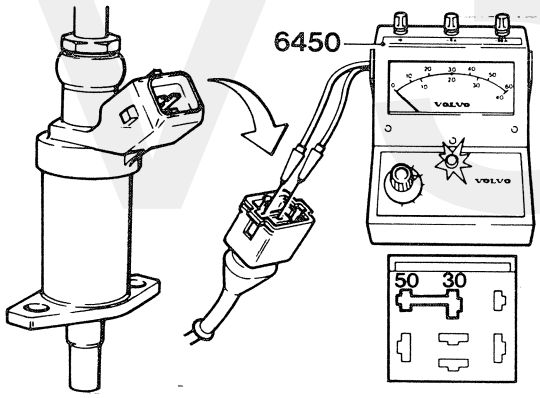
SS1

Fuel pump does not work

- check the fuse for the fuel pump in the fuse block behind the battery;
- bridge terminals **30** and **87b** of the control relay connector (remove the relay) and check the voltage (12V) at the fuel pump while starting;
- check the earth connections.

If the voltage and the earth connections are in order, but the fuel pump does not work: renew the fuel pump.

Fuel pump works but no voltage reading is obtained: check the wiring and the fuse and/or renew the relay.



41 923

SS2

Cold-start injector does not work

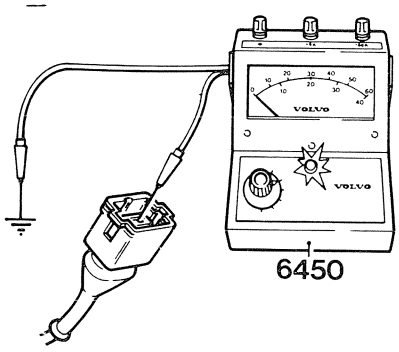
Unplug the connector from the cold-start injector and connect it to special tool **6450**.
Remove the relay.
Bridge terminals **30** and **50** of the control relay connector: the test lamp should now light up for a few seconds, depending upon the temperature of the engine.

Lamp does not light up: unplug the connector from the cold-start injector and connect special tool **6450** to the blue/yellow cable and to earth.
Bridge terminals **30** and **50** of the control relay connector.

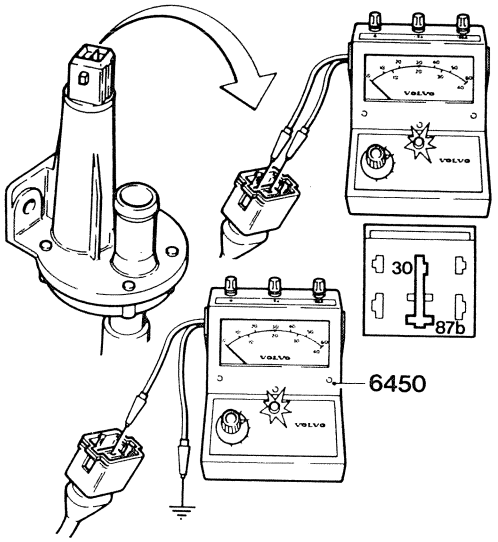
Switch on the ignition.

Lamp lights up for a few seconds: the wiring running to the thermal time switch is interrupted, or the thermal time switch itself is defective.

Lamp does not light up: the blue/yellow cable to the cold-start injector is interrupted.



41 924



41 922

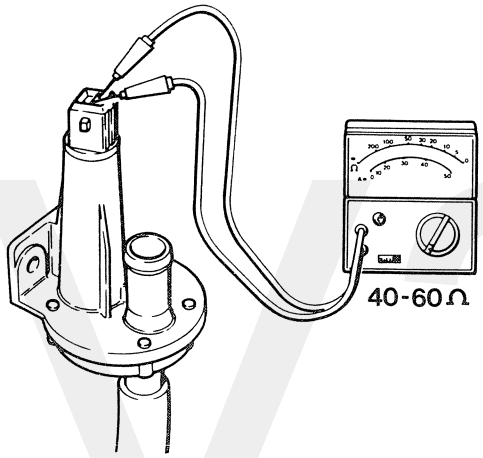
SS3

Auxiliary air valve does not close

Unplug the connector from the auxiliary air valve and connect it to special tool **6450**. Bridge terminals **30** and **87** of the control relay connector.
Switch on the ignition: the test lamp should now light up.

If the lamp does not light up:
- check the earth connection;
- check the voltage between the blue cable of the connector and earth.

Lamp still does not light up: wiring interrupted (see the wiring diagram).

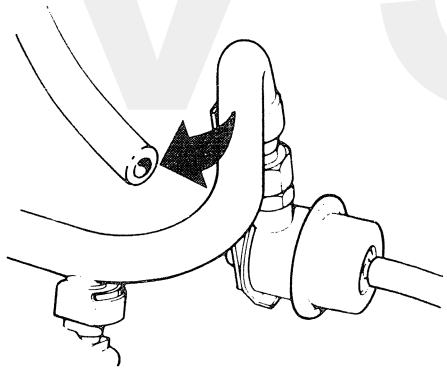


41 917

SS4

Check the resistance of the auxiliary air valve

Measure with an ohmmeter the resistance between the pins of the auxiliary air valve.
Resistance should be **40-60 ohms**.



41 065

SS5

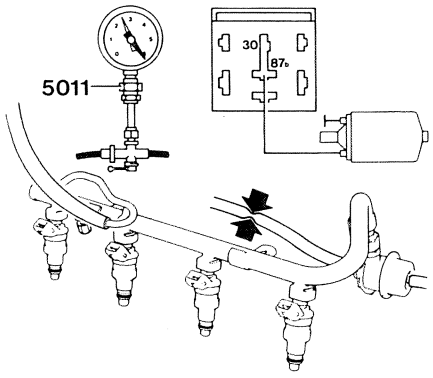
Line pressure is too high

Disconnect the return line from the pressure regulator.
Blow into the return line.
If it is open: renew the pressure regulator.
If it is blocked: remove the blockage or renew the return line.

SS6

Line pressure is too low

Check the fuel level in the tank.
Check the fuel system for leakage.
Check the pressure regulator: see *RR11*.
Take the necessary corrective action.



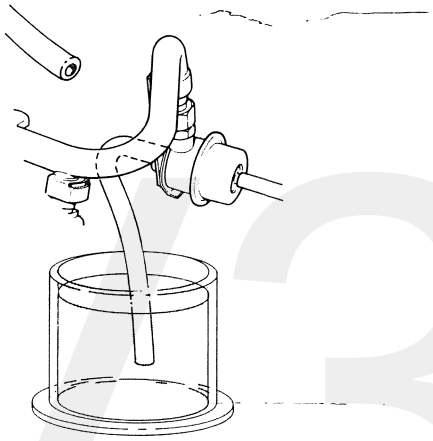
41 066

SS7

Check the capacity of the fuel pump

Actuate the fuel pump by bridging terminals **30** and **87b** of the control relay connector. Pinch off the return line **very briefly** (with a clamp). There should be an immediate and substantial increase in line pressure.
Note:
- the line pressure must not rise above **600 kPa**;
- for connecting up the pressure gauge, see Operation *RR9.*

Inadequate capacity:
- check for possible voltage loss at the pump;
- blocked filter;
  Note: if the filter has been fitted facing in the wrong direction, **never** reverse it to face in the correct direction: it must always be renewed.
- lines are blocked;
- pressure relief valve in pump is defective (renew the pump).



41 067

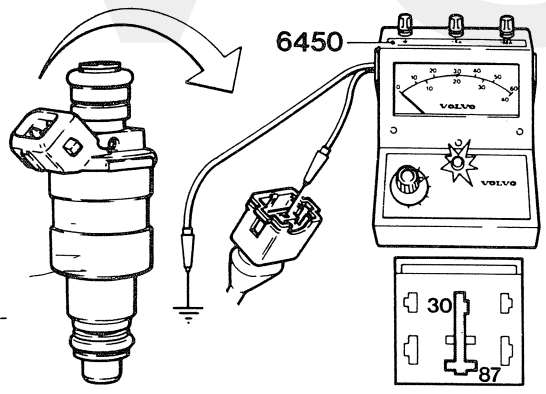
SS8

Check the fuel pump delivery

Disconnect the return line from the pressure regulator. Connect a hose to the pressure regulator and insert the open end in a graduated beaker with a minimum capacity of 1 litre.
Actuate the pump by bridging terminals **30** and **87b** of the control relay connector and note the time it takes to pump **1 litre** of fuel into the beaker. The maximum permissible time for this is **30 seconds**.

Delivery is adequate: renew the pressure regulator.

Delivery is inadequate: see Operation *SS7.*



41 068

Check the injectors (SS9-SS10)

SS9

One or more injectors do not click

Switch off the engine. Unplug the connectors from the injectors and measure the resistance of each injector.
15-17.5 ohms at approx. 20°C.
17-19 ohms at approx. 80°C.

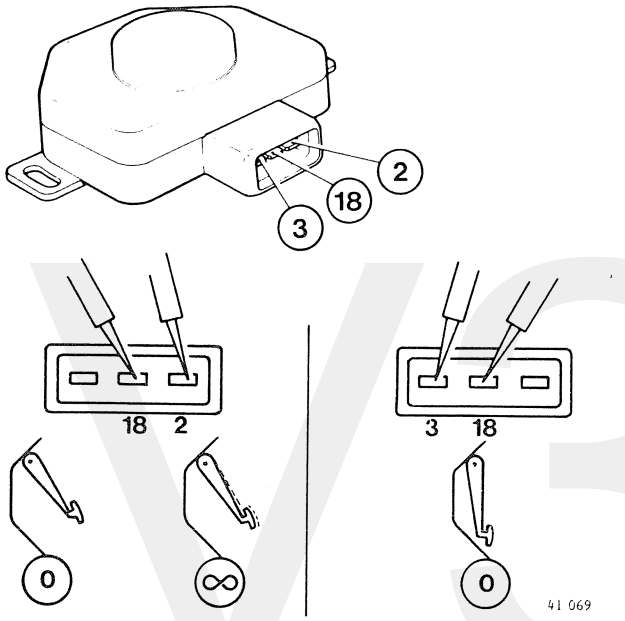
Test value incorrect: renew the injector.

Test value correct:
Bridge terminals **30** and **87** of the control relay connector.
Check the voltage with special tool **6450** between the blue cable running to the injector and earth on the manifold.
Lamp lights up: check the blue-white cable running to the ECU in accordance with the wiring diagram.
Lamp does not light up: check the blue cable running to the control relay connector

SS10

Injectors make a clicking noise but the engine runs erratically at idle

Run the engine at idling speed.
Unplug the connectors from the injectors one by one: the engine speed should drop each time a connector is unplugged.
If the engine speed does not drop: the injector in question is defective.
If the engine speed does drop, carry out a complete check of the LE-Jetronic system (see Operations *RR1-RR35*).



SS11

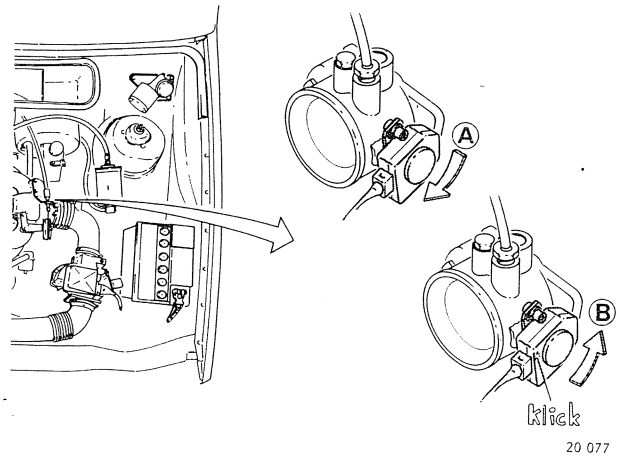
Check the throttle butterfly switch

Unplug the connector.
Measure with an ohmmeter the resistance across terminals **2** and **18**.
With the throttle butterfly in the idle position the resistance should be **0 ohms**.
When the throttle butterfly is slightly open the resistance should be infinite (the ohmmeter gives no reading).
If necessary, adjust the throttle butterfly switch.

If this does not help: renew the throttle butterfly switch.
Now measure the resistance between terminals **3** and **18**.
With the accelerator pedal fully depressed the resistance should be **O ohms**.
If necessary, adjust the throttle butterfly switch.

If this does not help: renew the throttle butterfly switch.

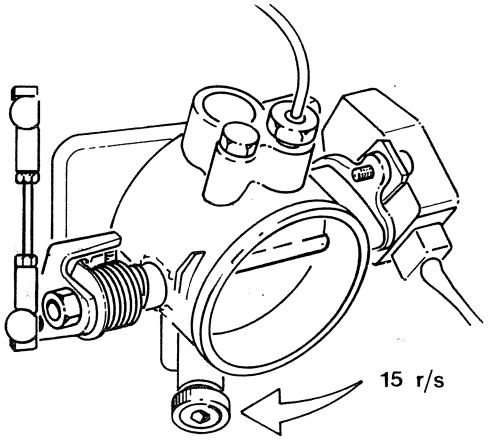
TT1-TT4. Adjusting the LE-Jetronic system



TT1

Adjusting the throttle butterfly switch

Slacken the two retaining bolts.
Turn the throttle butterfly switch first clockwise (A), and then slowly counter-clockwise until a click is heard (B).
Tighten the throttle butterfly switch in this position. (The clicking noise is caused by a microswitch).
Check: the click should be heard with the slightest angular displacement of the throttle valve spindle.

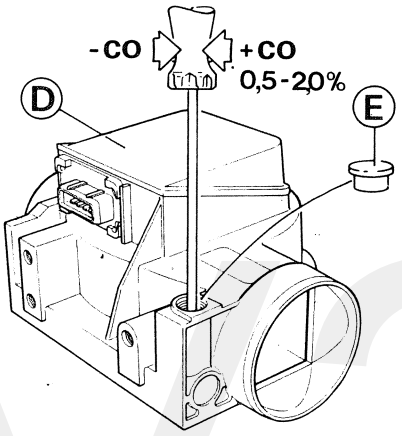


20 078

TT2

Adjusting the idling speed

The idling speed can be regulated with the idle adjustment screw (C) at the bottom of the throttle valve housing. The correct idling speed is 15 r/s (900 r/min).

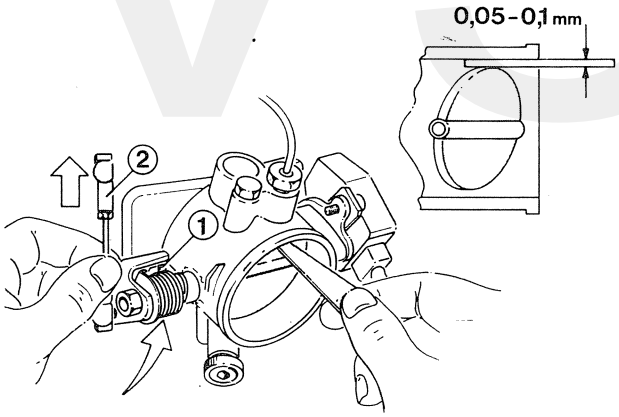


20 079

TT3

Adjusting the CO-content

The CO-content of the exhaust gases is adjusted with the CO adjustment screw in the air mass meter (D).
To adjust the CO-content, first remove the tamper-proof cap seal (E) and blank off the Pulsair system (if fitted).
Turning the adjustment screw clockwise increases the CO-content; turning counter-clockwise reduces it.
When adjusting the CO-content it should be set at **1 %**.
When checking the CO-content the tolerance range is **0.5-2.0%**.
Fit a new tamper-proof seal after adjusting the CO-content.
In the case of excessive deviation from the specified CO-content: check the injectors and the cold-start injector for leakage.



20 080

TT4

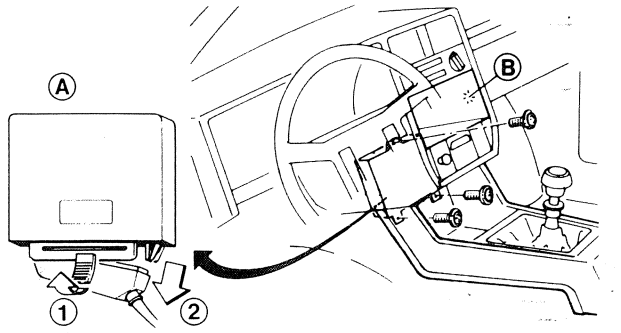
Basic setting of the throttle butterfly valve

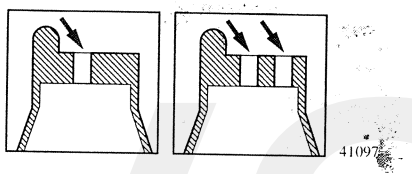
If the engine still does not run properly after the previously mentioned adjustments have been carried out, you will have to check the basic setting of the throttle valve. This basic setting is done at the factory and can really only change through scoring or wear of the adjustment screw (1) or through wear of the throttle valve spindle.

The check is carried out as follows. Slightly raise the connecting rod (2) so that the throttle valve opens. Insert a 0.05 mm feeler gauge at the top between the throttle valve and the throttle valve housing and then release the connecting rod (2). It should now be possible to move the feeler gauge easily between these parts.
Repeat this procedure with a 0.1 mm feeler gauge. This time it should not be possible to move the feeler gauge between the throttle valve and the throttle valve housing.
Any necessary adjustments can be made with the adjustment screw (1).

UU1-UU6. Removing/fitting component parts of the LE-Jetronic system

Special tools: 2901

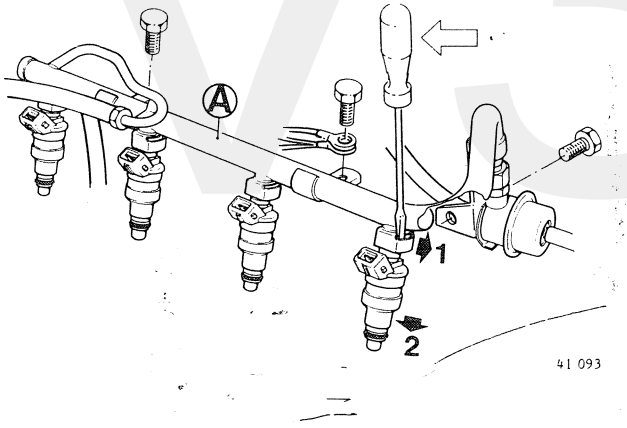




UU1

Removing/fitting the Electronic Control Unit

Switch off the ignition.
Remove a side panel from the centre console.
Unplug the connector from the ECU (A): push in the locking tab (1) and take out the connector (2).
Remove the blanking plate or radio (B).
Remove the three screws: two via the holes in the console and one via the radio compartment.
Note: from chassis No. 813199 the upper attachment of the ECU was modified with a simple 'snap-lock' fitting. In this case it is no longer necessary to remove the blanking plate or radio.
The ECU is fitted in reverse order to removal.
Note: make sure that the locking tab is properly located. If this should be difficult to do, make an extra groove in the connector (see drawing).

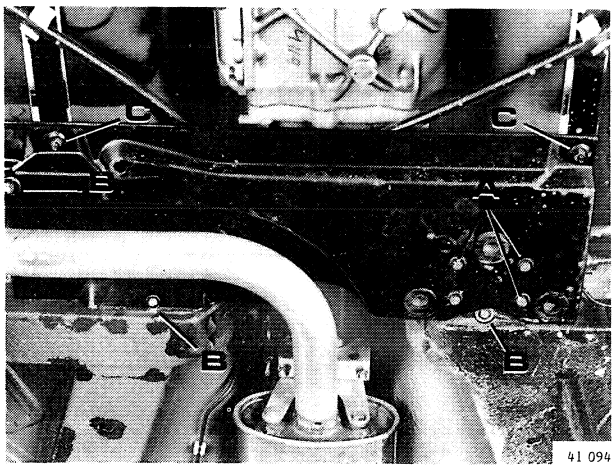


UU2

Removing/fitting the injectors

To remove the injectors, the injection manifold (A) has to be released from the inlet manifold.
Do this by removing the three retaining bolts and raising the injection manifold together with the injectors.
Then disconnect the earth leads.
Remove the sliding clips sideways (1) and pull the injectors out of the injection manifold (2).

The injectors are fitted in reverse order to removal.
Note: if necessary, renew the O-ring seals and check for leakage. (Lightly grease the O-ring seals before fitting.)
Connect up the earth leads.

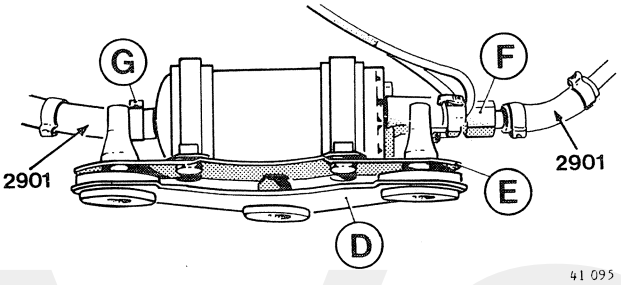


Removing/fitting the fuel pump *(UU3-UU5)*

UU3

Remove the heat shield

Remove the four bolts (A) from the pump and the three self-tapping screws (B) and two nuts (C).
Remove the heat shield.



UU4

Remove the baseplate

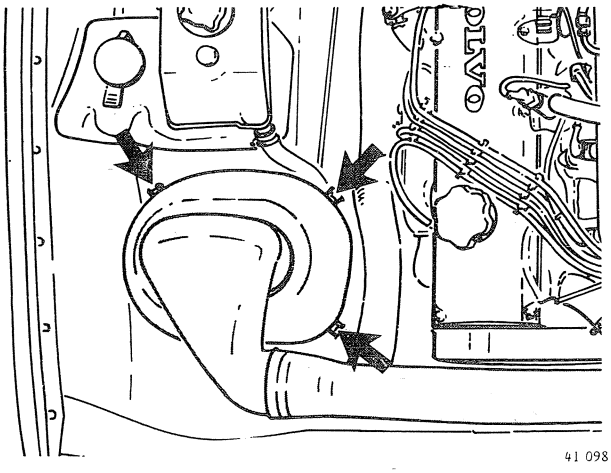
Pull the baseplate (D) out of the rubber mounts in the support plate (E).

UU5

Remove the fuel pump

Disconnect the wiring.
Pinch off the fuel hose at both sides of the fuel pump with clamp **2901**.
Release the union nut (F) and cut through the hose clip (G).
Release the two mounting clamps and remove the fuel pump.

The pump is fitted in reverse order to removal.
Note: always use a new hose clip (G).
Fit the fuel pump in the correct position on the support plate (E).
Take note of the direction of flow of the fuel.
Check for correct operation and also check for leakage. Make sure that the fuel lines are not kinked!
When connecting the wiring, make sure that the positive and negative leads are properly connected.



UU6

Remove the air filter (complete assembly)

Remove the header assembly with connecting pipe from the air filter.
Pull the air filter assembly up and off the rubber mounts.

Fitting is in reverse order to removal.

VV1-VV5. Removing/installing the fuel tank, B19/B200

VV1

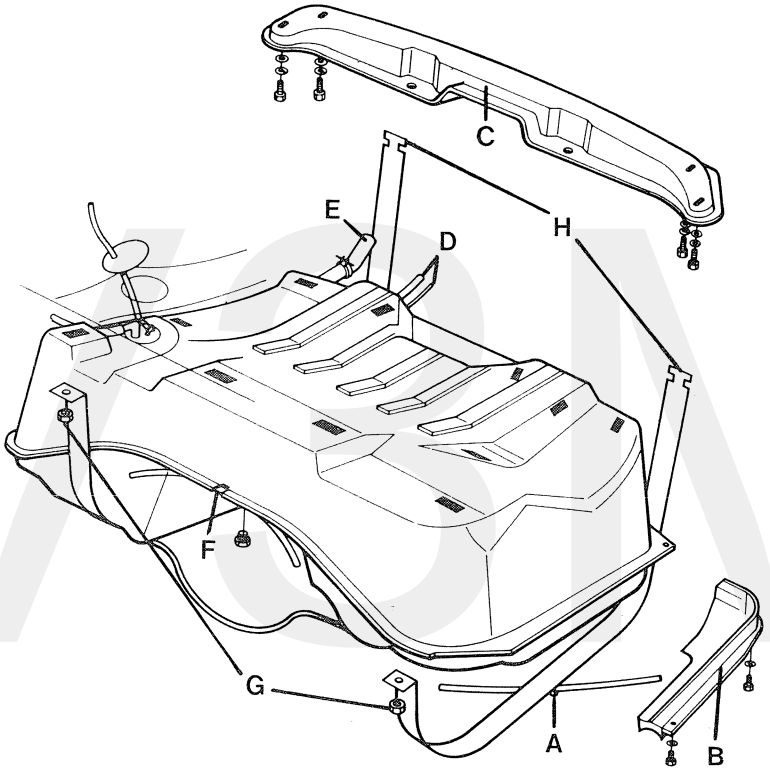
Drain the fuel from the tank

Via the drain plug at the bottom of the tank.

VV2

Remove the transaxle unit

See the relevant Service Manual.



41 440

VV3

Removal

- Remove the cover under the rear seat and disconnect the hoses andelectrical connections from the tank transmitter unit.
- Release the left-hand handbrake cable from the clip (A) on the fuel tank.
- Remove the left-hand heat shield (B) from the fuel tank.
- Remove the cross member (C).
- Disconnect both hoses (D) from the fuel tank.
- Disconnect the filler hose (E).
- Take the fuel hose (F) out of the clips at the front of the fuel tank.
- Support the fuel tank and remove the nuts (G).
- Unhook the mounting straps (H) from the body at the rear and remove the tank.

VV4

Renew or transfer component parts of the fuel tank

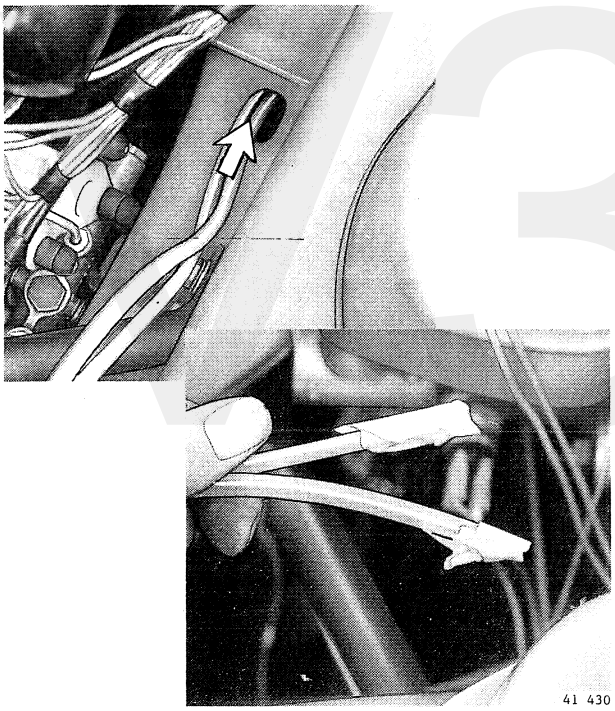
VV5

Installation

Installation is in reverse order to removal.
Note
- Always use new hose clips on the tank transmitter unit.
- Fill the fuel tank.
- Check for leakage.
- Check the operation of the fuel gauge.

WW1. Renewing the fuel lines

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



WW1

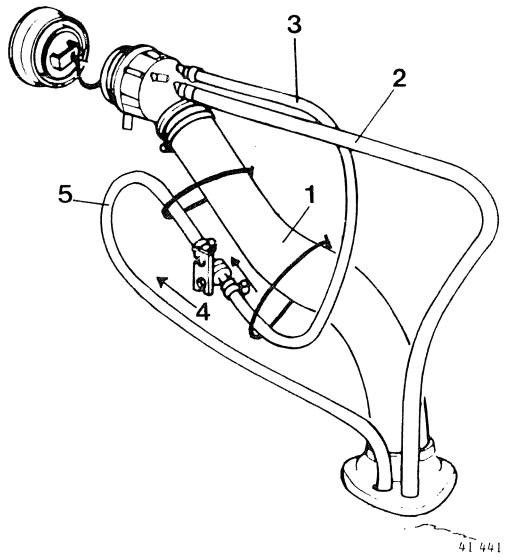
Fuel lines

When fitting the fuel lines, they are routed through the body side members to the rear.
To prevent dirt from entering the lines the ends must be sealed with tape beforehand.

XX1-XX5. Renewing the filler neck and petrol filler cap

1 Fuel tank filler neck and petrol filler cap, B19/B200
2 Check valve, B19/B200
3 Three-way valve for float chamber ventilation B19/B200

With effect from chassis number 614696 (B19) the filler neck and petrol filler cap on the fuel tank were modified. For earlier production models a modified version of the new filler neck/petrol filler cap is supplied for Service purposes. As a result, a check valve has to be fitted in the breather hose when this modified version is installed.



41 441

XX1

1 Remove the filler neck

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

XX2

Fit the filler neck

Position the rubber seal.
Locate the filler neck in the rear wing.
Apply firm pressure to the filler neck until it clicks into position.

XX3

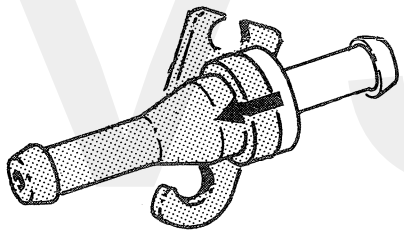
Connect up the pipe and hoses.

IMPORTANT! Use hose clips on all pipe/hose connections.

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

IMPORTANT! Note the directional arrow on the check valve housing.

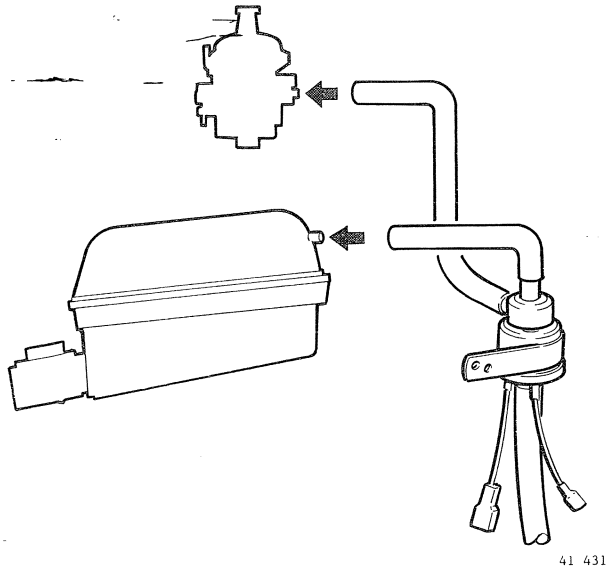
Connect the other hose (5) to the check valve (the hose is already in place on the car).
Secure the check valve in the correct position to the filler pipe with two tie-fasteners.


41 421

XX4

2 Check valve, B19/B200

Correct direction of flow
The arrow on the black upper part of the check valve indicates the correct direction of flow.
The directional arrow must point towards the discharge opening of the overflow hose (to atmosphere).


41 431

XX5

3 Three-way valve for float chamber ventilation, B19/B200

CAUTION! Incorrect connection of the hoses leads to abnormally high fuel consumption. The correct way of connecting the hoses is shown in the adjacent illustration.

Group 25. Inlet and exhaust system

YY1. Removing/fitting the inlet and exhaust system

Risks to avoid when working on the carburettor
When work is being carried out on the carburettor it is not uncommon for petrol to spill over the engine. If the engine is hot, there will not only be a risk of the petrol igniting but also a health hazard on account of the high benzene content in the surrounding air. **Lead** in petrol also presents 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 commencing work on it.

YY1

Remove/fit the inlet and/or exhaust manifolds

See Operations *D1-D6* for removal and *H1-H8* for fitting the inlet and exhaust manifolds.

YY2-YY4. Renewing the exhaust system

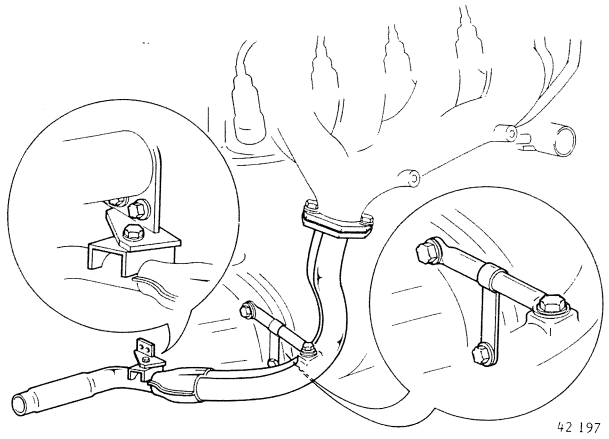
YY2

Fitting the complete exhaust system

It is important to follow the assembly sequence given below in order to ensure stress-free mounting of the exhaust system.

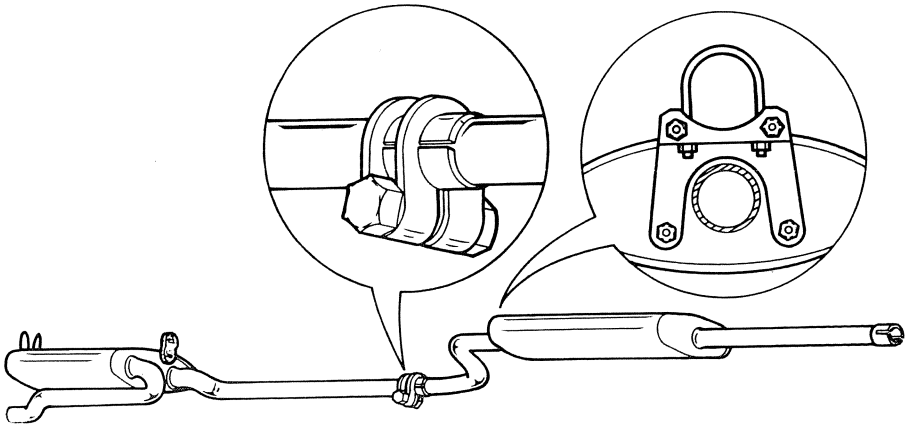
General
- Always use new gaskets.
- The exhaust pipes must overlap approx. 60 mm at their connecting joints.
- There should be a minimum clearance of 25 mm between the exhaust components and the fixed parts of the vehicle body.
- If necessary, renew the rubber mounting straps.
- The exhaust clips must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

YY3



Exhaust downpipe

Release the mounting bracket bolts on the engine and the front flange of the torque tube.
Use a **new** gasket.
Align the exhaust downpipe accurately and fit it finger-tight to the manifold and the mounting brackets.
Tighten the attachment on the manifold.
Secure the downpipe to the mounting brackets.
Tighten the mounting brackets.



42 212

YY4

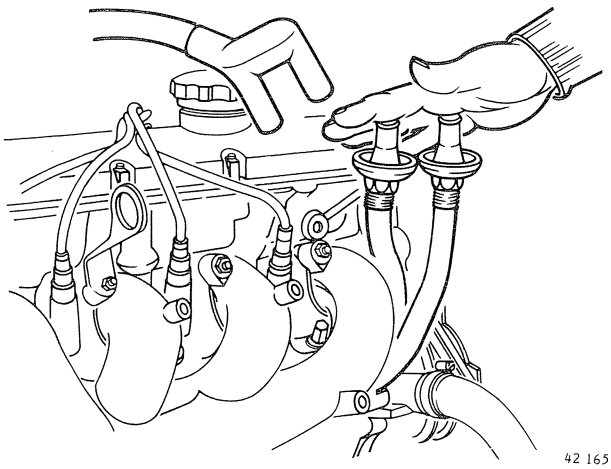
Silencers and exhaust pipes

- Fit the front and main silencers under the car with the clips and mounting straps.
- Align the exhaust system and observe the clearance to the fixed parts of the vehicle body.
- Tighten the exhaust clips.
- Check the system for gas-tightness.

ZZ1-ZZ3. Checking/renewing the Pulsair system, B19/B200

Check:

- that all connections are secure and leak-tight;
- that the hoses are intact.

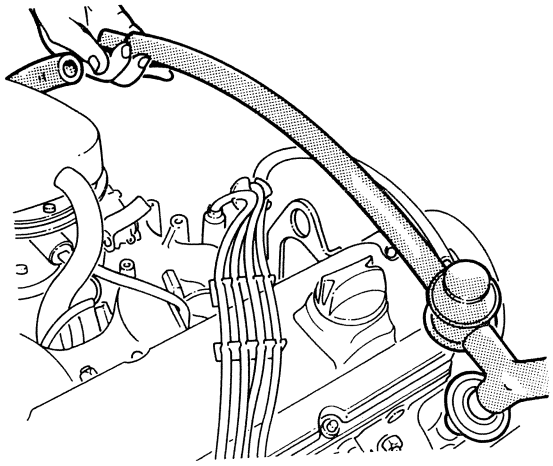


42 165

ZZ1

Check/renew the non-return valves, B19/B200
(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 air being sucked in through the valves.
Non-return valves functioning correctly: continue from Operation *ZZ2*.
If not, renew the non-return valves.

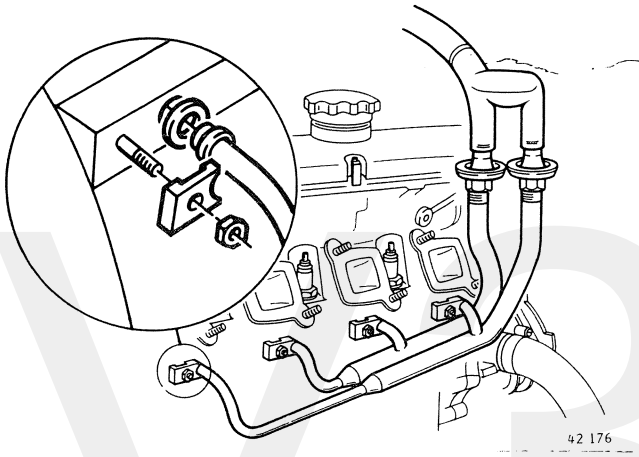


ZZ2

Check the shut-off valve, B200KS (Pulsair system)

The shut-off valve must be checked with the engine running at idle.
- Connect up the CO-tester.
- Disconnect the hose at the air filter (a gurgling noise should be heard).
- Blank off the hose connection; the CO-content should now increase (to approx. 1.5%).

If the valve does not open with the engine running at idle, then the valve is defective.
The valve **should close**, however, when vacuum is applied to the control line of the valve (this simulates braking on the engine).
Note: if the valve does not close, this may result in afterburning in the exhaust system.
Reconnect the hose.

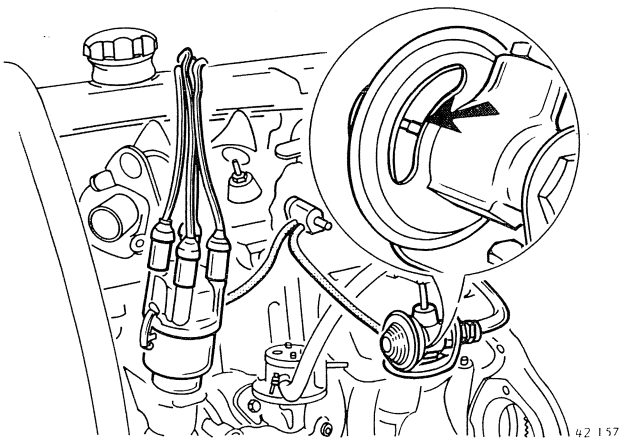


ZZ3

Remove/fit the non-return valves and/or distribution pipes

The illustration shows the component parts of the system.
On B19 and B200 engines the manifold must be removed in order to renew the distribution pipes (under the manifold).

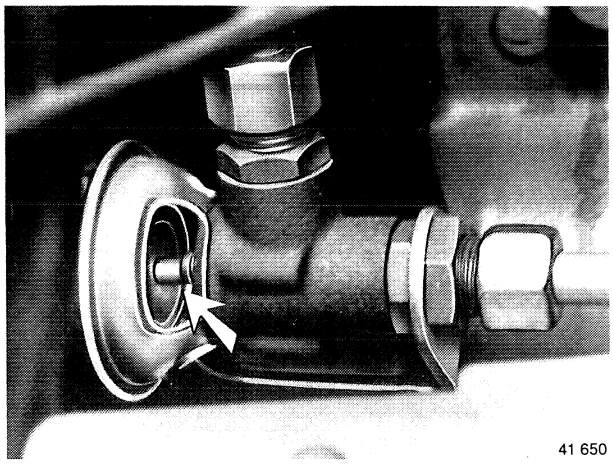
AB1-AB3. Checking/renewing the EGR system, B19/B200



AB1

Check the vacuum valve

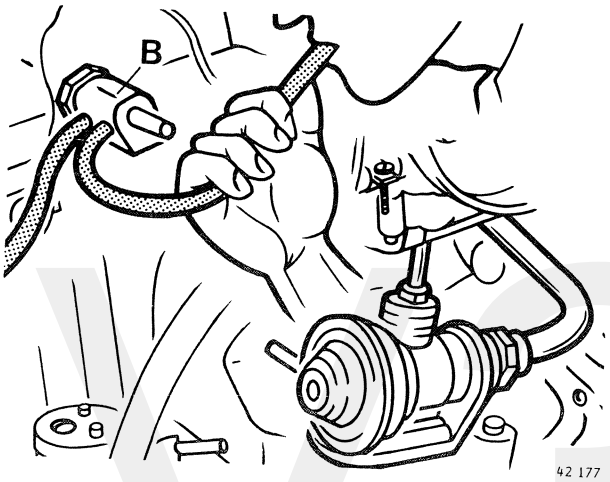
Cold engine, coolant temperature below approx. 65°C
With a cold engine the EGR vacuum valve should be closed at all engine speeds. Raise the engine speed and check whether the vacuum valve stays closed.
Check this by observing the movement of the link rod; see the illustration.
If the vacuum valve opens, this indicates that the thermostat valve is faulty and must be renewed. The thermostat valve should open at a coolant temperature of approx. 64-67°C.



41 650

Hot engine, coolant temperature approx. 65°C
With a hot engine the EGR vacuum valve should open at speeds above idling.
Run the engine warm.
Raise the engine speed and check whether the vacuum valve opens. If the valve does not open, check the hoses, the thermostat valve and the vacuum controlled (Ranco) valve. Run the engine at idle and check whether the vacuum valve closes. If not, disconnect the vacuum hose from the valve. If it still does not close, then the valve is binding. Clean or renew the valve.

AB2

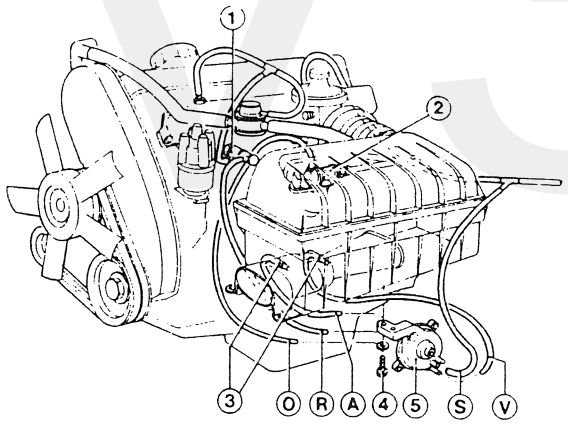


42 177

Check the thermostat valve

Test conditions: engine stationary and coolant temperature at least 65°C.
Disconnect the vacuum hose at the vacuum valve. Blow through the hose to check that the thermostat (B) is open and that the hoses are not blocked.
Check the operation of the vacuum controlled (Ranco) valve.
Connect the vacuum hose from the thermostat valve to the vacuum controlled valve directly to engine vacuum (depression).
Run the engine at idle and check whether the vacuum valve opens.

AB3



EGR system, B19A

With effect from model year 1984, the EGR system was changed to a stepless system.
A vacuum controlled valve (5) regulates the volume of exhaust gases recycled via the EGR valve (2) to the inlet manifold. This is variable and dependent upon engine load and temperature.
The system is activated by the thermostat valve (1) when the coolant reaches a temperature of 65°C. The velocity of the airflow in the intake is also measured (two connections (3)). On the basis of this data the recycling of the exhaust gases is regulated proportionately. The EGR system works only at partial engine load.

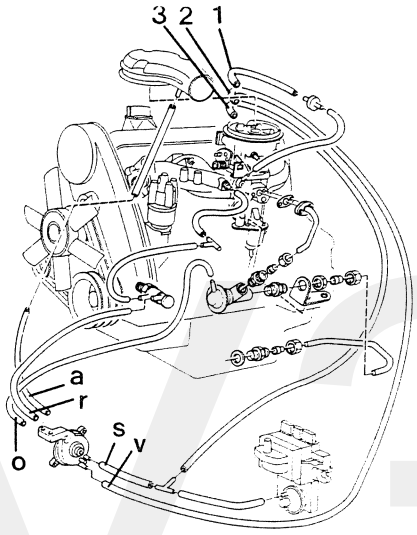
AC. Drawing of EGR system with vacuum booster housing

The vacuum booster housing is secured to the bottom of the air filter by two bolts (4) and can be disassembled after the air filter housing has been removed from the car.
The various hoses have to be connected as shown in the diagram below. The letters correspond to the respective markings on the vacuum booster housing (5).

AC1

EGR system, B200KS

With effect from model year 1985 the vacuum booster connections on B200KS engines were relocated from the air filter to the carburettor; these are connected as shown in the drawing below.



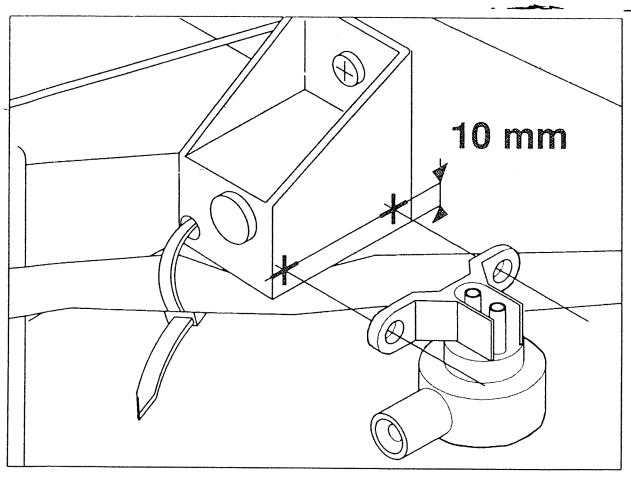
Modified sequence of hoses on B200KS

Hose (1) corresponds to the **red** input on the carburettor.
Hose (2) corresponds to the **green** input on the carburettor.
Hose (3) corresponds to the **black** input on the carburettor.

The letters a, r, o, s and v in the drawing correspond to the same letters on the vacuum booster housing.

AD. Use of load dependent EGR control valve, B200EA

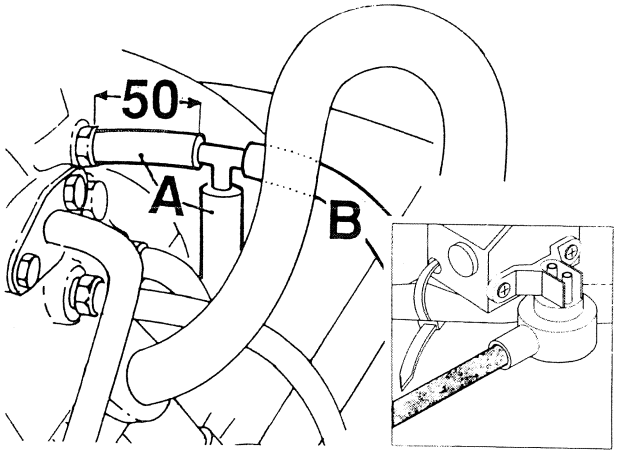
Models with a B200EA engine may give rise to driveability complaints in the form of engine hesitation, especially at low engine speeds and loads.
This hesitant response can be remedied by fitting a load dependent EGR control valve.
Carry out the following operations:



AD1

Fit the control valve

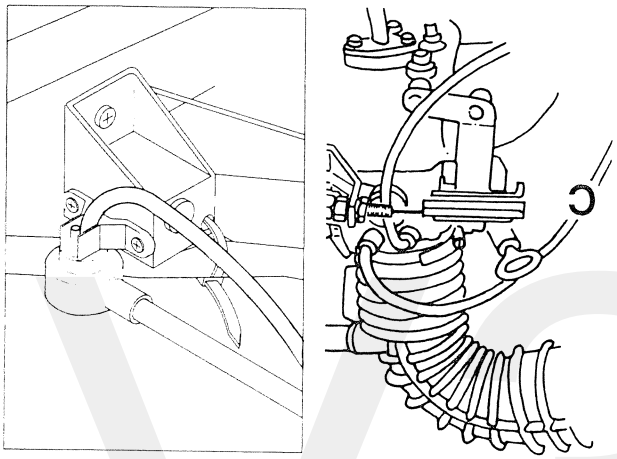
Fit the control valve (Part No. 13676119) on the bracket of the air intake unit as shown in the illustration.



AD2

Connect up the constant vacuum hose

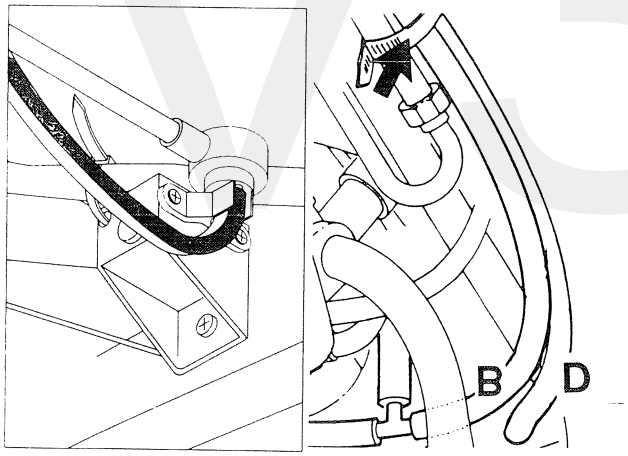
Cut the hose in two (A) and fit a T-piece as indicated.
Slide a new hose (B) over the T-piece and connect it to the lower branch of the control valve (white marking).
Note:
T-piece: Part No. 9490244.
Hose (B): Part No. 9489584, length 600 mm.



AD3

Connect up the vacuum hose

Pull hose C (hose between throttle valve housing and thermostat) off the thermostat valve.
Slide the free end of this hose over the branch of the control valve with the red marking.



AD4

Connect up the new vacuum hose

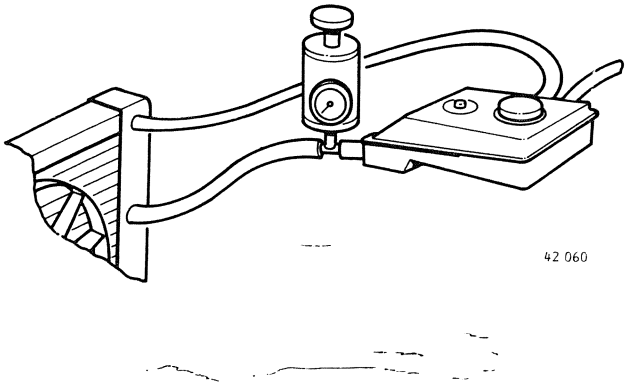
Slide the new hose (D) over the thermostat valve connection.
Pass this hose along hose B towards the control valve.
Slide hose D over the branch of the control valve with the yellow marking.

Note
Hose (D): Part No. 9489584, length 850 mm.

For a neat finish, secure the hoses with tie-fasteners.
This also prevents the hoses from coming into contact with hot components.

Group 26. Cooling system

AE1. Pressure testing the cooling system, B19/B200



AE1

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 petrol 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 remain steady and show no perceptible drop for a period of 30 seconds.

AE2-AE5. Coolant, B19/B200

AE2

Topping-up

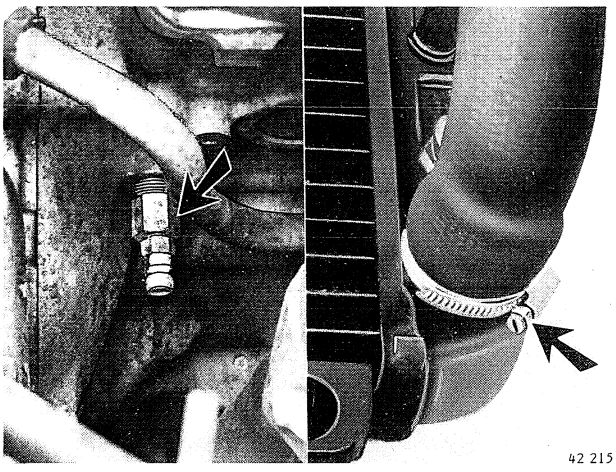
Always use Volvo coolant **type C (bluish-green)** when topping-up the cooling system, in the following proportions:
Nordic countries:
1 part Volvo coolant to 1 part water;
Europe, with the exception of Nordic countries: 1 part Volvo coolant to 2 parts water.

AE3

Changing the coolant

Coolant composition

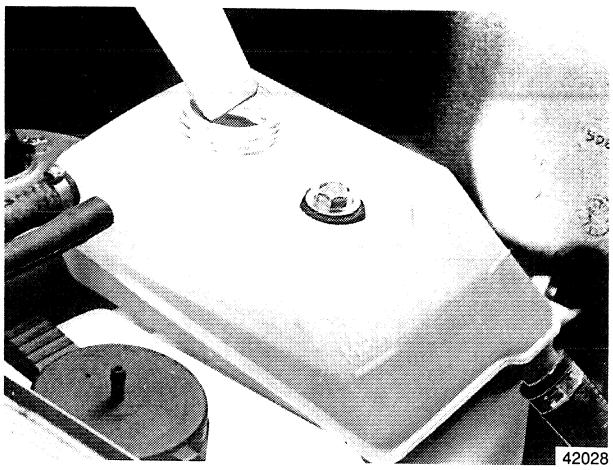
- The coolant should be changed every second autumn. After this period the corrosion-protective additives will have lost some of their effect.
- Never fill the cooling system with water on its own. Always use genuine Volvo coolant diluted with clean water in the ratios given under *AE2*.



AE4

Drain the cooling system

Place a drip tray in position.
Disconnect the radiator bottom hose.
Open the drain tap at the right-hand side of the cylinder block.
Note: close the drain tap after draining the cylinder block.



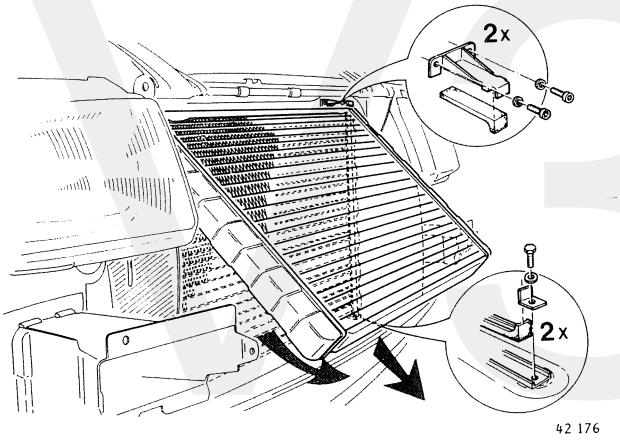
AE5

Fill the cooling system

Remove the pressure cap from the expansion tank and fill the tank up to 'MAX'.
Replace the pressure cap.
Run the engine warm and top-up the coolant level as required.
Check the cooling system for leakage in accordance with Operation *AE1*.
The total capacity of the cooling system is:

B19 up to 1982	litres	8.0
B19 from 1982 onwards/B200	litres	7.0

AE6-AE9. Removing/fitting the radiator, B19/B200



AE6

Drain the cooling system

Disconnect the radiator bottom hose.

AE7

Remove the radiator

Take off the grille and the front bumper.
Disconnect all hoses from the radiator.
Remove the bottom bolts and brackets.
Remove the top bolts and brackets (at the left-hand side first).
Pull the bottom of the radiator forwards and remove it with a downwards movement.

AE8

Fit the radiator

Fitting is in reverse order to removal.
Note: smear the B19 and B200 bottom rubber mountings with petroleum jelly.

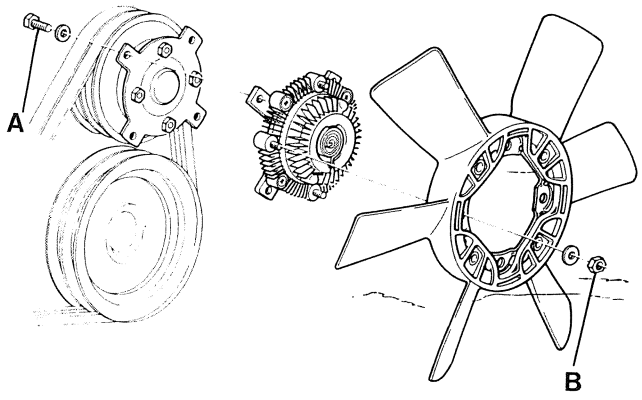
AE9

Fill the cooling system

See Operation *AE2*.

AF1-AF2. Removing/fitting the viscous coupling cooling fan, B19/B200

B19 engines from model year 1984 and all B200 engines are equipped with a visco-clutched engine cooling fan.



42 167

AF1

Remove the viscous coupling fan

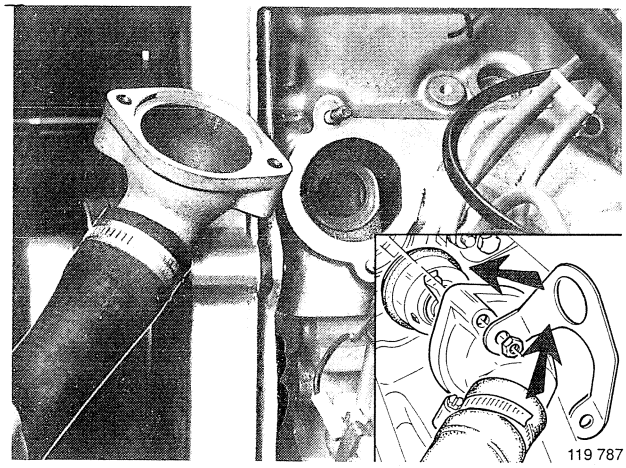
Remove the four retaining bolts (A).
Withdraw the fan from the engine compartment together with the viscous coupling.
The fan can then be separated from the viscous coupling (4 nuts (B)).

AF2

Fit the viscous coupling fan

Fitting is in reverse order to removal.
Tightening torque of retaining bolts and nuts: 9 Nm.

AG1-AG5. Checking/renewing the coolant thermostat, B19/B200



119 787

AG1

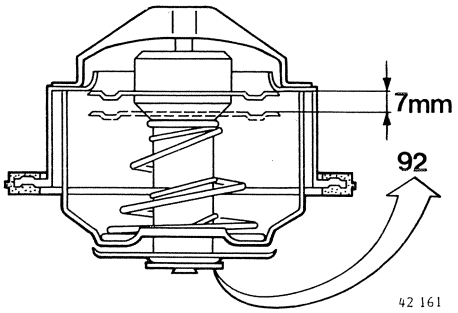
Drain the cooling system

Only the radiator.

AG2

Remove the thermostat

Remove the lifting eye and the thermostat housing.
Take out the thermostat and clean the mating surfaces.



AG3

Check the thermostat

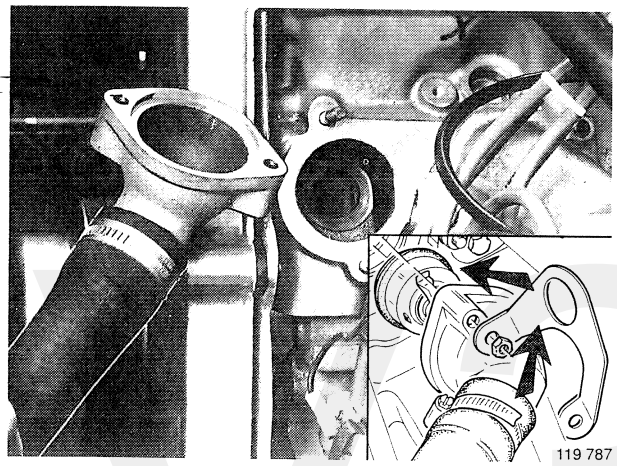
If necessary, test the thermostat in hot water.

B19

Marked with	:	92
Opens between	:	91 and 93°C
Fully open at	:	102°C
Minimum opening	:	7 mm

B200

Marked with	:	87
Opens between	:	86 and 88°C
Fully open at	:	97°C
Marked with	:	92
Opens between	:	91 and 93°C
Fully open at	:	102°C
Minimum opening	:	7 mm



AG4

Fit the thermostat

Fit a new gasket on the thermostat.
Fit the thermostat housing and the lifting eye.

AG5

Fill the cooling system

Fit the bottom coolant hose.
See Operation *AE2*.

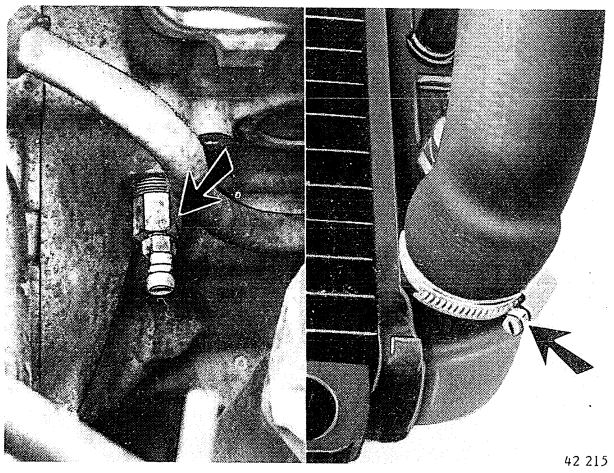
AH1-AH12. Removing/fitting the water pump, B19/B200

Special tools: 5197

AH1

General

Renewal of the water pump, rubber seals or gaskets should always be preceded by a pressure test of the cooling system.
The water pump is frequently replaced without good reason, for example when there is only a leak due to a faulty gasket. In the event of leakage, the system must therefore first be pressure-tested (see Operation *AE1*) to determine the precise location of the leak and to prevent unnecessary replacement of the pump.



AH2

Drain the cooling system

See Operation *AE4*.

AH3

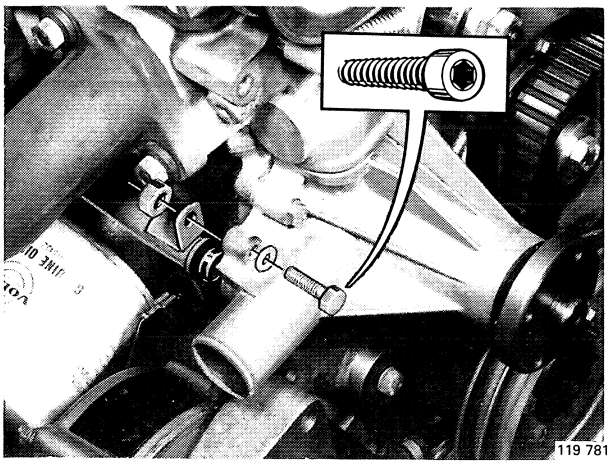
Remove:

- the fan shroud;
- the timing case cover;
- the radiator bottom hose from the water pump.

AH4

Remove the water pump pulley

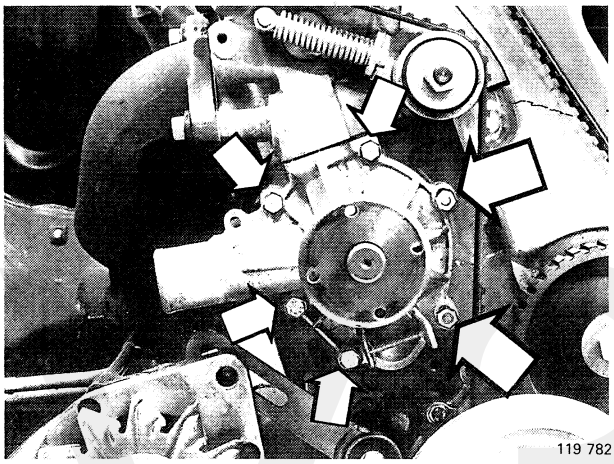
See Operation *C2*.



AH5

Release the return pipe from the water pump

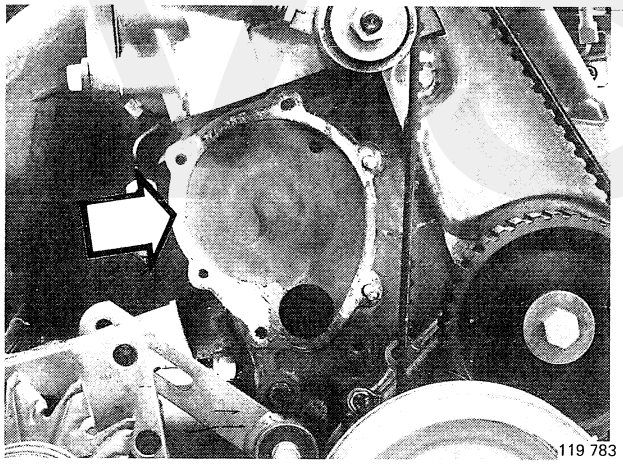
Remove the bolt, washer and nut.



AH6

Remove the water pump

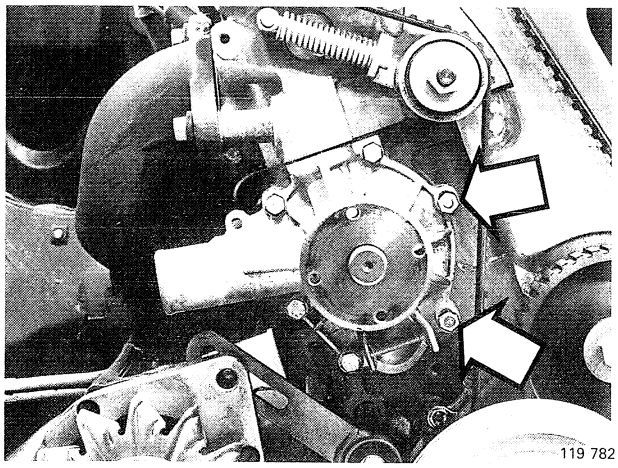
Remove all the bolts, washers and nuts.



AH7

Clean the joint face and mating surface

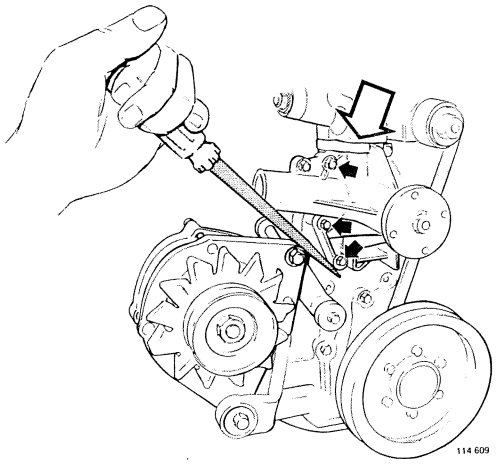
Scrape away all traces of the old gasket from the cylinder block joint face and the water pump. Clean the mounting surface of the rubber O-ring on the side of the cylinder head.



AH8

Fit the water pump

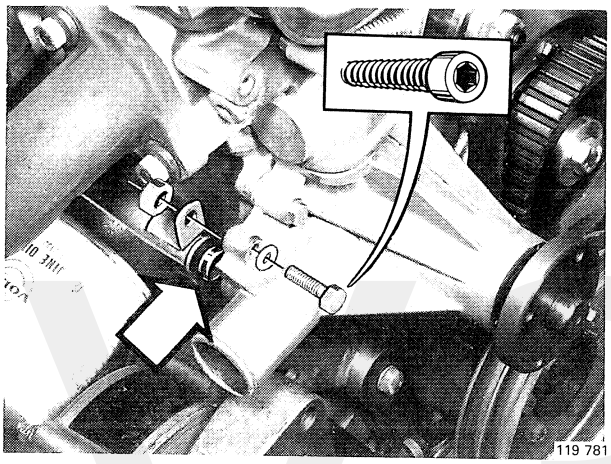
Use a new gasket between the pump and the cylinder block.
Fit a new O-ring on the water pump.
Secure the pump with the two nuts.
Make sure that the O-ring is accurately positioned and is not damaged.
Tighten the nuts so that the pump does not slide down but can be moved upwards with manual pressure.



AH9

Tighten the water pump against the cylinder head

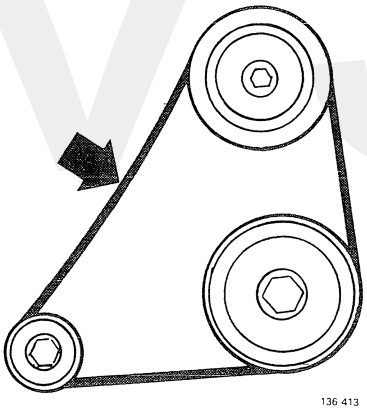
Fit the other washers and bolts.
Tighten the bolts and nuts.



AH10

Fit:

- the return pipe. **NB.** On vehicles equipped with a Pulsair system the pipe retaining bolt must be replaced by a hexagon socket-head screw;
- the timing case cover.



AH11

Fit the V-belts

When the V-belts are correctly tensioned it must be possible to deflect the belts **5-10 mm** between the pulleys.
NB. When the alternator V-belt is being renewed, always replace both V-belts as a set.
When adjusting the cooling system V-belt on cars with power steering and one V-belt only, use special tool **5197**.

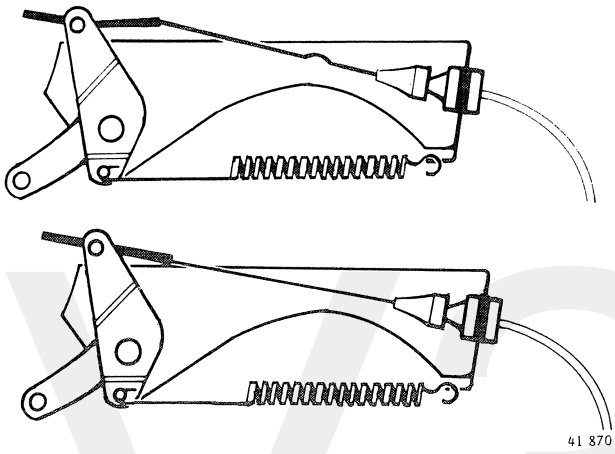
AH12

Fill the cooling system

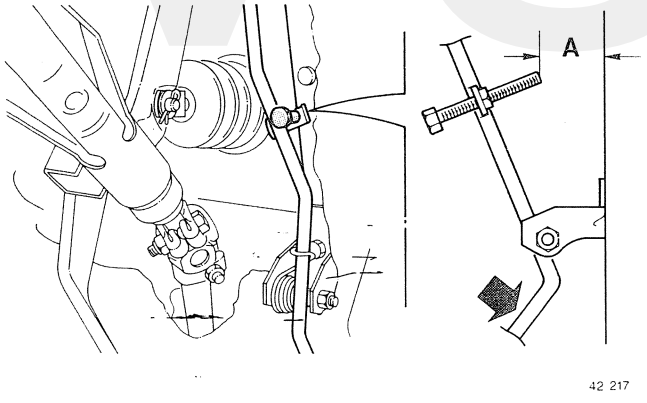
See Operation *AE2-AE3*.

Group 27. Engine controls

AJ1-AJ2. Choke and throttle linkage, B19/B200



41 870



42 217

AJ1

General

- Kinks in the throttle and choke cables are not permitted since this can adversely influence the service life and operation of the cables.
- In the throttle-released position the inner cable should be in one 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 in the inner cable. Correct, if necessary, by bending the accelerator pedal at the cable end-fitting.

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.

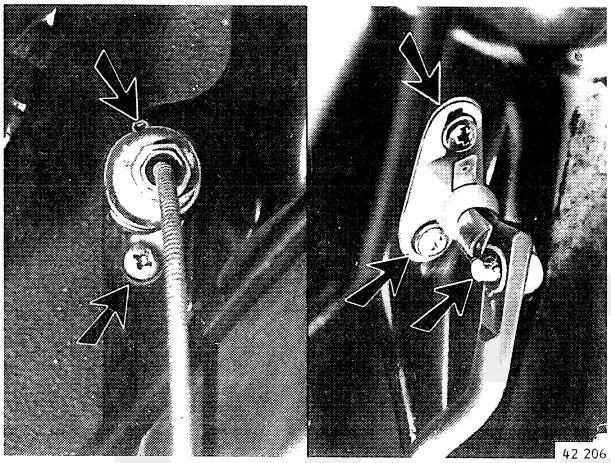
AJ2

Pedal height setting, B19/B200 RHD models

new accelerator pedal must be adjusted as follows:
- push the pedal down against its stop;
- then adjust the bolt to 30.5 ±1 mm (dimension A, B19/B200) between the pedal box and the adjustment bolt.
- attach the throttle cable to the carburettor and adjust the cable.

CAUTION! Do not bend the accelerator pedal.

AK1-AK6. Renewing/adjusting the throttle cable, B19/B200



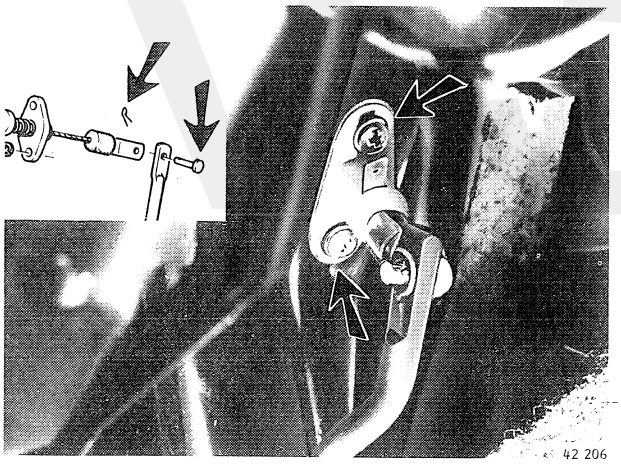
AK1

Disconnect the throttle cable from the engine

AK2

Remove the throttle cable from the accelerator pedal/pedal box

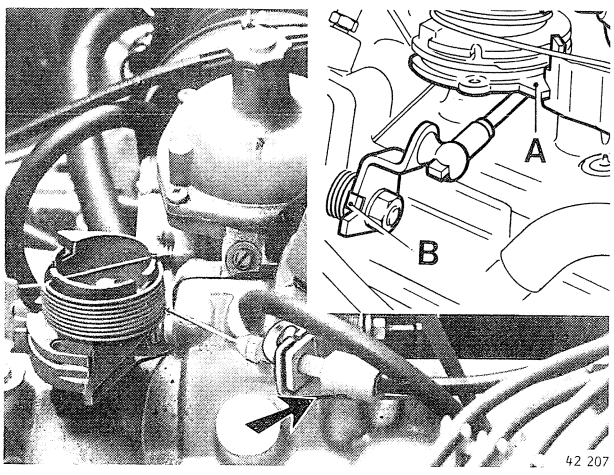
Release the inner cable from the pedal.
Remove the cross-head screws and lock washers.
Withdraw the throttle cable from the engine compartment.



AK3

Connect the throttle cable to the accelerator pedal/pedal box

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

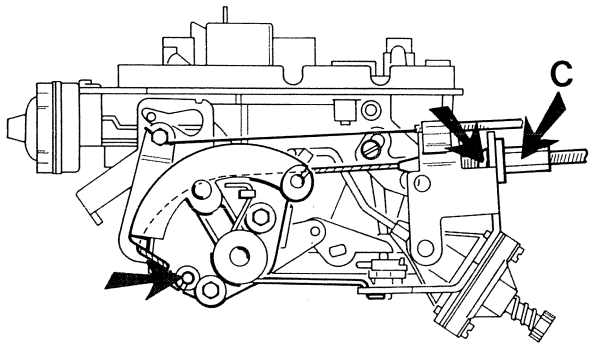


AK4

Fit and adjust the throttle cable on the engine

B19A

Fit the throttle cable through the bracket and connect it to the cam.
Fit the retaining clip.
Release the link rod from the carburettor.
Adjust the throttle cable so that it is tensioned and the roller is just abutting the stop (A).
Fit the link rod and unscrew the rod end to adjust its length so that the cam (B) is just abutting the flange of the throttle valve spindle.

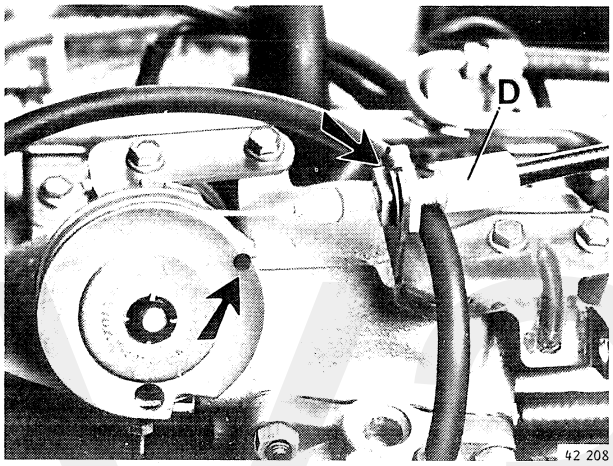


42 085

AK5

B200K

Fit the throttle cable through the bracket and connect it to the cam.
Fit the retaining clip.
Adjust the throttle cable with adjusting screw (C) so that the cam is against the stop and the cable is just tension-free.
Note: the choke must not be pulled out.



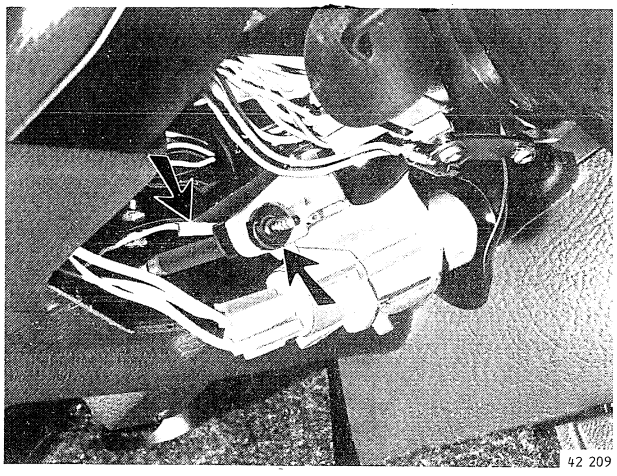
42 208

AK6

B19E/B200E

Fit the throttle cable through the bracket and connect it to the cable drum.
Fit the retaining clip.
Adjust the throttle cable with adjusting screw (D) so that the throttle cable drum is against the stop and the cable is just tension-free.

AL1-AL5. Renewing/adjusting the choke cable, B19/B200



42 209

AL1

Disconnect the choke cable from the engine

AL2

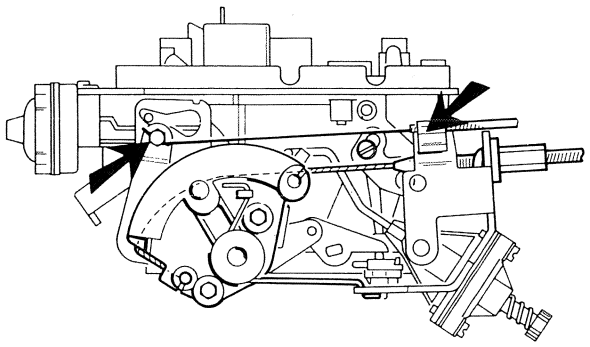
Remove the steering column trim cover

Remove the ignition key.
Unscrew the choke knob.
Remove the attachment from the lower cover.

AL3

Remove the choke cable from the steering column

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



42 085

AL4

Fit the choke cable

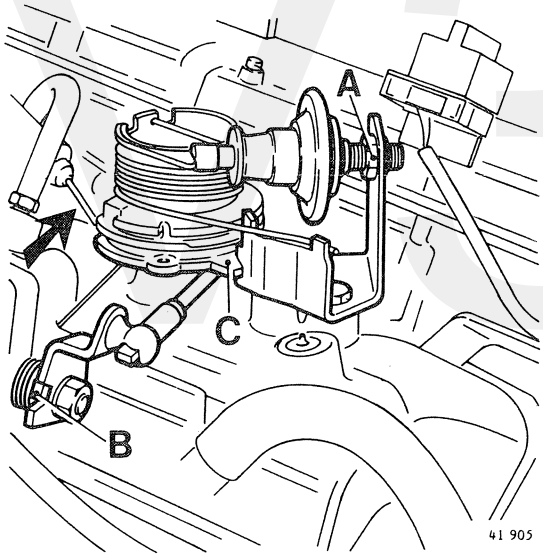
The choke cable is fitted in reverse order to removal.

AL5

Adjust and secure the choke cable

Connect up the choke outer cable and secure it with the retaining clip.
Insert the inner cable end in the trunnion and secure.
Check for correct operation.

AM1-AM4. B19A dashpot, adjusting and functional check



41 905

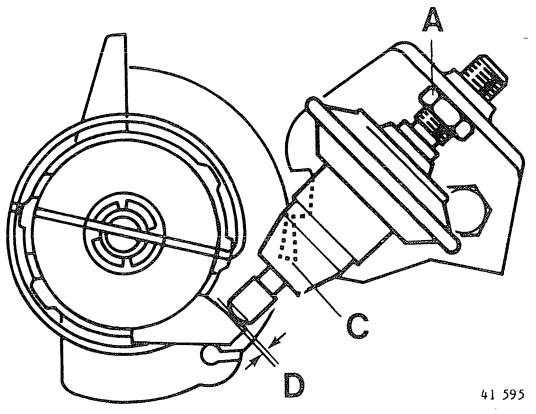
AM1

Back off the lock nut (A) and screw the dashpot away from the roller (a short distance).

AM2

Adjust the throttle linkage

Disconnect the throttle control rod from the carburettor.
Adjust the throttle cable so that it is taut, with the roller just abutting the stop.
Reconnect the throttle control rod and adjust its length so that the cam (B) is just abutting the flange of the throttle valve spindle.
Note: the choke must not be pulled out when adjusting the throttle linkage.



41 595

AM3

Adjust the position of the dashpot

Screw the dashpot back towards the roller so that, with the dashpot plunger pushed in fully and the roller (C) abutting the stop, the fitted clearance (D) is **0.5 ±0.1 mm**.
Tighten the lock nut (A).

AM4

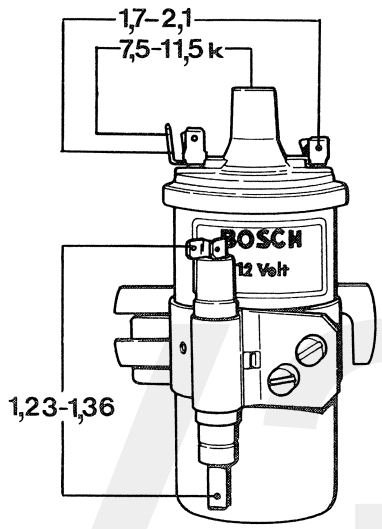
Check the operation of the dashpot
(with the engine switched off)

Turn the roller (by hand) away from the dashpot.
Bring the roller back towards its original position until it is just abutting the dashpot.
Release the roller and note the time it takes for the dashpot to return to its rest position: this should be 2 to 3 seconds. If not, renew the dashpot.

Group 28. Ignition system

AN1. Fault tracing - ignition system, B19A (-'84)

Special tools: 9921, 9940



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.

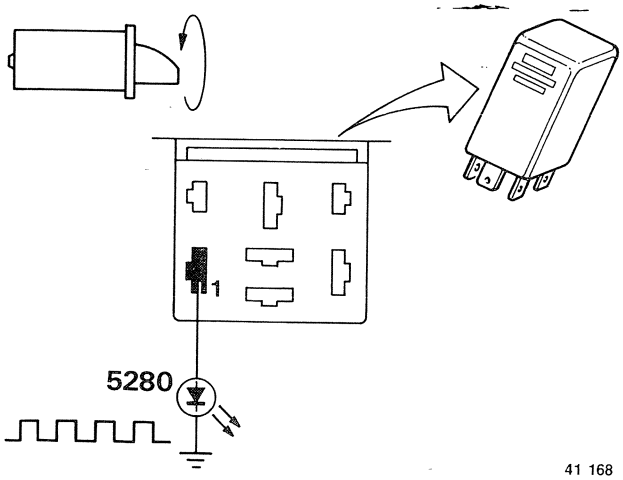
AN1

B19
Resistance of primary winding, measured between terminals 1 and 15: **1.7-2.1 ohms**.
Resistance of secondary winding, measured between terminal 1 and HT: **7.5-11.5 k-ohms**.
Resistance of ballast resistor: **1.23-1.36 ohms**.

AO1-AO7. Fault tracing - ignition system, B19E

Special tools: 5280, 6450

Note: if the engine fails to start, you must first determine whether the fault lies in the ignition system or in the fuel injection system.
Proceed as follows:

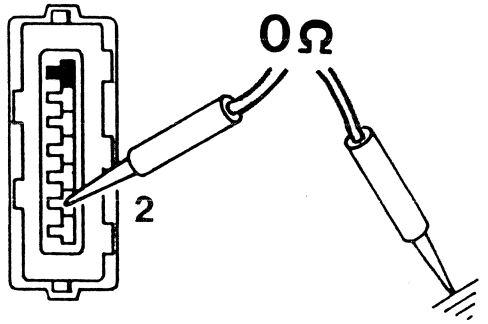


41 168

Remove the control relay from the fuel injection system.
Connect special tool **5280** (LED) between connector terminal 1 and earth.
The lamp should flash when the engine is cranked.

Lamp flashes: fault in the fuel injection system (see 'Fault tracing - fuel injection system').
Lamp remains off: test the cable for interruption from connector terminal 1 to terminal 1 of the ignition coil.
If the cable is not interrupted, this indicates a fault in the ignition system; see Operations *AO1-AO8.*
Replace the control relay.

The test values given here are for an engine temperature of approx. 20°C.



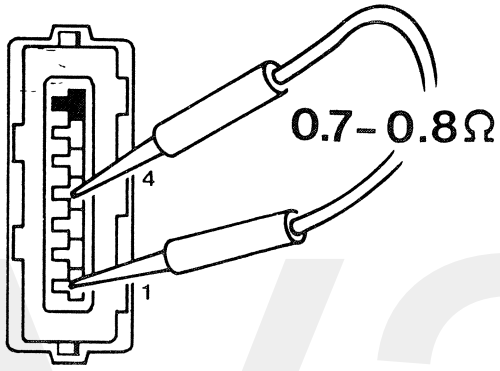
41 170

AO1

Unplug the connector from the ECU

Measure the resistance with an ohmmeter across connector terminal 2 and earth.
The resistance should be **0 ohms**.

Resistance is infinite: cable interrupted.
Resistance is 0 ohms: *AO2.*



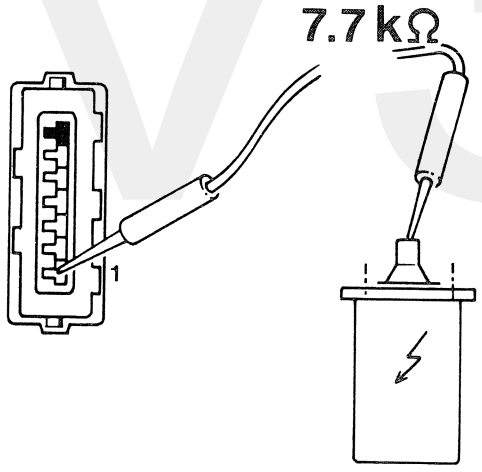
41 171

AO2

Test the ignition coil primary winding

Measure the resistance with an ohmmeter across connector terminals 1 and 4 (ignition coil primary winding).
The resistance should be **0.7-0.8 ohms**.

Different resistance reading: cable interrupted and/or ignition coil defective.
Resistance correct: Operation *AO3.*



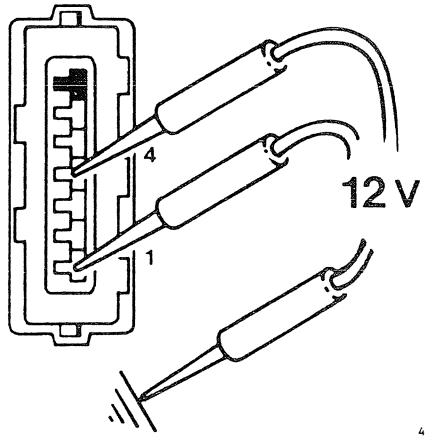
41 172

AO3

Test the ignition coil secondary winding

Measure the resistance with an ohmmeter across connector terminal 1 and the HT terminal of the ignition coil (secondary winding).
The resistance should be **7.7 k-ohms**.

Different resistance reading: cable interrupted and/or ignition coil defective.
Resistance correct: Operation *AO4.*



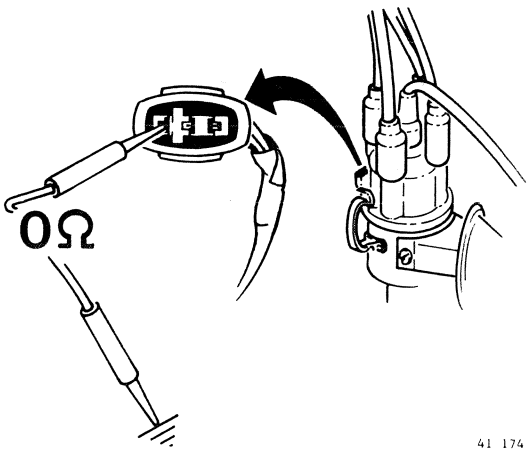
41 173

AO4

Switch on the ignition

Using voltmeter **6450**, measure the voltage across connector terminal 1 and earth and across connector terminal 4 and earth.
12 V should be measured at both terminals.

No voltage: cable interrupted.
Test reading 12 V: Operation *AO5.*
Switch off the ignition.



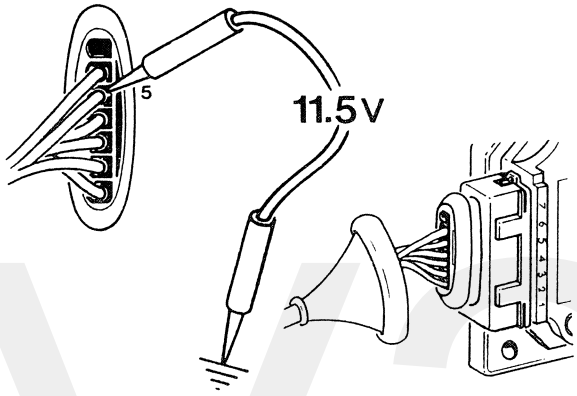
41 174

AO5

Test the distributor

Plug the connector back on the ECU and unplug the connector from the distributor. Measure with an ohmmeter (as indicated in the adjacent illustration) the resistance across the distributor connector and earth.
The resistance should be **0 ohms**.
Resistance is infinite:
- cables from ECU terminals 2 and/or 3 are interrupted;
- poor contact at terminals 2 and/or 3 between the ECU and the connector;
- ECU defective.

Resistance is 0 ohms: Operation *AO6.*
Plug the connector back on the distributor.

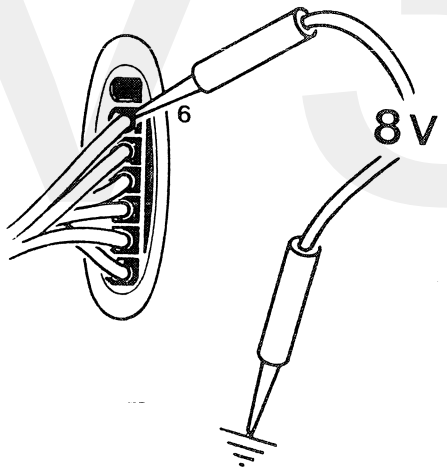


41 175

AO6

Test the ECU

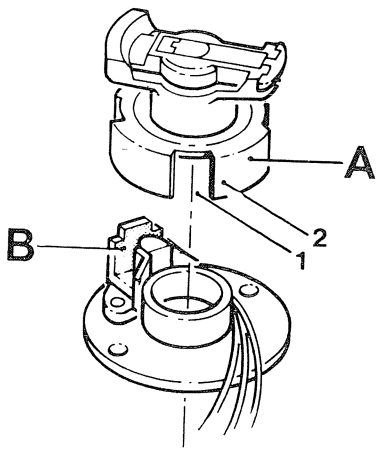
Pull the rubber boot away from the ECU connector.
Switch on the ignition.
Using voltmeter **6450**, measure the voltage across ECU connector terminal 5 (from the rear of the connector) and earth.
The test reading should be 11.5 V.
Different voltage reading: ECU defective.
Fit a new ECU and repeat the test.
Voltage correct: Operation *AO7.*



41 177

AO7

Using voltmeter **6450**, measure the voltage across ECU connector terminal 6 (from the rear of the connector) and earth.



41 178

AO8

Rotate the crankshaft so that the rotor drum (A) on the distributor turns slowly. Each time a flange (2) of the rotor drum passes in front of the Hall transmitter (B) the meter should show a reading of **approx. 8 V**.
Each time a gap (1) in the rotor drum passes in front of the Hall transmitter the **voltage reading should practically disappear**.

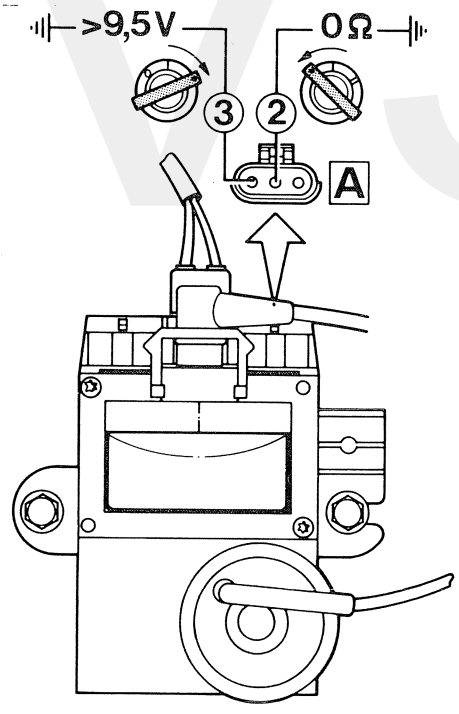
Voltage correct: ECU defective.
Different voltage reading: Hall transmitter in distributor defective.
Switch off the ignition. Return the rubber boot to its original position.

AP1-AP11. Fault tracing - electronic ignition, B19A ('84-)/B200

The two main problems which may be encountered are:
- engine fails to start; see Operations *AP1-AP8*;
- engine starts with difficulty and/or runs erratically; see Operations *AP9-AP11*.

In all cases, however, check the following points first:
- connectors A, B and (if fitted) C;
- the spark plugs;
- the spark plug leads and the HT lead;
- the distributor cap and rotor arm.

AP1-AP8. Engine fails to start



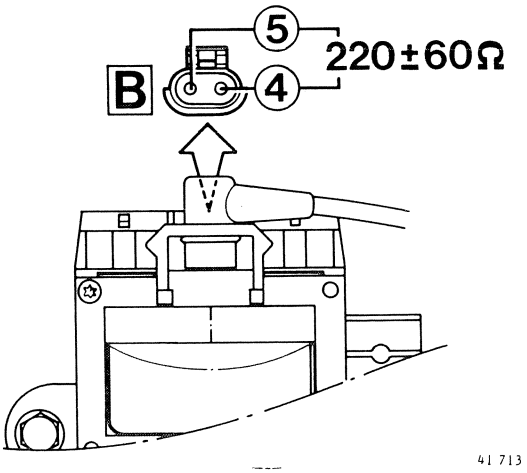
41 712

AP1

Unplug connector A.
Switch on the ignition.
Crank the engine and measure with a voltmeter the voltage across connector 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: Operation *AP2*.
Switch off the ignition.

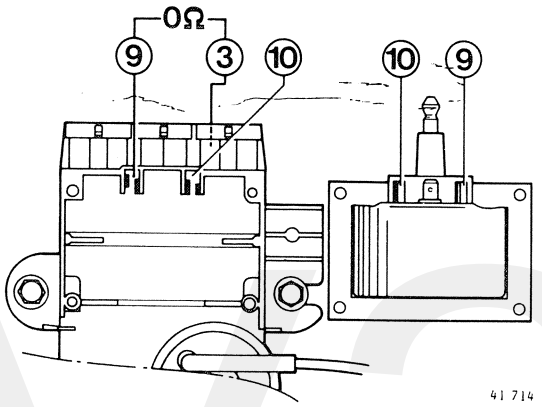
AP2

Measure with an ohmmeter the resistance across connector terminal 2 and earth.
The resistance should be **0 ohms**.
Resistance higher: check the earth connection.
Resistance is 0 ohms: Operation *AP3*.



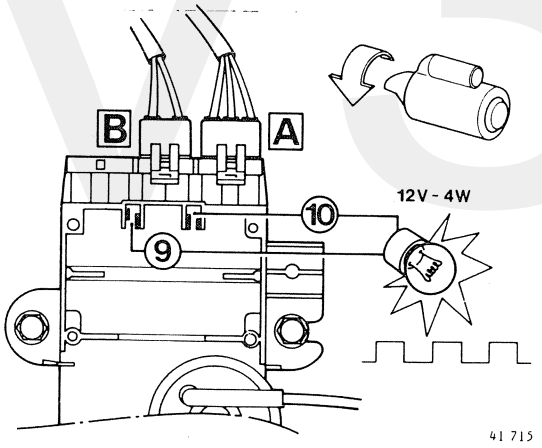
AP3

Neem steker B los.Unplug connector B.
Measure the resistance of the sensor module across connector terminals 4 and 5.
The resistance should be **220 ±60 ohms**.
Resistance higher or lower: renew the sensor module.
Resistance 220 ±60 ohms: Operation *AP4.*
Note: examine the sensor module and the flywheel for dirt and other foreign matter.



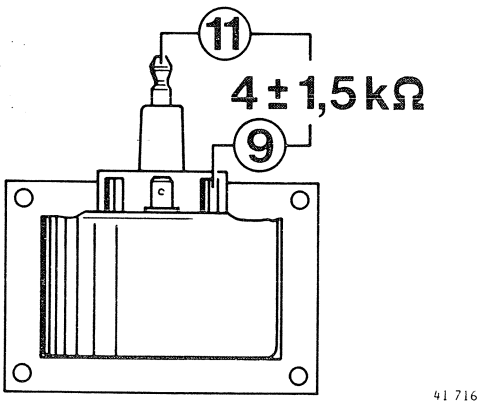
AP4

Disconnect the HT lead from the ignition coil.
Remove the ignition coil.
Examine terminals 9 and 10 for evidence of corrosion.
Measure the resistance across ignition unit terminals 3 and 9.
The resistance should be **0 ohms**.
Resistance higher: renew the ignition unit.
Resistance 0 ohms: Operation *AP5.*



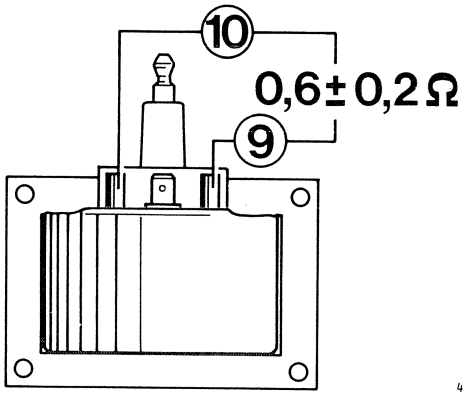
AP5

Reconnect the wiring at connectors A and B.
Switch on the ignition.
Connect a 12 V test lamp with a rating of at least 4 W between terminals 9 and 10 of the ignition unit.
Crank the starter motor; the test lamp should flash.
Lamp does not flash: fit a new ignition unit.
Lamp flashes: Operation *AP6.*



AP6

Measure with an ohmmeter the resistance of the ignition coil secondary winding 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: Operation *AP7.*

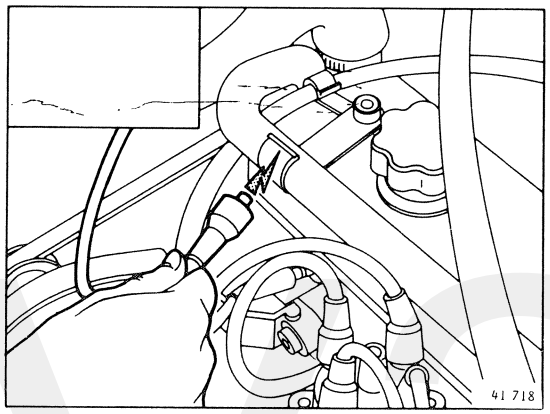


41 717

AP7

Test the ignition coil primary winding

Measure with an ohmmeter the resistance of the ignition coil primary winding across terminals 9 and 10.
The resistance should be **0.6 ohms ±0.2 ohms**.
Resistance higher or lower: renew the ignition coil.
Resistance 0.6 ohms ±0.2 ohms: Operation *AP8.*


41 718

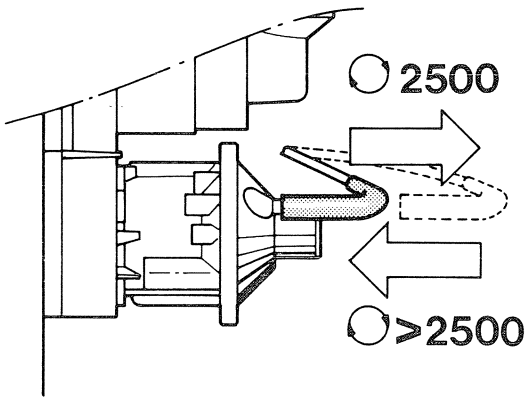
AP8

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 about 2 cm away from the cylinder block. Crank the starter motor.
No spark: renew the ignition unit.
Spark present: ignition unit working correctly.

Note: never let sparks arc across to the ignition unit housing.

AP9-AP10. Engine starts with difficulty and/or runs erratically

- Check the power supply and the earth connection of the ignition unit; carry out Operations *AP1-AP2.*
- Check the sensor module; carry out Operation *AP3.*

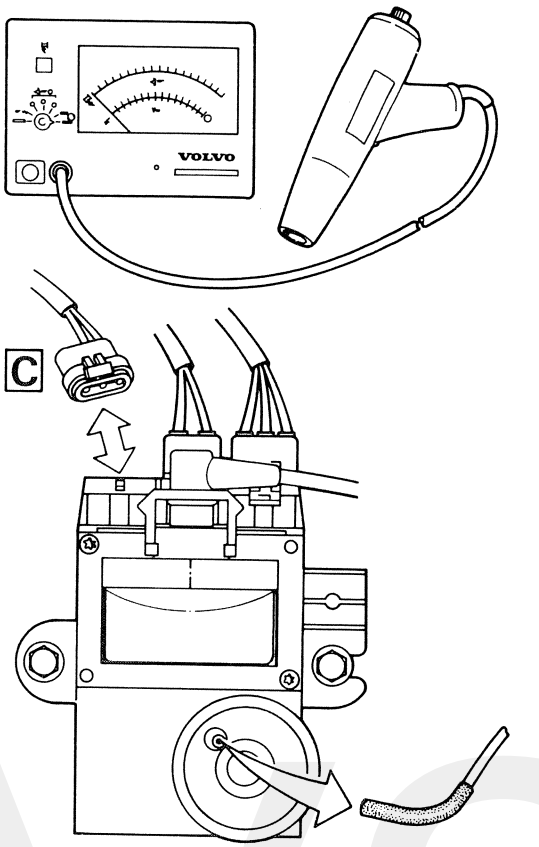


41 719

AP9

Check the vacuum diaphragm unit

Connect up a rev-counter.
Pull the hose off the vacuum diaphragm unit.
Run the engine at a constant 2,500 r/min.
Reconnect the hose: the engine speed should now increase.
Engine speed does not increase: fit a new ignition unit.
Engine speed increases: Operation *AP10.*
Switch off the engine.



41 720

AP10

Check the ignition timing point

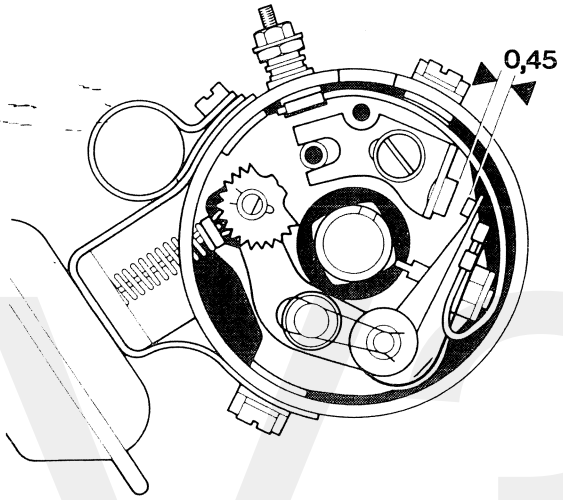
Connect up a stroboscope lamp.
Disconnect the vacuum hose from the vacuum diaphragm unit.
Measure the ignition advance at a maximum engine speed of 900 and 2,500 r/min; the reference values for checking are as follows:

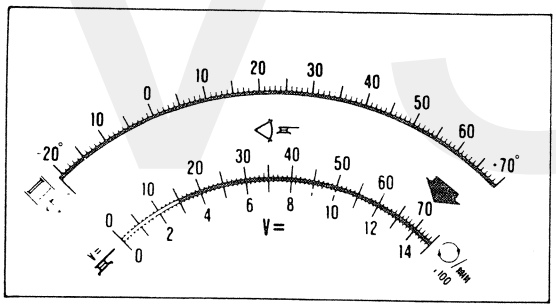
Engine type	900 r/min	2,500 r/min
B19A '84-	15 ±2	24 ±3
B200K -'86	15 ±2	24 ±3
B200E -'86	12 ±2	30 ±3
B200K '87-	15 ±3	20 ±3
B200EA '87-	11 ±2	22 ±3
B200E/F '87-	11 ±2	22 ±3

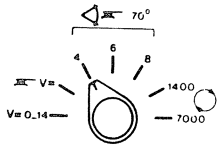
Measured values outside tolerance: fit a new ignition unit.
Measured values as per specification: ignition timing correct.

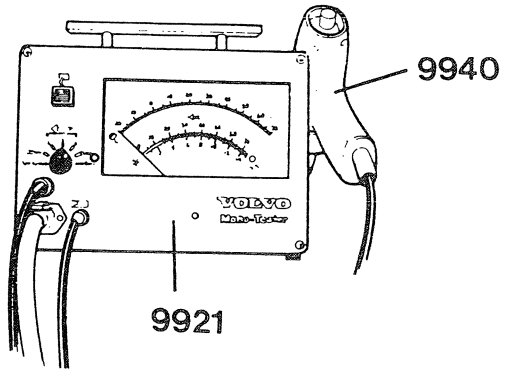
AQ1-AQ12. Repair and maintenance of the conventional ignition system, B19A (-'84)

Special tools: 9921, 9940









Distributor - general

AQ1

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.
Smear the rotor arm shaft with a small amount of grease.
$W
Crank the engine until the highest point of a cam on the rotor arm shaft is located under the small fibre lug of the contact breaker point.
Now use a feeler gauge to set the gap at **0.45 mm**.
$W
Connect up the Volvo Monotester.
Turn the Monotester test switch to position 4.
$W
Crank the engine with the starter motor and read off the dwell angle on the 0-70 scale, (see Operation *AQ2*).
If necessary, adjust the gap.
Fit the rotor arm, the anti-condensation cap and the distributor cap.

AQ2

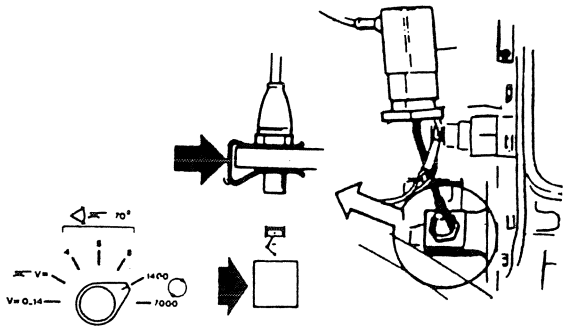
Bosch distributor,	**dwell angle**
Bosch ...	**59° - 65°**

AQ3

Adjusting the ignition timing (general)

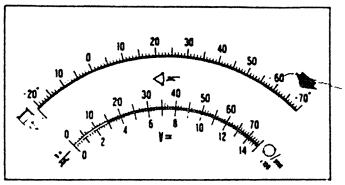
Note: the ignition timing must be adjusted with the Volvo Monotester **9921** and the sensor.

AQ4



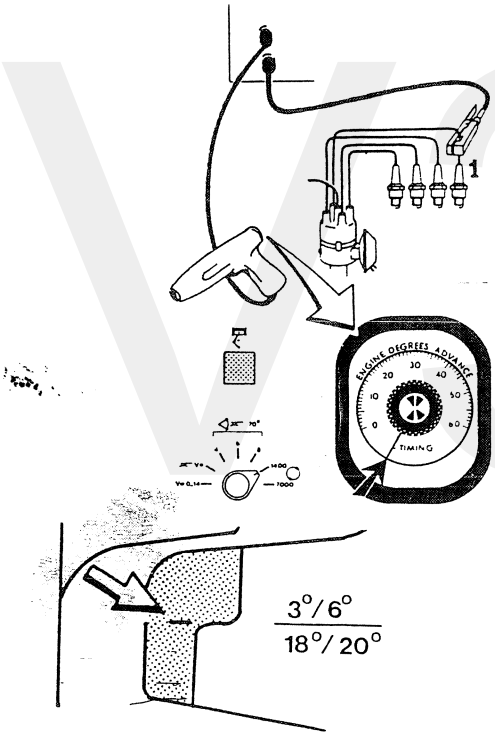
Adjust the ignition timing with the sensor

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° - +70° 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).
In the event of deviations the distributor must be tested on a distributor test bench and, if necessary, reconditioned.
Tighten the distributor attachment.
Connect up the vacuum hose.



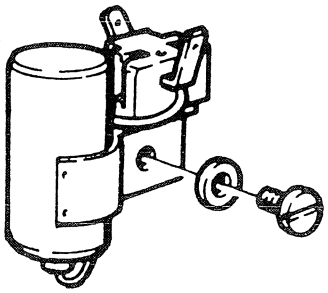
AQ5

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 **10**° ±**2**° BTCD.
Correct, if necessary, by turning the distributor.
Repeat this procedure at 41.7 r/s (2,500 r/min.).
The lamp should flash at **19**° ±**2**° BTCD.
$W
In the event of deviations the distributor must be tested on a distributor test bench and, if necessary, reconditioned.
Tighten the distributor attachment.
Connect up the vacuum hose.

AQ6

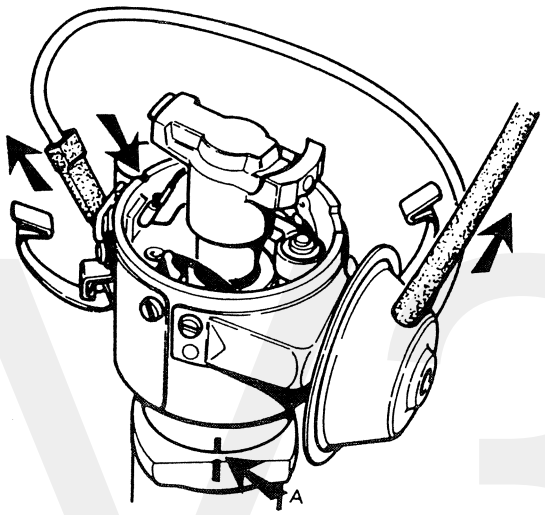


Check the capacitor

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

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

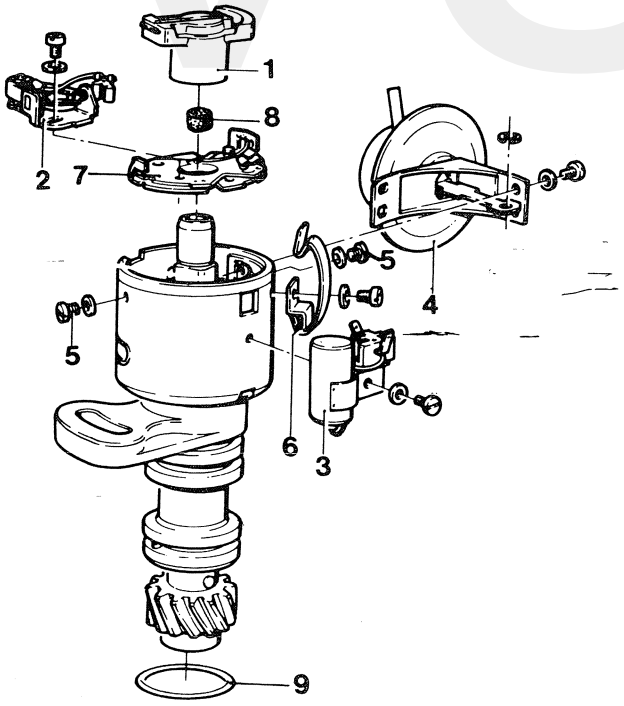
AQ7-AQ12. Distributor, reconditioning, B19A (-'84)



AQ7

Remove the distributor from the car

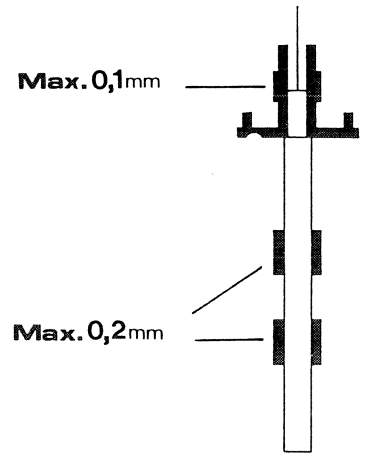
Remove the distributor cap.
Disconnect the vacuum hose.
Disconnect the low tension lead.
Remove the rotor arm and the anti-condensation cap.
Fit the rotor arm.
Crank the engine until the rotor arm registers with the mark on the distributor body.
Make a mark on the distributor body and the cylinder block (A).
Remove the set screw.
Lift out the distributor.



AQ8

Disassemble the distributor

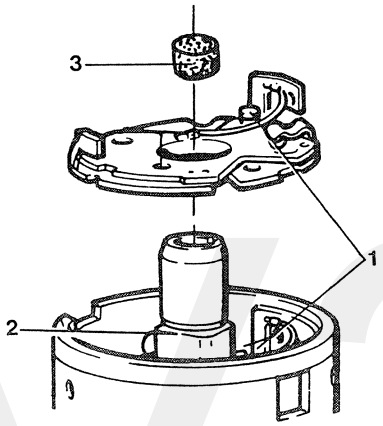
Remove the rotor arm (1).
Remove the contact breaker points (2).
Remove the capacitor (3).
Remove the vacuum control unit (4).
Remove the screws (5) from the baseplate and the hold-down clip (6).
Note: the hold-down clips (6) are not equal in length.
Mark the baseplate (7) relative to the distributor body.
Remove the baseplate: turn it clockwise and lift out.
Remove the felt lubrication pad (8).
Remove the O-ring (9).



AQ9

Clean and check all parts

The maximum permissible radial play between the distributor shaft and the contact breaker cam is **0.1 mm**.
The maximum permissible radial play between the distributor shaft and the bushes in the distributor body is **0.2 mm**.
In the event of excessive clearance, the distributor body must be renewed (complete new unit).
Check all other parts for wear and damage.
Renew the rotor arm and the distributor cap if the contacts are worn or excessively pitted.
Also check the distributor cap for hairline cracks.



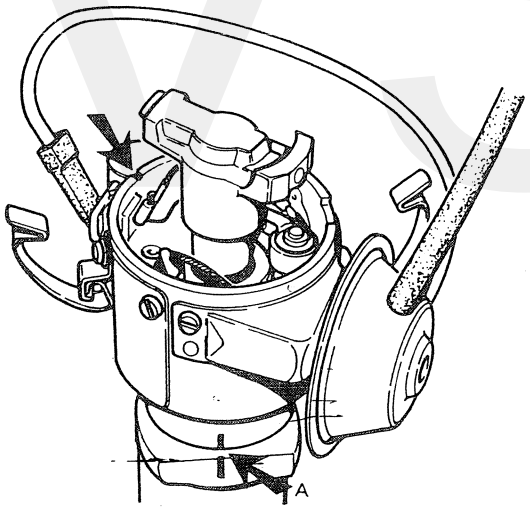
AQ10

Assemble the distributor, B19A-'84

Lubricate the parts

1 Lubricate the pivot points with grease.
2 Coat the distributor drive shaft cams with a thin film of grease.
3 Soak the felt lubrication pad in oil.

Assembly is in reverse order to disassembly.
Note the marks on the baseplate and distributor body.



AQ11

Fit the distributor, B19A-'84

Locate the distributor.
Press the distributor down while simultaneously rotating the rotor arm until the pinion is correctly located.
The rotor arm must now be facing towards the mark on the distributor body.
The marks on the distributor body and cylinder block must now register with each other.
Insert the set screw (do not tighten).
Fit the anti-condensation cap, the rotor arm and the distributor cap.
Connect up the wiring and the vacuum hose.

AQ12

Adjust the ignition timing

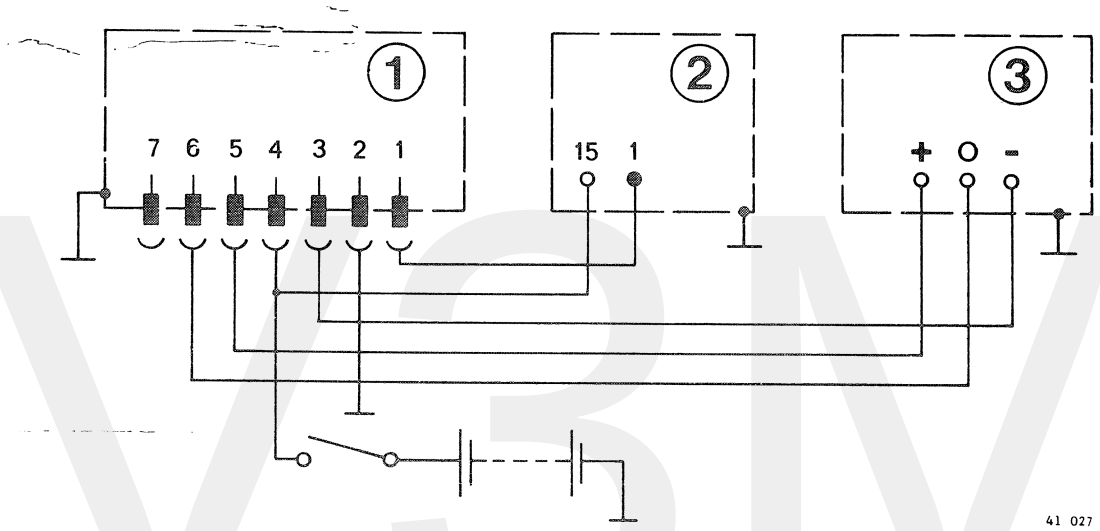
See Operation AQ1.

AR. Repair and maintenance of the Hall-type ignition system, B19E

General

Starting with model year 1983, the B19E engine was equipped with a breakerless ignition system which works on the principle of the Hall effect. This system restricts mechanical wear to a minimum. Once it is set correctly, there is virtually no need to readjust the ignition timing.

Brief description of the Hall-type ignition system, B19E



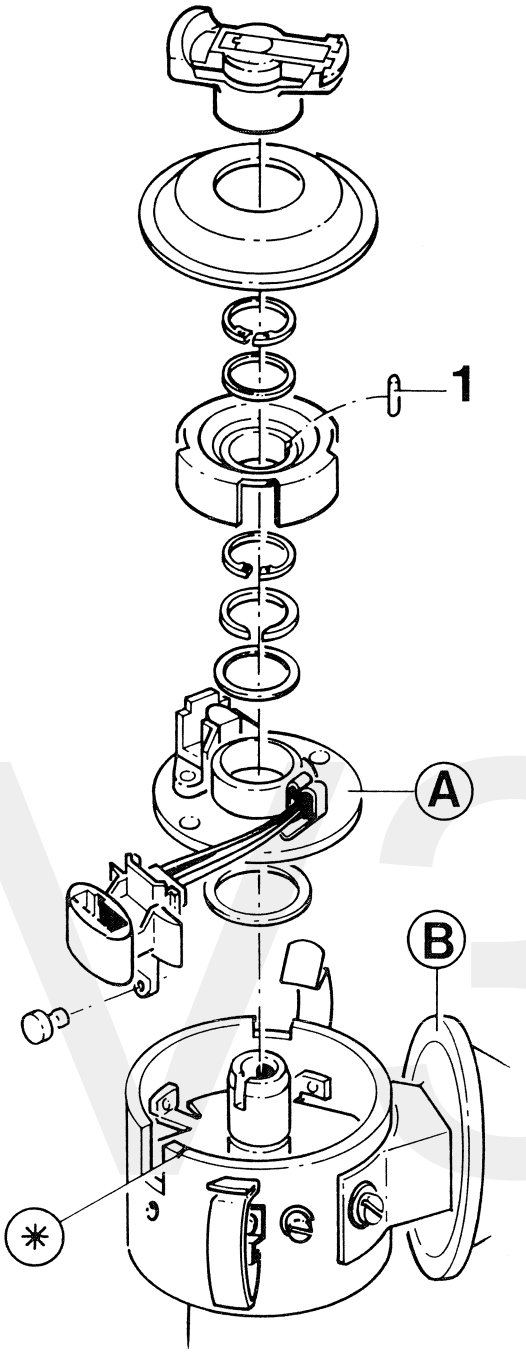
The B19E ignition system consist of three components:
- ECU (1);
- ignition coil (2);
- distributor (3) with a Hall transmitter.

A schematic outline of the wiring diagram is shown above. The ECU (1) is equipped with a dwell angle compensating device. This adapts the Hall signal in the case of a big dwell angle with high ignition voltage and high engine speed. At lower engine speeds the fixed dwell angle is adjusted back electronically. This reduces the primary current and keeps down the temperature rise of the ignition coil.

With the ignition on and the engine stationary the quiescent current is switched off automatically to protect the ECU from overheating.
The quiescent current is switched back into circuit when the engine is started.

In the electronic ignition system the ballast resistor on the ignition coil has been discontinued. It has been replaced by an integrated circuit in the ECU (1).

With this type of system the ignition timing **cannot be adjusted statically**.



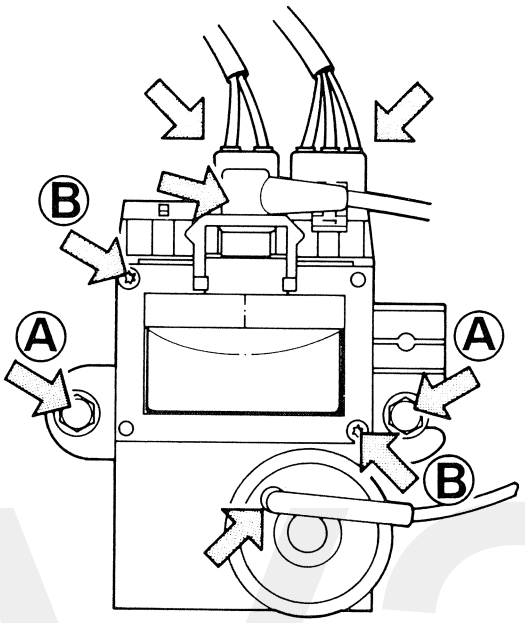
Renewing the Hall transmitter (A) in the distributor

Remove the parts in the sequence shown in the illustration.

Note:
- be careful not to lose the locking pin (1) when disassembling;
- make sure that the Hall transmitter (A) correctly engages the spindle of the vacuum control unit (B) when reassembling.

*** Mark**

AS1-AS3. Repair and maintenance of the Renix ignition system, B19A ('84-)/B200

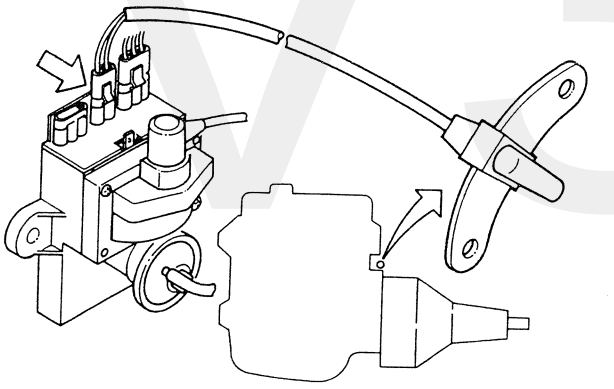


41 709

AS1

Remove/fit the ignition unit and ignition coil

Disconnect the wiring, the 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

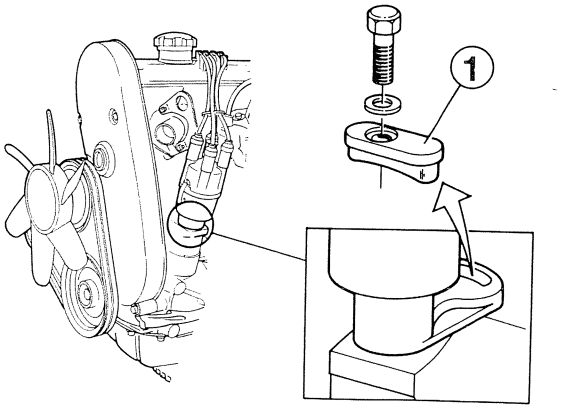


41 710

AS2

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 very important not to mix up the cables when they are connected to the new plug.
Fitting is in reverse order to removal.



41 711

AS3

Distributor

The distributor has a very simple design. There is no vacuum or centrifugal advance and the distributor body can be fitted in only one position on the cylinder block. Removing/fitting is done in the usual way.
Note: to prevent movement of the distributor body relative to the engine, the slotted hole is blanked off with a plastic insert (1). After assembly, and with No. 1 cylinder at TDC, the mark on the distributor body should register with the middle of the rotor arm.

AT1. Change-up indicator, B200

Preliminary operations

Disconnect the vacuum hose from the Renix unit and connect a vacuum pump to the hose. Connect up a rev-counter. Start the engine and **slowly** increase the engine speed until the test 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 test correctly.

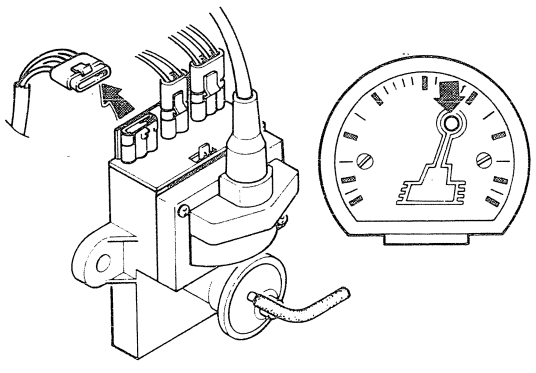
AT1

Check whether the test lamp lights up at the following vacuum depressions and engine speeds.

	Test	Pump vacuum up to kPa	Engine speed r/min
B200	1	65	1,550 ±250
	2	35	2,250 ±250
	3	10	3,750 ±250

Remove the vacuum pump and rev-counter.
Reconnect the vacuum hose to the Renix unit.

AT2-AT4. Fault tracing

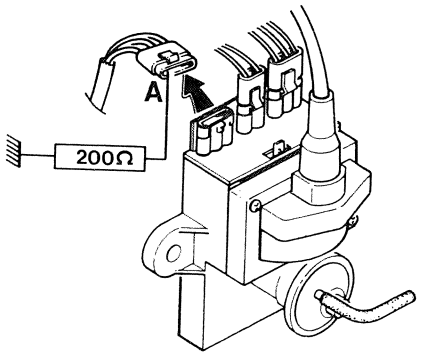


42 496

AT2

Change-up indicator warning lamp stays on

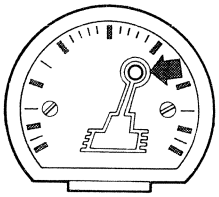
Remove the left-hand connector from the ignition unit:
Warning lamp stays on: check the wiring.
Warning lamp goes out: renew the unit.



AT3

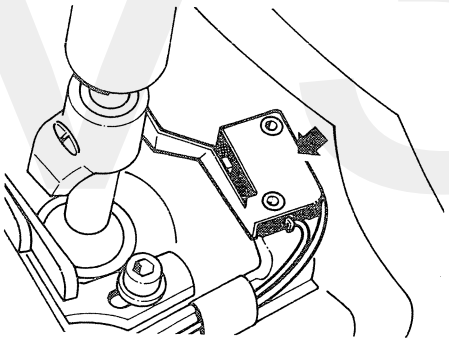
Warning lamp does not light up

Remove the left-hand connector from the ignition unit.
Connect the left-hand female connector A with 200 ohms resistance to earth:
Warning lamp lights up: renew the 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 *AT4*.



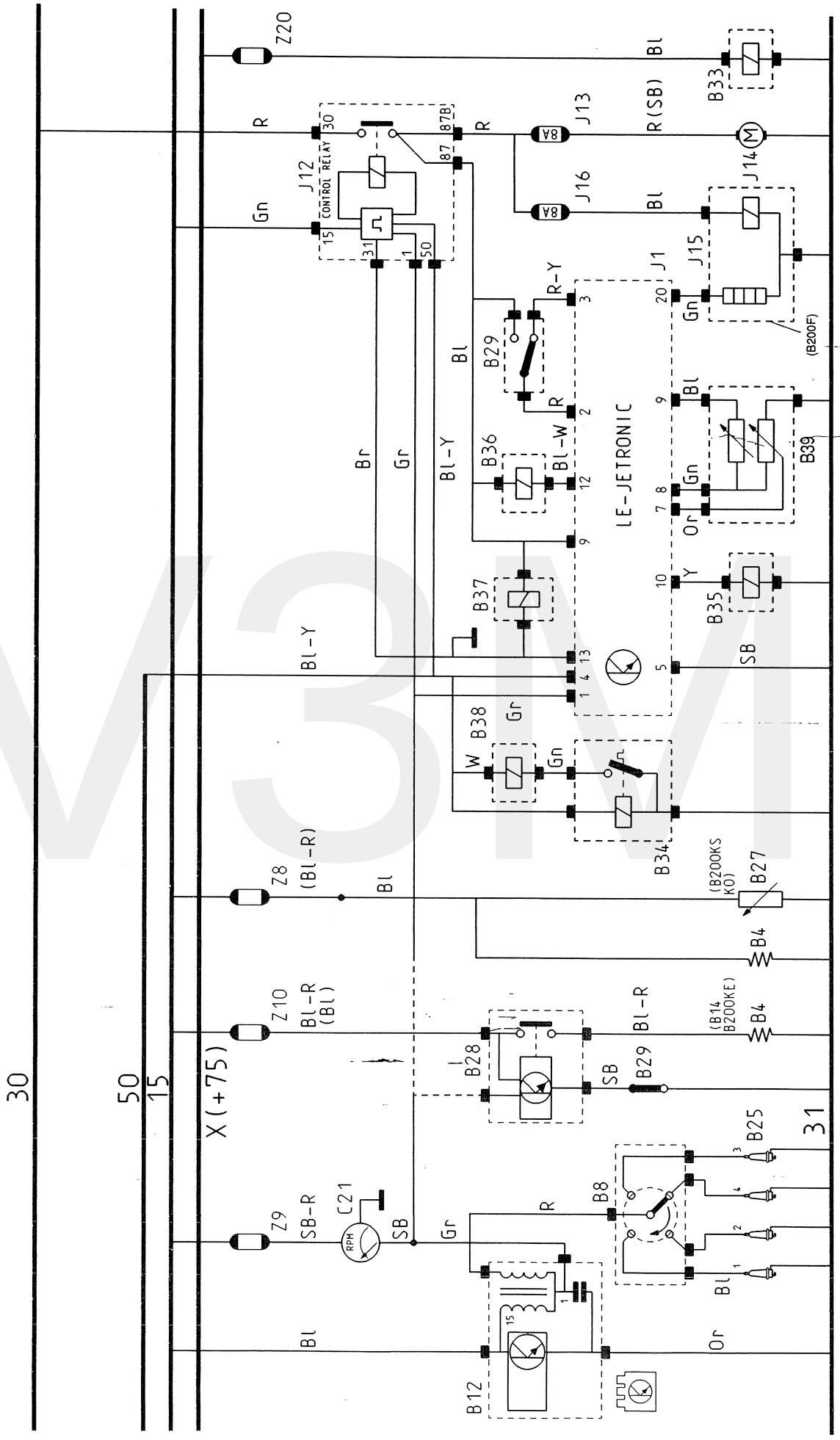
42 498

AT4

Check the microswitch

Check the microswitch alongside the gear lever. Voltage should be present at both terminals with the gear lever in neutral and the ignition switched on.

Wiring diagram LE-Jetronic



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Notes