11

Specifications

Basic engine data

Engine

Number of cylinders 12

Cylinder arrangement . . . . . 60 degree included angle ‘V’

Cycle . . . . . Four stroke

Induction system . . . . . Turbocharged and charge cooled

Combustion system . . . . . Direct injection

Nominal bore . . . . . 135 mm (5.315 in)

Stroke . . . . . 152 mm (5.984 in)

Compression ratio . . . . . 26,11 litres (1593.24 in³)

Cubic capacity 14.5:1

Firing order A6, B1, A3, B4, A5, B2, A1, B6, A4, B3, A2, B5

Tappet clearances (hot or cold) . . . . .

Engines before ‘build line number’ 8281 (6C27437/29):

Inlet valves . . . . . 0,4 mm (0.016 in)

Exhaust valves . . . . . 0,5 mm (0.020 in)

Engines from ‘build line number’ 8281 (6C27437/29):

Inlet valves . . . . . 0,2 mm (0.008 in)

Exhaust valves . . . . . 0,5 mm (0.020 in)

Direction of rotation . . . . . Anti-clockwise from the rear of the engine

Injection timing . . . . . As stamped on engine data plate

Rated power output . . . . . 400 to 740 kW

Maximum rated speed . . . . . 1800 rev/min

Dry weight of engine . . . . . 2120 kg (4674 lb)
(Approximate)

Dry weight of electropak
(Approximate)

3012 TG . . . . . 2365 kg (5214 lb)

3012 TAG . . . . . 2315 kg (5103 lb)

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11

Recommended specific applied torques

Caution: *The torque loads listed below apply to threads in an oil wet condition, unless the use of thread locking compound is recommended.*

Application of a torque specification is NOT enough to ensure that the relevant components are retained securely as an assembly. It is important to conform also to the recommendations for assembly and, if given, the sequence in which the bolts or nuts must be tightened. This information is given in the relevant section of this publication.

If a bolt or nut is retained with a locking washer, lock plate or split pin, the specification for a torque load can be exceeded, if necessary, by the MINIMUM amount that is needed for correct assembly.

		Nm	lbf ft
Alternator			
Nut, pulley		95	70
Auxiliary drive shaft			
Nut, flange	(18 mm 27 A/F)	200	300
	(22 mm 32 A/F)	300	221
Camshafts		200 to 250	148 to 184
Bolts, camshaft gear	'A' bank	217	160
	'B' bank		
Screws, countersunk head, thrust plate		24	18
Connecting rods			
Nuts, big end bearing		60	44
		(Caution - refer to operation 13-1)	
Crankcase			
Bolts, main bearing cap			
Front, centre and rear		177	131
Others		488	360
Side bolts, main bearing cap			
Front, centre and rear		114	84
Others		177	131
Studs, cylinder head		315	232
Crankshaft			
Bolts, damper and pulley		80	59
Cap screws, flywheel		315	232
Cylinder heads			
Bolts, cylinder head to crankcase			
Bolts in induction ports only		200	148
All other long bolts		240	148
			(plus a further 90°)
Nuts, cylinder head to crankcase (earlier engines)		200	148
			(plus a further 90°)
Bolts, rocker box to cylinder head		46	34
Cap screws, rocker box to cylinder head		35	26
Bolts, rocker box cover to rocker box		23	17
Lock nut, adjustment screw, bridge piece		40	30

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New engines, from engine number 6A28293, do not have rocker boxes and each rocker shaft is mounted on three pedestals which are bolted to the relevant cylinder head. A rocker cover, formed in Vynalester, encloses the rocker assembly. Bolt holes are sealed with rubber washers and the interface with the cylinder head is sealed with a special rubber sealing ring.

For these engines, a new type of fuel injector is used. These fuel injectors are longer and have the connections for the leak-off fuel above the rocker covers.

A single cylinder head may be removed from the engine and given an overhaul while the engine is still connected to its relevant driven unit. In this situation, ensure that the batteries are disconnected.

Pedestal rocker cover

To remove and to fit	12-1

To remove

1 Disconnect the batteries.

2 Release the banjo connection bolts from the fuel injectors and remove the relevant high pressure pipes for the fuel supply from the fuel injection pump to the fuel injectors.

3 Remove the two short and five long special bolts which retain the pedestal rocker cover and then remove carefully the pedestal rocker cover.

To fit

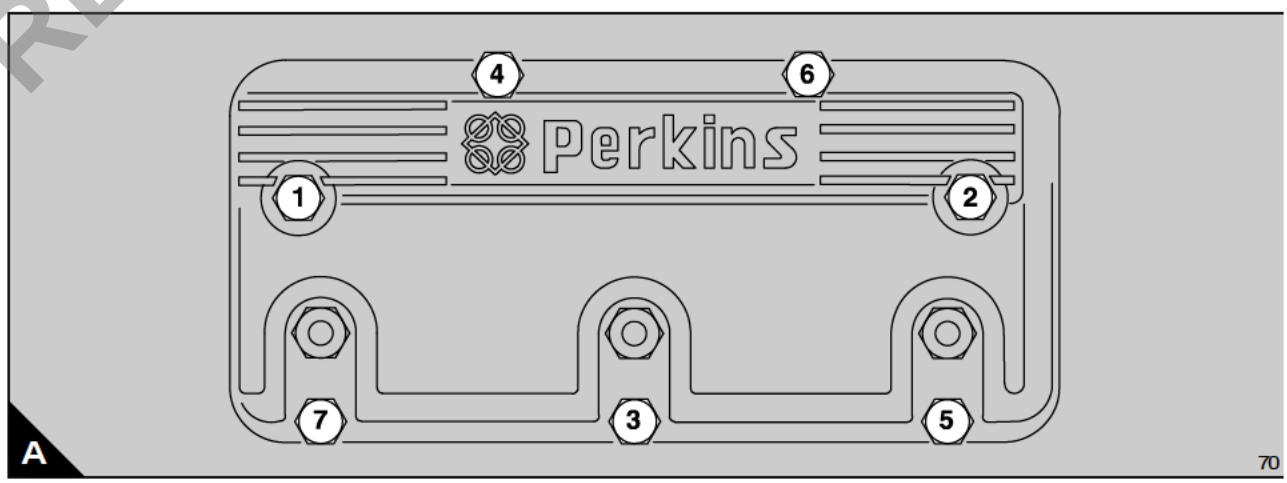
New sealing washers should be fitted to the special bolts and a new seal fitted to the pedestal rocker cover.

1 Ensure that the seal is fitted correctly into the groove around the pedestal rocker cover, put the pedestal rocker cover on the cylinder head and fasten it to two of the pedestals by the two short bolts with sealing washers. Do not tighten the bolts.

2 Fit the five long bolts, with sealing washers, through the pedestal rocker cover into the cylinder head. Tighten lightly all of the bolts.

3 Tighten evenly all the bolts in the sequence shown (A) to a torque of 11 Nm (8 lbf ft).

4 Fit all other components which were removed, in reverse sequence to their removal.



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Fits and clearances - Cylinder heads, rocker assemblies and valves

Bridge pieces on guides (A3)

Bore of bridge piece	12,755 to 12,780 mm (0.5021 to 0.5031 in)
Diameter of guide	12,728 to 12,739 mm (0.5011 to 0.5015 in)
Clearance (new)	0,016 to 0,052 mm (0.0006 to 0.0020 in)
Permissible worn clearance	0,10 mm (0.004 in)

Valve springs (A4)

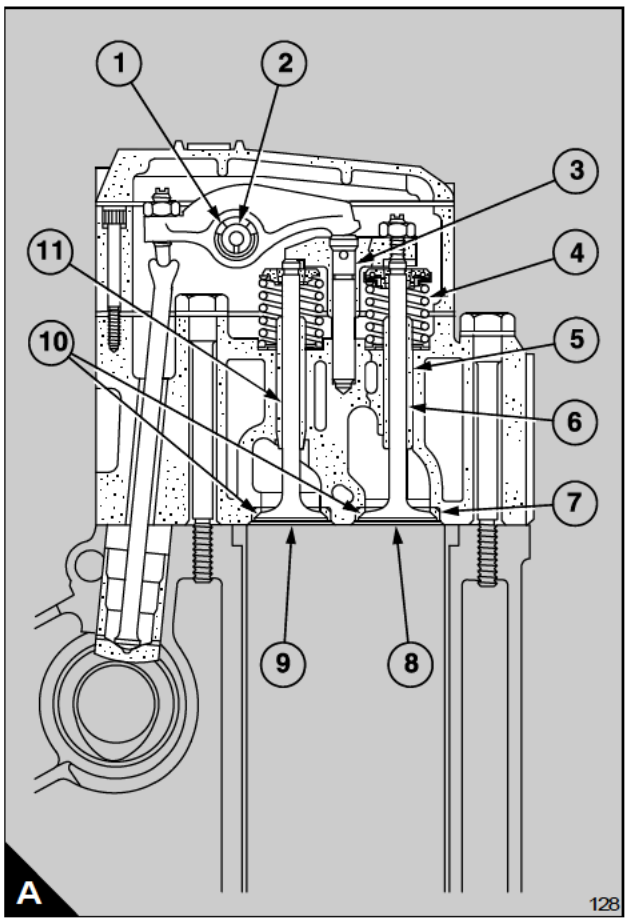
Free length (nominal)	47,066 mm (1.853 in)
Permissible worn length	44,713 mm (1.76 in)
Load when compressed to 26,87 mm (1.058 in)	0,5071 to 0,5605 kN (114 to 126 lbf)

Valve guides (A5)

Bore in cylinder head for valve guide	18,00 to 18,02 mm (0.7087 to 0.7094 in)
Outside diameter of valve guide (inlet and exhaust)	18,028 to 18,041 mm (0.7097 to 0.7103 in)
Interference fit (new)	0,008 to 0,041 mm (0.0003 to 0.0016 in)
Permissible interference fit (worn)	0,008 mm (0.0003 in)

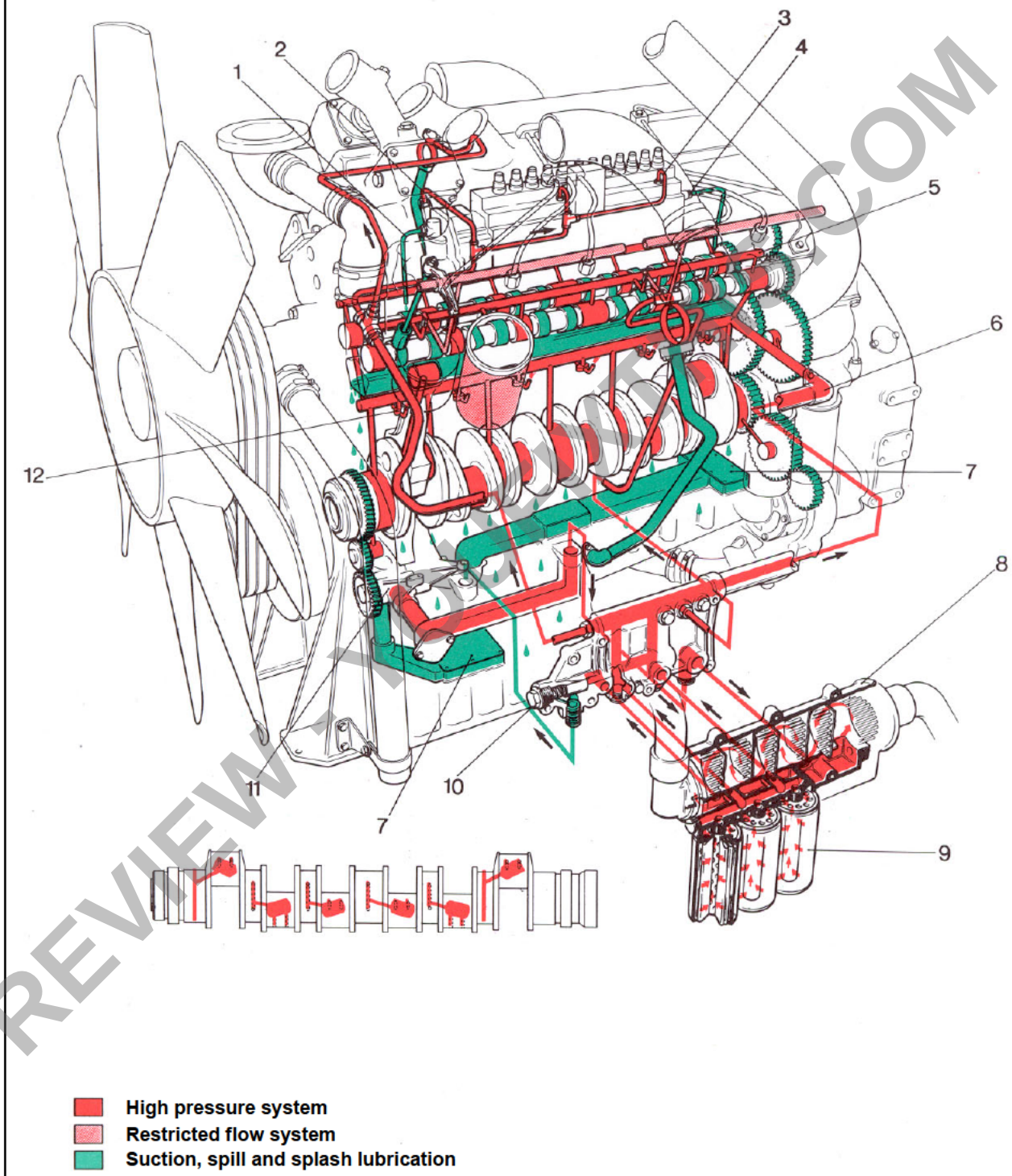
Inlet valves in guides (A11)

Diameter of valve stem	9,464 to 9,482 mm (0.3726 to 0.3733 in)
Bore of valve guide	9,525 to 9,550 mm (0.3750 to 0.3760 in)
Clearance (new)	0,043 to 0,086 mm (0.0017 to 0.0034 in)
Permissible worn clearance	0,137 mm (0.0054)



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A

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To dismantle and to assemble 20-12

Special tools:

Lift adaptor, 21825 876
Mounting bracket OD 21467
Spanner OD 5192
Key OD 21465
Extractor OD 21466
Anti-rotation tool OD 21468
Puller OD 5343

To dismantle

Caution: *Before the fuel injection pump and the governor are dismantled, clean thoroughly the outside of the assembly with kerosene and dry with compressed air.*

1 Hold securely the mounting bracket OD 21467 in a vice, fit the assembly onto the bracket and remove the lift adapter, 21825 876.

2 Remove all locking wire from the assembly, release the six bolts which retain the inspection cover (A5) and remove the inspection cover and the joint (A6).

3 Remove the six clips (A4) which retain the threaded plates (A3) and turn the threaded plates 90° to release them from the cambox (A7).

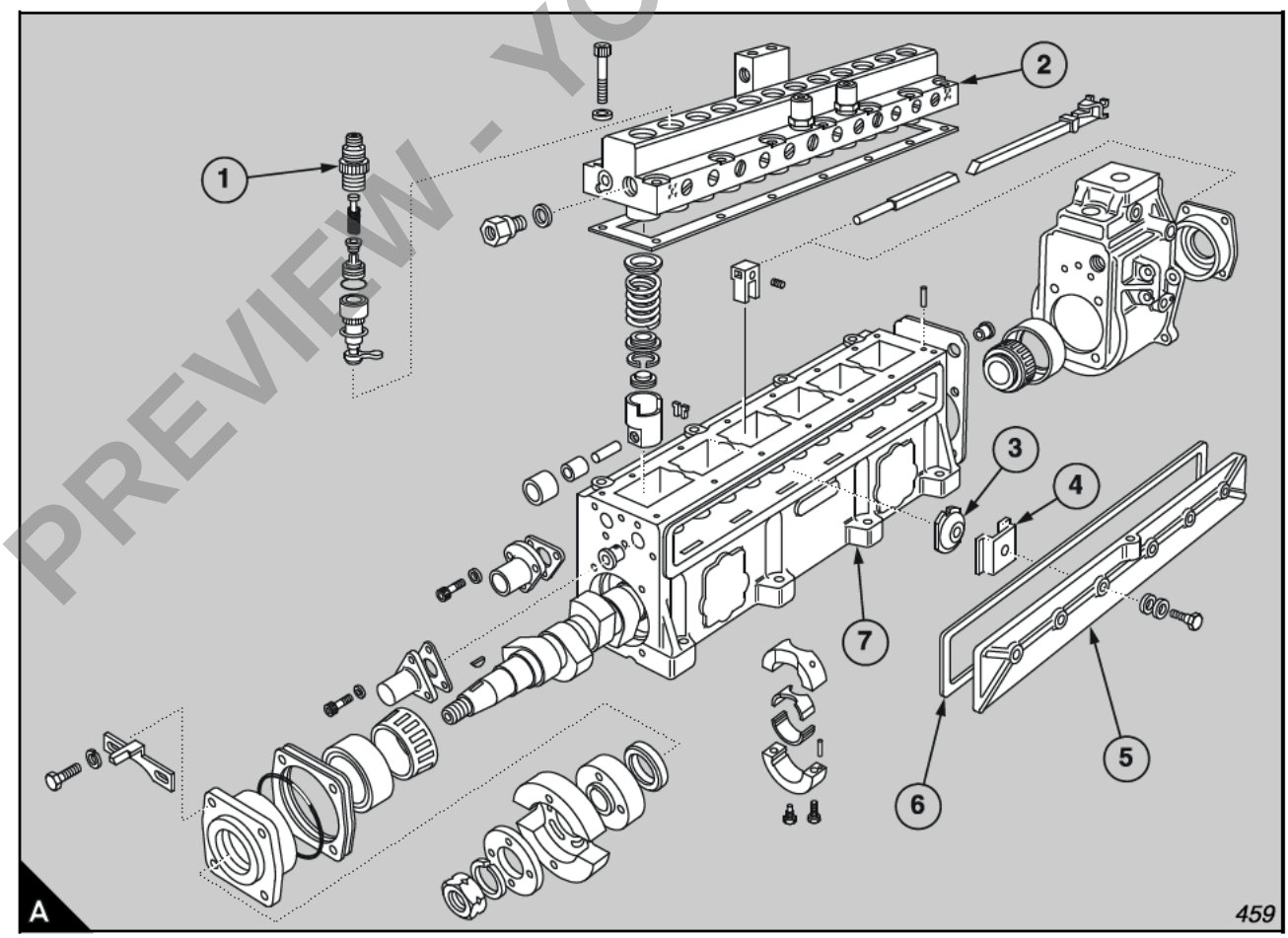
4 Use the spanner OD 5192 to loosen each of the holders of the delivery valves (A1) one or two turns. Do not remove the holders during this operation.

5 Release, evenly and gradually, the cap screws which hold together the cambox and the body of the pump (A2). Press lightly downward on the body while the screws are removed. Do not lift the body of the pump at this stage.

6 Loosen the vice and put the complete assembly of the fuel injection pump and the mounting bracket onto the bench.

7 Move carefully the assembly of the fuel injection pump onto its side, with the opening downward on the bench.

8 Lift carefully the body of the pump away from the cambox so that the plungers remain in their respective barrels.

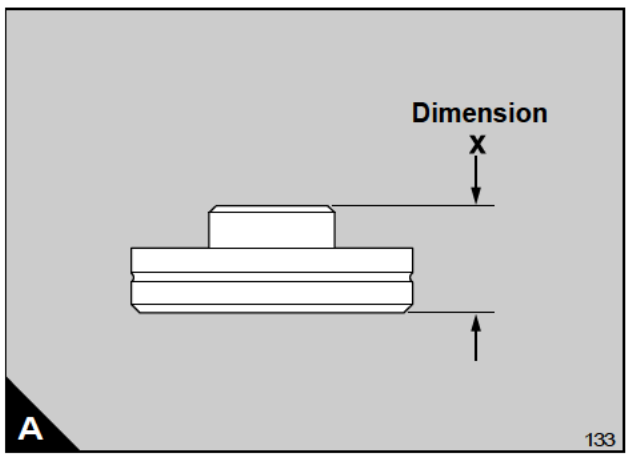


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Sizes of spacers (A) available for the tappets

Part Number	Dimension 'X'	Identification mark no.
509459	5,65 to 5,70 mm (0.222 to 0.224 in)	1
509460	5,75 to 5,80 mm (0.226 to 0.228 in)	2
509461	5,85 to 5,90 mm (0.230 to 0.232 in)	3
509462	5,95 to 6,00 mm (0.234 to 0.236 in)	4
509463	6,05 to 6,10 mm (0.238 to 0.240 in)	5
509464	6,15 to 6,20 mm (0.242 to 0.244 in)	6B
509465	6,25 to 6,30 mm (0.246 to 0.248 in)	7
509466	6,35 to 6,40 mm (0.250 to 0.252 in)	8
509467	6,45 to 6,50 mm (0.254 to 0.256 in)	9B
509468	6,55 to 6,60 mm (0.258 to 0.260 in)	10
509469	6,65 to 6,70 mm (0.262 to 0.264 in)	11
509470	6,75 to 6,80 mm (0.266 to 0.268 in)	12
509471	6,85 to 6,90 mm (0.270 to 0.272 in)	13
509472	6,95 to 7,00 mm (0.274 to 0.276 in)	14
509473	7,05 to 7,10 mm (0.278 to 0.280 in)	15
509474	7,15 to 7,20 mm (0.281 to 0.283 in)	16B
509475	7,25 to 7,30 mm (0.185 to 0.287 in)	17
509476	7,35 to 7,40 mm (0.289 to 0.291 in)	18B
509477	7,45 to 7,50 mm (0.293 to 0.295 in)	19B
509478	7,55 to 7,60 mm (0.297 to 0.299 in)	20
509479	7,65 to 7,70 mm (0.301 to 0.303 in)	21
509480	7,75 to 7,80 mm (0.305 to 0.307 in)	22
509481	7,85 to 7,90 mm (0.309 to 0.311 in)	23
509482	7,95 to 8,00 mm (0.313 to 0.315 in)	24
509483	8,05 to 8,10 mm (0.317 to 0.319 in)	25
509484	8,15 to 8,20 mm (0.321 to 0.323 in)	26
509485	8,25 to 8,30 mm (0.325 to 0.327 in)	27
509486	8,35 to 8,40 mm (0.329 to 0.331 in)	28
509487	8,45 to 8,50 mm (0.333 to 0.335 in)	29
509488	8,55 to 8,60 mm (0.337 to 0.339 in)	30
509489	8,65 to 8,70 mm (0.341 to 0.343 in)	31
509490	8,75 to 8,80 mm (0.344 to 0.346 in)	32
509491	8,85 to 8,90 mm (0.348 to 0.350 in)	33



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Pedestal rocker assembly

12-2 To remove and to fit ... 32
12-3 To dismantle and to assemble ... 33

Rocker box cover

12-4 To remove and to fit ... 34

Rocker box

12-5 To remove and to fit ... 34
12-6 To dismantle and to assemble ... 35
12-7 To inspect and to correct ... 36

Tappet clearances

12-8 To check and to adjust ... 38

Cylinder head assembly

12-9 To remove and to fit ... 40
12-10 To dismantle and to assemble ... 44
12-11 To clean and to inspect the cylinder head ... 45
12-12 To correct a valve seat ... 46
12-13 To remove a valve seat insert ... 47
12-14 To fit a valve seat insert ... 48
12-15 To inspect the valve guides ... 49
12-16 To renew a valve guide ... 50
12-17 To inspect the bridge pieces and guides ... 51
12-18 To renew a bridge piece guide ... 51
12-19 To recondition a fuel injector sleeve ... 52
12-20 To renew a fuel injector sleeve ... 53

Valves, valve springs and valve rotators

12-21 To remove and to fit ... 57
12-22 To inspect and to correct ... 57

Push rods

12-23 To remove and to fit ... 58
12-24 To inspect ... 58

Fits and clearances - Cylinder heads, rocker assemblies and valves ... 59

Cylinder heads, rocker assemblies and valves (continued) ... 60

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To renew a fuel injector sleeve 12-20

Special tools:

Remover tool for fuel injector sleeves, 21825 771

Tap, 21825 773

Expander tool for fuel injector sleeves, 21825 776

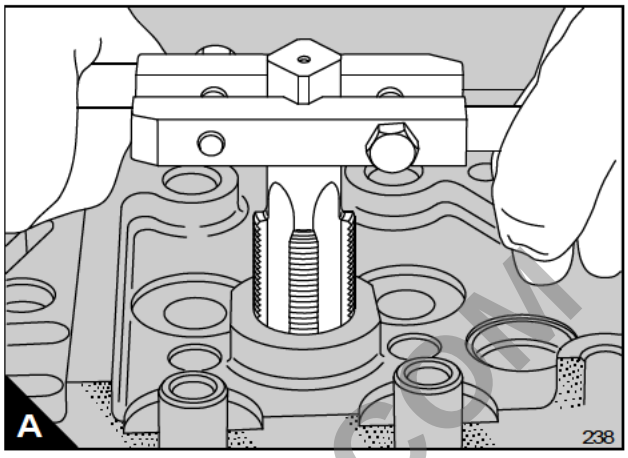
Ball type expander tool, 21825 883

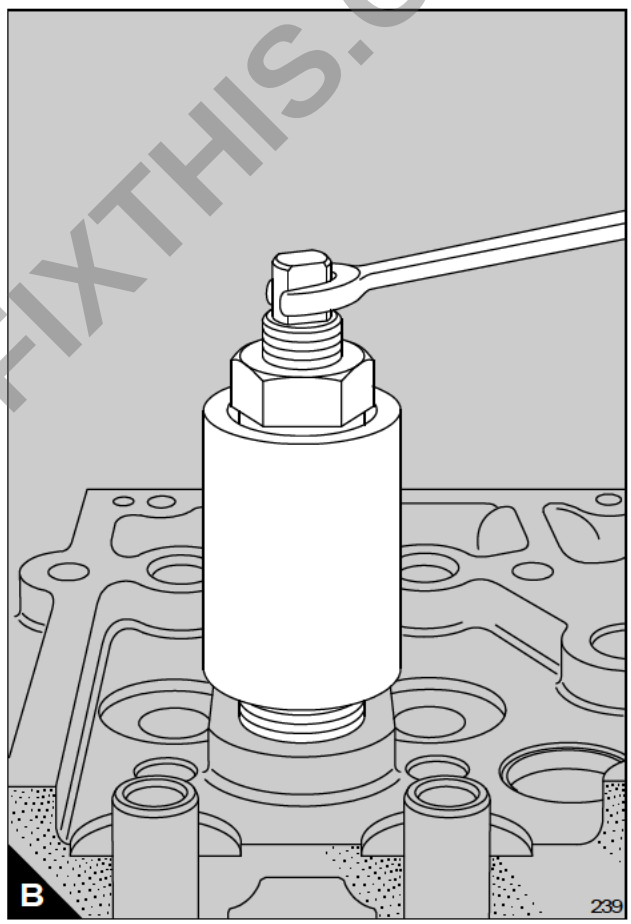
A fuel injector sleeve which is outside the limit, or has been damaged, or which leaks from the expanded joints and cannot be corrected by further expansion of the ends of the fuel injector sleeves, must be renewed in accordance with the instructions given below.

Caution: *The fuel injector sleeves may be renewed without the removal of the cylinder head from the engine. In this situation, the coolant must be drained until the level is below the cylinder head, and the piston which is below the faulty fuel injector sleeve must be moved to BDC.*

1 Use the tap, 21825 773, to make a thread in the fuel injector sleeve to a minimum depth of 25 mm (one inch)(A). If the work is done without the removal of the cylinder head from the engine, push some clean rag down the larger bore to prevent the possible entry of debris into the cylinder of the engine. The tap should be given a full application of grease to retain the particles of copper debris.

2 Move up the nut of the remover tool, 21825 771, to the top of its thread and fit fully the stud into the thread in the fuel injector sleeve (B).





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Crankshaft gear - idler gear for lubricating oil pump

Clearance (new) . . . . . 0,10 to 0,20 mm (0.004 to 0.008 in)

Idler gear for lubricating oil pump - gear of lubricating oil pump

Clearance (new) . . . . . 0,10 to 0,39 mm (0.004 to 0.015 in)

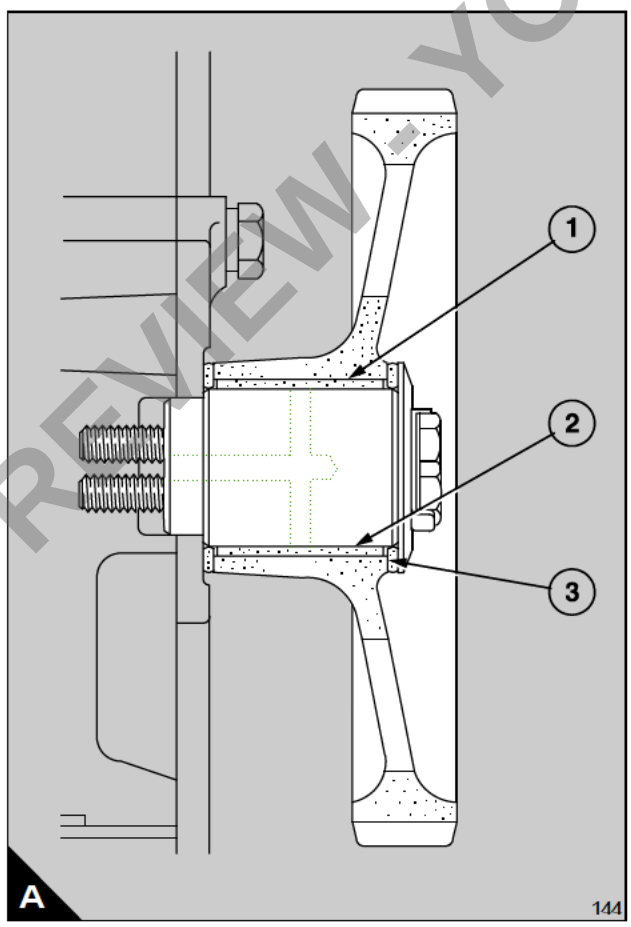
Idler gears on axles

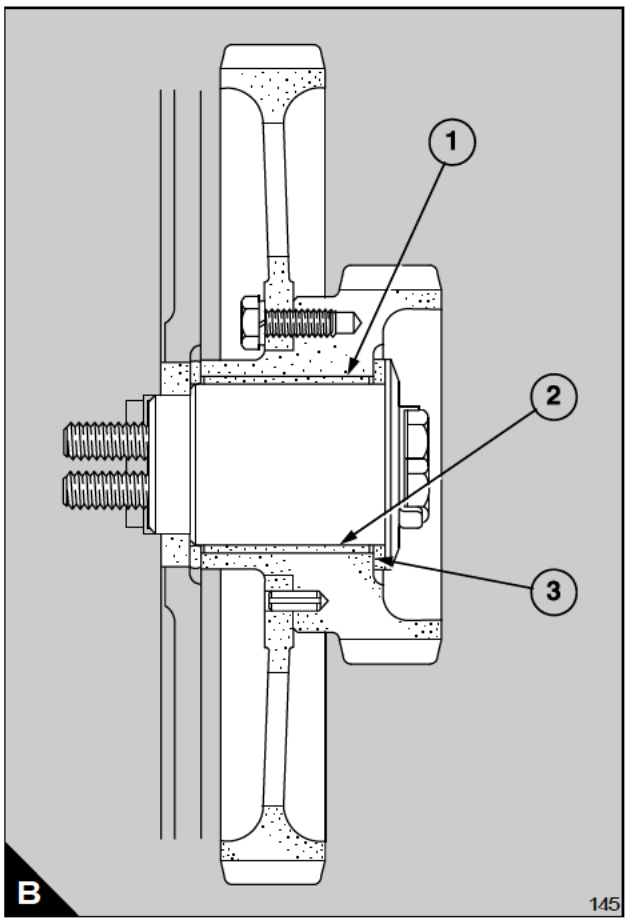
Main idler gear (A)

Bore of gear (new) (A1) . . . . . 50,000 to 50,025 mm (1.9685 to 1.9695 in)
Diameter of bush (new) . . . . . 50,089 to 50,127 mm (1.9720 to 1.9735 in)
Interference (new) . . . . . 0,064 to 0,127 mm (0.0025 to 0.0049 in)
Bore of bush (new) (A2) . . . . . 44,983 to 45,034 mm (1.7709 to 1.7729 in)
Axle diameter (new) . . . . . 44,910 to 44,950 mm (1.7681 to 1.7697 in)
Clearance (new) . . . . . 0,033 to 0,124 mm (0.0013 to 0.0048 in)
Permissible worn clearance . . . . . 0,199 mm (0.0078 in)

Double idler gear (B)

Bore of gear (B1) . . . . . 50,000 to 50,025 mm (1.9685 to 1.9695 in)
Diameter of bush . . . . . 50,089 to 50,127 mm (1.9720 to 1.9735 in)
Interference (new) . . . . . 0,064 to 0,127 mm (0.0025 to 0.0049 in)
Bore of bush (B2) . . . . . 44,983 to 45,034 mm (1.7709 to 1.7729 in)
Diameter of axle . . . . . 44,910 to 44,950 mm (1.7681 to 1.7697 in)
Clearance (new) . . . . . 0,033 to 0,124 mm (0.0013 to 0.0048 in)
Permissible worn clearance . . . . . 0,199 mm (0.0078 in)



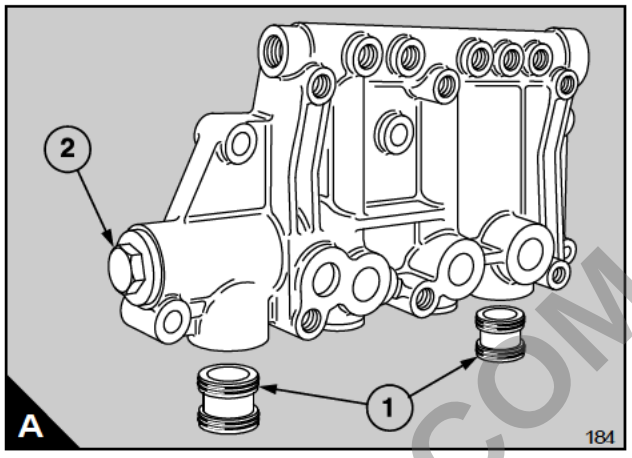


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19

Relief valve



To remove and to fit 19-17

1 The illustration (A) shows the location of the relief valve for early engines: in the mounting adaptor for the heat exchanger. On new engines, the location of the relief valve is near the crankcase in the lower rear end of the heat exchanger. The same type of relief valve is used for both locations.

To remove

1 Remove the cap (A2) and withdraw the assembly of the relief valve. Check the plunger and the housing for scratches and for damage. If the scratches are deep, the complete assembly must be renewed.

To fit

Caution: *To ensure that the opening pressure is correct, always fit a new spring.*

1 Check the spring for distortion, and measure its free length. A new spring conforms to the requirements given below:

Free length	123,2 mm (4.85 in)
Length under load of 39,5 kgf (87 lbf)	74,0 mm (2.91 in)

2 Lubricate lightly the plunger and ensure that it slides freely in the bore of the casing. Insert the spring. Fit the cap, with a new copper washer, and tighten it securely.

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Special tools:

Shaft remover/replacer, 21825 897

Bearing replacer, 21825 898

Water seal replacer, 21825 899

Oil seal replacer, 21825 903

Note: Seal repair kits are available from Perkins dealers.

Caution: *Certain special tools are needed to dismantle and to assemble the coolant pump. It is recommended that an exchange unit is fitted but if the special tools are available, proceed as follows:*

To dismantle

1 Release the five bolts (A17), with plain and the spring washers, which retain the end cover (A12) on the pump casing (A9); remove the end cover and discard the 'O' ring (A16).

2 Remove the lock nut which retains the drive gear and, with the assembly on a soft work bench, use a suitable puller (B) to remove the drive gear from the shaft.

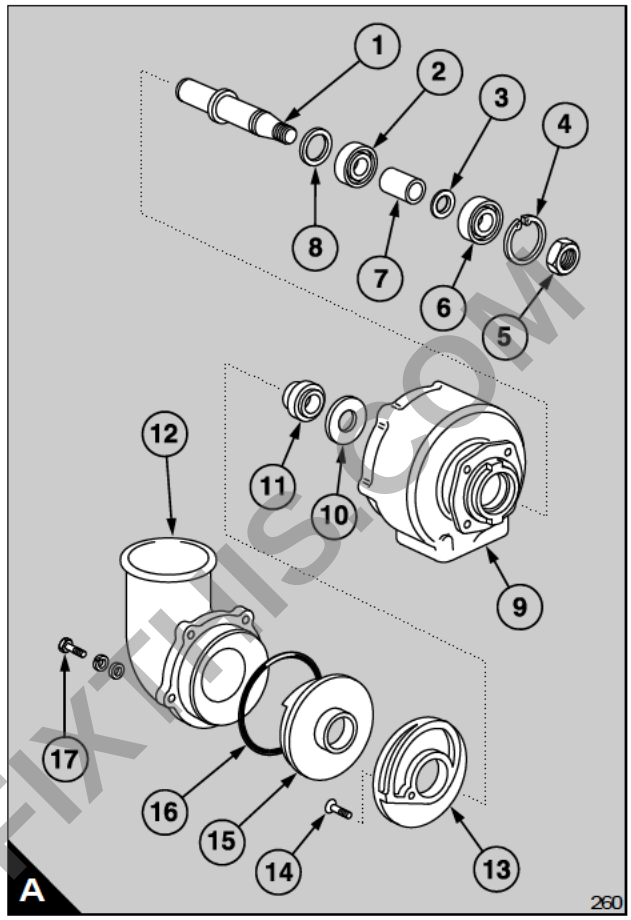
3 Remove the nut (A5) and the circlip (A4).

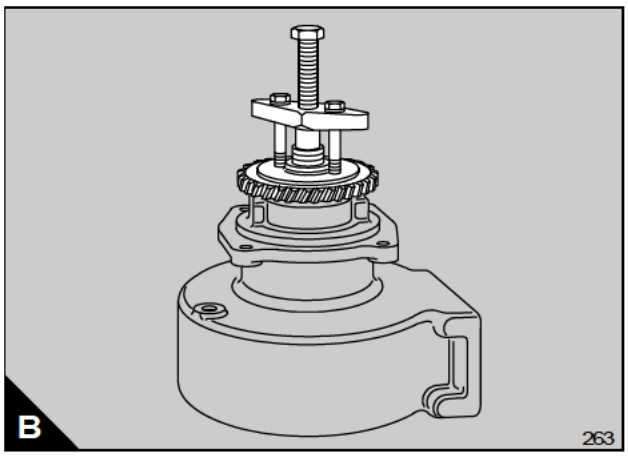
4 The next operation will require the use of the special tool 21825 897, which is in two parts: a guide and a thrust pad. Put the large diameter of the guide on the bed of a hand-press. Fit the assembly of the coolant pump over the guide with the small end down. It must be in the correct position for the shaft to pass through the centre of the tool. The small end of the thrust pad, must be located on the top of the shaft. Press the shaft through the impeller then remove the impeller, fit the thrust pad again and press the shaft fully through the coolant pump.

5 Remove the countersunk head screw (A14) and lift out the backplate (A13).

6 Remove the seal (A11) from its seat in the impeller.

7 Use a soft drift to remove the counterplate (A10) and the oil seal (A8) from the casing and use a suitable puller to remove the two ball bearings (A2 and A6) from the shaft (A1).





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