Specifications

Basic engine data

Cycle	Four stroke
Number of cylinders	4
Cylinder arrangement	In line
Firing order	1, 3, 4, 2
Direction of rotation	Clockwise from the front

Induction system

UA and UB	Naturally aspirated
UC	Turbocharged

Cubic capacity

UA and UC engines	2956 cc (183 in^3)
UB engines	2602 cc (159 in^3)

Compression ratio

UA and UC engines	17.5:1
UB engines	22.0:1

Combustion system

UA and UC engines	Direct injection
UB engines	Indirect injection

Nominal bore

UA and UC engines	97,000 mm (3.82 in)
UB engines	91,010 mm (3.58 in)
Stroke	100,000 mm (3.94 in)

Valve tip clearances (cold)

Inlet and exhaust	0,35 mm (0.014 in)
Lubricating oil pressure **(1)**	280 kPa (41 lbf/in^2) 2,86 kgf/cm^2
Typical dry installed engine weight **(2)**	200 kg (440 lb)

(1) Minimum pressure at maximum engine speed and normal engine temperature.
(2) Engine weight may alter with final specification.

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3

Cylinder head assembly

Rocker cover

To remove and to fit **Operation 3-1**

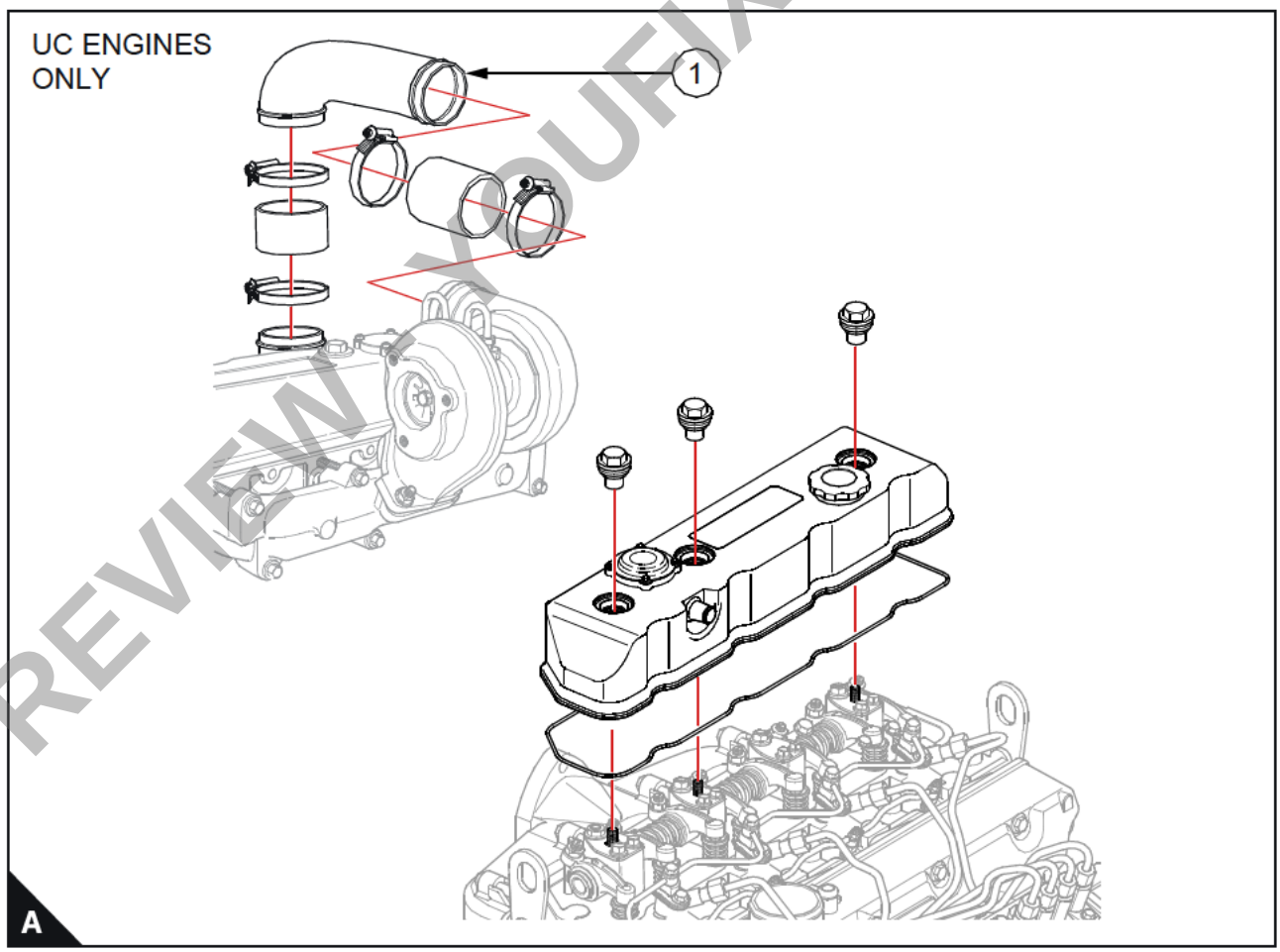
Special requirements

Torque Nm (lbf ft) kgf m	
Cap nuts	11 (8) 1,1

***Cautions*:**

- *If the cap nut is over-tightened, the stud and plate assembly for the rocker pedestal may be damaged.*
- *When the crossover pipe is removed, cover the holes in the turbocharger and in the induction manifold to prevent the entry of dirt.*

Note: On UC engines, the crossover pipe (A1) must be removed first.



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Recommended torque tensions

Most of the fasteners referred to in this manual have standard torque tensions that are shown in the table below. Those fasteners that need special torque tensions are listed in separate table.

Procedures referred to in this manual will have the torque tensions (standard or special) shown in the text and also listed in the table for special torque tensions.

Note: The torque tensions that are shown in this manual apply to fasteners with threads lightly lubricated with clean engine oil.

Standard torques for setscrews and nuts

Thread size	Torque		
	Nm	lbf ft	kgf m
M6 x 1,00	9	7	0,9
M8 x 1,25	22	16	2,2
M10 x 1,50	44	33	4,5
M12 x 1,75	78	58	8,0
M14 x 2,00	124	91	12,6
M16 x 2,00	190	140	19,3

Standard torques for studs (metal end)

Thread size	Torque		
	Nm	lbf ft	kgf m
M6 x 1,00	5	4	0,5
M8 x 1,25	11	9	1,1
M10 x 1,50	18	14	1,8
M12 x 1,75	25	19	2,5

Standard torques for pipe unions, plugs, and adaptors

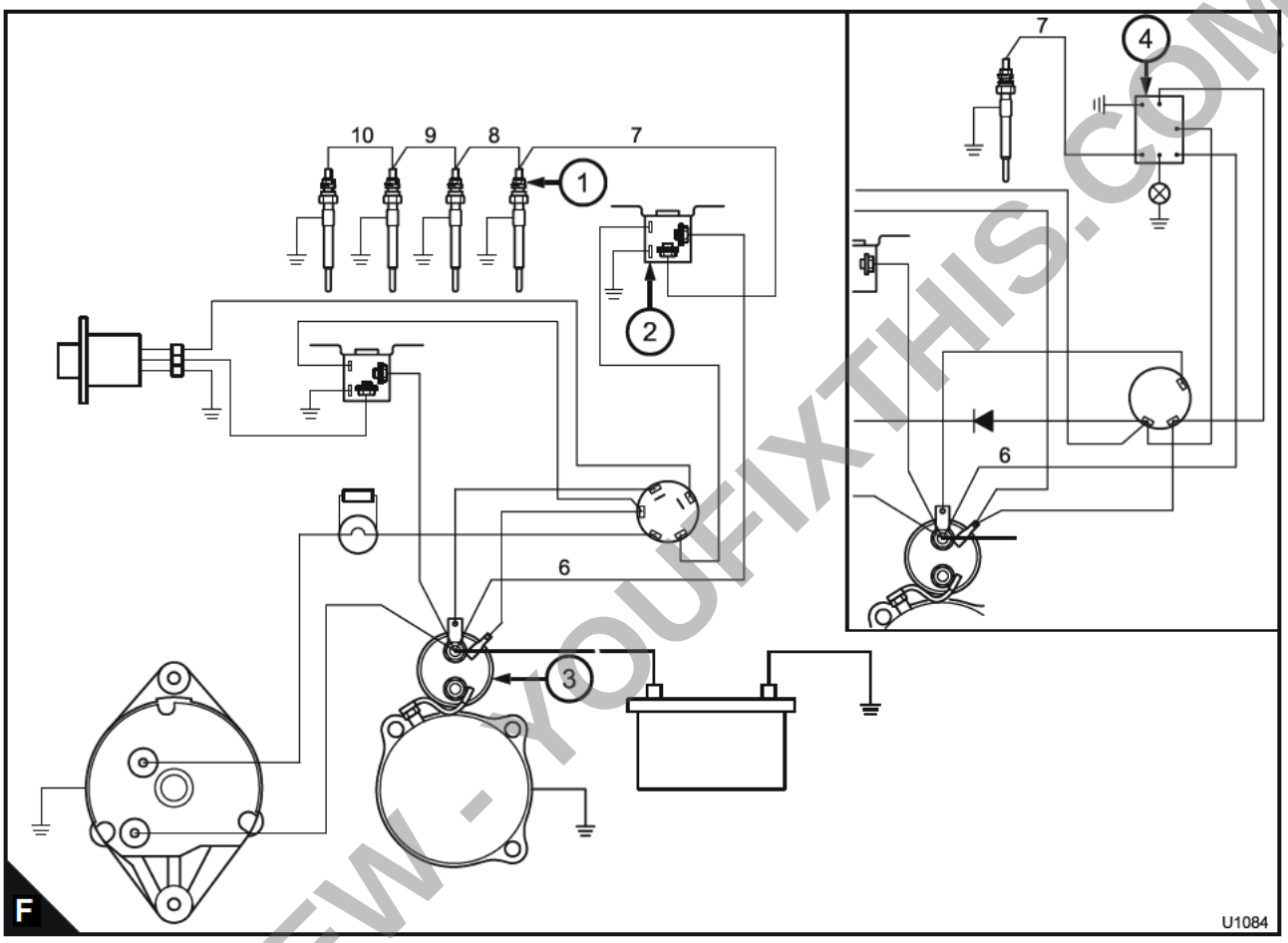
Thread size (Inches)	Torque		
	Nm	lbf ft	kgf m
1/8 PTF	9	7	0,9
1/4 PTF	17	13	1,7
3/8 PTF	30	23	3,0
3/4 PTF	45	35	4,5

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Key to indicate cables to be changed.

Cables affected	Instructions
Glow plug links	Remove original cables 8, 9, and 10 and fit 120 x 0,3 cables
Fourth glow plug (A1) to glow plug relay (A2) or glow plug controller (A4)	Remove original cable 7 and fit a 120 x 0,3 cable
Starter motor solenoid (A3) to glow plug relay or glow plug controller	Remove original cable 6 and fit a 120 x 0,3 cable



Service operations

Remove the induction manifold, see Operation 3-8.

See Operation 14-4 to check the glowplugs.

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Contents

1 General information

Introduction ... 1

Engine views - Naturally aspirated engine ... 3

Engine views - Turbocharged engine ... 4

Engine I.D. location ... 5

Safety precautions ... 6

Viton seals ... 8

Engine lift equipment ... 9

POWERPART consumable products ... 10

2 Specifications

Basic engine data ... 13

Data and dimensions ... 14

Thread sealant ... 30

Recommended torque tensions ... 31

Compression test data ... 34

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3 Cylinder head assembly

Rocker cover

Operation 3-1 To remove and to fit 35

Rocker assembly (latest engines)

Operation 3-2 To remove and to fit 36

Rocker assembly (earlier engines)

Operation 3-3 To remove and to fit 38

Rocker shaft (latest engines)

Operation 3-4 To dismantle, to inspect and to assemble 40

Rocker shaft (earlier engines)

Operation 3-5 To dismantle, to inspect and to assemble 41

Valve tip clearance

Operation 3-6 To check 42

Valve springs (with cylinder head fitted)

Operation 3-7 To remove and to fit 43

Exhaust / induction manifolds and gasket

Operation 3-8 To remove and to fit 44

Cylinder head setscrews

Operation 3-9 To remove and to fit 45

Cylinder head gasket

Operation 3-10 To remove and to fit 46

Valve and valve springs

Operation 3-11 To remove and to fit 47

Valve stem

Operation 3-12 To inspect 48

Valve depth

Operation 3-13 To check 49

Valve guides

Operation 3-14 To check 50
Operation 3-15 To remove and to fit 51

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Pistons and connecting rods

Pistons

Type:

UA engines ... Re-entrant combustion bowl
UB engines ... Flat top with recess for valves
UC engines ... Re-entrant combustion bowl, inserted top ring groove
Height of piston above top face of cylinder block ... 0,386/0,511 mm (0.0152/0.0201 in)
Diameter of bore for gudgeon pin ... 30,003/30,009 mm (1.1812/1.1814 in)

Width of groove for top ring

UA and UC engines ... 2,06/2,08 mm (0.081/0.082 in)
UB engines ... 2,08/2,10 mm (0.082/0.083 in)
Width of groove for second ring ... 2,06/2,08 mm (0.081/0.082 in)
Width of groove for third ring ... 4,04/4,06 mm (0.159/0.160 in)
Service height grade ... See Operation 4-10
Oversize piston ... 0,5 mm (0.020 in) on the diameter

Piston rings

Top compression ring ... Chromium / barrel faced
Second compression ring ... Taper face, cast iron
Oil control ring ... Coil spring loaded, chromium faced
Width of top ring ... 1,97/1,99 mm (0.077/0.078 in)
Width of second ring ... 1,97/1,99 mm (0.077/0.078 in)
Width of third ring ... 3,97/3,99 mm (0.156/0.157 in)

Clearance of top ring in groove

UA and UC engines ... 0,07/0,11 mm (0.003/0.004 in)
UB engines ... 0,003/0,005 mm (0.09/0.13 in)
Clearance of second ring in groove ... 0,07/0,11 mm (0.003/0.004 in)
Clearance of third ring in groove ... 0,05/0,09 mm (0.002/0.004 in)
Gap of top ring ... 0,20/0,55 mm (0.008/0.022 in)
Gap of second ring ... 0,30/0,63 mm (0.012/0.025 in)
Gap of third ring ... 0,20/0,48 mm (0.008/0.019 in)

Connecting rods

Type ... "H" section
Diameter of parent bore for big-end ... 56,000/56,015 mm (2.2047/2.2053 in)
Diameter of parent bore for small end ... 32,930/32,955 mm (1.2964/1.2974 in)
Length between centres (parent bores) ... 159,975/160,025 mm (6.2982/6,3002 in)

Length grades, see Operation 4-11.

Continued

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Valve stem

To inspect **Operation 3-12**

Special requirements

Diameter mm (in)	
Inlet valve	6,970-6,985 (0.2704-0.2750)
Exhaust valve	6,945-6,960 (0.2734-0.2740)

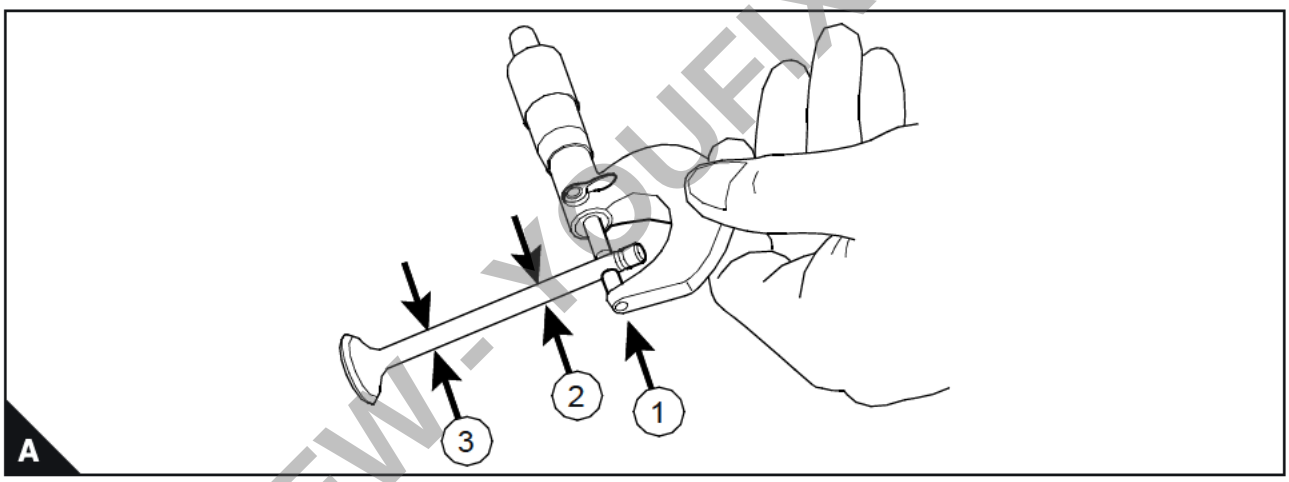
Warning! *Wear eye protection during this operation.*

***Cautions*:**

- *Ensure that the valve springs are compressed squarely or the valve stem can be damaged.*
- *Genuine valve stem seals must be used. If they are not, damage can occur to the valve stems and valve seats.*

Check the valve stem for excessive wear or damage. If found to be excessively worn or damaged, renew.

Check valve stem diameters at positions A1, A2 and A3 with a micrometer. If the diameter is less than the standard minimum diameter, renew.



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5

Crankshaft assembly

Crankshaft pulley

To remove and to fit **Operation 5-1**

Special requirements

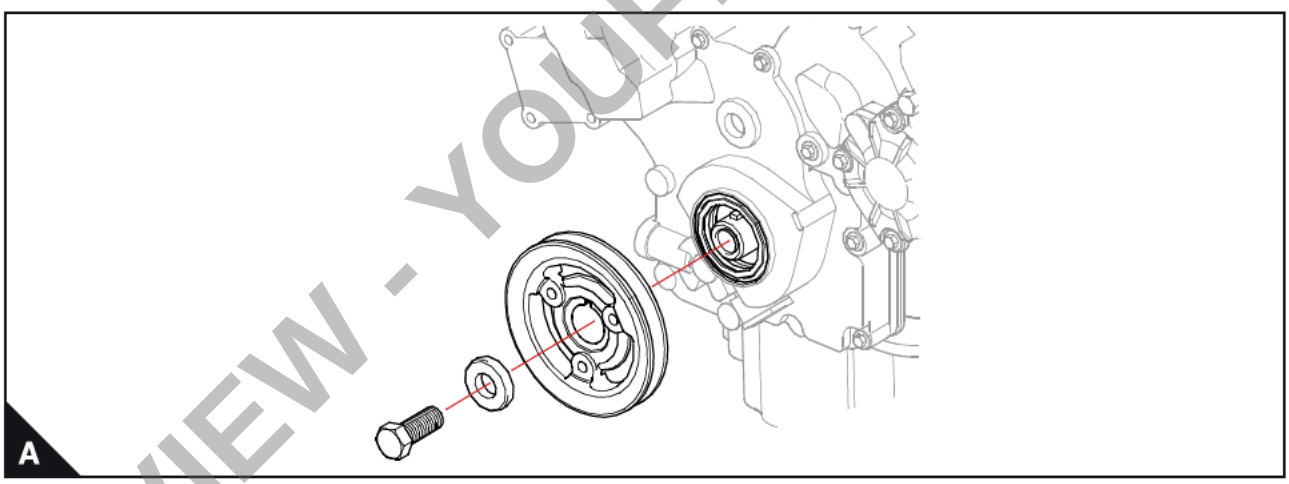
Torque Nm (lbf ft) kgf m	
Setscrews	185 (136) 19,0

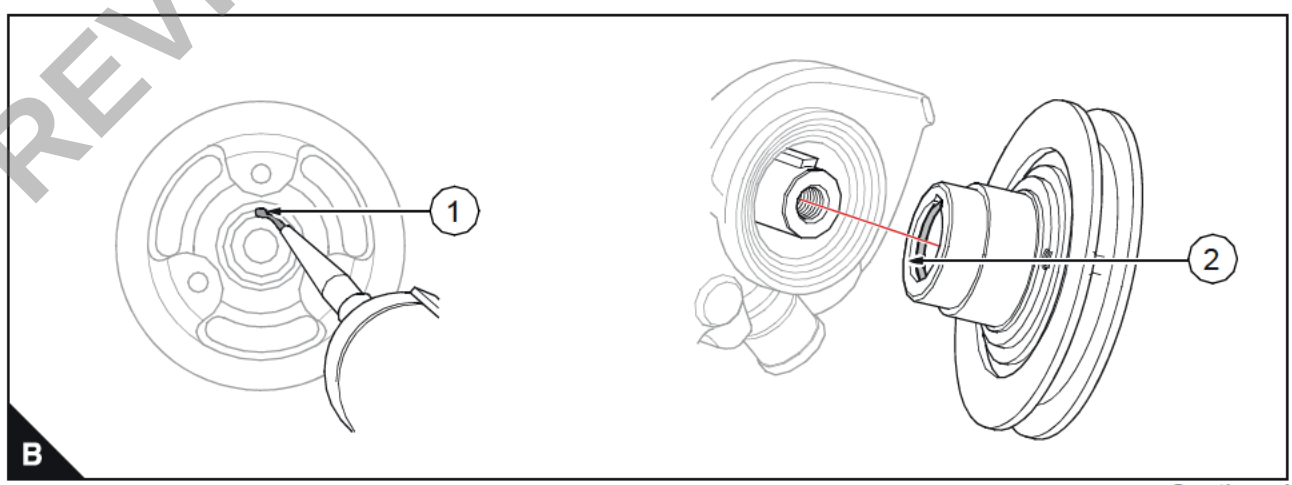
Some applications have an axial power take-off that is driven off the crankshaft pulley. The crankshaft pulley, on these applications, is retained by a retainer (B2) as well as a washer and setscrew.

If an axial power take-off is used, it will be necessary to use an extractor to remove the crankshaft pulley. Lock the crankshaft to prevent its counter-clockwise movement.

Caution: *Remove the device used to lock the crankshaft.*

Note: If the surface for the oil seal is damaged or there is a deep groove that is caused by the oil seal, it may be possible to fit a wear sleeve, refer to Operation 5-2.





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Camshaft assembly for the fuel injection pump

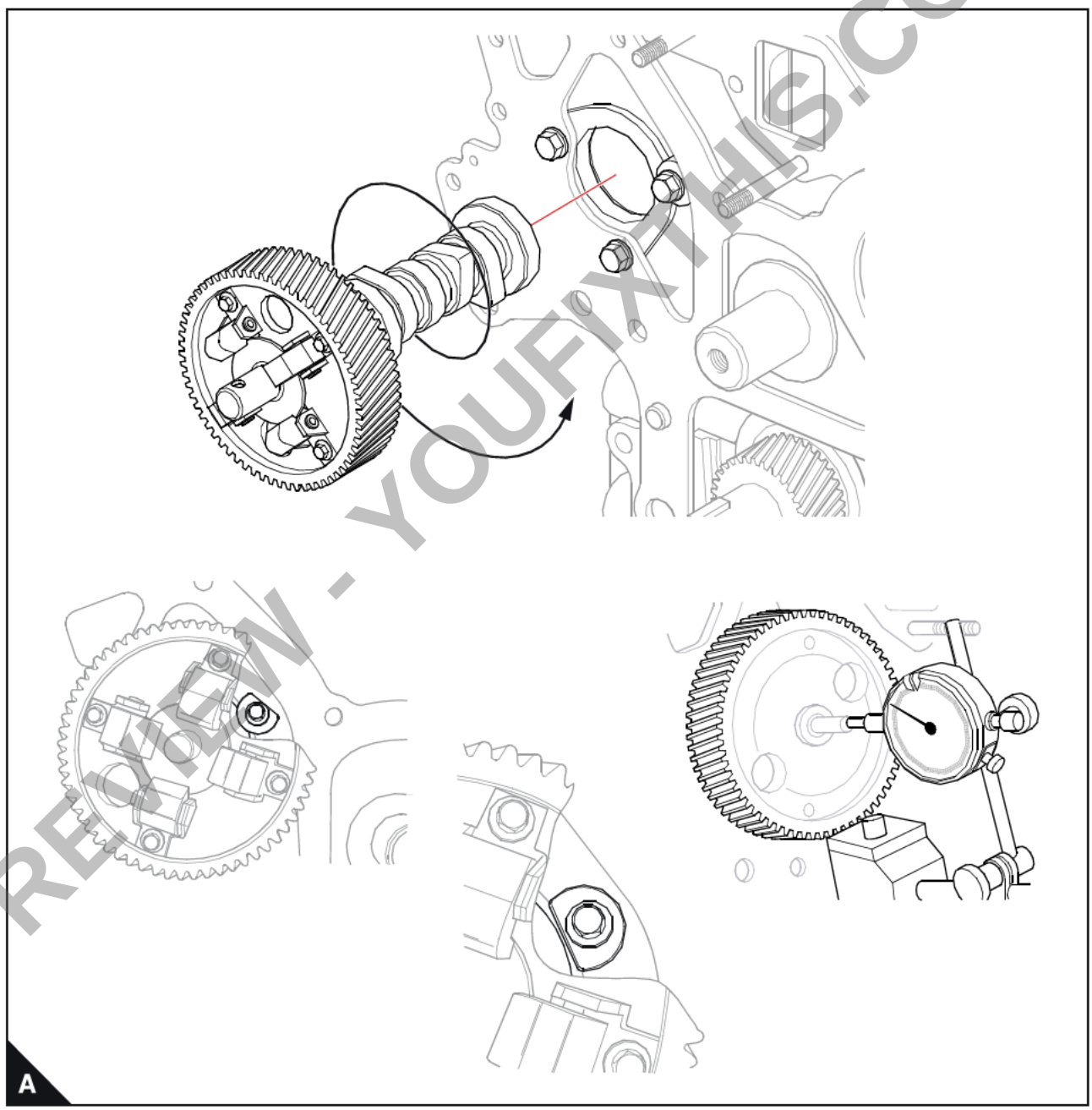
To remove and to fit **Operation 6-9**

Note: The camshaft is supplied only as an assembly of camshaft, bearing and gear. If the bearings, the cams or the gear is worn, a new camshaft assembly will have to be fitted. If this occurs, the fuel injection timing will have to be set, see Operation 8-2.

1 Release the setscrew for the plate that retains the camshaft bearing.

2 Rotate the plate 180° and tighten the setscrew. This will hold the plate away from the bearing.

Maximum permissible end float: 0,35 mm (0.014 in)



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Aluminium sump

To remove and to fit **Operation 10-4**

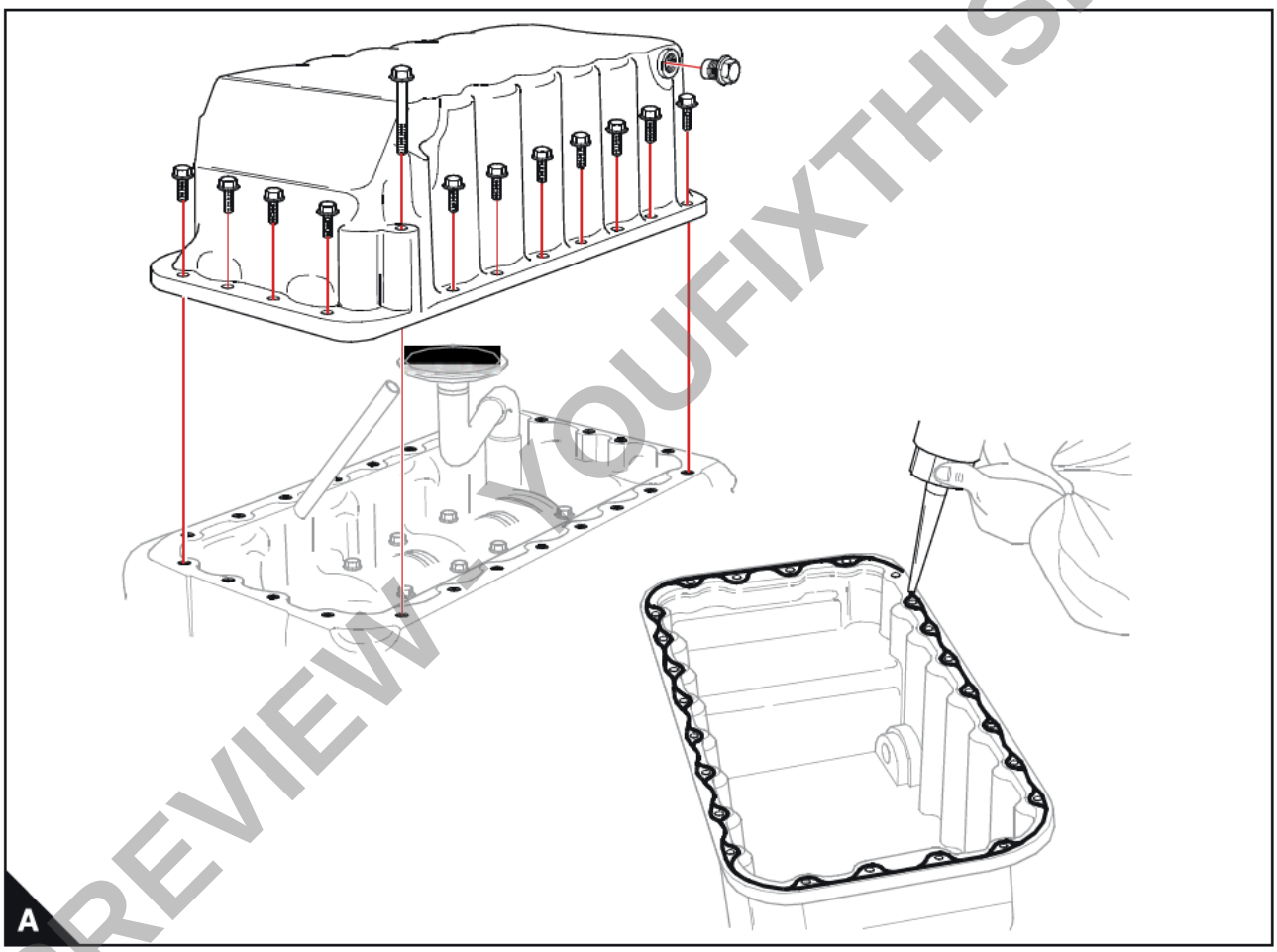
Special requirements

Torque Nm (lbf ft) kgf m		POWERPART products	
Setscrews	22 (16) 2,2	**Description**	**Part number**
Drainplugs	34 (25) 3,5	Silicone adhesive	21826038

Refer to Operation 10-2 for renewal of engine oil.

Note: Some agricultural applications have an engine with a divided sump to allow for a drive shaft. If this sump is used, both drain plugs must be removed, to ensure that all of the lubricating oil is drained.

When refitting, put a bead of POWERPART Silicone adhesive along the flange of the sump.



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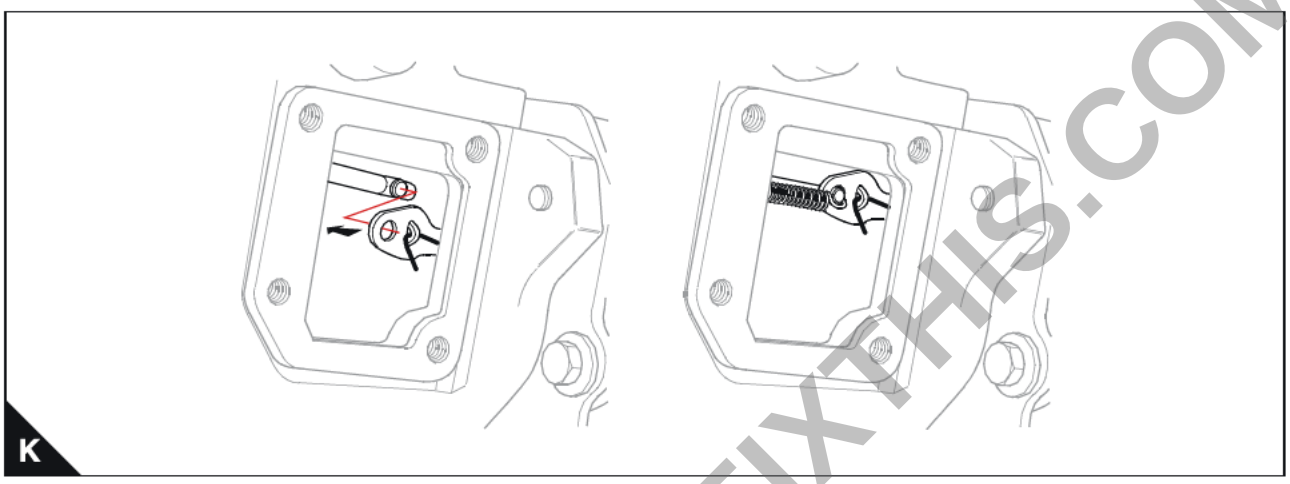
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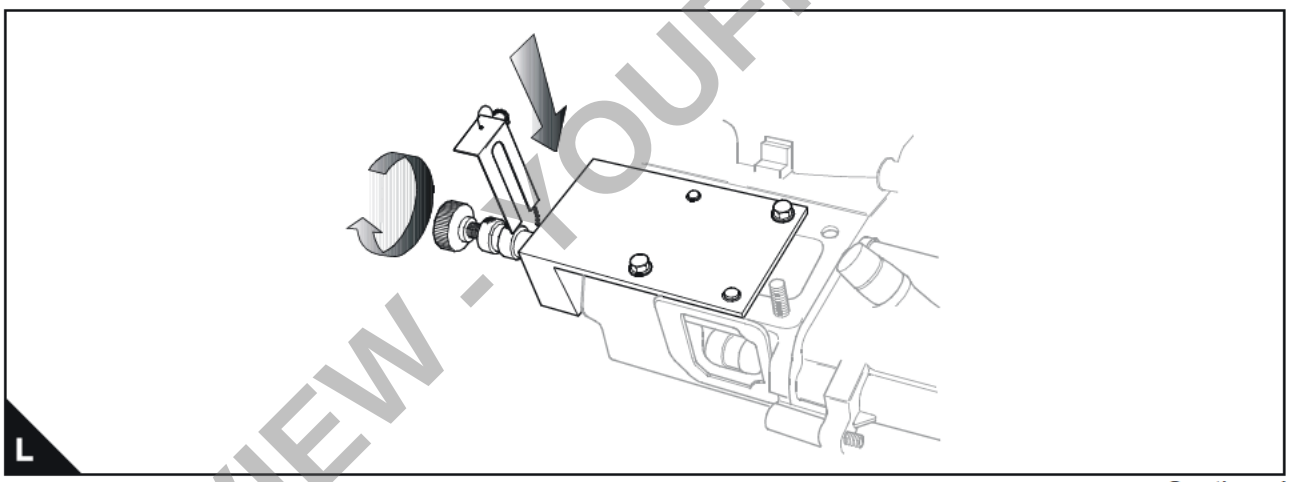
Note: The engine should be partially built without the fuel injection pump, but with the timing case.

13 Put the peg on the end of the adjustment rod into the hole in the control link. Fit the retaining spring to the peg (K).

14 Push the clamping tool towards the timing case, rotate the adjustment knob counter-clockwise slowly until the control link is just in tension (L).

15 Ensure that the setting ring is not in contact with the locking ring, refer to illustration (M) on the following page. Check that the control link is still in tension.With the setting plate flat against the rear face of the tool, adjust the setting ring to obtain a feeler gauge fit between the setting ring and the setting plate. Always ensure that the control link remains in tension.





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