
Perkins 3000 Series

WORKSHOP MANUAL

3008/CV8

8 cylinder diesel engines for industrial applications

The contents of this manual are applicable to both CV8 and 3000 Series - 3008 engines.

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Running-in and test

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10

General information

Introduction

This workshop manual has been designed to provide assistance in the service and the overhaul of Perkins 3008/CV8 engines. Most of the general information, which is included in the User's Handbook (sections 1 to 9), has not been repeated in this Workshop Manual and the two publications should be used together.

Read the 'Safety precautions' and remember them. They are given for your protection and must be applied at all times.

Bank and cylinder bore identification

The left and right sides of the engine are as seen from the rear (flywheel) end. Where reference is made to 'A' and 'B' banks of cylinders: 'A' bank is to the left and 'B' bank to the right when seen from the front end.

The numbers of the cylinders start from the front of the crankcase, A1 to A4 and B1 to B4.

To ensure that you use the correct information for your specific engine type, refer to 'Engine identification'.

Danger is indicated in the text by two methods:

Warning! *This indicates that there is a possible danger to the person.*

Caution: *This indicates that there is a possible danger to the engine.*

Note: Is used where the information is important, but there is not a danger.

Engine identification

The engine number is stamped on the data plate which is fastened to the left side of the crankcase.

For early engines, a typical engine number is: 4B26715U 59426T, which consists of these codes:

| | |
|-------|------------------------|
| 4B | Engine family |
| 26715 | Engine number |
| U | Country of manufacture |
| 59426 | Build line number |
| T | Year of manufacture |

Engines made after August 1994, have a new engine number system. For these engines, a typical number is: SGD 08 0012 U 1509 Y, which consists of these codes:

| | |
|------|-----------------------------|
| SG | Engine application |
| D | Engine type |
| 08 | Number of engine cylinders |
| 0012 | Engine specification number |
| U | The country of manufacture |
| 1509 | Build line number |
| Y | Year of manufacture |

Units such as the fuel injection pump and turbochargers have their own data plates.

If you need parts, service or information for your engine, you must give the complete engine number to your Perkins distributor.

General safety precautions

These safety precautions are important.

Reference must also be made to the local regulations in the country of operation.

- Only use these engines in the type of application for which they have been designed.
- Do not change the specification of the engine.
- Do not smoke when you put fuel in the tank.
- Clean away fuel which has been spilt. Material which has been contaminated by fuel must be moved to a safe place.
- Do not put fuel in the tank while the engine runs (unless it is absolutely necessary).
- Do not clean, add lubricating oil, or adjust the engine while it runs (unless you have had the correct training; even then extreme caution must be used to prevent injury).
- Do not make adjustments that you do not understand.
- Ensure that the engine does not run in a location where it can cause a concentration of toxic emissions.
- Other persons must be kept at a safe distance while the engine or equipment is in operation.
- Do not permit loose clothing or long hair near moving parts.
- Keep away from moving parts during engine operation. **Warning!** *The fan cannot be seen clearly while the engine runs.*
- Do not operate the engine if a safety guard has been removed.
- Do not remove the filler cap of the cooling system while the engine is hot and while the coolant is under pressure as dangerous hot coolant can be discharged.
- Fuel and oil pipes MUST be inspected for cracks or damage before they are fitted to the engine.
- Do not allow sparks or fire near the batteries (especially when the batteries are on charge), because the gases from the electrolyte are highly flammable. The battery fluid is dangerous to the skin and especially to the eyes.
- Disconnect the battery terminals before a repair is made to the electrical system.
- Ensure that the engine is operated only from the control panel or from the operator's position.
- Be extremely careful if emergency repairs must be made in adverse conditions.
- If your skin comes into contact with high pressure fuel, obtain medical assistance immediately.
- Read and use the instructions relevant to lift equipment which are given on page 18.
- Always use a safety cage to protect the operator when a component is to be pressure tested in a tank of water. Fit safety wires to secure the plugs which seal the hose connections of a component which is to be pressure tested.
- Do not allow compressed air to contact your skin. If compressed air enters your skin, obtain medical help immediately.
- Turbochargers operate at a high speed and at high temperatures. Keep fingers, tools and other items away from the inlet and outlet ports of the turbocharger and prevent contact with hot surfaces.
- Diesel fuel and lubricating oil (especially used lubricating oil) can damage the skin of certain persons. Protect your hands with gloves or a special solution to protect the skin.
- Do not wear clothing which is contaminated by lubricating oil. Do not put material which is contaminated with oil into the pockets.
- Discard used lubricating oil in a safe place to prevent contamination.
- Ensure that the control lever of the transmission drive is in the 'out-of-drive' position before the engine is started.
- The combustible material of some components of the engine (for example certain seals) can become extremely dangerous if it is burned. Never allow this burnt material to come into contact with the skin or with the eyes.
- Fit only genuine Perkins parts.

Engine lift equipment

Use only the lift equipment which is designed for the engine. The part number for the lift adaptor to use for the 3008 engine is: 21825 822.

Use lift equipment or obtain assistance to lift heavy engine components such as the cylinder block, cylinder head, flywheel housing, crankshaft and flywheel.

Check the engine lift brackets for security before the engine is lifted.

Asbestos joints

Some joints and gaskets contain compressed asbestos fibres in a rubber compound or in a metal outer cover. The 'white' asbestos (Chrysotile) which is used is a safer type of asbestos and the danger of damage to health is extremely small.

Contact with asbestos particles normally occurs at joint edges or where a joint is damaged during removal, or where a joint is removed by an abrasive method.

To ensure that the risk is kept to a minimum, the procedures given below must be followed when an engine which has asbestos joints is dismantled or assembled.

- Work in an area with good ventilation.
- Do NOT smoke.
- Use a hand scraper to remove the joints - do NOT use a rotary wire brush.
- Ensure that the joint to be removed is wet with oil or water to contain any loose particles.
- Spray all asbestos debris with water and place it in a closed container which can be sealed for safe disposal.

Environmental protection

There is legislation to protect the environment from the incorrect disposal of used lubricating oil. To ensure that the environment is protected, consult your Local Authority who can give advice.



Viton seals

Some seals used in engines and in components fitted to engines are made from Viton.

Viton is used by many manufacturers and is a safe material under normal conditions of operation.

If Viton is burned, a product of this burnt material is an acid which is extremely dangerous. Never allow this burnt material to come into contact with the skin or with the eyes.

If it is necessary to come into contact with components which have been burnt, ensure that the precautions which follow are used:

- Ensure that the components have cooled.
- Use Neoprene gloves and discard the gloves safely after use.
- Wash the area with a calcium hydroxide solution and then with clean water.
- Disposal of gloves and components which are contaminated, must be in accordance with local regulations.

If there is contamination of the skin or eyes, wash the affected area with a continuous supply of clean water or with a calcium hydroxide solution for 15-60 minutes. Obtain immediate medical attention.

Useful information

To clean components

It is important that the work area is kept clean and that the components are protected from dirt and other debris. Ensure that dirt does not contaminate the fuel system.

Before a component is removed from the engine, clean around the component and ensure that all openings, disconnected hoses and pipes are sealed.

Remove, clean and inspect each component carefully. If it is usable, put it in a clean dry place until needed. Ball and roller bearings must be cleaned thoroughly and inspected. If the bearings are usable, they must be flushed in low viscosity oil and protected with clean paper until needed.

Before the components are assembled, ensure that the area is as free from dust and dirt as possible. Inspect each component immediately before it is fitted, wash all pipes and ports and pass dry compressed air through them before connections are made.

Use suitable gloves for protection when components are degreased or cleaned with trichloroethylene, white spirit, etc. Degreasing solutions which are basically trichloroethane are not recommended.

Suitable fluids to clean and to protect components

Warning! Full information for the use of all the products listed below and for their safe disposal, and especially for the health and safety of the personnel who use them, will be found in the Manufacturer's data.

Ardrox 667: Ardrox Limited, Brentford, Middlesex.

Maxan 774: Henkel Chemicals Limited, Edgeware Road, London.

These products are basically methylene chloride and are safe to use on most metals for the removal of carbon and to remove paint. They can damage rubber and most plastic materials.

Method of use

The components to be degreased must be lowered completely into the degreasing solution. Allow enough time to elapse for the components to be thoroughly cleaned. Subsequently, the components must be thoroughly flushed in clean water. In use, maintain a layer of water at least 76 mm (3 inches) deep above the cleaning fluid to ensure that vapour and toxic gases are not released.

Warning! Do NOT smoke near the container. Protection for the eyes and for the skin must be used always during the use of these fluids, and the container must be in a place with good ventilation.

Duroclean 150 powder: Diversey Limited, Northampton.

This product is basically an alkaline degreasing solution and is safe to use on brass, copper and ferrous metals. It must not be used on aluminium, lead, tin or zinc.

Method of use

It is recommended that Duroclean 150 is used with a maximum concentration of 50 grams for each litre of water. The components to be degreased must be lowered completely into the degreasing solution which is heated to 65°C.

Leave to soak until all contamination has been removed.

Subsequently, the components must be thoroughly flushed in clean water. If necessary, a suitable corrosion inhibitor can be added to the last quantity of water.

Warning! Protection for the eyes and for the skin must be used always during the use of this product.

Crodafluid CR2: Croda Chemicals Limited, Goole, Yorkshire.

This product is basically an acid solution with a corrosion inhibitor. It is used to remove corrosion from components that are made of ferrous metals.

Method of use

Crodafluid CR2 must be contained in a tank that is made from a material which is not affected by acid. Before the process begins, the components must be degreased before they are lowered completely into the Crodafluid solution. For medium to heavy deposits of corrosion, the solution can be heated to 70°C. Inspect the components now and then to check the results of the process. Surface corrosion can be removed in a short period of time. The last operation is to wash thoroughly the components in clean water.

Warning! Protection for the eyes and for the skin must be used always during the use of this product.

Diverspray 30: Diversey Limited, Northampton.

This product is a moderate and basically alkaline compound with corrosion inhibitors. It is either sprayed over the components to clean them, or is contained in a tank, for the immersion and agitation of the components.

Diverspray 30 may be added to water to wash components if a corrosion inhibitor is necessary. It is used after other processes, such as corrosion removal, are finished.

NALCO 2568 Powder: NALCO Limited,
PO Box 11,
Winnington Avenue,
Northwich CW8 4DX

This product (which is supplied only in quantities of 25 kg) is an inhibited sulphamic acid and can be used for the removal of hard deposits from the tube stack of the oil cooler.

Warning! *The solution must be made and used in accordance with the manufacturer's instructions.*

The NALCO 2568 powder should be mixed with clean fresh water in the ratio which follows:

15 - 40 kg/Tonne of water

(15 - 40 lb/100 UK gallons of water)

When the action of the solution is finished, dip the tube stack in a solution made from: 0,5 kg (1 lb) of sodium carbonate to 25 litres (5 UK gallons) of hot water. The final operation is to dry the inside of the tubes with compressed air.

Oil seals

Apply petroleum jelly to oil seals before they are fitted, and do not damage the lip of the seal on sharp edges. Unless other specifications apply, fit the seal with the edge of the lip toward the bearing.

Hose connections

Do not use a screwdriver to remove hoses by force because adaptors or pipe connections can be damaged. Cut through the hose and then cut the ends of the hose from the adaptor or pipe connection.

When a new hose is fitted, a suitable rubber lubricant can be used instead of antifreeze, water or french chalk. Never lubricate a hose with oil or grease.

Gaskets, joints and 'O' rings

Discard all used items if an engine or a component is dismantled and fit only new and correct parts.

If a jointing compound is needed, 'Hylomar PL 32' jointing compound is recommended for use, but on metal joints ONLY. Only a thin application is needed, an excessive quantity of compound can restrict the flow of fluids in pipes and passages.

Caution: *'Hylomar' jointing compound must NOT be used in contact with any fibre joints as the solvent contained in 'Hylomar' can damage the joint material.*

Apply a small amount of a suitable lubricant to 'O' ring seals to prevent damage during assembly.

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Locking devices

Split pins, lock plates and tab washers that have been used must be discarded. Various methods to retain securely the nuts of an engine are shown (A). Stiffnuts can be used again only if they have not lost their grip and the original torque is needed to turn them.

There must be a minimum protrusion of one full thread of the bolt or stud through the stiffnut when it is tightened fully.

Discard all stiffnuts which have nylon or fibre inserts.

Application of thread locking compounds

Remove all oil, grease and dirt from engine parts before thread locking compounds are applied to them. Most thread locking compounds have a date by which they must be used, ensure that the compounds used are within those dates.

Fits and clearances

The dimensions given at the end of each section are acceptable limits. The components which have measurements within these limits are acceptable for a complete period of service.

Certain components which are worn by more than these limits can be corrected in accordance with a Service Reclamation Scheme (SRS). Information about the Service Reclamation Schemes is available from the Service Department at Perkins Engines (Shrewsbury) Limited.

Applied torques

The specifications for applied torques, which are given in section 11B, apply to certain bolts and nuts where damage or failure can occur if they are incorrectly tightened.

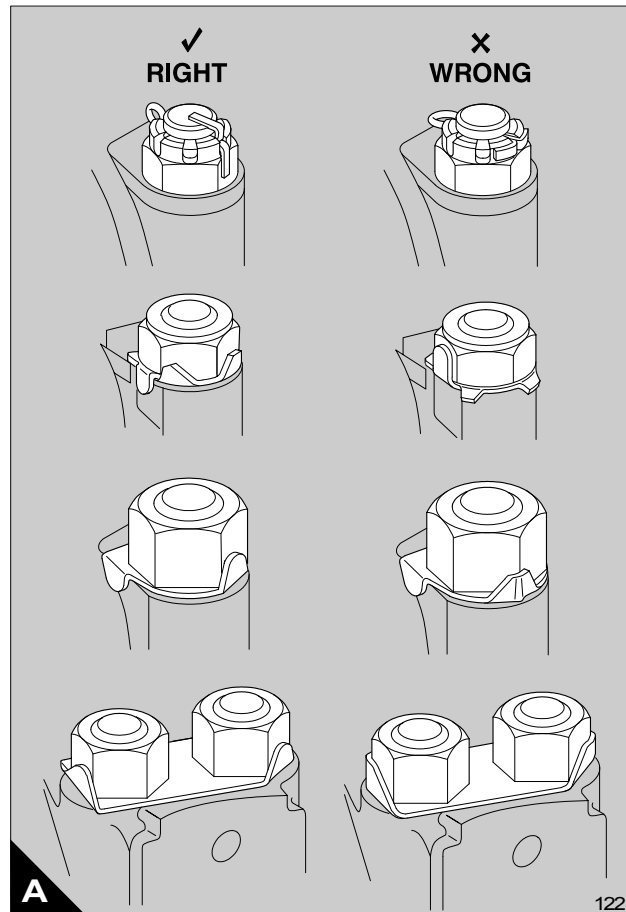
Where joints are fitted, for example, between the cylinder head and the crankcase, it is also important that bolts and nuts are tightened evenly and gradually, and in the correct sequence.

The torque wrenches, listed below, are suitable for the torque load requirements of the 3008/CV8 engine, and are available from Perkins Distributors.

8 to 54 Nm (6 to 40 lbf ft), 21825 846

30 to 150 Nm (20 to 110 lbf ft), 21825 991

70 to 310 Nm (50 to 230 lbf ft), 21825



Checks for cracks

When possible, it is recommended that components which are affected by high stresses, such as the crankshaft, the connecting rods, the gears and the cylinder liners are tested for cracks during overhaul. They should also be checked for cracks when they have been affected by an excessive load or impact.

It is recommended that ferrous components are tested by the electro-magnetic method if possible. Portable electro-magnetic test equipment is available from Radalloyd Limited, Oadby, Leicester.

Non-ferrous components can be tested by the use of a dye penetrant process such as 'Ardrox 996', available from Ardrox Limited, Brentford, Middlesex. The dye penetrant must conform to one of the standards listed below:

MIL-STD 271-E

MIL-L 25135

B.S. 5750

D.T.D. 929

Exchange units

It is recommended that unserviceable units are returned, as complete as the new exchange unit, with covers fitted to all openings and the joint faces protected. When necessary, protect the unit, both inside and outside, from corrosion.

Parts

To ensure maximum reliability, fit only genuine PERKINS parts supplied by a PERKINS distributor. These parts are made to the latest specification and have a guarantee for 12 months. The use of parts, such as filter elements, which do not conform to PERKINS standards, may reduce the life of the engine and can affect the warranty.

If you need parts, spares or information for your engine, give the complete engine number to your Perkins distributor. This will ensure that the correct parts can be obtained.

Approved lubricants and fluids

Equivalent lubricants and fluids of other manufacturers are acceptable

| | Product or specification | Manufacturer |
|---------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|
| Alternator | | |
| Cleaning fluid for diodes | Fluid grade 8-23 | Applied Chemicals Limited |
| Grease for diodes | Silicon MS200, MS4 and MS5 | Applied Chemicals Limited |
| Camshafts | | |
| Anti-seize compound | Rocol J166 | Rocol Limited |
| Anti-scuffing paste | Rocol | |
| Cooling system | | |
| Lips of oil seal in coolant pump | Shell Alvania R3 Grease | Shell Oils |
| Hose and 'O' rings | Liner lubricant | Morris's Shrewsbury |
| Compound for cleaning the system | Lissapol 'N', 1% (10 cc/ltr - 45 cc/Imp. gallon) | I.C.I Limited |
| | Lissapol 'NDB', 2% (20 cc/ltr - 90 cc/Imp. gallon) | |
| To remove hard deposits from the oil cooler | NALCO 2568 powder (in 25 kg drums only) | NALCO Limited |
| Exhaust system | | |
| Anti-seize compound for threads | Copaslip Rocol J166 | Slip Group Rocol Limited |
| Joints | | |
| Jointing compound | Hylomar Silicone Sealant | Marston Bentley Limited Adhesive and Sealants Division, Wigan |
| Sealant and thread locking | Loctite AVV, 241, 270, 290, 542 and 601 | Douglas Kane Sealants Morris's Shrewsbury Shell Oils Various |
| Lubrication system | | |
| 'O' rings and relevant bores | Liner lubricant | Morris's Shrewsbury |
| Starter motor | | |
| Cleaning fluid for commutators | White spirit | |
| Lubricant for splines | Aeroshell DID5598 | Shells Oils |
| 'O' ring lubricant | Glycerine | |
| Lubricator wick | Mineral oil SAE 5W/20 | Various |

11

Specifications

Basic engine data

Engine

| | |
|----------------------------------------------------------|-------------------------------------|
| Number of cylinders | 8 |
| Cylinder arrangement | 90 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 | 14.5:1 |
| Cubic capacity | 17,4 litres (1062 in ³) |
| Firing order | A1, B1, B2, A3, B3, A2, A4, B4 |
| Tappet clearances (hot or cold) | |
| Engines before build line number 8281 (4B 27377 8281 V): | |
| Inlet | 0,4 (0.016 in) |
| Exhaust | 0,5 (0.020 in) |
| Engines from build line number 8281 (4B 27377 8281 V): | |
| Inlet | 0,2 (0.008 in) |
| Exhaust | 0,5 (0.020 in) |
| Direction of rotation | Clockwise: view on front (fan end) |
| Injection timing | As stamped on engine data plate |
| Rated power output | 325 to 480 kW |
| Maximum rated speed | 1800 rev/min |
| Dry weight of engine | TAG2A Electropak: 1725 kg |
| (Approximate) | TAG3A and TAG4 Electropaks: 1823 kg |
| | Engine only: 1550 kg |

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Cooling system

| | |
|-----------------------------------------|-----------------------------------------------------|
| Coolant pump | Centrifugal, gear driven unit |
| Capacity of coolant system | 68.2 litres (15 UK gallons) |
| (does not include radiator) | |
| Coolant system pressure | 50-70 kN/m ² (7-10 lbf/in ²) |
| (at normal temperature of operation) | |
| Temperature (normal) | 78 to 94°C |
| Thermostat | Single element, wax capsule type |
| Approved coolant | See section 5 - 'Engine fluids' in the |
| | User's Handbook TSD 3250 |

Fuel system

| | |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Type | Low-pressure supply to injection pump with return of spill fuel to the tank |
| Fuel injection pump | 8 element, in-line unit |
| Governor | All speed, integral with fuel injection pump; constant speed for operation of generators (for other applications, variations are fitted) |
| Fuel lift pump | Mechanical, operated by camshaft |
| Fuel supply pressure | 140 to 210 kN/m ² (20 to 30 lbf/in ²) |
| Fuel injectors | Axial supply, low spring type, six spray holes |
| Injection pressure | 250 bar (early engines 240 bar) |
| Main fuel filter | Two screw-on type canisters |
| Primary fuel filter/water separator | Centrifugal type |
| Approved fuel | See section 5 - 'Engine fluids' in the |
| | User's Handbook TSD 3250 |

Lubrication system

| | |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Type | Wet sump |
| Capacity of lubricating oil sump | |
| Maximum | 54,5 litres (12 UK gallons) |
| Minimum | 40,9 litres (9 UK gallons) |
| Early engines: Maximum | 25 litres (5.5 UK gallons) |
| Minimum | 13,6 litres (3 UK gallons) |
| Total capacity of lubricating oil system | |
| Early engines | 60,7 litres (13.4 UK gallons) 31,2 litres (6.9 UK gallons) |
| Lubricating oil pressure | |
| Normal load conditions | 413 kN/m ² (60 lbf/in ²) Minimum at rated speed 345 kN/m ² (50 lbf/in ²) |
| Pump | Spur gear type, gear driven |
| Pressure relief valve | Spring loaded plunger, not adjustable Opening pressure 455 kN/m ² (66 lbf/in ²) |
| Oil-to-coolant heat exchanger | Tube stack and body, with baffle plates |
| Filters | Two, screw-on type canisters and one lubricating oil by-pass filter |
| Maximum recommended temperature of sump oil | 125°C |
| Approved lubricating oil | See section 5 - 'Engine fluids' in the User's Handbook TSD 3250 |

Induction and exhaust systems

| | |
|---------------------|-----------------------------------------------------------------------------|
| Aspiration | Pressure charged by two turbochargers or one turbocharger for early engines |
| Charge cooler | Two, air-to-air, single pass, integral with radiator |
| Air filters | Two, paper element type |

Electrical equipment

| | |
|----------------------------------|--------------------------------------------------------------------------------------------|
| Alternator | 24 volt 40 ampere |
| Starter motor | 24 volt - flange fitted |
| Stop control | 24 volt, energised-to-run |
| Engine protection switches | 24 volt instrument sender/switches for oil pressure, coolant temperature and coolant level |

Auxiliary equipment

| | |
|------------------|---------------------------------------------------------------------------------------------|
| Compressor | Twin cylinder: 0,88 m ³ /minute (31 ft ³ /min) of air at 2000 rev/min |
|------------------|---------------------------------------------------------------------------------------------|

Recommended applied torques

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 | | |
| Pulley - thin nut | 50 | 37 |
| Pulley - thick nut | 95 | 70 |
| Auxiliary drive shaft | | |
| Flange nut, M22 (32 mm A/F) | 300 | 220 |
| Camshafts | | |
| Screws for camshaft gears | 40 | 30 |
| Countersunk head screws for thrust plate | 70 | 52 |
| Compressor | | |
| Drive gear nut | 150 | 111 |
| Connecting rods | | |
| Big end bearing nuts - round headed bolts | 60 | 44 |
| Big end bearing nuts - 'D' headed bolts | 70 | 52 |
| Coolant gallery | | |
| Setscrews and nuts | 23 | 17 |
| Crankcase | | |
| Main bearing cap bolts | 488 | 360 |
| Side bolts for main bearing cap | 177 | 130 |
| Oil feed grub screws in cylinder vee | 12 | 9 |
| Crankshaft | | |
| Bolts for pulley and attachments | 95 | 70 |
| Cylinder heads | | |
| Bolts, cylinder head to crankcase (M15) | 240 | 177 |
| | (and a further 90°) | |
| Bolts, cylinder head to crankcase (M14) (fitted to early engines) | 240 | 177 |
| Bolts in inlet ports of cylinder heads | 200 | 148 |
| Bolts and studs, 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 |
| Lock nut, adjustment screw, tappet | 40 | 30 |
| Locking screw for position of rocker oil hole | 28 | 21 |



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