

# **WORKSHOP MANUAL**

**200 Series  
Diesel Engines**

**4.135, 4.154, 4.182**

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1990  
**Perkins Engines Limited**  
Peterborough, England

# Contents

<b>General Information</b>	<b>A</b>
<b>Engine views</b>	<b>B</b>
<b>Technical data</b>	<b>C</b>
<b>Maintenance</b>	<b>D</b>
<b>Fault diagnosis</b>	<b>E</b>
<b>Cylinder head</b>	<b>F</b>
<b>Pistons and connecting rods</b>	<b>G</b>
<b>Cylinder block and liners</b>	<b>H</b>
<b>Crankshaft and main bearings</b>	<b>J</b>
<b>Timing case and drive</b>	<b>K</b>
<b>Timing</b>	<b>L</b>
<b>Lubrication system</b>	<b>M</b>
<b>Cooling system</b>	<b>N</b>
<b>Fuel system</b>	<b>P</b>
<b>Flywheel and backplate</b>	<b>Q</b>
<b>Electrical equipment</b>	<b>R</b>
<b>Exhauster</b>	<b>T</b>
<b>Index</b>	<b>ZZ</b>

# General Information

**A**

**A**

<b>Introduction</b>	...	...	<b>A2</b>
<b>Safety precautions</b>	...	...	<b>A3</b>
<b>Engine identification</b>	...	...	<b>A4</b>
<b>Running-in procedure</b>	...	...	<b>A4</b>
<b>POWERPART consumable products</b>	...	...	<b>A5</b>
<b>Perkins companies</b>	...	...	<b>A6</b>
<b>Examples of service assistance</b>	...	...	<b>A6</b>

## Introduction

This manual has been written to give assistance to all personnel engaged in the maintenance and overhaul of Perkins 200 Series engines.

There are three engine types in the 200 Series. These are the 4.135, 4.154 and 4.182 engines. The information applies to all three engine types unless indicated.

Overhaul of the engine or components must only be done by personnel who have had the correct training.

The left and right side of the engine are as seen from the rear.

Parts and other services are available from your Perkins distributor. If you do not know his location, check with one of the Perkins companies given on Page A6.

**Read and remember the safety precautions. These are given for your protection and must be used at all times.**

### Legislation

This publication is written for world wide use. In countries where legislation controls engine smoke emission, noise, safety factors, etc., then all instructions, data and dimensions given must be applied so that, after service (preventive maintenance) or repair, the engine operation is correct to the local regulations.

## Safety precautions

THESE SAFETY PRECAUTIONS ARE IMPORTANT. Reference must also be made to the local regulations in the country of operation.



A

- Do not use these engines in marine applications.
- Do not change the specification of the engine.
- Do not smoke when you put fuel in the tank.
- Clean away any fuel which has fallen and move material which has fuel contamination to a safe place.
- Do not put fuel in the tank during engine operation (unless really necessary).
- Never clean, lubricate or adjust the engine during operation (unless you have had the correct training when extreme caution must be used to prevent injury).
- Do not make any adjustments you do not understand.
- Ensure the engine is not in a position to cause a concentration of toxic emissions.
- Persons in the area must be kept clear during engine and equipment or vehicle operation.
- Do not permit loose clothing or long hair near parts which move.
- Keep away from parts which turn during operation. Note that fans can not be seen clearly while the engine is run.
- Do not run the engine with any safety guards removed.
- Do not remove the radiator cap while the engine is hot and the coolant is under pressure as dangerous hot coolant can be discharged.
- Do not use salt water in the cooling system or any other coolant which can cause corrosion.
- Keep sparks or fire away from batteries (especially while during charge) or combustion can occur. The battery fluid can burn and is also dangerous to the skin and especially the eyes.
- Disconnect the battery terminals before you make a repair to the electrical system.
- Only one person must be in control of the engine.
- Ensure the engine is only operated from the control panel or operator's position.
- If your skin comes into contact with high pressure fuel, get medical assistance immediately.
- Diesel fuel can cause skin damage to some persons. Use protection on the hands (gloves or special skin protection solutions).
- Do not move equipment unless the brakes are in good condition.
- Ensure that the transmission drive control is in 'out of drive' position before the engine is started.
- Fit only correct Perkins Parts.

## A4 GENERAL INFORMATION

# Engine identification

The first two letters of the engine number give an indication of the engine type as shown below:

GA — 4.154 engine

GB — 4.135 engine

GC — 4.182 engine

The engine number is stamped on a machined pad on the left side of the cylinder block above the fuel injection pump (see illustration). A typical engine number is GBA12345J.

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

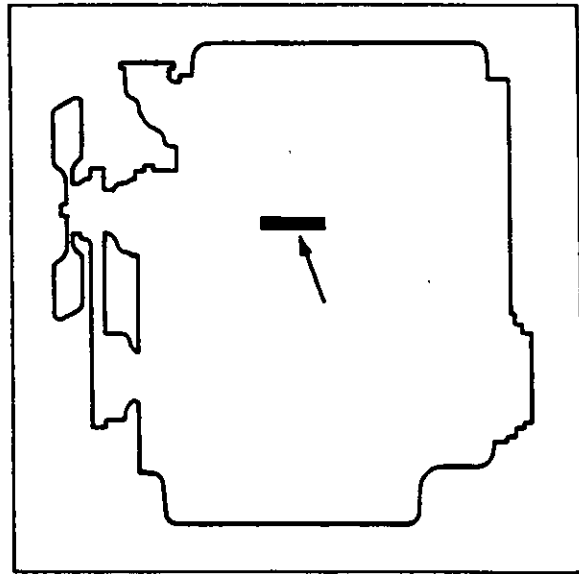


Fig. A1.  
Engine number position.

## Running-in procedure

To get maximum performance and life from your new engine, operate the engine as shown below for the first 800 km (500 miles) or 25 hours of operation.

Where possible, operate the engine at different speeds.

If your machine has a geared drive, use a lower gear when more power is needed.

Do not run the engine at high no load speeds.

Do not apply an overload to the engine.

## POWERPART consumable products

To give assistance in the correct operation, service and maintenance of your engine and machine, Perkins Engines Ltd. have made available the products shown below.

The instructions for the use of each product are given on the outside of each container. These products are available from your Perkins distributor.

### **POWERPART Antifreeze**

Protects the cooling system against frost and corrosion. See page D3.

### **POWERPART De-Icer**

Removes frost.

### **POWERPART Easy Flush**

Cleans the cooling system.

### **POWERPART Easy Seal**

Stops leakages from the cooling system.

### **POWERPART Foam Action Gasket Remover**

Allows easy and rapid removal of old gaskets and joints.

### **POWERPART Hylomar**

Universal jointing compound which seals joints.

### **POWERPART Hylosil**

Silicone rubber sealant which prevents leakage through gaps.

### **POWERPART Inhibitor**

Protects cooling system against corrosion when anti-freeze is not used.

### **POWERPART Lay-Up 1**

A diesel fuel additive for protection against corrosion. See page D4.

### **POWERPART Lay-Up 2**

Protects the inside of the engine and of other closed systems. See page D4.

### **POWERPART Lay-Up 3**

Protects outside metal parts. See page D4.

### **POWERPART Moisture Dispersant and Rust Penetrant**

Dries damp equipment and gives protection against corrosion. Passes through dirt and corrosion to lubricate and to assist removal of components.

### **POWERPART Retaining Compound**

Retains components which have a transition fit or an interference fit, for example, pulleys, bushes etc.

### **POWERPART Studlock**

Secures threaded fasteners. Recommended for fasteners which, normally, are not removed.

### **POWERPART Threadseal**

Seals threads and pipe connections. Low pressure systems can be used immediately.

A

## Examples of service assistance

### Service literature

The service literature which follows is available from your local Perkins distributor at a nominal cost.

#### Users handbooks

These give:

- Correct operation and maintenance
- To start and stop
- To remove air from the fuel system
- Fault diagnosis
- Coolants
- Frost precautions
- Protection of engines not in service.

#### Fault finding guide

This gives:

- Fault diagnosis in more detail.

### Service instruction

Apply to Product Education Department, Peterborough, for information, see below for address.

## Perkins companies

### Australia

Perkins Engines Australia Pty. Ltd.,  
Suite 2, 364 Main Street,  
Morningside 3931, Victoria, Australia.  
Telephone: 597 51877. Telex: Perkoil AA 30816.  
Fax: 597 58793.

### France

Moteurs Perkins S.A.,  
9-11 Avenue Michelet,  
93583 Saint Ouen, Cedex, France.  
Telephone: (1) 40-10-42-00. Telex: 642924F.  
Fax: (1) 40-10-42-45.

### Germany

Perkins Motoren G.m.b.H.,  
8752 Kleinostheim, Postfach 1180, West Germany.  
Telephone: 6027 5010. Telex: 4188869A PER D.  
Fax: 6027 501124.

### Italy

Motori Perkins S.p.A.,  
Via Socrate 8,  
22070 Casnate con Bernate (Como), Italy.  
Telephone: 031 452332. Telex: 380658 Perkit I.  
Fax: 031 452335.

### Japan

Massey Ferguson Perkins Engines K.K.,  
Reinzaka Building, 6th Floor, 14-2 Akasaka,  
1-chome, Minato-ku, Tokyo 107, Japan.  
Telephone: 03 586 7377. Telex: Perkoil J2424823.  
Fax: 03 582 1596.

### Singapore

Perkins Engines Asia Pacific,  
4 Kian Teck Drive, Singapore 2262.  
Telephone: 2656333/2653223.  
Telex: Perkoil RS37729. Fax: 2641188.

### United Kingdom

Perkins Engines Limited,  
Frank Perkins Way, Eastfield,  
Peterborough PE1 5NA, England.  
Telephone: 0733 67474. Telex: 32501 Perken G.  
Fax: 0733 582240.

Perkins Engines (Shrewsbury) Limited,  
Sentinel Works, Shrewsbury SY1 4DP, England.  
Telephone: 0743 52262. Telex: 35171/2 PESL G.  
Fax: 0743 69911.

### United States of America

Perkins Engines Inc.,  
1700, Bellemeade Court,  
Lawrenceville, Georgia 30245, USA.  
Telephone: 404 822 3000. Telex: 544141 Perken Law.  
Fax: 404 822 3006.

Perkins Engines Latin America Inc.,  
Suite 620,  
999, Ponce de Leon Boulevard,  
Coral Gables, Florida 33134, USA.  
Telephone: 305 442 7413. Telex: 32501 Perken G.  
Fax: 305 442 7419.



# Engine Views **B**

Perkins engines are made for specific applications and the views which follow are not necessarily correct for your engine specification.

**B**

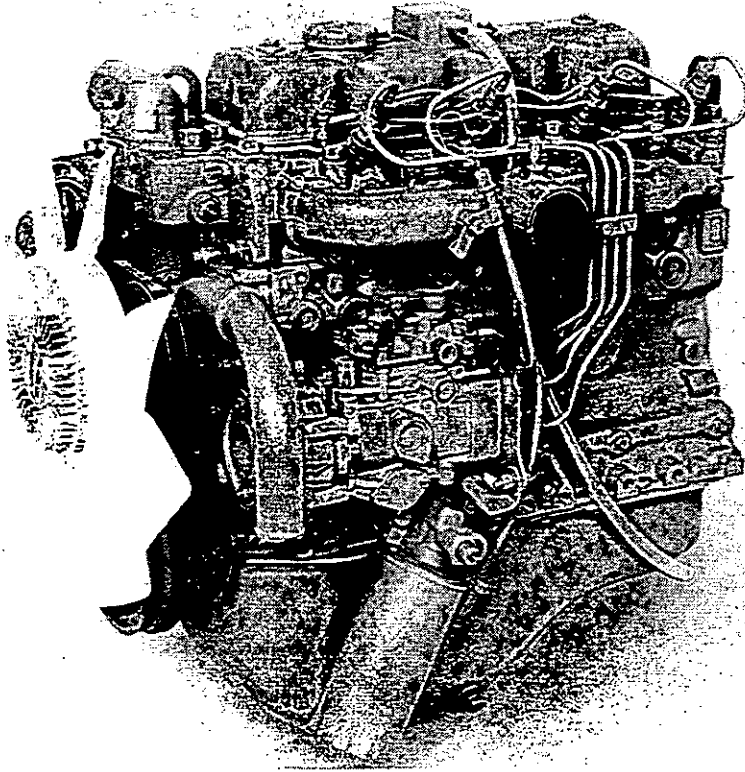


Fig. B1.  
Front/left side of 4.135 engine.

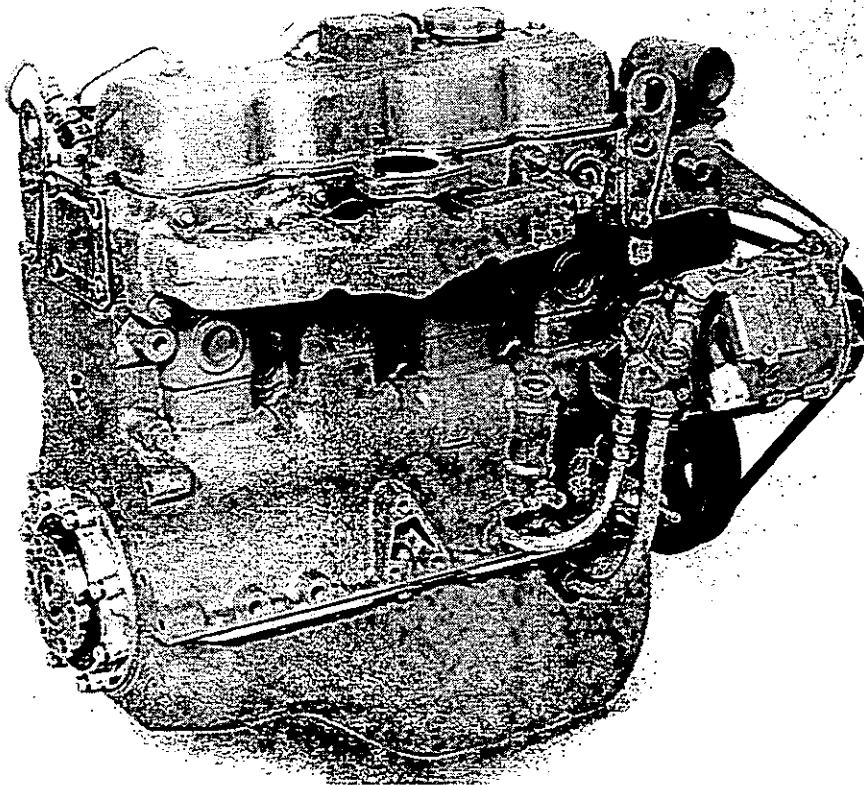


Fig. B2.  
Rear/right side of 4.135 engine.

B

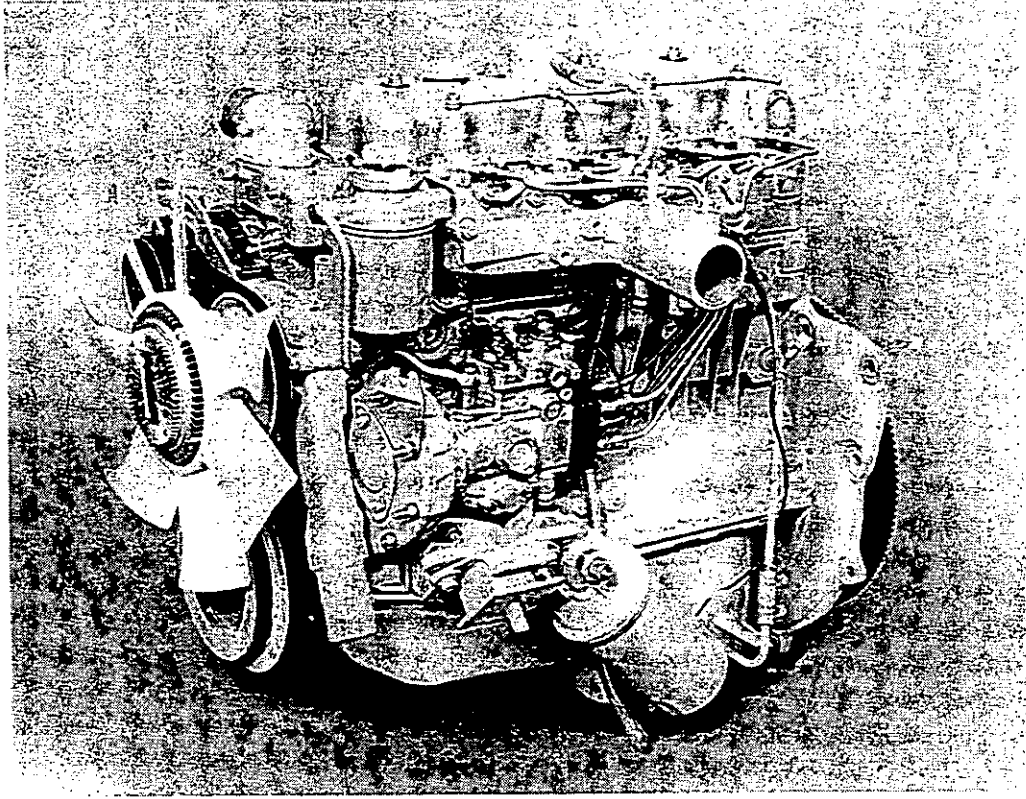


Fig. B3.  
Front/left side of 4.154 engine.

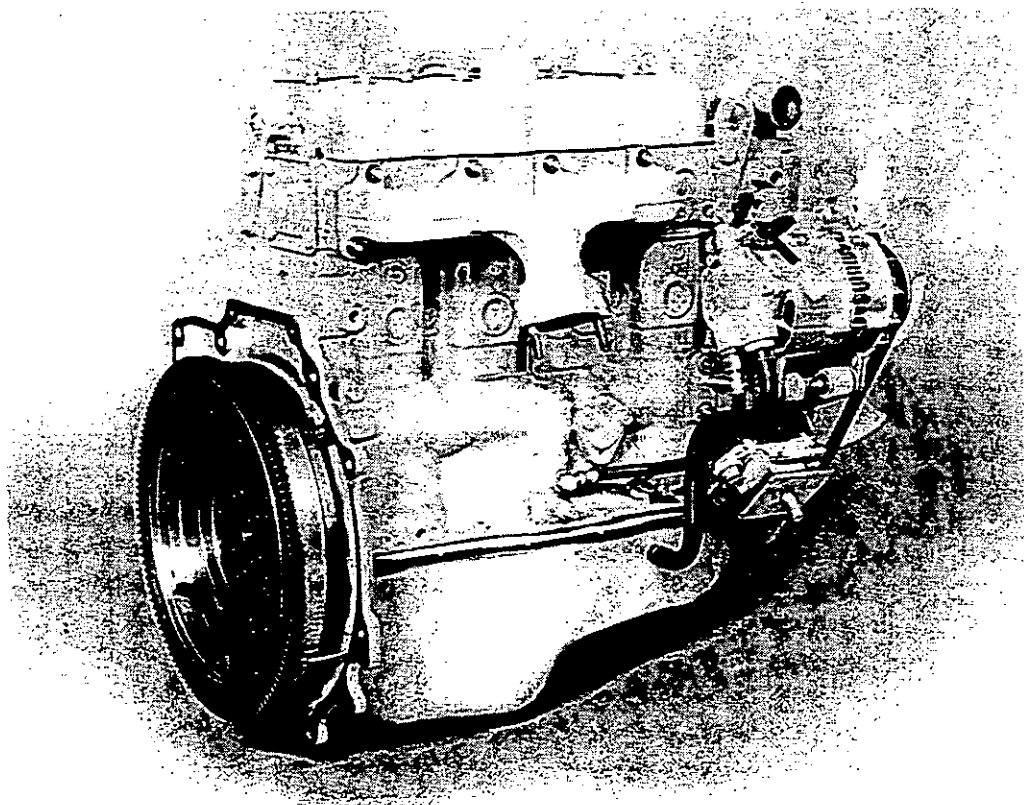


Fig. B4.  
Rear/right side of 4.154 engine.

## 4 ENGINE VIEWS

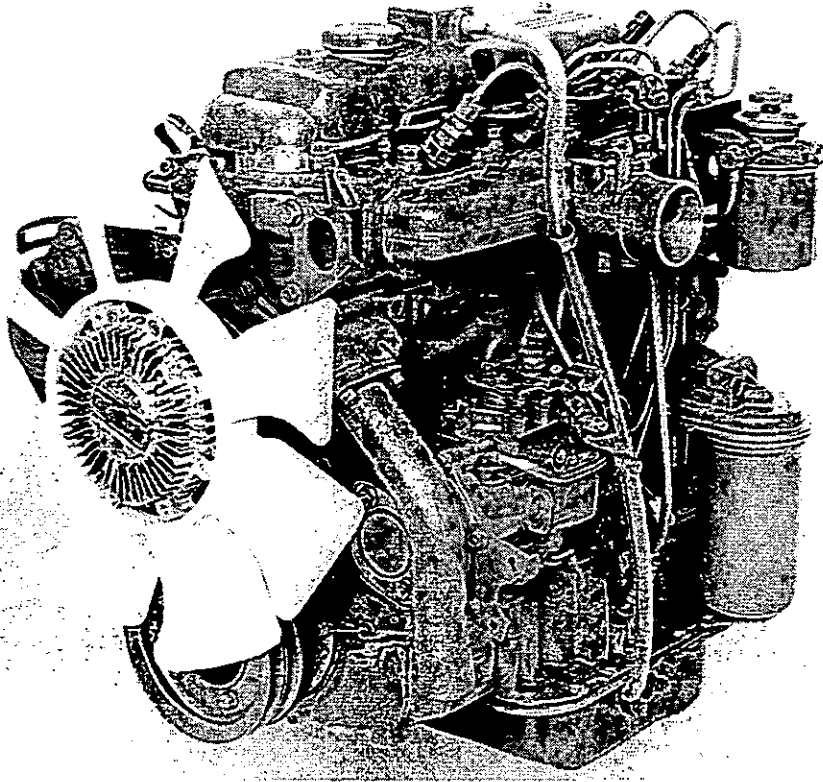


Fig. B5.  
Front/left side of 4.182 engine.

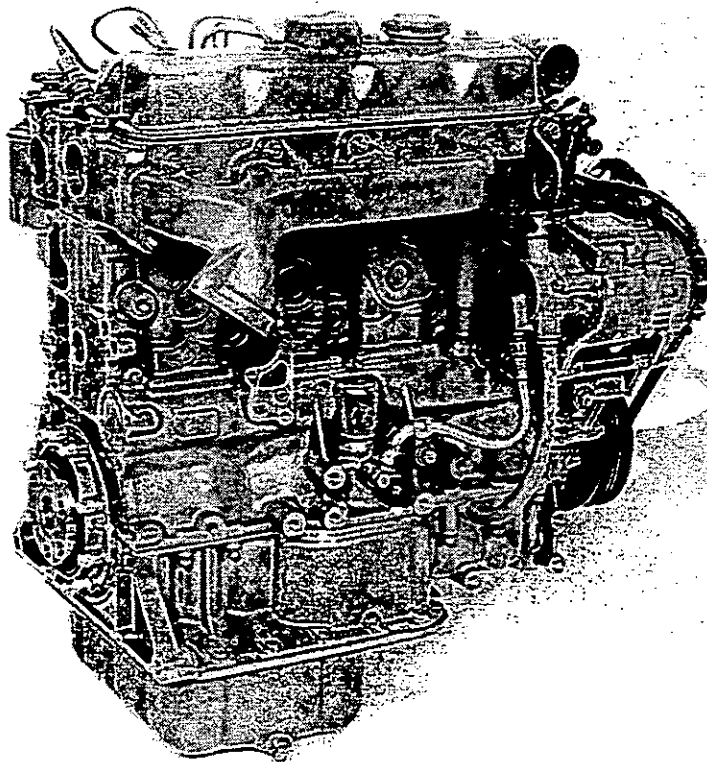


Fig. B6.  
Rear/right side of 4.182 engine.

# Technical Data C

C

## Engine data

	4.135	4.154	4.182
No. of cylinders	4	4	4
Cycle	Four stroke	Four stroke	Four stroke
Combustion system	Indirect injection	Indirect injection	Indirect injection
Nominal bore	88,9 mm (3.5 in)	88,9 mm (3.5 in)	95,0 mm (3.74 in)
Stroke	88,9 mm (3.5 in)	101,6 mm (4.0 in)	105,0 mm (4.13 in)
Compression ratio	21:1	21:1	21:1
Cubic capacity	2,209 litres (134.8 in <sup>3</sup> )	2,523 litres (153.9 in <sup>3</sup> )	2,977 litres (181.7 in <sup>3</sup> )
Firing order	1,3,4,2	1,3,4,2	1,3,4,2
Valve tip clearance (cold)	0,30 mm (0.012 in)	0,30 mm (0.012 in)	0,30 mm (0.012 in)
Lubricating oil sump capacity	5,0 litres (8.8 Imp. pints) 5,3 US quarts	6,0 litres (10.6 Imp. pints) 6,3 US quarts	6,0 litres (10.6 Imp. pints) 6,3 US quarts
Lubricating oil pressure:	207 kN/m <sup>2</sup> (30 lbf/in <sup>2</sup> ) 2,1 kgf/cm <sup>2</sup> minimum at maximum engine speed and normal engine temperature.		
Direction of rotation:	Clockwise from the front.		

### Approximate installed dry engine weights

4.135	...	...	...	...	...	...	...	240 kg (530 lb)
4.154	...	...	...	...	...	...	...	245 kg (540 lb)
4.182	...	...	...	...	...	...	...	251 kg (553 lb)

## Rating details

### Vehicle applications

Maximum gross rating:	4.135	...	...	...	49 kW (66 bhp) at 4,250 rev/min
	4.154	...	...	...	50 kW (67 bhp) at 3,600 rev/min
	4.182	...	...	...	63.5 kW (85 bhp) at 3,600 rev/min
Maximum torque	4.135	...	...	...	137 Nm (101 lbfft) 14,0 kgfm at 2,200 rev/min
	4.154	...	...	...	158 Nm (117 lbfft) 16,2 kgfm at 2,000 rev/min
	4.182	...	...	...	198 Nm (146 lbfft) 20,2 kgfm at 1,800 rev/min

### General Industrial applications

Maximum gross rating:	4.135	...	...	...	47.5 kW (64 bhp) at 4,000 rev/min
	4.154	...	...	...	45.5 kW (61 bhp) at 3,000 rev/min
	4.182	...	...	...	58 kW (78 bhp) at 3,000 rev/min
Maximum torque	4.135	...	...	...	137 Nm (101 lbfft) 14,0 kgfm at 2,200 rev/min
	4.154	...	...	...	158 Nm (117 lbfft) 16,2 kgfm at 2,000 rev/min
	4.182	...	...	...	198 Nm (146 lbfft) 20,2 kgfm at 1,800 rev/min

**Note:** The rating and torque information given above is general and can change with different applications. For more details apply to Technical Service Department, Perkins Engines Limited, Peterborough, England or to one of the companies given on Page A6.

## Altitude

If the engine is to operate at an altitude higher than 1500m (5,000ft), the fuel delivery can be changed to reduce exhaust smoke and fuel consumption. Perkins Engines Ltd. can give the percentage of fuel reduction needed if details of engine application and ambient conditions are given.

Any change to the fuel injection pump settings must be made by a Perkins distributor or an approved fuel pump distributor.

## Recommended torque tensions

The tensions given below will apply with the components lightly lubricated before assembly.

Cylinder head setscrews: 4.135 and 4.154	...	...	115 Nm (85 lbfft) 11,7 kgfm
	4.182	...	122 Nm (90 lbfft) 12,4 kgfm
Connecting rod nuts: 4.135	...	...	73 Nm (54 lbfft) 7,5 kgfm
	4.154	...	81 Nm (60 lbfft) 8,3 kgfm
	4.182	...	88 Nm (65 lbfft) 9,0 kgfm
Main bearing cap setscrews	...	...	115 Nm (85 lbfft) 11,7 kgfm
Camshaft gear setscrews	...	...	69 Nm (50 lbfft) 7,0 kgfm
Fuel injection pump gear nut	...	...	69 Nm (50 lbfft) 7,0 kgfm
Camshaft thrust plate setscrews	...	...	23 Nm (17 lbfft) 2,4 kgfm
Idler gear hub setscrews/nuts	...	...	31 Nm (23 lbfft) 3,2 kgfm
Crankshaft pulley setscrew: 4.135 and 4.154	...	...	245 Nm (180 lbfft) 25 kgfm
	4.182	...	390 Nm (289 lbfft) 40 kgfm
Flywheel setscrews: 4.135 and 4.154	...	...	130 Nm (95 lbfft) 13,1 kgfm
	4.182	...	155 Nm (115 lbfft) 15,9 kgfm
Atomisers: 4.135 and 4.182	...	...	69 Nm (50 lbfft) 7,0 kgfm
Atomiser flange nuts: 4.154	...	...	23 Nm (17 lbfft) 2,4 kgfm

## Component data and dimensions

This information is given as a guide for personnel engaged on engine overhauls and the dimensions are mainly those used in the factory.

Where the information changes for different engine types, this is indicated in the text.

The basic thread type for 4.135 and 4.154 engines is UNF or UNC but some fasteners have heads with a metric A/F dimension.

The basic thread type on 4.182 engines is metric.

Fitted equipment can use a different thread type to the engine.

### Cylinder block

Parent bore diameter for cylinder liner:							
4.135 and 4.154	...	...	...	...	...	...	96,84/96,86 mm (3.8125/3.8135 in)
Parent bore diameter for cylinder liner: 4.182	...	...	...	...	...	...	98,50/98,53 mm (3.878/3.879 in)
No. 1 camshaft bore diameter	...	...	...	...	...	...	52,00/52,03 mm (2.047/2.048 in)
No. 2 camshaft bore diameter	...	...	...	...	...	...	51,75/51,78 mm (2.037/2.038 in)
No. 3 camshaft bore diameter: 4.135	...	...	...	...	...	...	51,25/51,28 mm (2.018/2.019 in)
				4.154 and 4.182	...	...	51,50/51,53 mm (2.028/2.029 in)
No. 4 camshaft bore diameter: 4.154 and 4.182	...	...	...	...	...	...	51,25/51,28 mm (2.018/2.019 in)
Tappet bore diameter	...	...	...	...	...	...	14,29/14,32 mm (0.563/0.564 in)

### Cylinder liners

Type	...	...	...	...	...	...	Dry, interference fit
Inside diameter: 4.135 and 4.154	...	...	...	...	...	...	88,93/88,95 mm (3.501/3.502 in)
				4.182	...	...	95,02/95,05 mm (3.741/3.742 in)
Maximum permissible worn inside diameter:							
4.135 and 4.154	...	...	...	...	...	...	89,15 mm (3.510 in)
4.182	...	...	...	...	...	...	95,25 mm (3.750 in)
Depth of liner flange below top face of cylinder block	...	...	...	...	...	...	0,00/0,10 mm (0.000/0.004 in)
Height of liner collar above top face of cylinder block	...	...	...	...	...	...	0,66/0,79 mm (0.026/0.031 in)

### Pistons – 4.135

Type	...	...	...	...	...	...	Controlled expansion, off centre gudgeon pin
Piston diameter	...	...	...	...	...	...	88,867/88,893 mm (3.4987/3.4997 in) measured at 90° to gudgeon pin bore and 80 mm (3.15 in) from top of piston
Bore diameter for gudgeon pin	...	...	...	...	...	...	28,00/28,01 mm (1.1024/1.1028 in)
Ring groove width: top	...	...	...	...	...	...	2,43/2,45 mm (0.096/0.097 in)
				2nd	...	...	2,42/2,44 mm (0.095/0.096 in)
				oil control	...	...	4,79/4,81 mm (0.1887/0.1895 in)



### Pistons – 4.154

Type	...	...	...	...	...	...	Controlled expansion, off centre gudgeon pin, flat top
Piston diameter	...	...	...	...	...	...	88,872/88,898 mm (3.4989/3.4999 in) measured at 90° to gudgeon pin bore and 18 mm (0.71 in) from bottom of piston
Bore diameter for gudgeon pin	...	...	...	...	...	...	27,996/28,008 mm (1.1022/1.1027 in)
Ring groove width: top	...	...	...	...	...	...	2,43/2,45 mm (0.096/0.097 in)
2nd	...	...	...	...	...	...	2,42/2,44 mm (0.095/0.096 in)
oil control	...	...	...	...	...	...	4,79/4,81 mm (0.1887/0.1895 in)

### Pistons – 4.182

Type	...	...	...	...	...	...	Controlled expansion, off centre gudgeon pin
Piston diameter	...	...	...	...	...	...	94,967/94,993 mm (3.7388/3.7399 in) measured at 90° to gudgeon pin bore and 22 mm (0.87 in) from bottom of piston
Bore diameter for gudgeon pin	...	...	...	...	...	...	29,996/30,008 mm (1.1809/1.1811 in)
Ring groove width: top	...	...	...	...	...	...	2,43/2,45 mm (0.096/0.097 in)
2nd	...	...	...	...	...	...	2,42/2,44 mm (0.095/0.096 in)
oil control	...	...	...	...	...	...	4,79/4,81 mm (0.1887/0.1895 in)

### Piston rings

Type: top	...	...	...	...	...	...	Chromium inserted
2nd	...	...	...	...	...	...	Internally stepped
oil control	...	...	...	...	...	...	Coil spring loaded
Ring width: top and 2nd	...	...	...	...	...	...	2,36/2,38 mm (0.093/0.094 in)
oil control	...	...	...	...	...	...	4,74/4,76 mm (0.1867/0.1874 in)
Ring clearance in groove: top	...	...	...	...	...	...	0,05/0,09 mm (0.002/0.004 in)
2nd	...	...	...	...	...	...	0,04/0,08 mm (0.002/0.003 in)
oil control	...	...	...	...	...	...	0,03/0,07 mm (0.001/0.003 in)
Maximum permissible ring clearance in groove	...	...	...	...	...	...	0,30 mm (0.012 in)
Ring gap: 4.135 and 4.154	...	...	...	...	...	...	0,35/0,55 mm (0.014/0.022 in)
4.182	...	...	...	...	...	...	0,40/0,60 mm (0.016/0.024 in)
Maximum permissible ring gap	...	...	...	...	...	...	1,5 mm (0.059 in)

### Gudgeon pin

Type	...	...	...	...	...	...	Fully floating
Outside diameter: 4.135 and 4.154	...	...	...	...	...	...	27,994/28,000 mm (1.1021/1.1024 in)
4.182	...	...	...	...	...	...	29,994/30,000 mm (1.1809/1.1811 in)
Clearance fit in small end bush: 4.135 and 4.154	...	...	...	...	...	...	0,014/0,041 mm (0.0006/0.0016 in)
4.182	...	...	...	...	...	...	0,012/0,039 mm (0.0005/0.0015 in)

### Small end bushes

Type	...	...	...	...	...	...	Steel back, bronze face
Inside diameter: 4.135 and 4.154	...	...	...	...	...	...	28,014/28,035 mm (1.1029/1.1037 in)
4.182	...	...	...	...	...	...	30,012/30,033 mm (1.1816/1.1824 in)



## 6 TECHNICAL DATA

### Connecting rods

Type	...	...	...	...	...	...	...
Big end side clearance	...	...	...	...	...	...	...
Maximum permissible side clearance	...	...	...	...	...	...	...

H section	0,24/0,33 mm (0.009/0.013 in)
	0,40 mm (0.016 in)

### Connecting rod alignment

Large and small end bores must be square and parallel to each other inside the tolerance of  $\pm 0,25$  mm (0.010 in) measured 127 mm (5 in) each side of the axis of the rod on a test mandrel as shown in fig. C1. With the small end bush fitted, the tolerance of  $\pm 0,25$  mm (0.010 in) is reduced to  $\pm 0,06$  mm (0.0025 in).

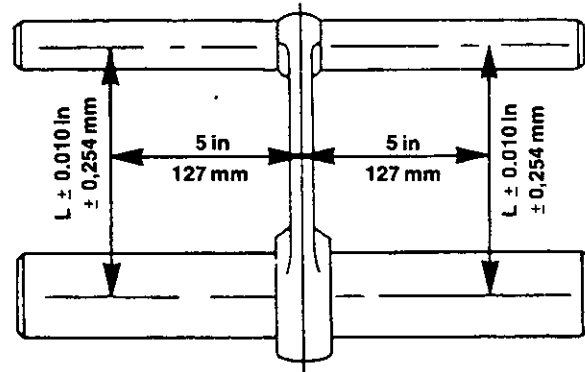


Fig. C1.  
Connecting rod alignment.

### Connecting rod bearings

Type	...	...	...	...	...	...	...
Clearance on big end	...	...	...	...	...	...	...
Maximum permissible clearance	...	...	...	...	...	...	...
Available undersize bearings	...	...	...	...	...	...	...

Steel back, aluminium tin face	0,04/0,08 mm (0.0015/0.003 in)
	0,10 mm (0.004 in)
	-0,25 mm (0.010 in), -0,51 mm (0.020 in),
	-0,76 mm (0.030 in)

### Crankshaft

Main journal diameter:	4.135	...	...	...	...	...	...
	4.154	...	...	...	...	...	...
	4.182	...	...	...	...	...	...
Maximum permissible main journal wear	...	...	...	...	...	...	...
Crankpin diameter:	4.135	...	...	...	...	...	...
	4.154	...	...	...	...	...	...
	4.182	...	...	...	...	...	...
Maximum permissible crankpin wear	...	...	...	...	...	...	...
Crankshaft end clearance	...	...	...	...	...	...	...
Maximum permissible end clearance	...	...	...	...	...	...	...
Main journals and crankpin diameters service grind undersizes	...	...	...	...	...	...	...

	64,987/65,000 mm (2.5585/2.5591 in)
	69,812/69,825 mm (2.7485/2.7491 in)
	75,812/75,825 mm (2.9847/2.9852 in)
	0,05 mm (0.002 in)
	52,987/53,000 mm (2.0861/2.0866 in)
	57,112/57,125 mm (2.2485/2.2491 in)
	61,112/61,125 mm (2.4060/2.4065 in)
	0,05 mm (0.002 in)
	0,14/0,39 mm (0.006/0.015 in)
	0,40 mm (0.016 in)
	-0,25 mm (0.010 in), -0,51 mm (0.020 in),
	-0,76 mm (0.030 in)

### Crankshaft thrust washers

Type	...	...	...	...	...	...	...
Position	...	...	...	...	...	...	...
Available oversize washer	...	...	...	...	...	...	...

Steel back, aluminium tin face	
Each side of centre main bearing housing	0,18 mm (0.007 in)

### Crankshaft main bearings

Type	...	...	...	...	...	Steel back, aluminium tin face
Bearing clearance: 4.135	...	...	...	...	...	0,04/0,09 mm (0.0016/0.0035 in)
	4.154 and 4.182	...	...	...	...	0,06/0,09 mm (0.0024/0.0035 in)
Maximum permissible clearance	...	...	...	...	...	0,12 mm (0.005 in)
Available undersize bearings	...	...	...	...	...	-0,25 mm (0.010 in), -0,51 mm (0.020 in), -0,76 mm (0.030 in)

### Camshaft

No. 1 journal diameter	...	...	...	...	...	51,91/51,94 mm (2.044/2.045 in)
No. 2 journal diameter	...	...	...	...	...	51,66/51,69 mm (2.034/2.035 in)
No. 3 journal diameter: 4.135	...	...	...	...	...	51,16/51,19 mm (2.014/2.015 in)
	4.154 and 4.182	...	...	...	...	51,41/51,44 mm (2.024/2.025 in)
No. 4 journal diameter: 4.154 and 4.182	...	...	...	...	...	51,16/51,19 mm (2.014/2.015 in)
Journal clearance in cylinder block	...	...	...	...	...	0,06/0,12 mm (0.002/0.005 in)
Maximum permissible journal clearance	...	...	...	...	...	0,15 mm (0.006 in)
Height of cams: 4.135 and 4.154	...	...	...	...	...	42,59 mm (1.677 in)
	4.182	...	...	...	...	42,58 mm (1.676 in)
Minimum permissible cam height: 4.135 and 4.154	...	...	...	...	...	42,49 mm (1.673 in)
	4.182	...	...	...	...	42,48 mm (1.672 in)
Camshaft end clearance	...	...	...	...	...	0,02/0,18 mm (0.001/0.007 in)
Maximum permissible camshaft end clearance	...	...	...	...	...	0,30 mm (0.012 in)
Maximum permissible run-out	...	...	...	...	...	0,08 mm (0.003 in)

### Cylinder head

Maximum permissible distortion	...	...	...	...	...	0,10 mm (0.004 in) across head 0,25 mm (0.010 in) along head
Valve seat angle: inlet	...	...	...	...	...	45°
	exhaust	...	...	...	...	30°
Valve seat width	...	...	...	...	...	2,0 mm (0.079 in)

### Valve guides

Protrusion above cylinder head	...	...	...	...	...	16,5 mm (0.65 in)
Valve stem to guide clearance: inlet	...	...	...	...	...	0,04/0,09 mm (0.0015/0.0035 in)
	exhaust	...	...	...	...	0,06/0,10 mm (0.002/0.004 in)
Maximum permissible clearance: inlet	...	...	...	...	...	0,13 mm (0.005 in)
	exhaust	...	...	...	...	0,14 mm (0.0055 in)

### Inlet valves

Face angle	...	...	...	...	...	45°
Stem diameter: 4.135 and 4.154	...	...	...	...	...	7,92/7,95 mm (0.312/0.313 in)
	4.182	...	...	...	...	8,96/8,98 mm (0.353/0.354 in)
Maximum permissible stem diameter:	...	...	...	...	...	7,87 mm (0.310 in)
	4.135 and 4.154	...	...	...	...	8,88 mm (0.350 in)
	4.182	...	...	...	...	40,40/40,60 mm (1.591/1.598 in)
Head diameter	...	...	...	...	...	40,40/40,60 mm (1.591/1.598 in)
Minimum permissible valve head thickness:	...	...	...	...	...	1,35 mm (0.053 in)
	4.135 and 4.154	...	...	...	...	1,0 mm (0.039 in)
	4.182	...	...	...	...	1,0 mm (0.039 in)



## 8 TECHNICAL DATA

### Exhaust valves

Face angle	...	...	...	...	...	30°
Stem diameter: 4.135 and 4.154	...	...	...	...	...	7,91/7,94 mm (0.3115/0.3125 in)
4.182	...	...	...	...	...	8,94/8,96 mm (0.352/0.353 in)
Maximum permissible stem diameter:						
4.135 and 4.154	...	...	...	...	...	7,86 mm (0.3095 in)
4.182	...	...	...	...	...	8,86 mm (0.349 in)
Head diameter: 4.135 and 4.154	...	...	...	...	...	35,87/36,13 mm (1.412/1.422 in)
4.182	...	...	...	...	...	37,40/37,60 mm (1.472/1.480 in)
Minimum permissible valve head thickness:						
4.135 and 4.154	...	...	...	...	...	1,35 mm (0.053 in)
4.182	...	...	...	...	...	1,0 mm (0.039 in)

### Outer valve springs

Free length: 4.135 and 4.154	...	...	...	...	...	45,9 mm (1.807 in)
4.182	...	...	...	...	...	55,7 mm (2.193 in)
Minimum permissible free length:						
4.135 and 4.154	...	...	...	...	...	43,6 mm (1.717 in)
4.182	...	...	...	...	...	52,7 mm (2.075 in)
Fitted length	...	...	...	...	...	40,3 mm (1.587 in)
Load at fitted length: 4.135 and 4.154	...	...	...	...	...	17,1/18,9 kgf (37.7/41.7 lbf)
4.182	...	...	...	...	...	32,4/34,2 kgf (71.4/75.4 lbf)
Minimum permissible load at fitted length:						
4.135 and 4.154	...	...	...	...	...	14,5 kgf (32.0 lbf)
4.182	...	...	...	...	...	30,1 kgf (66.4 lbf)
Out of square tolerance	...	...	...	...	...	1,37 mm (0.054 in)

### Inner valve springs

Free length	...	...	...	...	...	44,1 mm (1.736 in)
Minimum permissible free length	...	...	...	...	...	42,0 mm (1.654 in)
Fitted length	...	...	...	...	...	37,8 mm (1.488 in)
Load at fitted length	...	...	...	...	...	12,1/13,3 kgf (26.7/29.3 lbf)
Minimum permissible load at fitted length	...	...	...	...	...	10,3 kgf (22.7 lbf)
Out of square tolerance	...	...	...	...	...	1,25 mm (0.049 in)

### Tappets

Stem diameter	...	...	...	...	...	14,22/14,25 mm (0.560/0.561 in)
Clearance in cylinder block bore	...	...	...	...	...	0,04/0,09 mm (0.0015/0.0037 in)

### Rocker shaft

Outside diameter	...	...	...	...	...	15,83/15,86 mm (0.6234/0.6244 in)
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### Rocker levers

Inside diameter of bush	...	...	...	...	...	15,88/15,90 mm (0.6250/0.6258 in)
Clearance of bush on shaft	...	...	...	...	...	0,02/0,06 mm (0.0006/0.0024 in)
Maximum permissible clearance	...	...	...	...	...	0,08 mm (0.003 in)

### Idler gear and hub

Inside diameter of gear bush	...	...	...	...	44,01/44,03 mm (1.7327/1.7336 in)
Outside diameter of hub	...	...	...	...	43,95/43,98 mm (1.7303/1.7313 in)
Clearance fit of bush on hub	...	...	...	...	0,03/0,08 mm (0.0014/0.0033 in)
Idler gear end clearance: 4.135	...	...	...	...	0,20/0,30 mm (0.008/0.012 in)
4.154 and 4.182	...	...	...	...	0,15/0,30 mm (0.006/0.012 in)

### Timing gears

Backlash	...	...	...	...	0,10/0,17 mm (0.004/0.007 in)
Maximum permissible backlash	...	...	...	...	0,30 mm (0.012 in)

### Lubricating oil recommendations

The engine lubricating oil must be equal to the US Ordnance specification MIL-L-46152 (AP1 Service CC/SE) or, if available, the later specification MIL-L-46152B (AP1 Service CC/SF).

Lubricating oils for use in Perkins diesel engines must have a minimum Viscosity Index of 80.

Always ensure that the correct viscosity grade of oil is used for the temperature range in which the engine will operate as shown below:

Temperature range	Viscosity grade
-18°C (0°F) to 0°C (32°F)	10W
0°C (32°F) to 27°C (80°F)	20W/20
Above 27°C (80°F)	30

### Lubricating oil relief valve

Setting pressure: 4.135 and 4.182	...	...	...	...	393 kN/m <sup>2</sup> (57 lbf/in <sup>2</sup> ) 4,0 kgf/cm <sup>2</sup>
4.154	...	...	...	...	345 kN/m <sup>2</sup> (50 lbf/in <sup>2</sup> ) 3,5 kgf/cm <sup>2</sup>

### Lubricating oil dump valve – 4.182

Setting pressure	...	...	...	...	786 kN/m <sup>2</sup> (114 lbf/in <sup>2</sup> ) 8,0 kgf/cm <sup>2</sup>
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### Lubricating oil pump clearances

Outer rotor to body: 4.135 and 4.154	...	...	...	...	0,14/0,20 mm (0.006/0.008 in)
4.182	...	...	...	...	0,14/0,25 mm (0.006/0.010 in)
	...	...	...	...	0,30 mm (0.012 in)
Outer rotor to body – maximum worn	...	...	...	...	
Inner rotor to outer rotor: 4.135 and 4.154	...	...	...	...	0,04/0,20 mm (0.002/0.008 in)
4.182	...	...	...	...	0,04/0,15 mm (0.002/0.006 in)
Inner rotor to outer rotor – maximum worn:					
4.135 and 4.154	...	...	...	...	0,30 mm (0.012 in)
4.182	...	...	...	...	0,25 mm (0.010 in)
Rotor end clearance	...	...	...	...	0,04/0,10 mm (0.002/0.004 in)
Maximum worn rotor end clearance	...	...	...	...	0,15 mm (0.006 in)
Maximum permissible shaft to body clearance	...	...	...	...	0,10 mm (0.004 in)





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