Perkins 4.41 Series

Model LM

WORKSHOP MANUAL

4 cylinder, naturally aspirated, diesel engine for agricultural and industrial use

Chapters

The following pages contain a detailed table of contents

Contents

1 General information

2 Specifications

3 Cylinder head assembly

4 Piston and connecting rod assemblies

5 Crankshaft assembly

Balancer unit

6 Timing case and drive assembly

Timing case cover

Front oil seal

Idler gear and hub

Fuel pump gear

Camshaft gear

Crankshaft gear

Timing case

Camshaft and tappets

7 Cylinder block assembly

8 Engine timing

9 Aspiration system

10 Lubrication system

11 Fuel system

12 Cooling system

13 Flywheel and flywheel housing

14 Electrical equipment

15 Auxiliary equipment

16 Special tools

1

General information

Introduction

This Workshop Manual has been designed to provide assistance in the service and overhaul of Perkins 4.41 engine. For overhaul procedures the assumption is made that the engine is removed from the application.

Most of the general information which is included in the relevant User's Handbook has not been repeated in this workshop manual and the two publications should be used together.

The details of some operations will be different according to the type of fuel injection pump which is fitted. The specific pump type used can be found by reference to the manufacturer's identification plate on the pump body but, generally, the type of pump fitted is as shown below:

- Lucas - DPA
- Stanadyne - DB2.

When reference is made to the "left" or "right" side of the engine, this is as seen from the flywheel end of the engine.

Special tools have been made available and a list of these is given in Chapter 16, Special tools. Reference to the relevant special tools is also made at the beginning of each operation.

Data and dimensions are included in Chapter 2, Specifications.

Read and remember the "Safety precautions" on page 4. They are given for your protection and must be used at all times.

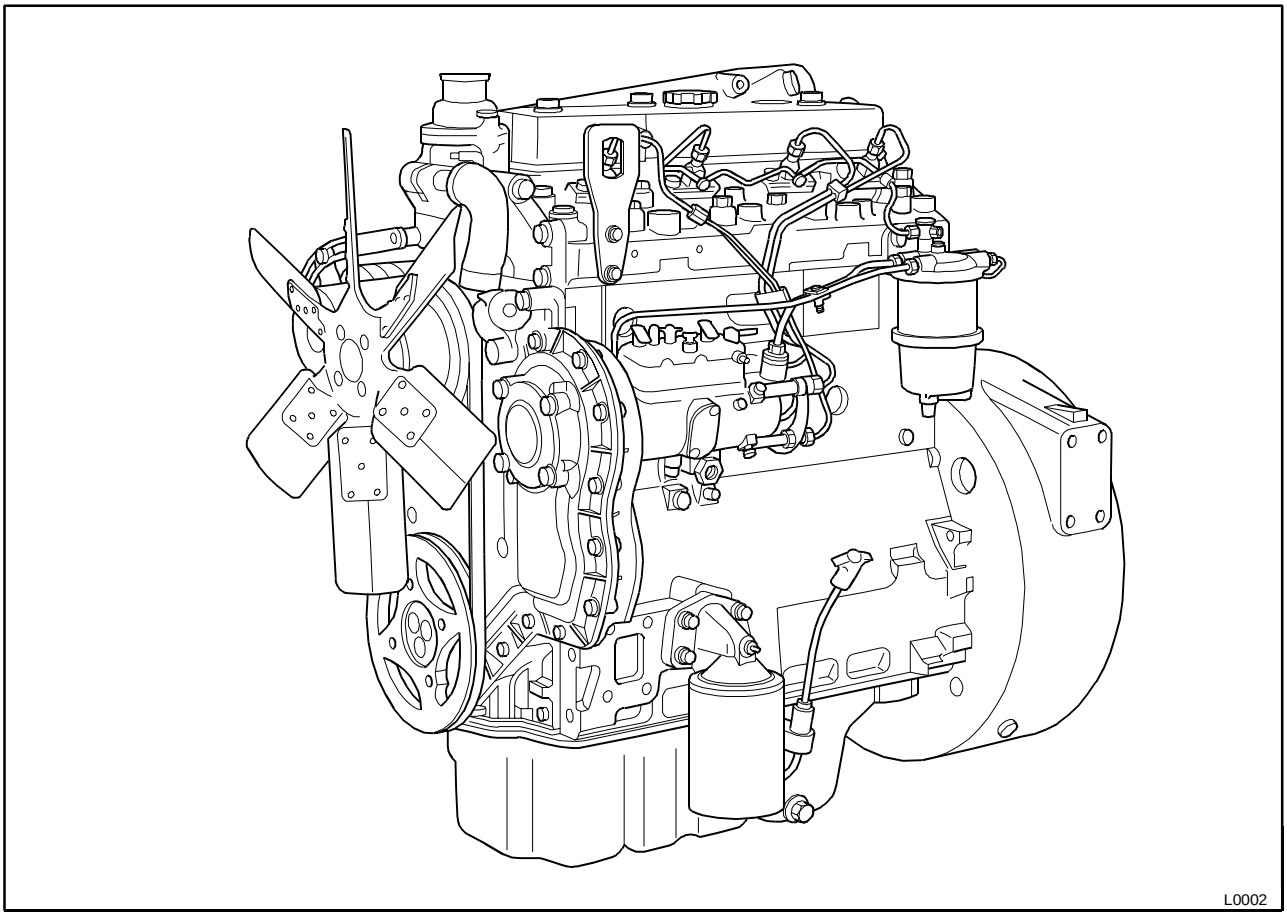
Danger is indicated in the text by two methods:

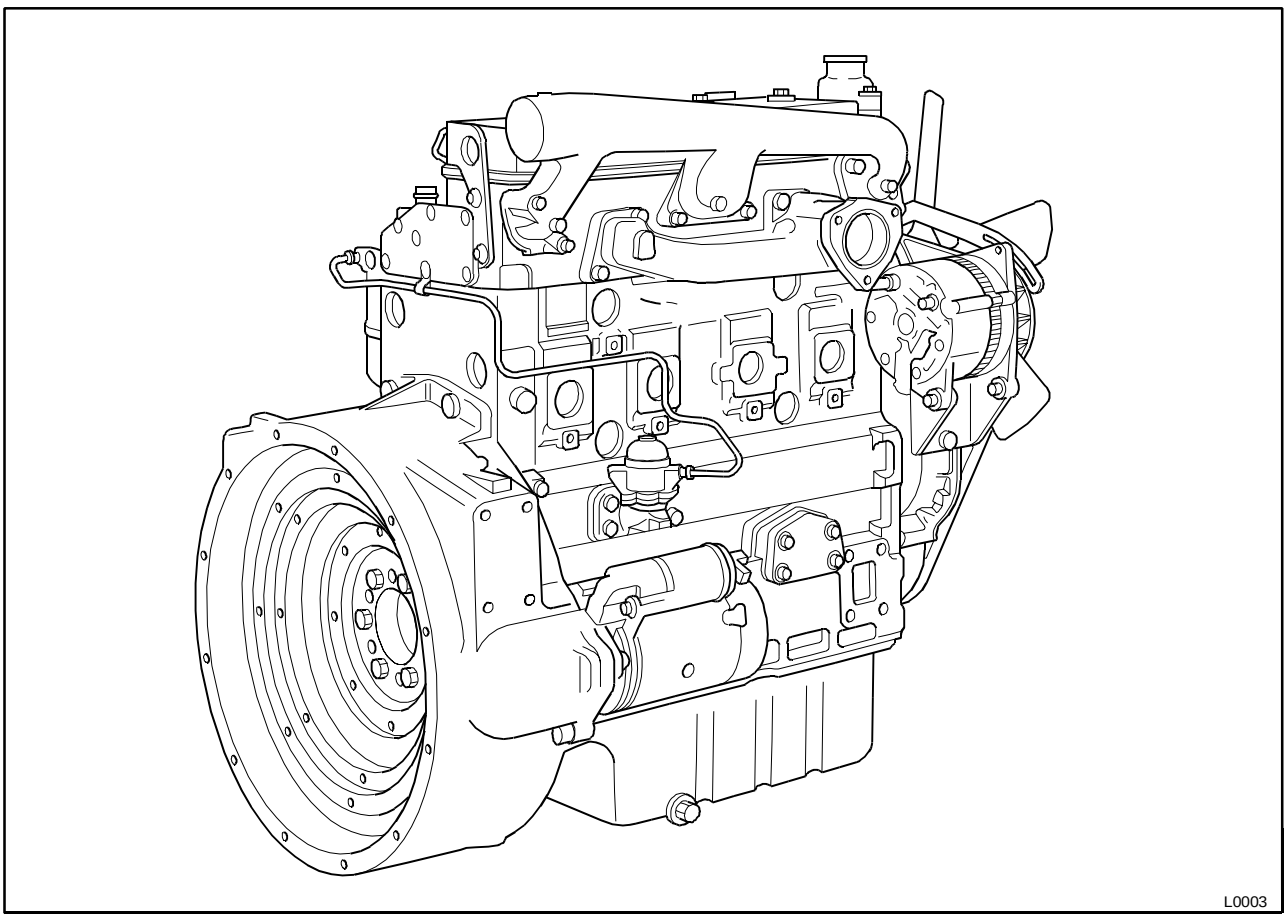
Warning! *This indicates that there is a possible danger to the person.*

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 views





Engine identification

The Perkins 4.41 engine has been designed for agricultural, industrial and generator set applications.

In this Workshop Manual, the engine type is indicated by code letters. These are the first two letters of the engine number as indicated below:

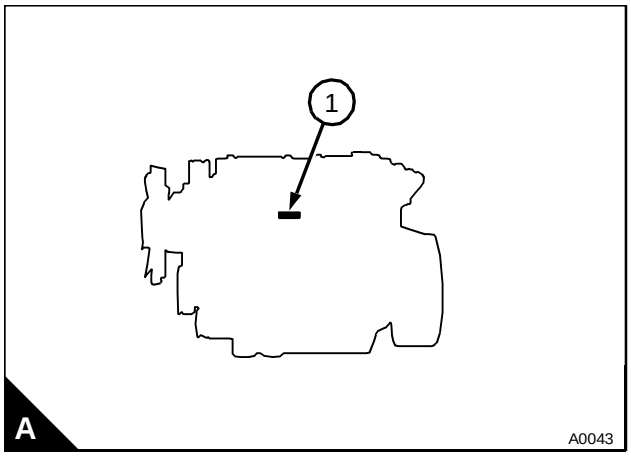
Code letters	Engine type
LM	Four cylinder, naturally aspirated

The engine number is stamped on a label which is fastened to the left side (A1) of the cylinder block. An example of an engine number is:

LM 50190 U 123450 A

Further information about the engine number system can be found in the relevant user's handbook.

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



Safety precautions

These safety precautions are important.

You must refer also to the local regulations in the country of use. Some items only refer to specific applications.

- 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 care 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 auxiliary equipment is in operation.
- Do not permit loose clothing or long hair near moving parts.
- Keep away from moving parts during engine operation.

Warning! *Some moving parts 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 or any component of the cooling system while the engine is hot and while the coolant is under pressure, because dangerous hot coolant can be discharged.
- 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.
- Only one person must control the engine.
- Ensure that the engine is operated only from the control panel or from the operators position.
- If your skin comes into contact with high-pressure fuel, obtain medical assistance immediately.
- 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 of clothing.
- 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.
- Use extreme care if emergency repairs must be made in adverse conditions.

Continued

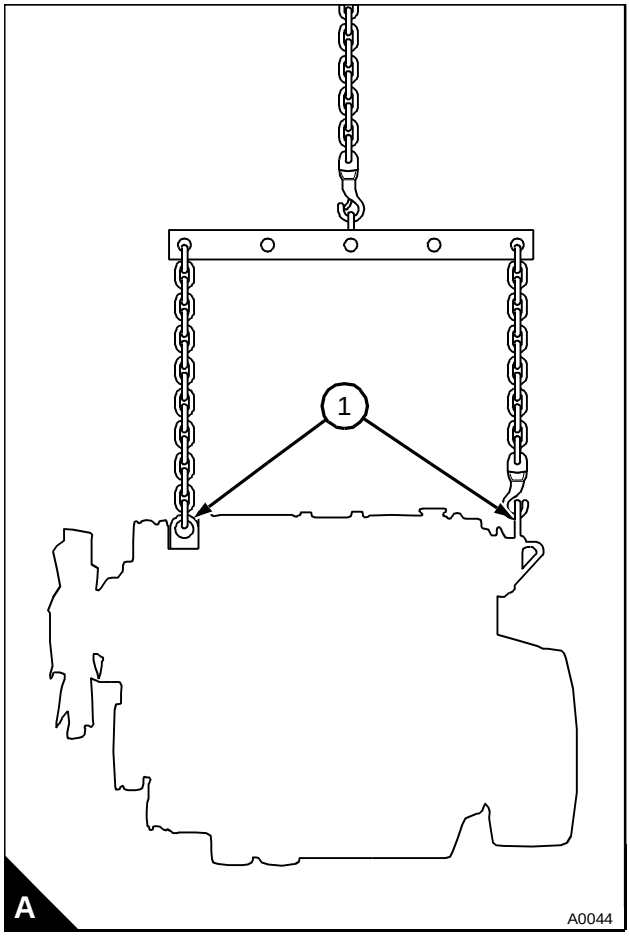
- The combustible material of some components of the engine (for example certain seals) can become extremely dangerous if it is burned. Never allow this burnt material to come into contact with the skin or with the eyes. Refer to "Viton seals" on page 7.
- Read and use the instructions relevant to lift equipment, see "Engine lift equipment" on page 6.
- Always use a safety cage to protect the operator when a component is to be pressure tested in a container 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.
- Do not clean an engine while it runs. If cold cleaning fluids are applied to a hot engine, certain components on the engine may be damaged.
- Fit only genuine Perkins parts.

Engine lift equipment

The maximum weight of the engine without coolant, lubricant or a gearbox fitted will vary for different applications. It is recommended that lift equipment of 500 Kg (1100 lbs) minimum capacity is used.

Before the engine is lifted:

- Always use engine lift equipment of the approved type and of the correct capacity to lift the engine. It is recommended that lift equipment of the type shown in (A) is used to provide a vertical lift, directly above the engine lift brackets (A1). Never use a single lift bracket to raise an engine.
- Check the engine lift brackets for damage and that they are secure before the engine is lifted. The torque for the setscrews for the engine lift brackets is 44 Nm (33 lbf ft) 4,5 kgf m.
- To prevent damage to the rocker cover, ensure that there is clearance between the hooks and the rocker cover.
- Use lift equipment or obtain assistance to lift heavy engine components such as the cylinder block, the cylinder head, the balancer unit, the flywheel housing, the crankshaft and the flywheel.



Viton seals

Some seals used in engines and in components fitted to engines are made of 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 calcium hydroxide solution and then with clean water.
- Disposal of components and gloves 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 calcium hydroxide solution for 15-60 minutes. **Obtain immediate medical attention**.

POWERPART recommended consumable products

Perkins have made available the products recommended below in order to assist in the correct operation, service and maintenance of your engine and your machine. 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. Part number 1 litre 21825166 or 5 litres 21825167.

POWERPART Chisel

Allows easy removal of old gaskets and joints. Currently Loctite chisel. Part number 21825163.

POWERPART Compound

To seal the outer diameter of seals. Currently Loctite Forma Gasket No 2. Part number 1861147.

POWERPART Easy Flush

Cleans the cooling system. Part number 2182501

POWERPART Gasket eliminator

Improves flange sealing when a gasket is not used. It provides a seal with temperature resistance that is flexible in positions where vibration and pressure occur. Currently Loctite 515. Part number 21826040.

POWERPART Jointing compound

Universal jointing compound which seals joints. Currently Hylomar. Part number 1861155 or 1861117.

POWERPART Lay-Up 1

A diesel fuel additive for protection against corrosion. Part number 1772204.

POWERPART Lay-Up 2

Protects the inside of the engine and of other closed systems. Part number 1762811.

POWERPART Lay-Up 3

Protects outside metal parts. Part number 1734115.

POWERPART Liquid gasket

To seal flat faces of components where no joint is used. Especially suitable for aluminium components. Currently Loctite 518. Part number 21820518

POWERPART Nutlock

To retain and seal threaded fasteners and cup plugs where easy removal is necessary. Currently Loctite 242e. Part number 21820242

POWERPART Platelock

For tight fitted metal surfaces. Suitable for metal plated surfaces and stainless steel, Currently Loctite 243. Part number 21826039.

POWERPART Repel

Dries damp equipment and gives protection against corrosion. Passes through dirt and corrosion to lubricate and to assist removal of components. Currently Loctite repel. Part number 21825164.

Continued

POWERPART Retainer (oil tolerant)

To retain components which have a transition fit. Currently Loctite 603. Part number 21820603.

POWERPART Retainer (high strength)

To retain components which have an interference fit. Currently Loctite 638. Part number 21820638

POWERPART Silicone adhesive

An RTV silicone adhesive for application where low-pressure tests occur before the adhesive sets. Used to prevent leakage where movement of the joint occurs. Currently Loctite 5900. Part number 21826038.

POWERPART Silicone rubber sealant

Silicone rubber sealant which prevents leakage through gaps. Currently Hylosil Part number 1861108.

POWERPART Studlock

To permanently retain large fasteners and studs. Currently Loctite 270. Part number 21820270.

POWERPART Threadlock

To retain small fasteners where easy removal is necessary. Currently Loctite 222e. Part number 21820222.

POWERPART Threadlock (hydraulic/pneumatic)

To retain and seal pipe connections with fine threads. Especially suitable for hydraulic and pneumatic systems. Currently Loctite 542. Part number 21820542

POWERPART Threadlock (pipe)

To retain and seal pipe connections with coarse threads. Pressure systems can be used immediately. Currently Loctite 575. Part number 21820575.

2

Specifications

Basic engine data

Number of cylinders	4
Cylinder arrangement	In-line
Cycle	Four stroke
Direction of rotation	Clockwise from the front
Induction system	Naturally aspirated
Combustion system	Direct injection
Nominal bore	101 mm (3.98 in)
Stroke	127 mm (5.000 in)
Compression ratio	15.3:1
Cubic capacity	407 litres (248 in^3)
Firing order	1, 3, 4, 2
Valve tip clearance (cold):	
- Inlet	0,20 mm (0.008 in)
- Exhaust	0,45 mm (0.018 in)
Lubricating oil pressure **(1)**	207 kpa (30 lbf/in^2) 2,1 kgf/cm^2

(1) Minimum at maximum engine speed and normal engine temperature.

Data and dimensions

Note: This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factory. The information applies to all engines, unless an engine type code is shown.

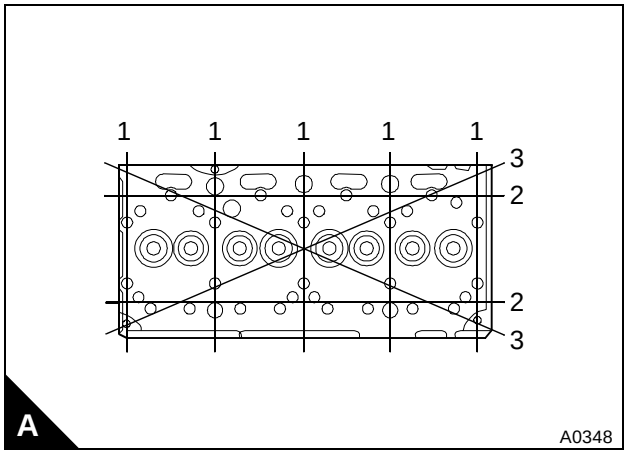
Cylinder head

Angle of valve seat:

Exhaust.. ... ... 46° (88° included angle)
Inlet ... ... 46° (88° included angle)
Diameter of parent bore for valve guide. ... ... 15,87/15,89 mm (0.6247/0.6257 in)
Leak test pressure . ... 200 kPa (29 lbf/in^2) 2,04 kgf/cm^2
Head thickness .. .. 102,79/103,59 mm (4.047/4.078 in)
Minimum permissible thickness after head face has been machined ... ...102,48 mm (4.035 in)

Maximum permissible distortion of cylinder head

A1... ... ...0,08 mm (0.003 in)
A2... ... ...0,15 mm (0.006 in)
A3... ... ...0,15 mm (0.006 in)



Inlet and exhaust valves

Inlet valves

Diameter of valve stem ... ...9,46/9,49 mm (0.3725/0.3735 in)
Clearance in valve guide . ...0,02/0,10 mm (0.0008/0.0039 in)
Maximum clearance in valve guide . ... 0,13 mm (0.005 in)
Diameter of valve head ... ...44,86/45,11 mm (1.766/1.776 in)
Angle of valve face .. .. .45°
Seal arrangement ... ...Rubber seal fitted to valve guide

Depth of valve head below the face of cylinder head:

Production limits .. ..1,27/1,60 mm (0.050/0.063 in)
Service limit . ... 1,85 mm (0.073 in)

Exhaust valves

Diameter of valve stem ... ...9,43/9,46 mm (0.371/0.372 in)
Clearance in valve guide . ...0,05/0,13 mm (0.002/0.005 in)
Maximum clearance in valve guide . ... 0,15 mm (0.006 in)
Diameter of valve head ... ...37,26/37,52 mm (1.467/1.477 in)
Angle of valve face .. .. .45°
Seal arrangement ... ...Rubber seal fitted to valve guide

Depth of valve head below face of cylinder head:

Production limits .. ..1,28/1,60 mm (0.050/0.063 in)
Service limit . ... 1,85 mm (0.073 in)

Valve seat inserts

Dimensions of recesses for valve seat inserts

Measurement	Inlet	Exhaust
A1	7,19/7,32 mm (0.283/0.288 in)	9,52/9,65 mm (0.375/0.380 in)
A2	51,22/51,24 mm (2.0165/2.0175 in)	42,62/42,65 mm (1.6780/1.6790 in)
A3	Chamfer 0,38 mm (0.015 in) maximum	Chamfer 0,38 mm (0.015 in) maximum