

SECTION A

Engine Description

The Perkins 4.108, 4.107 and 4.99 Series Diesel Engines with which this manual is concerned are indirect injection, four cylinder, four stroke power units. The 4.108 and 4.107 have a bore of 3.125 in (79,4 mm) and a stroke of 3.5 in (88,9 mm), and the 4.99 has a bore of 3.0 in (76,2 mm) and a stroke of 3.5 in (88,9 mm).

Throughout this manual, whenever the "left" or "right" hand side of the engine is referred to, it is that side as viewed from the flywheel end of the engine.

Cylinder Block and Crankcase

The cylinder block is of monoblock construction, cast integrally with the crankcase, it is manufactured from high duty cast iron alloy.

The 4.108 engine is fitted with "dry" type, unshouldered thinwall liners, and the 4.107 and 4.99 engines are fitted with "wet" liners, flanged at the top and sealed at the bottom by two synthetic rubber rings located in the cylinder block.

Both liner types are centrifugally cast from high duty alloy iron.

Cylinder Head and Valves

The cylinder head is a specially toughened high duty alloy casting and is secured to the cylinder block by studs and nuts, both are phosphated for increased torque characteristics. The joint between the cylinder head and block is made from a black composite material and is known as a 'Klinger' type gasket.

Two overhead valves are fitted to each cylinder, push rod operated via the valve mechanism mounted on the head and enclosed by a pressed steel cover. Each inlet valve has a synthetic rubber oil deflecting seal, both inlet and exhaust valves are retained by two springs located between a hardened steel seat and a hardened spring cap secured by split conical collets. All valves operate in unshouldered cast iron guides pressed into the head.

Combustion System

The Perkins 'H' system of combustion is of the pre-combustion type, being formed completely in the cylinder head, thus giving a flat topped piston with

uniform heat distribution. Intimate mixing of the fuel and air over a wide speed range is ensured, which increases the engines performance, efficiency and flexibility. The upper part of the combustion chamber is machined in the cylinder head and is hemispherical in shape: the lower part being formed by an insert in the form of an accurately machined plug located in the cylinder head, this contains the throat connecting the combustion chamber to the cylinder. Fuel is introduced into this chamber by means of pintle type atomiser nozzles.

Valve Mechanism

The valves are operated by cast iron, mushroom type tappets, located in guides machined in the cylinder block, through pushrods to forged steel rocker levers with lead bronze lined, steel backed wrapped bushes. Valve clearances are adjusted by means of a hardened ball ended screw and locknut at the pushrod end of the rocker lever.

Crankshaft

The crankshaft is forged from chrome-molybdenum steel with four integral balance weights. The 4.108 crankshaft is treated by "Tufftride" process. The rear of the crankshaft is machined to accommodate the thrust washers which are replaceable, copper lead lined, steel backed, which control the crankshaft end float and are positioned either side of the rear main bearing. An oil thrower and flywheel location flange are also machined at the rear end, whilst the front end is keyed for a power take off.

Main Bearings

Three main bearings are provided for the crankshaft and are of the replaceable pre-finished, thin wall, steel backed, aluminium tin lined type. The high duty cast iron bearing caps are dowel located and each is secured by two high tensile steel setscrews.

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Camshaft

The special cast iron alloy camshaft which has chill hardened cams, is mounted in a low position on the right hand side of the cylinder block and supported by three bearings machined directly into the cylinder block. These bearings are pressure lubricated by means of internal drillings and the cams and tappets are splash lubricated.

Connecting Rods and Bearings

The connecting rods are molybdenum alloy steel stampings with 'H' section shank, the big end parting face is inclined at 45° to the axis of the rod and serrated for cap location. The caps are each secured by two high tensile steel setscrews. The big end bearing bores are fitted with replaceable pre-finished thin wall, aluminium-tin lined, steel backed bearings. The small end bores being fitted with bronze lined steel backed bushes.

Timing Gear Arrangement

The camshaft and fuel injection pump are driven by the crankshaft gear via an idler gear. This helical gear train which makes provision for fuel pump timing adjustments is located on the front face of the cylinder block and enclosed by a pressed steel cover bolted to a steel backplate.

The camshaft and fuel injection pump drive gears are manufactured from spheroidal graphite cast iron, the crankshaft and idler gears being of steel treated by the Sulfinuz or Tufftride process.

Pistons and Gudgeon Pins

The pistons are manufactured from special high silicon aluminium alloy, fitted with three compression rings and one oil control ring above the gudgeon pin and one oil control ring below. The upper oil control ring comprises four laminated segments. The gudgeon pins are of the fully floating type, located axially in the piston by circlips. The piston has a steel insert rolled into the top groove.

Lubrication System

The lubrication of the engine is by full pressure feed from a rotor type oil pump, driven by spiral gears from the camshaft. An oil strainer is fitted on the end of the pump inlet pipe, the pump then delivers the oil via a full flow filter, bolted on the fuel pump side of the cylinder block to the main oil gallery. This gallery is drilled lengthwise through the crankcase, drillings from the main oil gallery to the main bearings and drillings in the main crankshaft journals to the crankpin journals provide the lubrication for the crankshaft. Oil feeds are also taken to the idler gear spigot which

maintains an intermittent feed by drillings in the spigot and idler gear to lubricate the timing gear arrangement, and to the centre camshaft bearing where due to special machining on the centre camshaft journal an adequate reduced pressure feed is maintained at the rocker assembly. The oil pump incorporates a pressure relief valve which limits the maximum oil pressure, whilst the oil filter incorporates a by-pass valve which prevents the engine being starved of oil should the filter element become blocked.

Lubricating Oil Sump

A pressed steel one piece lubricating oil sump is fitted as standard, but customers special requirements can be catered for. An oil level dipstick is located in the sump.

Crankcase Ventilation

A large diameter open type breather pipe is fitted to the cylinder head cover. Air movement assists in drawing fumes from the crankcase, the top end of the pipe is directed downwards to return any oil mist to the sump.

Cooling System

A centrifugal type circulating water pump is fitted to the front face of the cylinder block, to assist the water circulation through the cylinder block and head. The water outlet is via a thermostat housing which is cast integral with the cylinder head, the thermostat restricts the flow of water when the engine is cold and brings about a faster warm up. When the water temperature reaches a pre-determined point the thermostat opens and allows normal coolant circulation. The water pump is belt driven from the crankshaft pulley, a pressed steel fan can be mounted on the water pump pulley.

Fuel Injection Equipment

A distributor type fuel injection pump is flange mounted on to a drive housing cast on the left hand side of the cylinder block. It is mounted horizontally at the front of the engine and gear driven via a splined drive shaft. The majority of pumps incorporate an hydraulic governor and an automatic advance and retard mechanism for automotive applications to provide optimum performance at all speeds.

Some agricultural engines may have mechanically governed fuel injection pumps.

The fuel lift pump is of the diaphragm type mechanically operated by an eccentric on the engine camshaft, via a small pushrod. It is located on the tappet inspection cover on the right hand side of the engine and is equipped for hand priming.

The atomisers are located in an accessible position on the left hand side of the cylinder head.

The nozzles are of the pintle type.

Provision is made for mounting a fuel filter on either side of the cylinder head. The filter should be of the paper element type and of approved design.

Induction Manifold

The induction manifold is an aluminium die casting, it is fitted on the right hand side of the cylinder head. Provision is made for mounting an air cleaner, the position and type of which can vary according to the particular application.

Exhaust Manifold

The cast iron exhaust manifold is fitted on the left hand side of the cylinder head. Alternative positions for the outlet flange are available to suit various applications.

Electrical Equipment

Twelve volt electrical equipment is fitted to this engine. The dynamo or alternator is mounted on the right hand side of the engine and is belt driven from the crankshaft pulley, belt tension is adjusted by means of a slotted link.

The starter motor is flange mounted to the flywheel housing.

Starting Aid

To aid starting under cold conditions a "Thermostart" heater is fitted into the induction manifold.

Tachometer Drive

Provision is made, on the right hand side of the engine, for a drive at half engine speed to be taken from the oil pump spiral gear to a tachometer, and an hourmeter or other ancillary can be driven from an additional gear.