Introduction

Features

- Fully machined inlet ports in cylinder head.
- Timing gear driven power take-off arrangements.
- Forged steel crankshaft.
- Controlled expansion pistons (٤,٢٣٦U, T٤,٢٣٦ and ٤,٢٤٨ only).
- Controlled coolant flow.
- High duty cast iron dry liners.
- Cylinder block extended below crankshaft.

Advantages

These features give the ٤,٢٣٦ series engines many related advantages:

- Ease of installation.
- Low vibration levels.
- Low fuel consumption.
- Low smoke and emissions.
- Low noise levels.
- High power to weight ratio.
  Accurate engine temperature control.

Additional features available on some models

- Lanchester type harmonic balancer (option).
- Integral lubricating oil cooler (standard on turbocharged engines).

The benefits

- High utilization
- High performance
- Low cost to owner
- Parts and service available world wide

The engine range

The ٤,٢٣٦ series engines is a family of ٤ cylinder, in-line engines of either ٣،٨٦ liter (٢٣٦ in٣) or ٤،٠٧ liter (٢٤٨ in٣) capacity. Power outputs range from ٣٥,٥ to ٧٦,٠ kW (٤٧,٥ to ١٠٢ bhp) at speeds from ١٥٠٠ to ٢٨٠٠ rev/min. They are suitable for all types of industrial, agricultural and automotive applications.

Model	Aspiration	Cylinder block type	Application
٤,٢٣٦U	Natural	Standard	Automotive
٤,٢٣٦	Natural	Standard	General agricultural and industrial
T٤,٢٣٦	Turbocharged	Standard	
٤,٢٤٨S	Natural	Stressed	

The ٤,٢٣٦ and ٤,٢٣٦S engines

Options

- Lanchester type harmonic balancer
- Heavy duty power take-off arrangements.
- Different fan, water pump and lubricating oil filter positions.
- Different lubricating oil sumps, inlet and exhaust manifolds.
- Electronic governor for synchronous speed applications.
- Flywheels and housings.
- Large range of accessories.

Features and advantages

These engines are for use in a wide range of agricultural and industrial equipment. They have components which will give long life under adverse conditions. An induction hardened crankshaft and timing gear arrangement give very good power transmission availability. The ٤,٢٣٦S model has a strengthened cylinder block design which makes it ideally suitable for use in frameless agricultural tractors and similar applications.

Basic technical data

Bore..... ٩٨,٤ mm (٣,٨٧٥ in)
Stroke..... ١٢٧,٠ mm (٥,٠٠ in)
Swept volume..... ٣,٨٧ liters (٢٣٦ in٣)
Number of cylinders..... ٤
Cylinder arrangement.... Vertical in line
Cycle ..... ٤ stroke
Compression ratio..... ١٦: ١
Combustion system..... Direct injection
Firing order..... ١،٣،٤،٢
Rotation..... Clockwise viewed from front
Basic thread form..... Unified
Dry weight (١)..... Industrial ٢٤٧ kg (٥٤٥ Ib)
Tractor ٣١٤ kg (٦٩٢ Ib)

(١) Bare engine approximate only.

General specification

Engine core components

Cylinder head and valves

The cylinder head is made of cast iron with a two stud location and fastened to the cylinder block with setscrews and studs. On the T٤,٢٣٦, setscrews only are used.

Inlet valve seat angles are different on ٤,٢٣٦ and T٤,٢٣٦. Use of exhaust seat inserts is standard on the T٤,٢٣٦ and ٤,٢٤٨ engines.

The cylinder head has integral valve guides. Each cylinder has two overhead valves and the rocker gear is fitted on top of the cylinder head and has a pressed steel cover. Each valve has one or two springs, according to engine rating, which are held in position by a hardened steel cap and split collets. The hardened steel valve spring seats are fitted into a machined recess on top of the cylinder head. The type of valve stem seals fitted is decided by engine specification.

Cylinder block and crankcase

The cast iron cylinder block is made as one unit with an integral crankcase. The sides of the cylinder block extend below the crankshaft centre line to give added strength. The type of cylinder block supplied will be according to engine type and application. The cylinder bores are fitted with dry type, high duty cast iron liners which are either flanged or straight, according to engine specification, and can be renewed. The water jacket extends down the full length of the cylinders and there is a water space between all cylinder bores.

Valve rocker assembly

The valves are operated by cold drawn push rods with induction hardened ends, flat faced, large head type tappets fitted in the cylinder block and forged rocker levers. The rockers and valve gear are lubricated by a reduced oil flow taken from number two camshaft bearing through a hole drilled in the cylinder block and head to a hardened steel hollow rocker shaft. The rocker shaft is supported by four brackets. The valve clearance adjustment is by hardened, ball ended adjustment screws and locknuts at the push rod end of the rocker lever.

Pistons and gudgeon pins
The pistons are made of a silicon aluminum alloy. The turbocharged engines are fitted with three ring expansion type pistons with a hard metal insert for the top ring groove. Some naturally aspirated engines also have three ring pistons but others have five rings, three compressions and an oil scraper above the gudgeon pin and a second oil scraper below the gudgeon pin. The hollow gudgeon pins are fully floating and are kept in an axial location by circlips. The pistons on turbocharged engines are cooled by lubrication oil from jets fitted in the cylinder block walls.

Connecting rods
The connecting rods are machined from 'H' section molybdenum steel alloy forgings and the big end bearings are of the pre-finished, thin wall type that can be renewed. The bearings are steel backed with a lead bronze bearing surface on the T٤,٢٣٦ and an aluminum/tin bearing surface on the naturally aspirated engines. The small end bearings take the form of wrapped bushes and are steel backed and lined with lead/ bronze material. The big end bearings caps are held in position by serrations which are machined on the big end face at right angles to the rod axis. They are held securely to the rod by high tensile steel bolts.

Crankshaft
The crankshaft has five main bearings and is forged from chrome molybdenum steel. There is a large flange at the rear to which the flywheel is fitted. The type of process used to harden the main and big end bearings and if balance weights are fitted to the crankshaft or not, is according to engine specification and application. End float and thrust are taken up by two split ٢٦٠° thrust washers positioned in the centre main bearing housing. . Both front and rear end seals are made of 'Viton', fitted with a metal insert and a round stainless steel tension spring. The front seal is fitted into the timing case and the rear seal is held in place by a one piece pressure die cast aluminum housing.

Main bearings
The five main bearings are of the thin wall type which can be renewed. They are steel backed with an aluminum/tin bearing surface. The main bearing caps on the naturally aspirated engine are of cast iron and on the turbocharged engine of spherical graphite iron for added strength. Each bearing cap is fastened to the cylinder block by two high tensile steel setscrews.

Timing drive
The camshaft, fuel injection pump, oil pump/balancer and auxiliary drives are taken from the front end of the crankshaft through a helical gear arrangement.
The gears can be of cast iron or steel according to application and rating and are housed in either a cast iron or aluminum timing gear case.

Camshaft
The camshaft is made from high duty cast iron with chill hardened cams supported by three pressure lubricated bearings. It is fitted on the right hand side of the cylinder block and the cams and tappets are splash lubricated.

Engine systems

Fuel system
The CAV rotary distributor type fuel injection pump is driven by a gear at the front of the engine and has a flange for attachment to the timing case on the left hand side of the engine. The two plunger mechanically governed pumps can have fixed phase timing or an automatic advance system according to application. The remainder of the fuel system consists of a fuel filter, fitted at the rear left hand side of the cylinder block, a diaphragm type lift pump driven by the camshaft, fitted on the right hand side of the engine and the fuel pipe work.

Combustion system
Fuel is directed into a toroidal type chamber in the piston head through a four hole atomiser nozzle. The ٤,٢٤٨٢ engine has a re-entrant type (squish lip) bowl design.

Lubrication system (without balancer)

The rotor type lubricating oil pump is driven by a gear at the front of the engine and a lubricating oil strainer is fitted to the suction pipe. Naturally aspirated engines have a ٣/٤ rotor lubricating oil pump and turbocharged engines a ٦/٧ type. The pump delivery goes through a relief valve housing and a canister type lubricating oil filter to the main passage, this extends along the length of the cylinder block. The lubricating oil filter can be fitted vertically up or vertically down, on the left hand side or right hand side of the vehicle type cylinder block but only on the left hand side of the agricultural type cylinder block.
It can also be fitted horizontally to the rear, on the left hand side of both cylinder blocks. A lubricating oil pressure switch can also be fitted on the left hand side of the cylinder block. The location of the lubricating oil filler can be at the front or rear of the cylinder head valve cover, or on the left hand side of the timing case, or right hand side of the cylinder block. An oil cooler can be fitted on naturally aspirated engines but must be fitted on turbocharged engines.

Cooling system.

A belt driven centrifugal water pump is used to pump the coolant around the cylinder block and head. The pump can be positioned at two separate heights above the engine centre line. The engine water outlet is fitted to the thermostat housing at the front of the engine. An external by-pass system is used on turbocharged engines and can be used on naturally aspirated engines according to application.

Crankcase ventilation

An open PVC breather pipe extends down the left hand side of the engine from the cylinder head valve cover. A baffle plate in the cover controls the release of oil vapor.

Balancer unit

A balancer unit is available for machines which use rigid mountings, such as frameless tractors etc. It is fitted in the engine lubricating oil sump and is installed in the center to give maximum effect. The balancer is driven by the timing gears at the front of the engine. The bush bearings for the balancer weight journals are pressure lubricated from the lubricating oil system. The roller bearings for the pump drive shaft and idler gears are splash lubricated. The lubricating oil pump is integral with the balancer as is the relief valve housing.