

# General specification

## Engine core components

### Cylinder head and valves

The cylinder head is of cast iron and fastened to the cylinder block with washer faced setscrews. The joint is made with a non-retorque steel core gasket with soft facings. Each cylinder has two overhead valves and the rocker gear is fitted on top of the cylinder head which has a cast aluminum cover. The valves operate in cast iron guides fitted to the cylinder head and have springs held in position by a hardened steel cap and split collets. Hardened steel valve spring seats are fitted in recesses in the cylinder head. Valve seat inserts are fitted to both valves on all full rate turbocharged engines. A synthetic rubber valve stem oil seal is fitted to the top of each inlet and exhaust valve guide.

### Cylinder block and crankcase

The cylinder block is made as one unit from high duty cast iron with an integral crankcase. The sides of the cylinder block extend below the crankshaft centre line to give added strength. The cylinder bores are fitted with dry liners of high duty cast iron, which can be renewed and are a press fit into the cylinder bores. The water jacket extends down the full length of the cylinders and a water space is made between all cylinder bores.

### Valve rocker assembly

The valves are operated by cold drawn push rods with induction hardened ends, flat faced, large head tappets fitted in the cylinder block and cast iron or forged steel rocker levers. The rockers and valve gear are lubricated by a reduced oil flow mechanism via the camshaft oil feed through internal holes to a hollow hardened steel rocker shaft. The rocker shaft is supported by cast iron brackets which give support between each pair of valves. Tappet adjustment is effected by hardened, ball ended adjustment screws and locknuts at the pushrod end of the rocker lever.

### Pistons and gudgeon pins

All engines have three ring, controlled expansion aluminum alloy pistons with steel skirt inserts and hard metal reinforcement for the top ring grooves. The hollow gudgeon pins are fully floating and axially located by circlips. Pistons on turbocharged engines are oil cooled on the underside by oil jets fitted in the crankcase.

### Connecting Rods

The connecting rods are machined from 'H' section molybdenum steel alloy forgings. On naturally aspirated engines the big end bearing caps are located by serrations machined on the big end faces at right angles to the rod axis, on turbocharged engines the bearing caps are located by dowels inserted in the flat big end faces which are at right angles to the rod axis. The caps are held to the rods by two high tensile steel bolts. The bearing shells are steel backed. On naturally aspirated engines the bearing surface is aluminum tin alloy; on turbocharged engines the bearing material is lead bronze with an overlay plating.

The small end bearings are wrapped bushes which are steel backed with a lead bronze facing.

### Crankshaft

The crankshaft is forged from chrome-molybdenum steel, with five main bearings. The rear end is flanged to accept the flywheel. The hardening process is selected according to engine specification.

End float and thrust are taken on split  $\frac{1}{16}^{\circ}$  washers positioned in the centre main bearing.

Both front and rear oil seals are in fluoroelastomeric rubber with metal insert and stainless steel garter spring, and feature an oil 'wind back' device. The front seal is carried in the aluminum alloy timing case cover, the rear seal running on the crankshaft rear flange is carried in a one piece aluminum alloy housing bolted to the cylinder block.

### The main bearings

The main bearings are of the renewable prefinished type. The steel backed shells have aluminum tin bearing surfaces. Bearing caps are in cast iron and each is secured to the cylinder block by two high tensile setscrews.

### Timing drive

The camshaft, fuel injection pump, lubricating oil pump, water pump and auxiliary drives are taken from the front end of the crankshaft via a helical gear train.

### Camshaft

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

## Engine systems

### Fuel system

All engines use a rotary distributor type of fuel pump fitted with mechanical governor, a boost control fuelling device is fitted on full rate turbocharged engines.

A camshaft driven diaphragm fuel lift pump, fuel filter or filters and appropriate pipe work complete the fuel system.

### Combustion system

A high turbulence direct injection combustion system is used.

### Lubrication system

The lubricating oil system is charged by a rotor type pump gear driven from the front end of the crankshaft. A strainer is fitted to the pump inlet, delivery is via a pressure relief valve, lubricating oil cooler where fitted, and full flow filter to the main distribution gallery. Various lubricating oil filter positions on both left and right hand side of the engine are available. Provision is made for a pressure switch and oil supply to an engine driven auxiliary on the left hand side of the cylinder block. Various filler positions on top and on the side of the engine are available.

### Cooling system

Engine coolant is circulated by a gear driven water pump situated on the left hand side of the timing case. A fully modulating thermostat controls both coolant temperature and water circulation. Provision is made for the water cooling of an engine driven auxiliary, the fitting of temperature sensing devices and the supply of hot water to cab heating systems.

### Crankcase ventilation

An open breather system is fitted as standard.

## Phaser 120Ti

GENERAL DATA	
Bore/Stroke	100 mm (3,937 in)/127mm (5,00 in)
No. of cylinders	Σ in-line vertical
Cubic capacity	Σ,0 liters (282,0 in <sup>3</sup> )
Cycle	Σ stroke
Aspiration	Wastegated turbocharger, with air/air intercooling
Combustion system	Fastram direct injection
Compression ratio	17,0:1
firing order	1,2,Σ,2
Rotation	Clockwise, viewed from front
Fuel pump	Bosch rotary, with boost control
Governing	Mechanical
Injectors	Low inertia, valve covered orifice (VCO)
Cooling	Liquid
Weight <sup>1</sup>	279kg (618lb)
Length <sup>†</sup>	611mm(24,0in)
Width	102 mm (4,0 in) with compressor
	112 mm (4,4 in) without compressor
Height	182 mm (7,2 in)
Thread form	Metric
Electrical	12 volt (24 volt optional)
Power take-off	From crankshaft axially or radially, Gear driven
	PTO from timing case on LHS beneath fuel pump
Air compressors	Bendix 100 with steering pump PTO
Vacuum pump	ClaytonH1Vo

1. Engine without fan drive, flywheel, flywheel housing and starter motor.

Weight does include alternator and filters.

2. Rear face of cylinder block to fan pulley.

## Phaser 170 Ti CNG EURO 2

GENERAL DATA	
Bore	100 mm (3,937 in)
Stroke	127 mm (5,000 in)
No. of cylinders	4 in-line vertical
Cubic capacity	4,0 liters (242,0 in <sup>3</sup> )
Cycle	4 stroke
Aspiration	Turbocharged, with air/air intercooling
Combustion system	Spark ignition
Compression ratio	9,2 :1
Firing order	1,3,4,2
Rotation	Clockwise, viewed from front
Fuel delivery control system	ECU
Cooling	Liquid
Weight*	270 kg
Length**	71cm
Width	72cm
Height	81cm
Thread form	Metric
Electrical	24 volt
Power take-off	From crankshaft axially or radially. Gear driven PTO from timing case on LHS beneath fuel pump
Air compressors	Bendix 100 with steering pump PTO

1. Engine without fan drive, flywheel, flywheel housing and starter motor.

Weight does include alternator and filters

2. Rear face of cylinder block to fan pulley