ALSTOM Engines
Paxman VP185

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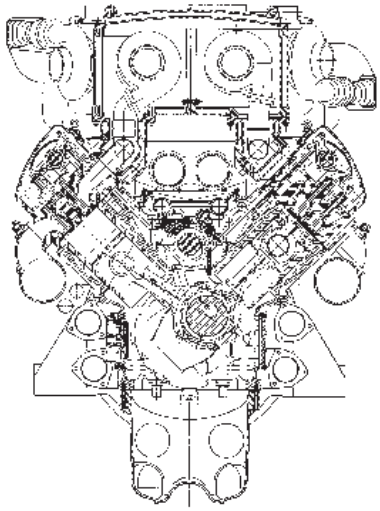


General Description

The VP185 range of 12 and 18 cylinder high speed diesel engines combine high power output with a light weight and compact design to meet the needs of marine, industrial, rail and off-road applications world-wide.

The top of the range 18VP185 produces powers up to 4000 kWb (5365 bhp) at a speed of 1950 r/min. The 18VP185 is perfectly suited for installations where weight and space are at a premium and high power output is essential. The simple design allows ease of maintenance for routine service and inspection.

Add to this the low fuel and lubricating oil consumption, long periods between overhauls, low exhaust emissions and high reliability and the customer has a package ideal for all aspects of power generation and marine propulsion.

Crankcase

This is cast in high strength spheroidal graphite iron, and is a robust and lightweight design. In the lower portion of the crankcase the underslung crankshaft is supported by main bearing caps which are double cross bolted to the deep side faces of the casting. In addition the vertical main bearing studs are hydraulically tensioned and the entire arrangement provides a strong and stiff core for the engine. Generously sized crankcase doors are provided to give access to the connecting rods and crankshaft for in-situ servicing. The crankcase supports the remainder of the engine's components to provide a self contained power unit.

Piston and liner

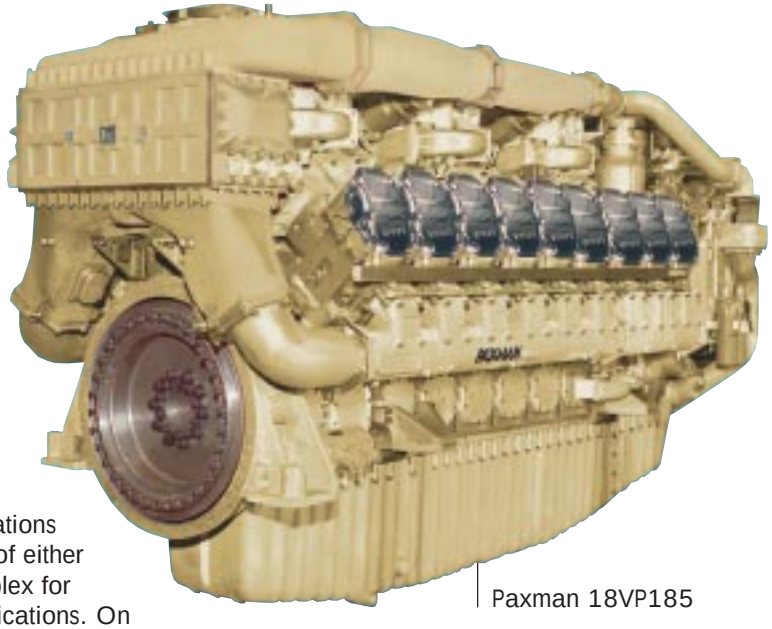
The piston is a monoblock design manufactured from spheroidal graphite iron. Piston cooling is achieved using a lubricating oil cooled gallery under the crown, behind the compression ring groove and much of the second ring groove. The oil feed is via accurately aligned standing jets mounted in the crankcase. The pistons run in wet liners made of centrifugally cast high grade cast iron. Each liner has a top flange which sits on the flat top deck of the engine block. The liner is trapped between the crankcase and the cylinder head at the liner flange. The lower support for the liner is arranged to be high in the crankcase and incorporates two 'O' ring seals and a large 'wedge' ring.

Connecting Rods

Side by side connecting rods are made from high-strength forged steel. The rods are fully machined to give strength and weight consistency between individual rods. After machining they are ferritic nitro-carburised. The large end is obliquely split to allow the rod to pass through the liner for assembly and overhaul. This permits rod and piston removal from the top of the engine without the need to removed the engine from its seatings.

Crankshaft

The crankshaft is a fully machined steel forging, fully nitrided for maximum strength and long wear life. Counterbalance weights are bolted to the crankshaft on every throw to reduce the out of balance caused by the connecting rods. The generous overlap between crankpin and main bearing journal provides a high degree of stiffness. Torsional damping is by means of either a tuned damper (18VP185), or a viscous damper



Paxman 18VP185

(12VP185), fitted to the free end and totally enclosed within the Free End Casing.

Cylinder Heads

The cylinder heads are manufactured from high strength compacted grey cast iron and have an internal configuration that ensures maximum flame face stiffness and high cooling efficiency. They are mounted individually and can be removed for maintenance without disturbing adjacent heads. The air and exhaust ports have been optimised aerodynamically to maximise the efficiency of cylinder charging and scavenging. Each cylinder head carries two inlet and two exhaust valves, and a centrally located unit pump injector.

Camshaft and Valve Train

A single camshaft located in the centre of the engine vee provides the actuation for all valves and unit pump injectors. The adoption of a single camshaft allows the camshaft gear to mesh directly with the crankshaft gear, so eliminating the need for idler gears and associated oil supply system. A large base circle coupled to high rates of lift give the essential characteristics for good combustion and low emission levels. The design of the push rod and rocker assembly has been optimised to give the highest stiffness for the minimum moving mass.

Lubricating Oil System

The engine is of the wet sump design with a gear driven externally accessible oil pump. For the 12VP185 duplex oil filters are standard for marine applications with a choice of either simplex or duplex for industrial applications. On the 18VP185 engine triplex oil filters have been chosen as standard for all on engine oil filter arrangements. The oil is cooled by a plate type oil cooler similar in construction to the heat exchanger, the temperature being controlled by a bypass thermostat. For most applications the oil cooler is mounted on engine providing a complete engine power unit and avoiding the use of connections to off engine equipment. Some flexibility in system design is however available to suit customer's special requirements.

Exhaust System and Turbocharging

The VP185 has a passive two-stage turbocharging system with intercooling and aftercooling. No valves or electronic controls are needed thereby maintaining the engine's central theme of simplicity and reliability. All of the exhaust manifolds are contained in a water cooled gas-tight casing to ensure that there are no exposed hot exhaust pipes. Each high pressure turbocharger expands the exhaust gas into a pair of similar low-pressure turbochargers. After expanding through the low pressure turbochargers the gas is exhausted from the engine to the site exhaust piping. The hot turbine side of the turbochargers and all interconnecting ductwork are contained within the water cooled, gas-tight turbocharger housings. Each turbocharger cartridge is mounted directly into the side of the housing with the associated turbine casings being fixed internally by bolts inserted from outside. This eliminates the use of fasteners within the hot gas area which leads to easier maintenance. The arrangement enables the turbochargers to be replaced rapidly when required. After insertion and bolting into place the cartridge has the external compressor casing fixed onto the outside by means of a Vee band clamp. The oil supply and drain connections run within the main housing wall avoiding the need for additional external oil feed and drain pipework. The total arrangement of manifold casings and turbocharger housings gives the engine a gas-tight system with a cool surface, an important safety feature.

Gear Train

The gear train is comprised of carburised and ground gears located in the lightweight aluminium casing at the non drive end of the engine inside the free end cover. The 90 degree engine configuration allows the camshaft drive gear to mesh directly with the crankshaft gear. Additional drives are taken for the gear driven oil and coolant pumps. The gear casing complete with all necessary gears, pumps and governor is built as a single unit and fitted to the engine as a pre-fitted assembly.

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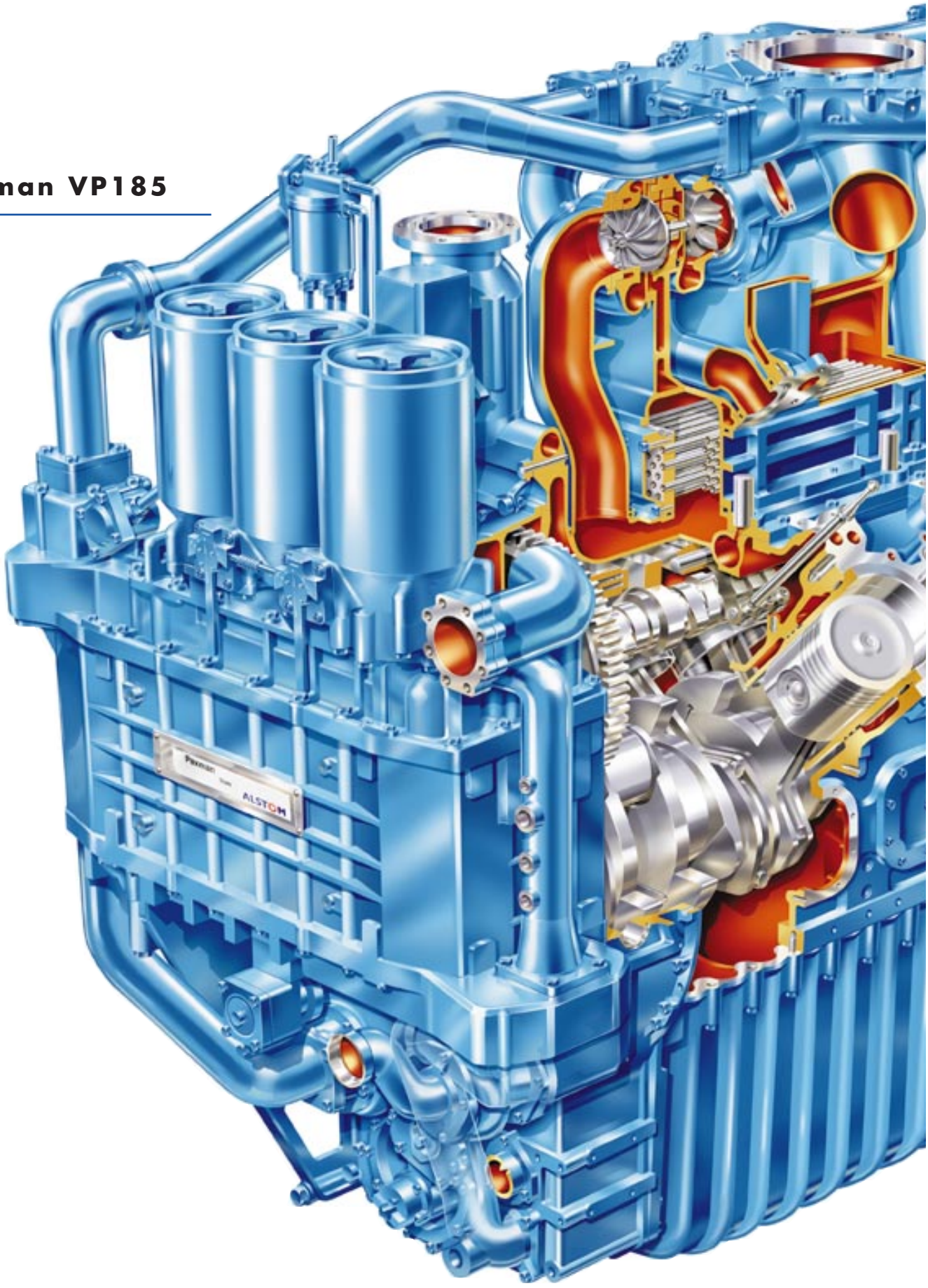

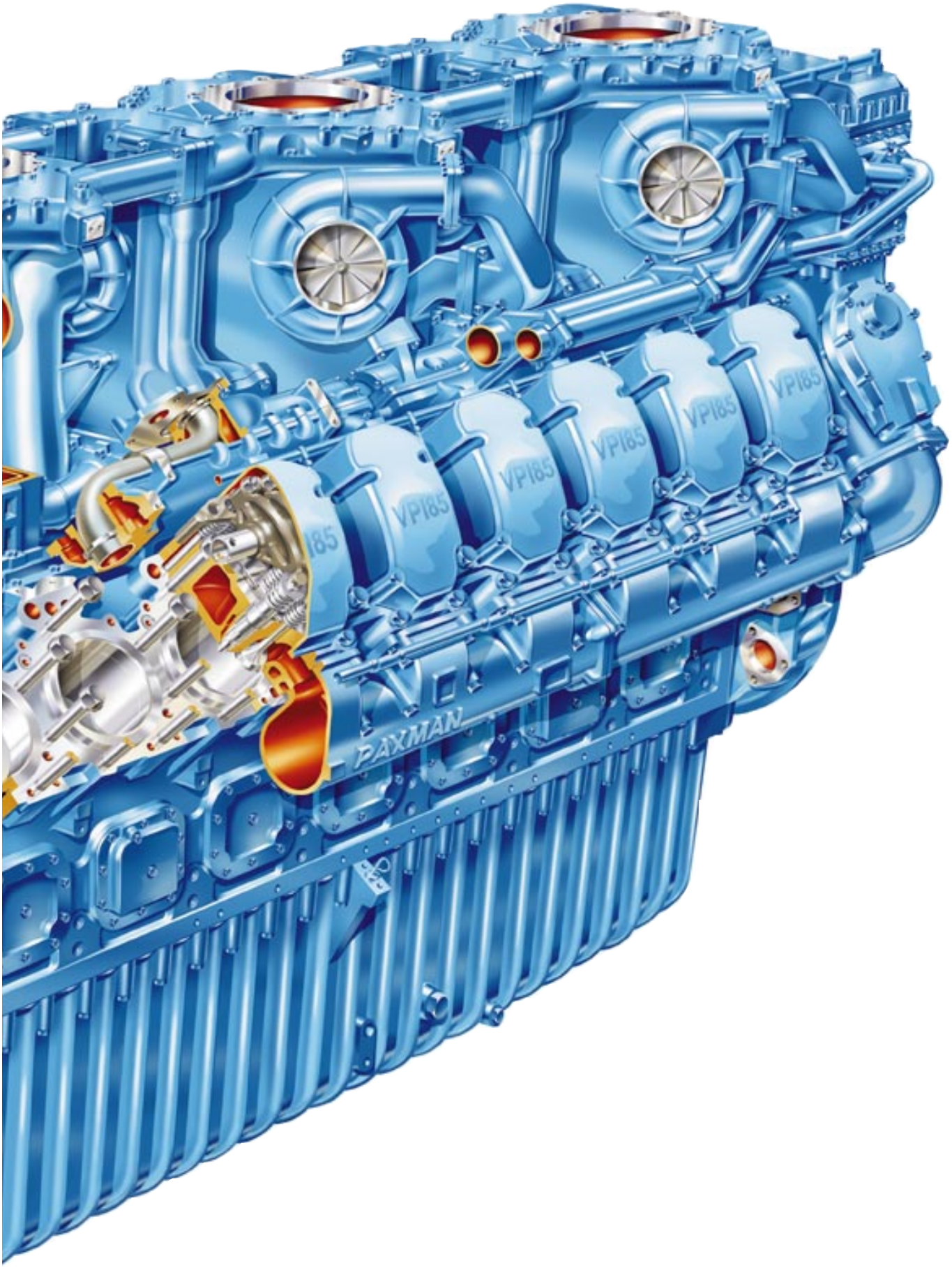
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Fuel Injection System

A combined fuel pump and injector, known as a unit pump injector, offers a high injection rate with a maximum injection pressure of 1400 bar. This gives good combustion characteristics with low emissions and low fuel consumption. Care has been taken to exploit the natural high injection stiffness for the unit injector by careful attention to the design of the push rod system driving the unit. The mechanical stiffness of the driving assembly has been maximised with the minimum of additional mass. The unit injector avoids the use of any exposed high pressure pipes or joints, and this is a distinct safety feature inherent in the VP185 design.

The unit injectors are rack controlled via a linkage operated by the engine mounted actuator. The actuator is located in the centre of the vee and receives its power from a gear drive from the camshaft gear wheel. The actuator is controlled by the off engine electronic control system but incorporates a back up mechanical governor for marine installations.

Fuel Filters

In standard form the marine propulsion and auxiliary engines are fitted with duplex fuel filters in a position which affords easy access for maintenance staff. The industrial engine has an option of either simplex or duplex depending on the application. Low pressure fuel oil is delivered via the fuel filters to the unit injectors from a gear driven fuel lift pump. The system eliminates the need for high pressure fuel pipes, a important safety feature.

Cooling Circuit

The cooling system is divided into two circuits designated Primary and Secondary. The primary circuit runs at relatively high temperatures and is based on the engine housing water circuit, and provides hot water to keep the engine warm which helps to maintain steady combustion. The secondary circuit runs at a lower temperature and is the key to achieving a sufficiently low lubricating oil and inlet air temperature in hot environments. The primary and secondary coolant is circulated around the engine by engine mounted gear driven pumps. In general two basic cooling arrangements are offered, designated marine and industrial, although specialised arrangements can be tailored to suit the particular requirements of the application.

Heat Exchanger

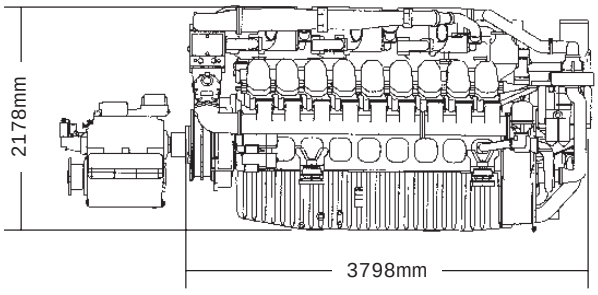
A single plate type heat exchanger on the marine engine cools both lub oil and primary engine coolant. Its close proximity to the respective pumps minimises pipe runs and allows the engine to be supplied as a finished power unit.

Governing

The standard marine engine is supplied with the Regulateurs Europa digital Viking 2200 governor and the RE2231 actuator with the option of ball head back up. The system offers a high response rate and close control of the engine coupled with a range of other control functions. For industrial applications and marine generators the Woodward UG8 actuator and 2301A speed controller is fitted as standard with the option of load share using either Heinzmann or RE governors. All governing systems can be integrated into larger distributed control schemes.

Engine Protection

The engine is fitted with alarm and shutdown switches which operate in the event of low lubricating oil pressure and engine overspeed. Alarm and shutdown functions can be tailored to suit individual requirements. A comprehensive data collection and monitoring system can be supplied which is capable of communicating with any ship control, DCS or central system as desired. As the range is so vast further details would be supplied on a job by job discussion.



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