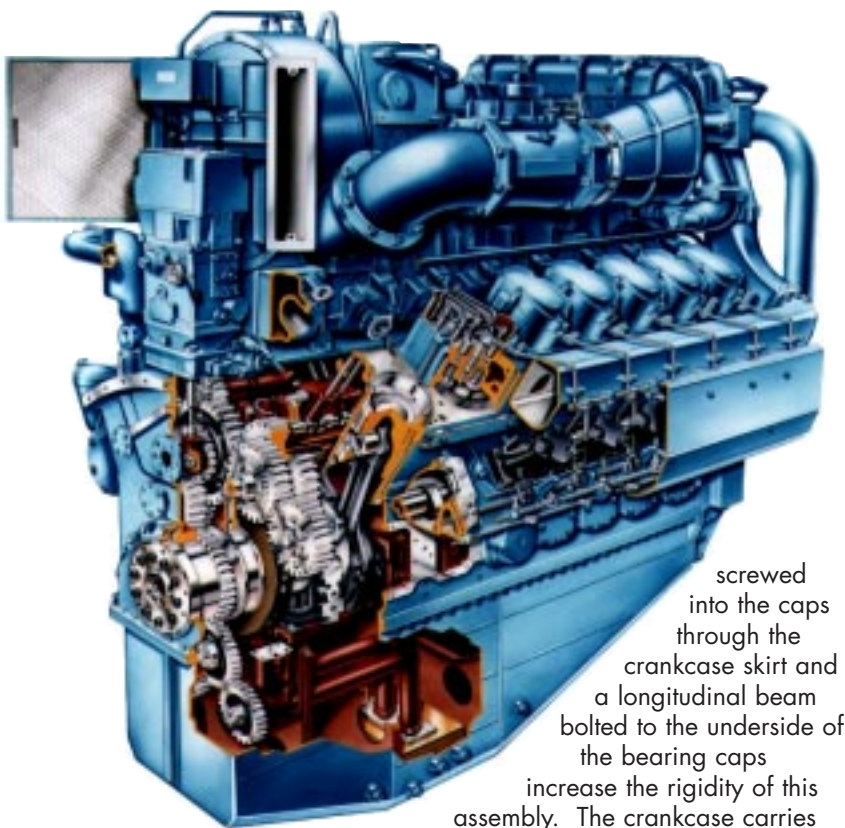


# Paxman Valenta Marine Propulsion Diesel Engines Specification



## ENGINE SPECIFICATION

**Crankcase** The crankcase is manufactured either from a high grade casting or fabricated from steel castings and plate (8, 12, 16 and 18 cylinder). The structure is fully stress relieved before machining. The underslung crankshaft is carried in main bearing caps located against side thrust by fitting faces. Lateral bolts

screwed into the caps through the crankcase skirt and a longitudinal beam bolted to the underside of the bearing caps increase the rigidity of this assembly. The crankcase carries wet type steel cylinder liners, surmounted by individual cylinder heads. The underside of the crankcase is enclosed by an oil sump complying with classification societies' requirements for pitch and roll.

**Crankshaft and Main Bearings** The forged steel nitride hardened crankshaft is carried in pre-finished main bearings of the steel shell type, lined with tin

aluminium. It is located by rings at the drive end of the engine. The crankshaft is flanged at the drive end for the attachment of the flywheel and driven machinery by set bolts. An additional bearing is provided to support the inboard end of driven machinery. A viscous torsional vibration damper (two on 16 and 18 cylinder engines) is bolted to the flange at the free-end of the crankshaft. The drive for the camshaft, governor, fuel injection, oil and water pumps is from a train of hardened gears located at the drive end of the engine. Eight cylinder engines have a gear driven secondary balancing system. Eighteen cylinder engines have gear driven primary balancing systems and primary balance weights on the crankshaft are fitted to all engines. The free-end cover is machined to S.A.E. No. 2 dimensions for the attachment of power take-off drives etc.

**Connecting Rods and Bearings** Fork and blade connecting rods (vee form engines). A large end block attached to the forked rod houses a tin aluminium thin wall bearing which runs on the crankpin. A lead bronze lined shell in the blade rod runs on a nitride hardened surface on the large end block. Rods and bearings are drilled for lubrication of the small ends and for piston cooling. 6 cylinder engines have oblique

split connecting rods using the same shell bearings as the vee engine fork rod

**Pistons** Aluminium alloy oil cooled pistons are each fitted with compression rings and an oil control ring above the fully floating gudgeon pin which is located by circlips. The top pressure ring is fitted in an "Alfin" bonded cast iron ring groove insert.

**Cylinder Heads, Valve Gear and Liners** Single unit cast iron cylinder heads with drilled passages giving optimum water flow around the valve seats, are fully interchangeable, and house two inlet and two exhaust valves seating on replaceable inserts and a central injector. The valves are operated by one push rod and rocker per two valves, a bridge piece actuating each pair of valves. The valve gear is fully enclosed by easily removable covers. The injector is enclosed by the valve cover, and the inlet pipe is sleeved to prevent leakage into the lubricating oil system. Hard chrome plated wet type liners of seamless steel tube flanged at the head end, carry copper plated steel rings above and below the flange for sealing against gas and water leakage; the lower end of the liner is sealed by two rubber rings. Water transfer from the housing jacket to the head is by ferrules sealed by rubber rings. The waterside surface of the liner is protected by chromium plating.

**Camshaft and Drive** The valve gear camshaft is located in a trough formed by the two banks of cylinders (vee engines) and at the side (in line engines). It is gear driven from the crankshaft and runs in pressure lubricated bearings. A separate tappet housing for each line of cylinders is fitted above the camshaft and contains roller type cam followers for operating the tubular push rods; return springs maintain constant engagement of each cam roller with its cam.

**Fuel Injection Equipment** Lucas single unit fuel injection pumps are operated by camshafts

running in aluminium cambox housings, which are located on the side(s) of the engine and are grouped below the air inlet manifolds. These fuel injection pump camshafts are lubricated from the engine system with a metered supply to the fuel pump plungers. Fuel feed and injection pumps are driven from the gear train at the drive end. The fuel system includes a fuel reservoir and air vessel. The combustion system employs direct injection of fuel by a central multi-hole injector into an open toroidal cavity in the top of the piston. Short identical double skinned fire avoidance pipes, of equal length, are fitted between the pumps and injectors.

#### **Governor, Drive and Controls**

A standard Regulateurs Europa 1100 series governor, driven from the engine gear train is located at the drive end of the engine. The governor controls the effective fuel delivery of the injection pump through a system of rods and levers. Precision self aligning spherical bearings are employed at the control rod ends and bearing points to minimise friction and lost motion. The Viking 22 electronic governor is available for remote control.

**Pressure Charging** One watercooled exhaust gas driven turbocharger is located at the free end (6 cylinder) or above the vee of 8 and 12, 16 and 18 cylinder engines. Two smaller turbochargers are fitted to lower rated 16 & 18 cylinder engines. Watercooled exhaust manifolds are fitted within the vee of the vee form engines.

**Air Intercoolers** The intercooler(s) for cooling the air for aspiration from the turbocharger(s) is mounted above the free-end of the engine. Water from the sea water circuit is the cooling medium. For some applications, aspiration air passes through a heater unit which is mounted between the intercooler and the air manifolds. This unit is heated by engine jacket water the flow of which is controlled to give the optimum manifold air temperature when

starting up and at low load running. Gunmetal waterboxes, nickel-aluminium-bronze tube plates and copper nickel tubes are standard materials used.

On generators the intercooler is incorporated in the raw water circuit (Valenta C engines).

**Lubrication** One engine-driven gear type lubricating oil pump (two in parallel - 12 and 16 cylinder engines, triple-rotor type - 18 cylinder engines) is housed inside the sump at the drive end of the engine. This pump supplies high-pressure oil to all bearing points in the engine (including water pump) via full flow filters and to the built-on oil coolers. Pressure is controlled by a single spring loaded relief valve.

**Cooling** Fresh water is circulated through the engine, oil cooler (6 cylinder engines) exhaust manifold jackets and turbocharger cooling system, by a single pump fitted at the free end of the engine shaft driven from the drive end gear train. Outlets from the engine are brought together to provide a common inlet to a thermostatic control valve mounted above and attached to the pump.

**Oil Coolers** The engine mounted tubular oil cooler is fresh water cooled (6 cylinder engine) and sea water cooled on other sizes. Gunmetal waterboxes, aluminium alloy cylinders and copper-nickel tubes are standard materials used. A thermostatically controlled valve (one per cooler) is fitted in the oil circuit.

**Exhaust** Flexible pipes, "Y" piece (16 and 18 cylinder engines) and absorption type silencers can be supplied.

**Crankcase Explosion Door** These are fitted to all engines.

#### **Filters:**

**Air** Circular oil wetted filter attached to the turbocharger is fitted to 6 cylinder engines. Oil wetted panel type filters mounted on trunking attached to the

turbocharger inlet casing are supplied for other engine sizes.

**Fuel Oil** Single element fuel oil filter is fitted to all engines. A filter-coalescer can be supplied for independent mounting in vessels.

**Lubricating Oil** Single element, full-flow filters are inserted in the pressure circuit for mounting adjacent to the engine.

**Fuel Feed Pump** A fuel feed pump is fitted to all engines. The suction lift of the pump should not exceed 1830 mm, 72in.

**Flywheel** Housings and flywheel can be coupled to any type of driven equipment.

**Overspeed** Built-in overspeed shutdown equipment is fitted.

**Testing** Engines are tested to a standard schedule when power and speed stops are set and sealed; additional tests are undertaken to customer's requirements. Engine Test Certificates are supplied with each engine.

## OPTIONAL EQUIPMENT

**Heat Exchanger** A standard range of tubular coolers with gunmetal waterboxes, aluminium cylinders and aluminium brass tubes are available to cover the complete engine speed range and sea water temperatures up to 32°C, 90°F. Coolers with cupro-nickel tubes can be provided.

**Sea Water Pump** A centrifugal, self-priming sea water pump with gunmetal body and impeller and stainless steel shaft is driven by belts from the engine free end pulley.

**Priming Pump** A motorised lubricating oil priming pump piped to the engine can be supplied for priming the engine and for sump emptying purposes.

## Filters:

**Fuel Oil and Lubricating Oil** Duplex filters with changeover

valves can be supplied at extra cost, if specified or when engines are built to classification societies requirements.

**Starting** Air, electric or hydraulic starter motors may be employed. Air receivers and diesel driven air compressor sets with exhaust silencer, unloading and relief valves can be supplied. Batteries and cables can be supplied. An independent hydraulic starting system can also be supplied.

Where required, Pre-heating to warm the engine before start can be supplied. This is in the form of a module comprising a heater tank, complete with heaters and a circulating pump.

**Exhaust Silencers** Various proprietary silencers are available, these can be of the straight through spark arrestor or snubber type. In cases where noise abatement is critical two silencers in series may be required. Care must be taken not to exceed the maximum back pressure as this will affect engine performance

**Free-End Drives** Pulleys can be provided at the free end of the crankshaft to drive water and hydraulic pumps, alternators, etc., by means of belts.

**Protection Equipment: Fresh Water and Lubrication Systems** Should these systems fail, pressure and temperature sensitive switches complete electric circuits to visual and audible alarms.

**Sumps** Marine type steel sumps are fitted to meet installation design angles, operational trim and classification societies' requirements of pitch and roll.

**Mounting** Feet suitable for marine are available. Marine engines are normally mounted on four-point anti vibration mount is to limit transmission of noise and vibration to the ships structure.

**Shut-down** All engines can be shut down by means of a solenoid

valve built into the governor. The supply voltage can be either 24, 32, 48, 110 or 200 volts d.c. A pneumatic shutdown device is also available.

**Coupled engines** (Marine engines in multiple driving one propeller). Governors can be provided with built-in transducers for remote indication of engine fuel rack position, to assist manual load control. Alternatively, complete automatic pneumatic or electronic load sharing systems can be supplied.

**Gearboxes** The engine can be supplied with various makes of gearbox and approved matchings between engine speed and shaft speed over a wide range are available. Choice of ratio is flexible due to the excellent torque characteristics of the engine. Modern gearboxes offer a wide range of options, including co-axial, drop centre, U drives, trolling valves, mounting facilities for CPP oil distribution boxes, power take-off points and facilities for electric, mechanical or pneumatic control. Paxman Diesels are happy to advise customers on the most appropriate configuration for the specific duty. Torsional vibration calculations can be carried out when details of all the driven equipment are available.

**Automatic Control Equipment** Automation of many of the ship's services is a recognised operational requirement. Standard units to meet specific requirements with the built-in protection of essential operating services can be provided. *Functions which can be automated are:*

Start and stop of propulsion and auxiliary diesel engines, increase and decrease of engine speed, manoeuvring - ahead, neutral and astern operations of gearboxes, engagement and disengagement of clutches and propeller shaft brakes, control of variable pitch propellers.

**Instruments** The direct reading instrument panels are supplied loose for mounting adjacent to the

engine. Coolant and lubricating oil temperatures, and oil pressure gauges are included. A complete monitoring system can be provided or if preferred, on engine transmitters can be supplied whose signals can be received by a monitoring system supplied by others.

**Couplings** A flexible coupling is fitted between the engine and

gearbox. This coupling gives a very high degree of damping to torsional vibrations.

**Equipment**

A standard range of heat exchangers, governors, air or electric starting systems are available. Alternatively, where practical, special equipment to meet customers specifications can be supplied.

**Spares** The Company can supply spares to meet operator's or classification societies' requirements.

**Tools and Spares** Standard tools are supplied for normal maintenance routine. A selected set of spares is also supplied.

<b>ENGINE DATA</b>					
<b>Engine Type</b>					<b>VALENTA</b>
Number of cylinders	..	..	..	..	6, 8, 12, 16, 18
Bore and Stroke	..	..	..	..	197mm x 216mm, 7.75in x 8.5in
Cycle	..	..	..	..	4 stroke
Compression ratio	..	..	..	..	12:1 to 13:1
Configuration	..	..	..	..	60° vee (in line - 6 cylinder)
Operating speed range	..	..	..	..	750 - 1640 r/min
Idling speed	..	..	..	..	600 r/min (basic engine)
Mean piston speed:	1500 r/min	..	..	..	10.8 m/s 2125ft/min
	1200 r/min	..	..	..	8.64 m/s 1700ft/min
Direction of rotation:	Standard	..	..	..	Anti-clockwise on flywheel end
	Special	..	..	..	Clockwise on flywheel end
Combustion system	..	..	..	..	Direct injection
Thread system:	Engine	..	..	..	ISO metric coarse
Starting systems:	Electric	..	..	..	178mm, (7in) (2 motors on 16 and 18 cylinder)
	Type	..	..	..	axial
	Voltage	..	..	..	24 - other voltages available
	Air motor:	..	..	..	10.00 bar, 146 lbf/in <sup>2</sup> (1 motor)
	Hydraulic motor	..	..	..	207 bar, 3000 lbf/in <sup>2</sup> (2 motors on 16 and 18 cylinder)
Alternator continuous output	..	..	..	..	1400 watts
Basic governor series	..	..	..	..	1100 (Regulateurs Europa)
Fuel	..	..	..	..	B.S.2869:1988 Class A1 and A2 and ASTM D-975 88 Nos 1 and 2 - D with minimum Cetane No. 45
Lubricating oil	..	..	..	..	S.A.E. 30 or 40 (according to duty). Heavy duty oil qualified to MIL-L-2104E specifications should be employed, with a TBN of 9 for engines running on fuels stated above



**ALSTOM Engines Ltd.**, Paxman Division,  
Hythe Hill, Colchester, Essex, CO1 2HW, England, Tel: +44 1206 795151, Fax: +44 1206 797869  
[www.ind.alstom.com](http://www.ind.alstom.com) [www.engines.ind.alstom.com](http://www.engines.ind.alstom.com)