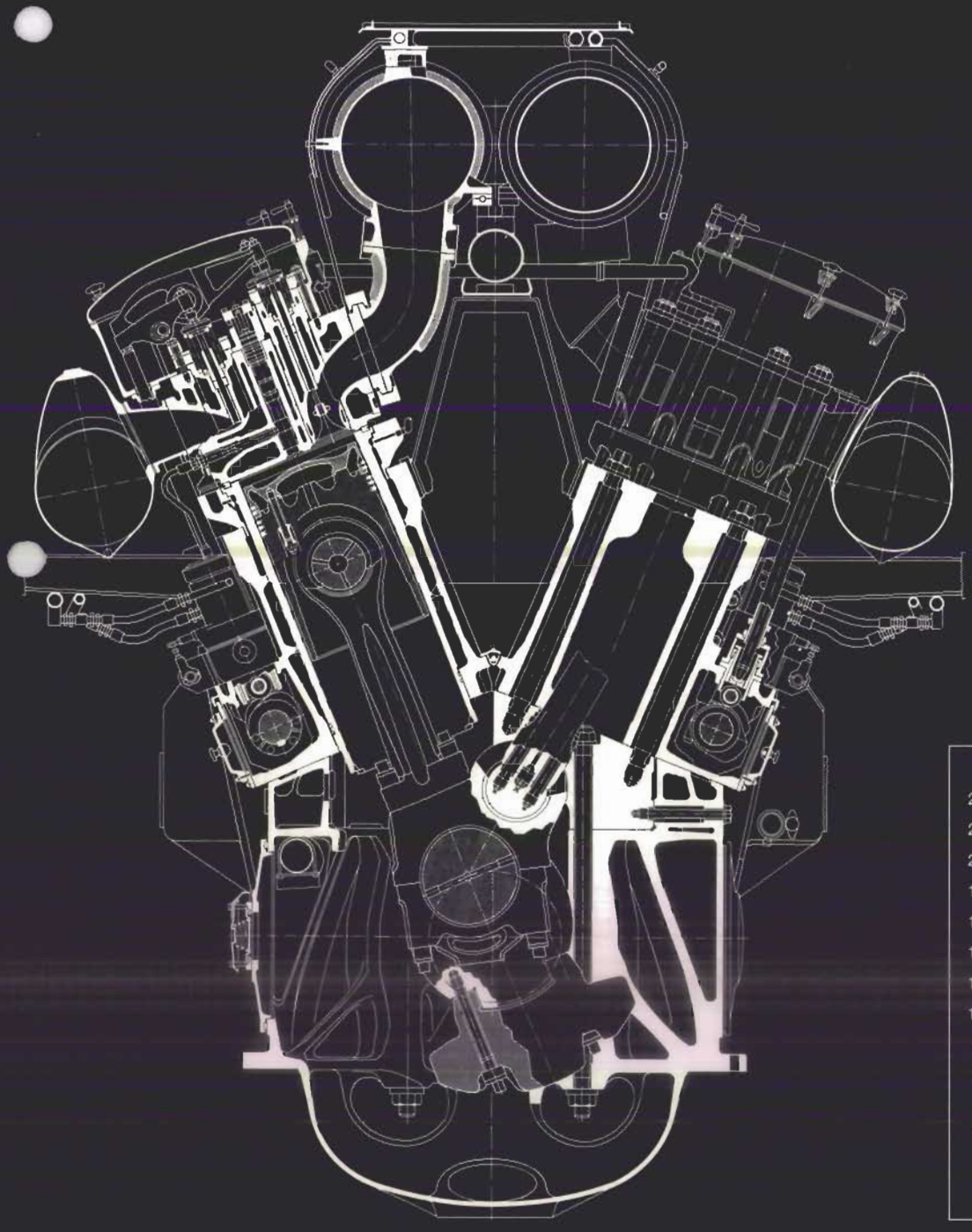
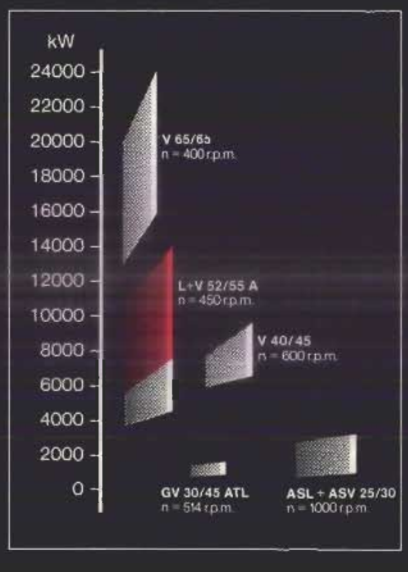
Brief Specification
Status: March 1977

M·A·N

Four-stroke Diesel engine V 52/55 A
775 kW/cylinder 450 r.p.m.





V 52/55 A

Working cycle:	4-stroke
Combustion process:	direct injection
Number of cylinders:	10, 12, 14, 16, 18
Cylinder bore:	520 mm
Piston stroke:	550 mm
Swept volume per cylinder:	117 dm^3
Cylinder output:	775 kW 1055 hp
Power/weight ratio:	14.3-15.6kg/kW 10.5-11.5 kg/hp
Coolant:	Water
Starting:	by compr. air
Specific fuel consumption at full load: (Tolerance 5%)	196 g/kWh 144 g/hp h

Performance Data

Speed	r.p.m.		450
Mean piston speed	m/s		8.25
Mean effective pressure	bar		17.7
		kW	hp
10 V 52/55 A	10 cyl.	7750	10550
12 V 52/55 A	12 cyl.	9300	12660
14 V 52/55 A	14 cyl.	10850	14770
16 V 52/55 A	16 cyl.	12400	16880
18 V 52/55 A	18 cyl.	13950	18990

General definition of diesel engine ratings (to ISO 3046/I)

Cont. rating 10% overload capacity for 1 hour's service within 12

Reference conditions:	
Air temperature	300 K (27°C)
Air pressure	1 bar
Cooling water temp. bef. charge-air cooler	300 K (27°C)

Engine power ranges of marine propulsion engines

MCR = Maximum Continuous Rating (fuel stop power)

I = operating range for continuous service

II = operating range temporarily admissible, e. g. during acceleration, manoeuvring (torque limit)

FP = design range for fixed-pitch propeller (Fig. 1)

VP = design range for controllable-pitch propeller with combinator (Fig. 2)

Reference conditions:	
Air temperature	318 K (45°C)
Air pressure	1 bar
Cooling water temp. bef. charge-air cooler	305 K (32°C)

Application

The engine is a single-acting four-stroke unit, able to burn low-grade fuels, exhaust-gas turbocharged, for both marine propulsion and stationary duties. The two banks of cylinders are arranged in Vee-form at an angle of 45°.

Engine frame

The engine frame is cast integral with bedplate and oil sump. The opening required in the top face of the frame for crankshaft installation is closed off by cast steel transverse members secured to the bearing supports by means of waisted bolts. Laterally these members are also bolted to the engine frame walls, forming a force and form-locking engine casing enclosing the crankshaft bearings in tunnel-like fashion. The side walls incorporate large openings closed off by covers giving ready access to running gear and bearings. Some of these covers are equipped with safety valves.

Main bearing

The steel-backed bearing shells are lead-bronze-lined and feature an electro-deposited protective layer. The crankshaft incorporates locating rings arranged at each side of the bearing between the distribution drive and the first pair of cylinders. In marine engines which feature a thrust bearing these locating rings have been recessed. The bearing caps are secured by means of two bolts arranged on the sides. The oil for crankshaft and piston pin bearing lubrication as well as for piston cooling is admitted via the crankshaft bearings.

Cylinder block

Each bank of cylinders has a continuous cylinder block. This cylinder block is clamped together with the engine frame by means of tierods relieving the cylinder block of the combustion forces.

Cylinder liner

The cylinder liners are made of wear-resistant cast iron and introduced into the cylinder block from above. They abut against a water-cooled collar, and are circulated by cooling water up to the liner flange, which is subject to extreme thermal load. Efficient cooling and uniform temperature are thus ensured. Two O-rings seal off the liner at its lower end.

Cylinder head

Each cylinder has its own nodular cast-iron cylinder head fastened to the liner by 8 stud bolts. Thanks to the stiff cylinder head, very uniform load distribution over the bearing surface is assured. Each cylinder head carries two inlet and exhaust valves, an indicator valve and a fuel injection valve. In addition to this, marine engines carry a safety valve. Reversible engines have a starting valve on each cylinder, whereas uni-directional engines, with the exception of the 10 V 52/55 A model, are equipped with starting valves only on the A bank. To facilitate maintenance, the inlet and exhaust valves have their own valve cage so that valves can be exchanged without disturbing the cylinder head. The cooling passages in the cylinder head are so shaped and arranged that uniform temperature distribution throughout the flame plate is ensured, as this has a decisive bearing on the life of this component.

Crankshaft

The crankshaft is a high-grade steel forging. In order to ensure efficient balancing of the masses each crankweb is fitted with a counterweight. The journals and crankpins are ground and polished. The lubricating oil is led from the main to the connecting rod bearings. The two-part camshaft drive gear is seated at the coupling end on a collar which stands proud of the bearing trunnion. If required, a shaft extension can be attached at the countercoupling end for taking off part of the engine output.

Vibration damper

An M.A.N.-type sleeve-spring vibration damper is fitted at the coupling end. This damper type was selected because it combines long life with constant detuning. The maintenance work involved is extremely little.

Connecting rod

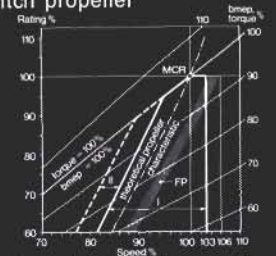
The drop-forged connecting rod assembly consists of a master rod and slave rod hinged to the connecting rod head by means of a slave pin. Master and slave rod can be removed from the connecting rod big end — for instance, during piston removal — without disturbing the connecting rod bearing. The connecting bolts of the connecting rod shaft and the bearing cap bolts are hydraulically slackened and tightened by means of the same device so that the bolts can be preloaded within narrow limits without any great effort. The two thin-walled journal bearing shells as well as the main bearings are lead-bronze lined and feature a thin, electrically applied protective coating. The same applies to the single-part connecting rod journal. Bores in the connecting rod shaft lead the oil through non-return valves to the piston bearings and piston cooling spaces.

Piston

Each piston is of composite construction. It consists of an aluminium body of good running characteristics and a steel head of high heat and wear resistance. The two parts are held

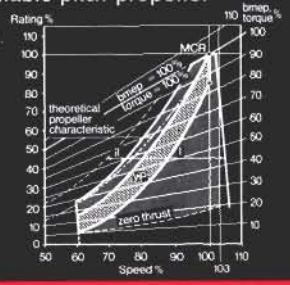
Marine Propulsion Engines with fixed-pitch propeller

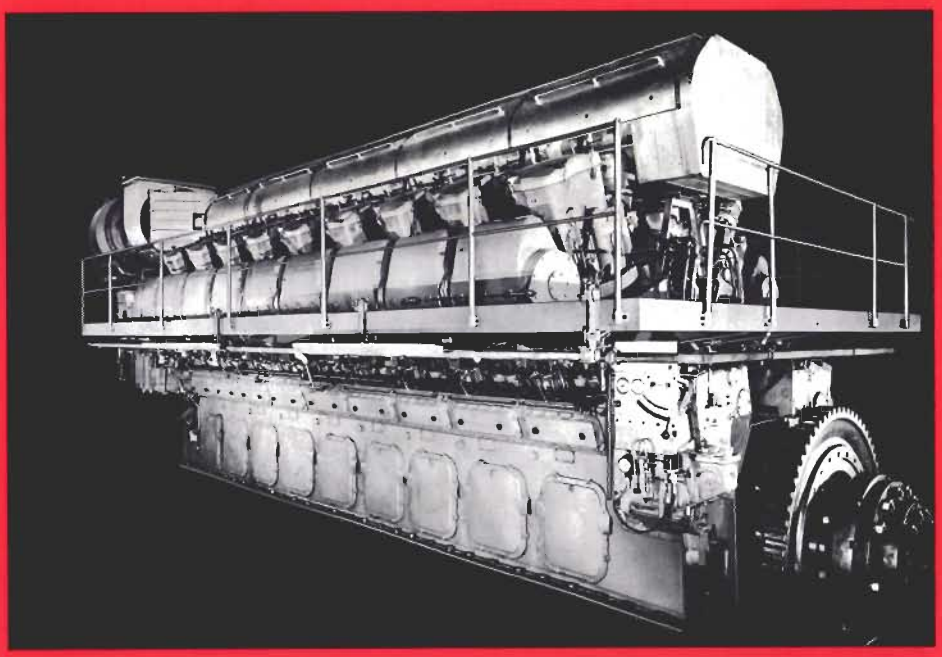
Fig. 1



Marine Propulsion Engines with controllable-pitch propeller

Fig. 2





together by waisted bolts. Each piston has 4 compression rings to seal against the gas forces and 1 oil scraper ring. The piston is cooled by lubricating oil. The piston pin is of the fully floating type and axially located and sealed off by aluminium discs.

Distribution

The two camshafts are underslung in the cylinder blocks and driven off the crankshaft by a gear train. The cams operate the fuel injection pumps and, through pushrods and rocker arms, the inlet and exhaust valves in the cylinder heads. The two-piece cams for operating the fuel injection pumps are adjustable. In the case of reversible marine engines, the cams are duplicated. For reversal, the camshafts are shifted axially by hydropneumatic action.

Valves

Each inlet and exhaust valve has two springs. The valve cones are turned by special rotators every time they lift. The head of the exhaust valve is rotated by small vanes fitted to the lower part of the stem and driven by the exhaust gases expelled from the cylinder, making for very clean heads in heavy fuel oil operation. The inlet valves are fitted with rotocaps. The valve stems are sealed by means of ring packs designed to prevent blow-by and to ensure accurately metered stem lubrication. The exhaust valve cages are cooled down to the region of the valve head, a technique which decisively prolongs the latter's service life.

Fuel system

An independent fuel transfer pump draws the fuel from the day tanks, forcing it via a combination of an automatic full-flow filter and a standby filter in bypass to the injection pumps. Each cylinder features an M.A.N.-type injection pump with helical-edge control. The point at which injection commences can be altered by adjusting the fuel cam. The fuel needle valve incorporated in the cylinder head is cooled by water. The engine is suitable for burning heavy fuel oil, even in pier-to-pier operation.

Lubricating system

All lubricating points are connected to the force-feed lubrication circuit. The lubricating oil is supplied by means of an independently driven pump which is detached from the engine. The lubricating oil is cleaned in an automatic microfilter with a mesh width of approx. 30µm. To increase reliability an indicator filter has been arranged downstream of the microfilter and protects the engine bearings should the microfilter be damaged. It indicates that the performance of the main filter is no longer adequate. The oil dripping off collects in the bedplate sump. Thanks to separate spray nozzles, an adequate supply of lubricating oil to the piston is ensured even at low engine speed. All the bearing points of the timing gear, such as valve drive on the cylinder head, camshaft with rollers and gear train, are connected to the lubricating oil circuit. The oil pressure in the circuit is maintained by a valve.

Cooling system

Cylinder liners, cylinder heads and exhaust valve cages are freshwater-cooled. The requisite cooling water pumps and heat exchangers are separate from the engine. The injection nozzles have their own cooling water circuit.

Starting system

The engine is started on compressed air of 10-30 bar. Each starting air valve is pneumatically opened by means of a separate cam-controlled pilot valve and closed by spring force. By selective actuation of the master starting valves most of the pressure built up in the cylinder by compression can be made to escape. The braking action thus afforded can be used to brake ships during sudden manoeuvres.

Control

The quantity of fuel supplied by the fuel injection pump to the injectors is controlled as a function of the engine load or speed required. A shut-down plunger is fitted to each fuel pump so that the engine can be automatically stopped in an emergency — such as overspeeding or upon low lubricating oil pressure — independent of the fuel admission control linkage.

Operation

All controls are mounted in a separate console detached from the engine. All manoeuvres, such as starting, reversing, fuel control and stopping, can be carried out from here. Emergency operation equipment is fitted directly to the engine. For bridge control or control from a central control station, and fully automatic control with unmanned machinery spaces, monitoring, alarm, and safety systems can be connected. The V52/55 A engine is also suitable for stand-by duties.

Exhaust-gas turbocharging

The engine is turbocharged to the constant-pressure system. This makes for straightforward and sturdy exhaust ducting, which can be efficiently lagged and makes for easy access to the maintenance-intensive parts of the engine. The uniform admission to the turbine inherent in the constant-pressure system improves charge

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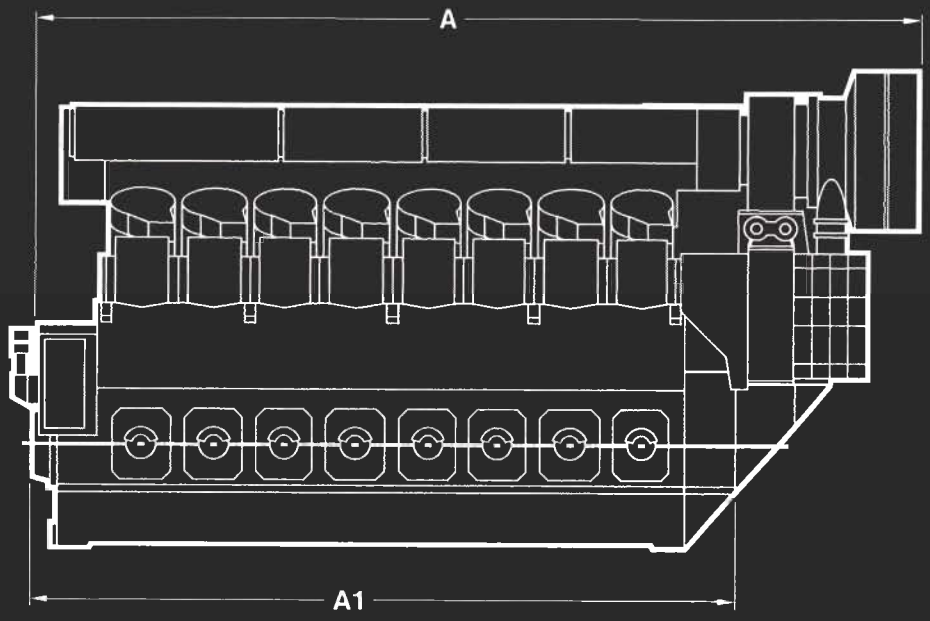
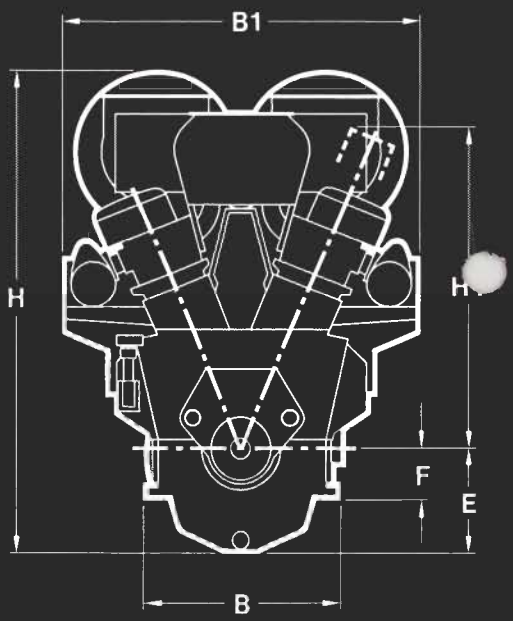
renewal and consequently the fuel consumption rate. All the cylinders of an engine operate under the same conditions so that engines with different numbers of cylinders have the same specific performance values. The charge air is cooled in an engine-mounted finned tube cooler through which water is passed. In stationary plants it is also possible to provide a separately mounted air-cooled charge-air cooler. Lubricating oil is fed to the plain bearings of the turbo-charger from the engine lubrication system.





Engine	No. of cyls.	A mm	A_1 mm	B mm	B_1 mm	H mm	E mm	F mm	H_1 mm	Appr. w. t
10 V 52/55 A	10	7450	5440	2100	4000	5200	1140	550	3600	121
12 V 52/55 A	12	8250	6240	2100	4000	5200	1140	550	3600	139
14 V 52/55 A	14	9050	7040	2100	4000	5200	1140	550	3600	164
16 V 52/55 A	16	9900	7840	2100	4000	5300	1140	550	3600	181
18 V 52/55 A	18	10700	8640	2100	4000	5300	1140	550	3600	200

H_1 = Height required for removing cylinder liner and piston

General

For further information please contact our representatives abroad, our technical branch offices in Germany or the Augsburg Works of M.A.N. All information given in this pamphlet corresponds to engine design at the of going to print and is subject to change without notice.