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SERVICE MANUAL

MARINE DIESEL ENGINE

4JHE,4JH-TE
4JH-HTE,4JH-DTE

YANMAR

SERVICE MANUAL

MARINE DIESEL ENGINE

MODELS

4JHE
4JH-TE
4JH-HTE
4JH-DTE

FOREWORD

This service manual has been compiled for engineers engaged in sales, service, inspection and maintenance. Accordingly, descriptions of the construction and functions of the engine are emphasized in this manual while items which should already be common knowledge are omitted.
One characteristic of a marine diesel engine is that its performance in a vessel is governed by its applicability to the vessel's hull construction and its steering system.
Engine installation, fitting out and propeller selection have a substantial effect on the performance of the engine and the vessel. Moreover, when the engine runs unevenly or when trouble occurs, it is essential to check a wide range of operating conditions—such as installation on the hull and suitability of the ship's piping and propeller—and not just the engine itself. To get maximum performance from this engine, you should completely understand its functions, construction and capabilities, as well as proper use and servicing.
Use this manual as a handy reference in daily inspection and maintenance, and as a text for engineering guidance.

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Models 4JH(B)E • 4JH-T(B)E
4JH-HT(B)E • 4JH-DT(B)E

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CHAPTER 1

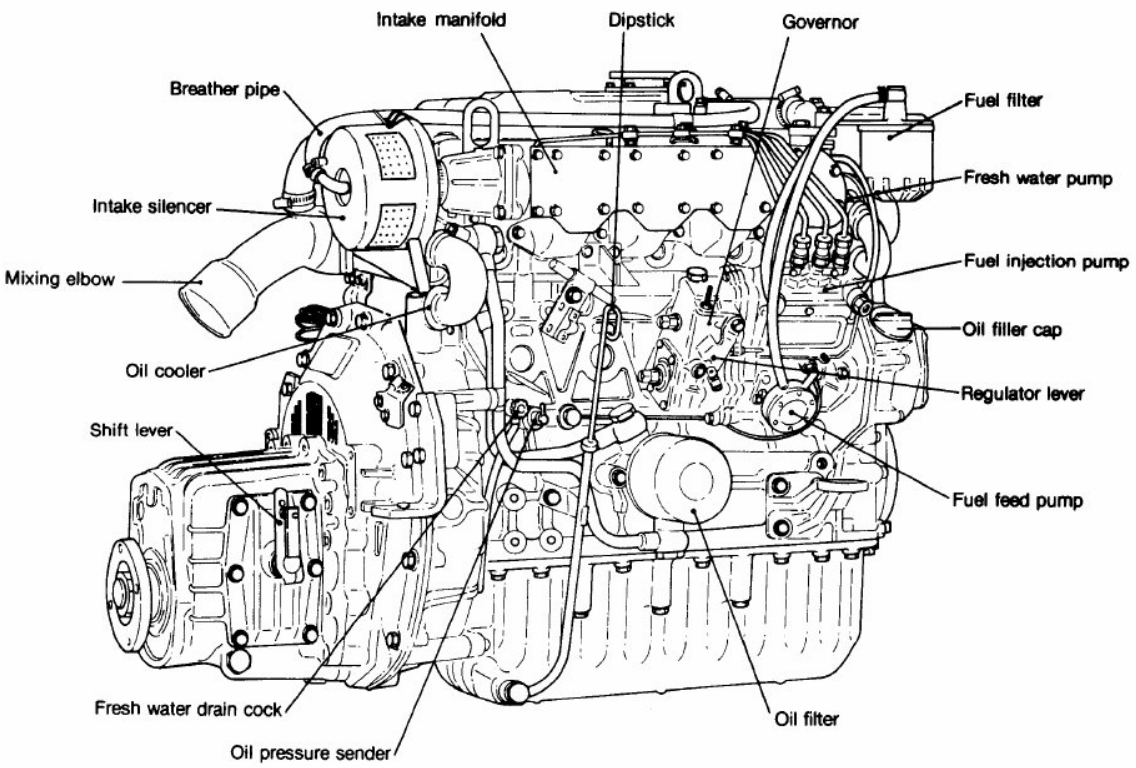
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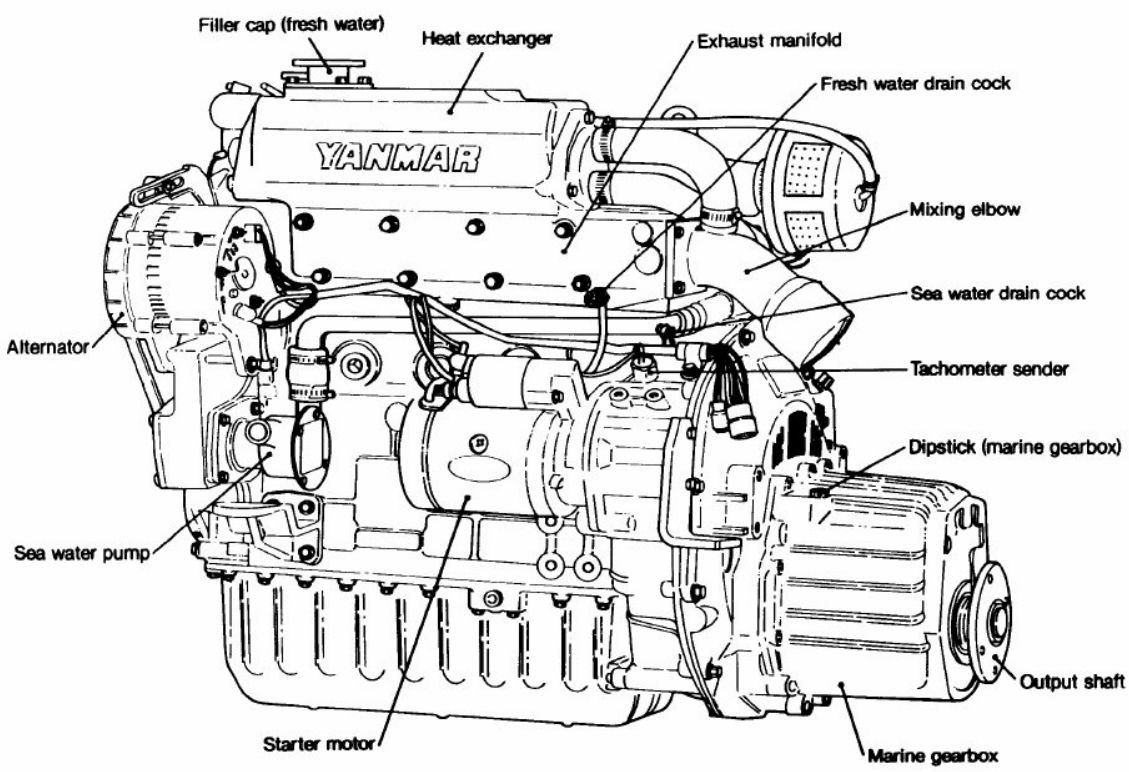
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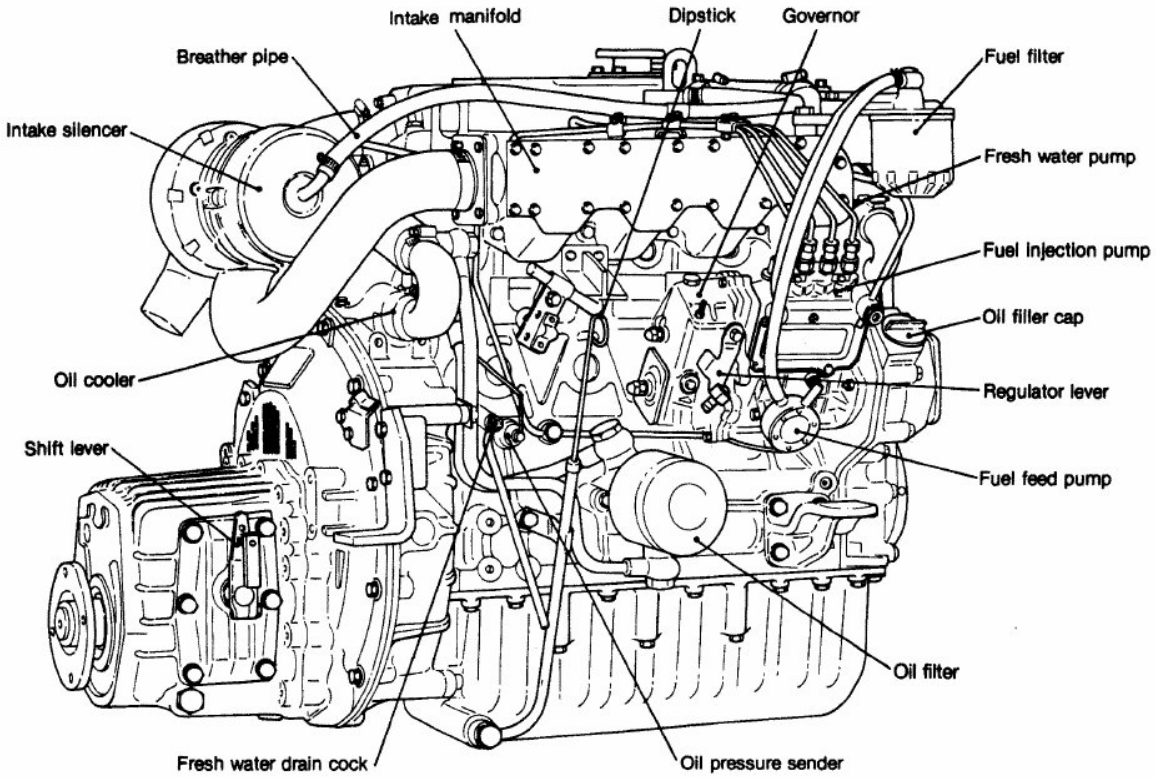
1-1 4JHE

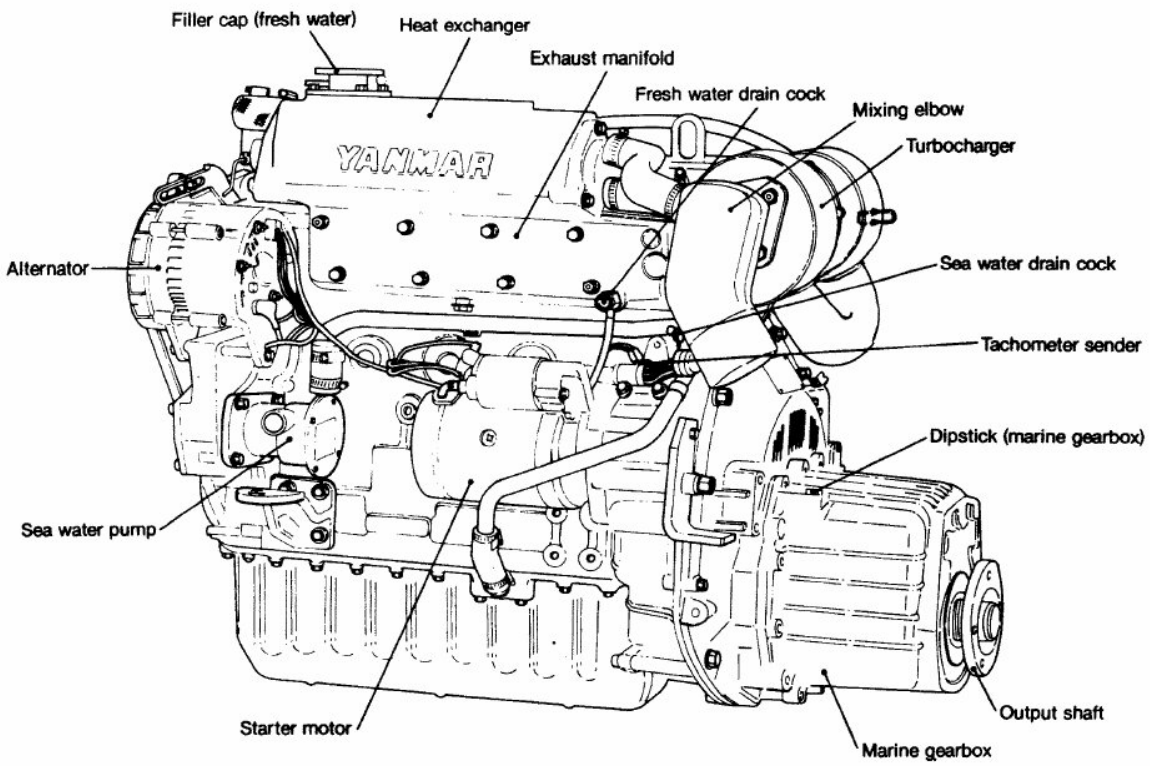




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1-2 4JH-TE

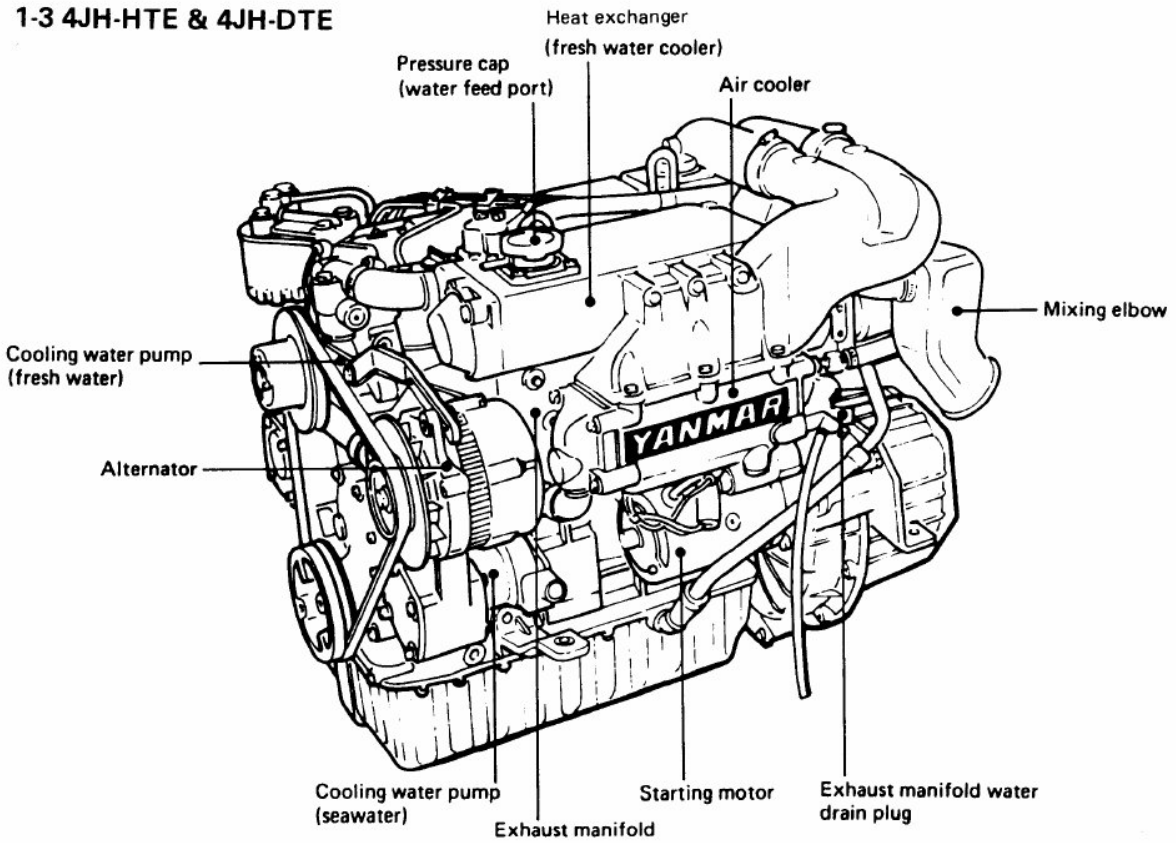


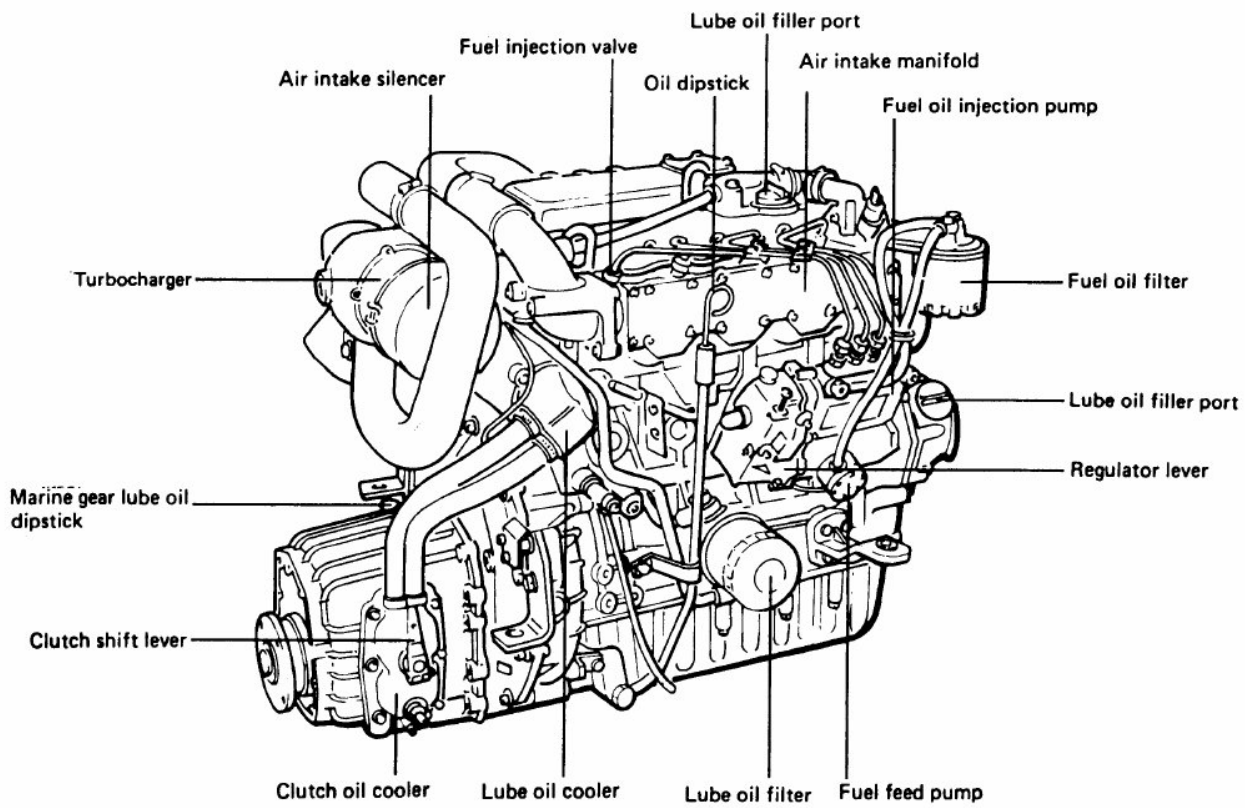


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1-3 4JH-HTE & 4JH-DTE





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2. Specifications

Model			4JHE	4JH-TE	4JH-HTE	4JH-DTE
Type			Vertical 4-cycle water cooled diesel engine			
Combustion system			Direct injection			
Aspiration			Normal aspiration	Exhaust gas turbine turbocharger	Exhaust gas turbine turbocharger with intercooler	
Number of cylinders			4			
Bore x stroke		mm (in.)	78 x 86 (3.07 x 3.39)			
Displacement		ℓ (cu.in.)	1.644 (100.33)			
One hour rating output (DIN6270B)	Output/crankshaft speed	HP/rpm (kW/rpm)	44/3600 (32.4/3600)	55/3600 (40.5/3600)	66/3600 (48.6/3600)	77/3600 (56.7/3600)
	Brake mean effective pressure	Kg/cm² (lb./in.²)	6.69 (95.15)	8.36 (118.91)	10.0 (142.20)	11.7 (166.37)
	Piston speed	m/sec. (ft./sec.)	10.3 (33.79)	10.3 (33.79)	10.3 (33.79)	10.3 (33.79)
Continuous rating output (DIN6270A)	Output/crankshaft speed	HP/rpm (kW/rpm)	40/3500 (29.5/3500)	50/3500 (36.8/3500)	60/3500 (44.2/3500)	70/3500 (51.5/3500)
	Brake mean effective pressure	kg/cm² (lb./in.²)	6.26 (89.04)	7.82 (111.23)	9.39 (133.53)	11.0 (156.42)
	Piston speed	m/sec. (ft./sec)	10.0 (32.81)	10.0 (32.81)	10.0 (32.81)	10.0 (32.81)
Compression ratio			17.8	16.2	15.9	15.9
Fire order			1 — 3 — 4 — 2 — 1 (180° each)			
Fuel injection pump			Bosch in-line type YPES-CL			
Fuel injection timing (FID)		degree	12° ±1° (*9° ±1°) bTDC	12° ±1° bTDC	12° ±1° bTDC	12° ±1° bTDC
Fuel injection pressure		kg/cm² (lb./in.²)	200 ±5 (2844 ±71)			
Fuel injection nozzles			Hole type			
Direction of rotation	Crankshaft		Counter-clockwise viewed from starn			
	Propeller shaft (Forward)		Clockwise viewed from starn			
Power take off			At flywheel side			
Cooling system			Constant high temperature fresh water cooling Fresh water: Centrifugal pump Sea water: Rubber impeller pump			
Lubrication system			Forced lubrication with trochoid pump			
Starting system	Starting motor		DC 12V, 1.8kW			
	AC generator		12V, 55A			
Turbocharger	Type			RHB52 (IHI)	RHB52HW (IHI)	
	Model			MY29	MY31	MY34
	Cooling system			Air cooling	Water cooling	
Air cooler system	Type				Sea-water cooled, Plate fin type	Sea-water cooled, Corrugated fin type
	Radiation area	m² (in.²)			0.76 (1178)	0.67 (1038)
Clutch	Model		KBW20		KBW21	KBW21
	Type		Constant mesh gear with multiple friction disc clutch			
	Reduction ratio (Forward/Reverse)		2.17/3.06, 2.62/3.06, 3.28/3.06			2.17/3.06, 2.62/3.06
	Propeller speed DIN6270A rating (Forward/Reverse)		1615/1145, 1336/1145, 1068/1145			1615/1145, 1336/1145
	Lubricating oil capacity Effect/max	ℓ (cu.in.)	0.15/1.2 (9.15/73.22)			
	Clutch weight	kg (lb.)	26 (57.33)		30 (66.15)	30 (66.15)
Dimensions	Overall length	mm (in.)	906.3 (35.68)		906.3 (35.68)	906.3 (35.68)
	Overall width	mm (in)	561 (22.09)		561 (22.09)	561 (22.09)
	Overall height	mm (in.)	659 (25.94)		668 (26.30)	668 (26.30)
Engine weight with clutch (dry)		kg (lb.)	226 (498)	232 (511)	246 (542)	246 (542)
Lubricating oil capacity Effect/max.		ℓ (cu.in.)	3.0/6.5 (183.06/396.63)			
Cooling water capacity (Fresh water)	Fresh water tank	ℓ (cu.in.)	6.0 (366.12)			
	Sub tank	ℓ (cu.in.)	0.8 (48.82)			

Note: *Applicable engine number #/E 00101 ~ 00574

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3. Construction

ENGINE MODEL		4JH	4JH-TE	4JH-HTE	4JH-DTE
Group	Part	Construction			
Engine Proper	Cylinder block	Integrally-cast water jacket and crankcase			
	Cylinder liner	Dry sleeve			
	Timing gear case	Cast aluminum			
	Oil sump	Cast aluminum, oil pan			
	Main bearings	Hanger-type bearings supports			
	Engine feet	Cylinder block and Flywheel mounting side			
Intake/Exhaust, Valve Drive	Cylinder head	Integrally-cast type, jet cooling between valves, Intake/exhaust valve seat inserts			
	Intake/exhaust valves	Mushroom shaped, seat angle: Intake: 120° Exhaust: 90°			
	Intake manifold	Aluminum diecast integral			
	Exhaust manifold	Water cooled integral with water tank			
	Air cooler			Plate fin type	Corrugated fin type
	Turbocharger	–	IHI RHB52 exhaust gas turbo	IHI RHB52HW exhaust gas turbo, Water cooled type.	
	Valve drive	Overhead valve push rod rocker arm system			
	Timing gear	Helical gear			
Main Moving Parts	Crankshaft	Stamped forging			
	Flywheel	Cast iron static balance with ring gear			
	Pistons	Cast aluminum, oval type			
	Piston rings	2 compression rings, 1 oil ring			
	Piston pin	Floating type			
	Connecting rod	Forged steel			
	Crank pin bushings	Aluminum bushings			
Lube Oil System	Lube oil pump	Trochoid type			
	Oil filter	Full flow paper element cartridge type			
	Oil cooler	Sea water cooled pipe type		Sea water cooled multi-pipe type	
	Control valve	Cylindrical type with external adjusting shims			
Cooling Water System	Fresh water pump	V-pulley driven, centrifugal type			
	Sea water pump	Gear driven, rubber impeller type			
	Thermostat	Wax pellet type			
	Fresh water cooler	Multi-tube type integral with exhaust manifold			
Bilge	Bilge pump	Electric			
Fuel Injection Equipment	Fuel injection pump	YANMAR YPES-CL type integral with governor			
	Fuel injection nozzles	Hole type			
	Fuel feed pump	Diaphragm type			
	Fuel filter	Paper element cartridge type			
Governor	Governor	Centrifugal all-speed mechanical type			
Remote Control Equipment	Engine speed & marine gearbox	Single control lever type with push-pull cable			
Starting Equipment	Electric starter	DC 12V, 1.8kW starter motor			
	Generator	12V, 55A with built-in IC regulator			
Marine Gearbox	Clutch	Multi-disc mechanical wet type			
	Reduction gear	Helical gear constant mesh type			

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