YANMAR

0000A0A1029-9006

SERVICE MANUAL

MARINE DIESEL ENGINE

4JH2 Series

4JH2E
4JH2-TE
4JH2-HTE
4JH2-DTE

2000.3.10

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

4JH2E
4JH2-TE
4JH2-HTE
4JH2-DTE

Ref. 4JH/4JH2E PARTS DEFERING

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CHAPTER 1

GENERAL

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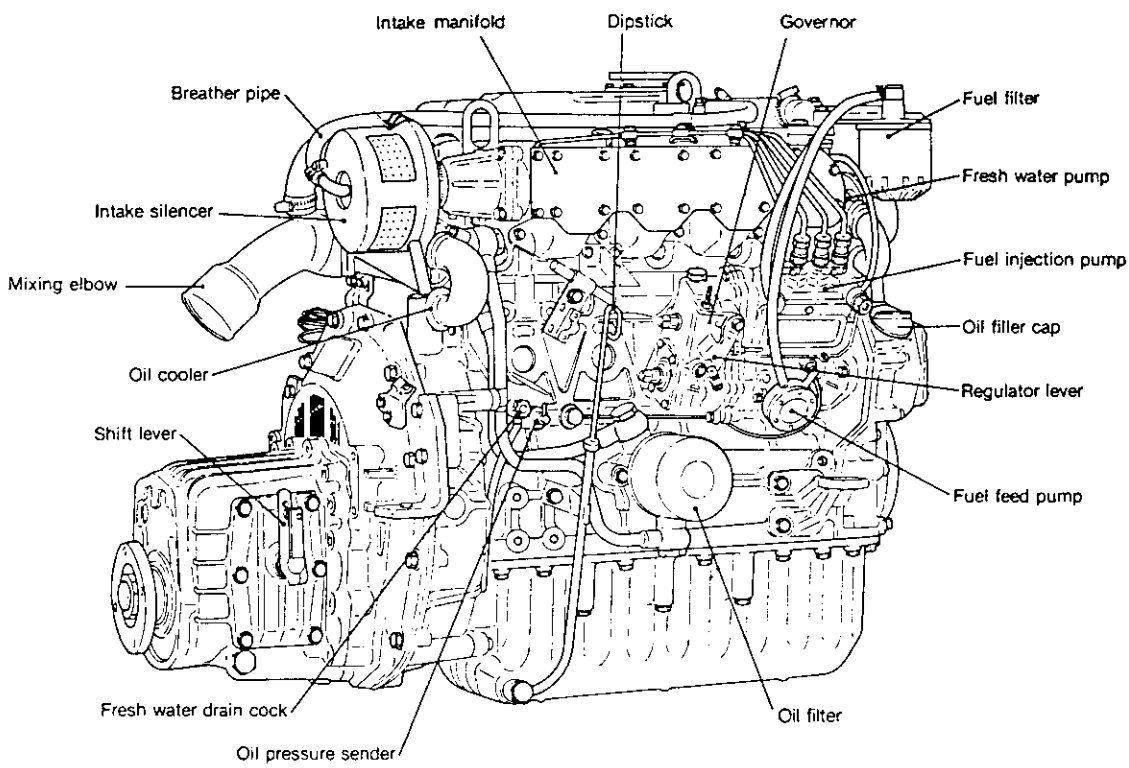
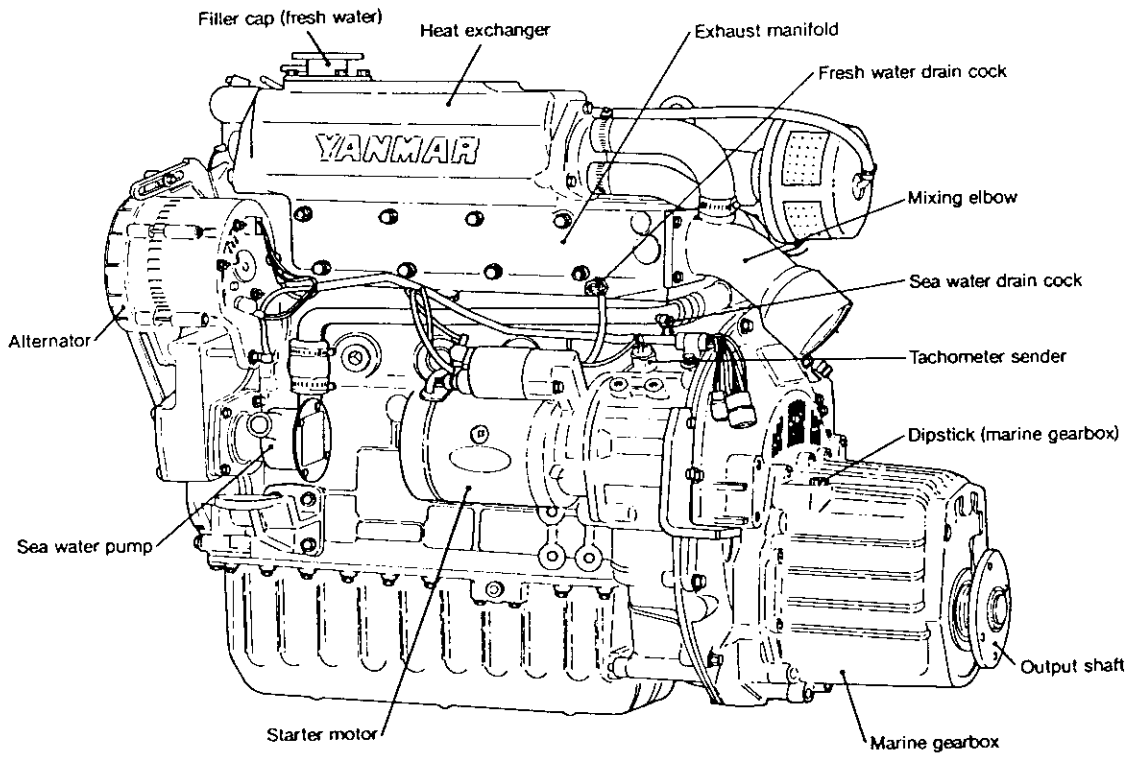
1. Exterior Views

1-1 4JH2E





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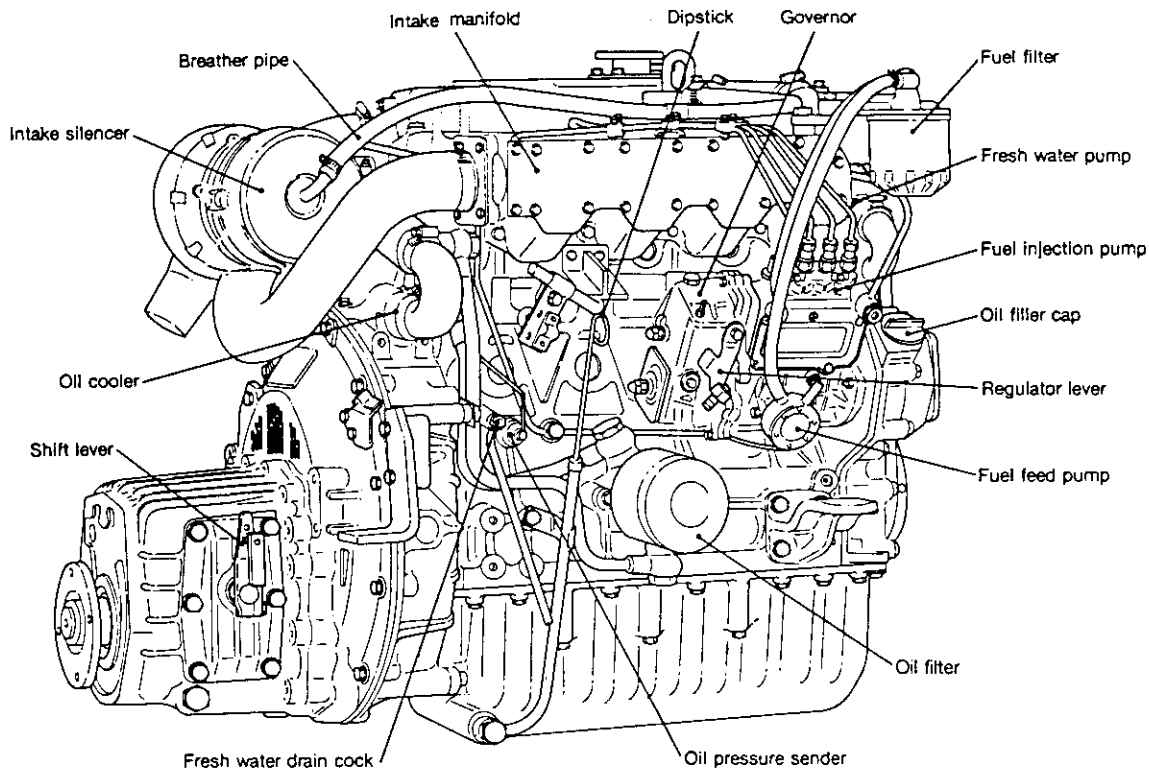
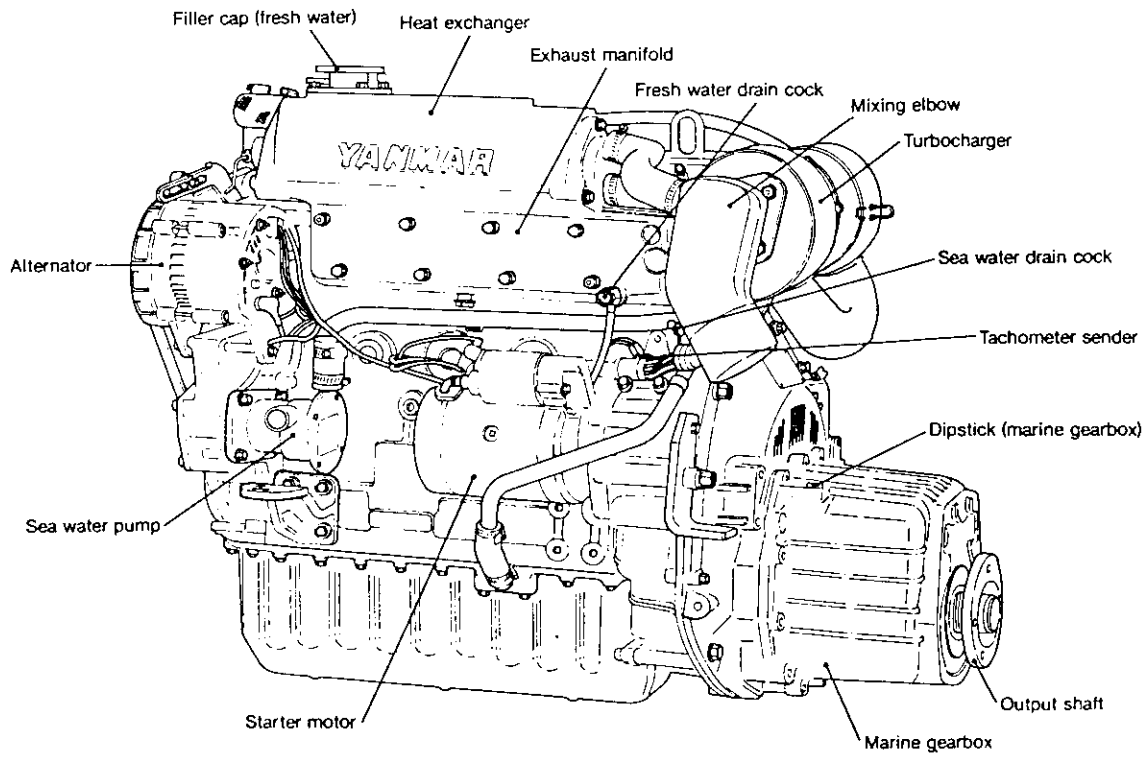
1-2 4JH2-TE





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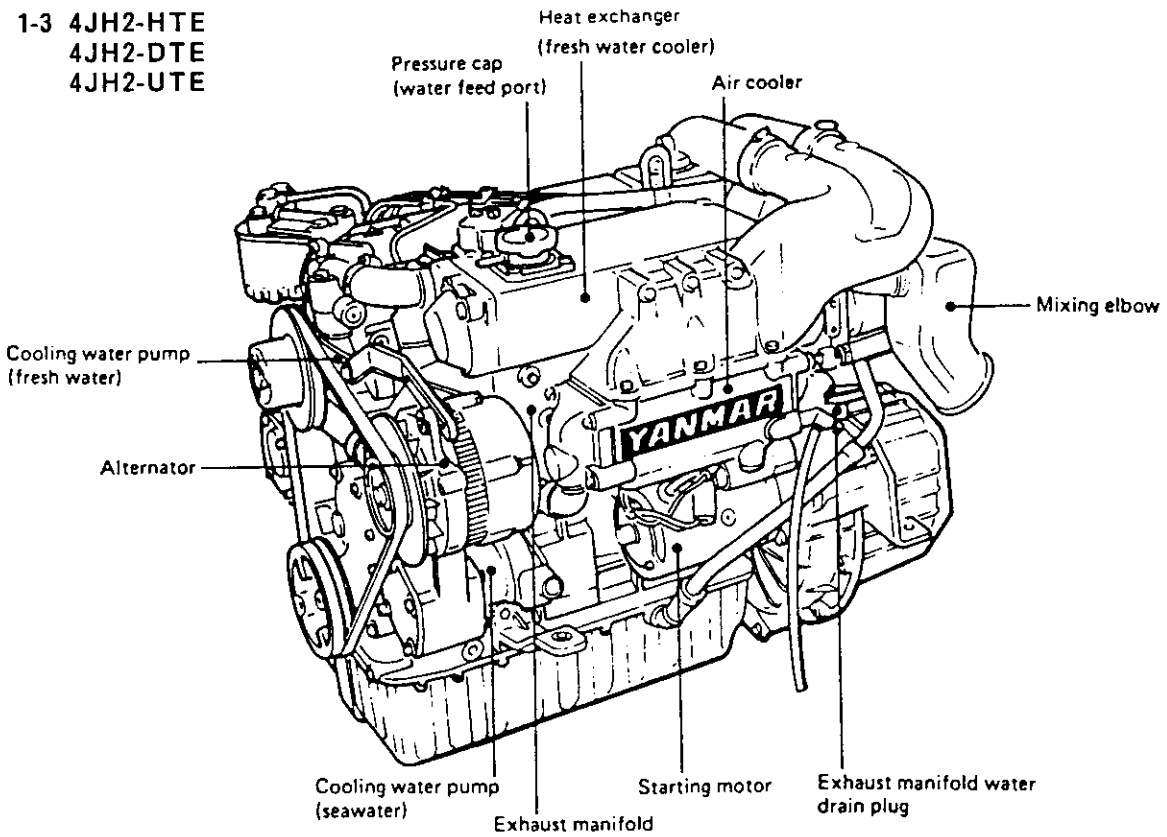
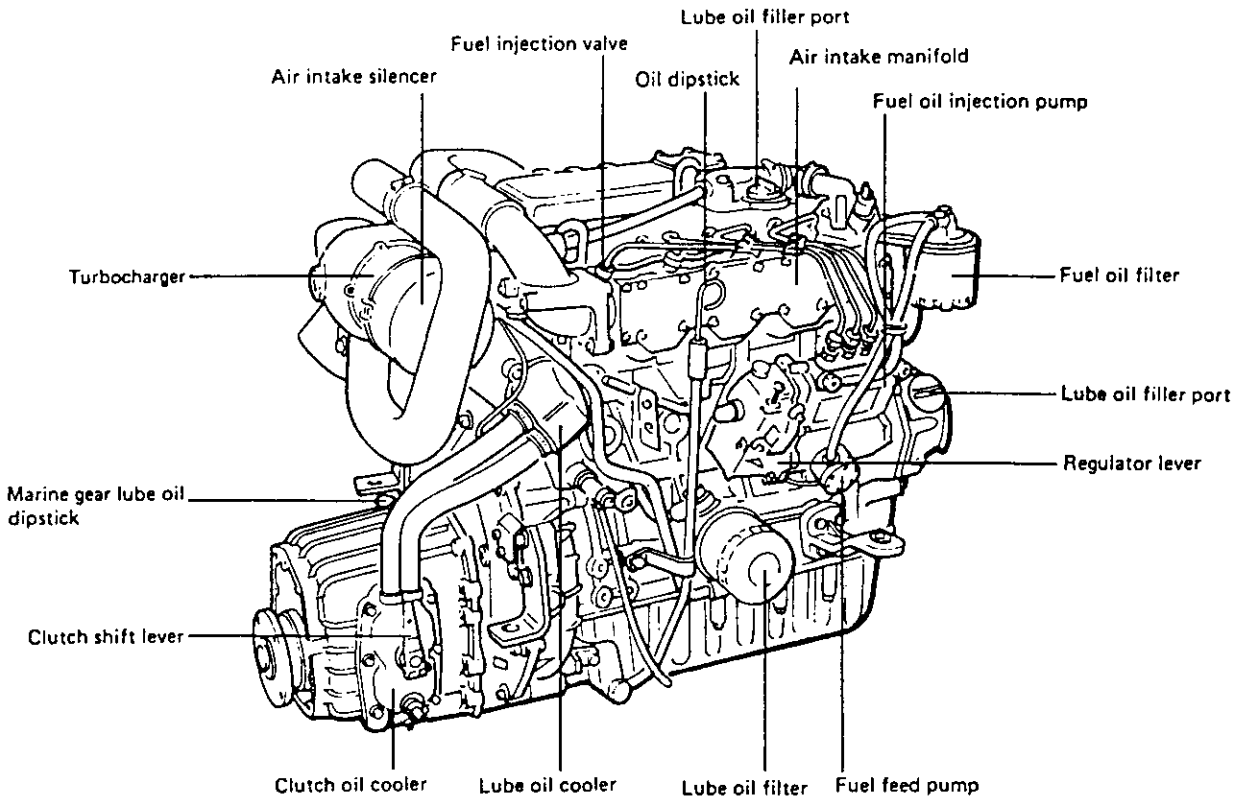
1-3 4JH2-HTE
4JH2-DTE
4JH2-UTE





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2. Specifications

2-1. Engine

Model			4JH2E	4JH2-TE	4JH2-HTE	4JH2-DTE	4JH2-UTE
Type			Vertical 4-cycle water cooled deisel engine				
Combustion system			Direct injection				
Aspiration			Normal aspiration	Exhaust gas turbocharger	Turbocharger with intercooler		
Number of cylinders			4				
Bore × stroke		mm(in.)	82×80 (3.23×3.39)				
Displacement		ℓ (cu.in.)	1.817 (110.87)				
One hour rating output (DIN6270B) flywheel output	Output/crankshaft speed	HP/rpm (kW/rpm)	50/36000 (36.8/3600)	62/36000 (45.6/3600)	75/36000 (55.2/3600)	88/36000 (64.7/3600)	100/36000 (73.5/3600)
	Breke mean effective Pressure	kg / cm² (lb./in.²)	6.88(97.8)	8.53(121.3)	10.32(146.7)	12.11(172.2)	13.8(196.3)
	Piston speed	m/sec.(ft./sec.)	10.3(33.79)	10.3(33.79)	10.3(33.79)	10.3(33.79)	10.3(33.79)
Continuous raing output (DIN6270A) flywheel output	Output/crankshaft speed	HP/rpm (kW/rpm)	46/3400 (33.8/3400)	57/3400 (41.9/3400)	69/3400 (50.7/3400)	80/3400 (58.8/3400)	91/3400 (66.9/3400)
	Breke mean effective Pressure	kg / cm² (lb./in.²)	6.70(95.2)	8.30(118.0)	10.05(142.9)	11.65(165.7)	13.3(189.2)
	Piston speed	m/sec.(ft./sec.)	9.75(32.0)	9.75(32.0)	9.75(32.0)	9.75(32.0)	9.75(32.0)
Compression ratio						17.2	17.2
Fire order			1 — 180°C — 3 — 180°C — 4 — 180°C — 2 — 180°C — 1				
Fuel injection pump			In-line type YPES-4CL				NP-VE4
Fuel injection timing (b.T.D.C)		degree	b.T.D.C 12°C±1	b.T.D.C 17°C±1	b.T.D.C 17°C±1	b.T.D.C 17°C±1	b.T.D.C 17°C±1
Fuel injection pressure		kg / cm²(lb./in.²)	200±5 (2844±71)				
Fuel injection nozzle			Hole type				
Direction of rotation	(Crankshaft)		Counter-clockwise viewed from stern				
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, 1.4kW				
	AC generator		12V, 55A (12V, 80A:option)				
Turbocharger	Type		–	RHB52	RHB52HW(IHI)		
	Model		–	MY67	MY60	MY34	
	Cooling system		–	Air Cooling	Water Cooling		
Air cooler system	Type		–		Sea-water cooled Plate fin type	Sea-water cooled, Corrugated fin type	
	Radiaton area	m²(in.²)	–		0.76 (1178)	0.67 (1038)	
	Overall length	mm(in.)	869.5	888.4 (34.98)			
	Overall width	mm(in.)	561	565 (22.24)			
	Overall height	mm(in.)		643.5 (25.33)			
Engine weight without marine gear(dry)		kg(lb.)	200 (440.9)	206 (454.2)	216 (476.2)	216 (476.2)	244 (538)
Lubricating capacity Effect/max.		ℓ (cu.in.)	2.5/7.0 (155.55/427.14) at engine installation angle 0°				
Cooling water capacity (Fresh water)	Fresh water tank	ℓ (cu.in.)	6.0 (366.12)				
	Sub tank	ℓ (cu.in.)	0.8 (48.82)				

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2-2. Marine Gear

	Model		KBW20	KBW21	KM3P2	KM4A
Marine gear system	Type		Multiple friction disc clutch (Parallel drive)		One clutch (Parallel drive)	One clutch (Angle drive)
	Reduction ratio (Forward/Reverse)		2.17/ 2.62/ 3.28/ 3.06, 3.06, 3.06	2.17/ 2.62/ 3.06, 3.06	2.36/ 2.61	1.47/ 2.14/ 2.63/ 3.30/ 1.47/,2.14, 2.63, 3.30
	Reduction of rotation (Forward)		Clockwise			Bi-rotation
	Lubrication oil capacity Effect/max.	ℓ(cu.in.)	0.15/1.2	0.15/1.2	0.05/0.35	0.2/1.3
	Lubricating oil		Dexron, ATF		SAE 20/30. Same as Engine oil	
	Weight	kg(lb.)	26	30	15.5	28

2-3. Applicability of Marine gear & Redection ratio

●:standard combination
○:optional combination
×:inapplicable

Marine Gear / Engine Model			4JH2E	4JH2-TE	4JH2-HTE	4JH2-DTE	4JH2-UTE
Model	Reduction ratio	I.D Mark					
KM3P2	2.36	S	●	×	×	×	×
	2.61	G	●	×	×	×	×
KBW20	2.17	S	●	●	×	×	×
	2.62	G	●	●	×	×	×
	3.28	GG	●	●	×	×	×
KBW21	2.17	S	○	○	●	●	●
	2.62	G	○	○	●	●	●
	3.28	GG	○	○	×	×	×
KM4A	1.47	SS	●	●	●	●	●
	2.14	S	●	●	●	●	●
	2.63	G	●	●	●	●	●
	3.30	GG	●	●	●	●	●

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3. Construction

ENGINE MODEL		4JH2E	4JH2-TE	4JH2-HTE	4JH2-DTE	4JH2-UTE
Group	Part	Construction				
Engine Proper	Culinder 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 bearing supports				
	Engine feet	Cylinder block and Flywheel mounting side				
Intake/Exhaust, Valve Drive	Cylinder head	Integrally-case 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	
	Tarbocharger	–	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-4CL				NP-VE4
	Fuel injection nozzles	Hole type				
	Fuel feed pump	Diaphragm type				Vane 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, 1.4kW starter motor				
	Generator	12V, 55A with built-in IC regulator				
Marine Gearbox	Clutch	Multiple friction disc clutch/cone clutch				
	Reduction gear	Helical gear constant mesh type				

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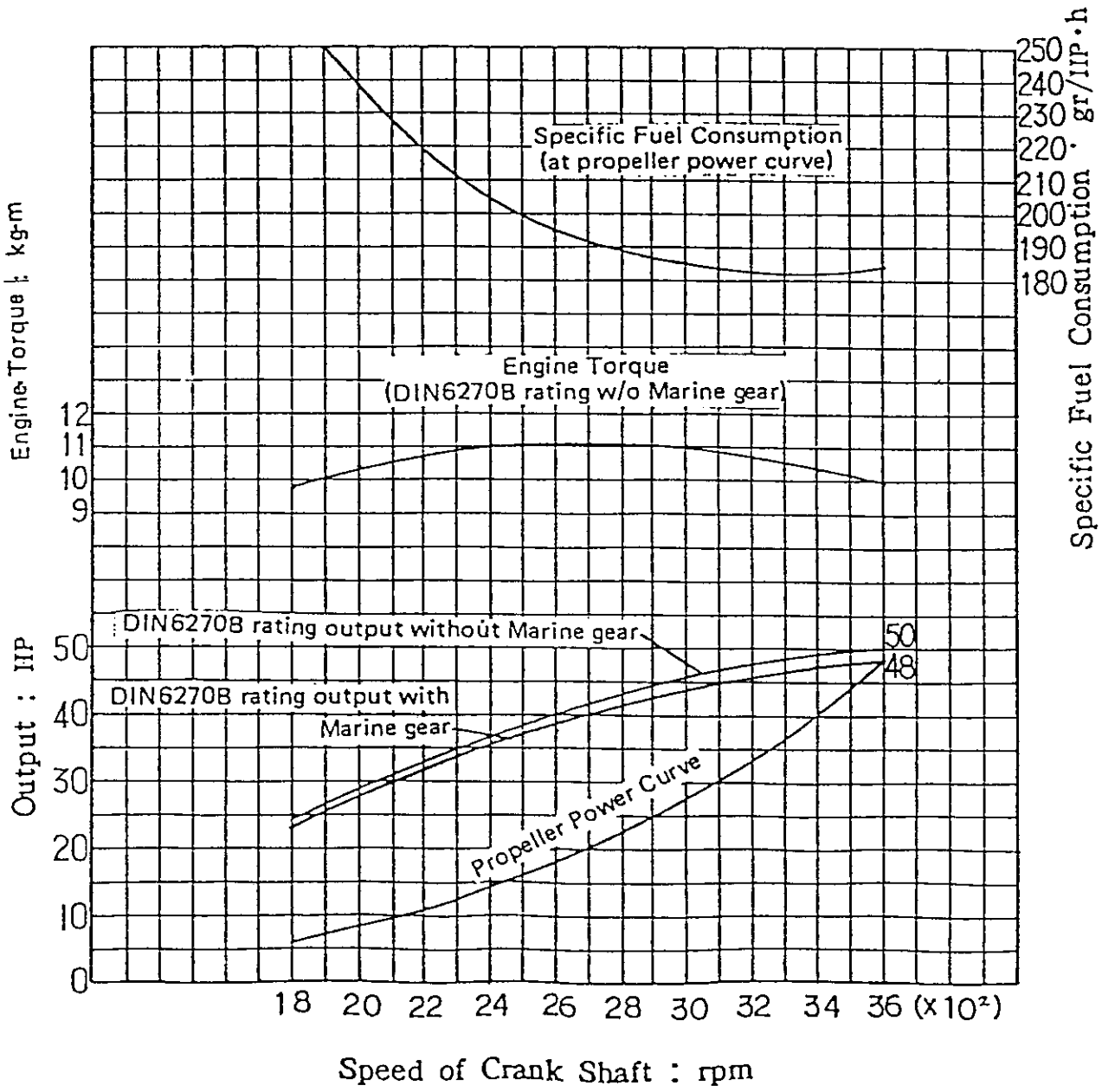
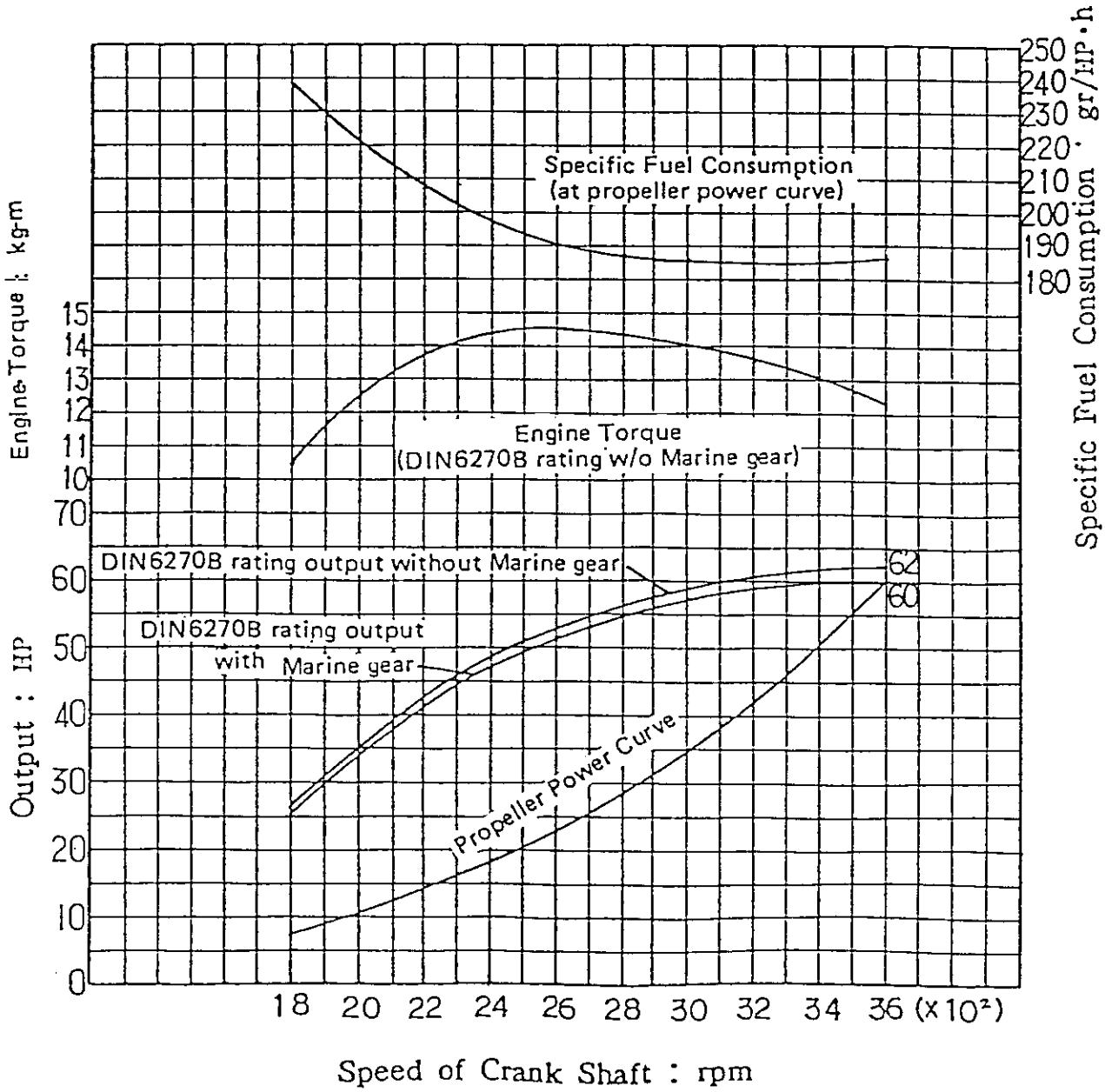
4-1. 4JH2E


Specific Fuel Consumption
(at propeller power curve)
Engine Torque
(DIN6270B rating w/o Marine gear)
DIN6270B rating output without Marine gear
DIN6270B rating output with
Marine gear
Propeller Power Curve
Engine Torque : kg-m
Output : IIP
Specific Fuel Consumption : gr/IIP·h
Speed of Crank Shaft : rpm
12
11
10
9
50
40
30
20
10
0
250
240
230
220
210
200
190
180
50
48
18 20 22 24 26 28 30 32 34 36 (x10²)

4-2. 4JH2-TE



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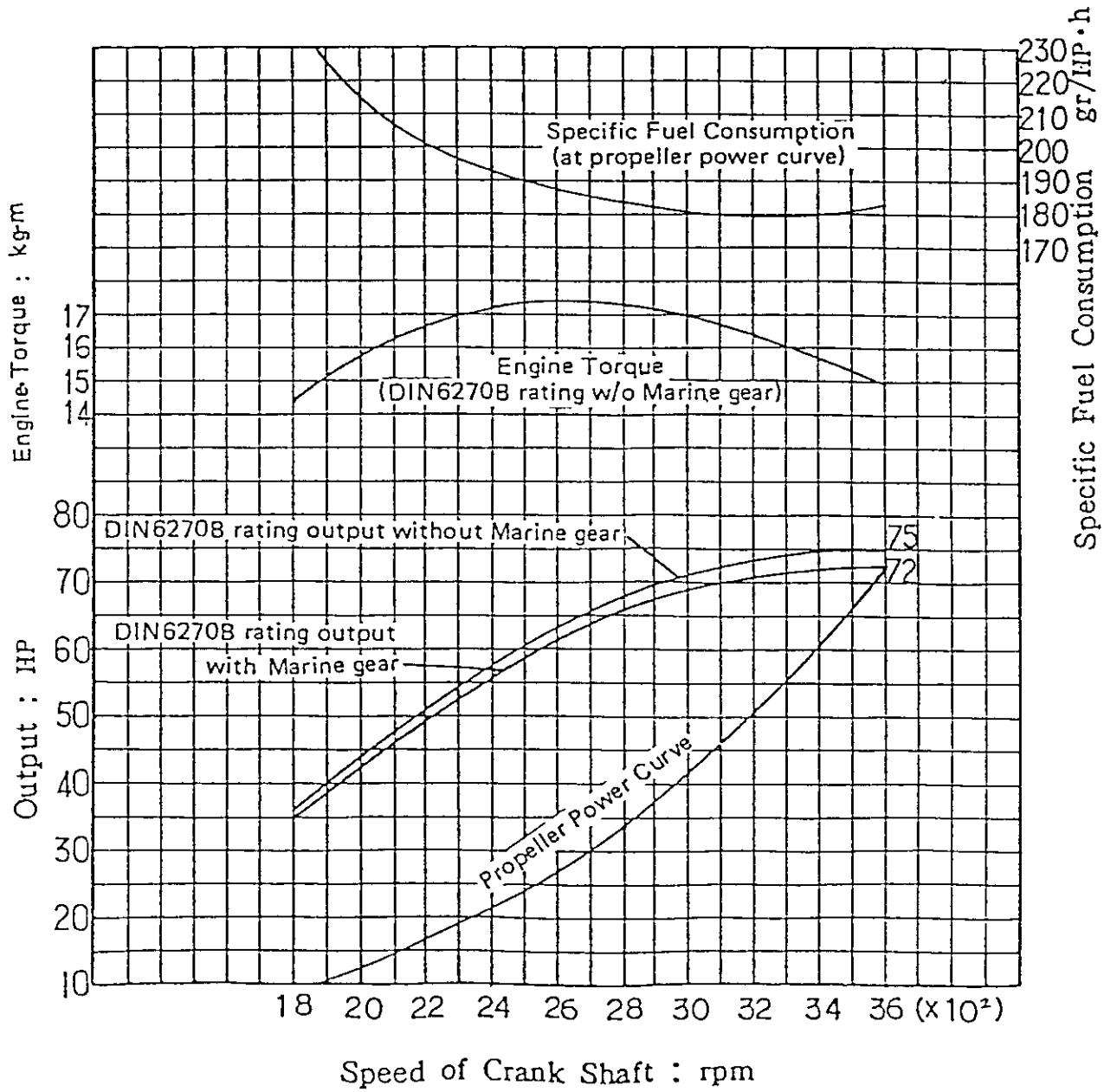
4-3. 4JH2-HTE



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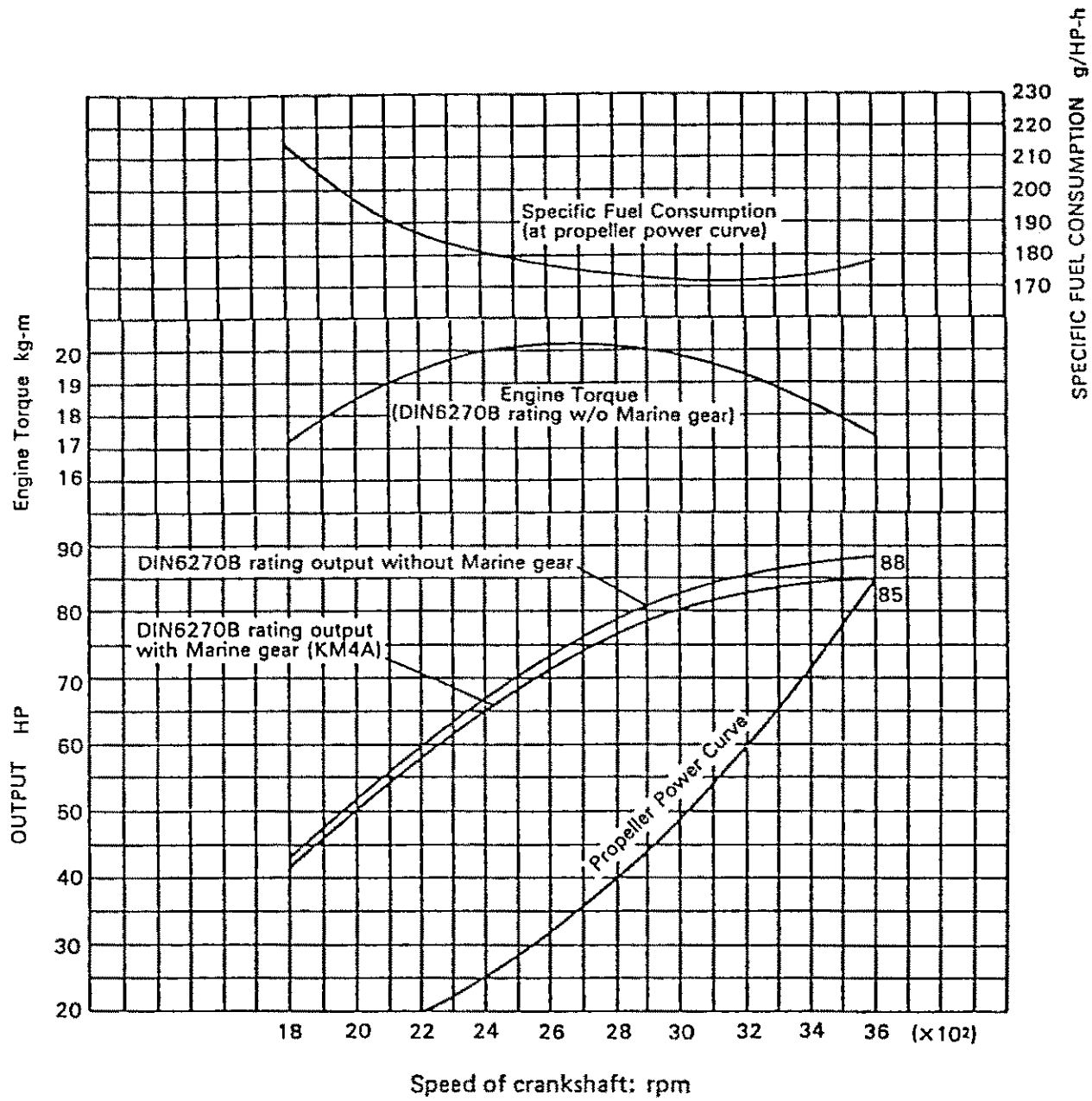
4-4. 4JH2-DT (B) E



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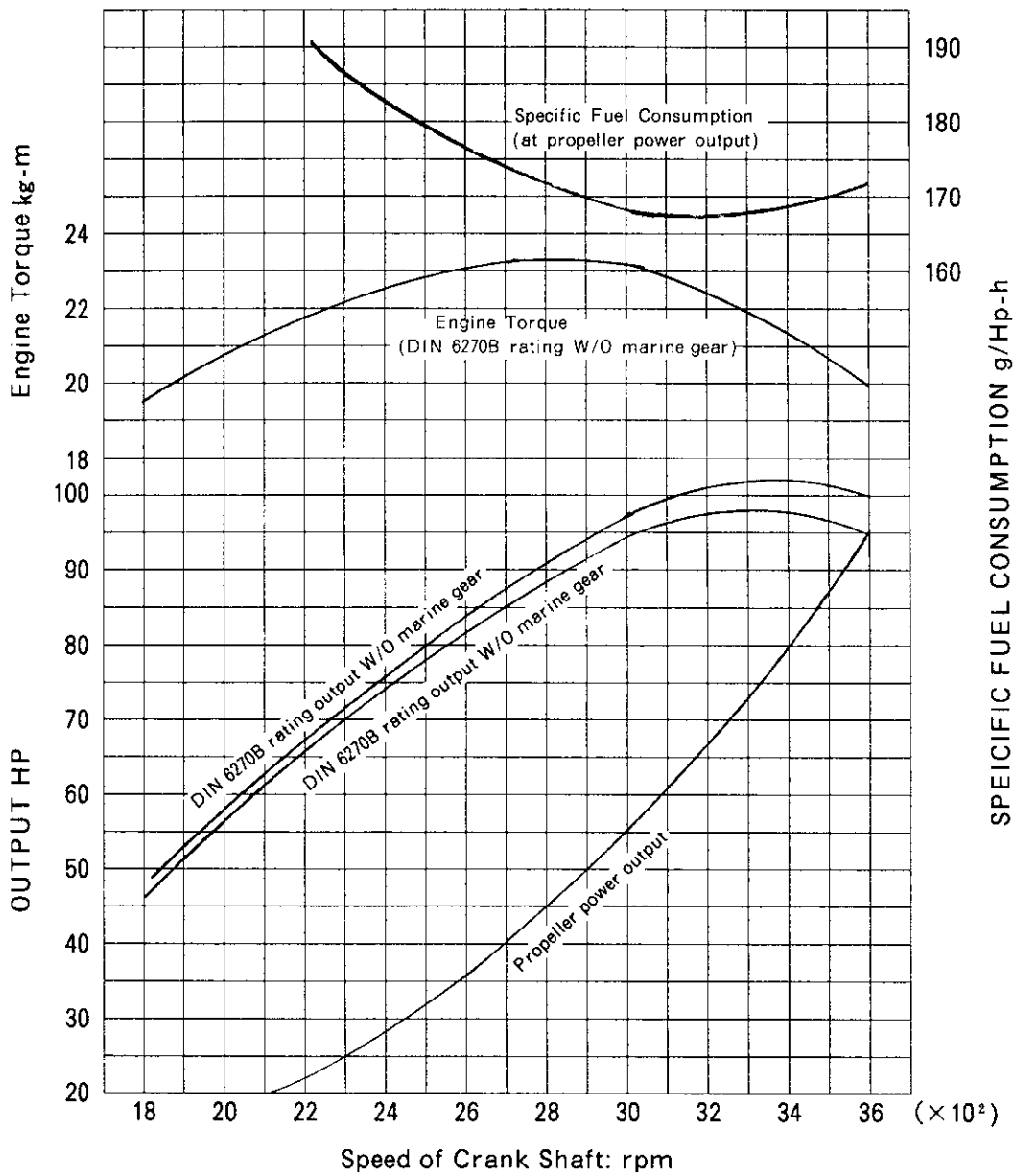
3-13.4JH2-UTE



NOTE

Output, torque and specific fuel consumption are measured at the propeller shaft (The engine flywheel output is approx. 3% higher)

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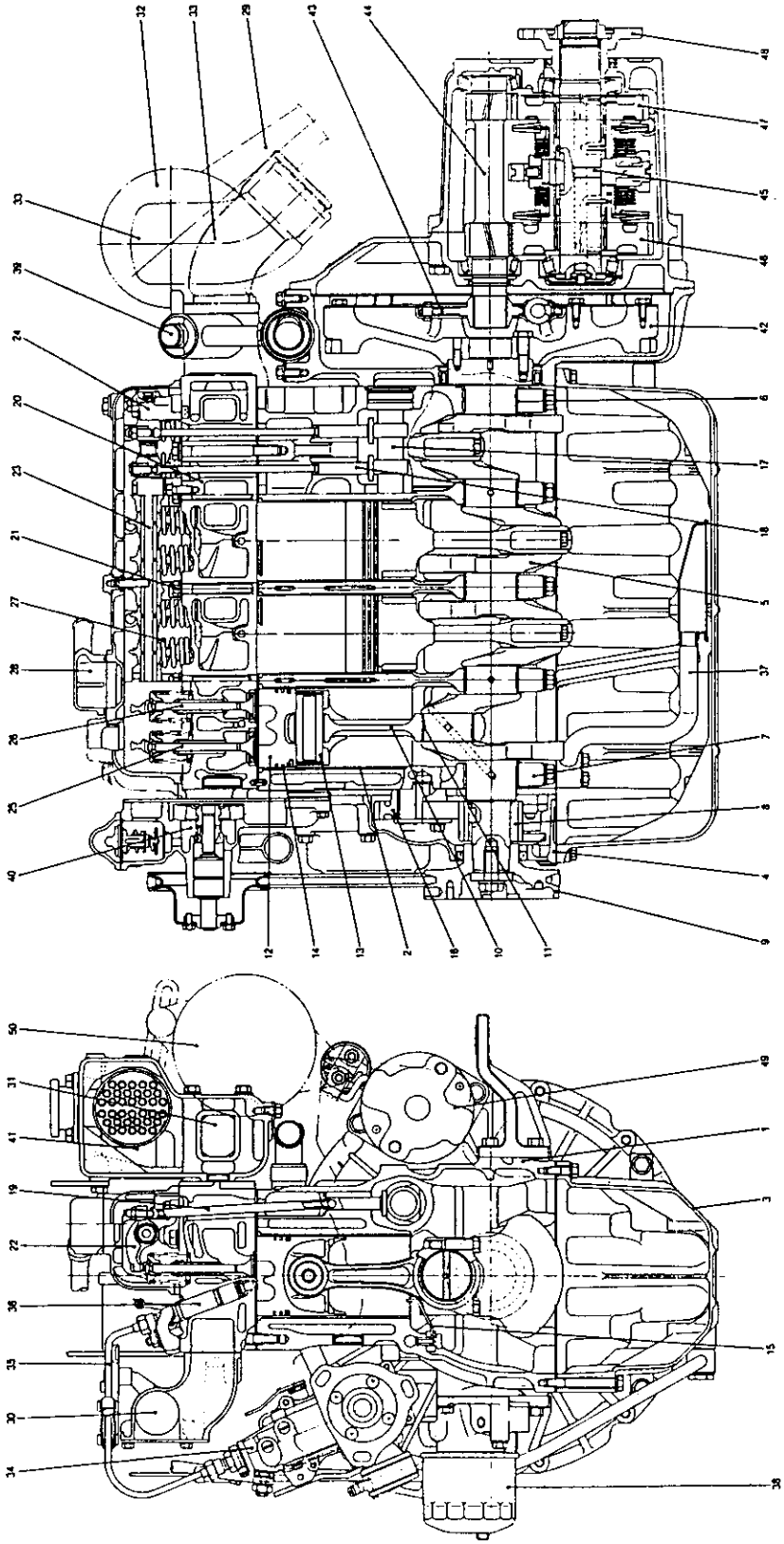
5. Engine Cross Section



1. Cylinder block
2. Cylinder liner
3. Oil pan
4. Timing gear case
5. Crankshaft
6. Main bearing bushing
7. Main bearing cap
8. Crank gear
9. Crankshaft V-pulley
10. Connecting rod
11. Crank pin bushing
12. Piston
13. Piston pin
14. Piston ring
15. Piston cooling nozzle
16. Idle gear
17. Camshaft
18. Tappet
19. Push rod
20. Cylinder head
21. Cylinder head bolt
22. Valve rocker arm
23. Valve rocker arm shaft
24. Valve rocker arm shaft support
25. Intake valve
26. Exhaust valve
27. Valve spring
28. Breather
29. Intake silencer
30. Intake manifold
31. Exhaust manifold
32. Turbocharger
33. Mixing elbow
34. Fuel injection pump
35. Fuel pressure pipe
36. Fuel injection nozzle
37. Lubricating oil inlet pipe
38. Lubricating oil filter
39. Lubricating oil cooler
40. Cooling water pump
41. Heat exchanger
42. Flywheel
43. Damper disc
44. Input shaft
45. Output shaft
46. Forward gear
47. Reverse gear
48. Output shaft coupling
49. Starting motor
50. Alternator

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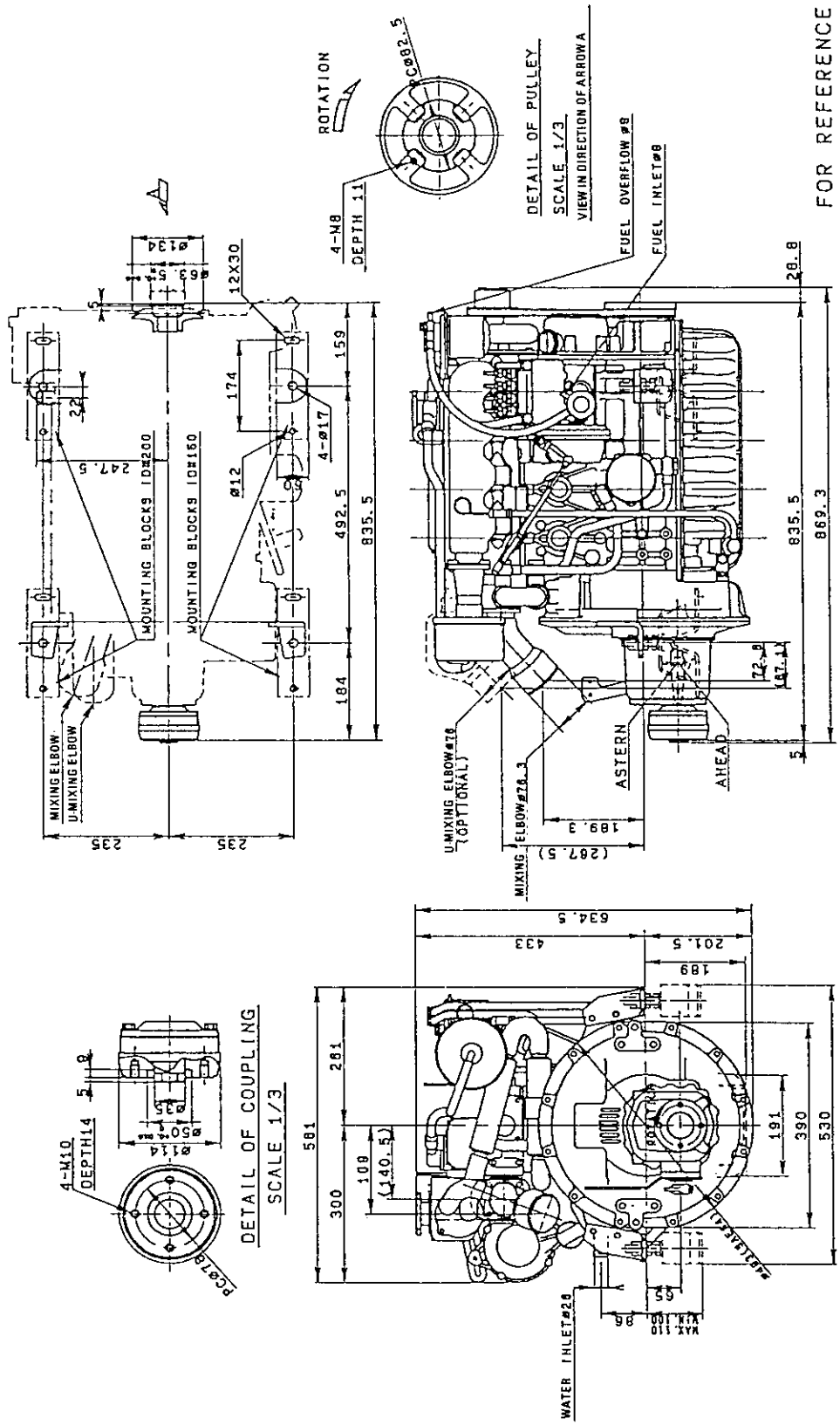
4JH2E x KM3P2 Unit: mm (in.)



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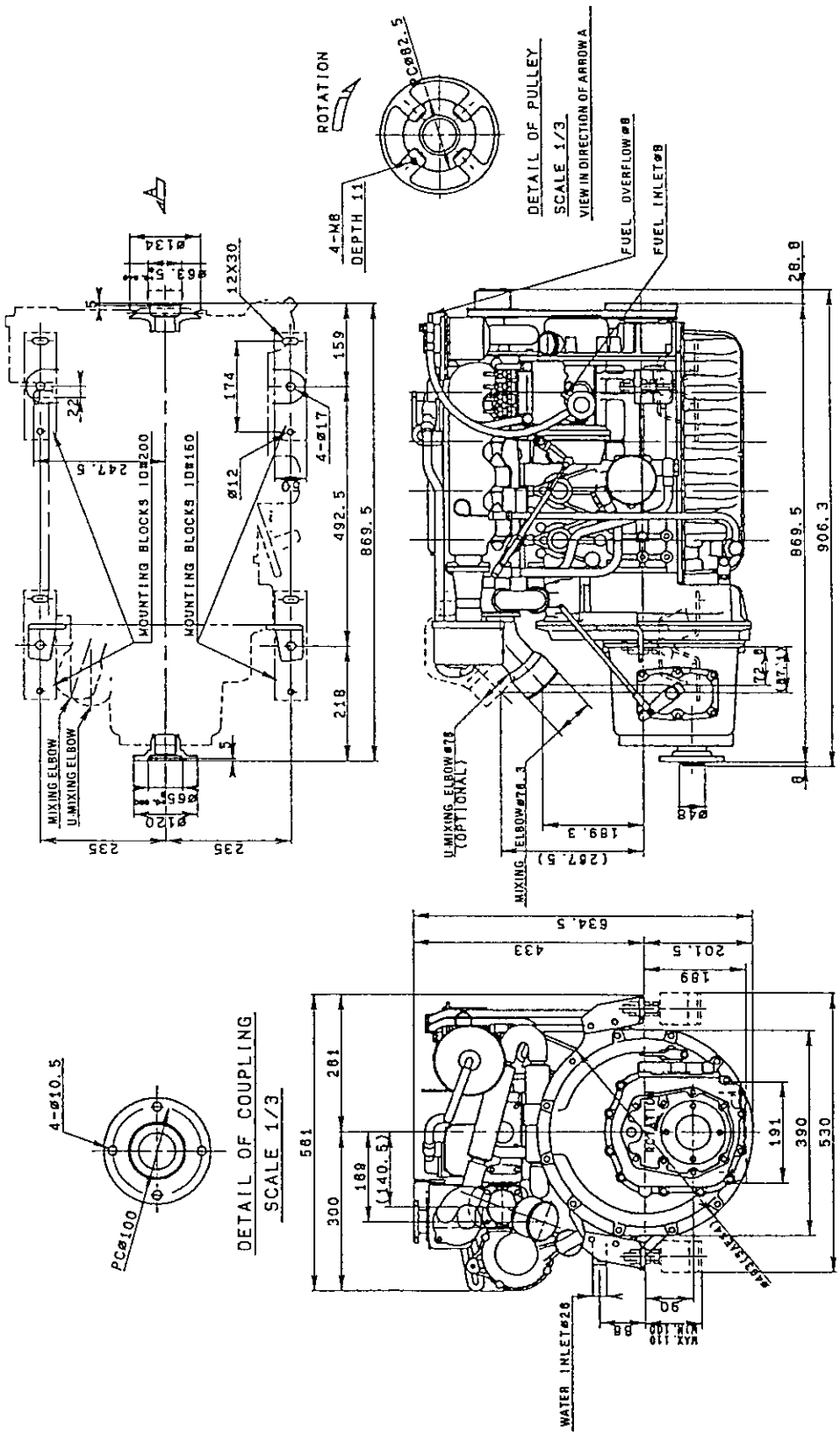
4JH2E x KBW20 Unit: mm (in.)



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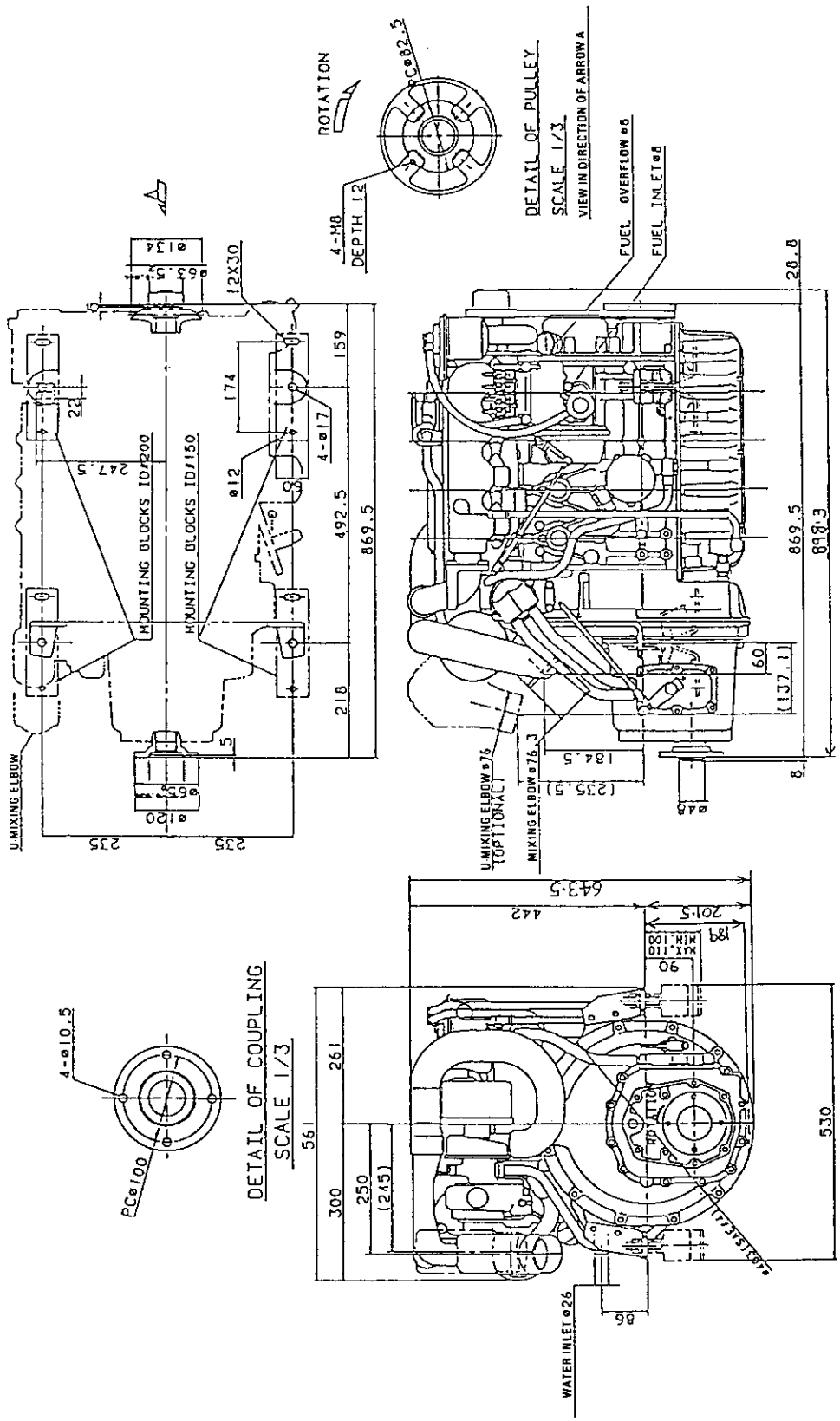
4JH2-HTE x KBW21 Unit: mm (in.)



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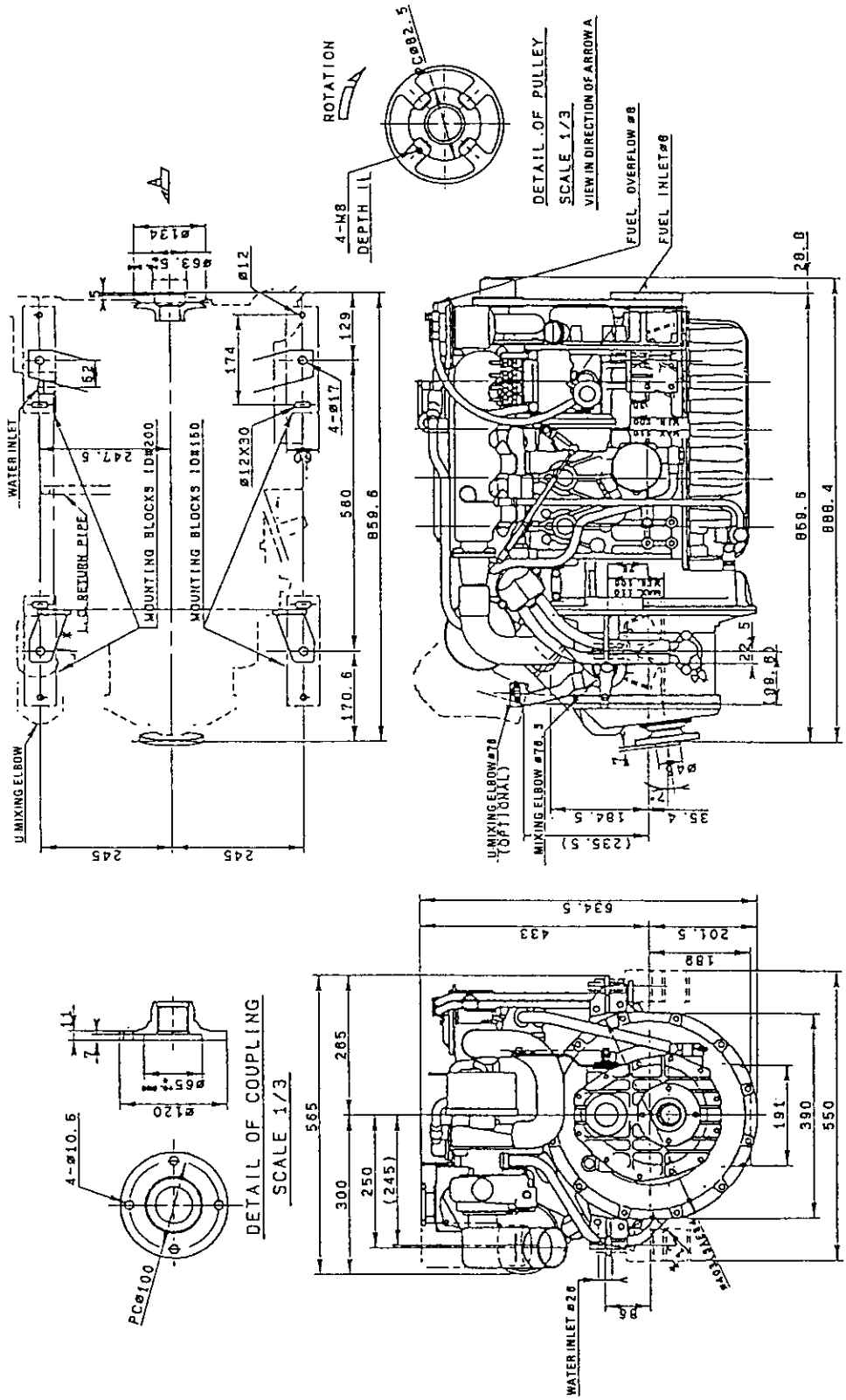
4JH2-TE x KM4A Unit: mm (in.)



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