YANMAR

0000A0A1015-9112

SERVICE MANUAL

MARINE DIESEL ENGINE

3JH2 Series

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 condi tions—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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CHAPTER 1

GENERAL

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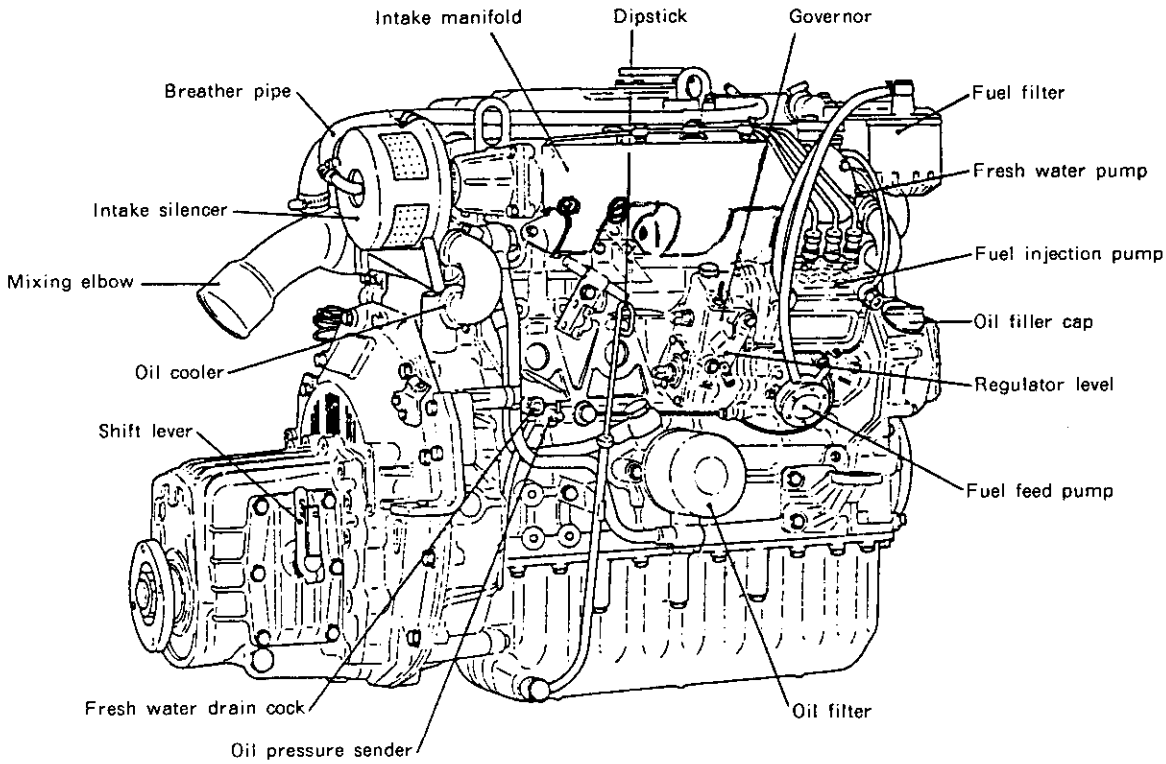
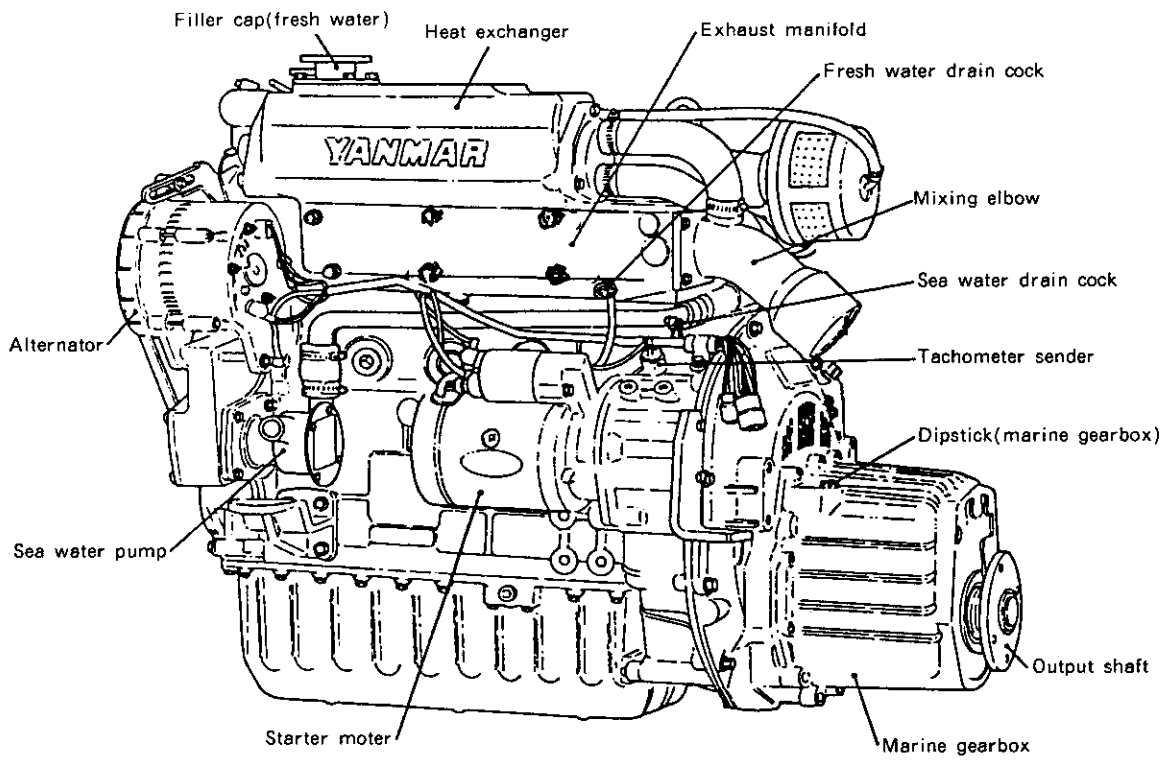
1. Exterior Views

1-1. 3JH2E





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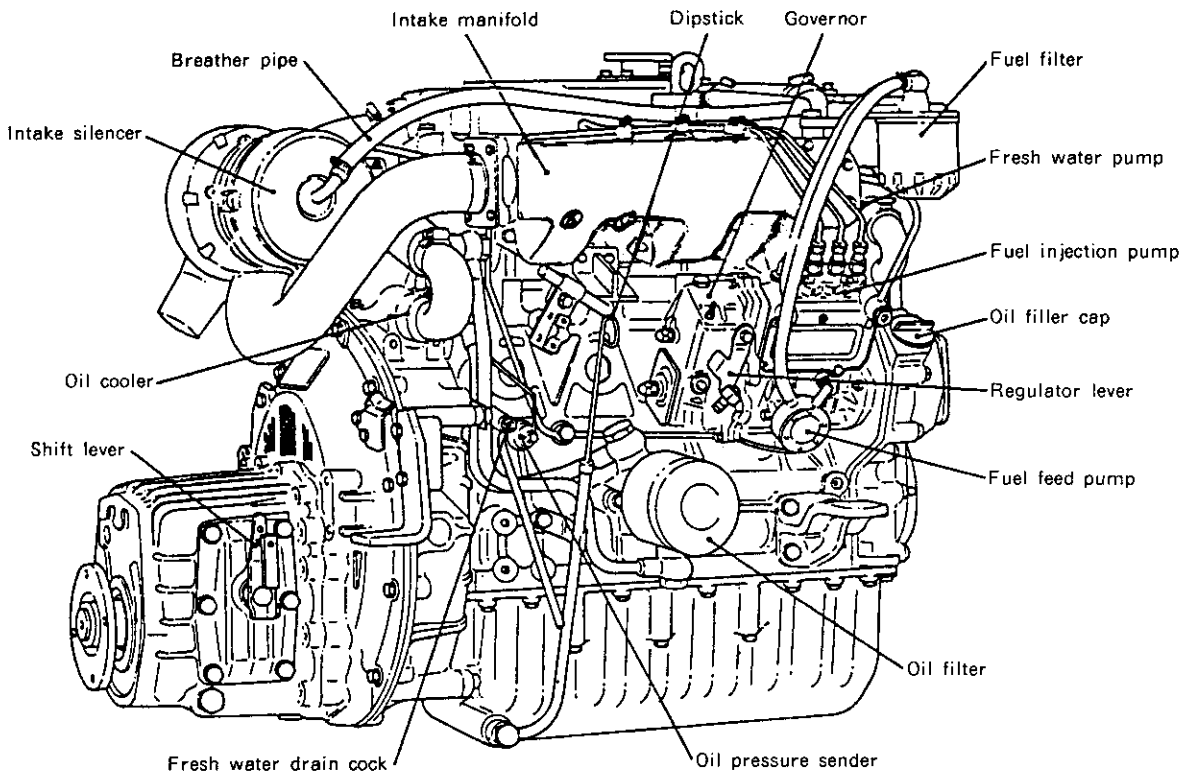
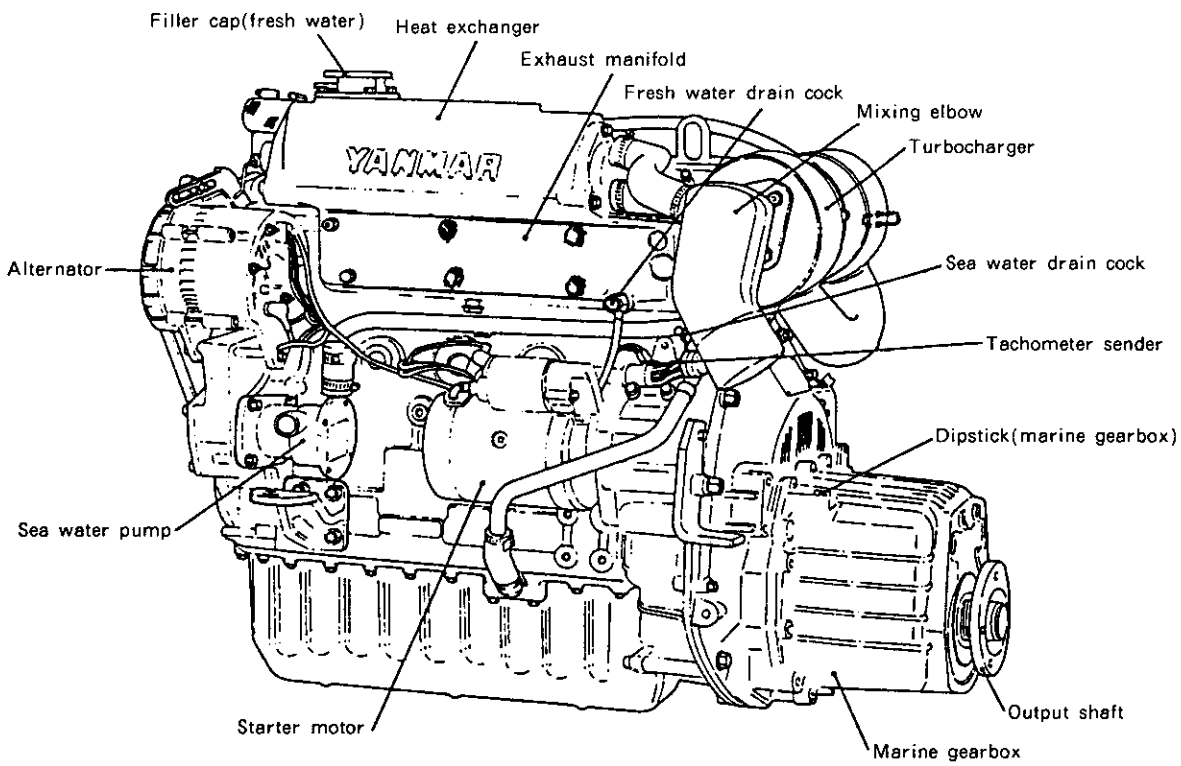
1-2. 3JH2-TE





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2. Specifications

2-1. Engine

Model			3JH2-(B)E	3JH2-T(B)E
Type			Vertical 4-cycle water cooled diesel engine	
Combustion system			Direct injection	
Aspiration			Normal aspiration	Exhaust gas turbocharger
Number of cylinders			3	
Bore × stroke		mm (in.)	82 × 86 (3.23 × 3.39)	
Displacement		ℓ (cu.in.)	1.363 (83.17)	
One hour rating output (DIN6270B) flywheel output	Output/crankshaft speed	kW/rpm (HP/rpm)	28.5/3600 (38.7/3600)	35.0/3600 (47.6/3600)
	Brake mean effective pressure	kgf/cm² (lb./in²)	6.97 (99.113)	8.62 (122.576)
	Piston speed	m/sec. (ft./sec.)	10.3	
Continuous rating output (DIN6270A) flywheel output	Output/crankshaft speed	kW/rpm (HP/rpm)	25.7/3400 (34.9/3400)	31.6/3400 (43.0/3400)
	Brake mean effective pressure	kgf/cm² (lb./in²)	6.80 (96.696)	8.35 (118.737)
	Piston speed	m/sec. (ft./sec.)	9.75	
Compression ratio			18.1	18.0
Fire order			1 — 240° — 3 — 240° — 2 — 240° — 1	
Fuel injection pump			YPES-CL	
Fuel injection timing (b.T.D.C.)		degree	14°	17°
Fuel injection pressure		kgf/cm²(lb./in².)	200±5 (19.6±0.5)	
Fuel injection nozzle			Hole type	
Direction of rotaion	(Crankshaft)		Counter-clock wise 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 (I.H.I.)
	Model		—	—
	Cooling system		—	Water cooling
Air cooler system	Type		—	—
	Radiation area	m² (in²)	—	—
Dimensions (with KMA)	Overall length	mm (in.)	760.2 (3JH2BE) / 782.3(3JH2E)	760.2 (29.93) / 782.3 (30.84)
	Overall width	mm (in.)	511.5	511.5 (20.65)
	Overall height	mm (in.)	587.5	587.5 (23.13)
Engine weight without marine gear (dry)		kg (lb.)	165	174
Lubricating oil capacity Effect/max.		ℓ (cu.in.)	2.1 / 4.9	
Cooling water capacity (Fresh water)	Fresh water tank	ℓ (cu.in.)	4.7	
	Sub tank	ℓ (cu.in.)	0.8 (48.82)	

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2-2. Marine Gear

Marine gear system	Model		KBW-10E		KM3A		
	Type		Multiple friction disc cluth (Parallel drive)		Cone clutch (Angle drive)		
	Reduction ratio (Forward/Reverse)		2.14/2.50	2.45/2.50	2.33/3.04	2.64/3.04	3.21/3.04
	Direction of rotation (Forward) viewed from stern		Clock wise		Clock wise		
	Lubricating oil capacity Effect/max.	ℓ (cu.in.)	0.2/0.7 (12.204/42.714)		0.05/0.35 (3.051/21.357)		
	Lubricating oil						
	weight	kg (lb.)	17.5 (38.588)		13 (28.665)		

2-3. Applicability of Marine gear & Reduction ratio

●: Standard combination
○: Optional combination
×: Inapplicable

Marine gear / Engine model			3JH2F	3JH2-TE
Model	Reduction ratio	I.D Mark		
KBW10E	2.14	S	●	●
	2.45	G	●	●
	2.83	GG	●	×
KM3A	2.33	S	●	●
	2.64	G	●	●
	3.21	GG	●	×

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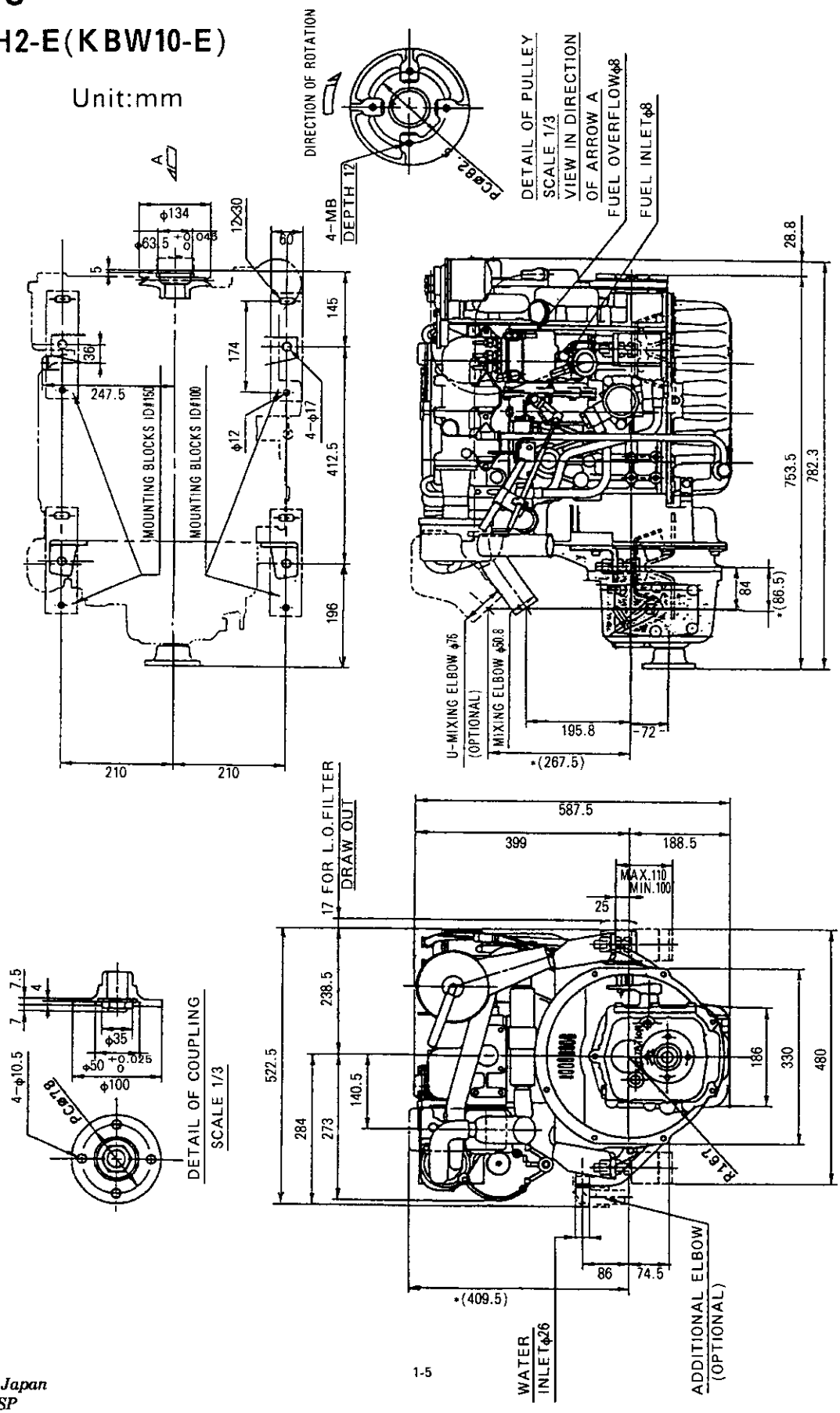
3. Engine Outline

3-1. 3JH2-E(KBW10-E)

Unit:mm



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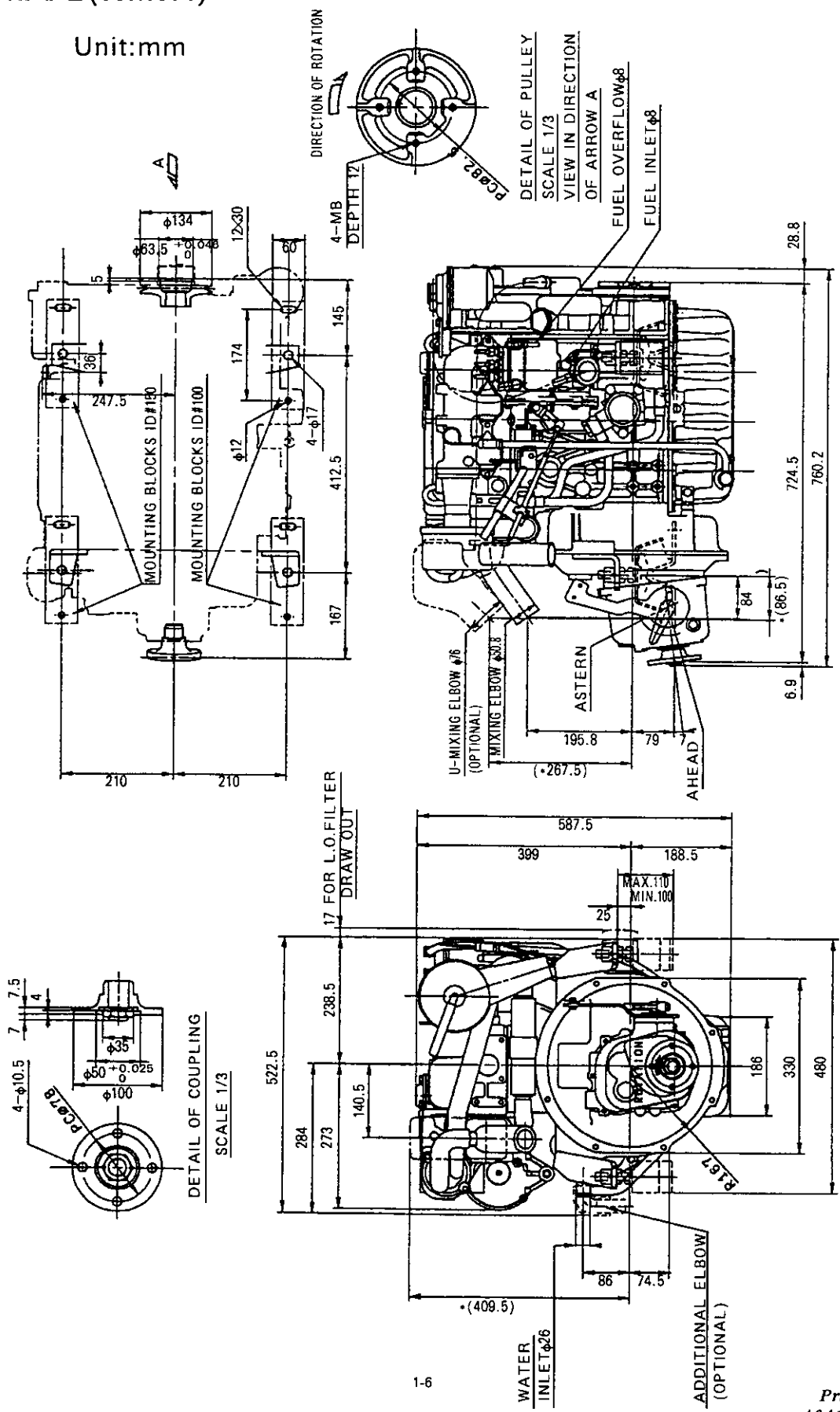
3-2. 3JH2-BE(KM3A)

Unit:mm



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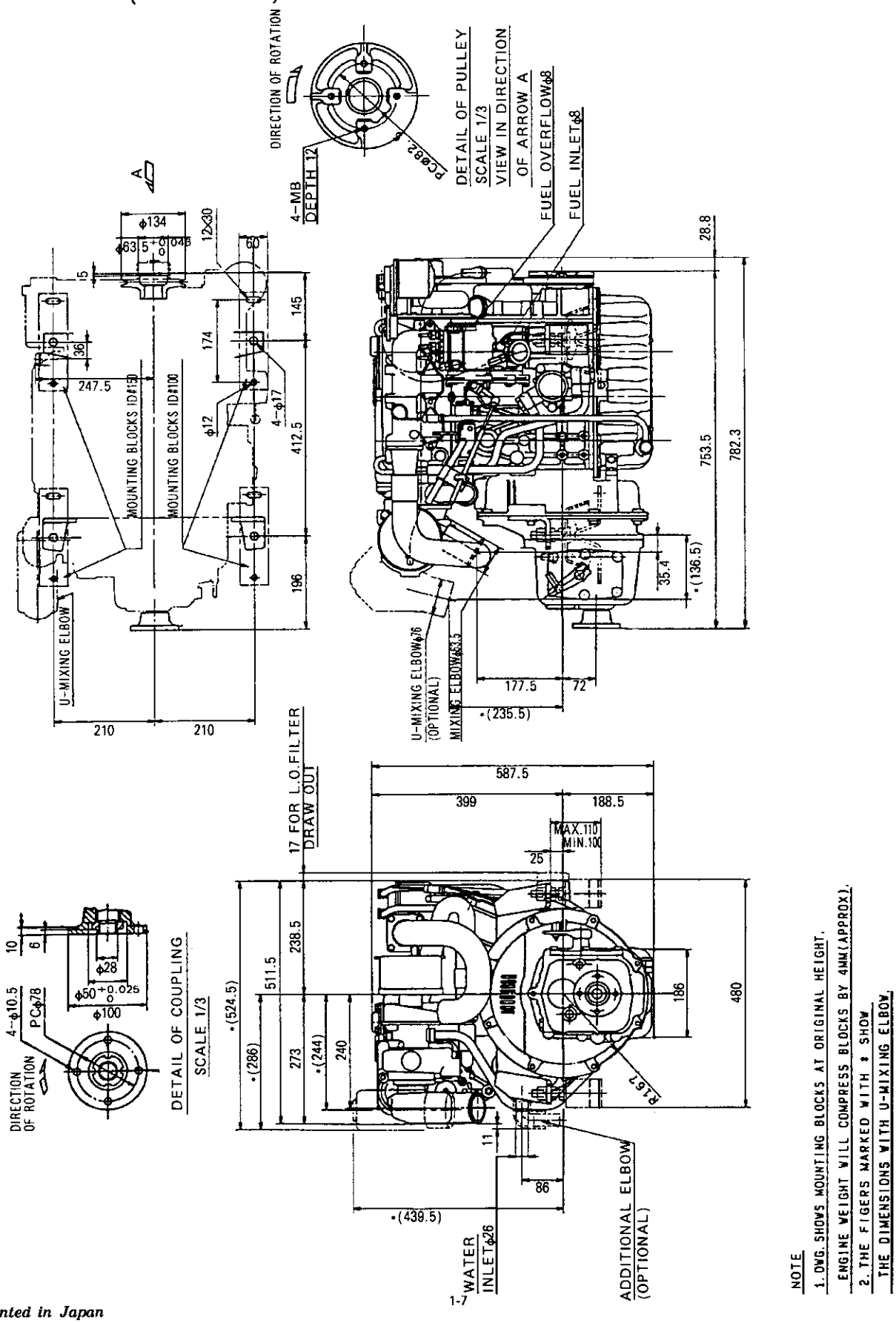
3-3. 3JH2TE(KBW10-E)



NOTE
1. DWG. SHOWS MOUNTING BLOCKS AT ORIGINAL HEIGHT.
ENGINE WEIGHT WILL COMPRESS BLOCKS BY 4MM(APPROX).
2. THE FIGERS MARKED WITH * SHOW
THE DIMENSIONS WITH U-MIXING ELBOW.

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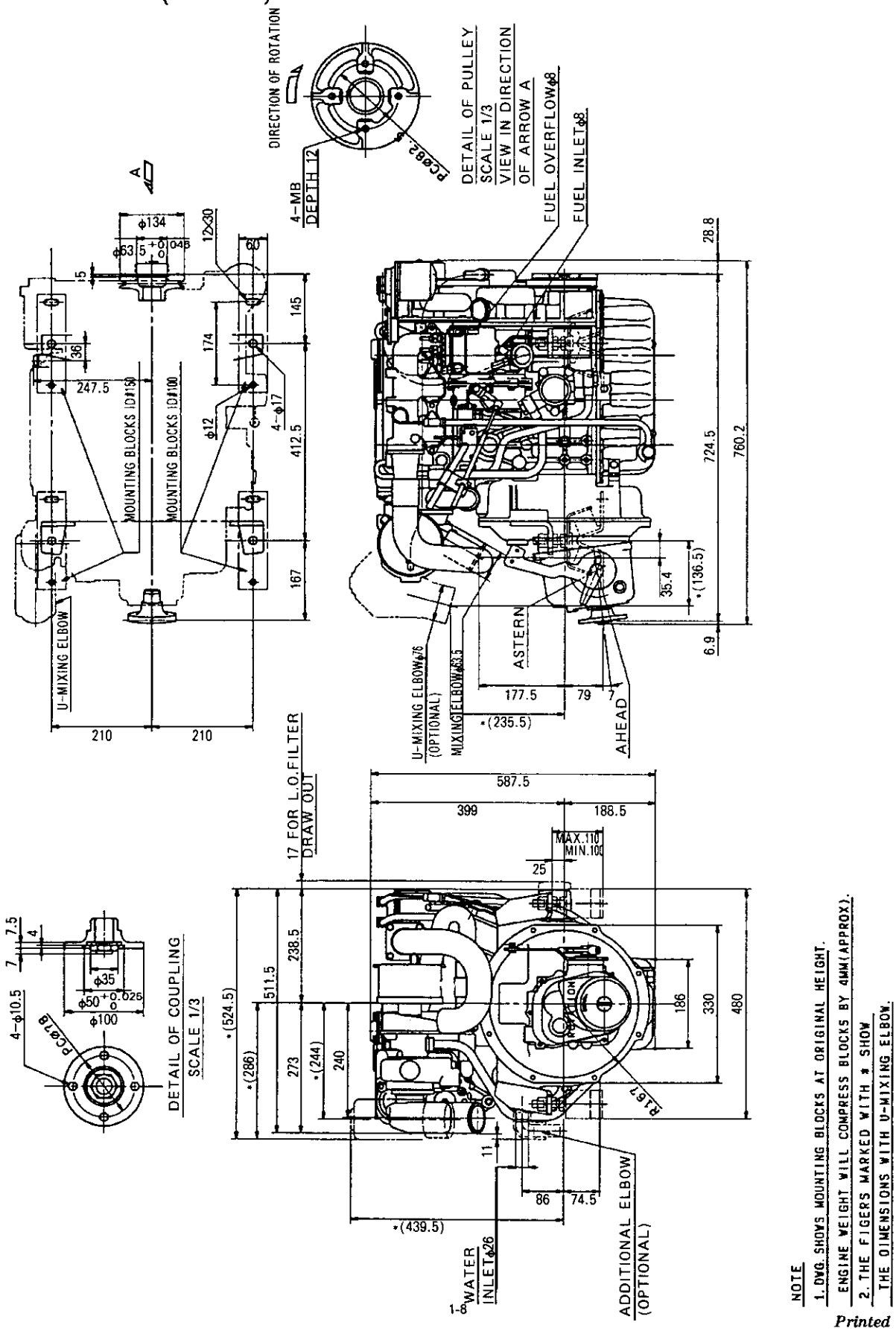
3-4. 3JH2-TBE(KM3A)



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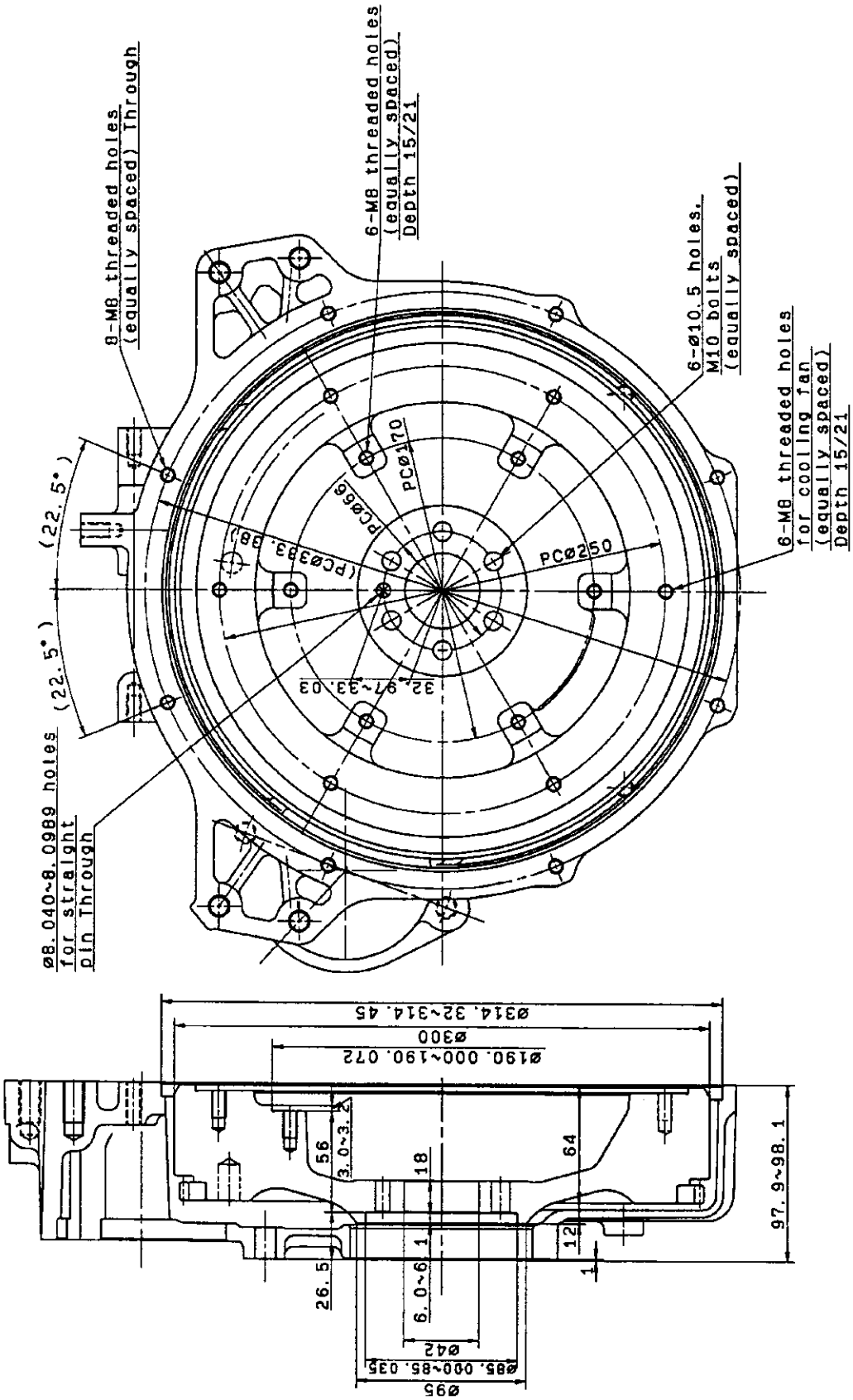
3-5. Dimensions of flywheel



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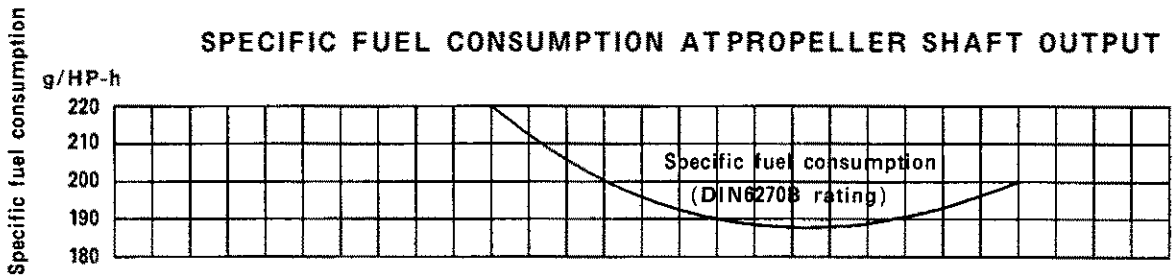
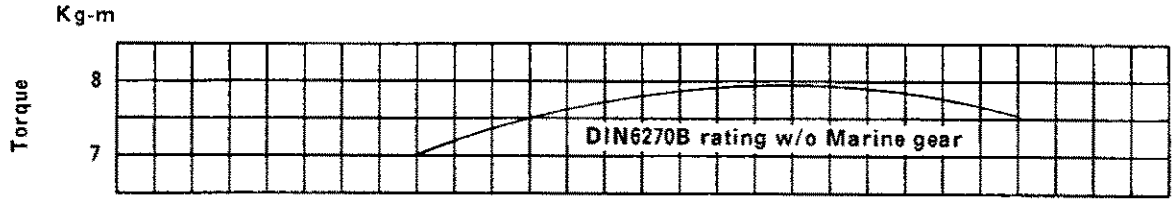
4. Performance Curves

4-1 3JH2-(B)E

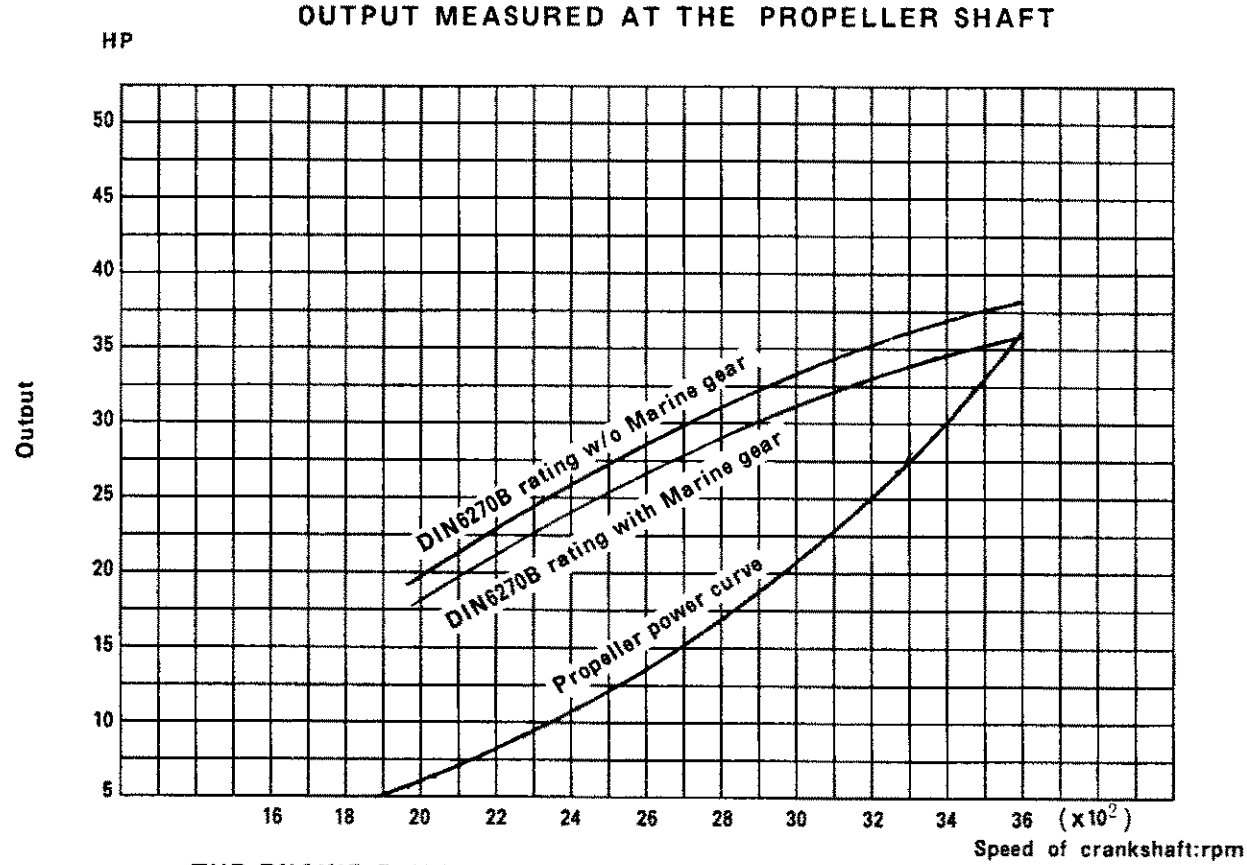
SPECIFIC FUEL CONSUMPTION AT PROPELLER SHAFT OUTPUT



TORQUE MEASURED AT THE PROPELLER SHAFT



OUTPUT MEASURED AT THE PROPELLER SHAFT



THE ENGINE FLYWHEEL OUTPUT IS APPROX 3% HIGHER

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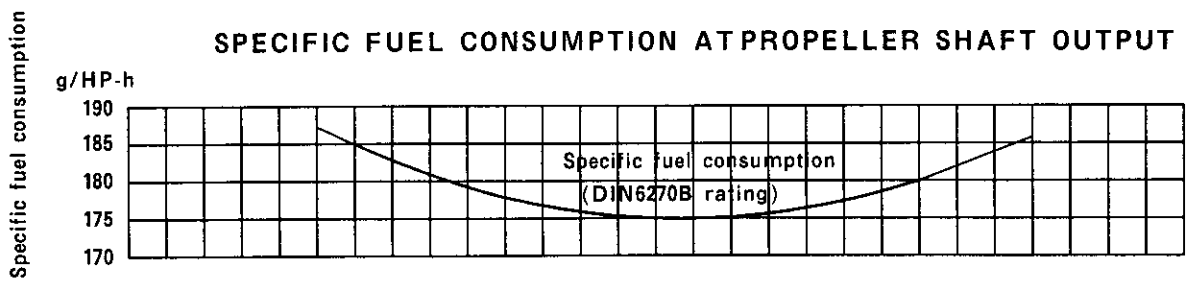
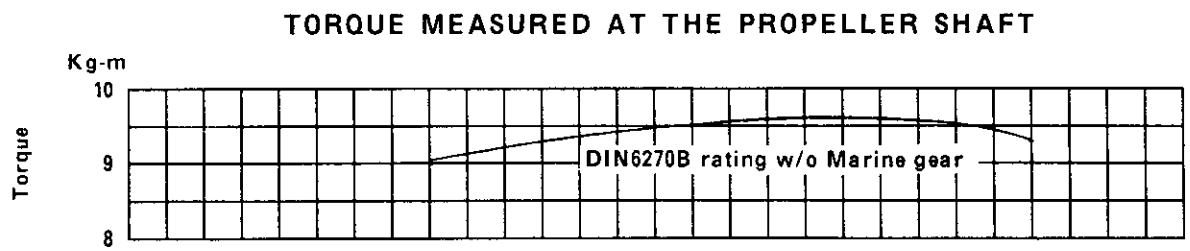
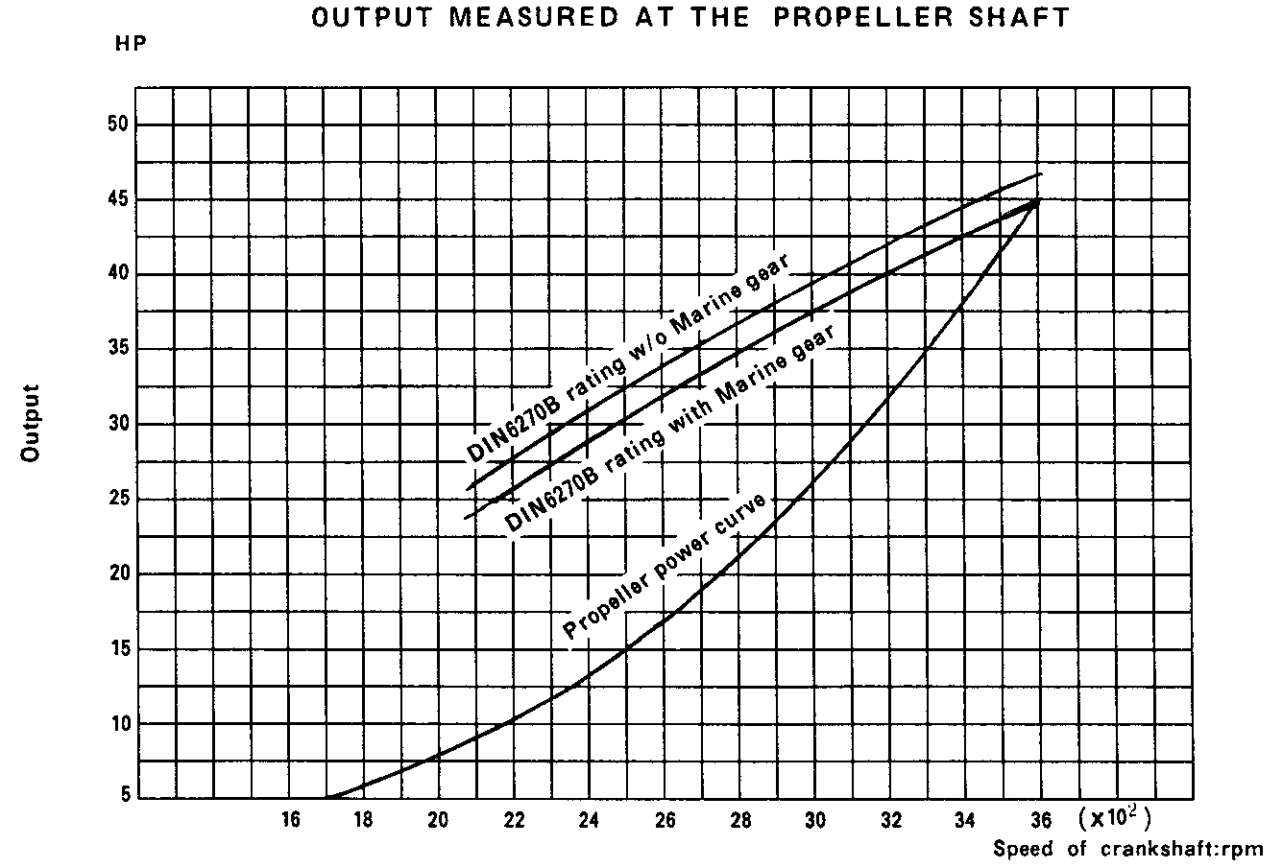
4-2. 3JH2-T(B)E







THE ENGINE FLYWHEEL OUTPUT IS APPROX 3% HIGHER

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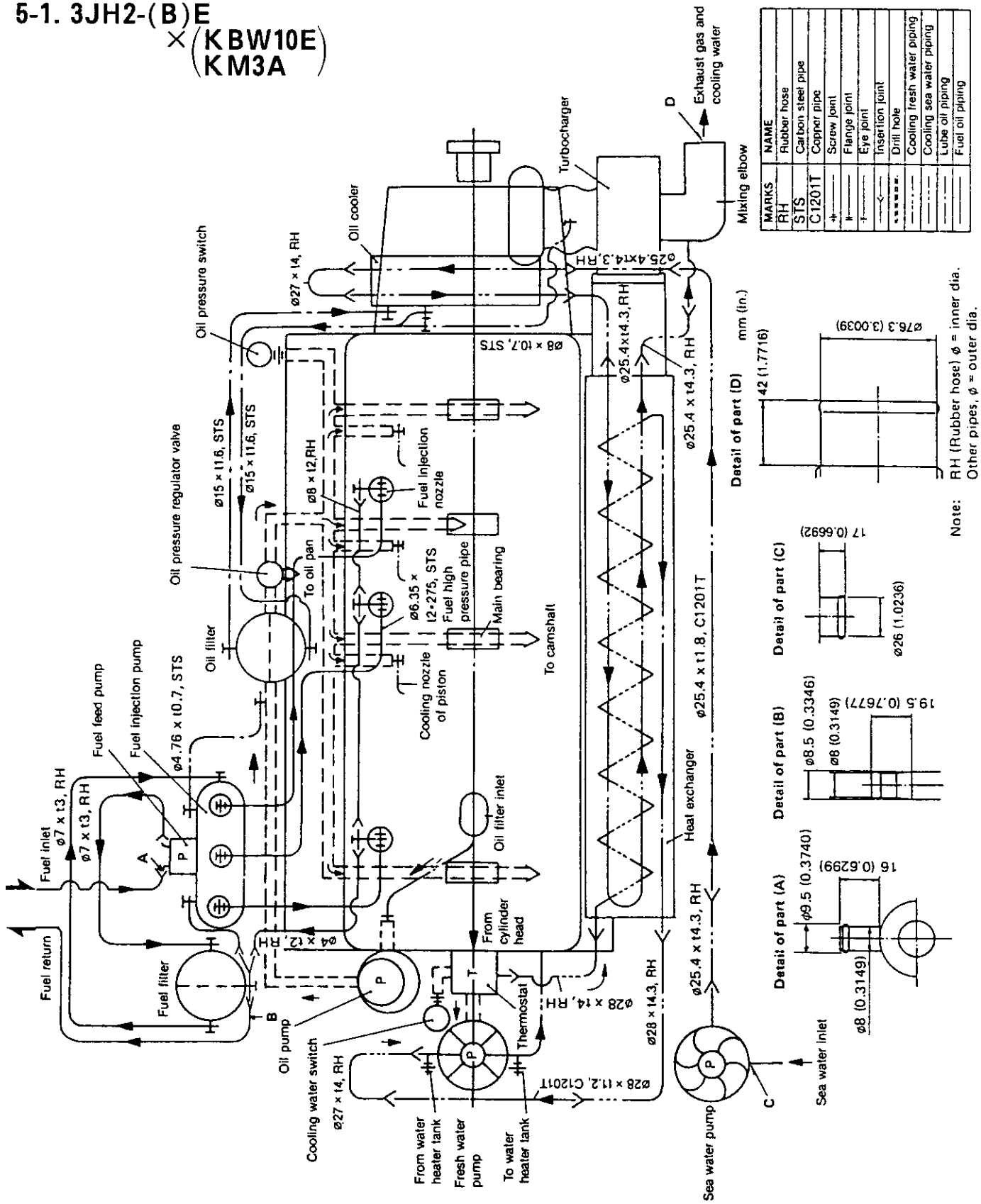
5. Piping Diagrams

5-1. 3JH2-(B)E ×(KBW10E / KM3A)



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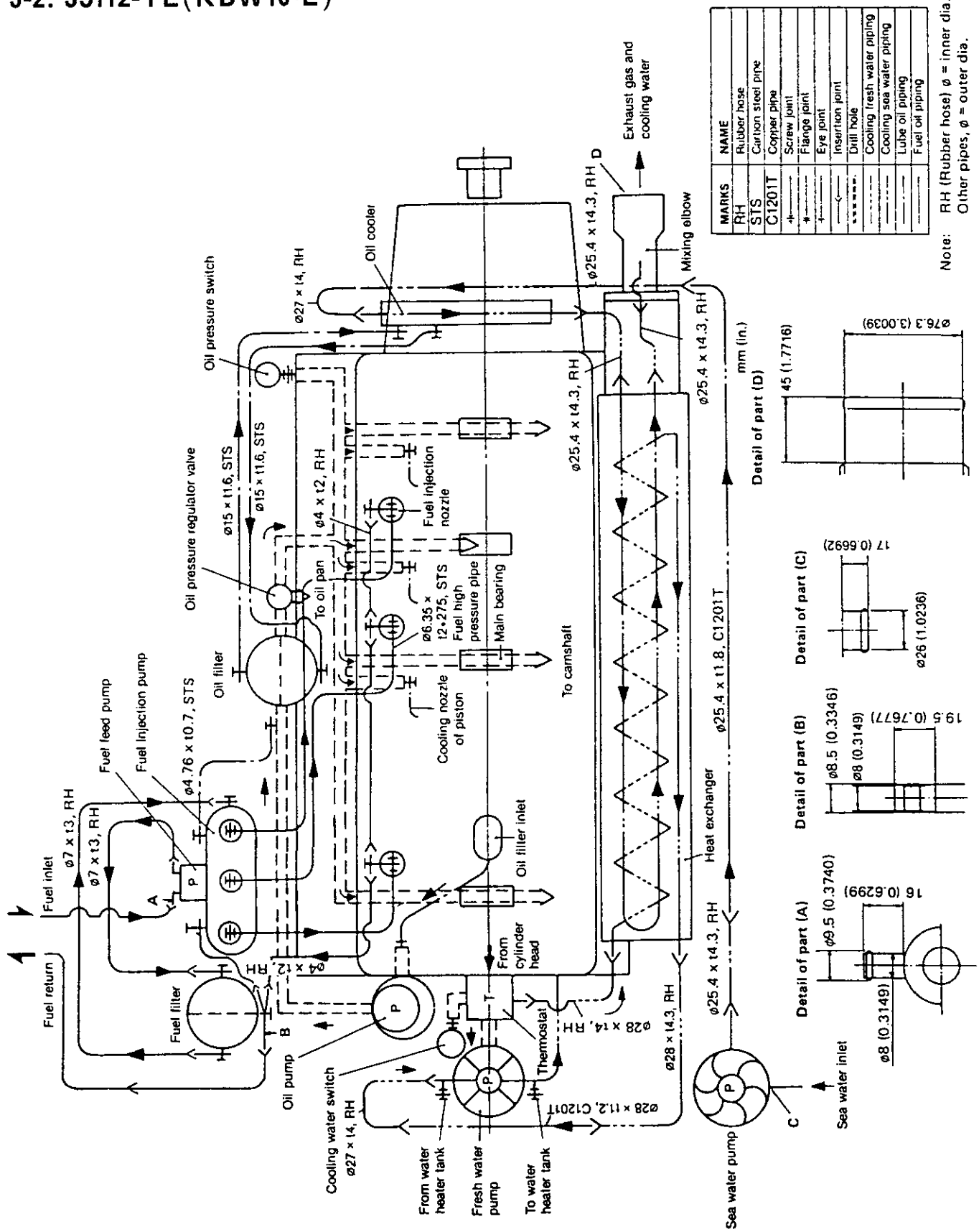
5-2. 3JH2-TE(KBW10-E)



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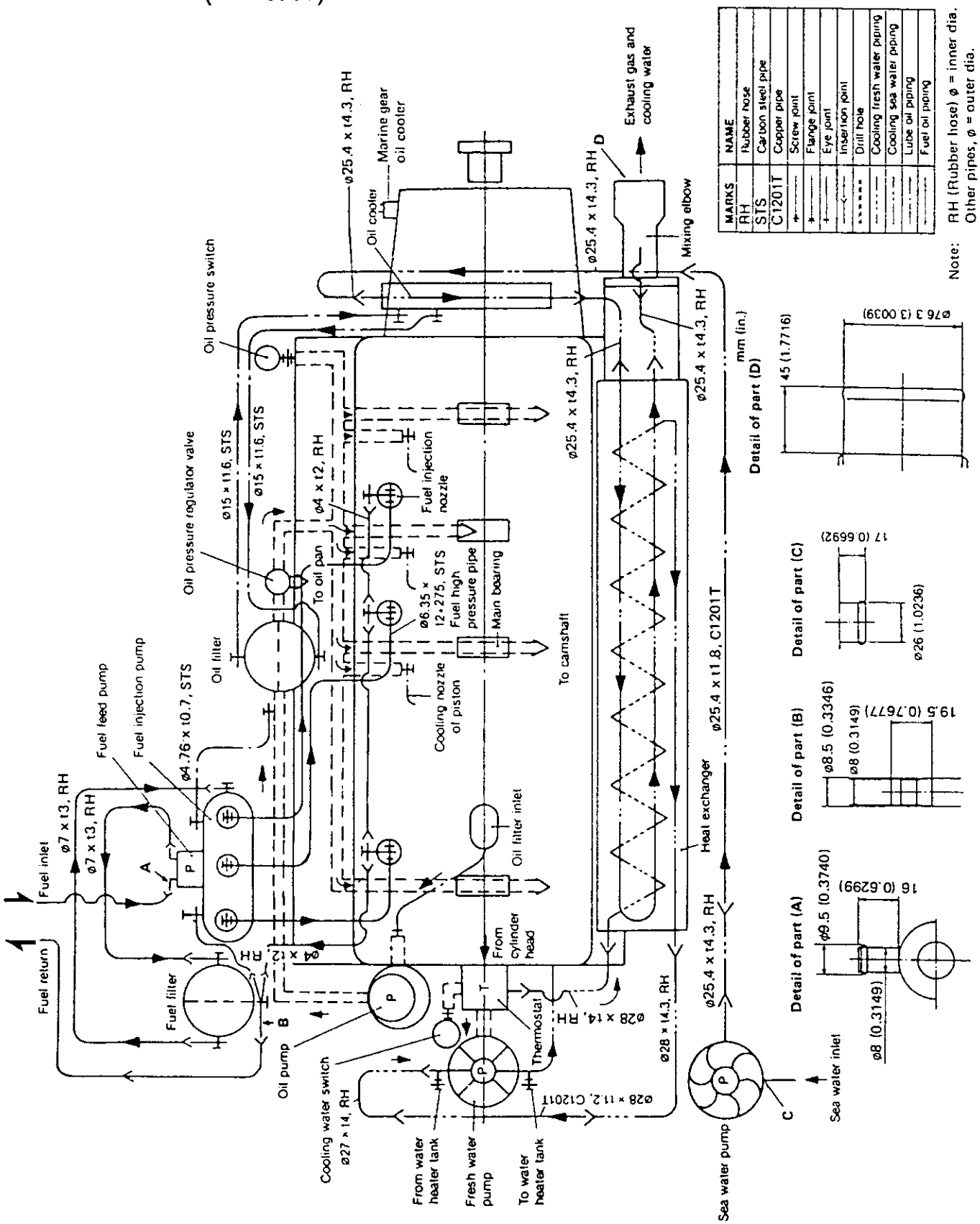
5-3. 3JH2-TBE(KM3A1)



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CHAPTER 2

BASIC ENGINE PARTS

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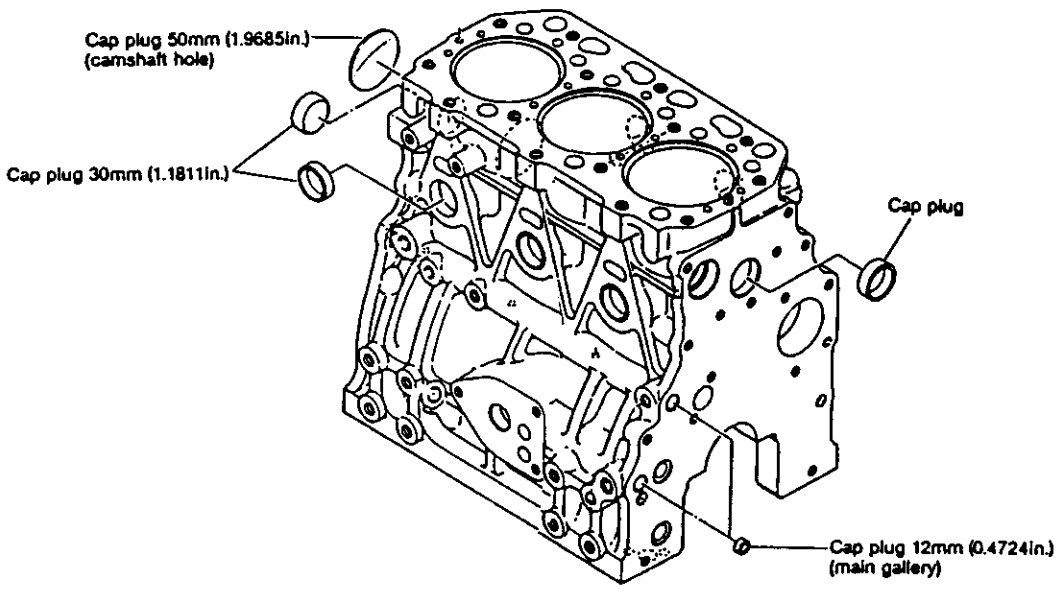
1. Cylinder Block

The cylinder block is a thin-skinned, (low-weight), short skirt type with rationally placed ribs. The side walls are wave shaped to maximize ridigity for strength and low noise.



1-1 Inspection of parts

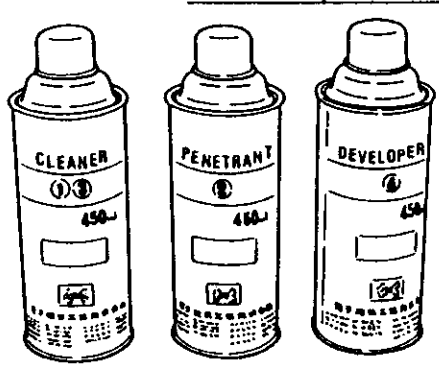
Make a visual inspection to check for cracks on engines that have frozen up, overturned or otherwise been subjected to undue stress. Perform a color check on any portions that appear to be cracked, and replace the cylinder block if the crack is not repairable.

1-2 Cleaning of oil holes

Clean all oil holes, making sure that none are clogged up and the blind plugs do not come off.

Color check kit
Part code No. 97550-004560

	Quantity
Penetrant	1
Developer	2
Cleaner	3



1-3 Color check procedure

(1) Clean the area to be inspected.
(2) Color check kit
The color check test kit consists of an aerosol cleaner, penetrant and developer.
(3) Clean the area to be inspected with the cleaner.
Either spray the cleaner on directly and wipe, or wipe the area with a cloth moistened with cleaner.
(4) Spray on red penetrant
After cleaning, spray on the red penetrant and allow 5 ~ 10 minutes for penetration. Spray on more red penetrant if it dries before it has been able to penetrate.
(5) Spray on developer
Remove any residual penetrant on the surface after the penetrant has penetrated, and spray on the developer. If there are any cracks in the surface, red dots or a red line will appear several minutes after the developer dries.
Hold the developer 300 ~ 400mm (11.8110 ~ 15.7480in.) away from the area being inspected when spraying, making sure to coat the surface uniformly.
(6) Clean the surface with the cleaner.

NOTE: Without fail, read the instructions for the color check kit before use.

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