YANMAR

HINSHI-H10-009

SERVICE MANUAL

MARINE DIESEL ENGINE

4JH3 Series

4JH3-TE
4JH3- HTE
4JH3- DTE

2000.3.10

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History of Revision	Page No.	1

Manual Name	Service Manual for Marine Diesel Engine
Engine Model :	4JH3-TE, HTE, DTE

Number of revision	Date of revision	Reason for correction	Outline of correction	correction item No.(page)	Corrected by
● New edition	Aug. 1998				

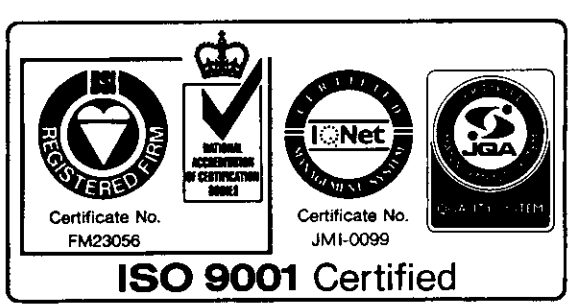
Foreword

This book describes the procedures for servicing the 4JH3 series marine diesel engine. Use this manual to help you service the engine accurately, quickly and safely. The descriptions in this manual are for the standard engine. Therefore, the specifications or components of your engine may vary, depending on the exact engine installed in the ship.

For more specific details, also refer to the service manual for the ship.

Note that modifications may be made in the specifications or parts in order to improve the engine. Any such changes which affect the contents of this manual will be noted by issuing a modification report each time a change is made.

For details about the marine gear, see the service manual for it (HINSHI-H10-011).



These products have been developed, designed, and manufactured in the facilities certified by the Standards for Quality Systems of ISO 9001.

CONTENS

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1. To Perform Service Safely

1.1 Warning Symbols

●Most accidents are caused by neglecting basic safety rules and precautions. To prevent this type of accident, always follow safe working practices.
Please read this manual carefully before starting repair or maintenances in order to gain a full understanding of the safety precautions and the appropriate inspection and maintenance procedures.
Do not attempt to perform repairs or maintenance if you don't have sufficient background knowledge, or it may result in an accident.

●It is impossible to cover every possible danger when making repairs or performing maintenance. Therefore, you must always exercise sufficient general consideration for safety, in addition to the specific matters marked with ⚠ CAUTION, both in this manual and on the product. Especially when performing a repair or maintenance procedure not described in this manual, ask for some advice from a person who has experience in that area.

●The warning symbols used in this manual and their meanings are as follows:

⚠ DANGER — **DANGER-indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.**

⚠ WARNING — **WARNING-indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.**

⚠ CAUTION — **CAUTION-indicates a potentially hazardous situation which, if not avoided, may result in injury.**

●Any issue marked with a [NOTICE] in this manual contains especially important information about servicing the engine. If the advice not followed, the product's performance and quality may not be guaranteed.

1.2 Safety Precautions (Be sure to follow the cautions below for your own safety.)

(1) Service Shop (Place)

⚠ WARNING

● Well-ventilated work area

Jobs such as running the engine, welding and polishing the paint with sandpaper should be done in a well-ventilated workplace.

【Otherwise】

It can be very dangerous to inhale poisonous gas or dust.

⚠ CAUTION

● Sufficiently wide and flat place

The floor space in a service shop where inspections or maintenance are performed should be wide enough and completely flat, without any pits or holes.

【Otherwise】

An accident may occur.

⚠ CAUTION

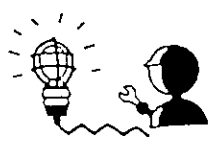
● Clean and orderly work area

No dust, mud, oil or parts should be left on the floor.

【Otherwise】

You may slip, trip or fall.

⚠ CAUTION



● Bright and safely lighted workplace

The workplace should be well lit. When performing a job in a position that is dark or difficult to see, use a portable work lamp. The bulb must be covered with a wire or plastic cage.

【Otherwise】

If the light does not have a cage, the bulb may be broken and can cause a fire.

⚠ CAUTION

● Workplace must have a fire extinguisher.

Keep a first-aid kit and a fire extinguisher close at hand, in case of injury or fire.

(2) Work Clothing

⚠ CAUTION

● Clothing for safe operation

Wear a helmet, protective clothing, safety shoes and other safety devices according to the job being performed. Make sure to wear close-fitting work clothes.

[Otherwise]

A serious accident can happen if you get caught in a machine.

(3) Tools to Be Used

⚠ WARNING

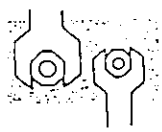
● Appropriate lifting and supporting devices

Never try to work on the engine if it is only supported with wooden blocks or by a jack. To lift and support the engine, be sure to use a crane with a sufficient lifting capacity or use a fixed jack designed for the job.

[Otherwise]

A serious accident may occur.

⚠ WARNING



● Use appropriate tools.

Use the right tools for the job to be done. Always use the correct size tool to loosen or tighten parts.

[Otherwise]

A serious injury or engine damage may occur.

(4) Use Genuine Parts, and Lubricants.

⚠ CAUTION

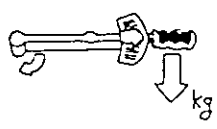
● Always use genuine parts.

[Otherwise]

The engine life may be shortened or an accident may occur.

(5) Tightening Nuts and Bolts

⚠ WARNING



● Always tighten each part to the specified torque if it is given in the manual.

[Otherwise]

Loose or falling parts may cause damage or injuries.

(6) Handling the Engine Parts

⚠ WARNING

● Be very careful of hot parts.

Do not touch the engine when it is running or immediately after it has stopped.

[Otherwise]
You may be badly burned.

⚠ WARNING

● Be careful around rotating parts

Keep your clothing and tools well away from any rotating parts.

[Otherwise]
You or the tools may be caught and you may be seriously injured.

⚠ WARNING

● Electrical shorts

Disconnect the terminal ⊖ at the battery before servicing the engine.

[Otherwise]
A short in the wires may cause a fire to break out.

⚠ WARNING

● Battery charging

Do not allow any open flame near the battery while it is charging.

[Otherwise]
When charging, the battery produces highly flammable gas and an explosion may occur.

⚠ WARNING

● Battery acid

The battery is filled with dilute sulfuric acid. Take special care to avoid getting it on your clothing or skin.

[Otherwise]
The battery acid will eat through fabric and can give you a serious chemical burn.

(7) Waste Disposal

⚠ CAUTION

● Observe the following instructions with regard to waste disposal.

【Otherwise】
The environment may be polluted.

- Waste liquids such as engine oil and cooling water must be discharged into a container. Any spills on the ground must be wiped up right away.
- Do not discharge any waste fluids into the sewerage, a river or the ocean.
- Harmful wastes such as oils, fuels, solvents, filter elements and batteries must be treated according to the applicable laws and regulations. Ask a qualified waste collection company for more information.

(8) Safety Label

⚠ CAUTION

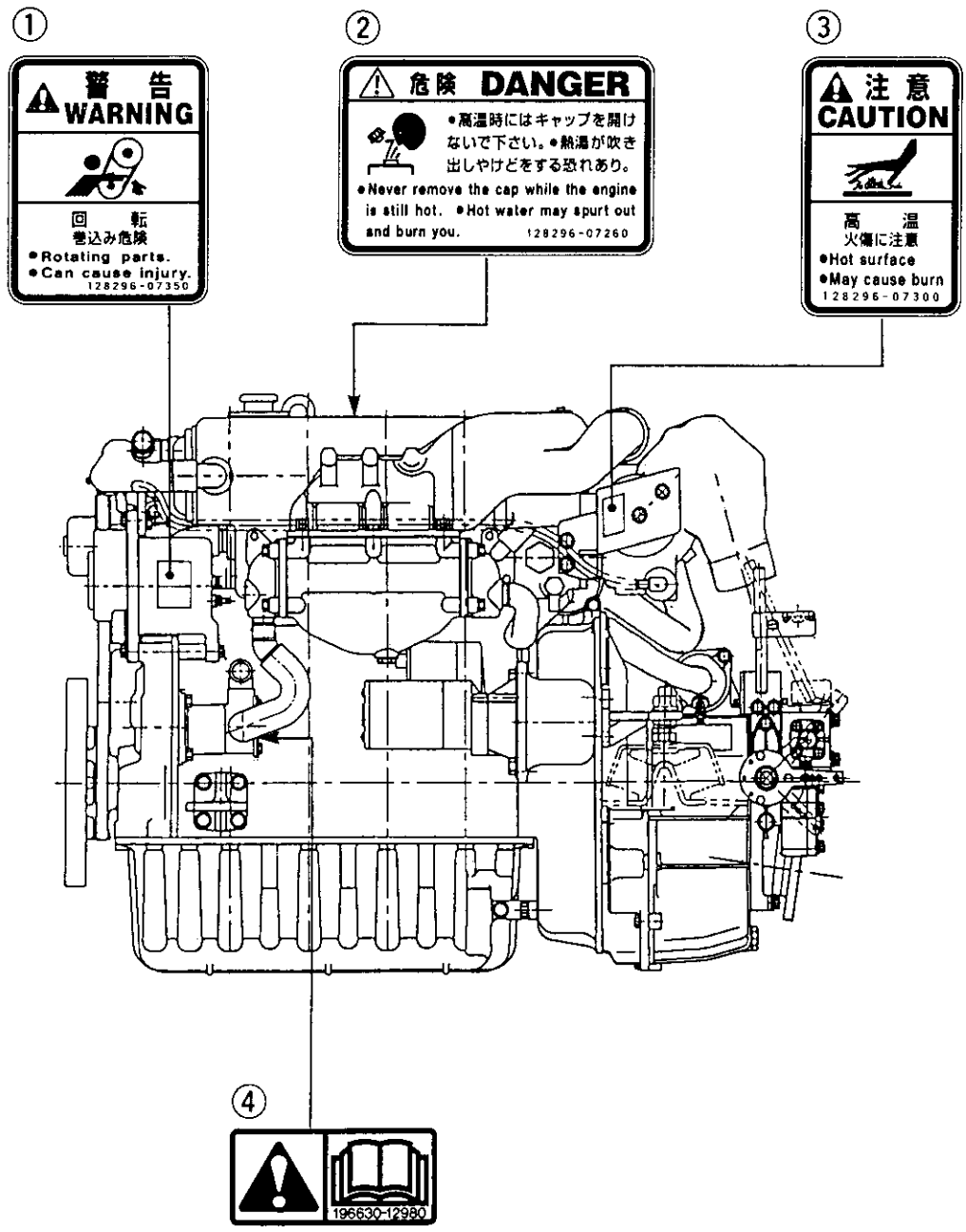
● Pay attention to the safety label warning on the product.

The safety label (caution plate) is placed on the product to improve safe operation.
If the safety label is missing or illegible, be sure to replace it with a new one.

1.3 Location of Product Safety Labels

To insure safe operation, product safety labels have been attached. Their location is shown in the diagram below. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also replace labels when parts are replaced, ordering them in the same way as for the parts.

Product Safety Labels, Parts Code Numbers	
①	128296-07350
②	128296-07260
③	128296-07300
④	196630-12980



2. General Description

2.1 Principal Particulars

● 4JH3-TE

Engine Model			4JH3-TE (Printed on name plate)		
			4JH3-TE	4JH3-TBE	4JH3-THE
Use			Pleasure boat		
Type			Vertical water-cooled 4-cycle diesel engine		
Number of cylinders-Bore×stroke mm			4-φ84×90		
Displacement ℓ			1.995		
Aspiration system			Turbocharger		
Cont. rating output kW{hp}/rpm			50.7{69}/3700		
Max. output kW{hp}/rpm			53.0{72}/3800		
High idling (rpm)			4,300 ± 25		
Low idling (rpm)			700 ± 25		
Combustion system			Direct injection		
Starting system			Electric starting		
Cooling system			Constant high temperature fresh water cooling		
Lubrication system			Totally enclosed and forced lubrication system with trochoid pump		
Marine gear	Model		KBW21	KM4A	KMH4A
	Type		Mechanical wet multiple disk clutch Input/output eccentric parallel drive	Mechanical wet cone clutch 7° Down angle drive	Hydraulic wet multiple disk clutch 8° Down angle drive
	Reduction ratio (Ahead/Astern)		S: 2.17/3.06 G: 2.62/3.06	SS:1.47/1.47 S: 2.14/2.14 G: 2.63/2.63 GG:3.30/3.30	S: 2.04/2.04 G: 2.45/2.45
Direction of rotation (when viewed from stern side)	Crankshaft		Counterclockwise		
	Propeller shaft		Clockwise		
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)		
Fuel injection valve			Pinhole injection nozzle YDLLAP (5 - 0.23 × 150°)		
Turbocharger			RHB52(IHI) Water cooling and forced lubrication system		
Elec. devices	Starter		DC12V - 1.4kW		
	Alternator		DC12V - 55A(option:80A)		
Lube oil capacity ℓ (raked angle)	Engine oil	Oil pan	6.5 (7°)	5.8 (0°)	
		Total	7.7 (7°)	7.0 (0°)	
	Clutch oil		1.2	1.3	2.0
Cooling water capacity ℓ	Fresh water tank		6.0		
	Subtank		0.8		
Dimensions (L×W×H) mm			898×560×635	888×565×635	886×565×635
Dry weight kg			249	247	250
Engine installation style			On the flexible rubber engine mount		
Recommended battery capacity			12V - 80A(5HR) or greater		
Recommended engine room ventilator			12m³ / min. or greater		

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● 4JH3-HTE

Engine Model			4JH3-HTE(Printed on name plate)		
			4JH3-HTE	4JH3-HTBE	4JH3-HTHE
Use			Pleasure boat		
Type			Vertical water-cooled 4-cycle diesel engine		
Number of cylinders-Bore×stroke mm			4-φ84×90		
Displacement ℓ			1.995		
Aspiration system			Turbocharger, intercooler		
Cont. rating output kW{hp}/rpm			67.7{92}/3700		
Max. output kW{hp}/rpm			70.6{96}/3800		
High idling (rpm)			4,300 ± 25		
Low idling (rpm)			700 ± 25		
Combustion system			Direct injection		
Starting system			Electric starting		
Cooling system			Constant high temperature fresh water cooling		
Lubrication system			Totally enclosed and forced lubrication system with trochoid pump		
Marine gear	Model		KBW21	KM4A	KMH4A
	Type		Mechanical wet multiple disk clutch Input/output eccentric parallel drive	Mechanical wet cone clutch 7° Down angle drive	Hydraulic wet multiple disk clutch 8° Down angle drive
	Reduction ratio (Ahead/Astern)		S: 2.17/3.06 G: 2.62/3.06	SS:1.47/1.47 S:2.14/2.14 G:2.63/2.63 GG:3.30/3.30	S: 2.04/2.04 G: 2.45/2.45
Direction of rotation (when viewed from stern side)	Crankshaft		Counterclockwise		
	Propeller shaft		Clockwise		
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)		
Fuel injection valve			Pinhole injection nozzle YDLLAP(5-0.26×150°)		
Turbocharger			RHB52(IHI) Water cooling and forced lubrication system		
Elec. devices	Starter		DC12V - 1.4kW		
	Alternator		DC12V - 55A(option:80A)		
Lube oil capacity ℓ (raked angle)	Engine oil	Oil pan	6.5 (7°)	5.8 (0°)	
		Total	7.7 (7°)	7.0 (0°)	
	Clutch oil		1.2	1.3	2.0
Cooling water capacity ℓ	Fresh water tank		7.2		
	Subtank		0.8		
Dimensions (L×W×H) mm			886×581×660		
Dry weight kg			260		
Engine installation style			On the flexible rubber engine mount		
Recommended battery capacity			12V - 80A (5HR) or greater		
Recommended engine room ventilator			16m³/ min. or greater		

● 4JH3-DTE

Engine Model			4JH3-DTHE(Printed on name plate)
			4JH3-DTHE
Use			Pleasure boat
Type			Vertical water-cooled 4-cycle diesel engine
Number of cylinders - Bore×stroke mm			4-φ84×90
Displacement ℓ			1.995
Aspiration system			Turbocharger, intercooler
Cont. rating output kW{hp}/rpm			85.3{116}/3700
Max. output kW{hp}/rpm			88.3{120}/3800
High idling (rpm)			4,300 ± 25
Low idling (rpm)			700 ± 25
Combustion system			Direct injection
Starting system			Electric starting
Cooling system			Constant high temperature fresh water cooling
Lubrication system			Totally enclosed and forced lubrication system with trochoid pump
Marine gear	Model		KMH4A
	Type		Hydraulic wet multiple disk clutch 8° Down angle drive
	Reduction ratio (Ahead/Astern)		S: 2.04/2.04 G: 2.45/2.45
Direction of rotation (when viewed from stern side)	Crankshaft		Counterclockwise
	Propeller shaft		Clockwise
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)
Fuel injection valve			Pinhole injection nozzle YDLLAP(5-0.26×150°)
Turbocharger			RHB52(IHI) Water cooling and forced lubrication system
Elec. devices	Starter		DC12V - 1.4kW
	Alternator		DC12V - 55A(option:80A)
Lube oil capacity ℓ (raked angle)	Engine oil	Total	5.8 (0°)
		Oilpan	7.0 (0°)
	Clutch oil		2.0
Cooling water capacity ℓ	Fresh water tank		7.2
	Subtank		0.8
Dimensions (L×W×H) mm			888×581×660
Dry weight kg			260
Engine installation style			On the flexible rubber engine mount
Recommended battery capacity			12V - 80A (5HR) or greater
Recommended engine room ventilator			20m³/ min. or greater

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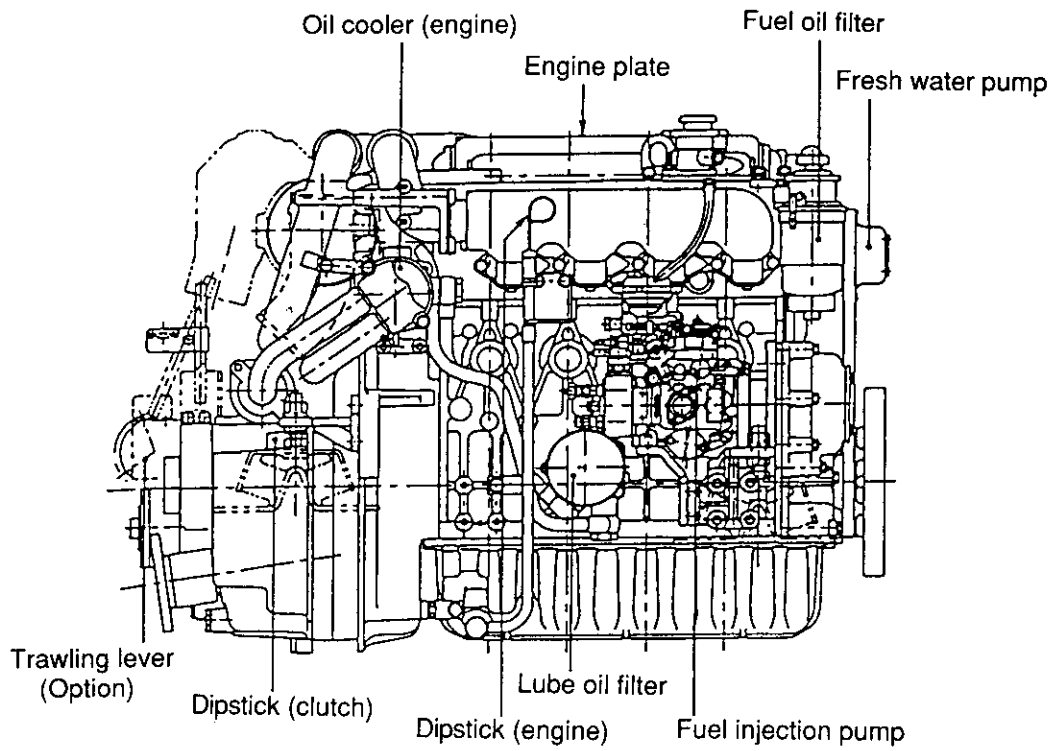
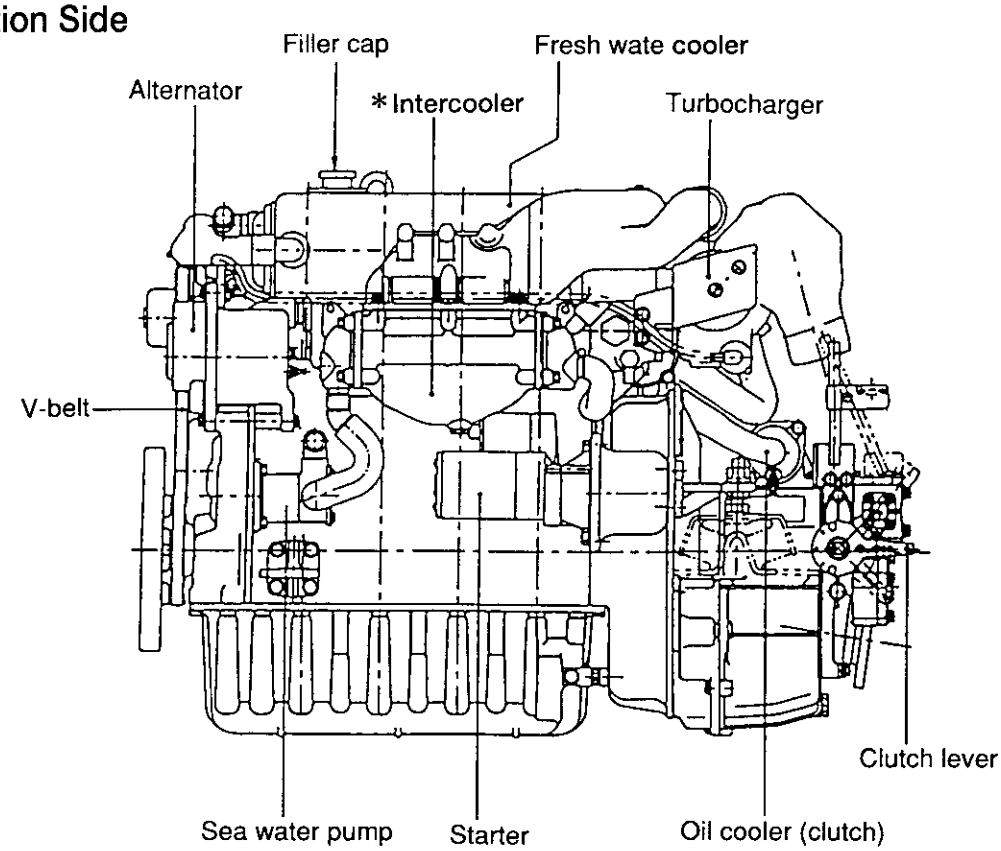
2.2 Appearance and Names of Parts

● Operation Side (Right side as viewed from the propeller.) Contains the main parts necessary for operation



● Non-Operation Side

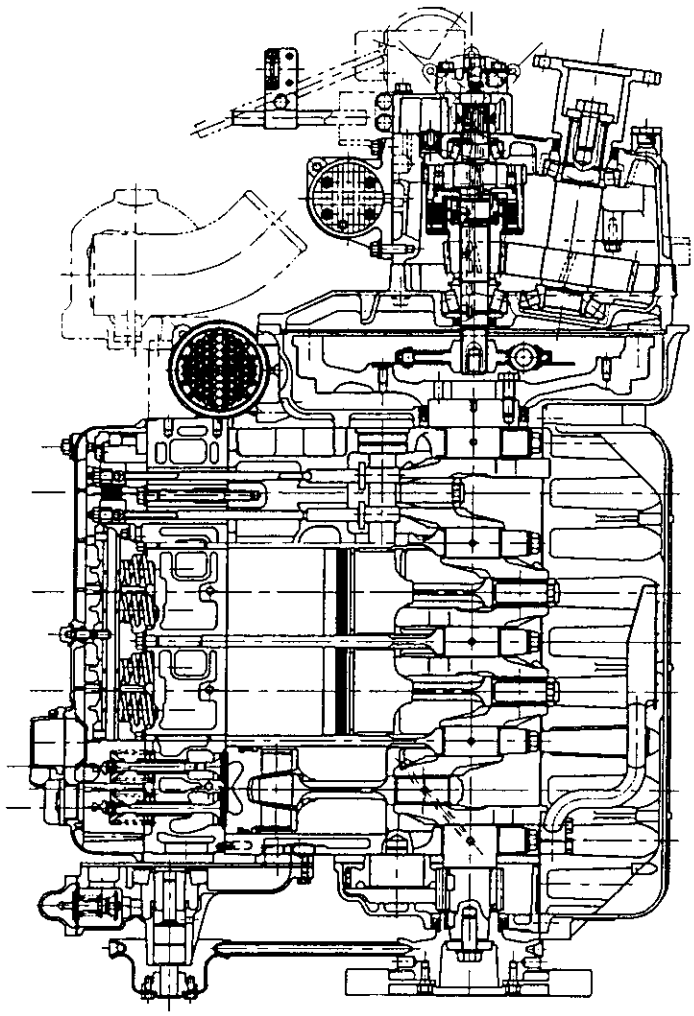


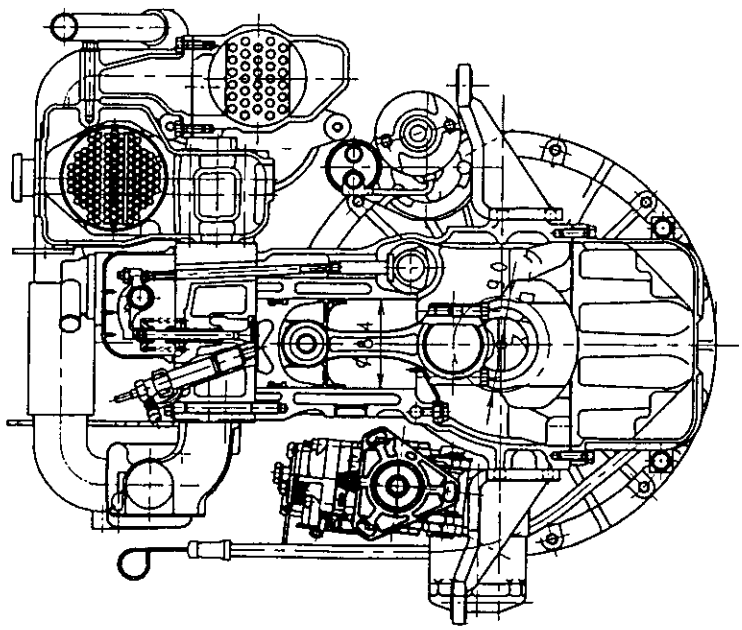
[NOTE]

The 4JH3-DTE engine (with KMH4A clutch) is used as the example for the above diagram.

The 4JH3-TE Series is not equipped with an intercooler (indicated by * mark in the diagram).

2.3 Cross-sectional Drawing



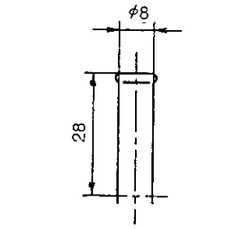


[NOTE]
The 4JH3-DTE engine (with KMH4A marine gear) is used as the example.

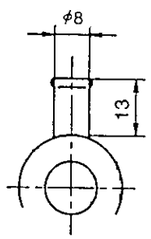
2.4 Piping Diagram

- 4JH3-TE,

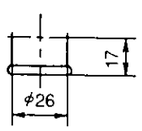
MARKS OF PIPING	NAME
RH	RUBBER HOSE
SGP STS	STEEL PIPE
C1201T	COPPER PIPE
	(UNION) SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB. OIL PIPING
	FUEL. OIL PIPING



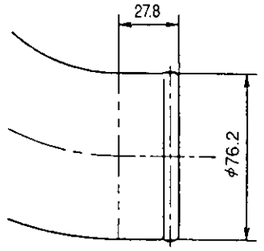
DETAIL OF PART Ⓐ



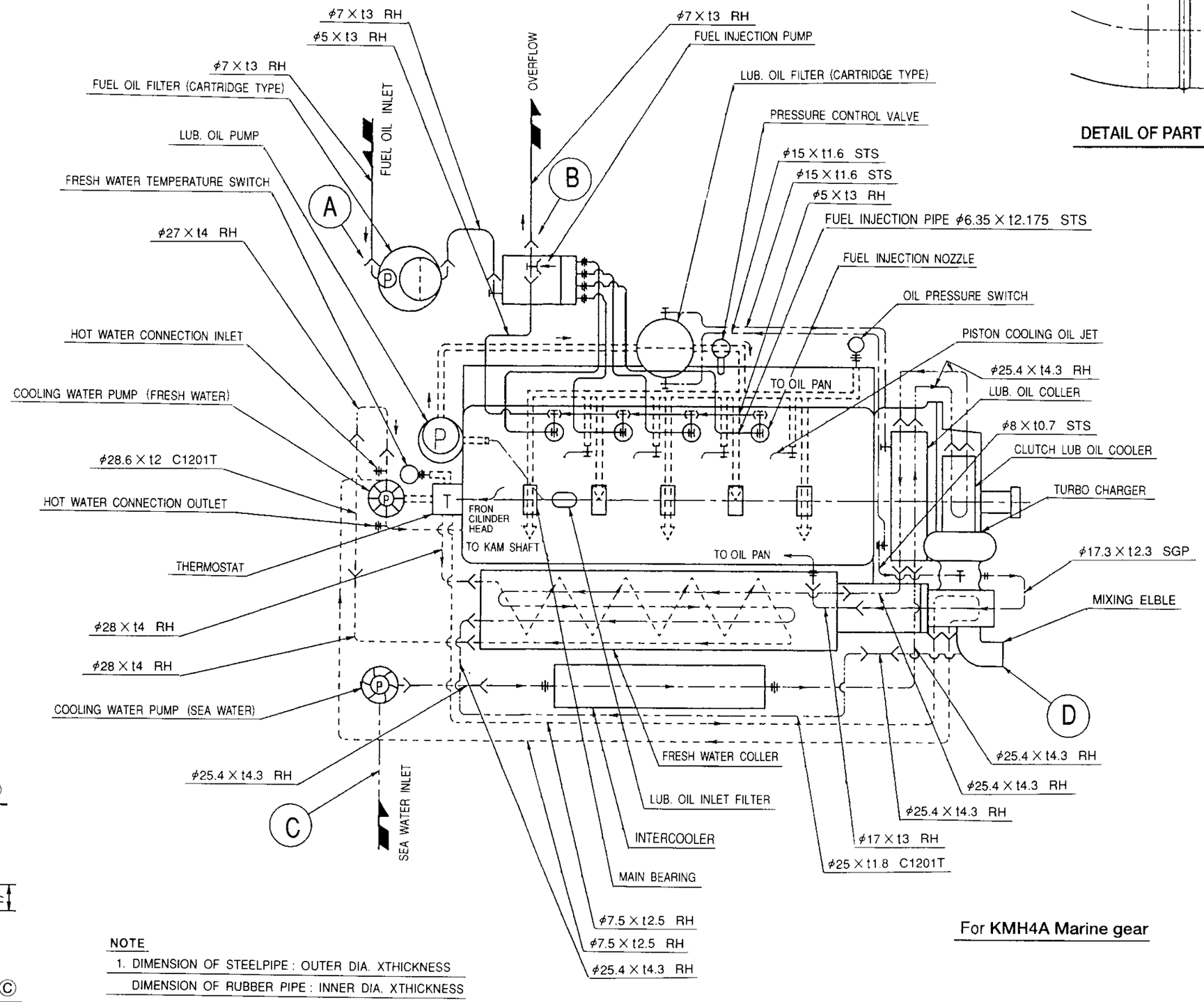
DETAIL OF PART Ⓑ



DETAIL OF PART Ⓒ



DETAIL OF PART Ⓓ



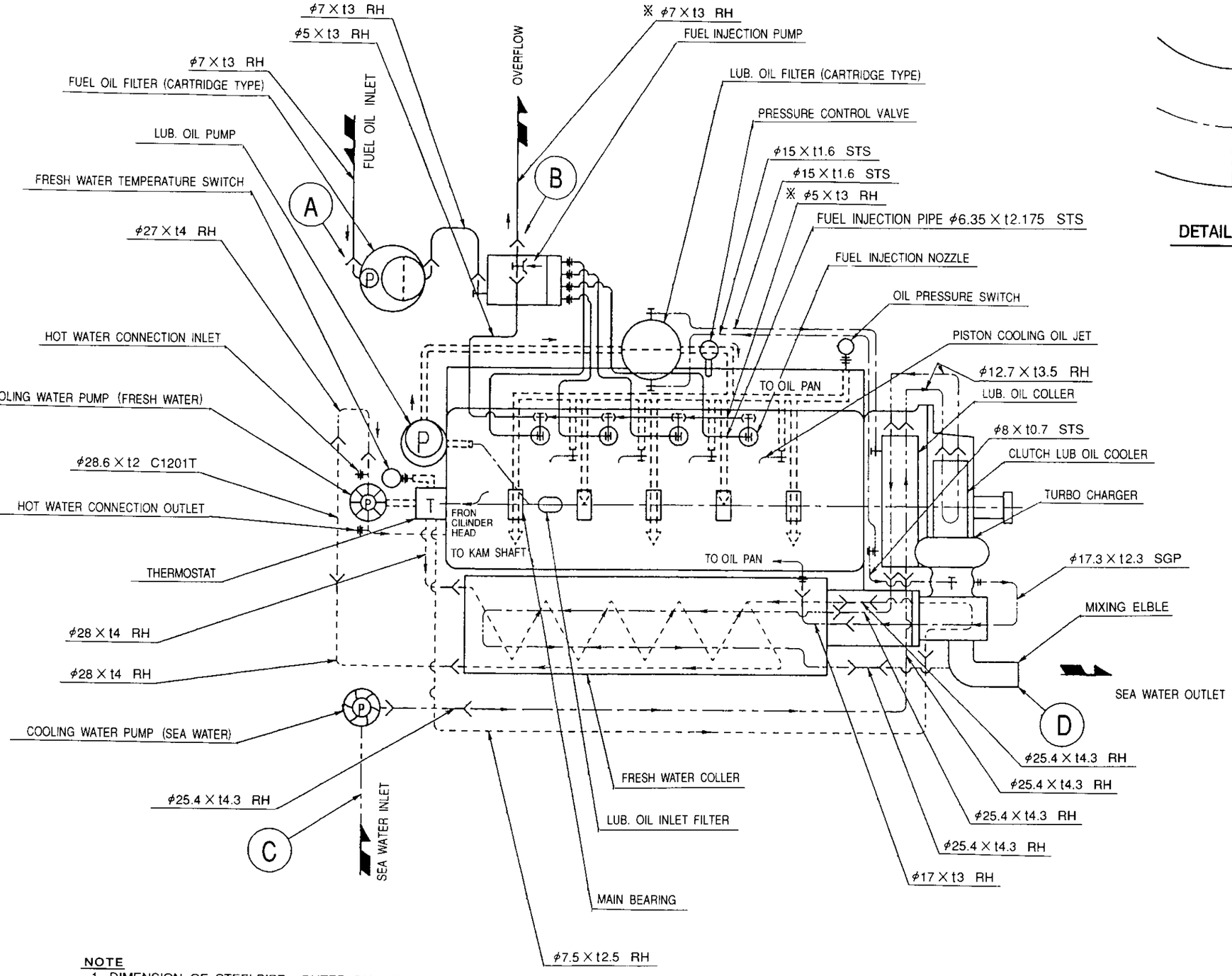
For KMH4A Marine gear

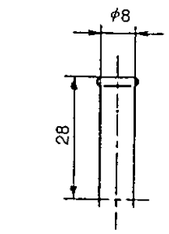
NOTE

1. DIMENSION OF STEELPIPE : OUTER DIA. XTHICKNESS
   DIMENSION OF RUBBER PIPE : INNER DIA. XTHICKNESS

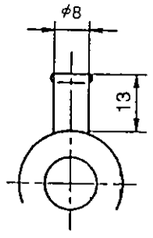
• 4JH3-HTE,DTE

MARKS OF PIPING	NAME
RH	RUBBER HOSE
SGP STS	STEEL PIPE
C1201T	COPPER PIPE
	(UNION) SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB. OIL PIPING
	FUEL. OIL PIPING





DETAIL OF PART Ⓐ



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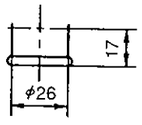
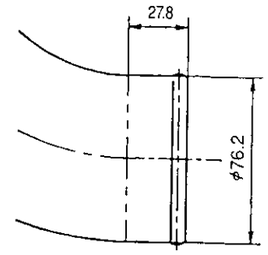


DETAIL OF PART Ⓒ



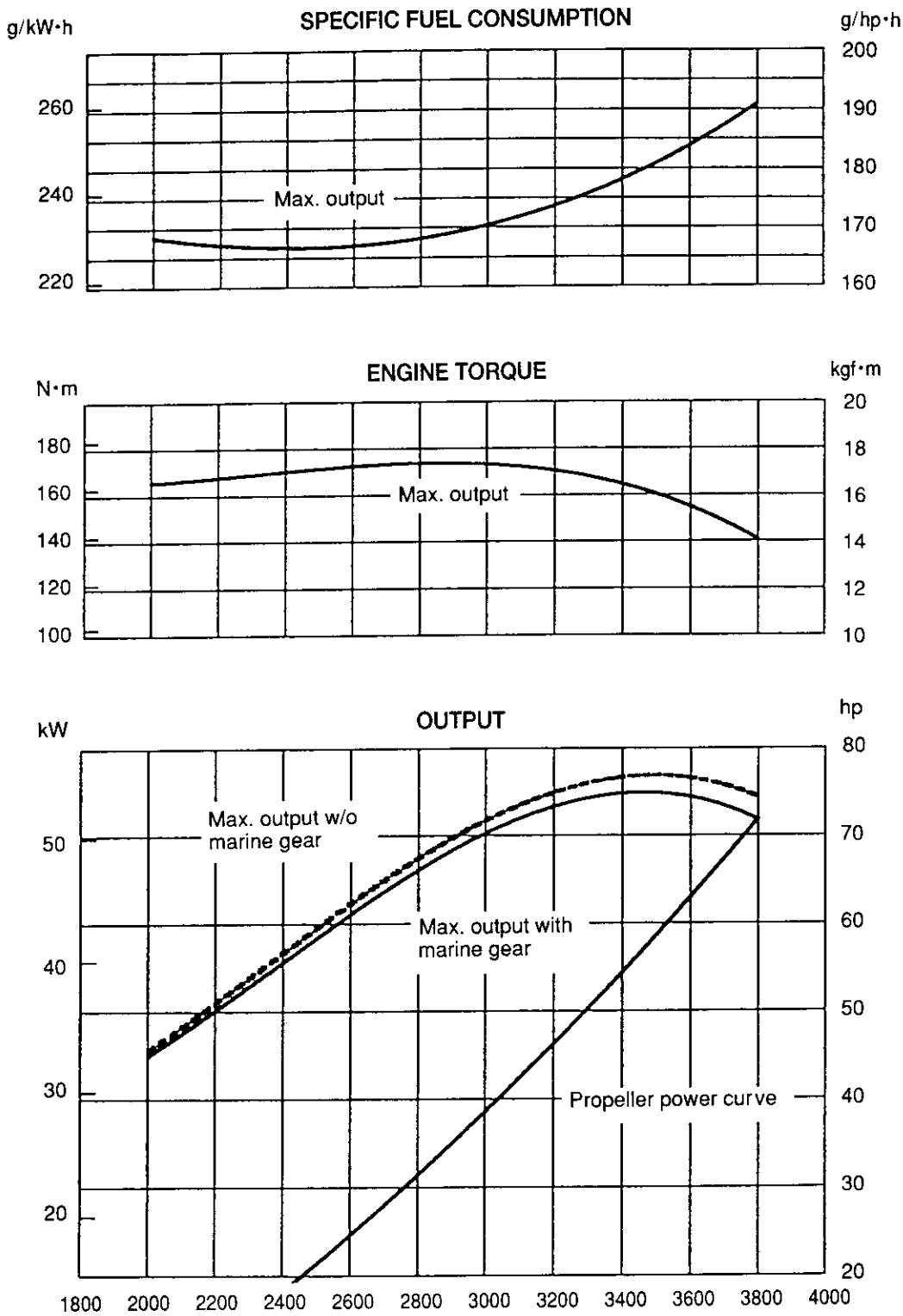
DETAIL OF PART Ⓓ

NOTE
1. DIMENSION OF STEELPIPE : OUTER DIA. XTHICKNESS
   DIMENSION OF RUBBER PIPE : INNER DIA. XTHICKNESS
2. FUEL RUBBER PIPES ARE SATISFIED MITH
   THE SPECIFICATION OF MANUFACTUER
   (NO. KH-500-0) (MARKED ※)

For KM4A and KBW21 Marine gear

2.5 Performance Curves

● 4JH3-TE (Max.output : 53.0kW/3800rpm with marine gear)



● 4JH3-HTE (Max.output : 70.6kW/3800rpm with marine gear)