

HINSHI-H10-011

SERVICE MANUAL

YANMAR Marine Gear

**KM3P/KM3A/KM4A
KBM20/KBM21/KMH4A**

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Introduction


This manual describes the handling and maintenance for KM3P, KM3A, KM4A, KBW20, KBW21 and KMH4A Marine Gears. Please use the manual to help you make necessary adjustments to the marine gear accurately, quickly, and safely. This manual explains the use with a standard engine.

In order to improve the quality of your marine gear, you will be notified of any modifications which have been made.



1. To Perform Service Safely

1.1 Warning Symbols

- Most accidents are caused by negligence of basic safety rules and precautions. For accident prevention, it is important to avoid such causes before development to accidents. Please read this manual carefully before starting repair or maintenance to fully understand safety precautions and appropriate inspection and maintenance procedures. Attempting a repair or maintenance job without sufficient knowledge may cause an unexpected accident.
- It is impossible to cover every possible danger in repair or maintenance in the manual. Sufficient consideration for safety is required in addition to the matters marked  CAUTION. Especially for safety precautions in a repair or maintenance job not described in this manual, receive instructions from a knowledgeable leader.
- Warning Symbols used in this manual and their meanings are as follows :



DANGER-Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.



WARNING-Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.



CAUTION-Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

- Any matter marked **[NOTICE]** in this manual is especially important in serving. If not observed, the product performance and quality may not be guaranteed.



1.2 Precautions for Safe Servicing

(1) Service Shop (Place)

⚠ CAUTION

● **Sufficiently wide and flat place**

The floor space of the service shop for inspection and maintenance shall be sufficiently wide and flat without any hole.

[Otherwise]

An accident such as a violent fall may be caused.

⚠ CAUTION

● **Clean, orderly arranged place**

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

[Otherwise]

An unexpected accident may be caused.

⚠ CAUTION

● **Bright, safety illuminated place**

The working place should be illuminated sufficiently and safely.

For a job in a dark position involving difficulty in observation, use a portable safety lamp. The bulb shall be covered with a wire cage.

[Otherwise]

The bulb may be broken accidentally to cause ignition of leaking oil.

⚠ CAUTION

● **Place equipped with a fire extinguisher**

Keep a first aid kit and fire extinguisher close at hand in preparation for an emergency of fire.

(2) Working Wear

⚠ CAUTION

● **Wears for safe operation**

Wear a helmet, working clothes, safety shoes and other safety protectors matching each job. Especially, wear well-fitting working clothes.

[Otherwise]

A serious accident such as trapping by a machine may arise.

(3) Tools to Be Used



● **Appropriate holding and lifting**

Never operate when the marine gear is supported with blocks or wooden pieces or only with a jack. To lift and hold the marine gear, always use a crane with a sufficient allowance in limit load or a rigid jack.

[Otherwise]

A serious accident may arise.



● **Use of appropriate tools**

Use tools matching the jobs to be done. Use a correctly sized tool for loosening or tightening a machine part.

[Otherwise]

A serious injury or marine gear damage may arise.

(4) Use of Genuine parts, Oil and Grease



● **Always use genuine product**

[Otherwise]

Shortening of marine gear life or an unexpected accident may arise.

(5) Bolt and Nut Tightening Torques



● **Always tighten to the specified torque if designated in the manual**

[Otherwise]

Loosening or falling may cause parts damage or an injury.

(6) Handling Of Product



● **Pay attention to hot portions**

Do not touch the engine or marine gear during running or immediately after it is stopped

[Otherwise]

Scalding may be caused by a high temperature.

(7) Waste Disposal

⚠ CAUTION

Observe the following instructions with regard to waste disposal. Negligence of each instruction will cause environmental pollution.

- Waste fluids such as engine and marine gear oil and cooling water shall be discharged into a container without spillage onto the ground.
- Do not let waste fluids be discharged into the sewerage, a river or the sea.
- Harmful wastes such as oil, fuel, coolants, solvents, filter elements and battery shall be disposed according to the relevant laws and regulations. Ask a qualified disposal company for example.



2. General

2.1 Specifications

● **KM3P**

Engine output (max.) (Flywheel) kw(hp)/rpm		41.2(56)/3800				
Clutch		Constant mesh gear with serve cone clutch (wet type)				
Reduction ratio	Forward	2.36	2.61	3.20	2.36	2.61
	Reverse	3.16	3.16	3.16	3.16	3.16
Direction of rotation	Input shaft		Counter-clockwise, viewed from stern			
	Output shaft	Forward	Clockwise, viewed from stern			
		Reverse	Counter-clockwise, viewed from stern			
Position of shift lever		Right side, viewed from stern				
Lubrication oil		SAE 20/30				
Lubrication oil capacity ℓ		0.35				
Applicable engin (Standard name)		3JH3E, 4JH3E				
Dry mass kg(N)		13(127)				

● **KM3A**

Engine output (max.) (Flywheel) kw(hp)/rpm		41.2(56)/3800				
Output shaft		excentric down angle				
Clutch		Constant mesh gear with serve cone clutch (wet type)				
Reduction ratio	Forward	2.33	2.64	3.21	2.33	2.64
	Reverse	3.04	3.04	3.04	3.04	3.04
Direction of rotation	Input shaft		Counter-clockwise, viewed from stern			
	Output shaft	Forward	Clockwise, viewed from stern			
		Reverse	Counter-clockwise, viewed from stern			
Position of shift lever		Right side, viewed from stern				
Lubrication oil		SAE 20/30				
Lubrication oil capacity ℓ		0.45				
Applicable engin (Standard name)		3JH3E, 4JH3E				
Dry mass kg(N)		13(127)				

● **KM4A**

Engine output (max.) (Flywheel) kw(hp)/rpm		73.6(100)/3800				
Output shaft		excentric 7° down angle				
Clutch		Constant mesh gear with serve cone clutch (wet type)				
Direction of rotation	Input shaft		Counter-clockwise, viewed from stern			
	Output shaft		Bi-rotation			
Reduction ratio (Both forward and reverse)		3.30	2.63	2.14		
Position of shift lever		Right side, viewed from stern				
Lubrication oil		Same as Engine lube oil				
Lubrication oil capacity ℓ		1.3				
Lube oil cooler		Sea-water cooling				
Applicable engin (Standard name)		4JH3E, 4JH3-TE, 4JH3-HTE				
Dry mass kg(N)		28(274)				

● KBW20

Engine output (max.) (Flywheel) kw(hp)/rpm		41.2(56)/3800					
Reduction system		One-stage reduction, helical gear					
Reversing system		Constant mesh gear					
Clutch		Wet type multi-disc, mechanically operated					
Reduction ratio	Forward	2.17	2.62	3.28	2.17	2.62	3.28
	Reverse	3.06			3.06		
Direction of rotation	Input shaft	Counterclockwise as viewed from stern					
	Output shaft	Forward	Clockwise as viewed from stern				
		Reverse	Counterclockwise as viewed from stern				
Lubrication oil		DEXRON ATF					
Lubrication oil capacity		ℓ		1.2			
Applicable engine (Standard name)		4JH3E					
Dry mass kg(N)		26(255)					

● KBW21

Engine output (max.) (Flywheel) kw(hp)/rpm		73.6(100)/3800					
Reduction system		One-stage reduction, helical gear					
Reversing system		Constant mesh gear					
Clutch system		Wet type multi-disc, mechanically operated					
Reduction ratio	Forward	2.17	2.62	—	2.17	2.62	
	Reverse	3.06			3.06		
Direction of rotation	Input shaft	Counterclockwise as viewed from stern					
	Output shaft	Forward	Clockwise as viewed from stern				
		Reverse	Counterclockwise as viewed from stern				
Lubrication oil		DEXRON ATF					
Lubrication oil capacity		ℓ		1.2			
Lube oil cooler		Sea-water cooling					
Applicable engine (Standard name)		4JH3-TE, 4JH3-HTE					
Dry mass kg(N)		30(294)					

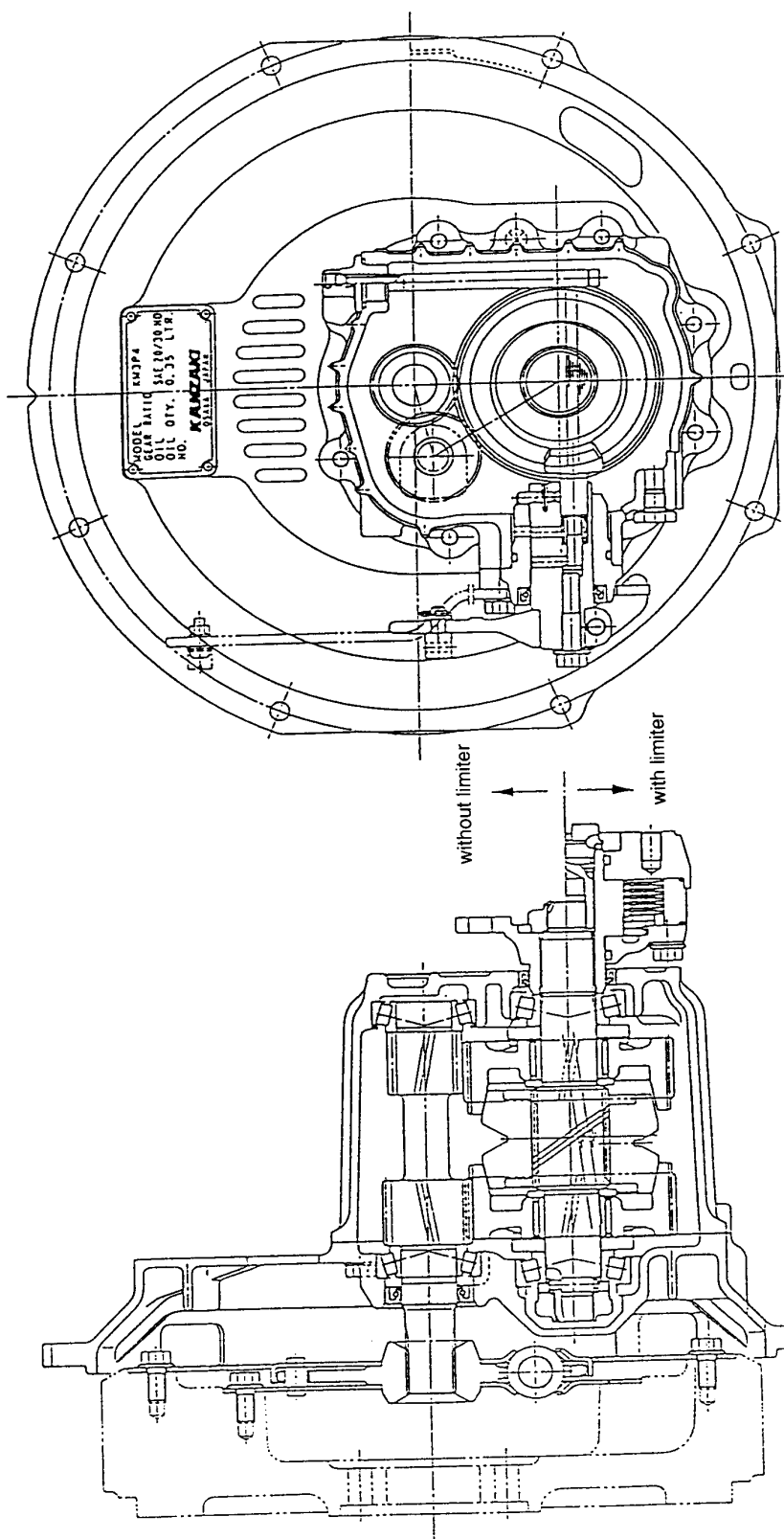
● KMH4A

Engine output (max.) (Flywheel) kw(hp)/rpm		91.9(125)/3800					
Output shaft		eccentric 8° down angle					
Reduction system		One-stage reduction, helical gear					
Reversing system		Constant mesh gear					
Clutch		Wet type multi-disc, hydraulic operation					
Reduction ratio (Both forward and reverse)		2.04			2.45		
Direction of rotation	Input shaft	Counter-clockwise, viewed from stern					
	Output shaft	Forward	Clockwise, viewed from stern				
		Reverse	Counter-clockwise, viewed from stern				
Lubrication oil		SAE30					
Lubrication oil capacity		ℓ		2.0			
Lubrication oil cooler		Sea-water cooling					
Applicable engine (Standard name)		4JH3-TE, 4JH3-HTE, 4JH3-DTE					
Dry mass		kg(N)		31(304)			

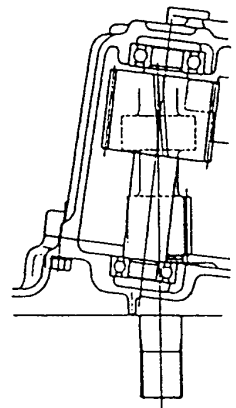
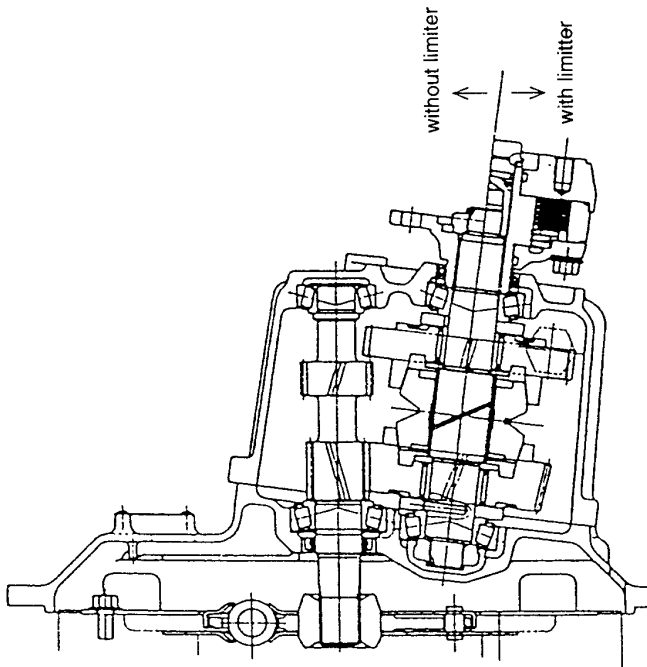
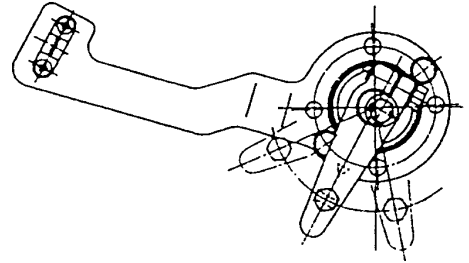
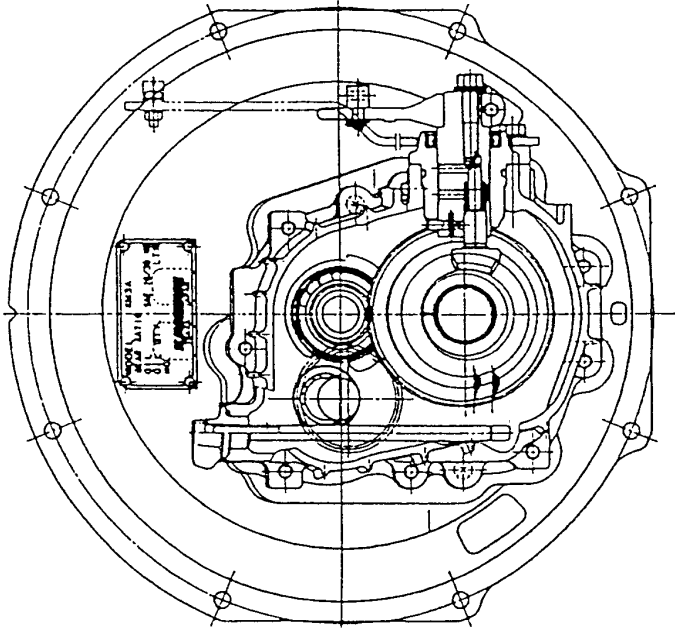


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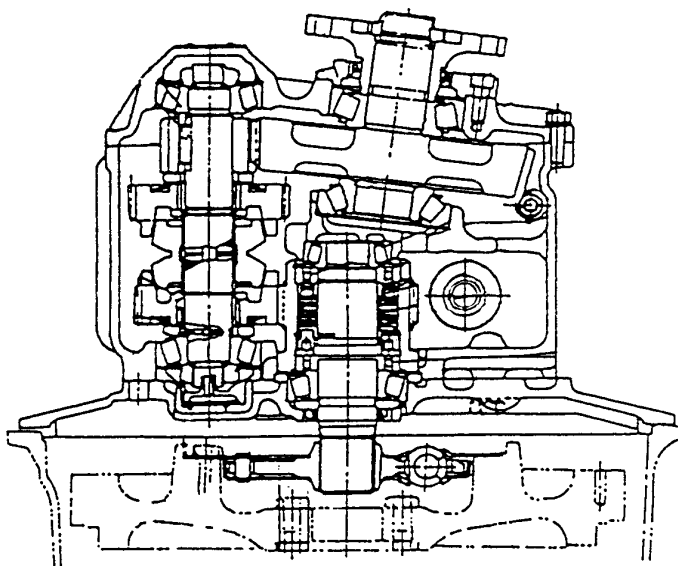
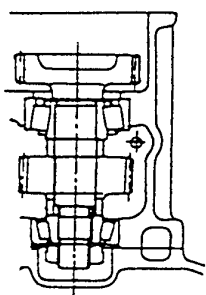
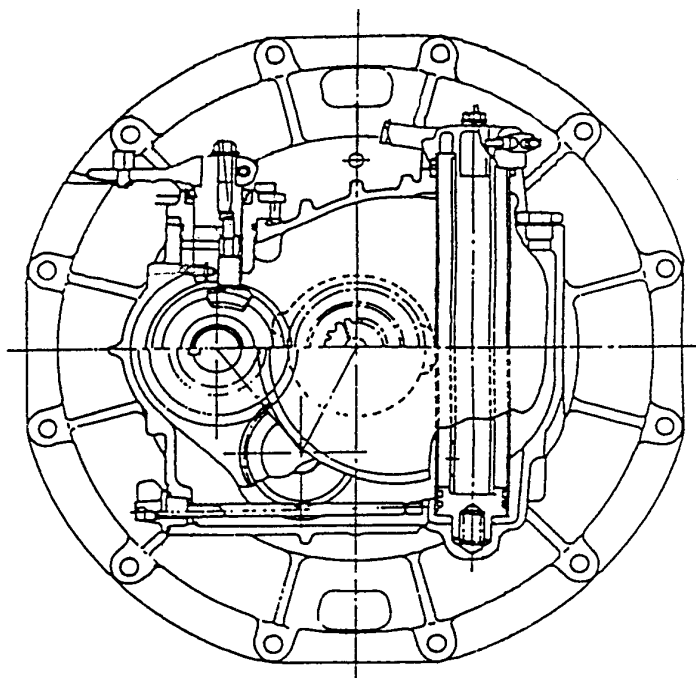
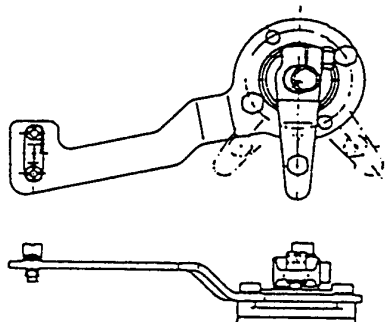
- KM3P



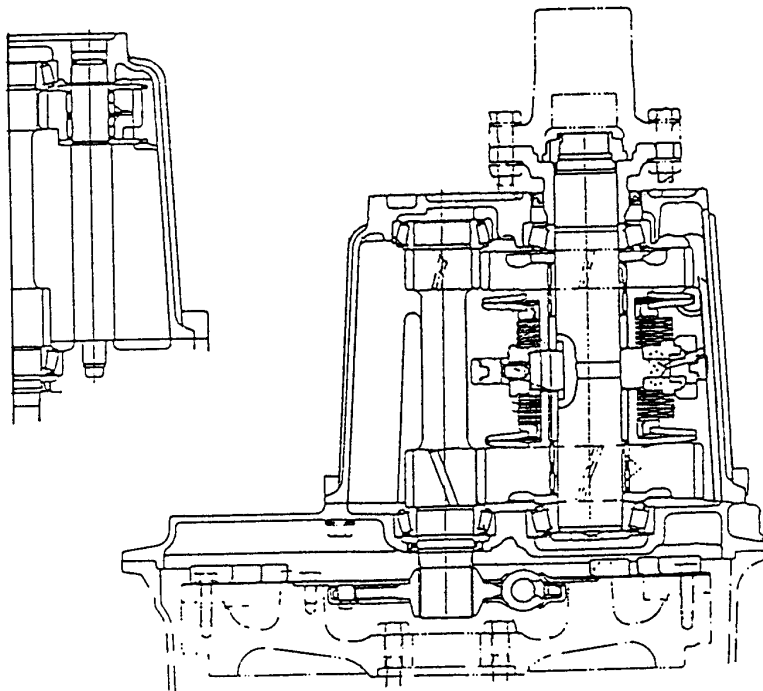
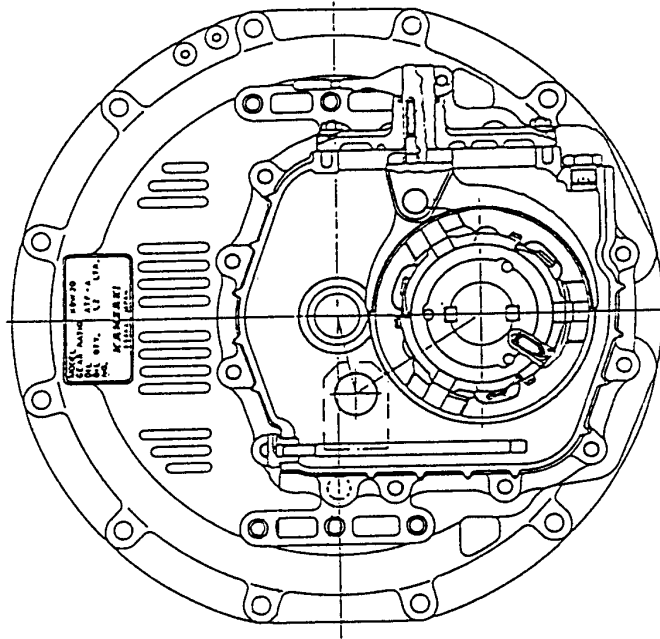
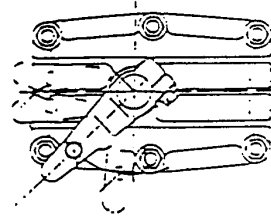
• KM3A



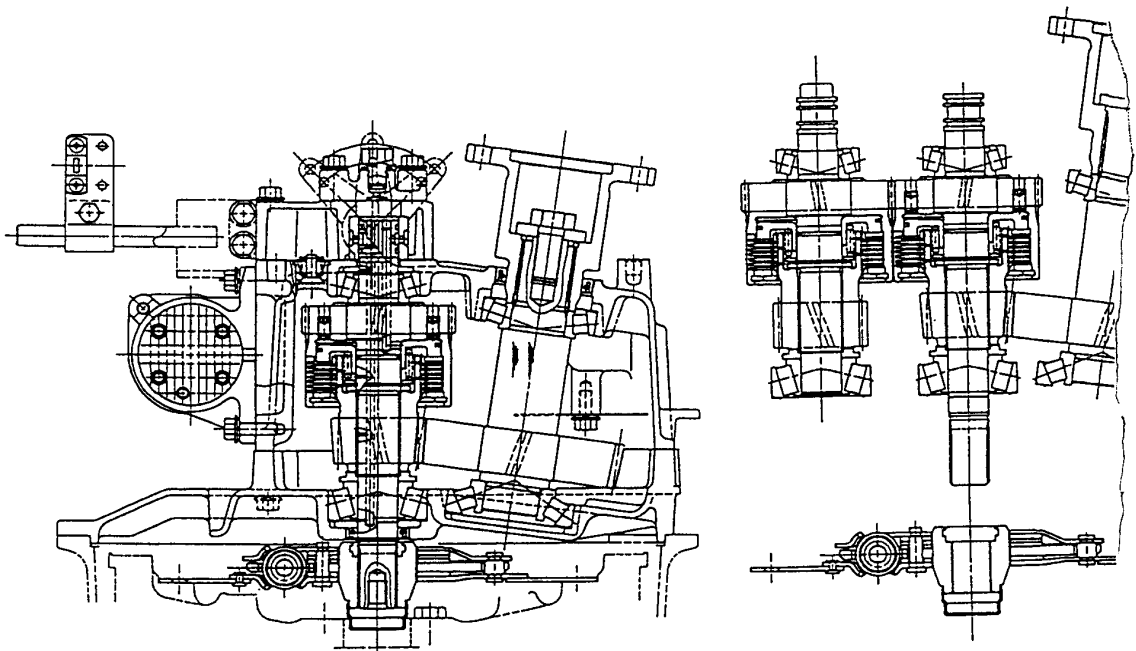
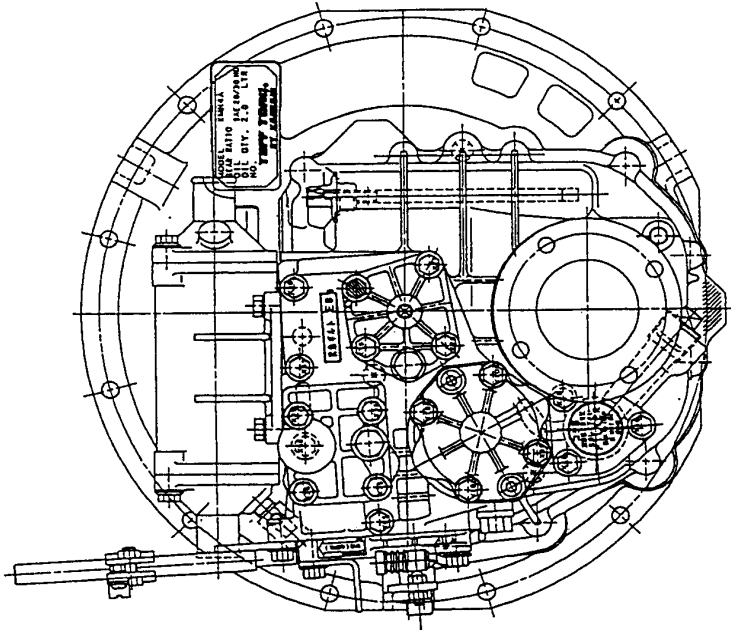
• KM4A



● KWB20



● KMH4A





3. Overhaul

3.1 Precautions

(1) For Safe Operation

Read the safety precautions at the beginning of this manual carefully and operate safely.

(2) Past Inspections for the Engine and the Marine Gear

For precise, high-quality operation, preparation is necessary. Check the customer management file for the past performance of the engine and marine gear.

- (2.1) When was the last maintenance work done?
- (2.2) How much has the marine gear been used (length of time/hrs. of use) since the last maintenance work?
- (2.3) What problems were found at the last inspection, and what maintenance work was performed?
- (2.4) Are the parts needed for replacement during maintenance on hand?
- (2.5) Is there a check sheet for the maintenance work?

(3) Preparation for Disassembly

- (3.1) Have ready all-purpose tools, special tools, gauges, grease, disposable parts, and replacement parts.
- (3.2) When disassembling complicated sections, make alignment markings which will not damage the parts but will make reassembly easier.

(4) Precautions for Disassembly

- (4.1) As each part is removed, check its condition and look for changes in shape, damage, and scratches.
- (4.2) Disassemble the parts in an orderly manner separating parts which can be reused from those which need to be replaced.
- (4.3) Clean or wash the parts to be reused thoroughly.

(5) Inspection and Measurement

- (5.1) Make the necessary inspections and measurements for parts to be reused and determine whether they are good or bad.

(6) Reassembly

- (6.1) Use the correct parts and assemble them in the correct manner to specified standards (tightening torque, adjustment values, etc.). Also, grease the important bolts and nuts as specified.
- (6.2) Be sure to use genuine parts for replacements.
- (6.3) Be sure to replace oil seals, O-rings, and packings with new ones.
- (6.4) Depending upon the placement of the packing, grease the seal packing, oil or grease moving parts, and insert grease in the lip of the oil sheet.

(7) Adjustment and Inspection:

- (7.1) Use gauges and testers to adjust to the specified standard.



3. Overhaul (Preparing for Overhaul)

3.2 Preparing for Overhaul

Prepare for the disassembly and maintenance of the marine gear as follows.

- (1) Secure the marine gear on a level base.

⚠ CAUTION

*Be sure the marine gear is secured.
If the marine gear falls over during operation, injury
or damage to parts may occur.*

- (2) Drain the marine gear lube oil.

- (3) Clean off any dirt, oil, or dust on the marine gear with detergent, air, steam, etc.

[NOTICE]

Be careful not to get any dust inside the marine gear during operation.

⚠ CAUTION

*Wear goggles and protective gear when using air or steam.
Flying particles may injure the eyes.*

[NOTICE]

- Be sure to replace the parts which upon inspection and measurement are faulty, whose measurements are outside the prescribed limits, or have exceeded the prescribed period of use.
- Parts which still meet the standard measurements and prescribed period of use, but which are expected to fall below the standard before the next inspection should be replaced early.



3.3 KM3P

3.3.1 Construction

3.3.1.1 Construction

This clutch is a cone-type, mechanically operated clutch. When the drive cone (which is connected to the output shaft by the lead spline) is moved forward or backward, its taper contacts with the large gear and transfers power to the output shaft.

The construction is simple when compared with other types of clutch and it serves to reduce the number of components, making for a lighter, more compact unit which can be operated smoothly. Although it is small, the power transmission efficiency is high even under a heavy load. Its durability is high and it is also reliable because high grade materials are used for the shaft and gear, and a taper roller bearing is incorporated. Power transmission is smooth because connection with the engine is made through the damper disc.

- The drive cone is made from special aluminum bronze which has both higher wear-resistance and durability. The drive cone is connected with the output shaft through the thread spline. The taper angle, diameter of the drive cone, twist angle, and diameter of the thread spline, are designed to give the greatest efficiency, thus ensuring that the drive cone can be readily engaged or disengaged.
- Helical gears are used for greater strength. The intermediate shaft is supported at 2 points to reduce deflection and gear noise.
- The clutch case and mounting flange are made from an aluminum alloy of special composition to reduce weight.

It is also anticorrosive against seawater.

- As the damper disc is fitted to the input shaft, power can be transmitted smoothly.
- There is small clearance between the dipstick and the inside of the dipstick tube. A small hole in the dipstick works as a breather.
- When the load on the propeller is removed, the engagement of the drive cone and the large gear is maintained by the shifter and V-groove of the drive cone. Even when the drive cone's tapered area and V-groove are worn, this engagement is maintained by the shift lever device and accordingly no adjustment of the remote control cable is required.
- The cup spring on the rear of the larger gear absorbs rotational fluctuations and stabilizes the engagement of the drive cone and the larger gear. Thus, the durability of the cone against wear is enhanced.

3.3.1.2 Specifications

Model		KM3P				
For engine models (standard)		3JH3E			4JH3E	
Clutch		Constant mesh gear with servo cone clutch (wet type)				
Reduction ratio	Forward	2.36	2.61	3.20	2.36	2.61
	Reverse	3.16	3.16	3.16	3.16	3.16
Direction of rotation	Input shaft	Counter-clockwise, viewed from stern				
	Output shaft	Forward	Clockwise, viewed from stern			
		Reverse	Counter-clockwise, viewed from stern			
Remote control	Control head	Single lever control				
	Cable	Morse. 33-C (cable travel 76.2mm or				
	Clamp	YANMAR made. standard accessory				
	Cable connector	YANMAR made. standard accessory				
Output shaft coupling	Outer diameter	$\phi 100$ mm (3.93")				
	Pitch circle diameter	4- $\phi 78$ mm (3.07")				
	Connecting bolt holes i	4- $\phi 10.5$ mm (4- $\phi 0.41$ ")				
Position of shift lever		Right side, viewed from stern				
Lubricating oil		SAE 20/30				
Lubricating oil capacity		ℓ 0.35				
Dry mass		kg(N) 13 (127)				

Note

In the case of clutch model KM3A, when are larger propeller or moment of inertia of the propeller than those listed in the table below is used, install the limiter (Option).

Reduction ratio	No. of blade	Diameter of the propeller	Moment of inertia GD^2 kg-m ² (N-m ²)	Material
2.36	3	450 (17.5)	≤ 0.15 (1.47)	Bronze
	4	425 (16.5)		
2.61	3	470 (18.5)	≤ 0.19 (1.86)	
	4	440 (17.5)		
3.20	3	490 (19)	≤ 0.23 (2.25)	
	4	460 (18)		