



KMH60A
KMH61A
SERVICE MANUAL

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YAMAHA
®

MARINE
GEAR

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Section 1

INTRODUCTION

This manual gives specific instructions for the proper repair on KMH transmissions.

Please follow the procedures carefully to ensure quality service.

Yanmar recommends that you read this *Service Manual* completely before starting with repairs, as some of the procedures described are rather complex.

Along with standard tools, Yanmar recommends the use of special tools, necessary to perform repairs correctly.

Yanmar products are continuously undergoing improvement. This *Service Manual* has been checked carefully in order to avoid errors. However Yanmar is not liable, for any misrepresentations, errors of description or omissions. Contact an authorized Yanmar marine dealer or distributor for any questions you have regarding this *Service Manual*.

INTRODUCTION

REVISION HISTORY

This manual is a living document. Periodic manual revisions are published to document product improvements and changes. This practice ensures the manual has the most current information.

As manual revisions become necessary, individual pages are prepared and sent to those who need the information. If a page, or number of pages should be replaced, the replacement information is sent along with a revised **Revision Control Table**. Discard the older, obsolete information.

At times the revision involves inserting additional pages in one or more sections. Insert the new information and only the **Revision Control Table** should be replaced.

This method of revision control represents the most cost-effective solution to providing fresh, updated information as needed.

Revision Control Table

Revision Number Revision Date	Volume	New Page Numbers Involved	Remarks	Initiating Dept.

Section 2

SAFETY

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Yanmar is concerned for your safety and the condition of your marine gear. Safety statements are one of the primary ways to call your attention to the potential hazards associated with Yanmar marine gear. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your marine gear. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.



This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

DANGER

Danger (the word “DANGER” is in white letters with a red rectangle behind it) - indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Danger is limited to the most extreme situations.

000001en

WARNING

Warning (the word “WARNING” is in black letters with an orange rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

000001en

CAUTION

Caution (the word “CAUTION” is in black letters with a yellow rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

000001en

CAUTION

Caution without the safety alert symbol indicates a potentially hazardous situation that can cause damage to the marine gear, personal property and / or the environment or cause the marine gear to operate improperly.

000001enTrans

SAFETY PRECAUTIONS

Before You Service

CAUTION



NEVER permit anyone to install or operate the marine gear without proper training.

Read and understand this Service Manual before you operate or service the marine gear to ensure that you follow safe servicing practices and maintenance procedures.

- Safety signs and labels are additional reminders for safe service and maintenance techniques.
- See your authorized Yanmar marine dealer or distributor for your installation, service and training needs.

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Precautions for Safe Servicing

DANGER



CRUSH HAZARD!

- Always use lifting equipment with sufficient capacity to lift marine gear.
- Have a helper assist you attaching the marine gear to the hoist.
- **NEVER** stand under hoisted marine gear. If the hoist mechanism fails, the marine gear will fall on you, causing serious injury or death.
- **NEVER** support marine gear with equipment not designed to support the weight of the marine gear such as wooden pieces, blocks or by only using a jack.
- Failure to comply will result in death or serious injury.

000008enTransSM

! DANGER**FIRE HAZARD!**

- Keep fire extinguishers handy in case of fire. Clearly indicate the location of the fire extinguishers with a safety sign.
- Ensure that the type of fire extinguishers are appropriate for material that might catch fire. Check with local authorities.
- Have all fire extinguishers checked periodically for proper operation and / or readiness.
- Post evacuation routes prominently. Periodically conduct fire drills.
- Ensure that appropriate fire detection and extinguishing equipment are installed and checked periodically for proper operation. Check with local authorities.
- Failure to comply will result in death or serious injury.

0000018en

! WARNING**SUDDEN MOVEMENT HAZARD!**

- When you install the “emergency nut” the boat will move forward as soon as you start the engine! Make sure the area is clear before you start the engine.
- Failure to comply could result in death or serious injury.

0000025en

! WARNING**SEVER HAZARD!**

- Keep hands and other body parts away from moving / rotating parts such as the flywheel or PTO shaft.
- Wear tight-fitting clothing and keep your hair short or tie it back while the engine is running.
- Remove all jewelry before you operate or service the marine gear.
- NEVER start the engine in gear. Sudden movement of the engine and / or vessel could cause death or serious personal injury.
- NEVER operate the marine gear without the guards in place.
- Before you start the engine make sure that all bystanders are clear of the area.
- Keep children and pets away while the engine is operating.
- Check before starting the engine that any tools or shop rags used during maintenance have been removed from the area.
- Failure to comply could result in death or serious injury.

0000002enTrans

⚠ WARNING

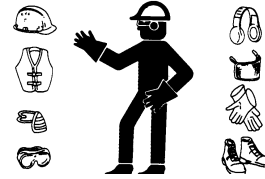


ALCOHOL AND DRUG HAZARD!

- NEVER operate the vessel while you are under the influence of alcohol or drugs.
- NEVER operate the vessel when you are feeling ill.
- Failure to comply could result in death or serious injury.

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⚠ WARNING



EXPOSURE HAZARD!

- Wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task at hand.
- NEVER wear jewelry, unbuttoned cuffs, ties or loose-fitting clothing when you are working near moving / rotating parts such as the cooling fan, flywheel or PTO shaft.
- ALWAYS tie back long hair when you are working near moving / rotating parts such as a cooling fan, flywheel, or PTO shaft.
- NEVER operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the alert signals.
- Failure to comply could result in death or serious injury.

000005en

⚠ WARNING**SHOCK HAZARD!**

- Turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the electrical system.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors. **ALWAYS** keep the connectors and terminals clean.
- Failure to comply could result in death or serious injury.

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⚠ WARNING**SEVER HAZARD!**

- Stop the engine before you begin to service the marine gear.
- Secure the propeller so it will not turn before you service the marine gear.
- **NEVER** leave the key in the key switch when you are servicing the marine gear. Someone may accidentally start the engine and not realize you are servicing it. This could result in a serious injury.
- If you must service the marine gear while it is operating, remove all jewelry, tie back long hair, and keep your hands, other body parts and clothing away from moving / rotating parts.
- Failure to comply could result in death or serious injury.

000010enTrans

⚠ WARNING**BURN HAZARD!**

- If you must drain the marine gear oil while it is still hot, stay clear of the hot marine gear oil to avoid being burned.
- **ALWAYS** wear eye protection.
- Failure to comply could result in death or serious injury.

000011enTrans

WARNING



BURN HAZARD!

- Wait until the engine cools before you drain the engine coolant. Hot engine coolant may splash and burn you.
- Failure to comply could result in death or serious injury.

0000016en

WARNING

SEVER HAZARD!

- NEVER service the marine gear while under tow or if the engine is running at idle speed. The propeller may rotate under these circumstances.
- Failure to comply could result in death or serious injury.

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WARNING

SEVER HAZARD!

- If the vessel has more than one engine, NEVER service a marine gear if either of the engines are running. In multi-engine configurations the propeller for an engine that is shut down may rotate if any of the other engines are running.
- Failure to comply could result in death or serious injury.

0000022en

WARNING

SUDDEN MOVEMENT HAZARD!

- Shift the marine gear into the NEUTRAL position any time the engine is at idle.
- Failure to comply could result in death or serious injury.

0000023en

WARNING



BURN HAZARD!

- Keep your hands, and other body parts, away from hot engine and marine gear surfaces such as the muffler, exhaust pipe, turbocharger (if equipped), engine block and marine gear chassis during operation and shortly after you shut down the engine. These surfaces are extremely hot while the engine is operating and could seriously burn you.
- Failure to comply could result in death or serious injury.

0000015enTrans

WARNING

Use heat resistant gloves when handling the hot housing halves and outer races.

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⚠ WARNING**FUME / BURN HAZARD!**

- Always read and follow safety related precautions found on containers of hazardous substances like parts cleaners, primers, sealants and sealant removers.
- Failure to comply could result in death or serious injury.

000014en

⚠ WARNING

Use heat resistant gloves when handling the hot housing halves and outer races.

0000102en

⚠ WARNING**BURN HAZARD!**

- Handle heated thrust collars with heat resistant gloves!
- Failure to comply could result in death or serious injury.

0000103en

⚠ WARNING**BURN HAZARD!**

- Handle heated tapered roller bearings with heat resistant gloves!
- Failure to comply could result in death or serious injury.

0000104en

⚠ WARNING**BURN HAZARD!**

- Handle heated tapered roller bearing outer races with heat resistant gloves!
- Failure to comply could result in death or serious injury.

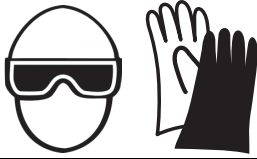
0000105en

⚠ WARNING**BURN HAZARD!**

- Handle heated output coupling with heat resistant gloves!
- Failure to comply could result in death or serious injury.

0000106en

⚠ CAUTION



COOLANT HAZARD!

- Wear eye protection and rubber gloves when you handle long life or extended life engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.
- Failure to comply may result in minor or moderate injury.

000005en

⚠ CAUTION



FLYING OBJECT HAZARD!

- ALWAYS wear eye protection when servicing marine gear and when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.
- Failure to comply may result in minor or moderate injury.

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⚠ CAUTION



SLIPPING AND TRIPPING HAZARD!

- Ensure that adequate floor space is set aside for servicing marine gear. The floor space must be flat and free of holes.
- Keep floor free of dust, mud, spilled liquids and parts to help prevent slipping and tripping.

Failure to comply may result in minor or moderate injury.

0000022en

⚠ CAUTION

POOR LIGHTING HAZARD!

- Ensure that the work area is adequately illuminated.
- Use task lighting to illuminate areas that need additional illumination.
- Always place wire cage on portable safety lamps.
- Failure to comply may result in minor or moderate injury.

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⚠ CAUTION**TOOL HAZARD!**

- Use tools appropriate for the task at hand.
- Use the correct size tool for loosening or tightening machine parts.
- Failure to comply may result in minor or moderate injury.

0000024en

CAUTION

Observe the following environmental operating conditions to maintain marine gear performance and avoid premature marine gear wear:

- Avoid operating in extremely dusty conditions.
- Avoid operating in the presence of chemical gases or fumes.

0000003enTrans

CAUTION

If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.

0000021en

CAUTION

NEVER hold the key in the **START** position for longer than 15 seconds or the starter motor will overheat.

0000007en

CAUTION

The illustrations and descriptions of optional equipment in this manual, such as the operator's console, are for a typical marine gear installation. Refer to the documentation supplied by the optional equipment manufacturer for specific operation and maintenance instructions.

0000018enTrans

CAUTION

Observe the following environmental operating conditions to maintain marine gear performance and avoid premature marine gear wear:

- **NEVER** run the marine gear if the ambient temperature is above $+45^{\circ}\text{C}$ ($+113^{\circ}\text{F}$) or below -15°C ($+5^{\circ}\text{F}$).
- If the ambient temperature exceeds $+45^{\circ}\text{C}$ ($+113^{\circ}\text{F}$) the marine gear may overheat and cause the marine gear oil to break down.
- If the ambient temperature falls below -15°C ($+5^{\circ}\text{F}$) rubber components such as gaskets and seals will harden causing premature marine gear wear and damage.
- Contact your authorized Yanmar marine dealer or distributor if the marine gear will be operated in either temperature extreme.

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CAUTION

- Only use the marine gear oil specified. Other marine gear oils may affect warranty coverage, cause internal marine gear components to seize and / or shorten marine gear life.
- Prevent dirt and debris from contaminating marine gear oil. Carefully clean the oil plug and dipstick and the surrounding area before you remove either one.
- NEVER mix different types of marine gear oil. This may adversely affect the lubricating properties of the marine gear oil.
- NEVER overfill. Overfilling may result in internal damage.

000005enTrans

CAUTION

The correct level of marine gear oil is very important for proper marine gear function:

- Check the marine gear for the proper amount of marine gear oil before you start the engine for the first time.
- Running the engine with insufficient oil level in the marine gear will cause damage to internal marine gear components.
- NEVER overfill the marine gear with marine gear oil. An excessive oil level may cause leakage at the shaft seals and the marine gear breather, and raise the operating temperature considerably.
- ALWAYS keep the oil level between upper and lower lines on the dipstick.

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CAUTION

Before operating the engine, check marine gear oil level.

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CAUTION

- During normal operation, the marine gear should only be shifted with the engine at idle.
- Shifting at higher engine speed may damage the friction disks and should be avoided in normal operation.
- In an emergency situation you can shift the marine gear at higher engine speed.

0000073en

CAUTION

If the marine gear oil temperature is too high, stop engine immediately and check the marine gear oil level and check the oil cooler for proper coolant and water flow.

Have the marine gear serviced by an authorized Yanmar marine dealer or distributor before you start the engine again.

0000074en

CAUTION

After you add marine gear oil, run the engine for several minutes and shut it down. Wait at least 10 minutes to check the marine gear oil level. This allows the oil to drain back into the sump, otherwise, you may overfill the marine gear with oil.

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CAUTION**New Marine Gear Break-In:**

- On the initial engine start-up, allow the engine to idle for approximately 15 minutes while you check for proper marine gear function and marine gear oil leaks.
- During the break-in period, carefully observe marine gear indicators (if any) for proper marine gear function.
- During the break-in period, check the marine gear oil levels frequently.

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CAUTION

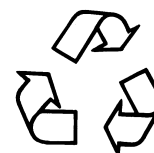
NEVER engage the starter motor while the engine is running. This may damage the starter motor pinion and / or ring gear.

0000012en

CAUTION

- **NEVER** attempt to modify the marine gear's design or safety features.
- Failure to comply may impair the marine gear's safety and performance characteristics and shorten the marine gear's life. Any alterations to this marine gear may affect the warranty coverage of your marine gear.

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CAUTION

- **ALWAYS** be environmentally responsible.
- Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.
- **NEVER** dispose of hazardous materials irresponsibly by dumping them into a sewer, on the ground, or into ground water or waterways.
- Failure to follow these procedures may seriously harm the environment.

0000013en

CAUTION

Protect the electric components from damage when you use steam or use high-pressure water to clean the engine or marine gear.

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CAUTION

If any indicator illuminates during engine operation, stop the engine immediately. Determine the cause and repair the problem before you continue to operate the engine.

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CAUTION

Establish a periodic maintenance plan according to the engine application and make sure you perform the required periodic maintenance at intervals indicated. Failure to follow these guidelines will impair the marine gear's safety and performance characteristics, shorten the marine gear's life and may affect the warranty coverage on your marine gear.

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CAUTION

Always tighten to the specified torque. Loose parts can cause equipment damage or cause it to operate improperly.

0000148en

CAUTION

Keep dirt out of marine gear housing. Dirt may shorten the life of the marine gear and cause it to operate improperly.

0000149en

CAUTION

If you have more than one engine, you cannot shift the marine gear into the "B" position after you install the "emergency nut."

0000077en

CAUTION

It is important to perform daily checks. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the marine gear.

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CAUTION

Only use replacement parts specified. Other replacement parts may affect warranty coverage, cause internal marine gear components to seize, or shorten marine gear life.

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