

OPERATION MANUAL

YANMAR®

MARINE DIESEL ENGINE

4JH4-TE



Be sure to read this manual for safe and
proper operation.
Store this manual carefully after use.

Thank you for purchasing the YANMAR Marine Diesel Engine.

[INTRODUCTION]

- This Operation Manual describes the operation, maintenance and inspection of the 4JH4-TE Yanmar Marine Diesel Engines.
- Read this Operation Manual carefully before operating the engine to ensure that it is used correctly and that it stays in the best possible condition.
- Keep this Operation Manual in a convenient place for easy access.
- If this Operation Manual is lost or damaged, order a new one from your dealer or distributor.
- Make sure this manual is transferred to subsequent owners. It should be considered as a permanent part of the engine and remain so.
- Constant efforts are made to improve the quality and performance of Yanmar products, so some details included in this Operation Manual may differ slightly from your engine. If you have any questions about this, please contact your Yanmar dealer or distributor.

Operation Manual (Marine Engine)	Model	4JH4-TE
	Code No.	42221-556180

- The essentials of the sail drive are described in this manual. For further details on its use, refer to the sail drive manual.

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1. FOR YOUR SAFETY

1.1 Warning Symbols

Most operation, maintenance and inspection problems arise due to users' failure to comply with the rules and precautions for safe operation described in this operation manual. Often, users do not understand or recognize the signs of approaching problems. Improper handling can cause burns and other injuries and can result in death.

Be sure to read this operation manual carefully before operating the engine and observe all of the instructions and precautions described in this manual. Follow the warning signs below in this manual. Pay special attention to parts containing these words and signs.



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.

This sign is also used to alert against unsafe practices.

- The descriptions captioned by **NOTICE** are particularly important cautions for handling. If you ignore them, the performance of your machine may deteriorate leading to problems.

1.2 Safety Precautions

(Observe these instructions for your own safety!)

1.2.1 Precautions for Operation

⚠ DANGER



Filler Cap of Coolant Tank

- Never open the cap of the coolant tank while the engine is still hot. Steam and hot water may spurt out and burn you seriously. Wait until the temperature of the coolant tank has dropped, wrap a cloth around the filler cap and loosen the cap slowly. After inspection, refasten the cap firmly.

⚠ DANGER



Battery

- Never smoke or permit sparks near the battery, because it may emit explosive hydrogen gas. Place the battery in a well-ventilated place.

⚠ DANGER



Fuel

- Use only diesel fuel. Never use other fuels, including gasoline, kerosene, etc., because they could cause a fire. The wrong fuel could also cause the fuel injection pump and injector to fail due to lack of proper lubrication. Be sure to check that you have selected the correct diesel fuel before filling the fuel tank.

Do not use starting fluids or sprays. Their use may cause explosion, serious injury and engine damage.

⚠ DANGER



Fire Prevention

- Be sure to stop the engine and confirm that there are no open flames in the vicinity before fueling. If you do spill fuel, wipe such spillage carefully and dispose of the wiping materials properly. Wash your hands thoroughly with soap and water.

Never place oil or other flammable material in the engine room.

Install a fire extinguisher near the engine room, and familiarize yourself with its use.

⚠ WARNING



Exhaust Gas

- Exhaust gas contains poisonous carbon monoxide and should not be inhaled.

Be sure to install ventilation ports or ventilators in the engine room and ensure good ventilation during engine operation.

⚠ WARNING**Moving Parts**

- Do not touch or let your clothing get caught in the moving parts of the engine, such as the front drive shaft, V-belt or propeller shaft, during engine operation. You will be injured.

Never operate the engine without covers on the moving parts.

⚠ CAUTION**Burns**

- The whole engine is hot during operation and immediately after shut-down. The exhaust manifold, exhaust pipe and high pressure fuel lines are very hot. Never touch these parts with your body or clothing.

⚠ WARNING**Alcohol**

- Never operate the engine while you are under the influence of alcohol. Never operate the engine when you are ill or not feeling well.

⚠ DANGER**Battery Fluid**

- Battery fluid is dilute sulfuric acid. It can blind you if it gets in your eyes, or burn your skin. Keep the fluid away from your body. If you touch it, wash it off immediately with a large quantity of fresh water and call your doctor for treatment.

⚠ WARNING**Fire by Electric Short-Circuits**

- Always turn off the battery switch before inspecting the electrical system. Failure to do so could cause short-circuiting and fires.

⚠ WARNING**Stop the Engine before You Service it.**

- Turn the battery switch off. If you must inspect while the engine is in operation, never touch moving parts. Keep your body and clothing well clear of all moving parts.

⚠ CAUTION**Scalds**

- When extracting oil from the engine while it is still hot, don't let the oil splash on you.

Wait until the temperature has dropped before extracting cooling water from the engine. Don't let it splash on you.

⚠ DANGER

Forbidden Modifications

- Modification will impair the safety and performance of the product and shorten product life.
Also note that any troubles arising from modification are not covered by our warranty.

⚠ DANGER

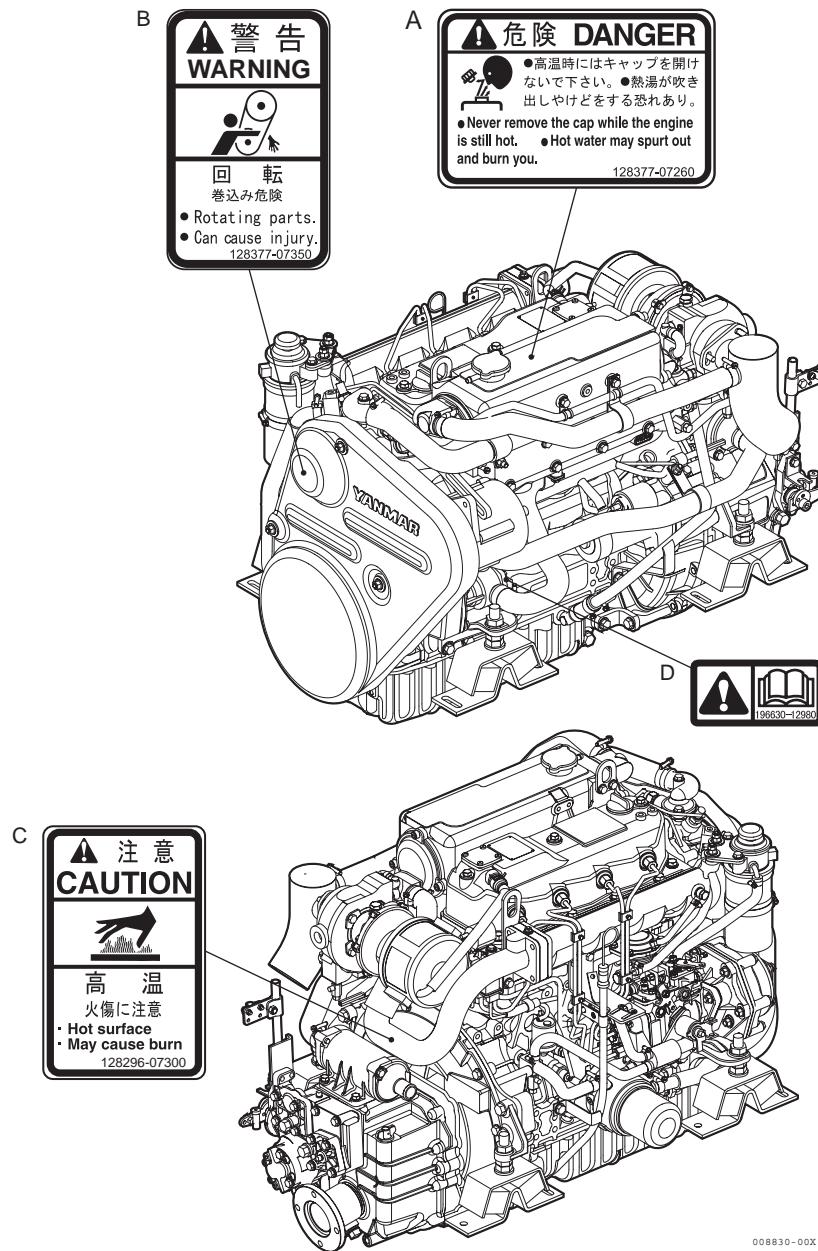
Precautions for Treating Waste

- Never dispose of waste oil or other fluid in a field, sewer, river, or the sea.
Treat waste matters safely observing regulations or laws.
Ask a waste recovery company to collect it.

1.3 Warning Labels

To insure safe operation, warning device labels have been attached. Their location is shown below and they should always be visible. Please replace if damaged or lost.

4JH4-TE



Product safety labels	
No	Part Code No.
A	128377-07260
B	128377-07350
C	128296-07300
D	196630-12980

2. PRODUCT EXPLANATION

2.1 Use, Propulsion System, Etc.

The engine is equipped with a marine gear or a sail drive unit. The marine gear output shaft connects with the propeller shaft.

In order to obtain full performance from your engine, it is imperative that you check the size and structure of the hull and use a propeller of the appropriate size.

As new boats are used, owners add additional equipment and completely fill the fuel and water tanks adding to the overall displacement (weight) of the vessel. Extra canvas enclosures, bottom paint, and bottom fouling can add additional hull resistance. It is recommended that new vessels be propped so the engines can operate at 100-200 rpm above rated rpm to allow for some added weight and hull resistance. Failure to do so can lead to reduced vessel performance, lead to increased smoke levels and cause permanent damage to your engines.

The engine must be installed correctly with safe cooling water and exhaust piping and electrical wiring. Any auxiliary equipment attached to the engine should be accessible and easy to use for onboard equipment.

To handle the drive equipment, propulsion systems (including the propeller) and other onboard equipment be sure to observe the instructions and cautions given in the operation manuals supplied by the shipyard and equipment manufacturers.

The laws of some countries may require hull and engine inspections, depending on the use, size and cruising area of the boat.

The installation, fitting and surveying of this engine all require specialized knowledge and engineering skills. Consult Yanmar's local subsidiary in your region or your distributor or dealer.

NOTICE

This engine is designed for pleasure boat applications.

The engine is designed to be operated at:

Maximum throttle (3000-3200 rpm) for less than 5% of total engine time. (30 minutes out of every 10 hours)

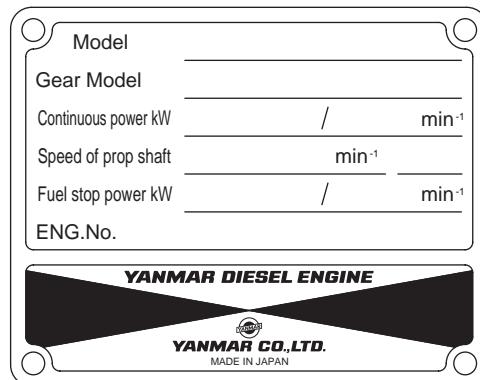
Cruising Speed (2800 rpm or lower) for less than 90% of total engine time (9 hours out of every 10 hours)

⚠ WARNING

Never modify this product or release the limit devices (which limit engine speed, fuel injection quantity, etc.). Modification will impair the safety and performance of the product and functions and shorten the product life. Please note that any troubles arising from modification of the product will not be covered by our warranty.

Detail of name plate

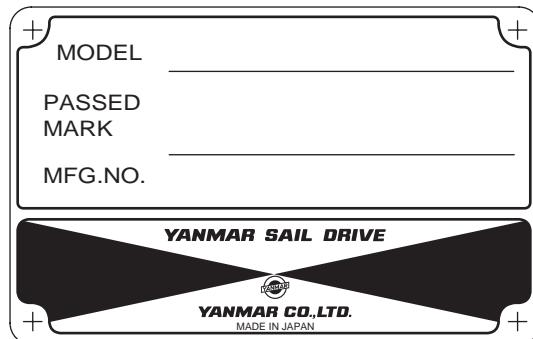
The nameplate shown below is attached to the engine. Check the engine's model, output, rpm and serial number on the nameplate.



The nameplate shown below is attached to the marine gear. Check the marine gear's model, gear ratio, oil used, oil quantity and serial number.



The nameplate shown below is attached to the sail drive. Check the sail drive model and serial number.



2.2 Engine Specifications

Engine model		unit	4JH4-TE									
Marine gear model		—	ZF30M	KM4A2	KMH4A	ZF25A	SD50-4T					
Use		—	Pleasure use									
Type		—	Vertical water cooled 4 cycle diesel engine									
Combustion system		—	Direct injection									
Aspiration		—	Turbocharged									
Number of cylinders		—	4									
Bore x stroke		mm (inch)	84 x 90 (3.31 x 3.54)									
Displacement		ℓ	1.995									
Continuous power	Output at crankshaft/ Engine speed	kW (hp)/min ⁻¹	50.2(68.3) / 3101									
Fuel stop power	Output at crankshaft/ Engine speed	kW (hp)/min ⁻¹	* ¹ 55.2(75.1)/3200									
	Output (propeller shaft)/ Engine speed	kW (hp)/min ⁻¹	* ¹ 53.0(72.1)/3200			—						
Installation		—	Flexible mounting									
Fuel injection timing		—	Plunger lift at Top Dead Center 1.26 ± 0.01 mm (when W-C.S.D. is released)									
Fuel injection opening pressure		MPa	21.6 ± 0.5									
Main power take off		—	At flywheel side									
Direction of rotation	Crankshaft	—	Counter-clockwise viewed from stern									
	Propeller shaft (Ahead)	—	Clockwise from stern	Clockwise or counter-clockwise (Bi-rotation)	—							
Cooling system		—	Fresh water cooling with heat exchanger									
Lubrication system		—	Complete enclosed forced lubrication									
Cooling water capacity (fresh water)		ℓ (quart)	Engine: 7.2(7.6), Coolant recovery tank: 0.8(0.8)									
Lubricating oil capacity (engine)	Rake angle	deg.	7 deg.	0 deg.		7 or 0 deg.						
	Total (Note 4)	ℓ (quart)	5.7 ± 0.3 (6.0 ± 0.3)	6.9 ± 0.3 (7.3 ± 0.3)		Refer to left						
	Oil pan only		5.2 ± 0.3 (5.5 ± 0.3)	6.4 ± 0.3 (6.8 ± 0.3)		Refer to left						
	Effective (Note 5)		2.4(2.5)									

(Note)

1. Rating condition

*¹ Temperature of fuel: 40°C at FO pump inlet: ISO 8665

2. hp = 0.7355kW

3. Density of fuel: 0.842g/cm³ at 15°C

4. The "Total" oil quantity includes oil in oil pan, channels, coolers and filter.

5. The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Engine model		unit	4JH4-TE					
Marine gear model		—	ZF30M	KM4A2	KMH4A	ZF25A	SD50-4T	Bobtail
Starting system	Type	—	Electric					
	Starting motor	V-kW	DC 12V - 1.4 kW					
	Alternator	V-A	12V - 80A (12V - 60A optional)					
Engine Dimension	Overall length	mm (inch)	923 (36.3)	903 (35.6)	933 (36.7)	1017 (40.0)	782 (30.8)	782 (30.8)
	Overall width		616(24.3)					
	Overall height		659(25.9)					
Flywheel major dimension		mm (inch)	D339 x 66 (13.3 x 2.6)					
Engine dry mass (include marine gear)		kg	235	237	238	237	249 (engine 207)	207

Marine gear and sail drive

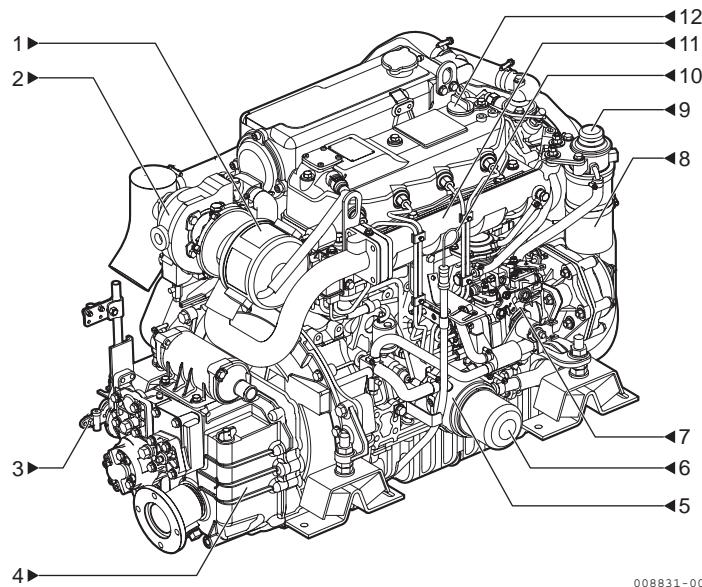
Model	—	ZF30M	KM4A2			KMH4A	ZF25A		SD50-4T (coupled at boat builder)		
Down angle	deg.	0	7			8	8		—		
Applicable engine model	—	4JH4-TE									
Type	—	Mechanical wet multiple disk clutch	Mechanical cone clutch			Hydraulic wet multiple disk clutch	Hydraulic wet multiple disk clutch		Mechanical cone clutch		
Reduction ratio (Forward/Reverse)	—	2.15/ 2.64	2.70/ 2.64	1.47/ 1.47	2.14/ 2.14	2.63/ 2.63	2.04/ 2.04	2.45/ 2.45	1.93/ 1.93	2.48/ 2.48	2.32
Propeller speed (Forward/Reverse) *	min ⁻¹	1444/ 1176	1150/ 1176	2115/ 2113	1451/ 1450	1180/ 1179	1520/ 1520	1263/ 1263	1607/ 1607	1250/ 1250	1337
Lubrication system	—	Splash		Centrifugal pump			Trochoid pump	Trochoid pump		Oil bath	
Lube oil	—	ATF		API CD or higher SAE #20 or #30				ATF		QuickSilver® only	
Lube oil capacity (total)	ℓ (quart)	1.1(1.2)		2.0(2.1)			2.0(2.1)	1.8(1.9)		2.2(2.3)	
Lube oil capacity (effect)		0.2(0.2)		0.2(0.2)			0.2(0.2)	—		0.1(0.1)	
Cooling system	—	Seawater cooling								—	
Mass	kg	27.5		30			31	30		42	

* At continuous power: Engine speed 3101 min⁻¹

2.3 Names of Parts

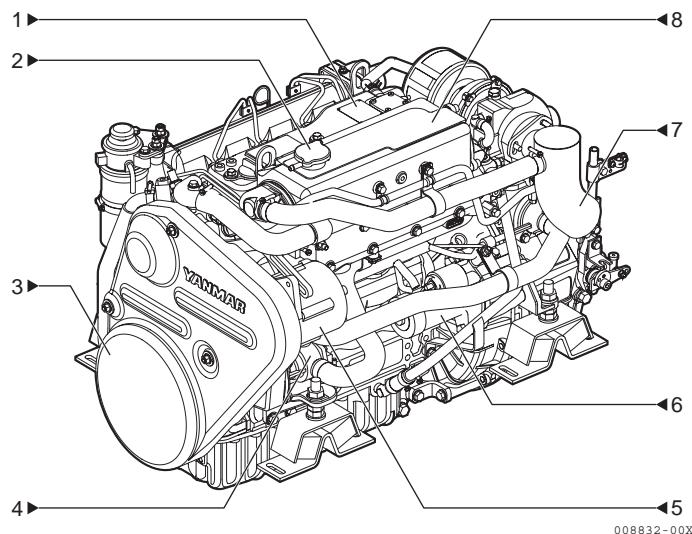
4JH4-TE

- Operation side



1	Intake silencer	5	Lube oil cooler	9	Fuel priming pump
2	Turbocharger	6	Lube oil filter	10	Dipstick
3	Shift lever	7	Fuel injection pump	11	Intake manifold
4	Marine gear (KMH4A)	8	Fuel filter	12	Oil filler cap

- Non operation side



1	Engine name plate (on the rocker arm cover)	4	Seawater pump	7	Exhaust mixing elbow
2	Coolant filler cap	5	Alternator	8	Coolant tank/Heat exchanger
3	Belt cover	6	Starter motor		

2.4 Major Servicing Parts

Name of part	Function
Name plate	Name plates are provided on the engine and the marine gear and have the model serial number and other data.
Fuel filter	Removes dust and water from fuel. The filter is a cartridge type, and the inner element should be replaced before clogging occurs. A water separator is on the bottom of the filter and should be drained periodically.
Fuel priming pump (on fuel filter)	This is a manual fuel pump. Moving the knob on the top of the fuel filter feeds the fuel. The pump is also used to bleed air from the fuel system.
Fuel feed pump	This is a mechanical pump used to feed fuel to the fuel injection pump. It is built into the fuel injection pump.
Filler port (engine)	Filler port for engine lube oil.
Filler port (marine gear)	Filler port for marine gear lube oil. Located on the top of the marine gear case.
Dipstick (engine)	Gauge stick for determining the level of the engine oil.
Lube oil filter	Filters fine metal fragments and carbon from the lube oil. The filter is a cartridge type, and the inner element should be replaced before clogging occurs.
Cooling System	There are two cooling water paths: fresh water and seawater. The engine is cooled by the fresh water/coolant in a closed circuit. The fresh water/coolant is cooled by seawater in a heat exchanger. The seawater also cools the marine gear-oil and also intake air (depending on model) through cooler (s) in an open circuit.
Fresh water pump	The centrifugal pump circulates fresh water/coolant inside the engine. The fresh water pump is driven by V-belt.
Sea water pump	Pumps seawater from outside vessel to the engine. The seawater pump is gear-driven and has a replaceable rubber impeller.
Filler cap (fresh water/coolant)	When the cooling water temperature rises, the pressure inside the fresh water tank increases. The pressure valve in the filler cap is open then hot water and steam pass through a rubber hose to the coolant recovery tank. When the engine becomes cool and the pressure inside the fresh water tank drops, the vacuum valve in the filler cap opens and the water in the coolant recovery tank returns to the water tank through the pipe and filler cap. This minimizes cooling water consumption.
Coolant recovery tank	Coolant recovery tank keeps temporarily fresh water/coolant, which overflows from the fresh water tank through the filler cap. Fresh water/coolant level can easily be checked and refilled in this tank.
Oil cooler (engine oil)	This heat exchangers cools the engine oil with fresh water.
Oil cooler (marine gear oil)	This heat exchangers cools the marine gear oil (KMH4A) with seawater.
Intake silencer	The intake silencer guards against dirt in the air and reduces the noise of air intake.
Turbocharger	The exhaust gas turbine is rotated by exhaust gas and the power is used to rotate the blower. The blower pressurizes the intake air, which gives high output.
Starter	This is a DC motor for electrical starting. Electric current causes the pinion gear to engage with the ring gear on the flywheel to start the engine.
Alternator	This is a AC generator built in the rectifier and regulator which rotates by V-belt drive to charge the battery during engine running.

2.5 Control Equipment

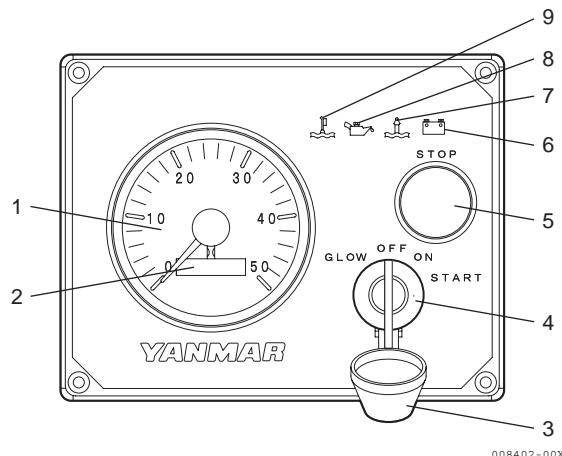
The equipment in the control room, making remote control possible, consists of the instrument panel, which is connected to the engine by wire harness, and the remote control handle, which is hooked up by remote control cables to the engine control lever and marine gear.

2.5.1 Instrument Panel (Option)

(1) Equipment and Functions

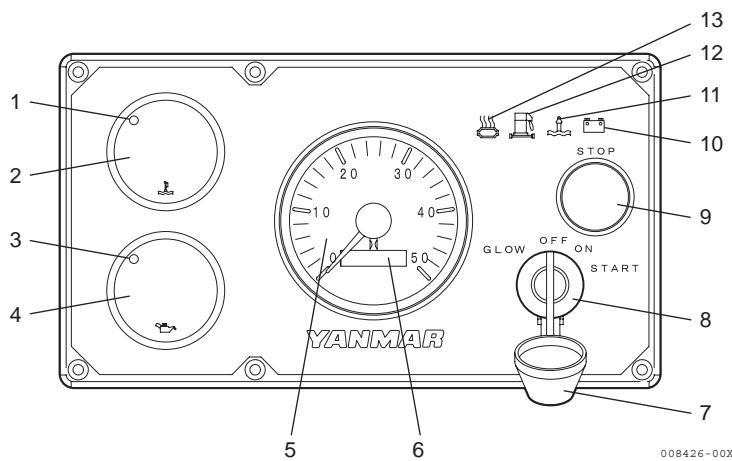
The instrument panel is located in the cockpit. The following instruments enable you to start / stop the engine and to monitor its condition during operation.

- B type

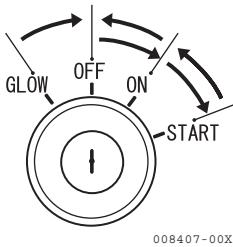


1	Tachometer	4	Key switch	7	Water in sail drive seal alarm
2	Hour meter	5	Stop button	8	Lube oil low pressure alarm
3	Moisture cap for key switch	6	Battery low charge alarm	9	Coolant high temperature alarm

- C type



1	Coolant high temperature alarm	6	Hour meter	11	Water in sail drive seal alarm
2	Coolant temperature meter	7	Moisture cap for key switch	12	Water in fuel filter alarm
3	Lube oil low pressure alarm	8	Key switch	13	Seawater insufficient flow alarm
4	Lube oil pressure meter	9	Stop button		
5	Tachometer	10	Battery low charge alarm		

Instruments, equipment	Functions	
Key switch Rotary switch with 4 positions 	OFF	The switch key can be inserted or removed. All electric current is cut off.
	ON	The electric current to the controls and equipment is turned on. Engine keeps running. To stop the engine, the key switch should be in the ON position. After stopping the engine, please turn OFF the key switch.
	START	The start position of the engine. The electric current to the starting motor is turned on. When you release the key, it will automatically turn to ON position.
	GLOW	The start aid position of the engine. The electric current to the air heater /glow plug is turned on. When you release the key, it will automatically turn to ON position. JH4 series: Air heater is an option.
	<p>Note When you don't use the engine, please remove the key from the key switch and cover the keyhole with the cap to protect from corrosion.</p>	
Stop button switch	Push button switch to stop the engine. The electric current to the stop solenoid is turned on.	

(2) Meters

B type and C type panels use analog electric systems and have a pointer indicator.

Instruments, equipment	Functions
Tachometer	The engine's rotation speed is indicated.
Hour meter	The number of hours of operation is indicated, and can be used as a guide for periodic maintenance checks. The hour meter is at the bottom of tachometer.
Coolant temperature meter (C type only)	The coolant temperature is indicated. It enables monitoring of the cooling condition of the engine.
Lube oil pressure meter (C type only)	The engine oil pressure is indicated. It enables monitoring of the pressure of the engine's lube oil.
Panel lights	When turning the key switch to ON, the meters light, for easy viewing.

(3) Alarm Equipment (Lamps and Buzzer)

When the sensor detects a problem during operation, the lamp comes on and the buzzer sounds.

Alarm lamps are located on the panel, buzzer is located on the back of panel.

Under normal conditions, the monitors are off. When there is a problem, the monitors light up.

	Battery low charge alarm	When the alternator output is too low, the lamp will come on. When charge begins, the lamp will turn off. (The alarm buzzer will not sound, when the lamp comes on.)
	Coolant high temperature alarm	When the temperature reaches the maximum (95°C[203°F] or higher), the lamp will light and the alarm will sound. Continuing operation at temperatures exceeding the maximum limit will result in damage and seizure. Check the load and the fresh water cooling system for any abnormalities.
	Lube oil low pressure alarm	When the lube oil pressure falls below normal, the oil pressure sensor will register this and the lamp will come on and alarm will sound. Continuing operation with insufficient oil pressure will result in damage and seizure. Check the oil level.
	Water in sail drive seal alarm	When sea water is detected between the seals of sail drive, the lamp will come on and alarm will sound.
	Water in fuel filter alarm (C type only)	When the drain inside the water separator in the fuel filter becomes excessive, the sensor will cause the lamp to come on.
	Sea water insufficient flow alarm (C type only)	This function is not available on this engine.

(4) Normal Action of Alarm Devices

Alarm devices act as shown below.

Please check that the alarm lamps and buzzer are working normally, when the key is turned on.

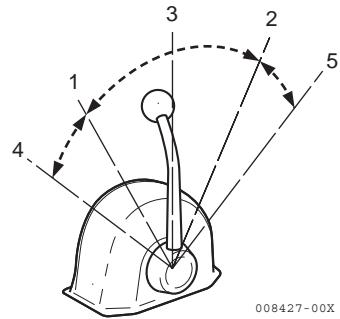
Key switch		OFF → ON	START → ON
Engine		Before start	Running
Alarm buzzer		Sound	Stop
Alarm lamps	Battery low charge alarm	Light	Off
	Coolant high temperature alarm	Off	Off
	Lube oil low pressure alarm	Light	Off
	Water in sail drive seal alarm	Off	Off

2.5.2 Single Lever Remote Control Handle

This remote control system uses a single handle to operate the marine gear-clutch (neutral, forward, reverse) and to control the engine speed.

NEUTRAL: Power to the propeller shaft is cut off and the engine idles.

The handle controls the direction of the boat (ahead or astern) and, at the same time, acts as an accelerator increasing the engine speed as it is pushed further in the FWD or REV direction.



1	FWD (forward, low speed)	4	Max. engine speed
2	REV (reverse, low speed)	5	Max. engine speed
3	NEUTRAL (boat is stopped)		

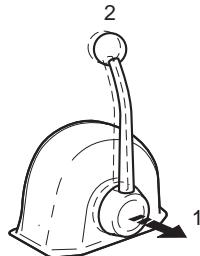
If the handle is pulled out, engine speed can be controlled without engaging the clutch (clutch remains in the NEUTRAL, no load position).

When turning the knob clockwise, the handle is fixed.

When loosening the knob, the handle can be moved.

NOTICE

Yanmar recommends the use of a single-lever type for the remote control system. If only the two-lever type is available in the market, operate the engine at 1000 rpm or lower before engaging and disengaging the marine gear-clutch.



(Only engine speed control)

1	Pull out handle	2	Knob
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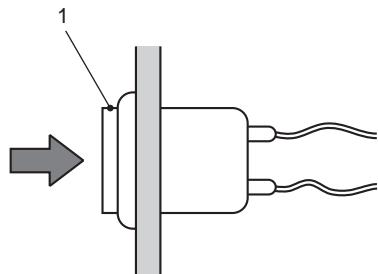
2.5.3 Shut-down Equipment

Electric operation

Push the stop button on the instrument panel when the key is in the ON position.

! CAUTION

If the engine is stopped suddenly during operation, the temperature of various engine parts will increase and engine troubles may occur.



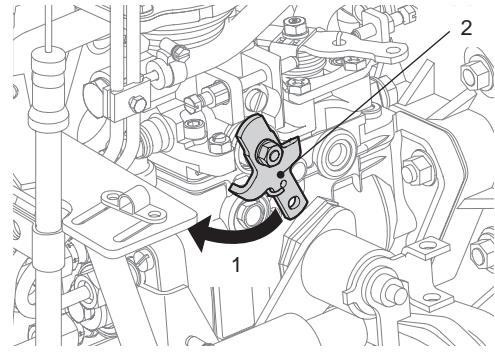
(Engine shut-down by stop button)

008404-00E

1	Stop button on the instrument panel
---	-------------------------------------

Emergency Stop:

When you can't stop the engine by the stop button on the panel, stop the engine by moving the stop lever attached on the fuel injection pump to the left by hand.



1	Stop	2	Stop lever
---	------	---	------------

3. BEFORE OPERATION

3.1 Fuel Oil, Lube Oil and Cooling Water

3.1.1 Fuel Oil

NOTICE

When other than the specified fuel oil is used, the engine will not perform to full capacity and parts may be damaged.

IMPORTANT:

Only use the recommended fuel to obtain the best engine performance and to keep the durability of the engine, also to comply with the emission regulations.

(1) Selection of Fuel Oil

Diesel fuel oil should comply with the following specifications.

- The fuel specifications need to comply with each national standard or international standards.
- ASTM D975 No.1-D
 - No.2-D for USA
 - EN590:96 for EU
 - ISO 8217 DMX International
 - BS 2869-A1 or A2 for UK
 - JIS K2204 for JAPAN

The following requirements also need to be fulfilled.

- Cetane number should be equal to 45 or higher.
- Sulphur content of the fuel.
It should not exceed 0.5% by volume. (Preferably it should be below 0.05%)
- Water and sediment in the fuel oil should not exceed 0.05% by volume.
- Ash should not exceed 0.01% by mass.
- 10% Carbon residue content of the fuel.
It should not exceed 0.35% by volume. (Preferably it should be below 0.1%)
- Aromatics (total) content of the fuel.
It should not exceed 35% by volume. (Preferably it should be below 30% and aromatics (PAH*) content of the fuel preferably it should be below 10%)

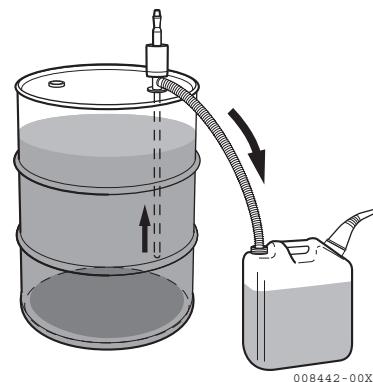
PAH*: polycyclic aromatic hydrocarbons.

- DO NOT use Biocide.
- DO NOT use Kerosene, residual fuels.

(2) Handling of Fuel Oil

- 1) Water and dust in the fuel cause engine failure. When fuel is stored, be sure that the inside of the storage container is clean, and that the fuel is stored away from dirt or rain water.
- 2) Keep the fuel container stationary for several hours to allow any dirt or water to settle to the bottom. Use a pump to extract the clear, filtered fuel from the top of the container for use.

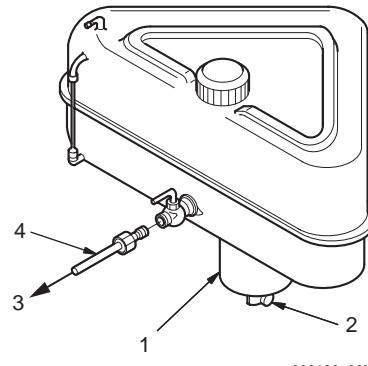
Use the clear filtered fuel from the upper middle section of the container only, leaving any contaminated fuel at the bottom.



(3) Fuel Tank (Optional)

Be sure to attach a drain cock to the fuel tank to enable dirt and water that settles at the bottom of the tank to be drained off.

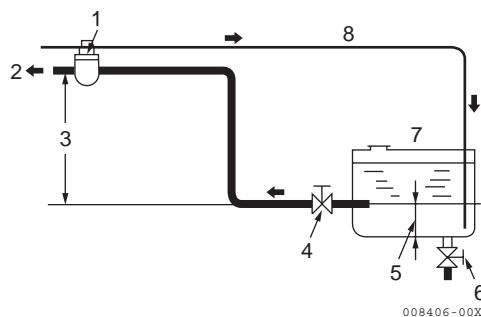
The fuel outlet should be positioned 20-30mm (3/4"-1 1/8") above the bottom of the tank so that only clean fuel is used.



1	Sediment	3	To engine
2	Drain cock	4	Fuel pipe

(4) Fuel System

Install the fuel pipe from the fuel tank to the fuel pump in accordance with the diagram. The recommended fuel/water separator (optional) is placed at the center section of the line.



1	Fuel filter	5	Approx. 20-30mm (3/4"-1 1/8")
2	To fuel injection pump	6	Drain cock
3	Less than 500 mm (20")	7	Fuel tank
4	Fuel cock	8	Fuel return pipe

3.1.2 Lube Oil

NOTICE

Using other than the specified lube oil will lead to seizure of parts, abnormal wear, and shorten engine life.

(1) Selection of Engine Lube Oil

Use the following lube oil.

- API Classification CD or higher
- SAE Viscosity 10W-30, 15W-40

Engine oil 10W30 and 15W-40 can be used throughout the year.

(2) Selection of Oil for Marine Gear

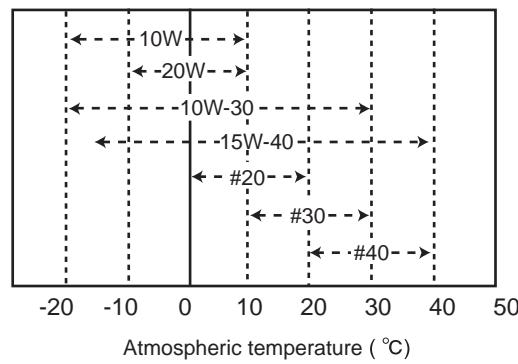
KM4A2, KMH4A

- API Classification CD or higher
- SAE Viscosity #20 or #30

ZF30M, ZF25A

- ATF (Automatic Transmission Fluid)

Selection of viscosity
(SAE Service grade)



008408-00E

(3) Selection of Oil for Sail Drive Unit

Only QuickSilver® High Performance Gear Lube must be selected and used for SD50-4T of 4JH4-TE.

QuickSilver® is registered trademark of Brunswick Corporation.

(4) Handling the Lube Oil

- 1) When handling and storing lube oil, be careful not to allow dust and water to enter the lube oil. Clean around the filler port before refilling.
- 2) Do not mix lube oils of different types or brands. Mixing may cause the chemical characteristics of the lube oil to change and lubricating performance to drop, reducing the engine's life.
Before supplying lube oil to the engine and marine gear for the first time, extract any lube oil remaining in the tank. Use new lube oil.
- 3) Lube oil supplied to the engine will undergo natural degradation with time even when the engine is not used.
Lube oil should be replaced at the specified intervals, regardless of whether the engine is being used or not.

If you operate your equipment at temperatures below the limits shown, consult your dealer for special lubricants and starting aids.

3.1.3 Cooling Fresh Water

It is important to check the coolant daily. Be sure to use clean soft water for cooling fresh water.

NOTICE

Be sure to add antifreeze to cooling fresh water.

In cold seasons, the antifreeze is especially important.

Without antifreeze, cooling performance will drop due to scale and rust in the cooling water system.

Without antifreeze, cooling water will freeze and expand, breaking various parts.

For your reference, antifreeze mixed with antirust is now available in the market.

Handling of Coolant

- 1) Choose antifreeze, which will not have any adverse effects on the materials (cast iron, aluminum, copper, etc.) of the engine's fresh water cooling system.
- 2) Use the proper mixing ratio of antifreeze to fresh water strictly as instructed by the antifreeze maker depending on the ambient temperature. LLC concentration should be 30% as a minimum and 50% as a maximum.
- 3) Replace the cooling water periodically, according to the maintenance schedule given in this operation manual.
- 4) Remove the scale from the cooling water system periodically, according to the instructions in this operation manual.
- 5) Use the proper mixing ratio of antifreeze to fresh water strictly, as instructed by the antifreeze maker. If too much antifreeze is used, the cooling performance of the cooling water will drop and the engine may become overheated.
- 6) Do not mix different brands of antifreeze.
Chemical reactions may make the antifreeze useless and engine trouble could result.

Consult your Yanmar dealer or distributor on the use of coolant/antifreeze, and detergents.

Coolant/antifreeze, which provides good performance for example, are shown below.

- TEXACO LONG LIFE COOLANT ANTI-FREEZE, both standard and pre-mixed.
Product code 7997 and 7998.
- HAVOLINE EXTENDED LIFE ANTIFREEZE/COOLANT.
Product code 7994

NOTICE

Excessive use of antifreeze also lowers the cooling efficiency of the engine. Be sure to use the mixing ratios specified by the antifreeze maker for temperature range.

3.2 Before Initial Operation

Perform the following before using the engine for the first time:

3.2.1 Supply Fuel Oil

DANGER



Using gasoline, etc. may cause a fire. To avoid mistakes, be sure to double-check the kind of fuel before filling. Wipe off any spilled fuel carefully.

- Before filling with fuel, wash out the fuel tank and fuel system with clean kerosene or light oil.
- Fill the tank with clean fuel oil free of dirt and water.

3.2.2 Supplying Engine Lube Oil

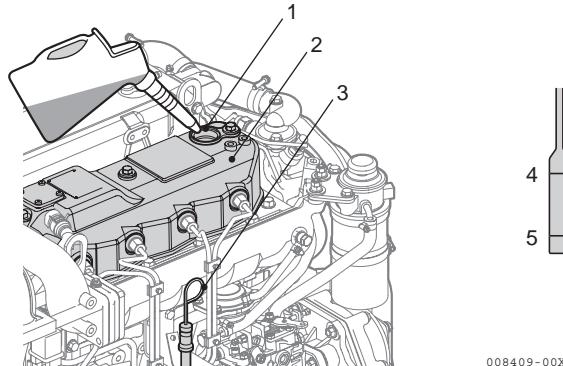
- 1) Remove the filler port cap (yellow) at the top of the rocker arm cover, and fill with engine oil.
- 2) Fill with oil to the upper limit on the dipstick. Insert the dipstick fully to check the level.
- 3) Tighten the filler port cap securely by hand.

Engine oil capacity (full)	
[Rake angle 7 deg.] ZF30M	$5.7 \pm 0.3 \text{ l}$ (6.0 ± 0.3 quarts)
[Rake angle 0 deg.] KM4A2, KMH4A, ZF25A SD50-T	$6.9 \pm 0.3 \text{ l}$ (7.3 ± 0.3 quarts)

NOTICE

Do not overfill.

Overfilling will cause oil to be sprayed out from breather and lead to engine problems.



008409-00X

1	Filler port	4	Upper limit
2	Rocker arm cover	5	Lower limit
3	Dipstick		

3.2.3 Supply Marine Gear Lube Oil

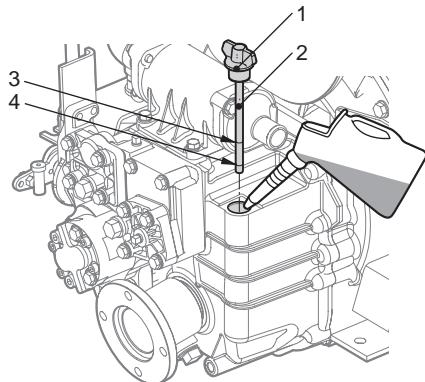
- 1) Remove the filler port cap at the top of the housing, and fill with marine gear lube oil.
- 2) Fill with oil to the upper limit on the dipstick, insert the dipstick fully to check the level.
- 3) Tighten the filler port cap securely by hand.

Marine gear & sail drive oil capacity (full)	
ZF30M	1.1 ℥ (2.3 pints)
KM4A2	2.0 ℥ (4.2 pints)
KMH4A	2.0 ℥ (4.2 pints)
ZF25A	1.8 ℥ (3.8 pints)
SD50-T	2.1 ℥ (4.4 pints)

Note:

Refer to the operation manual of the sail drive SD50-T for the procedure of supplying the sail drive lube oil.

KMH4A



008410-00X

1	Oil filler cap	3	Upper limit
2	Dipstick	4	Lower limit

3.2.4 Supply Cooling Fresh Water

Supply cooling fresh water according to the following procedures.

Be sure to add antifreeze to the cooling fresh water.

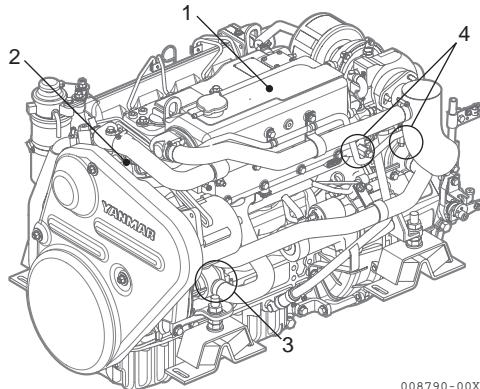
1) Be sure to close all the water drain cocks.

Model	Drain cocks in fresh water line	Drain cocks in seawater line
4JH4-TE	3	2 (Clutch cooler: 1)

Note:

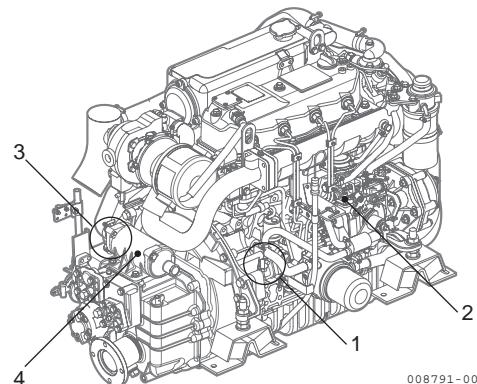
1. The water drain cocks are opened before shipping from the plant.
2. Marine gear ZF25A doesn't have a drain cock on the clutch cooler.
3. Seawater pump doesn't have a drain cock.
When loosening side cover bolts of seawater pump, seawater drains.

4JH4-TE



008790-00X

1	Coolant tank	3	Drain seawater from seawater pump cover
2	Fresh water pump	4	Drain cocks for fresh water



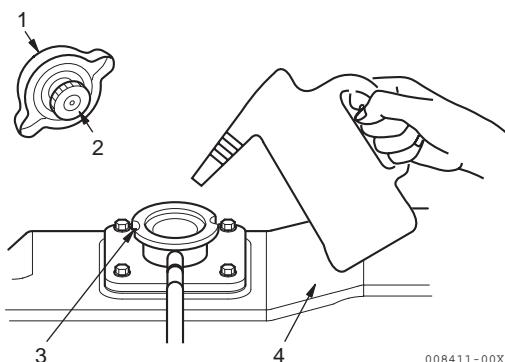
008791-00X

1	Drain cock for fresh water	3	Drain cock for seawater
2	Fuel pump	4	Clutch cooler

- 2) Remove the filler cap of the fresh water cooler by turning the cap counterclockwise 1/3 of a turn.
- 3) Pour cooling water slowly into the fresh water/coolant tank so that air bubbles do not develop. Pour until the water overflows from the filler port.

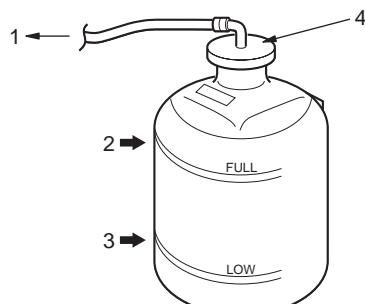
DANGER

If the filler cap is loose, hot steam and water will spout out and may cause burns.



- 4) After supplying cooling water, replace filler cap and tighten it firmly. Failure to do so will cause water leakage. To replace the cap, align the tabs on the bottom of the cap with the notches on the filler port and turn clockwise 1/3 of a turn.
- 5) Remove the coolant recovery tank cap and fill with coolant to the upper limit (Full). Replace cap.
Coolant recovery tank capacity:
0.8 l (1.7 pints)
- 6) Check the rubber hose connecting the coolant recovery tank to the fresh water cooler. Be sure the hose is securely connected and there is no looseness or damage.
When the hose is not watertight, an excessive amount of cooling water will be used.

1	Filler cap	3	Notches
2	Tabs	4	Fresh water cooler



1	To fresh water cooler	3	Lower limit
2	Upper limit	4	Cap

3.2.5 Cranking

When the engine has not been used for a long period of time, all of the moving parts will be lack of lube oil. Using the engine in this condition will lead to seizure. After a long period of disuse, distribute lube oil to each part by cranking before warm-up operation. Perform in accordance with the following procedures.

- 1) Open seacock.
- 2) Open fuel cock.
- 3) Put remote control lever in NEUTRAL.
- 4) Turn on battery switch and insert key into key switch. Turn the key to the ON position.
- 5) Mechanical stop device
Pull the stop lever on the governor to cut fuel continuously while cranking.

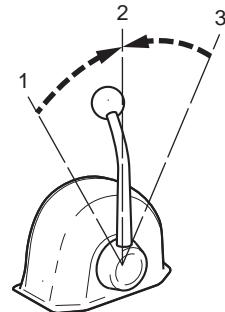
Note:

Don't use the stop button in this case.

- 6) When the key switch is turned to the START position, the engine will begin cranking. Continue cranking for about 5 seconds, and check for abnormal noise during that time. (If you remove your hand from the stop lever while cranking, the engine will start.)

Note:

When the engine has not been used for a long period of time, check that the key can move from START position to ON position smoothly.



1	Forward	2	Neutral	3	Reverse
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3.2.6 Check and Resupply Lube Oil and Cooling Water

When engine oil, clutch oil, or cooling water is supplied for the first time or when they must be replaced, conduct a trial operation of the engine for about 5 minutes and check the quantity of lube oil and cooling water. The trial engine operation will send the lube oil and cooling water to the passages, so the lube oil and cooling water levels will drop. Check and resupply as necessary.

1) Supplying engine Lube oil (See 3.2.2)

Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.

2) Supplying marine gear lube oil (See 3.2.3)

3) Supplying cooling water (See 3.2.4)

DANGER



Never open the cap of the coolant tank while the engine is still hot. Steam and hot water will spurt out and burn you seriously. Wait until the temperature of the coolant tank has dropped, wrap a cloth around the filler cap and loosen the cap slowly. After inspection, refasten the cap firmly.

4. HOW TO OPERATE

⚠ WARNING**Alcohol**

- Never operate the engine while you are under the influence of alcohol or when you are ill or feel unwell as this results in accidents.

⚠ WARNING

To prevent exhaust gas poisoning, ensure good ventilation during operation. Install ventilation windows, ports or ventilators in the engine room.

⚠ WARNING

Never touch or allow your clothes to touch the moving parts of the engine during operation. If the front drive shaft, V-belt, propeller shaft, etc. catches your body or clothes, serious injury may result. Check that no tools, cloth, etc. are left on or around the engine.

⚠ CAUTION

The engine is very hot during operation and immediately after stopping, especially the exhaust manifold and the exhaust pipe. Avoid burns! Never touch or allow your clothes to touch any part of the engine.

4.1 Inspection before Starting

Before starting the engine, make it a daily rule to conduct the following inspections:

(1) Visual Checks

Check for the following:

- 1) Lube oil leakage from the lube oil system
- 2) Fuel oil leakage from the fuel system
- 3) Water leakage from the cooling water system
- 4) Damage to parts
- 5) Loosening or loss of bolts

If any problem is found, do not operate the engine before completing repairs.

(2) Checking and Resupplying Fuel Oil

Check the fuel level inside the fuel tank and supply with the recommended fuel, if necessary. (See 3.2.1)

(3) Checking and Resupplying Engine Lube Oil

- 1) Check the engine oil level with the oil dipstick.
- 2) If the oil level is low, supply with the recommended lube oil using the filler port. Supply oil up to the top mark on the oil dipstick. (See 3.2.2)

(4) Check and Resupply Marine Gear Lube Oil

- 1) Check the marine gear oil level with the oil dipstick.
- 2) If the oil level is low, supply with the recommended lube oil using the filler port. Fill oil up to the top mark on the oil dipstick. (See 3.2.3)

(5) Check and Resupply Fresh Water

DANGER



Do not open the filler cap during operation or immediately after stopping the engine.

Hot steam and water will spout out. To remove the cap, wait until the engine has cooled down, wrap the cap with a cloth and loosen the cap slowly. After checking, replace the cap and tighten firmly.

Check the fresh water level before operation while the engine is cold.

It is dangerous to check the water level while the engine is hot, and the cooling water level will be misread due to thermal expansion.

Check the cooling water daily at the coolant recovery tank only and supply if necessary.

Do not remove the filler cap of the coolant tank during normal operation.

- 1) Check that the coolant level is above the lower limit on the side of the coolant recovery tank. If the coolant level is close to the lower limit, remove the coolant recovery tank cap and supply coolant to the upper limit.
- 2) When the water level in the coolant recovery tank is low, remove the filler cap of the coolant tank and check the amount of cooling water in the coolant tank. Fill with coolant if the water level is low.

NOTICE

If the coolant runs out too often, or only the coolant in the fresh water tank drops without any change in the water level of the coolant recovery tank, there may be some leakage of water or air. In such cases, consult your Yanmar dealer or distributor without delay.

Note:

The water rises in the coolant recovery tank during engine operation. This is not abnormal. After stopping the engine, the cooling water cools down and the extra water in the coolant recovery tank returns to the coolant tank.

(6) Check the Remote Control Handle

Be sure to check that the remote control handle lever moves smoothly before use. If it is hard to operate, lubricate the joints of the remote control cable and also the lever bearings.

If the lever comes out or there is play in the lever, adjust the remote control cable.
(See 4.3.1(5))

(7) Check the Electric Devices

When operating the key switch, check that the alarm devices work normally. (See 2.5.1)

(8) Prepare Fuel, Lube Oil, and Cooling Fresh Water in Reserve

Prepare sufficient fuel for the day's operation. Always store lube oil and coolant water in reserve (for at least one refill) onboard, to be ready for emergencies.

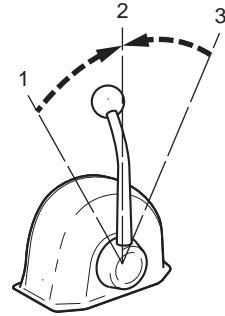
4.2 How to Start the Engine

(1) Start the Engine According to the Following Procedures:

- 1) Open the seacock.
- 2) Open the fuel cock.
- 3) Set the remote control lever in NEUTRAL.

NOTICE

Safety equipment should make it impossible to start the engine in any other position than NEUTRAL.



008413-00X

- 4) Turn on the battery switch.

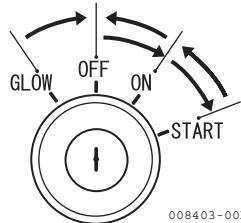
1	Forward	2	Neutral	3	Reverse
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- 5) Insert the key into the key switch and turn the key to ON. If the alarm buzzer sounds and alarm lamps come on, the alarm devices are normal.

Note:

The coolant high temperature alarm lamp does not come on. (See 2.5.1.(4))

- 6) Turn the key switch to start the engine.
Release the key switch when the engine has started. The alarm buzzer should stop and the alarm lamps go out.



008403-00X

Air Heater (Option)

When it is cold, please turn the key to GLOW position for 15 seconds before starting the engine.

Note:

When the engine has not been used for a long period of time, check that the key can move from START position to ON position smoothly.

(2) Restarting after Starting Failure

Before turning the key switch again, be sure to confirm that the engine has stopped completely. If an attempt to restart is made while the engine has not stopped, the pinion gear of the starter motor will be damaged.

NOTICE

Never hold the key in the START position for 15 seconds or more. Starter motor may be burned.

If the engine does not start the first time, wait for about 15 seconds before trying again. After the engine has started, do not turn the key off. (It should remain ON.)

Alarm devices will not work when the key is OFF.

! CAUTION

If vessel is equipped with a water lift (water lock) muffler, excessive cranking could cause sea water to enter the cylinders and damage the engine.

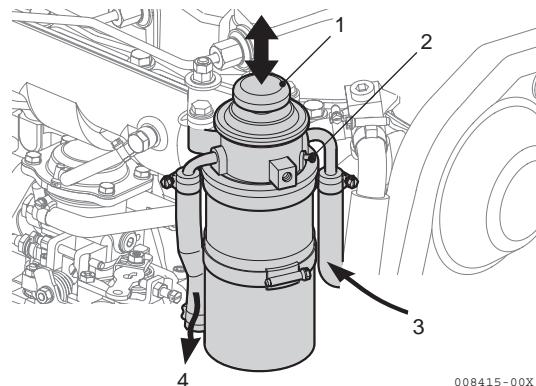
(3) Air Bleeding of the Fuel System after Starting Failure

If the engine doesn't start in several trials, there may be air in the fuel system. If air is in the fuel system, fuel cannot reach the fuel injection pump. Bleed the air in the system according to the following procedures.

Fuel system air bleeding procedures

- 1) Check the fuel level in the fuel tank.
Replenish if Insufficient.
- 2) Open the fuel cock of the fuel tank.
- 3) Loosen the air bleeding bolt on the top of the fuel filter by turning it 2-3 times with a minus driver.
- 4) Feed the fuel with the priming pump. The priming pump is on the top of the fuel filter. Move the priming pump knob up and down until fuel mixed with air bubbles flows out of the air bleeding bolt.
- 5) Allow the fuel containing air bubbles to flow.
When the fuel coming out is clear and not mixed with any bubbles, tighten the air bleeding bolt.

In subsequent engine operation after the start-up, the automatic air-bleeding device works to purge the air in the fuel system. No manual air-bleeding is required for normal engine operation.



1	Priming pump	3	From fuel tank
2	Air bleeding bolt	4	To fuel injection pump

(4) After the Engine has Started

After the engine has started, check the following items at a low engine speed:

- 1) Check that the gauges and alarm devices on the instrument panel are normal.
- 2) Check for water or oil leakage from the engine.
- 3) Check that exhaust color, engine vibrations and sound are normal.
- 4) When there are no problems, keep the engine at low speed with the boat still stopped to send lube oil to all parts of the engine.
- 5) Check that sufficient cooling water is discharged from the seawater outlet pipe. Operation with inadequate seawater discharge will damage the impeller of the seawater pump. If seawater discharge is too small, stop the engine immediately.
Identify the cause and repair.
 - Is the seacock open?
 - Is the inlet strainer on the hull bottom clogged?
 - Is the seawater suction hose broken, or does the hose suck in air due to a loose connection?

NOTICE

The engine will seize if it is operated when cooling seawater discharge is inadequate or if load is applied without any warm up operation.

4.3 Remote Control Handle Operation

(1) Engine Acceleration and Deceleration

Use the throttle handle to control acceleration and deceleration. Move the handle slowly.

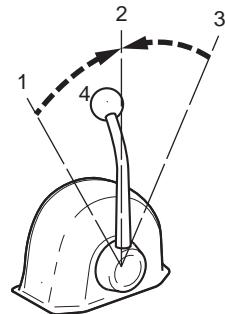
(2) FORWARD - NEUTRAL (Boat Stopped) - REVERSE Clutch

Use the clutch handle to change from FORWARD to NEUTRAL (boat stopped) or to REVERSE.

NOTICE

Shifting the marine gear while operating at high speed or not pushing the handle fully into position (partial engagement) will result in damage to marine gear parts and abnormal wear.

- 1) Before using the marine gear, be sure to move the throttle handle to a low idle position (less than 1000 min^{-1}). Move the throttle handle slowly to a higher speed position after completing clutch engagement.
- 2) When changing the handle between FORWARD and REVERSE, bring the clutch to NEUTRAL and pause before slowly shifting to the desired position. Do not shift abruptly from FORWARD to REVERSE or vice versa.
- 3) Move the clutch handle accurately and fully into the FORWARD, NEUTRAL, and REVERSE positions.



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1	Forward	3	Reverse
2	Neutral	4	Throttle handle/clutch handle

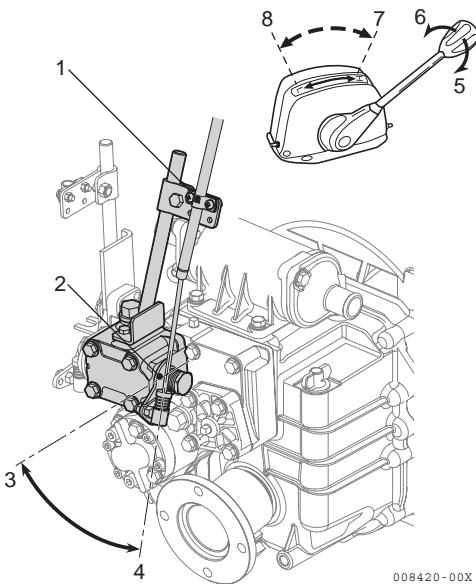
(3) Switching to Trawling (Available for KMH4A only) **OPTION** **KMH4A**

Use the trawling handle to begin trawling. When changing from forward or reverse operation to trawling, the speed of propeller revolution will be reduced to a bare minimum.

NOTICE

When trawling, do not raise the engine speed over 1000min^{-1} , as this results in early wear of and damage to the clutch.

- 1) Operation continues at a low engine speed of 1000min^{-1} or less.
- 2) Reduce the speed by moving the trawling handle from H (high speed) to L (low speed). Adjust the speed to the desired rate and secure the trawling handle in place.
- 3) Before returning to normal operation, be sure to put the trawling handle on H (high speed) position.
- 4) Increase engine speed and continue normal operation.



008420-00X

1	Cable fitting	5	Loosen
2	Trawling lever	6	Tighten
3	Low speed (Trawling)	7	[High speed] Normal operation
4	High speed	8	[Low speed] Trawling

4.4 Cautions During Operation

Always be on the lookout for problems during engine operation.

Pay particular attention to the following:

(1) Is sufficient water being discharged from the seawater outlet pipe?

If the discharge is small, stop the engine immediately; identify the cause and repair.

(2) Is the exhaust color normal?

The continuous emission of black exhaust smoke indicates engine overloading. This shortens the engine's life and should be avoided.

(3) Are there abnormal vibrations or noise?

Depending on the hull structure, engine and hull resonance may suddenly become great at a certain engine speed range, causing heavy vibrations. Avoid operation in this speed range. If you hear any abnormal sounds, stop the engine and inspect.

(4) Alarm buzzer sounds during operation.

If the alarm buzzer sounds during operation, lower the engine speed immediately, check the warning lamps, and stop the engine for repairs.

(5) Is there water, oil, or gas leakage, or are there any loose bolts?

Check the engine room periodically for any problems.

(6) Is there sufficient fuel oil in the fuel oil tank?

Replenish fuel oil in advance to avoid running out of fuel during operation.

(7) When operating the engine at low speed for long periods of time, race the engine once every 2 hours.

Note: Racing the engine

With the clutch in NEUTRAL, accelerate from the low speed position to the high speed position and repeat this process about 5 times. This is done to clean out carbon from the cylinders and the fuel injection valve. Neglecting to race the engine will result in poor exhaust color and reduce engine performance.

(8) If possible, periodically operate the engine at near maximum speed, while underway. this will generate higher exhaust temperatures, which will help clean out hard carbon deposits, maintaining engine performance and prolonging the life of the engine.

(9) Electric operation

Never turn off the battery switch during operation. Damage to parts in the electric system will result.

4.5 Shut-down the Engine

Stop the engine in accordance with the following procedures:

- 1) Stop the boat. Reduce the engine speed to the low idle speed and put the remote control handle in NEUTRAL
- 2) Be sure to race the engine before shut-down.
(See 4.4 (7))
- 3) Cool down the engine at low speed
(approximately 1000 min^{-1}) for about 5 minutes.

NOTICE

Always remember to allow engine to idle approximately 1000 min^{-1} for five minutes prior to shut down to remove heat from major components.

Shut-down of the engine suddenly while operating at high speed will cause the engine temperature to rise quickly, causing deterioration of the oil and sticking of parts.

- 4) Push the stop button on the instrument panel when the key is in the ON position.

Note:

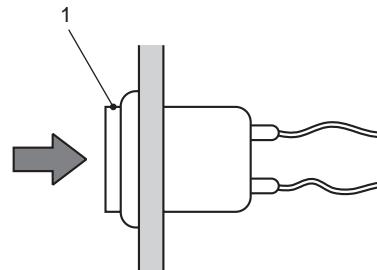
Continue to push the stop button until the engine is completely stopped. If you release the button before the engine has completely stopped, it may restart.

- 5) Turn the key switch to OFF after shutting down, remove the key and place it in a safe place.

Note:

When you don't use the engine, remove the key from the key switch and cover the keyhole with the cap to protect from corrosion.

- 6) Cut off the battery switch.
- 7) Close the fuel tank cock.
- 8) Close the seacock.



(Engine shut-down by stop button)

008404-00E

1	Stop button on the instrument panel
---	-------------------------------------

NOTICE

Neglecting to close the seacock could allow water to leak into the boat and may cause it to sink. Be sure to close the seacock.

Emergency Stop

When you can't stop the engine by the stop button on the panel, stop the engine by moving the stop lever attached on the fuel injection pump to the left by hand.

(See 2.5.3)

4.6 Long Term Storage

- (1) In cold temperatures or before long term storage, be sure to drain the seawater from the seawater cooling system.

⚠ CAUTION

Drain seawater from the seawater cooling system after the engine has cooled down.

NOTICE

If seawater is left inside, it may freeze and damage parts of the cooling system (fresh water cooler, seawater pump, etc.) when ambient temperature is below 0°C [32F].

- 1) Open the seawater drain cock attached on the seawater pump cover for 4JH4-TE. Open the seawater drain cocks attached on the seawater pump cover and inter cooler for 4JH4-HTE. Drain off the seawater inside.

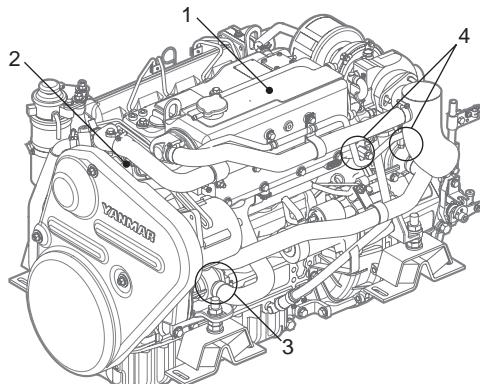
If no liquid comes from the drain cock(s), it may be necessary to use a stiff wire to remove any debris to allow drainage.

- 2) Loosen the 4 bolts fixing the side cover of the seawater pump, remove the cover and drain the seawater from inside.

Retighten the bolts when finished.

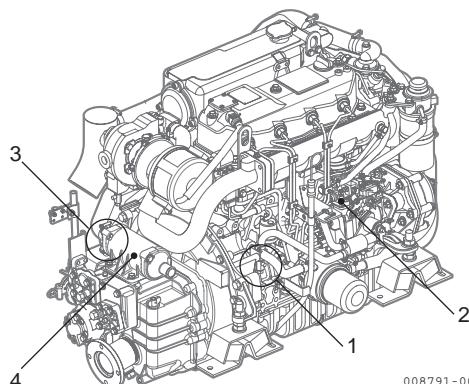
- 3) Close the drain cock(s).

4JH4-TE



008790-00X

1	Coolant tank	3	Drain seawater from seawater pump cover
2	Fresh water pump	4	Drain cocks for fresh water



008791-00X

1	Drain cock for fresh water	3	Drain cock for seawater
2	Fuel pump	4	Clutch cooler

- (2) Be sure to add antifreeze to the cooling fresh water.

NOTICE

If antifreeze is not used, the cooling fresh water may freeze and damage parts of the cooling water system (fresh water cooler, cylinder block, cylinder head, etc.) when ambient temperature is below 0° [32°F]. Also if antifreeze is not used, the cooling water system (fresh water cooler, cylinder block, cylinder head, etc.) will rust during long term storage.

- (3) If the time for a periodic inspection is close, perform it before storing the engine for a long period of time.
- (4) Clean the outside of the engine wiping off any dust or oil.
- (5) To prevent condensation inside the fuel tank, either drain off the fuel or fill the tank.
- (6) Grease the exposed area and joints of the remote control cable and the bearings of the remote control handle.
- (7) Cover the intake silencer, exhaust pipe, etc. with vinyl sheets and seal them to prevent moisture from entering.
- (8) Drain bilge in the hull bottom completely. water may leak into the boat when it is moored, and whenever possible it should be hauled out, covered and blocked.
- (9) Waterproof the engine room to prevent rain and seawater from entering.
- (10) During long term storage, charge the battery once a month to compensate for the battery's self-discharge.
- (11) When you don't use the engine, remove the key from the key switch and cover the key-hole with the cap to protect from corrosion.

5. MAINTENANCE & INSPECTION

5.1 General Inspection Rules

Conduct Periodic Inspection for Your Safety.

The functions of engine components will degenerate and engine performance will drop according to the use of the engine. If countermeasures are not taken, you may encounter unexpected troubles while cruising at sea. Consumption of fuel or lube oil may become excessive and exhaust gas and engine noise may increase. These all shorten the life of the engine. Daily and periodic inspection and servicing increase your safety at sea.

Inspect Before Starting.

Make it a daily rule to inspect before starting. (See 4.1)

Periodic Inspections at Fixed Intervals

Periodic inspections must be made after every 50, 250, 500 and 1000 hours of use.

Conduct periodic inspections according to the procedures described in this Operation Manual.

Use Genuine Yanmar Parts.

Be sure to use genuine Yanmar parts for consumable and replacement parts. Use of other parts will reduce engine performance and shorten the life of the engine.

Consult Your YANMAR Dealer or Distributor.

Specialized technicians are ready to assist you with periodic inspections and maintenance. Consult your YANMAR dealer or distributor in accordance with the service agreement.

Servicing Tools

Prepare servicing tools onboard to be ready for inspecting and servicing the engine and other equipment.

Tightening Torque of Bolts & Nuts

Over-tightening of bolts and nuts causes them to come off or their threads to be damaged. Insufficient tightening causes oil leakage from the installation face or troubles due to the loosening of bolts.

Bolts and nuts must be tightened to the appropriate tightening torque. Important parts must be tightened with a torque wrench to the correct tightening torque and in the right order. Consult with your dealer or distributor if the servicing requires the removal of such parts.

The standard tightening torque for standard bolts & nuts is listed below.

NOTICE

Apply the following tightening torque to bolts having "7" on the head. (JIS strength classification: 7T) Tighten bolts with no "7" mark to 60% tightening torque. If the parts to be tightened are made from light alloy aluminum, tighten the bolts to 80% tightening torque.

Bolt dia. x pitch (mm)		M6 x 1.0	M8 x 1.25	M10 x 1.5	M12 x 1.75	M14 x 1.5	M16 x 1.5
Tightening torque	(N·m)	11 ± 1	26 ± 3	50 ± 5	90 ± 10	140 ± 10	230 ± 10
	(kgf·m)	1.1 ± 0.1	2.7 ± 0.3	5.1 ± 0.5	9.2 ± 1	14.3 ± 1	23.5 ± 1
	(lb·ft)	8.0 ± 0.7	19 ± 2.1	37 ± 3.6	66 ± 7.2	103 ± 7.2	170 ± 7.2

5.2 List of Periodic Inspection Items

Daily and periodic inspections are important to keep the engine in its best condition. The following is a summary of inspection and servicing items by inspection interval. Periodic inspection intervals should vary depending on the uses, loads, fuels and lube oils used and handling conditions, and are hard to establish definitively. The following should be treated as a general standard only.

Section 5.3 gives a detailed explanation of which parts must be inspected and the procedure for doing so for each interval.

NOTICE

Schedule your own periodic inspection plan according to the operational conditions of your engine and inspect every item. Neglect of periodic inspection may lead to engine troubles and shorten the life of the engine.

Inspection and servicing at 1000 hours and thereafter require special knowledge and techniques. Consult your Yanmar dealer or distributor.

○: Check ◎: Replace ●: Consult local dealer

System	Item	Before starting	Initial 50 hrs.	Every 50 hrs. or monthly**	Every 250 hrs. or 1 year**	Every 500 hrs. or 2 years**	Every 1000 hrs. or 4 years**
Fuel system	Check the fuel level, and refill	○					
	Drain the fuel tank		○		○		
	Drain the fuel filter			○			
	Replace the fuel filter				◎		
	Check the injection timing						●
	Check the injection spray condition						●*
Lubricating system	Check the lube oil level	Engine ○ Marine gear ○					
	Replace the lube oil	Engine ○ Marine gear ○	◎		◎		
	Replace the lube oil filter	Engine ○ Marine gear ○	◎		◎		
	Seawater outlet	○ During operation					
	Check cooling water level	○					
	Check the impeller of the cooling water pump (seawater pump)				○		◎
Cooling system	Replace the fresh water coolant	Every year (when long life coolant is used of a specified type, are placement period of two years can be obtained.)					
	Clean & check the water passages						●

* For EPA requirements see also 5.4 and table on next page.

** Whichever comes first

○: Check ◎: Replace ●: Consult local dealer

System	Item	Before starting	Initial 50 hrs.	Every 50 hrs. or monthly**	Every 250 hrs. or 1 year**	Every 500 hrs. or 2 years**	Every 1000 hrs. or 4 years**
Air intake and exhaust system	Wash turbocharger blower				●*		
	Clean the exhaust/water mixing elbow				○	◎	
	Clean air cleaner				○		
Electrical system	Check the alarm lamps & devices	○					
	Check the electrolyte level in the battery			○			
	Adjust the tension of the alternator driving belt		○		○		◎
	Check the wiring connectors				○		
Cylinder head, etc.	Check for leakage of water and oil	○ (After starting)					
	Retighten all major nuts and bolts				●		
	Adjust intake/exhaust valve clearance		●				●
Remote control system, etc.	Check/adjust the remote control operation	○	○				●
	Adjust the propeller shaft alignment		●				●
	Replace rubberized hoses (for water and fuel)	Every two years or 2,000 hrs. of operation**					

* For EPA requirements see also 5.4 and below table.

** Whichever comes first

Inspection and maintenance for EPA emission related parts.

Parts	Interval
Check fuel injection nozzle (cleaning)	1500 hours
Check fuel injection nozzle (adjustment)	3000 hours
Check fuel injection pump (adjustment)	3000 hours
Check turbocharger (adjustment)	3000 hours

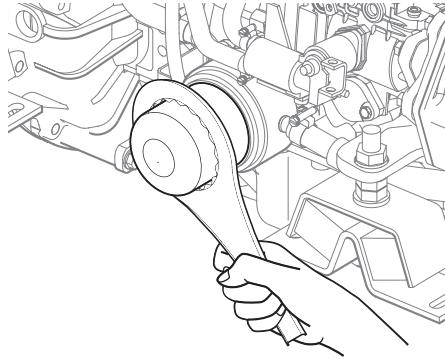
5.3 Periodic Inspection Items

5.3.1 Inspection on Initial 50 Hrs. of Operation (or after 1 Month)

(1) Replacing the Engine Lube Oil and Lube Oil Filter (1st time)

During initial operation of the engine, the oil is quickly contaminated due to the initial wear of internal parts. The lube oil must therefore be replaced early. Replace the lube oil filter at the same time. It is easiest and most effective to drain the engine lube oil after operation while the engine is still warm.

- 1) Remove the lube oil dipstick. Attach the oil drain pump and pump out the oil.
For easier draining, remove the oil filler cap (yellow) at the top of the rocker arm cover.
- 2) Remove the lube oil filter with the filter detach/attach tool.
(Turn counterclockwise.)
- 3) Clean the filter installation face and attach the new filter, tightening by hand until seal touches.
- 4) Turn an additional 3/4 of a turn with the attachment tool.
(Turn clockwise.
Tightening torque: 20 - 24 N·m (177-212 lb-in))
- 5) Fill with new lube oil. (See 3.2.2)
- 6) Perform a trial run and check for oil leaks.
- 7) Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.



008435-00X

! CAUTION

Beware of oil splashes if extracting the Lube oil while it is hot

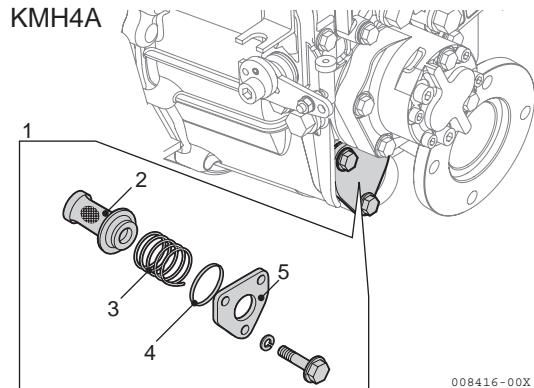
(2) Replacing the Marine Gear Lube Oil and Clean the Marine Gear Oil Filter (1st time)

During initial operation, the oil is quickly contaminated due to the initial wear of internal parts. the lube oil must therefore be replaced early. wash the lube oil filter at the same time.

Note:

Refer to the operation manual of marine gear or sail drive for the procedure.

- 1) Drain off the marine gear oil.
Remove the cap from the filler port and attach the oil drain pump. Drain off oil.
- 2) Wash the lube oil filter. **KMH4A**
 - a) Remove the side cover and then remove the filter inside the cover.
 - b) Clean the filter thoroughly with kerosene.
 - c) Hold the filter in place with the coil spring and insert them into the case. Fit an O-ring to the side cover and reattach the side cover. Tighten the side cover bolts.
- 3) Fill with new lube oil. (See 3.2.3)
- 4) Perform a trial run and check for oil leakage.



008416-00X

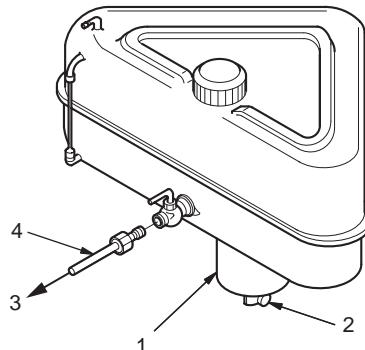
1	Lube oil filter	4	O-ring
2	Filter	5	Side cover
3	Coil spring		

(3) Draining the (Optional) Fuel Tank

Put a pan under the drain to catch the fuel.

Open the drain cock and drain off any water or dirt collected.

Once the water and dirt have been drained off and the fuel coming out is clear, close the drain cock.



008429-00X

1	Sediment	3	To engine
2	Drain cock	4	Fuel pipe

(4) Inspection and Adjustment of Intake/Exhaust Valve Clearance (1st time)

During initial operation of the engine, the intake/exhaust valve clearance may be quickly changed due to the initial wear of internal parts. Therefore adjustment is necessary. This adjustment requires specialized knowledge and techniques. Consult your Yanmar dealer or distributor.

(5) Adjusting the Remote Control Cable

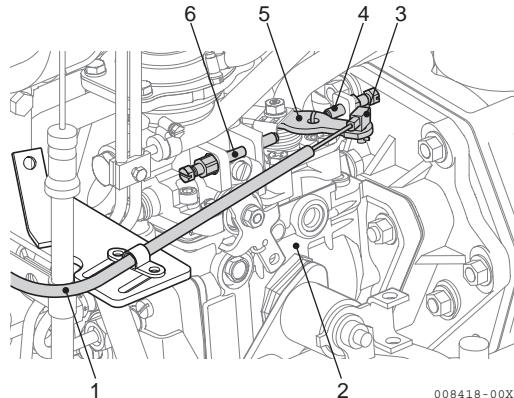
The various control levers on the engine side are connected to the remote control lever by remote control cables. The cables will become stretched and the attachments loose after long hours of use causing deviation. It is dangerous to control operation under these conditions, and the remote control cables must be checked and adjusted periodically.

1) Adjusting the throttle remote control cable

Check to see that the control lever on the engine side moves to the high speed stop position and low speed stop position when the remote control lever is moved to H (high speed) and L (low speed) respectively.

When there is deviation, loosen the bracket for the remote control cable on the engine side and adjust.

Adjust the high speed stop position first and then adjust the low speed idling by the adjustment bolt on the remote control lever.



! CAUTION

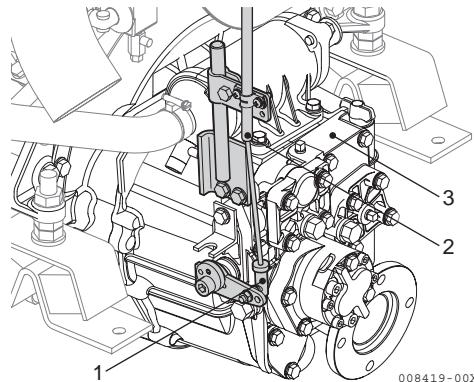
Never adjust the high speed stop bolt. This will void warranty.

1	Cable	4	Low speed stop bolt
2	Fuel injection pump	5	Control lever
3	Adjustment part	6	High speed stop bolt

2) Adjusting the clutch remote control cable

Check to see that the control lever moves to the correct position when the remote control handle is put in NEUTRAL, FORWARD, REVERSE.

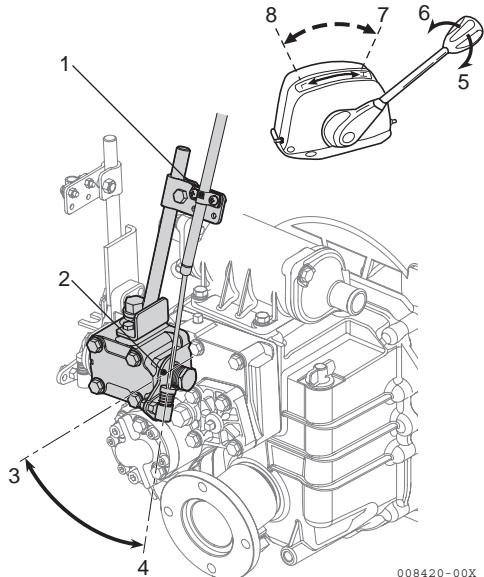
Use the NEUTRAL position as the standard for adjustment. When there is deviation, loosen the bracket for the remote control cable adjust and retighten.



1	Adjustment part	3	Marine gear
2	Cable		

3) Adjusting the position of the trawling remote control handle **KMH4A**

- Check to see that the trawling lever on the marine gear side is in the high speed position when the trawling remote control handle is in H (high speed) position.
- Check to see that the trawling lever on the marine gear side is in the low speed position when the trawling remote control handle is in L (low speed) position.
- If the positions are not aligned, loosen the setting screw of the cable fitting and adjust the position of the cable.



008420-00X

1	Cable fitting	5	Loosen
2	Trawling lever	6	Tighten
3	Low speed (Trawling)	7	[High speed] Normal operation
4	High speed	8	[Low speed] Trawling

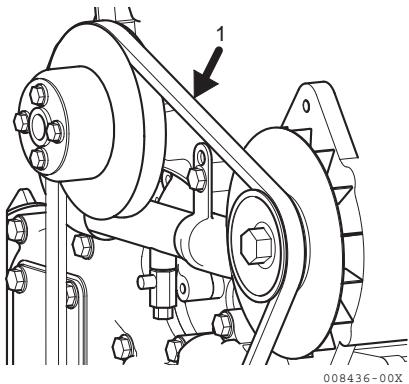
(6) Adjusting the Tension of the Fresh Water Pump Driving Belt (Alternator Driving Belt)

When there is not enough tension in the V-belt, it will slip and the cooling water pump will fail to supply adequate cooling water. Engine over-heating and seizure will result.

When there is too much tension in the V-belt, the belt will become damaged more quickly and the bearing of the cooling water pump may be damaged.

When there is too much tension in the V-belt, the belt will become damaged more quickly and the bearing of the cooling water pump may be damaged.

- Check the tension of the V-belt by pressing down on the middle of the belt with your finger. With proper tension, the V-belt should deflect 8-10 mm (0.315-0.393inches).
- Remove the belt cover. Loosen the set bolt and move the alternator to adjust V-belt tension. Fasten the belt cover with 4 nuts and washers.
- Be careful not to get any oil on the V-belt. Oil on the belt causes slipping and stretching. Replace the belt if it is marred.



008436-00X

1	Push
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(7) Adjusting the Propeller Shaft Alignment

The flexible engine mounts are compressed a little in the initial engine operation and it may cause the centering misalignment between the engine & the propeller shaft.

This adjustment requires specialized knowledge and techniques. Consult your Yanmar dealer or distributor.

5.3.2 Inspection Every 50 Hrs. (or Monthly)

(1) Drain the Fuel Filter

When water and dirt are mixed in with the fuel, it becomes impossible for the fuel injection pump and the fuel injection valve to work. Drain periodically to keep the filter from becoming clogged. When there is a lot of drain collected in the oil/water separator, at the bottom of the fuel filter, the fuel filter alarm lamp will light up (C panel only).

- 1) Close the fuel cock.
- 2) Loosen the plug screw at the bottom of the fuel filter oil/water separator, and drain off any water and dirt collected inside.

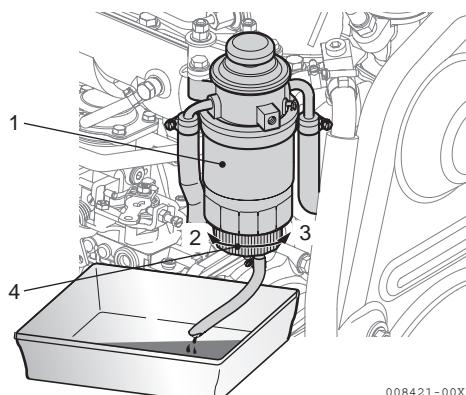
Note:

When the C type instrument panel is used, the fire-resistant cover is installed to the lower part of the fuel filter to protect the alarm switch of water level. Loosen a hose clamp and remove the fire-resistant cover.

- 3) Retighten the plug screw.
- 4) Be sure to bleed air out of the fuel system.

(See 4.2(3))

When there is a heavy deposit, drain the fuel tank at the same time.



008421-00X

1	Fuel filter	3	Tighten
2	Loosen	4	Plug screw

(2) Checking Electrolyte Level in the Battery

! WARNING

Before inspecting the electrical system, be sure either to turn off the battery switch or to disconnect the (-) terminal of the ground cable. Otherwise, a short circuit could cause a fire.

Ensure good ventilation when charging the battery. The use of open flames is strictly prohibited. Hydrogen gas may also catch fire.

Battery fluid is dilute sulfuric acid. It can blind you or burn your eyes or skin. Wear goggles and gloves when handling battery fluid. Should the fluid be deposited on your skin, wash with a large quantity of fresh water and seek treatment from a doctor.

- 1) If operation continues with insufficient battery fluid, the battery will be destroyed. Check the fluid level periodically. If the level is lower than specified, fill with distilled water (available in the market) to the upper limit of the battery. (Battery fluid tends to evaporate in high temperatures, especially in summer. In such cases, inspect the battery earlier than specified.)

- 2) If the starter rpm is too low and the engine cannot be started, measure the specific gravity of the battery with a hydrometer.

The specific gravity of the fluid when fully charged is over 1.27(at 20°C)[68F].

Fluid with a specific gravity of below 1.24 needs charging. If the specific gravity cannot be raised by charging, the battery must be replaced.

NOTICE

The capacities of the standard alternator and the recommended battery assume only the power necessary for regular engine operation.

If the power is also used for onboard lighting or other purposes, the generating and charging capacities may be insufficient. In such cases, consult your Yanmar dealer or distributor.

5.3.3 Inspection Every 250 Hrs.

(1) Draining the Fuel Tank

Refer to 5.3.1 (3).

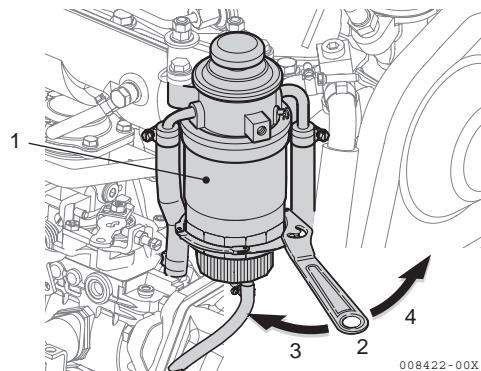
(2) Replacing the Fuel Filter

Replace the fuel filter periodically before there is clogging and the fuel flow is reduced.

- 1) Close the fuel cock of the fuel tank.
- 2) Drain the fuel from the fuel drain cock at the bottom of the fuel filter.
- 3) Remove the connectors of the wiring and remove the alarm switch using spanner.
- 4) Remove the fuel filter using the filter wrench.
- 5) Clean the fuel filter mounting face.
- 6) Replace the fuel filter with new one. Tighten the new fuel filter.

Part No. of the fuel filter:129574-55800

- Install the alarm switch to the new fuel filter.
- Apply fuel oil to the gasket of the new fuel filter.
- Lightly screw in the fuel filter in position and tighten it by hand until the gasket comes into contact with the seat. After tightening by hand, use the filter wrench to tighten it about 3/4 of a turn.



1	Fuel filter	3	Loosen
2	Filter wrench	4	Tighten

Tightening torque	11.8-15.6N·m (1.2-1.6kgf·m)
-------------------	-----------------------------

- 7) Bleed the fuel system.
 - If you spill fuel, wipe spillage carefully.
 - Start the engine to check for fuel leakage.

(3) Adjusting the Tension of the Fresh Water Pump Driving Belt (Alternator Driving Belt)

Refer to 5.3.1(6).

NOTICE

When replacing the V-belt, it is necessary to loosen the V pulley of the cooling fresh water pump.

(4) Replacing the Engine Lube Oil and Lube Oil Filter, and the Marine Gear Oil.

Refer to 5.3.1(1) and 5.3.1(2).

(5) Checking the Impeller of Seawater Pump

Depending on the use, the inside parts of the seawater pump deteriorate and the seawater discharge performance drops. At the specified interval or when the volume of discharged seawater is reduced, inspect the seawater pump in accordance with the following procedures;

- 1) Loosen the side cover bolts and remove the side cover.
- 2) Illuminate the inside of the seawater pump with a flashlight and inspect.
- 3) If any of the following problems are found, the disassembly and maintenance are necessary:
 - Impeller blades are cracked or nicked.
 - Edges or surfaces of the blades are marred or scratched.
 - Wear plate is damaged.

Removing the impeller

There are two kinds of special service tool for removing impeller:

- Puller A (Standard) 129671-92110

A	B
M18 x 1.5	M10-length40

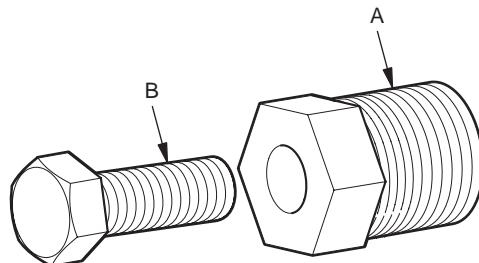
- a) Remove the side cover of seawater pump.
- b) Screw the puller A to the impeller.
- c) Turn the M10 bolt of the puller clockwise and the impeller will come out of pump body.

Note:

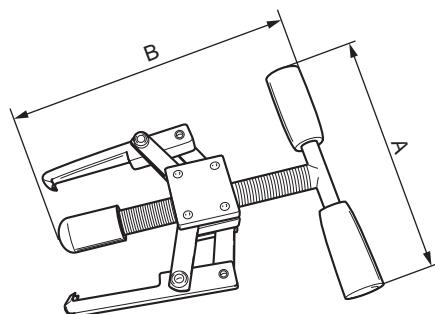
When replacing an used impeller with new one, purchase an impeller with M18 thread. Turn the M18 screw side of the impeller to the cover side, and install it.

- Puller B (Option) 129671-92100

A	B
≈110	≈140



008424-00X



008425-00X

- 4) If no damage is found when inspecting the inside of the pump, reassemble the side cover fitting the O-ring.

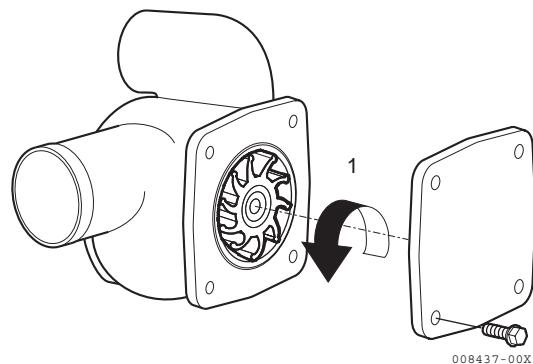
Note:

The impeller must be replaced periodically (every 1000 hrs.) even if there is no damage.

- 5) If a large amount of water leaks continuously from the water drain pipe beneath the seawater pump during operation, the disassembly and maintenance (replacement of the lip seal) is necessary. When disassembly and maintenance of the seawater pump is necessary, consult your Yanmar dealer or distributor.

NOTICE

The seawater pump turns counter-clockwise as viewed from the side cover, so the impeller must be installed as shown in the below figure. If the impeller has been removed for any reason and must be reassembled, be very careful not to install it in the wrong direction. Additionally, if the engine is being turned manually, be careful to turn it in the correct direction. Incorrect turning will twist the impeller blades and damage it.



1 | Direction of rotation

(6) Washing Turbocharger Blower

When engine speed seems sluggish or the exhaust color poor, the blades of the turbocharger blower may be dirty. Wash the blower. Consult your Yanmar dealer or distributor.

(7) Cleaning Exhaust/Water Mixing Elbow

The mixing elbow is attached to the turbocharger. The exhaust gas is mixed with seawater in the mixing elbow. Remove the mixing elbow and maintain it according to the following procedures.

- 1) Clean dirt and scale out of the air pass and seawater pass of the mixing elbow.
- 2) Repair the crack or damage of the mixing elbow by welding, or replace if necessary.
- 3) Inspect the gasket and replace if necessary.

(8) Clean air cleaner

Disassemble the air cleaner (intake silencer) and clean it with a neutral detergent. Reassemble after it is completely dry.

(9) Checking Wiring Connectors

Check whether each electric connection part doesn't have looseness. If the disconnection part will be found, repair or consult with Yanmar distributor or dealer.

(10) Retightening All Major Nuts and Bolts

When operating for long periods of time, The major bolts and nuts may come loose. It is dangerous to operate the engine in such condition. Retightening is necessary.

This maintenance requires specialized knowledge. Consult your Yanmar dealer or distributor.

5.3.4 Inspection Every 500 Hrs.**(1) Cleaning Exhaust/Water Mixing Elbow.**

Replace the used mixing elbow with new one every 500 hours or 2 years, whichever comes first, even if any damage is not found.

5.3.5 Inspection Every 1000 Hrs.

(1) Inspecting Inner Parts of the Seawater Pump

Depending on the use, the inside parts of the seawater pump deteriorate and seawater discharge performance drops.

At the specified interval or when the volume of seawater discharged is reduced, inspect the seawater pump in accordance with the following procedures;

- 1) Loosen the side cover bolts and remove the side cover.
- 2) Illuminate the inside of the seawater pump with a flashlight and inspect.
- 3) If wear plate is damaged, the disassembly and maintenance are necessary.
- 4) If no damage is found when inspecting the inside of the pump, install a new impeller and reassemble the side cover fitting the O-ring.

Note:

1. *The impeller must be replaced at every 1000 hours even if the impeller is not damaged.*
2. *When removing the impeller, use the special service tool for removing impeller.
Refer to 5.3.3(5).*

If a large amount of water leaks continuously from the water drain pipe beneath the seawater pump during operation, disassembly and maintenance (replacement of the lip seal) is necessary.

When disassembly and maintenance of the seawater pump is necessary, consult your Yanmar dealer or distributor.

NOTICE

The seawater pump turns counter-clockwise as viewed from impeller cover side, so the impeller must be installed as shown in the below figure. If the impeller has been removed for any reason and must be reassembled, be very careful not to make a mistake and turn it in the wrong direction. Additionally, if the engine is being turned manually, be careful to turn it in the correct direction. Incorrect turning will twist the impeller blades and damage it.

(2) Inspecting and Adjusting Intake/Exhaust Valve Clearances

When operating for long periods of time, the clearance between the intake/exhaust valve and the rocker arm will change and affect operation performance. Adjustment is necessary.

Adjustment requires specialized knowledge and techniques. Consult your Yanmar dealer or distributor.

(3) Inspecting and Adjusting the Fuel Injection Spray Condition

Adjustment is necessary to obtain optimal fuel injection to ensure the best possible engine performance. This inspection requires specialized knowledge and techniques.

Consult your Yanmar dealer or distributor.

(4) Adjusting the Remote Control Cables

Refer to 5.3.1(5).

(5) Inspecting and Adjusting the Fuel Injection Timing

Fuel injection timing must be adjusted periodically to ensure optimal engine performance.

This maintenance requires specialized knowledge.

Consult your Yanmar dealer or distributor.

(6) Cleaning and Checking Water Passages

When it is used for a long time, cleaning of the cooling water passages is periodically necessary, because trash, scales, rust, and so on collect in the cooling water passages and the cooling performance declines.

The following maintenances are necessary.

- Heat exchanger inspection.
- Pressure cap inspection.

This maintenance requires specialized knowledge. Consult your Yanmar dealer or distributor.

(7) Adjusting Tension of Alternator Driving Belt

Replace the alternator driving belt with new one every 1000 hours or four years, whichever comes first, even if there is no crack on the belt surface.

Refer to 5.3.1(6) for the procedure.

(8) Adjusting Propeller Shaft Alignment

The rubber tension of the flexible engine mounts is lost after many hours' use. This leads to a drop in vibration absorption performance, and also causes centering misalignment of the propeller shaft.

NOTICE

Be sure to replace the Yanmar flexible engine mounts every 1000 hours or 4 years, whichever comes first.

This maintenance requires specialized knowledge. Consult your Yanmar dealer or distributor.

5.3.6 Annually

(1) Replacing Fresh Water Coolant

Cooling performance drops when cooling water is contaminated with rust and scale.

Even if antifreeze or antirust is added, the cooling water must be replaced periodically because the properties of the agent will degenerate.

To drain the fresh water/coolant, open the fresh water cocks (three) as shown in 3.2.4.

Refer to 3.2.4 for the procedures.

5.3.7 Every Two Years

Replace rubberized hoses for water and fuel periodically every two years or 2,000 hours of operation, whichever comes first. Consult your Yanmar dealer or distributor.

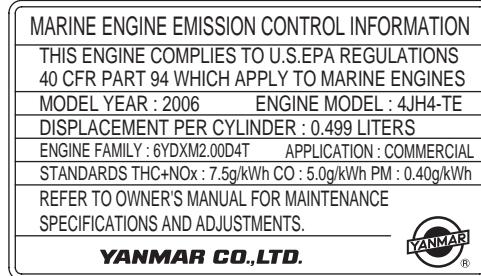
5.4 EPA Requirements

This regulation is applied only in U.S.A.

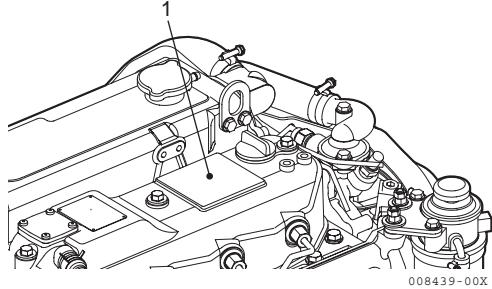
5.4.1 EPA Certification Plate

This engine has the following EPA certification plate attached:

- EPA certification plate (4JH4-TE)



- Attachment position for certification plate
 (attached to the top of the rocker arm cover)



1 | EPA certification plate

5.4.2 Conditions to Insure Compliance with Emission Standards

This product is an EPA approved engine.

The following are the conditions that must be met in order to insure that the emissions during operation meet the EPA standards.

Be sure to follow these.

- The operating conditions should be as follows:

- 1) Ambient temperature: -20 - 40°C
- 2) Relative humidity: 80% or lower
- 3) Permissible value for intake negative pressure: 2.0kPa (200 mm Aq) or lower
- 4) Permissible value for exhaust back pressure: 20 kPa (2000 mm Aq) or lower

- The fuel and lubricating oil used should be as- follows:

- 1) Fuel: The diesel fuel oil, ASTM D975 No.1-D or No.2-D, equivalent (Cetane No. 45 minimally.)
- 2) Lubricating oil: Type API, class CD

- Do not remove the seals limiting the amount of fuel injected and the engine speed.

- Be sure to carry out inspections.

Follow the basic guidelines outlined in 5.3 (Periodic Inspection Items) of this manual and keep a record of the results.

Pay particular attention to these important points: replacing the lubricating oil, lubricating oil filter, the fuel filter and cleaning the intake silencer/filter element.

Note:

Inspections are divided into two sections in accordance with whom is in charge of carrying out the inspection: (the User) and (the Maker).

5.4.3 Inspection and Maintenance

Inspection and maintenance for EPA emission related parts are shown in the chart below.

These must be performed to keep the emission values of your engine in the standard values during the warranty period. The warranty period is determined by the age of the engine or the number of hours of operation (refer to attached "Warranty statement").

Inspection and maintenance not noted below are the same as the periodic maintenance. See 5.2 and 5.3.

Parts	Interval
Check fuel injection nozzle (cleaning)	1500 hours
Check fuel injection nozzle (adjustment)	3000 hours
Check fuel injection pump (adjustment)	3000 hours
Check turbocharger (adjustment)	3000 hours

Note:

The inspection and maintenance shown above are to be performed at your Yanmar dealer or distributor.

6. TROUBLE AND TROUBLESHOOTING

Trouble	Probable cause	Measure	Reference
Alarm buzzer and alarm lamps on during operation.	NOTICE Shift to low speed operation immediately, and check which lamp has come on. Stop the engine for inspection. If no abnormality is identified and there is no problem with operation, return to port at your lowest speed and request repairs.		
Lube oil low pressure alarm. Warning lamp goes on.	Engine lube oil level low. Lube oil filter clogged.	Check lube oil, add or replace. Replace.	3.2.2
Water in sail drive seal alarm goes on.	Breakage of rubber seal on the sail drive.	Check and change the rubber seal.	
Coolant temperature high alarm warning lamp goes on.	Insufficient coolant in coolant tank. Insufficient seawater causing temperature to rise. Contamination inside cooling system.	Check coolant and replenish. Check seawater system. Ask for repairs.	3.2.4
Faulty warning devices.	NOTICE Do not operate the engine if alarm devices are not repaired. Serious accidents may result if difficulties are not spotted due to faulty alarm lamps. When switch is turned ON: Alarm buzzer does not sound. Circuit broken or buzzer defective. Ask for repairs.		
Warning lamps do not go on.	Lube oil low pressure. Water in sail drive seal alarm. No current available. Circuit broken or lamp burnt out.	Ask for repairs.	
One of the warning lamps does not go out.	Sensor switches faulty.	Ask for repairs.	
Battery low charge lamp does not go out during operation.	V-belt is loose or broken. Battery defective. Alternator failure.	Replace V-belt; adjust tension. Check fluid level, specific gravity. replace. Ask for repairs.	5.3.1(6) 5.3.2(2)

Note:

Other warning lamps do not go on when the switch is turned on. They only go on when there is an abnormality.

Trouble	Probable cause	Measure	Reference
Starting failures.			
Starter turns, but engine does not start.	No fuel. Fuel filter is clogged. Improper fuel. Faulty fuel injection system. Compression leakage from intake/exhaust valve.	Replenish fuel; bleed air. Replace element. Replace with recommended fuel. Ask for repairs. Ask for repairs.	4.1(2)/4.2(3) 5.3.3(2)
Starter does not turn or turns slowly. (Engine can be turned manually)	Faulty clutch position. Insufficient battery charge. Cable terminal contact failure. Faulty safety switch device. Faulty starter switch. Power lacking due to accessory drive engaged.	Shift to NEUTRAL and start. Check fluid level; recharge; replace. Remove corrosion from terminal; retighten. Ask for repairs. Ask for repairs. Ask for repairs. Consult your dealer.	4.2(1) 5.3.2(2)
Engine cannot be turned manually.	Internal parts seized; broken.	Ask for repairs.	
Abnormal exhaust color black smoke.	Load increased. Improper propeller matching. Contaminated intake silencer. Improper fuel. Faulty spraying of fuel injector. Incorrect intake/exhaust valve clearance.	Consult your dealer. Consult your dealer. Clean element. Replace with recommended fuel. Ask for repairs. Ask for repairs.	
White smoke.	Improper fuel. Faulty spraying of fuel injector. Fuel injection timing off. Lube oil burns; excessive consumption.	Ask for repairs. Ask for repairs. Ask for repairs. Ask for repairs.	3.1.1 5.3.4(3)

Consulting your Yanmar dealer or distributor
Refer difficult problems and repairs to your Yanmar dealer or distributor. At the time of trouble, check and report the following:
1. Engine model and serial number: 2. Boat name, material of hull, size (tons): 3. Use, type of boating done, no. of hours run: 4. Total number of operation hours (refer to hour meter), age of boat: 5. Condition before trouble (engine rpm, type of operation, load condition, etc.): 6. Details of trouble: (Exhaust color; sound of engine; does engine start; can engine be turned manually; type of fuel used; brand and viscosity of lube oil; etc.) 7. Past problems and repairs: This needs to be one page lined as SERVICE HISTORY Date Engine Hours Service completed

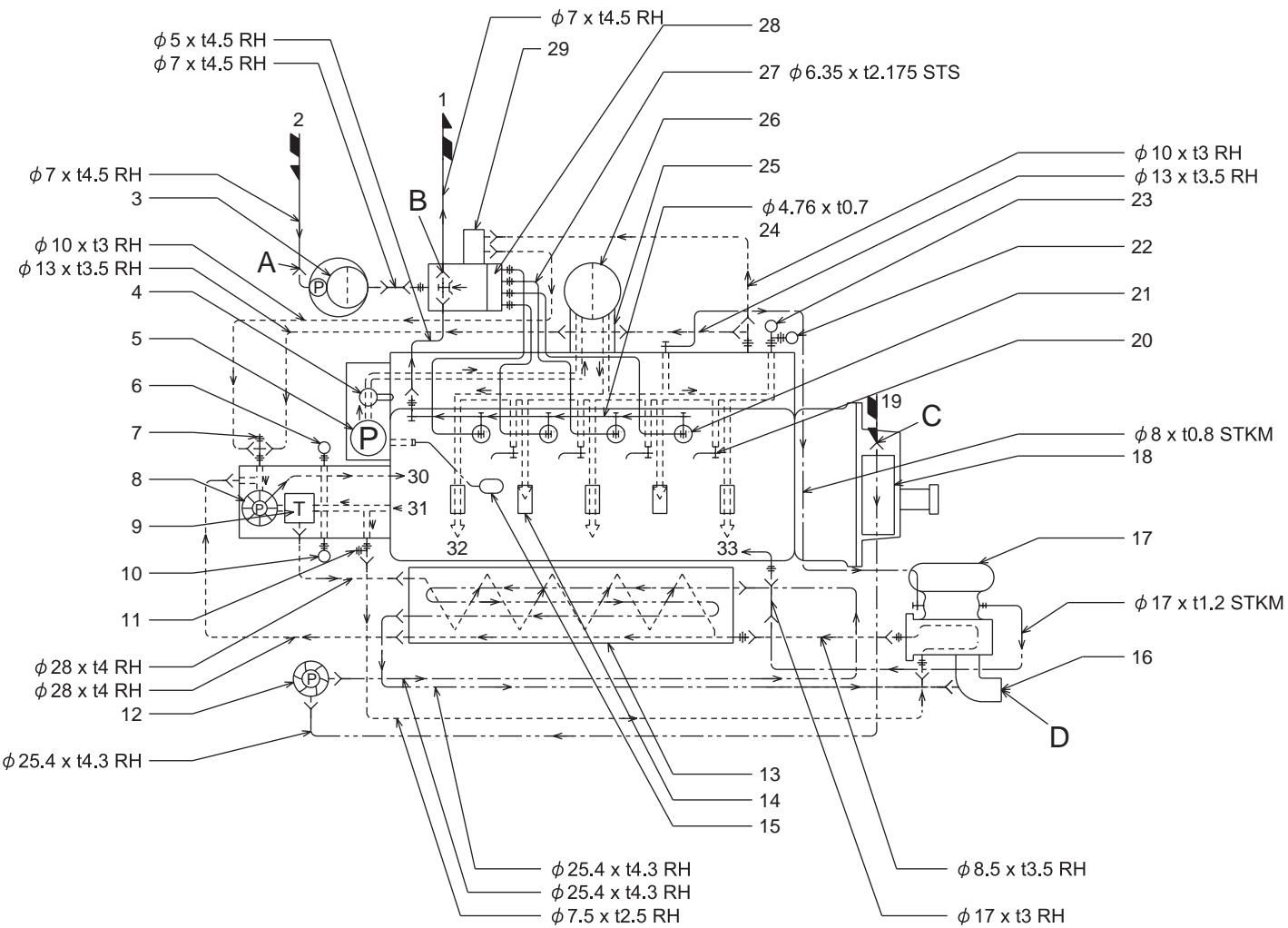
7. SYSTEM DIAGRAMS

7.1 Piping Diagrams

Marks of piping	
RH	Rubber hose
SGP STS	Steel pipe
C1201T	Copper pipe
—+ —	Screw joint (Union)
— —	Flange joint
—T—	Eye joint
—<—	Insertion joint
-----	Drill hole
-----	Cooling fresh water piping
-----	Cooling seawater piping
-----	Lube oil piping
_____	Fuel oil piping

1	Fuel overflow
2	Fuel oil inlet
3	Fuel oil filter (Cartridge type)
4	Pressure control valve
5	Lube oil pump
6	Fresh water temperature sensor (Option)
7	Hot water connection return
8	Cooling water pump (Fresh water)
9	Thermostat
10	Fresh water temperature switch
11	Hot water connection outlet
12	Cooling water pump (Seawater)
13	Fresh water cooler
14	Main bearing
15	Lube oil inlet filter
16	Mixing elbow
17	Turbo charger
18	Clutch lube oil cooler
19	Seawater inlet
20	Piston cooling oil jet
21	Fuel injection nozzle
22	Oil pressure sensor (Option)
23	Oil pressure switch
24	Double walled steel tube
25	Lube oil cooler
26	Lube oil filter (Cartridge type)
27	Fuel high pressure pipe
28	Fuel injection pump
29	W-C. S. D
30	To block
31	From head
32	To cam shaft
33	To oil pan
34	Cock (Seawater inlet)

Piping diagram of 4JH4-TE with KMH4A/ZF25A

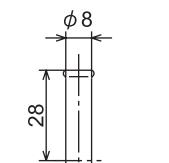
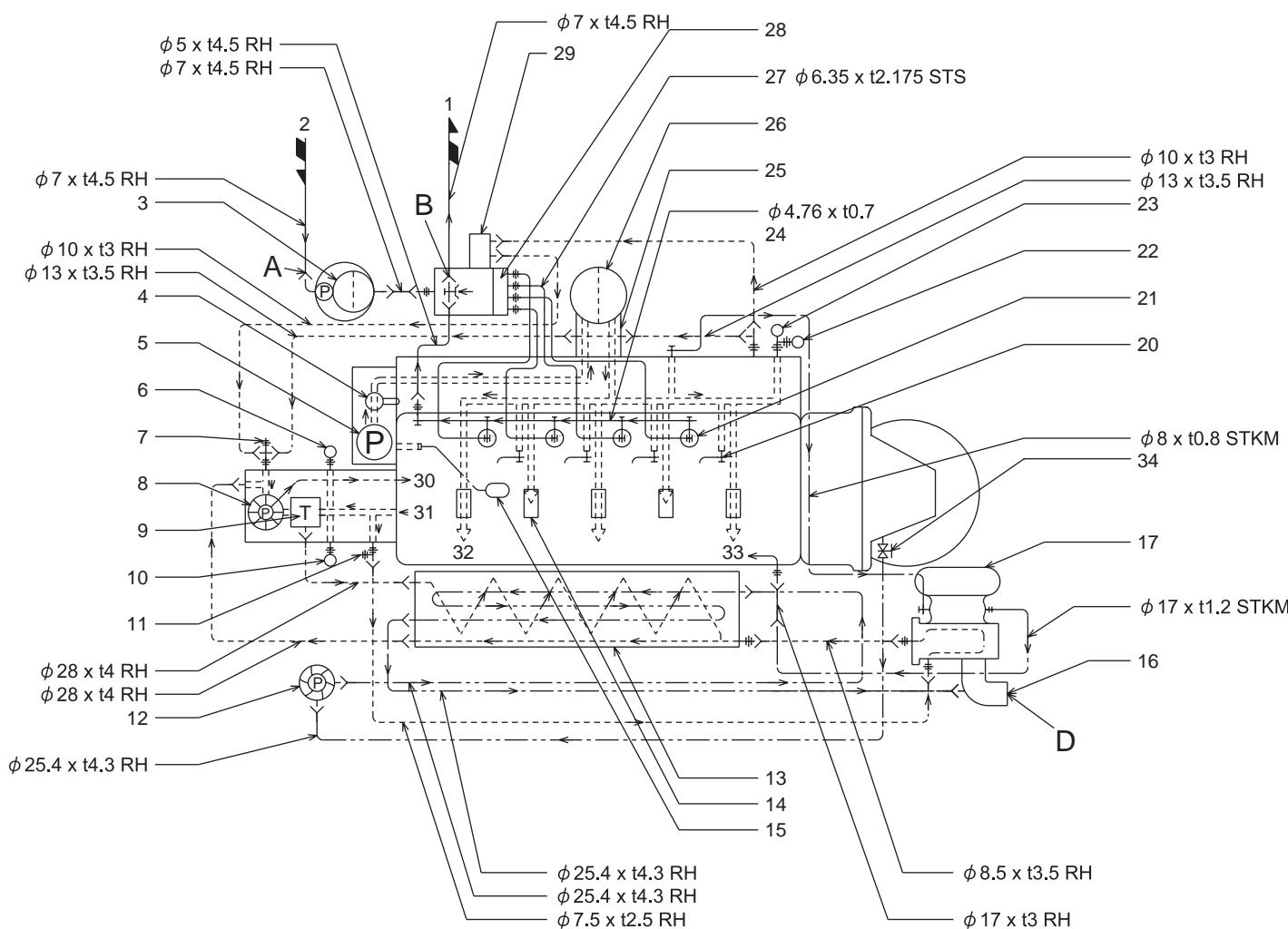


Note

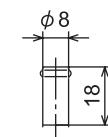
As for the pipe size specified in the diagram, the steel pipe shows an outside diameter and a wall thickness and the rubber tube shows a inside diameter and a wall thickness.

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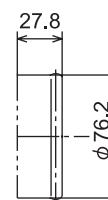
Piping diagram of the 4JH4-TE with SD50



Detail of part A



Detail of part B



Detail of part D

Note

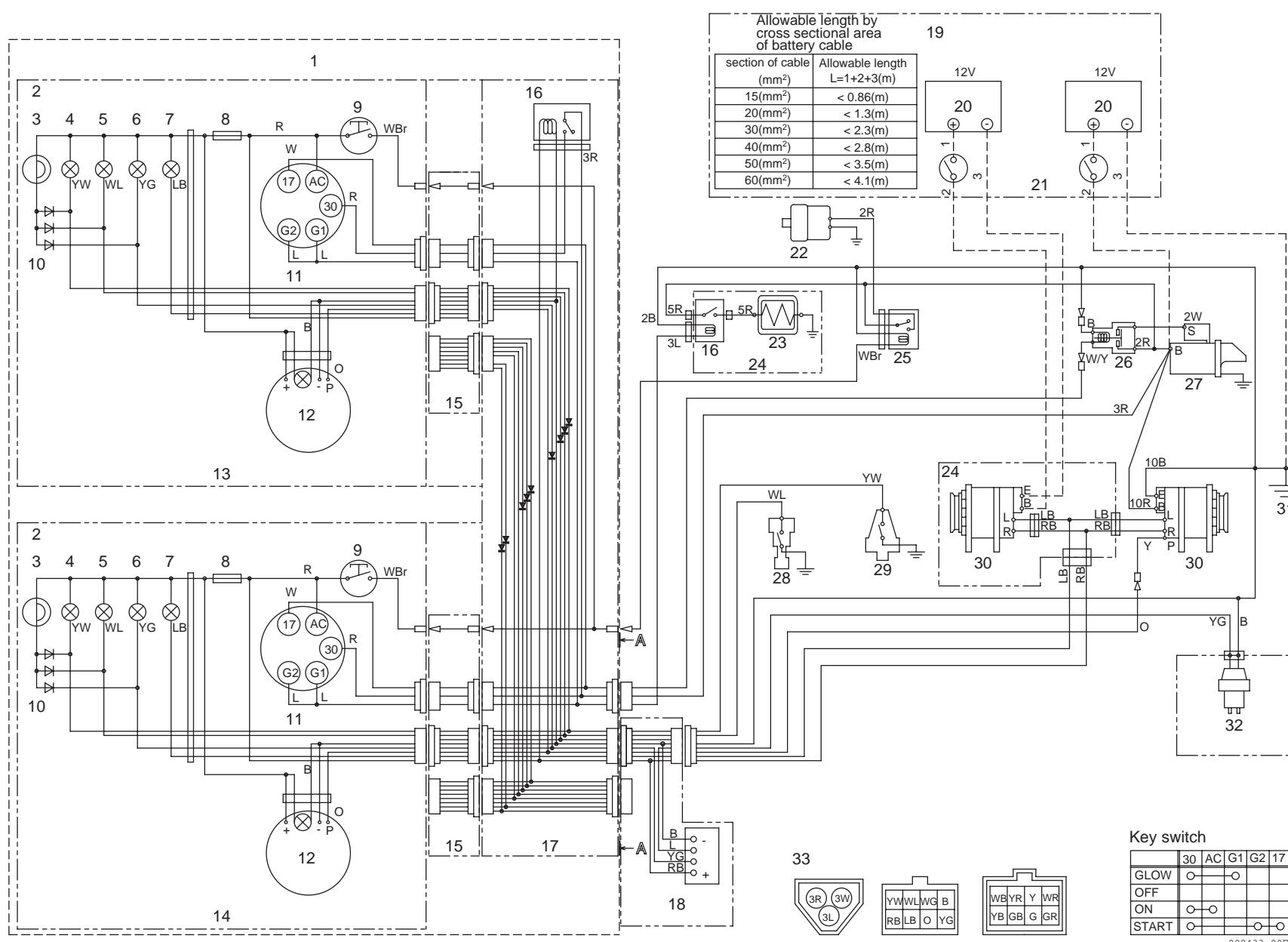
As for the pipe size specified in the diagram, the steel pipe shows an outside diameter and a wall thickness and the rubber tube shows a inside diameter and a wall thickness.

7.2 Wiring Diagrams

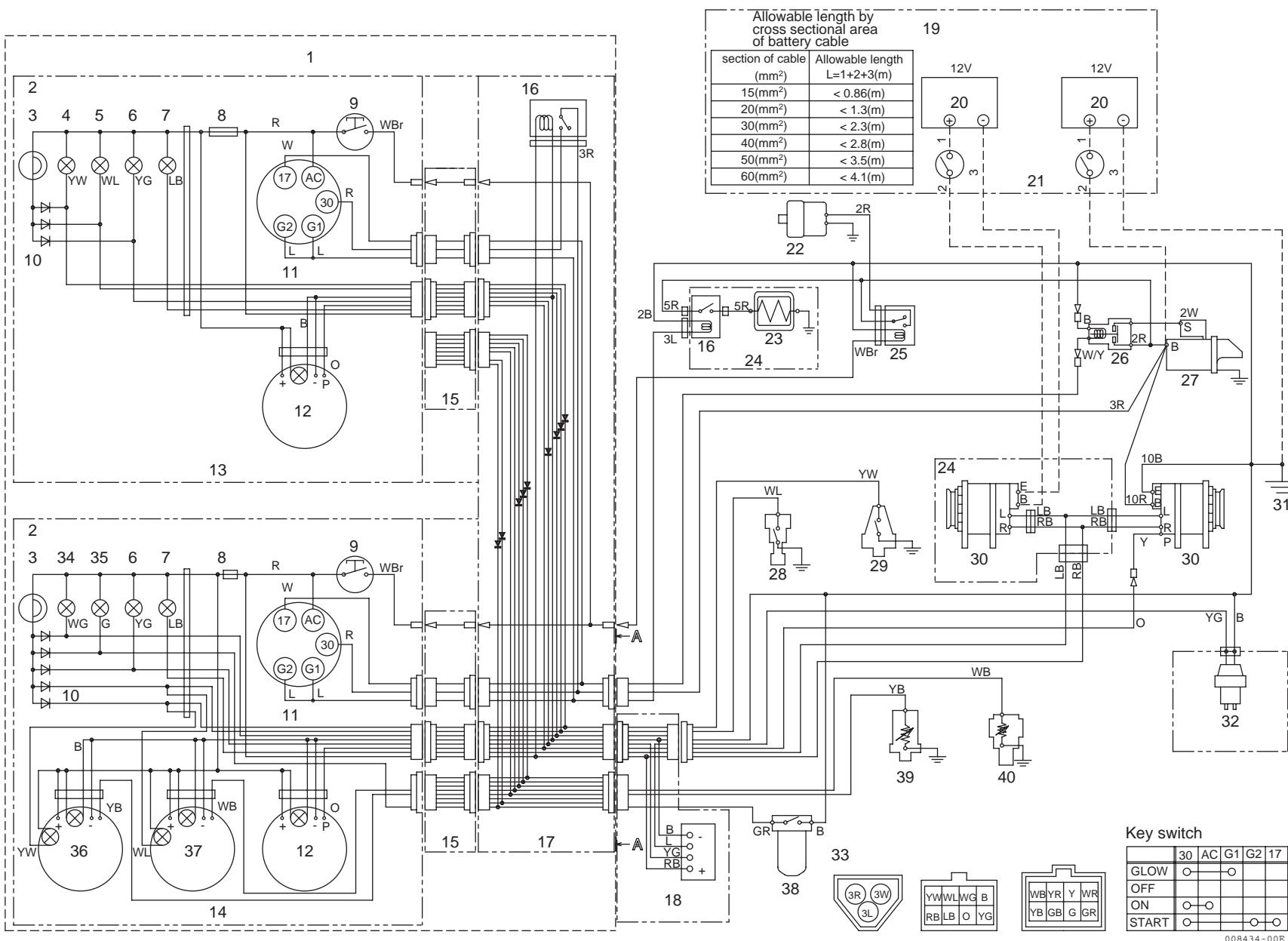
(Color coding)		Engine harness
R	Red	+
B	Black	-
W	White	Ignition
L	Blue	Air heater/grow (option)
RB	Red/Black	Alternator exciter
LB	Blue/Black	Alternator charge alarm
YW	Yellow/White	Engine oil pressure alarm
YB	Yellow/Black	Engine oil pressure
YG	Yellow/Green	Sail drive seal
WL	White/Blue	Water temperature alarm
WB	White/Black	Water temperature
WG	White/Green	Sea water flow alarm
GR	Green/Red	Fuel filter alarm
O	Orange	Pulse for tachometer
WBr	White/Brown	Electric stop

1	Option
2	Alarm lamps
3	Buzzer
4	Oil pressure
5	CWF temperature
6	Sail drive seal
7	Charge
8	Fuse (3A)
9	Stop switch
10	Diodes
11	Key switch
12	Tachometer hour meter
13	Instrument panel (sub station) (Option)
14	Instrument panel (main station) (Option)
15	Wire harness
16	Relay
17	Wire harness for sub panel
18	Amplifier only for sail drive
19	Procured by customer
20	Battery
21	Battery switch
22	Engine stop solenoid with VE pump
23	Air heater
24	Option
25	Stop relay
26	Starter relay
27	Starter
28	Cooling water temperature switch
29	Engine oil pressure switch
30	Alternator
31	Earth bolt
32	Only for sail drive
33	Details of coupler (View from A-A)
34	Seawater
35	Fuel filter
36	Alarm oil pressure meter
37	Alarm water temperature meter
38	Fuel filter switch
39	Oil pressure sender
40	Cooling water temperature sender

Wiring diagram of the 4JH4-TE with panel B x B type



Wiring diagram of the 4JH4-TE with panel C x B type



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User's record

Date of purchase
Engine model Engine serial number Marine gear model & serial number Gear ratio
Place of purchase (Name of dealer)