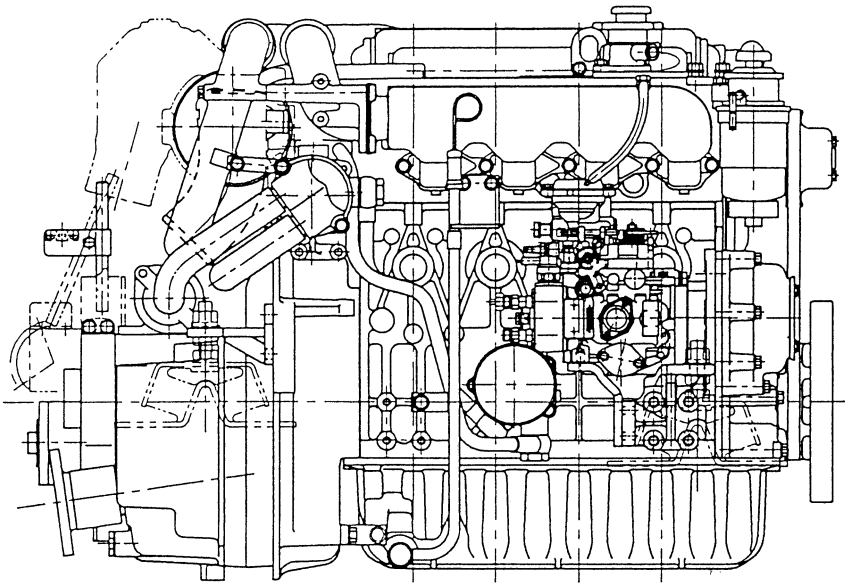
OPERATION MANUAL

YANMAR

MARINE DIESEL ENGINE

4JH3-TE/-TCE/-HTE/-DTE



Model 4JH3-DTE(with KMH4A marine gear)

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

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page No.

1. FOR SAFE OPERATION

Following the precautions described in this manual will enable you to use this engine with complete satisfaction. Failure to observe any of the rules and precautions, however, may result in injury, burns, fires, and engine damage. Read this manual carefully and be sure you fully understand it before beginning operation.

1.1 Warning Symbols

These are the warning signs which are used in this manual and on the products.
Pay special attention to them.

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

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

⚠ CAUTION CAUTION- Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. It may also be used to alert against unsafe practices.

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

1.2 Safety Precautions

(Observe these instructions for your own safety.)

Precautions for Operation

⚠ DANGER

Burns from Scalding

- Never remove the filler cap of the fresh water cooler while the engine is still hot. Steam and hot water will spurt out and seriously burn you. Wait until the water temperature has dropped, then wrap a cloth around the cap and loosen it slowly.
- After inspection, refasten the filler cap firmly. If the cap is not secure, steam or scalding water may be emitted during operation causing burns.

⚠ DANGER

Proper Ventilation of the Battery Area

- Be sure the area around the battery is well-ventilated and there is nothing which could start a fire. During operation and charging, hydrogen gas is emitted from the battery and can be easily ignited.

⚠ DANGER

Fires from Oil Ignition

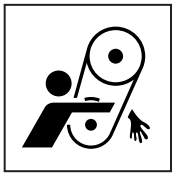
- Be sure to use the correct type of fuel when refueling.
  Mistakenly filling with gasoline or the like will result in ignition.
- Be sure to stop the engine before refueling.
  If you spill fuel, wipe such spillage carefully.
- Never place oils or other flammable material close to the engine as this could result in ignition.

⚠ WARNING

Exhaust Gas Poisoning

- Be sure to establish good ventilation in the engine room with windows, vents, or other ventilation equipment. Check again during operation to be sure that ventilation is good. Exhaust gas contains poisonous carbon monoxide and should not be inhaled.

⚠ WARNING



Moving Parts

- Do not touch the moving parts of the engine (propeller shaft, V-belt, PTO-pulley, etc.) during operation or let your clothing get caught in them as this can result in injury.
- Never operate the engine without the covers on the moving parts.
- Check before starting the engine to see that any tools or cloths used in maintenance have been removed from the area.

⚠ CAUTION

Burns from Contact with Hot Engine Parts

- The whole engine is hot during operation and immediately after stopping.
  The turbocharger, exhaust manifold, exhaust pipe, and engine 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 or when you are ill or feel unwell as this results in accidents.

Safety Precautions for Inspection

⚠ DANGER

Battery Fluid

• Battery fluid is diluted sulfuric acid. It can blind you if it gets in your eyes, or burn your skin. Keep the fluid away from your body. Wash it off immediately with a large quantity of fresh water if you get any on you.

⚠ WARNING

Fire due to Electric Short-Circuits

• Always turn off the battery switch or detach the earth cable (-) before inspecting the electrical system. Failure to do so could cause short-circuiting and fires.

⚠ WARNING

Precautions for Moving Parts

• Stoop the engine before you service it. If you must inspect while the engine is operating, never touch moving parts. Keep your body and clothing well clear of all moving parts as this could result in injury.

⚠ CAUTION

Precautions for Removing Hot Oil and Water to Prevent Burns

• If extracting oil from the engine while it is still hot, do not let the oil splash on you.

• Wait until the temperature has dropped before removing cooling water from the engine to avoid getting scalded.

NOTICE:

Do not alter the diesel engine.

Rebuilding the engine or altering parts to increase the speed or the amount of fuel discharged, etc. will make operation unsafe, and result in damage and shortening of engine life.

NOTICE:

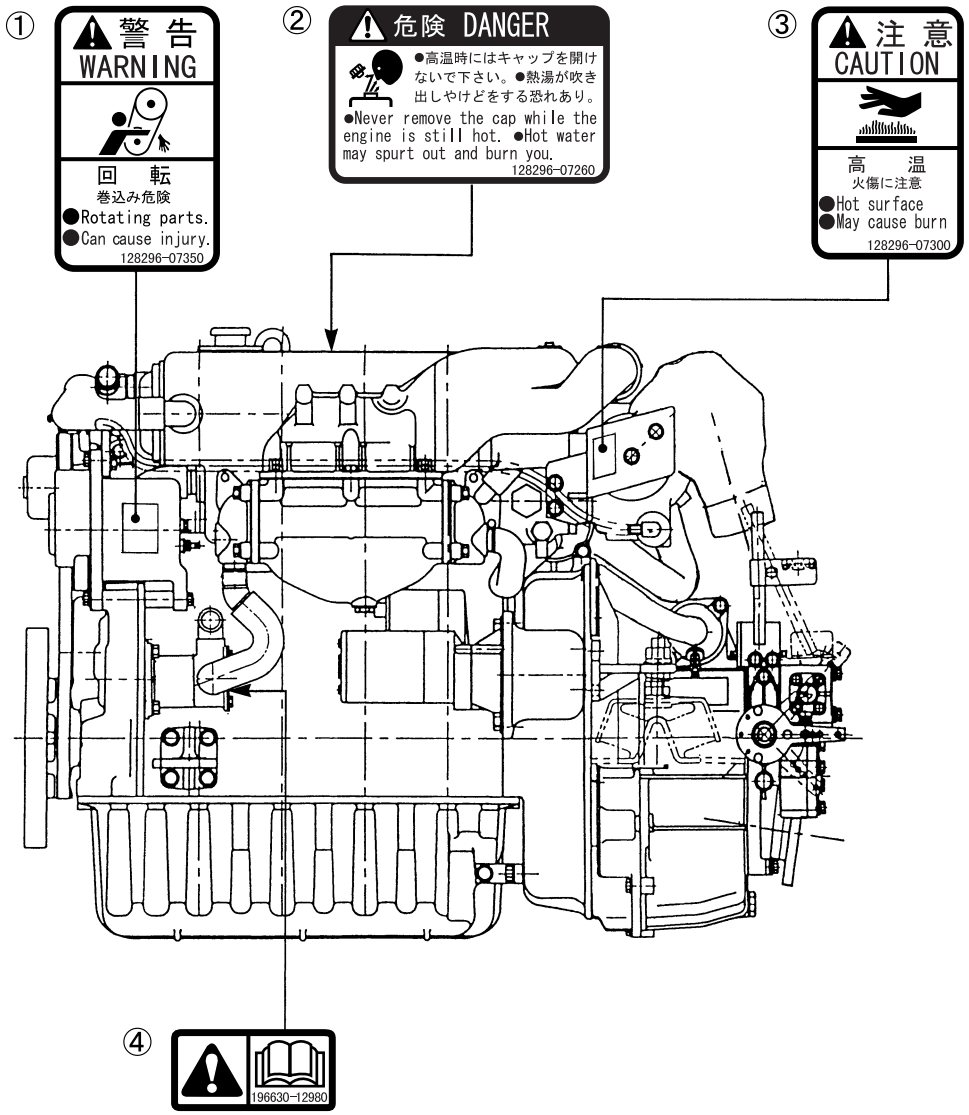
Disposal of waste materials

- *Put oil or liquids to be disposed in a container. Never dispose of waste oil or other fluids outside, in a sewer, river, or the sea.*
- *Treat waste materials safely observing all regulations and laws. Ask a waste recovery company to collect and dispose of it.*

1.3 Location of Product Safety Labels

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

Product Safety Labels, Parts Code Numbers	
1	128377-07350
2	128296-07260
3	128296-07300
4	196630-12980



The above diagram shows a side view of the engine.

2. PRODUCT EXPLANATION

2.1 Use & Driving System

This is light, compact diesel elngine for use in pleasure boats. The engine is equipped with a turbocharger and intercooler which insures maximum output while preserving lightness and compact size. (The 4JH3-TE /-TCE are equipped with the turbocharger only.)
Power output for this group of engines increases progressively from 4JH3-TE(4JH3-TCE), 4JH3-THE to 4JH3-DTE.
In case of engine with marine gear. connect the propeller shaft to the marine gear output shaft. The 4JH3-TCE is with drive SD40-4T. For the sail drive, please refer to its operation manual.
The different types of applicable marine gears for each engine are shown below.

Engine / Marine gear	4JH3-TE	4JH3-THE	4JH3-DTE	Note
KBW21	O	O	×	O : Applicable × : Not applicable
KM4A	O	O	×	
KMH4A	O	O	O	

The installation, fitting and surveying of this engine all require specialized knowledge and engineering skills. Additionally, boat and engine inspection may be required by the laws of some countries. Consult Yanmar's local subsidiary in your region or your distributor or dealer.

In order to get full performance from your engine, it is imperative that the size and structure of the boat be suited to the engine. It is equally important to use the correct driving device and a propeller of the appropriate size and specifications.
The engine must be installed correctly with safe cooling water and exhaust piping and electrical wiring. The PTO work should be easy to use for onboard equipment.

Consult your Yanmar dealer or distributor when selecting optional parts. Optional parts selections should take into account operational and surrounding conditions.

This Operation Manual explains the basic points for standard operation. Variations are explained under the specially marked sections.

This operation Manual explains the basic points for standard operation. Variations are explained under the leter emblems for easy reference.

MODEL : Explanation of indicated model only.
OPTION : Explanation of optional parts.
CUSTOMER : Explanation of use of parts from other boat manufacturers.

Where there are no leter emblem sections the explanation applies to all models.
Explanation for driving devices, propellers, etc. and optional parts are not included, and special attention should be paid to the explanations and safety precautions in the operation manuals provided by the boat and equipment manufacturers.

2.2 Engine Specifications

2.2.1 4JH3-TE

Engine model			4JH3-TE					
Use			Pleasure boat					
Type			Vertical water-cooled 4-cycle diesel engine					
No. of cyl.-bore×stroke			4-ϕ84×90					
Displacement L			1.995					
Aspiration			Turbooharged					
Cont. rating kW{hp}/rpm			50.7(69) / 3700					
Max. output kW{hp}/rpm (Crankshaft)			*55.2(75)/3800 **53.5(72.8)/3800					
High idling rpm			4300±25					
Low idling rpm			700±25					
Combustion system			Direct injection					
Starting system			Electric starting					
Cooling system			Constant high temperature fresh water cooling					
Lubricating system			Forced lubrication system with trochoid pump					
Marine gear	Model		KBW21		KM4A		KMH4A	-
	Type		Mechanical wet multiple disk clutch input/output eccentric parallel drive		Mechanical wet cone clutch 7° Down angle drive		Hydraulic wet multiple disk clutch 8° Down angle drive	
	Reduction ratio (Ahead/Astern)		2.17/3.06	2.62/3.06	1.47/1.47	2.14/2.14	2.04/2.04	2.45/2.45
					2.63/2.63	3.30/3.30		
Direction of rotation	Crankshaft		Counterclockwise (Viewed from stern side)					
	Propeller shaft		Clockwise (Viewed from stern side)					
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)					
Fuel injection valve			Pinhole injection nozzle YDLLA-P(5-0.22×150°)					
Turbocharger			RHB52(IHI) Water cooled and forced lubrication system					
Elec. devices	Starter		DC12V-1.4kW					
	Alternator		DC12V-55A					
Lube oil capacity (raked angle) L	Engine	Oilpan	5.2(7°)		6.4(0°)			Refer to the left
		All	6.3(7°)		7.5(0°)			
	Marine gear		1.2		1.3		2.0	-
Cooling water capacity L	Fresh water tank		6.0					
	Subtank		0.8					
Dimensions (L×W×H) mm			898×560×635		888×565×635		886×565×635	763×566×635
Engine installation style			On the flexible rubber engine mount					
Recommended battery capacity			12V-120A or greater					
Recommended engine room ventilator			$12m^3$/min or greater					
Dry mass kg			249		247		250	219

Note:
1. Rating condition : ISO 3046-1, 8665
2. 1hp=0.7355kW
*3. Fuel condition : Density at 15℃=0.860,Fuel oil temperature *:25℃ at the fuel injection pump inlet*
*** : ISO 8665(Fuel oil temp. 40℃ at the fuel injection pump inlet)*

2.2.2 4JH3-TCE

Engine model			4JH3-TCE
Use			Pleasure boat (Sailing boat)
Type			Vertical water-cooled 4-cycle diesel engine
No. of cyl.-bore×stroke mm			4-ϕ84×90
Displacement L			1.995
Aspiration			Turbooharged
Cont. rating kW{hp}/rpm			50.7(69)/3700
Max. output kW{hp}/rpm (Crankshaft)			*55.2(75)/3800 **53.5(72.8)/3800
High idling rpm			4300±25
Low idling rpm			700±25
Combustion system			Direct injection
Starting system			Electric starting
Cooling system			Constant high temperature fresh water cooling
Lubricating system			Forced lubrication system with trochoid pump
Sail drive	Model		SD40-4T
	Type		Mechanical wet cone clutch
	Reduction ratio		Refer to the operation manual for the sail drive
Direction of rotation	Crankshaft		Counterclockwise(Viewed from stern side)
	Propeller		Refer to the operation manual for the sail drive
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)
Fuel injection valve			Pinhole injection nozzle YDLLA-P(5-0.22×150°)
Turbocharger			RHB52(IHI) Water cooled and forced lubrication system
Elec. devices	Starter		DC12V-1.4kW
	Alternator		DC12V-55A
Lube oil capacity (raked angle) L	Engine	Oilpan	6.4 (Raked angle 0°)
		All	7.5 (Raked angle 0°)
	Drive		Refer to the operation manual for the sail drive
Cooling water capacity L	Fresh water tank		6.0
	Subtank		0.8
Dimensions (L×W×H) mm			1086×565×1238(Propeller shaft center)
Engine installation style			On the flexible nubber engine mount
Recommended battery capacity			12V-120A or greater
Recommended engine room ventilator			12m^3/min or greater
Dry mass kg			219(Engine)

Note:
1. Rating condition : ISO 3046-1, 8665
2. 1hp=0.7355kW
*3. Fuel condition : Density at 15℃=0.860,Fuel oil temperature *:25℃ at the fuel injection pump inlet*
*** : ISO 8665(Fuel oil temp. 40℃ at the fuel injection pump inlet)*

2.2.3 4JH3-HTE

Engine model			4JH3-HTE						
Use			Pleasure boat						
Type			Vertical water-cooled 4-cycle diesel engine						
No. of cyl.-bore×stroke mm			4-ϕ84×90						
Displacement L			1.995						
Aspiration			Turbooharged						
Cont. rating kW{hp}/rpm			67.7(92)/3700						
Max. output kW{hp}/rpm (Crankshaft)			*73.6(100)/3800 **71.4(97)/3800						
High idling rpm			4300±25						
Low idling rpm			700±25						
Combustion system			Direct injection						
Starting system			Electric starting						
Cooling system			Constant high temperature fresh water cooling						
Lubricating system			Forced lubrication system with trochoid pump						
Marine gear	Model		KBW21		KM4A		KMH4A		-
	Type		Mechanical wet multiple disk clutch input/output eccentric parallel drive		Mechanical wet cone clutch 7° Down angle drive		Hydraulic wet multiple disk clutch 8° Down angle drive		
	Reduction ratio (Ahead/Astern)		2.17/3.06	2.62/3.06	1.47/1.47	2.14/2.14	2.04/2.04	2.45/2.45	
					2.63/2.63	3.30/3.30			
Direction of rotation	Crankshaft		Counterclockwise (Viewed from stern side)						
	Propeller shaft		Clockwise (Viewed from stern side)						-
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)						
Fuel injection valve			Pinhole injection nozzle YDLLA-P(5-0.25×150°)						
Turbocharger			RHB52(IHI) Water cooled and forced lubrication system						
Elec. devices	Starter		DC12V-1.4kW						
	Alternator		DC12V-55A						
Lube oil capacity (raked angle) L	Engine	Oilpan	5.2(7°)		6.4(0°)				Refer to the left
		All	6.3(7°)		7.5(0°)				
	Marine gear		1.2		1.3		2.0		-
Cooling water capacity L	Fresh water tank		7.2						
	Subtank		0.8						
Dimensions (L×W×H) mm			898×581×660		888×580×660		886×581×635		763×581×660
Engine installation style			On the flexible rubber engine mount						
Recommended battery capacity			12V-120A or greater						
Recommended engine room ventila-tor			16m^3/min or greater						
Dry mass kg			258		256		259		228

Note:
1. Rating condition : ISO 3046-1, 8665
2. 1hp=0.7355kW
*3. Fuel condition : Density at 15℃=0.860,Fuel oil temperature *:25℃ at the fuel injection pump inlet*
*** : ISO 8665(Fuel oil temp. 40℃ at the fuel injection pump inlet)*

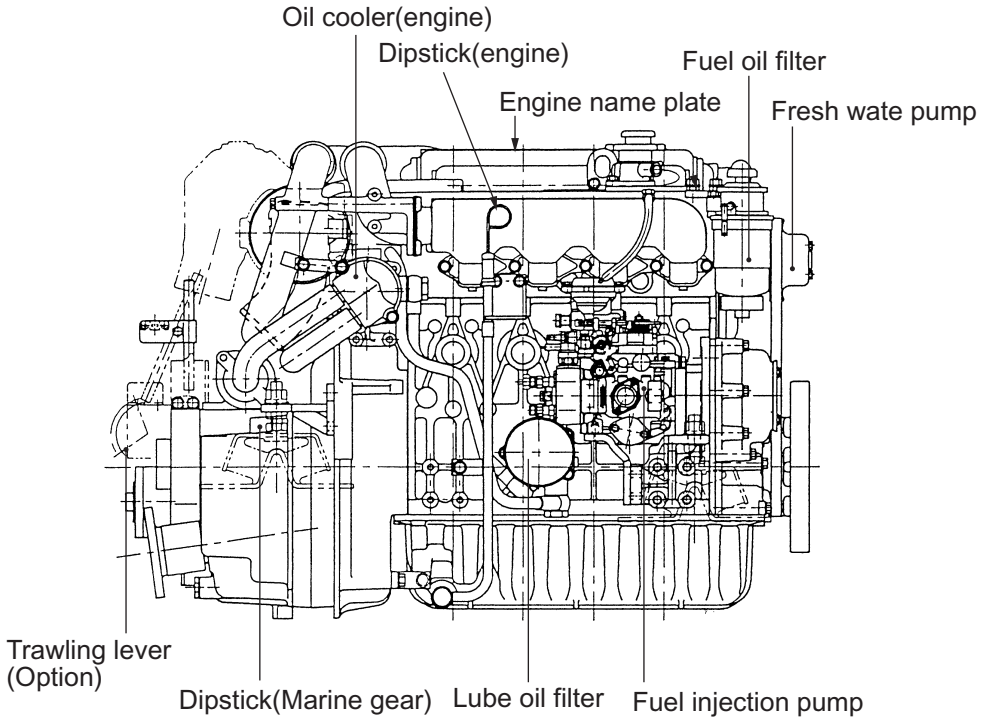
2.2.4 4JH3-DTE

Engine model			4JH3-DTE			
Use			Pleasure boat			
Type			Vertical water-cooled 4-cycle diesel engine			
No. of cyl.-bore×stroke mm			4-ϕ84×90			
Displacement L			1.995			
Aspiration			Turbooharged			
Cont. rating kW{hp}/rpm			85.3(116)/3700			
Max. output kW{hp}/rpm (Crankshaft)			*91.9(125)/3800 **89.1(121.3)/3800			
High idling rpm			4300±25			
Low idling rpm			700±25			
Combustion system			Direct injection			
Starting system			Electric starting			
Cooling system			Constant high temperature fresh water cooling			
Lubricating system			Forced lubrication system with trochoid pump			
Marine gear	Model		KMH4A			-
	Type		Hydraulic wet multiple disk clutch 8° Down angle drive			
	Reduction ratio (Ahead/Astern)		2.04/2.04, 2.45/2.45			
Direction of rotation	Crankshaft		Counterclockwise (Viewed from stern side)			
	Propeller shaft		Clockwise (Viewed from stern side)			-
Fuel injection pump			Bosh-distributor type Model VE(ZEXEL)			
Fuel injection valve			Pinhole injection nozzle YDLLA-P(5-0.26×150°)			
Turbocharger			RHB52(IHI) Water cooled and forced lubrication system			
Elec. devices	Starter		DC12V-1.4kW			
	Alternator		DC12V-55A			
Lube oil capacity (raked angle) L	Engine	Oilpan	6.4(0°)			Refer to the left
		All	7.5(0°)			
	Marine gear		2.0			-
Cooling water capacity L	Fresh water tank		7.2			
	Subtank		0.8			
Dimensions(L×W×H) mm			898×581×660	888×581×660	886×581×635	763×581×660
Engine installation style			On the flexible rubber engine mount			
Recommended battery capacity			12V-120A or greater			
Recommended engine room ventilator			$20m^3$/min or greater			
Dry mass kg			260			229

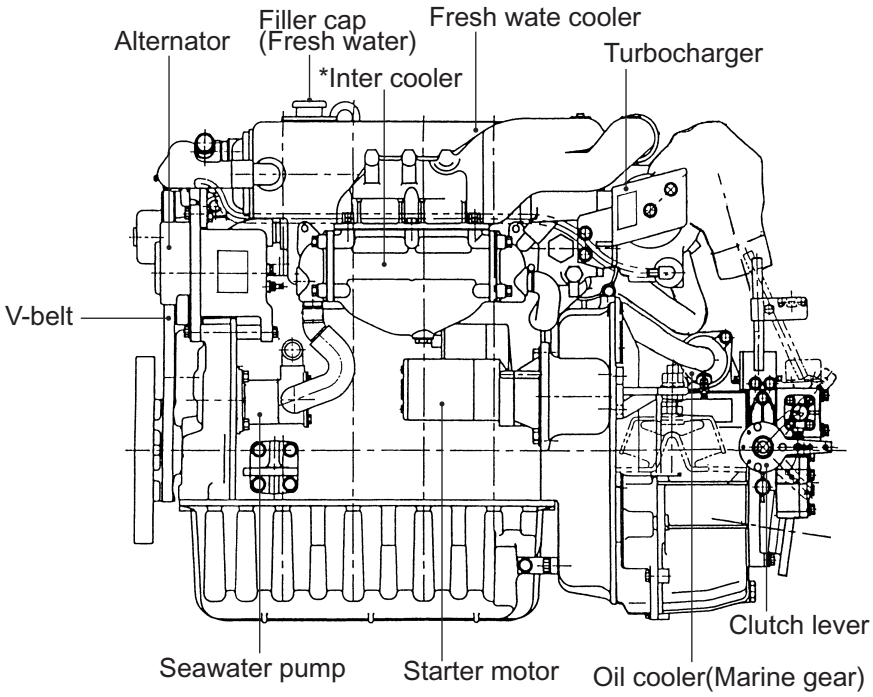
Note:
1. Rating condition : ISO 3046-1, 8665
2. 1hp=0.7355kW
*3. Fuel condition : Density at 15℃=0.860,Fuel oil temperature *:25℃ at the fuel injection pump inlet*
*** : ISO 8665(Fuel oil temp. 40℃ at the fuel injection pump inlet)*

2.3 Names of Parts

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



• Non-Operation Side



NOTE:

The 4JH3-DTE engine with KMH4A is used as the example for the above drawings.
*The 4JH3-TE is not equipped with an intercooler (indicated by * mark in the above).*

2.4 Major Servicing Parts

Name of part	Function
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	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 oil)	Filler port for engine lube oil.
Filler port (marine gear oil)	Filler port for marine gear lube oil. Located on the top of the marine gear case.
Dipstick (engine oil)	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 Water System **]**	This engine is cooled by 2 cooling systems:fresh water and seawater.
・Fresh water cooler (Built-in fresh water tank)	The tank stores the fresh cooling water and is built into the fresh water cooler. Cooling seawater passes through the fresh water cooler to cool the fresh water by heat exchange.
・Cooling water pump	Located on top of the fresh water tank the filler cap closes the filler port. It has two pressure regulating valves (pressure valve and vacume valve).
・Filler cap	When the cooling water temperature rises, the pressure inside the fresh water tank increases causing the pressure valve in the filler cap to open. Hot water and steam pass through a rubber hose to the subtank to condense the hot water. (The filler port and the subtank are connected by a rubber hose.)
・Subtank	When the load is reduced and the cooling water temperature falls, the pressure in the fresh water tank is lowered, and this activates the vacume valve in the filler cap causing the cool water in the subtank to return to the fresh water tank. This process reduces the consumption of cooling water.
Oil cooler (engine oil)	This heat exchanger cools the engine oil with seawater.
Oil cooler (marine gear oil)	This heat exchanger cools high temp. marine gear oil with seawater.(KBW21,KMH4A)
Turbocharger	With the pressurized intake air feeding device the exhaust gas turbine is rotated by exhaust gas, and the power is used to rotate the blower This pressurizes the intake air for sending to the cylinder gives high power output.
Intercooler	This heat exchanger cools the pressurized intake air from the turbocharger with seawater and increases the intake air guantity.
Starter motor	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 operation.

2.5 Operation Equipment

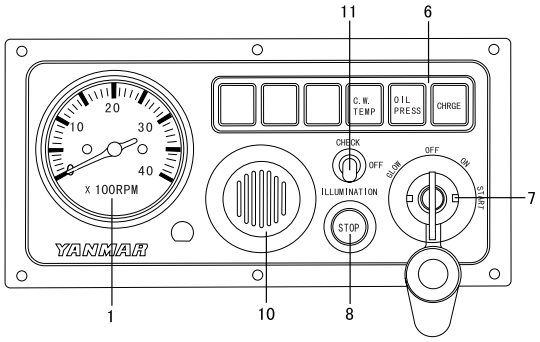
Explanation of the equipment used to operate the engine.

2.5.1 Instrument Panel

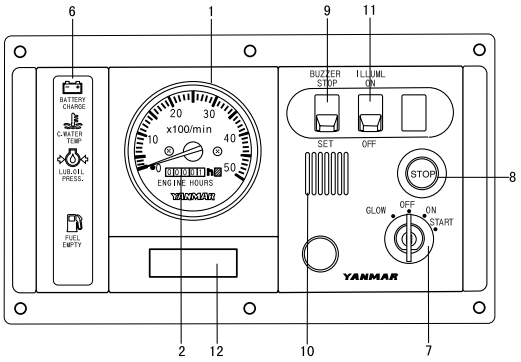
OPTION

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

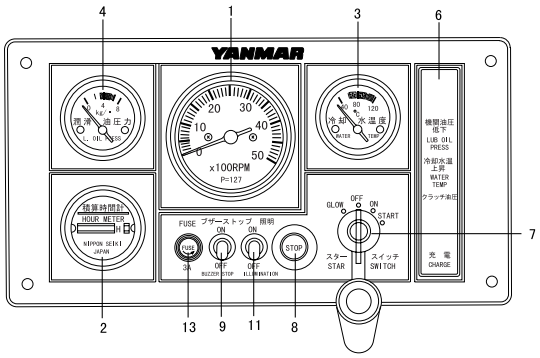
♦**B type**



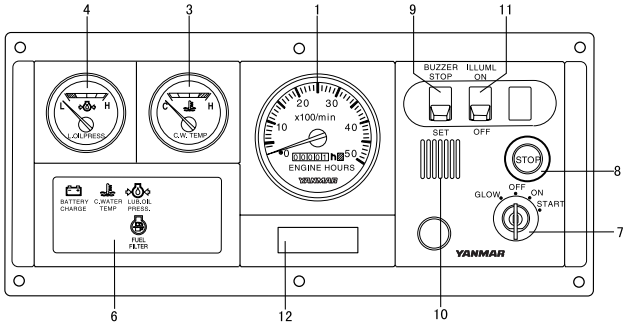
♦**New B type**



♦**C type**



♦**New C Type**



No.	Model		B	C	New B	New C
7	Switch unit	Key switch (Starter switch)	O	O	O	O
8		Engine stop switch	O	O	O	O
10		Alarm buzzer	O	O	O	O
9		Alarm buzzer stop switch	×	O	O	O
11		Illumination switch for meters	O	O	O	O
11		Lamp check	O	×	×	×
6	Alarm lamp unit	Battery not charging	O	O	O	O
		C.W high temp.	O	O	O	O
		L.O. low press.(engine)	O	O	O	O
		Fuel filter	×	×	×	O
		Sail drive leak	×	×	Δ	O
		Fuel empty	×	×	O	Δ
1	Tachometer	Tachometer with hour meter	×	×	O	O
		Tachometer	O	O	-	-
2		Hour meter	×	O	-	-
4	Sub meter unit	C.W. temp. meter	×	O	×	O
3		L.O. press. meter	×	O	×	O
12	Clock unit	Quartz clock	×	×	Δ	Δ

O: Available ×: Not available Δ: Optional

(1) Meters

The following meters are located in the upper center part of the instrument panel.

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

Turn the panel light switch (illumination switch) ON for easy viewing.

• Tachometer
The engine speed is indicated. Engine speed can be monitored.

• Hour meter
The number of hours of operation is indicated, and can be used as a guide for periodic maintenance checks.

• Cooling Water Temperature Meter (C, New C)
The cooling water temperature is indicated. Enables monitoring of the cooling condition of the engine.

• Lube Oil Pressure Meter (C, New C)
The engine oil pressure is indicated.
Enables monitoring of the condition of the engine's lube oil.

(2) Alarm Devices

When there is some problem during operation, the alarm buzzers and lamps will come on.

• Alarm buzzers
When the various alarm lamps come on, the alarm buzzers will come on at the same time and continue to sound. However, no alarm buzzer will sound when the charge lamp comes on.

• Buzzer stop switch
When the buzzer sound is no longer necessary, it can be turned off with the Buzzer stop switch.

• Alarm lamps
The alarm monitor window indicates the trouble spot when one of the symbols shown below lights up. When operation is normal the alarm lights are off; however, should some problem arise, the sensors will pick it up and cause the light behind the appropriate symbol to come on.

1. BATTERY CHARGE

When the charge is abnormal, the lamp will come on. When charging begins the lamp will go off. (Alarm buzzer will not sound when the lamp comes on.)

2. C.WATER TEMP

When the temperature of the cooling fresh water exceeds the maximum (95 degree C or higher), the lamp will light. Continuing operation at temperatures exceeding the maximum will result in damage and seizure. Check the load and the cooling system for any abnormalities.

3. LUB.OIL PRESS.

When the lube oil pressure falls below specified oil pressure sensor will detect this and the lamp will come on. Continuing operation with insufficient oil will result in damage and seizure. Check the oil level.

4. FUEL FILTER (New C)

When the drain inside the water separator in the fuel filter becomes excessive, the sensor will cause the lamp to come on. Clean out the drain in the water separator. If operation is continued without cleaning, it will become impossible to feed fuel to the engine or damage and seizure of the fuel injection pump will result.

5. SAIL DRIVE LEAK (New C, New B(optional))

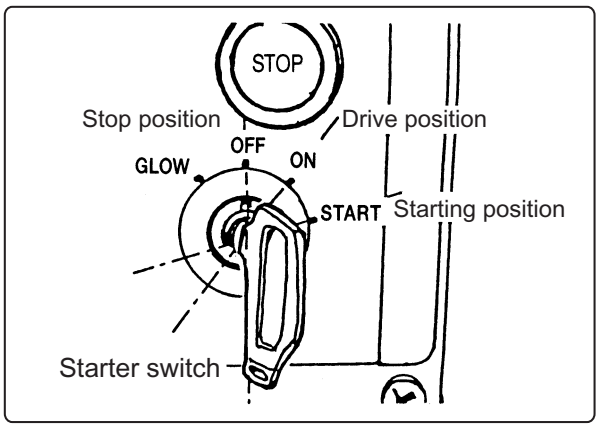
When the seal rubber attached between sail-drive and hull is damaged and sea water leaks into between the seal rubbers, the lamp comes on. If this hapenes, stop the engine and quickly return to the nearest port under sail for repairs.

6. FUEL EMPTY (New B, New C(optional))

When the amount of fuel in the tank is insufficient, the sensor will activate the lamp. Fill with fuel.

(3) Starter Switch

This is the switch for starting engine operation. It is a rotary-type 3-step switch. Position is changed by turning the key in the switch.



OFF is the position where the engine is stopped. All current is cut off.
The key can be inserted and removed in this position.

ON is the position for operation.
Current flows to the instruments and alarm devices.

START is the position for starting.
When the starter motor turns, the engine starts.
The key returns automatically to the ON position when you remove your hand.

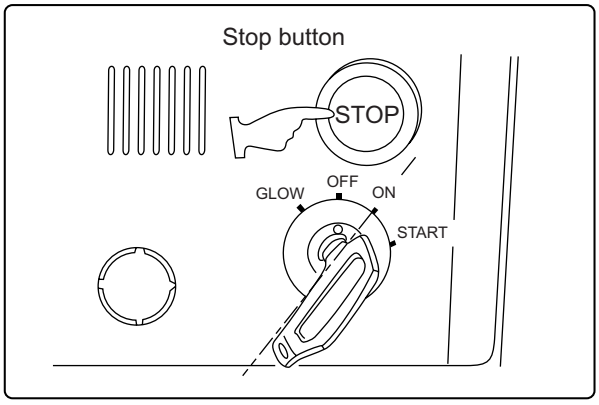
GLOW is the position for turning on the air heater. The air heater (OPTION) aids starting during cold conditions by warming up the intake air before starting.

Note:Neutral Safety Switch OPTION for KM4A KMH4A

The engine can only be started when the clutch is in Neutral. If an attempt is made to start the engine in any other position, the neutral safety switch will operate to make starting impossible.

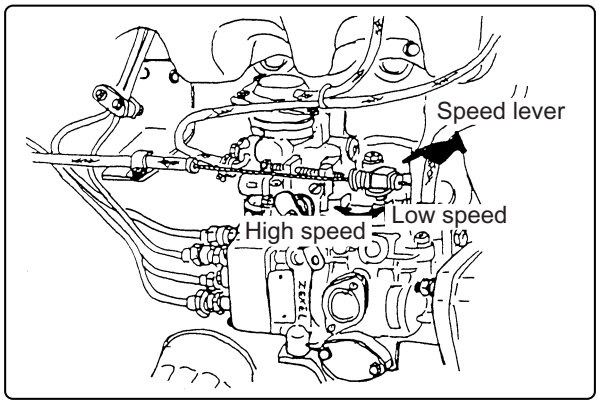
(4) Stop button

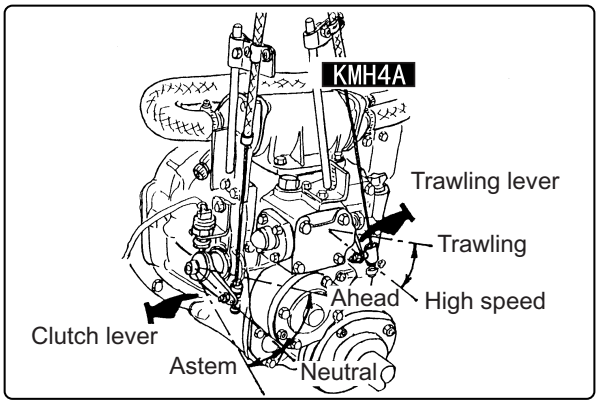
The engine is stopped by pushing the stop button on the right of the control panel.
When the stop button is pushed, the solenoid valve on the fuel injection pump works to cut off the fuel supply and stop the engine.
Continue to push the stop button until the engine has come to a complete stop.



2.5.2 Remote Control Handle

This engine is controlled by the remote control handle located in the cockpit. The speed control lever on the engine side and clutch lever on the marine drive are connected by remote control cable with the various remote control handles in the cockpit (We reccomend you a single hanrdle remote control device). There are the following kinds of remote control handles. When using other kinds of remote control devices, consult their operation manuals.



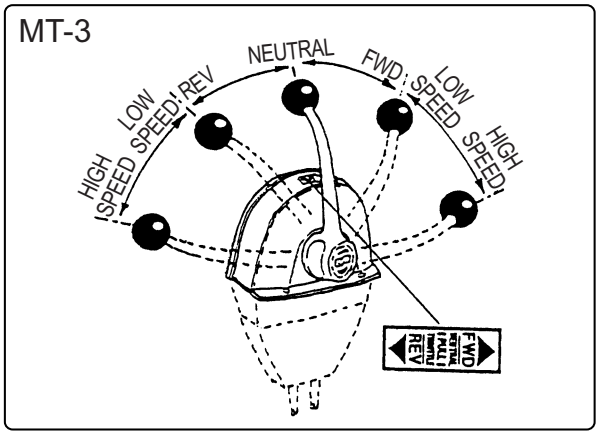


(1) Morse Remote Control Handle

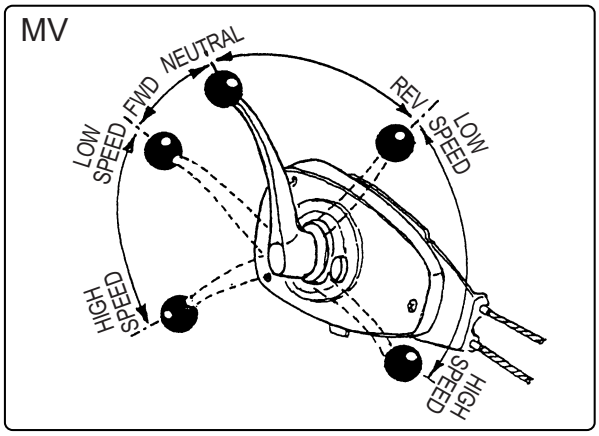
OPTION

This is a single-handle remote control device connected by a remote control cable. It operates the clutch to neutral, forward, and reverse and controls the engine speed.

Model MT-3 : Top mounting type.



Model MV : Side mounting type.



The labels for operation on the handle are:

∆**FWD:** Forward
NEUTRAL: Clutch disengaged position
THROTTLE: Position to reduce engine speed
∇**REV:** Reverse

Operation of the handle is as follows:

• Starting and stopping
Put the handle in NEUTRAL.
This puts the clutch in the cut-off position (stop) and idles the engine at a low speed.

• Forward
Move the handle from NEUTRAL to ΔFWD(forward).
This engages the clutch in forward and simultaneously increases the engine speed.
Pushing the handle further in the same direction increases engine speed to full speed.

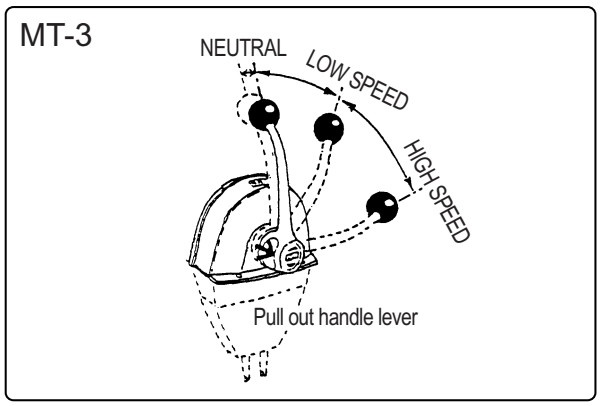
• Reverse
Move the handle from NEUTRAL to ∇REV(reverse).
This engages the clutch in reverse and simultaneously increases the engine speed.
Pushing the handle further in the same direction increases engine speed to full speed.

• Free throttle operation
When the boat is stopped (clutch is in neutral position), the idling speed of the engine can be increased in the following manner.

1. Leave the handle lever in **NEUTRAL**.
2. Disengage the clutch.

   MT-3:Pull out the handle lever all the way.

   MV: Pull out the free throttle button next to the handle lever.
3. With the lever or button pulled out, move the handle lever in either the forward or reverse direction to increase idling speed.



• Returning to normal operation from free throttle operation.

MT-3:Return the handle lever to NEUTRAL. The lever will return auto matically to the normal position.

MV: Return the handle lever to NEUTRAL and push the free throttle button in.