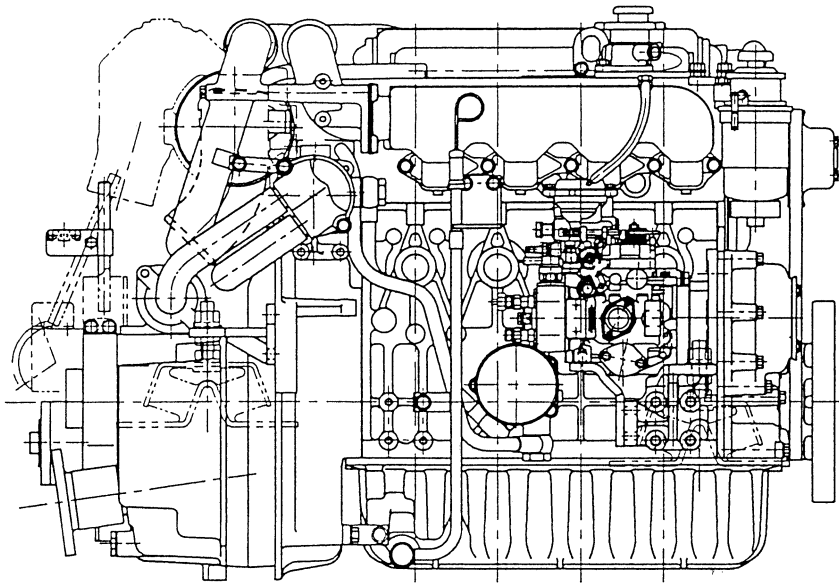


OPERATION MANUAL

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.**

| | |
|--|-----------|
| 1 FOR SAFE OPERATION | 1 |
| 1.1 Warning Symbols | 1 |
| 1.2 Safety Precautions | 2 |
| 1.3 Location of Product Safety Labels | 4 |
| 2 PRODUCT EXPLANATION | 5 |
| 2.1 Use & Driving System | 5 |
| 2.2 Engine Specifications | 6 |
| 2.2.1 4JH3-TE | 6 |
| 2.2.2 4JH3-TCE | 7 |
| 2.2.3 4JH3-HTE | 8 |
| 2.2.4 4JH3-DTE | 9 |
| 2.3 Names of Parts | 10 |
| 2.4 Major Servicing Parts | 11 |
| 2.5 Operation Equipment | 12 |
| 2.5.1 Instrument Panel | 12 |
| 2.5.2 Remote Control Handle | 15 |
| 3 BEFORE OPERATION | 18 |
| 3.1 Fuel Oil, Lube Oil and Cooling Water | 18 |
| 3.1.1 Fuel Oil | 18 |
| 3.1.2 Lube oil | 19 |
| 3.1.3 Cooling Water | 19 |
| 3.2 Supplying Fuel | 20 |
| 3.2.1 Filling the Fuel Tank | 20 |
| 3.2.2 Bleeding the Fuel System | 20 |
| 3.3 Supplying Engine Lube Oil | 21 |
| 3.4 Supplying Marine Gear Lube Oil | 21 |
| 3.5 Supplying Cooling Water | 22 |
| 3.6 Cranking | 23 |
| 3.7 Checking the Lube Oil and Cooling Water | 23 |
| 4 HOW TO OPERATE | 24 |
| 4.1 Inspection Before Starting | 24 |
| 4.2 Checking the Illumination Lamps of the Panel Meters | 26 |
| 4.2.1 Checking the Illumination Lamps of the Panel Meters | 26 |
| 4.2.2 Checking the Alarm Devices | 26 |
| 4.2.3 Checking the Panel Meters | 26 |
| 4.3 starting | 27 |
| 4.3.1 Daily Starting | 27 |
| 4.3.2 Starting Under Low Temperature Conditions | 27 |
| 4.3.3 Restarting After Starting Failure | 27 |
| 4.3.4 After the Engine has Started | 28 |
| 4.4 Adjusting the Engine Speed | 28 |
| 4.5 Clutch Operation for the Marine Gear | 29 |
| 4.5.1 Forward, Neutral, Reverse | 29 |
| 4.5.2 Switching to Trawling (Available for KMH4A only) | 29 |
| 4.6 Check During Operation | 30 |
| 4.7 Stopping the Engine | 31 |
| 4.8 Operation Procedure | 32 |
| 4.9 Long-Term Storage | 33 |
| 4.9.1 Before storing for long periods of time, perform the following. | 33 |
| 4.9.2 Checking the Engine for Reuse After a Long Storage Period | 34 |

| | |
|---|-----------|
| 5 MAINTENANCE & INSPECTION | 35 |
| 5.1 List of Periodic Inspections | 36 |
| 5.2 Periodic Inspection Items | 37 |
| 5.2.1 Inspection After Initial 50Hrs. Operation | 37 |
| 5.2.2 Inspection Every 50 Hours | 39 |
| 5.2.3 Inspection Every 250 Hrs. or 1 yr. | 41 |
| 5.2.4 Inspection Every 500 Hrs.or 2 yrs. | 44 |
| 5.2.5 Inspection Every 1000 Hrs. or 4 yrs. | 45 |
| 6 TROUBLE AND TROUBLESHOOTING | 47 |
| 6.1 Simple problems and the appropriate countermeasures | 47 |
| 6.2 Emergency Repairs for Marine Gear Trouble | 49 |
| 6.3 Consulting Your Yanmar Dealer or Distributor | 50 |
| 7 SYSTEM DIAGRAM | 52 |
| 7.1 Wiring diagram | 52 |
| 7.1.1 B type Instrument Panel | 52 |
| 7.1.2 C type / C type x B type(No.2 station) Instrument Panel | 54 |
| 7.1.3 New B type Instrument Panel | 56 |
| 7.1.4 New C type / New C type x New B type(No.2 station) | 58 |
| 7.1.5 Instrument Panel | 58 |

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.

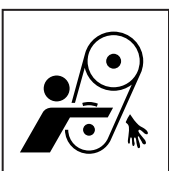
⚠ WARNING



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.

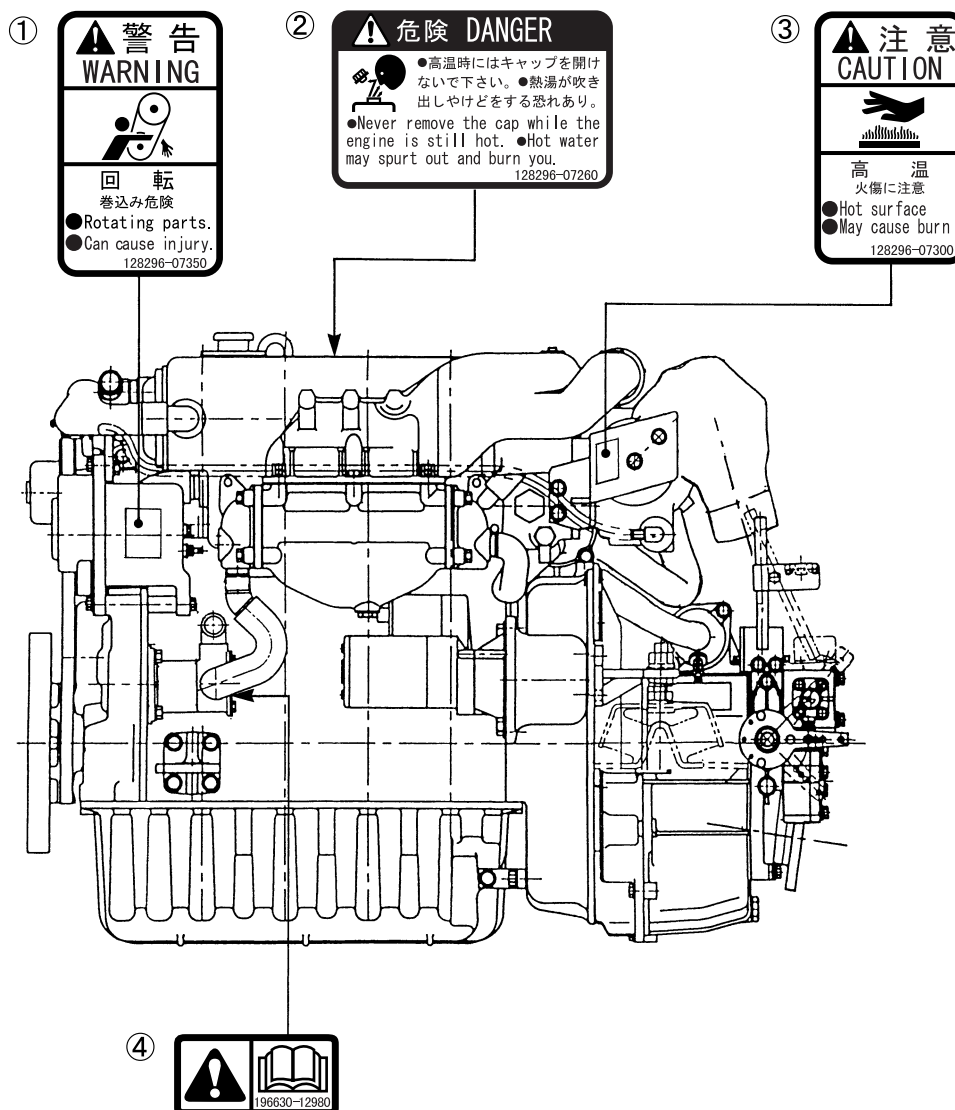
NOTICE:**Disposal of waste materials**

- 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 engine 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 | ○ | ○ | × | ○ : Applicable × : Not applicable |
| KM4A | ○ | ○ | × | |
| KMH4A | ○ | ○ | ○ | |

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 letter 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 letter 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 | | Turbocharged | | | | | | |
| 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 2.63/2.63 | 2.14/2.14 3.30/3.30 | 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(5-0.22×150°) | | | | | | |
| Turbocharger | | RHB52(IH) 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°C=0.860, Fuel oil temperature *:25°C at the fuel injection pump inlet ** : ISO 8665(Fuel oil temp. 40°C 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 | | Turbocharged | |
| 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 |
| | | | All |
| | | Drive | Refer to the operation manual for the sail drive |
| Cooling water capacity | L | Fresh water tank | |
| | | Subtank | |
| 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°C=0.860, Fuel oil temperature *:25°C at the fuel injection pump inlet ** : ISO 8665(Fuel oil temp. 40°C at the fuel injection pump inlet) | | | |

2.2.3 4JH3-HTE

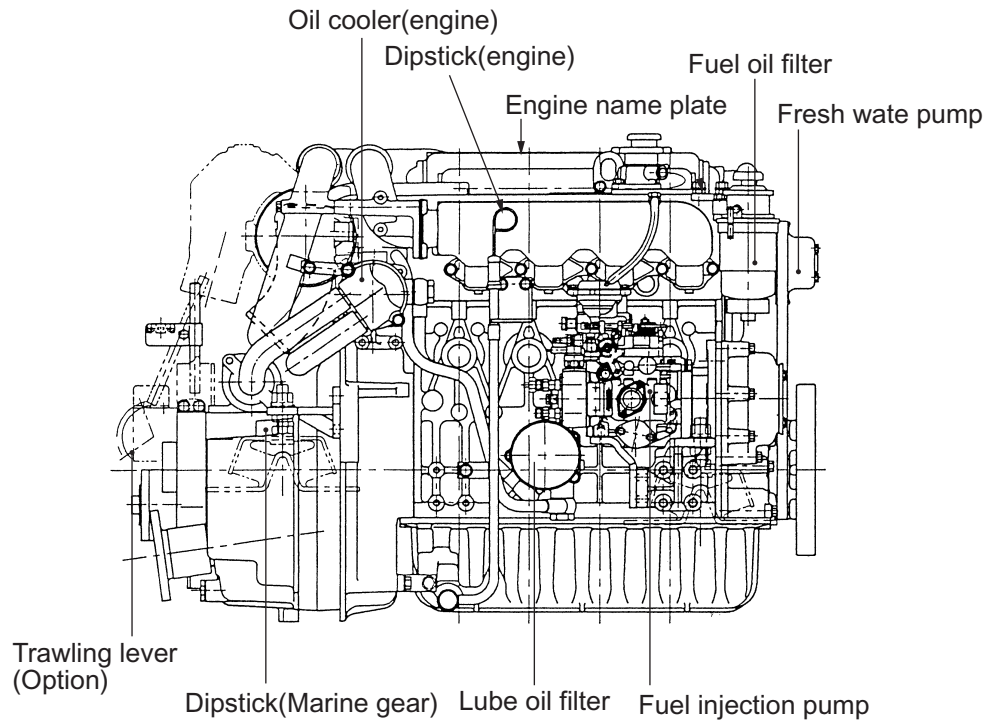
| | | | | | | | | |
|--|--------------------------------|---|-------------|--|------------------------|--|-------------------|---|
| Engine model | | 4JH3-HTE | | | | | | |
| Use | | Pleasure boat | | | | | | |
| Type | | Vertical water-cooled 4-cycle diesel engine | | | | | | |
| No. of cyl.-bore×stroke | mm | 4-φ84×90 | | | | | | |
| Displacement | L | 1.995 | | | | | | |
| Aspiration | | Turbocharged | | | | | | |
| 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 2.63/2.63 | 2.14/2.14 3.30/3.30 | 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(5-0.25×150°) | | | | | | |
| Turbocharger | | RHB52(IHI) Water cooled and forced lubrication system | | | | | | |
| Elec. devices | Starter | DC12V-1.4kW | | | | | | |
| | Alternator | DC12V-55A | | | | | | |
| Lube oil capacity (raked angle) | 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 | 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 ventilator | | 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°C=0.860, Fuel oil temperature * :25°C at the fuel injection pump inlet | | | | | | | | |
| ** : ISO 8665(Fuel oil temp. 40°C at the fuel injection pump inlet) | | | | | | | | |

2.2.4 4JH3-DTE

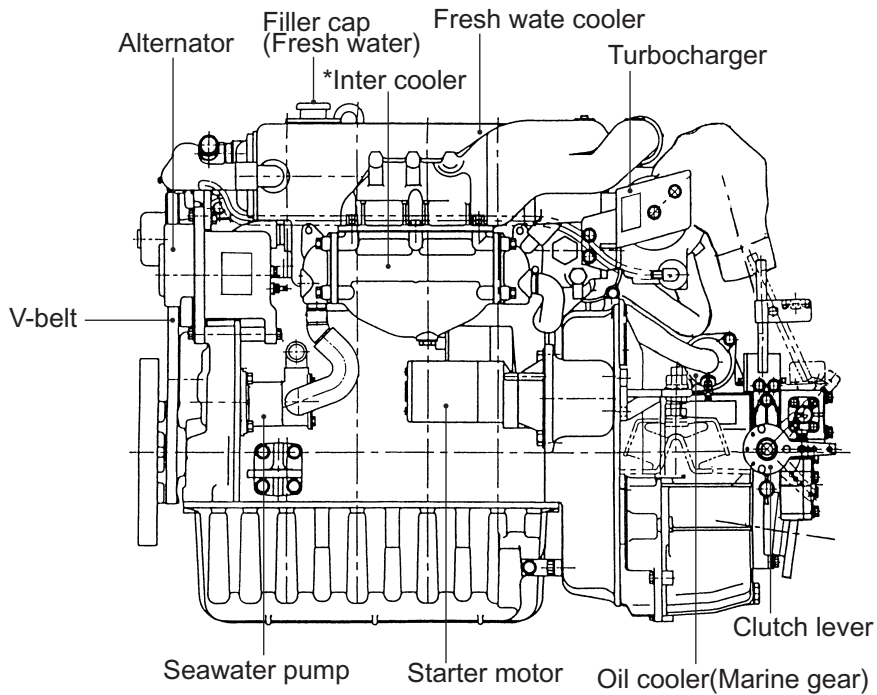
| | | | | | | |
|---|-----------------------------------|--|-------------|-------------|-------------------|-------------|
| Engine model | | 4JH3-DTE | | | | |
| Use | | Pleasure boat | | | | |
| Type | | Vertical water-cooled 4-cycle diesel engine | | | | |
| No. of cyl.-bore×stroke | mm | 4-φ84×90 | | | | |
| Displacement | L | 1.995 | | | | |
| Aspiration | | Turbocharged | | | | |
| 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) | Engine | Oilpan | 6.4(0°) | | Refer to the left | |
| | | All | 7.5(0°) | | | |
| | Marine gear | 2.0 | | - | | |
| Cooling water capacity | 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°C=0.860, Fuel oil temperature *:25°C at the fuel injection pump inlet ** : ISO 8665(Fuel oil temp. 40°C 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 KM4A 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 quantity. |
| 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

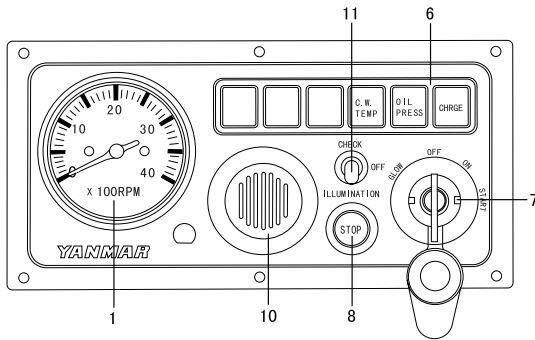
Explanation of the equipment used to operate the engine.

2.5.1 Instrument Panel

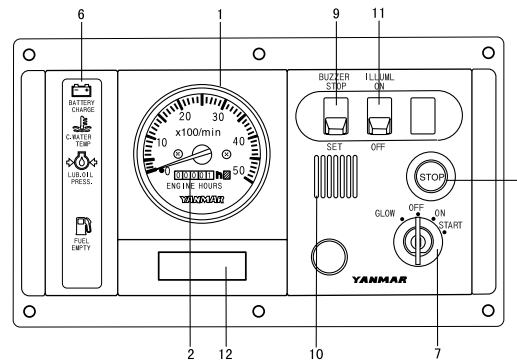
OPTION

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.

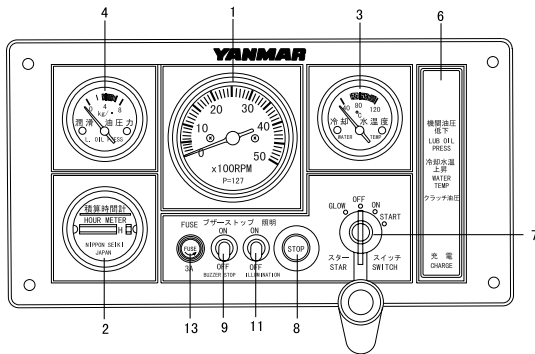
◆ **B type**



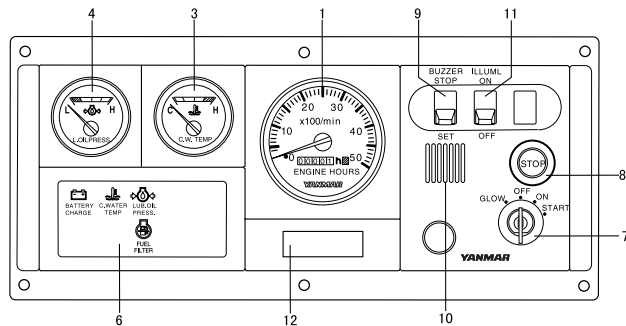
◆ **New B type**



◆ **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 | x | O | O | O |
| 11 | | Illumination switch for meters | O | O | O | O |
| 11 | | Lamp check | O | x | x | x |
| 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 | x | x | x | O |
| | | Sail drive leak | x | x | Δ | O |
| | | Fuel empty | x | x | O | Δ |
| 1 | Tachometer | Tachometer with hour meter | x | x | O | O |
| | | Tachometer | O | O | - | - |
| 2 | | Hour meter | x | O | - | - |
| 4 | Sub meter unit | C.W. temp. meter | x | O | x | O |
| 3 | | L.O. press. meter | x | O | x | O |
| 12 | Clock unit | Quartz clock | x | x | Δ | Δ |

O: Available x: 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 happens, stop the engine and quickly return to the nearest port under sail for repairs.



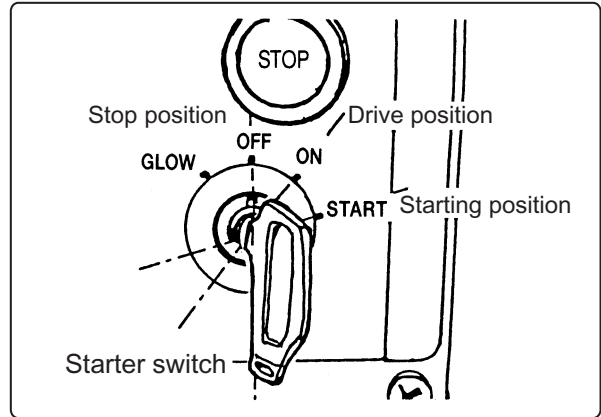
6. FUEL EMPTY (New B, New C(optional))

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.

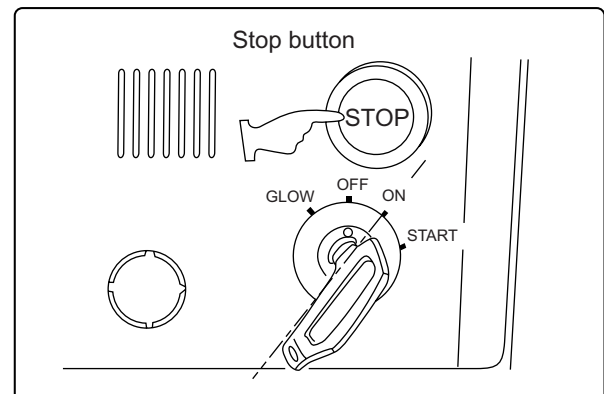
Note: Neutral Safety Switch

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.

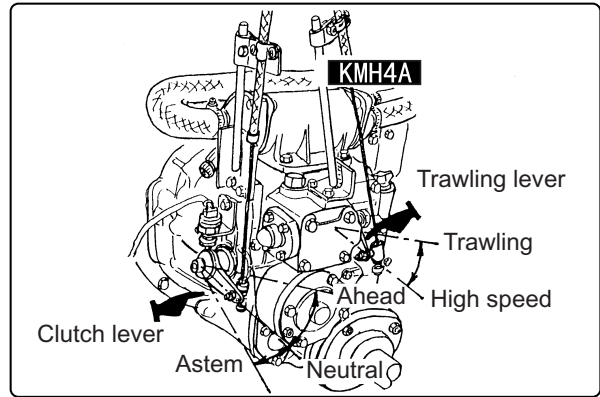
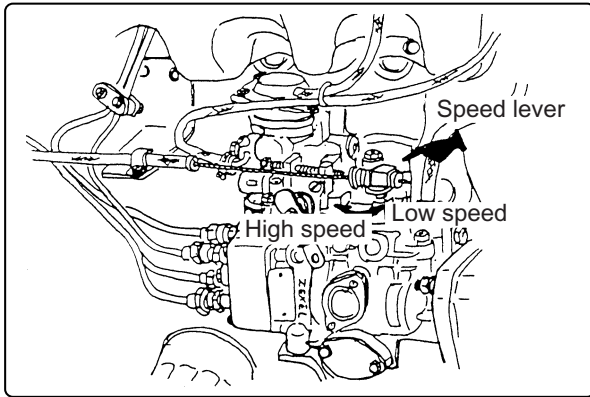
(4) Stop button

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 recommend you a single handle remote control device). There are the following kinds of remote control handles. When using other kinds of remote control devices, consult their operation manuals.



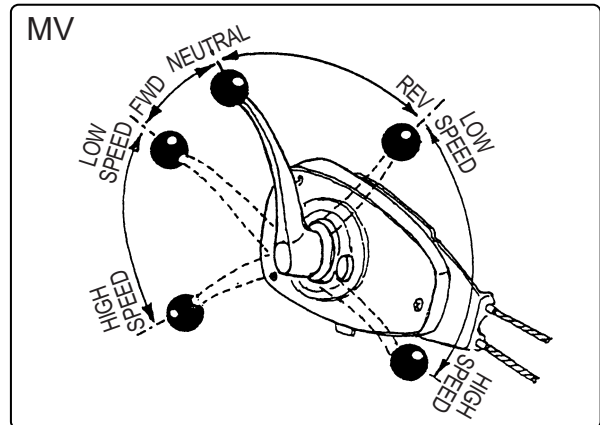
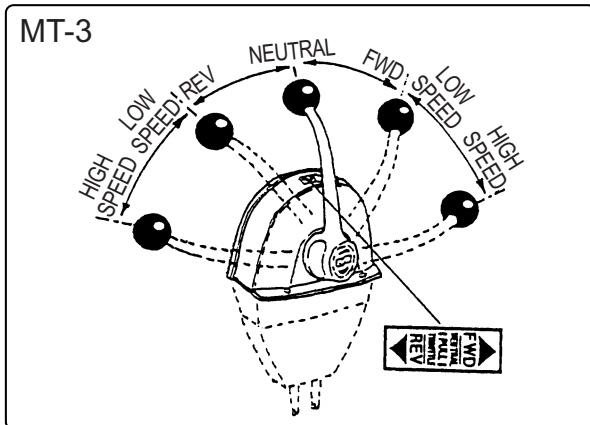
(1) Morse Remote Control Handle

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:

- ΔFWD: Forward
- NEUTRAL: Clutch disengaged position
- THROTTLE: Position to reduce engine speed
- ▽REV: Reverse

Operation of the handle is as follows:

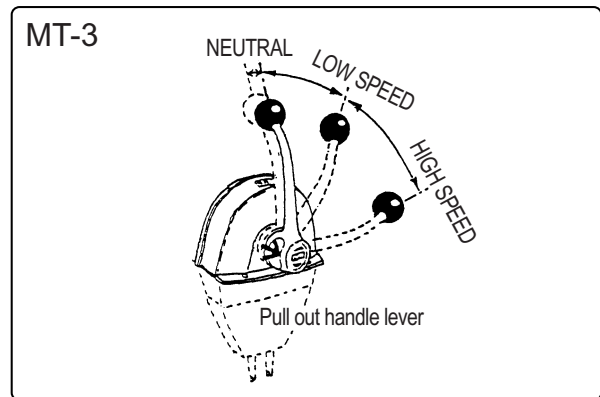
- Starting and stopping
Put the handle in NEUTRAL.
This puts the clutch in the cut-off position (stop) and idles the engine at a low speed.
- Forward
Move the handle from NEUTRAL to ΔFWD(forward).
This engages the clutch in forward and simultaneously increases the engine speed.
Pushing the handle further 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.

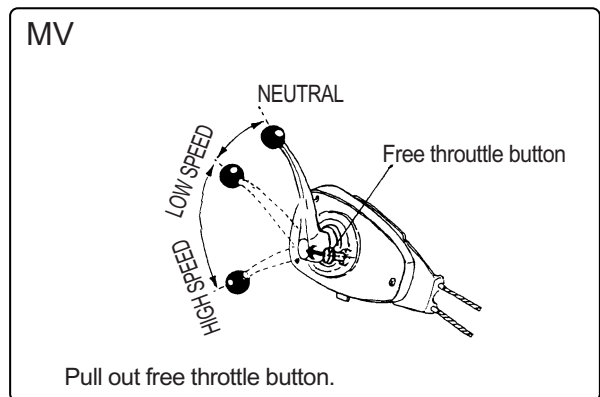
3. With the lever or button pulled out, move the handle lever in either the forward or reverse direction to increase idling speed.



- Returning to normal operation from free throttle operation.

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

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



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