

# OPERATION MANUAL

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SAIL-DRIVE

***SD25***

 English

**YANMAR**

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OPERATION MANUAL	MODEL	SD25
	CODE	0ASDM-EN0032

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# INTRODUCTION

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This Operation Manual describes Sail-Drive Model SD25. For engine handling and operation, refer to the respective operation manuals for Engine Models 1GM10C, 2YM15, 3YM20, 3YM30 and 3YM30AE.

However, instructions for the marine gear box are not necessary as they are included in the operation manual of the engine.

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# SAFETY

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Yanmar considers safety of great importance and recommends that anyone that comes into close contact with its products, such as those who install, operate, maintain or service Yanmar products, exercise care, common sense and comply with the safety information in this manual.



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

## DANGER

Indicates a hazardous situation which, if not avoided, *will* result in death or serious injury.

## WARNING

Indicates a hazardous situation which, if not avoided, *could* result in death or serious injury.

## CAUTION

Indicates a hazardous situation which, if not avoided, *could* result in minor or moderate injury.

## NOTICE

Indicates a situation which can cause damage to the Sail-Drive, personal property and/or the environment or cause the equipment to operate improperly.

## SAFETY PRECAUTIONS

### General Information

There is no substitute for common sense and careful practices. Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, other bodily injury or death. This information contains general safety precautions and guidelines that must be followed to reduce risk to personal safety. Special safety precautions are listed in specific procedures. Read and understand all of the safety precautions before operation or performing repairs or maintenance.

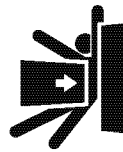
### Before You Operate

#### DANGER



- Never permit anyone to install or operate the Sail-Drive without proper training.
- Read and understand this *Operation Manual* before you operate or service the Sail-Drive to ensure that you follow safe operating practices and maintenance procedures.
- Safety signs and labels are additional reminders for safe operating and maintenance techniques.
- See your authorized Yanmar marine dealer or distributor for additional training.

#### Crush Hazard



- Never stand under a hoisted Sail-Drive.
- If the hoist mechanism fails, the Sail-Drive will fall on you. When you need to transport a Sail-Drive for repair, have a helper assist you to attach it to a hoist and load it onto a truck.
- Never support marine gear with equipment not designed to support the weight of the marine gear such as wood blocks or by only using a jack.
- Never use the Sail-Drive lifting eye to lift the engine and Sail-Drive as an assembly. Use the engine lifting eyes to lift the engine and Sail-Drive. Only use the Sail-Drive lifting eye to lift the Sail-Drive as a separate component.



## During Operation and Maintenance

### DANGER

#### Explosion Hazard



While the engine is running or the battery is charging, hydrogen gas is being produced and can be easily ignited. Keep the area around the battery well-ventilated and keep sparks, open flame and any other form of ignition out of the area.

#### Fire Hazard



Ensure that appropriate fire detection and extinguishing equipment are installed and checked periodically for proper operation.

### WARNING

#### Fire Hazard

Undersized wiring systems can cause an electrical fire.



#### Sever Hazard



- Never service the Sail-Drive while under tow or if the engine is running at idle speed. The propeller may rotate under these circumstances.
- Never wear jewelry, unbuttoned cuffs, ties or loose fitting clothing and always tie long hair back when working near moving/rotating parts. Keep hands, feet and tools away from all moving parts.
- Always remove any tools or shop rags used during maintenance from the area before operation.
- Never service the Sail-Drive while under tow or if the engine is running at idle speed. The propeller may rotate under these circumstances.
- Always stop the engine before you begin to service the Sail-Drive and secure the propeller so it will not turn.

#### Alcohol and Drug Hazard



Never operate the engine while under the influence of alcohol or drugs or when feeling ill.

## WARNING

### Exposure Hazard



Always wear personal protective equipment including appropriate clothing, gloves, work shoes, eye and hearing protection as required by the task at hand.

### Entanglement Hazard



- Never leave the key in the key switch when you are servicing the Sail-Drive. Someone may accidentally start the engine and not realize you are servicing it.
- Never operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.

### Burn Hazard



Some of the engine and Sail-Drive surfaces become very hot during operation and shortly after shut-down. Keep hands and other body parts away from hot surfaces.

### Sudden Movement Hazard

Always stop the engine before beginning service.

## WARNING

### Exhaust Hazard



- Never block windows, vents, or other means of ventilation if the engine is operating in an enclosed area.
- All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisoning.
- To prevent accidental equipment movement, never start the engine in gear.
- Before starting the engine, always make sure that all bystanders are clear of the area. Keep children and pets away while the engine is operating.
- Avoid unexpected equipment movement. Shift the Sail-Drive into the NEUTRAL position any time the engine is at idle.

### Electrical Shock Hazard



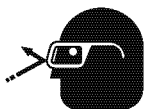
- Always turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the Sail-Drive.
- Always keep the electrical connectors and terminals clean. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.

**⚠ CAUTION****Poor Lighting Hazard**

Ensure that the work area is adequately illuminated. Always install wire cages on portable safety lamps.

**Tool Hazard**

Always use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.

**Exposure Hazard**

Always wear eye protection when servicing the Sail-Drive or when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.

**Slipping and Tripping Hazard**

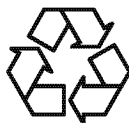
Ensure that adequate floor space is set aside for servicing Sail-Drive. The floor space must be clean, flat and free of spilled liquids and debris to prevent slipping or tripping.

**NOTICE**

It is important to perform daily checks as listed in this *Operation Manual*.

Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor Sail-Drive performance and can help extend the life of the Sail-Drive and engine.

Always be environmentally responsible.



Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as lubrication oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.

Never dispose of hazardous materials by dumping them into a sewer, on the ground or into ground water or waterways.

Never attempt to modify the Sail-Drive's design or safety features.

- Never release or modify the limiting devices such as the engine speed limit, fuel injection limit, etc.
- Modification will impair the safety and performance of the product and shorten product life.
- Modifications to the design, safety or limiting features will void the warranty.

## NOTICE

If the Sail-Drive oil temperature is too high, stop engine immediately and check the Sail-Drive oil level.

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The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the propeller itself.

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Failure to use the correct anode material may result in inadequate protection and excessive corrosion of underwater drive system components. Use only aluminum anodes in brackish and saltwater applications. In freshwater applications, use aluminum or magnesium anodes for best results. Never use magnesium anodes in brackish or salt water, as they will induce alkali attack by over-protection and it will bring hydrogen bubbles and hydroxides, which will lead to severe damage to the drive system.

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

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Only use replacement parts specified. Other replacement parts may affect warranty coverage.

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

# PRODUCT OVERVIEW

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## OVERVIEW

### Owner/Operator Responsibilities

The operator must, and assumes all responsibility to:

- Read and understand the *Operation Manual* prior to operating the Sail-Drive;
- Perform all safety checks as necessary to ensure safe operation;
- Comply with and follow all lubrication and maintenance instructions and recommendations; and
- Have an authorized Yanmar dealer/distributor perform periodic checkups.

Conducting normal maintenance service and replacing consumable parts as necessary is the responsibility of the owner/operator and necessary to provide the best durability, performance and dependability of the Sail-Drive while keeping your overall operating expenses to a minimum. Individual operating habits and usage may increase the frequency of performing maintenance service condition. Monitor conditions frequently to determine if the maintenance intervals suggested in the manual are frequent enough for your Sail-Drive.

### New Sail-Drive Break-In:

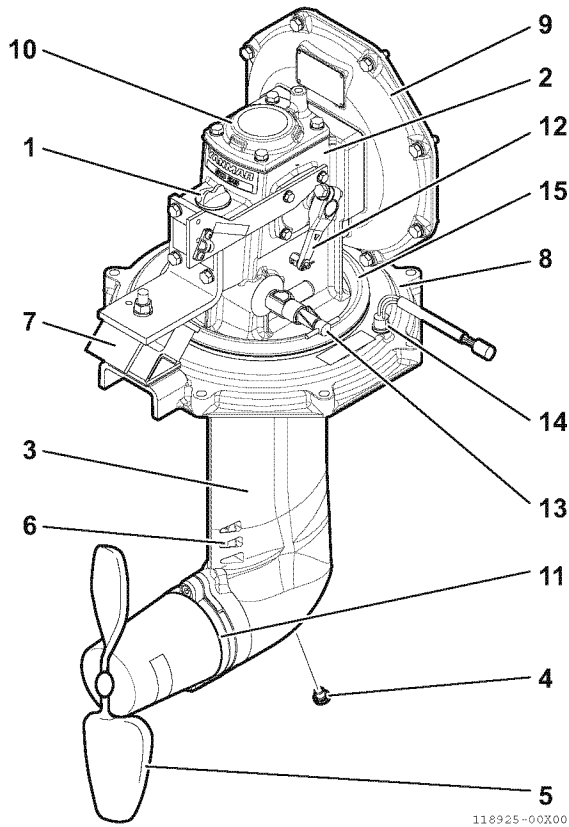
- On the initial engine start-up, allow the engine to idle for approximately 15 minutes while you check for proper Sail-Drive function and Sail-Drive oil leaks.
- During the break-in period, carefully observe Sail-Drive seal indicator for proper Sail-Drive function.
- During the break-in period, check the Sail-Drive oil levels frequently.

### Dealer/Distributor Responsibilities

In general, a dealer's responsibilities to the customer include predelivery inspection and preparation such as:

- Ensure that the vessel is properly equipped.
- Prior to delivery, make certain that the Yanmar Sail-Drive and other equipment are in proper operating condition.
- Make all necessary adjustments for maximum efficiency.
- Familiarize the customer with the on-board equipment.
- Explain and demonstrate the operation of the Sail-Drive and vessel.

COMPONENT IDENTIFICATION



118925-00X00

- |                                |                     |
|--------------------------------|---------------------|
| 1 – Dipstick                   | 9 – Mounting flange |
| 2 – Upper gear case            | 10 – Upper cover    |
| 3 – Lower gear case            | 11 – Anode          |
| 4 – Lubricating oil drain plug | 12 – Shift lever    |
| 5 – Propeller                  | 13 – Water cock     |
| 6 – Seawater inlet             | 14 – Seal sensor    |
| 7 – Flexible mount             | 15 – Diaphragm      |
| 8 – Seal flange                |                     |

Figure 1

## GALVANIC CORROSION

Galvanic corrosion results whenever two or more dissimilar metals (like those found on the sail-drive) are submerged in a conductive solution, such as saltwater, polluted water or water with a high mineral content because a chemical reaction takes place causing electrical current to flow between the metals. The electrical current flow causes the metal that is most chemically active, or anodic, to erode. If not controlled, galvanic corrosion may corrode Sail-Drive components.

## CORROSION CONTROL

It is the boat designer's responsibility and/or the re-powering engineer's responsibility to design the proper systems and equipment to control and reduce the possibility of galvanic corrosion.

However, it is essential that the owner/operator frequently monitor the anodes for wear, inspect the sail-drive for corrosion and replace the anodes often enough to provide a sacrificial surface for the electrical current to attack. Galvanic isolators and isolation transformers are also available from the aftermarket (not supplied by Yanmar). The Galvanic isolator is a device that is installed in series with the (AC) grounding (GREEN) conductor of the shore-power cable to effectively block low-voltage DC galvanic current flow but permit the passage of alternating current (AC)\*.

The rate of corrosion depends on numerous factors, such as:

- the number, size and location of sacrificial anodes on the sail-drive and vessel;
- the marina environment, such as stray current in the water, fresh or salt water and use and isolation of shore power;
- improper application of marine paint or antifouling paint;
- failure to repaint damaged areas; and
- how the vessel is bonded.

Please check with the boat builder, dealer or other professional to determine if your vessel and/or Sail-Drive is adequately protected from galvanic corrosion.

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\* "The Boatowner's Guide to Corrosion", by Everett Collier.

### **NOTICE**

The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the propeller itself.

### **NOTICE**

Failure to use the correct anode material may result in inadequate protection and excessive corrosion of underwater drive system components. Use only aluminum anodes in brackish and saltwater applications. In freshwater applications, use aluminum or magnesium anodes for best results. Never use magnesium anodes in brackish or salt water, as they will induce alkali attack by over-protection and it will bring hydrogen bubbles and hydroxides, which will lead to severe damage to the drive system.

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If sacrificial anodes erode quickly or if signs of corrosion are evident, the owner should take immediate corrective action. Yanmar recommends consulting an engineer specializing in marine electricity and corrosion control to determine the best way to correct the rapid erosion of the anodes.

## SHORE POWER

Vessels that are connected to shore power require additional protection to prevent destructive low voltage galvanic currents from passing through the shore power ground wire. Galvanic isolators are available from the aftermarket (not supplied by Yanmar) to block these currents while still providing a path to ground for dangerous shock currents.

### **NOTICE**

If the AC shore power ground is not isolated from the boat ground, sacrificial anodes may be unable to neutralize the increased galvanic potential. Corrosion damage that results from the improper system design or application is not covered by the Yanmar Limited Warranty.

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## UNDERWATER DRIVE COATING

The lower gear case coating may be damaged when hit by objects in the water, or when having deposits removed from it. The underwater coating must be inspected at least once per year and when it is believed that an object was hit that may have caused damage, should be repaired and such areas should be repainted immediately.

Observe the following precautions when applying antifouling or marine paint to the bottom of the boat hull:

- Always follow the paint/coating manufacturer's directions for surface preparation and application.
- Always use a high quality primer and topcoat paint specifically designed for aluminum outboards, Sail-Drives or Stern-Drives.
- Never paint the sacrificial anodes installed on the Sail-Drive.
- Never paint the Sail-Drive with a material that contains copper or tin.
- Never paint over drain holes, sacrificial anodes, or other items specified by the sacrificial anode Manufacturer.

Consult your authorized Yanmar Marine dealer or distributor for assistance.

### **NOTICE**

Galvanic corrosion damage, normal maintenance and consumable parts are not covered by the Yanmar Limited Warranty.

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# BEFORE YOU OPERATE

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This section of the *Operation Manual* describes propeller selection, propeller fitting, lubricating oil specifications and how to replenish them. It also describes the daily instrument panel and remote-control device checks.

Before you operate the Sail-Drive, review the *Safety* section on page 3.

## BEFORE YOU OPERATE

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### PROPELLER SELECTION

#### Recommended Propeller Size (Maximum)

Engine model	Folding type diameter	2-Blade fixed type diameter
1GM10C	14 in.	14 in.
2YM15	14.5 in.	15 in.
3YM20	15 in.	16 in.
3YM30	16 in.	16.5 in.
3YM30AE	16 in.	16.5 in.

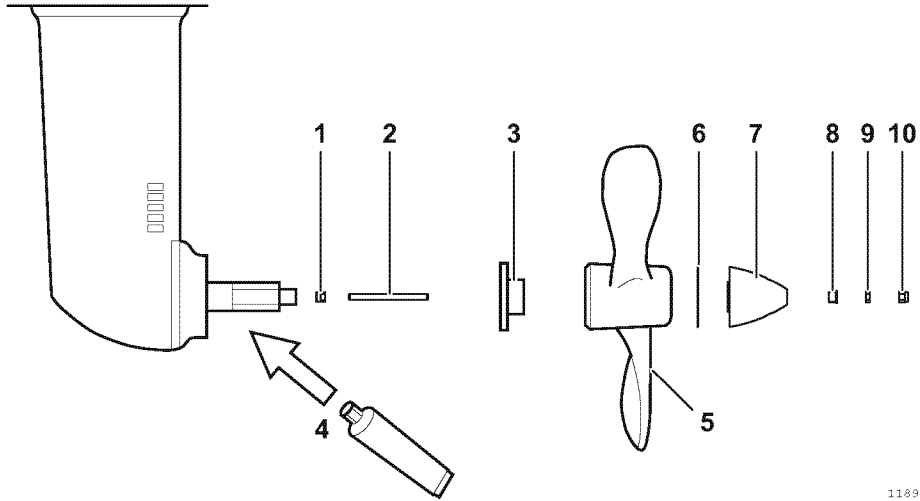
#### **NOTICE**

Make sure the propeller (fixed or folding) has a rubber bushing with sufficient rotational flexibility. If a propeller is used without a rubber bushing, the shaft, bearing and gears of the Sail-Drive will be damaged.

Consult your Yanmar dealer for advise on propeller selection.

---

## Fitting a Fixed Propeller (2-Blade)



118926-00X00

**Figure 1**

No.	Part Name	Note	No.	Part Name	Note
1	Nut 8	Tightening Torque 13.7 to 15.7 N·m (10.1 to 11.6 lb-ft)	6	Washer	-
2	Bolt M8	Tightening Torque 13.7 to 15.7 N·m (10.1 to 11.6 lb-ft)	7	Propeller nut M16	Tightening Torque 113 to 123 N·m (83 to 91 lb-ft)
3	Spacer	-	8	Spacer	-
4	Grease	-	9	Lock nut M8	Tightening Torque 13.7 to 15.7 N·m (10.1 to 11.6 lb-ft)
5	Propeller	-	10	Nylon nut M8	Tightening Torque 13.7 to 15.7 N·m (10.1 to 11.6 lb-ft)

### ■ Locking procedure for fixed propeller nut (optional)

When tightening the nut to 113 to 123 N·m (83 to 91 lb-ft) torque for the SD25 by using propeller nut fixing tool, move the shift lever to ahead and hold the crankshaft V-pulley clamp nut with a wrench to stop the propeller rotating or keep shift lever in neutral. Block propeller from rotating by using an appropriate piece of wood against the hull.

- If folding propeller or another type of propeller is installed, obey installation manual that is provided from each propeller supplier

## BEFORE YOU OPERATE

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### LUBRICATING OIL

The choice of lubricating oil is very important. If an unsuitable oil is used, or an oil change is neglected, it may result in damage and reduce the life of the Sail-Drive. When selecting a lubricating oil, use one of the following:

#### Lubricating Oil Chart

<b>Engine model</b>	1GM10C	2YM15, 3YM20, 3YM30, 3YM30AE
<b>Lubricating oil for the Sail-Drive</b>	API CC or greater and SAE 10W-30	API GL4 or GL5 and SAE 80W-90 or 90

Use only oil of quality GL-4 or GL-5 in the API service, and SAE No. 90 or 80W-90. (Except model SD25 × 1GM10C).

Use only oil of quality CC or greater in the API service, and SAE No. 10W-30. (Applicable model: SD25 × 1GM10C).

## FILLING WITH LUBRICATING OIL

Sail-Drive model	SD25
Standard unit	2.2 L (2.3 qt)
Long-reach unit	2.5 L (2.6 qt)

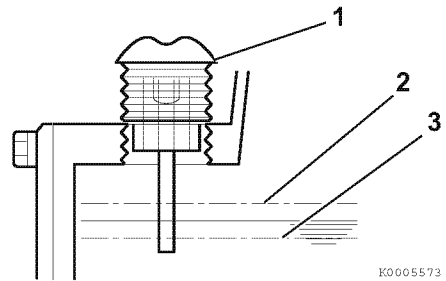
### NOTICE

The lubricating oil capacity of the standard unit is different from that of the long-reach unit. Confirm the capacity by means of the oil capacity nameplate.

1. Remove the dipstick (yellow cap). Fill with approved lubricating oil.
2. Check the amount of lubricating oil by inserting the dipstick as far as possible. Do not screw the dipstick in (1, **Figure 2**). The oil level should reach the upper mark on the dipstick (2, **Figure 2**).

### NOTICE

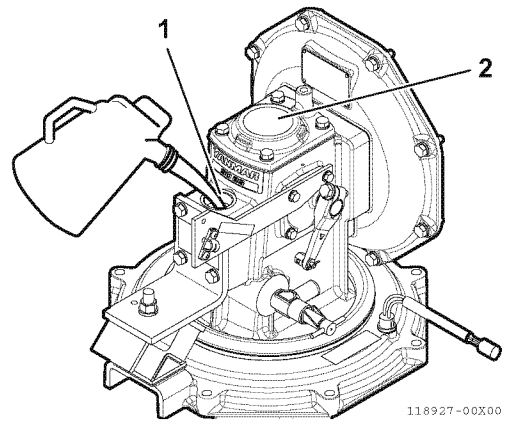
It takes about 10 minutes to fill up the Sail-Drive with lubricating oil. Check the oil level 15 minutes after adding the specified quantity of oil.



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- 1 – Dipstick
- 2 – Upper limit
- 3 – Lower limit

**Figure 2**



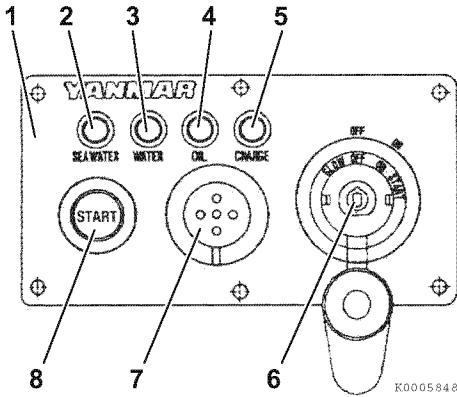
118927-00X00

- 1 – Oil supply port
- 2 – Oil capacity nameplate

**Figure 3**

**CHECKING THE INSTRUMENT PANEL ALARM SYSTEM**

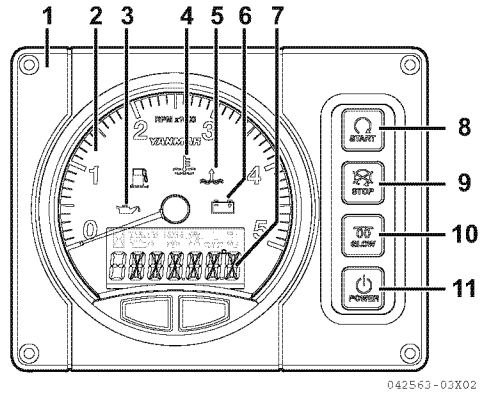
**A-type**



- 1 – “A” instrument panel
- 2 – Seawater in sail drive alarm lamp (Optional)
- 3 – Cooling water temperature alarm lamp
- 4 – Engine oil low pressure alarm lamp
- 5 – Battery low charge alarm lamp
- 6 – Key switch
- 7 – Alarm buzzer
- 8 – Start switch (Push button)

**Figure 4**

**B20 - type**



- 1 – “B20” instrument panel
- 2 – Tachometer
- 3 – Engine oil low pressure alarm lamp
- 4 – Cooling water temperature alarm lamp
- 5 – Seawater in sail drive alarm lamp (Optional)
- 6 – Battery low charge alarm lamp
- 7 – LCD (Hour meter)
- 8 – Start switch
- 9 – Stop switch
- 10 – Glow switch
- 11 – Power switch

**Figure 5**



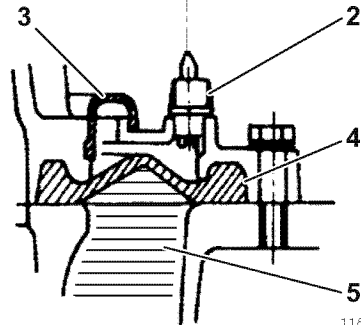
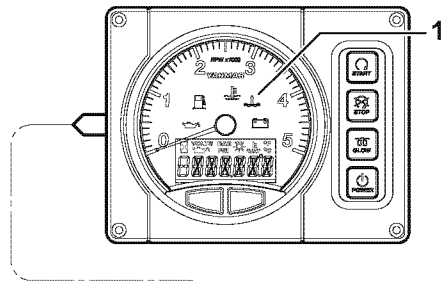
Turn the battery switch on. Turn the key (6, **Figure 4**) or power switch (11, **Figure 5**) to the ON position and check the lamps on the panel (**Figure 4**, **Figure 5**) with the engine off:

1. The lubricating oil warning lamp should be illuminated. (4, **Figure 4**) (3, **Figure 5**)
2. The cooling water temperature warning lamp should be out. (3, **Figure 4**) (4, **Figure 5**)
3. The charge warning lamp should be illuminated. (5, **Figure 4**) (6, **Figure 5**)
4. The rubber seal warning lamp should be out. (2, **Figure 4**) (5, **Figure 5**)
5. The warning buzzer should sound.

*Note: All the above alarm signals will continue until you push the starting button or turn the key (power switch) to the OFF position.*

## **⚠ WARNING**

The rubber seal alarm lamp warns of seawater entering the vessel. The watertight structure of the Sail-Drive is dual type. Even if the rubber diaphragm A (4, **Figure 6**) is damaged and seawater enters, the rubber diaphragm B (3, **Figure 6**) prevents it from entering the vessel. The rubber seal switch between the rubber diaphragms (3, **Figure 6**) and (4, **Figure 6**) sounds the warning buzzer and lights the rubber seal lamp on the instrument panel. If this happens, stop the engine and under sail, quickly return to the nearest port for repairs.



118928-00X00

- 1 – ON (Rubber seal lamp)
- 2 – Rubber seal sensor
- 3 – Diaphragm (B)
- 4 – Diaphragm (A)
- 5 – Seawater

**Figure 6**

### DAILY CHECKS

Before starting the Sail-Drive, make sure it is in good operating condition. Make sure you check the following items:

#### Visual Checks

1. Check for damaged or missing parts.
2. Check for loose, missing or damaged fasteners.
3. Check oil level. *See Filling with Lubricating Oil on page 19.*
4. Open cooling water cock before operation. Close cooling water cock after operation. *See Engine Cooling Water on page 25.*

#### NOTICE

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

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# SAIL-DRIVE OPERATION

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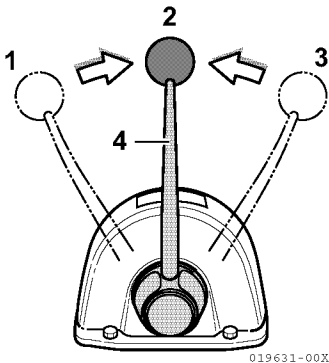
Before you operate the Sail-Drive, read the following safety information and review the *Safety* section on page 3.

## REMOTE CONTROL DEVICE CHECK

### NOTICE

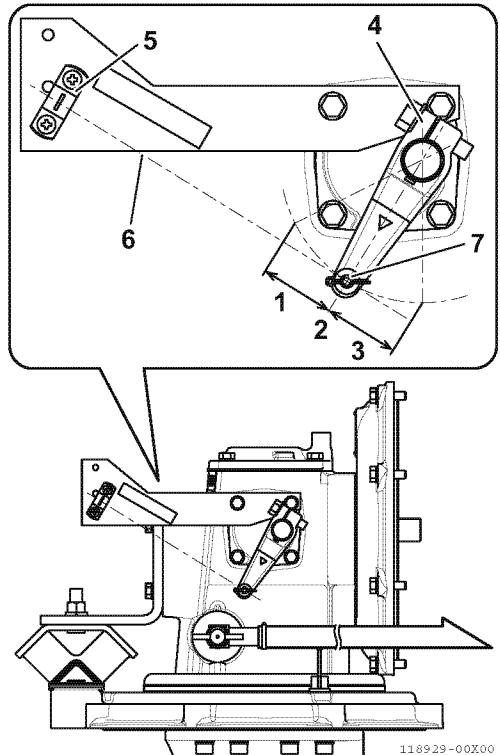
Before operating the engine, check Sail-Drive oil level.

With the engine running low idle, shift the control handle of the remote-control head (single lever control) rapidly through NEUTRAL - AHEAD - NEUTRAL - ASTERN. If a shift operation is done slowly, the tip of the clutch dog is worn away by being hammered, and, consequently, the clutch fails to engage. Confirm that the shift lever of the Sail-Drive moves smoothly to AHEAD, ASTERN and NEUTRAL by remote-control. Because the Sail-Drive SD25 uses a dog clutch, the clutch is not engaged unless the shift lever is moved to the AHEAD or ASTERN position.



- 1 – Astern
- 2 – Neutral
- 3 – Ahead
- 4 – Control handle

**Figure 1**



- 1 – Astern
- 2 – Neutral
- 3 – Ahead
- 4 – Shift lever
- 5 – Cable clamp
- 6 – Remote control cable
- 7 – Pivot

**Figure 2**

## SAILING WITHOUT ENGINE RUNNING

**Fixed propeller:**

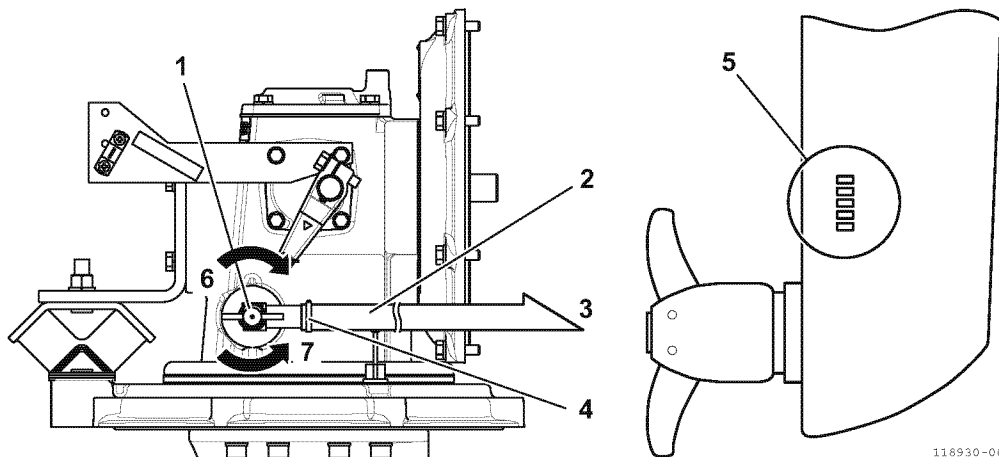
During sailing, keep control handle in ASTERN position if boat speed remains under 10 knots. Over 10 knots please do not use a fixed propeller.

**Folding propeller:**

Keep control handle in neutral during sailing.

## ENGINE COOLING WATER

Opening or closing the cooling water system of the engine driving the Sail-Drive is done by the cooling water cock fixed on the upper case of the Sail-Drive. Be sure to open the cock (1, **Figure 3**) and confirm that cooling water exits from the exhaust in the hull, before leaving the dock.



- 1 – Cooling water cock
- 2 – Cooling water hose
- 3 – To cooling water pump
- 4 – Hose clamp

- 5 – Seawater inlet
- 6 – CLOSE
- 7 – OPEN

**Figure 3**

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# PERIODIC MAINTENANCE

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Before you perform maintenance on the Sail-Drive, read the following safety information and review the *Safety* section on page 3.

This section of the *Operation Manual* describes the procedures for proper care and maintenance of the Sail-Drive.

## PERIODIC MAINTENANCE

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### TIGHTENING FASTENERS

Use the correct torque when tightening fasteners. Applying excessive torque may damage the fastener or component and too little torque may cause a leak or component failure.

### TORQUE CHARTS

Nominal designation of screw thread	Tightening torque N·m (lb·ft)	Part name
M5	3.9 ± 1.0 (2.9 ± 0.7)	Clamp
M6	5.9 ± 1.0 (4.4 ± 0.7)	Anode, Shift lever shaft
M8	14.7 ± 1.0 (10.8 ± 0.7)	Cover (upper), Mounting flange
M10	29.4 ± 2.0 (21.7 ± 1.5)	Cover (rear), Gear housing
M12	47.0 ± 2.0 (34.7 ± 1.5)	Flexible mount



## Periodic Maintenance

### CAUTION

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

#### ■ The importance of periodic maintenance

Sail-Drive deterioration and wear occur in proportion to the length of time the Sail-Drive has been in service and the conditions it is subjected to during operation. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor Sail-Drive performance and helps extend the life of the Sail-Drive.

#### ■ The importance of daily checks

The Periodic Maintenance Table assumes that the daily checks are performed on a regular basis. Make a habit of performing daily checks before the start of each operating day. See *Filling with Lubricating Oil on page 19*, *Checking The Instrument Panel Alarm System on page 20* and *Engine Cooling Water on page 25*, and refer to the Operation Manual for your engine.

#### ■ Keep a log of Sail-Drive hours and daily checks

Keep a log of the number of hours the Sail-Drive is run each day and a log of the daily checks performed. Also note the date, type of repair (e.g., replaced bearings), and parts used for any service needed between the periodic maintenance intervals. Failure to perform periodic maintenance will shorten the life of the Sail-Drive.

#### ■ Yanmar replacement parts

Yanmar recommends that you use genuine Yanmar parts when replacement parts are needed. Genuine replacement parts help ensure long Sail-Drive life.

#### ■ Tools required

Before you start any periodic maintenance procedure, make sure you have the tools you need to perform all of the required tasks.

#### ■ Ask your authorized Yanmar marine dealer or distributor for help

Our professional service technicians have the expertise and skills to help you with any maintenance or service related procedures.

Daily and periodic maintenance is important to keep the Sail-Drive in good operating condition. The following is a summary of maintenance items by periodic maintenance intervals. Periodic maintenance intervals vary depending on Sail-Drive application and are hard to establish definitively. The following should be treated only as a general guideline.

*Note: These procedures are considered normal maintenance and are performed at the owner's expense.*

# PERIODIC MAINTENANCE

## PERIODIC MAINTENANCE TABLE

○: Check or Clean ◇: Replace ●: Consult your authorized Yanmar Marine dealer or distributor

System	Item	Periodic maintenance interval						
		Daily (See Daily Checks on page 22)	50 hours or after 1 month	Every 100 hours	Every 250 hours	Every year	Every 2000 hours	Every 7 years
Lubricating oil	Check oil level, fill if necessary	Before operation ○						
	Change lubricating oil		First ◇	◇				
Cooling water	Open/close cooling water cock	Before/after operation ○						
	Clean cooling water suction hole					○		
Remote control system	Inspect remote control device					○		
	Inspect and/or replace the clutch shifter				●			
Anode	Inspect and replace anode (Refer to page 33)			◇				
Lower case	Repair case coating					●		
Boat hull water- tightness	Inspect rubber diaphragm							◇*
	Inspect and test seal sensor					○		
Flexible mount	Inspect and/or replace the flexible mount, mounting height of the engine					●		
	Replace the flexible mount						●	

\* The diaphragms are important components that prevent the leakage of water into the boat, which could lead to the sinking of the boat. The owner/operator of the boat should always pay attention to the condition of the Sail-Drive and especially check if it shows any irregularities.

Such diaphragms have a shorter lifespan than the life of the boat itself and for that reason they need to be replaced once every seven (7) years. If the sensor which is located between the diaphragms signals any water ingress, the boat should immediately be brought to the nearest dock for inspection and/or replacement of the diaphragms, even if the seven (7) year period mentioned above has not expired. After the expiry of such seven (7) year period the diaphragms should be replaced and the boat should not be used with the Sail-Drive having diaphragms older than seven (7) years.

## WHEN THE VESSEL IS OUT OF THE WATER, PERFORM THE FOLLOWING:

### Removing Deposits from the Lower Gear Case

Remove seaweed, seashells and other marine growth from the lower gear case. Completely remove deposits around the cooling water intake (2, **Figure 1**) since the engine may overheat if the cooling water intake amount is insufficient.

### Repairing Damaged Coating

The lower gear case coating may be damaged when hit by objects in the water, or when having deposits removed from it. Never use paint containing copper or tin. This will damage the drive and void the warranty. Use a high quality primer and topcoat paint specifically designed for aluminum outboards or stern-drives. Follow the manufacturer's directions for surface preparation and application. Consult your authorized Yanmar Marine dealer or distributor for assistance.

### Inspecting the Anode

See *Inspecting and replacing the anode on page 33*.

### Inspecting the Folding Propeller

Confirm that the blade of the folding propeller opens smoothly. Inspect for wear on the blade-fixing pins, replacing them when wear is excessive. Apply seawaterproof grease to the pins in the blade gear and propeller shaft.

Check the instructions of the manufacturer of the folding propeller.

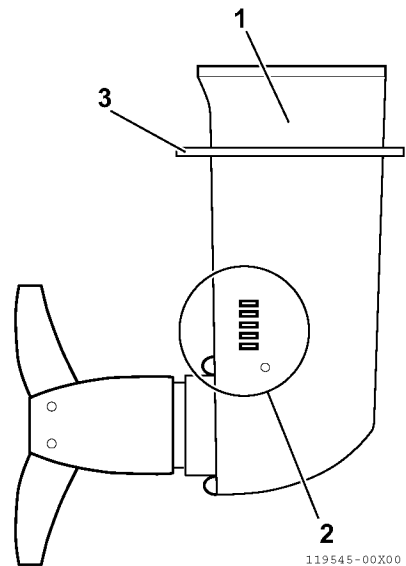
### Draining Water

Drain the engine cooling water, together with the water in the Sail-Drive case. If this water is not drained, freezing may cause the engine block and/or the Sail-Drive case to crack.

### Check Protector

Before every storage period on shore check protector and replace if needed.

*Note: Protector keeps sunlight away from diaphragm A.*



- 1 – Lower gear case
- 2 – Seawater inlet
- 3 – Protector

**Figure 1**

## PERIODIC MAINTENANCE PROCEDURES

### After Initial 50 Hours of Operation

Perform the following procedures after the first 50 hours of operation.

- Draining and replacing lubricating oil
- Inspecting and replacing the clutch shifter

#### ■ Draining and replacing lubricating oil

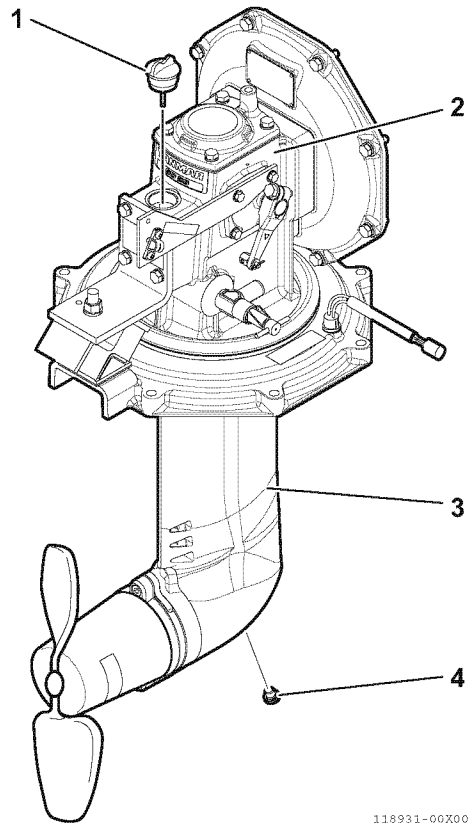
When the vessel is out of the water, drain the oil by removing the lower gear case drain plug, and the upper gear case oil dipstick.

#### **▲ CAUTION**

Let the drive unit cool at least 5 minutes after operation before removing the oil drain plug. Hot oil could spurt out forcefully if the drain plug is removed from the drive unit immediately after operation.

#### *Replacing oil*

Refer to *Filling with Lubricating Oil* on page 19.



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- 1 – Dipstick
- 2 – Upper gear case
- 3 – Lower gear case
- 4 – Lubricating oil drain plug

**Figure 2**

#### ■ Inspecting and replacing the clutch shifter

Consult your authorized Yanmar dealer or distributor for procedure.

**Every 100 Hours of Operation**

Perform the following maintenance every 100 hours of operation.

- Changing the lubricating oil
- Inspecting and replacing the anode
- Changing the lubricating oil

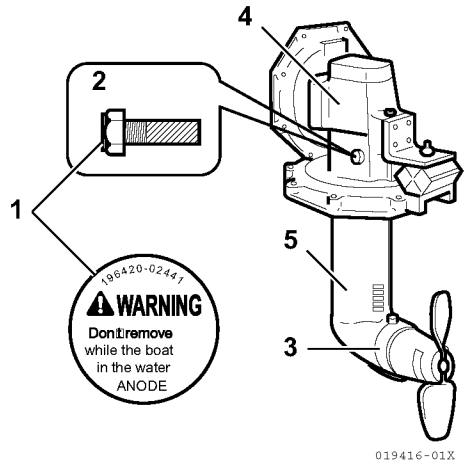
See *Draining and replacing lubricating oil* on page 32.

■ Inspecting and replacing the anode

To prevent corrosion of the Sail-Drive body by sea or lake water, replace the anode every 100 hours of operation, once every six months or when it has reduced to half of the original volume (size).

**NOTICE**

The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the propeller itself.



- 1 – Safety label
- 2 – Anode
- 3 – Anode
- 4 – Upper gear case
- 5 – Lower gear case

**Figure 3**

Anodes are provided on the upper gear case and the lower gear case. To inspect and replace the anode 2 on the upper gear case only when the vessel is out of the water.

## Every 250 Hours of Operation

Perform the following maintenance every 250 hours of operation.

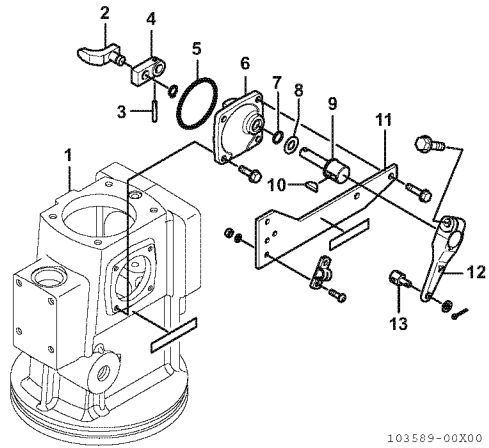
- Inspecting and replacing the clutch shifter

### ■ Inspecting and replacing the clutch shifter

Shifter, Taper pin, Shift arm and Shift shaft (2, 3, 4, 9, **Figure 4**): Check whether partial damage is existed or not. If any damage is confirmed, replace these parts with new one

*Note: Please refer to Parts Catalog for each parts code*

Consult your authorized Yanmar dealer or distributor for procedure.



- 1 – Housing (Upper gear case)
- 2 – Shifter
- 3 – Taper pin
- 4 – Shift arm
- 5 – O-ring (1A G55)
- 6 – Shift lever support
- 7 – O-ring (1A P10A)
- 8 – Thrust washer
- 9 – Shift shaft
- 10 – Woodruff key
- 11 – Cable Bracket
- 12 – Shift lever
- 13 – Pivot

**Figure 4**

**Every Year**

Perform the following maintenance every year of operation.

- **Cleaning cooling water suction hole**
- **Inspecting remote control device**
- **Repairing case coating**
- **Inspecting installation/water sealing condition**
- **Inspecting seal sensor**
- **Inspecting and/or replacing the flexible mount**

■ **Cleaning cooling water suction hole**

*See Removing Deposits from the Lower Gear Case on page 31.*

■ **Inspecting remote control device**

*See Remote Control Device Check on page 24.*

■ **Repairing case coating**

*See Repairing Damaged Coating on page 31.*

■ **Inspecting installation/water sealing condition**

**Rubber diaphragms (A) and (B)**

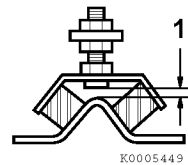
The rubber diaphragms (A) and (B) of the Sail-Drive are important parts for the hull and crew safety. Since rubber degenerates during use, be sure to inspect them when any irregularities are shown, or water ingress is signaled. The vessel must be lifted onto a block for this procedure. To replace, consult your Yanmar Marine dealer.

■ **Inspecting seal sensor**

*See (Figure 6) on page 21.* See your authorized Yanmar Marine dealer or distributor for inspection procedure.

■ **Inspecting and/or replacing the flexible mount**

Replace if clearance is less than 1 mm (1, **Figure 5**). See your authorized Yanmar Marine dealer or distributor for procedure.



**Figure 5**

**⚠ WARNING**

**Do not re-use the clamp ring.**

### Every 2000 Hours of Operation

Perform the following maintenance every 2000 hours of operation.

- **Replacing the flexible mount**
- **Replacing the flexible mount**

See your authorized Yanmar dealer or distributor for procedure. Flexible Mount must be replaced every 2000 hours.

### Every 7 Years

Perform the following maintenance every 7 years of operation.

- **Replacing rubber diaphragm, clamp ring**
- **Replacing rubber diaphragm, clamp ring**

To replace, consult your Yanmar Marine dealer.



# SPECIFICATIONS

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Model	SD25	
Reduction gear system	Constant mesh gear with dog clutch	
Direction of rotation	Input shaft	Counter-clockwise viewed from stern
	Propeller shaft	Counter-clockwise viewed from stern
Reduction ratio	Ahead	2.64
	Astern	2.64
Engine speed	3600 min <sup>-1</sup>	3200 min <sup>-1</sup>
Propeller speed	1364 min <sup>-1</sup>	1212 min <sup>-1</sup>
Lubrication system	Oil bath type	
Lubrication oil capacity	Standard unit	2.2 L (2.3 qt)
	Long-reach unit	2.5 L (2.4 qt)
Dry weight	30 kg (66 lb)	
Remote-control device	Control head	Single lever control
	Cable	MORSE 33C type (equivalent)
Applicable engine model (Maximum rated output power at crankshaft)	1GM10C 6.7 kW (9.1 hp)/3600 min <sup>-1</sup>	-
	2YM15 10 kW (13.6 hp)/3600 min <sup>-1</sup>	-
	3YM20 15.3 kW (20.8 hp)/3600 min <sup>-1</sup>	-
	3YM30 21.3 kW (29 hp)/3600 min <sup>-1</sup>	3YM30AE 21.3 kW (29 hp)/3200 min <sup>-1</sup>

**Note:**

- A propeller with rubber bushing must be used in all SD series Sail-Drives.
- 1 hp metric = 0.7355 kW

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