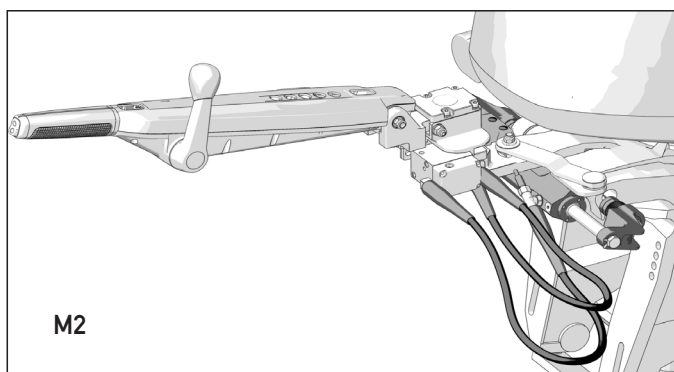


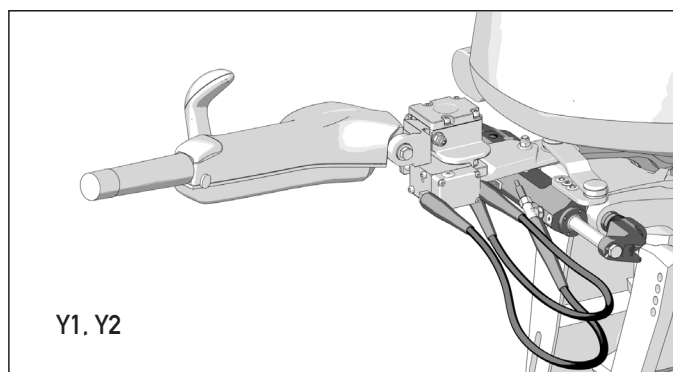
# Installation manual

## ZTF TILLER SYSTEM

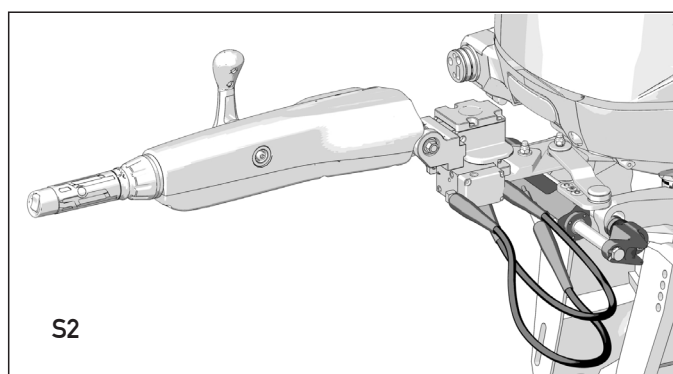
MERCURY MARINE



YAMAHA



SUZUKI



 <sup>®</sup> **ULTRAFLEX**



PARTNER





Dear Customer,

The ZTF Tiller Systems are produced by **ULTRAFLEX** Company belonging to **ULTRAFLEX GROUP**.

**ULTRAFLEX GROUP** is a leader in steering systems for pleasure and professional boats since 1935.

**ULTRAFLEX** production is since ever synonymous of reliability and safety. All **ULTRAFLEX** products are designed and manufactured to ensure the best performance, in accordance to the aim they were manufactured for.

The quality management system involves all the company resources and processes starting from the design, in order to:

- ensure product quality to the customer;
- maintain and improve the quality standards constantly;
- pursue a continuous process improvement to meet the market needs and to increase the customer satisfaction;
- constantly test the products to verify their conformity with EC directives, ISO standards and ABYC (American Boat and Yacht Council) requirements.

To ensure your safety and to maintain a high quality level, **ULTRAFLEX** products are guaranteed only if they are used with original spare parts.

**ULTRAFLEX Sp.A.**

16015 Casella (Genova) Italia - Via Crose, 2

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## DOCUMENT REVISIONS

| Rev. | Date       | Revision description |
|------|------------|----------------------|
| 0    | 24/06/2022 | First edition        |

## MANUAL USE AND SYMBOLS USED

THE INSTALLATION AND MAINTENANCE MANUAL should be kept for regular reference by the owner of the boat and transferred to any new owner with the boat.

It is necessary to read carefully the manual, before ANY ACTIVITY involving the product, handling and unloading included.

In this manual the following symbols are used to ensure the user safety and to guarantee the correct operation of the product:

**⚠ DANGER**



Immediate hazards which CAUSE severe personal injury or death.

**⚠ WARNING**



Denotes that a hazard exists which can result in injury or death if proper precautions are not taken.

**⚠ CAUTION**



Denotes a reminder of safety practices or directs attention to unsafe practices which could result in personal injury or damage to the craft or components or to the environment.

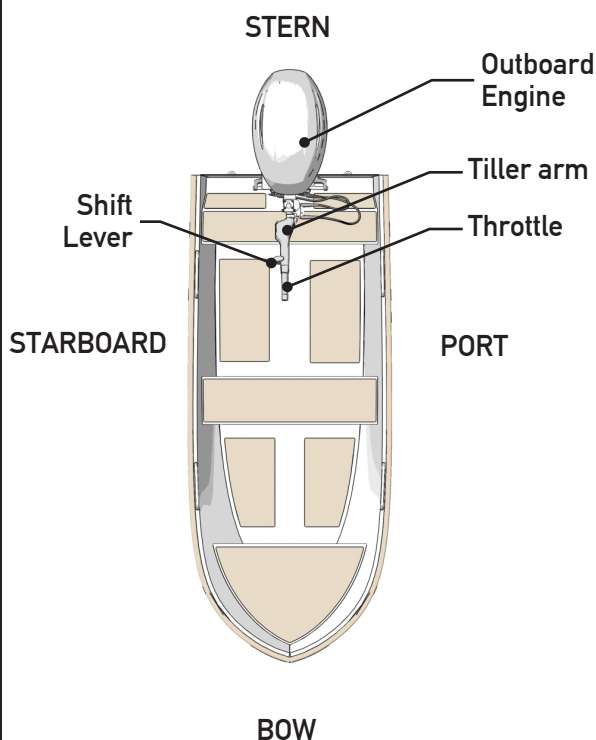
**NOTICE**



Important information for the correct installation and for maintenance, that does not cause any damage.



The symbol aside indicates all the operations which must be carried out by qualified or skilled staff, in order to avoid hazards.  
We recommend training the staff in charge of the product installation and checking their knowledge.



The picture aside explains the meaning of some nautical words included in this manual.

### LEGEND

m.p.h. = miles per hour  
km/h = kilometres per hour

10 m.p.h. = 8,69 knots  
10 m.p.h. = 16,1 km/h  
10 knots = 11,5 m.p.h.  
10 knots = 18,5 km/h  
10 km/h = 6,21 m.p.h.  
10 km/h = 5,4 knots



## INTRODUCTION LETTER

This installation and maintenance manual is an integral part of the product and should be easily available to staff in charge of use and maintenance.

The user must know the content of this manual.

**ULTRAFLEX** declines all responsibility for possible mistakes in this manual due to printing errors.

Although the main features of the type of product described are not subject to change, **ULTRAFLEX** reserves the right to modify any parts, details and accessories it deems necessary to improve the product or for manufacturing or commercial requirements, at any time and without being obliged to update this manual immediately.

ALL RIGHTS ARE RESERVED. Publishing rights, trademarks, part numbers and photographs of **ULTRAFLEX** products included in this manual are **ULTRAFLEX** property.

Great care has been taken in collecting and checking the documentation included in this manual to make it as complete and comprehensible as possible. Nothing included in this manual can be interpreted as warranty either expressed or implied - including, not in a restricted way, the suitability warranty for any special purpose. Nothing included in this manual can be interpreted as a modification or confirmation of the terms of any purchase contract.

### WARNING

To ensure the correct product and component operation, the product must be installed by qualified staff. In case of part damage or malfunction, please contact the qualified staff or our Technical Service.

### TECHNICAL SERVICE

#### **UFLEX Sr.L.**

Via Milite Ignoto,8A  
16012 Busalla (GE)-Italy  
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Email: [service@ultraflexgroup.it](mailto:service@ultraflexgroup.it)  
[www.ultraflexgroup.it](http://www.ultraflexgroup.it)

#### North - South - Central America:

#### **UFLEX USA**

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Ph.: +1.941.351.2628  
Email: [sales@uflexusa.com](mailto:sales@uflexusa.com)  
[www.uflexusa.com](http://www.uflexusa.com)

## WARRANTY

**ULTRAFLEX** guarantees that its products are well designed and free from manufacturing and material defects, for a period of two years from the date of manufacturing.

For the products which are installed and used on working or commercial boats the warranty is limited to one year from the date of manufacturing.

If during this period the product proves to be defective due to improper materials and/or manufacture, the manufacturer will repair or replace the defective parts free of charge.

Other direct or indirect damages are not covered by this warranty. In particular the company is not responsible and this warranty will not cover any damage resulting from incorrect installation or use of the product (except for replacement or repair of defective parts according to the conditions and terms above).

This warranty does not cover the products installed on race boats or boats used in competitions.

Descriptions and illustrations included in this manual should be used as general reference only.

For any further information please contact our Technical Service.

**ULTRAFLEX** steering systems are marked **CE** according to the Directive 2013/53/EU.

We remind you that only **CE** marked steering systems must be used on the boats marked **CE**.

We inform you that **ULTRAFLEX** warranty is null if **ULTRAFLEX** components are replaced with products of other brands.



# 1 PRODUCT DESCRIPTION

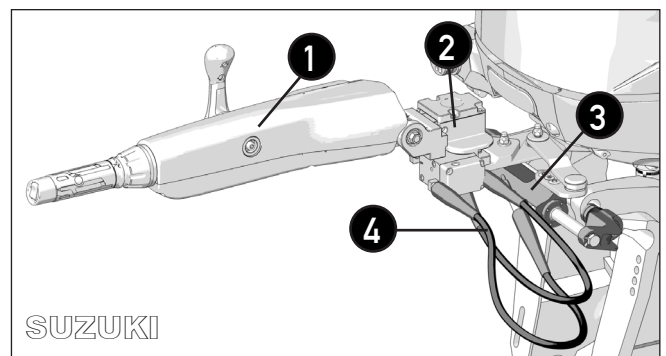
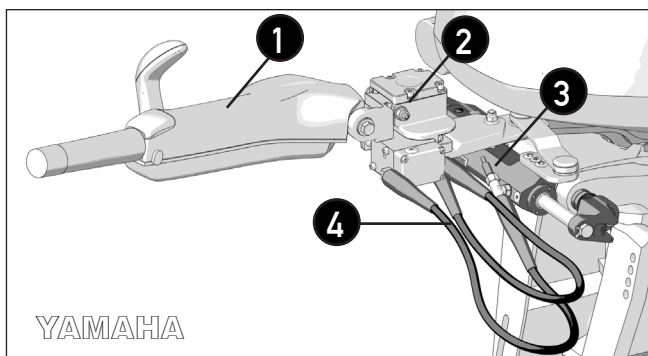
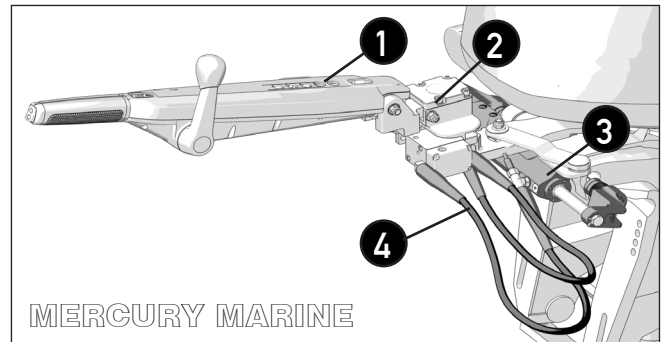
## 1.1 ZTF Tiller System description

The ZTF Tiller System is an hydraulic device that counters the propeller torque of outboard engines on the tiller handle while the operator is not actively making a steering route change. It enables the driver to maintain the right route without relevant physical effort.

The hydraulic valve gets opened when the operator makes a steering route change and the propeller torque is present on the tiller handle. It is important that the operator keeps a firm grip on the tiller handle all time long while operating the boat; specifically during steering route changes.

The ZTF Tiller System is made of four main components:

- ❶ Tiller handle (supplied directly by the engine manufacturer or any dealer)
- ❷ Main valve device
- ❸ UC128-ZTF hydraulic cylinder
- ❹ Hydraulic hoses



### NOTICE

The ZTF Tiller System is always supplied oil-filled, purged, functioning and with properly connected hoses.

### ⚠ CAUTION

Avoid twisting, damaging, bending and disconnecting the hoses.

### ⚠ CAUTION

The ZTF Tiller System is meant to be used with:

- Mercury Marine outboard engines of the 75 through 115 horsepower EFI four stroke family of engines built since 2014.
- Yamaha outboard engines of 90-115-130 HP produced from 2015 to date, and engines of 150-175-200 HP - models 2.7L F150 Mechanical, VF150 V MAX SHO, F175, VF175 V MAX SHO, and F200 Mechanical
- Suzuki DF150A/175A/200A

and must be installed only on boats specifically designed and suitably equipped for being steered with the tiller handle. The installer and the driver are responsible for ensuring the proper functioning of the ZTF Tiller System on the boat, bearing in mind factors like speed, torques and working conditions.

### ⚠ CAUTION

Do not use this device for purposes other than those it was made for, as specified in the installation manual.

### ⚠ CAUTION

For installations other than the ones required for above-mentioned Mercury Marine, Yamaha and Suzuki engines, please contact **ULTRAFLEX** Technical Service.

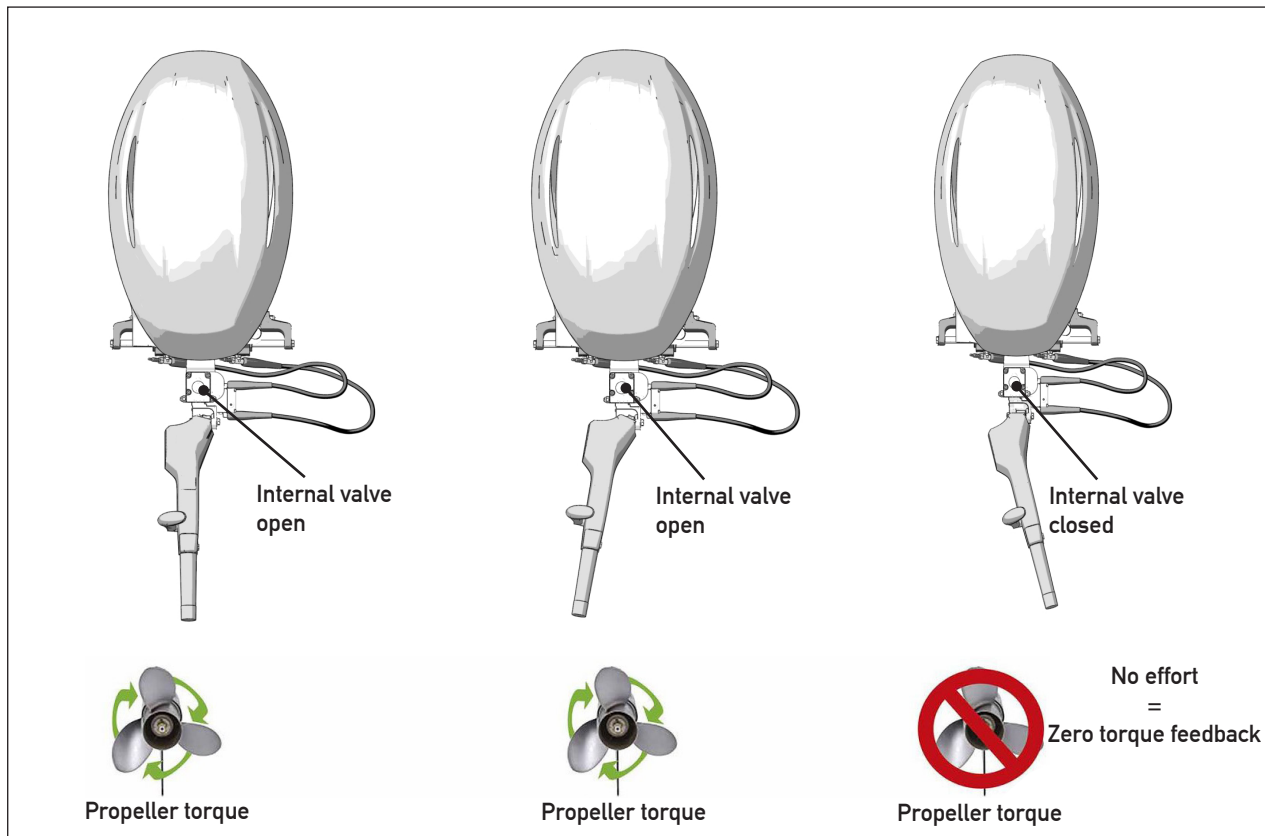


### 1.2 Operating principle

The hydraulic valve and corresponding cylinder of the ZTF Tiller System opens and closes when the pilot pushes or pulls the tiller handle. When the pilot steers straight (keeping the steering route), the hydraulic valve is closed thus removing the steering load from propeller torque on the tiller handle.

#### ⚠ WARNING

The operator **MUST** maintain a firm grip on the tiller handle under **ALL** operating conditions; either actively changing route or when maintaining a fixed route (with valve closed) as sea conditions, floating debris, or other factors could suddenly change the steering route despite pilot's will.



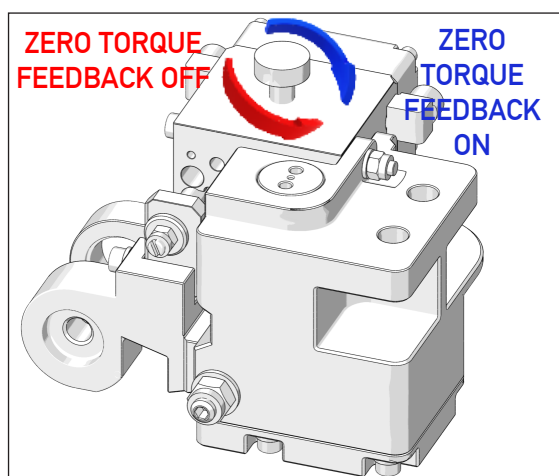
The ZTF Tiller has a By-Pass Knob underneath the primary assembly that can be used to engage or disengage the hydraulic valve. Turning the knob clockwise completely will activate the ZTF valve - locking out the propeller torque while not actively changing steering route. Turning the knob counter-clockwise will disengage the ZTF Tiller valve which will allow the propeller torque to reach the tiller handle - even when not actively making a steering route change.

#### ⚠ WARNING

It is essential that the pilot confirms the functionality and status of the ZTF Tiller System before using it.

To determine whether the system works properly, first check if the By-Pass Knob is firmly closed by turning the By-pass Knob clockwise. Then firmly push on the back of the engine to simulate a steering change (without pushing on the tiller handle simultaneously). If the engine does not turn in either direction, the ZTF is engaged.

If the engine moves, tighten the By-Pass Knob in the clockwise direction and check again to see if the engine moves. If it keeps moving, do not use the boat and contact our technical service for support.



## 2 TRANSPORTATION

### 2.1 General warnings

The product weight with its packaging is around 20kg (44 lbs.). Therefore, it can be handled manually.

#### WARNING

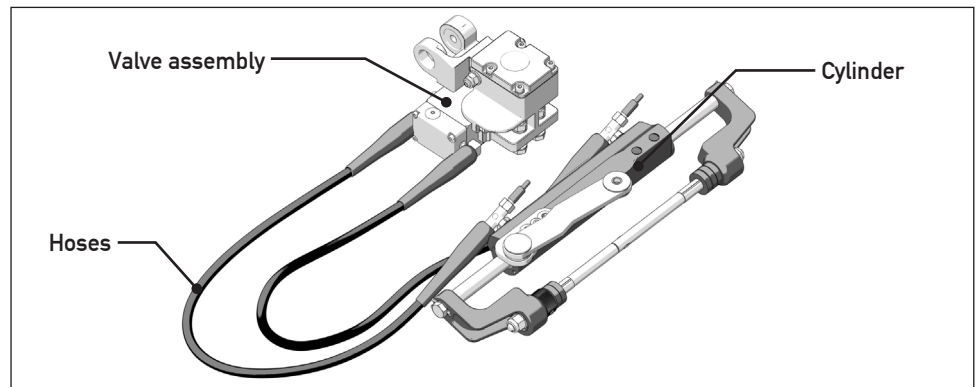
The staff in charge of handling must operate with protective gloves and safety shoes.

### 2.2 Packaging contents

Before using the equipment check that the product has not been damaged during transportation. Make also sure that all the standard components are in the packaging. In case of damage, do not use the ZTF Tiller System and notify the freight carrier and your dealer/distributor immediately.

The ZTF Tiller System is provided with the following items:

#### 1 Main system

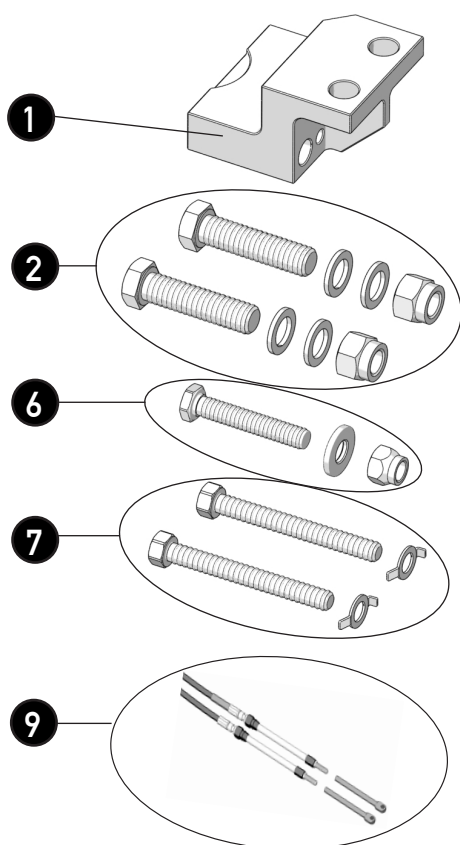


#### 2 Accessory kit based on installation type. (see the following chart with related drawings and paragraph 3.2)

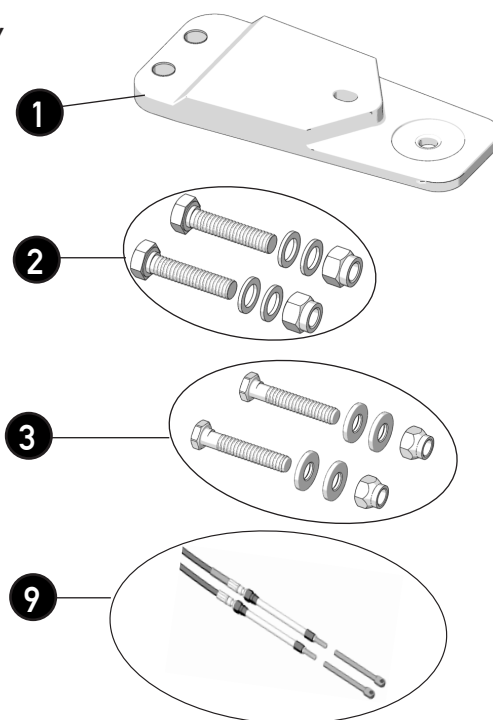
|   | MERCURY                              | YAMAHA   |  | SUZUKI   |
|---|--------------------------------------|--|--|--|
|   | KIT ND1-MM<br>(75-115 HP<br>ENGINES) | KIT ND1-Y<br>(90-115-130 HP<br>ENGINES FROM<br>2015) | KIT QU1-Y<br>(150-175-200 HP<br>ENGINES) | KIT QU1-S<br>(DF150A / 175A /<br>200A ENGINES) |
| PROVIDED IN THE KIT   | M2                                   | Y1   | Y2                                       | S2   |
| 1. Bracket  | ✓                                    | ✓  | ✓  | ✓  |
| 2. Hardware fastening the device to the bracket (2 screws M12, 2 nuts, 4 washers)   | ✓                                    | ✓  | ✓  | ✓  |
| 3. Hardware fastening the cylinder link arm to the engine arm (2 special bolts ULTRABOLT, 2 high nuts, 4 washers)                                       | ✗                                    | ✗  | ✓  | ✓  |
| 4. Hardware fastening the cylinder link arm to the engine arm (1 SVS bolt ULTRABOLT, 1 SVS washer, 1 thin nut)  | ✗                                    | ✓  | ✗  | ✗  |
| 5. Hardware fastening the bracket to the engine arm (2 pivots, 2 washers, 2 nuts)<br>CAUTION: this hardware is always included in Yamaha tiller handles | ✗                                    | ✓  | ✗  | ✗  |
| 6. Hardware fastening the cylinder link arm to the engine arm (1 SVS bolt ULTRABOLT, 1 SVS washer, 1 thin nut)  | ✓                                    | ✗  | ✗  | ✗  |
| 7. Hardware fastening the bracket to the engine arm (2 screws, 2 washers) CAUTION: washers always included in Mercury Marine tiller handles             | ✓                                    | ✗  | ✗  | ✗  |
| 8. 2 Caps   | ✗                                    | ✗  | ✗  | ✓  |
| 9. Throttle cables and shift cables   | ✓                                    | ✓  | ✓  | ✓  |



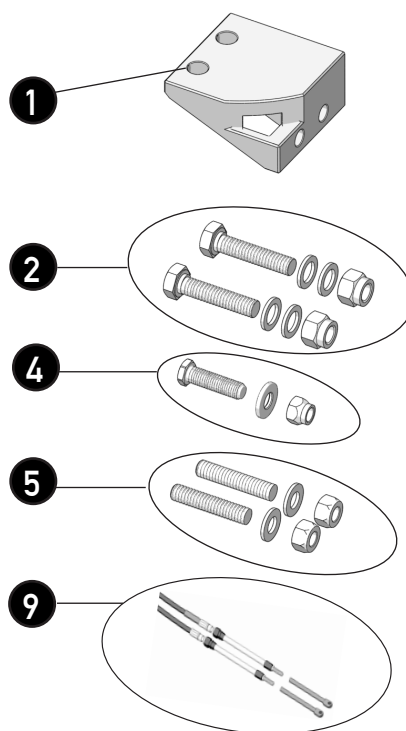
### KIT ND1-MM

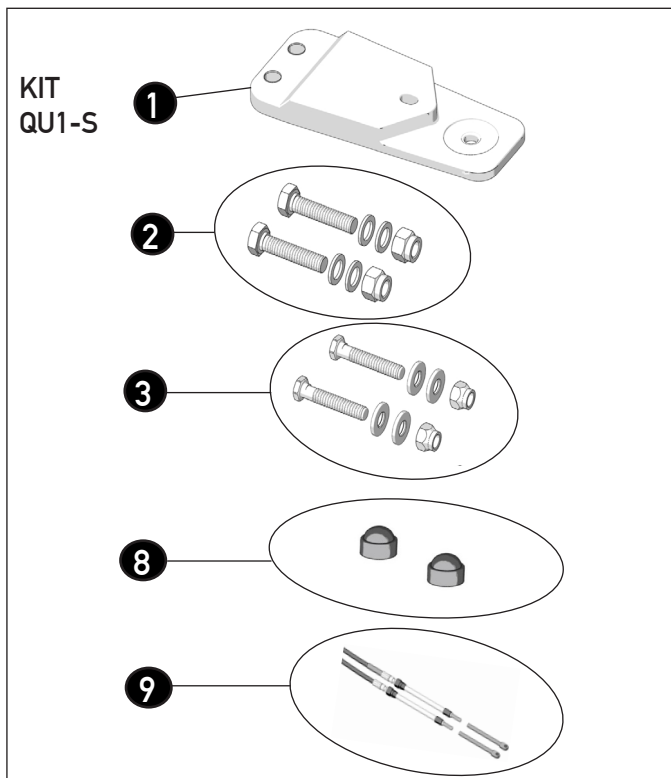


### KIT QU1-Y



### KIT ND1-Y





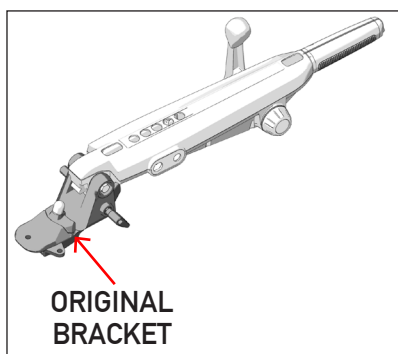
### ⚠ CAUTION

The packaging must be disposed of according to the existing laws.

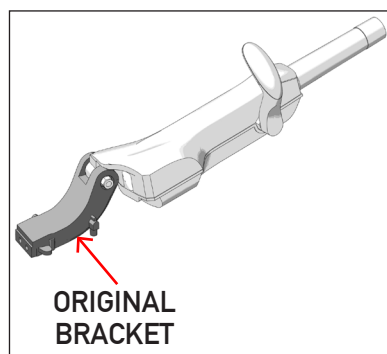
### NOTICE

If engine manufacturer's is new it will be supplied with original bracket and the required fastening screws. It will be necessary to remove the original bracket in order to install the ZTF system.

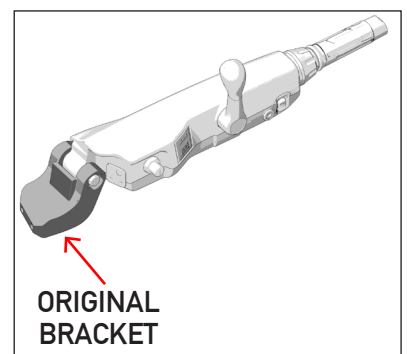
Mercury Marine tiller handle (not included but directly supplied by the engine dealer)



Yamaha® tiller handle (not included but directly supplied by the engine dealer)



Suzuki tiller handle (not included but directly supplied by the engine dealer)



## 3 INSTALLATION

### 3.1 Safety warnings

Strictly follow the precautions and the safety warnings throughout this entire manual. Failure to do so could result in loss of steering with possible damage, injuries and death.

**ULTRAFLEX** declines all responsibility for errors during installation, mis-application, mis-use, neglect, or lack of maintenance or routine inspection.

#### DANGER

- DO NOT PUT HANDS BETWEEN THE MOVING PARTS.
- Do not disable in any way the safety devices.
- Do not modify or add devices to the system, without **ULTRAFLEX** written authorization or technical intervention which will prove the modification.
- Installation should only be performed by well experienced and trained marine technicians.

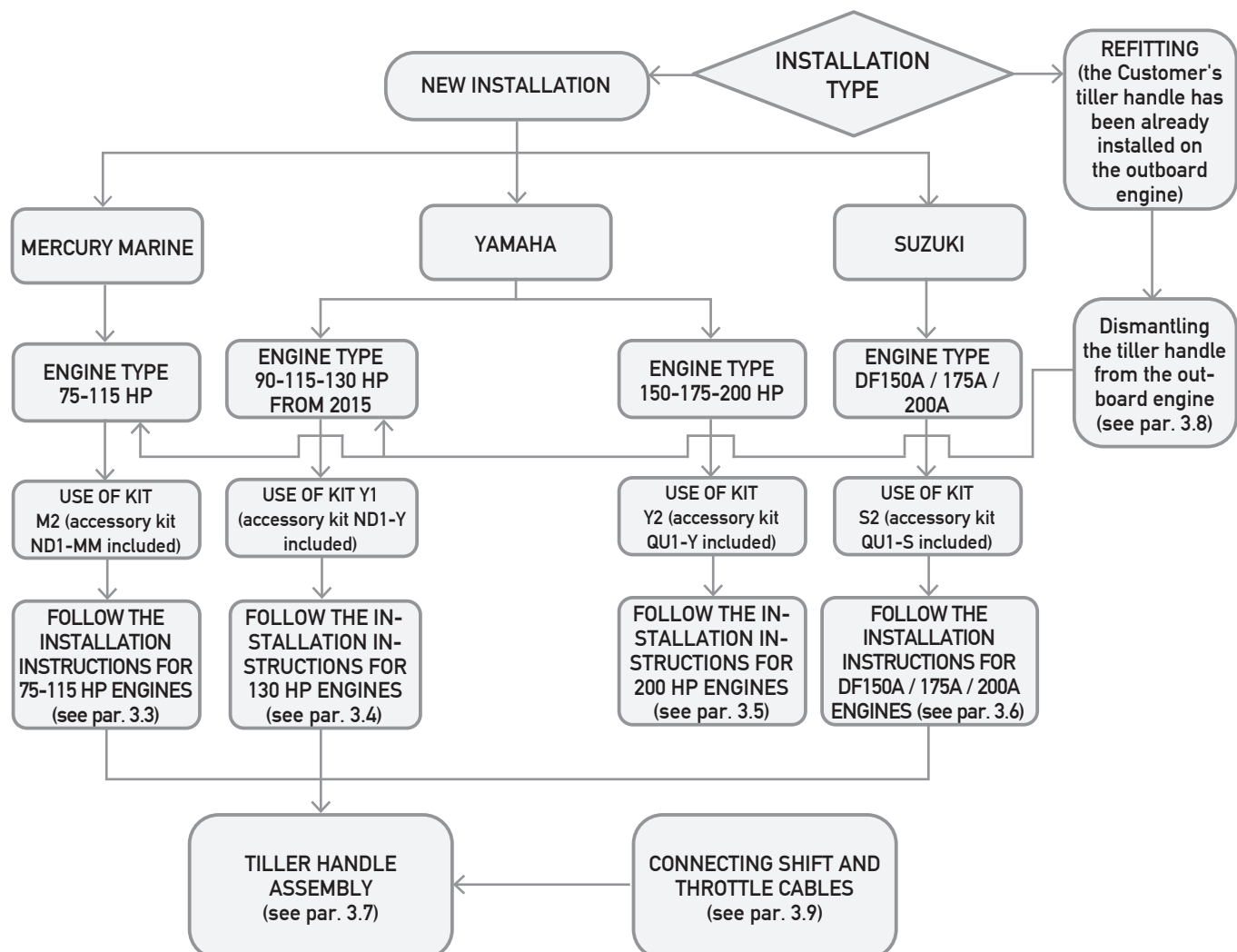
### 3.2 Installation ways

The ZTF system has two different installation ways:

1) **NEW INSTALLATION:** The Customer purchases a new engine manufacturer's tiller handle.

2) **REFITTING:** Customer's tiller handle has been already installed on outboard engine.

Moreover, the installation procedure changes according to the type of an outboard engine on which the ZTF system is installed, as described in the following scheme:





### 3.3 Installation with 75-115 HP Mercury Marine engines

The ZTF installation requires the use of KIT ND1-MM (see also par. 2.2).

#### NECESSARY TOOLS



(2 x) Open end wrench  
18 mm



MOLYKOTE® 1000



Torque wrench

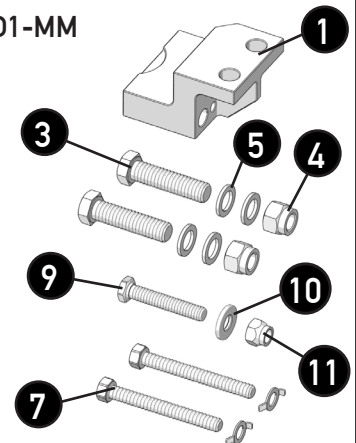


Open end wrench  
14 mm



Open end wrench  
9/16"

#### KIT ND1-MM



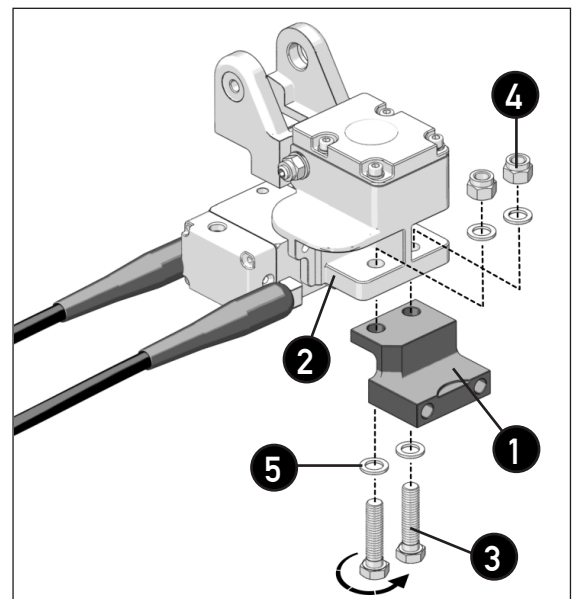
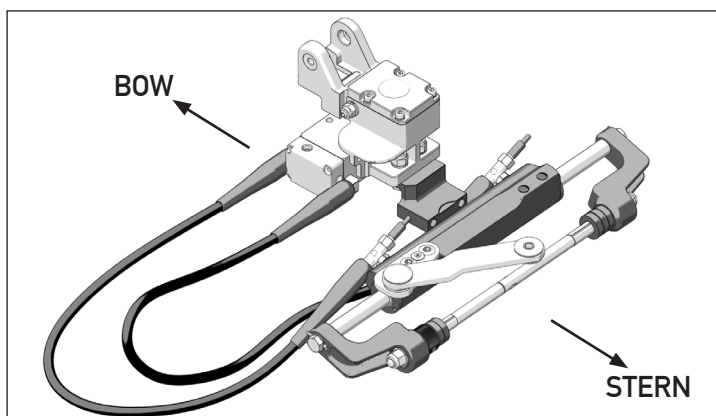
- 1 Fasten bracket (1) on device (2) using screws (3) and nuts (4) after having properly placed washers (5). Lock using 2 18mm wrenches with a tightening torque of 80 Nm (59 lb.-ft.).

#### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.

#### ⚠ CAUTION

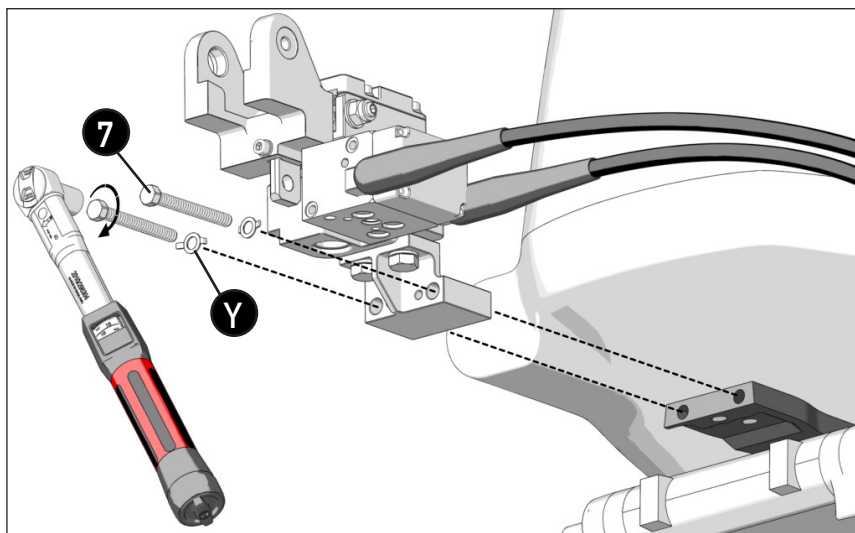
The bracket must be oriented as shown in the picture.



- 2 Fasten the device with the bracket on the engine arm using screws (7) and interposing washers (Y), following the tightening torque and the instructions included in the manual of the tiller handle.

### ⚠ CAUTION

During this operation, be careful not to damage, bend and disconnect the hydraulic hoses.

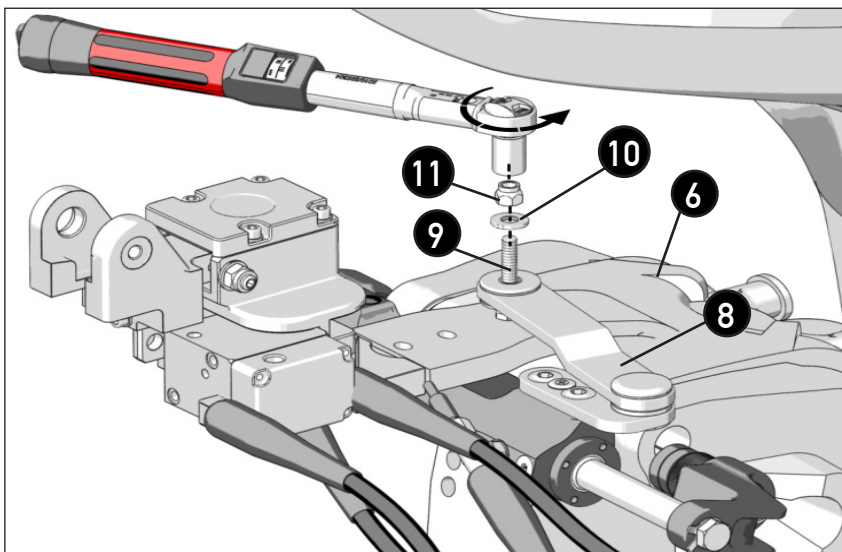


- 3 Fasten the cylinder link arm (8) to the engine arm (6) by screwing a 3/8" ultrabolt (9) by interposing washer (10): tighten the ultrabolt using a 14 mm wrench with a torque of 54 Nm (40 lb.-ft.).

Screw the self-locking nut (11) with a 9/16" wrench and tighten it with a torque of 27 Nm (20 lb.-ft.). After having fastened the nut (11), recheck that the tightening torque - 54 Nm (40 lb.-ft.) - of the screw (11) is correct.

### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.



- 4 Complete the assembly of UC128 cylinder on the outboard engine by following what is reported on the installation and maintenance manual of the cylinder itself, except for the fastening phase of the cylinder link arm to the engine arm, which is described in the previous points.

### ⚠ WARNING

Do not disconnect the hydraulic hoses for any reason.

- 5 Assemble the tiller handle on the ZTF device as described in paragraph 3.7.



### 3.4 Installation with 90-115-130 HP Yamaha engines from 2015 to date



The ZTF installation with 90-115-130 HP engines from 2015 requires the use of KIT ND1-Y (see also par. 2.2).

#### NECESSARY TOOLS



(2 x) Open end wrench  
18mm



MOLYKOTE® 1000



Torque wrench

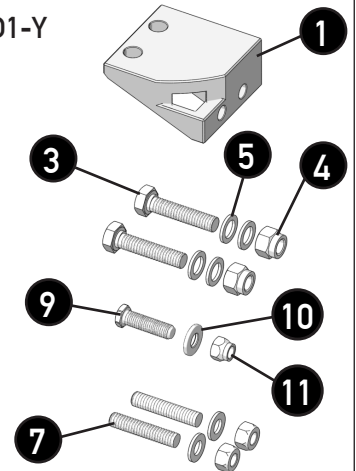


Open end wrench  
14mm



Open end wrench  
9/16"

KIT ND1-Y



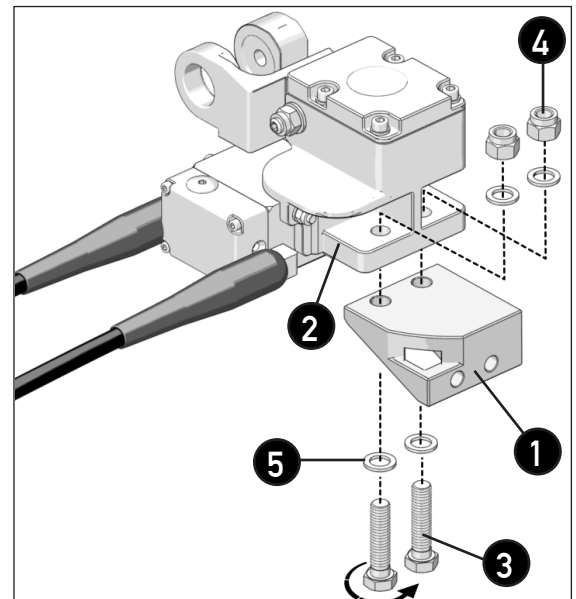
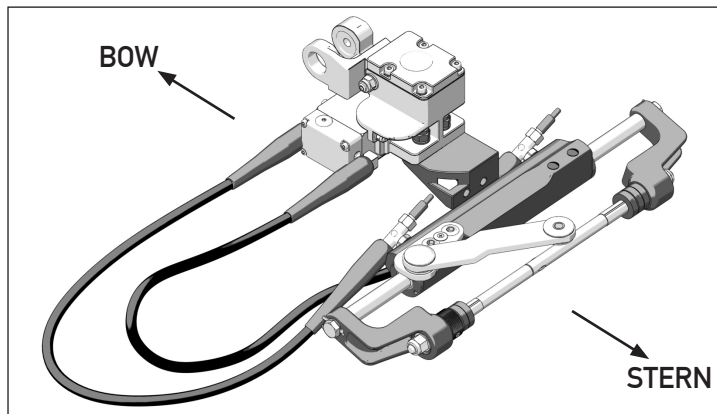
- 1 Fasten bracket (1) on device (2) using screws (3) and nuts (4) after having properly placed washers (5). Lock using 2 18mm wrenches with a tightening torque of 80 Nm (59 lb.-ft.).

#### ⚠ CAUTION

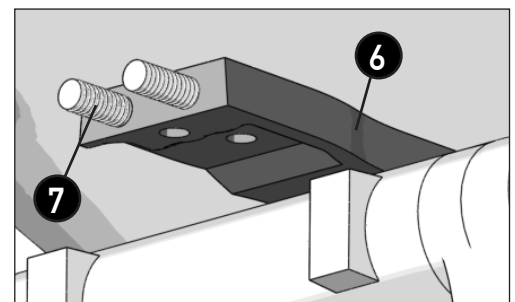
Apply grease to the screw shafts before tightening the nuts.

#### ⚠ CAUTION

The bracket must be oriented as shown in the picture.



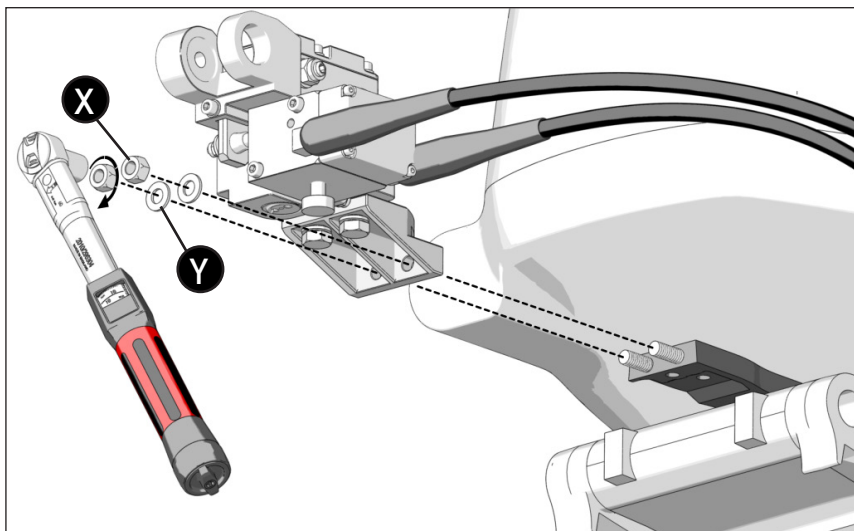
- 2 Screw and lock the studs (7) to the engine arm (6) following the tightening torque and the instructions included in the manual of engine manufacturer's tiller handle.



- 3** Fasten the device with the bracket on the engine arm using nuts (X) and interposing washers (Y), following the tightening torque and the instructions included in the manual of engine manufacturer's tiller handle. Apply grease to the pivots before tightening the nuts.

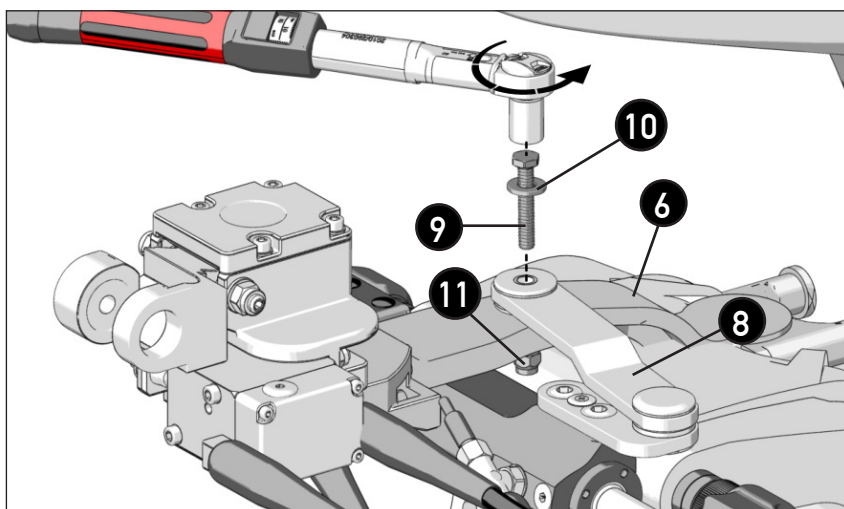
### ⚠ CAUTION

During this operation, be careful not to damage, bend and disconnect the hydraulic hoses.



- 4** Fasten the cylinder link arm (8) to the engine arm (6) by screwing a 3/8" ultrabolt (9) in the closest hole to the stern, by interposing washer (10): tighten the ultrabolt using a 14 mm wrench with a torque of 54 Nm (40 lb.-ft.).

Screw the self-locking nut (11) with a 9/16" wrench and tighten it with a torque of 27 Nm (20 lb.-ft.). After having fastened the nut (11), recheck that the tightening torque - 54 Nm (40 lb.-ft.) - of the screw (11) is correct.



### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.

- 5** Complete the assembly of UC128 cylinder on the outboard engine by following what is reported on the installation and maintenance manual of the cylinder itself, except for the fastening phase of the cylinder link arm to the engine arm, which is described in the previous points.

### ⚠ WARNING

Do not disconnect the hydraulic hoses for any reason.

- 6** Assemble the tiller handle on the ZTF device as described in paragraph 3.7.



### 3.5 Installation with 150-175-200 HP Yamaha engines



The ZTF installation with 150-175-200 HP engines requires the use of KIT QU1-Y (see also par. 2.2).

#### NECESSARY TOOLS



(2 x) Open end wrench  
18mm



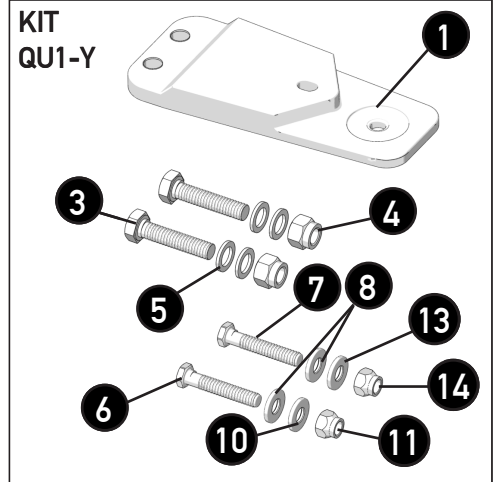
MOLYKOTE® 1000



Torque wrench



Open end wrench  
9/16"



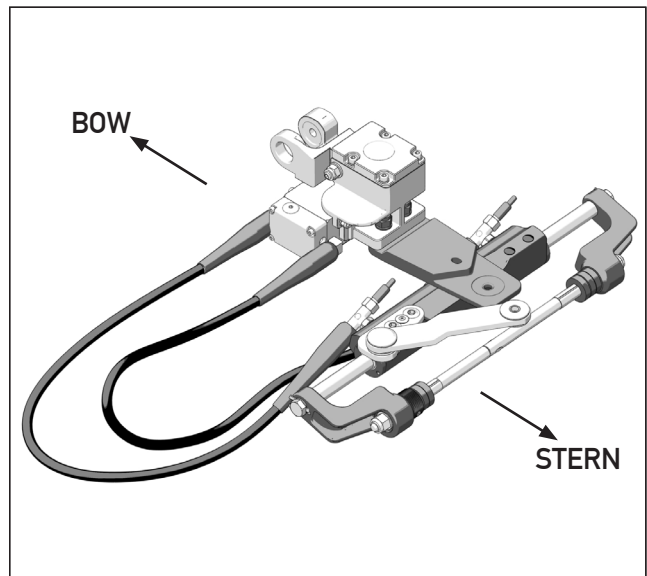
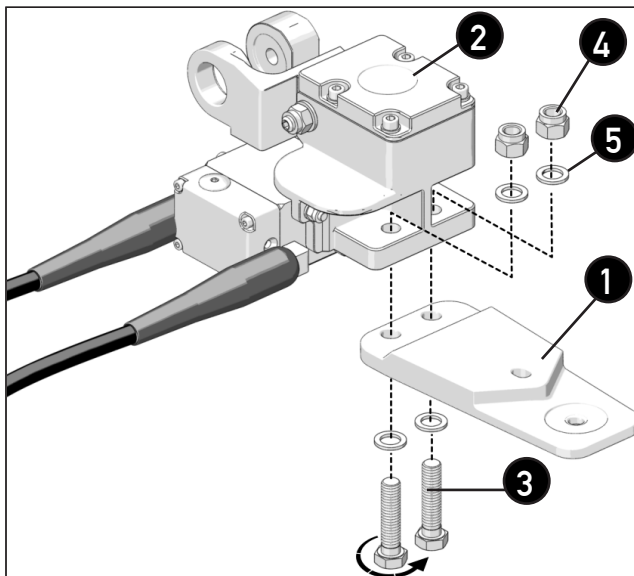
- 1 Fasten bracket (1) on device (2) using screws (3) and nuts (4) after having properly placed washers (5). Lock using 2 18mm wrenches with a tightening torque of 80 Nm (59 lb.-ft.).

#### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.

#### ⚠ CAUTION

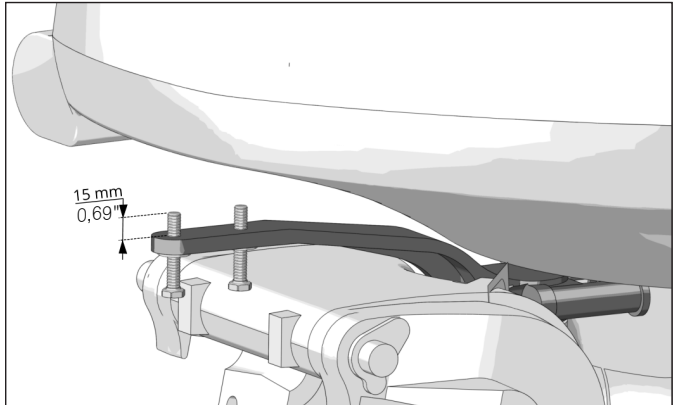
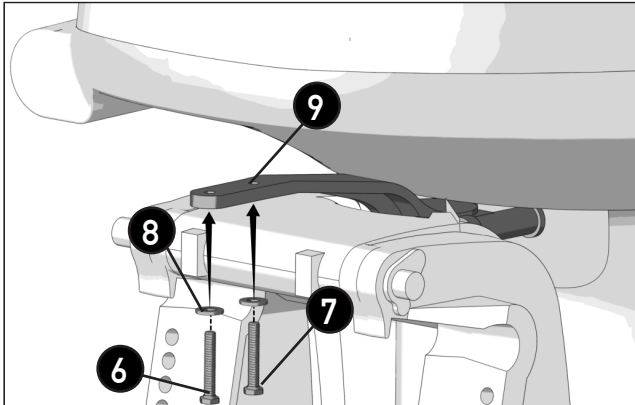
The bracket must be oriented as shown in the picture.



- 2 Insert the two ultrabolts (6) and (7) with washers (8) into the engine arm (9) up to half of their length.

### NOTICE

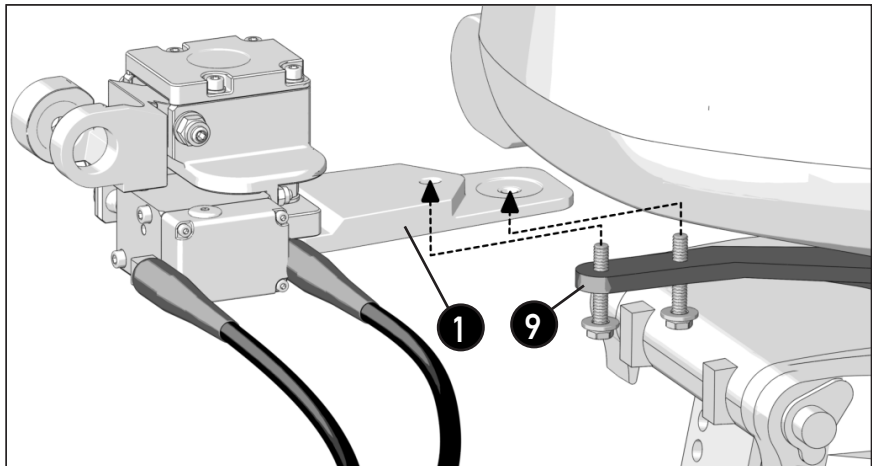
The screws must protrude from the engine arm by around 15 mm (0.59").



- 3 Assemble the device with bracket (1) on the engine arm (9).

### CAUTION

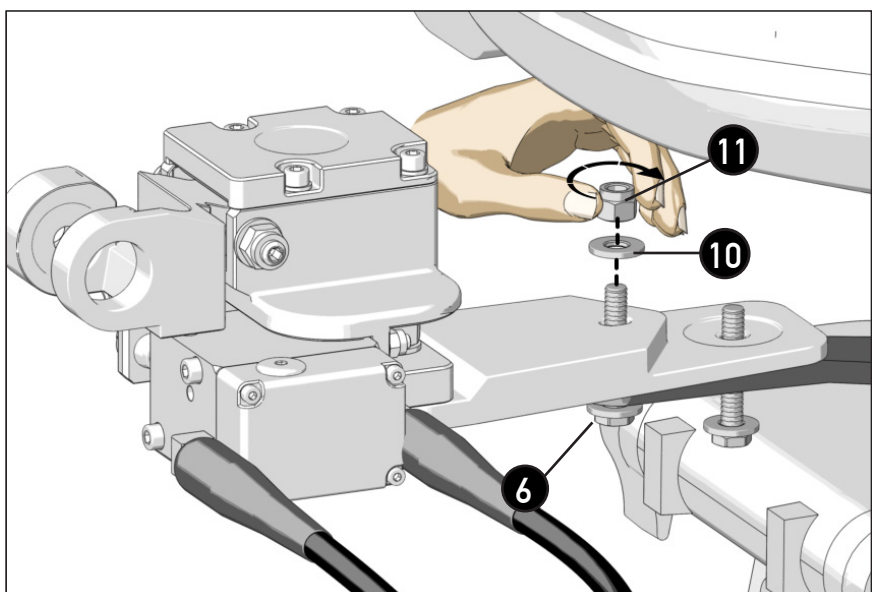
Be careful not to bend, kink or disconnect hydraulic hoses.



- 4 Place washer (10) on the front ultrabolt (6), which is the closest to the device and tighten manually the self-locking nut (11).

### CAUTION

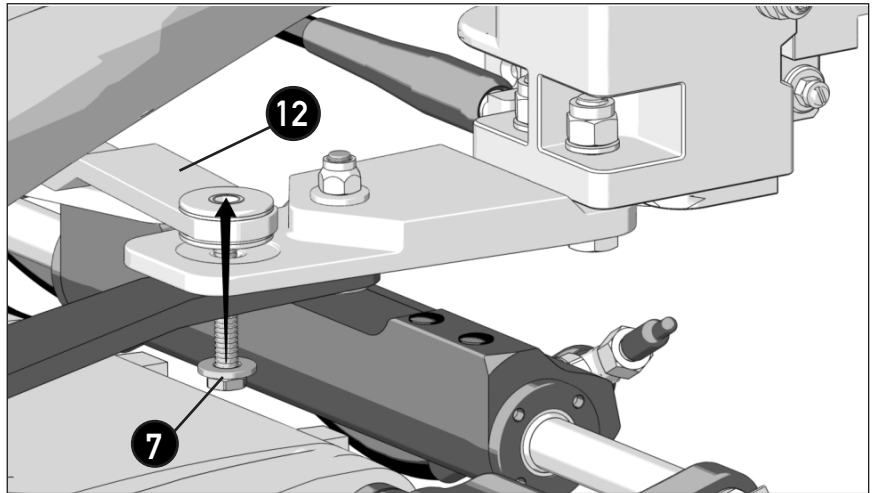
Apply grease to the screw shafts before tightening the nuts.



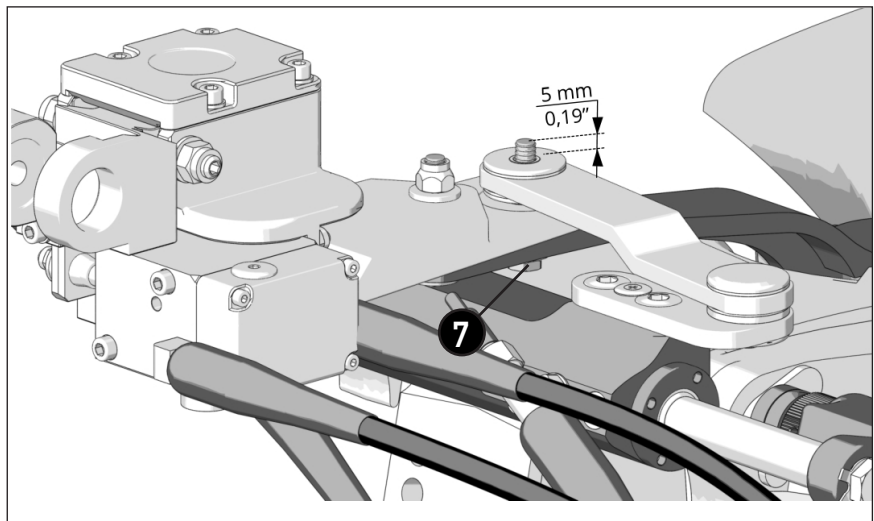
- 5 Place the cylinder link arm (12) on the rear screw (7).

### NOTICE

In order to complete the fastening process of the cylinder to the engine hose, refer to the instructions included in the manual of the cylinder.



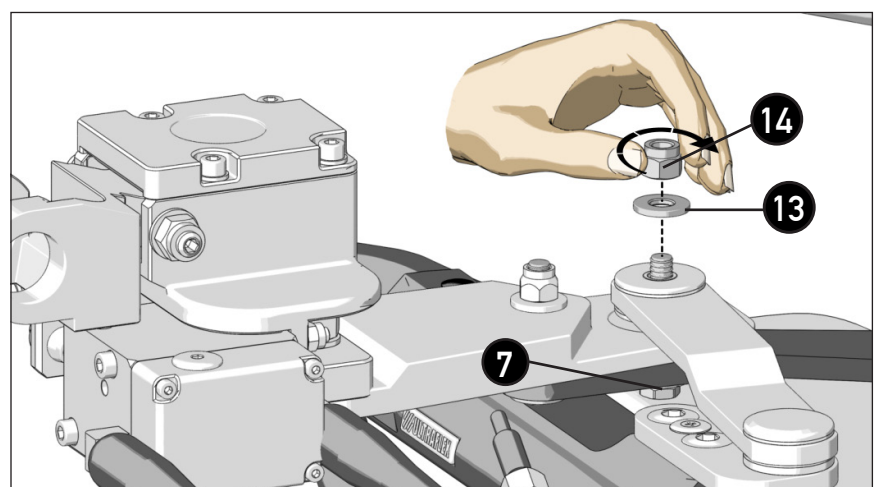
- 6 Screw ultrabolt (7) letting it protrude from the cylinder link arm by at least 5 mm (0.19"), then place washer (13) (see picture below).



- 7 Manually tighten the self-locking nut (14) on screw (7).

### CAUTION

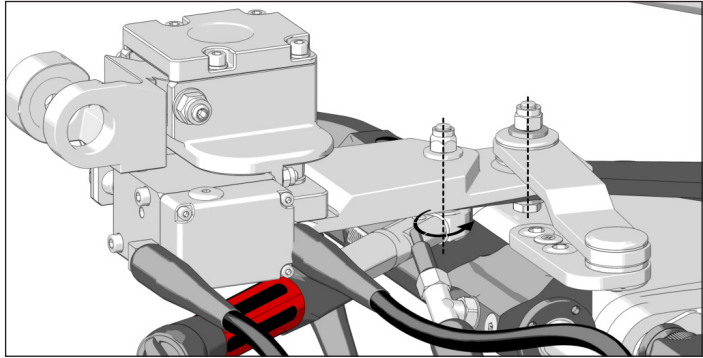
Apply grease to the screw shaft before tightening the nut.



- 8 Bring the two ultrabolts into contact with the engine tiller arm and fasten them using a 9/16" wrench with a torque of 54 Nm (40 lb.-ft.).

### ⚠ CAUTION

This operation requires careful attention.

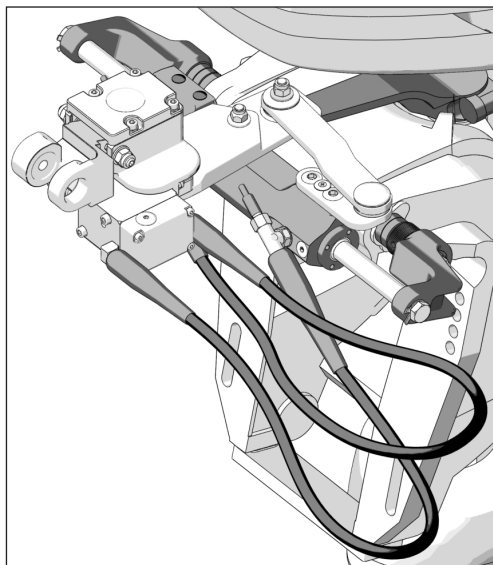
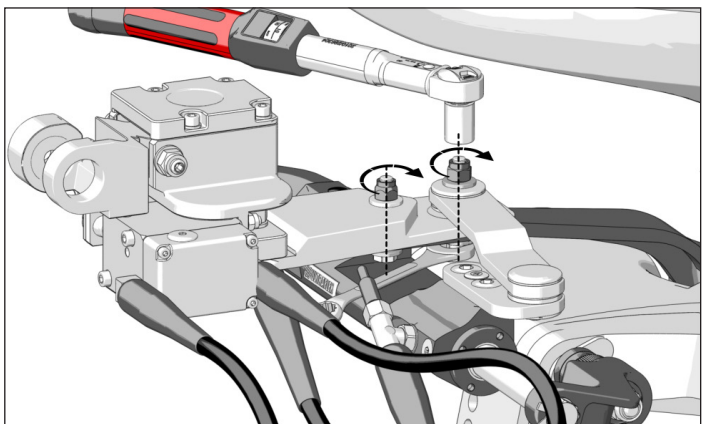


- 9 Afterwards, while holding a screw with a 9/16" wrench, fasten the corresponding nut with a torque of 54 Nm (40 lb.-ft.). Repeat this operation on the other nut always by holding its screw.

Double-check the tightening of screws and nuts by repeating the same procedure described in points 8 and 9 (fastening screws and nuts while holding screws).

### ⚠ CAUTION

This check requires careful attention.



- 10 Complete the assembly of UC128 cylinder on the outboard engine following what is reported on the installation and maintenance manual of the cylinder itself, except for the fastening phase of the cylinder link arm to the engine arm, which is described in the previous points.

### ⚠ WARNING

Do not disconnect the hydraulic hoses for any reason.

- 11 Assemble Yamaha tiller handle on the ZTF device as described in paragraph 3.7.



### 3.6 Installation with 150-175-200 HP Suzuki engines

The ZTF installation with 150-175-200 HP engines requires the use of KIT QU1-S (see also par. 2.2).

#### NECESSARY TOOLS



(2 x) Open end wrench  
18mm



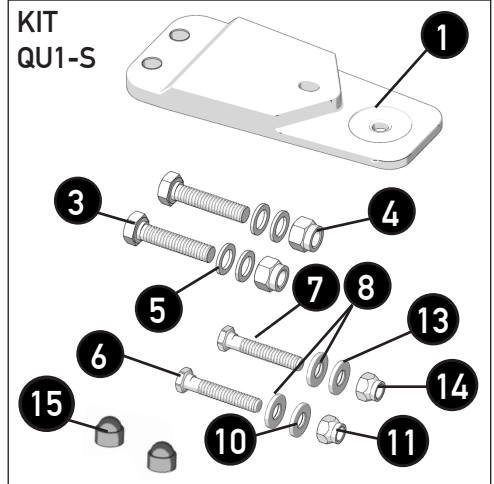
MOLYKOTE® 1000



Torque wrench



Open end wrench  
9/16"



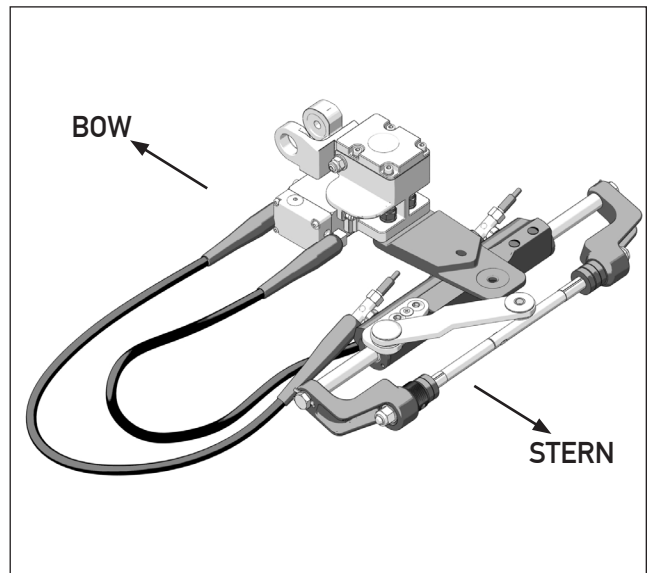
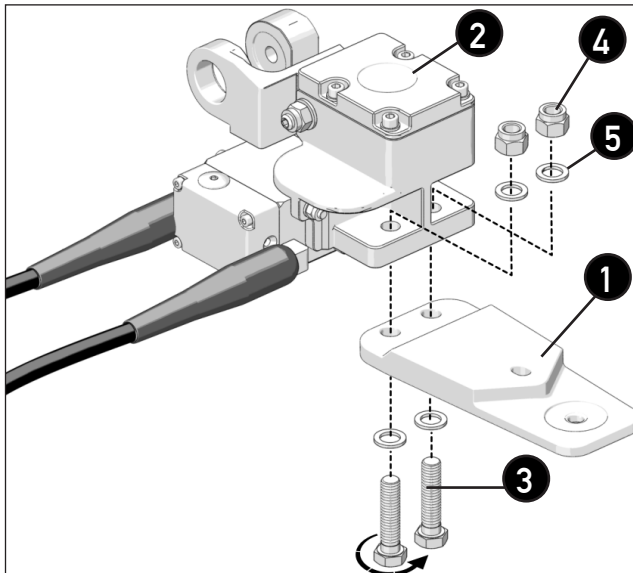
- 1 Fasten bracket (1) on device (2) using screws (3) and nuts (4) after having properly placed washers (5). Lock using 2 18mm wrenches with a tightening torque of 80 Nm (59 lb.-ft.).

#### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.

#### ⚠ CAUTION

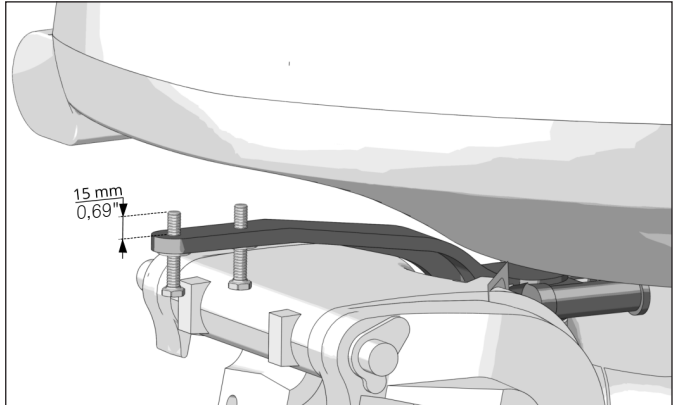
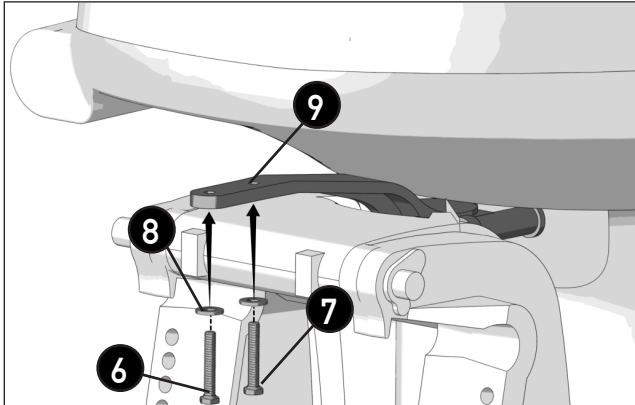
The bracket must be oriented as shown in the picture.



- 2 Place the two ultrabolts (6) and (7) with washers (8) into the engine arm (9) up to half of their length.

### NOTICE

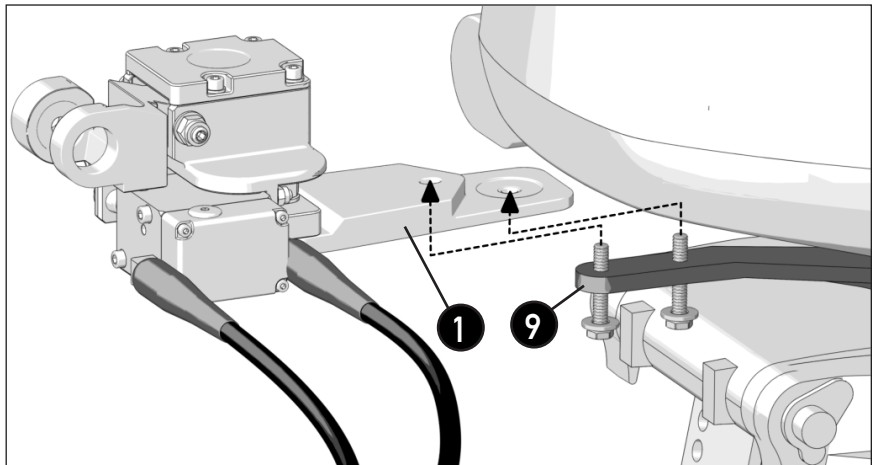
The screws must protrude from the engine arm by around 15 mm (0.69").



- 3 Assemble the device with bracket (1) on the engine arm (9).

### CAUTION

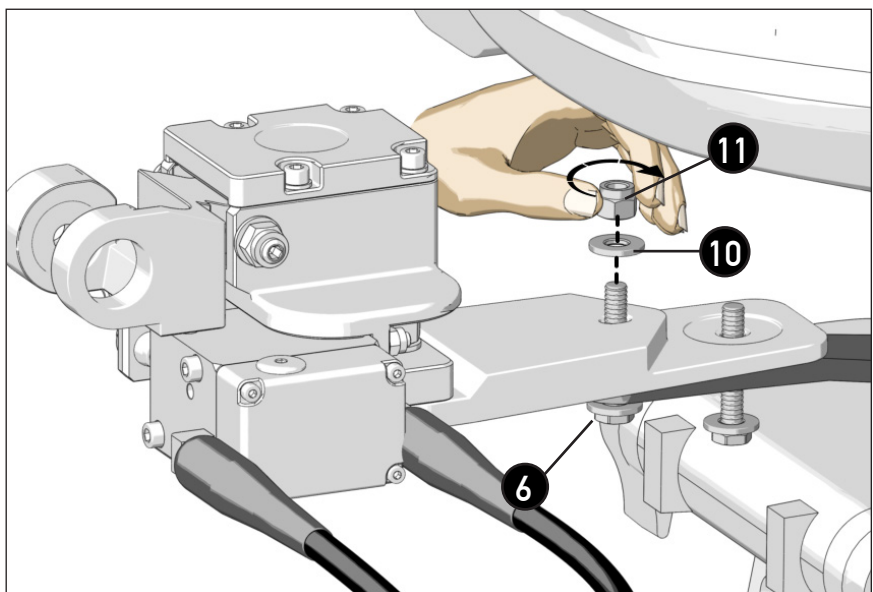
Be careful not to bend, kink or disconnect hydraulic hoses.



- 4 Place washer (10) on the front ultrabolt (6), which is the closest to the device and tighten manually the self-locking nut (11).

### CAUTION

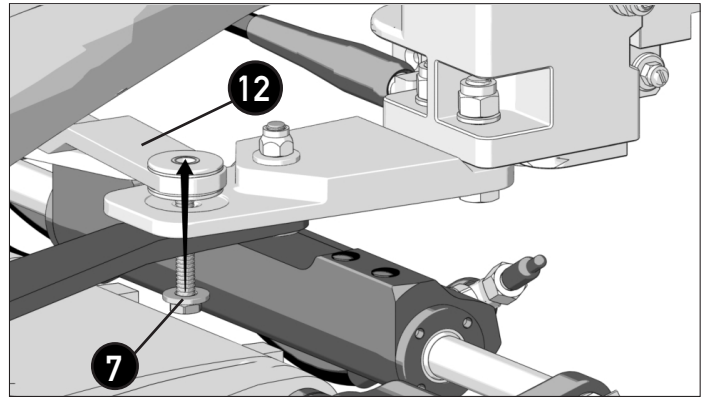
Apply grease to the screw shafts before tightening the nuts.



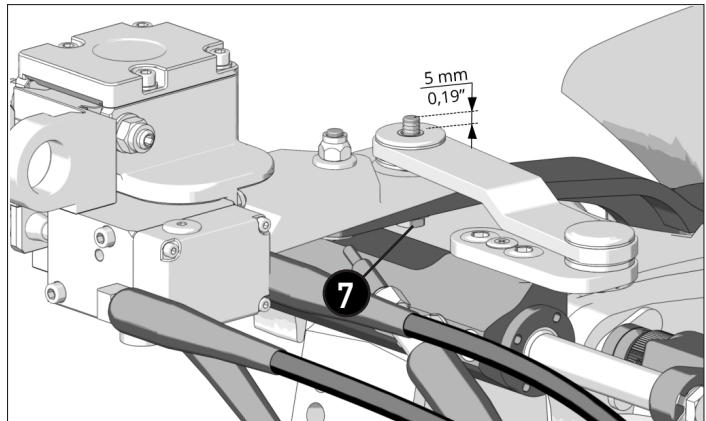
- 5 Place the cylinder link arm (12) on the rear screw (7).

### NOTICE

In order to complete the fastening process of the cylinder to the engine hose, refer to the instructions included in the manual of the cylinder.



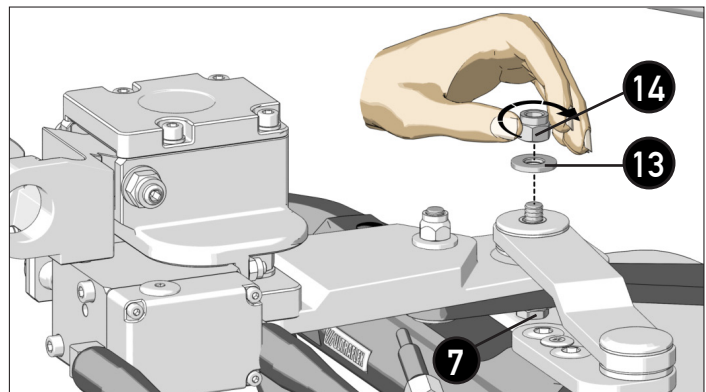
- 6 Screw ultrabolt (7) letting it protrude from the cylinder link arm by at least 5 mm (0,19"), then place washer (13) (see picture below).



- 7 Manually tighten the self-locking nut (14) on screw (7).

### CAUTION

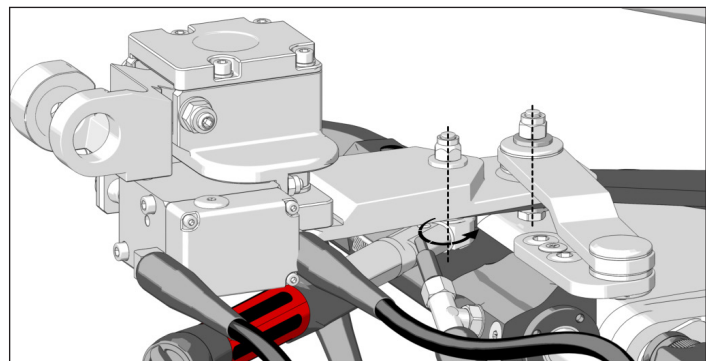
Apply grease to the screw shaft before tightening the nut.



- 8 Bring the two ultrabolts into contact with the engine tiller arm and fasten them using a 9/16" wrench with a torque of 54 Nm (40 lb.-ft.).

### CAUTION

This operation requires careful attention.

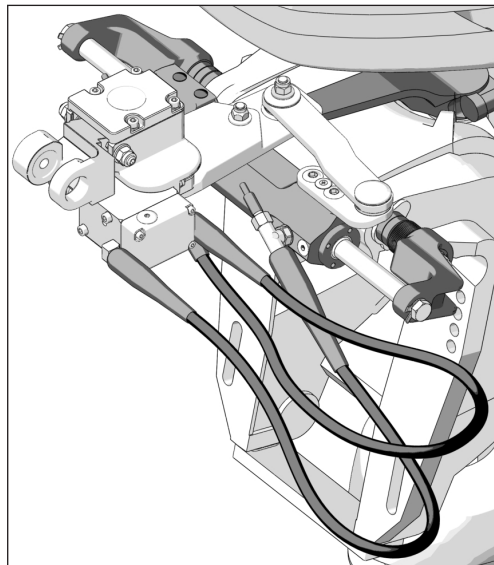
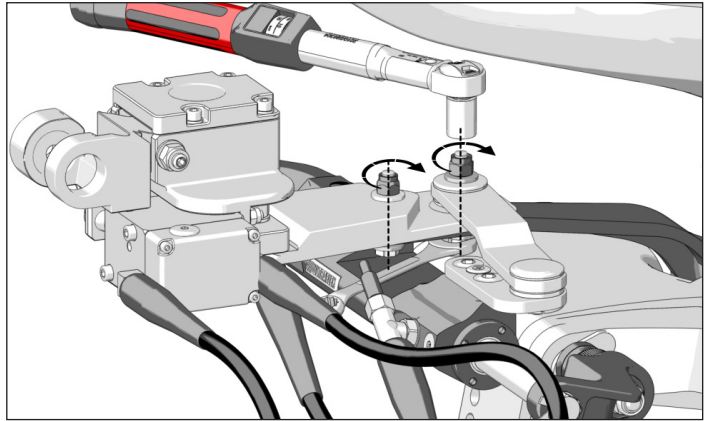


- 9 Afterwards, while holding a screw with a 9/16" wrench, fasten the corresponding nut with a torque of 54 Nm (40 lb.-ft.). Repeat this operation on the other nut always by holding its screw.

Double-check the tightening of screws and nuts by repeating the same procedure described in points 8 and 9 (fastening screws and nuts while holding screws).

### ⚠ CAUTION

This check requires careful attention.



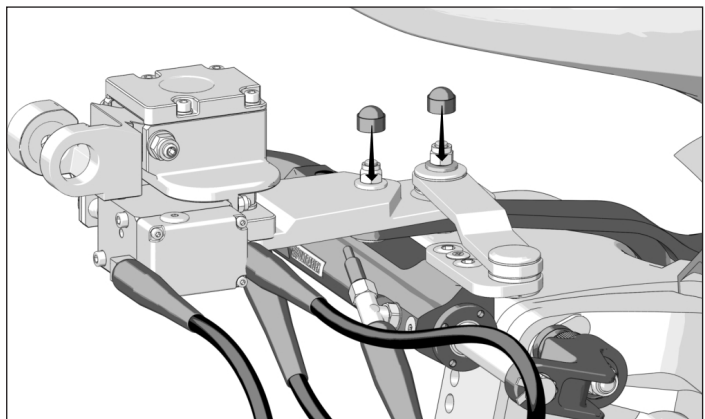
- 10 Complete the assembly of UC128 cylinder on the outboard engine following what is reported on the installation and maintenance manual of the cylinder itself, except for the fastening phase of the cylinder link arm to the engine arm, which is described in the previous points.

### ⚠ WARNING

Do not disconnect the hydraulic hoses for any reason.

- 11 Assemble the tiller handle on the ZTF device as described in paragraph 3.7.

- 12 Insert caps to protect nuts on the engine side bracket.



## 3.7 Tiller handle assembly

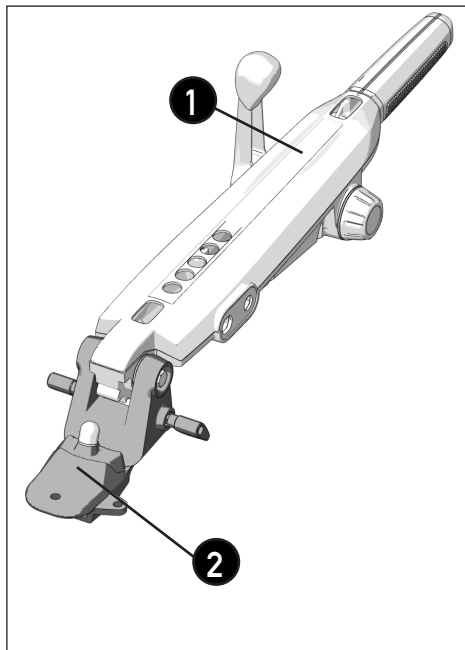


The tiller handle is composed of the main body (1) and the original bracket (2), including the adjustment mechanism, for connecting it to the engine arm.

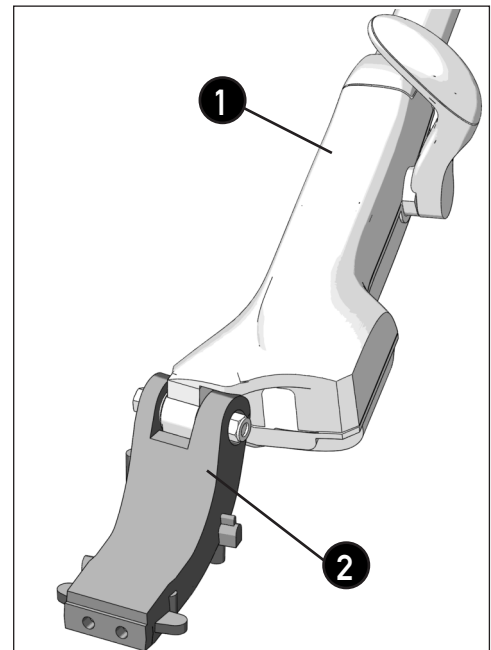
In order to install the tiller handle on the ZTF device, it is necessary to remove bracket (2) and assemble the main body (1) directly on the ZTF device.

To this end, refer to what is reported in following paragraphs.

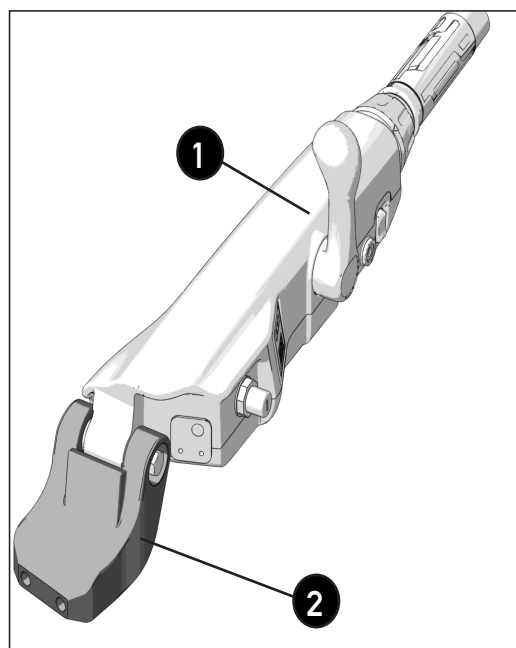
MERCURY MARINE



YAMAHA



SUZUKI



### 3.7.1 Original bracket removal



In order to install the tiller handle on the ZTF device, it is necessary to remove the original bracket, taking care not to damage the screw, the bushings, the washers and the connecting nut. Be careful to the position of these parts, since they will be reused for assembling the main body of the tiller handle to the device.

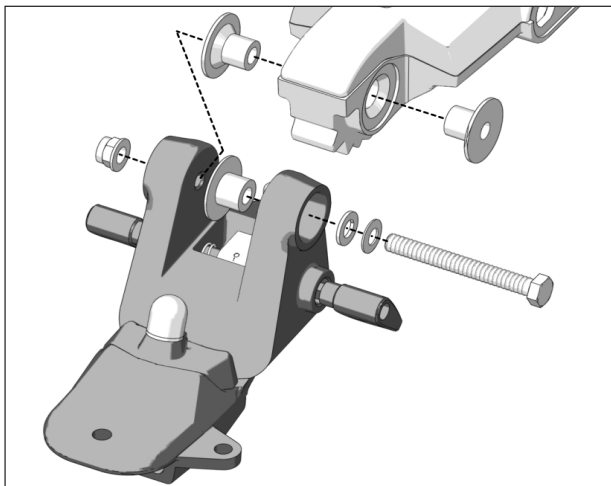
#### NOTICE

During disassembly, ALL components must be removed, since they will be reused for the following reassembling.

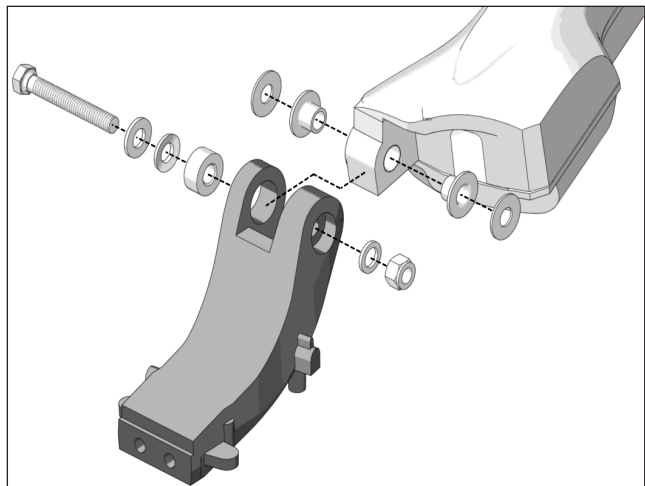
#### ⚠ CAUTION

If these components are damaged, they must be replaced. In this case, contact the technical service.

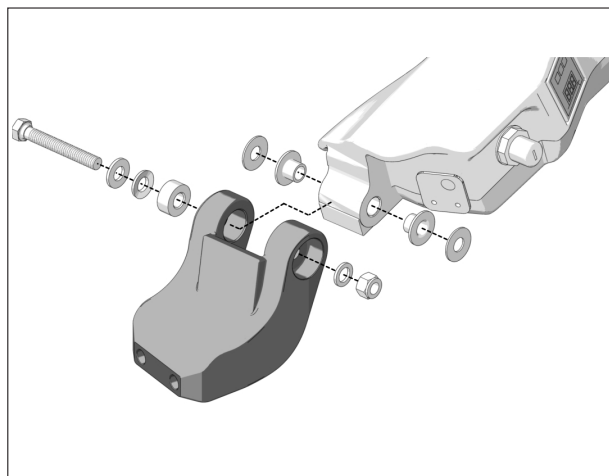
MERCURY MARINE



YAMAHA



SUZUKI



## 3.7.2 ZTF device assembly on tiller handle



### MERCURY MARINE

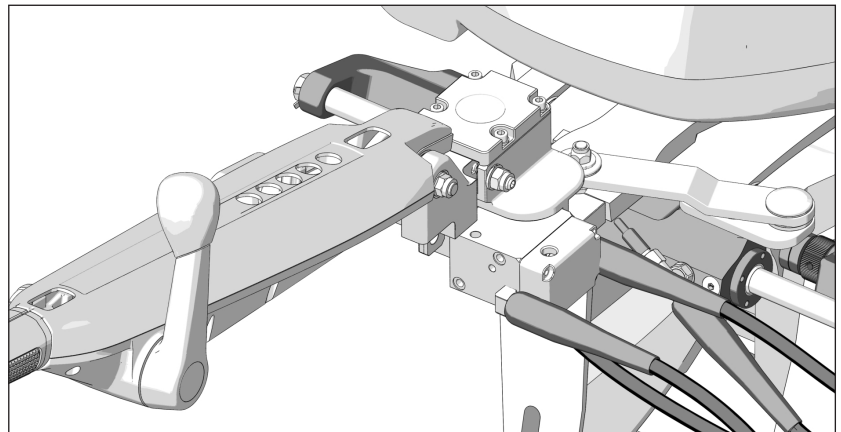
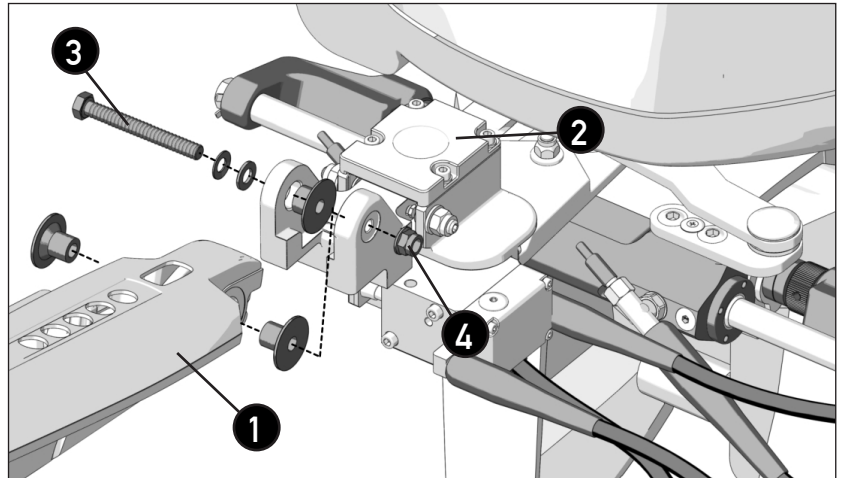
**1** The main body of the tiller handle must be fastened to the device in line with the fork.

Fasten the tiller handle (1) to device (2), taking care of positioning bushings, spacers and washers as shown in the picture aside (following the same order in which they were disassembled).

After having lubricated bolt (3), fasten nut (4) with a tightening torque between 29.4 and 34.3 Nm (from 21.68 to 25.29 lb.-ft.), avoiding excessive play of the handle allowing its tilt to any angle. Check that the upward and downward movements of tiller handle are correct and there is no free play along the horizontal axle, enabling the proper functioning of the device.

#### **⚠ CAUTION**

Apply grease to the screw shafts before tightening the nuts.



### YAMAHA

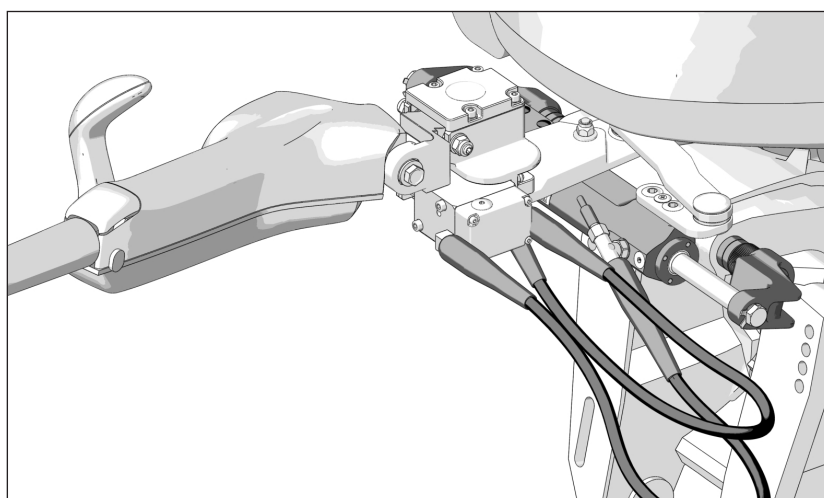
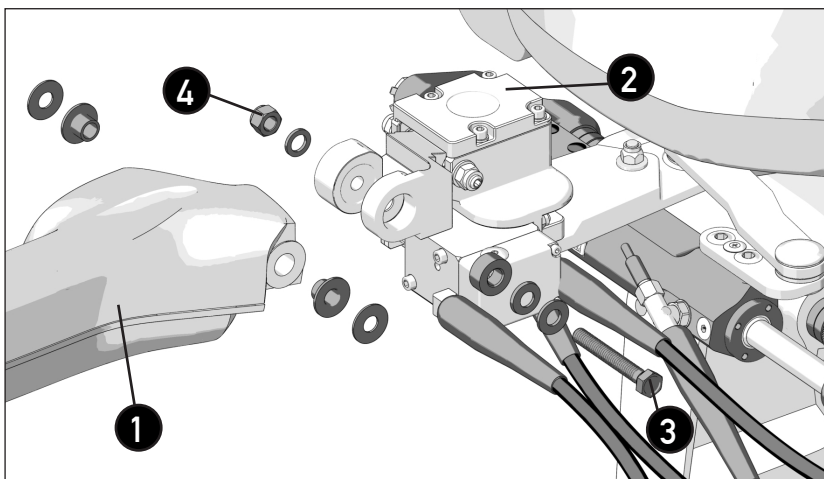
**1** The main body of the tiller handle must be fastened to the device in line with the fork.

Fasten the tiller handle (1) to device (2), taking care of positioning bushings, spacers and washers as shown in the picture aside (following the same order in which they were disassembled).

After having lubricated bolt (3), fasten nut (4) with a tightening torque between 29.4 and 34.3 Nm (from 21.68 to 25.29 lb.-ft.), avoiding excessive play of the handle allowing its tilt to any angle. Check that the upward and downward movements of tiller handle are correct and there is no free play along the horizontal axle, enabling the proper functioning of the device.

#### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.



## SUZUKI

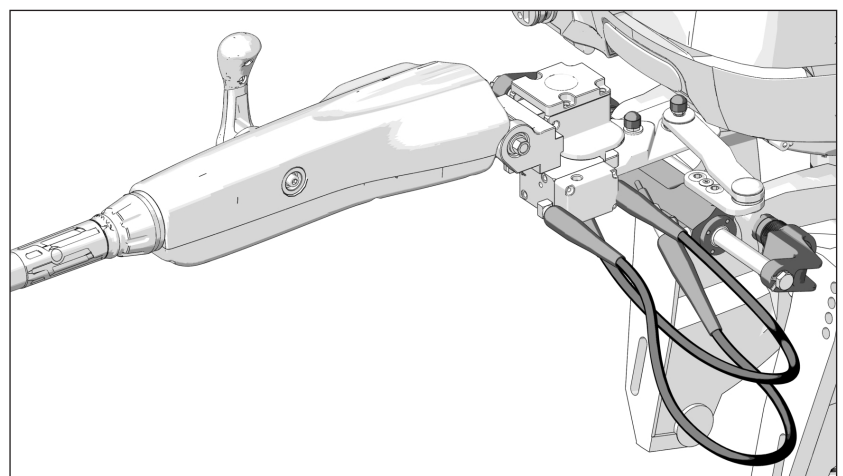
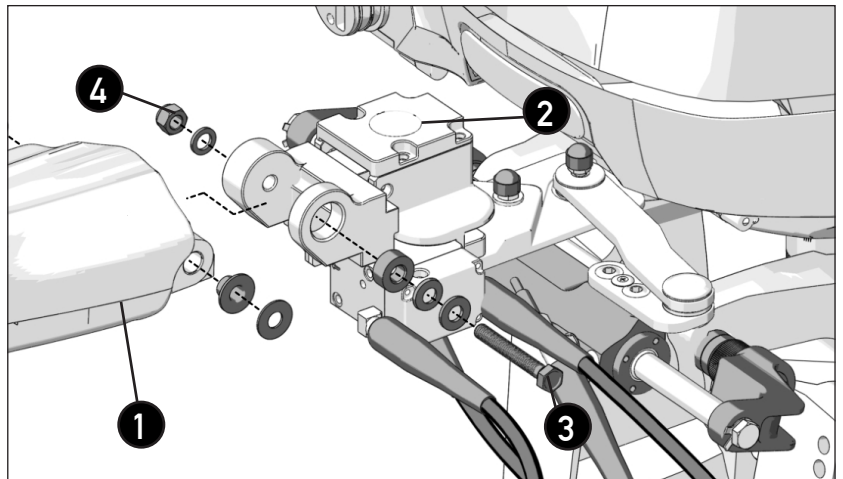
- 1 The main body of the tiller handle must be fastened to the device in line with the fork.

Fasten the tiller handle (1) to device (2), taking care of positioning bushings, spacers and washers as shown in the picture aside (following the same order in which they were disassembled).

After having lubricated bolt (3), fasten nut (4) with a tightening torque between 29.4 and 34.3 Nm (from 21.68 to 25.29 lb.-ft.), avoiding excessive play of the handle allowing its tilt to any angle. Check that the upward and downward movements of tiller handle are correct and there is no free play along the horizontal axle, enabling the proper functioning of the device.

### ⚠ CAUTION

Apply grease to the screw shafts before tightening the nuts.



### 3.8 Tiller handle disassembly from outboard engine ("refitting" installation)

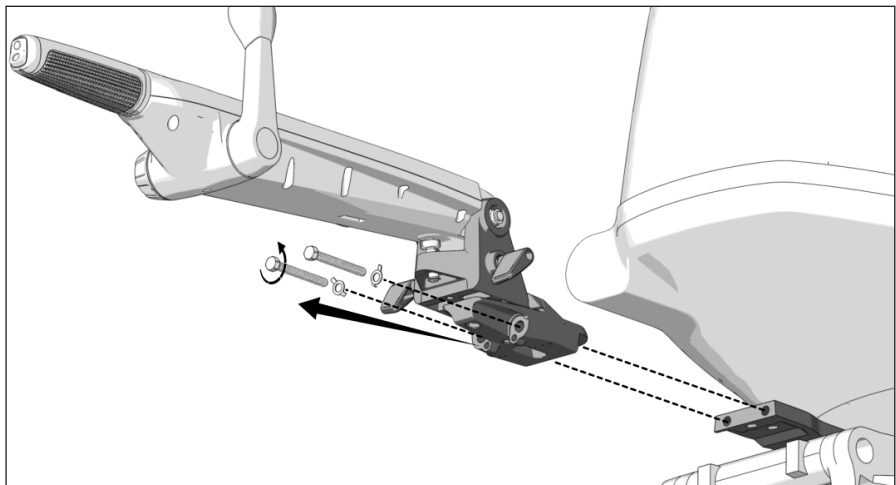


#### MERCURY MARINE

- 1 Remove the tiller handle from the engine arm, taking care of keeping the extracted washers. Check their conditions. Replace any even slightly damaged components (in this case, contact the technical service). Proceed with assembling the device following what is reported in paragraph 3.3.

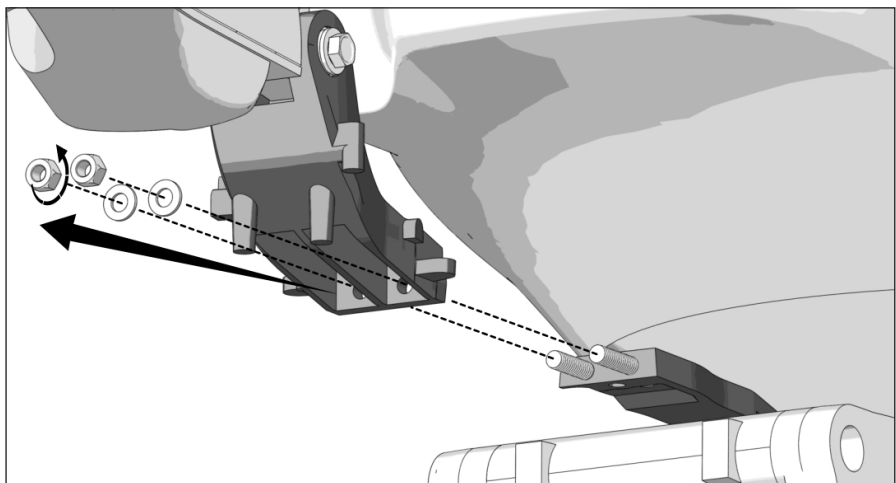
#### NOTICE

The screws must be replaced by those included in the kit.



#### YAMAHA

- 1 Remove the tiller handle from the engine arm, taking care of keeping the extracted nuts and washers. Check their conditions together with the ring preventing the nut lock. Replace any even slightly damaged components (in this case, contact the technical service). Proceed with assembling the device following what is reported in paragraph 3.4 and 3.5.



### 3.9 Wiring



Proceed with replacing the cables (shift and throttle) and with connecting the tiller handle to the engine controls (throttle, shift, ignition, etc.) following the instructions supplied by engine manufacturer.

#### ⚠ WARNING

After the installation of the ZTF system in Suzuki engines, the electric wiring could be no more suitable. In this case, contact Suzuki for a new electric wiring.



## 4 MAINTENANCE

### 4.1 Ordinary maintenance

Proper maintenance is a key factor for a greater durability of the ZTF system in the best operating and performance conditions and functionally ensures safety over time. It is recommended that well experienced and trained marine technicians carry out maintenance operations. Regular inspections and proper care of the ZTF Tiller System is recommended for safe use and proper performance. The personnel must be provided with PPE (Personal Protective Equipment), which is commonly used for similar operations, and follow the safety procedures specified below.

#### WARNING

Main cautions to be assumed while carrying out maintenance interventions on the ZTF system are:

- Do not wear rings, chains, bracelets, etc.
- Always use PPE (gloves).
- Do not use open flames for cleaning.
- Do not smoke

#### WARNING

Before using, or at the beginning of the season:

- with the engine turned off, test the good working of the ZTF system, trying to move the outboard engine acting on the motor hood and checking that it is fixed in position;
- check the correct functioning of the cylinder on the shaft and, in case of necessity, purge the system;
- check that the hoses are not twisted or damaged;
- check that nuts and bolts are in good conditions and properly tightened.

#### Technical Service

For any information or for assistance with unusual applications, please contact our Technical Service (See paragraph "Informative letter").

### 4.2 ZTF system filling and purging

The ZTF system is already supplied oil-filled and purged, ready to be used. Therefore, no periodical oil topping up is required.

The following filling and purging procedure must be carried out only after having repaired a fault, e.g. in case of hose breaking or replacement of the cylinder gaskets. This kind of events entails oil leakage from the system and, consequently, refilling is required.

Fault situations must be examined on case-by-case basis.

The purging procedure of the ZTF system requires the use of Ultraflex Bubble Buster, which is not provided in this kit.

#### NECESSARY TOOLS



Open end wrench  
16mm



Allen wrench  
4mm



### NOTICE

In order to proceed with the system filling and purging, an hydraulic oil (Ultraflex OL150 or compatible ones) is recommended, as indicated in the use and maintenance manual of UC128 cylinder.

Before connecting the Bubble Buster to the system, read its manual in order to identify its related parts.

### NOTICE

The purging procedure must be carried out once the ZTF system has been already previously connected to the on the outboard engine.

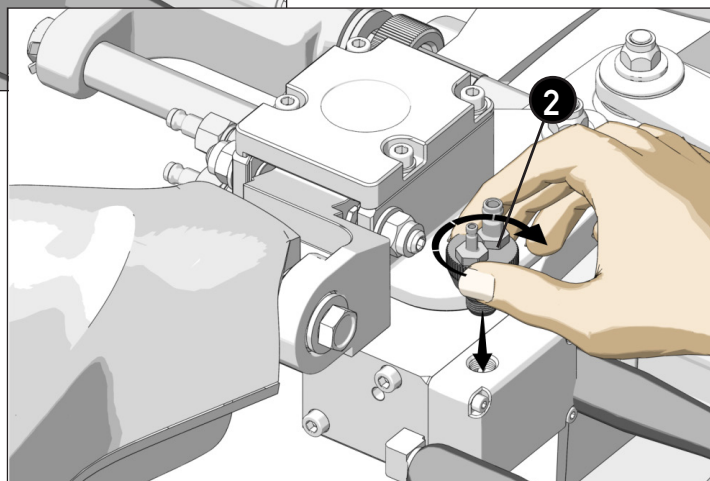
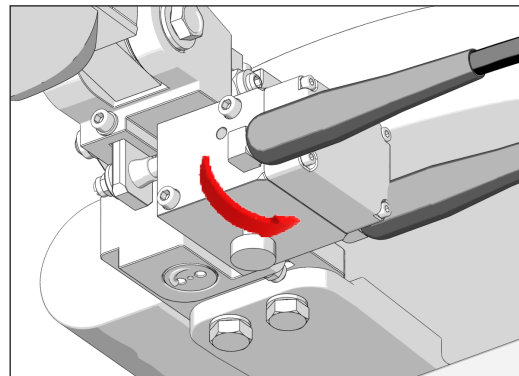
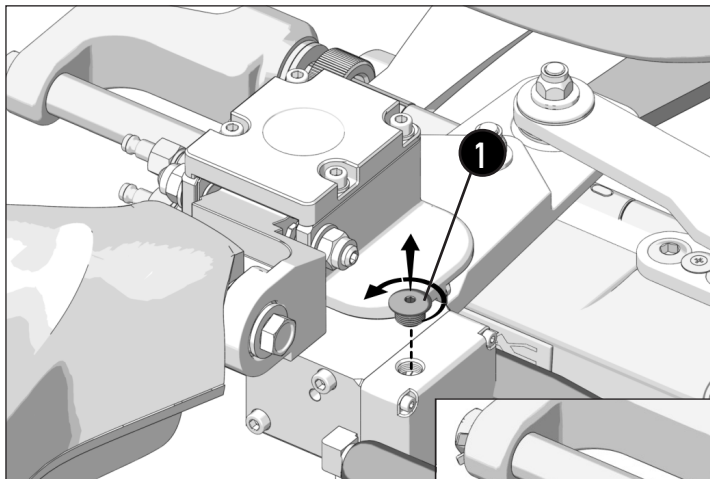
Follow the steps below:

- 4.2.1 Connecting the Bubble Buster to the system;
- 4.2.2 Filling and purging operation;
- 4.2.3 Disconnecting the Bubble Buster;
- 4.2.4 Check the ZTF system functioning.

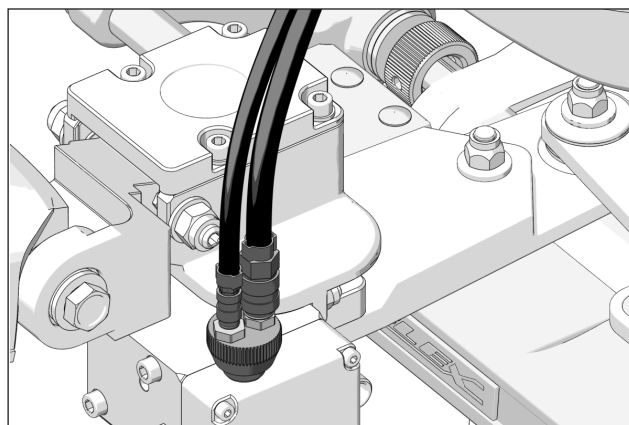
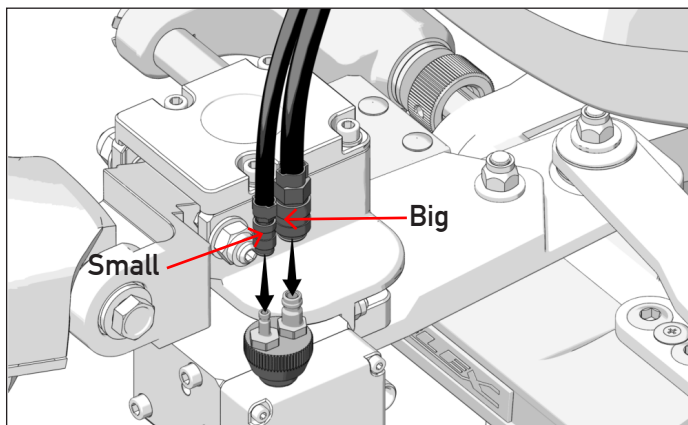
## 4.2.1 Connecting the Bubble Buster to the system

Proceed as follows (if necessary, please refer to the Bubble Buster instructions):

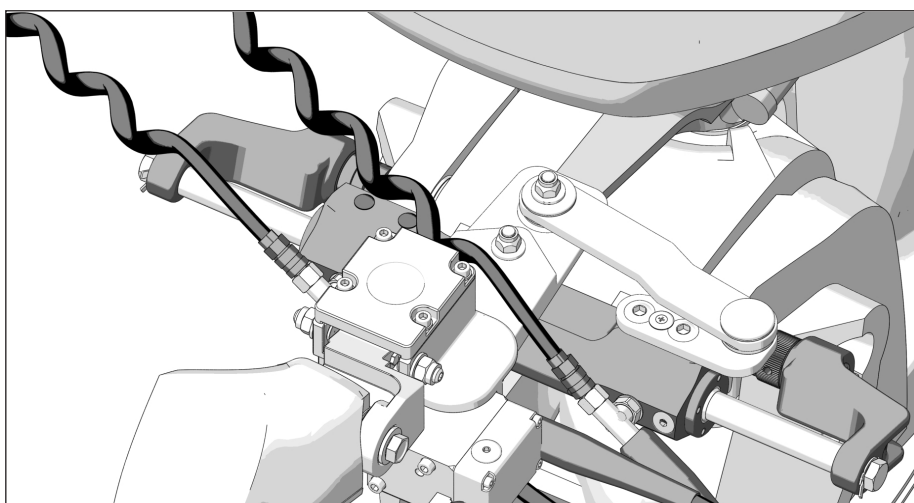
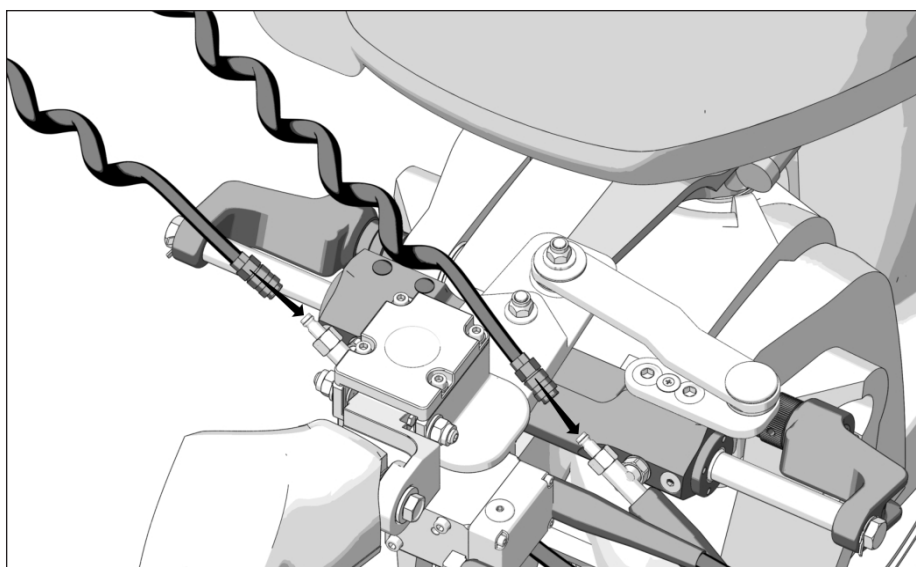
1. After having assembled the system on the outboard engine, loosen the by-pass knob in order to set the system in by-pass mode (see page 8). Remove cap (1) with a 4 mm Allen wrench and keep it until operations end.
2. Manually tighten the filling fitting (2) of the Bubble Buster provided with quick couplings .



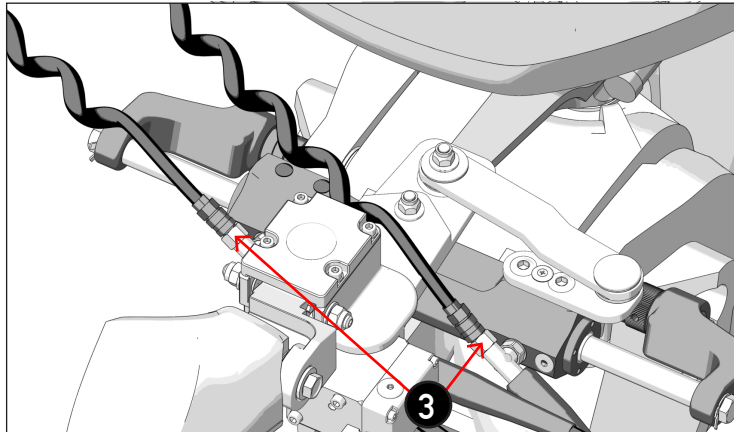
3. Connect the pair of transparent hoses to the Bubble Buster fitting. Such hoses are provided with a small and a big fast connect fittings at their end.



4. Connect the other pair of transparent hoses to the cylinder purge valves. Such hoses have the same dimension and are provided with fast connect fittings at their end.



- Loosen the release nuts (3) for enabling the oil to pass through. Do not unscrew more than one turn and a half. Use a 16 mm wrench.



- Connect the battery clamps: the red clip to the positive terminal and the black one to the negative terminal.

### ⚠ CAUTION

Only 12 Vdc power supplies are allowed.

## 4.2.2 Filling and purging operation



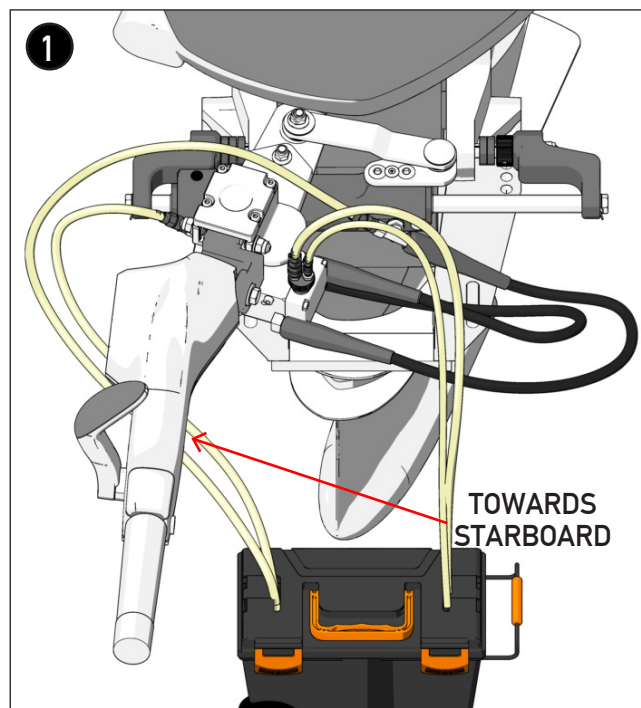
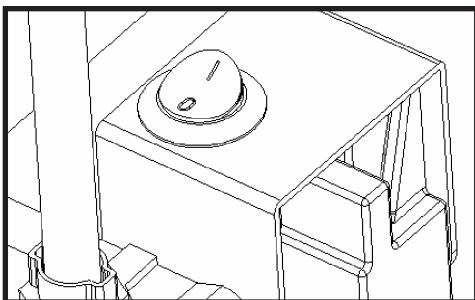
Proceed as follows:

- Move the cylinder towards the end of stroke on the starboard side (see picture 1) by steering the tiller handle in the same way as during navigation.

### NOTICE

The by-pass knob must be fully loosened (system in by-pass mode).

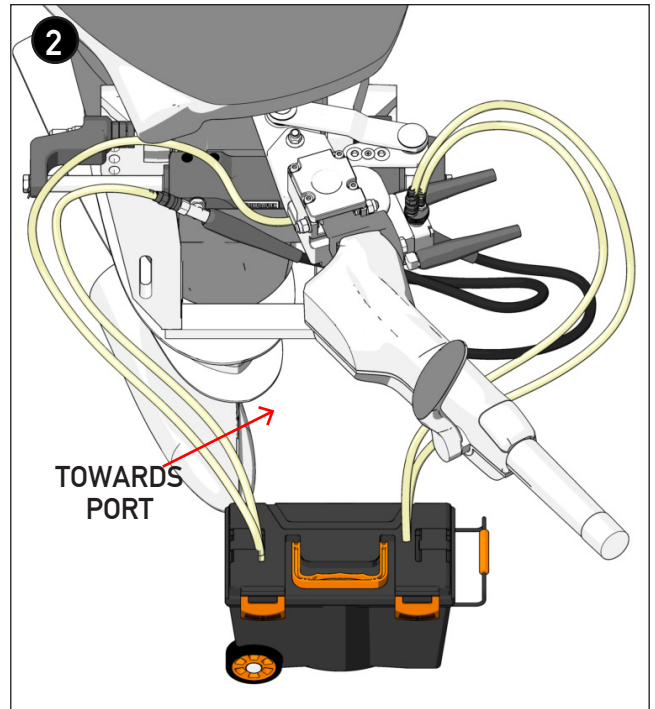
- Start the Bubble Buster by pressing the switch shown below.



- The oil will start circulating into the system and, from the two transparent hoses connected to the cylinder, oil together with air will start flowing.
- Without moving the tiller handle and, therefore, the cylinder, wait for a couple of minutes until the transparent hoses show only oil with very few air bubbles.
- Move the cylinder slowly towards the opposite side (port, see picture 2), by always acting on the tiller handle.



6. Once on the port side, leave the cylinder in this position and wait again for a few minutes.
7. Slowly move the cylinder with the tiller handle. Repeat the steering movement from starboard to port and the opposite at least 3 times.
8. With the cylinder placed at the end stroke (port), push the handle again towards port: the cylinder cannot move, since it is at the end stroke. This push on the handle will further expel air bubbles (keep pushing for 10 seconds).
9. Move the cylinder slowly towards starboard and repeat the previous operation.
10. Tighten the by-pass knob: the system will be in by-pass off mode, neutralizing the propeller torque effect on the throttle knob.
11. Move the cylinder slowly using the tiller handle and repeat the steering movement from starboard to port and the opposite at least 3 times.
12. At this stage, the system will be oil-filled and purged: looking at the transparent hoses of the Bubble Buster, no air bubbles should be visible. If they are still visible, repeat the whole purging procedure again.



### ⚠ CAUTION

It is recommended to start the purging operation with the cylinder at the end of stroke.

## 4.2.3 Disconnecting the Bubble Buster

Proceed as follows:

1. Tighten the release nuts using a 16 mm wrench and a torque of 20 Nm (15 lb.-ft.).
2. Turn the Bubble Buster off by pressing the suitable switch.
3. Disconnect the 4 transparent hoses of the Bubble Buster, two from the cylinder and two from the pump fitting.
4. Unscrew the pump fitting and screw immediately the cap with a 2 Nm torque using a 4 mm Allen wrench.

## 4.2.4 Check the ZTF system functioning

Before using the purged ZTF system during navigation, check carefully its functioning.

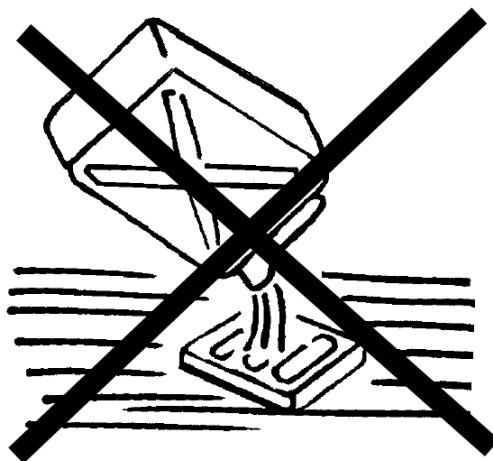
1. Move the cylinder along the whole stroke, making sure that there are no malfunctions or interferences.
2. With the outboard engine in central position, push and pull the engine by acting on the motor hood: if the system has been properly purged, the engine will not move.
3. By slightly pushing the motor hood towards starboard and, at the same time, pushing the engine towards port by acting on the motor hood, the engine must not rotate towards port.
4. Repeat the previous check by inverting the movement directions.

## 5 DISMANTLING

### 5.1 Dismantling

When for any reason, the ZTF system is put out of service, it is necessary to follow some rules in order to respect the environment.

Sheaths, pipelines, plastic or non-metallic components must be disassembled and disposed of separately.



## NOTES

[illegible]

## NOTES

[illegible]

## NOTES

[illegible]

