Installation and Maintenance Manual

HYDRAULIC CYLINDER FOR OUTBOARD ENGINES

UC 94-OBF

CE

UFLEX

NMMA

UCINA PARTNER

MEMBER ABYC Setting Standards for Safer Boating®

Member of CISQ Federation RINA ISO 9001:2000 Certified Quality System

Member of CISQ Federation RINA ISO 14001 Certified Environmental System

(Dr. No 22930/d 28/02/2008)

Dear Customer,

We would like to thank you for choosing an **ULTRAFLEX** SpA product.

ULTRAFLEX SpA has been a leader in steering systems for pleasure and professional boats for many years.

All **ULTRAFLEX** SpA products are designed and manufactured to ensure the best performance.
To ensure your safety and to maintain a high quality level, **ULTRAFLEX** SpA products are guaranteed only if they are used with original spare parts (see attached document "Application Spare Parts").

ULTRAFLEX SpA and Quality Management System is certified CISQ-IQNet by the Italian Shipping Registry (RINA), in conformity with the UNI EN ISO 9001:2000 rule. **ULTRAFLEX** SpA certification No. 6669/02/S (former 420/96).

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 the 94/25/CE, ISO 10592 and ABYC (American Boat and Yacht Council) requirements.

"Established in 1989 **UFLEX** USA is a leader in steering and control systems for the marine industry. With full manufacturing capabilities in Sarasota, Florida, **UFLEX** USA can support all sectors of the marine industry regardless of volume and/or product requirements. And, as an affliate of the **ULTRAFLEX** Group, **UFLEX** USA has tremendous resources to draw upon for new product development in hydraulics, electronics and many other technologies.

Innovative product design and unparalleled dedication to quality customer service and products continue to be cornerstone of **UFLEX** USA's growth. Today our products can be found as originally installed equipment on many of the most widely known and respected boat brands in the world.
Aftermarket parts can be sourced from trained and experienced distributor network troughout North and South America.

Our dedication to providing the highest quality products and service is only matched by our commitment to developing new products employing the lastest materials and technology to enhance our customer's boating experience. From steering wheels to sophisticated electronic controls, **UFLEX** USA has everything you need to make sure that your boat looks and perform it's best for many, many years."

TABLE OF CONTENTS

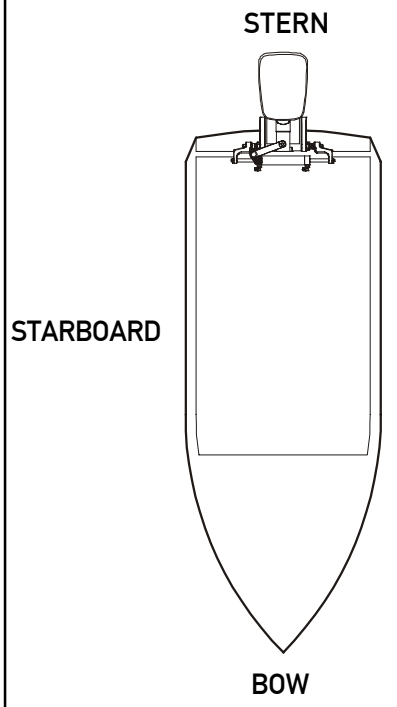
IMPORTANT:
The additional documents "Application Guide" and "Spare Parts List" are attached to this manual.

MANUAL USE AND SYMBOLS USED

THE INSTALLATION AND MAINTENANCE MANUAL is the document accompanying the product from its sale to its replacement and discharge. The manual is an important part of the product itself.
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	Hazards or unsafe practices which COULD CAUSE severe personal injury or death.
⚠ CAUTION	Hazards or unsafe practices which COULD CAUSE minor injury or product or property damage.
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 contained in this manual.

INTRODUCTION

This installation and maintenance manual represents an important part of the product and must be available to the people in charge of its use and maintenance.
The user must know the content of this manual.
UFLEX USA declines all responsibility for possible mistakes in this manual due to printing errors.
Apart from the essential features of the described product, **UFLEX** USA reserves the right to make those modifications, such as descriptions, details and illustrations, that are considered to be suitable for its improvement, or for design or sales requirements, at any moment and without being obliged to update this publication.

Great care has been taken in collecting and checking the documentation contained in this manual to make it as complete and comprehensible as possible. Nothing contained 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 contained 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 Assistance Service.

TECHNICAL ASSISTANCE SERVICE

North - South - Central America:
UFLEX USA
6442 Parkland Drive
Sarasota, FL 34243
Tel: +1.941.351.2628
Fax: +1.941.360.9171
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Email: ut@uflexgroup.it
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WARRANTY

1. **Two Year Limited Warranty. UFLEX** USA, Inc. warrants that all products manufactured by **UFLEX** USA, Inc. or **ULTRAFLEX** S.p.A. and sold by **UFLEX** USA to the retail purchaser ("Purchaser") that for two (2) years after the date of manufacture to be free from defects due to material or workmanship, subject to the exclusions below. Improper installation AVOIDS this warranty. Installation should only be attempeted by a trained and qualified technician.

2. **Exclusions.** This limited warranty does not cover and does not extend to any of the following:
   (a) Failure caused by normal wear and tear, climatic conditions, misure, neglect, lack of proper maintenance, accident, fire or other casualty damage, racing, overloading, negligence, modification, beaching or grounding of vessel, collision, impact, towing, acts of war or hostilities;
   (b) components not manufactured by **UFLEX** USA, Inc., or its affiliates;
   (c) cost of removal or reinstallation of any component (including components manufactured by **UFLEX** USA, Inc.) or disassembly or reassembly of the unit containing the component;
   (d) components not manufactured by **UFLEX** USA, Inc. or **ULTRAFLEX** S.p.A., whether or not warranted by the other manufacturer;
   (e) any product which has not been properly installed.

3. **Limitations.** THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS SHALL BE PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND **UFLEX** USA, INC.'S SOLE AND EXCLUSIVE LIABILITY UNDER THIS WARRANTY. LABOR FOR REPLACEMENT IS NOT INCLUDED. **UFLEX** USA, Inc.'s obligation under this warranty is limited to the repair or replacement (at **UFLEX** USA, Inc.'s sole election) of any covered item found to be defective, when delivered by Purchaser pursuant to written authorization and instructions from **UFLEX** USA, Inc., shipping prepaid to **UFLEX** USA, Inc.'s plant or other designated repair facility. Repaired or replaced items are warranted as provided herein for the unexpired portion of the applicable warranty period. THIS WARRANTY, AND THE RIGHTS AND REMEDIES UNDER IT, IS EXCLUSIVE AND IS GIVEN IN PLACE OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WHETHER ARISING BY LAW, CUSTOM, CONDUCT OR USAGE OF TRADE, PURCHASER'S REMEDIES SHALL BE LIMITED AS STATED HEREIN AND **UFLEX** USA, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES OR LOSSES RESULTING FROM DEFECTS. THE RETAIL SELLER IS NOT A CO-WARRANTOR AND IS NOT AUTHORIZED BY **UFLEX** USA, INC. TO AMEND OR MODIFY THIS LIMITED WARRANTY IN ANY MANNER.

4. **Transferability of Warranty.** This limited warranty may not be transferred to subsequent purchasers.

5. **Miscellaneous. UFLEX** USA, Inc. is an affiliate of **ULTRAFLEX** S.p.A. **UFLEX**, USA, Inc., reserves the right to make changes in the design and construction of its products at any time, without notice and without any obligation to incorporate such changes into products of prior manufacture. This limited warranty applies to new components sold by **UFLEX** USA, Inc.. This limited warranty contains the entire agreements between **UFLEX** USA, Inc. and Purchaser and suspersedes all prior agreements, discussions, negotiations, commitments and representations, whether oral or written, between them regarding **UFLEX** USA, Inc's warranty. If any provision of this limited warranty, or the application of it, is determined to be invalid of unenforceable for any reason, the remainder of this limited warranty and the application of it shall not be affected.

6. **Ultron 3000 and PowerC.** The Ultron 3000 and "PowerC - User and Installation Manual" describes activities, operations, technical specifications which must be followed during the installation and/or usage of the product, in order to keep a valid warranty. Descriptions and drawings in that manual are suitable to allow installation and use of the product to skilled persons. In case of doubt and/or for any information, please contact our Technical Service.

All communications and notices from Purchaser regarding this limited warranty should be sent to: **UFLEX** USA, INC., 6442 Parkland Drive, Sarasota, FL 34243; (941) 351-2628.

Return policy

Any product that is presumed defective should be reported to **UFLEX** USA within 48 hours of receipt or discovery in the field. Upon notification **UFLEX** USA will attempt to troubleshoot the problem with our customer over the phone. If we are unable to resolve the problem **UFLEX** will issue a Return Goods Authorization number and we require that the product in question be returned to **UFLEX** with all its parts in its original packaging. The product should be returned freight prepaid to:

UFLEX USA
RGA Department - RGA #
6442 Parkland Drive
Sarasota, Florida 34243

Upon receipt **UFLEX** will examine the product to determine the cause of the defect. If the product is determined to have a defect in workmanship or material, it will be repaired at our discretion.

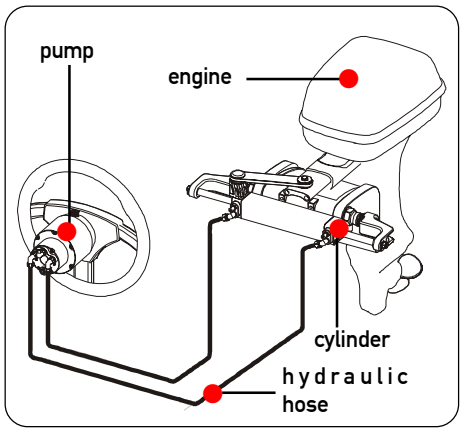
Our warranty does not cover labor, towing or other expenses. Further, it does not cover products that have been improperly installed, damaged in installation, misapplied, or misused.

Our products are not intended for use in racing applications.

1 PRODUCT DESCRIPTION

1.1 Hydraulic steering system operation

All **UFLEX** hydraulic steering systems are designed in conformity with UNI-EN-ISO 10592 and A.B.Y.C. P21 regulations. All **UFLEX** steering systems can operate at temperatures between -20°C (+22°F) and +60°C (+166°F). All the components are made for the marine environment, using materials and working processes which offer long life and safety under the most extreme conditions. A hydraulic steering system consists of a steering pump, a cylinder tied to the rudder or to the outboard or sterndrive engine and the connecting hoses (see picture). Under normal operating conditions, a turn of the steering wheel will pump the oil, which flows in through the hoses to the cylinder, according to the turn direction. With the consequent cylinder movement the oil will flow to the pump through the hoses and at the same time moves the engine or the helm which are connected to the cylinder. The pumps are equipped with a valve, which prevents outgoing fluid from returning along the same hose. It also allows the operation of the steering systems with two or more steering stations. The cylinders are double acting and may be balanced or unbalanced. In the unbalanced cylinders the two chambers have different volumes and so they need a different number of turns of the steering wheel and a different rotation effort. The balanced cylinders have same number of steering wheel turns in order to move the helm from the center to the end stroke in the two opposite directions. A well balanced steering system needs a correct choice of the pump for the cylinder. **UFLEX** produces different pump models, which have different capacity (cm^3 of oil moved each steering wheel turn) and for each type of installation. While choosing the pump it is important to consider the cylinder volume. The number of starboard and port turns is determined by the ratio between the cylinder volume and the pump capacity.



Example: if the pump has a capacity of 20 cm^3 [1,2cu.in.] and the cylinder has a volume of 94cm^3 [5,7cu.in.], the formula looks like this: 94/20=4,7. Accordingly, the steering wheel will turn 4 times and an half before the cylinder will completely turn from one side to the other. In case of installations with double cylinders connected in parallel the cylinder volume must be added. Applications with less than 4 turns are not recommended, as they need a higher effort, also applications with more than 8 turns are also not recommended, as the response of the boat to steer is slowly. The maximum operating pressure is 7,0MPa (70 bar) (1000 PSI).

1.2 Warnings for the product correct use

⚠ WARNING

Before beginning the installation, check the mounting compatibility of the UC94-OBF cylinder to the engine by consulting the attachted document "Application Guide" contained in the packaging.

⚠ DANGER

Do not modify the steering cylinder in any way to fit it to your engine application, otherwise the cylinder will no longer operate in safety and it will endanger the boat and the occupants.

⚠ WARNING

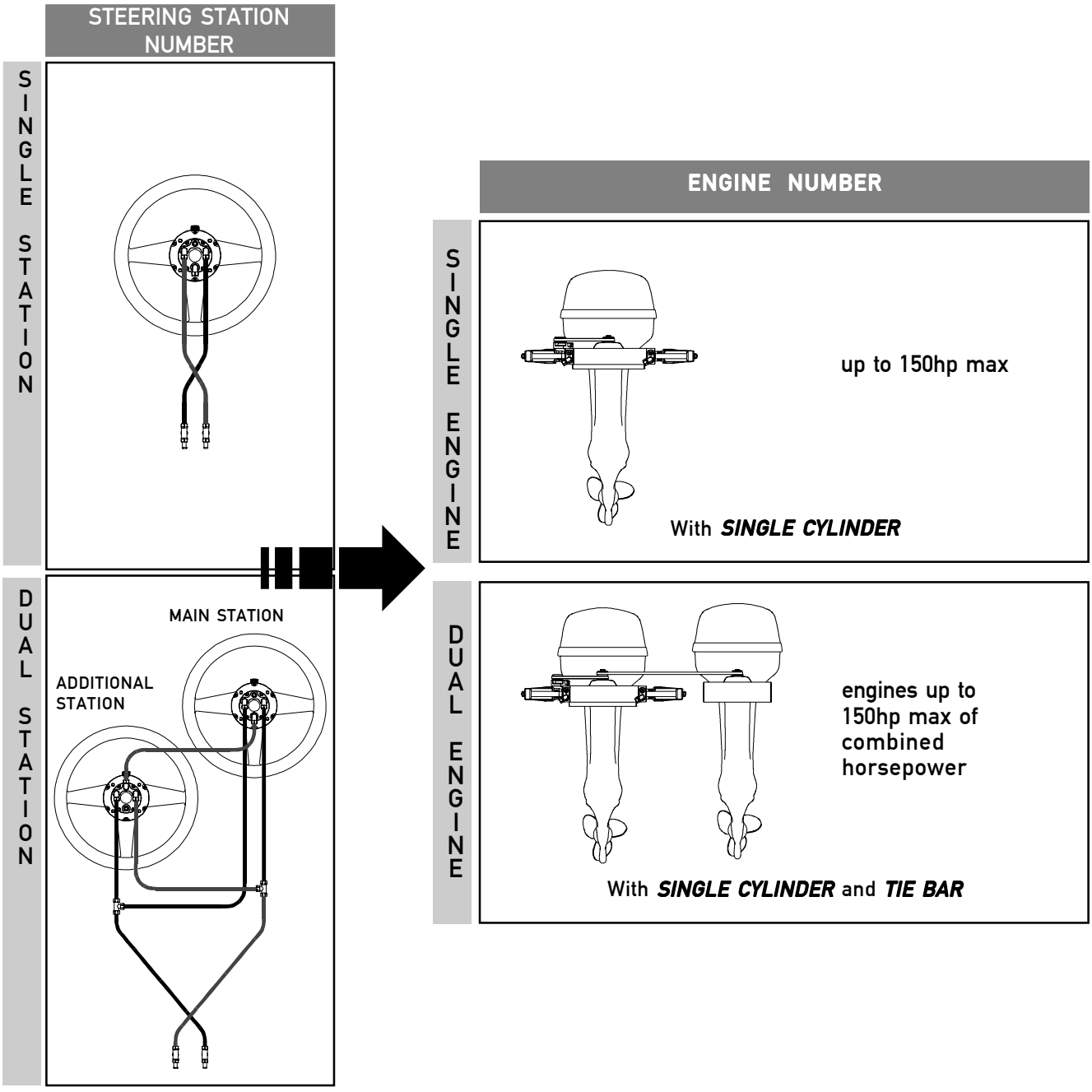
All **UFLEX** steering systems must not be installed on boats equipped with engines whose maximum horsepower is higher than the horsepower rating approved by boat manufacturer.

⚠ WARNING

The UC94-OBF front mount cylinder must not be installed on race boats.

1.3 Configurations

The hydraulic cylinder for outboard engine UC94-OBF model can be installed on boats a single engine used with a single or dual steering system.



⚠ DANGER

Dual engine installations require the use of a tie bar.

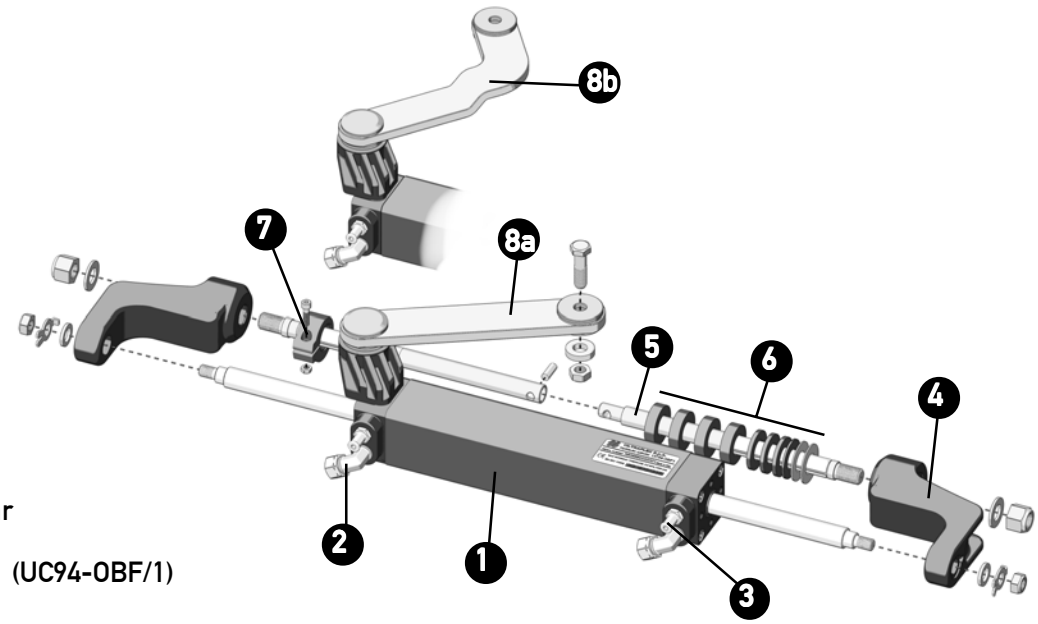
⚠ CAUTION

In case of double engine applications with a total horsepower which exceeds 150hp, it is necessary to assemble the **Ultraflex** UC 128-OBF cylinder.

1.4 UC94-OBF cylinder description

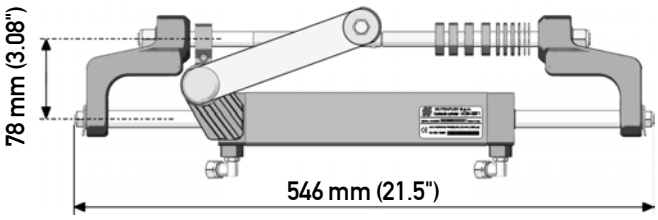
UC94-OBF is a hydraulic outboard front mount cylinder which has been designed and manufactured to be used as a component in the hydraulic steering systems, as described in the previous paragraph.
The cylinder is installed to the tilt tube rod of the available engines on the market as shown in the attached document "Application guide". It is possible to meet all the different cylinder applications due to the two different link arms and a proper spacer kit. The following picture shows the main cylinder components:

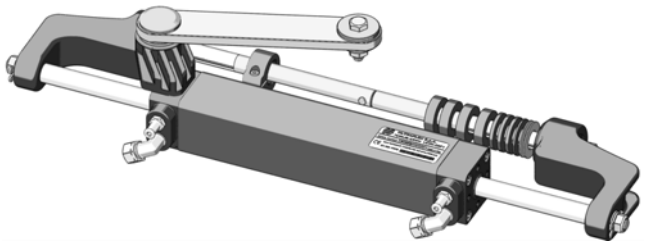
1. Cylinder body
2. Fittings
3. Bleed valves
4. Bull horns
5. Tilt tube rod
6. Spacers
7. Adjustment collar
8a. Straight link arm (UC94-OBF/1)
8b. Curved link arm (UC94-OBF/3)



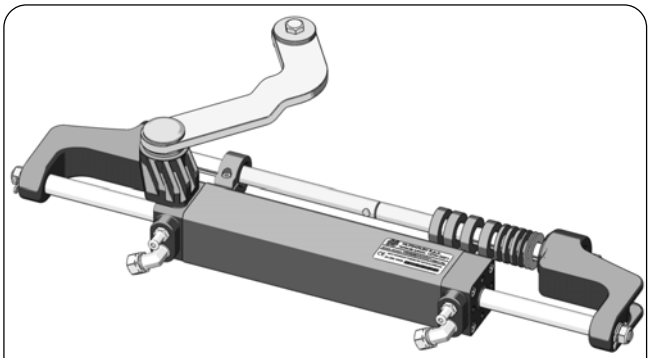
1.5 Technical features

SPECIFICATIONS	UC94-OBF/1 -/3
Volume	94 cc - 5.7 cu. in
Outout force	278 kg - 613 lbs
Inside diameter	30 mm - 1.18"
Stroke	186 mm - 7.3"
Oil	in compliance with ISO VG 15





UC94-OBF/1



UC94-OBF/3

2 TRANSPORT

2.1 General warnings

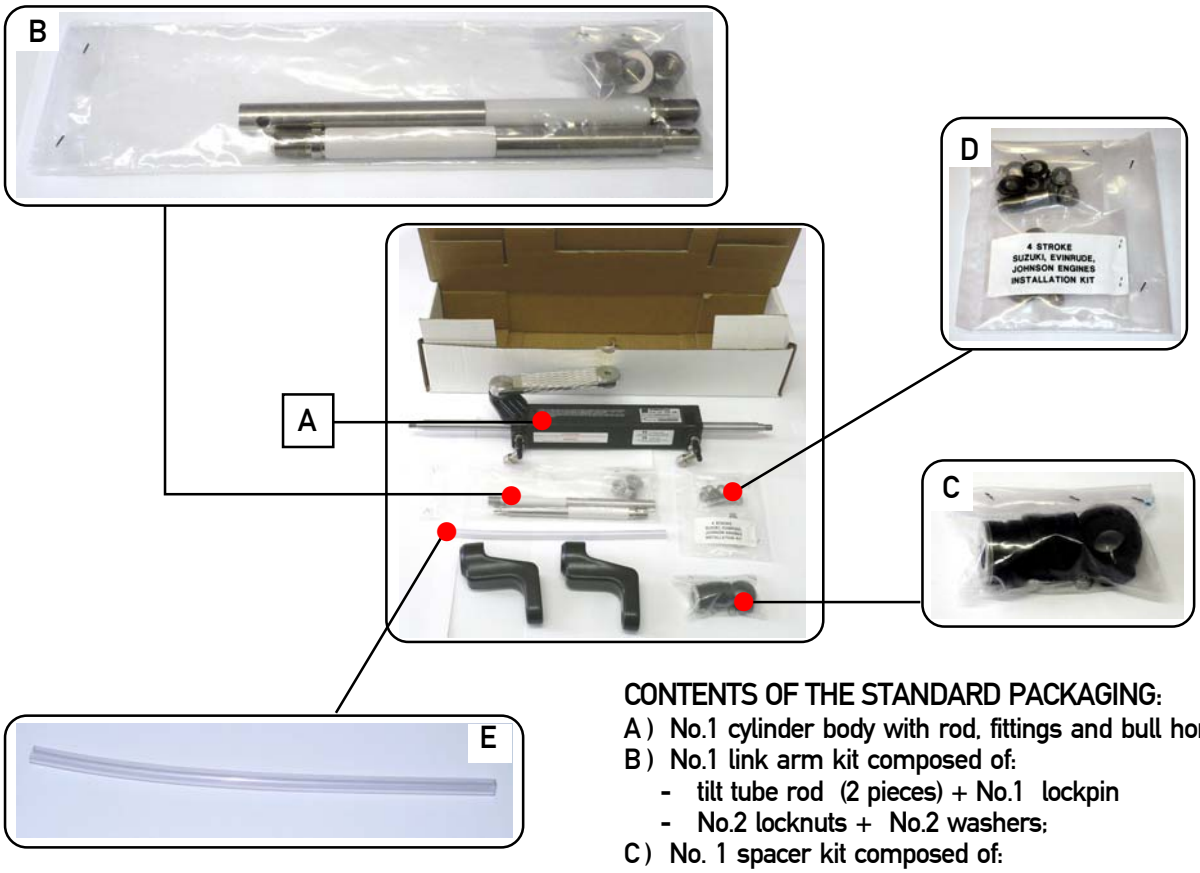
The product weight with its packaging is 8kg (18 pounds) and so it can be handled manually.

⚠ 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 transport.
Also make sure that all the standard components are in the packaging (see list). In case of damage, notify the claim to the forwarder and inform the supplier.



CONTENTS OF THE STANDARD PACKAGING:

A) No.1 cylinder body with rod, fittings and bull horns;
B) No.1 link arm kit composed of:
- tilt tube rod (2 pieces) + No.1 lockpin
- No.2 locknuts + No.2 washers;

C) No. 1 spacer kit composed of:
- No.8 plastic spacers;
- No.2 steel spacers;
- No.1 ring nut for adjustement collar;

D) No.1 kit composed of:
- No.3 locknuts + No.2 washers;
- No.2 lock washers;
- No.1bolt;
- No.1 kit for Suzuki, Evinrude and Johnson engines;

E) No.1 plastic hose for the hydraulic circuit bleeding;

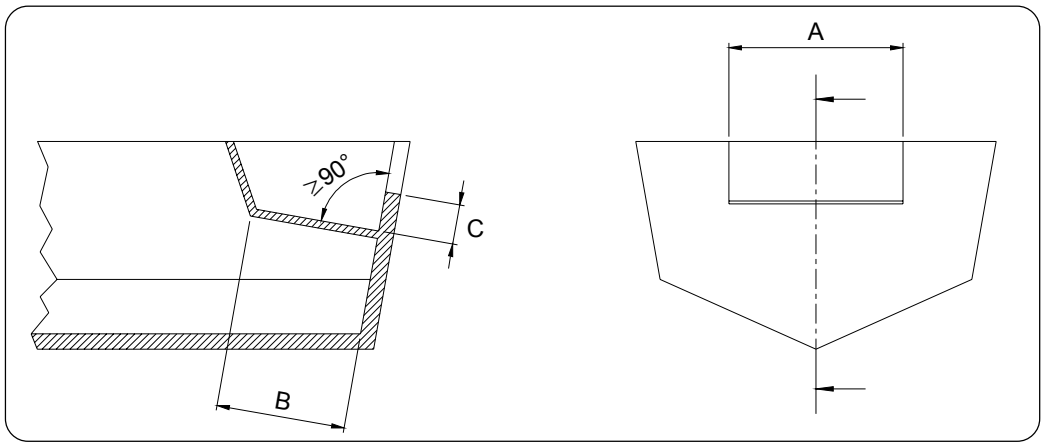
⚠ CAUTION

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

3 INSTALLATION

3.1 Minimum transom requirements

The following picture shows the minimum splash well dimensions. These dimensions must be respected in order to prevent the cylinder from being damaged when the outboard engine is completely tilted upwards. The picture shows also the minimum transom dimensions, needed for the installation and the correct operation of the engine steering cylinder.



MINIMUM SPLASH WELL DIMENSION REQUIREMENTS			
Engine No.	A	B	C
1	560 mm - 21.25"	152 mm - 5.98"	152 mm - 5.98"
2	1110 mm - 43.70"	152 mm - 5.98"	152 mm - 5.98"

⚠ WARNING

ENGINE JACK PLATE APPLICATION TO THE TRANSOM.
A jack plate installation will change all the application clearances. A new clearance check must be completed with the tilting of the engine in conjunction with the vertical movement of the jack plate in all the possible positions. If the steering cylinder comes into contact with the splash well, transom and/or jack plate, **stop the installation immediately!** Use the jack plate manufacturer's instructions to limit the upper or lower direction in which the interference occurs. If this is not possible please contact specialized staff.

3.2 Necessary tools


Allen wrench 4 mm [5/32"]


Open end wrench 19mm [3/4"]


Open end wrench 14mm [9/16"]


Pliers

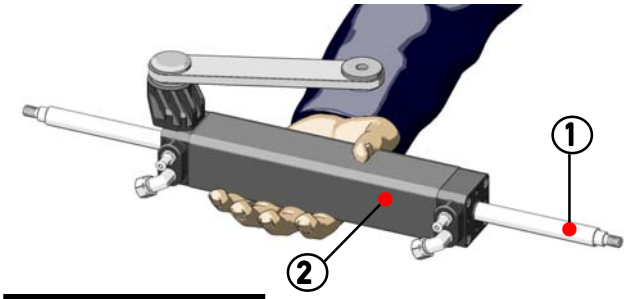

Torque wrench

⚠ CAUTION

During installation use only stainless steel tools to prevent the corrosion of the metal parts.

3.3 Cylinder installation

1 After removing the protective caps of the fittings, manually center the rod (1) on the cylinder body (2).

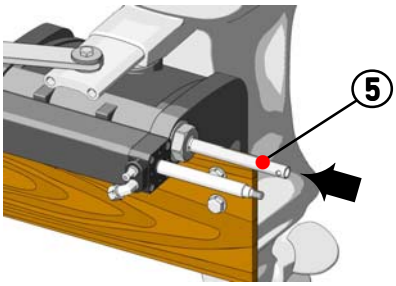


⚠ CAUTION

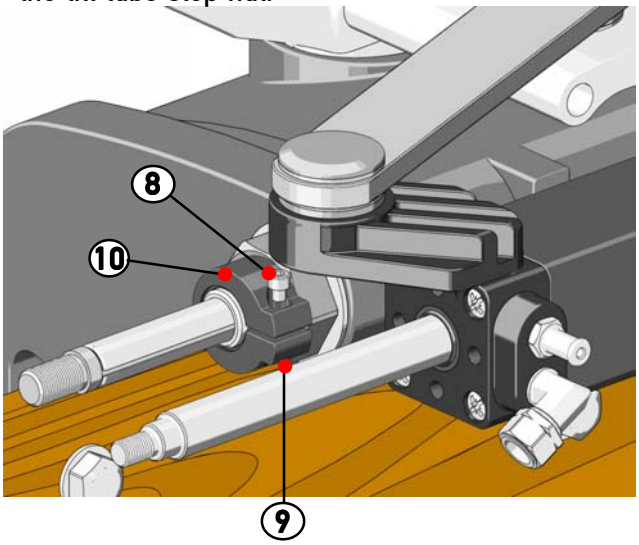
During this phase an oil leak from the fittings can occur. This oil must not be discharged into the sea in any case.

4 Grease the two parts of which the tilt tube rod is made up (5) and (6), by using marine grease to prevent the corrosion of the metal parts.

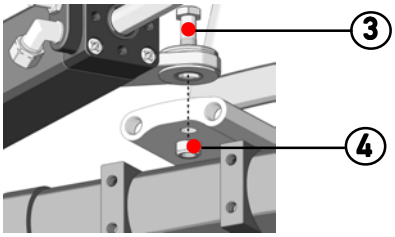
5 Insert the first part of the tilt tube rod (5) into the tilt tube.



7 Position the bolt (8) and the nut (9) on the adjustment collar (10) and screw it to the right side of the tilt tube until it comes into contact with the tilt tube stop nut.



2 Position the engine straight so that its arm is perpendicular to the transom.

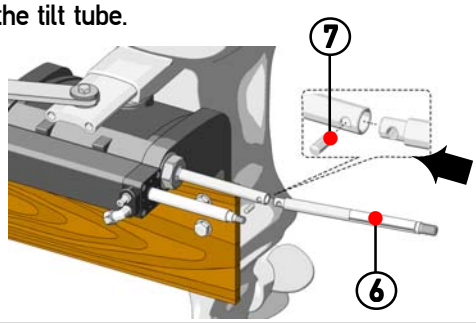


3 With reference to the application instructions contained in the Application Guide, connect the link arm to the tiller arm by means of the screw (3), and tighten it with a torque of 40[Nm] (29,5 [lb·ft]). Thread on the locknut (4) and tighten it with a torque of 25[Nm] (18,5 [lb·ft]). After tightening the locknut (4), check for the right torque 40[Nm] (29,5 [lb·ft]) of the screw (3).

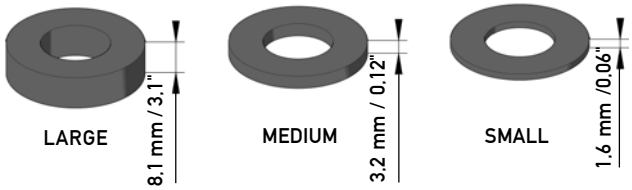
⚠ WARNING

It is important to check periodically, at least every 3 months (or every month for professional uses), the right torque of this screw (3) and of the locknut (4).

6 Insert the secord part of the tilt tube rob (6) by locking it by means of the pin (7), then holding the pin with your hand continue to insert the tilt tube rod into the tilt tube.



8 With reference to the' "Application Guide" choose the spacers for the tilt tube rod.



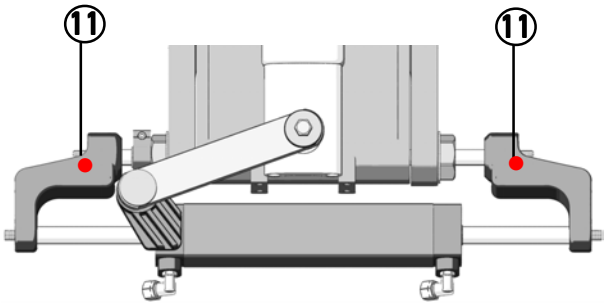
⚠ WARNING

If the engine is mentioned in the "Application Guide" continue the installation following point 12. If the engine used is not present in the reference table choose the correct spacers and follow the instructions of points 9-10-11.

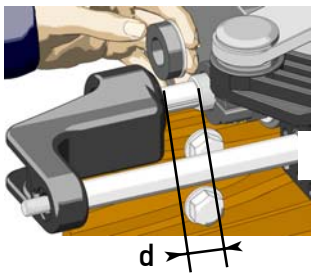
NOTICE

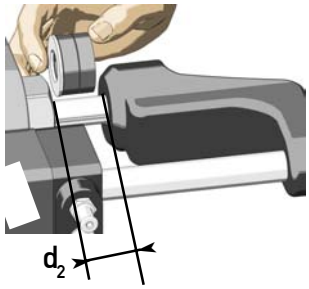
In this phase ensure that the cylinder body is centered on the rod and that the engine is perpendicular to the transom.

9 Insert the right and left bull horns (11) by connecting the rod and the tilt tube rod as shown in the picture.



10 Choose the spacers to fill the gap between ring nut and bullhorn d and d_2 between tilt tube and bullhorn and considering the thickness of the stainless washer.





⚠ WARNING

Always leave a minimum clearance between spacers and bullhorn in order to allow the rod tilting in the tilt tube.

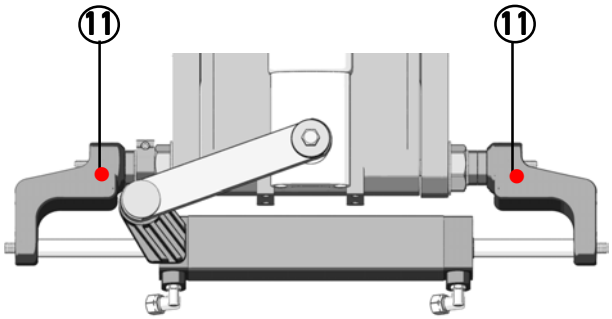
11 Once the correct spacers have been chosen, remove the bull horns.

12 Insert the plastic and stainless steel spacers and the two stainless washer on the tilt tube rod.

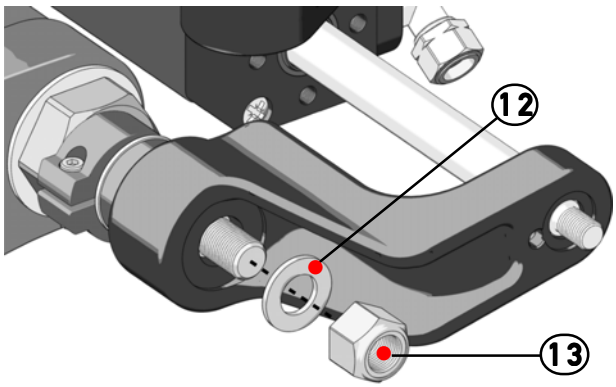
NOTICE

Both the stainless steel spacers must be positioned towards the tilt tube on the opposite side of the bull horns to avoid their wear during engine lifting and lowering.

13 Insert the right and left bull horns (11) by connecting rod and tilt tube rod as shown in the picture.



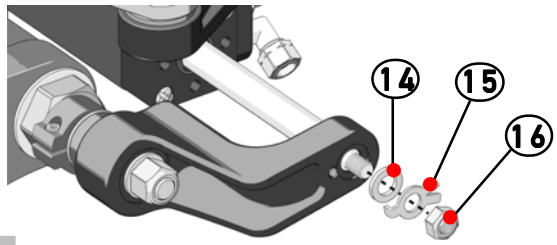
14 Insert the washers (12) on the two ends of the tilt tube rod and tighten the nuts (13), with a torque of 70[Nm] (52[lb·ft]). after greasing them with marine grease.



15 Position thewashers (14) and the lock screw (15) and tighten the bolt with a torque of 30[Nm] (22 [lb·ft])

NOTICE

The lock washer tabs must be bent afterwards (see point 22).

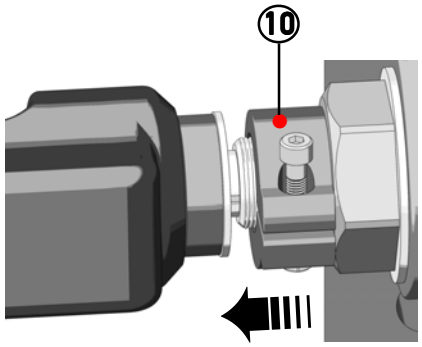


16 Check the correct tilting of the engine.

⚠ WARNING

If while tilting the engine is blocked, reduce the overall dimensions of the spacers.

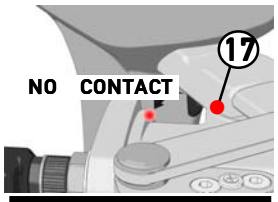
17 Unscrew the adjustment collar (10) and bring it into contact with the stainless washer, until the clearance is eliminated.



18 Check the correct cylinder installation by moving manually the engine on the right and on the left.

NOTICE

The rotation must be as symmetric as possible so that the steering angle is the same on both sides.



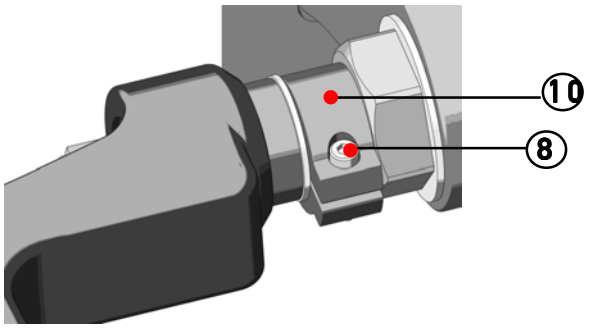
⚠ WARNING

The engine must stop through the cylinder end stroke without coming into contact with the mechanical stop (17) on the engine.

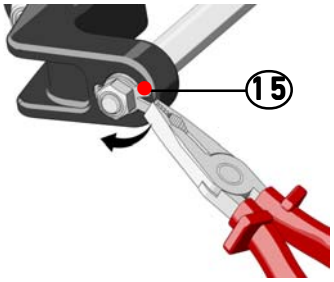
NOTICE

Otherwise it is necessary to modify the installation, by changing the thickness of the spacers and by repeating the procedure from point 13.

19 Tighten the set screw (8) on the adjustment collar (10) with a torque of 3[Nm] (2 [lb·ft]).



20 Bend the tabs of the lock washers (15) bringing them into contact with the screw head and taking care not to damage the bull horns while using the pliers.



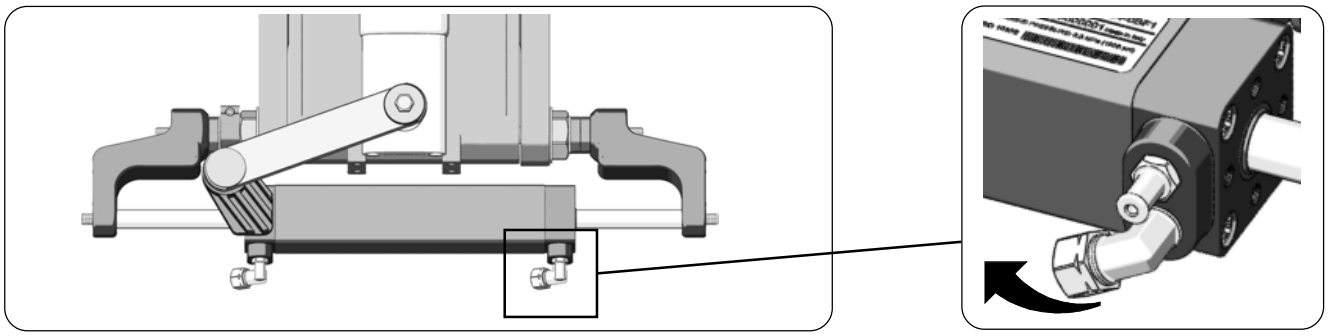
21 Check again the correct engine movement both during the right/left rotation and during the tilting.

⚠ WARNING

In this phase clearance should be enough to avoid frictions but it should not be excessive since it could cause engine instability. In case of contact with the transom, stop the installation and contact the specialized staff.

3.4 Hose installation

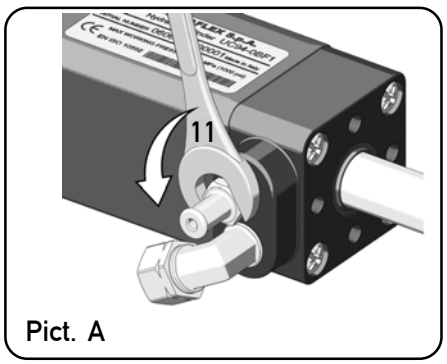
The two fittings mounted on the cylinder body are already oriented and are ready to be used. If for practical reasons the orientation must be changed, do as follows:



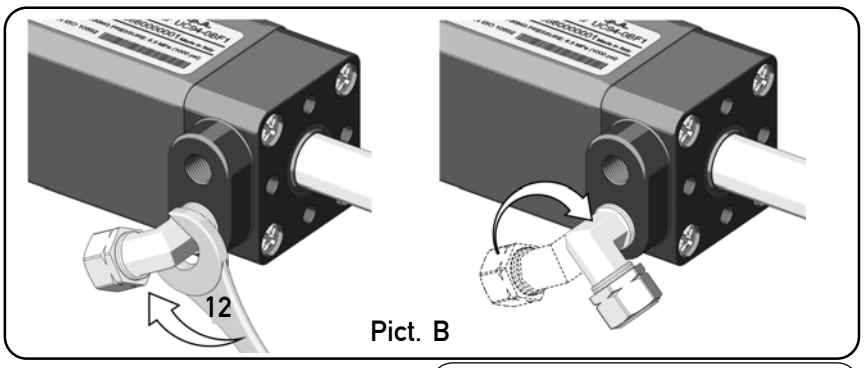
⚠ DANGER

It is possible the orient the fittings ONLY BY SCREWING them up and not more than one turn (360°).
By unscrewing the fittingthe thread is damaged and the cylinder does not operate properly.

To turn the fitting more than 270° it is necessary to:
1) remove the bleed valve from its seat by means of an open end wrench of 11 mm (7/16")(Pict. A);
2) screw the fitting until it reaches the desired position (Pict. B) by means of the open end wrench of 12 mm (15/32");
3) mount again the bleed valve by tightening it with a torque of 12 Nm (9 [lb·ft])



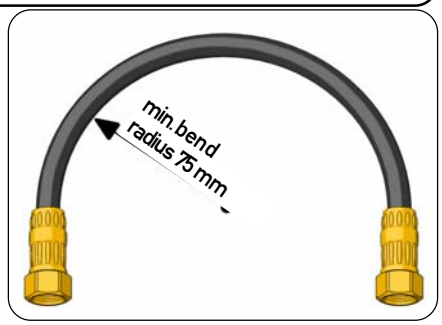
Pict. A



Pict. B

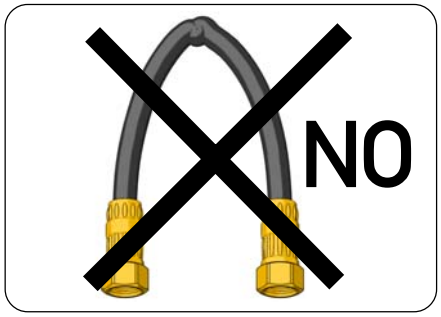
Screw the hoses on the cylinder fittings with a torque of 20[Nm] (15[lb·ft]) according to the following instructions:

- minimum hose bend radius 75 mm;
- no interference during engine tilting;
- no interference with the transom;



⚠ WARNING

An excessive hose bend could result in its internal breaking which will cause a bad operation of the system. In this case it is necessary to replace the damaged hose.



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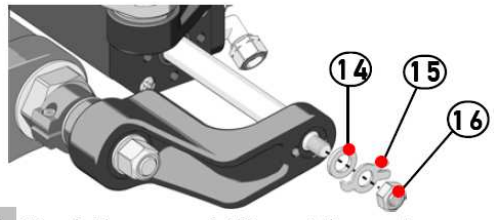
30[Nm] (22 [lb·ft])

15 Position the washers (14) and the lock screws (15) and tighten the bolt (16) with a torque of 30[Nm] (22 [lb·ft]).

NOTICE

The lock washer tabs must be bent afterwards (see point 22).



16 Check the correct tilting of the engine.

⚠ WARNING

If while tilting the engine is blocked, reduce the overall dimensions of the spacers.

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3.6 Filling and purging

After the first installation and after maintenance operations it is necessary to fill the system with hydraulic oil. This operation must avoid the air in the system, to ensure the good system operation. The hydraulic system must be filled from the highest point of the system, which means from the upper steering station.

⚠ CAUTION

To avoid air bubbles in the oil, it is necessary to fill the tank slowly.

⚠ WARNING

The filling and bleeding operations must be carried out at least by two operators.

⚠ DANGER

Use **UFLEX** oil or other compatible oils.

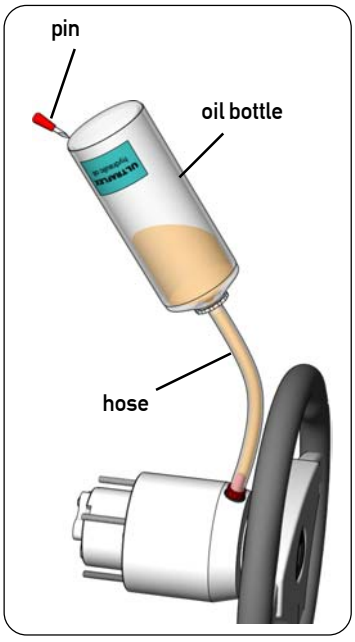
COMPATIBLE OILS
AGIP OSO 15
MOBIL DTE 11M
SHELL TELLUS T15
ESSO NUTO H15
Q8 HAYDN 15

TECHNICAL FEATURES	
Viscosity at 40°C	14.3 cSt
Viscosity at 100°C	3.3 cSt
Viscosity index	96
Flash point V.A.	190°C
Yield point	-30°C
Volumic mass 15°	0.860 kg/l

In the days after the filling, check the oil level; if necessary top off the system.
At the beginning the oil level can lower, as small amounts of air can be released in a homogeneous way. According to the types of installation, it is necessary to carry out the different bleeding procedures, as it follows.

3.6.1 Positioning of the oil bottle

- Remove the pump cap and insert the fittings.
- Attach the spout to a new bottle of hydraulic oil and connect the hose to the fittings and the bottle spout.
- Turn the bottle upside down and pierce it with the supplied pin, as shown in the picture, to ease the oil passage towards the pump.
  Fill the pump until no air bubbles are visible in the hose.



⚠ WARNING

While replacing the oil bottle, during the filling process, close all the bleed valves on the cylinder/s. To bleed the system, check that oil is always present in the filling hose. If some air is in the system during the bleeding process, the whole bleeding process must be started again.

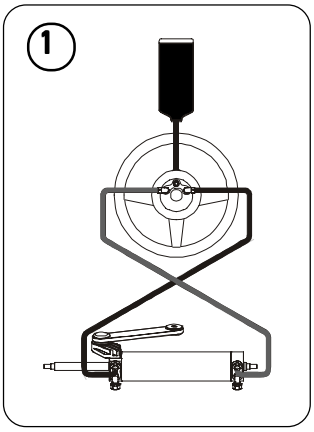
⚠ CAUTION

Replace the bottle before it empties and use recovered oil only after 24 hours.

3.6.2 Single steering station

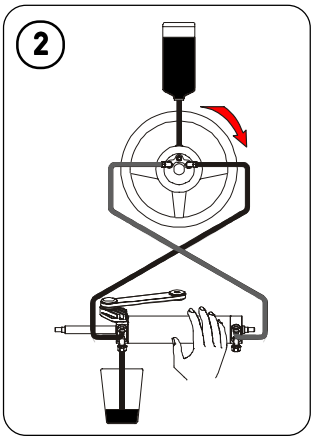
- Unscrew the two bleed valves and manually push the cylinder body to one side until it stops as shown in picture 1.

- Position the oil bottle as explained in paragraph 3.6.1.



- Close the bleed valve on the cylinder end stroke side and put a purged oil tank near the other bleed valve (as shown in picture 2).

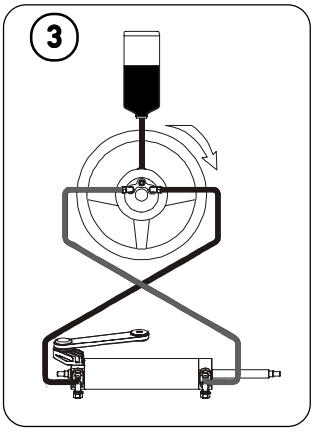
- Turn the steering wheel slowly (as shown in picture 2) so that the oil can come out of hoses.



NOTICE

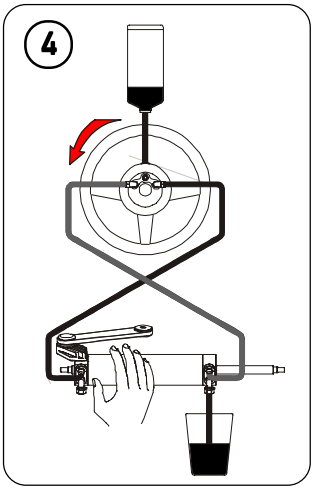
Hold the cylinder body with the hand to prevent movements caused by the air present in the cylinder chamber (picture 2).

- When the oil comes out of the bleed valve (without air bubbles), close the bleed valve and continue to turn the steering wheel in the same direction to fill the cylinder chamber (picture 3).
  During this phase the cylinder body will move to the opposite direction up to the end stroke.



- Open the other bleed valve and move purged oil tank to the other side.
  Holding the cylinder body in this position, turn the steering wheel as shown in picture 4, until oil without air bubbles comes out of the bleed valve.
  Then close the bleed valve.

- Repeat the entire procedure to ensure the absence of air in the system.



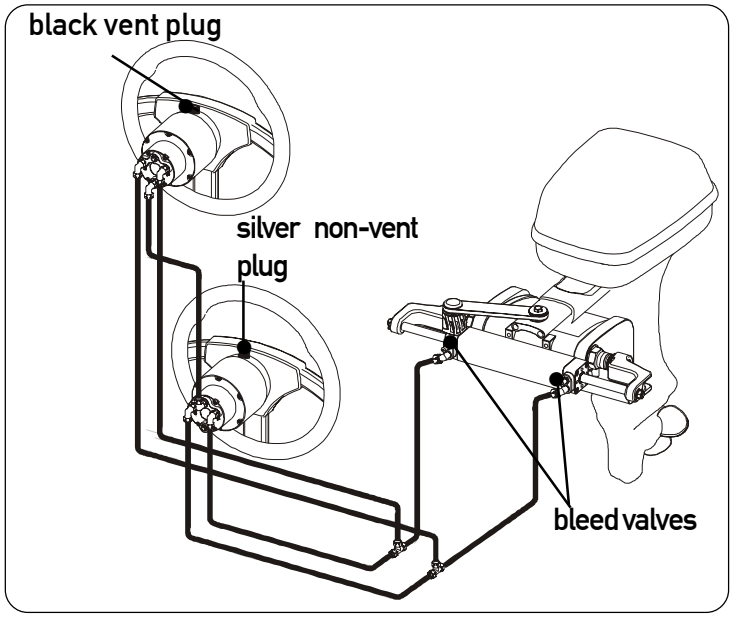
NOTICE

The described procedure is the same even in case of single station, dual engine, single cylinder and tie bar.

3.6.3 Dual steering station

- Manually unscrew the two bleed valves on the cylinder and push the cylinder to one side up to the end stroke.

- Position the oil bottle near the main steering station (upper) according to what is described in paragraph 3.6.1.



⚠ WARNING

Wait until the oil reaches the lower tank and both tanks are filled.

- Follow the same bleeding procedure described in paragraph 3.6.2 starting from the lower station and repeat it for the upper station.

⚠ WARNING

For the additional steering station (lower) tank use only the silver non-vent plug (supplied with the "kit OB-2S"). For the main steering station (upper) tank use only the black vent plug.

- Repeat the procedure at least 3 times to ensure the absence of air in the system.

NOTICE

The purging procedure is the same for dual station, dual motor, single cylinder and tie bar.

3.7 General recommendation

⚠ WARNING

It is very important to check the absence of air in the system before using the boat! We recommend trying to manually move the engine towards port and starboard, making sure that there is no movement of the cylinder body on the main cylinder shaft.
If the cylinder body moves more than 1/6 inches (15mm), there is still air in the system. The air presence in the system can cause bad responses to the controls and so it can cause damage, injuries or death.

4 SAFETY WARNINGS

This section shows the safety rules which must be followed for the correct equipment operation.
We recommend reading carefully this section and also the other manuals supplied with the steering system components.

4.1 Safety warnings during use and installation

RESPECT STRICTLY the following safety rules:
UFLEX declines all responsibility in case the user does not follow these rules and it is not responsible for negligence during the use of the system.

⚠ DANGER

- **DO NOT PUT HANDS BETWEEN THE MOVING PARTS.**
- Do not disable the safety devices.
- Do not modify or add devices to the system, without **UFLEX** written authorisation or technical intervention which will prove the modification.
- Do not use the equipment for a purpose different from the one it has been designed for, which is specified in the installation and maintenance manual.
- Do not let non-specialized staff perform the installation.
- Do not disassemble the hydraulic connections before bleeding the oil in the system completely. The hoses can contain high pressure oil.

⚠ WARNING

- Do not put the feet on the cylinder.
- Check the system after the installation and the purging but before operating the vessel. Turn the steering wheel until the cylinder/s reaches/reach the end stroke.
  Turn the steering wheel to the opposite direction. Repeat on each installed helm to verify the correct installation and the system operation.
- Carefully use sealing fluid (such as Loctite). If it reaches the hydraulic system, it may cause damage and mechanical failure.
- Do not use teflon tape or adhesive tape to seal the fittings, as this material may be injested, by causing the system fail.
- During the system installation, prevent foreign matters from entering the system.
  Even a little object may cause lasting damage that are not detected immediately.
- Avoid too narrow bend radius of hoses.
- Avoid the hose contact with edges or sharp corners.
- Avoid the hose contact with heat sources.

4.2 Clothing

⚠ WARNING

During installation, inspection or maintenance,
IT IS STRICTLY FORBIDDEN to wear necklaces, bracelets or clothes which could get caught in the moving parts.

5 MAINTENANCE

5.1 Ordinary maintenance

⚠ WARNING

Poor installation and maintenance may result in loss of steering and cause property damage and/or personal injury. Maintenance requirements change according to climate, frequency and the use. Inspections are necessary at least every two years and must be carried out by specialized marine mechanics. Check the cylinder fittings and the seals and the helm gaskets to prevent leaks. Replace them if necessary.
To keep a suitable oil level in the tank, fill and bleed the system as described in this manual in paragraph 3.6.
Check the hose and the entire system wear, the nut and bolt tightening every six months and make sure that they are not damaged.
Clean the system using water and non-abrasive soap.

⚠ WARNING

Use only compatible hydraulic oils, indicated in the paragraph "technical features" and "filling and bleeding ". Do not use brake oils or automatic transmission fluid (ATF) in any case.

5.2 Troubleshooting

⚠ WARNING

Whenever the following checks need the removal and/or disassembly of the steering system components, such work must be carried by specialized staff. **UFLEX** offers general information only and is not responsible for any consequences resulting from incorrect disassembly.

PROBLEM	CAUSE	SOLUTION
During the filling, the steering system becomes completely jammed.	• Blockage in the hoses between steering system and cylinder.	• Replace hoses. **⚠ WARNING** The damaged hose must be replaced, otherwise it may cause loss of steering and severe personal injury or property damage.
The system is very difficult to fill. Air keeps bubbling at the top of the steering system tank even after filling the system completely.	• Air in the system.	• Repeat the filling and the bleeding procedure of the system. • Install horizontally the hoses and in any case with a maximum inclination of 3cm each meter.
	• Leaks from the cylinder bleeder.	• Tighten the bleeder on the cylinder.
	• Coiled hose.	• Uncoil and straighten the hose.
	• Helm has been mounted upside down.	• Mount the helm with the filling hole in up position.
The steering system is stiff and hard to turn, even when the boat is not moving.	• Restrictions in hoses or fittings.	• Look for and remove the restriction.
	• Air in oil	• Repeat the filling and the bleeding procedure of the system.

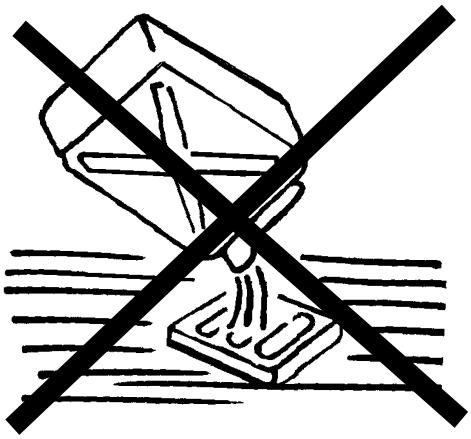
The steering system is stiff and hard to turn, even when the boat is not moving.	• Wrong oil has been used.	• Drain the filling and bleeding system. **⚠ WARNING** **UFLEX** is not responsible for damage caused by fluids that are not recommended in this manual and so the warranty is cancelled.
The steering system is stiff and hard to turn, even when the boat is not moving, if unbalanced cylinders are used.	• Dirt in the valve.	**⚠ WARNING** Do not use the boat and contact a specialized technician for the valve cleaning.
The steering system is easy to turn at the dock but becomes hard to turn when the boat is in motion.	• The steering wheel is too small.	• Replace the steering wheel with a bigger one. **⚠ WARNING** Only within the maximum dimensions allowed by the helm.
	• Incorrect setting of the torque tab.	• Adjust the torque tab.
	• Air in oil.	• Check the oil level and repeat the bleeding procedure as explained in this manual.
When the steering wheel is turned, the rod (movable rod cylinders) or the body (fixed cylinder rod) of the cylinder do not move.	• Air in the system.	• Repeat the filling and bleeding procedure of the system.
	• Oil leak.	• Look for the leak and contact specialized staff.
	• Helm mounted upside down.	• Mount the helm with the filling hole in up position.
Leaks from steering system fittings.	• Bad tightening or low torque of the fittings.	• Tighten the fittings with a maximum torque of 20Nm (15 in.lbs).
	• Lack of fitting sealant. **⚠ WARNING** Never use teflon tape or adhesive tape on any fitting.	• Drain and disassemble the steering system. Remove the fittings and remove the oil from threads. Put the sealant on the fittings and tighten them, install the helm. **⚠ WARNING** After this operation it is necessary to carry out another bleeding.
Leaks from the tank plug.	• Bad tightening of the plug.	• Tighten the plug.
	• The vent plug (black) on the additional helm is in the lower position.	• Replace the vent plug (black) with the plug for the additional helm kit (silver).
	• Worn and damaged seal.	• Replace the plug.
	• Too high oil level.	• Follow the procedure to maintain the suitable oil level, which is described in the pump manual.

6 DISMANTLING

6.1 Dismantling

When for any reason, the steering 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.

The steering system CONTAINS POLLUTING OILS
which must be disposed of according to the rules in force in the country.



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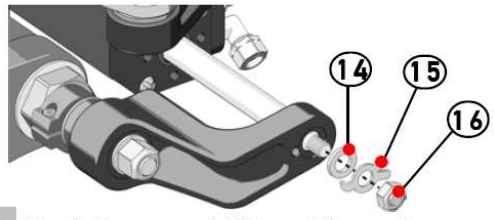
UC 94-OBF

15 Position the washers (14) and the lock screws (15) and tighten the bolt (16) with a torque of 30[Nm] (22 [lb·ft]).

NOTICE

The lock washer tabs must be bent afterwards (see point 22).



16 Check the correct tilting of the engine.

⚠ WARNING

If while tilting the engine is blocked, reduce the overall dimensions of the spacers.

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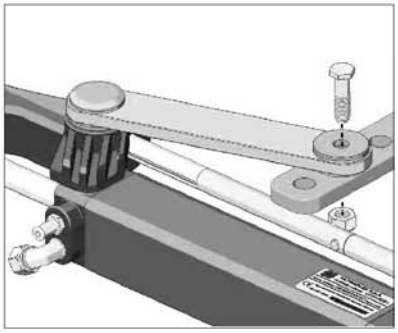
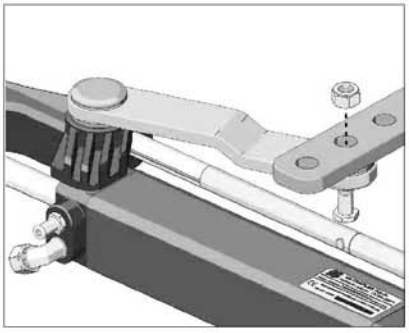
Engine applications

ENGINE	TYPE	YEAR	CYLINDER	CODE
MARINER MERCURY	135-150 optimax 2T	1999 – ▯	UC94-OBF/1	39423Z
	75-90 2T	1990 – ▯	UC94-OBF/1	39423Z
	115 2T	1988 – ▯	UC94-OBF/1	39423Z
	125 2T	1994 – ▯	UC94-OBF/1	39423Z
	75-90 4T	2000 – ▯	UC94-OBF/1	39423Z
	115 4T EFI / Saltwater EFI	2001 – ▯	UC94-OBF/1	39423Z
YAMAHA	70B 2T 3 cil. carb.	1984 – ▯	UC94-OBF/1	39423Z
	75C-90A 2T 3 cil. carb.	1998 – ▯	UC94-OBF/1	39423Z
	115C-130B V4 2T carb.	1990 – ▯	UC94-OBF/1	39423Z
	150F V6 2T carb.	1996 – ▯	UC94-OBF/1	39423Z
	150 V6 HPDI 2T	2000 – ▯	UC94-OBF/1	39423Z
	F80A-F100A 4T	1999 – ▯	UC94-OBF/1	39423Z
	F115A 4T	2000 – ▯	UC94-OBF/1	39423Z
	F150A 4T	2004	UC94-OBF/1	39423Z
HONDA	BF 75-90 4T	1995 – ▯	UC94-OBF/1	39423Z
	BF 150 4T	2004	UC94-OBF/1	39423Z
JOHNSON	BJ70 4T	2001 – ▯	UC94-OBF/1	39423Z
	BJ90-115-140 4T	2001 – ▯	UC94-OBF/1	39423Z
	J90-115 V4 2T	1995 – ▯	UC94-OBF/1	39423Z
	J150 V6 2T	1995 – ▯	UC94-OBF/1	39423Z
EVINRUDE	75-90 E-tec 2T	2004	UC94-OBF/1	39423Z
	E100 -115hp V4 2T	1995 – ▯	UC94-OBF/1	39423Z
	E135-150hp V6 2T	1995 – ▯	UC94-OBF/1	39423Z
SUZUKI	DF70 4T	1998 – ▯	UC94-OBF/1	39423Z
	DF90-115-140hp 4T	1998 – ▯	UC94-OBF/1	39423Z
SELVA	Whiteshark 150 HPDFI 2T	2001 – ▯	UC94-OBF/1	39423Z
	Narwhal 115 EFI 4T	2001 – ▯	UC94-OBF/1	39423Z
	Marlin 100 4T	2000 – ▯	UC94-OBF/1	39423Z
	Portofino 80-70 2T	1995 – ▯	UC94-OBF/1	39423Z
	Montecarlo 100-90 2T	1995 – ▯	UC94-OBF/1	39423Z
TOHATSU	M60-70-90-120-140 2T	2004	UC94-OBF/1	39423Z
	MD70-90 TLDI 2T	2004	UC94-OBF/1	39423Z

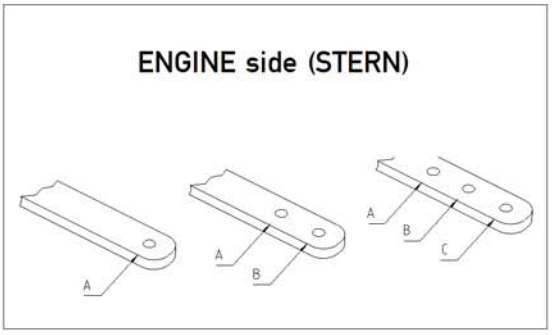
Link arm reference guide



Tiller arm bolt up



Tiller arm bolt down



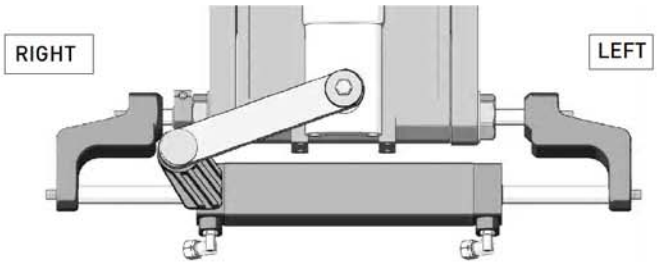
Tiller arm hole typologies and location

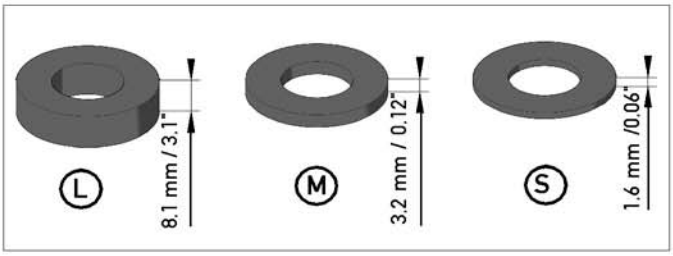
NOTICE

Besides the interferences, the boat maximum steering angle must be considered when choosing the tiller arm and its position with respect to the tilt tube rod (up or down in the position A, B or C).

	ENGINE	BOLT INSERTION	LINK ARM HOLE POSITION
MARINER MERCURY	75-90 2T	up	A
	115-125 2T		
	75-90 4T		
	115 4T EFI / Saltwater EFI		
HONDA	BF75-90 4T	up	A
	BF 150 4T		C
YAMAHA	70B 2T 3 cil. carb.	up	A
	75C-90A 2T 3 cil. carb.	down	C
	115C-130B V4 2T carb.	down	A
	150F V6 2T carb.	down	B
	150 V6 HPDI 2T	down	B
	F80A-F100A 4T	up	A
	F115A 4T	up	A
	F150A 4T	up	A
SUZUKI	DF70 4T	down	A
	DF90-115-140hp 4T	down	A
JOHNSON	BJ70 4T	down	A
	BJ90-115-140 4T	down	A
	J90-115 V4 2T	down	A
	J150 V6 2T	down	A
EVINRUDE	75-90 E-tec 2T	down	A
	E100-115hp V4 2T	down	A
	E135-150hp V6 2T	down	A
SELVA	Whiteshark 150 HPDFI 2T	down	B
	Narwhal 115 EFI 4T	up	A
	Marlin 100 4T	up	A
	Portofino 80-70 2T	up	A
	Montecarlo 100-90 2T	up	A
TOHATSU	M60-70-90-120-140 2T	down	A
	MD70-90 TLDI 2T	down	A

Spacer reference guide





The spacer position shown in the following table must be considered only as a reference.
Some engines could have different features according to the production years.

⚠ WARNING

The engine end strokes must not come earlier than the cylinder end strokes.

⚠ WARNING

The adjustment collar must be always mounted on the right side.

ENGINE	TYPE	RIGHT SPACERS			LEFT SPACERS		
		L	M	S	L	M	S
MARINER MERCURY	115-125 2T	-	-	-	2	1	1
	135-150 Optimax 2T	-	-	-	2	2	-
	75-90 4T	-	-	-	2	2	-
	115 4T EFI / Saltwater EFI	-	-	-	2	2	-
YAMAHA	70B 2T 3 cil. carb.	-	-	-	2	-	-
	75C-90A 2T 3 cil. carb.	-	1	-	1	1	-
	115C-130B V4 2T carb.	-	1	-	2	-	-
	150F V6 2T carb.	1	-	-	2	-	-
	150 V6 HPDI 2T	-	-	-	2	1	1
	F80A-F100A 4T	-	-	1	2	1	-
	F115A 4T	-	-	-	2	1	1
	F150A 4T	-	-	1	2	1	-
HONDA	BF75-90 4T	-	-	-	2	1	1
	BF 150 4T	1	1	-	1	1	-
JOHNSON	BJ70 4T	-	-	-	2	1	-
	BJ90-115-140 4T	-	-	-	2	1	-
	75-90 E-tec 2T	-	-	1	2	1	-
	J90-115 V4 2T	1	-	1	1	1	-
	J150 V6 2T	-	-	-	2	2	1
EVINRUDE	E100-115hp V4 2T	1	-	1	1	1	-
	E135-150hp V6 2T	-	-	-	2	1	1
SUZUKI	DF70 4T	-	-	-	2	1	-
	DF90-115-140hp 4T	-	-	-	2	1	-
SELVA	Whiteshark 150 HPDFI 2T	-	-	-	2	1	1
	Narwhal 115 EFI 4T	-	-	-	2	1	1
	Marlin 100 4T	-	-	-	2	1	-
	Portofino 80-70 2T	-	1	-	-	1	-
	Montecarlo 100-90 2T	-	1	-	-	1	-
TOHATSU	M60-70-90-120-140 2T	-	-	1	1	2	-
	MD70-90 TLDI 2T	-	-	1	1	2	-

Installation and Maintenance Manual

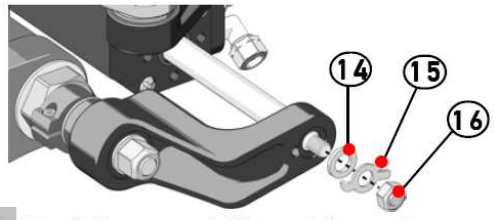
HYDRAULIC CYLINDER FOR OUTBOARD ENGINES

UC 94-OBF

15 Position the washers (14) and the lock screws (15) and tighten the bolt (16) with a torque of 30[Nm] (22 [lb·ft]).

NOTICE

The lock washer tabs must be bent afterwards (see point 22).



16 Check the correct tilting of the engine.

⚠ WARNING

If while tilting the engine is blocked, reduce the overall dimensions of the spacers.

UFLEX

NMMA PARTNER UCINA MEMBER ABYC Setting Standards for Safer Boating RINA ISO 9001:2000 Certified Quality System RINA ISO 14001 Certified Environmental System

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