

Hydraulic Steering System For Outboard Engine

Manual for Owner, Installer

MO 150H TYPE



SEAFIRST
ENGINEERING

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1. Introduction

On board the boat, correct operation and handling according to this manual is essential at any time to assure the safety and the proper function. Incorrect operation and /or handling without fully understanding the contents of the manual can cause irreparable damage or fatal accident in the worst case. Read this manual carefully to have good understanding on the contents before setting out to sea.

- Read this manual carefully to have good understanding on the contents
- Always bring this manual with you to the boat, and keep it where it is readily available.
- Pay attention that the manual will not be lost or contaminated while not in use.
- In case of resale or transfer of the system, be sure to give this manual to the new owner.
- Please note that the illustration and/or contents of this manual may partly differ from the actual product due to the specification change. Etc.

• Notice to Customers :

Thank you for purchasing Seafirst Outboard steering system.

This manual provides the information for correct installation, operation, maintenance and inspection of the system with cautionary remarks. Please read this manual carefully before starting operation to ensure the correct use of the system.

This system is intended for the installation by a person who has basic understanding and skill in the servicing of hydraulic steering system. Without such knowledge and skill, attempted installation could cause failures or mechanical damages to the system. Please have your system installed by your dealer, if you are not a specialized mechanic.

In the course of boat operation, always keep this manual on board where it would not be lost or get wet. If you transfer or resell this hydraulic steering system, be sure to give this manual to the new owner.

• Notice to Dealers :

Please explain the product and address any cautionary remark to the customer. Make sure that this manual and part of it removed during the installation work be handed over to the customers.

Special attention should be paid for the cylinder installation. Notice to the transom limitation and mechanical interference of the cylinder, its linkage in steering and tilting-up operation

2. Instruction Symbols

CAUTION

CAUTION indicates special precautions that must be taken to avoid damages to the outboard engine

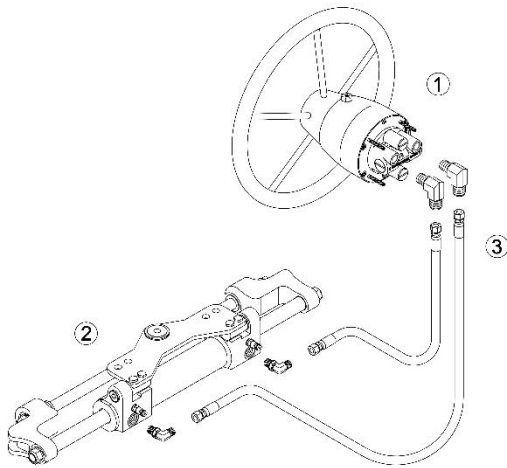
IMPORTANT

IMPORTANT is an importation to proper operation, inspection or maintenance.

Operating Instruction

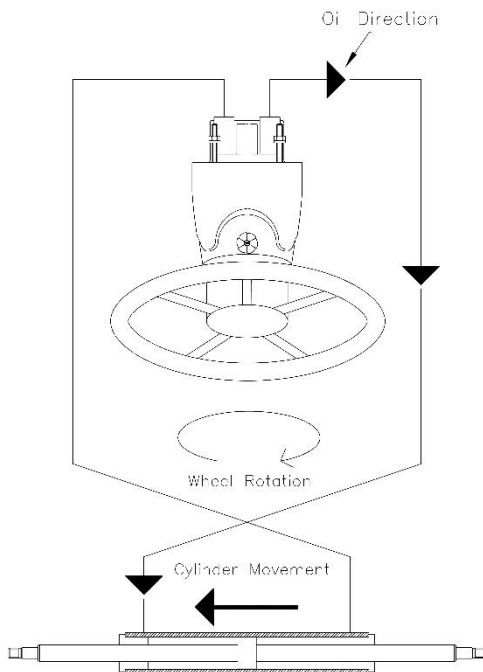
1. Components and its role

Our hydraulic steering system is consist of as table



Component	Description
1. Helm Pump	The piston pump is designed for manual hydraulic steering. It has inbuilt lock valve.
2. Cylinder	SOC3016H type is universal installation.
3. Hydraulic Hose	It s path for the oil to flow from the helm pump to the cylinder

2. How it works



If Steering wheel is rotated in clock wise, oil is pumped out from the port (right port from the front view) into the port of cylinder (port side).

This cause the cylinder tube move to the port side, which move the boat to right side (starboard), Oil displaced from the opposite end of the cylinder flows back to the helm pump.

For steering in the opposite direction, simply turn the helm pump the other way.

When no course corrections are required, the inbuilt lock valve holds the outboard engine stationary.

MAXIMUM OPERATING PRESSURE : 80 BAR
RECOMMENDATIONS FOR THREAD SEALANT IF REQUIRED: LOCTITE 572

1. Packaged system

1-1) MO 150H type : Complete system for single engine

System Model	Applicable Outboard Motors	Cylinder
MO150H - R1	Yamaha 4stroke : 75hp ~ 150hp, Yamaha 2stroke : 50hp, 60hp and from 100hp to 150hp Suzuki : from 70hp to 150hp Mercury : from 50hp to 150hp, except old 4 stroke (1732cc) 75hp and 115hp Honda : from BF 50~BF 150 except old BF115A / old BF130A Tohatsu M 120 ~ M 140 Evinrude : from 65hp to 150hp	SOC 3016H-R1
MO150H-R4	Yamaha 4stroke : From 30hp to 60hp, Yamaha 2stroke : From 50hp to 85hp	SOC 3016H-R4
MO150H-R5	Honda old BF115A / old BF130A	SOC 3016H-R5
MO150H-R6	Old Mercury 1732cc From 75hp to 115hp	SOC 3016H-R6

150HP APPLICABLE

MO 150H type package



*Cylinder based on
SOC 3016H type*

1-2) Components of MO 150H

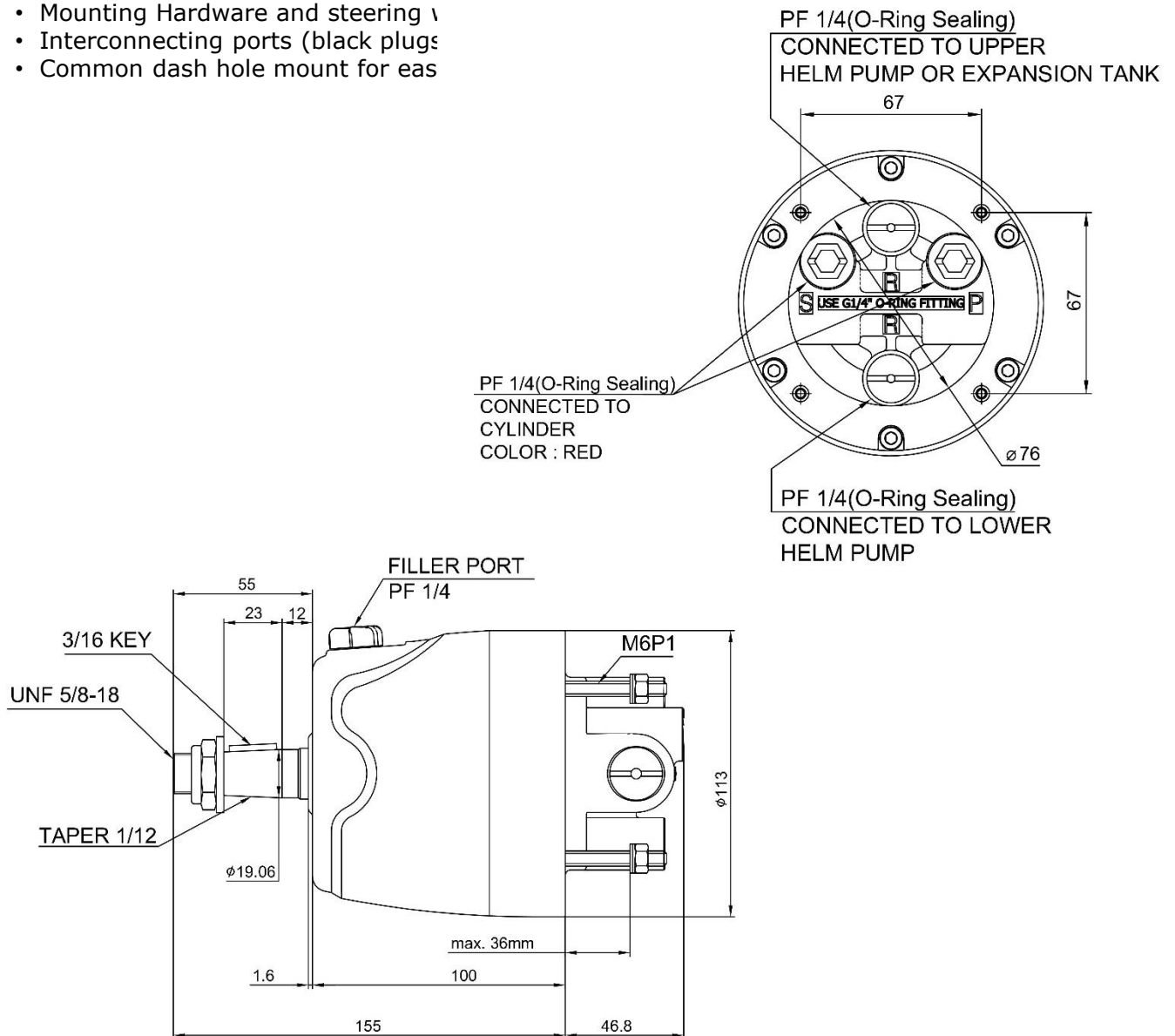
Model	Description	Page
CSH018 Helm Pump	Front Mount Helm pump 18cc	6
SOC 3016H type CYLINDER	Front Mount Outboard cylinder. When ordering, specify the engine model.	8
SF OIL 15 Hydraulic Oil	Hydraulic oil 1 liter x 2 bottles. SAE NO 15.	-
NH 04-SS-07 Hydraulic Hose	1/4" Hydraulic Hose 7 meter x 2pcs	
Accessories included	Helm pump fittings, Helm pump mounting hardware kit, Accessories kit OAK-300 (Bleed tube, Funnel, Oil supply tube)	-
The Steering Wheel is not included in the package.		-

1. HELM PUMP

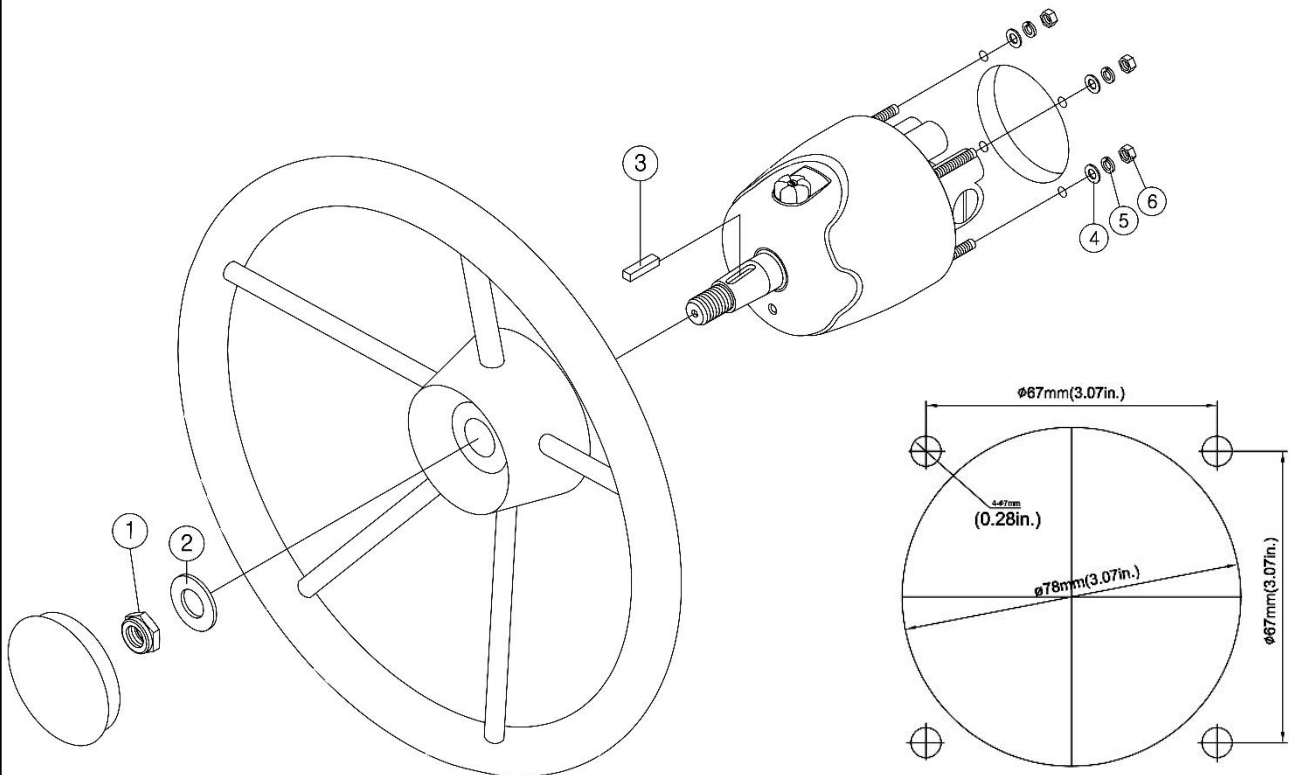
1-1) : SPECIFICATION & FUNCTION

Model	Displacement		Lock valve	Steering Wheel
	cc / rev	cu.in / rev		
CSH 018	18	1.09	Built-in	Min Dia 260mm

- Maximum durability
- 3 ball bearings supporting the rotar, which make the helm pump be used for heavy duty use.
- At factory, the two ports on the rear are blocked tightly with black plugs while the two ports are blocked loosely with red plugs for an easy open to connect hydraulic hose fittings.
- Fixed displacement
- Lock Valve Inbuilt
- Mounting Hardware and steering v
- Interconnecting ports (black plugs)
- Common dash hole mount for eas



1-2) MOUNTING THE HELM PUMP IN FRONT



PANEL CUT DIMENSION

Mounting the helm pump (CSH series)

1. To install the pump, cut a hole of diameter 78mm in the dash board (panel).
2. Mark the location of the four holes by using Template supplied additionally
3. Drill 4 holes with Diameter 7mm.
4. Install the helm pump into the hole and tighten the helm pump with 4 x Nuts and Washers supplied as mounting hardware.

Mounting the wheel

1. Make sure that your steering wheel is suitable for 3/16" straight key and taper on 3/4" shaft.
2. Grease the shaft cone and install the wheel on the shaft with key supplied.
3. Tighten the wheel with UNF 5/8-18 Nylon Nut and Plain Washer supplied as mounting hardware.

Mounting Hardware Kit

No	Description	Q'ty	No	Description	Q'ty
1	UNF 5/8-18 Nylon Nut	1	4	Plain Washer M6	4
2	Plain Washer	1	5	Spring Washer M6	4
3	Straight Key 3/16"	1	6	Nut M6	4

2 Cylinder 2-1) Specification

Basic Model : SOC3016H-R1 SOC3016H-R4 SOC3016H-R5 SOC3016H-R6	
Volume	101cc
Output force	354kg
Shaft diameter	16mm
Bore diameter	30mm
Stroke	200mm

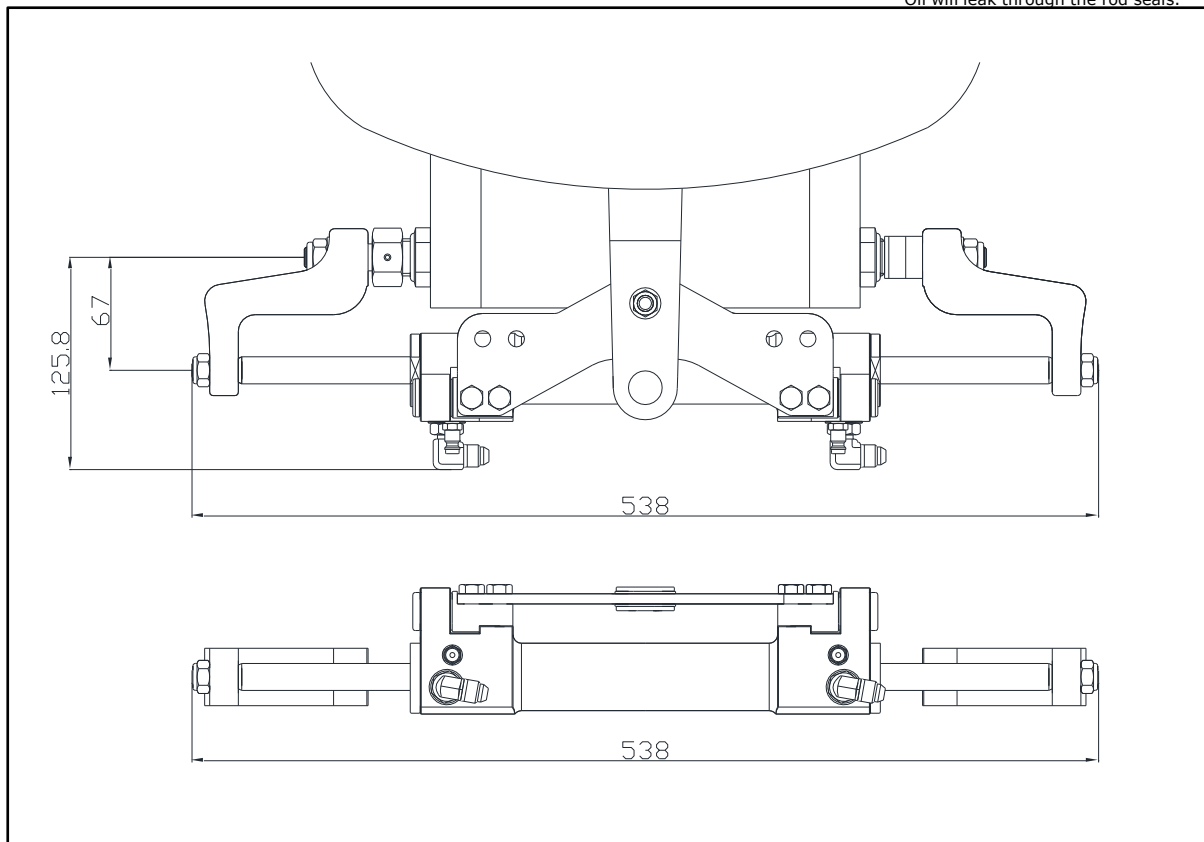
- Stainless steel shaft with hard chrome plate
- Aluminum tube with anodizing
- Aluminum arms with anodizing
- Stainless steel lock nuts
- Compact Design for less space installation
- Install for single.
- Balanced cylinder : The number of turns lock to lock is equal port to starboard



CAUTION

Never damage the cylinder rod.
Oil will leak through the rod seals.

SOC 3016H type

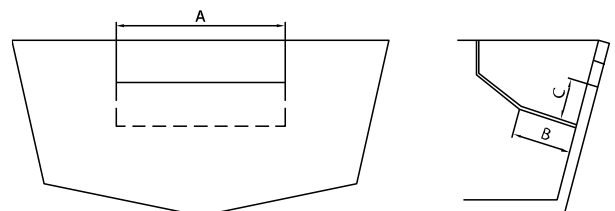


2-2) Application to Engine horse power

No of Cylinder	Outboard Motor Installation	Max Allowable hp
1	Single (1)	Application up to 150hp

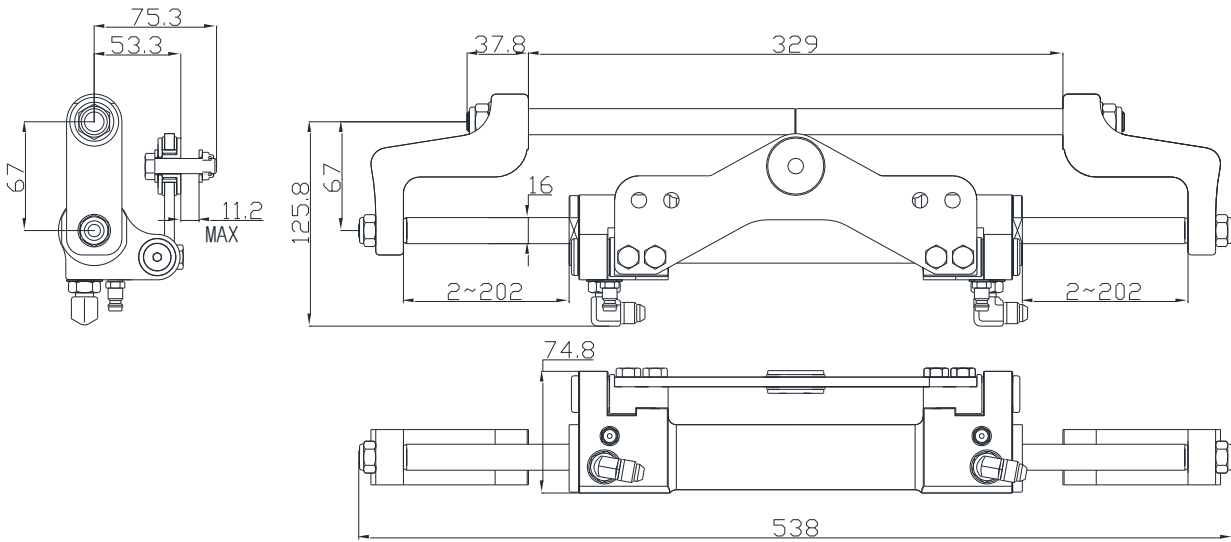
2-3) Splashwell Dimension Requirements

No of Engine	A	B	C
1	540mm	152mm	127mm



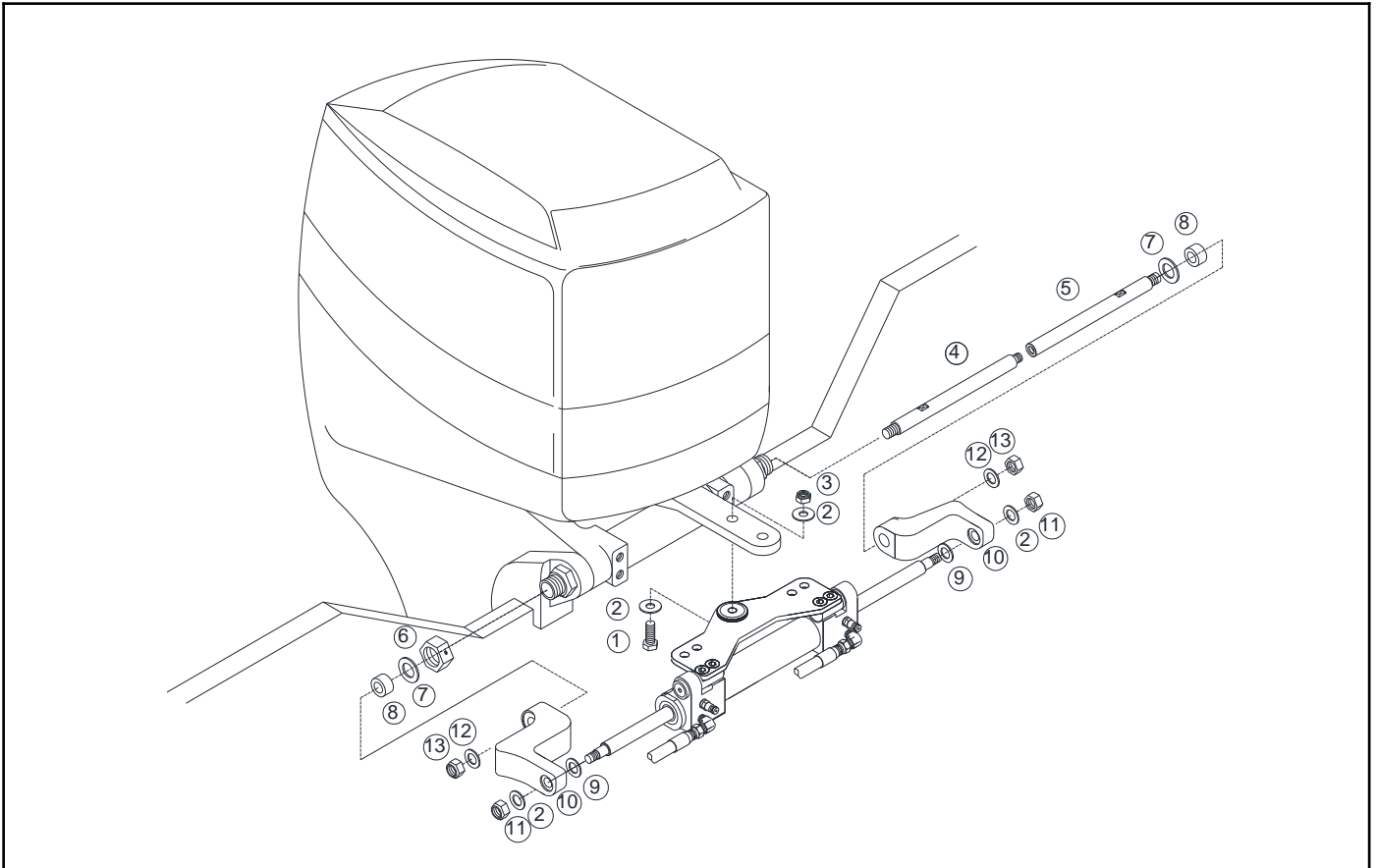
2-4) Dimension of Cylinder

SOC 3016H type



2-5) Install cylinder to engine

Cylinder model : SOC 3016H – R1, R4, R5, R6



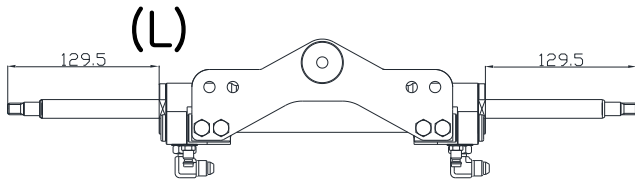
No	Part Number	No	Description
1	B30824038S	1	Bolt
2	PW10118020S	4	Plain Washer
3	NY030824014S	1	Nylock Nut
4	C3016115	1	Support Rod R
5	C3016116	1	Support Rod L
6	C3520139	1	ADJ Nut
7	PW1625025S	2	1.5T Plain Washer
8	C3520123-H	2	Space ring Kit
9	C3016117	2	Rod Washer
10	C3016114	2	Arm
11	NY10150017S	2	Nylock Nut
12	PW1224020S	2	Plain Washer
13	NY12175019S	2	Nylock Nut

Installation – Cylinder

2-5) Install cylinder to engine

SOC 3016H-R1 , R4, R5 and R6 CYLINDER

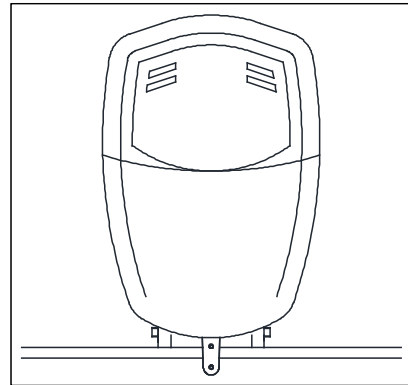
1. After removing the protective caps of the fittings, manually center the rod of the cylinder body. For the center, “(L)” length should be 129.5mm.



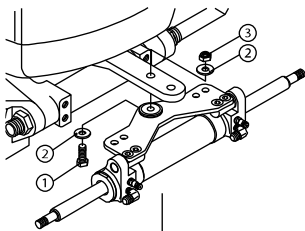
⚠ CAUTION

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

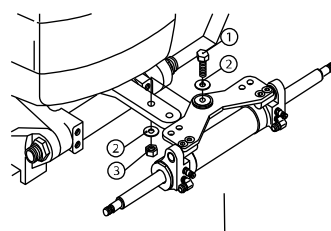
2. Position the engine straight so that its arm is perpendicular to the transom.



3. Connect the cylinder plate to the engine steering arm by means of the bolt ①. and tighten this bolt with a torque 25[Nm] after insert the washer ②. Thread on the Lock nut ③ and tighten it with torque 15[Nm] after insert the washer ②.



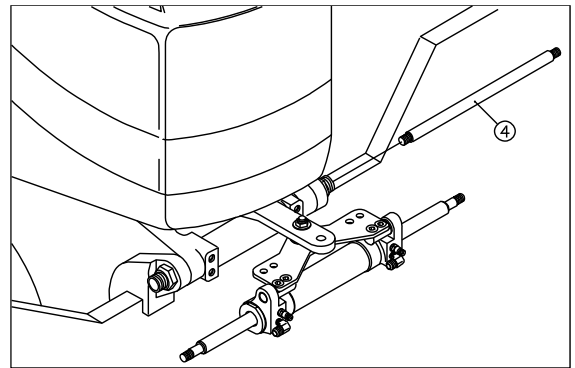
*For YAMAHA, SUZUKI,
TOHATSU, ETC*



*For HONDA, MERCURY,
YAMAHA 115BEF, 130BEF*

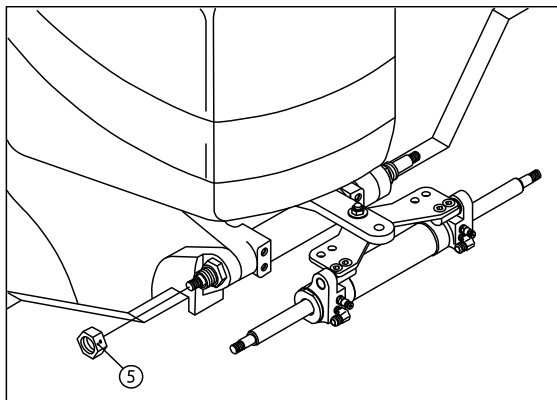
**For Installation of SOC3016H-R4 or R5, please see Page 14*

4. Insert the support rod ④ into the tilt tube.

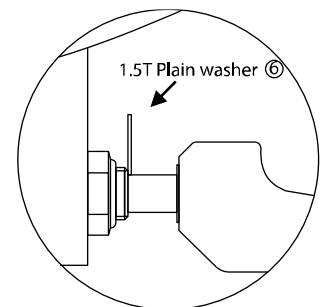
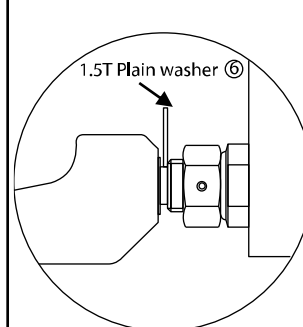


⚠ Grease the support rod ④, by using marine grease to prevent the corrosion of the metal parts.

5. Insert the ADJ nut ⑤ to the left part of the tilt tube. And then screw it until it comes into contact with the stop nut.



6. Insert the right and left arm. Then, position the 1.5T plain washer ⑥ between tilt tube end and arm as shown in the picture.

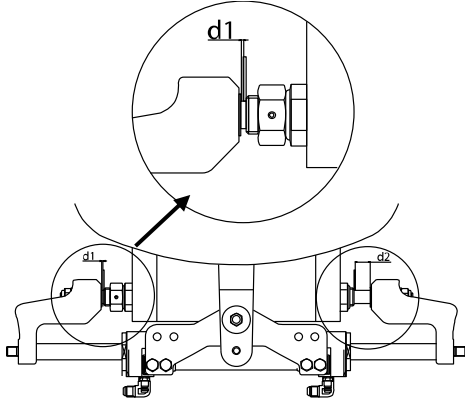


Installation – Cylinder

2-5) Install cylinder to engine

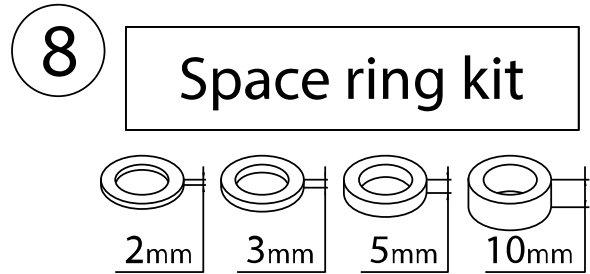
SOC 3016H-R1 , R4, R5 and R6 CYLINDER

7. Measure the gap (d1) between 1.5T plain washer and arm.

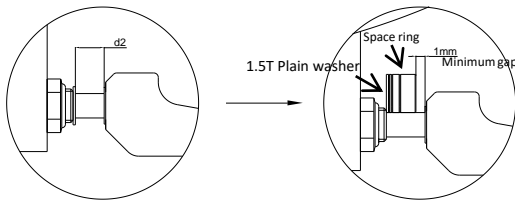


8. If the gap(d1) is less than 1mm, do not use any space ring.

However, if it is more than 1mm, using the proper space ring ⑧ to fill up the gap.



9. Measure the gap(d2) between 1.5T plain washer to arm and choose the proper space rings to fill the gap. Leave 1mm as maximum gap after choosing proper space rings to make engine tilting easy. (Refer to the ' Example '. That will be useful formula when you choose space ring)



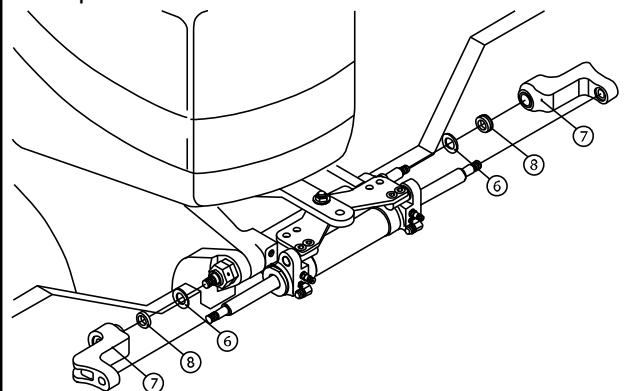
◆ Example

$$\begin{aligned}
 & d2 = 21\text{mm} \text{ (Normal measurement)} \\
 & \quad - 1\text{mm} \text{ (Minimum space)} \\
 & \text{-----} \\
 & \quad 20\text{mm}
 \end{aligned}$$

(You may need 2T+3T+5T+10T Space ring = 20mm)

10. Once the correct space ring have been chosen for d1 and d2, remove the arm.

11. Insert the 1.5T plain washer ⑥ and correct space ring ⑧. Then, Insert the right and left arm as shown in the picture.



Installation – Cylinder

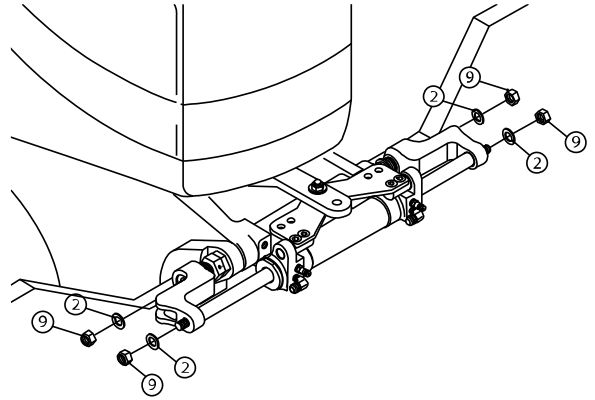
2-5) Install cylinder to engine

SOC 3016H-R1 , R4, R5 and R6 CYLINDER

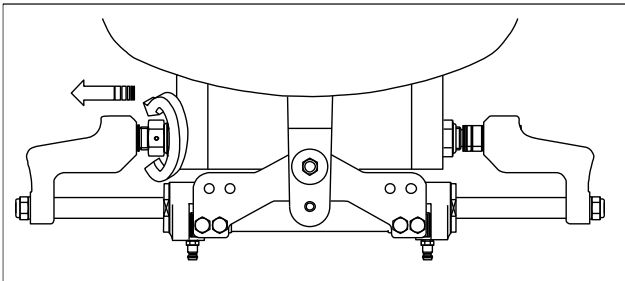
◆ NOTICE

Both the 1.5T stainless washer must be positioned towards the tilt tube on the opposite side of the arm to avoid their wear during engine lifting and lowering.

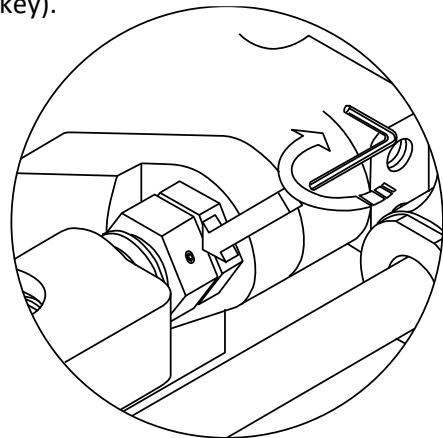
12. Insert the washers ② on the ends of the support rod and cylinder rod. and tighten the nuts ⑨ with a torque [70Nm] after greasing.



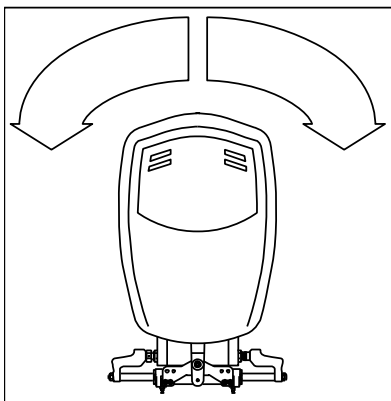
13. Screw the ADJ nut to the left side and bring it into contact with the 1.5T plain washer, until clearance is eliminated.



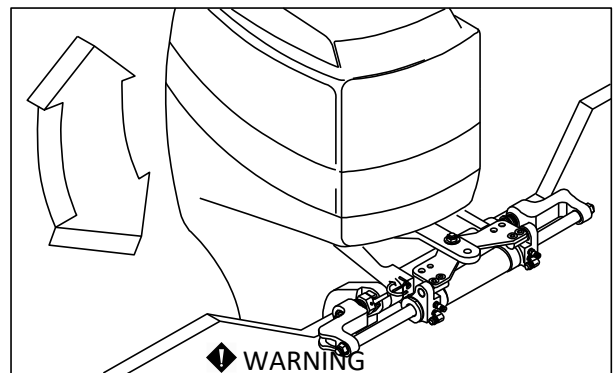
14. Tighten the set screw on ADJ nut with a 2mm allen key(hex key).



15. Check the correct cylinder installation by moving manually the engine on the right and on the left. The rotation must be as symmetric as possible so that the steering angle is the same on both sides.



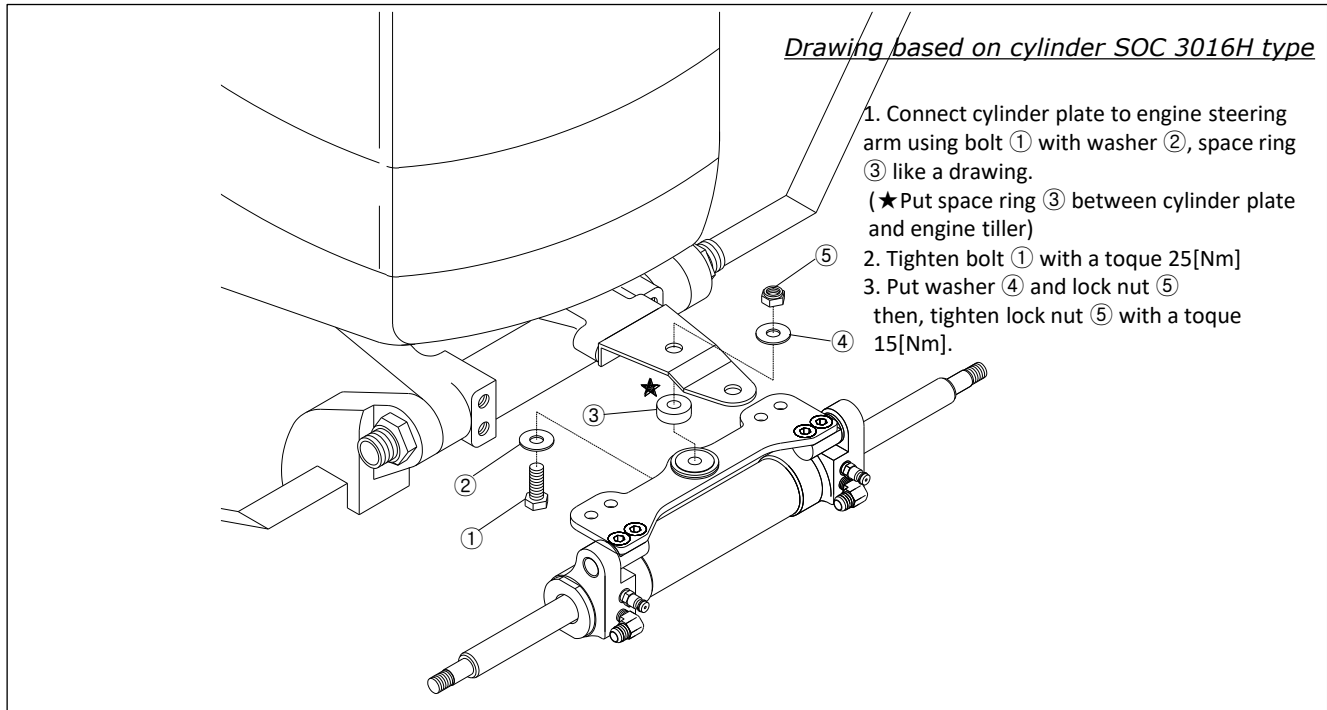
16. Check again in the correct engine movement both during the tilting.



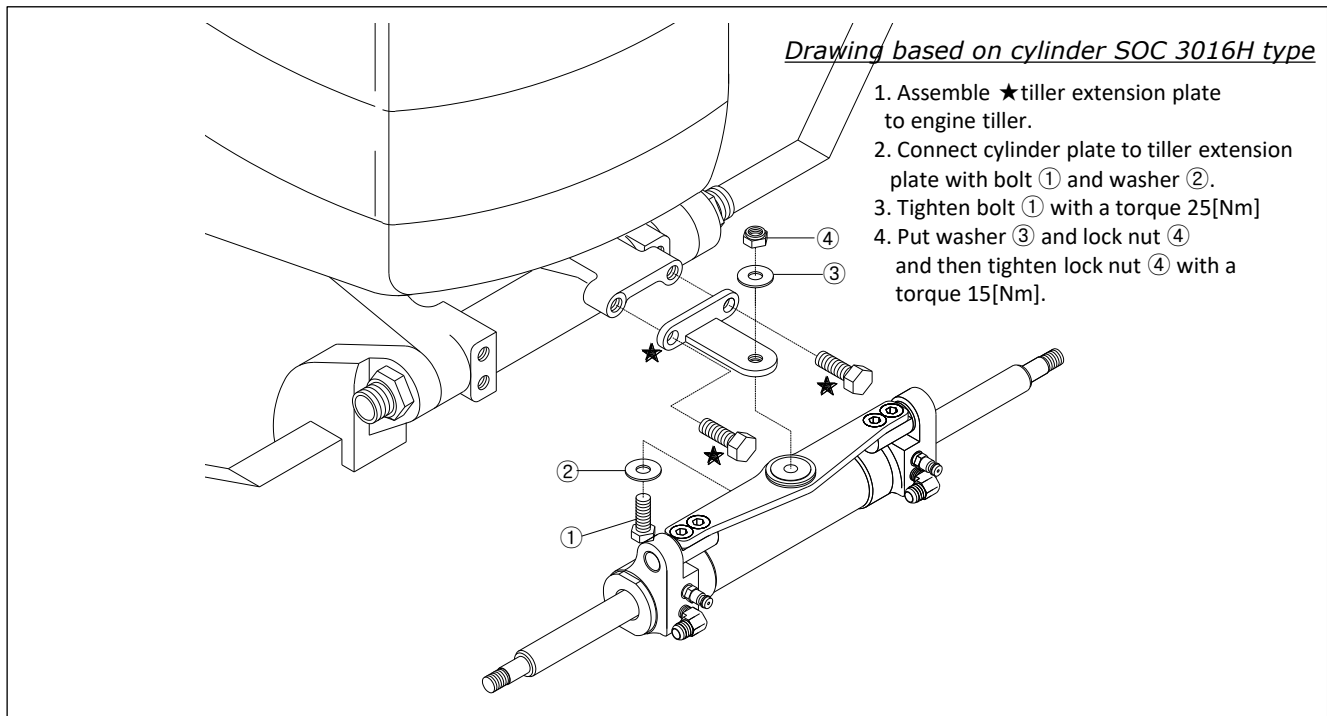
In case of the any contact with the transom, stop the installation and contact the specialized staff.

2-5) Install cylinder to engine

Engine Maker	Engine Model	Cylinder	Remark
YAMAHA	2 stroke 50hp ~ 95hp 4 stroke 30hp ~ 60hp	SOC 3016H-R4	



Engine Maker	Engine Model	Cylinder	Remark
HONDA	BF 115A	SOC 3016H-R5	
	BF 130A		



3. Test Procedures

3-1) Test Procedures after Installation




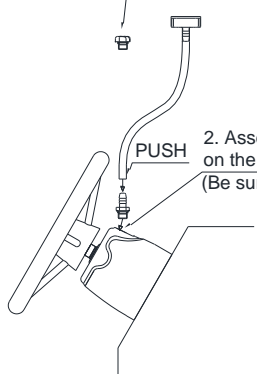
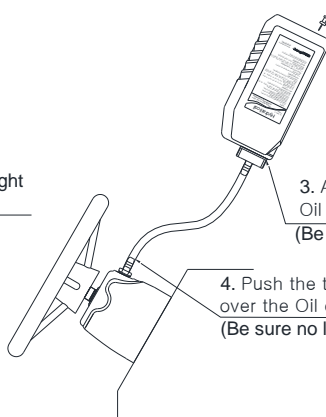
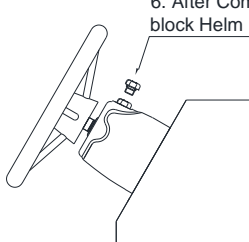
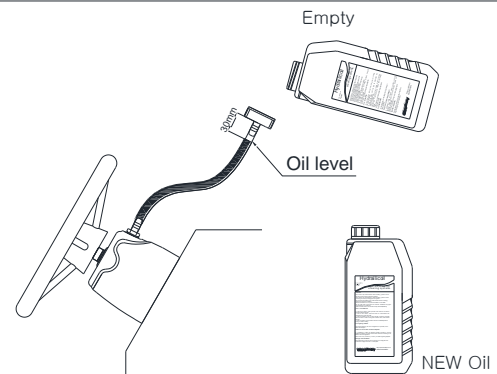
Procedure	Test	Check Point
1. Leakage Test	For the test, apply a pressure on the cylinder, hose and helm pump by rotating steering wheel further at the end of steering.	<ul style="list-style-type: none">•Helm pump : Two ports which oil come out•Hose : Hose couplings•Cylinder : Two ports which oil come out/in
2. Wheel turn	For the test, rotate steering wheel from left to right and count the wheel turn. Also count the wheel turn from right to left	<ul style="list-style-type: none">•Ideal wheel turn to achieve : 5.6•18cc helm pump with SOC3016 cylinder
3. Hose kinked	For the test, check the entire hose from helm pump to cylinder	
4. Cylinder interface	For the test, tilt up the engine fully. Check if any interference of cylinder , hose etc	

Installation – Oil Filling and bleeding

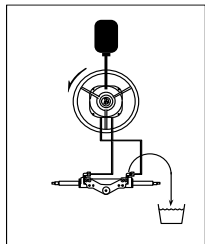
4. Oil Filling and Air Bleeding

These instructions show how to fill and purge the manual hydraulic steering system. Incorrect oil supply or incorrect air-vent will cause helm-mans feel heavy of the steering wheel while rotation of the steering wheel and will cause a continuous wheel turn without stopping.

Recommend Hydraulic Fluid : ISO 15.

FILLING & PURGING		
1. Filling & Purging Kit (OAK-300) includes		
1) Oil coupler, Oil cap, transparent tube (600mm)	2) Transparent tube (1meter) for bleeding from cylinder	3) Push Pin
 <p>OIL COUPLER OIL CAP</p>		
How to fill and Purge the system		
<p>①</p> <p>1. Remove the oil plug (Keep it of reuse) from Helm pump.</p>  <p>PUSH</p> <p>2. Assemble the Oil coupler with tight on the filler port of Helm pump. (Be sure no leak of air or oil)</p>	<p>②</p>  <p>3. Assemble the Oil cap on Oil bottle with tight. (Be sure no leak of air or oil)</p> <p>4. Push the transparent tube (600mm) over the Oil coupler deeply. (Be sure no leak of air or oil)</p> <p>5. Make 3~4 holes on the oil bottle byusing Push pin like drawing.</p>	
<p>③</p> <p>6. After Completing Filling & Purging, block Helm Pump with Oil Plug</p> 	<p align="center">* CAUTION</p>  <p>Empty</p> <p>Oil level</p> <p>NEW OIL</p> <p>*Caution Do not let oil level fall down to 30mm from Oil cap while exchanging new oil bottle.</p>	

4. Oil Filling and Air Bleeding

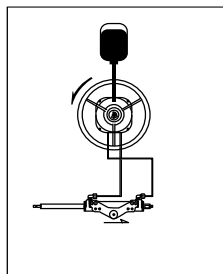


Step 2

Step 1 : Fill the helm pump full of oil.

Step 2 : Open the right bleeder.

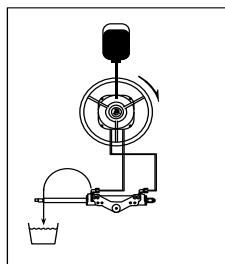
Slowly turn steering wheel anti-clockwise until a steady stream of air free oil comes out of the right bleeder.



Step 3

Step 3 : Close the right bleeder. Continue to turn steering wheel anti-clockwise until the cylinder tube is fully moved on one side of the rod.

Open the left bleeder

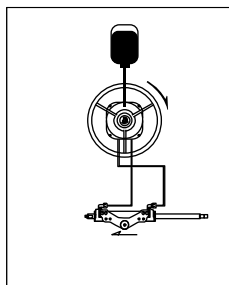


Step 4

Step 4 : Holding the cylinder tube (to prevent it from moving back)

slowly turn the steering wheel clockwise until a steady stream of air free oil comes out of the left bleeder .

While continuing to turn the wheel, close the left bleeder and let go of the cylinder tube.

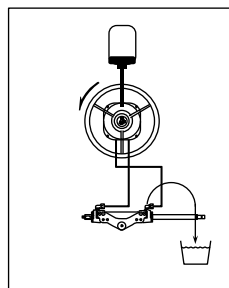


Step 5

Step 5 : Continue turning the steering wheel clockwise

until the cylinder tube is fully moved at other side of rod.

The steering wheel will come to a stop. Open right bleeder .



Step 6

Step 6 : Slowly turn the steering wheel anti-clockwise

until a steady stream of air free oil comes out of bleeder.

While continuing to turn the steering wheel, close the right bleeder.

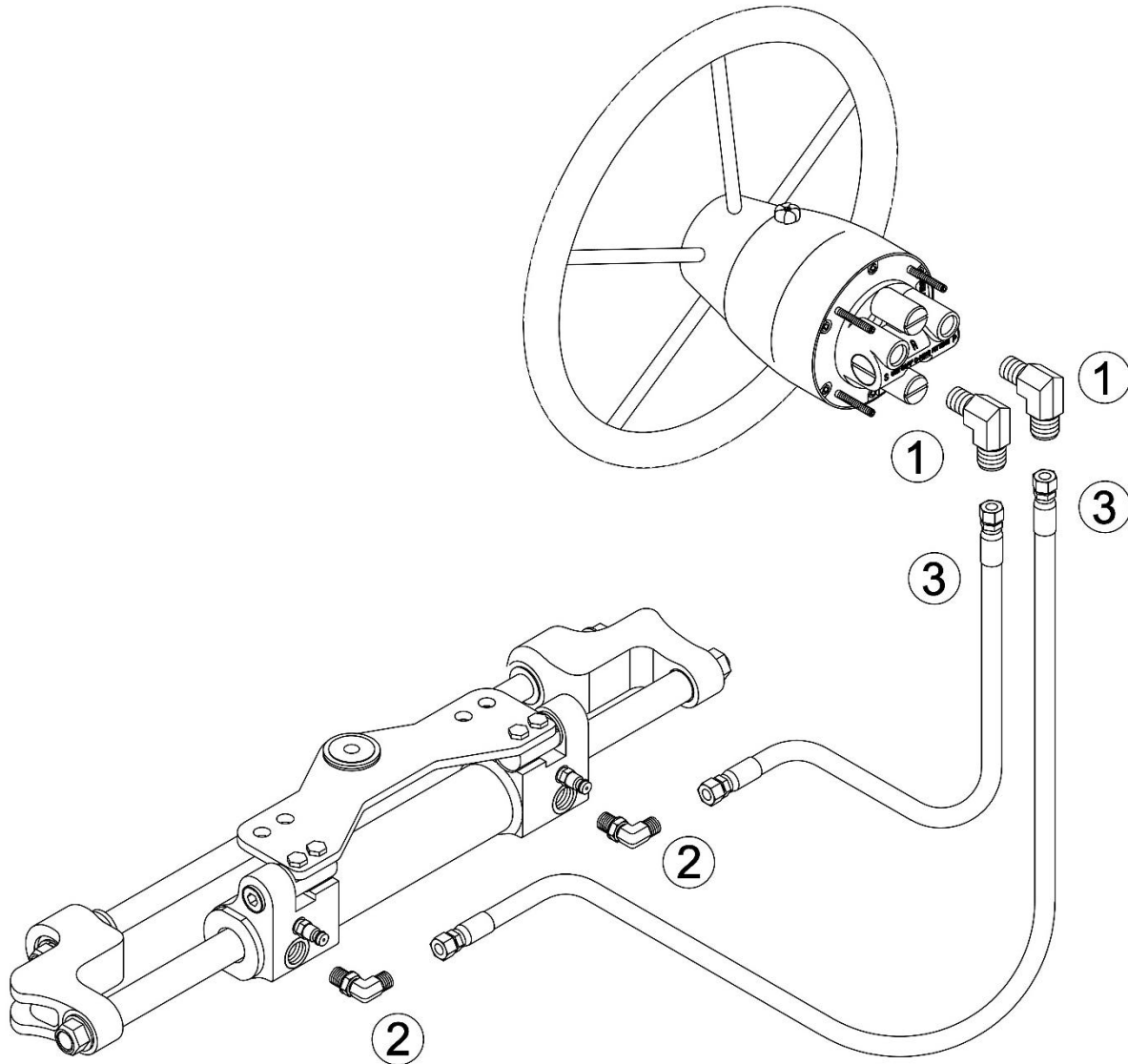
Now, fill and purge is complete.

CAUTION

During the filling the oil, turn the steering wheel slowly. If you turn the steering wheel too fast, foam may grow in the oil. In this case you can continue the filling after 24 hours.

System Diagram –Single Engine

1. SINGLE ENGINE 1-1 Single Station



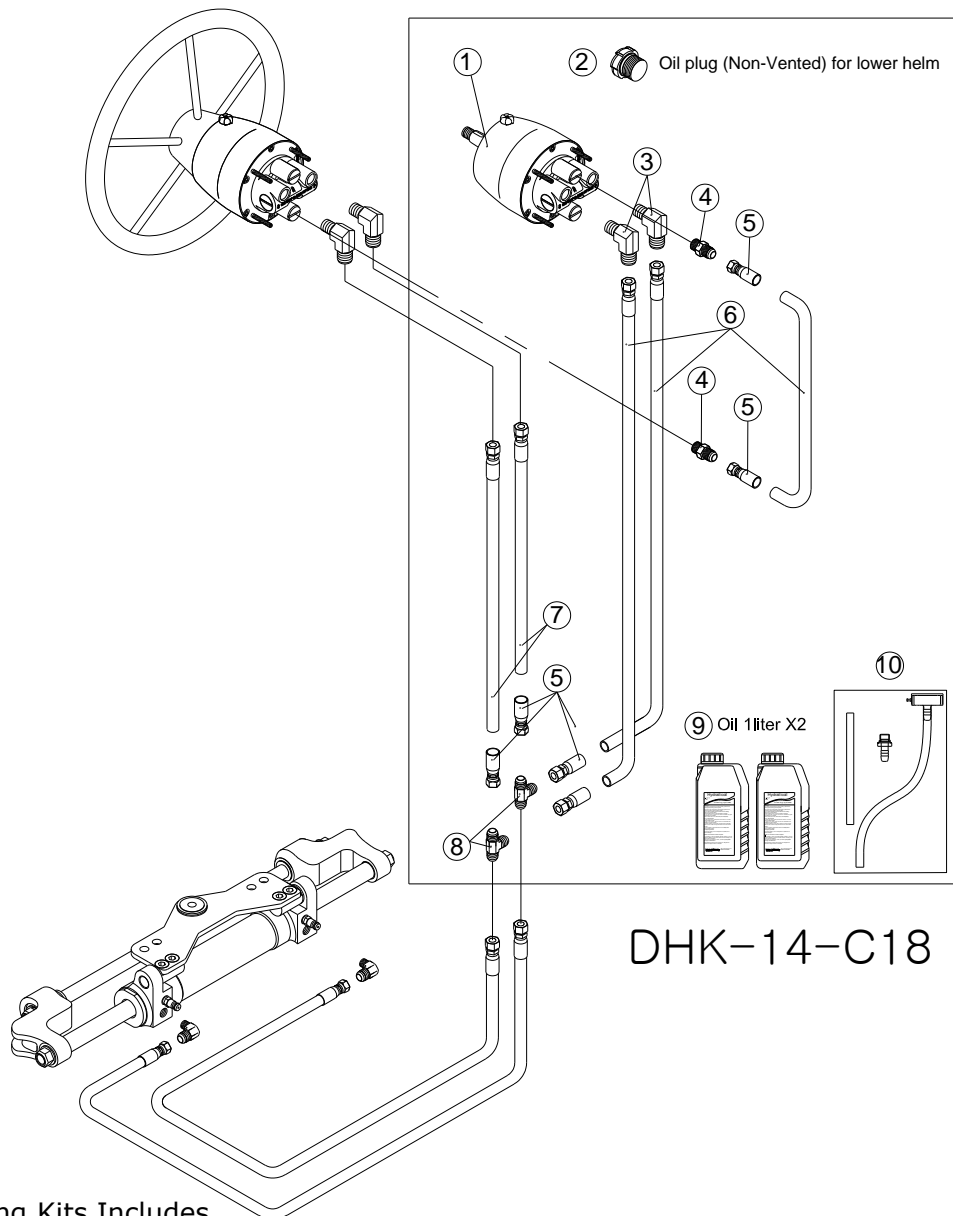
Fitting and Hoses For MO 150H

No	Part Number	Part Name	Q'TY	Remark
1	HLO14H0S	Elbow fitting (PF ¼ Oring x PF 1/4)	2	Standard Supply in MO 150H package.
2	HLO14H0S	Elbow fitting (PF ¼ Oring x PF 1/4)	2	
3	NH04-SS-07	Hose 7M (PF 1/4 hose coupling)	2	

*Fittings & Hose specification could depend on market requirement

System Diagram –Single Engine

1. SINGLE ENGINE 1-2) Dual Station



Dual Steering Kits Includes

No	Description	DUAL STATION ¼ DHK-14-C18	Q'TY
1	HELM PUMP	CSH018	1
2	CAP(Ø1)	C1800802	1
3	ELBOW FIITINGS	HLO14H0S	2
4	STRAIGHT FIITINGS	HSO14H0S	2
5	CAMPUKA	CPK0414	6
6	HOSE 30M	NH04-SS-30	1
7	HOSE 04M	NH04-SS-04	1
8	TEE FIITNGS	HTH300	2
9	OIL (1LITTER)	SF OIL 15	2
10	OIL ACCESSORIES KIT	OAK-300	1

⚠ CAUTION

Poor installation and maintenance may result in loss of steering and cause property damage and/or personal injury. Maintenance requirement change according to climate, frequency and the use. Inspections are necessary at least every year and must carry out by specialized marine mechanics. Check the cylinder fittings and the seals and the helm O-rings to prevent leaks. Replacement if necessary. To keep a suitable oil level in the helm pump, fill and bleed the system as described in the manual. Check the hose and entire system wear, the nut and bolt tightening every six months and make sure that they are not damaged.

Trouble Shooting

Description of failure	Cause of failure	Corrective action
There is some instability when the steering wheel is turned	Air remain	Repeat the air bleeding procedure
	Low oil level in the helm pump	Add the hydraulic oil
	Oil leak	Repair
Steering is hard to turn	The cylinder is not connected properly to the outboard engine	Check and correct the connecting area on the cylinder
	Interference or breakage of hoses and/or fittings	Check for any sharp bent of the hose, or interference and/or breakage on the hose fittings.
	Application of unauthorized hydraulic oil having higher viscosity	Replace the oil with SEAFIRST OIL or alternatively ISO # 15
	Failure of steering pivot shaft on the outboard engine	Contact your dealer for system inspection
Cylinder does not move in response to the steering wheel operation	Foreign matters stuck between the check valve and the seat in the helm pump	Contact your dealer for the check valve replacement
Cylinder returns to the initial position as the steering wheel stops its operation	Air remains in the system	Repeat the air bleeding procedure
	Foreign matters stuck between the check valve and the seat in the helm pump	Contact your dealer for the check valve replacement

Cleaning

Clean the system using water and non-abrasive soap



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