

Hydraulic Steering System For Outboard Engine

Manual for Owner, Installer

MO 700H TYPE



SEAFIRST
ENGINEERING

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Manual Version : SCSM-700H-Ver.1

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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

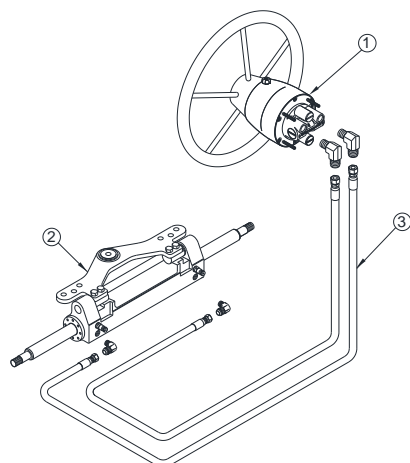
CAUTION

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.

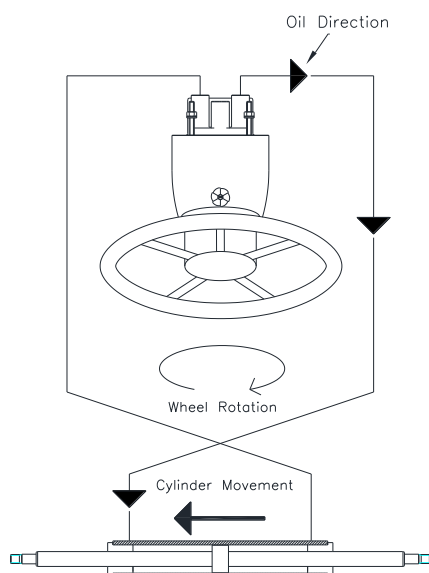
1. Components and its role



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	SOC3822H-W7 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 pump 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 700H type : Complete system for single engine

System Model	Description	Remark
MO 700H-W7	Any above 200HP of all brands	SOC 3822H-W7

700HP APPLICABLE

MO 700H type package



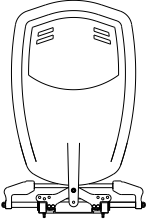
Cylinder based on SOC 3822W-7 type

1-2) Components of MO 700H-W7

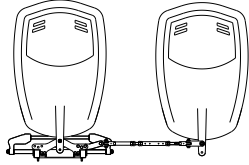
Model	Description	Page
NSH025	Front Mount Helm pump	9
SOC 3822H-W7	Front Mount Outboard cylinder	11
SF OIL 15 Hydraulic Oil	Hydraulic oil 1 liter x 2 bottles.	-
NH 06-SS-07 Hydraulic Hose	3/8" Hydraulic Hose 7 meter x 2pcs	
Accessories included	Helm pump fittings, Helm pump mounting hardware kit, Accessories kit OAK-300 (Bleed tube, Funnel, Oil supply tube)	-
The Steering Wheel is not included in the package.		-

2. General Order Guide

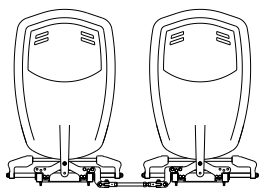
2-1) MO 700H-W7 - Single engine, Single Cylinder

System	Application	Wheel Turns	Components	Model	Q'ty	Remark
	Any above 200hp of all brands	6.5	Cylinder Helm Pump Hose Oil Accessories kit	SOC 3822H-W7 NSH 025 NH 06-SS-07 SF OIL 15 OAK-300	1 1 2 2 1	MO 700H Package Kit

2-2) MO 700HT1-W7 - Twin engine, Single Cylinder

System	Application	Wheel Turns	Components	Model	Q'ty	Remark
	Up to 700HP	6.5	Cylinder Helm Pump Hose Oil Accessories kit Tie Bar	SOC 3822H-W7 NSH 025 NH 06-SS-07 SF OIL 15 OAK-300 3822-TBA-1-2	1 1 2 2 1 1	MO 700HT1-W7 Package Kit

2-3) MO 700HT2-W7 - Twin engine, Two Cylinder

System	Application	Wheel Turns	Components	Model	Q'ty	Remark
	Up to 1400HP	10.8	Cylinder Helm Pump Hose Hose Hose Coupling T fitting Oil Accessories kit Tie Bar	SOC 3822H-W7 NSH 030 NH 06-SS-07 NH 06-SS-04 C3520149 HTO14NNS SF OIL 15 OAK-300 3822-TBK-2-2	2 1 2 1 4 2 4 1 1	MO 700HT2-W7 Package Kit

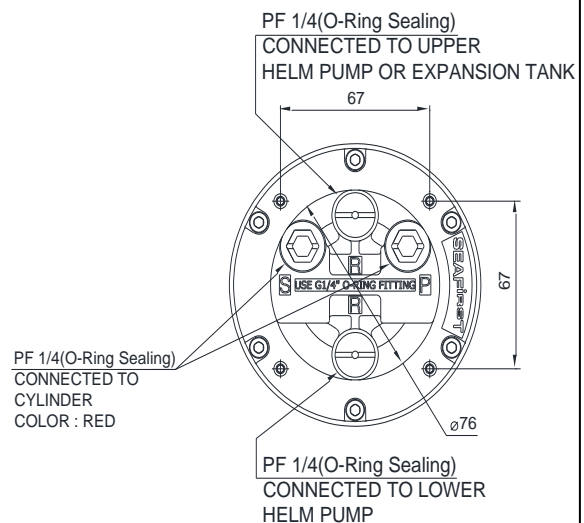
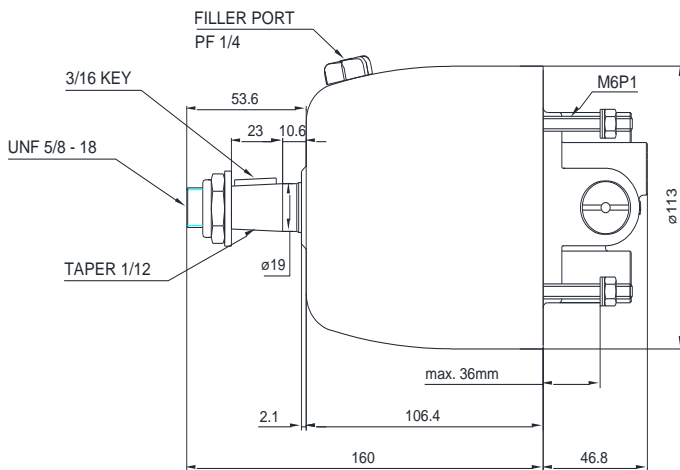
Installation – Helm Pump

1. HELM PUMP

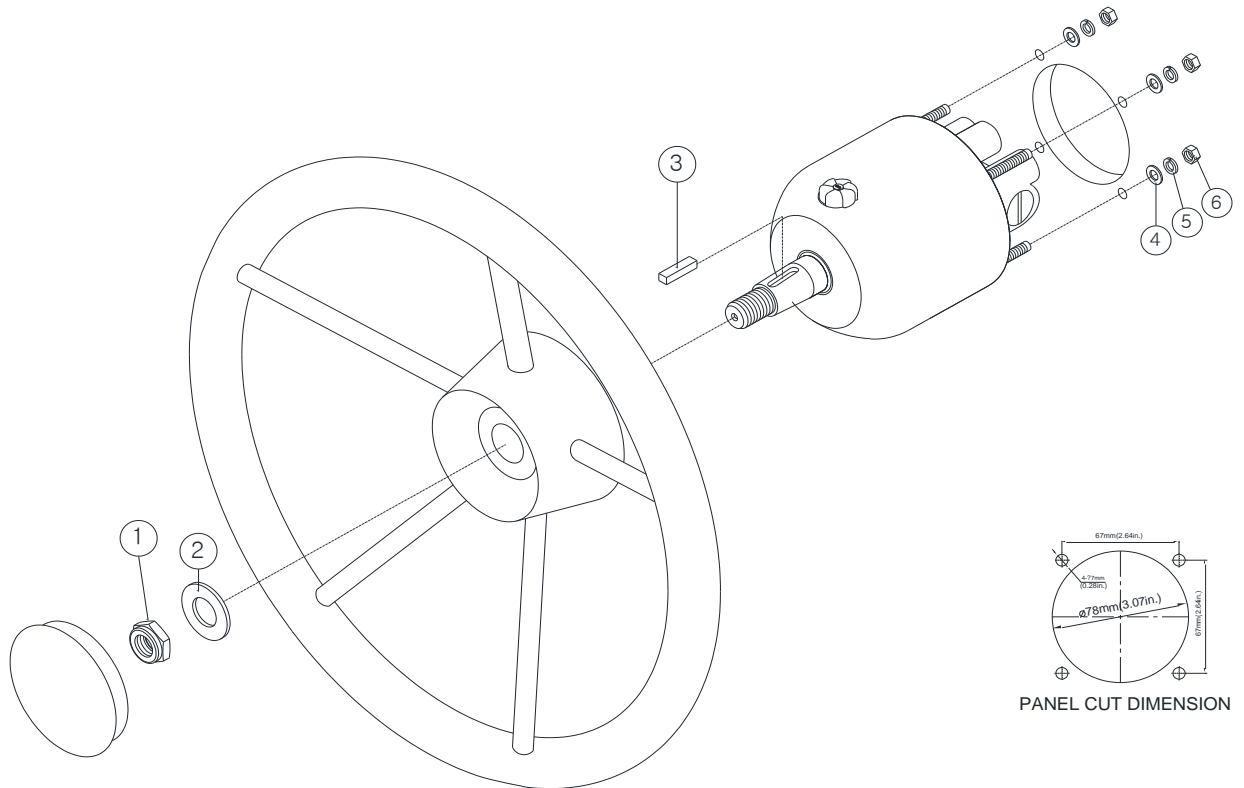
1-1) : SPECIFICATION & FUNCTION

Model	Displacement		Lock valve	Steering Wheel
	cc / rev	cu.in / rev		
NSH 018	18	1.09	Built-in	Min Dia 260mm
NSH 022	22	1.34		Min Dia 350mm
NSH 025	25	1.52		Min Dia 350mm
NSH 030	30	1.83		Min Dia 350mm
NSH 037	37	2.26		Min Dia 395mm
NSH 044	44	2.68		Min Dia 395mm

- Maximum durability
- 3 ball bearings supporting the rotar, which make the helm pump be used for heavy duty use.
- SS 304 shaft
- 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 wheel mounting hardware supplied as standard
- Interconnecting ports (black plugs) for dual stations of steering .
- Common dash hole mount for easy replacement with other brand



1-2) MOUNTING THE HELM PUMP IN FRONT



Mounting the helm pump (NSH 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 58 Nylon Nut, Plain Washer UNF 5/8-18 supplied as mounting hardware.

Mounting Hardware Kit

No	Description	Q'ty	No	Description	Q'ty
1	58 Nylon Nut	1	4	Plain Washer M6	4
2	Plain Washer UNF 5/8-18	1	5	Spring Washer M6	4
3	Straight Key 3/16"	1	6	Nut M6	4

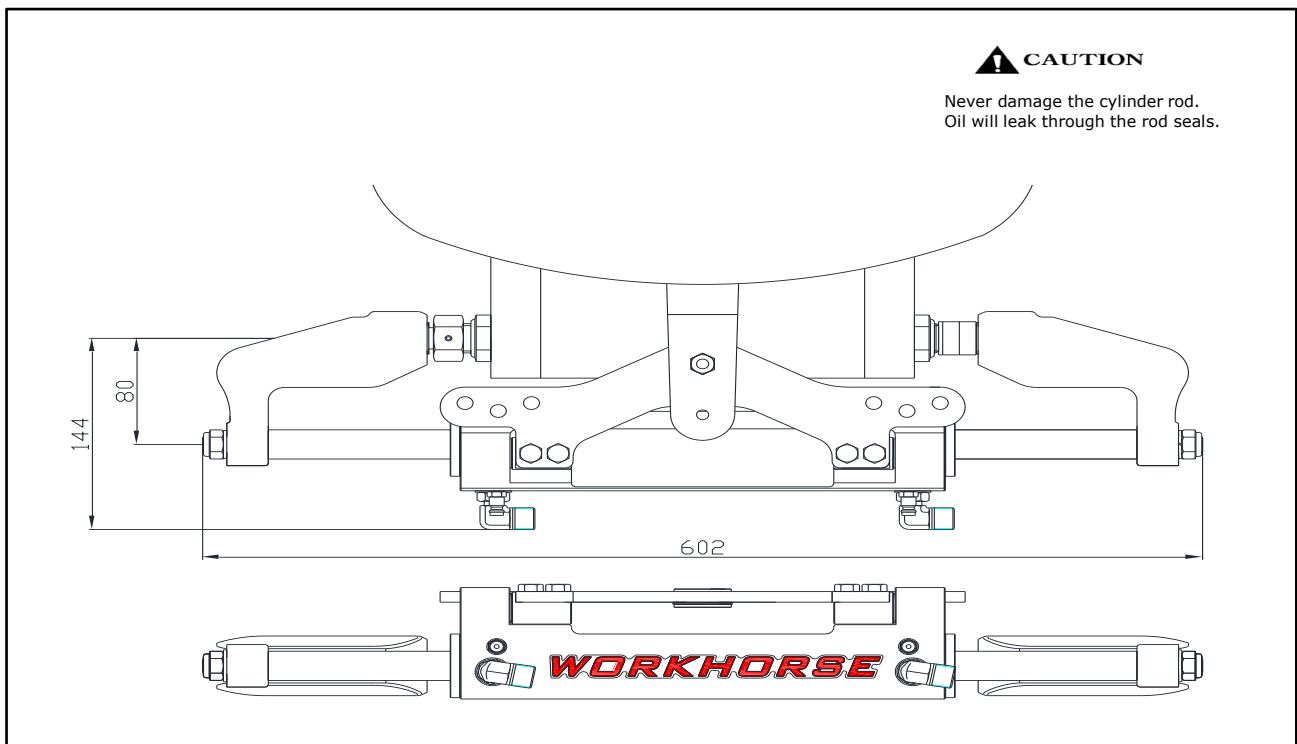
2. Cylinder

2-1) Dimension & Specification

Basic Model : SOC 3822H-W7	
Volume	168cc
Output force	528kg
Shaft diameter	22mm
Bore diameter	38mm
Stroke	215mm

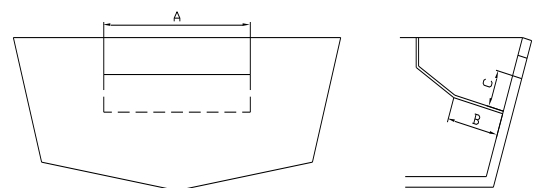
- Stainless steel shaft with hard chrome plate
- Aluminum tube with anodizing
- Aluminum arms with anodizing
- Stainless steel lock nuts
- Compact Design for less space installation
- Install for single and multi engines
- Balanced cylinder : The number of turns lock to lock is equal port to starboard

SOC 3822H-W7 type

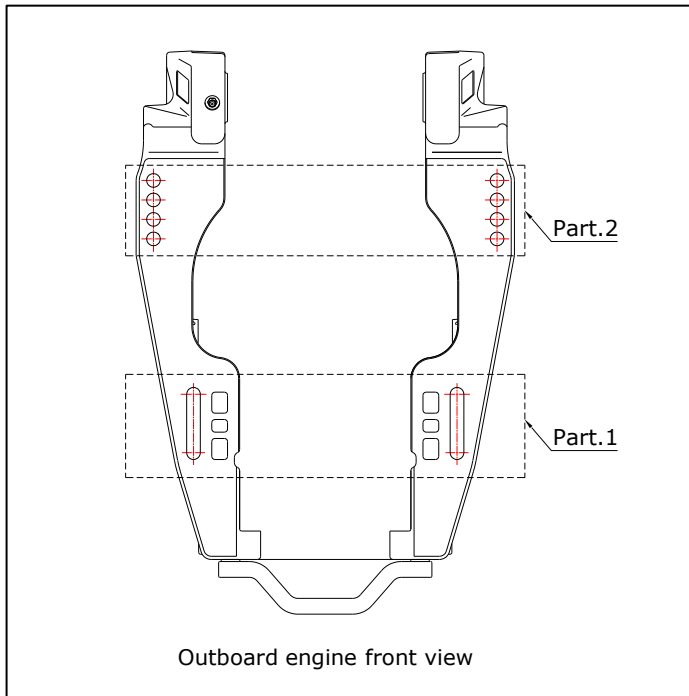


2-2) Splashwell Dimension Requirements

No of Engine	A	B	C	Min. engine center distance
1	608mm	165mm	140mm	N/A
2	1256mm	152mm	127mm	680mm

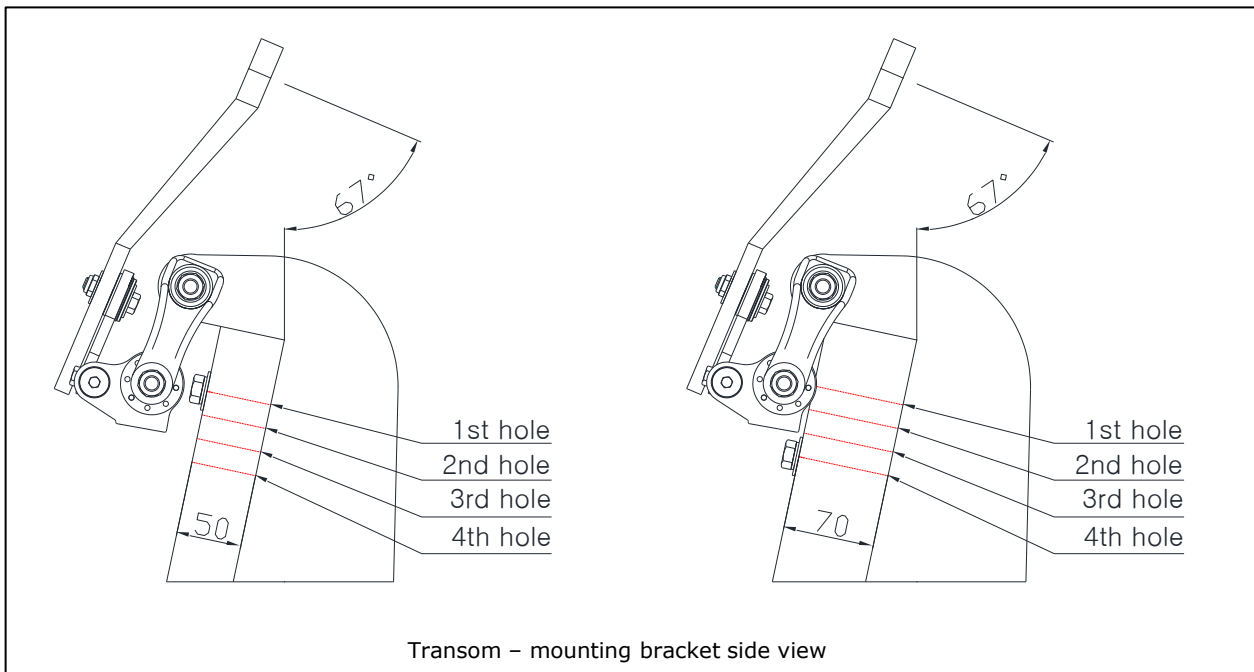


2-3) Engine Bolt Position



PART 1. Transom bolt - Position

- Mount the outboard engine on the transom, then use transom bolts to fix the engine on PART 1 marked on the picture.
- After completing the fixation on PART 1, refer to the below pictures for PART 2.

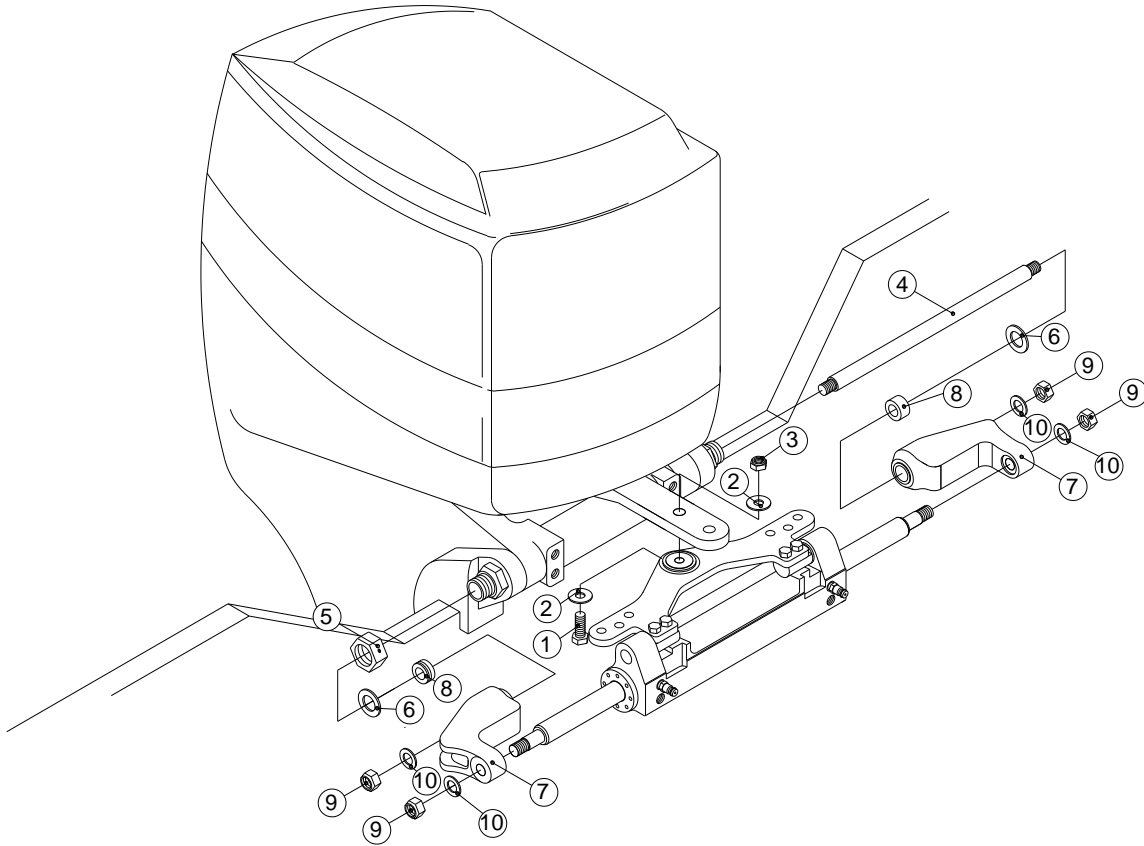


PART 2. Transom bolt - Position (Recommend)

- If the thickness of transom is greater than 50mm, the bolt must be tightened on 4th hole.
- If the thickness of transom is less than or equal to 50mm, the bolt can be positioned at any hole

2-4) Install cylinder to engine

Cylinder model : SOC 3822H – W7

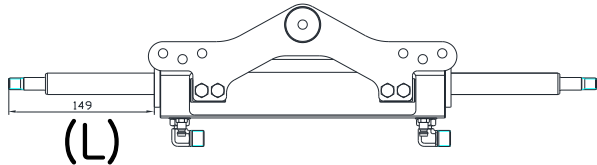


No	Part Number	Q' TY	Description
①	B30824038S	1	Bolt
②	PW1018020S	2	Plain washer
③	NY030824014SS	1	Nylock Nut
④	C3520137	1	Support rod
⑤	C3520139	1	ADJ. nut
⑥	PW1625025S	2	1.5T Plain washer
⑦	C3822115	2	ARM R
⑧	C3520123-H	2	Space ring kit
⑨	NY12150019S	4	Nylock Nut
⑩	PW1224020S	4	Plain Washer

2-5) Install cylinder to engine

SOC 3822H-W7 cylinder

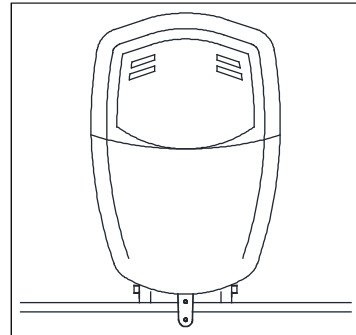
1. After removing the protective caps of the fittings, manually center the rod of the cylinder body. For the center, “(L)” length should be 149mm.



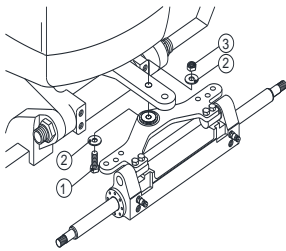
⚠ CAUTION

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

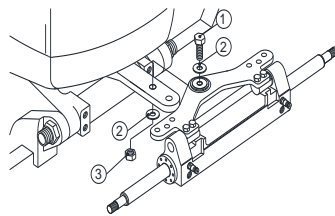
2. Position the engine straight so that its arm is perpendicular to the transom.



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.

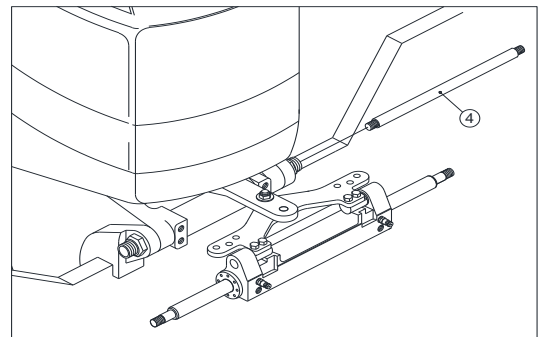


For YAMAHA, SUZUKI



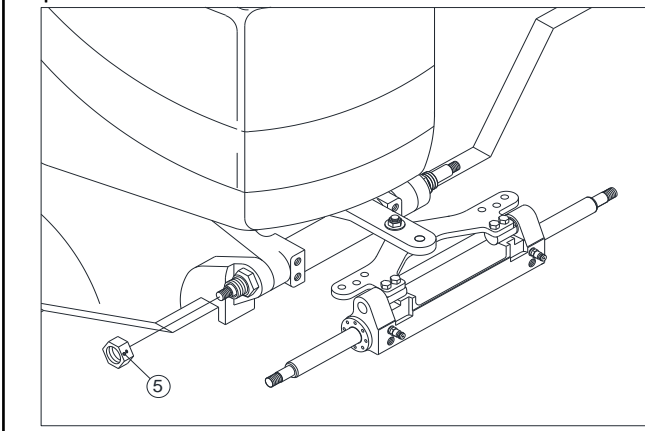
For HONDA, MERCURY

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

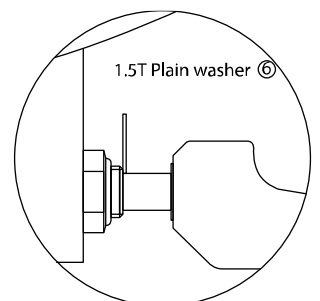
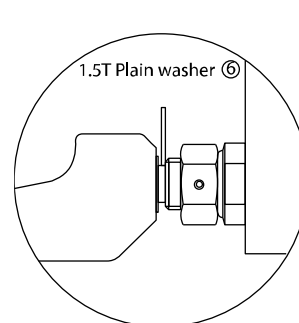


⚠ Grease the support rod ④, by using marine grease to prevent the corrosion of the metal parts.

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 1.5T plain washer and arms in both sides as shown in the picture.

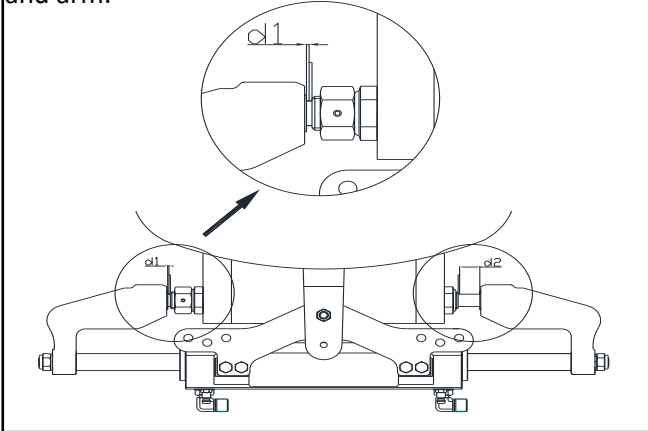


Installation – Cylinder

2-5) Install cylinder to engine

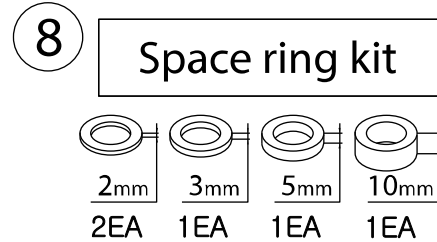
SOC 3822H-W7 cylinder

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

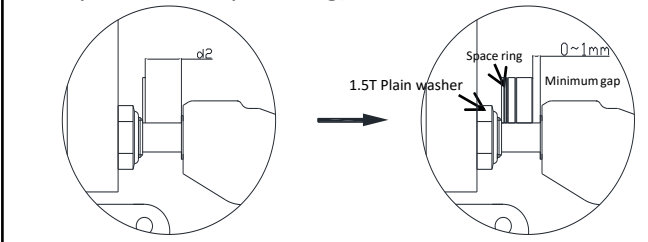


8. If the gap(d1) is less than 1mm, do not use any space ring.

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 and arm and choose the proper space rings to fill the gap. Leave 2mm 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)



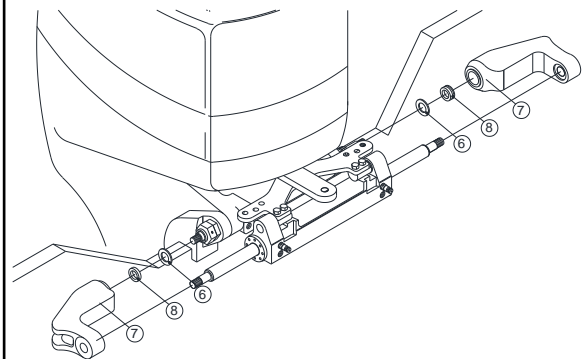
Example

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

(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.

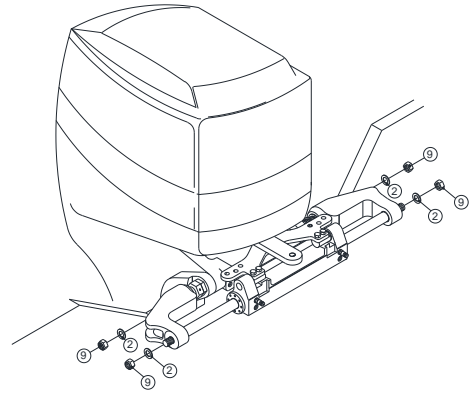


2-5) Install cylinder to engine

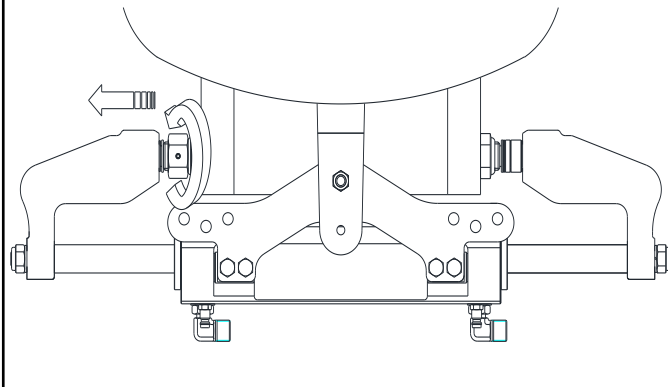
◆ NOTICE

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.

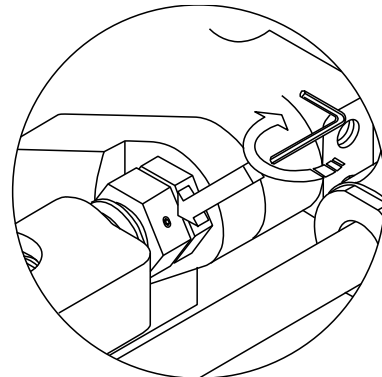
12. Insert the washers ② on the ends of the support rod and cylinder rod. and tighten the nuts ⑨ with a torque [70Nm] after greasing.



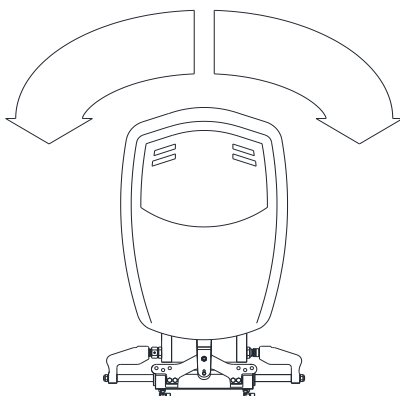
13. Screw the ADJ nut to the left side and bring it into contact with the 1.5T plain washer, until clearance is eliminated.



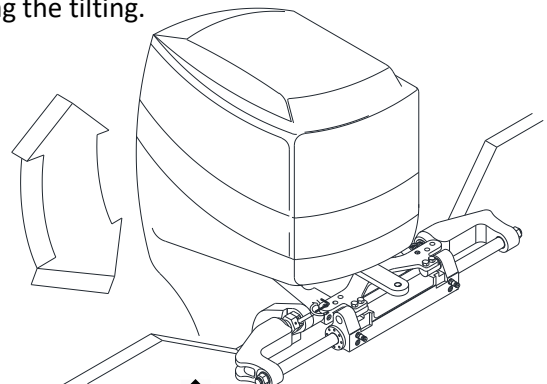
14. Tighten the set screw on ADJ nut with a 2mm allen key(hex key).



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.



◆ WARNING

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

3. Test Procedures

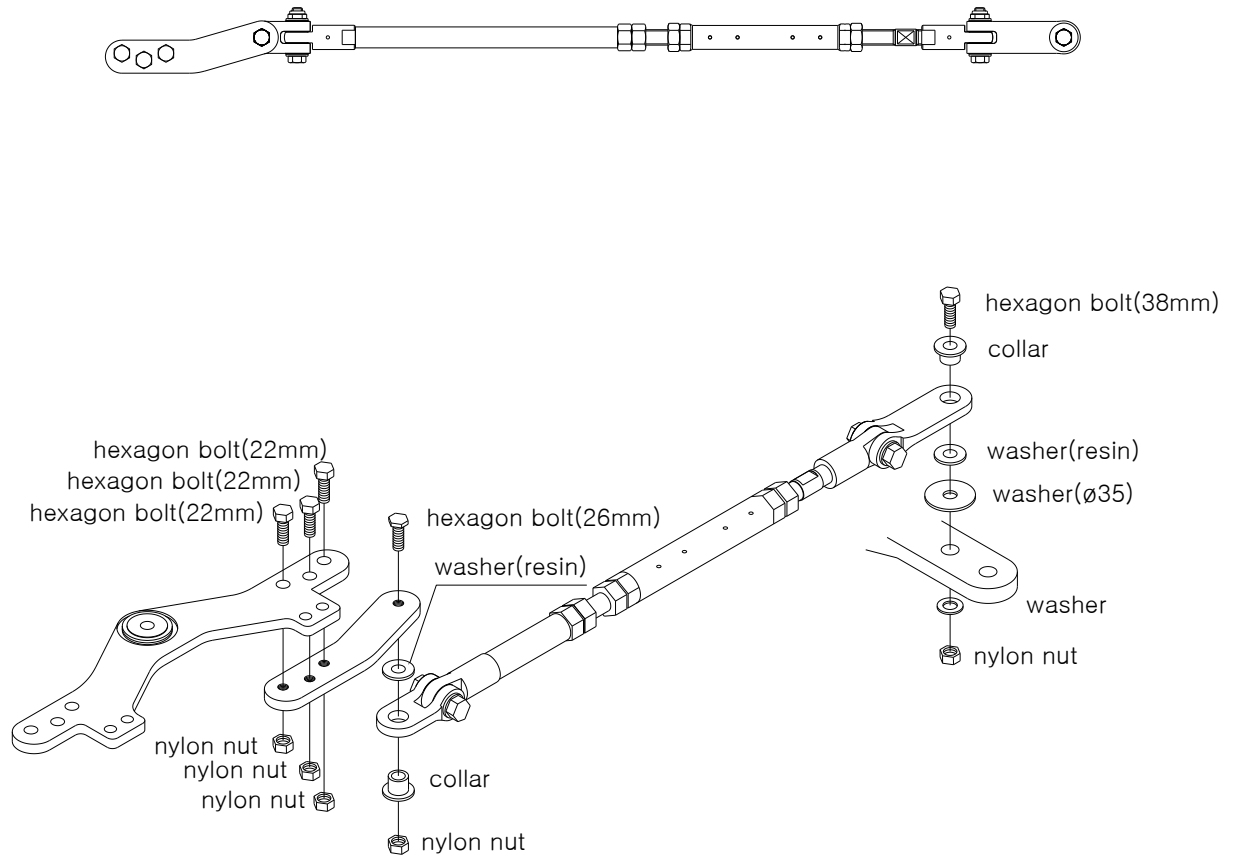
3-1) Test Procedures after Installation

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	Ideal wheel turn to achieve <ul style="list-style-type: none"> •18cc helm pump with SOC3822 cylinder : 9.3 •22cc helm pump with SOC3822 cylinder : 7.6 •25cc helm pump with SOC3822 cylinder : 6.7 •30cc helm pump with SOC3822 cylinder : 5.6 •37cc helm pump with SOC3822 cylinder : 4.5 •44cc helm pump with SOC3822 cylinder : 3.8
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	

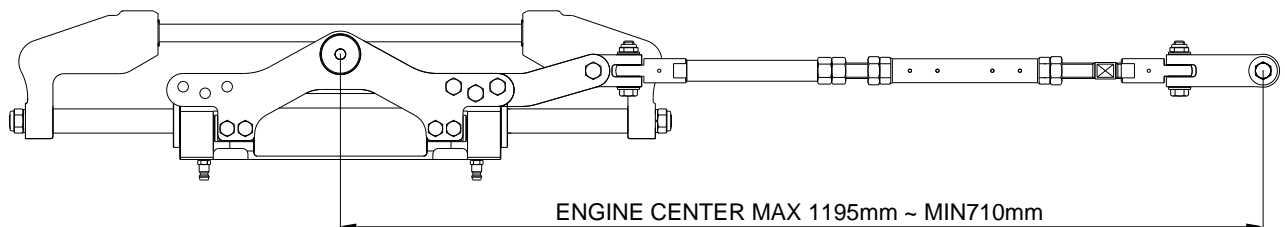
4. Tie Bar

4-1) TIE BAR MODEL : 3822-TBA-1-2 (Single Cylinder For Twin Engines)

4-1-1) Specification



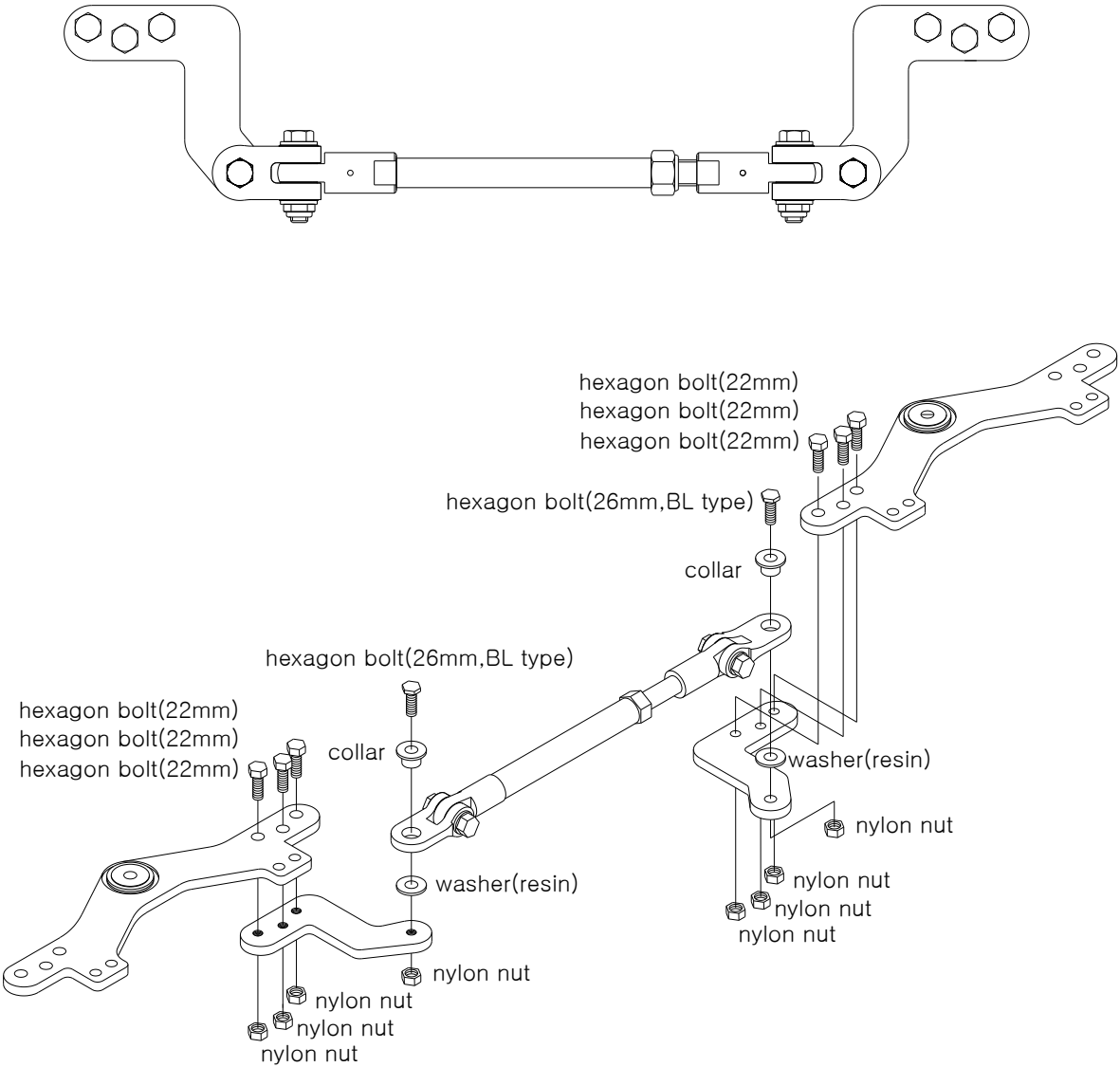
4-1-2) Application



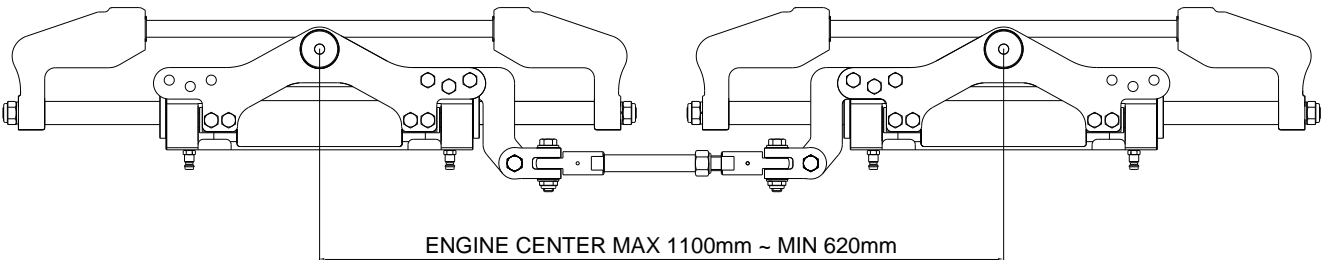
4. Tie Bar

4-2) TIE BAR MODEL : 3822-TBK-2-2 (Twin Cylinder For Twin Engines)

4-2-1) Specification



4-2-2) Application



Installation – Oil Filling and bleeding

5. 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

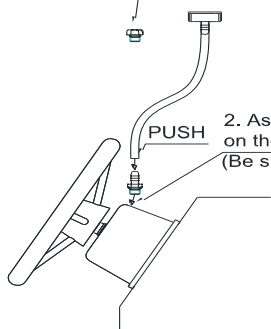
3) Push Pin



How to fill and Purge the system

①

1. Remove the oil plug (Keep it of reuse) from Helm pump.

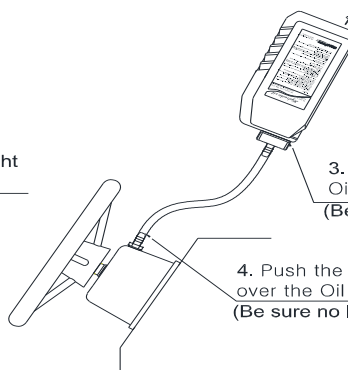


2. Assemble the Oil coupler with tight on the filler port of Helm pump. (Be sure no leak of air or oil)

PUSH

②

5. Make 3~4 holes on the oil bottle by using Push pin like drawing.

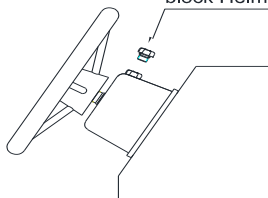


3. Assemble the Oil cap on Oil bottle with tight. (Be sure no leak of air or oil)

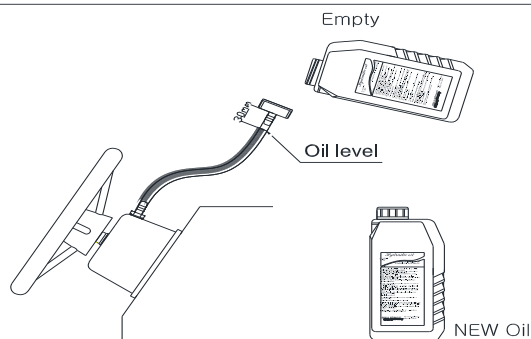
4. Push the transparent tube (600mm) over the Oil coupler deeply. (Be sure no leak of air or oil)

③

6. After Completing Filling & Purging, block Helm Pump with Oil Plug

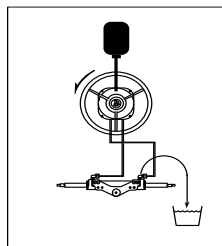


※ CAUTION



※ Caution
Do not let oil level fall down to 30mm from Oil cap while exchanging new oil bottle.

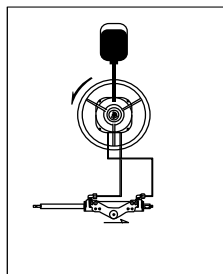
5. Oil Filling and Air Bleeding



Step 2

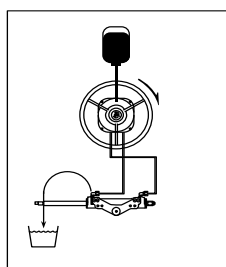
Step 1 : Fill the helm pump full of oil.

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.



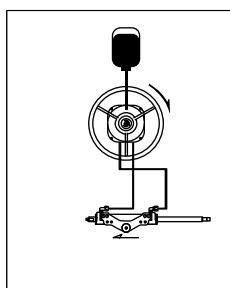
Step 3

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



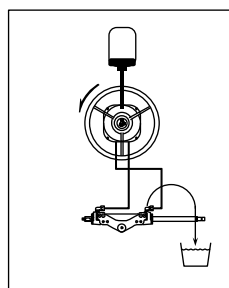
Step 4

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.

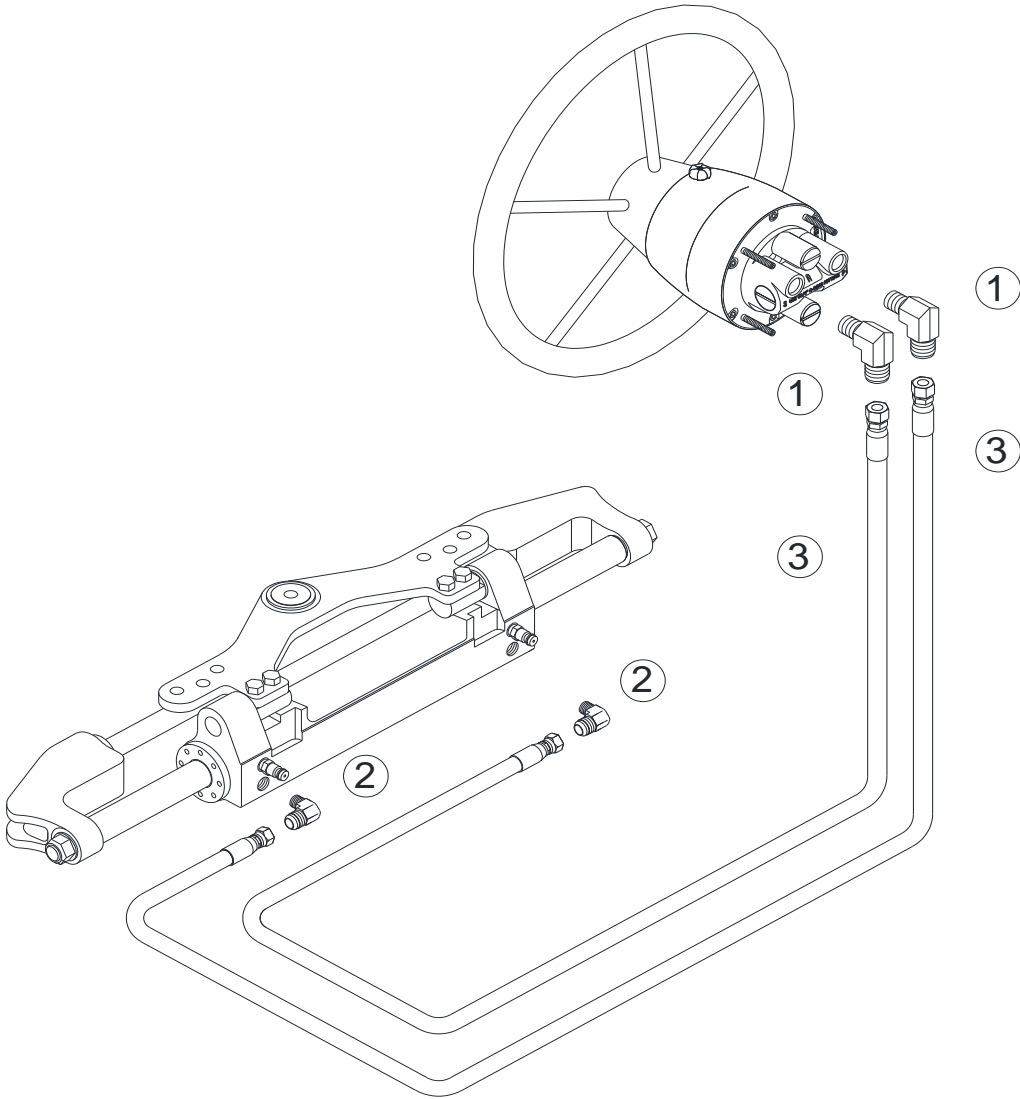
CAUTION

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 700H-W7

No	Part Number	Part Name	Q'TY	Remark
1	HLO14N0S	Elbow fitting (PF 1/4 Oring x PF 3/8)	2	Standard Supply in MO 700H-W7 package.
2	HLO14N0S	Elbow fitting (PF 1/4Oring x PF 3/8)	2	
3	NH06-SS-07	Hose 7M (PF 3/8 hose coupling)	2	

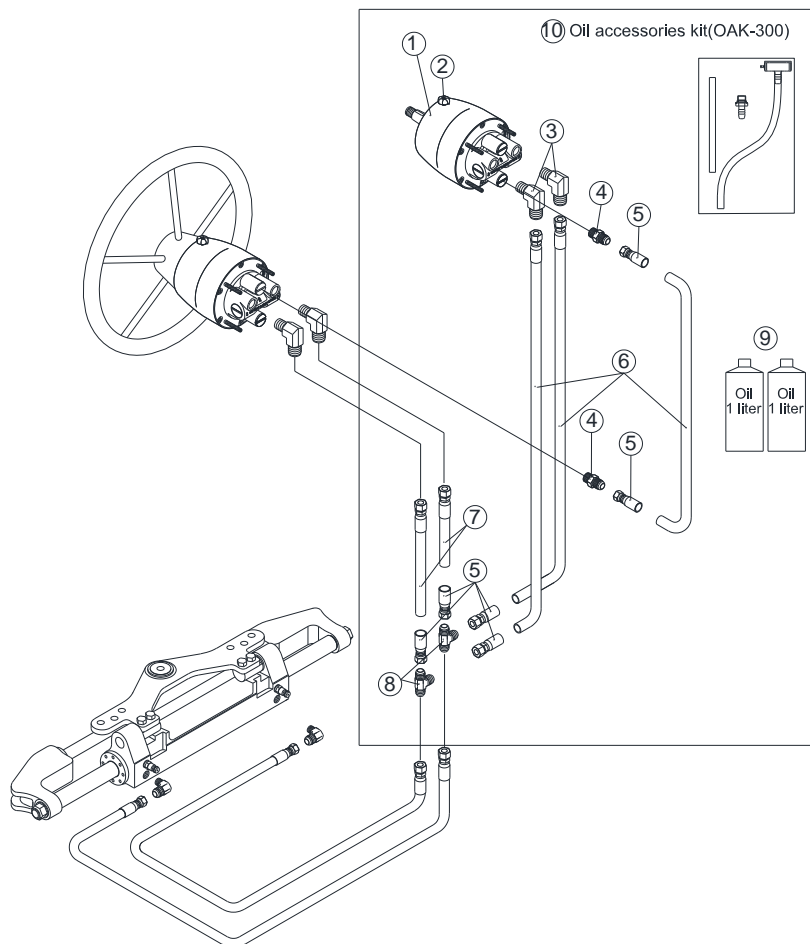
*Fittings & Hose specification could depend on market requirement

1. SINGLE ENGINE

1-2 Dual Station

Dual station Kit 3/8

Part No : DHK-38-25



Dual Steering Kits Includes

No	Description	DUAL STATION 3/8 DHK-38-25	Q'TY
1	HELM PUMP	NSH-025	1
2	CAP(Blocked)	C1800803	1
3	ELBOW FIITINGS	HLO14N0S	2
4	STRAIGHT FIITINGS	HSO14N0	2
5	REUSABLE HOSE COUPLING	C3520149	6
6	HOSE 30M	NH06-SS-30	1
7	HOSE 04M	NH06-SS-04	1
8	TEE FIITNGS	HTN300	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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