



TECHNICAL MANUAL



**HYDRAULIC CYLINDER
FOR INBOARD ENGINES**

UC 339-I

UC 442-I

UC 530-I



Technical Manual for Equipments of:
HYDRAULIC STEERING GEAR

PAGES LIST

Technical Manual comprises of:

- n. 3 preliminary pages
- n. 8 descriptive pages
- n. 5 tables



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1.1 Cylinders description:

The production of hydraulic cylinders from 172 Kgm to 270 Kgm are designed and manufactured utilizing advanced technology to meet the highest quality standards and requirements of our customers.

This is a list of features that differ from our competitors:

- **Brass Cylinder tube**, this material can withstand higher pressures than aluminium cylinder tubes.
- **Double seals** are used in each cylinder head to compensate the small leaks due to many hours of work.
- **Straight threaded holes** for the input and output ports that allow the use of a washer for assembly of rigid tubing or flexible hoses for an increased seal tightness.
- Avoiding the use of taper threads, means that Teflon tape or Loctite can be eliminated.
- **The bleeder screws** are separate from the hose fittings, and are inclined at 30° to help bleed the system without having to lift the cylinder.
- **Piston Rods in Stainless steel AISI 316, chromium plated & ground** in a protected environment to guarantee a maximum plating of chrome, and an excellent protection against marine corrosion, together with a low surface roughness guaranteeing a long seal life.
- The chrome contributes to eliminating at least 30% of friction due to the use of seals, whereas the hardness protects against accidental scratching which is another cause of seal wear.
- **One end of the rod is machined** to allow the use of a spanner to secure the positioning of the ball joint.
- **Cylinder support in brass.**

NB: On request, hydraulic cylinders with rod end ball joints in stainless steel AISI 316L for marine use, anti corrosion and maintenance free, to reduce problems dismantling the pins.



2.1 Safety Instructions

- a) Before any trial, control and functional test of the Steering Gear, make sure that the steering gear and the rudders are able to manoeuvre without causing damage.
- b) Do not leave the system with power on, if not needed (ship anchored).
- c) Before any maintenance or replacement of electronic or hydraulic components, switch off the power supply and inform by use of appropriate signs that the manoeuvre of equipment is prohibited because of work in progress.
- d) In case of the need to proceed with electrical, hydraulic or mechanical adjustments with the equipment powered on and functional, be very careful of moving parts and use only isolated tools.
- e) Carry out the adjustments, and restore the equipment according to their normal function.
- f) Before starting onboard work near electrical, mechanical or hydraulic materials, take care by protecting with an appropriate cover.

2.2 Preliminary Controls

- a) Make sure that the Steering gear and rudder can manoeuvre without causing damage.
- b) Check that all tubing is connected correctly.
- c) Check that the motors and solenoid valves are powered.



3.1 Mounting platform:

The machine installation can be done in differently desired directions, for this purpose an iron or sound wood Mounting Platform must be prepared and fixed firmly to the hull at the required height and perfectly square with the rudder stock.

3.2 Fastening of the iron base:

Before drilling the mounting platform, with the base (already drilled), make sure that:

- 1) The rudder is in a symmetrical position with the boat
- 2) The cylinder rod is in the intermediate position of its stroke (1/2 way)
- 3) The base axis in parallel with the boat axis.
- 4) The base is at the correct distance from the rudder axis “**Steering gear axis centre**” to be **respected** after which it may be drilled and tightened with bolts.

3.3 Alignment between rudder axis and cylinder axis:

Before tightening the bolts, suitable thicknesses of packing should be used, (if the mounting platform could not be planed before) in a way that the inclination between the cylinder axis and the two gudgeon pins (tiller arm base), is not more than approx 2°; errors within this range are compensated for by the ball joints on the cylinder rods.

A good alignment is to be preferred as well as the welded stops at the base angles, after tightening the bolts.

**4.1 Rigid tubing:**

It is advisable to use steel tubing without welding (Mannesman) of different diameters as indicated in the drawing "Hydraulic Scheme"

The various connections must be made with steel flanges to be welded electrically to the tube, or threaded steel pipe fittings or welded steel pipe fittings; do not use hemp on the threaded pipe fittings but an appropriate Teflon tape, found on sale.

Check to see that the tubes are internally clean before assembling, fasten well with brackets so that they will not vibrate and do not pass inside the cold stores, even if the oil used is at a low freezing point.

The position of the tube connections "1" and "2" which go from the hydraulic transmitter to the power packs and then to the actuator must not be inverted.

4.2 Flexible tubing:

The flexible tubing should be mounted with the external fitting, using two spanners so no deformation occurs.

They should be free of any contact, so no rubbing occurs during working.

(All the Tubing will be installed by the Shipyard)

**5.1 Manual hydraulic system “A”:**

By turning the steering wheel the hydraulic pump/transmitter sends oil to the actuator/cylinder which moves the tiller arm, and thus the rudder shaft in the desired direction.

The power sent to the actuator is supplied by the operator and depends upon the diameter of the wheel, the ratio between the delivery of the hydraulic transmitter and c.c. of the actuator (the number of turns is decided on by this ratio), as well as the tube dimensions for reasons of friction.

5.2 With Emergency Manual Tiller Arm (to be carried out by the shipyard)

In case of an electric power failure the manoeuvre is always possible with the hydraulic transmitter.

In case of the manual hydraulic system “A” failure proceed by opening the actuator by-pass, and manoeuvre with the emergency tiller arm.

If provided, prepare the chain blocks, insert the emergency Tiller arm, close the exclusion valve of the V.E.I.S. valve which excludes the tubing and cylinders, then manoeuvre according to the instructions from the bridge.



Chapter 6	FILLING THE SYSTEM
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Unscrew one of the air bleeder screws on the cylinder and insert the transparent plastic tubing on it and place the other end into a bucket. Now start filling the Transmitter with oil and slowly turn the hydraulic transmitter steering wheel in the same direction as the unscrewed air bleeder screw until clean oil comes out of the tube with no air bubbles. Close the air bleeder screw.

Now repeat the same operation with the other air bleeder screw on the cylinder, filling and turning the wheel in the opposite direction until clean oil comes out of the tube with no air bubbles.
The oil level in the transmitter should not be above the piston block inside.

Once finished filling the system, turn the wheel from hard over to hard over several times to see if the rudder responds correctly and check that there are no leaks at the connections.
The transmitter plug/cap must be vented.

Chapter 7	MAINTENANCE
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It is sufficient for the maintenance to periodically control the transmitter oil level, which should not be below the minimum level.

Periodically grease the device and the stainless steel piston rods.

The piston rods should be protected from eventual leaking from the top cover.

Chapter 8	MAINTENANCE
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Use **ULTRAFLEX** oil or other compatible oils:

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

Technical feature:

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