USER MANUAL

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ELECTRO-HYDRAULICALLY OPERATED PILOT DOOR & ROPE LADDER REEL

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1. INTRODUCTION

1.1 GENERAL

The pilot doors are fitted in the side shell plating, one at port side and the other at starboard side.
The pilot doors consist of folding type door and ladder reel with pilot ladder. The doors are in closed position flush with the side shell plating. And in open position the door stow inside with folded at folding hinge. The doors are watertight by means of a sealing steel bar in coaming. In closed position, the doors are secured by six hydraulically operated cleating devices. In addition, these can be mechanically secured by 2 locking.
On site installation is limited to welding of the frame assembly, ladder reel assembly, grating assembly and connection of the electric and hydraulics.
Every door is factory tested and adjusted. Moreover, the door is approved by Germanischer Lloyd.

1.2 SAFETY PRECAUTIONS

1.2.1 HYDRAULIC SYSTEM

Installation and maintenance procedures must be performed by qualified personnel only.
For safety reasons, no pipe connections or components may be loosened while the hydraulic system is under pressure.

Always switch off the pumps before starting any work on the hydraulics. Never work with oily hands.

1.2.2 ELECTRICAL SYSTEM

Installation and maintenance procedures must be performed by qualified personnel only.
Use extreme care when troubleshooting or performing maintenance tasks on installation parts which use high voltages.
As a precautionary measure, use only one hand when servicing electrically live equipment.
Use caution when overriding interlocks to trouble shoot.
Remove all power from the system, before starting a maintenance procedure, to prevent unexpected door operation.
Always verify that power is shut-off before connecting or disconnecting cables.

2. OPERATION DESCRIPTION

2.1 NORMAL OPERATION

-Opening the door-

1. Release the safety bar installed at the pilot door.
2. Confirm if "EMERGENCY OPERATION" switch is turned off.
3. Turn on the "MAIN POWER" switch.
4. Turn on the "HYDRAULIC PUMP" switch.
5. Open the pilot door completely by pushing the "DOOR OPEN" button.
6. Install the temporary rope guide at the side shell coaming.
7. Open the grating by pushing the "GRATING OPEN" button.
8. Lift up the ladder reel by pushing the "LADDER REEL UP" button.
9. Spread the ladder down by pushing the "LADDER DOWN" button.
10. Return the ladder reel to original position by pushing the "LADDER REEL DOWN" button.
11. Close the grating by pushing the "GRATING CLOSE" button.
12. Turn off the "HYDRAULIC PUMP" switch
13. Turn off the "MAIN POWER" switch.
14. Install the temporary hand rail at the side coaming.

-Closing the door-

1. Remove the temporary hand rail from the shell side coaming.
2. Turn on the "MAIN POWER" switch.
3. Turn on the "HYDRAULIC PUMP" switch.
4. Open the grating by pushing the "GRATING OPEN" button.
5. Lift up the ladder reel by pushing the "LADDER REEL UP" button.
6. Wind up the ladder by pushing the "LADDER UP" button.
7. Return the ladder reel to original stowing position by pushing "LADDER REEL DOWN" button.
8. Close the grating by pushing the "GRATING CLOSE" button.
9. Remove the temporary rope guide from the side shell coaming.
10. Close the pilot door completely by pushing the "DOOR CLOSE" button.
11. Turn off the "HYDRAULIC PUMP" switch.
12. Turn off the "MAIN POWER" switch.
13. Return the safety bar to the original locked position.

2.2 EMERGENCY OPERATION

2.2.1 IN THE CASE OF LIMIT SENSORS FAILURE

-Opening the door -

1. Release the safety bar installed at the pilot door.
2. Turn on the "MAIN POWER" switch.
3. Turn on the "HYDRAULIC PUMP" switch.
4. Turn on the "EMERGENCY OPERATION" switch.
   -Check if the "EMERGENCY OPERATION" lamp is lit on.

-Check if the "DOOR CLOSE" lamp is on.
5. Unlock the door cleats by pushing the "CLEAT UNLOCK" button.
6. Open the pilot door completely by pushing the "DOOR OPEN" button.
7. Install the temporary rope guide at the bottom side of coaming.
8. Open the grating by pushing the "GRATING OPEN" button.
9. Lift up the ladder reel by pushing the "LADDER REEL UP" button.
10. Spread the ladder down by pushing the "LADDER DOWN" button.
11. Return the ladder reel to original position by pushing the "LADDER REEL DOWN" button.
12. Close the grating by pushing the "GRATING CLOSE" button.
13. Turn off the "HYDRAULIC PUMP" switch
14. Turn off the "EMERGENCY OPERATION" switch.
    -Check if the "EMERGENCY OPERATION" lamp is lit off.
    -Check if the "DOOR OPEN" lamp is on.
15. Turn off the "MAIN POWER" switch.
16. Install the temporary hand rail at the bottom side of coaming.

-Closing the door-

1. Remove the temporary hand rail from the bottom side of coaming.
2. Turn on the "MAIN POWER" switch.
3. Turn on the "EMERGENCY OPERATION" switch.
   -Check if the "EMERGENCY OPERATION" lamp is lit on.
   -Check if the "DOOR OPEN" lamp is on.
4. Turn on the "HYDRAULIC PUMP" switch.
5. Open the grating by pushing the "GRATING OPEN" button.
6. Lift up the ladder reel by pushing the "LADDER REEL UP" button.
7. Wind up the ladder by pushing the "LADDER UP" button.
8. Return the ladder reel by pushing "LADDER REEL DOWN" button.
9. Close the grating by pushing the "GRATING DOWN" button.
10. Remove the temporary rope guide from the bottom side of coaming.
11. Close the pilot door completely by pushing the "DOOR CLOSE" button.
12. Lock the door cleats by pushing the "CLEAT LOCK" button.
13. Turn off the "HYDRAULIC PUMP" switch.
14. Turn off the "EMERGENCY OPERATION" switch.
    -Check if the "EMERGENCY OPERATION" lamp is lit off.
    -Check if the "DOOR CLOSE" lamp is on.
15. Turn off the "MAIN POWER" switch.
16. Return the safety bar to the locked position.

2.2.2 IN THE CASE OF POWER FAILURE

In the case of power failure, the whole system must be operated in manual mode; for the door, wedge cleat, ladder wheel and grating the hand pump is used; for the ladder, hand lever is used.

-Opening the door-

1. Release the safety bar installed at the pilot door.
2. Install the hand lever at the hand pump.
3. Turn the manual override to push the Y3 solenoid valve tap, and unlock the door cleats using the hand pump.
4. Turn the manual override to push the Y1 solenoid valve tap, and open the door completely

using the hand pump.
5. Install the temporary rope guide at the bottom side of coaming.
6. Turn the manual override to push the Y8 solenoid valve tap, and open the grating using the hand pump.
7. Turn the manual override to push the Y5 solenoid valve tap, and lift up the ladder reel using the hand pump.
8. Spread the ladder down following the procedure as below:
   - Release the knob and hand lever stored at the hydraulic power unit bracket.
   - Fit the knob into the knob hole on the motor cover and turn it clockwise to disengage the lock pin.
   - Fit the manual handle onto the motor shaft through the hole at the center of the cover.
   - Spread the ladder down by rotating the wheel counterclockwise using the hand lever.
9. Turn the manual override to push the Y6 solenoid valve tap, and return the ladder reel to normal position using the hand pump.
10. Turn the manual override to push the Y7 solenoid valve tap, and close the grating using the hand pump.
11. Install the temporary hand rail at the bottom side of coaming.
12. Remove the hand lever from the hand pump and the ladder wheel.

-Closing the door-

1. Fit the hand lever onto the hand pump and the ladder wheel.
2. Remove the temporary hand rail from the bottom side of coaming.
3. Turn the manual override to push the Y8 solenoid valve tap, and open the grating using the hand pump.
4. Turn the manual override to push the Y6 solenoid valve tap, and lift up the ladder reel using the hand pump.
5. Wind up the ladder by rotating the wheel clockwise using hand lever.
6. Turn the manual override to push the Y5 solenoid valve tap, and return the ladder reel to normal position using the hand pump.
7. Turn the manual override to push the Y7 solenoid valve tap, and close the grating using the hand pump.
8. Remove the temporary rope guide at the bottom side of coaming.
9. Turn the manual override to push the Y2 solenoid valve tap, and close the door using the hand pump.
10. Turn the manual override to push the Y4 solenoid valve tap, and lock the door cleats using the hand pump.
11. Remove the hand lever and knob from the hand pump and ladder wheel and store them at normal position.
12. Release the safety bar installed at the pilot door.

3. INSTALLATION INSTRUCTION

3.1 INSTALLATION OF EQUIPMENT.

When equipment is installed, it is essential to note the correct mounting position, ambient temperature, operating voltage etc. equipment must be installed stress-free ; mounting surface must be properly flat and bolts must be tightened uniformly.

3.2 INSTALLATION OF PIPING.

The following should be observed, in as far as applicable.

The hydraulic diagram is intended primarily to show the functioning of the hydraulic system. And it cannot be regarded to be a piping diagram. Line sizes are given as an indication only.
Hoses should be used where movement of components relative to constructions would otherwise create high stresses in pipes, couplings, flanges or bolt, and also where otherwise strong vibrations would occur (which may lead to fatigue of connections and will produce extra noise.)
For the same reasons, the location of pipe supports should be chosen carefully.
Choosing the correct sizes, materials and the correct locations for hoses is the full responsibility of the company installing the piping.

When selecting pipe, hoses and screw connectors/ flanges, ensure that pressure rating (i.e. wall thickness and material) is appropriate for the application. Use only seamless precision steel tube.

Before it is installed, the pipe must be cleaned to remove all dirt, scale, sand, swart, etc. before commissioning all pipe must be cleaned according to the enclosed cleaning instructions.
Pipes must be carefully installed without distortions.

PF threaded connections on components are designed such they allow application of sealed o-ring seal connectors. Sealing materials such as hemp and compound are not permitted because they produce dirt which can lead to malfunctions of the equipment.
Note : Damaged pipes and hoses must be replaced immediately.

3.3 FLUSHING

Before commissioning, the system should be flushed carefully according to CETOP RT 117H.
Since this is extremely important a part of CETOP RT 117H. is reproduced here, we assume that the normal system oil (or an oil type that can be mixed with it) is used as flushing oil. If special flushing oil is required (if the required cleanliness standard cannot otherwise be satisfied), please refer to the quoted CETOP norm.

3.3.1 INTRODUCTION

Flushing is a procedure witch is vital to the satisfactory operation of a hydraulic system. Omission or curtailment of flushing will inevitably lead to rapid wear of components, malfunction and breakdown.

3.3.2 CONDITIONS OF COMPONENTS

All components must be supplied ready for assembly into the system in a clean condition, inhibited with preservative oil and all openings sealed. Temporary sealing devices, plugs, etc., should be removed immediately prior to assembly. Particular attention should be given to piping, which should be free from scale, rust, flux and etc. Piping not in a clean condition should be rejected either replaced or cleaned before assembly. Thorough cleaning before assembly may not be possible in the case of very large pipes, so that these will require special attention during flushing to attain the required standard of cleanliness.

3.3.3 SYSTEM PREPARATION.

System components which may present a restriction to the flow or which may be damaged by the high flushing flow should be by-passed by suitable make-up pieces.
These components, which may have been flushed on assembly, include reservoirs, pumps, motors, dead-end components such as cylinders, directional control valves, flow regulators and other valves containing small orifices. Filters may be left in position, but with their elements removed.
Air bleeds should be fitted to all high points in the system to ensure filling of pipes and components.
Drain points should be fitted to every low point in the system and to dead-ends to assist in the removal of contaminants.
Dead-end should be avoided as far as possible or bridged with make-up pieces.
Flushing connections, possibly of the self-seal type, should be fitted to each loop in the system. The connections should be large enough to pass the flushing flow at a low pressure drop.
Only the simplest system can be flushed in one operation. In the majority of system, they should be devided into sections or loops, the section being flushed in turn. Pump stations and valve manifold must be flushed separately from the piping system, unless they have been supplied in a clean condition.

3.3.4 STEEL PIPES AND FITTINGS.

Before installation, and after all fabrication has been completed, all pipes and fittings should be treated as follows, unless supplied in a clean condition :
All accessible welds on pipes and fittings must be inspected for the presence of welding beads.
If beads are found, they should be ground off before the cleaning procedure is undertaken.
All welded steel pipes and flange fittings are to be blown with steam or air to remove loose scale, welding beads, dirt or sand. Then they are to be immediately submerged and washed in a hot alkaline solution, prepared and used in accordance with recommended practices. During this operation, all dirt, paint and grease are removed from the metal, thereby preparing the pipe and fittings for pickling. The welded parts are then to be pickled by any one of the standard pickling precesses in order to remove mill scale from the metal. It is extremely important that all traces of pickling materials be removed by water washing or other suitable means so that no chance of subsequent contamination of the oil with the acidic products can occur.
After thoroughly drying the pipe with dry air, it should be coated with a suitable rust preventative oil which will be readily soluble in, and hence removed by the flushing oil, finally all the openings should be closed to prevent the entry of foreign material and excessive moisture.

3.3.5 FLUSHING EQUIPMENT.

The flushing rig should comprise pumps, reservoirs, filters and hose connections.
The pumps should incorporate adjustable relief valves to be set at a pressure above that required to pass the full pump flow through the system to be flushed. The required pump flow capacity is defined in the next section.
The reservoir should have a capacity at least equal to three times the pump delivery per minute and preferably of greater capacity than the system to be flushed.
The filters should have disposable elements. Duplex filters are preferred as they permit the change-over to a clean element without interrupting the flushing procedure. The filters should incorporate clogging indicators. An automatic filter bypass is not preferred.
The filter size should be selected to pass the specified pump delivery at a low pressure drop, depending upon type and should have a generous dirt-holding capacity. The degree of filtration should be selected to meet the requirements of the system flushed.

3.3.6 FLUSHING VELOCITY AND TEMPERATURE.

To ensure that the system is flushed as quickly and efficiently as possible, both the flushing velocity and temperature should be as high as conveniently possible.
A reasonable temperature limit for mineral oils is 60℃.
The fluid velocity should preferably at least twice the rated velocity of the system and in any case at least 8 m/s.
In order to ensure that flow is turbulent the Reynolds number should be at least 3000.(this is attained if vd/ υ >3, where v is the flow speed in m/s, d is the inner pipe diameter in mm, and υ is the viscosity in nm^2/s or cSt).

3.3.7 FLUSHING PROCEDURE

With the system prepared, fill the system by feeding the flushing to the flushing rig so that the fluid is filtered before entering the system . New fluid is often dirty by hydraulic standards.
Circulate the flushing fluid and bleed the system to remove trapped air. Heat the fluid to a temperature of 60℃. Flush carefully until the lines are sufficiently clean. As a guideline appr. 2..3 hours is required for each line. The contamination level can be checked by taking samples to be investigated by recognized laboratory.
In the case of large installations only, where it was not possible to clean the pipes before assembly, pneumatic hammers fitted with pipe saddles may be used to loosen contaminant adhering to the pipe, especially at formed bends and weld areas.
This procedure should be used with great care and avoided if ll possible by cleaning the pipes before assembly.
After flushing, all oil must be drained from the flushing line. Take care to carefully close the hydraulic components to avoid new contamination.

3.4 COMMISSIONING

Commissioning involves a number of procedures that should all receive careful attention:

1. Visual inspection for damage and dirt picked up during delivery.
2. Installation and mounting of sets and subassemblies.

3. Connection of hydraulic actuators in the machine.
4. Flushing of pipes and hoses.
5. Electrical wiring for drives and control, after checking the supply ratings. Connect cooling water if necessary.
6. Filling the fluid reservoir with the prescribed, or otherwise suitable fluid, especially one of the proper viscosity, is essential for trouble free operation of the system.
7. Ensure absolute cleanliness. Clean the filler screw and cap(if available) on the storage vessel before opening. Check the fluid reservoir for dirt and clean if necessary.
8. Examine the fluid for the presence of water.
9. The inherent contamination of the fluid which the system is filled should not exceed CETOP class 19/16 (or NAS-class 10).
   (Filling up the system should be carried out in such a way that ingression of contaminants and chemicals is avoided. This means that unused clean oil must be filtered during filling up the reservoir. It must be emphasized that failures of hydraulic systems will often occur, especially during start-up, if this is not done with due care.)
10. Most systems are equipped with a special filling-coupling which ensure that oil always passes the return oil filter before it enters the reservoir. A separate pump should be used for filling the reservoir in this case.
    If the system is not equipped with a filling-coupling it must be filled through the filter-opening on the reservoir. The filter-element in this filter-opening must not be removed during filling-up.
11. Open suction-valves if present.
12. Check the direction of rotation of the pumps.
13. Start the drive motor slowly (electric-motors should be tested by rapid on and off switching) in order to check the direction of rotation.
14. Bleeding of the system at the actuator lines should be carried out at the highest point possible.
    Operate the directional control valves and extend and retract the actuators several times.
    Increase the load slowly. Increase the settings of pressure valves and regulators.
    The system has been properly bled when there is no more foam in the reservoir, no jerky movements of the actuators and no unusual noises.
15. Check the fluid level and top up after the bleeding, if necessary.
16. Valve adjustment.
    Initially adjust pressure control valves, flow control to low settings. Directional control valves should be set to the neutral position.
17. Monitor the steady-state operating temperature when the machine has been in full operation for several hours.
18. Repair any leaks, usually by simply re-tightening connectors and bolts after a few hours of service.
19. Renew the filter elements. Most contamination is collected during the first few hours of service.

4. INSPECTION AND MAINTENANCE

4.1 INSPECTION

The hydraulic equipment has been designed for a long trouble free service life.
It requires very little maintenance. Nevertheless maintenance is essential in order to maintain trouble free operation because practical experience has shown that up to 80% of faults and damage are due to contamination, lack of servicing and incorrect choice of fluid.

By remaining alert and by paying close attention to detail it is possible to detect faults in their very early stages and do prevent them from developing into more serious malfunctions. This is particularly true during the early stages but also remains true throughout the service lift of the equipment.

A constant look out must be kept for:
- external leak,
- dirt,
- damage, especially to hoses and pipes,
- unusual noises from pumps, motors, couplings, mountings etc.
- proper functioning of instruments.

Special attention must be given to the cylinder rods. Cylinder rod can be made of carbon steel or stainless steel and be protected by chrome layer or nickel chrome layers. Even the thickest protection layers can be affected by a corrosive atmosphere. It is therefore essential to either protect the protruding part of the rod retains a thin hydraulic oil film in that case. The intervals for retraction of piston rods depend on the circumstances and may vary from daily (in coastal areas and marine applications) to weekly.

If greases or other corrosion inhibitors are used, the period may vary from monthly to each 6 months depending on the type of corrosion inhibitor used.(Please note that some types of corrosion inhibitor may damage seals and/or react with hydraulic fluid.)

Use only recommended oil, see chapt. 8 Lubricant and oil chart.

4.2 PREVENTIVE MAINTENANCE

4.2.1 Hydraulic fluid

-Fluid level-

Continuous checking is necessary because, as the volume of the fluid in the system falls below the minimum mark, it can cause a rise in the operating temperature, accumulation of undissolved air and pump failure due to cavitation.

-Fluid temperature-

The operating temperature is normally between 40℃ and 90℃. A maximum temperature of 60℃ is recommended for mineral oil based fluids because, higher temperatures cause aging of the fluid and shorten the life of seals and hoses.

-Fluid condition-

The aging of the fluid depends on a number of operating parameters such as temperature, pressure, air humidity, dirty environment, etc.
The aging of the fluid can be judged from a simple visual examination.

Appearance	Contaminants	Possible Causes
Dark in color	Product of oxidation	Overheating, insufficient fluid changes, possible ingress of other fluid
Milky in color	Water or foam	Ingress of water or air
Water separation	Water	Ingress of water, e.g. coolant
Air bubbles	Air	Ingress of air, e.g. due to low fluid level or leaky suction
Floating or sunken contaminants	Solids	Wear, dirt, aging
Smell of burnt oil	Product of aging	Overheating

4.2.2 FILTER REPLACEMENT

By far the largest number of premature failures in hydraulic systems are due to contaminated fluid. The task of the filters is to keep contamination within limits, i.e. limit the size and concentration of the dirt particles in order to protect the equipment against excessive wear.

-Filters without blocking indicators-

There must be changed for the first time immediately after the initial commissioning. subsequent changes are advised at monthly to six-monthly intervals depending on the operation conditions.

-Filters with blocking indicators-

These are monitored continuously. The check must be made daily when working temperature has been reached.

-Breather filter-

These filter the air which flows in and out the fluid reservoir as the level fluctuates. The frequency of inspection and element changing or cleaning depends on the condition of the environment.

4.2.3 PAINTING

All corrosive parts of the door and the power pack are covered by a protective paint. Only if necessary these parts may be re-painted preferably in the original colors. Non-painted system parts or components such as air bleed plugs, pumps, proximity switches, control/indication boxes and panels must not be painted.
Be aware that paint might cause system failure and always obstructs an easy disassembly of system parts. When painting the surroundings of the Pilot hydraulic door or parts of the hydraulic system, the hydraulic door and the parts of the hydraulic system must be covered with protective covering.

5. INSPECTION AND SERVICE INTERVALS

Daily and (on ships) before departure

- Check the free passage of the door and remove obstacles that door from closing.

Weekly

- Check the hydraulic fluid level.
  Power units must be discharged first and filled up if necessary.
- Check for damage of the sealing surface of the door.
- Check the wedges and blocking cones.
  Lubricate these once again if necessary.

Monthly

- Check the pressure of the power unit.
- Check the operation of the complete system, hand pump.

Every two months

- Check the setting of the pressure control valves, flow control valve and signaling devices such as pressure switches, proximity switches etc.

Hydraulic fluid filter

- 1st replacement of the filter after approx. 50 working hours or max. 1 year.
- 2nd, 3rd, 4th, etc. replacement of the filter after 250 working hours or max. 4 years.

Hydraulic fluid

- Renew the hydraulic fluid every 2 years

6. LUBRICANT AND OIL CHART

6.1 LUBRICANT MECHANICAL PART

Lubricate at adjusting bolts and jointing pins with universal grease.

6.2 LUBRICANT RUBBER PACKING

Clean with white spirit.
Lubricant with silicone grease.

6.3 RECOMMENDED HYDRAULIC OIL

Mineral oil ISO VG 32(To be changed every 2 years)

7. EQUIPMENT INFORMATION

NO	COMPONENT NAME	MAKER	MODEL	REMARK
1	ELE. MOTOR	HYOSUNG	2HP*4P Insulation : F	
2	HYD. PUMP	SHIMADZU	YP10-3.0-A2-H2-R	
3	SUCTION FILTER	DHC	DOF-03	
4	RETURN FILTER	MP FILTRI	MPF0301AG1P25NB	
5	AIR BREATHER	DHC	DFBT-06(PT3/4")	
6	LEVEL SWITCH	ELECTROTEC	LM1BF	
7	LEVEL GAUGE	DHC	DOG-100	
8	HAND PUMP	BY		
9	DRAIN VALVE		PT1/2, 5K	
10	LINE CHECK V/V	TOKIMEC	HC400, PT1/4	
11	RELIEF V/V	VICKERS	DGMC-3-PT-CW	
12	SOLENOID V/V (FOR RELIEF V/V)	VICKERS	DG4V-3S-2A-M-U-D5	
13	PRESSURE GAUGE	DHC	ϕ 60*250K	
14	FLOW CONTROL V/V	VICKERS	DGMFN-3-Y-A2W-B2W	
15	PILOT CHECK V/V	VICKERS	DGMPC-3-ABK-BAK	
16	SOLENOID V/V	VICKERS	DG4V-3S-6C-M-U-D5	
17	PROXIMITY SENSOR	AUTONICS	PRCM30-10AO	
18	LIMIT SWITCH	SUNGHO	SHLS-101L	