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1 SCOPE

This manual covers operation, maintenance and repair of the antiheeling system butterfly valve and it's accessories.
It should be read in conjunction with the butterfly valve drawings included in the as-built drawing set.

2 DESCRIPTION

The butterfly valve is of ISO PN10 or JIS 10K pressure class with a wafer or lug type cast iron body.
It is operated by a pneumatic quarter-turn, spring return actuator controlled with an integrated spool operated pilot valve which properly directs supply and exhaust air.
On the top of the butterfly valve assembly is a common junction box through which the electric power connections to pilot valve spool and valve position monitoring micro switches are made.
In the junction box two cam operated micro switches for monitoring of butterfly valve open and closed position are installed.
The travelling time from closed to open / open to closed, shall, for a properly adjusted valve assembly be from 5 to 10 seconds.

3 OPERATION

The butterfly valve operates dependant of the antiheeling pump and thus it can only be controlled by / from the antiheeling control system, the ways are described in the system operation manual.
There are, however, a few points to be mentioned here.

In the case of failure to air supply or control power supply the valve is immediately closed by the spring.
For emergency opening of the valve (only if the air supply is intact) there is a manual override button in the pilot valve end.

4 TROUBLE SHOOTING

Although the valve is of robust marine construction, failures may occur either due to hidden material weakness not detected by scheduled quality control or long lasting borderline operational conditions.
The notes below and the chart on page 4 does not present a solution to every problem, however, a guide to detect the most common failures.

Notes!

The chart on page 4 should be followed in the sequence indicated.

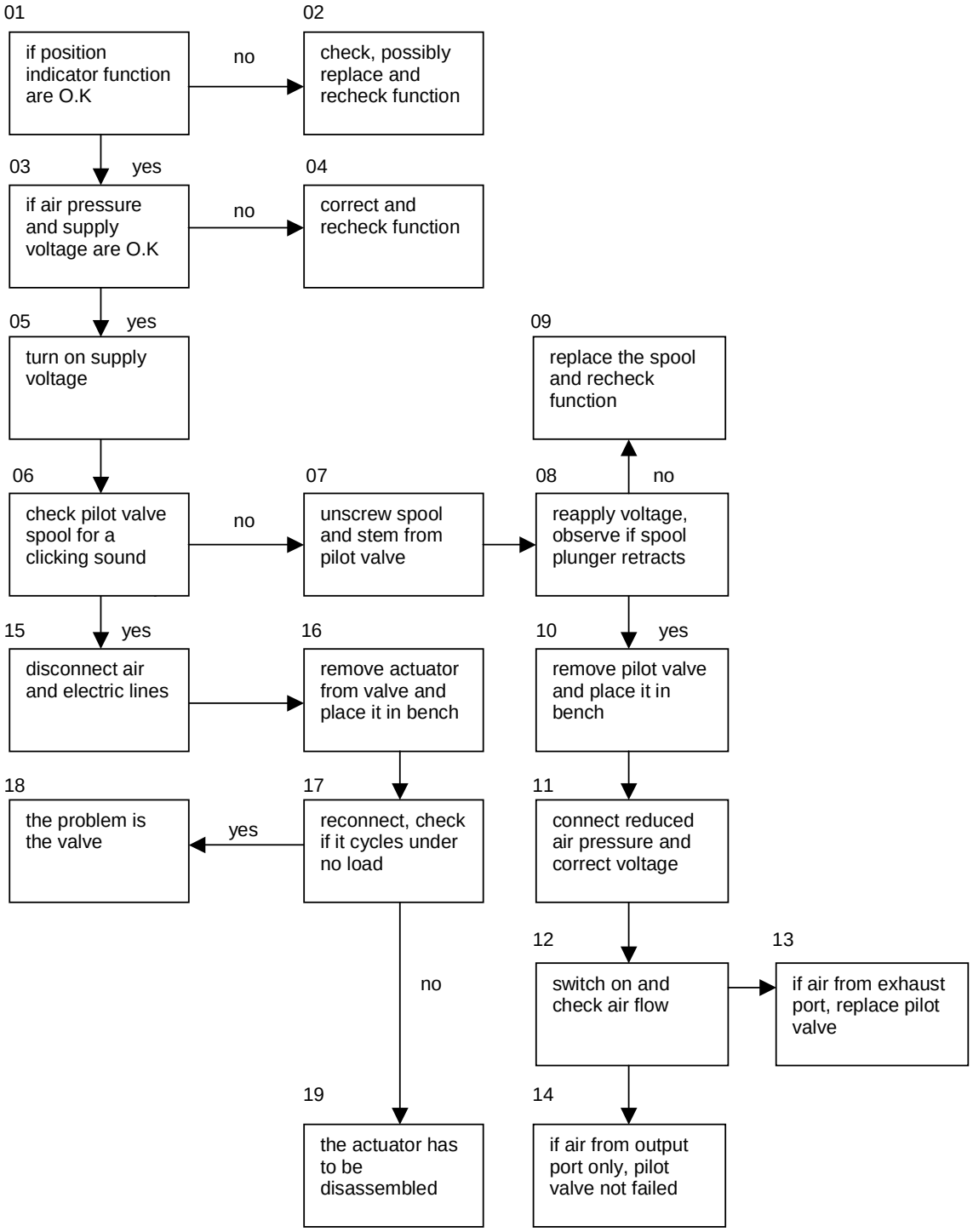
The actuator requires dry, non-lubricated air, filtered to 25 µm with pressure 6 - 8 barg to operate properly, and sufficient air supply volume to avoid sharp pressure drops as it is cycled.

If air is leaking from the air exhaust port all the time when the pilot valve is energized, this may indicate incomplete shifting of pilot valve spool, defect pilot valve seat o-rings or leaking piston seals in the actuator.

Supply voltage should be within ± 10 % of correct voltage (pilot valve is tagged with correct voltage).

Valve disc movement may be obstructed by a solid body.

The actuator including the junction box and the pilot valve may easily be removed from the butterfly valve by unscrewing four bolts.


01
if position indicator function are O.K
no
02
check, possibly replace and recheck function
03
yes
if air pressure and supply voltage are O.K
no
04
correct and recheck function
05
yes
turn on supply voltage
06
check pilot valve spool for a clicking sound
no
07
unscrew spool and stem from pilot valve
08
no
reapply voltage, observe if spool plunger retracts
09
replace the spool and recheck function
15
yes
disconnect air and electric lines
16
remove actuator from valve and place it in bench
10
yes
remove pilot valve and place it in bench
18
the problem is the valve
yes
17
reconnect, check if it cycles under no load
11
connect reduced air pressure and correct voltage
12
switch on and check air flow
13
if air from exhaust port, replace pilot valve
no
19
the actuator has to be disassembled
14
if air from output port only, pilot valve not failed

5 PREPARING FOR MAINTENANCE

Before any maintenance to the butterfly valve, air supply and electric connection must be closed / switched off and disconnected.
If the maintenance is to include the butterfly valve itself, the pipeline must also be isolated and emptied.
Start by removing the actuator and it's accessories from the valve which may be left in the pipeline in the case of maintenance only to the actuator.
If the maintenance also or only is to include the valve, it shall be adjusted to a near closed position, removed from pipeline and placed in a bench.

6 REPLACEMENT OF VALVE SEAT

If the butterfly valve exhibits leakage to an extent that interfere with the antiheeling system performance and it has been established that the leakage is due to damaged or worn valve seat, then the seat has to be replaced.
For this repair operation, spare parts conforming to the "seat replacement kit" (refer to the basic valve assembly drawing included with the as-built drawing set) are to be available.
Provided the valve is separated from the actuator, removed from the pipeline and fixed in a bench, proceed as follows (numbers in brackets are referring to item numbers in the basic valve assembly drawing enclosed with the as-built drawing set) –

- turn the valve to open position
- remove the retaining ring (9), the trust washer (8) and the stem retainer (7)
- remove the stem (6), bushing (4) and seal (3)
- remove the disc (5) and protect it's edge at all times
- deform the damaged seat (2) into an oval shape and remove it from the body
- do not grease the outside of the replacement seat or the inside of the body
- deform the replacement seat into an oval shape and push it into the body with the seat stem holes aligned to the body stem holes.
- apply a thin layer of grease to the inside of the new seat and particularly the two stem holes
- insert the seal (3) and the bushing (4)
- push the stem (6) into the stem hole of the body until the bottom of the stem is flush with the inner top edge of the seat

- insert the disc (5) into the seat by lining up the disc hole with the stem hole of the seat. Note! The broached double "D" flats in the disc must be towards bottom of the valve body

- with a downward pressure and rotating the stem back and forth, push the stem until it touches the bottom of the body stem hole, make certain that when pushing stem through disc bottom that the broached flats of stem and disc are aligned

- reinstall stem retainer (7), thrust washer (8) and retaining ring (9)

- the valve should now be ready for reinstallation in the pipeline

7 ACTUATOR MAINTENANCE

The actuator which is designed for 500.000 operations, is permanently lubricated and additional lubrication is normally not required.
If, however, the valve fails to operate properly and it has been established that the failure is due to the actuator, then it may be necessary to disassemble it for inspection and maintenance.

Before the actuator is disassembled the control accessories must be removed from it and it must be splitted from the valve and brought to the ship workshop or to an ashore repair shop.

Numbers indicated in brackets refer to the actuator assembly drawing included in the as-built drawing set.

7.1 Replacement of piston seals

Piston seals (12), (14) and (9) may be replaced as indicated below

- dismantle the springhouses (25)

- fasten the actuator by the shaft between soft vice jaws

- loosen the nuts (2) and screw out the bolts (1)

- turn the actuator until the pistons (10) reach the housing ends

- note how the pistons are assembled

- the piston (10) is drawn from the cylinder by putting two bars into the piston top holes and than bending the bars together and draw to remove the piston from the cylinder

- o-rings (12) and support band (14) shall be replaced

- support element (9) shall be replaced
- grease the cylinder inner surface
- assemble the pistons in the same position as they had before disassembly
- assemble the springhouses (25).

7.2 Replacement of shaft seals

Shaft seals (18) and (38) and washers (32, 33 and 39) may be replaced as indicated below:

- split actuator from valve
- dismantle the retaining rings (31 and 40)
- dismantle the stop ring (64) and note it's position towards the shaft
- replace the o-rings (18) and (38)
- replace the washers (32), (33) and (39)
- grease all parts before reassembly
- install new retaining rings (31 and 40) with their rounded edge towards the actuator centre, do not open the retaining rings more than strictly necessary
- check that the retaining rings fit in their tracks without clearance.

7.3 Replacement of bearings

The bearings (16) and (36) are easy to replace when the actuator are disassembled according to clause 7.2 above.

Upon the successful reassembly the actuator shall be assembled with the valve, the control accessories assembled on it and air supply and electric power reconnected.