Read in conjunction with Pneumatic Deluge Valve Set Schematic (section 7).

## 1. PRINCIPLE OF OPERATION.

1.1. The clack is locked shut by water pressure on the large rolling diaphragm (24) acting via the piston rod on the latch (27). The water pressure on the large diaphragm is taken from below the lower isolation valve via an isolation valve (13), a filter (12) and non-return valve (11) and enters the diaphragm chamber via a restricted orifice (29) (built into the diaphragm chamber casting). The only exit for the water pressure on the large diaphragm is via the small rolling diaphragm (23) which is held closed by air pressure. If water is released from the large diaphragm chamber faster than it can be replaced from the supply via the restricted orifice the piston will release the latch and allow the clack to lift.

1.2. Air pressure supplied from a compressor (1) (or from an external air source via a pressure regulator) via a quick fill valve (2), a non return valve (3) and a filter (4) holds the small rolling diaphragm (23) closed trapping the water in the large diaphragm chamber.

1.3. When the valve is to be opened the air pressure on the small diaphragm is reduced by either:-
1.3.1. Operation of the electrical solenoid valves (7) + (8) (electrical energy supplied from a control panel)
1.3.2. Via the manual dump valve (6)
1.3.3. The activation of a frangible glass bulb detector head in a pneumatic detection system.

1.4. When the air pressure on the small diaphragm (23) is released the restriction in the isolation valve (2) (which has a 3mm hole drilled in the ball exposed in the closed position) stops air being replaced faster than it is released. As the air pressure drops below a critical value the small diaphragm (23) lifts allowing water in the large diaphragm chamber to exit to drain; the large diaphragm (24) to lift and release the clack. The low air pressure switch (5) will close on falling pressure to send an alarm signal to the control panel, if fitted.

1.5. Once the clack has lifted it will be held open by the latch / lever which will fall forward aided by a spring and stop the clack falling back on to its seat. While the clack is held open water in the body of the valve can exit via the non-return valve (17), ring the water motor alarm bell (20) and activate the pressure switch (18). This will give a continuos warning that the system has been flooded until positive action is taken to close the bell line isolation valve (19) or re-seat the clack.

1.6. All ball valves shown are shown in the closed position for clarity. This does not represent their final position when the valve is in operation. Ball valves are shut when the handle is perpendicular to the pipe work (with the exception of valve (2) which has a small 3mm hole drilled through the ball exposed in the closed position).



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## 2. COMMISSIONING - TO SET THE VALVE ( Operating Mode )

2.1. Isolate the valve by closing the lower butterfly valve (25). Isolate the water supply to the large diaphragm (24) by closing ball valve (13). Ensure the bell test line valve (16) is locked shut.

2.2. Switch off the air compressor. Ensure there is no residual air pressure in the pipe work by opening valve (6).

2.3. If the valve has been tripped and water has filled the system open the main 2" drain valve (14) to drain the system completely and quickly. Make sure that the upper butterfly isolation valve (26) is open. Open the hydraulic chamber bleed bolt (22).

2.4. Remove the lower right hand bolt (when the valve is viewed from the front) bolt from the front cover of the valve. Insert a screwdriver and engage with the slot in the latch (27) pin. Turn the screwdriver clockwise to force the large piston and diaphragm (24) back [water may exit through the bleed nut (22)], allowing the latch (27) to swing back and the clack to drop on to its seat. (If the clack will not drop cleanly on to its seat follow the instructions below on how to change the clack seating). Leave the lower right hand cover plate bolt out until the valve has been set since any leak past the clack will be detected by water exiting through this hole.

2.5. Ensure ball valve (6) is closed. Close main 2" drain valve (14). Ensure that the detector line (if fitted) is airtight. Replace any detector heads which may have activated. Ensure that the solenoid valves (7) and (8) (if fitted) are closed.

2.6. Open the air supply valve (2) (handle parallel to the pipe work). Start the air compressor, fill the air system until the correct pressure (normally between 3.0 and 4.0 bar) registers on the detector line pressure gauge (9).

2.7. Close the air supply valve (2) so that air can only enter the system via the 3mm orifice in the ball. Lock in position.

2.8. Close the bleed nut (22) finger tight. Open ball valve (13) and allow water to fill the hydraulic chamber forcing the large rolling diaphragm (24) down under pressure, which in turn will force the latch (27) to secure the clack shut. Pressure gauge (10) should register the water pressure from the main supply. Slowly open the bleed nut (22) until clear water flows and any air in the chamber has been exhausted. Fully close and tighten the bleed nut (22).

2.9. Ensure that the small pneumatic diaphragm has seated correctly by checking that no water is exiting through the pneumatic chamber drain (28). If water is seen turn off the air compressor plus valve (13) and re-seat the pneumatic diaphragm. In extreme cases it may be necessary to remove the pneumatic diaphragm and clean the seat.

2.10. Slowly open the lower butterfly isolation valve (25). If the clack has not seated correctly water will escape past the clack and exit through the lower right hand bolt hole in the valve front cover. If no water is seen after a few minutes replace the lower right hand cover plate bolt and fully open the butterfly valve (25) and secure in position with a padlock and chain or leather strap.



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2.11. Ensure that the upper isolation butterfly valve (26) is secured in the open position with a padlock and chain or leather strap.

2.12. Ensure that the bell line isolation valve (19) is locked in the open position and the bell test line valve (16) is locked shut.

2.13. The valve is now set and in its operating mode.

## 3. TO TEST THE ALARM BELL AND ALARM PRESSURE SWITCH

3.1. The system should be tested weekly for correct operation of the water turbine and gong and its associated pressure switch. To test the alarm bell with the valve set and without tripping the valve and filling the system with water open ball valve (16). The bell should ring and a steady flow of water should be seen at the drip union (21). The pressure switch (18) should activate. Note the non return valve (17) will prevent water from entering the valve body.

3.2. Following a bell test close and lock ball valve (16). Ensure the bell line drains through the drip union (21) until it is dry.

## 4. TO TRIP TEST THE VALVE

4.1. It is possible to trip the valve (lifting the clack) without filling the system with water by closing the upper butterfly valve (26) and releasing air pressure on the small diaphragm via methods described in 1.3.1, 1.3.2 & 1.3.3 above.

4.2. Once the valve has tripped re-set as described in section 2 above.

## 5. TO TEST THE AIR SUPPLY

5.1. With the system in the operating mode. Close valve (13), close valves (25) & (26), then slowly open valve (6).

5.2. If fitted the compressor Pressure Switch will initiate the compressor starting but the air flow to the system will be restricted by the orifice in ball valve (2). As the pressure continues to drop the alarm pressure switch (5) will close to send a signal to the alarm panel. Pressure switch (5) should be set to operate between 1–0 bar falling.

5.3. To reset the system, close ball valve 6 and check that the system pressure reaches 3-4 bar and that the compressor stops.

5.4. Repeat steps 2.8 – 2.13 to set to operating mode.



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## 6. TO REPLACE THE CLACK SEAL

6.1. Isolate the valve by closing the lower butterfly valve (25). Isolate the water supply to the large diaphragm (24) by closing ball valve (13).

6.2. If the valve has been tripped and water has filled the system open the main 2" drain valve (14) to drain the system completely and quickly. Make sure that the upper butterfly isolation valve (26) is open. Open the hydraulic chamber bleed bolt (22).

6.3. Remove the valve access cover plate. Note the highest bolt is fitted on to a stud to facilitate removal and replacement of the cover by allowing it to be hung from the stud while the remaining bolts are removed or put into position.

6.4. Two jacking bolt tapings are provided on either side of the access cover to be used if the cover is tight and cannot be freed easily from the valve body. If jacking screws are used ensure they are withdrawn and do not stop the cover seating when it is replaced.

6.5. Replace the clack rubber seal and ensure that the clack is free on its hinge. Allow the clack to fall to its seated position. Replace the front access cover; tighten all bolts (check jacking bolts are fully withdrawn).

6.6. Reset valve as described in 2 above

## 7. TO REPLACE THE HYDRAULIC AND THE PNEUMATIC ROLLING DIAPHRAGMS.

7.1. Isolate the valve by closing the main lower supply butterfly valve (25), the water supply to the hydraulic chamber (13), turn off the air compressor and release any residual air pressure by opening the manual dump valve (6). Remove all water, air and drain pipe work from the diaphragm chambers.

7.2. The cover of the pneumatic diaphragm chamber can now be lifted off by removing the ring of six bolts. The pneumatic diaphragm can now be removed.
Note the pneumatic diaphragm consists of a rubberised rolling diaphragm bonded to a plastic piston. These two items are supplied as a factory made unit and should not be dismantled.

7.3. With or without the pneumatic chamber removed the six larger bolts holding the hydraulic chamber to the valve body can be removed and the chamber lifted off exposing the hydraulic diaphragm and piston assembly which can be pulled free.

7.4. The hydraulic piston and diaphragm assembly is normally supplied as a complete unit. However if it is necessary to dismantle it the rolling diaphragm must be replaced with the rubberised face in contact with the water in the hydraulic chamber and the fabric side towards the main valve body (normally exposed to air unless the valve is tripped).

7.5. To assemble follow the procedure above in reverse order.



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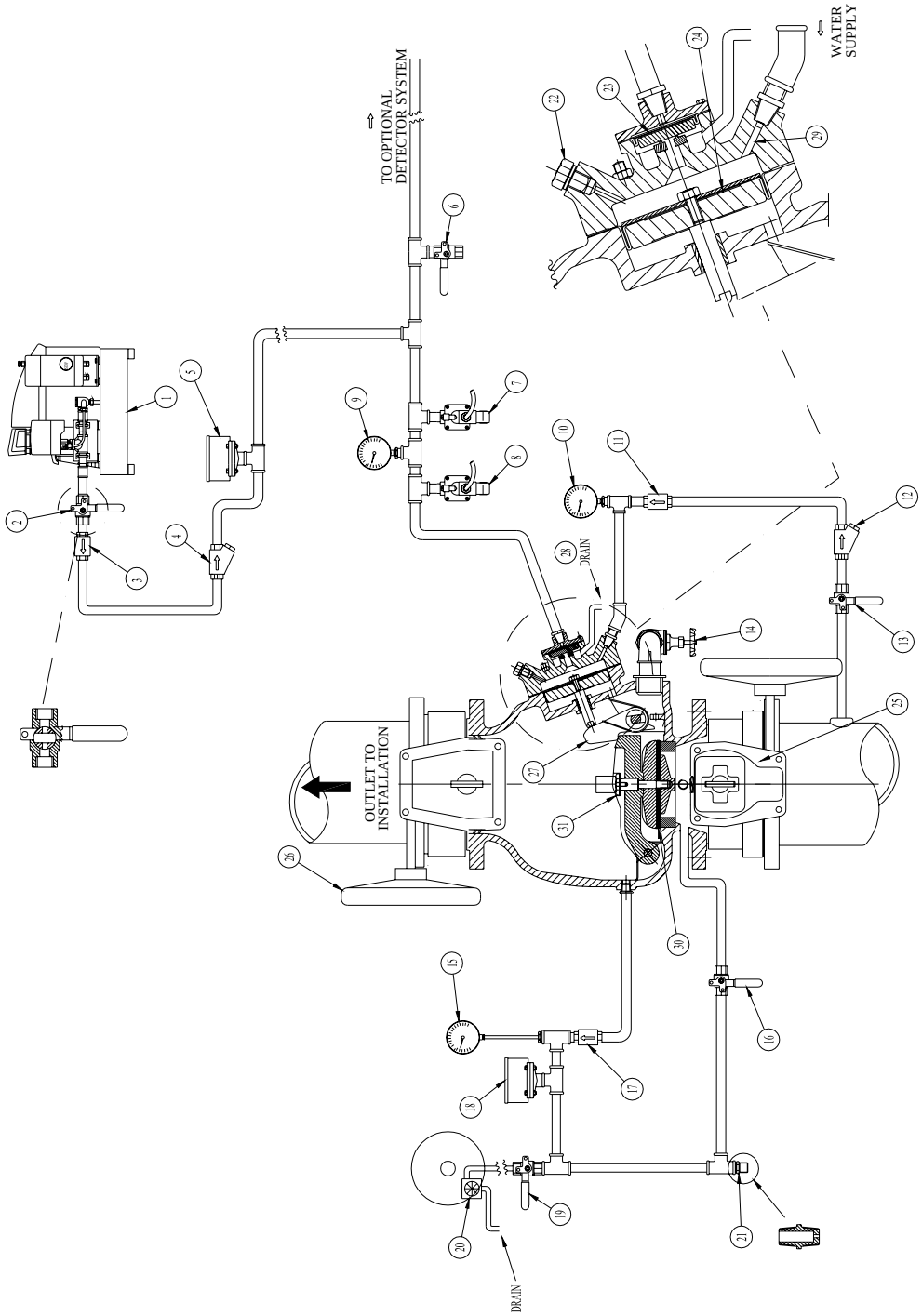
## 7. PNEUMATIC DELUGE VALVE SET SCHEMATIC




| ITEM | DESCRIPTION |
|---|---|
| 1 | COMPRESSOR (C/W PRESSURE SWITCH) |
| 2 | BALL VALVE – 3mm RESTRICTED |
| 3 | NON-RETURN VALVE |
| 4 | FILTER |
| 5 | PRESSURE SWITCH |
| 6 | BALL VALVE |
| 7 | SOLENOID VALVE (OPTIONAL) |
| 8 | SOLENOID VALVE (OPTIONAL) |
| 9 | PRESSURE GAUGE – NO LOSS COUPLING |
| 10 | PRESSURE GAUGE – NO LOSS COUPLING |
| 11 | NON-RETURN VALVE |
| 12 | FILTER |
| 13 | BALL VALVE |
| 14 | 2" DRAIN |
| 15 | PRESSURE GAUGE – NO LOSS COUPLING |
| 16 | BALL VALVE |
| 17 | NON-RETURN VALVE |
| 18 | PRESSURE SWITCH |
| 19 | BALL VALVE |
| 20 | WATER TURBINE AND GONG |
| 21 | DRAIN – 3mm ORIFICE |
| 22 | DIAPHRAGM CHAMBER BLEED SCREW |
| 23 | PNEUMATIC DIAPHRAGM |
| 24 | HYDRAULIC DIAPHRAGM & PISTON |
| 25 | MAIN BUTTERFLY ISOLATION VALVE |
| 26 | UPPER BUTTERFLY ISOLATION VALVE |
| 27 | LEVER / LATCH |
| 28 | WATER CHAMBER DRAIN |
| 29 | RESTRICTED ORIFICE |
| 30 | RUBBER CLACK SEAL |
| 31 | RUBBER SEAT INSERT (200mm ONLY) |

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