

Commissioning Operating and Maintenance Instructions **for ORION Spill Type Pressurisation Units**

1. General

The "Orion" pressurisation unit (the Unit) is ideal for controlling and maintaining pressure in large sealed heating (or cooling) systems. The water in sealed systems expands on heating (increasing pressure) and contracts on cooling (reducing pressure). The Unit continuously and automatically monitors system pressure and maintains it within set limits. On heating, if pressure reaches the upper limit, the Unit's pressure control valve ("spill valve") discharges water to a covered atmospheric tank, the "spill tank". Water enters the covered spill tank below surface level. On cooling, as pressure falls, the unit pumps water from the spill tank into the system to maintain pressure. The Unit also makes up water losses due to the small leaks, maintenance operations, vapour loss from glands etc. that are present in most large systems. Low and high pressure volt free switches allow boiler or chiller safeguarding. A built-in accumulator vessel prevents excessive pump starting. On some units an intermediate vessel is included to prevent high temperature water reaching the accumulator vessel bladder. A low-level switch in the spill tank warns of fault situations and protects against pumps running dry.

2. Documentation:

Each unit is supplied complete with:

- These instructions
- A wiring schematic
- A general assembly drawing
- Detailed instructions for major components.

3. Safety

Please be aware of the following potential hazards, which could be present during installation, commissioning, servicing and operation:

- Injury hazard from heavy/sharp objects during installation. Plan and execute the installation with care.
- Injury hazard from pressure containing parts. In general, before working on pipe-work or other pressure containing parts, isolate and drain them. Never exceed maximum working pressure of the unit.
- Electrical hazard. The unit uses mains voltage electricity. External voltages may be fed to the unit which are not isolated by the unit isolator. Equipment on the unit may operate automatically without warning.
- Mechanical hazard. The unit has moving parts. Equipment on the unit may operate automatically without warning.
- Scalding hazard. The equipment may contain very hot water at pressure. Surfaces may be hot.
- Confined spaces. The spill tank on the unit is a confined space and contains water. The level and temperature of the water may vary considerably during operation.

The unit must only be worked on by suitably qualified and trained personnel.

4. Installation

We recommend installation in accordance with BS 7074 (code of practice).

Consult Health and Safety Executive guidance note PM5 (PM5). The Orion is a "category C" pressurising system in the context of PM5.

Location: The unit should be located indoors in a dry, frost-free area. Ideally the unit should be raised slightly above floor level on a level concrete plinth.

Pipe-work: The system connection of the unit should be connected to the return leg of the system, just upstream of the circulating pump, via an anti-gravity loop.

Consult the general assembly drawing specific to the unit for details of pipe-work connections.

Accumulator vessels have a water connection (usually on the bottom) and an air valve (schrader type valve - similar to a car tyre valve) which is usually on the top, off-centre. Some accumulator vessels also have a small threaded connection on the top centre, fitted with a temporary plastic cap. This temporary plastic cap must be replaced with a permanent fitting (valve, end cap or pressure gauge) to prevent water leakage in service.

Connect the cold water supply to the side-mounted break tank (or the feed valve) via an isolating valve and as shown in the general assembly drawing. Leave isolating valve closed.

Pipe the overflow to drain.

Connect the Unit to the heating system via an isolating valve. Leave isolating valve closed.

Required electrical power supply varies depending on unit specification. Consult the wiring schematic for details. Connect the power supply to the unit in accordance with local regulations (we would recommend use of a fused isolator). Leave electrical power OFF

Wire the high and low system pressure cut-outs in series with the boiler controls to cut out boiler if a fault occurs in accordance with PM5.

ENSURE THE SET IS EFFICIENTLY EARTHED

5. COMMISSIONING

We strongly recommend that the Unit be commissioned by the manufacturer. Contact our sales office for details.

5.1: Calculate The Required Pressure Settings:

The Unit maintains system pressure within a range. Careful consideration must be given to the minimum and maximum allowable pressures. In general, minimum pressure will be that which is required to prevent boiling or air locking in those parts of the system at lowest pressure (usually the highest parts). Maximum pressure should be determined from the system (boiler) safety valve (after allowing for any differences in static head).

5.1.1. Pressure Limits:

PM5 gives guidance on pressure limits. In general:

High Pressure Cut-Out should be set to a maximum pressure 0.35 bar g. below that at which safety valve lifts.

Low Pressure Cut-Out should be set to a pressure high enough to prevent boiling in the highest parts of the system at maximum operating temperature.

5.1.2. Other pressure settings: These are:

Pump(s) On (use a different pressure for each pump in multi-pump units)

Pump(s) Off

Spill Valve Open

Spill valve Close (on Units with electrically activated spill valves)

Accumulator air pre-charge pressure.

The settings to be used will depend to some degree on the type of pressure controller supplied with the Unit. Specific details of the pressure controller will be supplied with the Unit. In general settings should be chosen to avoid over frequent operation of pumps and spill valve, and to avoid nuisance boiler cut-out.

5.2: Prepare the unit for commissioning.

For the purposes of these instructions we assume the following conditions apply initially:

Electrical power is OFF at the Unit Isolator

The Unit is dry and all isolation valves are closed.

Cold make up water supply is connected to the Unit and isolated.

The heating or cooling system has already been filled with water via a temporary quick-fill connection and vented of air.

5.3. Set accumulator vessel air pre-charge pressure.

The accumulator vessel prevents excessive pump starts. The air pressure in it should be set 0.2 bar g. below the intended low pressure alarm setting. To set the air pressure:

Remove plastic cover from the schrader valve. Open the accumulator vessel drain valve. Using a compressor and accurate pressure gauge, set the air pressure to the required value. Close the accumulator vessel drain valve. Replace the schrader valve plastic cover.

5.4. Check Level Switch(es) and Fill the spill tank to minimum level.

The spill tank should be empty at the start of this procedure.

Electrically isolate the unit pump(s) by removing the pump power fuses within the unit panel. This is a precaution against dry running which would damage the pumps.

Turn power on to the unit.

Check that the low level light comes on. If it does not, check that the low level switch is not sticking and is installed the correct way up. In spill tanks with more than one level switch the low level switch is the lowest in the tank. If the low level light comes on when the low level switch float is raised the switch is installed incorrectly. Turning the switch through 180 degrees should correct this.

If the Unit has a mechanical make-up water valve (ball float type), open the make-up water isolation valve. Water will enter the spill tank until minimum level is reached.

If the unit has an electrical make-up water valve follow this procedure:

Check that the electrical valve has been energised. If it has not, check that the make-up water level switch, in the spill tank, is functioning correctly (as for low level switch).

Open the make-up water isolation valve.

Water will enter the spill tank until minimum level is reached. The electrical valve will then close.

Turn power off.

5.5. Vent the pumps

Refer to the pump manufacturer's instructions specific to the pumps.

Open isolating valves at pump inlets.

Vent pumps in accordance with pump manufacturer's instructions.

5.6. Fill the unit's pipe-work

Keep the system isolation valve closed.

Open isolating valves at pump outlets.

Open isolating valves on solenoid dump valve line

Open accumulator vessel isolating valve

Open isolating valves to pressure switches and pressure transducer.

Fully open the snubber valve on pressure transducer line.

5.7. Set up the pressure switches

Refer to the pressure switch manufacturer's instructions.

Set the low and high pressure switches to the required pressures, using the adjusting screws.

Set the switching differential to minimum, using the adjusting screws.

5.8. Set up the pressure controller

Turn power off.

Electrically isolate the unit pump(s) by removing the pump power fuses within the unit panel. This allows initial pressure controller set-up without the pumps actually operating.

Turn power on.

Refer to the pressure controller manufacturer's instructions.

Set the controller to start and stop pumps and open and close dump valve at the required pressures.

Turn power off.

Refit the pump power fuses within the unit panel.

5.9. Starting the pumps for the first time.

Keep the system isolation valve closed.

Fit a drain line to the expansion vessel drain valve

Turn power on.

Pumps will run until the pump cut-out pressure is reached. On multi-pump units with cascade operation all pumps may come on initially.

Check direction of pumps' rotation. Correct if necessary by switching off and swapping 2 phases on the incorrectly rotating pump.

Pressure can be released (and pump run times extended) by letting water out of the expansion vessel drain line. This can also help to remove air from the pipe-work.

Slowly release pressure and check pump(s) come on (in sequence on multi-pump units).

Check direction of rotation of all pumps.

5.10. Testing the solenoid dump (spill) valve

Keep the system isolation valve closed.

Allow pumps to run to bring the unit up to pressure.

Turn power off.

Electrically isolate the unit pump(s) by removing the pump power fuses within the unit panel.

Turn power on.

Refer to the pressure controller manufacturer's instructions.

Reduce set point until solenoid dump valve opens. Check that it closes after pressure falls.

Return set point to required level.

Turn power off.

Refit the pump power fuses within the unit panel.

Turn power on. Pumps may operate to restore pressure.

5.11. Testing the low pressure switch and volt-free contact (boiler interlock)

Keep the system isolation valve closed.

Allow pumps to run to bring the unit up to pressure.

Turn power off.

Electrically isolate the unit pump(s) by removing the pump power fuses within the unit panel.

Turn power on.

Check low pressure volt-free contact (refer to wiring diagram)

Drain water from the unit gradually until Low Pressure Lamp illuminates

Check pressure

Check low pressure volt-free contact again - it should have changed state

Turn power off.

Refit the pump power fuses within the unit panel.

Turn power on. Pumps will operate to restore pressure.

5.12. Testing the high pressure switch and volt-free contact (boiler interlock)

5.12.1) By using the pumps – preferred method

In some units the “closed valve head” of the pumps (the pressure generated by the pumps operating against a closed valve) may be high enough to cause the high pressure condition.

Keep the system isolation valve closed.

Refer to the pressure controller manufacturer’s instructions.

Increase set point 0.2 bar above the high pressure limit setting.

Check high pressure volt-free contact (refer to wiring diagram)

Allow pumps to run until High Pressure Lamp illuminates

Check pressure

Check high pressure volt-free contact again - it should have changed state

Return set point to required level.

Solenoid dump valve will operate to restore pressure.

5.12.2) OR By adjusting high pressure switch setting

Use this method when the “closed valve head” of the pumps (see 11.1) is not high enough to cause the high pressure condition.

Keep the system isolation valve closed.

Using the method described in 11.1 increase pressure using the pumps.

When pressure has stabilised, but is less than the high pressure limit setting, adjust the set point downwards until the pumps stop running.

Check high pressure volt-free contact (refer to wiring diagram)

Reduce the set pressure on the high pressure switch until High Pressure Lamp illuminates

Check pressure

Check high pressure volt-free contact again - it should have changed state

Increase the set pressure on the high pressure switch to the required normal value

Return set point to required level.

Solenoid dump valve may operate to restore pressure.

5.13 Completing the commissioning

When the above steps are completed and the unit is switched on the system isolation valve should be slowly opened. Check that water is present at the high points of the system by venting them.

Keep a record of all settings.

6. Operation

The boilers can now be switched on. The expanded water generated will flow into the expansion vessel(s) causing a gradual system pressure increase until the solenoid dump valve opens. Check that this pressure is acceptable and within the boiler safety valve range and that this has not lifted. Re-check the high pressure switch setting.

On a chilled water system, the water will contract when the chillers are brought into operation, bringing the pump into action. When the chillers are switched off, the temperature will rise allowing the expanded water to pass into the expansion vessel. The highest system pressure occurs with the chillers switched off and the system at ambient temperature.

The unit is fully automatic

7. Maintenance

We strongly recommend that the Unit be serviced annually by the manufacturer. Contact our sales office for details.

In general, the boilers chillers fed by the unit should be off and the system at room temperature before carrying out maintenance other than a visual check.

Daily, we would recommend that a visual check be carried out to check for pump trip or other obvious faults. Building Management System monitoring (if available) may be used to help with this.

Monthly, we would recommend that the following items be checked.

- Level switch operation
- Pump operation
- Solenoid dump valve operation
- Feed water make-up valve operation

These can be checked by following the appropriate section of the commissioning instructions.

Annually, and after any period of prolonged inactivity, we would recommend that the following items be checked.

- Accumulator vessel air pre-charge pressure
- Level switch operation
- Pressure switch settings and operation
- Pump operation
- Solenoid dump valve operation
- Feed water make-up valve

These can be checked by following the appropriate section of the commissioning instructions.