Ormandy Rycroft

Heating & Cooling Solutions

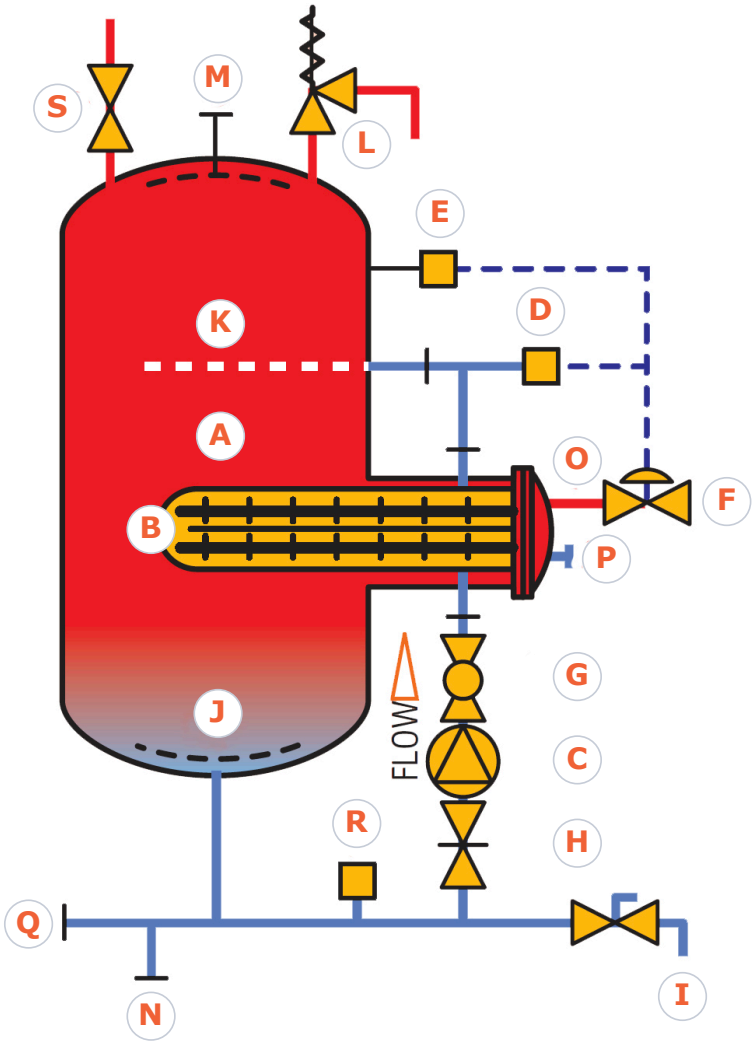
Maximiser Calorifier

Operating & Maintenance Manual

Contents

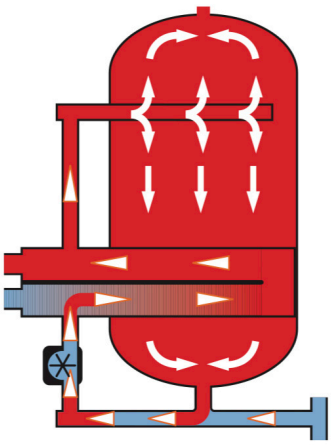
1. Typical Layout

Schematic Drawings

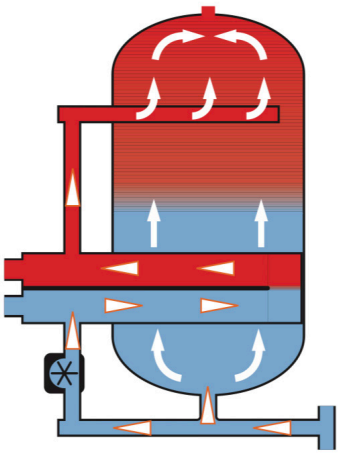


Key

- **A** Storage Section
- **B** Heat Exchanger
- **C** Pump
- **D** Control Thermostat
- **E** Hi Limit Thermostat
- **F** Control Valve
- **G** Regulating Valve
- **H** Isolating Valve
- **I** Drain Cock
- **J** Spreader Plate
- **K** Sparge Pipe
- **L** Pressure/Temp Relief Valve
- **M** Secondary Flow
- **N** Secondary Return
- **O** Primary Flow
- **P** Primary Return
- **Q** Cold Feed
- **R** Flow Switch (Optional Extra)
- **S** Vent



When the draw off is less than the pump circulation rate, all the cold feed is fed to the heat exchanger. The pump also takes hot water from the bottom of the cylinder, maintainng a full reserve of hot water.



When the draw off exceeds the pump circulation rate, excess cold water collects in the bottom of the cylinder ready to be passed through the heat exchanger when the peak demand ceases.

2. General Description

Working Principles

The Maximiser is a high output semi-storage calorifier, fitted with an in-built non-storage heat exchanger.

An integral pump circulates water from the bottom of the storage section, through the heat exchanger and back into the top of the storage section.

The water is heated from cold to the set temperature in a single pass through the heat exchanger. The fixed circulation rate of the pump limits the maximum demand from the boiler. If the demand for hot water exceeds the circulation rate of the pump, the additional hot water is drawn from the reserve hot water in the storage section.

Once the demand falls below the pump capacity, the heat exchanger begins to heat the cold water that has collected in the bottom of the storage cylinder. The full reserve of hot water is therefore quickly recovered.

When there is only a small demand for hot water, the cold feed passes directly to the heat exchanger, without first entering the storage section. On its way to the heat exchanger, cold water mixes with hot water drawn by the pump from the bottom of the storage cylinder. Demand from the boiler is therefore only that necessary to raise the partially warmed water to the set temperature.

A direct acting thermostatic control valve fitted on the primary side, has a quick response and modulates and regulates the set temperature.

There is a manual regulating valve on the secondary side to adjust the circulation rate of the pump. This limits the maximum demand from the boiler.

A secondary return connection is located in the cold feed pipeline that leads to the storage cylinder for circulation of hot water around the distribution pipework. A separate circulating pump is necessary for this.

The integral pump on the Maximiser cannot provide external circulation.

3. Installation

Certain precautions should be taken with all calorifier installations to avoid adverse operating conditions and to provide a safe system of working.

Where the secondary system is open to the atmosphere, the vent pipe must slope upwards at all points and as near vertical as possible. No isolating valve should be fitted in the vent pipe, but where two or more calorifiers share a common vent, a three way escape valve is recommended for each calorifier.

The safety valves and any bursting disc should be fitted with a discharge pipe, laid with a downward gradient to a safe place, where any discharge is visible.

Pipework connected to the calorifier should be independently supported and provision made for expansion. It is recommended that isolating valves are fitted adjacent to the calorifier for ease of maintenance and as a safety precaution on the primary side.

A check valve on the secondary return will increase the amount of hot water that can be drawn from the cylinder, before any cold water reaches the distribution system under extreme overload conditions.

Make sure that the external pipework and calorifier are made from compatible materials. The combination of copper and galvanised steel should be avoided due to the risk of corroding the galvanised surface.

Galvanised cylinders benefit from an initial period of operation at 60°C or below, while a protective scale forms on the surface. Galvanised cylinders and pipework are not suitable for soft water. Nor should they be coupled to a water softener.

Calorifiers coupled directly to the mains or a booster pump set, require a manual or automatic vent to purge the system of air during filling. It is also necessary to fit an expansion vessel to accommodate the changes in volume of the stored water in an unvented system.

Use the lifting eyes provided for manipulating the calorifier into position. If the vessel is lagged, do not attempt to use slings around the body, for they may crush the outer casing.

The Maximiser must be mounted on level foundations and if necessary, the support under the neckpiece and the pipe support, adjacent to the pump, must be shimmed to give a firm contact with the floor.

Ensure that the control valve and any isolating valves are supported square with the calorifier flanges, when fitting the bolts.

Tighten the bolts in a diametrically opposite pattern, so that the load is evenly distributed around the joints.

Fit the thermostat into the pipework above the heat exchanger and connect it to the control valve.

Coil up any loose capillary and clip it to the pipework.

4. Pre-Commissioning Procedure

Safe System of Working

1. Before filling the Maximiser, check all flange bolts are tight and screwed fittings are sealed with PTFE tape.
2. Close the drain cock.
3. Open the pressure gauge cock.
4. Open the two valves on either side of the Maximiser pump fully.
5. If the entire system is empty, open the isolating valves on the secondary flow and secondary return. If the remaining system is full of water from some previous test, keep the isolating valves closed until after the cylinder is filled.
6. In order to fill the vessel, it is necessary to vent the main shell from the top connection (N). If the vent is a single pipe rising to the top of the building, this is ideal and pressure will build up gradually as the level of water rises above the cylinder into the vent pipe. If the vent pipe is shared with other equipment, the 3-port escape cock should be turned to atmosphere. If the system is a closed system (i.e. no vent pipe), open the 2-port valve, fitted to connection N.
7. Filling the vessel must be done gradually by cracking open the cold feed isolating valve. If this valve is opened too wide, the high pressure jet striking the diffuser plate in the bottom of the shell, may cause damage.
8. When the vessel is full, water will discharge from the atmospheric vent requiring it to be closed.
9. Any closed valves in the secondary flow and return can now be opened.
10. Manual vents in the distribution pipework, together with a few well chosen outlets, such as bathroom or sink taps should now be opened to flush out any trapped air as system pressures begin to balance out.
11. Finally, the circulating pump in the distribution line can be run and vented and a check made at the various vent points to ensure that all the air has been released from the system.
12. Check for any leaks.
13. If leaks are detected during the filling operation, close the cold feed isolating valve and if necessary, the valves in the secondary flow and return, before releasing the pressure via the Maximiser drain cock. If a 3-port vent is fitted, this should be returned to the atmospheric position. Likewise, a 2-port valve fitted on the vent connection should be re-opened.
14. When the joints have been re-made, follow the previous filling procedure, opening the cold feed valve partially until pressure is restored.
15. Finally, the Maximiser pump can be run and checked for correct rotation.
16. Before commissioning the Maximiser, blow down the steam line to the control valve to remove any dirt. (See manufacturers leaflet).

If the primary supply is steam, precautions should be taken to clear the line of condensate before the valve.

This will normally take the form of a simple separator and steam trap.

The line size should be adequate for the steam velocity not to exceed 30 m/sec, which is usually larger than the valve size.

A strainer is recommended in front of the valve. The circulating pump is three phase, requiring a started and isolating switch.

An indicator lamp is essential to advise the operator that the pump is running and in some instances an alarm system will be necessary for remote control.

5. Commissioning Procedure

Stage 1

1. Switch off the distribution system circulating pump.
2. Check the isolating valve in front of the Maximiser pump is fully open.
3. Fully open the regulating valve beyond the Maximiser pump and then wind it shut, counting the number of complete revolutions.
4. Open the regulating valve 25% (i.e. a quarter of the total revolutions previously counted).
5. Start the Maximiser circulating pump.
6. Set the control thermostat to 65°C.
7. Crack open the primary isolating valve to allow any accumulated condensate to pass through.
8. Continue to open the primary isolating valve a 10th of a turn every 5 seconds, stopping if any crackling noises occur and waiting for the noise to subside.
9. After one full turn, the increments can be increased to a ¼ turn every 5 seconds, until the valve is fully open.
10. Always turn a fully opened valve back a fraction to ensure that it is free and readily closed in an emergency.
11. Monitor the flow temperature in the pipework immediately above the heater section, using a contact thermometer. If the temperature is below 65°C, proceed to step 13.
12. If the temperature is 65°C or above, open the regulating valve beyond the pump in increments until the temperature falls below 65°C.
13. Raise the thermostat setting to 70°C. This should not affect the flow temperature leaving the heater since the primary isolating valve is already fully open and unable to achieve 65°C.

14 Gradually close the regulating valve, allowing the flow temperature to exceed 65°C, but below 70°C.

15 If the temperature does reach 70°C, the thermostat will begin to control and the primary valve may hunt, causing some temperature fluctuations. open the regulating valve again slightly to get the temperature stable below 70°C.

16 Do not delay too long before adjusting the thermostat back to 65°C, when the flow temperature should drop as the valve takes full control and stabilises at 65°C.

17. Some further adjustment of the regulating valve will now be necessary due to a rise in storage temperature during the trial.

Ideally, the above test should have been carried out with a draw off equal to the hourly rating of the Maximiser.

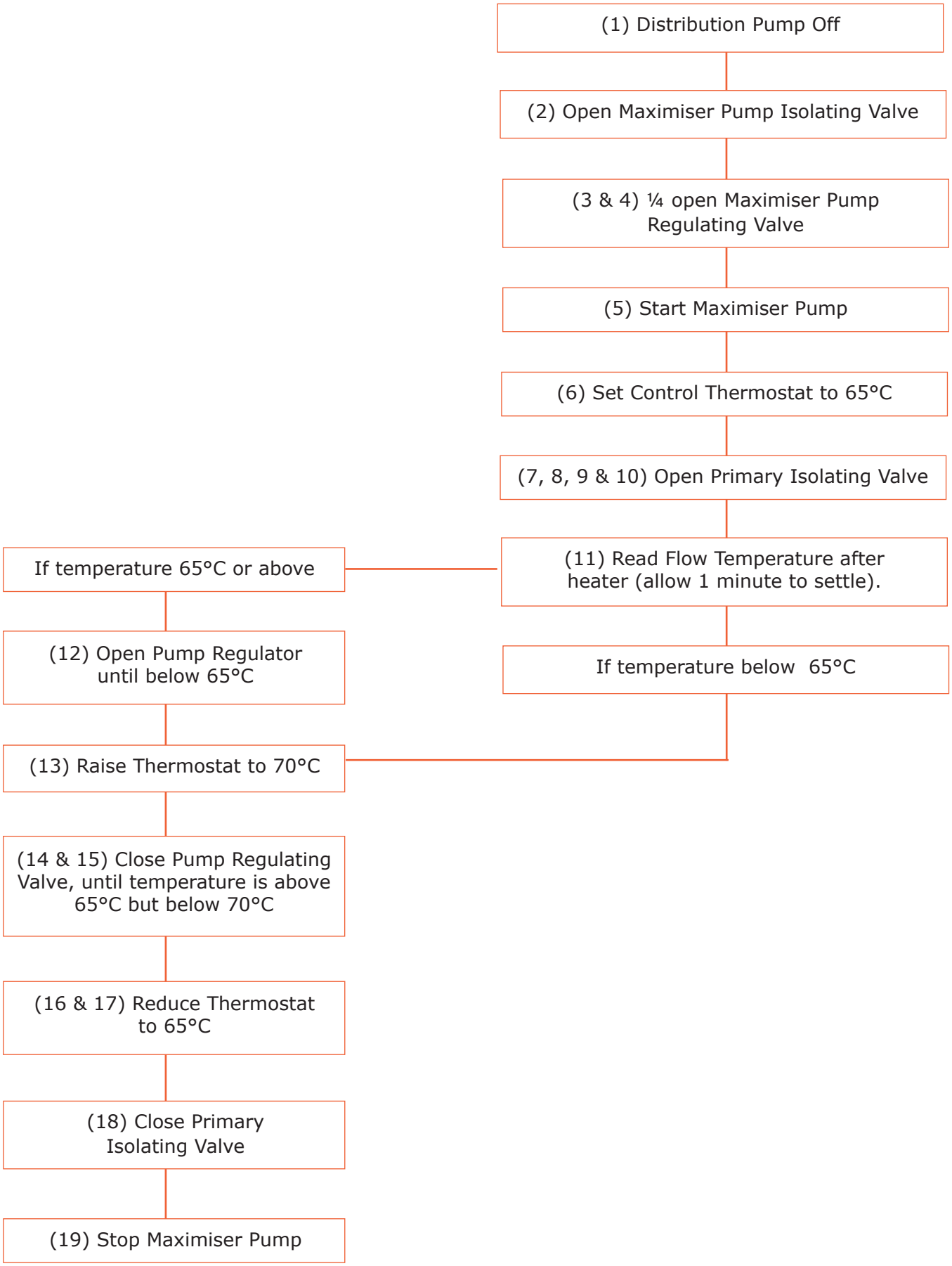
However, this is rarely practical during the commissioning trial, when there is no external demand for hot water.

18 To refine the control and ensure the Maximiser heater will deliver against the full load, close the primary isolating valve.

19 When the primary pressure is zero, switch off the maximiser pump.

5. Commissioning Procedure Cont

Stage 1



5. Commissioning Procedure Cont

Stage 2

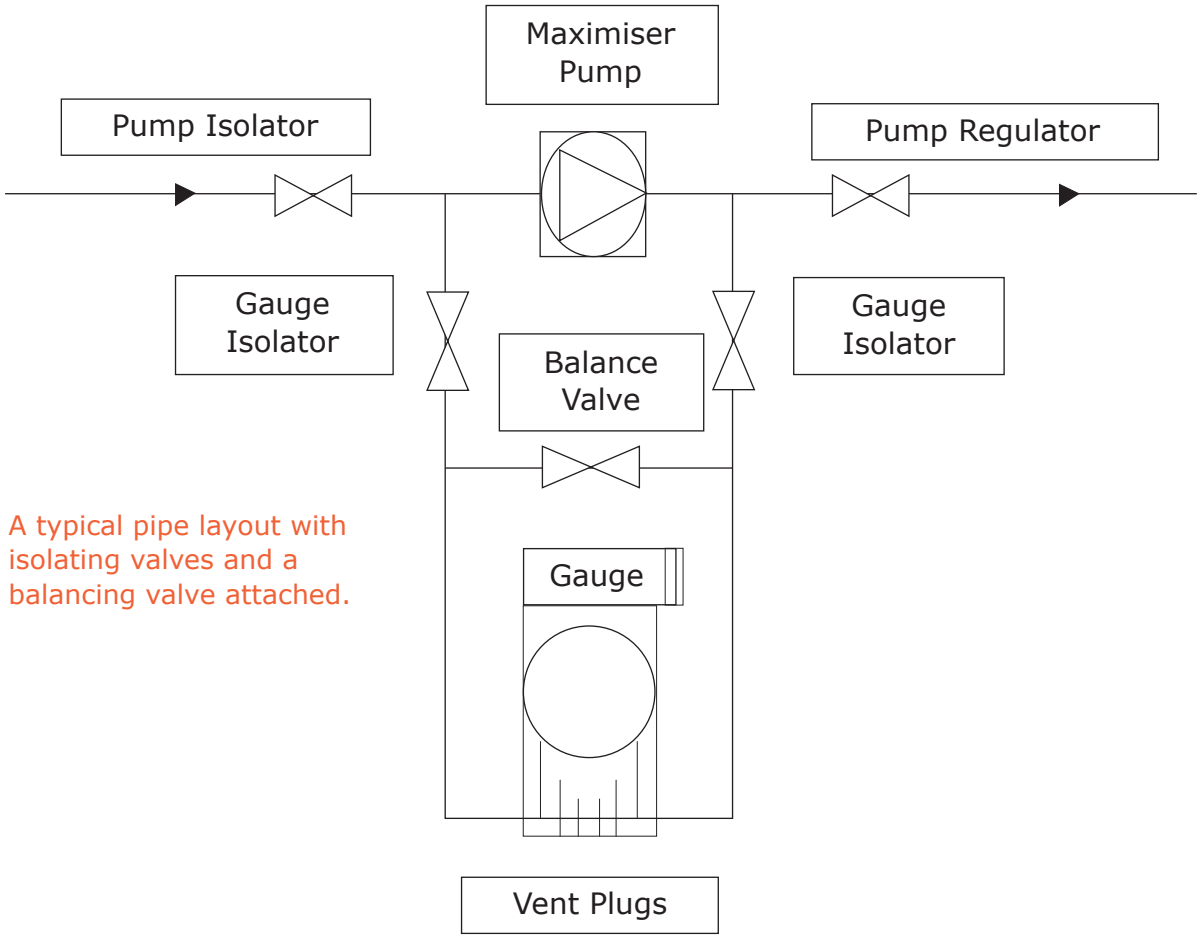
20. Draw off sufficient water from hot water fittings, such as bathroom taps and sink taps to fill the bottom half of the Maximiser with cold water.
21. Start the Maximiser pump.
22. Open the primary isolating valve gradually, repeating steps 7, 8, 9 & 10.
23. Measure the flow temperature in the pipework, immediatly above the heater section, using a contact thermometer. It should be 65°C or less.
24. Raise the thermostat setting to 70°C and repeat steps 14, 15 & 16.
25. The Maximiser is now at its peak setting and capable of delivering the maximum possible continuous hourly rating. Note the position of the regulating valve, checking the number of turns open.

    If it is desired to economise on boiler power, or operate at a reduced load during off peak season, it is only necessary to close the regulating valve further to limit the secondary flow across the heater.

To determine accurately the reduced power demand of the Maximiser, it is necessary to measure the pump head and relate this to the characteristic curve of the pump.

There are binder pressure tappings on either side of the pump that can be connected to a differential pressure gauge.

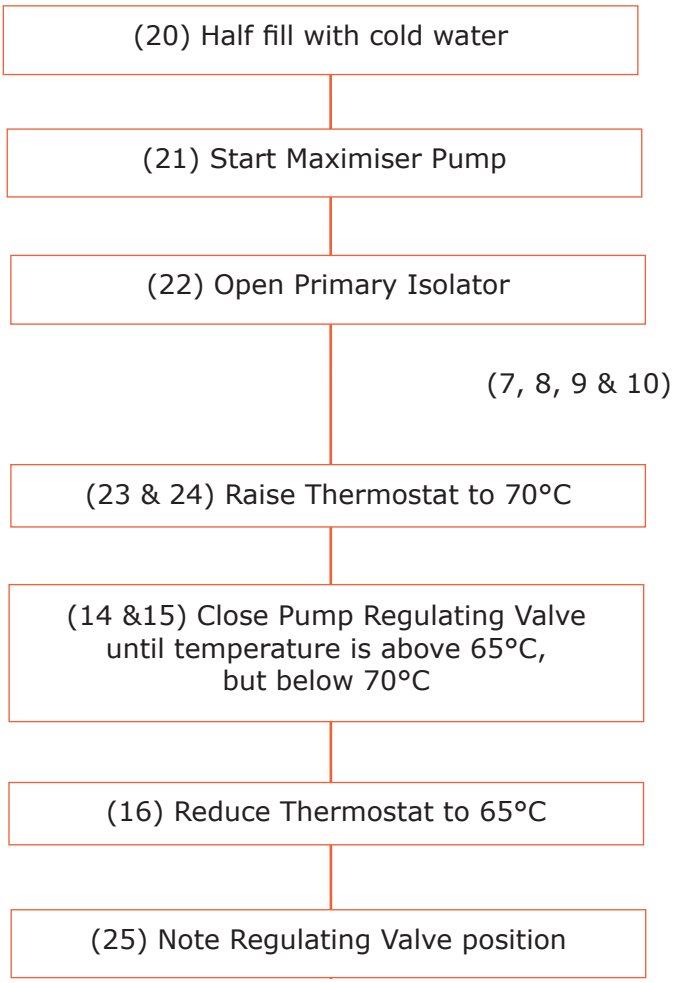
Make sure that the gauge will withstand the static head of the system and make provision for venting air from the pipework, connecting the gauge to the pump.



A typical pipe layout with isolating valves and a balancing valve attached.

5. Commissioning Procedure Cont

Stage 2



6. maintenance

Drain down of the storage section and the heat exchanger is achieved from a single draw off cock in the circulation pipework.

When the storage is to be drained, the regulating valve and the isolating valve in the circulating pipework should be left open. With a single vented calorifier, the cold feed, secondary flow and return are normally isolated from the calorifier, leaving the vent open to assist drain down and avoid partial vacuum in the shell.

When two or more calorifiers share a common vent; the threeway escape valve should be turned slowly to the drain position to allow a gradual reduction in pressure, rather than a sudden drop.

The thermostat and control valve have been selected for their sensitivity and ability to modulate. Ormandy Rycroft Limited can accept no responsibility for the safety or performance of the Maximiser if these items are changed for an alternative product without consultation.

Withdrawal of the heater battery will require removal of the non-asbestos gasket that straddles the longitudinal baffle at the tubeplate face. This should be done after withdrawal has started but before the first transverse baffle is exposed.

After the unit has been in service for some time, it is advisable to renew the non-asbestos gasket if the battery has to be withdrawn. This gasket can only be satisfactorily fitted after all the transverse baffles are back inside the shell and before the tubeplate is finally pushed home.

The main flange of a copper heat exchanger shell has a loose steel backing ring. If the copper flange has been distorted during the battery withdrawal, it must be restored to shape before fitting a new gasket. Bolting the chest to the copper flange, without fitting the battery or any joints is the best way to do this.

When fitting the chest gasket, make sure the mid feather bars are correctly located across the joint.

Heavy scale deposits will reduce the performance of the heat exchanger and these are best removed by immersing the battery in diluted hydrochloric or sulphuric acid.

This treatment is not possible with galvanised Maximiser batteries but proprietary solutions are available such as H. T. L. 'A' from Houseman, which is not harmful to galvanised surfaces below 50°C.

All such treatments should be promptly followed by a neutralising wash before refitting the battery.

As with all calorifiers, it is recommended that an early inspection should be made of the Maximiser internals to see that no undue corrosion or deterioration has taken place.

Once the general well being of the unit is established, an annual inspection is normally sufficient.

Prompt identification and elimination of any corrosive conditions will ensure a long and satisfactory life of the unit.

If it is deemed necessary to carry out a hydraulic test at any time, instructions given under Pre-commissioning tests must be carefully observed.

When making enquiries or ordering spares, please quote the serial number displayed on the Maximiser nameplate.

The capacity of the unit is not sufficient to identify the size of various components fitted.

7. Fault Finding Chart

Effect: Low Storage Temperature

Fault	Check	Solution
Sticking valve or fractured valve component.	Remove the thermostat connection and check for free movement of the valve. See operating and maintenance instructions for the particular valve supplied. New valves may take several hours operation to work freely.	Fit spare valve assembly or replace the damaged components.
Failure of the mid feather joint in the chest or the shell, allowing bypass of the heat exchanger surface.	Remove the chest from the heat exchanger to see that the mid feather of the joint is intact and matches the mid feather of the chest. Partially withdraw the battery from the heat exchanger shell to see if the rubber mid feather of the longitudinal baffle is intact. Do not pull the battery too far out or the transverse baffles will dislodge the mid feather joint.	Unless the joints are new and in good condition, replace the joints on both sides of the tubeplate before re-assembly.

8. Spare Parts List

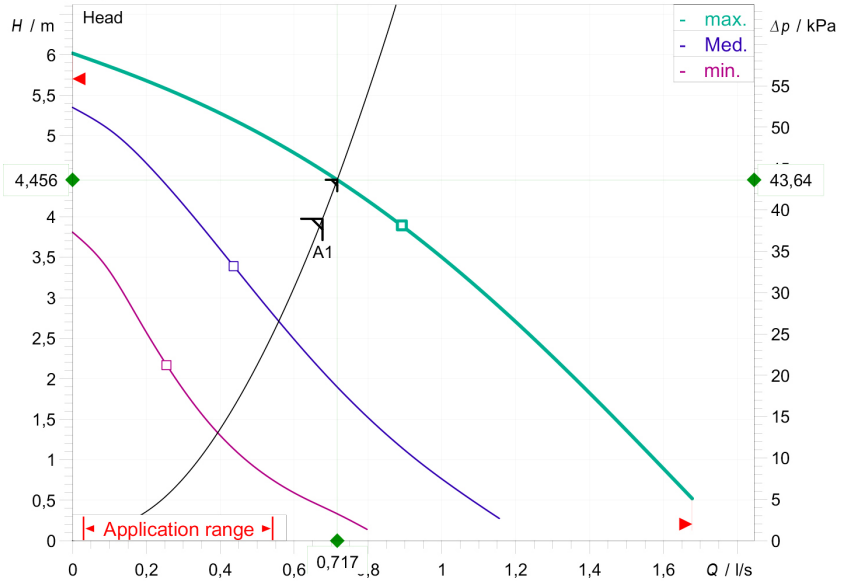
Maximiser Serial No. . . . . .

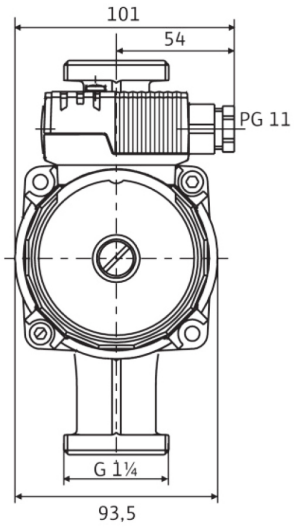
- Heater battery, complete with baffles
- Set of battery joints, including baffle seal
- Set of battery bolts, nuts and washers.
- Inspection cover joint.
- Set of inspection cover bolts, nuts and washers.
- Circulating pump complete.
- Pump spares, see attached leaflet.
- Drain cock with hose attachment.
- Drain cock handle.
- Isolating valve to pump.
- Regulating valve for pump.
- Thermostatic control valve. } **Customer Supply**
- Control valve spares, see attached leaflet. } **Customer Supply**
- Thermostat. } **Customer Supply**
- Pressure gauge.
- Thermometer.
- Pressure/Temperature relief valve.
- Binder test plug.
- Bursting disc.
- Anti-vacuum valve.

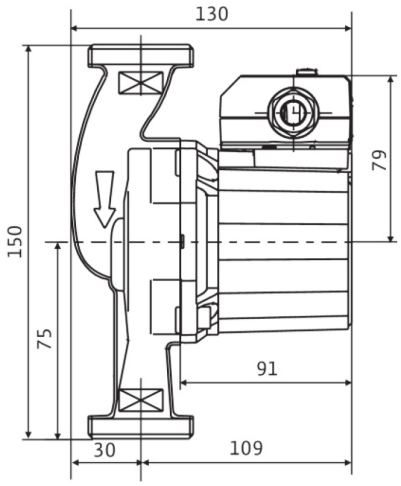
8. Pump Details

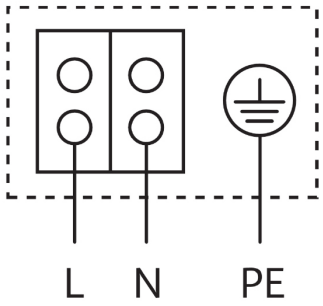
Typical Example of a Pump

Duty chart









Requested data

Flow	0,68 l/s
Head	3,98 m
Media	Water 100 %
Fluid temperature	20,00 °C
Density	998,30 kg/m³
Kin. viscosity	1,00 mm²/s

Hydraulic data (Duty point)

Flow	0,72 l/s
Head	4,46 m
Power input P1	0,13 kW

Product data

Glandless standard pump STAR-Z 20/7-3(150mm)	
Max. operating pressure	1000 kPa
Fluid temperature	2 °C ... + 65 °C
Max. ambient temperature	40 °C
Max. permitted total hardness in potable water circulation systems	3.21 mmol/l (18°dH)

Motordata per Motor/Pump

Mains connection	1~ 230 V / 50 Hz
Permitted voltage tolerance	±10 %
Max. speed	2700 1/min
Power input P1	147 W
Current consumption	0,58 A
Degree of protection	IP44
Insulation class	F
Motor protection	Not required (blocking-cu
Type of connecting cable	1 x PG11

Fitting dimensions

Pipe connection on the suction side	G 1¼, PN 10
Pipe connection on the pressure side	G 1¼, PN 10
Port to Port	150 mm

Materials

Pump housing	Bronze, CuSn5Zn5Pb2-C
Impeller	PPE-GF30
Shaft	Oxide ceramic
Bearing	Carbon, synthetic resin-impregnated

Information for order placements

Weight approx.	2,8 kg
Item number	4081203

The above is a typical example of a standard pump. This is not neccessarily the pump that will be used in your vessel. A data sheet with the exact model of the pump used in your product will be sent to you along with the manual.

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