

## Instruction Manual for Pool Heater

### 120PHR (84kW to 120kW)



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## 1) INTRODUCTION

The Thermalec PHR heater is designed for use with swimming pools, spas and other similar installations. To prevent damage to the heater it must not be operated unless it is fully flooded with a sufficient flow of pool water. An interlock is fitted, ensuring that the heater cannot be operated unless the filter pump is running.

A temperature controller is fitted to allow control of the water temperature in the range 15 to 45°C. The maximum water temperature is limited to 52°C by a safety thermostat. A thermometer displays the pool water temperature when the heater is OFF. When the heater is ON the reading may be slightly higher, depending on the flow rate through the heater.

The heater is designed to have a maximum operating pressure of 2 bar (30 psi). Exceeding this limit will operate the pressure relief valves located on the heater vessel.

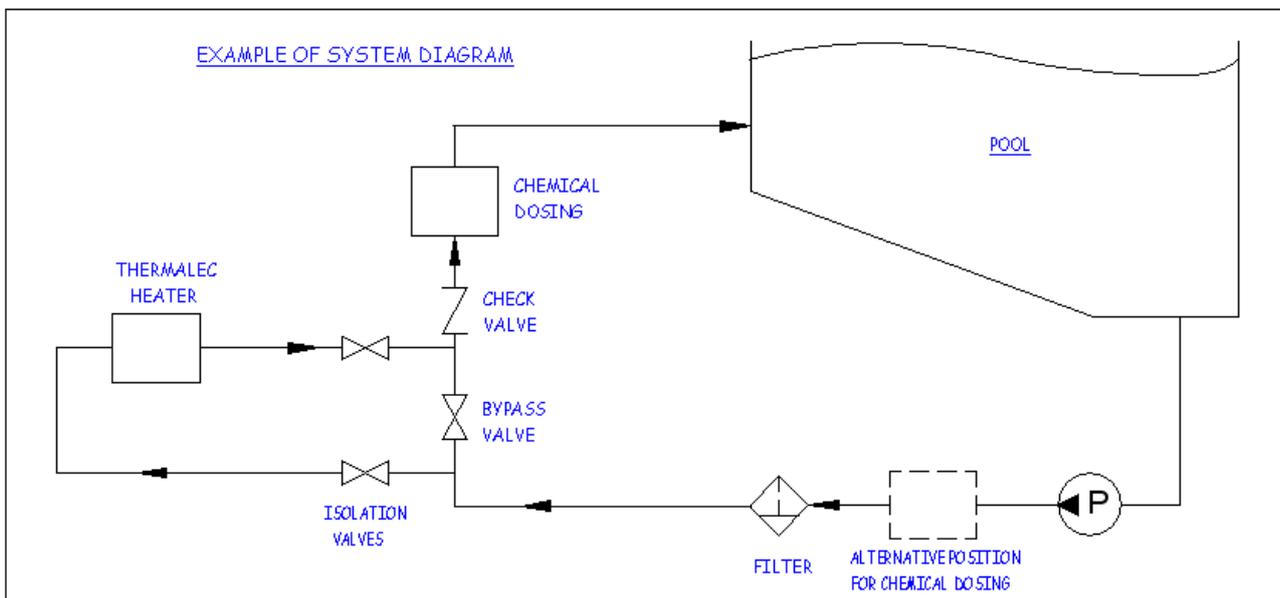
The IP rating of the heater is IP21 and it should be installed in a weatherproof enclosure with good drainage

The pool temperature will gradually rise if the heater has been sized according to our published sizing charts. Our Economy 7 charts are sized such that in early May (of an average year) an outdoor pool with a solar cover will reach the required temperature in about five nights. The actual time taken to reach temperature is determined by the ambient air and water temperatures and by the overall heat losses from the pool.

## 2) INSTALLATION

**Regulations & Codes of Practice.** The heater should be installed by a competent person in accordance with the relevant standards for the country of use. In the UK these standards are BS 7671 (IEE Regulations, 16th Edition) and the SPATA standards. Electrical installations for swimming pools in the UK are classified as 'Notifiable' under Part P of the Building Regulations 2005. This means that a qualified electrician, registered with a self-certification scheme, must carry out the work. Alternatively, another person may carry out the work, but it must be notified to the local authority who will arrange for inspection & testing to be carried out.

### Plant Layout.



Chemical dosing systems should not be installed adjacent to the heater. If installed upstream of the heater it must be before the filter. If installed downstream, a check valve must be fitted to prevent backflow of chemicals when the filter pump is not operating. There should be a drop in level between the pipe leaving the heater and entering the dosing system.

The pipe system should have valves to isolate the heater. A shut off valve should be included in the bypass to stop the flow around the heater when not required. The flow rate through the heater should be chosen with regard to the table below:

Flow Rate	84 kW	96 kW	108 kW	120 kW
Hard water maximum - use bypass above this rate - minimise scale formation	9000 gal/hr 700 l/min	9000 gal/hr 700 l/min	9000 gal/hr 700 l/min	9000 gal/hr 700 l/min
Soft water maximum - use bypass above this rate - improves element life	4500 gal/hr 350 l/min	4500 gal/hr 350 l/min	4500 gal/hr 350 l/min	4500 gal/hr 350 l/min
Minimum	1680 gal/hr 8400 l/hr	1920 gal/hr 9600 l/hr	2160 gal/hr 10800 l/hr	2400 gal/hr 12000 l/hr

To calculate the exact flow rate allow the pump to run without the heater on for a few minutes and then take a reading of the thermometer. Then switch the heater on and allow about five minutes for the temperature to stabilise before taking a second reading. The difference between the two readings gives the exact temperature rise for that flow rate. Use the following formulae to establish the rate:

$$\text{Flow (Gallons/hour)} = \frac{\text{Heater kW rating} \times 190}{\text{Temperature rise in degrees C.}}$$

$$\text{Flow (Litres/min.)} = \frac{\text{Heater kW rating} \times 14.4}{\text{Temperature rise in degrees C.}}$$

**Plumbing.** To enable the supply cable to be inserted through the back panel, allow space behind the heater equal to at least the depth of the heater casing. The minimum clearance above the heater should 400mm.

Flow direction through the heater is left to right, allowing the temperature controller to sense the temperature coming from the pool. The direction may be changed by reversing the probes of the control thermostat and the safety thermostat, as follows:

- Switch heater circuit breakers to OFF;
- Switch main power supply and pump interlock supply to OFF;
- Remove main cover;
- Reverse two probes. Controller probe is situated at the left-hand end of the element plate; the safety thermostat probe at the right (marked with a short length of white sheathing);
- Move the thermometer probe to the empty pocket on the left-hand side;
- Reinstate the top cover before reconnecting connecting electrical supplies.

Pipe connections are stub flanges to suit 3" nominal bore pipe (uPVC or ABS). If using ABS the solvent jointing compound must be suitable for both materials. Reducers may be fitted to suit smaller pipes. It is not necessary to fit unions either side of the heater as the stub flanges are easily disconnected from the heater, by removing the nuts securing the aluminium backing flanges to the heater. In very tight installations, the studs themselves may be unscrewed.

Levelling Screws are provided for use in the four holes in the base of the heater to level it, but more importantly they will stop the heater rocking on its base. If the heater is shelf mounted, the holes may be used to screw the heater down, either by bolting down with the packing screws from underneath, or by using wood screws from the top. If the heater is connected with rigid pipework and is floor mounting, the levelling screws, together with the pipes and cable will make the heater stable.

**Electrical Installation.** All work must be carried out by a "competent person" as defined in section 2.

To provide earth leakage protection, a Residual Current Device (RCD) must be fitted to installations involving swimming pools or spas. The RCD must be rated to carry the current drawn by the heater (see table below) and the current drawn by other items of equipment on the same supply

Overcurrent protection must also be provided in the form of a Miniature Circuit Breaker (MCB). Due to the continuous high load that will be drawn, MCBs should be rated at least 20% higher than of the current shown below.

Specific Electrical Supply	84 kW	96 kW	108 kW	120 kW
400V – Three Phase (UK)	121 Amps	138 Amps	156 Amps	173 Amps
380V – Three Phase (Euro)	128 Amps	146 Amps	164 Amps	182 Amps

The size and specification of the cable to the heater should be decided by consulting the regulations stated in section 2. To minimise the effects of volt-drop, the plant room should be located as close as possible to the main electrical supply.

The supply cable enters via the removable plate at the back of the heater. The plate should be drilled out to suit the size of cable gland used. Under no circumstances should cable be installed through the metal plate without the use of a gland.

To access the terminals, remove the heater cover and terminal cover. The wires of the incoming power supply (L1, L2, L3, N and E) must be connected to the appropriate terminals.

It is vital that all wires are firmly terminated into each terminal; a spanner should be used to ensure that the clamps are pulled firmly down onto the incoming cable ends. Ensure that the cable is of sufficient diameter to ensure a good clamp is made and, if required, wind a length of copper strand around the other strands to increase the diameter. After termination, check all the cables for tightness and replace both sets of covers.

The heater will not operate without a pump interlock supply that switches 230V ON when the filter pump is running. The live of this supply should be connected to terminal A and the neutral to terminal B of the heater. The supply must be taken from the last device switching the pump to ensure that the heater will switch off at the same time as the filter pump.

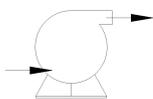
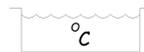
This pump interlock supply can also be used to further control the operation of the heater. A timeswitch can be fitted to interrupt the supply to terminal A; ensuring that it can only come on during specific periods of cheap electricity. This is detailed on drawing APH 1319, together with arrangements for an override switch allowing the filter pump to be run continuously.

Thermalec also produce a range of Pool Control Panels, which enable pumps, heating and all other pool items to be controlled from a single control box. All panels are made to order, to match the specific equipment. Please contact the Sales office for more details.

## COMMISSIONING

When using the heater for the first time (or after it has been isolated for the winter) it is vital that the heater is commissioned using the correct procedure. **Failure to do so will result in serious damage to the heater.**

- g) Check heater circuit breakers are all OFF;
- h) Check main power supply is OFF;
- i) Check filter pump is OFF;
- j) Check heater drain valve is closed;
- k) Set pool temperature controller to less than 15°C;
- l) Check heater isolation valves are OPEN and water is flowing through the heater;
- m) Check that the heater is full of water before proceeding;**
- n) Check that timeswitch (if fitted) is on and heater control supply is enabled;
- o) Switch on the Filter Pump - **Check positive flow of water into pool;**

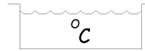


Amber pump supply lamp ON

- p) Switch main power supply to ON  
Red main supply lamp ON;
- q) Remove seal from heater circuit breakers and switch ON

Red, White and Amber heater status lamps ON;

- r) Set pool temperature controller to desired temperature



First Green heater status lamp ON (closing of contactor can be heard);

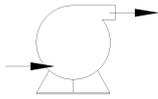
- s) After a delay of several minutes the second bank of contactors will close

Second Green heater status lamp ON (closing of contactor can be heard), two lamps now ON;

- t) After a delay of several minutes the third bank of contactors will close

Third Green heater status lamp ON (closing of contactor can be heard), all lamps now ON.

- u) Turn filter pump OFF;



Amber pump supply lamp OFF. Green and Amber heater status lamps OFF;

- v) Turn filter pump ON;

- w) Reset the timeswitch.

### 3) WINTER ROUTINE

If the pool is to be closed over the winter damage may be caused by chemically treated water and debris left standing in the vessel. The following procedure should be followed

- a) Switch heater circuit breakers to OFF;
- b) Switch main power supply and pump interlock supply to OFF;
- c) Remove main cover and check main terminals for tightness;
- d) Apply WD40 (or similar to) all electrical components, particularly the contactors;
- e) Close heater isolation valves ;
- f) Empty vessel using drain valve;
- g) Remove drain valve locking screw and check for debris at the bottom of vessel with 6mm dowel rod.  
If rod cannot be fully inserted then consideration should be given to opening the vessel to remove debris.

If the pool is to be kept in semi-operation during the winter then the heater may only be left full of water if the filter pump is fitted with a frost-stat.

### 4) FAULT - FINDING

**Safety Warning.** The electrical supplies to the heater are potentially lethal. All maintenance and repair operations should be carried out by trained personnel, supported by appropriate safe systems of work. Before removing the top cover ensure that, both the three phase main supply and, the single phase pump interlock supply, are both isolated.

**Status Lamps.** The lamps on the front panel monitor the heater and give indication of any faults that may have developed in the system. The lamps will light in sequence 1 through 8. The green lamps will only light (and the pool water be heated) when the others are all lit. The following actions should be taken if any of these lamps are not lit,

<b>Colour Meaning</b>	<b>Action</b>
1 RED Mains supply OK	Check main supply MCB or RCD has not tripped. Check control fuse (inside unit), spare is provided.
2 AMBER Pump Interlock supply OK	Check that filter pump running (may be controlled by timer) Check that 230V is present across terminals A and B
<b>Colour Meaning</b>	<b>Action</b>
3 RED Heater supplies OK	Check that unit circuit breaker is switched on.

- |   |       |   |   |
|---|-------|---|---|
| 4 | WHITE | Temperature safe  | Reset Safety Thermostat by pressing red button.<br>If Thermostat trips again, check for insufficient water flow caused by blockages or air in the system. |
| 5 | AMBER | Pump Interlock relay OK   | Check that pump interlock relay (inside unit) is securely plugged in and switching  |
| 6 | GREEN | Heating in progress<br>1 (first heater bank)                      | Check that Control Thermostat is set to desired pool temperature.   |
| 7 | GREEN | Heating in progress<br>2 (second heater bank, after short delay)  | Check that Control Thermostat is set to desired pool temperature.   |
| 8 | GREEN | Heating in progress<br>3 (third heater bank, after further delay) | Check that Control Thermostat is set to desired pool temperature.   |

**Controller Drift.** The calibration of the controller drifts over time, requiring the value set on the dial to be gradually increased to maintain the same actual temperature in the water. Thermostat should be replaced.

**Contactors Frequently Switching.** Switching of the contactors every few minutes indicates that the direction of water flow is incorrect.

**Heater Circuit Breaker Trips.** Check if red reset button from Safety Thermostat has popped out. If so reset and wait, if thermostat trips again check for sufficient water flow and air in system. If trip is not associated with this check individual heating elements for insulation resistance.

**Protective Devices on Supply Trip.** If RCD has tripped, first check that other equipment in the installation has not caused the trip, and then check heating elements for insulation resistance. If MCB has tripped, check it is correctly rated (section 2).

**Noise.** Excessive “buzzing” when heating indicates small amounts of rust on the pole faces of the contactor. As mentioned in section 4, WD40 should be applied to the affected area.

**Pool Not Reaching Desired Temperature.** If the status lamps are lit as described above and the contactors can be heard engaging, then the heater can be said to be operating correctly. If the pool does not reach the required temperature after an appropriate number of hours then the current drawn by the heater should be checked using a clip-on ammeter. An alternative method is to set the temperature control several degrees above normal and use the main supply meter to check how many Units (kWh) the heater consumes in an hour. This figure should be slightly above the kW rating of the heater, allowing for the filter pump and other domestic equipment on the same supply. If the consumption is less than the rating of the heater then the issue is elsewhere in the system, for example:

- Low voltage supplied to the heater, indicating that cable diameter is too small or run is too long.
- Inadequate mixing of the warm water from the heater with the cooler water in the pool, leading to a layer of warmer water forming at the height of the inlets. To cure, alter the direction of the pool inlet jet downwards.
- Incorrect setting of any timeswitches fitted to heater or filter pump.
- Timeswitches are not synchronised with the main electrical supply meter
- Lack of water flow caused by insufficient pump head, or blockages in the pipe-work.

**Warranty.** The heater is guaranteed for two years against faulty workmanship or materials. This does not cover damage caused by incorrect commissioning & maintenance or by other neglect of the heater.