OWNER/INSTALLATION MANUAL
FOR

PPT8/12/16/22L/LY

(SD617650 Iss.X 08/12/09)

Health and Safety Warning:
As the heat pump includes electrical and rotational components it is required that only trained and competent persons should remove panels giving internal access to the unit.

Congratulations!

You are now an owner of a Calorex Heat pump!

Contents

1.0 Introduction and Function

1.1 Introduction

The Calorex 'Propac' range of air/water heat pumps are designed for swimming pool heating and consists of 4 models. Heat pumps in this manual are designed to heat pool water and spas within the range of 10°C to 40°C. Standard units are suitable for outdoor pools operating in ambient temperatures above 10ºC. Reverse cycle defrost models operate in ambient temperatures down to -15ºC.The water heat exchanger is a full flow type, manufactured from titanium tube, which is a highly corrosion resistant material. The heat pumps are suitable for use in fresh water and salt water pools. PPT8/12 heat pumps are fitted with rotary compressors and PP16/22 heat pumps are fitted with scroll compressors. Both types of compressor are known for quiet running. With these features the heat pump is designed to have a long, trouble free life.

All units have integral safety devices to protect the heat pump from internal and external faults. Indicator lamps indicate operating mode. An adjustable digital thermostat controls water temperature. Also a 6 minute cycle time delay is incorporated.

IMPORTANT NOTE

Calorex Heat Pumps Limited is an ISO9001:2000 certified company.

All Calorex heat pumps are CE approved

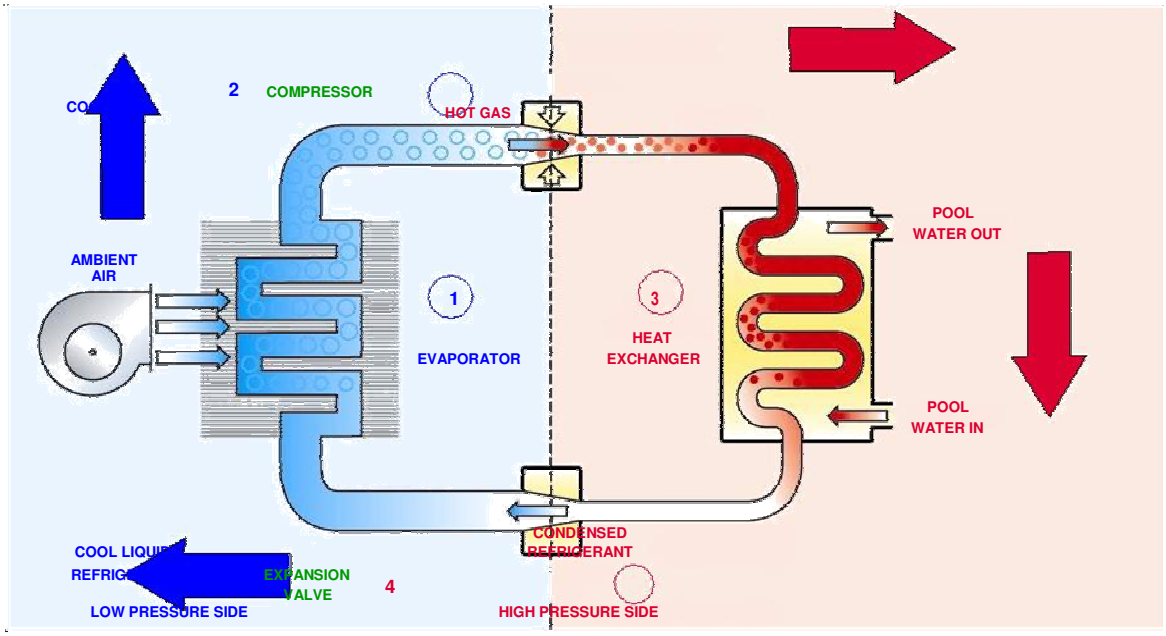
1.2 Function

The Calorex Swimming pool heat pump provides thermodynamic heating by means of a vapour compression cycle, (similar to that employed in a conventional refrigerator), in addition to acting as an active solar collector.

1. THE EVAPORATOR collects the heat from the outside ambient air, pre-heated by the sun. In the Calorex swimming pool heat pumps, high volumes of outside air are drawn into the unit by the fan expelled through the evaporator fins. The evaporator has liquid refrigerant passing through it which is at a considerably lower temperature than the ambient air. Therefore the air gives up its heat to the refrigerant which then vaporises.This preheated vapour now travels to -

2. THE COMPRESSOR where it is compressed and upgraded to a much higher temperature. The hot vapour now enters -

THE HEAT PUMP CYCLE



3. THE CONDENSER where it is surrounded by the pool water. The heat is given up to the cooler pool water and the now cooler refrigerant returns to its former liquid state but still under high pressure from the compressor.

This pressure is released by passing the liquid through -

4. THE EXPANSION DEVICE and from there, now at normal pressure, it is returned to the evaporator and the cycle starts again.

Coefficient of Performance

The efficiency of a Heat Pump is usually called its 'Coefficient of Performance' - (C.O.P.) which is simply a ratio of heat output to energy input, both being expressed in kW. Thus a Heat Pump absorbing 1 kW of electricity, collecting 4 kW of energy from the air, and delivering 5 kW of heat to the pool water is said to have a C.O.P. of 5:1.

This ratio will vary according to the temperature of the water and the ambient air.

2.0 Installation

2.1 Siting

a Ensure heat pump on site is as ordered, i.e. model, electrical supply and factory fitted options.

b Inspect unit for damage, in particular inspect the evaporator (finned side) to ensure that it is undamaged. (Minor indentations in the fins do not affect performance). If severely damaged, endorse delivery note in presence of the driver and send a recorded delivery letter to transport company giving details. Protect unit if installation is delayed.

c Provide a firm level base capable of supporting operational weight of unit; spread load if mounted on timber floor.

d Ensure water cannot collect under unit, it is recommend that units are installed on plinths 100mm above finished floor level. This also aids condensate drainage.

e Allow adequate clearance to service panels on unit; recommend 500mm minimum.

f All Calorex heat pumps are by design as quiet as is practical, however due consideration should be given to siting the heat pump in order to minimise the noise coming from the machine, for example by positioning the machine so that the inlet/outlets are parallel to occupied premises.

g Ensure loose debris such as leaves, grass cuttings, etc will not block air inlet grilles.

h Consider protection from extreme weather conditions if installed externally, i.e. lean-to-cover or building

2.2 Air flow

Due consideration must be given to air flow i.e. do not obstruct inlet or outlet and ensure discharge to air cannot recirculate to inlet. (See figure 1).

FIG 1 POSSIBLE POSITIONS OF A CALOREX HEAT PUMP

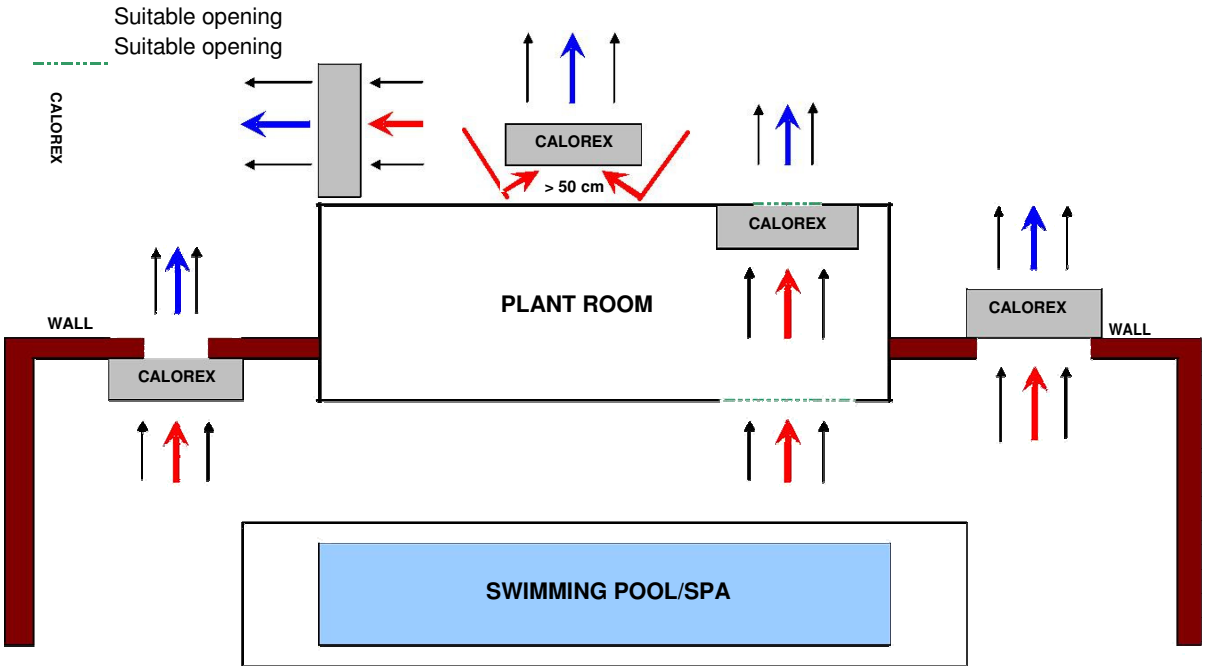


TABLE 1

MODEL	Minimum Free Area m²	
	Inlet	Discharge
PPT8	0.157	0.168
PPT12	0.264	0.168
PPT16	0.264	0.173
PPT22	0.308	0.173

Required Free Areas to provide air flow to and from heat pumps when installed in an enclosed area or where required to pass air through a wall etc.

Free areas is the available area through which air can pass through a grille or louvres.

Note if multiple units are installed in an enclosed area then the inlet free areas required for each unit can be added together to form one inlet aperture. BUT discharge from each unit must be kept separate and must not be incorporated into one common duct system.

3.0 Plumbing

a) Calorex Heat Pumps have water inlet/outlet connections as follows:

All models have 1½" BSP parallel, male threads.

The heat pump is supplied with bungs fitted in the water connection fittings. These need to be removed before the heat pump is installed. See section 3.2.

b) The Calorex Heat Pump must be connected after the filter in the return pipe to the pool. If an existing heater is being retained, then the Calorex Heat Pump should be connected between the filter and the other heater. (See figure 4).

c) Suitable breakable couplings should be installed local to the heat pump.

d) If the heat pump is installed at a lower level than the pool then isolation valves should be fitted.

e) A drain valve or plug should be fitted to the lower pipe to facilitate drain down in the winter period.

f) Connections on all models are by BSP parallel male threaded fittings. These should be hand tightened only, otherwise damage may result to the threads of the plastic fittings.

g) The condensate drain at the base of the unit collects condensation from the evaporator fins. This should run away to waste via ¾" domestic waste piping. It is therefore necessary to ensure that the Calorex Heat Pump is placed on a level plinth so that the condensate water can run away with adequate fall to waste i.e. ½" per foot minimum and must incorporate a "u" trap as to not overflow the edges of the drip tray inside the heat pump. See figure 3.

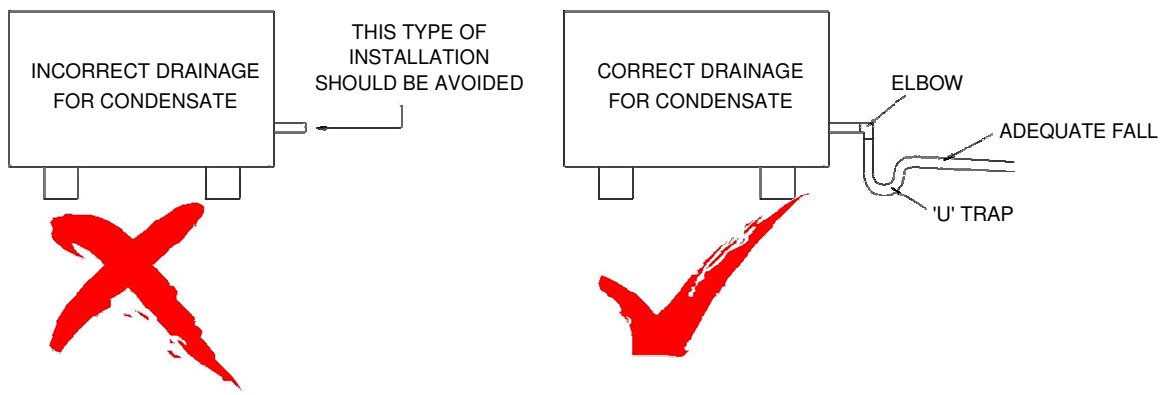


FIG 3

h. When the pipework installation is complete the pool pump should be switched on and the system tested for leaks. Also check the filter gauge to see that there is not an excessive increase in back pressure. If everything is then working normally the water circulating system is ready for use.

i. Water circuit to and from the unit is to be capable of maintaining within specified limits the rate of flow required by the heat pump. (See section 10).

j. All pipework must be adequately supported with allowance expansion/ contraction especially with plastic pipework.

k. It is recommended that when installing water systems the last connections to be made in the system should be breakable connections to avoid any stresses on the unit connections.

IMPORTANT

1. All Pool Purifying Devices and Chemical Injection Systems to be fitted down stream of the heat pump unless installation is as per filter dosing (see figure 4). This includes the practice of dosing chemicals direct into skimmer basket, which results in concentrated corrosive liquids passing over vulnerable metal components.

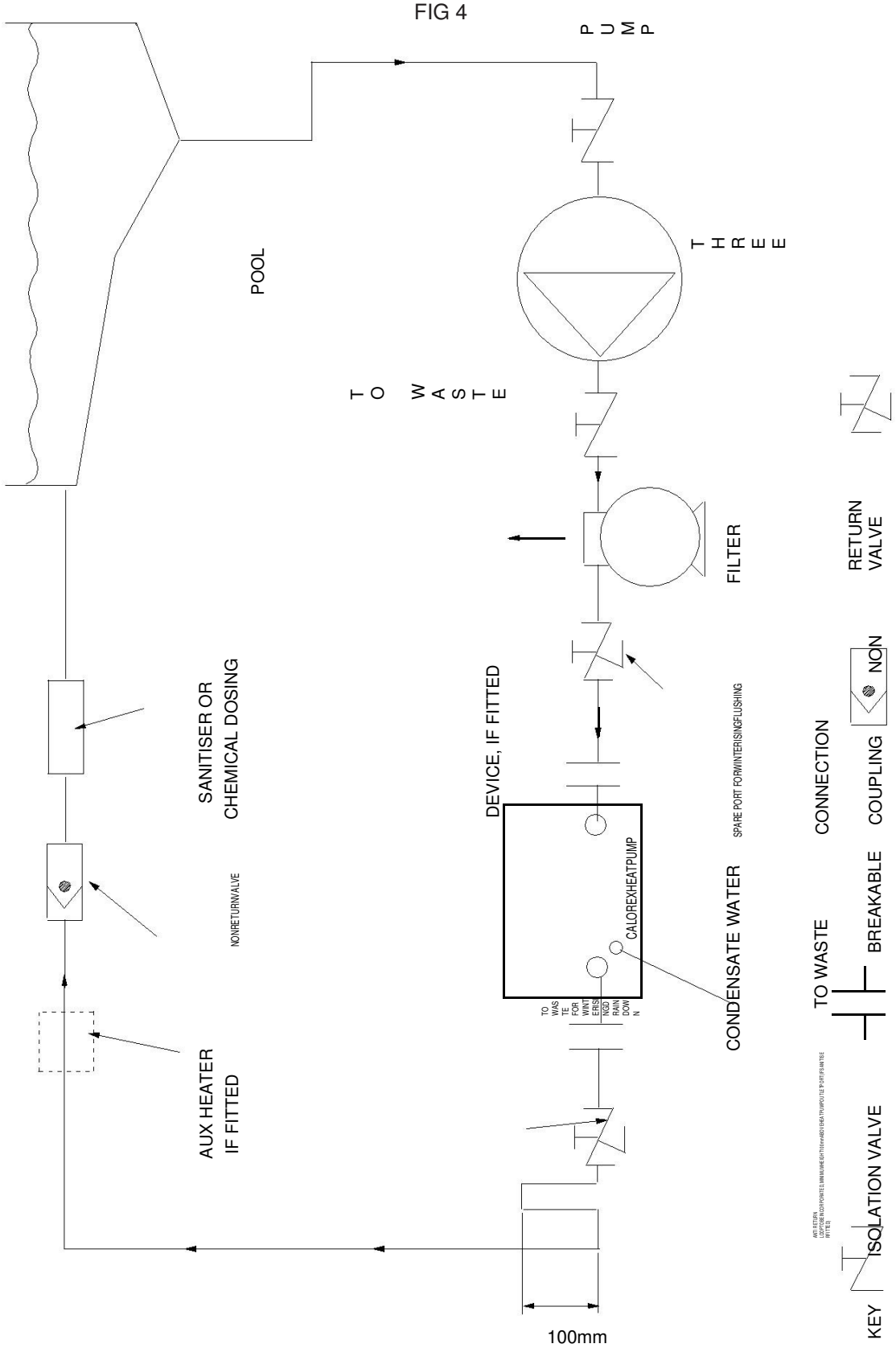
2. Water quality must be maintained as follows:

pH	7.2 - 7.8
Total Alkalinity	80 - 120 ppm as $CaCO_3$
Total Hardness	150 - 250 ppm as $CaCO_3$
Total dissolved solids	Max 1000 ppm
Saline Water	Max 35,000 ppm
Chlorine - free Cl Range	1.0 - 2.0 ppm Domestic
Chlorine - free Cl Range	3.0 - 6.0 ppm Commercial
Ozone	0.9 Max ppm
Bromine	2 - 5 ppm
Baquacil	25 - 50 ppm
Aquamatic Ionic Purifier	Max 2 ppm Copper

3. Maximum pressure of water in heat pump circuit should not exceed 3kg/cm^2(50 psi)

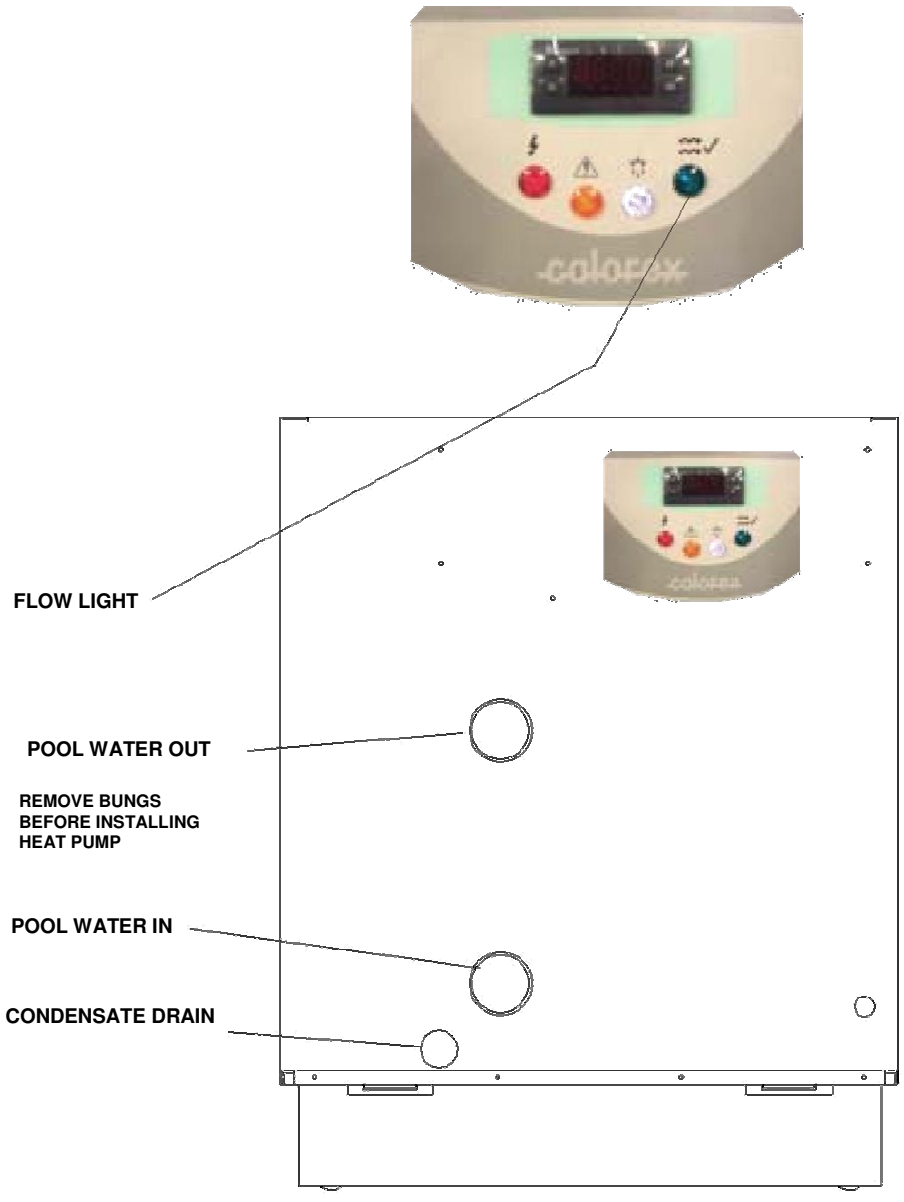
3.1 Recommended Plumbing Schematic

FIG 4



3.2 Determining Water Flow

The heat pump is fitted with a water flow switch which inhibits the operation of the heat pump when the water flow is below 5000l/hr. Adjust the flow rate until the flow light (green lamp) is illuminated. This lamp indicates that the water flow through the heat pump is adequate.



HEAP PUMP SIDE

PPT8/12 FLOW RATE 115 litres
per minute
PPT 16/22 FLOW RATE

4.0 Electrolytic Corrosion in Swimming Pools

Electrolytic corrosion will occur when dissimilar metals that are in contact with each other create a potential difference between themselves. Sometimes separated by a conductive substance known as an electrolyte, the dissimilar metals will create a small voltage (potential difference) that allows the ions of one material to pass to the other.
Just like a battery, ions will pass from the most positive material to the more negative material.

Anything more than 0.3 volts can cause the most positive material to degrade.

A swimming pool with its associated equipment can create this effect. The pool water being an ideal electrolyte and components of the filtration circuit, heating system, steps, lights etc providing the dissimilar metals needed to complete the circuit.
Whilst these small voltages are rarely a safety threat, they can create premature failure through corrosion. Not dissimilar to corrosion through oxidation, electrolytic corrosion can cause complete failure of a metallic material in a very short period of time.

In order to prevent this type of corrosion all metallic components in contact with swimming pool water should be bonded together using 10mm² bonding cable. This includes non-electrical items such as metal filters, pump strainer boxes, heat exchangers, steps and handrails. It is highly recommended that bonding be retrofitted to existing pools, which may not be protected by this system.

4.1 Electrical (Machine Wiring and Supply).

SEE FIGURES 5,6,7 AND 8 FOR PREFERRED METHOD

All electrical work to be carried out in accordance with I.E.E. standards, latest issue, or local codes of practice as applicable.

The machine should be installed in line with EMC2004/108/EC.

Protected supply to incorporate fuses or motor type circuit breakers (Type C) to specified rating, (see Data Sheet) . H.R.C. fuses are recommended. An isolator which disconnects all poles must be fitted within 2m and in sight of machine.†

All units must be correctly earthed-grounded. An earth leakage trip of the Current operating type (30mA) is recommended to be fitted to all pool electrics.

INCONSISTENT ELECTRICAL SUPPLY

The following limits of operation must not be exceeded if Calorex machines are to be guaranteed either in performance or warranty terms:

	Minimum	Maximum
Voltage single phase	207V	253V
Voltage three phase	360V	440V
Frequency - Hz	47,5	52,5

This voltage must be made available at the heat pump while running.

† Note the Isolator must have a minimum of 3mm air gap when turned off.

NOTE: Three phase heat pumps are fitted with a phase protection relay and will not run if the phases are not connected in the correct order (phase sequence) or if the supply voltage is 15% less than the nominal voltage (415V for 3N~ 50Hz). The lamp on the phase rotation relay (situated in the electric box is illuminated when the phases are correctly connected and the voltage is sufficient.

IMPORTANT

The user should be made aware that THE WHOLE installation should be isolated when working on ANY PART.

4.2 Location of Mains Input and External Interlock Terminals

REMOVE SCREWS FROM TOP COVER AND LIFT OFF

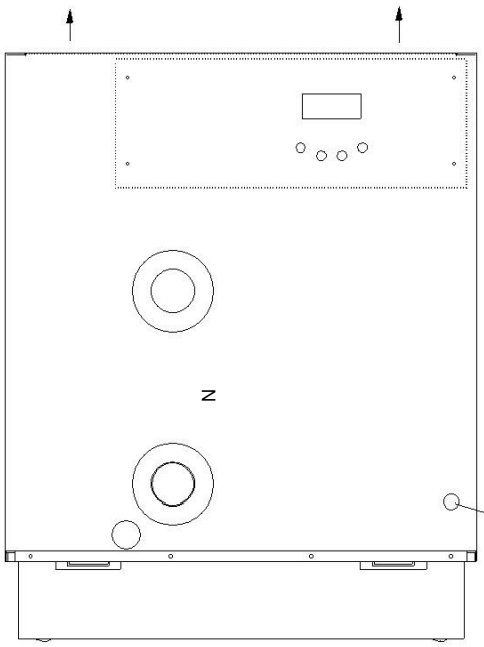
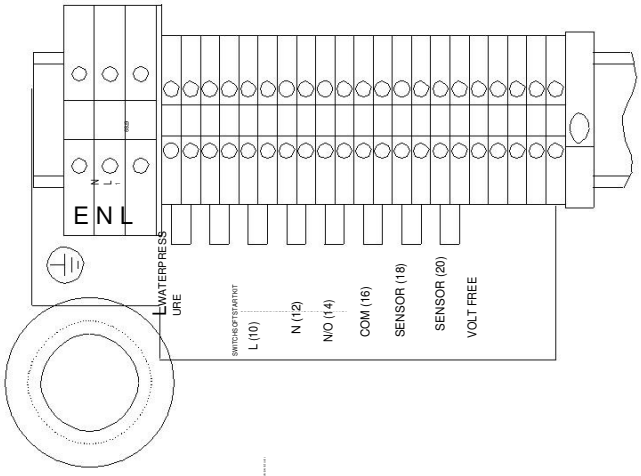
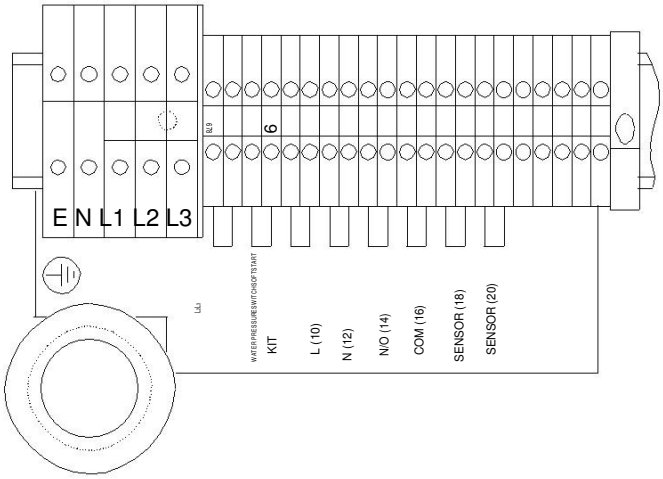


FIGURE 5

SINGLE PHASE 230V ~1N 50Hz



THREE PHASE 400V ~3N 50Hz



5.0 Optional Features

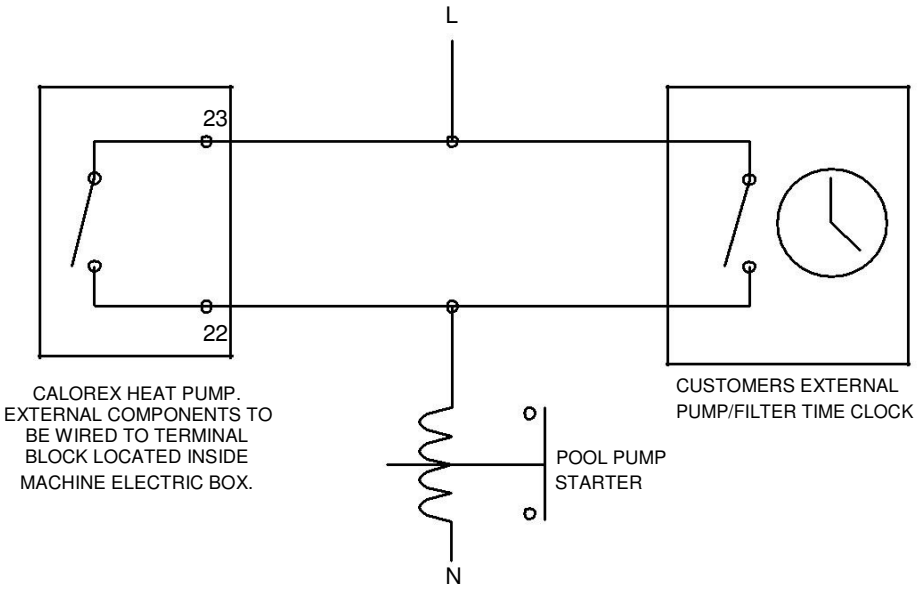
5.1 Pool Pump Synchronisation

For installations where the filter pump, which also priovides water to your heat pump, is controlled by a time clock (supplied by the installer) your Calorex heat pump can overridde “pump off” periods set on the time clock so that the filter pump will run if your swimming pool requires heating. By doing so your filter pump will only run when:

a) A block period of pump “running” has been set on the time clock for filtration purposes.

b) The pool requires heating.

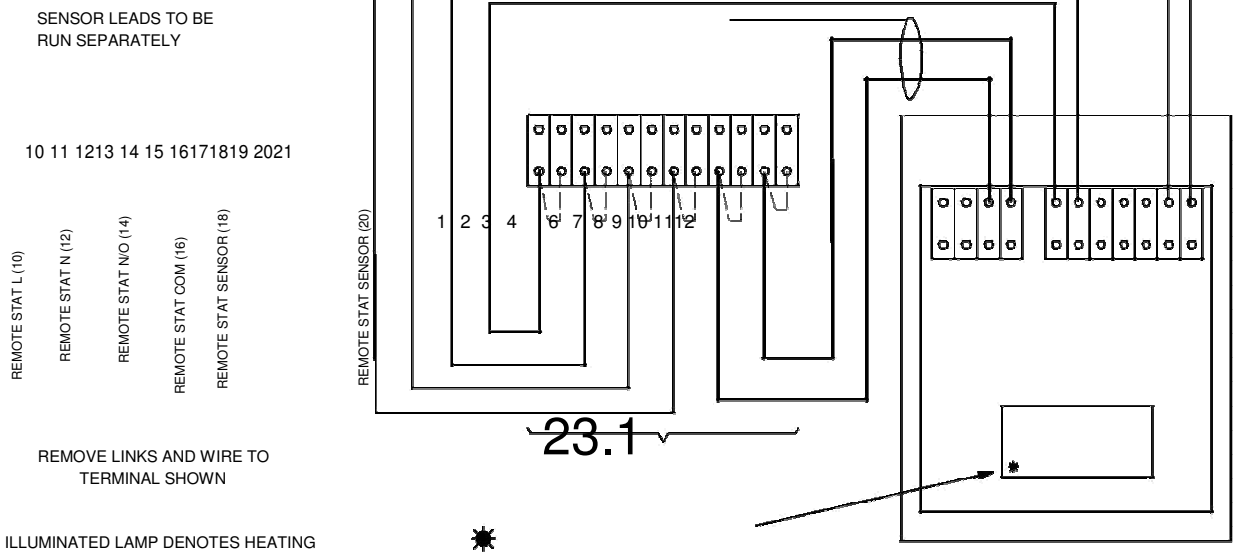
This feature operates by overriding the filter pump time clock for three minutes each hour so that water is pumped through the heat pump. If during this sampling period the heat pump detects a need for water heating it will continue to override the time clock until the swimming pool temperature is satisfied. If water heating is not required the filter pump will turn off after the three minute sampling period and not restart untl the next hourly sampling period or time clock pre set run time. This feature will reduce filter pump run time and consequently save energy as well as unnecessary filter pump wear and tear.



5.2 Remote Thermostat

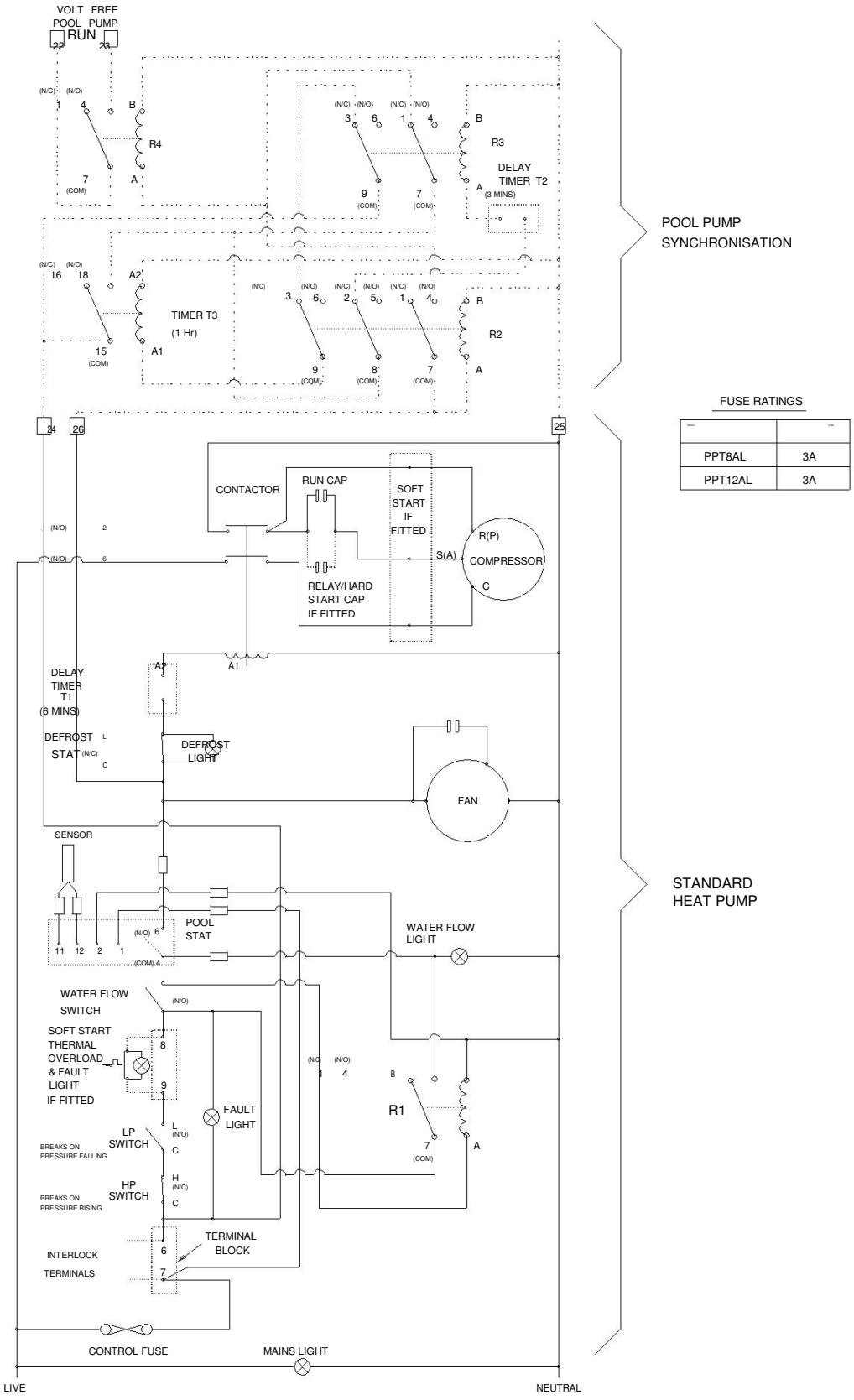
A remote thermostat kit is available which allows the user of the heat pump to control the setting of the heat pump away from the heat pump, for example from inside the home. Please note the thermostat is rated at IP40 and is not suitable for outdoor use.

With the heat pump isolated electrically, remove lid from heat pump and disconnect the links as shown. Connect wires between heat pump and remote thermostat as shown in the diagram below. See label inside thermostat cover for further information. When correctly connected replace lid of heat pump and restore power to the heat pump.



To Change the temperature press and release the P key to display required temperature, to alter required temperature press the up or down keys. After 5 seconds the display reverts to actual water temperature.

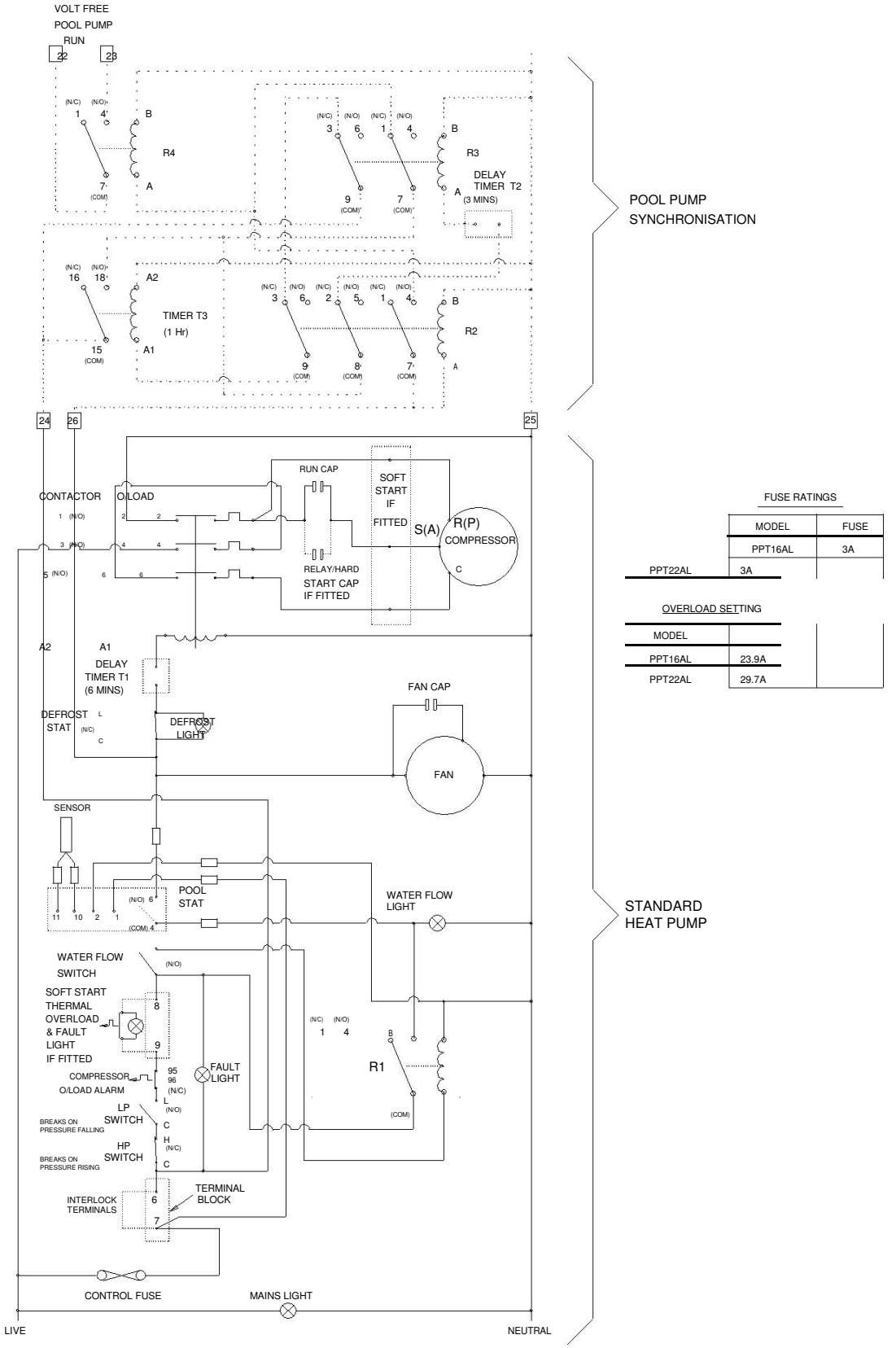
6.0 Circuit Diagrams PPT8/12 AL SINGLE PHASE 230V~1N 50Hz



FUSE RATINGS

PPT8AL	3A
PPT12AL	3A

PPT16/22 AL SINGLE PHASE 230V~1N 50Hz



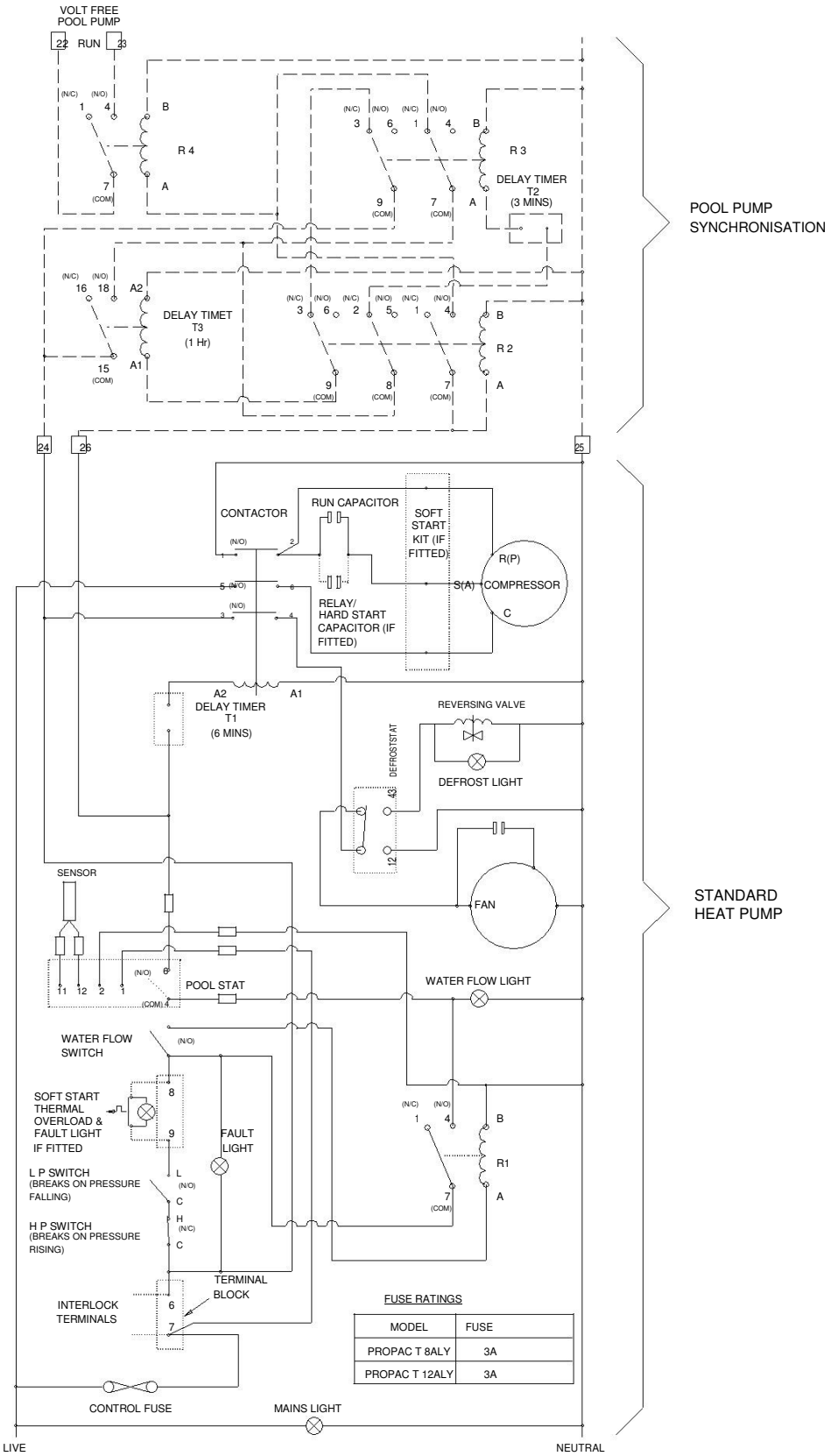
FUSE RATINGS

MODEL	FUSE
PPT16AL	3A
PPT22AL	3A

OVERLOAD SETTING

MODEL	
PPT16AL	23.9A
PPT22AL	29.7A

PPT8/12 ALY SINGLE PHASE 230V~1N 50Hz

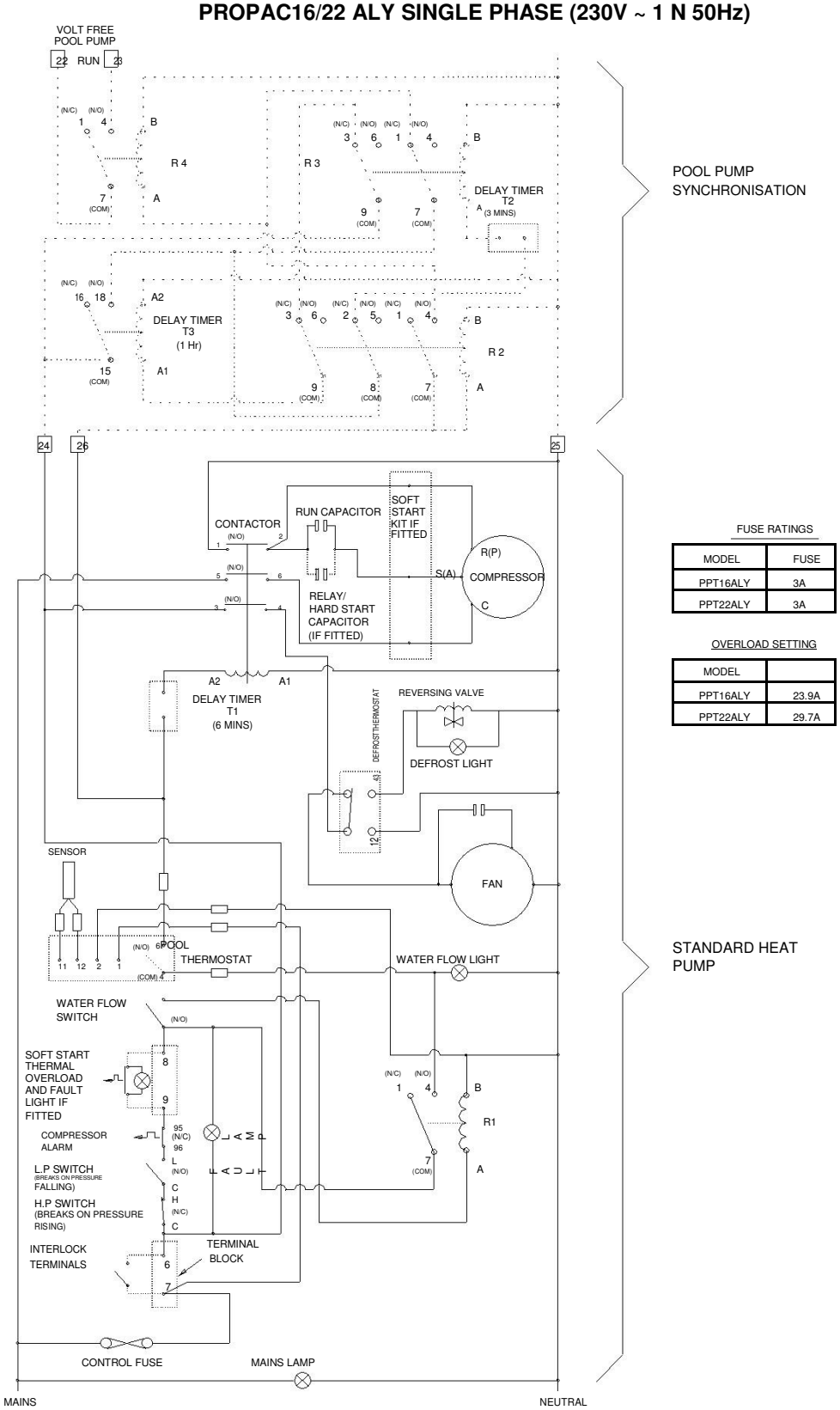


FUSE RATINGS

MODEL	FUSE
PROPAC T 8ALY	3A
PROPAC T 12ALY	3A

PPT16/22 ALY SINGLE PHASE 230V~1N 50Hz

PROPAC16/22 ALY SINGLE PHASE (230V ~ 1 N 50Hz)



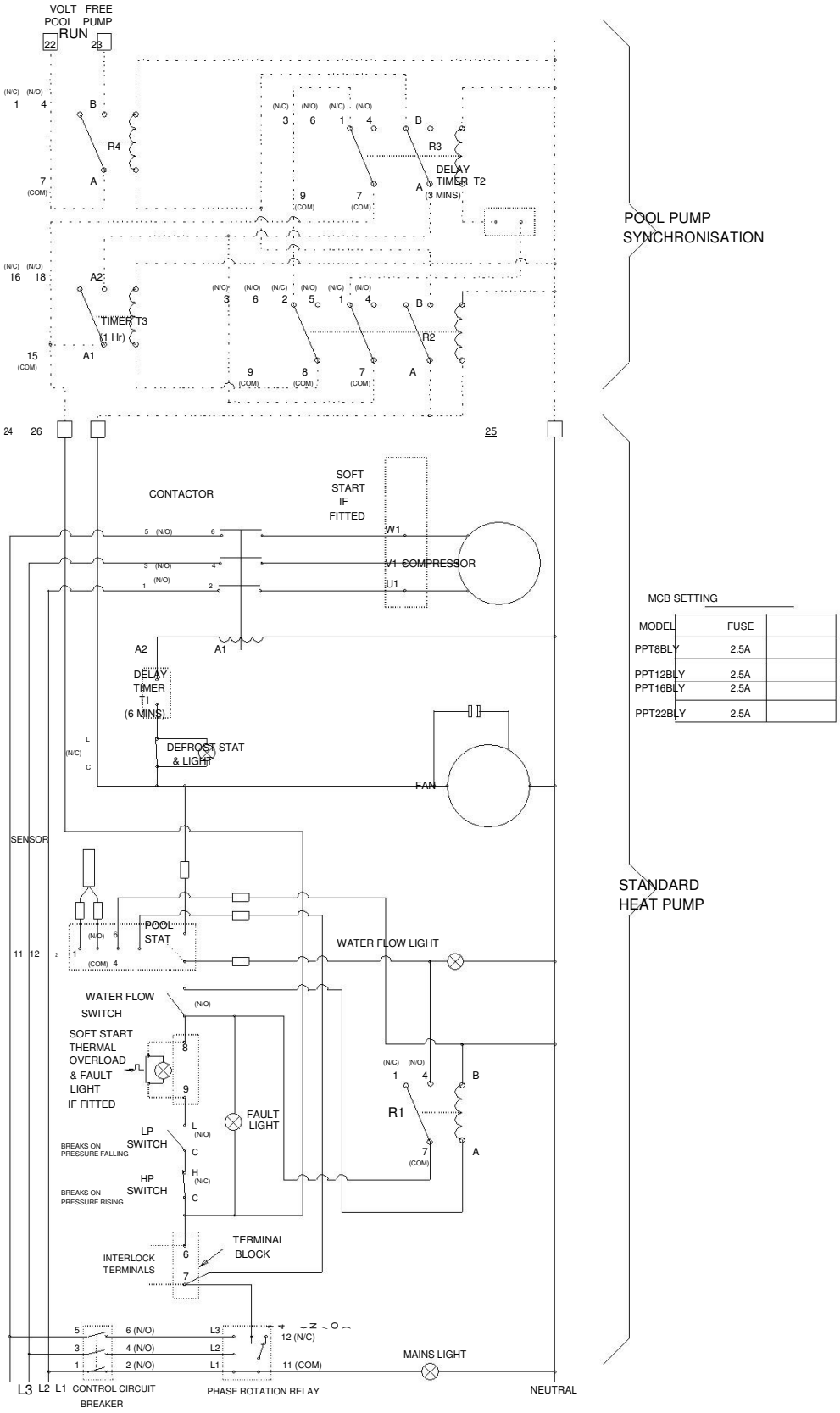
FUSE RATINGS

MODEL	FUSE
PPT16ALY	3A
PPT22ALY	3A

OVERLOAD SETTING

MODEL	
PPT16ALY	23.9A
PPT22ALY	29.7A

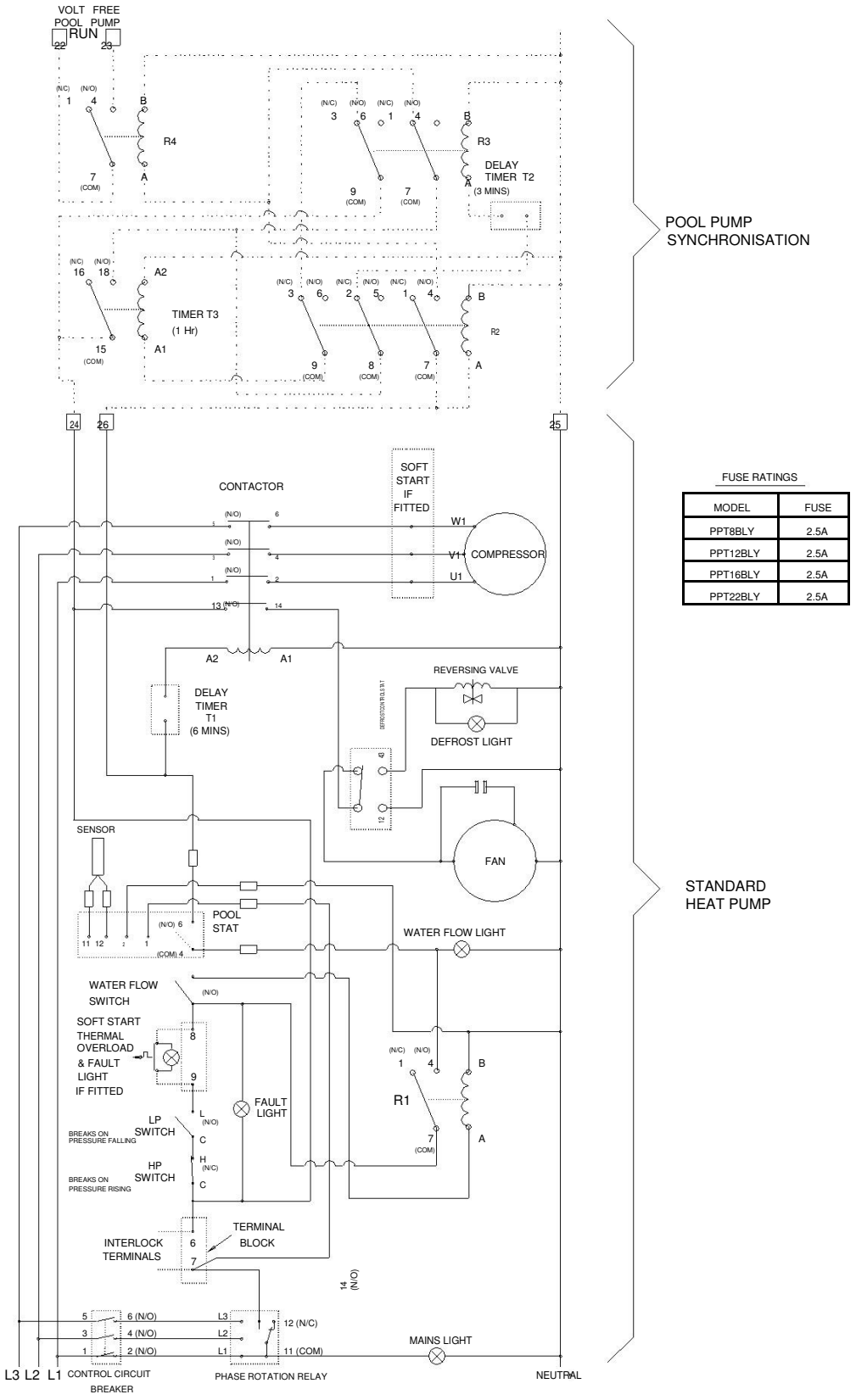
PPT8/12/16/22 BL THREE PHASE 400V~3N 50Hz



MCB SETTING

MODEL	FUSE	
PPT8BLY	2.5A	
PPT12BLY	2.5A	
PPT16BLY	2.5A	
PPT22BLY	2.5A	

PPT8/12/16/22 BLY THREE PHASE 400V~3N 50Hz



FUSE RATINGS

MODEL	FUSE
PPT8BLY	2.5A
PPT12BLY	2.5A
PPT16BLY	2.5A
PPT22BLY	2.5A

7.0 Regular planned maintenance

Operations to be carried out during a regular planned maintenance visit are as follows:

1. Clean the evaporators. (This action may be required more frequently than regular servicing).
2. Check operation of fans and compressors.
3. Check capacitor tolerances - where fitted.
4. Check condition of all heat exchangers/evaporators.
5. Check refrigeration system parameters.
6. Check operation of control valves.
7. Check for water leaks.
8. Check driptrays and internal drain lines for blockages and clear.
9. Check operation of controls and calibrate if necessary.
10. Check operation of interlocks in use.
11. Final check of overall operation of unit
12. Indicate on Service report any faults found or causes for concern.
13. Recommended servicing frequencies:
    - Light to medium use: one visit per year
    - Heavy use: two visits per year

8.0 Controls and indication lamps

CONSOLE

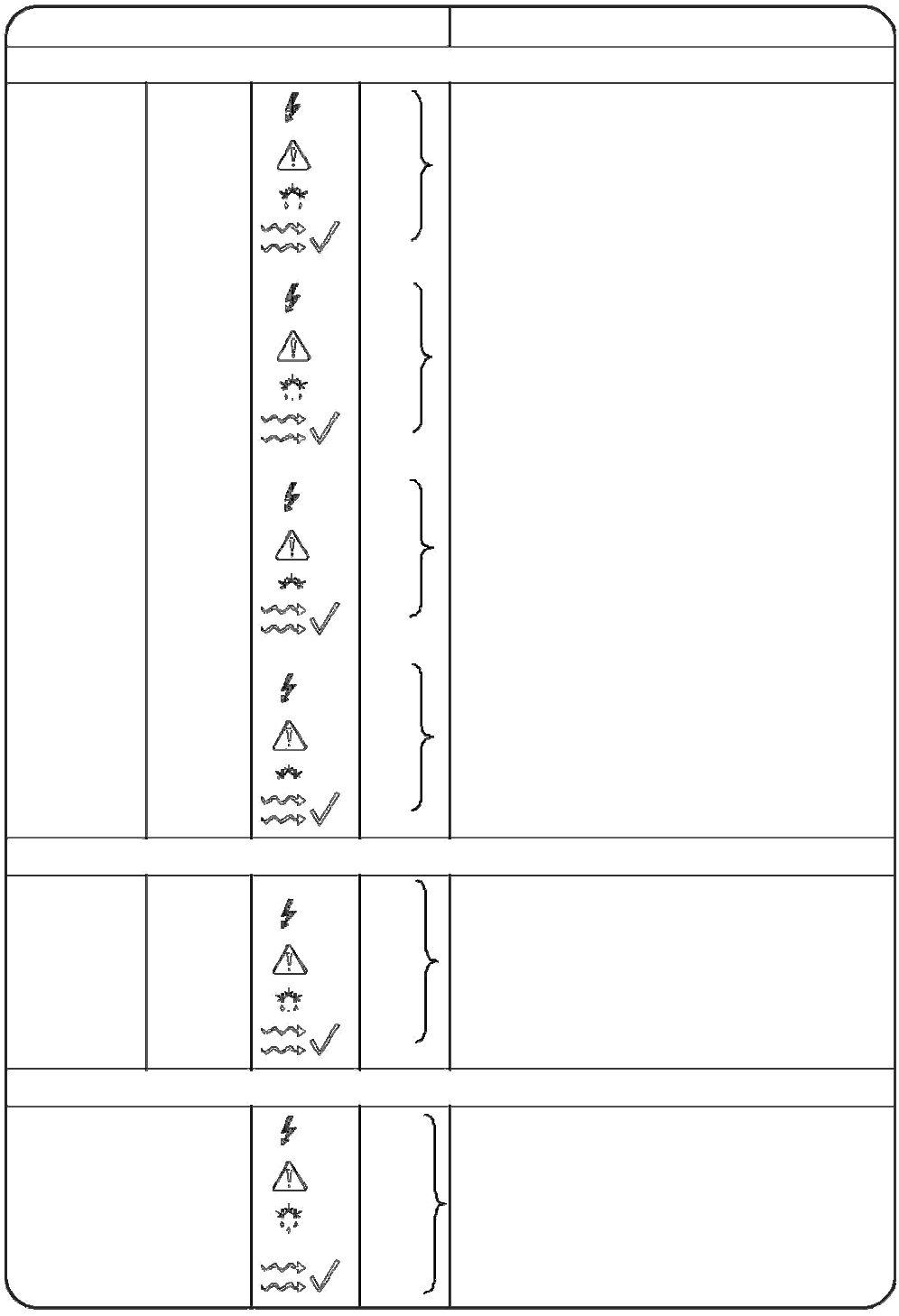
	MAINS	RED	Electrical supply on
	FAULT	AMBER	Internal or external fault condition
	DEFROST	WHITE	Defrost Mode
	WATER FLOW	GREEN	Water flowing at adequate rate

8.1 Digital Thermostat

An adjustabe single stage digital thermostat controls and maintains the water temperature.

Press and release the P key to display required temperature, to alter required temperature press the up or down keys. After 5 seconds the display reverts to actual water temperature.

9.0 Heat Pump Malfunction



ERROR: undefined
OFFENDING COMMAND: ‘~

STACK: