



MAGNUS

Heat Pump Water Heaters

Application & Installation

MWP Series - Pool Heating models



Heating Capacity
26kW – 80kW



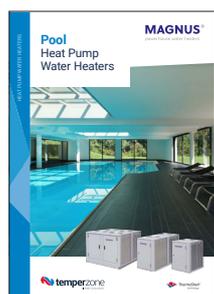
Heat Pump Water Heaters for Pools

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Other relevant documents:

- Specification Sheets



Overview brochure available



Heat Pump Water Heaters MWP Series

Magnus[®] heat pumps water heaters by Temperzone utilise the highest efficiency technologies to minimize energy consumption. The MWP Series is specifically designed to deliver heated water to pool applications. They reduce dependence on combustion of fossil fuels by using clean energy sources. Durability and reliability are also key features.





Heat Pump Water Heaters MWP Series

General

Introduction

Magnus® hot water heat pumps by Temperzone provide ideal heating solutions as we move to a sustainable future using cleaner energy sources.

Magnus Series heat pumps utilize the highest efficiency technologies to minimise energy consumption and are not dependent on combustion of fossil fuels. They can deliver up to 6 times the heating energy output for every unit of electrical energy consumed.

Magnus® MWP Series heat pump units are specifically designed to deliver heated water to swimming pool applications only (not Spa pools).

The Thermoshell® is designed to operate direct in-line with high flow pool pumps, have low pressure drop and a low temperature difference of nominal 3 degree temperature difference across the heat exchanger.

Magnus® MWP Series heat pumps incorporate the proprietary UC8 unit control module with sophisticated software installed specific to the application of pool heating.

Typical applications include:

- Civic swimming pools
- Retirement homes
- Leisure centres
- Water parks
- Hotels and resorts

Figure 1





Heat Pump Water Heaters MWP Series

Features

Energy Efficient

Each MWP system is comprised of a refrigeration system with highly efficient ThermoShell® heat exchangers to extract 'free' heat from the ambient air and transfer it directly to water, and from there to your pool.

Note: A pump is not included, as every application is different and therefore requires correct pump sizing, and the pump may be part of the water treatment/filtration system.

Performance

For every 1kW of energy input, up to 6 kW of energy output is produced, depending on the ambient conditions.

ThermoShell® Technology

The unit includes a compact long life highly efficient titanium water heat exchanger design. It is resistant to chemical corrosion from chlorine or salt water and has a low pressure drop compared to plate heat exchangers.

Compressor

Each high efficiency compressor is hermetically sealed, quiet running and supported on rubber mounts to minimise vibration.

Soft Starting (MWP 230 model)

Digital compressors are soft starting therefore have none of the problems associated with high in-rush current.

Durable

Coil fins are epoxy coated for extra protection in corrosive environments, e.g. salt laden sea air. Each MWP unit's cabinet is constructed from high grade galvanised steel - polyester powder coated (grey) for all weather protection and is rated IP 44. External fasteners are SKT® coated steel – marine grade. Heat exchange coils comprise aluminium corrugated plate fins on mechanically expanded rifled copper tube.

Insulation

Units are insulated to prevent external condensation forming on the cabinet exterior. The insulation is foil faced and meets fire test standards AS 1530.3 (1989) and BS 476 parts 6 & 7. Internal piping is also insulated to minimise any heat loss.

Control

Each MWP includes a TZT-100 Controller which is pre-wired within the unit. Different control strategies can be accommodated in conjunction with filtration and chlorination systems. BMS control options are available.

Refrigerant

Each MWP unit is shipped from the factory with a charge of R410A.

Quiet

The unit's coil design permits low fan speeds and hence low noise levels. The compressor is isolated in a built-in, insulated compartment to minimise noise.

Unit Protection

Units are fitted with a high pressure lockout that protects the unit in the event of water flow failure. Sensors protect against low air coil temperature and loss of refrigerant. Units include an anti-rapid cycle timer for compressor on/off protection.

Provision has been made for a water pump flow verification input signal that will protect individual units from a loss of water flow.

Each compressor has internal overload protection.

Wiring

A control panel, located in each MWP unit, is fully wired ready to accept the main power supply. The electrical supply required is:

MWP 230KS:

1 phase 230 V a.c. 50 Hz, plus neutral and earth.

MWP 250, 400, 800 KT

3 phase 400 V a.c. 50 Hz, plus neutral and earth.

Each system complies with the requirements of the Regulatory Compliance Mark (RCM) for electrical safety (AS/NZS 60335.2.40) and EMC (AS/NZS CISPR.14).

Provision has been made for compliance with DRED, ie demand response enabling device standard AS/NZS 4755.3.1.

Peace of Mind

Temperzone operates a quality management system that conforms to AS/NZS ISO 9001:2008. The company's products have been selected, against worldwide competition, for use in some of the most exclusive projects – chosen because of their proven efficiency, durability, performance, reliability and value.

Accessory

1. Drain connection kit (25mm OD) - supplied.
2. 10m extension lead for TZT-100 relocation, if required.

System Protection

1. HP and loss of refrigerant protection.
2. Anti-rapid cycle timer and internal overload for
3. Compressor protection.
4. Circuit breaker control circuits.
5. Time-and-temperature controlled electronic de-ice switch prevents icing up of the outdoor coil during heating cycle.
6. Sensor fault indication.
7. Compressor minimum run time to ensure oil return.
8. 12V control circuit.

Self Diagnostics

The Unit Controller (UC8) has a LED display to indicate faults and running conditions.



Heat Pump Water Heaters MWP Series

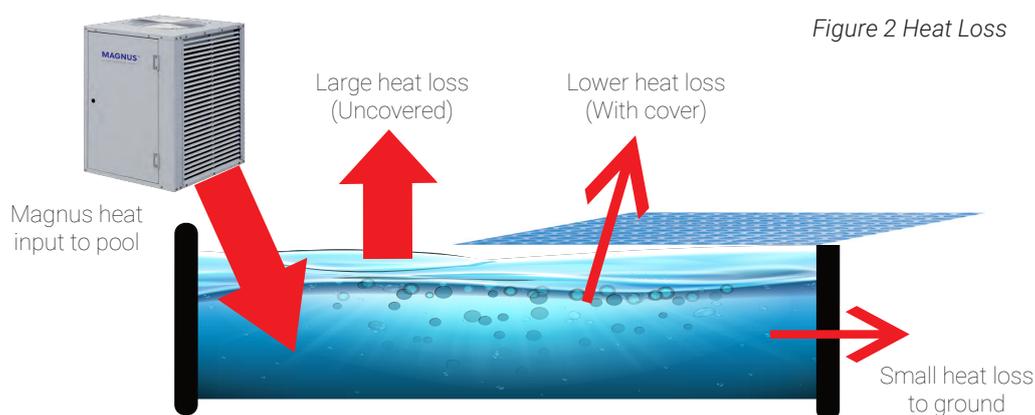
Application

Before installing any swimming pool heating, a heat load assessment of the pool should be first conducted by consulting with a qualified engineer. There is no simple 'rule of thumb' according to the size of the pool. The following additional factors must be considered before selecting a heat pump with appropriate performance to suit the nature and proposed usage of the pool.

- Is the swim season summer fringe, off season or all year round?
- What are the climatic conditions at the location of the pool installation? (Summer/Winter)
- What water temperature is the pool to be maintained at whilst in use?
- Is the pool in direct sunlight, predominantly shaded or indoors?
- Is a pool thermal insulation cover to be used correctly while the pool is not in use?
- If below ground, is it in an alluvial/gravel soil type?

A swimming pool cover is highly recommended for heat retention and energy savings (Figure 2).

An alternative consideration for selecting heat pump capacity is the heat-up time from cold. Swimming pools have a huge thermal mass so pool temperature does not change rapidly with the operation of the heat pump. A typically sized heat pump could take several days to elevate the pool temperature from cold to desired setting. If a pool is only used intermittently through the colder period, then a selection based on minimum heat-up time may be required for the heat pump capacity.



Unit Selection

As discussed on the previous page, there are many factors that need to be taken into account when sizing a Pool Water Heater. The minimum information you require to use this Selection Guide are:

- i. Your swimming pool surface area,
- ii. A prediction of the usage of your pool, and
- iii. Location.

The following selection procedure is for OUTDOOR pools. For INDOOR pools, contact Temperzone for a list of additional information required to make a more accurate unit selection.

STEP 1. Identify the Heating Profile that suits Your Intended Use & Location in Table 1 (profiles A to N)

If your city is not listed, use the nearest one, or contact Temperzone Sales.

STEP 2. Determine Required Heating Capacity of MWP unit

by reading from your Pool Surface Area up to your Heating Profile, then go left to the Required Capacity (Graph 1).

STEP 3. Determine which MWP unit meets the capacity requirement

move from Required Heating Output across to the model peak capacity line (Graph 2).

STEP 4. Check other factors that may alter this recommendation up-or-down a model size

refer Notes below and exposure allowances on next page.

Table 1. Outdoor Pool Heating Profiles by Location

Usage:	Extended Season (October – April)								All Year (Peak in July)							
Operation:	8am – 6pm (10 hours/day)								8am – 6pm				24 hours			
Pool Cover:	4pm – 9am			MIN AVG operating ambient	No cover used			MIN AVG operating ambient	4pm – 9am			MIN AVG operating ambient	4pm – 9am			MIN AVG operating ambient
Pool temp.:	25°C	28°C	32°C		25°C	28°C	32°C		25°C	28°C	32°C		25°C	28°C	32°C	
Australia																
Adelaide	M	L	J	17	H	G	E	17	J	H	G	11	L	L	K	10
Brisbane	N	M	K	18	J	H	F	18	L	J	H	14	M	L	L	13
Cairns	n/a	n/a	M	26	N	L	H	26	N	M	K	22	N	N	M	20
Canberra	M	L	J	15	H	G	E	15	J	H	G	7	L	L	K	5
Darwin	n/a	n/a	n/a	28	n/a	N	L	28	n/a	N	M	27	n/a	N	N	24
Hobart	K	J	H	14	H	F	E	14	J	H	G	8	L	L	K	7
Melbourne	M	L	J	15	H	G	E	15	J	H	G	10	L	L	K	9
Perth	N	M	K	18	J	H	F	18	L	J	H	14	M	L	L	13
Sydney	N	L	K	17	J	H	F	17	K	J	H	13	M	L	K	11
New Zealand																
Auckland	L	K	H	16	H	F	E	16	J	H	G	12	L	L	K	11
Hamilton	H	F	D	13	D	B	A	13	E	D	C	7	H	E	D	5
Taupo	H	F	D	13	D	B	A	13	E	D	C	7	H	E	D	5
Wellington	L	K	H	16	H	F	E	16	J	H	G	12	L	L	K	11
Christchurch	H	F	D	13	D	B	A	13	E	D	C	7	H	E	D	5
Dunedin	H	F	D	13	D	B	A	13	E	D	C	7	H	E	D	5

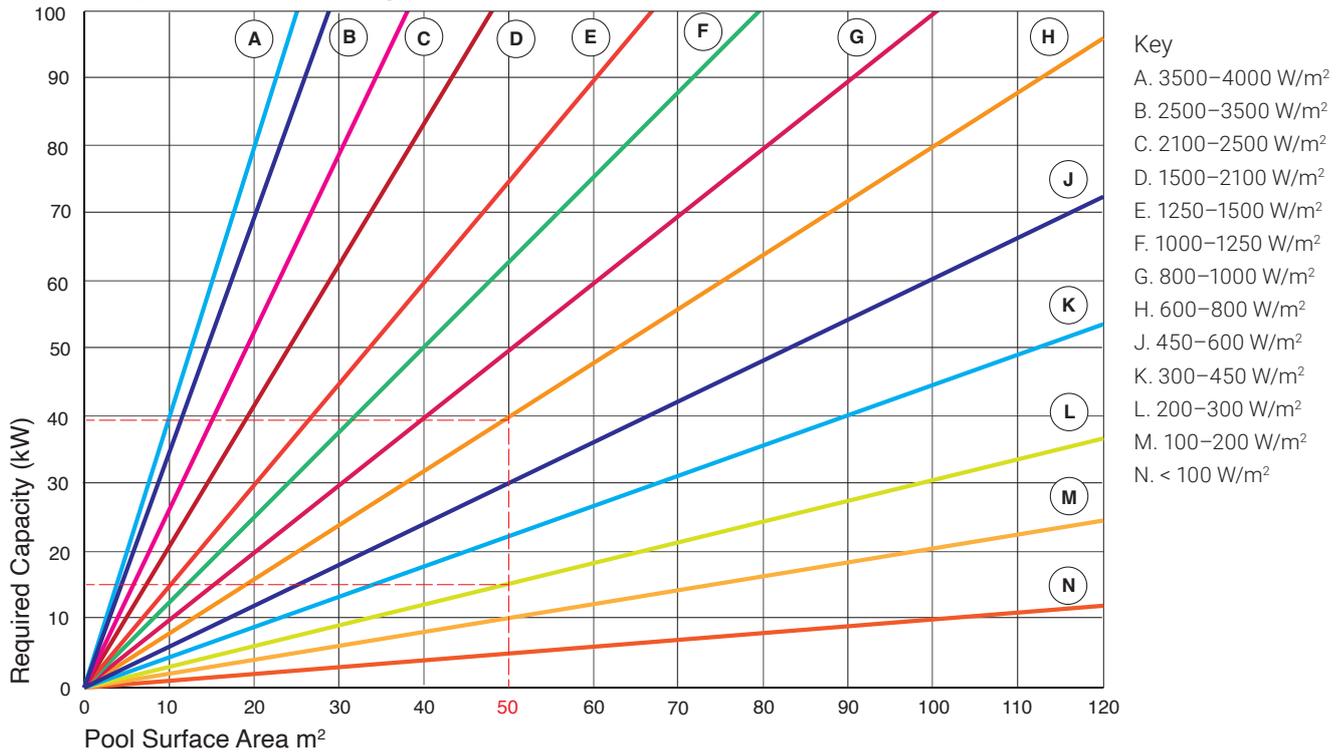
For other locations, contact your nearest Temperzone Sales office.

Note:

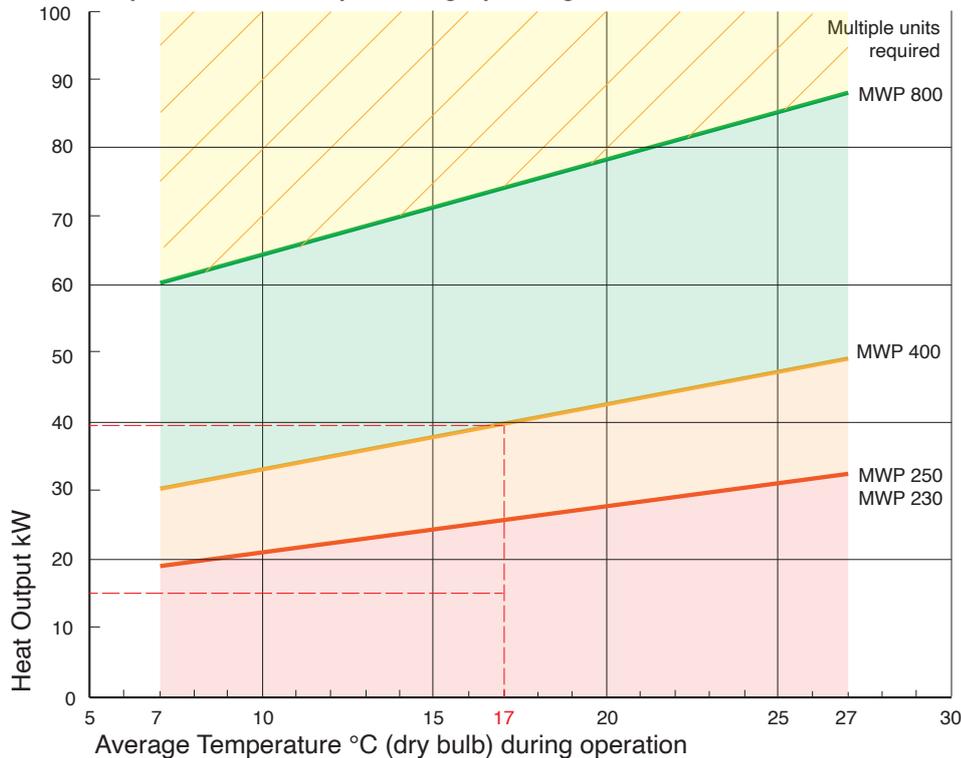
1. A thermal pool cover is highly recommended, if not mandatory in some Cities/States when using pool heating devices. Heating profiles for use **without a pool cover** is more for illustrative purposes to demonstrate heat losses without a cover, which are significant.
2. Longer daily operating hours of the heat pump will **reduce** the output capacity required to maintain pool temperature.
3. Nominal heating profiles based on the following operating parameters:
 - Hours of use (cover off) from 9 am to 4 pm, 7 hours.
 - Nominal Heat Pump operating hours are limited to between 7 am and 5 pm. These may be subject to filtration pump operating hours.
 - 24 hour operation of heat pump (IF PERMITTED) can halve the required heat pump output capacity, eg when a 10 hour operation of the Heat Pump appears marginal for duty, a couple extra hours operation may satisfy requirements.
4. Adjustment to heating profile requirements can be made for deviation to the tabled specifications, eg for cover off 4 hr/day, deduct 20% from required capacity; for cover off 10hr/day add 10% to required capacity.

Unit Selection (continued)

Graph 1 - Pool Heating Profiles



Graph 2 - Nominal Output During Operating Hours



Disclaimer
 Temperzone Ltd takes no responsibility for the completeness, reliability and accuracy of this information. It is a guide only. Any action based on this information is strictly at your own risk. Consult a professional consultant for the most accurate selection for your application.

OUTDOOR POOL EXPOSURE (allowances made in above heating profiles)

- Minor shading up to 25% at peak of winter. For 50% shading, add 10% to required heat pump capacity.
- Moderate exposure to wind. For high wind areas add 25% to required heating capacity. For sheltered areas deduct 25%.
- No allowance for water features. For Infinity Edge, add equivalent area to pool surface area. For Waterfall, add 3 times area to pool surface area.
- Average depth 1.5m nominal in ground pool. Additional heat loss expected for walls exposed to air or ground water.
- Number of swimmers entering pool each day based on 1 per 6m² pool area, i.e. 10 swimmers per day entering a 60m² pool.

SELECTION EXAMPLE.

50m² pool, Sydney, 28°C extended season only, no cover gives Profile H; with cover Profile L.

Selection: Given average day temperature during operation of 17°C, with no cover, model MWP 400 falls marginally short, whereas with a cover a MWP 250 will maintain pool temperature comfortably, with less running hours.



Heat Pump Water Heaters MWP Series

Application



Magnus heat pumps utilize the refrigeration process to extract heat from ambient air and deliver that heat to a duty requirement. The heat pump operates most efficiently at the highest ambient air temperature, so it is best to operate through the middle of the day rather than in the evenings.



The air discharging from the unit is quite cold and possibly below freezing temperature at low ambient conditions. Care should be taken that this air is not discharging under windows or plants which are sensitive to the cold. It is possible that condensation will form on surfaces above the unit so be cautious that these surfaces are not sensitive to deterioration from moisture.

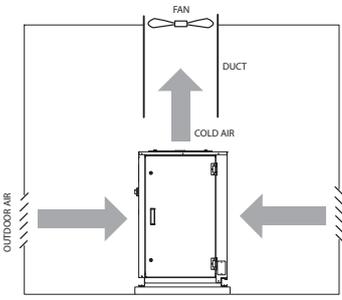


Avoid installation in closed-in areas where the air recirculates through the unit and a cold micro-climate can develop around the unit diminishing its performance. If a unit is to be installed in an enclosed room or space (eg plant room, enclosed courtyard), then that space should be ventilated to prevent the enclosure temperature falling to less than 5 degrees below outside ambient temperature. The fan discharge from the unit may be ducted directly to outside the enclosure provided the air flow resistance does not exceed 25Pa. A boost extract fan may be required. Refer to Temperzone for advice on duct sizing.

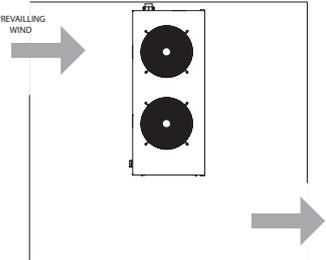


It is a normal process for ice to form on the evaporator coil during operation at ambient temperatures below 5 degrees. Each Magnus pool heating unit has a fully automated de-ice system.

Condensation will run continuously from the unit during operation – more so after a de-ice cycle has been completed and a large volume ice has been melted off the coil. Care should be taken with the installation where this condensate runs off to. If this condensate is likely to form a hazard on an access path then the unit should be placed in a drip tray and drained to a waste point.



Plant room



Enclosed space

Consideration will need to be given when integrating the operation of the heat pump with automatic chlorination equipment on the same pool pump to prevent over chlorination. Longer run time for the heat pump will be required during the colder months so chlorinator dosage rate will need to be reduced.

Any application and installation must comply with local/national codes and regulations.



Heat Pump Water Heaters MWP Series

Installation

Follow these Installation Instructions to ensure optimum performance, reliability and durability.

Units must be installed in accordance with all national and regional regulations and bylaws. National Health and Safety regulations must be followed to avoid personal injuries.

The appropriate local permits must be acquired and adhered to.

Local regulations on maximum boundary noise need to be considered when positioning the unit.

Remove equipment from packaging and inspect for transit damage. Report any damage immediately to Temperzone.

 Dispose of packaging in an environmentally thoughtful manner.

 **WARNING:** Keep appliance area clear and free from combustible materials, gasoline and other flammable vapours and liquids.

There must be no restriction to air flow above the unit.

Figure 3a Minimum Clearances

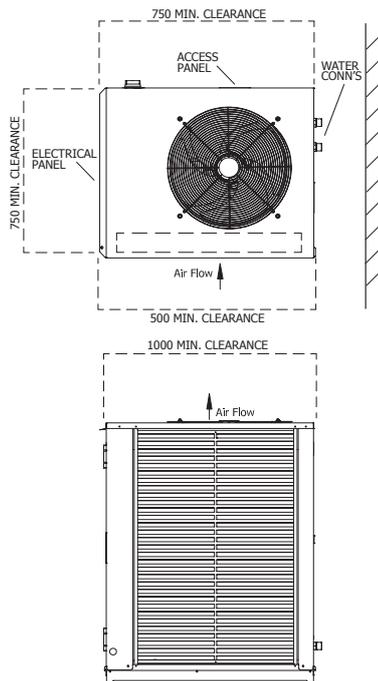
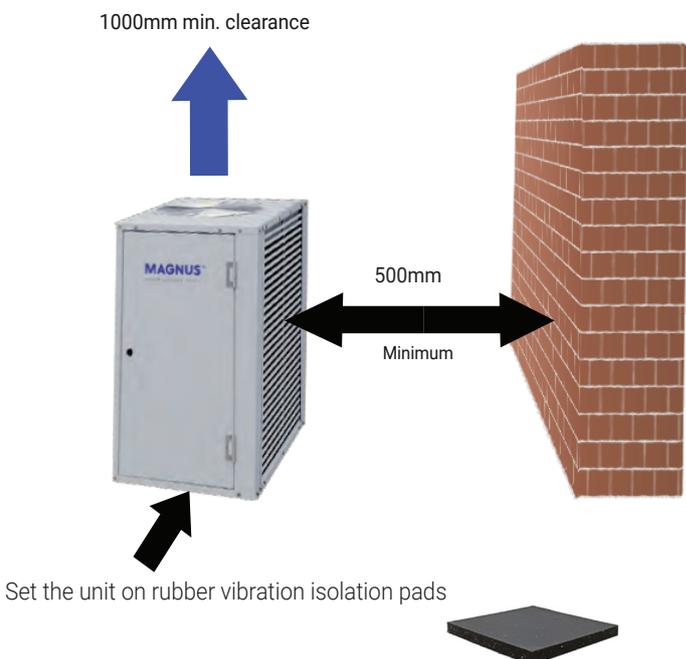


Figure 3b Alternative Orientation



The Magnus MWP heat pump should be located on a rigid base or foundation, eg concrete pad, and set on rubber vibration isolation pads.

Allow sufficient space around the unit to facilitate water pipe connection, future service, and maintenance requirements, working space in front of the electrical panel and unobstructed air flow through the unit. Refer to the minimum clearance requirements illustrated here (Fig.3a) and pages the relevant Specification Data sheet supplied for your model.

In all installations it is preferred that the coil be installed perpendicular to the wall (Fig.3a). In installations where this is not possible, the unit must be installed with a minimum of 500mm clearance between the coil and the wall (Fig.3b). If multiple units are installed adjacent there must be 1m clearance between facing coils.



Heat Pump Water Heaters MWP Series

Installation

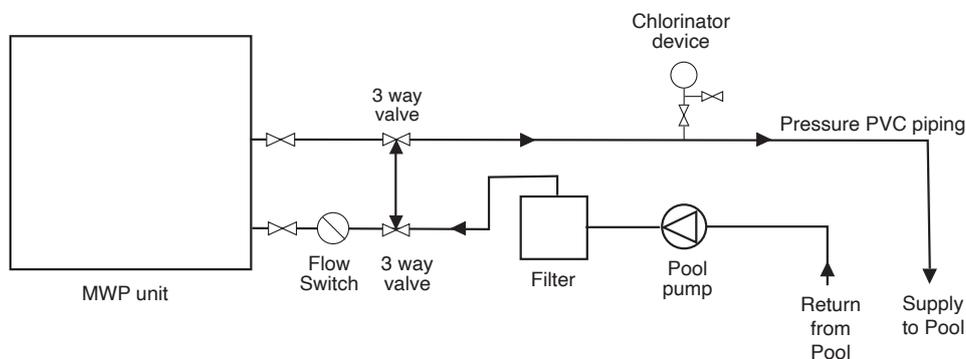
Piping

The MWP Heat Pump should be located at close proximity to the pool, pump and filter as practicably possible. Keep pipe length as short as possible with as few bends and restrictions as possible. Restricted flow may result in high pressure faults occurring. Connecting pipework may be insulated to minimize heat losses and prevent freezing in sub-zero ambient. The Heat Pump must be installed after the water filter and before the chlorinator.

The titanium thermoshell heat exchanger has a very low water pressure drop in operation so a secondary boost water pump should not be required for most residential applications but may be required for commercial applications. The pool pump should be sized to provide sufficient flow for the operation of the heat pump. If the pump flow is excessive for the heat pump operation, then that excess flow may be bypassed around the heat pump via a balancing valve per the included schematic.

Model	Water IN & OUT Connections	Nominal water flow rate
MWP 230	1 1/2" (38mm) PVC union	125 l/min. (2.08 l/s)
MWP 250	1 1/2" (38mm) PVC union	130 l/min. (2.16 l/s)
MWP 400	2" (50mm) PVC union	200 l/min. (3.33 l/s)
MWP 800	2" (50mm) PVC union (2 pair)	400 l/min. (6.66 l/s)

Figure 4 External Piping Schematic
– typical single unit installation



Note: Multiple units, installed in-series or in-parallel, may require additional pumps to service the flow required.



Heat Pump Water Heaters MWP Series

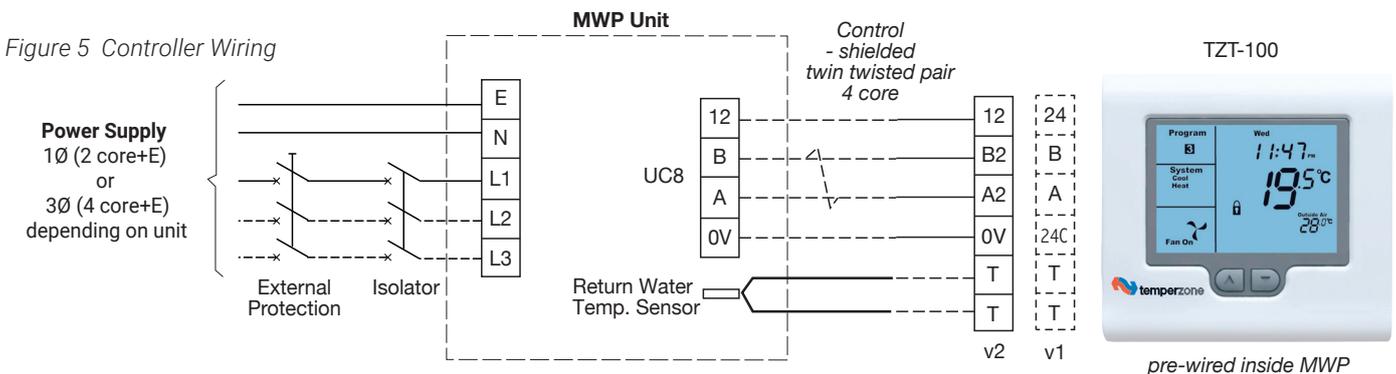
Electrical

Electrical power wiring must be installed and certified by persons with appropriate qualifications.

- All power wiring is to be done to the appropriate electrical standard of the country in which the unit is being installed.
- The person installing the wiring is responsible for the correct selection of wiring size and auxiliary components.
- Wire the unit directly from the electrical Distribution Board. The unit should have its own dedicated circuit breaker on the Distribution Board.
- Route the power supply cord through the orifice next to the water connections.
- A signed 'Certificate of Compliance' must be left with the unit for insurance purposes.

Model	Power Supply	Max. Running Current *
MWP 230	Single Phase 230V ac 50Hz	35 A
MWP 250	Three Phase 400V ac 50Hz	17 A/ph.
MWP 400	Three Phase 400V ac 50Hz	22 A/ph.
MWP 800	Three Phase 400V ac 50Hz	40 A/ph.

* Excludes any allowance for external pump.





Heat Pump Water Heaters MWP Series

Controller

The Magnus MWP Series pool heat pump comes factory fitted with a TZT-100 temperature controller – a multi-function device that can control the operation of the pool water heat pump. (Other control options are shown on the next page).

The TZT-100 controller is pre-configured/pre-wired within the electrical panel, but may be re-located to another location (out of the weather) within the home or a control room if this is more convenient to make regular adjustments to the operation, eg desired pool temperature. (A 10m extension cable is supplied.)

The TZT-100 is always ON, however the heat pump operation is only enabled by the operation of the external Pool Pump & Filtration/Chlorination system (supplied by others) which provides the essential water flow through the unit. (Requires TZT-100's DIP switch 6 'ON' and DIP switch 8 'ON' for a single set point).

Note:

1. The unit is flow switch activated.
2. The communications cable and sensor wire must be installed away from any power cables to avoid the possibility of electrical interference.
3. The unit must NOT be switched off in freezing conditions.



Figure 6. TZT-100

Features

- LED to indicate status of the unit [Power On/Off].
- Real time clock.
- 12 or 24 hour time display
- °C or °F display
- Auto-Restart or No Restart after power failure
- Backlit screen for ease of reading;
- Soft touch tab keys
- PIN protected menus (Installer PIN)
- Keypad and/or temperature lock
- Integrated Modbus option
- Battery backup (Lithium).
- Audible beep to acknowledge key entry
- 24V control cable.



Heat Pump Water Heaters MWP Series

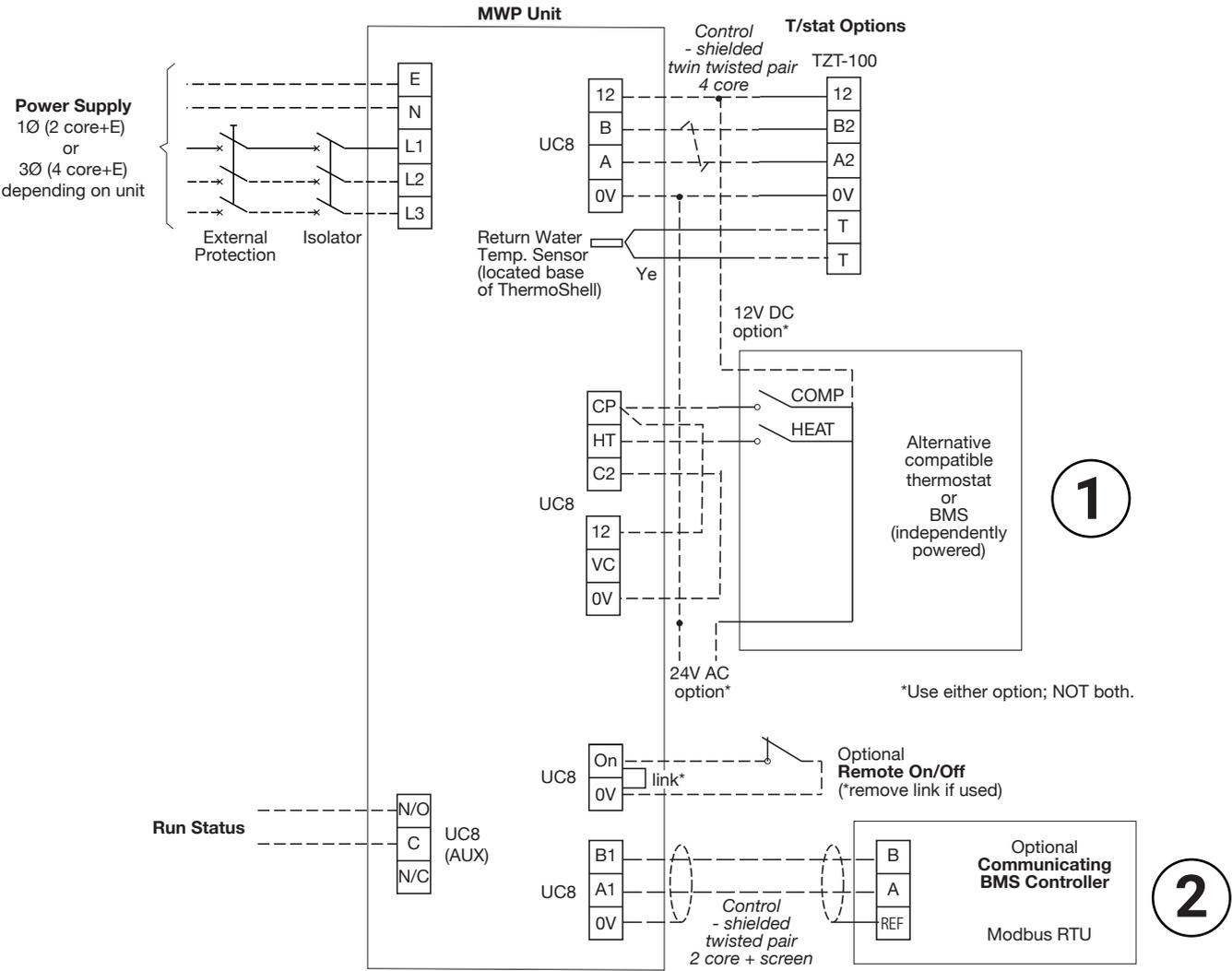
Alternative Control Wiring

Other options include:

- 1. Universal 24V ac or 12V dc dry contact for either compatible thermostat or BMS control via input/output.
- 2. BMS control via Modbus over RS485.

For a full list of the Modbus control setup, settings and read/write parameters refer Appendix I or contact Temperzone for details or visit www.temperzone.com; model search 'BMS'.

Figure 7





Heat Pump Water Heaters MWP Series

Water Circulation

Water Flow Switch

A water flow switch is installed internally in each Thermoshell®.

The purpose of flow switch is to permit the product to heat **only if there is water flow through product**.

The switch enables the operation of the MWP unit when connected to any water circulation system.

The supplied TZT-100 thermostat located inside the product will not function unless the product has power supply and the flow switch has a closed circuit (confirming there is flow through the product).

As there will be a minimum number of hours of operation required to initially heat pool water and maintain pool water temperature, the heat pump pool water circulation pump needs to have a time clock control set/adjusted to accommodate the minimum hours of operation required.

Initial heat-up of any pool will require a pool cover fitted (ideally) and heat pump circulation pump set to 24/7 operation until the pool water has reached target set point and cycled off. The time clock settings for pool water circulation pump hours-of-operation then needs to be set to allow the product to maintain a set pool temperature.

The run-hours to maintain pool water set point will depend upon how the product has been sized to meet the heating requirements, and seasonal requirements. (Refer Unit Selection guide as part of manual to determine theoretical run hours for pool heating).

Note: There can be unseasonal weather events that can affect the required run-hours to maintain pool water temperature. This may require an extension of pool water circulation pump run-hours to compensate for the additional energy losses from pool water, which affects pool water temperature.

Flow Switch Troubleshooting

The flow switch detects flow through product and in some rare cases this flow switch may bounce on and off (reducing heat output) due to air getting into system, causing inadequate flow. Identify where air pockets could be occurring and bleed the pipework to enable the heat pump to be able to operate as intended. If the heat pump has operated fine previously, but flow rate is now preventing flow switch making control circuit, carry out a back wash and rinse of filter system and clean any skimmer baskets in pool and pre-filters of pump to see if this improves flow rate of circulation pump. If all fails, consult your pool pump installer to ensure adequate flow is provided to heat pump during heating period.

Pool water circulation via filtration system pump

In many pool heating applications the pool filtration pump is also the circulation pump for the heat pump installed. This pump has to run a minimum of hours per day, because of minimum filtration requirements and incorporated chlorinating control of pool water. If the filtration times have to be adjusted above set hours of filtration system circulation pump, consult the installer of chlorinating system to ensure run times does not affect the chemical balance of pool being heated.

Pool water circulation via separate circulation pump

In some installations there are requirements for a designed separate heating circulation pump system servicing heat pump and pool installed. This will require an additional pump, powered and controlled separately by others, to only activate when pool heating set point temperature is below set point for required pool temperature. Ensure that heat pump TZT-100 thermostat is set at or above desired pool temperature, when using this form of heating circulation.



Heat Pump Water Heaters MWP Series

Commissioning

A Commissioning Checklist is included on the back page to assist you with the commissioning process.

Power

WARNING! Do not turn the unit on until the external water pump is switched on and water is flowing through the unit.

- Check the units are electrically connected in accordance with the wiring diagram (refer Specifications Sheet or unit label).
- Check all wiring connection and terminal tightness.
- Check the dip switch settings on the TZT-100 and UC8 controllers match those on the MWP wiring diagram.
- Remove the shipping blocks from beneath each compressor. Check that each compressor is securely mounted.
- Ensure the Temperature Controller (thermostat) is OFF.
- Switch ON the Mains distribution board circuit breaker, the internal circuit breakers and the unit's external ON/OFF switch.
- Check the supply voltage.
- Check the communications cable and sensor wire are installed away from any power cables to avoid the possibility of electrical interference.
- Once started, check for correct rotation of the compressor. If rotation is incorrect the compressor will not pump, be noisy and draw low current. To correct motor rotation, swap two phases at the mains power terminals.

TZT-100 Quick Start Guide

- Power on the MWP unit at the isolator switch.
- Push TZT-100 Power button.
- Push [mode] button and select 'Heating'.

The MWP unit will operate continuously, first to reach then maintain the target temperature, provided the circulation/ filtration pump is operating 24/7. The default target water temperature suitable for a pool is 28°C (Note, it will take up to 60 hours from cold state to reach and comfortably maintain temperature – depending on the outdoor ambient and ground temperatures).

The compressor should start, and after a few seconds the fan should also start. If not, refer Troubleshooting section.

Refer TZT-100 Operation instructions for more detail (p.20).

TZT-100 Advanced Installer Settings

Advanced Set-up will depend on the control method being implemented (refer page 10) . A separate 'Installer manual' is supplied with the TZT-100 covering advanced installation and operation instructions.

Use following instructions for setting up the TZT-100 for the type of operation required. There are a few factory settings that must remain unchanged, regardless of the type of control method to be used.

Dip switches 1, 2, 3, 5, 7 all set to OFF position.

Dip switch 4 set to ON position.

Dip switches can be viewed by separating the front interface from the back panel using a flat head screw driver in the base slot.



- TZT-100 dip switches 6 & 8, to be set as required, according to the chosen control method (refer page 10).
- Enter the Installer menu:-
Press and hold O/RIDE button until the figures '88:15' appears on the display (after about 15 seconds). Adjust this figure to '88:21' by pressing the up (▲) or down (▼) buttons, then tap O/RIDE again to enter the menu.
Using the Installer menu, tap O/RIDE button to move forward through the menu, tap PROG button to move backward through the menu. Press up (▲) or down (▼) button to adjust the value of each function.
- Set the highest water temperature the user is permitted to set the heat pump to run up to, as follows:-
Move through the Installer menu until HL=35 (default) appears in the display. Press up (▲) or down (▼) button to adjust the value in the range: 22°C – 28°C for a typical pool.
- Check the setting of the T-T terminals that the water temperature sensor is connected to:-
Move through the Installer menu until 'tt=RS' (default) appears in the display. The default setting is correct for this application. If the factory default is not showing then scroll up (▲) or down (▼) until 'RS' appears.
- Check the calibration of the water temperature sensor:-
Move through the Installer menu until the function 'C1=3.0' (factory default) appears on the display. If not, adjust '0.0' by pressing the down (▼) button in 0.1 increments.
- Exit the Installer menu by pressing PROG button.



Heat Pump Water Heaters MWP Series

Commissioning (continued)

General Checks

- a. Check that the air flow over the coil is not restricted and that the fan is running smoothly.
- b. Check the unit is installed level and that condensate drains freely by pouring some water into the base tray.
- c. Check the operation of the thermostat or BMS.
(Satellite symbol on TZT-100 indicates communicating.)
- d. Check connection pipes have been insulated.
- e. Leave all relevant documentation with the unit.
- f. Check for leaks at water connections.

De-Ice Cycle

Under normal operation in cold conditions the coil will at times change to a white appearance as a frost forms. The unit is programmed to de-ice no more frequently than once every 50 minutes. At the end of each de-ice cycle, the coil should be completely clear of ice. Should a layer of clear ice form on the coil, then contact your Installer or Temperzone Customer Service (www.temperzone.biz).

Protection Against Freezing

If the outdoor ambient temperature falls close to freezing point the external pump must continue to circulate water to prevent freezing, whether heating is called for or not.

Maintenance

At Four Weeks

- a. Check compressor compartment for oil stains indicating refrigerant leaks.
- b. Check tightness of electrical connections.

Yearly

- a. Check tightness of all fan and motor mountings.
- b. Check tightness of electrical connections.
- c. Check that fan motors are free running.
- d. Check condensate drains for free drainage.
- e. Check for leaks at water connections.
Use a suitable liquid pipe sealant (eg Loctite 567) to prevent any joint leaks
- f. Check and remove as necessary any organic material and dust accumulation from coil fins and inside the fan chamber (power off). In corrosive environments, the checking and cleaning frequency should be increased.
- g. Touch up any unit paintwork damage to prevent corrosion.



Heat Pump Water Heaters MWP Series

Troubleshooting

Water temperature varies significantly from its setting

- Unit may have been incorrectly sized for the pool.
- Unit may be in a protection or diagnostic failure mode
- Check the flow switch is not tripping in and out due to air in the pipework

Unit does not seem to deliver the heating when most needed

- Heating capacity at design conditions may be incorrect. As the outside temperature falls, heat losses increase.
- Check the unit's Specifications for information on the minimum/maximum operating temperatures.

For a new installation, why does it take some days before the heat pump unit seems to work properly?

- Many new pools have a large amount of concrete and other structural materials that are generally cold and full of moisture. This is most evident in the winter when trying to heat the pool water from scratch.
- Allow sufficient amount of time for unit to heat the pool. This could be up to 60 hours. Start heating well before you need the warmth most.
- Units need to be checked regularly to ensure proper operation and that they are not exceeding operating limits for any length of time.

Unit runs excessively – the pool temperature remains too cold in winter.

- Keep doors and windows to indoor pool areas closed. This area may require heating.
- Apply a pool cover on both indoor and outdoor pools. This will reduce heat loss and also help keep the pool clean.
- Location of remote temperature sensor may be wrong. (The standard location is at the base of the ThermoShell.)
- Check top air discharge is unblocked and air flow to the coil face is clear and not restricted or blocked.
- Check no ice is forming on the coil between de-ice cycles (Refer 7.10).

TZT-100 displays an error code or doesn't operate as expected.

Refer to page 26 for troubleshooting symptoms and faults. Contact your Installer or Temperzone if problems persist.

Unit Controller (UC8) displays an error code

Refer to UC8 Controller label on the unit for operation & fault diagnostics information; or visit www.temperzone.com and model search 'UC8 Controller'. Here you will also find a 'UC8 Troubleshooting Guide'.

Check the UC8 Controller dip switch settings match those on the wiring diagram.

Unit Does Not Start

- Check there is water flow through the unit. The unit will not start if the internal flow switch detects no water flow.
- Circuit breaker may have been tripped. Reset circuit breaker.
- Unit may be off or in wall thermostat mode. Check unit is switched on at the unit, and external temperature controller is in Heating mode.
- Unit may be in a protection or diagnostic failure mode. Check for fault code display on unit's controller board (refer also 6.5).

Water Dripping Outside

Condensation released during unit operation is normal.

If a condensate drain has been installed and it is connected to a drain system:

- Check gaskets and fittings around drain for leaks and plugs.
- Check drain line is unblocked.

Note: If a threaded component ever needs to be removed or replaced, use a suitable liquid pipe sealant (eg Loctite 567) to prevent any joint leaks.

Ice or Frost Forms On Unit's Coil

Under normal operation in cold conditions the coil will at times change to a white appearance as a frost forms. The unit is programmed to de-ice no more frequently than once every 50 min. At the end of each de-ice cycle, the coil should be completely clear of ice. Should a layer of clear ice form on the coil, then contact your Installer or Temperzone Customer Service (www.temperzone.com).

WARRANTY & TECHNICAL SUPPORT

Please refer to the separate warranty document supplied with the unit, or visit www.temperzone.biz for details.

Australia:

warranty@temperzone.com.au

spares@temperzone.com.au

Telephone: 1800 21 1800

New Zealand:

nztechnical.support@temperzone.com

Telephone: 0800 TZWARRANTY (899 2777)



Heat Pump Water Heaters MWP Series

Servicing

Internal Unit Controller (UC8)

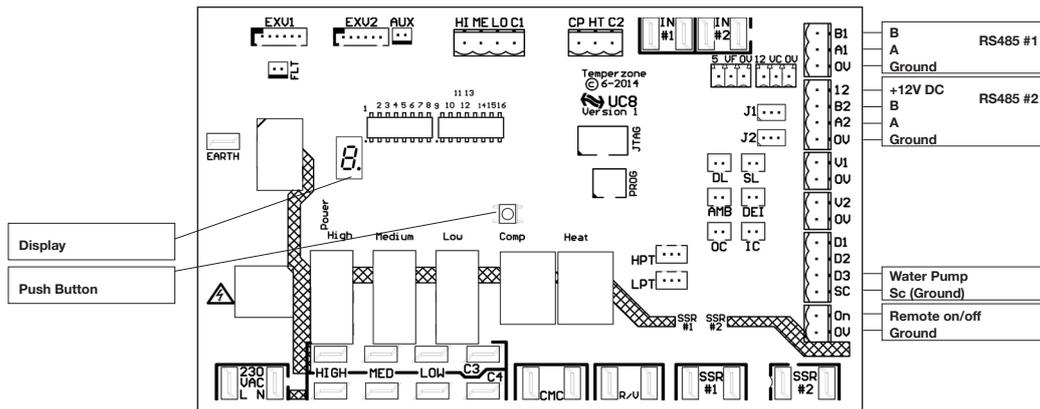


Table 1, Information available on the UC8 display.

Item	Unit	Abbreviation	Examples
Compressor suction line pressure	kPa	SLP	SLP 1034 Suction line pressure 1034 kPa
Evaporating temperature	°C	Et	Et 12 Evaporating temperature 12°C
Compressor suction line temperature	°C	SLt	SLt 18 Suction line temperature 18°C
Compressor suction side superheat	K	SSH	SSH 6 Suction side superheat 6K
Compressor discharge line pressure	kPa	dLP	dLP 2447 Discharge line pressure 2447 kPa
Condensing temperature	°C	Ct	Ct 42 Condensing temperature 42 °C
Compressor discharge line temperature	°C	dLt	dLt 70 Discharge line temperature 70°C
Compressor discharge side superheat	K	dSH	dSH 28 Discharge side superheat 28K
De-ice sensor temperature (located on fins of the outdoor coil)	°C	ICEt	ICEt 39 De-ice sensor temperature 39°C
Capacity	%	CAP	CAP 100 Capacity 100%
Expansion valve 1 opening	%	EE1	EE1 75 Expansion valve 1 75% open
Expansion valve 2 opening	%	EE2	EE2 75 Expansion valve 2 75% open



Heat Pump Water Heaters MWP Series

Servicing

Internal Unit Controller (UC8) Protection Functions

The UC8 implements system protection functions such as indoor coil frost, extreme high and low pressures, rapid on-off cycling of the compressors, loss of refrigerant and more.

The following applies to all protection functions except where otherwise indicated:

Unit operating capacity may automatically be reduced before a protection function is activated. Such a reduction may be sufficient to prevent an actual trip from occurring.

When a compressor is stopped by a protection function it is held off for a period of 3 minutes, after which it is allowed to restart (provided the cause of the trip has cleared).

When a protection function is active and when a unit is locked out the alarm relay output "FLT" is active.

More detailed information about protection functions and troubleshooting refer to document "UC8 troubleshooting information", available for free download from www.temperzone.biz.

1 High pressure protection (HP)

Units are fitted with high pressure transducers connected to UC8 input HPT. A compressor is switched off when the discharge line pressure reading exceeds 4238 kPa.

The display shows the letters 'HP' when protection is active. 

2 Low pressure protection (LP)

Some units may be fitted with low pressure switches. These switches connect to UC8 inputs IN#2. When a low pressure switch activates (the electrical circuit opens) then the compressor is stopped.

Some HWP units are fitted with low pressure transducers connected to UC8 input LPT. A compressor is switched off when the suction line pressure reading falls below 228 kPa.

The display shows the letters 'LP' when protection is active. 

3 High discharge line temperature protection

The controller monitors the compressor discharge line temperature via a sensor connected to input 'DL' (red wires). The compressor is stopped when:

- The temperature rises above 110°C for longer than 30 minutes.
- The temperature rises above 120°C (immediate action).

The display shows the message 'Hi-t' when protection is active. 

4 High discharge superheat protection

Discharge superheat is defined as the difference between the compressor discharge gas temperature

and the condensing temperature. When this temperature differential becomes very high it is an indication that the compressor is being starved of refrigerant gas. Common reasons for this could be a lack of refrigerant (under-charged or loss-of-charge) or a problem with the expansion device (for example a stuck accumulator or loose wiring to an EEV).

The protection is activated when discharge superheat exceeds 45K for longer than 30 minutes.

The display shows the message 'Hi-dSH' when protection is active. 

5 Low discharge superheat protection

Discharge superheat is defined as the difference between the compressor discharge gas temperature and the condensing temperature. When this temperature differential stays very low it can be an indication that the compressor is being flooded with liquid refrigerant. Common reasons for this could be an excess of refrigerant (over-charged) or a problem with the expansion device (for example loose wiring to an EEV).

The protection is activated when discharge superheat remains below the threshold for longer than 15 minutes. The threshold varies linearly from 0K at standard mode minimum capacity (40%) to 10K at nominal capacity (100%).

This protection function is disabled when a compressor operates at less than standard mode minimum capacity (< 40%).

The threshold for a variable speed compressor operated in boost mode (capacity above 100%) is fixed at 10K.

The display shows the message 'LO-dSH' when protection is active. 

6 High evaporation temperature / high suction line temperature protection

The unit has a low pressure transducer connected to the compressor suction line. The controller calculates the evaporating temperature from the suction line pressure reading. Additionally the controller monitors the compressor suction line temperature via a sensor connected to input 'SL' (white wires).

The protection function stops the compressor when:

- The evaporating temperature remains above 27.5°C for longer than 15 minutes.
- The suction line temperature remains above 30°C for longer than 15 minutes.

The display shows the message 'Hi-SL' when protection is active. 



Heat Pump Water Heaters MWP Series

Servicing

Internal Unit Controller (cont'd)

7 Other alarms

The controller performs many other protection functions. For example:

- Signals from sensors and transducers must remain inside normal operating range.
- Modbus RTU communications with connected devices (e.g. TZT-100 or a Carel Power+ inverter) must continue uninterrupted.
- Modbus RTU communications with a controller such as a BMS that is controlling the unit must continue uninterrupted.

Refer to document 'UC8 Troubleshooting Guide' for details.

8 Lock-out

Each protection function has a trip counter. A trip counter is reset to 0 whenever the compressor run request is removed. Any trip that has occurred more than 12 hours ago is removed from the trip count. For some protection functions, when the trip counter reaches value 3 (i.e. three consecutive trips occur) then the unit is "locked out".

When a unit is locked out the compressor is not allowed to start. Lock-out is designed to protect the compressor from repeatedly starting when a serious fault exists that requires the attention of a service technician.

The display shows the code of the fault that caused the lock-out condition.

A unit that is locked out can be unlocked using any one of the following methods:

- Remove mains power from the unit for at least 3 seconds, then restore power.
- Issue an 'unlock' command via Modbus RTU serial communications
- Reset the controller via Modbus RTU serial communications

If a unit has locked out and has been unlocked twice, then locks out for a third time without having managed at least once to stop once under normal control, then the controller will no longer allow the unit to be unlocked by the method described. The controller display will show the message "Lockout".

If this has happened the following steps must be taken to unlock the unit:

- i) Remove power, then restore power.
- ii) Press push button SW3 on the controller.

iii) Start the unit heating as normal.

iv) Stop the unit by means of a normal off-command (e.g. via the thermostat, remote on/off signal or Modbus control).

Ensure the unit does not stop on yet another trip by identifying and remedying the cause of the fault.

Refer to Temperzone (page 16) if assistance is required.



Heat Pump Water Heaters MWP Series

TZT-100

Operation Manual



Introduction

This multi-function thermostat can be configured by your installer to suit a wide variety of systems. It has been factory set to a mode that best suit your MWP needs.

The full TZT-100 Installer Manual supplied includes a wealth of information, most of which is irrelevant to a swimming pool application. Use this condensed guide, unless looking for more detail.

Setting the Clock

The thermostat is fitted with a real time clock. (In Manual mode, this clock has no function other than to display the time. The clock display can be disabled by the installer if desired.)

This clock is used by the thermostat for the programming functions as described below.

It is essential that the clock time and day are set accurately if you require your programmed events to start on time.

Lift the cover flap to reveal four extra buttons: MODE, O/RIDE, PROG and FAN.

To set the clock, tap the 'PROG' button. The LCD will show the hours digit flashing. Use the up (▲) or down (▼) button to adjust the hours to the correct time (note the AM / PM symbol). Tap the 'PROG' button again and now the minutes digits will flash. Adjust this value using the up (▲) or down (▼) button to show the correct minute. Tap the 'PROG' button again and now the weekday flashes, again use the up (▲) or down (▼) button to set this value to the correct day of the week. Tap the 'PROG' button again to exit the clock set function.

Note: Programmed heating intervals (events) is not required or recommended for pool heating. Continuous heating is the most common strategy, due to the time it takes to reheat a pool. Reduced running costs are achieved through the use of pool covers, etc. to minimise heat loss; while maintaining a warm pool ready for use.

To Review the Set Temperature:

The Desired Temperature should be pre-set to 28°C. Simply tap the up (▲) or down (▼) button to first turn on the LCD backlight, then again to display the currently set temperature.

Changing Your Desired Temperature (setpoint)

Press the up (▲) or down (▼) button. The thermostat display will change to show the word "SET", and the active set point for the heating mode. If desired, change this setting up or down. After a 3 second pause the new figure is saved and the display returns to the current temperature (described as 'ROOM' for air systems). The recommended temperature for a pool is 28°C (maximum 35°C).

Button Functions

Lift the cover flap to reveal four extra buttons:

MODE (and On/Off)

The mode should be pre-set to "Heat" only mode.

Select "Off" mode to power the unit off. Other modes are not applicable to pool heating.

O/RIDE (Override)

Commercial Programmable Mode:

The "O/RIDE" button is used to override the current "event" time scheduling, and to hold the currently set temperature indefinitely. This set temperature will be maintained until released by tapping the "O/RIDE" button again. "Hold" will be displayed in the LCD to confirm this function is active.

(Residential Programmable Mode: Daily Event programming is not required or recommended for pool heating.)

PROG

In Commercial Programmable Mode:

Tap the "PROG" button to begin setting the clock. Press and hold the "PROG" button for 3 seconds to begin programming a regular and optimum heating period for the day. Refer pages 14 to 17 of the TZT-100 User Manual.

FAN

Not used for MWP applications.

Control

The thermostat will turn on the Heating when the pool temperature falls below the Heat set point temperature. In Heat-only mode, only the word "Heat" will be displayed in the LCD. When your thermostat is calling for heat, the word "Heating" will be displayed.

If the word "Heat" is flashing, the thermostat is performing an anti-rapid-cycle safety delay prior to restarting the heating cycle.



Heat Pump Water Heaters MWP Series

TZT-100

Operation Manual (cont'd)



Padlock Symbol.
Whenever this symbol is shown, a control limit has been reached, or a button, or other function has been locked out.



Spanner Symbol.
If you see a spanner ICON flashing on your LCD, the installer has left your thermostat in "Commissioning mode" Although your thermostat will operate your heating and cooling system whilst in "commissioning mode", all active safety and energy conservations delays have been disabled. It is therefore HIGHLY recommended that you contact your installer and request that the installer mode be disabled.



Satellite Symbol
This indicates that your thermostat is receiving or sending information to another "communicating" controller, or a Building Management System. Information received from the building supervisory control system may change the function (mode or set temperature) of the thermostat. This is normal and no cause for concern.

The intent of this communications is to permit the centralised control of building functions which can include building climate control. To achieve this the BMS must be able to override thermostat settings made by the user. This ability is especially useful when a large building, with multiple units, must be controlled.

TEXT "Locked":
The temperature of the outside air can initiate, or prevent certain functions within the thermostat from operating. If this happens, the word "LOCKED" appears. These functions automatically "unlock" once the outside air temperature becomes favourable.

TEXT "Hold":
This indicates that the residential program is held (inactive) and a permanent set temperature is enabled. This temperature can be changed manually if desired however automatic time based temperature changes are suspended.

TEXT "FAULT"
The TZT-100 has been "requested" to shut down the heating as a response from an external command. This request may have come from a sensor fitted to the system, a sensor monitoring supply power or a multitude of safety interlocks that can be used. To clear this fault a service call to your service person may be necessary.

For full product specifications visit www.temperzone.biz; model search 'TZT-100'.

Troubleshooting

Symptom	Suspected Fault	Suggested Remedy
Temperature display seems inaccurate	Sensor calibration setting may be incorrect	Refer advanced Installer Manual p.19 for information on how to calibrate the sensor.
Wall controller has no display	Check the units mains power circuit breaker	- Reset home circuit breaker. Call an approved service agent. - Faulty Wiring. Call an approved service agent.
Spanner Symbol in the LCD flashes all the time	Installer has left the thermostat in 'Commissioning mode'	Contact your installer and request "Commissioning mode" be disabled.
Some buttons do not appear to operate. Padlock is shown on LCD.	Key board lock is on.	See full manual page 28 for more information on this function. This is not a fault. Buttons or functions may be locked to prevent unauthorised tampering.
Cannot enter 'Cool' mode.	This is not a fault.	Not applicable to MWP application.
I cannot set my desired heating set temperature.	Padlock Symbol is flashing	This is not a fault. Your factory will have set control limits for the Heating set temperature.
'Heat' is flashing in the LCD. Heating has not started	This is not a fault. Heating will start shortly.	The TZT-100 is performing an Anti Rapid Cycle delay to conserve energy and to protect the heating system.
Temperature display in the wrong format – C or F	The TZT-100 can operate in either degrees Celsius or Fahrenheit mode. This is set by your installer.	Contact your installer or Temperzone for information on changing your display format.



Heat Pump Water Heaters MWP Series

Commissioning Checklist

Site Name/address:

Installing Company Date:

Serviceman: Tel:

Model: Serial No: Unit Site Ref:

Unit is installed level and bolted down?	Y / N	Compressor shipping block/s removed?	Y / N
Does unit have adequate safe access?	Y / N	All electrical terminals are tight?	Y / N
Unit's coil faces have required clearance?	Y / N	Electrical Certificate Of Compliance issued?	Y / N
Water inlet to correct connection? i.e. bottom	Y / N	Refrigerant?	R410A / R32
Interconnecting water pipes are insulated?	Y / N	Refrigerant leak checked?	Y / N
Water drains tested okay?	Y / N	UC8 program version	v
System water leak checked?	Y / N	Water setpoint temperature?	°C
External water pipe diameter	mm	Has client had controls demonstrated?	Y / N
External water pipe length	m		
Thermostat type:	TZT-100 / BMS / Schneider / Other? (name):		

Mark UC8 dip switch positions with an 'X'

	SW1							
	1	2	3	4	5	6	7	8
On								
Off								

	SW2							
	9 (1)	10 (2)	11 (3)	12 (4)	13 (5)	14 (6)	15 (7)	16 (8)
On								
Off								

Record the following UC8 monitored conditions, at least 10 minutes after compressor starts, using push button SW3 (or WiFi Service Utility). Push repeatedly to scroll through list:

Low Pressure:	SLP	kPa	Outdoor ambient temperature:	°C
Evaporating temperature:	Et	°C	UC8 V1 output:	dcV
Suction Line temperature:	SLt	°C	UC8 V2 output:	dcV
Suction Superheat:	SSH	K	Compressor 1 current:	A
Discharge Line Pressure:	dLP	kPa	Compressor 2 current:	A
Condensing temperature:	Ct	°C	Fan current:	A
Discharge Line temperature:	dLt	°C	Total current L1/L2/L3:	A
Discharge Superheat:	dSH	K	Mains supply voltage:	V
De-ice Sensor temperature:	ICEt	°C	De-ice cycle tested okay?	Yes / No
Required Capacity:	CAP	%	External pool pump size	
Expansion Valve 1:	EE1	%		
Expansion Valve 2:	EE2	%		
Modbus address:	Add			
Water In temperature*	in	°C		
Water Out temperature	out	°C		

Comments:

* Note: In/out water temperature difference should be greater than 5°C when heating.

Retain this checklist with the unit and take a copy for your records.