Heat Pump Water Heaters : **Potable** (Single Pass)
MWS models (c/w UC8) R32
Installation & Maintenance

CONTENTS Page

Other Relevant Documents:
- MWS Applications Manual
- Specifications Sheet (model specific)
- R32 Handling : Water Heating Units

1. GENERAL

1.1 Introduction

Follow these instructions to ensure optimum performance, reliability and durability of the unit.

Units must be installed in accordance with all national and regional regulations and bylaws (eg AS/NZS 3500.4, AS 3498 or G12/AS2 of the NZ Building Code for Legonella protection).

National Health and Safety regulations must be followed to avoid personal injuries.

The appropriate permits must be acquired & adhered to.

Seismic restraints must be fitted if required.

The accompanying 'R32 Handling' pamphlet forms part of these Installation & Maintenance instructions.

⚠ **WARNING.**

These units use R32 refrigerant (Class A2L) which is mildly flammable.

The unit shall be installed, operated and stored in a adequately ventilated space (eg outdoors) where there is no continuously operating open flames (eg an operating gas appliance) or other R32 ignition source. If the refrigerant gas comes into contact with fire, a poisonous gas may occur. Be aware that R32 does not contain an odour.

1.2 Site Preparation

IMPORTANT. System designers and installers must first familiarise themselves with the contents of the MWS Applications Manual prior to installing any unit. This contains important information about site requirements that will ensure the unit performs to its design capabilities. Available at www.temperzone.biz; model search 'MWS'.

GENERAL

2. INSTALLATION

2.1 Positioning

⚠ **WARNING**

The appliance should be located in an area where leakage of the unit or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance.

⚠ **WARNING**

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

MWS units are designed to be located outdoors and as close to the hot water storage tank area as acoustic criteria allows.

Refer to figure 1 and in supplied Specifications sheet for minimum clearances. If multiple units are to be placed side-by-side then allow at least 1m between coil faces.

When determining the position of the unit, allow adequate space around the unit to facilitate water pipe connections, future servicing and maintenance (Fig.1). Ensure there is enough working space in front of the electrical access panel.

Note: The discharge air from the unit is very cold when the unit operates in cooler conditions, and may be well below the freezing temperature. Take care in selecting the installation position that the exhaust air from the unit is not under a window or plants that are cold sensitive. It is also possible to get increased condensation on surfaces above the unit exhaust air which may deteriorate some surfaces. Avoid installations where ponding of chilled air is likely to occur. Choose a well-ventilated location.

2.2 Plant Room

Where an indoor installation is desired, sufficient ventilation must be provided to maintain the internal air temperature no lower than 5°C below the external ambient air temperature. It is possible to duct the exhaust air from the unit, however the static at the fan must be less than 25 Pa. It is recommended that an additional in-line fan be installed to maintain airflow through the unit.

2.3 Mounting

The unit should be fastened to a firm flat raised horizontal base using the holes supplied in the mounting channels and thin isolation pads.

The unit must be installed level to ensure water drains freely out the drain exits (refer 2.4)

The unit is shipped with blocks installed under the

INSTALLATION

compressors. Ensure these blocks are removed from the compressor feet prior to starting the unit.

2.4 Condensate Drain

When the unit is operating, condensation forms on the coils and drains out the mounting rail drain channel/s; this is normal. It is recommended the condensate be piped to a suitable drainage point to prevent ponding and/or slippery mould growth around the base of the unit.

An optional Drain Connnector Kit (p/n 060-000-437) is available with 25mm OD stub. Alternatively, for a drip free installation a separate drain tray beneath the unit could be used to drain condensate to a suitable drainage point.

The drain line should have a slope of at least 1 in 50 and must not be piped to a level above the unit drain tray. Fit a vent pipe (10mm ID) within 500 mm of the unit. The drain must not be piped to a point higher than the base tray of the drain tray. Discharge point must comply with AS/NZS 3500.4.

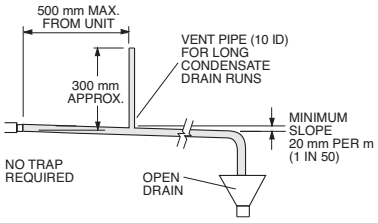


Figure 2

2.5 Multiple Storage Tank Installations

If this unit is to be installed to supply a multi-storage tank installation, refer to the MWS Application Manual before proceeding. A particular plumbing configuration is required for the system to work correctly. These systems must function as a balanced flow, thermally stratified system.

2.6 Water Connection

IMPORTANT. The MWS is a 'single pass' water heater. Refer MWS Applications Manual for site requirements and recommendations before doing any water connection.

The MWS unit's IN and OUT water connections are:

MWS 250: 19mm ($^3/_4$") BSP male

MWS: 500: 25mm (1") BSP male

DO NOT downsize the interconnecting piping as this increases flow rate and will reduce heating performance.

Pipe lengths should be as short as practical, have as few bends as possible and be sized to minimise pressure losses in the piping system.

Connection pipes must be insulated to minimise heat loss, prevent icing-up in low ambient temperatures and protect against corrosive environments. We recommend UV resistant foil faced pipe insulation.

The water inlet of the MWS unit must be connected either to: (1) the cold water supply to the tank (downstream of any non-return), or (2) the cold water expansion valve. An isolation valve should be installed on the inlet side of the unit.

MWS units are designed to supply hot water to the storage tank (hot water cylinder) from 'the top down'; not 'bottom up' like most water heaters.

The outlet of the MWS unit must be connected to a dedicated port in the top 20% (by volume) of the storage tank.

Retrofits: Where there are no suitable ports at the top of the tank, the heat-pump outlet can be teed into the hot water outlet of the tank, provided there is an in-line tank (usually the ring-main return tank) between the main storage tanks and the hot water outlets.

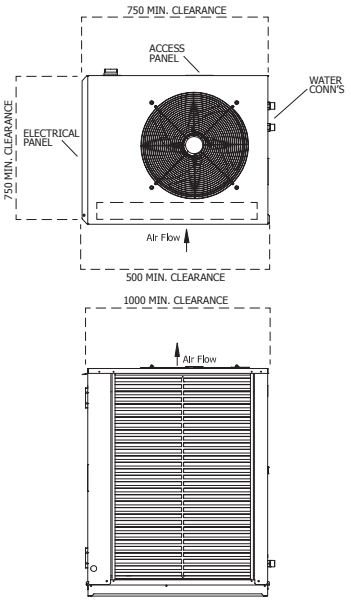


Figure 1 Clearance Requirements

3. WIRING

3.1 General

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

A signed 'Certificate of Compliance' must be left with the unit for insurance purposes.

3.2 Power to Unit

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.

See the Specification Sheet for supply voltage range, frequency, phase and maximum operating current .

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 entry hole provided in the base of the unit Any low voltage BMS communications cables must not be run in parallel with power supply wiring. DO NOT install wiring in contact with refrigeration piping.

3.3 Turnkey Control (internal)

The MWS provides a turnkey solution (plug'n play) that requires no additional wiring. Simply connect power to the unit and the water temperature sensor (supplied; refer 3.4) to storage tank; then switch the unit. The unit's built-in UC8 Controller works to maintain a leaving water temperature (LWT) of 62°C.

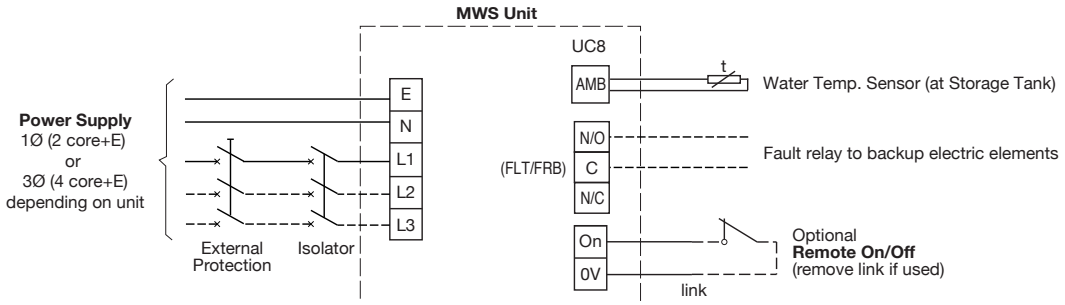
3.4 Water Temperature Sensor

The water temperature sensor (supplied) must be connected between the AMB socket on the UC8 control board to a thermal sensor pocket in the lower third of the storage tank, and secured. Tanks supplied by Temperzone have this pocket pre-fitted. Do not install sensor wire alongside power supply wiring.

3.5 Control Option

Optional use remote ON/Off connections are available on the UC8 (Fig.2).

Figure 3 Client Wiring



4. COMMISSIONING

4.1 General

Use the Commissioning Checklist on page 10 to record site details.

4.2 Indoor Installations

a. If installed indoors, check the refrigerant charge size is in accordance with the minimum room size (refer R32 Handling document).
b. Check the ventilation machinery and outlets are operating adequately and are not obstructed.

4.3 Power

⚠ **WARNING**
Do not turn the unit on until the water connections are made and the external inlet valve is open.

⚠ **WARNING**
Do not turn the unit on if outdoor ambient is below freezing point, otherwise damage may occurr.

a. Check the units are electrically connected in accordance with the wiring diagram (refer Specifications Sheet or unit label).
b. Check all wiring connection and terminal tightness.
c. Remove the shipping blocks from beneath each compressor. Check that each compressor is securely mounted.
d. Switch ON the Mains distribution board circuit breaker, the internal circuit breakers and the unit's external ON/OFF switch.
f. Check the supply voltage.

4.4 Operation

a. The compressor should start, and after a few seconds the fan should also start. If not refer Troubleshooting (page 4).
b. The unit is programmed to operate on its own based on the following conditions:
Run Mode: The remote On/Off switch is On, and
- the water temperature sensor (AMB) in the storage tank is reading less than 35°C, and
- the outdoor ambient temperature is above -15°C.

Stop Mode: The remote On/Off switch is Off, or
- the entering water temperature (EWT) is greater than 35°C, as there is no effective capacity control at these temperatures.

c. ***For 3 phase models only (MWS 250/500):***
Check for correct rotation of the compressor. If rotation is incorrect the compressor will not pump, be noisy and will draw low current. To correct motor rotation, swap two phases at the mains power terminals.

4.5 Leaving Water Temperature (LWT)

The unit's UC8 controller is preset to deliver 62°C for leaving water temperature. Legonella control regulations (refer 1.1) require that this must not be changed for potable water applications, unless an alternative means of control is applied (eg UV sterilisation). Contact Temperzone for more details on how to select lower water temperatures.

4.6 General Checks

a. Check the in-built *Wilo* De-ice water pump's 3 speed dial is set to speed 1 (roman numeral 'I'). Using a higher speed setting will damage the unit.
b. Check that the air flow over the coil is not restricted and that the fan is running smoothly.
c. Check the unit is installed level and that condensate drains away freely by pouring some water into the base tray.
d. Leave all relevant documentation with the unit.
e. Check for leaks at water connections.
f. Refrigerant leak check all brazed and fitted joints.
⚠ **WARNING.**
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.
g. Check for leaks at water connections.

4.7 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 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.biz).

During de-ice, the fans will stop operating. A second, de-ice pump will operate, pumping water from the top of the tank, through the system, to provide energy to de-ice the coil. Once the ice has been removed, the unit will enter a dry cycle, before recommencing heating operation again. During very low ambient conditions, the hot water supply temperature will reduce by a few degrees. This is to protect the compressor and to limit maximum refrigerant temperatures. This slightly increases the rate of hot-water production, and the operating efficiency under these conditions. Legionella control is maintained as it is unlikely that all heating cycles within a 7 day period occur during very low ambient conditions.

4.6 Protection Against Freezing

If the outdoor ambient temperature falls close to freezing point the pump will periodically circulate water to prevent freezing, whether heating is called for or not.
This protection relies on uninterrupted power to the unit. Two warning labels are supplied to warn against disconnecting the power supply where freezing conditions are likely (eg while building occupants are on holiday).

The labels should be fixed adjacent to the heat pump outdoor power point and on the main fuse/switchboard of the building. Advise the building occupier.

5. MAINTENANCE

Read the additional 'R32 Handling' instructions accompanying this product.

⚠ **WARNING.**

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.
If a leak is suspected, all naked flames shall be removed/ extinguished.
If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut-off valves) in a part of the system remote from the leak.

5.1 At Four Weeks

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

5.2 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.
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.

6. TROUBLESHOOTING

6.1 **Unit does not seem to deliver the hot water when most needed**

- Unit may have been incorrectly sized for the peak demand.
- Unit may be in a protection or diagnostic failure mode (refer 7.6 below).
- Heating capacity at design conditions may be incorrect.
- Check the unit's brochure for information on the minimum/ maximum operating temperatures.
- 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 6.5).
- Check the in-built water pump is set to speed '1'.

6.2 **Unit displays an error code:**

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

6.3 **Unit does not start**

- Circuit breaker may have been tripped. Reset circuit breaker.
- Unit may be off. Check unit is switched on at the unit, and there is external power at the source.
- Unit may be in a protection or diagnostic failure mode. Check for fault code display on unit's controller board (refer also 4.5).

6.4 **Water dripping outside**

Condensation released during unit operation is normal. The unit should have been drain connected at the time of installation (refer 2.3)

- Check drain line is not blocked, restricted or running uphill.
- If a condensate drain has been installed and is connected to a drain system, check gaskets and fittings around drain for leaks and plugs.

6.5 **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.biz).

8 WARRANTY

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)

NOTE Specifications are subject to change without notice due to the manufacturer's ongoing research and development programme.

INSTALLER TO COMPLETE

Commissioning Check List

Site Name/address: .....

Installing Company ..... Date: .....

Serviceman: ..... Tel: .....

Model: ..... Serial No: ..... Unit Site Ref: .....

Unit is installed level?	Y / N
Does unit have adequate safe access?	Y / N
Water drains tested okay?	Y / N
Water connections checked?	Y / N
In-built water pump set to 'Ext. In'?	Y / N
All electrical terminals are tight?	Y / N
Electrical Certificate of Compliance issued?	Y / N
Refrigerant leak checked?	Y / N

Unit is installed level with water storage tank?	Y / N
Read & understood the MWS Application Manual?	Y / N
Is this a commercial kitchen application?	Y / N
Is supplementary electric heat a part of the system?	Y / N
Is this a multi-tank installation?	Y / N
Connection pipes insulated?	Y / N
Is storage tank temp. sensor correctly positioned?	Y / N

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:

Heat Cycle:

Low Pressure:	SLP	kPa
Evaporating temperature:	Et	°C
Suction Line temperature:	SLt	°C
Suction Superheat:	SSH	K
Discharge Line Pressure:	dLP	kPa
Condensing temperature:	Ct	°C
Discharge Line temperature:	dLt	°C
Discharge Superheat:	dSH	K
De-ice Sensor temperature:	ICEt	°C
Water In temperature:	in	°C
Water Out temperature:	out	°C
Hot Water Cylinder temp.:	odt	°C
Required Capacity:	CAP	%
Expansion Valve 1:	EE1	%
Expansion Valve 2:	EE2	%
Modbus Address:	Add	

Entering Water temperature*:	°C
Leaving Water temperature:	°C
Compressor amps:	A
Total amps:	A
Input voltage:	A

* Note: Water temperature difference should be: Heating 35°C - 50°C..

APPENDIX I – UC8 CONTROLLER

Figure 3

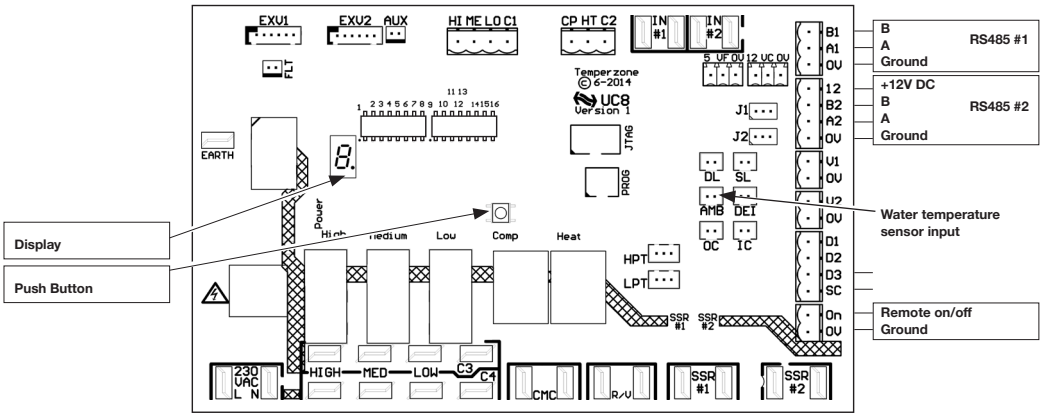


Table 1, Information available on the UC8 display.

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

APPENDIX II – 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 accurator 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.

6 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.

7 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.

8 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 SAT-3 thermostat, 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.

9 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 6) if assistance is required.

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www.temperzone.com

Auckland

Head Office
38 Tidal Rd, Mangere, Auckland
Private Bag 93303, Otahuhu
New Zealand

Phone: (09) 279 5250
Email: sales@temperzone.co.nz

Hamilton

Phone: (07) 839 2705
Email: tzhamilton@temperzone.com

Wellington

Phone: (04) 569 3262
Email: wgtn@temperzone.com

Christchurch

Phone: (03) 379 3216
Email: chch@temperzone.com

Sydney

Head Office
14 Carnegie Place, Blacktown
NSW 2148
PO Box 8064, Seven Hills West
NSW 2147, Australia

Phone: (02) 8822 5700
Email: sales@temperzone.com.au

Adelaide

Phone: (08) 8115 - 2111
Email: sasales@temperzone.com.au

Melbourne

Phone: (03) 8769 7600
Email: vicsales@temperzone.com.au

Brisbane

Phone: (07) 3308 8333
Email: qldsales@temperzone.com.au

Perth

Phone: (08) 6399 5900
Email: reception@airskill.com.au

Newcastle

Phone: (02) 4692 1155
Email: sales@mcintoshair.com.au

Launceston

Phone: (03) 6331 4209
Email: info@hvac-supplies.net

Singapore

Phone: +65 6733 4292
Email: sales@temperzone.com.sg

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Materials and specifications are subject to change without notice due to the manufacturer's ongoing research and development programme.