Thu Jul 10 2014

# Concealed Water Cooled Package Unit

## Installation & Maintenance

temperzone
QUALITY AIR CONDITIONING

# Installation & Maintenance

## GENERAL

CWP – A general designation which applies to all versions (refer fig.3 for nomenclature)
The CWP series must be installed in accordance with all National and local safety codes.

Configurations
The CWP series are water cooled packaged air conditioning units, designed primarily to be installed within a plant room, a dedicated plant or closet enclosure.

## REFRIGERATION SYSTEM

### General

The refrigeration system in the package unit has been charged with R410A refrigerant: refer to wiring specification table for the specific quantities. Access points are provided to measure discharge and suction operating pressures. Beware of the high system pressures: use only R410A rated gauges. The CWP series units have up to four independent refrigeration circuits and four compressors to provide the flexibility and economy of four stages of operation i.e. utilising one or more circuits as conditions vary, plus the advantage of staggered starting.

### Compressors

The compressor lubricant is polyolester oil (POE). Note this oil absorbs moisture quickly if exposed to air. The compressors are directional scroll type. On commissioning, the compressors must be checked for correct rotation (see Start up procedure).

Compressors are fitted with adjustable anti – rapid cycle timers. Controls fitted prevent rapid cycling and starts on multiple compressor units.

## POSITIONING

### Mounting

The CWP series units have been designed to be installed in an enclosed plant room or enclosure, and can be utilised with or without a plinth.

Fit anti vibration mounts or pads between the unit and the plinth or mounting surface.
CWP units are designed to be used with simple, short duct layouts. Units should be located as close to the air conditioned space as possible; refer to fig.2 for application considerations.
When determining the position of the air conditioner, allow adequate space around the unit to facilitate future servicing and maintenance. Ensure minimum working space is maintained in front of the electrical access panel.

### Condensate Drain

The standard design has an internal water trap to simplify condensate drainage connection. Therefore an external trap should not be fitted. (Refer figure 1). The drain requires a slope of at least 1mm drop in 50mm length of drain, and must not be piped above the unit drain pipe connection level.

For long condensate pipe runs, fit a vent pipe near the drain trap. The top of the vent pipe must be at least 215mm above the CWP units drain connection (Refer figure 1).

Check drainage by pouring water into the drain tray and ensuring that it clears. Failure to adhere to these instructions could cause flooding.

### Water Supply & Return

All CWP water connections are threaded male type. See specific Unit Data Sheet.
The CWP series units (excluding flexible hoses) have a maximum water pressure limit of 2760kPa (400psi).

The optional 600mm flexible high pressure water hose's utilise threaded swivel type pipe connections. Maximum water pressure for flexible high pressure water hose is 1720kPa (250psi).

Poor quality water supply must be pre-filtered, and it is essential that adequate water treatment is maintained, particularly where open cooling towers are used.

Note: It is required that the water system be fitted with a water flow switch and water pump safety interlock. These prevent the CWP series from going into fail safe lockout status due to a loss of water flow. Failure to install the above items will require the resetting of all CWP series units installed in any one system, either by breaking the power supply to each unit, or breaking the thermostat control circuit.

CWP****R units require a minimum water supply temperature of 17°C.

### Circuit Balancing Valve

It is mandatory that a water circuit balancing valve to be fitted to each unit to maintain water flow at a constant rate. The minimum water flow rates in litres per second (l/s) are as follows:

| Model | Minimum Water Flow |
|---|---|
| CWP0063 | 0.42 |
| CWP0083 | 0.5 |
| CWP0096 | 0.58 |
| CWP0109 | 0.67 |
| CWP0132 | 0.8 |
| CWP0178 | 1.08 |
| CWP0217 | 1.34 |
| CWP0266 | 1.6 |
| CWP0374 | 2.27 |
| CWP0447 | 2.6 |
| CWP0568 | 3.4 |
| CWP0890 | 4.9 |
| CWP1030 | 5.7 |

### Electrical Requirements

Electrical work must be carried out by a qualified and licensed electrician. The unit must be wired directly from a distribution board by means of a circuit breaker or fuse, and a mains isolator provided (by others) – to Australian Standards.

Note: DO NOT USE REWIREABLE FUSES.

The CWP series are provided with electrical diagram for a 240V AC control circuit, control circuit for a thermostat, on /off switch and / or time clock.
The control transformer 240V primary voltage is used for countries with 230 – 240V power supply. For countries with supply voltages of 200 – 220V, change the primary voltage tapping on the transformer to 208V.

Standard units are suitable for use with thermostats with manual Heat/Cool selection or automatic change over, subject to the contact ratings of the thermostats.

The air conditioner should be connected to the appropriate power supply for each model, as specified in the wiring diagram, with neutral and adequate earth. The power supply is to have an accessible switch to allow isolation of the unit. Refer to the wiring diagram located inside the unit when connecting to the heating/cooling thermostat. All wiring to the air conditioner must comply with the wiring regulations of the local electrical authority.

### Unit Protection

1. Unit protection is incorporated in CWP Protection Board.

2. A pump verification relay indicates water flow before the compressor will
start. A high pressure lockout protects the unit from low water flow in cooling mode, or fan failure in heating mode. Sensors protect against low air coil temperature and loss of refrigerant. Unit includes an anti rapid cycle device for compressor protection.

3. A low refrigerant temp safety thermostat is incorporated to protect against icing up of the water within the unit's tube-in-tube heat exchanger.

4. A non-specific fault LED/output signal is also included for remote fault indication to building management systems (refer wiring).

5. Note: Lockout protection can be reset by switching unit's power supply off and on. Lockout protection will also reset when the thermostat switches, or is switched to the dead zone.

6. Units Supplied With Electric Heat CWP*****EK*Y models supplied with electric heat include both auto (90°C) and manual (120°C) high temp safety thermostats. If the manual safety t/stat requires resetting, then the auto safety t/stat has failed and is required to be replaced.

### Room Thermostat

(Reverse Cycle Models)
The thermostat should be set within the recommended operating range of between 19°C and 30°C. The thermostat should not be used as an on-off switch.

## COMMISSIONING

### Check Tests

If crankcase heater has been fitted it would be required to be turned on for a 4hr period prior to the unit being commissioned. This process is required for the heat to drive any liquid refrigerant from the compressor oil.

Check that the shipping blocks beneath each compressor have been removed and that each compressor is secure on its mounts.

Check that all fans and fan motors run freely without vibration.

Check that the thermostat is correctly wired to the unit and is set at the desired temperature.

Check that the air filters (if fitted) are clean have been correctly installed.

Check that all of the air diffuser dampers are opened if appropriate.

Check all water valves are open, & condenser water pump is running.

Check condensate drain and safety drain tray for free drainage.

### START UP PROCEDURE

Use the Temperzone commissioning sheet to help you complete the following procedure:

1. After complying with all check test steps, switch the unit on. System -1 compressor will start straight away. Where units have multiple systems, System 2, 3 & 4 compressors will start up to 6 minutes later, due to the inbuilt delay timer.
2. Check for correct compressor rotation. If rotation is incorrect the compressor will not pump and will be noisy, and will draw minimal current. To correct the motor rotation, change the phasing at the main power terminal.
3. Check the supply voltage compliance to the design voltage between each phase and neutral.
4. Measure the current draw on each phase of each compressor motor and check the current draw of each fan motor. Check all readings against the nominated values stated in the unit wiring diagram.
1. Fit R410a gauges and measure the suction and discharge pressure of all refrigeration circuits if applicable.
2.
3. Test the operation of reversing valves by running the unit in both heating and cooling modes.
4. Check the evaporator fan's operation.
5. Check the tightness of all electrical connections and sign the check label.
6. Touch up any paintwork damage to prevent corrosion.

### SETTING SUPPLY AIR FLOW

Consult the CWP series technical data brochure for performance details of airflow / duct static pressure if required.

High humidity levels can occur in tropical or subtropical conditions, and / or when heavily moisture laden fresh air is introduced.

Care must be taken to select an airflow which results in a suitable coil face velocity to prevent water carryover.

In a free blow low resistance application, beware of exceeding the fan motors full load amp limit (refer to units wiring diagram).

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## MAINTENANCE

Monthly
1. Check air filters, and vacuum, wash or replace as necessary.
2. Check condensate drain for free drainage.
3. Check compressor compartment for oil stains which could indicate refrigerant leaks.

Note:
The manufacturer reserves the right to change specifications at any time, without notice or obligation.

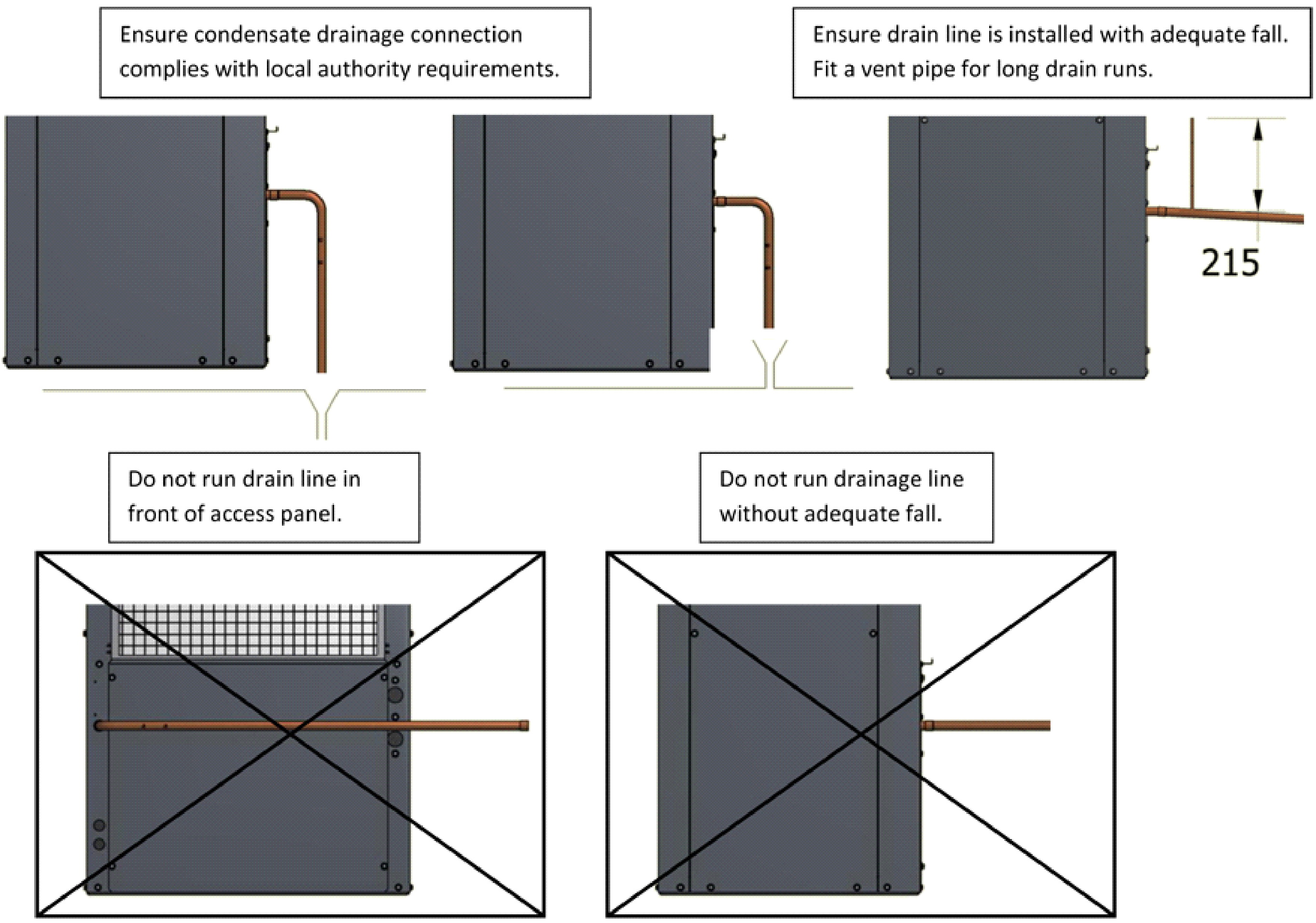
Important:
Minimum fall in Condensate drainage line should not be less than 1mm drop in 50mm length of drain.

Quarterly
(3 monthly or 1200 hours of operation)
1. Check the operation of electric heaters, if fitted.
2. Check air supply at diffusers.
3. Check for excessive noise and vibration, and correct as necessary.
4. Check the tightness of all fans, and motor mountings.
5. Check for insulation and duct damage and repair as necessary.
6. Remove lint and dust accumulation from evaporator coil.
7. Touch up any paintwork damage to prevent corrosion.

Half Yearly
(6 monthly or 2400 hours of operation)
1. Check the tightness of all electrical connections.
2. Check the tightness of all fans, and motor mountings.
3. Check the suction and discharge operating pressures.
4. Replace air filters if necessary.
5. Check condensate drain for free drainage.

Yearly
1. Full monthly check.
2. Full half yearly check.
3. Check all refrigerant piping for chaffing or vibration.

**Fig .1 Condensate Drain**



## Fig 2 Application considerations.

### Recommendations for Noise Isolation

1. Avoid installing units, directly adjacent to spaces where noise is critical.
2. Use flexible connections between unit and rigid ducting.
3. Use generous sized acoustically lined ducts.
4. Use formed radius 90° bends in sheet metal ducting to minimise air nose.

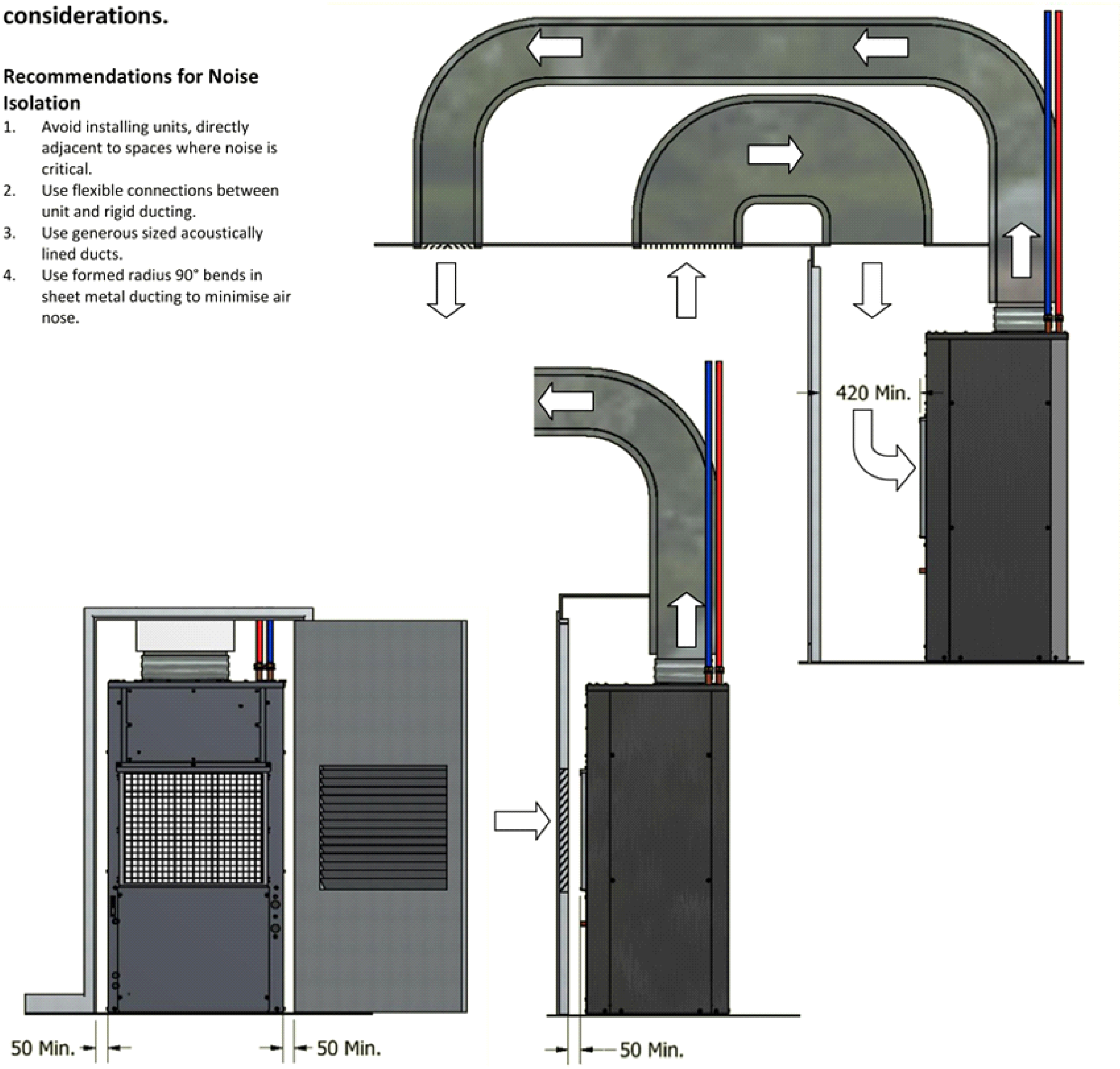



**Fig. 3 Nomenclature**

C W P 0 1 0 9 C E K S Y

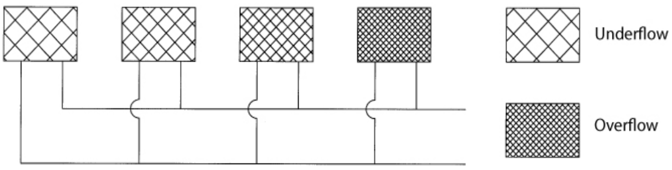
| Series | Size | Type |
|---|---|---|
| **C**- Closet<br>**W**- Water Sourced<br>**P**-Packaged | Divide by 10<br>to get approx.<br>Nominal Capacity<br>In kilowatts | **C** – Cooling only<br>**CE** – Cooling only with electric heat<br>**R** – Reverse cycle<br>**RE** – Reverse cycle with electric heat<br>**K** – Refrigerant R410A<br>**S** – Single phase power supply<br>**T** – Three phase power supply<br>**Y** – EC– DC Motor |

# Comissioning

## 1. WATER BALANCING

### 1.1 Why Balance?

It is obvious that in forced circulation water systems water flow can be too high in some circuits and too low in others in relation to the flows the designers intended them to have. Balancing is a matter of adjusting pressure drops to get precisely the right flows at each control loop and each terminal (air conditioner) under all operating conditions. However, if nothing is to compensate for it, the terminal closest to the pump will be favoured at the expense of the most distant circuits in a direct return system. Flows will be much too high close to the pump and much too low far from the pump. Even in a Reverse Return system, although each terminal is supposed to be at an equal distance (pressure drop) with the same flow rate, each individual water cooled unit can require different flow rates depending on its size.




### 1.2 Water Balancing Procedures

- Before starting any water cooled unit , make sure the water system has been flushed. Ensure each unit has water and power connected to it and the water shut-off valves are fully open. Leave the water balancing valve in the mid position.
- Balancing should start with the risers. Use each floor's flow control valve to balance the water flow at that floor and to ensure proper water distribution throughout the entire system.
- On each floor, balance one horizontal branch completely before balancing another branch. Within each branch, balance the nearest unit to the riser first and work through towards the furthermost unit until the whole branch has been done. Then repeat the water balancing within the branch at least once more as above.
- For every individual water cooled unit one of the methods below can be used to adjust its water flow rate to optimum :
- Measure and set the water flow through each unit to the nominal figure shown in the Installation & Maintenance instruction sheet. The compressor does not need to be operating. Run the compressor until the unit settles in.
- When the entering water temperature (EWT) is close to the designed condition, i.e. 35 ± 3°C, measure the outer surface temperature at the middle of the tube-in-tube condenser using an accurate digital thermometer (thermo couple type preferred). Adjust the balancing valve until the temperature is between 41 - 46°C.
- Adjust the water flow rate to achieve a 5 - 7°C difference between the leaving water temperature and entering water temperature (LWT-EWT) on cooling and accept 3–5°C on heating. Use an accurate thermometer combined with temperature wells placed inside the main stream of water pipe.
- Once water balancing is finished, every balancing valve's position must be fixed to maintain the achieved water balance.

## 2. PRE START-UP CHECKS

Before commencing, both power supply and water supply should be connected and ready for all the water cooled units. The water loop pipes must have been flushed and cleaned. Perform the following checks and record the results on a Commissioning Sheet (refer page 16) before startup of a unit;

- Water connections to the unit have been completed and the flow direction is the same as indicated on the unit. The service valves should be fully open and the balancing valve left in the mid position.
- If an automatic flow control valve is used, check that the appropriate size cartridge has been inserted which complies with the units designated nominal flow rate (refer unit's Installation & Maintenance instructions).
- Compressor locking devices have been removed and discarded (as per the installation instructions).

CPW 33–49 models: Cut and remove the plastic cable ties holding the compressor against the electrical box.
CPW 78, 95 models: Remove locknuts and washers from mounting studs and discard. Fit rubber isolating sleeves over mounting studs. Remove wooden shipping block from alongside compressor.

- Check the drain by pouring water into the drain tray and ensuring that it clears.
- Where spring mounts are used, adjust the spring on each of the four corners so they are evenly depressed. Check the unit is sitting on the springs freely.
- Check air filtration is fitted in the system and is accessible for cleaning and/or replacement.
- Check that the thermostat is correctly wired to the unit and is set at the desired temperature.
- Check the supply voltage is between 200 - 252 volts.

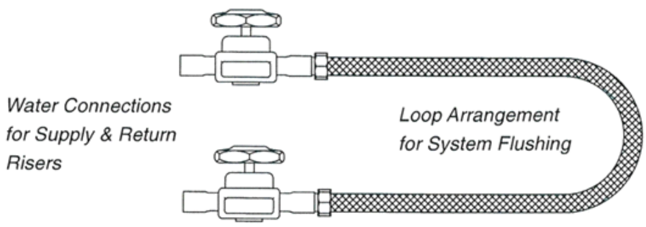
## 3. TEST RUN

Test run the unit on both cooling and heating (if applicable) cycles and check
the following :

- Measure entering water temperature and record it on the Commissioning Sheet (refer page 16). If the water temperature difference (TD) method is used to balance the water distribution, the leaving water temperature is also to be measured. Set water TD at 5-7°C on cooling or 3-5°C on heating.
- Measure the current draw on the compressor motor and the current draw of the fan motor. Check all readings against the specified valves in the Installation & Maintenance pamphlet or on the wiring diagram.
- Measure the condenser surface temperature at its mid position. This temperature represents the condensing temperature.

Note: The measuring of suction and discharge pressures is discouraged here.
Each unit has been accurately pre-charged in the factory. Some units have only 400 grams refrigerant charge in total. Each unnecessary measurement will let out 20-40 g of charge which will affect the unit performance.

- Measure the air temperature on to the unit and off the unit, and outside ambient temperature and record.
- Check the supply air flow at each outlet. Balance the air distribution if necessary.
- Listen for any unusual noises coming from the unit, unit mounting or ducting, and if there is any, correct them.



WATER COOLED UNITS
Commissioning Sheet
(Sample)

Model No. : ……………………………………

Start Up Date : …………………………………..

Serial No. : ……………………………………

Unit Location : …………………………………

Checks Before Start-Up :

- Supply, return water piping connected ?……………………………………
- Right Cartridge inserted ? ………………………………… (Auto flow control valves)
- Drain pipe drain water freely ? …………………………………..
- Mounting springs adjusted and balanced ? …………………………………..
- Air filter fitted ? ……………………………
- Room thermostat setting right ? …………………………………
- Supply voltage between 200-252V (1Ø) or 342-436V (3Ø) ? …………………………………………..

Cooling Cycle Operation :

- Compressor Amps ……………………………………..
- Entering Water Temperature ………………………….. (Water temp. difference should be 5-7°C)
- Leaving Water Temperature ……………………………
- Mid Condensate Surface Temp …………………………………..
- Room Air On Temperature ……………………………………..
- Unit Air Off Temperature ……………………………………..
- Outside Ambient Temperature ……………………………………

Heating Cycle Operation :

- Compressor Amps ……………………………………………
- Entering Water Temperature …………………………… (Water temp. difference should be 3-5°C)
- Leaving Water Temperature …………………………….
- Room Air On Temperature ……………………………..
- Unit Air Off Temperature ……………………………….
- Outside Ambient Temperature ………………………………….



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Start Up Date ........................................ Installing Company ..........................................................................................

Contract Name .......................................................................... Model No./ Serial No. ................................ / ...............................

| REFRIGERATION | System 1 | System 2 (if applicable) |
|---|---|---|
| Refrigerant type ........................................ | R410A | R410A |
| Refrigerant added on site per system, if required (kg) .................. | | |
| Superheat setting (°C) ........................................ | | |
| Suction pressure/Discharge pressure on Cooling (kPag) .................. | / | / |
| Suction pressure/Discharge pressure on Heating (kPag) .................. | / | / |
| Refrigerant leak check ?........................................ | YES / NO | YES / NO |

| ELECTRICAL | | |
|---|---|---|
| Supply voltage ........................................ | | |
| Compressor drawn amps ........................................ | / | / |
| Overload setting ........................................ | | |
| Compare published compressor amps ........................................ | | |
| Outdoor fan motor amps drawn ........................................ | | |
| Indoor air fan motor amps drawn ........................................ | | |
| Boost heater element amps drawn ........................................ | | |
| Total Unit amps drawn ........................................ | | |
| Thermostat setting (°C) ........................................ | | |
| Thermostat operating correctly ? ........................................ | YES / NO | |
| Contactors & relays operating correctly ? .................................. | YES / NO | |
| All terminals checked for tightness and label signed ? .................. | YES / NO | |

| TEMPERATURES | |
|---|---|
| Outside ambient temperature (°C) ........................................ | |
| Indoor Unit air temperature On / Off on Heating (°C) .................. | / |
| Indoor Unit air temperature On / Off on Cooling (°C) .................. | / |

| DUCTING | |
|---|---|
| Total Return air flow (Total of all inlets) (l/s) .................................. | |
| Total System external resistance (Pa) * .................................. | |
| Estimate of Fresh Air Make-Up ( % or l/s ) .................................. | |

* Total of external resistances measured downstream of fan outlets plus upstream of coil(s)

| GENERAL | |
|---|---|
| Air filters: overall size and number ........................................ | |
| Drain pipe traps and vents fitted as per Installation Instructions?............ | YES / NO |
| Drain is clearing water properly? ........................................ | YES / NO |
| Check vibration of Outdoor Unit ........................................ | OK / EXCESSIVE |
| Pulley and/or Belt change ........................................ | |
| Belt tensioning adjusted? ........................................ | YES / NO |
| Paint finish checked and repaired?........................................ | YES / NO |

PULLEY ADJUSTMENT & BELT TENSIONING: Refer to

SIGNED : ........................................ Approved Installer



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## General Fault Finding

| Symptom | Probable Cause |
|---|---|
| Moisture carryover down supply duct (indoor coil): | (1) Too high indoor air flow / coil velocity (for given entering air humidity) |
| | ((2) Poor condensate/drain tray trapping, venting or drain line fall |
| | (3) Blocked condensate/drain tray outlet |
| | (4) Unit not level or sloped away from drain outlet |
| Water leaking from indoor unit base: | (1) Poor condensate / drain tray trapping, venting or drain line fall |
| | (2) Blocked condensate/drain tray outlet |
| | (3) Unit not level or sloped away from drain outlet |
| Lack of temperature difference across indoor coil: | (1) Too high indoor air flow |
| | (2) Undercharge of refrigerant (high superheat good indicator of this) |
| | (3) Extreme line losses due to long line length or undersizing of pipes |
| | (4) High wet bulb temperature/RH in room, i.e. high latent load reduces sensible heat proportion |
| Excessive temperature difference across indoor coil: | (1) Too low indoor air flow |
| | (2) Low wet bulb temperature/RH in room, i.e. low latent load increases sensible heat proportion |
| Noisy scroll compressor: | (1) Reversing valve stuck half-way |
| | (2) Compressor running in wrong diection, swap two phases |
| | (3) Liquid flooding back, reduce charge to increase superheat |
| Lack of indoor air flow: | (1) Ducting undersized |
| | (2) Ducting poorly installed, kinked, squashed, tight bends |
| | (3) Plenum design incorrect creating turbulence |
| | (4) Blocked filter |
| Noise from indoor unit / fan: | (1) Ducting undersized |
| | (2) Ducting poorly installed, kinked, squashed, tight bends |
| | (3) Plenum design incorrect creating turbulence and generating noise |
| Indoor fan stops in dead zone: | (1) Likely to be a function of the thermostat |
| | (2) Unit has been wired to achieve this function, refer installation instructions for wiring change required |
| Compressor cutting out on internal klixon: | (1) Run or start capacitor failure if single phase |
| | (2) Failure of outdoor fan in cooling mode, indoor fan in heating mode |

## FAULT FINDING BY SYSTEM PRESSURE

To use this chart, first consider pressures on Cooling cycle to narrow the field, then consider pressures on Heating cycle to zero in on possible fault.

| COOLING Suction Pressure | COOLING Discharge Pressure | HEATING Suction Pressure | HEATING Discharge Pressure | Possible Symptoms COOLING | Possible Symptoms HEATING | Probable Cause |
|---|---|---|---|---|---|---|
| LOW | LOW | LOW | LOW | 2,3,4 | 2,3,4 | Undercharge of refrigerant |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | | NORMAL | LOW | | | |
| | | | NORMAL | 1 | None | Operation of cooling cycle in too low ambient and/or romm condition |
| | | | HIGH | | | |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | 1 | 7 | Low indoor air flow, dirty filters, blocked coil, indoor fan motor |
| | NORMAL | LOW | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | | NORMAL | LOW | 1 | None | Operation of cooling cycle in too low room condition |
| | | | NORMAL | 1 | None | Operation of cooling cycle in too low room condition |
| | | | HIGH | 1 | 7 | Short circuiting of indoor air supply-return; low indoor air flow |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | HIGH | LOW | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | Closed liquid or suction shut off valve(s),, blockage in liquid or suction lines or components |
| | | NORMAL | LOW | | | |
| | | | NORMAL | | None | Indoor TXV/Accurator blockage, Outdoor unit check valve stuck/blocked/installed back of front |
| | | | HIGH | | | |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |

Possible Symptoms legend:
(1) Frosting or Icing of Indoor Coil, (2) High Superheat, (3) Low Amps, (4) Loss of Capacity, (5) Low Superheat, (6) High Amps (7) High Pressure Switch Tripping, (8) Premature Icing of Outdoor Coil, (9) Noisy Scroll Compressor

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## FAULT FINDING BY SYSTEM PRESSURE

To use this chart, first consider pressures on Cooling cycle to narrow the field, then consider pressures on Heating cycle to zero in on possible fault.

| COOLING Suction Pressure | COOLING Discharge Pressure | HEATING Suction Pressure | HEATING Discharge Pressure | Possible Symptoms COOLING | Possible Symptoms HEATING | Probable Cause |
|---|---|---|---|---|---|---|
| LOW | LOW | LOW | LOW | | 2,3,4 | Slight undercharge of refrigerant |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | | NORMAL | LOW | | | |
| | | | NORMAL | | None | |
| | | | HIGH | | | |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | NORMAL | LOW | LOW | None | | Slight undercharge of refrigerant |
| | | | NORMAL | None | | |
| | | | HIGH | None | | Outdoor TXV/accurator blockage, Indoor unit check valve stuck/blocked/installed back to front |
| | | NORMAL | LOW | None | | |
| | | | NORMAL | None | None | No obvious fault diagnosable by pressures alone |
| | | | HIGH | None | 6 | Operation of heating cycle in too high ambient and /or room temp, room air short circuit |
| | | HIGH | LOW | None | 3,4 | R/Valve not fully closed in heat mode, outoor unit check valve not sealing/stuck open |
| | | | NORMAL | None | | |
| | | | HIGH | None | 6 | Operation of heating cycle in too high ambientand/or room temp, room air short circuit, low air flow |
| | HIGH | LOW | LOW | | | |
| | | | NORMAL | 6,7 | 8 | Outdoor coil air flow impeded or short circuiting, eg ducting on outdoor coil |
| | | | HIGH | | | |
| | | NORMAL | LOW | | | |
| | | | NORMAL | | None | |
| | | | HIGH | | | Overcharge of refrigerant, non-condensables in system (moisture?) |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | Overcharge of refrigerant, non-condensables in system (moisture?) |

Possible Symptoms legend:
(1) Frosting or Icing of Indoor Coil, (2) High Superheat, (3) Low Amps, (4) Loss of Capacity, (5) Low Superheat, (6) High Amps (7) High Pressure Switch Tripping, (8) Premature Icing of Outdoor Coil, (9) Noisy Scroll Compressor

## FAULT FINDING BY SYSTEM PRESSURE

To use this chart, first consider pressures on Cooling cycle to narrow the field, then consider pressures on Heating cycle to zero in on possible fault.

| COOLING Suction Pressure | COOLING Discharge Pressure | HEATING Suction Pressure | HEATING Discharge Pressure | Possible Symptoms COOLING | Possible Symptoms HEATING | Probable Cause |
|---|---|---|---|---|---|---|
| LOW | LOW | LOW | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | | NORMAL | LOW | | | |
| | | | NORMAL | 3,4 | None | R/Valve not fully closed in cool mode, indoor unit check valve not sealing/stuck open |
| | | | HIGH | | | |
| | | HIGH | LOW | 3,4,9 | 3,4,9 | R/Valve stuck mid-way, compressor valve/pipe leak from high to low side, incorrect comp rotation |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | NORMAL | LOW | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | | NORMAL | LOW | | | |
| | | | NORMAL | | None | Operation of cooling cycle in too low room condition |
| | | | HIGH | | | Operation of cooling cycle in too high room condition, Short circuiting of indoor air supply-return |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | | | |
| | HIGH | LOW | LOW | 6,7 | 8 | Outdoor coil air blocked or short circuiting, outdoor fan fail, high indoor air flow, extreme ambient |
| | | | NORMAL | | | |
| | | | HIGH | | | Closed liquid or suction shut off valve (s),, blockage in liquid or suction lines or components |
| | | NORMAL | LOW | | | |
| | | | NORMAL | 6,7 | None | Operation of cooling in too high ambient and/or room condition |
| | | | HIGH | 6,7 | 6,7 | Operation of cooling and heating in too high ambient and/or room condition |
| | | HIGH | LOW | | | |
| | | | NORMAL | | | |
| | | | HIGH | 5, 6, 7 | 5, 6, 7 | Overcharge of Refrigerant, Non-condensables in system, i.e.moisture |

Possible Symptoms legend:
(1) Frosting or Icing of Indoor Coil, (2) High Superheat, (3) Low Amps, (4) Loss of Capacity, (5) Low Superheat, (6) High Amps (7) High Pressure Switch Tripping, (8) Premature Icing of Outdoor Coil, (9) Noisy Scroll Compressor

temperzone QUALITY AIR CONDITIONING

# Frequently Asked Questions

## Why does the temperature in my office vary so much from its setting?

There are a number of reasons that this can occur. Most temperzone controllers have fairly close differentials, and control to plus or minus 0.5 to 1.0°C. However: -

### 1. Oversized

If the unit has been oversized then in the mid-season i.e. spring and autumn when the cooling or heating load is light the unit becomes significantly oversized for the room load. The unit may even swing from heating to cooling cycles and back again during the day. It is probable that the minimum run timer and anti-rapid cycle timer that protect the compressor from short cycling and possible damage are having an influence and keeping the compressor on or off longer than the controller desires.

### 2. Design Criteria

Most cooling design temperatures are based on the design temperature being exceeded at 3.00 pm for approx 10 days a year on average. If the unit is correctly sized, the indoor temperature may rise a degree or two for a few hours on the days when the design temperature is exceeded. It is rare that hot conditions last more than a few days at a time. It does not make sense to oversize a unit for a few days of the year. This is the one reason why units should be selected as close as possible to the estimated cooling load whilst also meeting the heating requirement. Over sizing units is more troublesome than under sizing. Generally undersizing by 5% should not cause too many complaints. This is one reason why units should be selected as close as possible to the room cooling AND/OR heating load.

### 3. Diffusers

Drafts from wrongly placed supply air diffusers could be affecting the temperature sensor built in to the wall plaque, correcting the placement or changing to a return air sensor could solve this issue.

### 4. Drafts

Drafts up the cable duct at the back of the controller surprisingly have been found to be responsible on many occasions for a poorly sensing controller.

### 5. Stratification

Stratification of the air within the room can give a false operation, the room needs good air circulation otherwise the controller does not read the temperature correctly and also the supply air may be short circuiting back to the return air.

## Why does my Nominal 10 kW unit not seem to deliver the heating when I need it most?

Undersized on Heating
Air Conditioning units are often selected by contractors to meet the cooling load without considering the heating load. It is strongly recommended by temperzone that the heating load also be considered as sometimes it could be higher than the cooling load which means the unit could be at a disadvantage right from day one.

### 6. Heating Capacity at Design

The heating duty is totally reliant on the outdoor temperature and how much heat it contains. Therefore the heating performance does reduce as the outside temperature falls, though at all times the kW heat pump output is greater than the kW input. As the outside temperature falls then the heat losses through the walls, floor and ceiling increase and so the heating duty requirement increases.

The heating load should be at least considered at the lowest ambient temperatures generally expected, not necessarily the one day in the year it is even lower! Residential design temperatures are lower than commercial design temperatures because they cover 24hours.

### 7. Effect of De-Ice

When the outdoor temperature falls below about 4.0°C ice may startat to form on the outdoor coil, the higher the moisture content of the air the more ice that may occur and in fact more icing occurs when the outdoor lower
temperature is between zero and 4.0°C than below zero. Heat Pump units have de-icing cycles built in to dispose of the ice but this usually means reversing the cycle for a few minutes during which time there is no heating and in fact a little cooling occurs. This is why outdoor temperatures units have a Gross and Nett heating duties shown, the difference between Gross and Nett being the allowance for de-ice cycles.

### 8. Night Set Back

If the heat pump is switched off at night to save energy, and that of course is a sensible thing to do, then on start up in the morning (or at any time) in heating mode then the room temperature will have fallen, how far being dependant on the outside temperature.
To reach the desired temperature requires the unit to raise the existing temperature of the air, structure and furniture (thermal mass) to that level. This is known as a pull up load which is often ignored when units are selected. A temperature controller with night set back would be the answer, this would keep the system in operation but allow the temperature to be
maintained a few degrees lower (or higher in summer). Not as energy efficient as turning the system off but allowing the unit to respond faster when needed and some level of comfort is maintained during the set-back period.

## In a new building why does it take some days before the Air Conditioning Heat Pump unit seems to work properly?

Any new building, especially a commercial building, has 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 building from scratch.
This load can be huge, consider a shopping centre built in mid-winter in the South Island with the inside of the building open to the elements. It may take a week or more when the system starts up to heat up all this material and draw out all the moisture before the space air temperature starts to feel the effect.
This also often results in heavy icing of the outdoor coils which cannot be de-iced because there is little or no available heat in the space from which to draw the necessary heat to melt the ice. This can then lead to compressor failure due to liquid slugging during or shortly after the start up/commissioning period.
Units need some nursing through this period and should not be left to their own devices. Crushed outdoor coil pipes caused by repeated freezing without a complete de-ice, are another symptom of this.

## Why is my Unit Spitting or Leaking Water?

Water spitting from a unit down the duct or dripping from underneath could be a result of a number of issues, we will list these in the order that they are most likely: -

#### 1. Poor Drain Trapping

From past experience nearly 90% of the complaints received about water leaking from a unit or water spitting down the duct are found to be caused by poor/ incorrect trapping or venting of the drain pipe or the drain pipe not sloping correctly. We recommend that the drain trap/vent/slope be investigated first before moving on to other possible issues.
Temperzone have a detail drawing of the trap/vent/slope requirements on all unit Installation and Maintenance sheets.
Not all units have identical trapping/venting requirements; check the unit installation detail pertinent for your unit.

#### 2. Water Carry-Over

This is dependent on many factors: -the face velocity across the indoor coil, the relative humidity of the air, the actual moisture content of the air, the dew point temperature of the air, the surface temperature and associated sensible heat ratio of the coil, the fin spacing of the coil, the number and position of fans, space between them and the ease of fan entry.
Therefore it is a very subjective issue, hard to define, and people's expectations vary considerably.

At fairly normal return air conditions, say 21.0° to 24.0°C and at 50% and with a nominal room sensible heat ratio of saymaximum air.

However, with the addition of fresh air load the %RH of the air on to the coil will increase and add more moisture load therefore the air flow/velocity should proportionally decrease as the fresh air quantity increases until for a 'Full Fresh Air' system we would recommend the cooling coil face velocity be no more than 2.0 m/s. This should also be considered (along with protection for the compressor) on any units with economisers fitted especially if the fresh air damper is controlled by a CO2 sensor and the compressors could remain operational with high/full fresh air. It is also a good reason why enthalpy/wet bulb control of the economisers' free cooling is far superior to simple temperature control.

With High Sensible Heat Applications the velocity could be up to 2.8 m/s without water carry over as so little moisture is condensed on the coil.


temperzone australia pty ltd

Sydeny: (02)8822 5700
Adelaide: (08) 8340 0607
Newcastle: (02) 4962 1155
Melbourne: (03) 8769 7600
Brisbane:(07) 33088333
Tasmania:(03) 63314209
Perth: (08)9314 3844
Townsville: (07) 4773 9566

www.temperzone.biz


The Manufacturer reserves the right to change specifications without prior notice.

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