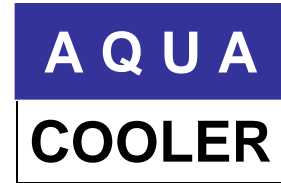


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MANUFACTURERS OF
WATER COOLERS AND
INDUSTRIAL CHILLERS.

OWNERS MANUAL

Standard R Series Process Water Chillers

For outdoor applications



MODEL PURCHASED: _____ SERIAL No: _____

SERVICE AGENT DETAILS: _____

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1. SAFETY

- This chiller is designed to be safe in the use for which it was planned, provided that it is installed, started and maintained in accordance with the instructions contained in this manual.
- The chiller contains electrical components that operate at line voltage and contains moving parts. It therefore must be isolated from the electrical supply before starting work.
- All maintenance operations that require access to the chiller must be carried out by suitably qualified technicians who have a thorough understanding of all necessary precautions associated with refrigeration machinery.
- The liquids to be cooled must be compatible with the materials used in the constructions of this chiller. These liquids can be water or mixtures of glycol and water for example.
- The liquids to be cooled must not be flammable.
- All panels must be re-installed after carrying out any maintenance work.
- The chiller contains refrigerants under pressure. If the chiller is no longer required it is essential that the refrigerant is reclaimed from the unit before disposal.
- The chiller is not to be used by the infirm or children unless they are supervised by responsible persons qualified to carry out the supervision.
- The unit should be secured to prevent it from toppling over.

1.1 MARKINGS

- 1.1.1 Find Wiring Diagram, Model Number, settings and specifications on a label adhered inside of the Control Box or on the base.
- 1.1.2 A four digit serial number can be found under the marking plate. With this number Aqua Cooler can trace the date of manufacture of the product and details on the unit.
- 1.1.3 The Chiller's Centre of Gravity is non symmetrical. Heavy End will be stencilled or labelled at one end of the chiller.

1.2 SAFETY INSTRUCTIONS

- The symbol below indicates live electrical parts. The utmost care should be taken when working on equipment. Always isolate power from the unit when working on it. Circuit Breakers and thermal overload protection are provided on the chiller



- Work should be carried out by qualified electricians only.
- Electrical connection should be in accordance with all the local relevant safety standards for wiring safety.

1.3 HANDLING REFRIGERANTS

The refrigeration circuit should only be worked on by a competent, qualified refrigeration mechanic.

Refrigerants have a narcotic effect when inhaled in high quantities. Should a leak occur of the refrigerants then the room should be vacated and should only be re-entered after suitable ventilation.

First Aid

- Eye Contact. Immediately flush with tepid water or sterile saline solution. Hold eyelids apart for 15 minutes while irrigating. Seek medical attention.
- Inhalation. Remove from area of exposure immediately and if you are assisting a victim avoid being exposed. Breathing apparatus must be worn in the presence of high concentration of refrigerants. If victim is not breathing then apply artificial respiration and seek urgent medical help. Give oxygen if available.
- Skin Contact. Cold Burns. Remove contaminated clothing and gently flush affected area with warm water (30C) for 15 minutes. Apply sterile dressing and treat as for a thermal burn. For large burns immerse in water for 15 minutes. DO NOT apply any form if direct heat. Seek medical attention.
- Ingestion. For advice contact the poisons centre on 131126 in Australia. If swallowed do not induce vomiting. Ingestion is considered unlikely due to product form.
- Advice to Doctor. Use of adrenaline and other catacholamines may be contraindicated due to possible cardiac sensation. Treatment for asphyxia.

Manual Handling.

Refer to Technical Data for unit weights. Do not try to move the unit manually. The unit has been design to accept a pallet jack that can be placed under the unit from either end.

1.4 ENVIRONMENTAL REGULATIONS

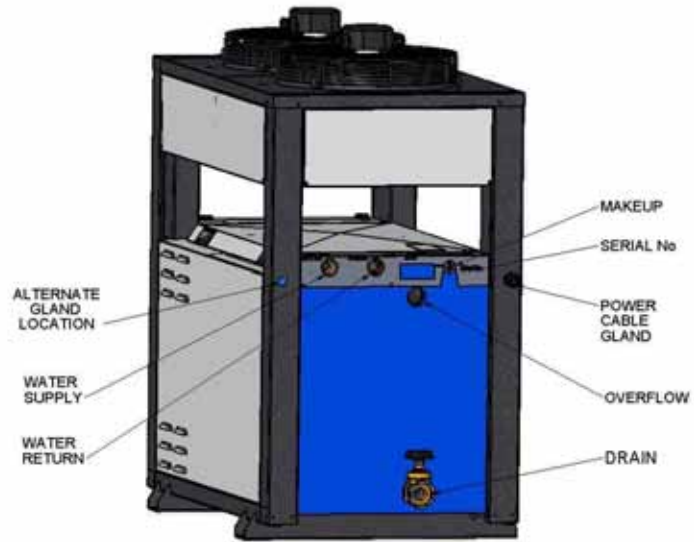
The unit must be disposed of in a proper fashion. The refrigerants in the system must be reclaimed by a qualified refrigeration mechanic and disposed of in accordance with the statutory requirements. The compressor contains oil that must not be dumped.

2.0 WARRANTY

Aqua Cooler Pty Ltd warrants this product for 12 months from the date of delivery to the first purchaser. This warranty covers all defects from faulty workmanship and materials. Its does not cover defects that are occasioned from misuse, alteration or installation not in accordance with the Aqua Cooler installation instructions.

3.0 TECHNICAL DATA

Figure below shows the R1 Chiller plumbing and serial number plate.



Chiller – Back View

PLUMBLING FITTINGS

| Chiller Series Model | R1 | R2 | R3 |
|-----------------------------------|------------|------------|----------|
| Return Water Connection | 1" BSP | 1" BSP | 1.5" BSP |
| Supply Water Connection | 1" BSP | 1" BSP | 1.5" BSP |
| Makeup Water Connection | 3/8" BSP | 3/8" BSP | 1" BSP |
| Overflow | 1,1/4" BSP | 1,1/4" BSP | 2" BSP |
| Drain (Gate Valve Factory Fitted) | 1,1/4" BSP | 1,1/4" BSP | 2" BSP |
| Power & Alarm Cabling Conduit | M20 | M25 | M32 |

| R1 SERIES | | R150A | R180A | R230A | R300A | R330A |
|--|------------|---|-------|-------|---------------------------------------|-------|
| Compressor horsepower | hp | 1.5 | 1.8 | 2.3 | 3.0 | 3.3 |
| Cooling Capacity at 5°C Supply ¹ | Watts | 1700 | 2450 | 3600 | 4900 | 5700 |
| Cooling Capacity at 10°C Supply | Watts | 2100 | 3100 | 4600 | 5900 | 6900 |
| Cooling Capacity at 15°C Supply | Watts | 2650 | 3800 | 5500 | 7000 | 8300 |
| Cooling Capacity at 20°C Supply | Watts | 3300 | 4600 | 6500 | 8200 | 9750 |
| Tank Capacity | L | 80 | | | | |
| Dry Weight | Kg | 160 | | 170 | 180 | |
| Overall Size | mm | 975L x 590W x 1060H | | | | |
| Power Requirements – Single Phase | | 240V 50Hz Single Phase | | | Not Readily Available In Single Phase | |
| Maximum Current Draw ² - Single Phase | A | 15.0 | 17.1 | 22.1 | | |
| Power Requirements – Three Phase | | 415V 50Hz 3 Phase plus Neutral (4A Max) | | | | |
| Maximum Current Draw - Three Phase | A/phase | 8.2 | 8.9 | 10.5 | 12.2 | 12.9 |
| Pump Option 1 – 0.45kW | | | | | | |
| Pump Flow At Maximum Pressure | L/hr (kPa) | 600L/hr at 170kPa | | | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 4200L/hr at 60kPa | | | | |
| Pump Option 2 – 0.75kW | | | | | | |
| Pump Flow At Maximum Pressure | L/hr (kPa) | 600L/hr at 440kPa | | | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 4200L/hr at 170kPa | | | | |
| Pump Option 3 – 0.75kW | | | | | | |
| Pump Flow At Maximum Pressure | L/hr (kPa) | 600L/hr at 550kPa | | | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 4200L/hr at 250kPa | | | | |

¹ Based on operation within a 45°C ambient environment. Increase cooling capacity by 20% for operation within 35°C environment

² Rated at 25°C water supply whilst operating within 45°C ambient environment and fitted with P5 pump

| R2 SERIES | | R420A | R540A | R670A | R830A | R1000A | R1200A | R1330A | |
|--------------------------------------|------------|--|-------|-------|---|--------|---|--------|--|
| Compressor horsepower | hp | 4.2 | 5.4 | 6.7 | 8.3 | 10.0 | 12.0 | 13.3 | |
| Cooling Cap. 5°C Supply ³ | Watts | 6100 | 8100 | 10300 | 11700 | 15600 | 17500 | 19200 | |
| Cooling Cap. 10°C Supply | Watts | 7500 | 9700 | 12500 | 14200 | 18800 | 21200 | 24400 | |
| Cooling Cap. 15°C Supply | Watts | 8900 | 11600 | 14900 | 17100 | 22300 | 25200 | 28400 | |
| Cooling Cap. 20°C Supply | Watts | 10600 | 13800 | 17900 | 20800 | 26400 | 29500 | 35600 | |
| Tank Capacity | L | 180 | | | | | | | |
| Dry Weight | Kg | 270 | | | 310 | | | | |
| Overall Size | mm | 1295L x 790W x 1340H | | | | | 1495L x 790W x 1340H | | |
| Power Requirements | | 415V 50Hz 3 Phase plus Neutral (4A Max) | | | | | | | |
| Max. Current Draw ⁴ | A/phase | 13.3 | 15.7 | 20.2 | 22.9 | 27.5 | 33.2 | 34.1 | |
| Power Cable (5msupplied) | | 2.5mm ² 4 Core + Earth Flexible V75 O/C | | | 4.0mm ² 4 Core + Earth V75 O/C | | 6.0mm ² 4 Core + Earth V75 O/C | | |
| Pump Option 4 - 0.70kW | | | | | | | | | |
| Pump Flow (Max Press.) | L/hr (kPa) | 1200 (240) | | | | | | | |
| Pump Flow (Max Press.) | L/hr (kPa) | 6000 (50) | | | | | | | |
| Pump Option 5 - 1.10kW | | | | | | | | | |
| Pump Flow (Max Press.) | L/hr (kPa) | 1200 (400) | | | | | | | |
| Pump Max Flow (Press.) | L/hr (kPa) | 6000 (130) | | | | | | | |
| Pump Option 6 - 1.40kW | | | | | | | | | |
| Pump Flow (Max Press.) | L/hr (kPa) | 1200 (550) | | | | | | | |
| Pump Flow (Max Press.) | L/hr (kPa) | 6000 (180) | | | | | | | |

³ Based on operation within a 45°C ambient environment. Increase cooling capacity by 20% for operation within 35°C environment

⁴ Rated at 25°C water supply whilst operating within 45°C ambient environment and fitted with P6 pump

| R3 SERIES | | R1500A | R2000A | R2500A |
|---|------------|---|--|--------|
| Compressor horsepower | hp | 15 | 20 | 25 |
| Cooling Capacity at 5°C Supply ⁵ | Watts | 25,000 | 36,000 | 45,000 |
| Cooling Capacity at 10°C Supply | Watts | 29,000 | 40,000 | 51,000 |
| Cooling Capacity at 15°C Supply | Watts | 36,000 | 49,000 | 62,000 |
| Cooling Capacity at 20°C Supply | Watts | 43,000 | 54,000 | 67,000 |
| Tank Holding Capacity | L | 500 | | |
| Dry Weight | Kg | 800 | 900 | 950 |
| Overall Size | mm | 2015L x 860W x 1545H | | |
| Power Requirements | | 415V 50Hz 3 Phase plus Neutral (4A Max) | | |
| Maximum Current Draw ⁶ | A/phase | 37 | 41 | 49 |
| Power Cable (5m supplied) | | 6mm ² 4 Core + Earth V75 O/C | 10mm ² 4 Core + Earth V75 O/C | |
| Pump Option 7 – 0.70kW | | | | |
| Pump Flow (Maximum Pressure) | L/hr (kPa) | 3,000 (400) | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 14,000 (200) | | |
| Pump Option 8 – 1.10kW | | | | |
| Pump Flow (Maximum Pressure) | L/hr (kPa) | 3,000 (500) | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 14,000 (250) | | |
| Pump Option 9 – 1.40kW | | | | |
| Pump Flow (Maximum Pressure) | L/hr (kPa) | 3,000 (650) | | |
| Pump Maximum Flow (Pressure) | L/hr (kPa) | 14,000 (350) | | |

4 TRANSPORT & STORAGE

4.1 Note when moving with a forklift that chillers are significantly heavier at the end with the compressor. This will be indicated by markings.

4.2 If using slings or ropes pass ropes through pallet.

⁵ Based on operation within a 45°C ambient environment. Increase cooling capacity by 20% for operation within 35°C environment

⁶ Rated at 25°C water supply whilst operating within 45°C ambient environment and fitted with P6 pump

DOMESTIC

4.3 Chillers are screwed onto a pallet and stretch wrapped. They must be upright and be top load only.

INTERNATIONAL

4.4 Exported Chillers must be fully enclosed in a crate which satisfies the country of origin regulations.

4.5 Remove all packing including strapping around evaporator coils before use.

4.6 If storing chiller for longer than one month avoid direct sunlight and leave in packaging.

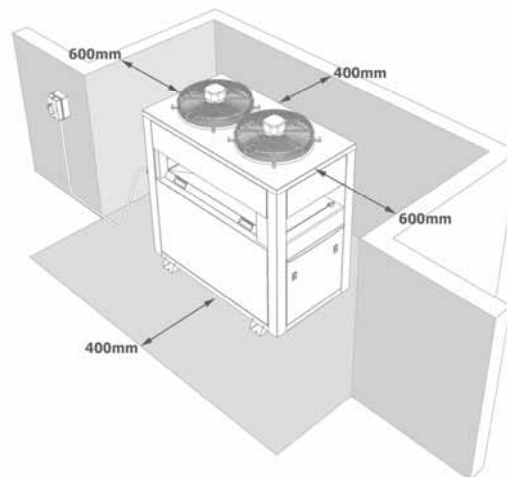
5 INSTALLATION

5.1 INSPECTION

Immediately upon receipt of the chiller, carefully inspect it for any damage that may have occurred in transit. Any such damage must be noted on the carrier's delivery documents. It is the consignee's responsibility to make any subsequent claims upon the carrier or the respective insurance company.

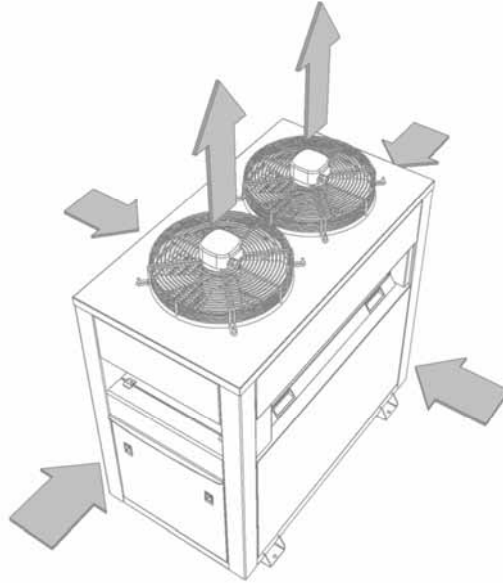
5.2 POSITIONING

This chiller has been designed for installation in outdoor locations, but may be installed indoors provided there is sufficient ventilation to prevent re-circulation of air through the condenser.



When installing indoors it is important to understand that the chiller will impart a significant heat load into the environment and it is essential to ensure a plentiful, unrestricted supply of ambient temperature air to the chiller. Should you have concerns over the installation site then please contact Aqua Cooler for advice.

Under no circumstances is ducting to be attached to the condenser fan outlets. Louvered panels or grates placed over the fans will reduce air flow and reduce the condensing capability of the chiller.



This chiller has been designed to draw air from each side and to exhaust vertically through the top of the unit. Preferably there should be no obstructions above the chiller, with a minimum of one metre clearance permitted in other circumstances. In addition to ensuring sufficient space around the chiller for free air movement, provision must be made around the chiller for service and regular maintenance.

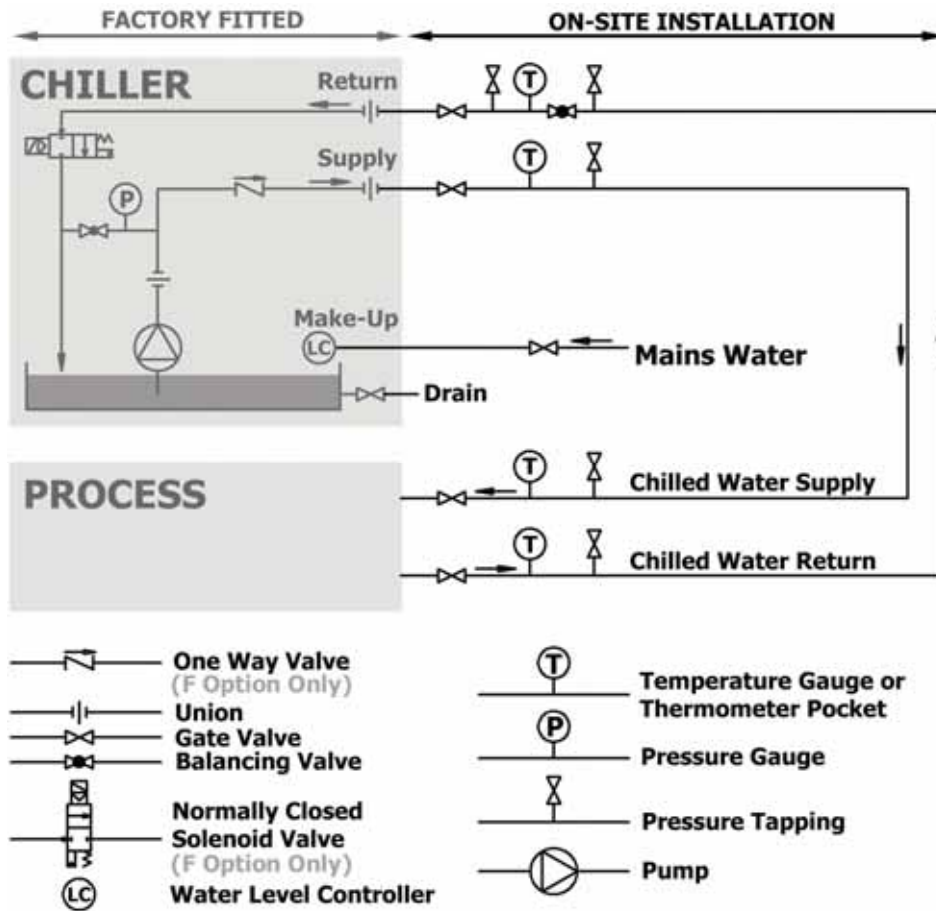
The chiller must be installed on a firm and level foundation, of adequate strength to support the chiller's full operating weight. Vibration isolation, such as rubber waffle pads, should be installed between the chiller and the supporting structure. The chiller should not be located where it is subjected to roof drainage and must be located above ground level in areas that are prone to stormwater flooding.

It is essential to ensure that adequate and safe service access to the chiller is provided. Failure to provide safe access to the chiller may lead to additional charges should servicing be required.

5.3 PLUMBING

The chilled water supply and return connections are supplied with BSP union connectors which have been fitted to facilitate access to the chiller should servicing be required.

In the event that the chilling unit is to be installed at a lower level than the process there is a risk that when the pump is switched off water will drain from the process lines back to the integral tank and out of the overflow. To prevent this from occurring ensure that the chiller is fitted with a flow control kit, consisting of a normally closed solenoid valve fitted to the return line and a non-return valve installed in the supply line.



It is critical that the chilled water pipework be of suitable size. Under sizing of pipework will result in insufficient pressure and reduced flows at the process. For assistance in specifying line sizing please contact Aqua Cooler.

All piping running to and from the chiller should be well insulated with a water resistant material to prevent the formation of condensation and to maximise the cooling capacity of the chiller.

A bypass valve is supplied as a standard feature to increase the pressure and flow of the chilled water supply if it is necessary to overcome process and pipe work pressure drop.

NOTE that the bypass valve is set in the fully open position when it leaves the factory. It is recommended that that the bypass valve is only closed as far as is necessary to overcome pressure drop and not to fully close the valve. If it is necessary to fully close the bypass valve to achieve flow through the process then the system pressure drop may have been underestimated and a larger pump may be required.

5.5 WATER TREATMENT

Water treatment should be added to ensure overall water quality is maintained in terms of pH, Calcium content, Alkalinity, Ionic strength of water etc. A corrosion inhibitor can also be added to the system.

Most scaling is either due to calcium carbonate or calcium sulphate precipitation. Certain

inorganic salts, most notably calcium sulphate (CaSO₄) have an inverted solubility curve (solubility in water decreases with increasing temperature).

The pH level of the circulated water should be monitored and maintained at between 6.5 and 8.5. At high pH values the scaling tendency is increased.

Ethylene glycol should be added if the system is run with water temperatures below 5°C, or if ambient conditions around the chiller can fall to sub zero temperatures. Please note that ethylene glycol can impact on pump performance and Aqua Cooler should be consulted for advice prior to it's implementation.

It is important to ensure that any water treatment is passive to the wetted materials used in the construction of the chiller, which include:

- Stainless Steel
- High Density Polyethylene
- Brass
- Copper

5.6 ELECTRICAL CONNECTIONS

The connection of the unit to the power network must be carried out in accordance with local supply authority regulations by a competent licensed electrician.

A suitable weatherproof isolating switch should be mounted close to the chiller into which the chillers power cable can be terminated. Ensure that the cable run from the chiller to the isolating switch does not exceed the 5 metre cable length factory fitted to the chiller.

Caution: Do not mount the isolating switch directly onto the chiller as this may inadvertently damage the refrigeration circuit.

Power cables must be adequately protected against mechanical damage. Conduit can be installed to the chiller by removing the power cable gland fitted at the point where the power cable enters the chiller and replacing it with a suitable M20, M25 & M32 cable conduit termination gland.

Mains supply cables must be sized to ensure adequate voltage at the chiller under all load conditions. Three phase power must be symmetrical, ensuring equal effective voltage and equal phase angles between consecutive phases.

Ensure all electrical connections are tight prior to start-up as during transit some connections may have vibrated loose.

Power should be supplied to the unit at least three hours prior to start up to ensure that the sump heater will boil off any refrigerant in the compressor oil.

6 COMMISSIONING

6.1 PROCEDURE

A comprehensive commissioning program carried out by qualified refrigeration mechanics is available through Aqua Cooler. Benefits of this service include extended warranty. For full details and conditions please contact Aqua Cooler.

- Before the chiller can be started it is essential that the water circuit is complete and ready for operation.
- Ensure that clearances around the chiller meet with minimum requirements specified.
- Ensure that the chiller is connected to a suitable isolating switch and that an adequate circuit breaker or fuse is installed at the switchboard.
- Ensure that all electrical connections and terminals are tight.
- Check the supply voltage to the chiller and ensure it is within the required limits specified on the wiring diagram.
- Supply power to the chiller – Power should be supplied for at least three hours prior to starting the compressor in order to ensure that the compressors sump heater can boil off any liquid refrigerant that may have migrated to the compressor's sump.
- Remove the tank cover and confirm that the tank is empty and that any packing material around the evaporator has been removed.
- Clean all surfaces and remove all litter.
- Prior to filling the tank open the drain valve to permit and any foreign material to be flushed from the tank. Ensure that all pipework has been flushed to ensure that it is thoroughly clean.
- Close the drain valve on the tank and permit water to enter the tank through the make up valve.
- Set the target water temperature to the maximum permissible temperature, such that the chill indicator on the thermostat is not illuminated.
- Press the green latching PWR button – the pump should turn on immediately – in order to prime the water circuit. It is essential to prevent the pump from running dry by turning off the chiller prior to the tank level falling below the pump draw off point. Restart the chiller once the water level in the tank has recovered.
- Adjust the bypass valve from the factory set fully open position to attain the desired water supply pressure and flow rate. Do NOT fully close the bypass valve as this will strain the pump. Only close as much as is necessary to overcome process and pipework pressure drop.
- Check the entire water circuit for leaks and add in water treatment should this be required.
- Turn off the chiller by pressing the green PWR button and then set the water temperature to a point at least 2°C below the current water temperature. If the Carel thermostat displays flashing OFF message turn thermostat on by pressing & holding **the thermostat ON for 3 seconds**.
- Turn on the chiller by pressing the PWR button – the compressor should cut in immediately. Check for any unusual noises or vibration. Check that the compressor does not cutout prior to water temperature reaching the set point. If the water temperature at start-up is above 30°C then there is a chance that the high pressure safety circuit may cut in to prevent damage to the compressor. If this does occur wait for 5 minutes then reset the high pressure safety switch per instructions.
- Adjust the water temperature set point to the desired value.

6.2 CHECKSHEET

- 1) Positioning: Check the unit to ensure that clearances are in accordance with Operating Instructions & that ventilation, as specified, is adequate
- 2) Water Tank: Remove the unit LID and check that the tank is EMPTY.
- 3) Electrical Connections: check that all connections are tight & secure.
- 4) Sump Heater: The unit should be energised three hours prior to commissioning.
- 5) Thermostat Setting : Set the display thermostat at required temperature with differential of 2°C in accordance with Operating Instructions. Set alarm thermostat, if fitted, approximately 10°C higher than display thermostat.
- 6) Pipe Sizing & Insulation: check that supply and return lines are of sufficient size for the duty and that both lines are suitably insulated.
- 7) Direction of ROTATION : check the direction of the pump, matching rotation with the arrow marked on end of pump. CHANGE Phases at point of entry or at the isolating switch and NOT at contactors. Confirm air is expelled from the condenser fans vertically.
- 8) Refrigeration System: Turn ON refrigeration only (exclude the pump & do NOT fill tank with water yet). Let the unit run for a short period & slight frosting on the coil should be visible indicating that the unit has not lost its refrigerant charge due to damage, if any, during transit.
- 9) Priming: Fill tank with water providing that coil frosts (as per Refrigeration System above). Check that water make-up line is connected & is open; check that pump suction valve & all other valves are open. START pump & prime lines; stop pump, if necessary, to ensure make-up water fills tank so that pump does not run dry. Continue in this way until all lines are fully primed.
- 10) Bypass : if the process is turned off & isolated from the pump supply & return via solenoid valve etc., the bypass valve can be fully opened and the unit tested with water recycling through the bypass rather than having the pump delivering water against a closed head, which may cause damage to the seal assembly.
- 11) Run CYCLE: switch ON refrigeration & check that unit cycles correctly.
- 12) Bypass Setting : after testing, the bypass valve should be set so that the pump will always have flow thus preventing damage if valves, to or from the process, are closed.

Monitoring and Safety Devices.

The refrigeration system is equipped with various devices to protect the system from critical failures and to aid in ease of maintenance and checking the health of the unit.

There is a sight glass and a drier fitted to the liquid line. The sight glass is to check that there is sufficient refrigerant charge in the unit. The drier will separate humidity from the refrigerant charge.

The LP cut out will similarly shut down the unit if the pressure in the refrigeration circuit is too low. An example of a failure here is the system has lost some refrigerant gas. The LP switch will cut out at 170 kPa and automatically reset at 410 kPa.

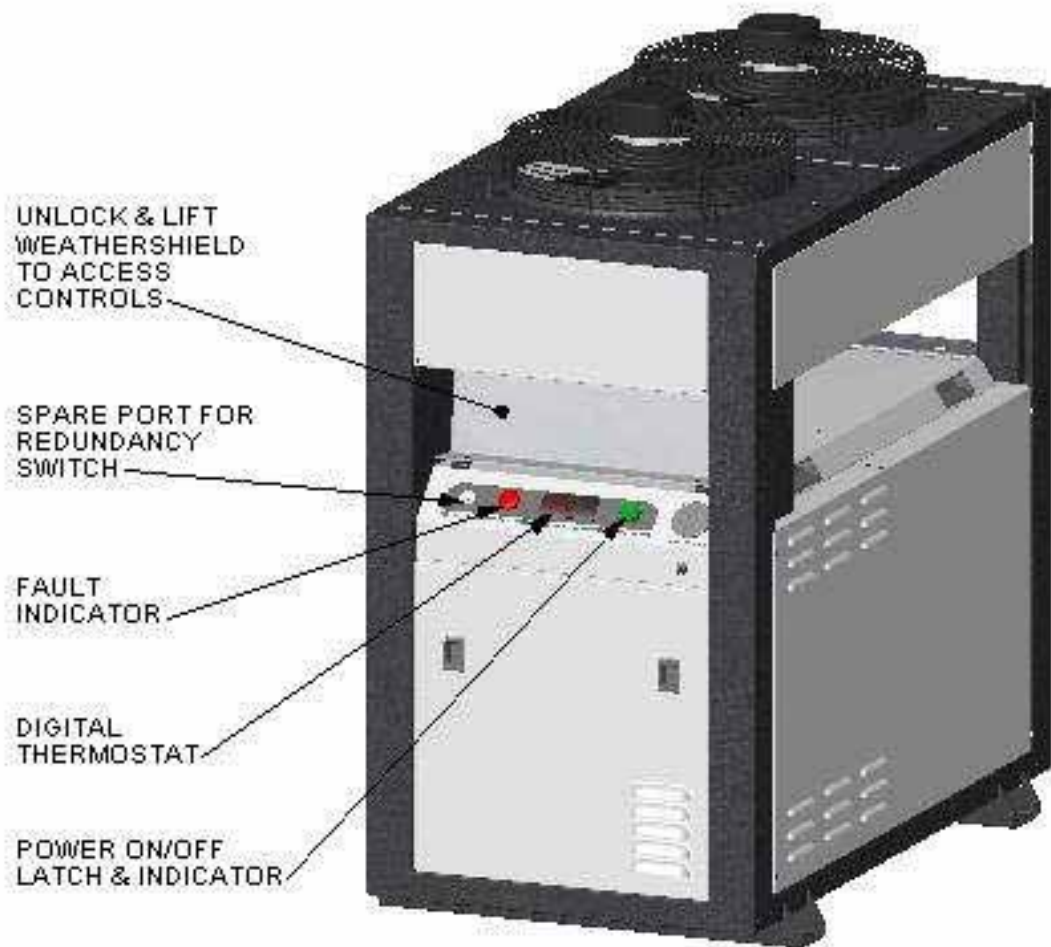
Factory pressure control settings are:

| Pressure Control | Setting |
|-----------------------------------|----------|
| High Pressure Cut-Out | 2800kPa |
| Low Pressure Cut-In | 410kPa |
| Low Pressure Cut-Out Differential | 240kPa |
| Low Pressure Cut-Out Point | (170kPa) |

7.0 OPERATION

7.1 CONTROL PANEL

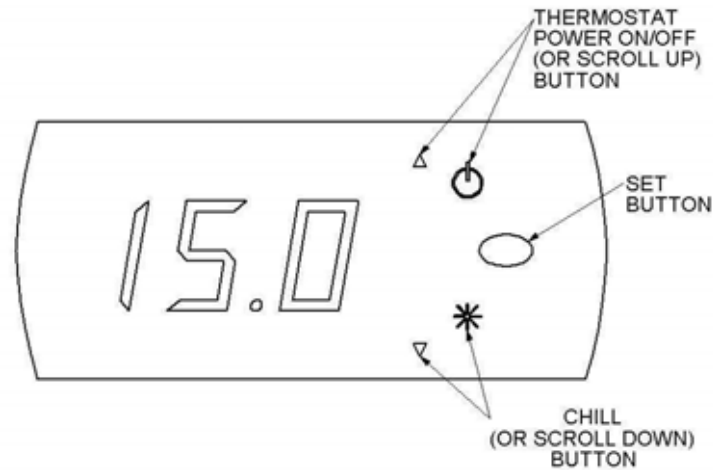
- 7.1.1 After commissioning all services should be connected.
- 7.1.2 Unlock weathershield with 4mm Allen Key to access Control Panel.



Chiller – Front View with Weathershield up

7.2 SETTING THE CAREL DIGITAL THERMOSTAT

The Carel thermostat has 3 buttons under the front membrane to configure parameters..



1. Press & hold the thermostat ON/OFF switch for 3 seconds
2. Press Set button for 1 sec to display temp set point
3. Change Set Point (St) to desired temperature (factory sets supply to 5 degrees).
4. Hold Set button for 3 seconds to access parameter setting menu
5. To access password parameter (pS) Enter 22
6. Use arrow keys to scroll through parameters.
7. Factory Set Parameters are;

| | |
|--|----------------|
| r1: Min Set Pt allowed for user : | 5° |
| r2: Max Set Pt allowed for user: | 25° |
| r3: Operating Mode: | 1 (no defrost) |
| rd: set point differential (hysteresis): | 2° |
| c0: compressor rest time: | 2 mins |
| d0: defrost setting: | 2 |

8. Press and hold Set button for 5 seconds to save settings and close.

NOTE that thermostat needs to be switched on as well as the chiller. If the display reads OFF then repeat above procedure. For further assistance with the thermostat settings ring Aqua Cooler or Carel Helpline 02 87629200

7.3 TURN ON CHILLER

Press the Green Power ON/Off button to turn on the chiller. The button should stay depressed and the light should stay on to indicate the pump is running. Red fault light should stay off.

8 MAINTENANCE

Warning: Isolate the power from the unit prior to working on the chiller.

Warning: Ensure that all personnel have read and understood the SAFETY section of this manual prior to working on the chiller.

These units have been purposely designed to minimise maintenance. However, to ensure optimum performance, qualified personnel should carry out regular maintenance. A comprehensive preventative maintenance program carried out by qualified refrigeration mechanics is available through Aqua Cooler. For full details and conditions please contact Aqua Cooler.

Should any faults be identified then please contact Aqua Cooler to arrange for a service call.

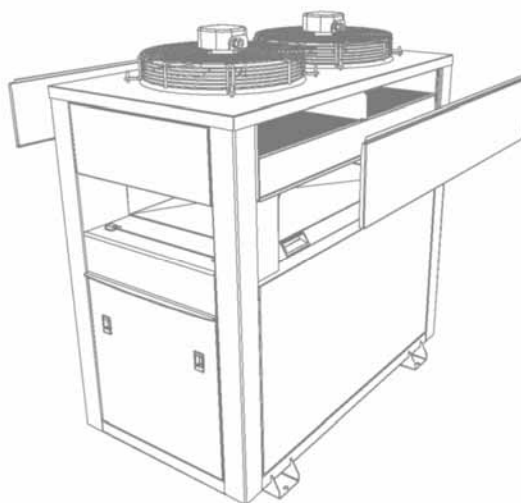
Recommended Preventative Maintenance Program:

| Operation | Frequency |
|---|------------|
| Clean Condenser Coil | 6 monthly |
| Check For Evidence Of Moisture In Refrigerant | 6 monthly |
| Check For Refrigerant Blockages | 6 monthly |
| Check For Evidence Of Refrigerant Leaks | 6 monthly |
| Check Refrigerant Operating Pressures | 6 monthly |
| Check Flow Rates & Pressure In Water Circuit | 6 monthly |
| Check For Integrity Of Electrical Connections | 6 monthly |
| Check Current Draw On All Motors | 12 monthly |
| Clean Out Buffer Tank | 12 monthly |

Cleaning the Condenser

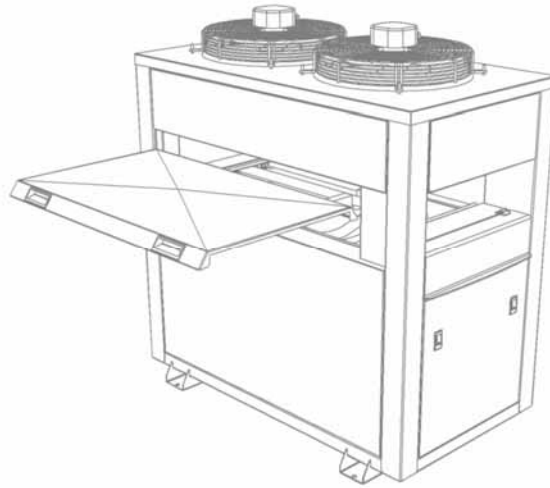
Ensure that the finned condenser coil is kept clean at all times. This may be accomplished using compressed air or any appropriate bottled inert gas. Care must be taken not to damage the aluminium fins. For full access to the condenser fins remove the side panels as shown in the following figure. For a thorough cleansing, use a mild detergent to clean the condenser fins. Ensure the panels are replaced once the task has been completed

Warning: Ensure electrical power to the chiller is isolated whenever the condenser side panels have been removed.

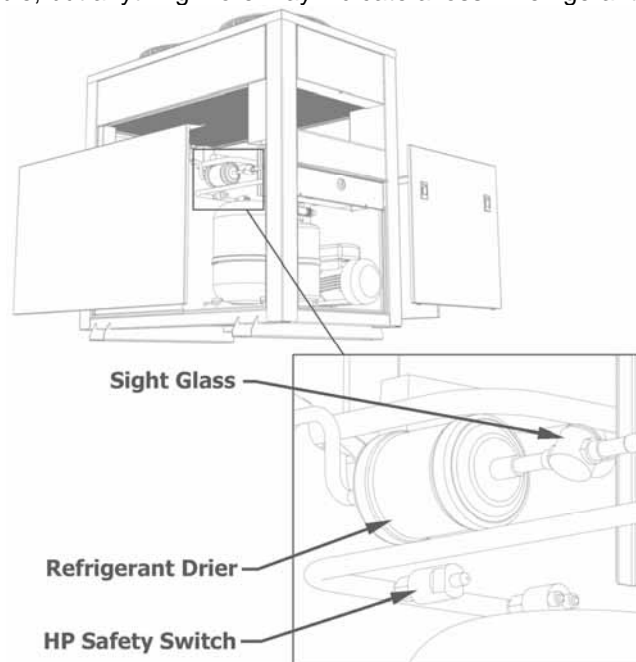


Checking the Refrigerant Circuit

The refrigeration circuit is hermitically sealed and should require no regular maintenance. However, to ensure that the integrity of the circuit has not been compromised a number of simple checks can be performed. Firstly remove the tank cover by unscrewing it and moving it out one side of the chiller or the other as per the following image. Turn off the process pump and allow the water in the buffer tank to settle. Check for evidence of gas bubbles rising from the evaporator.



The sight glass can be viewed without removing any additional panels. The location can be easily seen in the following image. Inspect the refrigerant sight glass for signs of moisture. A coloured tag within the sight glass will clearly show if moisture is present in the system. With the compressor operating check that the sight glass is full of liquid. A small stream of bubbles is acceptable, but anything more may indicate a loss in refrigerant charge.



Check whether a marked temperature difference is evident across the refrigerant drier, which is located adjacent to the refrigerant sight glass. A significant temperature difference is an indicator that the drier is blocked.

Look for evidence of oil around refrigerant fittings as this is a clear indicator of a leak.

Confirm that no refrigerant pipes are rubbing against each or anything else as this may lead to a refrigerant pipe rupture.

Refrigerant Pressure Settings

This chiller is fitted with both a high pressure and a low pressure safety device. The location of the high pressure safety device can be seen in the previous diagram and features manual reset via a red reset button located on the device. The HP cut out is designed to prevent excessive refrigerant pressures building up inside of the unit, which would generally only occur if the condenser is partially blocked, ambient temperatures are exceedingly high, a condenser fan has failed, or there is a blockage in the refrigerant circuit.

In the event of the high pressure cut out activating try and rectify the root cause of the high pressure and then reset the device by pushing the red reset button.

This low pressure (LP) cut-out automatically resets. The LP cut out is designed to ensure that the pressure in then refrigerant circuit exceeds ambient conditions at all times, thus preventing the compressor sucking in moisture laden air, or worse still, liquid water in the event of a leak.

The only other pressure control is used to cycle the second fan on and off in order to maintain optimal refrigerant pressures in the circuit.

Checking the Water Circuit

Check the flow rate and supply pressure being delivered to the process to ensure than they have not deteriorated. Inspect around and inside the chiller for evidence of water leaks or condensation.

If the cooling water is very hard (high concentration of carbonates, calcium and magnesium salts) then de-scale the internal surfaces of the water pipes and fittings with a suitable chemical ensuring it does not react with the materials directly in contact with the cooling water.

| Component | Material(s) |
|--|-----------------|
| Evaporator/Water Pipes | Copper |
| Buffer Tank | HDPE |
| Pump | Stainless Steel |
| Solenoid Valve/Distributor/Connections | Brass |

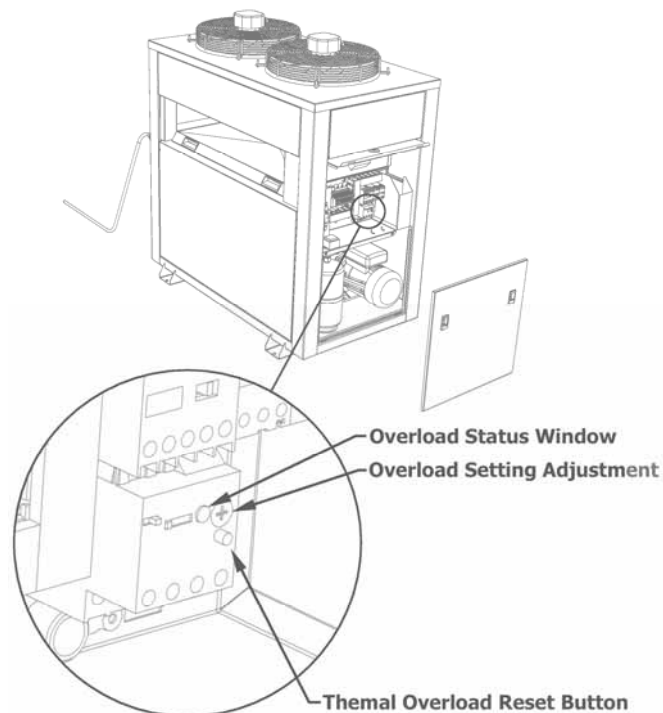
The buffer tank is fitted with a drain valve that can be opened to flush out contaminated water or sludge that may have accumulated in the buffer tank sump.

This chiller is exceedingly tolerant of contaminants within the water circuit, but none the less it is recommended that a cooling water sample be analysed annually to check for adverse conditions that may reduce the service life of the chiller.

ELECTRICAL

Note: The electrical circuit should only be inspected and serviced by a qualified refrigeration mechanic or electrician.

Remove the front cover using the two quick release latches. The electrical enclosure can then be accessed by removing two screws and lifting up the electrical fascia. Note that the fascia can be held in the open position by using a screw to fix it to the underside of the condenser. Clean out any dust or contaminants that may have accumulated within. Check that all screw terminals are tight. Monitor fan, pump and compressor current draws and check them against the ratings detailed in the wiring diagram at the end of this manual.



(R2 & R3 models only)

Note that on all 3 phase chillers, Phase Failure is fitted as standard. Therefore check the Phase Failure device has not caused a fault trip and reset if required.

9 TROUBLESHOOTING

Whenever a fault indicator is illuminated, the chiller will stop. To identify turn the chiller off using the PWR button, then follow the troubleshooting guide to locate the problem. Once the fault indicator goes out then the cause has been rectified.

| Problem | Likely Cause(s) | Symptom | Remedy |
|--|---|---|---|
| Refrigeration Fault Indicator Is Illuminated, but can be reset by turning the chiller off. (The Pump Fault Indicator is OFF) | The high pressure safety switch has been tripped due to an inability to dissipate sufficient heat from the condenser into the ambient air. The high pressure safety switch automatically resets itself once the pressures drop. | <ul style="list-style-type: none"> Chill indicator on the thermostat illuminated Ambient temperature are well within the operation limits of the chiller (Refer Technical Data) | <ul style="list-style-type: none"> Check that the condenser fins are not dirty or blocked. If dirty clean condenser fins per maintenance instructions Air flow through condenser obstructed or warm air re-circulating through condenser. Remove any obstructions. |
| | | <ul style="list-style-type: none"> Ambient temperature exceeds permissible limits at point of installation (Refer Technical Data) | <ul style="list-style-type: none"> Ensure that the ambient temperature does not exceed the permissible operation limits specified in the technical data section of this manual |
| | The high pressure safety switch has been tripped due to excessive heat being pumped into the condenser. | <ul style="list-style-type: none"> The temperature on the thermostat is well above the setpoint. Ambient temperature are well within the operation limits of the chiller (Refer Technical Data) | <ul style="list-style-type: none"> Heat load possibly too high for chiller. Reduce the heat load to within limits specified in technical data Water temperatures in the system may have been above maximum running temperature of the chiller (Refer Technical Data) when the chiller was started. Remove all heat loads from the system and attempt to get the water temperatures down to acceptable limits. |

| Problem | Likely Cause(s) | Symptom | Remedy |
|--|--|---|--|
| Refrigeration Fault Indicator Is Illuminated, but can be reset by turning the chiller off. (The Pump Fault Indicator is OFF) | The high pressure safety switch has been tripped due to the failure of the fan cycle control to bring on the second fan. | <ul style="list-style-type: none"> After resetting the chiller, the compressor starts up and only the front fan operates until the chiller cuts out again and the refrigeration fault indicator comes on again. The air temperature coming off the front fan is very hot. | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a replacement fan cycle control and a service technician to fit it. |
| | The high pressure safety switch has been tripped due to the presence of moisture in the refrigeration circuit. | <ul style="list-style-type: none"> Indicator on sight glass indicates presence of moisture | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and rectify the problem. |
| | The low pressure safety switch has been tripped due to a loss in refrigerant charge | <ul style="list-style-type: none"> Chill indicator on the thermostat is illuminated When reset and the compressor is running the sight glass bubbles continuously When reset and the compressor is running there is no appreciable temperature difference from one side of the refrigerant drier to the other. There may be evidence of oil around some of the refrigeration circuit fittings | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and rectify the problem. |
| | The low pressure safety switch has been tripped due to a blocked drier. | <ul style="list-style-type: none"> When reset and the compressor is running there is an appreciable temperature difference from one side of the refrigerant drier to the other | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and rectify the problem. |
| Refrigeration Fault Indicator Is Illuminated and cannot be reset by turning the chiller off. (The Pump Fault Indicator is OFF) | The compressor thermal overload has tripped | <ul style="list-style-type: none"> By pressing the reset button on the compressor overload the refrigeration fault indicator goes off | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and identify/rectify the cause of the problem |

| Problem | Likely Cause(s) | Symptom | Remedy |
|--|--|---|--|
| Refrigeration Fault Indicator Is Illuminated and cannot be reset by turning the chiller off. (The Pump Fault Indicator is OFF) | A fan thermal overload has tripped | <ul style="list-style-type: none"> By pressing the reset button on one of the fan overloads the refrigeration fault indicator goes off | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and identify/rectify the cause of the problem |
| | The low pressure safety switch remains tripped due to the loss of most of the refrigerant charge | <ul style="list-style-type: none"> With the chiller turned off, using an AC voltmeter it is found that there is ~240V between the Neutral terminal "N" and terminal "3", but no voltage is found between the Neutral terminal "N" and terminal "4" There may be evidence of oil around some of the refrigeration circuit fittings | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and rectify the problem. |
| | The fault relay is itself faulty | <ul style="list-style-type: none"> With the chiller turned off, using an AC voltmeter it is found that there is ~240V between the fault relay terminals "A1" and "A2" | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a replacement fault relay and a technician to install it if necessary |
| Water temperature exceeds set point despite compressor continually operating | Heat load too high for chiller | <ul style="list-style-type: none"> Few if any bubbles evident in the liquid sight glass whilst the compressor is operating | <ul style="list-style-type: none"> Reduce the heat load to within limits specified in technical data Allow water temperature to fall before restarting unit |
| | Loss in refrigerant charge – insufficient refrigerant entering evaporator | <ul style="list-style-type: none"> A lot of bubbles evident in the liquid sight glass whilst the compressor is operating | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to check for leaks and to eliminate them before replenishing refrigerant charge |
| The thermostat is off and both indicator lights are off, despite power being supplied to the chiller. | <p>The phase failure device has tripped (Only On Models Fitted With P option)</p> <p><i>The phase failure relay will automatically reset itself once all phase are present, are in the correct rotational direction, and each phase voltage is above the low voltage trip level (360V factory setting)</i></p> | <ul style="list-style-type: none"> Phase(s) missing Mains voltage below 360VAC | <ul style="list-style-type: none"> Check power supply Chiller will restart automatically |

| Problem | Likely Cause(s) | Symptom | Remedy |
|--|---|---|--|
| The thermostat is off and both indicator lights are off, despite power being supplied to the chiller. | Control circuit breaker tripped | <ul style="list-style-type: none"> All three phases are present The control circuit breaker is in the OFF position. | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the electrical circuit for damaged or faulty components |
| The chiller is not operating, despite both the chill and power indicators on the thermostat being illuminated | Remote Link removed | <ul style="list-style-type: none"> Neither fault indicator is illuminated The remote link shown on the wiring diagram between terminals “7” and “8” is open | <ul style="list-style-type: none"> Re-apply link between terminals “7” and “8” |
| Process Flow Fault Indicator Is Illuminated and cannot be reset by turning the chiller off. (The Refrigeration Fault Indicator is also ON) | Pump thermal overload has tripped | <ul style="list-style-type: none"> By pressing the reset button on the pump overload, both the process flow and refrigeration fault indicator go off | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the unit and rectify the problem. |
| Water temperature below set point | Low water level in tank – temperature sensor not submerged | <ul style="list-style-type: none"> Make up valve continuously adding water to the tank Ice formation over evaporator | <ul style="list-style-type: none"> Check chilled water circuit for leaks |
| | Low water level in tank – temperature sensor not submerged | <ul style="list-style-type: none"> Make up valve not adding water to the buffer tank Ice formation over evaporator | <ul style="list-style-type: none"> Check chilled water circuit for leaks Check supply of mains pressure water to make up valve If necessary call 1800 005 790 to organise for a replacement make up valve and a technician to install it if necessary |
| | Thermostat failure | <ul style="list-style-type: none"> Temperature display either not operational or random | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a replacement thermostat and a technician to install it if necessary |
| Process overheating despite chilled water temperature being within acceptable range | Excessive pressure drop in system – reduced flow to process | <ul style="list-style-type: none"> Water pressure gauge indicates peak pressure for pump as detailed in technical data | <ul style="list-style-type: none"> Inspect the chilled water circuit for obstructions or scale build-up within pipe work |
| | Bypass fully open – reduced flow to process | <ul style="list-style-type: none"> Water pressure gauge does not indicate peak pressure for pump as detailed in technical data | <ul style="list-style-type: none"> Slowly close bypass valve until acceptable flow realised |

| Problem | Likely Cause(s) | Symptom | Remedy |
|---|---|---|---|
| Error message "E1" flashing on thermostat | Water temperature exceeds 45°C | <ul style="list-style-type: none"> Return/Inlet water supply pipe temperature indicate water temperature returning to chiller is greater than 45° | <ul style="list-style-type: none"> Drain water from the tank and allow it to refill from the mains supply. Refer solutions to problem "Water temperature exceeds set point" |
| | Temperature sensor damaged | <ul style="list-style-type: none"> Pump continues to operate | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a replacement temperature sensor and a technician to install it if necessary |
| Message "DF" on thermostat | Set point button ▲ and ▼ have been pressed simultaneously | | <ul style="list-style-type: none"> Wait for 60 seconds for message to disappear |
| No temperature display and all indicator lights are off, despite power being supplied to the unit | Control circuit breaker tripped | | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a service technician to inspect the electrical circuit for damaged components |
| Water temperature exceeds set point and compressor does not operate, but pump remains operating | Ambient temperature too high | <ul style="list-style-type: none"> Chill indicator on thermostat illuminated but refrigeration indicator remains off Ambient temperature exceeds permissible limits at point of installation (Refer Technical Data) | <ul style="list-style-type: none"> Reset high pressure safety switch Consider relocating the chiller to a cooler environment |
| | Condenser fins dirty or blocked, air flow through condenser obstructed or warm air re-circulating through condenser | <ul style="list-style-type: none"> Chill indicator on thermostat illuminated but refrigeration indicator remains off Ambient temperature does not exceed permissible limits at point of installation (Refer Technical Data) | <ul style="list-style-type: none"> Clean condenser fins per maintenance instructions Ensure there are no obstructions around the condenser per the installation instructions Reset high pressure safety switch |
| | Front fan failed | <ul style="list-style-type: none"> Chill indicator on thermostat illuminated but refrigeration indicator remains off Resetting the high pressure safety switch starts unit running but front fan does not operate | <ul style="list-style-type: none"> Call 1800 005 790 to organise for a replacement fan and if necessary a service technician to fit it |

| | | | |
|--|--|--|---|
| | Fan overload(s) tripped (Automatically Reset) | <ul style="list-style-type: none"> • Chill indicator on thermostat illuminated but refrigeration indicator remains off • Resetting the high pressure safety switch starts unit running but fans do not operate | <ul style="list-style-type: none"> • Wait for fan internal thermal overloads to reset as fans cool down • Call 1800 005 790 to organise for a service technician to inspect the fan(s) for damage and to replace if necessary |
|--|--|--|---|

10 CHILLER OPTIONS

This manual describes standard type chillers however many variants are available as options.

Chiller Options include:

1. Remote Condenser
2. Water Cooled Condenser
3. Close Tolerance on water supply temperature +/- 0.1°C
4. Tandem configurations – slave master
5. Web Enabled & microprocessor control
6. Potable grade water supply
7. Floodback prevention
8. Remote fault indication & switching
9. Single Phase on R150 to R230 chillers only
10. Quiet operation
11. UPS
12. Surge Protection
13. Castors or special footings

Specifications for chiller options are contained in a separate document titled Chiller Options.