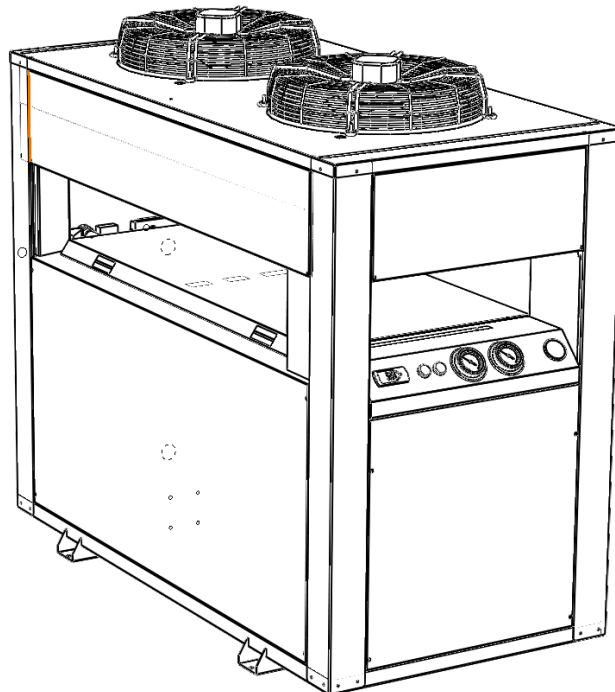


AQUA
COOLER

Aqua Cooler Pty Limited

PRODUCT MANUAL

R Series I WATER CHILLER
R150 to R330
001-D129 ISS H



Terms and Conditions

Listed below are some basic operational and installation conditions that must be adhered to for Aqua Coolers warranty to remain valid and more importantly for trouble free chiller operation

- If the chiller is supplied without a pump then the minimum flow rate specified in the manual must be maintained through the units at all times.
- The chiller must be commissioned in accordance with the instruction in the manual and the chiller must be commissioned under normal operating conditions
- The operational settings on the controller must not be altered without first consulting Aqua Cooler
- The temperature cut out set point must never be set below 5°C without first consulting Aqua Cooler
- The water bypass in the chiller must never be fully closed
- The chiller must be installed on level surface
- The chiller must be powered up for at least 4 hours before starting the chiller to allow for the sump heater to warm the compressor oil.
- The pressure in the sealed refrigeration system must be checked by a refrigeration mechanic before starting the chiller to ensure that the pressure on the suction side is at least 200 kPa
- For any service work not carried out by Aqua Cooler, Aqua Cooler will only cover costs of refrigerant to the value of the specified charge in the units.
- It is not Aqua Cooler's responsibility to connect the chiller to the BMS unless agreed to before delivery of the chiller
- The chiller must not be installed too close to walls and other chillers with clearances to be at least what is specified in the manual
- The chiller must be installed with proper, neat access to facilitate servicing in a manner that is compliant with safe work practices. Additional charges may apply for site where access to the chiller is unsafe or restricted
- Aqua Cooler will manufacture the chiller to the specification provided to the sales department. If the information supplied is incorrect Aqua Cooler takes no responsibility for wear on the chiller for short cycling in the case where the chiller is over sized for the heat load or the chiller unable to maintain temperature when the chiller is too small for the heat load
- Aqua Cooler takes no responsibility for repairs carried out on the chiller by unauthorised service agents or if parts are installed that are not from Aqua Coolers approved supplier list
- Costs for installations where a crane lift is required to undertake major repairs will not be covered by Aqua Cooler
- All the information in this brochure is correct at the time of writing – however with constant development some of the information may have changed

FOREWARD

This manual is designed to explain the installation, operation and the basic maintenance of the product. It is recommended that for service issues Aqua Cooler Pty Ltd be contacted before and work commences. A comprehensive service manual is available to be down loaded from the website.

CONTACT DETAILS

Aqua Cooler Pty Ltd
161 Orchard Road
Chester Hill NSW 2162
Australia

Toll Free 1800649233 or +612 9721 9300
Fax + 612 9721 9344

www.aquacooler.com.au

Aqua Cooler Refrigeration Trading Authorisation number is AU12165

CONTENTS

Safety	3
Marking	5
Certification	6
Warranty	6
General Information	6
Intended Use	6
Water Circuit	7
Technical Data	8
Cooling System Schematic	9
Dimensions	10
Transport and Storage	11
Installation . electrical, water connection, water treatment, control circuit and final checks	11
Operation	18
Control	18
Service and Maintenance	21
Wiring Tandem Set Up	29
Pump Curves	30
Critical Spares	30
Data Sheets	31
Trouble Shooting	32
Wiring Diagram	33
Release Notes	33
Customised Installations	34
Commissioning	35
Chiller Control & Management System Supplement with High Ambient Spray Kit (see P8 & 18)	App

SAFETY

THE UNIT IS DESIGNED FOR OUTDOOR USE.

- This unit is designed to be safe in the use for which it was planned provided that it is installed, started up and maintained in accordance with the instructions contained in this manual.
- The unit contains electrical components that operate at line voltage and contains moving parts. It therefore must be isolated from the electrical supply before being worked on. All maintenance operations that require access to the unit must be carried out by suitably qualified technicians who have a thorough understanding of all necessary precautions associated with refrigeration and electrical machinery.
- The liquids to be cooled must be compatible with the materials used in the constructions of this unit. 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 unit is not to be used by the infirmed 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.



- Where the above symbol is shown there are live electrical parts and the utmost care should be taken.
- Electrical installation 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.
- Always isolate power from the unit when working on it.
- Minimum temperature setting is 5 degrees on the unit. Any lower than this may cause a plate heat exchanger rupture and the escape of refrigerants and water

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.

SAFETY

R134a HazChem code 2RE

R134a is non . flammable.

2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>INGREDIENT NAME</u>	<u>CAS NUMBER</u>	<u>WEIGHT %</u>
1,1,1,2-Tetrafluoroethane	811-97-2	100

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of the MSDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250°C), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

POTENTIAL HEALTH HAZARDS

SKIN: Irritation would result from a defatting action on tissue. Liquid contact could cause frostbite.

EYES: Liquid contact can cause severe irritation and frostbite. Mist may irritate.

INHALATION: R-134A is low in acute toxicity in animals. When oxygen levels in air are reduced to 12-14% by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels, cardiac arrhythmia may occur.

INGESTION: Ingestion is unlikely because of the low boiling point of the material. Should it occur, discomfort in the gastrointestinal tract from rapid evaporation of the material and consequent evolution of gas would result. Some effects of inhalation and skin exposure would be expected.

DELAYED EFFECTS: None Known

ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.)
Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas.

SAFETY

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

EYES: Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite, water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention immediately. **DO NOT** give epinephrine (adrenaline).

INGESTION: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. **DO NOT** induce vomiting unless instructed to do so by a physician.

ADVICE TO PHYSICIAN: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT:	Gas, not applicable per DOT regulations
FLASH POINT METHOD:	Not applicable
AUTOIGNITION TEMPERATURE:	>750°C
UPPER FLAME LIMIT (volume % in air):	None*
LOWER FLAME LIMIT (volume % in air):	None*
	*Based on ASHRAE Standard 34 with match ignition
FLAME PROPAGATION RATE (solids):	Not applicable
OSHA FLAMMABILITY CLASS:	Not applicable

EXTINGUISHING MEDIA:

Use any standard agent – choose the one most appropriate for type of surrounding fire (material itself is not flammable)

UNUSUAL FIRE AND EXPLOSION HAZARDS:

R-134A is not flammable at ambient temperatures and atmospheric pressure. However, this material will become combustible when mixed with air under pressure and exposed to strong ignition sources. Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (e.g. very high temperatures and/or appropriate pressures).

A full material safety data sheet for R134a refrigerant gas is available at

<http://www.refrigerants.com/msds/r134a.pdf>

Disposal

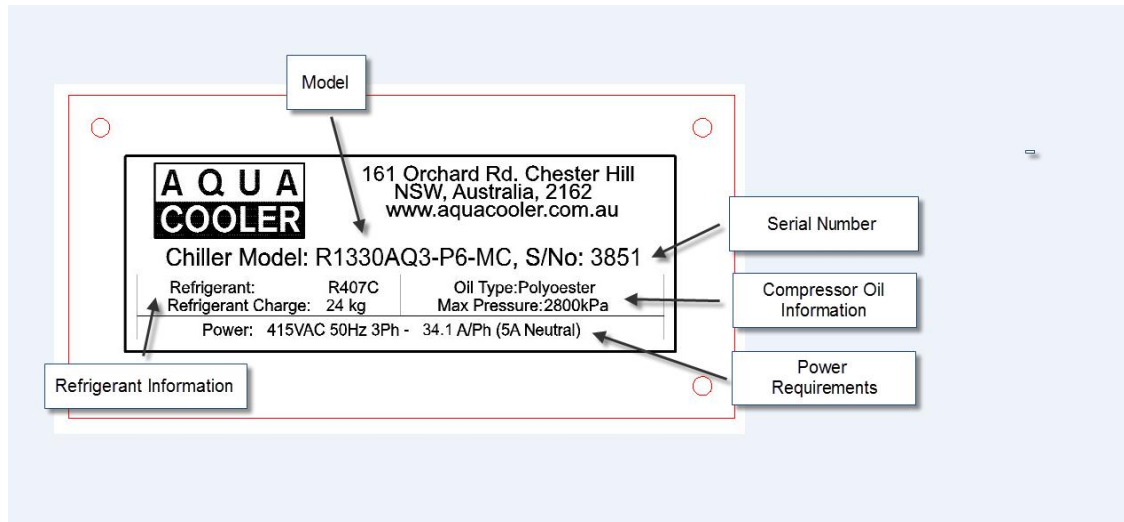
The unit must be disposed of in a proper fashion. The refrigerants in the system must be reclaimed by a qualified refrigeration mechanic and disposed of in accordance with the statutory requirements. The compressor contains oil that must not be dumped.

Manual Handling

The unit weighs 180kG . it is recommended that the unit not be moved manually.

MARKING

The unit will have on it various markings. There is a marking plate on the unit as shown below giving regulatory requirements. There will be a wiring diagram as shown in the wiring diagram section of this document provided in a larger scale for ease of maintenance.

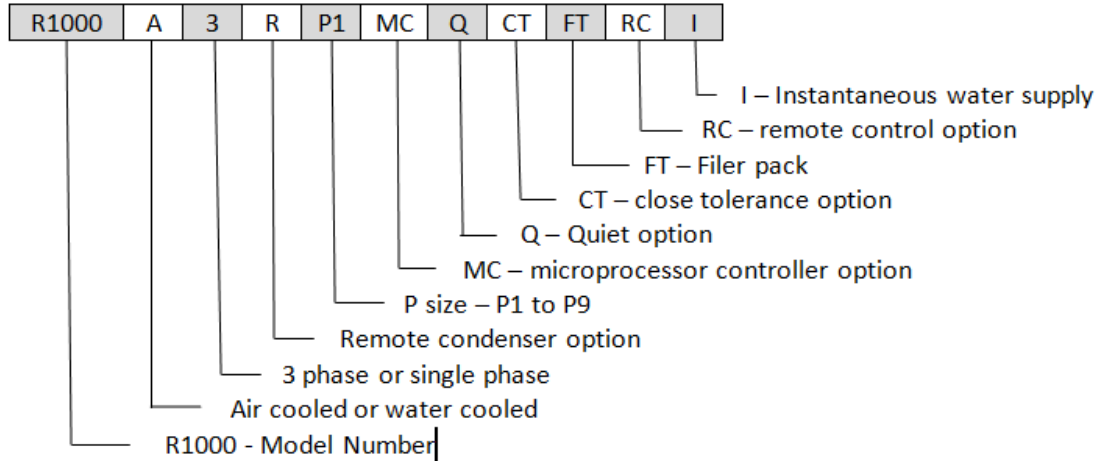


A four digit serial number sticker will also be placed under the marking plate. With this number Aqua Cooler can trace the date of manufacture of the product and details on the unit.

R1 Electrical Settings				
	Comp	Pump	Fan	Total
R150A3-P1	3.2A/Ph	2.9A	0.9A	6.1A/Ph
-P2		5.0A		8.2A/Ph
-P3		5.0A		8.2A/Ph
R180A3-P1	3.9A/Ph	2.9A	0.9A	6.8A/Ph
-P2		5.0A		8.9A/Ph
-P3		5.0A		8.9A/Ph
R230A3-P1	5.5A/Ph	2.9A	0.9A	8.4A/Ph
-P2		5.0A		10.5A/Ph
-P3		5.0A		10.5A/Ph
R300A3-P1	7.2A/Ph	2.9A	0.9A	10.1A/Ph
-P2		5.0A		12.2A/Ph
-P3		5.0A		12.2A/Ph
R330A3-P1	7.9A/Ph	2.9A	0.9A	10.8A/ph
-P2		5.0A		12.9A/Ph
-P3		5.0A		12.9A/Ph

MARKING

The wiring diagram will show the model of the unit and the options installed. The designation below outlined the available options



CERTIFICATION

All the electrical components in the chiller have certification for electrical safety. The electrical box and all the exposed components are rated to IP66 against weather ingress.

WARRANTY

Any claim under this warranty must be made within 12 months of the date of purchase of the product. To make a claim under the warranty, return the product (with proof of purchase) to the supplier where you purchased the product or contact Aqua Cooler regarding warranty conditions.

Aqua Cooler will pay your reasonable, direct expenses of claiming under this warranty. You may submit details and proof of your expense claim to Aqua Cooler Pty Ltd for consideration.

This warranty is given by Aqua Cooler Pty Ltd, ABN 13 245 994 351, of 161 Orchard Rd, Chester Hill, NSW 2162 . ph 02 9721 9310.

This warranty is provided in addition to other rights and remedies you have under law: Our goods come with guarantees which cannot be excluded under the Australian Consumer Law. You are entitled to replacement or refund for a major failure and to compensation for other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Attached to this document is a comprehensive commissioning procedure. This must be carried out in accordance with the procedure and returned to Aqua Cooler or Aqua Cooler can do the commissioning, otherwise the warranty will be voided.

The instructions laid out in this manual as to the proper use and operation of the chiller must be followed otherwise this will also void the warranty. At the end of the installation section of this manual there is a check list . it is important that all these action items have been carried out in accordance with the manual's instructions.

GENERAL INFORMATION

The chiller is designed to refrigerate and circulate water to a heat developing process to aid in keeping that process cool. It has an evaporator, an air cooled condenser and scroll compressors to circulate the refrigerant gas. Water is circulated out of the unit via a pump. The chiller can be ordered with two types of controller. The high end controller is a microprocessor that is programmable to vary the water temperature to customer requirements and to feed back to the user system information via the internet or to a high level interface via SNMP protocols. The basic level controller is a relay based unit that controls temperature and start timing and provides no more feedback than its external display.

INTENDED USE

The chiller is designed to be installed outdoors and refrigerate water for a heat developing process . not for drinking or food preparation purposes. Any other use of this water chiller is not as it is intended.

CHILLED WATER CIRCUIT

The chiller can be installed to feed a remote buffer tank or be a closed loop system. Whichever installation is required MUST be specified at the time of order.

The chilled water circuit consists of

1. Immersed copper evaporator
2. Flow meter
3. One way valve . if ordered
4. Pump
5. Motorised Ball Valve . if ordered
6. Expansion tank . for closed loop systems
7. Pressure relief valve . feeds to drain in closed loop system
8. Filter pack . if ordered . 0.5 micron

The chilled water path starts with the pump delivering the water through a one way valve and to the process. The return water passes through a flow meter to monitor the flow rate, through the evaporator and back to the pump.

The primary pump will run full time unless the system detects a drop in flow.

It is important to ensure that any water treatment is passive to the wetted parts of the system which include

- Stainless Steel
- Copper
- High Density Polyethylene
- Brass
- ABS Plastic
- Nitrile Rubber

TECHNICAL DATA

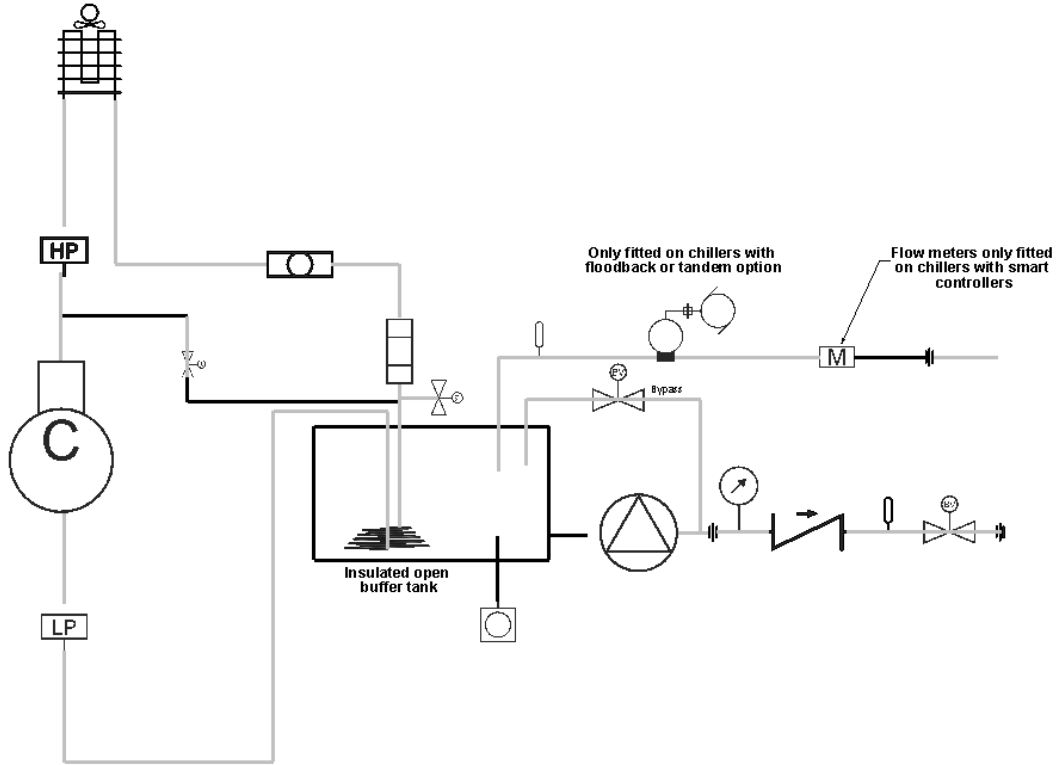
TECHNICAL DATA						
		R150	R180	R230	R300	R330
Compressor horsepower	hp	1.5	1.8	2.3	3	3.3
Cooling capacity at 5° supply ¹	Watts	2200	2800	3700	4500	5100
Cooling capacity at 10° supply		2500	3300	4400	5500	6300
Cooling capacity at 15° supply		3100	4100	5500	6600	8000
Cooling capacity at 20° supply		3900	5100	6800	8100	9700
Tank holding capacity	L	80				
Dry weight	kg	160		170	180	
Dimensions (L x W x H)	mm	1075 x 675 x 1120				
Noise Rating	dB at 5 m					
Pump Option 1 – 0.45 kW						
Water flow at maximum pressure	L/hr	1200 at 170 kPa				
Water flow at minimum pressure		4200 at 60 kPa				
Pump Option 2 – 0.75 kW						
Water flow at maximum pressure	L/hr	1200 at 440 kPa				
Water flow at minimum pressure		4200 at 170 kPa				
Pump Option 3 – 0.75 kW						
Water flow at maximum pressure	L/hr	1200 at 550 kPa				
Water flow at minimum pressure		4200 at 250 kPa				
1. Based on operation within a 45° ambient. Increase cooling capacity by 20% for operation within a 35° ambient 2. Rated at 25 water supply whilst operating within a 45° ambient environment and fitted with a option 3 pump						

Construction:	
Numbers of Compressors:	1
Compressor Type	Scroll
Power Cable Requirements (5 metre supplied)	2.5mm ² 4 Core + Earth
Number of Fans:	2
Number of Pumps:	1
Chassis Construction:	Power Coated Galvanised Steel Frame with powder coated steel panels
Water Connections:	Supply/ Return 1" Female BSP Drain 1 1/4" BSP Make up water – 3/8" female BSP

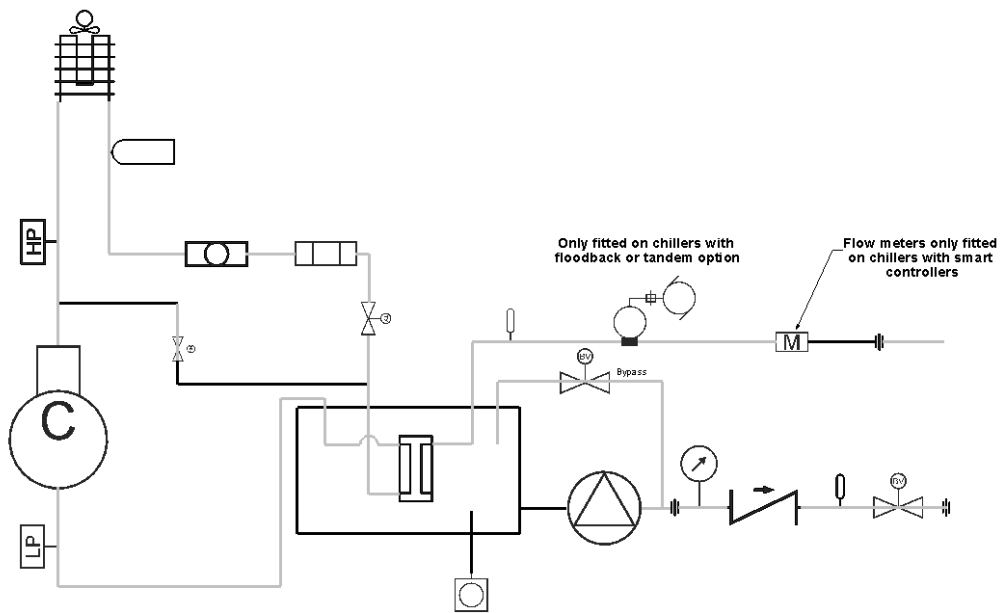
Power Data						
Power Requirements:	415V 50Hz 3 Phase Plus Neutral (4A Max)					
P1 Pump Power Consumption	0.45 kW					
P2 Pump Power Consumption	0.75 kW					
P3 Pump Power Consumption	0.75 kW					
Fan Power Consumption Each	.78 kW					
Lock Rotor Amps – Compressor	60 A					
Model		R150	R180	R230	R300	R330
Power requirements – single phase		240V 50 Hz Single Phase			Not readily available in single phase	
Maximum current draw – single phase ²	A	15	17.1	22.1		
Maximum current draw – 3 phase	A	9.0	9.8	10.9	11.8	13.1
Power requirements – 3 phase	415V 50 Hz 3 phase plus neutral (4A Max)					

COOLING SYSTEM SCHEMATIC

Immersed Copper Coil Evaporator

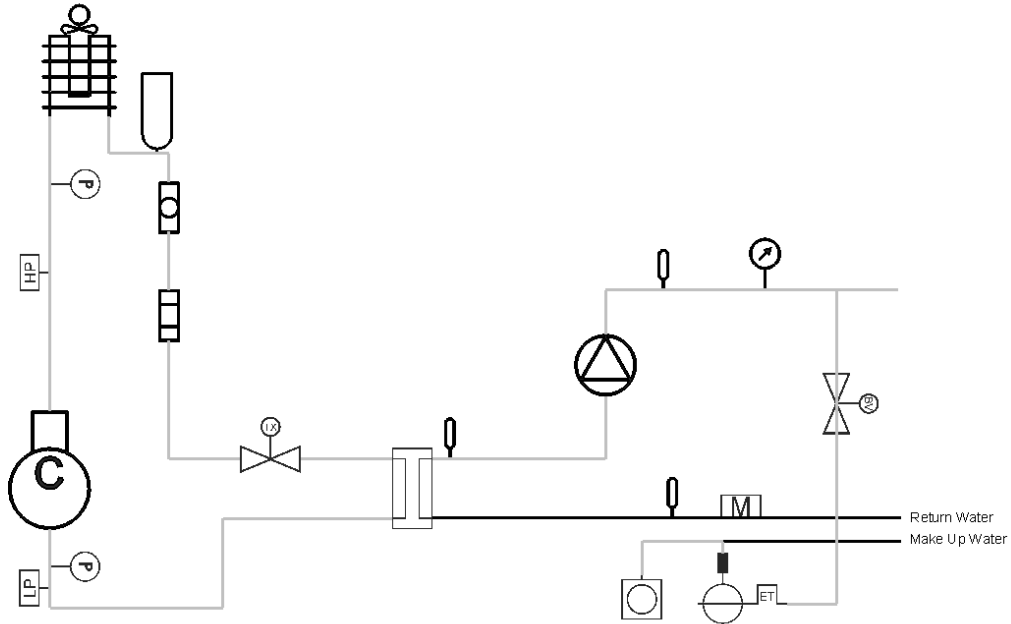


Brazed Plate Heat Exchanger Evaporator Model



COOLING SCHEMATIC

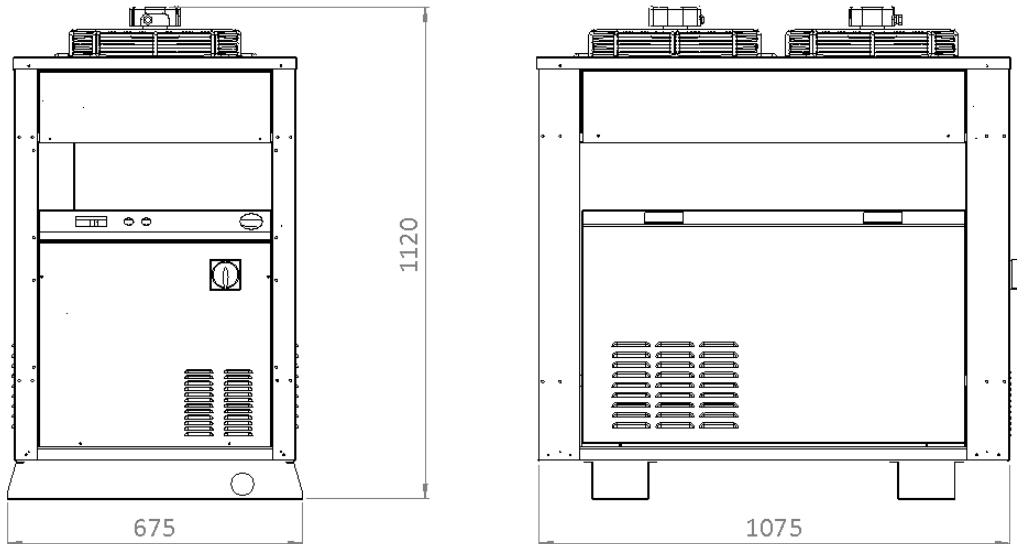
Closed Loop Installation



Cooling Schematic Symbols

	Liquid receiver		Air Cooled Condenser		Pressure transducer
	Pump		One way valve		Ball valve
	Compressor		TX valve		Flow meter
	Sight glass		Drier		Pressure gauge
	Low pressure switch		Drain		Thermowell
	Motorised ball valve		Expansion tank		Water regulating valve
	Pressure relief valve		Strainer		High pressure switch
	Hot gas bypass valve		Isolation valve		Plate heat exchanger

DIMENSIONS

**TRANSPORT AND STORAGE**

Immediately upon receipt of the chiller, carefully inspect the chiller 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 respective insurance company.

Any hidden damage should be reported to Aqua Cooler as soon as possible.

If the unit is to be stored before installation then care must be taken to ensure no foreign matter can get into the water pipes. If the storage is for a prolonged period it is recommended that the water circuit be changed with nitrogen and sealed.

INSTALLATION

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. There is also a site inspection procedure at the end of this manual. It is strongly recommended that Aqua Cooler or one of its agents carry out a site inspection to confirm that the installation site will not compromise the chillers performance.

Vibration isolation, such as rubber waffle pads, should be installed between the chiller and the supporting structure. The chiller is not supplied with anti-vibration pads however the chiller will sit on the four mounting points in the feet of the base.

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.

INSTALLATION

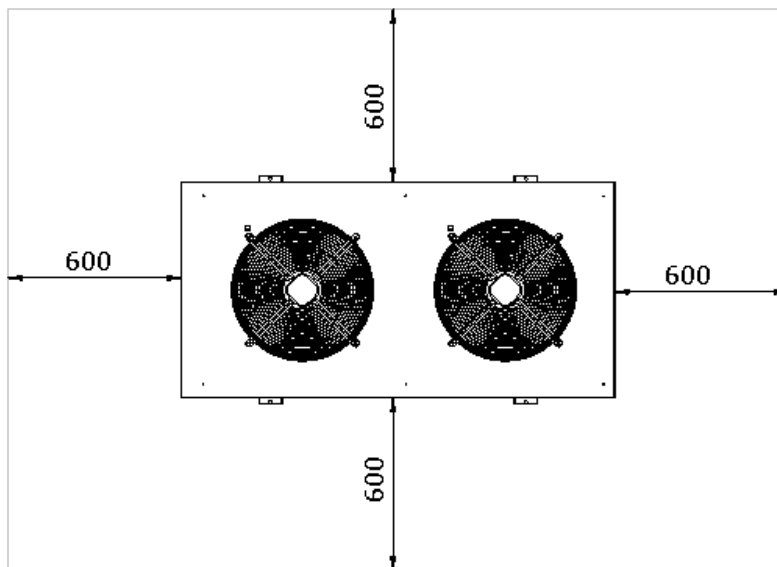
Note: Under no circumstances is ducting to be attached to the condenser fan outlet.

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.

The water fittings on the standard unit are at the rear of the unit. That is the end as the unit away from the electrical box and the unit should be positioned so this end is as close to the process as possible. The remote condenser unit has the water fittings marked on the front of the module.

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.

At least 600mm should be left around the unit to allow for proper ventilation of the condensers. See diagram. The unit should not be installed in a closed off room and if it is to be installed under anything then there should be a minimum of 2 metres of clear air above the unit.

**Installation of the Water Path**

Before filling the unit with water the pressure gauge on the front of the unit that is marked "SUCTION" should be checked. If the pressure is below 300kPa then the chiller should be checked for leaks. Failure to do so may cause water to be drawn into the refrigeration circuit and cause damage to the refrigeration components.

On the rear of the standard unit and on the front of the refrigeration module of the remote condenser version, the supply and return water will be marked next to the water fittings. The water fittings are 1+female BSP. The supply water is to the chilled water to the process and the return water is the water from the process with the heat load. The make-up water is a 3/8+female BSP and connects to a ball valve that automatically controls the level of water in the tank. If the make-up water pressure is greater than 700kPa then a pressure limiting valve must be fitted.

INSTALLATION

All pipe work with refrigerated water running to and from the chiller should be fitted with a water resistant insulation material to prevent sweating and maximise the efficiency of the chiller.

Once all the pipe work is completed and the make-up water connected check the system for leaks. If this all looks OK open up the make-up water . there is a float valve in the tank that will automatically shut off when the proper tank level is reached.

Electrical Installation

The chiller draws a large amount of current and it is important that the connection of the unit to the power supply must be carried out in accordance with the local standards and only by a licensed electrician.

The power supply system on site and the circuit protection must be designed for the total current of the unit taking into account the in rush current and the lock rotor amps of the compressor. see Technical Data. The circuit breaker must be set no more than 125% of the units rated load current.

The chiller has an isolation switch mounted behind the front panel. The power cable for the chiller should be run through the internals of the chiller or through the guide holes provided in the feet on the chiller. There is an access hole in the base of the chiller under the isolation switch.

Care should always be taken to ensure cables are free of hot spots and sharp edges and when putting the cover back on the isolation switch ensure that the face seats correctly to ensure the waterproof seal is maintained.

Power cables should be adequately protected against mechanical damage.

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 angle between consecutive phases. The pump, fans and the compressors rely on correct phase rotation.

Ensure all electrical connections are tight prior to start up.

Power should be provided to the unit for as long as possible . minimum of three hours . before start up to ensure that the sump heater will boil off refrigerant from the sump oil. The unit is now ready to be started up.

Remote Condenser Installation

R Series Chillers can be ordered in configurations featuring the ability to remotely mount the condenser in order to permit maximum installation flexibility. When ordered with a remote condenser configuration we deliver the condenser and the chilling unit separately. Both the chiller and the condenser are *pre-charged* with refrigerant and fitted with isolation valves.

The distance from the chiller to the condenser should be kept as small as possible. Excessive distance lead to high refrigerant pressure drops which in turns leads to loss in chiller capacity. We recommend that the condenser should be located no more than 9m vertically from the chiller, and the total refrigerant piping should be kept less than 20metres. However for long refrigerant pipe runs between chiller and condenser pipe size can be increased to compensate for losses.

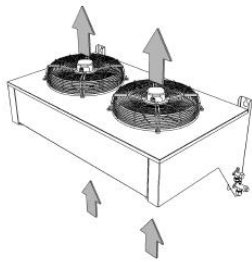
INSTALLATION

Connection Requirements

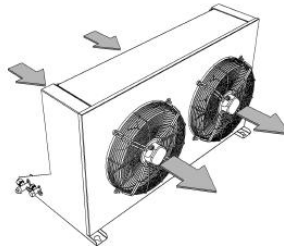
	R420AR-R670AR	R830AR-R1200AR
Discharge Line	3/4"	3/4"
Liquid Return Line	1/2"	5/8"
Electrical Connection	2 * 3 Core + E 1mm ² or 1 * 6 Core + E 1mm ²	

The condenser can be installed in either a vertical discharge orientation or a horizontal discharge orientation. Care must be taken to ensure that air flow is not restricted around the condenser in order to prevent re-circulation of air through the condenser. The condenser 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 damage.

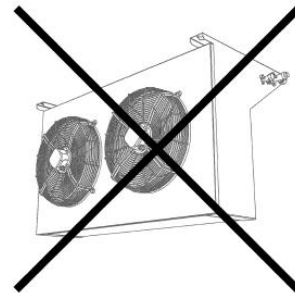
Under no circumstances is ducting to be attached to the condenser fan outlets. When installing beneath a ceiling do not mount the condenser upside down, instead use brooker rods or similar to support the condenser.



Vertical Discharge Configuration



Horizontal Discharge Configuration



Incorrect Horizontal Discharge Configuration

The condenser is fitted with a junction box switch into which the electrical supply from the chiller must be connected. Both the chiller and the condenser are fitted with refrigerant isolation valves with flare connections.

It is essential to provide suitable protection preventing inadvertent contact with the discharge and liquid return lines. Both these lines can get extremely hot and direct contact may cause burns. Aqua Cooler accepts no responsibility for any injuries resulting from the refrigerant connection pipes.

It is essential that a suitably qualified refrigeration mechanic connects the refrigerant piping between the chiller and the condenser.

Once the refrigerant lines have been connected between the condenser and the chiller it is essential to pressurise the lines with nitrogen and check for leaks. Once cleared of leaks the the lines should be evacuated. This can be performed at either the condenser or the chiller by attaching leads to the appropriate schrader valve on the refrigerant isolation valves. There should be no need to add additional refrigerant to the lines as long as the lines do not exceed 9m in total length. Once evacuated and charged (if necessary) the shut off valves can be opened.

INSTALLATION

There are two major stages in commissioning the electrical circuit. First is to ensure that the supply phase sequence is correct at the chiller. The second is to ensure that the subsequent connection between chiller and condenser does not reverse the phase sequence.

To confirm the phase sequence at the chiller use a phase rotation meter or check the direction that the pump motor turns. A directional arrow is shown on the rear of the pump motor to assist in this task. Ensure that there is water in the system and turn the pump on. If the pump turns in the wrong direction then correct the phase sequence at the supply isolation switch and not within the chillers electrical enclosure.

Once this task has been completed the fan direction should be checked. It will be necessary to organize somebody to view the operation of the fans at the condenser. Gain access to the electrical enclosure by removing the panel above the water fitting on the refrigeration module.

Press and hold down each of the fan contactors and confirm that the fans are sucking air through the condenser and exhausting it off the fans themselves as shown by the arrows in previous images. If incorrect then rectify the sequence at the isolating switches on the condenser.

Before starting up the chiller have the following installation requirements been carried out

- Has the unit got proper ventilation
- Was the pressure on the suction gauge above 300kPa before filling the unit with water
- Is the bypass in the tank left open
- Is the power supplied to the unit in accordance with the requirements
- Has air been bled from the water path

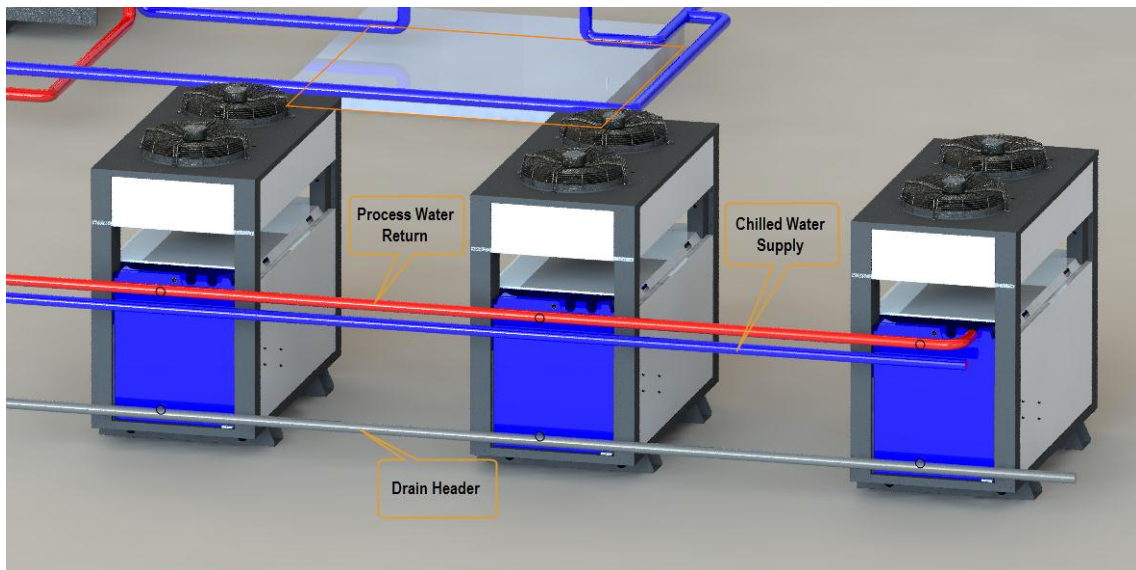
INSTALLATION**Multiple Chiller Installations**

Aqua Coolers chiller can be installed in multiple installations for redundancy or to allow scaling as process application increases in size – for example adding power to a data centre.

There are some requirements for the installation to prevent issues when the chillers duty cycle or if a chiller develops a fault and the central controller or BMS starts another one.

The requirements are

- The chillers must be ordered with the flood back option – this hydraulically isolated the chiller when it is in standby mode. There is a motorised ball valve on the return water line and a check valve on the water outlet line
- A drain header must be installed between the chillers. This allows the water level in all the chillers to same. Obviously this will not work if the chillers are installed at different levels.
- The controller in the chiller has a high water temperature alarm acknowledge delay. This setting needs to be set to at least 2 minutes. When the chillers duty-cycle the water sitting in the tank of the standby chiller can get warm especially on warmer days and when the chiller starts up the high temperature alarm will activate – this alarm delay will give the chiller time to start cooling the water and allow cold water in the pipe work to stir the tank. See the service and maintenance section of the manual on how to change this setting.



Standard Aqua Cooler chiller can be installed together in pairs and one of the chillers will act as the master and the other the slave and the master will duty cycle the chillers and keep a healthy. If there are more than two chillers Aqua Cooler can supply a central chiller controller to monitor and duty cycle the chillers

OPERATION

The unit is ready to be started up. Once power is provided to the chiller, turn the ON/OFF switch to on and the unit will start automatically. The pump will start immediately and the controller will start measuring the flow rate to check that the pump is running normally.

There is a meter-cock controlled bypass inside the tank . it is left fully open when it leaves the factory. This will be marked. This can be adjusted to balance the flow and pressure supplied to the process.

HOWEVER THE BYPASS MUST NEVER BE FULLY CLOSED – DOING SO MAY CAUSE THE REFRIGERATION SYSTEM TO FREEZE UP AND REQUIRE A REPAIR NOT COVER UNDER WARRANTY

The compressors have a two minute start delay. Once the compressors have cut in the watch the display to ensure that the water temperature is coming down.

On the standard controller the temperature is the only thing that is displayed.

It is a good idea after the unit has been running for 5 minutes check that the water temperature is dropping and check there are no bubbles in the sight glass . if these two things are happening then the unit is running properly. Give the system a final check to ensure that there are no water leaks. An amp meter can also be run over the wires into the contactors to ensure that the compressor and the pump are drawing the right amount of amps according to the technical data.

CONTROL**SMART CONTROLLER – MC/ CT Option**

Operational logic is as follows

Start up . Pump ON, Ball Valve OPEN (if fitted), 10 second delay and then flow readings are taken to check pump is running normally.

After compressor hold time and set point plus hysteresis COMP1 ON

If water temperature reaches set point them compressor OFF. Unit then waits for both the hysteresis and compressor hold time again and then starts compressor.

WATER TEMPERATURE CONTROL**Set Point**

Compressors will turn compressors off when the set point is breached. Compressors will be turned on again at temperature plus hysteresis.

If the temperature is dropping faster than the rate of change then the unit will cut out before the set point to prevent temperature overruns

Max and Min Set Point

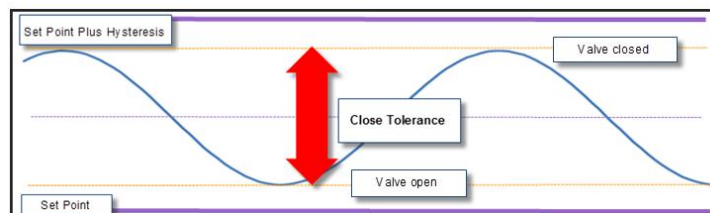
This prevents casual operator from setting supply temperatures too high or too low

Temperature Control - High and Low Temperature Alarm Stop

High and low temperature limits can be set in order that if they are breached then the chiller will shut down. In very rare instances a component may fail without triggering any of its internal fault indicators. The chiller may think it is running normally yet not refrigerating. It is recommended that high and low temperature stop is set to yes to prevent this happening.

Close tolerance

If the unit has been manufactured for close tolerance then the controller will attempt to keep the water temperature within the close tolerance number around the midpoint between the set point and the hysteresis.



For example if the set point is 10 degrees, the hysteresis 2 and the close tolerance 1 degree then the controller will attempt to keep the temperature between 10.5 and 11.5 degrees.

The ability of the chiller to keep the temperature as close to the set point will vary depending on heat load. The closer the heat load is to the chillers rated capacity the more accurate the chiller can maintain the close tolerance. Under low loads the chiller will be unable to maintain less that 1°C close tolerance

CONTROL

WATER TEMPERATURE CONTROL**Temperature Hysteresis**

This is the temperature off-set from the set point where the compressor is allowed to start. It is designed to give the compressors an operating band to work across and limit compressor start-ups.

Temperature Control - High and Low Temperature Alarm Stop

High and low temperature limits can be set in order that if they are breached then the chiller will shut down. In very rare instances a component may fail without triggering any of its internal fault indicators. The chiller may think it is running normally yet not refrigerating. It is recommended that high and low temperature stop is set to yes to prevent this happening.

Low Load Control

The system has an automated setting that will adjust the temperature hysteresis if the load on the chiller is too low and there are too many compressor start-ups. If the time between start up is less than 3 times the hysteresis then the chiller will widen the hysteresis by half the hysteresis up away from the set point and then recalculate. It will do this to a maximum of 3 times of half the hysteresis if the cycle times remain too short. If the cycle times increase then the system will start to lower up the hysteresis again.

WATER FLOW CONTROL**Flow Control**

The system monitors flow rates and will send a warning if the %warning flow rate+ setting is breached and shut the chiller down if the flow alarm point is breached. Zeroing the flow alarm turns it off. It is recommended that the flow alarm is not turned off.

Pump Delay Time

The controller will wait this time before taking flow reading . it is designed to give the ball valve time to open before indicating flow problems

Run Pump on Stop

If this setting is turned on the chiller will run the pump after the chiller has cut out. This is to clear any refrigerant that has pooled in the evaporator and prevent the risk of freeze ups.

High Return Alarm Acknowledge Delay

In the case of the chillers being installed in redundancy the water sitting in the redundant chillers buffer tank may have gotten warm. When the chiller starts up this warm water will set off the high temperature alarm. By activating this alarm delay the controller will wait for the chiller to have a change at reducing water temperatures.

CONTROL

FAN SPEED CONTROL AND REFRIGERANT PRESSURES CONTROL**Fan Speed Control**

The controller monitors the discharge pressure of the refrigeration circuit and makes decisions for fan speed based on this value. In the menu there is a valve for minimum run (default 1500 kPa) which when reached will start the fans and run them at 20% speed. There is a fan full speed setting (default 2200 kPa) that will run the fans at full speed. The fan speed will then run proportionally between these two values.

High Pressure Control

The system will monitor the discharge pressure of each of the refrigeration circuits and will send a warning when the pressure starts to get too high. If the alarm pressure is breached then it will shut the unit down. It will do this 3 times in a 24 hour period before shutting the chiller down permanently. There compressor wiring circuit has an automatically re-setting high pressure safety switch installed and set at 2800 kPa for R407 gas and 2200 Kpa for R134a. But setting the controllers alarm above these settings the automatically resetting HP safety switch will allow the chiller to keep re-starting until something fails in the chiller.

If the chiller is to be installed in redundancy . that is with another chiller in tandem or with multiple chillers and controlled by a BMS or the Aqua Cooler central control system, this feature will de-activated.

Low Pressure Control

The system will monitor the suction pressure of the refrigeration circuit and will send a warning when the pressure starts to get too low. If the alarm pressure is breached then it will shut the unit down. It will do this 3 times in a 24 hour period before shutting the chiller down permanently. There compressor wiring circuit has an automatically re-setting low pressure safety switch installed and set at 170 kPa for R407 gas for safety back up. The LP also has a hysteresis . that is after shutting down at say 200 kPa and the hysteresis is set at 200 kPa, the unit will not be allowed to start until the suction pressure has risen to 400 kPa.

If the chiller is to be installed in redundancy . that is with another chiller in tandem or with multiple chillers and controlled by a BMS or the Aqua Cooler central control system, the alarm will de-activated. A warning will still show.

CONTROL

DELAYS AND OTHER ALARMS**Compressor Hold Time**

The controller will wait 120 before starting compressors up after shut down to prevent too many start ups.

Alarm Acknowledge Delay

This delay is the time that the program waits before flagging an alarm. This may be useful in the event of a tandem switch over to a tank of very warm water for example. If the water is too warm then the high water temperature alarm may be triggered. If there is a delay then it will give the newly activated chiller time to pull the water temperature down.

High Ambient Control

If the high ambient water spray kit is fitted then the system will spray the condensers with water once air on temperature is breached AND the fans are running. The water spray will turn off once the ambient temperature has dropped or the fans have stopped running.

Tandem Control

One chiller will need to be assigned a master chiller and the other a slave chiller . see the service section for instructions on doing this. The master chiller will do all the controlling and timing. Output 16 (status) on the control board will be energised while it is running closing the indicated input (enable) on the standby chiller not allowing it to run. After a week the output will de-energise and the standby chiller will run . its output 16 energising closing the input on the now standby chiller.

The rest of the control settings and the default setting for the parameters outlined above are outlined below . it is recommended that they are not altered without consulting Aqua Cooler

The settings below are the only ones that should be altered by the operator . the rest of the menu are for setting up the chiller and should not be altered. The controller also has some options not relating to this model of chiller.

CONTROL – STANDARD CONTROLLER**Temperature Control – Set Point**

Compressors will turn compressors off when the set point is breached. Compressors will be turned on again at temperature plus hysteresis

Temperature Control - Max and Min Set Point

This prevents casual operator from setting supply temperatures too high or too low

Compressor Rest Time

The controller will wait 120 before starting compressors up after shut down to prevent too many start ups.

SERVICE and MAINTENANCE

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

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

Warning: When the mains controller is de-energised the power contactors are live, even if the components are not operating.

For all service and spare part requirements within Australia please call Aqua Cooler on 1800 005 790

All maintenance must be carried out by qualified refrigeration mechanics.

These units have been designed for the minimum of maintenance. However to ensure optimum performance qualified personnel should carry out regular maintenance. A comprehensive preventative maintenance program is available through Aqua Cooler carried out by qualified refrigeration mechanics.

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

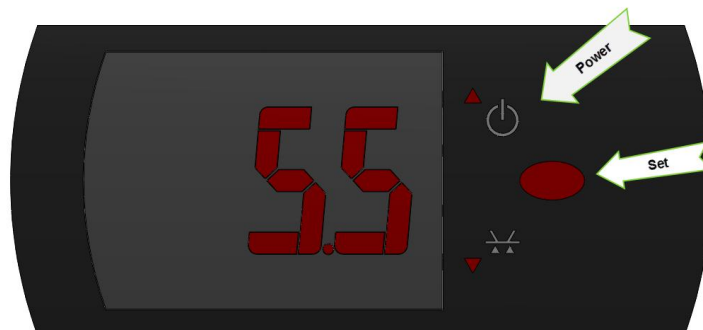
Recommended preventative maintenance program

Operation	Frequency
Refrigerant Charge	6 Monthly
Electrical connections are tight	6 Monthly
Compressor amp draw	12 Monthly
Pump amp draw	12 Monthly
Condenser strainer cleaned	6 Monthly

Accessing the electrical box

The electronics and switching gear are housed in an IP rated box behind the lower front panel of the chiller. Remove the 4 screws on the panel and the box is then accessible. On a standard chiller with the standard controller the box does not need to be accessed to have the settings changed but the smart controller is housed inside the box and changing the settings will need the box to be opened.

Standard Controller



SERVICE and MAINTENANCE

Changing the setting on a standard controller . the standard controller is on the outside of the chiller

1. Hold Power ON/OFF switch for 3 seconds
2. Press Set button for 1 sec to display temp set point
3. Change Set Point (St) 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. Set Parameters to the values below

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.

Smart Controller – CT Option

The controller on the smart version of the chiller is mounted on the door of the electrical box.



SERVICE and MAINTENANCE

Data Logging

The chiller is automatically storing data on its operational parameters and performance. In the event that there is a problem with the chiller this data may become useful for diagnosis.

Downloading Data from the Controller

The operational data can be downloaded from the controller by either using a USB flash drive. There are two types of files on the system . and event log and a time log. The event log takes reading every time there is an event change, compressor on or off for example. The time log saves data every set time period. The default is every 10 minutes but this can be set as low as every 2 minutes. At 10 minutes intervals there is over a week of data saved on the board. The parameters that are logged are the supply, return and ambient temperatures, the suction and discharge pressures and the water flow rate. All changes of state are also logged on the inputs and outputs. Using this data is a good way to check the effective running of the chiller and to help with diagnosis when a service visit is needed.

Preventative maintenance programs carried out by trained technicians are available on request. These programs are designed to offer peace of mind in extending the operational life of the chiller by pre-emptively address any service problems that may arise. For further details contact Aqua Cooler.

Download via USB . insert a USB key into the USB key on the right hand side of the circuit board controller.

1. Go to %LOG DOWNLOAD+in the parameter menu and press OK
2. Scroll to %Time Log to USB+and press OK
3. The data will take about 30 seconds to download and the screen will show when the download is complete
4. Putting the USB into a computer will show the folder labelled %AQUA+and inside this will be a excel data file. The excel file will have labels for all the data that has been logged . the newest data will be at the top.

NOTE: the shorter the time between readings the less history the system can record. 10 mins should give approximately 3 weeks of data logging

Calibration of Sensors – MC Option

The temperature sensors will be calibrated before dispatch but in the even one needs to be replaced then it is a good idea to recalibrate the sensors as they effect the operation of the chiller.

1. Scroll through the controller to parameters menu
2. Scroll down to the Sensor Menu sub- menu
3. Scroll through to the ambient, supply or return calibration
4. Place the sensor and a calibrated thermometer together and allow the temperature to settle
5. Press OK and the value will flash. Use the up and down scroll buttons to calibrate the sensor to the thermostat and press OK again
6. Exit the program

SERVICE and MAINTENANCE

Updating Software

From time to time requirements may require a software upgrade of the system and with the right programmer this can be done from a laptop on site. If the chiller is connected to the internet or a high level management system then the upgraded software will also be accompanied by a new BIN file to allow viewing on standard SNMP based systems

Contact Aqua Cooler on the procedure to up load new firmware into the chiller.

THERE ARE OTHER PARAMETERS IN THE PROGRAMMING MENU – SOME ARE USED IN SOME OF THE OTHER OPTIONS – SOME NOT AT ALL. THEY SHOULD NOT BE ALTERED. ALTERING THE PARAMETERS NOT RELEVANT TO THE OPERATION OF YOUR CHILLER MAY AFFECT ITS PERFORMANCE AND REQUIRE AN OUT OF WARRANTY SERVICE CALL. THE PPRMETERS SHOULD NOT BE ALTERED WITHOUT A THOROUGH UNDERSTANDING OF THE CHILLERS OPERATION OR AFTER FIRST CONTACTING AQUA COOLER

Changing the setting on the controller

If it is installed then the remote panel can be used to program the chiller otherwise remove the front panel of the chiller and open up the electrical box. Take precautions to ensure that none of the electronics or the switching gear can get wet. To change the programming parameters the circuit board will need power so it is recommended that the chiller is switched off using the green ON/OFF button on the front of the chiller.

By opening the electrical box the programmable circuit board controller can be seen mounted on the door. The four small red buttons next to the display are the buttons used for changing the parameters in the programming. The two buttons on the left are the up and down scroll buttons. The button top right is the OK button and the last button is the ESC.

Set Points Sub Menu

Water Supply Temperature	
Setting the water supply temperature . Temperature that the refrigeration system with cut out	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll through the menu until %SETPT WATER TEMP+shows • Press %OK+ and %SET WATER TEMP+ will show and the water temperature will flash • Use scroll keys to adjust up or down and press %OK+ again and %NEW WATER TEMP+will show <p>Press the escape key to revert to home page</p>

Temperature Hysteresis .	
Temperature between refrigeration circuit cut out and cut in Range 2 to 5 degrees	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Use scroll keys to find %TEMP HYSTERESIS • Default is 2 degrees . press %OK+and SET TEMP HYSTER+will show • Use scroll keys to change value and press %OK+ • %NEW TEMP HYSTER+will show • Press escape keys to return to home page • NOTE . hysteresis cannot be set below 2 degrees to prevent compressor short cycling

SERVICE and MAINTENANCE

Set Points Sub Menu

Setting water flow alarms	
<p>Setting the alarm for the chilled water and condenser water flow . this setting when breached will place the unit into standby</p> <p>Range 0-5 l/s</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %LOW ALARM 1+for chilled water supply and %LOW ALARM 2+for condenser water flow • Press %OK+and %CONFIG FL ALM1+will show with the value flashing • Change the value to where the warning needs to be and press %OK+ . the alarm rate should be below the value of the warning • The screen will confirm your choice • Press the escape key to revert to home page
<p>Setting the warning for chilled water and condenser water flow. This setting will simply give a warning that the flow rate is dropping . the chiller will still run.</p> <p>Range 0-5 l/s</p>	<ul style="list-style-type: none"> • Scroll to %PARAMETER MENU+and press %OK+ • Scroll to %LOW WARNING 1+ for chilled water supply and %LOW WARNING 2+for condenser water flow • Press %OK+and %CONFIG FL WARN1+will show with the value flashing . as a rough guide the flow rates for the condenser water and the chilled water should be around 1.4 l/s • Change the value to where the warning needs to be and press %OK+ • The screen will confirm your choice • Press the escape key to revert to home page
Close tolerance control	
<p>These chillers will have a hot gas bypass valve installed for the purposes of maintaining a closer temperature tolerance. To set this valve the CLOSE TOLERANCE but be set to ON in the system menu</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %CLOSE TOLERANCE TEMP+and press %OK+ • Value will flash and can be set to minimum of 0.1 degrees and maximum of 1.9 . Press %OK+and screen will confirm choice <p>Press the escape key to revert to home page</p>
Setting high pressure (HP) and low pressure (LP) alarms and warnings	
<p>Controller will send out and warning at warning pressure and shut unit down at alarm pressure</p> <p>Range 2000 . 4000 kPa for HP Range 0-500 kPa for LP LP Hysteresis 100-300 kPa</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %HP Warn Press+or %LP Warn Press+ • Press %OK+and choices will be shown • Select choice and press %OK+and the screen will confirm choice • Press the escape key to revert to home page <ul style="list-style-type: none"> • Scroll to %PARAMETER MENU+and press %OK+ • Scroll to %HP ALM Press+or %LP Alarm Press+ • Press %OK+and choices will be shown • Select choice and press %OK+and the screen will confirm choice • Press the escape key to revert to home page
Maximum and Minimum Temperature Limits	
<p>This set a minimum and maximum temperature limit for the chiller and is there to prevent casual operators setting the supply temperature above or below recommended set points.</p> <p>Range -5 to 20 Min 10 to 30 Max</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %MIN TEMP LIMIT+or %MAX TEMP LIMIT+ • Press %OK+and %SET MAX LIMIT+will show will value flashing • Select choice and press %OK+and the screen will confirm choice • Press the escape key to revert to home page

SERVICE and MAINTENANCE

Set Points Sub Menu

Setting fan speed control	
<p>If fan speed controllers are installed the minimum run speed (20%) and max run speed (100%) can be set again corresponding discharge pressures</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %Fan Min SP Pressure+ • Press %OK+ and change required pressure • Select choice and press %OK+ and the screen will confirm choice • Press the escape key to revert to home page <p>The same procedure is followed to set %Fan Max SP pressure+</p> <p>Note . of fan speed controller are being retrofitted to a unit then the fan speed option will have to be activated in the parameters menu.</p>

Delay/ Hold Sub Menu

Compressor Hold Time .	
<p>After the cooler has reached cut out temperature and the compressor will turn off. In order to minimise compressor starts there is a rest time.</p> <p>Range 5- 180 seconds</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %COMP HOLD TIME+ and press %OK+ • Value will flash and can be set to minimum of 5 seconds and maximum of 3 minutes . IT IS RECOMMENDED THAT THIS VALUE IS NOT ALTERED TO BELOW THE DEFAULT 2 MINUTES • Press %OK+ and screen will confirm choice <p>Press the escape key to revert to home page</p>

High and Low Temperature Stop	
<p>High and low temperature alarm cut out . the unit can be set to go into standby if the high and low temperature alarms are breached and they will stay in standby until the fault is cleared by pressing the %OK+ button</p> <p>Range Yes and No</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SYSTEMSETTING sub menu • Scroll to %HIGH TEMP STOP+ and %LOW TEMP STOP+ and press %OK+ • %SET HI TEMP STOP+ will show with %ES+ and %NO+ manu choices • Change as desired, press %OK+ and %STOP ON HI TEMP+ will show confirming choice • Do same to change low temperature standby • Press the escape key to revert to home page

High and Low Temperature Alarm	
<p>High and low temperature alarm cut out . the unit can be set to go into standby if the high and low temperature alarms are breached and they will stay in standby until the fault is cleared by pressing the %OK+ button</p> <p>Range Low -5 to 10 High 10 to 40</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SET POINTS sub menu • Scroll to %HIGH TEMP ALARM+ and %LOW TEMP ALARM+ and press %OK+ • %SET HI TEMP ALARM+ will show temperature choices • Change as desired, press %OK+ and %NEW HI TEMP ALM+ will show confirming choice • Do same to change low temperature alarm • Press the escape key to revert to home page

Setting auxiliary inputs	
<p>Inputs 17 and 18 can be used as auxiliary fault inputs</p> <p>Option NO and NC</p>	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SYSTEM SETTINGS sub menu • Scroll to %Auxiliary Input N/O latched+ • Press %OK+ and change to N/O or N/C • Select choice and press %OK+ and the screen will confirm choice • Press the escape key to revert to home page

SERVICE and MAINTENANCE

Setting alarm acknowledge delay	
Inputs 17 and 18 can be used as auxiliary fault inputs Range 0-120 Minutes	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to the DELAY/ HOLD sub menu • Scroll to %ALM ACK DELAY+ • Press %OK+ and change to setting • Select choice and press %OK+ and the screen will confirm choice • Press the escape key to revert to home page <p>It is recommended that the setting is not greater than 1 or 2 minutes</p>

Tandem Installation	
Assigning the chillers into a single or tandem set installation	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SYSTEM SETTING sub menu • Scroll to %SINGLE/DUAL AUTO+ and press %OK+ • Change set up to %DUAL AUTO OPER+ and press %OK+ • The screen will confirm your choice • Press the escape key to revert to home page <p>NB . This only need be done on the master chiller</p>
Assigning chiller role . Master or Slave	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SYSTEM SETTING sub menu • Scroll to %MASTER/ SLAVE+ and assign one chiller the master chiller and one chiller the slave chiller • Screen will show %SET MASTER/ SLAVE+ and change to whichever one is which and press %OK+ • The screen will confirm your choice • Press the escape key to revert to home page
Duty Cycle Time	<ul style="list-style-type: none"> • Scroll through the screen menu until PARAMETERS MENU shows, press OK and then scroll through to SYSTEM SETTING sub menu • Scroll to %CYCLE CHANGEOVER+ and press %OK+ • %SET CYCLE PERIOD+ will show and the choices are %OFF+ where there will be no duty cycling at all but the chillers will still act in tandem . ie if one develops a fault it will start the other up. %10 MIN CYCLE TEST+ which will duty cycle chiller every ten minutes . this is more for installation testing and will revert to a weekly cycle after 2 hours and %WEEKLY CYCLE+ which will duty cycle the chillers weekly. Note that if chillers are to switch at a set time every week then the timer will need to be set as mentioned above • Press the escape key to revert to home page
Weekly Timer Reset	<ul style="list-style-type: none"> • Scroll to %CYCLE TIMR RESET+ • Press %OK+ and %ZERO CYCLE TIMR+ and %PRESS OK+ • %NEW CYCLE STARTED+ will show and the clock will reset • At any time during the week the timer can be viewed to see how long to changeover

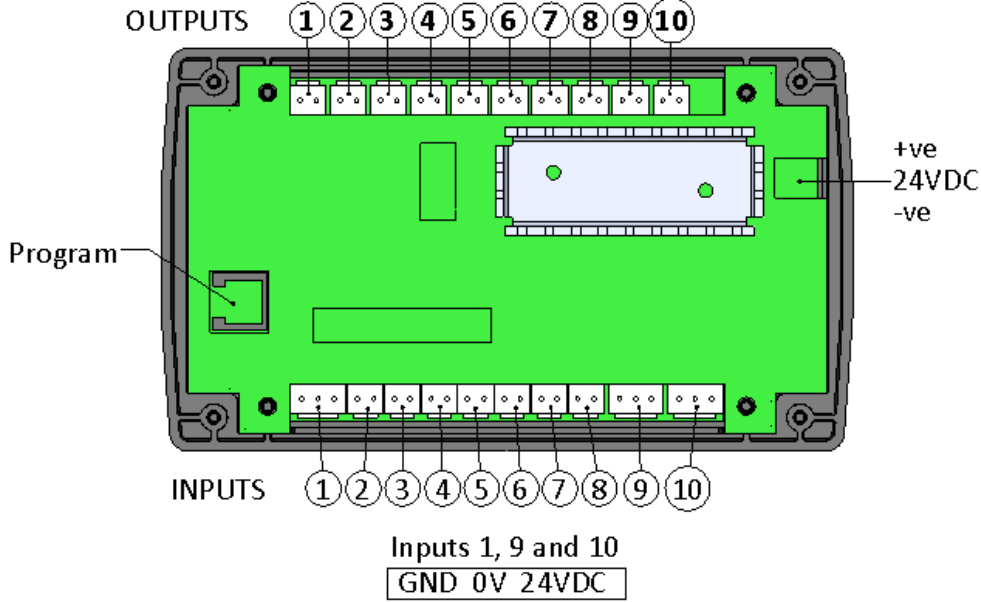
SERVICE and MAINTENANCE

Full Setting List – again some of the settings are not for this model of chiller and it is recommended that THEY ARE NOT altered without a full understanding of the chillers programming or without checking with Aqua Cooler first. The settings reflect Aqua Cooler recommended setting for the installation ordered. If at a later time another chiller is installed in tandem or the chiller is added to a multiple chiller set them some of the setting may change.

PARAMETER MENU			
MENU ITEM	SETTING	MENU ITEM	SETTING
SYSTEM MENU			
SINGLE DUAL/OPN	Single	CLOSE TOLERANCE	OFF
MASTER /SLAVE	MASTER	HIGH TEMP STOP	YES
CYCLE CHANGEOVER	Off	LOW TEMP STOP	YES
NO HE SENSORS	0	VAR SPEED FUNCTION	OFF
AUX INPUTS	N/O	FAN SPEED CONTROL	YES
SNMP DATA	FRACTIONAL	NETWORK CONTROL	OFF
SPRAY COOL	OFF		
EMAIL LOG MENU			
EMAIL ALARM ON/OFF	OFF	MANAGE DATA LOG	OFF
DATA LOG PERIOD	2 MINS		
SET TIME MENU			
TIME ZONE	Set after install	SET DAY OF MONTH	Set after install
SUMMERTIME ON/OFF	Set after install	SET WEEKDAY	Set after install
SET YEAR	Set after install	SET TIME	Set after install
SET MONTH	Set after install		
DELAY HOLD MENU			
ALARM ACK DELAY	30	COMPRESSOR HOLD TIME	120 SECONDS
PUMP DELAY TIME	30		
SET POINT MENU			
PULL DOWN PER MIN	0.6	LP ALARM PRESSURE	80 for R134a
TEMPERATYRE HYSTERESIS	2	LP HYSTERESIS PRESSURE	100 for R134a
CLOSE TOLERANCE TEMP	OFF	FAN MAX SPEED PRESSURE	1600 for R134a
HIGH TEMPERATURE ALARM	30	HP ALARM PRESSURE	2200 for R134a
LOW TEMPERATURE ALARM	0	HP WARN PRESSURE	1700 for R134a
HIGH RETURN ALARM	30	LP WARNING PRESSURE	100 for R134a
LOW RETURN ALARM	0	CIRC FLOW ALARM	0
MIN TEMP LIMIT	5	FLOW ALARM 1	0.5 l/s
MAX TEMP LIMIT	20	SUPPLY FLOW WARNING 1	1.0 l/s
SET PT AMB OTEMP	45	SET POINT TEMP	CUSTOMER SPECIFIC
FAN MIN SP PRESSURE	900 for R134a		
SENSOR MENU			
CCT1 SUCT PR SIZE	-.5 -7 BAR	CIRC FLOW PIPE	DN25
CCT1 DIS PR DISCH PR SIZE	0-30 BAR	TEMP ALL CAL – 1	SEE PROCEDURE
SUPPLY FLOW PIPE	DN 25		

SERVICE and MAINTENANCE

Controller Input and Output Schematic

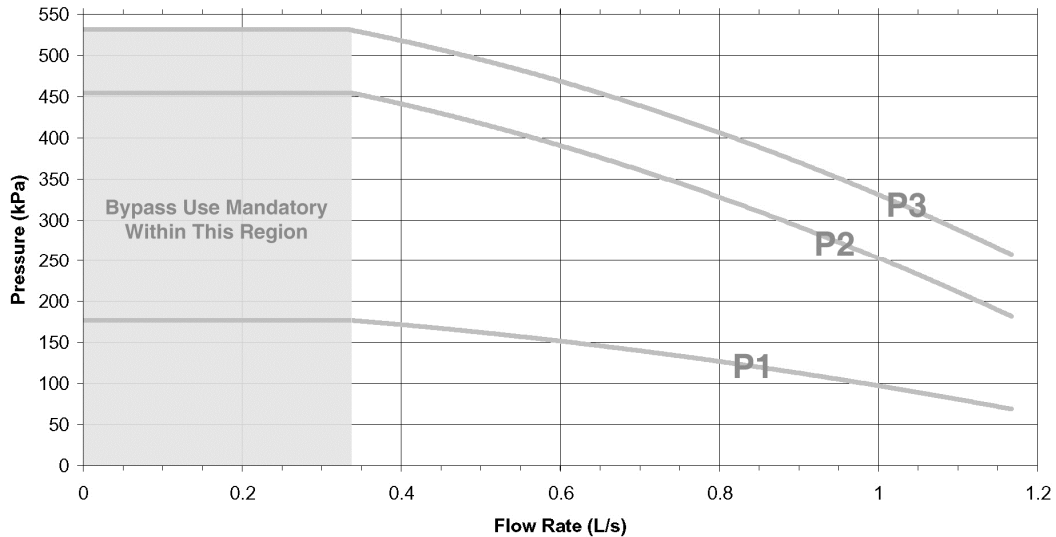


Connector	Type	Control
Outputs . 1 to 8 across the top of the board 0-10V Output 1 0-10V Output 2	24VDC 0-10 Volt out put 0-10 Volt out put	1 Compressors 2 Hot Gas/ Spray Cool 3 Pump 4 Ball Valve 5 Fan Bank 6 Master Fault 7 Master Run 8 Standby/ Tandem link enable/ Status 9 Variable Speed Compressor Control 10 Fan speed control
Inputs . 1- 24 across the bottom of the board IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10	0-10V Input 0-10V NC Input 0-10V NC Input 0-10V/ NTC thermistor 0-10V/ NTC thermistor 0-10V/ NTC thermistor 0-10V/ NTC thermistor 0-10V NC input 0-10V Inout 0-10V input	Supply Pump Flow Meter Compressor 1 fault input ON/OFF Switch Plate pack safety sensor Ambient temperature sensor Chilled water supply temperature sensor Chilled water return temperature sensor Standby/ Tandem link Suction pressure Discharge pressure

WIRING DIAGRAM . TANDEM INSTALLATION

The chiller can be installed with another to provide redundancy. This is only available for the chillers ordered with the smart controller. Once installed the chillers can be set to duty cycle and provide back-up should one develop a fault. Contact Aqua Cooler for details

PUMP CURVES



CRITICAL SPARE PARTS

Part Description	Aqua Cooler part No.
Thermostat	z-8705
Compressor MTZ036	z-9010
Sump heater	z-9046
TX Valve	z-9079
Drier	z-9116
Sight Glass	z-9121
Pressure control . fan	z-9182
Contactors 2 pole 6A	z-9300
Contactors 3 pole 9A	z-9301
Thermal overload 5.5-8A	z-9320
Fans 350mm	z-9754
Pumps	
P1	z-9732
P2	z-9733
P3	z-9734

DATA SHEETS

Fan Data Sheet

<http://img.ebmpapst.com/products/datasheets/W6D800GO0101-ENG.pdf>

Compressor data sheet

<http://doc.3c-e.com/danfoss/odsg/pdf/FRCC-UD-100115-041841.pdf>

Pump data sheet

<http://www.lowara.com/lowdata/doc/EN/ceaca-td-en.pdf>

Flow meter data sheet

http://www.burkert.com.au/products_data/datasheets/DSS030-Standard-EU-EN.pdf

TROUBLE SHOOTING and WORK METHODS

Symptom	Possible Causes	Solutions
Low Flow Alarm	Faulty Pump	Replace Pump ensuring new pump has been leak tested, phase wiring is around the right way See below for installation http://www.lowara.com/lowdata/doc/ml/surface-im-xx.pdf See below for technical data
	Blocked plate heat exchanger	Isolate the chiller and attempt to back flow through the plate pack Replace if the plate pack has become chronically blocked See below for data sheet Faulty electrical contactors . check operation and replace if necessary
	Work Around	If the pump seems like it is functioning and the flow rate is low then zeroing the flow alarm will allow the pump to run until the cause of the alarm can be found.
Compressor Fault	High head pressure . HP alarm tripping	Check head pressures when the unit is running. Possible causes blocked condenser . check for dust or debris build up and clean
		Dead or dying fan . check amp draw of fans or air flow. Replace if needed
		Too high a heat load for the rating of the unit. Check install and site specifications
		Bad installation or too high ambient . check that there is no other equipment in the vicinity that may be throwing heat onto the unit or that the unit has not been installed improperly
	Low pressure . LP alarm tripping	Flow rate from pump may be too low
		TX valve may have seized Unit may have developed a refrigeration leak and lost gas charge . check pressures or run leak detector over the unit.
Work Around	Second compressor should still be running and carrying much of the heat load. Once the faulty compressor is fixed then the programming will have to be updated as the program will have defaulted to another setting to keep the unit running. <ul style="list-style-type: none"> • On the screen go to %PARAMETERS MENU+and press %OK+ • Scroll to SWITCH ON FOR NEXT C+. %TIMER+should be showing underneath this. Press %OK+and scroll to %FIXED HEAT LOAD+and press %OK+ • The screen should confirm your choice 	

WIRING DIAGRAM

A wiring diagram unique to the chiller will be in the electrical box with this manual . if it has not been provided please contact Aqua Cooler to organise a copy.

Legend for component marking in the electrical box/ wiring diagram			
CTOL	Compressor Thermal Overload	C	Compressor contactor
CER	Compressor enable relay	P	Pump contactor
PER	Pump enable relay	F	Fan contactor
FER	Fan enable relay	FVSD	Fan variable speed drive
HGBV	Hot gas bypass valve relay	PTOL	Pump thermal overload
FTOL	Fan thermal overload	MPM	Motor protection module
FSC	Fan speed controller	CSS	Compressor soft starter
CB	Circuit breaker	TSTAT	Thermostat
FMCB	Fan motor circuit breaker	CMCB	Compressor motor circuit breaker
PF	Phase failure relay	LP	Low pressure switch
HP	High pressure switch	ER	Enable relay
PMCB	Pump motor circuit breaker	PVSD	Pump variable speed drive

RELEASE NOTES
Software Release

Revision	Date	Description
B	01/01/12	Software to version P264_56_E00_010 Improved network control Improved VSD function with integrated PID loop Keypad lockout added as an option
C	06/03/12	Software to version P264_32_EB0_011 Bacnet and Modbus stacks added to controller
D	25/04/12	Software to version P264_56_EB0_012 - Option to keep secondary pumps running for single chiller - Option to flash or steady fault output - Add pump delay time for alarm low flow before pump switch off - Pump Run-on except for ON/Off manual control - XML reminder only for updates, not new installs - Fixed compressor fault timer wrap issue
E	06/06/12	Software to version P264_56_EB0_013 - Upgraded to TCP/IP stack V5.41 - LOCAL_RUN_OID corrected - Supply and Return water temp alarm min values to -15 deg - Reset some PSET_XXX default values - Email Trigger on Log Time - SPIFlash() driver test for ID - PIC32 Chip ID in S/W version (EB4 = PIC32MX460F512 and EB6 = PIC32MX695F512)
F	26/10/12	Chiller firmware P264_64_EB4_014A for New P264 Board - Time corrected 1 day error - Added slow warnings on LCD - Other As per P243 V1.42 - Added PSET_VSD option #3 = SCROLL DGT inverse compressor output 0-10V - Scroll not inverse output - normal 0 - 10V for 0 to 100%
Not released	09/01/13	Chiller firmware P264_64_EB4_015 for New P264 Board - Added Light Load Adapt - Compressor cycle period < 3 x Rest time then +/- Hyst/2 - - Added FAN early OFF for Discharge pressure < Low set pt -
G	07/02/13	Chiller firmware P264_64_EB4_016AA for New P264 Board - Removed 12% error on 4-20mA inputs - Fast pull down last compressor temp + HYST/2 - Light load adapt only high side and always ON
H	15/04/13	Chiller firmware P264_64_EB4_017 - Add Spray Cool Temp no Compressor option - Add PSET_RCUE for UART11 connection to and shutdown if remote RCU fails - Add web pump run on time display - Added Remote RCU Dewpoint Difference action from RCU
H	12/09/13	Firmware to version P264-64-EB4-204

RELEASE NOTES

Hardware Release

Revision	Date	Description
C	06/03/12	Low voltage switching gear introduced in MC models Copper coils made default evaporator
E	21/05/12	Lordan coils introduced on R300/R330
F	15/04/13	Fan speed control on MC models driven from controller

COMMISSIONING

It is important that the chiller is commissioned in accordance with the guidelines below in order to ensure proper and trouble free operation.

Outlined below is a check list showing all the considerations that must be taken for the proper installation and operation of the chiller.

Pre-start checks

Procedure	Carried out in accordance with procedure?	Notes
Check that there has been no evidence of damage from transport		
Has adequate clearance been left around and above the chiller as per the instructions outlined in the installation section		
Check that the isolation switch has been installed close to the chiller in line of sight		
On standard chillers and remote condenser models ensure that the power connection to the chillers and between the modules is protected		
Note down the pipe run from the chiller to the process.		
Note down the water pipe sizes to and from the chiller		
Has the water pipe work been fitted with insulation		
Check the refrigeration circuit for oil residue and run a leak detector over the refrigeration system.		
On remote condenser model note the distance between the two modules		
On remote condensers note the refrigeration pipe sizes between the two modules.		

Electrical Connection

Isolate power to the chiller and access the electrical box and check all wiring is tight.		
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COMMISSIONING

Water Connection

Was the pressure on the suction gauge checked before the unit was filled with water . see Installation		
Open the mains make up water to the chiller . has all the air been bled from the system		
Check the water path for leaks		

Start Up

Press the ON/OFF button on the front of the chiller and the pump will start up

After adding power to the chiller, change the water temperature setting and all other alarms to customer or site needs		
After chiller has started check and note down the current draw for the compressors, pump and fans Pump < 6 amps Compressors < 28 amps Fans < 8 amps		
Note down the water flow reading Should be ~ 2 l/s		
Note down pump pressure		
Check the sight glass for evidence of bubbles or moisture		
Check that water temperature is dropping		
Note down the oil level on the compressor sight glass		
Adjust the bypass valve to suit customer and/ or site needs		
Fit gauges and note down running pressures on the chiller		

COMMISSIONING

Tandem Installation Checks

On the master chiller set the cycle time to 10 minute test and after 10 minutes check that the chillers duty cycle.		
Fault the running chiller and check the other chiller starts and vis-a-versa		

Finishing Off

Is the electrical box closed and door secure		
Are all panels secure		
If the mesh was removed from the side of the chiller has it been replaced		
Are all tools and debris clear of the site		
Are there any site specific feature that may hinder the operation of the chiller in the future		

Notes

SITE INSPECTION

Proposed Chiller Model:		Date Inspected:	
		Inspected By:	
		Company:	
		Contact Number:	

Business Name Of Installation Site:	
Installation Site Street Address:	
Installation Site Phone Number:	
Installation Site Facsimile Number:	
Installation Site Contact Name:	
Installation Site Contact Position:	
Access Limitations: Any issues relating to service access including after hours access, induction course requirements, hot works permits, confined spaces, safety harness requirements	
Equipment Serviced By Chiller:	

SITE INSPECTION

Chiller Installation – Clearances

Mark out any condensing units or other possible heat sources that may effect the operation of the proposed chiller installation
Highlight any walls/fixtures/items that encroach on the clearances required for the chiller installation.



Insert Drawing and photo of site here:

Minimum Space Requirements:		
Chiller Model	Actual Foot print	Space Required around chiller.
R Series I	975L x 590W x 1060H	600(E) x 2000(H)
R Series II	975L x 590W x 1060H 1495L x 790W x 1340H	800(E) x 2000(H) 800(E) x 2000(H)
R Series III & T Series	2015L x 860W x 1545H	800(E) x 2000(H)
R3000	2585(L) x 1400(W) x 1830(H)	1000(E) x 2000(H)
R3000 Condensing Unit	2135(L) x 1400(W) x 1680(H)	1000(E) x 2000(H)
R3000 Refrigeration Unit	1200(L) x 970(W) x 1510(H)	600(E) x 2000(H)
H Series	2020(L) x 1610(W) x 1600(H)	1000(E) x 2000(H)
L Series	2010(L) x 1780(W) x 1600(H)	1000(E) x 2000(H)

Chiller Installation - Continued			
Isolation Switch:	YES/NO	Drainage Provided:	YES/NO

SITE INSPECTION

Chiller Water Circuit Requirements			
Notes:			
Pipe Size:		Pipe Insulation:	
Length:		Height Difference:	
Balancing Valve:	YES/NO	Isolation Valves:	YES/NO
Water Treatment:	YES/NO	Make Up Water:	YES/NO
Treatment Used:			
Supply Pressure:		Flow Rate:	
Pressure Tap Points:	YES/NO	In Line Filtration:	YES/NO

Remote Condenser Requirements			
Notes:			
Pipe Size:		Pipe Insulation:	
Length:		Height Difference:	

SITE INSPECTION

General Notes/Feedback

Completion		
<p>Aqua Cooler uses the information from this site inspection sheet to confirm that the chiller will be installed and operating correctly. Should any problems or issues be raised as a result of the site inspection process then Aqua Cooler will take steps to address them with the customer, ensuring that the chiller operates reliably and without compromise to the long service life we expect of our products. We appreciate any feedback given as all data is used to influence our continual product development program.</p>		
Signature Of Service Agent	Print Name	Date
Signature Of Customer Representative	Print Name	Date

Filing – Aqua Cooler		
Signature	Print Name	Date Of Entry
Specify Follow Up Work Required:		

PREVENTATIVE MAINTENANCE

Model:		Date Serviced:	
Serial Number:		Serviced By:	
		Company:	
		Contact Number:	

Business Name Of Installation Site:	
Installation Site Street Address:	
Installation Site Phone Number:	
Installation Site Facsimile Number:	
Installation Site Contact Name:	
Installation Site Contact Position:	

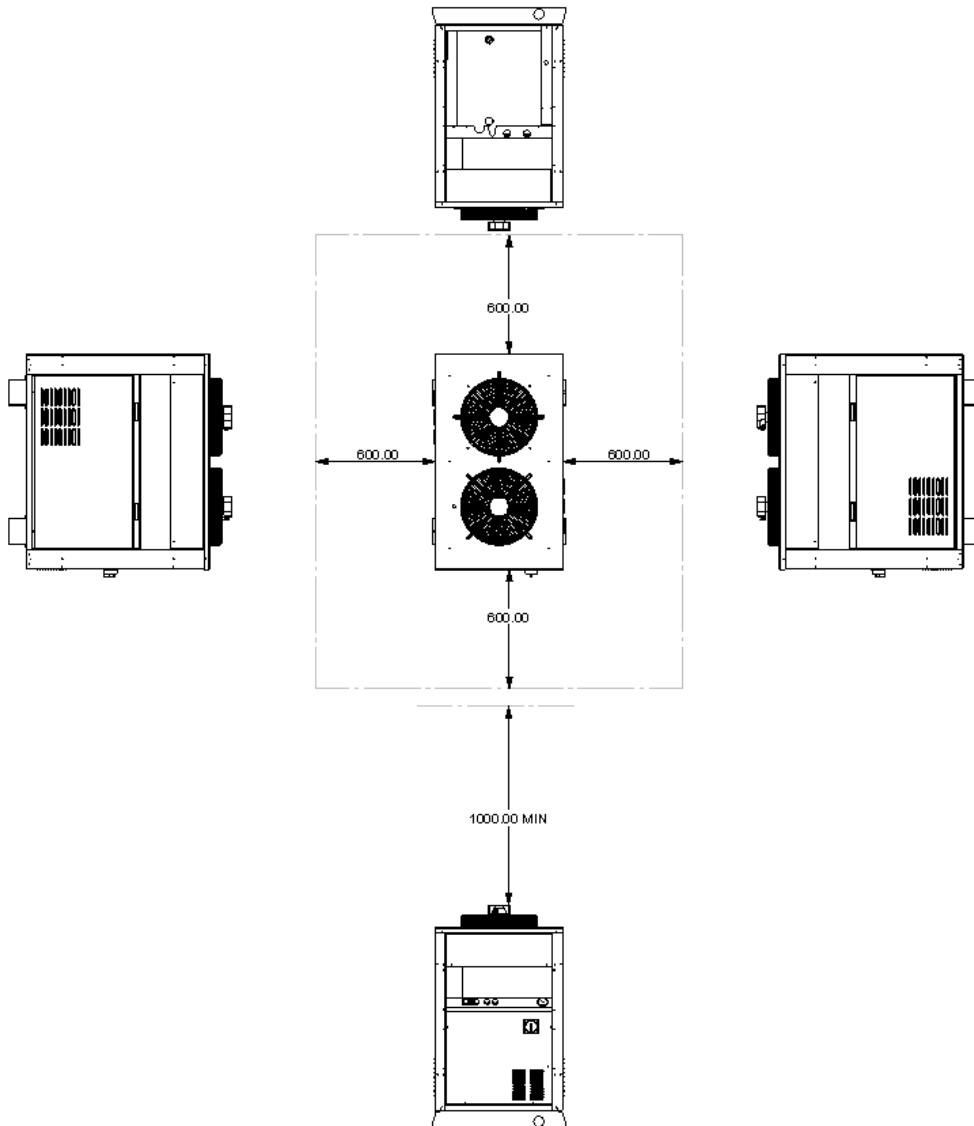
Access Limitations: Any issues relating to service access including after hours access, induction course requirements, hot works permits, confined spaces, safety harness requirements	

Equipment Serviced By Chiller:	

PREVENTATIVE MAINTENANCE

Chiller Installation - Clearances

Mark out any external physical damage, including evidence of rust, on the image below. Highlight any loose or missing screws and identify any walls/fixtures/items that encroach on the clearances detailed.



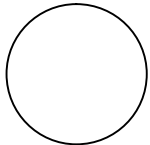
Notes:

PREVENTATIVE MAINTENANCE

<p>Chiller Installation – Refrigeration/Water Circuit</p> <p><i>Cross out any answers that are inapplicable</i></p>
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Inspect Evaporator/Water Circuit			
Evaporator Leak:	YES/NO	If Yes Where: <i>(Tick where applicable)</i>	<input type="checkbox"/> Distributor <input type="checkbox"/> Distributor Line(s) <input type="checkbox"/> Header <input type="checkbox"/> Coil(s)/ Plate Pack <input type="checkbox"/> Tx Valve <input type="checkbox"/> Other
Evaporator Notes:	<input type="text"/> <input type="text"/> <input type="text"/>		
Float Operation: <i>(Tick where applicable)</i>	<input type="checkbox"/> OK . Shuts Off <input type="checkbox"/> Will Not Shut Off <input type="checkbox"/> Damaged	Water Quality: <i>(Tick where applicable)</i>	<input type="checkbox"/> Clean <input type="checkbox"/> Cloudy/Dirty <input type="checkbox"/> Oil Residue <input type="checkbox"/> Surface Scum
Water Circuit Notes:	<input type="text"/> <input type="text"/> <input type="text"/>		

Check Operational Indicators At Front Of Chiller			
Water Pressure:	kPa	Temp Set Point:	°C
Flow rate:	l/s		

Remove Front Cover And Inspect Refrigeration Circuit			
Oil Residue:	<input type="checkbox"/> None <input type="checkbox"/> Suction Rotolok <input type="checkbox"/> Discharge Rotolok <input type="checkbox"/> Receiver Inlet <input type="checkbox"/> Receiver Outlet <input type="checkbox"/> Other	Oil Level: <i>(Draw Level)</i>	
Refrigeration Notes:	<input type="text"/> <input type="text"/> <input type="text"/>		

PREVENTATIVE MAINTENANCE

Tighten Electrical Terminals

Ensure customer has no objections to the chiller being completely turned off at the isolating switch

Notes:	

Refrigeration Operation

Ensure water temperature is within 2 °C of the setpoint prior to recording readings

Connect Pressure Gauges To Suction and Discharge Lines			
Ambient Temp:	°C	Water Temp:	°C
Suction Pressure:	kPa	Discharge Pressure:	kPa
Fans Operational:	Front Only / Both	Sight Glass: (Tick where applicable)	<input type="checkbox"/> Full <input type="checkbox"/> Occasional Bubbles <input type="checkbox"/> Continuous Bubbling <input type="checkbox"/> Dry (Green) <input type="checkbox"/> Wet (Yellow)
Measure Phase Voltages At Circuit Breaker			
Compressor Amps:	(Red) A	(White) A	(Blue) A
Fan Amps:	(Red) A	(White) A	(Blue) A
Pump Amps:	(Red) A	(White) A	(Blue) A
Voltage Levels:	(Red-White) V	(Red-Blue) V	(White-Blue) V

PREVENTATIVE MAINTENANCE

PARAMETER MENU					
MENU ITEM	SETTING	ACTUAL	MENU ITEM	SETTING	ACTUAL
SYSTEM MENU					
SINGLE DUAL/OPN	Single		CLOSE TOLERANCE	OFF	
MASTER /SLAVE	MASTER		HIGH TEMP STOP	YES	
CYCLE CHANGEOVER	Off		LOW TEMP STOP	YES	
NO HE SENSORS	0		VAR SPEED FUNCTION	OFF	
AUX INPUTS	N/O		FAN SPEED CONTROL	YES	
SNMP DATA	FRACTION AL		NETWORK CONTROL	OFF	
SPRAY COOL	OFF				
EMAIL LOG MENU					
EMAIL ALARM ON/OFF	OFF		MANAGE DATA LOG	OFF	
DATA LOG PERIOD	2 MINS				
SET TIME MENU					
TIME ZONE	Set after install		SET DAY OF MONTH	Set after install	
SUMMERTIME ON/OFF	Set after install		SET WEEKDAY	Set after install	
SET YEAR	Set after install		SET TIME	Set after install	
SET MONTH	Set after install				
DELAY HOLD MENU					
ALARM ACK DELAY	30		COMPRESSOR HOLD TIME	120 SECS	
PUMP DELAY TIME	5 SECS 15 WITH BALL VALVE		COMPRESSOR ON TIME	30	
COMPRESSOR OFF TIME	30		HT ACKNOWLEDGE DELAY	30	
SET POINT MENU					
PULL DOWN PER MIN	0.6		FAN MIN SP PRESSURE	900	
TEMPERATYRE HYSTERESIS	2		LP ALARM PRESSURE	80	
CLOSE TOLERANCE TEMP	OFF		LP HYSTERESIS PRESSURE	100	
HIGH TEMPERATURE ALARM	30		FAN MAX SPEED PRESSURE	1600	
LOW TEMPERATURE ALARM	3		HP ALARM PRESSURE	2200	
HIGH RETURN ALARM	30		HP WARN PRESSURE	1700	
LOW RETURN ALARM	3		LP WARNING PRESSURE	100	
MIN TEMP LIMIT	5		FLOW ALARM 1	0.1 l/s	
MAX TEMP LIMIT	20		SUPPLY FLOW WARNING 1	0.5 l/s	
SET PT AMB OTEMP	45		SET POINT TEMP	CUSTOMER SPECIFIC 5 for testing	
SENSOR MENU					
CCT1 SUCT PR SIZE	-.5 to 7 BAR Carel 0-10 BAR - Schneider		SUPPLY FLOW PIPE	DN 25	
CCT1 DIS PR DISCH PR SIZE	0-30 BAR Carel 0-40 BAR - Schneider		TEMP ALL CAL – 1	SEE PROCEDURE	

PREVENTATIVE MAINTENANCE

<p>Cleaning</p> <p><i>Ensure customer has no objections to the chiller being completely turned off at the isolating switch</i></p>

<i>Remove Condenser Side Covers – Wear Safety Glasses When Blowing Out Condenser With Compressed Gas</i>	
Notes:	

<p>General Notes/Feedback</p>

<p>Completion</p>		
<p>Aqua Cooler uses the information from this data sheet to confirm that the chiller is installed and operating correctly. Should any problems or issues be raised as a result of this preventative maintenance procedure then Aqua Cooler will take steps to address them with the customer, ensuring that the chiller operates reliably and without compromise to the long service life we expect of our products. We appreciate any feedback given as all data is used to influence our continual product development program.</p>		
Signature Of Service Agent	Print Name	Date
Signature Of Customer Representative	Print Name	Date

<p>Filing – Aqua Cooler</p>		
Signature	Print Name	Date Of Entry
Specify Follow Up Work Required:		