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K SERIES CHILLERS

KTC, KTD, KTR

STANDARD MODELS

INSTRUCTION MANUAL

Issue 11.5



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1.0 Introduction

By selecting a K series chiller, you have invested in many years' experience in the design and manufacture of precision temperature control instrumentation.

ATC has built your K series chiller without compromise to meet the objectives of performance and reliability. Please read this manual carefully to ensure you understand the operation of the machine and how to use the unit safely and efficiently.

If you have any questions regarding installation or repair of this unit, please contact ATC direct.

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Safety

For your safety we draw your attention to the following **Warning** and **Caution** statements throughout the manual , identified by the symbols...





and





respectively.


The safe operation of a K series chiller always remains the responsibility of the operator.

 **Attention:** *Failure to comply with a Caution will invalidate product warranty and absolve ATC from any liability, howsoever caused, and could result in permanent damage to equipment.*

 **Caution:** *Failure to comply with a 'Warning' may result in personal injury or death. ATC does not accept any liability for injury caused through use of this equipment.*

 **Warning:** If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

 **Warning:** There are no user serviceable parts in this equipment.

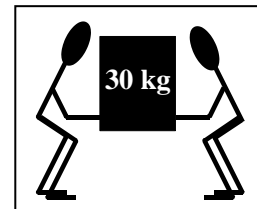
 **Caution:** The high integrity refrigeration system contains no user-serviceable parts. Repair and service requires specialised knowledge and tools. Any unauthorised tampering with the refrigeration system automatically invalidates warranty.

1.1 Unpacking

Please check that both the packaging and the unit are undamaged. If there is any doubt, it is vital that you inform both ATC and the carrier before making a claim on the carrier. There are no hidden shipping bolts or other fixings. You should inspect the packaging for signs of transit damage before signing for the unit, and if possible unpack the unit before signing. Once you have signed for the goods, ATC cannot be held responsible for any transit damage subsequently found.



Warning: 30kg (66lb) – Two-person lift required.



Remove the unit from its original packaging and ensure that there is no packaging left around the cooling ducts.

Please retain all packaging in the unlikely event that the chiller needs to be returned to our local representatives.

1.2 Site requirements

- **Hard, level surface.**
- **Clean, dust free environment.** Air-cooled chillers move large volumes of air, and large amounts of air-borne contamination will result in fouling of the condenser. This will reduce the capacity of the unit and in extreme cases cause a system shut-down.
- **Non-condensing ambient,** from +4°C to +40°C. Maximum cooling capacity is achieved at 22°C, and will de-rate by 2% per °C until capacity is lost at 30°C.
- **Electrical supply.** Two standard versions are available, 230V 50Hz 3A or 115V 60Hz, 6A. Other options are available on request.
- **Ensure there is easy access to the ON/OFF switch**
- **Clearance** front and rear of the unit at least 250mm (10 inches).
- **Plumbing** to be clean and compatible with the fluid to be used. It is advisable that the minimum of right angle bends and compression fittings are used to reduce pressure losses in the pipework. See also section 2.0

1.3 Warranty registration

Please visit the website warranty registration page to ensure ATC can offer you the best possible support;

<https://www.app-therm.com/warranty-registration/>

- a) **For how long is my ATC product under warranty?**
ATC provides a comprehensive return to base 2-year parts, 1-year labour warranty from delivery as standard on all new equipment, provided it has been installed and operated in accordance with the manual.
- b) **Where will ATC fulfill the product warranty?**
ATC's standard warranty terms are Return to Base (RTB) – issues with chillers are often easily solvable over the phone or email, or by reviewing ATC's technical guidance on the web and in the product manual. On occasion, at the discretion of ATC, goods may be serviced on site FOC or a service loan unit may be supplied. Warranty cover excludes the cost of travel by engineers and loan unit rental charges. Obtaining onsite service for a product, even in full warranty, is a chargeable service.
- c) **Who is liable for shipping charges in the event of warranty failure?**
During the **first year** of the warranty period, freight costs to and from ATC are covered by ATC. During the **second year** of the warranty, freight costs to and from ATC are payable by the customer.
- d) **I'm experiencing problems with my chiller. It's within warranty – what do I do next?**
Contact ATC to discuss the issue you are having on +44(0)1530 839998 or support@app-therm.com. Be sure to have your model number and serial number on-hand to aid those attempting to solve remotely.
- e) **Telephone support couldn't fix my chiller – what do I do next?**
An RMA form must be completed. This allows both the end-user and ATC to clarify your details, to set the party responsible for shipping costs, and to set a different return address if desired. Shipping advice is provided, and the end-user must sign a declaration that states the unit is safe to handle. Return the form by email for fastest response.
- f) **What happens if my chiller failed outside warranty or requires non-warranty repair work?**
A purchase order will be requested to cover an initial inspection – this will only be invoiced if the inspection shows there is no fault. If packaging is required, i.e. a crate, a separate charge will be levied. If the end user prefers ATC to arrange a collection, a shipping charge may be levied.
- g) **Our process must continue running – can we have a loan unit whilst our chiller is in repair?**
ATC hold several standard air-cooled chillers at the factory for the sole purpose of offering for loan. These are available on a first-come, first-serve basis. Models up-to 3kW capacity are available.

2.0 Installation

Having ensured that your installation meets all the site requirements identified in section 1.2, it is best practice that the fluid lines between your application and the chiller have the following characteristics.

Fluid line requirements

- *As short as possible.* Ideally between 1 and 2 metres (between 3 and 6 feet).
- *Large diameter.* Ideally at least 12mm (½ inch) internal diameter
- *Black tubing,* to inhibit growth of algae. Alternatively, use solid copper or welded ABS.
- *Free from right angle bends*
- *Clean.* If your installation is to existing pipe work, the system should be flushed clean prior to filling. Hexid fluids are the recommended coolant choice as they provide excellent corrosion protection, freeze protection, algae inhibition and good heat transfer properties.

Caution: Always use ATC recommended fluids in your K series chiller. Never use other anti-freeze mixtures, as they may corrode your application and will damage the K series pump seals.

All connections should be made using the fittings and clips provided. Where threaded or compression type fluid joints are to be made, always use a suitable jointing compound such as PTFE tape.

Voltage selection option

Caution: If your KT chiller is rated for multi-tap and dual frequency operation, it is essential that the voltage selector switch on the KT chiller is set to match the voltage and frequency available at your site. The voltage selector switch cover plate can be found on the right side of the chiller cover, when viewed from the front. Access is via the four securing screws on the cover plate.

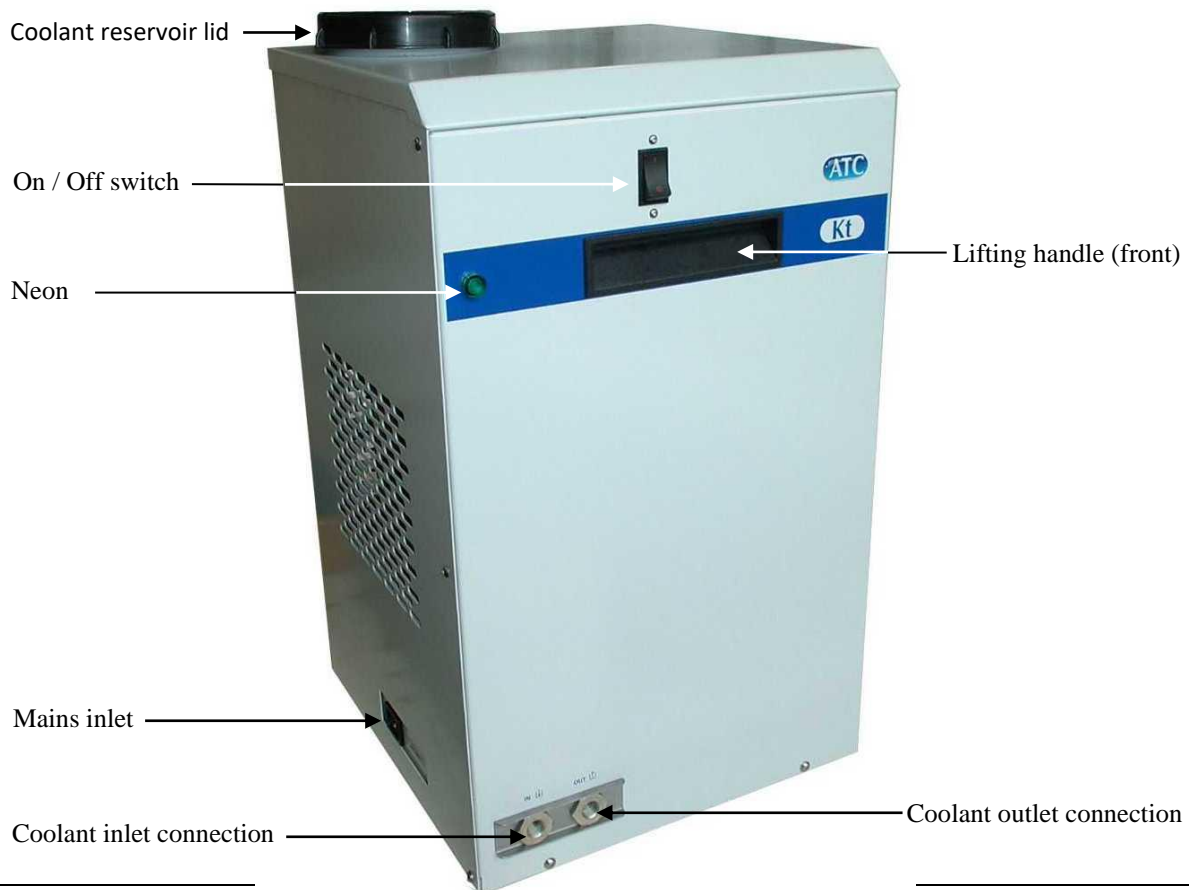
Having ensured that the system is correctly connected, with the inlets and outlets having the correct orientation relative to your application, all joints tight and leak free, and with the unit isolated from the electrical supply, prepare to fill the unit with Hexid fluid.

Chiller filling procedure

1. Check valves in your application are open
2. Remove lid from the coolant reservoir
3. Fill with Hexid to within 40mm (1½ inches) of the tank rim.
4. Switch the unit on.
5. Wait while the fluid level drops in the tank.
6. Switch the unit off.
7. Repeat steps 3 to 5 until all of the air has been purged from the system.
8. Top up to a level 40mm (1½ inches) below the tank rim.
9. Check the inlet and outlet connections, and the inside of your application carefully for leaks. If no leaks are found, the system is ready to be run.

Warning: Always isolate the chiller from the electrical supply when filling the tank.

Component identification photograph, KT series
(model shown is KTR)



3.0 Operation


KTR models only

Connect the mains cable and switch the unit on. The neon will illuminate, and the chiller runs automatically. KTR chillers have been configured to provide temperature stability to $+0.2^{\circ}\text{C}$, and the actual temperature achieved will be in the range 12°C - 20°C , depending on the load and ambient temperature. This model is designed to provide a reliable and inexpensive alternative to tap water.

The pump in the standard version KTR6*** may require priming, simply achieved by switching the unit on and off repeatedly until no bubbles are seen in the tank.

KTC models only

Connect the mains cable and switch the unit on, and the temperature display will illuminate. KTC chillers have been configured to provide temperature stability to $+0.2^{\circ}\text{C}$, and the actual temperature achieved will be in the range 12°C - 20°C , depending on the load and ambient temperature. This model is designed to provide a reliable and inexpensive alternative to tap water.


The KTC includes digital coolant temperature display and high/low temperature and low fluid level alarms. The single neon and  icon provide visual alert to the alarm conditions:

- High temperature alarm: Preset at 25°C – neon, buzzer* and HI warning display
- Low temperature alarm: Preset at 7°C – neon, buzzer* and LO warning display
- Low fluid alarm: Neon and buzzer* and AL warning display

* The buzzer can be muted by pressing the “U” button on the controller.

No adjustments can be made to the factory-set cooling parameters.

KTD models only

Connect the mains cable and switch the unit on, and after a short self-test, the temperature controller will show coolant temperature. The KTD chiller is fitted with a high performance 3 term PID controller, which is capable of controlling temperature to within 0.1°C of set point. The single neon,  alert icon and buzzer provide visual and audible alarm to both high *and* low temperature (triggered if the temperature deviates more than 10°C either side of the set point), and to low fluid level.

Setting a new set point. (KTD Only)

Push the 'P' button, then release it. The display will flash 'SP 1'.

To modify the set point, press the 'UP' button to increase it or the 'DOWN' button to decrease it.

Once the new set temperature is displayed the value is stored automatically after approximately 10 seconds, 'SP 1' will continue to flash during this time.

K 39 Controller error messages

Error	Reason	Action
----	Probe interrupted	Verify the correct connection between probe and instrument and then verify the correct functioning of the probe
uuuu	The measured variable is under the probe's limits (under-range)	
oooo	The measured variable is over the probe's limits (over-range)	
ErAt	Auto-tuning not possible because the process value is higher (with "Func" =HEAt) than [SP- SP/2] or lower (with "Func" =CooL) than [SP+ SP/2].	Swap the instrument to OFF control (OFF) and then to automatic control (rEG) in order to make the error message disappear. Once the error has been found, try to repeat the auto-tuning.
noAt	Auto-tuning not finished within 12 hours	Check the functioning of probe and actuator and try to repeat the auto-tuning.
LbA	Loop control interrupted (Loop break alarm)	Check the working of probe and actuator and swap the instrument to (rEG) control
ErEP	Possible anomaly of the EEPROM memory	Push key "P"

If the set point is moved more than 10 °C the alarm may be triggered. The alarm resets when coolant temperature comes within 10°C of the set point. It is not possible to set the temperature outside the preset values of -4 °C and +35 °C.

Fluid flow and pressure

KT chillers fitted with a 2 or 3 litre per minute pump are capable of producing up to 150 psi, because of the high-pressure volumetric pump. These units are normally supplied factory set to run at an operating pressure of 35 psi, which is suitable for most applications. The pressure setting is controlled by an internal bypass valve, which will open above the preset level to protect your application from higher pressures.

It is possible for customers to change the operating pressure of all K series chillers, except KT chillers fitted with a 6 litre/minute pump¹. For details of this procedure, refer to the technician section.

4.0 Maintenance requirements, Operator

Caution: Failure to carry out service at the specified intervals may permanently damage your equipment. For maintenance and service requirements for technicians, and for troubleshooting, refer to the technician section.

Exterior cleaning: Wipe up any spillages using a damp cloth only. Do not use detergents.

Interval	Actions
Weekly	Check fluid level Check external connections for leaks
Annually	Change the fluid

¹ The 6 litre/minute pump is specially designed for low pressure applications, and the flow rate and pressure settings cannot be changed on these units.

5.0 Technician Section

Warning: Opening the refrigeration system may expose the operative to toxic and corrosive compounds (HF). Take protective measures including suitable eye protection.

Warning: Gases may exceed 300 psi (20 bar) during operation.

Warning: All refrigerants do not support combustion and are asphyxiating gases.

Warning: After switching off, the condenser cooling fan blades continue to rotate. Do not attempt servicing whilst the blades are rotating.

Warning: All chillers contain water and electricity in close proximity. Always ensure the unit is isolated before service. All K series chillers are protected from over current by the master circuit breaker. **Never bypass this component.**

5.1 Fluid flow and pressure adjustment

It is possible to change the operating pressure of all K series chillers, except KT chillers fitted with a 6 litre/minute pump², as follows:

1. Remove the cover from the chiller, giving access to the top compartment.
2. With the chiller running, release the locking nut on the pressure relief valve.
3. Turn the valve knob anticlockwise to reduce the flow/pressure, clockwise to increase the flow/pressure.

² The 6 litre/minute pump is specially designed for low pressure applications, and the flow rate and pressure settings cannot be changed on these units.

Caution:

Changing the flow/pressure with the pressure relief valve will also change the preset pressure safety setpoint. This will move to a lower pressure than the factory setting when decreasing the flow/pressure, and to a higher pressure when increasing the flow/pressure.

Caution:

When the flow/pressure is manually increased by the pressure relief valve, the safety provided by the valve will be affected at higher pressures than standard. For this reason, please ensure that it is safe for your application to operate at pressures in excess of 35 psi. A blockage in your application could result in the pressure exceeding the raised safety pressure.

We recommend that *pressures exceeding 60psi must never be used.*

5.2 Maintenance and service requirements

Caution: Failure to carry out service at the specified intervals may permanently damage your equipment.

Interval	Actions
Weekly	Check fluid level (unless checked by Operator) Check external connections for leaks (unless checked by Operator)
Monthly	Check the condenser (air intake) is free from obstructions or accumulations of debris. Cleaning may be achieved with a domestic vacuum cleaner with brush attachment.*
Annually	Change the fluid (unless changed by Operator) Check for fluid leaks throughout the whole system. Check the condenser for fouling.

* **Caution:** Never blow the condenser out with compressed air.

Caution: If the mains lead is lost or damaged contact ATC who will be able to supply a replacement of the correct specification.

5.3 Troubleshooting

Symptom	Causes
Compressor not running, but fan running	<p>Is the controller displaying an alarm?</p> <p>If there is no obvious cause, check...</p> <ul style="list-style-type: none"> • The condenser is clean • Ambient temperature not above 30°C <p>The likely cause is the compressor's internal protection has been activated and should restart in five minutes.</p>
Noisy operation / High fluid pressure And/or low flow	<p>Check:</p> <ul style="list-style-type: none"> • No restrictions in the pipe work • Pressure set too low (factory set pressure altered?) <p>Clean system with weak detergent solution, rinse thoroughly to remove all detergent. Use Hexid fluid as coolant.</p>
Fluid lines becoming fouled brown or green	<p>Algae contamination.</p> <p>Clean system with weak detergent solution, rinse thoroughly to remove all detergent. Replace fluid lines with black lines, if not already fitted, to inhibit algae growth. Use Hexid fluid as coolant.</p>
Fluid seen leaking from system	<p>Under high humidity conditions, fluid may appear to be leaking from the system. This is usually just condensation but do check for fluid leaks.</p>
Poor cooling	<p>Continued failure to cool may indicate high ambient temperature or excessive load applied to the unit. Check these first</p> <p>Otherwise, may be caused by blocked condenser.</p> <p>Clean with soft brush or vacuum cleaner with brush attachment</p>

6.0 Return of goods procedure

If the unit is damaged during transit, or subsequently develop a fault requiring its return to ATC, the following procedure must be followed.

1. Call the ATC service point on +44(0)1530 839998 or email sales@app-therm.com.
 - You will be issued with a Return Materials Authorisation number ('Q number').
2. Return the completed RMA form to ATC, together with your purchase order number.
3. Pack the returning item securely, enclosing a copy of the completed RMA form, and ensure that the packaging is clearly labelled with the Q number. Neither ATC nor your shipper will be liable for any damage incurred in transit.
4. Upon receipt of the completed RMA form, an engineer will be allocated or a service loan unit* will be despatched if available.

* Please note that ATC will raise an invoice as part of the service loan procedure, and you will receive a credit against this upon the safe return of the loan unit.

Address for return units:

Applied Thermal Control Limited
Goods Inward
39 Hayhill Industrial Estate
Barrow upon Soar
Leicestershire
LE12 8LD
United Kingdom

6.1 Specifications

Environmental

- For indoor use only
- Altitude: up to 2000 metres
- Ambient temperature range: 4°C - 40°C
- Maximum relative humidity: 80% for ambient temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C ambient temperature.
- Mains supply voltage not to exceed $\pm 10\%$ of the nominal voltage.
- Installation Category II
- Pollution Degree 2

KTR



- Cooling capacity: 480 Watts at 22°C
- Dimensions, height x width x depth: 515 x 315 x 315mm (20 x 12.4 x 12.4 inches)
- Weight: 30kg (66lbs)
- Cooling temperature range: 4°C - 30°C
- Pumps available
 - High pressure volumetric type: 2litre/minute or 3litre/minute
 - Low pressure centrifugal type: 6 litre/minute
- Fluid connections: ¼" BSP x 10mm (3/8") Nickel plated brass hose tail adaptors. Custom connections available.
- Temperature stability: $\pm 0.2^\circ\text{C}$, with stable load, dependent on stable ambient temperature
- Power requirements: 3 Amps 230V 50/60Hz, 7 Amps 115V 60Hz
- Warranty: 2 years parts, 1 year labour.

KTC

- Cooling capacity: 480 Watts at 22°C
- Dimensions, height x width x depth: 515 x 315 x 315mm (20 x 12.4 x 12.4 inches)
- Weight: 30kg (66lbs)
- Cooling temperature range: 4°C - 30°C
- Pumps available
 - High pressure volumetric type: 2litre/minute or 3litre/minute
 - Low pressure centrifugal type: 6 litre/minute
- LED temperature display resolution: 1°C standard, 0.1°C option
- Fluid connections: ¼" BSP x 10mm (3/8") Nickel plated brass hose tail adaptors. Custom connections available.
- Temperature stability: $\pm 0.2^\circ\text{C}$ with stable load, dependent on stable ambient temperature
- Power requirements: 3 Amps 230V 50/60Hz, 7 Amps 115V 60Hz
- Warranty: 2 years parts, 1 year labour.

KTD

- Cooling capacity: 480 Watts at 22°C
 - Dimensions, height x width x depth: 515 x 315 x 315mm (20 x 12.4 x 12.4 inches)
 - Weight: 30kg (66lbs)
 - Cooling temperature range: 4°C - 30°C
 - Pumps available
 - High pressure volumetric type: 2litre/minute or 3litre/minute
 - Low pressure centrifugal type: 6 litre/minute
 - LED temperature display resolution: 1°C standard, 0.1°C option
 - Fluid connections: ¼" BSP x 10mm (3/8") Nickel plated brass hose tail adaptors. Custom connections available.
 - Temperature stability: ±0.1°C
 - Power requirements: 3 Amps 230V 50/60Hz, 7 Amps 115V 60Hz
 - Warranty: 2 years parts, 1 year labour.
-

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AUTHORISATION TO COMPILE THE TECHNICAL FILE			
Mitchell Howard, Applied Thermal Control Ltd, 39 Hayhill Industrial Estate, Barrow-upon-Soar, Loughborough, LE12 8LD, UK.			
DESCRIPTION & IDENTIFICATION OF MACHINERY			
Generic denomination;	K-Series		
Function;	Recirculating chiller		
Model;	All with 'K' prefix.		
Type;	Air-cooled or water-cooled vapour compression-based.		
Serial number;			
Commercial name;	As above.		
NOTIFIED BODY			
Not applicable			
QUALITY ASSURANCE SYSTEM			
QMS International Ltd, Muspole Court, Muspole Street, Norwich, NR3 1DJ, United Kingdom. ASCB Registered; 201409-2			
DECLARATION			
<p>The manufacturer declares that the machinery described above fulfils all the relevant provisions of the;</p> <ul style="list-style-type: none"> • Machinery Directive 2006/42/EC. • EMC Directive 2014/30/EU, via harmonised standards; <ul style="list-style-type: none"> ○ IEC 61000-6-2:2005 (Immunity for industrial environments). ○ IEC 61000-6-4:2006 +A1:2011 (Emission for industrial environments). • Low Voltage Directive 2014/35/EU. • RoHS Directive 2011/65/EU (RoHS 2); <ul style="list-style-type: none"> ○ The machinery above contains no Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent Chromium (Cr6+), Polybrominated Biphenyls (PBB) or Polybrominated Diphenyl Ether (PBDE). • RoHS Directive (EU) 2015/863 (RoHS 3); <ul style="list-style-type: none"> ○ Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm ○ Benzyl butyl phthalate (BBP): < 1000 ppm ○ Dibutyl phthalate (DBP): < 1000 ppm ○ Diisobutyl phthalate (DIBP): < 1000 ppm 			
PERSON EMPOWERED TO DRAW UP DECLARATION			
 Robert Poniatowski, CEO Signed in Barrow-upon-Soar, UK, date 6/JAN/2020			

Appendix 1: Water cooled condenser option

The water-cooled condenser option is available as an alternative to the air-cooled standard version.

Chillers with a water-cooled condenser require an in-house cooling water supply, which meets the following recommended specifications:

- 5 litres/minute
- 1 bar minimum differential pressure across chiller
- 25°C maximum temperature, but lower is better

Coolant and house water connections

There are two pairs of water connections on the rear of water-cooled chillers. The lower pair are the recirculating coolant connections; these are the connections for the coolant supply to your application. The higher pair are the connections for the house water supply.

Standard configuration for both coolant and house water is

Inlet	Left
Outlet	Right

with respect to the chiller unit.

All other operation features are the same as those described in the main body of this manual.