

**RC**  
**Recirculating**  
**chiller**

*Operating instructions*

**RC Recirculating chillers**

RC350G

RC400G

RC1400G

RC3000G

## CONTENTS

<b>1</b>	<b>Safety</b>	<b>4</b>
<b>2</b>	<b>Installation</b>	<b>5</b>
2.1	Connection for closed loop circulation	6
2.2	Connection for open loop circulation	6
2.3	Siting the chiller	7
2.4	Filling the reservoir	7
2.5	By-pass	7
2.6	Remote alarm socket	8
2.7	Remote probe	8
<b>3</b>	<b>Operation</b>	<b>8</b>
3.1	The controller	9
3.2	Temperature setting	9
3.3	Over/undertemperature alarm setting	9
3.3.1	Setting high alarm offset	10
3.3.2	Setting low alarm offset	10
3.4	Cooling	10
3.5	Tuning	10
3.6	Undertemperature thermostat	10
<b>4</b>	<b>Safety devices</b>	<b>11</b>
4.1	Undertemperature thermostat	11
4.2	Flow fail cut-out	11
4.3	Overtemperature cut-out	11
4.4	High pressure cut-out	11
4.5	Compressor overtemperature thermostat	11
<b>5</b>	<b>Fault diagnosis</b>	<b>12</b>
<b>6</b>	<b>Technical specification</b>	<b>13</b>
<b>7</b>	<b>Maintenance</b>	<b>13</b>
7.1	Cleaning	14
7.2	Replacement of fuses	14
7.2.1	RC350G, RC400G, RC3000G	14
7.2.2	RC1400G	14
<b>8</b>	<b>Guarantee</b>	<b>14</b>
<b>9</b>	<b>Service</b>	<b>15</b>

## 1 Safety

The following symbols marked on the equipment mean:-



Caution: Read these operating instructions fully before use and pay particular attention to sections containing this symbol



Caution: Surfaces can become hot during use.

### Always observe the following safety precautions



- Use only as specified by the operating instructions, or the intrinsic protection may be impaired.
- After transport or storage in humid conditions, dry out the unit before connecting it to the supply voltage. During drying out the intrinsic protection may be impaired.
- Connect only to a power supply with a voltage corresponding to that on the serial number label.
- Connect only to a power supply which provides a safety earth (ground) terminal.
- Before moving, disconnect at the power supply socket. Do not remove the IEC connector (where applicable).
- Do not check the temperature by touch, use the temperature display or a thermometer.
- To reduce the risk of eye injury during high temperature operation, use safety goggles or spectacles.



- Do not touch surfaces which become hot during high temperature operation.
- Ensure that the mains switch is easily accessible during use.
- Do not block or restrict ventilation slots.
- If liquid is spilt inside the unit, disconnect it from the power supply and have it checked by a competent person.
- It is the users responsibility to carry out appropriate decontamination if hazardous material is spilt on or inside the equipment.
- Do not connect to a power supply or switch on before filling the system.
- To prevent excessive pressure occurring during closed loop operation fill the system to a maximum of 95% of the total volume to allow for liquid expansion.
- Take care when topping up or draining, as the liquid in the system may be very hot or cold.
- If the **alarm** lamp is illuminated do not touch the liquid, it may be very hot. Refill carefully.
- Drain before moving the unit. Before draining allow the liquid to cool to below 50°C or heat to above 10°C.



- Use only liquids specified in the operating instructions, within the specified temperature range. If the **alarm** lamp is illuminated the liquid temperature may be above its recommended maximum: do not inhale the vapours given off as they may be toxic; liquids should be safely discarded and replaced.
- When pumping to external apparatus, always use connecting pipe or hose suitable for the operating temperature and liquid used, and check that the pipe connections are secure.
- Do not disconnect any pipes or hoses while they contain very hot or cold liquid.
- Refrigerated circulators are heavy, take care when lifting or moving; empty weights vary from 24kg to 88kg.



## 2 Installation

Remove packing materials carefully, and keep for future shipment or storage of the unit.

Packs contain:

- Recirculating chiller: RC350G, RC400G, RC1400G, RC3000G
- Mains cable
- Operating instructions
- Optional remote probe

PRES Reservoir accessory pack:

- PRES Reservoir
- 2 x Clips
- 2 x 3/8" to 1/2" adaptor
- 4 x M4 CSK screws
- Mounting instruction drawing

Optional Remote Probe

### Rear view: RC350G/400G/1400G chiller

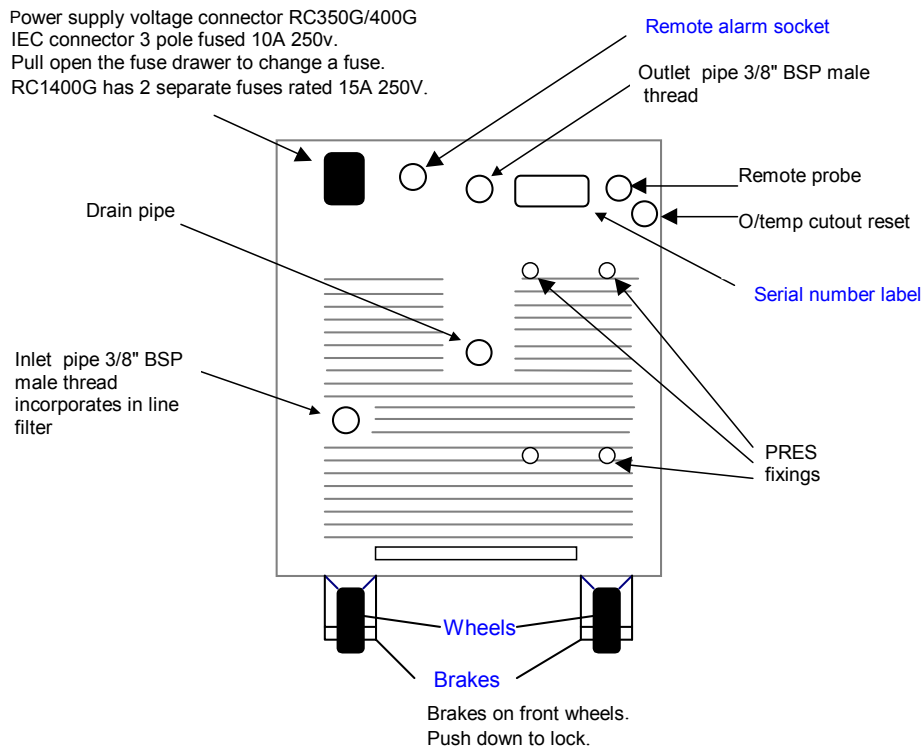
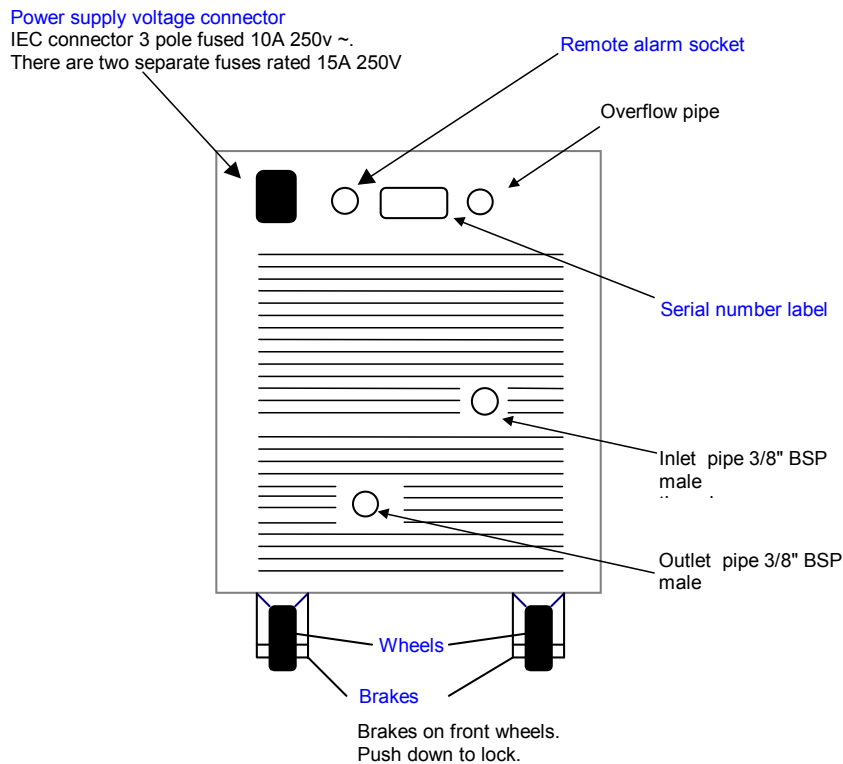


Figure 1

**Rear view: RC3000G**



**Figure 2**

**2.1 Connection for closed loop circulation**

**Use pipe of a suitable bore, which will withstand a pressure up to 40psi.**

The IN-let and OUT-let connections (3/8" BSP Males) are on the rear panel of the chiller (see figures 1 and 2). Connect the unit to the external apparatus; ensure that the connections are liquid tight. The RC should be as close as possible to the apparatus.

**Connection for closed loop circulation with PRES Reservoir**

The PRES Reservoir can simplify the priming of systems when operating a Closed Loop system that has no filling port available on the suction side of the pump

Attach the PRES reservoir to the rear panel of the circulator according to the instructions provided. Remove the 3/8" BSP straight connector from the IN-let pipe. Screw one end of the flexihose assembly onto the IN-let pipe, then connect to the reservoir by holding the pipe in position whilst turning the other swivel connector on the reservoir on to the other stationary end of the flexihose. **IF YOU ATTEMPT TO CONNECT IT ANY OTHER WAY THIS WILL KINK THE HOSE.**

**2.2 Connection for open loop circulation**

When circulating through an open tank, connect the RC inlet to the lowest point of the tank. The RC outlet hose should be positioned as far as possible from the RC inlet hose. Unless the set temperature of the liquid in the tank is the equal to the ambient temperature, insulate the tank.

### 2.3 Siting the chiller

Lift the chiller by the four bottom corners. Take care when lifting as the chillers weigh between 42 and 90 kg when empty.

For the most efficient operation, position the chiller so that the air flow through and around it is not restricted. There should be at least 100mm clearance on all sides. Lock the wheels to ensure that the chiller stays in place.

If the RC is to be stored below a bench, make sure that the hosing and power cable are long enough to allow it to be removed.

**Do not move the chiller while it is operating.**

### 2.4 Filling the reservoir

Liquid specification.

+10°C to +60°C	water (tap or distilled)
-10°C to +30°C	60% water, 40% inhibited ethylene glycol.

WARNING - inhibited ethylene glycol is TOXIC: Follow the manufacturer's instructions. For safe disposal consult your local Environmental Health Office.

Check that all hose connections are liquid tight.

Set the water/glycol switch to water/glycol. Remove the filler cap and fill the reservoir. Allow the liquid level to fall, refill until the liquid level remains constant. For RC3000G remove the cap from the overflow tap. Open the tap and position a container under the tap. Fill the reservoir until liquid flows from the overflow. Close the tap and proceed as: RC350G, RC400G and RC1400G. If the system is circulating through an open tank, refit the filler cap and fill the open tank. Plug in and switch the power on. A buzzer will sound and the general alarm will light. This indicates that there is no flow. Press the flow fail override switch for about 5 seconds and release. The buzzer and general alarm light will switch off and the pump will run. To stop the chiller cooling or heating during filling switch off the cooler (RC350G, RC400G, RC1400G only) and set the temperature equal to the actual temperature. Refer to section 3.2 for temperature setting.

In a closed loop system, to prevent excessive pressures occurring when the liquid circulates system, allowances for the expansion of the liquid with temperature must be made. Therefore the system should not be filled to more than 95% of its total volume, thus leaving 5% for expansion at the top of the system. **DO NOT OVERFILL THE SYSTEM.**

For open loop circulation top up the tank.

With the PRES Reservoir on a closed loop system filling is done by the reservoir. First remove the cap from the main reservoir on top panel of the unit. Pour water in until it covers the cooling coil and just starts to come up the side of the filler tube (this will allow for expansion). Then replace the cap. Filling can then be done through the PRES Reservoir on the rear panel by removing the top cap and pouring in water whilst switching on the pump. Any air in the system should be flushed through and should appear bubbling up at the bottom. Once it stops bubbling, fill the reservoir until 1/3 full and replace the cap. **it's important that you replace the cap to prevent any syphoning from occurring once the unit is switched off.**

### 2.5 By-pass

Systems where there is low flow due to restrictions in the external system (below 2 litres per minute) it is recommended to fit a by-pass (RC-BYP).

To operate with the RC-BYP, fill the system as much as possible and, with the by-pass valve fully open (clockwise), start the circulator. Continue to top up the reservoir until the level remains stable. Replace the filler cap securely and proceed to close the by-pass valve (anticlockwise) until it is fully closed or the circulator cuts out. If the circulator cuts out, open the by-pass valve 1/2 a turn and press the flow fail reset. The circulator should start and continue to pump, if not continue to open the by-pass valve in 1/2 turn stages. Once the unit is pumping, open the filler cap, top up the reservoir, then replace and securely refit the filler cap.

## 2.6 Remote Alarm Socket

This alarm is operative whenever the liquid temperature goes outside the user-settable bands around the set point. The factory setting for these alarms is 10°C above and below the set point; to alter the setting, refer to section 3.3. During the initial heat up or cool down phase, or whenever the set temperature is changed, the alarm is disabled. The alarm is also operated by the flow fail and a separate overtemperature cutout that operates when the equipment has gone outside its upper range. The alarm relay contacts are connected to a three pin Alarm output socket on the rear of the unit, for the attachment of an external alarm device - a light or buzzer for example. The contact ratings are 2A at 240V

Connect the external alarm socket pins as follows:

- Pin1 Ground
- Pin 2 Output
- Pin 3 Output

## 2.7 Remote Probe

Plug remote probe into socket on rear panel, if required.

Place remote probe in liquid which is to be temperature controlled. Clamp in position so that it cannot be accidentally pulled out of liquid.

## 3 Operation

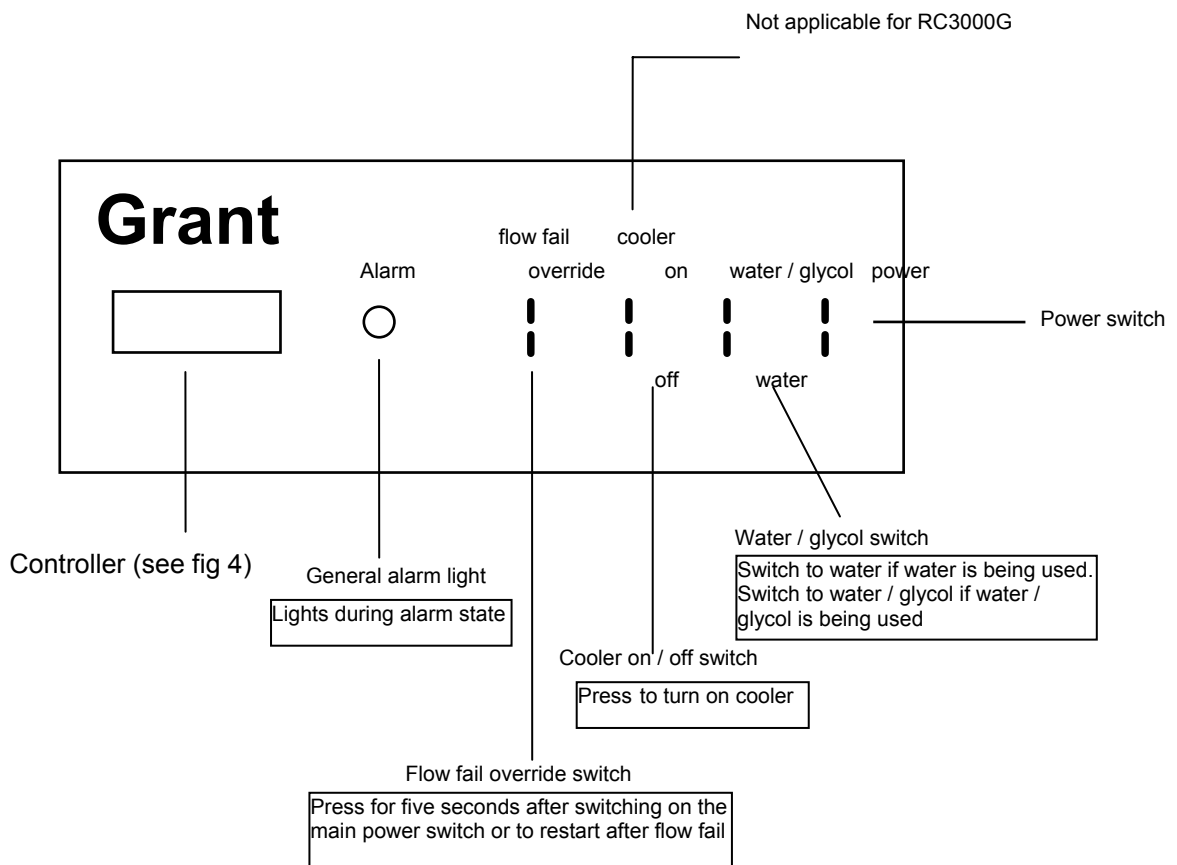
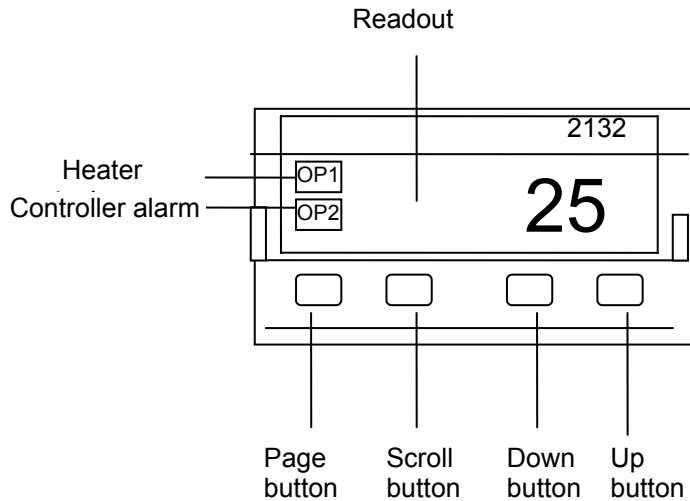


Figure 3





**Figure 4**

### 3.1 The controller

The controller (see Figure 4) is used to set the operating temperature, high and low temperature alarm levels and to initiate the self tune routine. During operation the actual liquid temperature is shown on the display. To view the set point, press and release the  or  button.

### 3.2 Temperature setting

To set the required operating temperature, press the  or  button until the required temperature is displayed. Two seconds after releasing the button the new value will be accepted and the display will revert to showing the actual temperature.

RC350G, RC400G and RC1400G control the liquid temperature by using a heater to balance the effect of the cooling power. They can also be used as heated circulators to raise and control the temperature of external equipment up to 60°C.

RC3000G controls temperature using a hot gas bypass system, which is effectively an on-off control for the refrigeration system; this is highly energy efficient, but means that the RC3000G can not be used for heating: the most stable performance is achieved when cooling a large volume with a stable heat load.

### 3.3 Over- and undertemperature alarm setting

The overtemperature and undertemperature alarms are set as an offset from the operating temperature, not as actual temperature values. For example, you might set the overtemperature alarm to operate if the temperature rises more than 5°C above the operating temperature.








Once set, the alarm levels will follow the operating temperature, always maintaining the same offset. This means that you don't have to reset the alarm levels each time the operating temperature is changed. You can, of course, change the alarm offset levels at any time.

The alarms are blocked until the chiller has reached its operating temperature - they will not operate during the initial cooling or heating phase.

These alarms are not safety devices; their only function is to attract attention.






If the alarms operate they will switch off when the temperature returns to within the offsets.

### 3.3.1 Setting high alarm offset

After setting the required temperature, press the  button until the display reads "1dHi". Press and release    button to display the present value of the high alarm. Press  the  or  button again to set the new value for the high alarm.

**Example:** If the set temperature is 15°C and you want the high alarm to operate if the temperature rises above 20°C, set the high alarm offset to 5°C.

### 3.3.2 Setting low alarm offset

Press the  button until the display reads "2dLo". Press and release the  or  button to display the present value of the low alarm. Press the  or  button again to set the new value for the low alarm.

**Example:** If the set temperature is 15°C and you want the low alarm to operate if the temperature falls below 5°C, set the low alarm offset to 10°C.

## 3.4 Cooling





Switch on the cooler for cooling of external loads. Cooling can be controlled at 60°C or below. However, if there is no external heat load, the RC cannot maintain an operating temperature of above approximately 35°C with the cooler switched on.

Do not switch the cooler on if:

- i) circulator has been tilted by more than 25° during the past six hours.
- ii) if the cooler was switched off within the last 10 minutes.

## 3.5 Tuning

You will normally need to tune the controller only once, during the initial commissioning of the process. However, if the process under control subsequently becomes unstable (because its characteristics have changed), you can retune again at any time for the new conditions. It is best to start tuning with the process at ambient temperature. This allows the tuner to calculate more accurately the low cutback and high cutback values that restrict the amount of overshoot or undershoot.

Press the  button until the display reads 'tunE', then press the  or  button to select 'on'. Press the  button again to revert to the display of the actual temperature. Self-tune is now in operation; the display will flash 'tunE' to indicate that tuning is in progress. Set the setpoint to the value at which you will normally operate the process. The controller will wait for one minute during which time you can change the setpoint. When the display stops flashing 'tunE' tuning is complete.

## 3.6 Undertemperature thermostat

To protect the system from freezing when water is being used, switch the water/glycol switch to water, a low temperature cutout will operate below + 10°C, switching the cooler off. The cooler will switch on again when the water temperature has risen to approximately +15°C. For operating temperatures below +10°C, we recommend that water/glycol is used and the switch set to water/glycol.

It is possible to run the system using water at temperatures down to +5°C, with the water/glycol switch set to water. Once the liquid temperature has reached +10°C, reduce the set temperature in 1°C steps to +5°C.

## **4.0 Safety devices**

### **4.1 Undertemperature thermostat**

See section 3.6. There is no alarm for this function.

### **4.2 Flow fail cut-out**

If there is no liquid flow everything stops working except the controller, and the alarms operate. When the chiller is first switched on there is no flow. Press the flow fail override switch for 5 seconds to start the flow. The alarms will switch off when the flow starts.

### **4.3 Overtemperature cut-out**

This prevents the heater chamber from overheating. If the temperature rises above 63°C the heater switches off and the alarms operate.



### **4.4 High pressure cut-out**

If the pressure in the refrigeration system reaches 20 bar the cooler switches off. There is no alarm for this function. A competent technician should reset the cut-out, referring to the service manual for instructions.

### **4.5 Compressor overtemperature thermostat**

If the compressor overheats the cooler will switch off. The cooler will automatically switch on again when the compressor has cooled down. There is no alarm for this function.

## 5 Fault diagnosis

	Symptom	Cause	Reason/Recovery procedure
	Power switched on	No power	Check that the chiller is connected to the CORRECT power supply voltage, check all fuses.
	Buzzer sounding Controller displays 1dHi or 2dLo	Temperature outside values set for over- or undertemperature alarm	The external heating load has increased so that it is too large for the cooler or the external cooling load has increased so that it is too large for the heater, so the chiller cannot control to the desired temperature. There is no recovery. Change the set temperature or use a more powerful circulator.
	Buzzer sounding General alarm light on	Flow fail alarm	Switch off the power to the chiller. Check the liquid level in the reservoir. Check that all hoses are connected correctly are water tight and that there are no blockages, air bubbles or kinks. If the set temperature is below 5°C check that the correct mix of water/glycol is being used (60% water 40% glycol). Drain or isolate the liquid to the input pipe before unscrewing and checking the inlet filter which is fitted to the inlet pipe (this can be checked without removing pipework). Switch the power on again and press the flow fail override switch for 5 seconds.
	Buzzer sounding General alarm light on Controller displays 1dHi RC cannot heat to set temperature	Over temperature cut-out  Cooler switched on	Over temperature due to malfunction of cooler, heater or flow fail. A competent technician should reset the cut-out, refer to the service manual. If the chiller fails to restart contact Grant's service department.  Switch cooler off. If this has no effect see below.
		External cooling load too large for RC.	There is no recovery. Either change the set temperature or use a more powerful circulator.
	RC cannot control at temperatures below 4°C	External heat source is too large for chiller capacity.	The external heat load is too large for the cooler so the chiller can not control to the desired temperature. There is no recovery. Either change the set temperature or use a more powerful device.
	Cooler not operating	Cooler not switched on	Switch cooler on. If cooler doesn't start see below.
		Undertemperature thermostat	Check that water/glycol mixture is in the system and switch the water/glycol switch to water/glycol. If the chiller does not start, see below.
		Compressor over-temperature thermostat	Check that the front and rear grilles are not obstructed and that the condenser is free from dust. Allow the compressor to cool down (typically 20 to 30 minutes); it will automatically switch on. If unit still does not start see below.
		Refrigeration high pressure cut-out	Switch off and contact Grant service department or arrange for a competent technician to consult the service manual.
	Controller displays S.br Alarm lights on Buzzer sounding	Sensor fault (if fitted)	Check remote probe is plugged in. Switch off and contact Grant service department.
	Controller displays Err1/2/3	Controller failure	Switch off and contact Grant service department.
	Controller displays Err 4	Controller keyboard failure	Switch the power off and then on without touching any of the controller buttons. If the fault does not clear switch off and contact Grant service department .

**6 Technical specification**

This equipment is for indoor use and will meet its performance figures within the ambient temperature range 10°C to 35°C, with maximum relative humidity of 80%. Installation category II (transient voltages). Pollution degree 2 in accordance with IEC 664. For operation at altitudes of up to 2000 metres.

Conforms to IEC61326-1 (EN 61326-1) Class B except where indicated \*.

**Class B equipment** is for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

**Class A equipment** is suitable for use in establishments other than domestic and those directly connected to a low voltage power supply network, which supplies buildings used for domestic purposes.

Supply voltage 220 - 240V 50Hz

	RC350G	RC400G	*RC1400G (Class A)	RC3000G
Temperature range	- 5°C to 60°C	- 10°C to 60°C	- 10°C to 60°C	- 10°C to 60°C
Stability (DIN 58966) @ 20°C with 10L of water at 20°C with 25L of water	± 0.25°C -----	± 0.25°C -----	± 0.25°C -----	----- ± 0.5°C
Cooling power @ 20°C in 20°C ambient	0.325kW	0.375kW	1.1kW	2.8kW
Pump Head Pressure @ 1L/min	22.5psi	9psi	22.5psi	22.5psi
Liquid flow rate	15L/min	12L/min	15L/min	15L/min
Power rating @ 230 V	1.5kW	1.5kW	3.0kW	2.0kW
Heater power	0.75kW	0.75kW	1.5kW	-----
Weight	42Kg	42Kg	53Kg	88Kg
Dimensions D / W / H	600 / 370 / 510	600 / 370 / 510	630 / 380 / 590	840 / 490 / 640
Reservoir capacity	1.7L	1.7L	2.5L	1.1L
Pipe connections	_____ 3/8 " BSP male _____			

Ambient working conditions

Operation: Safe operation ambient 5°C - 40°C

Liquid specification. Use only the following liquids.

+10°C to +60°C water (tap or distilled)  
-10°C to +30°C 60% water, 40% inhibited ethylene glycol.

**WARNING - TOXIC:** Follow manufacturer's instructions. For safe disposal consult your Local Environmental Health Office

## **7 Maintenance**

All Grant laboratory products are designed to comply with IEC1010-1 and can be flash tested. Some are fitted with radio frequency interference suppressers. Therefore it is recommended that only a d.c. test is performed.

Routine maintenance:

Check monthly that dust is removed from the grilles.

Check monthly that the line strainer which is fitted on the inlet pipe is clean, particularly when foreign particles can enter the pumped liquid. Switch off, and shut off and drain any head of liquid. Undo the strainer retaining nut on the underside of the brass fitting, remove the strainer and clean it. Refit by reversing the procedure.

Inspect and replace where necessary any worn or damaged hoses.

### **7.1 Cleaning**

The case can be cleaned with a damp cloth after disconnection. Do not use solvents.

Before using any decontamination or cleaning method except that recommended, check with our service department, or in other countries with our distributor, that the proposed method will not damage the equipment

### **7.2 Replacement of fuses**

Fuse replacement should only be carried out by a competent person.

#### **7.2.1 RC350G and RC400G**

Disconnect the unit from the power supply.

Remove the IEC plug from the socket in the back of the bath.

Press down the fuse drawer catch.

Pull out the fuse drawer, check and replace with the correct fuses if necessary.

The fuses should be 1.25 x 0.25 inch ceramic quick acting, rated: 10AF 240V.

Push back the drawer and replace the IEC plug.

#### **7.2.2 RC1400G and RC3000G**

Disconnect the unit from the power supply.

Locate the fuses on the control unit rear panel to the power cable inlet.

Use a screwdriver of correct size to turn the fuse holder cap a quarter turn anti-clockwise to release the fuse holder cap.

Check and replace fuse if necessary.

Replace with correct fuses.

The fuse should be 1.25 x 0.25 inch ceramic quick acting rated 15AF 240V.

Replace the fuse holder cap.

## **8 Guarantee**

When used under laboratory conditions and according to these instructions this chiller is guaranteed for three years against faulty materials or workmanship.

**9 Service**

For service, return for repair to our Service Department or, in other countries, to our distributor.

Grant Instruments (Cambridge) Ltd  
Service  
Shepreth  
Cambridgeshire.  
SG8 6GB  
England

Tel:           **+44 01763 260811**  
Fax:           **+44 01763 262410**

Grant Instruments (Cambridge) Ltd.  
Shepreth,  
Cambridgeshire,  
SG8 6GB  
England

Tel: +44 (0) 1763 260811  
Fax: +44 (0) 1763 262410  
EMAIL: [marketing@grantinst.co.uk](mailto:marketing@grantinst.co.uk)  
INTERNET: <http://www.grant.co.uk>