



## Low temperature bath/circulator R series

*Operating Manual*

**Grant Instruments**, based near Cambridge, England is a world leader in the manufacture and design of equipment for sample preparation, scientific analysis, data acquisition and data analysis providing solutions to the global scientific and industrial markets.

### **Standards Compliance and Quality**

Grants' brand and reputation are based around quality, reliability and accuracy. We ensure our products stringently meet all necessary international safety standards. We pay particular attention to the safety testing of products and remain at the forefront of the product safety standard for laboratory equipment IEC 61010-1. The company is committed to operating its safety test laboratory in accordance with the requirements of ISO 17025.

Grant operates a Quality Management System that complies with the requirements of BS EN ISO 9001:2008.

Beyond compliance to the standard, Grant is committed to continually improving in everything we do; with particular emphasis on understanding what matters to our customers and suppliers, and designing our systems and work to meet their needs.

If you have any feedback on Grant's products or services we would like to hear from you. Please send all feedback to:

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## 1.0 Use of products

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The following products are covered by this operating manual:

- R1 & R1L
- R2 & R2L
- R3 & R3L
- R4 & R4L
- R5

The products listed above low temperature circulators designed for indoor laboratory use by a professional user.

Grant R series low temperature baths/circulators (referred to as R unit in this text) are designed to be used with a Grant Optima™ heating circulator (referred to as Optima unit in text). They provide a source of cooling for many sensitive analytical procedures. Applications requiring the precision temperature control of samples include spectrophotometry, viscometry, refractrometry and electrophoresis. Grant's range of more powerful chillers are ideally suited for applications requiring the removal of the mechanical or electrical heat produced in apparatus or machinery, combined with a higher pressure flow for faster heat removal within restricted systems.

## 2.0 How to use this operating manual

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This operating manual will allow you to unpack, set-up and operate the R unit correctly and safely. Important safety information, symbols and warnings are listed below and should be read carefully. Section 4 gives information about how to unpack and install the product correctly. Section 5 gives provides operating information. Product technical specifications and tips are provided in sections 6 and 7. The warranty for this product is for THREE YEARS and is detailed in section 8 and should be registered by completing the on-line registration form at [www.grantinstruments.com](http://www.grantinstruments.com).

If there is a technical matter that this operating manual does not address, or any other question concerning this product, please contact Grant Instruments or your local distributor, who will be able to provide any additional information.

## 3.0 Safety information

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### 3.1 Safety compliance

The Grant R series low temperature bath/circulator meets the requirements of international safety standard IEC 61010: Safety requirements for electrical equipment for measurement, control, and laboratory use.

### 3.2 Safety symbols

The symbols below are marked on the equipment and throughout this manual to indicate:



Caution: Surfaces and heat transfer liquid can be hot during and after use.



Read this manual before using the bath.



Important safety warning.

### 3.3 Safety warnings



Read the whole of these instructions. Safety may be impaired if they are not followed.



Only use liquids specified in these 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.



Do not use the R series unit with flammable heat transfer liquids.



Do not use the R series unit to heat any sample material that could cause a fire or any other kind of hazard.



Do not use the equipment in an area where there are aggressive or explosive chemical mixtures.



If a potentially hazardous liquid is spilt onto or inside the equipment, disconnect it from the power supply and have it checked by a competent person.



Before moving, disconnect from the mains power supply



It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on the equipment.



If the alarm lamp is illuminated do not touch the liquid or the tank base, they may be very hot. Refill carefully, a hot heater can cause a spattering of very hot water droplets and scalding steam.



Do not touch surfaces which become hot during high temperature operation.

## 4.0 Operating instructions

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### 4.1 Unpacking instructions

Standard equipment includes:

- R series refrigeration unit with lid
- Communications cable (except R1 & R1L)
- Interconnect mains power cable (R1, R2 & R3 only)
- Mains cord with plug (R4 & R5 only)
- Operating manual



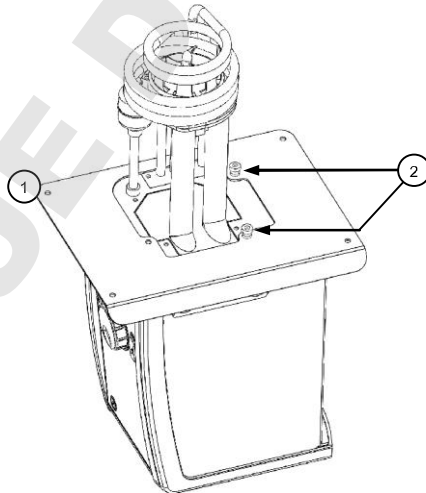
R series refrigeration units weigh between 20kg and 47kg. Take necessary precautions when moving and lifting.

Remove packing materials carefully and retain them for future shipment or storage of the equipment.

### 4.2 Fitting the controller to the R unit

The Optima unit can be fitted in two orientations on the R unit facing over the tank opening or outwards

1. Remove the bridge plate from the R unit tank by unscrewing the four black thumb screws.
2. Fit the Optima unit through the hole in the bridge plate and align using the locating threads. Secure using the retaining nuts. Hand tighten only.
3. Re-attach the bridge plate onto the R unit, using the retained black thumb screws.



### 4.3 Recommended liquids

The following table lists the recommended liquids for different temperature ranges. Always ensure the liquid used is safe and suitable for your working temperature. If using non-recommended heat transfer liquids, it is the responsibility of the user to conduct an assessment to ensure the intended fluid is compatible with the R unit. If in doubt please contact the Grant technical support team.



To ensure protection the overtemperature cut-out must be set appropriately for the heat transfer liquid selected (see table below).



If using non-recommended heat transfer liquids it is important to set the over-temperature cut-out to a value no higher than 25°C below the fire point of the liquid.



Use fume extraction when using silicone fluids at elevated temperatures

Temp range	Recommended liquid	Comments
-50°C to 50°C	Silicone oil – low viscosity	Bayer silicone M3. Follow the manufacturer's instructions. For safe disposal consult your local regulations.
-30°C to 30°C	50% water, 50% antifreeze (inhibited ethylene glycol)	WARNING: Ethylene glycol is toxic – follow the manufacturer's instructions. For safe disposal consult your local regulations. Use a lid to reduce the dilution of the mixture caused by condensing water vapour from the air, and to maintain the cool down rate.
0°C to 30°C	80% water, 20% antifreeze (inhibited ethylene glycol)	
5°C to 99.9°C	Water*	Water can be used but care should be taken above 60°C as hot vapour can be dangerous. Use a lid or polypropylene spheres above 60°C to ensure good performance & reduce evaporation. At temperatures approaching 99°C the temperature performance will be affected due to localised boiling. The units should not be used to boil water.
70°C to 120°C	Silicone fluid Viscosity ~20cs Flash point ≥230°C Fire Point ≥280°C	Dow Corning DC200/20 silicone fluid is a suitable liquid – follow the manufacturer's instructions. For safe disposal consult your local regulations.

\* See section 7.1 for further details

#### 4.4 Installation

After transportation, let the unit stand in its intended working position for six hours. This is to allow the oil to drain to the bottom of the compressor. This is normal procedure for refrigeration compressors. Allow at least 100mm clearance from obstructions on all sides so that there is free air flow through the unit, from the front to the back (this also has the advantage that air is not blowing directly out of the sides onto instruments next to the R series unit).



Place the unit a level, non-combustible surface. Ensure that the mains plug and the switch at the rear of the unit are easily accessible.



If the equipment has been transported or stored in cold or humid conditions, condensation may form inside it. If that could have happened, allow time (at least 2 hours at room temperature) for the condensation to evaporate before using the equipment.



Do not block or restrict ventilation slots.



Do not connect to a power supply or switch on before filling the tank.



Drain before moving the unit. Before draining allow the liquid to cool below 50°C.



Do not touch the condenser fins, they are sharp and may cause injury.

#### 4.5 Electrical supply



Connect the R unit to a grounded (earthed) electrical power supply with voltage and frequency within the range specified on the serial number plate.



The R unit must only be connected to the mains using the mains cord supplied or one with an identical rating (see section 9.4)



Ensure the mains switch and isolating device (power supply connector) are easily accessible during use.



## 5.0 Operating procedures

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### 5.1 Operation

#### 5.1.1 Liquid level

Fill the tank to an appropriate level with a liquid suitable for your working temperature; see section 4.3 for liquid options. Allow for thermal expansion and contraction of the liquid during operation and for any liquid in external circulation paths. If using liquids that can evaporate then periodic checking and refilling should be completed. The low level float switch will alarm if the liquid level drops below the minimum required level and the unit will switch off the heater and stop temperature control.

#### 5.1.2 Operation above 60°C

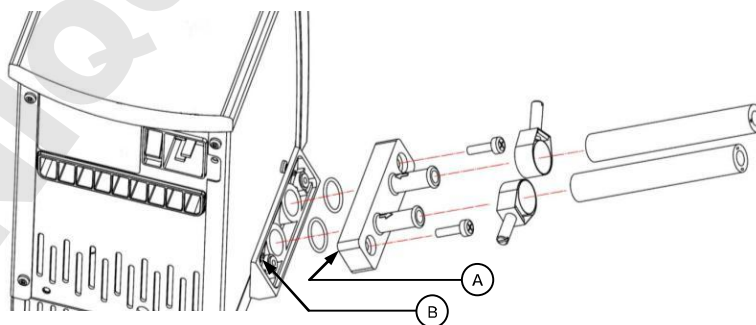
A lid or polypropylene spheres must be used above 60°C to maintain temperature control and to ensure that the bath fluid temperature reaches the set point. They will save energy by preventing excessive evaporation and reduce the frequency that the bath needs to be refilled.



Take care when lifting and removing the lid as it may be hot. Steam and hot vapours can cause scalding.

#### 5.1.3 Using the control unit pump

The Optima unit allows liquid to be pumped around a closed external system (not open to the atmosphere). It cannot be used for circulation through an external open tank. The pump is fitted with a blanking plate as standard. Fit a pump connector plate as shown below. Ensure o-rings are located in the grooves, use silicone grease to hold the o-rings in place. Note: the blanking/connector plates have a locating hole (see A below) to assist correct alignment onto the pump moulding. It is important to verify the hole is aligned with the corresponding locating pin (see B below) on the pump moulding. Failure to do so will result in a leaking connection. Retain the blanking plate for refitting when the pump is no longer required.



Always use pump connectors and hoses that are suitable for the operating temperature and liquid used. Check the pipe connections are secure.



Never disconnect any pipes or hoses while they contain very hot or very cold liquids or while the Optima unit is pumping.



Never use silicone oil with silicone tubing.

Pumping heat transfer liquid around an external system can lead to hazards that are outside the control of Grant Instruments. It is essential that the user conducts a risk assessment of the entire equipment installation to ensure that correctly rated materials have been used throughout and that the system can be used safely.

#### 5.1.4 Emptying the R unit

The R unit tank should be emptied to a safe level prior to moving. A drain tap is included on R2, R3, R4 & R5 units to allow convenient emptying. See section 5.2.3 for full details.



Allow the liquid temperature to fall below 50°C before emptying.

#### 5.1.5 Setting up and switching on

Follow instructions in section 5.1.3 to attach the pump connector plate and insulated hose. Before filling and switching on, attach the open end of the hose to the application, taking care to note the inlet and outlet.



Ensure all hoses are connected securely. Liquid will begin pumping immediately once the equipment is switched on.

Add the appropriate working liquid to the bath to at least the minimum recommended fill level such that the float level switch is fully raised.

#### Power supply for the R1, R2 & R3 units

The Optima unit takes its power from the mains socket outlet on the rear of the cooler unit, (see Section 5.2.2) via the interconnecting power cable. Plug one end of this interconnecting cable into the power inlet socket on the rear of the Optima unit and the other end into the socket outlet mounted on the rear of the cooler unit. Plug the mains cable into the fused power inlet socket on the rear of the refrigeration unit.

Switch on the R unit using the power switch on the front of the R unit and rear of the Optima unit. The motor will start immediately and the buzzer will sound while the unit starts up. The low temperature bath/circulator is ready to use.

#### Power supply for the R4 & R5 units

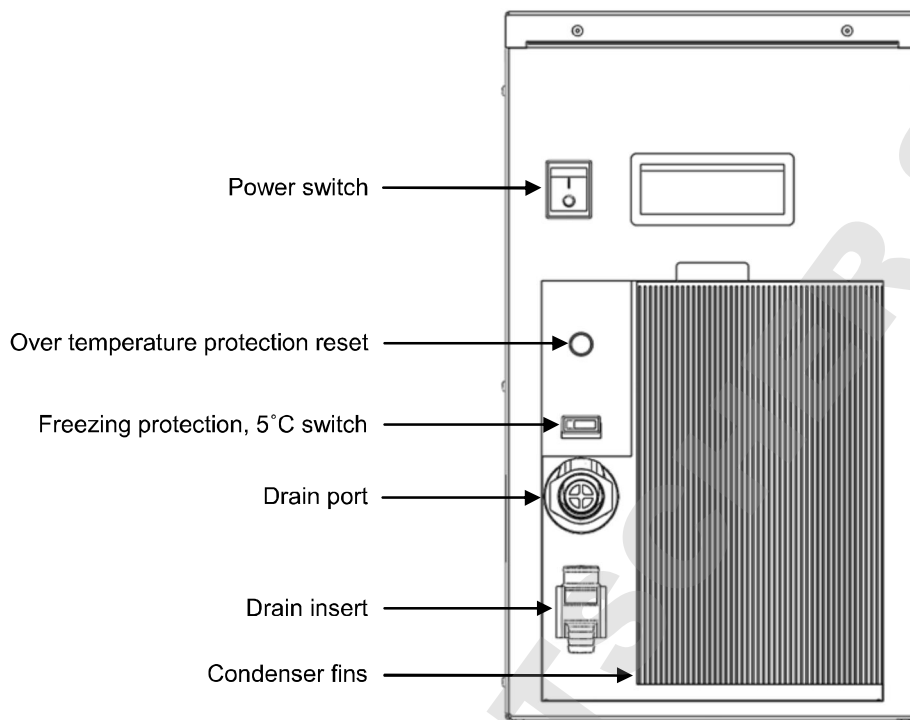
The Optima unit is connected directly to the mains supply with the IEC cable supplied with the Optima unit. Connect the R unit directly to the mains using the IEC cable provided (see Section 5.2.2).

#### Power supply for 120V models

The 120V Optima units and refrigeration units have separate fixed mains cords. Connect both to the mains supply.

## 5.2 Using the R unit

### 5.2.1 Product description, refrigeration unit front panel (grille removed)



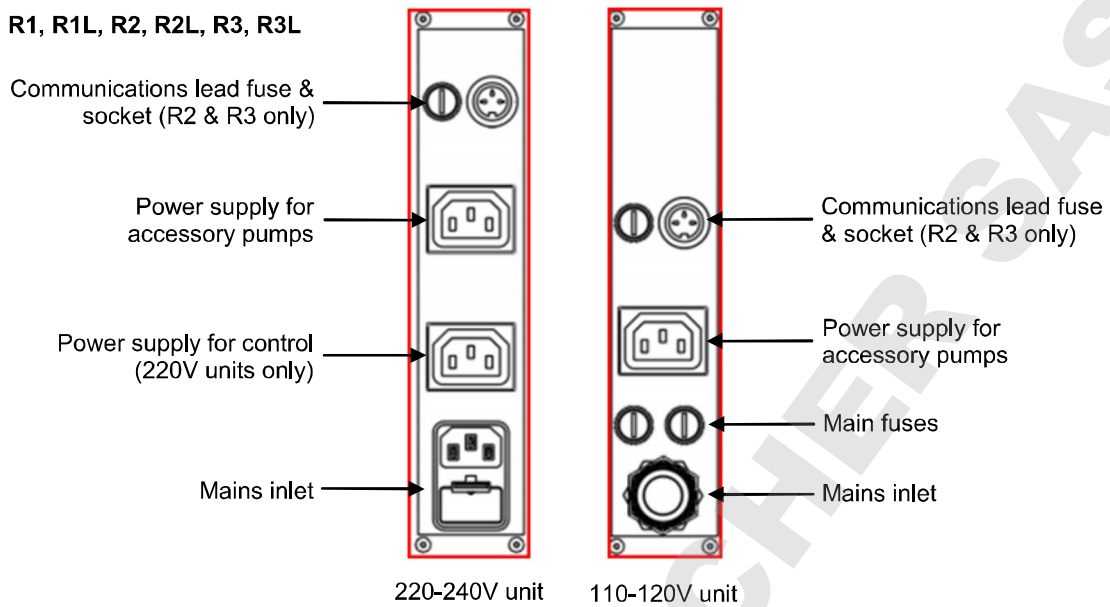
The over temperature protection reset: protects the unit from overheating by the over temperature cut-out. This will be actuated when the working fluid is raised above between 110°C and 120°C. The unit can be reset by waiting for the liquid to cool below 100°C, then unscrewing the black cap and pushing in the revealed button.

The freezing protection switch uses a low temperature thermostat to ensure the working fluid never drops below 5°C. With the switch in the depressed/in position the cooling will be switched off by a low temperature protecting thermostat. If water is used in the bath this will prevent it from freezing. In the out/off position the thermostat is bypassed allowing the unit to run at temperatures below 5°C.

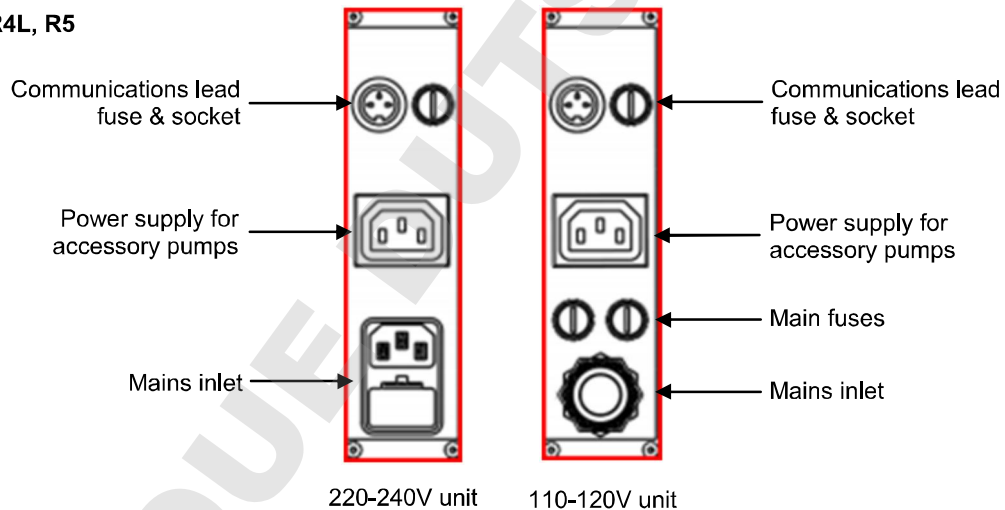
The drain port and insert allow convenient emptying of the refrigeration bath. To drain the unit first remove the drain insert from the holder and connect a suitable length of hosing with a bore of 12.7mm (1/2") to the drain insert. Have the non connected end of tubing in a receptacle, suitable for the liquid to be drained. Push the drain insert into the drain port and let the liquid drain. To release the drain insert push down the grey button on the drain body and extract the drain insert. Liquid to be drained should not be below 10°C or above 50°C.

## 5.2.2 Refrigeration, rear panels

### R1, R1L, R2, R2L, R3, R3L



### R4, R4L, R5



## 5.2.3 Using the Optima heating circulator

The R unit series are designed for use with the Grant Optima heating circulator range consisting of four models T100, TC120, TX150 and TXF200. Previous G series Optima heating circulators can be used, but may require an alternative bridge plate for mounting the Optima unit. Please contact the Grant instruments technical support team for information.

For full instructions on the functionality and operation of the Optima unit please consult the following applicable manuals:

- 30423 – T100/TC120 Operating manual
- 30424 – TX150/TXF200 Operating manual.

Please read the entire manual to ensure safe operation.

### 5.3 Examples of use

This section provides examples of how the unit can be used to achieve specific requirements.

#### 5.3.1 Example 1 – Control at 10°C using a T100 Optima unit & R2 unit

The following procedure can be used with a T100 and R2 unit for temperature control at 10°C:

1. Fill the R2 tank with four litres of water.
2. Connect the Optima unit to the R unit using the interconnect main cable provided.
3. Connect the R unit to the mains using the cord provided.
4. Switch the R unit and Optima unit on.
5. Press the **F** button four times – the display will show the current liquid type.
6. Use the main dial to select “H2O” and press **S** button to save.  
*The liquid type will be set and unit will return to the normal temperature display.*
7. Press the **S** button while the display is showing the bath temperature  
*This will cause the display to flash indicating that it can be set.*
8. Use the main dial to set the temperature to 10°C.  
*If no key is pressed for 10 seconds then the display will revert back to showing the bath temperature and the set temperature will remain at its original value.*
9. Press the **S** button to store the requested value and the display will revert to showing the bath temperature.

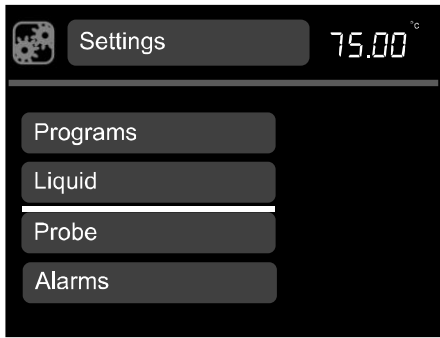
#### 5.3.2 Example 2 – Control at -25°C using a TXF200 Optima unit & R3 unit.

The following procedure can be used with a TXF200 and R3 unit for temperature control at -25°C:

1. Fill the R3 tank with four litres of 50% water + 50% antifreeze.
2. Connect the Optima unit to the R unit using the interconnect main cable provided.
3. Connect the R unit to the mains using the cord provided.
4. Switch the R unit and Optima unit on.
5. Set the liquid type to water-glycol following the menus below:

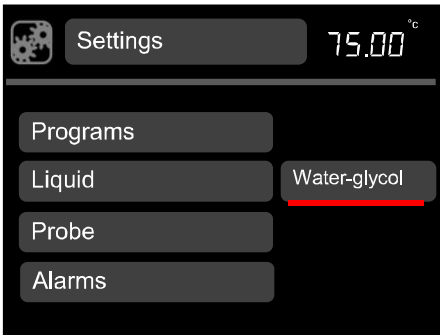


Rotate the dial until the **settings** icon is highlighted, press the **S** button.



Rotate the dial to scroll up and down the list until **liquid** is highlighted, press **S** to select.

*Liquid options are displayed.*



Rotate the dial to scroll through the liquid options, select water-glycol, press **S** to save the selection.

*The display returns to the settings screen.*

Press **F** to return to the home screen.

6. Set the temperature to  $-25^{\circ}\text{C}$  by following the menu below:



Rotate the dial until the **set temperature** icon is highlighted, press the **S** button.

Rotate the dial to set the  $-25^{\circ}\text{C}$ .

*If no key is pressed for 10 seconds or if **F** is pressed, the set temperature icon is no longer active and will remain at its original value.*

Press **S** to store the requested value.

*If the temperature selected is higher than the current liquid temperature the heater will switch on and the heater icon will be displayed.*

## 6.0 Technical specifications

### 6.1 Operating conditions

Ambient temperature range	5 to 40°C
Altitude above sea level	Up to 2,000m (6,500ft)
Operating environment	Indoor use only
Maximum relative humidity	80% RH up to 31°C decreasing to 50% RH at 40°C

### 6.2 Electrical details

Mains supply: 230V @ 50Hz or 120V @ 60Hz

Pollution degree: 2

Installation category: II

Mains supply voltage fluctuations are not to exceed  $\pm 10\%$  of the nominal supply voltage.

### 6.3 Specification

Specification		R1	R2	R3	R4	R5
Typical cooling power at an ambient of 20°C	@ 20°C	340	340	160	900	1100
	@ 0°C	150	150	156	500	1050
	@ -10°C	120	120	120	300	800
	@ -20°C	65	65	50	180	580
	@ -30°C	-	-	5	40	370
	@ -40°C	-	-	-	-	130
	@ -47°C	-	-	-	-	25
Minimum temperature		-25°C		-30°C		-47°C
Maximum temperature		100°C				
Refrigerant type		R134a			R404a	
Refrigerant charge		140gm		150gm	500gm	
Tank capacity		5L			20L	12L
Top opening		110/145mm			230/305mm	260/115mm
Liquid depth min/max		80/140mm				120/180mm
Drain		No	Yes			
Switchable refrigeration		No	Yes			
Safety 100°C limit		Cut-out				
Safety freezing protection		5°C thermostat & switch				
Safety (high pressure)		No			27 Bar	
Max power consumption		340W		370W	850W	1400W

## 7.0 Technical Tips

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### 7.1 Which water should you use in your R unit tank?

For the long-term reliability of the equipment it is important to use oxygenated water that is free from ions and minerals that can cause corrosion of stainless steel. We recommend the use of distilled water and de-ionised water from modern ion exchange systems that do not use salt back flushing to regenerate the ion-exchange cartridges.

Stainless steel is protected from corrosion by a layer of chromium oxide. If the layer is damaged, oxygen present in water can reform the oxide layer. If the water is still or de-oxygenated, and the oxide layer is damaged, ions can corrode the stainless steel tank. If a water bath has been unused for some time, or water boiled, we recommend changing to fresh distilled water or correct de-ionised water.

Water normally contains calcium or magnesium ions. De-ionised water has most ions removed as indicated by its conductivity level; the purer the water the lower the conductivity. It is important to use only de-ionised water from an ion exchange system with replaceable cartridges. Do not use de-ionised water generated from an ion-exchange system that incorporates a salt back-flush system to regenerate the ion-exchange resin as this can leave sodium ions that are very corrosive to stainless steel.

### 7.2 How to prevent rust in R unit tanks

Most Grant tanks, as well as immersed parts, are made from type 304 stainless steel, an extremely versatile general purpose grade of stainless steel. It is the excellent forming characteristic that has made this grade dominant in the manufacture of laboratory and industrial water baths, as well as domestic sinks and saucepans. Type 304 stainless steel is highly suitable for applications where hygiene is important; it exhibits good heat resistance and excellent resistance to corrosion.

However, despite resistance to general surface corrosion, stainless steel is susceptible to specific types of corrosion, in particular pitting (small pin hole style corrosion) and stress corrosion cracking. It can also undergo general corrosion in specific environments, such as one containing hydrochloric or sulphuric acids.

Stainless steel is protected by its high content of alloying elements, primarily chromium and nickel. Chromium is the most important with respect to corrosion resistance, although the nickel assists in allowing the chromium to do its job. The chromium forms an oxide layer on the surface of the steel, which inhibits further oxidation. This layer adheres extremely well to the metal substrate, but it is essential that it remains intact, and must be protected from various forms of damage.

If the surface chromium oxide layer becomes damaged, oxygen present in water can partially reform the oxide layer, so it is advisable to ensure that water is always fresh and well oxygenated. Baths that will be out of use for an extended period should be emptied, and all moisture should be wiped from the bottom of the tank.

In some cases a brown layer may appear on the surface of a stainless steel tank. In most of these cases this is not rust, but it may be a surface deposit of minerals from the local water supply, or ferrous particles or salts that have fallen into the tank. These surface deposits can usually be removed by using a household cleaner such as Duraglit or Silvo metal polish.



### 7.3 How to prevent algae and bacteria?

Water baths provide the ideal environment for the growth of micro-organisms. If left uncontrolled the growth of these organisms can result in a range of serious problems and health risks from pathogenic bacteria.

The growth of algae on the surface of parts will cause biofouling which can reduce performance.

Micro-organisms that produce acidic metabolic by-products can cause bio-corrosion by depolarisation of metal surfaces.

There are a number of biocides available on the market.

## 8.0 Warranty information

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When used in laboratory conditions according to this manual, this product is guaranteed for THREE YEARS against faulty materials or workmanship.

Extended warranty for years four and five can be purchased by contacting our sales department at [labsales@grantinstruments.com](mailto:labsales@grantinstruments.com).

## 9.0 Maintenance and service

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### 9.1 Cleaning

Regular maintenance of the R unit is important to allow the unit to perform to its specification and is required for warranty validity.

The removable grille enables easy access to the condenser for cleaning. Cooling power will be reduced if the fins become clogged with dust. The condenser fins (see section 5.2.3) should be examined monthly and, if necessary, use a vacuum cleaner nozzle and soft brush to remove the dust.

Clean the outside of the equipment with a damp cloth, using water only. Do not use chemical cleaning agents. Before using any other cleaning or decontamination method, check with Grant Instruments or your local representative to make sure that the proposed method will not damage the equipment. Scale on immersed parts can be removed using chemical de-scaling products designed for use on equipment that has metal parts.



De-scaling products may be toxic and manufacturer's instructions should always be followed

### 9.2 Fuses

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

The refrigeration unit has externally accessible fuses that can be changed by a qualified technician. Disconnect the unit from the power supply socket. Remove the IEC power plug from the rear of the unit. Press down the fuse drawer catch and pull out. Check fuses and if necessary replace. Push the fuse drawer back in until fully engaged and replace the IEC plug.

Replacement fuses must be 1.25" x 0.25" anti surge ceramic type with the rating defined in the following table:

R unit	Fuse rating
R1, R2 & R3	15AT
R4	5AT
R5	10AT
R1L, R2L & R3L	10AF
R4	10AT

### 9.3 Replacing the mains cord

Any replacement mains cords used for the control unit or refrigeration unit must meet the same specification as the one originally supplied to maintain the safety of the unit.

All 230V mains cables (including the interconnect mains cable) must have the following markings; <HAR>, HO5VV-F 3Gx1mm<sup>2</sup> 70°C and be rated to carry 10A. The mains plug and IEC connector must carry approvals from a European certification body (e.g. BSI, VDE or equivalent).

The 120V refrigeration units have fixed mains cords which should not be replaced.

### 9.4 Routine safety tests

If routine tests are to be made, we recommend a test of the integrity of the protective earth conductor and an insulation test at 500V DC. Routine flash tests are not recommended for any electrical equipment, because repeated high voltage tests degrade insulation materials.

### 9.5 Service

If service is required, switch off the unit and contact Grant Instruments or your local representative for repairs.

Please note, all returned units must be accompanied by a Return Materials Authorisation (RMA) number, obtainable by contacting the Grant service department (details below).

Service Department  
Grant Instruments (Cambridge) Ltd  
Shepreth  
Cambridgeshire  
SG8 6GB  
UK

Tel: +44 (0) 1763 260 811  
Fax: +44 (0) 1763 262 410  
E-mail: [labservice@grantinstruments.com](mailto:labservice@grantinstruments.com)

## 10.0 Optional accessories

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### 10.1 Alternative pump

A pump comes as standard on Optima models TC120, TX150 and TXF200. If greater head (pressure) is required you can choose from two accessory pumps and the appropriate pump lid. Add L to pump part numbers for 120V (60Hz) versions. See the Grant website at [www.grantinstruments.com](http://www.grantinstruments.com) for full technical specifications.

Pump Product	Description
VTP1	Max head pressure: 1000mBar Max flow rate: 9 L/min
VTP2	Max head pressure: 1700mBar Max flow rate 12 L/min
17927	Pump lid for LTC2

A full listing of product accessories and options is available in the Grant Scientific Reference Catalogue (a copy of which is available upon request) and on the Grant website at [www.grantinstruments.com](http://www.grantinstruments.com).

## 11.0 Troubleshooting

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Symptom	Possible cause	Action required
Unit fails to cool	Compressor overheated causing internal over-temperature thermostat to operate	Wait for compressor to cool, when thermostat will reset and compressor will switch on again.
Unit failing to cool below 5°C	Freezing protection switch is on and is preventing further cooling	Switch off freezing protection (see section 5.2.3).
Unit not cooling at higher temperatures	Over temperature protection switch has tripped	Refrigeration unit may have temperatures in excess of 100°C. Leave the unit to cool and reset (see section 5.2.3)
Cooling performance reduced	Condenser fins clogged	Carry out routine cleaning (see section 9.1)

For any other errors or service requests, please contact Grant Instruments service department.

## 12.0 Contact Grant Instruments

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At Grant we are continuously trying to improve the performance we offer our customers. If you have any feedback on Grant's products or services we would like to hear from you. Please send all feedback to:

Quality Manager  
Grant Instruments (Cambridge) Ltd  
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## 13.0 Compliance

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### WEEE directive

Grant Instruments complies fully with the Waste Electrical & Electronic Equipment (WEEE) regulations 2006. We are a member of the B2B compliance scheme (Scheme Approval Number WEE/MP3338PT/SCH), which handle our WEEE obligations on our behalf. Grant Instruments have been issued with a unique registration number by the Environmental Agency, this reference number is WEE/GA0048TZ.

For information regarding WEEE collections in the UK please contact our B2B Compliance Scheme directly on 01691 676 124.  
For other countries please contact your equipment supplier.

For General WEEE information please visit: [www.b2bcompliance.org.uk](http://www.b2bcompliance.org.uk)

### RoHS directive

All the products covered by this manual comply with the requirements of the RoHS Directive (Directive 2011/65/EC).

### Electrical safety and electromagnetic compatibility

All the products covered by this manual comply with the requirements of the Low Voltage Directive (2006/95/EC) for electrical safety and the EMC directive (2014/30/EC) for electromagnetic compatibility.

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