

## 2 Refrigerated circulating baths and re-circulating chillers

### **Optima range**

Refrigerated circulating baths

### **RC series**

Re-circulating chillers



## Refrigerated circulating baths » Optima™ range

# Optima refrigerated thermostatic baths and circulators

Cost-effective and efficient multi-purpose systems for low temperature applications.

- **Powerful precision cooling** whether used in open-loop or closed-loop format
- **Combining legendary quality, reliability and design for everyday usage** – useful features, straightforward maintenance, compact design
- **Robust, durable construction** for longevity, reliability and long-term low cost of ownership
- **A complete range** – 18 models to cover basic through to sophisticated needs
- All refrigeration products come with market-leading 3-year warranties



## Operating temperature

The four Grant Optima™ thermostats can be combined with the five Grant refrigeration units to provide a choice of 18 models. The colour-coded summary table on p. 2.4 shows you the temperature range of each combination.

The following page showcases our most popular model, the versatile mid-range TC120-R2.

## Liquids

We recommend the following liquids for use with refrigerated thermostatic baths and circulators:

- 50 to 50°C: Silicone oil – low viscosity  
(Bayer silicone M3)
- 30 to 30°C: 50% water 50% antifreeze  
(inhibited ethylene glycol)
- 0 to 30°C: 80% water 20% antifreeze  
(inhibited ethylene glycol)
- 5 to 99.9°C: Water

## Refrigerated circulating baths » TC120-R2 mid range showcase

## showcase – mid range example

Model TC120-R2 range - 20 to 100°C, stability  $\pm 0.1^\circ\text{C}$

Our most popular model – a versatile system for the laboratory, with a comprehensive specification to suit most low temperature applications.

- **Optima™ digital thermostat (TC120) for precise temperature control**
- **Cooling/heating range - 20°C to 100°C**
- **Stability  $\pm 0.1^\circ\text{C}$**
- **Easy to use rotary dial and two function keys**

**Clear 4 digit display** – easy to read from a distance for instant reassurance

**Visual alarm and countdown timer** – alerts you when your attention is required

**User calibration facility** for optimum accuracy at the required operating temperature

Operating setpoint plus **3 adjustable preset temperatures** for convenience

**Low liquid protection and over-temperature cut-out**

**Easy access to coolant reservoir** for local cooling of tubes, bottles etc

**Easily accessible power switch**

**Powerful efficient cooling,** ozone-friendly refrigerant

**Removable grille** – easy access to drain valve\* and condenser for routine maintenance

\*Drain valve not available on R1 systems



**Also available as a kit (LTC2 and LTC4)** see page 2.6

**Adjustable over-temperature protection**

**Dual-position bridge plate** – ensures visibility/accessibility of the thermostat whilst optimising bench space

**Powerful integral pump** – allows temperature-controlled fluid to be circulated to external equipment (16L/min, 210mbar)

**Convenient carrying handles** front and rear for repositioning the unit

**Designed for quiet operation** for minimal impact on your working environment

**Robust construction,** corrosion resistant materials, stainless steel tank – durable in demanding environments

**5°C thermostat on/off switch** – stops tank freezing when operating with water

**Applications:**

- University research/teaching - temperature control of external equipment including: spectrophotometers & refractometers. Circulation of temperature control fluid to jacketed vessels, cooling crystallisation vessels
- Industrial laboratories - temperature probe calibration, product testing, product QC, temperature control of external equipment

## Refrigerated circulating baths » Factors to consider

# Factors to consider when choosing your system

### ■ Do you need to immerse samples within a tank?

Consider the working area required. The table on p. 2.4 shows the dimensions of the top opening and the min/max liquid depths

### ■ Cooling power required at a given temperature

For example, if your operating temperature is 0°C, and you need 500 W cooling power, you will need the R4 (or R5) refrigeration unit with any of the controllers. Alternatively to calculate the power required use the following formula:

$$W = \frac{V \times T \times K}{60 \times t(\text{mins})}$$

### ■ Cool-down time required to reach that temperature

Calculate the cool-down time required according to the following formula, and refer to the cool down curves for individual performance.

$$t(\text{mins}) = \frac{V \times T \times K}{60 \times W}$$

### ■ Do you need to control the temperature of/remove the heat from an external device?

**1.** Consider the pump requirement. Liquid flow rate is critical in order to maintain adequate exchange of heat within the external system. Flow rate is dependent on the restrictions within the system. Factors which cause a pressure drop are height, length, pipe bore and the number and angle of bends within the system. To maintain sufficient flow in a highly restricted system, a high pressure pump is required. The integral pumps in the Optima™ series thermostats are satisfactory for most laboratory applications; for more powerful pump requirements select either of the Grant accessory vertical turbine pumps (VTP).

**2.** Consider whether you need to control the temperature within the external apparatus. For external temperature control choose TX150 or TXF200 controller and an external temperature probe.

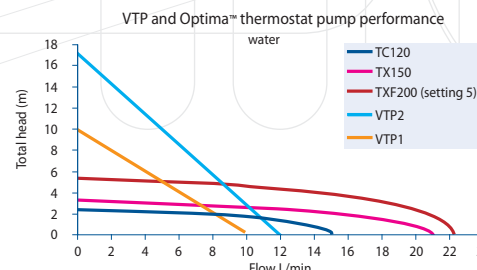
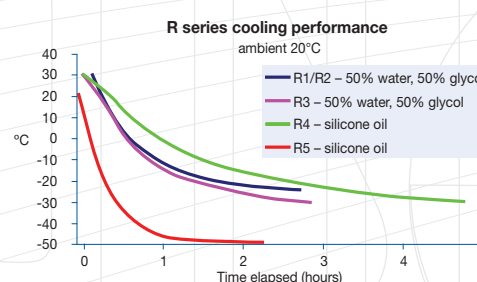
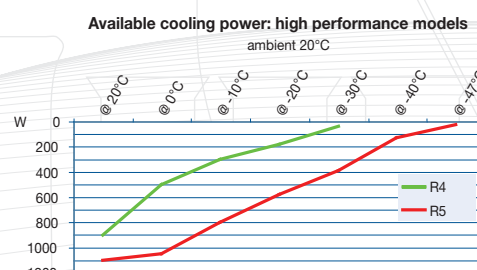
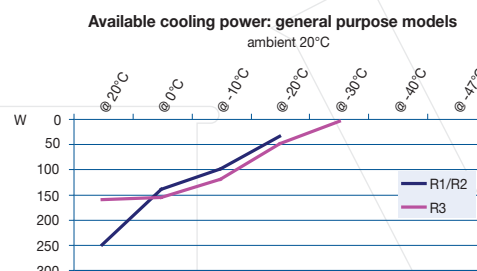
### ■ Do you require temperature ramping?

If yes, choose TX150 or TXF200 controller and Labwise accessory software. For refrigeration on/off control by programmable relay choose refrigeration units R2 to R5.

### ■ What other features do you require?

Consider the numerous features offered by the four Optima™ series controllers, and select the controller that meets your needs.

W = average cooling power	Water	K = 4200
V = total system liquid volume L	50/50 water/glycol	K = 3800
T = temperature difference °C	Alcohol	K = 2100
K = liquid heat capacity (J/L/°C)	Silicone oil	K = 1800



















## Refrigerated circulating baths » Models, options and accessories

## Refrigerated baths and circulators – range of available models, options and accessories

**Effective operating temperature range (refrigeration unit + thermostat)**

- 0 to 100°C
- 20 to 100°C
- 30 to 100°C
- 47 to 100°C












**Key to symbols**

- |                                                                                                   |                                                                                                                      |                                                                                                                 |                                                                                                                       |
|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
|  display         |  timer                              |  fixed over temperature cutout |  visual alarm                      |
|  pump            |  USB                                |  audible alarm                 |  5 point recalibration             |
|  drain           |  program storage                    |  menu system                   |  external probe socket             |
|  program storage |  refrigeration high pressure switch |  programmable                  |  adjustable overtemperature cutout |









**Thermostatic control units**

Digital		Digital high performance	
T100	TC120	TX150	TXF200
			
2.5 kg h: 335 mm d: 172 mm w: 120 mm	3 kg h: 335 mm d: 172 mm w: 120 mm	3 kg h: 345 mm d: 172 mm w: 120 mm	3 kg h: 345 mm d: 172 mm w: 120 mm

**Refrigeration units**

Capacity (L) Outer tank dimensions	Working area (l x w) Min/max liquid depths Weight				
<b>R1 – 5 L stainless steel</b>  h: 410 mm d: 410 mm w: 230 mm 20 kg	• 110 x 145 mm • 85/140 mm • 19.2 kg	T100-R1	TC120-R1	TX150-R1	TXF200-R1
<b>R2 – 5 L stainless steel</b>  h: 410 mm d: 410 mm w: 230 mm 20 kg	• 110 x 145 mm • 85/140 mm • 19.2 kg 	T100-R2	TC120-R2 (showcased on page 7.2)	TX150-R2	TXF200-R2
<b>R3 – 5 L stainless steel</b>  h: 410 mm d: 410 mm w: 230 mm 21 kg	• 110 x 145 mm • 85/140 mm • 19.2 kg 	-	-	TX150-R3	TXF200-R3
<b>R4 – 20 L stainless steel</b>  h: 530 mm d: 490 mm w: 390 mm 40 kg	• 230 x 305 mm • 85/140 mm • 37.8 kg  	T100-R4	TC120-R4	TX150-R4	TXF200-R4
<b>R5 – 12 L stainless steel</b>  h: 585 mm d: 575 mm w: 415 mm 47 kg	• 260 x 115 mm • 125/180 mm • 47 kg  	T100-R5	TC120-R5	TX150-R5	TXF200-R5

**Options and accessories**

<b>Labwise™ PC software</b> (optional)					
Allows two-way communication for status display, programming and data capture (see p. 3.1 for more information) USB cable provided		-	-		
<b>External probes</b> (optional)					
<b>TXPEP</b> flexible plastic probe, 3 m cable		-	-		
<b>TXSEP</b> stainless steel probe, 3 m cable		-	-		
<b>Remote switching device</b> (optional)					
For switching mains powered appliances on and off (up to max. 8 Amps)		-	-	1	1
<b>Vertical turbine pumps</b> (optional)*					
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm			Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		
<b>VTP 1</b>	max. pressure 1000 mbar max. flow 9 L/min				
<b>VTP 2</b>	max. pressure 1650 mbar max. flow 12 L/min				





\* when pump is fitted, available working area is reduced.

## Refrigerated circulating baths » Technical specifications

## Low temperature refrigerated baths and circulators – technical specification

## Grant Optima™ thermostats



● = standard

			Digital		Digital High Performance	
			T100	TC120	TX150	TXF200
						
Stability (DIN 12876)	water @ 10°C	°C	± 0.1	± 0.1	± 0.1	± 0.1
	-10°C for 50% water, 50% glycol	°C	–	± 0.1	± 0.1	± 0.1
Uniformity (DIN 12876)	water @ 10°C	°C	± 0.1	± 0.1	± 0.1	± 0.1
	-10°C for 50% water, 50% glycol	°C	–	± 0.1	± 0.1	± 0.1
Setting resolution		°C	0.1	0.1	0.1 (0.01 with Labwise)	
Display			4 digit LED		full colour QVGA TFT	
Timer function			–	1 to 6000 mins	1 min to 99 hrs 59 mins	
No. stored temperature values			3	3	3	3
Recalibration points			2	2	5	5
Socket for external probe (TXPEP, TXSEP)			–	–	●	●
Communications interface			–	–	USB / RS232	USB / RS232
Programmable			–	–	remote via PC / laptop 1 program/30segments	via user interface/remote via PC / laptop 10 programs/100segments
No. stored programs			–	–	1 x 30 segment	10 x 100 segment
Relays			–	–	1	1
Safety	overtemperature		fixed		adjustable cut-out	
	fluid level – float switch		●	●	●	●
Alarms (can be configured to switch a relay)			–	high(no relay)	high and low	high and low
Language capability			–	–	EN, FR, DE, IT, SP	EN, FR, DE, IT, SP
Heater power	230 V	kW	1.3	1.3	1.9	1.9
	120 V	kW	1.4	1.4	1.4	1.4
Electrical power	230 V	kW	1.4 (50-60 Hz)	1.4 (50 Hz)	2.0 (50 Hz)	2.0 (50-60 Hz)
	120 V	kW	1.5 (50-60 Hz)	1.5 (60 Hz)	1.5 (60 Hz)	1.5 (50-60 Hz)
Height above tank rim		mm	200	200	200	200
Depth below tank rim		mm	135	135	135	135

## Grant Optima™ thermostat pumps (integral)

Maximum pressure	water	mbar		210	310	530
Maximum flow	water	L/min		16	18	22 (adjustable flow rate)
Pump connector	6 mm bore*				fits 9 mm diameter tubing	
Pump connector	11 mm bore*				fits 15 mm diameter tubing	

## High pressure pumps (optional)

			VTP pumps	
			VTP1	VTP2
				
Maximum pressure	water	mbar	1000	1650
Maximum flow	water	L/min	9	12
Pipe bore	inlet/outlet	mm	12.7	12.7
Electrical connection			10 amp IEC	10 amp IEC
Power consumption		W	30	40
Power output to liquid @ 20°C		W	15*	22*
Safety			thermal fuse	thermal fuse

\*\* The optional VTP pumps will transfer additional heat to the baths and reduce the net cooling power of the refrigeration unit. The above figures must be taken into consideration when choosing the refrigeration unit

Note: when ordering a VTP pump, please specify which refrigeration base unit it is to be used with

## Refrigerated circulating baths » models and ready assembled kits

Pump connectors (optional)	Part number
Replacement plastic pump inlet/outlet connector. Fits tubing 6mm outer dia. Temperature range -50 to 200°C	P-M6
Replacement plastic pump inlet/outlet connector. Fits tubing 11mm outer dia. Temp range -50 to 200°C	P-M11
Stainless steel pump inlet/outlet connector, M16 x 1 male. Fits M16 hose. Temp range -50 to 200°C	M-M16
Metal pump inlet/outlet connector, dual seal super rapid 4mm. Fits semi rigid tubing 4mm outer dia. Temp range -20 to 100°C	M-SR4
Metal pump inlet/outlet connector, dual seal super rapid 6mm. Fits semi rigid tubing 6mm outer dia. Temp range -20 to 100°C	M-SR6
Metal pump inlet/outlet connector, dual seal super rapid 8mm. Fits semi rigid tubing 8mm outer dia. Temp range -20 to 100°C	M-SR8
Metal pump inlet/outlet connector, hose barb 7mm. Fits flexible tubing 7mm inner dia. Temp range -40 to 120°C	M-HB7
Metal pump inlet/outlet connector, hose barb 9mm. Fits flexible tubing 9mm inner dia. Temp range -40 to 120°C	M-HB9
Metal pump inlet/outlet connector, hose barb 12mm. Fits flexible tubing 12mm inner dia. Temp range -40 to 120°C	M-HB12
Metal pump inlet/outlet plate, 1/4 " BSP/G1/4 female. Temp range -50 to 200°C	M-UC

## Grant R series refrigeration units – models and specifications

● = standard

	R1	R2	R3	R4	R5		
Relay control (refrigeration on/off)	–	●	●	●	●		
Refrigerant	R134a	R134a	R134a	R134a	R404a		
Drain	–	●	●	●	●		
Overtemperature cut-out	100°C limit	●	●	●	●		
Water freezing protection thermostat	●	●	●	●	●		
Refrigeration high pressure switch	27 bar	–	–	●	●		
Cooling power, ambient 20°C	@ 20°C	W	250	250	160	900	1100
	@ 0°C	W	140	140	150	500	1050
	@ -10°C	W	100	100	120	300	800
	@ -20°C	W	35	35	50	180	580
	@ -30°C	W	–	–	5	40	370
	@ -40°C	W	–	–	–	–	130
Electrical power (maximum)	230 V	W	334 (50 Hz)*	334 (50 Hz)*	354 (50 Hz)*	850 (50 Hz)	1400 (50 Hz)
	120 V	W	328 (50-60 Hz)	328 (50-60 Hz)	370 (60 Hz)	780 (60 Hz)	–
EMC emissions	Class	B	B	B	B	B	

\* Optima™ thermostats and accessory pumps can be powered from the back of the R1, R2 and R3 220-240 V refrigeration units. Allow up to 2 kW of extra power from the electrical supply

## LTC Kits

## LTC2 (TC120 + R2)



The TC120-R2 is available ready assembled with the thermostat mounted on the refrigerator and supplied with insulated tubing and clips to form a ready-to-use system

## LTC4 (TX150 + R4)



The TX150-R4 programmable refrigerated circulator is available as a kit with the thermostat mounted on the refrigerator and supplied with insulated tubing and clips to form a ready-to-use system

# Re-circulating chillers

## RC series

Comprehensive range of robust recirculating chillers delivering a constant flow of temperature-controlled liquid to provide powerful, regulated cooling down to  $-10^{\circ}\text{C}$  for many types of industrial machinery and scientific apparatus. Suitable for circulation through open and closed systems.

- Temperature range  $-10^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  or  $-5^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  (model dependent)
- Stability  $\pm 0.25^{\circ}\text{C}$  or  $\pm 0.5^{\circ}\text{C}$  (model dependent)
- Choice of models with different cooling power – from 350 to 3000 W
- Efficient, reliable and cost-effective alternative to cooling with mains water

Choice of four models – three acting as recirculating chillers/heaters, one as a powerful dedicated recirculating chiller (RC3000G)

Digital controller for accurate and reproducible temperature setting. User-selectable high and low temperature alarms

Robust construction, using corrosion resistant materials – long term durability and reliability in demanding applications



RC350G recirculating chiller

In-built safety features protect the user, equipment and application from overtemperature, undertemperature and flow failure

A useful TUNE facility enables automatic optimisation of the chiller's closed-loop temperature control parameters to meet specific user requirements

Lockable wheels allow RC units to be moved easily from location to location and ensure that they stay put once in position





- Applications:**
- Electronics - cooling system for etch baths, glass coating for top-up display in aircrafts
  - Industry - print head cooling for textile industry, calibration system probe
  - Academia - physics and astronomy lab equipment cooling, sea water cooling for producing ikatite minerals
  - Research - seed research, cooling of scientific X-ray analytical units, SEM cooling



## Refrigerated circulating baths » Re-circulating chillers » models and specifications

## Products for special low temperature applications – models and specifications

● = standard

			Re-circulating chillers – digital control			
			RC350G	RC400G	RC1400G	RC3000G**
			 42 kg h: 510 mm d: 600 mm w: 370 mm	 42 kg h: 510 mm d: 600 mm w: 370 mm	 53 kg h: 590 mm d: 630 mm w: 380 mm	 88 kg h: 640 mm d: 840 mm w: 490 mm
Temperature range	ambient 20°C	°C	-5 to 60		-10 to 60	
Stability (DIN 58966)	@ 20°C using water	°C	± 0.25*		± 0.5*	
Display			LED			
Display resolution		°C	1.0			
Typical cooling power, ambient 20°C	@ 20°C	W	350	400	1300	3000
	@ 0°C	W	120	150	600	1500
	@ -10°C	W	–	20	150	575
Heater power		kW	0.75		1.5	–**
Overall consumption	220/240 V	W	1.5		3.0	2.0
Liquid flow rate, maximum		L/min	15	12	15	
Pump head pressure @ 1 L/min		bar	1.6	0.62	1.6	
Pipe connection, inlet/outlet	3/8" BSP male				●	
Reservoir capacity		L	1.7	1.7	2.5	1.1
Safety:					●	
– temperature	switchable undertemperature thermostat				●	
– temperature	fixed overtemperature cut-out		●			–
– level	flow-fail device				●	
Electrical supply		V	230 (50 Hz)			
EMC emissions		Class	B	B	A	B

\* with 10 litres of water in the system # with 25 litres of water in the system \*\* improved performance is achieved in applications with a large load  
 \*\* RC3000G has no heater so can only control against a heat load

## Accessories for RC series

- **RC BYP** – bypass to overcome flow restrictions (flow < 1 L/min), e.g. in narrow tubes or small cells
- **RC PR** – pressure gauge to assist with setting up cooling systems and monitoring performance
- **PRES** – priming reservoir to simplify priming in a closed loop system which has no filling port available on the RC inlet (not required for RC3000G)
- **External probe** – Pt1000 probe for remote sensing temperature control. On request only, requires modification to chiller
- **RC HF9, RC HF12, RC HF17** – Rear connecting fittings (pair) for 9, 12 and 17 mm internal diameter hose sizes respectively