

## 2 Refrigerated / heating circulating baths and recirculating chillers

**Optima™ range**

Refrigerated circulating baths

**RC series**

Recirculating chillers

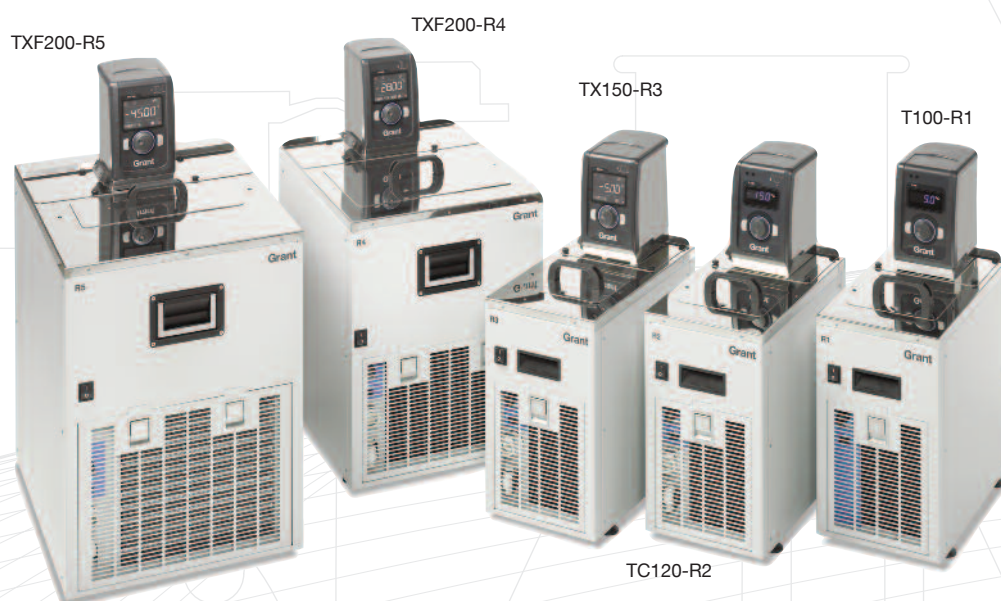


## Refrigerated/heating circulating baths » Optima™ range

# Optima refrigerated / heating 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 comprehensive range** – 18 models to cover basic through to sophisticated needs
- Market leading 3 year warranty



## Operating temperature

The four Grant Optima™ thermostats can be combined with 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 / heating 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 temperature presets** for convenience

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

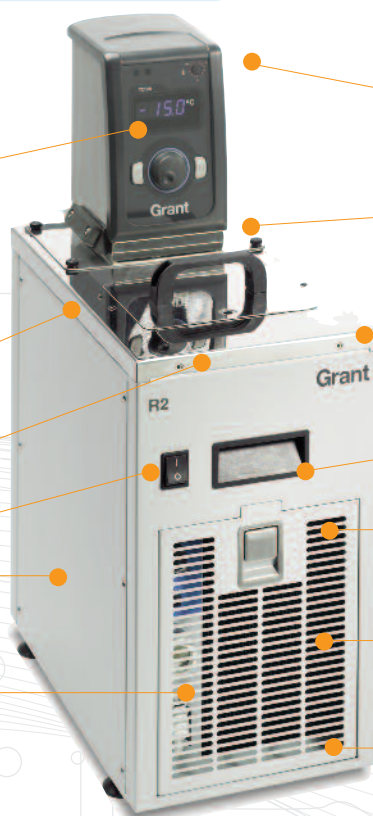
**Easy access to coolant reservoir** for local cooling of tubes, bottles etc

**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)** see page 2.6

**Adjustable over temperature protection** provides sample 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 / heating 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:

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

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

### ■ 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).

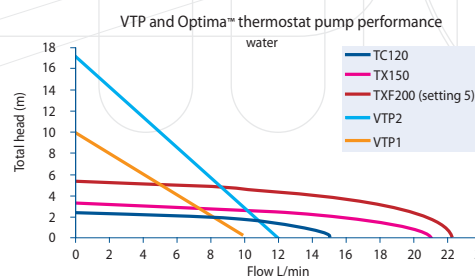
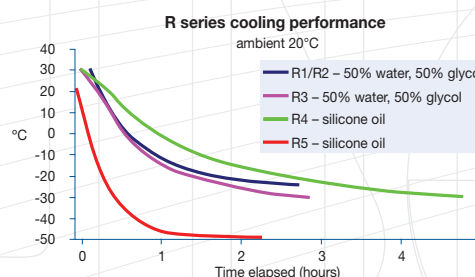
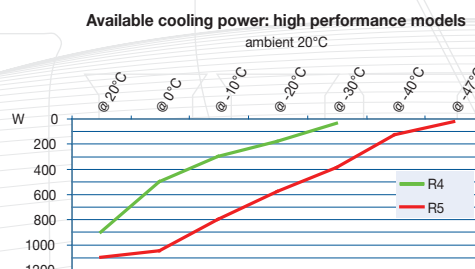
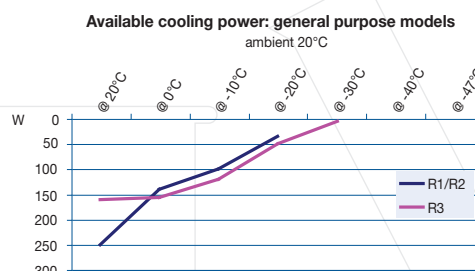
**2.** Consider whether you need to control the temperature within the external apparatus. For external temperature control choose TX150 or TXF200 controller and an external temperature probe.

### ■ 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.



## Refrigerated / heating circulating baths » Models, options and accessories

## Refrigerated / heating circulating baths – models, options and accessories

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

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

**Key to symbols**

- |  |                 |  |                                                    |  |                        |
|--|-----------------|--|----------------------------------------------------|--|------------------------|
|  | display         |  | fixed over temperature cutout relay/ relay control |  | visual alarm           |
|  | timer           |  | audible alarm                                      |  | 5 point re-calibration |
|  | pump            |  | menu system                                        |  | external probe socket  |
|  | USB/RS232       |  | programmable                                       |  | 2 point recalibration  |
|  | drain           |  | refrigeration high pressure switch                 |  |                        |
|  | program storage |  | adjustable over temperature cutout                 |  |                        |

**Thermostatic control units**

General purpose digital		Advanced digital	
T100	TC120	TX150	TXF200
2.5 kg h: 335 mm d: 172 mm w: 120 mm	2.5 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	• 110 x 145 mm • 85/140 mm • 20 kg											
<b>R2 – 5 L stainless steel</b>  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 85/140 mm • 20 kg 											
<b>R3 – 5 L stainless steel</b>  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 85/140 mm • 21 kg 	-	-									
<b>R4 – 20 L stainless steel</b>  h: 530 mm d: 490 mm w: 390 mm	• 230 x 305 mm • 85/140 mm • 40 kg 											
<b>R5 – 12 L stainless steel</b>  h: 585 mm d: 575 mm w: 415 mm	• 260 x 115 mm • 125/180 mm • 47 kg 											

**Options and accessories**
**Labwise™ PC software (optional)**

Allows two-way communication for status display, programming and data capture (see p. 3.1 for more information)  
USB cable provided

**External probes (optional)**

**TXPEP** flexible plastic probe, 3 m cable

**TXSEP** stainless steel probe, 3 m cable

**Remote switching device (optional)**

For switching mains powered appliances on and off (up to max. 8 Amps)

**Vertical turbine pumps (optional)\***

Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm

**VTP 1**

max. pressure 1000 mbar  
max. flow 9 L/min

**VTP 2**

max. pressure 1650 mbar  
max. flow 12 L/min

Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow





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

## Refrigerated / heating circulating baths » Technical specifications

## Low temperature refrigerated baths and circulators – technical specification

## Grant Optima™ thermostats



● = standard

	General purpose digital		Advanced digital	
	T100	TC120	TX150	TXF200
				
Stability (DIN 12876) water @ 10°C	°C ±0.1	°C ±0.1	°C ±0.1	°C ±0.1
-10°C for 50% water, 50% glycol	°C –	°C ±0.1	°C ±0.1	°C ±0.1
Uniformity (DIN 12876) water @ 10°C	°C ±0.1	°C ±0.1	°C ±0.1	°C ±0.1
-10°C for 50% water, 50% glycol	°C –	°C ±0.1	°C ±0.1	°C ±0.1
Setting resolution	°C 0.1	°C 0.1	°C 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
Re-calibration 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 over temperature	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	kW 1.3	kW 1.9	kW 1.9
120 V	kW 1.4	kW 1.4	kW 1.4	kW 1.4
Electrical power 230 V	kW 1.4 (50-60 Hz)	kW 1.4 (50 Hz)	kW 2.0 (50 Hz)	kW 2.0 (50-60 Hz)
120 V	kW 1.5 (50-60 Hz)	kW 1.5 (60 Hz)	kW 1.5 (60 Hz)	kW 1.5 (50-60 Hz)
Height above tank rim	mm 200	mm 200	mm 200	mm 200
Depth below tank rim	mm 135	mm 135	mm 135	mm 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 inner diameter tubing		
Pump connector 11 mm bore		fits 15 mm inner diameter tubing		

## High pressure pumps (optional)

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

Note: 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 / heating circulating baths » Models and ready assembled kits

Pump connectors (optional)	Part number
Replacement plastic pump inlet/outlet connector. Fits tubing 9mm inner dia. Temp range -50°C to 200°C	P-M6
Replacement plastic pump inlet/outlet connector. Fits tubing 15mm inner dia. Temp range -50°C to 200°C	P-M11
Stainless steel pump inlet/outlet connector, M16 x 1 male. Fits M16 hose. Temp range -50°C 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°C 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°C 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°C to 100°C	M-SR8
Metal pump inlet/outlet connector, hose barb 7mm. Fits flexible tubing 7mm inner dia. Temp range -40°C to 120°C	M-HB7
Metal pump inlet/outlet connector, hose barb 9mm. Fits flexible tubing 9mm inner dia. Temp range -40°C to 120°C	M-HB9
Metal pump inlet/outlet connector, hose barb 12mm. Fits flexible tubing 12mm inner dia. Temp range -40°C to 120°C	M-HB12
Metal pump inlet/outlet plate, 1/4 " BSP/G1/4 female. Temp range -50°C 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	–	●	●	●	●
Over temperature 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
@ 0°C	W	140	140	150	500
@ -10°C	W	100	100	120	300
@ -20°C	W	35	35	50	180
@ -30°C	W	–	–	5	40
@ -40°C	W	–	–	–	130
@ -47°C	W	–	–	–	25
Electrical power (maximum)					
230 V	W	334 (50 Hz)*	334 (50 Hz)*	354 (50 Hz)*	850 (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
Capacity	L	5	5	5	20

\* 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

**4**  
year warranty

\* Insulated tubing temperature range -40°C to 80°C

## LTC4 (TX150 + R4)



The TX150-R4 programmable refrigerated circulator is supplied with a thermostat, refrigerator, insulated tubing\* and clips to form a ready-to-use system  
Self assembly required

**4**  
year warranty

\* Insulated tubing temperature range -40°C to 80°C

# Recirculating chillers

## RC series

Comprehensive range of robust re-circulating chillers delivering a constant flow of temperature-controlled liquid to provide powerful, regulated cooling at  $-10^{\circ}\text{C}$  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 3000W
- 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

**Inbuilt safety features** protect the user, equipment and application from over temperature, under temperature 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 ikaite minerals
  - Research - seed research, cooling of scientific X-ray analytical units, SEM cooling



## Refrigerated / heating circulating baths » Recirculating 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 over temperature 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  
 \*\* 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** – for remote sensing temperature control. On request only. Specify when ordering, 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