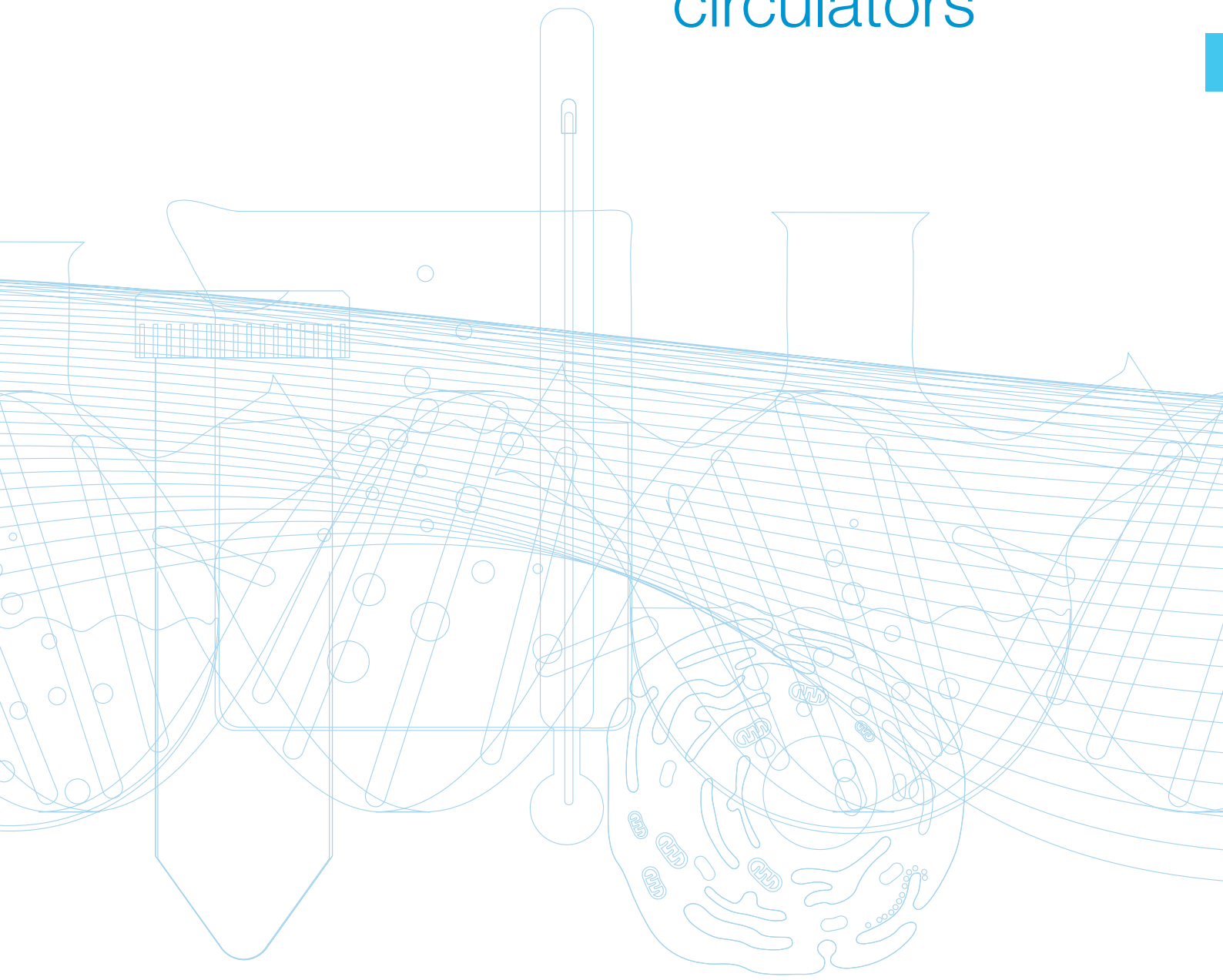
6 Refrigerated thermostatic baths and circulators



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 Grant's legendary quality and reliability and designed for everyday use** – useful features, straightforward maintenance, compact design
- **Robust, durable construction** for longevity, reliability and long-term low cost of ownership
- **A complete range** – 19 models to cover basic through to sophisticated needs
- All refrigeration products come with the **best possible support** – Grant's excellent service and market-leading warranties

Applications

Grant low temperature circulators provide a source of precision cooling for many sensitive analytical procedures including spectrophotometry, viscometry, refractometry and electrophoresis. They are suitable for use in both open and closed loop circulation (i.e. remote vessel open or closed).

Alternatively, **Grant RC** series of recirculating chillers (closed circulators) can be used (see p. 16.8). These are generally needed for more powerful cooling requirements, e.g. the removal of mechanical or electrical heat produced in apparatus or machinery. Please contact Grant for advice.

Operating temperature

The four Grant Optima™ thermostats can be combined with the five Grant refrigeration units to provide a choice of 19 models. The colour-coded summary table on p. 6.4 shows you the temperature range of each combination.

The following page showcases our most popular model, the versatile mid-range GD120-R2.

showcase – **mid range** example

Model GD120-R2* range - 20 to 100°C, stability ± 0.1°C

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

- **Optima™ digital thermostat (GD120) for precise temperature control**
- **Cooling/heating range - 20 to 100°C**
- **Stability ± 0.1°C**
- **Heat removal – typically 200 W at + 5°C (most common working temperature)**
- **5 litre tank volume (other tank sizes available)**
- **Range of convenient programming features**

LTC1

The GD120-R2 is available ready-assembled with the thermostat mounted on the refrigerator and supplied with insulated tubing and clips to form a system ready to use.

Audible and visual alarms – alert you when your attention is required

Simple-to-use rotor plus two keys provide access to the interactive interface for fast, accurate set-up

Powerful integral pump – allows temperature-controlled fluid to be circulated to external devices via tubing (tubing not supplied)

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

Choice of 230V and 115 V models

Operating setpoint plus 3 adjustable preset temperatures for convenience

Convenient timer function for reaction timing

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

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

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. 6.4 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:

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

W = average cooling power	Water	K = 4200
V = total system liquid volume L	50/50 water/glycol	K = 3800
ΔT = 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.

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

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 GR150 or GP200 controller and an external temperature probe.

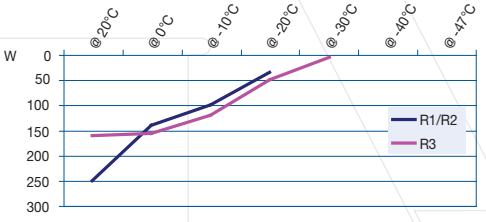
Do you require temperature ramping?

If yes, choose GR150 or GP200 controller and Labwise accessory software. For refrigeration on/off control by programmable relay choose refrigeration units R2 to R5.

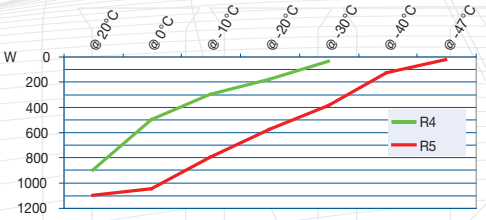
What other features do you require?

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

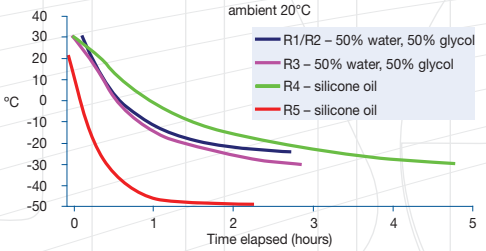
Available cooling power: general purpose models
ambient 20°C



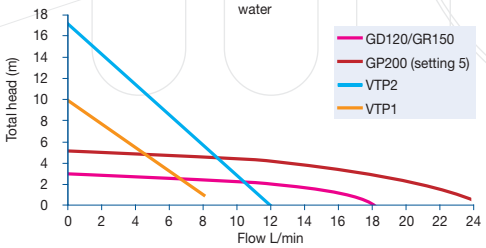
Available cooling power: high performance models
ambient 20°C



R series cooling performance
ambient 20°C



VTP and Optima™ thermostat pump performance
water



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
- pump
- offset adjustment
- drain
- program storage
- relay/ relay control
- audible alarm
- menu system
- RS232
- refrigeration high pressure switch
- adjustable overtemperature cutout
- visual alarm
- 2 point recalibration
- external probe socket
- programmable

Thermostatic control units

	Digital		Digital high performance	
	GD100	GD120	GR150	GP200
	 h: 315 mm d: 145 mm w: 115 mm	 h: 315 mm d: 145 mm w: 115 mm	 h: 315 mm d: 145 mm w: 115 mm	 h: 315 mm d: 145 mm w: 115 mm

Refrigeration units

Capacity (L) Outer tank dimensions	• Working area (l x w) • Min/max liquid depths • Weight				
R1 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 80/140 mm • 19.2 kg	GD100-R1	GD120-R1	GR150-R1	GP200-R1
R2 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 80/140 mm • 19.2 kg	GD100-R2	GD120-R2 (showcased on page 7.2)	GR150-R2	GP200-R2
R3 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 80/140 mm • 19.2 kg		GD120-R3	GR150-R3	GP200-R3
R4 – 20 L stainless steel  h: 530 mm d: 490 mm w: 390 mm	• 230 x 305 mm • 80/140 mm • 37.8 kg	GD100-R4	GD120-R4	GR150-R4	GP200-R4
R5 – 12 L stainless steel  h: 585 mm d: 575 mm w: 415 mm	• 260 x 115 mm • 120/180 mm • 47 kg	GD100-R5	GD120-R5	GR150-R5	GP200-R5

Options and accessories

Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture (see p. 15.1 for more information)		–	–		
External probes (optional)					
for monitoring and controlling temperature of remote loads **FF17** flexible nylon probe, 2 m cable 100 mm x Ø 4.5 mm		–	–		
LL17 stainless steel probe, 2 m cable 125 mm x Ø 5 mm		–	–		
Remote switching device (optional)					
For switching mains powered appliances on and off (up to max. 8 Amps)		–	–	1	2
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.

Glossary

2 point calibration	Provides calibration across wide temperature range with high and low reference points, used to re-set calibration of instrument.
Offset adjustment	Allows accurate temperature control where the monitored temperature is different from the target temperature, often used in conjunction with an external probe
Pump	Enables fluid to be circulated externally instead of within the bath. Typically to provide temperature control to a remote instrument (tubing and connectors not supplied)

Low temperature refrigerated baths and circulators – technical specification

Grant Optima™ thermostats

● = standard

			Digital		Digital High Performance	
			GD100	GD120	GR150	GP200
						
Stability (DIN 58966)	water @ 10°C	°C	± 0.1	± 0.1	± 0.1	± 0.1
	50% water, 50% glycol @ 10°C	°C	–	± 0.1	± 0.1	± 0.1
Uniformity (DIN 58966)	water @ 10°C	°C	± 0.1	± 0.1	± 0.1	± 0.1
	50% water, 50% glycol @ 10°C	°C	–	± 0.1	± 0.1	± 0.1
Setting resolution		°C	0.1	0.1	0.1 (0.01 with Labwise)	
Display			4 digit 13 mm LED		4 digit 13 mm LED 2 line 16 character LCD	
Display resolution		°C	0.1	0.1	0.01 (LCD)	0.01 (LCD)
Timer function			–	1 to 9999 mins	1 min to 99 hrs 59 mins	
No. stored temperature values			4	4	4	4
Two point re-calibration			●	●	●	●
Offset adjustment			–	–	●	●
Socket for external probe (PT1000)			–	–	●	●
RS232 interface			–	–	●	●
Programmable			–	–	remote via PC	remote via PC/direct
No. stored programs			–	–	1 x 30 segment	5 x 30 segment
Relays			–	–	1	2
Safety	overtemperature		–	adjustable cut-out		
	fluid level – float switch		●	●	●	●
Alarms (can be configured to switch a relay)			–	high	high and low	high and low
Heater power	240 V	kW	1.4	1.4	2	2
	115 V	kW	1.3	1.3	1.3	1.3
Electrical power*	220-240 V	kW	1.5 (50-60 Hz)	1.5 (50 Hz)	2.2 (50 Hz)	2.2 (50-60 Hz)
	110-120 V	kW	1.4 (50-60 Hz)	1.4 (60 Hz)	1.4 (60 Hz)	1.4 (50-60 Hz)
Height above tank rim		mm	180	180	180	180
Depth below tank rim		mm	135	135	135	135

Grant Optima™ thermostat pumps (integral)

Maximum pressure	water	mbar		310	310	530
Maximum flow	water	L/min		17	17	21 (adjusted flow rate)
Pipe bore	inlet/outlet	mm		6, 11	6, 11	6, 11

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

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
Mains power 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

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	156	500	1050
	@ - 10°C	W	100	100	120	300	800
	@ - 20°C	W	35	35	50	180	580
	@ - 30°C	W	–	–	5	40	390
	@ - 40°C	W	–	–	–	–	130
	@ - 47°C	W	–	–	–	–	25
Electrical power (maximum)	220-240 V	W	334 (50 Hz)*	334 (50 Hz)*	354 (50 Hz)*	684 (50 Hz)	1305 (50 Hz)
	110-120 V	W	328 (50-60 Hz)	328 (50-60 Hz)	370 (60 Hz)	684 (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 mains supply

** 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 spacify which refrigeration base unit it is to be used with

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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