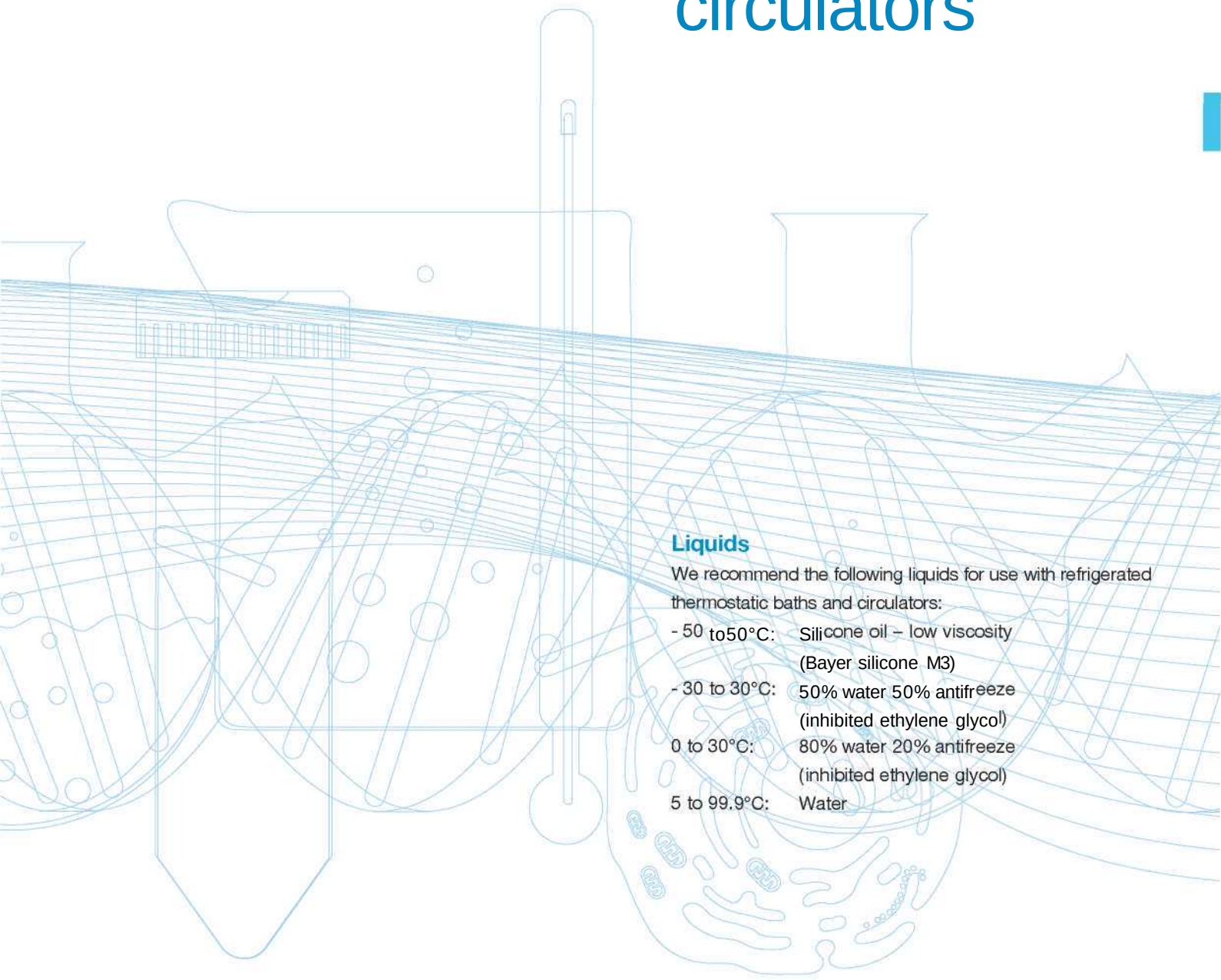
7 Refrigerated thermostatic baths and circulators



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 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
- Al refrigeration products come with market-leading 3-year 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. 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 18 models. The colour-coded summary table on p. 7.4 shows you the temperature range of each combination.

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

showcase - **mid range** example

Model TC120-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 (TC120) for precise temperature control**
- **Cooling/heating range - 20 to 100°C**
- **Stability ± 0.1 °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

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

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 devices (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

LTC Kits (ready assembled with thermostat mounted to refrigeration unit)

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 system ready to use.

LTC4 (TX150 + R4)

The TX150-R4 programmable refrigerated circulator 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.

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. 7.4 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)	Siliconeoil	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).

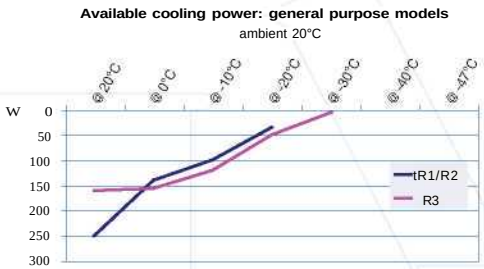
2. Consider whether you need to control the temperature within the external apparatus. For external temperature control choose TX150 or TXF200 controller and an external temperature probe.

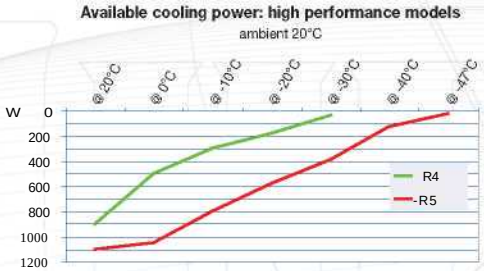
- **Do you require temperature ramping?**

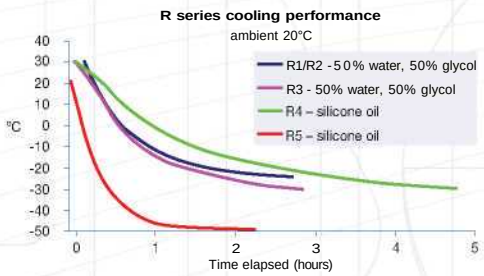
If yes, choose TX150 or TXF200 controller and Labwise accessory software. For refrigeration on/off control by programmable relay choose refrigeration units R2 to R5.

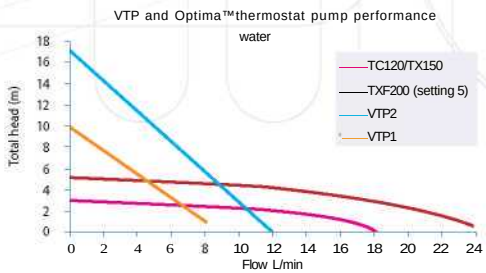
- **What other features do you require?**

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









Refrigerated baths and circulators - range of available models, options and accessories

Effective operating temperature range (refrigeration unit + thermostat)

- 0to100°C
- -20to100°C
- -30 to 100°C
- -47 to 100°C

Key to symbols

^ display
D timer
I pump
offset adjustment
4 drain
fixed over temperature cutout
relay/ relay control
audible alarm
menu system
USB
refrigeration high pressure switch
visual alarm
2 2 point recalibration
external probe socket
5* programmable

Thermostatic control units

	Digital		Digital high performance	
	T100	TC120	TX150	TXF200
	 h: 335 mm d: 172 mm w: 120 mm	 h: 335 mm d: 172 mm w: 120 mm	 h: 345 mm d: 172 mm w: 120 mm	 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				
R1 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 85/140 mm • 19.2 kg	T100-R1	TC120-R1	TX150-R1	TXF200-R1
R2 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 85/140 mm • 19.2 kg	T100-R2	TC120-R2 (showcased on page 7.2)	TX150-R2	TXF200-R2
R3 – 5 L stainless steel  h: 410 mm d: 410 mm w: 230 mm	• 110 x 145 mm • 85/140 mm • 19.2 kg	-	-	TX150-R3	TXF200-R3
R4 – 20 L stainless steel  h: 530 mm d: 490 mm w: 390 mm	• 230 x 305 mm • 85/140 mm • 37.8 kg	T100-R4	TC120-R4	TX150-R4	TXF200-R4
R5 – 12 L stainless steel  h: 585 mm d: 575 mm w: 415 mm	• 260 x 115 mm • 125/180 mm • 47 kg	T100-R5	TC120-R5	TX150-R5	TXF200-R5

Options and accessories

Labwise™ PC software (optional)				
Allows two-way communication for status display, programming and data capture (see p. 16.1 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)	-	-	1	1
Vertical turbine pumps (optional)*				
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm **VTP1** max. pressure 1000 mbar max. flow 9 L/min **VTP2** 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	
			T100	TC120	TX150	TXF200
						
Stability (DIN 12876)	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 12876)	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 LED		full colour QVGA TFT	
Timer function			–	1 to 9999 mins	1 min to 99 hrs 59 mins	
No. stored temperature values			3	3	3	3
Two point re-calibration			●	●	●	●
Offset adjustment			–	–	●	●
Socket for external probe (TXPEP, TXSEP)			–	–	●	●
Communications interface			–	–	USB	USB
Programmable			–	–	remote via PC 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 and low	high and low
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	23 (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 electrical 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
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

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
	@ -47°C	W	–	–	–	–	25
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

** 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