

Peltier Temperature Control for Thermo Scientific UV-Vis Spectrophotometers

Integrated thermostating and temperature
ramping options for your spectrophotometer

Temperature control and sample stirring are important for many UV-Visible analysis methods. Peltier thermostatted accessories outperform traditional heater/chiller units to deliver superior performance with:

- Compact integrated design
- Simple set-up
- Fast, precise temperature control

Air-cooled Peltier Accessory for the Thermo Scientific™ GENESYS™ 10S and BioMate™ 3S Spectrophotometers

- Routine thermostating with simple operation
- Precise temperature control from 20 to 60 °C
- In-cuvette magnetic stirring
- Zero maintenance and worry-free performance

Control temperature and in-cuvette stirring from the convenient interface of the external controller unit or through computer control software.



Water-cooled Peltier Accessories for the Thermo Scientific™ Evolution™ 200 and 300 Spectrophotometers

- Wider temperature range from 0 to 110 °C
- Multiple cell efficiency for higher sample throughput
- Controlled temperature ramping capability in Thermo Scientific™ INSIGHT™ 2 software for DNA melting experiments
- Integrated controller/cooler for a compact footprint



Smart Air-cooled Peltier Accessory for Evolution 300

When you need maximum performance in both the instrument and accessory, the Smart Air-cooled Peltier delivers:

- 15 to 95 °C temperature range
- Computer controlled temperature ramping
- Pre-programmed calculations for enzyme kinetics and DNA melting parameters
- Zero maintenance and worry-free performance
- Absorbance measurements to 4A in our top-of-the-line spectrophotometer



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Advantages of Peltier Thermostating Systems

Exceptional Stability

Unlike recirculating water systems that rely on the transfer of heat to a large volume of liquid, Peltier-based temperature control devices offer exceptional temperature stability and fast temperature transitions. The data in Figure 1 illustrates the small temperature differential between the set temperature of the accessory and the temperature as measured inside a standard, 1 cm cuvette.

Set Temperature (°C)	Measured Temperature (°C)
20	20.1
37	36.3
60	58.6

Table 1

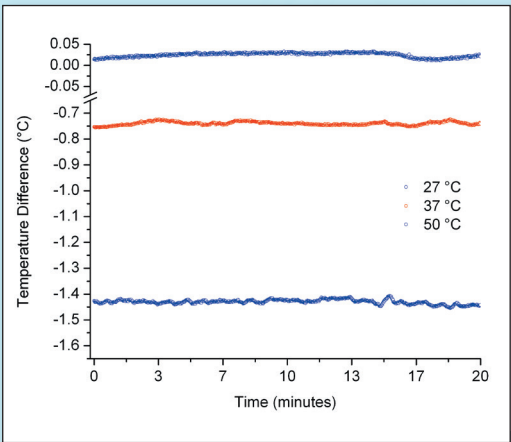


Figure 1: Deviation between the set point temperature (Peltier block temperature) and the temperature measured inside a standard, 1 cm cell filled with water. Data obtained using SPG-1A Air-cooled Peltier in a GENESYS 10S spectrophotometer.



SPG-1A Air-cooled Peltier System for GENESYS 10S and BioMate 3S

Less Maintenance and Flood Risk

Compared to traditional large-volume recirculator systems that rely on 4 L or more of water/anti-freeze mixture, Peltier thermostating systems eliminate or substantially reduce both routine maintenance and flood impact in the event of a hose failure. Thermo Scientific water-cooled systems use a small volume of recirculating deionized water that requires only occasional topping up and in the event of a hose failure they will deposit less than 150 mL before the internal low-water alarm turns the pump off.

- Zero maintenance with air-cooled designs
- Low maintenance with water-cooled designs
- No additional pumps or tanks required
- No flood risk

Fast Ramping

All Thermo Scientific Peltier accessories offer precise temperature control with careful approach to the set point temperature. Precision electronics allow thermal equilibrium to be reached rapidly inside the cell without exceeding the set point temperature and risking damage to the sample. Figure 2 shows the ramping profile of the SPG-1A Air-cooled accessory as the set point temperature approaches 25 °C. The efficiency of the ramping is also demonstrated in Table 2 where equilibrium data for two common temperature transitions is given.

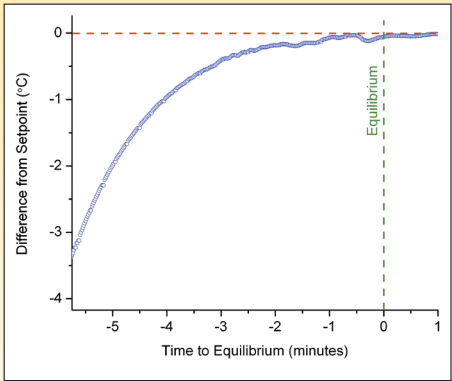


Figure 2: Temperature of the solution in a standard cuvette during ramping to Peltier set point temperature. The dotted green line indicates thermal equilibrium, which defines time zero. The Air-cooled Peltier accessory does not overshoot the set point temperature.

Temperature Change (°C)	Time to Equilibrium (m:ss)	Ramp Rate (block temp) (°C / min)
25–37	5:52	53.8
37–50	7:26	53.5

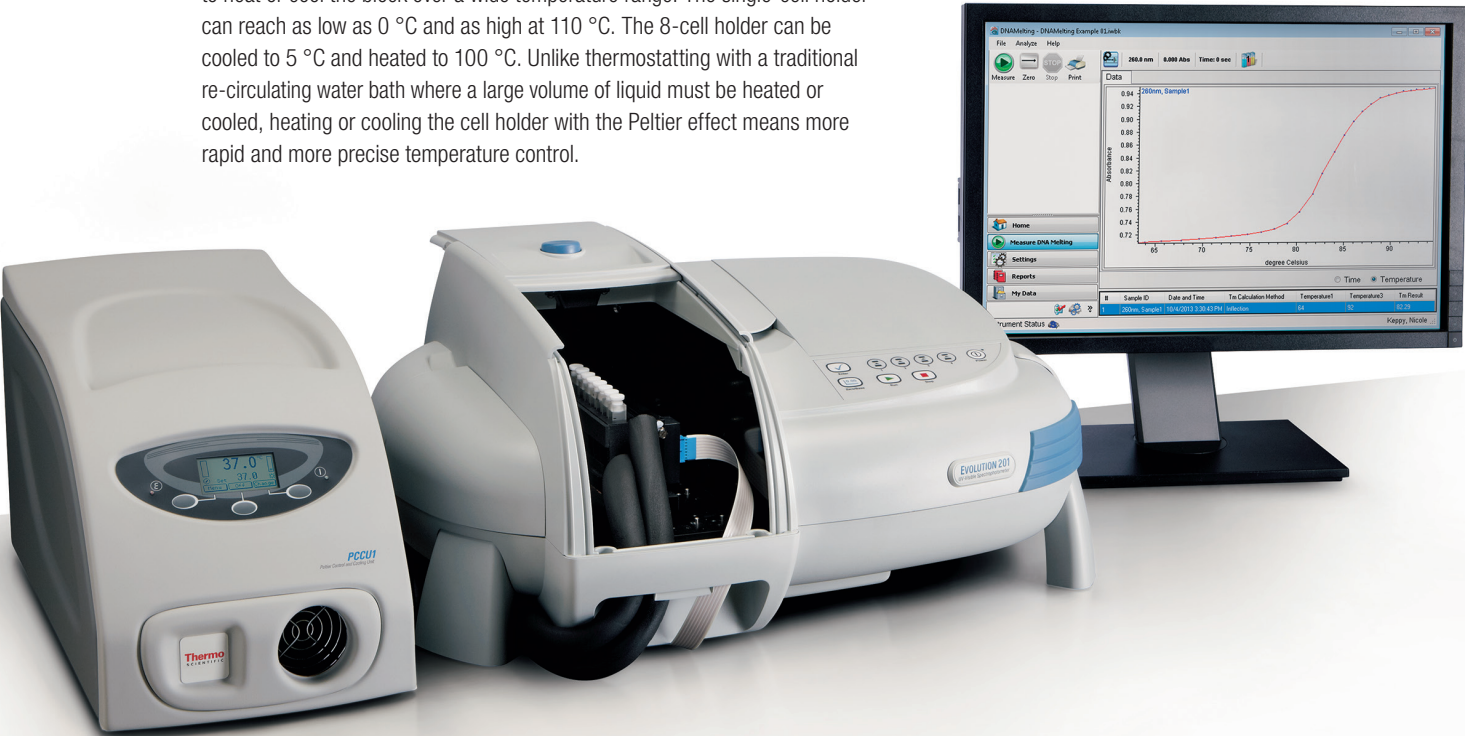
Table 2: Time to equilibrium with the Air-cooled Peltier accessory. Equilibrium is defined as 10 consecutive measurements of the sample temperature made at 1-second intervals with consistency within 0.005 °C.

Water-cooled Power for Extended Temperature Range on Evolution Spectrophotometers

The Thermo Scientific Peltier Control and Cooling Unit (PCCU1) module integrates a control module and a recirculator to provide both electronic control of temperature and a flow of water to act as a heat sink for the Peltier element in the sample compartment. No laboratory water flow or external pump and water reservoir are required.

Precise Thermostating

Re-circulating water provides an effective heat sink to allow the Peltier element to heat or cool the block over a wide temperature range. The single-cell holder can reach as low as 0 °C and as high at 110 °C. The 8-cell holder can be cooled to 5 °C and heated to 100 °C. Unlike thermostating with a traditional re-circulating water bath where a large volume of liquid must be heated or cooled, heating or cooling the cell holder with the Peltier effect means more rapid and more precise temperature control.

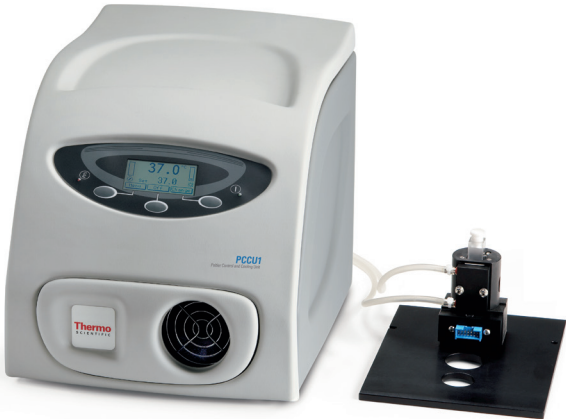


8-cell Peltier System for Evolution Spectrophotometers

Temperature Ramping

INSIGHT software takes control of the PCCU1 and allows you to implement programmed temperature ramping with multiple ramp and hold cycles. Add a thermocouple and thermocouple hub and you can monitor the exact temperature in each cell as you perform heating and cooling cycles to study DNA denaturation and renaturation or other complex temperature programmed experiments using INSIGHT 2 Bio software.

Maximum ramp and hold cycles per experiment	20
Maximum ramp rate	20 °C per minute
Minimum ramp rate	0.4 °C per minute



Single-cell Peltier System for Evolution Spectrophotometers

Smart Air-cooled Peltier for Evolution 300



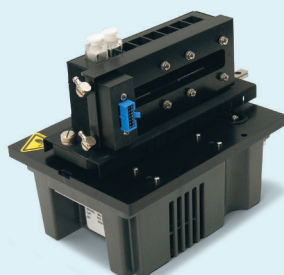
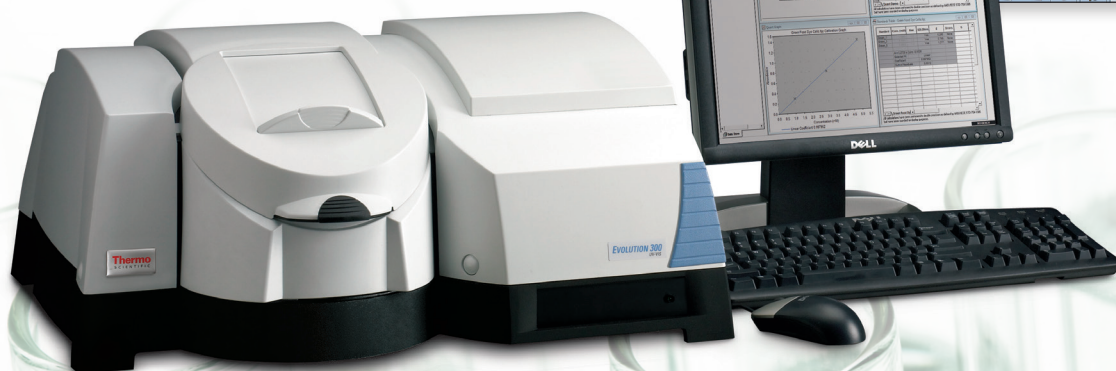
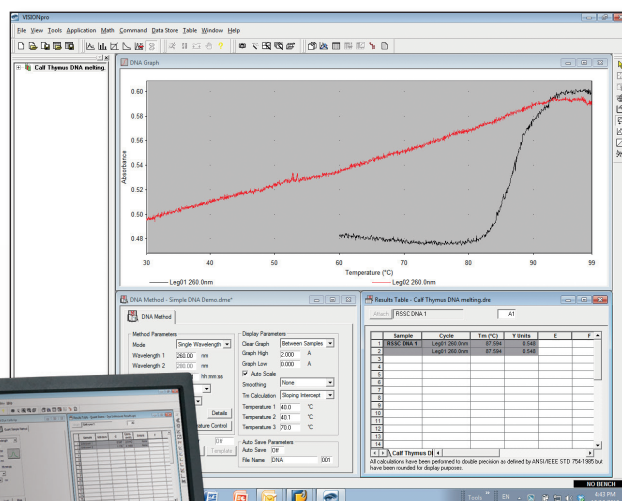
The Ultimate in Precision Temperature Control

The Evolution 300, the top of the line Thermo Scientific UV-Visible spectrophotometer, features a uniquely powerful Peltier accessory. The Smart Air-cooled Peltier offers a single cell position with precise Peltier thermostating or ramping for cell temperatures between 15 and 95 °C with ramp rates as low as 0.1 °C per minute. This outstanding performance is delivered with air-cooling provided by a turbine fan that circulates air underneath the instrument. No hoses. No spills. No compromises in performance.

A Powerful Tool for Life Science Research

Thermo Scientific™ VISION//fe™ software takes full advantage of the Smart Air-cooled Peltier accessory's capabilities. VISION//fe offers:

- A sophisticated kinetics application supporting serial, parallel, and triggered rate modes
- Advanced kinetics analysis software with modeling for pre-defined enzyme behavior models ranging from basic Michaelis-Menten treatments to binding models such as Hill plots, Lineweaver-Burke and Eadie-Hofstee
- DNA denaturation/renaturation application that exploits the accessory's control of the heating/cooling cycles to deliver the pinnacle of precision and control for your most important samples
- A wide range of T_m calculation methods which you can extend and customize using UVcalc



8-cell Peltier Accessory

Single-cell and 8-cell Peltier Accessories for Evolution 300

Thermostating with External Control

Use the external PCCU1 controller to specify temperature to a precision of 0.1 °C in the Single-cell or 8-cell Water-cooled Peltier accessories in the Evolution 300. The single-cell holder can cool to 0 °C and heat up to 110 °C. The 8-cell holder can be cooled to 5 °C and heated to 100 °C.

Air-cooled Simplicity for GENESYS 10S and BioMate 3S

The SPG-1A Air-cooled Peltier accessory for the GENESYS 10S and BioMate 3S delivers precise fixed point temperature control between 20 and 60 °C. Quickly specify the temperature for the analysis to a precision of 0.1 °C, and control the rate of stirring. The control module features a large temperature display and graphical indication of the stirring speed. Both parameters are simple to set using the push-button interface on the external control module or through Thermo Scientific™ VISION/ite™ software.

Lower Cost, More Bench Space, and No Maintenance

The Air-cooled Peltier accessory is less expensive than most re-circulating liquid temperature controllers and delivers better performance with absolutely no maintenance. The Peltier control system provides high accuracy temperature control without the need to watch water levels, mix in anti-freeze or anti-bacterial, or plumb the accessory with hoses and clamps.

Ideal for Life Science Assays

Designed for biologically relevant assays that require temperature control at 25, 37, 40 and 50 °C, the Air-cooled Peltier accessory is ideal for the life science laboratory. A perfect companion for the BioMate 3S and GENESYS 10S Bio, this accessory gives you temperature control for kinetics or routine life science analysis. With a wide 20 to 60 °C temperature range, a variety of assays can be accomplished with this accessory.



Efficient Sample Stirring with Peltier Thermostatting Systems

Sample stirring is an important parameter to consider in the laboratory. Stirring a liquid sample:

- Eliminates thermal gradients in the sample
- Aids in mixing reactants

The efficiency of the stirring process is crucial to accurate data. Figure 3 depicts the stirring performance of the Air-cooled Peltier accessory. Successive additions of a concentrated sample result in an increase of the total absorption. The data shows that equilibrium is established in a 3 mL cell in 1.08 seconds. The rate of stirring on all Peltier accessories with external controllers can be varied from 0 to 1800 rpm.

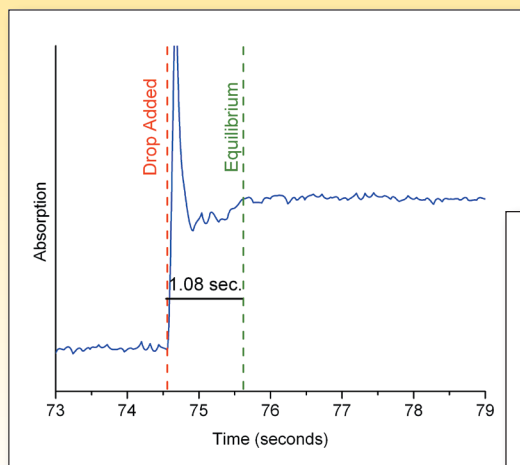
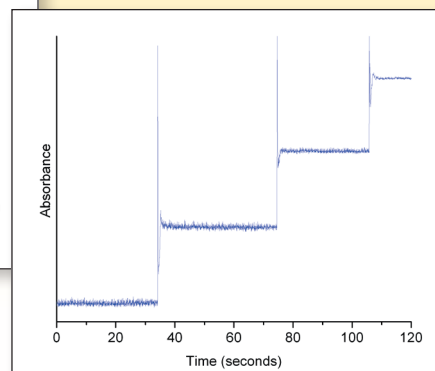


Figure 3: Absorption profile of an aqueous solution of DNA with successive additions of a concentrated stock solution. The graph shows the detail associated with one addition of stock solution. The time between the addition of the concentrated solution and equilibrium is 1.08 seconds.



Selection Guide, Specifications and Ordering Information

Unit	SPG-1A Air-cooled Peltier Accessory	Single-cell Water-cooled Peltier Accessory	8-cell Water-cooled Peltier Accessory	Smart Air-cooled Peltier Accessory
Applications	<ul style="list-style-type: none"> Biochemical kinetics Enzymatic food analysis Equilibrium studies 	<ul style="list-style-type: none"> Kinetics studies Equilibrium studies DNA melting 	<ul style="list-style-type: none"> Kinetics studies Equilibrium studies DNA melting 	<ul style="list-style-type: none"> Kinetics studies Equilibrium studies DNA melting
Compatible Spectrophotometers	<ul style="list-style-type: none"> BioMate 3S GENESYS 10S Bio GENESYS 10S Evolution 60S 	<ul style="list-style-type: none"> Evolution 201 Evolution 220 Evolution 260 Bio Evolution 300 	<ul style="list-style-type: none"> Evolution 201 Evolution 220 Evolution 260 Bio Evolution 300 	<ul style="list-style-type: none"> Evolution 300
Control from Remote Control Unit	Yes	Yes	Yes	No
Control from Computer Software	Yes with VISION ^{lite} software	Yes with INSIGHT 2 software	Yes with INSIGHT 2 software	Yes with VISION ^{life} software
Accessible Temperature Range	20–60 °C	0–110 °C ¹	5–100 °C	15–95 °C ²
Ramp Rate³ (per minute)	NA	0.4–20 °C	0.4–10 °C	0.1–6 °C
Includes Stirring	Yes	Yes	Yes	Yes
Available Temperature Probe for Sample	No	With INSIGHT software and temperature probe hub	Up to 8 cells with INSIGHT software and temperature probe hub Single probe with VISION ^{pro} ™ software	Yes
Part Number	222-238100	699-131100	699-131200	10010301

¹ Maximum setpoint with external controller is 101 °C. Maximum setpoint in INSIGHT 2 software is 110 °C.

² Maximum block temperature is 110 °C. Minimum block temperature is 5 °C.

³ Maximum achievable ramp rates listed are near the mid-point of the accessible temperature range. Maximum ramp rates near the limits of the accessory's temperature range are lower.

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