TED series temperature control cards

The PRO800, chassis accepts two 8000 series modules. Use our LDC8000 and our TED8000 series modules to set up a space saving laser current & temperature controller…

Introduction - TED8000 Series Temperature Controllers

A wide range of thermo-electric temperature control modules are available from ± 2A/16W to ± 8A/64W, with 16 bit resolution. The TED8000 series modules provide excellent temperature stabilization, typically ±0.001°C when using an AD590 thermal sensor, for optimal laser operation and other applications requiring precise thermal control. In general, this facilitates highly stable operation of temperature sensitive components; one example is optical nonlinear birefringent crystal experiments, where phase matching requires sensitive control of the crystal's temperature.

Separate adjustment of the P, I and D settings of the PID servo loop, enable optimal settling times for different thermal loads. If the TED8000 module is used with a laser diode control module in the same chassis, the temperature window protection feature switches the laser diode current off if the temperature of the laser departs from a preset temperature window (high and low thresholds).

The TED8000 series of temperature controllers operate within our PRO8000 series mainframe, and are ideal companions to our LDC8000 laser diode current controller modules shown on page 366.

High Power Laser Systems

With up to 64 Watts of cooling power, the TED8080 is well matched to our LDC8080 laser diode control module that provides 8A laser drive current (shown on page 371). Laser diodes typically operate at approximately 2 to 3 Volts forward bias voltage. At 8A, this results in an overestimated thermal load of 16W to 24W, assuming 0% lasing efficiency and all the electrical energy is converted to thermal energy.

High Channel Count Laser Systems

When using our eight channel laser controller (MLC8000 series), the TED8080 is an ideal choice to temperature stabilize a large number of lasers mounted on a common cold plate. Consider eight MLC modules, each operating eight lasers at 200mA (maximum for the MLC8080 series). Assuming the lasers are operated at 3V, the maximum total thermal load for the system (assuming 100% of the laser current is converted to thermal energy) is 38.4W. This is well within the 64W capacity of the TED8080.

TEC Safeguards

Damage to the TE cooler is prevented by setting an adjustable TEC current limit. This can either be set via a recessed potentiometer on the module front panel (hardware limit), via the front panel softkeys or one of the standard interfaces (software limit).

When used with our laser diode current controllers, an additional laser diode safety feature can be enabled; a temperature window protection can be activated. If the laser temperature departs from the preset window, the laser current will be switched off immediately. The temperature modules of the TED8000 series meet extremely high standards regarding precision and drift performance and provide a low noise, bipolar output. This enables extremely stable wavelength control and safe thermal load management.

Choice of temperature sensors

The temperature modules of the TED 8000 series can be operated with thermistors, AD590/AD592 IC sensors and LM335 transducers. When operated with a thermistor the thermistor calibration constant can be set so that all applicable settings and displays can be done directly in °C, rather than Ω (ohms).

With the modules of the TED8000PT series a Pt100 temperature sensing element can be operated replacing the IC sensor.

For extremely low temperature applications, such as the operation of a lead-salt lasers, a kryo option is offered for all model temperature modules. As a Pt1000 sensor is used for operating temperatures in the range of 20 to 310K, the controller is modified to control a heating element.

Adjustable PID control loop

The P-, I- and D- settings of the temperature control loop can be set via menu-driven softkeys or via one of the remote interfaces. This ensures fast laser temperature settling times. Combination laser current / temperature control modules are also available (ITC8000 series, see page 372 for details). Cable CAB420-15 is delivered with each of the TED8000 modules to connect them with any of our laser diode mounts.

TED8000 Series Temperature Control

	TED8020	TED8040	TED8080
Type of controller	PID with Adjustable Share		
P/I/D-Share	12 bit Control Range		
Card Width	1 slot	1 slot	2 slots
Connector	15-pin D-sub (f)		
Weight	< 500g	< 600g	< 700g
Operating temperature	0 to +40 °C		
Storage temperature	−40 to +70 °C		

Other PRO8000 Modules: WDM laser sources with precise wavelength calibration and 1nm tuning. Optical Switches for automated switching within test setups. Optical detectors for precision optical measurements.

TED8000 Series Specifications

	TED8020	TED8040	TED8080
Control Range	–2A to +2A	–4A to +4A	–8A to +8A
Compliance Voltage		> 8V	
Maximum Output Power	16W	32W	64W
Measurement Resolution I_{TEC}	0.07mA	0.15mA	0.3mA
Measurement Accuracy I_{TEC}	± 5mA	± 10mA	± 25mA
Measurement Resolution U_{TEC}		0.3mV	
Measurement Accuracy U_{TEC}		± 20mV	
Noise & Ripple (typ.)	< 1mA	< 2mA	< 4mA
Temperature Sensors: Thermistor			
Control Range		5Ω to 20kΩ Switchable 50Ω to 200kΩ	
Calibration		Exponential Form, Steinhart-Hart	
Resolution		0.3Ω/3Ω	
Accuracy		±2.5Ω/±25Ω	
Stability, typ.		< 0.5Ω/< 5Ω	
Temperature Sensor: IC-sensors (AD590/AD592/LM335)			
Control Range		–12.375 °C to +90 °C	
Calibration		2-point-linearization	
Resolution		0.0015 °C	
Accuracy		±0.1 °C	
Temperature, stability typ.		< 0.001 °C	
Temperature Sensor: Pt100 Platinum			
Control range		–12.375 °C to + 90 °C	
Resolution		0.0015 °C	
Accuracy		±0.3 °C	
Stability typ.		< 0.005 °C	
Temperature Sensor Pt1000 (KRYO)			
Control range		20 to 310K	
Resolution		(20 to 155K) 2mK	
Accuracy		(20 to 155K) ± 2K	
Temperature Stability typ.		(20 to 155K) 0.005K	
TEC current limit			
Setting range (20-turn pot)	0 to ≥ 2A	0 to ≥ 4A	0 to ≥ 8A
Resolution D/A converter	0.5mA	1mA	2mA
Accuracy	±20mA	±40mA	±80mA

PID Control Systems

A PID control system combines three different control strategies into one feedback loop. The PID refers to how the error signal (difference between where you are and where you want to be) is processed prior to being fed back to the driving element responsible for changing the system. The purely proportional controller simply scales the error signal by some number prior to feeding it back to the drive element. Normally we talk about the gain of a proportional feedback system. With proportional controllers it is often difficult to prevent them from oscillating around a value slightly offset from the desired value. An older household thermostat is typical of a simple proportional controller.

An integrating controller does a summation of the error signal over some time period and then feeds back this integrated error signal to the system driver. An integrating controller is useful for reducing the offset often found in proportional systems. Integrating controllers are often referred to as reset controllers in that they "reset" the gain of the simplified proportional controllers through the integration of the error signal. As implied, the integrating strategy is often combined with proportional strategy to yield a PI servo control loop that is better more likely to approach the desired set point with minimum offset than a simple P system.

A differential controller, typically not found by itself, is useful for its ability to adjust the response of the servo loop in proportion to the rate of change of the error signal. When combined with the PI to form a full PID system it provides a highly adaptable servo loop that offers both a fast settling time as well as an extremely small offset error.

The technical data are valid at 23 ± 5°C and 45 ±15% relative humidity

ITEM#	$	£	€	¥	DESCRIPTION
TED8020	$1,173.00	£ 714.00	€1.020,00	¥163,200	PRO 8000 TEC Controller, 16W
TED8040	$1,288.00	£ 784.00	€1.120,00	¥179,200	PRO 8000 TEC Controller, 32W
TED8080	$1,564.00	£ 952.00	€1.360,00	¥217,600	PRO 8000 TEC Controller, 64W
TED8020PT	$1,391.50	£1,266.27	€1.530,65	¥236,555	PRO 8000 TEC Controller, 16W, Pt100
TED8040PT	$1,506.50	£1,370.92	€1.657,15	¥256,105	PRO 8000 TEC Controller, 32W, Pt100
TED8080PT	$1,782.50	£1,622.08	€1.960,75	¥303,025	PRO 8000 TEC Controller, 64W, Pt100 2 slots