

# LDT 5416

## Thermoelectric Temperature Controller

### Product Features

16W output power for thermal management

High stability within 0.01°C for sensitive experiments

Hybrid P-I control loop for simple and fast setting time

Three display modes provide easy access to information

Three thermistor modes for a wide variety of usable thermistors

Visual fault indicators for immediate notification of errors

Designed to be economical and flexible for a wide variety of applications, the LDT-5416 Thermoelectric Temperature Controller offers a stable, low noise, bipolar output up to 16W and is optimized for controlling the temperature of laser diodes and photodetectors. Two of the temperature sensor modes, 10 $\mu$ A and 100  $\mu$ A, allow the thermoelectric controller to control and display thermistor resistance while delivering a bipolar current to a thermoelectric module. A third temperature sensor mode, linearized 10k $\Omega$ , allows the temperature controller to display and control a calculated temperature set point with a 10k $\Omega$  thermistor. The instrument's hybrid proportional-integral control loop offers fast settling times with a typical long term temperature stability of 0.01°C.



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## Thermoelectric Temperature Controller

### Easy Operation

The intuitive front panel features a highly visible LED display, which has three display modes for easy operation: (1) Actual, which displays the measured resistance or temperature of a thermistor sensor, (2) Set, which displays the setpoint resistance or temperature of a thermistor sensor, and (3) TE Current, which displays the drive current supplied to the TE module.

### Multiple Temperature Sensor Control Modes

The incorporation of user-selectable temperature sensor modes of 10  $\mu$ A, 100  $\mu$ A, and linearized ensures versatility over a wide range of temperatures and applications. This allows the LDT-5416 to operate over a thermistor control resistance range of 0 to 200 k $\Omega$ . In addition, the unique linearized thermistor mode of the LDT-5416 can display and control temperature using a 10 k $\Omega$  thermistor. By

using a precision 10 k $\Omega$  thermistor, users can achieve temperature accuracy of  $\pm 1.0$   $^{\circ}$ C without the need of Steinhart-Hart constants. In linearized thermistor mode, the LDT-5416 can operate over a 10 to 40  $^{\circ}$ C temperature range.

### Application Flexibility

The LDT-5416 allows the user to bypass the internal set resistance function of the front panel knob and control resistance set point with an external resistor of known value. This is convenient for reproducing the same temperature quickly and accurately.

In addition, the P-I control loop of the LDT-5416 optimizes slew rate and settling time. Adjustment is easy with the rear panel GAIN control. For automated testing or to remotely compute actual temperature, the LDT-5416 also offers an analog voltage output that corresponds to the thermistor resistance.

## Specifications<sup>1</sup>

### CONTROL SYSTEM

Temperature Stability (1 hour): <sup>2</sup>	$\pm 0.005$ $^{\circ}$ C
Temperature Stability (24 hours): <sup>2</sup>	$\pm 0.01$ $^{\circ}$ C
Temperature Coefficient:	$< 0.0025$ $^{\circ}$ C/ $^{\circ}$ C
Control Algorithm:	Proportional (Adjustable) Integral (Fixed)

### SENSOR

Thermistor:	NTC (2-wire)
Thermistor Sensor Resistance	
10 $\mu$ A Bias Setting	
Range:	0 to 199.9 k $\Omega$
Resolution (Display):	0.1 k $\Omega$
Accuracy:	$\pm 1\%$ of reading $\pm 100\Omega$
100 $\mu$ A Bias Setting	
Range:	0 to 19.99 k $\Omega$
Resolution (Display):	0.01 k $\Omega$
Accuracy:	$\pm 1\%$ of reading $\pm 10\Omega$
Linearized Thermistor Mode <sup>3</sup>	
Range:	10 - 40 $^{\circ}$ C (0 to 15 k $\Omega$ )
Resolution (Display):	0.1 $^{\circ}$ C
Accuracy:	$\pm 1$ $^{\circ}$ C

### TEC OUTPUT

Output Type:	Bidirectional, linear
Isolation:	Floating with respect to earth ground
Output Current	Specified only for ambient temperatures 23 $\pm 5$ $^{\circ}$ C
Range:	-4.00 A to + 4.00 A
Resolution (Display):	0.01 A
Accuracy:	$\pm 0.05$ A
Current Limit Range:	-4.00 A to +4.00 A
Compliance Voltage:	$\pm 4$ V
Maximum Output Power:	$> 16$ W
Current Noise and Ripple:	$< 2$ mA rms

### AUXILIARY OUTPUT

Analog Output Gain Factor:	100 mV/k $\Omega$ (100 $\mu$ A) 10 mV/k $\Omega$ (10 $\mu$ A)
Analog Output Impedance:	2 k $\Omega$ (nominal)
External Fan Output Voltage:	12 V (nominal)
External Fan Output Max. Current:	100 mA (maximum)

### GENERAL

I/O Connectors:	Female 15-pin, D-sub (TEC I/O) Isolated Female BNC (Analog Output)
Power Requirements:	100-240 VAC; 50/60 Hz; 75W
Size (HxWxD):	14.2 cm x 25.9 cm x 6.6 cm; 5.6" x 10.2" x 2.6"
Weight:	1.35 kg (3.0 lbs.)
Operating Temperature:	10 $^{\circ}$ C to 40 $^{\circ}$ C
Storage Temperature:	-40 $^{\circ}$ C to 70 $^{\circ}$ C
Humidity:	$< 85\%$ , relative, non-condensing
Compliance:	CE

### NOTES

1. All specifications unless otherwise noted are for a one hour warm up.
2. Temperature stability tested at 25  $^{\circ}$ C with a 10 k $\Omega$  thermistor on the 100  $\mu$ A setting.
3. To achieve rated accuracy, a 10 k $\Omega$  thermistor with at least 1% accuracy and a Beta in the range of 3900 to 4050 must be used. Use of a thermistor outside of this accuracy and Beta will result in inaccurate temperature readings and set points.

### ORDERING INFORMATION

LDT-5416	Thermoelectric Temperature Controller
LDM-4405	Low Cost TO-Can Laser Diode Mount
CC-501S	TE Controller / Unterminated Interconnect Cable
CC-505S	TE Controller / Laser Diode Mount Interconnect Cable
TS-510	10k $\Omega$ Calibrated Thermistor ( $\pm 0.2^{\circ}$ C)
UCA-350	Unipolar Heater Control Adapter

In keeping with our commitment to continuing improvement, ILX Lightwave reserves the right to change specifications without notice or liability for such changes.



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