2510 TEC SourceMeter

The Model 2510 Thermoelectric Cooler Controller is designed to:

- control the power to the TEC to maintain a constant temperature, current, voltage, or thermistor resistance
- measure the resistance of the TEC
- software PID loop

CONTROL SYSTEM SPECIFICATIONS

SET: Constant Peltier Temperature
Constant Peltier Voltage
Constant Peltier Current
Constant Thermistor Resistance

CONTROL METHOD:

Programmable software PID loop.

Proportional, Integral, and Derivative gains independently programmable.

SETPOINT SHORT TERM STABILITY: ±0.005°C rms.[2, 3]

SETPOINT LONG TERM STABILITY: ±0.01°C.[2, 4]

SETPOINT RANGE: –50°C to 225°C.

OVER TEMPERATURE LIMIT: 250°C max.

UNDER TEMPERATURE LIMIT: –50°C max.

SETPOINT RESOLUTION: 0.001°C, 1mV, 100µA, 0.01% of nominal (25°C) thermistor resistance.

HARDWARE CURRENT LIMIT: 1.0A to 5.25A ±5%.

SOFTWARE VOLTAGE LIMIT:±0.5 to 10.5V ±5%.

TEC OUTPUT SPECIFICATIONS

OUTPUT RANGE: ±10 VDC at up to ±5 ADC.

OUTPUT RIPPLE: <5mV rms.[5]

AC RESISTANCE EXCITATION: ±(9.6mA + 190µA).[10, 11]

TEC MEASUREMENT SPECIFICATIONS

FUNCTION	1 Year, 23°C ±5°C
Operating Resistance [1, 6, 7, 8]	±(2.0% of rdg + 0.1Ω)
Operating Voltage [1, 6]	±(0.1% of rdg + 4mV)
Operating Current [6]	±(0.4% of rdg + 8mA)
AC Resistance [1, 13]	±(0.10% of rdg + 0.02Ω)

OPEN SHORTED THERMOELECTRIC DETECTION

LOAD IMPEDANCE: Stable into 1µF typical.

COMMON MODE VOLTAGE: 30VDC maximum.

COMMON MODE ISOLATION: >10^9Ω, <1500pF.

MAX. SENSE LEAD RESISTANCE: 1Ω for rated accuracy.

MAX. FORCE LEAD RESISTANCE: 0.1Ω.

THERMAL FEEDBACK ELEMENT SPECIFICATIONS (1 Year, 23°C ±5°C)

Sensor Type	RTD		Thermistor				Solid State	
	100 Ω	1 kΩ	100 Ω	1 kΩ	10 kΩ	100 kΩ	Current Output (I_{ss})	Voltage Output (V_{ss})
Excitation [9]	2.50 mA	833 µA	2.5 mA	833 µA	100 µA	33 µA	+13.5V	2.5 mA
Compliance						833 µA max	833 µA	15.75 V max
Nominal Resistance Range	0–250 Ω	0-2.50 kΩ	0–1 kΩ	0–10 kΩ	0–80 kΩ	0–200 kΩ		
Excitation Accuracy	±2.9%	±2.9%	±2.9%	±2.9%	±2.9%	±2.9%	±12%	±2.9%
Nominal Sensor Temperature Range	–50° to +250°C	–50° to +250°C	–50° to +250°C	–50° to +250°C	–50° to +250°C	–50° to +250°C	–40° to +100°C	–40° to +100°C
Sensor Coefficients	α, β, δ	α, β, δ	A, B, C	A, B, C	A, B, C	A, B, C	Slope & offset	Slope & offset
Measurement Accuracy ±(% rdg + offset)	0.04 + 0.07 Ω	0.04 + 0.4 Ω	0.04 + 0.07 Ω[1]	0.04 + 0.4 Ω[1]	0.02 + 3 Ω[1]	0.04 + 21 Ω	0.03 + 100 nA	0.03 + 500 µV

THERMISTOR MEASUREMENT ACCURACY[14]

Nominal Thermistor Resistance	Accuracy vs. Temperature 0°C	25°C	50°C	100°C
100 Ω	0.021°C	0.035°C	0.070°C	0.27°C
1 kΩ	0.015°C	0.023°C	0.045°C	0.18°C
10 kΩ	0.006°C	0.012°C	0.026°C	0.15°C
100 kΩ	0.009°C	0.014°C	0.026°C	0.13°C

OPEN/SHORTED ELEMENT DETECTION

SOFTWARE LINEARIZATION FOR THERMISTOR AND RTD

COMMON MODE VOLTAGE: 30VDC.

COMMON MODE ISOLATION: >10^9Ω, <1000pF

MAX. VOLTAGE DROP IN INPUT FORCE LEADS: 1 volt.

MAX. SENSE LEAD RESISTANCE: 100Ω for rated accuracy.

SENSE INPUT IMPEDANCE: > $1 \cdot 10^8$Ω.

GENERAL

NOISE REJECTION:

SPEED	NPLC	CMRR[12]
Normal	1.00	90 dB

SOURCE OUTPUT MODES: Fixed DC level.

PROGRAMMABILITY: IEEE-488 (SCPI-1995.0), RS-232, 3 user-definable power-up states plus factory default and *RST.

POWER SUPPLY: Nominal 100 to 240VAC rms, 50–60Hz, 90VA.

WARRANTY: 1 year.

EMC: Conforms to European Union Directive 89/336/EEC, EN 61326-1.

SAFETY: Conforms to European Union Directive 73/23/EEC, EN 61010-1.

VIBRATION: MIL-PRF-28800F Class 3 Random Vibration.

WARM-UP: 1 hour to rated accuracies.

DIMENSIONS, WEIGHT: 89mm high × 213 mm wide × 370mm deep (3½ in × 8⅜ in × 14⅝ in). **Bench configuration (with handle & feet):** 104mm high × 238mm wide × 370mm deep (4⅛ in × 9⅜ in × 14⅝ in). **Net Weight:** 3.8kg (8.38 lbs).

ENVIRONMENT: Operating: 0°–50°C, 70% R.H. up to 35°C. Derate 3% R.H./°C, 35°–50°C. **Storage:** –25° to 65°C

NOTES

1 With remote voltage sense.
2 With 10kΩ thermistor as sensor.
3 Short term stability is defined as 24 hours with Peltier and Model 2510 at 25°C ±0.5°C.
4 Long term stability is defined as 30 days with Peltier and Model 2510 at 25°C ±0.5°C.
5 10Hz to 10MHz measured at 5A output into a 2Ω load.
6 Common mode voltage = 0V (meter connect enabled, connects Peltier low output to thermistor measure circuit ground). ±(0.1% of rdg + 0.1Ω) with meter connect disabled.
7 Resistance range 0Ω to 20Ω for rated accuracy.
8 Current through Peltier > 0.2A.
9 Default values shown, selectable values of 3µA, 10µA, 33µA, 100µA, 833µA, 2.5mA. Note that temperature control performance will degrade at lower currents.
10 AC Ohms is a dual pulsed measurement using current reversals available over bus only.
11 @23°C ±5°C.
12 For 1kΩ unbalance in LO lead. Minimum amplifier specification.
13 Resistance range 0Ω to 100Ω for rated accuracy.
14 Accuracy figures represent the uncertainty that the Model 2510 may add to the temperature measurement, not including thermistor uncertainty. These accuracy figures are for thermistors with typical A, B, C constants.

HW 3/13/02
Rev. B

LTR	REVISIONS	APP.	DATE
A	24052 REL	SZ	4/12/00
B	27123 REV	SZ	4/10/02

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SPECIFICATIONS

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