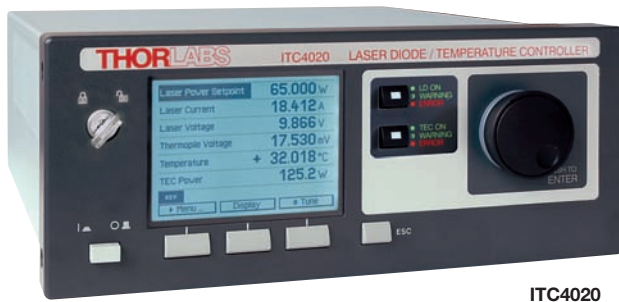


Laser Diode and Temperature Controllers (Page 1 of 3)



ITC4020

Includes Power Cord, Connection Cable for our Laser Mounts, Sub-D Connector Kit, and USB Cable.

The ITC4000 Series of controllers combines a laser diode current controller with a TEC controller to provide precise, stable current for laser diodes with injection currents between 1 A and 20 A as well as excellent temperature stabilization (0.002 °C over 24 hrs.) These controllers support all laser diode and monitor diode pin configurations and can be operated in a constant current (CC) or constant power (CP) mode. Most common temperature sensors can be used, and the ITC4000 Series can be adapted to different thermal loads via a digital PID controller. These controllers offer both an auto PID setting function and separate control of the P, I, and D parameters.

The ITC4000 device is controlled via front panel keys and intuitive operation menus on a large, easy-to-read graphic LCD display. Additionally, members of this series can be controlled via an SCPI-compatible USB Interface. A higher setting and measurement resolution is offered via remote control operation.* Many enhanced features like the Quasi-Continuous Wave (QCW) operation mode, an internal modulation generator, and diverse laser diode and TEC element protection features are provided. These features provide silent, power-efficient operation, making the ITC4000 Series an ideal choice for most applications.

Laser Diode Operation Modes

The laser diodes can be driven in either constant current (CC) mode, where the laser current is held precisely at the level adjusted by the user, or constant power (CP) mode, where an optical power sensor is used to monitor the output power of the laser for active power control. The ITC4000 Series offers two independent monitor inputs: one for photodiodes and one for thermopiles, both of which can be chosen for controlling the laser diode.

The analog modulation via external input or the internal function generator enables modulation of the laser diode in CC and CP modes. A control output voltage proportional to the laser current is provided for monitoring purposes.

Depending on the application, the ITC4000 Series of laser diode drivers can be operated in continuous wave (CW) or quasi-continuous wave (QCW) mode. The integrated pulse generator can be triggered internally with an adjustable repetition rate or externally via a BNC jack at the rear of the unit (see page 1458 and page 1459 for more details about the operation modes).

Features

- 3 Models for Laser Currents up to 1 A, 5 A, or 20 A
- TEC Currents up to ± 8 A or ± 15 A (Model Dependent)
- Excellent Temperature Stability: 0.002 °C (24 hrs)
- For Anode- and Cathode-Grounded Laser Diodes and Photodiodes
- Constant Current (CC) and Constant Power (CP) Control Modes
- Continuous Wave (CW) or Quasi-Continuous Wave (QCW) Operation
- Modulation via Internal Function Generator or External Modulation Input
- Analog Laser Current Monitor Output
- Supports Photodiodes, Thermopiles, Sensor Amplifiers, and Power Meters with Voltage Output for Optical Power Control
- Sensor Calibration for Power Display in mW
- Supports Thermistor, RTD, and IC Temperature Sensors
- Enable Key Switch and Interlock
- Enhanced Laser Diode and TEC Element Protection
- Digital PID Control with Auto PID Setting Function
- SCPI-Compliant USB Interface and Driver Set
- Power Efficient by Active Power Management

Enhanced Protection Features for the Laser Diode

The maximum allowed laser current, which is set as a precisely adjustable current limit, cannot be exceeded in any operation mode or for any compliance voltage. Electrical filters, careful grounding of the chassis, electronic output short-circuit, and the soft start feature ensure that the laser current remains transient-free under all circumstances, even in the case of power line failure (see page 1458 for details about the protection features).

TEC Controller

The ITC4000 Series contains a high-performance digital TEC controller for currents up to either ± 8 A or ± 15 A. It offers an excellent temperature stability of 0.002 °C over 24 hours together with the same enhanced safeguard and operation features of the TED4015 (see pages 1452 - 1453). The digital PID controller can adapt to different thermal loads by individual adjustable parameters or by the auto PID function. For more details, see page 1459. The ITC4000 Series supports thermistors up to 1000 k Ω , temperature sensing ICs, or Platinum RTD sensors with a maximum control range of -55 to 150 °C. This temperature range is only a theoretical value; the actual rated temperature range is limited by the connected sensor and thermal setup.

For maximum TEC element protection, the ITC offers the same features as the TED4015 controller. These protection features include an adjustable TEC output current limit, temperature sensor operation alerts, and monitoring of the actual and set temperature by an output signal.

*The front panel resolution is limited by the display. A higher setting and measurement resolution is offered via remote control.

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Laser Diode and Temperature Controllers (Page 2 of 3)

ITEM #	ITC4001		ITC4005		ITC4020	
	Front Panel ^a	Remote Control ^a	Front Panel ^a	Remote Control ^a	Front Panel ^a	Remote Control ^a
Current Control (Constant Current Mode)						
Control Range ^b	0 to 1 A		0 to 5 A		0 to 20 A	
Compliance Voltage	>10 V					
Setting/Measurement Resolution	100 μ A	16 μ A	1 mA	80 μ A	1 mA	320 μ A
Accuracy	$\pm(0.1\% + 500 \mu\text{A})$		$\pm(0.1\% + 2 \text{ mA})$		$\pm(0.1\% + 8 \text{ mA})$	
Noise and Ripple (rms, Typical)	<15 μ A		<500 μ A		<10 mA	
Drift, 24 Hours (0-10 Hz, Typical)	<100 μ A		<300 μ A		<1 mA	
Temperature Coefficient	<50 ppm/ $^{\circ}$ C					
Current Limit						
Setting Range	1 mA to 1 A		5 mA to 5 A		20 mA to 20 A	
Resolution	100 μ A	16 μ A	1 mA	80 μ A	1 mA	320 μ A
Accuracy	$\pm(0.12\% + 800 \mu\text{A})$		$\pm(0.12\% + 3 \text{ mA})$		$\pm(0.12\% + 12 \text{ mA})$	
Power Monitor Input - Photodiode						
Photocurrent Measurement Ranges	2 mA / 20 mA					
Photocurrent Measurement Resolution	1 μ A / 10 μ A	32 nA / 320 nA	1 μ A / 10 μ A	32 nA / 320 nA	1 μ A / 10 μ A	32 nA / 320 nA
Photocurrent Accuracy	$\pm(0.08\% + 0.5 \mu\text{A}) / \pm(0.08\% + 5 \mu\text{A})$					
Photodiode Reverse Bias Voltage	0 to 10 V					
Power Monitor Input - Thermopile^c						
Voltage Measurement Ranges	10 mV / 100 mV / 1 V / 10 V					
Voltage Measurement Resolution	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V
Voltage Accuracy	$\pm(0.1\% + 10 \mu\text{V}) / \pm(0.1\% + 100 \mu\text{V}) / \pm(0.1\% + 1 \text{ mV}) / \pm(0.1\% + 5 \text{ mV})$					
Constant Power Control						
Photocurrent Control Ranges	0 to 2 mA / 0 to 20 mA					
Photocurrent Setting Resolution	1 μ A / 10 μ A	32 nA / 320 nA	1 μ A / 10 μ A	32 nA / 320 nA	1 μ A / 10 μ A	32 nA / 320 nA
Voltage Control Ranges	1 μ V to 10 mV / 10 μ V to 100 mV / 100 μ V to 1 V / 1 mV to 10 V					
Voltage Setting Resolution	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V	1 μ V / 10 μ V 100 μ V / 1 mV	0.16 μ V / 1.6 μ V 16 μ V / 160 μ V
Power Limit						
Photocurrent Limit Range	5 μ A to 2 mA / 50 μ A to 20 mA					
Sensor Voltage Limit Range	1 μ V to 10 mV / 10 μ V to 100 mV / 100 μ V to 1 V / 1 mV to 10 V					
Laser Voltage Measurement						
Measurement Principle	4-Wire					
Laser Overvoltage Protection						
Setting Range	1 V to 11 V					
Laser Current Monitor Output						
Load Resistance	>10 k Ω					
External Modulation Input						
Small Signal 3 dB Bandwidth, CC Mode	DC to 100 kHz		DC to 100 kHz		DC to 50 kHz	
Internal Modulation						
Waveforms	Sine, Square, Triangle					
Frequency Range	20 Hz to 100 kHz		20 Hz to 100 kHz		20 Hz to 50 kHz	
Modulation Depth	0.1 to 100%					
QCW Mode						
Pulse Width Range	100 μ s to 1 s					
Pulse Width Resolution	1 μ s					
Repetition Rate Range	1 ms to 5 s (0.2 to 1000 Hz)					
Repetition Rate Resolution	10 μ s					
Trigger						
Input and Output Level	TTL or 5V CMOS					
TEC Current Output						
Control Range	-8 to 8 A		-15 to 15 A		-15 to 15 A	
Compliance Voltage	>12 V		>15 V		>15 V	
Output Power (Max)	>96 W		>225 W		>225 W	
Resolution (Constant Current Mode)	1 mA	0.1 mA	1 mA	0.1 mA	1 mA	0.1 mA
Accuracy	$\pm(0.2\% + 20 \text{ mA})$		$\pm(0.2\% + 20 \text{ mA})$		$\pm(0.2\% + 20 \text{ mA})$	
TEC Current Limit						
Setting Range	0.1 A to 8 A		0.1 A to 15 A		0.1 A to 15 A	

^aThe front panel resolution is limited by the display. A higher setting and measurement resolution is offered via remote control.^bControl range and thermal stability depend on thermistor parameters.^cThe Thermopile Power Monitor Input can also be used for sensor amplifiers and power meters with voltage output.

...continued on next page

Laser Diode and Temperature Controllers (Page 3 of 3)

ITEM #	ITC4001		ITC4005		ITC4020	
	Front Panel*	Remote Control*	Front Panel*	Remote Control*	Front Panel*	Remote Control*
NTC Thermistor Sensors						
Resistance Measurement Range	100 Ω to 100 kΩ / 1 kΩ to 1 MΩ (2 Ranges)					
Control Range (Max)	-55 to 150 °C					
Resolution (Temperature)	0.001 °C					
Resolution (Resistance, 100 kΩ/1 MΩ Range)	0.1 Ω / 1 Ω	0.03 Ω / 0.3 Ω	0.1 Ω / 1 Ω	0.03 Ω / 0.3 Ω	0.1 Ω / 1 Ω	0.03 Ω / 0.3 Ω
IC Sensors						
Supported Temperature Sensors	AD590, AD592 (Current); LM335, LM235, LM135, LM35 (Voltage)					
Control Range with AD590	-55 to 150 °C					
Control Range with AD592	-25 to 105 °C					
Control Range with LM335	-40 to 100 °C					
Control Range with LM235	-40 to 125 °C					
Control Range with LM135	-55 to 150 °C					
Control Range with LM35	-55 to 150 °C					
Resolution	0.001 °C	0.0001 °C	0.001 °C	0.0001 °C	0.001 °C	0.0001 °C
Pt100/Pt1000 RTD Sensors						
Temperature Control Range	-55 to 150 °C					
Resolution	0.001 °C	0.0003 °C	0.001 °C	0.0003 °C	0.001 °C	0.0003 °C
Temperature Window Protection						
Setting Range Twin	0.01 to 100.0 °C					
Protection Reset Delay	0 to 600 s					
Window Protection Output	BNC, TTL					
Temperature Control Output						
Load Resistance	>10 kΩ					
Transmission Coefficient	$\Delta T * 5 V / T_{WIN} \pm 0.2 \%$ (Temperature Deviation, Scaled to Temperature Window)					
TEC Voltage Measurement						
Measurement Principle	4-Wire / 2-Wire					
Resolution	100 mV	40 mV	100 mV	40 mV	100 mV	40 mV
Accuracy (with 4-Wire Measurement)	± 50 mV					
Digital I/O Port						
Number of I/O Lines	4 (Separately Configurable)					
Input Level	TTL or CMOS, Voltage Tolerant up to 24 V					
Output Level (Source Operation)	TTL or 5 V CMOS, 2 mA (Max)					
Output Level (Sink Operation)	Open Collector, up to 24 V, 400 mA (Max)					
Interface						
USB2.0	According to USBTMC/USBTMC-USB488 Specification Rev. 1.0					
Protocol	SCPI Compliant Command Set					
Drivers	VISA VXI pnp™, MS Visual Studio™, MS Visual Studio.net™, LabVIEW™, LabWindows/CVI™					
General Data						
Safety Features	Interlock, Inhibit, Keylock Switch, Laser Current Limit, Laser Power Limit, Soft Start, Short Circuit when Laser off, Adjustable Laser Overvoltage Protection, Over-Temperature Protection, Temperature Window Protection					
Display	LCD 320 x 240 Pixel					
Line Voltage / Frequency	100 - 120 V and 200 - 240 V $\pm 10\%$, 50 to 60 Hz					
Operating Temperature	0 to 40 °C					
Dimensions (W x H x D without Operating Elements)	10.35" x 4.80" x 12.09" (263 mm x 122 mm x 307 mm)					

*The front panel resolution is limited by the display. A higher setting and measurement resolution is offered via remote control.

ITC4000 Series of Controllers and Connector Cables

ITEM #	\$	£	€	RMB	DESCRIPTION
ITC4001	\$ 2,950.00	£ 2,124.00	€ 2,566.50	¥ 23,511.50	Benchtop Laser Diode and TEC Controller ± 1 A
ITC4005	\$ 3,400.00	£ 2,448.00	€ 2,958.00	¥ 27,098.00	Benchtop Laser Diode and TEC Controller, ± 5 A
ITC4020	\$ 3,900.00	£ 2,808.00	€ 3,393.00	¥ 31,083.00	Benchtop Laser Diode and TEC Controller, ± 20 A
CAB4005	\$ 80.00	£ 57.60	€ 69.60	¥ 637.60	Cable for LDC4000 Series, 5 A, 13W3 to D-Sub-9, 1.5 m Long
CAB4006	\$ 80.65	£ 58.07	€ 70.17	¥ 642.78	Cable for LDC4000 Series, 20 A, 13W3 to 13W3, 1.5 m Long
CON4005	\$ 14.50	£ 10.44	€ 12.62	¥ 115.57	Connector Kit for LDC4000 Series, 20 A, 13W3 Male
CAB4000	\$ 65.00	£ 46.80	€ 56.55	¥ 518.05	Cable for TED4000, 5 A, 17W2, D-Sub-9
CAB4001	\$ 170.00	£ 122.40	€ 147.90	¥ 1,354.90	Cable for TED4000, 20 A, 17W2, 17W2
CON4001	\$ 22.00	£ 15.84	€ 19.14	¥ 175.34	Connector Kit for TED4000, 20 A, 17W2 Male