

## Product Features

Precision 10A / 20A current source with integrated 128W temperature controller

Multiple levels of laser diode protection

LIV capabilities via remote interfacing for characterizing laser diodes

Analog modulation up to 100 kHz

Integrated 4-wire laser and TEC voltage measurements

Temperature controller compatible with thermistor, IC, and RTD temperature sensors

TTL trigger output

USB and GPIB remote interface

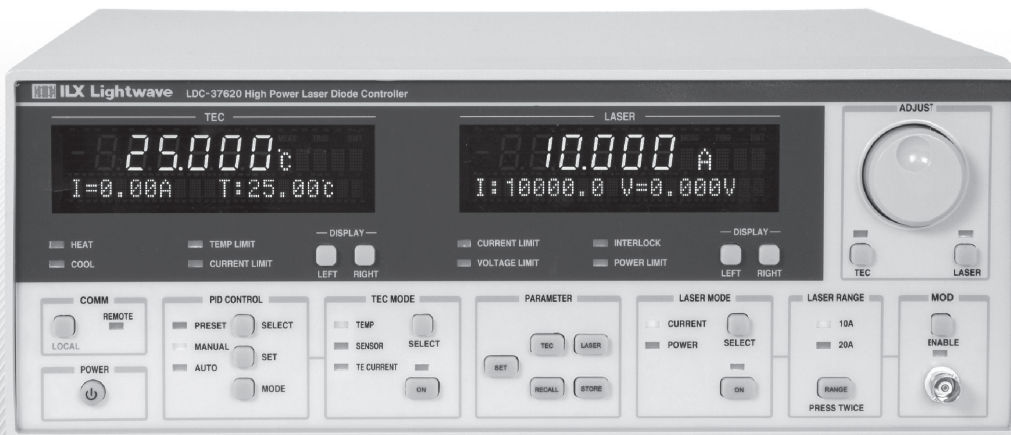
LabVIEW® drivers

The LDC-37620 High Power Laser Diode Controller is an industry leading combination laser current source and temperature controller specifically designed for high power single-emitter laser diodes. Careful attention to the design allows the LDC-37620 to deliver up to 20A at 4V of compliance voltage. The LDC-37620 has built in 4-wire laser voltage measurement with integrated LIV functionality making this instrument ideal for precision, high power laser diode characterization. The high power temperature controller was designed to provide up to 128W of cooling power to handle the large heat output of high power laser diodes.

Integrated redundant laser protection circuits ensure safe operation of high power single-emitter lasers even during unforeseen power surges. All of ILX's proven laser diode protection strategies have been designed into the LDC-37620 including slow start, adjustable current limits and compliance voltage, intermittent contact protection, and shorting relays. The laser current source also features a TEC interlock function that will protect against laser thermal runaway by immediately shutting down the laser current if the temperature is above the user defined temperature limit.

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### HIGH POWER PRECISION LASER DIODE TESTING

The LDC-37620 High Power Laser Diode Controller is designed as a current source specifically tailored to high power single-emitter laser diodes. Ideal for R&D or manufacturing testing, precision low noise current is delivered to the laser, with four-wire voltage measurement allowing for monitoring and control of laser voltage, LIV testing, and laser qualification testing setups.

### SETTING THE STANDARD IN LASER DIODE PROTECTION

ILX Lightwave's internal testing and protection standards ensure protection for high power single-emitter lasers under abnormal operation conditions such as intermittent contact or severe power spikes. These standards have led to advanced protection features like clamping current limits, even under modulated conditions.

The LDC-37620 was designed as a current source specifically for high power laser diodes. The driver provides multiple laser diode protection features such as current and voltage limits, slow start turn-on, floating outputs, fast error detection, and immunity to operational and power line transients. Transients from normal instrument operation such as output on/off have been thoroughly tested and minimized.

A feature not found in most laser diode drivers - fast output shutout - provides an additional level of protection from intermittent contacts between the laser and the current source. Intermittent contact can occur by loose or worn cables causing a momentary open in the circuit or by pogo-pins momentarily losing connection to the laser. If intermittent contact is left undetected, a severe voltage transient can occur which will damage sensitive laser diodes.

These protection features all work in conjunction with all instrument modes of operation, providing worry free, fail-safe control of your laser diode.

### PRECISION LIV TESTING

The LDC-37620 was developed to allow for rapid onboard LIV testing of high power laser diodes with low noise and precision forward voltage measurement. An adjustable 0V to 5V photodiode reverse bias voltage ensures linear measurements and fast conversion

speed. Accurate forward voltage measurements are maintained during high current output and long cable use through a four-wire measurement system. Remote LIV commands and on-board memory for collected data allow for automated LIV data collection, saving time and ensuring systematic testing and instrument operation.

### EASE OF OPERATION

The front panel of the LDC-37620 was designed for ease of use and readability. The front panel features two large 7-segment displays, each of which also has an integrated dot matrix display. Instrument controls are grouped by mode and function to allow for easy setup. The displays allow for easy viewing of multiple parameters including laser diode current, laser diode voltage, photodiode measurement, measured temperature, set temperature, TEC current, and TEC voltage. Each display can be easily configured to display the most relevant measurements in your application.

### REMOTE OPERATION

Remote instrument operation in an R&D or production environment is available through a USB or GPIB interface. Remote commands have been structured in SCPI format and, where possible, standard SCPI commands have been used. A trigger output is provided for integration into an automated measurement system where the TTL level output indicates a current step change for initiation of a measurement.

A robust and easy to modify LabVIEW® driver is available for download.

### SAVE AND RECALL SETTINGS

For multiple instrument test configurations, the LDC-37620 offers a STORE and RECALL feature. The STORE function allows the user to store all the front panel settings for any given instrument condition. The RECALL function allows retrieval of any of the saved conditions at any time. This saves time in instrument reconfiguration for different production runs or R&D experiments.

# LASER CURRENT SOURCE

## LDC-37620

### DRIVE CURRENT OUTPUT <sup>1</sup>

Output Current Range:	0–10A	0–20A
Setpoint Resolution (Display):	1mA	1mA
Setpoint Resolution (Remote): <sup>12</sup>	1mA	1mA
Setpoint Accuracy (% of SP):	±0.1% ± 10mA	±0.1% ± 10mA
Compliance Voltage:	0 – 4V adjustable	0 – 4V adjustable
Temperature Coefficient:	<50ppm/°C	<50ppm/°C
Short-Term Stability (one-hour): <sup>2</sup>	<50ppm	<50ppm
Long-Term Stability (24-hour): <sup>3</sup>	<100ppm	<100ppm
Noise and Ripple (rms) <sup>4</sup>		
High Bandwidth Mode (rms):	<5mA	<7mA
Low Bandwidth Mode (rms):	<5mA	<7mA
Transients		
Operational: <sup>5</sup>	<25mA	<25mA
1 kV EFT/Surge: <sup>6</sup>	<80mA / <150 mA	<80mA / <150 mA

### COMPLIANCE VOLTAGE LIMIT ADJUST

Range:	0 – 4.4V	0 – 4.4V
Setpoint Resolution (Display):	0.1V	0.1V
Setpoint Resolution (Remote):	15mV	15mV
Accuracy:	±2.5% FS	±2.5% FS

### DRIVE CURRENT LIMIT SETTINGS

Range:	0 - 10.1A	0 - 20.2A
Resolution:	100mA	100mA
Accuracy:	±101mA	±202mA

### PHOTODIODE FEEDBACK

Type:	Differential	Differential
Photodiode Reverse Bias:	0 – 5V adjustable	0 – 5V adjustable
Photodiode Current Range:	5 to 10000µA	5 to 10000µA
Output Stability: <sup>7</sup>	0.02% of SP	0.02% of SP
Setpoint Accuracy:	±0.05% of FS	±0.05% of FS

### EXTERNAL ANALOG MODULATION

Input:	0 – 10V, 1 kΩ	0 – 10V, 1 kΩ
Transfer Function:	1A/V	2A/V
Bandwidth (3dB)		
High Bandwidth: <sup>8</sup>	DC to 100kHz	DC to 100kHz
Low Bandwidth: <sup>9</sup>	DC to 10kHz	DC to 10kHz

### TRIGGER OUTPUT

Type:	TTL	TTL
Pulse Width:	13 µs	13 µs
Delay:	2.5 mS	2.5 mS

### MEASUREMENT (DISPLAY)

Output Current		
Range:	0 – 10.000A	0 – 20.000A
Resolution:	0.001A	0.001A
Accuracy:	±0.1% FS + 10mA	±0.1% FS + 10mA
Photodiode Current		
Range:	0 – 10000µA	0 – 10000µA
Resolution:	1µA	1µA
Accuracy:	±4µA	±4µA
Photodiode Responsivity <sup>10</sup>		
Range (µA/mW):	0.00 – 1000.00	0.00 – 1000.00
Resolution:	0.01µA/mW	0.01µA/mW
Optical Power		
Range (mW):	0.00 – 20000.0	0.00 – 20000.0
Resolution:	0.1mW	0.1mW
Forward Voltage		
Range:	0.000 – 4.000V	0.000 – 4.000V
Resolution:	1mV	1mV
Accuracy: <sup>11</sup>	±2mV	±2mV

## GENERAL

I/O Connectors	
TEC I/O:	Female, 25-pin, D-sub
Analog Input:	None
Remote Interface:	GPIO IEEE 488.1; USB 2.0 (B-Type)
Power Requirements <sup>1</sup>	AC Input Selector; 115/230 VAC; 500W; 50-60 Hz
Size (HxWxD):	5.0" x 13.9" x 13.6"; 127 mm x 353 mm x 345 mm
Weight:	22.0 lbs.; 9.98 kg.
Operating Temperature:	10°C to 40°C
Storage Temperature:	-30°C to 70°C
Humidity:	<85% relative, non-condensing
Compliance:	CE

## CURRENT SOURCE NOTES

- <sup>1</sup> All values relate to a one-hour warm-up period.
- <sup>2</sup> Over any one-hour period, half-scale output.
- <sup>3</sup> Over any 24-hour period, half-scale output.
- <sup>4</sup> Measured electrically with a frequency range of 100Hz to 340kHz (High Bandwidth), 100Hz to 17kHz (Low Bandwidth).
- <sup>5</sup> Maximum output current transient resulting from normal operational situations (e.g., power on-off, current on-off), as well as accidental situations (e.g., power line plug removal). In the LDC-37620 there is a potential for up to 100mA operational transient when the laser is enabled and then the TEC output is enabled. To protect the laser in all condition it is recommend setting both the current and voltage limit just above typical operating conditions and enabling the TEC output prior to the laser current output.
- <sup>6</sup> Maximum output current transient resulting from a 1000V power line transient spike. Tested to ILX Technical Standard #LDC-00196; request ILX App Note #13.
- <sup>7</sup> Maximum monitor photodiode current drift over any 30 minute period. Assumes zero drift in responsivity of photodiode.
- <sup>8</sup> 50% modulation at mid-scale output. Higher bandwidth is possible with smaller modulation signal.
- <sup>9</sup> Small signal specification is for typical 10% modulation depth. Large signal specification assumes 50% modulation depth at mid-scale output.
- <sup>10</sup> Responsivity value is user-defined and is used to calculate the optical power.
- <sup>11</sup> Four wire voltage measurement at the load. Voltage measurement accuracy while driving calibration load. Accuracy is dependent upon load and cable used.
- <sup>12</sup> Based on resolution of digital to analog converters used in circuit.

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### Specifications

#### TEMPERATURE CONTROL<sup>1</sup>

LDC-37620

Temperature Control Range: <sup>2</sup>	
Thermistor Sensor:	-100°C to +200°C
IC Sensor:	-100°C to +150°C
RTD Sensor:	-100°C to +200°C

Temperature Setpoint and Measurement	
Repeatability and Accuracy: <sup>3</sup>	
0°C:	±0.001°C / ±0.01°C
25°C:	±0.002°C / ±0.04°C
50°C:	±0.007°C / ±0.15°C
75°C:	±0.05°C / ±0.9°C
Temperature Stability: <sup>4</sup>	
1 Hour:	±0.002°C
24 Hours: <sup>4</sup>	±0.003°C

#### TEMPERATURE SENSOR

Types:	
Thermistor:	NTC (2-wire)
IC-V Semiconductor IC Sensor:	LM-335 voltage output; 5 to 14 mV/K
IC-I Semiconductor IC Sensor:	AD-590 current output; 1 µA/K
RTD Sensor	Platinum 100Ω / 1000Ω (2-wire)

Thermistor Sensor Resistance	
10 µA Bias Setting	
Range:	0 to 450 kΩ
Resolution (Display): <sup>6</sup>	0.01 kΩ
Accuracy:	±180 Ω

100 µA Bias Setting	
Range:	0 to 45 kΩ
Resolution (Display): <sup>6</sup>	0.001 kΩ
Accuracy:	±18 Ω

IC-V Sensor Voltage	
Nominal Bias:	1 mA
Range:	0 to 6V
Resolution (Display): <sup>6</sup>	0.0001 V
Accuracy:	±2 mV

IC-I Sensor Current	
Nominal Bias:	5 to 15 V
Range:	0 to 600 µA
Resolution (Display): <sup>6</sup>	0.001 µA
Accuracy:	±0.18 µA

RTD Sensor Resistance	
1 mA Bias Setting	
Range:	0 to 1500 Ω
Resolution (Display): <sup>6</sup>	0.01 Ω
Accuracy:	±0.8 Ω

2.5 mA Bias Setting	
Range:	0 to 200 Ω
Resolution (Display): <sup>6</sup>	0.001 Ω
Accuracy:	±0.1 Ω

User Sensor Calibration	
Thermistor:	Steinhart-Hart, 3 constants
IC Sensors:	Slope, Offset
RTD	R <sub>0</sub> , A, B, C

#### TEC OUTPUT

Output Type:	Bi-directional, linear
Isolation:	Floating with respect to earth ground
Current Setpoint	
Range:	-8.00A to +8.00A
Resolution (Display): <sup>6</sup>	0.01A
Accuracy:	±0.05A
Current Limit	
Range:	-8.05A to +8.05A
Accuracy:	±0.05A
Voltage Measurement <sup>7</sup>	
Range:	-16.00V to +16.00V
Resolution (Display): <sup>6</sup>	0.01V
Accuracy:	±0.01V
Compliance Voltage:	±16V
Maximum Output Power:	128W
Current Noise and Ripple: <sup>5</sup>	<2.5 mA rms

#### AUXILIARY I/O SPECIFICATIONS

Analog Control Input	
Input Voltage Range:	-5V to +5V
Input Resistance:	>100 kΩ
Gain: <sup>9</sup>	2 °C/V
Bandwidth:	5 Hz
External Fan Control Output <sup>8</sup>	
Output Voltage Range:	0 to +12V
Maximum Current:	500 mA

#### TEMPERATURE CONTROL NOTES

- All values are specified for an ambient temperature of 23±5°C after a 1 hour warm up unless otherwise specified.
- Software limits of range. Actual range depends on the physical load, sensor type, and TEC module used.
- Accuracy figures represent the uncertainty that the LDC-3706 series adds to the measurement. This figure does not include the sensor calibration uncertainties. Thermistor accuracy figures are quoted for a typical 10 kΩ thermistor and 100 µA current setting for -5°C to 50°C.
- Temperature stability measurements made in a stable, ambient environment ±0.5°C with a 10 kΩ thermistor on the 100 µA setting after a 2 hour warm up period. Stability is defined as  $\pm(T_{max}-T_{min})/2$  over the measurement period.
- Measured over the full DC current range into a 1Ω load.
- Maximum resolution available when operating in the control mode (using the 7-segment display) resolution will be reduced when displayed on the lower display. In remote operation, six significant digits of resolution are reported.
- Measured at the output connector. Users may enter in cable resistance to provide an accurate voltage measurement at the load.
- Unregulated output and requires a minimum of a 120mA current draw.
- Transfer function is applicable to linear sensors only. Use of non-linear sensors, such as thermistors, may result in a non-linear transfer function which varies over the temperature modulation range.

#### ORDERING INFORMATION

LDC-37620	High Power Laser Diode Controller
LDM-4409	High Power Laser Diode Mount, C-Mount
CC-308H	Current Source/Laser Diode Mount Interconnect Cable
CC-320	Current Source/Laser Diode Mount Interconnect Cable
CC-325	Current Source/Laser Diode Mount Interconnect Cable, Unterminated
CC-340	Current Source/Laser Diode Mount Interconnect Cable, Unterminated
CC-594H	TE Controller/Unterminated Interconnect Cable
CC-595S	TE Controller / Laser Diode Mount Interconnect Cable
CC-596H	TE Controller/High Power Laser Diode Mount Interconnect Cable