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Diode Laser Controllers

- Up to 3 A of low-noise drive current
- Modulation to 1 MHz
- Complete diode laser characterization
- IEEE-488.2 interface standard
- CE compliant

The model 06 DLD 103A and 06 DLD 105 diode laser controllers are sophisticated current sources, thermoelectric cooler (TEC) controllers, and diagnostic instruments–combined in a single package. In addition to providing highly stable current, they have data acquisition and graphic display capabilities. The standard IEEE-488.2 interface bus and external laser power input permit integration into automated test and data-acquisition systems. A battery-backed memory stores up to eight individual setup configurations for easy recall.

The 06 DLD 103A will provide up to 500 mA of stable, noise-free drive current; the 06 DLD 105 will provide up to 3.0 A of drive current.

INNOVATIVE USER INTERFACE

The controllers feature a large 240 × 128 element backlit liquid crystal display (LCD). A user-friendly, menu-driven operating system allows an operator to input current and temperature values and display operating parameters and graphs representing the laser's performance.

CHARACTERIZATION AND DIAGNOSTIC CAPABILITIES

In the ***Diode Plot*** mode, both the 06 DLD 103A and the 06 DLD 105 have the capability to characterize a diode laser's operating current, photocurrent, voltage, and power output graphically. In the ***Time Plot*** mode, the operator can study the temporal characteristics of those parameters, along with the temperature, TEC current, and voltage. The time interval between samples is user selectable between 1 millisecond and 3500 seconds.

External analog signals from current amplifiers and power meters can also be collected and analyzed in both ***Time Plot*** and ***Diode Plot*** modes.

Modes of Operation

Melles Griot diode laser controllers operate in three distinct modes: constant current, constant current with high-frequency modulation, and constant power.

Constant-Current Mode

In this mode, the current source is configured to deliver highly stable, clean current to the diode laser. An external modulation signal can be applied to the unit's front-panel input for remote linear control of the operating current. The current resulting from this modulation signal is summed with the operating current, which is set from the unit's front panel. For the 06 DLD 103A, two analog modulation bandwidth settings are available: dc to 500 Hz and dc to 1.0 MHz (700 μsec and 350 nsec minimum rise/fall times, respectively). Together with the current range selection, this enables the user to operate the 06 DLD 103A so that the output current is as noise free as possible. For the 06 DLD 105, the bandwidth is 250 kHz.

Constant-Current Mode with High-Frequency Modulation

These diode laser controllers are capable of digitally modulating a diode laser with current pulses whose rise and fall times are ≤20 nsec (06 DLD 103A). Digital modulation refers to switching between low and high operating current levels in response to an input signal's logic level state. The user can select the value for each current level.

An internal square wave generator is also provided in the unit for digital modulation purposes. The period can be set from 0.49 μsec to 16 msec (60 Hz to 2 MHz), with a continuously adjustable duty cycle (to 1 Mb/sec for the 06 DLD 105).

Constant-Power Mode

These drivers can be used to stabilize diode laser output power. Current from the diode laser's internal monitor photodiode (if so equipped) is used as the feedback signal in the power control loop. Since the diode laser's photomonitor current is kept constant, its

USING DIODE LASERS WITH FIBER OPTICS

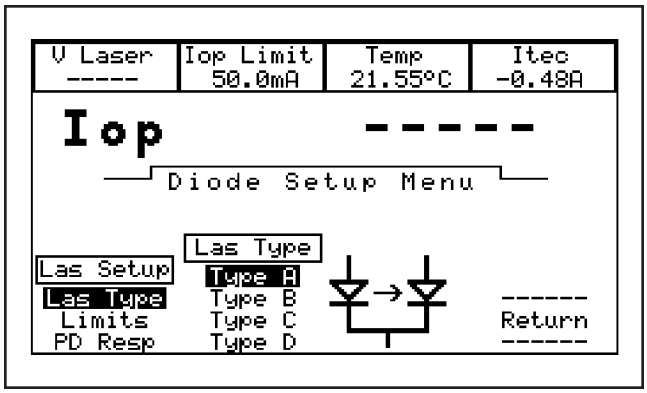
The model 17 HLD 001 diode laser mount with TE cooling is designed for use with Melles Griot fiber positioning equipment. The 17 HLD 001 attaches directly to a MicroBlock™ positioning stage for precise alignment to focusing lenses and fiber optics. For details of the 17 HLD 001, see Chapter 32, *Mechanical Accessories.*

output power is also kept constant. Two user-selectable gain settings are available to permit using diode lasers with photomonitor currents from 1 μA to 2 mA (photo-low setting) and 10 μA to 10 mA (photo-high setting).

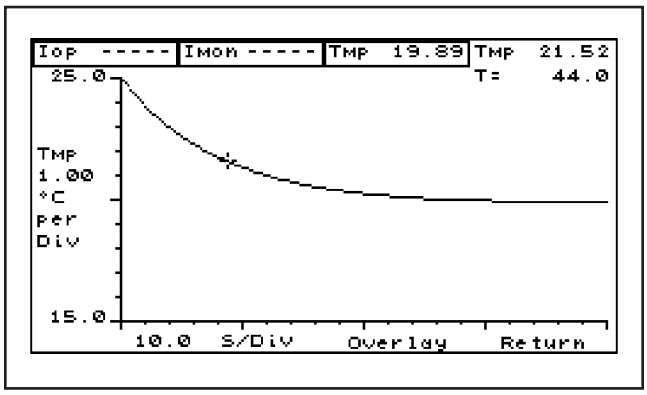
The 06 DLD 103A and 06 DLD 105 can also display the optical output power of the diode laser. The instrument allows the user to enter the diode laser's photodiode responsivity. It then automatically calculates and displays the actual output power.

FLEXIBLE TEMPERATURE-CONTROL CAPABILITIES

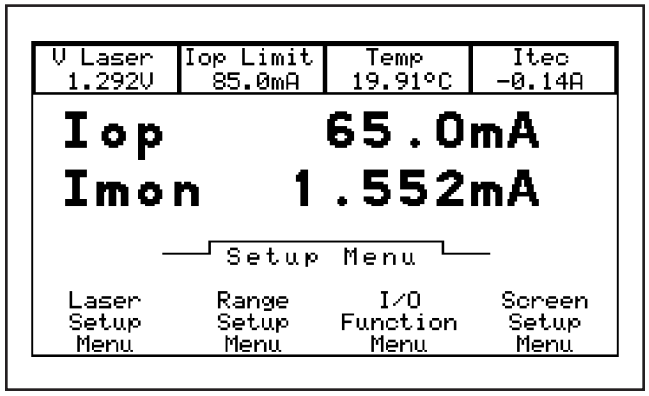
The large LCD and intuitive software make temperature stabilization of a diode laser easy. The instrument leads the user through temperature sensor, limit, and set point selection. The low-noise output is ideal for driving thermoelectric cooler modules which are routinely used for stabilizing and tuning the wavelength/frequency of a diode laser, as well as for prolonging the laser's lifetime. The instrument is compatible with a wide range of temperature sensors and sensing techniques for flexibility and convenience. These include thermistors, integrated circuit temperature sensors, and diode laser voltage feedback. To prevent accidentally overdriving the thermoelectric cooler module, an adjustable current limit is provided. In addition, a user-selectable high-temperature limit is standard to protect the diode laser from damage caused by thermal runaway.



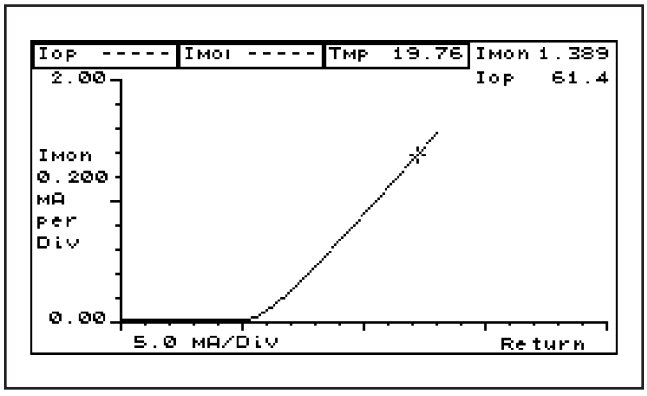
Setup screen for diode laser package type



Diode laser temperature versus time in time plot mode



Setup mode of the 06 DLD 103A



I_{mon} versus I_{op} curve in diode plot mode

SPECIFICATIONS: 06 DLD 103A DIODE LASER CONTROLLER

Constant Current Mode

Current Range: 1–500 mA

Resolution: 0.1 mA

Temperature Coefficient: <100 ppm/ºC

Drift (over 1 hour @25ºC): <10 ppm

Noise (rms):
Low/high bandwidth
Range: 1–100 mA: <1 μA/1 μA
2–200 mA: <3 μA/4 μA
3–300 mA: <5 μA/10 μA

Constant Power Mode

Range: 0–10 mA

Resolution:
Photo-low: 1 μA
Photo-high: 10 μA

Temperature Coefficient: <100 ppm/ºC

Drift: <100 ppm/ºC

Analog Modulation: dc–1 MHz

Modulation*

Internal Modulation:

Type (digital): square wave

Period (user selectable):
0.49 μsec–16 msec (60 Hz– 2 MHz)

Pulse Width (user selectable): 0.24 μsec–16 msec

External Modulation:

Analog Modulation:

Frequency: dc–1 MHz

Input Impedance: 100 kΩ

Digital Modulation:

Rise/fall time: 10 nsec

Maximum I_{op}: <100 mA

Input Impedance: 50 Ω

Overshoot: 10% maximum

Other Parameters

Voltage Compliance: 0–10 Vdc

Display Accuracy (full scale): ±0.1%

Current Limit Range: 5–500 mA

External Input:

Range (full scale): ±1 to ±10 Vdc

Resolution (full scale): ±0.1%

Monitor Output:
Operating current, monitor current, laser voltage, TEC current, and actual temperature can be monitored

General Information

Dimensions (W × H × D):
180 mm × 300 mm × 105 mm (7.1 in. × 11.8 in. × 4.1 in.)

Weight: 7.0 kg (15.5 lb)

Power Requirements:
100 Vac ± 10%,
120 Vac ± 10%,
220 Vac ± 10%,
240 Vac ± 10%,
50–60 Hz

Operating Temperature: +5ºC to 40ºC

Storage Temperature: −40ºC to 70ºC

Safety: Complies with CDRH 21CFR 1040.10
CE compliant

**Modulation bandwidth, noise, and temperature coefficient are dependent upon the diode laser type used in power-stabilized mode. Values used are for Sharp Model LT026.*

Diode Laser Controller

	PRODUCT NUMBER
500-mA Diode Laser Controller	06 DLD 103A
Cable, 10-nsec rise time high-frequency	06 DLH 001
Cable, 100-kHz with flying leads	06 DLH 005
Cable, 56 DOL Laser Assemblies	56 DLH 001

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SPECIFICATIONS:
06 DLD 105 DIODE LASER CONTROLLER

Constant Current Mode

Current Range: 10–3000 mA

Resolution: 0.1 mA

Temperature Coefficient: <100 ppm/°C

Drift (over 1 hour @25°C): <10 ppm

Noise (rms) Low/High Bandwidth:
Range: 10–1000 mA: <10 μA/204 μA
20–2000 mA: <20 μA/40 μA
30–3000 mA: <30 μA/60 μA

Constant Power Mode

Range: 0–10 mA

Resolution:
Photo-low: 1 μA
Photo-high: 10 μA

Temperature Coefficient: <100 ppm/°C

Drift: <100 ppm/°C

Analog Modulation: dc–1 MHz

Modulation*

Internal Modulation:
Type (digital): square wave
Period (user selectable):
0.73 μsec–16 msec (60 Hz– 1.3 MHz)
Pulse Width (user selectable): 0.49 μsec–16 msec

External Modulation:
Analog Modulation:
Frequency: dc–1 MHz
Input Impedance: 100 kΩ
Digital Modulation:
Rise/fall time: 100 nsec
Maximum I_{op}: <100 mA
Input Impedance: 50 Ω
Overshoot: 10% maximum

Other Parameters

Voltage Compliance: 0–5 Vdc

Display Accuracy (full scale): ±0.1%

Current Limit Range: 30–3000 mA

External Input:
Range (full scale): ±1 to ±10 Vdc
Resolution (full scale): ±0.1%

Monitor Output:
Operating current, monitor current, laser voltage, TEC current, and actual temperature can be monitored

General Information

Dimensions (W × H × D):
180 mm × 300 mm × 105 mm (7.1 in. × 11.8 in. × 4.1 in.)

Weight: 7.0 kg (15.5 lb)

Power Requirements:
100 Vac ± 10%,
120 Vac ± 10%,
220 Vac ± 10%,
240 Vac ± 10%,
50–60 Hz

Operating Temperature: +5°C to 40°C

Storage Temperature: −40°C to 70°C

Safety: Complies with CDRH 21CFR 1040.10
CE compliant

**Modulation bandwidth, noise, and temperature coefficient are dependent upon the diode laser type used in power-stabilized mode. Values used are for Sharp Model LT026.*

Diode Laser Controller

	PRODUCT NUMBER
3-A Diode Laser Controller	06 DLD 105
Cable, 10-nsec rise time high-frequency	06 DLH 001
Cable, 100-kHz with flying leads	06 DLH 005
Cable, 56 DOL Laser Assemblies	56 DLH 001

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