



LDM21(/M) 5.6 mm/9 mm Laser Diode Mount

User Guide



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Chapter 1 Safety



Warning

This unit must not be operated in explosive environments.



Warning

Avoid exposure – laser radiation emitted from apertures

Chapter 2 Description

The LDM21(/M) is a temperature-controlled laser diode mount. When used with Thorlabs LDC Series Laser Controllers and TED Series TEC Controllers, a laser diode can be operated with precise temperature control for wavelength and power stability. A four pin socket accepts all 9 mm and 5.6 mm laser diodes. Easy to use polarity switches allow the laser mount to be configured for all possible laser pin assignments.

The LDM21(/M) was designed with features that allow it to be easily incorporated into complex systems. The front of the LDM21(/M) has an SM1 (1.035"-40) thread to accept a wide variety of Thorlabs SM1 1.0" optics mounts and accessories. Also standard with the mount are 4-40 tapped holes on 30 mm centers for mounting any number of Thorlabs cage assembly products. There are also four 8-32 (M4 x 0.7) tapped holes to allow the unit to be post mounted.

The LDM21(/M) uses a thermo-electric cooler (TEC) to precisely regulate the operating temperature of a laser diode. Temperature sensing is accomplished using an integrated thermistor and AD592 solid state temperature sensor. The Thorlabs TED200C supports these sensors.

NOTE: The LDM21(/M) is intended for laser diodes requiring low input power and operating across a limited temperature range. Its primary function is to maintain the laser diode case temperature at a constant temperature to within 0.2 °C, ideally at 25 °C in a typical laboratory ambient environment (20 to 30 °C). Please refer to the Safe Operating Area chart in this manual to ensure that the LDM21(/M) is used within its capabilities.



Figure 1 Inside View of LDM21 and Included Components

Chapter 3 Setup

3.1 Laser Installation

1. Unpack the laser mount and remove the four 2-56 socket-head screws from the front cover using a 5/64" hex driver (provided).
2. Remove the two Phillips head 2-56 screws from the laser-mounting flange and remove the flange.
3. Determine the laser pin configuration from the laser diode manufacturer's data sheets and set the LD (Laser Diode) and PD (Photodiode) switches located on the inside of the unit according to Figure 2.

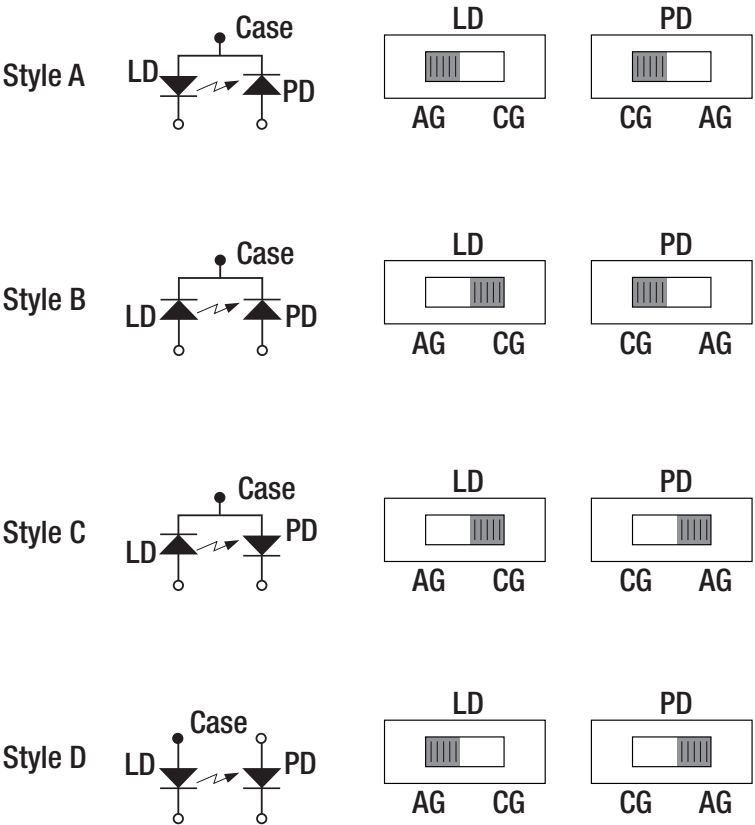


Figure 2 Polarity Switch Settings

- The four sockets comprising the laser diode connector are through-hole type sockets with a blind clearance of 0.48" (1.22 cm) measured from the front face of the copper cold plate. It is not necessary to trim the laser diode leads prior to mounting into this connector unless they are longer than 0.48" (1.22 cm).
- The laser connector is located close enough to the front face of the copper cold plate to allow easy installation of short-leaded lasers. The clearance area around the LD and PD sockets is sufficient to prevent the pins from contacting the cold plate.
- Most laser diodes are three pins with the case tied to one of the laser pins and also to one of the photodiode pins. The other laser and photodiode pins will be isolated from the case. The LDM21(/M) was designed to operate the laser case at ground potential, therefore this common pin will be inserted into either the 12 o'clock or the 6 o'clock position of the laser connector. Locate the isolated laser pin and insert it in the 3 o'clock position. The isolated photodiode should now be in the 9 o'clock position. Refer to Fig. 3. (Orient the mount with the PD polarity switch above the LD socket).
- The LDM21(/M) Mount is also compatible with style E and style H laser diodes, which do not have a photodiode; they have only a laser diode and a ground pin. They can therefore be set up the same as style A (LD Anode Ground) or style B (LD Cathode Ground) respectively.
- Replace the laser mounting flange and the cover. Install both screws through the mounting flange and loosely into the mount. Carefully tighten each screw a little bit at a time until the flange is just snug. Do not over-tighten either screw- the flange should sit slightly above the cold plate. Reinstall the cover using the four 2-56 cap head screws provided.

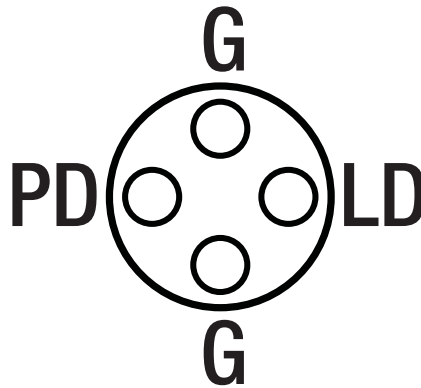


Figure 3 LD and PD Orientation

3.2 5.6 mm Adapter

By default, the LDM21(/M) is designed to be used with standard 9 mm laser diode packages. The mount can be used with a standard 5.6 mm using the included adapter, which can be found in the small brown envelope marked “Accessories” on the outside. Included in this envelope is the 9 mm mounting plate and the imperial to metric mounting adapter.

3.3 4-Pin Laser Diodes

The LDM21(/M) also supports 4-pin laser diodes. Insert the laser into the 4-pin socket and note which laser pin is in the 3 o’clock position (laser anode or cathode). Also note which photodiode pin is in the 9 o’clock position (anode or cathode). The mount will tie the laser and photodiode pins located at 12 o’clock and 6 o’clock together and also to ground. By noting which polarity pins are inserted into the socket, you can convert the 4-pin layout to one of the 3-pin layouts in Figure 2 on page 3. Set the LD and PD polarity switches accordingly.

3.4 Laser Controller Connections

Using the Thorlabs LDC/ITC Series Laser Controllers:

- The LDM21(/M) is compatible with all Thorlabs LDC LD controllers and ITC series combination controllers (LD and TEC). Appropriate cables with DB9 connectors are included with Thorlabs controllers and ensure that the controllers cannot be connected incorrectly. Additionally, these controllers have built-in protection circuitry that protects the laser when not in use.
- The nomenclature for the Laser Diode polarity switch on the LDC/ITC driver and the LDM21(/M) are consistent with each other. For example, if the laser polarity on the driver is set to “AG” (anode grounded), then the LD polarity switch on the LDM21(/M) should also be set to AG, and so forth.
- The nomenclature for the Photo Diode polarity switch on the LDC4000 Series Benchtop Controllers, PRO8 Laser Diode Current Control Modules, and ITC series drivers and the LDM21(/M) is as follows: The photodiode polarity switch on the LDM21(/M) must always be set to “CG”. The photodiode polarity should be set with the internal Laser controller switch only. For more information on how to set Polarity settings on the Laser controller, please refer to the appropriate Laser Controller manual.

Using a third-party laser controller:

- When using a third-party controller, a custom cable will have to be made to properly interface to the laser mount. Please refer to the table on the next page for laser connections:

Pin	Signal	Description
1	Interlock (LDC Specific)	This pin is the input to the Interlock Circuits. When using Thorlabs LDCs, no external circuitry is required.
2	Photodiode Cathode	This pin is connected to the 9 o'clock pin on the laser socket when the PD Polarity Switch is set to AG (Anode Grounded). It is attached to ground and the 12 o'clock and 6 o'clock pins on the laser socket when the PD Polarity Switch is set to CG (Cathode Grounded).
3	Laser Ground (Case)	This pin is connected to the 12 o'clock and 6 o'clock pins on the laser socket and corresponds to the settings of the LD and PD polarity switches. i.e., if the LD and PD switches are set to AG, then this pin grounds the Anodes of the laser and photo diode.
4	Photodiode Anode	This pin is connected to the 9 o'clock pin on the laser socket with the PD Polarity Switch is set to CG (Cathode Grounded). It is attached to ground and the 12 o'clock and 6 o'clock pins on the laser socket when the PD Polarity Switch is set to AG (Anode Grounded).
5	Interlock Return	This pin is the return side of the Interlock circuitry. Pins 1 and 5 are shorted internally in the LDM21(/M).
6	N/A	
7	Laser Diode Cathode	This pin is connected to the 3 o'clock pin on the laser socket when the LD Polarity Switch is set to AG (Anode Grounded). If the pin is not connected, it will be floating
8	Laser Diode Anode	This pin is connected to the 3 o'clock pin on the laser socket when the LD Polarity Switch is set to CG (Cathode Grounded). If the pin is not connected, it will be floating
9	N/A	

3.5 TEC Controller Connections

Using the Thorlabs TED Series TEC Controllers:

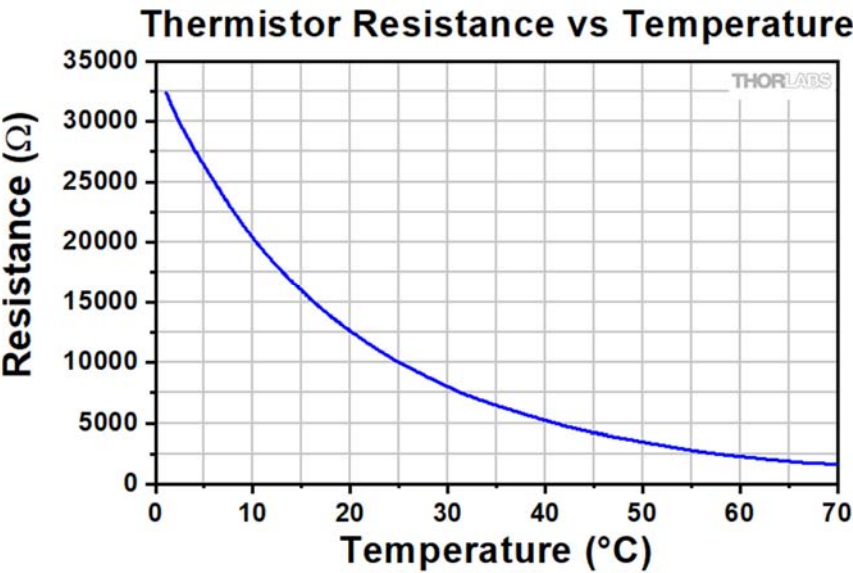
- The LDM21(M) is best used with Thorlabs TED200C or related TEC Controllers. The TED series are shipped with a mating DB9 cable that plugs directly into the controller and laser mount. Using the cable supplied with the TED, the controller cannot be connected incorrectly. Simply connect the cable included with the TED to the Laser Mount and to the controller.

Using a third-party TEC controller:

- When using a third-party controller, a custom cable will have to be made to properly interface to the laser mount. Please refer to the table below for laser connections.

Pin	Signal	Description
1	N/A	N/A
2	Thermistor (+)	The 10 kΩ @ 25 °C NTC thermistor (provided for temperature feedback).
3	Thermistor (-)	The thermistor return pin
4	TEC (+)	This pin is connected to the positive terminal of the TEC element.
5	TEC (-)	This pin is connected to the negative terminal of the TEC element.
6	N/A	N/A
7	AD592 (-)	The negative terminal of the AD592 temperature transducer. When using Thorlabs TEDs, no external circuitry is required. To use this device with third party controllers, it must be properly biased. Refer to Analog Devices AD592 Data for application information.
8	N/A	N/A
9	AD592 (+)	The positive terminal of the AD592

3.6 Thermistor Data



Resistance (Ω)	°C	Resistance (Ω)	°C
15895	15	9563	26
15153	15	9149	27
14451	17	8755	28
13785	18	8380	29
13155	19	8023	30
12558	20	7684	31
11991	21	7362	32
11454	22	7055	33
10944	23	6762	34
10460	24	6484	34
10000	25		

Figure 4 Thermistor Curve and Data

3.6.1 Theoretical Resistance Values

The relationship between resistance and temperature can also be calculated using the following equations.

$$R_T = R_{ref} e^{(A+B/T+C/T^2+D/T^3)}$$

$$T_R = (A_1 + B_1 \ln\left(\frac{R}{R_{ref}}\right) + C_1 \ln^2\left(\frac{R}{R_{ref}}\right) + D_1 \ln^3\left(\frac{R}{R_{ref}}\right))^{-1}$$

Where A, B, C, D, A₁, B₁, C₁, and D₁ are constant values that depend on the material; see table below for values. R_{ref} is the resistance value at a reference temperature, which is room temperature in this case. T is the temperature in K.

Constants	Value	Unit
A	-14.6337	-
B	4791.842	K
C	-115334	K ²
D	3.730535E+06	K ³
A₁	3.354016E-03	-
B₁	2.569850E-04	K ⁻¹
C₁	2.620131E-06	K ⁻²
D₁	6.383091E-08	K ⁻³
T₀	298.15	K
R_{ref}	10000	Ω

3.7 Mounting Other Accessories

The LDM21(/M) includes a SM1 threaded hole centered on the laser for mounting Thorlabs SM1-series optic mounts. This is most often used for mounting aspheric collimating optics available separately from Thorlabs.

Also included are four 4-40 tapped holes mounted on 30 mm centers for attaching our cage assembly products. Using the combination of the SM1 threaded mount and the cage assemblies' products, a wide variety of optical systems can be easily assembled from off-the-shelf products.

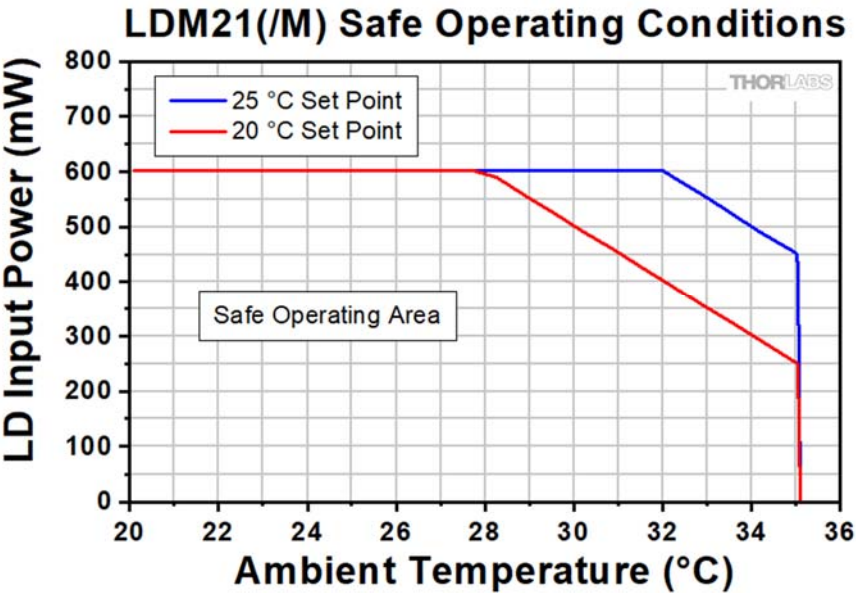
Chapter 4 Operation

- With the laser mounted and the laser and temperature controller connected, the LDM21(/M) is ready to operate. Please refer to the operating instructions for the laser and temperature controller for specific operating instructions.
- When operating at low temperatures in high humidity climates, the laser mount may develop internal condensation. If this occurs, turn the laser off, open the case, and allow the mount to dry off completely before re-using.
- When using a collimating optic in the 1" threaded mount, the lens may be positioned slightly laterally by loosening the four 2-56 screws on the cover and shifting the cover plate manually.

4.1 Safe Operating Area

The LDM21(/M) is intended to be operated at a fixed temperature set-point of 25 °C but can be operated as low as 20 °C as long as the input power to the laser diode (input current x LD voltage) does not exceed the values specified in the Safe Operating Area curve as a function of ambient temperature. It is not recommended that the LDM21(/M) be driven with more than 600 mW of input power, set to a temperature below 20 °C, or operated in an ambient temperature above 35 °C. Operating the LDM21(/M) outside of the safe operating area will result in thermal runaway of the cooling system which will damage the laser diode mounted in the unit.

Additionally, the 2 W maximum cooling capacity includes the power dissipated by the TEC element in addition to the input power of the laser diode. Careful monitoring of the TEC power (TEC Current x TEC Voltage) along with the parameters of the SOA curve will further ensure that the system is operating within its capabilities.



4.2 Maintaining the LDM21(/M)

There are no serviceable parts in the LDM21(/M). The housing may be cleaned by wiping with a soft damp cloth. If you suspect a problem with your LDM21(/M), please call Thorlabs Technical Support, and an engineer will be happy to assist you.

Chapter 5 Troubleshooting

1. Laser Driver will not enable.
 - If you are using our laser and TEC controllers with our LDM21(/M) mount, make sure that both cables are fully inserted into their DB9 connectors.
2. Laser wavelength or power is unstable even though the TEC controller shows a stable temperature.
 - Make sure that your laser diode is fully inserted into the LDM21(/M) laser socket and that its body is in full contact with the copper cold plate.
 - Make sure that the appropriate mounting flange is installed over your laser. There are two different flanges; one specifically for 5.6 mm diodes and one for 9 mm diodes.
3. The LDC series laser driver indicates an “Open Circuit” alarm when I try to enable the laser.
 - The LD and PD polarity switch settings are incorrect. Refer to Fig. 1 and the data sheet for your specific laser diode to ensure the proper settings. The LD polarity switch setting on your LDM21(/M) must also match the LD polarity switch on the rear panel of your LDC series laser diode controller.
 - The laser diode is installed into the wrong pins on the laser diode socket. Refer to Fig. 2 for the correct orientation of the laser diode pins and compare this to the data sheet for your laser diode.
4. My laser diode does not have an integrated photodiode. How does it get installed, and how do the polarity switches get set?
 - If your laser diode has one of its two active leads common to the case of the laser, that lead must be connected to one of the “G” sockets on the laser diode connector (refer to Fig. 2) while the other pin is connected to the “LD” socket in the 3 o’clock position. Depending on the pin orientation of your laser, you might be using either the “G” socket at 12 o’clock

or the “G” socket at 6 o’clock. Refer to your laser diode data for pin orientation. If your cathode pin is common to the body of your laser diode, set the LD polarity switch to “CG”. If your anode pin is common to the body of your laser diode, set the LD polarity switch to “AG”. The setting for the PD polarity switch is irrelevant.

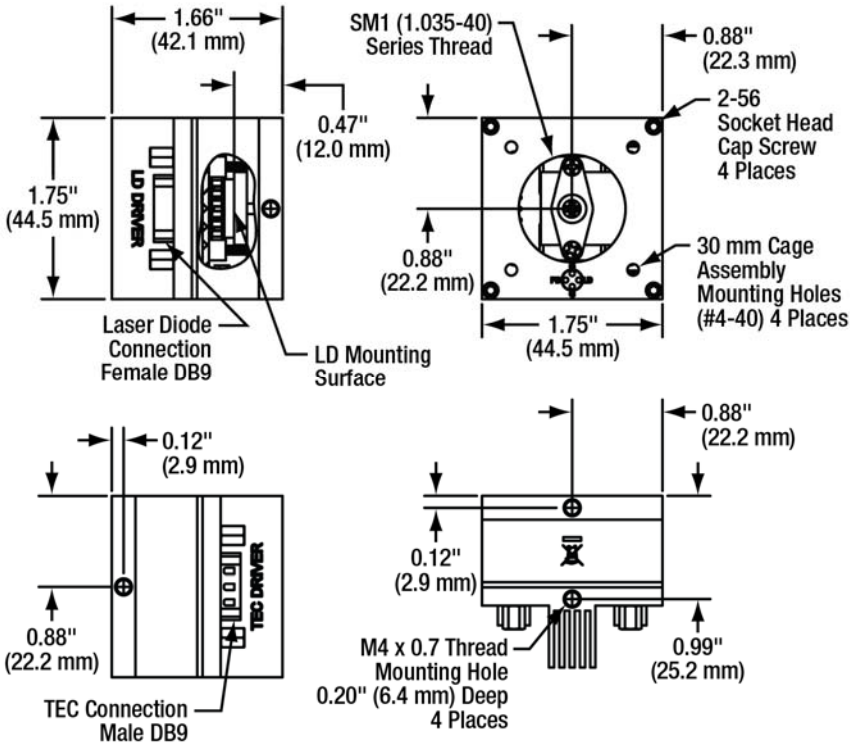
If you still have problems or questions regarding the operation of your LDM21(/M), please contact Thorlabs Tech Support.

Chapter 6 Specifications

Item #	LDM21(/M)
General	
Size	1.75" x 1.75" x 1.66" (44.5 mm x 44.5 mm x 42.1 mm)
Weight	3 oz (0.08 kg)
Accessory Mounting	1.035"-40 Thread for SM1 Series Optics Mounts 4-40 x 30 mm Tapped Holes for Cage Assembly Products
Mounting Holes	LDM21: 8-32 or LDM21/M: M4
Laser Specifications	
Lasers Supported	5.6 mm and 9 mm
Max Laser Current	500 mA ^a
Max Laser Input Power	600 mW ^a
Laser Pin	Ø5.6 and Ø9.0 mm Laser Diodes A, B, C, D, E, and H Configurations
Configurations	Selectable
Laser Polarity Select	Slide Switches
Laser Interface	DB9 Female
TEC Specifications	
Max TEC Current	2.5 A
Max TEC Voltage	1.8 V
TEC Heating/ Cooling Capacity	2 W
Typical Temperature Range (LD dependent)	
Temperature Range	20 – 30° C
Temp Sensor 1 Thermistor	10 kΩ ± 3%, NTC Beta = 3977 K ± 0.75%
Temp Sensor 2 Analog Devices AD592	1 µA/K
TEC Interface	DB9 Male

a. See Safe Operating Area on page 14 for more information.

Chapter 7 Mechanical Drawing



Chapter 8 Warranty and RMA Information

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC and are not disassembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user’s responsibility to delete all private data stored on the device prior to disposal.



Annex I

8.1 Return of Devices

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

Chapter 9 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



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