



LDMC20 C-mount Laser Mount

User Guide



















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Chapter 1 Warning Symbol Definitions

Below is a list of warning symbols you may encounter in this manual or on your device.

Symbol	Description
	Direct Current
	Alternating Current
	Both Direct and Alternating Current
	Earth Ground Terminal
	Protective Conductor Terminal
	Frame or Chassis Terminal
	Equipotentiality
	On (Supply)
	Off (Supply)
	In Position of a Bi-Stable Push Control
	Out Position of a Bi-Stable Push Control
	Caution: Risk of Electric Shock
	Caution: Hot Surface
	Caution: Risk of Danger
	Warning: Laser Radiation
	Caution: Spinning Blades May Cause Harm

Chapter 2 Safety

 **WARNING** 
This unit must not be operated in explosive environments

 **WARNING** 
Avoid exposure – laser radiation emitted from apertures

Chapter 3 Description

Features

- Supports Many One-Tab and Two-Tab C-mount Devices¹
- TEC Cooling
- Integrated Fan Control
- >20 W Heat dissipation @ $T_{\text{ambient}} = T_{\text{laser}} = 25\text{ }^{\circ}\text{C}$
- TEC Element Prolongs LD Life, Stabilizes Output Power, and Stabilizes Wavelength

The LDMC20(M) is a laser diode mount for C-mount devices that features an integrated thermoelectric cooler (TEC) with integrated fan control to precisely regulate the operating temperature of a laser diode. The LDMC20 is capable of dissipating at least 20 W heat loads at 25 °C for both ambient and laser temperature. The system also utilizes an automatic fan speed control, to actively cool the heat sink. The TEC control circuit provides a stable, cost effective, temperature platform for laser diodes. This, combined with current control, can be used to tune and stabilize the laser diode wavelength.

The LDMC20 is compatible with Thorlabs series of ITC controllers, and is capable of operating up to 20 A. The mount's safety and protection features a remote safety interlock connection and a TEC lockout circuit that prevents enabling of the laser diode unless the temperature controller is also enabled. The TEC lockout can be bypassed by setting an on-board jumper, but Thorlabs does not recommend doing this due to the potentially high temperatures generated by the LD.

The LDMC20 mount has a compact design, with an integrated fan to increase the cooling capacity, and still offers the features typical to our other products. The mounting options include multiple 1/4-20 (M6) mounting holes, 30 and 60 mm cage system mounting holes, and SM1 threaded aperture for mounting of optics.

The automatic fan speed control is designed to shut off with small heat loads and maintain the lowest possible speed with higher heat loads to minimize the amount of fan-induced vibration. The isolated fan design reduces vibration. For sensitive applications, the mount includes a switch that allows the user to disable the fan. See the power dissipation limits graph for use with the fan off.

The laser is held in the mount such that the emission facet is nominally centered in the SM1-threaded (1.035"-40) port. This port is intended for mounting aspheric lenses for collimation purposes, using the proper adapter and lens. Z translation is achieved by rotating the adapter in the SM1 port with a spanner wrench. A pair of knurled knobs provides X-Y fine translation of this port so that the beam can be precisely centered. The front cover plate of the LDMC20 is equipped with eight 4-40 tapped holes to accommodate our 30 mm or 60 mm cage systems.

¹ See section 4.2.1, page 6 for Supported C-mount Devices.

Chapter 4 Setup

4.1. Package Contents

- LDMC20 Mount
- 2-56 Screw
- #4 washer
- Replacement Screws
- Hex Key Kit
- Fan Power Supply
- TEC/LDC Cable Set
- Line Cord
- Operating Manual

4.2. Setup Instructions

1. Unpack the laser mount and remove the four 6-32 socket head screws from the top cover using a 7/64 hex driver.
2. Untighten the two 4-40 socket head screws securing the laser diode clamp to the small copper block with a 3/32 hex driver.
3. To drive C-mount devices through the LDMC20, the ITC Controller must be set to “Cathode to Ground” configuration. Refer to Figure 1, page 5 to determine which C-mount devices can be used with the LDMC20.
4. Carefully insert the C-mount device into the LDMC20’s main pocket and secure using a 2-56 socket head screw.
5. Tighten the two 4-40 socket head screws securing the laser diode clamp to the small copper blocks with a 3/32 hex driver. Do not over tighten as this can put stress on the laser tabs and can break the laser tabs.
6. For One-Tab C-mount Deices: If the C-mount device body is connected to laser “anode” or “cathode”, install the 4-40 screw and washer onto the PCB side noting “Anode to body” or “Cathode to body”. If the body is isolated (Two-tab C-mount devices), do not install the screw. A second screw is supplied as a replacement or to be used to short the laser contacts during handling or transport to safeguard the installed laser.
7. Lastly, re-attach the cover plate using four 6-32 socket head screws.

4.2.1. Supported C-mount Devices

The following figure shows which C-mount devices are supported. “A” and “C” stand for Anode and Cathode, respectively. The device configurations which are not crossed out are compatible with the LDMC20.

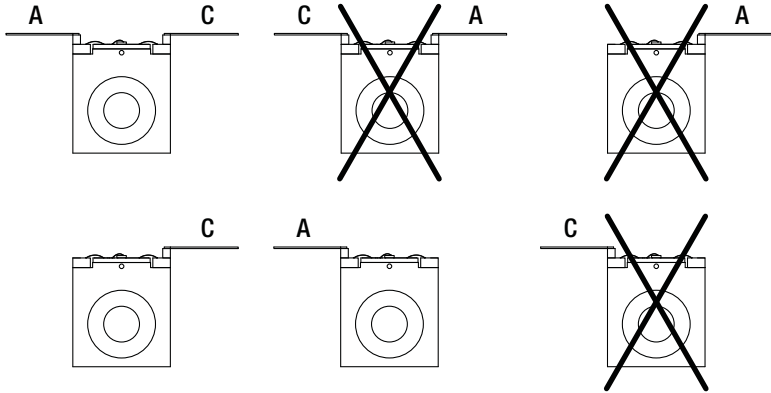


Figure 1 Supported C-mount Devices

WARNING

Make sure the laser diode is installed correctly and the polarity switches on the driver side are set as per the laser diode pin configuration provided by the manufacturer. Connecting the LD driver to mount with incorrect installation will damage the laser diode.

WARNING

Use of thermal grease is not recommended for use with C-mount laser. Thermal grease will creep and eventually contaminate the laser facet.

4.3. Fan Power

Locate the toggle switch on the side of the mount. Set the switch to “off” position to completely disable the fan. Set the switch to “auto” position to set the fan to automatic variable control.

4.4. Controller Operation

4.4.1. ITC Series Operation

When using Thorlabs ITC controllers, the fan power will be supplied through the TEC Cable. The included power supply is NOT needed.

4.4.2. Third Party Controller Operation

If your third party controller includes a fan power supply voltage, it may be used by connecting to the TEC connector. The controller must be able to supply 12 VDC, 500 mA.

Locate the included power supply module and the supplied line cord. Install the line cord into the power supply and plug into an appropriate wall socket.

Plug the power supply output plug into the LDMC20 power input receptacle located on the side of the unit.

4.5. Thorlabs' LDC Series Laser Controller Connection

The LDMC20 is compatible with all Thorlabs ITC laser diode controllers. It may be necessary to adjust the protection settings to allow operation without the TEC protection provided by the ITC. Appropriate cables are included with the LDMC20 mount which interface directly to any of our ITC controllers.

The LD and TEC connections are made using the standard 7W2 connector. The cables included with the mount can interface with any of the Thorlabs ITC40xx drivers.

The nomenclature for the Laser Diode polarity switch on the ITC40xx drivers is as follows: *If the laser polarity on the driver is set to "CG" (cathode grounded), then the Laser Diode on the LDMC20 is set for cathode grounded configuration. Please be aware of the polarity of the drive current of your laser driver.*

4.6. Using a Third-Party 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. If using a custom-made cable, we recommend using a shielded cable for the sensor inputs with twisted pairs. Use a separate shielded cable for the Laser current and Laser voltage measurement lines. The Laser current lines should be as short as possible and as close together as possible (e.g. twisted) to minimize inductance.

4.6.1. Laser Pin Connections

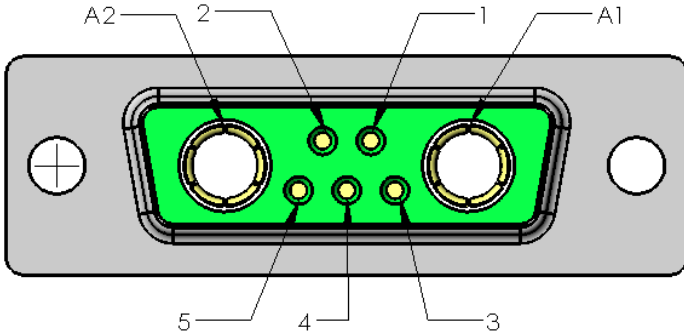


Figure 2 LD 7W2 D Sub Connection

For mating with this connector, please use shell FCT FM7W2P-K120 and contacts FCT FMP006P103. Wires up to a maximum gauge of 14 AWG can be used.

Pin	Signal	Description
A1	Laser Cathode	This pin is connected to the laser diode cathode. Right side looking at the laser pocket.
A2	Laser Anode	This pin is connected to the laser diode anode. Left side looking at the laser pocket.
1	Interlock and Status Return	This pin is the return side of the Status and Interlock circuitry.
2	Interlock and Status Pin	This pin is the input to the LD Status indicator and interlock circuits. When using Thorlabs' ITC controllers, no external circuitry is required.
3	NC	Not used.
4	Laser Voltage (Anode)	This pin is connected to LD Interface Pin A2.
5	Laser Voltage (Cathode)	This pin is connected to LD Interface Pin A1.

4.6.2. TEC Pin Connections

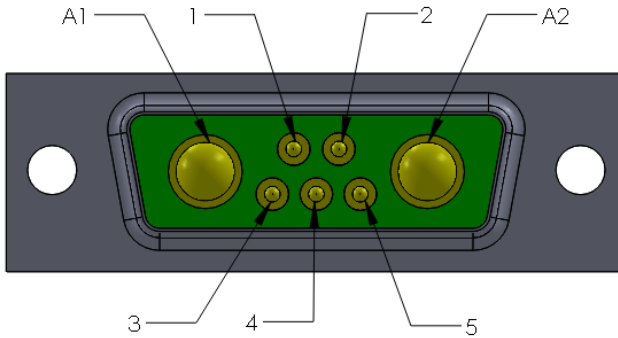


Figure 3 TEC 7W2 D Sub Connection

For mating with this connector, please use shell FCT FM7W2S-K121 and contacts FCT FMP006S103. Wires up to a maximum gauge of 14 AWG can be used.

Pin	Signal	Description
A1	TEC(+)	This pin is connected to the positive terminal of the TEC element.
A2	TEC(-)	This pin is connected to the negative terminal of the TEC element.
1	Thermistor (+)	The 10 kΩ @ 25 °C NTC thermistor (provided for Temperature feedback).
2	Thermistor (-)	Thermistor return pin.
3	Fan Power	Fan power, 12 V, 500 mA supply can be used to power the fan.
4	TEC Lockout (+)	This pin is connected to the anode of the photo-relay side of the TEC lockout circuit. When using Thorlabs' TED Series, no external circuitry is required. To use these features with third-party controllers, please refer to the Status and Interlock section of this manual.
5	Ground	This pin is ground for Fan Power and TEC Lockout.

If you wish to make full use of all of the Status and Interlock features with your third-party drivers, please contact Thorlabs and an engineer will help you determine if this is possible and how to implement these features.

5.3. Temperature Sensor

The LDMC20 includes a 10 k Ω thermistor for temperature feedback. We recommend setting the sensor type to Thermistor (low) when operating with a Thorlabs ITC or TED4xxx series controller. The graph below shows the typical thermistor resistance versus temperature. Full thermistor specifications can be found in Chapter 8 on page 17.

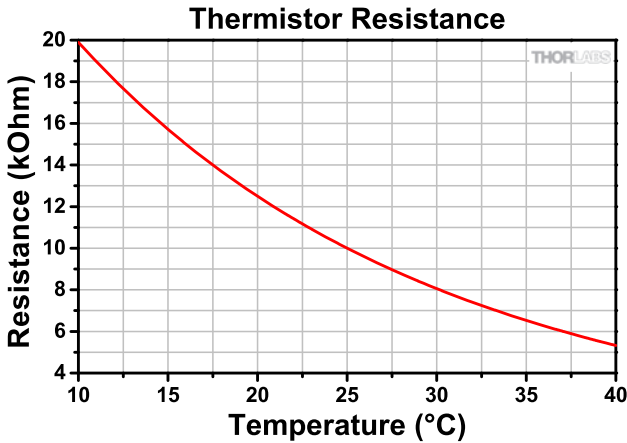


Figure 5 Thermistor Resistance vs. Temperature

5.4. Active Fan Cooling System

The LDMC20 incorporates a fan in the heat sink to improve the heating/cooling capacity of the mount. The fan speed is actively controlled to provide the best overall performance when high power loads are installed and to keep noise and vibration to a minimum when light loads are applied. Do not block the fan or prevent it from spinning. This will cause the mount to possibly overheat and go into a thermal runaway condition.

For users with sensitive applications, a switch has been provided on the side of the mount to turn the fan on or off. The switch has two states:

1. Off – This turns off the fan completely.
2. Auto – This sets the fan to the default variable speed.

It is recommended for high heat loads not to turn off the fan. The power dissipation by the laser can send the mount into thermal run away under the right conditions and can damage the laser. Please follow the safe operating area curve found in section 5.4 below to operate the mount within the limits.

5.5. Safe Operating Area (SOA)

The safe operating area for the mount is basically the area at which the thermal power of the laser diode can be removed and dissipated by the LDMC20. How much power the mount can dissipate depends on a number of factors, ambient temperature and set point temperature being the most important. The graph below can be used to determine how much power the mount can efficiently remove and maintain proper stabilization. Most low and medium power laser diodes will fall within this curve.

To calculate the thermal power of the installed laser diode two factors need to be known, forward operating voltage (VF) and the operating current (Iop). Both are typically published in all laser diode spec sheets.

$$P_{\text{thermal}} = (V_F)(I_{op})$$

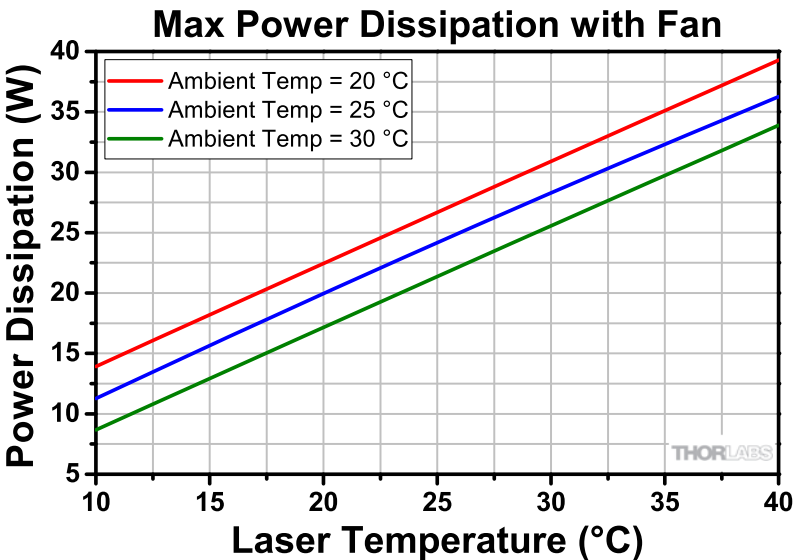


Figure 6 Environment Temp Effects of Power Dissipation with Fan

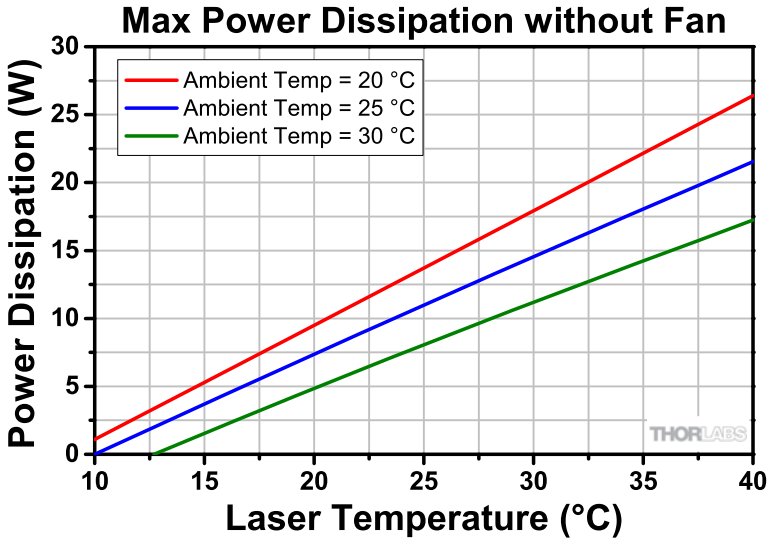


Figure 7 Environment Temp Effects of Power Dissipation w/o Fan

5.6. Maintaining the LDMC20

There are no serviceable parts in the LDMC20. The housing may be cleaned by wiping with a soft, damp cloth. If you suspect a problem with your LDMC20, please call Thorlabs and an engineer will be happy to assist you.

5.7. Collimating Technique

Optimization in the X and Y axes can be performed by adjusting the thumbscrews on the front plate. Z-optimization is performed by rotating the S1TM09 with a Thorlabs SPW301 or equivalent spanner wrench. One should start with the lens firmly mounted in the S1TM09 but far away from collimation.

We suggest that Z-optimization be done with care; rotate the assembly by $\frac{1}{4}$ or $\frac{1}{2}$ turn at a time, and then check the beam quality (preferable using a camera) some distance away from the LDMC20(M).



WARNING: OVERROTATING CAN CAUSE DAMAGE!



Over-rotating the lens assembly may cause contact between the lens assembly and the C-mount laser and can result in damage, especially if the laser is operating. The metallic lens holder can come in contact with the laser leads, causing a temporary short, which the controller may respond to by overdriving the current. If the short is then removed, this high current can be sent through the laser, permanently damaging the device. Extreme caution should be taken to prevent this from happening.

Chapter 6 Safety Interlock Connections

The LDMC20 is equipped with a Remote Interlock connector located on the side panel. In order to enable the laser source, a short circuit must be applied across the terminals of the Remote Interlock Connector. In practice this connection is made available to allow the user to connect a remote actuated switch to the connector (i.e., an open door indicator). The switch, which must be normally open, has to be closed in order for the unit to be enabled. Once the switch is in an open state, the laser diode must automatically shut down.

All units shipped from Thorlabs are configured with a shorting device installed in the interlock connector. If you are not going to use this feature, then you can leave the shorting device installed and the unit will operate normally as described in the procedures in this manual. If you wish to make use of the interlock feature, you will need to acquire the appropriate connector mate and wire it to your remote interlock switch. Next, remove the shorting device by unscrewing it from the input and install the connector into the interlock input.

The interlock feature does not directly control the laser connections. It only affects the interlock lines on pins 1 and 2 for the laser controller connection. An appropriate laser controller with interlocking support must be used for this feature to operate.

The interlock input only accepts a 2.5 mm mono phono jack. This connector is readily available at most electronics stores (Radio Shack, Digikey, Mouser, Allied, etc.).

The electrical specifications for the interlock input are as follows:

Specification	Value
Type of Mating Connector	2.5 mm Mono Phono Jack
Open Circuit Voltage	+5 VDC with Respect to Chassis Ground (when used in conjunction with Thorlabs drivers)
Short Circuit Current	~8 mA DC
Connector Polarity	Tip is positive, Barrel is Ground
Interlock Switch Requirements	Must be N.O. Dry Contacts. Under no circumstances should any external voltages be applied to the Interlock Input

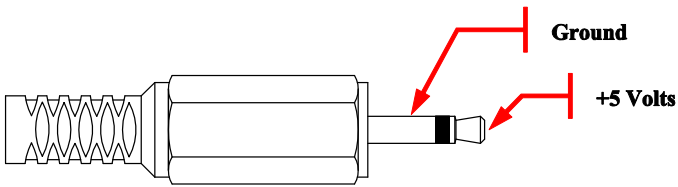


Figure 8 Remote Interlock Connector

Chapter 7 Trouble Shooting

Laser Driver Will Not Enable

If you are using Thorlabs' Laser controller with your LDMC20:

Possible Solution	Directions
Remote interlock is open	Make sure that either the shorting device is installed in the REMOTE INTRLK connector on the side of the LDMC20. If you have a remote interlock switch connected to this REMOTE INTRLK connector, it must be in a closed position.
TEC element is not active	The internal TEC Lockout is preventing the laser diode from operating. Make sure the TEC control is active.

Laser Wavelength or Power is Unstable.

Possible Solution	Directions
LD is not fully seated	Make sure your laser diode is fully inserted into the LDMC20 laser pocket and its body is in full contact with the copper cold plate.
LD is mode hopping	The laser diode may be operating on a mode transition. Try adjusting the temperature to shift the laser diode to a more stable operating point.
Mount is set outside safe operation area	Verify the thermal power of the laser diode is operating within the SOA as described in Section 4.5, page 7.

The ITC Series Laser Driver Indicates an “Open Circuit” Alarm When You Try to Enable the Laser

Possible Solution	Directions
LD orientation may be incorrect in the socket	Refer to the laser diode data sheet for your specific diode to ensure proper orientation.

If you still have problems or questions regarding the operation of your LDMC20, please feel free to call Thorlabs and ask for Technical Support.

Chapter 8 Specifications

Performance Specifications	
Laser Specifications	
Lasers Supported	Single- and Dual-Tab C-mount ²
Max Laser Current	20 A ($T_{\text{ambient}} = 25\text{ }^{\circ}\text{C}$)
Modulation Frequency	DC to 50 kHz
Laser Interface	7W2 Female, Hybrid D Sub
TEC Specifications	
Maximum TEC Current ³	11.1 A
Maximum TEC Voltage	14.5 V
Qmax	95.4 W
Temperature Sensors	10 k Ω Thermistor $\pm 2.2\%$ @ 25 $^{\circ}\text{C}$, NTC, $\beta = 3984$ Vishay NTCLE305E4103SB
Operating Temperature	10 to 40 $^{\circ}\text{C}$
Storage Temperature	10 to 80 $^{\circ}\text{C}$

X-Y Translation	
Resolution	250 $\mu\text{m}/\text{rev}$
Total Translation	$\pm 1.0\text{ mm}$
Center Thread	SM1-Threaded ($\text{\O}1.035\text{-}40$); 0.535" (13.5 mm) Deep

Physical Specifications	
Laser Interface	7W2 Female, Hybrid D Sub
TEC Interface	7W2 Male, Hybrid D Sub
Indicators	LD Enabled Green LED
Size (L x W x D)	4.00" x 4.00" x 4.05" (101.6 x 101.6 x 102.9 mm)
Weight	1543 grams (3.4 lbs)
Mounting Threads	6x 1/4"-20 (3x M6-1 for LDMC20/M)
Cage Rods	30 mm and 60 mm
Power Supply Connector	2.1 mm Power Jack
Interlock Connector	2.5 mm Phono Jack
Power Supply	12VDC, 500mA

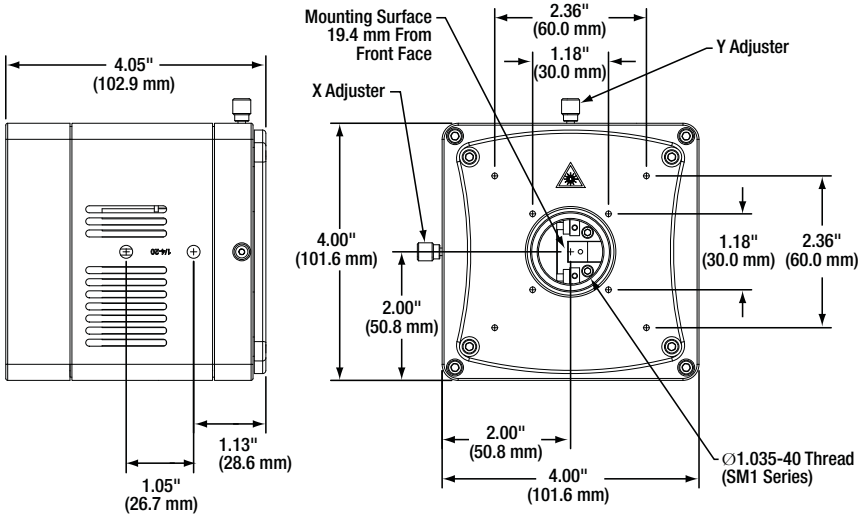
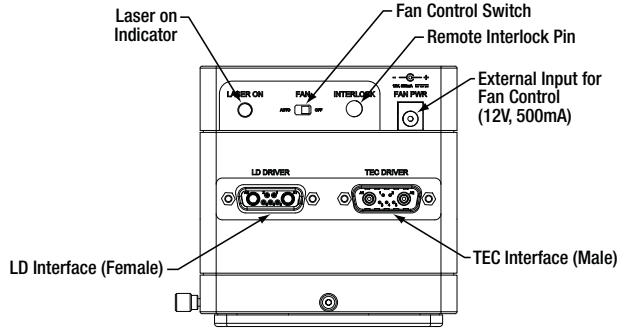
² See Section 4.2.1, page 6 for Supported C-mount Devices

³ When operating with Thorlabs ITC40xx controllers the recommended max operating current should be set to 8A to ensure the TEC over voltage limits are not exceeded.

Laser Modulation

The laser may be modulated through the attached current controller, such as the ITC40xx series controllers. Bandwidth is typically limited to the capabilities of the attached current controller. Refer to the bandwidth specifications of the controller.

Chapter 9 Mechanical Drawing



Chapter 10 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated



Wheelie Bin Logo

As the WEEE directive applies to self-contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e.g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB's, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

10.1 Waste Treatment is Your Own Responsibility

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

10.2 Ecological Background

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

Chapter 11 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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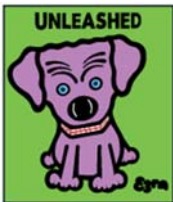
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