Helium-Neon Laser Series

Laser Models 1100, 1000, and 1500 Series
Power Supplies 1200 and OEM Series

User's Manual

LUMENTUM

ECO-066866

945-002, REV 503 NOVEMBER 2018

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Contact Information

Thank you for purchasing this Lumentum product. We are confident this product will serve you well. Any comments or questions you have concerning our product or your application are encouraged. Please contact your local sales representative or us directly, toll-free, at:

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Table of Contents

List of Tables

List of Figures

Preface

Thank you for purchasing the Lumentum Helium-Neon Series laser.

The Lumentum 1100, 1000, and 1500 Series red Helium-Neon laser products offer low noise, high power stability, and long life for the most demanding applications.
With more than 1.5 million units sold, Lumentum Helium-Neon lasers are the industry standard for many advanced system designs.

Our close-cathode design rapidly and uniformly distributes discharge heat throughout the laser, resulting in excellent thermal, beam-pointing, and power stability.
Our field concentrator design ignites the discharge within milliseconds of applying the start voltage.
Hard-sealed internal mirrors, small physical size, and low noise result in greater reliability, longer life, and enhanced performance.

About This Manual

Information contained herein is deemed to be reliable and accurate. No responsibility is assumed for its use or for any infringements on the rights of others. Lumentum reserves the right to change the design, specifications, etc. of the products described at any time without notice. If you have questions or comments about any part of this manual, please call Lumentum at the contact information provided on the previous pages.

Last Revision: November 2018

1 Safety Information, Instructions, and Symbols

1.1 Alert Messages

The cautions and warnings used throughout this manual are explained below. Read this section carefully before operating the laser for the first time

Warning
A Warning message indicates a nearby hazard that, if not avoided, may result in serious injury or property damage.
Note
A Note provides information about installation, operation, or maintenance of the system that is important to know but is not necessarily hazardous. Notes also provide instructions or company policy for the protection of property, safe work practices, reminders of proper safety procedures, or the location of safety equipment.

	Read Manual. Identifies particular instructions, procedures, or manuals that must be read before continuation with a task.
	Laser Safety Eyewear. Identifies an operation that requires any user to wear approved laser-safety eyewear.

1.2 Safety Symbols

The following symbols may be marked on the units (Table 1). Observe all safety instructions that are associated with a symbol.

Symbol	Description
	Laser safety. See the user's manual for instructions on handling and operating the unit safely.
	General hazard. Identifies a set of recognizable conditions with the potential for initiating an event that could result in death, injury, or illness to people or damage to facility or equipment.
	Electrical hazard. Identifies a potential electrical shock or burn hazard from electrical voltages.

Table 1: Safety Symbols

1.3 Safety Summary

Note

The cautions and warnings used throughout this manual are explained below. Read this section carefully before operating the laser for the first time.

The 1100, 1000, and 1500 Helium-Neon (HeNe) lasers can be Class II, IIIA, or IIIb lasers, as defined by the USA Code of Federal Regulation (CFR) 21 CFR 1040.10 Laser Safety Standard, or Class 2M, 3R or 3B, as defined by the EN 60825-1 European standard.

The lasers are original equipment manufacturer (OEM) components, designed for integration, and, as such, they do not fully comply with the laser safety requirements of either 21 CFR 1040.10 or EN 60825-1.

The laser safety standards require that certain laser safety features be provided on the end-product or system. The end-user is responsible for adding those.

The following is a summary of the HeNe 1100, 1000 Series lasers Compliance Conditions of Acceptability.

1.4 Conditions of Acceptability Safety Symbols

The 1100 and 1000 Series lasers are OEM or system components, and, as such, are only intended for integration into other equipment, not as a stand-alone system.

This product is an equipment component. It does not fully comply with all electrical or laser safety requirements that are applicable to a stand-alone system or equipment.

When this laser is installed in the end-product, the end-user must provide consideration to the following:

1 All electrical safety features or the protection enclosure shall be provided in the end-product, as required by IEC61010-1 or any other applicable electrical safety regulations.

2 All laser safety features and indicators, as required by 21 CFR 1040.10 or EN60825-1 or any other applicable laser safety standards, shall be provided by the end-user.

3 The following statement shall be included in the end-product instruction/installation manual if adjustments or controls are accessible to the user or operator of the final product.

"CAUTION – Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure."

4 The product's thermal circuitry shall be evaluated in the end-product.

5 Compliance with the FDA-CDRH laser product requirements and safety standards shall be determined and provided in the end-user application.

6 The end-user is required to provide information about the limit values of the materials to be processed, the fumes, and the particulate matter generated by machining these materials and their removal requirements.

1.5 Safety Inspection Instructions

The following safety instructions must be observed whenever the unit is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user's manual is in direct violation of the standards of design, manufacture, and intended use of the unit. Lumentum assumes no liability for the customer's failure to comply with any of these safety requirements.

1.5.1 Before Initializing and Operating the Unit

- ☑ Inspect the unit for any signs of damage and read the user's manual thoroughly.
- ☑ Install the unit as specified in the **3. Getting Started** section.
- ☑ Ensure that the unit and any devices or cords connected to it are properly grounded.

1.6 General Safety Guidelines

It is recommended that all persons who use, or are near, lasers be aware of the potential hazards.

Warning

VISIBLE RADIATION.

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION. NEVER LOOK INTO THE BEAM PATH. KEEP ALL BODY PARTS AND REFLECTIVE MATERIALS OUT OF THE BEAM PATH.

The free space HeNe Series lasers can be either Class 2M, 3R, or 3B laser sources.

- **The Class 3B lasers can have a maximum rated output power of 25mW CW at wavelengths of 633nm.**
- **The Class 3R lasers can have a maximum rated output power of 3.2mW CW at wavelengths of 633nm.**
- **The Class 2M lasers can have a maximum rated output power of 0.7mW CW at wavelengths of 633nm.**

Exposure to the laser beams must be avoided.
Some, but not all, potential human hazards include permanent loss of vision and/or subsurface skin damage.

Warning

- **THE STARTING AND OPERATING VOLTAGES OF THE LASER HEADS ARE LETHAL AND ARE SPECIFIED HEREIN. IF ACCESS TO A POWER SUPPLY IS NECESSARY, ENSURE THAT THE POWER SUPPLY IS TURNED OFF AND UNPLUGGED.**
- **If it is necessary to operate the laser head while a power supply is exposed, extreme caution is advised to avoid exposure to high voltages and only licensed personnel should do it.**

	Warning
	• **Operating the lasers in the presence of flammable gases or fumes is extremely hazardous.** • **Provide protective eyewear suitable for the output wavelength of your laser. Control all beam reflections.** • **Laser glasses may not provide enough protection if a very powerful beam is viewed directly.** • **Post the area with laser safety warning signs. Ensure that no beams are emitted through windows, doors, etc.** • **Operate the laser only under the direct supervision of a person knowledgeable in laser safety. Limit access to the laser area by spectators unless supervised.** • **Do not mount the laser at or near eye level for a person in the standing or sitting position; enclose beam paths whenever possible.** • **Attenuate laser power to a low level to minimize the intensity of accidental stray reflections or refractions when aligning a chain of optical components in the laser beam.** • **Never leave the laser on and unattended.** • **If the laser power supply has a key switch on a front panel, the key must be inserted and turned to enable the laser to operate. The key is captive in the operational position. Remove the key when the laser is not in use or unattended. Store the key in a safe place.**

Note

HeNe Series lasers should not be operated unless all appropriate safety precautions are taken. These include, but are not limited to:

- **Wearing protective safety glasses by all people in the vicinity of the laser system;**
- **Installing warning lights, signs, safety screens and/or curtains;**
- **Implementing a safety interlock so the laser shuts down if someone unexpectedly enters an area containing the laser; and**
- **Containing the beam to eliminate or minimize the possibility of exposure to the beam.**

1.7 Electrical Safety Information

Warning

NEVER TOUCH A LASER CABLE WHEN ITS POWER SUPPLY IS ON.

- A laser requires a high voltage start pulse of about 10,000 volts. The normal operating voltage of a laser exceeds 1,000 volts and can be as high as 4,000volts.
- A residual high voltage can exist on the cables leading from the power supply to the laser after the power supply is turned OFF. Wait at least 10 secs after turning it OFF before manipulating them.

1.7.1 Classification

The 1100s laser consists of an anodized metal chassis that is internally connected directly to earth via a power cord and, therefore, is classified as a Class 1 instrument. Class 1 refers to equipment relying on ground protection as a means of shock protection.

Use only the type of power cord supplied with a 1200 Series power supply. Connect the power cord only to a power outlet equipped with a protective earth contact. Never connect to an extension cord that is not equipped with this feature.

Disconnect the power cord from a 1200 power supply before adding or removing any components. Do not rely solely on electrical safety devices or interlocks

1.7.2 Disconnecting from Line Power

Some of the power supply circuits are powered whenever the unit is connected to the AC power source (line power). To ensure that the unit is not connected to the line power, disconnect the power cord from the AC line-power source (receptacle). The power cord must always be accessible from this point. If the unit is installed in a cabinet, the operator must be able to disconnect the unit from the line power by the system's line-power switch.

1.7.3 Line Power Requirements

The 1200s power supply can operate from any single-phase AC power source that supplies between 100 and 230 VAC at a frequency range of 50 to 60 Hz. The exact maximum power consumption is dependent on the configuration of each system. Typically is less than 30VA

1.7.4 Fuse Type

The fuse type used by the 1200s power supply is dependent on the configuration of each system.

1.8 Compliance

1.8.1 FDA-CDRH Compliance

Under the US FDA CDRH, Lumentum lasers comply with the CFR, Title 21, Subchapter J, which pertains to laser safety and labeling. See http://www.fda.govfor more information.

Lumentum offers two versions of lasers as certified by the US FDA CDRH. These versions are CDRH certified and non-CDRH certified, as follows:

- The CDRH 1500s laser version complies with CDRH requirements. The CDRH accession number is 9620546. This version can be used as a stand-alone instrument.
- The non-CDRH 1100s, 11000s certified versions are only for OEM customers who integrate the laser into their instruments. The customer is responsible for CDRH certification of their instrument.

1.8.2 Safety Compliance

The 1100s and 1500s lasers adhere to the International Electro technical Commission IEC standard 60825-1:2014 concerning laser safety, and IEC standard 61010-1.
They also carry the US, Canadian **UL mark**, the **TUV SUD mark**.

1.8.3 Safety Labels

The following sample safety labels are affixed to the outside of the HeNe Series lasers and are not to be removed either prior to or after installation.

Label 1 1	**Serial Number Label**	
Label 2 2	**Warning-Explanatory - Aperture Label**	**Class 2M**  **Class 3R <4mW**  **Class 3B <10mW**  **Class 3B <20mW**

		 **Class 3B <35mW** 

Table 2: Laser Safety Labels

A typical placement of required laser safety labels is shown in Figures 1 and 2.

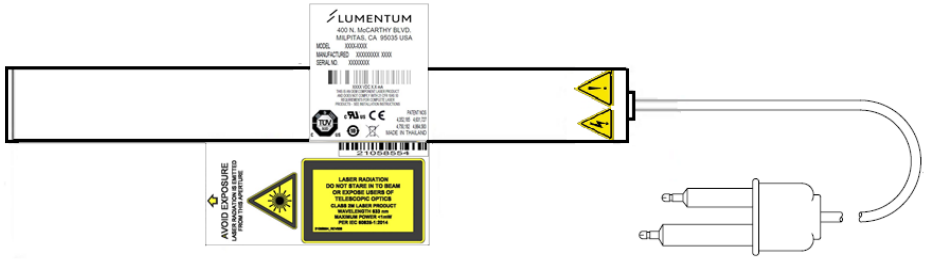

Figure 1: Placement of Safety Labels on 1100 Lasers

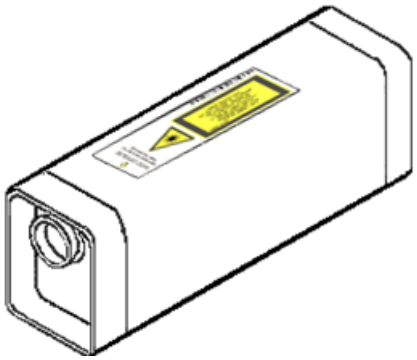

Figure 2: Placement of Safety Labels on 1500s Laser

The lasers also comply with the China RoHS, RoHS and WEEE European Directives.

2 General Information and Specifications

2.1 General Information

This user's manual for the Model 1100 Series, Model 1000 Series, and Model 1500 Series Helium-Neon Laser contains complete operating instructions. Each laser is available as a component for OEM or as CDRH-compliant 1500 self-contained system. Various compatible AC and DC power supplies are available for each laser, and an optional AC/DC universal supply is available for the Model 1500 Novette™ system.

Figure 3 shows a 1200 power supply, Model 1100 lasers, Model 1000 laser tubes, and the Model 1500 laser system.

Figure 3: Helium-Neon Laser Systems

2.1.1 Protective Housing

The housing of the 1100 and 1500 lasers is designed to prevent collateral radiation in excess of admissible limits, as well as laser radiation in excess of the accessible emission limits.

2.1.2 Key Control

The AC power supply is activated when the key is turned to the "ON" position. A three-second time delay occurs before the laser is activated. The key cannot be removed when turned to the "ON" position.

2.1.3 Key Features

- Long operating life

- Low noise
- Hard-sealed internal mirrors
- Excellent beam-pointing stability
- Long-term amplitude stability
- Small package

2.1.4 Applications

- Hand-held bar code scanning
- Laboratory use in polarization experiments
- DNA sequencing
- Flow cytophotometry
- Hematology
- Confocal microscopy
- Semiconductor inspection
- High-speed printing
- Photo processing

2.1.5 Standard Accessories

- 1100 lasers have a fixed laser head cable
- 1500s have a Universal AC/DC power supply.
- User's manual

2.1.6 Optional Accessories

- 100/120, 120, or 220 V AC power supply
- Optical adapter for Model 1500 Series
- Accessory bezels for Model 1100 Series

2.2 Specifications

2.2.1 Model 1100 Series Specifications

The Model 1100 Series helium-neon laser consists of a packaged head with Alden-type or equivalent connectors. The Model 1100 Series laser head is compatible with the Model 1200 power supply, available in either 100/120 or 220 V AC configurations.

Table 3 lists the specifications for Model 1100 Series packaged laser heads. Beam parameters are guaranteed at the Far Field.

The coherence length of the HeNe lasers is typically between 20 and 28cm.

Specifications	1101	1103	1107	1108	1122	1125	1135	1137	1144	1145	102	196
	1101P	1103P	1107P	1108P	1122P	1125P	1135P	1137P	1144P	1145P		
Mini output power (mW)	1.5	2	0.8	0.5	2	5	10	7	17	25/22	2	1.5
Beam diameter (mm)	0.63	0.63	0.48	0.48	0.63	0.81	0.68	0.81	0.7	0.7	0.63	0.49
Beam divergence (mrad)	1.3	1.3	1.7	1.8	1.3	1	1.2	1	1.15	1.15	1.3	1.6
Beam pointing stability (mrad) 25 °C cold start	n/a	n/a	n/a	n/a	<0.10	<0.10	<0.20	<0.10	<0.20	<0.20	<0.10	<0.10
Beam pointing stability (mrad) 15min warm-up	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03	<0.03
[1] Min polarization ratio	500:1	500:1	500:1	500:1	500:1	500:1	500:1	500:1	500:1	500:1	n/a	n/a
Longitudinal mode spacing (MHz) nominal	730	730	1090	1090	730	435	320	435	257	257	637	637
Max mode sweeping's ripple	3%	3%	10%	20%	3%	2%	2%	2%	1%	1%	<5%	<5%
[2] Max noise 30-10MHz (rms)	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	1.0%	0.2%	1.0%	1.0%	1.0%	1.0%
Max power drift over 8 hrs	±2.5%	±2.5%	±2.5%	±2.5%	±2.5%	±2.5%	±3.0%	±2.5%	±2.0%	±2.0%	±2.5%	±2.5%
Maxi warm-up time (min), to 95% power	10	10	10	10	10	10	15	10	20	20	10	10
Operating voltage (VDC±100)	1700	1700	1350	1350	1800	2350	3100	2450	3800	3800	1550	1550
Operating current (mA ±0.1)	4.9	4.9	4	4	6.5	6.0-6.5	6.5	6.0-6.5	6.5	6.5	4.5	4.5
Max starting voltage (KV DC)	10	10	7	7	10	10	10	10	10	10	10	10
Class CDRH / IEC	IIIa / 3R	IIIa / 3R	II, IIIa / 2M, 3R	II / 2M	IIIa / 3R	IIIb / 3B	IIIb / 3B	IIIb / 3B	IIIb	IIIb / 3B	IIIa / 3R	IIIa / 3R

[1] Polarized version **only.**

[2] When used in conjunction with Lumentum Model 1200 Series power supply.

Table 3: Model 1100 Series Specifications.

The Model 1100 Series, excluding models 1101, 1103, 1107, and 1108, has a static alignment of the following values:

- Centered to outer cylinder within 0.025 cm (0.01 in)
- Parallel to outer cylinder within 1 mrad.

The Model 1100 Series accessory bezels are shown in 4.

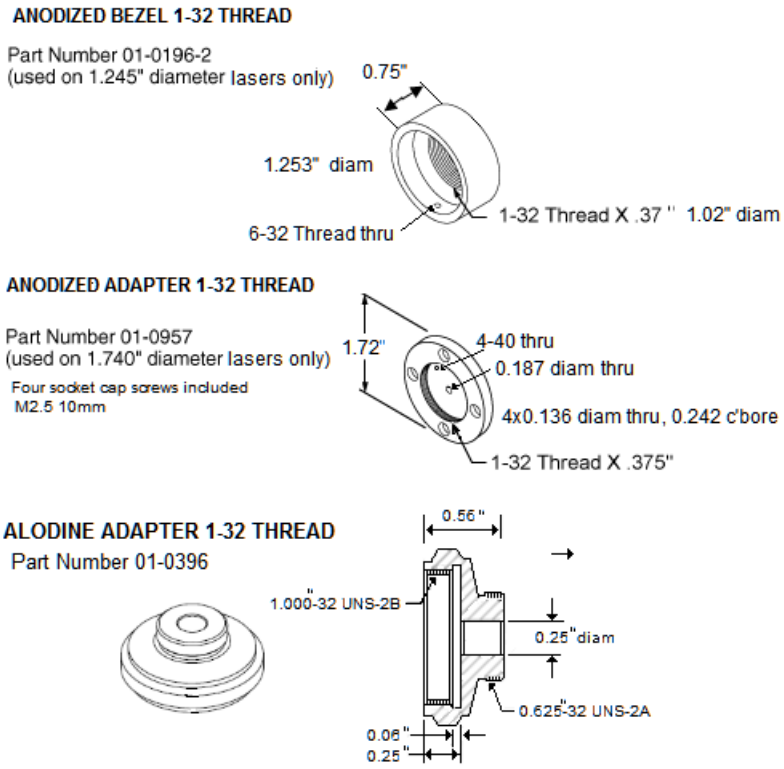

Figure 4: Model 1100 Series Accessory Bezels

2.2.2 Model 1500 Series Novette Specifications

Model 1500 Series Novette™ helium-neon laser self-contained systems incorporate a hard-sealed, internal mirror, plasma tube, and a power module. The packages are compact and self-contained.

Table 4 lists the specifications for Model 1500 Series systems.
Beam parameters are guaranteed at the Far Field.

Specification	1507/1507P	1508/1508P
Minimum output power (TEM_{00}, 633 nm)	0.80 mW	0.50 mW
Wavelength	633 nm	
Beam diameter (TEM_{00}, $1/e^2$ points ±3%)	0.48 mm	
Beam divergence (TEM_{00}, ±3%)	1.7 mrad	
[1] Minimum polarization ratio (P versions)	N/A	500:1
Longitudinal mode spacing	1090 MHz	
[2] Maximum noise (30 Hz to 10 MHz)	1.0% rms	
Maximum drift with respect to mean power, over 8 h	±2.5%	
Maximum mode sweeping contribution	10%	20%
Maximum warm-up time (minutes to 95% power)	10	
Operating current (at 120 V AC)	150 mA AC	
Operating current (at 200 V AC)	82 mA AC	
Expected operating lifetime	>12,000 hrs	
Weight	1.81 kg (4 lb)	
CDRH Class	IIIa	II
IEC 60825-1 Class	3R	2M

[1] TEM_{00} version only.
[2] When used with Lumentum Model 1200 Series power supply.

Table 4: Model 1500 Series Novette™ Specifications

Figure 5 shows the Model 1500 Series typical dimensions.

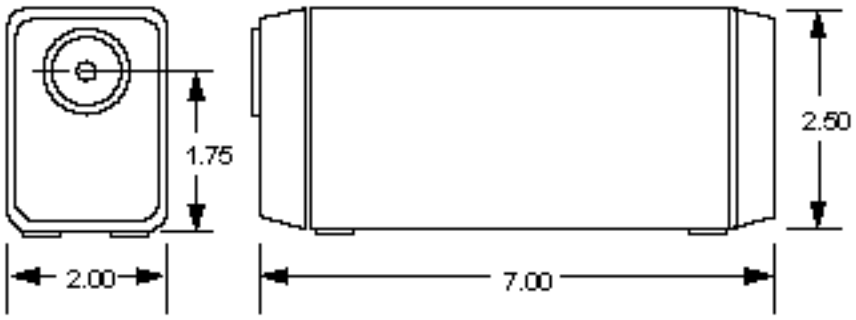

Figure 5: Model 1500 Series Laser (dimensions in inches)

The base plate of the Novette™ is slotted for mounting As shown in Figure 6. The head of a standard Socket Head Cap screw can be inserted on that slot and fastened the laser to standard adapters to an optical bench.

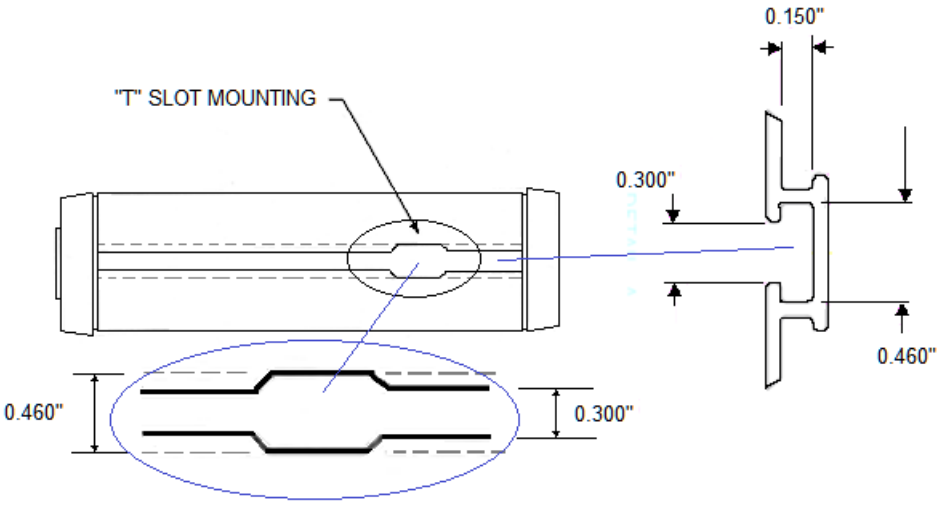

Figure 6: Model 1500 Series Bottom Plate Slot Mount

The Model 1500 Series Novette™ includes an external Universal AC/DC power supply which provides 12VDC to the 1500 laser input.

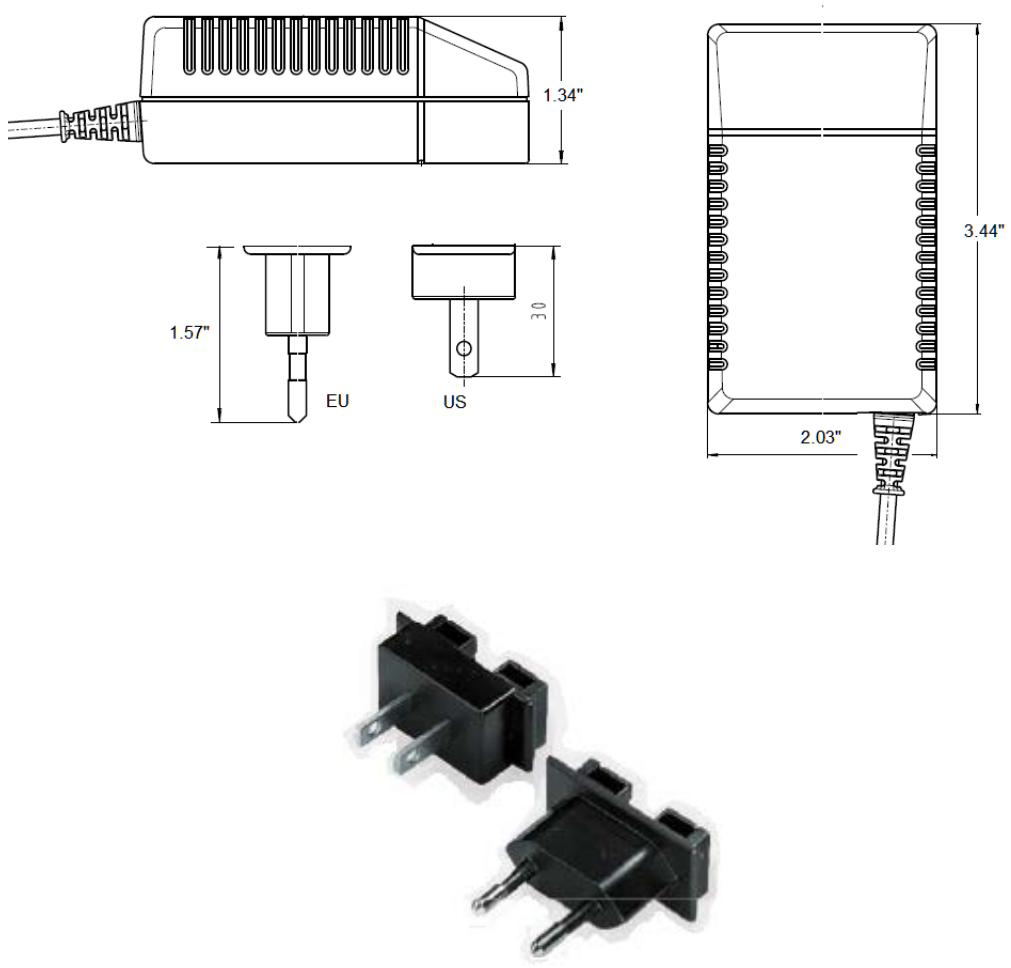

Figure 7: Model 1500 Series Power Supply Dimensions

The 1500 series is made in two versions, input power 100/120VAC and 220VAC.

Model	Minimum Rated Output Power	100/ 120 V AC	220 V AC
1507	0.8 mW, random polarization	1507-1	1507-2
1507P	0.8 mW, linear polarization	1507P-1	1507P-2
1508	0.5 mW, random polarization	1508-1	1508-2
1508P	0.5 mW, linear polarization	1508P-1	1508P-2

Table 5: Novette ™ 1500 Series and Input Voltages

2.2.3 Model 1000 Series Specifications

The Model 1000 Series helium-neon laser are coaxial plasma tubes with a hard-sealed internal mirror. They feature improved thermal distribution for superior beam pointing and power stability. Small physical size and low noise are characteristics that give the OEM system designer greater flexibility.
Table 5 lists the specifications for Model 1000 Series HeNe tubes.
Beam parameters are guaranteed at the Far Field.

Specifications	1001	1003	1007	1008	1022	098-0	098-2	098-3
	1001P	1003P	1007P	1008P	1022P			
Mini output power (mW)	1.5	2	0.8	0.5	2	1	2	2
Beam diameter (mm)	0.63	0.63	0.48	0.48	0.63	0.75	0.49	0.49
Beam divergence (mrad)	1.3	1.3	1.7	1.7	1.3	2.7	1.6	1.6
* Min polarization ratio	500:1	500:1	500:1	500:1	500:1	638	638	638
Longitudinal mode spacing (MHz) nominal	730	730	1090	1090	730	637	637	637
Max mode sweeping's ripple	3%	3%	10%	20%	3%	5%	10%	5%
** Max noise 30-10MHz (rms)	0.1%	0.1%	0.1%	0.1%	0.1%	0.5%	0.5%	0.5%
Max power drift over 8 hrs	±2.5%	±2.5%	±5%	±5%	±2.5%	±5%	±5%	±5%
Maxi warm-up time (min) up to 95% power	10	10	10	10	10	15	15	15
Operating voltage (VDC±100)	1300	1300	1000	1000	1300	1000	1200	1200
Operating current (mA ±0.1)	4.9	4.9	4	4	6.5	3.7	3.7	4.5
Max starting voltage (KV DC)	10	10	7	7	10	8	12	10
Class CDRH / IEC	IIIa / 3R	IIIa / 3R	II, IIIa / 2M, 3R	II / 2M	IIIa / 3R	IIIb / 3B	IIIb / 3B	IIIb / 3B

[1] TEM_{00} version only.
[2] When used with Lumentum Model 1200 Series power supply.

Table 6: Model 1000 Series HeNe Tube Specifications

2.2.4 Other Specifications

Table 7 summarizes Physical and Environmental specifications for each of the model series. Where a range is given, the values indicate the specifications of more than one model within the series.

Specification	Model 1100 Series	Model 1500 Series Novette	Model 1000 Series
Physical			
Dimensions (L)	17.8 to 63.5 cm (7.0 to 25.0 in)	W x H x L 5.1x6.35x17.8 cm 2.0x2,5x7.0 in	40.1 to 48.6 cm (15.79 to 19.13 in)
Weight	3.2 to 4.5 kg (7 to 10 lb)	1.8 kg (4 lb)	3.7 to 4.1 kg (8 to 9 lb)
Environmental			
Operating temperature	-29 to 47 °C (-20 to 117 °F)	0 to 35 °C (32 to 95 °F)	-20 to 47 °C (-40 to 158 °F)
Storage temperature	-40 to 150 °C (-40 to 302 °F)	-40 to 70 °C (-40 to 158 °F)	-40 to 150 °C (-40 to 302 °F)
Humidity	0 to 95% RH non-condensing	0 to 95% RH non-condensing	0 to 95% RH non-condensing
Operating altitude	0 to 3048 m (0 to 10,000 ft)	0 to 3048 m (0 to 10,000 ft)	0 to 3048 m (0 to 10,000 ft)
Storage altitude	0 to 21,336 m (0 to 70,000 ft)	0 to 21,336 m (0 to 70,000 ft)	0 to 21,336 m (0 to 70,000 ft)
Shock (reliability purposes only)	25 g for 11 ms 100 g for 1 ms	25 g for 11 ms 100 g for 1 ms	25 g for 11 ms 100 g for 1 ms
Drop Test	[1] Per IEC61010-1	Per IEC61010-1	[1] Per IEC61010-1

[1] : Drops of over 10mm can slightly mis align the laser mirrors with subsequent loss of power and/beam performance.

Table 7. Other Specifications for Models 1100, 1500, and 1000

3 Getting Started

The Model 1100 Series helium-neon laser requires a high DC voltage current regulated power supply, with an Alden-type or equivalent connectors.
The power supply Model 1200 Series provides a safer way to energize a 1100 laser.

The Model 1500 Series Novette ™ helium-neon laser system requires an external 12V DC AC converter.

	**Warning**
	LASERS REQUIRE SPECIAL HANDLING HeNe lasers are fragile devices, mostly made out of glass. A laser requires a sensitive alignment to obtain the desired optical specifications. A shock to a laser equivalent to dropping a laser from a 1 cm height may immediately misalign a laser, degrading the laser power and other relevant beam specifications. Sometimes disabling the laser entirely.

3.1 Before Initializing and Operating the Unit

☑ Inspect the unit for any signs of damage.

☑ Read the user's manual thoroughly and become familiar with all safety symbols and instructions to ensure that the unit is operated and maintained safely.

3.2 Initial Inspection

	**Warning**
	To avoid electrical shock, do not initialize or operate any unit if it bears any sign of damage to any portion of its exterior surface, such as the outer cover or panels.

Check that the unit and contents are complete:

1. Wear an anti-static wrist strap and work in an electrostatic discharge (ESD) controlled area.

2. Inspect the shipping container for any indication of excessive shock to the contents and inspect the contents to ensure that the shipment is complete.

3. Inspect the unit for structural damage that may have occurred during shipping.

4. Keep the packaging.

Immediately inform Lumentum and, if necessary, the carrier if the contents of the shipment are incomplete, if the unit or any of its components are damaged or defective, or if the unit does not pass the initial inspection.

3.3 Operating Environment

In order for the unit to meet the warranted specifications, the operating environment must meet the following conditions for temperature, humidity, and ventilation.

3.3.1 Temperature

The Model 1100 and 1000 series lasers can be operated in the temperature range of -29 to 47 °C (-20 to 117 °F). Model 1500 series units can be operated in the temperature range of 0 to 35 °C (32 to 95 °F).

3.3.2 Humidity

The unit can be operated in environments with up to 95% humidity non-condensing. Do not expose it to any environmental conditions or changes to environmental conditions that can cause condensation to form inside the unit.

	**Warning**
	DO NOT USE THE LASER OUTDOORS To prevent potential fire or shock hazard, do not expose the unit to any source of excessive moisture.

3.4 Storing and Shipping

To maintain optimum operating reliability, do not store the Model 1100 or Model 1000 series in locations where the temperature falls below -40 °C (-40 °F) or rises above 150 °C (302 °F). Do not store the Model 1500 series in locations where the temperature falls below -40 °C (-40 °F) or rises above 70 °C (158 °F). Avoid any environmental condition that can result in internal condensation. Ensure that these temperature and humidity requirements can also be met whenever the unit is shipped. Store the lasers in the original container and packing material.

3.4.1 Claims and Repackaging

Immediately inform Lumentum and, if necessary, the carrier, if

- The contents of the shipment are incomplete

- The unit or any of its components are damaged or defective
- The unit does not pass the initial inspection

In the event of carrier responsibility, Lumentum will allow for the repair or replacement of the unit while a claim against the carrier is being processed.

3.4.2 Returning Shipments to Lumentum

Lumentum only accepts returns for which an approved Return Material Authorization (RMA) has been issued by Lumentum sales personnel. This number must be obtained prior to shipping any material to Lumentum. The owner's name and address, the model number and full serial number of the unit, the RMA number, and an itemized statement of claimed defects must be included with the return material.

Ship return material in the original shipping container and packing material. If these are not available, typical packaging guidelines are as follows:

1. Wear an anti-static wrist strap and work in an ESD controlled area.

2. Wrap the unit in anti-static packaging. Use anti-static connector covers, as applicable.

3. Pack the unit in a reliable shipping container.

4. Use enough shock-absorbing material (10 to 15 cm or 4 to 6 in on all sides) to cushion the unit and prevent it from moving inside the container. Pink poly anti-static foam is the best material.

5. Seal the shipping container securely.

6. Clearly mark FRAGILE on its surface.

7. Always provide the model and serial number of the unit and, if necessary, the RMA number on any accompanying documentation.

8. Ship the unit only to the address given at the beginning of this document.

4 Operating and Maintenance Instructions

4.1 Laser Heads and Power Supply

Make sure the power supplies used match both the voltage and current requirements of a laser head. Failure to do so will prevent the laser to function reliably or function at all.

	Warning
	Power supplies are not interchangeable between models. Connect the power supply only to the appropriate laser model.

	Warning
	**NEVER TOUCH A LASER CABLE WHEN ITS POWER SUPPLY IS ON.** • A laser requires a high voltage start pulse of about 10,000 volts. The normal operating voltage of a laser exceeds 1,000 volts and can be as high as 4,000volts. • A residual high voltage can exist on the cables leading from the power supply to the laser after the power supply is turned OFF. Wait at least 10 secs after turning it OFF before manipulating them.

4.2 Initializing the Laser

	Warning
	• The power supply input cord plug must have a safety ground contact, and this contact must be connected to the power source receptacle safety ground contact. Ensure this contact is grounded to the user's facility. • Failure to do so may expose the user to high voltage if touches the laser housing or an accessory connected to the laser housing.

	Warning
	• Ensure the power supply is in the OFF state. • When using a power supply 1200 model ensure that the key switch on the power supply is in the “OFF” position. • Ensure the laser cable and power supply input cord are properly connected to their sources,

BEFORE TURNING ON the laser power supply, perform the following steps:

1. Always have the laser connected to the power supply before applying power.

2. Check the voltage requirement of the power supply.

3. Lasers equipped with a laser shutter must have it in the “open” position. The shutter is manually placed in the open or closed position.

TO INITIALIZE THE LASER:

1. Energize the power supply input, or turn the key switch of a 1200 power supply to the “ON” position.

2. The 1200 power supply or a power supply equipped with FDA-CDRH delay will ignite the laser after a three-second delay.

3. Emission from the laser head will be visible.

4.3 Troubleshooting

	Warning
	• A residual high voltage can exist on the cables leading from the potted module to the high voltage receptacle after the power supply is turned off.

If the laser fails to turn on after following the initialization procedure, perform the following:

1. De-energize the power supply input, or turn the key switch of a 1200 power supply to the “OFF” position.

2. Unplug the high voltage power cable.

3. Check the fuse in the power supply.

   3.1 If the fuse is open, replace it with an identical fuse and follow the initialization procedure again.
   An abnormal input line transient could cause the fuse to trip. If this is the reason for failure, normal operation can be resumed.

   3.2 If the laser still fails to turn on or if the fuse continues to open, a malfunction within the power supply may exist. Exchange the power supply and follow the initialization procedure again.

4. If the lasers turns on with the replacement power supply, return the faulty power supply to Lumentum in accordance with the return procedure outlined in the **3.4.2 Returning Shipments to Lumentum** section.

5. If the laser output still is not present or is intermittent, ensure that the power supply input voltage is within required limits and the high voltage connection between the laser head and the power supply is properly mated.

6. If the problem persists, exchange the laser and follow the initialization procedure again

7. If the laser output still is not present or is intermittent return both the power supply and laser head to Lumentum in accordance with the return procedure outlined in the **3.4.2 Returning Shipments to Lumentum** section.

4.4 Calibrating the Unit

The laser units do not require calibration.
A laser will be able perform to specifications after the initial warm-up period is up.
Beam parameters are guaranteed at the Far Field.

Warning

- Do not dismantle the laser head for any reason.

The laser plasma tube and ballast resistance are sealed in the laser head and any manipulation or shock may misalign the optics, affects performance or decrease power, or prevent lasing.

- Access to Lumentum power supplies is not intended.

Contact a Lumentum representative for any issue regarding the laser head or power supply.

5 Power Supplies

All Lumentum helium-neon power supplies provide a highly regulated constant current Output, allowing for excellent optical stability and performance.

The power supply automatically adjusts laser tube voltage to maintain a fixed discharge current.

A CDRH time delay is active on all power supplies, and may be defeated on power supply Modules or OEMs.

All power supplies have complete fault protection and can withstand output short circuits, output open circuits, or arc-to-ground conditions.

Power supplies are available for 100, 115, 230 VAC, 24VDC and 12VDC operation, with efficiencies greater than 85 percent.

Key Features

- Highly regulated, constant-current output
- Complete fault protection
- Exceptional direct current (DC) stability
- Typical conversion efficiency >85%
- Compact, rugged packaging
- Exceptional lifetime

Applications

- For use with Lumentum helium-neon laser heads and tubes

Compliance

- TÜV EN 60950
- CUL UL60950-1

Environmental

- Ambient Temperature: Operating -20ºC to 50 ºC
  Non-operating -20ºC to 70 ºC
- Humidity: <95% non-condensing
- Altitude: Operating < 3,048 meters (10,000ft)
  Non-operating < 12,192 meters (40,000ft)
- Reliability testing: Shock: 25 g for 11 msec
  Vibration: random 1-200Hz, 1.15grm
  Drop: ISTA 2

5.1 Model 1200 Series Power Supply

The Model 1200 power supply is energized by 100, 120 or 230VAC 50/60Hz source.

A hard wired power cord is built-in the power supply, the plugs are shown in Figures 8 and 9.

- For 230VAC units,
  A 250VAC 10A 2.5 meter long cord terminated with CEE 7-VB plug

Figure 8. Model 1500 Series power supply 230VAC cord

- For 100VAC, 120VAC units:
  A 125VAC 10A 72” long cord terminated with a NEMA 5-15P plug.

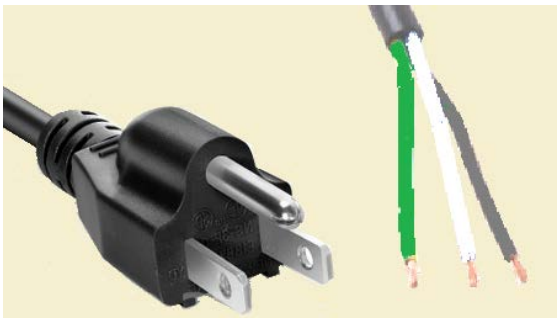

Figure 9. Model 1500 Series power supply 100 , 120 VAC cord

Warning

The Series 1200 has a front panel Safety Key switch and a rear panel Safety Interlock jumper. Both are wired in series with the input AC power line conductor.

Disconnect the power supply from the input power whenever the Safety Interlock is wired to an external interrup loop.

The key switch is a Oslo K1-101-S1S2N2 KEY A126.
The interlock plug a MOLEX (BEAU VERNITRON) P-3302-CCT or 0383315602.

Models **120x-1** are used with 120VAC inputs, **120x-2** with 230VAC inputs, and **120x-3** with 100VAC inputs.

Table 8 lists the pairing between 1100s lasers and 1200s power supplies.

Power Supply Model		Input Voltage +/-10%	Laser Model	Output Voltage +/- 200V	Current DC +/- 0.1mA	Optical Noise <10MHz
1201	1201-1	115 VAC	102, 196, 1101/P, 1103/P	1700VDC	4.9mA	<0.1%
	1201-2	230 VAC				
	1201-3	100 VAC				
1202	1202-1	115 VAC	1125/P, 1137/P	2300VDC	6.0mA	<0.2%
	1202-2	230 VAC				
	1202-3	100 VAC				
1205	1205-1	115 VAC	1107/P, 1108/P	1250VDC	4.0mA	<0.1%
	1205-2	230 VAC				
	1205-3	100 VAC				
1206	1206-1	115 VAC	1122/P	1800VDC	6.5mA	<0.1%
	1206-2	230 VAC				
	1206-3	100 VAC				
1216	1216-1	115 VAC	1135/P	3100VDC	6.5mA	<1%
	1216-2	230 VAC				
	1216-3	100 VAC				
1218	1218-1	115 VAC	1144/P, 1145/P	3800VDC	6.5mA	< 0.5%
	1218-2	230 VAC				
	1218-3	100 VAC				

Table 8: 1200s Model Selection for 1100 Laser Series.

The Power Supply 1200 Series carry the **CE mark**.

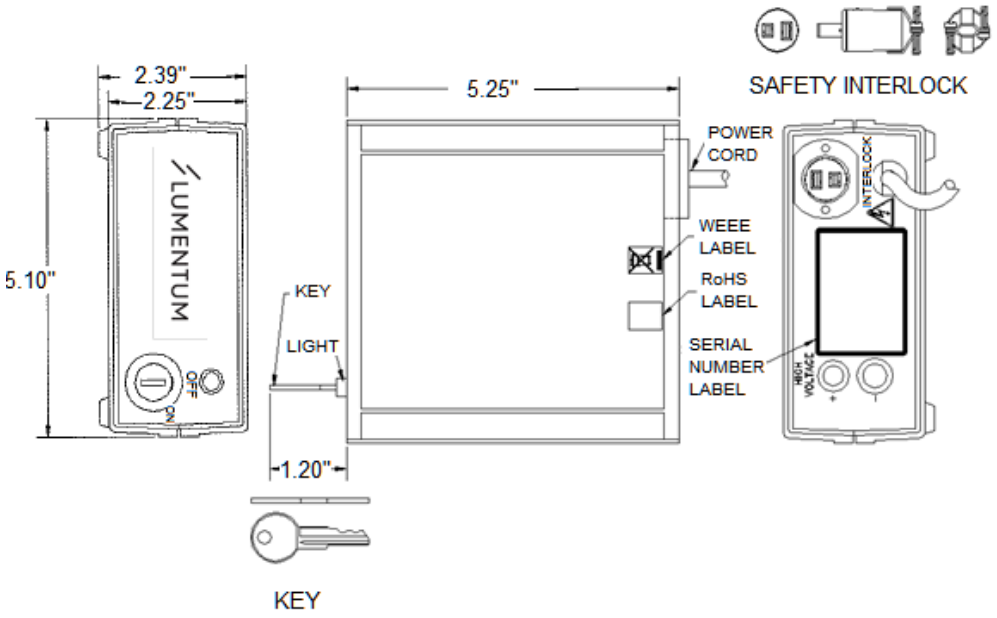

Fig. 10- Small Model 1200 Series Power Supply Dimensions.
1201-xx, 1202-xx, 1205-xx, 1206-xx, 1207-xx, 1208-xx

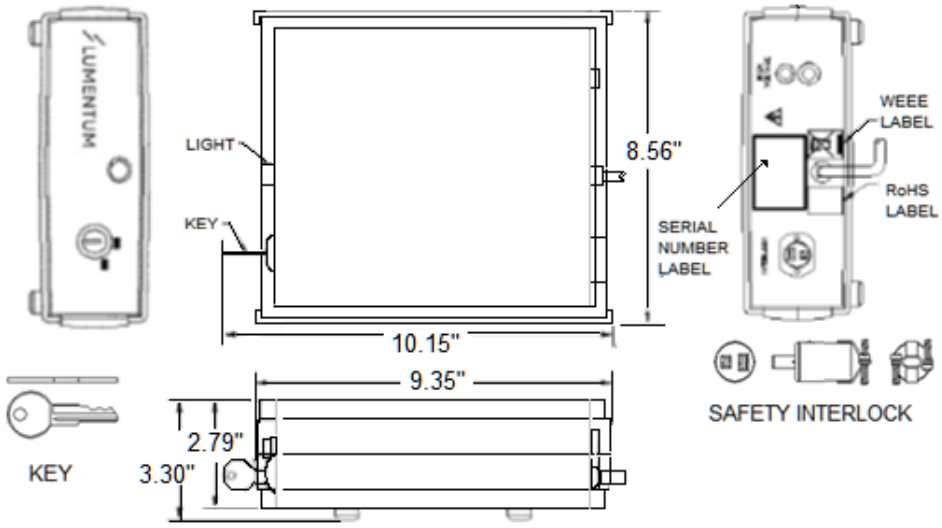

Fig. 11- Large Model 1200 Series Power Supply Dimensions.
1216-xx, 1218-xx

5.2 OEM Series Power Supply

The OEM or Module power supplies allows to drive the lasers where confined spaces are encountered.

Their output / input power efficiency is > 75%.
A typical current ripple is < 0.75% rms or <2%p-p.
They include a standard Interlock Loop input for safety interrupt when opened.

There are three types of Module Series: **101T**, **314T** and **380T**.

101T

The 101T Series Module dimensions are 3.75”W x 1.50”D x 1.00”H.
The standard input is 12VDC. It provides four typical output voltage / current versions. Its dimensions are shown in Figure 8.

The standard configuration carries:

- 12 inches input wires bundle (flying leads). Red-12VDC, Black-ground
- 12 inches output high voltage cable terminated in an Aldon type of HV connector,
- Interlock Loop wire (purple color) to enable shutdown when a safety loop and is open.
-

The table 9 show available 101T models. The Figure 12 shows the dimensions.

Lumentum PN	Model name	HV Output (VDC)	CURRENT (mA)	Input (VDC)	HV cable (in)	Input cable (in)	Special
21105343	101T-1250	1250	4.0	12	12	12	
22087812	101T-1250-4-5	1250	4.0	12	12	6	No Itlk, Molex input
21105344	101T1250-4-2	1250	4.0	12	6	12	
21105346	101T-1250-4-4 TTL	1250	4.0	12	12	12	TTL input
21105348	101T-1350-4-1	1350	4.0	12	12	12	
21172231	101T-1250-1350-3.5-BRH-2	1350	3.5	12	6	12	Start delay
21104786	101T-1700-4.5-TTL-1	1700	4.5	12	12	12	TTL input
21105351	101T-1700-4.9-2	1700	4.9	12	6	12	
21127603	101T-1700-4.9-TTLBRH-4	1700	4.9	12	12	12	TTL input, Delay
21105422	101T-1700	1700	4.9	12	12	12	
21105423	101T-1800	1800	6.5	12	12	12	
21105424	101T-2300-6.0-4	2300	6.0	12	12	12	
21158281	101T-2300-6.0-4-24 ADJ	2300	6.0	24	12	12	

Table 9 - 101T Models.

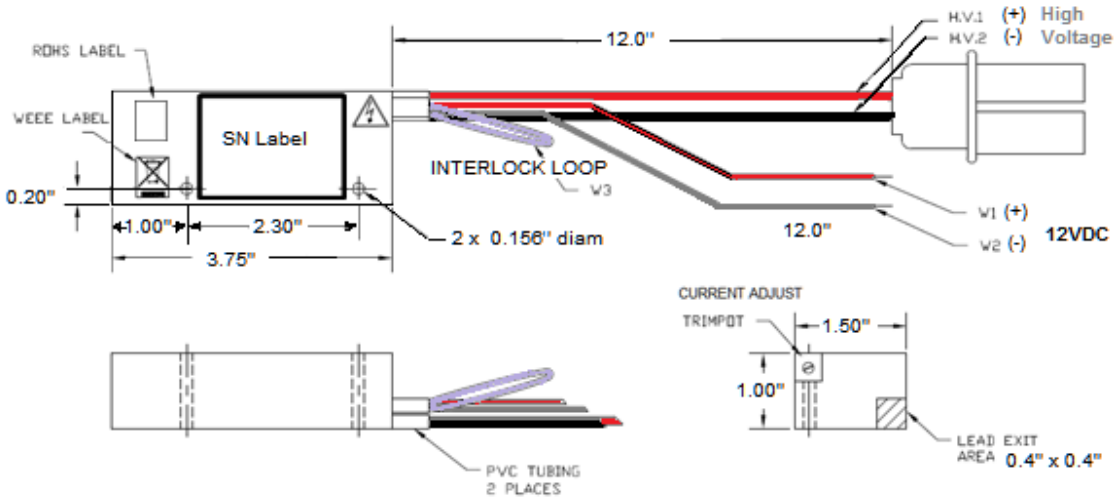

Figure 12- Module 101T Series Power Supply Dimensions

314T

The 314T Series Module dimensions are 4.25”W x 3.00”D x 1.20”H.
Similar to the 101T, the 314T Series offer typical combination of voltage / current outputs but using the AC power line as an input. Wiring guide shown in Appendix.
The standard input for the 314T Series is 120/230VC. Some Modules are available for 100/200VAC inputs.
The standard configuration carries:

- 12 inches input wires bundle (flying leads),
- either a 12 or a 6 inches output high voltage cable terminated in an Aldon type of HV connector,
- Interlock Loop wire to enable shutdown when a safety loop and is open.

Its dimensions are shown in Figure 13. Table 10 shows available 314T models.

Lumentum PN	Model name	HV Output (VDC)	CURRENT (mA)	Input (VAC)	HV cable (in)	Input cable (in)
21105428	314T-1250-4-4	1250	4.0	120/230	12	12
21105377	314T-1250	1250	4.0	100/200	12	12
21105378	314T-1250-4-2	1250	4.0	120/230	6	12
21105379	314T-1350-4-2	1350	4.0	100/200	6	12
21105380	314T-1700	1700	4.9	120/230	12	12
21105381	314T-1700	1700	4.9	100/200	12	12
21105382	314T1700-4.9-2	1700	4.9	120/230	6	12
21105383	314T-1700-4.9-2 DELAY	1700	4.9	120/230	6	12
21105385	314T-1800	1800	6.5	120/230	12	12
21105386	314T1800-6.5-2	1800	6.5	150/230	6	12
21105432	314T-2300	2300	6.0	100/200	12	12
21105430	314T-2300	2300	6.0	120/230	12	12

Table 10 - 314T Models.

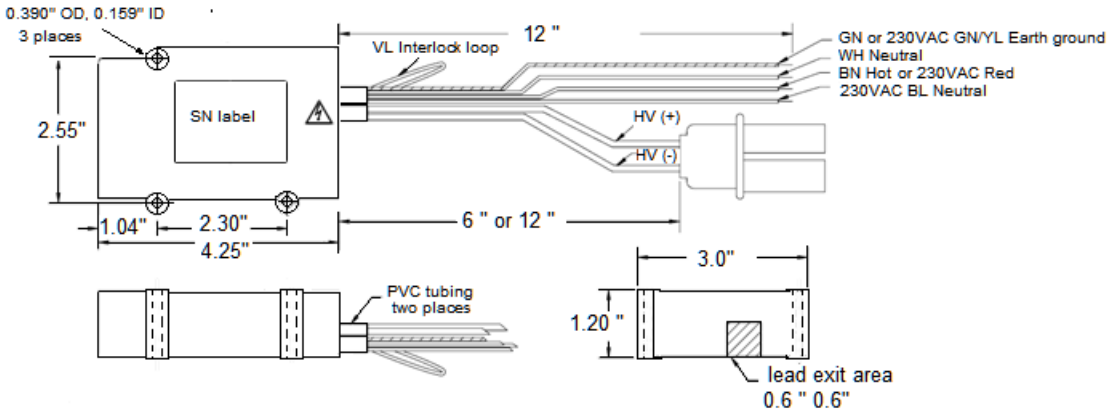

Figure 13- Module 314T Series Power Supply Dimensions

380T

The 380T Series Module dimensions are is 7.00”W x 2.40”D x 1.40”H.

Similar to the 314T, the 380T Series offer typical combination of voltage / current outputs with higher output voltage ranges.
The standard input for the 380T Series is 120/230VC. Some Modules are available for 100/200VAC inputs. Wiring guide shown in Appendix.

The standard configuration carries:

- 12 inches input wires bundle (flying leads),
- either a 12 inches output high voltage cable terminated in an Aldon type of HV connector,
- Interlock Loop wire to enable shutdown when a safety loop and is open.

Its dimensions are shown in Figure 14.

Lumentum PN	Model name	HV Output (VDC)	CURRENT (mA)	Input (VAC)	HV cable (in)	Input cable (in)
21105400	380T-3100 100V	3100	6.5	100/200	12	12
21105435	380T-3100	3100	6.5	120/230	12	12
21105403	380T-3800 100V	3800	6.5	100/200	12	12
21105436	380T-3800	3800	6.5	120/230	12	12

Table 11 - 380T Models

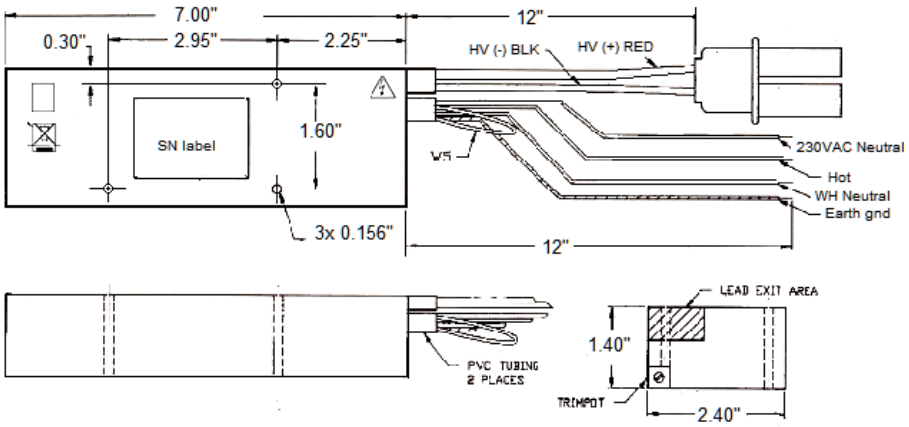

Figure 14- Module 380T Series Power Supply Dimensions

Table 12 lists the pairing between 1100s, 1000s lasers and standard OEMs power supplies.

Power Supply Model	Input Voltage +/-10%	Laser Model	Output Voltage +/- 200V	Current DC +/- 0.1mA	Optical Noise <10MHz
101T-1700	12VDC	102, 196, 1101/P, 1103/P 1007*, 1008 "	**1700VDC**	4.9mA	<0.1%
314T-1700	120/230VAC				
314T-1700 100V	100/200VAC				
101T-2300-6.0-4	12VDC	1125/P, 1137/P	**2300VDC**	6.0mA	<0.2%
314T-2300	120/230VAC				
314T-2300 100V	100/200VAC				
101T-1250	12VDC	1107/P, 1108/P 1001", 1003 *, 098-3 *	**1250-1350VDC**	4.0mA	<0.1%
101T-1350-4-1	12VDC				
101T-1250-1350-3.5-BRH-2	12VDC				
314T-1250	100/200VAC				
314T-1250-4-2	120/230VAC				
101T-1800	12VDC	1122/P 1022*	**1800VDC**	6.5mA	<0.1%
314T-1800	120/230VAC				
		1135/P	**3100VDC**	6.5mA	<1%
380T-3100 100V	230 VAC				
380T-3100 100V	100/200VAC				
		1144/P, 1145/P	**3800VDC**	6.5mA	< 0.5%
380T-3800	120/230VAC				
380T-3800 100V	100/200VAC				

* Laser tubes require a series ballast resistor, otherwise can become unstable.

Table 12: OEMs Model Selection for 1100 and 1000 Laser Series.

Lumentum also offers a variety of OEM power supplies as shown below in Table 13.

Lumentum PN	Model name	HV Output (VDC)	CURRENT (mA)	Input (VDC)	HV cable (in)	Input cable (in)	Size L x D x H	Comments
21105356	103-1250	1250	4.0	12VDC	6	12	4 x 1.5 x 1	
21105357	103-1700	1700	4.9	12VDC	6	12	4 x 1.5 x 1	
21105427	106-05-4.0	1250	4.0	12VDC	6	12	4 x 1.5 x 1	
21105364	111-1700-4.9-TTL-2	1700	4.9	24VDC	6	12	5.1 x 1.5 x 1.1	TTL input
21105367	121T-1250-4-2	1250	4.0	12VDC	6	12	5.1 x 1.5 x 1.1	
21105374	180T-2700-5-4	2700	5.0	12VDC	12	12	4.3 x 3 x 1.2	
21105376	314S-1250-4-1	1250	4.0	1020/230VAC	12	12	4.3 x 3.3 x 1.2	

Table 13: Other OEM models.

6 APPENDIX

6.1 1100 Lasers Housing Configuration

The Model 1100 Series laser head basic dimensions are shown in Figure 15. The values are listed in Table 14. The shaded areas are free areas for user installation.

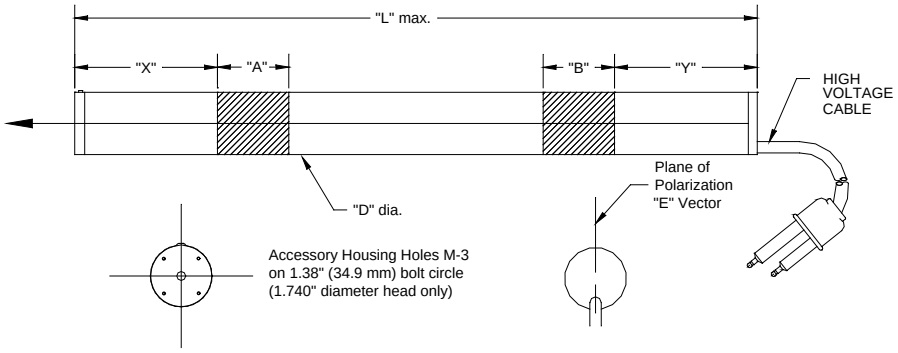

Figure 15: Model 1100 Series Housing Configuration

Models	"L"	"D"	"A"	"B"	"X"	"Y"
1107,1107P 1108, 108P	17.78 cm (7.0 in)	3.162 ± .013 cm (1.245 ± .005 in)	2.54 cm (1.0 in)	2.54 cm (1.0 in)	1.27 cm (.50 in)	1.9 cm (.75 in)
1101, 1101P 1103, 1103P	24.13 cm (9.5 in)	3.162 ± .013 cm (1.245 ± .005 in)	5.08 cm (2.0 in)	5.08 cm (2.0 in)	2.54 cm (1.0 in)	2.54 cm (1.0 in)
1122, 1122P	27.2 cm (10.71 in)	4.42 ± .013 cm (1.74 ± .005 in)	5.08 cm (2.0 in)	5.08 cm (2.0 in)	3.81 cm (1.5 in)	3.81 cm (1.5 in)
1125, 1125P, 1137, 1137P,	40.11 cm (15.79 in)	4.42 ± .013 cm (1.74 ± .005 in)	5.08 cm (2.0 in)	5.08 cm (2.0 in)	7.62cm (3.0 in)	7.62cm (3.0 in)
1135, 1135P,	48.6 cm (19.13 in)	4.42 ± .013 cm (1.74 ± .005 in)	5.08 cm (2.0 in)	5.08 cm (2.0 in)	10.16 cm (4.0 in)	10.16 cm (4.0 in)
1144, 1144P, 1145, 1145P	63.5 cm (25.0 in)	4.42 ± .013 cm (1.74 ± .005 in)	5.08 cm (2.0 in)	5.08 cm (2.0 in)	12.7 cm (5.0 in)	12.7 cm (5.0 in)

Table 14: Model 1100 Series dimensions

6.2 OEMs AC WIRING GUIDANCE

The Table 15 shows the Input AC wiring for the 314T and 380T power supplies.

AC INPUT CONNECTIONS						
WIRE COLOR	**100VAC**	**200VAC**	**WIRE COLOR**		**120VAC**	**230VAC**
RED	HOT	HOT	BROWN	WHITE	HOT	HOT
RED		NEUTRAL	BLUE	WHITE		NEUTRAL
YELLOW	NEUTRAL		WHITE	YELLOW	NEUTRAL	
GREEN	GND	GND	GREEN/YELLOW	GREEN	GND	GND

Table 15. OEM Power Supply AC INPUTS

Contact Information

Telephone	
APAC	800 0825-LITE (+800 0825-5483)
China	10 400 120-LITE (+10 400 120-5483)
EMEA	800 0000-LITE (+800 0000-5483)
North America	1 844 810-LITE (1 844 810-5483)
Fax	
APAC	800 0010-LITE (+800 0010-5483)
China	10 400 121-5483
EMEA	800 0010-LITE (+800 0000-5483)
North America	1 844 910-5483

If you have issues using these toll-free numbers, please contact Customer.service@lumentum.com or call 1 613-843-5378

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