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THORLABS

HRS015 - March 9, 2016

Item # HRS015 was discontinued on March 9, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

STABILIZED HENE

- **Frequency Stabilization of ±2 MHz**
- **Intensity Stabilization of ±0.2%**
- **Output Power: >1.2 mW**
- **632.991 nm Output Wavelength in Vacuum**
- **Linear Polarization Greater than 1000:1**

HRS015
Power Supply Included

Application Idea

HRS015 Mounted in an HCM2 Cage-Compatible HeNe Mount

Hide Overview

OVERVIEW

Thorlabs' Stabilized Helium Neon Laser allows for either frequency or intensity stabilization, necessary for many spectroscopy, interferometry, and wavemeter applications. In frequency-stabilized mode, the laser will keep its lasing frequency (i.e., wavelength) constant, while in intensity-stabilized mode, the laser will keep its output power constant. Under normal operating conditions, the lifetime of the HRS015 will be around 25,000 hours. For more details on the stabilization modes, please see the *Stabilized HeNe* tab.

The plots below show the key parameters of the HeNe when the laser is in the frequency-stabilized mode. The left-most plot shows the optical spectrum of the laser; the data for this graph was collected using Thorlabs' OSA201 Fourier Transform Optical Spectrum Analyzer. The center plot shows the power fluctuations over an eight hour period after a cold start. As seen in this graph, the HRS015 laser's power stabilizes significantly in less than 25 minutes and then reaches the final stabilized value in ~1 hour. Finally, the plot to the far right shows the fractional change in wavelength over five hours of operation. If the power to the laser needs to be cycled after reaching stabilization, the typical time to relock the laser is ~5 min; please note that the relock time depends on the shut down period as the laser will continue to cool while the power is off.

The laser is housed in a cylindrical tube, which can be conveniently mounted in a V-clamp mount such as Thorlabs' C1513 Kinematic Mount. The Ø1.77" tube is also compatible with our HCM2 HeNe Mount for 60 mm Cage Systems, as pictured above. For details on our assortment of HeNe accessories, please see the *HeNe Accessories* tab. The front bezel of this stabilized laser is internally SM1 (1.035"-40) threaded for compatibility with any of Thorlabs' SM1-threaded components.

The polarization axis is marked by a laser-engraved line on the laser's front face. The

Key Specifications		
Wavelength	632.991 nm (Vacuum)	
Stabilized Power	>1.2 mW	
Polarization	Linear >1000:1	
Mode Structure	TEM_{00} >99%	
Beam Diameter	0.7 mm	
Beam Divergence	1.25 mrad	
Beam Drift[a]	<0.2 mrad	
Long-Term Beam Drift[a]	<0.05 mrad	
Power Input	AC Universal (120/240 VAC)	
Lifetime (Typ.)[b]	25,000 h	
Stabilization Specifications		
Output Frequency Stability	1 Minute 1 Hour 8 Hours	±1 MHz ±2 MHz ±2 MHz
Output Intensity Stability	1 Minute 1 Hour 8 Hours	±0.1% ±0.2% ±0.3%
Time to Lock[c]	<25 Minutes	
Temperature Range to Maintain Lock	15 - 30 °C	

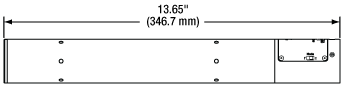
- Beam drift is specified during the period that the laser is

front face also includes an integrated beam stop and an industry-standard 4-40 tapped hole pattern compatible with our SM05AHN SM05-Threaded Adapter and HCL FiberPort Adapter.

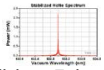
Please note that back reflections into the laser aperture will impair the ability of the control loop to stabilize the frequency or intensity of the laser. Furthermore, large amounts of back reflections can potentially disturb the population inversion of the laser, rendering it unable to lase properly. For instances where back reflections cannot be avoided, Thorlabs recommends using an optical isolator (for example, Item # IO-2D-633-VLP). Additionally, due to the significant ASE background, a bandpass filter should be used for precision measurements.

warming up while long-term beam drift is specified after the laser is fully stabilized (after ~1 hour of warm up)
- Laser lifetime is defined as the usage time required before the laser output power drops to 50% of the specified output power.
- At an ambient temperature of 25 °C.

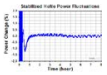
This laser is shipped with a power supply with a universal voltage input.



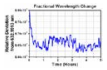
Click for Dimensions



Click to Enlarge



Click to Enlarge



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Hide Specs

SPECS

Specifications	
Wavelength	632.991 nm (Vacuum)
Stabilized Power	>1.2 mW
Unstabilized Power	1.2 mW to 2.7 mW
Polarization	Linear, >1000:1
Mode Structure	TEM_{00} >99%
Beam Diameter	0.7 mm
Beam Divergence	1.25 mrad
Beam Drift[a]	<0.2 mrad
Long-Term Beam Drift[a]	<0.05 mrad
Noise (30 Hz to 10 MHz)	<0.3% rms (Max)
Time to Lock[b]	<25 Minutes
Temperature Range to Maintain Lock	15 - 30 °C
Power Input	AC Universal (120/240 VAC, 50 - 60 Hz)
Power Consumption	<40 VA
Starting Voltage	10 kV (DC)
Operating Voltage	1.5 kV (DC)
Operating Current	5.0 mA
Series Resistors in Housing	94 kΩ
Shock	15 g for 11 msec
CDRH/CE Classification	IIIa/3R
Lifetime (Typ.)[c]	25,000 h
Dimensions	Ø1.77" x 13.65" (Ø45.0 ± 0.5 mm x 346.7 mm)
Weight	600 g

Stabilization Specifications	
Frequency Stabilized Mode	
1 Minute	±1 MHz
1 Hour	±2 MHz
8 Hours	±2 MHz
Intensity Stabilized Mode	
1 Minute	±0.1%
1 Hour	±0.2%
8 Hours	±0.3%

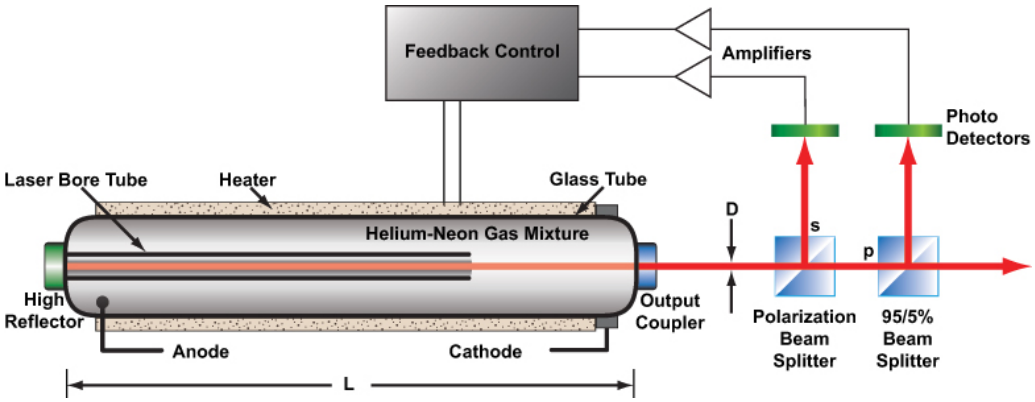
- Beam drift is specified during the period that the laser is warming up, while long-term beam drift is specified after the laser is fully stabilized (after ~1 hour of warm up).
- For a typical HeNe at an ambient temperature of 25 °C.
- Laser lifetime is defined as the usage time required before the laser output power drops to 50% of the specified output power.

Hide Stabilized HeNe

STABILIZED HENE

Stabilized HeNe Lasers

Stabilized HeNe lasers offer the ability to change between two modes of operation: frequency and intensity stabilization.



Stabilization Feedback Mechanism Schematic

Frequency Stabilization Mode

The frequency stabilization mode will balance the intensity of two modes under the gain curve in order to keep the frequency of the laser stable. The tube length is specifically chosen to only allow two cavity modes at the output. The polarization states of the modes are orthogonal (i.e. one will be s-polarized and the other will be p-polarized). Using a polarizing beamsplitter, one of the modes is directed to a photodetector, while the remaining mode passes through a second beamsplitter where 5% of the output is reflected to a second photodetector, as shown in the schematic above. An error signal generated by the two photodetectors is used to control a heater wrapped around the glass tube. the heater causes the tube to expand and contract as necessary to stabilize the frequency. The frequency stabilization mode also delivers some intensity stability.

Since our stabilized HeNe features a single mode output, the coherence length is increased to hundreds of meters.

Intensity Stabilization Mode

The intensity stabilization mode will stabilize the intensity of the output beam. This mode operates on the same principle as frequency stabilization; however, only one of the photodectectors is used to generate the feedback error signal to control the heater. The intensity stabilization mode also delivers some frequency stability.

On Thorlabs' HRS015 Stabilized HeNe, either mode can be quickly selected by adjusting the toggle switch into the desired position.

Hide HeNe Accessories

HENE ACCESSORIES

FiberPort and Thread Adapters

Click for Details

Adapters for Standard Cylindrical HeNe Lasers[a]

The SM05AHN Thread Adapter allows SM05-threaded components to be attached directly to the front of a HeNe laser and is ideal for enclosing a HeNe beam path using SM05 Lens Tubes. The HCL FiberPort Adapter allows a FiberPort coupler to be attached directly to the front of a HeNe laser. Both adapters can be attached to the laser via counterbored slots that fit industry-standard M3 and 4-40 four-bolt patterns. The HCL can also be mounted via the internal C-Mount-Threaded (1.00"-32) central bore.

- Note that these adapters are not compatible with the HNL008 Series of Cylindrical HeNe Lasers.

Mounting Adapters

HCM2 Cage Mount

Large V-Clamp Mounts

HCM2
A HeNe Laser Mounted in the HCM2 Cage System Adapter Plate

Click to Enlarge

The HCM2 Cage Mount enables integration of a cylindrical HeNe laser with a diameter between 1.74" and 1.77" (44.2 mm and 45.0 mm) into a 60 mm cage system or SM2 (2.035"-40) lens tube system. The HCM2 provides ±1.0 mm of coarse X and Y adjustment, and is compatible with Ø1/2" and Ø1" posts.

C1513
HeNe Laser Mounted in the C1513 V-Clamp

Click to Enlarge

The C1512(/M) and C1513(/M) are designed specifically for fastening Ø0.56" (14 mm) to Ø2" (50 mm) cylindrical lasers to Thorlabs' rigid Ø1.5" Posts. One PM4(/M) Clamping Arm is included with each unit and additional clamping arms can be purchased as needed here.

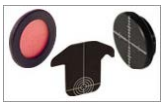
Hide Laser Safety

LASER SAFETY

Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina.

Safe Practices and Light Safety Accessories



- Thorlabs recommends the use of safety eyewear whenever working with laser beams with non-negligible powers (i.e., > Class 1) since metallic tools such as screwdrivers can accidentally redirect a beam.
- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Laser Barriers and Blackout Materials can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.
- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.
- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use laser sign lightboxes if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Laser Barrier or Beam Trap.

Laser Classification

Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1

outlines the safety of laser products. A description of each class of laser is given below:

Class	Description	Warning Label
1	This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser.	
1M	Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly.	
2	Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm).	
2M	Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams.	
3R	Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser, however, this presents a low risk level to injury. Visible, continuous-wave lasers are limited to 5 mW of output power in this class.	
3B	Class 3B lasers are hazardous to the eye if exposed directly. However, diffuse reflections are not harmful. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. In addition, laser safety signs lightboxes should be used with lasers that require a safety interlock so that the laser cannot be used without the safety light turning on. Class-3B lasers must be equipped with a key switch and a safety interlock.	
4	This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock.	
All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign		

Hide Stabilized HeNe Laser

Stabilized HeNe Laser

Part Number	Description	Price	Availability
HRS015	Stabilized HeNe Laser, 632.991 nm (Vacuum), 1.2 mW, Polarized	$4,195.00	Lead Time

Visit the *Stabilized HeNe* page for pricing and availability information:
http://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=5281