

REO HeNe Lasers

High-Quality Lasers For
Precise Applications And
Measurements

Broadest Range of Wavelengths Available



EXCELITAS
TECHNOLOGIES®



Company Profile

REO is the world leader in high performance HeNe laser manufacturing...

The Research Electro-Optics (REO) legacy is derived from HeNe laser manufacturing. Superior HeNe lasers require the highest quality laser optics. This is what inspired REO's founder, Dr. Robert Knollenberg, to bring optics manufacturing in-house. Today, REO is the world leader in high performance HeNe laser manufacturing, enabled by our unique combination of optics fabrication and expert assembly capabilities.

REO integrates proprietary in-house designed and manufactured laser mirrors into our HeNe lasers. Additionally, REO has provided the majority of mirrors for the HeNe laser industry for the last two decades.

REO was also the first company to successfully develop mirrors for volume green HeNe lasers, with their notoriously low gain. Application of our design and optics manufacturing experience developed a unique Frequency and Intensity Stabilized HeNe Laser product. This provides an ideal solution for instrumentation and metrology applications which require long coherence length and high amplitude stability.

In 2018, REO was acquired by Excelitas Technologies® Corp. This acquisition has helped support the growth capabilities of the HeNe product line. Today, the REO brand continues to offer the widest range of HeNe wavelengths and highest HeNe powers available on the market.



1972



Particle Measuring Systems (PMS) is founded.

1979

PMS founder, Dr. Robert Knollenberg, decides to start manufacturing his own HeNe lasers in order to tailor them to his particle counter's needs.

1980

Dr. Knollenberg decides to begin manufacturing optics to tailor them to the HeNe lasers' needs – PMS Electro-Optics is formed.

1986

PMS Electro-Optics develops superpolishing technique to improve mirror efficiency.

1989

PMS Electro-Optics begins uses IBS coating to further improve mirror quality.



REO facility in Colorado



R&D Lab on site



Quality inspection on site

Contents

Company Profile & Timeline	2-3
REO Core Competencies	4
HeNe Lasers vs. Diode Lasers	5
HeNe Offering Specifications	6-7
REO HeNe Advantages	8
Stabilized HeNe Details	9
Tunable HeNe & 30mW HeNe Details	10
OEM Advantages	11

1994



Optics division becomes independent from PMS as Research Electro-Optics.

2002

REO builds a new facility to accommodate growing business.

2007

Coherent Auburn Optics Group acquisition brings additional growth in optical manufacturing expertise.

2018



Excelitas acquisition of REO provides additional support and investment in the HeNe laser product line.

REO Core Competencies



REO fabricates all HeNe mirrors used in our lasers. We also sell our mirrors to other HeNe laser manufacturers.



We manufacture many optical assemblies and have experience with integrating additional assemblies with our HeNe lasers – such as fiber-coupling.

We coat all of the HeNe mirrors we manufacture, enabling us to customize coating specifications via our in-house LDT testing, low absorption coatings, and superpolished surfaces.



REO has many in-house metrology capabilities which ensure the quality of fabrication, thin film deposition, and assembly.



REO HeNe lasers are uniquely suited for a wide range of applications:

- FTIR applications
 - Narrow/stable linewidth
- Semiconductor Inspection
- Particle Counting
- Metrology
- Alignment
- Raman Spectroscopy
- Research Labs & Universities
- Confocal Microscopy
- Food/Agricultural sorting
- DNA Sequencing
- Flow Cytometry
- Imaging and Medical Equipment
- Opacity Monitoring
- Maritime Visual Guidance Systems
- Hematology
- Polarization Experiments
- Ellipsometry



HeNe Lasers vs. Diode Lasers

Although both are diodes and Helium-Neon lasers are well-suited for a number of OEM applications, there are some things to take into consideration when making this decision for your application.

Diodes are an extremely versatile product. With a wide variety of wavelengths and a wide range of prices to choose from, they certainly present many options. They are also very small, making them easy to integrate into a product with limited space.

There are, however, several drawbacks:

Beam Quality:

The mode inherent to a diode is elliptical, astigmatic, and highly divergent. These qualities make the beam very difficult to use without a number of correctional optics to compensate. In addition to this, the characteristics of a diode beam can vary within even a single batch of diodes.

Conversely, the beam directly out of a HeNe is fundamentally Gaussian, easily focusable, and very slightly divergent (typically less than 2 mrad). Additional optics can be added to a diode to mimic these qualities but this adds not only additional cost and assembly time, it also adds more points of potential failure.

Parameter	HeNe	Diode
Best Beam Quality	✓	
Narrowest Linewidth	✓	
Highest Output Power		✓
Smallest Device Size		✓
Longest Lifetime	✓	
Variety/tunability of Frequencies		✓
Robustness Against Retro-reflection	✓	
Lowest Cost	✓	



Wavelength Bandwidth/Stability:

The bandwidth of a laser diode is also very wide – on the order of several nanometers. To stabilize a diode is a costly process but it can be done with enough effort.

By comparison, wavelength stability is inherent to a HeNe. The bandwidth of an unstabilized HeNe is on the order of a few GHz, ~1000 times that of a diode. A stabilized HeNe is ~100 times better than that.

Robustness:

Diodes are very sensitive to ESD and radiation. They can also be damaged by optical feedback.

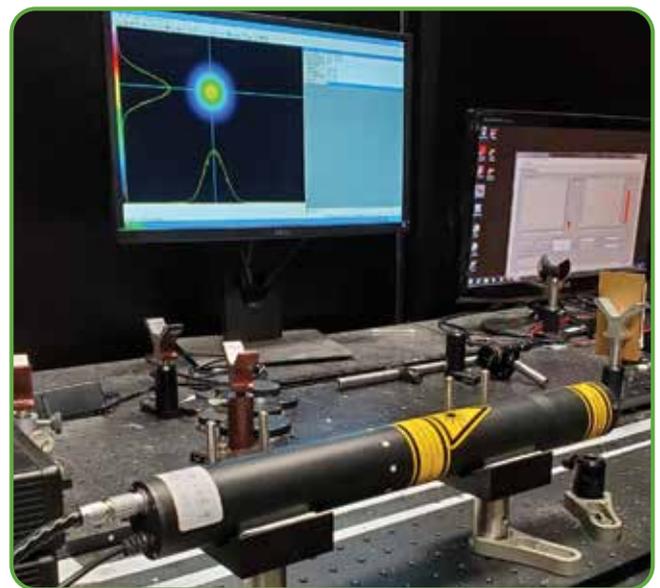
HeNe's are inherently robust to radiation, ESD, and optical feedback.

Inter-Cavity Access:

HeNe's also allow access to inner cavity power, which is useful for particle counting applications.

Wavelength Standard:

The HeNe wavelength is an atomic reference. The transition of Neon is well-enough known that the HeNe is used as a standard to measure against.



HeNe Specifications

Wavelength (nm)	Power (mW)	Polarization	Mode Structure	Beam Diameter (mm)	Beam Divergence (mrad)	Longitudinal Mode Spacing (MHz)	Lo Be (
Green HeNe Laser Systems							
543 (multimode)	0.5	Linear, > 500:1	Multimode	1.62	4.02	566	
543	0.5	Random	TEM ₀₀ > 99%	0.64	1.07	566	
543	0.5	Linear, > 500:1	TEM ₀₀ > 99%	0.72	0.96	415	
543	1.0	Linear, > 500:1	TEM ₀₀ > 99%	0.83	0.84	303	
543	1.0	Random	TEM ₀₀ > 99%	0.70	0.98	441	
543	1.5	Linear, > 500:1	TEM ₀₀ > 99%	0.83	0.84	303	
543	2.0	Random	TEM ₀₀ > 99%	0.83	0.84	303	
Yellow HeNe Laser Systems							
594	1.0	Linear, > 500:1	TEM ₀₀ > 99%	0.74	1.03	416	
594	2.0	Linear, > 500:1	TEM ₀₀ > 99%	0.74	1.03	416	
Red HeNe Laser Systems							
633	0.5	Random	TEM ₀₀ > 99%	0.57	1.41	1082	
633	0.8	Linear, > 500:1	TEM ₀₀ > 99%	0.57	1.41	1082	
633	1.5	Random	TEM ₀₀ > 99%	0.57	1.41	1082	
633	1.5	Linear, > 500:1	TEM ₀₀ > 99%	0.64	1.25	714	
633	2.0	Random	TEM ₀₀ > 99%	0.81	1.00	566	
633	2.0	Linear, > 500:1	TEM ₀₀ > 99%	0.81	1.00	566	
633	3.0	Linear, > 500:1	TEM ₀₀ > 99%	0.70	1.20	633	
633	5.0	Random	TEM ₀₀ > 99%	0.80	1.01	441	
633	5.0	Linear, > 500:1	TEM ₀₀ > 99%	0.80	1.01	441	
633	12.0	Random	TEM ₀₀ > 99%	0.88	0.92	316	
633	12.0	Linear, > 500:1	TEM ₀₀ > 99%	0.88	0.92	316	
633	17.0	Random	TEM ₀₀ > 99%	0.98	0.82	252	
633	17.0	Linear, > 500:1	TEM ₀₀ > 99%	0.98	0.82	252	
633	30.0	Linear, > 500:1	TEM ₀₀ > 99%	1.22	0.66	163	
Stabilized Red HeNe Laser Systems							
633	1.5	Linear, > 500:1	TEM ₀₀ > 99%	0.7	1.2		
Infrared HeNe Laser Systems							
1152	1.0	Linear, > 500:1	TEM ₀₀ > 99%	1.09	1.34	375	
1523	1.0	Linear, > 500:1	TEM ₀₀ > 99%	1.36	1.43	316	
3390	2.0	Linear, > 500:1	TEM ₀₀ > 99%	2.02	2.13	316	
Dual Line HeNe Laser Systems							
1523/633	0.8/1.0	Linear, > 500:1	TEM ₀₀ > 99%	1.36/0.87	1.42/0.82	316	
1152/3390	2.0/3.0	Linear, > 500:1	TEM ₀₀ > 99%	0.90/1.55	1.62/2.78	316	
Tunable HeNe Laser Systems							
633	4.0	Linear, > 500:1	TEM ₀₀ > 99%	0.77	1.05	428	
612	2.5			0.76	1.03		
604	0.5			0.75	1.02		
594	0.6			0.74	1.02		
543	0.3			0.71	0.97		

Beam Term Beam Drift (mrad)	"Noise (30Hz – 10MHz)" RMS	Laser Head Weight (g)	Dimensions (Ø x L) mm	CRDH/CE Classification	REO Model	Replacement Head PN	Recommended Power Supply
< 0.02	< 1%	600	44.5 x 330.2	IIIa/3R	40141	30683	39783
< 0.05	< 1%	600	44.5 x 330.2	IIIa/3R	30967	30605	39783
< 0.05	< 1%	650	44.5 x 425.5	IIIa/3R	30968	30682	39783
< 0.05	< 1%	750	44.5 x 533.4	IIIa/3R	39581	30526	39784
< 0.05	< 1%	650	44.5 x 533.4	IIIa/3R	39568	30532	39783
< 0.05	< 1%	750	44.5 x 533.4	IIIa/3R	33361	32656	39784
< 0.05	< 1%	750	44.5 x 533.4	IIIa/3R	30972	30609	39784
< 0.05	< 1%	650	44.5 x 425.5	IIIa/3R	40094	30571	39783
< 0.05	< 1%	650	44.5 x 425.5	IIIa/3R	39582	30639	39783
< 0.05	< 5% S	600	44.5 x 177.8	IIIa/3R	31008	39698	39783
< 0.05	< 5%	600	44.5 x 177.8	IIIa/3R	31007	39697	39783
< 0.05	< 5%	600	44.5 x 177.8	IIIa/3R	31005	30404	39783
< 0.05	< 1%	600	44.5 x 241.3	IIIa/3R	30025	30028	39783
< 0.05	< 1%	600	44.5 x 330.2	IIIa/3R	30988	30629	39783
< 0.05	< 1%	600	44.5 x 330.2	IIIa/3R	30989	30621	39783
< 0.05	< 1%	600	44.5 x 346.1	IIIa/3R	14354	14353	39783
< 0.05	< 1%	650	44.5 x 425.5	IIIa/3R	30990	30630	39783
< 0.05	< 1%	650	44.5 x 425.5	IIIa/3R	30991	30623	39783
< 0.05	< 1%	750	44.5 x 533.4	IIIa/3R	30992	30633	39785
< 0.05	< 1%	750	44.5 x 533.4	IIIa/3R	30993	30624	39785
< 0.04	< 1%	840	44.5 x 660.4	IIIa/3R	39635	30635	39786
< 0.05	< 1%	840	44.5 x 660.4	IIIa/3R	30995	30625	39786
< 0.05	< 1%	6939	1069 x 95.25 x 95.25	IIIa/3B	16194	Integrated	Integrated
			44.5 x 381.0	IIIa/3R	32734	32732	32733
< 0.02	< 5%	853	44.5 x 533.4	IIIa/3B	40136	30684	39785
< 0.02	< 5%	853	44.5 x 533.4	IIIa/3B	33141	30612	39785
< 0.05	< 5%	750	44.5 x 533.4	IIIa/3B	32172	30685	39785
< 0.05	< 20%	750	44.5 x 533.4	IIIa/3B	40137	30538	39785
< 0.05	< 20%	750	44.5 x 533.4	IIIa/3B	40138	30615	39785
< 0.05	< 1%	5000	450.8 x 100.0 x 120.7	IIIb	30602 (115 V input) 30603 (230 V input)	Integrated	Integrated



REO HeNe Laser Advantage

REO has the broadest range of HeNe wavelengths commercially available. Our low-defect surfaces provide unparalleled beam quality and allow our lasers to lase at low gain transitions, giving REO the widest range of HeNe wavelengths available.

REO HeNe tubes are made of mostly stainless steel as opposed to the traditional, all-glass tube, providing a number of advantages.

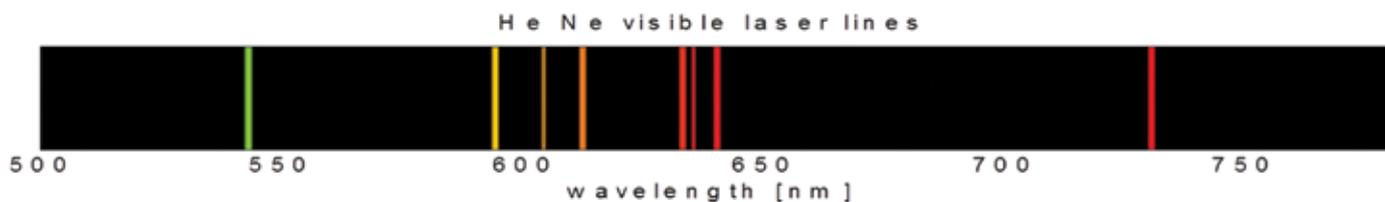
Stainless HeNe Tubes vs. All-Glass HeNe Tubes

- **Optical Assembly Coupling:** The metal tubes of REO HeNe lasers allow additional optical assemblies, like fiber-coupling, to be directly attached to the tube, rather than the housing. This ensures superior beam pointing stability.
- **Robustness:** As most of our HeNe is made of metal, our lasers are much easier to handle than the standard, all-glass tube. Thanks to this body-design, there are also more options for mounting bare tubes – particularly for OEM solutions.
- **Lifetime:** Most HeNe failures are caused by the escape of the helium inside the tube. Helium is an extremely small gas and is not easily trapped in any container.

The lifetime of a HeNe based on helium diffusion alone is impacted by two factors: the pressure of the helium inside the tube and the diffusion coefficient of the tube material. In all HeNe lasers, the helium pressure inside the tube is comparable, which means that the more important factor here is the diffusion coefficient of the wall itself. Glass has a much higher diffusion coefficient than metal – which causes the diffusion rate of helium to be approximately ten times more through glass than through metal.

The diffusion coefficient of glass is also highly dependent on temperature, making the impact of operation or storage at elevated temperatures on an all glass tube much more drastic than that on a mostly metal tube.

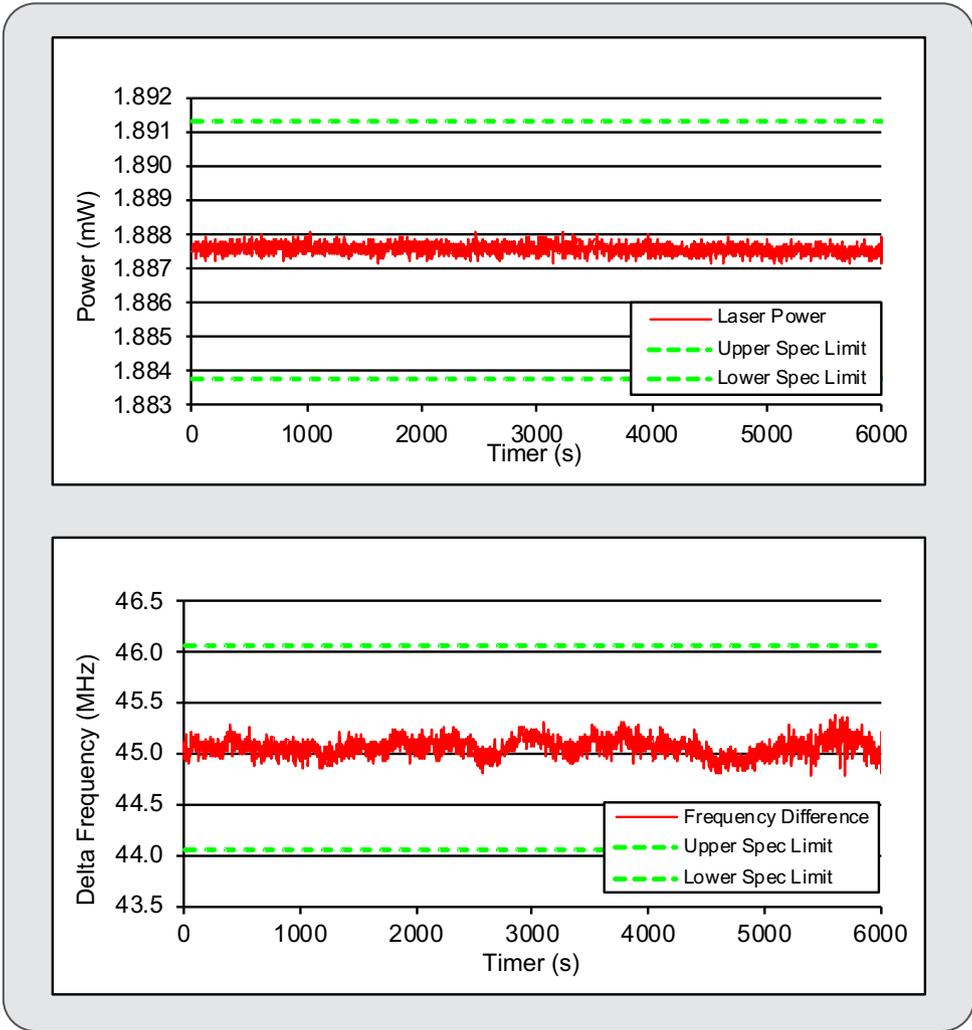
The metal of our tubes also acts as the cathode of the tube, meaning that the current density concentrated on our cathodes is much lower than the typical cathode in a glass tube. This lower density of current reduces failure caused by material sputtering into the bore.



Stabilized HeNe Details

REO offers the highest power stabilized HeNe on the market at 1.5mW. This is made possible by our patented optical configuration which uses a non-normal incidence birefringent optical component rather than a non-mode-hopping mirror.

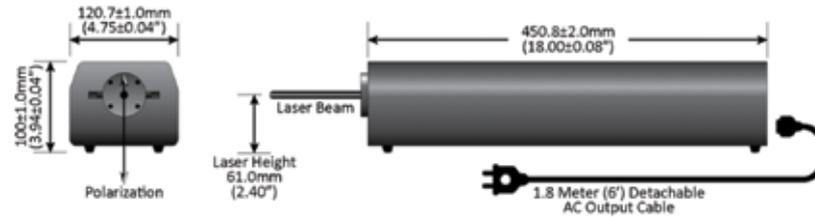
Our configuration is both lower loss than this non-mode-hop mirror and also results in the polarization being fixed relative to the tube's geometry, making the tube easier to install without having to determine the polarization direction in the first place. Our stabilized HeNe laser can also be customized for use in an OEM application. Please contact us to discuss how this product can be best modified to suit your needs.



Tunable HeNe Details

The Line-Tunable HeNe Laser generates 500:1 linearly polarized outputs of five independent line-selectable wavelengths: 543 nm, 594 nm, 604 nm, 612 nm, and 633 nm. Each of these wavelengths can be individually selected by tuning the Littrow prism at the end of the laser via a micrometer adjustment.

This product is a tremendous value for any application that requires multiple wavelengths but not necessarily multiple lasers, such as research labs or educational institutions.

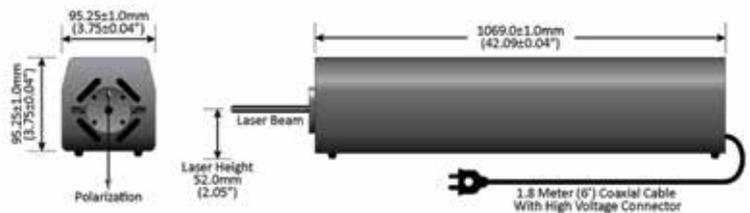


543 nm	594 nm	604 nm	612 nm	633 nm
0.3 mW	0.6 mW	0.5 mW	2.5 mW	4.0 mW

30mW HeNe Details

REO also offers the highest power 633nm HeNe on the market. The 16194 Red HeNe Laser generates a 500:1 linearly polarized output of 30.0 mW (minimum) at 633 nm. Longitudinal mode frequency is approximately 163 MHz. Utilizing enhanced designs and superior optical components this HeNe laser delivers unsurpassed operational stability and lifetime. The mirror quality and performances are optimized to result in the highest quality HeNe laser available in the market.

For this model, the power supply is integrated into the housing design and automatically configures for use with either 110V or 220V, making the system as compact as possible.



REO OEM Advantages

Our unique metal body design makes our HeNe lasers uniquely suited for OEM applications.

We can directly attach any optical assemblies (telescopes, periscopes, fiber-coupling) to the body of our laser, rather than just the housing, allowing for a more stable pointing solution.

Our HeNe's were developed with an OEM application in mind. Due to the need for flexibility and the tight space constraints of this application, we decided to depart from the traditional all-glass tube in favor of a mostly metallic one, allowing us to safely mount the laser directly into the machining without any additional housing.

Our lasers also have lower rates of helium diffusion due to our metallic housing. This means that field replacements are less frequently required, easing the service burden on an equipment manufacturer.

The REO HeNe laser team is committed to providing the best OEM solution for your application. Both our lasers and our qualification procedures can be modified to meet your specific requirements, so that there is no need to compromise with a product that is less than ideal.



Fiber Coupling



Integration of Custom Optical Assemblies



Compact Power Supply & Electronics Options

About Excelitas Technologies

Excelitas Technologies® Corp. is a photonics technology leader focused on delivering innovative, high-performance, market-driven solutions to meet the lighting, optronics, detection and optical technology needs of our OEM customers. Serving a vast array of applications across biomedical, scientific, safety, security, consumer products, semiconductor, industrial manufacturing, defense and aerospace sectors, Excelitas stands committed to enabling our customers' success in their end-markets. Our photonics team consists of 7,000 professionals working across North America, Europe and Asia, to serve customers worldwide.



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For a complete listing of our global offices, visit www.excelitas.com/locations

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