

How a helium neon gas laser works

Components & general description

The Helium Neon laser is one of the most economical and commonly used gas lasers on the market. The laser is typically designed to operate in the red at 632.8nm, although many users find it beneficial in the green at 543.5nm, yellow at 594.1nm, orange at 611.9nm, and in the infrared at 1523 or 3921nm.

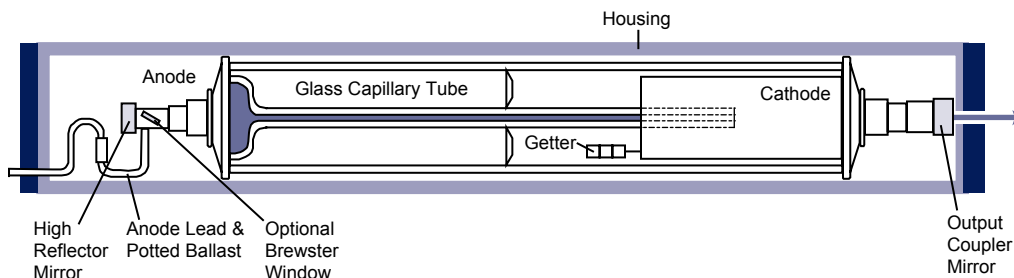
HeNe lasers have been used extensively for such applications as holography, spectroscopy, metrology, reprographics, laser light displays, medical treatments, and bar code scanning, although we're finding that many users are now replacing their existing HeNe systems with smaller, more efficient laser diode modules.

The following is a basic description of how a HeNe laser works. If you have any questions, please do not hesitate to call or email.

Major components of a HeNe laser system

A complete HeNe laser system requires four major components.

1. **AC or DC power source:** The input voltages required to operate a power supply are typically 10-14VDC, 22-30VDC, 90-110VAC (Japan), 100-130VAC, 180-220VAC (Europe), and 200-240VAC.
2. **Power supply:** The power supply converts the input voltage to a high DC voltage capable of ionizing the HeNe gas and sustaining the operation by supplying a regulated current from a voltage source.
3. **Ballast resistor:** This mechanism is placed in series with the HeNe laser anode to promote a stable electrical discharge and to prevent the laser from oscillating.
4. **HeNe laser:** High voltage ionizes the helium and neon gas mixture and generates light at the desired wavelength. The following page contains more detailed information concerning how a HeNe laser works.



General description of a HeNe laser

The typical HeNe laser is basically an optical cavity that consists of a glass capillary tube with a mirror at each end. The tube contains a helium and neon gas mixture that, when excited, utilizes the mirrors at each end of the tube to transform the spontaneous emission into a stimulated laser light emission. One mirror (called the high reflector mirror) reflects virtually 100% of the light, while the other (called the output coupler mirror) reflects approximately 99%. Therefore, about 1% of the light will exit the laser at the desired wavelength.

Some HeNe lasers do not incorporate internal mirrors but, rather, include a special glass window, called a Brewster window. This window is mounted at a precise angle (Brewster angle) to allow light to pass through and become linearly polarized. The output coupler mirror is positioned outside of the HeNe tube. The light is almost completely transmitted, virtually cutting out reflection and resulting in a minimal loss of output power. This intense, clearly visible light is ideal for applications requiring the observation of extremely tiny particles, such as dust.

