Focused Lens-End Lamps

The addition of a Lens-End to a technical lamp is an important development in miniature lamps as it allows the use of lower wattage lamps while maintaining light output. The lens gathers light resulting in an intensity increase of up to 10 times at the end of the lamp, compared to the output of an equivalent lamp without lens, measured at this same point. Most popular Lens-End Lamps are those types mounted in a smooth or threaded type base as illustrated in this catalog. However, other Lens-End Lamps exhibiting similar characteristics to those described here, some unbased and some smaller in size, are specified throughout the catalog.

The purpose of the lens-end is to gather light and project it into a useful direction. These Lens-End Lamps by themselves cannot satisfy all requirements of an optical system. The lamps have both a focal length and working plane. The working plane is that area where light distribution is optimized for intensity, uniformity and consistency of light pattern between lamps. The working plane is typically located perpendicular to the lamp mechanical axis and at a distance of 0.5-3 millimeters from the lens-end. Figures 1 & 2 show typical working plane light patterns for both the 1/4 inch diameter and ½-20 diameter lamps. Due to variations in the manufacturing process for these lamps the light pattern will vary slightly from lamp to lamp. A sample of lamps should be tested in any new design to ensure proper operation.

To best utilize these Lens-End Lamps it is recommended that the area to be illuminated (fiber optics aperture, or light guide) be placed directly into the working plane. For projection of the light at distances exceeding the distance of the working plane, the addition of an external lens is recommended. Using the working plane with an aperture as the source for a larger transfer lens can provide a uniform well-defined beam for illumination of a distant object.

Lens-End & Special Lamps are designed and constructed for those critical optical applications, which require a miniature light source with high quality glass envelopes and precisely positioned compact tungsten filaments. Preferred filaments for Technical Lamps are of C-6 construction. These filaments are designed to operate at low voltage and high current providing for rugged construction, miniature size and high light output. Many of the subminiature lamps are equipped with sturdy coiled, coil CC-6 filaments. Each filament is carefully positioned and secured to the electrodes.

Typical parameters for lamps in this section are 2.5-12.0 volts and 0.020-1.0 amps. Color temperatures range between 2,200° Kelvin for long life lamps and 3,000° Kelvin for shorter life lamps. Rated life in hours of 30,000 is common.

Fabrication of these lamps occurs in atmospherically controlled environments, incorporating rigid production control. Inspection of each unit to stringent quality control standards is mandatory. The end results being quality glass bulbs free of contamination, filaments of consistent shape, and quality bases manufactured to extremely close tolerances.

These stringent manufacturing processes, quality glass, and compact filaments allow for the addition of an optical lens placed directly onto the lamp. This lens increases light output up to 10 times compared to an equivalent lamp without lens. This phenomenon makes possible a reduction in operational voltage of the lamp resulting in prolonged lamp life.

Lens-End & Special Lamps can be vacuum or, more commonly, filled with a gas such as argon, krypton, or a halogen mixture. Vacuum lamps have a lower surface temperature than gas filled lamps. Maximum current rating for vacuum lamps is approximating 400 milliamps. Gas-filled lamps minimize tungsten filament evaporation and make possible the unique combination of high brightness, high color temperature and long life in a miniature lamp size. Current draw of gas filled lamps exceeds 400 milliamps.

The ¼ inch diameter smooth side based lamps and the ½-20 threaded base lamps provide an optical axis aligned to the mechanical axis of the base within a tolerance of ±3°. These lamps also

Figure 1: 1/4″ Diameter Lamps
Mounting, Working Plane & Typical Working Plane Pattern
(mounting set screw to contact back 1/3 of lamp only)

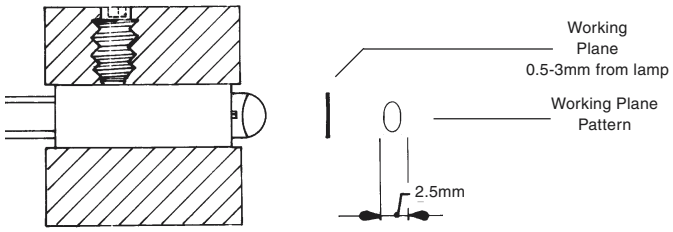
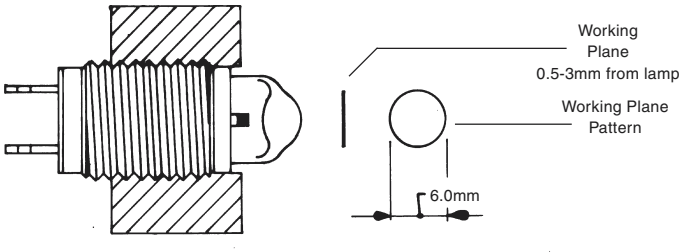


Figure 2: 1/2" & 3/8" Diameter Lamps
Mounting, Working Plane & Typical Working Plane Pattern



allow for axial adjustment necessary to optimize light distribution and light pattern. Please see Figures 1 and 2 for recommended mounting details.

Mounting these lamps must be done carefully to ensure the sleeve is not distorted which can cause premature lamp failure. The smooth sided sleeve lamps are typically mounted in a bored hole of matching diameter and held in place by the use of a set screw on the rear portion of the lamp. It is recommended that the setscrew only contact the rear one third of the sleeve and that the torque be limited to prevent distortion of the sleeve. Any sign of indentation on the sleeve indicates excessive pressure from the setscrew.

In this section of the catalog, light output is expressed in terms of total luminous flux (in units of Lumens) or mean spherical candle power (M.S.C.P.), or illuminance at a given distance (in units of lux or footcandles).

Lumens = M.S.C.P. x 4 x 3.14(p)
where M.S.C.P. is in lumens per steradian

Lux = 0.0929 foot-candles
where lux is defined as lumens per square meter and foot-candles as lumens per square foot