

The image shows several UV-C lamps and quartz sleeves. One lamp is shown horizontally at the top left, with its electrical base. Below it, several quartz sleeves of different lengths and diameters are arranged in a cluster, some overlapping. The background is a solid blue color with a faint circular pattern.

UV-C - Lamps & Quartz Sleeves  
for Surface Disinfection  
& Water Purification

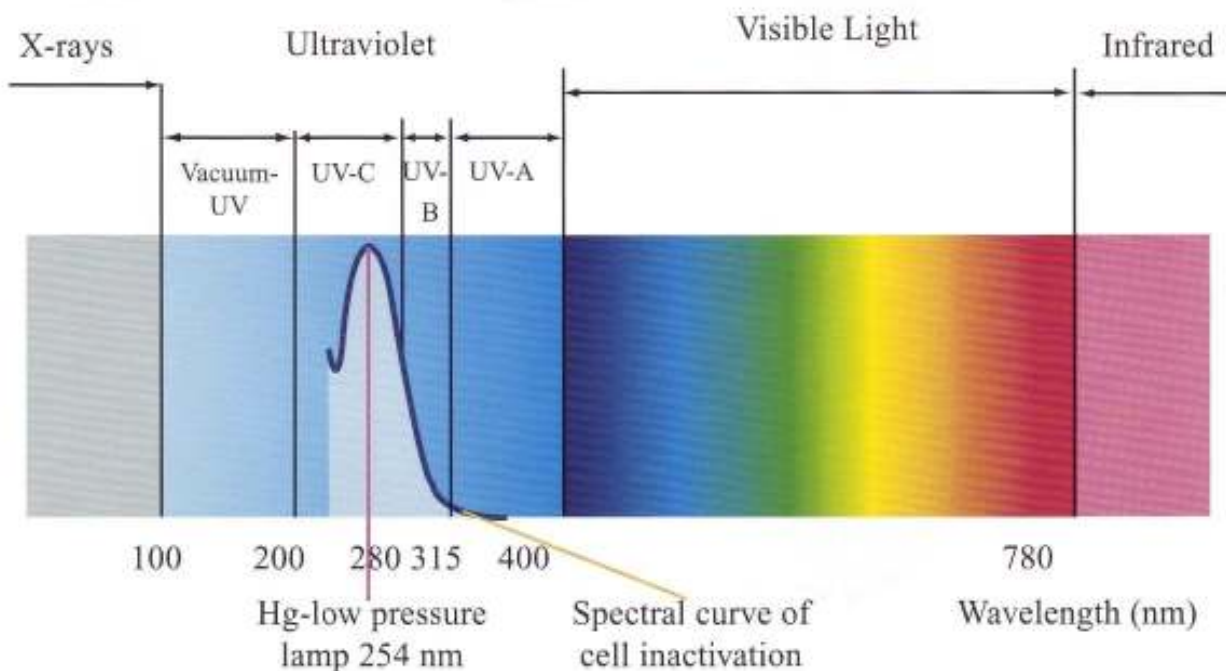
## Low Pressure UV-C (Ultraviolet) Germicidal Lamps

Low pressure UV germicidal lamp is a kind of short wave low pressure mercury vapor discharge lamp. The excited atom of mercury vapor emits short waves of ultraviolet light under the low pressure in the sealed glass tube.

Germicidal lamps should not be confounded with fluorescent lamps for while transmit small amount of ultraviolet, the coated phosphor powder inside the glass tube converts the ultraviolet into visible light to illuminate the lamp, while germicidal lamps can not be confounded with sun tanning lamps or black either, for while these are also ultraviolet lamps, the ultraviolet produced is of longer wavelength and is not useful for germicidal purpose. Germicidal lamps emit short wave ultraviolet that is lethal to microorganism.

### UV-C Action:

It has been many years since it first became necessary to disinfect water and air. At first people choose chemical methods to disinfect water, chlorine in particular. However, scientific research shows that these processes have bad effect on health and environment. Chlorine has reaction with the substances in the water and from residues and by products, which do damage to the environment and health. Furthermore, some pathogens have already developed resistance to chlorine, calling into the question the success of the disinfection process.



Today, after many years of research, it has been discovered that the most effective alternative process available to us is the disinfection of water and air using ultraviolet light. UV ray is light with very high energy level and a wavelength of 200-400nm. One of the most effective wavelengths for disinfection is that of 254nm. Over 90% of total UV radiation energy is at 254nm. Wavelength of 200-280nm is named UV-C. So disinfection using 254nm wavelength is called UVC disinfection. 254nm radiation destroys microorganisms by changing their genetic information or DNA.

### Ozone Action:

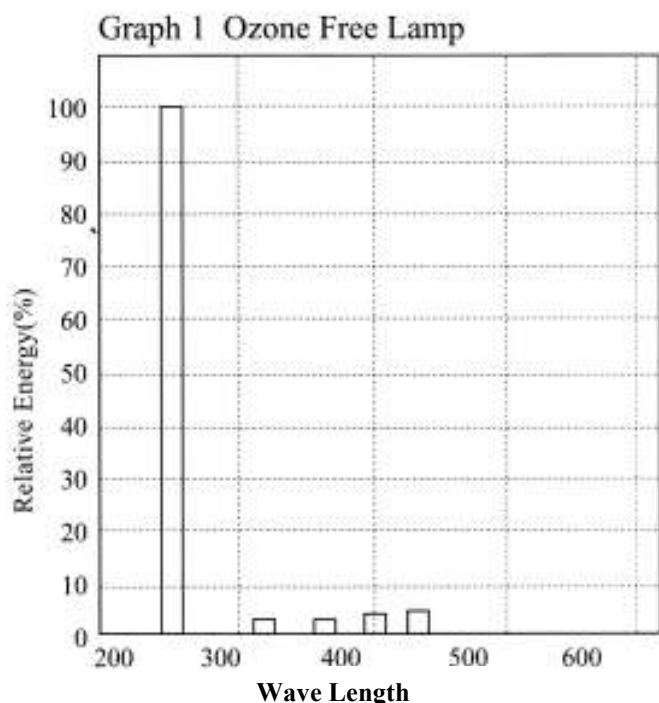
The deep UV radiation at 185nm wavelength produces abundant amounts of ozone in air. Ozone is an extremely active oxidizer and destroys microorganisms on contact. Ozone also acts as a deodorizer. One of Ozone's advantages is that it can be carried by air into places that the UV radiation cannot reach directly. Ozone in conjunction with hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) produces highly energetic particles called hydroxyl radical (OH). The radical oxidation is much more effective than direct oxidation with ozone. This radical oxidation technology is called Advance Oxidation Process (AOP) or Advanced Oxidation Treatment (AOT).

### Type & Specification:

#### Ozone Free UV Germicidal Lamps:

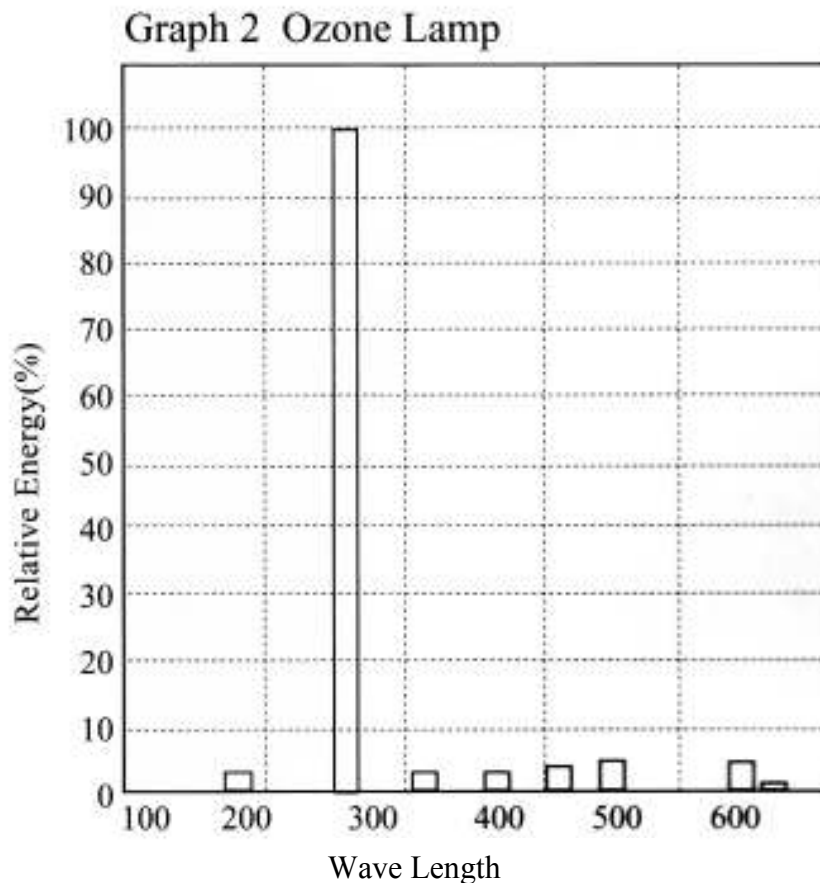
Quarld® L (low) germicidal lamps use ozone free fused quartz which cuts off 185nm ozone-producing line and emits 254nm line only.

L-type germicidal lamp is used to disinfect air, water and surface where ozone production is not desired, such as UV water purifier used at home. Please see graph 1 for the spectral energy distribution of ozone free UV lamps.



**Ozone Producing UV-C Germicidal Lamps:**

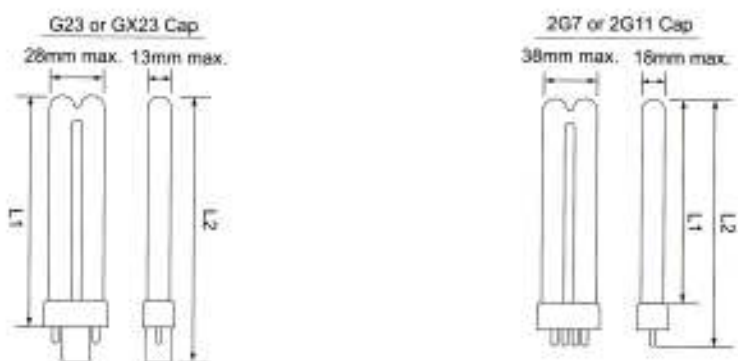
Quarld® VH (very high) germicidal lamps use high purity fused quartz which emits both 185nm ozone-producing line and 254nm germicidal line. VH lamps produce ozone to oxidize hydrocarbons to get TOC (total organic carbon) reduction water used by industries such as semiconductor industry, where super-purified water is necessary. VH lamps are also used to treat soil and groundwater contaminated with petroleum hydrocarbons, metals, VOCS, TNT in Advanced Oxidation Process (AOP) and Advanced Oxidation Treatment (AOT). Please see graph 2 for the spectral energy distribution of ozone producing UV lamps.



**Low Pressure Compact Germicidal Lamps:**

The design of “H” shaped and “U” shaped germicidal lamps is primarily employed in application where more intense UV radiation is needed in a limited space. So it is compact. “H”-shape and “U”-shape are also instant start lamps.

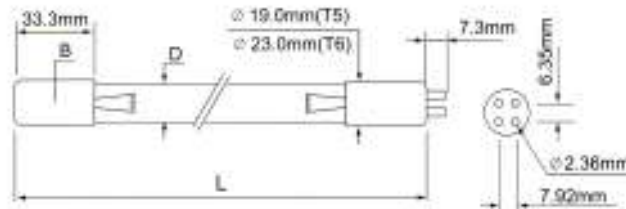
| Lamp Model  | Lamp Watts | Dimension (mm)    |                   | Cap (B) | Lamp Voltage V@50 Hz | Lamp Current mA | UV Output |                        | Useful Lifetime Hour |
|-------------|------------|-------------------|-------------------|---------|----------------------|-----------------|-----------|------------------------|----------------------|
|             |            | (L <sub>1</sub> ) | (L <sub>2</sub> ) |         |                      |                 | Watts W   | @1m mW/cm <sup>2</sup> |                      |
| Ozone Free  | W          | (L <sub>1</sub> ) | (L <sub>2</sub> ) | (B)     | V@50 Hz              | mA              | Watts W   | @1m mW/cm <sup>2</sup> | Hour                 |
| G5L/H/G23   | 5          | 85                | 105               | G23     | 35                   | 180             | 1,2       | 12                     | 6000                 |
| G7L/H/G23   | 7          | 115               | 135               | G23     | 45                   | 180             | 1,9       | 20                     | 8000                 |
| G9L/H/G23   | 9          | 145               | 165               | G23     | 60                   | 180             | 2,4       | 23                     | 8000                 |
| G11L/H/G23  | 11         | 215               | 235               | G23     | 90                   | 155             | 3,0       | 30                     | 8000                 |
| G18L/H/2G11 | 18         | 195               | 225               | 2G11    | 58                   | 375             | 5,5       | 60                     | 8000                 |
| G24L/H/2G11 | 24         | 290               | 320               | 2G11    | 87                   | 345             | 8,5       | 90                     | 8000                 |
| G36L/H/2G11 | 36         | 385               | 415               | 2G11    | 87                   | 435             | 12,0      | 120                    | 8000                 |
| G55L/H/2G11 | 55         | 503               | 533               | 2G11    | 105                  | 540             | 17        | 170                    | 8000                 |



**Single Ended 4 Pin Linear Germicidal Lamps:**

Quarld preheat germicidal lamps are operated by a preheat-start circuit that employs a relatively compact and economical ballast. The preheat circuit requires for electrical connections per lamp and a slight to moderate delay is needed to start the lamp.

| Lamp Model  | Lamp Watts | Dimension (mm) |     | Cap (B) | Lamp Voltage V@50 Hz | Lamp Current mA | UV Output |                        | Useful Lifetime Hour |
|-------------|------------|----------------|-----|---------|----------------------|-----------------|-----------|------------------------|----------------------|
|             |            | (L)            | (D) |         |                      |                 | Watts W   | @1m mW/cm <sup>2</sup> |                      |
| Ozone Free  | W          | (L)            | (D) | (B)     | V@50 Hz              | mA              | Watts W   | @1m mW/cm <sup>2</sup> | Hour                 |
| G10T5L/SE4P | 10         | 215            | 15  | 4 Pin   | 39                   | 420             | 2,9       | 23                     | 6000                 |
| G15T5L/SE4P | 15         | 303            | 15  | 4 Pin   | 40                   | 420             | 4,0       | 37                     | 8000                 |
| G23T5L/SE4P | 23         | 436            | 15  | 4 Pin   | 65                   | 420             | 6,9       | 68                     | 8000                 |
| G37T5L/SE4P | 37         | 793            | 15  | 4 Pin   | 105                  | 420             | 12,9      | 130                    | 8000                 |
| G55T5L/SE4P | 55         | 1149           | 15  | 4 Pin   | 150                  | 420             | 16,0      | 150                    | 8000                 |
| G75T5L/SE4P | 75         | 1550           | 15  | 4 Pin   | 210                  | 420             | 21,0      | 180                    | 8000                 |



## Quartz Sleeve for UV-C Disinfection and Ozone Producing

### 1. Description & Application:

EN09 is mechanically drawn electrically fused clear quartz glass tube. It uses natural quartz as raw material with averaged  $\text{SiO}_2$  99,95%. Due to its slightly lower purity than that of EN08, EN09 has lower transmission in deep UV-C range such as ozone forming line 185nm, so EN09 can not be used as ozone producing application. But EN09 still has a good transmission in UV-C range of 200-280nm wavelengths such as at UV disinfection line 254nm. So this item is a good material in UV-C disinfection application such as employed as sleeve of low pressure ozone free UV-C lamps. EN09 UB with  $\text{OH} \leq 150\text{ppm}$  can be used as sleeve of low pressure ozone free UV-C lamps.

### Chemical Composition and Hydroxyl (OH)

|        | Al | Li  | K   | Na  | Ca  | Fe  | Ti  | Mg  | Cu  | B   | OH         | $\text{SiO}_2$ |
|--------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------|----------------|
| EN09UB | 18 | 0,6 | 2,0 | 2,3 | 1,8 | 1,8 | 4,6 | 0,4 | 0,3 | 0,5 | $\leq 150$ | $\geq 99,95\%$ |

### Transmission (tube wall 1,5mm)

| nm | 185  | 200  | 220  | 245  | 254  | 320  | 340  | 500  | 800  |
|----|------|------|------|------|------|------|------|------|------|
| %  | 43,5 | 45,0 | 74,3 | 89,0 | 89,7 | 92,3 | 92,4 | 92,4 | 92,4 |

### 2. Quartz Sleeve for both Ozone Free UV-C Lamps and Ozone Producing UV Lamps EN08:

EN08 is mechanically drawn electrically fused clear quartz glass tube. It uses natural crystal quality quartz as raw material with averaged  $\text{SiO}_2 \geq 99,98\%$ . Due to this high purity, EN08 has an excellent transmission in both, deep UV range of 100-200nm wavelength and UV-C range of 200-280nm wavelengths. By vacuum annealing, the OH of EN08 can be lowered below 1ppm. This item is a good material in ozone producing and UV-C disinfection field.

| Type   | OH               | Application   |
|--------|------------------|---|
| EN08UB | OH $\leq$ 150ppm | Sleeve of low pressure ozone free UV-C Lamps and low pressure ozone producing UV lamps.       |
| EN08SB | OH $\leq$ 1ppm   | Sleeve of medium pressure ozone free UV-C lamps and medium pressure ozone producing UV lamps. |

### Chemical Composition

|      | Al | Li  | K   | Na  | Ca  | Fe  | Ti  | Mg  | Cu  | B   | SiO <sub>2</sub> |
|------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|
| EN08 | 18 | 0,6 | 0,6 | 0,8 | 0,5 | 0,3 | 0,1 | 0,5 | 0,1 | 0,5 | $\geq$ 99,98%    |

### Transmission

| nm | 185  | 200  | 220  | 245  | 254  | 320  | 340  | 500  | 800  |
|----|------|------|------|------|------|------|------|------|------|
| %  | 64,8 | 67,5 | 84,3 | 89,8 | 90,4 | 92,3 | 92,4 | 92,5 | 92,5 |

