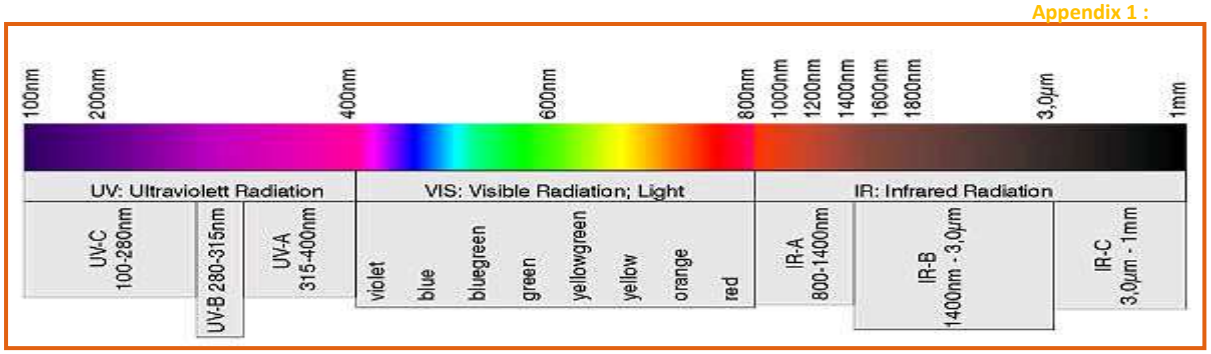
# 1°- INFRARED HALOGEN HEATER EMITTERS- INFRARED RADIATION

## 1.1°- ELETROMAGNETIC SPECTRUM

Light can be defined as an electromagnetic wave within the range of 100nm to 100 000nm (1mm). The spectrum's limits are as follows:

- Visible light, 380 – 780 nm
- Near infrared **NIR**, 780 –1400 nm
- Short wavelength (shortwave) IR **SWIR**, 1400 – 3000 nm
- Mid wavelength IR **MWIR**, also intermediate-IR (IIR), 3000 – 8000 nm
- Long wavelength IR **LWIR** , 8000 – 15000 nm
- Far infrared **FIR**, 15000 – 100 000 nm

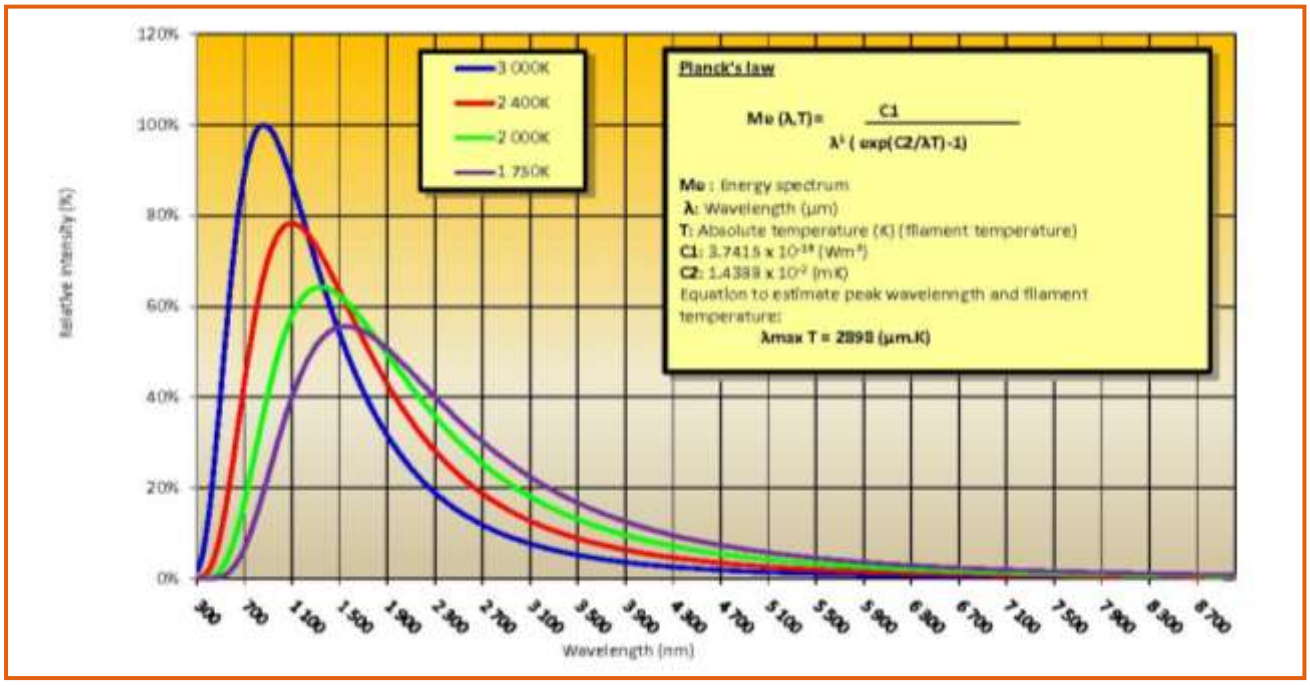
Appendix 1 :




## 1.2°- EMISSION CURVE OF INFRARED HALOGEN HEATER EMITTERS

Higher filament temperature will increase the ratio of visible light and decreasing infrared amount. Light produced with a higher temperature filament has more bluish spectrum, which gives a more white light to human eyes**.**

Appendix2 :

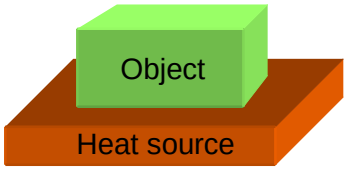


## 2°- INFRARED HALOGEN HEATER EMITTERS- HEAT TRANSFERT

The heat transfer is achieved by 3 different methods: **Conduction, Convection and Radiation.**

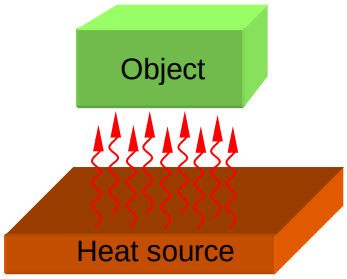
### 2.1°- CONDUCTION

Occurs when an object is placed in direct contact to a heat source in which the heat is transferred from the source the object (as a pan on a hot stove…).



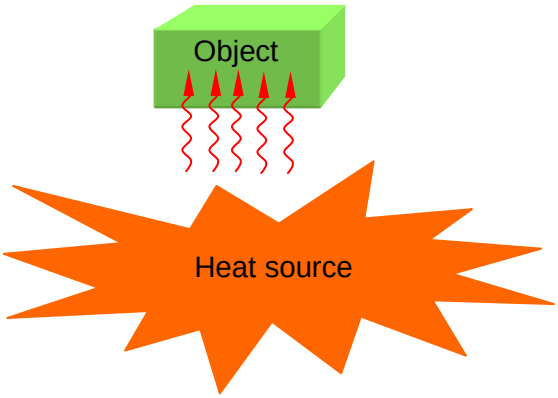

### 2.2°- CONVECTION

Occurs when a heat source transfers heat to the surrounding atmosphere which in turn, transfers heat to the object (as hair dryer, conventional oven…).




### 2.3°- RADIATION

Occurs when a heat source emits infrared electromagnetic waves which when striking and absorbed by an object. This is the heating way of **Infrared Halogen Heater Emitter**, microwave oven and also the sun.




## 3°- INFRARED HALOGEN HEATER EMITTERS- TECHNOLOGY

### 3.1°- GENERAL DESCRIPTION

Infrared Halogen Heater Emitter is a kind of conventional incandescent Emitter designed with appropriated filament temperature (Color Temperature Tc) to get better efficiency to the object to heat and filled with halogen gas. Heating with Infrared Halogen Heater Emitter is natural, simple and without any contact with the object to heat.

### 3.2°- HIGH EFFICIENCY

Due to the Emitter envelope in quartz glass material and the pure tungsten of the filament, large amounts of energy can be transferred in a short time, controlled quickly and precisely. The energy (radiation) penetrates into the object being heated and doesn't just act on the surface.

### 3.3°- LONG LIFE

The “Halogen cycle” (a chemical reaction whereby evaporated tungsten particles are returned to the filament) delays the filament tungsten consumption and guarantees extremely long Emitter life.

### 3.4°- ECOLOGICAL & ECONOMY

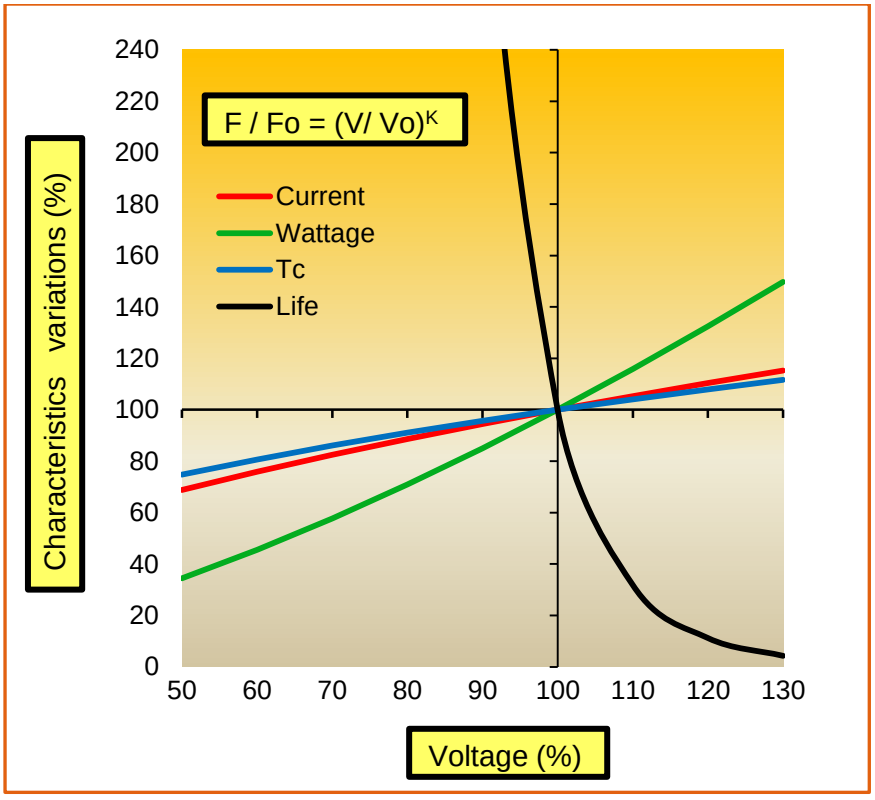
Infrared Halogen Heater Emitters are ecological heating source because there is no emission formation, no oxygen consumption, no air pollution and no odor.
As it is very easy to control the power output and as the warm up time is short (0.5 to 1sec.), it is possible to switch off Emitters to save energy.

## 4°- INFRARED HALOGEN HEATER EMITTERS- TECHNICAL INFORMATION

### 4.1°- EMITTER VOLTAGE vs. OTHER CHARACTERISTICS

Important characteristics of infrared halogen heater Emitter can be estimated quickly with the equation as shown below:

| F | Current | Wattage | Tc |
|---|---|---|---|
| K | 0.54 | 1.54 | 0.42 |

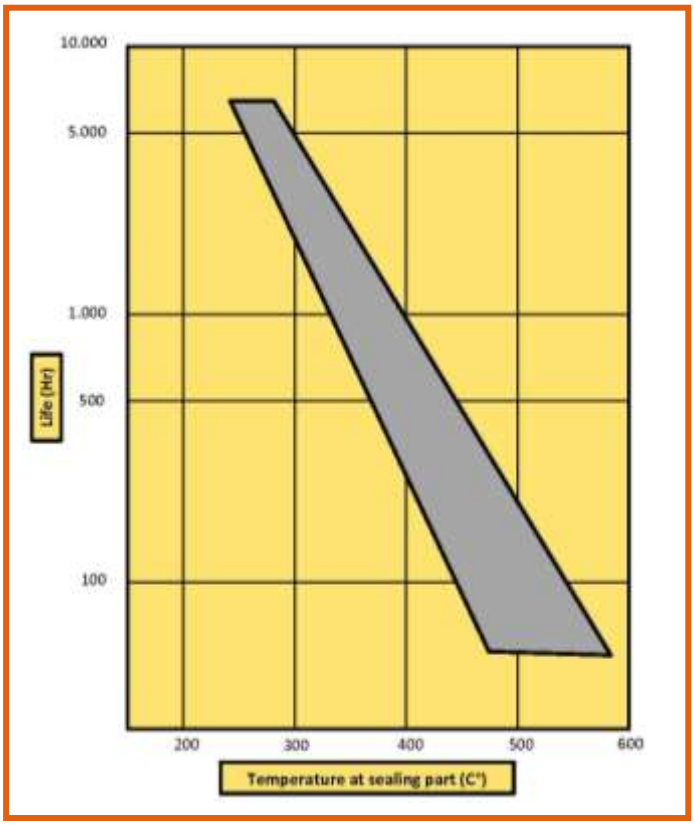


The life of halogen heater Emitters is directly link to the filament temperature and to rated voltage. Of course, the rated voltage can be adjusted but the halogen heater Emitters are made with an amount of halogen gas appropriate to the specific designed filament temperature (nominal voltage). So operating Emitter at higher than nominal voltage causes a blackening on inner wall of glass tube by excess tungsten vapor. Paradoxically operating Emitter at a lower than nominal voltage leads to insufficient temperature of optimum value for filament and excess gas may damage the filament.

Such operations may therefore result to shorten Emitter life.

### 4.2°- SEALING TEMPERATURE vs. SEALING LIFE

Temperature at the Emitter seal must be kept lower 350°C, because a molybdenum foil is used at the seal however, the is not completely air tight. There is a small gap between the quartz seal and outer lead which enters through the quartz. Through this gap, very small quantities of air can be introduced into the seal area. Molybdenum easily oxidizes when temperature rise above 350°C. Measurement of the temperature at the seal can be made by using a thermocouple.



## 4.3°- MAXIMUM ACCEPTABLE TEMPERATURE FOR INFRARED HALOGEN HEATER EMITTERS