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# Frequently Asked Questions
# Intex IR Sources

### What is the principle of radiation in your emitters?
In Intex emitters, a thin conductive film is heated by the electric current. The spectrum is that of thermal radiation with an emissivity of approximately 0.8.

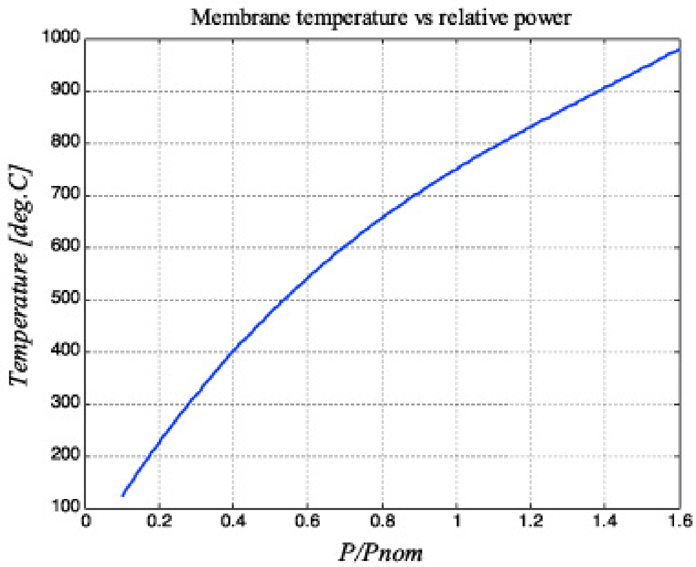
### What are the main advantages of such sources?
Intex emitters radiate a wide spectrum and have a relatively small response time. They can be used as a source of pulsed radiation up to 100 Hz without a mechanical modulator.

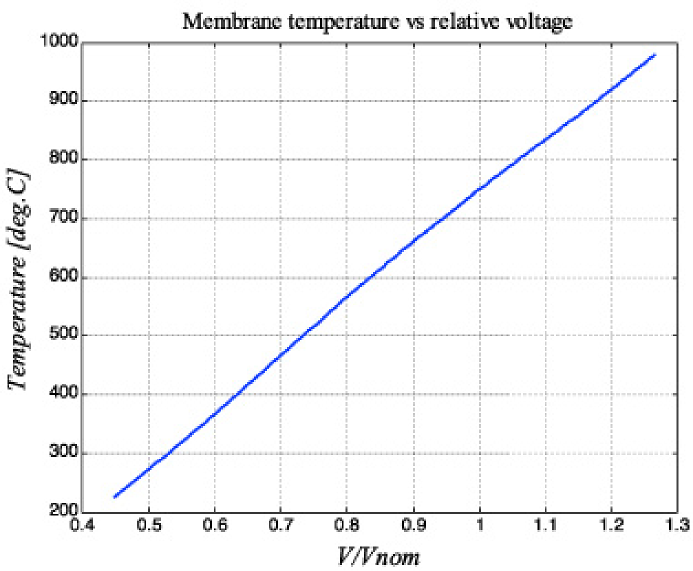
### What forms of voltage may be used?
There are no restrictions on the waveforms and polarities of applied voltage.

### What is the maximum temperature of the radiator?
The emitter survives short excursions up to 900°C. But we recommend 750°C and guarantee an emitter life of 5000 hours with rectangular voltage pulses and a duty cycle of 50%.

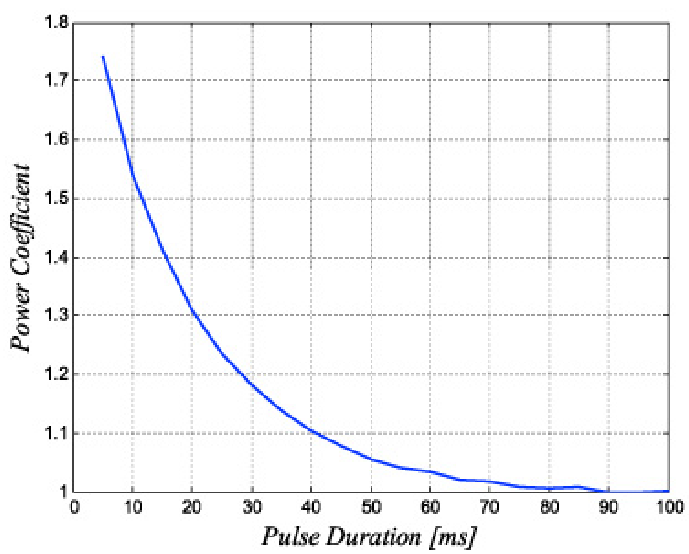
### How can I know the maximum temperature for another voltage waveform or another temperature?
For rectangular pulses (*t > 50 ms*), the emitters reach a stable temperature. For this case, nominal parameters are indicated in the specification. If another temperature is desired, it can be estimated from the graphs below. *P/Pnom* is the ratio of pulse power to nominal power. *V/Vnom* is the ratio of pulse voltage to nominal voltage.

For example, for a lifetime of 20,000 hours at 800°C, a 5% duty cycle is recommended. The pulse duration will be small, requiring a much larger power coefficient - 1.7, 2.2, 2.7 and 3.3, for frequencies of 2, 3, 4 and 5 Hz, respectively at a 5% duty cycle. These are calculated values however and have not been actually tested.



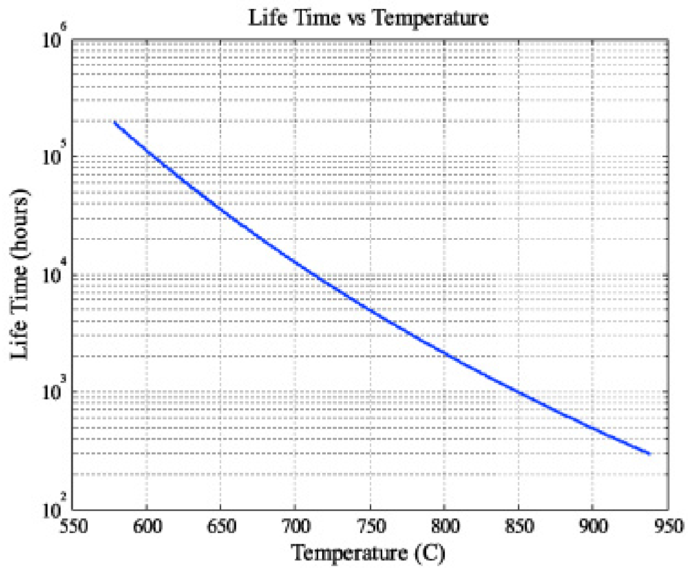

For short pulses and duty cycle 50% you can evaluate power coefficient from the graph and correct power.




For voltage pulses where t < 50 ms, you can adjust the voltage and power experimentally. For this, you must use a fast-response (0.5 ms or less) detector to measure the emitter temperature. Perform the initial calibration of your detector with nominal-voltage pulses. The measured amplitude of the output signal corresponds to a temperature of 750°C. Power the emitter with the required form and frequency and adjust voltage to give the same amplitude signal as during calibration. The required voltage for another temperature can then be estimated from these same graphs.

**What is the main parameter to adjust the power source; nominal voltage or nominal current?**
You may use both nominal voltage and nominal current, but the best way is to adjust the overall nominal power. Emitter temperature and radiation are dependent on the power.

**What is the dependence of emitter lifetime on temperature and duty cycle?**
Emitter lifetime is proportional to temperature, and inversely proportional to duty cycle. For other-than-nominal temperatures, the lifetime may be estimated from the graph below. For another duty cycle, you may correct the lifetime by the factor = (50%/duty cycle). Exceeding 750°C for more than a few seconds is not recommended, as this may destroy the emitter.




**Can Intex emitters operate in vacuum?**
Yes. But the nominal parameters in vacuum will be changed. The emitter temperature results from the balance between input power and energy dissipation. Approximately 60% of the heat energy is dissipated in air, about 30% to the silicon frame and only about 10% is radiated. Operation in vacuum cuts power consumption by more than 2X, however the response time will increase proportionally as well.

**You mention response time. Is it a time constant for heating or cooling? How is it measured?**
We use an InSb detector (response time = 0.1 ms) for IR radiation (λ ~ 3 μ). The emitter is given 100ms rectangular voltage pulses with nominal power. The time for the signal to achieve half of its maximum amplitude is the response time. The response times are approximately the same for both heating and cooling.

**Does the radiation depend on ambient temperature?**
The radiation depends on the temperature of the emitter. For a given input power, changes of ambient temperature cause the same change in emitter temperature. The result can be estimated, as radiation is proportional to $T^4$. For example, an increase of 10°C in ambient temperature increases the radiation by about 4%. For stable radiation, the emitter temperature must be stable.

**What must the temperature of header be for its normal operation?**
Nominal parameters are specified for emitters without a heat sink at a standard ambient temperature of 60°C. The temperature can be stabilized however up to 100°C. You can estimate the correction of the input power as follows: every 10°C increase in case temperature allows for lowering of input power by 2.3%.

**Must the emitters be visually inspected and cleaned prior to installation? If yes, what is the recommended cleaning procedure?**
It is not recommended to clean emitters before use as they are fragile.