



## Infrared Heat.....for the Technically Challenged

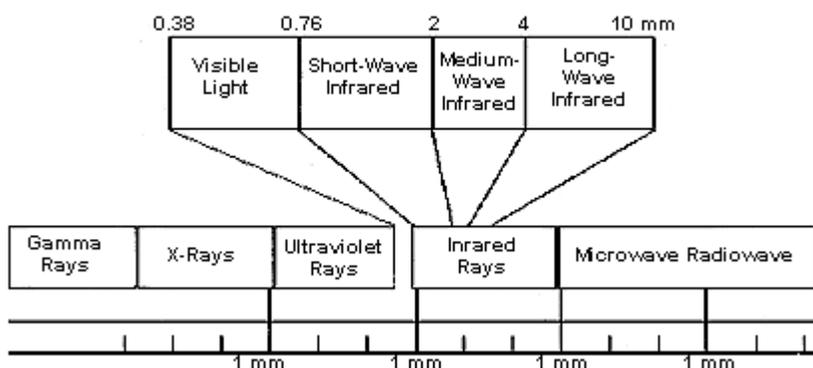
By Deitz Kracker

I think that “Technically Challenged” sounds a lot better than “Dummies”, though I will be the first to admit that that is the category I fall into when it comes to understanding the basics of thermodynamics. I wrote in my “Mind Over Matter” article last month that one of the first steps necessary in educating yourself was to make sure you have a complete understanding of Infrared Energy. I decided that I could use some of that understanding myself so, here is my understanding of Infrared Heat, in the words of a Thermodynamic Dummy.

Everyone learns, or should have learned, from the fourth grade science book, that there are three properties of heat transfer: conduction, convection, and radiation. Conduction is heat moving from one solid surface to another, such as a pan heating up on a metal stove burner. Convection is heat moving through a gas or fluid caused by the fact that heated gas or fluid rises and as it does, it displaces cold gas or fluid, which in turn pushes the warm gas or fluid, and so on and so on. Radiation can be compared to the sun’s energy which “radiates” or is emitted in waves. Whether it is the sun, a calrod, quartz tube, or ceramic element, if the heat comes from them in waves, then it is being “radiated”.

Radiation is the transfer of energy by waves. These waves are measured on a scale called the electromagnetic spectrum. (Move on to the sixth grade science book.) On one end of this spectrum is ultra-violet light (the sun), then visible light, which we receive as “waves”, there are also radio “waves”, micro “waves”, radar “waves” and x-rays, but towards the middle and the opposite end of the spectrum we find Infrared waves, both “near” and “far” infrared depending on the frequency of the waves. “Far” infrared is usually considered to be “long” wave, while “near” is referred to as “short”. The difference is that short wave would be more intense and penetrate better. How these are absorbed makes the decision on which to use.

### The Electromagnetic Spectrum



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All radiant energy that is emitted can be either absorbed, reflected, or passed through, as with glass. It is these properties that allow us to use them for heating purposes. Let’s look at emission first. **Emission** means to send off and as I mentioned above, when energy is transferred without physical contact, it is radiated. So, many substances can emit infrared energy, but some emit it better than others. A substance that emits 100% of its infrared energy is said to be a *black body*, the perfect emitter. As with most “perfect” things, it doesn’t exist. It’s just the “10” all emitters are measured by. Think of all of the substances heaters are made out of,

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metal, glass, and ceramic. If any heater glows, or emits light as part of its energy, it is farther away from a perfect *black body*. Ceramic emitters are the only heaters that do not emit light with its energy, that's one of the reasons we claim it to be 96% infrared energy efficient.

**Absorption** is next in importance. Infrared energy does not become heat until it is absorbed by something. What that something is depends on how much heat is absorbed. The same energy is emitted, but the absorption rates of substances varies greatly. The quantity of energy a substance is able to absorb is called its **emissivity** and is measured on a scale of 1-10. Infrared energy should only be used on substances that have a good absorption rate. To boil water, for example, would be very difficult and take a long time using Infrared energy. The conductive method of heat transfer works must faster. When considering using infrared energy on a product or process, the absorption rate must be considered. Tables on emissivity are available for easy reference that list the specific heat of many substances. You can find one on our web page at:

[www.InfraredHeaters.com/page13.htm](http://www.InfraredHeaters.com/page13.htm)

The opposite of absorption is **reflection**. Again, some substances are naturally more reflective than others thereby giving off the heat it has just received rather than keeping it. Those substances that are more reflective are going to be more difficult to heat than those that absorb the energy and keep it.

Now that you know the basics of how things can be heated, you need to use this knowledge to help you select which type of heat transfer, or combination, should be used. Then determine which type of heaters of that transfer type would work best. Practice. Make a list of every process and product you see, identifying the type of heat transfer, heaters being used and the emissivity factor of each products. This will soon become a habit and much of the information committed to memory. This makes it easier to specify new heating applications and evaluate retrofits. Though you may still be "technically challenged" by engineering standards, you have an "elementary" and usable understanding of thermodynamics.

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- Wire guard extends along the entire outlet area of the baseboard.
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- Residential models in "White" powder coat finish, Commercial models in "Bankers Bronze" Brown
- Powder coated 12-gauge heavy duty aluminum housing with junction boxes located on each end of the unit.
- Liquid filled heating elements. Heat transferring liquid in a copper tube casing with aluminum fins.
- Commercial Brown unit has built-in wireway cover running the entire length of the unit.
- In built thermostat kits, optional relays, disconnect switch and additional accessories are available.

# Vendor Spotlight

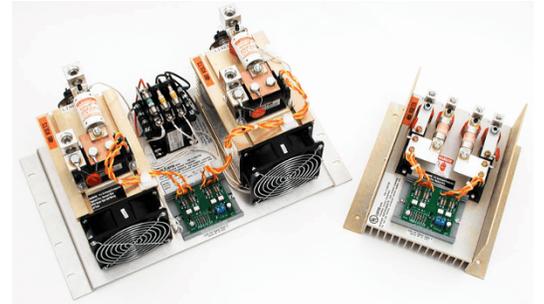
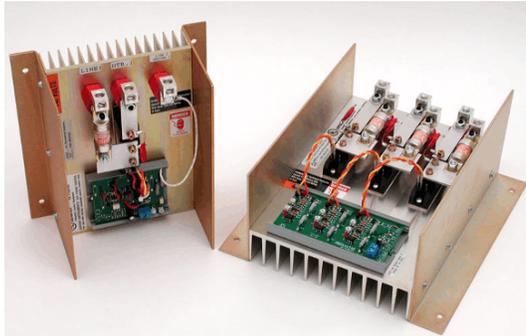
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- 24 - 600 volt
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[CZ SSR Power Controllers](#) - Zero Voltage switched power controllers

[C1P SCR Power Controllers](#) Linear Phase Angle proportional control, Up to 300% better than “light dimmers” , 20-60 Amp, 120V to 480V units

[TSS SCR Power Controllers](#) - 2 wire, solid state temperature control

[A1P SCR Power Controllers](#) - Phase angle proportional control.

[D Series SCR Power Controllers](#) Manually controlled, Works on 120V to 480V lines, 20 to 60 Amp, 1 to 98% power output resolution, potentiometer

[R1 SCR Power Controllers](#) - ON-OFF contactors

[2CP-8CP SCR Power Controllers](#) Multi-Zone Phase Angle Fired or zero voltage switched, 2 to 8 zone packages, 10-100 Ampere Output up to 480 Volts

[MAP, MTP, MAI and MITP](#) mA Output & Interface Potentiometer Control SCR & SSR Drives

Heater Type	Heater Characteristics	Control Type	Typical Applications
Constant Resistance Elements. Immersion heaters.	Slow Response	On/Off Zero Voltage Switched	Large tank heating and mechanical relay replacement.
Medium wave infrared, ceramic, cartridge, duct, strip, and band heaters. Platens.	Faster response, Constant resistance heaters only.	Zero Voltage Switched	Thermoforming, textiles, ind. furnaces & ovens, extruders, kilns, chemical process heat-
Open coil/wire heaters. Medium wave IR quartz. IR panels.	Fastest, most precise response.	Phase Angle Fired	Paper & pulp drying, packaging machines, pharmaceutical, infrared ovens & dryers.
Silicon Carbide heaters. Graphite heaters.	Load changes in resistance with age. High temperature elements.	Phase Angle Fired with Current Limit Option	High temperature ovens and furnaces, glass, ceramics and high temperature alloys.
Tungsten (T-3) lamps and heaters. Short wave IR elements. Molybdenum heaters.	High inrush currents. High hot: cold resistance ration.	Phase Angle Fired with Soft Start option	High speed paper & ink dryers, high temp. IR, high temp. materials processing.

For more information on these products: [www.HeatersPlus.com/avatar.htm](http://www.HeatersPlus.com/avatar.htm)

## What are the office cats Midnight and Sydney up to this month?



Salesman Val Katelniaks has a heavy workload. I guess Syd and Mid didn't read the bumper sticker on his bulletin board.

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