



# Technical Information Data Bulletin

## Metals - Typical Emissivity Values

TEMPERATURE & PROCESS INSTRUMENTS - INC

	1.0 micron	1.6 micron	5.1 micron	8-14 microns
<b>Aluminum</b>				
Non-Oxidized	0.1-0.2	0.02-0.2	0.02-0.2	0.02-0.1
Oxidized	0.4	0.4	0.2-0.4	0.2-0.4
<b>Alloy A 3003</b>				
Oxidized	NA	0.4	0.4	0.3
Roughened	0.2-0.8	0.2-0.6	0.1-0.4	0.1-0.3
Polished	0.1-0.2	0.02-0.1	0.02-0.1	0.02-0.1
<b>Brass</b>				
Polished	0.8-0.95	0.01-0.05	0.01-0.05	0.01-0.05
Burnished	NA	NA	0.3	0.3
Oxidized	0.6	0.6	0.5	0.5
<b>Carbon</b>				
Non-oxidized	0.8-0.95	0.8-0.9	0.8-0.9	0.8-0.9
Graphite	0.8-0.9	0.8-0.9	0.7-0.9	0.7-0.8
<b>Chromium</b>	0.4	0.4	0.03-0.3	0.02-0.2
<b>Copper</b>				
Polished	0.05	0.03	0.03	0-0.3
Roughened	0.05-0.2	0.05-0.2	0.05-0.15	0.05-0.1
Oxidized	0.2-0.8	0.2-0.9	0.5-0.8	0.4-0.8
<b>Gold</b>	0.3	0.01-0.1	0.01-0.1	0.01-0.1
<b>Haynes Alloy</b>	NA	0.5-0.9	0.3-0.8	0.3-0.8
<b>Inconel</b>				
Oxidized	0.4-0.9	0.6-0.9	0.6-0.9	0.7-0.95
Sandblasted	0.3-0.4	0.3-0.6	0.3-0.6	0.3-0.6
Electro-polished	0.2-0.5	0.25	0.15	0.15
<b>Iron</b>				
Oxidized	0.4-0.8	0.5-0.9	0.6-0.9	0.5-0.9
Non-oxidized	0.35	0.1-0.3	0.05-0.25	0.05-0.2
Rusted	NA	0.6-0.9	0.5-0.8	0.5-0.7
Molten	0.35	0.4-0.6	NA	NA
<b>Iron Cast</b>				
Oxidized	0.7-0.9	0.7-0.9	0.65-0.95	0.6-0.95
Non-oxidized	0.35	0.3	0.25	0.2
Molten	0.35	0.3-0.4	0.2-0.3	0.2-0.3
<b>Iron Wrought Dull</b>	0.9	0.9	0.9	0.9
<b>Lead</b>				
Polished	0.35	0.05-0.2	0.05-0.2	0.05-0.1
Rough	0.65	0.6	0.4	0-4
Oxidized	NA	0.3-0.7	0.2-0.6	0.2-0.6
<b>Magnesium</b>	0.3-0.8	0.05-0.3	0.03-0.15	0.02-0.1
<b>Mercury</b>	NA	0.05-0.15	0.05-0.15	0.05-0.15
<b>Molybdenum</b>				
Oxidized	0.5-0.9	0.4-0.9	0.3-0.7	0.2-0.6
Non-oxidized	0.25-0.35	0.1-0.3	0.1-0.15	0.1
<b>Monel (Ni-Cu)</b>	0.3	0.2-0.6	0.1-0.5	0.1-0.14
<b>Nickel</b>				
Oxidized	0.8-0.9	0.4-0.7	0.3-0.6	0.2-0.5
Electrolytic	0.2-0.4	0.1-0.3	0.1-0.15	0.05-0.15
<b>Platinum</b>				
Black -	NA	0.95	0.9	0.9
<b>Silver</b>	0.04	0.02	0.02	0.02
<b>Steel</b>				
Cold-Rolled	0.8-0.9	0.8-0.9	0.8-0.9	0.7-0.9
Ground Sheet	NA	NA	0.5-0.7	0.4-0.6
Polished Sheet	0.35	0.25	0.15	0.1
Molten	0.35	0.25-0.4	0.1-0.2	NA
Oxidized	0.8-0.9	0.8-0.9	0.7-0.9	0.7-0.9
Stainless	0.35	0.2-0.9	0.15-0.8	0.1-0.8
<b>Tin (Non-oxidized)</b>	0.25	0.1-0.3	0.05	0.05
<b>Titanium</b>				
Polished	0.5-0.75	0.3-0.5	0.1-0.3	0.05-0.2
Oxidized	NA	0.6-0.8	0.5-0.7	0.5-0.6
<b>Tungsten</b>				
Polished	0.35-0.4	0.1-0.3	0.05-0.25	0.03-0.1
<b>Zinc</b>				
Oxidized	0.6	0.15	0.1	0.1
Polished	0.5	0.05	0.03	0.02



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## Non-metals - Typical Emissivity Values

TEMPERATURE & PROCESS INSTRUMENTS - INC

	1.0 micron	1.6 micron	5.1 micron	8-14 microns
Asbestos	0.9	0.9	0.95	0.95
Asphalt	NA	0.95	0.95	0.95
Basalt	NA	0.7	0.7	0.7
Carborundum	NA	0.9	0.9	0.9
Ceramic	0.4	0.8-0.95	0.95	0.95
Clay	NA	0.8-0.95	0.95	0.95
Concrete	0.65	0.9	0.95	0.95
Cloth	NA	0.95	0.95	0.95
Glass				
Plate	NA	0.98	0.85	0.85
"Gob"	NA	0.9	NA	NA
Gravel	NA	0.95	0.95	0.95
Gypsum	NA	0.4-0.97	0.8-0.95	0.8-0.95
Ice	NA	NA	0.98	0.98
Limestone	NA	0.4-0.98	0.98	0.98
Paint -	NA	NA	0.9-0.95	0.9-0.95
Paper(any color)	NA	0.95	0.95	0.95
Plastic (opaque				
Over 20 mils)	NA	0.95	0.95	0.95
Rubber	NA	0.9	0.9	0.95
Sand	NA	0.9	0.9	0.9
Snow	NA	0.9	0.9	0.9
Soil	NA	NA	0.9-0.98	0.9-0.98
Water	NA	NA	0.93	0.93
Wood, Natural	NA	0.9-0.95	0.9-0.95	0.9-0.95

To optimize surface temperature measurements consider the following guidelines:

1. Determine the object emissivity using the suitable instrument for measurement.
2. Avoid reflections by shielding the object from surrounding high temperature sources.
3. For higher temperature objects use shorter wavelength instruments, whenever any overlap occurs.
4. For semi-transparent materials such as plastic films and glasses, assure that the background is uniform and lower in temperature than the object.
5. Mount the sensor perpendicularly to the surface whenever the emissivity is less than 0.9. In any case, do not exceed angles more than 30 degrees from incidence.



### MicroRay PRO Series Compact Infrared Thermometers

- Optics 15:1 to 20:1
- Temperature Range -22 to 1112°F (-30 to 600°C)
- Three Models to Choose From

### MicroRay Xtreme Series Compact Infrared Thermometers

- Optics: 35:1 to 50:1
- Temperature Range -22 to 1832°F (-30 to 1000°C)
- Optional PC Interface & Graphing Interface w/ USB Cable
- Three Models to Choose From



### IRtec P Series Infrared Thermometers

- Six Models to Choose From
- Wide Temperature Range -30 to 2000°C (-20°F to 3630°F)
- Enhanced Optics up to 200:1
- Laser or Optional Telescoping Sighting
- Fast Response Time 300 ms
- Display Temperature in °C/°F or K
- Acoustic & visible alarm
- Auxiliary Thermocouple input
- 1 mV/° Analog output