

Typical Emissivity Values

These tables are for use with the **FTI 6** thermal imaging system. The values listed are based on an average emissivity at the temperature listed.

These values are intended to be used as a guideline only. For precise measurements it is recommended that the emissivity values for specific materials be determined to ensure that accuracy is maintained. Further information on determination of emissivity is available in Land Technical Note 209.

	Temperature		Emissivity
	°C	°F	
Alloys			
20% Ni, 25% Cr, 55% Fe, oxidised	200	392	0.90
	500	932	0.97
60% Ni, 12% Cr, 28% Fe, oxidised	270	518	0.89
	560	1040	0.82
80% Ni, 20% Cr, oxidised	100	212	0.87
	600	1112	0.87
	1300	2372	0.89
Alumina brick	17	63	0.68
Alumina			
Mean grain size 10µ	1010	1850	0.30
	1565	2850	0.18
Mean grain size 50µ	1010	1850	0.39
	1565	2850	0.28
Mean grain size 100µ	1010	1850	0.50
	1565	2850	0.40

	Temperature		Emissivity
	°C	°F	
Aluminium			
Aluminium (weathered)	17	63	0.89
Aluminium foil	27	80	0.89
Aluminium foil (bright)	-	-	0.04
Aluminium disc (roughened)	27	80	0.28
Unoxidised	25	77	0.02
	100	212	0.03
	500	932	0.06
Oxidised	200	390	0.11
	600	1110	0.19
Heavily oxidised	93	200	0.20
	504	940	0.31
Highly polished	100	212	0.05
Roughly polished	100	212	0.18
Commercial sheet	100	212	0.09
Highly polished plate	227	440	0.04
	577	1070	0.06
Bright rolled plate	170	338	0.04
	500	932	0.05
Alloy A3003, oxidized	316	600	0.04
	482	900	0.04
Alloy 1100-0	93	200	0.05
	427	800	0.05
Alloy 24ST	24	75	0.09
Alloy 24ST, polished	24	75	0.09
Alloy 75ST	24	75	0.11
Alloy 75ST, polished	24	75	0.08
Aluminium oxide	277	530	0.63
	499	930	0.42
	827	1520	0.26
Anodized sheet (chromic acid process)	100	212	0.55

	Temperature		Emissivity
	°C	°F	
Asbestos			
Board	38	100	0.96
Cement	0	32	0.96
	200	392	0.96
Cement (red)	1371	2500	0.67
Cement (white)	1371	2500	0.65
Cloth	93	199	0.90
Paper	38	100	0.93
	371	700	0.93
Slate (wallboard)	20	68	0.97
Fabric	-	-	0.78
Asphalt	38	100	0.93
Basalt	20	68	0.72
Bismuth			
Bright	80	176	0.34
Unoxidised	25	77	0.05
	100	212	0.06
Brass			
73% Cu, 27% Zn, polished	247	476	0.03
	357	674	0.03
63% Cu, 38% Zn, polished	257	494	0.03
	377	710	0.04
83% Cu, 17% Zn, polished	277	530	0.03
Matte	20	68	0.07
Burnished brown	20	68	0.40
Oxidized	200	392	0.61
	400	752	0.60
	600	1112	0.61
Unoxidized	25	77	0.04
	100	212	0.04
Polished	38	100	0.10
	316	600	0.10
Rolled plate, natural	22	72	0.06
Dull plate	349	660	0.22

	Temperature		Emissivity
	°C	°F	
Brick			
Red (rough)	21	70	0.93
Gault cream	1371	2500	0.26
	2760	5000	0.30
Fire Clay	1371	2500	0.75
Light Buff	538	1000	0.80
Lime Clay	1371	2500	0.43
Fire Brick	1000	1832	0.78
Magnesite Refractory	1000	1832	0.38
Grey Brick	1100	2012	0.75
Silica (glazed)	1094	2000	0.88
Silica (unglazed)	1094	2000	0.80
Building	1000	1832	0.45
Sandlime	1371	2500	0.59
	2760	5000	0.63
Cadmium	25	77	0.02
Carbon			
Lampblack	25	77	0.95
Lampblack (rough deposit)	100	212	0.84
	500	932	0.78
Graphite (pressed and filed surface)	20	68	0.98
	510	950	0.98
Unoxidized	25	77	0.81
	100	212	0.81
	500	932	0.79
Filament	260	500	0.95
	1038	1900	0.53
	1404	2560	0.53
Graphized	100	212	0.76
	300	572	0.75
	500	932	0.71
Rough Plate	100	212	0.77
	320	608	0.77
	500	932	0.72

	Temperature		Emissivity
	°C	°F	
Carborundum	1010	1850	0.92
	1399	2550	0.82
Ceramic			
Alumina on Inconel	427	800	0.69
	1093	2000	0.45
Earthenware (glazed)	21	70	0.90
Earthenware (matte)	21	70	0.93
Porcelain	22	72	0.92
Zirconia on Inconel	427	800	0.62
	1093	2000	0.45
Chipboard (untreated)	-	-	0.90
Chromium	38	100	0.08
	538	1000	0.26
Polished	150	302	0.06
	1093	2000	0.36
Clay			
Fired	70	158	0.91
Shale	20	68	0.60
Tiles (light red)	1371	2500	0.32
	2760	5000	0.34
Tiles (red)	1371	2500	0.40
	2760	5000	0.51
Tiles (dark purple)	1371	2500	0.78
	2760	5000	0.78
Cobalt (unoxidized)	500	932	0.13
	1000	1832	0.23

	Temperature		Emissivity
	°C	°F	
Concrete			
Dry	36	97	0.95
Rough	0	32	0.92
	17	63	0.95
	93	200	0.94
Tiles (natural)	1371	2500	0.63
	2760	5000	0.62
Tiles (brown)	1371	2500	0.87
	2760	5000	0.83
Tiles (black)	1371	2500	0.94
	2760	5000	0.91
Cotton Cloth	20	68	0.77
Copper			
Cuprous oxide	38	100	0.87
	260	500	0.83
	538	1000	0.77
Black oxidized	38	100	0.78
Etched	38	100	0.09
Matte	38	100	0.22
Roughly polished	38	100	0.07
Polished	38	100	0.04
Highly polished	38	100	0.02
Rolled	38	100	0.64
Rough	38	100	0.74
Molten	538	1000	0.15
	1077	1970	0.16
	1221	2230	0.13
Plate	199	390	0.57
	599	1110	0.57
Nickel plated	38	100	0.37
	260	500	0.37

	Temperature		Emissivity
	°C	°F	
Dolomite Lime	20	68	0.41
Dow Metal	-17.8 316	0 600	0.15 0.15
Emery Corundum	80	176	0.86
Fibre board			
Hard, untreated	-	-	0.85
Porous, untreated	-	-	0.85
Filler (white)	-	-	0.88
Firebrick	17	63	0.68
Glass			
Convex D	100 316 500	212 600 932	0.80 0.80 0.76
Nonex	100 316 500	212 600 932	0.82 0.82 0.78
Smooth	0	32	0.92
Chemical ware	35	2	0.97
Window	43 93	6 200	0.93 0.94
Gold			
Enamel	100	212	0.37
Plate (.0001 on .0005 silver)	93 399	200 750	0.11 0.14
Plate (.0001 on .0005 nickel)	93 399	200 750	0.07 0.09
Polished	38 260 538 1093	100 500 1000 2000	0.02 0.02 0.03 0.03

	Temperature		Emissivity
	°C	°F	
Granite			
Natural surface	36	97	0.96
Smooth	21	70	0.45
Gravel	38	100	0.28
Gypsum	20	68	0.85
Hardwood			
Cross grain	17	63	0.82
With grain	17	63	0.71
Hessian fabric (uncoloured)	-	-	0.87
Ice	0	32	0.97
Inconel			
Sheet	538	1000	0.28
	649	1200	0.42
	760	1400	0.58
Iron			
Oxidized	100	212	0.74
	499	930	0.84
	1199	2190	0.89
Unoxidized	100	212	0.05
Red rust	25	77	0.70
Rusted	25	77	0.65
Liquid	1516	2760	0.42
	1535	2795	0.29
Polished	427	800	0.14
	1027	1880	0.38

	Temperature		Emissivity
	°C	°F	
Iron (Continued...)			
Sheet (smooth)	899 1038	1650 1900	0.55 0.60
Sheet (heavily rusted)	20	68	0.69
Cast (oxidized)	199 599	390 1110	0.64 0.78
Cast (unoxidized, polished)	100	212	0.21
Cast (strong oxidation)	40 250	104 482	0.95 0.95
Wrought (dull)	25	77	0.94
Wrought (smooth)	38	100	0.35
Wrought (polished)	38	100	0.28
Lacquer			
Black	93	200	0.96
Blue on aluminium foil	38	100	0.78
Clear on aluminium foil (2 coats)	93	200	0.09
Clear on bright copper	93	200	0.66
Clear on tarnished copper	93	200	0.64
Red on aluminium foil (2 coats)	38	100	0.68
White	93	200	0.94
White on aluminium foil (2 coats)	38	100	0.69
Yellow on aluminium foil (2 coats)	38	100	0.57
Lead			
Polished	38 260	100 500	0.06 0.08
Rough	38	100	0.43
Oxidized	38	100	0.43
Oxidized at 1100°F	38	100	0.63
Grey oxidized	38	100	0.28
Lime mortar	38 260	100 500	0.90 0.92
Limestone (natural surface)	36	97	0.96

	Temperature		Emissivity
	°C	°F	
Magnesium			
Polished	38	100	0.07
	260	500	0.13
Oxide	1027	1880	0.16
	1727	3140	0.20
Marble			
White	38	100	0.95
White (smooth)	38	100	0.56
Grey (polished)	38	100	0.75
Mica	38	100	0.75
Molybdenum	38	100	0.06
	260	500	0.08
	538	1000	0.11
	1093	2000	0.18
Oxidized at 1000°F	316	600	0.80
	371	700	0.84
	427	800	0.84
	482	900	0.83
	538	1000	0.82
Monel			
Ni-Cu	200	392	0.41
	400	752	0.44
	600	1112	0.46
Oxidized	20	68	0.43
	593	1110	0.146
Mortar	17	63	0.87
Dry	36	97	0.94

	Temperature		Emissivity
	°C	°F	
Nickel			
Polished	38	100	0.05
Oxidized	38	100	0.31
	260	500	0.46
Unoxidized	25	77	0.05
	100	212	0.06
	500	932	0.12
	1000	1832	0.19
Electrolytic	38	100	0.04
	260	500	0.06
	538	1000	0.10
	1093	2000	0.16
Nickel Oxide	538	1000	0.59
	1093	2000	0.86
Paint			
Alumatone silver finish	25	77	0.26
Oil base general	17	63	0.87
flat black	-	-	0.94
gloss black	-	-	0.92
flat grey	-	-	0.97
gloss grey	-	-	0.96
Paper			
Cardboard	-	-	0.81
White	-	-	0.68
Perspex plexiglass	17	63	0.86
Plastic			
Black	-	-	0.95
White	-	-	0.84
Clear, acrylic	36	97	0.94

	Temperature		Emissivity
	°C	°F	
Plaster	17	63	0.88
Plasterboard (untreated)	-	-	0.90
Platinum	38	100	0.05
	260	500	0.05
	538	1000	0.10
Black	38	100	0.93
	260	500	0.96
	1093	2000	0.97
Oxidized at 1100°F	260	500	0.07
	538	1000	0.11
Plywood	17	63	0.91
Smooth, dry, commercial	36	97	0.82
Untreated	-	-	0.83
Polypropylene	17	63	0.97
P.V.C.	17	63	0.92
Redwood			
Wrought, untreated	-	-	0.83
Untreated	-	-	0.84
Rendering (grey)	-	-	0.92
Roofing materials			
Metal (<i>Average</i>)	0	32	0.61
Shingles Asphalt (sml.ceramic coated rock granules) (<i>Average</i>)	0	32	0.79

	Temperature		Emissivity
	°C	°F	
Roofing materials (Continued...)			
Shingles Fibreglass (sml. ceramic coated rock granules) (<i>Ave</i>)	0	32	0.86
Asphalt (lge. ceramic coated granules) (<i>Average</i>)	0	32	0.88
Roofing paper	20	68	0.91
Bituminized roofing felt	-	-	0.91
Cedar Shingle	-	-	0.96
Tar and Stone (BUR)	-	-	0.97
Rubber			
Stopped, black	35	95	0.97
Hard	23	74	0.94
Soft, grey	24	76	0.86

	Temperature		Emissivity
	°C	°F	
Sand	20	68	0.76
Sandstone Red	38	100	0.67
	38	100	0.72
Sawdust	20	68	0.75
Shale	20	68	0.69
Silica Glazed Unglazed	1000	1832	0.85
	1100	2012	0.75
Silicon Carbide	149	300	0.83
	649	1200	0.96
Silk Cloth	20	68	0.78
Siding Acrylic Enamel Coating (<i>Average</i>) Solid Vinyl (<i>Average</i>)	0	32	0.34
	0	32	0.84
Silver Plate Polished	93	200	0.06
	370	700	0.07
	38	100	0.01
	260	500	0.02
	538	1000	0.03
	1093	2000	0.03
Skin (human)	32	90	0.98

	Temperature		Emissivity
	°C	°F	
Soil			
Surface	38	100	0.38
Black Loam	20	68	0.66
Ploughed field	20	68	0.38
Dry	20	68	0.92
Saturated with water	20	68	0.95
Soot			
Acetylene	24	75	0.97
Camphor	24	75	0.94
Candle	121	250	0.95
Coal	20	68	0.95
Steel			
Cold rolled	93	200	0.80
Ground sheet	938	1720	0.55
	1099	2010	0.61
Polished sheet	38	100	0.07
	260	500	0.10
	538	1000	0.14
Mild steel (polished)	24	75	0.10
Mild steel (smooth)	24	75	0.12
Mild steel (liquid)	1599	2910	0.28
Mild steel (liquid)	1799	3270	0.28
Unoxidized	100	212	0.08
Oxidized	25	77	0.80

	Temperature		Emissivity
	°C	°F	
Steel Alloys			
Type 301 (polished)	24	75	0.27
	232	450	0.57
	949	1740	0.55
Type 303 (oxidized)	316	600	0.74
	1093	2000	0.87
Type 310 (rolled)	816	1500	0.56
	1149	2100	0.81
Type 316 (polished)	24	75	0.28
	232	450	0.57
	949	1740	0.66
Type 321	93	200	0.27
	427	800	0.32
Type 321 (polished)	149	300	0.18
	816	1500	0.49
Type 321 (with blk. oxide)	93	200	0.66
	427	800	0.76
Type 347 (oxidized)	316	600	0.87
	1094	2000	0.91
Type 350	93	200	0.18
	427	800	0.27
Type 350 (polished)	149	300	0.11
	982	1800	0.35
Type 446 (polished)	149	300	0.15
	816	1500	0.37
Type 17-7PH	93	200	0.44
	316	600	0.51
Type 17-PH	149	300	0.09
	816	1500	0.16
Type C-1020 (oxidized)	316	600	0.87
	1094	2000	0.91
Type PH-15-7MO	149	300	0.07
	649	1200	0.19
Type 18-8 (buffed)	20	68	0.16
Type 18-8 (oxidized)	60	140	0.85
Stellite (polished)	20	68	0.18
Styrofoam insulation	37	99	0.60

	Temperature		Emissivity
	°C	°F	
Tape			
Electrical, black insulating	35	95	0.97
Masking	36	97	0.92
Tile			
Asbestos floor	35	95	0.94
Glazed	17	63	0.94
Tin (unoxidized)	25	77	0.04
	100	212	0.05
Tinned Iron (bright)	24	76	0.05
	100	212	0.08
Titanium			
Alloy C110M (polished)	149	300	0.08
	649	1200	0.19
Alloy C110M (oxidized at 1000°F)	93	200	0.51
	427	800	0.61
Alloy TI-95A (oxidized at 1000°F)	93	200	0.35
	427	800	0.48
Anodized onto stainless steel	93	200	0.96
	316	600	0.82
Tungsten			
Unoxidized	25	77	0.02
	100	212	0.03
	500	932	0.07
	1000	1832	0.15
	1500	2732	0.23
	2000	3632	0.28
Filament (aged)	38	100	0.03
	538	1000	0.11
	2760	5000	0.35

	Temperature		Emissivity
	°C	°F	
Uranium Oxide	1027	1880	0.79
Varnish (flat)	-	-	0.93
Wallpaper	-	-	0.88
Water (distilled)	20	68	0.96
Waterglass	20	68	0.96
Wood panelling	36	97	0.86
Zinc			
Bright galvanized	38	100	0.23
Commercial 99.1%	260	500	0.05
Galvanized	38	100	0.02
Oxidized	260	500	0.11
	538	1000	0.11
Polished	38	100	0.02
	260	500	0.03
	538	1000	0.04
	1093	2000	0.06

These tables are presented through the courtesy of Infrasppection Institute Inc., U.S.A.