## AMTIR-8 Material Properties

| PROPERTY | METRIC UNITS | ENGLISH UNITS |
|---|---|---|
| Composition | GeAsSe | |
| Glass Transition Temperature (Tg) | 135 °C | 275 °F |
| Annealing Temperature | 142 °C | 288 °F |
| Dilatometric Softening Point | 158 °C | 316 °F |
| Upper Use Temperature | 105 °C | 221 °F |
| Thermal Expan. Coeff. (-150 to 25 °C) | 21.3 ppm / °C | 11.8 ppm / °F |
| Thermal Expan. Coeff. (25 to 100 °C) | 24.4 ppm / °C | 13.6 ppm / °F |
| Specific Heat | cal/gm-°C (J/gm-°K) | 0.074 (0.0031) |
| Thermal Conductivity (25 to 75 °C) | $5.8 \times 10^{-4}$ cal /sec-cm-°K | $1.41 \times 10^{-1}$ BTU/ Hr-ft-°F |
| Knoop (Vickers) Hardness | 170 (153) | |
| Young's Modulus (E) | 19.8 GPa | $2.87 \times 10^{6}$ lbs /in² |
| Shear Modulus (G) | 7.72 GPa | $1.12 \times 10^{6}$ lbs/ in² |
| Poisson's Ratio | 0.282 | |
| Tensile Strength | 7.6 MPa | 1100 lbs / in² |
| Compressive Strength | 145 MPa | 21,000 lbs / in² |
| Rupture Modulus (ASTM-C158) | 16.9 MPa | 2445 lbs / in² |
| Density | 4.53 gm/cm³ | 283.2 lbs/ft³ |
| Dielectric Constant | 8.1 | |
| Resistivity (@100Hz) | $>1 \times 10^{12}$ ohm-cm | $>4 \times 10^{11}$ ohm-in |
| Stress Opt. Coeff. (avg Tens. & Comp.) | 3 to 12 um, $x10^{-12}$ m²/N | 10 |
| Refractive Index @ 3 um (20.0 °C) | 2.62289 | |
| Refractive Index @ 8 um (20.0 °C) | 2.60798 | |
| Refractive Index @ 12 um (20.0 °C) | 2.59821 | |
| SWIR Abbe Value | 1 to 2 um | 20 |
| MWIR Abbe Value | 3 to 5 um | 189 |
| LWIR Abbe Value | 8 to 12 um | 164 |
| $\Delta n/\Delta T$ @ 3 um | < 11 ppm/ °C | |
| $\Delta n/\Delta T$ @ 8 um | < 8 ppm/ °C | |
| $\Delta n/\Delta T$ @ 12 um | < 7 ppm/ °C | |
| Chemical Durability (weight loss in milligrams for 100 gm sample in a 4 Hour Period) | | |
| **Solution** | **Temperature (°C)** | **Milligrams** |
| $H_2O$ | 90 °C | 0 |
| 2% $NH_4OH$ | 60 °C | 10 |
| 2% KOH | 60 °C | 25 |
| HCl, $H_2SO_4$, $HNO_3$ & EtOH (all conc) | 60 °C | 0 to 0.02 |

NOTE: All data provided on these datasheets are typical production values for Standard Anneal, optical grade material. All tolerances are consistent with industry practice. (example: Refractive Index values typically ±0.001 for 2 to 12 um, ±0.002 for 1 to 2 um) They are believed to be accurate and representative of normal AMI melt practice, at the time of publication. Current maximum blank size available meeting standard quality specifications is Ø150 mm x 25 mm thick. (Larger diameters may be available in the future.)



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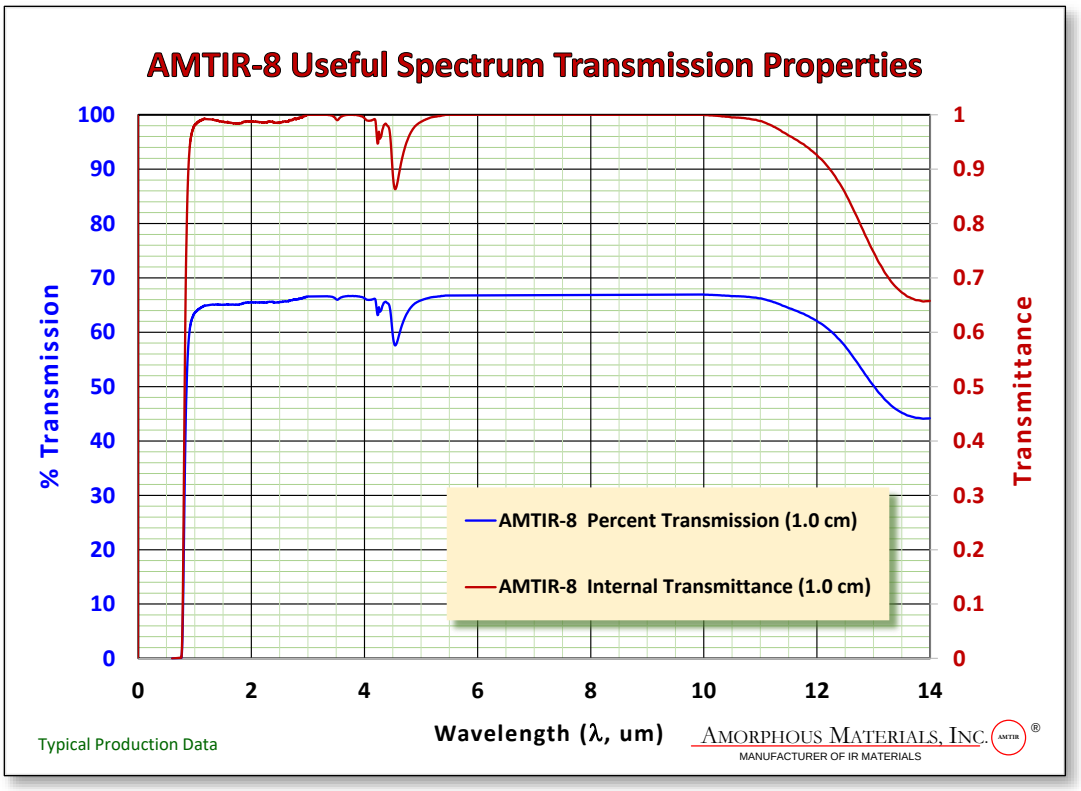


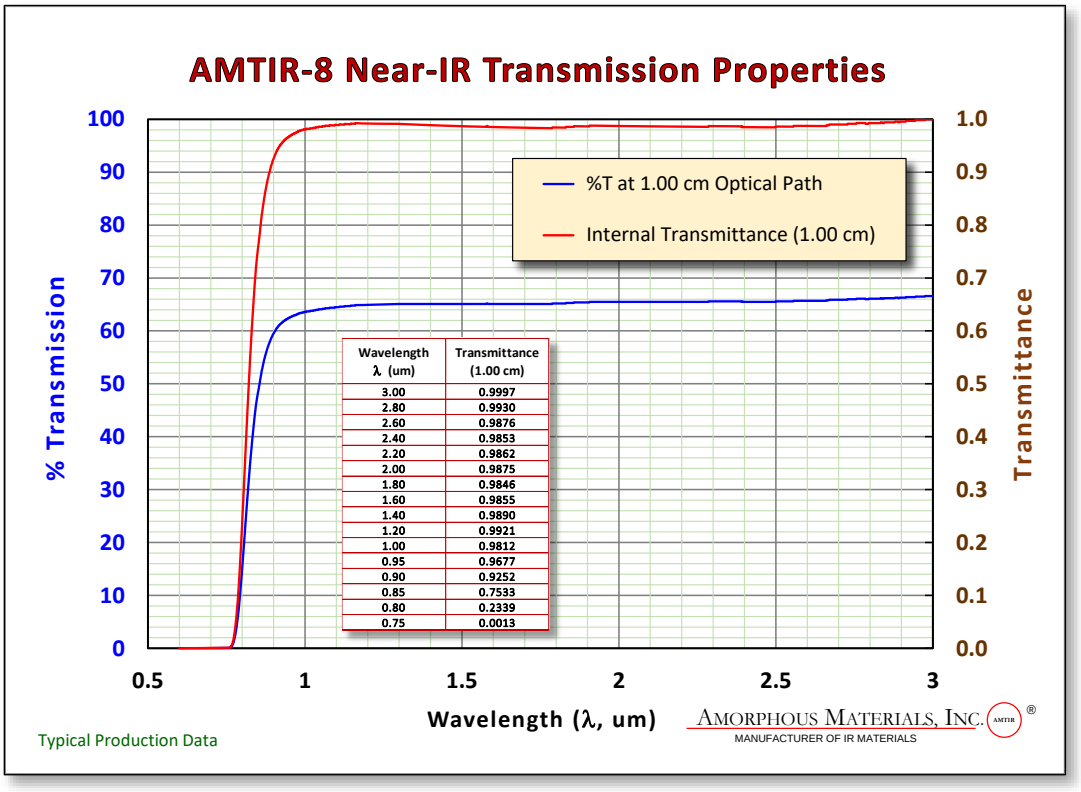


| Wavelength λ (um) | Transmittance (1.00 cm) |
|---|---|
| 3.00 | 0.9997 |
| 2.80 | 0.9930 |
| 2.60 | 0.9876 |
| 2.40 | 0.9853 |
| 2.20 | 0.9862 |
| 2.00 | 0.9875 |
| 1.80 | 0.9846 |
| 1.60 | 0.9855 |
| 1.40 | 0.9890 |
| 1.20 | 0.9921 |
| 1.00 | 0.9812 |
| 0.95 | 0.9677 |
| 0.90 | 0.9252 |
| 0.85 | 0.7533 |
| 0.80 | 0.2339 |
| 0.75 | 0.0013 |



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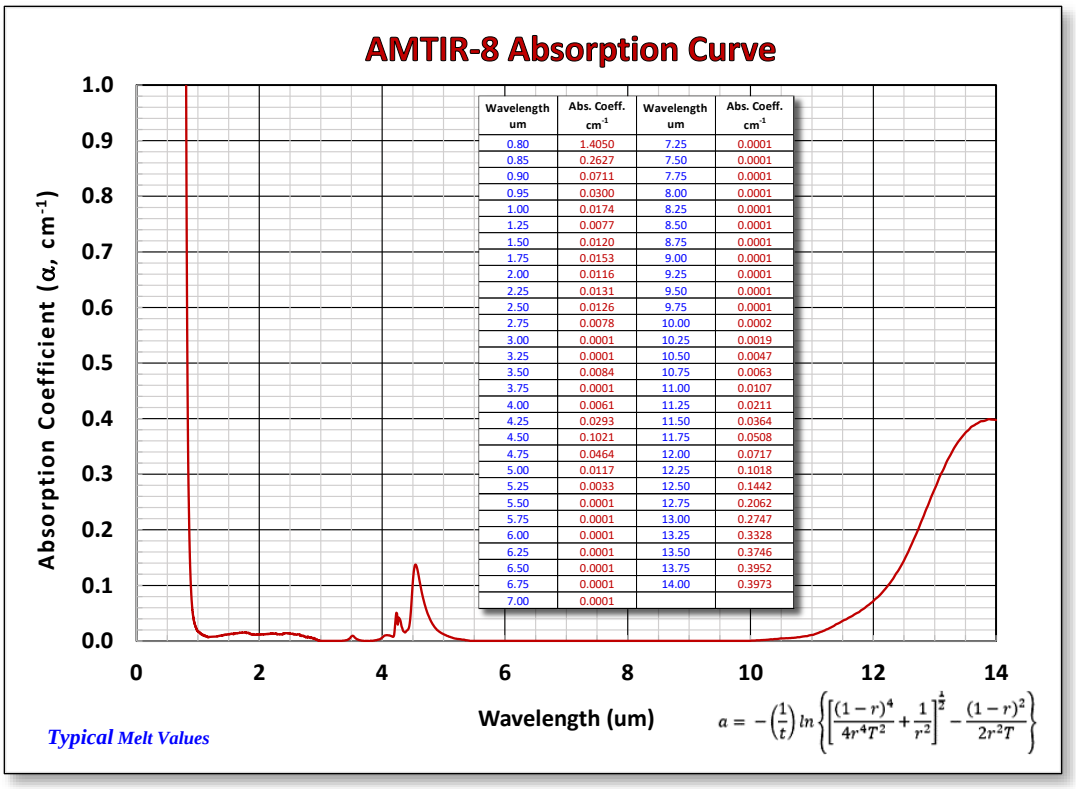


| Wavelength um | Abs. Coeff. $cm^{-1}$ | Wavelength um | Abs. Coeff. $cm^{-1}$ |
|---|---|---|---|
| 0.80 | 1.4050 | 7.25 | 0.0001 |
| 0.85 | 0.2627 | 7.50 | 0.0001 |
| 0.90 | 0.0711 | 7.75 | 0.0001 |
| 0.95 | 0.0300 | 8.00 | 0.0001 |
| 1.00 | 0.0174 | 8.25 | 0.0001 |
| 1.25 | 0.0077 | 8.50 | 0.0001 |
| 1.50 | 0.0120 | 8.75 | 0.0001 |
| 1.75 | 0.0153 | 9.00 | 0.0001 |
| 2.00 | 0.0116 | 9.25 | 0.0001 |
| 2.25 | 0.0131 | 9.50 | 0.0001 |
| 2.50 | 0.0126 | 9.75 | 0.0001 |
| 2.75 | 0.0078 | 10.00 | 0.0002 |
| 3.00 | 0.0001 | 10.25 | 0.0019 |
| 3.25 | 0.0001 | 10.50 | 0.0047 |
| 3.50 | 0.0084 | 10.75 | 0.0063 |
| 3.75 | 0.0001 | 11.00 | 0.0107 |
| 4.00 | 0.0061 | 11.25 | 0.0211 |
| 4.25 | 0.0293 | 11.50 | 0.0364 |
| 4.50 | 0.1021 | 11.75 | 0.0508 |
| 4.75 | 0.0464 | 12.00 | 0.0717 |
| 5.00 | 0.0117 | 12.25 | 0.1018 |
| 5.25 | 0.0033 | 12.50 | 0.1442 |
| 5.50 | 0.0001 | 12.75 | 0.2062 |
| 5.75 | 0.0001 | 13.00 | 0.2747 |
| 6.00 | 0.0001 | 13.25 | 0.3328 |
| 6.25 | 0.0001 | 13.50 | 0.3746 |
| 6.50 | 0.0001 | 13.75 | 0.3952 |
| 6.75 | 0.0001 | 14.00 | 0.3973 |
| 7.00 | 0.0001 | | |

| Wavelength (um) | Fresnel Coefficient | Transmission (%) (2.54 cm) | Transmittance (2.54 cm) (corrected) | Absorption Coefficient ($cm^{-1}$) |
|---|---|---|---|---|
| 1.000 | 0.648 | 63.57 | 0.981 | 0.0174 |
| 2.000 | 0.663 | 65.48 | 0.988 | 0.0116 |
| 3.000 | 0.666 | 66.57 | 0.999 | 0.0001 |
| 4.000 | 0.667 | 66.24 | 0.993 | 0.0061 |
| 4.500 | 0.667 | 59.78 | 0.896 | 0.1021 |
| 4.960 | 0.667 | 65.68 | 0.984 | 0.0147 |
| 5.000 | 0.667 | 65.90 | 0.987 | 0.0117 |
| 6.000 | 0.668 | 66.77 | 0.999 | 0.0001 |
| 7.000 | 0.668 | 66.81 | 0.999 | 0.0001 |
| 8.000 | 0.669 | 66.85 | 0.999 | 0.0001 |
| 9.000 | 0.669 | 66.89 | 0.999 | 0.0001 |
| 10.000 | 0.669 | 66.93 | 0.999 | 0.0002 |
| 11.000 | 0.670 | 66.22 | 0.988 | 0.0107 |
| 12.000 | 0.670 | 62.07 | 0.926 | 0.0717 |
| 13.000 | 0.671 | 50.13 | 0.747 | 0.2747 |
| 14.000 | 0.672 | 44.17 | 0.658 | 0.3973 |

**NOTE:** Amorphous Materials, Inc. calculates the values for the Absorption Coefficients, using an approach used routinely by many infrared Optical Engineers. The applicable equation is found on the Absorption Curve. Calculate the ABSORBANCE, at a given wavelength (α), by correcting for multiple-internal reflections (i.e., Fresnel losses) and dividing this value by the light path (i.e., sample thickness in centimeters).



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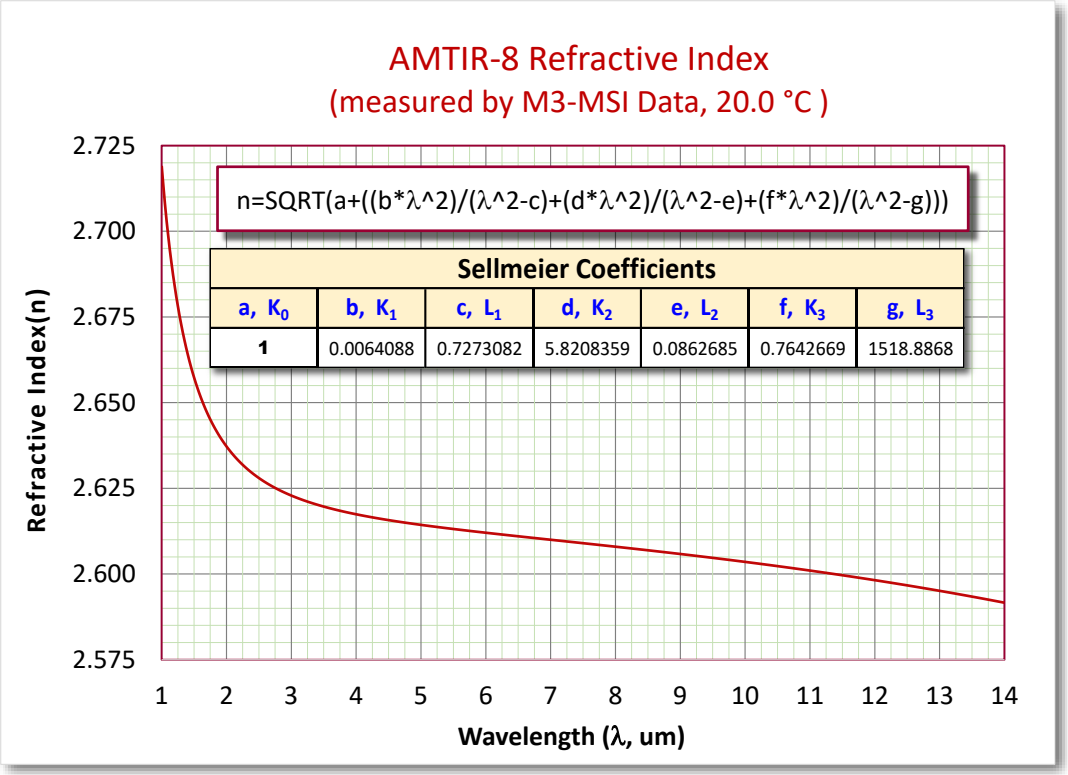


## AMTIR-8 REFRACTIVE INDEX and THERMAL COEFFICIENT DATA

| Wavelength (microns) | Refractive Index 20.0 °C | Average Δn/ΔT |
|---|---|---|
| 1.0000 | 2.71907 | 0.000015 |
| 1.5000 | 2.65729 | 0.000014 |
| 2.0000 | 2.63722 | 0.000013 |
| 3.0000 | 2.62289 | 0.000011 |
| 4.0000 | 2.61743 | 0.000010 |
| 5.0000 | 2.61434 | 0.000009 |
| 6.0000 | 2.61205 | 0.000008 |
| 7.0000 | 2.61000 | 0.000008 |
| 8.0000 | 2.60798 | 0.000008 |
| 9.0000 | 2.60585 | 0.000008 |
| 10.0000 | 2.60354 | 0.000008 |
| 11.0000 | 2.60101 | 0.000007 |
| 12.0000 | 2.59821 | 0.000007 |
| 13.0000 | 2.59510 | 0.000007 |
| 14.0000 | 2.59164 | 0.000006 |

**NOTE:** Refractive Index values are typical production values for Standard Anneal glass and may vary by ±0.0006 (group relative) melt-to-melt. Thermal Coefficient Δn/ΔT values are group relative constants and do not vary significantly in the 6th decimal place.



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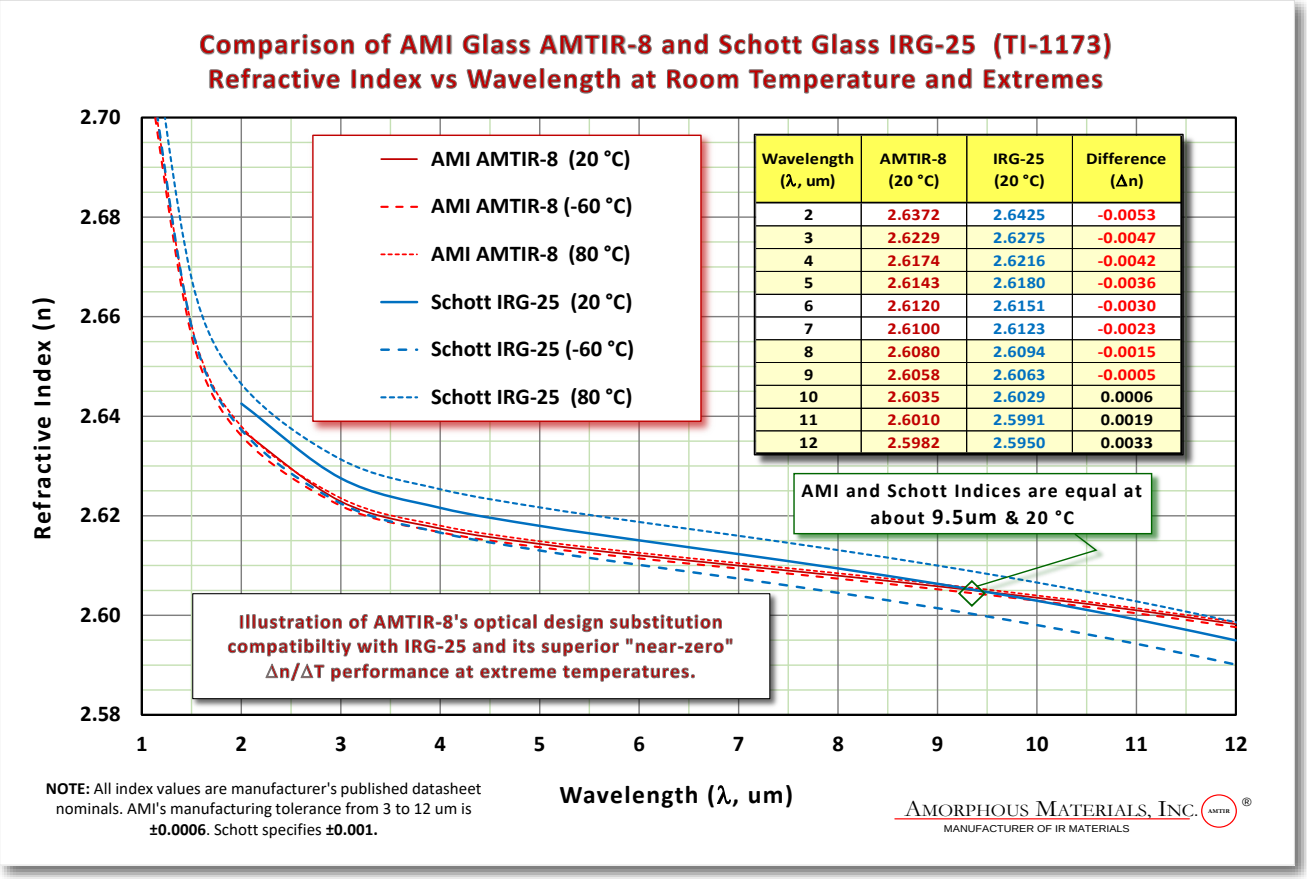
# Why Choose AMTIR-8?

Although a completely different chemical family of glass materials, in most optical design applications, AMTIR-8 may be used as a direct replacement for Schott IRG-25 (formerly known as TI-1173).

AMTIR-8's superior thermal behavior makes it virtually immune to MTF problems or physical damage in most thermal environments, hot and cold. Furthermore, it was designed to be fully thermal expansion compatible with most aluminum alloys used for mounting windows and lenses.




A supplemental datasheet containing both ZEMAX Optic Studio™ Sellmeier Coefficients for room temperature and Thermal Coefficients *(Δn/ΔT constants)* is available upon request.



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