

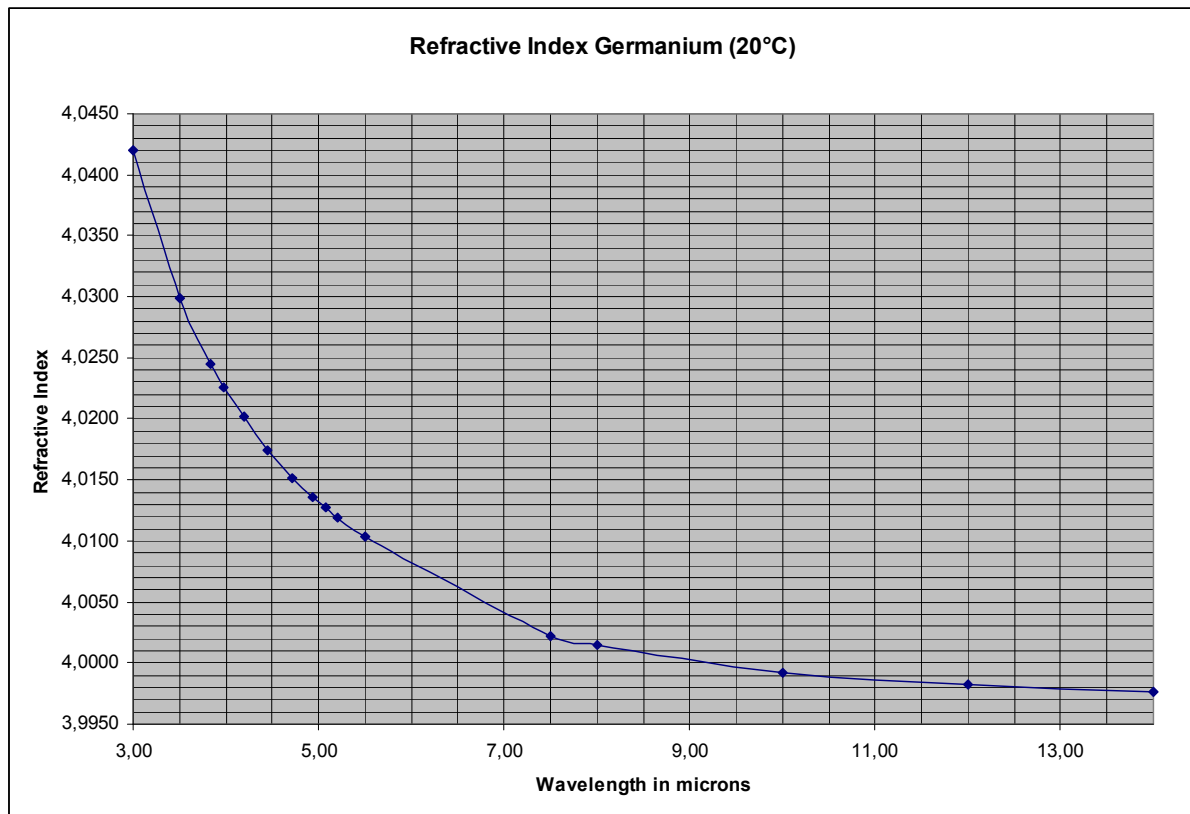
## Germanium

### Physical Properties<sup>[1]</sup>

- Melting Point 938.25°C
- Density 5.323 g/cm<sup>3</sup>
- Thermal Expansion Coefficient 5.7 x 10<sup>-6</sup>/K
- Youngs Modulus <111> 155.6 GPa
- Modulus of Rupture 72.4 MPa

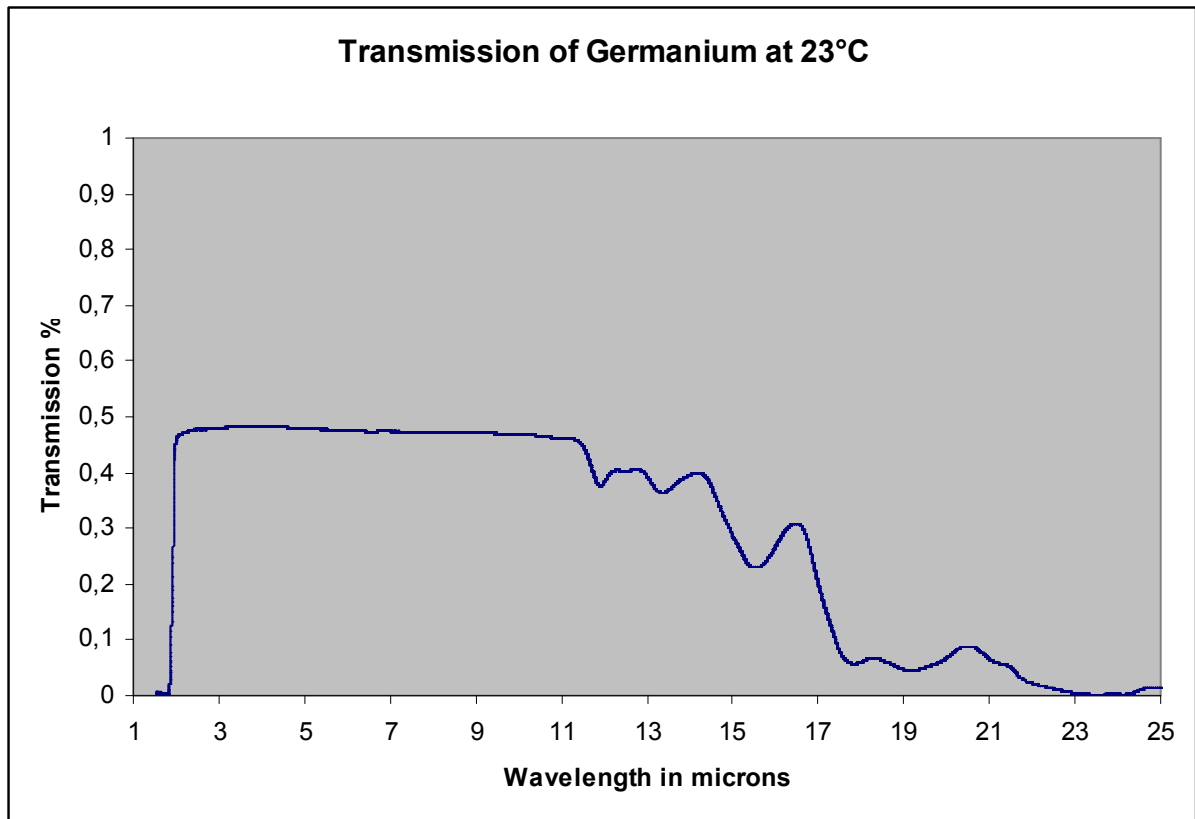
### Optical Properties<sup>[2]</sup>

- Refractive Index



- Dn/dT 4.14 x 10<sup>-4</sup>/°K @ 5.2μ

- Transmission



### Material Specifications

- |                        |                                   |
|------------------------|-----------------------------------|
| • Purity               | > 99.999%                         |
| • Crystal Structure    | Monocrystalline & Polycrystalline |
| • Type/Dopant          | N/Antimony; P/Boron               |
| • Orientation          | <111>                             |
| • Resistivity          | 0.5 - 40 $\Omega$ /cm             |
| Standard Optical Grade | 5.0 - 40 $\Omega$ /cm             |
| EXPT Grade             | 0.5 - 5.0 $\Omega$ /cm            |
- EXPT Grade has specific enhanced properties for applications where electromagnetic shielding is required.

### Products

- |                                |   |
|--------------------------------|---|
| • Rods and Discs               | 10 - 500 mm                             |
| • Plano Optics                 | 10 - 500 mm; 350 x 350 mm               |
| • Lenses                       | 10 - 500 mm                             |
| • Rectangular and other shapes | 350 x 350 mm; max. 500 mm diagonal      |
| • Witness samples and Wedges   | 25.4 mm $\varnothing$ ; 1 - 10 mm thick |

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### Tolerances

Tolerances are diameter dependent , and they are based on a 10 mm minimum to 500 mm **maximum**. Fabrication is according to DIN 286-2 (1990-11) and ASME Y14.5M 1994. Tighter tolerances are available upon request.

- Diameter:  $\pm 0.2 \text{ mm}$  to  $\pm 1.5 \text{ mm}$
- Thickness:  $\pm 0.1 \text{ mm}$  to  $\pm 0.8 \text{ mm}$
- Flatness:  $\pm 30'$
- Parallelism:  $\leq 25 \mu\text{m}$
- Perpendicularity:  $\leq 30 \mu\text{m}$
- Chamfer: 0.1 to 1.6 mm
- ETV:  $\leq 30 \mu\text{m}$
- Roundness:  $\leq 30 \mu\text{m}$
- Length and Width:  $\pm 0.05 \text{ mm}$

### Surface Quality

- As cut
- Standard D46 Rq = 2  $\mu\text{m}$  max.
- Fine D15 Rq = 0.8  $\mu\text{m}$  max.
- Superfine D7 Rq = 0.2  $\mu\text{m}$  max.
- Polish
  - S/D: 60/40 or better
  - Flatness: 5 fringes
  - Irregularity: 2 fringes
  - Parallelism: 0.01 mm

Rq is defined as RMS deviation of all peaks/valleys to surface.  
Polishing provided for filters and witness samples only.

### Quality Assurance:

- Full traceability according to MIL 130 Standard back to Melt / Lot

[1] Taken from NIST Database.

[2] Measured by Photonic Sense.