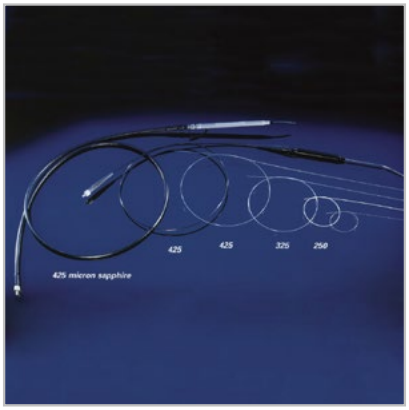
Fiber Optics

LASER COMPONENTS

Single Crystal Sapphire Optical Fiber
Unmatched Versatility

Typical Sensor Uses

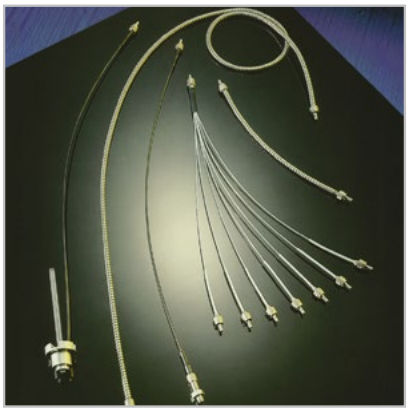
- Very high temperature pyrometry – view around corners
- Spectroscopy in hostile environments – resists abrasion
- Combustion in-chamber research – piston and turbines
- Sensing in fluorine plasmas – resists etching
- High temperature mechanical parts – hangars in furnaces



Individual bare sapphire fibers or sheathed cables with connectors are available. We also makes sapphire straight and curved tips.

Typical Laser and Medical & Dental Uses

- Er:YAG dental lasers – hard and soft tissue
- Er:YAG trunk fibers – transmission at 2.94 µm
- Dental handpiece tips – straight and curved
- Medical lasers – lithotripsy, bone surgery
- Bio-compatible, non-toxic – USP Class IV
- Nd:YAG high power – >1200 J/cm^2 damage



The single crystal fiber transmits from the near UV to 4.5 µm in the infrared and is ideal for use in very high temperature and highly corrosive environments.

Germany and Other Countries
Laser Components Germany GmbH
Tel: +49 8142 2864–0
Fax: +49 8142 2864–11
info@lasercomponents.com
www.lasercomponents.com

United Kingdom
Laser Components (UK) Ltd.
Tel: +44 1245 491 499
Fax: +44 1245 491 801
info@lasercomponents.co.uk
www.lasercomponents.co.uk

Fiber diameter (± 25 µm)	425 µm
Diameter with optional PTFE heat shrink buffer	750 µm
Minimum bend radius (mm)	80
Fiber length (± 2 cm)	< 2 m

Properties of Single Crystal Sapphire

Refractive Index (Ordinary Ray)

λ (µm)	0.265	0.297	0.365	0.579	0.894	1.693	2.249	3.303
n	1.834	1.816	1.794	1.769	1.758	1.744	1.732	1.702

Sellmier Coefficients	A_1 = 1.023798 A_2 = 1.058264 A_3 = 5.280792	Λ_1 = 0.00377588 Λ_2 = 0.0122544 Λ_3 = 321.3616
Thermal coefficient of index	appx. 13 x 10^{-6}/deg. C in visible region. Our sapphire fibers are grown along the crystallographic c-axis <0001>	
Specific gravity	3.98	
Hardness	1525 Knoop, Mohs 9	
Melting point	2040 C	
Tensile strength:	275 to 400 MPa (40 – 58 kpsi)	
Compressive strength	2.0 GPa (300 kpsi)	
Young's modulus	345 GPa (50 x 10^6 psi)	
Thermal conductivity	0 C = 46.06 W/mK 100 C = 25.56 W/mK 12.56 W/mK (Sapphire's thermal conductivity at liquid N2 temperature is greater than silver's)	
Specific heat	0.10 cal/gC	
Thermal expansion coefficient	20 – 500 C = 7.7 x 10^{-6}/C	
Effective NA	0.12	

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