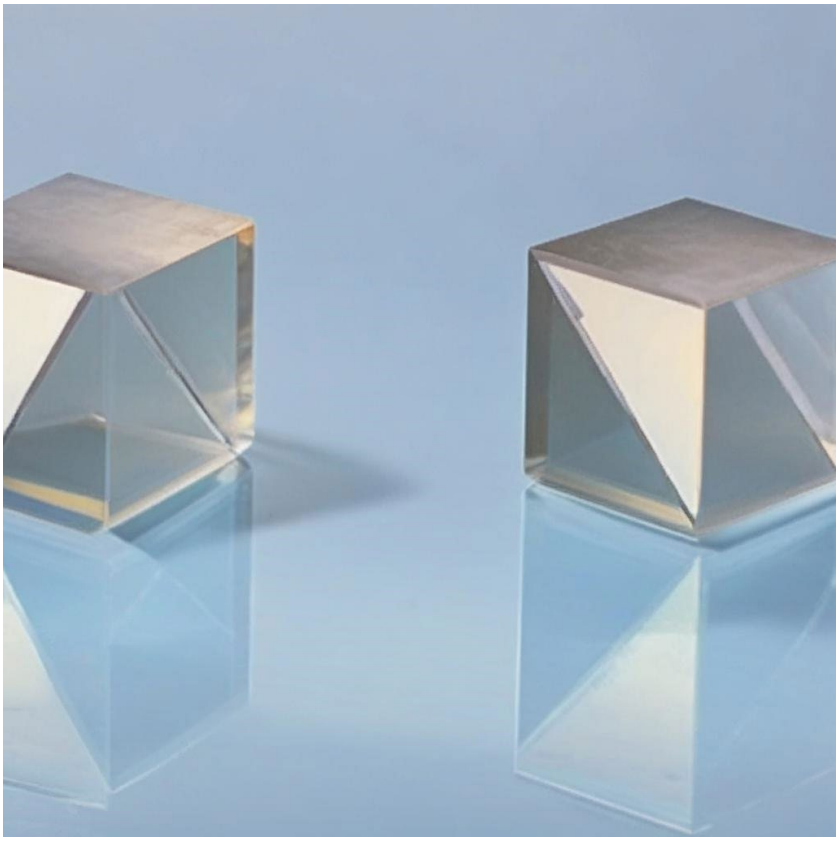
Photonics On Crystals

POC-OC-122464-Terbium Gallium Garnet Crystal Datasheet

Main Features

- High Verdet constant (35 Rad T^-1 m^-1) for excellent magneto-optical performance.
- High thermal conductivity (7.4 W m^-1 K^-1), ensuring efficient heat dissipation.
- Superior laser damage threshold (>1 GW/cm²) for high-power laser systems.
- Low optical loss (<0.1%/cm), minimizing light absorption.
- Broad application range from 400 nm to 1100 nm (excluding 475 nm–500 nm).



Material General Description

Terbium Gallium Garnet (TGG) is a high-performance magneto-optical crystal widely used in Faraday devices, including optical isolators and rotators. This cubic crystal system offers a unique combination of high thermal conductivity, low optical loss, and excellent Verdet constant, making it the material of choice for optical systems requiring high power and precision. TGG crystals are especially suitable for multi-stage laser amplification systems and ring-type laser cavities due to their robustness and optical clarity. With its high laser damage threshold, TGG ensures stable performance in demanding applications, including industrial and scientific laser systems.

General Applications

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1. **Optical Isolators and Rotators**
   TGG crystals are primarily used in Faraday isolators and rotators, essential for protecting laser systems by isolating back-reflected light. Their high Verdet constant enhances their efficiency in these devices.

2. **Laser Systems**
   TGG is commonly used in high-power laser applications where thermal management and optical quality are crucial. Applications include YAG and Ti:Sapphire lasers in industrial cutting, welding, and research systems.

3. **Ring Laser Systems**
   The low absorption and high thermal conductivity of TGG make it ideal for ring laser gyroscopes and amplifiers requiring stable and consistent performance over extended use.

4. **Environmental and Scientific Instruments**
   TGG crystals are used in magneto-optical spectrometry and environmental monitoring systems to manipulate light polarization in highly accurate setups.

Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	Tb3Ga5O12
Crystal Structure	Cubic
Lattice Constant	12.355 Å
Density	7.13 g/cm³
Melting Point	1725°C
Mohs Hardness	8.0
Thermal Conductivity	7.4 W m^-1 K^-1
Laser Damage Threshold	>1 GW/cm²
Refractive Index @1064 nm	1.954

Optical, Laser, and Nonlinear Optical Properties

Property	Value
Verdet Constant	35 Rad T^-1 m^-1
Wavelength Range	400 nm–1100 nm
Transmission Loss	<0.1%/cm
Absorption Bandwidth	Broad
Thermal Expansion Coefficient	7.4 × 10^-6 K^-1

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Standard Fabrication Specifications

Specification	Value
Orientation	[111] within ±15′
Extinction Ratio	>30 dB
Diameter Tolerance	±0.1 mm
Length Tolerance	±0.2 mm
Surface Quality (Scratch/Dig)	10/5 (MIL-PRF-13830B)
Flatness	≤λ/8 @ 633 nm
Wavefront Distortion	≤λ/8 @ 633 nm
Parallelism	20 arc sec
Perpendicularity	15 arc min
Chamfer	0.2 mm × 45°
AR Coating	<0.2% @ 1064 nm

Coating Specification

- Anti-Reflective (AR) coating options available for specific laser wavelengths.
- Typical coatings include <0.2% reflectivity at 1064 nm.

POC Strength and Capabilities

Photonics On Crystals (POC) specializes in manufacturing high-quality TGG crystals with precise tolerances and tailored coatings for specific applications. POC ensures rigorous quality control standards and offers customization services to meet client-specific requirements. With advanced fabrication techniques and a commitment to excellence, POC delivers industry-leading TGG crystals for scientific and industrial applications.

Standard Products

Face Dimensions (mm)	Length (mm)	Coatings	Price (USD)
3 × 3	5	Uncoated	370
3 × 3	5	AR@1064 nm	435
Custom Size	Custom	Coating as required	Request

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For customized dimensions and coatings, please contact POC for solutions tailored to your requirements.