POC-OC-122404- Datasheet for BIBO Crystals by Photonics On Crystals (POC)

1. Main Features

- High effective nonlinear coefficients (3.5–4 times higher than BBO and 1.5–2 times higher than LBO), ideal for blue laser applications.
- Broad transparency range from 286–2500 nm, enabling versatile photonic uses.
- High damage threshold and resistance to moisture ensure operational reliability.
- Precision-engineered crystals, offering angular acceptance of 2.32 mrad-cm and walk-off angle of 25.6 mrad.
- Produced using TSSG growth technique for superior single-crystal quality.

---

2. Material General Description

Bismuth Triborate (BiB3_33O6_66, or BIBO) is a cutting-edge nonlinear optical crystal, renowned for its exceptional nonlinear coefficients and high damage threshold. With a nonlinear coefficient 3.5–4 times greater than BBO, it offers superior efficiency for frequency doubling and tripling processes. This makes it particularly effective for generating high-energy blue lasers. Additionally, its inertness to moisture and wide transparency range (286–2500 nm) make it suitable for various optical systems. Grown via the top-seeded solution

growth (TSSG) method, BIBO exhibits excellent homogeneity and structural integrity. Its chemical and structural properties are finely tuned for advanced photonic applications, offering reliability and precision under demanding conditions.

---

3. General Applications and Examples

Frequency Doubling for Blue Lasers
BIBO crystals are pivotal for frequency doubling in the visible spectrum, especially for high-energy blue lasers used in scientific research, biomedical imaging, and laser projection.

Optical Parametric Oscillators (OPOs)
Due to its broad transparency and nonlinear efficiency, BIBO is utilized in OPOs for generating tunable coherent light across the visible to near-infrared spectrum.

Ultrashort Pulse Applications
BIBO is a preferred choice for ultrafast laser applications, including femtosecond and picosecond laser systems, due to its phase-matching properties and high efficiency in harmonic generation.

High-Power Systems
With a high damage threshold, BIBO is well-suited for high-power laser systems used in industrial cutting, welding, and medical equipment.

Scientific Instrumentation
Its superior nonlinear properties make it ideal for advanced spectroscopy, precision measurements, and optical research requiring accurate frequency control.

---

4. Chemical and Structural Properties

Parameter	Specification
Crystal Structure	Monoclinic, Point group C_2
Lattice Parameters	$a = 7.116$ Å, $b = 4.993$ Å, $c = 6.508$ Å, $\beta = 105.62^\circ$
Melting Point	726°C
Mohs Hardness	5–5.5 Mohs
Density	5.033 g/cm^3
Thermal Expansion Coefficients	$a_{\parallel} = 4.8 \times 10^{-6}/\mathrm{K}$, $b_{\perp} = 4.4 \times 10^{-6}/\mathrm{K}$, $c_{\perp} = 2.69 \times 10^{-6}/\mathrm{K}$

Parameter	Specification
Crystal Structure	Monoclinic, Point group C_2
Lattice Parameters	$a = 7.116\ \text{Å},\ b = 4.993\ \text{Å},\ c = 6.508\ \text{Å},\ \beta = 105.62^\circ$
Melting Point	726°C
Mohs Hardness	5–5.5 Mohs
Density	5.033 g/cm^3
Thermal Expansion Coefficients	$a_{\parallel} = 4.8 \times 10^{-6}/\text{K},\ b_{\perp} = 4.4 \times 10^{-6}/\text{K},\ c_{\perp} = 2.69 \times 10^{-6}/\text{K}$

---

5. Optical and Nonlinear Optical Properties

Property	Value
Transparency Range	286–2500 nm
Absorption Coefficient	<0.001 cm^{-1} @ 1064 nm
Physical Axis	$X/Y/Z$
Phase-Matching Angle	168.9°
Effective Nonlinear Coefficient (d_{eff})	3.0 pm/V
Angular Acceptance	2.32 mrad·cm
Walk-Off Angle	25.6 mrad
Temperature Acceptance	2.17°C·cm

---

6. Spectrum Transmission Curves

N.A

---

7. Coating Specification

- Dual and triple-band AR coatings for SHG and THG.
- BBAR and P-coatings tailored for specific OPO and THG applications.
- Custom coatings available upon request for enhanced performance.

---

8. Standard Fabrication Specifications

Parameter	Specification
Dimension Tolerance	$\pm 0.1\,\mathrm{mm}$
Clear Aperture	Central 90% of the diameter
Surface Quality (Scratch/Dig)	10/5 to MIL-PRF-13830B
Flatness	$\lambda/8 \,@\, 633\,\mathrm{nm}$
Perpendicularity	<15 arc minutes
Chamfer	0.2 mm @ 45°
Damage Threshold	>0.3 GW/cm^2 @ 1064 nm, 10 ns

---

9. POC Strength and Capabilities

Photonics On Crystals (POC) excels in providing high-quality BIBO crystals with stringent quality control and advanced fabrication techniques. With an experienced engineering team, POC offers comprehensive customization options to suit specific laser systems and photonics requirements. Our facilities are equipped to handle large-scale production while maintaining exceptional precision and quality. POC's commitment to innovation ensures the delivery of crystals optimized for both standard and emerging photonic applications.

---

10. Standard Products

Face Dimensions (mm)	Length (mm)	Application	Coating	Price (USD)
10 x 10	15	SHG/THG Applications	BBAR/Custom	1200
5 x 5	10	OPO Systems	P-Coating	800
8 x 8	12	Ultrafast Lasers	Custom	950
Customization Available	**Upon Request**	**Contact for Details**	**Custom**	**Quote**