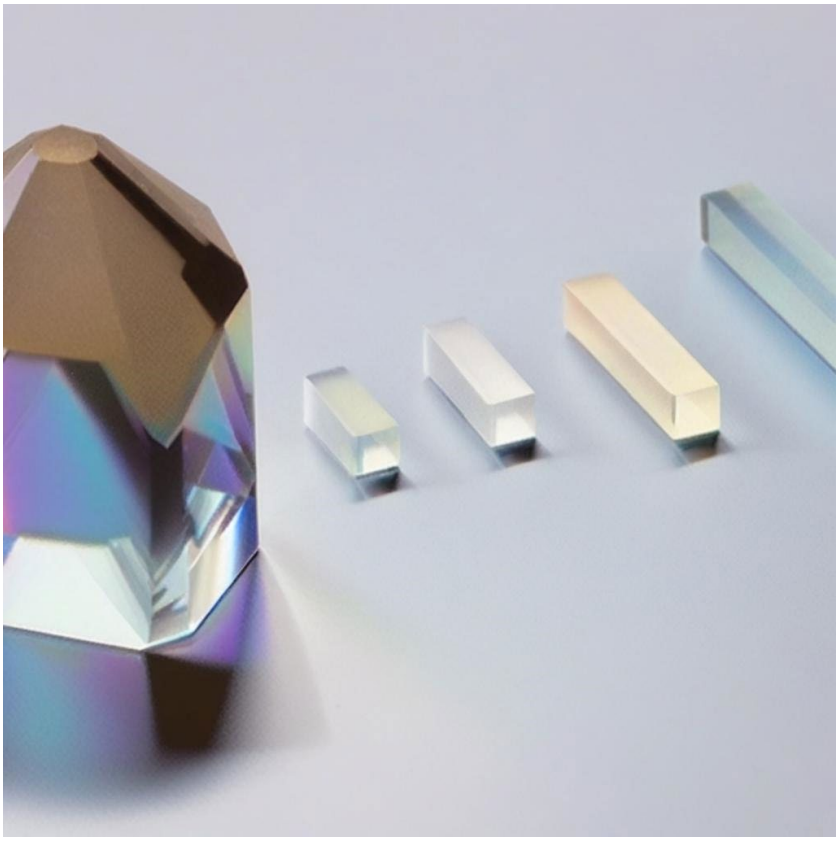
Photonics On Crystals

POC-OC-122508-Color Center Diamond Crystal Datasheet

1 Main Features:

- Outstanding nitrogen-vacancy (NV) spin properties for quantum applications.
- Precise nitrogen doping and controlled NV center density.
- Exceptional magnetic, temperature, and strain field sensitivity.
- Long coherence times and operational stability.
- Customizable NV densities tailored for various quantum sensing and communication applications.



---

2. Material General Description:

The **Color Center Diamond**, primarily featuring nitrogen-vacancy (NV) centers, represents an engineered single crystal diamond with unique quantum properties. These NV centers are atomic-scale defects consisting of a nitrogen atom adjacent to a vacancy in the diamond lattice. Negatively charged NV centers exhibit excellent spin coherence properties, making them ideal for quantum information science, sensing applications, and fundamental physics experiments.

Photonics On Crystals provides high-purity single crystal diamonds with controlled NV concentrations. The manufacturing process utilizes advanced doping techniques to achieve uniform NV distribution. Depending on specific requirements, NV densities are available in two configurations: DNV-B1 (low-density) and DNV-B14 (high-density). These materials are optimized for

precision sensing, enabling groundbreaking advancements in quantum communication, magnetometry, and strain field detection.

---

3. General Applications and Examples:

The **Color Center Diamond** finds extensive use in:

1. **Quantum Communication**: Ideal for secure data transfer and quantum cryptography systems, where NV centers serve as qubits.
2. **Quantum Computing**: Provides long coherence times and stable quantum states for scalable computing technologies.
3. **Magnetometry**: NV centers enable highly sensitive magnetic field measurements for material characterization and biomedical diagnostics.
4. **Temperature and Pressure Sensing**: High sensitivity in extreme environments, such as oil exploration or space instrumentation.
5. **Photon Detection and Imaging**: Advanced photon generation and manipulation for next-generation imaging systems.

Example Use Case: In secure quantum communication, high-density NV-doped Color Center Diamonds ensure stable and reliable quantum state transmission over long distances. For magnetometry, low-density NV configurations achieve ultra-sensitive field detection in biophysical and industrial applications.

---

4. Chemical, Physical, or Structural Properties:

Property	**Value**
Crystal Orientation	{100} ± 3°
Standard Dimensions (mm)	3 x 3 x 0.5 ± 0.05
Edge Roughness	≤ 0.2 mm
Carbon-13 Isotope Fraction	1.1%

---

5. Quantum Properties:

Characteristic	**DNV-B1**	**DNV-B14**
Typical Nitrogen Density (N[0])	800 ppb	13 ppm
Typical NV Density	300 ppb	4.5 ppm
Typical Coherence Time T2 (µs)	1	0.5
Typical Coherence Time T2* (µs)	200	10

---

6. Optical Properties:

Parameter	Value
Spin Coherence Time	Long stability at room temperature
Magnetic Sensitivity	High performance for precise sensing
Absorption Coefficient Range	Low for visible and infrared wavelengths
Photon Yield	Optimized for quantum efficiency

---

7. Coating Specifications:

Custom coatings are available upon request to enhance the surface quality and extend the operational performance of the diamond. Protective layers can minimize environmental impacts, including thermal and chemical exposure.

---

8. Standard Fabrication Specifications:

Fabrication Parameter	Details
Orientation	Customizable orientations available
Thickness	Configurable based on user needs
Surface Quality	< 1 nm RMS for optical-grade applications

---

9. POC Strength and Capabilities:

Photonics On Crystals (POC) excels in delivering state-of-the-art diamond-based materials optimized for quantum technologies. With precision engineering and customizable solutions, POC provides:

- Comprehensive support for product customization.
- Advanced doping techniques for precise NV center control.
- Global expertise in quantum-grade diamond manufacturing.

---

10. Standard Products:

Product Type	Dimensions (mm)	NV Density	Price (USD)
DNV-B1	3 x 3 x 0.5	Low (300 ppb)	1200
DNV-B14	3 x 3 x 0.5	High (4.5 ppm)	1500
Custom Configurations	As requested	Customizable	Upon Request

For additional customization, please contact POC.

Photonics On Crystals