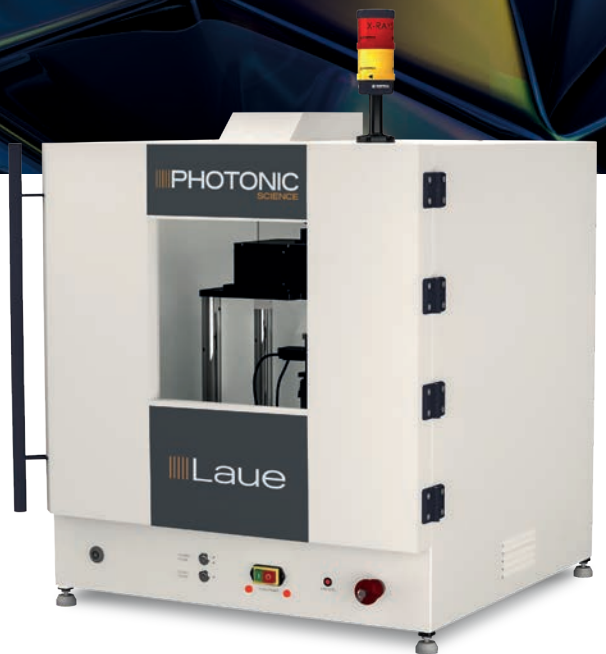


APPLICATION NOTE

Using Laue Crystal Orientation Systems for CVD Diamond Processing and Quality Control

Fast, non-destructive orientation measurement for single-crystal CVD diamond substrates, plates and production batches

Single-crystal CVD diamond is increasingly used in quantum, electronic and optical devices, where crystallographic orientation directly affects growth behaviour, colour-centre alignment, device performance, cutting strategy and final QA. Fast, repeatable orientation measurement is therefore essential for both R&D and production workflows.



Why orientation matters in CVD diamond

- | **Quantum and colour-centre devices:** alignment to diamond crystal directions supports improved sensing and photonic performance, especially in NV devices.
- | **Electronic diamond devices:** [100] substrates support homoepitaxial growth, morphology control and dopant incorporation.
- | **Optical components:** orientation control supports polarisation-sensitive optics, Raman lasers and high-power plates.
- | **Manufacturing:** orientation data guides sawing, polishing, laser marking, sorting and release documentation.

Why Laue diffraction

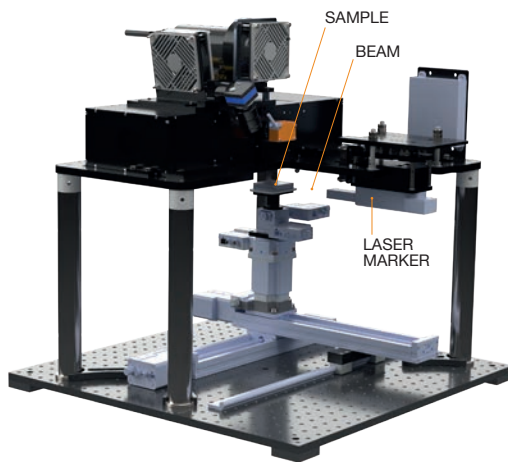
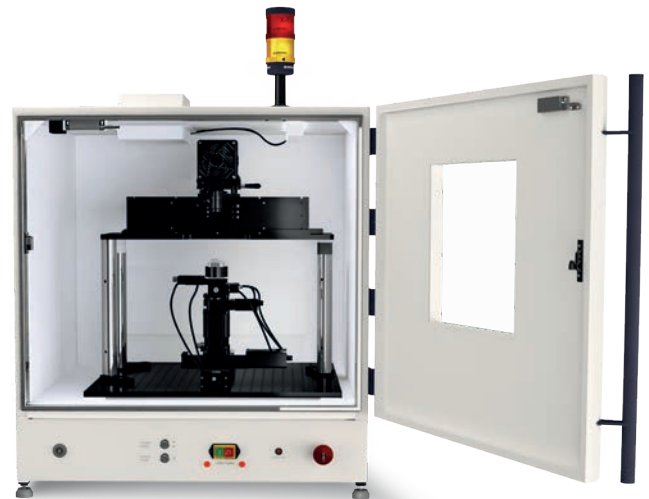
- | **Fast orientation measurement:** white-beam Laue captures multiple diffraction spots in a single exposure.
- | **Flexible sample handling:** suitable for seeds, plates, substrates and tray-mounted batches.
- | **Simple alignment workflow:** vertical/horizontal configurations, alignment cameras and motorised stages support production use.
- | **Non-destructive and automatable:** ideal for repeatable QC before cutting, polishing, laser marking or final release.

Photonic Science Laue Systems for CVD Diamond

Compact cabinet systems combining an air-cooled x-ray source and optics, a high-resolution back-reflection CCD detector, and dedicated Laue orientation software for rapid, repeatable QC without a water chiller or specialist bench infrastructure.

Core System Advantages

- | Typical CVD diamond exposures of 1-5 seconds on standard Laue configurations.
- | 450 μm beam spot, with 250 μm fine-focus option.
- | 155 x 105 mm, 2500 x 1710 pixels active detector area
- | Automated spot detection, misorientation calculation and CSV output for QA traceability.
- | Vertical or horizontal configurations with manual or motorised positioning options.



Laser Marking System

Incoming or post-growth QC

Measures CVD diamond orientation and automatically indexes patterns using PSEL Laue Software.

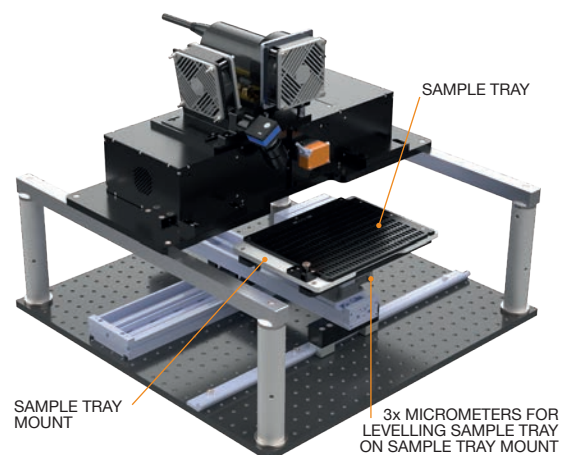
- | Motorised goniometer re-orientates to key planes such as [001], [111] and [011].
- | Integrated compact 1064 nm laser for direct misorientation marking.
- | Supports orientation-guided cutting & polishing workflows.
- | Designed for continuous production use with minimal operator input.

Batch Quality Control System

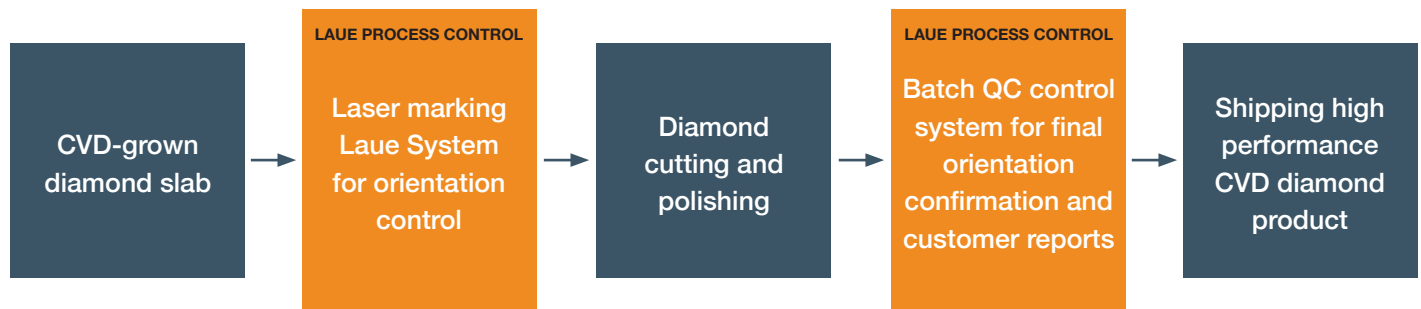
High-throughput orientation QC for CVD diamond samples

Automated inspection of multiple samples or points of interest across a tray.

- | Motorised XYZ stages for repeatable sample positioning.
- | Automated **multi-sample** scanning macros reduce operator input.
- | Supports seed verification post-growth checks, substrate sorting and final inspection.



A Practical CVD Diamond Orientation Workflow



Occasional Seed Checks and R&D Orientation

For factories, universities, and development labs that only need periodic orientation checks, **Laue-LT** provides a compact, lower-throughput route to in-house Laue capability.

It is well-suited to seed verification, process development, troubleshooting, and occasional substrate checks, where full automation is not required.

Summary

Photonic Science Laue Systems give CVD diamond manufacturers a fast route from crystal growth to orientation decision, helping reduce manual interpretation, improve repeatability, and connect growth, processing and final QA.