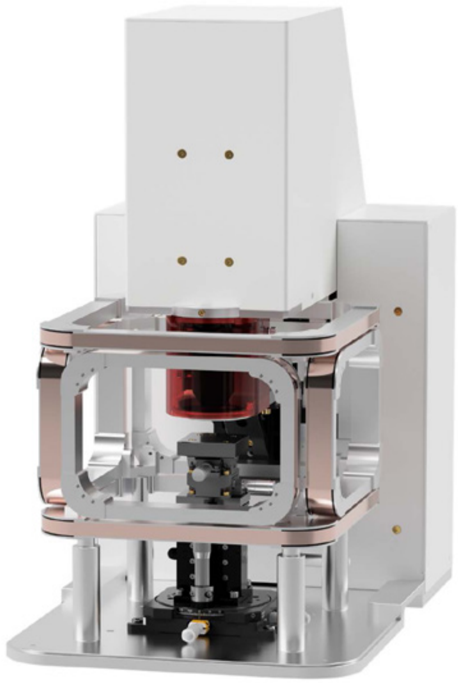
Quantum Diamond Microscope



State of the art,

wide-field imaging of magnetic fields.

Applications spanning

geoscience, bio-imaging, electronics, materials characterization, and quantum research

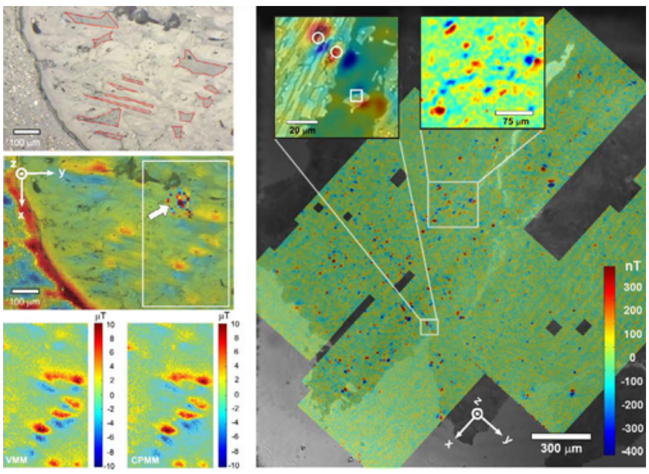
Specifiction Microscope		
	Metric	**Value**
Performance (typical)	Magnetic Sensitivity	< 5 μT/Hz (at 1 μm spatial resolution), < 200 nT/Hz (at 10 μm spatial resolution)
	Minimum Spatial Resolution	≤ 1 μm
	Field of View (FoV)	Up to (4 × 4) mm² per FoV (larger samples can be imaged with tiling, motorized stages)
	Operating Frequency	DC - 100 Hz
General	Dimensions (W x L x H)	330 mm x 493 mm x 564 mm
	Cooling	Air-cooled
	Vibration	Op. Theatre (ISO) or better
	Weight	25 kg (approx.)
Controller		
General	Cable Length (to microscope)	3 m (custom lengths available)
	Operating Voltage	100-240 VAC, 50/60 Hz
	Power Consumption	800 W max, 400 W typical
	Cooling	Air-cooled
	Weight	10 kg (approx.)
	Environment	10 °C to 35 °C, <90% R.H. (non-condensing)
	Dimensions (W x L x H)	450 mm x 450 mm x 180 mm (rack-mountable)

Highlights

- **Image millitesla to nanotesla magnetic fields**
  Tunable spatial resolution down to less than one micron and field-of-view up to (4 × 4) mm².
- **Correlate magnetic and optical images**
  Collect magnetic and optical images of samples using the same optical system for straightforward co-registration.
- **Vector measurements**
  The NV-diamond sensor enables reconstruction of the magnitude and direction of magnetic fields, providing superior reconstruction of magnetic source distributions.
- **Quantum-grade diamond**
  Manufactured by QDM.IO partner Element Six, with properties optimized for microscale magnetic field mapping applications.
- **Robust and easy to use**
  Operates under ambient room conditions, with no cryogenics, vacuum systems, or special power requirements.

Operated using Ferrum

- **Easily configure measurements with Ferrum**
  Fully integrated software with an intuitive graphical user interface, including live visualization of data during acquisition.
- **Built from the ground up for wide-field magnetic imaging**
  Continuously updated with new features and supported by expert QDM.IO technical staff.
- **GPU-accelerated data analysis**
  Go from raw hyperspectral imaging data to magnetic field maps in seconds using a suite of GPU-based data analysis tools.



Imaging of a geological sample using a quantum diamond microscope. Reproduced from GGG, Vol. 18, Iss. 8, 3254-3267 (2017). DOI: 10.1002/2017GC006946

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QUANTUM CATALYZER

Quantum Diamond Microscope

Publications
Examples of academic work using QDM technology.

GEOSCIENCE

Paleomagnetic evidence for a long-lived, potentially reversing martian dynamo at ~3.9 Ga SC Steele, RR Fu, MWR Volk, TL North, AR Brenner, AR Muxworthy, GS Collins, and TM Davison
Science Advances 9, eade9071 (2023).
DOI: https://doi.org/10.1126/sciadv.ade9071

Plate motion and a dipolar geomagnetic field at 3.25 Ga AR Brenner, RR Fu, ARC Kylander-Clarkb, GJ Hudak , and BJ Foley
PNAS 119 (42), e2210258119 (2022).
DOI: https://doi.org/10.1073/pnas.2210258119

Micrometer scale magnetic imaging of geological samples using a quantum diamond microscope
DR Glenn, RR Fu, P Kehayias, D Le Sage, EA Lima, and BP Weiss Geochemistry, Geophysics, Geosystems 18 (8), 3254-3267 (2017).
DOI: https://doi.org/10.1002/2017GC006946

Solar nebula magnetic fields recorded in the Semarkona meteorite RR Fu , BP Weiss, EA Lima R. J Harrison, X-N Bai, SJ Desch, DS EbelL, C Suavet, H Wang, DR Glenn, D Le Sage, T Kasama, RL Wals- worth, and AT Kuan
Science 346,1089-1092 (2014).
DOI: https://doi.org/10.1126/science.1258022

LIFE SCIENCES

Single-cell magnetic imaging using a quantum diamond micro- scope
DR Glenn, K Lee, H Park, R Weissleder, A Yacoby, MD Lukin, H Lee, RL Walsworth, and CB Connolly
Nature Methods 12, 736–738 (2015).
DOI: https://doi.org/10.1038/nmeth.3449

Optical magnetic imaging of living cells
D Le Sage, K Arai, DR Glenn, SJ DeVience, LM Pham, L. Rahn-Lee, M.
D. Lukin, A.Yacoby, A Komeili, and RL Walsworth
Nature 496, 486–489 (2013).
DOI: https://doi.org/10.1038/nature12072

HC Davis, P Ramesh, A Bhatnagar, A Lee-Gosselin, JF Barry, DR Glenn, RL Walsworth, and MG Shapiro
Nature Communications, 9(1): 131 (2018).
DOI: https://doi.org/10.1038/s41467-017-02471-7

CONDENSED MATTER, MATERIALS SCIENCE, AND ELECTRONICS

Imaging Viscous Flow of the Dirac Fluid in Graphene Using a Quantum Spin Magnetometer
MJH Ku, TX Zhou, Q Li, YJ Shin, JK Shi, C Burch, H Zhang, F Casola, T Taniguchi, K Watanabe, P Kim, A Yacoby, and RL Walsworth Nature 583, 537–541 (2020).
DOI: https://doi.org/10.1038/s41586-020-2507-2

Magnetic Field Fingerprinting of Integrated-Circuit Activity with a Quantum Diamond Microscope
MJ Turner, N Langellier, R Bainbridge, D Walters, S Meesala, TM Babinec, P Kehayias, A Yacoby, E Hu, M Lončar, RL Walsworth, and EV Levine
Physical Review Applied 14, 014097 (2020).
DOI: https://doi.org/10.1103/PhysRevApplied.14.014097

QUANTUM RESEARCH

High-Precision Mapping of Diamond Crystal Strain Using Quantum Interferometry
MC Marshall, R Ebadi, C Hart, MJ Turner, MJH Ku, DF Phillips, and RL Walsworth
Phys. Rev. Applied 17, 024041(2022)
DOI: https://doi.org/10.1103/PhysRevApplied.17.024041

Characterisation of CVD diamond with high concentrations of nitro- gen for magnetic-field sensing applications
AM Edmonds, CA Hart, MJ Turner, PO Colard, JM Schloss, KS Ols- son, R Trubko, ML Markham, A Rathmill, B Horne-Smith
Mater. Quantum. Technol. 1 025001(2021)
DOI: https://doi.org/10.1088/2633-4356/abd88a