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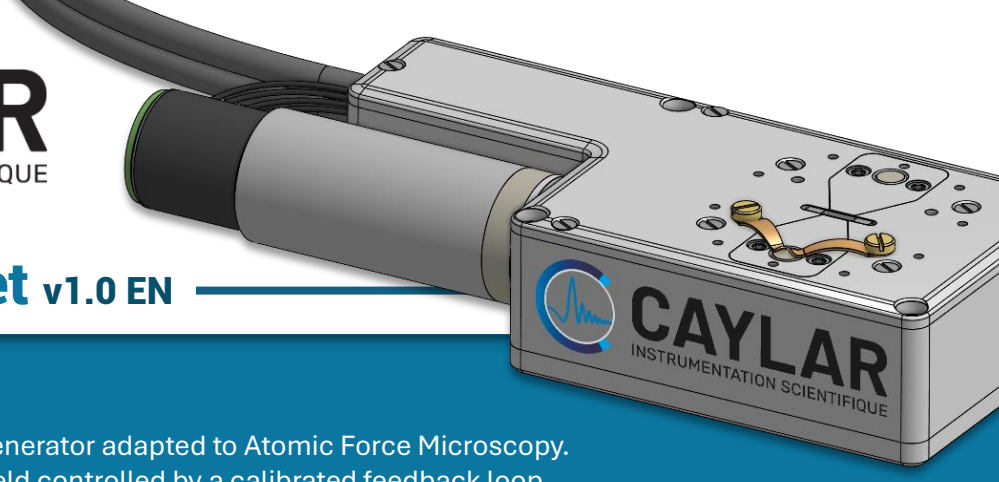
INSTRUMENTATION SCIENTIFIQUE



MFG V24 Datasheet v1.0 EN

DESCRIPTION

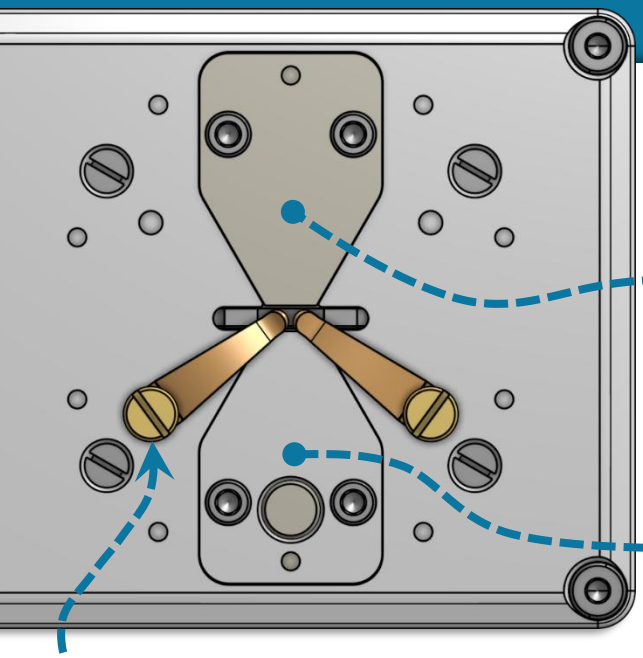
The MFG is a compact Magnetic Field Generator adapted to Atomic Force Microscopy.
It produce a variable bipolar magnetic field controlled by a calibrated feedback loop.
The system is composed of one Magnetic Field Controller (MFC) and one Magnetic Field Module (MFM).
The MFG is capable of in-plane (≈ ±0.6T) and out-of-plane (≈ ±0.2T) field operations.

MFM Characteristics

Dimensions	117 x 42 x 21.1 mm (l x w x h)
Cable length (to MFC)	≈ 3 meters (optional 1 to 10 m)
High vacuum compatibility	Optional, 5.10-7 mbar

MFC Characteristics

Dimensions	Rack 2U – 315.5 x 235.54 x 95.3 mm (l x w x h)
Remote controls	Ethernet / RS232 / USB (Serial)
Manual controls	Front rear Oled Screen & Keyboard
Supply voltage	100 to 240 VAC / 47 to 63 Hz (28VA MAX)



In & Out of plane poles configuration

MFM is provided with two different sets of two poles optimized for in-plane or out-of-plane.

INPLANE

	min	typ.	max	Unit
Max B range [1]	± 0.55	± 0.57	± 0.61	T
Sensor noise [2]		3	26	uT rms
Max regul error		0	± 0.5	mT
Max regul overshoot [1]		0	0.7	mT
Absolute Accuracy [1]		< ± 2		mT

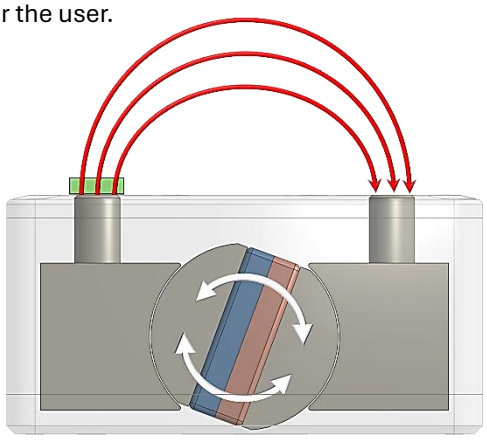
OUTPLANE

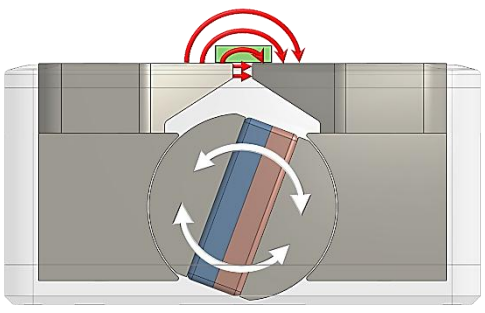
	min	typ.	max	Unit
Max B range [1] (Symmetric in open loop)	- 0.175 +0.195	- 0.19 + 0.2	- 0.195 + 0.21	T
Sensor noise [2]		10	44	uT rms
Max regul error		0	± 0.2	mT
Max regul overshoot [1]		0	0.3	mT
Absolute Accuracy [1]		< ± 1		mT

(1): **Measured and calibrated at 0.3 mm from surface**, centered at the user sample position by an external hall sensor.
(2): Feedback Hall sensor noise: real magnetic field noise is lower than these values and only dependent of thermal noise and system vibrations.

Clips and fixations

MFM is provided with a set of two removable clips for user sample fixation. Additional M2 and M1.6 mounting holes are also available for the user.





These two drawings present a cross-view of the MFM magnetic circuit for out and in plane configuration. It shows the operating principle.

Theoretical field lines
User sample position

Fully open and custom system

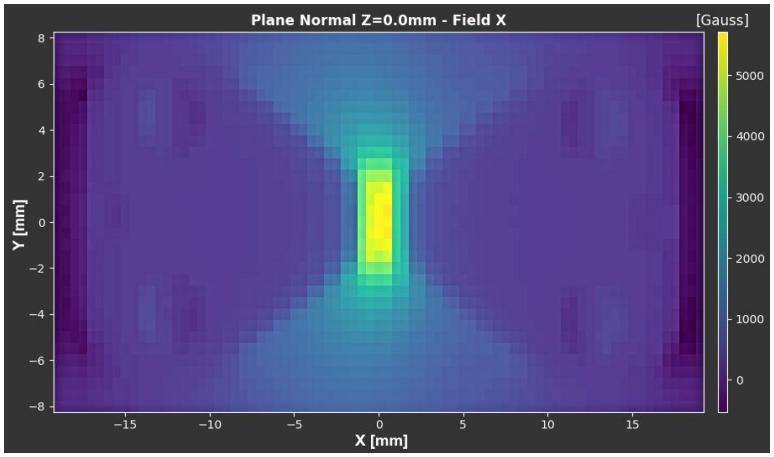
You can use the system in closed loop or open loop by controlling the stepper motor by yourself. You can also create your own calibration table instead of the default calibration.

We can provide customs calibrations for your different sample thickness on request as well as custom program for your specific needs.

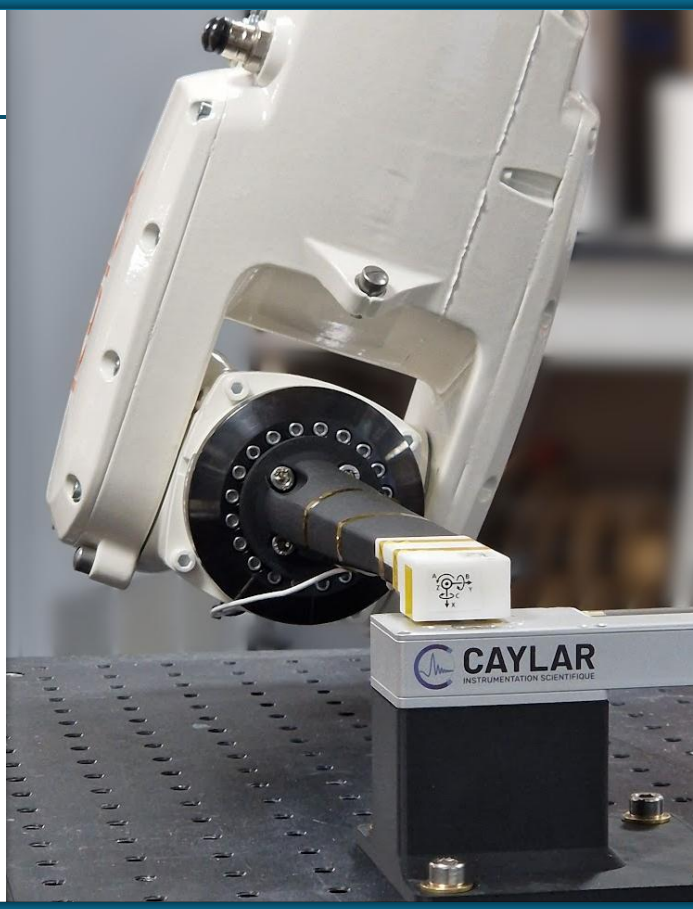
3D field mappings datas

Complete maps of the field module for different intensity are available. The maps are made by a robotic arm with a spatial resolution up to 0.1 mm. The magnetic field is measured by a 3-axis hall sensor.

We can simulate and provide custom poles on request for different field intensity/homogeneity.



Example of mapping result for in-plane config. at B = +0.55T



Example of use with Park System AFM - 2d Material: Pt/Co h-BN Sample

- The picture bellow shows MFM phase changes due to externally applied out-of-plane magnetic fields.
- Magnetic textures in the Pt/Co (1.9 nm) h-BN sample imaged by polar magneto-optical Kerr microscopy (a) (PMOKE) and magnetic force microscopy (b-e) at different out-of-plane fields. Acquired on Park NX10 AFM with the MFG system.
- Data re-processed from a figure originally published in Ref. 1 with a permission. Ref. 1: B. El-Kerdi, Nano Letters. 8, 3202–3208 (2023)