

## Model 74046 Magnetoresistance (MR) Probe Option

The MR probe option performs fast and reliable measurements of MR, GMR spin-valve, CMR and other magnetoresistive materials as a function of both in-plane magnetic field and temperature. This measurement option includes data acquisition, control, and analysis software to automatically extract pertinent parameters for the device under test. These include free and pinned layer parameters of both simple and synthetic spin-valve sensors.

The MR probe features four in-line pins for solder-less connection to the sample and is interchangeable with the VSM sample rod for compatibility with variable temperature and autorotation options. The temperature range of use extends from 20 K to 450 K when used with the 74018 LHe/LN<sub>2</sub> cryostat, 325 K to 673 K with the 74034 oven, and 100 K to 673 K with the 74035 single-stage variable temperature assembly. Angular dependent MR measurements are possible when used in combination with the 74033 autorotation option. Contact pins maintain their position on the sample while the entire assembly rotates with respect to the magnet field.



The fully automated MR software is an intuitive yet powerful user interface providing automatic control of all experimental parameters for unattended operation. Experiment recipes can be saved, retrieved, and edited, and measurement data can be displayed and exported in graphical or tabular format. Multiple step profiles can also be defined to allow for flexibility in the preparation steps and for developing annealing step process methodologies.

The MR probe option is composed of several user-replaceable parts, including contact pins, ceramic pin guides, a ceramic sample holder, a contact pressure spring, and a printed circuit board, providing the convenience of in-field service.

### Included Equipment

1. MR hardware insert
2. Lake Shore Model 776 matrix switch
3. Model 2400 Keithley sourcemeter
4. 4-wire I-V cable and MR adapter box
5. MR spare kit (2 PCBs, 1 contact pressure spring, 8 points, 1 pin guide, 1 lower holder — user-replaceable)

### Specifications

Number of probes	4
Probe pin to pin spacing	0.9 mm
Total 4-pin spacing	2.7 mm
Nominal sample cross-section	4.5 mm × 4.5 mm
Maximum sample height	3 mm
Temperature range	20 K to 673 K
Current ranges	6 ranges; 1 μA to 100 mA
Current direction	In-plane
Resistance ranges	9 ranges: 0.2Ω, 2 Ω, 20 Ω, 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, up to 10 MΩ
Probe tip compliance voltage	0 V to 5 V, measurement 0 V to 100V, contact formation

### Ordering Information

- 74046** Magnetoresistance option—can be used with variable temperature options (741-VTA not included)
- 74035** Single stage variable temperature option
- 74018** LHe/LN<sub>2</sub> variable temperature cryostat option
- 74034** High temperature oven option
- 74033** Autorotation option
- 741-VTA** Variable temperature option kit (required for use with variable temperature options only)
- E2M** Rotary vacuum pump with KF-16 inlet for evacuating oven vacuum space to 0.13 Pa ( $1 \times 10^{-3}$  torr) — only required for use with variable temperature options
- TPS-FRG** Compact turbo pumping system for cryogen transfer line maintenance usage (can also be used in place of the E2M rotary vacuum pump) — only required for use with variable temperature options

