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NMR Permanent Magnet PM-1055

*A secondary field reference for NMR testing
and Hall teslameters calibration*



Real size view of PM-1055 Magnet

Principal uses of this compact magnet are a consequence of its main technical properties :

- **High field homogeneity**, associated with a **large gap**, compared to its small external dimensions.
- Simple way for testing NMR magnetometers without need of a big magnet.
- Stable field generation for calibration of Hall magnetometers ; primary calibration by NMR.
- Magnet, needing no power supply, for laboratory physics experiments.

- This type of magnet is proposed in various field strength value, from 0.01T to 0.5T; for low field values, physical dimensions are identical, up to 0.27T; for 0.5T, dimensions increase.

- The gap dimension allows to place any current magnetometer probe in the homogeneous zone.

- The field homogeneity in the center of the gap is such as NMR signal on sample up to 1cm³ can get good signal (see specs in the table at next page).

- The stray field outside magnet PM-1055 is reduced to a minimum, reducing care of ferrous mass elimination near the magnet (see graph next page).

- A coil allows field compensation with PT2025 Metrolab NMR magnetometer for example, or low frequency field modulation (<11Hz) for simple NMR signal detection; this coil is fed via a coaxial Lemo, size 0, with one end at the magnet mass (see specs next page).

- The main cause of field value drift is temperature, due to TC specs of the magnet core material. Correction of this drift may be performed by measuring temperature of the magnet. Pt RTD may be used on both sides of the magnet, in brackets fixed with the M4 or M6 tapped holes.

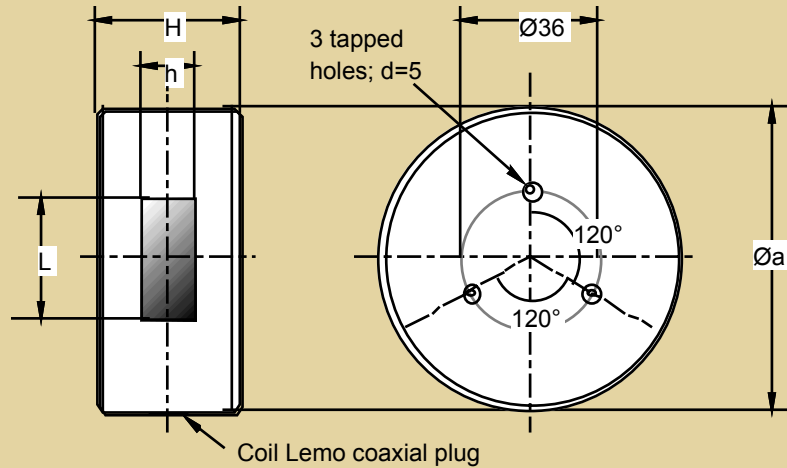
- Such a compensation may be realized using an NMR magnetometer as reference.

- For Hall devices calibration, NMR reference may be used, in the same time if the probes can be installed side by side, or alternately with temperature control.

- For students' experiments, PM-1055 magnet may be used either for NMR demonstration or for experiments on charged particles deviation.

- The association of a set of PM-1055 magnets of different field values with a Metrolab PT-2025 magnetometer, with the corresponding probes, can realize a ready-made calibration system.

Physical dimensions

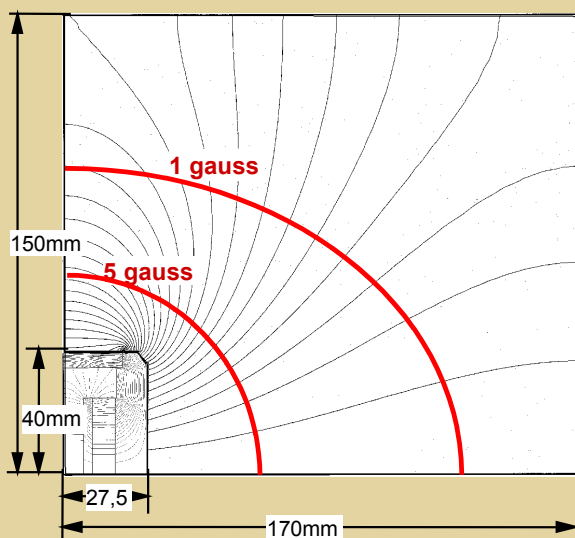


Specifications

| Ordering denomination | PM-1055... -001F | -005F | -010F | -027S | -050N |
|--------------------------|---------------------|---------|---------|---------|---------|
| Tesla value(+/-10%) | 0,01 | 0,05 | 0,105 | 0,27 | 0,5 |
| Magnet core material | Ferrite | Ferrite | Ferrite | Sm/Co | Nd/Fe/B |
| Temp.coeff.(ppm/°K) | -2100 | -2100 | -2100 | -350 | -1200 |
| Size (Øa x H mm) | 80 x 39 | 80 x 39 | 80 x 39 | 80 x 39 | 80 x 55 |
| 3 tapped holes :120°/Ø36 | M4 | M4 | M4 | M4 | M6 |
| Gap (Ø x H mm) | 50 x 13 | 50 x 13 | 50 x 13 | 50 x 13 | 50 x 13 |
| Homogeneous diam.(mm) | 12 | 12 | 12 | 12 | 12 |
| Aperture (L x h mm) | 32 x 14 | 32 x 14 | 32 x 14 | 32 x 14 | 32 x 14 |
| Auxil. coil (+/-T/A) | 0,06 | 0,06 | 0,06 | 0,06 | 0,075 |
| I _{max} (+/-mA) | 50 | 50 | 50 | 50 | 50 |
| Approx. Weight (g) | 920 | 920 | 920 | 920 | 1250 |

Stray field map

For this purpose, we only represent ¼ of the region around the magnet, because of the symmetry. The graph concerns magnet PM-1055-050N, and the two red lines delimit the 1 and 5 gauss zones (0.1 and 0.5 mT), corresponding respectively to $2 \cdot 10^{-4}$ and 10^{-3} of the gap field.



This graph shows the dimensions of the zone affected by the presence of the magnet, but also where ferrous magnetic pieces should not be placed in order not to affect value of the inner field

NMR Field Calibrating System

This example shows a calibration system consisting in a PT-2025 equipped with a 1062-3 type probe and a permanent magnet type PM-1055-027S. Additional magnets and probes can extend the field range of calibration.



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