Integrating fluxmeters are often used to control permanent magnet devices by the use of sense coils. The Laboratorio Elettrofisico Helmholtz coils are an easy addition to any fluxmeter for a fast, accurate and low cost measuring technique to control the quality of permanent magnets. Our design consists of a pair of identical wound coaxial coils, connected in series at a fixed distance equal to their radius. This configuration permits the sample to be placed in a large uniformity central volume.

**KEY BENEFITS**

- Easy to use
- Low cost
- Precise and accurate
- Meets international standards (IEC 60404-14)
- Non-destructive method of testing
- Feedback control for calibration and magnetization system

**MEASURING PRINCIPLE**

When connected to a fluxmeter, the Helmholtz coil provides an output flux $\Phi$ proportional to the magnetic moment $M$ of the sample: $\Phi = K_H \cdot M$, where $K_H$ is the coil’s constant (each coil is given with the proper certified constant).

This measurement procedure is described in the International Standard IEC 60404-14.

The magnetic moment is an essential magnetic property. For a permanent magnet sample, the magnetic moment $M$ is the product of its magnetic polarisation $J_d$ (in the working point) and its volume $V$; this gives directly the Helmholtz coil's formula:

$$J_d = \frac{K_H \cdot \Phi}{V}$$

For example: for ferrites and rare earth magnets, having essentially a linear $J$ vs. $H$ relationship in the second quadrant, the $J_d$ is very close to the magnetic remanence $B_r$. 
HOW IT WORKS

When connected to a fluxmeter, the Helmholtz coil provides an output flux $\Phi$ proportional to the magnetic moment $M$ of the sample: $M = K_H \Phi$ where $K_H$ is the coil’s constant (each coil is provided with its own certified constant). This measurement procedure is described in the International Standard IEC 60404-14.

$J = \frac{K_H \cdot \Phi}{V} \cdot \frac{\alpha}{\sin\alpha}$ (\(\alpha\) in radiant)

HOW TO MEASURE

How to choose the right Helmholtz coil size

The large volume with field uniformity in the center of the Helmholtz coils is approximately an ellipsoid having a major axis of 0.93 R and a minor axis of 0.62 R. The magnet to be measured should fit within this volume to have the best reading accuracy (uniformity within 1%).

The resulting Helmholtz coil measurement is an intrinsic quantity (the magnetic moment) of the sample that can be used as the reference criteria for cross-comparison (between suppliers, customers, etc) and quality control (QC).

MODELS AVAILABLE

<table>
<thead>
<tr>
<th>Models</th>
<th>Diameter</th>
<th>$K_H$ (typical)</th>
<th>Measurement Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/R15</td>
<td>32 mm (1.18&quot;)</td>
<td>$4.5 \cdot 10^{-5}$ m</td>
<td>12 mm (0.47&quot;) - H 9 mm (0.35&quot;)</td>
</tr>
<tr>
<td>HM/R32</td>
<td>64 mm (2.52&quot;)</td>
<td>$1.1 \cdot 10^{-4}$ m</td>
<td>29 mm (1.14&quot;) - H 19 mm (0.75&quot;)</td>
</tr>
<tr>
<td>HM/R58</td>
<td>116 mm (4.57&quot;)</td>
<td>$4.5 \cdot 10^{-4}$ m</td>
<td>53 mm (2.086&quot;) - H 34 mm (1.338&quot;)</td>
</tr>
<tr>
<td>HM/R100</td>
<td>200 mm (7.87&quot;)</td>
<td>$2.8 \cdot 10^{-3}$ m</td>
<td>90 mm (3.543&quot;) - H 60 mm (2.362&quot;)</td>
</tr>
<tr>
<td>HM/R150</td>
<td>300 mm (11.81&quot;)</td>
<td>$7.3 \cdot 10^{-3}$ m</td>
<td>135 mm (5.314&quot;) - H 90 mm (3.543&quot;)</td>
</tr>
<tr>
<td>HM/R250</td>
<td>500 mm (19.69&quot;)</td>
<td>$8.8 \cdot 10^{-3}$ m</td>
<td>225 mm (8.86&quot;) - H 150 mm (5.91&quot;)</td>
</tr>
</tbody>
</table>

Size 32/58/100 always in stock. Customized models are also available upon request.
Founded in 1959, Laboratorio Elettrofisico is a global company specializing in engineering, designing, and manufacturing the world's most precise magnetizing and magnetic measuring equipment. Headquartered in Milan, LE has laboratories, testing facilities, support staff, and services centers in the United States, India, and China.