# APPLICATION NOTES

## High accuracy (0.2 A/m = 0.0025 Oe) coercivity meter to complement VSM's accuracy limit and internal stress by drying of the plastic cement

**In conjunction with global efforts to realize a decarbonized society, a rapid shift is occurring toward EVs and renewable energy. What is indispensable for energy conservation, which is needed in the entire industry, is high-performance soft magnetic materials that minimize energy loss due to the conversion of eddy currents generated by electromagnetic induction phenomena into thermal energy. There are a variety of materials with various compositions, but the coercive force of 50 A/m or less, and even around 1 A/m in the development of cutting-edge materials, are at the forefront. On the other hand, the measurement limit of a vibrating sample magnetometer (VSM), which is the mainstream for measuring magnetic properties, is at most 50 A/m. Since the measured values vary by several tens of A/m, the limit of accuracy that can be considered as reliable measurement is only several hundred A/m. The relationship is shown in Figure 1.**

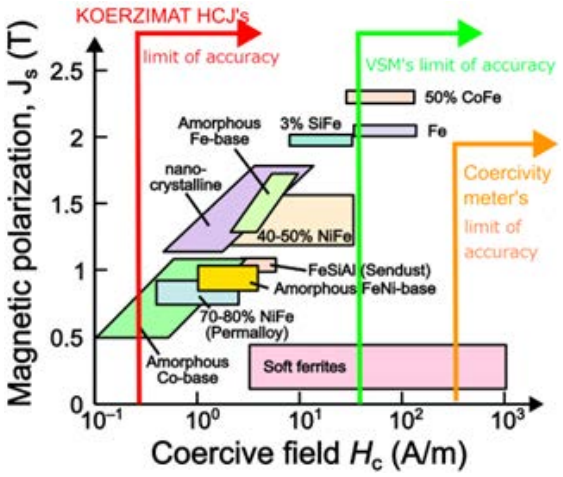


*Figure 1: Soft magnetic materials with low coercivity*


*Figure 2: KOERZIMAT HCJ (Coercivity Meter)*

The reality is that the coercive force measurement limit of accuracy in VSM (yellow-green line) and a readily available coercive force meter (orange line) hardly cover the accuracy required for the measurement of advanced high performance soft magnetic materials that are currently expected to be developed and manufactured.

Another problem with VSM is that the drying of the plastic cement that holds the sample in place causes internal stress in the sample, which in turn reduces the accuracy of the coercive force measurement.

In contrast, the red line is Foerster's KOERZIMAT HCJ (Figure 2), which has a measurement accuracy of 0.2 A/m = 0.0025 Oe and complies with IEC 60404-7 „Method for measuring the saturation coercive force (below 160 kA/m) of magnetic materials in an open magnetic circuit", revised in January 2019.

With KOERZIMAT HCJ, the needs for accurate coercivity measurement of advanced high performance soft magnetic materials are almost covered. The measurement time is only a few minutes.

For samples that fit into a space of up to Φ 40 mm x 130 mm or Φ 60 mm x 80 mm, KOERZIMAT HCJ can accurately measure the coercive force even for parts that require evaluation in their manufactured state, parts with complex shapes, or parts assembled from multiple parts, even when the magnetic force changes significantly due to machining distortion, changes in magnetic domains, and other effects.

**Further applications**

KOERZIMAT HCJ has been the de facto standard for quality control in the cemented carbide supply chain for several decades worldwide. KOERZIMAT HCJ is used to control the sintering process by measuring the coercive force to evaluate the grain size of tungsten carbide.

**Related product**

KOERZIMAT MS (Figure 3) can measure saturation magnetization and determine the ratio of tungsten carbide to cobalt or nickel by measuring saturation magnetization, both non-destructively and quickly, and is used from the development stage to production quality control.


*Figure 3: KOERZIMAT 1.097 MS (Saturation Polarization)*