

# System for characterisation of AC properties of permanent magnets

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MEASUREMENTS

## Introduction

In the high-speed multi-pole synchronous electric machines the eddy current loss in permanent magnets has a considerable influence on their efficiency. Heat generated within the rare-earth magnets, such as neodymium iron boron (NdFeB), increases their temperature and reduces their strength resulting in impaired performance. To meet the growing need for characterization of the permanent magnet properties under dynamic magnetization Brockhaus Messtechnik has developed a new measurement system for evaluation of their eddy current loss under arbitrary magnetization conditions. This measurement system can be used for loss comparison of magnets with different sizes, geometries and lamination ratios, allowing their optimum selection for electric drives and automotive applications.

## Main features

- Max magnetising field  $H$  of 350 kA/m
- Suitable for measuring magnets with cross-sections up to 30mmx30mm (customised pole caps designs for other magnet sizes are also possible)
- Adjustable distance between electromagnet poles for testing magnets with height within range from 2mm to 30mm
- Electromagnet core made of high permeability material and low AC power loss
- Simultaneous measurements of flux density  $B$  and magnetic field strength  $H$
- Adjustable number of primary and secondary windings for optimisation of magnetisation conditions within wide range of measurement frequencies ( up to 2kHz)
- Suitable for characterisation of various types of magnets, such as NdFeB, SmCo, Alnico
- Compatible with Brockhaus MPG200 measurement unit

## Measurement setup



## Types of measurements

The following AC properties characterisation of permanent magnets can be performed :

- Measurement of AC power loss of permanent magnets under various magnetisation conditions, such as: sinusoidal magnetisation and user-defined magnetisation
- Influence of geometry and dimensions of permanent magnets on their AC power loss
- Measurements of magnetic properties of non-magnetised permanent magnets
- Evaluation of effective reduction in AC power loss by segmentation of permanent magnets
- Investigation of the effect of switching frequencies of power electronics (PWM) on the AC power loss in permanent magnets