

# Characterization of the accommodation effect in soft hysteretic materials via sensorless measurement technique

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## Abstract-

The well-known voltamperometric method has only been used so far in the identification of symmetric hysteresis cycles for reasons that are explained in the main text. This paper extends the sensorless measurement method to the characterization of asymmetric loops, without losing the main advantage of this technique, i.e., the low-cost setup and the simplicity of the procedure. The current through-and the induced voltage on-the primary and secondary coils, which are wound around a magnetic core, are the measurands. Moreover, by carefully choosing the input signals, so that a series of major loops is defined along the whole  $B - H$  measured path, a way is suggested to avoid the problems caused by the dc offset of the instrumentation chain and to reduce the uncertainty in the determination of the initial state of magnetization. Both the offset and the initial magnetization state are necessary for a correct reconstruction of the induction field. A complete analysis of the capabilities and critical aspects of the proposed measurement procedure is carried out through a theoretical discussion supported by simulation and experimental results. The measurement of nonsymmetric cycles and their accommodation are shown and discussed as the final objective of the proposed approach.

**Index Terms-** Accommodation, magnetic hysteresis, modeling, nonsymmetric cycles, sensorless measurement technique, soft magnetic materials

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