Are you already familiar with our industry-standard services?

- Accredited testing laboratory in accordance with DIN EN ISO/IEC 17025 for various NDT methods
- Certificate of competence of the accredited laboratory to qualify and validate (new) nondestructive testing methods for industrial testing practice in the field of ultrasonic testing
- Rapid transfer to market readiness for qualified, standard-compliant use in industrial applications, both for new developments (in-house developments) or for adaptations
- Our associated quality management system is certified in accordance with DIN EN ISO 9001

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Sensor and Data Systems for Safety, Sustainability and Efficiency



Inspecting material properties magnetically

3MA-II, 3MA-X8, BEMI



Left: Steel cable stress analysis with 3MA-X8; middle: Analyzing hardness and hardness depth of induction-, case- and nitride-hardened components

Micromagnetic materials characterization with 3MA-II, 3MA-X8 and BEMI

Iron and steel parts are often made from ferromagnetic materials. They are thermally treated and machined to create functional characteristics. Determining the quality of the surface layer properties requires suitable inspection methods. Micromagnetic methods offer a fast, nondestructive way to characterize and analyze materials with up to 100 percent process integration.

Micromagnetic inspection systems

- 3MA-II (Micromagnetic Multiparameter, Microstructure and Stress Analysis): High-performance system for material characterization
- 3MA-X8: Simple calibration, high measuring speed, flexible sensor shaping, concurrent operation of several sensors with a single inspection device

 BEMI (Barkhausen Noise and Eddy Current Microscope): 3MA with special high-resolution sensor; scanner for determining material characteristics

Functionality

The systems combine four micromagnetic methods:

- Harmonic analysis in the time signal of the tangential magnetic field strength (3MA-II, 3MA-X8)
- Magnetic Barkhausen noise analysis (3MA-II, BEMI)
- Incremental permeability analysis (3MA-II, 3MA-X8, BEMI)
- Eddy current impedance analysis (3MA-II, 3MA-X8, BEMI)

Right: Barkhausen noise and eddy current microscope BEMI

Carrying out these methods at multiple frequencies supplies more than 40 micromagnetic parameters representing the characterization of the material structure. By combining these parameters, production issues such as batch fluctuations and tolerances can be easily managed. Onetime calibration using defined component conditions is required for the quantitative determination of the material characteristics. Common target parameters are:

- Hardness, hardness depth
- Layer thickness and layer properties
- Residual and load-induced stress
- Microstructures
- Tensile test values

Examples of application

- Quality assurance for induction, case, press, nitride, laser, electron beam hardening processes
- Grinding burn characterization
- Detection of thermal treatment defects
- Surface hardening characterization

- Online characterization of rolled steel
- Incoming goods inspection
- Residual, load-induced stress testing, even on integrated components
- Monitoring and recurring inspections (early detection of thermal aging, neutron embrittlement, fatigue, creep damage, stress change)
- Material characterization with high spatial resolution

Benefits

- Fast, nondestructive testing of material characteristics up to a depth of 5 mm
- Simultaneous determination of multiple quality parameters
- Continuous monitoring and documentation of quality parameters
- Increase of the inspected production volume; more cost-effective production by cost reduction
- Integrated process monitoring
- Custom implementation to meet special requirements (test probe design, software)