By the way, you already know our industrial grade accredited inspection services?

- Accredited laboratory in line with DIN EN ISO / IEC 17025, to qualify and validate new non-destructive testing (NDT) processes for industrial applications
- Accelerated time-to-market and opportunity for qualified, norm-compliant deployment in industrial applications as well as for complete new in-house developments or custom adaptation of innovative NDT technologies, even in fields where norms have not been established
- Certification of the corresponding quality management system in accordance with DIN EN ISO 9001

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Iron and steel parts, as well as components used in machines, vehicles and plant engineering are often made from ferromagnetic materials. These components are thermally treated and machined in order to create the desired functional characteristics. Determining the quality of the surface layer properties requires suitable inspection methods. Micromagnetic methods offer a fast and nondestructive way to characterize and analyze materials during or directly after a production step with up to 100 percent process integration.

**Micromagnetic Inspection Systems**

- **3MA** *(Micromagnetic Multiparameter, Microstructure and stress Analysis)*
  - High-performance inspection system for material characterization in manufacturing and development
- **MikroMach** *(Micromagnetic Material Characterization)*
  - Transportable, compact version of the 3MA with limited frequency range
- **BEMI** *(Barkhausen Noise and Eddy Current Microscope)*
  - 3MA with special high-resolution sensor
  - Scanner for determining material characteristics with high spatial resolution of up to 10 μm

**Functionality**

The 3MA, MikroMach and BEMI inspection systems combine four micromagnetic methods:

- Harmonic analysis in the time signal of the tangential magnetic field strength
- Magnetic Barkhausen noise analysis
- Incremental permeability analysis
- Eddy current impedance analysis

Carrying out these methods under multiple frequencies supplies more than 40 micromagnetic parameters which represent the characterization of the material structure. By combining these parameters in a multiparameter approach, production issues such as batch fluctuations and handling/processing tolerances can be easily managed. One-time calibration using defined component conditions is required for the quantitative determination of the material characteristics.

**Common target parameters for the calibration include:**

- Hardness
- Hardness depth (SHD, CHD, NHD)
- Layer thickness and layer properties
- Residual and load-induced stress
- Microstructures
- Tensile test values (strength, yield, breaking elongation, etc.)

**Application Examples**

- Quality assurance for induction, case, press, nitride, laser and electron beam hardening processes
- Grinding burn detection and characterization
- Detection of thermal treatment defects
- Surface hardening characterization
- Online characterization of rolled steel
- Incoming goods inspection
- Residual and load-induced stress testing, even on integrated components
- Monitoring and recurring inspections (early detection of thermal aging, neutron embrittlement, fatigue, creep damage, stress change)
- High spatial resolution material characterization and optimization

**Benefits**

- Fast, nondestructive testing of material characteristics to a depth of 5 mm
- Simultaneous determination of multiple quality parameters
- Continuous monitoring and documentation of quality parameters
- Alternative to destructive test methods
- Increases the volume of production that can be inspected
- More cost-effective production by reducing the costs associated with testing and defects (rejects, rework, etc.)
- Integrated process monitoring
- Custom implementation to meet special requirements (test probe design, software)