



MAGNATEST® ECM

Material properties test module

3.621



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Application

MAGNATEST EMC is the line-ready compact module for simple testing tasks. The unit simply and reliably performs testing tasks such as material mix and deviation testing as well as deviations in surface hardness and case-hardening depth. MAGNATEST ECM is designed to be used as the core component in quality assurance systems during series production and for installation in production systems. It is particularly suitable for applications that primarily focus on profitability and less on multiple functions.

Simple testing of mass-produced components for **differences in:**

- Identification, material differentiation or sorting
- Microstructure
- Strength
- Hardness

Testing of **geometric characteristics**, such as:

- Shape accuracy
- Completeness of assembled parts (bearings, etc.)
- Machining state on all metallic series parts, e.g. hubs, steering system components, connecting rods, sintered carbide balls, chain links, profile shafts, shearing heads

Features of MAGNATEST® ECM

- Low-cost eddy current module for non-destructive material property testing
- Genuine magnetic induction testing using harmonic wave evaluation
- Test parameters can be varied in large ranges
- Very simple device operation
- Sorting of the test pieces into two groups „OK“ and „NOK“
- Unidimensional measured value display using LED bar graph
- Key switch for operation locking

Operating principle

The part to be tested non-destructively is subjected to an alternating magnetic field which is generated within the test sensor. While in the presence of the magnetic field, eddy currents are induced in the electrically conductive component by magnetic induction.

Depending on the electrical conductivity and the hysteresis characteristics of the test material, a potential is then transferred from the material to the receiver winding of the test sensor.

Analysis of the received signal allows evaluation of many different conductive materials (ferromagnetic, austenitic, and non-ferromagnetic).

As the hysteresis loop is strongly influenced by material properties such as hardness, alloy content, and grain structure, the properties of the component can be accurately determined by analyzing its electrical conductivity and magnetic permeability.

At higher excitation field strengths, a non-sinusoidal signal is received that is composed of the fundamental frequency, plus additional higher harmonics (electromagnetic noise).

Analysis of the harmonic content of the received signal shows very accurate information about the mechanical or thermal treatment of ferromagnetic materials. If the material is able to be evaluated by analyzing the harmonic component of the received signal, the resultant test will be extremely stable and very reliable.

Changing the various properties of the material will influence different areas of the hysteresis loop. By varying the excitation field strength, the test can be focused on a specific area of the hysteresis loop which provides the most accurate information about the specific property to be determined. By selecting the appropriate excitation frequency or range of frequencies, the penetration of the magnetic field into the material can be controlled, allowing both surface and internal properties to be determined independently or simultaneously.

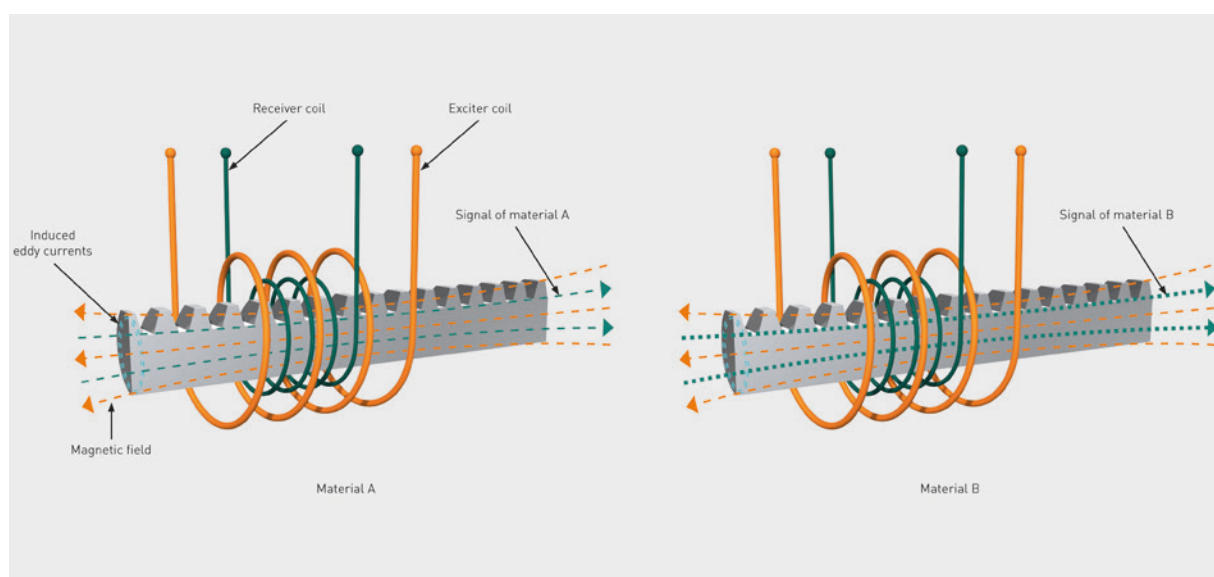


Fig 1: Schematic drawing of the magnetoinductive testing

Mechanical construction

In its standard configuration, the MAGNATEST ECM consists of the components:

- MAGNATEST ECM 3.621
- Mains cable, sensor cable
- Sensor system

The system can be adapted in steps to the specific test situation by adding further components:

- MAGNATEST ECM / LV
- Housing 6 HU
- Configuration adapter
- Combination with additional MAGNATEST ECM, MAGNATEST ECM Compact Edition and / or STATOGRAPH ECM
- 19" equipment cabinet in different configurations
- Remote control, extended display and evaluation by PC program eddyAssist

MAGNATEST® ECM 3.621

The MAGNATEST ECM contains the control elements, the test channel and power supply.

- Input keys for user inputs
- Key-operated switch for locking operating functions
- LC display for plain-text messages
- LED bar graph for measured value and threshold display
- Individual LEDs to display certain conditions



Fig 2: MAGNATEST ECM

Test sensors and probes

All current coils (HF and NF) as well as probes (HF and NF) can be used with the MAGNATEST ECM.



Fig 3: Test sensors and probes

Housing 6 HU

To accommodate one to four ECM modules. Dimensions approx. 365 x 535 x 355 mm (H x W x D).

Configuration ádapter

Plug-on module for automatic configuration of the MAGNATEST ECM. Stores the configuration data for one application.

If required, FOERSTER can determine an application-specific instrument setting in its application laboratory and save it on the configuration adapter. Specimen test pieces must be submitted for this purpose.

MAGNATEST® ECM / LV

MAGNATEST ECM 3.621 output amplifier for certain LF applications with high power requirement (e.g. evaluation of harmonics at test frequencies below 256 Hz).

- Connection socket for MAGNATEST ECM 3.621
- Sensor connection socket
- Mains connection socket
- Dimensions approx. 261 x 106 x 313 mm (H x W x D)
- Weight approx. 5 kg

Connecting cable for output amplifier

Connecting cable between MAGNATEST ECM and MAGNATEST ECM / LV.

Technical data

	MAGNATEST ECM
Test frequency	2 Hz - 128 kHz in 17 steps
Throughput rate	Depending on the test frequency, approx. 10 parts / second at 1 kHz
Test trigger	Manual, external, internal
Sorting thresholds	Circle In combination with the evaluation software eddyAssist also Ellipse and Rectangle
Sorting test	Group analysis
Excitation	Single-frequency, various frequencies adjustable
Sensor output	0.35 Arms, 20 Vpp, Magnetic field strength variable in 1% steps
Digitization of the measured signal	16 bit AD Converter
Input amplifier	Overvoltage protection (± 13 V)
Test	Single-coil absolute operation Two-coil differential operation is possible with an adapter if desired
Evaluation	up to the 7 th harmonic for frequencies up to 256 Hz
Interfaces	Serial interface to additional ECMs or PC Parallel interface to the testing line (inputs via optocouplers; outputs via relays)
Microprocessor	For sequence control, operator prompting self-test etc.
Signal processor	For measured-value acquisition and pro-cessing, fast Fourier transformations (FFT)
Permitted supply voltage	115 / 230 V +10%-15%, 50-60 Hz
Power consumption [VA]	45 VA
Dimensions (H x W x D)	261 x 106 x 313 mm
Weight	approx. 5 kg
Temperature range	5 – 40 °C
Protection class (DIN 40 050)	IP 30

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