MAGNATEST® ECM 3.621

* Low-cost eddy-current module for non-destructive testing using the magneto-inductive method

* Genuine magneto-inductive testing by evaluation of harmonics

* Test parameters variable over wide ranges

* Simple operation

* Test pieces sorted in two groups: o.k. / n.o.k.

* One-dimensional display of measured value by LED bar graph

* Key-operated switch for locking operating functions

ECM = Eddy Current Module
Features

- Fully compatible with MAGNATEST S (also suitable for frequencies below 64 Hz with the output amplifier MAGNATEST ECM/LV option)
- All MAGNATEST S test coils and probes can be used
- This permits test settings found with the MAGNATEST S to be used with the MAGNATEST ECM as well
- MAGNATEST I or VRH sensors can also be connected
- Can be combined with additional MAGNATEST® ECM, STATOGRAPH® ECM and/or DEFECTOMAT® ECM
- PC interface to evaluation program eddyWin running with MS WINDOWS®
- Simple integration into existing control cabinets
- Physically separated interface for the most important control signals to the testing line
- Mains failure protection by battery backup of the parameter memory

Application

Automatic piece testing for

- Hardness
- Strength, microstructure
- Identification, material differentiation or sorting
- Geometric characteristics such as
  - Shape accuracy
  - Completeness of assembled parts (bearings, etc.)
  - Machining state on all metallic series parts, e.g. hubs, door locks, steering system components, connecting rods, sintered carbide balls, chain links, profile shafts, shearing heads

Mode of operation

The exciter winding of the test coil magnetizes the test piece to determine its material characteristics. The voltage induced in the receiver winding depends on the shape and size of the hysteresis curve. The hysteresis curve is influenced by the hardness, the alloying constituents and the grain structure.

A non-sinusoidal signal consisting of ground wave and harmonics is produced at high exciter field strength values. By variation of the exciter field strength, it is possible to select the driving range of the hysteresis curve that possesses a magnetic characteristic upon which the sought material characteristic has an especially great influence.

An analysis of the proportions of harmonics supplies information about the material condition. Alloy composition and mechanical or thermal treatment of ferromagnetic test pieces that influence different ranges of the hysteresis curve can be evaluated with high test reliability. Selection of the appropriate exciter frequency permits selective observation of core and surface characteristics.

The test criterion relates to the changes in conductivity in the case of non-ferromagnetic materials.
Construction

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

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

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

- MAGNATEST ECM/LV
- Housing 6 HU
- Configuration adapter
- Combination with additional MAGNATEST ECM, STATOGRAPH ECM and/or DEFECTOMAT ECM
- Remote control and extended display and evaluation by PC program eddyWin

Please refer to separate leaflet „ECM-SYSTEM“, Order No. 107 593 4, for possible combination options.

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
- Sensor connection socket
- Serial interface to additional ECMs or PC
- Parallel interface to the testing line (inputs via optocouplers; outputs via relays)
- Service socket
- Mains connection socket
- Standard plug-in unit for 19" cabinets
- Dimensions approx. 261 X 106 x 313 mm (H x W x D)
- Mass approx. 5 kg
Test coils

All coils designed for the MAGNATEST S system can be connected to the MAGNATEST ECM.

Refer to data sheet „MAGNATEST S sensor systems and accessories“ for a detailed description, Order No. 137 992 5.

Moreover, MAGNATEST I and MAGNATEST VRH coils and probes can also be connected via corresponding adapters.

Conversion kit 60 Hz

Used for connection to 230 V/60 Hz or 115 V/60 Hz mains.

Housing 7 HU

To accommodate one to four ECM modules. Dimensions approx. 310 x 559 x 318 mm (H x W x D).

Configuration adapter

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

Determining the instrument setting

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.

Measuring cable 1 m

Connecting cable between ECM service socket and oscilloscope.

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 64 Hz). Ensures full compatibility with the MAGNATEST S with regard to the electrical power data.

- Connection socket for MAGNATEST ECM 3.621
- Sensor connection socket
- Mains connection socket
- Standard plug-in module for 19" cabinets
- 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.

Further accessories

Accessories of the MAGNATEST S system which can be used:

- Power booster
- Sensor multiplexer
- Coil cable adapter, differential mode

Detailed description in the “MAGNATEST S Test System 3.625” Equipment Sheet, Order No.137 375 7.

<table>
<thead>
<tr>
<th>Recommended sensors</th>
<th>Part-No.</th>
<th>Probe cable</th>
<th>Adapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF coils, HF coils (MAGNATEST ECM)</td>
<td>3.621.xx-3xxx</td>
<td>3.625.11-9911</td>
<td>-</td>
</tr>
<tr>
<td>LF coils, HF coils (MAGNATEST S)</td>
<td>3.625.xx-3xxx</td>
<td>3.625.11-9911</td>
<td>-</td>
</tr>
<tr>
<td>LF probes (MAGNATEST S)</td>
<td>3.625.xx-4xxx</td>
<td>3.625.01-9942</td>
<td>-</td>
</tr>
<tr>
<td>HF probes (MAGNATEST S)</td>
<td>3.625.xx-4xxx</td>
<td>3.625.01-9922</td>
<td>-</td>
</tr>
<tr>
<td>LF coils, LF probes (MAGNATEST I)</td>
<td>3.610-xxx</td>
<td>3.610-071</td>
<td>3.625.01-9931</td>
</tr>
<tr>
<td>HF coils, HF probes (MAGNATEST I)</td>
<td>3.610-xxx</td>
<td>3.610-071</td>
<td>3.625.01-9951</td>
</tr>
<tr>
<td>Coils (MAGNATEST VRH)</td>
<td>3.222-7xx-xxx</td>
<td>3.610-071</td>
<td>3.621.01-9961</td>
</tr>
</tbody>
</table>
Test sequence

The ECM’s test sequence is controlled by two external signals: TEST ON/OFF and TPIECE CLOCK. TEST ON/OFF controls test release. TPIECE CLOCK controls the evaluation sequence (assignment of flaw signals to test pieces).

The test result is signaled by the ECM to control by instantaneous signals (threshold transgression THRESH A, THRESH B and THRESH C) on the one hand and by static signals (SORT S0 = flawless test piece, SORT S1 = defective test piece) on the other. A test piece is evaluated as defective if flaw threshold C was exceeded at least once.

Threshold transgressions THRESH A, THRESH B and THRESH C are signaled immediately they occur and for the duration of the threshold transgression by LEDs and by output signals at socket IN/OUT. The sorting signals SORT S0 and SORT S1 are output at socket IN/OUT only when the tail of the test piece is reached. The criterion for this is the trailing edge of the input signal TPIECE CLOCK.

<table>
<thead>
<tr>
<th>Recommended accessories</th>
<th>Part-No.</th>
<th>Cable to ECM</th>
<th>Cable to sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output amplifier MAGNATEST ECM/LV</td>
<td>3.621.01-2011</td>
<td>3.625.11-9911</td>
<td>3.625.11-9911</td>
</tr>
<tr>
<td>Power booster</td>
<td>3.625.01-1401</td>
<td>3.625.11-9911</td>
<td>3.625.11-9911</td>
</tr>
<tr>
<td>Sensor multiplexer</td>
<td>3.625.01-1501</td>
<td>3.625.11-9911</td>
<td>3.625.11-9911</td>
</tr>
<tr>
<td>Coil adapter, differential mode</td>
<td>3.625.01-9701</td>
<td>3.625.11-9911</td>
<td>-</td>
</tr>
</tbody>
</table>

```
Test ON  Test OFF  Test ON
TEST ON/OFF

THRESH C

Test piece 1  Test piece 2

TPIECE CLOCK

Test piece 1 flawless

SORT S0

Test piece 2 defective

SORT S1
```
## Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital sine-wave generator (crystal-stabilized)</td>
<td>Frequencies from 2 Hz to 128 kHz in 17 steps</td>
</tr>
<tr>
<td>Sensor output</td>
<td>0.35 Arms, 20 Vpp, magnetic field strength variable in 1% steps</td>
</tr>
<tr>
<td>Digitization of the measured signal</td>
<td>16 bit A/D converter</td>
</tr>
<tr>
<td>Test mode</td>
<td>Single-coil absolute mode</td>
</tr>
<tr>
<td></td>
<td>Two-coil differential mode by use of adapter</td>
</tr>
<tr>
<td>Input amplifier</td>
<td>Overvoltage protection (± 13 V)</td>
</tr>
<tr>
<td>Filter</td>
<td>Stop filter against mains interference</td>
</tr>
<tr>
<td></td>
<td>50/100/150 Hz or 60/120/180 Hz</td>
</tr>
<tr>
<td>Evaluation</td>
<td>up to the 7th harmonic for frequencies up to 256 Hz</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>for sequence control, operator prompting self-test etc.</td>
</tr>
<tr>
<td>Signal processor</td>
<td>for measured-value acquisition and processing, fast Fourier transformations (FFT)</td>
</tr>
<tr>
<td>Permitted supply voltage</td>
<td>115/230 V +10% -15%, 50-60 Hz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>+5 °C to +40 °C</td>
</tr>
<tr>
<td>Enclosure (DIN 40 050)</td>
<td>IP 30 (ECM without housing)</td>
</tr>
<tr>
<td></td>
<td>IP 54 (ECM in housing 6 HU)</td>
</tr>
</tbody>
</table>
## Product information

### Leaflets

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM - SYSTEM 2.010 and PC software eddyWin</td>
<td>107 593 4</td>
</tr>
<tr>
<td>STATOGRAPH ECM 6.421</td>
<td>107 521 7</td>
</tr>
<tr>
<td>DEFECTOMAT ECM 2.841</td>
<td>107 522 5</td>
</tr>
<tr>
<td>MAGNATEST S Test System 3.625</td>
<td>137 375 7</td>
</tr>
<tr>
<td>MAGNATEST S Sensor Systems 3.625</td>
<td>137 992 5</td>
</tr>
<tr>
<td>MAGNATEST D Test System</td>
<td>150 536 0</td>
</tr>
</tbody>
</table>

### Application infos

#### Tensile Strength Testing

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beer Barrels</td>
<td>135 975 4</td>
</tr>
<tr>
<td>Suspension Bolts of Highvoltage Insulator</td>
<td>144 662 2</td>
</tr>
</tbody>
</table>

#### Hardness Testing

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Hub</td>
<td>139 289 1</td>
</tr>
<tr>
<td>Top of Thrust Bolts</td>
<td>139 393 6</td>
</tr>
<tr>
<td>Door Handle for Passenger Cars</td>
<td>141 990 0</td>
</tr>
<tr>
<td>Chain Links</td>
<td>141 991 9</td>
</tr>
<tr>
<td>Shaver Guards</td>
<td>145 994 5</td>
</tr>
<tr>
<td>Bolt Testing Equipment</td>
<td>125 046 9</td>
</tr>
</tbody>
</table>

#### Grade Verification

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austenitic Pipes</td>
<td>141 993 5</td>
</tr>
<tr>
<td>Tool Tips of Hard Metal</td>
<td>144 663 0</td>
</tr>
<tr>
<td>Hard Metal Balls</td>
<td>144 664 9</td>
</tr>
<tr>
<td>Raw Pieces of Drills</td>
<td>145 987 2</td>
</tr>
<tr>
<td>Idler Arm</td>
<td>145 988 0</td>
</tr>
<tr>
<td>Automotive Pistons</td>
<td>125 045 0</td>
</tr>
<tr>
<td>Zinc Wires</td>
<td>149 577 1</td>
</tr>
</tbody>
</table>

#### Combined flaw and hardness testing

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie Rod</td>
<td>125 052 3</td>
</tr>
<tr>
<td>Ball Pin</td>
<td>125 053 1</td>
</tr>
</tbody>
</table>
Should you have any special problems please contact:

INSTITUT DR. FÖRSTER
Prüfgerätebau GmbH & Co. KG
Postfach 15 64
D-72705 Reutlingen
In Laisen 70
D-72766 Reutlingen
Phone +49 (0) 7121/140-0
Fax +49 (0) 7121/140-488
www.foerstergroup.de

or one of our agencies abroad

Information and illustration may
be subject to change

Division TS
Test systems for semi finished
products
Postfach 15 64
D-72705 Reutlingen
In Laisen 70
D-72766 Reutlingen
Phone +49 (0) 7121/140-270
Fax +49 (0) 7121/140-459
e-mail ts@foerstergroup.de
Order no. 107 513 6

Division CT
Test systems for component testing
Joseph-von-Fraunhofer-Str. 15
D-44227 Dortmund
Phone +49 (0) 231/97 50 49-0
Fax +49 (0) 231/97 50 49-8
e-mail foerster.ct@t-online.de

OUTSTANDING!
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