# MAGNATEST® 3.633

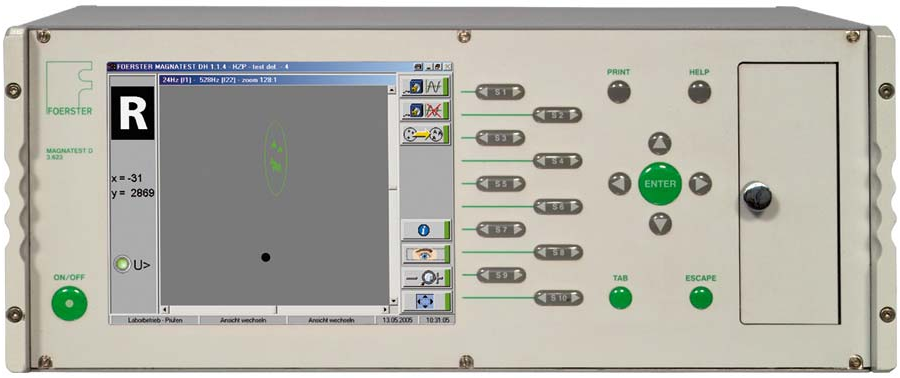



Fig. 1: MAGNATEST 3.633

The MAGNATEST is a test instrument for non-destructive testing of metallic materials for their different magnetic and/or electrical properties on the base of magneto-inductive method.

It is mainly used in the manufacturing process of tubes, bars, wire and billets etc. for grade and heat treatment verification.

With the MAGNATEST 3.633 a modern test instrument has been created which offers the operator an easy, fast, and secure solution of almost any test task in the field of materials testing.

## Characteristics

- Processor controlled test system
- Single-coil absolute operating mode, therefore no compensation coil required
- Constant excitation current; therefore defined magnetic field over the whole test
- High output current amplitude is possible for a high sensitivity of the magnetic properties by selecting the shape and size of the hysteresis loop
- Multi-frequency testing for better reliability by the basic unit MAGNATEST D-HZP
- Simultaneous multi-frequency testing for highest test speed with option MAG DH-HZP
- Simple operator interface thanks to application specific function keys and high-resolution TFT color display
- Standard interfaces for peripheral devices (keyboard, mouse, printer, network, etc.)

## Mode of operation

The part under test is exposed to the magnetic field created by the test coil. Eddy currents are induced within the electrically conductive material. Additionally the part is magnetized as far as ferromagnetic material is to be tested.

The voltage induced in the receiver winding depends on the electrical conductivity (electrical property) as well as on the shape and size of the hysteresis curve (magnetic property). It is analyzed and allows a sensitive test of ferromagnetic and austenitic steels as well as non-ferromagnetic materials.

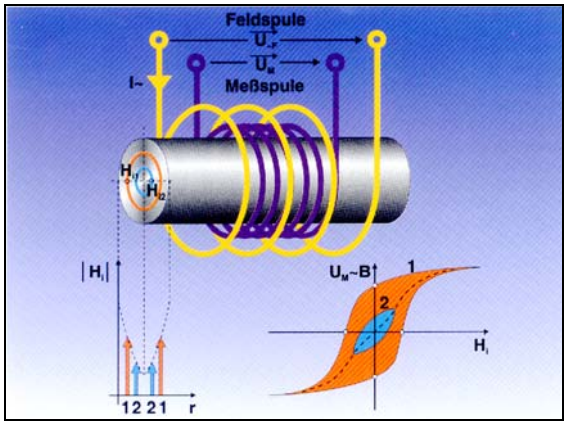



Fig. 2: Schema of the magneto-inductive method

Since the hysteresis curve itself is strongly influenced by technological parameters like hardness, alloy content and grain structure a determination of those parameters is particularly sensitive to the magnetic properties.

By variation of the excitation field strength it is possible to select that range of the hysteresis curve which gives the highest sensitivity to the magnetic properties of the material under test.

Choosing the appropriate excitation frequency allows selective observation of core and surface characteristics.

## Innovation: Simultaneous Multi-frequency Test

Basically the multi-frequency testing by base unit MAGNATEST D-HZP increases the reliability of the test result. The simultaneous multi-frequency testing of MAGNATEST DH-HZP offers in contrary to serial multi-frequency testing important advantages when used in the semi-finished product industry. Especially regarding to high speeds in automatic lines a higher number of measured values along one tube/bar are possible. Mean values are then based on higher number of values and this increases reliability.

The excitation signal is controlled generated with selected lower and upper limit values of the frequency band. It contains concurrently several test frequencies and only the lowest one determines the excitation time and consequently the test speed. All other higher frequent signal components do not lead to an increase of excitation period and consequently test speed.

This kind of excitation with a lot of simultaneously applied frequencies and time optimized lead to highest speeds with maximum testing potential.

The frequency spectrum of the measured signal is evaluated by the use of Fourier analysis.

All these characteristics of the simultaneous multi-frequency testing qualify the MAGNATEST DH-HZP especially for the check of material´s grade and heat treatment in the area of semi-finished products.

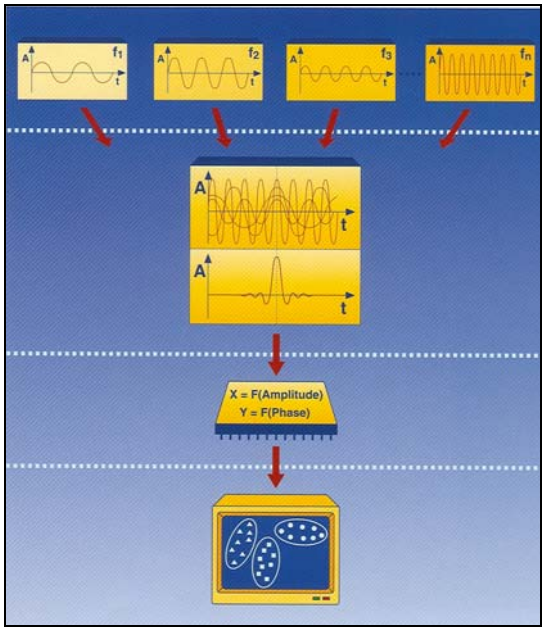



Fig. 3: Generating of a simultaneous multi-frequency signal excitation

## Construction

The MAGNATEST 3.633 in its standard configuration consists of the following components:

- MAGNATEST D-HZP basic unit
- Test Coil
- Coil Cable
- Optional Function module MAG DH-HZP

and can be adapted to the respective requirements by adding further components from the accessory program.


The basic unit includes all components which are required for performing an application:

- robust instrument housing 4HU with integrated fan, power supply, front pad keyboard, high-resolution TFT color screen, diskette drive behind tight closing front lid
- PC plug-in unit with processor module, mass storage device, peripheral interfaces (2 x serial, 1 x parallel, 2 x USB, 1 x PS/2, Ethernet, VGA)
- analog signal board
- signal evaluation board
- power amplifier
- opto-isolated I/O interface

## Profile for the semi-finished product testing:

The requirements for an automated "online“ test regarding grade and heat treatment in the area of semi-finished products have changed in the recent years.

- consequent use of multi-frequency method to increase test reliability
- simultaneous application of low frequencies for high penetration depth and high frequencies for surface properties
- use at high speeds (> 120 m/min) and short parts (< 3 m)
- high degree of automation for calibration and test sequences
- easy setting of all required test parameters and significant documentation of test results
- integrated additional functions as dynamic calibration, trend tracing, test of outliers etc. for a controlled adaptation of the test sequence to the conditions of production environment
- possibilities for remote control by higher ranking quality control systems or integration in the Instrumentation SW when other FOERSTER test systems are simultaneously used in the same testing line

## Industrial Reference:

The optimum performance of the user interface and the universal possibilities of integration in production lines and processes lead to the best industrial user acceptance.

To meet all aspects of a high user acceptance, the MAGNATEST DH-HZP was tested and optimized during a several month period in close cooperation with EDELSTAHLWERKE Südwestfalen GmbH.

The stipulated ensurance of the product quality required highest performance during this period in the manufacturing process of steel bars having a large grade and heat treatment variety, high production speeds and as well short bar length.

By this in-situ test the high standard of MAGNATEST DH-HZP has achieved sustained success in relation to reliability and robustness.

The simultaneous multi-frequency test of MAGNATEST DH-HZP has achieved the target.

## Function modules

With the function module MAG DH-HZP measurements are continuously triggered as long as the test is released, e.g. by light barriers.

After deactivation of test release input the values of all measurements are combined to an overall-result of the bar/tube via median calculation and output to the Opto I/O-interface.

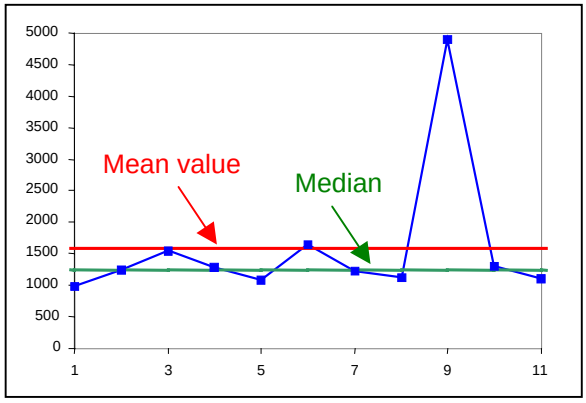
The median is the central value of an ordered series of measured values, e.g.:

measured values: 980, 1080, 1100, 1120, 1220, 1250,1280, 1310, 1550, 1650, 4900

Arithmetic mean: 1585

Median : 1250

The median lies closer to the measured values and supresses outliers in a better way.




**Further characteristics:**

- simultaneous multi-frequency testing with only one parameter set simplifies the instrument setting during test and Einrichtbetrieb
- sorting gates: circle, ellipse, rectangle (manual ranges), box regression
- manual or external test release
- testing speed depends on the chosen frequence band
- simple use during test of series by password protected standard settings
- automated optimization of the individual frequencies ("matched mode“, "equalized mode“)
- significant documentation modules
- several remote functions for remote control and integration in quality assurance systems
- Remote Service for maintenance and telediagnosis
- Selectable function modules to establish test sequences, determination of the required number of calibration pieces
  - activation of a dynamic calibration
  - activation of a outliers test during calibration mode
  - automated switch from calibration mode to test mode
  - activation of a trend tracing during test mode
  - continuation of existing test requests after a brake

## Accessories

### Test coils

All test coils of the MAGNATEST S and D system can be used for the MAGNATEST 3.633. A detailed description can be found in the leaflet "MAGNATEST S Transmitter Systems 3.625".

### Coil cables

Coil cables of different lengths and with different connectors are available. The following table summarizes the available cables.

| Coil cable | Order no. |
|---|---|
| Coil cable 3 m | 3.625.11-9911<br>138 162 8 |
| Coil cable 5 m | 3.625.11-9911 M5<br>166 051 9 |
| Coil cable 10 m | 3.625.11-9911 M10<br>138 149 0 |
| Coil cable 3 m,<br>angled connector | 3.625.01-9914<br>166 120 5 |
| Coil cable 10 m,<br>angled connector | 3.625.01-9914 M10<br>136 611 4 |

An adapter for two-coil differential mode is optionally available. If the difference in signal amplitude of good and bad pieces is only very little, the use of two-coil mode can be helpful.

### Coil multiplexer

Multiplexer for operation of up to eight coils with one MAGNATEST 3.633. This enables to shorten the dimensional changeover time when the different sized coils are mounted on shifting table and can be optionally shifted to the test position.

When using the coil multiplexer the use of coil cables with angled connector is not possible.

The coil multiplexer is described in detail in a separate leaflet "MAGNATEST D 3.623 Coil Multiplexer".

### Mouse

Standard PC mouse with serial or USB connector, no PS/2 connector.

### Keyboard

Compact keyboard with touch pad and USB interface.

### Industrial keyboard

Robust keyboard in a drawer 1HU for integration into 19" cabinets, with touch pad.

### External CD-ROM drive

External drive to be used for software update and other installation purposes.

### Signal indicator

for displaying test results, sorting outputs, error conditions, etc. There are two lamps (red/ green) for displaying up to four operating modes.. For more information see leaflet "Signal Light 3.623.01-2000".

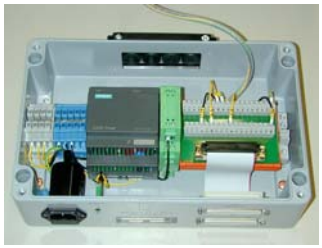
### Transfer component

Transfer component with 37-pin DSUB connector and screw terminals for connecting external peripherals to the MAGNATEST 3.633. The transfer component will be connected via the connecting cable to the opto-I/O interface. The external input and/or output lines can be connected at the screw terminals.

The transfer component is useful especially when mounting the test instrument into a 19"-cabinet.

### I/O-Adapter 3.623

Versatile extension module for easy integration of additional components. The base version allows the connection of external signals (e.g. from the PLC) by the 37-pin transfer component. Several options enable the adaptation to most implementation situations. Please ask for separate leaflet "MAGNATEST D I/O-Adapter 3.623".



### Opto-I/O-Tester

Test device for easy check of functionality of the MAGNATEST 3.633 opto-I/O interface. This device will be connected instead of other peripherals and allows the display of MAGNATEST output signals by LED's as well as generating MAGNATEST input signals by manual switches. For a detailed specification please ask for the separate leaflet "MAGNATEST D Opto-I/O-Tester".

### Connecting cable

37-pin cable for connection of signal indicator, transfer component, I/O-Adapter, or Opto-I/O-Tester.

### Mounting set 19"

When installing the MAGNATEST 3.633 into a 19"-cabinet the mounting set 19" is required. Please note that a later installation of the mounting set requires some extra work; therefore, please state already with your order if the mounting set 19" is necessary.

### Mounting set 19" for DS 6.430 cabinet

Complete mounting set for installing the MAGNATEST 3.633 into the 19"-cabinet of the FOERSTER DS 6.430 system. Includes the mechanical components (sliding bars, assembly material, strain relief), as well as the components for connecting the opto-I/O interface (transfer component, connecting cable).

Please pay attention to additionally ordering the mounting set 19" (3.623.01-0491) together with the MAGNATEST 3.633.

## Technical Data

| | |
|---|---|
| Test frequency | 2 Hz to 12 kHz |
| Test throughput | depending on test frequency |
| Test release | manual, external |
| Sorting gates | circle, ellipse, rectangle (manual ranges), box regression |
| Test mode | group analysis |
| Number of sorting groups | 6 |
| Excitation | serial or simultaneous multi-frequent |
| Output amplifier | current-driven max. 2.0 $A_P$, max. 36 $V_P$ |
| Test | single-coil absolute mode; two-coil differential mode optional |
| Evaluation | test signal according to amplitude and phase |

| | |
|---|---|
| Interfaces | serial, USB, printer (parallel), mouse (serial), external keyboard(PS/2), external monitor (VGA) |
| Inputs | 8 (galvanically isolated) |
| Outputs | 8 (galvanically isolated) |
| Permitted supply voltage | 115 V/230 V $\pm$ 10%, 50 Hz or 60 Hz (please state the mains frequency when ordering) |
| Dimensions for 19” cabinet | 178 x 490 x 420 mm (HxWxD) |
| Mass | approx. 18 kg |
| Operating temperature | +5°C to +40°C |
| Relative humidity | 8% to 80%, non-condensing |
| Enclosure | IP 65, front side |

## Product information

### Leaflets

| | |
|---|---|
| MAGNATEST D Signal indicator | **150 865 2** |
| MAGNATEST D I/O-Adapter | **188 010 0** |
| MAGNATEST D Opto-I/O-Tester | **188 009 8** |
| MAGNATEST S Test system 3.625 | **137 375 7** |
| MAGNATEST S Sensor system | **137 992 5** |
| MAGNATEST D Coil multiplexer | **188 159 0** |

Should you have any special problems please contact:

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Information and illustration may be subject to change

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## Product informations

| Designation | Part No. | Order No. |
|---|---|---|
| MAGNATEST D-HZP SEMI-FINISHED PRODUCT TESTING | 3.633 | 5031010 |
| Option MAG DH-HZP | | 5031117 |

**These items are the standard versions (desktop housing). For mounting into a 19" industrial cabinet please make sure to add the mounting set 19" to your p.o.**