

# MAGNATEST® D-HZP

Magneto-Inductive Material Testing  
for Magnetic and Electrical Properties



## The Company

**FOERSTER is a global technology leader for non-destructive testing of metallic materials. One of the "Hidden Champion" companies, FOERSTER operates worldwide with an extensive network of ten subsidiaries plus qualified representatives in more than 60 countries and works closely with its customers.**

### **FOERSTER Division Test Systems (TS)**

Division TS specializes in developing and manufacturing technical systems for the automated, non-destructive testing of metallic long products and heavy plates. Electromagnetic methods such as eddy current and flux leakage testing, ultrasound and inductive heat flow thermography are used to inspect these semi-finished products for flaws that are invisible to the naked eye.

These systems are made for the metal producing and metalworking industries, where tubes, wires, bars, billets, rails, profiles, metal sheets and similar items are produced on rolling mills, drawing lines, welding lines or processed in various finishing operations. FOERSTER products perform many critical test applications during these processes.



## Magneto-Inductive Testing of Semi-Finished Products



### Identification Testing – Why?

Material mixes can occur even in fully-automated production processes. They can cause significant economic damage not just to tools in the finishing line, but can even result in consequential damages amongst users. Hence, the MAGNATEST D-HZP is available for automated and non-destructive identification testing in the production of semi-finished products. The wide range of sensors with different geometries and diameters allows for a precise adjustment to the material to be tested.

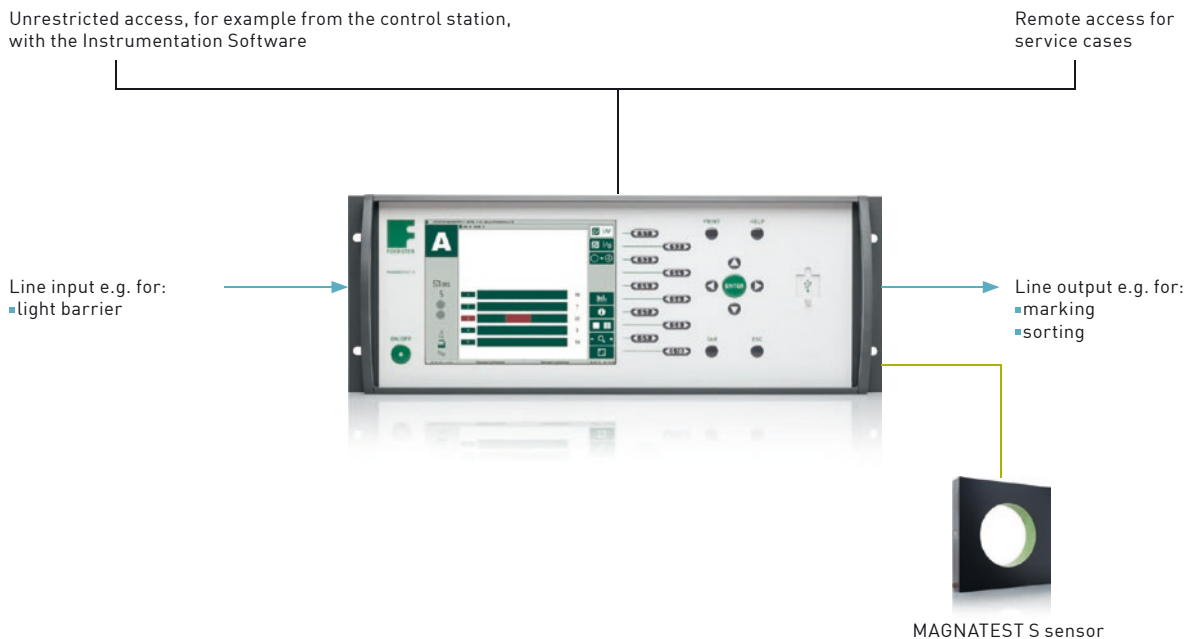
### Fully-Automated Testing with MAGNATEST® D-HZP

FOERSTER's MAGNATEST D-HZP guarantees magneto-inductive testing on the highest level: the system performs the testing of material for its properties fully automatically. Doing this in the single coil absolute operation makes a comparator coil unnecessary. Even the smallest structure discrepancies can be made visible through the combination of high excitation currents with a complex evaluation electronic. Furthermore, MAGNATEST D-HZP offers extensive opportunities for the documentation of the test results such as test piece statistic, histogram display and test data export, which are clearly presented on the big color display. An intuitive operation supports the user during the setup of the instrument.

### Advantages of MAGNATEST® D-HZP

- Single coil absolute operation, therefore no comparator coil required
- Constant magnetic field strength due to load-independent excitation current
- High excitation current intensity possible for an increased test sensitivity for the magnetic properties through targeted modulation of the hysteresis
- Increased test security due to multi-frequency testing
- Test frequencies ranging from 2 Hz – 128 kHz
- 8 in- and outputs to the line
- Full network integration and remote access for process integration
- Automatic creation of statistically valid sorting thresholds according to the number of calibration pieces
- Continuous increase of statistical certainty through activation of the dynamic calibration mode
- Activation of a trend observation for sorting areas during testing possible
- Integrated operator PC with Microsoft Windows® 7
- Easy to use intuitive function buttons and high resolution TFT color display
- Standardized interfaces for peripheral equipment (keyboard, mouse, printer, USB, network, etc.)
- Easy integration into control cabinets
- Optionally available: multiplexer with 4 channels (expandable to 8 channels)

## Complete Integration into the Test Line



### Ideal Addition for Every Test Line

The MAGNATEST D-HZP is the ideal addition to surface crack testing. It performs the identification testing, as well as testing the heat treatment condition of semi-finished material. Eight digital in- and outputs are available for enabling the line integration. The Ethernet connection allows for a remote access to, for example, transfer the current test results to a control station. Direct operation takes place with the function buttons placed at the front side. Furthermore, it is possible to connect a monitor, keyboard, mouse and printer. The flexible integration possibilities due to a highly compact and robust 4 HU housing make it ideally suited for the industrial environment.

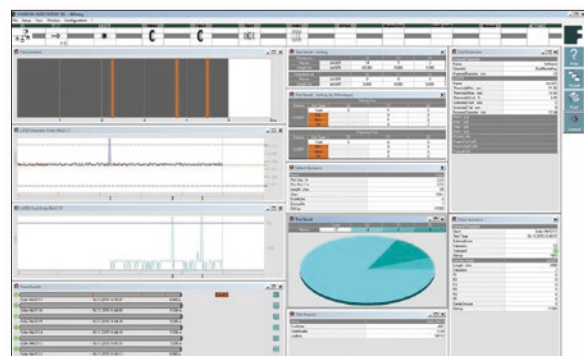
### Perfect Collaboration between FOERSTER Test Instruments

FOERSTER offers a wide range of different test systems such as DEFECTOMAT, CIRCOGRAPH, ROTOMAT, TRANSOMAT and CIRCOFLUX. To coordinate the communication of all systems for the automated process, FOERSTER has developed the Instrumentation Software.

This software is a comprehensive data management tool which takes care of the order and settings management throughout the entire test section. Furthermore, all test results are collected and then issued as a combinatorial statistic.

### Features of the Instrumentation Software

- Clear presentation of the entire test section
- All test results are issued as a combinatorial test result
- Generation of a cross-line test report
- Individual color assignments for different defect types can be defined
- Test piece recognition for superordinate material tracking system
- Central database for test results



Regarding its layout and operation, the interface of the FOERSTER Instrumentation Software resembles already known FOERSTER software and clearly displays all combinatorial results



## FOERSTER Test Lines



### Test Lines Made by FOERSTER

Since material testing is only one part of a complex test line, the MAGNATEST D-HZP is often combined with test instruments such as DEFECTOMAT and CIRCOGRAPH. As full-range supplier FOERSTER develops, manufactures and delivers turnkey multi-function test lines to its customers. These are precisely adapted to individual needs – and even make the integration of third-party components possible. Following an initial concept development, the appropriate solution with all requested functions is constructed – always in close consultation with the customer.

### Decades-long Construction Know-How

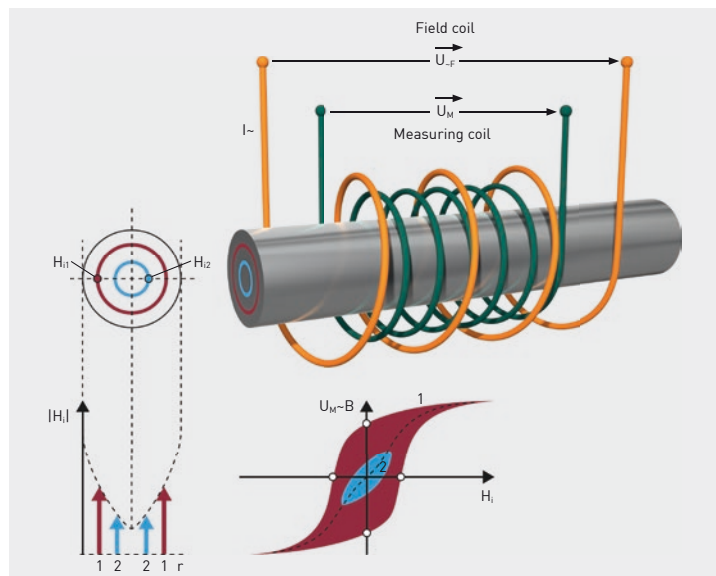
FOERSTER's construction department is specialized in the creation of individual test line concepts. This is where decades-long know-how meets highly motivated employees who want to achieve the optimum for our customers. Therefore, the various components of the test line are precisely adapted to the technological requirements of the customers. At the same time, the mechanical design engineers already think one step

ahead, since the conception of a maintenance-friendly and reliable test system is one of the core competencies of FOERSTER.

### A Perfect Interplay

The testing method of MAGNATEST D-HZP is based on electromagnetic interaction. During the material property testing, external interferences can have negative effects and falsify the test result. Due to many years' experience, the mechanical design engineers know how to reduce these kinds of interferences, e.g. with shielding measures, as well as what the logical sequence of the individual test instruments needs to be. For the test result evaluation, all data of the individual test systems are displayed in the Instrumentation Software. That way, all components systematically interlock and, in the end, result in an optimal and individual complete solution.

## Operating Principle MAGNATEST® D-HZP



Scheme of magnetic inductive testing

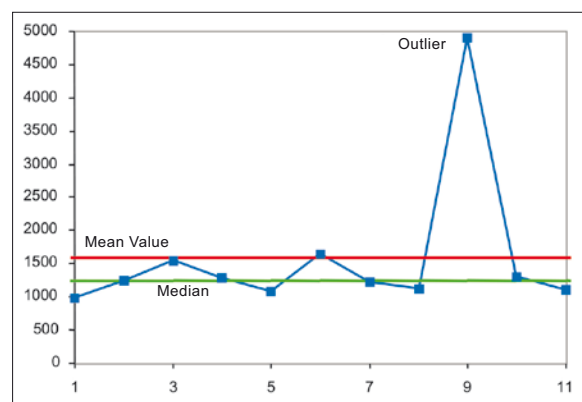
The MAGNATEST D-HZP operates according to the magneto-inductive principle. The test material is guided through a transformational-built test coil. The field winding is operated with a load-independent alternating current and generates an alternating magnetic field. Frequency and intensity are variable.

A voltage dependent on the magnetic properties (permeability, remanence, coercivity) and the electrical conductivity of the test material is induced in the measurement winding of the test coil. An evaluation of the voltage regarding value and phase (impedance plane) is then performed. This is possible for ferromagnetic, austenitic steels and non-ferrous metals. The physical characteristics are determined by technological characteristics (hardness, structure, alloy components, carbon content) and thus enable their inspection.

Through variation of the excitation field strength, it is possible to specifically select that dynamic range of the hysteresis curve which, regarding the magnetic values, is influenced especially strong from the sought-after technology-value. A sufficient power supply enables the modulation to the saturation range. Through the selection of the excitation frequency, a selective observation of near-core and near-surface properties is enabled. During multi-parameter testing, a broadband inspection is made possible through the combination of different settings, which consequently increases test security.

During identification testing of semi-finished products, several evaluations are typically triggered along the bar or the tube. Instead of applying the mean value, the median is used to reduce the influence of outliers on the test result. This overall result enables sorting.

Alternatively, the inhomogeneity testing evaluates every single measured value and can display the individual results as OK/NOK-signal. This also allows determining local deviations of the properties along the test piece.



As opposed to the arithmetic mean value, the result presentation by means of median calculation suppresses outliers and is therefore more meaningful

## Robust Sensors for Precise Test Results



### FOERSTER Sensors for High-Quality Test Results

As a leading developer of test coils, FOERSTER constantly strives to offer its customers new and innovative solutions to achieve optimal test results. Thus, a variety of sensors for various geometries and diameters is available to reliably test wire, billets, tubes and bars for their properties. Proven and in use for decades, the sensors provide reproducible test results in quality assurance and process control.

### The Right Sensor for Every Requirement

The standard range for MAGNATEST D-HZP encompasses sensors for a material diameter between 5 mm - 200 mm. The fine gradations of the test coils ensure precise test results and a perfect adjustment to customer requirements. For diameters larger than 200 mm special versions, individually adapted to customer needs, can be manufactured.

### Features of MAGNATEST® Sensors

- Testing of metallic materials for their different magnetic and electronical properties
- Material diameter between 5 mm – 200 mm
- Special versions for dimensions larger than 200 mm are available
- Fine gradations of test coils available for optimal test results
- Reliable operation even in harsh environments

**foerstergroup.de**



## Worldwide Sales and Support Offices



### Headquarters

- Institut Dr. Foerster GmbH & Co. KG, Germany

### Subsidiaries

- Magnetische Pruefanlagen GmbH, Germany
- FOERSTER Tecom, s.r.o., Czech Republic
- FOERSTER France SAS, France
- FOERSTER Italia S.r.l., Italy
- FOERSTER Russland AO, Russia
- FOERSTER U.K. Limited, United Kingdom
- FOERSTER (Shanghai) NDT Instruments Co., Ltd., China
- FOERSTER Japan Co., Ltd., Japan
- NDT Instruments Pte Ltd, Singapore
- FOERSTER Instruments Inc., USA

The FOERSTER Group is being represented by subsidiaries and representatives in over 60 countries – worldwide.

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