

Magnetic Analysis Corporation

MULTIMAC®

Eddy Current Tester

Multi Mode, Computer Based Eddy Current Equipment

- Operates with encircling, sector, or rotary test sensors
- Differential and/or Absolute mode operation
- Up to 8 test channels
- Broad test frequency selection - 1KHz to 5MHz
- Store & recall setups; print & transfer data
- Inspect tube or bar, magnetic or non-magnetic

OVERVIEW

Coil or Rotary Probe Operation

MultiMac® lets you configure your eddy current test application the way you want - all with just one compact tester. MultiMac test channels can be individually configured for use with encircling test coils, segmented encircling coils, sector/tangent coils, or rotating test probes - eliminating the need to have several instruments. Yet MultiMac includes all the best features of MAC's separate encircling coil and rotary probe instruments to ensure you get the top performance you need.

Features

Features include a wide selection of test parameters and special circuits to enhance signal-to-noise, typical of MAC testers. Operator interface is by keyboard and mouse. The MultiMac is a high speed, industrial quality computer with Windows® Operating System and MAC's latest proprietary software. The instrument is packaged in a heavy duty cabinet that includes a built-in monitor, air conditioning, and pull out keyboard. There is no need to access the cabinet interior during setup and operation. MultiMac is also available in other cabinet configurations with output connectors for an optional external monitor.

Magnetic or Non-Magnetic Material

With these features, MultiMac can operate on a wide variety of non-magnetic products, or use Direct Current saturation systems to inspect magnetic material. Test speeds can range from one foot per minute up to several thousand. Installation can be in-line or at a separate test station. MultiMac end suppression circu-



MultiMac Main Test Screen, above, shows test parameters, including thresholds, and simultaneous polar and linear view of one channel. Multi Screen (see page 3) shows polar & linear view for up to 8 channels.

ity with optional optical sensor can be used for testing cut lengths to prevent false signals from leading and trailing ends. User configurable reports containing customer and product information in addition to defect location, time, amplitude and phase can be stored locally or on a network server.

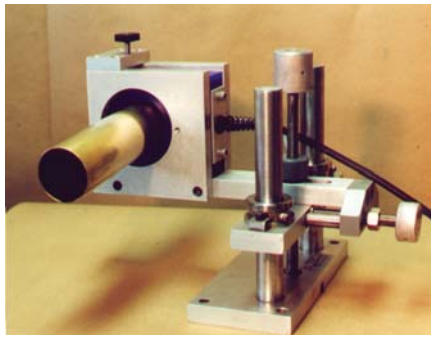
Versatile

MultiMac's test channels can operate at the same or different frequencies for special applications. One channel can be set as a differential (null) channel to detect short weld line defects, for example, while a second absolute channel simultaneously detects long, continuous surface flaws such as laps and seams. Additional absolute channels can check for long continuous open welds or magnetic inclusions. Up to 8 output modules can be used to operate a variety of devices, based on All Phase, Sector, or Chord thresholds, each of which can be assigned up to 3 threshold output levels.

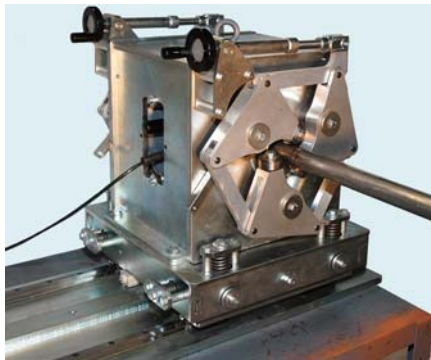
Simple Setup

The main test display provides all the information needed to set up and operate MultiMac. Polar and linear signal traces can be simultaneously displayed, along with all test parameters.

MultiMac® for Encircling & Sector Test Coil Inspection



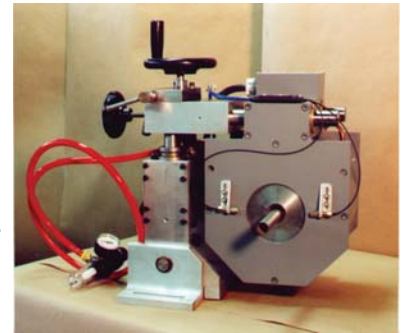
Series 30 Coil Platform Encircling Test Coil



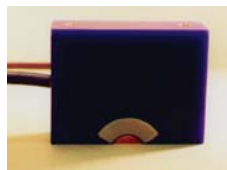
A 65 mm Coil Platform with optional Floating Head allows the coil platform to follow the movement of the tube or bar under test. This feature is useful for tube weld mills, bar and wire drawing benches where the material under test tends to move around.

ENCIRCLING TEST COILS can be used for testing non-magnetic or magnetic tube, bar or wire for short, intermittent surface flaws. For non-magnetic material, Coil Platforms, such as the CP-30, shown at left, provide accurate horizontal and vertical adjustment to obtain proper centering of the material in the coil. Test coils and Coil Platforms are available in a range of types and sizes. Standard coil sizes range from 1/8" (3.18 mm) up to 7-3/4" (196.9 mm) ID.

Where the material is magnetic, **Direct Current Saturation** is required to suppress permeability variations which can interfere with the eddy current test. MAC includes suitable DC saturation as part of the Coil Platform. The Series 352 Coil Platform, for example, is supplied with a DC power supply. It is air cooled and is suitable for thin and medium wall carbon steel tubing. Water cooling is utilized for larger, more powerful saturating Coil Platforms. The 65 mm Coil Platform, shown at left, can use standard or segmented encircling test coils.



Series 352 Air Cooled Saturation Coil Platform with test coil



Tangent (sector) Coil

Where only the weld zone or a similar localized area requires inspection, **TANGENT (Sector) COILS** can be used. A tangent coil often improves the signal-to-noise ratio of the test by limiting the area of the tube or bar under inspection. Coil Platforms for tangent coil testing of non-magnetic and magnetic material are available.

MultiMac® for Rotary Test Inspection

TEST PROBES MOUNTED ON ROTATING HEADPLATES

are used to inspect non-magnetic and magnetic tube, wire and bar for long, surface seam type defects.

Rotary probe technology is the method of choice to detect this type of defect which may not be detected by encircling coils. Changes in speed, even dead stops, do not affect the test because the probes continually spin around the material.

Headplate designs are available for surface or air ride configuration to handle different surface conditions and test specifications. Continuous or cut length material can also be handled.



MAC's Rotomac® E-Rotary test head, shown above, tests tube, bar or rod in continuous operations such as drawing, parts forming, or straight and cut. The inspection can operate automatically as defective pieces can be identified, then marked or rejected further down line, after the cutting and forming operation. Models for small diameter rod and wire are also available.



Shown above is the Model 750 Rotomac® rotary test head for inspecting 7-1/2" (190.5 mm) diameter cut lengths, often in-line with straighteners or installed in a separate test station. Installations can be completely automatic, including marking and sorting devices. The rotary is usually mounted in conjunction with MAC Slide/Elevating and Drive Mechanisms to position the rotary housing and move the material accurately through the test head.

MultiMac[®]

Inspection Design Features

EIGHT CHANNELS

differential or absolute, each able to operate over the entire frequency range of 1 KHz to 5 MHz, with appropriate test coils or rotary probes.

SIMULTANEOUS POLAR/ LINEAR MULTI SCREEN

provides all the setup and test information on the built-in or external monitor. In the polar display, the amplitude and phase are represented by the length and angle of the signal. The linear display is a strip chart, real-time, scrolling portrayal of the vertical channel.

TRACK SCREEN

shows a visual representation of the product, end sensors etc. that is useful during initial setup.

CHART SCREEN

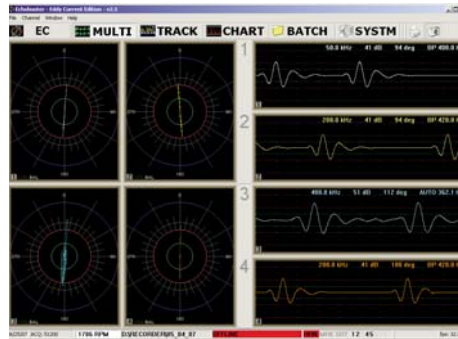
shows the linear test results from up to 8 channels at a time. Each channel can record up to 3 charts based on the type of thresholds.

SOFTWARE CONTROL

of all functions, such as phase, filter, sensitivity, thresholds, outputs and end sensors, is handled by keyboard entry and mouse. Parameters can be locked out to prevent unauthorized changes.

VERSATILE THRESHOLD SELECTION

including Chord, Sector or All Phase, at three different levels, individually and independently configured. The Sector threshold can be rotated 360°. The threshold selection feature allows complex gating for challenging test conditions. A counter is supplied on each active gate.



MultiMac Multi Screen, shows simultaneous polar and linear displays for four channels. Up to 8 channels, with all thresholds, can be displayed simultaneously.

AUTO SPEED SHIFT FILTERING

when used with the optional encoder, automatically adjusts filters to the optimum frequency for the current line speed. For rotary applications, this filter is governed by the RPM and material diameter.

ENHANCEMENT CIRCUITS

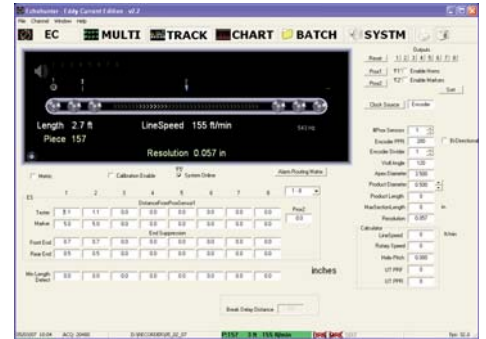
may be selected, if desired, to improve the apparent signal-to-noise ratio of signals in any phase. Circuits include Aph+, Aph-, V+, H-, and V+H-. The V+ H- has an adjustable H- factor. V+H- is primarily for rotary applications.

AUTO TRACKING BALANCE

for all differential channels, combines with system monitors to assure reliable tester function, even under adverse conditions. The System Ready Indicator on the display will identify if the power, coil condition and balance are not adequate.

EIGHT OUTPUTS

Choice of 3 thresholds per channel can be mapped to any of 8 outputs. Independently configurable for time or distance delay and normal, reject or latched mode.



MultiMac End Suppression screen for inputting data for end sensors

REPORTING CAPABILITIES

built-in through Windows[®] Operating System. Data can be stored, printed, and annotated via the keyboard and mouse, and transferred using normal computer interface procedures.

NETWORKING

Test results and information are available through customer networks for quick and easy follow up and quality assurance of settings and results during testing. TCP/IP communication protocol is supported.

STORE AND RECALL

All settings can be stored and recalled from a library on the internal storage device, or network. When networked, multiple instruments can share the same library for assurance of correct settings in multiple test lines.

Settings can be named and annotated using the keyboard. Setups can also be stored and recalled from a HDD, providing virtually unlimited storage capacity.

SPECIFICATIONS

CHANNELS	Up to 8 test channels Flaw (Differential), Absolute, or Rotary.
TEST FREQUENCY	1KHz to 5 MHz. 20 pre-selected frequencies, or user selection of any frequency.
FLAW BANDWIDTH	Variable up to 5 KHz.
FILTER	High Pass, Low Pass, Band Pass, BP-Auto and Out are available. Fixed filter positions adjustable from 0.1 Hz to 5000 Hz flaw frequency. The bandwidth of the BP filter can be selected through a "Q" factor dictating the ratio of high to low pass filters. Auto Speed Filter is operated from Line Speed utilizing optional encoder for coil applications, and from RPM meter and material diameter for rotary applications.
PHASE	0 - 359°, calibrated in 1° steps.
SENSITIVITY	0 - 99 dB, calibrated in 1dB steps.
THRESHOLDS	All Phase, Sector and Chord thresholds available for flaw tester, all assignable with up to three levels. The sector can be rotated to any phase angle. There are counters for active thresholds. Only active thresholds will be displayed on the screen.
CALIBRATION	Internally generated signal provides a system check for repeatability of all parameters.
BALANCE	Auto tracking continuous AC self-balance in the entire frequency range.
DISPLAY	Polar, linear and running charts are simultaneously displayed on the EC setup screen along with testing parameters and status indication for the current channel. MULTI screen simultaneously displays up to 8 channels polar and linear /chart display. Other screens include TRACK, CHART, BATCH, and SYSTEM Built-In Display Model: Includes built-in 17" TFT display. For cabinetry that does not include the built-in display, a back panel output connector is provided for optional external monitor.
CONTROLS	Software controls for all functions, set through keyboard and mouse.
SYSTEM STATUS INDICATOR	Software displayed in system status section of display, including indicators for Coil, Balance, Threshold and System Ready conditions.
END SUPPRESSION	Optional external switch end sensor and optional encoder to suppress end signals.
OUTPUTS	CE Units - four 24 V DC output modules are provided, each with a relay and an opto-isolated output. Outputs can be routed to accept any thresholds. Combined current draw for all outputs cannot exceed 2 amps Non CE units also have four 120 V AC outputs.
STORE & RECALL SETUPS	An unlimited number of setups can be stored and recalled
REPORT	Test data report is managed in the BATCH screen. The report contains user and product information as well as defect location, time of the occurrence, amplitude and phase.
DATA STORAGE	Record linear strip charts
MODE	A Lockout Mode prevents unauthorized changes in equipment settings.
COILS & COIL DRIVE	All Standard MAC coil types. Adjustable Primary/ Bridge drive up to 20 V pp.
COIL CONNECTOR:	Standard 7 pin for coil and 11 pin for rotary applications
CABINET DIMENSIONS	25" W x 22" H x 26" D (63.5 cm x 55.8 cm x 86.4 cm) for cabinet Air conditioner adds an additional 8" (20.3 cm) to depth
CABINET WEIGHT	230.5 lbs. (104.54 kg.) for cabinet. Air conditioner is an additional 48 lbs. (21.8 kg) Other cabinetry options are available
POWER REQUIREMENT	120 /240 VAC, 50/60 Hz, single phase, 5 amps.

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