

## Ultrasonic Rotary Test Systems

### Precision Ultrasonic Inspection at High Throughput Speeds for Round Bar and Tubular Products.



*Echomac® UT-500 Rotary Ultrasonic System to inspect steel bar, mounted on a 125 mm Triple Drive Roll Constant Center Bench*

#### **UNIQUE ROTARY MECHANISM**

The high performance of Magnetic Analysis Corp. rotary UT systems starts with the precision rotary mechanism. All MAC rotaries utilize a unique rotary transformer system with rotary mounted pulsers and receivers to provide maximum sensitivity and minimum noise.

#### **TRANSDUCER POSITIONING**

The other critical part of a high quality UT test is accurate positioning of transducers. MAC uses precision test blocks designed to securely hold the transducers while unique transducer holders allow accurate and quick set up of multiple tests including: shear waves for detecting transverse and longitudinal surface and subsurface defects, as well as compression waves to detect internal defects and measure wall thickness, OD and ID.

The test block and transducer holders also ensure that the transducer positions are accurately maintained while the rotary spins at the high speeds required to allow small defect detection without sacrificing

throughput speed. MAC offers rotary test heads in various sizes for 10mm to 360mm diameter product.

#### **ECHOMAC FD-SERIES ELECTRONICS**

Once the signals are captured in the rotary they must be analyzed, presented and stored in a way that makes sense to the operator without compromising the quality of the results. This is where the MAC FD series electronics comes into play. The Echomac instrumentation and software offers the power to house up to 32 channels of electronics in one computer chassis, and the flexibility to allow the customer to configure the system to meet their requirements. Each channel can be easily configured for flaw detection, lamination, or wall thickness measurement. An optional 4 channel diameter package is available to measure wall thickness, outside and inside diameter, and eccentricity.

#### **PRECISION HANDLING MECHANICS**

A high performance UT quality control system requires more than just a precision test instrument.

Without precision mechanics providing proper centering, high stability and consistent speed of the tube or bar through the rotary, the test results will be compromised. MAC offers multiple styles of mechanics with their UT systems providing the customer with options depending on their needs and budgets. MAC V-Roll benches offer an economic system based on 120 degree drive rolls. Alternatively, triple pinch based benches are available that offer the ultimate in automation and rapid size changeover.

#### **CLEAN, TEMPERATURE CONTROLLED WATER**

The other critical element is a high volume source of clean, temperature controlled water. MAC offers a wide range of recirculating water packages, for the various size rotaries, which ensure that coupling is maintained and untested ends are kept to a minimum. These systems are compatible with additional customer provided water storage.

#### **CONTROL SYSTEMS**

Finally tying the whole thing together are control options that allow the whole system to be set up and run from a central location.

## FEATURES & ADVANTAGES

The Echomac Rotary test configuration provides important advantages over segmented, stationary transducer systems, including “spin the tube” and phased array.

### **100% Coverage**

100% defect coverage can be achieved at relatively high throughput rates.

### **Multiple Test Transducers**

Multiple transducer elements allow simultaneous testing in many different directions such as CW, CCW, FWD, REV, and for wall thickness and lamination, an advantage over phased array’s sequential testing. In addition, multiple elements can be used for each test to increase the throughput speed.

### **Seal-Less Operation**

MAC’s larger capacity UT Rotaries are also designed to operate without any internal seals. These “seal-less” rotaries are much less likely to be damaged by grit and other mill contaminants and provide greater reliability.

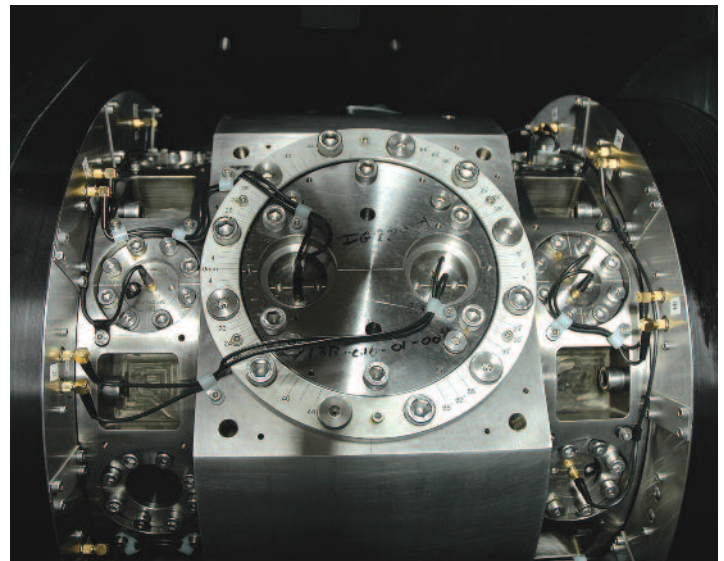
### **Acid Resistant Stainless Steel**

All components of the rotary mechanism that come in contact with water are constructed of acid resistant stainless steel

### **Shorter Change-over Times**

The shear wave transducer holders are designed to allow easy reconfiguration for different diameter material through a simple rotational adjustment of the transducer offset, ensuring rapid changeover while maintaining the accuracy of settings.

Change-over times can also be kept to a minimum with Echomac’s Triple Drive Roll Benches and ability to store and recall an unlimited number of setups. Quick



*180 mm UT Rotary with MAC’s latest multiplex transducer design, is shown above. The center disk contains two test planes of offset transducers for shear wave testing of longitudinal defects. The two outer test planes, one on either side, contain normal perpendicular incident beam transducers to detect transverse defects and to measure thickness.*

access knobs for bushing and diaphragm changes, and Echomac’s system of offsetting, rather than angulating transducers are just a few of the features that enhance customer convenience.

### **New Multiplex Transducer Design**

MAC’s new Multiplex transducer design allows lower noise signals and up to 32 transducer elements, an important step to meet tighter specifications that require detecting smaller and smaller defects without sacrificing throughput speed.

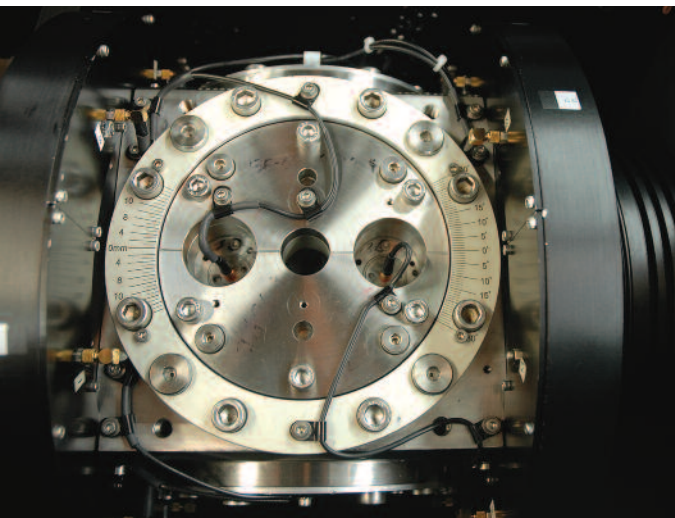
### **Sophisticated Controls**

Depending on the customer’s requirements, standard controls manage the water system, the variable frequency drive speed of both the UT rotary and the bench, defect marking, sorting, and data archiving.

The optional Conductor provides comprehensive control of the test system, including full bench parameter input to the separate PLC device via a keyboard and push button panels. Central batch data input can be provided when the Echomac test and bench is integrated with other test methods in use. Unified tube status reporting is also provided, for installations with multiple test stations. This is important for customer record keeping and tube prove up.

### **Integrate with Other Tests or Existing Lines**

Echomac Rotaries can be integrated with eddy current, flux leakage, and other tests for a comprehensive inspection system. MAC can also ensure accurate integration with an existing NDT line, matching the line speed and meeting the sorting, defect marking, and stringent data archiving requirements.



*Closeup of the rotating transducer holder for a 50 mm 16 channel UT Echomac Rotary.*

## APPLICATIONS

- ❑ *Oil Country Tubular Goods*
- ❑ *Heat Exchanger Tube*
- ❑ *Hydraulic Boiler Tube*
- ❑ *Umbilical Tube*
- ❑ *Special Quality Bars*

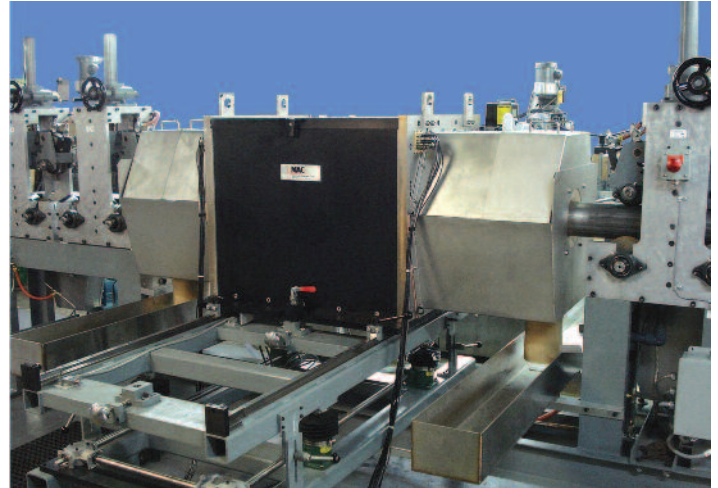
Echomac Rotary UT systems are being used in a wide range of applications. In the OCTG business UT systems are being used to test to API 5CT and 5L standards including full defect detection as well as wall thickness monitoring. Seamless as well as welded tube is being tested.

A large number of systems are also being used in applications testing heat exchanger tube, boiler tube, hydraulic tubing and umbilical tubing. MAC has systems operating both in-line as well as in off-line testing systems.

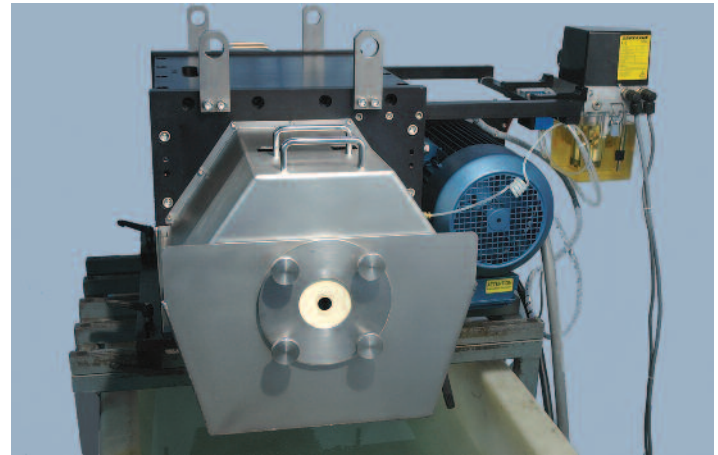
Bar and wire is another common application area of MAC UT Rotaries. Systems are being utilized to test everything from large round billet and bar at early stages of the steel production process down to small diameter highly finished bar.

***MAC offers one of the largest ranges of UT testing options in the business, all without compromising the quality of test results.***

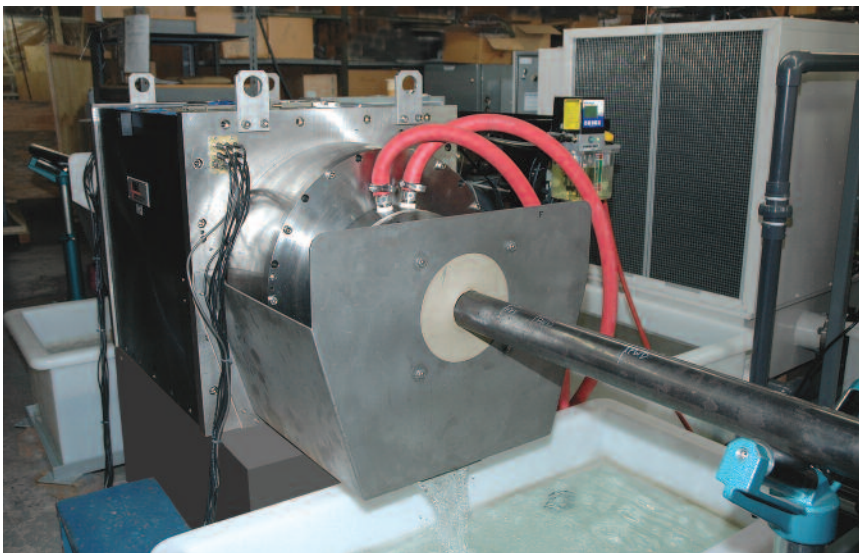
***For more Information, contact us at  
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*180 mm Echomac UT System for inspecting hot rolled seamless carbon steel tube, includes 16 test channels to detect longitudinal and transverse flaws and lamination. The rotary is shown above on a slide and elevate table, adjacent to Pinch Stands, all mounted on a Standard V-Roll Welded Drive Bench.*



*50mm Echomac UT Rotary with oiler system that constantly supplies fresh oil to the bearings to extend their life and permit increased rotary speeds.*



*The covers have been removed from this 180mm rotary showing the hoses that constantly feed more water couplant into the rotary housing than is leaked out from the bottom, thereby eliminating the need for internal seals. What water does leak out is then fed through the recirculating system and reused.*



*Recirculating water chiller systems that can be integrated with the Echomac UT rotary operation to provide clean, temperature controlled couplant for UT testing.*

## ROTARY MECHANISM SPECIFICATIONS

English Series	Size Range		Maximum RPM	Maximum Number of Active Transducers
100 Series	1/4" - 1"	(6.35 - 25.4 mm)	3600/4500	Two
150 Series	1/4" - 1 1/2"	(6.35 - 38.1 mm)	4000	Three
Metric Series	Size Range			
50 mm	10 - 50 mm	(.375" - 2")	3600	Seven/Sixteen
75 mm	15 - 75 mm	(.625" - 3")	2400	Eight/Sixteen
100 mm	20 - 100 mm	(.875" - 4")	2400	Seven/Sixteen
125 mm	25 - 125 mm	(1" - 5")	1800	Seven/Fourteen
150 mm	30 - 150 mm	(1.18" - 6")	1800	Eight/Sixteen
180 mm	35 - 180 mm	(1.4" - 7")	1200	Sixteen, optional up to 32
220 mm	40 - 220 mm	(1.5" - 8.6")	850	Fourteen, optional up to 28
360 mm	100 - 360 mm	(4" - 14.2")	300	Sixteen, optional up to 32

*The above specifications are suggested ranges, maximum RPM and transducer numbers, but additional options are available for specific applications upon request.*

### V-Roll Welded UT Drive Benches

*Includes eight bottom V-rolls with top pinch rolls, plumbing for water supply and drain, and provision for horizontal and vertical alignment of Rotary Mechanism, and an AC frequency controlled drive motor.*

Bench Type	Size Range	Type of Top Pinch
DB UT 1600	3/16" - 1 1/2" (4.76 - 38.1 mm)	air or spring loaded
DB UT 3500	1/4" - 3 1/2" (6.35 - 88.9 mm)	air or spring loaded
DB UT 6000	3/4" - 5 1/2" (19.05 - 139.7 mm)	air loaded

### Triple Drive Roll Constant Center UT Benches

*Includes 3 point triple drive and centering guides, and a single point adjustment of the table height and diameter of the triple driving and centering guides to align the bench and testers with the incoming and outgoing production line. The triple drive guides operate similar to a drill chuck which opens and closes its grasp of the tube at three points, maintaining a stable positioning of the test product.*

**Sliding Tables:** are available for supporting the ultrasonic rotary unit, adjusting its horizontal position, and moving the rotary off-line for setup and maintenance.

Bench Type	Size Range
Triple Bench - Small	5 mm - 100 mm tubing only
Triple Bench - Medium	16 mm - 160 mm tubing or bar, up to 100mm diameter
Triple Bench - Large	25 mm - 250 mm tubing or bar

### Utility Requirements

Electrical	240/480V, 60 Hz, 3 phase alternating current, 20 - 150 amps; and 120V, 60 Hz, single phase, 20 amps (International voltages and frequencies are available if specified at time of order)
Water	45 psi, quantity of gpm is dependent on the series selected.
Air	100 psi, 690 kPa, 6.9Bar
Drain	3" capacity gravity feed for 15 gpm minimum, depending on series selected.

