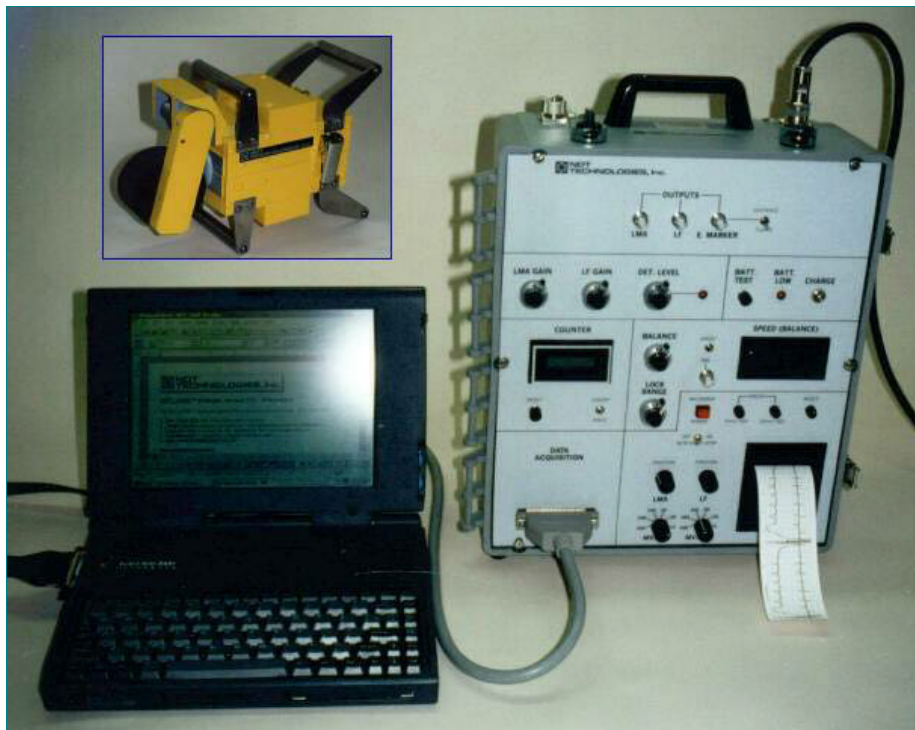


The **LMA-Test™**  
NON-DESTRUCTIVE  
WIRE ROPE INSPECTION  
SYSTEM



with **NDT\_CARE™** (Computer Aided Rope Evaluation) Software

The Standard of  
Accuracy & Reliability



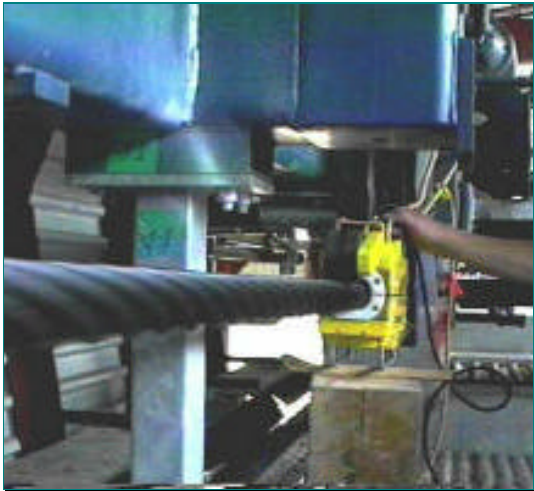
Founded in 1980, NDT Technologies, Inc. is recognized as the technical leader in non-destructive inspection equipment for the safety and reliability of wire ropes.

We are uniquely qualified and equipped to develop practical rope inspection procedures and test instrumentation for the reliable inspection of wire ropes.



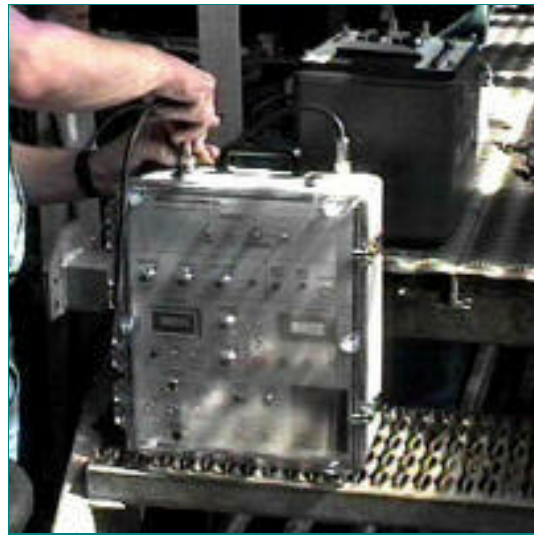
We make more types of rope inspection instruments than any other manufacturer.

Our experience and know-how is backed by a vigorous ongoing research effort into all aspects of wire rope safety. Our total and undivided commitment to wire rope safety gives you, our customers, peace of mind.



Electromagnetic inspection methods have a remarkable potential for improving wire rope safety. Combining the inherent capabilities of magnetic flux leakage methods with our knowledge and experience in electronics, signal conditioning and computer technology, we have made a commitment to a program of research, development and product engineering. This commitment has yielded impressive results.

A multiyear research effort has led to the development of the LMA-Test™ system, the most advanced and accurate wire rope inspection system presently available.



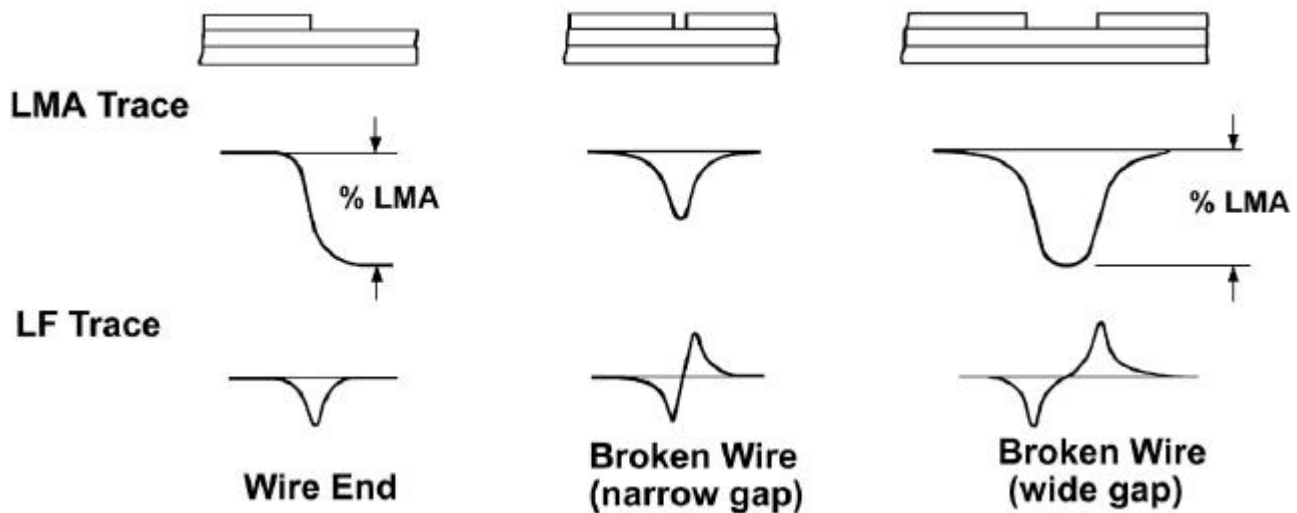
# Non-Destructive Inspection with LMA-Test™

The LMA-Test rope inspection instrument magnetically saturates a section of the steel rope with strong samarium - cobalt magnets. Where there is an irregularity in the rope, such as a broken wire, corrosion or abrasion, the

distorted magnetic flux leaks from the rope. Sensors close to the rope sense the magnetic leakage flux pattern. The magnetic leakage flux induces electrical test signals in the sensors. Signal processing circuitry modifies the test

signals to make them proportional to the loss of metallic area caused by rope defects. A strip chart recorder and/or a cassette tape recorder records and displays signals.

The following is a short defect catalog with typical chart patterns of important types of rope flaws:



The system consists of two different signal traces:

- **The Loss-of Metallic-Area (LMA) Trace** gives a quantitative indication of loss of metallic cross-sectional area caused, for instance, by broken wires, corrosion, and abrasion
- **The Localized-Flaw (LF) Trace** is used to pinpoint the location of broken wires. After flaws have been located on the LF Trace, the LMA Trace is used for a detailed defect analysis.

# The LMA-Test™ Wire Rope Inspection System

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Failure of wire ropes poses a serious safety hazard. The cost of wire rope failure - in terms of human injury, equipment damage, liability suits and production downtimes - can be substantial. Safety is a primary concern to users and producers of wire rope. Periodic inspections are universally enforced by safety authorities.

Wire ropes fail in many different ways. Bending, vibration and tension cause

fatigue breaking of wires. Environmental conditions, such as water or aggressive chemicals cause corrosion. Pounding, impacts, kinks or abnormal friction cause wear, peening and other mechanical damages. All wire ropes wear out eventually. They have to be inspected at regular intervals. The longer rope has been in service, or the more severe the service, the more thoroughly and frequently it has to be inspected. When the damage exceeds certain limits, the rope must be replaced.



Interstrand and core-to-strand nicking. (Outer strand removed)



Severe abrasion, peening, broken wires



External and internal broken wires. (Valley breaks)



Severe abrasion, broken wire



Corrosion, broken wires



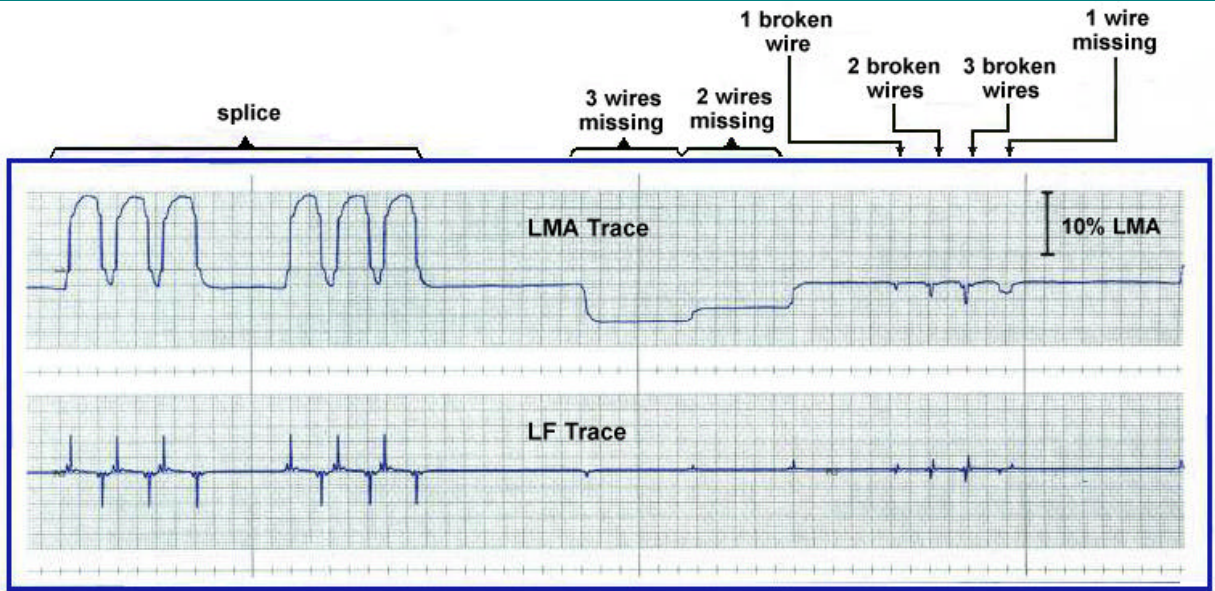
Fatigue breaks

Wire rope needs competent periodic inspection throughout its service life

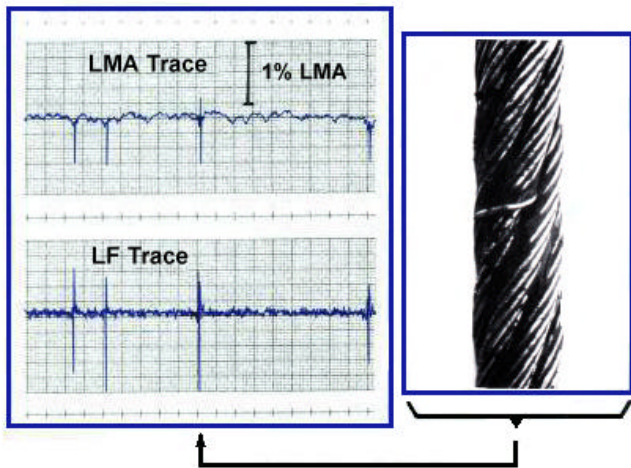
- to prevent human injury,
- to prevent equipment damage,
- to prevent unscheduled production downtime,
- to protect against loss and liability suits,
- to extend rope life,
- to avoid unnecessary and premature rope retirement,
- to give operators peace of mind

Visual rope inspection is the most widely used and simplest method. However, the reliability of purely visual inspections is often insufficient. Grease, dirt or plastic coatings make visual inspections difficult, if not impossible. Internal flaws can not be detected. A thorough visual inspection is extremely time consuming. Because of the limited attention span of the inspector, rope defects are often overlooked. This uncertainty causes premature rope retirement in many cases, which can be avoided by more

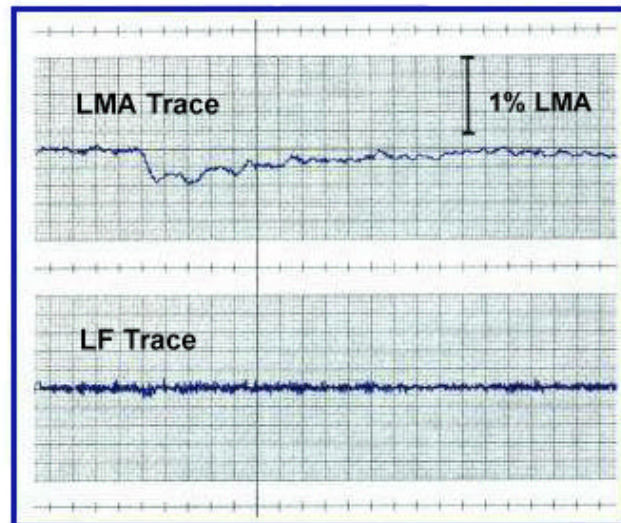
accurate inspection methods. A recent study found that approximately 70% of all ropes are condemned, without any loss of strength at all, to compensate for unreliable inspections. Our **LMA-Test™** instrumentation overcomes most of these problems. The **LMA-Test™** equipment provides non-destructive inspection that accurately pinpoints internal and external rope defects which can not be otherwise detected. The **LMA-Test™** instrumentation protects your rope investment.



The above chart recording of a test rope with well defined standard flaws illustrates the performance of the LMA-Test™ system. Using the defect catalog, this chart recording is self explanatory.



The chart recording on the left illustrates the amazing accuracy and resolving power of the LMA-Test™ wire rope inspection system. The broken wire in this rope is bent back, causing first an increase and then a decrease of metallic cross-sectional area. The corresponding chart pattern of the LMA trace shows this increase and decrease with great detail. The chart recording also indicates additional broken wires.

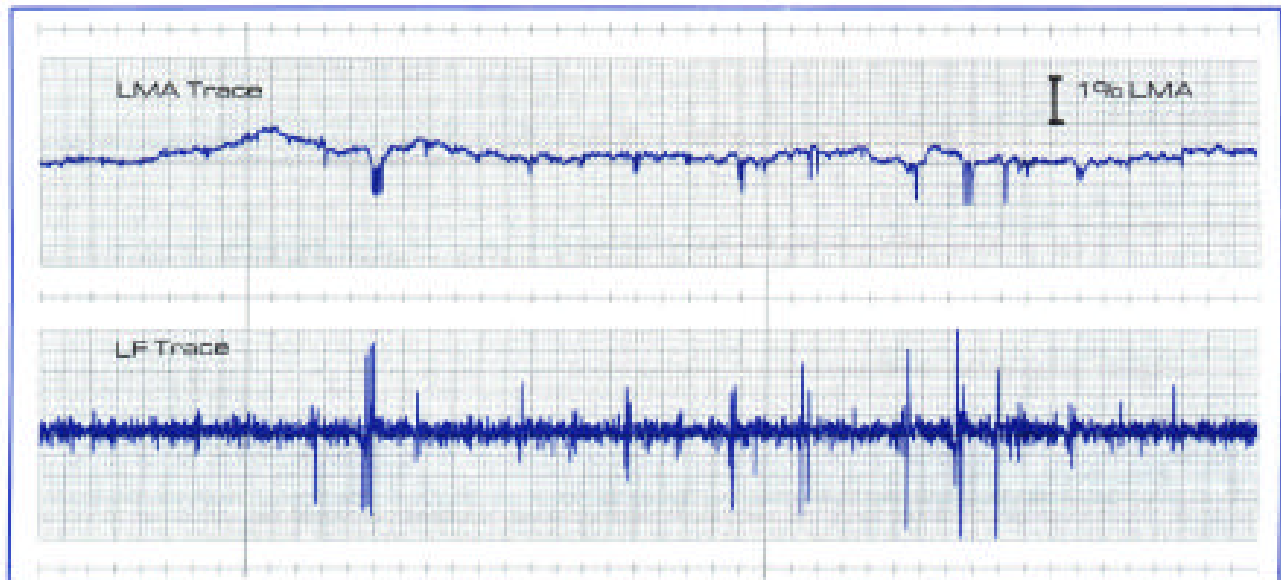


The LMA trace in this chart recording shows a 0.5% loss of metallic cross-sectional area caused by abrasion.

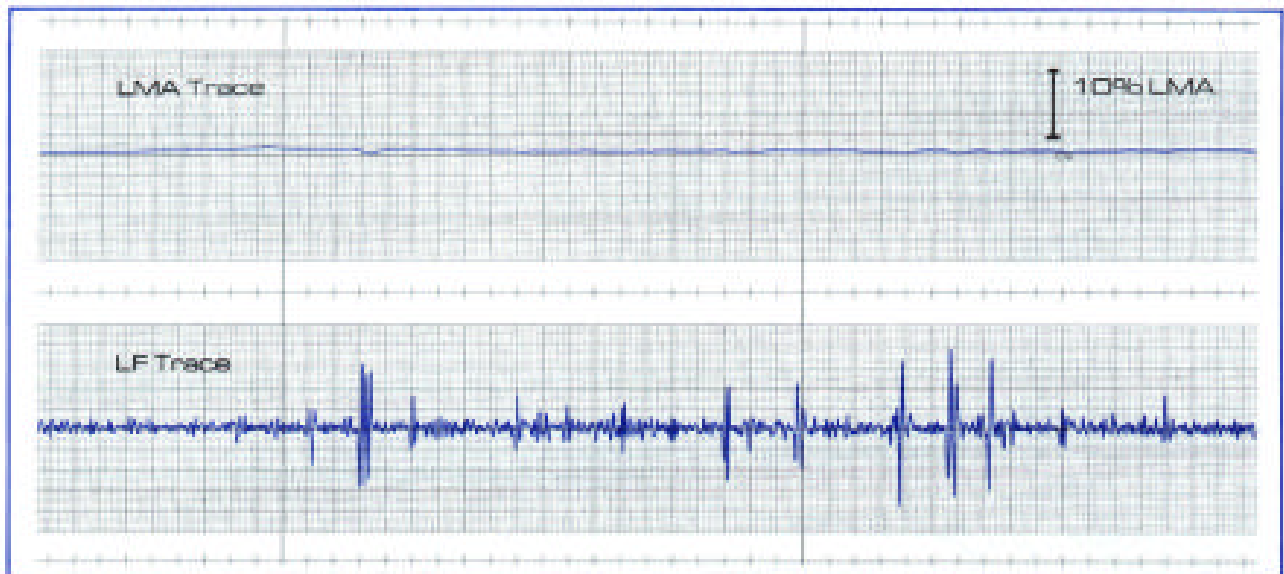
# LMA Test™ Instrumentation vs. Competitor

The following chart recordings compare the **LMA Test™** inspection system with the next best competing instrument. These recordings demonstrate the superior accuracy and resolving power of the **LMA Test™** system.

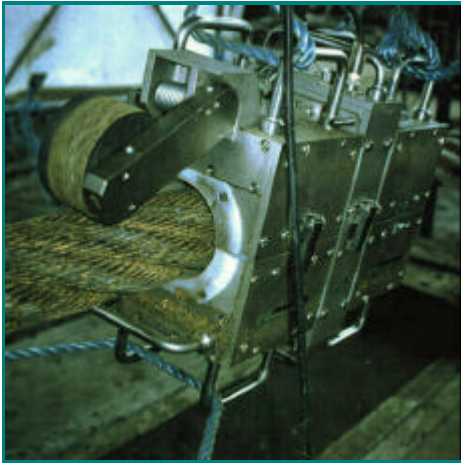
**LMA-TEST™**



**COMPETITOR**



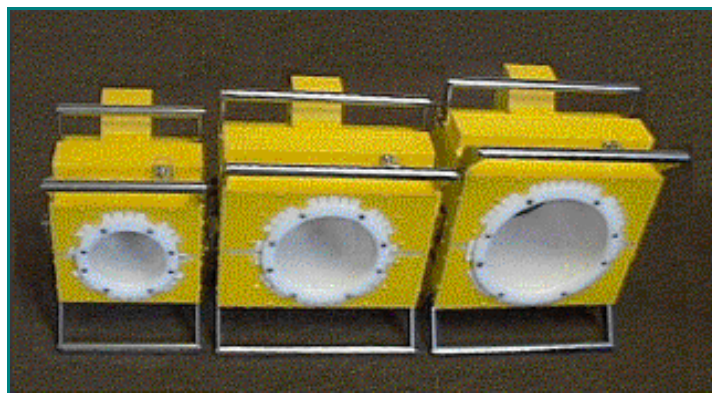
The **LMA Test™** recording shows considerably more detail, including broken wires, than the corresponding recording by the competing instrument. The resolution of the **LMA Test™** LMA trace is an order of magnitude better than that of the competitor.



The accuracy and resolving power of the **LMA-Test™** rope inspection systems have no equal...anywhere.

Our instruments are practical, rugged, and accurate. They supply the reliable information needed to make your decisions. **LMA-Test™** inspection systems give simultaneous quantitative and qualitative readings of a rope's external and internal broken wires.

The accuracy and reliability of the **LMA-Test™** inspection systems is unmatched. Their resolution is better by an order of magnitude than that of any competing instrument. **LMA-Test™** instruments are lighter and easier to use than other instruments. Their inherent ruggedness makes **LMA-Test™** instruments ideal for tough field use.



In addition to our regular line of wire rope inspection instruments, NDT Technologies also manufactures customized instrumentation for practically any application. Please contact us for your customized requirements. Shown at the left are Sense Heads for the inspection of Flexpipes for the Off-shore Oil industry.

<p><b>NDT Technologies, Inc.</b> has recently developed its <b>NDT_CARE™</b> system for the computer-assisted evaluation of wire rope. This hardware/software package was designed for use in conjunction with NDT Technologies' <b>LMA-Test™</b> electromagnetic wire rope inspection equipment.</p> <p>The <b>NDT_CARE™</b> wire rope analysis system consists of two separate parts:</p> <ol style="list-style-type: none"><li>(1) Data Acquisition hardware and software, and</li><li>(2) the <b>NDT_CARE™</b> software package for computer-assisted data analysis and chart evaluation.</li></ol> <p><b>Data Acquisition</b></p> <p>For data acquisition, each user can choose his or her own computer-based digital data acquisition system (hardware and software). These systems are readily available from numerous manufacturers. All known data acquisition packages can store data in the widely used Excel-compatible CSV (comma separated value) format, which is required by the <b>NDT_CARE™</b> software. The real-time graphical display of data during acquisition is also possible for most systems.</p> <p>Data acquisition PC cards (formerly called PCMCIA cards) allow the use of notebook computers as portable and battery-operated data acquisition systems. Please contact NDT Technologies, Inc. for advice on choosing an appropriate system.</p>	<p><b>Wire Rope Evaluation Software</b></p> <p>The <b>NDT_CARE™</b> software is available as an Excel Add-In. It requires <b>Excel</b> Version 7.0 or higher. The Add-In is easy to use. It exploits the advanced charting and data processing features of <b>Excel</b>. Here are some highlights of the <b>NDT_CARE™</b> software.</p> <ol style="list-style-type: none"><li>1. A very special and proprietary feature is Signal Enhancement. This capability allows LMA (loss of metallic cross-sectional area) measurements with unprecedented accuracy. Previously, results at this accuracy level could only be obtained with annular coils that must be wrapped around the rope for each inspection. (An awkward procedure, which is impractical and unfeasible for actual field inspections). Our proprietary Signal Enhancement method offers an inspection accuracy that is equal to that of annular coils while, at the same time, retaining the usual and convenient "clamshell" design of our sensor heads. Please note that, especially after Signal Enhancement, our test results are more accurate by an order of magnitude than those of our competitors.</li><li>2. The program makes test results completely independent of rope speed, and it allows scaling and customized formatting of charts.</li><li>3. Test results can be displayed in the forward or reverse direction. This is useful for comparing results from subsequent inspections that</li></ol>	<p>were performed with the rope running in opposite directions.</p> <ol style="list-style-type: none"><li>4. An overview chart of the entire rope length on a single page allows easy location of critical rope sections for a more careful evaluation.</li><li>5. The program allows the convenient calibration of test results by using our proven and very simple "calibration wire" method.</li><li>6. The program's Post-Calibration feature offers an alternative approach to calibration. The Post-Calibration procedure is graphical and is performed by clicking-and-dragging on one of the charts.</li><li>7. The software allows zero adjustment of the LMA trace. This is important when the inspection is started on a deteriorated section of the rope. The adjustment procedure is completely graphic and consists, essentially, of a click-and-drag operation on any one of the charts.</li><li>8. Using Excel VBA (Visual Basic for Applications), the user can write his or her own subroutines that are custom tailored to specialized requirements. This feature is particularly useful for research projects.</li><li>9. Using the chart formatting capabilities of Excel, the user can change the appearance of all charts as desired. Many other features, too numerous to mention, are also available. For example, the test data can be compressed and/or sent by e-mail. Or charts can be exported into word processor documents, data bases, presentation graphics, etc.</li></ol>
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The following chart recordings illustrate the enhancement capabilities of the **NDT\_CARE™** software. It can be seen from the following example that signal resolution is greatly improved by using the **NDT\_CARE™** software. The resolving length of anomalies as small as 50 mm can be realized. This is a substantial increase in accuracy which can not be obtained from any other electromagnetic wire rope inspection equipment.

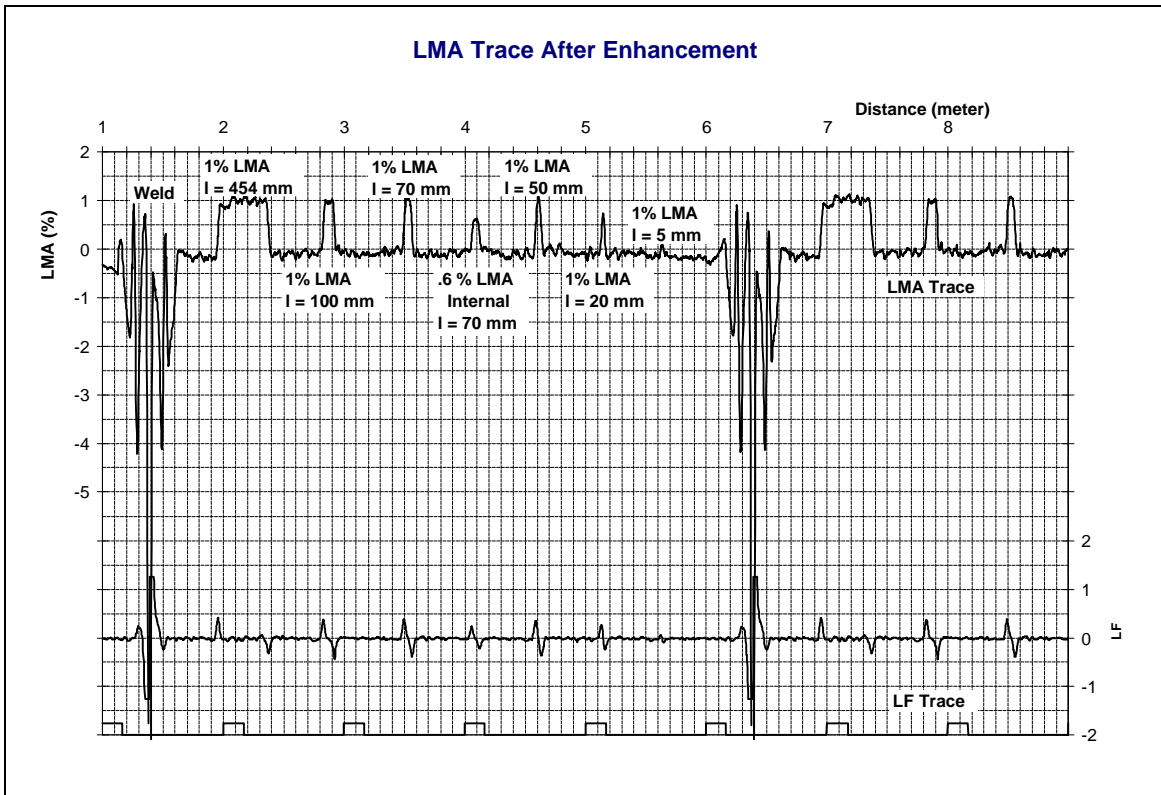
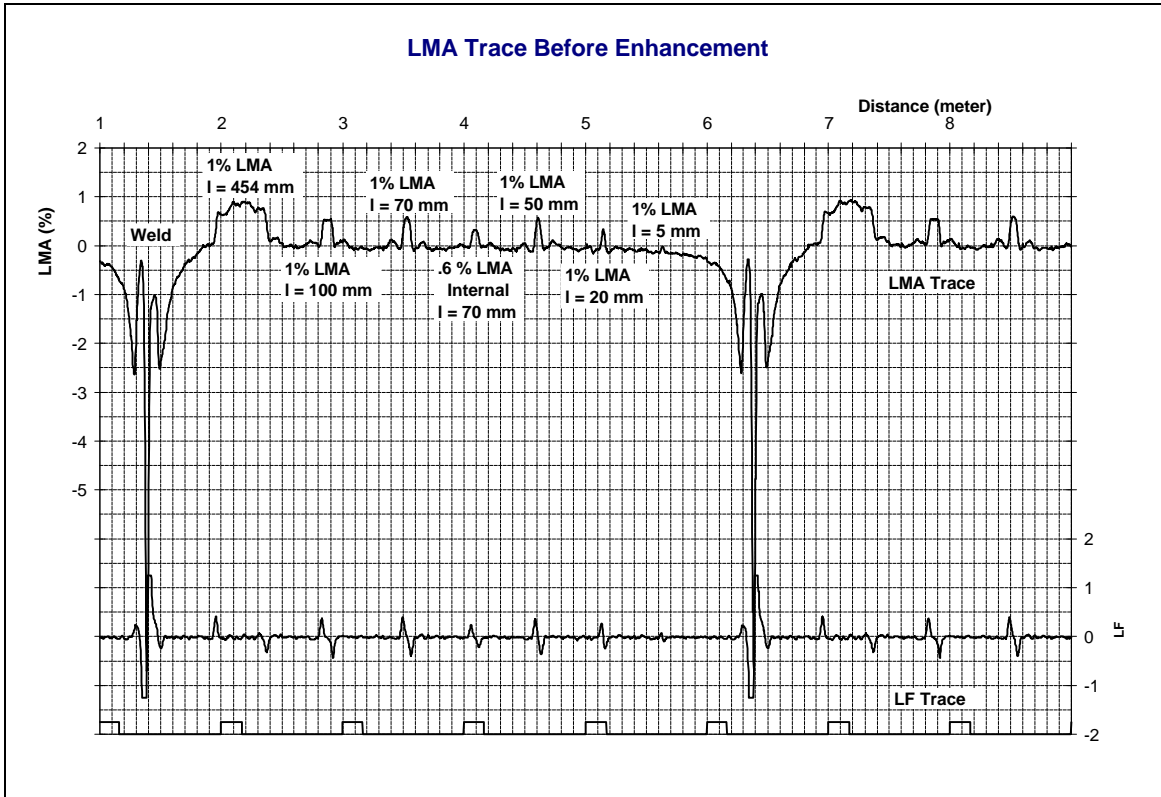
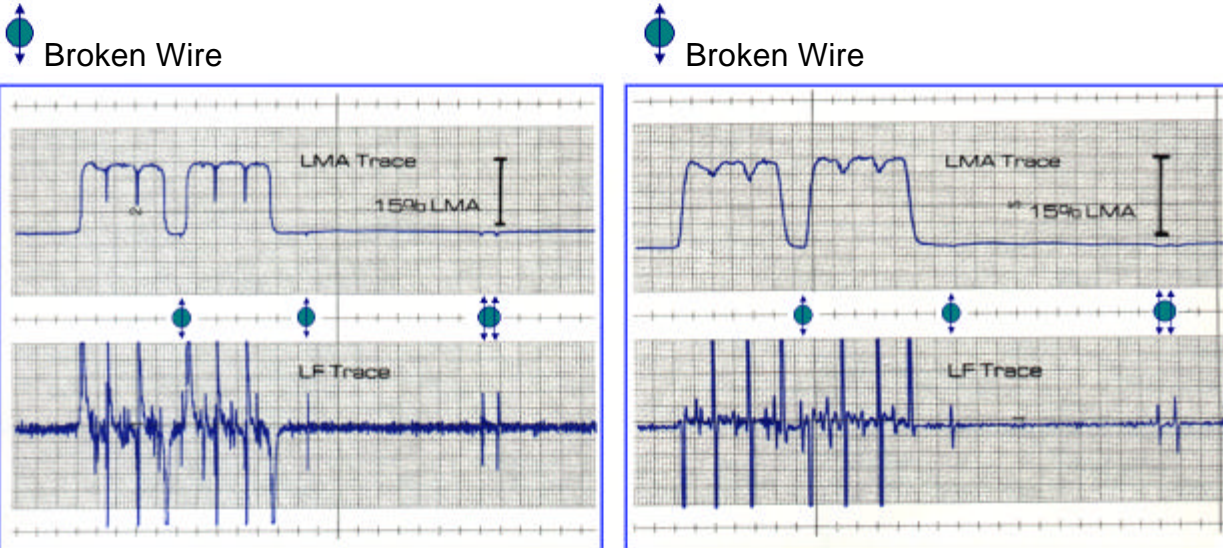


Chart recordings of a rope splice. The LMA-Test™ recording on the left clearly indicates broken wires on the LMA trace.

The broken wire signals are conspicuously missing from the competitor's LMA trace on the right.

## LMA-Test™

## Competitor



*Please visit us online*

		P.O. Box 637, So. Windsor, CT, 06074 USA Tel: (860) 644-5655 Fax: (860) 644-5656
<a href="#">History</a>	<a href="#">Affiliates</a>	<p>Electromagnetic inspection is a sophisticated non-destructive evaluation procedure used for the in-service inspection of wire ropes.</p> <p>Modern wire rope test instruments are of the so-called dual-function LFLMA type. This means that they can simultaneously detect Localized Flaws (LFs) and measure Loss of Metallic Cross-Sectional Area (LMA).</p>
<a href="#">Features</a>	<a href="#">Links</a>	
<a href="#">Products</a>	<a href="#">EMail</a>	
<a href="#">Papers</a>	<a href="#">Request Form</a>	
<a href="#">Software</a>	<a href="#">Projects</a>	
NDT CARE Software Version 1.03 later available Manufacturers of Super Magnaflux Wire Rope Test Instrumentation		Request more info via our Request Form

<http://www.ndttech.com>



P.O. Box 637  
 South Windsor, CT. 06074 USA  
 Tel: (860) 644-5655  
 Fax: (860) 644-5656  
 Email: [ndttech@worldnet.att.net](mailto:ndttech@worldnet.att.net)