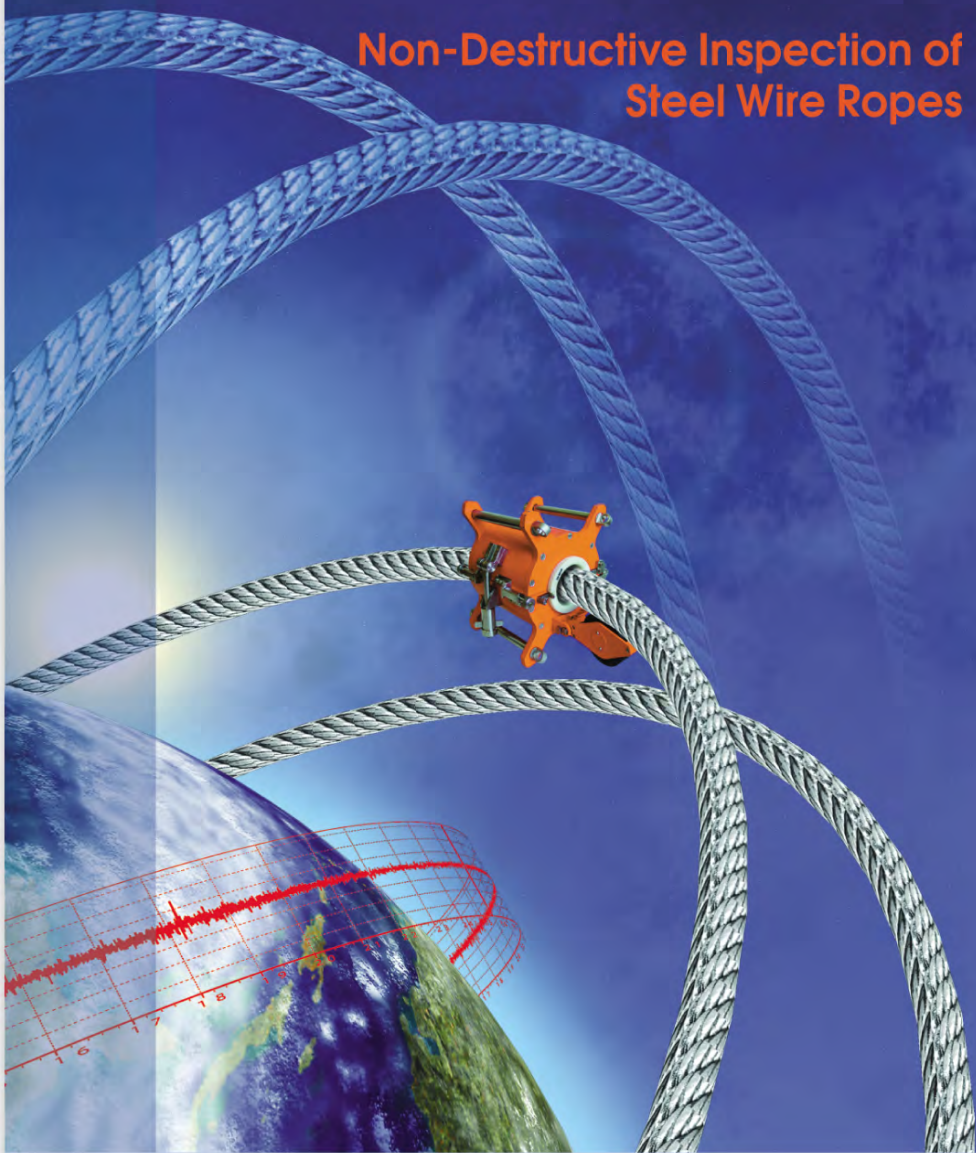


Non-Destructive Inspection of Steel Wire Ropes



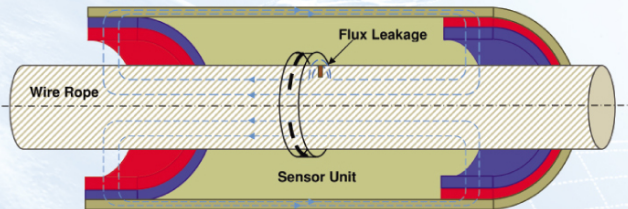
INTRODUCTION

Wire ropes deteriorate for many reasons resulting in a decrease in strength over their lifetime. For safe operation, wire ropes should be periodically inspected and discarded at the appropriate time - premature discard of a wire rope is wasteful and costly. Comparing inspection data with the discard values contained in the appropriate standard, allows the duty holder to make an informed decision whether to discard the rope or allow it to remain in service.

INTRON PLUS presents state-of-the-art instruments INTROS[®] for the non-destructive testing (NDT) of steel wire ropes. INTROS[®] covers a wide range of rope diameters, and can be used for rope inspection in mines, cranes, elevators, ropeways, bridges, overhead transmission lines, etc. INTROS[®] is dual function instrument, i.e. it simultaneously measures loss of metallic area (LMA), caused by corrosion, abrasion or wear and reveals local flaws (LF) in the form of internal and external broken wires, pitting corrosion, cross-nicking, welding spots, etc. INTROS[®] is suitable to inspect stranded, spiral, half-locked, full-locked, plastic coated or plastic filled valley ropes made from bright and galvanized wire, with fiber or steel core. It meets the requirements of ASTM E1571, ISO 4309, EN 12927, IMCA LR 004, IMCA HSSE 023, and IMCA M 197.

PRINCIPLE OF OPERATION

The instrument operation is based on the magnetic flux leakage (MFL) method that detects anomalies in normal flux patterns created by discontinuities in ferrous material, saturated by a magnetic field. This inspection method is commonly known as magnetic rope testing (MRT).



Strong magnets, implemented into magnetic head, magnetically saturate the rope. The magnetic field above the rope surface (flux leakage) remains uniform whilst the rope contains no irregularities; therefore, sensors pick up the signal, which is of a constant value. When there are changes in cross section of the rope or broken wires occur, the magnetic field distorts, and flux leakage increases locally above the rope surface. These irregularities create change of signal in the sensors. The basic unit collects signals for storage and processing.

DESCRIPTION

INTROS[®] consists of a basic unit (BU) and magnetic head (MH) connected with a detachable data transfer cable up to 20 m in length. Magnetic heads are designed to inspect ropes with diameters from 6 mm to 175 mm. The diameter range for each magnetic head is highlighted in the equipment designation (e.g. "MH22-45" is capable of testing ropes from 22 mm up to 45 mm in diameter). The Monoblock MB8-24 does not have a separate BU and accommodates the magnetic head and boards in the same body, therefore needs no connecting cable. During inspection, the rope moves through the magnetic head or the magnetic head moves along the rope, whilst the basic unit collects inspection data. During the test, the basic unit displays inspection data, the speed of the rope and the current instrument position along the rope. After inspection, data can be downloaded from the basic unit to a computer in the form of signal-distance diagrams, called traces, e.g. LMA, LF, inspection speed traces. Traces can also be viewed in real time during the inspection if required.

BASIC UNIT INTROS[®]

Two versions of the basic unit are available: BU-16 and BU-M. The both units are hand held and have storage for inspection data and a downloading capability. Both units feature a waterproof keypad, rechargeable batteries and a leather pouch to protect the unit from dust and rain. They can be attached to the magnetic head to travel along a static rope, functioning in the standalone mode.

The basic unit BU-16 can work with all magnetic heads except MH6-26, MH22-45, MH60-85, MH80-120, MH100-150, and MH100-175. It has two part LED displays to indicate measuring parameters and distance.



Dimensions	230x85x35 mm
Weight	0.7 kg
Power supply	AA rechargeable batteries
Continuous work	6 hours
Length of cable	Up to 8 m
Storage capacity	16 Mb
Ingress protection	IP65
Ambient temperature	-10°...+50°C

The basic unit BU-M is compatible with all magnetic heads and has a large illuminated graphic display, capable of indicating inspection data and battery level. Increased memory capacity allows the storage of bulk data, which is important when inspecting ropes of large diameter.



Dimensions	235x125x37 mm
Weight	1 kg
Power supply	Li-ion batteries
Continuous work	5 hours
Length of cable	Up to 20 m
Storage capacity	8 Gb
Ingress protection	IP65
Ambient temperature	-25°...+55°C

MAGNETIC HEADS INTROS®

The magnetic heads consist of two halves connected together by hinges. The heads MH60-85, MH80-120, MH100-150, and MH100-175 have dismantable halves and assemble on the rope in a special way. Sensors may be detachable to fit a certain range of rope diameter, or non-detachable for higher ingress protection level. Sleeves align the rope in the head and protect the sensors. MH60-85, MH80-120, MH100-150, and MH100-175 align the rope with special spring loaded wheels. Each magnetic head is equipped with a distance counter to provide an accurate measurement of the current location on the rope.



Monoblock MB8-24 has non-detachable sensors and a set of sleeves.

Diameter of ropes	from 8 to 24 mm
Dimensions	280x125x82 mm
Weight	3.5 kg
Inspection speed	from 0 to 1 m/s
Ingress protection	IP54
Ambient temperature	-10°...+50°C



Magnetic head MH6-24F has detachable sensors and a set of sleeves.

Diameter of ropes	from 6 to 24 mm
Dimensions	264x188x66 mm
Weight	3 kg
Inspection speed	from 0 to 2 m/s
Ingress protection	IP54
Ambient temperature	-10°...+50°C



Magnetic head MH6-26 has non-detachable sensors and a set of sleeves.

Diameter of ropes	from 6 to 26 mm
Dimensions	250x185x105 mm
Weight	4 kg
Inspection speed	from 0 to 4 m/s
Ingress protection	IP67
Ambient temperature	-25°...+55°C



Magnetic head MH20-40 has non-detachable sensors and a set of sleeves.

Diameter of ropes	from 20 to 40 mm
Dimensions	330x205x190 mm
Weight	8.7 kg
Inspection speed	from 0 to 2 m/s
Ingress protection	IP65
Ambient temperature	-10°...+50°C



Magnetic head MH22-45 has non-detachable sensors and a set of sleeves.

Diameter of ropes	from 22 to 45 mm
Dimensions	295x185x195 mm
Weight	11.1 kg
Inspection speed	from 0 to 4 m/s
Ingress protection	IP67
Ambient temperature	-25°...+55°C

Magnetic heads MH24-64 and MH24-64M5 have detachable sensors and a set of sleeves. MH24-64M5 has improved performance and inspection speed.

Magnetic head MH40-64 has non-detachable sensors and a set of sleeves.



Diameter of ropes:	
MH24-64/24-64M5	from 24 to 64 mm
MH40-64	from 40 to 64 mm
Dimensions	330x235x195 mm
Weight	15 kg
Inspection speed:	
MH24-64/40-64	from 0 to 2 m/s
MH24-64M5	from 0 to 4 m/s
Ingress protection:	
MH24-64/24-64M5	IP54
MH40-64	IP65
Ambient temperature:	
MH24-64/40-64	-10°...+50°
MH24-64M5	-25°...+55°



Magnetic head MH60-85 has detachable sensors and a set of sleeves

Diameter of ropes	from 60 to 85 mm
Dimensions	690x526x288 mm
Weight	59 kg
Inspection speed	from 0.2 to 1.5 m/s
Ingress protection	IP65
Ambient temperature	-10°...+50°C

Magnetic heads MH80-120/100-150/100-175 have detachable sensors and a set of sleeves. These magnetic heads are installed on the rope with the roller system, and aligned on the rope with adjustable wheels.

Diameter of ropes:

MH80-120	from 80 to 120 mm
MH100-150	from 100 to 150 mm
MH100-175	from 100 to 175 mm

Dimensions:*

MH80-120	895x520x440 mm
MH100-150	950x550x490 mm
MH100-175	980x646x509 mm

Weight:*

MH80-120	163 kg
MH100-150	220 kg
MH100-175	250 kg

Inspection speed:

MH80-120/100-150	from 0.2 to 1.5 m/s
MH100-175	from 0.02 to 1.5 m/s

Ingress protection:

MH80-120/100-150	IP65
MH100-175	IP65

Ambient temperature:	-10°...+50°
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* Including roller system





MH6-26 inspects the rope of a chair lift



Flare stack guy rope inspection with MH20-40 and climber



Inspection of bridge stay rope with MH80-120



Adjustment of MH60-85 on the rope



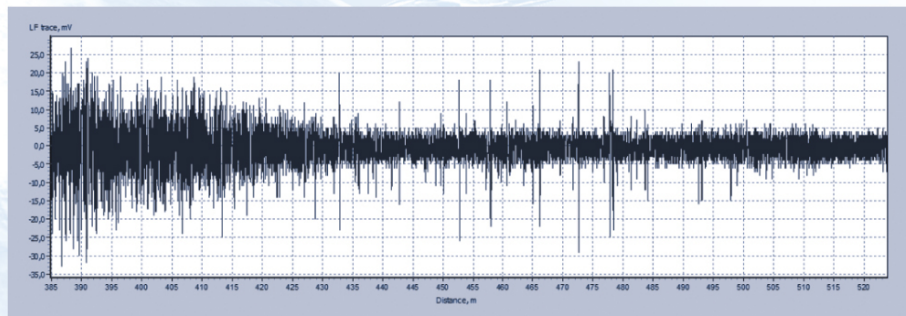
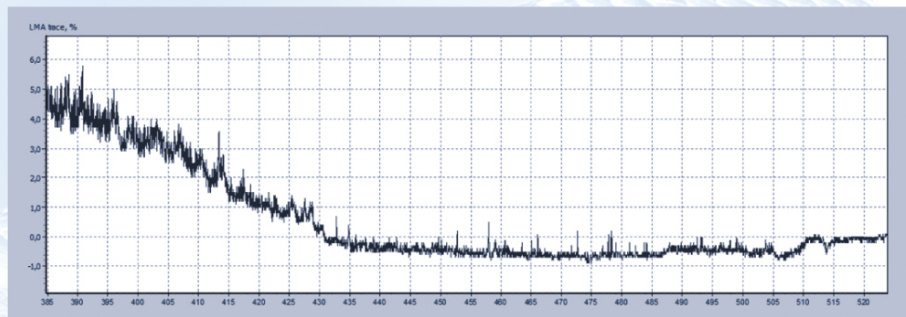
Simultaneous inspection of mine ropes with MH24-64M5



MH100-175 inspects 162 mm rope on board vessel

SOFTWARE WINTROS®

Correct interpretation of test results is the most important issue when making a decision about the future of the rope. Downloading and further analysis of traces are provided with the in-house developed software Wintros®, delivered to the customer along with the basic unit. Among other useful functions of Wintros® there are settings and calibration of the instrument, chart zooming and filtering, automatic marking of defects, comparison of charts in the same window, cut-off options, etc. Wintros® can automatically generate the rope inspection report. Rope Strength® software has also been developed to assess rope residual strength in terms of NDT data.



INTRON PLUS provide training of customers at its rope laboratory, or at the customer's site.



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