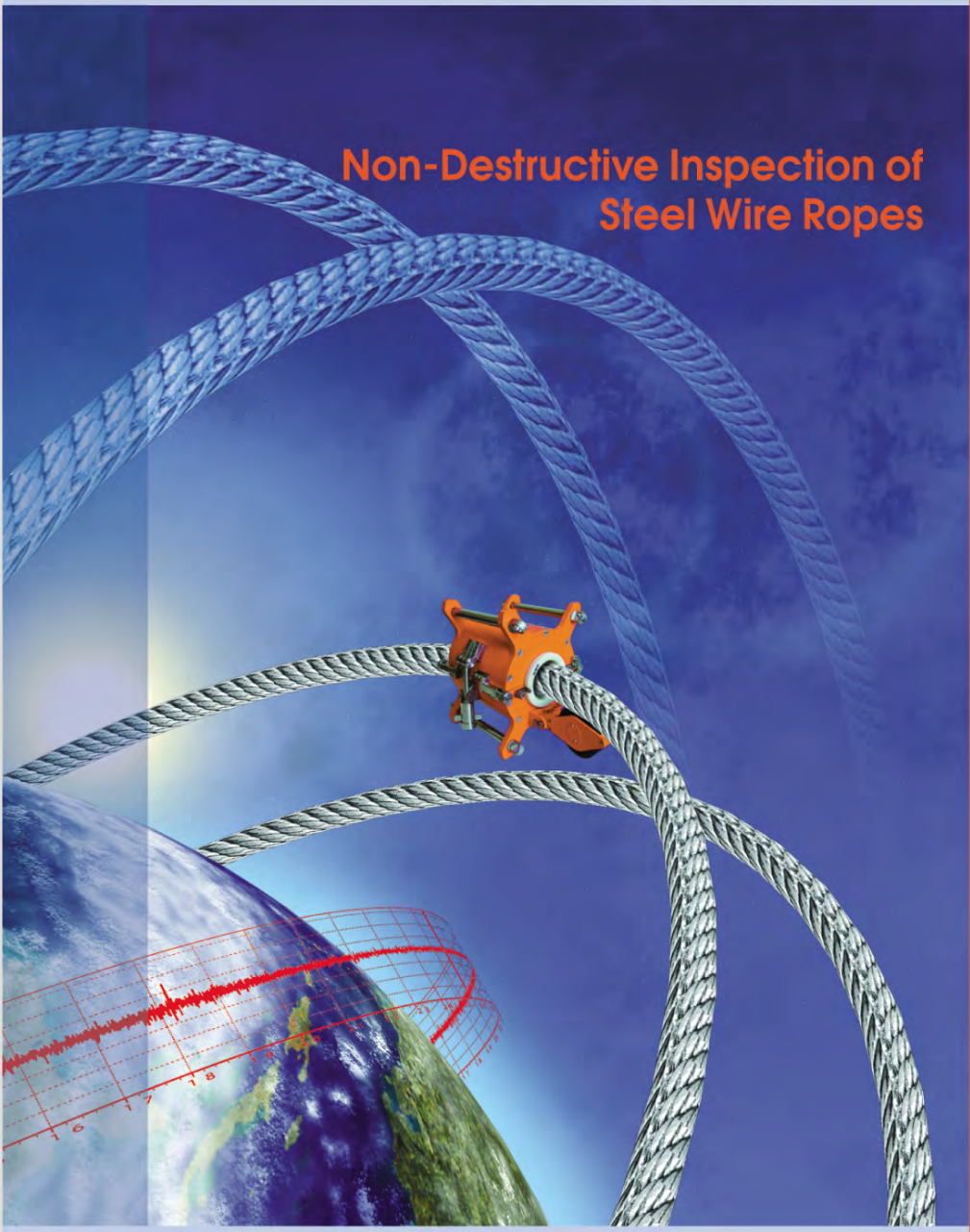
# Non-Destructive Inspection of Steel Wire Ropes



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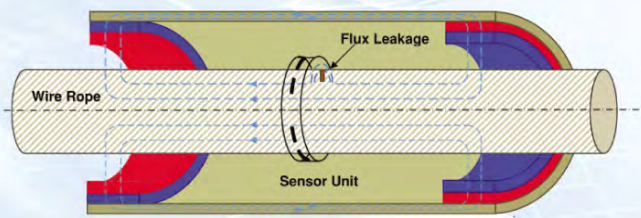
## INTRODUCTION

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 12927-8, 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.

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## 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 | IP66 |
| Ambient temperature | -25°...+55°C |

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## 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 dismountable 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 | IP66 |
| Ambient temperature | -25°...+55°C |

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**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 | IP66 |
| 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° |

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**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 | IP54 |
| 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 | IP54 |
| MH100-175 | IP65 |
| Ambient temperature: | -10°...+50° |

* Including roller system

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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

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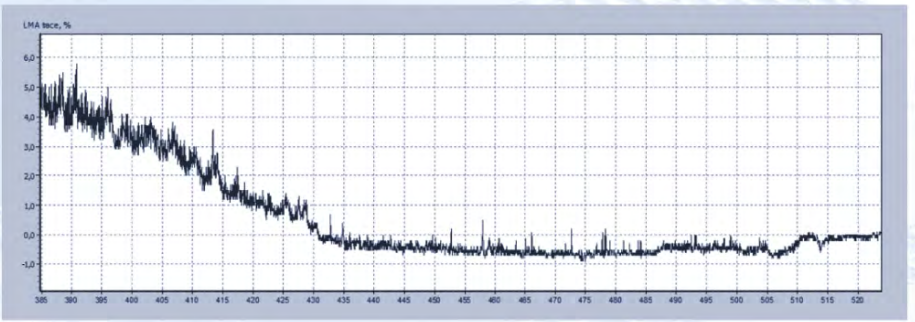
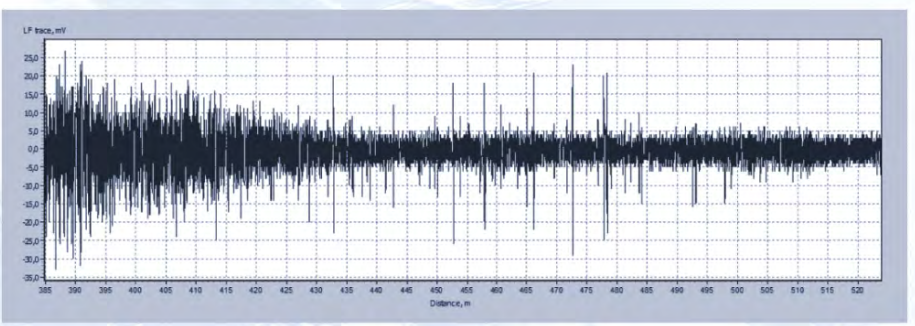
## SOFTWARE WINTROS©

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 asses rope residual strength in terms of NDT data.




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

ASNT Corporate Partner

OIPEEC



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ISO 9001:2015

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