



INDENTER FOR CABLE CONDITION MONITORING

(AMS Model IPAM4)



Capabilities

- Non-destructive mechanical cable insulation test
- Portable
- User-friendly software to collect and analyze data
- Battery operated and also includes an AC/DC power supply
- Each test completed in less than one minute
- Performs testing on a wide variety of cable types and sizes
- Includes hardware and software for easy system calibration and field calibration checks

The Indenter Polymer Aging Monitor (IPAM) System measures, records, and evaluates cable degradation using a non-destructive cable clamp assembly.

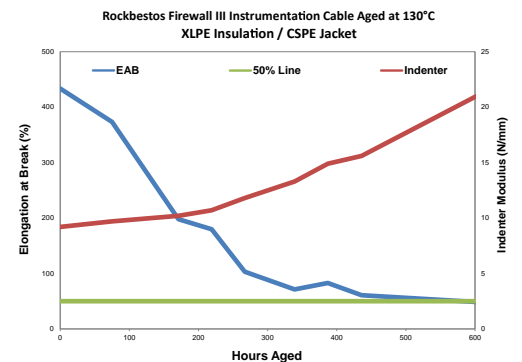
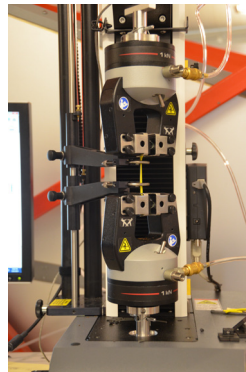
About

The hand-held IPAM system measures the indenter modulus or hardening of the cable's jacket and insulation material. Routine IPAM measurements will protect crucial safety-related systems within a nuclear power plant from failure as part of a comprehensive predictive maintenance program. The IPAM system is user-friendly, and is being used at nuclear facilities and laboratories throughout the U.S. and around the world.

AMS has served the nuclear power industry for 35 years, and is a world leader in the areas of instrumentation and control (I&C) system testing, diagnostics, prognostics, EMC measurements, EMI/RFI troubleshooting, cable and connector testing, predictive maintenance of equipment and processes, and automated test equipment development. The IPAM system is part of a comprehensive cable aging management program that AMS offers to the nuclear power industry.

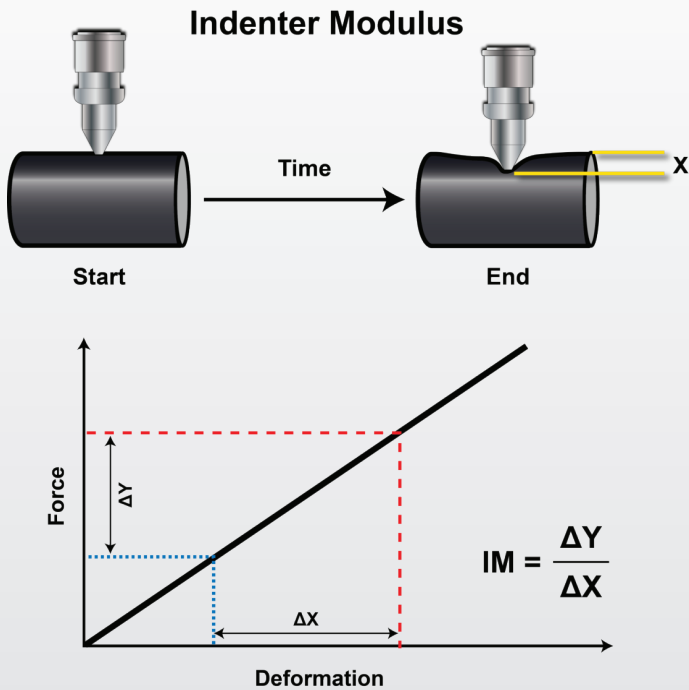
Elongation-at-Break Correlation

The Elongation at Break (EAB) test is a destructive laboratory test of a cable to determine the ductility of the polymer material as it hardens with age. The EAB test is the industry standard used to determine the qualified life of an in-service cable. AMS performs the EAB test in our cable testing laboratory and correlates the results to the indenter modulus (IM) measured in the field. This is a non-destructive, in-situ method for monitoring the aging of in-service cables in harsh industrial environments.



System Includes

- Cable clamp assembly (CCA) with 5 foot control cable (1.5 meters)
- Indenter Data Acquisition Box (DAQ) with battery holding bracket
- Pocket PC handheld computer
- RS-232 (serial) cable from Main Control Unit to Pocket PC
- Removable 4Ahr Lithium ion battery
- Belt holster for complete portable system
- 9V external AC/DC power supply with AC power cord
- Indenter software for handheld computer
- Data file viewer software for desktop/laptop computer
- Operation manual
- 24V Battery charger
- Portable storage cases



Technical Specifications

	<u>Weight</u>	<u>Size</u>
Clamp Assembly:	3.5 lbs (1.6 Kg)	1-3/4" x 1-7/8" x 10-1/4" (44.5 mm x 45.3 mm x 260.4 mm)
Main Control Unit (including battery):	2.3 lbs (1.0 Kg)	4-1/4" x 6-1/2" x 1-3/4" (108 mm x 165 mm x 44.5 mm)
External AC/DC Power:	10 oz (0.3 Kg) (with cords)	2" x 1-3/8" x 4" (52 mm 34.9 mm x 101.6 mm)
Probe Speed:	0.2 in/min (5.08 mm/min) at +/-5% speed regulation)	
Force Sensor Range:	10 lbs (4.54 Kg) with common usage range between 0 and 2 lbs (0 - 0.9 Kg) Accuracy over range +/-2%	
Wire Clamping Range:	0.125 in (3.26 mm) to 2.0 in (50.8 mm)	
Force Range:	Adjustable 0-10 lbs (0 - 4.54 Kg) Factory setting is limited at 2 lbs (0.91 Kg)	
Battery Operation:	Approximately 4 hours dependent on number of tests taken (may also be limited by Pocket PC battery life)	

For more information please contact:

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✳ 10CFR50 Appendix B Program

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AMS IPAM4 INDENTER POLYMER AGING MONITOR

SYSTEM SPECIFICATION



DESCRIPTION OF CONCEPT

Many of the polymers used in cable insulation and jackets harden when subjected to stressors that accelerate aging degradation. The Indenter works by pressing an instrumented anvil against the cable's jacket or insulation to a fixed depth limit. The anvil moves at a constant velocity while the force is measured during indentation. The ratio of force to deformation is the Indenter Modulus (IM).

SYSTEM INCLUDES

- Cable clamp assembly with control cable (5 feet) (1.53 meters). Cable attaches to main control unit.
- Indenter Main Control Unit with battery holding bracket
- 9-Volt external AC/DC power supply with AC power cord
- RS-232 (serial) cable from Main Control Unit to Pocket PC
- Indenter software for Pocket PC
- Desktop data file viewer program
- Operation manual
- Pocket PC
- Removable 4Ahr Lithium ion battery
- Battery charger
- Foam lined transport case
- Belt holster for clamp assembly

REAR PANEL COMPONENTS

- COM port - for RS-232 DB9 serial cable (furnished)
- RS-232 to USB converter (furnished)
- FUSE - 2A ATO style (furnished)
- DC Power In (from external AC/DC power supply- furnished)
- Battery power input

ACCESSORIES

- Force sensor zeroing adjustment tool
- Allen wrench hex key set
- Spare fuses

FRONT PANEL COMPONENTS

- Power switch
- Clamp assembly connector
- Power, and low battery LED indicators
- Force sensor zeroing trim pot and shunt test button
- Force limit indicator LED with override button

OTHER:

Serial Number:	Each Indenter is assigned a consecutive serial number to track calibration information with unit.
Force Limit:	Adjustable 0-10 lbs. (0 - 4.54 Kg). Factory setting 2 lbs. (0.91 Kg)
Battery Type:	Removable intelligent Lithium ion fast charge type
Battery Charging:	External charger. Full charge in approximately two hours (per battery). Charging slots for 2 batteries.
Battery Operation:	Approximately 4 hours dependent on number of test taken (may also be limited by notebook or Pocket PC battery life)

CALIBRATION COMPONENTS

Calibration Fixture:	Includes dial indicator for velocity calibration
Weights:	1 - 500 gram, 1 - 1 Kg, and 1 - 2 Kg weights (Weights are used to calibrate force sensor.)
Stop Watch:	To be supplied by user (Stop watch and dial indicator are used to calibrate velocity)



PHYSICAL PROPERTIES:

	Weight:	Size:
Clamp Assembly	3.5 lbs. (1.6 Kg)	1-3/4" x 1-7/8" x 10-1/4" (44.5mm x 45.3mm x 260.4mm) Clamp head retracted adds approximately 1" (25.4mm)
Main Control Unit (including battery)	2.3 lbs. (1 Kg)	4-1/4-in x 6-1/2-in x 1-3/4" (108mm x 165mm x 44.5mm)
External AC/DC power	10 oz. (0.3 Kg) (with cords)	2" x 1-3/8" x 4" (52 mm 34.9mm x 101.6 mm)

CLAMP ASSEMBLY:

Probe Speed:	0.2 in/min	(5.08 mm/min) at +/-5% speed regulation
Force Sensor Range:	10 lbs., (4.54 Kg) with common usage range between 0 and 2 lbs (0 - 0.9 Kg). Accuracy over range +/-2%	
Wire Clamping Range:	0.125" (3.26mm) to 2.0 in (50.8mm)	
Clamping Mechanism:	Open clamp jaw, insert specimen, close clamp	
Clamp Indicating Lights:	Scanning and Power	
Clamp Control Switches:	Scan, Abort, Light push buttons	

EXTERNAL AC/DC POWER SUPPLY

AC Input:	120-240 VAC 50/60Hz	DC Output:	9 VDC
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SOFTWARE:

1. Software provides for metric and English options for configuration, etc.	
2. Includes Pocket PC software for running test and storing information about the test. Software includes ability to export test results into Windows Excel spreadsheet.	
3. Includes desktop viewer program (for Windows XP & 7) for viewing test results.	
4. Data is transferred from Pocket PC to your Desktop computer (not included) either via Microsoft ActiveSync software (included) or by SD card (included) for use with Pocket PC.	
Note: A USB port is REQUIRED on your notebook or Desktop PC to transfer data from the IPAM4 Pocket PC to your notebook or Desktop PC.	
Peak Force Setting Range:	0 to 10 lbs. (0 to 4.54 Kg). Common usage 0-2 lbs. (0 - 0.9 Kg).
Maximum Deformation:	Adjustable within program
Modulus Calculation Range:	Adjustable with low and high limits between 0 and 10 lbs (0 - 4.54Kg) force and 0 to 0.2 inches (0-5.08 mm) probe travel

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