

**IPCO**  
**PLUG**

 **APRIS**



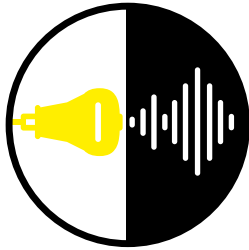
**FAST: 10 SECONDS**

**ANY TUBE MATERIAL**

**ANY TUBE SHAPE**

**APRIS // ACOUSTIC PULSE  
REFLECTOMETRY INSPECTION SYSTEM**

## APRIS // How it works



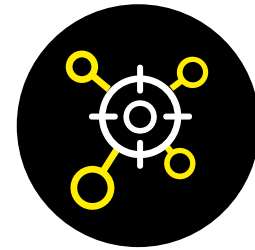
### STEP 1

Probe injects an acoustic pulse down the tube.



### STEP 2

Returned echoes generated by defects are recorded and analysed.



### STEP 3

A set of proprietary, patented algorithms identifies and reports the exact location, type and size of inner diameter tube defects.

## NDT TUBE // Testing

The impact of human factors is more prominent with the increased complexity and sophistication of today's NDT techniques. Root cause analysis of some of the tube failures identified the need for reliable technicians and technologies.

Technologies for inspecting heat exchanger tubes are rapidly changing and continually evolving. Variance in test results depends on both the instrument and operator expertise. APRIS delivers notable advantages in tube inspection by minimizing downtime and enhancing operator-level productivity.

### INDUSTRY APPLICATIONS

- › Surface & Stabilizer Condenser
- › Kerosene Product Water Cooler
- › Fire Tube Boiler
- › Propylene Condenser
- › Ammonia Chiller
- › Air Fin Fan Cooler
- › Process Heater and Cooler
- › Gland Steam Condenser
- › Water Tube (D Shaped) Boiler
- › HP/LP Heater
- › Other Shell and Tube Heat Exchangers

### UNIQUE KEY FEATURES

- 1. Any tube size up to 4" in diameter, regardless of shape or material**
  - › U-bends, twisted and spiral wound tubes
  - › Ferrous & Non Ferrous, graphite and plastics
- 2. Ultra-fast, non-invasive inspection**
  - › Less than 10 seconds per tube
  - › No need for inventory of consumable probes or standards
- 3. Less expertise required**
  - › Testing is easily performed by any operator with minimal training
  - › Artificial Intelligence based data interpretation & report generation



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## Heat Exchanger // Failure Mechanism

Some possible factors that affect the performance and productivity of heat exchangers.

- › Under deposit cooling water corrosion of tubes
- › Process corrosion
- › Stress-corrosion cracking (SCC) of tubes in cooling water service
- › Steam/condensate corrosion
- › Process fouling

### HOW TO MINIMIZE IN-SERVICE TUBE FAILURES USING APRIS

#### 1. Minimize downtime

- › Inspect 2,000 tubes per equipment during a 10-hour shift
- › Use less resources and consumables for inspection

#### 2. Effective decision-making

- › Precise and reliable results based on 100% inspection
- › Corrective actions in terms of plugging, re-tubing and design process change

#### 3. Preventive maintenance

- › Mitigate risks associated with production output
- › Conserve the lifespan of equipment

## APRIS SPECIFICATIONS

<b>INSPECTION RANGE</b>	Tube Size	7mm - 100mm (0.27" - 4") inner diameter	
	Length	Up to 25m (82') length, if inspected from one end; Up to 50m (164') length, if inspected from both ends	
<b>DETECTABLE DEFECTS</b>		5/16" - 2 1/2" (7mm - 63.5mm) Tubes	2 1/2" - 4" (63.5mm - 100mm) Tubes
	Holes	Minimum diameter 0.039" (1mm)	Minimum diameter 0.118" (3mm)
	Blockages	Minimum 5% of cross section reduction	Minimum 10% of cross section reduction
	Wall Loss	Minimum 10% of wall thickness	Minimum 20% of wall thickness
<b>TUBE CONFIGURATION</b>	Any configuration including U-bends, finned tubes, twisted tubes, multiple bends and spiral wound tubes.		
<b>TUBE MATERIAL</b>	Any material including metals (ferrous & non-ferrous) and non-metals (graphite, composites)		
<b>INSPECTION SPEED</b>	10 seconds per tube depending on tube size, length and configuration.		
<b>HARDWARE</b>	Compact Handheld Device — Non-invasive probe assembly including a transducer, controls, LCD screen and adaptors.		
<b>SOFTWARE</b>	Data Acquisition Software — APRIS software installed on computer used for inspection setup, probe status and test data recording.		
<b>ALGORITHM</b>	Patented Acoustic Pulse Reflectometry (APR) technology featuring specialized, proprietary algorithms for tube inspection.		
<b>REPORTING</b>	Customizable, graphical on-line reports. Available output in PDF and HTML format.		
<b>PHYSICAL CHARACTERISTICS</b>	Compact, rugged and lightweight design. Total box weight: 14.88 lbs (6.75kg) Box dimensions: 46 L x 33 W x 21 H cm (18.1" x 12.9" x 8.2")		
<b>POWER INPUT</b>	Dual voltage system (110V/220V)		
<b>TEMPERATURE RANGE</b>	-10° to +50° C (14° to 122° F)		
<b>CERTIFICATIONS</b>	CE Declaration of Conformity; Safety Certificate IEC 61010; EMC Test Certificate; Company Quality System certified to ISO 9001:2015		
<b>STANDARDS</b>	ASTM E2906/E2906M-13 ASME BPVC.V-2017-Article 18		
<b>PREREQUISITES</b>	Tube should be cleaned prior to being inspected. Blow drying is recommended to avoid water stagnation, if water jetting is to be performed.		