Pulsec™
Portable Pulsed Eddy Current Instrument

The Pulsec offers PEC (Pulsed Eddy Current) technology in a compact battery operated instrument. This portability, combined with a GE Sensing & Inspection Technologies array probe and powerful layer-by-layer diagnostic imaging provides an efficient and easy to use Eddy Current inspection solution for the aerospace industry.
Pulsec™
Always on Spot

Pulsed Eddy Current (PEC) technology has several key advantages over conventional single and multi-frequency eddy current inspection techniques.

First, there is the greater depth of penetration thanks to the low frequencies contained in the drive pulse. Second, there is the better depth resolution of the Giant-Magnetoresistive (GMR) pick-up sensor. Third, imaging and post-processing capabilities provide easier detection & analysis.

Pulsec at a Glance
Pulsec is a powerful yet portable NDT instrument designed primarily for detecting sub-surface corrosion and cracks* in aerospace structures.

• Pulse excitation with a low frequency bias over a wide frequency range, providing an improved signal to noise ratio at deeper penetration into the material.
• Rich data depth unequalled in portable instruments (typically 100 to 1 frequency selection). More detailed information leads to a better analysis.
• Choice of array probes:
  • Ergonomic hand held x-encoded linear array probe (1" active area)
  • Compact 2" linear array probe with encoder for hand inspection or connection to mechanical scanning equipment
• Layer by layer imaging & internal data analysis in real time.
• Post-processing & data analysis with storage and data transfer capability.

* Crack detection capability may be affected by probe configuration & orientation of the defect.

The Principle
Pulsed Eddy Current (PEC) technology has many of the same advantages as conventional eddy current technology. Because it is also an induced electromagnetic technique, it is generally used to inspect conductive material. In contrast to the ultrasonic inspection method, neither conventional nor Pulsed Eddy Current require direct contact with the material; as a result inspections may be carried out through non-conductive coatings such as paint.

The drive coil is one significant area where the Pulsec differs from conventional eddy current instruments. The Pulsec’s drive coil is excited by a broadband impulse that is rich in low frequencies. These induce transient eddy currents in the test material. Just as with standard eddy currents, the lower frequencies penetrate deeper into the material. By employing a time-based analysis of the time required for these currents to return, the instrument gives the operator useful information about the material’s properties across the full depth of penetration. This is presented in a ‘layer by layer’ C-scan array, providing improved data interpretation.
The Advantages
Pulsec™ has several advantages over conventional single channel or multiple-frequency Eddy Current inspection:

- Compared with single and multi-frequency testing, data is generated and collected over a wide frequency and depth range.
- Rich data sets from the wide frequency range in the pulse can be processed and analyzed in a layer-by-layer fashion. This provides unique detection and interpretation for multi-layer structures.
- Improved results and imaging compared to the conventional impedance phase plane representation.
- The operator does not have to select a specific inspection frequency because a wide range of frequencies is generated and received.
- The Pulsec makes it easier to select an optimum single inspection frequency for follow-up testing or analysis.

Array Technology
GE Sensing & Inspection Technologies’ Pulsed Eddy Current technology is based on GMR elements. GMR is the phenomenon where the resistance of certain materials drops dramatically as a magnetic field is applied. Sensors based on this technology offer high sensitivity, flat frequency response and a small footprint, all of which are ideally suited for manufacturing high resolution Pulsed Eddy Current arrays.

Typical inspection result
The two red areas in Time Gate 2 show areas of corrosion, Time Gates 3 and 4 show the internal structure.
# Technical Specifications

## Measurement System

**Probe Support**
1 inch scan width 32 element probe with internal encoder.
2 inch scan width probe with 64 elements.
Hybrid Coil Driver/GMR Pickup

**Resolution**
Normal = 1.5 mm (1/16”), Low = 3 mm (1/8”), High = 7.5 mm (1/32”)

**Scanning Speed**
Normal = 30 mm/sec (1.2”/sec), Low = 120 mm/sec (4.5”/sec), High = 30 mm/sec (1.2”/sec)

**Typical Detectability for 4 layer Aluminum Testing**
- 1 mm (0.040”) depth (between 1st Layer): 5% material loss or greater
- 2 mm (0.080”) depth (between 2nd & 3rd Layers): 10% material loss or greater
- 3 mm (0.120”) depth (between 3rd & 4th Layers): 20% material loss or greater
- 4 mm (0.160”) depth (underside of 4th Layer): 20% material loss or greater

## Data Acquisition

**Data Channels**
One—three

**PRF (Pulse Repetition Frequency)**
1 kHz maximum

**A/D Resolution**
16 bit

**Rate**
1M samples/sec maximum

**Samples per A-Scan**
500

**Pulse Shape Selection**
Square, Triangular and ¼ Sine Wave

**Pulse Drive**
20 mA to 4 A (Max. 15 V)

**Processor**
1.1 GHz

**Internal Memory**
3GB

**Hard Disk**
40GB Drive

**Storage Capacity**
300 jobs at 100MB/job

**Positional Input**
2 incremental encoder channels

**Data Input/Transfer with Remote Input/Output Accessory Options**
USB® HUB, USB ThumbDrive®, USB-HD

## Connectors

**Probe**
D-type 17 Socket + 4 Co-Axial

**Interface**
Two PS2, one VGA, two USB

**Supports**
USB ThumbDrive, remote keyboard and mouse

## Software

**Offline Analysis Reporting Software**

## Packaging & Operating Environment

**Housing**
Molded plastic enclosure with protective TBR boot

**Sealing**
IP52 compliant with internal circulation cooling fan

**Display Size**
26A mm (10.4 in) diagonal

**Display Type**
Transmissive TFT SVGA

**Display Resolution**
800 x 600

**Operating Temperature**
0°C to 40°C (32 °F to 104 °F)

**Weight**
6 kg (13 lb)—with battery

**Dimensions**
335 W x 270 H x 150 D mm (13.2 W x 10.6 H x 5.9 D inch)

## Power

**Power Source**
Battery and external AC charger/power supply

**Battery**
Dual Li-ion battery pack 2x 12.6v 6.8 A hr

**Battery Life**
6 Hours

**Charge Time**
4 Hours

**Power Supply/Charger**
Universal Type 100 to 240 VAC, 50 to 60 Hz

**Power Consumption**
25 W

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