Inspection Instruments, Inc.

ACT
Acoustic Concrete Tester

The Acoustic Concrete Tester helps assess if a concrete structure is free of defects such as delaminations, spalls, honeycombing, and horizontal flaws. In addition, the ACT can evaluate the thickness of structural elements such as concrete pavements, slabs, retaining walls, tunnel liners, foundation footings, and more. The ACT tests structures as thin as 75 mm and as thick as 900 mm. ACT uses sophisticated Ultrasonic Echo Technology to take the uncertainty out of concrete thickness determination. No need to manually generate an impact. No need to assume a wave speed.

Testing with the ACT is easy:

- Place two probes on the structure (directly or using the ACT Telescoping Pole)
- Touch ACT screen to generate signal
- Structure thickness is displayed in real time
- Concrete wavespeed is displayed in real time
- Test data is saved for later printing and reporting

The ACT is light, has a high visibility screen and runs an entire day on its rechargeable battery.

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How does it work?

For a given structural element and material there is a one-to-one relationship between resonant (dominant) frequency and thickness.

The ACT easily determines the resonant frequency. Its transmitter emits a broad band wave field that contains all frequencies necessary to test structures between 75mm and 900 mm thick. Most of these frequencies get dissipated, but the one matching the resonant frequency of the concrete element remains, is amplified and gets picked up by the receiver.

An unexpected or an additional dominant frequency indicates a discontinuity (possible defect) in the structural element.

Applications:

Tunnel linings
Underwater Concrete Structures
Grout-filled precast concrete structural shells or hollow brick walls to confirm adequate filling
Polystyrene-filled “Super-T” concrete beams
Silo walls
Concrete Pavements
Foundation footings
Retaining Walls
Concrete slabs
Concrete columns
and more.

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Specifications:

Physical
Size: 75x175x235 mm
Weight: 2.2 kg
Display: Large backlit transflective VGA touch screen for any lighting conditions
Operating Temperature: 0° to 50° C
Storage Temperature: -20° to 65° C
Battery: internal, 8 hours duration, rechargeable with fast charger (3 hours)

Electronic
Microprocessor PXA 255 XSCALE up to 400 MHz
Data storage on Flash card up to 128 MB
Sampling digitizing frequency greater than 1 MHz (net frequency after DSP 192 KHz)
Sampling frequency accuracy within 0.01%

Functional
Material resonant frequency from real time FFT.
Generates output graphs to illustrate reports.
Screen may be personalized with company logo.
Probes attach to ACT Telescoping Pole for convenient testing.

Probes
Matched, interchangeable transceivers
Materials: Brass
Dimensions: 60 mm diameter, 45 mm length
Weight: 0.5 kg
Cable length: 2.4 m
Broad band transmission
Receiving frequencies: 2 – 30 KHz
Resonant frequency: > 36 KHz
Optional underwater probe available

One year warranty.

Ultrasonic Echo Technology

The ACT transmitter administers a broadband wave field to the concrete surface. The wave field, unlike the mechanical impact used in the impact Echo Method, is independent of the surface condition and includes all frequencies required to obtain a test result. This versatility makes it possible to use the same set of sensors to test structures with a wide range of material properties and thicknesses.

The wave field generated by the ACT transmitter propagates through the concrete, setting up cyclical reflections in the structure. The ACT then processes the received signal using a high sampling rate, and converts it into the frequency domain using real time Fast Fourier Transform (FFT). This process identifies the resonant frequency corresponding to a period T of twice the travel time along the shortest path within the structure, or twice its thickness. The ACT displays the calculated thickness.

Discontinuities in the structure, like spalls, delaminations, or horizontal flaws are detected when the ACT displays an unexpected thickness or identifies additional dominant frequencies.

The ACT actually measures the concrete wave speed of the concrete structure. This eliminates the need to assume a wave speed or to core the structure to back calculate a wave speed. Avoiding wave speed assumptions makes ACT results exceptionally reliable, while avoiding coring makes its use feasible in a vast array of applications.

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