

Pundit PL-200 / PL-200PE – Ultrasonic Testing



Introduction

The Pundit PL-200 and PL200PE continue the illustrious Pundit tradition that began in the 1970s. The first to use a new generation touchscreen display unit. The Touchscreen unit can control conventional Ultrasonic Pulse Velocity Transducers as the PL-200 and the Pulse Echo Transducer as the PL200 PE.

The world known Pundit range offers users a reliable and accurate method for determining the sonic properties of materials.

The pulse velocity in a material depends on its density and its elastic properties. These in turn are related to the quality and the strength of the material.

Applications

Ultrasonic testing can be used for:

- The homogeneity of a material
- The presence of voids, cracks or other internal imperfections or defects
- Changes in the concrete which may occur with time (i.e. due to the cement hydration) or damage from fire, frost or chemical attack
- The strength or modulus of a material
- The quality of the concrete in relation to specified standard requirements
- Single sided thickness measurement
- Poisson's ratio and E modulus calculation

Materials

An essential tool for investigating a wide range of materials. Including Concrete, Ceramics and Refractories, Timber and many others

Features

- Housing specially designed to be used on-site in harsh environments
- Screen with highest resolution and sharpest image available in the market allowing best possible analysis of the measured waveforms
- Settings directly accessible on measuring screen
- On board storage and review of waveforms
- Automatic and manual triggering and user adjustable trigger threshold
- Modular concept: Expandable with all Proceq Pulse Velocity and Pulse Echo transducers, upcoming Pundit ultrasonic products will be directly compatible.

Stress Waves

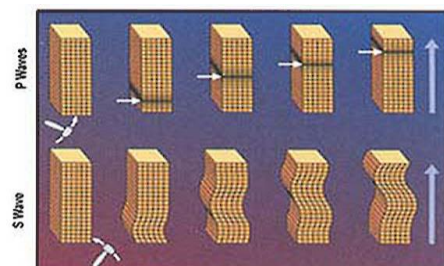
Ultrasonic testing is sub section of stress wave testing. The main characteristics of stress waves in a material are their frequency and the type of wave measured.

The correct choice of frequency is based upon the material being tested. Coarse grained concrete responds better to a lower frequency. Fine grained mortars or rock works better with higher frequencies.

The two test methods offered by the Pundit use of either compression waves [P waves] or shear waves.

The particle motion associated with compression waves can be described as vibration parallel to the direction of wave travel, much as a sound wave

The particle motion associated with shear waves can be described as vibration perpendicular to the direction of wave travel.





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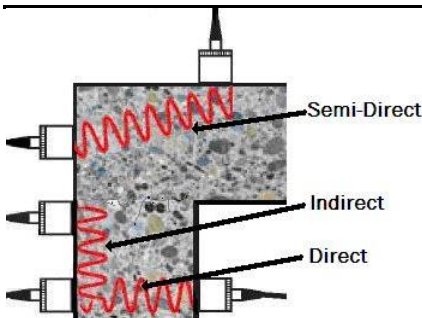


Ultrasonic Pulse Velocity Method

Ultrasonic testing in its most basic mode is called time of flight. This refers to timing the arrival of an ultrasonic pulse from one transducer to another.

The ultrasonic pulse in standard operation is a p-wave (or compression wave). The ultrasonic pulse velocity (UPV) is calculated by dividing the distance between the transducer by the time of arrival.

Transmission Modes



The Pundit PL-200 offers three methods of transmission. These can be seen in the image above. The method of transmission is determined by access to the concrete elements surfaces and the characteristic being tested.

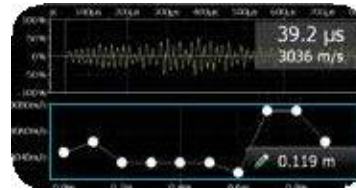
Transducer Frequencies

Comes standard with 54 kHz p-wave transducers, although a range of frequencies are available from 24 kHz to 500 kHz. There are also exponential transducers available for dry coupling and wood applications and a range of 250 kHz shear wave transducers available.



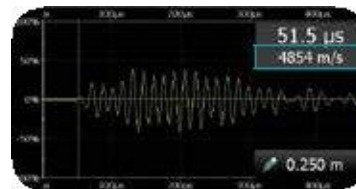
Comprehensive Measurement Modes

Line Scans



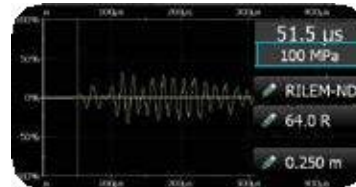
Assesses the concrete uniformity and detects cracks as well as other defects. The measured pulse velocities are displayed as a line.

Pulse Velocity / Transmission Time / Distance



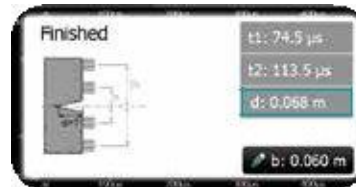
Calculates the pulse velocity of the material under test with zoom and scroll for precise A-Scan inspection. Update rate of up to 25Hz

Compressive Strength



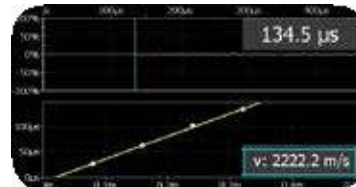
Determines compressive concrete strength via Ultrasonic Pulse Velocity correlation, or by using SONREB.

Crack Depth



Determines the depth of perpendicular cracks according to BS 1881.

Surface Velocity



Improved surface velocity measuring. Determines surface velocity according to BS 1881.

Standards and Norms

EN12504-4 (Europe), ASTM C 597-02 (North America), BS 1881 Part 203 (UK), ISO1920-7:2004 (International), IS13311 (India), CECS21 (China).

Shear Wave Measurement

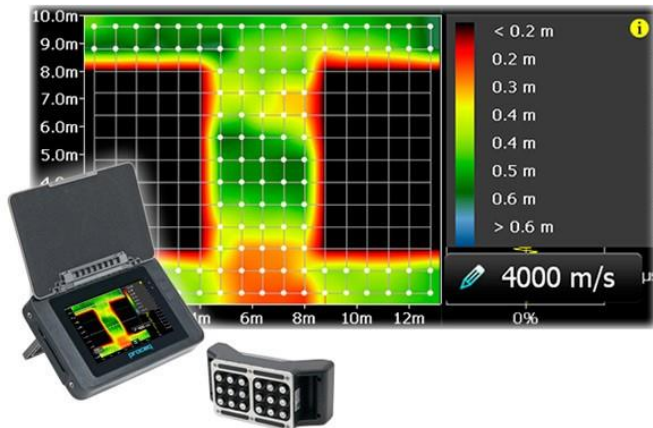
By measuring shear and P waves it is possible to calculate Poisson's ratio, and given material density the E modulus.



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Ultrasonic Pulse Echo Method

The Pulse Echo technology widely extends the application range of the Pundit Touchscreen Unit and offers a variety of special features.

- Single side determination of slab thickness
- Detection and localization of voids, pipes, cracks (parallel to surface) and honeycombing
- Advanced echo tracking technology helps identifying the main echo
- Control buttons and optical feedback directly on the probe increase measurement efficiency
- Automatic estimation of the Pulse Velocity
- Easy B-Scan measuring through center marker and rulers directly on the probe
- Dry-contact transducer: no couplant required, suited for measuring on rough surfaces
- Lightweight and ergonomic handling

Pulse Echo Transducer

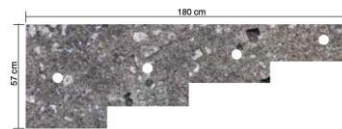
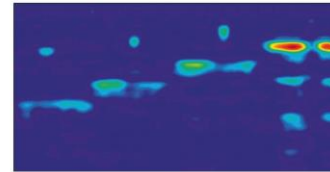
The Pulse Echo transducer is a shear wave transducer designed for single-handed and two-handed operation. It is particularly suited to testing where access is limited to a single side.



Scan Modes

B-Scan

- A cross-sectional view perpendicular to the scanning surface is provided. It facilitates the search for pipes, cracks, voids, etc.
- Cursor placement allows a direct readout of the slab thickness and the location of hidden objects or defects.



In this example a B-Scan of a concrete object containing steel pipes.

A-Scan

- A-Scan allows direct analysis of the raw signal.
- Digital filters for better echo visibility and noise suppression.
- Automatic readout of slab thickness (Echo tracker).

Area Scan

- Contour map of velocity or thickness results over a concrete surface.
- Gate function focuses on critical regions. E.g. reflections at rear of a tunnel grout.



Transducer Specifications

Bandwidth	50 kHz
Aperture Size	2 x 25 cm ²

Test Subject Limitations

Wavelength	50 mm
Maximum Grain Size	50 mm
Minimum Lateral Dimension	2 x Thickness
Penetration Depth	Typically 500 mm (up to 1 m ideal)
Minimum object detectable	30 mm cylindrical air pocket



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Specifications

Range	0.1-7930 μ s
Resolution	0.1 μ s (< 793 μ s), 1 μ s (>793 μ s)
Display	7" Colour, 800 x 480
Pulse Voltage	100 – 450 Vpp [Pulse Velocity] 100 – 400 Vpp [Pulse Echo]
Bandwidth	20 – 500 kHz
Receiver Gain	1X – 10,000X (0-80dB) 11 steps
Memory	8 GB Flash memory allowing storage of up to 100,000 A-Scans
Battery	Lithium Polymer, 3.6 V. 14.0 Ah
Battery Lifetime	>8h (in standard mode)
Operating Temperature	0° > 30° (Charging, operating) 0° > 40° (Charging, Off) -10° > 40° (Not Charging)
Humidity	< 95% RH, non-condensing
IP Classification	IP 54

Form Supplied

Pundit PL200 comes standard with:

- Pundit Touchscreen
- 2 Transducers 54 kHz
- 2 BNC cables 1.5m, BNC Adapter Cable
- Couplant
- Calibration Rod
- Battery Charger, USB cable
- DVD w. Software, Documentation, Carrying Strap, Case



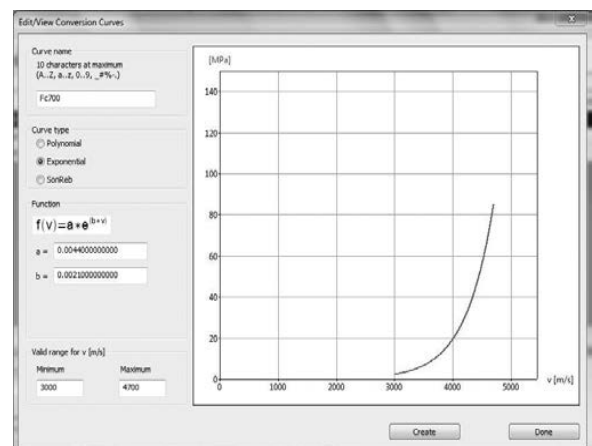
Pundit PL200PE comes standard with:

- Pundit Touchscreen
- Pundit Pulse Echo Transducer incl. cable
- Contact tester
- Battery charger, USB cable
- DVD w. software, Documentation, Carrying Straps, Case

PL Link Analysis Software

The Windows based PL Link allows data review and retrospective adjustment of measurement setting. It is also used to load strength conversion curves into the system.

ID	Name	Date & Time	Measurement Type	Subtype	Trans 1	Trans 2	Distance	Depth	Conversion Factor
1	25	04/05/2018 11:27 AM	Steel	2791 kHz	25.1 μ s	0.000 m	0.000 m	1.00	
2	25	04/05/2018 11:27 AM	Steel	2791 kHz	25.1 μ s	0.000 m	0.000 m	1.00	
3	25	04/05/2018 11:27 AM	Steel	2791 kHz	25.1 μ s	0.000 m	0.000 m	1.00	
4	25	04/05/2018 11:27 AM	Steel	2791 kHz	25.1 μ s	0.130 m	0.000 m	1.00	
5	25	04/05/2018 11:27 AM	Concrete	2791 kHz	46.6 μ s	0.130 m	0.000 m	1.00	



About PCTE

PCTE have over 30 years' experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.

Other Equipment

The full Proceq range of equipment is available for insitu non-destructive concrete measurement, including Schmidt Hammers, Covermeters, Half Potentials, Resistivity and Permeability. The Olson Instrument range includes the NDE360, CTG, Freedom Data PC and DAS as well as the resonance tester. We also supply Intelli-Rock maturity, temp and humidity logging systems, corrosion rate monitoring equipment, and Ground Penetrating Radar.