Quality Assurance for Deep Foundations

Pile Dynamics, Inc.

Pile Driving Analyzer® (PDA) Model Comparison - PAK versus PAX - June 2009

Two PDA models are available, PAK and PAX. Both monitor acceleration and strain sensors attached to a foundation, and process their signals after each blow from a driving hammer or suitable drop weight (for tests on non driven piles). Both estimate static bearing capacity and evaluate integrity of driven piles or drilled shafts. During initial pile driving a PDA also investigates hammer performance and driving stresses. Both models run on Windows® XP and store acquired data on hard disk. The PDA-W software processes results from either model; PDA-W results are summarized graphically and numerically by the PDIPLOT and PDI-CURVES software programs. Data acquired with either model PDA is further analyzed by CAPWAP® software running on a computer.

PAK - This PDA has a minimum 40 GB hard disk, 512 MB of DRAM, USB and Ethernet ports, built in CD-RW drive, 10.4 inch color display screen, and sealed keyboard with built in tactile feel for field conditions. The PAK runs on 12V DC (car battery), with a small internal backup battery for brief power interruptions or AC (primarily for office use). The PAK simultaneously acquires up to 4 channels of strain and 4 channels of acceleration (2 piezoelectric and 2 piezoresistive). This is helpful when 4 channel strain measurement is desired/required for augered cast-in-place/CFA piles, drilled shafts or spiral weld pipes, or where measurements are required at two different locations along the shaft. The PAK performs analog (hardware) integration of acceleration data. All data collection and data processing (from over 185 possible results, 9 quantities can be simultaneously displayed for each blow) are performed with the PDA-W program. Please consult current specifications for more details.

PAX - This smaller unit has an 8.4 inch color display with a touch screen for easy and intuitive operation. It includes USB, Ethernet and video ports. The PAX operates continuously for at least 6 hours on built-in batteries, and may last up to 8 hours when judiciously operated (it may be connected to a 12V DC car battery for extended applications). It is compatible with wireless “smart sensors” that know their calibration and thus do not require entering this information into the PAX, and send data to the PDA via radio. This simplifies the test setup and allows the PAX to remain up to 100m away from the foundation being tested. The PAX allows the selection of a higher data sampling rate, affording a more detailed record. It also offers the option of a larger record size, suitable for long piles or when a high sampling rate is selected. Data transfer to a PC is via USB Flash Drive (memory stick) or Ethernet connection. This model of PDA is available as a PAX-4 (2 strain and 2 acceleration channels, choice of piezoelectric or piezoresistive) or a PAX-8 (up to 4 strain and 4 acceleration channels, 2 piezoelectric and 2 piezoresistive). Acceleration data is digitally integrated to velocity. The PAX-4 may be upgraded to a PAX-8.

The PAX comes with three modes of operation: Local, Remote and SPT. In the PAX-Local mode, the on-site engineer controls all operations, as with the PAK. During data collection or review, the force and velocity data are displayed vs. time on the screen. Nine results are displayed (e.g. maximum stresses, transferred energy, Case Method capacity etc.) from among the more than 185 user choices. In the PAX-Remote mode, the engineer is not on site. The PAX is operated on site by a trained technician or pile crew member who attaches the sensors to the test pile, enters the pile name and connects the PAX to the Internet. The PDA engineer in the office checks the sensors and controls the PAX data acquisition process, as well as data interpretation, by running the PDA-W program in a computer connected to the PAX through the Internet. In this mode the PAX can either acquire and transmit data via the Internet to the office for real-time remote processing during the test, or acquire data in a stand-alone mode, with data transmission and processing delayed to a later time. Significant cost and time savings can be realized with remote operation (as already demonstrated by worldwide acceptance of an earlier remote PDA model, PAL-R) by more convenient scheduling of the testing, reduced travel expenses and quicker report turn-around times. The SPT mode is designed to measure the energy transmitted by SPT hammers, a requirement for the calibration of SPT rigs in accordance with ASTM and Eurocode. Please consult current specifications for more details.

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