

GEOTECH

SEISMOGRAPHS



MULTICHANNEL SEISMOGRAPH LAKKOLIT-X-M4



FEATURES

- Data rate up to 100 Mb/s
- Built-in electronic switcher
- Data recoding and preliminary processing by embedded signal processors in real time
- Improved reliability through increased integration
- Recorded frequency - 1...6608 Hz
- Record length up to 40500 readings/samples

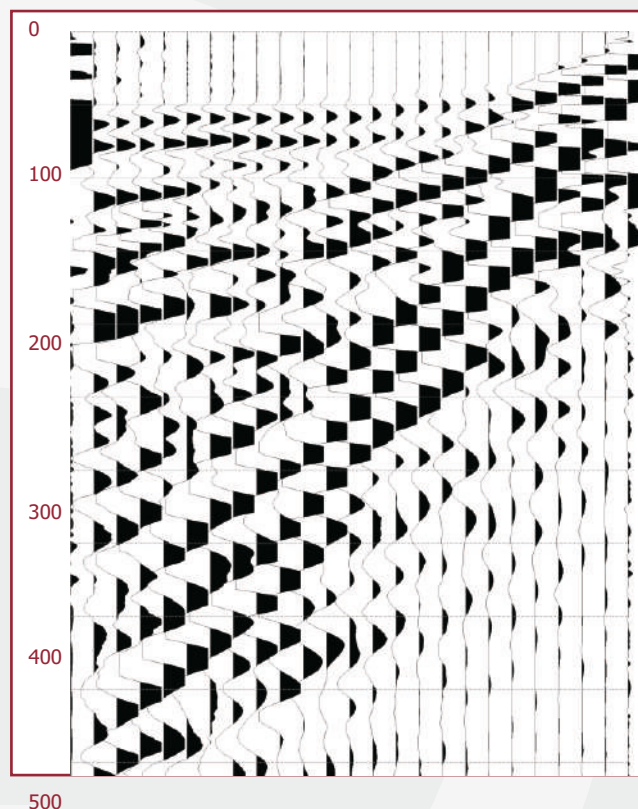
The station is capable of integrating one or several Lakkolit X-M4 units.

The Lakkolit X-M4 receives and preliminarily processes data from 24 seismic channels. Data is displayed and additionally processed in the field via laptop with application software or a special control unit.

With the Lakkolit X-M4, surveys can be performed efficiently and effectively with only one operator.

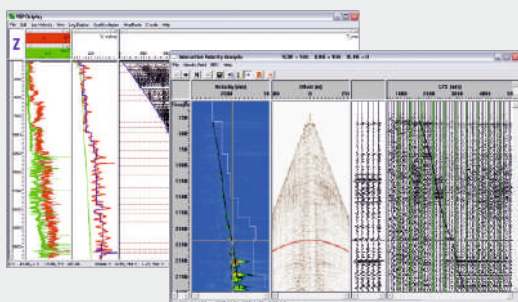
The software RadExPro Plus™ is designed for integrated processing of engineering seismic data, VSP survey data processing and geo-radiolocation for Windows 9x/Me/2000/XP.

The Lakkolit-X-M4 is a digital multichannel engineering seismograph, designed for engineering geological and micro-zonation surveys by refracted wave, seismic refraction and vertical seismic profiling methods.



SPECIFICATIONS

Number of channels	24 to 1024
Power supply	12±30% V
Power consumption	3 W
Distortion	0.008 %
Preamplifier gains	0, 16, 36 dB, 1 %
Transmission ratio	$2.16 \cdot 10^{-3}$, $\mu\text{V} / \text{ADC}$
Noise floor	0.17 μV
Dynamic range	130 dB
Common-mode rejection	120 dB
Recording time	256 to 163840 msec
Record length	up to 5120 readings
Recorded frequency	1 to 6608 Hz
Operating temperature	-30 to +50°C



SOFTWARE

The software program RadExPro operates on standard PCs and workstations for OS Windows

- Full-function shallow surface seismic investigations data processing
- VSP survey data processing
- Geo-radiolocation data processing
- Processing and interpretation of correlation refraction method data.

LAKKOLIT -X-M4

24-CHANNEL REGISTRATION LAKKOLIT 24-M4 UNIT



- Review of recorded data in real time on all 24 channels or on each channel separately, with spectral analysis
- Data archiving for 10-shift operation
- Data rerecording on PC for further processing
- 2 Gb flash-memory capacity
- Embedded GPS receiver for locating geographical coordinates to be entered into the SEG Y file names
- Embedded battery (12 V; 4,5 mAh)
- IP67 protection
- Low power consumption (2,6...5,4 W)
- TFT color display 640x480
- A lightweight and Small size design

SPECIAL CONTROL UNIT (SCU)

SCU is designed to control the Lakkolit X-M4 seismic recording station. It receives and preliminary processes data under hard field conditions (-30 to +50°C, IP67).



SEISMIC CABLE

The field seismic cable is delivered by customer request. Specifications of the seismic cable (severe operation design is optional), its length, and inter-geophone interval can be varied.



HUB



RADIO TRIGGERING SYSTEM (COM)

The radio triggering system consists of a receiving unit, a transmitting unit, a receiving antenna, and a transmitting antenna. The Radio triggering system allows for remote use of the station synchronized with a seismic vibration source via radio channel at a distance of up to 500 m.



GEOPHONES

The required number of different types of geophones can be delivered by customer request.



DREAM Wi-Fi

Dream Wi-Fi is a data transfer system. IT is designed for data exchange between the Lakkolit 24-M4 and a remote PC at a distance of up to 4 km of direct line of sight.



MULTICHANNEL SEISMOGRAPH LAKKOLIT-MT

TECHNICAL SPECIFICATIONS

Channels	6 ... 1024
Frequency, Hz	0,5 ... 1600
Distortion, %	0,003
Dynamic range, dB	130
Preamplifier gains	1, 8, 64
Noise floor, uV	0,06 ... 0,2
Common Mode Rejection, dB	120
Environment	Ip67
Record length	up to 40960 readings
Record time, msec	256 ... 163840
Power supply, V	9 ... 25
Power consumption, W (for one channel)	0,3
Temperature range, C	-40 ... +60
Synchronizer	
Size, mm	260x195x110
Weight, kg	3,2
Recorder	
Length, mm	232
Diameter, mm	48
Weight, kg	0,35

MULTICHANNEL SEISMOGRAPH LAKKOLIT-MT

The Lakkolit-MT is a multichannel seismograph for engineering applications and micro-zoning surveying. The Lakkolit-MT provides the user with a flexible multi-channel seismic acquisition system. In this system, several telemetry units can be linked with the synchronization unit that controls the seismic system. Each telemetry unit includes a six-channel registration unit and a six-channel seismic cable with geophones. Using the Lakkolit-MT, a specialist can create and build a surveying system, including 3D data collection. A laptop/control unit is used to control the seismographs. The system has a robust casing, allowing it to function perfectly in extreme weather conditions.



FEATURES

- Modular concept
- Robust waterproof metal housing
- Wireless communication
- Remote start of recorders and a seismic vibration source simultaneously via radio channel
- Operation with different synchronization system
- High-quality data registration.



Recorder

THE LAKKOLIT-MT INCLUDES

- Six-channel recorder for recording, digitizing and transmission seismic signals from geophones to the control unit or PC. The recorders can be linked with a six-channel telemetric seismic cable with geophones
- Control unit or PC for controlling the seismographs' operating modes;
- Synchronizer for:
 - * setting the same frequency for all recorders
 - * charging recorders from battery or external power sources
 - * starting the recording using synchronization channel
 - * connecting the control unit or PC
- Radio triggering system (consisting of a transmitter and receiver) for remote start of the station synchronized via radio channel at a distance of up to 500 meters
- Three or Six-channel telemetric seismic cable with 2, 5 or 10 meter channel
- Vertical and horizontal geophones.



Synchronizer

PILE TESTING DEVICE IDS-2



IDS-2 is a multichannel system that provides monitoring not only of reinforced-concrete, bored and iron piles, but also of stripe foundations, underground tunnels and a number of other complex structures. The recorder (or a set of < 4 recorders) information collection and processing are operated with a shockproof water-protected tablet PC with Wi-Fi connection.

Providing a load bearing capacity of the foundation is one of the crucial engineering tasks. Sonic Integrity Testing (SIT) is a method developed for operational control over building of new understructures and testing the denseness of the existing ones. This downhole seismic testing method is based on analyzing the acoustic wave propagation in the pile depth caused by impact. Due to reflections from the pile toe and pile defects, it is possible to determine denseness and integrity of the pile. SIT allows to locate:

- the pile toe
- considerable inclusions (in size of 10-20% of the pile rad.)
- horizontal crack systems;
- reinforcing cages
- necking or bulging areas
- changes in soil layers
- changes in concrete density

SPECIFICATIONS

Control and data acquisition	tablet PC, Ip67
Interface	WiFi
Maximum distance between detectors and PC, m	100
Power supply	Li-Ion removable/rechargeable battery 3,4 A*h
Running time of the recorder, hours	17
Running time of the tablet PC, hours	16
Distortion, %	0,01
Preamplifier gains	0,125; 1; 16; 128
Dynamic range, dB	110
Common-mode rejection, dB	110
Attenuation at Nyquist frequency, dB	120
Frequency, Hz	5...2000
Sampling rate, kHz	1...32
Rate-meter	velocimeter
Weight (4 recorders), kg	5
Weight of a tablet PC, kg	1,3
Weight of a recorder (battery attached), kg	0,28
Size of a recorder in a transport packaging, cm	38x30x36
Size of a recorder, mm	ø50×148

DELTA-03 SEISMIC SIGNAL RECORDER



The Delta Seismic Recorder is designed to detect seismic signals from external (natural and artificial) seismic vibrations. It is a permanent seismic station with the possibility of data logging to a removable high-capacity flash disk, and data transmission to a PC for real-time analysis and recording.

The Delta-03 includes the Delta-03M signal recorder, cables, a magnetic antenna, a PCMCIA Flash disk (2 32GB), and a socket to connect with the seismic cable.

FEATURES

- 4 (8) channels for easy connection to any sensor (i.e., seismometers, accelerometers)
- Low power consumption
- Remote control
- Embedded mode of accuracy with internal GPS
- Geophone calibration mode
- Removable mass storage
- Small size and lightweight.

APPLICATIONS

- Micro-zonation surveying
- Earthquake Early Warning
- Aftershock Warning.

COMMUNICATIONS

PC-based via interfaces Ethernet 10/100 and RS-232

SYNCHRONIZATION

Performed in real time;
Recorder uses the high-stability TCXO to maintain time accuracy;
Internal GPS receiver sets and calibrates real-time clock automatically within time points specified by operator or at the command of an operator.

TELEMETERING NETWORKS

The recorder is designed to be part of a telemetering network using the GSM system or satellite modems in the data transfer mode or telephone modems;
Telemetering networking is possible using the Internet via 4G/3G/2G modems and local networks with an external IP address

SOFTWARE

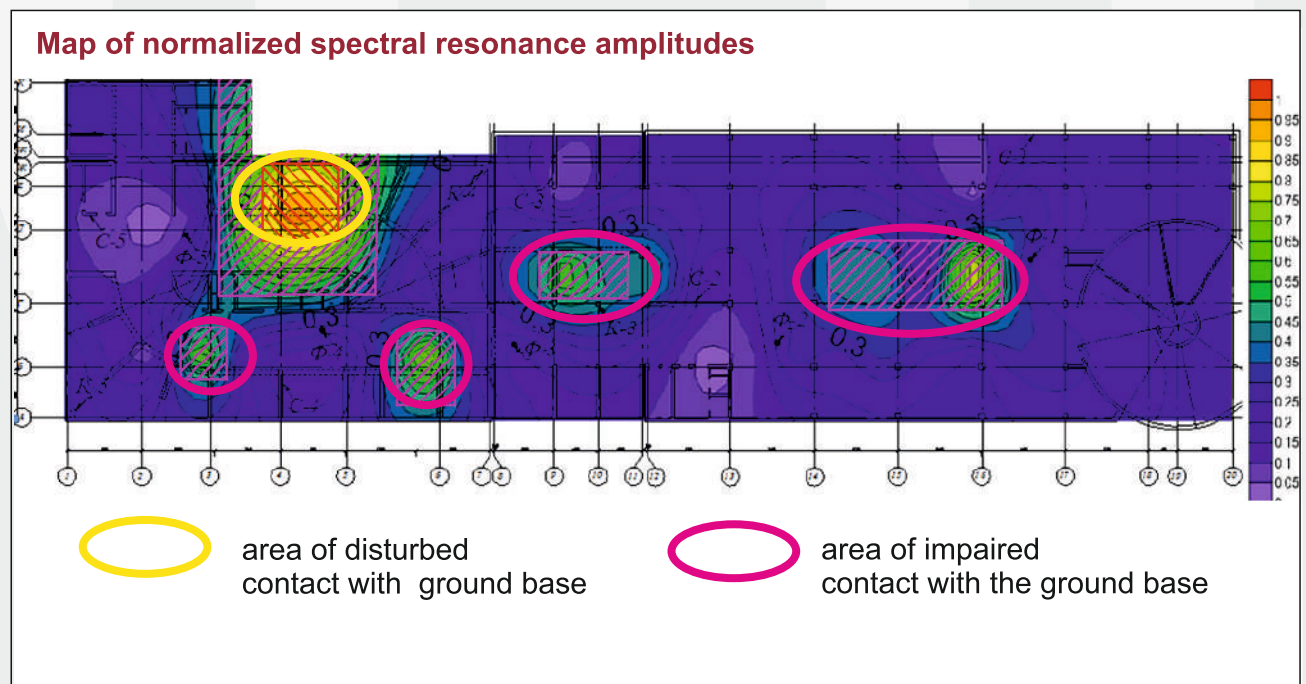
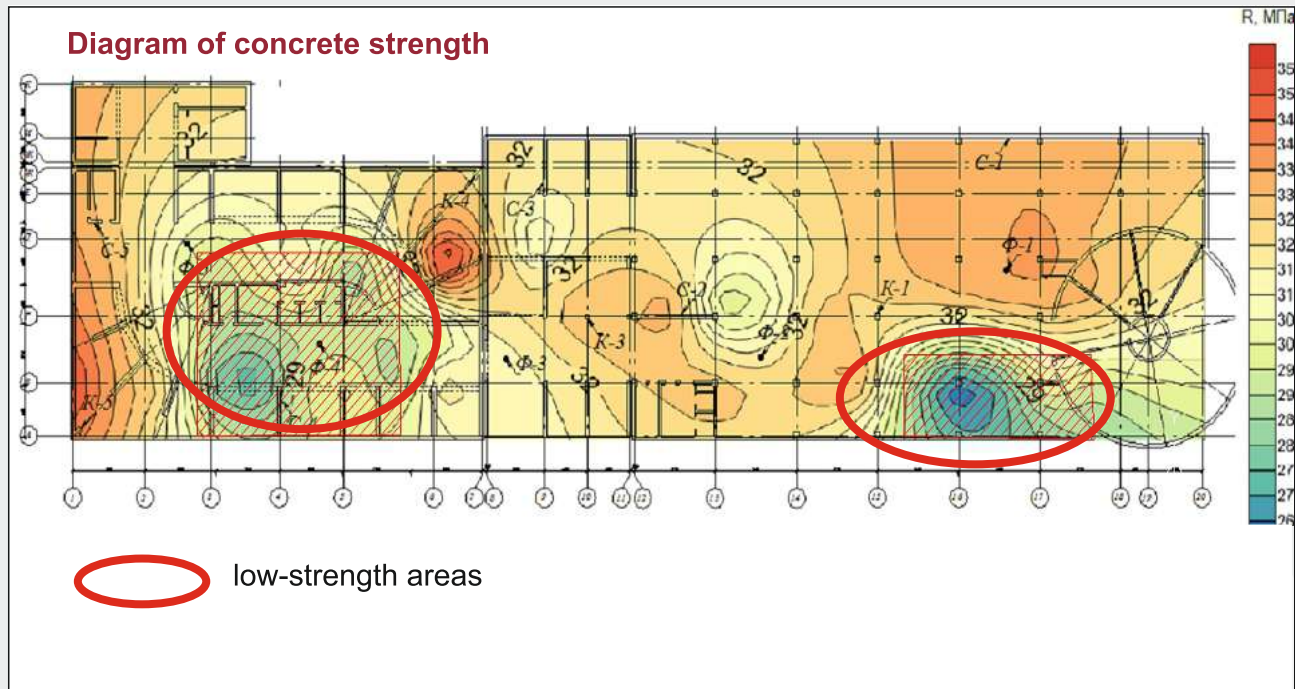
The software is designed for Windows XP/7/8/10

SPECIFICATIONS

Number of channels	4 (8)
Watertight Integrity Environment	Ip66
Temperature range	-40...+60°C
Input voltage	10,5...20B
Power consumption	1W (1,4W)
Writing to disk, no communication 4ch (8 ch)	1,2W (1,6W)
Writing to disk, with communication 4 ch (8 ch)	
Interface: Ethernet RS-232	100Base-T
A/D Converter	24-bit
Gain Selection	1, 4, 16, 64
Maximum Input Signal	5 B
Common mode rejection	not less than 110 dB
Dynamic Range (100 Hz)	133 dB
Noise level (at 50 Hz)	0,013
Sample rates, sps	25, 31.25, 50, 62.5, 100, 125, 200, 250, 500, 1000
FIR Filter	130 dB
GPS-receiver	Internal
Free-running Accuracy	$2 \cdot 10^{-7}$
Recording capacity	PCMCIA Flash disk (2 ... 32Gb)
File format	DDB, ADB, Miniseed, CSS, DAT

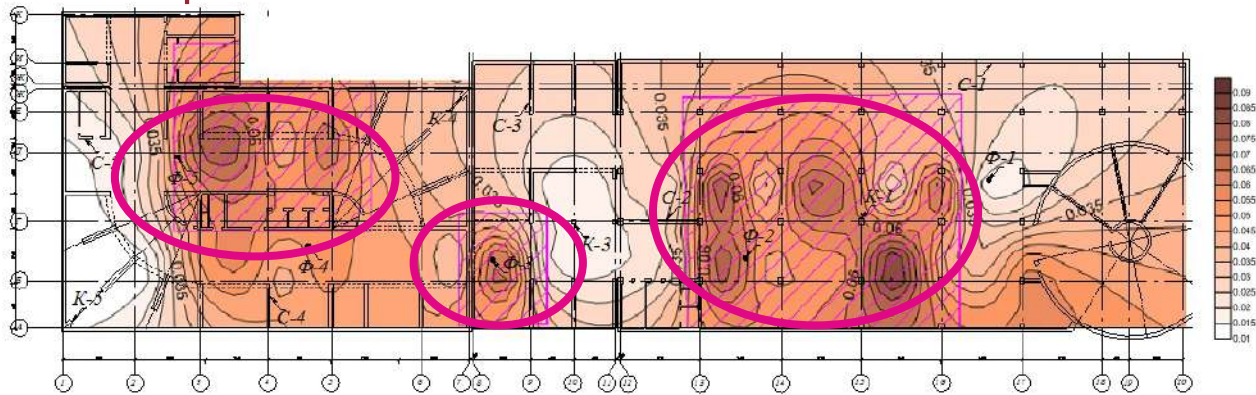
IMPACT-METHOD

The software is used for automotive basic plates thickness, possible defects detection, survey the plate and soil engagement condition.



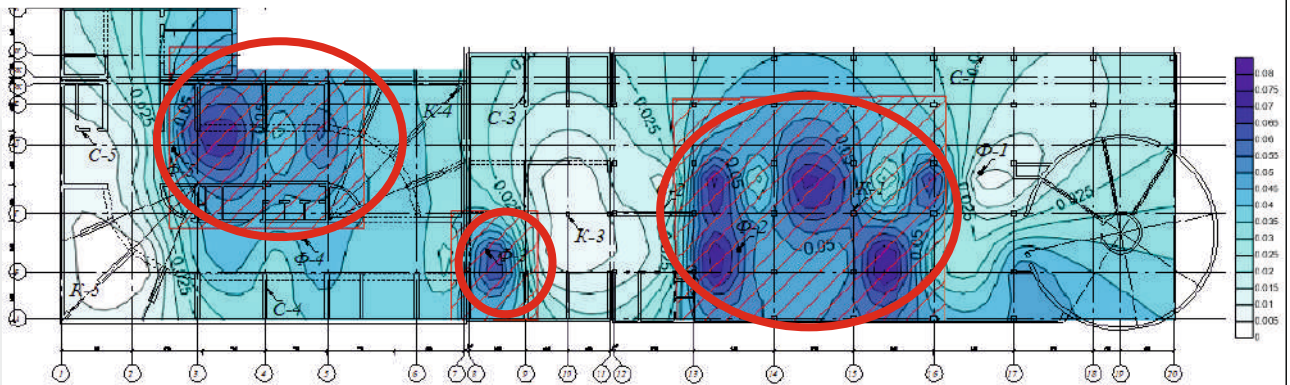
IMPACT-METHOD

Map of the volume fraction of voids



 increased fissuring areas

Map of the volume fraction water-filled voids



 water-filled areas

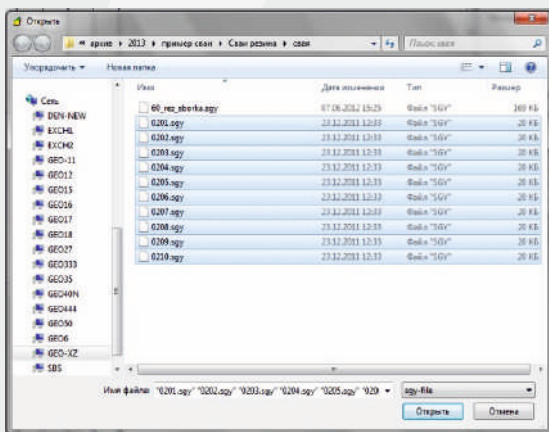
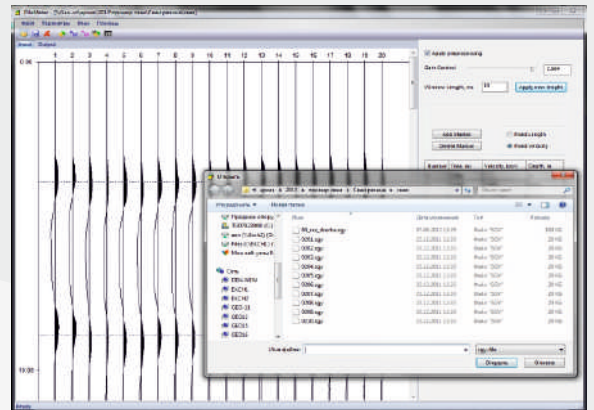
PILEMETER

PILEMETER

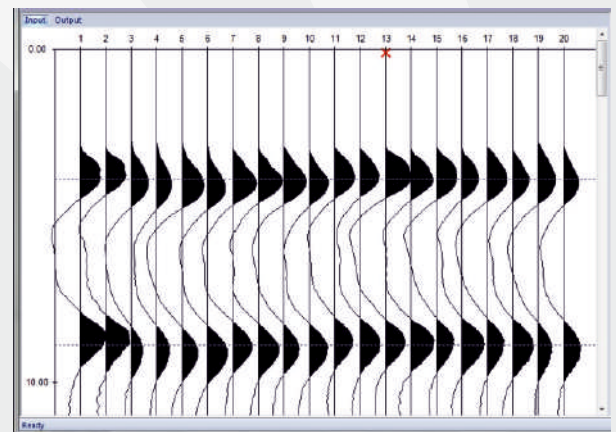
Specialized PILEMETER software provides automated detection of the length of a pile or rate of the acoustic wave in the pile, and, more importantly, allows one to collect this necessary data easily and clearly. This Specialized software also helps to determine the thickness and defects of piles using the Impact Echo Principle.

It also..

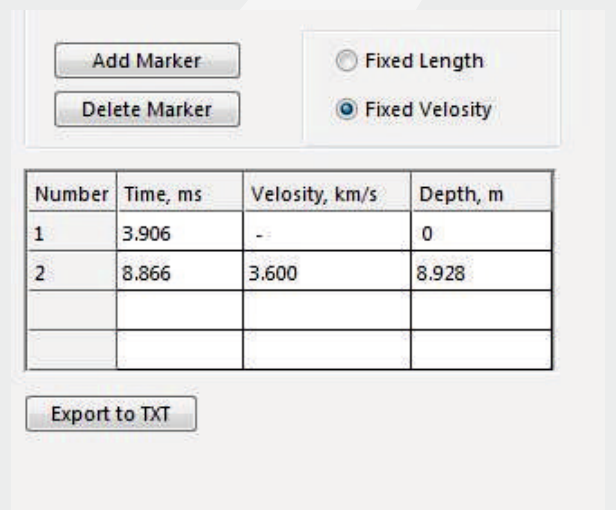
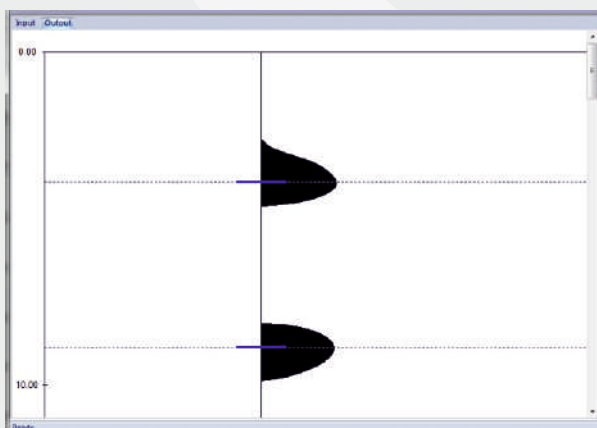
Once the longitudinal wave velocity in the pile is defined, this software determines the length, integrity and localizing defects of piles.



the results of pile surveying



results preprocessing, scrapping of noisy traces



THREE-COMPONENT SEISMOMETER SPV-3K

TECHNICAL SPECIFICATIONS

Frequency, Hz	0,45 to 65
Dynamic range, dB	110
Conversion ratio, V/m	500
Output amplitude, V	$\pm 2,2$
Amplitude nonlinearity, %	± 7
Bandpass flatness	$3 \pm 0,5$
Operational deviation from vertical axis	± 10
Power supply, V	8 ... 18
Power consumption, W	0,65
Diameter, mm	160
Height (with handle), mm	135
Weight (without cable), kg	2,9
Operating temperature range, degrees C	-30 to +55
Environment	IP67

The Three-component Seismometer SPV-3K is designed to convert velocities acting along measurement axes of the Seismometer into proportional electrical signals.

The Seismometer is intended for work with our Seismic Signal Recorder Delta-03, or any other recording system.

APPLICATIONS

- Measurement of amplitudes, natural and forced vibration periods of buildings, structures and critical facilities for the purpose of evaluating their seismic resistance
- Detailed seismic zoning and seismic micro-zoning
- Seismology
- Seismic exploration.



The Seismometer can come equipped with a system which records its deviation from a vertical axis with the display of vertical deviation angle or generation of alarm signal in the case of excessive deviation (optional). This information can be used to determine the position of a Seismometer in offshore seismic exploration conditions.



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