

Laboratory of Water Leak Detection 'AquaLAB'



Larnaca , Cyprus

TECHNICAL PROPOSAL

LABORATORY OF WATER LEAK DETECTION

In most water-distribution systems and pipelines, a large percentage of the water is lost in transit from treatment plants to consumers. Factors that contribute to this loss are old and poorly constructed pipelines, inadequate corrosion protection, poorly maintained valves and mechanical damage.

Our water leak detection test van is a cost-effective way to conserve water, save lost revenue, and control unnecessary costs. Early detection of leaks reduces the possibility of public health risks and the potential for major property damage.

Utilizing state-of-the-art equipment the water leak detection test van is capable of locating and exposing the exact location of hidden underground water leakages. Further, our investigative procedures are non invasive/non destructive and can detect and identify the damage locations without digging or trenching.



The mobile laboratory of water leak detection **AQUALAB** includes a number of features such as:

- 1. Determines the pipeline route of a water supply network*
- 2. Checks up valves and gates for the presence of leakages*
- 3. Measures the water flow in a section of the pipeline*
- 4. Pinpoints the place of water leakages*
- 5. Stores data for graphing, processing and later analysis.*



With our mobile laboratory of water leak detection **AQUALAB** you can perform all of these tests and measurements



AQUALAB consists of the following major component parts:

- Tracing and pin-pointing equipment
- Ultrasonic flow meters
- Acoustic leak detection equipment
- Line/pipe locator with bluetooth and GPS
- Acoustic leak location equipment
- Notebook (Laptop)
- Tool set
- Power supply (Generator)
- Vehicle with leak detection van furnishing
- Documentation set
- Accessories

A. MAIN EQUIPMENT

1. ACCURATE PINPOINTING OF UNDERGROUND FLUID LEAKS

Eureka3 is a high performance leak noise correlator used for the location of leaks in buried water pipes. The system combines sophisticated technology with flexible operation to locate leaks in difficult conditions, e.g. where there is substantial background noise, where only the quietest of leak noise is present, or with a variety of pipe materials. The system is based around the PrimeTouch™ processor platform. PrimeTouch comprises radio receivers, signal processing electronics and runs the Eureka3 software application.

The innovative Eureka3 provides high performance leak location for **ALL** pipe materials even on plastic pipes.

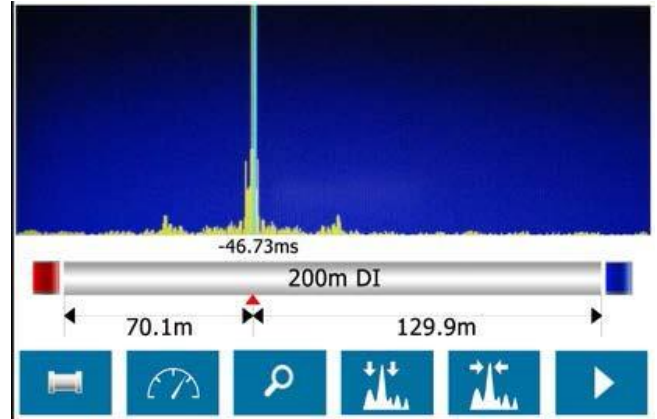


Eureka3 - Easy touch screen operation

The Eureka3 software operates on the PrimeTouch® hardware platform which is designed for water leakage control applications. The high visibility colour display provides clear operation in all weather conditions. The touch screen ensures easy operation involving the minimum actions to achieve results. Large 'virtual buttons' allow use when gloves are worn. The use of dual co-processor accelerates filtering, coherence and correlation processing.

Eureka3+ - Powerful Adaptive Filtering

The Eureka3+ incorporates the new Adaptive Filter. This operates live in the frequency domain and automatically applies different filter frequency ranges selecting the correlation with the best peak. Spectral Whitening is a further option which gives constant amplitude at all frequencies; boosting high frequencies (which are attenuated along the pipe). These filters enable the location of difficult leaks missed using correlators with conventional filters. The Eureka3+ option also features post-processing such that re-analysis of results can be carried out on and off site.



Velocity correction for improved accuracy

Potential errors in the leak position result from the use of default velocity values of leak noise propagation. The velocity correction function overlays a correlation peak produced from induced noise, over the correlation produced from the leak noise. This auto-corrects for velocity variation giving a more accurate leak location result.

Features

- High definition touch screen for easy Operation
- Street-working friendly
- Velocity correction function
- Powerful new Adaptive Filter
- Unwanted noise suppression

2. ULTRASONIC FLOW METERING SYSTEM

The **PrimeFlo3** is a non-invasive flowmeter which eliminates the need to enter the pipe or interrupt the water supply giving the following advantages;

- no head loss
- no water contact
- no contamination
- no process shutdown

When a flow meter is required in the water network the significant costs relate to the installation activity such as chamber building cost, pipe cutting and supply interruption. The installation costs are very much reduced by using the **PrimeFlo3** non-invasive technology.

This results in simple, cost effective, installation and thus the opportunity to have increased network measurement points.

Transit time technology

This uses the principle that ultrasonic waves travelling in the direction of water flow (t1) move faster than those travelling against the water flow (t2). The resultant difference in transit time is directly proportional to the flow velocity. The volume flow rate is then determined from the internal cross sectional area of the pipe. The PrimeFlo3 is supplied for measurements on all types of metal, concrete and plastic pipes.



Applications:

- Leak detection
- Minimum night flow measurement
- Network flow and pressure surveys
- Measurement of user consumption profiles
- Step testing
- Verification of existing fixed meter performance

Features:

- Non-invasive flow measurement on pipe sizes 25 - 2500mm (one pair of sensors only)
- Remote communications via 3G or GPRS
- On-line data availability via PrimeWeb
- Rechargeable battery, 6 months life (under defined conditions)
- Integral pressure measurement
- Waterproof; sensors IP68 and processor IP67 (with lid closed)

3. ACOUSTIC LEAK DETECTION SYSTEM

Phocus3 is an advanced leak noise logger designed for detecting and localising water leakage. Wireless communications allows both 'lift and shift' or permanent distribution network operation. On site leakage results may be obtained via the Communications Module with detailed analysis carried out on the host software.



Three sample epochs to separate consumer use from leakage **Phocus3** is an intelligent acoustic logger which detects the noise generated by a water leak. The logger samples pipeline noise at one second intervals during each of three sample epochs during the night when background acoustic noise is lowest. It carries out statistical analysis on each of the three epochs to determine the Leakage Confidence Factor. The lowest leak noise amplitude is also measured, termed the Critical Noise Value. This value is important as a measure of how close to the leak the logger is situated.



Features:

- Rapid overnight identification of leaks
- Radio contact for greater range
- Small size
- Histogram display of noise data
- Phocus noise algorithm to reduce incidence of undetected leaks
- GPS coordinates stored in logger
- Leak listening
 real time (whilst on site)
 recorded to aid remote leak identification

Data acquisition

Data collected by the Communications Module is transferred to the PC software via USB. Data may be displayed as a table of all logger Critical Noise dB values and Leakage Confidence Factors for easy comparison of results. Histogram displays in 3D give further logger data analysis. Loggers are shown on a Google Map*, colour coded by Leak Confidence Factor and thus relative position to leak(s). Clicking on an individual logger allows access a logger data report.

Logger characteristics

- Smallest size - local IR contact model is 40mmx 113mm (including handle)
- Intelligence in logger to determine presence and level of leak noise
- Epoch data memory approximately one year in most situations
- Powered for >5 years (dependent upon operational use)
- Submersible to IP68

4. PRECISION PIPE LOCATOR

The DXL4 Cable Avoidance Tools represent a significant advance in cable detecting performance. Innovative new features have been introduced and the popular existing modes of detection have been enhanced to allow the DXL4 Cable Avoidance Tool to successfully detect even the hardest to find pipes and cables. Particular attention has been paid to effect better working practices and to minimise the potential for human error to impact on operating performance.

IMPROVED PERFORMANCE ACROSS ALL FOUR DETECTION MODES

The DXL4 Cable Avoidance Tool has improved performance across all modes of detection; Power, Radio, Generator and AllScan, whilst remaining easy to operate ensuring there is only a minimal need for training or retraining.

DEPTH MEASUREMENT

The DXL4 when used alongside the SGV4 Signal Generator will measure and indicate the depth of buried pipes, cables and sondes at the push of a button.



SIMULTANEOUS DUAL-FREQUENCY

The simultaneous dual-frequency 33kHz and 131kHz signal output of the Signal Generators is ideal for maximising the number of buried services that can be energised and then detected, providing a significant improvement in the detection of the smaller diameter or poorly earthed cables.

OVERLOAD PROTECTION

Optimised Locator Sensitivity and Noise Rejection means that the DXL4 can deal with the highest levels of background interference found, allowing even the weakest of signals to be detected successfully.

The C.Scope SGV4 Signal Generator is designed for use alongside the DXL4 Cable Avoidance Tool. It enables significantly more underground utilities to be detected including street lighting cables.

SIMULTANEOUS DUAL-FREQUENCY

The simultaneous dual-frequency 33kHz and 131kHz signal output of the Signal Generators is ideal for maximising the number of buried services that can be energised and then detected.

The SGV4 Signal Generator can apply the dual frequency signal without direct connection to buried services, using either a Signal Clamp or the simple induction method from ground level, providing a significant improvement in the detection of the smaller diameter or poorly earthed cables.

THREE SIGNAL APPLICATION TECHNIQUES

The SGV4 offers three alternative ways to apply a Signal Generator signal:

Direct Connection allows specific pipes or cables to be individually traced, identified and their depths measured. The use of Signal Clamps, Signal Injectors and Direct Connection leads make this mode the most effective method for pinpointing pipes and cables.

If it is difficult or inconvenient to use Direct Connection, then the Wraparound technique can be utilised to successfully energise a street



Induction allows the Signal Generator to induce a detectable and traceable signal to previously unknown, undetected or inaccessible underground metal pipes or cables.

5. ACOUSTIC LEAK LOCATION SYSTEM

Mikron3 is designed for optimum leak pinpointing and confirmation. The combination of advanced sensors with low-noise processing electronics gives excellent acoustic performance. With its choice of sensors and processors, **Mikron3** is a flexible operational tool.

Acoustic leak location principle

Water escaping from pressurised pipes generates a noise which is propagated through the water and pipe material. This noise can be detected at available fittings such as valves and hydrants. The noise also travels directly from the leak through the ground to the surface where it is detected by the ground microphone.



Leak pre-location

The Listening Rod is placed upon available pipe fittings such as valves or hydrants. Comparison of the noise levels indicates which section of pipe includes the leak. The Listening Rod has an ergonomic design that is balanced and comfortable to hold. It also has LED lights to help find fittings in deep chambers.

Pinpointing/confirming the leak position

The high sensitivity ground microphone is for use on flat surfaces above the suspected leak position. The rubber cushioned housing is decoupled from the advanced piezo sensing element providing excellent isolation from airborne noises. A tripod adaptor can be fitted for use on rough surfaces and softer ground.

Features:

- High quality piezo sensors for optimum sound quality
- Sensor gain control for quiet leaks
- Wireless sensor communications for reduced airborne noise pick-up
- Dynamic listen control
- Listening rod and ground microphone sensors

B. ADDITIONAL EQUIPMENT

6. NOTEBOOK (LAPTOP)

The notebook (Laptop) provides an interface for data acquisition, data analysis and data storage for the mobile laboratory of water leak detection.



7. TOOL SET KNIPEX L-BOXX® 52 parts

- Equipped with 52 brand name quality tools, some VDE tested according to DIN EN 60900
- Several boxes can be securely joined together
- Flexible inner partitions
- With two-part tool holder made of hard-wearing polyester fabric
- Tool holders are connected to each other using hook-and-loop
- Handle can be lowered into a hollow in the lid to save space
- Ergonomically shaped handles with additional moulded recess on the side for flexible, convenient handling
- Dimensions, exterior (W x H x D): 442 x 151 x 357 mm; dimensions, interior (W x H x D): 375 x 107 x 311 mm
- Strong box made of impact- and shock-proof ABS plastic
- Snipe Nose Side Cutting Pliers, (Stork Beak Pliers)
- High Leverage Diagonal Cutter
- Pliers Wrench, pliers and a wrench in a single tool
- KNIPEX Cobra®, Hightech Water Pump Pliers
- KNIPEX Cobra® XL, Pipe Wrench and Water Pump Pliers
- Screwdrivers for slotted screws 3,5 x 100 mm
- Screwdrivers for slotted screws 5,5 mm x 125 mm
- Screwdriver for Torx® screws TX15, TX20, TX25
- Screwdriver for cross recessed screws.



- PH1 and PH2
- Electrician's Chisel
 - Voltage detector, single-pole, 247
 - 8100 SA 8 Zyklop set of metal ratchets, 28 parts
 - Joker open-end wrench
 - set of hex key wrenches
 - Express key
 - Safety cutter knife
 - Locksmith's hammer
 - Mason's Chisels
 - spirit level type 70

C. AUXILIARY GENERATOR

8. GEKO R7401 ROBUST GENERATOR

This modern gasoline generator is ideal for independent work on construction sites and for industrial, commercial or private operation. With a large fuel tank it guarantees up to 8 hours running time and offers excellent performance and at the same time it is very safe to use.

Technical Specifications:

El. capacity: 1~ cos φ 1,0	6450 VA
Voltage 1~	230 V
Max. sum. current 1~	28 A
Current 1~ (CEE)	28 A
Current 1~ (Schuko)	16 A
Max. starting current cos φ 0,6 (with 20% voltage drop)	45 A 1~
Frequency	50 Hz
Safety class alternator	IP 23
Engine type	Honda GX 390 Super Silent
Number of cylinders	1
Torque-speed	3000 U min-1
Fuel type	Gasoline
Engine oil capacity	1,3 l
Engine power	7,5 kW
Cooling engine/alternator	Air / Air
Tank capacity	20 l
Operating time: 75% load	8 h
Weight	95,5/104,5kg with battery
Dimensions L x W x H	740 x 500 x 530 mm
Noise power level LWA	97 dB(A)
Noise pressure (10m)	69 db(A)



D. VEHICLE

9. Chassis: IVECO Daily or equivalent



10. Vehicle Body Work

The test van is designed to be easy to operate and service. It is equipped with high quality insulated wall panelling and air conditioning. The body is divided into technical and operator compartments separated by a partition wall. The technical compartment includes all the necessary tools and equipment for carrying out testing and inspections. Safety is an important feature of the test vans and hence all equipment is properly mounted and secured for transit. The operator compartment provides a pleasant environment to work in with more room and plenty of storage. It is equipped with cabinetry and workbenches that increase the operators' efficiency and productivity.

Features:

- Roof mounted air conditioner
- Warning lamp led - visual indication of operating condition, in plastic housing mounted behind rear door with a red/green color
- Internal lighting 230 VAC & 12V DC
- Insulated walls and roof for thermal and noise
- Special PVC floor in operator area
- Special aluminium tread plate suitable for rough loading in high voltage area
- Partition wall, Operating desk & Swivel chair
- Drawers for storage of accessories
- Flood light
- Walkie Talkie
- Traffic Cone warning triangle
- Rubber boots/Protective Helmet/Working gloves
- Fire extinguisher
- Rechargeable handlamp

E. DOCUMENTATION

11. Included one full set of laboratory documentation



Holding company "EMZ"
Head office and Factory:
Aradippou Industrial and Commercial Estate,
Larnaca, Cyprus
RN HE 132211; IN 9.84

F. TRAINING

12. Full training is provided for the test van personnel. The training includes the full use of the equipment and covers the basic test van operations such as safety management, routine and preventative maintenance of equipment.

G. WARRANTY

13. Our test vans are covered by a warranty for a period of one (1) year. At the end of this period, the manufacturer can provide upon order an after-sales service of the equipment.

J. CONTACT INFORMATION

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