



PermaNET+ | GPRS/4G enabled Correlating Leak Noise Logger Fixed Network Buried Water Pipe Leak Detection

PermaNET+ is the award-winning leak detection system that combines a leak noise sensor with versatile telemetry technology for creating a fixed network to monitor leakage in buried water pipes.

Representing the next stage in development of noise logging and leak detection, PermaNET+ is a cost-effective solution that is practical for large-scale deployment.

Compatibility with Google Maps ensures users are provided with **real-time visual representations** of precise PermaNET+ **deployment sites**, **allowing leakage teams to respond quickly**.

PermaNET+ is a data logger & leak noise sensor device based on fixed network telemetry for **24X7 leak monitoring of buried water pipes**.



The PermaNET + installed usually as **multiple units** for creating a fixed leak detection network detection system, employs a specialized microphone that monitors & detects sound waves created by escaping water from a leaking buried water pipe and performs statistics analysis to generate data for a **"noise histogram"**.

The PermaNET+ leak detection system **may alert the operator up to 10 days prior the water reaching the surface**

Features:

- **Quick response:** enables leakage teams to respond quickly to specific locations when a leak is detected
- **Determine leak size:** by matching daily alarms with flow data to enable prioritisation of leak alerts
- **Telemetry:** LTE-based 4G cellular communication standard with fallback 2G capability
- **Precise logging:** ability to log noise more frequently to establish the noise profile and profile alarms for precise immediate leakage alarm
- Secondary validation:
 - Aqualog detailed noise histogram to reduce 'false positives'
 - Audio remotely listen to the noise
 - Remote correlation to localise leak position
- Fully waterproof: the IP68 rating has been tested at 10m depth over a 24 hour period
- **Easy to use:** compatible with the HWM Deployment app and can also be programmed through PermaNET Web
- PermaNET Web: software supports
 - Correlation GIS Interface
 - Map view Remote reconfiguration
 - Aqualog Filtering









PermaNET+ | Fixed Water Network Leak Detection

How the PermaNET+ is used to create a Leak detection network :

PermaNET+ is a powerful leak detection system that allows the user to **deploy a fleet of data loggers** around a water network that are **permanently installed to listen for leaking pipes**.

Typically \geq 20 loggers are recommended to be installed within an area keeping distance upto 200 meters between loggers when installed on a metal pipe & upto 50 meters when installed on plastic pipes

The device listening for possible leaks analyses & determines **Leak /No Leak** and **in case of a suspected leak**, based on built in algorithms , **goes into an alarm mode** , alerting the water department team, while **recording the leak noise sound**.

Sound and data files recordings : in the logger are **automatically** sent over the internet to the **DataGATE server**, and accessible through the PermaNET web application.

Length of Sound recording of suspected leak identified by the PermaNET + is by default for **10 seconds** (Max: 20 seconds).



Histograms & Aqualogs: Additionally, the leak detection team can view daily Histograms of individual loggers, or via detailed Aquascans including 3D views.

Built in Telemetry & GIS Mapping : Equipped with an integral modem supporting GPRS/2G, 4G, LTE-M (Cat-1), with an external GPRS antenna. PermaNET+ operates on low cost cellular data transmission to the DataGate server. In such a case that data transmission is unavailable, it falls back to 2G based on sim card which is slotted into the system , in which case an SMS with Logger ID is included as a message to the user advising a potential leak. With the Built in 2 way UDP communication , it is also possible to remotely reprogram the logger.

Remote Monitoring : PermaNET+ is also compatible with google maps & allows overlay allowing leakage teams to monitor each deployed logger's status via Google Maps compatible software

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The leak noise sensor loggers can be programmed to switch on at a given time in a night or day for noise sampling.

The system can be ordered to make recordings remotely to take an additional recording at a time of choice the next day.



Sites coloured Yellow are not detecting a leak, Red sites are where a leak is suspected. When sound files are available, two buttons. appear. To perform secondary confirmation validation click <Add to Validate List> and the <Validate> button to launch the Leak Localisation & Correlation tool.





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The Sensors once installed are viewable on the DataGate server for complete management of water network, viewing status of sensors installed with capability of proactive & progressive correction of Leaks as they appear with alarms.

Leak Localisation and Correlation Tool

In addition to listening to the sounds recorded, you can use this tool to perform some rudimentary correlations to gain confidence that a leak is present.

1. Choose 2 loggers to test between. In the example shown, a check is being performed between the 2 sites ringed to identify if the Leak suspected can be confirmed.

2. For both loggers, click <<Add to Validate List>>

3. Next click the <<Validate>> button

4. The PermaNET+LLC (Leak, Localisation & Correlation) tool will launch and perform a correlation on the sound files available

5. The Average indicates a confidence level for the correlation a clear peak indicated on the graph confirms that a leak is detected with high confidence between the two loggers selected.



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*The department team or designated expert can **validate the leak by hearing the sound** & use secondary measure of acoustic leak detection to confirm leak location.

Alarms:

- In case the PermaNET + logger signal is no longer available will show up as an alarm.
- In case the sensors suspect a leak, the unit can be programmed to call out twice on the same day.





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Antenna options for LTE 4G connectivity:

Antennas for cellular GPRS data transmission is selected or advised based on chamber construction, and is installed as close to the surface as possible. Antenna options include :

- 1. Carant Type (Subsurface Chambers)
- 2. I-Bar (for attaching to structures external to subsurface chambers)
- Button (drilled into chambers manhole / lids) 3.



Specifications

Operating Temperature	-20 to 60°C
Battery Life	5 years (depending on settings and signal condition)
Memory	Primary recording: 1 million readings
Dimension	Logger without antenna: H = 84mm, W = 114.5mm, D = 113.3mm Leak Noise Sensor: H = 89.3mm, W = 50mm, D = 50mm
Weight	Logger: 338g, Leak Noise Sensor: 476g
Construction	PC/ABS plastic enclosure Stainless steel LNS
Antenna	Multiple external options
Internal Cellular moddern	Cellular modem supporting 2G/3G/NBIoT/LTE-M (Cat-1) with SMS backup where available
Alarms	Leak / No Leak Signal Received / Not Received
Logger ID	7 alphanumeric characters. Readable factory set serial number in firmware
Communication	Laptop or Desktop PC via USB
Environmental	IP68

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