LS Series

Wireless Monitoring System

Long-range radio data acquisition systems (LS Series) constitute a new tool in the geotechnical and structural monitoring world. The LS systems help users:

- Better manage their structure or project by providing data from the instruments of their choice;
- Improve the protection of large structure by connecting large arrays of instruments;
- Lower costs by connecting instruments over long distances without the need for cabling.

LS *Series* Wireless package: node, gateway, Android device and visualization platform (RDMS)

Why use the LS Series?

Engineers and project owners can obtain long-term, reliable and more comprehensive coverage of the structures or areas they wish to monitor at a lower cost. While the DL Series can connect a large number of instruments in a small area more efficiently, difficulties quickly arise when projects contain large areas or structures. The cost of running instrument cables in large-scale instrumentation projects is often prohibitive and becomes a deterrent to the installation of robust and thorough monitoring systems. Deploying the LS Series and taking advantage of its kilometre-range radio reduces costs for a wide range of projects.

How do they work?

GKM Consultants' long-range systems integrate a new high-range, low-power radio with state-of-the-art geotechnical sensors. The system is built around a nodes-gateway structure. Instruments are directly wired connected to nodes, which acquire and transfer data over long distances to a gateway where all data is centralized and accessible.

Example applications

Mine tailings

Mine tailings often require a large number of instruments spread out over a large area. A common situation is to have wells instrumented with piezometers along a several-kilometre-long dike. Using the LS Series makes it possible to cover distances up to 15 km (with a free line of sight) to transmit measurements to a base station.

Structural health

Structures such as bridges, railways and highways often span long distances. With the LS Series, a wide range of instruments, including tiltmeters and settlement systems, can all be linked to a central station (the gateway).

Urban tunneling

Large tunnels in urban environments can pose challenges with regard to the protection of surrounding buildings. To monitor their effects, a large number of instruments, such as tiltmeters, are attached to buildings and structures. Running cables up and down buildings and across streets back to a central logger is expensive and sometimes simply not possible. Implementation of an LS Series system can cover a large number of buildings in a 600 square kilometre area for a fraction of the cost of standard instrumentation.

Technical Features

LS Series

Gateway

The gateway receives data and coordinates the nodes in its network. Up to 100 nodes can be connected to a single gateway. Its large on-board memory can store years of readings.

It hosts a cellular modem, ensuring permanent connectivity. The gateway regularly uploads its data to GKM Consultants' servers for analysis and visualization on our remote data management system (RDMS).

Nodes

Nodes contain an on-board circuit that performs measurement on many types of instruments. They hold several years' worth of data.

They can be connected locally and configured using a USB cable and an Android application. During deployment, this application provides immediate information on radio signal strength back to the gateway, eliminating all the risk of installing a radio-enabled system with a signal that is too weak.

Options

Local data logger

Nodes can be used as a local data logger system without the use of a gateway to remotely retrieve data. This cost-effective option is convenient for localized monitoring where real-time is not required.

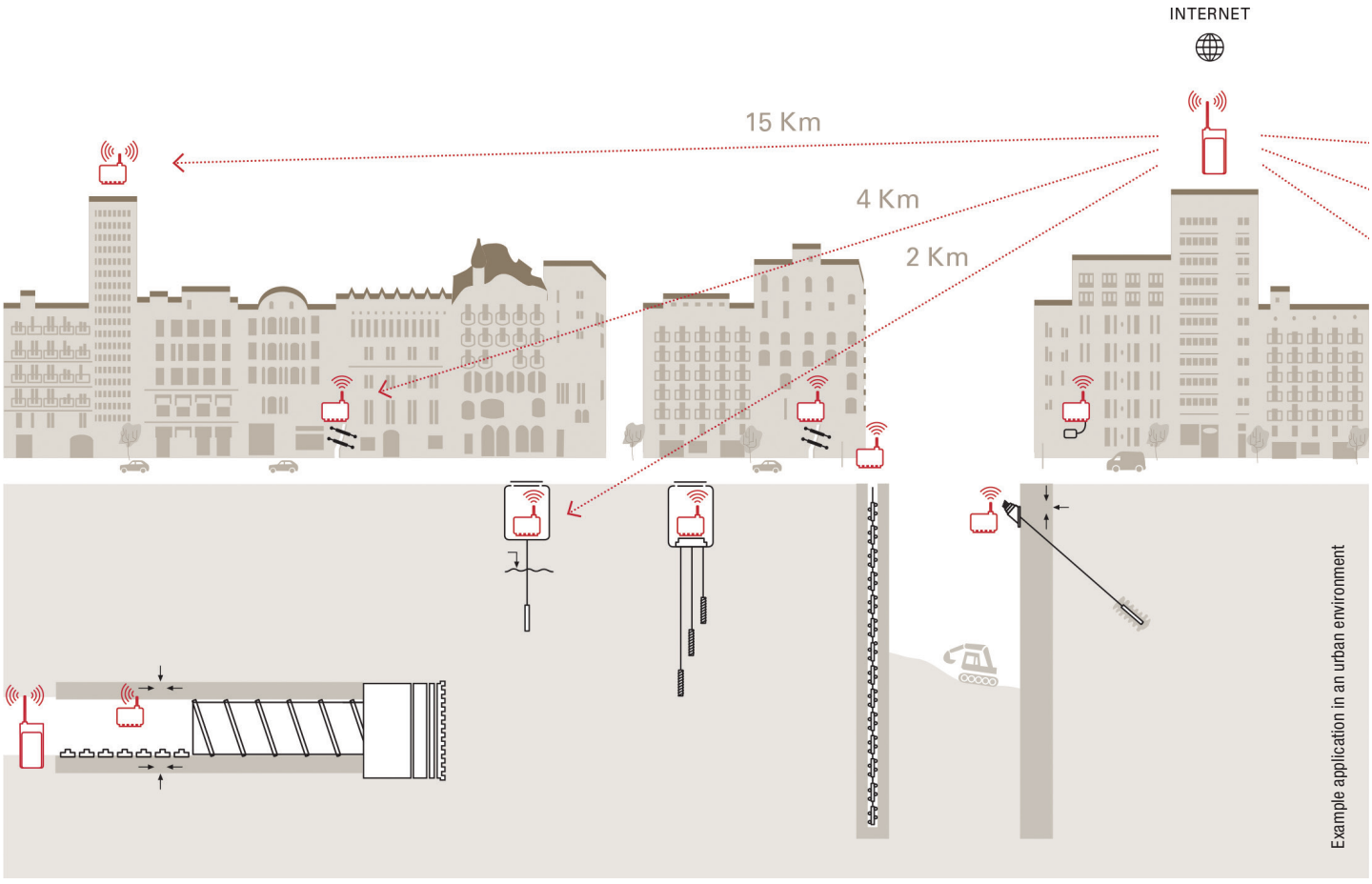
Gateway Connections

In most applications, the data is uploaded by the gateway through its on-board cellular modem.

Other connection options, such as a direct local connection or connection through a company network, are available for the gateway.

Gateway Power

The gateway is powered by a solar panel and battery or 120-220 V AC.



Technical Information

Battery life

Up to 10 years

Data storage

Each node can store up to 200,000 readings.
The gateway has 8 Gb of on-board memory.

Radio range

Up to 15 km

Temperature range

-40 to 50 °C

Environmental protection rating

IP67

Compatible instruments

Vibrating wire instruments (1- and 5-channel options)

Analog instruments (4 channels)

- Thermistors
- RTDs
- Bridge Strain gages
- Thermocouples
- Potentiometers
- ±10 V
- 4-20 mA

Vibrating wire Node

Excitation voltage: . . . . . ±5 V
Measurement range: . . . . . 300 to 7000 Hz
Resolution (-40 to 85 °C): . . . . . 0.12 Hz
Accuracy (-40 to 85 °C): . . . . . 0.018% FS

Thermistor

Measurement range: . . . . . 0 Ω to 4 MΩ
Resolution: . . . . . 1 Ω
Accuracy (20 °C): . . . . . 0.05 °C

Barometer

Pressure range: . . . . . 300 to 1100 hPa

Tiltmeter Node

Type: . . . . . MEMS (Micro-Electro-Mechanical System)
Inclinometer Range: . . . . . ±15°
Accuracy (±5°): . . . . . 0.004°
Accuracy (±15°): . . . . . 0.025°
Resolution: . . . . . 0.001°
Repeatability: . . . . . 0.005°
Axes: . . . . . Biaxial
Temperature sensor resolution: . . . . . 0.1 °C
Temperature sensor accuracy: . . . . . ±0.5 °C

Analog node

Power supply:
5 V DC / 12 V DC / 24 V DC up to 60 mA selectable for each channel

Voltage

Measuring ranges [V DC]: . . . . . ±10; ±1.25
Accuracy (-40 to 85 °C): . . . . . ±0.05% FS

Current loop (2-3 wires)

Measuring range: . . . . . 4-20 mA
Accuracy (0 to 50 °C): . . . . . 0.05% FS

Potentiometer

Accuracy (0 to 50 °C): . . . . . ±0.02% FS

Full wheatstone bridge

Accuracy (0 to -50 °C): . . . . . ±0.1% FS

Thermistor

Accuracy (0 to 50 °C): . . . . . ±0.2 °C

PT 100

Accuracy (20 °C): . . . . . ±0.8 °C

LS *Series* Wireless tiltmeter node

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