

# loadsensing<sup>W</sup>

WORLDSENSING

## WIRELESS MONITORING SYSTEM

GATEWAY

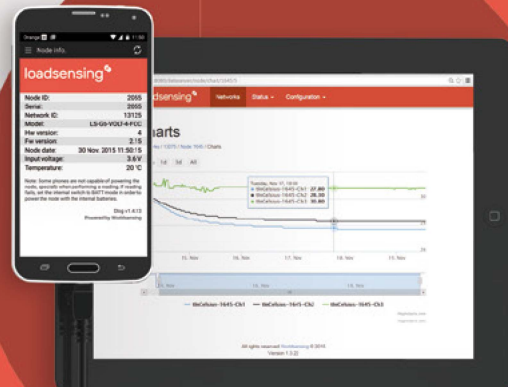


WIRELESS DATA UNIT



WIRELESS TILTMETER

SOFTWARE SUITE



[www.SpectoTechnology.com](http://www.SpectoTechnology.com)

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## THE CONNECTED INFRASTRUCTURE SOLUTION MONITORING HOW STRUCTURES EVOLVE

**Loadsensing** is a data acquisition and monitoring system which combines state-of-the-art wireless monitoring and advanced software tools. It is widely recognized as the leading solution for connecting and monitoring infrastructures in remote locations.

**Loadsensing** devices are battery-powered and equipped with long-range, low-power wide area network (LPWA) radio communications and are compatible with a wide range of geotechnical sensors. The software suite is web-based and facilitates real-time data capture and analytics. It is also possible to set automatic alarms to make operations safer.

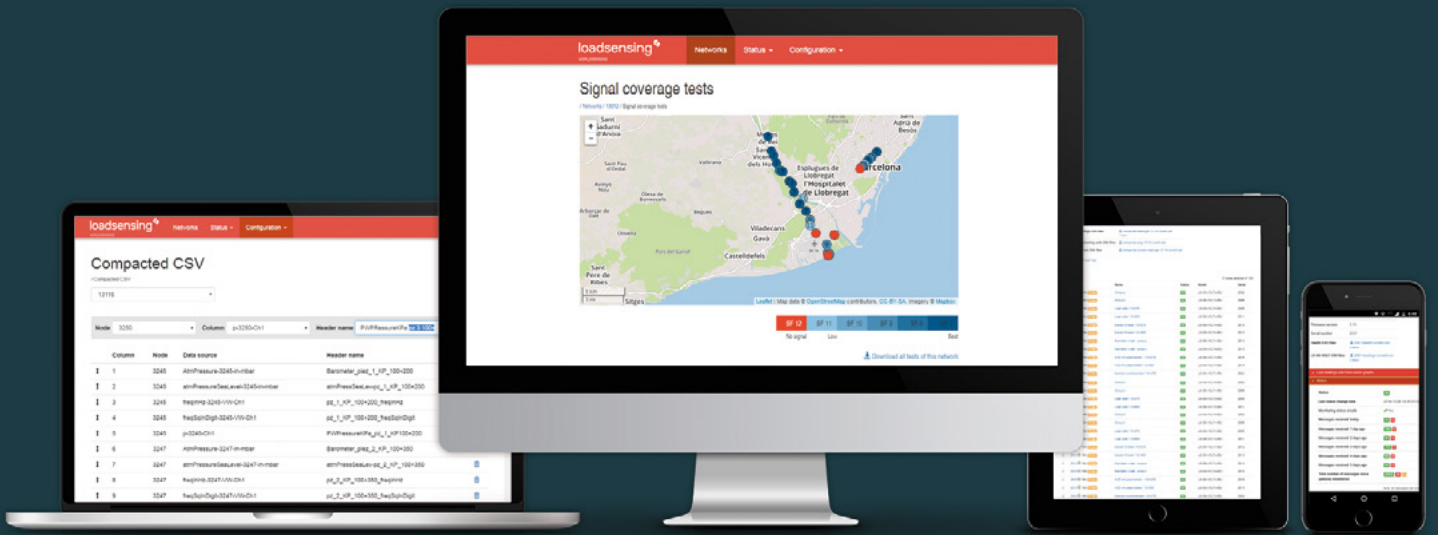
Mining and construction companies and operators of bridges, tunnels, dams, railways and many other inaccessible assets can now work with reliable data. Having access to this information and real-time insights enables operators to anticipate needs, manage their workforce, diminish risks, and even prevent disasters.

### FEATURES

- Long-range communication of over 9 miles / 15km
- Truly low-power, 10 years of unattended runtime
- Wireless LPWA communication
- Supports most structural and geotechnical sensors (vibrating wire, digital, analog)
- Wireless tiltmeter
- Integrated alarm system
- User-friendly web software

### BENEFITS

- Leverage already formatted data to optimize operations
- Remotely monitor hard-to-access infrastructures
- Cover a wide area with geotechnical sensors
- Easily add sensors to extend measurement range
- Save resources through fast implementation
- Decrease costs through easy maintenance
- Diminish risks and make operations safer



## SOFTWARE SUITE

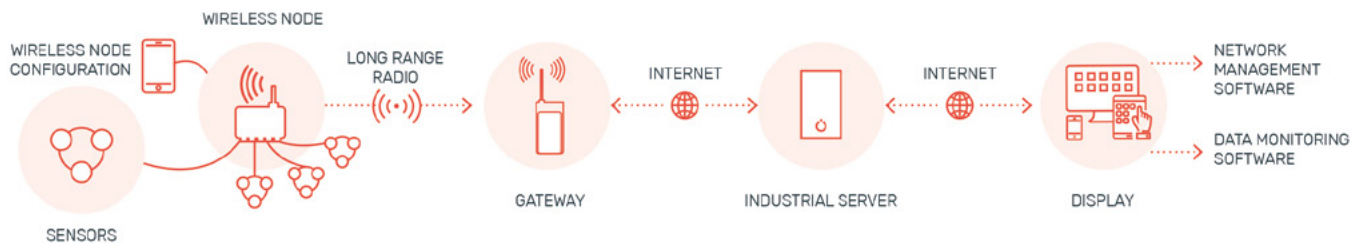
### NETWORK AND ASSET MANAGEMENT SOFTWARE

- Network communications configuration and control
- Wireless data unit and sensor attributes display
- Wireless data unit configuration
- Sensor data in near real time
- Conversion of raw sensor data in engineering units
- Manual and automatic data download in .csv
- Data transmitted in a secure manner
- Remote change of sensor's sampling rate
- Data accessible through Modbus TCP
- Able to push data on user FTP

### DATA MANAGEMENT SOFTWARE

- Sensor data visualization and download (tables and graphs)
- Topological view
- Creation of virtual variables
- Configuration of alarm thresholds
- Alarms sent to stakeholders by email
- Automatically generated reports (tables, graphs and notes)

## HOW IT WORKS



Operational Intelligence  
for Mines and Industrial Companies

Worldsensing is not only among the best in the world at connecting distributed infrastructures with smart devices, we also know how to extract intelligence from collected data to transform operations. Our software solutions combine location intelligence with infrastructure monitoring.



**NODE: LS-G6-INC15**

BOX DIMENSIONS (WxLxH): 100x100x61 mm  
 OVERALL DIMENSIONS: 150x120x61 mm (excluding antenna)  
 EXTERNAL ANTENNA: 100 mm length (including connector)  
 HOUSING MATERIAL: Aluminium alloy  
 Internal C-size 3.6 V High-power batteries, from 1 up to 2 batteries

**NODE: LS-G6-VW-1P (POLYCARBONATE)**

BOX DIMENSIONS (WxLxH): 151x80x60 mm  
 OVERALL DIMENSIONS: 160x85x60 mm  
 INTERNAL ANTENNA  
 RADIO COVERAGE: 60 % of the achieved with the external antenna  
 WITHOUT GROUNDING  
 HOUSING MATERIAL: Polycarbonate  
 Internal C-size 3.6 V High-power batteries, 1 battery



**WIRELESS TILTMETER**  
 LS-G6-INC15

**APPLICATIONS**

- Remote tilt monitoring from retaining and building walls
- Landslide monitoring
- Bridge pier monitoring
- Structural load monitoring
- Ground subsidence

**SPECIFICATIONS**

Type:	MEMS (Micro-Electro-Mechanical) Inclinometer
Range:	± 15°
Accuracy (± 5°):	0.03% FS / 0.004°
Accuracy full range:	0.17% FS / 0.025°
Resolution:	0.001°
Repeatability:	0.005°
Axes:	Two (biaxial)
Temperature sensor resolution:	0.1 °C
Temperature sensor accuracy:	±0.5 °C

**BATTERY LIFE ESTIMATION Wireless tiltmeter**

SAMPLING RATE	Barcelona temperature profile *	Singapore temperature profile*
5 min	1.2 years	1.1 years
1 h	5.8 years	4.7 years
6 h	8.3 years	6.4 years

\* Estimations for 2 x saft LSH 14 batteries

**VIBRATING WIRE 1ch and 5ch NODES**  
 LS-G6-VW-1P, LS-G6-VW-1M, LS-G6-VW-5

**VIBRATING WIRE NODE 1ch and 5ch**

**VIBRATING WIRE**

Measurement method: Embedded algorithms increasing immunity to noise

Excitation wave:	+/- 5 V
Measurement range:	300 to 7,000 Hz
Resolution (-40 to +85°C):	0.12 Hz
Accuracy (-40 to +85°C):	0.018 % FS

**THERMISTOR**

Measurement range:	0 ohm to 4 Mohm
Resolution:	1 ohm
Accuracy (20°C):	0.05°C (0.04 % FS)

**BAROMETER**

Pressure Range:	300 to 1,100 hPa
Relative Accuracy (950 to 1,050 hPa at 25°C):	±0.12 hPa

**BATTERY LIFE ESTIMATION Vibrating wire nodes**

CHANNELS & SAMPLING	BATTERIES*	BATTERY LIFE ESTIMATION*
1 CH 5 min	1 cell	3 years
1 CH 30 min	1 cell	7 years
5 CH 5 min	1 cell	1.5 years
5 CH 5 min	4 cell	5 years
5 CH 30 min	1 cell	4 years
5 CH 30 min	4 cell	>10 years

\* Nominal capacity of each battery: 5.8 Ah. Considering laboratory conditions



**Nodes: LS-G6-ANALOG-4, LS-G6-DIG-2 and LS-G6-VW 5 ch**

BOX DIMENSIONS (WxLxH): 100x200x61 mm

OVERALL DIMENSIONS: 140x220x61 mm

(excluding antenna)

EXTERNAL ANTENNA: 114 mm length (including connector)

HOUSING MATERIAL: Aluminium alloy

Internal C-size 3.6 V High power batteries, from 1 up to 4 batteries

**NODE: LS-G6-VW-1M (ALUMINIUM)**

BOX DIMENSIONS (WxLxH): 100x100x61 mm

OVERALL DIMENSIONS: 140x120x61 mm (excluding antenna)

EXTERNAL ANTENNA: 114 mm length (including connector)

HOUSING MATERIAL: Aluminium alloy

Internal C-size 3.6 V High power batteries, 1 battery



**ANALOG NODE**

LS-G6-ANALOG-4

**ANALOG NODE 4ch**

Each channel is individually configured by the user

**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 (8x)

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 (POT)**

Accuracy (0 to +50°C): +/- 0.02 % FS

**FULL WHEATSTONE BRIDGE (FWB)**

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

**BATTERY LIFE ESTIMATION \*\***

Channels & Sampling	BATTERY LIFE ESTIMATION **				
	Current @12V@24mA	Current @24V@24mA	Voltage @12V@24mA	FWB@5V@0.7 kΩ	Pot@5V@1.5 kΩ
Warm up time	1 second	1 second	1 second		
1 CH 5 min	6 months	4 months	5 months	1.5 years	1.5 years
1 CH 6 hours	>10 years	>10 years	>10 years	8.5 years	>10 years
4 CH 5 min	1.5 months	39 days	2 months	1.5 months	7 months
4 CH 6 hours	8 years	6.5 years	>10 years	8.5 years	>10 years

**DIGITAL NODE**

LS-G6-DIG-2

**DIGITAL NODE**

One RS485 channel and two SDI-12 channels

Power supply: 12 V DC up to 120 mA

RS485 full or half duplex supported

Suitable for a chain of in-place inclinometers

Modbus RTU RS485

Supported sensors: RTS, Sisgeo and Geosense digital inclinometers

**BATTERY LIFE ESTIMATION \*\***

RST and Sisgeo chains of Inclinometers

Number of sensor	Sampling rate		
	6 hours	30 minutes	3 minutes
10 (RST)	>10 years	2.5 years	4 months
30 (RST)	5.2 years	4 months	26 days
10 (SISGEO)	4 years	5 months	30 days

**SHARED SPECIFICATIONS**

**INTERNAL DATA STORAGE**

Up to 72,500 readings including time and 5 sensors

Up to 200,000 readings including time and 1 sensor

Sampling rate: 30 seconds to 1 day

Time synchronization by radio: Time discipline better than ± 10 seconds

Operating temperature: -40°C to 80°C (-40°F to 175°F)

Weather protection: IP67

**ACCESSORIES**

**ACCESSORIES**

Saft LSH 14 C-size spiral cell

Node-mobile cable

External mounting brackets for wall mounting

Plate for pole mounting

Tiltmeter horizontal mounting plate

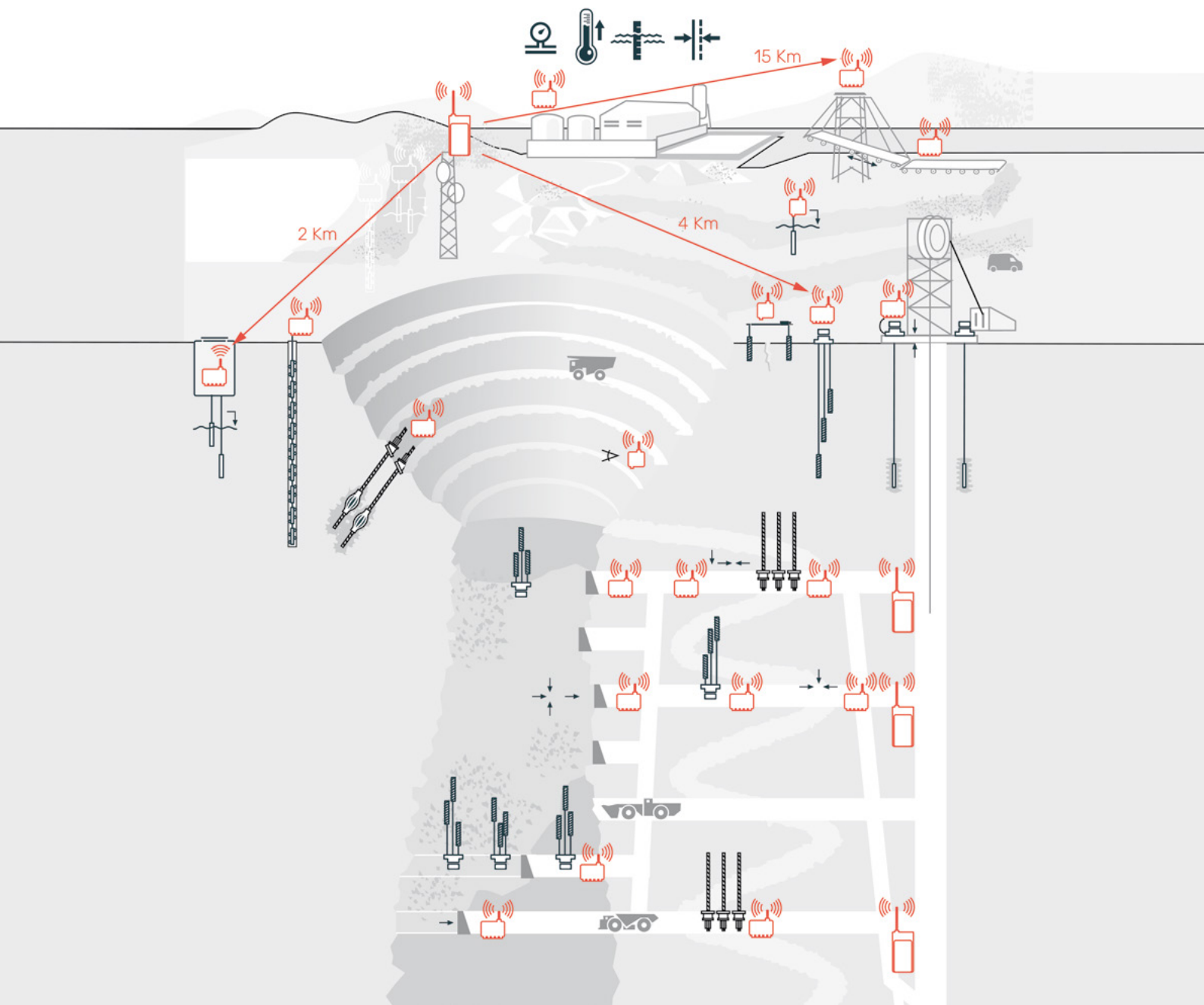
Tiltmeter vertical mounting bracket

\*\* Estimations for 4 x saft LSH 14 batteries. Considering laboratory conditions

Specifications are subject to review and change without notice



## HOW IT WORKS IN MINES





## CONFIGURATION APP

### DLOG APP

Simple and fast connection to wireless node

Runs on Android devices

Easy sensor configuration: ID, sampling rate, frequency sweep, interface type, etc.

Checks radio signal coverage

Records coordinates (GPS)

Downloads data from wireless node and sends by e-mail or saves it on the Android device

Takes current reading

Updates wireless node firmware



## GATEWAY

### BASE STATION

ISM Sub 1 GHz band, sensitivity: down to -137 dBm

Detachable omnidirectional 1/2 dipole

Integrated GPS antenna

GNSS High Sensitivity GPS module

### POWER

Power supply: 48 V DC PoE

Nominal: 3 Watts

DC power supply (ex.: solar panel use): 11 to 30 Volts

### MECHANICAL

Size: 210 x 310 x 170 mm, including mounting kit

Weight: 2 kg including mounting kit

IP67 rating

Operating range: -20 to + 60 °C

### NETWORK INTERFACES

10/100 Ethernet WAN (RJ45 PoE)

Integrated 3G Modem & Antenna (HSDPA, EDGE, GPRS) quad band

### LS gateways:

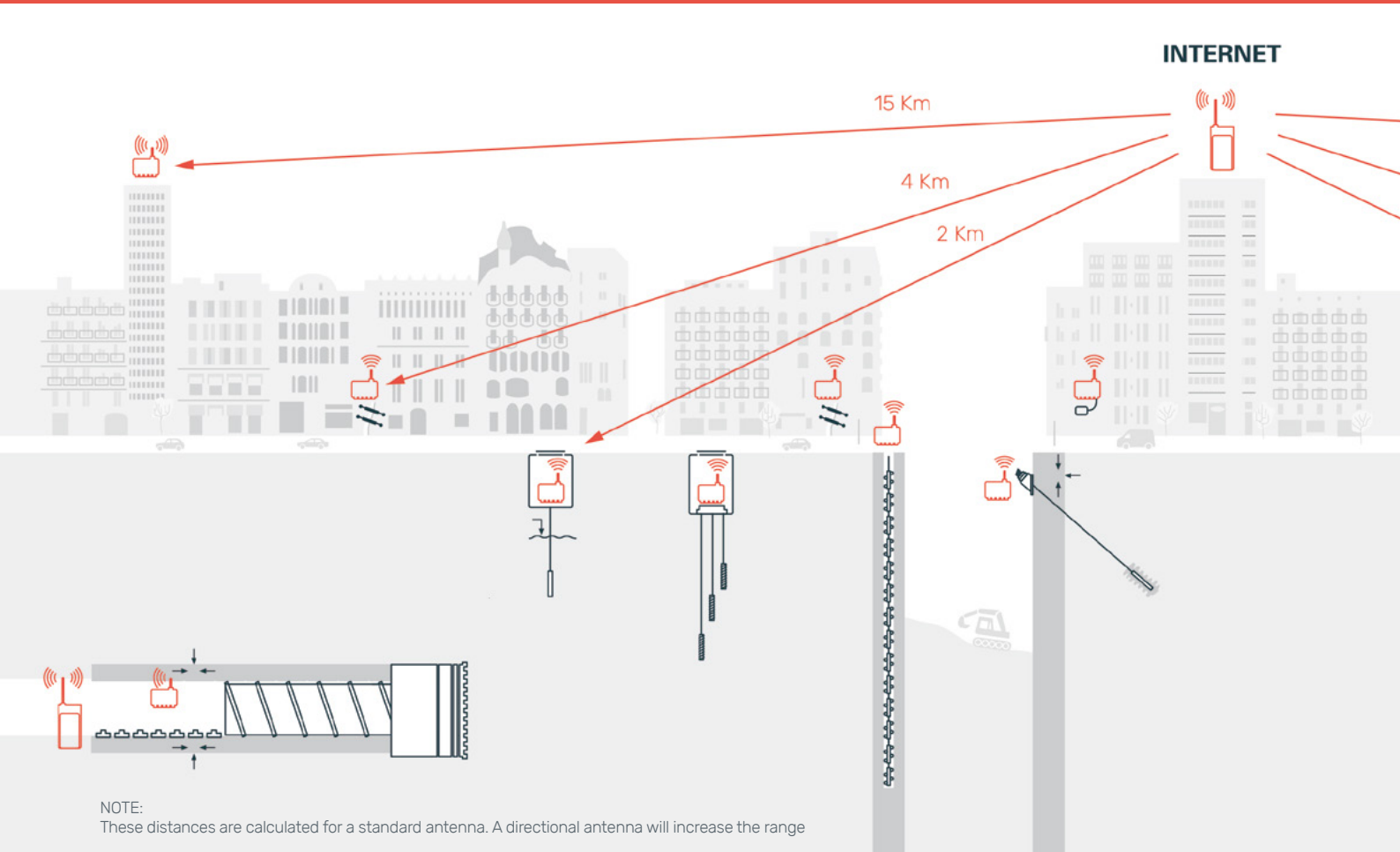
868 MHz ISM band

915 MHz FCC ISM band

915-928 MHz ISM band



# HOW IT WORKS IN CITIES



## RADIO & APPLICATIONS

### LONG RANGE RADIO

OPEN FIELD:	15 km
CITY STREET:	4 km
MANHOLE IN A CITY STREET:	2 km
TUNNEL:	4 km

### RADIO SPECS

ISM sub 1 GHz operating frequency bands adjustable to each territory requirements
No repeaters needed
High sensitivity: down to -137 dBm
Transmission: +14 dBm high efficiency / +20 dBm
Maximum link budget: 151 dB / 157 dB
Remote sampling rate change
Bidirectional communications capabilities