



REMOTE MONITORING FOR TUNNELS

Use remote monitoring technology before, during and after construction for crucial data about the behavior of the tunnel, the ground and third party assets in the zone of influence.

FRONTIER
How You Measure Matters
PRECISION

Senceive



ADDRESSING YOUR **CHALLENGES**

Tunnel engineers have trusted Senceive technology for more than a decade. It is designed and built for the tough demands of underground projects and provides **precise, reliable structural and geotechnical data** to help you address the unique pressures and challenges of your tunneling project.



Limited Time

**Ideal where only short
access windows are
available**

- Installed in minutes
- Works straight out of the box
- Still working after 10 years



Limited Space & Difficult Access

**Compact, autonomous
sensors will not interfere
with your operations**

- No clearance issues due to small size
- Measure where it matters most
- No wires needed and therefore less risk of damage



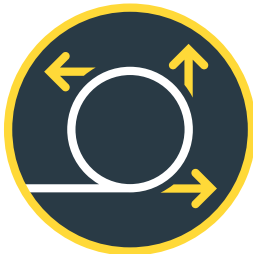
Tough Conditions

Long life performance

- Rugged instruments for construction site conditions
- Withstands extremes of heat, cold, water and more
- Robust mesh networks can resist damage to elements without systematic loss of performance



Senceive solutions have been used in over a **hundred tunneling projects** in more than **20 countries** over the last decade. They have been used in applications extending from just a **few hours to 25 years**.



Changing Needs

Adapt the monitoring system as your project progresses

- Flexible moving and fitting of sensors
- Change settings without leaving your desk and share the data with your whole team
- Integrate structural and geotechnical sensors



Protect People & Infrastructure

Early warning of distress and defects without leaving your desk

- Automated alarms when trigger levels are breached
- Early warning of failure in tunnel or damage to buildings above
- Fewer site visits means reduced risk exposure



Stay on Budget

Use cost-effective monitoring for cost-effective tunneling

- Save money through reduced site visits and long life performance
- Works straight out of the box
- Increased confidence and productivity through reliable real-time data

Wireless monitoring plays a valuable role in the construction and maintenance of various tunnel elements and underground structures:

- Refurbishment and structural modification, for example for strengthening, track lowering and electrification
- Monitoring movement of third-party buildings and assets
- Shafts and diaphragm walls
- New construction
- Temporary works

As with any of our wireless monitoring solutions, a typical tunnel monitoring system will comprise **three key elements**: sensors, a cellular communications gateway and an online data portal.

For **dense sensor networks** and highly responsive reporting, choose our **FlatMesh™** intelligent mesh platform. Where sensors are widely dispersed and where you need to transmit data through physical obstructions (including soil and rock) our **long-range GeoWAN™** platform may be more suitable.

In order to relay data from the sensor positions deep underground to the Gateway that is typically located just outside the portal, repeater nodes may be used. Alternatively, Wi-Fi or ethernet connections can be used where available.

WIRELESS MONITORING FOR TUNNELS





A wide range of sensors can be integrated with our platforms to provide geographically dispersed stakeholders with data including:



Convergence/ Divergence



Deformation



Crack and joint movement



Lateral or vertical ground movement



Ground pore water pressure



Strain

Senceive instruments can be supplied with a wide range of brackets and fixings for use at any angle on virtually any surface. Options include magnetic fixings for ferrous metal linings and mounting plates that use screws, bolts or adhesive for concrete. For brick and masonry structures a rigid aluminum beam with tilt sensors is often used to measure movement of the whole structure rather than individual bricks or blocks. FlexiMeasure, our flexible inclinometer solution can be fitted around a typical tunnel intrados in an hour.



Harnessing intelligent
monitoring to keep people
and infrastructure safe



Contact us

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