



## REMOTE MONITORING FOR RAIL

Use remote monitoring technology to manage earthworks, track and structures - protect people and infrastructure throughout the asset lifecycle.

**FRONTIER**  
*How You Measure Matters*  
**PRECISION**

  
**Senceive**





# ADDRESSING YOUR **RAIL** CHALLENGES

Rail engineers have trusted Senceive technology for more than a decade. It is designed and built for the tough demands of railway applications and provides **precise, reliable structural** and **geotechnical data** to help you address the unique pressures and challenges of your rail 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 proven in railway applications
- Withstands extremes of heat, cold, water and more
- Robust mesh networks can resist damage to elements without systematic loss of performance



Senceive solutions are used by operators, contractors, professional surveyors and engineers around the world. Approved, accredited and proven in the field, the technology is the natural choice where long-term performance in critical applications is required. That's why **more than 10,000 of our rail sensors** were installed in 2020 alone.



### **Changing Needs**

**Adapt the monitoring system as your project progresses**

- Flexibility to move sensors to fit project needs
- Change settings without leaving your desk; share 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 such as landslide or structural movement
- Fewer site visits means reduced risk exposure



### **Stay on Budget**

**Cost-effective monitoring for cost-effective rail construction & maintenance**

- Save money through reduced site visits and enhanced long- life performance
- Increased confidence and productivity through reliable real-time data
- Optimize long-term maintenance – **predict and prevent** costs less than **fail and fix**



# WIRELESS MONITORING FOR RAIL

As with any of our wireless monitoring solutions, a typical rail 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.

Data transmission from the sensor nodes to the gateway can use radio, ethernet or Wi-Fi depending on site conditions.

A wide range of sensors can be integrated with our platforms to provide geographically dispersed stakeholders with data from track, structures and earthworks:



## TRACK MONITORING

To measure changes in track geometry including rail cross level, twist, superelevation and settlement



## SLOPE MONITORING

To get early warning of landslides, rockfall or subsidence to prevent disruption and danger



## BRIDGE MONITORING

To prevent failure through structural health monitoring



## TUNNEL MONITORING

To understand ground and structural behavior during construction and operation



## CONSTRUCTION MONITORING

To manage your liabilities to third parties using sensors that are discreet and non-disruptive





## EASE OF USE

We know that access windows are precious; that's why we've built our monitoring solutions to be:

- Fitted in minutes
- Reporting before you've left site
- Still reporting more than 10 years later.

**Precise, reliable instruments**  
installed with no specialist  
skills required.





# INTEGRATED REMOTE MONITORING SOLUTIONS FOR STRUCTURAL & GEOTECHNICAL APPLICATIONS



## 1: PIEZOMETER

Automate logging of groundwater level and pore water pressure by linking geotechnical instruments to a vibrating wire integrator node.



## 2: TRIAXIAL TILT NODE

Tilt nodes detect rotational movement and can be set to trigger automated alerts and accelerate sampling. Many thousands of tilt nodes are in use on railways around the world. Used here to detect slope movement.



## 3: NANO TILT NODE

The Nano delivers the same precise measurements as our standard tilt nodes in a smaller, more robust enclosure, and offers more user-interaction. Used here to monitor track movement.



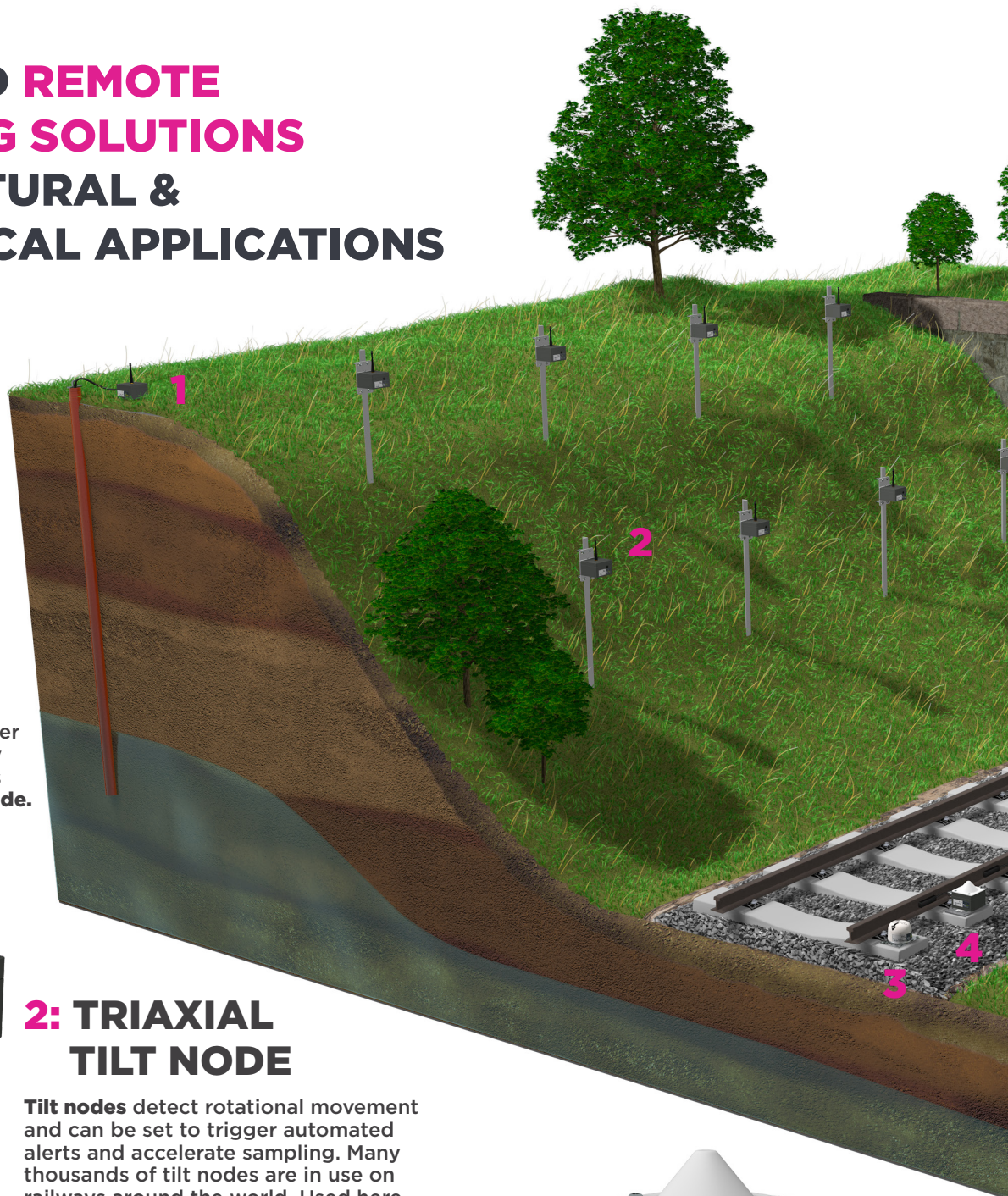
## 4: MILLIVOLT SENSOR

The Millivolt Sensor Node enables a variety of structural and geotechnical sensors to be integrated into a wireless monitoring system. Strain gauges on trackbed are just one example.

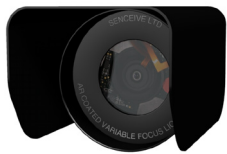
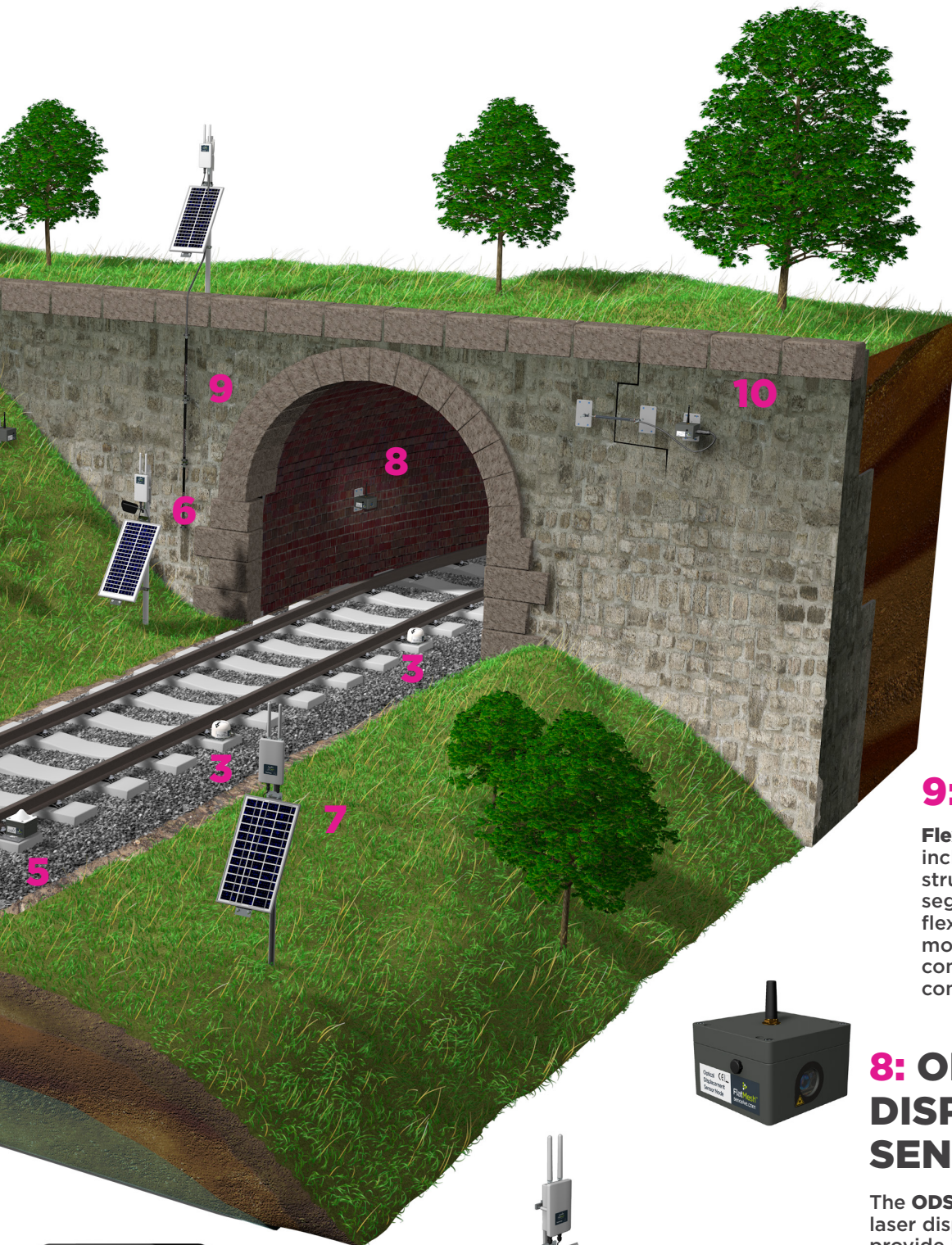


## 5: TEMPERATURE SENSOR

The PT100 RTD Sensor Node enables precise temperature monitoring and critical rail temperature alerting. Can be supplied with an integrated High-G triaxial tilt sensor for combined tilt and temperature monitoring.







## 6: 4G CAMERA

Solar-powered **FlatMesh™** camera for great quality static monochrome images day or night. Used as an integral part of intelligent monitoring solution with automated triggering and wireless communications for remote locations.



## 7: 4G GATEWAY

The **FlatMesh™ 4G Gateway** provides all the functionality required to operate a wireless sensor network in a remote location. With a solar panel no fixed power supply is required. Data is transmitted from the sensors to the Gateway and onwards to a secure cloud-based server and data management platform.



## 8: OPTICAL DISPLACEMENT SENSOR (ODS)

The **ODS** combines a tilt meter and a laser displacement sensor. Together they provide information about the stability of the structure the sensor is fixed to and relative movement of a target structure. Here it is measuring convergence of the tunnel intrados.



## 10: CRACK SENSOR

The **crack sensor** node interfaces to a linear displacement sensor. Applications include crack movement, pile separation, structural movement and expansion joint monitoring.



## 9: FLEXIMEASURE

**FlexiMeasure** is a lightweight inclinometer engineered for structural monitoring. Multiple segments can form a chain of flexibly coupled sensors to monitor movement including distortion and convergence, heave and settlement, consolidation and compaction.





# TRACK

Wireless monitoring helps you **assess long-term trends** to **optimize maintenance**, and **detect sudden movement** that could represent a safety issue.

Clients around the world choose Senceive solutions when they need **real-time insight** into long-term changes in track geometry.

They know they can trust the technology to deliver **precise, reliable data** in tough trackbed conditions. And they welcome the quick, simple installation process that helps reduce the risks associated with boots on ballast.

**Use a combination of tilt nodes, temperature sensors, optical displacement sensors and strain gauges to monitor track movement and the causes of that movement – without leaving your desk.**



# STRUCTURES

Use wireless technology to **monitor bridges, tunnels, buildings** and **other structures** such as electrification gantries and retaining walls.

Our technology is chosen by rail engineers throughout the asset lifecycle. During construction our range of **robust, highly portable sensors** can **safeguard** the structures being built and manage risk to third parties. And on operational structures, monitoring can support your asset management by identifying where significant movement is taking place and intervention is needed.

It can also **characterize structural movement** that is within acceptable bounds and therefore prevent unnecessary intervention.

**Helping you  
manage risk and  
extend the life  
of rail structures.**







# EARTHWORKS & GEOTECHNICAL

Use wireless monitoring to automate **logging of ground movement** and **geotechnical parameters** in vertical and horizontal boreholes.

Monitor railway earthworks such as cuttings and embankments for **early warning of landslides** and **failures**.

Send **automated alerts** to asset owners in the event of potentially dangerous situations before any material encroaches on the railway track.

**Using unique and proven intelligent monitoring technology you can be confident that next time the ground moves, the trains can be stopped.**



“

**The sensors are reliable, wireless and scalable to suit a wide range of applications. We have successfully deployed them across multiple rail sites in Canada. Senceive products have proven to be a real game changer for both end clients and contractors.**

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**Tom Bye**

Managing Director  
Summit Infrastructure, Canada





**Harnessing intelligent  
monitoring to keep people  
and infrastructure safe**



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