FUGRO SEALSAFE® TUNNEL MONITORING SYSTEM

Rapid urbanisation increases operational and maintenance pressures on critical assets such as immersed tunnels. SealSafe® is a compact, contactless remote measuring system that accurately monitors deformation and displacement of rubber seals, known as Gina seals. These seals are strategically positioned in the joints of immersed tunnels, fitted during asset construction and left during its lifetime.

SealSafe® provides early warning of any movement of the seals inside the joint, raising the alert to potential leakages or structural damage. These early signs allow scheduled maintenance plans to be put in place during the asset’s lifetime, reducing the risk of unforeseen repair costs and disruption to transport services through unexpected tunnel closures.

SAFE LIFETIME EXTENSION OF ASSETS
Immersed tunnels under rivers or sea channels are composed of concrete segments linked to one another by large Gina seals that ensure the tunnel is watertight.

SealSafe® consists of beams of infrared laser sensors, which can be fitted along the circumference of the tunnel and linked to a single data logger. These sensors monitor movement and detect changes in the shape of the Gina seals over time. Data is transmitted to the cloud via wireless connection and can be accessed in real time through Fugro’s Gaia.Monitoring® platform.

BENEFITS
- Real-time access to data, available through Fugro’s Gaia.Monitoring® platform
- Early warning of any movement of the joints where visual inspection is not possible or very restricted
- Timely maintenance and repair plan, reducing the risk of unforeseen costs
- Minimises unexpected tunnel closures and disruption of critical services
SEALSAFE®

Technical Specifications

Dimensions*

- Beam Length: 0.40 – 1.15 m
- Number of sensors per beam: 2 – 7
- Individual sensor distance: 15 cm

* Other dimensions available on request

Measurement specifications

- Measurement range: 20 – 100 mm (20 – 200 mm under dark environmental conditions)
- Resolution: 0.1 mm
- Accuracy: 2 mm

Environmental

- IP rating: IP68 (2 bar, <48 hr)
- Operating temperature range: 10 – 35°C

Connectivity

- Data acquisition connection: RS485 (9600 baud, 8N1)
- Data format: proprietary NMEA sentence
- Connector: Fischer MINIMAX, beams can be connected up to a chain of 150 sensors
- Power supply: 30V – 36V (max 0.8W/sensor)

Auxiliary system components

- Cable feedthrough: Feeds cable between datalogger and sensors under Omega seal
- Joint distance sensor: Optical laser distance metre, to measure (changes in) joint distance
- Datalogger / Power supply: Transfers data to central server, via 4G for example
- Gaia.Monitoring® data portal: Fugro’s online data delivery platform for data presentation and analysis

INNOVATION FEATURES

- Contactless system that does not require connection between tunnel segments or the Gina seals; only connected at the end of one of the adjacent segments.
- Custom cable feedthrough that links the sensors to the datalogger via a cable under the Omega seal.