



# Intelligent Linear Heat Detection Systems

## Application Note

### Temperature Monitoring Solutions for Railway, Utility, and Road Tunnels

#### Overview

Distributed temperature sensing (DTS) using fiber optic sensing cables has been well recognized and proven within the industry as an ideal and practical technology to monitor for fires in railway, utility, and road tunnels.

The capability of DTS systems to monitor thousands of temperature measurement points in real-time along the complete length of either single or multiple fibers provides superior coverage, resulting in an efficient and cost-effective monitoring solution.

Given the long range capability of DTS solutions, the DTS control unit itself can be located outside of the tunnel, which avoids the need for power within the tunnel itself.

Since the sensing cable is optical fiber, it is intrinsically safe, is immune to EMI, and is not affected by smoke.

With ranges from 4km to 18km, SensorTran's array of DTS products and solutions are ideally suited to tunnel monitoring applications.



#### Better Decisions from Better Data

- Provides real-time dynamic temperature information for up to 40,000 points along a single fiber
- Fast measurement speeds enable immediate identification of fires and of developing hot spots within the tunnels
- Long range capability together with fast measurement speeds allow long tunnels to be monitored effectively and efficiently
- Since the DTS identifies the location of each temperature measurement point, the position, movement, and spread of fires and hot spots can be fully monitored by control rooms

#### Intelligent Monitoring Solutions

SensorTran's intelligent DTS monitoring solutions for tunnel monitoring provide real-time dynamic temperature data along the complete length of single or multiple optical fibers installed within the tunnel.

The DTS systems monitor the temperature for up to 40,000 discrete points with fine resolution, high accuracy, and very fast measurement speeds along a standard telecommunications-grade optical fiber up to 18km long.

With an onboard computer, such systems have an open communications architecture, allowing for reliable and easy interfacing with third-party systems and networks over, for example, Ethernet, Modbus, OPC, and SCADA. The systems also support programmable relay outputs.

SensorTran's specifically developed application software presents the data to the operator in a meaningful, representative, and intuitive graphical format.

Intelligent alarm types and configurations can be readily tailored for each specific project, to alert the operator - providing early warning of both potential and present dangers.

## System Features and Benefits

**SensorTran's** intelligent solutions provide a wealth of features:

- ⇒ up to 50 fiber optic channels available to provide monitoring for large tunnel networks from a single DTS monitoring unit
- ⇒ open communications architecture provides reliable and easy interfacing with third party systems and networks (e.g. Ethernet, OPC, SCADA, Modbus) together with flexible remote control and data output/input capabilities
- ⇒ intelligent and multiple alarm types and configurations can be readily tailored to each specific project to alert the operator of both potential and present dangers as well as other undesirable health events
- ⇒ each sensing fiber can be defined into unlimited zones with individual alarm types and set points for each zone, allowing alarms to fully reflect the changing characteristics along the full length of the tunnel
- ⇒ specifically developed application software presents the data to the operator in a meaningful, representative, and intuitive graphical format
- ⇒ wide range of packaging solutions are available to meet exacting project requirements
- ⇒ onboard and expandable data storage provides for historical data archiving
- ⇒ extensive onboard self diagnostics and autonomous operation with safe shutdown and auto start-up capabilities



## System Configuration

Single or multiple DTS units can be provided either as standalone equipment or within a cabinet. A typical single-DTS unit configuration is shown in the image below. DTS networks can also be readily implemented, providing expanded coverage for large tunnel networks.

Fiber optic channels: Up to 50 channels can be provided, which allows for monitoring of multiple tunnels in either **single-ended** or **double-ended** configuration



- ◆ Data and alarm output: Ethernet, OPC, Modbus, SCADA, relay contacts, RS232, RS485, etc.
- ◆ Remote control and data input: Ethernet, OPC, SCADA, RS232, RS485, etc.
- ◆ Peripheral equipment: printers, remote displays & keyboards, data back-up, etc.
- ◆ Extensive historian capability able to replay/revisit alarm events and asset performance



## Optical Fiber Sensing Cable and Configuration

SensorTran's range of DTS monitoring units is designed for use with standard telecommunications-grade optical fiber.

A range of optical sensing cables can be provided in accordance with specific project requirements or, alternatively, can be provided by the client. For tunnel monitoring applications, these cables are typically low-smoke, zero halogen type.

The sensing cable can be configured in either single-ended or double-ended configuration. In double-ended configuration, both ends of the fiber are connected to the DTS system to form a "loop".

Double-ended configuration has the additional advantage that in the unlikely event of a fiber break, the tunnel can still be totally monitored by the system.

## The SensorTran Advantage

SensorTran, a NASA technology spin-off, is committed to supplying its customers with smart distributed monitoring solutions. SensorTran's systems are conceived to have a low lifetime cost of ownership (LCO) by way of efficient design, superior engineering and reliable construction. SensorTran's team is dedicated to providing "best-in-industry" customer care from project conception to the development of specifications, through installation, training and beyond.

SensorTran is ISO-9001 certified and UL registered. SensorTran is also the proud recipient of a Frost & Sullivan Product Innovation Award for the DTS 5100 solution.



SensorTran has made every effort to ensure information contained in this document is accurate at the time of printing, however, product specifications and features are subject to change without notice.

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