

ROAD TUNNELS – LINEAR HEAT DETECTION USING DISTRIBUTED TEMPERATURE SENSOR TECHNOLOGY

Bandweaver's FireLaser distributed temperature sensing (DTS) technology has a successful track record in applications within road tunnel infrastructure. This environment has very specific demands of any solution such as low maintenance, low cost of ownership, high reliability and effective fire detection, and the FireLaser DTS technology is very well suited to road tunnel type settings.



FireLaser DTS has distinct advantages specifically in tunnel monitoring and ventilation control. It is fundamentally important that underground links have a high degree of reliability where the main risks are:

- › Safety of tunnel users and owners
- › To ensure continual availability of the tunnel
- › To ensure trouble free operation
- › Minimize maintenance work

Fires and field tests have shown that the temperature of burning vehicles in tunnels rises much more quickly than can be expected in a normal fire. How quickly and in which direction smoke and gases move depends on various factors, such as:

- › Safety of tunnel users and owners
- › The extent of the fire (fire load, intensity)
- › The ventilation system
- › Natural air currents
- › The smoke venting system
- › The profile and pitch of the tunnel



In traditional detection systems, if the seat of the fire does not happen to be immediately under a point type sensor, the fire can no longer be detected with certainty, mainly due to detector spacing. The FireLaser fire detection system does not have any such “gaps”, since the radiation heat given off by the fire is applied over the continuous length of sensing cable, and is recorded and displayed accordingly.

The fire detection system which incorporates a FireLaser DTS system recognizes a fire and automatically actuates the relevant, preprogrammed protective measures (alarm signals, ventilation control, extinguishing measures, etc.). The fire alarm system needs to provide information on the exact location of the fire and key data on fire development in order to bring the necessary rescue or fire-fighting measures into action systematically.

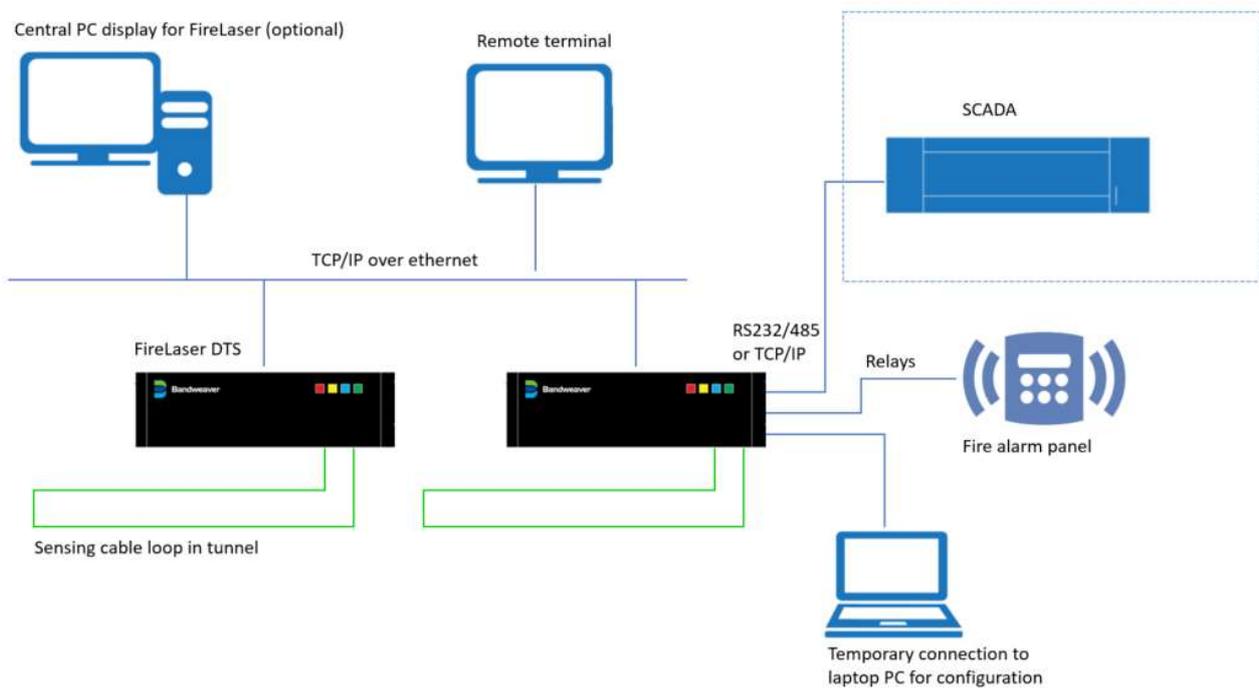
The Bandweaver FireLaser linear heat detection system has a centrally located sensor control unit, which is able to determine the temperature at any position along the length of connected DTS sensor cable. The sensor cable is fed through the assets to be protected. The cable is divided, through software configuration, into multiple fire detection zones, where each zone can have its own unique characteristic alarm thresholds assigned to it, so the system is extremely flexible in this regard.



Cable is suspended from a tunnel ceiling by use of the various fixing methods. If the sensing cable is installed in a straight line (along the line of sight of the tunnel), fixings should be installed on the tunnel ceiling at the rated separation, dependent upon the method employed. If the cable is not installed in a straight line, additional fixings may be required. Cable ties should be used to attach the sensing cable to the fixings. It is important that the sensing cable is installed carefully so that the cable parameters are not exceeded.



The minimum level of protection is achieved by locating the sensing cable at the tunnel ceiling, its position defined by the structure of the ceiling, but generally under a flat ceiling, the sensor cable can be located in the centre of the ceiling, at a distance of 25mm to 150mm from the ceiling surface. A suitable cable fixing method should be adopted, using the recommended cable fixing distances, generally 1.5m apart. This type of application is a so called “room protection” (see approvals) application, where the sensor cable is located at a distance away from the main fire risk.



An example of the system architecture

The location of the FireLaser controllers for an application is governed mainly by the geography of the site. Please note that the total cable length per circuit should never exceed 4 Km. this implies that accurate cable length calculations need to be made during the design process. A reasonable allowance for error should be made by the system designer. Many new installations will tend to use twin bore tunnels, for rail or road traffic to travel in opposing directions. Fiber optic cable is installed in each leg of the tunnel provided there is access from one tunnel to the other, so that cable can conveniently form a loop.



Approvals

The DTS system is approved to EN54 part 22. "Room Protection" is defined within EN54 part 22 para 3.1.12. The heat classification A1N indicates a normal operating temperature within the local environment of between 25C to 50C, and the alarm activation temperature between 54C and 65C. The scope of the EN54 part 22 fire standard covers the application of linear heat detection in a tunnel environment.



About Bandweaver Technologies

Bandweaver has been providing advanced fiber optic monitoring sensors and integrated technologies since 2002. Our knowledge regarding the application of distributed temperature sensing technology and linear heat detection within the fire industry is second to none. We focus on the safe integration of FireLaser DTS technologies into clients' proprietary systems and provide exceptional systems design support, product support during installation and provide long term maintenance packages.

For further information and system design support please contact our global team at www.bandweaver.com