What guarantees a safe passage here?

FibroLaser III – reliable fire protection for long and widespread systems.

Answers for infrastructure.
FibroLaser: detecting hazards – acting safely

When fire breaks out in tunnels, halls, and parking garages, on conveyor belts or in cable trays, fast action is required. Health and human life must be protected, damage to material assets minimized, high outage and resulting costs avoided. With the line type heat detection system FibroLaser™, Siemens offers a state-of-the-art solution, which has been proven worldwide and constitutes the largest installed base on the market.
Protecting your systems over the entire life cycle

**System solution – for systematic protection**

Only the best individual solution to a problem provides optimal protection. As a comprehensive solution FibroLaser combines:

- Leading sensor and signal technology – from deception-free fire detection and localization to automatic control of an extinguishing system.
- A multitude of network and integration possibilities – for every customer request, from integration in a danger management system to individual PC visualization.

**Comprehensive – all you need for fire protection**

With Siemens you rely on an expert in fire protection, offering complete solutions for applications in special environments. Siemens offers you everything from one source, e.g. for tunnels:

- Planning and consulting
- Fire detection with FibroLaser and Sinteso™ point type detectors
- Monitoring with Siveillance™ systems from Siemens
- Evacuation with the E100 voice alarm system

This guarantees that all these systems interact and work smoothly. You are provided with consistent specifications and documentation for all systems. In addition, the number of your contacts is reduced to one supplier and one contact person, which simplifies the project-related communication and coordination significantly.

**Cost effectiveness – over the entire life cycle**

FibroLaser is designed for many years of reliable operation and minimized life cycle costs.

This can already be experienced during planning by qualified experts and special VdS-tested design and calculation software – and continues in the implementation of the quickly installed, 100% maintenance-free sensor technology. Simple integration into economical standard systems also contributes to curbing costs.

The wear-free system, the long life, and high resistance of the sensor cable against dirt, dust, moisture, corrosive atmospheric, and nuclear radiation have a positive impact on the maintenance. In addition, a local service by trained staff is guaranteed over decades.

And in case of modernization, Siemens also guarantees the highest cost effectiveness: for example, components such as controllers, cables or network components can be replaced individually and modernized. Moreover, the new FibroLaser III is also compatible with the protocols of OTS100 and OTS-X. The network can therefore be easily incorporated.

**Experience – worldwide unique**

Experience is the best guarantee. With more than 10 years experience, Siemens is the pioneer in heat detection with line type heat detectors, and has a competent knowledge of applications. Siemens also has the largest installed base on the market with a length of more than 2,000 km and more than 1,200 controllers.

With the test tunnel Hagerbach a unique infrastructure is available for research, development, practical test, and optimization.

### Highlights

- Protection for harsh environmental conditions, for long or widespread systems – through line type heat detection
- Entire process from fire detection to transmission of information to the fire department – from one source
- Experience of a leading supplier – and a partner that is active worldwide
- High flexibility – through a system solution that allows simple integration and expansion

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In train tunnels FibroLaser can monitor and precisely localize striking increases in temperature.

FibroLaser is ideal for monitoring difficult applications such as conveyor belts.
The system – speed plus precision equals safety

Cable tray or road tunnel – so different the installations, so clear the demands on fire protection: quick detection and localization of the fire source – and minimizing the time until the fire alarm confirms. FibroLaser is a leader in both regards. Thus, the system satisfies the central requirements to prevent damage to lives and equipment and to protect your business operation.

- **Reliability over the entire distance – up to 20 km**
  As a line type heat detection system, FibroLaser offers consistent safety over the entire installation – with a detection area of up to two times 10 km in length. It meets the latest standards for line type heat detection. Through the certification of the VdS according to Pr EN 54-22, FM accreditation, and many other international endorsements, the doors are open to a broad range of applications.

- **Reliable heat detection – thanks to a robust sensor technology**
  FibroLaser provides high reliable heat detection also under harsh conditions: Robust sensor technology enables usage even under adverse conditions e.g. dampness, corrosion or dirt. Undiminished precision also during electromagnetic interference such as in cable trays or train tunnels.

- **Quick detection – precise localization**
  FibroLaser is sensitive to both convection and radiation heat. They are precisely analyzed within one second up to 0.5 m. As a result, the system is able to detect fires extremely quickly and with precise localization – combined with maximum immunity against deceptive phenomena and the elimination of false alarms.

- **Reliable alarming – efficient reaction**
  For fast and reliable alarm and evacuation, pre-alarm can be defined in order to warn the control center before the fire department receives the fire alarm. In order to intervene efficiently, FibroLaser provides the fire department with important information such as the exact location, the fire extent, and the direction of propagation of the fire. Also, necessary sections such as ventilation, smoke extraction systems, guidance system, and extinguishing systems are controlled according to the fire. The transmission of fire alarm and control commands takes place via a standard interface.

**Highlights**

- Consistent safety, compliant with the relevant standards, for an area of up to 20 km in length
- Highest precision and reliability under harsh environmental conditions
- Extremely quick heat detection with maximum immunity against deceptive phenomena
- Fast alarming and safe evacuation thanks to pre-alarm and detailed information
Examples for individual definition of parameters. In the praxis the parameters can be freely chosen and are respectively adapted to the risk and the environmental conditions.

The technology – light recognizes fire

FibroLaser uses the characteristics of glass fibre cables for a highly precise temperature sensor and fire localization system. The criteria that will ultimately sound an alarm can be individually defined – based on on-site conditions.

- The principle – temperature sensing with light reflection
  The system components of FibroLaser are the control unit and the attached glass fibre sensor cable. The control unit sends a laser beam through the cable. The glass fibre reflects this light and scatters it back – split into “Stokes” and “Anti-Stokes” signals (Raman Effect). While Stokes signals have nearly the same signal strength at all temperatures, this value rises proportionally to the temperature with Anti-Stokes signals.

  Thanks to semiconductor laser diodes, FibroLaser can measure these effects in glass fibres up to 10 km in length. By comparing Stokes and Anti-Stokes the control unit now reliably calculates the temperature and position of a heat source. Through optimization of temporal and local resolution, even slight temperature changes – such as an increase of a few degrees Celsius per minute – can be reliably and exactly displayed.

- The zoning – 1,000 sections on one cable
  On one sensor cable of up to 10 km in length 1,000 zones can be set up (2-channel system: 2 x 1,000 zones) – for instance for ventilation, cameras, emergency lights, traffic light control or intervention. These zones can be staggered one after the other, or partitioned in parallel. Every zone may be set with an individual alarm parameter.

- The alarm – configure parameters individually
  On-site conditions determine the parameters in which an alarm should be activated. FibroLaser allows three different criteria here: surpassing a defined maximum temperature – deviating too far from the average temperature of a zone – or experiencing a rapid temperature increase.

Highlights

- Quick, reliable heat detection and fire localization by determining the light reflection
- Partitioning the sensor cable in up to 1,000 zones
- Individually configurable alarm parameter to adapt to on-site conditions

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Detection range

**Alarm threshold 58 °C**
**Pre-alarm threshold 40 °C**

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Detection range

**Alarm threshold 15 °C**
**Pre-alarm threshold 7 °C**

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Detection range

**Alarm threshold 10 °C in 120 s**
**Pre-alarm threshold 6 °C in 60 s**

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Temperature in °C

<table>
<thead>
<tr>
<th>Temperature in °C</th>
<th>Detection range</th>
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<td>Alarm threshold 58 °C</td>
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<tr>
<td>50</td>
<td>Pre-alarm threshold 40 °C</td>
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Temperature in °C

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Temperature in °C

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Exceeding of a defined maximum temperature

Exceeding of a defined maximum difference from average zone temperature

Exceeding of a defined maximum temperature rise
**The integration – best protection through intelligent networking**

FibroLaser means more than detection, localization, and information transfer. The system can be integrated into the most diverse configurations and works together with a multitude of other systems, which are needed in case of emergency. Convenient visualization – directly on site or over Internet – rounds off the system philosophy.

- **Networkable – in every size and complexity**
  Only your requirements are crucial for the layout of FibroLaser. Whether a stand-alone system with relay output is recommended or the integration into a more complex technical environment – everything is possible.

  Some examples:
  - Integration into a comprehensive fire protection system
  - Easy integration into a higher level danger management system or connection to memory programmable control units over TCP/IP with all standard protocols
  - Easy expansion with hundreds of inputs and outputs in order to control complex control units
  - Special, customized solutions are developed in close cooperation with the customer

- **Danger under control – completely**
  In the event of an alarm, various systems must be coordinated for use:
  - Fire alarm
  - Video surveillance
  - Warning signal control
  - Ventilation
  - Illumination
  - Extinguishing
  - Monitoring the operating rooms
  - Customized controls

  Only when all the protection facilities involved are fully interconnected, will the safety system develop its full potential. Trust in the reliable proficiency of the control interfaces – because we offer the entire system technology from one source.

- **Visualization – where and how you want it**
  Tunnels, conveyor belts, parking decks – no matter how long or extensive the facility is: with FibroLaser, you see everything at a glance. Whether at a local terminal or over the Internet from anywhere in the world.
Even with the usual dirt and strong winds in tunnels, FibroLaser provides for reliable fire protection.

With FibroLaser, you don’t lose time: An open fire is located in less than 1 minute with a resolution of less than 3 m.

Reliable fire protection over the entire distance: FibroLaser in road tunnels

Strong winds of up to 10 m/s swirl smoke and hot gases in road tunnels, so that the maximum temperatures do not occur necessarily at the spot of the fire source. This is the reason why FibroLaser measures both the convection and radiation heat to ensure a reliable fire detection and localization.

- **Safe flow of traffic:**
  **FibroLaser in road tunnels**
  More and more road traffic will be moved "underground"—in order to create more efficient connections and to relieve the burden on cities. Tunnels and galleries are therefore the nerve centers of our mobile society. People, vehicles, and infrastructure must be protected here against the fire with maximum reliability.

  FibroLaser already renders reliable worldwide service in some of the most important tunnels day by day:
  - Quick detection and precise localization of the source of fire— for the selective activation of the appropriate systems from video surveillance and ventilation to the extinguishing system.
  - Ascertainment of the size and direction of the fire—information which is crucial for fast and appropriate action by the fire department.

- **Examples from practical experience**
  - Mont Blanc Tunnel (France)
  - Gotthard Tunnel (Switzerland)
  - Rennsteig Tunnel (Germany)
  - Lecco Tunnel (Italy)
  - Funing Tunnel (China)
  - KP Expressway (Singapore)

**Highlights**

- People, vehicles, and infrastructure must be protected against fire with maximum reliability.
- Quick detection and precise localization of the source of fire even in the event of strong winds in tunnels.
- Well-directed intervention thanks to the determination of the size and direction of fire.
Reliable protection of people and goods: FibroLaser in train tunnels

Electromagnetic fields, humidity, dust, dirt, and draft are the main challenges for reliable fire detection in train tunnels. The line type heat detection system FibroLaser is well equipped for it and completely insensitive to such disturbances.

- **Locating the source of heat:**
  FibroLaser in train tunnels
  In these times of high-speed traffic, the number of train tunnels has increased worldwide – and now include connections under the sea. Millions of people and thousands of tons of goods pass through them daily.

  The functions in particular:
  - Exact localization of the source of a fire – only then systems or air hatches can be activated at the correct location.
  - Determination of the fire’s direction and size, so that the fire department can intervene quicker and with more precision.

- **Examples from practical experience**
  - Indra Railway Tunnel (Spain)
  - MRTA Metro Bangkok (Thailand)
  - Betuwe Route Railway Tunnel (The Netherlands)
  - Orte Railway Tunnel (Italy)

**Highlights**

- Reliable and exact localization of the source of a fire
- The fire department can intervene quicker and with more precision and can thus save lives
Safety in obscured areas: 
FibroLaser for industrial applications

As a robust, maintenance-free system FibroLaser is the optimal heat detection system for areas subject to harsh environmental conditions, such as corrosive gases, high humidity or dirt and for areas, in which the sensor cannot be accessed any longer after the installation.

**Robust, even in the smallest corner:** FibroLaser for industrial applications
Fires can occur in many areas of sprawling facilities such as conveyor belts, cable trays, manufacturing lines, factory workshops or parking slots – in the ceiling, walls, and perhaps even under the floor.

But what is at first invisible has to be reliably recognized and located, in order to prevent the fire from growing rapidly and causing resulting massive damage.

Here, FibroLaser assumes the function of:
– Reliably registering even slight temperature increases
– Sounding an alarm when the defined tolerance limits are reached

**Examples from practical experience**
– Helsinki Energy (Finland)
– Ontario Power Generation (Canada)
– Power Plant Opatovice (Czech Republic)
– OMV Refinery Schwechat (Austria)
– Chi Ma Wan Cable Tray (Hong Kong)

**Highlights**

– Preventing the fire from growing rapidly and causing massive damage under difficult environmental conditions – without false alarms through deceptive phenomena

– Reliable long-term protection, even for areas that are difficult to access, thanks to the maintenance-free sensor cable

– Complete safety for long distances and wide areas
Research and testing – welcome to a different kind of laboratory

One hour away from Zurich (Switzerland) lies a subterranean, one-of-a-kind test laboratory: the Hagerbach tunnel. Here Siemens researches the phenomena of fires that are able to spread over long distances. Here innovative ideas must stand up to practical tests.

- **A success story – since 1997**
  Since operations started about one decade ago, a multitude of different tests have been carried out in the Hagerbach tunnel.

  The themes range from early detection and reliable localization to dependable extinguishing – demonstrated under real conditions.

- **New findings – also for specialists**
  Every year the widespread network of tunnel systems is visited by local and foreign fire experts. They witness how FibroLaser makes reliable detection and localization even under adverse conditions – for example in thick smoke, where video surveillance systems only show black monitor screens.

- **Practical know-how – basis for market leadership**
  Last but not least, the practical experience gained here has led to Siemens being the worldwide leading provider of fire safety solutions with line type heat detection systems.

  Fast, deception-free detection and fighting of fire sources belong to the core competences of the company, which is committed to the safety of human life and assets.

- **Experience the tests – live in the Hagerbach tunnel**
  Interested in a fascinating visit to the Hagerbach tunnel? You’ll find a Siemens contact nearby – who will be pleased to hear of your interest.

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**Highlights**

- You can be sure to get leading-edge technology – based on long-term research and development
- Proven highly effective practice – through their own testing facilities from Siemens Building Technologies in the test gallery Hagerbach
- Direct insight into latest developments
The FibroLaser OTS30xx Controller allows a fast, precise temperature monitoring over distances up to 10 km. The flexible alarm criteria allow an appropriate reaction to critical conditions (pre-alarm) and fast alerting with corresponding controls in the event of fire (alarm). In addition to the localization of the source of fire, the system provides crucial information regarding size and direction of the fire.

The FibroLaser OTS30xx-SC (Switch-Controller) allows a fast, selective temperature monitoring over distances up to 20 km. The "optical switch" installed in the device allows monitoring of two sensor fibres of maximum 10 km each. Through the two optical channels the Switch-Controller also allows the installation of a back-up system used to monitor the entire area in the event of cable break.

The standard version offers two glass fibre cables. The metal-free MFLT4-FRNC cable is mainly used for tunnel applications. In industrial plants, an extremely high robustness is generally required as regards mechanical impact. Therefore, the SWLT4-FRNC steel-stranded cable is used for such applications. Both cables are equipped with a halogen-free, infrared-absorbing, and retardant cable sheet FRNC (Flame Retardant Non Corrosive).

The FibroLaser system is ideal for temperature monitoring in power plants and in the heavy industry. For these sectors such cables are required, which can be easily operated over years at temperatures of several 100 °C, or in areas with high radioactive radiation.

The available network components allow the integration of FibroLaser control units into a complete system. The FibroNet elements allow an easy network connection of the control units over all standard protocols such as TCP/IP or modules. With the FibroNet-IO the system can be upgraded with hundreds of inputs and outputs. All network components can be preassigned on request.

The FibroManager allows an easy overview as regards the temperature values and the system conditions such as pre-alarm, alarm or disturbance in the programmed zones. The FibroWeb PC software allows the visualization of the customized facility with all indicators such as temperature values, alarms, active ventilation, etc. This visualization based on customer demands is adapted individually.

*xx is the monitoring distance in km (xx = 01, 02, 04, 06, 10)
Answers for infrastructure.

- **Megatrends driving the future**
  The megatrends – demographic change, urbanization, climate change, and globalization – are shaping the world today. These have an unprecedented impact on our lives and on vital sectors of our economy.

- **Innovative technologies to answer the associated toughest questions**
  Throughout a 160-year history of proven research and engineering talent, with more than 50,000 active patents, Siemens has continuously provided its customers with innovations in the areas of healthcare, energy, industry, and infrastructure – globally and locally.

- **Increase productivity and efficiency through complete building life cycle management**
  Building Technologies offers intelligent integrated solutions for industry, commercial and residential buildings, and public infrastructure. Over the entire facility’s life cycle, our comprehensive and environmentally conscious portfolio of products, systems, solutions, and services for low-voltage power distribution and electrical installation technology, building automation, fire safety and security ensures the:
  - optimum comfort and highest energy efficiency in buildings,
  - safety and security for people, processes, and assets,
  - increased business productivity.