



PROTECTOWIRE® *FiberSystem* 8000

Fiber Optic
Linear Heat
Detection for
Special Hazard
Applications

The Protectowire Fiber Optic System

In today's complex industrial environments, the potential for down time and financial losses caused by overheat and fire can be disastrous if not detected and located quickly. That is why Protectowire Linear Heat and Fire Detection Systems are the first choice of many design professionals. With thousands of systems installed world-wide, The Protectowire Company is a leader in linear heat detection technology. Our new FiberSystem 8000 is based upon today's most advanced technology in the field of fiber optic temperature measuring techniques and incorporates many unique and specifiable features not available on competitive systems.

Principle

The Protectowire FiberSystem 8000 measures temperatures by means of optical fibers functioning as linear sensors. Temperatures are recorded along the sensor cable as a continuous profile. This ensures high accuracy

of temperature discrimination over great distances or large surfaces, while reducing measuring times.

The system utilizes the so-called Raman effect to measure temperatures with optical fibers made of quartz glass. Quartz glass is a form of silicon dioxide with amorphous solid structure. Thermal effects induce lattice

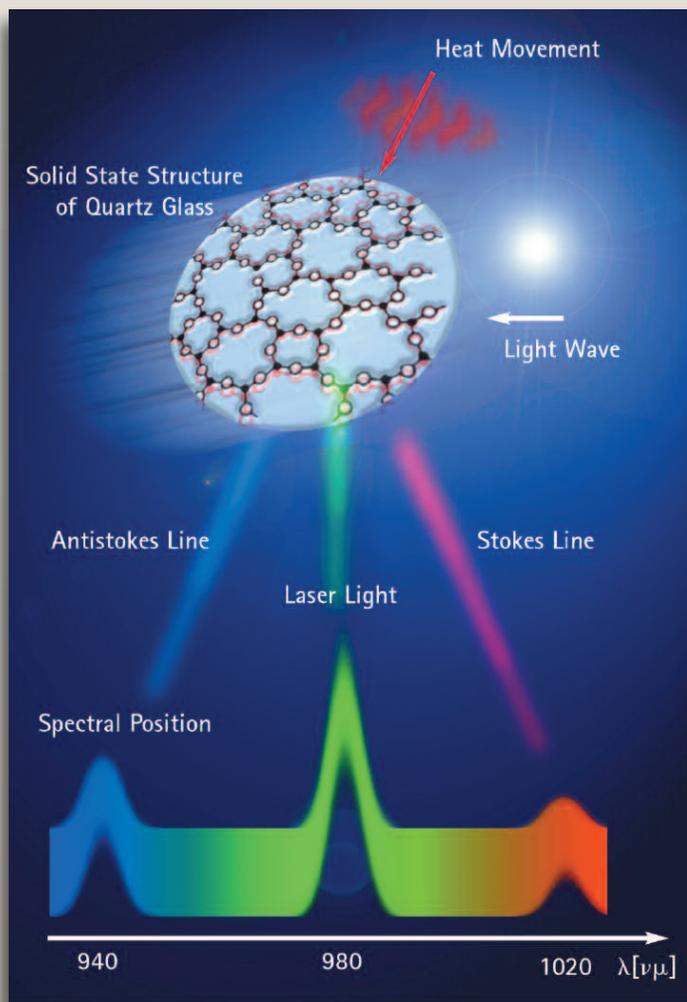
oscillations within the solid. When light falls onto these thermally excited molecular oscillations, an interaction occurs between the light particles (photons) and electrons of the molecule. Light scatter, also known as Raman scatter, occurs in the optical fiber. Unlike incident light, this scattered light undergoes a spectral shift by an amount equivalent to the resonance frequency of the lattice oscillation.

The light scattered back from the fiber optic therefore contains three different spectral components:

- Rayleigh scatter with the wavelength of the laser source used.
- Stokes components with the higher wavelength in which photons are generated.
- Anti-Stokes components with a lower wavelength than the Rayleigh scatter, in which photons are destroyed.

The intensity of the so-called Anti-Stokes band is temperature dependent, while the Stokes band is practically independent of temperature. The local temperature of the optical fiber is derived from the ratio of the Anti-Stokes and Stokes light intensities.

Using semiconductor laser diodes and a new type of evaluation procedure, the FiberSystem 8000 Controller is capable of detecting both scatter effects (Rayleigh and Raman) in up to 6 miles (10 km) of optical sensor cable and reliably indicate temperature changes as small as one or two degrees centigrade per minute.



Protectowire . . . on the cutting edge of Linear Heat Detection Technology

Features

The Protectowire FiberSystem 8000 has been developed to satisfy the most demanding fire detection applications. By using state-of-the-art technology, we now have the capability to reduce response time, minimize false alarms, increase system reliability and provide a new level of communication and alarm information to the system user.

The Linear Fiber Optic Sensor is a cable that is capable of detecting hot gases as well as radiated heat and is adaptable to

individual objects or hazards. The sensor cable contains no electronics and is therefore immune to electromagnetic disturbances of all kinds.

The sensor cable has been designed to provide years of useful service. Its rugged construction resists most environmental influences, such as temperature, pressure and moisture changes as well as pollution and exhaust gases, which contain high amounts of corrosive materials.

Installation and maintenance of the sensor cable is simple. A damaged section can be repaired easily by splicing in a new length of cable.

Like all Protectowire Linear Heat Detection Systems, FiberSystem 8000 will provide an exact location of the fire or hot spot anywhere along the sensor's length.

- **Unique zoning capabilities.**

A single length of sensor can be partitioned into different segments (zones) for various requirements (e.g. video, ventilation, extinguishment zones). Zones can be defined as desired and even overlapped, increasing system control capabilities.

- **Multiple alarm initiating criteria by zone.**

Alarm initiating may be based upon a maximum temperature per zone, temperature development per zone in terms of time (time differential /rate-of-rise) or temperature difference between a measurement location and the zone average (zone differential).

- **Capable of providing visualization of the fire size.**

Based upon the length of sensor in alarm.

- **Capable of determining the direction of fire spread.**

Most fires have a dominant direction of spread. Knowing this direction of spread, the intervention forces can direct their attack to the less dangerous side of the fire.

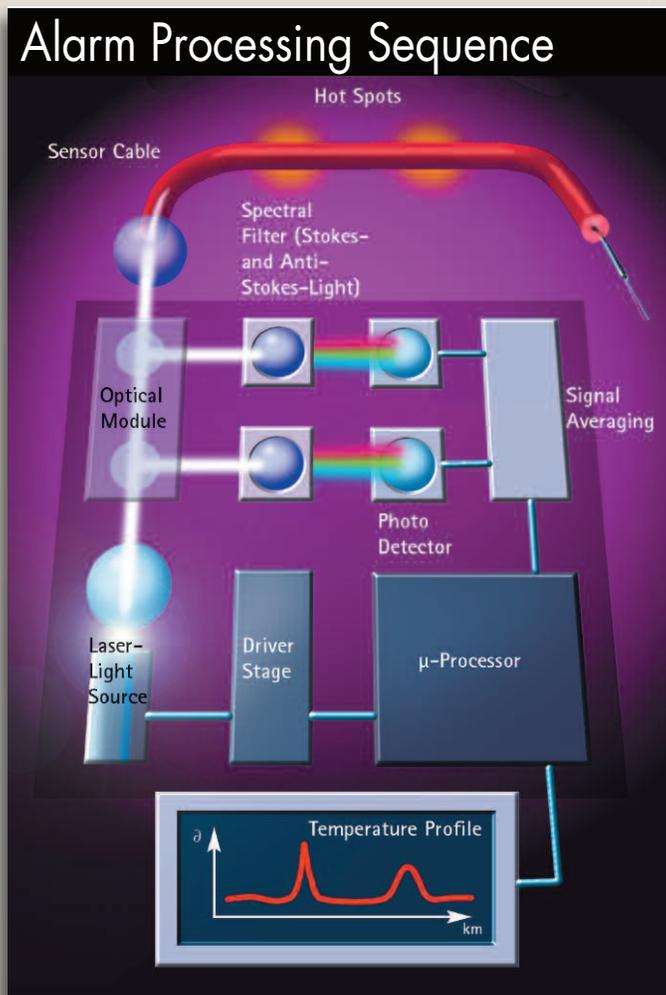
- **Available in 1, 2 or 4 channel models.**

Standard PTS Controllers are configured to operate as a Single Channel Single End device. In this configuration, if a fiber break caused by fire or mechanical damage should occur, the monitored area after the fiber break would be lost, and would no longer be capable of initiating an alarm.

When a Multi-Channel Controller is utilized, it incorporates additional optical connectors. These connectors allow the device to operate in a Multi-Channel Single End mode, or a Multi-Channel Closed Loop mode.

In a Multi-Channel Single End configuration, the Controller performs single ended measurements on two or four separate fibers thus providing distinct detection "channels." In the Multi-Channel Closed Loop operating mode, the sensor cable is installed in a loop and the Controller performs measurements from both ends of the fiber. If a break should occur in the fiber, the entire sensor cable length continues to be monitored from both directions thus ensuring detection over the entire length of the sensor cable up to the point of the break.

- **Capable of continuous temperature monitoring in ranges up to 6 miles (10 km).**



System Configuration

The Protectowire FiberSystem 8000 is custom configured to each customer's application requirements and is specifically designed for high risk commercial and industrial hazards that demand high reliability and customized system features. Special capabilities, such as custom operating logic, temperature monitoring, visualization of fire size and spread, outdoor or hazardous installation environments, and extinguishment release activation can all be provided to meet the most demanding operational requirements.

The system consists of the following major components:

- **Fiber Optic Sensor Cable.**
The sensor cable consists of two models. A non-metallic model and a stainless steel reinforced version. Both models contain two independent color-coded quartz fibers. Depending upon the model selected, the inner core is clad with a layer of fine stainless steel wires or tightly packed Aramid yarns. The sensor's core is then sheathed in a flame retardant jacketing material to a diameter of .16 inches (4 mm).
- **The FiberSystem 8000 PTS Controller.**
The Controller is housed in a NEMA 1 (IP20) type enclosure and contains the system operating software, laser light generator, signal receiver module, digital processor, and 24 VDC power supply module.

The Controller is provided with four (4) optically decoupled inputs and forty four (44) voltage-free outputs (forty three alarm and one trouble) for alarm and trouble reporting to a main fire alarm panel. Optionally available is a relay extension module that can operate up to 256 volt-free outputs for fire detection system control unit interface. The system can be integrated easily into your management platform (e.g. SCADA systems) by either directly communicating over Ethernet (TCP/IP) using SCPI (Standard Commands for Programmable Interface), or Modbus RS232, RS422, RS485 and TCP/IP.

Enhanced User Interface Capabilities

The Configuration Software is the heart of the new Protectowire FiberSystem 8000. It provides an easy-to-use graphical user interface to the PTS Controller from a computer and can be used as the basic application for calibrating the sensor, creating configurations, creating measurement sequences, starting measurements, and viewing traces.

In addition, you can set instrument specific data, start and stop measurements, save results (traces), and manage the connected instrument. The software makes it possible to create multiple zones along a single length of sensor cable, determine the direction of fire spread, provide visualization of the fire size based upon the length of sensor in alarm and configure zone related alarm generated outputs for event handling.



Passive and Maintenance-free Sensors for Every Application

With over 70 years of experience in linear heat detection technology, The Protectowire Company offers the widest range of linear heat detectors in the world. Our new fiber optic sensors are available in several different constructions designed to satisfy every application need.

The standard sensor cable designated Type MF, consists of a non-metallic core that accommodates two optical fibers. The coatings of the optical fibers have

been specifically selected to suit the widest range of environmental and application temperature requirements. The sensor cable uses a halogen-free, flame-retardant jacket that provides high flexibility and good bending behavior. High tensile strength is provided by tightly buffered Aramid yarns braided around the inner core.

The Type MF sensor cable is ideal for use in applications with high amounts of electromagnetic disturbances like rail tunnels or electrical cable trays, since its metal-free construction minimizes the risk of induced voltages. No electronic components or devices are needed in the sensor circuit. The detection system is completely passive in the actual measuring and detection process.

For those applications that require the ultimate in rugged performance, a second version of the basic sensor cable is available. This sensor cable known as Type FR is constructed using a stainless steel core tube. In the tube are two independent color-coded quartz fibers. The stainless steel tube is clad with a layer of fine stainless steel wires and sheathed in a halogen-free, flame-retardant jacket specifically designed to provide high reliability, excellent tensile strength and rugged mechanical construction.



Global Leadership in Linear Heat Detection Technology

In the special hazard fire protection industry, the focus is on the protection of people's lives and property. The Protectowire Company has achieved its leadership position within the industry by continually developing and improving products designed to meet the challenges of a broad range of applications.

Our specialized engineering and design talents are focused on providing a total system approach that offers unique capabilities. Whatever the application, we can design a system to fit your needs.

The Protectowire Company and its employees are dedicated to bringing you products designed, engineered, and manufactured with the highest degree of quality and reliability.

This is demonstrated by over 75 years of excellence within the fire protection community. We are an ISO 9001:2008 Registered Company and hold other specific approvals around the world.



The Protectowire Company, Inc.
60 Washington Street, Pembroke, MA 02359-1833 U.S.A.
781-826-3878; Fax 781-826-2045
Website: www.protectowire.com
E-mail: pwire@protectowire.com

Manufacturer of
Special Hazard
Fire Detection Systems