PROTECTOWIRE® FireSystems

Protectowire FiberSystem 4000 OTS Series Controllers

Features

- Unique zoning capabilities. A single length of sensor can contain up to 128 zones and 640 sub-zones.
- Multiple alarm initiating criteria by zone.
- Programmable custom operating logic.
- Capable of temperature monitoring.
- Graphic display of zones, temperature profile, fire size, and spread using optional visualization software.
- Optional Ethernet Interface (TCP/IP) available.

Description

The Protectowire FiberSystem 4000 has been designed for use as a linear heat detection system using state-of-the-art fiber optic sensing technology. The system consists of Type PFS Fiber Optic Sensor Cable and the OTS Series Controllers with related software. The system can be 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.

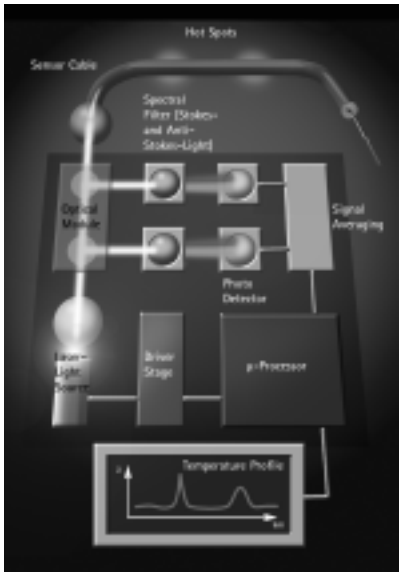
Like all Protectowire Linear Heat Detection Systems, FiberSystem 4000 will provide an exact location of the fire or hot spot anywhere along the sensor's length. When configured using the optional Charron-02 Configuration and Visualization Software, the System is also capable of providing graphical representation of the fire size and direction of fire spread based upon the length of sensor in alarm.

The system utilizes the so-called Raman effect to measure temperatures with optical fibers made of quartz glass. Thermal effects induce lattice oscillations within the solid fibers. When light falls onto these thermally excited molecular oscillations, an interaction occurs between the light particles (photons) and electrons of the molecule. Light scattered back from the optical fibers contains three different spectral components:

- Rayleigh scatter with the wavelength of the laser source used.
- Stokes components with a higher wavelength.
- Anti-Stokes components with a lower wavelength than the Rayleigh scatter.

The intensity of the 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. By detecting the back-scattered Raman light from the PFS Sensor Cable, the Controller is capable of reliably indicating temperature changes as small as one or two degrees centigrade per minute.

Alarm Processing Sequence



System Design Features

Each OTS Controller is provided with four programmable optically decoupled inputs, and ten programmable voltage-free outputs (nine alarm, one multifunction) for alarm and trouble reporting to a main fire alarm panel. Optionally, up to 20 volt-free outputs for fire detection control unit interface are also available. A PC connection using an RS232 interface is provided for setting operating parameters during initial start-up. As an option, a PC can be connected at the Controller to permanently display zones and/or the temperature profile using a special license for the visualization software. Also available is an optional Ethernet Interface (TCP/IP) that allows the OTS Controller to be integrated into a network.

Configuration: Designed for 19 inch (48.3 cm) rack mounting, the OTS Controller is modular in design and contains the system operating software, transmitter module, receiver module, digital module (with RS232 and optional Ethernet Interface), and power supply module available in 24 VDC, or 115/230 VAC.

- Transmitter Module: This module contains the laser and its control. Its function is to generate the laser light by means of a semiconductor laser diode, and to control its overall operation.
- Receiver Module: This unit contains the entire optical design including coupler and optical receiver. Its function is to couple the laser light generated in the transmitter module to the sensor cable. Additionally, the Raman back-scattered light returned from the sensor fiber is distributed to the individual measurement channels, converted optically/electrically and amplified.
- Digital Module: The Digital Module controls the overall operation of the Controller and the temperature measurement process. Based upon the data it receives, the unit calculates the temperature profile along the sensor cable, controls alarm processing based upon stored zone definitions, manages the integrated four inputs and ten (20 optional) outputs, and communicates over the serial interface or via Ethernet (optional). The device software (firmware) is also stored in the Digital Module.
- Power Supply Module: This module supplies all components of the OTS Controller with the necessary operating voltage.

Visual Indicators & Controls: The Controller is provided with eleven (11) system status indicators and one (1) key operated reset switch mounted on the front panel. The LED visual indicators are grouped into five functional categories and signal the following information:

- Operation - Power On (green); Laser On (green); Fault/Trouble (yellow).
- Communication - RS232 Sending (green); RS232 Receiving (green); Ethernet Connection Established (green); Active Ethernet Communication (green).
- Switch Contacts - Active Input (green); Switched Output (green).
- Alarms - One red LED indicator (on steady, Alarm Active; flashing, Previous Alarm Unacknowledged).
- Explosion Protection - Explosion protection loop closed (green).

Functions

Measurement Parameters: The OTS Controllers evaluation procedure permits local measurement of the temperature in the sensor cable. The location resolution of the continuous measurement can be set project specific. The longer the sensor cable and the shorter the spatial resolution, the more measurement locations must be queried and the longer a measurement cycle lasts.

Range	Spatial Resolution	Cycle Time	Accuracy
2 km (6,560 ft.)	1 m (3.3 ft.)	14-15 seconds	+/- 2.0
2 km (6,560 ft.)	1.5 m (5 ft.)	14 seconds	+/- 1.0
2 km (6,560 ft.)	2 m (6.6 ft.)	14 seconds	+/- 0.5
2 km (6,560 ft.)	3 m (10 ft.)	14 seconds	+/- 0.5
4 km (13,120 ft.)	3 m (10 ft.)	14 seconds	+/- 3.0

Zones: A single length of sensor cable can be subdivided into different zones for various requirements (e.g. video, ventilation, and extinguishment zones). Zones can be defined as desired and even overlapped, increasing system control capabilities. All model OTS Controllers provide a maximum of 128 zones. Individual alarm parameters and outputs can be assigned to each zone. The OTS4000 Controller also provides the ability to subdivide 64 zones into a maximum of ten sub-zones each (640 total). This

feature is particularly useful for connecting the Controller to a control panel with extinguishing release capabilities.

Alarm Initiation: Temperature measurement on the sensor cable by the OTS Controller takes place at periodic intervals known as the measurement cycle time. An alarm is triggered at the end of the measurement cycle if any one of the following alarm criteria is exceeded in a zone:

- Maximum temperature per zone.
- Temperature development per zone in terms of time (time differential/rate-of-rise).
- Temperature difference between a measurement location and the zone average (zone differential).

Unlike conventional systems, these alarm settings are user selectable and can be adapted individually by zone depending upon the specific requirements of the application.

Fire Size: When using the enhanced Charon-02 Configuration and Visualization Software, the OTS Controllers are capable of providing visualization of the fire size. There are five standard fire sizes available for visualization: Size 1 = 5 m (16.5 ft.); Size 2 = 10 m (33 ft.); Size 3 = 50 m (164 ft.); Size 4 = 100 m (328 ft.); Size 5 = 500 m (1,640 ft.).

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. The enhanced visualization software provides three different options for determining the direction of fire spread.

- No direction - localized.
- Toward the OTS Controller (beginning of the sensor cable run).
- In the direction away from the OTS Controller (toward the end of the sensor cable run).

Alarm Reset: Alarms triggered by alarm contacts must be reset. This is done with one of the four input contacts, the key operated switch on the front of the OTS Controller, or via the visualization software.

Communication

The Charon-02 Configuration and Visualization Software is the heart of the Protectowire FiberSystem 4000. The system can be easily adapted to specific customer requirements, and offers numerous options for displaying and processing the recorded alarm and temperature data. The software makes it possible to create multiple zones along a single length of sensor cable, provide unique alarm visualization graphics, and to configure zone related alarm generated outputs for event handling.

During initial system startup, a separate PC containing the Charon-02 Software is used to configure and commission the OTS Controllers. After the Controller has been configured and the proper operating parameters defined, the PC is disconnected and no longer required. By purchasing the optional software license, the visualization software can be fully utilized to display expanded graphics showing the recorded alarm and temperature measurement data over an RS232 connection to a PC or a third party system. An optional Ethernet Interface (TCP/IP) is also available to integrate the OTS Controller into a network.

In order to ensure proper operation of the Charon-02 Software, Administrator access is needed for installation on your computer along with hardware and software components that meet or exceed the following minimum system requirements:

- PC with Intel Pentium III (500 MHz processor).
- Microsoft Windows NT 4.0 with Service Pack 6 or higher, Windows 2000 Service Pack 2 or higher, or Microsoft Windows XP Service Pack 1.
- Graphic interface and monitor with a resolution of 800 x 600 or higher.
- 128 MB of memory.
- At least 250 MB of free hard drive memory for program installation and the database.

FiberSystem 4000 OTS Specifications

Performance

Range: Model OTS2000 - 2 km (6,562 ft.); Model OTS4000 - 4 km (13,124 ft.)

Power Input

Standard: DC Power Supply, 22 - 30 VDC, maximum power consumption 50 W @ 24 VDC

Optional: AC Power Supply, 85 - 264 VAC, 47 - 63 Hz.

Typical input current: 0.95 A @ 115 VAC and 0.45 A @ 230 VAC

Communication

Interface RS232, socket SUB-D 9 pin male

Ethernet Interface, TCP/IP, socket RJ45

Four programmable inputs, socket SUB-D 9 pin female

10 programmable outputs, socket SUB-D 25 pin female; 20 programmable outputs, socket SUB-HD 44

Environmental Operating Conditions

Ambient temperature: 0° to 40°C (32° to 104°F)

Humidity: Maximum 95% non-condensing

Mounting

Designed for 19 inch (48.3 cm) rack or cabinet mounting

Size H x W x D: 13.5 cm x 44.9 cm x 31.8 cm (5.3 in. x 17.7 in. x 12.5 in.)

Weight: 10.2 kg (22.5 lbs.)

Ordering Information

FiberSystem 4000 OTS Controllers - Select the model number of the basic system control unit.

- **OTS2000** - Fiber Optic Fire Detection Controller 2,000 m (6,560 ft.) range, 24 VDC power supply, 10 outputs, 4 inputs, and spatial resolution of 1.5 - 3 m (5 - 10 ft.).
- **OTS4000** - Fiber Optic Fire Detection Controller 4,000 m (13,120 ft.) range, 24 VDC power supply, 10 outputs, 4 inputs, and spatial resolution of 1.5 - 3 m (5 - 10 ft.).

OTS Controller Options - Add option code letter(s) to basic OTS model number when ordering.

Option Code	Description	OTS2000	OTS4000
A	115/230 VAC Power Input	■	■
B	20 Programmable Outputs	■	■
C	TCP/IP Interface	■	■
D	EX-Zone Access for Explosive Hazards	■	■
	ATEX Certified Zone 0		
E	OTS Enhanced Public Software Code Access	■	■
F	Enhanced Spatial Resolution up to 1 m (3.3 ft.)	■	○
G	Enhanced Spatial Resolution up to .5 m (1.6 ft.)	■	○
H	Extinguishing Control up to 640 Sub-Zones	○	■
J	Enhanced Spatial Resolution up to 1 m (3.3 ft.)	○	■
K	Enhanced Spatial Resolution up to .5 m (1.6 ft.)	○	■

■ Option Available ○ Option Not Available

Accessories

Model Number	Description
INS-24	Installation Set for 24 VDC Controllers. Includes (1) E-2000 Pigtail, (1) Joint Box, (5) End-of -Line Protective Covers, and (1) each Power Supply Cable, Input Cable, Output Cable, and Communication Cable.
INS-115	Installation Set for 115 VAC Controllers. Includes (1) E-2000 Pigtail, (1) Joint Box, (5) End-of -Line Protective Covers, and (1) each Power Supply Cable, Input Cable, Output Cable, and Communication Cable.
INS-230	Installation Set for 230 VAC Controllers. Includes (1) E-2000 Pigtail, (1) Joint Box, (5) End-of -Line Protective Covers, and (1) each Power Supply Cable, Input Cable, Output Cable, and Communication Cable.

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